Secondary 4 Mathematics
2nd Term Pre-exam (Paper 2)

Time allowed: 1.5 hours

Total Mark: 54

- *Answer ALL questions. All the answers should be marked on the Answer Sheet.*
- *Note that you may only mark **ONE** answer to each question. Two or more answers will score **NO MARKS**.*
- *All questions carry equal marks. No marks will be deducted for wrong answers.*

SECTION A

1. If $4^x \cdot 8^{2x} = 32$, find the value of x.

   A. $\frac{1}{3}$

   B. $\frac{5}{12}$

   C $\frac{1}{2}$

   D. $\frac{5}{8}$

2. Factorize $x^2 - 4y^2 + 4yz - z^2$.

   A. $(x + 2y - z)(x + 2y + z)$

   B. $(x + 2y + z)(x - 2y - z)$

   C. $(x - 2y + z)(x + 2y - z)$

   D. $(x - 2y + z)^2$

3. $\sqrt[3]{(-27)(-a)^3} =$

   A. $\frac{3}{a}$

   B. $3a$

   C. $3a^{\frac{3}{2}}$

   D. $9a^2$

4. If $36^x = 216^y$, and x, y are non-zero numbers, find $x : y$.

A. 6 : 1

B. 3 : 2

C. 2 : 3

D. 1 : 6

5. If $f(x) = 3^{2x-4}$, find $f(1-x) \cdot f(1+x)$.

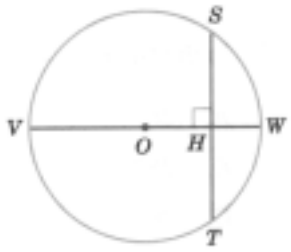
A. $\frac{1}{81}$

B. $\frac{1}{9}$

C. $\frac{1}{3}$

D. 1

6. In the figure, a chord ST is perpendicular to a diameter VW. If VH = 16 cm and HW = 4 cm, find ST.



A. 10 cm

B. 12 cm

C. 14 cm

D. 16 cm

7. If $4(x-1)^2 = (x+1)^2$, solve for x.

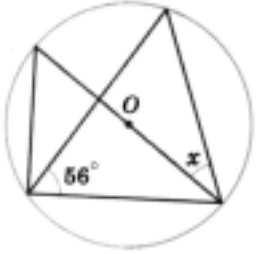
A. $x = 1$ or $x = -1$

B. $x = \frac{1}{4}$ or $x = 1$

C. $x = -3$ or $x = \frac{1}{2}$

D. $x = 3$ or $x = \frac{1}{3}$

8. In the figure, x =



A. 26 °

B. 28 °

C. 30 °

D. 34 °

9. If the equation $(p-1)x^2 - 2x + 1 = 0$ has distinct real roots, then

A. $p > 2$

B. $p \geq 2$

C. $p < 2$

D. $p \leq 2$

10. If $p(x^2 + x) + q(x^2 - x) \equiv 3x^2 + 6x$, find p and q.

A. $p = 3,\ q = 6$

B. $p = 6,\ q = 3$

C. $p = -\frac{9}{2},\ q = \frac{3}{2}$

D. $p = \frac{9}{2},\ q = -\frac{3}{2}$

11. Solve $\begin{cases} x^2 - 3 = y^2 \\ y = x - 3 \end{cases}$.

A. $\begin{cases} x = 2 \\ y = -1 \end{cases}$

B. $\begin{cases} x = 4 \\ y = 1 \end{cases}$

C. $\begin{cases} x = 5 \\ y = 2 \end{cases}$ or $\begin{cases} x = -2 \\ y = -5 \end{cases}$

D. $\begin{cases} x = 1 \\ y = -2 \end{cases}$ or $\begin{cases} x = 3 \\ y = -4 \end{cases}$

12. If x varies jointly as y^2 and z^2, then which of the following is a constant?

A. $y^2 z^2$

B $\frac{z^2}{xy^2}$

C. $\frac{y^2}{xz^2}$

D. $\frac{x}{y^2 z^2}$

13. Which of the following statements is / are true?

I. $\sin 90° = \sin 30° + \sin 60°$

II. $\cos 90° = 2\cos 45°$

III. $\frac{1}{2}\tan 60° = \tan 30°$

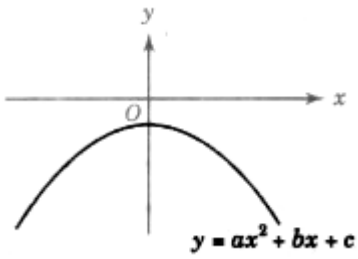
A. I only.

