GOVT OF KARNATAKA
BANGALORE URBAN ZILLA PANCHAYATH
DEPARTMENT OF SCHOOL EDUCATION

UTTARA UNNATI-2

MATHEMATICS

HANDBOOK OF PRACTICE PAPERS

PREPARED FOR THE QUALITATIVE

IMPROVEMENT OF SSLC EXAM-2024

RESULTS

ENGLISH MEDIUM

ALONG WTIH MODEL ANSWERS

OFFICE OF THE

DEPUTY DIRECTOR OF PUBLIC INSTRUCTION

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ಶ್ರೀ ಕಾಂತರಾಜು ಪಿ ಎಸ್ ಭಾ.ಆ.ಸೇ
ಮುಖ್ಯ ಕಾರ್ಯನಿರ್ವಹಣಾಧಿಕಾರಿಗಳು

ಮುಖ್ಯ ಕಾರ್ಯನಿರ್ವಹಣಾಧಿಕಾರಿಗಳ ಕಚೇರಿ
ಎಸ್ ಕರಿಯಪ್ಪ ರಸ್ತೆ
ಬನಶಂಕರಿ
ಬೆಂಗಳೂರು ನಗರ ಜಿಲ್ಲಾ ಪಂಚಾಯತ್
ಬೆಂಗಳೂರು

:: ಅಭಿನಂದನಾ ನುಡಿ ::

ಶಾಲಾ ಶಿಕ್ಷಣವು ವಿದ್ಯಾರ್ಥಿಗಳ ಜೀವನದಲ್ಲಿ ಅತ್ಯಂತ ಮಹತ್ವದ ಘಟ್ಟವಾಗಿದ್ದು, ಅದರಲ್ಲೂ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಎನ್ನುವುದು ಅತ್ಯಂತ ಪ್ರಮುಖವಾದ ಮೈಲಿಗಲ್ಲಾಗಿದೆ. ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಪರೀಕ್ಷೆಯನ್ನು ವಿದ್ಯಾರ್ಥಿಗಳು ವಿಶ್ವಾಸಪೂರ್ವಕವಾಗಿ ಬರೆಯುವಂತಾಗಲೂ ಮತ್ತು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಈ ದೆಸೆಯಲ್ಲಿ ಸಿದ್ಧಗೊಳಿಸಲು ಅನುವಾಗುವಂತೆ ಬೆಂಗಳೂರು ಉತ್ತರ ಶೈಕ್ಷಣಿಕ ಜಿಲ್ಲೆಯ ಉಪನಿರ್ದೇಶಕರ ಕಚೇರಿಯಿಂದ **ಉತ್ತರ ಉನ್ನತಿ–2** ಎನ್ನುವ ಅಭ್ಯಾಸ ಪತ್ರಿಕೆಗಳ ಕೈಪಿಡಿಯನ್ನು ಮಾದರಿ ಉತ್ತರಗಳ ಸಮೇತ ನೀಡುತ್ತಿರುವುದು ಹರ್ಷದಾಯಕ ವಿಷಯವಾಗಿದೆ. ಪರೀಕ್ಷೆಗೆ ಉಳಿಕೆ ಇರುವ ದಿನಗಳಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳು ಮತ್ತು ಶಿಕ್ಷಕರು ಸದರಿ ಕೈಪಿಡಿಯನ್ನು ಆಧರಿಸಿ ತಮ್ಮ ಹಂತದಲ್ಲಿ ಕ್ರಿಯಾಯೋಜನೆ ರಚಿಸಿಕೊಂಡು ಸದರಿ ಹೊತ್ತಿಗೆಯನ್ನು ಪರಿಣಾಮಕಾರಿ ಬಳಸಿಕೊಂಡು ಉತ್ತಮ ಫಲಿತಾಂಶ ಪಡೆಯಲು ಸಹಕಾರಿಯಾಗಲೀ ಎಂದು ಆಶಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳ ಫಲಿತಾಂಶವು ಕೇವಲ ವಿದ್ಯಾರ್ಥಿಗೆ ಸಂಬಂಧಿಸಿದ ಫಲಿತಾಂಶವಾಗಿರದೇ, ಬೆಂಗಳೂರು ನಗರ ಜಿಲ್ಲೆಯ ಫಲಿತಾಂಶವೂ ಆಗಿರುವುದರಿಂದ ಜಿಲ್ಲೆಯ ಫಲಿತಾಂಶವನ್ನು ಪರಿಮಾಣಾತ್ಮಕವಾಗಿ ಮತ್ತು ಗುಣಾತ್ಮಕವಾಗಿ ಹೆಚ್ಚಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಈ ಪುಸ್ತಿಕೆಯು ದಾರಿದೀಪವಾಗಲೀ ಎಂದು ಹಾರೈಸುತ್ತಾ, ಈ ಹೊತ್ತಿಗೆಯನ್ನು ಹೊರತರುವಲ್ಲಿ ಶ್ರಮಿಸಿದ ಎಲ್ಲಾ ಅಧಿಕಾರಿಗಳು ಮತ್ತು ಸಂಪನ್ಮೂಲ ಶಿಕ್ಷಕರಿಗೆ ತುಂಬು ಹೃದಯದ ಅಭಿನಂದನೆಗಳು.

01.01.2024
ಬೆಂಗಳೂರು

ಕಾಂತರಾಜು
ಮುಖ್ಯ ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಧಿಕಾರಿಗಳು

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ಸಂದೇಶ

ಪ್ರತಿಯೊಂದು ವಿದ್ಯಾರ್ಥಿಯ ಜೀವನದಲ್ಲೂ ಪ್ರಾಥಮಿಕ ಮತ್ತು ಪ್ರೌಢ ಶಿಕ್ಷಣವೂ ಮಹತ್ವಪೂರ್ಣವಾಗಿದೆ. ಇಂದಿನ ವಿದ್ಯಾರ್ಥಿಗಳೇ, ಮುಂದಿನ ರಾಷ್ಟ್ರದ ಭವಿಷ್ಯತ್ತಿನ ಸಂಪತ್ತಾಗಿರುವುದರಿಂದ, ಶಿಕ್ಷಣದ ಅಂತಸತ್ವವನ್ನು ಮತ್ತಷ್ಟು ಗಟ್ಟಿಗೊಳಿಸುವ ಮತ್ತು ಗುಣಾತ್ಮಕವಾಗಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ನಮ್ಮೆಲ್ಲರ ಜವಾಬ್ದಾರಿ ಇದೆ. ಸಾರ್ವತ್ರಿಕ ಶಿಕ್ಷಣವನ್ನು ಸಾಧಿಸಿದ ನಂತರ, ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸ್ಪರ್ಧಾತ್ಮಕ ಜಗತ್ತಿಗೆ ಅಣಿಗೊಳಿಸುವಂತಹ ಗುಣಾತ್ಮಕ ಶಿಕ್ಷಣಕ್ಕೆ ಒತ್ತು ನೀಡಬೇಕಾದ ಈ ಸಂಧರ್ಭದಲ್ಲಿ ನಮ್ಮ ಬೆಂಗಳೂರು ಉತ್ತರ ಶೈಕ್ಷಣಿಕ ಜಿಲ್ಲೆಯ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಪರೀಕ್ಷಾ ಫಲಿತಾಂಶವನ್ನು ಹೆಚ್ಚಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಹಲವಾರು ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಹಮ್ಮಿಕೊಳ್ಳುತ್ತಲೇ ಬರಲಾಗಿದೆ. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಶಾಲಾ ಶಿಕ್ಷಕರು ಮತ್ತು ಮುಖ್ಯ ಶಿಕ್ಷಕರನ್ನು ಶೈಕ್ಷಣಿಕವಾಗಿ ಸಧೃಡರನ್ನಾಗಿ ಮಾಡುವಲ್ಲಿ ನಮ್ಮ ಕಚೇರಿಯ ಶಿಕ್ಷಣಾಧಿಕಾರಿಗಳು, ವಿಷಯ ಪರಿವೀಕ್ಷಕರು, ಸಂಪನ್ಮೂಲ ಶಿಕ್ಷಕರ ತಂಡವನ್ನು ರಚಿಸಿಕೊಂಡು ಕಾರ್ಯೋನ್ಮುಖರಾಗಿದ್ದಾರೆ.

ನಮ್ಮ ಈ ಬೆಂಗಳೂರು ಉತ್ತರ ಜಿಲ್ಲೆಯ ಶೈಕ್ಷಣಿಕ ಪಗ್ರತಿಯ ಒಂದು ಭಾಗವಾದ, ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಪರೀಕ್ಷೆಯ ಫಲಿತಾಂಶವನ್ನು ಗುಣಾತ್ಮಕವಾಗಿ ಹೆಚ್ಚಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಪ್ರತಿವರ್ಷ **"ಉತ್ತರ ಉತ್ತುಂಗ"** ಎಂಬ ಹೊತ್ತಿಗೆಯನ್ನು ಹೊರತರುತ್ತಿದ್ದು ಸದರಿ ವರ್ಷ ಹೊಸ ಶೀರ್ಷಿಕೆಯೊಂದಿಗೆ ಮಾದರಿ ಉತ್ತರಗಳ ಸಮೇತ **'ಉತ್ತರ ಉನ್ನತಿ–2'** ಎಂಬ ಶೀರ್ಷಿಕೆಯಡಿಯಲ್ಲಿ ಅಭ್ಯಾಸ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನೊಳಗೊಂಡ ಕೈಪಿಡಿಯನ್ನು ಹೊರತರಲಾಗುತ್ತಿದ್ದು ಇದರ ಉಪಯೋಗವನ್ನು ಎಲ್ಲಾ ಶಿಕ್ಷಕರು ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳು ಪಡೆಯುವಂತಾಗಲೀ ಎಂದು ಆಶಿಸುತ್ತೇನೆ.

ಕೇವಲ ಉತ್ತೀರ್ಣಗೊಳಿಸುವ ಒಂದೇ ಮಾನದಂಡವನ್ನು ಇಟ್ಟುಗೊಳ್ಳದೇ, ವಿದ್ಯಾರ್ಥಿಯ ಗುಣಾತ್ಮಕ ಫಲಿತಾಂಶಕ್ಕೆ ಇನ್ನೂ ಉಳಿಕೆ ಇರುವ ದಿನಗಳಲ್ಲಿ ಜಿಲ್ಲೆಯ ಎಲ್ಲಾ ಶಾಲಾ ಮುಖ್ಯ ಶಿಕ್ಷಕರು, ಶಿಕ್ಷಕರು ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳು ತಮ್ಮದೇ ಆದ ಕ್ರಿಯಾ ಯೋಜನೆಯನ್ನು ರಚಿಸಿಕೊಂಡು ಉತ್ತಮ ಸ್ಥಾನ ಪಡೆಯುವಂತಾಗಲೀ ಎಂದು ಶುಭ ಹಾರೈಸುತ್ತೇನೆ.

ಈ ಕೈಪಿಡಿಯನ್ನು ಹೊರತರುವಲ್ಲಿ ನಮ್ಮ ಕಚೇರಿಯ ಶಿಕ್ಷಣಾಧಿಕಾರಿಗಳು ಹಾಗೂ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ನೋಡಲ್ ಅಧಿಕಾರಿಗಳಾದ ಶ್ರೀ ರಮೇಶ್ ವಿ ರವರಿಗೂ , ಎಲ್ಲಾ ವಿಷಯ ಪರಿವೀಕ್ಷಕರು ಮತ್ತು ಅವರ ಸಂಪನ್ಮೂಲ ತಂಡಕ್ಕೆ ತುಂಬು ಹೃದಯದ ಧನ್ಯವಾದಗಳನ್ನು ಅರ್ಪಿಸುತ್ತೇನೆ.

01.01.2024

ಬೆಂಗಳೂರು

ಲೋಹಿತೇಶ್ವರ ರೆಡ್ಡಿ ಕೆ ಪಿ

ಉಪನಿರ್ದೇಶಕರು (ಆಡಳಿತ)

ರಮೇಶ್ ವಿ
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ಜಿಲ್ಲಾ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ನೋಡಲ್ ಅಧಿಕಾರಿಗಳು

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ಮುನ್ನುಡಿ

ಶಿಕ್ಷಣವು ವಿದ್ಯಾರ್ಥಿಯ ವ್ಯಕ್ತಿತ್ವ ಬೆಳವಣಿಗೆಯಲ್ಲಿ ತನ್ನದೇ ಆದ ಮಹತ್ವವನ್ನು ಹೊಂದಿದೆ. ಅದರಲ್ಲೂ ಮಾಧ್ಯಮಿಕ ಶಿಕ್ಷಣವೂ ವಿದ್ಯಾರ್ಥಿಯ ಮುಂದಿನ ಭವಿಷ್ಯದ ತಳಪಾಯವಾಗಿದ್ದು, ರಾಷ್ಟ್ರದ ಉತ್ತಮ ನಾಗರೀಕ ಪ್ರಜೆಯನ್ನಾಗಿಸುವಲ್ಲಿ ಮಹತ್ತಮ ಘಟ್ಟವಾಗಿದೆ. ಕರ್ನಾಟಕ ಶಿಕ್ಷಣ ಸಂರಚನೆಯ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ ಮಾಧ್ಯಮಿಕ ಶಿಕ್ಷಣದ ಮಹತ್ತರ ಘಟ್ಟವೆಂದೇ ಪರಿಗಣಿತವಾಗಿರುವ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ವಿದ್ಯಾರ್ಥಿಗಳು ಮುಂದಿನ ಶೈಕ್ಷಣಿಕ ಆಯ್ಕೆ ಮತ್ತು ವೃತ್ತಿ ಜೀವನ ನಿರ್ಧಾರದ ಕೈಗೊಳ್ಳುವ ಪ್ರಥಮತಃ ಹಂತವಾಗಿದ್ದು, ಈ ತರಗತಿಯ ಫಲಿತಾಂಶವೂ ಅತ್ಯಂತ ಮಹತ್ತರವಾಗಿರುತ್ತದೆ.

ಪ್ರತೀ ವರ್ಷ ಕರ್ನಾಟಕ ಶಾಲಾ ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯ ನಿರ್ಣಯ ಮಂಡಳಿಯಿಂದ ನಡೆಸಲ್ಪಡುವ ಹತ್ತನೇ ತರಗತಿಯ ಪರೀಕ್ಷೆಗೆ ಬೆಂಗಳೂರು ಉತ್ತರ ಶೈಕ್ಷಣಿಕ ಜಿಲ್ಲೆಯಿಂದ ಪ್ರಸಕ್ತ ವರ್ಷ 44378 ಶಾಲಾ ವಿದ್ಯಾರ್ಥಿಗಳು ಪರೀಕ್ಷೆಗೆ ಹಾಜರಾಗುತ್ತಿದ್ದು, ಈ ವಿದ್ಯಾರ್ಥಿಗಳ ಫಲಿತಾಂಶವನ್ನು ಗುಣಾತ್ಮಕವಾಗಿ ಹೆಚ್ಚಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಶಾಲಾ ಶಿಕ್ಷಕರಿಂದ ಮೊದಲುಗೊಂಡು, ಮುಖ್ಯ ಶಿಕ್ಷಕರು ಅಲ್ಲದೇ ತಾಲ್ಲೂಕು ಹಂತ, ಜಿಲ್ಲಾ ಹಂತ, ರಾಜ್ಯ ಹಂತದ ಎಲ್ಲಾ ಅಧಿಕಾರಿಗಳು ವಿವಿಧ ಕಾರ್ಯತಂತ್ರಗಳ ಮುಖೇನ ಪ್ರಯತ್ನಿಸುತ್ತಲೇ ಇದ್ದಾರೆ. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ನಮ್ಮ ಕಚೇರಿಯಿಂದಲೂ 22 ಮೇ 2023 ರಂದು ಸರ್ಕಾರಿ ಮತ್ತು ಅನುದಾನಿತ ಪ್ರೌಡಶಾಲಾ ಮುಖ್ಯ ಶಿಕ್ಷಕರ ಸಭೆ ಕರೆದು ಪ್ರಸಕ್ತ ವರ್ಷದ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಫಲಿತಾಂಶವನ್ನು ಗುಣಾತ್ಮಕವಾಗಿ ಹೆಚ್ಚಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಕ್ರಿಯಾ ಯೋಜನೆಯನ್ನು ರಚಿಸಿ, ವಿವಿಧ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳ ಮೂಲಕ ಶಿಕ್ಷಕರು ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಮುಟ್ಟುವಂತಹ ಕೆಲಸವನ್ನು ಜೂನ್ 2023ರಿಂದಲೂ ಮಾಡುತ್ತಲೇ ಬರುತ್ತಿದೆ.

ಈ ಕಾರ್ಯಚಟುವಟಿಕೆಯ ಒಂದು ಭಾಗವಾಗಿ **“ಉತ್ತರ ಉನ್ನತಿ–2”** ಎಂಬ ಮಾದರಿ ಉತ್ತರಗಳನ್ನು ಒಳಗೊಂಡ ಅಭ್ಯಾಸ ಪತ್ರಿಕೆಗಳ ಸಂಪನ್ಮೂಲ ಸಾಹಿತ್ಯವನ್ನು ರಚಿಸಿ, ಪ್ರಸ್ತುತ ಶಿಕ್ಷಕರಿಗೆ ನೀಡುತ್ತಿದ್ದೇವೆ. ಈ ಸಂಪನ್ಮೂಲ ಸಾಹಿತ್ಯವನ್ನು ಗುಣಾತ್ಮಕ ಫಲಿತಾಂಶದ ಒಂದು ಕಾರ್ಯತಂತ್ರವಾಗಿ ಹೇಗೆ ಬಳಕೆ ಮಾಡಬೇಕೆಂದು ವಿಷಯ ಪರಿವೀಕ್ಷಕರು ಮತ್ತು ವಿಷಯವಾರು ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳ ಮುಖೇನ ಮಾರ್ಗದರ್ಶನ ಮಾಡಿದ್ದು, ಇದು ಈ ಶೈಕ್ಷಣಿಕ ವರ್ಷದ ಬೆಂಗಳೂರು ಉತ್ತರ ಜಿಲ್ಲೆಯ ಫಲಿತಾಂಶವನ್ನು ಹೆಚ್ಚಿಸುವಲ್ಲಿ ಸಹಕಾರಿಯಾಗುವುದೆಂಬ ಆಶಯದೊಂದಿಗೆ ಈ ಕೈಪಿಡಿಯನ್ನು ಶಿಕ್ಷಕರ ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳ ಕೈಗಿಡಲಾಗುತ್ತಿದೆ. ಇದರ ಸದುಪಯೋಗವನ್ನು ಜಿಲ್ಲೆಯ ಎಲ್ಲಾ ವಿದ್ಯಾರ್ಥಿಗಳು, ಶಿಕ್ಷಕರು ಪಡೆದು, ಉತ್ತಮ ಫಲಿತಾಂಶಕ್ಕಾಗಿ ಶುಭ ಹಾರೈಸುತ್ತೇನೆ.

01.01.2024

ಬೆಂಗಳೂರು

ರಮೇಶ್ ವಿ

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ಶುಭ ಹಾರೈಕೆ

ಶಿಕ್ಷಣವು ಜ್ಞಾನವನ್ನು ಕಟ್ಟಿಕೊಳ್ಳುವ, ಜ್ಞಾನವನ್ನು ಸಂರಚಿಸಿಕೊಳ್ಳುವ ಹಾಗೂ ಜ್ಞಾನಾನ್ವೇಷಣೆಯತ್ತ ನಮ್ಮನ್ನು ಪ್ರೇರೇಪಿಸುವ ಒಂದು ಅದ್ಭುತ ಪ್ರಕ್ರಿಯೆ. ಬೋಧನೆ, ಕಲಿಕೆ, ಕಲಿಕೆಯ ದೃಢೀಕರಣ ಹಾಗೂ ಮೌಲ್ಯಮಾಪನ ಕ್ರಿಯೆಗಳು ಈ ಪ್ರಕ್ರಿಯೆಯ ಪ್ರಮುಖ ಭಾಗಗಳಾಗಿವೆ. ಮೌಲ್ಯಮಾಪನವು ವಿದ್ಯಾರ್ಥಿಗಳ ಗುಣಾತ್ಮಕ ಕಲಿಕೆಯನ್ನು ಹಾಗೂ ಕಲಿಕಾಫಲಗಳನ್ನು ಒರೆಹಚ್ಚುವ ಒಂದು ಸಾಧನವಾಗಿದೆ. ಈ ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಸದೃಢಗೊಳಿಸುವ ಹಿನ್ನೆಲೆಯಲ್ಲಿ ಹಾಗೂ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು 2023–24ನೇ ಸಾಲಿನ ಪರೀಕ್ಷೆಗಾಗಿ ಸಿದ್ಧಗೊಳಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಬೆಂಗಳೂರು ಉತ್ತರ ಜಿಲ್ಲೆಯಿಂದ ಅಭ್ಯಾಸ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನು ಒಳಗೊಂಡಿರುವ "**ಉತ್ತರ ಉನ್ನತಿ–2**" ಎಂಬ ಕೈಪಿಡಿಯನ್ನು ಹೊರತರಲಾಗುತ್ತಿದೆ. 2023–24ನೇ ಸಾಲಿನ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಫಲಿತಾಂಶ ಸುಧಾರಣೆಗಾಗಿ ಹೊರತರುತ್ತಿರುವ ಈ ಆವೃತ್ತಿಯು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಪ್ರಶ್ನೆಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುವ, ವಿಶ್ಲೇಷಿಸುವ ಹಾಗೂ ಸೂಕ್ತ ರೀತಿಯಲ್ಲಿ ಉತ್ತರಿಸುವ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಸದೃಢಗೊಳಿಸುವತ್ತ ಬಹಳ ಪರಿಣಾಮಕಾರಿಯಾಗಿದೆ. ಈ "ಉತ್ತರ ಉನ್ನತಿ–2" ನೂತನ ಆವೃತ್ತಿಯು 2023–24ನೇ ಸಾಲಿನ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಉತ್ತಮ ಕಲಿಕಾ ಸಾಮಗ್ರಿಯಾಗಿ ಉಪಯೋಗವಾಗಲಿ ಎಂಬುವುದು ನಮ್ಮ ಆಶಯ. ಈ ಕೈಪಿಡಿಯನ್ನು ಹೊರತರುವಲ್ಲಿ ತಮ್ಮ ಅಮೂಲ್ಯ ಸಲಹೆ ಹಾಗೂ ಮಾರ್ಗದರ್ಶನವನ್ನು ನೀಡಿದ ಉಪನಿರ್ದೇಶಕರು (ಆಡಳಿತ), ಬೆಂಗಳೂರು ಉತ್ತರ ಜಿಲ್ಲೆ, ಇವರಿಗೂ ಹಾಗೂ ಜಿಲ್ಲಾ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ನೋಡಲ್ ಅಧಿಕಾರಿಗಳಿಗೂ ಮತ್ತು ಈ ಕಾರ್ಯಕ್ಕೆ ಶ್ರಮಿಸಿದ ಎಲ್ಲಾ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು, ವಿಷಯ ಪರಿವೀಕ್ಷಕರು ಹಾಗೂ ಅಧಿಕಾರಿ ವೃಂದದವರಿಗೂ ಹೃತ್ಪೂರ್ವಕ ಅಭಿನಂದನೆಗಳು. 2023–24ನೇ ಸಾಲಿಗೆ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಪರೀಕ್ಷೆಗೆ ಹಾಜರಾಗುತ್ತಿರುವ ಎಲ್ಲಾ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೂ ಶುಭ ಹಾರೈಸುತ್ತಾ ಜಿಲ್ಲೆಯ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಫಲಿತಾಂಶವು ಉತ್ತುಂಗಕ್ಕೆ ಏರಲೆಂದು ಮನದುಂಬಿ ಆಶಿಸುತ್ತೇನೆ.

