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. $a \cdot a(a+a) =$

   A. a^4 .

   B. $2a^3$.

   C. $a^3 + a$.

   D. $3a^2 + a$.

2. If $a = 1 - 2b$, then $b =$

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

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

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

   D. $\frac{1-a}{2}$.

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3. If $f(x)=2x^2-3x+4$, then $f(1)-f(-1)=$

A. -6 .

B. -2 .

C. 2 .

D. 6 .

4. $(2x-3)(x^2+3x-2)\equiv$

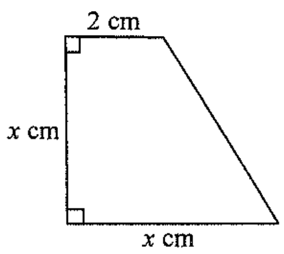
A. $2x^3+3x^2+5x-6$.

B. $2x^3+3x^2+5x+6$.

C. $2x^3+3x^2-13x-6$.

D. $2x^3+3x^2-13x+6$.

5. In the figure, the area of the trapezium is 12 cm^2 . Which of the following equations can be used to find x ?



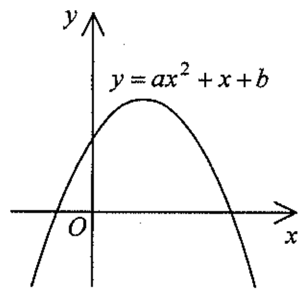
A. $x(x+2)=12$

B. $x(x+2)=24$

C. $x^2-x(x-2)=12$

D. $x^2-x(x-2)=24$

6. The figure shows the graph of $y=ax^2+x+b$. Which of the following is true?



A. $a>0$ and $b<0$

B. $a>0$ and $b>0$

C. $a<0$ and $b<0$

D. $a<0$ and $b>0$

7. If $\begin{cases}\beta=\alpha^2-3\\ \beta=4\alpha-3\end{cases}$, then $\beta=$

A. 4 .

B. 13 .

C. 0 or 4 .

D. -3 or 13 .

8. If the quadratic equation $kx^2+6x+(6-k)=0$ has equal roots, then $k=$

A. -6 .

B. -3 .

C. 3 .

D. 6 .

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9. The solution of $2(3-x) > -4$ is

A. $x < 5$.

B. $x > 5$.

C. $x < 10$.

D. $x > 10$.

10. If $x^2 + 2ax + 8 \equiv (x+a)^2 + b$, then $b =$

A. 8 .

B. $a^2 + 8$.

C. $a^2 - 8$.

D. $8 - a^2$.

11. If the 2nd term and the 5th term of a geometric sequence are -3 and 192 respectively, then the common ratio of the sequence is

A. -8 .

B. -4 .

C. 4 .

D. 8 .

12. Peter sold two flats for \$ 999 999 each. He lost 10% on one and gained 10% on the other. After the two transactions, Peter

A. gained \$ 10 101 .

B. gained \$ 20 202 .

C. lost \$ 10 101 .

D. lost \$ 20 202 .

13. Let x and y be non-zero numbers. If $2x - 3y = 0$, then $(x+3y):(x+2y) =$

A. $3:2$.

B. $4:3$.

C. $9:7$.

D. $11:8$.

14. If z varies directly as y^2 and inversely as x , which of the following must be constant?

A. xy^2z

B. $\dfrac{y^2z}{x}$

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

D. $\dfrac{z}{xy^2}$

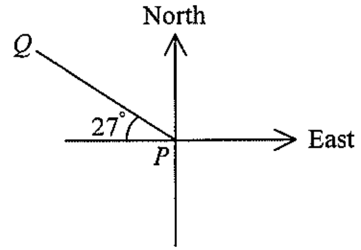
15. In the figure, the bearing of P from Q is