B. II only.

C. III only.

D. None of the above.

14. The figure shows the graph of the equation $y = ax^2 + bx + c$. Which of the following must be true?



I. $a < 0$

II. $c > 0$

III. $b^2 - 4ac > 0$

A. I only.

B. II only.

C. III only.

D. I and II only.

15. If $\cos\theta = \frac{1}{x}$, where $x > 0$, then $\sqrt{1 + \tan^2\theta} =$

A. x

B. $-x$

C. $\frac{1}{x}$

D. $-\frac{1}{x}$

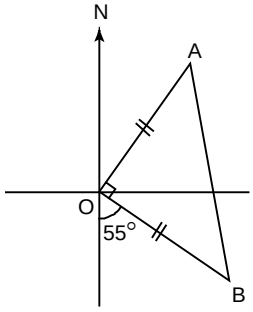
16. In the figure, the bearing of B from A is

A. 005°.

B. 055°.

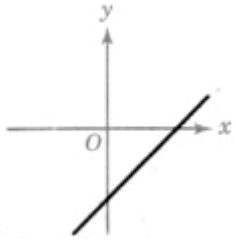
C. 095°.

D. 170°.

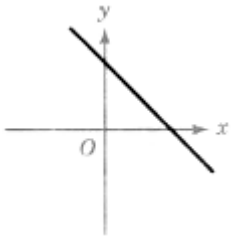


17. If a, b are positive and c is negative, which of the following may represent the graph of $ax + by + c = 0$?

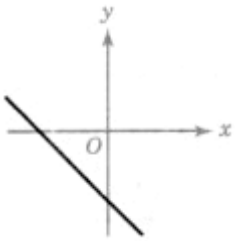
A.



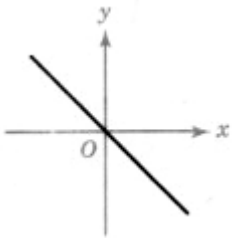
B.



C.

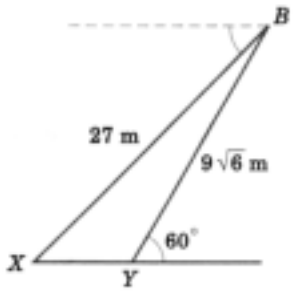


D.



18. In the figure, X and Y are two observers on level ground. X is due west of Y. A balloon B is due east of Y and at an angle of elevation of $60°$. If the distances of B from X and Y are 27 m and $9\sqrt{6}$ m respectively, then the angle of depression of X from B is

A. $15°$
B. $30°$
C. $45°$
D. $60°$

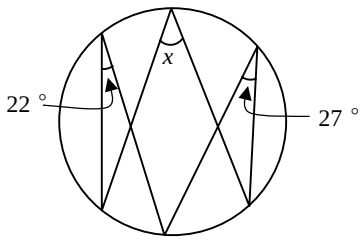


19. Given that $x = 3 - \sqrt{5}$, the value of $x^3 - 32x$ is

A. –24
B. $5\sqrt{5} - 21$
C. $12 - 4\sqrt{5}$
D. $2 - 14\sqrt{5}$

20. In the figure, x =

A. 26 °
B. 28 °
C. 30 °
D. 34 °



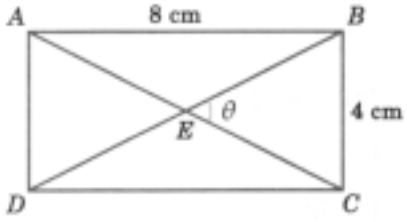
21. In the figure, ABCD is a rectangle. Find θ correct to the nearest degree.

A. 26°

B. 27°

C. 52°

D. 53°



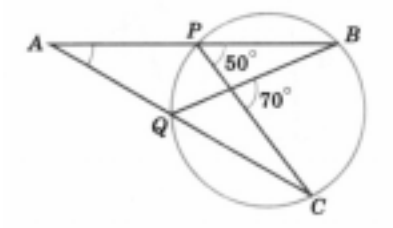
22. In the figure, APB and AQC are straight lines. Find $\angle$BAC.

A. 15°

B. 20°

C. 25°

D. 30°



23. Let $f(x) = (x+2)(x-3)+5$. Find the remainder when $f(x)$ is divided by $x+1$.

A. 0

B. 1

C. 2

D. 3

24. Let $f(x) = x$ and $g(x) = x^2$. Then $f(x^2) - g(2x+1) =$

A. $(3x+1)(x+1)$

B. $-(3x+1)(x+1)$

C. $(5x+1)(3x+1)$

D. $-(5x+1)(3x+1)$

25. A wire of length p is bent into the form of a sector with radius r and angle of sector x^o. Express x in terms of r and p.