01.01.2024

ಬೆಂಗಳೂರು

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ಕೈಪಿಡಿಯ ಕುರಿತು

2024 ನೇ ಸಾಲಿನ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ಪರೀಕ್ಷೆಯನ್ನು ನಡೆಸುವ ವಿಧಾನದಲ್ಲಿ ಹಲವಾರು ಬದಲಾವಣೆಗಳನ್ನು ತರಲು ಕರ್ನಾಟಕ ಶಾಲಾ ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯ ನಿರ್ಣಯ ಮಂಡಳಿ ನಿರ್ಧರಿಸಿರುವುದು ತಮಗೆಲ್ಲಾ ತಿಳಿದಿರುವ ವಿಷಯವೇ ಆಗಿದೆ. ಈ ಬಗ್ಗೆ ಈಗಾಗಲೇ ನಡೆಸಿರುವ ಮುಖ್ಯ ಶಿಕ್ಷಕರ ಮತ್ತು ಶಿಕ್ಷಕರ ಸಭೆಗಳಲ್ಲಿ ವಿಸ್ತೃತವಾಗಿ ತಿಳಿಯಪಡಿಸಿದೆ. ಈ ಬದಲಾವಣೆಗಳೊಂದಿಗೆ ಶಿಕ್ಷಕರನ್ನು ಶೈಕ್ಷಣಿಕವಾಗಿ ಬಲಪಡಿಸಲು ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳು ಆತ್ಮವಿಶ್ವಾಸದಿಂದ ಪರೀಕ್ಷೆಯನ್ನು ಬರೆಯುವಂತೆ ಮಾಡಲು ಪ್ರತಿ ವರ್ಷದಂತೆ ಈ ವರ್ಷವೂ 'ಉತ್ತರ ಉನ್ನತಿ–2' ಎಂಬ ಅಭ್ಯಾಸ ಪತ್ರಿಕೆಗಳ ಕೈಪಿಡಿಯನ್ನು ಹಲವಾರು ಬದಲಾವಣೆಗಳೊಂದಿಗೆ ತಮ್ಮ ಮುಂದಿಡಲು ನಾವು ಹರ್ಷಿಸುತ್ತೇವೆ. ಇದು 'ಉತ್ತರ ಉತ್ತುಂಗ'ದ ಹೊಸ ಶೀರ್ಷಿಕೆಯ ಹೊಸ ಆವೃತ್ತಿ ಎಂಬುದನ್ನು ತಿಳಿಸಲು ಖುಷಿ ಎನಿಸುತ್ತದೆ.

ಹಿಂದಿನ ಕರ್ನಾಟಕ ಪ್ರೌಢ ಶಿಕ್ಷಣ ಪರೀಕ್ಷಾ ಮಂಡಳಿ, ಪ್ರಸ್ತುತ ಕರ್ನಾಟಕ ಶಾಲಾ ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯ ನಿರ್ಣಯ ಮಂಡಳಿಯು 2019–20 ರಲ್ಲಿ ಪ್ರಕಟಿಸಿರುವ **"ದೀವಿಗೆ"** ಎಂಬ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ವಿನ್ಯಾಸ ಕೈಪಿಡಿ, ಮಂಡಳಿಯು ಈ ಹಿಂದಿನ ವರ್ಷಗಳಲ್ಲಿ ಪ್ರಕಟಿಸಿರುವ ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳು ಮತ್ತು ಸದರಿ ವರ್ಷ ಮೌಲ್ಯಮಾಪನಕ್ಕೆ ಪರಿಗಣಿಸಿರುವ ಪರಿಷ್ಕೃತ ಅಧ್ಯಾಯಗಳ ಆಧಾರದ ಮೇಲೆ ಈ ಅಭ್ಯಾಸ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನು ಸಂಪನ್ಮೂಲ ಶಿಕ್ಷಕರ ತಂಡದಿಂದ ರಚಿಸಲಾಗಿದ್ದು, ಸದರಿ ಸಾಹಿತ್ಯವು 10 ಅಭ್ಯಾಸ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನು ಒಳಗೊಂಡಿದೆ. ವಿಶೇಷವಾಗಿ ಈ ವರ್ಷದ ನೂತನ ಆವೃತ್ತಿಯಲ್ಲಿ ಕರ್ನಾಟಕ ಶಾಲಾ ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯ ನಿರ್ಣಯ ಮಂಡಳಿಯು ಪ್ರಕಟಿಸಿರುವ ಮಾದರಿ ಉತ್ತರಗಳ ಮಾದರಿಯಲ್ಲಿ ಪ್ರತಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳಿಗೂ ಉತ್ತರ ಕೀಲಿಯನ್ನು ನೀಡಲಾಗಿದೆ. ಇದು ವಿದ್ಯಾರ್ಥಿಗಳ ಸ್ವ ಮೌಲ್ಯಮಾಪನಕ್ಕೆ ಹೆಚ್ಚು ಅನುಕೂಲಕರವಾಗಿದೆ.

ಸದರಿ ಅಭ್ಯಾಸ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನು ವಿವಿಧ ಕಾರ್ಯತಂತ್ರಗಳನ್ನು ಬಳಕೆ ಮಾಡಿ ವಿದ್ಯಾರ್ಥಿಗೆ ಅಭ್ಯಾಸ ಮಾಡಿಸಬಹುದಾಗಿದ್ದು, ಪ್ರತಿ ಅಭ್ಯಾಸ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯ ಬಳಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಹಿಮ್ಮಾಹಿತಿ ನೀಡಿ ಫಲಿತಾಂಶ ಸುಧಾರಣೆಗೆ ಶ್ರಮಿಸುವುದು.

ಸದರಿ **"ಉತ್ತರ ಉನ್ನತಿ–2"** ನೂತನ ಕೈಪಿಡಿಯು ಶಿಕ್ಷಕರಿಗೆ ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳ ಅಭ್ಯಾಸಕ್ಕಾಗಿ ಪ್ರಕಟಿಸುತ್ತಿರುವ ಅಭ್ಯಾಸ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳಾಗಿದ್ದು, ಈ ಸಾಹಿತ್ಯವನ್ನು ತರಲು ಸೂಕ್ತ ಮಾರ್ಗದರ್ಶನ ನೀಡಿದ ನಮ್ಮ ಜಿಲ್ಲೆಯ ಶೈಕ್ಷಣಿಕ ನಾಯಕರು ಆದಂತಹ ಶ್ರೀ ಲೋಹಿತೇಶ್ವರ ರೆಡ್ಡಿ ಕೆ.ಪಿ ರವರು, ಉಪನಿರ್ದೇಶಕರು (ಆಡಳಿತ)ರವರಿಗೆ ತುಂಬು ಹೃದಯದ ಧನ್ಯವಾದಗಳನ್ನು ಅರ್ಪಿಸುತ್ತೇನೆ. ಅದರಂತೆ ಈ ಕಾರ್ಯದ ಪ್ರತಿ ಹಂತದಲ್ಲೂ ಅಗತ್ಯ ಸಲಹೆ, ಸಹಕಾರ ನೀಡಿ ಈ ಸುಂದರ ಹೊತ್ತಿಗೆ ಹೊರತರಲು ಪರಿಶ್ರಮಿಸಿದ ನಮ್ಮ ಕಚೇರಿ ಶಿಕ್ಷಣಾಧಿಕಾರಿಗಳು ಹಾಗೂ ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ ನೋಡಲ್ ಅಧಿಕಾರಿಗಳು ಆದಂತಹ ಶ್ರೀ ರಮೇಶ ವಿ ರವರಿಗೂ, ಮತ್ತೊಬ್ಬ ಶಿಕ್ಷಣಾಧಿಕಾರಿಗಳಾದ ಪಂಕಜ ಜಿ ಸಿ ರವರಿಗೂ ಧನ್ಯವಾದಗಳು. ಇನ್ನೂ ನಮ್ಮ ಈ ಪರಿಶ್ರಮದಲ್ಲಿ ಜೊತೆಯಲ್ಲಿದ್ದು, ಸಹಕರಿಸಿದ ನಮ್ಮ ಕಚೇರಿಯ ಎಲ್ಲಾ ವಿಷಯ ಪರಿವೀಕ್ಷಕರಿಗೂ ಮುಖ್ಯವಾಗಿ ಕಳೆದ ಐದು ವರ್ಷಗಳಿಂದ ನಮ್ಮ ಕಚೇರಿಯ ಎಲ್ಲಾ ಶೈಕ್ಷಣಿಕ ಕಾರ್ಯಕ್ರಮಗಳಲ್ಲಿ ಕೈ ಜೋಡಿಸುತ್ತಿರುವ ಎಲ್ಲಾ ವಿಷಯ ಸಂಪನ್ಮೂಲ ಶಿಕ್ಷಕರಿಗೂ ಧನ್ಯವಾದಗಳನ್ನು ಅರ್ಪಿಸುತ್ತಿದ್ದೇನೆ. ಈ ಸಾಹಿತ್ಯವನ್ನು ತಮ್ಮ ಉಪಯೋಗಕ್ಕೆ ನೀಡಲು ಆನಂದವೆನಿಸುತ್ತದೆ.

ವಂದನೆಗಳೊಂದಿಗೆ,

01.01.2024

ಬೆಂಗಳೂರು

ರಾಮಲಿಂಗೇಗೌಡ ಎಂ.ಜಿ

MATHEMATICS RESOURCE TEAM

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"Without mathematics, there's nothing you can do. Everything around you is mathematics. Everything around you is numbers"

— Shakuntala Devi

OFFICE OF THE DDPI, DEPARTMENT OF PUBLIC INSTRUCTION,

BANGALORE NORTH DISTRICT

SSLC EXAM 2024, MODEL QUESTION PAPER SET – 01

Subject: Mathematics

Max Marks: 80 Time: 3.15 Hrs. Code: 81E No. Of Questions: 38

I. Four alternatives are given for each of the following questions / incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet. **8 × 1 = 8**

1. If the nth term of an arithmetic progression a_n, n = 4n+5 , then its 5^{th} term is

(A) 20 (B) 14 (C) 25 (D) 24

2. "The product of two consecutive positive integers is 30." This can be expressed algebraically as

(A) x (x + 2) = 30 (B) x (x – 2) = 30 (C) x (x – 3) = 30 (D) x (x + 1) = 30

3.In a circle the angle between a radius and a tangent at non-centre end of the radius is

(A) 90° (B) 180° (C) 45° (D) 360°

4. (7 × 11 × 13 + 13) is a / an

(A) Composite number (B) Prime number (C) Irrational number (D) Imaginary number.

5. The sum of the probabilities of all the elementary events of an experiment is

(A) 0.5 (B) 1 (C) 2 (D) 1.5

6 .The diagonals of a rhombus are 16 cm and 12 cm, in length. The side of the rhombus in length is:

(A) 20 cm (B) 8 cm (C) 10 cm (D) 9 cm

7. If we cut a cone in two parts by a plane parallel to the base, then the bottom part left over is the:

(A) Cone (B) Frustum of cone (C) Sphere (D) Cylinder

8.The midpoint of a line segment joining two points A(2, 4) and B(-2, -4) is

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

II. Answer the following questions: 8 × 1 = 8

9. Write the statement of "Basic Proportionality" theorem (Thales theorem).

10. Write the number of zeros of the polynomial $p(x) = x^3 + 2x^2 + x + 6$.

11. The probability of an event 'E' is 0.05, then what is the probability of an event 'Not E'

12. Find the surface area of a sphere of radius 7cm

13. Find the distance between the points A (2, 6) and B (5, 0) by using distance formula.

14. If a pair of linear equations represented by lines has no solutions (inconsistent) then write what kinds of lines are these.

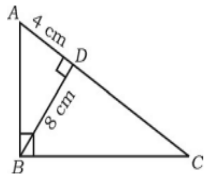
15.Express the denominator of $\mathbf{23/20}$ in the form of $2^n \times 5^m$ and state whether the given fraction is terminating or non-terminating repeating decimal.

16.Find the value of the discriminant of the quadratic equation $2x^2 - 4x + 3 = 0$.

III. Answer the following questions: 8 × 2 = 16

17. Find the 30th term of the arithmetic progression 5, 8, 11,. .

18. In ABC, ∠ABC = 90°, BD ⊥ AC. If BD = 8 cm, AD = 4 cm, find CD and AB.



19. Solve the given pair of linear equations by Elimination method $2x + y = 8$ and $x - y = 1$

OR

Find the value of k, if the pair of linear equations $2x - 3y = 8$ and $2(k - 4)x - ky = k + 3$ are inconsistent.

20. Prove that $2 + \sqrt{\mathbf{5}}$ is an irrational number.

OR

Find the HCF of 24 and 40 by using Euclid's division algorithm.

21. Sum and product of the zeroes of a quadratic polynomial $P(x) = ax^2 + bx - 4$ are $\mathbf{1/4}$ and -1 respectively. Then find the values of a and b

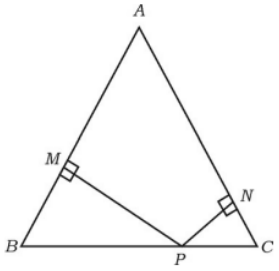
22. If $\sin \boldsymbol{\theta} = \mathbf{12/13}$, , find the values of $\cos \boldsymbol{\theta}$ and $\tan\boldsymbol{\theta}$

23 . Draw a circle of radius 3 cm. Construct a pair of tangents to it , from a point 8 cm away from its center.

24. Two unbiased dice whose faces are numbered 1 to 6 are rolled once. Find the probability of getting a sum equal to 7 on their top faces.

IV. Answer the following questions : 9 × 3 = 27

25. In Δ ABC, AB = AC. P is a point on BC such that PN ⊥ AC and PM ⊥ AB as shown in the figure. Prove that MB . CP = NC . BP



26. The sum of the reciprocals of Rehman's age (in years) 3 years ago and his age 5 years from now is 1/3. Find his present age.

OR

The diagonal of a rectangular field is 60 m more than its shorter side. If the longer side is 30 m more than the shorter side, then find the sides of the field.

27. Prove that $\sec\theta\,(1 - \sin\theta)\,(\sec\theta + \tan\theta) = 1$.

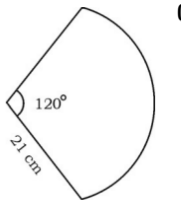
OR

Evaluate $4\sin 30 + \tan 48 \cdot \tan 42 - 3\tan 45$

28. Prove that the lengths of the tangents from an external point are equal.

29. A hand fan is made up of cloth fixed in between the metallic wires. It is in the shape of a sector of a circle of radius 21 cm and of angle 120° as shown in the figure.

Calculate the area of the cloth used and also find the total length of the metallic wire.



30.Find the mean of the following data

C.I	0-10	10-20	20-30	30-40	40-50
frequency	3	5	9	5	3

OR

Calculate the mode for the following frequency distribution table.

Class interval	frequency
10-25	2
25-40	3
40-55	7
55-70	6
70-85	6
85-100	6

31. During the medical check-up of 35 students of a class, their weights were recorded as follows. Draw a less than type of ogive for the given data

Weight (in kg)	Number of students
Less than 38	0
Less than40	3
Less than42	5
Less than44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35

32. Show that the triangle whose vertices are A (8, – 4),B (9, 5) and C (0, 4) is an isosceles triangle.

OR

Find the ratio in which the point P(2, x) divides the line joining the points A(-2, 2) and B(3, 7) internally . Also find the value of x .

33. Construct a triangle with sides 5 cm, 6 cm and 7 cm and then construct another triangle whose sides are **3/5** of the corresponding sides of the given triangle.

V. Answer the following questions: 4 × 4 = 16

34. Find the solution of the pair of linear equations by graphical method. $x + y = 7$ & $3x - y = 1$

35. If the first term of an AP is 2 and the sum of first five terms is equal to one-fourth of the sum of the next five terms, find the sum of the first 30 terms

36. There is a small island in the middle of a 100 m wide river and a tall tree stands on the island. P and Q are points directly opposite to each other on the two banks, and in line with the tree.If the angle of elevation of top of the tree from Pans Q are 30 and 45 respectively, find the height of the tree.

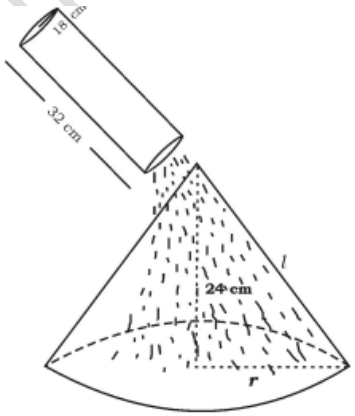
37. A bucket of height 8 cm and made up of copper sheet is in the form of frustum of right circular cone with radii of it upper and lower ends as 9 cm and 3 cm respectively. calculate

a. the volume of water which can fill the bucket.

b. the area of copper sheet required to make the bucket.

OR

Sand is filled in a cylindrical vessel of height 32 cm and radius of its base is 18 cm. This sand is completely poured on the level ground to form a conical shaped heap of sand. If the height of the conical heap is 24 cm. Find the base radius and slant height of the conical heap.



V. Answer the following questions: 1 × 5 = 5

38. State and prove Pythagoras theorem.

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BANGALORE NORTH DISTRICT

SSLC EXAM 2024, MODEL QUESTION PAPER SET – 02

Subject: Mathematics

Max Marks: 80 Time: 3.15 Hrs. Code: 81E No. Of Questions: 38

I. Four alternatives are given for each of the following questions / incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet. **8 × 1 = 8**

1. If $a_n = n^2-2$ then the value of a_4 is

A) 14 B) 16 C) 18 D)20

2. If a pair of linear equations are given by $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$, then the condition for the intersecting lines is given by.

A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ C) $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ D) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

3. ABC and BDE are two equilateral triangles such that D is the mid –point of BC. Ratio of the areas of triangles ABC and BDE is

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

4. Angle between tangent and radius is always equal to

A) 50° B)60° C)70° D)90°

5. Given 15 cotA=8 then the value of secA is

A) $\frac{15}{8}$ B) $\frac{8}{15}$ C) $\frac{15}{17}$ D) $\frac{17}{8}$

6. If Median is equal to 26 , mode is equal to 27 then Mean is

A) 25 B)25.5 C)26 D)26.5

7. Probability of sure event is

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

8. The Volume of the frustum of cone is given by

A) $\frac{1}{3}\pi h({r_1}^2 + {r_2}^2)$ B) $\frac{1}{3}\pi h(r^2 - {r_2}^2 + r_1r_2)$

C) $\frac{1}{3}\pi h({r_1}^2 + {r_2}^2 + r_1r_2)$ D) $\frac{1}{3}\pi h(r^2 - {r_2}^2)$

II. Solve the following **[1X8=8]**

9. Show that $\tan48^0.\tan23^0.\tan42^0.\tan67^0=1$

10. Find the volume of cube whose one edge is 4cm

11. State Pythagoras theorem.

12. Express 140 as a product of prime numbers.

13. From a point Q, the length of tangent to a circle is 24cm and the distance of Q from the centre is 25cm. Then find the value of Radius of the circle.

14. Find the distance between the origin and a point (5,12).

15. Find the discriminant of the quadratic equation $x^2 + 6x + 5 = 0$ and hence find the nature of the roots.

16. Find the quadratic polynomial whose sum and product is ¼ and -1 respectively

III. Solve the following **[2X8=16]**

17. Find the sum of the given AP 7+10.5+14+……..+84

18. Solve the pair of linear equations by elimination method $2x + y = 6$ and $x - y = 3$

19. Prove that 2-3√3 is irrational.

20. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure the lengths.

21. Find the distance between the two points (-3,3) and (-4,4).

22. Find the coordinates of the point which divides the line joining of (-1,7) and (4,-3) in the ratio 3:4.

23.Solve the given quadratic equation by formula method $3x^2 - 5x + 2 = 0$.

24. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears

(i) a two-digit number

(ii) a perfect square number

(iii) a number divisible by 5.

IV. Solve the following: [3X9=27]

25. During the medical check-up of 35 students of a class, their weights were recorded as follow

(in KG)	Number of students
Less than 38	0
Less than 40	3
Less than 42	5
Less than 44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35

Draw a less than type Ogive for the given data.

