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CBSE
Class IX Mathematics
Term 2
Sample Paper – 1

Q1. Let D represent a repeating decimal. If P denotes the r figures of D which do not repeat themselves, and Q denotes the s figures which do repeat themselves, then the incorrect expression is :

(a) D = . PQQQ..
(b) 10^r D = P.QQQ...
(c) 10^{r+s} D = PQ.QQQ...
(d) $10^r(10^s-1)$ D = Q(P-1)

Sol. (d)

Q2. Which of the following correctly shows 185367249 according to International place value chart?

(a) 1, 853, 672, 49
(b) 18, 536, 724, 9
(c) 185, 367, 249
(d) None of these

Sol. (c)

Q3. If x – k divides $x^3 - 6x^2 + 11x - 6 = 0$, then K can't be equal to

(a) 1
(b) 2
(c) 3
(d) 4

Sol. (d)

→ x = k is zero of polynomial

Now put k = 1

$1^3 - 6(1)^2 + 11(1) - 6 = 0$

$1 - 6 + 11 - 6 = 0$

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$0 = 0$

$k = 2$

$(2)^3 - 6(2)^2 + 11 \times 2 - 6 = 0$

$8 - 24 + 22 - 6 = 0$

$2 - 2 = 0$

$k = 3$

$(3)^3 - 6(3)^2 + 11 \times 3 - 6 = 0$

$27 - 54 + 33 - 6 = 0$

$21 - 21 = 0$

$k = 4$

$(4)^3 - 4(4)^2 + 11 \times 4 - 6 = 0$

$64 - 96 + 44 - 6 = 0$

$56 - 42 = 0$

$k = 14$

Q4. $\sqrt{6 + 2\sqrt{2} + 2\sqrt{3} + 2\sqrt{6}} - \frac{1}{\sqrt{5-2\sqrt{6}}}$ is Equal to

(a) 1
(b) $\sqrt{2}$
(c) $6\sqrt{2}$
(d) $2\sqrt{6}$

Sol. (a)

$$\sqrt{(1)^2 + \left(\sqrt{2}\right)^2 + \left(\sqrt{3}\right)^2 + 2(1)\left(\sqrt{2}\right) + 2(1)\left(\sqrt{3}\right) + 2\left(\sqrt{2}\right)\left(\sqrt{3}\right)}$$

$$-\frac{1}{\sqrt{\left(\sqrt{3}\right)^2 + \left(\sqrt{2}\right)^2 - 2\sqrt{2}.\sqrt{3}}}$$

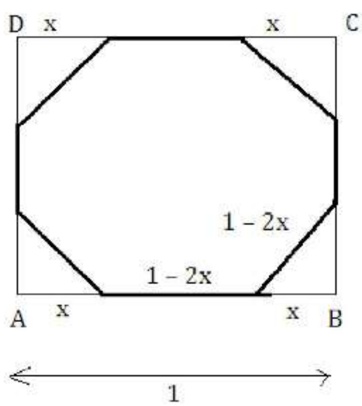
$$\left(1 + \sqrt{2} + \sqrt{3}\right)^2 - \frac{1}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3+\sqrt{2}}}$$

$\frac{1+\sqrt{2}+\sqrt{3}}{1} - \frac{(\sqrt{3}+\sqrt{2})}{(\sqrt{3})^2-(\sqrt{2})^2}$

$\frac{1+\sqrt{2}+\sqrt{3}}{1} - \frac{\sqrt{3}+\sqrt{2}}{1}$

$\frac{1+\sqrt{2}+\sqrt{3}}{1} - \sqrt{2} - \sqrt{3} = 1$

Q5. A regular octagon is to be formed by cutting equal isosceles right triangles from the corners of a square. If the square has sides of one unit, the leg of each of the triangle has length;



(a) $\frac{2+\sqrt{2}}{3}$
(b) $\frac{2-\sqrt{2}}{2}$
(c) $\frac{1-\sqrt{2}}{2}$
(d) $\frac{1+\sqrt{2}}{3}$

Sol. (a)

$x^2 + x^2 = (1-2x)^2$
$2x^2 = 1 + 4x^2 - 4x$
$0 = 2x^2 - 4x + 1$
$x = \frac{4 \pm \sqrt{16-4.2.1}}{2.2}$
$x = \frac{4 \pm 2\sqrt{2}}{4} = \frac{2 \pm \sqrt{2}}{2}$
$x = \frac{2+\sqrt{2}}{2}, \frac{2-\sqrt{2}}{2}$

