Government of Karnataka

DEPARTMENT OF SCHOOL EDUCATION AND LITERACY

Learning outcome Based Assessment (LBA)

QUESTION BANK

2026-27

MATHEMATICS

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NINTH STANDARD

DEPARTMENT OF STATE EDUCATIONAL RESEARCH AND TRAINING

BANASHANKARI 3rd STAGE, BENAGALURU-560085

&

DISTRICT INSTITUTE OF EDUCATION AND TRAINING KOLAR

ಪರಿಕಲ್ಪನೆ ಮತ್ತು ಮಾರ್ಗದರ್ಶನ	
ಶ್ರೀಮತಿ ರಶ್ಮಿ ಮಹೇಶ್. ವಿ, ಭಾ.ಆ.ಸೇ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು, ಶಾಲಾ ಶಿಕ್ಷಣ ಮತ್ತು ಸಾಕ್ಷರತಾ ಇಲಾಖೆ	
ಶ್ರೀಮತಿ. ಡಾ. ಕೆ. ವಿದ್ಯಾಕುಮಾರಿ, ಭಾ.ಆ.ಸೇ ರಾಜ್ಯ ಯೋಜನಾ ನಿರ್ದೇಶಕರು, ಸಮಗ್ರ ಶಿಕ್ಷಣ ಇಲಾಖೆ, ಬೆಂಗಳೂರು	**ಶ್ರೀಮತಿ. ಅನಿತಾ ನಾಜರೆ,** ನಿರ್ದೇಶಕರು **DSERT** ಬೆಂಗಳೂರು
ಡಯಟ್ ಸಹಕಾರ	
ಶ್ರೀ. ನಂಜುಂಡಯ್ಯ. ಎನ್, ಪ್ರಾಂಶುಪಾಲರು, ಡಯಟ್, ಕೋಲಾರ	ಶ್ರೀ. ನಾಗರಾಜು, ಹಿರಿಯ ಉಪನ್ಯಾಸಕರು, ಡಯಟ್ ಕೋಲಾರ
ಸಂಯೋಜನೆ	
ಶ್ರೀಮತಿ. ರಾಧ. ಪಿ, ಹಿರಿಯ ಸಹಾಯಕ ನಿರ್ದೇಶಕರು, **D.S.E.R.T**, ಬೆಂಗಳೂರು	
ರಚನಾ ಸಂಪನ್ಮೂಲ ತಂಡ	
1. ಶ್ರೀಮತಿ ಪುಷ್ಪ. ಎಚ್. ಎಸ್, ಸ.ಶಿ **GHS**, ಮಾದಮಂಗಲ, ಬಂಗಾರಪೇಟೆ(ತಾ)	**2.** ಶ್ರೀ. ರಾಘವೇಂದ್ರ. ಎಸ್, ಸ.ಶಿ, **GGPUC**, ಕೋಲಾರ (ತಾ & ಜಿ)
3. ಶ್ರೀಮತಿ. ನಾಗರತ್ನ. ಜೆ. ಎಂ, ಸ.ಶಿ, **GHS**, ಬೆಗ್ಲಿಹೊಸಹಳ್ಳಿ, ಕೋಲಾರ(ತಾ & ಜಿ)	**4.** ಶ್ರೀಮತಿ. ನಾಜೀಮಾ ಫಝುಲತ್, ಸ.ಶಿ **GJC Boys**, ಮುಳಬಾಗಿಲು(ತಾ), ಕೋಲಾರ(ಜಿ)
5. ಶ್ರೀ. ಶಿವಕುಮಾರ್. ಕೆ, ಸ.ಶಿ, **GHS**, ಕುರುಗಲ್, ಕೋಲಾರ(ತಾ & ಜಿ)	**6.** ಶ್ರೀ. ಮಧುಸೂಧನ್. ಬಿ,ಎಮ್, ಸ.ಶಿ, ಬಾಪೂಜಿ ಪ್ರೌಢಶಾಲೆ, ಕೋಲಾರ(ತಾ&ಜಿ)
ಪರಿಷ್ಕರಣಾ ಸಂಪನ್ಮೂಲ ತಂಡ	
ಶ್ರೀ. ಅರುಣ್ ಕುಮಾರ್. ಎಂ, ಸ.ಶಿ, **KPS**, ಸೋಮಯಾಜಲಹಳ್ಳಿ, ಶ್ರೀನಿವಾಸಪುರ(ತಾ), ಕೋಲಾರ	ಶ್ರೀ. ಶಿವರಾಮ. ಎಂ. ಎಸ್, ಸ.ಶಿ, **GHS**, ಮಟ್ಟಕನ್ನಸಂದ್ರ, ಶ್ರೀನಿವಾಸಪುರ(ತಾ), ಕೋಲಾರ(ಜಿ)
ಪರಿಶೀಲಕರು	
ಶ್ರೀ. ಗುರುರಾಜ್ ಹೊಸೂರಕರ್, ಸ. ಶಿ, **KPS**, ಹೆಗ್ಗನಹಳ್ಳಿ, ಬೆಂಗಳೂರು ಉತ್ತರ ವಲಯ – 1	ಶ್ರೀ. ರಾಘವೇಂದ್ರ ಆರ್, ಸ.ಶಿ, **KPS**, ಆವಣಿ, ಮುಳಬಾಗಿಲು(ತಾ), ಕೋಲಾರ(ಜಿ)
ಶ್ರೀ. ಬಾಲಕೃಷ್ಣ ರಾವ್. ಪಿ. ಎನ್, ಸ.ಶಿ, **GHS**, ನಂಬಿಹಳ್ಳಿ, ಶ್ರೀನಿವಾಸಪುರ(ತಾ), ಕೋಲಾರ(ಜಿ)	
ಮಾರ್ಗದರ್ಶಕರು	
ಶ್ರೀ. ಹರಿಪ್ರಸಾದ್ ಜಿ.ವಿ ಉಪನಿರ್ದೇಶಕರು, **D.S.E.R.T**, ಬೆಂಗಳೂರು	ಶ್ರೀ. ಟಿ.ಕೆ. ರಾಘವೇಂದ್ರ, ನಿವೃತ್ತ ಹಿರಿಯ ಉಪನ್ಯಾಸಕರು, ಡಯಟ್, ಕೋಲಾರ

ಮುನ್ನುಡಿ

ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ತರಗತಿ ನಿರ್ದಿಷ್ಟ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಕಲಿಕೆಯನ್ನು ಉಂಟುಮಾಡಲು ಹಾಗೂ ರಾಷ್ಟ್ರ, ಮತ್ತು ರಾಜ್ಯ ಮಟ್ಟದ ಸಾಧನಾ ಸಮೀಕ್ಷೆಗಳಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳ ಕಲಿಕಾ ಸಾಧನೆಯನ್ನು ಉತ್ತಮಪಡಿಸುವ ಮೂಲಕ ಶಾಲಾ ಶೈಕ್ಷಣಿಕ ವ್ಯವಸ್ಥೆಯನ್ನು ಬಲಪಡಿಸಲು ಹಾಗೂ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ತರಗತಿ ಪ್ರಕ್ರಿಯೆಗಳನ್ನು ಪರಿಣಾಮಕಾರಿಗೊಳಿಸಲು ರಾಜ್ಯಮಟ್ಟದಲ್ಲಿ ಹಲವಾರು ಉಪಕ್ರಮಗಳನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ತರಗತಿ ಪ್ರಕ್ರಿಯೆ, ಮೌಲ್ಯಾಂಕನ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಗಳನ್ನು ಸಾಮರ್ಥ್ಯಾಧಾರಿತ, ಕಲಿಕಾ ಫಲ ಆಧಾರಿತವಾಗಿ ನಿರ್ವಹಿಸಲು ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ನಿರೀಕ್ಷಿತ ಕಲಿಕಾ ಸಾಮರ್ಥ್ಯಗಳನ್ನು ಬೆಳೆಸಲು ರಾಜ್ಯ ಶೈಕ್ಷಣಿಕ ಸಂಶೋಧನೆ ಮತ್ತು ತರಬೇತಿ ಇಲಾಖೆ (DSERT) ಯಿಂದ ಕ್ರಮಗಳನ್ನು ಕೈಗೊಳ್ಳಲಾಗುತ್ತಿದೆ. ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ 2026–27ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿಗೆ ಒಂದನೇ ತರಗತಿಯಿಂದ ಹತ್ತನೇ ತರಗತಿಯವರೆಗೆ 'ಗಣಿತ' ವಿಷಯದಲ್ಲಿ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಮೌಲ್ಯಾಂಕನ ಪ್ರಶ್ನಕೋಠಿಯನ್ನು (LBA) ರೂಪಿಸಲಾಗಿದೆ.

ಪ್ರತಿ ತರಗತಿಗೆ ಸಂಬಂಧಿಸಿದ ಕಲಿಕಾ ವಿಷಯಗಳಲ್ಲಿ, ಕಲಿಕಾ ಸಾಮರ್ಥ್ಯಗಳು ಹಾಗೂ ಕಲಿಕಾ ಫಲಗಳ ಆಧಾರದಲ್ಲಿ ಪ್ರಶ್ನೆಗಳನ್ನು ರೂಪಿಸಲಾಗಿದೆ. ಗಣಿತ ವಿಷಯದಲ್ಲಿ ಪರಿಕಲ್ಪನಾತ್ಮಕ ಜ್ಞಾನ, ತಿಳಿವಳಿಕೆ, ಕೌಶಲ, ಅನ್ವಯ, ಸಮಸ್ಯಾ ಪರಿಹಾರ ಕೌಶಲಗಳು, ಗಣಿತೀಯ ಅನ್ವಯನ, ಸೃಜನೆ ಹಾಗೂ ಉನ್ನತ ಮಟ್ಟದಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳ ಕಲಿಕೆಯನ್ನು ಮೌಲ್ಯಾಂಕನ ಮಾಡುವ ಉದ್ದೇಶದಿಂದ ವಸ್ತುನಿಷ್ಠ, ಸಂಕ್ಷಿಪ್ತ, ವಿವರಣಾತ್ಮಕ, ಅನ್ವಯಿಕ, ಕೌಶಲಾಧಾರಿತದಂತಹ ವಿವಿಧ ಸ್ವರೂಪದ ಪ್ರಶ್ನೆಗಳನ್ನು ರಚಿಸಲಾಗಿದೆ. ಇವು ಕಲಿಕಾರ್ಥಿಗಳಲ್ಲಿ ಉನ್ನತ ಮಟ್ಟದ ಚಿಂತನಾ ಕೌಶಲಗಳನ್ನು ಮೂಡಿಸಲು ಉಪಯುಕ್ತವಾಗಿವೆ.

ಕಲಿಕಾ ಫಲ / ಸಾಮರ್ಥ್ಯ ಆಧಾರಿತ ಮೌಲ್ಯಾಂಕನವು ಕೇವಲ ವಿದ್ಯಾರ್ಥಿಗಳ ಶೈಕ್ಷಣಿಕ ಸಾಧನೆಯನ್ನು ಅಳೆಯುವ ಸಾಧನವಲ್ಲ; ಬದಲಾಗಿ ಕಲಿಕೆಯ ಗುಣಮಟ್ಟವನ್ನು ವೃದ್ಧಿಸುವ, ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಪರಿಣಾಮಕಾರಿಯಾಗಿಸುವ ಹಾಗೂ ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿಯ ಕಲಿಕಾ ಪ್ರಗತಿಯನ್ನು ನಿರಂತರವಾಗಿ ಗುರುತಿಸಿ, ಅಗತ್ಯ ಶೈಕ್ಷಣಿಕ ಬೆಂಬಲ ಒದಗಿಸುವ ಪ್ರಮುಖ ಶೈಕ್ಷಣಿಕ ಸಾಧನವಾಗಿದೆ. ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ **ಶಿಕ್ಷಕರು ಸದರಿ ಪ್ರಶ್ನೆಕೋಠಿಯನ್ನು ತರಗತಿ ಪ್ರಕ್ರಿಯೆ, ಮೌಲ್ಯಾಂಕನ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಗಳಲ್ಲಿ ನಿರಂತರವಾಗಿ (CCE) ಬಳಸುವುದು ಅತ್ಯವಶ್ಯಕವಾಗಿದೆ.**

ರಾಜ್ಯದ ಎಲ್ಲಾ ಶಾಲೆಗಳಲ್ಲಿ ಗಣಿತ ಬೋಧನಾ–ಕಲಿಕಾ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಮತ್ತಷ್ಟು ಉತ್ತಮಗೊಳಿಸುವಲ್ಲಿ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಕಲಿಕೆಯನ್ನು ಉನ್ನತೀಕರಿಸುವಲ್ಲಿ ಈ **ಕಲಿಕಾಫಲ ಆಧಾರಿತ** ಮೌಲ್ಯಾಂಕನ ಪ್ರಶ್ನೆಕೋಠಿಯು ಉಪಯುಕ್ತವಾಗಲಿದೆ. ಸದರಿ ಕಾರ್ಯದಲ್ಲಿ ಭಾಗವಹಿಸಿದ ವಿಷಯ ಪರಿಣಿತರು, ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು, ಶಿಕ್ಷಣ ತಜ್ಞರಿಗೆ ಇಲಾಖೆಯು ಕೃತಜ್ಞತೆಗಳನ್ನು ಸಲ್ಲಿಸುತ್ತದೆ.

ನಿರ್ದೇಶಕರು
ಡಿ.ಎಸ್.ಇ.ಆರ್.ಟಿ, ಬೆಂಗಳೂರು

ಕಲಿಕಾ ಫಲ ಆಧಾರಿತ ಪ್ರಶ್ನೆಕೋಠಿಯನ್ನು ಬಳಸಲು ಅನುಸರಿಸಬೇಕಾದ ಸೂಚನೆಗಳು

- ಇದು ಕಲಿಕಾ ಫಲ ಆಧಾರಿತ ಪ್ರಶ್ನೆಕೋಠಿಯಾಗಿದ್ದು, ಪ್ರತಿ ಎಲ್ ಓ ಗಳಿಗೆ ಸಾಧ್ಯವಿರುವ ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳನ್ನು ಸಿದ್ಧಪಡಿಸಿ ಇದರಲ್ಲಿ ನೀಡಲಾಗಿದೆ.
- ಇದನ್ನು ಶಿಕ್ಷಕರು ತಮ್ಮ ದೈನಂದಿನ ಕಲಿಕಾ ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಲಾಗಿದೆ
- ಈ ಪ್ರಶ್ನೆ ಕೋಠಿಯು ಬಹು ಆಯ್ಕೆ, ಒಂದು ಅಂಕ, ಎರಡು ಅಂಕ, ಮೂರು ಅಂಕ, ನಾಲ್ಕು ಅಂಕ ಮತ್ತು ಐದು ಅಂಕದ ಪ್ರಶ್ನೆಗಳನ್ನು ಒಳಗೊಂಡಿದ್ದು, ಪ್ರತಿ ಎಲ್ ಓ ಗಳಿಗೆ ಅನ್ವಯಿಸುವಂತೆ ಸಿದ್ಧಪಡಿಸಿದ್ದು, ಅವುಗಳನ್ನು ಅಧ್ಯಾಯವಾರು ನೀಡಲಾಗಿದೆ.
- ಸದರಿ ಪ್ರಶ್ನೆಕೋಠಿಯು ಎಲ್ ಓ ಆಧಾರಿತ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಪ್ರತಿ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸೂಕ್ತವಾದ ಉತ್ತರವನ್ನು ಸಹ ನೀಡಲಾಗಿದೆ. ಇಲ್ಲಿ ನೀಡಲಾದ ಉತ್ತರವನ್ನು ಹೊರತು ಪಡಿಸಿ ಬೇರೆ ವಿಧಾನದಿಂದಲೂ ಬಿಡಿಸಲು ಸಾಧ್ಯವಿದ್ದರೆ, ಅದನ್ನು ತರಗತಿಯ ಪ್ರಕ್ರಿಯಲ್ಲಿ ಚರ್ಚಿಸಲು ಅವಕಾಶವಿದೆ.
- ಇದನ್ನು ತರಗತಿಯ ಕಲಿಕಾ ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ನಿರಂತರವಾಗಿ ಮತ್ತು ಸಮಗ್ರವಾಗಿ ಪ್ರತಿ ಮೌಲ್ಯಮಾಪನದ ಸಂದಂರ್ಭದಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಲಾಗಿದೆ.
- ಸದರಿ ಸಾಮಗ್ರಿಯನ್ನು ಶಿಕ್ಷಕರು ಒಂದು ಸಂಪನ್ಮೂಲವಾಗಿ ಬಳಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಿದ್ದು, ಇದನ್ನು ಪ್ರತಿ ಮಗುವಿಗೆ ಝರಾಕ್ಸ ಮಾಡಿ ನೀಡಲೇ ಬೇಕೆಂದು ತಿಳಿಸಿರುವುದಿಲ್ಲಾ. ಮಕ್ಕಳಿಗೆ ಎಲ್ ಓ ಆಧಾರಿತ ಕಲಿಕೆಯು ಖಾತರಿ ಪಡಿಸಿಕೊಳ್ಳಲು ನಡೆಸುವ ನಿರಂತರ ಮತ್ತು ಸಮಗ್ರ ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಿದೆ.
- ಇಲಾಖೆಯು ಹಮ್ಮಿಕೊಳ್ಳುವ ಎಲ್ಲಾ ತರಗತಿವಾರು ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಸದರಿ ಪ್ರಶ್ನೆಕೋಠಿಯಲ್ಲಿ ನೀಡಲಾದ ಎಲ್ ಓ ಗಳನ್ನು ಆಧಾರವಾಗಿ ಯೋಜನೆಯನ್ನು ಸಿದ್ಧಪಡಿಸಿ ನಡೆಸಲಾಗುವುದು.

COMPETNCIES AND LEARNING OUTCOMES

Curricular Goals	Competencies	Learning Outcomes	Chapter Name
Understands numbers (natural, whole, integer, rational, irrational, and real), ways of representing numbers, relationships amongst numbers, and number sets.	**C-1.1:** Develops understanding of numbers, including the set of real numbers and its properties.	1. Classify real numbers. Identify the decimal expansion of rational numbers as terminating or non-terminating and recurring and convert recurring decimals into p/q form. Find rational numbers between any two rational numbers Represent irrational numbers on number line. 2. Establish the connection between the number sets and simplify irrational numbers. 3. Apply logical reasoning to establish the properties of real numbers and use them in different situations.	**1. Number System**
Builds deductive and inductive logic to prove theorems related to numbers and their relationships (such as '√2 is an irrational number', recursion relation for ***Virahanka*** numbers, formula for the sum of the first ***n*** square numbers).	**C-2.1:** Apply laws of indices to simplify rational and irrational numbers	4. Extends the understanding of powers (radical powers) and exponents and apply the laws of indices to real numbers.	
	C-3.1: States and motivates/proves the Remainder Theorem, Factor Theorem, and Division Algorithm.		
	C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or polynomial equations) and draws conclusions about the	5. Identify and classify algebraic expressions as polynomials. Identify the types and degree of polynomials. Find the value of the polynomials and check whether the given value is zero of the polynomials or not.	**2. Polynomials**

Discovers and proves algebraic identities and models real-life situations in the form of equations to solve them.	situation being modeled.	6. Check whether the given polynomial is a factor of the other polynomial and factorize them using factor theorem. 7. Find the product, expand, factorize the polynomials using suitable algebraic identities.	
		8. Identify linear equations in two variables and write them in standard form. Form linear equations in two variables from real-life situations. Verify whether the given values are the solutions for the given linear equation in two variables or not.	**4. Linear Equations in Two Variables**
	C-3.3: Learns Brahmagupta's quadratic formula (in symbolic and poetic forms), its derivation, and applies it to solve Bhaskara's poetic puzzles and modern-day problems.		
	C-4.1: Describes relationships, including congruence of two-dimensional geometric shapes (lines, angles, triangles), to make and test conjectures and solve problems.	9. Identify various properties of lines and angles and apply them to solve problems.	**6. Lines and Angles**
		10. Establish the properties of congruence of two triangles and apply them to solve problems related to different types of congruent triangles.	**7. Triangles**
	C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals and applies them to solve geometric problems.	11. Derive mathematical statements related to quadrilaterals and use them to solve problems. 12. Prove the properties of parallelogram logically and use these properties to solve problems and to prove midpoint theorem.	**8. Quadrilaterals**

Analyses characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships.	**C-4.3:** Proves theorems related to circle geometry, including chords, subtended angles, inscribed polygons, and area in terms of π.	13. Prove properties of chord in a circle logically. Establish the relationship between the angle subtended at the centre and angle subtended at the circumference by the same arc and solve various problems. 14. Prove the properties of cyclic quadrilaterals and solve problems related to cyclic quadrilaterals.	**9. Circles**
	C-4.4: Understands the irrationality of π, historical approximations of π, and Madhava's infinite series formula for π.		
	C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, including graphical solutions of equations and area calculations using coordinates.	15. Identify the X-axis, Y-axis, origin, and quadrants in the Cartesian plane. Mark the points in the cartesian plane and Identify the coordinates of the point marked on the Cartesian plane also identify the quadrant to which they belong	**3. Coordinate Geometry**
	C-4.6: Understands the definitions, history, motivation, and applications of trigonometric functions, including Aryabhata's introduction of sine and cosine functions.		
Derives and uses formulae to calculate areas of plane figures, and surface areas and volumes of solid objects.	**C-5.1:** Visualizes, represents, and calculates the area of a triangle using Heron's Formula and its extension to cyclic quadrilaterals using Brahmagupta's Formula.	16. Apply Heron's Formula to find the area of triangles in real-life situations.	**10. Heron's Formula**

	C-5.2: Visualizes and derives formulae for calculating surface areas and volumes of solid objects such as cubes, cuboids, spheres, hemispheres, cylinders, cones, and their combinations.	17. Derive formulae for the surface area and volume of a cone and apply them to find the volume and surface area of cone-shaped objects found in the surroundings. 18. Derive formulae for the surface area and volume of spheres and hemispheres and apply them to find the volume and surface area of such objects found in the surroundings and solve various problems.	**11. Surface Areas and Volumes**
Analyses and interprets data using statistical concepts (such as measures of central tendency, standard deviations) and probability.	**C-6.1:** Applies measures of central tendency such as mean, median, and mode.		
	C-6.2: Applies concepts of probability to solve problems involving the likelihood of everyday events.		
Begins to perceive and appreciate the axiomatic and deductive structure of Mathematics.	**C-7.1:** Proves mathematical statements and performs geometric constructions using assumptions, axioms, postulates, definitions, and mathematical vocabulary.		
	C-7.2: Visualizes and appreciates geometric proofs for algebraic identities and other "proofs without words."		
	C-7.3: Proves theorems using Euclid's axioms and postulates for angles, triangles, quadrilaterals, circles, and area-related	19. Define a point, line, line segment, ray, angles, and surfaces. 20. Apply definitions, Euclids axioms, and postulates to solve basic problems related to lines, angles, and plane	**5. Introduction to Euclid's Geometry**

	theorems involving triangles and parallelograms.	figures.	
	C-7.4: Constructs geometrical figures such as line segment bisectors, angle bisectors, triangles, and polygons satisfying given constraints.		
Builds skills such as visualisation, optimisation, representation, and mathematical modelling along with their application in daily life.	**C-8.1:** Models daily-life phenomena and uses graphs, tables, and equations to draw conclusions.	21. Represent and analyse given data using different forms such as tables (grouped or ungrouped), bar graphs, histograms (with equal and unequal class intervals), and frequency polygons.	**12. Statistics**
	C-8.2: Uses two-dimensional representations of three-dimensional objects to visualize and solve problems involving surface area and volume.		
	C-8.3: Employs optimization strategies to maximize desired quantities (e.g., area, volume, or output) under given constraints.		
Develops computational thinking, i.e., deals with complex problems and is able to break them down into a series of simple problems that can then be solved by suitable procedures/algorithms.	**C-9.1:** Decomposes a problem into smaller sub-problems.	22. Solve various problems in daily life situations	
	C-9.2: Describes and analyzes a sequence of instructions being followed.		
	C-9.3: Analyzes similarities and differences among problems to develop solutions applicable to multiple situations.		

	C-9.4: Engages in algorithmic problem-solving to design effective solutions.		
Knows and appreciates important contributions of mathematicians from India and around the world.	**C-10.1:** Recognizes the important contributions of Indian and other mathematicians to the development of Mathematics, including numbers, geometry, and algebra.		
	C-10.2: Recognizes modern contributions to Mathematics in India and abroad and understands emerging frontiers and major open questions in the field.		
Explores connections of Mathematics with other subjects.	**C-11.1:** Applies mathematical knowledge and tools to analyze problems and situations across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.	23. Appreciate the integration of mathematics with other subjects	All chapters

INDEX

Sl. No	CHAPTER	Page No.	
		Questions	Answers
01	NUMBER SYSTEM	12 – 17	97 – 108
02	POLYNOMIALS	18 – 23	109 – 118
03	COORDINATE GEOMETRY	24 – 28	119 – 121
04	LINEAR EQUATIONS IN TWO VARIABLES	29 – 31	122– 124
05	INTRODUCTION TO EUCLID GEOMETRY	32 – 36	125 – 129
06	LINES AND ANGLES	37 – 48	130 – 142
07	TRIANGLES	49 – 56	143 – 152
08	QUADRILATERALS	57 – 66	153 – 165
09	CIRCLES	67 – 77	166 – 175
10	HERONS FORMULA	78 – 80	176 – 180
11	SURFACE AREAS AND VOLUMES	81 – 88	181 – 190
12	STATISTICS	89 – 95	191 – 198

CHAPTER -1 NUMBER SYSTEM

LO. No	Learning Outcomes	Question Numbers
1	Classify real numbers. Identify the decimal expansion of rational numbers as terminating or non-terminating and recurring and convert recurring decimals into $\frac{p}{q}$ form. Find rational numbers between any two rational numbers. Represent irrational numbers on number line.	1, 2, 3, 4, 5, 8, 16, 23, 24, 25, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 51, 64, 65, 66, 71, 73, 74
2	Establish the connection between the number sets and simplify irrational numbers.	6, 7, 9, 10, 11, 12, 13, 17, 27, 28, 29, 30, 49, 50, 53, 54, 55, 58, 59, 60, 68, 69, 70,
3	Apply logical reasoning to establish the properties of real numbers and use them in different situations.	26, 61, 62, 63, 72
4	Extends the understanding of powers (radical powers) and exponents and apply the laws of indices to real numbers	14, 15, 18, 19, 20, 21, 22, 31, 32, 33, 34, 35, 52, 67,

EASY	AVERAGE	DIFFICULT	TOTAL
19	50	05	74

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries One-mark)

1. A number 1.101001000….. is an example for (EASY)

A) Natural number B) Whole number

C) Rational number D) Irrational number

2. Every rational number is a (EASY)

A) Natural number B) Real number

C) Whole number D) Irrational number

3. Among the following the rational number is (EASY)

A) $\sqrt{25}$ B) π C) 1.232342345…….. D) $\sqrt{3}$

4. Among the following an irrational number is (EASY)

A) $\sqrt{49}$ B) $\frac{4}{3}$ C) 5.478 D) $\sqrt{13}$

5. Between two rational numbers (AVERAGE)

A) There is no rational number.

B) There is exactly one rational number.

C) There are infinitely many rational numbers.

D) There is only one rational number and no irrational number.

6. The value of $\sqrt{6} \times \sqrt{27}$ is (AVERAGE)

A) 162 B) $9\sqrt{2}$ C) $9\sqrt{3}$ D) $3\sqrt{2}$

7. $2\sqrt{3} + \sqrt{3}$ is equal to (EASY)

A) $2\sqrt{6}$ B) $2\sqrt{3}$ C) $3\sqrt{3}$ D) $2\sqrt{9}$

8. The decimal form of $\frac{32}{1000}$ is (EASY)

(A) 0.032 (B) 0.32 (C) 0.0032 (D) 0.320

9. $\sqrt{6} \times \sqrt{3}$ is equal to (EASY)

(A) $2\sqrt{3}$ (B) $3\sqrt{2}$ (C) $3\sqrt{3}$ (D) $3\sqrt{6}$

10. The rationalising factor (R.F) of $\sqrt{5} + \sqrt{3}$ is (EASY)

A) $\sqrt{5} - \sqrt{3}$ B) $\sqrt{5} + \sqrt{3}$ C) $\sqrt{3}$ D) $\sqrt{5}$

11. The rationalising factor (R.F) of $2 - 5\sqrt{7}$ is (EASY)

A) $2 - 5\sqrt{7}$ B) $2 + 5\sqrt{7}$ C) $2(5\sqrt{7})$ D) $-3\sqrt{7}$

12. Rationalising the denominator of $\frac{1}{\sqrt{3}+\sqrt{2}}$ is (AVERAGE)

A) 1 B) $\sqrt{3} + \sqrt{2}$ C) $\sqrt{3} - \sqrt{2}$ D) $\sqrt{5}$

13. Value of $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$ is (AVERAGE)

A) $\frac{\sqrt{80}}{\sqrt{20}}$ B) 2 C) 4 D) $\sqrt{2}$

14. The value of $(256)^{\frac{1}{4}}$ is (AVERAGE)

A) 16 B) 256 C) 4 D) 2

15. The value of $\left(\sqrt{x^3}\right)^{\frac{2}{3}}$ (AVERAGE)

A) $x^{\frac{2}{3}}$ B) x^3 C) $x^{\frac{2}{9}}$ D) x

16. A number 0.6666666…… can be expressed in the form of $\frac{p}{q}$ as (AVERAGE)

A) $0.\overline{6}$ B) $\frac{10}{3}$ C) $\frac{47}{7}$ D) $\frac{2}{3}$

17. The product of $3 + 2\sqrt{2}$ and $3 - 2\sqrt{2}$ is (AVERAGE)

A) $(3 + 2\sqrt{2})$ B) $(3 - 2\sqrt{2})$ C) 1 D) $9 + 4\sqrt{2}$

18. $m^3 \times m^3$ can be expressed as (EASY)

A) m^6 B) m^9 C) m^1 D) m^0

19. The value of $\frac{10^5}{2^3 \times 5^3}$ is (AVERAGE)

A) 10 B) 50 C) 100 D) 1000

20. $(ab)^{-2}$ can be expressed as (AVERAGE)

A) $\frac{1}{a^2b^2}$ B) $\frac{1}{a^{-2}b^{-2}}$ C) a^2b^2 D) $\frac{-2}{ab}$

21. The value of 1000^0 is (EASY)

A) 1000 B) 100 C) 10 D) 1

22. The value of $\{[(2)^2]^2\}^2$ is (AVERAGE)

A) 16 B) 64 C) 256 D) 512

II. Answer the following questions: (One-mark questions)

23. Define rational number. (EASY)

24. Define irrational number. (EASY)

25. Give an example for irrational number. (EASY)

26. Is zero a rational number?

Can you write it in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$? (EASY)

27. Add: $2\sqrt{2} + 5\sqrt{3}$ and $\sqrt{2} - \sqrt{3}$ (EASY)

28. Multiply: $6\sqrt{5}$ by $2\sqrt{5}$ (EASY)

29. Divide: $8\sqrt{15}$ by $2\sqrt{3}$ (EASY)

30. Simplify: $(\sqrt{11} - \sqrt{7})(\sqrt{11} + \sqrt{7})$ (AVERAGE)

31. Simplify: $\left(\sqrt[3]{27}\right)^2$ (AVERAGE)

32. Find the value of $9^{\frac{3}{2}}$. (AVERAGE)

33. Find the value of $\sqrt[3]{\sqrt{64}}$ (DIFFICULT)

34. Find the value of $64^{\frac{1}{2}}$ (AVERAGE)

35. Find the value of $(32)^{\frac{2}{5}}$ (AVERAGE)

III. Answer the following questions: (Two-marks questions)

36. Express the following in $\frac{p}{q}$ form. (AVERAGE)

(A) 0.123 (B) 0.0534

37. Find 4 rational numbers in $\frac{p}{q}$ form between 1 and 2. (AVERAGE)

38. Find 5 rational numbers in $\frac{p}{q}$ form between 3 and 4. (AVERAGE)

39. Find 6 rational numbers in $\frac{p}{q}$ form between 4 and 5. (AVERAGE)

40. Find 4 rational numbers between $\frac{1}{3}$ and $\frac{1}{4}$. (AVERAGE)

41. Classify the following numbers as rational or irrational: (EASY)

(i) $\sqrt{23}$ (ii) $\sqrt{225}$

(iii)1.101001000100001... (iv) 7.478478...

42. Express 0.333333……. in the form of $\frac{p}{q}$ (AVERAGE)

43. Express 0.99999……. in the form of $\frac{p}{q}$ (AVERAGE)

44. Express 0.121212……. in the form of $\frac{p}{q}$ (AVERAGE)

45. Express 2.123123123……. in the form of $\frac{p}{q}$ (AVERAGE)

46. Express $1.\overline{27}$ in the form of $\frac{p}{q}$ (AVERAGE)

47. Express $0.\overline{256}$ in the form of $\frac{p}{q}$ (AVERAGE)

48. Express $0.4\overline{7}$ in the form of $\frac{p}{q}$ (AVERAGE)

49. Find the sum of $5\sqrt{x}+7\sqrt{y}, 12\sqrt{x}-9\sqrt{y}$ and $-8\sqrt{x}+3\sqrt{y}$ (AVERAGE)

50. Evaluate$\sqrt{128}+\sqrt{50}-\sqrt{98}$ (AVERAGE)

51. Find an irrational number between $\frac{1}{7}$ and $\frac{2}{7}$ (AVERAGE)

52. Simplify $\left(\sqrt{3}+\sqrt{7}\right)^2$ (AVERAGE)

53. Simplify $(3+\sqrt{3})(2+\sqrt{2})$ (AVERAGE)

54. Simplify: $(4+\sqrt{3})(2-\sqrt{2})$ (AVERAGE)

55. Simplify $(5+\sqrt{3})(5-\sqrt{3})$ (AVERAGE)

56. Simplify $(2-\sqrt{5})^2$ (AVERAGE)

57. Simplify $(\sqrt{5}+\sqrt{2})^2$ (AVERAGE)

58. Rationalise the denominator and simplify: $\frac{1}{\sqrt{3}+\sqrt{2}}$ (AVERAGE)

59. Rationalise the denominator and simplify: $\frac{1}{\sqrt{7}-\sqrt{6}}$ (AVERAGE)

60. Rationalise the denominator and simplify: $\frac{1}{\sqrt{7}-2}$ (AVERAGE)

IV. Answer the following questions: (Three-marks questions)

61. Recall that π(pi) is defined as the ratio of the circumference of a circle to its diameter. That is, $\pi = \frac{22}{7}$. This seems to contradict the fact that π is an irrational number. How would you resolve this contradiction? (AVERAGE)

62. In a mathematics activity, a student Sahana argues that since the value of the fraction $\frac{1}{3}$ is 0.333…… and it is non-terminating, it is an irrational number. Her classmate Ravi states that since it is in the form $\frac{p}{q}$, it is a rational number. Whose argument is correct? Justify with appropriate mathematical rule. (AVERAGE)

63. Pritam and Sneha are discussing a mathematical rule. Pritam argues that "the sum of two irrational numbers is always an irrational number." But Sneha contradicts this, saying "this is not always true; in some cases, the sum can also be a rational number." Using the properties of real numbers, prove whose argument is correct with a suitable example. (AVERAGE)

64. Locate $\sqrt{2}$ on the number line. (AVERAGE)

65. Locate $\sqrt{3}$ on the number line. (AVERAGE)

66. Locate $\sqrt{5}$ on the number line. (DIFFICULT)

67. Find the value of:

(i) $(9)^{\frac{3}{2}}$ (ii) $(125)^{\frac{2}{5}}$ (iii) $(16)^{\frac{3}{4}}$ (AVERAGE)

68. Rationalise the denominator and simplify: $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}}$ (AVERAGE)

69. Rationalise the denominator and simplify: $\frac{1}{7+3\sqrt{2}}$ (AVERAGE)

70. Rationalise the denominator and simplify: $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ (AVERAGE)

71. Write the following in decimal form and say what kind of decimal expansion each has:

(i) $\frac{36}{100}$ (ii) $\frac{1}{11}$ (iii) $4\frac{1}{8}$ (AVERAGE)

V. Answer the following questions (Four-marks questions)

72. In a quiz, it was asked 'based on value, which among $\sqrt{2}$ and $\sqrt[3]{3}$ is greater?'. A student named Ramesh immediately answers, "Since the value of 3 is greater than the value of 2, $\sqrt[3]{3}$ must be greater." Is this reasoning mathematically correct? Analyze. (DIFFICULT)

73. Represent $\sqrt{5.3}$ on the number line (DIFFICULT)

74. Represent $\sqrt{9.3}$ on the number line (DIFFICULT)

CHAPTER – 2 POLYNOMIALS

LO. No	Learning Outcomes	Question Numbers
5	Identify and classify algebraic expressions as polynomials. Identify the types and degree of polynomials. Find the value of the polynomials and check whether the given value is zero of the polynomials or not. Find the product, expand, factorize the polynomials using suitable algebraic identities.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 24, 25, 26, 27, 29, 31, 32, 33, 34, 37, 38, 39, 40, 42, 43, 44, 77.
6	Check whether the given polynomial is a factor of the other polynomial and factorize them using factor theorem.	22, 23, 28, 30, 46, 47, 48, 49, 50, 51, 52, 53, 80, 81, 82
7	Find the product, expand, factorize the polynomials using suitable algebraic identities.	19, 20, 21, 35, 36, 41, 45, 54, 5, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 75, 76, 77, 78, 79, 83.

EASY	AVERAGE	DIFFICULT	TOTAL
29	44	10	83

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries one mark)

1. Among the following an example of polynomial is (EASY)

   A) $4x^2 + 2x - 1$ B) $x^{-2} - 1$ C) $y + \frac{2}{y}$ D) $5\sqrt{y} + 1 = 0$

2. The coefficient of x^2 in $9x^2 + 4x - 6$ is (EASY)

   A) 2 B) 3 C) 6 D) 9

3. A polynomial of degree 1 is called (EASY)

   A) Linear polynomial B) Quadratic polynomial

   C) Cubic polynomial D) Quadratic equation

4. A polynomial with degree 2 is called (EASY)

   A) Linear polynomial B) Quadratic polynomial

   C) Cubic polynomial D) Quadratic equation

5. A polynomial with degree 3 is called (EASY)

A) Linear polynomial B) Quadratic polynomial

C) Cubic Polynomial D) Cubic equation

6. $x + 2$ is an example of (EASY)

A) Constant polynomial B) Linear polynomial

C) Quadratic polynomial D) Cubic polynomial

7. $y^2 + 2y - 15$ is an example of (EASY)

A) Constant polynomial B) Linear polynomial

C) Quadratic polynomial D) Cubic polynomial

8. A polynomial in one variable with 3 terms is (EASY)

A) $x^2 + 2x + 4$ B) $3xyz$ C) $2x + 3y + 5z$ D)x^3

9. Among the following, the linear polynomial is (EASY)

A) $2x + 5$ B) $2x^2 + 5x + 6$

C) $3x^3 - bx^2 + 5x + 7$ D) $8x^{-2} + 6x + 4$

10. Among the following, the quadratic polynomial is (EASY)

A) $ax + b$ B) $ax^2 + bx + c$

C) $ax^3 + bx^2 + cx + d$ D) $ax^{-2} + bx + c$

11. The degree of the polynomial $5x^7 + 2x^3 - 4x + 10$ is (EASY)

A) 2 B) 3 C) 5 D) 7

12. $\sqrt{10}$ is a constant polynomial of degree ` ` (EASY)

A) 0 B) 1 C) 2 D) 10

13. The degree of a polynomial $(x^3 + 6)(x^2 - 1)$ is (AVERAGE)

A) 2 B) 3 C) 5 D) 6

14. The zero of the polynomial $p(x) = -9x + 9$ is (EASY)

A) 0 B) -9 C) -1 D) 1

15. The zero of the polynomial $p(x) = x^2 - 1$ is (EASY)

A) 0 and 1 B) -2 and 1 C) -1and 1 D) 1 and 2

16. The value of the polynomial $7x^4 + 3x^2 - 4$, when x $= -2$ is (EASY)

A) 100 B) 110 C) 120 D) 130

17. $\frac{1}{2}$ is the zero of polynomial (AVERAGE)

A) $(x - 4)$ B) $(x + 2)$ C) $(x + 4)$ D) $(2x - 1)$

18. The number of zeros of polynomial $x^2 + 4x + 3$ is (EASY)

A) 1 B) 2 C) 3 D) - 3

19. If $3 + 5 - 8 = 0$, then the value of $(3)^3 + (5)^3 - (8)^3$ is (AVERAGE)

A) 260 B) –160 C) –360 D) 160

20. The value of 104×96 is (AVERAGE)

A) 9984 B) 9469 C) 10234 D) 11324

21. $(x + 2)$ and $(x + 3)$ are the factors of (AVERAGE)

A) $x^2 + 3x + 2$ B) $x^2 + 5x + 6$ C) $x^2 - 5x + 6$ D) $x^2 - 5x - 6$

22. The factors of $x^2 + 7x + 6$ are (AVERAGE)

A)$(x + 1)$ and $(x + 6)$ B)$(x + 3)$ and $(x + 2)$

C)$(x - 1)$ and $(x - 6)$ D)$(x - 3)$ and $(x - 2)$

23. If one of the factors of $x^2 + x - 20$ is $(x + 5)$ then the other factor is (AVERAGE)

A) $(x - 4)$ B) $(x + 2)$ C) $(x + 4)$ D) $(x - 5)$

24. In the polynomial $p(x) = ax^2 + bx + c$, if $a = 0$, then it becomes (AVERAGE)

A) Quadratic polynomial B) Linear polynomial

C) Cubic polynomial D) Biquadratic polynomial

25. If $f(x) = x^2 - 2$, then the value of $f(0) + f(1)$ is (AVERAGE)

A) 1 B) 2 C) 3 D) - 3

26. If $p(x) = x - 3$ then, the value of $p(1) + p(-1)$ is (AVERAGE)

A) -2 B) -6 C) 2 D) 6

27. If $f(x) = x^2 - 2\sqrt{2}x + 5$ then, the value of $f(\sqrt{2})$ is (AVERAGE)

A) 3 B) 7 C) 13 D) 11

28. If $x^2 + kx + 12 = (x + 4)(x + 3)$ then, the value of k is (AVERAGE)

A) 3 B) 4 C) 7 D) 12

29. The difference of the zeroes of $f(x) = x^2 - 10x + 24$ is (DIFFICULT)

A) 2 B)-2 C) 5 D) 10

30. If $(x+2)$ is a factor of $x^2 + mx + 14$ then, the value of m is (DIFFICULT)

A) 2 B) 9 C) 7 D) - 9

II. Answer the following questions. (One - mark questions)

31. Define a Binomial. Give an example. (EASY)

32. Define a linear polynomial. Give an example. (EASY)

33. Define a quadratic polynomial. Give an example. (EASY)

34. Write the degree of constant polynomial. (EASY)

35. Find the product of $(m + n)$ and $(m - n)$ (EASY)

36. Write the factors of $x^2 + (a + b)x + ab$ (EASY)

37. Write the coefficient of x^2 in $2 - x^2 + x^3$ (EASY)

38. Find the value of $p(x) = 5x^2 - 3x + 7$ at $x = 1$ (EASY)

39. Write the zero of the polynomial, $p(x) = cx + d$ (EASY)

40. Verify whether $x = \frac{4}{5}$ is a zero of a polynomial $p(x) = 5x - \pi$ (EASY)

41. If $m + n + p = 0$ then find the value of $m^3 + n^3 + p^3$ (EASY)

III. Answer the following questions. (Two marks questions)

42. Give one example each of a binomial of degree 35, and of a monomial of degree 100. (EASY)

43. Find the zero of the polynomial $p(x) = 3x - 2$ (AVERAGE)

44. Find the zeros of the polynomial $p(x) = x^2 - x - 2$ (AVERAGE)

45. Expand: $(2a - 3b)^2$ (AVERAGE)

46. Check whether –2 and 2 are zeroes of the polynomial $p(x) = (x^2 - 2x)$ (AVERAGE)

47. Examine whether $x + 2$ is a factor of $x^3 + 3x^2 + 5x + 6$ (AVERAGE)

48. Examine whether $x + 1$ is a factor of $x^3 + x^2 + x + 1$ (AVERAGE)

49. Examine whether $x - 3$ is a factor of $x^3 - 4x^2 + x + 6$ (AVERAGE)

50. Factorise $y^2 - 5y + 6$ by using the Factor Theorem (AVERAGE)

51. Find the value of k, if $(x - 1)$ is a factor of $4x^3 + 3x^2 - 4x + k$ (AVERAGE)

52. Find the value of k, if $(x - 1)$ is a factor of $x^2 + x + k$ (AVERAGE)

53. Find the value of k, if $(x - 1)$ is a factor of $kx^2 - \sqrt{2}x + 1$ (AVERAGE)

54. By using suitable identity, find the product of $(x + 4)$ and $(x + 10)$ (AVERAGE)

55. Find the sum of $(x + y)^2$and $(x - y)^2$ (AVERAGE)

56. Factorise: $4x^2 + 8x + 3$ (AVERAGE)

57. Factorise: $2x^2 - 7x - 15$ (AVERAGE)

58. Factorise: $6x^2 + 5x - 6$ (AVERAGE)

59. Factorise: $12x^2 - 7x + 1$ (AVERAGE)

60. Factorise: $3x^2 - x - 4$ (AVERAGE)

61. Factorise : $49a^2 + 70ab + 25b^2$ (AVERAGE)

62. Evaluate 104^3 using suitable identity. (AVERAGE)

63. Evaluate 105×106 using suitable identity. (AVERAGE)

64. Factorise $27y^3 + 125z^3$ (AVERAGE)

65. Expand $(3a + 4b + 5c)^2$ by using suitable identity. (AVERAGE)

66. By using suitable identity, find the product of $(3 - 2x)$ and $(3 + 2x)$ (AVERAGE)

67. Evaluate 95×96 using suitable identity. (AVERAGE)

68. Evaluate 104×96 using suitable identity. (AVERAGE)

69. Factorise using suitable identity: $9x^2 + 6xy + y^2$ (AVERAGE)

70. Factorise using suitable identity: $x^2 - \frac{y^2}{100}$ (AVERAGE)

71. Factorise: $x^3 + x^2 - 4x - 4$ (AVERAGE)

72. Factorise: $x^3 - 2x^2 - x + 2$ (AVERAGE)

73. The length and breadth of a rectangular blackboard are $(x + 12)$ units and $(x - 7)$ units. Find the area of the rectangular blackboard. (DIFFICULT)

IV. Answer the following questions: (Three marks questions)

74. Classify the following as linear, quadratic and cubic polynomials: (EASY)

(i) $x^2 + x$ (ii) $x - x^3$ (iii) $y^2 + y + 4$ (iv) $1 + x$ (v) $3t$ (vi) r^2 (vii) $7x^3$

75. If $x + y + z = 0$ then, prove that $x^3 + y^3 + z^3 = 3xyz$ (AVERAGE)

76. If $a + b + c = 10$ and $ab + bc + ca = 5$ then, find the value of $a^2 + b^2 + c^2$. (DIFFICULT)

77. If $x + y = 12$ and $xy = 27$ then, find the value of $x^3 + y^3$. (DIFFICULT)

78. By using suitable identity factorise: $8x^3 + 27y^3 + 36x^2y + 54xy^2$ (AVERAGE)

79. The length, breadth and height of a cuboidal tank are $(x + 10), (x + 4)$ and $(x - 6)$ units respectively. Find the volume of a cuboidal tank. (DIFFICULT)

V. Answer the following questions (Four marks questions)

80. Factorise: $x^3 - 3x^2 - 9x - 5$ (DIFFICULT)

81. Factorise: $x^3 - 6x^2 + 11x - 6$ (DIFFICULT)

82. Factorise: $x^3 - 23x^2 + 142x - 120$ (DIFFICULT)

VI. Answer the following questions. (Five marks questions)

83. (A) Verify: $x^3 - y^3 = (x - y)(x^2 + y^2 + xy)$

(B) Prove that $x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$

(DIFFICULT)

CHAPTER – 3 CO-ORDINATE GEOMETRY

LO. No	Learning Outcomes	Question Numbers
15	Identify the X-axis, Y-axis, origin, and quadrants in the Cartesian plane. Mark the points in the cartesian plane and Identify the coordinates of the point marked on the Cartesian plane also identify the quadrant to which they belong.	All Questions

EASY	AVERAGE	DIFFICULT	TOTAL
14	17	03	34

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet.
(Each question carries one marks)

1. The coordinates of the origin are **(EASY)**

   A) (0, 1) B) (1,0) C) (0, 0) D) (1, 1)

2. The perpendicular distance of a point (4, 3) from y-axis is **(EASY)**

   A) 4 units B) 3 units C) 0 units D) 7units

3. Abscissa of a point is positive in **(EASY)**

   A) I and II quadrants B) I and IV quadrants

   C) I quadrant only D) II quadrant only

4. If y co-ordinate of a point is zero, then this point is always lies **(EASY)**

   A) in I quadrant B) in II quadrant

   C) on x −axis D) on y −axis

5. A point both of whose coordinates are negative will lie in **(EASY)**

   A) I quadrant B) II quadrant

   C) III quadrant D) IV quadrant

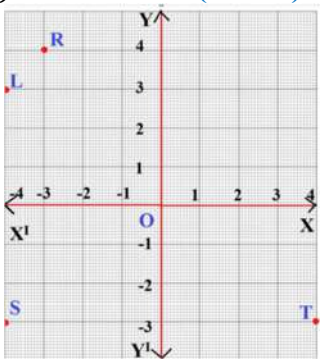
6. The point at which the two coordinate axes meet is called the **(EASY)**

   A) Abscissa B) Ordinate C) Origin D) quadrant

7. In the given graph the point whose coordinates are $(-4,-3)$ is **(EASY)**

   A) T B) R

   C) L D) S



8. The quadrant in which the point $(-3, 2)$ lies is **(EASY)**

A) I B) III C) IV D) II

9. The point (0, 2) lies on **(EASY)**

A) x-axis B) Origin C) y-axis D) I quadrant

10. On joining the points (0, 2), (2, 2), (2, 0) and (0, 0) in a graph, the plane figure we get is a

A) Rectangle B) Square C) Rhombus D) Parallelogram

(AVERAGE)

11. Ordinate of all the points on x-axis is **(AVERAGE)**

A) 1 B) -1 C) 2 D) 0

12. The point whose abscissa is 4 and lies on the x - axis is **(AVERAGE)**

A) (0 4) B) (4, 0) C) (4, 1) D) (1, 4)

13. Ordinate of a point is positive in **(EASY)**

A) I quadrant only B) II quadrant only

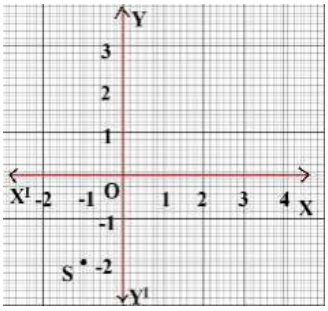
C) I and II quadrants D) II and IV quadrants

14. The perpendicular distance of a point (5, -2) from x-axis is **(AVERAGE)**

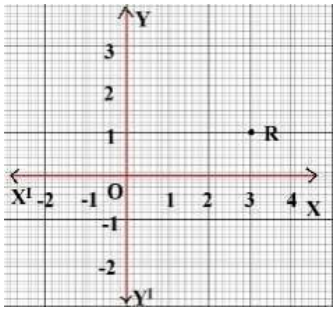
A) 5 units B) 0 units C) 3 units D) 2 units

15. The point which represent (4, -2) among the following is **(AVERAGE)**

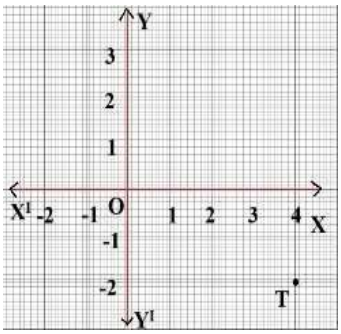
(A)



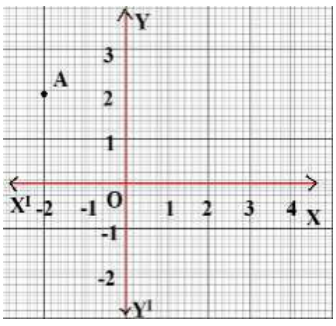
(B)



(C)



(D)



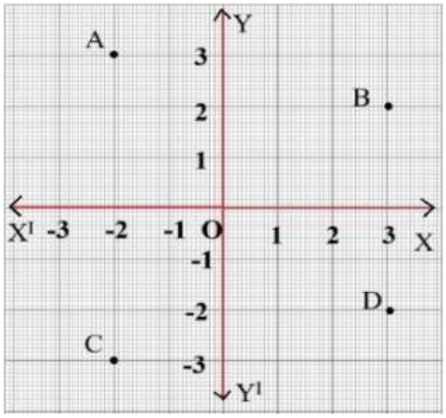
16. In the given graph, the co-ordinates of A, B, C and D are respectively **(AVERAGE)**

(A) (3,2), (-2,3), (-2,-3) and (3,-2)

(B) (3,-2), (-3,2), (-2,-3) and (3,-2)

(C) (-2,3), (3,2), (-2,3) and (-3,2)

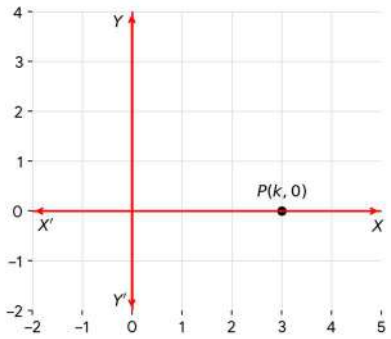
(D) (-2,3), (3,2), (-2,-3) and (3,-2)



17. In the graph, if $k = x + 1$, then the value of x is **(AVERAGE)**

(A) 0 (B) 2

(C) 3 (D) 4

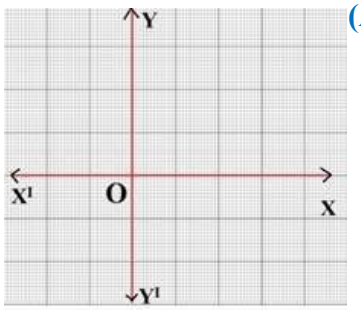


II. Answer the following questions. (One-mark questions)

18. Write the coordinates of a point lying on the x-axis at a distance of 4 units to the left of the origin. **(EASY)**
19. Write the quadrant in which the point (-4, -1) lies on cartesian plane. **(EASY)**
20. Write the coordinates of a point which lies on both x -axis and y- axis. **(EASY)**
21. Write the abscissa and ordinate of the point (6, -3). **(EASY)**
22. Write the quadrant of the point (x, y), where $x < 0$ and $y > 0$. **(AVERAGE)**
23. The point P lies 5 units above the x −axis and 3 units to the left of the y-axis, then write the coordinates of the point P. **(AVERAGE)**
24. Write the coordinates of a point that lies 7 units above the x - axis and 0 units from the y- axis. **(AVERAGE)**

III. Answer the following questions. (Two marks questions)

25. Name the following with respect to graph. **(AVERAGE)**



a) Horizontal line

b) Vertical line

c) The point of intersection of two axes

d) Each part of the plane divided by two axes.

