FORMULAS FOR REFERENCE

SPHERE	Surface area	=	$4\pi r^2$
	Volume	=	$\frac{4}{3}\pi r^3$
CYLINDER	Area of curved surface	=	$2\pi rh$
	Volume	=	$\pi r^2 h$
CONE	Area of curved surface	=	πrl
	Volume	=	$\frac{1}{3}\pi r^2 h$
PRISM	Volume	=	base area × height
PYRAMID	Volume	=	$\frac{1}{3}$ × base area × height

There are 36 questions in Section A and 18 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

Section A

1. $(2x)^3 \cdot x^3 =$

A. $6x^6$.

B. $8x^6$.

C. $6x^9$.

D. $8x^9$.

2. If $2x - 5y = 7$, then $y =$

A. $\frac{5}{2x-7}$.

B. $\frac{5}{2x+7}$.

C. $\frac{2x-7}{5}$.

D. $\frac{2x+7}{5}$.

Go on to the next page

3. $\frac{1}{x+1}-\frac{1}{x-1}=$

A. $\frac{2}{1-x^2}$.

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

C. $\frac{2x}{1-x^2}$.

D. $\frac{2x}{x^2-1}$.

4. $pr+qr-ps-qs=$

A. $(p+q)(r-s)$.

B. $(p+q)(s-r)$.

C. $(p-q)(r-s)$.

D. $(p-q)(s-r)$.

5. If $f(x)=\frac{x}{1+x}$, then $f(3)\,f(\frac{1}{3})=$

A. $\frac{3}{16}$.

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

C. $\frac{3}{4}$.

D. 1 .

6. Which of the following is an identity / are identities?

I. $x^2-4=0$

II $x^2-4=(x-2)^2$

III. $x^2-4=(x+2)(x-2)$

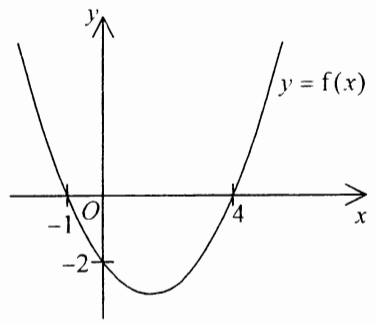
A. II only

B. III only

C. I and II only

D. I and III only

7. The figure shows the graph of $y=f(x)$. If $f(x)$ is a quadratic function, then $f(x)=$



A. $\frac{1}{2}(x+1)(x-4)$.

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

C. $\frac{1}{2}(x-1)(x+4)$.

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

8. Solve $3x^2=21x$.

A. $x=3$

B. $x=7$

C. $x=0$ or $x=3$

D. $x=0$ or $x=7$

Go on to the next page

9. Find the range of values of k such that the quadratic equation $x^2 + 2x - k = 2$ has two distinct real roots.

A. $k > -3$

B. $k \geq -3$

C. $k > -1$

D. $k \geq -1$

10. The marked price of a car is 50% higher than the cost. If the car is sold at a 20% discount on the marked price, then the percentage profit is

A. 10%.

B. 20%.

C. 30%.

D. 40%.

11. A sum of \$ 14 000 is deposited at 4% per annum for 5 years, compounded yearly. Find the interest correct to the nearest dollar.

A. \$ 2 378

B. \$ 2 800

C. \$ 3 033

D. \$ 3 034

12. In the figure, the 1st pattern consists of 3 dots. For any positive integer n, the $(n+1)$ th pattern is formed by adding $(2n+3)$ dots to the nth pattern. Find the number of dots in the 6th pattern.

A. 35

B. 37

C. 48

D. 50

13. Let x, y and z be non-zero numbers. If $x : y = 1 : 2$ and $y : z = 3 : 1$, then $(x + y) : (y + z) =$

A. 3 : 4.

B. 4 : 3.

C. 8 : 9.

D. 9 : 8.

14. It is given that x varies directly as y and inversely as z^2. If y is decreased by 10% and z is increased by 20%, then x is decreased by

A. 10%.

B. 23.6%.

C. 25%.

D. 37.5%.

Go on to the next page

15. The scale of a map is $1 : 8\,000$. If the area of a park on the map is $2\ cm^2$, then the actual area of the park is