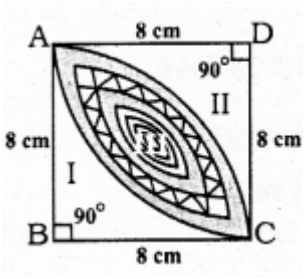
26. Construct a triangle with sides 5 cm, 6 cm and 7 cm and then another triangle whose sides are $\frac{7}{5}$ of the corresponding sides of the first triangle.

27. Find the median for the given data

Class Interval	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Frequency	2	3	8	6	6	3	2

28. Prove that " The lengths of tangents drawn from an external point to a circle are equal".

29. Calculate the area of the designed region in the given figure common between the two quadrants of circles of radius 8 cm each



30. Prove that - $\frac{tan\theta}{1-cot\theta} + \frac{cot\theta}{1-tan\theta} = 1 + sec\theta.cosec\theta$

'OR'

Prove that – $(sinA+cosecA)^2+(cosA+secA)^2 = 7+tan^2A+cot^2A$

31. Obtain all other zeroes of 3x4+6x3-2x2-10x-5, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$

32. A train travels a distance of 480 km at a uniform speed. If the speed had been 8km/h less then it would have taken 3hours more to cover the same distance. Find the speed of the train.

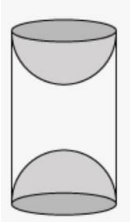
33.The sum of the 4^{th} and 8^{th} terms of an AP is 24 and the sum of the 6^{th} and 10^{th} terms is 44. Find the first three terms of the AP

V. Solve the following : [4X4=16]

34. A container opened from the top and made up of a metal sheet, is in the form of a frustum of a cone of height 16cm with radii of is lower and upper ends as 8cm and 20cm, respectively . Find the cost of the milk which can completely fill the container , at the rate of Rs 20per litre. Also find the cost of metal sheet used to make the container , if it costs Rs 8per $100cm^2$

'OR'

A wooden article was made by scooping out a hemisphere from each end of a solid cylinder , If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.

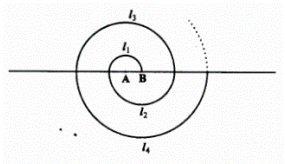


35. Solve the given pair of equations graphically $2x + y = 6$ and $4x – 2y – 4 = 0$

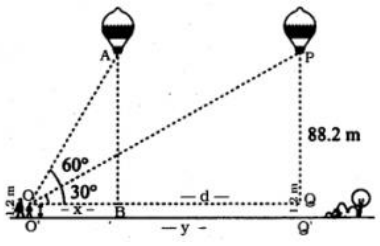
36. 200 logs are stacked In the following manner. 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on (see the fig. given below). In how many rows are the 200 logs placed and how many logs are In the top row?

'OR'

A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm. 1.0 cm. 1.5 cm, 2.0 cm as shows In fig. What Is the total length of such a spiral made up of thirteen consecutive semicircles? (Take $\pi=227$)



37. A 1.2m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60^0. After some time , the angle of elevation reduces to 30^0. Find the distance travelled by the balloon during the interval.



VI. Solve the following : [1X5=5]

38. State and Prove Thales Theorem.

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OFFICE OF THE DDPI, DEPARTMENT OF PUBLIC INSTRUCTION,

BANGALORE NORTH DISTRICT

SSLC EXAM 2024, MODEL QUESTION PAPER SET – 3

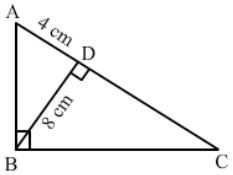
Subject: Mathematics

Max Marks: 80 Time: 3.15 Hrs. Code: 81E No. Of Questions: 38

I. Four alternatives are given for each of the following questions / incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet. **8 × 1 = 8**

1. 15^{th} term of the A.P x-7, x-2, x+3 _____ is
   (A) x + 73 (B) x + 63 (C) x + 83 (D) x + 53

2. In the following figure, $\angle ABC=90^0$ and BD⊥ AC. If BD = 8cm, AD = 4cm, then the length of CD is _____
   (A) 4 cm (B) 8 cm (C) 16 cm (D) 10 cm



3. The distance of the point P (x, y) from the origin is _____
   (A) $\sqrt{x^2 + y^2}$ **(B)** $x^2 + y^2$
   (C) $x^2 - y^2$ **(D)** $\sqrt{x^2 - y^2}$

4. If a and b are any two positive integers, then HCF (a, b) × LCM (a, b) is equal to
   (A) a + b (B) a – b (C) a × b (D) a ÷ b

5. If the polynomial p (x) = x^2 – x + 1 is divided by (x – 2) then the remainder is _____
   (A) 2 (B) 3 (C) 0 (D) 1

6. The sum and product of the roots of the quadratic equation $4x^2+1=0$ are respectively.
   (A) 1 and 4 (B) 0 and 1 (C) 0 and -1/4 (D) 0 and ¼

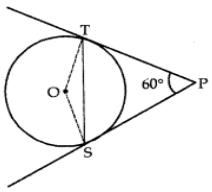
7. Value of 3 + $\sec^2 \theta$ is _____
   (A) 4 + $\tan^2 \theta$ (B) 4 + $\cot^2 \theta$ (C) 2 + $\cot^2 \theta$ (D) 3 + $\cot^2 \theta$

8. If the circumference of the base of a cylinder is 44cm and height 20cm, then its lateral surface area is _____
   (A) 440 cm^2 (B) 880 cm^2 (C) 88cm^2 (D) 44 cm^2

II. Answer the following questions: 8x1=8

9. Find the 9^{th} term from the end (towards the first term) of the A.P 5,9,13…..185.

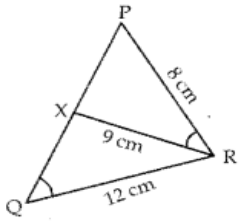
10. Find the sum of the first 30 multiples of 4.11. If PS and PT are tangents from an external point P such that PS = 10 cm and ∠SPT = 60°. Find the length of chord ST.



12. Find the area of a quadrant of a circle whose circumference is 22 cm.
13. Find the distance of the point P (2, 3) from the x-axis.
14. Express 3825 as a product of its prime factors:
15. Two unbiased coins are tossed. What is the probability of getting at most one head?
16. If the area of the surface of sphere is 4π cm. Find the diameter of the sphere.

III. Answer the following questions **8x2=16**

17. In the given figure, if $\angle PQR = \angle PRX$, then find ar (ΔPRX) : ar (ΔPQR).



18. On comparing the ratios a_1/a_2, b_1/b_2, and c_1/c_2, find out whether the $3x + 2y = 5$; $2x - 3y = 7$ are consistent, or inconsistent.
19. Draw a pair of tangents to a circle of radius 4.5 cm, which are inclined to each other at an angle of 45°.
20. Prove that $3 + 2\sqrt{5}$ is irrational

OR

Given that HCF (306, 657) = 9, find LCM (306, 657).

21. If $(\alpha - \beta)$, α, $(\alpha + \beta)$ are zeroes of the polynomial $p(x) = 2x^3 - 16x^2 + 15x - 2$, then find the value of α.
22. What is the discriminant of the equation $x^2 - 2x + 3 = 0$? Also, determine the number of solutions this equation has.

OR

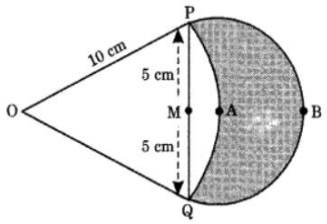
Find the roots of $3x^2 - 5x + 2 = 0$ by using the quadratic formula.

23. If $\sin\theta + \cos\theta = \sqrt{2}$, then evaluate $\tan\theta + \cot\theta$.
24. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears
    (i) a two-digit number
    (ii) a perfect square numbers

IV. Answer the following questions **9x3=27**

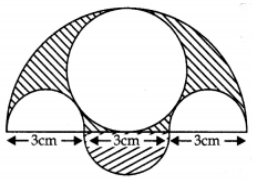
25. Prove that "The lengths of tangents drawn from an external point to a circle are equal"
26. In figure are shown two arcs PAQ and PBQ. Arc PAQ is a part of circle with centre O and radius OP

while arc PBQ is a semi-circle drawn on PQ as diameter with centre M. If OP = PQ = 10 cm show that area of shaded region is $25(\sqrt{3} - \pi/6)$ cm^2



OR

Three semicircles each of diameter 3 cm, a circle of diameter 4.5 cm and a semicircle of radius 4.5 cm are drawn in the given figure. Find the area of the shaded region.



27. Draw a triangle PQR such that PQ = 5 cm, ∠P = 120° and PR = 6 cm. Construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔPQR.
28. Find the value of 'K', for which the points are collinear. **(8, 1), (k, –4), (2, –5).**
29. Thirty women were examined in a hospital by a doctor and the number of heart beats per minute was recorded and summarised as follows. Find the mean heartbeats per minute for these women, choosing a suitable method.

ber of heart beats per te	65-68	68-71	71-74	74-77	77-80	80-83	83-86
ber of women	2	4	3	8	7	4	2

OR

The following data gives the information on the observed lifetimes (in hours) of 225 electrical components:

ime (in hours)	0-20	20-40	40-60	60-80	80-100	100 - 120
uency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

30. If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are a – b, a, a + b, then find the value of a and b.

OR

If 4 is a zero of the cubic polynomial $x^3 - 3x^2 - 10x + 24$, find its other two zeroes.

31. Evaluate $(1 + \tan^2 A/1 + \cot^2 A) = (1 - \tan A/1 - \cot A)^2 = \tan^2 A$

OR

In triangle ABC, right angled at B, if $\tan A = \frac{1}{\sqrt{3}}$, find the value of sin A cos C + cos A sin C.

32. A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of 30^0. A girl standing on the roof of 20 m high building, finds the angle of elevation of the same bird to be 45^0. Both the boy and the girl are on opposite sides of the bird. Find the distance of the bird from the girls.
33. The following tables give the production yield per hectare of wheat of 100 farms of a village.

Production Yield	50-55	55-60	60-65	65-70	70-75	75-80
Number of farms	2	8	12	24	38	16

Change the distribution to a more than type distribution and draw its ogive.

V. Answer the following questions **4x4=16**

34. If the ratio of the sum of first n terms of two A.P/s is (7n + 1):(4n + 27), find the ratio of their mth terms.

OR

The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7:15. Find the numbers

35. Draw the graph of $2y = 4x - 6$; $2x = y + 3$
36. Obtain all other zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeroes are $\sqrt{(5/3)}$ and $-\sqrt{(5/3)}$.
37. 504 cones, each of diameter 3.5 cm and height 3cm, are melted and recast into a metallic sphere. Find the diameter of the sphere and hence find its surface area. (Use $\pi = 22/7$) .

VI. Answer the following questions **5x1=5**

38. State and prove "Basic Proportionality Theorem"

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OFFICE OF THE DDPI, DEPARTMENT OF PUBLIC INSTRUCTION,

BANGALORE NORTH DISTRICT

SSLC EXAM 2024, MODEL QUESTION PAPER SET – 4

Subject: Mathematics

Max Marks: 80 Time: 3.15 Hrs. Code: 81E No. Of Questions: 38

I. Four alternatives are given for each of the following questions / incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet. **8 × 1 = 8**

1. The HCF and the LCM of 12,21,15 respectively are

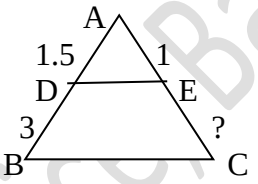
a. 3, 140 b. 12, 420 c. 3, 420 d. 420, 3

2. If the common difference of an A P is 5, then What is $a_{18} - a_{13}$?

a. 5 b. 20 c. 25 d. 30

3. In the given figure , DE|| BC, the value of EC is

a. 1.5 cm b. 3 cm c. 2 cm d. 1 cm



4. If the sum of the zeroes of the polynomial $f(x) = 2x^3 - 3kx^2 + 4x - 5$ is 6, then the value of k is

a. 2 b. - 2 c. 4 d. - 4

5. The Empirical relationship between Mean, Mode & Median is

a. Mode = 3 median – 2 mean b. Median = 2 mode + 3 median

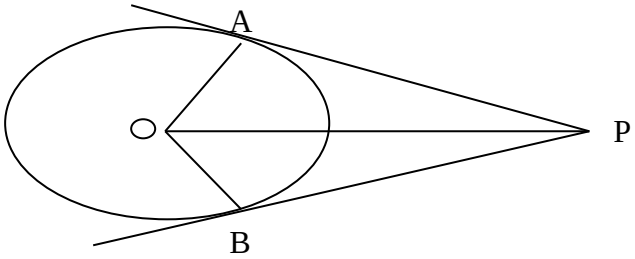
b. 2 mean = 3 mode – 2 median d. none of the above

6. Volume of a frustum of a cone is

a. $\pi l(r_1 + r_2)$ b. $\pi l(r_1 + r_2) + \pi(r_1 + r_2)$ c. $1/3\ \pi h\ (r_1^2 + r_2^2 + r_1 r_2)$ d. $4/3\ \pi r^3$

7. In the adjoining figure, if ∠AOP = 60^0 then, ∠APO = ?

a. 120^0 b. 90^0 c. 60^0 d. 30^0

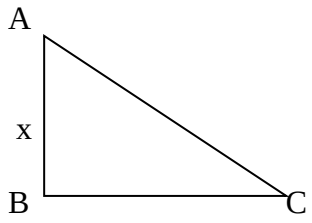


8. The value of $9\sec^2 A - 9\tan^2 A$ is

a. 0 b. 1 c. 8 d. 9

II Answer the following **8 x 1 =8**

9. If the angle formed at the center at the centre of a circle with radius 'r' is 90^0, what is the area of the sector ?
10. State Euclid's division algorithm.
11. If the zero of the polynomial $x^2 + kx + k$ is -2 , then find the value of 'k' ?
12. State converse of Pythagoras theorem.
13. If $\sqrt{3}\cot A = 1$ then find the value of acute angle A?
14. Find the value of 'x' in the following figure. [Angle C = 45^0]



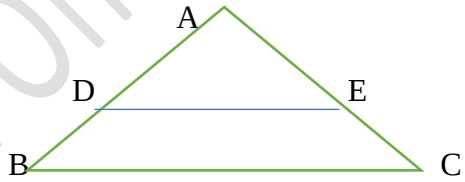
15. Check whether it is consistent or inconsistent $5x^2 - 3x + 1 = 0$
16. Find the sum of all 11 terms of an A P whose middle term is 30?

III Answer the following? **8 X 2 = 16**

17. Write whether rational number 7/75 will have terminating decimal expression or a non-terminating decimal?
18. Solve: $2x - y = 2$
    $x + 3y = 15$ by substitution method.
19. Find the roots of the quadratic equation $6x^2 - x - 2 = 0$
20. A die thrown once, what is the probability of getting an even prime number?
21. Find the distance between the points (0, 5) and (-5, 0)
22. A ladder 25 m long just reached the top of a building 24 m high from the ground. What is the distance of the foot of ladder from the base of the building?

OR

In figure ∠D = ∠E and AD/DB = AE /EC, Prove that ▲BAC is an isosceles triangle.



23. Draw a line segment of 7 cm and divide it in the ratio 3: 5 by geometrical constructions.
24. Prove that $\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$

OR

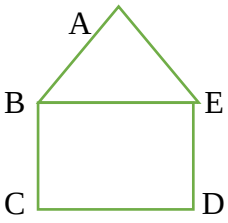
Evaluate: $\frac{3\tan^2 30^0 + \tan^2 60^0 + \operatorname{cosec} 30^0 - \tan 45^0}{\cot^2 45^0}$

IV Answer the following: **9 x 3 = 27**

25. A fraction becomes 1/3 when 2 is subtracted from the numerator and it becomes 1/2 when 1 is subtracted from the denominator. Find the fraction?

OR

In the figure, ABCDE is a pentagon with BE||CD. BC is perpendicular to CD. AB = 5cm, AE = 5cm, BE = 7cm, BC = x-y and CD= x+y. If the perimeter of ABCDE is 27 cm. Find the value of x and y, given x, y ≠ 0



26. Find the zeroes of the quadratic polynomial $5x^2 + 8x – 4$ and verify the relationship between the zeroes and the co-efficient of the polynomial.

27. Find the roots of the equation $2x^2 + x – 4 = 0$ by the method of completing the square

OR

The ages of two students A and B are 19 years and 15 years respectively. Find how many years it will take so that the product of their ages becomes equal to 480.

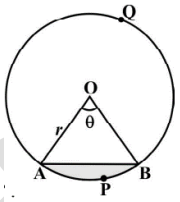
28. Find the co-ordinates of the points which divide the line segment joining the points (5, 7) and (8, 10) in 3 equal parts.

OR

Find the area of a triangle whose vertices are (-5, -1) (3, -5) and (5, 2)

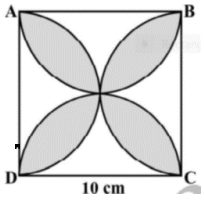
29. Prove that "the length of tangents drawn from an external point to a circle are equal".

30. If a chord of circle of radius 10cm subtend an angle of 60^0 at the center of the circle. Find the area of the corresponding segment of the circle. (Take π = 3.14, V3 = 1.7)



OR

Find the area of the shaded region where ABCD is a square of side 10cms and semicircle are drawn with each side of square as diameter.



31. Calculate the mode for the following frequency distribution.

C-I	F
15 – 20	3
20 – 25	8
25 – 30	9
30 – 35	10
35 – 40	3
40 – 45	2

32. Change the following distribution to a less than type distribution and draw its ogive.

C I	F
0 – 10	2
10 – 20	12
20 – 40	2
30 – 40	4
40 – 50	3

33. Draw a circle of radius 2 cm with center 'o' and take a point P outside the circle such that OP = 6.5 cm. From P draw two tangents to the circle.

V Answer the following questions: 4 x 4 = 16

34. Solve the given linear equation graphically:

$2x - y = 2$; $4x - y = 4$

35. The first term of an A P is 3, the last term is 83 and the sum of all its terms is 903. Find the number of terms and the common difference of the AP?

OR

The 13^{th} term of an AP is four times its 3 rd term. If the fifth term is 16, then find the sum of its first ten terms?

36. The horizontal distance between two poles is 15m. The angle of depression of the top of first pole as seen from the top pf second pole is 30^0. If the height of the first of the pole is 24m. Find the height of the second pole. [use $\sqrt{3} = 1.732$]
37. Prove that "Area of similar triangles are proportional to the squares on the corresponding sides".

VI. Answer the following: 5 x 1 = 5

38. A right triangle whose sides are 15 cm is made to revolve about its hypotenuse. Find the volume and the surface area of the double cone so formed. [use $\pi = 3.14$].

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OFFICE OF THE DDPI, DEPARTMENT OF PUBLIC INSTRUCTION,

BANGALORE NORTH DISTRICT

SSLC EXAM 2024, MODEL QUESTION PAPER SET – 5

Subject: Mathematics

Max Marks: 80 Time: 3.15 Hrs. Code: 81E No. Of Questions: 38

I. Four alternatives are given for each of the following questions / incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet. **8 × 1 = 8**

1.If the nth term of an arithmetic progression is 3n + 2 then the common difference is

(A)2 (B) 5 (C)3 (D) 8

2. A number is divided by 23 given 27 quotient 4 as remainder is

(A) 624 (B)625 (C)626 (D)627

3. Formula to find the curved surface area of a sphere is

(A)πr^1 (B)$4\pi r^2$ (C)$3\pi r^3$ (D)$2\pi r^2$

4. The value of cos(90° – 30°) is

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

5.The graphical representation of 2x + 3y-9 =0 and 4 x + 6y-18=0

(A) intersecting line (B) perpendicular lines (C) parallel line. (D) coincident line

6. When 2 unbiased coins are tossed at a time, the probability of getting 2 heads is

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

7. The maximum number of tangents that can be drawn to a circle from an external point is

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

8. The zeroes of $x^2 - 2x - 8$

(A) (2,-4) (B) (4 -2) (C)(-2,-2) (D) (-4,-4)

II Answer the following questions: 8×1=8

9. State Converse Thales theorem.

10.write the discriminant of $x^2 + 2x - 3 = 0$

11.Find the coordinates of the midpoint of the line segments joint the(6,2)and (4,4)

12. find the value of sin 30°+ cos 60°

13. Find the area of the circle with Radius 5cm

14.Write the formula to find the volume of the frustum of a cone.

15.In Euclid's division lemma, if a =3q+ r then write all possible values of r.

16.find the mean of the data: 4,10,5,9,12 is

III. Answer the <u>following</u> question: 8×2=16

17.Solve 10x+3y=75 and 6x-5y=21

18.Find the sum of first 22 terms of an Arithmetic progression 8,3,-2.....

19.Finding the distance between the points A(8,-3) and B(0,9) using distance formula.

OR

Show that the points (3,2)(-2,-3) and (2,3)are collinear or non collinear

20.Draw a circle of radius 3cm. Construct a pair of tangents to it, from a point 5 cm away from the circle.

21.Find the root of the quadratic equation $9x^2 - 3$ X -20 =0 by formula method

OR

Find the Nature of the root of the equation$x^2 - x + 12 = 0$

22.Find the quotient and reminder when p(x)=$3x^3 + x^2 + 2x + 5$ is divided by g(x)=$x^2 + 2x + 1$.

23A solid metallic right circular cylinder 1.8 m high with diameter of its base 2m is melted and recast into a right circular cone with base of diameter 3 m. find the height of the cone.

24.Two identical dice are thrown. what is the probability of getting both the equal faces.

IV. **Answer the following questions: 9 X 3 = 27**

25.Prove that the tangent at any point of a circle is perpendicular to the radius through the point of Contact.

26.prove that √3 is irrational number.

27.The following table gives the production yield per hectare of paddy of 50 forms of a village

Yield (kg/ hect)	50-55	55-60	60-65	65-70	70-75	75-80
No of farms	2	8	12	25	38	16

Change the distribution to a more that type and draw it's give.

28.Find the Mean of the following data.