26. Write the quadrant or the axis on which do each of these points lie. **(AVERAGE)**

(-3, 5) (2, -2) (-3, 0) (-4, -6)

27. Write the coordinates of the following points. **(AVERAGE)**

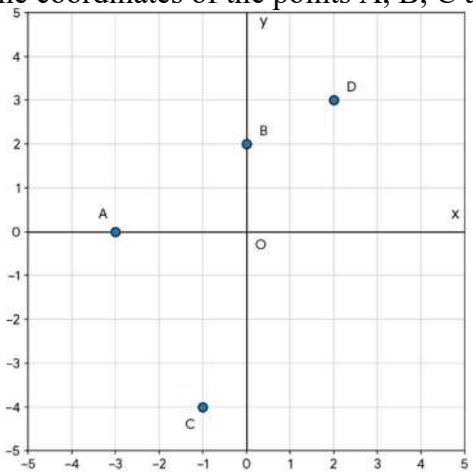
a) Lying on x-axis with x coordinate 5 b) Lying on y-axis with y coordinate -2

28. Write the coordinates of a point:

(i) Whose ordinate is -4 and lies on the Y-axis.

(ii) Whose abscissa is 5 and lies on the X-axis. **(AVERAGE)**

29. In the given graph, Write the coordinates of the points A, B, C and D.



(AVERAGE)

IV. Answer the following questions. (Three marks questions)

30. Plot the following points on the graph **(AVERAGE)**

	P	Q	R
x	0	2	-2
y	2	4	0

31. Draw the line passing through (2, 3) and (3, 2). Find the coordinates of the points at which this line intersects x-axis and y-axis. **(DIFFICULT)**

V. Answer the following question. (Four marks questions)

32. The coordinates of the three vertices of a square KLMN are K(-4, 2), L(3, 2), M(3, -5). Plot the points K, L, M on a graph. Complete the square and write the coordinates of N.

(DIFFICULT)

33. Represent the following situation in the graphical form and find the area of closed figure.

A 9^{th} standard student is started from his house located at the point (4,3), later he went to his friend's home located at the point which is 4 units right from the origin on the x- axis. After that both of them reached the school which is located at the origin.

(DIFFICULT)

34. Plot the points $A(4,4)$ & $B(-4,4)$ on a Cartesian plane. Join these points and the origin to form a triangle. Name the type of triangle formed and find its area.

(AVERAGE)

CHAPTER – 4 LINEAR EQUATION IN TWO VARIABLES

LO. No	Learning Outcomes	Question Numbers
8	Identify linear equations in two variables and write them in standard form. Form linear equations in two variables from real-life situations. Verify whether the given values are the solutions for the given linear equation in two variables or not.	All Questions

EASY	AVERAGE	DIFFICULT	TOTAL
12	14	05	31

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries one mark)

1. Standard form of linear equation in two variables x and y is (EASY)

   A) $ax + by = 0$ B) $ax + by + c = 0$

   C) $ax - by - c = 0$ D) $ax + by = 0$

2. The number of solutions that linear equation $2x - 5y = 7$ has (EASY)

   A) A unique solution B) Two solutions

   C) Infinitely many solutions D) No solution

3. The positive solution of the equation $ax + by + c = 0$ always lie in the (EASY)

   A) I quadrant B) II quadrant

   C) III quadrant D) IV quadrant

4. The solution of the equation $x - 2y = 4$ is (AVERAGE)

   A) (0, 2) B) (2, 0) C) (1, 1) D) (4, 0)

5. If (3, 0) is the solution of the linear equation $2x + 3y = k$, then the value of k is

   A) 6 B) 4 C) 5 D) 2

   (EASY)

6. The linear equation having the solution $x = 5$ and $y = 2$ is (EASY)

   A) $5x + 2y = 7$ B) $x + 2y = 7$ C) $x + y = 7$ *D*) $5x + y = 7$

7. Which among the following is not a linear equation in two variables? (EASY)

   A) $ax + by = c$ B) $ax^2 + by = c$ C) $2x - 5 = 3y$ D) $2y - 6 = 3x$

8. The number of solutions for the linear equation in two variables is (EASY)

A) 1 B) 4 C) 2 D) Infinite

9. Solution of the linear equation $3x + 0y + 7 = 0$ is of the form (EASY)

A) $\left(\frac{-7}{3}, 3\right)$ B) $\left(4, \frac{-7}{3}\right)$ C) $\left(\frac{7}{3}, 0\right)$ D) $\left(0, \frac{-7}{3}\right)$

10. In a cricket match, total runs scored by two batsmen is 181. The linear equation form for the statement is (AVERAGE)

A) $x - y = 181$ B) $xy = 181$ C) $x + y = 181$ D) $\frac{x}{y} = 181$

11. Any point on the line $y = -x$ is always of the form (DIFFICULT)

(A) (a, a) (B) $(a, -a)$ (C) $(0, a)$ (D) $(-a, -a)$

12. If a linear equation passes through the origin, its constant term (c) in the standard form $ax + by + c = 0$ must be (AVERAGE)

(A) 1 (B) Any positive number

(C) 0 (D) undefined

II. Answer the following questions. (One - mark questions)

13. "Twice the first number is added to the second number, the result is 8". Express the statement as a linear equation in two variables. (AVERAGE)

14. Is the equation $x + \frac{1}{Y} = 8$ a linear equation in two variables? (AVERAGE)

15. If $x = 0$, then find the value of y in the equation $3x + 4y = 12$. (AVERAGE)

16. Write a solution for the equation $x + y = 5$. (AVERAGE)

17. $y = 3x - 7$ write this in standard form of linear equation in two variables. (EASY)

18. Find whether the point (2, -1) lies on the line $3x - y = 7$. (AVERAGE)

19. Write the equation of a line parallel to the x- axis. (AVERAGE)

20. Represent the equation $5x = 2y + 2$ in the form of $ax + by + c = 0$. (EASY)

III. Answer the following questions. (Two marks questions)

21. Express $2x - 8 = 6y$ in standard form and write the values of a, b and c. (EASY)

22. Express 5x + 2y = 2 in the form $ax + by + c = 0$ and find the value of $a + b + c$. (AVERAGE)

23. If the point (3, 4) lies on the graph of the equation $3y = px + 7$, then find the value of p. (AVERAGE)

24. Find the value of k, if $x = 3$ and $y = 2$ is a solution of the equation $3x + 4y = k$.(EASY)

25. Find the coordinates of the points where the line represented by the equation 4x+3y =12 intersects the x-axis and y-axis. (AVERAGE)

26. The linear equation $5x - 4y = 20$ intersects the x −axis at A and y −axis at B. Find the coordinates of points A and B. (DIFFICULT)

27. Find the value of m, if the line represented by $mx + (m + 1)y = 20$ passes through a point whose abscissa is twice its ordinate, and the ordinate is 2. (DIFFICULT)

IV. Answer the following questions. (Three marks questions)

28. Verify which of the following are solutions of the equation $x + 2y = 6$

a) (1, 2) b) (2, 2) c) (0, 3) (AVERAGE)

29. A vehicle charges ₹25 for the first km and ₹15 each for every subsequent km travelled. Express this situation in linear equation in two variables. If the distance travelled is 9 km, then find the total amount to be paid. (DIFFICULT)

30. If $(k, 2k + 1)$ is a solution of the linear equation $4x - 5y = 13$, find the value of k. Also find one more solution for the given equation. (DIFFICULT)

V. Answer the following question. (Four marks questions)

31. Find any four solutions for the linear equation $3x + y - 12 = 0$. (AVERAGE)

CHAPTER – 5 INTRODUCTION TO EUCLID'S GEOMETRY

LO. No	Learning Outcomes	Question Numbers
19	Define a point, line, line segment, ray, angles, and surfaces.	8, 9, 10, 11, 15, 16, 18, 19, 20, 21, 22, 23, 31, 32, 41.
20	Apply definitions, Euclid axioms, and postulates to solve basic problems related to lines, angles, and plane figures.	1, 2, 3, 4, 5, 6, 7, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 33, 34, 35, 36, 37, 38, 39, 40

EASY	AVERAGE	DIFFICULT	TOTAL
31	8	2	41

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries one marks)

1. The mathematical statement which needs a proof is (EASY)

   (A)Theorem (B) Axiom (C) Definition (D) Postulate

2. Things which are double of the same thing are (EASY)

   (A) Equal to one another (B) unequal

   (C) halves of the same thing (D) One is double of the other

3. Axioms are assumed as (EASY)

   (A) Universal truths without the need for any proof.

   (B) Universal truths specific to geometry.

   (C) Theorems.

   (D) Definitions.

4. Euclid divided his famous treatise "The elements" into (EASY)

   (A) 13 chapters (B) 12 chapters (C) 11chapters (D) 9 chapters

5. A statement that does not apply to Euclid's axioms (AVERAGE)

   (A) Things which are equal to the same thing are equal to one another

   (B) If equals are added to equals, the wholes are equal

   (C) If equals are subtracted from equals, the remainders are equal

   (D) A terminated line can be produced indefinitely

6. The correct statement among the following is (AVERAGE)

(A) Only one line can pass through a single point

(B) There are an infinite number of lines that pass through two distinct points.

(C) A terminated line can be produced indefinitely on both sides

(D) If two circles are congruent, then their radii are unequal.

7. If $a = 6$ and $b = a$, then $b = 6$. This is an example for the axiom (EASY)

(A)Things which are equal to the same thing are equal to one another

(B) If equals are added to equals, the wholes are equal

(C) If equals are subtracted from equals, the remainders are equal

(D)The whole is lesser than the part

8. A pyramid is a solid figure, the base of which is (EASY)

(A) only a triangle (B) only a square (C) only a rectangle (D) any polygon

9. The side faces of a pyramid are always (EASY)

(A) Triangles (B) Squares (C) Polygons (D) Trapeziums

10. In Indus Valley Civilization (about 3000 B.C.), the bricks used for construction work were having dimensions are in the ratio (EASY)

(A) 1 : 3 : 4 (B) 4 : 2 : 1 (C) 4 : 4 : 1 (D) 4 : 3 : 2

11. The number of dimensions, a point has (EASY)

(A) 0 (B) 1 (C) 2 (D) 3

12. The maximum number of lines that can be drawn through a point on a plane is

(A) One (B) Two (C) Finite (D) Infinite

(EASY)

13. The number of lines that can be drawn through two points on a plane (EASY)

(A) zero (B) only one (C) at least one (D) at most one

II. Answer the following questions: (One-mark questions)

14. Write any one Euclid's postulate. (EASY)
15. Define a point based on Euclidian geometry. (EASY)
16. Define a ray. (EASY)
17. Write the significance of Euclid's fifth postulate. (AVERAGE)

18. Define a plane. (EASY)

19. Name the part of a line with two end points. (EASY)

20. How many dimensions does a line has? (EASY)

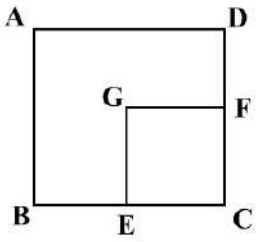
21. Define perpendicular lines. (EASY)

22. Write the name of the Euclid's famous book. (EASY)

23. How many common points can a pair of distinct lines (non-coincident lines) can have? (EASY)

24. Two sheets of A4 size paper have equal areas, because one coincides with the other. Write the axiom that explains the given statement. (EASY)

25. In the adjoining figure area (ABCD) > area (ECFG). Write the axiom that explains the given statement. (EASY)



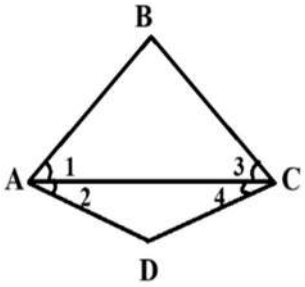
26. The weight of Gagan and Uday was same. Each of them gained five kg of weight. Compare their weights and write your conclusion using suitable axiom. (EASY)

III. Answer the following questions. (Two marks questions)

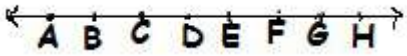
27. Differentiate between axioms and postulates. (AVERAGE)

28. A and B have the exact weight. If they lose weight by 2kg in the given time, how will their new weights be compared? Justify your answer. (AVERAGE)

29. In the adjoining figure we have $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$. Show that $\angle A = \angle C$. (AVERAGE)



30. In the following figure, show that the length of AH > (AB + BC + CD). (AVERAGE)



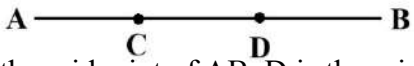
31. Define the following terms (EASY)

i) Ray ii) Line segment

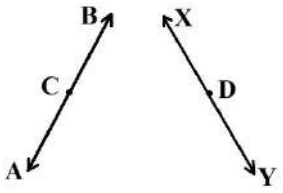
32. Define these terms: (EASY)

a) Collinear points b) Non-collinear points

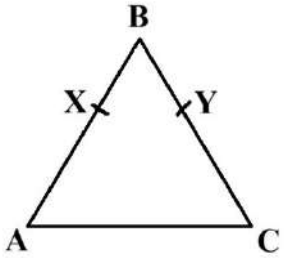
33. In figure, AD = BC = 7.5cm and CD = 1.5cm then what is the measure of AC + BC? (AVERAGE)



34. In figure, C is the midpoint of AB, D is the midpoint of XY. If AC = XD then by using Euclid's axiom, Prove that AB = XY. (AVERAGE)



35. In the figure, AB = BC and BX = BY then, prove that AX = CY. (AVERAGE)



IV Answer the following questions: (Three marks questions)

36. If a point C lies between two points A and B such that $AC = BC$, then prove that AC = $\frac{1}{2}$ AB. (DIFFICULT)

37. In figure, if $AC = BD$, then prove that $AB = CD$ (DIFFICULT)



38. Write true or false for the following statement. Give reason for your answers

i) Only one line can pass through a single point.

ii) There are an infinite number of lines which pass through two distinct points.

iii) If two circles are congruent, then their radii are equal. (AVERAGE)

V Answer the following questions: (Five marks questions)

39. Write any five Euclid's axioms. (EASY)

40. Write any five Euclid's postulates. (EASY)

41. In the given figure, name the following: (EASY)

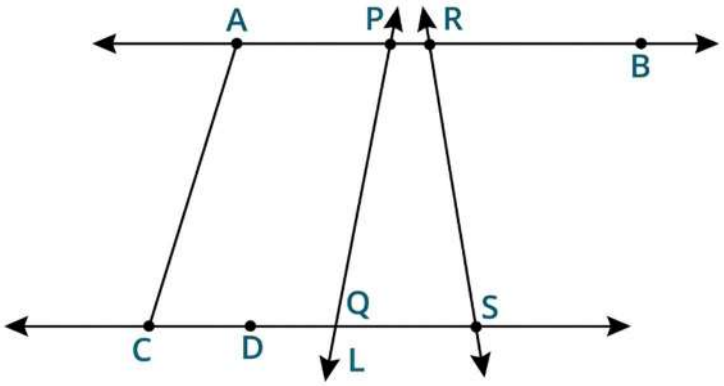
(i) any two line segments.

(ii) any two rays.

(iii) Four collinear points.

(iv) one pairs of non–intersecting line segments.

(v) parallel lines.



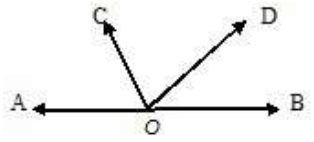
CHAPTER – 6 LINES AND ANGLES

LO. No	Learning Outcomes	Question Numbers
9	Identify various properties of lines and angles and apply them to solve problems.	All questions

EASY	AVERAGE	DIFFICULT	TOTAL
28	43	11	82

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries one mark)

1. In the given figure, AOB is a straight line. If $\angle AOC + \angle BOD = 85^0$, then $\angle COD$ measures **(EASY)**



(A) 85^0 (B) 90^0

(C) 95^0 (D) 100^0

2. A pair of complementary angles such that one angle is half of another is **(AVERAGE)**

(A) $50^0, 40^0$ (B) $120^0, 60^0$ (C) $55^0, 35^0$ (D) $60^0, 30^0$

3. Two adjacent angles on the same line are **(EASY)**

(A) Vertically opposite angles (B) Complementary angles

(C) Linear pair angles (D) Alternate angles

4. When two lines intersect, then the correct statement is **(EASY)**

(A) Adjacent angles are always complementary

(B) Adjacent angles are always supplementary

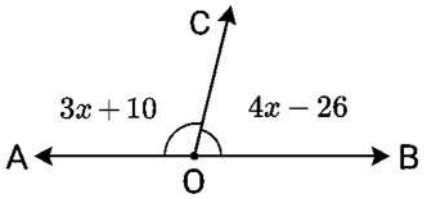
(C) Opposite angles are always supplementary

(D) Opposite angles are always complementary

5. If two interior angles on the same side of a transversal which intersects two parallel lines are in the ratio 2:3, then the measure of the larger angle is **(AVERAGE)**

(A) 54^0 (B)120^0 (C)108^0 (D)136^0

6. In the given figure, AOB is a straight line. If $\angle AOC = (3x + 10)^0$ and $\angle BOC = (4x - 26)^0$, then the measure of $\angle BOC$ is **(AVERAGE)**



(A) 96^0 (B) 86^0

(C) 76^0 (D) 106^0

7. The statement which is not true among the following is **(EASY)**

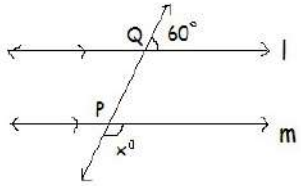
(A) Through a given point, only one straight line can be drawn.

(B) Through two given points, it is possible to draw one and only one straight line.

(C) Two straight lines can intersect only at one point.

(D) A line can be produced to any desired length.

8. The measure of 'x' in the given figure is **(EASY)**



(A) 60^0 (B) 90^0

(C) 120^0 (D) 64^0

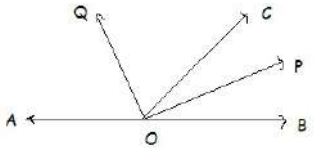
9. If a ray stands on a line, then the sum of two adjacent angles so formed is **(EASY)**

(A) 360^0 (B) 90^0 (C) 180^0 (D) 45^0

10. The angle between the bisectors of a linear pair of angles $\angle AOC$ and $\angle BOC$ is

(A) Right angle (B) Straight angle

(C) Reflex angle (D) Acute angle **(EASY)**



11. If two lines intersect each other, then the vertically opposite angles are always. **(EASY)**

(A) Equal (B) Supplementary (C) unequal (D) Complementary

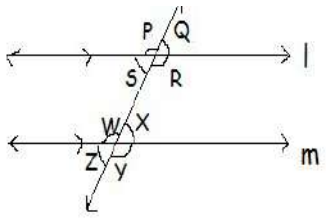
12. An angle that measures 180^0 is called **(EASY)**

(A) Obtuse angle (B) straight angle (C) Right angle (D) Acute angle

13. In the adjoining figure the alternate angle of R is **(EASY)**

(A) W (B) X

(C) Y (D) Z



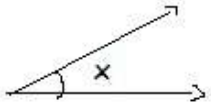
14. A ray that divides an angle into two equal angles is called **(EASY)**

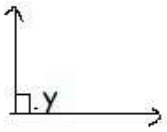
(A) Perpendicular bisector (B) Angular Bisector (C) Transversal (D) Vertex

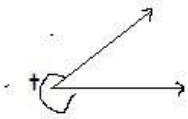
15. One of the following is an example for reflex angle **(EASY)**

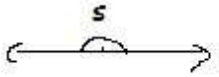
(A) 45^0 (B)120^0 (C)180^0 (D)270^0

16. The figure which represents straight angle is **(EASY)**

(A) 

(B) 

(C) 

(D) 

17. Number of right angles that make a straight angle is **(EASY)**

(A) 1 (B) 2 (C) 3 (D) 4

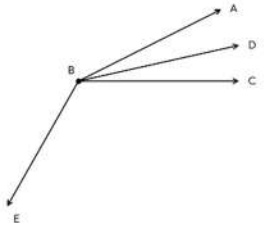
18. Number of straight angles that make a complete angle is **(EASY)**

(A) 1 (B) 2 (C)3 (D)4

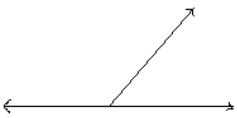
19. In the given figure, the common side for angles ∠ABD and ∠DBC is **(EASY)**

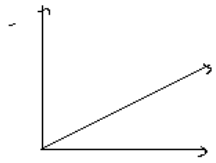
(A) AB (B) BD

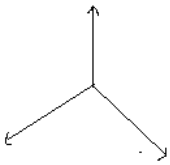
(C) BC (D) AE

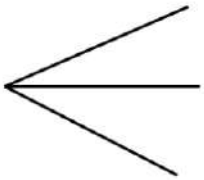


20. Linear pair of angles among the following figures is **(EASY)**

(A) 

(B) 

(C) 

(D) 

21. The complementary angle of 45^0 is **(EASY)**

(A) 45^0 (B) 30^0 (C) 90^0 (D) 60^0

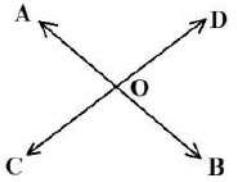
22. The Supplementary angle of 120^0 is **(EASY)**

(A) 20^0 (B) 40^0 (C) 60^0 (D) 180^0

23. In the given figure one pair of vertically opposite angle is **(EASY)**

(A) $\angle AOC = \angle COB$ (B) $\angle AOC = \angle DOB$

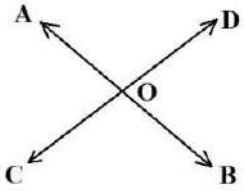
(C) $\angle AOD = \angle AOC$ (D) $\angle DOB = \angle BOC$



24. In the given figure, a pair of adjacent angles is **(EASY)**

(A) $\angle AOC$ and $\angle COB$ (B)$\angle AOC$ and $\angle DOB$

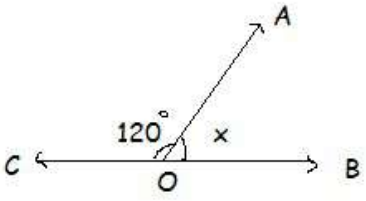
(C)$\angle AOD$ and $\angle BOC$ (D)$\angle DOB$ and $\angle COA$



25. In the figure, the value of x is **(AVERAGE)**

(A) 40^0 (B) 60^0

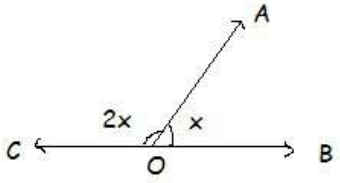
(C) 80^0 (D) 100^0



26. In the figure, the value of x is **(AVERAGE)**

(A) 20^0 (B) 30^0

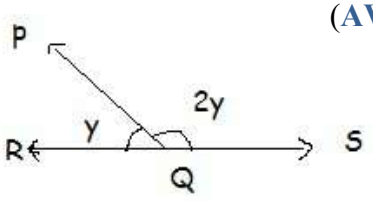
(C) 45^0 (D) 60^0



27. In the figure, the measure of $\angle PQR$ is **(AVERAGE)**

(A) 30^0 (B) 45^0

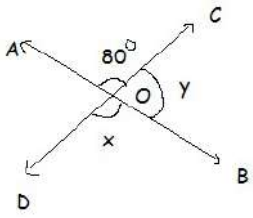
(C) 120^0 (D) 60^0



28. In the figure, the sum of angles X and Y is **(AVERAGE)**

(A) 100^0 (B) 180^0

(C) 360^0 (D) 540^0



29. In ΔABC, if $AB = AC$ and $\angle BAC = 40^0$, then the measure of $\angle B$ is **(AVERAGE)**

(A) 60^0 (B) 70^0 (C)100^0 (D)180^0

30. The complementary angle of 65^0 **(AVERAGE)**

(A) 25^0 (B) 35^0 (C) 65^0 (D) 75^0

31. A part of line with two end points is called **(EASY)**

(A) Line segment (B) A ray (C) parallel lines (D) Intersecting lines

32. Reflex angle measures **(EASY)**

(A) More than 90^0 (B) Equal to 90^0

(C) More than 180^0 and less than 360^0 (D) Equal to 180^0

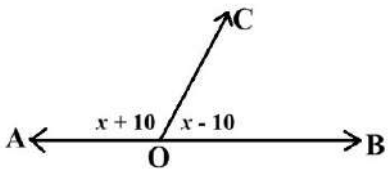
33. Number of common points for two parallel lines are **(EASY)**

(A) One (B) Two (C) Three (D) zero

34. In the figure, the value of x is **(AVERAGE)**

(A) 80^0 (B) 90^0

(C) 100^0 (D) 110^0



35. PQ and RS lines intersect at 'O' and $\angle QOS = 63^0$, then $\angle QOR =$ **(AVERAGE)**

(A) 63^0 (B) 117^0 (C) 17^0 (D) 153^0

36. If one angle is 5 times its supplementary angle, then the measure of the smaller angle is

(A) 15^0 (B) 120^0 (C) 60^0 (D) 30^0

(AVERAGE)

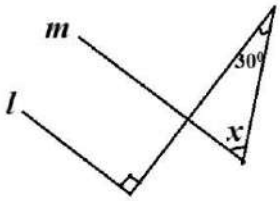
37. Angles of a triangle are in the ratio 5 : 3 : 7, then the triangle is **(AVERAGE)**

(A) A right triangle (B) An acute angle triangle

(C) An obtuse angle triangle (D) An isosceles angle

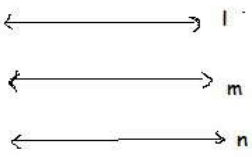
II. Answer the following questions (One - mark questions)

38. In the figure if l || m then find then measure of x. **(AVERAGE)**

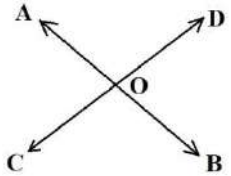


39. In the given figure, what can you say about lines l and n, if l || m and m || n?

(AVERAGE)



40. In the given figure, if $\angle$ DOB = 60^0, then find the measure of $\angle$COA. **(AVERAGE)**

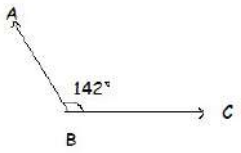


41. If two supplementary angles measure $(55 + 3a)^0$ and $(115 - 2a)^0$, then find the value of a. **(AVERAGE)**

42. Define obtuse angle. **(EASY)**

43. Define collinear points. **(EASY)**

44. In the figure, if $\angle ABC = 142^0$, find the measure of reflex $\angle ABC$. **(AVERAGE)**



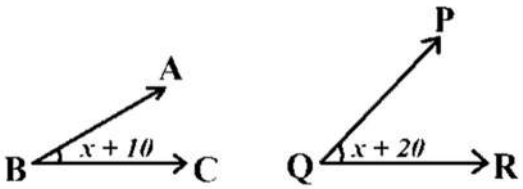
45. If one angle of a linear pair is 75^0, find the other. **(AVERAGE)**

46. "All supplementary angles form a linear pair", Is this statemen true? **(EASY)**

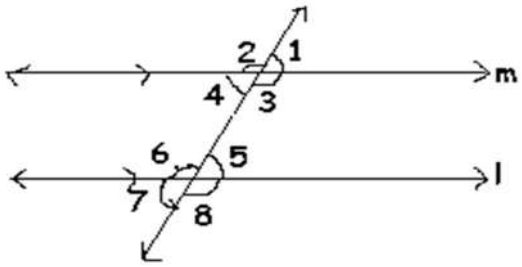
47. Four rays originate from point O. What is the sum of all angles formed at O? **(EASY)**

III. Short answer type questions: (Two marks questions)

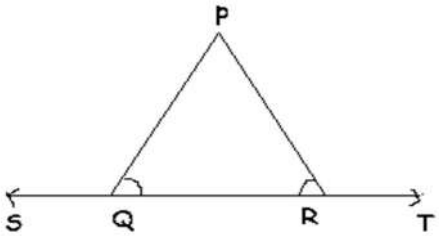
48. In the figure, the angles formed are complementary to each other then, find the value of x. **(AVERAGE)**



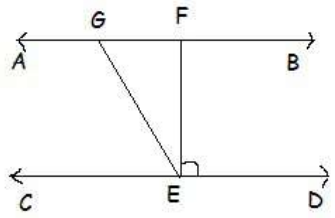
49. In the figure, if $\angle 2 = 130^0$ and $\angle 5 = 50^0$, Check whether m||n and give suitable reason for your answer. **(AVERAGE)**



50. In the figure, $\angle PQR = \angle PRQ$, then prove that $\angle PQS = \angle PRT$. **(AVERAGE)**



51. In the figure, if AB||CD, EF||CD and $\angle GED = 126^0$, then find the measure of $\angle GEF$ and $\angle FGE$. **(DIFFICULT)**

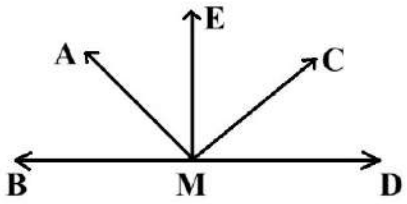


52. The ratio of two complementary angles is 4 : 5. Find the measure angles. **(AVERAGE)**

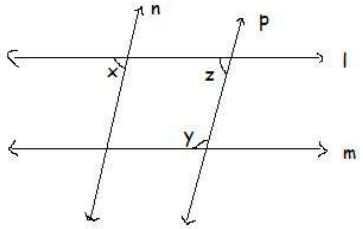
53. The difference of two complementary angle is 20^0. Find the measure angles. **(AVERAGE)**

54. The supplementary angle of one angle is $\frac{1}{3}^{rd}$ of the other. Find the measure of two angles. **(AVERAGE)**

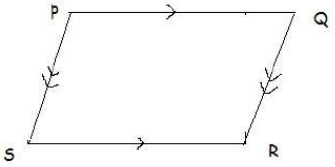
55. In the figure, $\angle AMB = \angle CMD$ and $\angle AME = \angle CME$ then, prove that $\angle BME = \angle DME$. **(AVERAGE)**



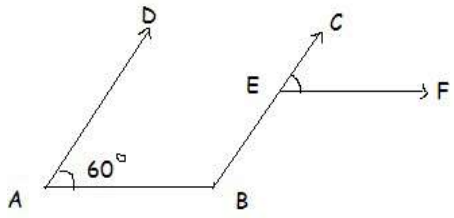
56. In the figure, $l||m$ and $n||p$, if $\angle X = 85^0$, then find the measure of $\angle Y$. **(AVERAGE)**



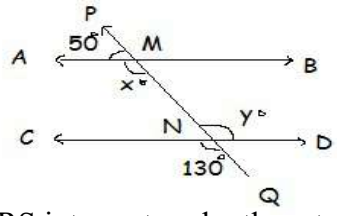
57. In the figure PQ||SR and PS||QR. Prove that $\angle SPQ = \angle SRQ$ **(AVERAGE)**



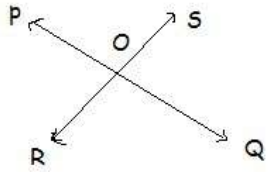
58. In the figure AD || BC and EF || AB, $\angle DAB = 60^0$, then find the measure of $\angle CEF$. **(DIFFICULT)**



59. In the given figure if AB||CD, then find the measures of X and Y. **(AVERAGE)**

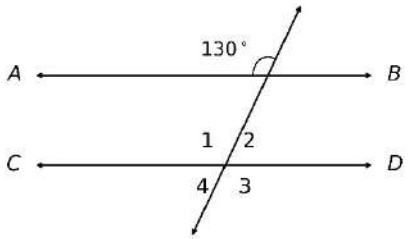


60. In the figure, lines PQ & RS intersect each other at point O. If ∠ POR : ∠ROQ = 5 : 7, then find the measure of all the angles. **(AVERAGE)**

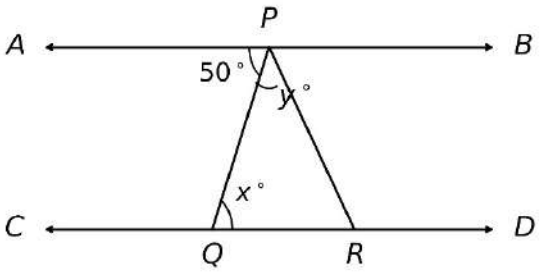


61. In the given figure, if AB||CD, then find the measures of ∠ 1, ∠ 2, ∠3 &∠4.

(AVERAGE)

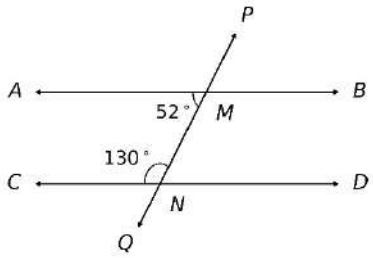


62. In the figure, if AB||CD, ∠ APQ = 50^0 and ∠PRD = 127^0, then find the measures of x and y.

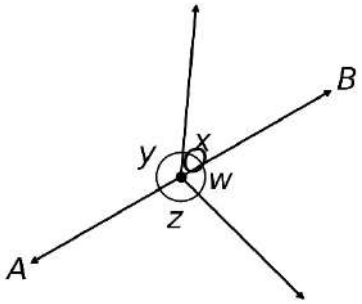


(AVERAGE)

63. In the figure, is AB || CD? Justify your answer. **(AVERAGE)**

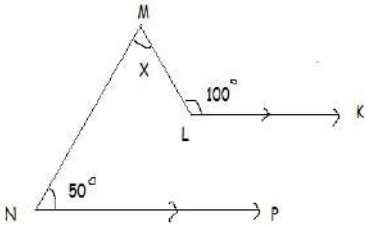


64. In figure, if X + Y = W + Z then, prove that AOB is a line. **(AVERAGE)**



IV. Answer the following questions: (Three marks questions)

65. In the given figure, LK||NP, if $\angle MLK = 100^0$ and $\angle MNP = 50^0$, then find the measure of 'X'.



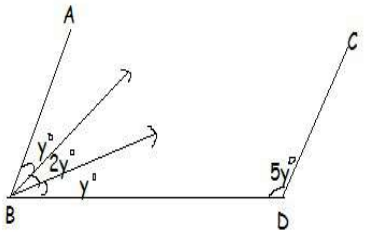
(DIFFICULT)

66. Prove that, "the lines which are parallel to the same line are parallel to each other".

(AVERAGE)

67. In the figure, if a line segment AB ∥ CD, find the measure of 'y' and $\angle CDB$.

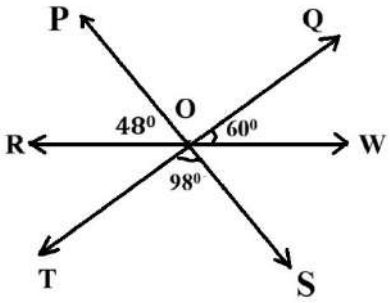
(DIFFICULT)



68. Prove that, "if two lines intersect each other, then the vertically opposite angles are equal"

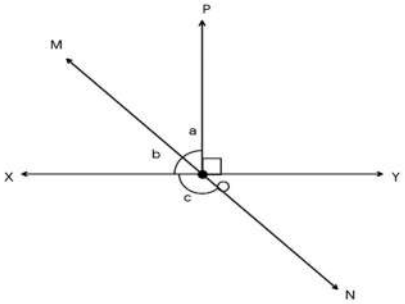
(AVERAGE)

69. In the figure, PS, QT and RW are straight lines which interest at 'O'.
Find the value of $\angle POQ + \angle TOS + \angle BOT$. **(AVERAGE)**

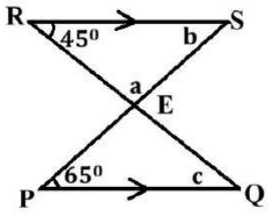


70. In figure, lines XY and MN intersect at O. if $\angle POY = 90^0$ and a : b = 2 : 3 find c.

(AVERAGE)



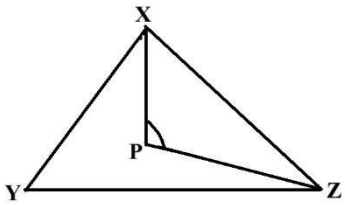
71. In the figure, RS || PQ, $\angle P = 65^0$ and $\angle R = 45^0$ then find the measure of a, b and c.



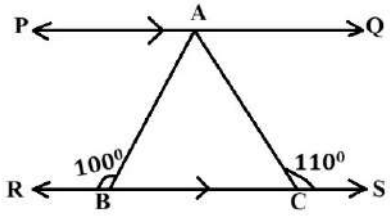
(AVERAGE)

72. In figure, PX and PZ are angular bisector of $\angle YXZ$ and $\angle YZX$ respectively.

If $\angle YZP + \angle YXP = 40^0$ the find the measure of $\angle Y$ and $\angle XPZ$. **(DIFFICULT)**

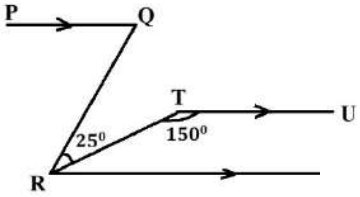


73. In the figure, PQ∥RS, if $\angle ABR = 100^0$ and $\angle ACS = 110^0$, then find the angles of ΔABC.



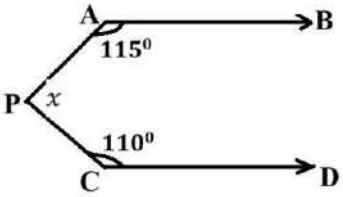
(AVERAGE)

74. In figure, PQ || RS || TU. If $\angle TRQ = 25^0$ and $\angle RTU = 150^0$, then find $\angle PQR$.

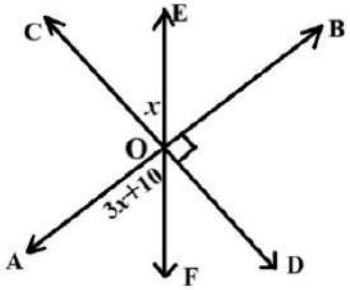


(AVERAGE)

75. In the figure, AB ∥ CD. Find measure of 'x'. **(DIFFICULT)**

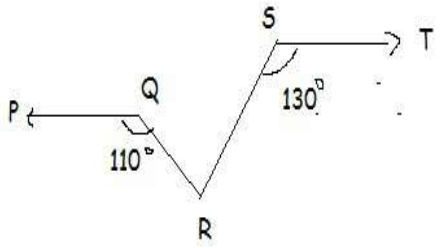


76. Find the value of x in the given figure. **(AVERAGE)**



77. In the figure, if PQ||ST, $\angle PQR = 110^0$ and $\angle RST = 130^0$, then find the measure of $\angle QRS$.

(DIFFICULT)



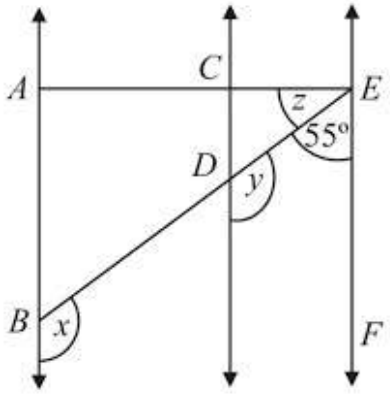
78. It is given that $\angle XYZ = 64^0$ and XY is produced to a point P. Draw a figure from the given information. If ray YQ bisects $\angle ZYP$, then find measures of $\angle XYQ$ and reflex $\angle QYP$.