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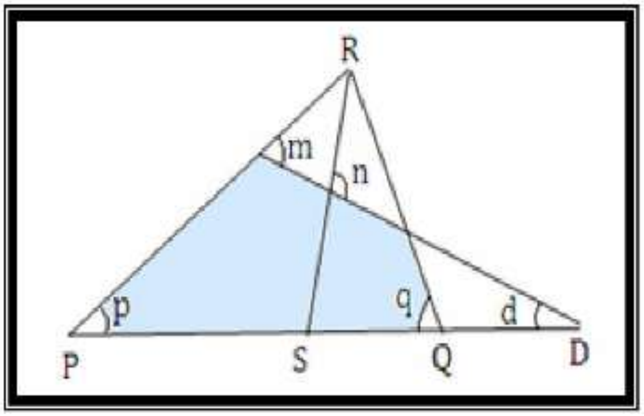
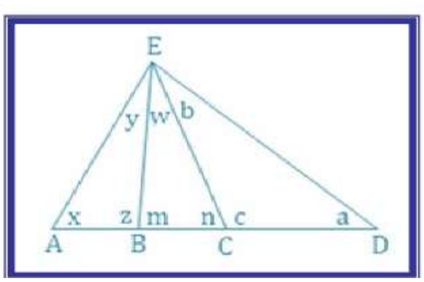
Q6. Given triangle PQR with RS bisecting angle R, PQ extended to D and angle 'n' a right angle, then:



(a) $\angle m = \frac{1}{2}(\angle p - \angle q)$
(b) $\angle m = \frac{1}{2}(\angle p + \angle q)$
(c) $\angle d = \frac{1}{2}(\angle q + \angle p)$
(d) $\angle d = \frac{1}{2}\angle m$

Sol. (b)
$\angle m = \angle p + \angle d, \angle d = \angle q - \angle m$ (There are two vertical angles each ∠m)
$\therefore \quad \angle m = \angle p + \angle q - \angle m$; $\quad \therefore \angle m = \frac{1}{2}(\angle p + \angle q)$

Q7. In a general triangle ADE (as shown) lines EB and EC are drawn. Which of the following angle relations is true?



(a) $x + z = a + b$
(b) $y + z = a + b$

(c) $m + x = w + n$
(d) $x + y + n = a + b + m$

Sol. (d)
From triangle AEC, $x + n + y + w = 180°$
From triangle BED, $m + a + w + b = 180°$
$\therefore \quad x + y + n = a + b + m$

Q8. Solve for 'x' $4\left(x - \frac{1}{x}\right)^2 + 8\left(x + \frac{1}{x}\right) = 29$

(a) 1

(b) 2

(c) 0

(d) None of these

Sol. (c)

The equation can be written as

$$4\left(x^2 + \frac{1}{x^2} - 2\right) + 8\left(x + \frac{1}{x}\right) - 29 = 0$$

$$\Rightarrow 4\left(x^2 + \frac{1}{x^2}\right) + 8\left(x + \frac{1}{x}\right) - 37 = 0$$

Let $x + \frac{1}{x} = y$

So the equation reduces to $4(y^2 - 2) + 8y - 37 = 0$

Q9. If P, Q, R, S are the sides of a quadrilateral. Find the minimum value of $\frac{p^2+q^2+r^2}{s^2}$

(a) ½
(b) 1/3
(c) 2/3
(d) 3/2

Sol. (b)

We have AB = P, BC = q , CD = r, AD = s

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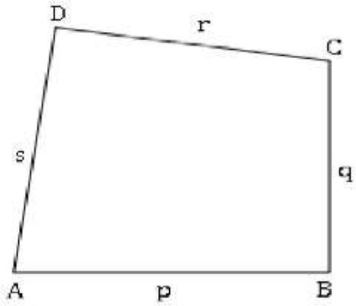


We know that

$(p-q)^2 + (q-r)^2 + (r-p)^2 \geq 0$

$\Rightarrow \quad 2(p^2+q^2+r^2) \geq 2\,(pq+qr+rp)$

$\Rightarrow \quad 3(p^2+q^2+r^2) \geq 2\,(p^2+q^2+r^2) + 2(pq+qr+rp)$

[on adding $p^2 + q^2 + r^2$ to both sides]

