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SECTION A

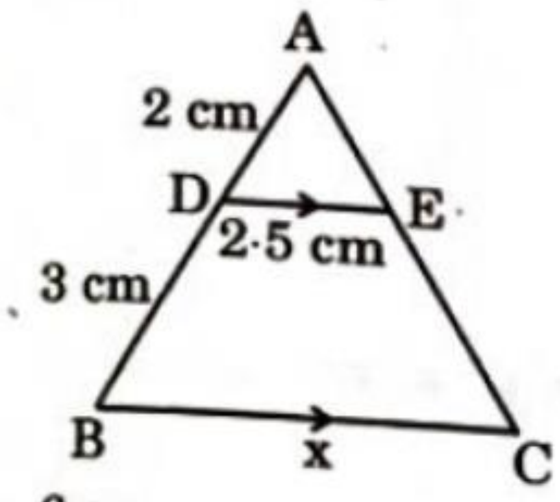
This section comprises multiple choice questions (MCQs) of 1 mark each.

1. The sum of the first 50 odd natural numbers is :

(a) 5000 (b) 2500

(c) 2550 (d) 5050

2. In the given figure, AD = 2 cm, DB = 3 cm, DE = 2·5 cm and DE ∥ BC. The value of x is :



(a) 6 cm (b) 3·75 cm

(c) 6·25 cm (d) 7·5 cm

Q.1. Solve (b)

$S_n = 1 + 3 + 5 \cdots 99$

$= \frac{50}{2}[1+99] = 50 \times 50 = 2500$

Answer – (b) 2500

Q.2. Solve (C) Acc. to figure

$$\frac{AD}{AB} = \frac{DE}{BC}$$

$$\frac{2}{5} = \frac{2.5}{x}$$

$x = 6.25$ cm Answer (C)

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3. **A circle is of radius 3 cm. The distance between two of its parallel tangents is :**

(a) 12 cm **(b)** 6 cm

(c) 3 cm **(d)** 4·5 cm

Q3 (b)

(b) 6cm

4. **The median class for the data given below is :**

Class	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	10	12	14	13	17

(a) 80 – 100 **(b)** 20 – 40

(c) 40 – 60 **(d)** 60 – 80

Q.4.(d)

class	frequency	cf
20-40	10	10
40-60	12	22
60-80	14	36
80-100	13	49
100-120	17	66

$n/2 = 33$

median class (d) Answer

60-80

5. **Mean and median of some data are 32 and 30 respectively. Using empirical relation, mode of the data is :**

(a) 36 **(b)** 26

(c) 30 **(d)** 20

Q5. (b) mode = 3 × median − 2 mean

mode = 3 × 30 − 2 × 32

= 90 − 64 = 26 (b) Answer

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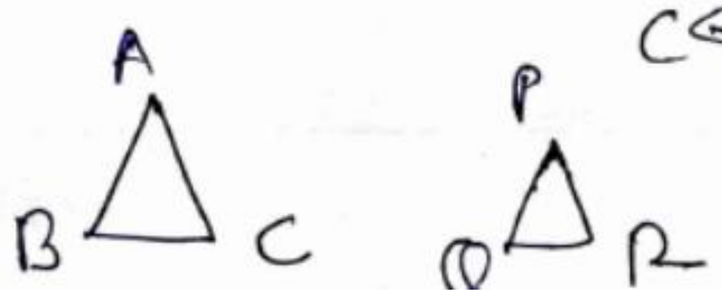
6. In two triangles Δ PQR and Δ ABC, it is given that $\frac{AB}{BC} = \frac{PQ}{PR}$. For these two triangles to be similar, which of the following should be true ?

(a) $\angle A = \angle P$ (b) $\angle B = \angle Q$

(c) $\angle B = \angle P$ (d) $CA = QR$

Q.6 (C) $\frac{AB}{BC} = \frac{PQ}{PR}$ $A \leftrightarrow Q$, $B \leftrightarrow P$, $C \leftrightarrow R$



(C) $\angle B = \angle P$ Answer

7. If $\sin\theta = \frac{3}{4}$, then $\frac{(\sec^2\theta - 1)\cos^2\theta}{\sin\theta}$ equals :

(a) $\frac{3}{5}$ (b) $\frac{3}{4}$

(c) $\frac{4}{3}$ (d) $\frac{9}{16}$

Q. 7(b) $\sin\theta = 3/4$ $\quad \frac{(\sec^2\theta - 1)\cos^2\theta}{\sin\theta} = \frac{\left(\frac{1}{\cos^2\theta} - 1\right)\cos^2\theta}{\sin\theta}$