A. $4\,000\ m^2$.

B. $6\,400\ m^2$.

C. $12\,800\ m^2$.

D. $16\,000\ m^2$.

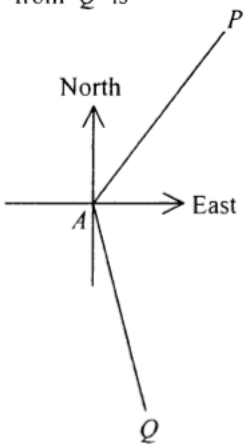
16. In the figure, $PA = QA$. If the bearings of P and Q from A are N42°E and S28°E respectively, then the bearing of P from Q is

A. N7°E.

B. N27°E.

C. N35°E.

D. N55°E.



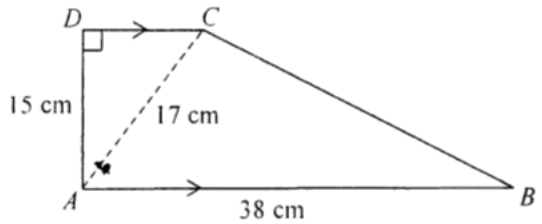
17. In the figure, the area of the trapezium $ABCD$ is

A. $345\ cm^2$.

B. $349\ cm^2$.

C. $690\ cm^2$.

D $698\ cm^2$.



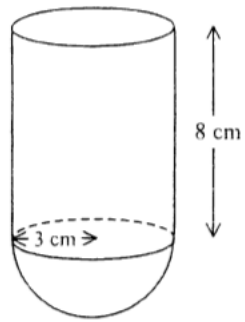
18. In the figure, the solid consists of a hemisphere of radius 3 cm joined to the bottom of a right circular cylinder of height 8 cm and base radius 3 cm. Find the volume of the solid.

A. $75\pi\ cm^3$

B. $90\pi\ cm^3$

C. $93\pi\ cm^3$

D. $108\pi\ cm^3$



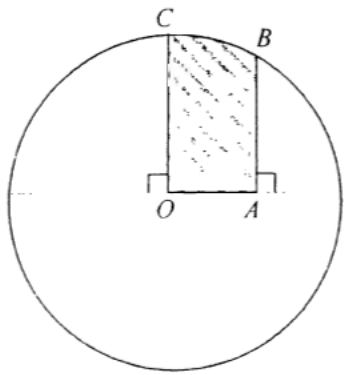
19. In the figure, O is the centre of the circle. B and C are points lying on the circle. If $OC = 2$ cm and $OA = 1$ cm, then the area of the shaded region $OABC$ is

A. $\frac{\pi}{2}\ cm^2$.

B. $\frac{2\pi}{3}\ cm^2$.

C. $\left(\frac{\sqrt{3}}{2} + \frac{\pi}{3}\right) cm^2$.

D. $\left(\sqrt{3} + \frac{2\pi}{3}\right) cm^2$.



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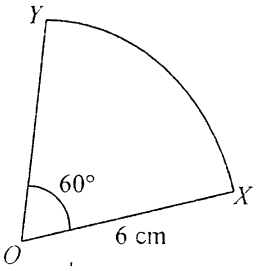
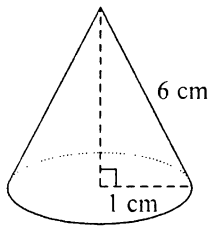
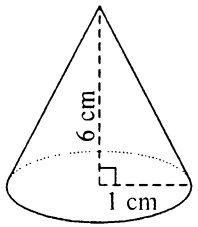
20. In the figure, sector OXY is a thin metal sheet. By joining OX and OY together, which of the following right circular cones can be folded?



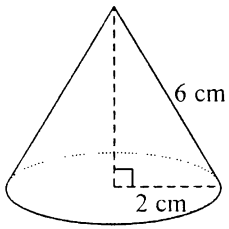
A.



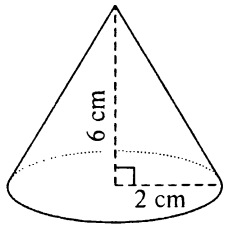
B.



C.



D.