$\Rightarrow \quad 3(p^2+q^2+r^2) \geq (p+q+r)^2$

[∵ sum of any three sides of a quadrilateral is greater than fourth one]

$\Rightarrow \quad 3(p^2+q^2+r^2) \geq (p+q+r)^2 > s^2$

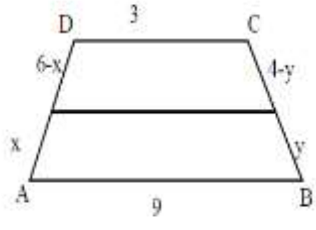
$\Rightarrow \quad \frac{p^2+q^2+r^2}{s^2} > \frac{1}{3}$

∴ Minimum value of $\frac{p^2+q^2+r^2}{s^2}$ is $\frac{1}{3}$

Q10. The parallel sides of a trapezoid are 3 cm and 9 cm . The non- parallel side are 4 cm and 6 cm. A line parallel to the base divides the trapezoid into two trapezoids of equal perimeters. Find the ratio into which each of the non- parallel sides is divided**.**

(a) 1 : 5
(b) 1 : 4
(c) 1 : 3
(d) None of these

Sol. (b)



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Now,

$3+(6-x)+(4-y)=x+9+y$

$\Rightarrow\ 2x+2y=4$

$\Rightarrow x+y=2$

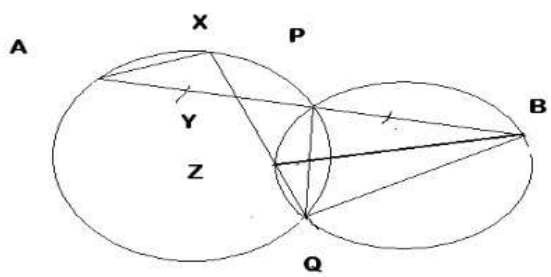
$\therefore\quad 63-x+4-y=10-(x+y)=8$

$\therefore ration\ =2:8=1:4$

Q11. Two circles C1 and C2 intersect at two distinct points P and Q in a plane. Let a line passing through P meet the circles C1 and C2 in A and B respectively. Let Y be the middle point of AB , let QY meet the circles C_1 and C_2 in X and Z respectively . Then which of the following is correct?

(a) Y is mid – point XZ
(b) Z is mid – point QX
(c) P is mid – point AB
(d) None of these

Sol. (a)



$\angle XAP=\angle XQP$ (Angles on the same arc PQ) ….. (i)

$\angle PQY=\angle PBZ=$ (Angles on the same arc PZ) …..(ii)

$\therefore\quad \angle PAY=\angle PBZ$ (From (i) and (ii))……. (iii)

$XY=ZY$

$\therefore$ Y is mid – point XZ

Q12. A square is inscribed in an equilateral triangle. Find the ratio of area of the square to that of the triangle.

(a) $4\sqrt{3}\ :7+3\sqrt{3}$
(b) $2\sqrt{3}\ :7+4\sqrt{3}$
(c) $4\sqrt{3}\ :7+4\sqrt{3}$
(d) None of these

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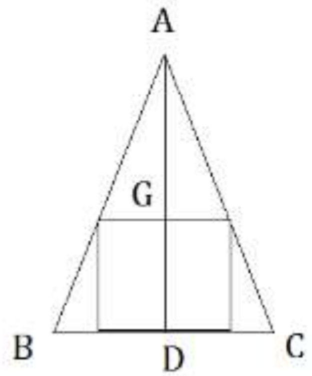
Sol. (c)



Let the side of square be 'a' So AG = $\frac{\sqrt{3}}{2}a$ and GD = a

So AD = AG +GD = $\left(\frac{\sqrt{3}}{2}+1\right)a \ldots\ldots\ldots\ldots(1)$

If 'b' be the side of equilateral triangle. Altitude of triangle is AD = $\frac{\sqrt{3}}{2}\ b \ldots\ldots(2)$

From (1) and (2) , $\left(\frac{\sqrt{3}}{2}+1\right)a=\frac{\sqrt{3}}{2}\ b$

$$So\ a=\frac{\sqrt{3}}{2+\sqrt{3}}\ b$$

Now are of square = $a^2=\frac{3}{7+4\sqrt{3}}\ b^2$ (3)