A. N 27° W .

B. S 27° E .

C. N 63° W .

D. S 63° E .



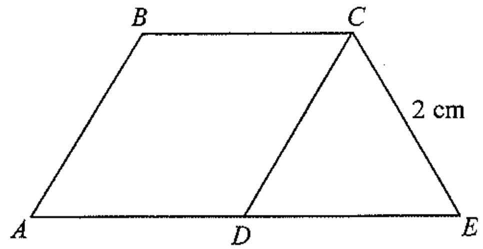
16. In the figure, $ABCD$ is a rhombus and CDE is an equilateral triangle. If ADE is a straight line, then the area of the quadrilateral $ABCE$ is

A. $2\sqrt{3}$ cm^2 .

B. $3\sqrt{3}$ cm^2 .

C. $4\sqrt{3}$ cm^2 .

D. $6\sqrt{3}$ cm^2 .



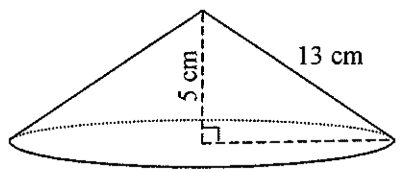
17. The figure shows a solid right circular cone of height 5 cm and slant height 13 cm . Find the total surface area of the cone.

A. 144π cm^2

B. 156π cm^2

C. 240π cm^2

D. 300π cm^2



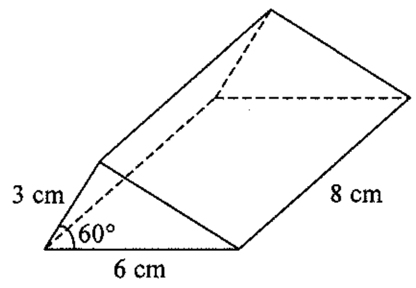
18. The figure shows a right triangular prism. Find the volume of the prism.

A. 36 cm^3

B. 72 cm^3

C. $36\sqrt{3}$ cm^3

D. $72\sqrt{3}$ cm^3



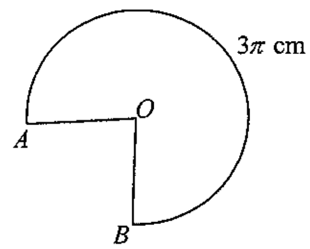
19. In the figure, OAB is a sector of radius 2 cm . If the length of $\overset{\frown}{AB}$ is 3π cm , then the area of the sector OAB is

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

B. 3π cm^2 .

C. 4π cm^2 .

D. 6π cm^2 .



20. For $0° \le \theta \le 90°$, the greatest value of $\frac{5-\sin\theta}{4+\sin\theta}$ is

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

B. 1 .

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

D. 2 .

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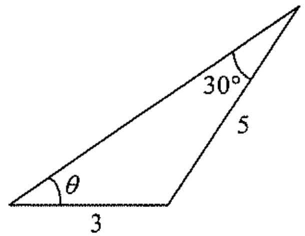
21. In the figure, θ is an acute angle. Find θ correct to the nearest degree.

A. 35°

B. 50°

C. 56°

D. 57°



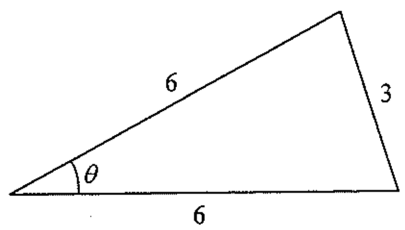
22. In the figure, $\cos\theta =$

A. $\frac{1}{8}$.

B. $\frac{1}{4}$.

C. $\frac{7}{8}$.

D. $\frac{7}{4}$.



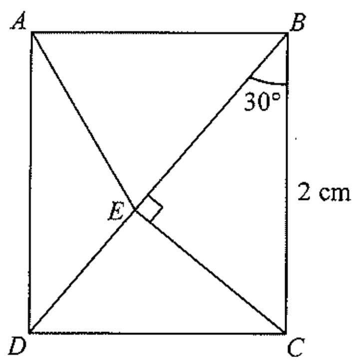
23. In the figure, $ABCD$ is a rectangle. If BED is a straight line, then the area of ΔABE is