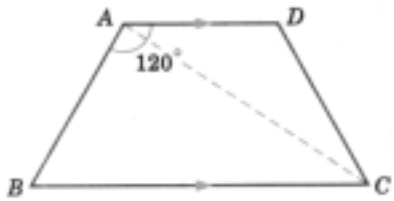
A. $\dfrac{180(p-2r)}{\pi r}$

B. $\dfrac{180(p+2r)}{\pi r}$

C. $\dfrac{\pi(p+2r)}{180\,r}$

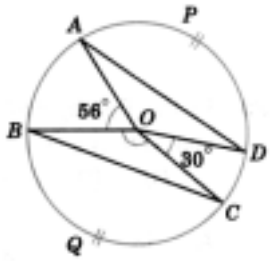
D. $\dfrac{\pi(p-2r)}{180\,r}$

26. The figure shows a trapezium ABCD in which AD // BC, $\angle BAD = 120°$ and $AB = \frac{1}{2}BC = 4$. Find AC.



A. $2\sqrt{3}$
B. $3\sqrt{3}$
C. $4\sqrt{3}$
D $8-\sqrt{3}$

27. In the figure, arc APD = arc BQC, $\angle COD = 30°$ and $\angle AOB = 56°$, find $\angle BOC$.



A. 86 °
B. 112 °
C. 116 °
D. 137 °

28. If $2a + 3b - 4c = 0$ and $a - 2b + 3x = 0$, find $a : b : c$.

A. 1 : 10 : 7
B. 1 : 7 : 10
C. –1 : 7 :10
D. –1 : 10 : 7

29. If the simultaneous equations

$$\begin{cases} y = ax^2 + bx + c \\ y = mx + n \end{cases}$$

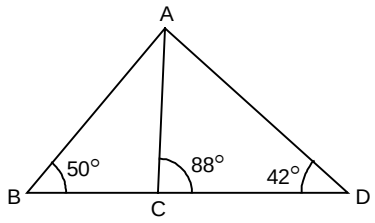
have only one solution, which of the following must be true?
(*a, b, c, m and n are non-zero constants.*)

A. $(b + m)^2 = 4c(a - n)$
B. $(b - m)^2 = 4a(c - n)$
C. $(b + m)^2 = 4a(c + n)$
D. $(b + m)^2 = 4a(n - c)$

30. Suppose y varies inversely as x. If x is increased by 60%, find the percentage change in y.

A. Decreased by 40%
B. Decreased by 37.5%
C. Increased by 40%
D. Increased by 37.5%

31. In the figure, BCD is a straight line. Arrange AC, BC and CD in ascending order of magnitude.



A. AC < CD < BC
B. CD < AC < BC
C. CD < BC < AC
D. BC < AC < CD

32. Find the quotient when $(x-1)[(2x-3)+(3x^2-2x+1)-(7+3x)]$ is divided by x^2-x-3.

A. $3x+4$
B. $3x-3$
C. $3x+9$
D. $3x-4$

33. Given that $x^{\frac{1}{2}}+x^{-\frac{1}{2}}=\sqrt{2}-1$, find the value of $x+x^{-1}$.

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

34. If $(3x+4y)\propto(4x-5y)$, then

A. $y\propto x^2$
B. $y\propto x$
C. $y\propto\frac{1}{x}$
D. $y\propto\frac{1}{x^2}$

35. y is partly constant and partly varies directly as the square root of x. When $x = 4$, $y = -7$ and when $x = 1$, $y = -2$. Find x when $y = -12$.

A. 6
B. 9
C. $\frac{1}{81}$
D $\frac{81}{25}$

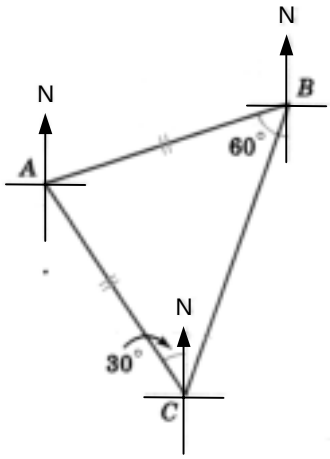
36. The figure shows the positions of three towns A, B and C. The bearings of A from B and C are S60°W and N30°W respectively. AB = AC. If BC = 120 km, then AB =