(DIFFICULT)

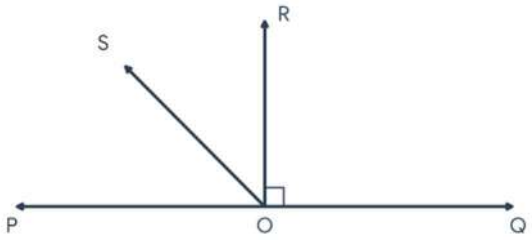
V. Answer the following questions (Four marks questions)

79. In fig, AB||CD and CD||EF also EA ⊥ AB, if $\angle BEF = 55^0$, then find the measures of x, y and z.

(DIFFICULT)

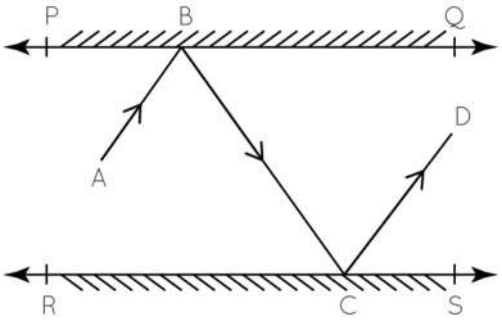


80. In the figure, POQ is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$ **(DIFFICULT)**



81. In the figure PQ and RS are two mirrors placed parallel to each other and incident ray AB strikes the mirror PQ at B, the reflected ray moves along the path AB and strikes the mirror RS at C and again reflects back along CD. Prove that $AB||CD$

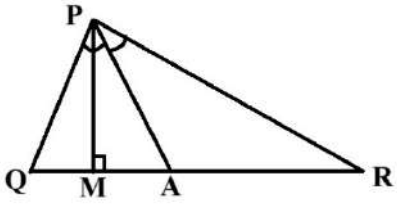
(DIFFICULT)



82. It is given that $\angle XYZ = 64^0$ and XY is produced to point P. Draw a figure from the given information. If ray YQ bisects $\angle ZYP$, find $\angle XYQ$ and reflex $\angle QYP$. **(DIFFICULT)**

83. In the figure, PA is angular bisector of $\angle QPR$. If $\angle PMA = 90^0$, then prove that

$\angle APM = \frac{1}{2}(\angle Q - \angle R)$ **(DIFFICULT)**



CHAPTER – 7 TRIANGLES

LO. No	Learning Outcomes	Question Numbers
10	Establish the properties of congruence of two triangles and apply them to solve problems related to different types of congruent triangles.	All questions

EASY	AVERAGE	DIFFICULT	TOTAL
19	31	5	55

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries one mark)

1. Congruent figures among these **(EASY)**

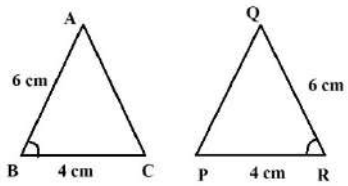
(A) Square and trapezium (B) Rectangle and circle

(C) Two circles of same radii (D) Scalene and Equilateral triangles

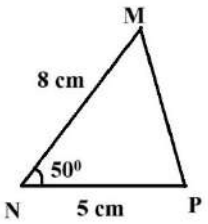
2. Observe the triangles, the correct statement among the following is **(EASY)**

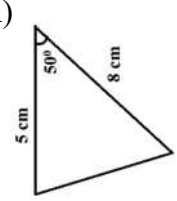
(A) $\Delta ABC \cong \Delta QPR$ (B) $\Delta ABC \cong \Delta PQR$

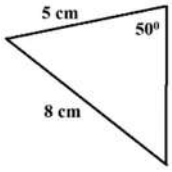
(C) $\Delta ACB \cong \Delta QRP$ (D) $\Delta ABC \cong \Delta QRP$

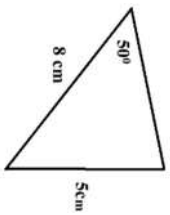


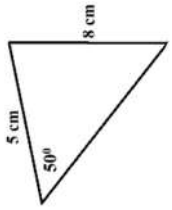
3. The triangle congruent to the given ΔMNP is **(EASY)**



(A)


(B)


(C)


(D)


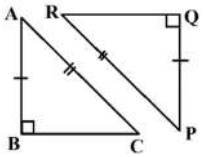
4. If $\Delta KLM \cong \Delta XYZ$ and $\angle L = 70^0$, $\angle M = 50^0$, then the measure of $\angle X$ is **(AVERAGE)**

(A) 50^0 (B) 60^0 (C) 70^0 (D) 120^0

5. The rule used to prove the congruency of ΔABC *and* ΔDEF is **(EASY)**

(A) S.S.S (B) S.A.S

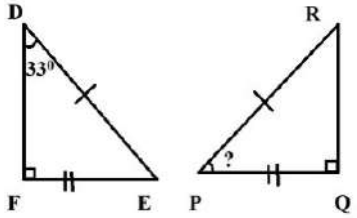
(C)A.S.A (D) R.H.S



6. If $\Delta DEF \cong \Delta KLM$, then corresponding sides are **(AVERAGE)**

(A) DE and LM (B) EF and KL (C) EF and KM (D) DF and MK

7. In the figure, the measure of $\angle P$ is **(AVERAGE)**



(A) 57^0 (B) 67^0

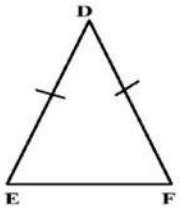
(C) 33^0 (D) 90^0

8. In an isosceles ΔBDE, $\angle B = \angle E$, then the correct statement is **(EASY)**

(A) $BD = BE$ (B) $DE = BE$

(C) $BD = DE$ (D) $DB = EB$

9. In the given ΔDEF, $\angle D = 45^0$, the measure of $\angle E$ is **(AVEARGE)**



(A) 67.5^0 (B) 57.5^0

(C) 135^0 (D) 45^0

10. The measure of each angle in an equilateral triangle is **(EASY)**

(A) 180^0 (B) 90^0 (C) 60^0 (D) 30^0

11. In ΔDEF and ΔXYZ, If $DE = XY, EF = YZ, DF = XZ, \angle Z = 35^0$ and $\angle X = 53^0$, then the measure of $\angle E$ is **(AVERAGE)**

(A) 88^0 (B) 92^0 (C) 127^0 (D) 145^0

12. If equal angles of an isosceles triangle measure 50^0 each, then the measure of its third angle is **(AVERAGE)**

(A) 25^0 (B) 40^0 (C) 50^0 (D) 80^0

13. In two triangles, if OF = AE, OX = PE and XF = AP, then **(AVERAGE)**

(A) $\Delta FOX \cong \Delta APE$ (B) $\Delta XOF \cong APE$ (C) $\Delta FOX \cong \Delta AEP$ (D) $\Delta OXF \cong \Delta PEA$

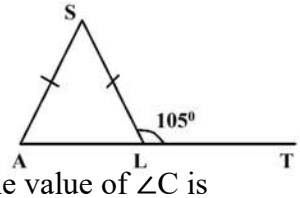
14. It is given that $\Delta CAT \cong \Delta DOG$, if AT = 5 cm, $\angle A = 80^0$, $\angle T = 60^0$, then **(AVERAGE)**

(A) $DO = 5cm, \angle D = 60^0$ (B) $OG = 5c\ m, \angle G = 80^0$

(C) $DG = 5c\ m, \angle G = 40^0$ (D) $GO = 5\ cm, \angle D = 40^0$

15. In the given figure SALT, $\angle SLT = 105^0$, then the measure of $\angle ASL$ is

(A) 30^0 (B) 75^0 (C) 85^0 (D) 105^0



(AVERAGE)

16. In triangle ABC, if AB = AC and $\angle B = 50^0$ then, the value of $\angle C$ is **(AVERAGE)**

(A) 40^0 (B) 50^0 (C) 80^0 (D) 130^0

17. In triangle PQR, if $\angle R = \angle P$, QR = 4cm and PR = 5cm then the measure of PQ is

(A) 4cm (B) 5cm (C) 2 cm (D) 2.5cm

(EASY)

II. Answer the following questions (One mark questions)

18. Define congruent triangles. **(EASY)**

19. Give an example of geometrical figures which are always congruent. **(EASY)**

20. Write the statement of A.S.A congruence rule. **(EASY)**

21. Write the statement of R.H.S congruence rule. **(EASY)**

22. Write the statement of S.S.S congruence rule. **(EASY)**

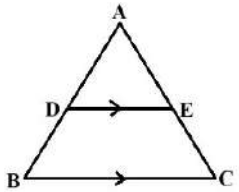
23. Write the statement of S.A.S congruence rule **(EASY)**

24. Write the corresponding vertices, if $\Delta PQR \cong \Delta XYZ$. **(EASY)**

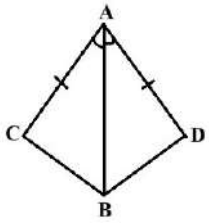
25. Write the corresponding sides, if $\Delta KLM \cong \Delta GHK$. **(EASY)**

26. In an isosceles ΔABC, $\angle A = \angle C$. Name the equal sides. **(EASY)**

27. In the given ΔABC, if DE ∥ BC, identify corresponding angles. **(EASY)**



28. In the given figure, identify the corresponding sides of the two congruent triangles.

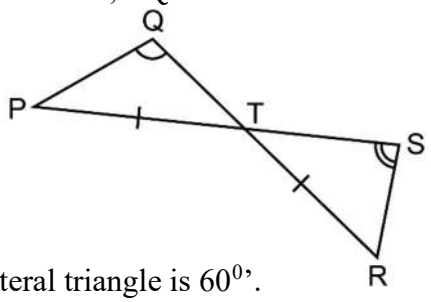


(AVERAGE)

III. Answer the following questions: (Two marks questions)

29. ΔABC and ΔXYZ are congruent triangles. If $\angle A = \angle X$ and $\angle C = \angle Z$ then identify corresponding sides. **(EASY)**

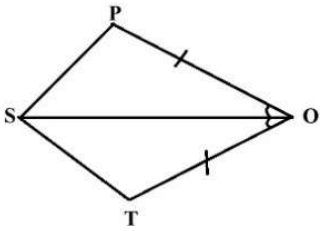
30. In the given figure PS and QR intersect at T, $\angle Q = \angle S$. Prove that $\Delta PQT \cong \Delta RST$. **(AVERAGE)**



31. Prove that, 'each angle of an equilateral triangle is 60^0'. **(AVERAGE)**

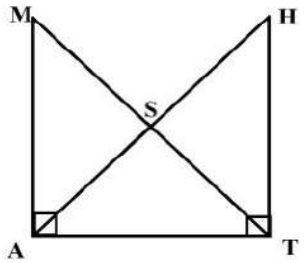
32. In the adjoining quadrilateral STOP, SO bisects $\angle O$, SP = 5cm, **(AVERAGE)**

Find the length of ST and give reason for your answer.

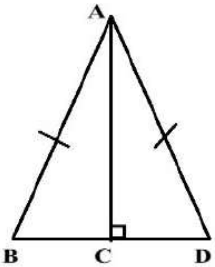


33. CAR is a right triangle, right angled at R. Acute angles are in the ratio $2 : 3$. Find the measure of acute angles. **(AVERAGE)**

34. In the given figure MATHS, AH = MT. Prove that AM = HT. **(AVERAGE)**

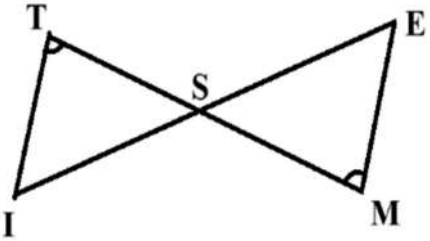


35. In the ΔABD, $AC \perp BD$, using RHS congruence rule prove that $\angle B = \angle D$. **(AVERAGE)**

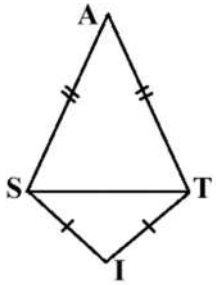


36. In an isosceles right triangle, find the measure of all the three angles. **(AVERAGE)**

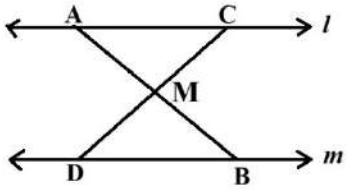
37. Observe the figure, line segment TM and EI intersect at S, S is the midpoint of TM and $\angle T = \angle M$. Prove that $\Delta SIT \cong \Delta SEM$. **(AVERAGE)**



38. ΔSAT and ΔSIT are isosceles triangles are on the same base ST. Prove that $\angle ASI = \angle ATI$. **(AVERAGE)**



39. In the figure, $l \parallel m$ and M is the midpoint of AB. Show that M is also midpoint of CD. **(AVERAGE)**



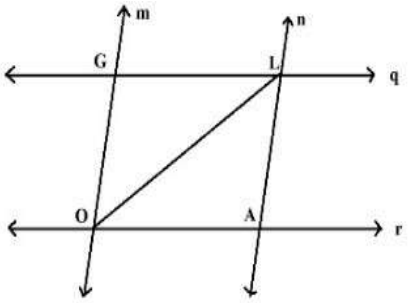
IV. Answer the following questions: (Three marks questions)

40. Prove that "each diagonal of a rectangle divides it into two congruent triangles". **(AVERAGE)**

41. In the given figure, $m \parallel n$ and $q \parallel r$. Prove that **(AVERAGE)**

i) $\Delta OGL \cong \Delta OAL$ using S.S.S congruence rule.

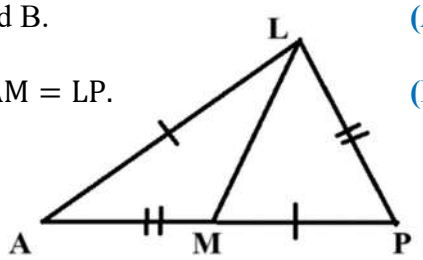
ii) $\angle G = \angle A$



42. AB is a line segment and line l is its perpendicular bisector. If a point P lies on l, prove that P is equidistance from A and B. **(AVERAGE)**

43. In the given figure LAMP, AL = MP, AM = LP. **(EASY)**

Prove that ∠ALM = ∠LMP.

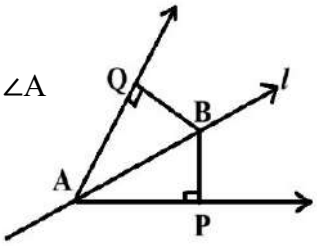


44. ABC is a right-angled triangle in which ∠A = 90^0 and AB = AC. Find the measures of ∠B and ∠C. **(AVERAGE)**

45. In fig, line l is the bisector of an angle ∠A and B is any point on l. BP and BQ are perpendiculars from B to the arms of ∠A. Show that **(AVERAGE)**

i. ΔAPB ≅ ΔAQB

ii. BP = BQ or B is equidistant from the arms of ∠A

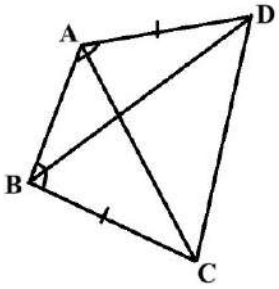


46. In fig, ABCD is a quadrilateral in which AD = BC and ∠DAB = ∠CBA prove that **(AVERAGE)**

i. Δ ABD ≅ ΔBAC

ii. BD = AC

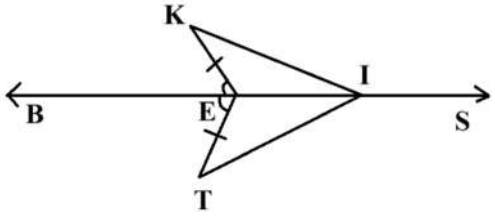
iii. ∠ABD = ∠BAC



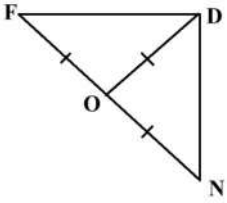
47. In the given quadrilateral KITE, BS bisects ∠KET and KE = ET. **(DIFFICULT)**

Prove that i) ΔKEI ≅ ΔTEI.

ii) KI = TI.

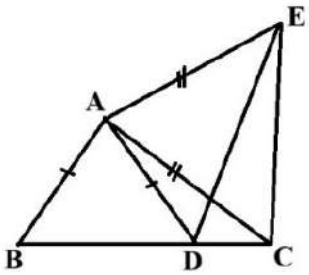


48. In the given ΔFND, FO = ON = OD. Prove that $\angle FDN = 90^0$. **(AVERAGE)**



V. Answer the following questions: (Four marks questions)

49. In fig AC = AE, AB = AD and ∠BAD = ∠EAC. Show that BC = DE. **(DIFFICULT)**

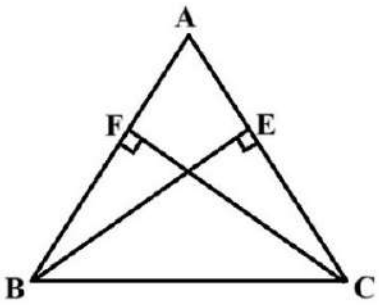


50. AD is an altitude of an isosceles triangle ABC in which AB = AC. show that

i. AD bisects BC **(AVERAGE)**

ii. AD bisect ∠A

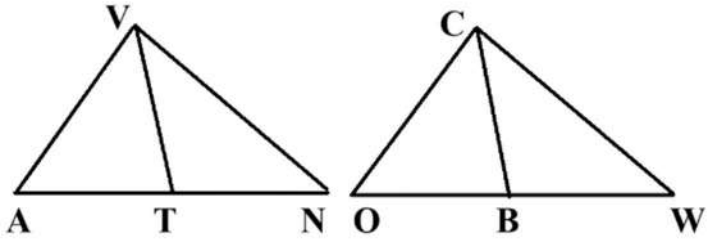
51. In fig, ABC is an isosceles triangle in which altitudes BE and CF are drawn to equal sides AC and AB respectively. Show that these altitudes are equal. **(DIFFICULT)**



52. In the given figure, $\Delta VAN \cong \Delta COW$, VT and CB are their medians. **(DIFFICULT)**

Prove that: i) $\Delta VAT \cong \Delta COB$

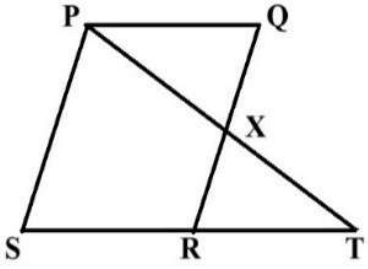
ii) VT = CB



53. PQRS is a parallelogram in which X is the mid-point of QR. **(DIFFICULT)**

Prove that: i) $\Delta PXQ \cong \Delta TXR$

ii) ST = 2PQ



VI. Answer the following questions: (Five marks questions)

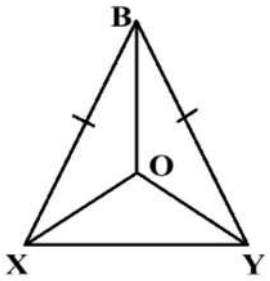
54. In the given figure, ΔBXY is an isosceles triangle, bisector of ∠X and ∠Y intersect at O.

Prove that **(AVERAGE)**

i) OX = OY

ii) ΔBOX ≅ ΔBOY

iii) OB bisects ∠XBY



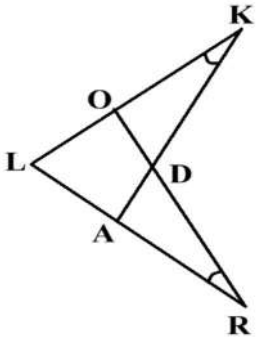
55. In the figure KOLARD, ∠AKL = ∠ORL and KL = RL. **(AVERAGE)**

Prove that

i) $\Delta KAL \cong \Delta ROL$

ii) AK = OR

iii) AR = OK



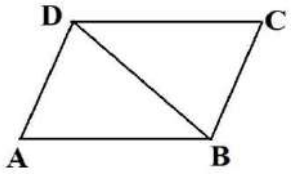
CHAPTER 8 – QUADRILATERALS

LO. No	Learning Outcomes	Question Numbers
11	Derive mathematical statements related to quadrilaterals and use them to solve problems.	32, 45, 46, 55, 56, 60, 74.
12	Prove the properties of parallelogram logically and use these properties to solve problems and to prove midpoint theorem.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 47, 48, 49, 50, 51, 52, 53, 54, 57, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 75, 76, 77, 78

EASY	AVERAGE	DIFFICULT	TOTAL
20	**51**	**7**	**78**

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries one mark)

1. In the figure, the diagonal of the parallelogram ABCD is **(EASY)**

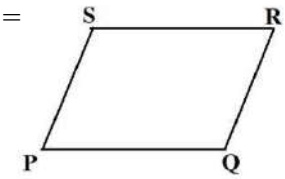


(A) AB (B) DC
(C) DB (D) AD

2. The sum of all the angles of a parallelogram is **(EASY)**

(A) 90^0 (B) 180^0 (C) 270^0 (D) 360^0

3. In the figure, If PQRS is a parallelogram then, $\angle P$ = **(EASY)**



(A) $\angle R$ (B) $\frac{1}{2}\angle R$
(C) $2\angle R$ (D) $3\angle R$

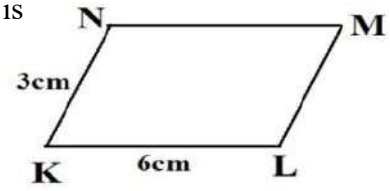
4. If the diagonals of a parallelogram are equal then it is a **(EASY)**

(A) Kite (B)Rectangle (C) Rhombus (D) Trapezium

5. In a parallelogram, the sum of any two consecutive angles measure **(EASY)**

(A) 90^o (B) 100^o (C) 150^o (D) 180^o

6. In the figure, KLMN is a parallelogram. If KL = 6cm and NK = 3cm, then the perimeter of the parallelogram is **(AVERAGE)**



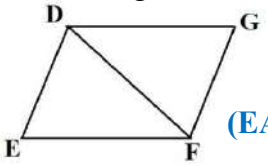
(A) 9cm (B) 18cm

(C) 24cm (D) 30cm

7. In a parallelogram, if all the four sides are equal in length then, it is a **(EASY)**

(A) Trapezium (B) Kite (C) Rectangle (D) Rhombus

8. In the figure, DEFG is a parallelogram. The correct statement among the following is



(A) $\angle E + \angle D = 90^0$ (B) $\angle D \neq \angle F$

(C) $\angle EDF = \angle DFG$ (D) $\angle E = 2\ \angle G$ **(EASY)**

9. In a parallelogram, if one of the angle measures 90^0, then it is a **(EASY)**

(A) Rectangle (B) Trapezium (C) Rhombus (D) Kite

10. With respect to a parallelogram, the correct statement among the following is

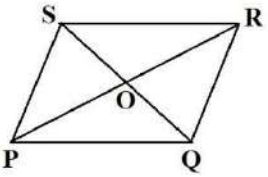
(A) Opposite sides are equal but not parallel.

(B) Opposite angles are always supplementary.

(C) Diagonals bisect each other.

(D) Diagonals are unequal and do not bisect each other. **(AVERAGE)**

11. In the figure PQRS is a parallelogram. The correct statement in the following is



(A) PO = 2OR (B) OQ = OS

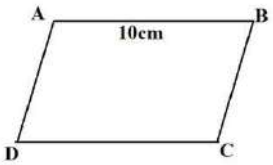
(C) PR = QS (D) PQ = 2 SR **(EASY)**

12. If one of the angle of a parallelogram is 70^0, then the measure of its adjacent angle is

(A) 20^0 (B) 70^0 (C) 90^0 (D) 110^0

(AVERAGE)

13. In the figure, ABCD is a parallelogram. If the perimeter of the parallelogram is 36cm and one of its side is 10cm, then the length of BC is



(A) 5cm (B) 8cm

(C) 10cm (D) 26cm

(AVERAGE)

14. If an angle of a parallelogram is two third of its adjacent angle, then its smallest angle is

(A) 54^0 (B) 72^0 (C) 81^0 (D) 108^0 **(AVERAGE)**

15. In a parallelogram, if the sum of the opposite angles is 80^0, then each of those opposite angle measures **(AVERAGE)**

(A) 20^0 (B) 40^0 (C) 80^0 (D) 100^0

16. If one angle of a parallelogram is 24^0 less than twice its smallest angle, then the largest angle is **(AVERAGE)**

(A) 68^0 (B) 102^0 (C) 112^0 (D) 136^0

17. The bisectors of any two adjacent angles of a parallelogram intersect at an angle **(AVERAGE)**

(A) 30^0 (B) 45^0 (C) 60^0 (D) 90^0

18. In a parallelogram ABCD, if $\angle A = 75^0$ then $\angle D - \angle C$ measures **(DIFFICULT)**

(A) 5^0 (B) 20^0 (C) 30^0 (D) 60^0

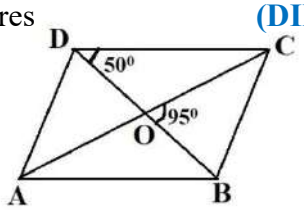
19. The bisectors of the angles of a parallelogram enclose a **(AVERAGE)**

(A) Parallelogram (B) Rhombus (C) Rectangle (D) Square

20. In the figure, ABCD is a parallelogram. Diagonals AC and BD intersect at 'O'. If $\angle CDO = 50^0$ and $\angle COB = 95^0$, then $\angle OAB$ measures **(DIFFICULT)**

(A) 30^0 (B) 45^0

(C) 50^0 (D) 60^0



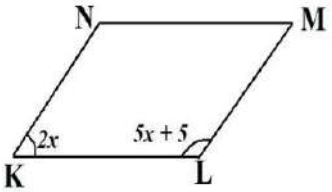
21. In a parallelogram, if the adjacent angles are in the ratio 2 : 3, then the measure of these adjacent angles are **(AVERAGE)**

(A) 20^0 and 30^0 (B) 36^0 and 54^0 (C) 60^0 and 120^0 (D) 72^0 and 108^0

22. In the figure, KLMN is a parallelogram. If $\angle K$ and $\angle L$ are $(2x)$ and $(5x + 5)$ respectively, then the value of 'x' is **(AVERAGE)**

(A) 25^0 (B) 30^0

(C) 50^0 (D) 130^0



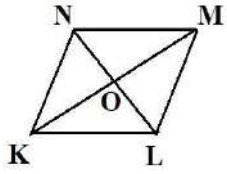
23. ABCD is a rhombus such that $\angle ACB = 40^0$, then $\angle ADB =$ **(AVERAGE)**

(A) 40^0 (B) 45^0 (C) 50^0 (D) 60^0

24. In the figure, if KLMN is a rhombus, then $\angle MOL$ measures **(AVERAGE)**

(A) 45^0 (B) 60^0

(C) 80^0 (D) 90^0



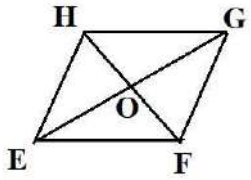
25. The perimeter of a rhombus of side length 10 cm is **(AVERAGE)**

(A) 10cm (B) 14cm (C) 20cm (D) 40cm

26. In the figure, EFGH is a rhombus. The correct statement among the following is

(A) $\angle E = \angle F = \angle G = \angle H = 90^0$ (B) EG = HF

(C) EF = 2FG (D) $\angle HOG = 90^0$ and OE = OG



(AVERAGE)

27. The sum of any two consecutive angles of a rhombus measures **(EASY)**

(A) 60^0 (B) 90^0 (C) 180^0 (D) 360^0

28. In rhombus ABCD, if $\angle ACB = 40^0$, then measure of $\angle AOB$ **(AVERAGE)**

(A) 40^0 (B) 45^0 (C) 50^0 (D) 60^0

29. If one angle of parallelogram is 70^0, then sum of remaining angles is

(A) 290^0 (B) 310^0 (C) 350^0 (D) 315^0

(AVERAGE)

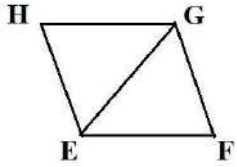
30. If the diagonals of a rhombus measure 18cm and 24cm, then the length of each side of the rhombus is **(AVERAGE)**

(A) 15cm (B) 16cm (C) 17cm (D) 20cm

31. In the figure, EFGH is a rhombus. If EF = EG, then $\angle EGF$ measures **(AVERAGE)**

(A) 45^0 (B) 50^0

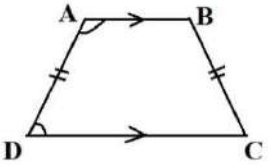
(C) 60^0 (D) 70^0



32. In the figure, the sum of the measures of $\angle A$ and $\angle D$ is **(AVERAGE)**

(A) 90^0 (B) 180^0

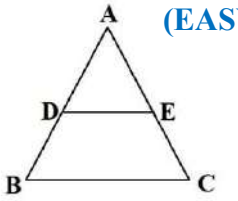
(C) 270^0 (D) 360^0



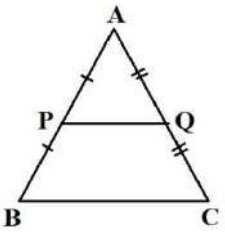
33. In ΔABC, D and E are the midpoints of AB and AC respectively. The relation between DE and BC is **(EASY)**

(A) DE = BC (B) DE $\perp$ BC

(C) DE = 2BC (D) DE = $\frac{1}{2}$BC



34. In ΔABC, the correct relation is **(EASY)**



(A) PQ = 2BC (B) BC = 2PQ

(C) BC = $\frac{1}{2}$ PQ (D) BC = 3PQ

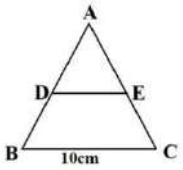
35. In a quadrilateral ABCD, If P, Q, R and S are the midpoints of AB, BC, CD and AD respectively then the quadrilateral formed by joining these midpoints is **(EASY)**

(A) Rhombus (B) Square

(C) Rectangle (D) Parallelogram

36. In ΔABC, D and E are the midpoints of AB and AC respectively. **(AVERAGE)**

If BC = 10cm, then the length of DE is

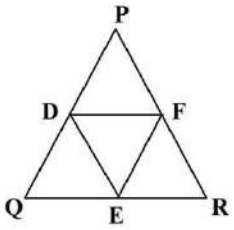


(A) 2.5cm (B) 5cm

(C) 10cm (D) 20cm

37. In ΔPQR, D, E and F are the midpoint of the sides PQ, QR and RP respectively.

If the perimeter of the ΔDEF is 24cm, then the perimeter of the ΔPQR is **(AVERAGE)**



(A) 12cm (B) 24cm

(C) 48cm (D) 72cm

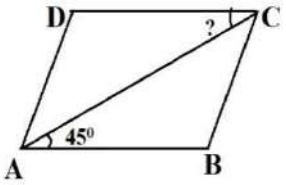
II. Answer the following questions: (One mark questions)

38. Write any two properties of parallelogram. **(EASY)**

39. Write any two properties of rhombus. **(EASY)**

40. Write the statement of mid-point theorem. **(EASY)**

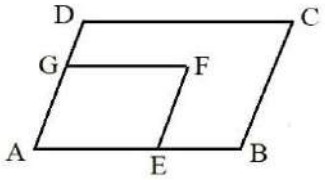
41. In the figure, ABCD is a parallelogram. If ∠BAC = 45^0, then write the measure of ∠DCA.



(AVERAGE)

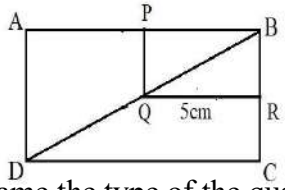
42. In a parallelogram, if one of the angle is twice the adjacent angle, then write the measures of adjacent angles. **(AVERAGE)**

43. In the figure ABCD and AEFG are two parallelograms. If ∠C = 55^0, then find ∠AEF.



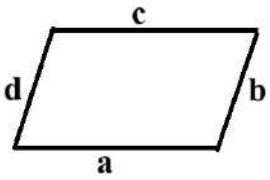
(AVERAGE)

44. In the figure ABCD and PQRB are rectangles. Q is the mid-point of BD. If QR = 5cm, then what is the measure of AB?

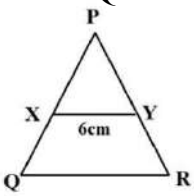


(AVERAGE)

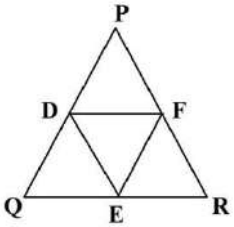
45. If all angles of quadrilateral are equal, then name the type of the quadrilateral. **(EASY)**
46. Is it possible to construct a quadrilateral having angles of 110^0, 80^0, 70^0 and 95^0? Justify your answer. **(EASY)**
47. In the figure, the sum of any two adjacent sides is 5 units. Find the perimeter of the parallelogram. **(AVERAGE)**



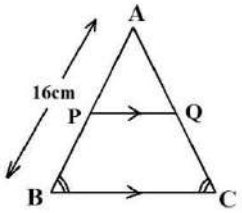
48. In ΔPQR, X and Y are the midpoints of PQ and PR. If XY = 6cm, then find the length of QR. **(EASY)**



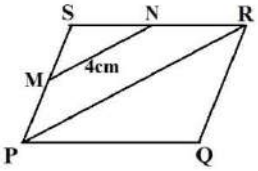
49. In ΔPQR, D, E and F are the midpoint of the sides PQ, QR and RP respectively. If the perimeter of the ΔPQR is 36cm, then find the perimeter of the ΔDEF. **(AVERAGE)**



50. In ΔABC, P is the midpoint of AB and AB = 16cm. If PQ ∥ BC, then write the length of AQ. **(DIFFICULT)**

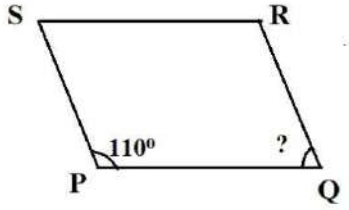


51. PQRS is a parallelogram. M and N are the midpoints of PS and SR. If MN = 4cm then find the length of the diagonal PR. **(AVERAGE)**

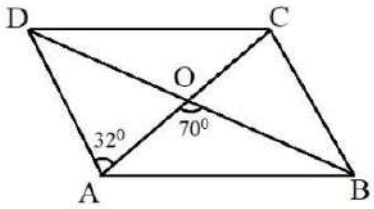


III. Answer the following questions: (Two marks questions)

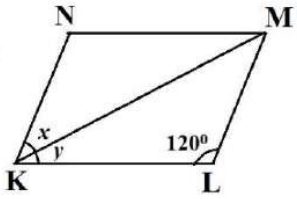
52. In the figure, PQRS is a parallelogram. If $\angle P = 110^0$, then find the measure of $\angle Q$. **(EASY)**



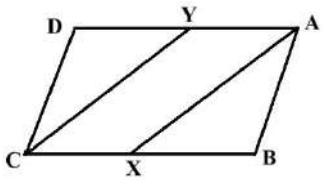
53. In the figure ABCD is a parallelogram. If $\angle DAC = 32^0$ and $\angle AOB = 70^0$, then find the measure of $\angle DBC$.



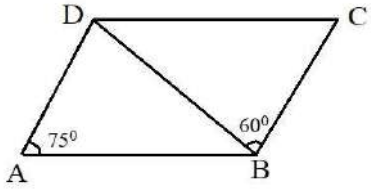
54. In the figure KLMN is a parallelogram. Find the values of 'x' and 'y'. **(AVERAGE)**



55. The angles of a quadrilateral are in the ratio 3 : 4 : 4 : 7 then, find the measure of four angles. **(AVERAGE)**
56. If one angle of a quadrilateral is 108^0 and the remaining three angles are equal then calculate the measure of equal angles. **(AVERAGE)**
57. In the figure, ABCD is a parallelogram AX and CY are the angle bisector of angles A and C respectively. Show that AX and CY are parallel. **(AVERAGE)**

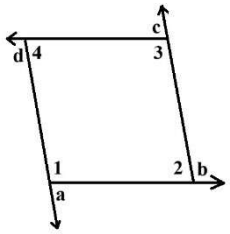


58. Prove that, "If one diagonal of a parallelogram bisects one angle, then it also bisects the opposite angle" **(AVERAGE)**
59. In the figure ABCD is a parallelogram if $\angle DAB = 75^0$ and $\angle DBC = 60^0$, find $\angle CDB$ and $\angle ADB$ **(DIFFICULT)**

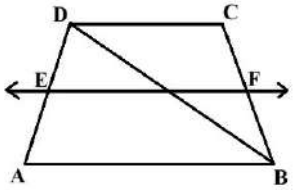


IV. Answer the following questions: (Three Mark questions)

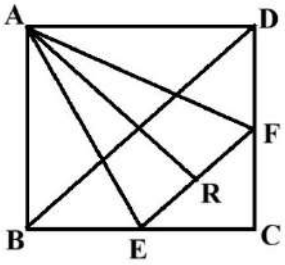
60. In the figure a, b, c and d are the exterior angle of a quadrilateral.
Find the value of a + b + c + d **(AVERAGE)**



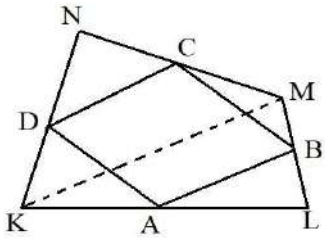
61. ABCD is a trapezium in which AB∥DC, BD is a diagonal and E is the midpoint of AD. A line is drawn through E parallel to AB intersecting BC at F. show that F is the midpoint of BC. **(AVERAGE)**



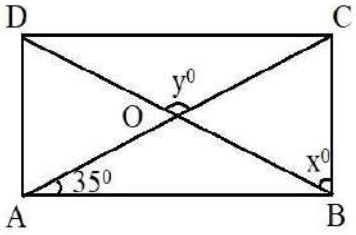
62. ABCD is a square. E and F are midpoints of DC and BC respectively. If R is the midpoint of EF, then prove that ΔAER ≅ ΔAFR. **(DIFFICULT)**



63. In the figure KLMN is a quadrilateral A, B, C and D are the midpoints of sides KL, LM, MN and NK respectively. Prove that ABCD is a parallelogram. **(AVERAGE)**



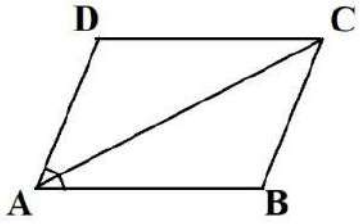
64. In the figure ABCD is a rectangle. Find the values of x and y. **(DIFFICULT)**



65. Diagonal AC of a parallelogram ABCD bisects ∠A as shown in the figure. Show that

(i) It bisects ∠C also,

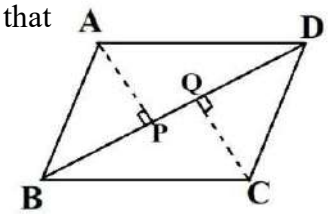
(ii) ABCD is a rhombus. **(AVERAGE)**



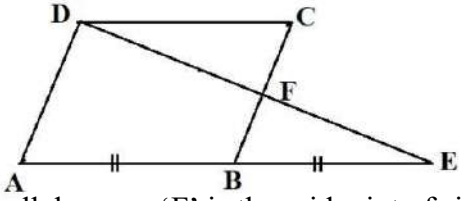
66. ABCD is a parallelogram and AP and CQ are perpendiculars from vertices A and C on diagonal BD, as shown in the figure. Show that

(i) ΔAPB ≅ ΔCQD

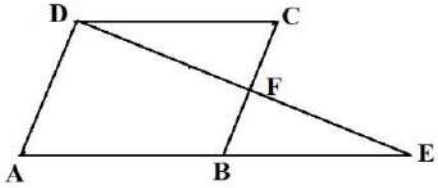
(ii) AP = CQ **(AVERAGE)**



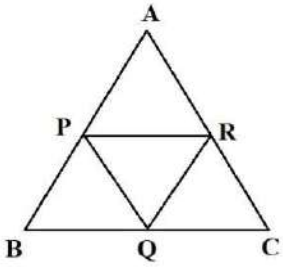
67. In the figure, ABCD is a parallelogram. If AB is produced to E such that AB = BE, then show that ED bisects BC. **(AVERAGE)**



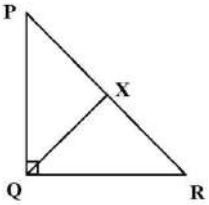
68. In the figure, ABCD is a parallelogram. 'F' is the midpoint of side BC. If AB and DF are produced to meet at 'E', then show that AE = 2AB **(AVERAGE)**



69. If P, Q and R are the midpoints of the sides AB, BC and CA of an equilateral triangle ΔABC, then prove that ΔPQR is also an equilateral triangle. **(AVERAGE)**



70. In the figure, ΔPQR is a right angled at 'Q'. If 'X' is the midpoint of PR then, show that XP = XQ = XR. **(AVERAGE)**



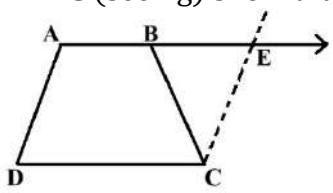
V. Answer the following questions: (Four marks questions)

71. Show that the diagonals of a square are equal and bisect each other at right angles. **(AVERAGE)**

72. Prove that "The diagonals of a parallelogram bisect each other." **(AVERAGE)**

73. Prove that, "In a parallelogram, the bisectors of any two consecutive angles intersect at right angles." **(DIFFICULT)**

74. ABCD is a trapezium in which AB || CD and AD = BC (see fig) show that



    i. ∠A = ∠B

    ii. ∠C = ∠D

    iii. Δ ABC ≅ Δ BAD

    iv. Diagonal AC = diagonal BD **(AVERAGE)**

75. ABC is a triangle right angled at C. A line through the midpoint M of hypotenuse AB and parallel to BC intersects AC at O. show that **(AVERAGE)**

    i. D is the midpoint of AC

    ii. MD ⊥ AC

    iii. CM = MA = $\frac{1}{2}$ AB

VI. Answer the following questions: (Five marks questions)

76. Prove that "The line segment joining the midpoints of two sides of a triangle is parallel to the third side" **(AVERAGE)**

77. Prove that, "the bisectors of the angles of a parallelogram form a rectangle" **(AVERAGE)**

78. Prove that, "the line joining the midpoints of consecutive sides of a quadrilateral form a parallelogram" **(AVERAGE)**

CHAPTER – 9 CIRCLES

LO. No	Learning Outcomes	Question Numbers
13	Prove properties of chord in a circle logically. Establish the relationship between the angle subtended at the centre and angle subtended at the circumference by the same arc and solve various problems.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 37, 38, 39, 42, 43, 45, 46, 47, 48, 49, 50, 51, 53, 54, 56, 58, 59
14	Prove the properties of cyclic quadrilaterals and solve problems related to cyclic quadrilaterals.	19, 20, 22, 32, 36, 39, 40, 41, 44, 52, 55, 57

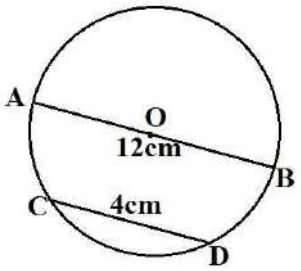
EASY	AVERAGE	DIFFICULT	TOTAL
12	38	09	59

I. Four alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries 1 mark)

1. Given a circle with centre 'O', the lengths of chord CD and AB are 4cm and 12cm respectively. The radius of the circle is **(EASY)**

   (A) 2cm (B) 4cm

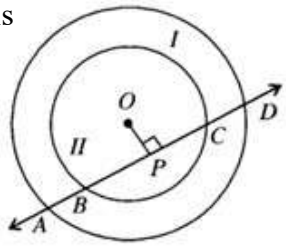
   (C) 6cm (D) 12cm



2. Given two concentric circles with centre O, A line cuts the circles at A, B, C, D respectively. If AB =3cm, then the length of CD is **(EASY)**

   (A) 1.5cm (B) 3cm

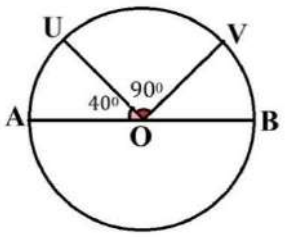
   (C) 6cm (D) 12cm



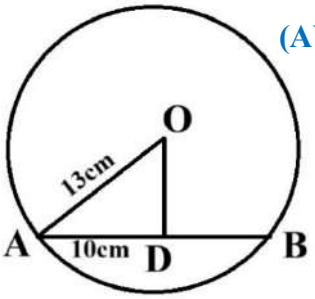
3. In the given circle with centre O. If $\angle AOU = 40^0$, then the measure of $\angle BOV$ is **(EASY)**

   (A) 50^0 (B) 80^0

   (C) 90^0 (D) 180^0



4. In the given circle with centre O, If chord AB = 10cm and AO = 13 cm then, the distance of the chord from the centre is **(AVERAGE)**



(A) 5cm (B) 10cm

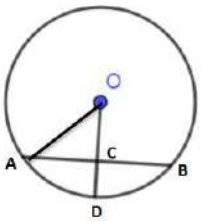
(C) 12cm (D) 13cm

5. AD is a diameter of a circle and AB is a chord. If AD = 34cm and AB = 30cm then, the distance of AB from the centre of the circle is **(DIFFICULT)**

A) 17cm B) 15cm

C) 4cm D) 8cm

6. In the figure O is the centre of the circle. If OA = 5cm, AB = 8cm and OD⊥AB then CD is equal to **(DIFFICULT)**



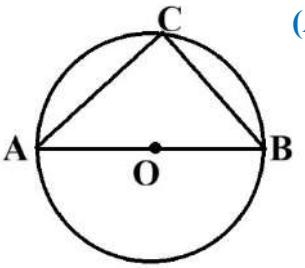
A) 2cm B) 3cm

C) 4cm D) 5cm

7. If AB = 12cm, BC = 16cm and AB ⊥BC, then the radius of the circle passing through the points A, B and C is **(DIFFICULT)**

A) 6cm B) 8cm C) 10cm D) 12cm

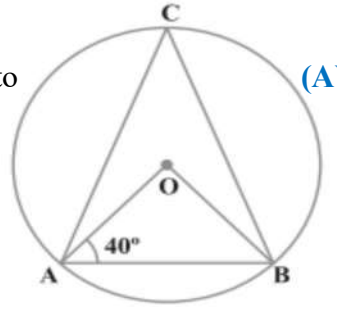
8. In the figure, if AOB is a diameter of the circle and AC = BC then ∠CAB is equal to **(AVERAGE)**



A) 30^0 B) 60^0

C) 90^0 D) 45^0

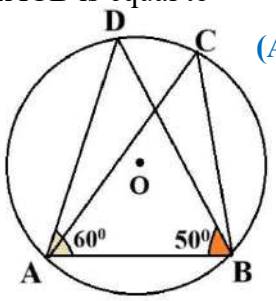
9. In the figure, if ∠OAB = 40^0 then ∠ACB is equal to **(AVERAGE)**



A) 50^0 B) 40^0

C) 60^0 D) 70^0

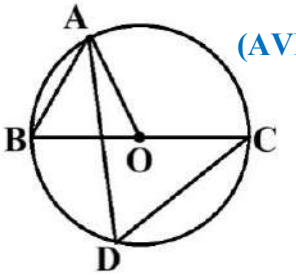
10. In the figure, if $\angle DAB = 60^0$ and $\angle ABD = 50^0$ then $\angle ACB$ is equal to **(AVERAGE)**



A) 60^0 B) 50^0

C) 70^0 D) 80^0

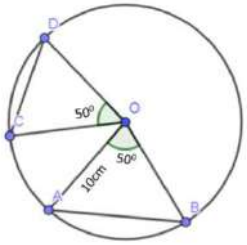
11. In the figure, O is the centre of the circle, BC is a diameter of the circle and $\angle BAO = 60^0$. The measure of $\angle ADC$ is **(AVERAGE)**



A) 30^0 B) 45^0

C) 60^0 D) 120^0

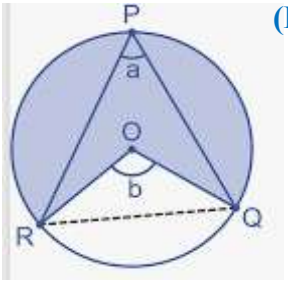
12. In the given circle with centre 'O', $\angle AOB = \angle COD = 50^0$, DC=10cm. Then the length of AB is **(EASY)**



(A) 5cm (B) 10cm

(C) 15cm (D) 20cm

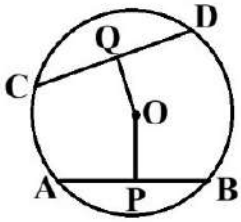
13. In the given figure O is the centre of the circle. The correct relation between 'a' and b' is **(EASY)**



(A) $a = \frac{1}{2}b$ (B) $a = b$

(C) $a = 2b$ (D) $a = 3b$

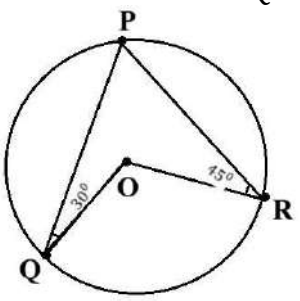
14. In the given figure O is the centre of the circle, OP ⊥ AB, OQ ⊥ CD. If OP = OQ and CD = 8 cm then AB = **(EASY)**



(A) 2cm (B) 4cm

(C) 5cm (D) 8cm

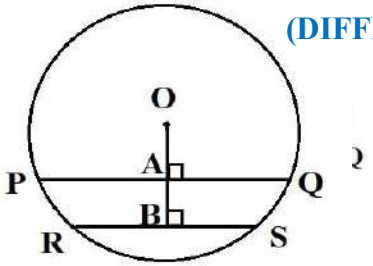
15. In the given figure, O is the centre of the circle. The measure of ∠QOR is **(AVERAGE)**



(A) 30^0 (B) 50^0

(C) 65^0 (D) 130^0

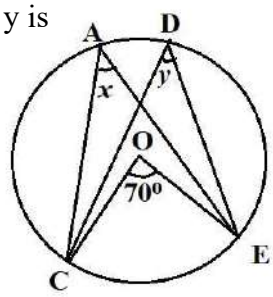
16. In the given circle O is the centre and its radius is 10cm, PQ=12cm and RS=16cm, then the measure of AB is **(DIFFICULT)**



(A) 2cm (B) 4cm

(C) 14cm (D) 16cm

17. In the given circle O is the centre, then the measure of y is **(EASY)**



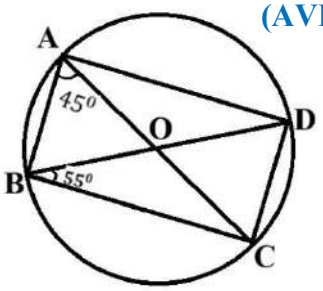
(A) 35^0 (B) 70^0

(C) $70 + x$ (D) 140^0

18. O is the centre of the circle, AB and CD are two chords of length 5cm and 6cm respectively and these chords subtend angles x^0 and y^0 at the centre of the circle respectively, then **(AVERAGE)**

(A) $x = y$ (B) $x < y$ (C) $x > y$ (D) $x \neq y$

19. In the given figure, O is the centre of the circle, $\angle DBC = 55^0$, $\angle BAC = 45^0$, then $\angle BCD$ is **(AVERAGE)**



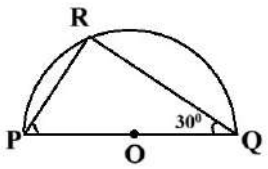
A) 50^0 (B) 55^0

(C) 100^0 (D) 80^0

20. ABCD is a cyclic quadrilateral such that AB is a diameter of the circle circumscribing it and ∠ADC=140^0 ,then the measure of ∠BAC is **(DIFFICULT)**

A) 80^0 B) 40^0 C) 50^0 D) 120^0

21. In the figure, O is the centre of the semicircle. **(AVERAGE)**



If $\angle RQP = 30^0$ then, the measure of $\angle RPQ$ is

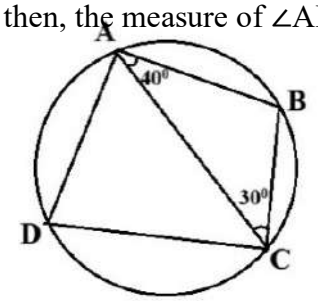
(A) 30^0 (B) 60^0

(C) 45^0 (D) 90^0

22. In the figure, If $\angle BAC = 40^0$ and $\angle BCA = 30^0$ then, the measure of $\angle ADC$ is

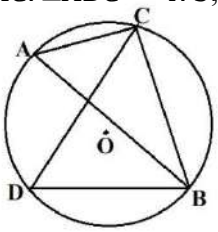
(A) 110^0 (B) 70^0

(C) 50^0 (D) 35^0



(AVERAGE)

23. In the given figure O is the centre of the circle. If $\angle BAC : \angle ABC = 4 : 5$, then the value of $\angle BDC$ is **(AVERAGE)**

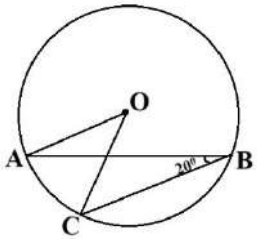


A) 10^0 (B) 40^0

(C) 55^0 (D) 90^0

II. Answer the following questions: (One mark questions)

24. In the figure, if $\angle ABC = 20^0$. Find the measure of $\angle AOC$.



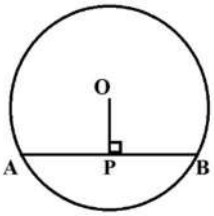
(AVERAGE)

25. Write the measure of sum of either pair of opposite angles of a cyclic quadrilateral.

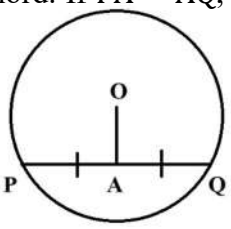
(AVERAGE)

26. In the figure O is the centre of the circle, PB = 4 cm. Find the length of the chord AB.

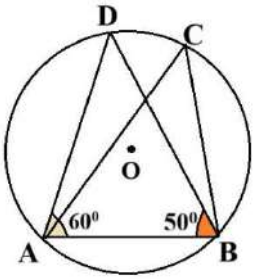
(EASY)



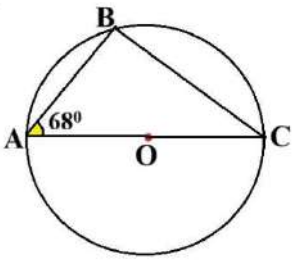
27. In the given circle with centre O and PQ is a Chord. If PA = AQ, then write the relation between PQ and OA. **(EASY)**



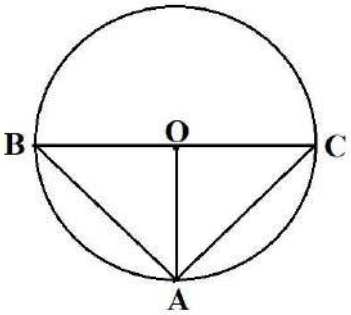
28. In the figure if $\angle BAC = 60^0$, $\angle ABD = 50^0$, then find the measure of $\angle ACB$ **(AVERAGE)**



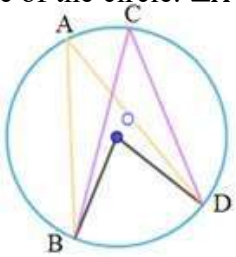
29. In the given circle with centre O, $\angle BAO = 68^0$, AC is the diameter. Find the measure of $\angle BCO$. **(EASY)**



30. In the given circle with centre O, AB=AC. If $\angle BOA = 90^0$. Find the measure of $\angle AOC$. **(AVERAGE)**



31. In the given figure O is the centre of the circle. $\angle A = \angle C$, Give reason. **(EASY)**

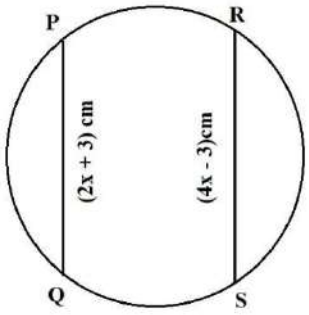


32. Define cyclic quadrilateral. **(EASY)**

III. Answer the following questions: (Two marks questions)

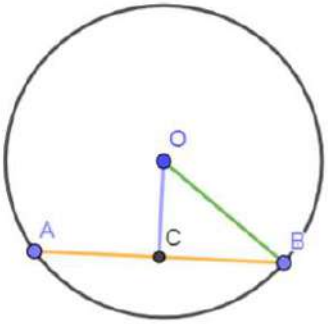
33. In the figure PQ and RS are equal chords of a circle. Find the value of x.