A. $\frac{\sqrt{3}}{6}$ cm^2 .

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

C. $\frac{2\sqrt{3}}{3}$ cm^2 .

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



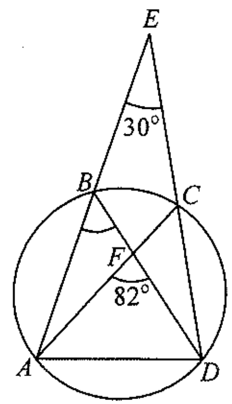
24. In the figure, $ABCD$ is a circle. AB produced and DC produced meet at E. If AC and BD intersect at F, then $\angle ABD =$

A. 41° .

B. 52° .

C. 56° .

D. 60° .



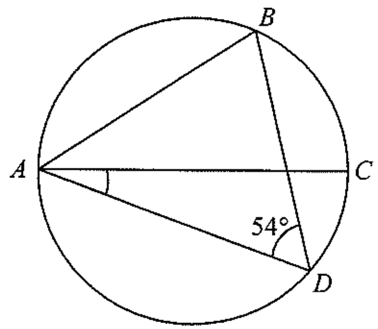
25. In the figure, $ABCD$ is a circle. If AC is a diameter of the circle and $AB = BD$, then $\angle CAD =$

A. 18° .

B. 21° .

C. 27° .

D. 36° .



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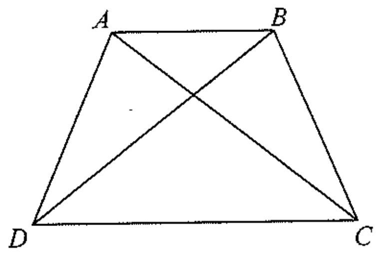
26. If $AC = BD$ and $AB \,//\, DC$, how many pairs of similar triangles are there in the figure?

A. 2 pairs

B. 3 pairs

C. 4 pairs

D. 5 pairs



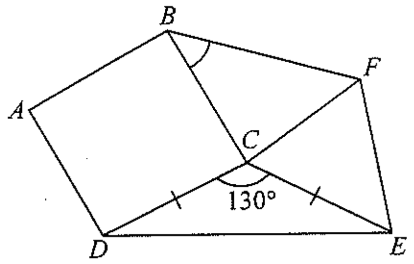
27. In the figure, $ABCD$ is a square. If CEF is an equilateral triangle, then $\angle CBF =$

A. $45°$.

B. $50°$.

C. $60°$.

D. $80°$.



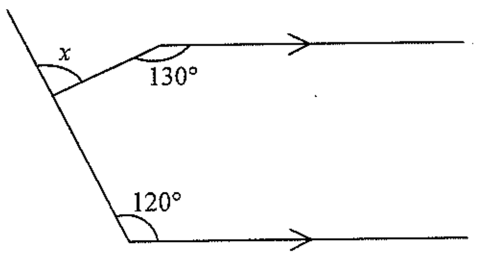
28. In the figure, $x =$

A. $50°$.

B. $60°$.

C. $70°$.

D. $90°$.



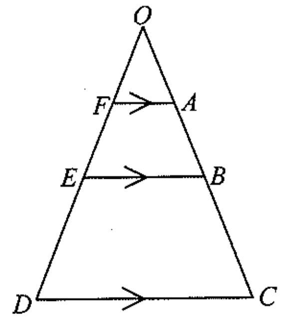
29. In the figure, $OABC$ and $OFED$ are straight lines. If $AB : BC = 2 : 3$ and $FA : DC = 1 : 5$, then $OA : AB =$

A. $1 : 1$.

B. $1 : 2$.

C. $5 : 8$.

D. $5 : 13$.



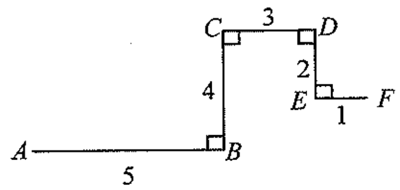
30. In the figure, the length of the line segment joining A and F is