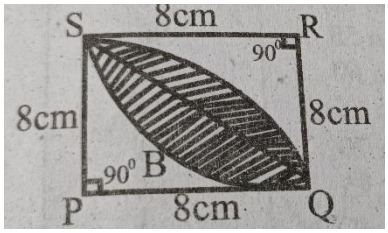
C.I	0-10	10-20	20-30	30-40	40-50
F	3	5	3	9	5

OR

Calculate the mode for the following distribution

CI	10-20	20-30	30-40	40-50	50-60
Frequency	7	8	2	2	1

28. In the area of the shaded reason in the given figure common between the two quadrants of circles of radius 8 centimetres each



29. Find the area of the triangle whose vertices are (2,-2),(-2,1),(5,2)

Or

Find the value of K if the points A(2,3) B(4,k) and(6,-3)are collinear.

30.The diagonal of the rectangular field is 60 metres more than the shorter side. If the longer side is 30 metres more than the shorter side find the side of the field.

31.The altitude of a right triangle is 7 centimetres less than its base .if the hypotenuse is 13 cm find other two sides.

32.Construct a triangle with sides 5cm.6cm and 7 cm and then another triangle whose sides are 7 /5 of the corresponding sides of the first triangle.

33 Show that $\sin\theta/1+\cos\theta$ $+1+\cos\theta/\sin\theta=2\operatorname{cosec}\theta$

V. Answer the following questions. 4×4 = 16

34.Solve the pair of linear equations graphically:2x-y=2 and 2x-3y=-6 using graphical method

35.The 4^{th} term of an AP is 11 and 8th term exceed twice the fourth terms by5. Find the sum of first 100 terms

Or

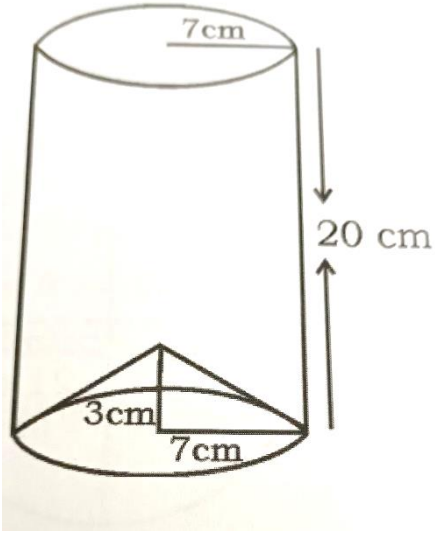
The $p,^{th}$ $q^{th}a$nd r^{th} term of an AP are a,b,c respectively. Prove that a(q-r)+b(r-p)+c(p-q)=0

36.The angle of elevation of the top of a flagpost from a point on a horizontal ground is found to be 30° on walking 6m towards the post,the elevation increased by 15°.Find the height of the flagpost.

37.Provethat Area of similar triangles are proportional to the squares on the corresponding sides.

VI Answer the following: **5×1=5**

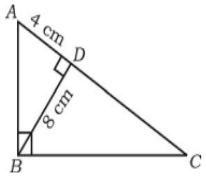
38.The bottom of the right cylindrical shaped vessel made from metallic sheet is closed by a cone shaped visual as shown in the figure. The radius of the circular base of the cylinder and radius of the circular base of the cone are each is equal to 7 cm.If the height of the cylinder is 20 centimetres and height of code is 3 centimetres calculate the cost of milk to fill completely this visual at the rate of rupees 20 per litre



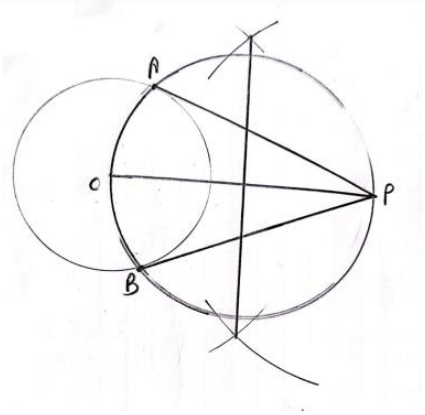
KEY ANSWER MODEL QUESTION PAPER – 1

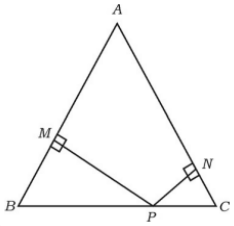
Qn. Nos.	Ans. Key	Value Points	Marks allotted
I		Four alternatives are given for each of the following questions: 8 x 1	
1.	(C)	25	1
2.	(D)	x (x +1) = 30	1
3.	(A)	90	1
4.	(A)	Composite Number	1
5.	(B)	1	1
6.	(C)	10 cm	1
7.	(B)	Frustum of Cone	1
8.	(C)	(0, 0)	1
II		**Answer the following questions: 8 x 1=8**	
9.		A line parallel to one side of a Triangle divides the other two sides in equal proportion.	1
10.		3	1
11.		P(E) + P (not E) = 1 0.05 + P(not E) = 1 P (not E) = 1 – 0.05 = 0.95	1
12.		S.A. = $4\pi r^2$ = 4 x (22 /7) x 7 x 7 = 616 cm^2	1
13.		d = $\sqrt{(5-2)2 + (0-6)2}$ = $\sqrt{32 + (-6)2}$ = $\sqrt{9 + 36}$ = $\sqrt{45}$	1
14.		Parallel Lines	1
15.	$20=2^2 5^1$	2 | 20 2 | 10 | 5	1

16.		$b^2 - 4ac$ $= (-4)^2 - 4 \times 2 \times 3$ $= 16 - 24$ $= -8$	1
III		**Answer the following questions : 8 x 2 = 16**	
17.		$a = 5\ d = 3\ n = 30$ $a_n = a + (n-1)\ d$ $a_{30} = 5 + (30 - 1)\ 3$ $= 5 + 29 \times 3$ $= 92$	2

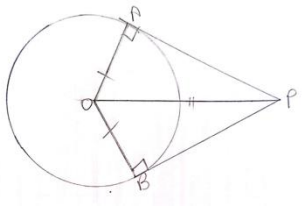
18.		 In $\Delta BDC = \Delta ADB$ $\frac{BD}{AD} = \frac{DC}{DB}$ $BD^2 = DC \times AD$ $8^2 = DC \times 4$ $DC = \frac{64}{4} = 16$	2
19.		$2x + y = 8$ $x - y = 1$ $3x = 9$ $x = 9/3 = 3$ $x - y = 1$ $3 - y = 1$ $y = 3-1 = 2$ OR $2x - 3y - 8 = 0$ $2(k-4)\ x - ky - (k+3) = 0$ $\frac{a1}{a2} = \frac{b1}{b2}$ $\frac{2}{2(k-2)} = \frac{3}{k}$ $k = 3k - 12$ $3k - k = 12$ $K = 12/2 = 6$	2

20.		Let $2 + \sqrt{5}$ be rational $2 + \sqrt{5} = p/q$ $2 - p/q = \sqrt{5}$ $\frac{2q-p}{q} = \sqrt{5}$ $\frac{2q-p}{q}$ is rational $\sqrt{5}$ is irrational This contradicts our assumption Therefore $2 + \sqrt{5}$ is irrational OR 24) 40 (1 40=1X24 +16 24 16 16) 24(1 24= 1X16 +8 16 08 8) 16 (2 16=2X8+0 16 00	2

21.		$\alpha + \beta = 1/4$ $-b/a = ¼$ $\alpha\beta = -1$ $c/a = -1$ b= -1 a=4	2
22.		$\sin\theta = 12/13$ BC = $\sqrt{13^2 - 12^2}$ = $\sqrt{169 - 144}$ = 5 $\cos\theta = 5/13$	2
23.		Circle Radius = 3 cm 8cm away from centre 	2

24.		n (S) = 6 x 6 = 36 n(A) = sum = 7 = (1,6) (3,4) (6,1) (4,3) P(A) = $\frac{n(A)}{n(S)}$ = $\frac{7}{36}$	2
IV		**Answer the following: 9 x 3 = 27**	
25.		 Data : In Δ ABC AB = AC PN ⊥ AC PN ⊥ AB T.P.T.: MB. CP = NC. PB Proof: in ΔBMP & ΔCNP ∟ M = ∟N = 90 ∟B = ∟C [AB = AC] (Angles opposite to equal sides in a Δ are equal) Δ BMP = ΔCNP $\frac{BM}{CN}$ = $\frac{BP}{CP}$ BM x CP = BP x CN	3

26.		OR d = b + 60 l = b + 30 let breadth be x d = x + 60 l = x + 30 $d^2 = l^2 + b^2$ $(x+60)^2 = (x + 30)^2 + x^2$ $x^2 + 120x + 3600 = x^2 + 60x + 900 + x^2$ $x^2 + 60x - 120x + 900 - 3600 = 0$ $x^2 - 60x - 2700 = 0$ $x^2 - 90x + 30x - 2700 = 0$ x (x – 90) + 30 (x – 90) = 0 x = 90 x = - 30 length cant be –ve x = 90 l = 90 + 60 = 150 cm b = 90 cm	3

27.		LHS = sec θ (1 – sin θ) (sec θ+ tanθ) $= \frac{1}{cos\theta}$ (1-sinθ) ($\frac{1}{cos\theta}$ + $\frac{\sin\theta}{\cos\theta}$) = ($\frac{1-\sin\theta}{\cos\theta}$) ($\frac{1+\sin\theta}{\cos\theta}$) = $\frac{1-sin^2\theta}{cos^2\theta}$ = $\frac{cos^2\theta}{cos^2\theta}$ = 1	3
		OR 4 sin 30 + tan 48 tan 42 – 3 tan 45 =4 x$\frac{1}{2}$ + tan 48. tan (90 – 48) – 3 x 1 = 2 + tan 48 x cot 48 – 1 = 2 + tan 48 x(1/tan48) - 1 = 2+1-1 = 2	
28.		 Data: (1) A circle with centre 0 is given (2) P is external point (3) PA & PB are tangents T.P.T. : PA = PB Construction : Join OA & OB Proof : In Δ OAP &Δ OBP 1) ∟ A = ∟ B [Radius ⊥ tangent] 2) OA = OB 3) OP is common By RHS congruency Δ OAP = Δ OBP **AP = BP (CPCT)**	**3**
29.		Length of metallic wire Arc BC = (θ/360) 2π r = (120 /360) 2 (22/7) 21 = 44 Length = arc BC + AB + AC = 44 + 21 + 21 = 86 cm Area of cloth = (θ/360) π r^2 = (120 /360) (22/7) 21X21 = 462 cm^2	**3**

30.			3

C.I	fi	xi	xifi
0-10	3	5	15
10-20	5	15	75
20-30	9	25	225
30-40	5	35	175
40-50	3	45	135
	25		625

$\bar{x} = \frac{\Sigma xifi}{\Sigma fi}$ = 625 /25 =25

			3

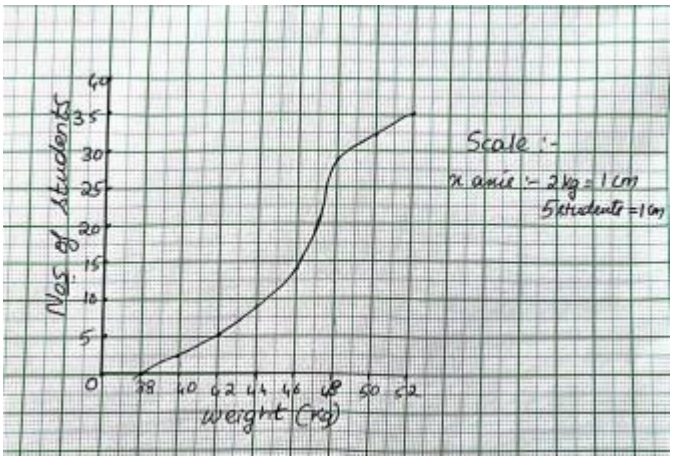
C .I	**f**
10-25	**2**
25-40	**3**
40-55	**7**
55-70	**6**
70-85	**6**
85-100	**6**

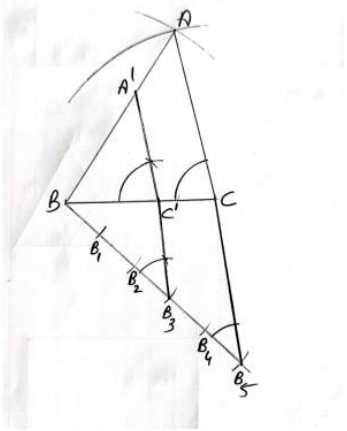
Mode = *l + [(f1 – f0)/ (2f1 – f0 – f2)] × h*

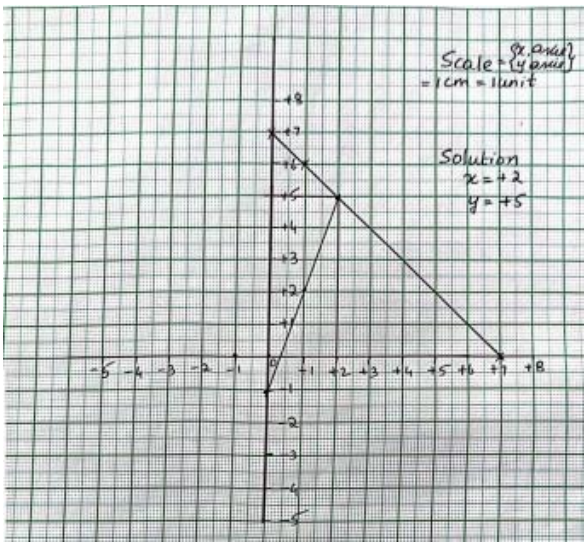
= 40 + [(7-3)/(14 -3-6)] X 15

= 40 + (4/5) X15

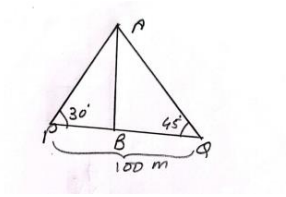
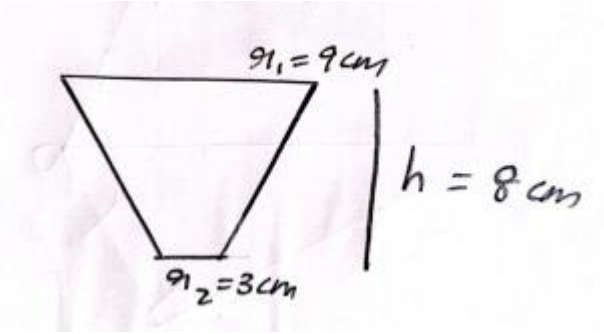
= 40 +12 =52

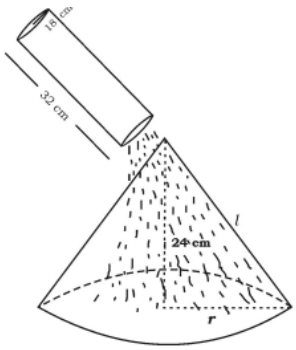
31.	ogives		3

<table>
<tr>
<td>32.</td>
<td></td>
<td>A (8, – 4) B (9, 5) C (0, 4)
AB = $\sqrt{(9-8)^2+ (5+4)^2}$
= $\sqrt{1^2+ 9^2}$
= $\sqrt{82}$
BC = $\sqrt{(0 – 9)^2+ (4 – 5)^2}$
= $\sqrt{9^2+ 1^2}$
= $\sqrt{82}$
It is isosceles le
CA = $\sqrt{(0 – 8)^2+ (4 + 4)^2}$
= $\sqrt{64 + 64}$
= $\sqrt{128}$
AB = BC = $\sqrt{82}$, It is isosceles Δ</td>
<td>3</td>
</tr>
<tr>
<td>33.</td>
<td></td>
<td>Δ= 5 cm, 6m, 7cm 3/5 Ratio
 
</td>
<td>3</td>
</tr>
<tr>
<td>34.</td>
<td></td>
<td>x + y = 7
x + y = 7
x = 0 y = 7 (0, 7)
y = 0 x = 7 (7, 0)
x = 1 y = 6 (1, 6)
<table>
<tr><td>x</td><td>0</td><td>7</td><td>1</td></tr>
<tr><td>y</td><td>7</td><td>0</td><td>6</td></tr>
</table>
3x – y = 1
x = 0 y = -1 (0, 1)
x = 2 6 – y = 1 , y=5 , (2, 5)
y = 2 3x – 2 = 1 x=1 (1, 2)
<table>
<tr><td>x</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>y</td><td>1</td><td>5</td><td>2</td></tr>
</table></td>
<td>3</td>
</tr>
</table>

			
35.		a = 2 $S_n = \frac{n}{2}$ [2a + (n-1) d] $S_5 = \frac{5}{2}$[2(2) + (5-1)d] = 10 (1+d) ---- (1) $S_{10} = \frac{10}{2}$[2(2) + (10-1)d] = 5 (4 + 9d) ------ (2) $S_6 + S_7 + S_8 + S_9 + S_{10} = S_{10} - S_5$ = 5 (4 + 9d) =- 10 (1+d) = 20 + 45d – 10 – 10d = 10 + 35d = 5 (2 + 7d)	3

		According to Qs 10 (1+d) = ¼ x 5 (2 + 7d) 40 + 40d = 10 + 35d 5d = - 30 d = - 6 $S_{30} = \frac{30}{2}$[2(2) + 30-1)1-6] = 15 (4 – 174) = 15 (- 170) **= - 2550**	**3**

36.		 ∟BPA = 30 ∟BQA = 45 In Δ APB $\frac{PB}{AB}$ = cot 30 PB = h cot 30 = h √3 ---------- (1) In Δ ABQ $\frac{BQ}{AB}$= tan 45 BQ = AB = h ------ (2) Adding (1) and (2) PB + BQ = h √3 + h 100 = h (√3 + 1) h = 100 / (√3 + 1) = 50 (√3 – 1) (by rationalizing the denominator)	4
37.		 Volume of H_2O = $\frac{1}{3}h\,(r_1^2 + r_2^2 + r_1 r_2)$ = $\frac{1}{3}(8)\,(9^2 + 9 \times 3 + 3^2)$ = $\frac{1}{3}\,\frac{22}{7}\,(81 + 27 + 9)$ =312 cm^3	4

Qn. Nos.	Ans. Key	Value Points	Marks allotted
		Area of copper sheet required to make bucket = CSA of frustrum + area of lower end of bucket $l = \sqrt{h^2+(r_1 - r_2)^2}$ $= \sqrt{8^2+(9-3)^2}$ $= \sqrt{64+36}$ l=10 cm Area of copper sheet required to make bucket = CSA of frustrum + area of lower end of bucket $=\pi l (r_1 + r_2) + \pi(r_2)^2$ $=\pi x\ 10\ (9+1) + \pi \times 3^2$ $= 120\pi + 9\pi = 129\pi\ cm^2$	**4**
38.		 Given : Height of a cylindrical bucket , **H = 32 cm** Radius of cylindrical bucket , **R = 18 cm** Height of the conical heap of sand , **h = 24 cm** Let the radius and slant height of the heap of sand be **'r' & ' l'.** Here, the sand filled in cylindrical bucket from a conical heap of sand on the ground. So **volume of cylindrical bucket will be equal to the volume of conical heap.**	**4**

Volume of cylindrical bucket = Volume of conical heap of sand

$\pi R^2H = 1/3\ \pi r^2h$

$R^2H = 1/3\ r^2h$

$18^2 \times 32 = ⅓ \times r^2 \times 24$

$18 \times 18 \times 32 = 8r^2$

$r^2 = (18 \times 18 \times 32)/8$

$r^2 = 18 \times 18 \times 4$

$r^2 = 1296$

$r = \sqrt{1296}$

r = 36 cm

Radius of the heap of sand **= 36 cm**

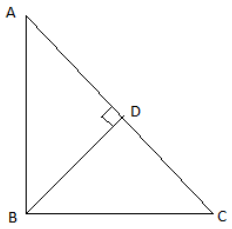
Hence the radius of heap is 36 cm.

$l^2 = h^2 + r^2$

$l = \sqrt{(h_2^2 + r_2 2)}$
$= \sqrt{(24^2 + 36^{2)}}$
$= 2 \times 2 \times 3\ \sqrt{13}$
$= 12\ \sqrt{13}$ cm

38. State and prove pythagoras theorem

"**In a right-angled triangle, the square of the hypotenuse side is equal to the sum of squares of the other two sides**



Given: ABC is a triangle in which $\angle ABC = 90^\circ$

To prove : $AC^2 = AB^2 + BC^2$

Construction: Draw $BD \perp AC$.