(AVERAGE)

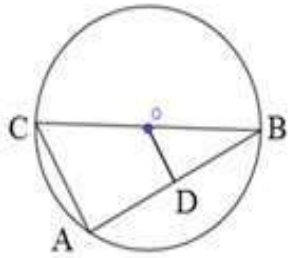


34. In the figure O is the centre of the circle, B is at a distance of 12 cm from its centre and length of the chord AB is 10cm. Find the distance of the chord from its centre.

(AVERAGE)

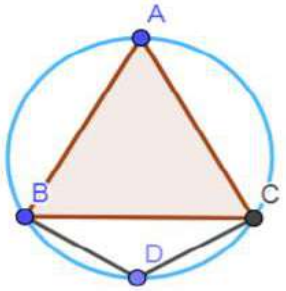


35. If BC is a diameter of a circle with centre O and OD is perpendicular to the chord AB of a circle. Show that AC=2(OD) **(AVERAGE)**

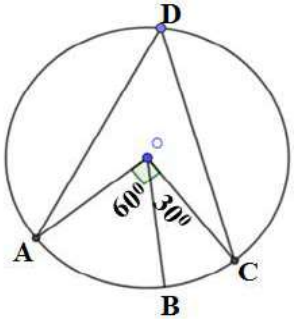


36. In the given figure ΔABC is an equilateral triangle and ABCD is a cyclic quadrilateral, then find the measure of $\angle BDC$.

(AVERAGE)

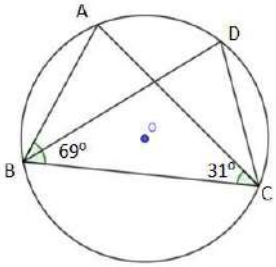


37. In the figure A, B and C are three points on the circle with centre O such that $\angle BOC = 30^0$ and $\angle AOB = 60^0$. If D is a point on the circle other than the arc ABC. Find the measure of $\angle ABC$.



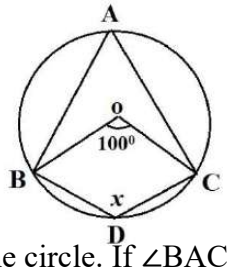
(AVERAGE)

38. In the figure, $\angle ABC = 69^0$, $\angle ACB = 31^0$. Find the measure of $\angle BDC$.



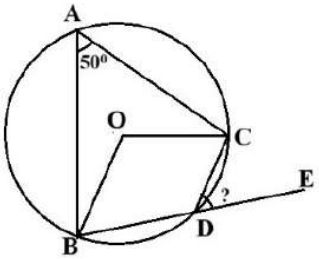
(AVERAGE)

39. In the figure, O is the centre of the circle. If $\angle BOC = 100^0$, then find the value of x.



(AVERAGE)

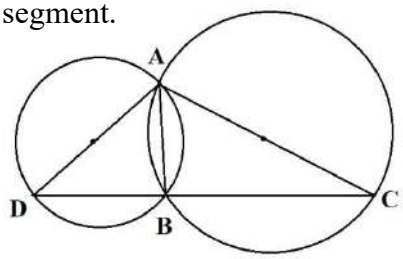
40. In the figure, O is the centre of the circle. If $\angle BAC = 50^0$ then, find the measure of $\angle CDE$.



(AVERAGE)

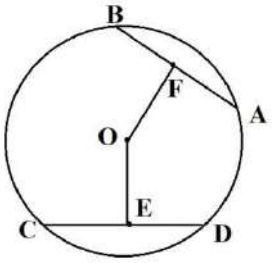
41. If diagonals of a cyclic quadrilateral are diameters of the circle through the vertices of the quadrilateral, prove that it is a rectangle. (AVERAGE)

42. In the figure two circles intersect at two points A and B. AD and AC are diameters to the two circles. Prove that DBC is a line segment.

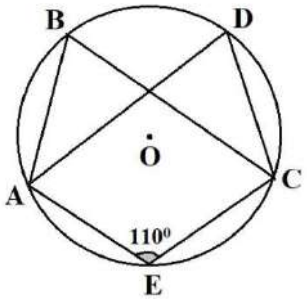


(AVERAGE)

43. In the given figure O is the centre of the circle. If OE< OF, Show that CD>AB. **(AVERAGE)**

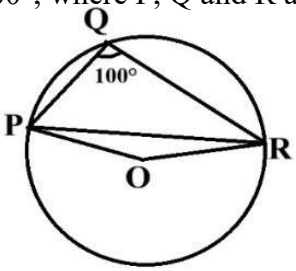


44. In the given figure, ABCE is a cyclic quadrilateral and O is the centre of the circle. If $\angle AEC = 110^0$, then find the measure ∠ABC and ∠ADC. **(AVERAGE)**

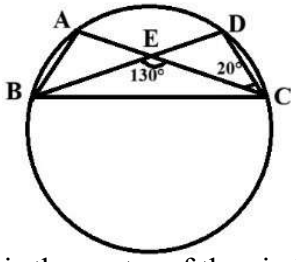


IV. Answer the following questions: (Three marks questions)

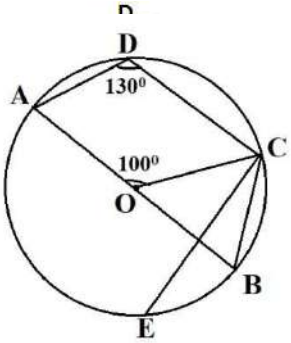
45. In the fig, ∠PQR = 100°, where P, Q and R are the points on a circle with centre O. Find ∠OPR. **(AVERAGE)**



46. In the fig, A, B, C and D are four points on a circle. AC and BD intersect at a point E such that ∠ BEC = 130° and ∠ ECD = 20°. Find ∠ BAC. **(AVERAGE)**

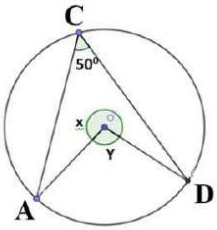


47. In the given figure, O is the centre of the circle, $\angle ADC = 130^0$ and the chord BC = chord BE. Find the measure of ∠CBE. **(DIFFICULT)**

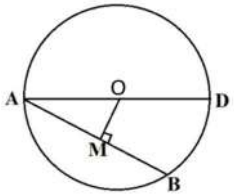


48. If circles are drawn taking two sides of a triangle as diameter. Prove that the point of intersection of these circles lie on the third side. **(AVERAGE)**

49. In the figure, O is the centre of the circle. Find the value of x. **(AVERAGE)**



50. AD is a diameter of a circle with centre O and AB is a chord. If AD = 34cm, AB =30cm, then find the distance of AB from the centre of the circle. **(AVERAGE)**



51. Prove that, "If the angles subtended by the chords of a circle at the centre are equal then chords are equal". **(AVERAGE)**

IV. Answer the following questions (Four marks questions)

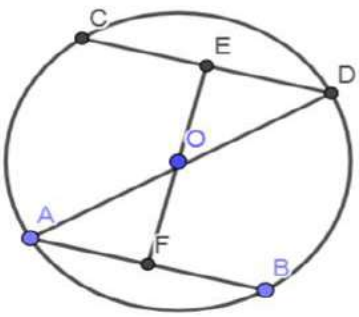
52. If the diagonals of a cyclic quadrilateral are diameter of a circle through the opposite vertices of the quadrilateral. Prove that the quadrilateral is a rectangle. **(AVERAGE)**

53. A circular park of radius 20m is situated in a colony. Three boys Ankur, Syed and David are sitting at equal distance on its boundary each having a toy telephone in his hands to talk each other. Find the length of the string of each phone. **(AVERAGE)**

54. Prove that "The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle." **(AVERAGE)**

55. If the non-parallel sides of a trapezium are equal, prove that it is cyclic. **(AVERAGE)**

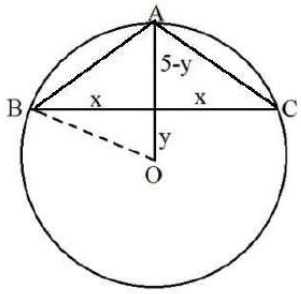
56. In the figure AB||CD. AD is a diameter of the circle whose centre is O. Prove that AB = CD. **(DIFFICULT)**



V. Answer the following questions: (Five marks questions)

57. Prove that, "The sum of either pair of opposite angles of a cyclic quadrilateral is supplementary". **(AVERAGE)**

58. In the circle of centre O, radius 5cm, AB and AC are the two chords of length 6cm each. Find the length of the chord BC. **(DIFFICULT)**



59. Three girls Reshma, Salma and Mandip are playing a game by standing on a circle of radius 5m drawn in a park. Reshma throws a ball to Salma, Salma to Mandip, Mandip to Reshma. If the distance between Reshma and Salma and between Salma and Mandip is 6m each, what is the distance between Reshma and Mandip? **(DIFFICULT)**

CHAPTER – 10 HERON'S FORMULA

LO. No	Learning Outcomes	Question Numbers
16	Apply Heron's Formula to find the area of triangles in real-life situations.	All questions

EASY	AVERAGE	DIFFICULT	TOTAL
7	16	8	31

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet (Each question carries one marks)

1. In Heron's formula, $\sqrt{s(s-a)(s-b)(s-c)}$ if a, b, c are the sides of a triangle, then the value of 's' is **(EASY)**

   A) $a+b+c$ B) $\frac{a+b+c}{2}$ C) $\frac{a+b+c}{4}$ D) $2a+2b+2c$

2. If one side of an isosceles triangle is 5cm & its equal sides measures 3cm each, then half of its perimeter is **(EASY)**

   A) 11cm B) 5.5cm C) 10cm D) 22cm

3. The sides of a triangle are 8cm & 11cm. If the perimeter of triangle is 32cm, then the measure of third side **(AVERAGE)**

   A) 8cm B) 11cm C) 13cm D) 32cm

4. If the semi perimeter of a triangle is 6cm & sides are 3cm, 4cm & 5cm, then its area is **(AVERAGE)**

   A) $6cm^2$ B) $12cm^2$ C) $18cm^2$ D) $24cm^2$

5. An isosceles right triangle has area $8cm^2$. The length of its hypotenuse is **(DIFFICULT)**

   A) $\sqrt{32}cm$ B) $\sqrt{16}cm$ C) $\sqrt{48}cm$ D) $\sqrt{24}cm$

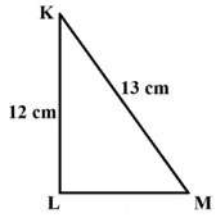
6. A traffic signal board is an equilateral triangle with side 'a', then the area of the traffic signal board is **(AVERAGE)**

   A) $\frac{\sqrt{3}}{2}a^2$ B) $\frac{\sqrt{3}}{4}a^2$ C) $\frac{\sqrt{3}}{2}a$ D) $\frac{\sqrt{3}}{4}a$

7. The area enclosed by the given triangle is **(EASY)**

   A) 156 cm^2 B) 78cm^2

   C) 30 cm^2 D) 25 cm^2



8. If the perimeter of an equilateral triangle is 60 m, then the area of the triangle is
   (A) $10\sqrt{3}$ m^2 (B) $15\sqrt{3}$ m^2 (C) $20\sqrt{3}$ m^2 (D) $100\sqrt{3}$ m^2
   (DIFFICULT)

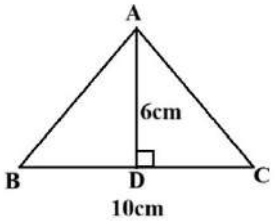
9. The area of an equilateral triangle is $16\sqrt{3}$ cm^2. Its perimeter is
   (A) 16cm (B) 24cm (C) 4cm (D) 48cm
   (DIFFICULT)

II. Answer the following questions: (One - mark questions)

10. If a, b, c are the sides of a triangle, 's' is the semi perimeter then write the formula to find the area of this triangle. **(EASY)**
11. The three sides of a triangle are 18 cm, 10 cm, & 14 cm. Find its semi perimeter. **(EASY)**
12. If the perimeter of an equilateral triangle is 180 cm, then find the measure of its side. **(EASY)**
13. The perimeter of a given triangle is 30cm. The sides are in the ratio 1 : 3 : 2 then, find measure of its smallest side. **(AVERAGE)**
14. If the semi perimeter of a triangle is 235 cm, a = 150 cm, b = 120 cm, c = 200 cm, then find the value of $(s-a)(s-b)(s-c)$. **(AVERAGE)**

III. Answer the following questions: (Two marks questions)

15. The sides of a triangle are 122m, 22m and 120m and its semi perimeter is 132m. Find its area. **(AVERAGE)**
16. The sides of a triangle are in the ratio $12 : 17 : 25$ and perimeter is 540 cm, then find the measure of each side. **(AVERAGE)**
17. The perimeter of an isosceles triangle is 32cm. The ratio of the one of the equal sides to its another is $3:2$. Find area of the triangle. **(AVERAGE)**
18. Using Heron's formula, find the area of an equilateral triangle of side $'x'$ cm. **(AVERAGE)**
19. If the area of an equilateral triangle is $64\sqrt{3}$ cm^2, then calculate the measure of its side. **(AVERAGE)**
20. In ΔABC, if AD ⊥ BC, AD = 6cm and BC = 10 cm then, find the area of ΔABC. **(EASY)**

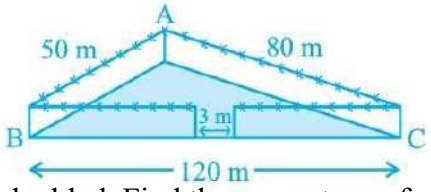


IV. Answer the following questions: (Three marks questions)

21. A traffic signal board, indicating 'SCHOOL AHEAD', is an equilateral triangle with side 'a'. Find the area of the signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board. **(AVERAGE)**
22. Two sides of a triangle are 18 cm and 10 cm and its perimeter is 42 cm. Find area of the triangle. **(AVERAGE)**
23. Sides of a triangle are in the ratio of 12 : 17 : 25 and its perimeter is 540cm. Find its area. **(AVERAGE)**
24. An isosceles triangle has perimeter 30 cm and each of the equal sides is 12 cm. Find area of the triangle. **(AVERAGE)**
25. The ground is in the form of a triangle having the sides 26 m, 28 m and 30 m. Find the cost of levelling the ground at the rate of ₹3 per square meter. **(AVERAGE)**
26. A triangular park has sides 120 m, 80 m and 50 m. A gardener needs to plant half of the park by Rose saplings and remaining by Lilly saplings. How much area does he need to plant each sapling inside the park? **(AVERAGE)**
27. The sides of a given triangle are 35cm, 54cm, and 61cm. Find the length of the longest altitude. **(DIFFICULT)**

V. Answer the following questions: (Four marks questions)

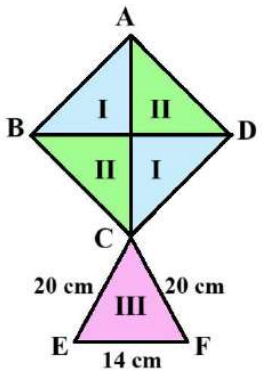
28. A triangular park ABC has sides 120m, 80m and 50m. A gardener Dhania has to put a fence all around it and also plant grass inside. How much area does she need to plant? Find the cost of fencing it with barbed wire at the rate of ₹20 per meter leaving a space 3m wide for a gate on one side. **(DIFFICULT)**



29. The side of a triangle is doubled. Find the percentage of area increase **(DIFFICULT)**
30. A rhombus shaped sheet with perimeter 40cm with one of its diagonals 12cm, is painted on both sides at the rate of ₹5 per cm^2. Find the cost of painting. **(DIFFICULT)**

VI. Answer the following questions: (Five marks questions)

31. In the given figure, ABCD is a square with diagonal 44cm and ΔCEF is an isosceles triangle. Find the area of region I (Light blue), region II (Green) and region III (Pink). **(DIFFICULT)**



CHAPTER – 11 SURFACE AREA AND VOLUMES

LO. No	Learning Outcomes	Question Numbers
17	Derive formulae for the surface area and volume of a cone and apply them to find the volume and surface area of cone-shaped objects found in the surroundings.	1, 2, 3, 4, 6, 7, 8, 9, 10, 25, 32, 33, 34, 40, 44,45, 46, 47, 49,50, 51, 52, 53, 63, 65, 66, 67, 68, 70, 72, 73, 74, 75, 78, 79, 80, 81, 82, 83, 86.
18	Derive formulae for the surface area and volume of spheres and hemispheres and apply them to find the volume and surface area of such objects found in the surroundings and solve various problems.	5, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 35, 36, 37, 38, 39, 41, 42, 43, 48, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 69, 71, 76, 77, 79, 80, 84, 85, 86, 87.

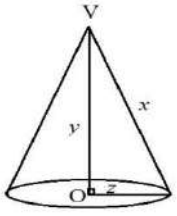
EASY	AVERAGE	DIFFICULT	TOTAL
12	43	32	87

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. (Each question carries one marks)

1. The formula used to find the curved surface area of a cone of radius 'r', and slant height 'l' in square units is **(EASY)**

   (A) πrl (B) $2\pi r(r+l)$ (C) $2\pi(r+l)$ (D) $2\pi rl$

2. In the given figure, a right circular cone is given with vertex 'v' and centre of circular base 'O'. The correct relationship between x^2, y^2 and z^2 is **(EASY)**

   (A) $y^2 = z^2 - x^2$ (B) $y^2 = x^2 - z^2$

   (C) $y^2 = x^2 + z^2$ (D) $y^2 = 2x^2 + z^2$

3. The radius of the base of a right circular cone is 7cm. If its slant height is 14cm, then its curved surface area is **(AVERAGE)**

   (A) 108cm^2 (B) 308cm^2 (C) 402cm^2 (D) 462 cm^2

4. The height of a cone is 16cm and base radius is 12cm. Its slant height is **(AVERAGE)**

   (A) 8cm (B) 10cm (C) 15cm (D) 20cm

5. The surface area of a metallic sphere of radius 7cm is **(AVERAGE)**

(A) 308 cm^2 (B) 462 cm^2 (C) 512 cm^2 (D) 616 cm^2

6. The curved surface of a cone is 308cm^2 and its slant height is 14cm. The radius of its base is **(AVERAGE)**

(A) 7cm (B) 8cm (C) 9cm (D) 12cm

7. A conical tent is 10m high and the radius of its base is 24m. The slant height of tent is **(AVERAGE)**

(A) 25m (B) 26m (C) 27m (D) 28m

8. A Joker's cap is in the form of cone of base radius 7cm and height 24cm. The area of sheet to make 10 such caps is **(DIFICULT)**

(A) 3500 cm^2 (B) 5500 cm^2 (C) 6500 cm^2 (D) 8500 cm^2

9. The diameter of two cones are equal. If their slant heights are in the ratio 5 : 4, then the ratio of their curved surface areas is **(AVERAGE)**

(A) 4 : 5 (B) 5 : 4 (C) 16 : 25 (D) 25: 16

10. The total surface area of a solid cone of radius 'r', height 'h' and slant height 'l' is **(EASY)**

(A) πrl (B) $\pi r(r+l)$ (C) $2\pi(r+l)$ (D) $2\pi rl$

11. The formula used to find the surface area of a sphere with radius 'r' **(EASY)**

(A) $2\pi r^2$ (B) πr^2 (C) $3\pi r^2$ (D) $4\pi r^2$

12. If the radius of sphere is 7cm, then its surface area is **(AVERAGE)**

(A) 154cm^2 (B) 308 cm^2 (C) 616 cm^2 (D) 1232 cm^2

13. If the surface area of sphere is 1386 cm^2, then its radius is (use $\pi = \frac{22}{7}$)

(A) 7cm (B) 10.5cm (C) 14cm (D) 21cm **(AVERAGE)**

14. If the radius of a sphere is doubled, then how many times does its surface area increases?

(A) 2 times (B) 3 times (C) 4 times (D) 8 times **(AVERAGE)**

15. The ratio of the surface area of a solid sphere to that of a solid hemisphere of same radius 'r' is (A) 1 : 1 (B) 4 : 3 (C) 2 : 3 (D) 3 : 2 **(AVERAGE)**

16. A solid sphere is cut into two hemispheres. The total surface area of one of the hemispheres is (A) $2\pi r^2$ (B) πr^2 (C) $3\pi r^2$ (D) $4\pi r^2$ **(EASY)**

17. If two solid hemispheres of same radius are joined together along their bases. Then surface area of this new solid is **(EASY)**

(A) $3\pi r^2$ (B) $4\pi r^2$ (C) $5\pi r^2$ (D) $6\pi r^2$

18. The surface area of a sphere is 'S'. If its radius is doubled, then its new surface area will be

(A) 2S (B) 4S (C) 8S (D) S^2

(AVERAGE)

19. The ratio of the radii two spheres is 2:3. The ratio of their surface areas is **(AVERAGE)**

(A) 2 : 3 (B) 4 : 9 (C) 8 : 27 (D) $\sqrt{2} : \sqrt{3}$

20. The diameter of a sphere with surface area $346.5cm^2$ is **(AVERAGE)**

(A) 5.25cm (B) 5.75cm (C) 10.5cm (D) 11.5cm

21. The radius of a spherical balloon increases from 7cm to 14cm when air is pumped into it. The ratio of the surface area of original balloon to inflated one is **(AVERAGE)**

(A) 1 : 2 (B) 1 : 3 (C) 1 : 4 (D) 4 : 3

22. A hemispherical bowl has radius 10.5 cm. The amount of milk (in litres) it can hold is

(A) 2.47 (B) 2.476 (C) 2.376 (D) 3.476

(AVERAGE)

23. If the surface area of a sphere is 676π cm^2, then it's radius is **(AVERAGE)**

(A) 8cm (B) 9cm (C) 12cm (D) 13cm

24. The radius of a sphere is 10cm. If its radius is increased by 1 cm, then the volume of the sphere is increased by **(DIFFICULT)**

(A) 13.3 % (B) 21.1 % (C) 30 % (D) 33.1 %

25. The volume of conical tent is 462 m^3 and the area of its base is $154m^2$. The height of the conical tent is **(AVERAGE)**

(A) 9m (B)1 cm (C) 15m (D) 24m

26. If the radius of a sphere is 2r, then its volume is **(EASY)**

(A) $\frac{4}{3}\pi r^3$ (B) $4\pi r^3$ (C) $\frac{8}{3}\pi r^3$ (D) $\frac{32}{3}\pi r^3$

27. If the radius of hemisphere is 5cm, then its volume in cm^3 is **(AVERAGE)**

(A) $\frac{250}{3}\pi$ (B) $\frac{500}{3}\pi$ (C) 75π (D) $\frac{125}{3}\pi$

28. A solid metal sphere of radius 7cm cut through the centre into two equal parts. The total surface area of each part is **(AVERAGE)**

(A) $231cm^2$ (B) $308cm^2$ (C) 462 cm^2 (D) $924cm^2$

29. The radius of a hemispherical balloon increases from 6cm to 12cm as air is pumped into it. The ratio of the volume of the balloon in the two cases is **(AVERAGE)**

(A) 1 : 8 (B) 1 : 4 (C) 1 : 2 (D) 2 : 1

30. If the volume and surface area of a sphere is numerically equal, then its radius is

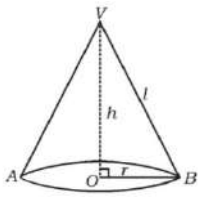
(A) 2 units (B) 3 units (C) 4 units (D) 5 units **(AVERAGE)**

31. The volume of a hemisphere is 18π cm^3. Its radius is **(AVERAGE)**

(A) 2cm (B) 3cm (C) 2.6 cm (D) 4cm

II. Answer the following questions: (One - mark questions)

32. Write the formula to find the total surface area of the given solid figure. **(EASY)**



33. Find the slant height of a right circular cone of height 28 cm and base radius 21 cm. **(AVERAGE)**

34. Find the curved surface area of a right circular cone whose slant height is 10 cm and base radius 21 cm. **(AVERAGE)**

35. Write the formula to find the curved surface area of hemisphere of radius r unit. **(EASY)**

36. Write the formula to find the total surface area of hemisphere with radius 'r' **(EASY)**

37. Find the curved surface area of a sphere of radius 21 cm. **(AVERAGE)**

38. Find the surface area of a sphere of radius 7 cm. **(AVERAGE)**

39. Find the total surface area of hemisphere of diameter 14 cm. **(AVERAGE)**

40. The perimeter of circular base of a right circular cone is 22 cm and its slant height is 10 cm. Find the curved surface area of the cone. **(AVERAGE)**

41. Write the formula to find the volume of a sphere of radius 'r' units. **(EASY)**

42. The radius of the base and slant height of a cone are 4 cm and 5 cm respectively. Find the height of the cone. **(AVERAGE)**

43. The surface area of a sphere is 100π cm^2. Find its radius **(AVERAGE)**

III. Answer the following questions: (Two marks questions)

44. Find the lateral surface area of a right circular cone of height 28 cm and base radius 21 cm. **(AVERAGE)**

45. The circumference of the base of 8 m high conical tent is $\frac{44}{7}$ m^2. Find the area of canvas required to make the tent. **(DIFFICULT)**

46. Diameter of the base of a cone is 10.5 cm and its slant height is 10 cm. Find its curved surface area. **(AVERAGE)**

47. Find the total surface area of a cone, if its slant height is 21m and diameter of its base is 24m. **(AVERAGE)**

48. Find the surface area of a sphere of diameter 14 cm. **(AVERAGE)**

49. The curved surface area of a right circular cone is 550 cm^2. If its slant height is 25 cm then, find the radius of its base. **(AVERAGE)**

50. The area of the base of a conical tent is 154 m^2. If its volume is 1232 m^3, then find the height of the conical tent. **(DIFFICULT)**

51. The radius of the base of a conical tent is 7 m and its height is 24 m. Find how many meters of cloth 5m wide is required to make the conical tent. (Take $\pi = \frac{22}{7}$) **(DIFFICULT)**

52. Find the volume of a right circular cone with radius 6 cm and height 7 cm. **(AVERAGE)**

53. The ratio of the volumes of two cones is 4: 5. If the ratio of the radii of their bases is 2 : 3, then, find the ratio of their heights. **(DIFFICULT)**

54. The circumference of the base of a hemispherical dome is 17.6 m. Find its curved surface area. **(AVERAGE)**

55. The surface area of a metallic ball is 154 cm^2. Find its radius. **(AVERAGE)**

56. The surface area of a football is 100π cm^2. Find the volume of air in it. **(DIFFICULT)**

57. A hemispherical tank has inner radius of 2.8 m. Find its capacity in litres. **(DIFFICULT)**

58. The volumes of two spheres are in the ratio 64 : 27. Find the ratio of their surface areas. **(DIFFICULT)**

59. The surface area of a sphere is 144π m^2. Find its volume. **(DIFFICULT)**

60. The curved surface area of a solid hemispherical toy is 1232 cm^2. Find its radius. **(DIFFICULT)**

61. A hemispherical bowl is made of steel, 0.25 cm thick. The inner radius of the bowl is 5 cm. Find the outer curved surface of the bowl. (Assume $\pi = \frac{22}{7}$) **(AVERAGE)**

62. The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases. **(AVERAGE)**

63. A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained. **(AVERAGE)**

64. Three solid copper spheres of radii 3 cm, 4 cm, and 5 cm respectively are melted together to form a single, large solid sphere. Calculate the radius of this new sphere. **(DIFFICULT)**

65. A solid metallic sphere of radius 6 cm is melted and recast into a solid right circular cone of radius 3 cm. Calculate the height of the resulting cone. **(DIFFICULT)**

66. An ice-cream parlour serves ice cream in a right circular cone of radius r and height h. A scoop of Ice cream, perfectly hemi spherical with the same radius as that of cone, is placed on top of the cone. If the ice cream melts completely, it fills the cone exactly to the brim without overflowing. Find the relationship between the height h and the radius r of the cone. **(DIFFICULT)**

IV. Answer the following questions: (Three marks questions)

67. A joker's cap is in the form of a right circular cone of base radius 7 cm and height 24cm. Find the area of the sheet required to make 10 such caps. (Assume $\pi = \frac{22}{7}$) **(AVERAGE)**

68. If the volume of a right circular cone of height 9cm is 48π cm^3, find the diameter of its base. **(AVERAGE)**

69. Find the volume of a sphere whose surface area is 154 cm^2. (Assume $\pi = \frac{22}{7}$) **(AVERAGE)**

70. Find the capacity of a conical vessel in litres whose radius is 7cm and slant height is 25 cm. (Assume $\pi = \frac{22}{7}$) **(DIFFICULT)**

71. The diameter of a metallic ball is 4.2cm. Find the mass of the ball, if the density of the metal is 8.9 g per cm^3? (Assume $\pi = \frac{22}{7}$) **(DIFFICULT)**

72. The height of cone is 16cm and its base radius is 12cm. Find the curved surface area and the total surface area of the cone. (Use $\pi = 3.14$) **(DIFFICULT)**

73. Find the volume of the largest right circular cone that can be cut out of a cube whose edge is 9cm. [neglect the wastage during the cutting process] **(DIFFICULT)**

74. The radius and height of a right circular cone are in the ratio 3 : 4. If the volume of the cone is 301.44cm^3, then find its slant height. (Take $\pi = 3.14$) **(DIFFICULT)**

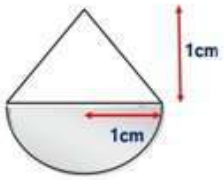
75. The height of a right circular cone is 16cm and its diameter is 24cm. Find the ratio of curved surface area to the total surface area. **(DIFFICULT)**

76. A hemispherical bowl made of brass has inner diameter 10.5cm. Find the cost of tin-plating it on the inside at the rate of ₹16 per 100cm^2. **(DIFFICULT)**

77. A shopkeeper has one spherical laddoo of radius 5cm. With the same amount of material find how many laddoos of radius 2.5cm can be made? **(DIFFICULT)**

78. A conical tent is to accommodate 11 persons. Each person must have 4 m^2 of the space on the ground and 20 m^3 of air to breathe. Find the height of the conical tent. **(DIFFICULT)**

79. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of π.



(DIFFICULT)

80. A metallic right circular cone of height 20 cm and radius of base 5 cm is melted and recast into small, identical solid spherical marbles. If the radius of each spherical marble is 0.5 cm, then calculate the total number of marbles that can be formed from the melted cone. **(DIFFICULT)**

81. What length of tarpaulin 3 m wide will be required to make a conical tent of height 8 m and base radius 6m? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm. [Use π=3.14] **(DIFFICULT)**

V. Answer the following questions: (Four marks questions)

82. A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3m. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required. **(DIFFICULT)**

83. A corn cob (see fig) shaped somewhat like a cone, has the radius of its broadest end has 2.1cm and length (height) as 20cm.If each 1cm^2 of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob. **(DIFFICULT)**



84. The diameter of a sphere is decreased by 25%. Find by what percent its curved surface area will decrease? **(DIFFICULT)**

85. Twenty seven solid iron spheres, each of radius 'r' and surface area S are melted to form a sphere with surface area S'. Find the **(DIFFICULT)**

(i) radius 'r' of the new sphere

(ii) ratio of S and S'

VI. Answer the following questions: (Five marks questions)

86. A solid hemisphere of lead, with a radius of 12 cm, is melted down and entirely recast into a right circular cone. If the curved surface area of this new cone is exactly $\sqrt{5}$ times its own base area, find the height of the cone. **(DIFFICULT)**

87. A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of ₹24640. If the cost of white-washing is ₹20 per square metre, find the

(i) inner surface area of the dome

(ii) volume of the air inside the dome **(DIFFICULT)**

CHAPTER – 12 STATISTICS

LO. No	Learning Outcomes	Question Numbers
21	Represent and analyze given data using different forms such as tables (grouped or ungrouped), bar graphs, histograms (with equal and unequal class intervals), and frequency polygons.	All questions

EASY	AVERAGE	DIFFICULT	TOTAL
18	16	03	37

I. Four alternatives are given for each of the following questions/incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet: (Each question carries one marks)

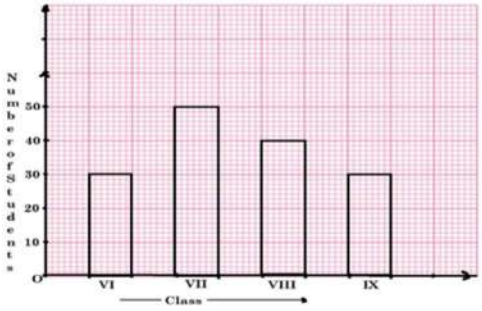
1. A visual representation of data using rectangular bars of different heights and equal spacing is **(EASY)**

A) Bar graph B) Sector graph C) Frequency polygon D) Histogram

2. In the given graph, the number of students in which two classes equal is **(EASY)**

A) VI and VIII B) VI and VII

C) VII and VIII D) VI and IX



3. In a bar graph, the length or height of a bar represent **(EASY)**

A) Class Interval B) Frequency C) Mid-point D) Data

4. In a histogram, the area of each bar is proportional to **(EASY)**

A) Class width B) Frequency C) Upper limit D) Mid-point

5. In a continuous class interval, the size of the class interval 20 – 30 is **(EASY)**

A) 10 B) 20 C) 25 D) 30

6. The class mark of the class interval 10 – 20 is **(EASY)**

A) 10 B) 15 C) 20 D) 11

7. Given the class intervals 0 –10, 10 – 20, 20 – 30, --------- then 20 is considered in the class interval **(EASY)**

A) 10 – 20 B) 20 – 30 C) 10 – 30 D)15 – 25

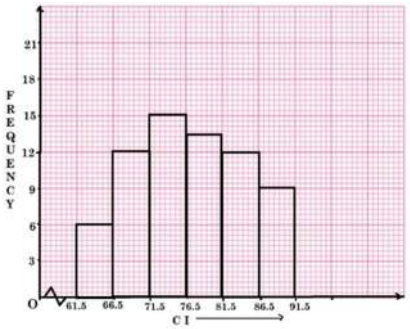
8. If the size of the continuous class interval is 5, then the next Class Interval after 10 – 15 is **(EASY)**

A) 15 – 20 B) 16 – 20 C) 15 – 19 D) 10 – 20

9. In the given graph frequency of class interval 71.5 – 76.5 is **(EASY)**

A) 9 B) 12

C) 15 D) 18



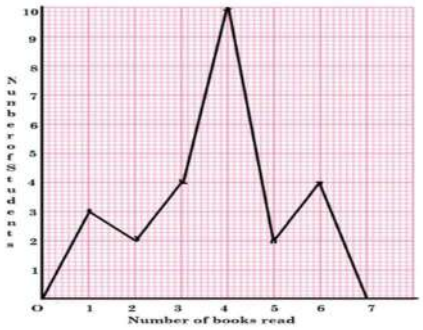
10. The graph suitable to compare the two different sets of data of same nature **(EASY)**

A) Histogram B) Pie chart C) Picture graph D) Frequency polygon

11. In the given graph, the number of students who read 6 books is **(EASY)**

A) 2 B) 3

C) 4 D) 5



12. Class mark can be calculated using the formula

A) $\frac{\text{Upper limit}}{2}$ B) $\frac{\text{Lower limit}}{2}$

C) $\frac{\text{Upper limit} - \text{lower limit}}{2}$ D) $\frac{\text{Upper limit} \quad \text{lower limit}}{2}$ **(EASY)**

13. Data collected by an investigator directly from the original source for a specific purpose is known as **(EASY)**

A) Secondary data B) Primary data C) Grouped data D) Arrayed data

II. Answer the following questions. (One - mark questions)

14. Define Bar graph. **(EASY)**

15. Find the class-mark, if the class interval is 10 – 20. **(EASY)**

16. Data regarding number of boys born in particular month of year is recorded. Which graph is suitable to represent this data. **(EASY)**

17. Name the graph which is most suitable to compare the marks scored in FA-1 & FA-2 of mathematics test marks. **(EASY)**

III. Answer the following questions. (Two marks questions)

18. The following table shows the daily production of toys in a factory. **(AVERAGE)**

Number of toys	Number of days
0 – 50	5
50 – 100	8
100 – 150	12
150 – 200	5

Draw a histogram to represent this data.

19. A class of 36 Students is divided into 5 groups as shown in the table below. Draw a bar graph for the following: **(AVERAGE)**

Group	A	B	C	D	E
Number of Students	5	8	6	10	7

20. The following table gives the marks obtained by students, construct a histogram.

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Students	2	5	7	10	6

(AVERAGE)

21. The marks obtained by 30 students in a test are given below. **(AVERAGE)**

Marks interval	**No. of students**
0 – 10	4
10 – 20	8
20 – 30	10
30 – 40	6
40 – 50	2

Draw a histogram for this data.

22. A family with monthly income of ₹22,000 has planned the following expenditure under various heads. **(AVERAGE)**

Heads	Expenditure in thousand rupees
Grocery	4
Education of children	5
Medicine	3
Rent	5
Fuel	2
Entertainment	1
Miscellaneous	1

Draw a bar graph for the data.

23. Given below are the seats won by the different political parties in the polling outcome of a state assembly election. **(AVERAGE)**

Political party	A	B	C	D	E	F
Seats won	75	55	37	29	10	37

Draw a bar graph to represent the polling results.

24. Write two differences between bar graph & histogram. **(AVERAGE)**

25. Define frequency polygon. How is it different from a histogram? **(EASY)**

IV. Answer the following questions. (Three marks questions)

26. For the following data draw a frequency polygon. **(AVERAGE)**

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	3	9	17	12	9

27. The following table shows the heights of 50 students in a school. **(AVERAGE)**

Height (in cm)	140-145	145-150	150-155	155-160	160-165
Number of Student	6	12	18	10	04

Draw a frequency polygon.

28. The following table gives the life time of 400 electric lamps. **(AVERAGE)**

Life time in hours	Number of lamps
300– 400	14
400 – 500	56
500 – 600	60
600 – 700	86
700 – 800	74
800 – 900	62
900 - 1000	48

i) Represent the given information with the help of a histogram.
ii) How many lamps have a life span of more than 700 hours?

V. Answer the following questions. (Four marks questions)

29. Monthly income of the 40 families is shown below. **(DIFFICULT)**

Income in ₹	**Number of families**
1000 – 2000	10
2000 – 3000	12
3000 – 4000	8
4000 – 5000	6
5000 – 6000	4

A) Draw a histogram to represent this data.
B) Draw a frequency polygon on the same graph using mid points.

30. The following table shows the heights of 50 students in a school. **(DIFFICULT)**

Height in cm	140-145	145-150	150-155	155-160	160-165
No. of students	6	12	18	10	04

A) Draw a frequency polygon.
B) What can you infer about the heights of the students from graph?

31. The marks obtained by students in mathematics test are given below. **(AVERAGE)**

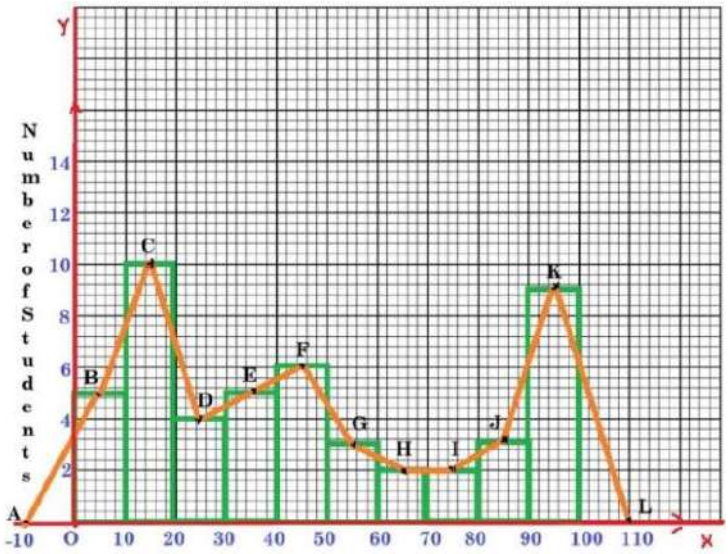
Marks	Number of students
0 – 10	4
10 – 20	8
20 - 30	10
30 - 40	6
40 - 50	2

A) Write the midpoint of each class.

B) Draw a frequency polygon for the data.

32. Marks scored by students in an examination for 100 marks is represented in frequency polygon as shown in the figure. Observe the graph & answer the following questions.

(AVARAGE)



a) How many students score more than 40 marks? **(AVERAGE)**
b) How many students score 60 to 80 marks?
c) How many students score more than 90 marks?
d) If ≤ 40 is grade NC, how many are NC?

33. A school physical education teacher recorded the daily step counts of 40 students to promote a health drive. The data collected over a week was organized into the following frequency table:

Daily Steps	Number of Teachers (Frequency)
2000–4000	5
4000–6000	10
6000–8000	13
8000–10000	8
10000–12000	4

i) What is the class size of the intervals used in this data?

ii) How many students walk fewer than 8000 steps daily?

iii) What are the benefits of walking more steps a day?

VI. Answer the following questions. (Five marks questions)

34. A survey conducted by an organisation for the cause of illness and death among the women between the ages 15 – 44 (in years) worldwide found the following figures (in %):

S No.	Causes	Female fatality rate (%)
1.	Reproductive health conditions	31.8
2.	Neuropsychiatric conditions	25.4
3.	Injuries	12.4
4.	Cardiovascular conditions	4.3
5.	Respiratory conditions	4.1
6.	Other causes	22.0

(i) Represent the information given above graphically.

(ii) Which condition is the major cause of women's ill health and death worldwide?

(iii) Try to find out, with the help of your teacher, any two factors which play a major role in the cause in (ii) above being the major cause. **(AVERAGE)**

35. The following data shows the number of students who scored with in a range of 0-50 marks. Draw a histogram & frequency polygon on the same graph. **(AVERAGE)**

Marks	0 - 10	10 - 20	20 – 30	30 – 40	40 - 50
Number of students	3	9	12	7	4

36. The following table gives the distribution of students of two sections according to the marks obtained by them. **(DIFFICULT)**

SECTION A		SECTION B	
MARKS	FREQUENCY	MARKS	FREQUENCY
0 – 10	3	0 - 10	5
10 – 20	9	10 – 20	19
20 – 30	17	20 – 30	15
30 – 40	12	30 – 40	10
40 – 50	9	40 – 50	1

Represent the marks of the students of both the sections on the same graph by two frequency polygons. From the two polygons compare the performance of the two sections.

37. In a class, marks scored by 80 students (for 100 Marks) are given below.

Obtained Marks	10 – 20	20 – 30	30 – 50	50 – 70	70 – 100
Number of students	6	17	15	16	26

Draw a histogram for the given data. **(AVERAGE)**

ANSWER KEY

CHAPTER-1 NUMBER SYSTEM

I. Multiple choice questions

1. D) Irrational number
2. B) Real number
3. A) $\sqrt{25}$
4. D) $\sqrt{13}$
5. C) There are infinitely many rational numbers.
6. B) $9\sqrt{2}$
7. C) $3\sqrt{3}$
8. (A) 0.032
9. (B) $3\sqrt{2}$
10. A) $\sqrt{5}-\sqrt{3}$
11. B) $2+5\sqrt{7}$
12. C) $\sqrt{3}-\sqrt{2}$
13. B) 2
14. C) 4
15. D) x
16. D) $\frac{2}{3}$
17. C) 1
18. A) m^6
19. C) 100
20. A) $\frac{1}{a^2b^2}$
21. D)1
22. C)256

II. One marks questions

23. A number can be expressed in the form of $\frac{p}{q}$ Where $p, q \in Z$ q $\neq 0$

24. A number cannot be expressed in the form of $\frac{p}{q}$

25. $\sqrt{3}, \pi$

26. Yes. $0 = \frac{0}{1} = \frac{p}{q}$ A rational number is a number that can be expressed in the form of $\frac{p}{q}$.