A. $\sqrt{68}$.

B. $\sqrt{77}$.

C. $\sqrt{82}$.

D. $\sqrt{85}$.



31. $A(2, 5)$ and $B(6, -3)$ are two points. If P is a point lying on the straight line $x = y$ such that $AP = PB$, then the coordinates of P are

A. $(-2, -2)$.

B. $(-2, 4)$.

C. $(1, 1)$.

D. $(4, 1)$.

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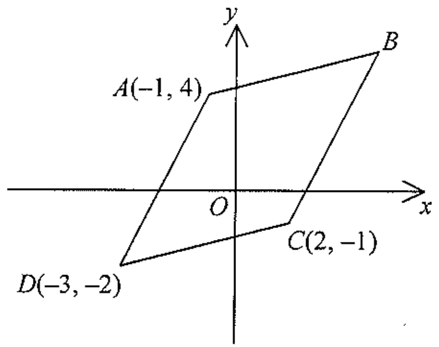
32. In the figure, $ABCD$ is a parallelogram. The coordinates of B are

A. $(3, 2)$.

B. $(3, 5)$.

C. $(4, 5)$.

D. $(4, 6)$.



33. If the equation of the straight line L is $x-2y+3=0$, then the equation of the straight line passing through the point $(2, -1)$ and perpendicular to L is

A. $x+2y+3=0$.

B. $x+2y-3=0$.

C. $2x+y+3=0$.

D. $2x+y-3=0$.

34. If the mean of five numbers 15 , $x+4$, $x+1$, $2x-7$ and $x-3$ is 6 , then the mode of the five numbers is

A. 1 .

B. 4 .

C. 5 .

D. 15 .

35. Bag X contains 1 white ball and 3 red balls while bag Y contains 3 yellow balls and 6 red balls. A ball is randomly drawn from bag X and put into bag Y . If a ball is now randomly drawn from bag Y , then the probability that the ball drawn is red is

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

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

C. $\frac{21}{40}$.

D. $\frac{27}{40}$.

36. If a fair die is thrown three times, then the probability that the three numbers thrown are all different is

A. $\frac{5}{9}$.

B. $\frac{17}{18}$.

C. $\frac{125}{216}$.

D. $\frac{215}{216}$.

Section B

37. If n is a positive integer, then $\frac{1}{1+2\sqrt{n}} - \frac{1}{1-2\sqrt{n}} =$

A. $\frac{4\sqrt{n}}{1-4n}$.

B. $\frac{-4\sqrt{n}}{1+4n}$.

C. $\frac{4\sqrt{n}}{4n+1}$.

D. $\frac{4\sqrt{n}}{4n-1}$.

38. The H.C.F. of $x^2(x+1)(x+2)$ and $x(x+1)^3$ is

A. $x(x+1)$.

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

C. $x^2(x+1)^3$.

D. $x^2(x+1)^3(x+2)$.

39. If a and b are positive integers, then $\log(a^b b^a) =$

A. $ab \log (ab)$.

B. $ab (\log a)(\log b)$.

C. $(a+b) \log (a+b)$.

D. $b \log a + a \log b$.

40. Let k be a positive integer. When $x^{2k+1}+kx+k$ is divided by $x+1$, the remainder is

A. -1 .

B. 1 .

C. $2k-1$.

D. $2k+1$.

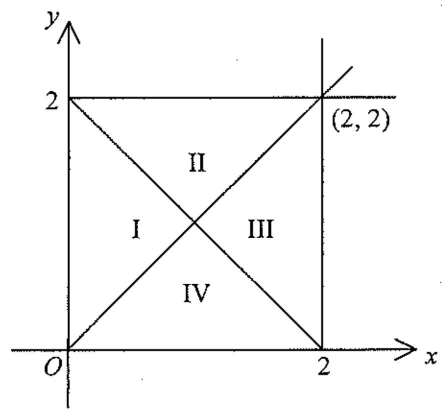
41. Which of the regions in the figure may represent the solution of
$$\begin{cases} x \le 2 \\ x+y \ge 2 \\ x-y \ge 0 \end{cases} ?$$