Area of Triangle = $\frac{\sqrt{3}}{4}\ b^2$ (4)

Ratio of areas of Square to Triangle: $\frac{3}{7+4\sqrt{3}}\ b^2:\frac{\sqrt{3}}{4}\ b^2$

$\frac{\sqrt{3}}{7+4\sqrt{3}}:\frac{1}{4}=4\sqrt{3}\ :7+4\sqrt{3}$

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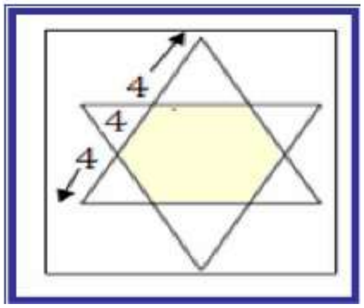
Q13. Two equilateral triangle measures 12 cm on each side. They are positioned to form a regular six-pointed star. What is the area of the overlapping figure?



(a) $48\sqrt{3}\ \text{cm}^2$
(b) $24\sqrt{3}\ \text{cm}^2$
(c) $36\sqrt{3}\ \text{cm}^2$
(d) $12\sqrt{3}\ \text{cm}^2$

Sol. (b)

Required Area = $\frac{\sqrt{3}}{4}(12)^2 - 3\left(\frac{\sqrt{3}}{4}(4)^2\right)$

$\frac{\sqrt{3}}{4} \times 144 - \frac{3\sqrt{3}}{4}(16)$

$\sqrt{3}(36-12) = 24\sqrt{3}\ \text{cm}^2$

Q14. Volume of a cube is 5832 m^3. Find the cost of painting its total surface area at the rate of Rs. 3.50 per m^2

(a) 6804
(b) 6805
(c) 6809
(d) None of these

Sol. (a)

Volume S^3 = 5832 m^3

S = 18 m

Painted area $6s^2$

= 1944 m^2

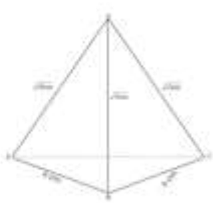
Cost = 1944×3.5

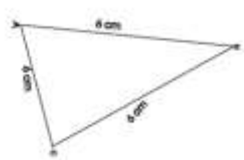
$= RS. 6804$

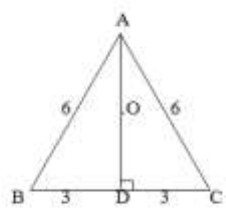
Q15. The base of a pyramid is an equilateral triangle of side length 6 cm. The other edges of the pyramid are each of length $\sqrt{15}$ cm. Find the volume of the pyramid.

(a) 6 cm^2
(b) 9 cm^2
(c) 8 cm^2
(d) None of these

Sol. (b)







In Δ ABC,

AD $= \sqrt{6^2 - 3^2}$

$= \sqrt{36 - 9}$

$= \sqrt{27}$

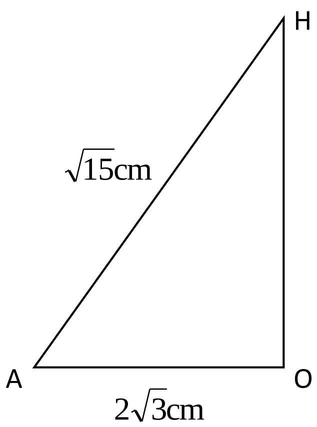
$= 3\sqrt{3}$

$\therefore$ AO = $= \dfrac{2}{3}$ x AD

$$= \frac{2}{3} x 3\sqrt{3}$$

$$= 3\sqrt{3} cm$$

Now, In Δ AOH



∴ OH = $\sqrt{(15)^2 - (2\sqrt{3})^2}$

= $\sqrt{15 - 12}$

= $\sqrt{3}$

ar (Δ ABC) = $\frac{\sqrt{3}}{4} x 6^2$

$= \frac{\sqrt{3}}{4} x 6 x 6$

= $9\sqrt{3}$

∴ Volume of the pyramid = $\frac{1}{3}$ (Base) x (Height)