27. $= 2\sqrt{2} + 5\sqrt{3} + \sqrt{2} - \sqrt{3}$

$= 2\sqrt{2} + 1\sqrt{2} + 5\sqrt{3} - 1\sqrt{3}$

$= 3\sqrt{2} + 4\sqrt{3}$

28. $(6\sqrt{5})(2\sqrt{5})$

$= 6 \text{ x } 2\sqrt{5 \text{ x } 5}$

$= 12\sqrt{25}$

$= 12 \text{ x } 5$

$= 60$

29. $8\sqrt{15} \div 2\sqrt{3}$

$= \frac{4 \text{ x } 2\sqrt{5}\sqrt{3}}{2\sqrt{3}}$

$= 4\sqrt{5}$

30. $(\sqrt{11} - \sqrt{7})(\sqrt{11} + \sqrt{7})$

$= (\sqrt{11})^2 - (\sqrt{7})^2$

$= 11 - 7$

$= 4$

31. $(\sqrt[3]{27})^2$

$= (\sqrt[3]{3^3})^2$

$= \left(3^{\frac{3}{3}}\right)^2$

$= 3^2 = 9$

32. $9^{\frac{3}{2}}$

$= (3^2)^{\frac{3}{2}}$

$= 3^3$

$= 27$

33. $\sqrt[3]{\sqrt{64}}$

$= \sqrt[3]{\sqrt{64}}$

$= \sqrt[3]{8}$

$= 2$

34. $64^{\frac{1}{2}} = (8^2)^{\frac{1}{2}} = 8$

35. $32^{\frac{2}{5}} = (2^5)^{\frac{2}{5}} = 2^2 = 4$

III. Two marks questions

36. A) $0.123 = \frac{123}{100}$

(B) $0.0534 = \frac{534}{1000}$

37. Multiply and divide the number by 5

$1 = 1 \text{ x } \frac{5}{5} = \frac{5}{5}$

$2 = 2 \text{ x } \frac{5}{5} = \frac{10}{5}$

The 4 rational numbers between 1 and 2 is $\frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{9}{5}$

38. Multiply and divide the number by 6

$3 = 3 \times \frac{6}{6} = \frac{18}{6}$

$4 = 4 \times \frac{6}{6} = \frac{24}{6}$

The 5 rational numbers between 3 and 4 is $\frac{19}{6}, \frac{20}{6}, \frac{21}{6}, \frac{22}{6}, \frac{23}{6}$

39.

$4 = 4 \times \frac{7}{7} = \frac{28}{7}$

$5 = 5 \times \frac{7}{7} = \frac{35}{7}$

41. The 6 rational numbers between 4 and 5 is $\frac{28}{7}, \frac{29}{7}, \frac{30}{7}, \frac{31}{7}, \frac{32}{7}, \frac{33}{7}$

40.

$\frac{1}{3} = \frac{1\times4}{3\times4} = \frac{4}{12} = \frac{4\times5}{12\times5} = \frac{20}{60}$

$\frac{1}{4} = \frac{1\times3}{4\times3} = \frac{3}{12} = \frac{3\times5}{12\times5} = \frac{15}{60}$

4 rational numbers between $\frac{1}{3}$ and $\frac{1}{4}$ is $\frac{16}{60}, \frac{17}{60}, \frac{18}{60}, \frac{19}{60}$

41. Rational numbers are $\sqrt{225}$, 7.478478.....

Irrational numbers are $\sqrt{23}$, 1.1010010001000001...

42. Let $x = 0.333333333.\ldots\ldots$ _____(1)

Multiply eq 1 by 10

$10x = 3.33333333$ ..... _____ _(2)

Subtract (1) from (2)

$10x - 1x = 3$

$9x = 3$

$x = \frac{3}{9}$

$x = \frac{1}{3}$

$0.33333333..... = \frac{1}{3}$

43. Let $x = 0.999999.\ldots\ldots$ _____(1)

Multiply equation 1 by 10

$10x = 9.999999$ ..... _____ _(2)

Subtract (1) from (2)

$10x - 1x = 9$

$9x = 9$

$x = \frac{9}{9}$

$0.9999999 = 1$

44. $x = 0.121212.\ldots\ldots\ldots$ _____(1)

Multiply equation (1) by 100

$100x = 12.1212.....$ _____ _(2)

Subtract (1) from (2)

$100x - 1x = 12$

$99x = 12$

$x = \frac{12}{99} = \frac{4}{33}$

$0.1212..... = \frac{4}{33}$

45. Let x= 2.123123123……._____(1)

Multiply equation (1) by 1000

$1000x = 2123.123123.....$ _____ _(2)

Subtract (1) from (2)

$1000x - 1x = 2123 - 2$

$999x = 2121$

$x = \frac{2121}{999} = \frac{707}{333}$

$2.123123..... = \frac{707}{333}$

46. Let x=1.272727…….._____(1)

Multiply equation 1 by 100

$100x = 127.2727.....$ _____ _(2)

Subtract (1) from (2)

$100x - 1x = 127 - 1$

$99x = 126$

$x = \frac{126}{99} = \frac{14}{11}$

47. x=0.256256 … …. . ____(1)

Multiply equation 1 by 1000

$1000x = 256.256256.....$ _____(2)

Subtract (1) from (2)

$1000x - 1x = 256 - 0$

$999x = 256$

$x = \frac{256}{999}$

48. x=0.47777....._____(1)

Multiply equation 1 by 10

$10x = 4.7777.....$_____(2)

Multiply equation 1 by 100

$100x = 47.7777.....$_____(3)

Subtract (2) from (3)

$100x - 10x = 47 - 4$

$90x = 43$

$x = \frac{43}{90}$

49. $5\sqrt{x} + 7\sqrt{y} + 12\sqrt{x} - 9\sqrt{y} - 8\sqrt{x} + 3\sqrt{y}$

$= 5\sqrt{x} + 12\sqrt{x} - 8\sqrt{x} + 7\sqrt{y} - 9\sqrt{y} + 3\sqrt{y}$

$= 9\sqrt{x} + 1\sqrt{y}$

50. $\sqrt{128} + \sqrt{50} - \sqrt{98}$

$\sqrt{64x2} + \sqrt{25x2} + \sqrt{49x2}$

$= 8\sqrt{2} + 5\sqrt{2} - 7\sqrt{2}$

$= 6\sqrt{2}$

51. Find an irrational number between $\frac{1}{7}$ and $\frac{2}{7}$

$\frac{1}{7} = 0.142857$

$\frac{2}{7} = 0.285714$

Irrational number between $\frac{1}{7}$ and $\frac{2}{7}$ is 0.202122232425……..

52. It is in the form of $(a+b)^2 = a^2 + b^2 + 2ab$

$(\sqrt{3} + \sqrt{7})^2 = (\sqrt{3})^2 + (\sqrt{7})^2 + 2\sqrt{3}\sqrt{7}$

$(\sqrt{3} + \sqrt{7})^2 = 3 + 7 + 2\sqrt{21}$

$(\sqrt{3} + \sqrt{7})^2 = 10 + 2\sqrt{21}$

53. $(3 + \sqrt{3})(2 + \sqrt{2})$

$(3+\sqrt{3})(2+\sqrt{2})$

$= 3(2+\sqrt{2})+\sqrt{3}(2+\sqrt{2})$

$= \underline{\underline{6+3\sqrt{2}+2\sqrt{3}+\sqrt{6}}}$

$= \underline{6+3\sqrt{2}+2\sqrt{3}+\sqrt{6}}$

54. $(4+\sqrt{3})(2-\sqrt{2})$

$= 4\left(2-\sqrt{2}\right)+\sqrt{3})(2-\sqrt{2})$

$= 8-4\sqrt{2}+2\sqrt{3}-\sqrt{6}$

55. $(5+\sqrt{3})(5-\sqrt{3})$

$= 5^2-(\sqrt{3})^2$

$= 25-9$

$= 16$

56. $\left(2-\sqrt{5}\right)^2$

$= 2^2-2(2)\left(\sqrt{5}\right)+\left(\sqrt{5}\right)^2$

$= 4-4\left(\sqrt{5}\right)+5$

$= 9-4\left(\sqrt{5}\right)$

57. $\left(\sqrt{5}+\sqrt{2}\right)^2$

$= \left(\sqrt{5}\right)^2+2\left(\sqrt{5}\right)\left(\sqrt{2}\right)+\left(\sqrt{2}\right)^2$

$= 5+2\sqrt{10}+4$

$= 9+2\sqrt{10}$

58. $\frac{1}{\sqrt{3}+\sqrt{2}}$

$= \frac{1}{\sqrt{3}+\sqrt{2}}\times\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$= \frac{\sqrt{3}-\sqrt{2}}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$

$= \frac{\sqrt{3}-\sqrt{2}}{3-2}$

$= \sqrt{3} - \sqrt{2}$

59. $\frac{1}{\sqrt{7}-\sqrt{6}}$

$= \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}}$

$= \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2 - (\sqrt{6})^2}$

$= \frac{\sqrt{7}+\sqrt{6}}{7-6}$

$= \sqrt{7} + \sqrt{6}$

60. $\frac{1}{\sqrt{7}-2}$

$= \frac{1}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2}$

$= \frac{\sqrt{7}+2}{(\sqrt{7})^2 - (2)^2}$

$= \frac{\sqrt{7}+2}{7-4}$

$= \frac{\sqrt{7}+2}{3}$

IV. Three marks questions

61. There is no contradiction here. When we measure a length using a scale (ruler) or any other instrument, we only get an approximate rational value and not an exact value. Therefore, when we write $\boldsymbol{\pi} = \frac{\mathbf{C}}{\mathbf{d}}$, at least one of the values—the circumference (C) or the diameter (d)—is an irrational number. According to the rule of rational numbers, to be in the form $\frac{\boldsymbol{p}}{\boldsymbol{q}}$, both p and q must be integers. But here, C or d is not an integer.

62. Here, Ravi's argument is correct. According to Sahana, the number is non-terminating. However, to be a rational number, a decimal expansion must be either terminating or repeating (recurring). Here, the digit 3 is repeating. Any non-terminating repeating decimal can be converted into the $\frac{\boldsymbol{p}}{\boldsymbol{q}}$ form. Therefore, $\frac{\mathbf{1}}{\mathbf{3}}$ is definitely a rational number.

63. Here, Sneha's argument is correct. The sum of two irrational numbers can be either rational or irrational. Pritam's argument does not apply to all cases.

Example: $5 + \sqrt{3}$ and $5 - \sqrt{3}$ are two different irrational numbers.

On adding them:

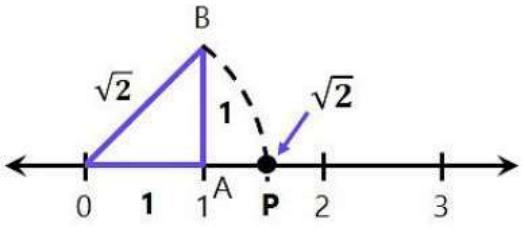
$5 + \sqrt{3} + 5 - \sqrt{3} = 10$

The resulting answer 10 is a rational number. Therefore, Sneha's logic that the sum of two irrational numbers can also be rational is correct.

64. Let's consider an integer 2. We can express 2 as the sum of squares of two numbers.

So, we have $2 = 1^2 + 1^2 \Rightarrow$

$(\sqrt{2})^2 = 1^2 + 1^2$

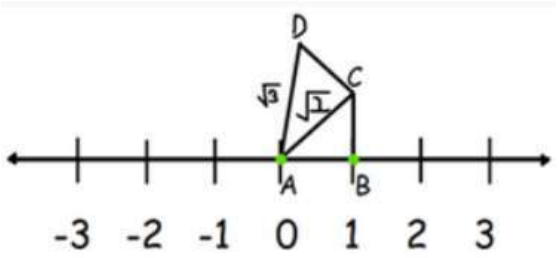


65. let's consider an integer 2. We can express 2 as the sum of squares of two numbers.

So, we have $2 = 1^2 + 1^2$

$\Rightarrow (\sqrt{2})^2 = 1^2 + 1^2$

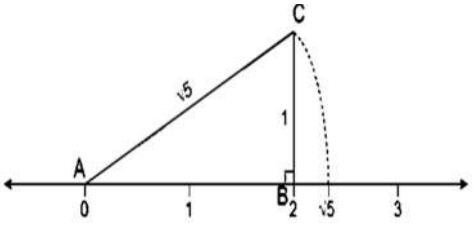
Now $3 = \underline{\underline{(\sqrt{3})^2 = (\sqrt{2})^2 + 1^2}}$



66. Let's consider an integer 5. We can express 5 as the sum of squares of two numbers.

So, we have $5 = 2^2 + 1^2$

$\Rightarrow (\sqrt{5})^2 = 2^2 + 1^2$



67. $(9)^{\frac{3}{2}} = \left((3)^2\right)^{\frac{3}{2}} = 3^{2*\frac{3}{2}} = 3^3 = 27$

$(32)^{\frac{2}{5}} = \left((2)^5\right)^{\frac{2}{5}} = 2^{5*\frac{2}{5}} = 2^2 = 4$

$(16)^{\frac{3}{4}} = \left((2)^4\right)^{\frac{3}{4}} = 2^{4*\frac{3}{4}} = 2^3 = 8$

68. $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}}$

$$= \frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} \times \frac{\sqrt{10}-\sqrt{3}}{\sqrt{10}-\sqrt{3}}$$

$$= \frac{(7\sqrt{30}-7(\sqrt{3})^2}{(\sqrt{10})^2-(\sqrt{3})^2}$$

$$= \frac{7\sqrt{30}-7(3)}{10-3}$$

$$= \frac{7\sqrt{30}-21}{7}$$

69. $\frac{1}{7+3\sqrt{2}}$

$\frac{1}{7+3\sqrt{2}} = \frac{1}{7+3\sqrt{2}} * \frac{7-3\sqrt{2}}{7-3\sqrt{2}}$

$$= \frac{7-3\sqrt{2}}{7^2-(3\sqrt{2})^2}$$

$$= \frac{7-3\sqrt{2}}{49-9\text{x}2}$$

$$= \frac{7-3\sqrt{2}}{49-18}$$

$$= \frac{7-3\sqrt{2}}{31}$$

70. $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$$\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\text{x}\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$$

$$= \frac{(\sqrt{5}+\sqrt{3})^2}{(\sqrt{5})^2-(\sqrt{3})^2}$$

$$= \frac{(\sqrt{5})^2+(\sqrt{3})^2+2\sqrt{5}\sqrt{3}}{5-3}$$

$$= \frac{5+3+2\sqrt{15}}{2}$$

$$= \frac{8+2\sqrt{15}}{2}$$

$$= \frac{2(4+\sqrt{15})}{2} = \underline{\mathbf{4+\sqrt{15}}}$$

71. $\frac{36}{100} = 0.36 = ter\text{min}ating$ decimal expansion.

$\frac{1}{11} = 0.090909..... = 0.\bar{9} = non-ter\text{min}ating$ recurring decimal expansion

$4\frac{1}{8} = \frac{33}{8} = 4.125$ teriminating decimal expansion.

V. Four marks questions:

72. $\sqrt{2} = 2^{\frac{1}{2}} = 2^{\frac{3}{6}}$

$\sqrt[3]{3} = 3^{\frac{1}{3}} = 3^{\frac{2}{6}}$

$\sqrt{2} = 2^{\frac{3}{6}} = (2^3)^{\frac{1}{6}} = \sqrt[6]{2^3} = \sqrt[6]{8}$

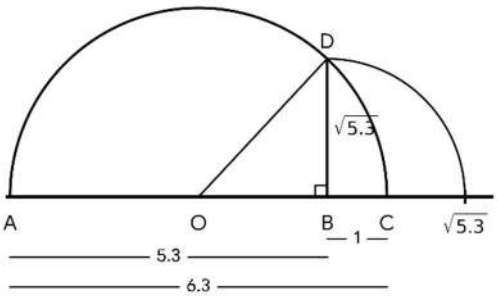
$\sqrt[3]{3} = 3^{\frac{2}{6}} = (3^2)^{\frac{1}{6}} = \sqrt[6]{3^2} = \sqrt[6]{9}$

$\sqrt[6]{9} > \sqrt[6]{8}$

$\therefore \sqrt[3]{3} > \sqrt{2}$

Even though the answer is correct, the reason given by Ramesh is mathematically incorrect.

73. Using Pythagoras theorem



$OD^2 = BD^2 + OB^2$

$\left(\frac{6.3}{2}\right)^2 = BD^2 + \left(\frac{4.3}{2}\right)^2$

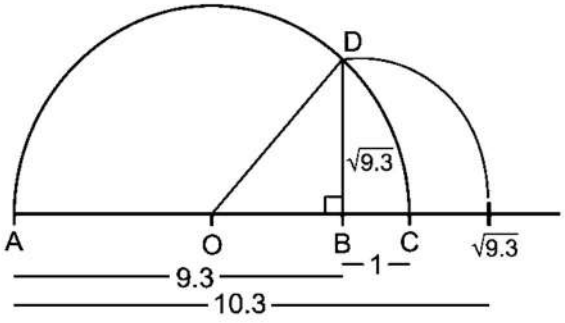
$BD^2 = (3.15)^2 - (2.15)^2$

$BD^2 = (3.15 + 2.15)(3.15 - 2.15)$

$BD^2 = 5.3(1) = 5.3$

$\underline{BD = \sqrt{5.3}}$

74. Using Pythagoras theorem



$$OD^2 = BD^2 + OB^2$$

$$\left(\frac{10.3}{2}\right)^2 = BD^2 + \left(\frac{8.3}{2}\right)^2$$

$$BD^2 = (5.15)^2 - (4.15)^2$$

$$BD^2 = (5.15 + 4.15)(5.15 - 4.15)$$

$$BD^2 = 9.3(1) = 9.3$$

$$\underline{\underline{BD = \sqrt{9.3}}}$$

CHAPTER-2. POLYNOMIALS

I. Multiple choice questions.

1. A) $4x^2+2x-1$
2. D) 9
3. A) Linear polynomial
4. B) Quadratic polynomial
5. C) Cubic Polynomial
6. B) Linear polynomial
7. C) Quadratic polynomial
8. A) x^2+2x+4
9. A) $2x+5$
10. B) ax^2+bx+c
11. D) 7
12. A) 0
13. C) 5
14. D) 1
15. C) -1and 1
16. C) 120
17. D) $(2x-1)$
18. B) 2
19. C) –360
20. A) 9984
21. B) x^2+5x+6
22. A) $(x+1)$ and $(x+6)$
23. A) $(x-4)$
24. B) Linear polynomial
25. D) – 3
26. B) – 6
27. A) 3
28. C) 7

29. A) 2

30. B) 9

II. One marks questions:

31. Binomial term: An expression having two terms Ex: $x^2 - 9x$

32. Linear polynomial: A linear polynomial is a polynomial with a degree of 1. Ex: $2x - 3$

33. Quadratic polynomial: A Quadratic polynomial is a polynomial with a degree of 2

Ex: $x^2 - 3x - 6$

34. The degree is zero

35. $(m+n)(m-n) = m^2 - n^2$

36. Factors of $x^2 + (a+b)x + ab$ are $x + a$ and $x + b$

37. The coefficient of x^2 is -1

38. $p(x) = 5x^2 - 3x + 7$ at x = 1

$p(x) = 5x^2 - 3x + 7$

$p(1) = 5(1)^2 - 3(1) + 7$

$p(1) = 5(1) - 3 + 7$

$p(1) = 5 + 4 = 9$

39. $p(x) = cx + d = 0$

$$x = \frac{-d}{c}$$

40. $p(x) = 5x - \pi$

$$p\left(\frac{4}{5}\right) = 5\left(\frac{4}{5}\right) - \pi = 4 - \pi \neq 0$$

$x = \frac{4}{5}$ is not a zeroes of a polynomial.

41. If $m+n+p=0$ then the value of $m^3 + n^3 + p^3 = 3mnp$

III. Two marks questions:

42. Binomial of degree 35 is $6x^{35} - 50$

Monomial of degree 100 is $25x^{100}$

43. $3x - 2 = 0$

$3x = 2$

$$x = \frac{3}{2}$$

44. $p(x) = x^2 - x - 2$

$= x^2 - x - 2$

$= x^2 - 2x + x - 2$

$= x(x-2) + 1(x-2)$

$= (x-2)(x+1)$

$(x-2) = 0 \quad or \quad (x+1) = 0$

$x = 2 \qquad\qquad x = 1$

45. $(2a - 3b)^2 = (2a)^2 + (3b)^2 - 2(2a)(3b)$

$= 4a^2 + 9b^2 - 12ab.$

46.

$p(x) = (x^2 - 2x)$

When $x =$ -2

$p(-2) = (-2)^2 - 2(-2)$

$p(-2) = 4 + 4 = 8 \neq 0$

$\therefore$-2 is not a zero of the polynomial $(x^2 - 2x)$

$p(x) = (x^2 - 2x)$

When $x = 2$ $p(2) = (2^2 - 2 * 2)$

$p(2) = 4 - 4 = 00$

$\therefore 2$ is a zero of the polynomial $(x^2 - 2x)$

47. If x+2=0 then x= -2

$p(x) = x^3 + 3x^2 + 5x + 6$

$p(-2) = (-2)^3 + 3(-2)^2 + 5(-2) + 6$

$= -8 + 3(4) - 10 + 6$

$= -12 + 12$

$= 0$

$\therefore x + 2$ is a factor of $x^3 + 3x^2 + 5x + 6$

48. $p(x) = x^3 + x^2 + x + 1$

$p(-1) = (-1)^3 + (-1)^2 + (-1) + 1$

$p(-1) = -1 + 1 - 1 + 1$

$p(-1) = 0$

Therefore, $x + 1$ is a factor of $x^3 + x^2 + x + 1$

49. $p(x) = x^3 - 4x^2 + x + 6$

$p(3) = (3)^3 - 4(3)^2 + (3) + 6$

$p(3) = 27 - 4(9) + 3 + 6$

$p(3) = 27 - 36 + 9$

$p(3) = 0$

$\therefore x - 3$ is a factor of $x^3 - 4x^2 + x + 6$

50. Factors of 6 are 1, 2 and 3

By trial, we find that p(2) = 0. hence y – 2 is a factor of p(y).

$p(y) = y^2 - 5y + 6$

$p(y) = y^2 - 2y - 3y + 6$

$p(y) = y(y-2) - 3(y-2)$

$\underline{\underline{p(y) = (y-2)(y-3)}}$

51.

$p(x) = 4x^3 + 3x^2 - 4x + k$

If $(x-1)$ is a factor then $(x-1) = 0 \Rightarrow x = 1$

$p(1) = 4(1)^3 + 3(1)^2 - 4(1) + k = 0$

$4(1) + 3(1) - 4(1) + k = 0$

$4 + 3 - 4 + k = 0$

$k = -3$

52. $p(x) = x^2 + x + k$, $x - 1$ is a factor

$p(1) = (1)^2 + 1 + k = 0$

$1 + 1 + k = 0$

$k = -2$

53. $p(x) = kx^2 - \sqrt{2}x + 1$, $x - 1$ is a factor

$p(1) = k(1)^2 - \sqrt{2}(1) + 1 = 0$

$k - \sqrt{2} + 1 = 0$

$k = -1 + \sqrt{2}$

54. $(x + 4)(x + 10)$

$= x(x + 10) + 4(x + 10)$

$= x^2 + 10x + 4x + 40$

$= x^2 + 14x + 40$

55. $(x+y)^2 + (x-y)^2$

$= x^2 + y^2 + 2xy + x^2 + y^2 - 2xy$

$= 2x^2 + 2y^2$

56. $4x^2 + 8x + 3$

$= 4x^2 + 2x + 6x + 3$

$= 2x(2x + 1) + 3(2x + 1)$

$= (2x + 1)(2x + 3)$

57. $2x^2 - 7x - 15$

$= 2x^2 - 10x + 3x - 15$

$= 2x(x - 5) + 3(x - 5)$

$= (x - 5)(2x + 3)$

58. $6x^2 + 5x - 6$

$= 6x^2 + 9x - 4x - 6$

$= 3x(2x + 3) - 2(2x + 3)$

$= (2x + 3)(3x - 2)$

59. $12x^2 - 7x + 1$

$= 12x^2 - 4x - 3x + 1$

$= 4x(3x - 1) - 1(3x - 1)$

$= (3x - 1)(4x - 1)$

60. $3x^2 - x - 4$

$= 3x^2 + 3x - 4x - 4$

$= 3x(x + 1) - 4(x + 1)$

$= (3x - 4)(x + 1)$

61. $49a^2 + 70ab + 25b^2$

$= (7a)^2 + 2(7a)(5b) + (5b)^2$ $\quad ,\left\{a^2 + 2ab + b^2 = (a + b)^2\right\}$

$= 49a^2 + 70ab + 25b^2 = (7a + 5b)^2$

62. $104^3 = (100+4)^3$

It is in the form of $(x + y)^3 = x^3 + y^3 + 3xy(x + y)$

$(100 + 4)^3 = 100^3 + 4^3 + 3(100)(4)(100 + 4)$

$104^3 = 1000000 + 64 + 1200(104)$

$104^3 = 1000064 + 124800$

$104^3 = 1124864$

63. It is in the form of $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(100 + 5)(100 + 6) = 100^2 + (5 + 6)100 + 5X6$

$105X106 = 10000 + 11X100 + 30$

$105X106 = 10030 + 1100$

$105X106 = 11130$

64. $27y^3 + 125z^3 = (3y)^3 + (5z)^3$

It is in the form of $a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$

$(3y)^3 + (5z)^3 = (3y + 5z)\left[(3y)^2 + (5z)^2 - (3y)(5z)\right]$

$(3y)^3 + (5z)^3 = (3y + 5z)\left[9y^2 + 25z^2 - 15yz\right]$

65. $(3a + 4b + 5c)^2$ is in the form of $(a + b + c)^2$

$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$(3a+4b+5c)^2 = (3a)^2 + (4b)^2 + (5c)^2 + 2(3a)(4b) + 2(4b)(5c) + 2(5c)(3a)$

$(3a+4b+5c)^2 = 9a^2 + 16b^2 + 25c^2 + 24ab + 40bc + 30ac$

66. $(3-2x)(3+2x)$

$= 3^2 - (2x)^2$

$= 9 - 4x^2$ $\{x^2 - y^2 = (x+y)(x-y)\}$

67. 95×96

$= (100-5)(100-4)$

$= (100)^2 + (-5-4)(100) + (-5)(-4)$ $(x+a)(x+b) = x^2 + (a+b)x + ab$

$= 10000 - 900 + 20$

$= 9120$

68. 104×96

$= (100+4)(100-4)$

$= 100^2 - 4^2$ $\{x^2 - y^2 = (x+y)(x-y)\}$

$= 10000 - 16 =$ **9984**

69. $9x^2 + 6xy + y^2$

$= (3x)^2 + 2(3x)y + y^2$ $\left\{a^2 + 2ab + b^2 = (a+b)^2\right\}$

$= (3x+y)^2$

70. $x^2 - \frac{y^2}{100}$

$= x^2 - (\frac{y}{10})^2$ $\{x^2 - y^2 = (x+y)(x-y)\}$

$= (x + \frac{y}{10})(x - \frac{y}{10})$

71. $x^3 + x^2 - 4x - 4$

$= x^2(x+1) - 4(x+1)$

$= (x+1)(x^2-4)$

$= (x+1)(x+2)(x-2)$

72. $x^3 - 2x^2 - x + 2$

$= x^2(x - 2) - 1(x - 2)$

$= (x - 2)(x^2 - 1)$

$= (x - 2)(x + 1)(x - 1)$

73. A= lb

$A = (x + 12)(x - 7)$

$= x(x - 7) + 12(x - 7)$

$= x^2 - 7x + 12x - 84$

$= x^2 + 5x - 84$

IV. Three marks questions:

74.

Linear Polynomials	$1+x$, $3t$,
Quadratic Polynomials	x^2+x , y^2+y+4 , r^2
Cubic Polynomials	$x-x^3$, $7x^3$

75.

Given $x+y+z=0$

$x+y=-z$

Cube on both sides

$(x+y)^3=(-z)^3$

$(x^3+y^3+3xy(x+y))=-z^3$

$x^3+y^3+3xy(-z)+z^3=0 \because x+y=-z$

$x^3+y^3-3xyz+z^3=0$

$x^3+y^3+z^3=3xyz$

76. $a + b + c = 10$ and $ab + bc + ca = 5$

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$10^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$100 = a^2 + b^2 + c^2 + 2(5)$

$100 - 10 = a^2 + b^2 + c^2$

$90 = a^2 + b^2 + c^2$

77. $x + y = 12$ and $xy = 27$

$x^3 + y^3 + 3xy(x + y) = (x + y)^3$

$x^3 + y^3 + 3(27)(12) = (12)^3$

$x^3 + y^3 + 3(27)(12) = (12)^3$

$x^3 + y^3 + 972 = 1728$

$x^3 + y^3 = 1728 - 972$

$x^3 + y^3 = 756$

78. $8x^3 + 27y^3 + 36x^2y + 54xy^2$

$= (2x)^3 + (3y)^3 + 3(12x^2y + 18xy^2)$

$= (2x)^3 + (3y)^3 + 3(2x)(3y)(2x + 3y)$

$= (2x + 3y)^3 \because x^3 + y^3 + 3xy(x + y) = (x + y)^3$

79.

$l = (x + 10), b = (x + 4)$ and $h = (x - 6)$.

Volume of a cuboidal tank= volume of a cuboid

$= lbh$

$= (x + 10)(x + 4)(x - 6)$

We know that, $(x + a)(x + b)(x + c) = x^3 + (a + b + c)x^2 + (ab + bc + ca)x + abc$

$(x + 10)(x + 4)(x - 6)$

$= x^3 + (10 + 4 - 6)x^2 + [(10x4) + (4x - 6) + (-6x10)]x + 10x4x - 6$

$(x + 10)(x + 4)(x - 6) = x^3 + 8x^2 + [40 - 24 - 60]x - 240$

$(x + 10)(x + 4)(x - 6) = x^3 + 8x^2 - 44x - 240$

V.Four marks questions:

80. $p(x) = x^3 - 3x^2 - 9x - 5$

$p(-1) = (-1)^3 - 3(-1)^2 - 9(-1) - 5 = 0$

Since $p(-1) = 0$, by the Factor Theorem, $(x + 1)$ is a factor of the $p(x)$

$p(x) = x^3 + x^2 - 4x^2 - 4x - 5x - 5$

$= x^2(x + 1) - 4x(x + 1) - 5(x + 1)$

$= (x + 1)(x^2 - 4x - 5)$

$= (x + 1)(x^2 - 5x + 1x - 5)$

$= (x + 1)[x(x - 5) + 1(x - 5)]$

$= (x + 1)(x + 1)(x - 5)$

81. $P(x) = x^3 - 6x^2 + 11x - 6$

$p(1) = (1)^3 - 6(1)^2 + 11(1) - 6 = 0$

Since $p(1) = 0$, by the Factor Theorem, $(x - 1)$ is a factor of the $p(x)$

$$p(x) = x^3 - x^2 - 5x^2 + 5x + 6x - 6$$
$$= x^2(x-1) - 5x(x-1) + 6(x-1)$$
$$= (x-1)(x^2 - 5x + 6)$$
$$= (x+1)(x^2 - 3x - 2x + 6)$$
$$= (x+1)[x(x-3) - 2(x-3)]$$
$$= (x+1)(x-2)(x-3)$$

82. $x^3 - 23x^2 + 142x - 120$

we shall now look for all the factors of -120. Some of these are

$\pm1, \pm2, \pm3, \pm4, \pm5, \pm6, \pm8, \pm10, \pm12, \pm15, \pm20, \pm24, \pm30, \pm60$.

By trial, we find that p(1) = 0. hence $x - 1$ is a factor of p(x).

Now we see that $x^3 - 23x^2 + 142x - 120 = x^3 - x^2 - 22x^2 + 22x + 120x - 120$

$= x^2(x-1) - 22x(x-1) + 120(x-1)$

$= (x-1)(x^2 - 22x + 120)$

Now $(x^2 - 22x + 120)$ can be factorised either by splitting the middle term or by using the Factor theorem. By splitting the middle term, we have

$(x^2 - 22x + 120) = x^2 - 12x - 10x + 120$

$= x(x-12) - 10(x-12)$

$= (x-12)(x-10)$

So $x^3 - 23x^2 + 142x - 120 = (x-1)(x-12)(x-10)$

83.

a) We know that: $(x+y)^3 = x^3 + y^3 + 3xy(x+y)$

$x^3 + y^3 = (x+y)^3 - 3xy(x+y)$

$x^3 + y^3 = (x+y)\left[(x+y)^2 - 3xy\right]$

$x^3 + y^3 = (x+y)\left[x^2 + y^2 + 2xy - 3xy\right]$

$x^3 + y^3 = (x+y)\left[x^2 + y^2 + 2xy - 3xy\right]$

$\underline{\underline{x^3 + y^3 = (x+y)\left[x^2 + y^2 - xy\right]}}$

b) LHS= $x^3 + y^3 + z^3 - 3xyz$

$$= (x^3 + y^3) + z^3 - 3xyz$$
$$= (x+y)^3 - 3xy(x+y) + z^3 - 3xyz$$
$$= \left[\left((x+y)^3 + z^3\right) - 3xy(x+y) - 3xyz\right]$$
$$= \left(x+y+z\right)^3 - 3z(x+y)\left(x+y+z\right) - 3xy(x+y+z)$$
$$= \left(x+y+z\right)\left[\left(x+y+z\right)^2 - 3z(x+y) - 3xy\right]$$
$$= \left(x+y+z\right)\left(x^2 + y^2 + z^2 + 2xy + 2yz + 2zx - 3xz - 3zy - 3xy\right)$$
$$= \left(x+y+z\right)\left(x^2 + y^2 + z^2 - xz - zy - xy\right)$$
$$= \frac{1}{2}\left(x+y+z\right)2\left(x^2 + y^2 + z^2 - xz - zy - xy\right)$$
$$= \frac{1}{2}\left(x+y+z\right)\left(2x^2 + 2y^2 + 2z^2 - 2xz - 2zy - 2xy\right)$$
$$= \frac{1}{2}\left(x+y+z\right)\left(x^2 + x^2 + y^2 + y^2 + z^2 + z^2 - 2xz - 2zy - 2xy\right)$$
$$== \frac{1}{2}\left(x+y+z\right)\left(x^2 + y^2 - 2xy + y^2 + z^2 - 2zy + x^2 + z^2 - 2xz\right)$$
$$= \frac{1}{2}\left(x+y+z\right)\left[(x-y)^2 + (y-z)^2 + (z-x)^2\right]$$
$$= RHS$$

CHAPTER-3 COORDINATE GEOMETRY

I. Multiple choice questions:

1. C) (0, 0)
2. A) 4 units
3. B) I and IV quadrants
4. C) x– axis
5. C) III quadrant
6. C) Origin
7. D) S
8. D) II
9. C) y-axis
10. B) Square
11. D) 0
12. B) (4, 0)
13. C) I and II quadrants
14. D) 2 units
15. C) T
16. D) (– 2, 3) (3, 2) (– 2, – 3) (3, – 2)
17. B) 2

II. One marks questions:

18. (– 4, 0)
19. III quadrant
20. (0, 0)
21. abscissa is 6 and ordinate is – 3
22. II quadrant
23. (– 3, 5)
24. (0, 7)

III. Two marks questions

25. a) Horizontal line: **x– axis**

    b) Vertical line: **y– axis**

    c) The point of intersection of two axes: **Origin**

d) Each part of the plane divided by two axes: **Quadrant**

26. The Point (– 3, 5) lies in **II quadrant**

The Point (2, –2) lies in **IV quadrant**

The Point (–3, 0) lies on **x-axis**

The Point (–4, –6) lies in **III quadrant**

27. a) (5,0)

b) (0, –2)

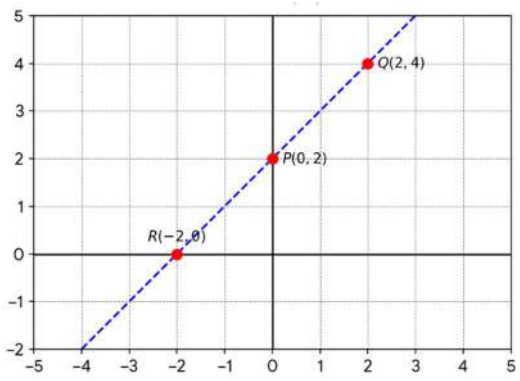
28. (i) (0,-4)

(ii) (5,0)

29. A (–3, 0) B (0, 2) C (–1, 4) D (2, 3)

IV. Three marks questions

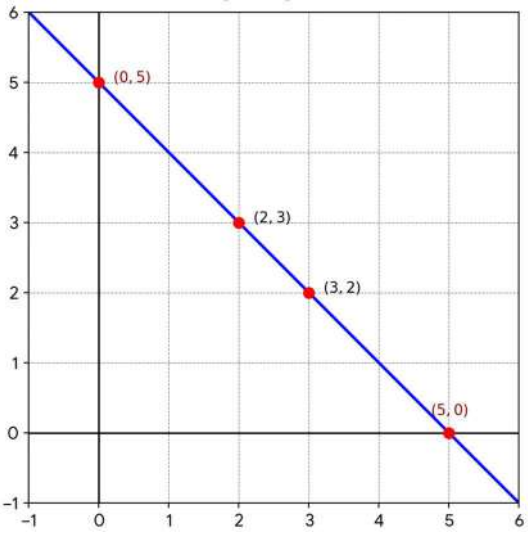
30.



31.

The coordinates of the point at which this line intersects x-axis are (5, 0).

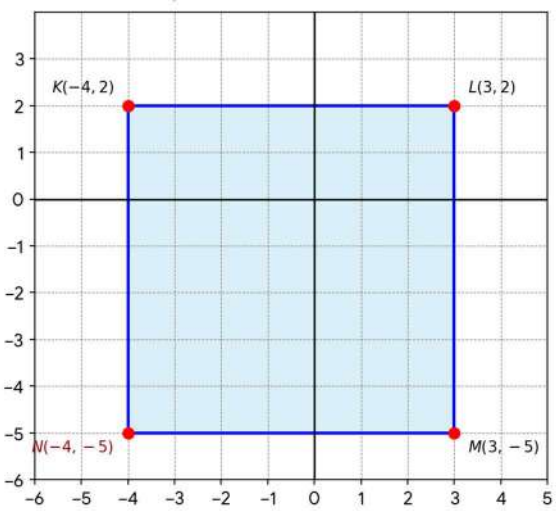
The coordinates of the point at which this line intersects y-axis are (0, 5).



V. Four marks questions

32.

The coordinates of N are (-4, -5)



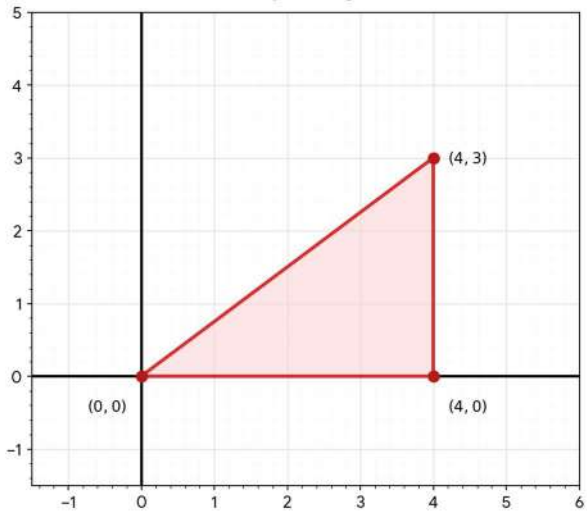
33. Area of closed triangle = $\frac{1}{2}$ x base x height

base = 4 units

height = 3 units

Area = $\frac{1}{2}$ x 4 x 3

Area = 6 square units



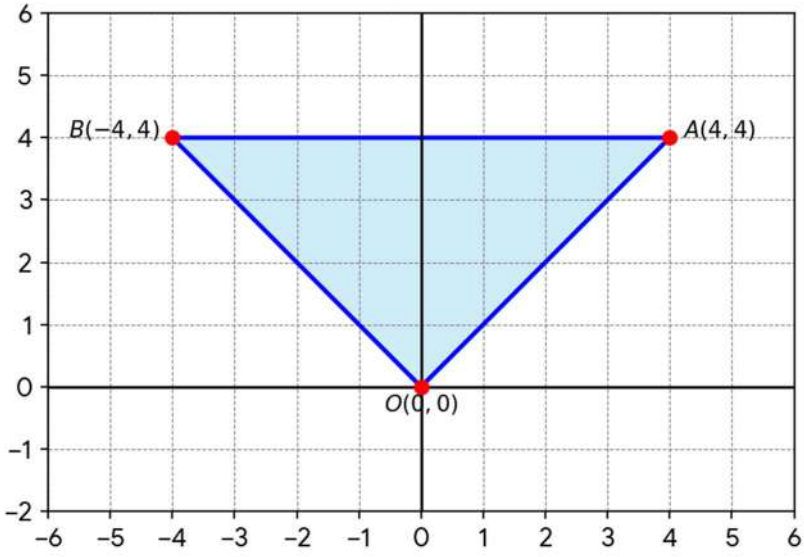
34.

Base = AB = 8 units, Height = h = 4 units

Area of $\Delta AOC = \frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 8 \times 4$

$= 16\ square\ units$



CHAPTER - 4 LINEAR EQUATION IN TWO VARIABLES

I. Multiple choice questions:

1) B) $ax + by + c = 0$
2) C) Infinitely many solutions
3) A) I quadrant
4) D) (4, 0)
5) A) 6
6) C) $x + y = 7$
7) B) $ax^2 + by = c$
8) D) Infinite
9) A) $(\frac{-7}{3}, 3)$
10) C) $x + y = 181$
11) (B) $(a, -a)$
12) (C) 0

II. One marks questions:

13) $2x + y = 8$
14) No
15) $y = 3$
16) If $x = 0$ then y=5. The solution is (0, 5)
17) $3x - y - 7 = 0$
18) 3(2) – (–1) =7, yes this point lies on the given line.
19) $y = a$
20) 5x – 2y – 2 = 0

III. Two marks questions:

21) Standard form is 2x – 6y – 8 = 0 here a = 2, b = – 6 and c = – 8
22) 5x +2y – 2 =0

$a + b + c = 5+2 – 2 = 5$

23) point (3, 4) lies on the line 3y = px + 7, so by substituting x=3 and y=4

3(4) = p(3) + 7

$p = \frac{5}{3}$

24) $3x + 4y = k,$ here x=3 and y=2

3(3) + 4(2) = k

k = 17

25) $4x + 3y = 12$

Point cuts the x-axis means y=0

$4x + 3(0) = 12$

$x = 3$. So, the point is (3, 0)

Point cuts the y-axis means $x = 0$

4(0) + 3y = 12

y = 4, so the point is (0, 4)

26) $5x - 4y = 20$ intersects the x −axis at $A(x, 0)$

$5x - 0 = 20$

$5x = 20$

$x = 4$, Coordinates of $A(4,0)$

$5x - 4y = 20$ intersects the y −axis at $B(0, y)$

$0 - 4y = 20$

$y = -5$, Coordinates of $B(0, -5)$

27) Ordinate, y - coordinate $= 2$

Abscissa, x - coordinate = Twice its ordinate = $2 \times 2 = 4$

Therefore, the given point is **(4, 2).**

$mx + (m + 1)y = 20$

$m(4) + (m + 1)(2) = 20$

$4m + 2m + 2 = 20$

$6m = 18$

$m = 3$

IV. Three marks questions:

28) $x + 2y = 6$

a) (1, 2) $x = 1$ and $y = 2$

1 + 2(2) = 5. This is not a solution.

b) (2, 2) $x = 2$ and y=2

2 + 2(2) = 6. This is a solution

c) (0, 3) $x = 0$ and y=3

0 + 2(3) = 6. This is a solution.

29) Distance travelled is 9 km

Amount to be paid is y

Amount for the first km is ₹25 and $x = 8$

So, the equation is $25 + 15x = y$

$$y = 25 + 15(8)$$

$$y = 145$$

Amount to be paid is ₹145

30) $4x - 5y = 13, \quad x = k, y = 2k + 1$

$4(k) - 5(2k + 1) = 13$

$4k - 10k - 5 = 13$

$-6k = 18$

$k = -3$

To find one more solution, let $substitute\ x = 2$

$4(2) - 5y = 13$

$8 - 5y = 13$

$-5y = 5$

$y = -1$

Therefore, another solution is (2, -1).

{Student can find different solution using appropriate method}

31) $3x$ + y - 12 = 0

y = 12 - $3x$

If x = 0, y = 12 - 3(0) = 12 So the solution is (0, 12)

If x = 1, y = 12 - 3(1) = 9 So the solution is (1, 9)

If x = 2, y = 12 - 3(2) = 6 So the solution is (2, 6)

If x = -2, y = 12 - 3(-2) = 18 So the solution is (-2, 18)

CHAPTER-5 INTRODUCTION TO EUCLID'S GEOMETRY

I. Multiple choice questions:

1. (A) Theorem

2. (A) Equal to one another

3. (A) Universal truths without need for any proof.

4. (A) 13 chapters

5. (D) the whole is lesser than its part

6. (C) A terminated line can be produced indefinitely on both sides

7. (A) Things which are equal to the same thing are equal to one another

8. (D) any polygon

9. (A) Triangles

10. (B) 4 :2 : 1

11. (A) 0

12. (D) Infinite.

13. (B) Only one

II. One marks questions:

14. A straight line may be drawn from any one point to any other point.

15. A location with no length, width or thickness.

16. A part of a line that starts at a point and extends infinitely in one direction

17. It leads to the development of non Euclidian geometry

18. A flat two dimensional surface that extends infinitely in all directions

19. Line segment

20. One.

21. Perpendicular lines are two lines that intersect to form a right angle.

22. The elements.

23. One

24. Things which are equal to same things are equal to one another.

25. Whole is greater than its part.

26. If equals are added to the equals, the wholes are equal.

III. Two marks questions:

27.

Axioms	Postulates
1) An axiom is a self evident truth 2) It requires no proof 3) Applicable to all the branches of Mathematics	1) An postulate is not self evident 2) It is a statement that is assumed to be True in order to prove other statements 3) Applicable to only Geometry

28. Let the weight of each friends A and B be 'x' kg.

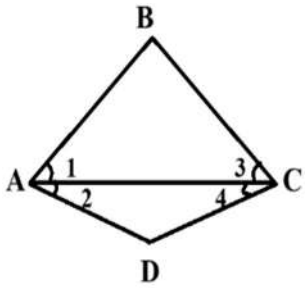
on adding 2kg

The weight of A and B = (x+2) kg each

According to Euclid's second axiom the whole is equal when equals are added to equals

So, the weight of A and B are equal.

29. Given



$\angle 1 = \angle 3$ ---------- (i)

and $\angle 2 = \angle 4$---------- (ii)

According to Euclid's axioms 2, if equals are added to equals,

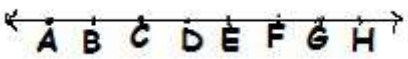
then wholes are also equal

on adding equations (i) and (ii) we get

$\angle 1 + \angle 2 = \angle 3 + \angle 4$

$\angle A = \angle C$

30. In the fig,



AH=AB + BC + CD + DE + EF + FG + GH

AB + BC + CD is a part of AH

AS per Euclid's axiom, "The whole is greater than the part

AH > (AB + BC + CD)

$\therefore$ The length AH > sum of lengths of AB + BC + CD

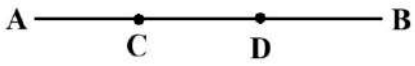
31. **(i) Ray:** A ray is a part of a line which has one endpoint and extends infinitely in the opposite direction.

(ii) **Line segment:** A part of a line with two end points.

32. a) **Collinear points**: Points that lie on the same line are called collinear points.

b) **Non-collinear points:** Points that do not lie on the same line are called collinear points.

33. Given AD = BC = 7.5cm



AC + CD = 7.5

AC = 7.5 – CD

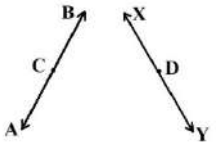
AC = 7.5 – 1.5

AC = 6cm

AC + BC = 6 + 7.5

AC + BC = 13.5cm

34. Given AC = XD

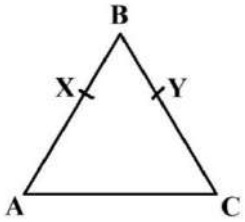


Multiply 2 on both sides

2AC = 2XD

AB = XY (axiom -6)

35. In the figure, AB = BC (Given)



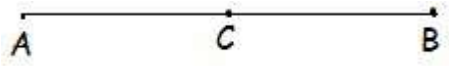
BX = BY (Given)

AB – BX = BC – BY

AX = CY (axiom -3)

IV. Three marks questions:

36. Data: In figure AC = BC



To prove: AC = $\frac{1}{2}$AB

Proof: AC = BC (given)

Now adding AC both sides

LHS+AC = RHS+AC

AC+AC = BC+AC

2AC = BC+AC

We know that BC+AC = AB (As it coincides with line segment AB)

2AC = AB (If equals are added to equals the wholes are equal)

AC = $\frac{1}{2}$AB

37.

Data: AC = BD



To prove: AB = CD

Proof: AC = BD (Given)

AC = AB + BC

BD = BC + CD

AB + BC = BC + CD (AC = BD Given)

According to Euclid's axiom, when equals are subtracted from equals remainders are also equal

AB + BC - BC = BC + CD - BC

AB = CD Hence proved.