$= \frac{(1 - \cos^2\theta) \times \cos^2\theta}{\cos^2\theta \sin\theta} = \frac{\sin^2\theta}{\sin\theta} = \sin\theta = 3/4$ (b) Ans

8. The 8th term of an A.P. is 17 and its 14th term is 29. The common difference of this A.P. is :

(a) 3 (b) 2

(c) 5 (d) −2

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(8) (b) $a_8 = a + 7d = 17$ — (1)

$a_{14} = a + 13d = 29$ — (2)

Sub eq (2) from eq (1).

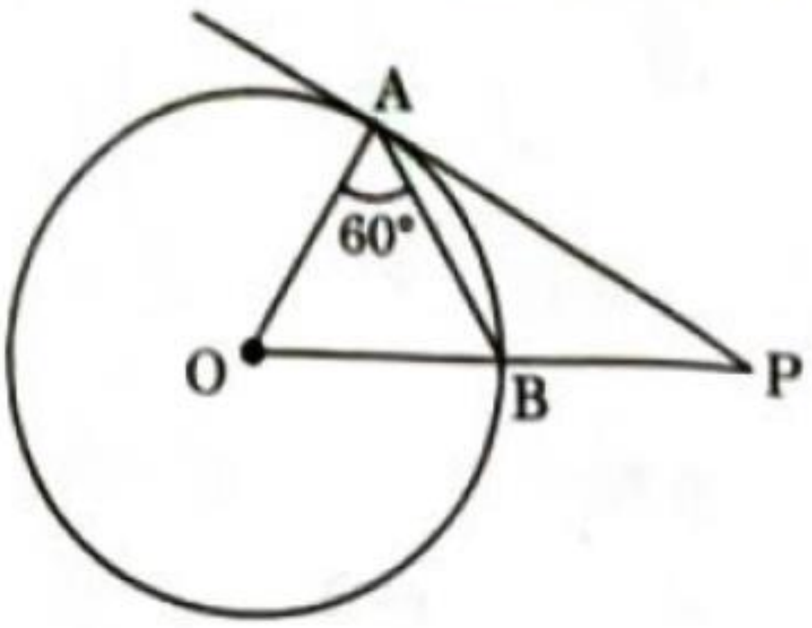
$6d = 12$

$\boxed{d = 2}$

$\boxed{a = 3}$

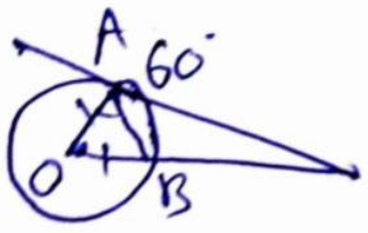
(b) Ans

9. In the given figure, O is the centre of the circle and PA is a tangent to the circle. If $\angle OAB = 60°$, then $\angle OPA$ is equal to :



(a) 60°
(b) 30°
(c) 15°
(d) 20°

(9) (b)



OA = OB → radius

$\angle A = 60° = \angle O = \angle B$

$\Delta OAB \Rightarrow$ equilateral triangle

$\angle OPA = 90° - 60° = 30°$ (b) Answer

10. One card is drawn at random from a well shuffled deck of 52 playing cards. The probability that it is a red king is :

(a) $\frac{1}{52}$
(b) $\frac{1}{26}$
(c) $\frac{2}{26}$
(d) $\frac{2}{13}$

(10) Solve (b) $P(E) = \frac{2}{52} = \frac{1}{26}$

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11. If the lines represented by equations $3x + 2my = 2$ and $2x + 5y + 1 = 0$ are parallel, then the value of m is :

(a) $\frac{2}{5}$ (b) $-\frac{5}{4}$

(c) $\frac{3}{2}$ (d) $\frac{15}{4}$

Q.11 (d) for parallel $\frac{3}{2} = \frac{2m}{5} \neq \frac{-2}{1}$

$15 = 4m \Rightarrow m = 15/4$ (d) Ans

12. $\Delta ABC \sim \Delta DEF$ and their perimeters are 32 cm and 24 cm respectively. If AB = 10 cm, then DE equals :