21. $2\sin(90° - \theta)\sin 60° - \cos 0° \cos\theta =$

A. $\sin\theta$.

B. $\sqrt{3}\sin\theta$.

C. $\sqrt{3}\cos\theta$.

D. $(\sqrt{3} - 1)\cos\theta$.

22. If $0° < \theta < 45°$, which of the following must be true?

I. $\tan\theta < \cos\theta$
II. $\sin\theta < \tan\theta$
III. $\sin\theta < \cos\theta$

A. I only

B. III only

C. I and II only

D. II and III only

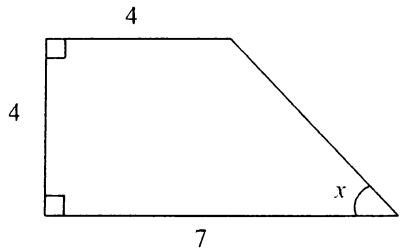
23. In the figure, $\sin x =$

A. $\frac{3}{7}$.

B. $\frac{3}{5}$.

C. $\frac{4}{5}$.

D. $\frac{4}{3}$.



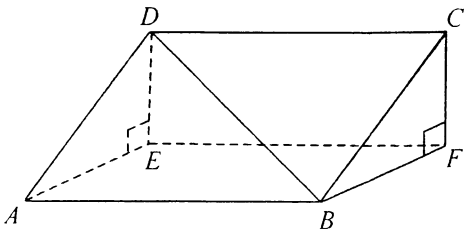
24. The figure shows a right prism $ABCDEF$ with a right-angled triangle as the cross-section. The angle between BD and the plane $CDEF$ is

A. $\angle BDE$.

B. $\angle BDF$.

C. $\angle DBE$.

D. $\angle DBF$.



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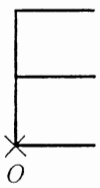
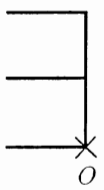
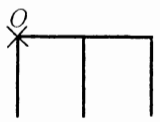
25.



If the plane figure above is rotated anticlockwise about the point O through $90°$, which of the following is its image?

A. 

B. 

C. 

D. 

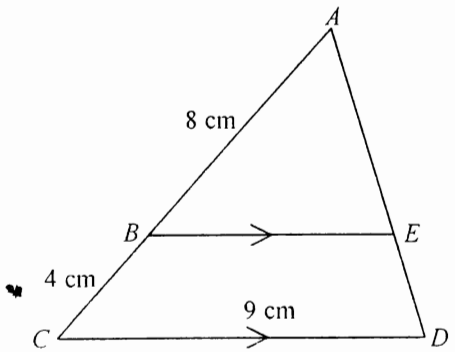
26. In the figure, ABC and AED are straight lines. If $AB = 8$ cm, $BC = 4$ cm and $CD = 9$ cm, then $BE =$

A. $\frac{32}{9}$ cm.

B. $\frac{9}{2}$ cm.

C. 5 cm.

D. 6 cm.



27. If the polar coordinates of the points A and B are $(5, 45°)$ and $(12, 135°)$ respectively, then the distance between A and B is

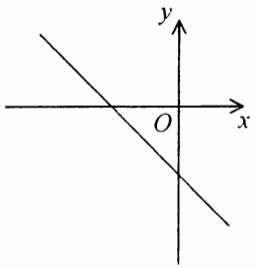
A. 3.

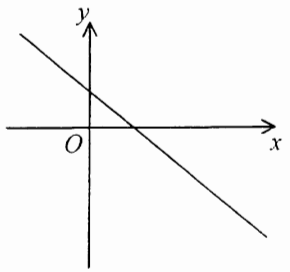
B. 7.

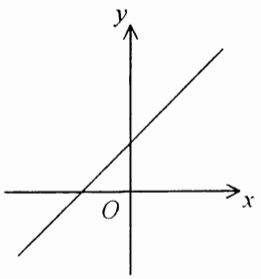
C. 13.

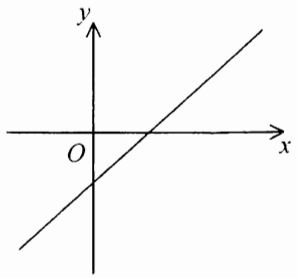
D. 17.

28. If $k < 0$, which of the following may represent the graph of the straight line $x - y = k$?

A. 

B. 

C. 

D. 