38. i) **False**,

There can be infinite number of lines that can be drawn through a single point. Hence the statement mentioned is false.

ii) **False**,

Through two distinct points, there can be only one line that can be drawn. Hence the statement mentioned is false.

iii) **True**, The circles coincide, and thus the radius of the two circles should be equal. Hence the statement mentioned is true;

V. Five marks questions:

39.

1. Things which are equal to the same thing are equal to one another.
2. If equals are added to equals, the wholes are equal.
3. If equals are subtracted from equals, the remainders are equal.
4. Things which coincide with one another are equal to one another.
5. The whole is greater than the part.
6. Things which are double of the same things are equal to one another.
7. Things which are halves of the same things are equal to one another.

40.

Euclid's Postulate 1: A straight line may be drawn from anyone point to any other point.

Euclid's Postulate 2: A terminated line can be produced indefinitely.

Euclid's Postulate 3: A circle can be drawn with any center and any radius.

Euclid's Postulate 4: All right angles are equal to one another.

Euclid's Postulate 5: If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.

41.

i) AC and CD

ii) QL and RB

iii) C,D,Q and S

iv) AB ‖ CS

v) AB ‖ CS

CHAPTER-6 LINES AND ANGLES

I. Multiple choice questions:

1. (C) 95^0

2. (D) 60^0, 30^0

3. (C) Linear pair angles

4. (B) Adjacent angles are always supplementary

5. (C) 108^0

6. (B) 86^0

7. (A) Through a given point, only one straight line can be drawn

8. (C) 120^0

9. (C) 180^0

10. (A) right angle

11. (A) equal

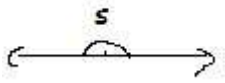
12. (B) straight angle

13.(A) W

14. (B) Angle bisector

15. (D) 270^0

16. (D)

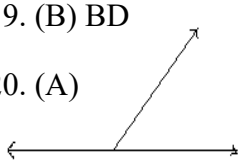


17. (B) 2

18. (D) 4

19. (B) BD

20. (A)



21. (A) 45^0

22. (C) 60^0

23. (B) $\angle AOC = \angle DOB$

24. (C) ∠DOB & ∠DOA

25. (B) 60^0

26. (D) 60^0

27. (D) 60^0

28. (B) 180^0

29. (B) 70^0

30. (A) 25^0

31. (A) line segment

32. (C) More than 180^0 and less than 360^0

33. (D) Zero

34. (B) 90^0

35. (B) 117^0

36. (D) 30^0

37. (B) An acute angle triangle

II. One marks questions:

38. $180^0 - 120^0 = 60^0$

39. $l \parallel n$ because lines which are parallel to the same line are parallel to each other

40. ∠DOB = ∠COA $=60^0$ (vertically opposite angle)

$\therefore \angle COA = 60^0$

41. $55 + 3a + 115 - 2a = 180$

$a + 170 = 180$

$\therefore a = 10$

42. The angle lie between 90^0 to180^0 is called obtuse angle

43.Three are more points lie on the same line is called collinear points

44. Reflex ∠ABC = $360^0 - 142^0$

$\angle ABC = 218^0$

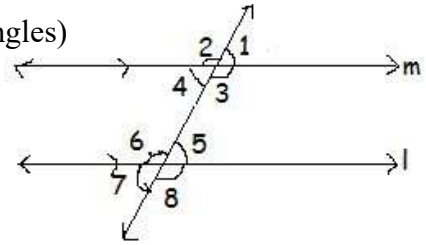
45. $180^0 - 75^0 = \mathbf{105^0}$

46. False

47. 360^0

III. Two marks questions:

48. $x + 10^0 + x + 20^0 = 90^0$ (complementary angles)



$2x + 30^0 = 90^0$

$2x = 90^0 - 30^0$

$\boldsymbol{x = 60^0}$

49. Yes $m \| n$

Given $\angle 2 = 130^0 = \angle 3$ (V.O.A)

$\angle 3 + \angle 5 = 130^0 + 50^0 = 180^0$

Since sum of the interior angles of the same side of the transversal is 180^0

$\therefore$ **m || n**

50.

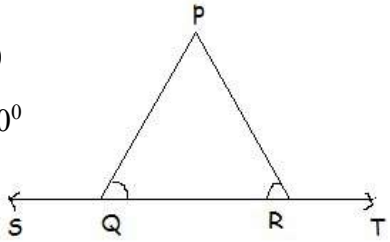
Since ST is a straight line

So, $\angle PQS + \angle PQR = 180^0$ (linear pair)

and $\angle PRT + \angle PRQ = 180^0$ (linear pair)

Now $\angle PQS + \angle PQR = \angle PRT + \angle PRQ = 180^0$

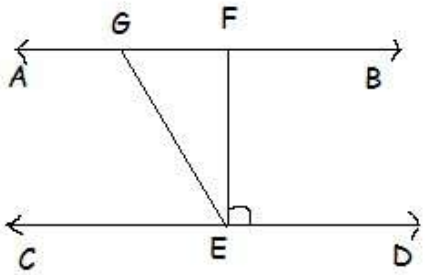
Since $\angle PQR = \angle PRQ$ (given)



$\angle PQS = \angle PRT$ Hence proved

51. Since AB || CD, GE is a transversal $\angle GED = 126^0$ (given)

So $\angle GED = \angle AGE = 126^0$ (alternate interior angles)



Also, $\angle GED = \angle GEF + \angle FED$

As $EF \perp CD$, $\angle FED = 90^0$

$\therefore \angle GED = \angle GEF + 90^0$

$\angle GED = 126^0 - 90^0$

$\angle GED = 36^0$

52. $4x + 5x = 180^0$

$9x = 180^0$

$x = \frac{180^0}{9}$

$x = 20^0$

$\therefore 4x = 4(20^0) = 80^0$ and $5x = 5(20^0) = 100^0$

$\therefore$ **The angles are 80^0 and 100^0**

53. Let one of the complementary angle be x, then the other angle will be $x - 20^0$

$\therefore x + x - 20^0 = 90^0$

$2x = 110^0$

$x = \frac{110^0}{2} = 55^0$

$x = 55^0$ and $x - 20^0 = 55^0 - 20^0 = 35^0$

$\therefore$ **The two angles are 55^0 and 35^0**

54. Let one of the supplementary angle be x, then the other angle will be $\frac{1}{3}x$

$\therefore x + \frac{1}{3}x = 180^0$

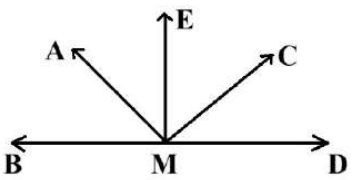
$\frac{4}{3}x = 180^0$

$x = 180^0 \times \frac{3}{4} =$ **135^0**

$\frac{1}{3}x = \frac{1}{3} \times 135^0 =$ **45^0**

The two angles are 135^0 and 45^0.

55. In the figure,



$\angle AMB = \angle CMD$ (Given) → (1)

$\angle AME = \angle CME$ (Given) → (2)

On adding (1) and (2)

$\angle AMB + \angle AME = \angle CMD + \angle CME$

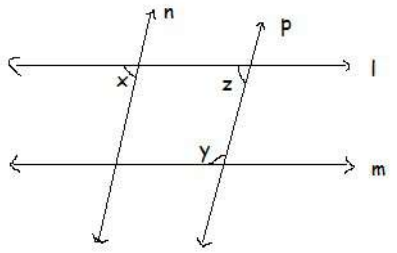
$\angle BME = \angle CME$

But, $\angle BME + \angle DME = 180^0$ (Linear pair)

$\Longrightarrow \angle BME = \angle DME = 90^0$

$\therefore \angle BME$ and $\angle DME$ are complementary angles.

56. Given $l \parallel m$ and $n \parallel p$



$\boldsymbol{\angle X = 85^0}$

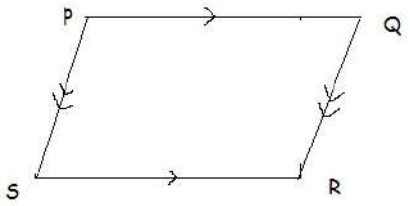
$\angle X = \boldsymbol{\angle Z = 85^0}$(Corresponding angles)

$\angle Y + \angle Z = 180^0$

$\angle Y + 85^0 = 180^0$

$\boldsymbol{\angle Y = 95^0}$

57. In the fig



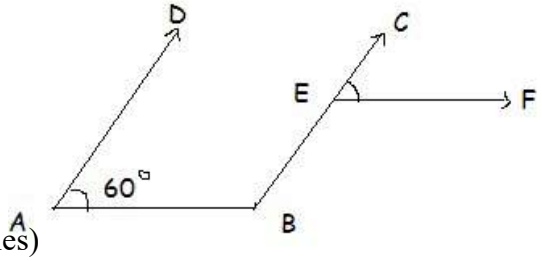
$\angle SPQ + \angle PSR = 180^0$---------- (1) (PQ || SR)

$\angle SRQ + \angle PSR = 180^0$————————(2) (PS || QR)

Equating (1) & (2) we get

$\boldsymbol{\angle SPQ = \angle SRQ}$

58. $\angle DAB + \angle CBA = 180^0$(Co-interior angles)



$60^0 = \angle CBA = 180^0$

$\boldsymbol{\angle CBA = 120^0}$

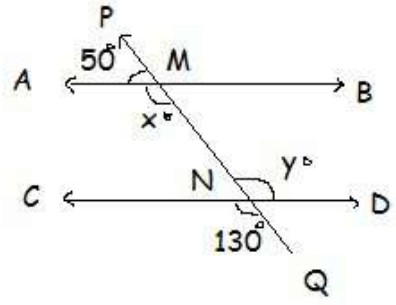
$\angle ABE = \angle BEF = 120^0$ (Alternate angles)

Now$\angle$ BEF + $\angle CEF = 180^0$ (linear pair)

$120^0 + \angle CEF = 180^0$

$\boldsymbol{\angle CEF = 60^0}$

59. $\angle PMA + \angle AMN = 180$ (linear pair)



$50 + x = 180^0$

$\boldsymbol{x = 130^0}$

$\angle CNQ = \angle MND = 130^0$ (Vertically opposite angles)

$130^0 = y$

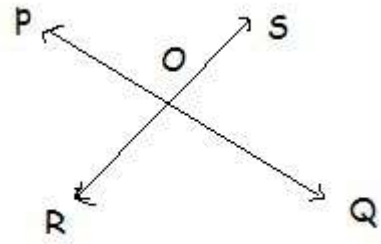
$\boldsymbol{y = 130^0}$

60. $\angle POR = \frac{5}{12} \times 180 = 75^0$

$\angle ROQ = \frac{7}{12} \times 180 = 105^0$

Now $\angle POS = \angle ROQ = 105^0$ (Vertically opposite angles)

And $\angle SOQ = \angle POR = 75^0$

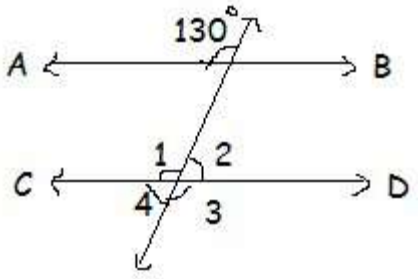


61. $\angle 1 = 130^0$ (corresponding angles)

$\angle 3 = 130^0$ (vertically opposite angles)

$\angle 4 = 180^0 - 130^0 = 50^0$ (linear pair angles)

$\angle 2 = 50^0$ (vertically opposite angles)



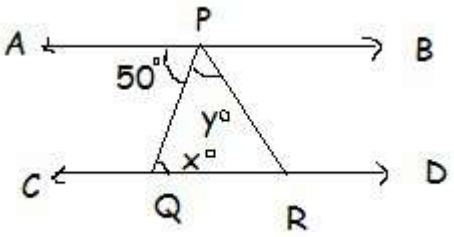
62. In the fig, AB||CD

X $= \angle APQ = 50^0$ interior alternate angles)

$\angle APR = \angle PRD$ (interior alternate angles)

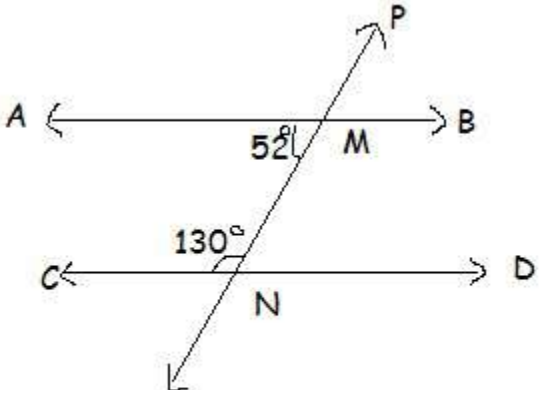
$Y = 127^0 - 50^0 = 77^0$

X = 50 ^{0}& Y = 77^0



63. From the fig, $130^0 + 52^0 = 182^0$

AB not parallel to CD (sum of the angles of same side of the transversal are not equal)



64. Data: In figure X + Y = W + Z

To prove: AOB is a straight line (or) X + Y $=180^0$

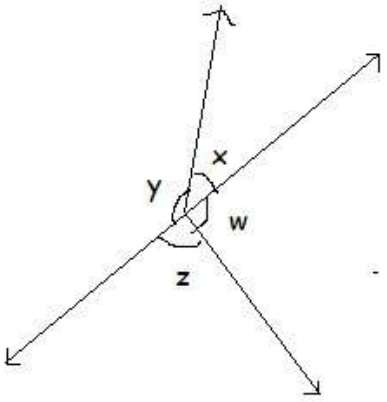
Proof: X + Y + W + Z = 360^0 (Angle around a point are 360^0)

(X + Y) + (W + Z) = 360^0

2(X + Y) = 360^0

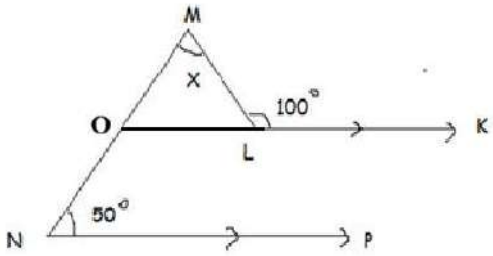
X + Y = 180^0

∴AOB is a straight line



IV. Three marks questions:

65.



Given $\angle MLK = 100^0 \angle MNP = 50^0$

In the fig, LK||NP Extend KL to meet MN at O,

$\angle MOL = \angle MNP$ (Corresponding angles)

$\therefore \angle MOL = 50^0$

$\angle MLO + \angle MLK = 180^0$(linear pair)

$\angle MLO + 100^0 = 180^0$

$\angle MLO = 80^0$

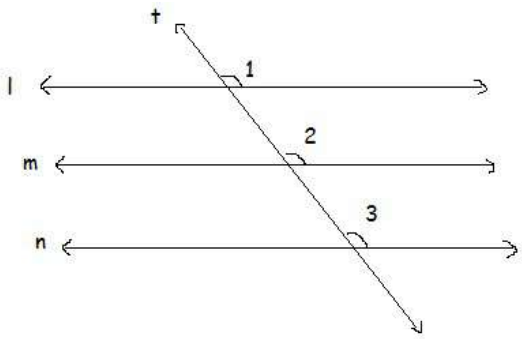
In ΔMOL,

$\angle MOL + \angle MLO + \angle OML = 180^0$

$50^0 + 80^0 + X = 180^0$

$X = 50^0$

66.



Data: $m||l$ and $n||l$

To prove: $m||n$

Construction: Draw a transversal 't'

Proof: $\angle 1 = \angle 2$ (Corresponding angles l||m)

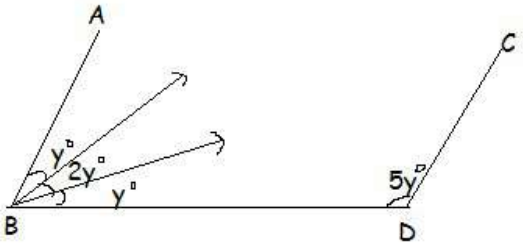
$\angle 1 = \angle 3$ (Corresponding angles n||l)

From the above $\angle 2 = \angle 3$

But this is a pair of corresponding angles

Hence $m||n$

67. In figure



AB||CD (given)

$\angle ABD + \angle CDB = 180^0$ (sum of the same side of the transversal is equal to 180^0)

$y^0 + 2y^0 + y^0 + 5y^0 = 180^0$

$9y^0 = 180^0$

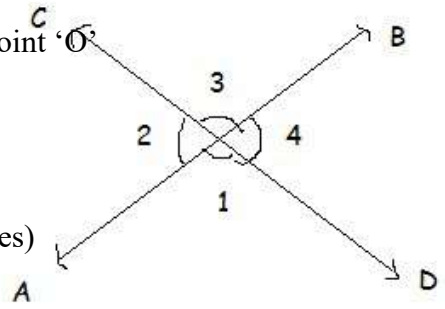
$\mathbf{y^0 = 20^0}$

$\therefore \angle CDB = 5y^0$

$= 5x20$

$\mathbf{\angle CDB = 100^0}$

68. Given: Two lines AB &CD intersect each other at the point 'O'



To prove: $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$

Proof: In fig

$\angle 1 + \angle 2 = 180^0$ ----------(1)(linear pair angles)

$\angle 2 + \angle 3 = 180^0$ ----------(2)

From (1) & (2)

$\angle 1 + \angle 2 = \angle 2 + \angle 3$

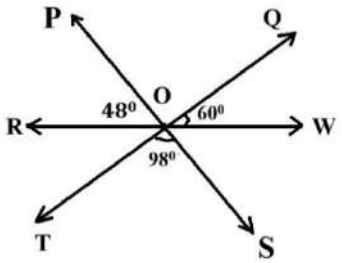
$\angle 1 = \angle 3$

Similarly

$\angle 2 = \angle 4$

$\mathbf{\angle 1 = \angle 3 \ \& \ \angle 2 = \angle 4}$

69. In the figure,



$60^0 + \angle POQ + 48^0 + \angle WOS + 98^0 + \angle ROT = 360^0$

$\angle POQ + \angle WOS + \angle ROT + 206^0 = 360^0$

$\angle POQ + \angle WOS + \angle ROT = 360^0 - 206^0$

$\mathbf{\angle POQ + \angle WOS + \angle ROT = 154^0}$

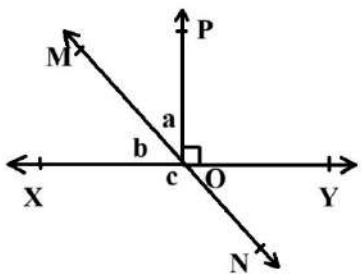
70. In the figure,

$\angle PCX + \angle PCO = 180^0$

$\angle PCX = 180^0 - 90^0$

$a + b = 90^0$

$2x + 3x = 90^0$



$5x = 90^0$

$x = \frac{90^0}{5} = \mathbf{18^0}$

b + c = 180^0 (Linear pair)

$3x$ + c = 180^0

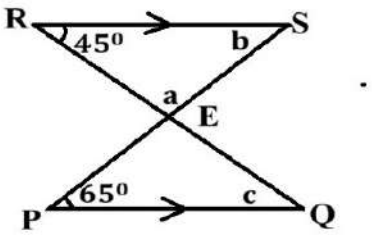
$3(18^0)$ + c = 180^0

c = $180^0 - 54^0$

c = 126^0

71. a) ∠RSE = ∠EPQ (V.O.A)

b = 65^0



b) SRE = EQP

c = 45^0

c) a + b + R = 180^0

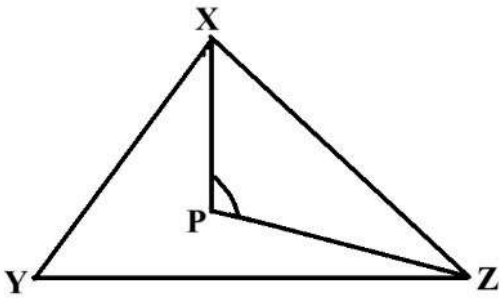
a + 65^0 + 45^0 = 180^0

a + 110^0 = 180^0

a = $180^0 - 110^0$

a = 70^0

72. In the figure, ∠YZP + ∠YXP = 40^0 (Given)



2(∠YZP) + 2(∠YXP) = 2 × 40^0

∠YZX + ∠YXZ = 80^0

∠Y = $180^0 - 80^0$

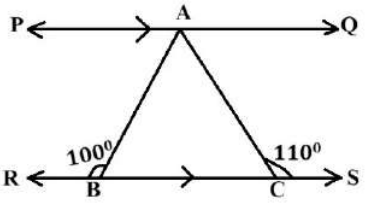
∠Y = 100^0

∠XZP + ∠PXZ = 40^0

∠XPZ = $180^0 - 40^0$

∠XPZ = 140^0

73. In the figure, $\angle ABC = 180^0 - 100^0$ (Linear Pair)



$\angle ABC = 60^0$

$\angle ACB = 180^0 - 110^0$

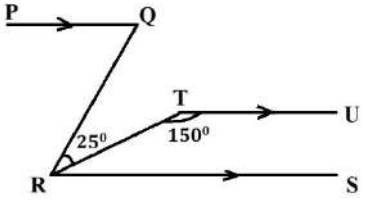
$\angle ACB = 70^0$

$\angle BAC = 180^0 - (60^0 + 70^0)$

$\angle BAC = 180^0 - 130^0$

$\mathbf{\angle BAC = 50^0}$

74. In the figure, $\angle T + \angle TRS = 180^0$



$\angle TRS = 180^0 - 150^0$

$\angle TRS = 30^0$

$\angle QRS = \angle QRT + \angle TRS$

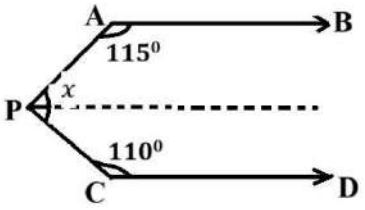
$= 25^0 + 30^0$

$\angle QRS = 55^0$

$\angle PQR = \angle QRS = 55^0$ (V.O.A)

75. In the fig, AB ‖ CD

Construction: through P draw a line PM which is parallel to AB.



(i) In the fig, $\angle BAP + \angle APM = 180^0$

$115^0 + \angle APM = 180^0$

$\angle APM = 180^0 - 115^0$

$\mathbf{\angle APM = 65^0}$

(ii) $\angle DCP + \angle CPM = 180^0$

$110^0 + \angle CPM = 180^0$

$\angle CPM = 180^0 - 110^0$

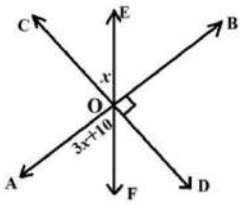
$\mathbf{\angle CPM = 70^0}$

$x = \angle APM + \angle CPM$

$= 65^0 + 70^0$

$\boldsymbol{x = 135^0}$

76. In the fig,



$\angle COE = \angle FOD = x$ (V.O.A)

$\angle DOB = \angle COA = 90^0$ (V.O.A)

$\angle AOF = \angle EOB = 3x + 10^0$ (V.O.A)

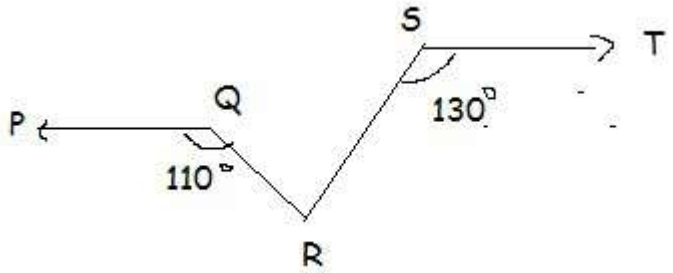
$x + x + 90^0 + 90^0 + (3x + 10^0) + (3x + 10^0) = 360^0$ (Complete angle)

$8x + 200^0 = 360^0$

$8x = 360^0 - 200^0$

$8x = 160^0 \implies \boldsymbol{x = 20^0}$

77. $\angle RST + \angle SRB = 180^0$ (AB||ST Drawn)



$\angle SRB = 180^0 - 130^0 = 50^0$

$\boldsymbol{\angle SRB = 50^0}$

PQ||ST

PQ||AB

$\angle QRB = \angle PQR = 110^0$ (Alternate angles)

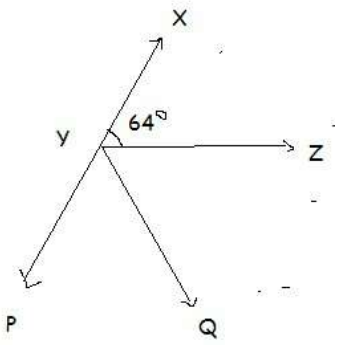
$\angle QRS + \angle SRB = \angle PQR$

$\angle QRS + 50^0 = 110^0$

$\angle QRS = 110^0 - 50^0$

$\boldsymbol{\angle QRS = 60^0}$

78. $\angle XYZ = 64^0$ (YQ bisects $\angle ZYP$)



$\angle XYP = 180^0$

$\angle ZYQ + \angle XYZ + \angle QYP = 180^0$ (linear)

$\angle ZYQ = \angle QYP = \frac{180-6}{2}$

$\boldsymbol{\angle ZYQ = 58^0}$

$\angle XYQ = 64^0 + 58^0$

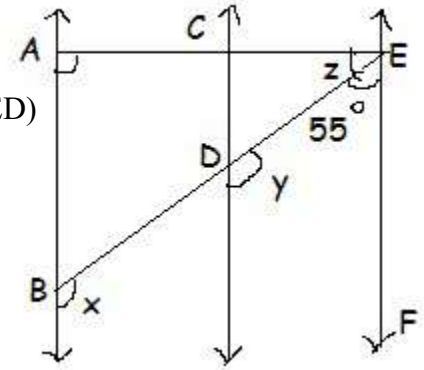
$\boldsymbol{\angle XYQ = 122^0}$

Reflex $\angle QYP = 360^0 - 58^0$

Reflex$\angle$QYP = 302^0

V. Four mark questions:

79. In the fig,



$y + 55 = 180^0$ (interior angles on the same side of the transversal ED)

$\therefore y = 180^0 - 55^0 = 125^0$

$\mathbf{y = 125^0}$

Again $x = y$ (AB||CD corresponding angles axiom)

$\mathbf{\therefore x = 125^0}$

Now since AB||CD and CD||EF

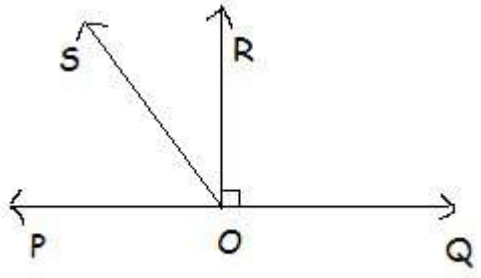
$\therefore$ AB||EF

So $\angle EAB + \angle FEA = 180^0$ (Interior angles on the same side of the transversal EA)

$\therefore 90^0 + Z + 55^0 = 180^0$

Hence $\mathbf{Z = 35^0}$

80. It is given that (OR $\perp$ PQ) and $\angle POQ = 180^0$



We can write it as $\angle ROP = \angle ROQ = 90^0$

We know that

$\angle ROP = \angle ROQ$

It can be written as

$\angle POS + \angle ROS = \angle ROQ$

$\angle POS + \angle ROS = \angle QOS - \angle ROS$

$\angle ROS + \angle ROS = \angle QOS - \angle POS$

So we get

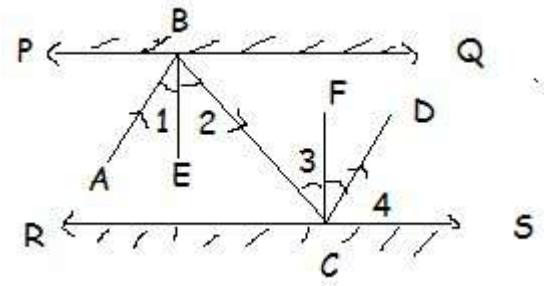
$2\angle ROS = \angle QOS - \angle POS$

(OR)

$\mathbf{\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)}$

Hence proved

81. Data: In the figure



Mirror PQ||RS

To prove: AB||CD

Construction: Draw BE⊥PQ &CF⊥ RS

Proof: W.K.T Angle incidence=Angle of reflection

$\angle 1 = \angle 2$(by laws of reflection)

$\angle 3 = \angle 4$

We also know that alternate interior angles are equal

Here BE⊥CF and the transversal line BC Cuts them at Band C

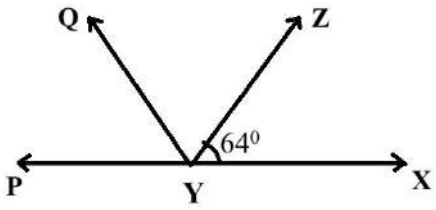
So, $\angle 2 = \angle 3$(As they alternate interior angles)

Now$\angle 1 + \angle 2 = \angle 3 + \angle 4$

$\angle ABC = \angle DCB$

So **AB||CD** (Alternate interior angles are equal)

82. $\angle QPR = 180^0 - (\angle Q + \angle R)$ (Sum of interior angles)



$\frac{1}{2}\angle QPR = \frac{1}{2} \times 180^0 - \frac{1}{2}(\angle Q + \angle R)$

$\angle QPA = 90^0 - \frac{1}{2}(\angle Q + \angle R)$

$\angle APM + \angle MPQ = 90^0 - \frac{1}{2}(\angle Q + \angle R)$

$\angle APM + 90^0 - \angle Q = 90^0 - \frac{1}{2}(\angle Q + \angle R)$

$\angle APM = -\frac{1}{2}\angle Q + \angle Q - \frac{1}{2}\angle R$

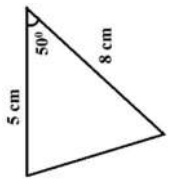
$\angle APM = \frac{1}{2}\angle Q - \frac{1}{2}\angle R$

$\angle APM = -\frac{1}{2}(\angle Q - \angle R)$

CHAPTER-7 TRIANGLES

I. Multiple choice questions:

1. (C) Two circles of same radii
2. (D) $\Delta ABC \cong \Delta QRP$
3. (A)



4. (B) 60^0
5. (D) R.H.S
6. (D) DF and MK
7. (A) 57^0
8. (C) $BD = DE$
9. (A) 67.5^0
10. (C) 60^0
11. (B) 92^0
12. (D) 80^0
13. (C) $\Delta FOX \cong \Delta AEP$
14. (D) $GO = 5\ cm, \angle D = 40^0$
15. (A) 30^0
16. (B) 50
17. (A) 4cm

II. One marks questions:

18. Two triangles are said to be congruent if their corresponding sides and angles are equal.
19. Two circles with same radii, equilateral triangles of same sides, squares of same sides,etc.
20. Two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of another triangle.
21. If in two right triangles the hypotenuse and one side of one triangle are equal to the hypotenuse and one side of the other triangle, then the two triangles are congruent.
22. If three sides of one triangle are equal to the three sides of another triangle, then the two triangles are congruent.

23. Two triangles are congruent if two sides and the included angle of one triangle are equal to the two sides and the included angle of the other triangle.

24. Corresponding vertices are $P \leftrightarrow X, Q \leftrightarrow Y$ and $R \leftrightarrow Z$.

25. Corresponding sides are $KL = GH, LM = HK$ and $KM = GK$.

26. $AB = BC$

27. $\angle ADE = \angle ABC$ and $\angle AEB = \angle ADC$

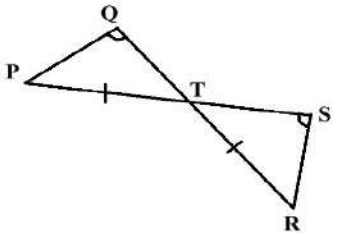
28. $AC = AD$, $AB = AB$ and $BC = BD$

III. Two marks questions:

29. Corresponding sides are

$AB = XY$, $BC = YZ$ and $AC = XZ$

30. In the given figure PS and QR intersect at T, $\angle Q = \angle S$.



To prove: $\Delta PQT \cong \Delta RST$

Proof: In ΔPQT & ΔRST

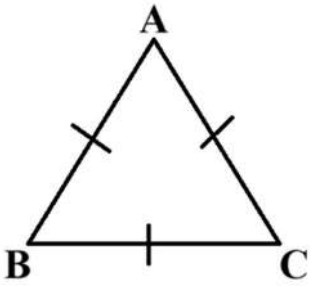
$\angle Q = \angle S$ (Given)

$\angle PTQ = \angle RTS$ (V.O.A)

$PT = TR$ (Given)

$\therefore \Delta PQT \cong \Delta RST$ (A.A.S Congruence rule)

31. ΔABC is an equilateral triangle. $AB = BC = AC$.



To prove: $\angle A = \angle B = \angle C$

Proof: In ΔABC

$AB = AC$

$\therefore \angle B = \angle C$(Opposite angles of equal sides) $\rightarrow\rightarrow$ (1)

$AB = BC$

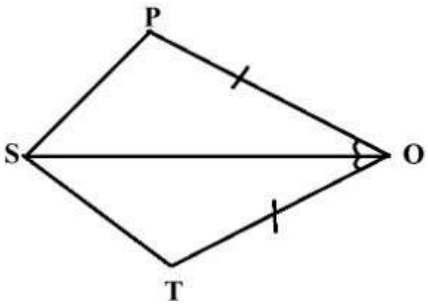
$\therefore \angle A = \angle C$ (Opposite angles of equal sides) $\rightarrow\rightarrow$ (2)

From (1) and (2)

$\therefore \angle A = \angle B = \angle C$ (Axiom 1)

$\angle A = \angle B = \angle C = 60^0$

32. Given: In the figure, $\angle SOP = \angle SOT$, $OP = OT$, $SP = 5$ cm, $ST = ?$



In ΔSOP and ΔSOT

$OP = OT$	(Given)
$\angle SOP = \angle SOT$	(Given)
$SO = SO$	(Common side)
$\Delta SOP \cong \Delta SOT$	(S.A.S. Congruence rule)
$ST = SP$	(C.P.C.T)
$ST = 5$ cm	

33. Given: CAR is a right triangle, $\angle R = 90^0$, let $\angle C : \angle A = 2 : 3$. $\angle C = ?, \angle A = ?$

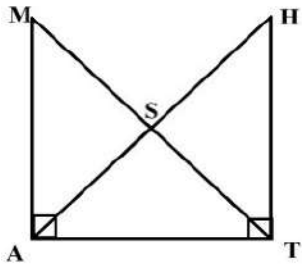
Solution: $\angle C + \angle A + \angle R = 180^0$

$\angle C + \angle A = 90^0$ $(\angle R = 90^0)$

$\angle C = \frac{2}{5} \times 90^0 = 36^0$

$\angle A = \frac{3}{5} \times 90^0 = 54^0$

34. In the given figure MATHS, $AH = MT$.

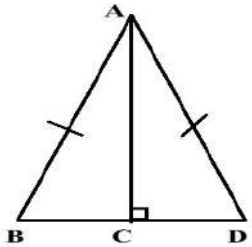


To Prove: AM = HT

Proof: In ΔMAT and ΔHAT

$\angle A = \angle T = 90^0$	(Given)
$AH = MT$	(Given)
$AT = AT$	(Common side)
$\Delta MAT \cong \Delta HTA$	(R.H.S. Congruence rule)
$AM = HT$	(C.P.C.T)

35. Given: In the $\Delta ABD, AC \perp BD$



To prove: $\angle B = \angle D$

Proof: In $\triangle ACB$ and $\triangle ACD$

$\angle ACB = \angle ACD = 90^0$ (Given)

$AB = AD$ (Given)

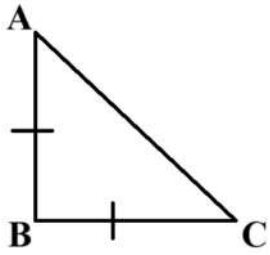
$AC = AC$ (Common side)

$\triangle ACB \cong \triangle ACD$ (R.H.S. Congruence rule)

$\angle B = \angle D$ (CPCT)

36. In $\triangle ABC$, $AB = BC$, $\angle A = ?$ $\angle B = 90^0$ $\angle C = ?$

Solution: In $\triangle ABC$



$AB = BC$ (Given)

$\angle A = \angle C = x$ (Opposite angles of equal sides)

$\angle A + \angle B + \angle C = 180^0$ (Angle sum property of triangle)

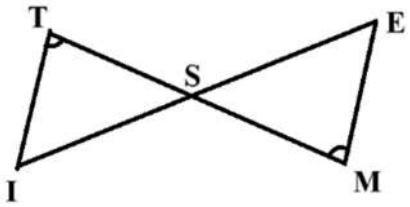
$x + 90^0 + x = 180^0$

$x = 45^0$

Therefore, each of the other to angles measure 45^0.

37. $TS = MS$ and $\angle T = \angle M$.

To Prove: $\Delta SIT \cong \Delta SEM$.



Proof: In ΔSIT and ΔSEM

$\angle T = \angle M$ (Given)

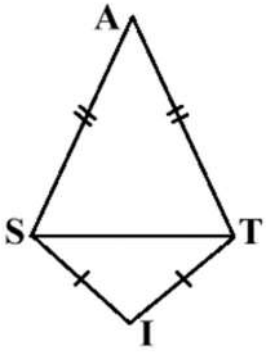
$TS = MS$ (Given)

$\angle TSI = \angle MSE$ (V.O.A)

$\therefore \Delta SIT \cong \Delta SEM$ (A.S.A. Congruence rule)

38. ΔSAT and ΔSIT are isosceles triangles are on the same base ST.

To Prove: $\angle ASI = \angle ATI$



Proof: In ΔSAT and ΔSIT

$AS = AT$ (Given)

$\angle AST = \angle ATS$ $\rightarrow (1)$ (Opposite angles of equal sides)

$SI = TI$ (Given)

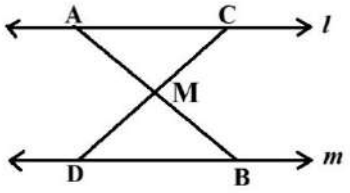
$\angle IST = \angle ITS \rightarrow (2)$ (Opposite angles of equal sides)

Adding (1) and (2)

$\angle AST + \angle IST = \angle ATS + \angle ITS$

$\angle ASI = \angle ATI$

39. In ΔAMC and ΔBMD



$AM = MB$ (M is Midpoint of AB)

$\angle CAM = \angle MBD$ (Alternate angles)

$\angle AMC = \angle DMB$ (V.O.A)

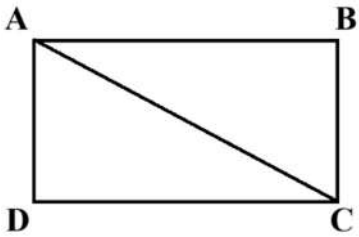
$\Delta AMC \cong \Delta BMD$ (A.S.A Postulate)

$MC = MD$ (CPCT)

$\therefore$ M is also mid point of CD

IV. Three marks questions:

40. Given: In rectangle ABCD, AC is the diagonal.



To Prove: $\Delta ADC \cong \Delta CBA$

Proof: In ΔADC and ΔCBA

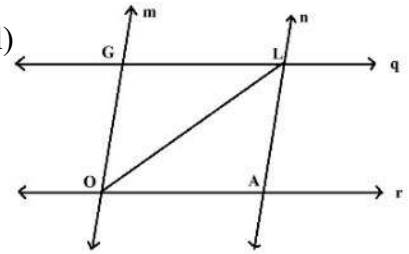
$AD = BC$ (Opposite sides of rectangle)

$DC = AB$ (Opposite sides of rectangle)

$AC = AC$ (Common sides)

$\Delta ADC \cong \Delta CBA$ (S.S.S. Congruence rule)

41. Given: In the figure, $m \parallel n$ and $q \parallel r$



i) GOAL is a parallelogram (two pair of opposite sides are parallel)

ΔOGL and ΔOAL

$GL = OA$ (Opposite sides of a parallelogram)

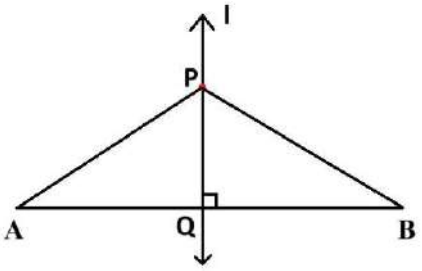
$OG = LA$ (Opposite sides of a parallelogram)

$OL = OL$ (Common side)

$\Delta OGL \cong \Delta OAL$ (S.S.S. Congruence rule)

ii) $\angle G = \angle A$ (C.P.C.T)

42. Given: In the figure, $AQ = BQ, \angle Q = 90^0$.

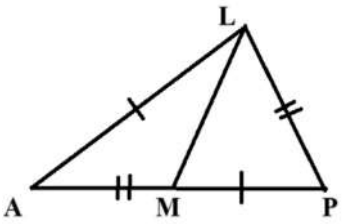


To prove: $AP = BP$

Proof: In ΔAQP and ΔBQP

$AQ = BQ$	(Given)
$\angle AQP = \angle BQP$	(Given)
$PQ = PQ$	(Common side)
$\Delta AQP \cong \Delta BQP$	(S.A.S. Congruence rule)
$AP = BP$	(C.P.C.T)

43. Given: In the figure LAMP, $AL = MP, AM = LP$.

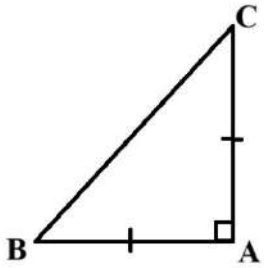


To Prove: $\angle ALM = \angle LMP$.

Proof: In ΔAML and ΔPML

$AL = MP$	(Given)
$AM = LP$	(Given)
$LM = LM$	(Common side)
$\Delta AML \cong \Delta PML$	(S.S.S. Congruence rule)
$\angle ALM = \angle LMP$	(C.P.C.T)

44. Given $AB = AC$ and $A = \angle 90^0$



$\therefore \angle B = \angle C$

$\angle A + \angle B + \angle C = 180^0$

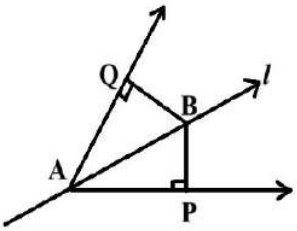
$90^0 + \angle B + \angle B = 180^0$

$2\angle B = 180^0 - 90^0 = 90^0$

$\angle B = \frac{90^0}{2} = 45^0$

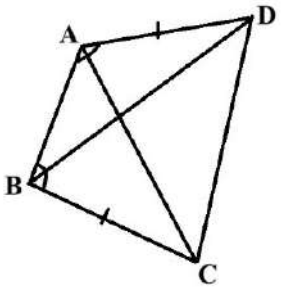
$\therefore \mathbf{\angle B = \angle C = 45^0}$

45. In the fig,



$\angle BAP = \angle BAQ$	(l is bisector of $\angle A$)
$\angle P = \angle Q = 90^0$	
$\angle ABP = \angle ABQ$	(remaining angles)
$AB = AB$	(common side)
$\mathbf{\Delta APB \cong \Delta AQB}$	**(A.S.A Postulate)**
$\mathbf{BP = BQ}$	**(CPCT)**

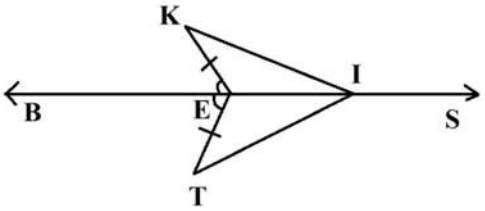
46. In ΔBAC and ΔABD



AB = AB	(Common side)
BC = AD	(Data)
∠ABC = ∠BAD	(Data)
ΔBAC ≅ ΔABD	**(S.A.S postulate)**
AC = BA	**(CPCT)**
∠BAC = ∠ABD	

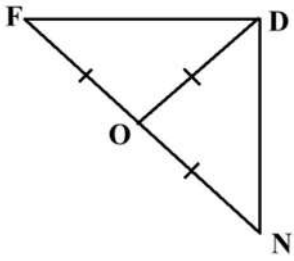
47. Given: In quadrilateral KITE, ∠BEK = ∠BET and KE = ET.

To Prove: i) ΔKEI ≅ ΔTEI. ii)KI = TI.



Proof: $\angle KEI = 180^0 - \angle BEK$ → (1)	(L.P.A)
$\angle TEI = 180^0 - \angle BET$	(L.P.A)
$\angle TEI = 180^0 - \angle BEK$ → (2)	(∠BEK = ∠BET)
∴ ∠KEI = ∠TEI	(Axiom.1)
In ΔKEI and ΔTEI	
KE = ET	(Given)
∠KEI = ∠TEI	(Proved)
EI = EI	(Common side)
∴ ΔKEI ≅ ΔTEI	(S.A.S. Congruence rule)
∴ KI = TI	(C.P.C.T)

48. Given: In ΔFND, FO = ON = OD.



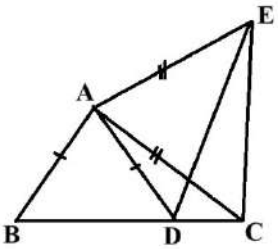
To Prove: $\angle FDN = 90^0$.

Proof: In ΔFOD

FO = OD	(Given)
∴ ∠OFD = ∠ODF = x	(Opposite angles of equal sides)
In ΔNOD	
ON = OD	(Given)
∴ ∠OND = ∠ODN = y	(Opposite angles of equal sides)
∴ In ΔFDN	
$\angle F + \angle D + \angle N = 180^0$	(Angle sum property of triangle)
$\angle F + \angle ODF + \angle ODN + \angle N = 180^0$	
$x + x + y + y = 180^0$	
$x + y = 90^0$	
$\angle FDN = 90^0$	

V. Four marks questions:

49. In ΔABC and ΔADE



AC = AE (Data)

AB = AD (Data)

∠BAD = ∠EAC (Data)

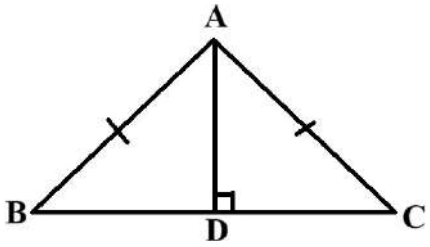
∠BAD + ∠DAC = ∠EAC + ∠DAC (Adding ∠DAC on both sides)

∠BAC = ∠EAD

∴ ΔABC ≅ ΔADE (S.A.S postulate)

BC = DE (CPCT)

50. In ΔADB and ΔADC



∠ADB = ∠ADC = 90^0 (Data)

AB = AC (Data)

AD = AD (common side)

ΔADB ≅ ΔADC (RHS Postulate)

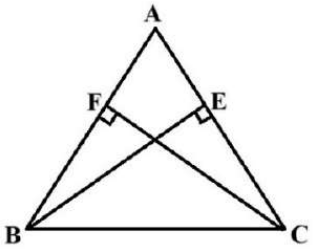
BD = DC (CPCT)

⟹ AD bisects BC

∠BAD = ∠CAD (CPCT)

⟹ AD bisects ∠A

51. Given ABC is isosceles triangle.



AC = AB

∠ABC = ∠ACB

⟹ ∠FBC = ∠ECB → 1

In ΔFBC and ΔECB

∠F = ∠E = 90^0 (Data)

∠FCB = ∠EBC (remaining angles)

BC = BC (Common side)

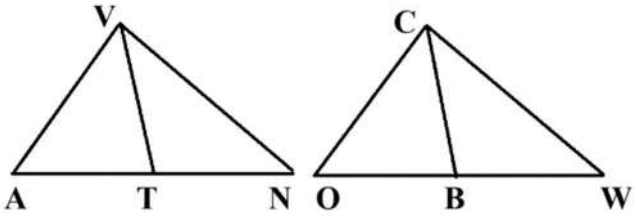
ΔFBC ≅ ΔECB (A.S.A postulate)

FC = BE **(CPCT)**

52. Given: $\Delta VAN \cong \Delta COW$, $AT = TN = \frac{1}{2}AN, OB = BW = \frac{1}{2}OW$

To Prove: i) $\Delta VAT \cong \Delta COB$

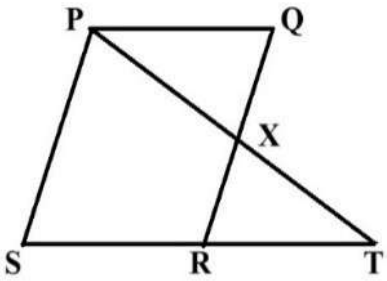
ii) VT = CB



Proof: In ΔVAT and ΔCOB

$VA = CO$	$(\Delta VAT \cong \Delta COB)$
$AN = OW$	$(\Delta VAT \cong \Delta COB)$
$\frac{1}{2}AN = \frac{1}{2}OW$	
$AT = OB$	
$VT = VT$	(Common side)
$\Delta VAT \cong \Delta COB$	(S.S.S. Congruence rule)
$VT = CB$	(C.P.C.T)

53. Given: PQRS is a parallelogram, $RX = QX$



To Prove: i) $\Delta PXQ \cong \Delta TXR$

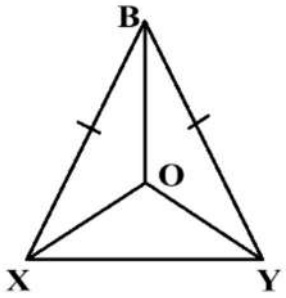
ii) ST = 2PQ

Proof: In ΔPXQ and ΔTXR

$\angle PQX = \angle XRT$	(Alternate angles, PQ ∥ SR)
$QX = RX$	(Given)
$\angle PXQ = \angle RXT$	(V.O.A)
$\Delta PXQ \cong \Delta TXR$	(A.S.A. Congruence rule)
$PQ = RT$	(C.P.C.T)
$PQ = SR$	(Opposite sides of equal angles)
$ST = SR + RT$	
$ST = PQ + PQ$	
$ST = 2PQ$	

VI. Five marks questions:

54. Given: ΔBXY is an isosceles triangle, $BX = BY$ $\angle OXY = \angle OYX$.



To Prove: i) $OX = OY$

ii) $\Delta BOX \cong \Delta BOY$

iii) $\angle XBO = \angle YBO$

Proof: i) $\angle OXY = \angle OYX$ (Given)

$OX = OY$ (Opposite angles of equal sides)

ii) In ΔBOX and ΔBOY

$BX = BY$ (Given)

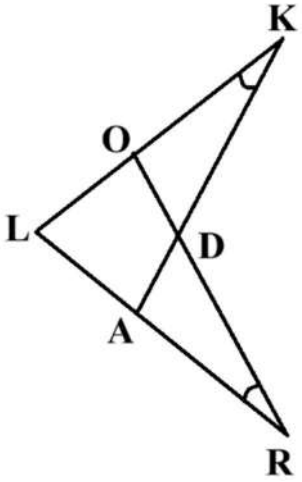
$OX = OY$ (From i)

$OB = OB$ (Common side)

$\Delta BOX \cong \Delta BOY$ (S.S.S. Congruence rule)

iii) $\angle XBO = \angle YBO$ (C.P.C.T)

55. . Given: In the figure, KOLARD, $\angle AKL = \angle ORL$ and KL=RL.