(a) 8 cm (b) 7·5 cm

(c) 15 cm (d) $5\sqrt{3}$ cm

Q.12. (b) $\frac{AB}{DE} = \frac{10}{DE} = \frac{32}{24}3$ $DE = 7.5$ cm (b) Ans

13. The two roots of the equation $3x^2 - 2\sqrt{6}x + 2 = 0$ are :

(a) real and distinct

(b) not real

(c) real and equal

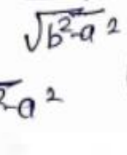
(d) rational

C

14. If $\sin\theta = \frac{a}{b}$, then sec θ is equal to $(0 \le \theta \le 90°)$:

(a) $\frac{a}{\sqrt{b^2 - a^2}}$ (b) $\frac{b}{\sqrt{b^2 - a^2}}$

(c) $\frac{\sqrt{b^2 - a^2}}{b}$ (d) $\frac{\sqrt{b^2 - a^2}}{a}$

(14) (b) $\sin\theta = \frac{a}{b}$ 

$\sec\theta = \frac{H}{B} = \frac{b}{\sqrt{b^2 - a^2}}$ (b) Ans

15. The distance between the points A(0, 6) and B(– 6, 2) is :

(a) 6 units (b) $2\sqrt{6}$ units

(c) $2\sqrt{13}$ units (d) $13\sqrt{2}$ units

(15) (c) $D = \sqrt{(0+6)^2 + (6-4)^2} = \sqrt{36+16} = \sqrt{52} = 2\sqrt{13}$ units

(c) Ans

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16. The value(s) of k for which the roots of quadratic equation $x^2 + 4x + k = 0$ are real, is :

(a) $k \geq 4$ (b) $k \leq 4$

(c) $k \geq -4$ (d) $k \leq -4$

(16) (b) $x^2+4x+k=0$

$D = \sqrt{(4)^2-4\times1} \geq 0$

$16-4k \geq 0$

$16 \geq 4k$

$4 \geq k$ (b) Ans

17. HCF of $(3^4 \times 2^2 \times 7^3)$ and $(3^2 \times 5 \times 7)$ is :

(a) 630 (b) 63

(17) (b) HCF $= 3^2 \times 7 = 63$ (b) Ans

(c) 729 (d) 567

18. If one zero of the quadratic polynomial $kx^2 + 3x + k$ is 2, then the value of k is :

(18) (a) $P(2) = 0$

$k(2)^2 + 3\times2 + k$

$4k + 6 + k = 0$

$5k + 6 = 0$

$k = -\frac{6}{5}$

(a) Ans

(a) $-\frac{6}{5}$ (b) $\frac{6}{5}$

(c) $\frac{5}{6}$ (d) $-\frac{5}{6}$

19. *Assertion (A) :* The surface area of largest sphere that can be inscribed in a hollow cube of side 'a' cm is πa^2 cm^2.

Reason (R) : The surface area of a sphere of radius 'r' is $\frac{4}{3}\pi r^3$.

(19) (c) as easphere $= 4\pi(\frac{a}{2})^2 = \pi a^2$

Both (A) & (R) is incorrect

(A) is true

20. *Assertion (A) :* When two coins are tossed together, the probability of getting no tail is $\frac{1}{4}$.

Reason (R) : The probability P(E) of an event E satisfies $0 \leq P(E) \leq 1$.

(20) (b) (A) is true

No tail (HH) favourable

$P(E) = \frac{1}{4}$

Both are true but no explaination (b)