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29. The straight line $4x + y - 2 = 0$ is perpendicular to the straight line

A. $4x + y - 9 = 0$.

B. $4x - y + 9 = 0$.

C. $x + 4y - 9 = 0$.

D. $x - 4y + 9 = 0$.

30. If the straight line $5x - 3y = 30$ cuts the x-axis and the y-axis at A and B respectively, then the coordinates of the mid-point of AB are

A. $(3, -5)$.

B. $(-3, 5)$.

C. $(5, -3)$.

D. $(-5, 3)$.

31. If the points $(0, 0)$, $(2, 0)$ and $(1, b)$ are the vertices of an equilateral triangle, then $b =$

A. 1 .

B. $\sqrt{3}$.

C. 1 or -1 .

D. $\sqrt{3}$ or $-\sqrt{3}$.

32. Which of the following could be the probability of an event?

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

B. $\frac{2005}{2006}$

C. -0.2006

D. 1.2006

33. Two fair dice are thrown. Find the probability that the sum of the two numbers thrown is a prime number.

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

B. $\frac{5}{11}$

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

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

34. $\{ x-6 , x-3 , x+4 , x+5 \}$ and $\{ x-8 , x-1 , x+2 , x+9 \}$ are two groups of numbers. Which of the following is/are true?

I. The two groups of numbers have the same mean.
II. The two groups of numbers have the same median.
III. The two groups of numbers have the same range.

A. I only

B. II only

C. I and III only

D. II and III only

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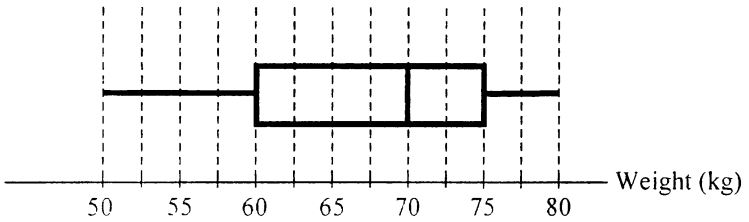
35. The box-and-whisker diagram below shows the distribution of the weights (in kg) of some students. Find the inter-quartile range of their weights.



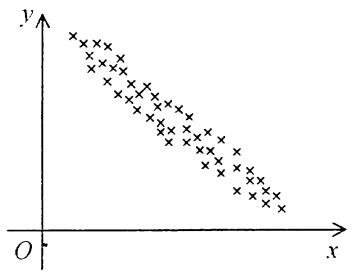
A. 5 kg

B. 10 kg

C. 15 kg

D. 30 kg

36. The scatter diagram below shows the relation between x and y. Which of the following may represent the relation between x and y?



A. y varies directly as x^2.

B. y decreases when x increases.

C. x increases when y increases.

D. x remains unchanged when y increases.

Section B

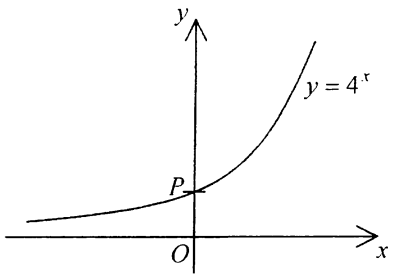
37. The figure shows the graph of $y = 4^x$. The coordinates of P are

A. $(1, 0)$.

B. $(0, 1)$.

C. $(4, 0)$.

D. $(0, 4)$.



38. Let a and b be positive numbers. If $\log\frac{a}{10} = 2\log b$, then $a =$

A. $10b^2$.

B. $20b$.

C. $b^2 + 10$.

D. $2b + 10$.

39. Convert the decimal number $2^{13} + 2^4 + 3$ to a binary number.

A. 10000000000111_2

B. 10000000001011_2

C. 10000000010011_2

D. 10000000100011_2

Go on to the next page

40. Let k be a non-zero constant. When $x^3 + kx^2 + 2kx + 3k$ is divided by $x + k$, the remainder is k. Find k.

A. -1

B. 1

C. -2

D. 2

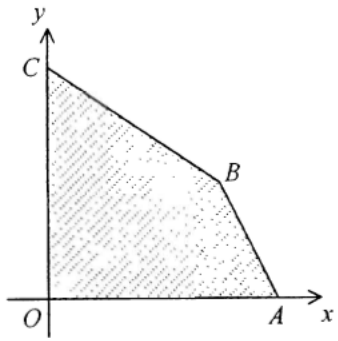
41. In the figure, O is the origin. The equation of AB is $2x + y - 8 = 0$ and the equation of BC is $2x + 3y - 12 = 0$. If (x, y) is a point lying in the shaded region $OABC$ (including the boundary), then the greatest value of $x + 3y + 4$ is