$= \frac{1}{3} x 9\sqrt{3} x \sqrt{3}$ $= 9\ cm^3$

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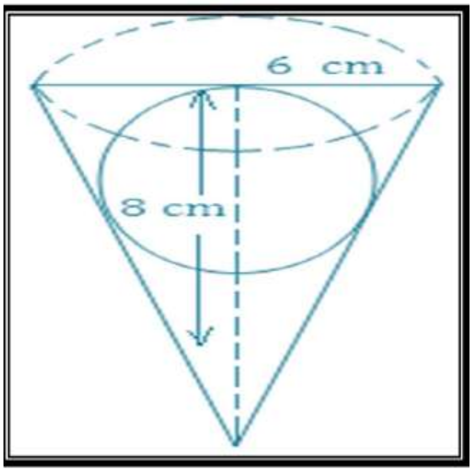
Q16. A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A sphere is lowered into the water and its size is such that when it touches the sides, it is just immersed. What fraction of the water



(a) $\frac{2}{5}$
(b) $\frac{3}{8}$
(c) $\frac{3}{5}$
(d) $\frac{3}{4}$

Sol. (b)

A vertical section of the conical vessel and the sphere when immersed are shown in the figure.

From right angles ΔAMB,

$\mathrm{AB}^2 = \mathrm{AM}^2 + \mathrm{MB}^2 = 82 + 62$

$= 64 + 36 = 0$

$\Rightarrow \mathrm{AB} = 10 \text{ cm}$

CB is tangent to the circle at M and AB is tangent to it at P.

PB = MB = 6

(∴ Lengths of tangents from an external point to a circle are equal in length)

∴ $\mathrm{AP} = \mathrm{AB} - \mathrm{PB} = (10 - 6) \text{ cm} = 4 \text{ cm}$

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Let r cm be the radius of the circle, then OP = OM = r

$\therefore \quad AO = AM - OM = (8 - r)cm$

From right angled ΔOAP,

$OA^2 = AP^2 + OP^2$

$\Rightarrow (8 - r)^2 = 42 + r^2$

$\Rightarrow 64 - 16r + r^2 = 16 + r^2$

$\Rightarrow 48 = 16r \;\Rightarrow r = 3.$

$\therefore$ Radius of circle i. e. of the sphere = 3 cm

$\therefore$ Volume of sphere $= \frac{4}{3}\pi \times 3^2 \text{ cm}^3 = 36\ \pi\text{cm}^3$

The volume of water which overflows = volume of the sphere = 36π cm^3.

Volume of water in the cone before immersing the sphere

= volume of the cone = $\frac{1}{3}\pi \times 6^2 \times 8 \text{ cm}^3$

$= 96\pi \text{ cm}^3$

$\therefore$ Fraction of water which overflows = $\frac{\text{Volume of water overflows}}{\text{Total volume of water}} = \frac{36\pi}{96\pi} = \frac{3}{8}$.

Q17. The mean of the following distribution is 50.

(a) 2

(b) 3

(c) 4

(d) 5

Sol. (d)

X	Frequency
10	17
30	5a+3

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50	32
70	7a-11
90	19

$\sum \text{fi} = 12\text{a} + 60, \quad \sum \text{fixi} = 640\text{a} + 2800$

$\overline{\text{x}} = \frac{\sum \text{fixi}}{\sum \text{fi}}$

$50 \; = \frac{640\text{a}+2800}{12\text{a}+60}$

a = 5

Q18. A total of 28 handshakes were exchanged at the conclusion of a party. Assuming that each participant was equally polite toward all the other, the number of people present was

(a) 14
(b) 28
(c) 56
(d) 8

Sol. (d)

Let No. of people is = x and each one has to hand shake with (x-1) persons.

$\therefore \; \frac{x(x-1)}{2} = 28$

$x^2 - x = 56$

$x^2 - x - 56 = 0$

$x^2 - 8x + 7x - 56 = 0$

$(x - 8)(x + 7) = 0$

$x = 8, x = \; -7$

$\therefore \;\; \text{No. of person} = 8$

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Q19. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

(a) $\frac{1}{2}$
(b) $\frac{3}{4}$
(c) $\frac{3}{8}$
(d) $\frac{5}{16}$

Sol. (b)

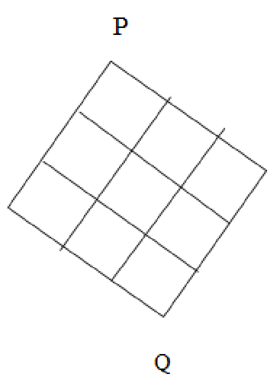
In a simultaneous throw of two dice, we have n(S) = (6×6) = 36.