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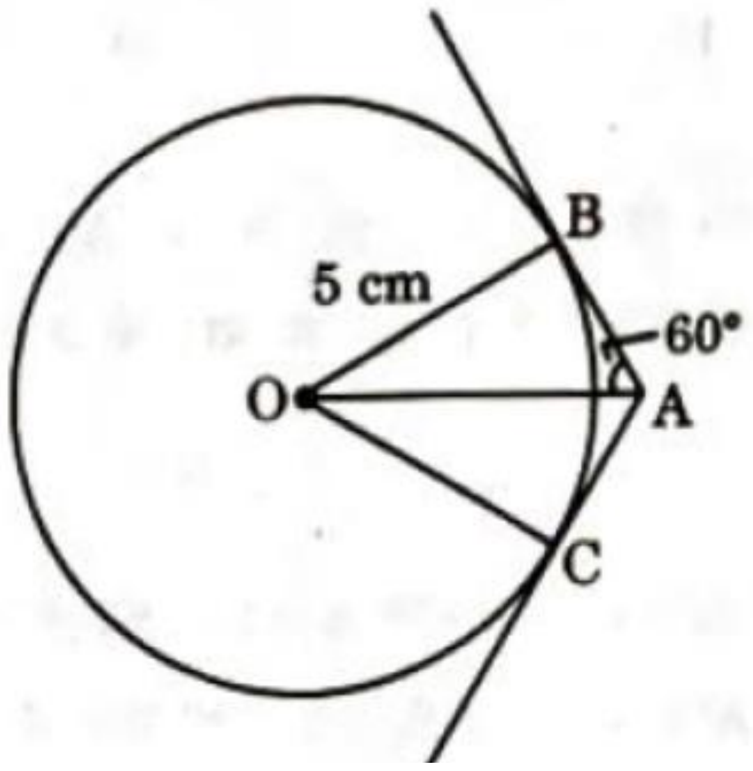
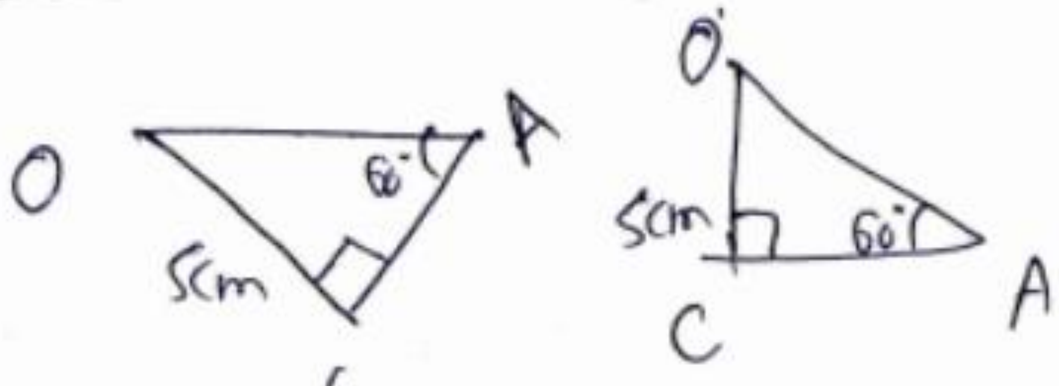
21. In the given figure, tangents AB and AC are drawn to a circle centred at O. If $\angle OAB = 60°$ and OB = 5 cm, find lengths OA and AC.



Section (B)

(21)



$\tan 60° = \frac{OC}{CA} = \sqrt{3}$

$\frac{5\sqrt{3}}{3}$ or $\frac{5}{\sqrt{3}}$ = CA.

$\sin 60° = \frac{5}{OA} = \frac{\sqrt{3}}{2}$

$\frac{10}{\sqrt{3}}$ cm = OA

or $\frac{10\sqrt{3}}{3}$ cm

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22. **Find the sum of the first 20 terms of the A.P. : $-\frac{29}{3}, -9, -\frac{25}{3}, -\frac{23}{3}, \ldots\ldots$**

(22) $a = -\frac{29}{3}$ $\quad d = -9 + \frac{29}{3} = \frac{2}{3}$; $S_{20} = \frac{n}{2}[2a + (n-1)d]$

$S_{20} = \frac{20}{2}\left[-\frac{29}{3} + 19 \times \frac{2}{3}\right] = 10\left[-\frac{29}{3} + \frac{38}{3}\right]$

$= 10 \times \frac{9}{3} = 30.$

23. **(a)** **Evaluate :**

$$\frac{\sin 30° + \tan 45°}{\sec 30° + \cot 45°}$$

OR

(b) **For A = 30° and B = 60°, verify that :**

$$\sin (A + B) = \sin A \cos B + \cos A \sin B.$$

(23) $\frac{\sin 30° + \tan 45°}{\sec 30° + \cot 45°} = \frac{\frac{1}{2} + 1}{\frac{2}{\sqrt{3}} + 1} = \frac{\frac{3}{2}}{\frac{2+\sqrt{3}}{\sqrt{3}}} = \frac{3}{2} \times \frac{\sqrt{3}}{2+\sqrt{3}}$

$= \frac{3}{2} \times \frac{\sqrt{3}}{(\sqrt{3}+2)} \times \frac{(\sqrt{3}-2)}{(\sqrt{3}-2)} = \frac{3[3 - 2\sqrt{3}]}{2 \times (3-4)} = \frac{3(3-2\sqrt{3})}{-2}$

$= 3\frac{(2\sqrt{3}-3)}{2}$

23 (OR) (b)