A. $60\sqrt{2}$ km

B. $60\sqrt{3}$ km

C. $120\sqrt{2}$ km

D. $120\sqrt{3}$ km



SECTION B

37. If α and β are the roots of the equation $3x^2 + 7x + 12 = 0$, then $(\alpha + 3)(\beta + 3) =$

A. 3

B. 5

C. 6

D. 12

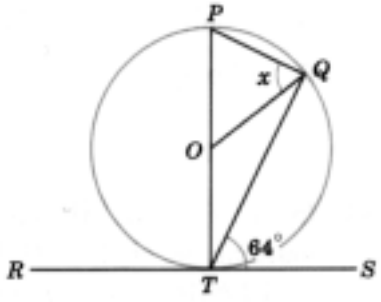
38. In the figure, RS is the tangent to the circle at T. If $\angle QTS = 64°$, find x.

A. 60 °

B. 64 °

C. 68 °

D. 72 °



39. If $x = \dfrac{1}{\sqrt{3}-\sqrt{2}} - \dfrac{1}{\sqrt{2}-1}$, then $\dfrac{1}{x} =$

A. $\sqrt{3}+1$

B. $\sqrt{3}-1$

C. $\dfrac{\sqrt{3}+1}{2}$

D. $\dfrac{\sqrt{3}-1}{2}$

40. Given that $\frac{9^x}{3^y} = \frac{m}{n}$, express x in terms of m, n and y.

A. $\frac{m(3^y)}{n\log 9}$

B. $\frac{y\log m}{\log n}$

C. $\frac{1}{2}\left(\frac{\log m - \log n}{\log 3} + y\right)$

D. $\frac{m+3^y}{n}$

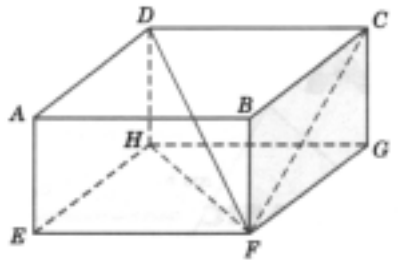
41. In the figure, ABCDEFGH is a rectangular block. If G is due north of F, then the compass bearing of D from F is NθW, where θ =

A. $\angle$CFD

B. $\angle$GFH

C. $\angle$DFE

D. $\angle$HFE



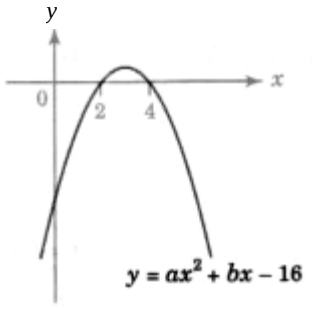
42. The figure shows the graph of $y = ax^2 + bx - 16$. Which of the following would be the correct equation of the graph?

A. $y = (x-2)(x-4)$

B. $y = -(x-2)(x-4)$

C. $y = 2(x+2)(x-4)$

D. $y = -2(x-2)(x-4)$



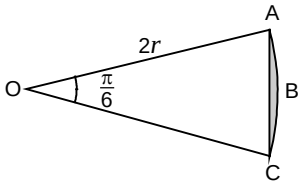
43. In the figure, OABC is a sector of radius 2r. If $\angle AOC = \frac{\pi}{6}$, find the area of the shaded part.

A. $\left(\frac{\pi}{6} - \frac{1}{2}\right)r^2$

B. $\left(\frac{\pi}{6} - 1\right)r^2$

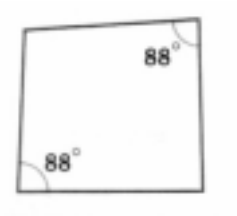
C. $\left(\frac{\pi}{3} - \frac{1}{2}\right)r^2$