Proof:

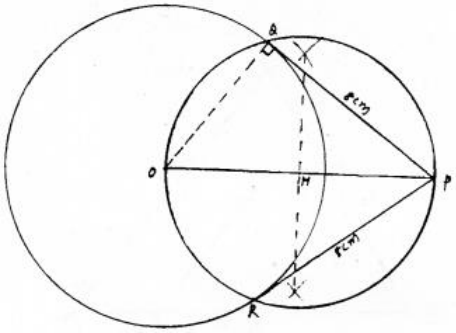
		STEP :1 In △ADB and △ABC ∠A=∠A [Common angle] ∠ADB=∠ABC [Each 90∘] △ADB∼△ABC [A−A Criteria] So, AD/AB=AB/AC Now, AB^2=AD×AC .....(1) STEP :2 In △BDC and △ABC ∠C=∠C [Common angle] ∠CDB=∠ABC [Each 90∘] △BDC∼△ABC [A−A Criteria] So, DC/BC= BC/AC BC^2=DC×AC .....(2) STEP :3: Adding equations (1) and (2) we get, AB^2+BC^2=AD×AC+CD×AC =AC(AD+CD) =AC×AC ∴$AB^2+BC^2=AC^2$	

KEY ANSWER MODEL QUESTION PAPER – 2

Qn.Nos	Ans Key	Value Poitns	Marks alloted
I 1.	(A)	If $a_n = n^2-2$ then the value of a_4 is A) 14 B) 16 C) 18 D)20 Ans ; (A) 14	1
2.	(A)	If a pair of linear equations are given by $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$, then the condition for the intersecting lines is given by. A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ C) $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ D) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ Ans: (A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	1
3.	(C)	ABC and BDE are two equilateral triangles such that D is the mid –point of BC. Ratio of the areas of triangles ABC and BDE is A) 2:1 B) 1:2 C) 4:1 D) 1:4 Ans: (C) 4:1	1
4.	(D)	Angle between tangent and radius is always equal to A) 50° B)60° C)70° D)90° Ans: (D) 90^0	1
5.	(D)	Given 15 cotA=8 then the value of secA is A) $\frac{15}{8}$ B) $\frac{8}{15}$ C) $\frac{15}{17}$ D) $\frac{17}{8}$ Ans: (D) 17/8	1
6.	(B)	If Median is equal to 26 , mode is equal to 27 then Mean is A) 25 B)25.5 C)26 D)26.5 Ans:(B) 25.5	1
7.	(A)	Probability of sure event is A) 1 B) 0 C) 2 D)3 Ans: (A) 1	1
8.	(C)	The Volume of the frustum of cone is given by A) $\frac{1}{3}\pi h({r_1}^2 + {r_2}^2)$ B) $\frac{1}{3}\pi h(r^2 - {r_2}^2 + r_1r_2)$ C) $\frac{1}{3}\pi h({r_1}^2 + {r_2}^2 + r_1r_2)$ D) $\frac{1}{3}\pi h(r^2 - {r_2}^2)$ Ans: (C) $\frac{1}{3}\pi h({r_1}^2 + {r_2}^2 + r_1r_2)$	1

II. Q.Nos	Value Points	Marks alloted
9.	Show that $\tan48^0.\tan23^0.\tan42^0.\tan67^0=1$ $\tan48^0.\tan23^0.\tan42^0.\tan67^0$ $\tan(90-42)^0.\tan42^0.\tan67^0.\tan(90-67)^0$ $\cot42^0\tan42^0\tan67^0.\cot67^0$ 1	1
10.	Find the volume of cube whose one edge is 4cm Volume of the cube $=a^3$ Volume of the cube $=4^3$ Volume of the cube $=64cm^3$	1
11.	In a right angled triangle , the square of the hypotenuse is equal to sum of the squares of the other two sides.	1
12.	Express 140 as a product of prime numbers. 140=2x2x5x7 2^2x5x7	1
13.	From a point Q, the length of tangent to a circle is 24cm and the distance of Q from the centre is 25 cm . Then find the value of Radius of the circle. By Pythagoras theorem we say that, $RQ^2=PR^2+PQ^2$ $25^2=x^2+24^2$ $625=x^2+576$ $x^2=625-576$ $x^2=49$ x=7cm. Radius =7cm.	1
14.	Find the distance between the origin and a point (5,12). $d=\sqrt{x^2+y^2}$ $d=\sqrt{5^2+12^2}$ $d=\sqrt{25+144}$ $d=\sqrt{169}$ d=13units	1
15.	Find the discriminant of the quadratic equation $x^2+6x+5=0$ and hence find the nature of the roots. $x^2+6x+5=0$	1

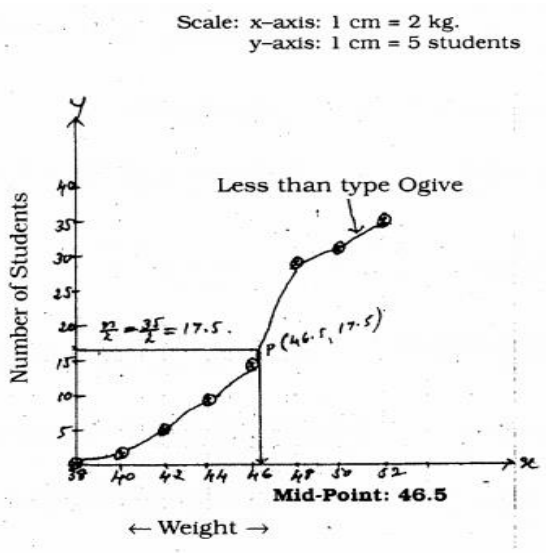
	$ax^2 + bx + c = 0$ a= 1, b=6, c=5 Δ=b2-4ac $\Delta=6^2-4(1)(5)$ Δ=36-20 Δ=16 Hence Δ>0, so we get two real roots	
16.	Find the quadratic polynomial whose sum and product is ¼ and -1 respectively Solution: $\alpha\beta$=-1 and $\alpha + \beta = ¼$ $x^2-(\alpha + \beta)x+ \alpha\beta=0$ $x^2-(¼)x+(-1) =0$ $x^2- ¼ x -1 =0$ $4x^2-x-4=0$	1
III 17.	Find the sum of the given AP 7+10.5+14+……..+84 7,10.5,14……84 a=7 d=10.5-7=3.5 a_n=84 so a_n=a+(n-1)d 84=7+(n-1)3.5 84-7=3.5n-3.5 77+3.5=3.5n 80.5=3.5n n=23 $S_{23}=\frac{n}{2}$ (a+l) $S_{23}=\frac{23}{2}$ (7+84) $S_{23}=\frac{23}{2}$ (91) S_{23}=1046.5	2
18.	Solve the pair of linear equations by elimination method $2x + y = 6$ and $x - y = 3$ 2x+y=6 x-y=3 3x=9	2

	x=3. x-y=3 3-y=3 -y=3-3 y=0	
19.	Prove that 2-3$\sqrt{3}$ is irrational Let us assume 2-3$\sqrt{3}$ as rational , where a and b are integers. So, 2-3$\sqrt{3}=\frac{a}{b}$ -3$\sqrt{3}=\frac{a}{b}-2$ -3$\sqrt{3}=\frac{2b-a}{b}$ $\sqrt{3}=\frac{2b-a}{3b}$ Here $\frac{2b-a}{3b}$ $is\ a\ rational\ ,so$ $\sqrt{3}$ is also rational but this is contradicts the fact that $\sqrt{3}$ is irrational. Hence our assumption was wrong, so we conclude 2-3$\sqrt{3}$ is irrational.	2
20.	Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure the lengths. r = 6 cm,, d = 10 cm., t = ?  Tangent, PQ = PR = 8 cm.	2
21.	Find the distance between the two points (-5,7) and (-1,3). $\therefore$ PQ = $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ = $\sqrt{\{-1-(-5)\}^2+(3-7)^2}$ = $\sqrt{(-1+5)^2+(-4)^2}$ = $\sqrt{(4)^2+(-4)^2}$ = $\sqrt{16+16}$ = $\sqrt{32}$ $\therefore$ PQ = $\sqrt{16\times2}$ $\therefore$ PQ = $4\sqrt{2}$	2
22.	Find the coordinates of the point which divides the line joining of (-1,7) and (4,-3) in the ratio 2:3.	2

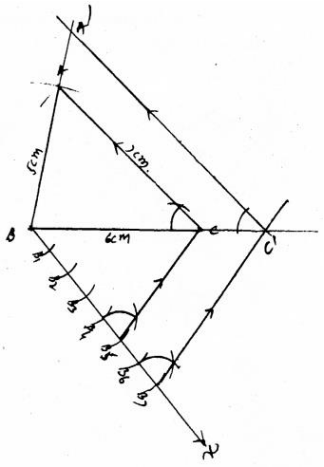
	$\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$ $= \left(\frac{2\times4+3\times-1}{2+3}, \frac{2\times-3+3\times7}{2+3}\right)$ $= \left(\frac{8-3}{5}, \frac{-6+21}{5}\right)$ $= \left(1, \frac{15}{5}\right)$ $= (1, 3)$ $\therefore$ P(x, y) = (1, 3) = (1, 3).	
23.	Solve the given quadratic equation by formula method $2x^2 - 7x + 3 = 0$. $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $= \frac{-(-7) \pm \sqrt{(-7)^2-4(2)(3)}}{2\times2}$ $= \frac{7 \pm \sqrt{49-24}}{4}$ $= \frac{7 \pm \sqrt{25}}{4} = \frac{7\pm5}{4}$ $= \frac{7+5}{4}$, OR $\frac{7-5}{4}$ $= \frac{12}{4}$ OR $\frac{2}{4}$ $\therefore$ x= 3 OR $\frac{1}{2}$.	2
24.	A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears (i) a two-digit number (ii) a perfect square number (iii) a number divisible by 5. Solution: Number of discs which are numbered from 1 to 30, n(S) = 90 (i) A two-digit number : Out of 90, one digit number = 9 $\therefore$ 2-digit numbers = 90 – 9 = 81 $\therefore$ 2-digit numbers, n(E) = 81 $\therefore$ $P(E) = \frac{n(E)}{n(S)} = \frac{81}{90}$ (ii) A perfect square number : 1, 4, 9, 16, 25, 36, 49, 64, 81 $\therefore$ n(E) = 9	2

	$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{9}{90} = \frac{1}{10}$ (iii) A number divisible by 5 : 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90 . $\therefore$ n(E) = 18 $\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{18}{90} = \frac{1}{5}$	
IV. 25.	During the medical check up of 35 students of a class , their weights were recorded as follow Draw a less than type Ogive for the given data.	3

Weight (in KG)	Number of students
Less than 38	0
Less than 40	3
Less than 42	5
Less than 44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35



26.	Construct a triangle with sides 5 cm, 6 cm and 7 cm and then another triangle whose sides are $\frac{7}{5}$ of the corresponding sides of the first triangle. Solution: Construct an ΔABC having sides 5 cm, 6 cm and 7 cm. Then construct another triangle whose sides are 75 of the corresponding sides of the first triangle.	3



27. . Find the median for the given data — 3

Class Interval	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Frequency	2	3	8	6	6	3	2

Solution:

Weight (in kg)	Number of students, f_1	Cumulative frequency, cf
40 – 45	2	2
45 – 50	3	5
50 – 55	8	13
55 – 60	6	19
60 – 65	6	25
65 – 70	3	28
70 – 75	2	30
	n = 30	

(i) n = 30, ∴ n2 = 15

Class interval having median is (55 – 60)

l = 55, n = 30, f = 6, cf = 13, h = 5

$$\therefore \text{Median} = l + \left[\frac{\frac{n}{2} - cf}{f}\right] \times h$$

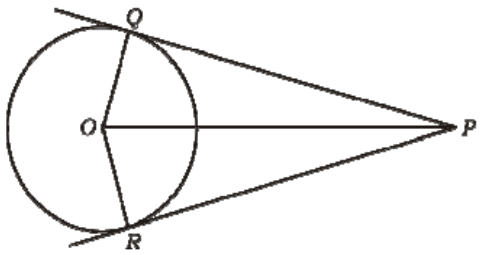
$$= 55 + \left(\frac{15-13}{6}\right) \times 5$$

$$= 55 + \frac{2}{6} \times 5$$

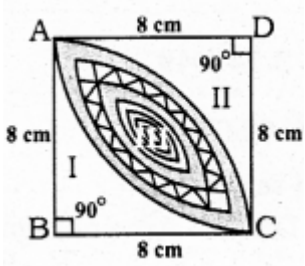
= 55 + 1.67

∴ Median = 56.67 kg.

28. Prove that " The lengths of tangents drawn from an external point to a circle are equal". — 3



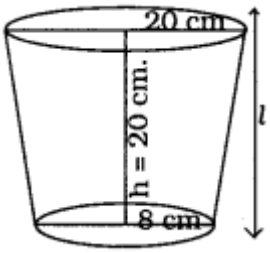
Data: 'O" is the center of the circle PQ and PR are tangents.
drawn from external point P.
To Prove: PQ = PR
Construction: Join OP, OQ and OR
Proof : In the figure
∠OQP = ∠ORP = 90º [OQ ⊥ PQ]
OR ⊥ PR
OQ = OR (radii of same circle)
OP = OP (common side)
ΔOQP ≅ Δ ORP [RHS]
∴ PQ = PR (C.P.CT)

29.	Calculate the area of the designed region in the given figure common between the two quadrants of circles of radius 8 cm each  i) Area of Square, ABCD = $a^2 = (8)^2 = 64\ cm^2$. ii) Sum of Areas of Part II and Part III = Area of the segment with centre D and radius of 8 cm. $\therefore \quad = \frac{\theta}{360} \times \pi r^2$ $= \frac{90}{360} \times \frac{22}{7} \times (8)^2$ $= \frac{1}{4} \times \frac{22}{7} \times 64$ $= \frac{352}{7}$ sq.cm. iii) Area of Part I = (Sum of Part I, II and III) – (Sum of the area of Part II, III) = Area of Square ABCD – (Sum of the area of part II and III) $= 64\,cm^2 - \frac{352}{7} cm^2$ $= \frac{448-352}{7} cm^2$ $= \frac{96}{7} cm^2$ Similarly, Area of Part II = $\frac{96}{7} cm^2$ $\therefore$ Area of Region III $= \frac{352}{7} - \frac{96}{7}$ $= \frac{256}{7} cm^2$	3
30.	. Prove that - $\frac{tan\theta}{1-cot\theta} + \frac{cot\theta}{1-tan\theta} = 1 + sec\theta.cosec\theta$	3

	$\text{LHS} = \frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta}$ $= \frac{\frac{\sin\theta}{\cos\theta}}{\left(1-\frac{\cos\theta}{\sin\theta}\right)} + \frac{\frac{\cos\theta}{\sin\theta}}{\left(1-\frac{\sin\theta}{\cos\theta}\right)}$ $= \frac{\frac{\sin\theta}{\cos\theta}}{\left(\frac{\sin\theta-\cos\theta}{\sin\theta}\right)} + \frac{\frac{\cos\theta}{\sin\theta}}{\left(\frac{\cos\theta-\sin\theta}{\cos\theta}\right)}$ $= \frac{\sin\theta \times \sin\theta}{\cos\theta(\sin\theta-\cos\theta)} + \frac{\cos\theta \times \cos\theta}{\sin\theta(\cos\theta-\sin\theta)}$ $= \frac{\sin^2\theta}{\cos\theta(\sin\theta-\cos\theta)} + \frac{\cos^2\theta}{\sin\theta(\cos\theta-\sin\theta)}$ $= \frac{\sin\theta \times \sin^2\theta - \cos\theta \times \cos^2\theta}{\cos\theta \times \sin\theta(\sin\theta-\cos\theta)}$ $= \frac{\sin^3\theta-\cos^3\theta}{\cos\theta \times \sin\theta(\sin\theta-\cos\theta)}$ $= \frac{(\sin\theta-\cos\theta) \times \left(\sin^2\theta+\cos^2\theta+\sin\theta.\cos\theta\right)}{\cos\theta \times \sin\theta \times (\sin\theta-\cos\theta)}$ $= \frac{\sin^2\theta+\cos^2\theta+\sin\theta\times\cos\theta}{\cos\theta \times \sin\theta}$ $= \frac{1+\sin\theta\times\cos\theta}{\cos\theta \times \sin\theta}$ $= \frac{1}{\cos\theta \times \sin\theta} + 1$ $= 1+\left(\frac{1}{\cos\theta}\right)\left(\frac{1}{\sin\theta}\right)$ $\text{LHS} = 1 + \sec\theta \times \cos\theta$ $\therefore$ LHS = RHS 'OR' Prove that – $(\sin A+\operatorname{cosec} A)^2+(\cos A+\sec A)^2 = 7+\tan^2 A+\cot^2 A$ $\text{LHS} = (\sin A + \operatorname{cosec} A)^2+(\cos A+\sec A)^2$ $= \{\sin^2 A + \operatorname{cosec}^2 A + 2\sin A . \operatorname{cosec} A\} \times \{\cos^2 A + \sec^2 A + 2\cos A \times \sec A\}$ $= (\sin^2 A + \operatorname{cosec} A + 2) + (\cos^2 A + \sec^2 A + 2)$ $= 2 + 2 + (\sin^2 A + \cos^2 A) + \sec^2 A + \operatorname{cosec}^2 A$ $= 5 + (\tan^2 A + 1)(\cot^2 A + 1)$ $\text{LHS} = 7 + \tan^2 A = \cot^2 A$ $\therefore$ LHS = RHS.	
31.	Obtain all other zeroes of 3x4+6x3-2x2-10x-5, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$ Solution:	3

	Solution: $\therefore$ Factors $= \left(x-\sqrt{\frac{5}{3}}\right)\left(x+\sqrt{\frac{5}{3}}\right)$ $= x^2-\frac{5}{3}$ $3x^2-5$ is the factor of polynomial. $\therefore$ following the Division lgorithm process, $3x^2-5\overline{)\,3x^4+6x^3-2x^2-10x-5\,(x^2+2x+1}$ $3x^4 \quad -5x^2$ $6x^3+3x^2-10x-5$ $6x^3 \quad -10x$ $3x^2 \quad -5$ $3x^2 \quad -5$ $0 \quad 0$ $\therefore$ In $q(x) = x^2 + 2x + 1$, there are two more roots. $x^2 + 2x + 1 = (x + 1)^2$ other roots are: x = -1, -1	
32.	A train travels a distance of 480 km at a uniform speed. If the speed had been 8km/h less then it would have taken 3hours more to cover the same distance. Find the speed of the train. Solution: Let the initial speed of a train be 'x' km/h. Time required to travel x km is 1 hour. Time required to travel 480 km ……? 480x hr If its speed decreases to 8 km/h, then it is (x – 8) km/h. Time required to cover (x – 8) km is 1 Hr. Time required to cover 480 km ……..? $\frac{480}{(x-8)}$ Hr. $\frac{480}{(x-8)}$ is 3 Hr. lesser than $\frac{480}{x}$. $\therefore \Rightarrow \frac{480}{(x-8)}+\frac{3}{1}=\frac{480}{x}$ $\Rightarrow \frac{480+3(x-8)}{(x-8)}=\frac{480}{x}$ $\Rightarrow \frac{480+3x-24}{(x-8)}=\frac{480}{x}$ $\Rightarrow \frac{(3x+456)}{(x-8)}=\frac{480}{x}$	3

	$\therefore x(3x + 456) = 480 (x – 8)$ $3x^2 + 456x = 480x + 3840$ $3x^2 + 456x – 480 x + 3840 = 0$ $3x^2 – 24x + 3840 = 0$ $\therefore x^2 – 8x + 1280 = 0$ This is the required equation. Now, we have to solve for x : $x^2 – 8x + 1280 = 0$ $x^2 – 40x + 32x + 1280 = 0$ $x(x – 40) + 32(x + 40) = 0$ $(x – 40) (x + 32) = 0$ If $x – 40 = 0$, then $x = 40$ If $x + 32 = 0$, then $x = -32$ $\therefore$ Average speed of train is 40 km/hr.	
33.	The sum of the 4^{th} and 8^{th} terms of an AP is 24 and the sum of the 6^{th} and 10^{th} terms is 44. Find the first three terms of the AP Solution: $a_4 + a_8 = 24$ ……. (1) $a_6 + a_{10} = 44$ …… (2) But A.P is a, a + d, a + 2d from equation (1). $a_4 + a_8 = 24$ $a + 3d + a + 7d = 24$ $2a + 10d = 24$ …….. (3) from equation (2). $a_6 + a_{10} = 44$ $a + 5d + a + 9d = 44$ $2a + 14d = 44$ …… (4) Subtracting eqn. (4) from equation (3) $\begin{array}{r} 2a+10d = 24 \\ 2a+14d = 44 \\ \hline -4d = -20 \end{array}$ $4d = 20$ $d=20/4$ $\therefore d = 5$ Substituting the value of d in equation (3)	3

	2a + 10d = 24 2a + 10(5) = 24 2a + 50 = 24 2a = 24 – 50 2a = -26 a = 26/2 , ∴ a = -13 . ∴ AP: a, a + d, a + 2d, …….. -13, -13 + 5, -13 + 2(5), …… -14, -8, -3, ……	
V. 34.	A container opened from the top and made up of a metal sheet, is in the form of a frustum of a cone of height 16cm with radii of is lower and upper ends as 8cm and 20cm, respectively . Find the cost of the milk which can completely fill the container , at the rate of Rs 20per litre. Also find the cost of metal sheet used to make the container , if it costs Rs 8per 100cm^2 Solution:  R = 20 cm r = 8 cm h = 20 cm ∴ Slant height, $l = \sqrt{h^2 + (R-r)^2}$ $= \sqrt{(16)^2 + (20-8)^2}$ $= \sqrt{256+144}$ $= \sqrt{400}$ $l = 20$ cm. ∴ Volume of metallic sheet,	4

$= \frac{1}{3}\pi h\,(R^2 + r^2 + Rr)$

$= \frac{1}{3}\pi \times 16\,(20^2 + 8^2 + 20 \times 8)$

$= \frac{1}{3}\pi \times 16 \times 624$

$= \frac{1}{3} \times 3.14 \times 16 \times 624$

$= 10449.92\ cm^3.$

Quantity of milk in the container

= 10449.821000

Cost of 1 litre of milk is Rs. 20,

Cost of 10.45 litres of milk ……. ??

∴ 20 × 10.45 = Rs. 209.

Cost of metal sheet = $\pi(R + r) + \pi r^2$

= π {20 × (20 + 8) + $(8)^2$}

= 3.14 × 624

= 1959.36 cm^2.

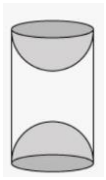
∴ Cost of preparing metallic container: For 100 cm^2 Rs. 8

∴ For 1959.36 cm^2 ……?

= 8 × 1159.36100

= Rs. 156.75. "OR"

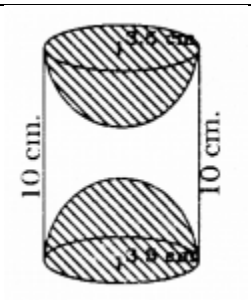
A wooden article was made by scooping out a hemisphere from each end of a solid cylinder , If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.



Solution:

Radius of base of cylinder, r= 3.5 cm

Height, h = 10 cm.



Total area of article, = Curved Surface area of Cylinder + 2 × Area of Hemisphere

$= 2\pi rh + 2 \times 2\pi r^2$

$$= 2 \times \frac{22}{7} \times 3.5 \times 10 + 2 \times 2 \times \frac{22}{7} \times (3.5)^2$$

$$= 3.5 \times 34 \times \frac{22}{7}$$

= 374 sq.cm.