LHS = $\sin(30° + 60°) = \sin 90° = 1$

RHS = $\sin 30° \cos 60° + \cos 30° \sin 60°$

$= \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = \frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1.$

proved

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24. **Find LCM of 480 and 256 using prime factorization.**

(24)

2	480
2	240
2	120
2	60
2	30
3	15
5	5
	1

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$480 = 2^5 \times 3 \times 5$

$256 = 2^8$

$LCM(480, 256) = 2^8 \times 3 \times 5$

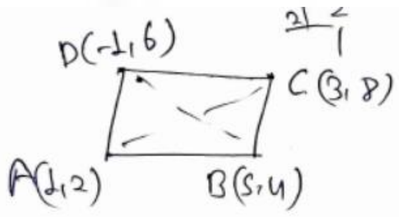
Ans

25. (a) **Show that A(1, 2), B(5, 4), C(3, 8) and D(–1, 6) are vertices of a parallelogram ABCD.**

OR

(b) **Show that the points A(3, 0), B(6, 4) and C(–1, 3) are vertices of a right-angled triangle.**

(25)



$AB = \sqrt{(5-1)^2+(4-2)^2} = \sqrt{20}$

$BC = \sqrt{(5-3)^2+(8-4)^2} = \sqrt{20}$

$CD = \sqrt{(3+1)^2+(8-6)^2} = \sqrt{16+4} = \sqrt{20}$

$DA = \sqrt{(2)^2+4^2} = \sqrt{20}$

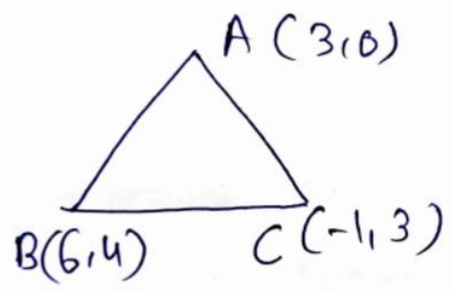
$AC = \sqrt{4+36} = \sqrt{40}$ Hence, AB = CD (Sides of ||gm)

$BD = \sqrt{6^2+2^2} = \sqrt{40}$ & AD = BC

& AC = DB (Diagonals)

Thus, the given ABCD is a ||gm.

(25) OR



$AB = \sqrt{(6-3)^2+4^2} = \sqrt{3^2+4^2} = 5$ unit

$BC = \sqrt{7^2+1^2} = \sqrt{50} = 5\sqrt{2}$ unit

$AC = \sqrt{4^2+3^2} = \sqrt{25} = 5$ unit

So, $(AB)^2+(AC)^2 = (BC)^2$ proved

26. **Find mean of the following data :**

Class	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75	75 – 90
Frequency	12	15	11	20	16	6

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(26)

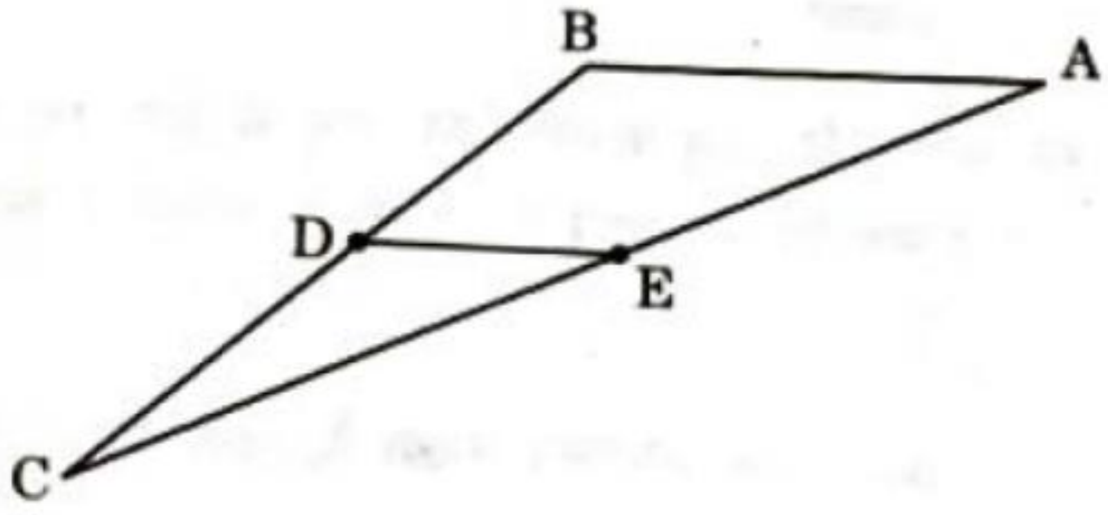
Class	frequency f_i	x_i	$f_i x_i$
0-15	12	$15/2$	$\frac{15}{2}\times 12 = 90$
15-30	15	$45/2$	$15\times\frac{45}{2} = \frac{675}{2} = 337.5$
30-45	22	$75/2$	$11\times\frac{75}{2} = \frac{825}{2} = 412.5$
45-60	20	$105/2$	$\frac{10}{20}\times\frac{105}{2} = 1050$
60-75	16	$135/2$	$\frac{8}{16}\times\frac{135}{2} = 1080$
75-90	6	$165/2$	$\frac{3}{6}\times\frac{165}{2} = 495$
	$\Sigma f_i = 80$		$\Sigma f_i x_i = 3465$