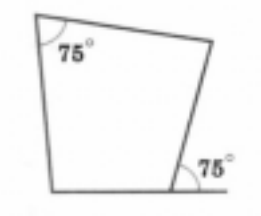
D. $\left(\frac{\pi}{3} - 1\right)r^2$



44. Which of the following figures must be a cyclic quadrilateral / cyclic quadrilaterals?

I. II. III.

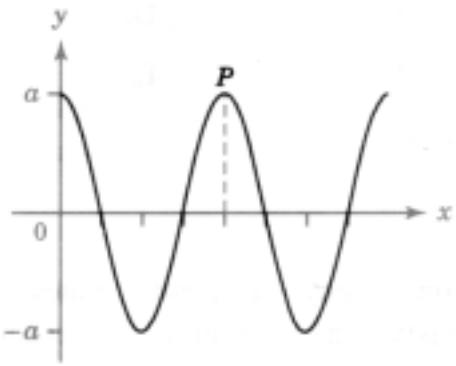




A. II only.
B. I and II only.
C. II and III only.
D. I, II and III.

45. The figure shows the graph of $y = a\cos 2x$. The point P is

A. $\left(\frac{\pi}{4}, a\right)$
B. $\left(\frac{\pi}{2}, a\right)$
C. (π, a)
D. $\left(\frac{3\pi}{2}, a\right)$

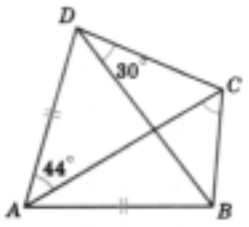


46. Given that $f(x) = 8(x-1)^3 - (x+1)^3$. Find $f(x+1)$.

A. $(x-2)(7x^2+8x+4)$
B. $(x-2)(5x^2+8x+4)$
C. $(x-2)(7x^2+6x+4)$
D. $(x+2)(7x^2-6x+4)$

47. The figure shows a cyclic quadrilateral ABCD. If $\angle CDB = 30°$, $\angle DAC = 44°$ and AB = AD, find $\angle BCA$.

A. 44 °
B. 53 °
C. 60 °
D. 74 °



48. Find the L.C.M. of $2(x-1)$, $4(1-x)^2(1+x)$ and $x(1+x)^2(1-x)$.

A. $2x(x^2-1)(x+1)$

B. $4x(x+1)(x-1)^2(1-x)^2$

C. $4(1-x)^2(1+x)^2$

D. $4x(1-x)^2(1+x)^2$

49. On a given graph of $y = x^2 - 4x + 3$, which one of the following straight lines should be drawn in order to solve the equation $2x^2 - 4x + 3 = 0$?

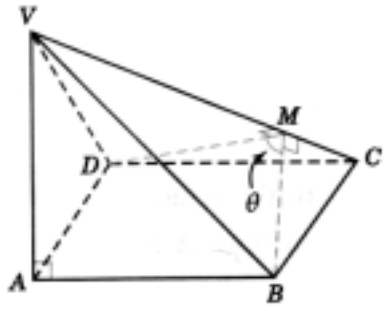
A. $y = 2x - \frac{3}{2}$

B. $y = -2x + \frac{3}{2}$

C. $y = 3x + \frac{1}{2}$

D. $y = 3x - \frac{1}{2}$

50. In the figure, VABCD is a pyramid with a square base ABCD. VA = VB = 10 cm and VA is perpendicular to the plane ABCD. If θ is the angle between the planes VBC and VCD, find $\cos\theta$.



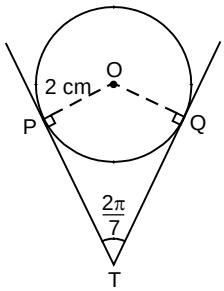
A. $1-\sqrt{3}$

B. $-\frac{1}{2}$

C. $\frac{1}{2}$

D. $\sqrt{3}-1$

51. In the figure, TP and TQ are tangents to the circle of radius 2 cm. Find the length of the major arc PQ.



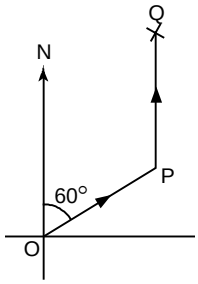
A. $\frac{4\pi}{7}$ cm

B. $\frac{10\pi}{7}$ cm

C. $\frac{15\pi}{7}$ cm

D. $\frac{18\pi}{7}$ cm

52. A ship leaves port O and sails on a bearing of N60°E at 15 km/h for 4 hours. Then it heads north and sails at 20 km/h for 3 hours and reaches Q. The distance between Q and O is



A. $60\,\text{km}$.

B. $60\sqrt{2}\,\text{km}$.

C. $60\sqrt{3}\,\text{km}$.

D. $120\,\text{km}$.

53. If the roots of the equation $2x^2 - ax + 6 = 0$ are in the ratio 3 : 4, find *a*.

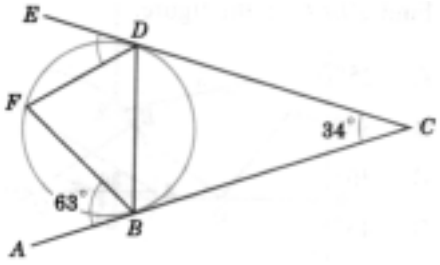
A. 3.5

B. 7

C. $\pm\frac{1}{2}$

D. ± 7

54. In the figure, the two tangents ABC and EDC touch the circle at points B and D respectively. Find $\angle$EDF.



A. 34 °

B. 44 °

C. 63 °

D. 73 °

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