35 Solve the given pair of equations graphically $2x + y = 6$ and $4x – 2y – 4 = 0$ — 4

Solution:

$2x + y = 6$

$y = 6 – 2x$

x	0	2
$y = 6 – 2x$	6	2

(ii) $4x – 2y – 4 = 0$

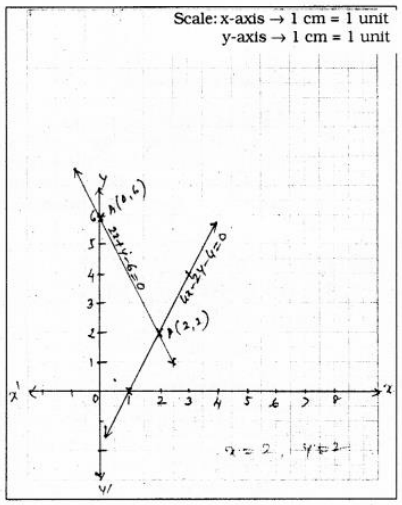
$4x – 2y = 4$

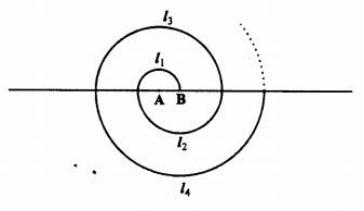
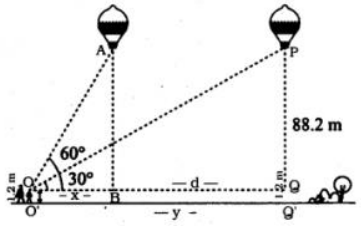
$-2y = 4 – 4x$

$2y = -4 + 4x$

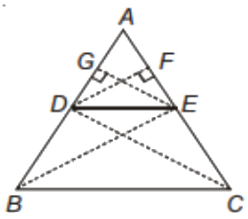
$y=−4+4x2$

x	1	3
$y=−4+4x2$	0	4

	Solution: intersecting point, P (2, 2) i.e., x = 2, y = 2  	
36	200 logs are stacked In the following manner. 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on (see the fig. given below). In how many rows are the 200 logs placed and how many logs are In the top row?  Solution: 20, 19, 18, ….. a = 20, d = 19 – 20 = -1 S_n = 200, n =?, a_n =? Sn=n2[2a+(n−1)d] 200=n2[2×20+(n−1)(−1)] 200=n2[40−n+1] 200=n2[41−n] ∴ 400 = n(41 – n) 400 = 4n – n^2 ∴ n^2 – 41n + 400 = 0 n^2 – 25n – 16n + 400 = 0 n(n – 25) – 16(n – 25) = 0 (n – 25) (n – 16) = 1f n – 16 = 0 then, n = 16 ∴ a_n = a + (n – 1) d a_{16}= 20 + (16 – 1) (-1) = 20 + 15(-1) = 20 – 15 ∴ a_{16} = 5 ∴ 200 logs are placed In 16 rows and there are 5 logs in the top row.	4

	OR A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm. 1.0 cm. 1.5 cm, 2.0 cm as shows In fig. What Is the total length of such a spiral made up of thirteen consecutive semicircles? (Take π=227)  [Hint: Length of successive semicircles is l_1, l_2, l_3, l_4 with centres at A, B, A. B respectively.] Solution : :l1=π×12,12=π×1.13=π×32 l1=π2,l2=p,l3=32π ∴ Arithmetic Progression, l_1, l_2, l_3, l_4, …….. $l_2 - l_1 = l_3 - l_2 = \frac{1}{2}\pi$ $\therefore \quad a = \frac{\pi}{2}, \quad d = \frac{\pi}{2}$ Circumference, $l = l_1 + l_2 + \ldots\ldots + l_{13}$ $= \frac{13}{2}[2a + 12d]$ $= \frac{13}{2}\left[2\times\frac{\pi}{2} + 12\times\frac{\pi}{2}\right]$ $= \frac{91}{2}\pi$ $= \frac{^{13}91}{2} \times \frac{22^{11}}{7}$ $= 13 \times 11$ $l = 143$ cm.	
37.	A 1.2m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60^0. After some time , the angle of elevation reduces to 30^0. Find the distance travelled by the balloon during the interval. Solution:  Solution: Height of the girl, OO' = 1.2 m	4

	$\angle AOB = 60°$ $\angle POQ = 30°$ Let OB = x m, BQ = d m, O'Q' = y m. AB = PQ = Q'P – Q'Q = 88.2 – O'O = 88.2 – 1.2 = 87 m. Let OQ = 'y'. Distance balloon travelled, d = BQ = (y – x) In $\perp\Delta AOB$, $\frac{AB}{OB} = \tan 60°$ $\frac{87}{x} = \sqrt{3}$ $\therefore \quad x = \frac{87}{\sqrt{3}}$ m In $\perp\Delta POQ$, $\frac{PQ}{OQ} = \tan 30°$ $\frac{87}{y} = \frac{1}{\sqrt{3}}$ $\therefore \quad y = 87\sqrt{3}$ m $d = y - x$ $= 87\sqrt{3} - \frac{87}{\sqrt{3}}$ $= 87\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)$ $= 87 \times \frac{2}{\sqrt{3}}$ $\therefore \quad OQ = d = 87 \times \frac{2}{3} \times \sqrt{3}$ $= 58\sqrt{3}$ m.	

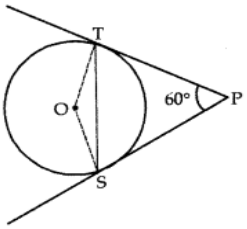
VI 38	**Basic Proportionality Theorem (Thales' Theorem)** **Statement** : In a triangle, a line drawn parallel to one side of a triangle intersecting the other two sides in distinct points, divides the other two sides in the same ratio. **Proof of the Theorem** **Given** : ΔABC, in which DE is drawn parallel to BC. **To Prove** : $\frac{AD}{DB} = \frac{AE}{EC}$ **Construction** : Join CD and BE. Draw $DF \perp AE$ and $EG \perp AD$.  **Proof** : $\text{ar}(\Delta ADE) = \frac{1}{2} \times AD \times EG$ ...(i) $\text{ar}(\Delta BDE) = \frac{1}{2} \times BD \times EG$ ...(ii) Dividing (i) by (ii), we get $\frac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times EG}{\frac{1}{2} \times BD \times EG} = \frac{AD}{BD}$ ...(iii) Similarly, $\text{ar}(\Delta ADE) = \frac{1}{2} \times DF \times AE$ and $\text{ar}(\Delta CDE) = \frac{1}{2} \times CE \times DF$ $\Rightarrow \frac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta CDE)} = \frac{\frac{1}{2} \times DF \times AE}{\frac{1}{2} \times DF \times CE} = \frac{AE}{CE}$ ...(iv) Now, $\text{ar}(\Delta BDE) = \text{ar}(\Delta CDE)$ [$\because$ Triangles on the same base and between the same parallel lines are equal in area] $\Rightarrow \frac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta BDE)} = \frac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta CDE)}$ $\therefore$ From (iii) and (iv), we get $\frac{AD}{DB} = \frac{AE}{EC}$ Hence proved.	5

KEY ANSWER MODEL QUESTION PAPER – 3

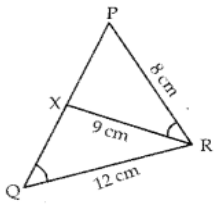
Qn.Nos.	Ans. Key	Value Points	Marks allotted
I. 1.	(B)	**Multiple Choice questions: 8 x 1 = 8** **15^{th} term of the A.P x-7, x-2, x+3 _____ is** (A) x + 73 (B) x + 63 (C) x + 83 (D) x + 53 Ans: KSEEB QP JAN 2015 x + 63	1
2.	(C)	**In the following figure, ∠ABC=90^0 and BD⊥ AC. If BD = 8cm, AD = 4cm, then the length of CD is _____** (A) 4 cm (B) 8 cm (C) 16cm (D) 10cm Ans: KSEEB JUNE 2015 16cm	1
3.	(A)	**The distance of the point P (x, y) from the origin is _____** **(A)** $\sqrt{x^2 + y^2}$ **(B)** $x^2 + y^2$ **(C)** $x^2 - y^2$ **(D)** $\sqrt{x^2 - y^2}$ Ans: APRIL 2022 $\sqrt{x^2 + y^2}$	1
4.	(C)	**If a and b are any two positive integers, then HCF (a, b) × LCM (a, b) is equal to** (A) a + b (B) a – b (C) a × b (D) a ÷ b Ans: APRIL 2019 a x b	1
5.	(B)	**If the polynomial p (x) = x^2 – x + 1 is divided by (x – 2) then the remainder is _____** (A) 2 (B) 3 (C) 0 (D) 1 Ans: APRIL 2018 3	1

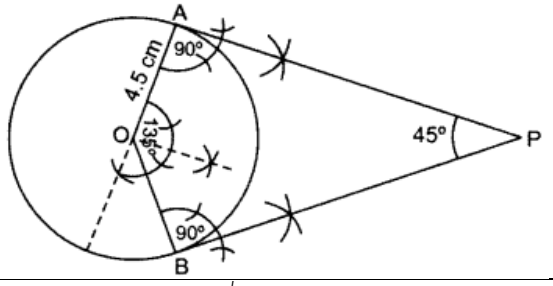
6	(D)	**The sum and product of the roots of the quadratic equation $4x^2+1=0$ are respectively.** (A) 1 and 4 (B) 0 and 1 (C) 0 and -1/4 (D) 0 and ¼ Ans: JUNE 2008 0 and 1/4	1
7.	(A)	**Value of $3 + \sec^2 \theta$ is _____** (A) $4 + \tan^2 \theta$ (B) $4 + \cot^2 \theta$ (C) $2 + \cot^2 \theta$ (D) $3 + \cot^2 \theta$ Ans: APRIL 2021 $4 + \tan^2 \theta$	1
8.	(B)	**If the circumference of the base of a cylinder is 44cm and height 20cm, then its lateral surface area is _____** (A) 440 cm^2 (B) 880 cm^2 (C) 88 cm^2 (D) 44 cm^2 Ans: JUNE 2013,10,7,6 880 cm^2	1

Qn.Nos.	Value Points		Marks allotted
II.	**Answer the following questions : 8 x 1 = 8**		
9.	**Find the 9th term from the end (towards the first term) of the A.P 5,9,13…..185.** Ans: a= 185, d = - 4 & 1 = 5 $a_9 = a + (n – 1) d$ $a_9 = a + (9 – 1) - 4$ $a_9 = 185 + 8 \times - 4$ $= 185 – 32$ $a_9 = 153$	½ ½	1
10.	**Find the sum of the first 30 multiples of 4.** Ans: The first 30 multiples of 4 are: 4, 8, 12, ….., 120 Here, a = 4, n = 30, d = 4 We know, $S_{30} = n/2 [2a + (n − 1) \times d]$ $S_{30} = 30/2[2 (4) + (30 − 1) \times 4]$ $S_{30} = 15[8 + 116]$ $S_{30} = 1860$	½ ½	1
11.	**If PS and PT are tangents from an external point P such that PS = 10 cm and ∠SPT = 60°. Find the length of chord ST.**		1

	Ans: As tangents from external point are equal in length. ∴ PT = PS ⇒ APST is isosceles A. $\frac{1}{2}$ ∠PTS = ∠PST = (180∘−60∘)/2 = 60° ⇒ ΔPST is equilateral. ∴ PS = PT = ST ∴ ST = 10 cm. $\frac{1}{2}$ 		
12.	**Find the area of a quadrant of a circle whose circumference is 22 cm**. Ans: Circumference of the circle, C = 22 cm (given) It should be noted that a quadrant of a circle is a sector which is making an angle of 90°. Let the radius of the circle = r As C = 2πr = 22, R = 22/2π cm = 7/2 cm $\frac{1}{2}$ ∴ area of the quadrant = (θ/360°) × πr^2 Here, θ = 90° So, A = (90°/360°) × π r^2 cm^2 = (49/16) π cm^2 = 77/8 cm^2 = 9.6 cm^2 $\frac{1}{2}$		1
13.	**Find the distance of the point P (2, 3) from the x-axis.** Ans: We know that, (x, y) = (2, 3) is a point on the Cartesian plane in the first quadrant. x = Perpendicular distance from y-axis y = Perpendicular distance from x-axis $\frac{1}{2}$ Therefore, the perpendicular distance from x-axis = y coordinate = 3 $\frac{1}{2}$		1
14.	**Express 3825 as a product of its prime factors:** Ans: Given: 3825 Using the division of a number by prime numbers method, we can get the product of prime factors of 3825. Hence, 3825 = 3 × 3 × 5 × 5 × 17 $\frac{1}{2}$ = $3^2 \times 5^2 \times 17$ $\frac{1}{2}$		1
15.	**Two unbiased coins are tossed. What is the probability of getting at most one head?** Ans: Here, S = {HH, HT, TH, TT). Let E = event of getting at most one head. ∴ E = {TT, HT, TH}. $\frac{1}{2}$		1

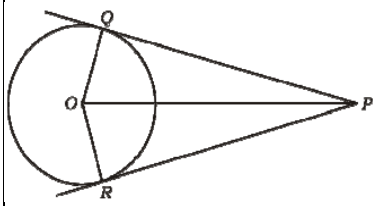
	$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{3}{4}$	$^1/_2$	
16.	**If the area of the surface of sphere is 4π cm. Find the diameter of the sphere.** Ans: Surface area of sphere = 4π $4\pi r^2 = 4\pi$ r = 1 ∴ Diameter = 2r = 2 × 1 = 2 cm	 $^1/_2$ $^1/_2$	1

Qn.Nos.	Value Points		Marks Allotted
III.	**Answer the following questions** **2x8=8**		
17.	**In the given figure, if ∠PQR = ∠PRX, then find ar (ΔPRX) : ar (ΔPQR).** Ans: In ΔPRX and ΔPQR, we have ∠P and ∠PQR = ∠PRX. ΔPRX ~ PQR (by AA similarity rule) $\Rightarrow \frac{ar(\Delta PRX)}{ar(\Delta PQR)} = \frac{RX^2}{QR^2} = \left(\frac{9}{12}\right)^2 = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$  ∠P = ∴	$^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$	2
18.	**On comparing the ratios a_1/a_2, b_1/b_2, and c_1/c_2, find out whether the 3x + 2y = 5 ; 2x – 3y = 7 are consistent, or inconsistent**. Ans: (i) Given: 3x + 2y = 5 or 3x + 2y – 5 = 0 and 2x – 3y = 7 or 2x – 3y – 7 = 0 Comparing the above equations with $a_1x + b_1y + c_1=0$ And $a_2x + b_2y + c_2 = 0$ We get, $a_1 = 3, b_1 = 2, c_1 = -5$ $a_2 = 2, b_2 = -3, c_2 = -7$ $a_1/a_2 = 3/2, b_1/b_2 = 2/-3, c_1/c_2 = -5/-7 = 5/7$ Since, $a_1/a_2 \neq b_1/b_2$ the lines intersect each other at a point and have only one possible solution. Hence, the equations are consistent.	$^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$	2
19.	**Draw a pair of tangents to a circle of radius 4.5 cm, which are inclined to each other at an angle of 45°.** Ans: Angle between the two radii = $180^0 - 45^0 = 135^0$ Draw ∠AOB = 135°,	 $^1/_2$ $^1/_2$ $^1/_2$	2

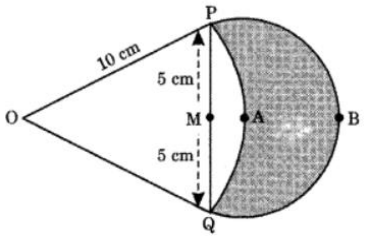
	∠OAP = 90°, ∠OBP = 90° ∴ PA and PB are the required tangents.  	$\frac{1}{2}$	
20.	**Prove that $3 + 2\sqrt{5}$ is irrational.** Ans: Let $3 + 2\sqrt{5}$ be a rational number. Then the co-primes x and y of the given rational number where ($y \neq 0$) is such that: $3 + 2\sqrt{5} = x/y$ Rearranging, we get, $2\sqrt{5} = (x/y) - 3$ $\sqrt{5} = 1/2[(x/y) - 3]$ Since x and y are integers, thus, $1/2[(x/y) - 3]$ is a rational number. Therefore, $\sqrt{5}$ is also a rational number. But this confronts the fact that $\sqrt{5}$ is irrational. Thus, our assumption that $3 + 2\sqrt{5}$ is a rational number is wrong. Hence, $3 + 2\sqrt{5}$ is irrational. **OR** **Given that HCF (306, 657) = 9, find LCM (306, 657).** Ans: As we know that, HCF×LCM=Product of the two given numbers Therefore, $9 \times LCM = 306 \times 657$ LCM = (306×657)/9 = 22338 Hence, LCM (306,657) = 22338	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2
21.	**If $(\alpha - \beta)$, α, $(\alpha + \beta)$ are zeroes of the polynomial $p(x) = 2x^3 - 16x^2 + 15x - 2$, then find the value of α.** Ans: Sum of zeroes = $-\frac{\text{Coeff. of } x^2}{\text{Coeff. of } x^3}$ $\Rightarrow (\alpha - \beta), \alpha, (\alpha + \beta) = \frac{-(16)}{2}$ $\Rightarrow 3\alpha = 8$ $\Rightarrow \alpha = \frac{8}{3}$.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2
22.	**What is the discriminant of the equation $x^2 - 2x + 3 = 0$? Also, determine the number of solutions this equation has.** Ans:		2

	Given, $x^2 - 2x + 3 = 0$ In the equation, $a = 1 ; b = -2 ; c = 3$ The formula for discriminant is, $\Delta = b^2 - 4ac$ $\Rightarrow \Delta = (-2)^2 - 4(1)(3)$ $\Rightarrow \Delta = 4 - 12$ $\Delta = -8 < 0$ Since the value of the determinant is negative, the equation will have no real solutions. **OR** **Find the roots of $3x^2 - 5x + 2 = 0$ by using the quadratic formula.** Ans: $3x^2 - 5x + 2 = 0$ Comparing equations with $ax^2 + bx + c = 0$ Here, $a = 3, b = -5, c = 2$ We know that, $D = b^2 - 4ac$ $D = (-5)^2 - 4\ (3)\ (2)$ $D = 25 - 24$ $D = 1$ So, the roots of the equation is given by $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ putting values $x = \frac{-(-5) \pm \sqrt{1}}{2 \times 3}$ $x = \frac{5 \pm 1}{6}$ Solving $x = \frac{5+1}{6}$ | $x = \frac{5-1}{6}$ $x = \frac{6}{6}$ | $x = \frac{4}{6}$ $x = 1$ | $x = \frac{2}{3}$ Hence, the roots of the equation are 1 and $\frac{2}{3}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
23.	**If $\sin\theta + \cos\theta = \sqrt{2}$, then evaluate $\tan\theta + \cot\theta$** Ans: $\sin\theta + \cos\theta = \sqrt{2}$ $\Rightarrow (\sin\theta + \cos\theta)^2 = (\sqrt{2})^2$ $\Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 2$ $\Rightarrow 1 + 2\sin\theta\cos\theta = 2$ $\Rightarrow \sin\theta\cos\theta = 1/2$ …… (i) we know, $\sin^2\theta + \cos^2\theta = 1$ …… (ii)	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2

	Dividing (ii) by (i) wet get $\frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}=\frac{1}{1/2}\Rightarrow\frac{\sin^{\not 2}\theta}{\not{\sin\theta}\cos\theta}+\frac{\cos^{\not 2}\theta}{\sin\theta\not{\cos\theta}}=2$ $\Rightarrow \tan\theta+\cot\theta=2$	$\frac{1}{2}$ $\frac{1}{2}$	
24.	**A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears** **(i) a two-digit number** **(ii) a perfect square numbers** Ans: The total number of discs = 90 P(E) = (Number of favourable outcomes/ Total number of outcomes) **(i)** Total number of discs having two digit numbers = 81 (Since 1 to 9 are single-digit numbers and so, total 2-digit numbers are 90-9 = 81) P (bearing a two-digit number) = 81/90 = 9/10 = 0.9 **(ii)** Total number of perfect square numbers = 9 (1, 4, 9, 16, 25, 36, 49, 64 and 81) P (getting a perfect square number) = 9/90 = 1/10 = 0.1	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2

Qn.Nos.	Value Points		Marks Allotted
IV.	**Answer the following questions** **3x9=27**		
25.	**Prove that "The lengths of tangents drawn from an external point to a circle are equal"** Ans:  Data: 'O" is the center of the circle PQ and PR are tangents. drawn from external point P. To Prove: PQ = PR Construction: Join OP, OQ and OR Proof : In the figure ∠OQP = ∠ORP = 90º [OQ ⊥ PQ] OR ⊥ PR OQ = OR (radii of same circle) OP = OP (common side) ΔOQP ≅ Δ ORP [RHS] ∴ PQ = PR (C.P.CT) **Note : If the theorem is proved as given in the test-book, give full marks**	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	3

26.	**In figure are shown two arcs PAQ and PBQ. Arc PAQ is a part of circle with centre O and radius OP while arc PBQ is a semi-circle drawn on PQ as diameter with centre M. If OP = PQ = 10 cm show that area of shaded region is $25(\sqrt{3} - \pi/6)$ cm^2**		3



Ans:

Given OP = OQ = 10 cm

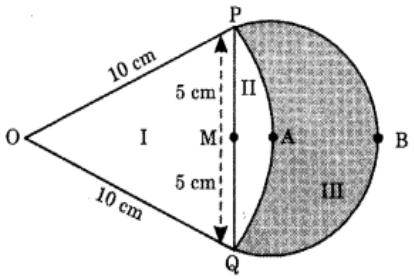
Tangents drawn from an external point to a circle are equal in length. $\frac{1}{2}$

OP = OQ = 10 cm

Therefore, AABC is an equilateral triangle.