A. Region I

B. Region II

C. Region III

D. Region IV



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42. If four arithmetic means are inserted between 12 and 27, then the sum of the four arithmetic means is

A. 78.

B. 90.

C. 105.

D. 117.

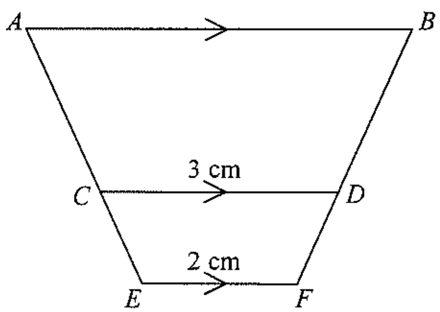
43. In the figure, ACE and BDF are straight lines. If the areas of the quadrilaterals $ABDC$ and $CDFE$ are 16 cm^2 and 5 cm^2 respectively, then the length of AB is

A. 4.5 cm.

B. 5 cm.

C. 5.5 cm.

D. 6 cm.



44. For $0° \le x \le 360°$, how many distinct roots does the equation $\cos x(\sin x - 1) = 0$ have?

A. 2

B. 3

C. 4

D. 5

45. $\sin(90° - x) + \cos(x + 180°) =$

A. 0.

B. $-2\cos x$.

C. $\sin x + \cos x$.

D. $\sin x - \cos x$.

46. $\sin^2 1° + \sin^2 3° + \sin^2 5° + \cdots + \sin^2 87° + \sin^2 89° =$

A. 22.

B. 22.5.

C. 44.5.

D. 45.

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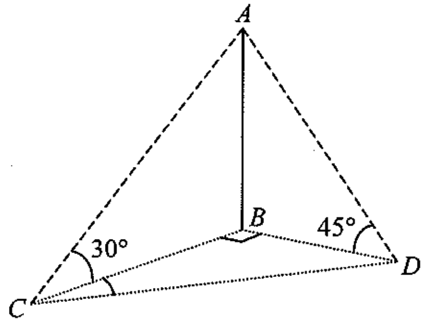
47. In the figure, B , C and D are three points on a horizontal plane such that $\angle CBD = 90°$. If AB is a vertical pole, then $\angle BCD =$

A. 15° .

B. 30° .

C. 45° .

D. 60° .



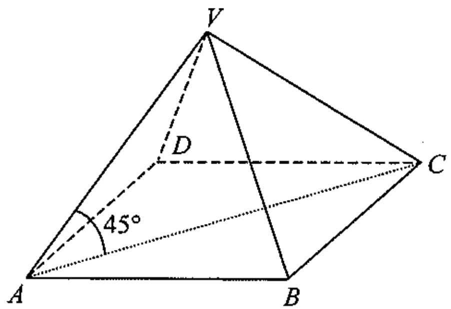
48. In the figure, $VABCD$ is a right pyramid with a square base. If the angle between VA and the base is 45° , then $\angle AVB =$

A. 45° .

B. 60° .

C. 75° .

D. 90° .



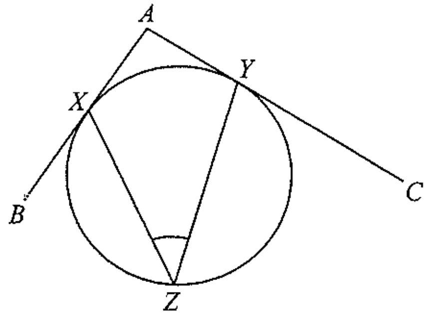
49. In the figure, AB and AC are tangents to the circle at X and Y respectively. Z is a point lying on the circle. If $\angle BAC = 100°$, then $\angle XZY =$