To Prove:

i) $\Delta KAL \cong \Delta ROL$

ii) AK = OR

iii) AR = OK

Proof: i) In ΔAKL and ΔORL

$\angle AKL = \angle ORL$ (Given)

$KL = RL$ (Given)

$\angle KLR = \angle KLR$ (Common side)

$\Delta KAL \cong \Delta ROL$ (A.S.A. Congruence rule)

ii) $AK = OR$ (C.P.C.T)

iii) $KL = LR$ (C.P.C.T)

$LO = AL$ (C.P.C.T)

$KL - LO = LR - AL$

$OK = AR$

CHAPTER 8 – QUADRILATERALS

I. Multiple choice questions:

1. (C) DB
2. (D) 360^0
3. (A) $\angle R$
4. (B) Rectangle
5. (D) 180^o
6. (B) 18cm
7. (D) Rhombus
8. (C) $\angle EDF = \angle DFG$
9. (A) Rectangle
10. (D) Diagonals are unequal and do not bisect each other.
11. (B) OQ = OS
12. (D) 110^0
13. (B) 8cm
14. (B) 72^0
15. (B) 40^0
16. (C) 112^0
17. (D) 90^0
18. (C) 30^0
19. (C) Rectangle
20. (B) 45^0
21. (D) 72^0 and 108^0
22. (A) 25^0
23. (C) 50^0
24. (D) 90^0
25. (D) 40cm
26. (D) $\angle HOG = 90^0$ and OE = OG
27. (C) 180^0
28. (C) 50^0
29. (A) 290^0
30. (A) 15cm

31. (B) 50^0

32. (B) 180^0

33. (D) DE $= \frac{1}{2}$BC

34. (B) BC $=$ 2PQ

35. (D) Parallelogram

36. (B) 5cm

37. (C) 48cm

II. One marks questions:

38. (i) Opposite sides are equal and parallel.

(ii) Diagonals bisect each other.

39. (i) All the sides are equal.

(ii) Diagonals bisect each other perpendicularly,

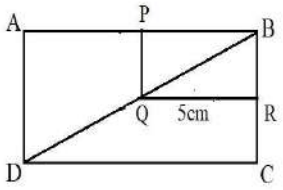
40. The line segment joining the midpoints of two sides of a triangle is parallel to the third side.

41. Given, $\angle BAC = 45^0$

$\therefore \angle DCA = 45^0$ [Alternate angles]

42. 60^0 and 120^0

43. $\angle AEF = 125^0$



44. QR = PB = 5cm

AB = AP + PB = 5 + 5 = **10cm**

45. Square and Rectangle

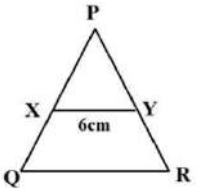
46. No. Because sum of four angles is greater than 360^0.

47. a + d = 5cm and b + c $=$ 5cm

a + d + b + c $=$ 5 + 5 $=$ **10cm**

48. Given XY = 6cm

QR = 2XY = 2(6) = **12cm**

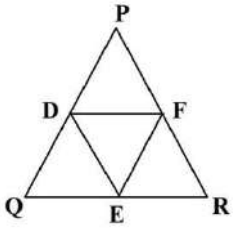


49. Given Perimeter of the ΔPQR = 36cm,

The perimeter of the ΔDEF $= \frac{1}{2}$ (Perimeter of the ΔPQR)

$= \frac{1}{2} \times 36$

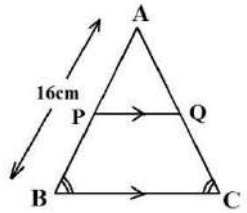
= 18cm



50. In ΔABC, AB = 16cm

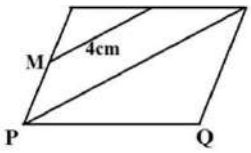
AC = 16cm.

AQ = AP = 8cm



51. MN = 4cm

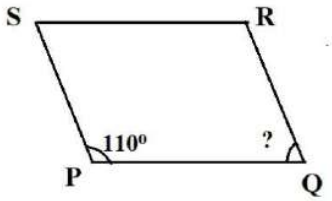
PR = 2MN = 2(4) = 8cm



III. Two marks questions

52. Given ∠P = 110^0, ∠Q =?

PQRS is a parallelogram.



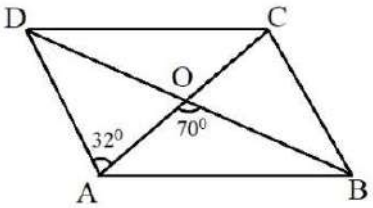
∠P + ∠Q = 180^0

110^0 + ∠Q = 180^0

∠Q = $180^0 - 110^0$

∠Q = 70^0

53. Given ∠DAC = 32º and ∠AOB = 70º, ∠DBC =?



∠BOC = 180^0 - 70^0 = 110^0

∠OCB = ∠DAC = 32^0 (alternate angles)

In ΔBOC,

∠OCB + ∠BOC + ∠OBC = 180^0

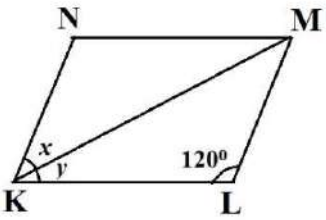
32^0 + 110^0 + ∠OBC = 180^0

∠OBC = 38^0

∠DBC = ∠OBC = 38^0

54. In the figure, KLMN is a parallelogram.

KM is a diagonal which bisects ∠K.



∴ x = y

∠K + ∠L = 180^0

x + y + 120^0 = 180^0

x + x = $180^0 - 120^0$

2x = 60^0

∴x = 30.

∴x = y = 30^0

55. Let the four angles of quadrilateral be $3x$, $4x$, $4x$ and $7x$.

Sum of four angles of quadrilateral is = 360^0

$3x + 4x + 4x + 7x = 360^0$

$18x = 360^0$

$\boldsymbol{x = 20^0}$

$3x = 3(20^0) = 60^0$

$4x = 4(20^0) = 80^0$

$4x = 4(20^0) = 80^0$

$7x = 7(20^0) = 140^0$

56. Let the three equal angles of a quadrilateral be 'x'

Given one angle is $= 108^0$

Sum of 4 angles of a quadrilateral is $= 360^0$

$108^0 + x + x + x = 360^0$

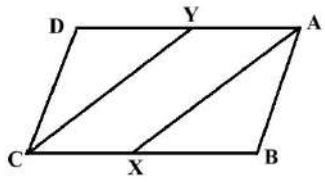
$108^0 + 3x = 360^0$

$3x = 360^0 - 108^0$

$3x = 252^0$

$\boldsymbol{x = 84^0}$

57. In the fig,



$\angle DCB = \angle DAB$ (opposite angles of a parallelogram)

$\frac{1}{2}\angle DCB = \frac{1}{2}\angle DAB$

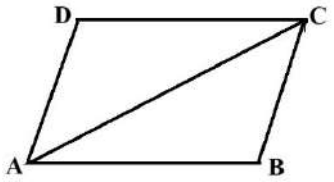
$\angle YCX = \angle YAX$

and CX ∥ YA (∵CB ∥DA)

∴ YCXA is a parallelogram.

⇒AX and CY are parallel.

58. Given diagonal AC bisects ∠DAB.



$\angle DAC = \angle CAB = \frac{1}{2}\angle DAB \rightarrow (1)$

In △ADC and △CBA

AD = CB (opposite sides)

DC = BA (opposite sides)

AC = AC (Common side)

△ADC≅ △CBA (SSS Congruency)

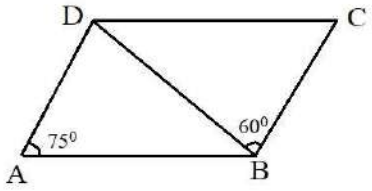
∠ACD = ∠CAB (CPCT)

∠DAC = ∠CAB (from 1)

∠ACD = ∠BCA

AC bisects ∠C also.

59. Given ∠DAB = 75º and ∠DBC = 60º, ∠CDB =? and ∠ADB =?



∠ADB = ∠DBC (Alternate angles)

∴∠ADB = 60^0

∠ADB + ∠DAB + ∠ABD = 180^0

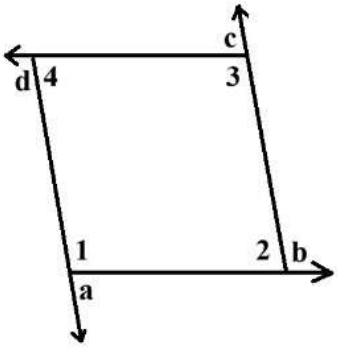
$60^0 + 75^0 + ∠ABD = 180^0$

$∠ABD = 45^0$

∴∠CDB = ∠ABD = 45^0 (Alternate angles)

IV. Three marks questions:

60. In the fig,



$a + 1 = b + 2 = c + 3 = d + 4 = 180^0$ (Linear Pair)

$a + 1 + b + 2 + c + 3 + d + 4 = 4 \times 180^0$

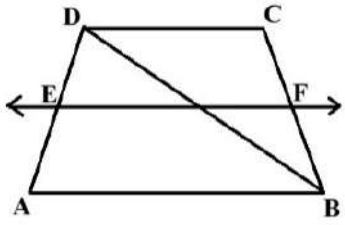
$a + b + c + d + (1 + 2 + 3 + 4) = 720^0$

$a + b + c + d + 360^0 = 720^0$

$a + b + c + d = 720^0 - 360^0$

$a + b + c + d = 360^0$

61. In ΔDAB,



DE = EA (Data)

EF ∥ AB (Data)

DO = OB (Converse of mid-point theorem)

Also, In ΔDBC

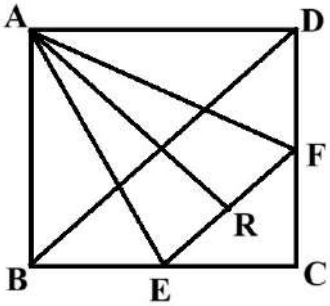
OF ∥ DC (DC ∥ AB and EF ∥ AB)

OB = DO (proved)

BE = FC (Converse of mid-point theorem)

F is the midpoint of BC.

62. In ΔABE and ΔADF,



AB = AD (sides of a square)

BE = DF $\left(\frac{1}{2}BC = \frac{1}{2}DC\right)$

$∠ABE = ∠ADF = 90^0$

ΔABE ≅ ΔADF (S.A.S congruency)

AE = AF →(1) (CPCT)

In ΔAER and ΔAFR,

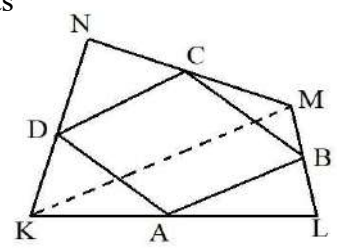
AE = AF (from 1)

AR = RA (Common side)

ER = RF (R is mid-point of EF)

∴ ΔAER ≅ ΔAFR (S.S.S congruency)

63. **Data:** KLMN is a quadrilateral. A, B, C and D are the midpoints of KL, LM, MN and NK respectively.



To Prove: ABCD is a parallelogram.

Proof: In △KLM,

AB ‖ KM and AB = $\frac{1}{2}$ KM (by Mid point theorem) ----(1)

In ΔKMN,

DC ‖KM and DC = $\frac{1}{2}$ KM (by Mid point theorem) ----(2)

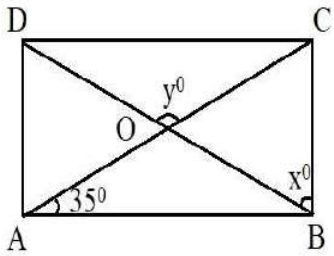
From (1) and (2)

AB ‖ DC and AB = DC

A pair of opposite sides are equal and parallel.

∴ ABCD is a parallelogram.

64. ABCD is a rectangle.



In △AOB, OA = OB (diagonals are equal and bisect each other)

∴∠OAB = ∠OBA = 35^0 (angles opposite to equal sides are equal.)

∠ABC = 90^0

∠OBA + ∠OBC = 90^0

$35^0 + x = 90^0$

$x = 90^0 – 35^0$

$x = 55^0$

In ΔAOB,

∠AOB + ∠OAB + ∠OBA = 180^0

∠AOB + 35^0 + 35^0 = 180^0

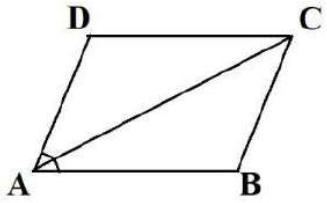
∠AOB = $180^0 – 70^0$

∠AOB = 110^0

y = ∠AOB (vertically opposite angles)

$y = 110^0$

65. Given Diagonal AC of a parallelogram ABCD bisects ∠A



i)In ΔADC and ΔABC

AD = BC (Opposite sides)

DC = BA (Opposite sides)

AC = AC (Common side)

ΔADC ≅ ΔABC (SSS congruency)

∠ACD = ∠BCA (CPCT)

Diagonal AC bisects ∠C.

ii) ∠ACD = ∠CAD

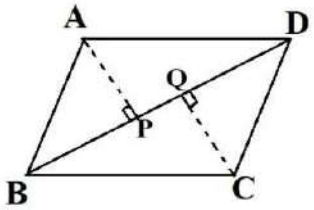
AD = CD (sides opposite to equal angles are equal)

But, DA = BC and AB = CD

∴ AB = BC = CD = DA

∴ ABCD is a rhombus.

66. Given ABCD is a parallelogram.



In ΔAPB and ΔCQD

AB = CD (opposite sides)

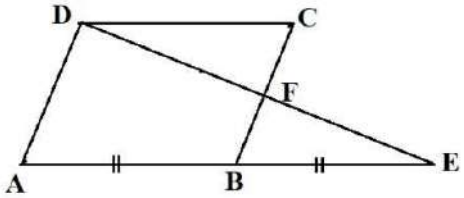
∠APB = ∠CQD = 90^0 (given)

∠ABP = ∠CDQ (alternate angles)

ΔAPB ≅ ΔCQD (ASA congruency)

And also, AP = CQ (CPCT)

67. Given ABCD is a parallelogram and AB = BE.



In ΔFDC and ΔFEB

DC = BE (Given and DC = AB)

∠DCF = ∠EBF (Alternate angles)

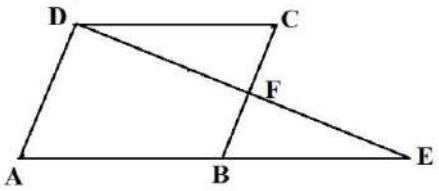
∠CFD =∠BFE (V.O.A)

ΔFDC ≅ ΔFEB (AAS Congruency)

∴ CF = FB (CPCT)

∴ ED bisects BC.

68. Given, ABCD is a parallelogram. 'F' is the midpoint of side BC.



In ΔFDC and ΔFEB

∠DCF = ∠EBF (Alternate angles)

∠CFD =∠BFE (V.O.A)

CF = FB (Given)

ΔFDC ≅ ΔFEB (ASA Congruency)

∴ DC = BE (CPCT)

But DC = AB

∴DC = AB = BE

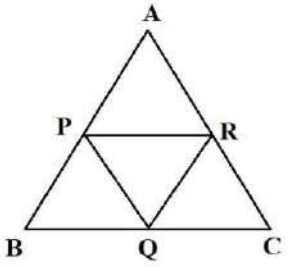
∴AE = AB + BE = AB + AB

⇒AE = 2AB

69. Given, ABC is an equilateral triangle.

∴AB = BC = AC.

Since P and Q are the midpoints of AB and BC



PQ = $\frac{1}{2}$ AC (by Midpoint theorem)

Similarly, PR= $\frac{1}{2}$ BC and QR = $\frac{1}{2}$ AB

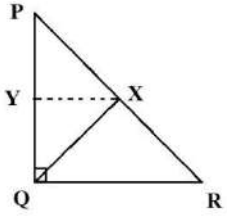
Given AB = BC = AC

$\frac{1}{2}$ AB = $\frac{1}{2}$ BC = $\frac{1}{2}$ AC

⇒ QR = PR = PQ

∴ΔPQR is also an equilateral triangle.

70. **Data:** ΔPQR is a right angled at 'Q'and 'X' is the midpoint of PR.



To Prove: XP = XQ = XR.

Construction: Through X draw XY ∥ RQ

Proof: In the figure,

∠PYX = ∠PQR = 90^0 (corresponding angles)

∴∠QYX = ∠PYX = 90^0

In ΔPQR, X is the midpoint of PR and

XY ∥ RQ (By construction)

∴Y is the midpoint of PQ. (converse of midpoint theorem)

∴PY = QY

In ΔPYX and ΔQYX

PY = QY (proved)

XY = XY (common side)

$\angle QYX = \angle PYX$ (each equal to 90^0)

$\Delta PYX \cong \Delta QYX$ (SAS postulate)

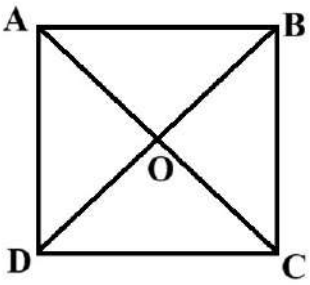
$\therefore$ XP = XQ (CPCT)

But XP = XR (X is midpoint of PR)

$\therefore$ XP = XQ = XR.

V. Four marks questions:

71. In ΔABC and ΔDCB



AB = DC (opposite sides)

BC = BC (Common sides)

$\angle ABC = \angle DCB = 90^0$

$\Delta ABC \cong \Delta DCB$ (S.A.S congruency)

AC = DB → (1) (CPCT)

In ΔAOB and ΔDOC

AB = DC (Opposite sides)

$\angle ABO = \angle ODC$ (Alternate angles)

$\angle BAO = \angle OCD$ (Alternate angles)

$\Delta AOB \cong \Delta DOC$ (A.S.A Congruency)

OB = OD → (2) (CPCT)

In ΔADO and ΔAOB,

AD = AB (Sides of a square)

AO = AO (Common side)

DO = OB (from 2)

$\Delta ADO \cong \Delta AOB$ (S.S.S congruency)

$\angle DOA = \angle AOB$ (CPCT)

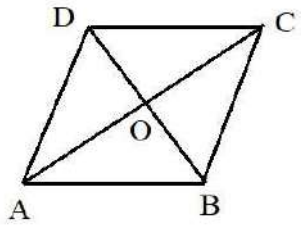
But, $\angle DOA + \angle AOB = 180^0$ (Linear pair)

$\Rightarrow \angle DOA = \angle AOB = 90^0$ → (3)

From (1), (2) and (3)

Diagonals are equal and bisect each other at right angles.

72. **Data:** ABCD is a parallelogram. AC and BD are the diagonals which Intersect at 'O'



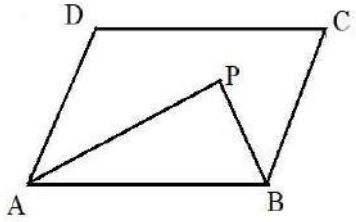
To Prove: OA = OC and OB = OD

Proof: In ΔAOB and ΔCOD

AB = DC	(opp. sides of a parallelogram)
∠ABO = ∠CDO	(Alternate angles)
∠BAO = ∠OCD	(Alternate angles)
△AOB ≅△COD	(SAS Postulate)
OA = OC and OB = OD	**(CPCT)**

Hence Diagonals of a parallelogram bisect each other.

73. **Data:** ABCD is a parallelogram. AP and BP are angular bisectors of ∠A and ∠B respectively.



To Prove: $\angle APB = 90^0$

Proof: In a parallelogram

$\angle A + \angle B = 180^0$

$2(\angle PAB) + 2(\angle PBA) = 180^0$

$\angle PAB + \angle PBA = \frac{180}{2} = 90^0$ ---(1)

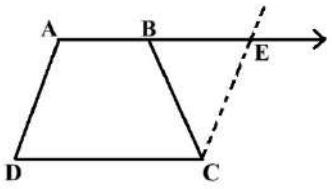
In ΔAPB, $\angle PAB + \angle PBA + \angle APB = 180^0$

$90^0 + \angle APB = 180^0$

$\angle APB = 180^0 - 90^0 = \mathbf{90^0}$

∴Bisectors of any two consecutive angles of a parallelogram intersect at right angles.

74. Given: ABCD is a trapezium in which AB || CD and AD = BC.



(i)In the fig,

AD = CE	(opp sides of parallelogram)
BC = CE	(AD = BC)
∠CEB = ∠CBE	(Opp angles of equal sides)
$\angle A + \angle CBE = 180^0$ →(1)	
$\angle B + \angle CBE = 180^0$ → (2)	
∠A = ∠B	(from 1 and 2)

ii) In the fig,

AB || CD

$\angle A + \angle D = 180^0$ (sum of the interior angles on the same side)

$\angle C + \angle B = 180^0$ (sum of the interior angles on the same side)

$\angle A + \angle D = \angle C + \angle B$

But, $\angle A = \angle B$ (proved in (i))

$\Rightarrow \angle D = \angle C$

iii) In $\triangle ABC$ and $\triangle BAD$

$AB = BA$ (Common side)

$BC = AD$ (Given)

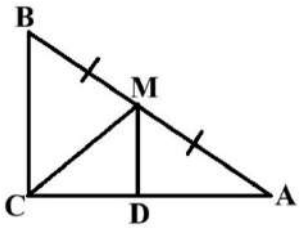
$\angle B = \angle A$ (proved)

$\triangle ABC \cong \triangle BAD$ (S.A.S congruency)

iv) $\triangle ABC \cong \triangle BAD$ (proved)

$AC = BD$ (CPCT)

75. (i)In $\triangle ABC$, M is the midpoint of AB and MD ∥ BC



$\therefore$ D is midpoint of CA. (converse of midpoint theorem)

(ii) $\angle BCA = \angle MDA = 90^0$ (corresponding angles)

$MD \perp AC$

(iii) In $\triangle AMD$ and $\triangle CMD$

$AD = CD$ (D is midpoint of AC)

$\angle ADM = \angle CDM = 90^0$

$DM = DM$ (Common side)

$\triangle AMD \cong \triangle CMD$ (S.A.S congruency)

$AM = CM$ (CPCT)

$AM = \frac{1}{2} AB$ (M is midpoint of AB)

$CM = AM = \frac{1}{2} AB$

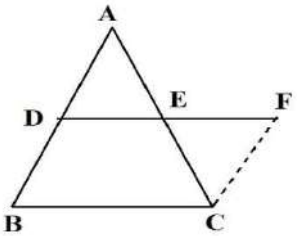
VI. Five marks questions:

76. **Data:** In $\triangle ABC$, D and E are the midpoints of AB and AC respectively.

DE is joined

To Prove: DE ∥ BC.

Construction: Draw CF ∥ BA and produce DE to meet this at F.



Proof: In $\triangle AED$ and $\triangle CEF$

$\angle AED = \angle CEF$ (V.O.A)

AE = CE (E is midpoint of AC)

$\angle DAE = \angle FCE$ (Alternate angles)

$\triangle AED \cong \triangle CEF$ (ASA Criterion)

$\therefore AD = CF$ and $DE = EF$ (CPCT)

But AD = BD (D is midpoint of AB)

And BD‖ CF (C0nstruction)

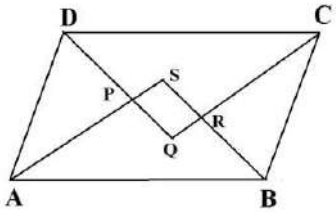
$\therefore$ BD = CF and BD‖ CF

$\Rightarrow$BCFD is a parallelogram.

DF ‖BC and DF = BC

$\Rightarrow$**DE ‖ BC**

77. ABCD is a parallelogram.



DC ‖ AB

$\angle A + \angle D = 180^0$

$\frac{1}{2}\angle A + \frac{1}{2}\angle D = 90^0$

$\Rightarrow \angle PAD + \angle PDA = 90^0$

$\Rightarrow \angle APD = 90^0$ (sum of three angles of a $\triangle$ is 180^0)

$\Rightarrow \angle SPQ = 90^0$ (V.O.A)

Now, AD ‖ BC

$\angle D + \angle C = 180^0$

$\frac{1}{2}\angle D + \frac{1}{2}\angle C = 90^0$

$\Rightarrow \angle QDC + \angle QCD = 90^0$

$\Rightarrow \angle DQC = 90^0$ (sum of three angles of a $\triangle$ is 180^0)

$\Rightarrow \angle PQR = 90^0$ (V.O.A)

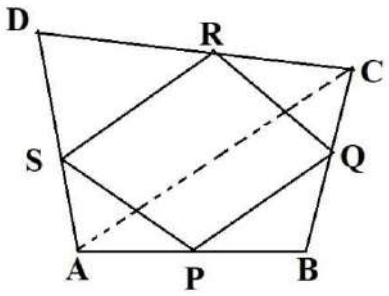
Similarly, $\angle QRS = 90^0$ and $\angle RSP = 90^0$.

Thus, PQRS is a quadrilateral and each of those angles is 90^0.

Hence, PQRS is a Rectangle.

$\therefore$ **The bisectors of the angles of a parallelogram form a rectangle**.

78. **Data:** ABCD is a quadrilateral. P, Q, R and S are the midpoints of AB, BC, CD and DA respectively.



To Prove: PQRS is a parallelogram.

Proof: In △ADC,

SR ‖ AC and SR = $\frac{1}{2}$ AC (by Mid point theorem) ----(1)

In ABC,

PQ ‖ AC and PQ = $\frac{1}{2}$ AC (by Mid point theorem) ----(2)

From (1) and (2)

SR ‖ PQ and SR = PQ

A pair of opposite sides are equal and parallel.

∴ PQRS is a parallelogram.

CHAPTER-9 CIRCLES

I. Multiple choice questions:

1. C) 6cm
2. B) 3cm
3. A) 50^0
4. C) 12cm
5. D) 8cm
6. A) 2cm
7. C) 10cm
8. D) 45^0
9. A) 50^0
10. C) 70^0
11. C) 60^0
12. B) 10cm
13. A) $a = \frac{1}{2} b$
14. D) 8cm
15. D) 130^0
16. A) 2cm
17. A) 35^0
18. B) $x < y$
19. D) 80^0
20. B) 50^0
21. B) 60^0
22. B) 70^0
23. B) 40^0

II. One marks questions:

24. 40^0
25. 180^0
26. 8cm
27. OA is perpendicular to PQ
28. 70^0

29. $\angle A + \angle B + \angle C = 180^0$

$68^0 + 90^0 + \angle C = 180$, $\angle C = 180 - 158 = 22^0$

30. $\angle AOC = 90^0$

31. Angles subtended in the same segment of a circle are equal.

32. If all the four vertices of a quadrilateral lie on the circle, then it is called cyclic quadrilateral.

III. Two marks questions:

33. $2x + 3 = 4x - 3$

$2x - 4x = -3 - 3$,

$-2x = -6$, $\Rightarrow$ **x = 3cm**

34. In the fig, OC $\perp$ AB

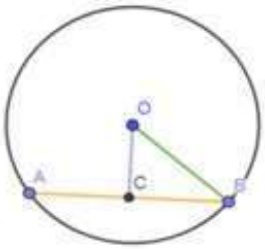
$\therefore$ AC = BC = ½ AB,

In ΔOCB,

$OC^2 = OB^2 - CB^2$

$= 12^2 - 5^2 = 119$,

OC = $\sqrt{119}$ cm



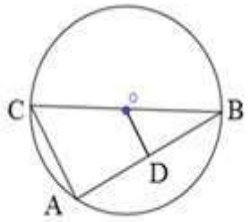
35. Given OD $\perp$ AB

$\therefore$ D is the mid point of AB

In ΔABC, O & D are midpoints of BC & AB respectively.

$\therefore OD \parallel AC$ & $OD = \frac{1}{2} AC$ (by midpoint theorem)

$\Rightarrow AC = 2OD$.



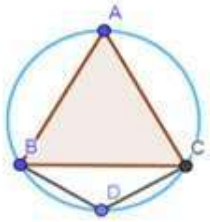
36. Given, ΔABC is an equilateral triangle.

$\angle BAC = 60^0$,

$\angle BDC + \angle BAC = 180^0$

$\angle BDC = 180^0 - 60^0$

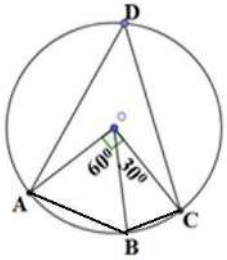
$\angle BDC = 120^0$



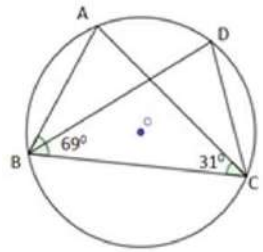
37. In the figure, Join AB and BC.

reflex $\angle AOC = 360^0 - (60^0 + 30^0) = 270^0$

Hence $\angle ABC = \frac{270^0}{2} = 135^0$ (Theorem)



38. Given, $\angle ABC = 69^0$ and $\angle ACB = 31^0$



In ΔABC,

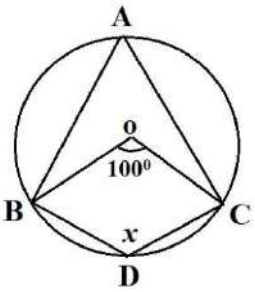
$\angle ABC + \angle BAC + \angle ACB = 180^0$

$\angle BAC = 180^0 - 69^0 - 31^0 = \mathbf{80^0}$.

$\angle BAC = \angle BDC$ (angles in the same segment are equal)

$\mathbf{\angle BDC = 80^0}$

39. "O" is the centre of the circle.



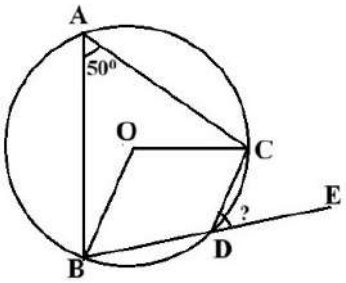
$\therefore \angle BAC = \frac{1}{2} \angle BOC$

$= \frac{1}{2} \times 100 = 50^0$

$x = 180^0 - \angle BAC = 180^0 - 50^0$

$\boldsymbol{x = 130^0}$.

40. Given, $\angle BAC = 50^0$



$\angle BAC + \angle BDC = 180^0$

$50^0 + \angle BDC = 180^0$

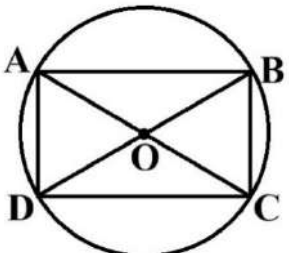
$\angle BDC = 180^0 - 50^0 = 130^0$

$\angle BDC + \angle CDE = 180^0$ (Linear pair)

$\angle CDE = 180^0 - 130^0$

$\mathbf{\angle CDE = 50^0}$

41. In the fig, AC is a diameter of circle.



$\angle ADC = 90^0$ and $\angle ABC = 90^0 \rightarrow$ (1) (angle in a semicircle)

BD is a diameter of circle

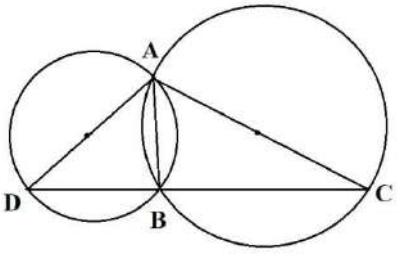
$\angle DCB = 90^0$ and $\angle DAB = 90^0 \rightarrow$ (2) (angle in a semicircle)

From (1) and (2)

$\angle ADC = \angle ABC = \angle DCB = \angle DAB = 90^0$

$\therefore$ ABCD is a rectangle.

42. In the fig, $\angle ABD = 90^0$ (angle in a semicircle)

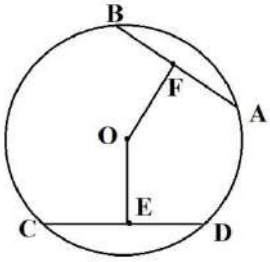


$\angle ABC = 90^0$ (angle in the semicircle)

so, $\angle ABD + \angle ABC = 90^0 + 90^0 = 180^0$

$\therefore$ DBC is a line.

43. If OE = OF

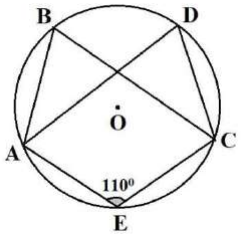


$\Rightarrow$ CD = AB (chords equidistant from the centre are equal)

But OE < OF (given)

CD > AB (chords nearer to the centre is longer)

44. In cyclic quadrilateral



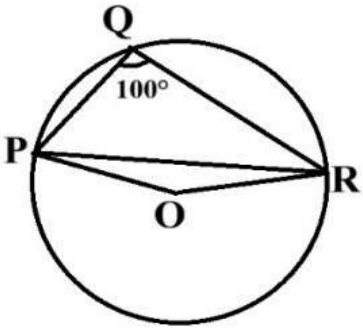
$\angle ABC + \angle AEC = 180^0$,

$\angle ABC + 110^0 = 180^0$

$\angle ABC = \angle ADC = 70^0$.

IV. Three marks questions:

45. In the figure



Reflex $\angle POR = 2\angle PQR = 2 \times 100^0 =$ **200^0**

$\angle POR = 360^0 - 200^0 =$ **160^0**

In ΔPOR, OP = OR

$\therefore \angle OPR = \angle ORP$

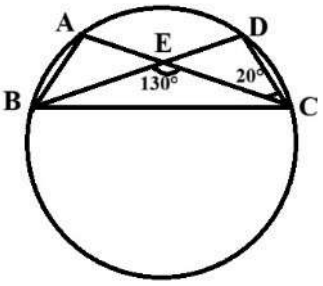
$\angle OPR + \angle ORP + \angle POR = 180^0$

$\angle OPR + \angle OPR + 160^0 = 180^0$

$2\angle OPR = 20^0$

$\angle OPR = 10^0$

46. In the fig,



$\angle BAC = \angle CDE$ (angles in the same segment)

In ΔEDC,

$\angle CEB = \angle CDE + \angle DCE$ (exterior angle sum property)

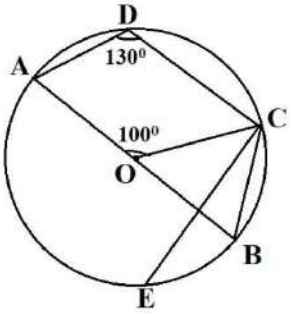
$130^0 = \angle CDE + 20^0$

$\angle CDE = 130^0 - 20^0 = 110^0$

But $\angle CDE = \angle BAC$

$\therefore \angle BAC = 110^0$

47. Reflex $\angle AOC = 2 \times \angle ADC$,



$= 2 \times 130^0 = 260^0$

$\angle AOC = 100^0$, $\angle COB = 180^0 - 100^0 = 80^0$

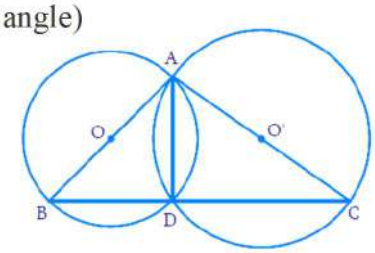
$\angle CEB = \frac{1}{2}\angle COB = \frac{1}{2} \times 80^0 = 40^0$

$\angle CEB = \angle ECB = 40^0$

$\angle CBE = 180^0 - (40^0 + 40^0) =$ **100^0**

48. In the figure,

∠ADB = 90° and ∠ADC = 90° (angle in a semicircle is a right angle)



∠ADB + ∠ADC = 90° + 90°

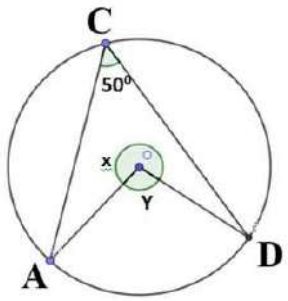
⇒∠ADB + ∠ADC = 180°

⇒ BDC is a straight line.

D lies on BC

Hence, the point of intersection of circles lies on the third side BC.

49. In the figure,



$\angle ACD = \frac{1}{2} Y$

$50^0 = \frac{1}{2}\ Y$

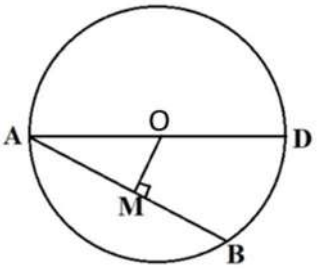
$\Longrightarrow Y = 100^0$

$X + Y = 360^0$ (angle at the centre of a circle)

$X + 100^0 = 360^0$

$X = 360^0 - 100^0 = \mathbf{260^0}$

50. Given AD = 34cm and AB = 30cm.



$AM = MB = \frac{1}{2}AB = \frac{1}{2}(30) = 15$ cm

In ΔOMA

Using Pythagoras theorem,

$OA^2 = OM^2 + AM^2$

Substituting the values

$17^2 = OM^2 + 15^2$

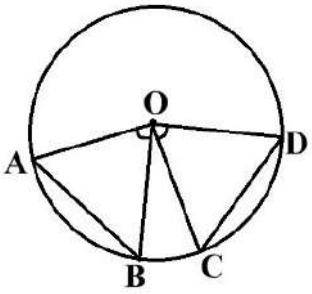
$OM^2 = 289 - 225 = 64$

OM = 8 cm

51. **Given:** Two chords AB and CD of a circle with center O, where ∠AOB = ∠COD.

To prove: AB = CD

Construction: Join OA, OB, OC, and OD.



Proof:

In ΔAOB and ΔCOD:

OA = OD (radii of the same circle)

∠AOB = ∠COD (given)

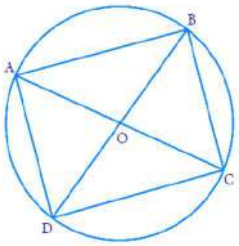
OB = OC (radii of the same circle)

$\Delta AOB \cong \Delta COD$. (SAS congruence)

AB = CD (corresponding sides of congruent triangles).

∴ If the angles subtended by two chords at the are equal then the chords are equal.

V. Four marks questions:



52. Let BD be the diameter of the circle, which is also a chord.

Then, $\angle BOD = 180°$

Since AC and BD are diameters of the circle

$\Rightarrow AC = BD$

$\therefore \angle BAD = \frac{1}{2} \times \angle BOD = 90°$ (Theorem)

Similarly, $\angle BCD = 90°$

Now, considering AC as the diameter of the circle, we get $\angle AOC = 180°$

$\angle ABC = \frac{1}{2} \times \angle AOC = 90°$ (Theorem)

Similarly, $\angle ADC = 90°$

In ΔABC and ΔBAD,

$\angle ABC = \angle BAD$ [Each equal to 90°]

AB = BA [Common side of triangle ABC and BAD]

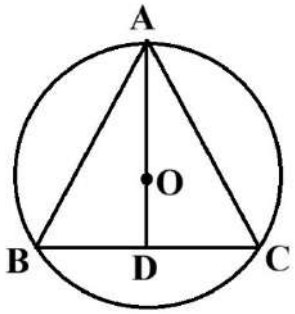
AC = BD [Diameter of the circle]

$\therefore \Delta ABC \cong \Delta BAD$ [By RHS congruence criteria]

$\Rightarrow BC = AD$ [By Corresponding parts of Congruent triangles theorem]

Similarly, AB = DC

As you can see, all the angles at the corners are 90º and the opposite sides are equal. We can say that the line joining the vertices ABCD is a rectangle.



53. Let A, B and C be the positions of Ankur, Syed and David respectively.

Draw AD ⊥ BC

AD is the median of ΔABC and it passes through the centre O

'O' (centroid) divides the line AD in the ratio 2 : 1.

So OA : OD = 2 : 1.

Or OA : AD = 2 : 3

$\frac{OA}{AD} = \frac{2}{3}$

$OA = \frac{2}{3} AD$

Let the side of a triangle be 'a' m.

$BD = \frac{a}{2}$ m

In ΔABD,

$AB^2 = BD^2 + AD^2$

$AD^2 = AB^2 - BD^2$

$AD^2 = a^2 - \left(\frac{a}{2}\right)^2$

$AD^2 = \frac{3a^2}{4}$

$AD = \frac{\sqrt{3}a^2}{2}$

Now,

$OA = \frac{2}{3} AD$

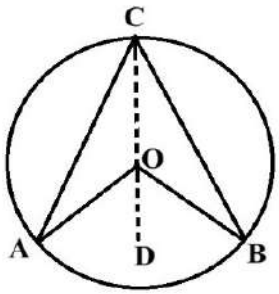
$OA = \frac{2}{3} \times \frac{\sqrt{3}a^2}{2}$

$20 = \frac{2}{3} \times \frac{\sqrt{3}a^2}{2}$

$a = 20\sqrt{3}$ m

The length of the string is $20\sqrt{3}$ m

54. Data: O is the centre of the circle. $\angle AOB$ is the subtended by the arc AB at the centre and $\angle ACB$ is the angle subtended by the same arc on the remaining part of the circle.



To Prove: $\angle AOB = 2\ \angle ACB$.

Construction: Draw angular bisector of $\angle C$ and produce it to D.

Proof: In ΔOAC,

$OA = OC$ (radii)

$\therefore \angle OAC = \angle ACO$

$\angle AOD = \angle OAC + \angle ACO$ (exterior angle is equal to sum of interior opp angles)

$\angle AOD = \angle ACO + \angle ACO$

$\angle AOD = 2\angle ACO \rightarrow (1)$

Similarly,

$\angle BOD = 2\angle BCO \rightarrow (2)$

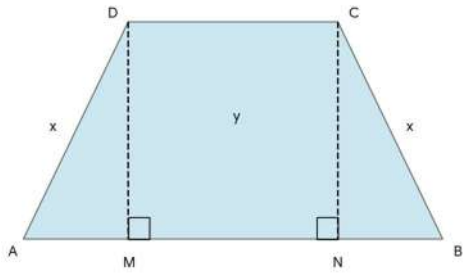
On adding (1) and (2)

$\angle AOD + \angle BOD = 2\angle ACO + 2\angle BCO$

$\angle AOD + \angle BOD = 2(\angle ACO + \angle BCO)$

$\angle AOB = 2\angle ACB$

55. In trapezium ABCD $AB \parallel DC$, $AD = BC = x$

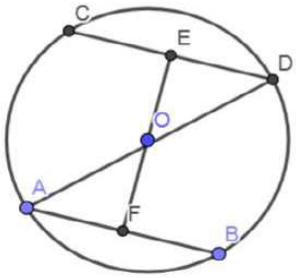


Construction: $DM \perp AB, CN \perp AB$

Proof: In $\triangle AMD$ and $\triangle BNC$,

$AD = BC$	(Data)
$DM = CN$	($AB \parallel DC$)
$\angle M = \angle N = 90^0$	(Construction)
$\triangle AMD \equiv \triangle BNC$	(RHS)
$\therefore \angle A = \angle B$	(CPCT)
$\angle A + \angle D = 180^0$	($AB \parallel DC$)
$\therefore \angle B + \angle D = 180^0$	($\because \angle A = \angle B$)
$\therefore$ ABCD is a cyclic quadrilateral	($\because$ Opposite angles are supplementary)

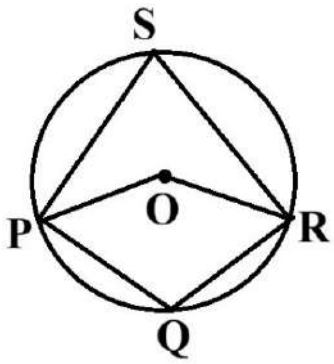
56. In ΔDOE and ΔAOF



OD = OA	(radii of same circle)
$\angle DOE = \angle AOF$	(vertically opposite angles)
$\angle EDO = \angle FAO$	(alternate angle CD ∥ AB)
Δ DOE ≅ ΔAOF	
OE = OF	(by CPCT)
CD = AB	(chords equidistant from the centre of a circle are equal)

VI. Five marks questions:

57. Data : PQRS is a cyclic quadrilateral.



To Prove: $\angle S + \angle Q = 180^0$

Proof: In the fig,

$\angle PSR = \frac{1}{2} \angle PQR$ → (1)

and Reflex $\angle POR = 2\angle PQR$

$\angle PQR = \frac{1}{2}$ Reflex $\angle POR$ → (2)

Adding equation (1) and (2)

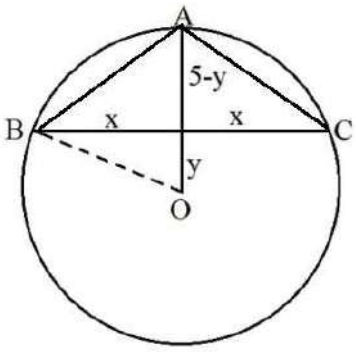
$\angle PSR + \angle PQR = \frac{1}{2} \angle PQR + \frac{1}{2}$ Reflex $\angle POR$

$= \frac{1}{2} [\angle PQR +$ Reflex $\angle POR]$

. $= \frac{1}{2} \times 360^0 = 180^0$

$\Longrightarrow \angle S + \angle Q = 180^0$

58. Let AB & AC be two equal chords.



AB = AC = 6cm,

BC = $x + x = 2x$

In the fig, AD ⊥ BC,

∴ BD = DC

AD is the perpendicular bisector & centre O lies on AD. Join OB & CD

Now BD = DC = x& OD = y

In ΔOBD, $\angle D = 90^0$ therefore $OB^2 = BD^2 + OD^2$

$25 = x^2 + y^2$ →(1), $x^2 = 25 - y^{22}$

Again in ΔABD, $\angle D = 90^0$ so $AB^2 = BD^2 + AD^2$

$36 = x^2 + (5 - y)^2$ → (2) substitute the value of x^2 in (2)

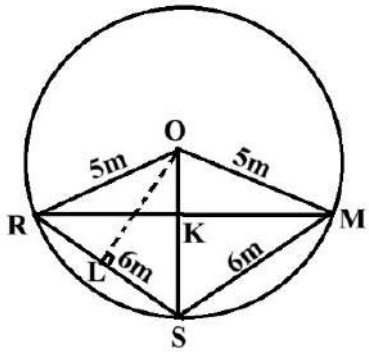
$36 = 25 - y^2 + 25 - 10y + y^2, y = \frac{7}{5}$

Put the value of y in (1)

$25 = x^2 + \left(\frac{7}{5}\right)^2 x = 4.8$cm

BC = 2 x = 2 x 4.8 = 9.6cm

59. In the fig, ORSM is a quadrilateral.



OR = OM = 5m and RS = SM = 6m

∴ ORSM is a Kite.

In a kite one diagonals bisect the other perpendicularly.

RK = KM and $\angle OKR = 90^0$

In ΔORS,

OR = OS (radii)

⟹ ORS is an isosceles triangle and OL bisects RS.