Then, E = {(1,2), (1,4), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,2), (3, 4), (3,6), (4,1), (4,2), (4,3),(4,4), (4,5), (4,6), (5,2), (5,4), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)}

$\therefore n\,(E) = 27$

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{27}{36} = \frac{3}{4}$

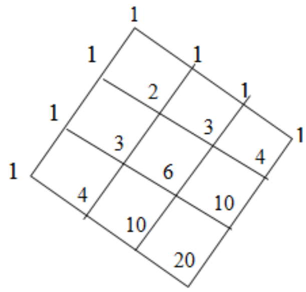
Q20. If only downward motion along lines is allowed, what is the total number of paths from point P to point Q in the figure below?



(a) 20
(b) 10
(c) 30
(d) None of these

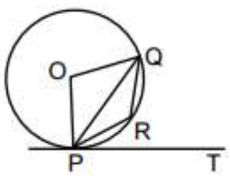
Sol. (a)

By using the principle of Pascal's triangle, we have,



∴ There are 20 paths possible from P to Q.

Q21. In the figure, PQ is a chord of a circle with centre O and PT is the tangent at P such that ∠QPT = 70°. Then the measure of ∠PRQ is equal to



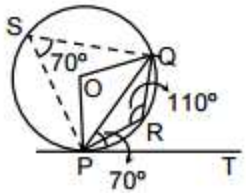
(a) 135°

(b) 250°

(c) 120°

(d) 110°

Sol. (d)

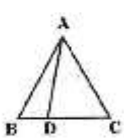


$\angle PSQ = \angle QPT = 70°$ (Angles in alternate segment of circle are equal)

$\therefore \ \angle PRQ = 180° - \angle PSQ$

$= 180° - 70° = 110°$

Q22. In the figure given, D divides the side BC of ΔABC in the ratio 3 : 5. What is the area of ΔABD?



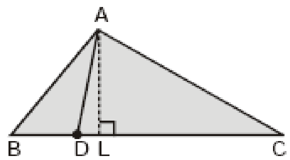
(a) $\frac{2}{5} \times ar\ (\Delta ABC)$
(b) $\frac{3}{5} \times ar\ (\Delta ABC)$
(c) $\frac{5}{8} \times ar\ (\Delta ABC)$
(d) $\frac{3}{5} \times ar(\Delta ABC)$

Sol. (d)

D divides BC in the ratio 3 : 5

$\Rightarrow$ BD : CD = 3 : 5

$\Rightarrow$ $BD = \frac{3}{8} \times BC$ ..... (1)



Draw $AL \perp BC$.

Area of $\Delta ABD = \frac{1}{2}(BD) \times (AL)$

$= \frac{1}{2}\left(\frac{3}{8} \times BC\right) \times (AL)$

$= \frac{3}{8}\left(\frac{1}{2} \times BC \times AL\right)$

$= \mathbf{\frac{3}{8}}(\boldsymbol{ar}\ \mathbf{\Delta ABC})$

Q22. The base of a comical tent is of are 616 sq. cm. A 48 cm long vertical pole is placed at its centre so that it touches the roof of the tent. How much canvas is needed to make the tent if the base is also covered with canvas?

(a) 2816 cm^2
(b) 2861 cm^2
(c) 2618 cm^2
(d) 2681 cm^2

Sol. (a)

$\pi r^2 = 616$ sq.cm (Given)

$\Rightarrow r = 14$ cm

$\Rightarrow l = \sqrt{h^2 + r^2} = 50$ cm

$\therefore$ T.S.A. = $\pi r(l + r)$ = **2816 sq.cm.**

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Q23. The mean of 100 observations is 50. If one of the observations, 50 is replaced by 150, what is the resulting mean?

(a) 50.5
(b) 51
(c) 51.5
(d) 52

Sol. (b)

Given:

Mean of 100 observations = 50

$\Rightarrow$ Sum of 100 observations = 5000

As one observation, 50 is replaced by 150, the new sum = Sum – Previous value + New value = 5000 – 50 + 150

= 5000 + 100 = 5100

$\therefore$ New mean $= \frac{5100}{100} = \mathbf{51}$

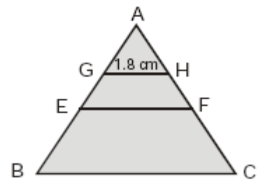
Q24. E and F are the midpoints of the sides AB and AC respectively of ΔABC; G and H are the midpoints of sides AE and AF respectively of the ΔAEDF. If GH = 1.8 cm. Find BC.