$\Rightarrow \angle POQ = 60°$

Now, Area of part II = Area of the sector – Area of the equilateral triangle POQ. $\frac{1}{2}$



$$= \pi r^2 \times \frac{\angle POQ}{360°} - \frac{\sqrt{3}}{4} \times (10)^2$$ $\frac{1}{2}$

$$= \pi(10)^2 \times \frac{60°}{360°} - \frac{\sqrt{3}}{4} \times (10)^2$$

Area of the semicircle on diameter PQ = ar(II) + ar(III)

$$= 100\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right) \text{ sq. units} \quad \text{units}$$ $\frac{1}{2}$

∴ Area of the shaded region (part III)

$$= \frac{25}{2}\pi - 100\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)$$

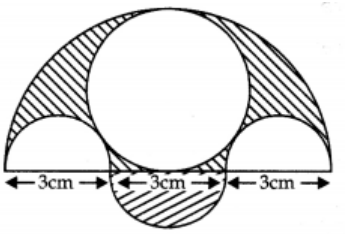
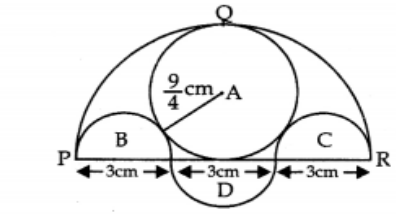
$$= 25\sqrt{3} - \frac{25}{6}\pi$$

$$= 25\left(\sqrt{3} - \frac{\pi}{6}\right) \text{ sq. units.}$$ $\frac{1}{2}$

OR

Three semicircles each of diameter 3 cm, a circle of diameter 4.5 cm and a semicircle of radius 4.5 cm are drawn in the given figure. Find the area of the shaded region.

$\frac{1}{2}$

	Ans:  Let us mark various regions of given figure by P, Q, R, A, B, C & D as shown below**:**  Area of semi-circle PQR = $\frac{\pi}{2}\left(\frac{9}{2}\right)^2 = \frac{81}{8}\pi$ cm^2 Area of region A = $\pi\left(\frac{9}{4}\right)^2 = \frac{81}{16}\pi$ cm^2 Area of region (B + C) = $\pi\left(\frac{3}{2}\right)^2 = \frac{9}{4}\pi$ cm^2 Area of region D = $\frac{\pi}{2}\left(\frac{3}{2}\right)^2 = \frac{9}{8}\pi$ cm^2 Area of shaded region $= \left(\frac{81}{8}\pi - \frac{81}{16}\pi - \frac{9}{4}\pi + \frac{9}{8}\pi\right)$ cm^2 $= \frac{63}{16}\pi$ cm^2 or $\frac{99}{8}$ cm^2	$1/2$ $1/2$ $1/2$ $1/2$ $1/2$	3
27.	**Draw a triangle PQR such that PQ = 5 cm, ∠P = 120° and PR = 6 cm. Construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of ΔPQR.** Ans: In ΔPQR, PQ = 5 cm, PR = 6 cm, ∠P = 120°		3

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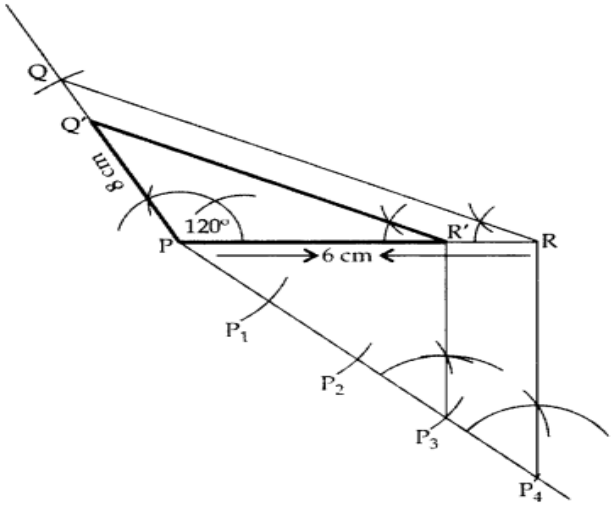

Construction of given triangle
Construction of acute angle with division
Drawing parallel lines
Obtaining of required triangles
∴ Δ PO‘R’ is the required Δ.
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<td>28.</td>
<td>
Find the value of ‘K’, for which the points are collinear.
(8, 1), (k, –4), (2, –5).
Ans:
A(8,1) B(k,-4) C(2,-5)
(x1, y1) (x2,y2) (x3,y3)

Since, the given points are collinear, it means the area of triangle formed by them is equal to zero.

Area of Triangle = $\frac{1}{2}[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)]=0$

$\Rightarrow \frac{1}{2}[8\ \{-4-(-5)\}+k\ (-5-1)+2\ \{1-(-4)\}]$

$=\frac{1}{2}(8-6k+10)=0$

$\Rightarrow \frac{1}{2}(18-6k)=0$

$\Rightarrow 18-6k=0$
$\Rightarrow 18=6k$
$\Rightarrow k=3$
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<td>29.</td>
<td>
Thirty women were examined in a hospital by a doctor and the number of heart beats per minute was recorded and summarised as follows. Find the mean heartbeats per minute for these women, choosing a suitable method.
<table>
<tr><td>Number of heart beats per minute</td><td>65-68</td><td>68-71</td><td>71-74</td><td>74-77</td><td>77-80</td><td>80-83</td><td>83-86</td></tr>
<tr><td>Number of women</td><td>2</td><td>4</td><td>3</td><td>8</td><td>7</td><td>4</td><td>2</td></tr>
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Ans:

From the given data, let us assume the mean as A = 75.5 $\frac{1}{2}$

x_i = (Upper limit + Lower limit)/2 3

Class size (h) = 3

Now, find the u_i and f_i u_i as follows: $\frac{1}{2}$

Class Interval	**Number of women(f_1)**	**Mid Point(x_1)**	**$U_1 = (x_1 - 75.5)/h$**	**F_1u_1**
65-68	2	66.5	-3	-6
68-71	4	69.5	-2	-8
71-74	3	72.5	-1	-3
74-77	8	75.5	0	0
77-80	7	78.5	1	7
80-83	4	81.5	2	8
83 -86	2	84.5	3	6
	Sum f_i= 30			Sum f_iu_i = 4

Mean = $\bar{x} = A + h\sum f_iu_i / \sum f_i$ 2

= 75.5 + 3×(4/30)

75.5 + 4/10

= 75.5 + 0.4 $\frac{1}{2}$

= 75.9

Therefore, the mean heartbeats per minute for these women is 75.9 $\frac{1}{2}$

OR

The following data gives the information on the observed lifetimes (in hours) of 225 electrical components:

Lifetime (in hours)	0-20	20-40	40-60	60-80	80-100	100 - 120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components

Ans:

Lifetime (in hours)	0-20	20-40	**40-60**	**60-80**	**80-100**	100 - 120
Frequency	10	35	**52**	**61**	**38**	29
			f 0	**f 1**	**f 2**	

From the data given as above we may observe that maximum class frequency is 61 belonging to class interval 60 – 80.

So, modal class = 60 – 80 $\frac{1}{2}$

Lower class limit (l) of modal class = 60

Frequency (f_1) of modal class = 61 3

Frequency (f_0) of class preceding the modal class = 52

Frequency (f_2) of class succeeding the modal class = 38

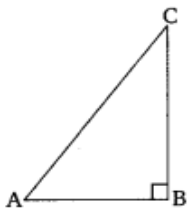
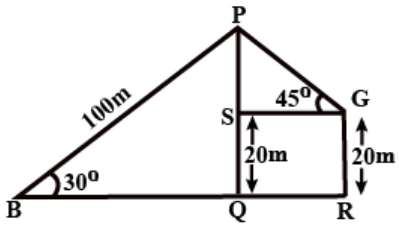
Class size (h) = 20

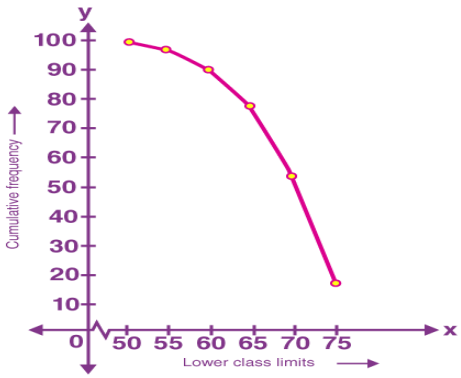
$\frac{1}{2}$

$\frac{1}{2}$

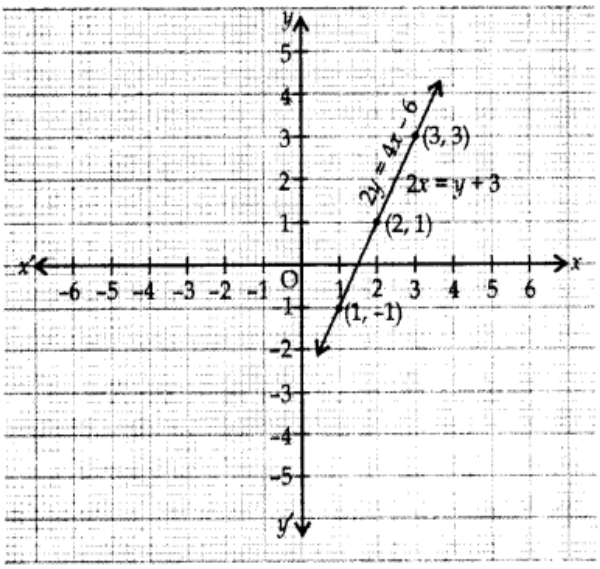
	$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$ $= 60 + \left(\frac{61 - 52}{2(61) - 52 - 38}\right)(20)$ $= 60 + \left(\frac{9}{122 - 90}\right)(20)$ $= 60 + \left(\frac{9 \times 20}{32}\right)$ $= 60 + \frac{90}{16} = 60 + 5.625$ $= 65.625$ So, modal lifetime of electrical components is 65.625 hours.	$^1/_2$ $^1/_2$ $^1/_2$	
30.	**If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are a – b, a, a + b, then find the value of a and b.** Ans: Let the given polynomial be: $p(x) = x^3 - 3x^2 + x + 1$ Given, The zeroes of the p(x) are a – b, a, and a + b. Now, compare the given polynomial equation with general expression. $px^3 + qx^2 + rx + s = x^3 - 3x^2 + x + 1$ Here, p = 1, q = -3, r = 1 and s = 1 For sum of zeroes: Sum of zeroes will be = a – b + a + a + b -q/p = 3a Substitute the values q and p. -(-3)/1 = 3a a = 1 So, the zeroes are 1 – b, 1, 1 + b. For the product of zeroes: Product of zeroes = 1(1 – b)(1 + b) $-s/p = 1 - b^2$ => $-1/1 = 1 - b^2$ Or, $b^2 = 1 + 1 = 2$ So, $b = \sqrt{2}$ Thus, $1 - \sqrt{2}$, 1, $1 + \sqrt{2}$ are the zeroes of equation $x^3 - 3x^2 + x + 1$. **OR** **If 4 is a zero of the cubic polynomial $x^3 - 3x^2 - 10x + 24$, find its other two zeroes.** Ans: Given cubic polynomial is $p(x) = x^3 - 3x^2 - 10x + 24$ 4 is a zero of p(x). So, (x – 4) is the factor of p(x). Let us divide the given polynomial by (x – 4).	$^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$ 1	3

	$x-4 \,\overline{)\, x^3 \quad -3x^2 \quad -10x \quad +24}$ (quotient $x^2 \quad +x \quad -6$) $-$ $x^3 \quad -4x^2$ $x^2 \quad -10x \quad +24$ $-$ $x^2 \quad -4x$ $-6x \quad +24$ $-$ $-6x \quad +24$ 0 Here, the quotient = $x^2 + x - 6$ $= x^2 + 3x - 2x - 6$ $= x(x + 3) - 2(x + 3)$ $= (x - 2)(x + 3)$	$^1/_2$ $^1/_2$ $^1/_2$	3
31.	**Evaluate (1 + $\tan^2$A/1 + $\cot^2$A) = (1 – tan A/1 – cot A)^2 = $\tan^2$A** Ans: Given: (1 + $\tan^2$A/1 + $\cot^2$A) = (1 – tan A/1 – cot A)^2 = $\tan^2$A LHS: = (1+$\tan^2$A) / (1+$\cot^2$A) Using the trigonometric identities we know that 1+$\tan^2$A = $\sec^2$A and 1+$\cot^2$A= cosec^2A = $\sec^2$A/ cosec^2A On taking the reciprocals we get = $\sin^2$A/$\cos^2$A = $\tan^2$A RHS: =(1-tanA)^2/(1-cotA)^2 Substituting the reciprocal value of tan A and cot A we get, = (1-sinA/cosA)^2/(1-cosA/sinA)^2 = [(cosA-sinA)/cosA]^2/ [(sinA-cos)/sinA)^2] = [(cosA-sinA)^2×$\sin^2$A] /[$\cos^2$A. /(sinA-cosA)^2] = $\sin^2$A/$\cos^2$A = $\tan^2$A The values of LHS and RHS are the same. Hence proved. **OR** **In triangle ABC, right angled at B, if tan A = $\frac{1}{\sqrt{3}}$, find the value of sin A cos C + cos A sin C.** Ans:	$^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$	3

	Let ABC is a right triangle at B. $\because \tan A = \frac{BC}{AB} = \frac{1}{\sqrt{3}}$ $\therefore \frac{BC}{AB} = \frac{1}{\sqrt{3}}$  Let $AB = \sqrt{3}k$ and $BC = k$ Then by Pythagoras' Theorem, we have: $AC^2 = AB^2 + BC^2 = \left(\sqrt{3}k\right)^2 + (k)^2$ $\Rightarrow \quad AC = \sqrt{4k^2} = 2k$ [Hypotenuse] Now $\sin A = \frac{BC}{AC} = \frac{k}{2k} = \frac{1}{2}$ $\cos A = \frac{AB}{AC} = \frac{\sqrt{3}k}{2k} = \frac{\sqrt{3}}{2}$ $\sin C = \frac{AB}{AC} = \frac{\sqrt{3}k}{2k} = \frac{\sqrt{3}}{2}$ $\cos C = \frac{BC}{AC} = \frac{k}{2k} = \frac{1}{2}$ (i) $\sin A \cos C + \cos A \sin C$ $= \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$ $= \frac{1}{4} + \frac{3}{4} = \mathbf{1}.$	$^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$ $^1/_2$	3
32.	**A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of 300. A girl standing on the roof of 20 m high building, finds the angle of elevation of the same bird to be 450. Both the boy and the girl are on opposite sides of the bird. Find the distance of the bird from the girls**. Ans: The position of the boy is at point B of elevation 30^0 and that of the girl is at point G of elevation 45^0. In △PQB $\sin 30^0 = \frac{PQ}{PB}$ $\Rightarrow \frac{1}{2} = \frac{PQ}{100}$ $\Rightarrow PQ = 50$ m  Now, PS=PQ−SQ =PQ−GR =(50−20) m =30 m	$^1/_2$ $^1/_2$ $^1/_2$	3

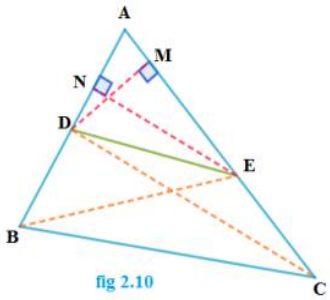
	In △PSG $\sin 45^0 = \frac{PS}{PG}$ $\Rightarrow \frac{1}{\sqrt{2}} = \frac{30}{PG}$ =>PG=30√2 m =>PG=3×1.41429 [since √2=1.41429] =>PG=42.42 The distance of the bird from the girls is 42.42 m	½ ½ ½	
33.	**The following tables give the production yield per hectare of wheat of 100 farms of a village.** Production Yield: 50-55 | 55-60 | 60-65 | 65-70 | 70-75 | 75-80 Number of farms: 2 | 8 | 12 | 24 | 38 | 16 **Change the distribution to a more than type distribution and draw its ogive.** **Ans:** Converting the given distribution to a more than type distribution, we get. **Production Yield (kg/ha) — Number of farms** More than or equal to 50 — 100 More than or equal to 55 — 100-2 = 98 More than or equal to 60 — 98-8= 90 More than or equal to 65 — 90-12=78 More than or equal to 70 — 78-24=54 More than or equal to 75 — 54-38 =16 Drawing axes and writing scale (½ + ½) = Marking points Drawing ogive  	1 1 1	3

Qn.Nos.	Value Points		Marks Allotted
V.	**Answer the following questions** **4x4=16**		
34.	**If the ratio of the sum of first n terms of two A.P/s is (7n + 1):(4n + 27), find the ratio of their mth terms.** Ans: Let a_1, d_1; a_2 d_2 be first term and common difference of two A.P.'s respectively. Given: $\frac{S_n \text{ of Ist AP}}{S_n \text{ of IInd AP}} = \frac{7n+1}{4n+27}$ $\Rightarrow \frac{\frac{n}{2}[2a_1+(n-1)d_1]}{\frac{n}{2}[2a_2+(n-1)d_2]} = \frac{7n+1}{4n+27}$ $\Rightarrow \frac{a_1+\frac{(n-1)}{2}d_1}{a_2+\frac{(n-1)}{2}d_2} = \frac{7n+1}{4n+27}$ ...(1) For mth term, we have $\frac{t_m \text{ of Ist AP}}{t_m \text{ of IInd AP}} = \frac{a_1+(m-1)d_1}{a_2+(m-1)d_2}$ ...(2) Compare LHS of (1) with RHS of (2) Put $\frac{n-1}{2} = m-1$ $\Rightarrow n-1 = 2m-2$ $\Rightarrow n = 2m-1$ Replace n by $2m-1$ in (1) we get $\frac{a_1+(m-1)d_1}{a_2+(m-1)d_2} = \frac{7(2m-1)+1}{4(2m-1)+27} = \frac{14n-6}{8m+23}$ ∴ Required rate is (14n – 6) : (8m + 23) Hence, in 10th week her savings will be ₹ 20.75. **OR** **The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7:15. Find the numbers** Ans: Let the reqd. numbers be α – 3β, α – β, α + β, α + 3β, α – 3β + α – β + α + β + α + 3β = 32 4α = 32 α = 8	½ ½ ½ ½ ½ ½ ½ ½	4

	∴ Numbers are $8-3\beta, 8-\beta, 8+\beta, 8+3\beta$ $\frac{(8-3\beta)(8+3\beta)}{(8-\beta)(8+\beta)} = \frac{7}{15}$ $\Rightarrow \quad \frac{64-9\beta^2}{64-\beta^2} = \frac{7}{15}$ $\Rightarrow 64 \times 15 - 9 \times 15\beta^2 = 7 \times 64 - 7\beta^2$ $\Rightarrow 960 - 135\beta^2 = 448 - 7\beta^2$ $\Rightarrow 128\beta^2 = 512$ $\Rightarrow \beta^2 = \frac{512}{128} = \frac{32}{8} = 4$ $\Rightarrow \beta = \pm 2$ When $\beta = 2$ Numbers are 2, 6, 10, 14 When $\beta = -2$ Numbers are 14, 10, 6, 2.	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
35.	**Draw the graph of $2y = 4x - 6$; $2x = y + 3$** Ans: $2y = 4x - 6$ $\Rightarrow y = 2x - 3$ x: 1, 2, 3 y: -1, 1, 3 (-1, 1), (2, 1), (3, 3) $2x = y + 3$ $\Rightarrow y = 2x - 3$ x: 1, 2, 3 y: -1, 1, 3 (1, -1), (2, 1), (3, 3)  For table construction 1 + 1 Drawing two lines by marking points 1 Marking point of intersection and writing values of x and y 1 **Note : Any other points can be considered to get straight line**		4
	Obtain all other zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeroes are $\sqrt{(5/3)}$ and $-\sqrt{(5/3)}$. **Ans:**		

36.	Since this is a polynomial of degree 4, hence there will be a total of 4 roots. $\sqrt{(5/3)}$ and $-\sqrt{(5/3)}$ are zeroes of polynomial f(x). $\therefore [x-\sqrt{(5/3)}]\,[x+\sqrt{(5/3)}] = x^2-(5/3)$ $3x^2 + 6x + 3$ $x^2 - 5/3 \;\big|\; 3x^4 + 6x^3 - 2x^2 - 10x - 5$ $3x^4 \quad -5x^2$ (-) (+) $+6x^3 + 3x^2 - 10x - 5$ $+6x^3 \quad - 10x$ (-) (+) $3x^2 \quad - 5$ $3x^2 \quad - 5$ (-) (+) 0 Therefore, $3x^2 + 6x + 3 = 3x(x + 1) + 3(x + 1)$ $= (3x + 3)(x + 1)$ $= 3(x + 1)(x + 1)$ $= 3(x + 1)(x + 1)$ Hence, $x + 1 = 0$ i.e. $x = -1, -1$ is a zero of p(x). So, its zeroes are given by: $x = -1$ and $x = -1$. Therefore, all four zeroes of the given polynomial are: $\sqrt{(5/3)}$ and $-\sqrt{(5/3)}$, -1 and -1.	$\frac{1}{2}$ $\frac{1}{2}$ 1 1 $\frac{1}{2}$ $\frac{1}{2}$	4
37.	**504 cones, each of diameter 3.5 cm and height 3cm, are melted and recast into a metallic sphere. Find the diameter of the sphere and hence find its surface area. (Use $\pi = 22/7$) .** Ans: Let the radius of sphere (R) = ? Let the radius of cone (r) = 3.5/2 = 35/20 Let the height of cone (h) = 3 cm Volume of metal in 1 cone = $1/3\pi r^2 h$ Volume of metal in 504 cones $= \left(504 \times \frac{1}{3} \times \frac{22}{7} \times \frac{35}{20} \times \frac{35}{20} \times 3\right) \text{cm}^3$ Volume of sphere = Volume of 504 cones $\Rightarrow \frac{4}{3}\pi R^3 = 504 \times \frac{1}{3} \times \frac{22}{7} \times \frac{35}{20} \times \frac{35}{20} \times 3$ $\Rightarrow \frac{4}{3} \times \frac{22}{7} \times R^3 = 504 \times \frac{77}{8}$ $\Rightarrow \frac{88}{21} \times R^3 = \frac{38808}{8}$ $\Rightarrow R^3 = \frac{38808}{8} \times \frac{21}{88} = \frac{814968}{704}$ $= 1157.625$ cm $\Rightarrow R = 10.5$ cm	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	4