RL = LS = $\frac{6}{2}$ = 3m

In ΔORL,

$OS^2 = OL^2 + LS^2$

$5^2 = OL^2 + 3^2$

$OL^2 = 25 - 9$

$OL^2 = 16$

OL = 4m

Area of $\Delta ORS = \frac{1}{2} \times RS \times OL$

$= \frac{1}{2} \times 6 \times 4 =$ **12m**

Area of $\Delta ORS = \frac{1}{2} \times OS \times RK$

$12 = \frac{1}{2} \times 5 \times RK$

RK = 4.8cm

$RM = 2RK = 2 \times 4.8$

RM = 9.6m

The distance between Reshma and Mandip is 9.6m

CHAPTER-10 HERON'S FORMULA

I. Multiple choice questions:

1. B) $\frac{a+b+c}{2}$
2. B) 5.5cm
3. C) 13cm
4. A) 6 cm^2
5. A) $\sqrt{32}$ cm
6. B) $\frac{\sqrt{3}}{4}$ a^2
7. C) 30 cm^2
8. D) $100\sqrt{3}$ m^2
9. B) 24cm

II. One marks questions:

10. Area = $\sqrt{s\,(s\,-\,a)\,(s\,-\,b)\,(s-c)}$
11. S = $\frac{18+10+14}{2}$ = 21cm
12. Each side is equal.

    ∴ perimeter = $3x = 180 \implies x = 60cm$
13. Sum of sides = $1x + 3x + 2x = 6x$

    Perimeter, $6x = 30, \implies x = \frac{30}{6} = 5cm$
14. (s – a) = 235 – 150 = 85cm

    (s – b) = 235– 120 = 115

    (s–c) = 235 – 200 = 35cm

    (s – a) (s – b) (s – c) =342125 cm

III. Two marks questions:

15. a = 122m, b = 22m, c = 120m, s = 132m

    Area = $\sqrt{s(\,s\,-\,a\,)(\,s\,-\,b\,)\,(\,s-c)}$

    $= \sqrt{132\,(\,132\,-\,122)(\,132\,-\,22)(132\,-\,120)}$

    = 1320 cm^2

16. Let the sides of the triangle be $12x, 17x, 25x$

$12x + 17x + 25x = 540,$

$54x = 540 \Longrightarrow x = \frac{540}{54} = 10\text{cm}$

$a = 12x = 12 \times 10 = 120\text{cm}$

$b = 17x = 17 \times 10 = 170\text{cm}$

$c = 25x = 25 \times 10 = 250\text{cm}$

17. AB = BC = $3x$ & AC = $2x$

Perimeter = $3x + 3x + 2x = 32$, $x = \frac{32}{8} = 4\text{cm}$

s = $\frac{a+b+c}{2} = \frac{12+12}{2} = 16\text{cm}$

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{16\,(16-12)\,(16-12)\,(16-8)} = 45.25\ \text{cm}^2$

18. In equilateral triangle each side is equal $a = b = c = x$ cm,

s = $\frac{a+b+c}{2} = \frac{x+x+x}{2} = \frac{3x}{2}$

A = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{\frac{3x}{2}(\frac{3x}{2}-x)(\frac{3x}{2}-x)(\frac{3x}{2}-x)}$

$= \frac{\sqrt{3}}{4}x^2\ \text{cm}^2$

19. Let each side of equilateral triangle be 'x'cm

Given the area of triangle = $64\sqrt{3}\ \text{cm}^2$

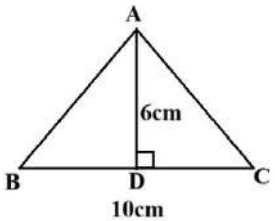
$\frac{\sqrt{3}}{4}a^2 = 64\sqrt{3}$

$a^2 = 64 \times 4 \Longrightarrow a^2 = 256$

$a = \sqrt{256} = 16$ cm.

∴ The length of each side of a equilateral triangle is = 16cm

20. Given AD ⊥ BC, AD = 6cm and BC = 10 cm



In the ΔABC,

area of ΔABC = $\frac{1}{2} \times$ BC $\times$ AD

$= \frac{1}{2} \times 10 \times 6 =$ **30 cm²**

IV. Three marks questions:

21. Given the side of an equilateral triangle is 'a'

Perimeter = 180 cm

3a = 180 cm ⇒ a = 60 cm

Area of equilateral triangle $= \frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4}(60)^2 = \mathbf{900\sqrt{3}\ cm^2}$

22. Given two sides of a triangle are 18 cm and 10 cm. Perimeter = 42cm

∴Third side = 42 – (18 + 10) = 42 – 28 = 14cm

s = $\frac{42}{2}$ = 21 cm

A = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{21\,(21-18)(21-10)(21-14)}$

$= \sqrt{21 \times 3 \times 11 \times 7}$

A = 21 $\sqrt{11}$ cm².

23. Given sides of a triangle are in the ratio of 12 : 17 : 25 and its perimeter is 540cm.

Let the sides of triangle be $12x$, $17x$ and $25x$.

Perimeter = 540

$12x + 17x + 25x = 540$

$\Longrightarrow 54x = 540$

$\Longrightarrow x = 10$cm

The sides are 12(10) = **120cm**, 17(10) = **170 cm** and 25(10) = **250cm**

s = $\frac{540}{2}$ = 270 cm

A = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{270(270-120)(270-170)(270-250)}$

$= \sqrt{270 \times 150 \times 100 \times 20}$

A = 9000 cm².

24. Given an isosceles triangle has perimeter 30 cm and each of the equal sides is 12 cm.

The third side is = 30 – (12 + 12) = 30 – 24 = 6 cm

s = $\frac{30}{2}$ = 15 cm

A = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{15(15-12)(15-12)(15-6)}$

$= \sqrt{15 \times 3 \times 3 \times 9}$

A = $9\sqrt{15}$ cm².

25. a = 26m, b = 28 m, c = 30m

A = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{42\,(42-26)\,(42-28)\,(42-30)}$

$= 336\text{m}^2$.

The cost of levelling the ground is 336 × ₹3 = ₹1008

26. Given sides of park, a = 120 m, b = 80 m, c = 50 m

s = $\frac{120+80+50}{2}$ =125m

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{125\,(125-120)\,(125-80)\,(125-50)}$

$= 375\sqrt{15}\ \text{m}^2$

Area required to plant each sapling is = $\frac{1}{2} \times 375\sqrt{15} = 187.5\sqrt{15}\ \text{m}^2$

27. a = 35 cm, b = 54 cm, c = 61 cm, s = $\frac{35+54+61}{2}$ = 75 cm

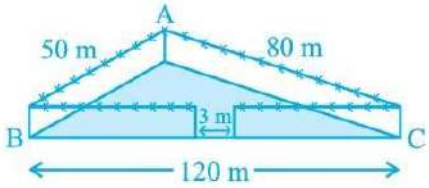
A = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{75\,(75-35)\,(75-54)\,(75-61)} = 420\sqrt{5}\text{cm}^2$.

Area of triangle = ½ × a × h = $420\sqrt{5}$ = ½ × 35 × h ,

h = $\frac{420\sqrt{5} \times 2}{35} = 24\sqrt{5}$ cm

V. Four marks questions:



28. Given the sides are 50m, 80m and 120m

s = $\frac{50+80+120}{2}$ = 125 m.

A = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{125\,(125-50)\,(125-80)\,(125-120)} = 375\sqrt{15}\ \text{cm}^2$.

Also, perimeter of the park = AB + BC + CA = 250 m Therefore, length of the wire needed for fencing = 250 m – 3 m (to be left for gate) = 247 m

And so the cost of fencing = ₹20 × 247 = ₹4940

29. let a, b, c be the sides of the triangle. $S_1 = s = \frac{a+b+c}{2}$,

$A_1 = \sqrt{S_1(S_1 - a)(S_1 - b)(S_1 - c)}$

When the sides are doubled 2a, 2b, 2c, $s_2 = 2s_1$

$A_2 = \sqrt{S_2(S_2 - 2a)(S_2 - 2b)(S_2 - 2c)}$

Substitute $S_2 = 2S_1$ in above equation

$A_2 = \sqrt{2S_1(2S_1 - 2a)(2S_1 - 2b)(2S_1 - 2C)}$

$= 4\sqrt{S_1(S_1 - a)(S_1 - b)(S_1 - c)}$

$= A_2 = 4A_1 = 4 \times$ Area of original triangle

Hence percentage increase in area $= \frac{increase\ in\ area}{original\ area} \times 100 = \frac{A_2 - A_1}{A_1} \times 100$

$= (\frac{A_2}{A_1} - 1) \times 100 = (4 - 1) \times 100 = 300\%$

30. let ABCD be rhombus AB = BC = CD = DA = X

P = 40cm, 4x = 40, x = 10cm, AB = BC = CD = DA = 10cm

In triangle ABCS = $\frac{10+10+12}{2}$ = 16 cm

$A = \sqrt{s(s - a)(s - b)(s - c)} = \sqrt{16(16 - 10)(16 - 10)(16 - 10)} = 48cm^2$.

Area of ABCD = $2 \times 48 = 96\ cm^2$.

Cost of painting the sheet = $5 \times 96 \times 2$ = Rs 960.

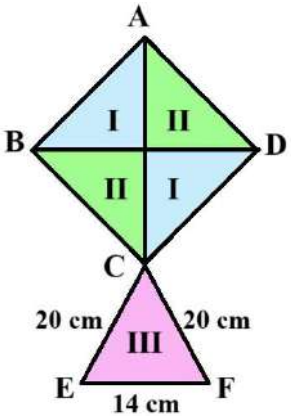
VI. Five marks question:

31. AC = BD = 44cm, AO = BO = $\frac{44}{2}$ = 22cm

In ΔAOB, $AB^2 = AO^2 + BO^2 = 22^2 + 22^2 = 22\sqrt{2}$ cm,

area of square = $(a)^2 = (22\sqrt{2})^2 = 968cm^2$.

Area of each triangle = area of square /4 = $\frac{968}{4}$ = 242 cm^2.



Area of region I = $2 \times 242 = 484\ cm^2$

Area of region II = $2 \times 242 = 484\ cm^2$

Area of lower triangle, a = 20 cm, b = 20 cm, c = 14 cm,

$s = \frac{20 + 20 + 14}{2} = 27$ cm

$A = \sqrt{s(s - a)(s - b)(s - c)}$

$= \sqrt{27(27 - 20)(27 - 20)(27 - 14)}$

$= 131.14cm^2$.

CHAPTER-11 SURFACE AREAS AND VOLUME

I. Multiple choice questions:

1. (A) πrl sq. units
2. (B) $y^2 = x^2 - z^2$
3. (B) 308 cm^2
4. (D) 20 cm
5. (D) 616 cm^2
6. (A) 7 cm
7. (B) 26 m
8. (B) 5500 cm^2
9. (B) 5 : 4
10. (B) $\pi r(r + l)$
11. (D) $4\pi r^2$
12. (C) 616cm^2
13. (C) 10.5 cm
14. (C) 4 times
15. (B) 4:3
16. (C) $3\pi r^2$
17. (B) $4\pi r^2$
18. (B) 4S
19. (B) 4:9
20. (C) 10.5 cm
21. (C) 1:4
22. (B) 2.476
23. (D) 13 cm
24. (D) 33.1%
25. (A) 9m
26. (D) $\frac{32}{3}\pi r^3$
27. (A) $\frac{250}{3}\pi r^3$
28. (C) 462 cm^2
29. (A) 1:4

30. (B) 3 units

31. (B) 3 cm

II. One marks questions:

32. $A = \pi r(r + l)$ sq. units

33. $l = \sqrt{h^2 - r^2} = \sqrt{28^2 - 21^2} = 35$cm

34. A= π r l = $\frac{22}{7}$ x 10 x 21 = 660 cm^2

35. $A = 2\pi r^2$

36. $A = 3\pi r^2$

37. $A = 2\pi r^2$

= 2 x $\frac{22}{7}$ x 21 x 21 = 2772 cm^2

38. $A = 4\pi r^2$

= 4 x $\frac{22}{7}$ x 7 x 7 = 616 cm^2

39. d = 14 cm $\Rightarrow$ r =7 cm

$A = 3\pi r^2$

=3 x $\frac{22}{7}$ x 7 x 7 = 462 cm^2

40. $2\pi r = 22$cm$\Rightarrow \pi r = 11$cm, $l = 10$ cm

A= πrl =11(10) =110 cm^2

41. V= $\frac{4}{3}\pi r^3$

42. h=$\sqrt{l^2 - r^2}$ =$\sqrt{5^2 - 4^2}$= 3cm

43. surface area of a sphere =100π cm^2

$4\pi r^2 = 100\pi$

r = 5 cm

III. Two marks questions:

44. $l = \sqrt{h^2 + r^2}$ = $l = \sqrt{28^2 + 21^2} = 35$ cm

A = $\pi rl = \frac{22}{7} \times 21 \times 35 = 2310$ cm^2

45. $2\pi r = \frac{44}{7}$, r = 1m

$l = \sqrt{h^2 + r^2} = \sqrt{1^2 + 8^2} = \sqrt{65}$ m

The area of the canvas required = $\pi rl = \pi \times 1 \times \sqrt{65} = \sqrt{65}\ \pi$ m^2

46. d=10.5cm ⇒ r = 5.25cm

$A = \pi rl = \frac{22}{7} \times 5.25 \times 10 = 165$ cm^2

47. r = 24m, l = 21m.

$A = \pi r (r + l) = \frac{22}{7}\ 24\ (24 + 21) = 3394.28$ m^2

48. d=14cm⇒ r = 7cm

$A = 4\pi r^2 = 4 \times \frac{22}{7} \times 7 \times 7 = 616$ cm^3

49. Given: CSA = 550 cm^2, l = 25cm.

$CSA = \pi rl \Rightarrow 550 = \frac{22}{7} \times r \times 25 \Rightarrow r = 7$cm

The radius of the base of the cone is 7cm

50. Given Area of the base, $\pi r^2 = 154$m^2 and Volume = 1232 m^3

Volume of the conical tent = 1232 m^3

$\frac{1}{3}\pi r^2 h = 1232$

$\frac{1}{3}(154)\ h = 1232$

h = 24m

The height of the conical tent is 24m

51. Given r = 7m, h = 24m

$l = \sqrt{h^2 + r^2} = \sqrt{24^2 + 7^2} = 25$m

$CSA = \pi rl = \frac{22}{7} \times 7 \times 25 = 550$ m^2

Area of the cloth = length × breadth

550 = length × 5

Length = 110 m

110 m of cloth is required to make the tent.

52. $V = \frac{1}{3}\pi r^2\ h = \frac{1}{3} \times \frac{22}{7} \times\ 6^2\ \times\ 7 = 264$ cm^3

53. Given ratio of the volumes of two cones is 4 : 5 ⇒ $v_1 : v_2 = 4 : 5$ or $\frac{v_1}{v_2} = \frac{4}{5}$

ratio of the radii of their bases is 2 : 3 ⇒ $r_1 : r_2 = 2 : 3$ or $\frac{r_1}{r_2} = \frac{2}{3}$

ratio of vertical heights $h_1 : h_2$ =?

$\frac{v_1}{v_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} \Rightarrow \frac{4}{5} = \frac{2^2 h_1}{3^2 h_2} \Rightarrow \frac{h_1}{h_2} = \frac{9}{5}$

The ratio of their vertical heights is 9 : 5

54. Given Circumference of the base = 17.6cm

$2\pi r = 17.6 \Rightarrow r = 2.8$ cm

CSA = $2\pi r^2 = 2 \times \frac{22}{7} \times (2.8)^2$

CSA = $49.28 cm^2$

55. Given, surface area of a metallic ball = 154 cm^2

$4\pi r^2 = 154$

$r^2 = \frac{154 \times 7}{4 \times 22} = \frac{49}{4}$

$r = \frac{7}{2} = 3.5$cm

56. Surface area of a football = 100π cm^2

$4\pi r^2 = 100\pi \Rightarrow r = 5$cm

The Volume of air inside the football is = $\frac{4}{3}\pi r^3$

$V = \frac{4}{3} \times \frac{22}{7} \times 5^3 = 523.8\ cm^3$

57. r = 2.8m

Volume of hemispherical tank = $\frac{2}{3}\pi r^3$

$V = \frac{2}{3} \times \frac{22}{7} \times (2.8)^3 = 45.99 m^3 = 45.99 \times 1000$ litre = 45,990 litre

58. $\frac{volume\ of\ sphere\ 1}{Volume\ of\ sphere\ 2} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{64}{27}$

$$\left(\frac{r_1}{r_2}\right)^3 = \left(\frac{4}{3}\right)^3$$

$$\frac{r_1}{r_2} = \frac{4}{3}$$

$\frac{surface\ area\ of\ sphere\ 1}{surface\ area\ of\ sphere\ 2} = \frac{4\pi r_1^2}{4\pi r_2^2} = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$

The ratio of their surface areas is = 16 : 9

59. surface area of a sphere = $144\pi m^2$

$4\pi r^2 = 144\pi$

$r^2 = 36 \Rightarrow r = 6$m

Volume of the sphere = $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times (6)^3 = 905.14\ m^3$

60. CSA of a solid hemispherical = 1232 cm^2

$2\pi r^2 = 1232$

$r^2 = 196 \Rightarrow r = 14$ cm

61. Inner radius, $r = 5\ cm$, Outer radius, $R = 5 + 0.25 = 5.25\ cm$

Outer CSA$= 2\pi r^2$

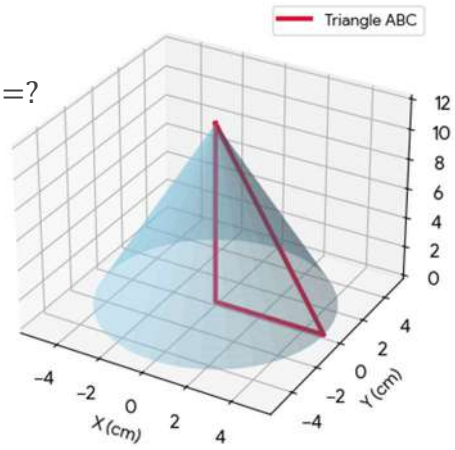
$$= 2 \times \frac{22}{7} \times (5.25)^2$$

$$= 173.25\ cm^2$$

62. $r = 7\ cm, R = 14\ cm, \frac{CSA1}{CSA2} = ?$

$$\frac{CSA1}{CSA2} = \frac{4\pi r^2}{4\pi R^2} = \frac{r^2}{R^2} = \left(\frac{7}{14}\right)^2 = \frac{1}{4}$$

63. Solid formed is a Cone, $h = 12\ cm,\ l = 13\ cm,\ r = 5cm,\ V = ?$



V$= \frac{1}{3}\pi r^2 h$

V$= \frac{1}{3} \times \frac{22}{7}(5)^2(12)$

V$= 314.28\ cm^3$

64. $r_1 = 3\ cm, r_2 = 4\ cm, r_3 = 5\ cm, R = ?$

$$V_1 + V_2 + V_3 = V$$

$$\frac{4}{3}\pi(r_1)^3 + \frac{4}{3}\pi(r_2)^3 + \frac{4}{3}\pi(r_3)^3 = \frac{4}{3}\pi(r_1)^3$$

$$\frac{4}{3}\pi[(r_1)^3 + (r_1)^3 + (r_1)^3] = \frac{4}{3}\pi R^3$$

$$(r_1)^3 + (r_1)^3 + (r_1)^3 = R^3$$

$$(3)^3 + (4)^3 + (5)^3 = R^3$$

$$27 + 64 + 125 = R^3$$

$$216 = R^3$$

$$6 = R$$

The radius of the new sphere is $6cm$

65. Sphere, R = 6cm, Cone, r = 3 cm

$$\frac{4}{3}\pi R^3 = \frac{1}{3}\pi r^2 h$$

$$4R^3 = r^2 h$$

$$4(6^3) = 3^2 \times h$$

$$96 = h$$

The height of the cone is 96 cm

66. Cone, radius = r, height = h radius of hemisphere = r

Volume of cone = Volume of Hemisphere

$$\frac{1}{3}\pi r^2 h = \frac{2}{3}\pi r^3$$

$$h = 2r$$

Height of the cone is twice its radius.

IV. Three marks questions:

67. Cone, r = 7 cm, h = 24 cm

$l = \sqrt{h^2 + r^2} = \sqrt{24^2 + 7^2} = 25$cm

Area of sheet required= 10LSA= $10\pi rl$= $10\times \frac{22}{7} \times 7\times 25$= 5500 cm^2

68. Cone, $h = 9\ cm, V = 49\pi\ cm^3$, r =?

$$\frac{1}{3}\pi r^2 h = 48\pi$$

$$\frac{1}{3} r^2 (9) = 48$$

$$r^2 = 16$$

$$r = 4cm$$

69. Sphere, TSA= 154 cm^2, V=?

$$4\pi r^2 = 154$$

$$4 \times \frac{22}{7} \times r^2 = 154$$

$$r = \frac{7}{2}\text{ cm}$$

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^3$$

$$V = 179.95cm^3$$

70. **Cone,** $h = 25\ cm,\ r = 7cm,\ V =?$

$$V = \frac{1}{3}\pi r^2 h$$

$$V = \frac{1}{3} \times \frac{22}{7} \times (7)^2 \times 25$$

$$V = 1283.33\ cm^3$$

71. Sphere, $d = 4.2cm \Rightarrow r = 21cm, density = 8.9g\ per\ cm^3, mass =?$

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3} \times \frac{22}{7}(21)^3$$

$$= 38808\ cm^3$$

72. $l = \sqrt{h^2 + r^2} = \sqrt{16^2 + 12^2} = 20$cm

LSA= $\pi rl = 3.14 \times 12 \times 20 = 753.6$ cm^2

TSA= $\pi r(r + l) = 3.14 \times 12(12+20) = 1205.76$ cm^2

73. Diameter of the base of the cone = 9cm ⇒ radius, r = $\frac{9}{2}$cm

Height, h = 9cm

Volume = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times \left(\frac{9}{2}\right)^2 \times 9 = 190.9$ cm^3

The volume of the largest right circular cone that can be cut out of a cube whose edge is 9cm is 190.9cm^3

74. Given the radius and height of a right circular cone are in the ratio 3 : 4 ⇒ r : h = 3 : 4

Let r = 3p and h = 4p

Volume of the cone = 301.44 cm^3

$\frac{1}{3}\pi r^2 h = 301.44 \Rightarrow \frac{1}{3} \times 3.14 \times (3p)^2 \times 4p = 301.44$

$\Rightarrow p^3 = 8 \Rightarrow p = 2$

r = 3p = 3(2) = 6cm

h = 4p = 4(2) = 8cm

$l = \sqrt{h^2 + r^2} = \sqrt{8^2 + 6^2} = 10$cm

The slant height of cone is 10cm

75. h = 16cm, d = 24cm ⇒ r = 12 cm

$l = \sqrt{h^2 + r^2} = \sqrt{16^2 + 12^2} = 20$cm

$\frac{CSA}{TSA} = \frac{\pi rl}{\pi r(r+l)} = \frac{20}{(12+20)} = \frac{5}{8}$

The ratio of curved surface area to the total surface area is 5 : 8

76. LSA of Hemisphere= $2\pi r^2$, r = $\frac{10.25}{2}$

$= 2 \times \frac{22}{7} \times \frac{10.25}{2} \times \frac{10.25}{2} = 173.25$ cm^2

cost of tin plating at the rate of Rs 16 per 100 cm^2 is= $\frac{173.25}{100} \times 16 = ₹ 27.72$

77. Radius of laddoo, R = 5cm

Volume of laddoo, $V_1 = \frac{4}{3}\pi R^3$

$V = \frac{4}{3} \times \frac{22}{7} \times 5^3 = 523.8$ cm^3

Radius of laddoo, r = 2. 5cm

Volume of laddoo, $V_2 = \frac{4}{3}\pi r^3$

$V = \frac{4}{3} \times \frac{22}{7} \times (2.5)^3 = 65.47$ cm^3

The Number of laddoos can be made = $\frac{523.8}{65.47} \approx 8$ laddoos

78. Area of the base of conical tent = 11 × 4m^2 = 44m^2

Volume of the conical tent = 11 × 20 = 220 m^3

$$\frac{1}{3}\pi r^2 h = 220$$

$$\frac{1}{3}(44)\, h = 220 \Rightarrow h = 15\text{m}$$

The height of the conical tent is 15m

79. Volume of the solid= Volume of cone + Volume of hemisphere

$$= \frac{\pi r^2 h}{3} + \frac{2\pi r^3}{3}$$

$$= \frac{\pi r 2}{3}(h+r) = \frac{\pi (1)2}{3}(1+2(1))$$

$$= \frac{\pi}{3}(3) = \pi \text{ cm}^3$$

80. Cone, $h = 20cm, r = 5cm,$ Sphere, $R = 0.5cm, n =?$

$$n \times \frac{4}{3}\pi R^3 = \frac{1}{3}\pi r^2 h$$

$$n \times 4R^3 = r^2 h$$

$$n \times 4 \times (0.5)^3 = (5)^2 \times 20$$

$$n = 1000$$

81. **Tarpaulin – Rectangle,** $B = 3m, L =$? **Cone,** $h = 8m, r = 6m$ **extra**$= 20cm = 0.2m$ **for stitching**

$$l = \sqrt{h^2 + r^2} = \sqrt{8^2 + 6^2} = 10\ cm$$

Area of rectangle = CSA of Cone

$$L \times B = \pi r l$$

$$L \times 3 = 3.14 \times 6 \times 10$$

$$L = 62.8\ m$$

∴ Actual length of tarpaulin required is $62.8 + 0.2 = 63m$

V. Four marks questions:

82. d = 10.5 m, r = $\frac{10.5}{2} = 5.25m$, h = 3m

Volume of cone= $\frac{\pi r^2 h}{3} = \frac{1}{3} \times \frac{22}{7} \times (5.25)^2 \times 3$ = 86.625 m^3

$l = \sqrt{h^2 + r^2} = \sqrt{3^2 + 5.25^2}$ = 6.05 cm (Aprox)

Area of canvas= LSA of cone = $\pi rl = \frac{22}{7} \times 5.25 \times 6.05$ = 99.825 m^2

83. $l = \sqrt{h^2 + r^2} = \sqrt{20^2 + 2.1^2}$ = 20.11 cm

LSA of corn cob= $\pi\ r\ l = \frac{22}{7} \times 2.1 \times 20.11$ =132.73 cm^2 (approx.)

∴ Number of grains on the entire curved surface of the cob = 132.73 × 4 = 530.92 = 531 (Approx.)

84. Let the diameter of the sphere bed

Radius $r_1 = \frac{d}{2}$

Diameter of sphere is decreased by 25%

Radius $r_2 = \frac{d}{2}(1 - \frac{25}{100}) = \frac{3}{8}$ d

CSA of sphere, $S_1 = 4\ \pi r_1^2 = 4\ \pi \left(\frac{d}{2}\right)^2 = \pi d^2$

CSA of sphere when radius decreased, $S_2 = 4\ \pi r_2^2 = 4\ \pi \left(\frac{3d}{8}\right)^2 = \frac{9}{16}\pi d^2$

Decrease in surface area, $S_1 - S_2 = \pi d^2 - \frac{9}{16}\pi d^2 = \frac{7}{16}\pi d^2$

Percentage of decrease in the surface area of the sphere is

$= \frac{S_1 - S_2}{S_1} \times 100$

$= \frac{7\pi d^2}{16\pi d^2} \times 100 = \frac{7}{16} \times 100 = 43.75\%$

85. Volume of old sphere= $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times r^3 = \frac{88}{21} r^3$

Volume of 27 old spheres= $27 \times \frac{88}{21} r^3$

(i) radius of new sphere =r'

Volume of new sphere = $\frac{4}{3}\pi(r')^3 = \frac{4}{3} \times \frac{22}{7}(r')^3 = \frac{88}{21}(r')^3$

$\Rightarrow\Rightarrow \frac{88}{21}(r')^3 = 27 \times \frac{88}{21} r^3$

$r' = 3r$

(ii) $S= 4 \pi r^2$

$S' = 4 \pi(r')^2 = 4 \pi(3r)^2 = 36 \pi r^2$

$S : S' = 4\pi r^2 : 36\pi r^2 = 1 : 9$

86. Hemi sphere, $R = 12cm$,

CSA of Cone $= \sqrt{5}$ Base area

$\pi r l = \sqrt{5}\pi r^2$

$l = \sqrt{5}r$

$l^2 = r^2 + h^2$

$(\sqrt{5}r)^2 = r^2 + h^2$

$5r^2 = r^2 + h^2$

$4r^2 = h^2$

$2r = h ------> (1)$

Volume of cone = Volume of hemi sphere

$\frac{1}{3}\pi r^2 h = \frac{2}{3}\pi R^3$

$r^2(2r) = 2 \times (12)^3 \qquad \{h = 2r\ from\ (1)\}$

$r^3 = 12^3$

$r = 12$

∴ The height of the cone is $h = 2r = 2(12) = 24\ cm.$

87. Total cost = ₹ 24640, Cost per m^2 = ₹ 20

Inner CSA=$\frac{24640}{20} = 1232\ m^2$

$2\pi r^2 = 1232$

$2 \times \frac{22}{7} \times r^2 = 1232$

$r^2 = 196$

$r = 14$ m

Volume = $\frac{2}{3}\pi r^3$

$V = \frac{2}{3} \times \frac{22}{7} \times 14^3$

V= 5749.33 m^3

CHAPTER-12 STATISTICS

I. Multiple choice questions:

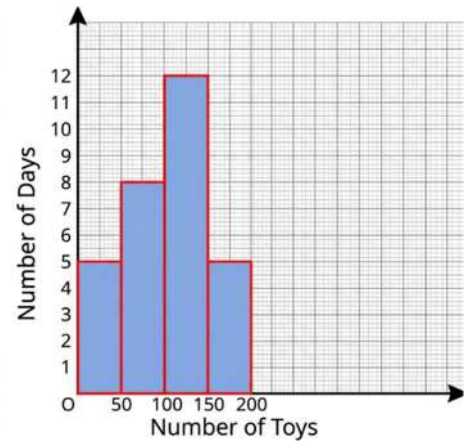
1. A) Bar graph
2. D) VI and IX
3. B) Frequency
4. B) Frequency
5. A) 10
6. B) 15
7. B) 20 – 30
8. A) 15 – 20
9. C) 15
10. D) Frequency polygon
11. C) 4
12. D) $\frac{\text{Upper limit + lower limit}}{2}$
13. B) Primary data

II. One marks questions:

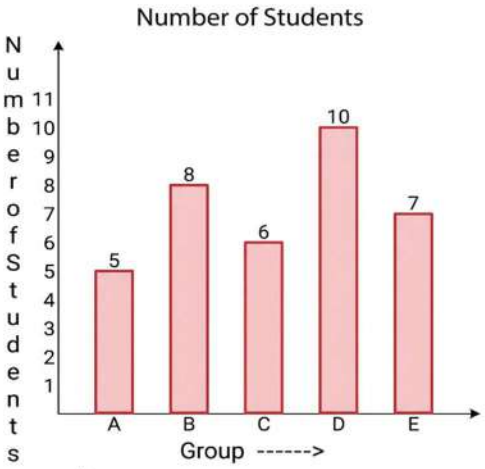
14. Bar Graph: The graphical representation of data using rectangular bars with equal gaps between them.
15. Class mark of 10 – 20 is 15 $\left(\frac{(10+20)}{2} = 15\right)$
16. Bar Graph
17. Frequency Polygon

III. Two marks questions:

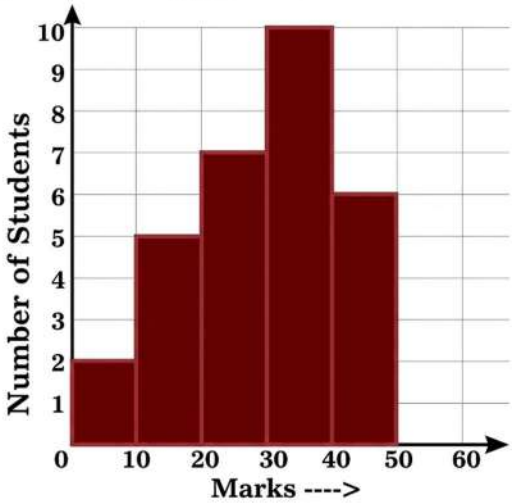
18.



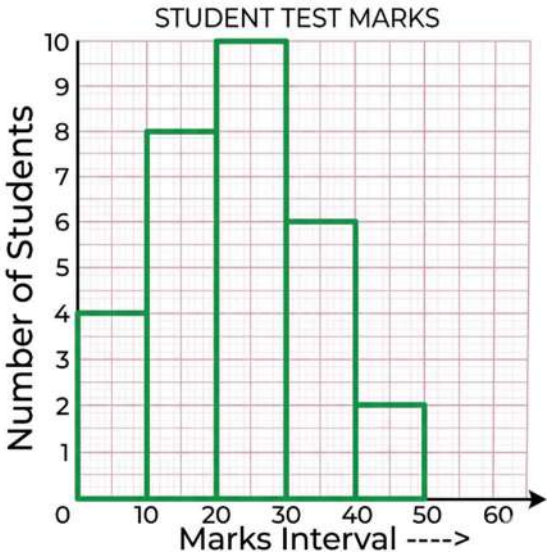
19.


Number of Students
Number of Students
11
10
9
8
7
6
5
4
3
2
1
5
8
6
10
7
A
B
C
D
E
Group ------>

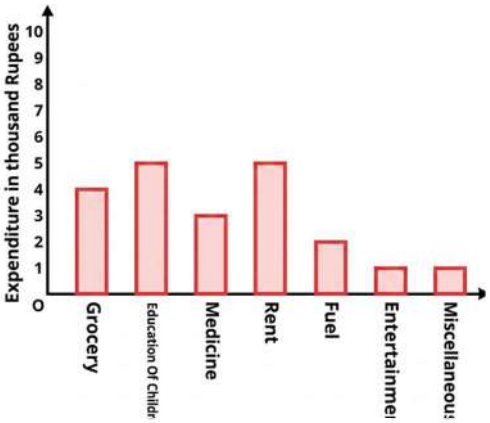
20.


Number of Students
10
9
8
7
6
5
4
3
2
1
0
10
20
30
40
50
60
Marks ---->

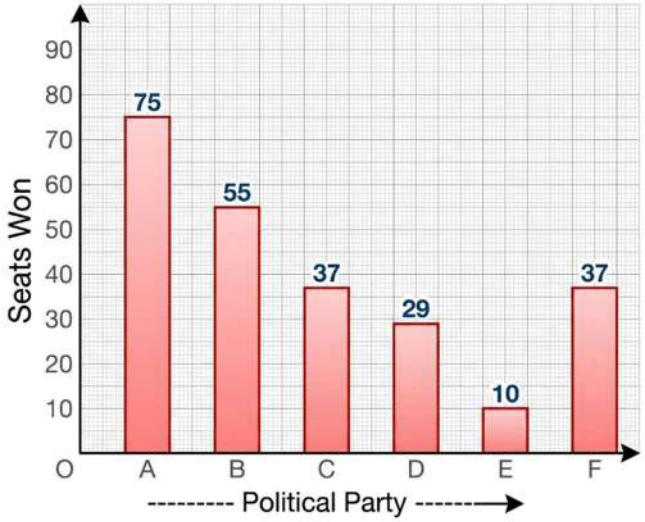
21.


STUDENT TEST MARKS
Number of Students
10
9
8
7
6
5
4
3
2
1
0
10
20
30
40
50
60
Marks Interval ---->

22.



23.



24.

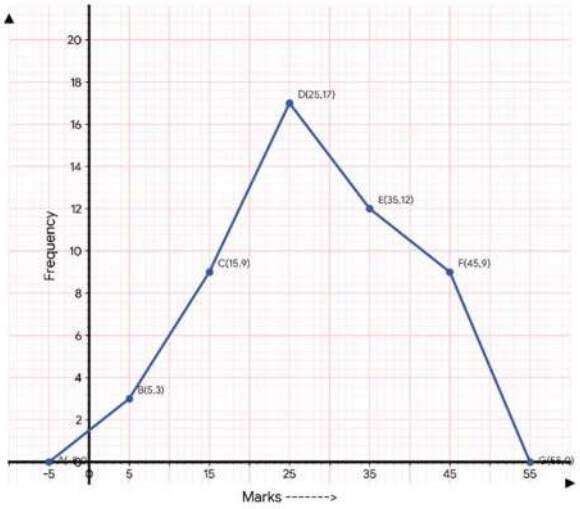
Sl no.	Bar Graph	Histogram
01.	Bars are separated	Columns are adjacent or no gap
02.	Each bar represents a group or category.	Each bar represents a class interval or range of values.
03.	Bars can be arranged in any order.	Columns are arranged in increasing or decreasing order.

25. Frequency polygon: A graphical representation o a frequency distribution by connecting the mid points of each class interval & their respective frequencies with straight lines.

A Frequency polygon graph is a curve that is depicted by a line segment, whereas Histogram depicts data through rectangular shaped bars with no spaces between them.

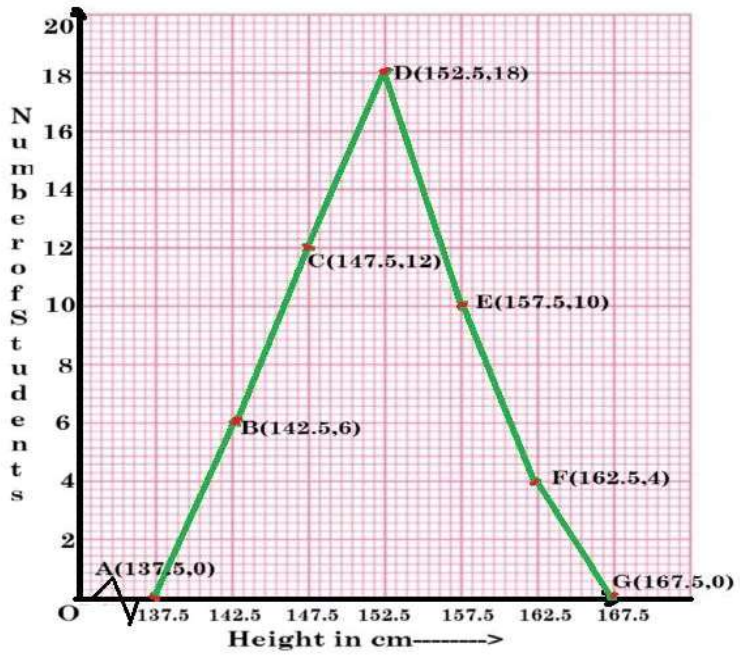
IV. Three marks questions:

26.

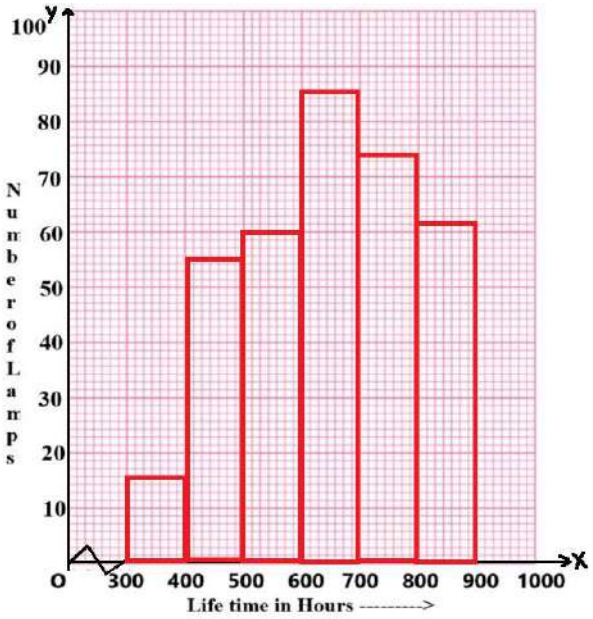


27.

CI	MIDPOINT	F
140-145	142.5	6
145-150	147.5	12
150-155	152.5	18
155-160	157.5	10
160-165	162.5	4



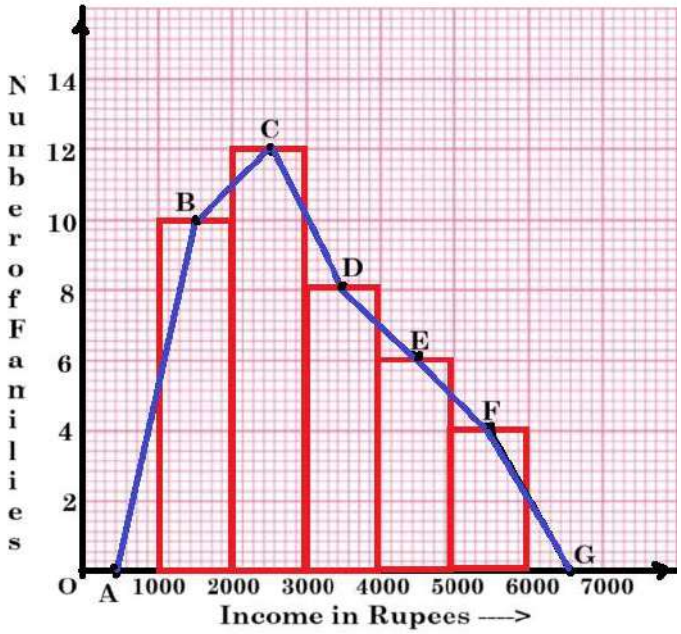
28. i)



ii. 74+62+48=184 lamps have a lifetime of more than 700 hours.

V. Four marks questions:

29.



30.

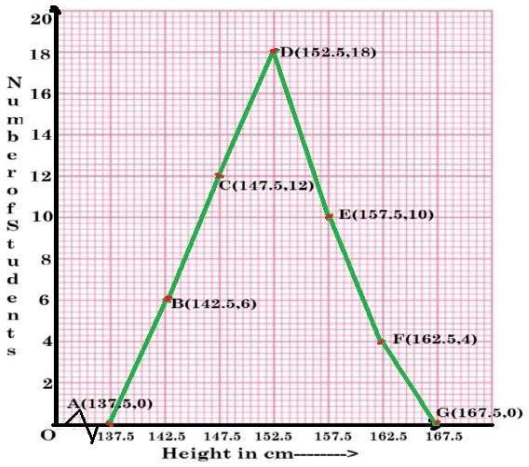
a) Most students are of the average height

around 150 – 155cm.

b) Few students are either very short

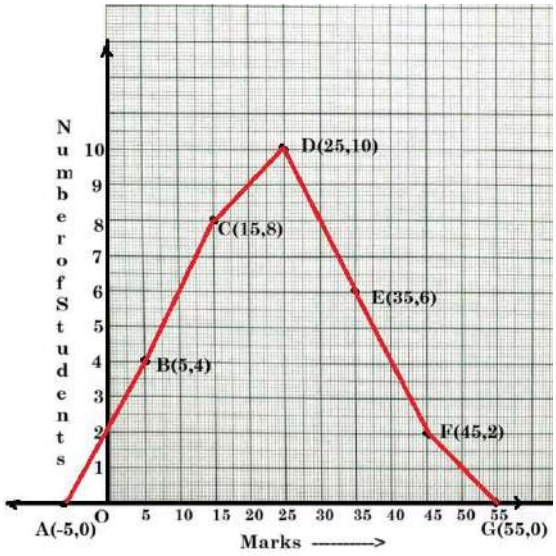
(140 – 145 cm) or tall (160 – 165 cm).

c) Normal distribution of height in the student group.



31.

C I	MID POINT	FREQUENCY
0 - 10	5	4
10 - 20	15	8
20 - 30	25	10
30 - 40	35	6
40 - 50	45	2



32. a) 25 students score more than 40 marks.

b) 4 students score 60 to 80 marks.

c) 9 students score more than 90 marks.

d) 24 students are NC.

33. i) 6000 – 4000 = 2000

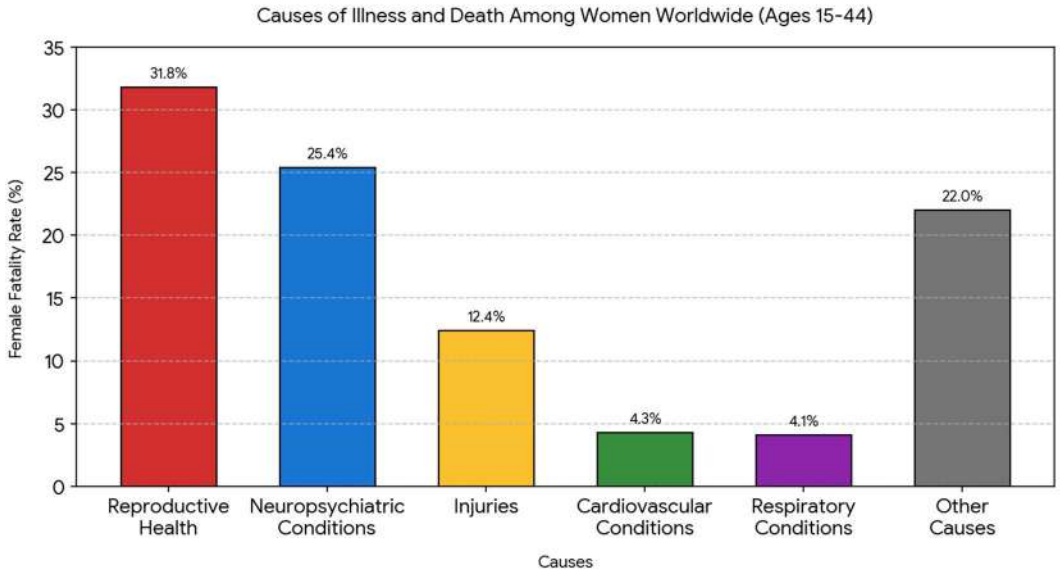
ii) 5+10+13= 28

iii) Strengthens the heart and reduces risk of stroke.
Burns calories to help maintain a healthy weight.
Releases endorphins that reduce stress, anxiety and depression.
Improves joint mobility and builds stronger bones over time.

VI. Five marks questions:

34.

i)



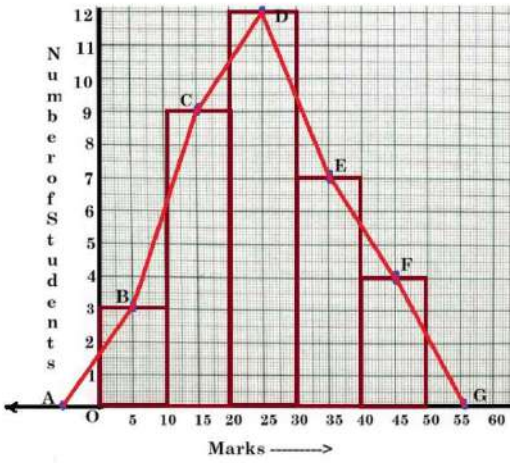
ii)

Reproductive health conditions.

iii) Lack of medical infrastructure and health awareness, Malnutrition and anaemia – any two

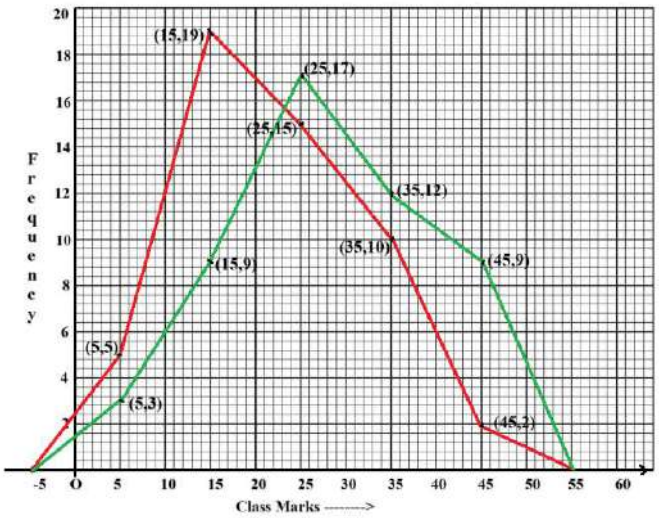
35.

C I	MID POINT	FREQUENCY
0 – 10	5	3
10 – 20	15	9
20 – 30	25	12
30 – 40	35	7
40 – 50	45	4



36.

MARKS	CLASS MARKS (MID POINT)	SECTION **A** FREQUENCY	SECTION **B** FREQUENCY
0 - 10	5	3	5
10 - 20	15	9	19
20 - 30	25	17	15
30 – 40	35	12	10
40 - 50	45	9	1



The peak of section "A" is at a higher range than section "B", therefore Section "A" performed better than section "B".

37.

marks	frequency	width of class	length of rectangle
10 – 20	6	10	$\frac{6}{10}$ X 10 = 6
20 – 30	17	10	$\frac{17}{10}$ X 10 = 17
30 – 40	15	20	$\frac{15}{20}$ X 10 = 7.5
40 – 50	16	20	$\frac{16}{20}$ X 10 = 8
50 – 60	26	30	$\frac{26}{30}$ X 10 = 8.66