(a) 0.9 cm
(b) 3.6 cm
(c) 7.2 cm
(d) 5.4 cm

Sol. (c)

$EF = \frac{1}{2}\ BC$ ....(1)

[∵ E and F are midpoints of sides AB and AC of ΔABC]



Similarly, $GH = \frac{1}{2} EF$ ...... (2)

From (1) and (2), we have

$GH = \frac{1}{2} \times \frac{1}{2} BC = \frac{1}{4} BC$

$\Rightarrow$ BC = 4 × GH

= 4 × 1.8 = 7.2 cm

$\therefore$ **BC = 7.2 cm**

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Q25. Which of the following statement is true?
(a) The ordinate is positive to the right of the origin
(b) The ordinate is negative to the left of the origin.
(c) The ordinate is negative below x – axis
(d) The ordinate is negative above x – axis

Sol. (c)

Q26. If the product of $x^2 - 6x + 5 \; and \; 2x^2 - 7x + 3 \;\; is \; 0$, which of the following is not a value of 'x'?
(a) 3
(b) 2
(c) 1/2
(d) 1

Sol. (b)

$(x^2 - 6x + 5)\,(2x^2 - 7x + 3) = 0$

$\Rightarrow (x-1)\,(x-5)\,(2x-1)\,(x-3) = 0$

$\Rightarrow x = 1, 5, \dfrac{1}{2}$ or 3.

So, 2 is not a value of *x*.

Q28. A cube of edge 'k' is divided into 'n' equal cubes. What is the edge of the new cube?
(a) $\sqrt[3]{nk}$
(b) $\frac{k}{\sqrt[3]{n}}$
(c) $\sqrt[3]{nK}$
(d) $\frac{\sqrt[3]{n}}{k}$

Sol. (b)

Edge of big cube = k units

Let the edge of small cube be 'a' units.

$\Rightarrow$ Volume of each small cube = a^3;

$\Rightarrow$ Volume of big cube = k^3

Given that there are 'n' small cubes

$\Rightarrow k^3 = n \cdot a^3$

$\Rightarrow a^3 = \dfrac{k^3}{n} \Rightarrow a = \dfrac{k}{\sqrt[3]{n}}$

$\therefore$ Length of the edge of the new cube is

$\boldsymbol{\dfrac{k}{\sqrt[3]{n}}}$.

Q29. If $y = 3^x$ and 'x' and 'y' are both integers, which of the following is equivalent to $3^{2x} + 3^x \times 3$?

(a) $y(y+3)$
(b) $y^2 + 3$
(c) $3y + 3$
(d) $3(y+3)$

Sol. (a)

$y = 3^x$ (Given)

$\therefore\ 3^{2x} + 3^x \times 3$

$= 3^x(3^x + 3) = \mathbf{y(y+3)}$

Q30. How many positive numbers from 1 to 200 both inclusive are equal to the cube of an integer?

(a) 6
(b) 5
(c) 4
(d) 0

Sol. (b)

$1^3 = 1$; $2^3 = 8$; $3^3 = 27$; $4^3 = 64$; $5^3 = 125$; $6^3 = 216$.

While the cubes of numbers from 1 to 5 are less than 200, cube of 6 is greater than 200.

Thus, there are 5 numbers from 1 to 200 both inclusive that are equal to the cube of an integer.

Q31. If 'a' and 'b' are real numbers, for what values does the equations 3x -5 +a = bx + 1 have a unique solution 'x'?

(a) For all 'a' and 'b'
(b) For no 'a' and 'b'
(c) For a≠ 6.
(d) For b ≠ 3.

Sol. (d)

$3x - 5 + a = bx + 1$

$\Rightarrow (3 - b)x + a = 6$

Comparing the coefficients on both the sides $3 - b = 0$ and $a = 6 \Rightarrow b = 3$.

$\therefore$ If $b = 3$, the coefficient of x will be cancelled on both the sides, i.e., x will vanish. **Thus, for a unique solution, $b \neq 3$.**