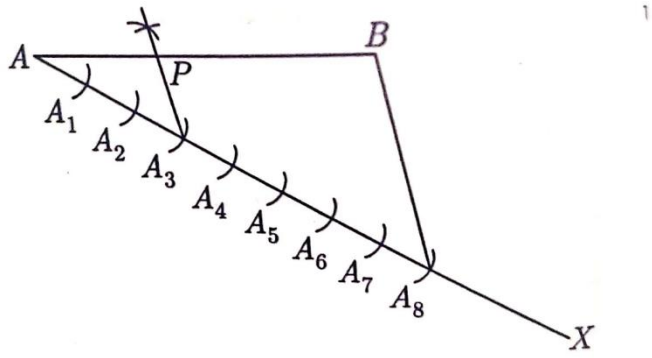
	∴ Diameter = 2R = 2(10.5) = 21 cm Surface area of metallic sphere = $4\pi R^2$ $= 4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$ = **1386 cm²**	½ ½	

Qn.Nos.	Value Points		Marks Allotted
VI	**Answer the following questions** **5x1=5**		
38.	**State and prove "Basic Proportionality Theorem"** **Statement**: If a line is drawn parallel to one side of a triangle and intersects the other two sides, then the other two sides are divided in the same ratio. **Data:** ABC is a triangle; DE is a line parallel to BC and intersecting AB at D and AC at E, i.e., DE || BC. **To Prove:** $\frac{AD}{DB} = \frac{AE}{EC}$ **Construction:** Join C to D and B to E. Draw EN ⊥ AB and DM ⊥ AC. **Proof:** Area of a triangle, ADE = ½ × AD × EN Similarly, Ar(BDE) = ½ × DB × EN Ar(ADE) = ½ × AE × DM Ar(DEC) = ½ × EC × DM Hence, $\frac{Ar(ADE)}{Ar(BDE)} = \frac{½ \times AD \times EN}{½ \times DB \times EN} = \frac{AD}{DB}$ …… (1) Similarly, $\frac{Ar(ADE)}{Ar(DEC)} = \frac{½ \times AE \times DM}{½ \times EC \times DM} = \frac{AE}{EC}$ ……. (2) Triangles DEC and BDE are on the same base, i.e., DE and between same parallels DE and BC. Hence, Ar(BDE) = Ar(DEC) From the above equations, we can say that $\frac{AD}{DB} = \frac{AE}{EC}$ Hence, proved.  fig 2.10	½ ½ ½ ½ ½ ½ ½ ½ ½	5

KEY ANSWER MODEL QUESTION PAPER – 4

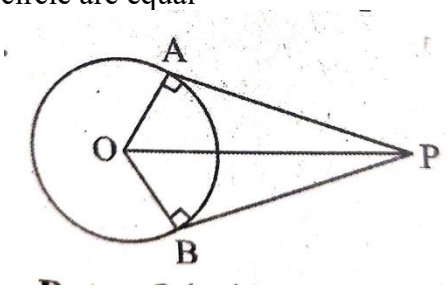
Qn. Nos.	Ans. key	Value point	Marks Allotted
I		**Multiple Choice Questions :** **8X1 = 8**	1
1	C	HCF: (12, 21, 15 ,) = 3 LCM: (12, 21, 15) = 2X2X3X5x7 = 420 (3, 420)	
2	C	$a_n = a + (n – 1) d$ $a_{18} – a_{13} = 85 – 60 = 25$	1
3	C	Since DE||BC, AD /DB = AE/EC = 1.5/3 =1/EC = EC = 2 cm	1
4	C	Sum of the zeroes , 6 = 3k/2, k = 12/3 =4	1
5	A	Mode = 3 median – 2 mean	1
6	C	$1/3\ \pi h (r_1^2+r_2^2+r_1r_2)$	1
7	D	30^0	1
8	D	9	1
II		**Answer the following :** **8 x 1 = 8** **(Direct answers , I mark should be given)**	
9.		$\Theta = \pi r^2 / 4$	1
10.		Given positive integers a and b there exists unique integers q and r satisfying $a = bq + r$ $(0 \leq r \leq b)$	1
11		$P (-2) = (-2)^2 + k(-2) + 4 = 0$ $4 – 2k + 4 = 0$ $2k = 8$ $K = 4$	1
12.		In a triangle if square of on side is equal to the sum of the squares of the other two sides then the angle opposite to the first side is a right angle.	1
13.		Cot A =1/ √3 $A = 60^0$	1
14.		tan C = opp / adj	1

		$\tan 45^0 = x / 50$ $1 = 50 \times 1$ $x = 50m$	1
15.		$5x^2 - 3x + 1 = 0$ $A = 5, \quad b = -3 \quad c = 1$ $D = b^2 - 4ac$ $(-3)2 - 4(5)(1)$ $9 - 20 < 0$ No real roots	1
16.		$\frac{11 + 1}{2} = 6$ $a_6 = a + 5d = 30$ $Sn = \frac{11 + 1}{2} = 6$ $11 (a + 5d) = 11 \text{ X } 30 = 330$	
III		**Answer the following :** **8 x 2 = 16**	
17.		$7/75 = 7/3 \text{ X } 5^2$ Since denominator of given rational number is not of form $2^m \text{ X } 5^n$. Hence, it is non termination decimal-expansion.	2
18.		$2x - y = 2$ -------1 $X + 3y = 15$-----2 From eqn 1 , $y = 2x - 2$ ------3 Substitute the value of y in eqn 2 $X + 6x - 6 = 15$ $7x = 21$ $X = 3$ Substitute the value of x in eqn 3 We get, $y = 2 \times 3 - 2 = 4$ $X = 3, \quad y = 4$	2
19.		$6x^2 - x - 2 = 0$ $6x^2 + 3x - 4x - 2 = 0$ $(3x - 2) (2x + 1)$ $X = -1/2, \quad x = 2/$	2
20.		Total possible outcomes of die is 6 $n(s) = 6$ favorable outcomes is only 2 that is there is one possible outcome $n(E) = 1$ $p (E) = n(E) / n (s) = 1 / 6.$	2
21.		$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $D = \sqrt{(-5 - 0)^2 + (0 - (-5))^2}$ $D = 5^2 + 5^2 = \sqrt{50}$	2

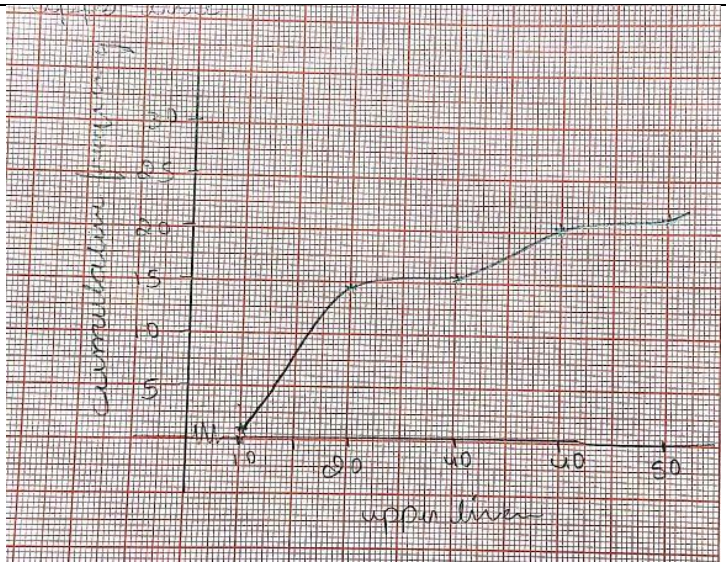
22.		Here AB = 24mCB = 25cm and angle CAB = 90^0 By Pythagoras theorem CB = $CB^2 - AB^2 = 23^2 - 24^2$ $625 - 576 = \sqrt{49}$ Then CA = 7m. **OR** We have D = E and AD / DB = AE/ EC By converse of BPT, DE||BC Due to corresponding angles we have ADE = ABC and AED = ACB Given ADE = AED Thus ABC = ACB Therefore BAC is an isosceles triangle.	2
23.		length 7 cm and divide it in the ratio 3 : 5 by geometrical constructions.  	2
24.		$\frac{\text{Sin A} - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$ $\frac{\sin A (1 - 2\sin^2 A)}{\cos A (2\cos^2 A - 1)}$ $\frac{\tan A (1 - 2 (1 - \cos^2 A)}{2 \cos^2 A - 1)}$ $\frac{\tan A (1 - 2 + 2\cos^2 A)}{2\cos^2 A - 1}$ $\frac{\tan A (2\cos^2 A - 1)}{2\cos^2 A - 1)} = \tan A$ **OR** $\frac{3 \tan^2 30^0 + \tan^2 60^0 + \text{cosec } 30^0 - \tan 45^0}{\text{Cot}^2 45^0}$ $\frac{3 \times (1/\sqrt{3})^2 + (\sqrt{3})^2 + 2 - 1}{(1)^2}$	2

		$\frac{3 \times 1/3 + 3 + 2 - 1}{1}$ $1 + 3 + 2 - 1 = 5$	
IV		**Answer the following :** **9 X 3 = 27**	
25.		Let the fraction be x / y .A.T. Q. $\frac{x-2}{y} = \frac{1}{3}$ $3x - 6 = y$ $Y = 3x - 6$ ----------1 $\frac{x}{y-1} = \frac{1}{2}$ $2x = y - 1$ $y = 2x + 1$ ---------2 From 1 and 2 $3x - 6 = 2x + 1$ $X = 7$ Substitute the value of x in equation 1 We get y = 15 Hence fraction is 7 / 15 **OR** We have CD = BE $X + y = 7$ --------1 Also, perimeter of ABCDE is 27cm, thus AB + BC + CD + DE + AE = 27 $5 + (x - y) + (x + y) + (x - y) + 5 = 27$ $3x - y = 17$ --------2 Adding equation 1 and 2 we have, $4x = 24$ $X = 6$ Therefore, $y = 7 - x$ $Y = 1$ X = 6 and y = 1	3
26.		We have $p(x) = 5x^2 + 8x - 4 = 0$ $5x^2 + 10x - 2x - 4 = 0$ $5x (x + 2) - 2 (x + 2) = 0$ $(x + 2) (5x - 2)$ Substituting p(x) = 0 We get -2 and 2 /5 Verification : sum of zeroes = -b/a = -8/5 Product of zeroes = c / a = -4 /5	3
27.		$2 x^2 + x - 4 = 0$ $X^2 + x / 2 - 2 = 0$ $X^2 + 2x (¼) - 2 = 0$ Adding and subtractions (¼) 2	3

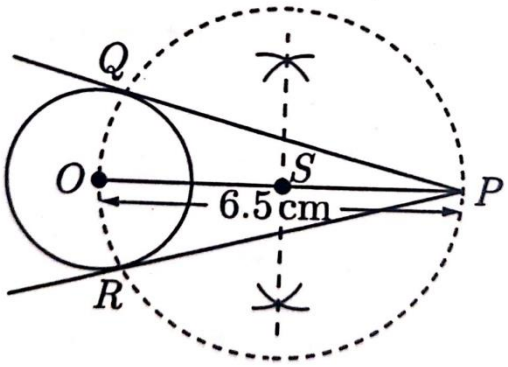
		We get $x^2 + 2x (¼) + (¼)^2 - (¼)^2 – 2$ $(x + ¼)^2 – (1 /16 + 2) = 0$ $(x + ¼)^2 – (1 + 33 / 16 = 0$ $(x + ¼)^2 - 33 / 16 = 0$ $(x + ¼)^2 = ± √33/4$ Thus roots are $x = \frac{-1 + √33}{4}$ $\frac{-1 - √33}{4}$ **OR** The age of student A is 19 years The age of student B is 15 years After x years their ages will 20 (x + 19) (x + 15) = 480 X2+ 15x + 19x + 285 = 480 X2 + 34x + 285 – 480 = 0 X2 + 34x – 195 = 0 X2 + 39x – 5x – 195 = 0 X (x + 39) – 5 (x +3) = 0 X + 39 = x = -39 X – 5 = 0 X = 5 Therefore After five years the product of the ages of student A and B will be 480	
28.		Let p (x_1, y_1) and Q(x_2 ,y_2) trisect AB. Thus P divides AB in the ratio 1 : 2 and Q divides AB in the ratio 2 : 1 $x = \frac{mx_2 + nx_1}{m + n}$ $y = \frac{my_2 + ny_1}{m + n}$ $P (x_1, y_1) = \frac{1 (-4) + 2 (2)}{2 + 1,}$ $\frac{2 (-6) + 1 (-3)}{2 + 1}$ $\frac{(-4 + 4)}{3}$ $\frac{- 6 –(- 6)}{3}$ $= (0 , -4)$ $Q (x_2, y_2) = \frac{2(-4) + 1 (2)}{2 + 1,}$ $\frac{2 (-6) + 1 (-3)}{2 + 1}$ $\frac{-8 + 2}{3}$	3

		$\frac{12 + (-3)}{3}$ = (-2, -5). **OR** Area of triangle = ½ [$x(y_2 – y_3) + x_2 (y_3 – y_1) + x_3 (y_1 – y_2)$] = ½ [-5(-5-2) + 3(2 + 1) + 5 (-1 + 5)] ½ [35 + 9 + 20] ½ [35 + 29] ½ x 64 = 32 sq. units. L = 30, f0 = 9, f1 =10, f2 = 3, h = 5 $M0 = l + \frac{[f1 – f0]}{[2f1 –f0 –f2]\ h}$ $30 + \frac{[\ 10 – 9\ ]}{[2 \times 10 – 9 – 3\ ] \times 5}$ 30 + 5/8 = 30 + 0.625 = 30.625	
29.		Statement : The length of tangents drawn from an external point to a circle are equal “  Data: ‘O’ is the centre of the circle. PA and PB are the two tangents drawn from an external point P. OA and OB are radii of the circle. To prove that : AOB + AOB = 180^0 OAP + OBP = 90^0 OP = OP (common side) OA = OB APO ≡BPO (RHS) OAP = OBP = 90^0 OAP + OBP = $90^0 + 90^0 = 180^0$ Therefore OAPB is acyclic quadrilateral APB + AOB = 180^0	3
30.		$\frac{\Theta}{360^0}$ X $\pi r2$ = Area of the sector 60^0/ 360 X 3,14 (10) ^{2} = 1/6 x 3.14 x 10 x10 = 52.33 cm^2 Area of triangle = $\frac{\sqrt{3}}{4}$ a^2	3

		$= \frac{\sqrt{3}\ 10 \times 10}{4}$ 43.30 area(minor segment) area (sector) – area of triangle 52.33 – 43.30 $= 9.03 cm^2$ area of circle $\Pi r^2 = 3.14 \times 10 \times 10$ 314 area (major segment) – area (circle) – area (minor segment) = 314 – 9.03 $= 304.97\ cm^2$ **OR** Let us mark the four un shaded regions a I , II, III and IV area of I + area of III area of ABCD – area of two semicircles of each radius 5 cm $[10 \times 10 – 2 \times ½ \times \pi \times 5^2]\ cm^2$ $[100 – 3.14 \times 25]\ cm^2$ $[100 – 78.5]\ cm^2$ $= 21.5\ cm^2$ Similarly, Area of II + area of IV = $21.5\ cm^2$ So area of the shaded region = area of ABCD – Area of [I+ II+ III +IV] $= [\ 100 – 2 \times 21.5\ )\ cm^2$ $[100 – 43]\ cm^2$ $= 57 cm^2$	
31.		$M = l + \frac{[f_1 – f_0]}{[\ 2f_1 – f_0 – f_2\ ]} \times h$ L = 30, $f_0 = 9$ $f_1 = 10$, $f_2 = 3$, h = 5 $30 + \frac{[10 – 9]}{[2 \times 10 – 9 – 3]} \times 5$ 30 + 5/8 = 30 + 0.625 30.625	3
32.		Less than type ogive	3



33.



3

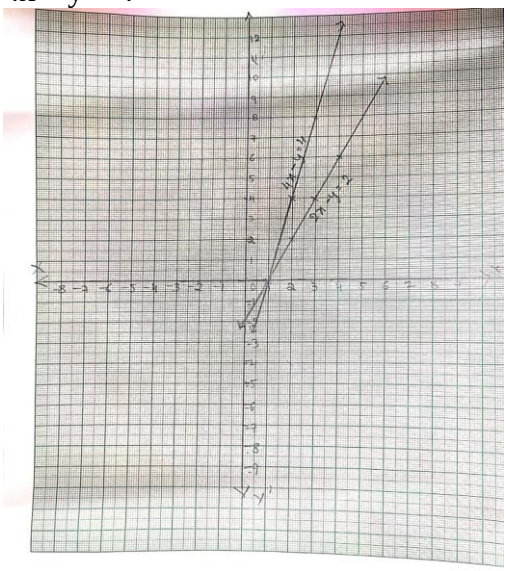
V **Answer the following :** **4 x 4 = 16**

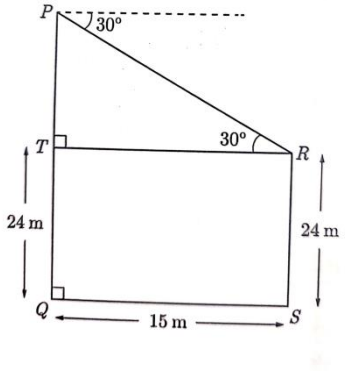
34. Solve graphically :

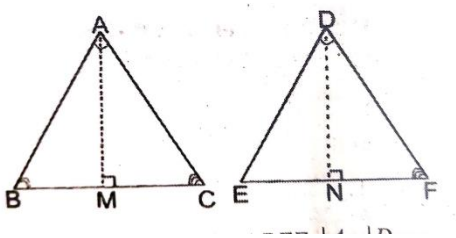
$2x - y = 2$

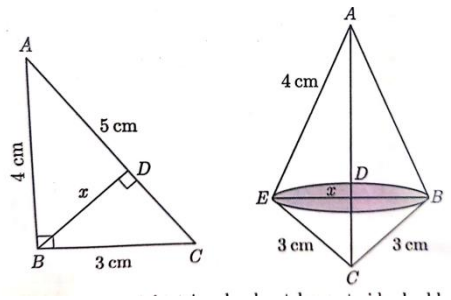
$4x - y = 4$

4



35.		$a = 3,\ a_n = 83,\ S_n = 903$ $S_n = n/2\ [\ a + a_n\ ]$ $903 = n/2\ [\ 3 + 83]$ $1806 = 86n$ $n = 1806 / 86$ $n = 21$ $S_n = n/2\ [\ 2a + (\ n- 1)\ d\ ]$ $903 = 21 / 2\ [\ 2 \times 3 + (\ 21 – 1\ )\ d\ ]$ $1806 = 21\ (\ 6 + 20d\ )$ $20d = 80$ $d = 4$ **OR** $a_{13} = 4a_3$ $a + 12d$ $4\ (\ a + 2d\ )$ $3a = 4d$---------1 $a_5 = 16$ $a + 4d = 16$ --------2 From 1 and 2 $a = 4/3\ d$ $4/3\ d + 4d = 16$ $16d = 48$ $d = 3$ Therefore, $a = 4,\ \ d = 3$ $S_n = n/2\ [\ 2a + (\ n -1\ )\ d\ ]$ $S_{10} = 10/2\ [\ 2 \times 4 + (\ 10 – 1\ )\ 3\ ]$ $5\ [\ 8 + 27\ ]$ $5 \times 35 = 175$ $S_{10} = 175$	4
36.		RS = first pole PQ = second pole  In right triangle PTR, $\tan 30^0 = PT / TR$ $1 / \sqrt{3} = PT / TR$ $PT = 15 / \sqrt{3} = 5\sqrt{3}$ $5 \times 1.732 = 8.66$	4

37.		PQ = PT + TQ 8.66 + 24 Second pole = 32.66m Statement: Areas of similar triangle are proportional to the squares on the corresponding sides “.  Data : ABC ≡ DEF A = D AB / DE = AC / Df = BC / EF B = E = C = F To Prove : $\frac{\text{area of ABC}}{\text{area of DEF}}$ = $AB^2/DE^2 = AB^2/DF^2 = BC^2/EF^2$ Draw AM perpendicular BC and DM perpendicular to EF $\frac{\text{Area of ABC}}{\text{Area of DEF}} = \frac{\frac{1}{2} BC \times AM}{\frac{1}{2} EF \times DN}$ ABM and DEN AMB = DNE = 90^0 B = E BAM = EDN ABM and DEN are equiangular ABM≡DEN AB /DE =AM /DN = BM / EN AB / DE = AM /AN But AB /DE = BC /EF = AM /DN = BC/ EF $\frac{\text{Area of ABC}}{\text{Area of DEF}}$ $\frac{BC}{EF} \times \frac{AM}{DN} = \frac{BC}{EF} \times \frac{BC}{EF} = \frac{BC^2}{EF^2}$ $\frac{\text{Area of ABC}}{\text{Area of DEF}} = \frac{BC^2}{EF^2} = \frac{AB^2}{DE^2} = \frac{AC^2}{DF^2}$	4

VI 38.		**Answer the following :** **5 x 1 = 5**  We have, $AC^2 = 20^2 + 15^2 = \sqrt{625}$ AC = 25cm Area (ABC) = area (ABC) ½ x AC x BD = ½ x BC x AB 25 x BD = 15 x 20 = 300 BD = 12cm Volume of double cone = volume of upper cone + volume of lower cone $= 1/3\ \pi\ (BD)^2$ x AD + $1/3\ \pi(BD)^2$ x CD $= 1/3\ \pi\ (BD)^2$ (AD + CD) $1/3$ x 3.14 x $(12)^2$ x 25 1/3 x 3.14 x 144 x 25 = 3768 cm^2 Surface area = CSA of upper cone + CSA of lower cone $= \pi(12)(20) + \pi\ (2)\ (15)$ $12\ \pi\ (20 + 15\ )$ = 12 x 3.14 x 35 = 1318.8cm^2. **********	5