A. 40° .

B. 45° .

C. 50° .

D. 55° .



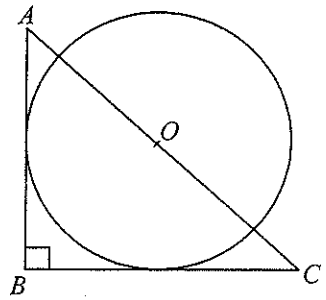
50. In the figure, O is the centre of the circle and AOC is a straight line. If AB and BC are tangents to the circle such that $AB = 3$ and $BC = 4$, then the radius of the circle is

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

B. $\frac{12}{7}$.

C. 2 .

D. $\frac{5}{2}$.



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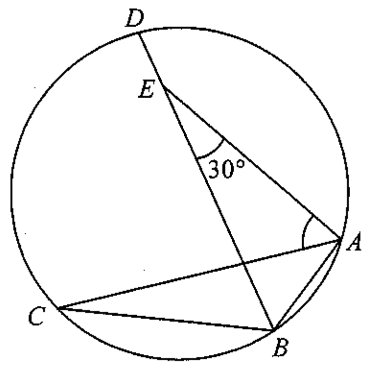
51. In the figure, $ABCD$ is a circle. If $\overset{\frown}{AB} : \overset{\frown}{BC} : \overset{\frown}{CD} : \overset{\frown}{DA} = 1 : 2 : 3 : 3$ and E is a point lying on BD, then $\angle CAE =$

A. $45°$.

B. $50°$.

C. $55°$.

D. $60°$.



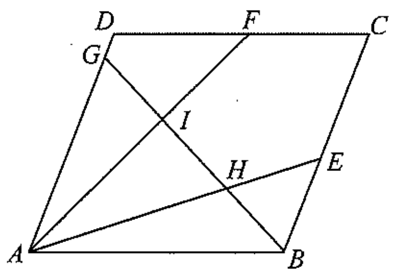
52. In the figure, $ABCD$ is a parallelogram. E, F and G are points lying on BC, CD and DA respectively. AE and AF divide $\angle BAD$ into three equal parts and BG bisects $\angle ABC$. If AE and AF intersect BG at H and I respectively, then $\angle GIF + \angle GHE =$

A. $120°$.

B. $150°$.

C. $180°$.

D. $210°$.



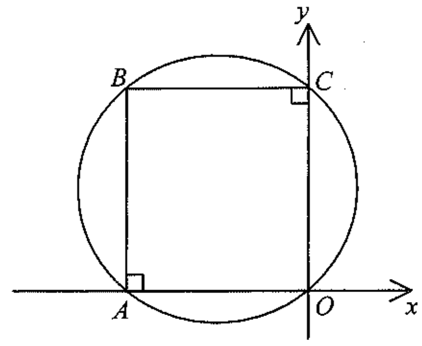
53. In the figure, O is the origin. If the equation of the circle passing through O, A, B and C is $(x+3)^2+(y-4)^2=25$, then the area of the rectangle $OABC$ is

A. 36 .

B. 48 .

C. 50 .

D. 64 .



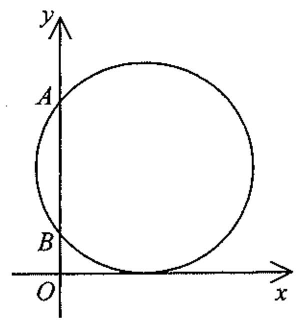
54. In the figure, the circle passing through $A(0, 8)$ and $B(0, 2)$ touches the positive x-axis. The equation of the circle is

A. $x^2+y^2-8x-10y+16=0$.

B. $x^2+y^2+8x+10y+16=0$.

C. $x^2+y^2-10x-10y+16=0$.

D. $x^2+y^2+10x+10y+16=0$.



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