A. 8.

B. 13.

C. 16.

D. 28.



42. The first negative term in the arithmetic sequence 2006, 1998, 1990, ... is

A. -8.

B. -6.

C. -4.

D. -2.

43. Let a, b and c be positive integers. If $b = \sqrt{ac}$, which of the following must be true?

I. $\log a^2$, $\log b^2$, $\log c^2$ is an arithmetic sequence.

II. a^3, b^3, c^3 is a geometric sequence.

III. 4^a, 4^b, 4^c is a geometric sequence.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

44. For $0° < x < 360°$, how many roots does the equation $3\cos^2 x - 4\cos x + 1 = 0$ have?

A. 2

B. 3

C. 4

D. 5

45. If the length of a side of a regular tetrahedron is 3 cm, then the height of the tetrahedron is

A. 3 cm.

B. $\sqrt{3}$ cm.

C. $\sqrt{6}$ cm.

D. $\frac{3\sqrt{3}}{2}$ cm.

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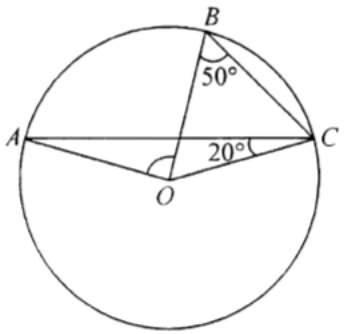
46. In the figure, O is the centre of the circle ABC. If $\angle OBC = 50°$ and $\angle ACO = 20°$, then $\angle BOA =$



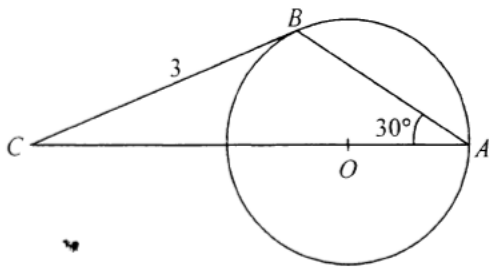
A. $50°$.

B. $60°$.

C. $70°$.

D. $80°$.

47. In the figure, O is the centre of the circle. A and B are points lying on the circle. If AOC is a straight line and BC is a tangent to the circle, then the radius of the circle is



A. $\frac{3}{2}$.

B. $\sqrt{3}$.

C. $2\sqrt{3}$.

D. $3\sqrt{3}$.

48. Let O be the origin. If the coordinates of the points A and B are $(6, 0)$ and $(0, 6)$ respectively, then the coordinates of the in-centre of ΔABO are

A. $(0, 0)$.

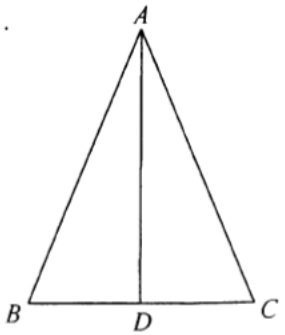
B. $(2, 2)$.

C. $(3, 3)$.

D. $(6-3\sqrt{2}, 6-3\sqrt{2})$.

49. In the figure, ABC is an acute-angled triangle, $AB = AC$ and D is a point lying on BC such that AD is perpendicular to BC. Which of the following must be true?

I. The circumcentre of ΔABC lies on AD.
II. The orthocentre of ΔABC lies on AD.
III. The centroid of ΔABC lies on AD.



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Go on to the next page

50. Consider the circle $x^2 + y^2 - 4x + 6y - 40 = 0$. Find the slope of the diameter passing through the point $(1, 2)$.

A. -5

B. -3

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

D. $\frac{-1}{5}$

51. A circle C cuts the y-axis at A and B. If $AB = 8$ and the coordinates of the centre of C are $(-3, 5)$, then the equation of C is

A. $x^2 + y^2 + 6x - 10y = 0$.

B. $x^2 + y^2 - 6x + 10y = 0$.

C. $x^2 + y^2 + 6x - 10y + 9 = 0$.

D. $x^2 + y^2 - 6x + 10y + 9 = 0$.

52. One letter is chosen randomly from each of the two words 'FORTY' and 'FIFTY'. Find the probability that the two letters chosen are the same.

A. 0.08

B. 0.16

C. 0.32

D. 0.48

53. There are two questions in a test. The probability that David answers the first question correctly is $\frac{1}{4}$ and the probability that David answers the second question correctly is $\frac{1}{3}$. Given that David answers at least one question correctly in the test, find the probability that he answers the second question correctly.

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

B. $\frac{2}{3}$

C. $\frac{3}{5}$

D. $\frac{4}{5}$

54. The standard deviation of the five numbers $10a+1$, $10a+3$, $10a+5$, $10a+7$ and $10a+9$ is

A. 8.

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

C. $\sqrt{10}$.

D. $2\sqrt{2}$.

END OF PAPER