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{3465}{80} = 43.31$$

27. (a) **Determine the ratio in which the point P(a, – 2) divides the line segment joining the points A(– 4, 3) and B(2, – 4). Also, find the value of 'a'.**

OR

(b) **In the given figure, in Δ ABC points D and E are mid-points of sides BC and AC respectively. If given vertices are A(4, – 2), B(2, – 2) and C(– 6, – 7), then verify the result DE = $\frac{1}{2}$ AB.**



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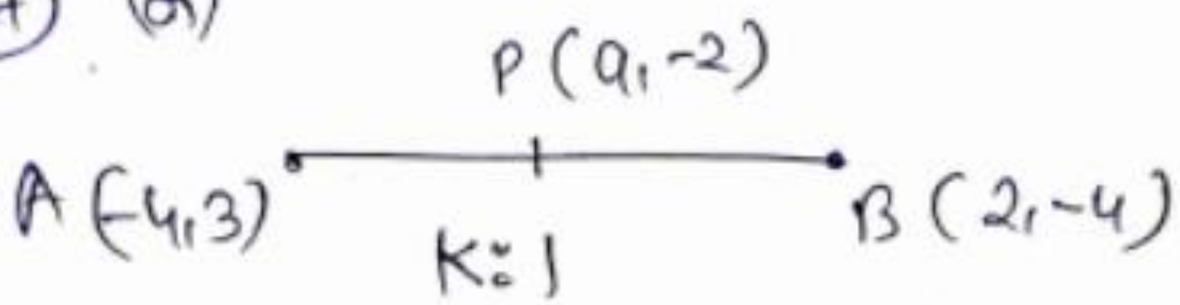
(27) (a)



Let ratio k:1

using section formula

$$x = \frac{2k+(-4)}{k+1} = a \quad \& \quad y = \frac{-4k+3}{k+1}$$

which is equal to a & -2.

$$\frac{-4k+3}{k+1} = -2 \rightarrow -4k+3 = -2k-2$$

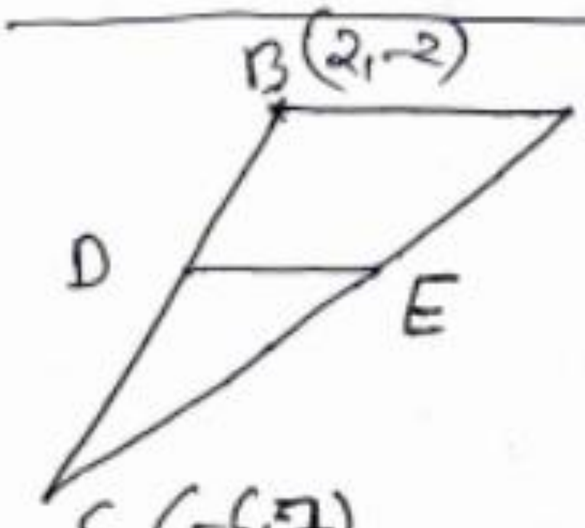
$$5 = -2k+4k = 2k$$

$$k = 5/2$$

So, ratio will be 5:2.

(b) OR

$$a = \frac{2\times5-4\times2}{7} = \frac{10-8}{7} = \frac{2}{7}$$ Ans



As D & E are mid-points of BC & AC respectively.

D = mid-pt of BC = $\left(\frac{2-6}{2}, \frac{-2-7}{2}\right)$

$= \left(-2, -\frac{9}{2}\right)$

E = mid-pt of AC = $\left(\frac{4-6}{2}, \frac{-2-7}{2}\right)$

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$DE = \sqrt{(-2+1)^2 + 0^2} = 1$

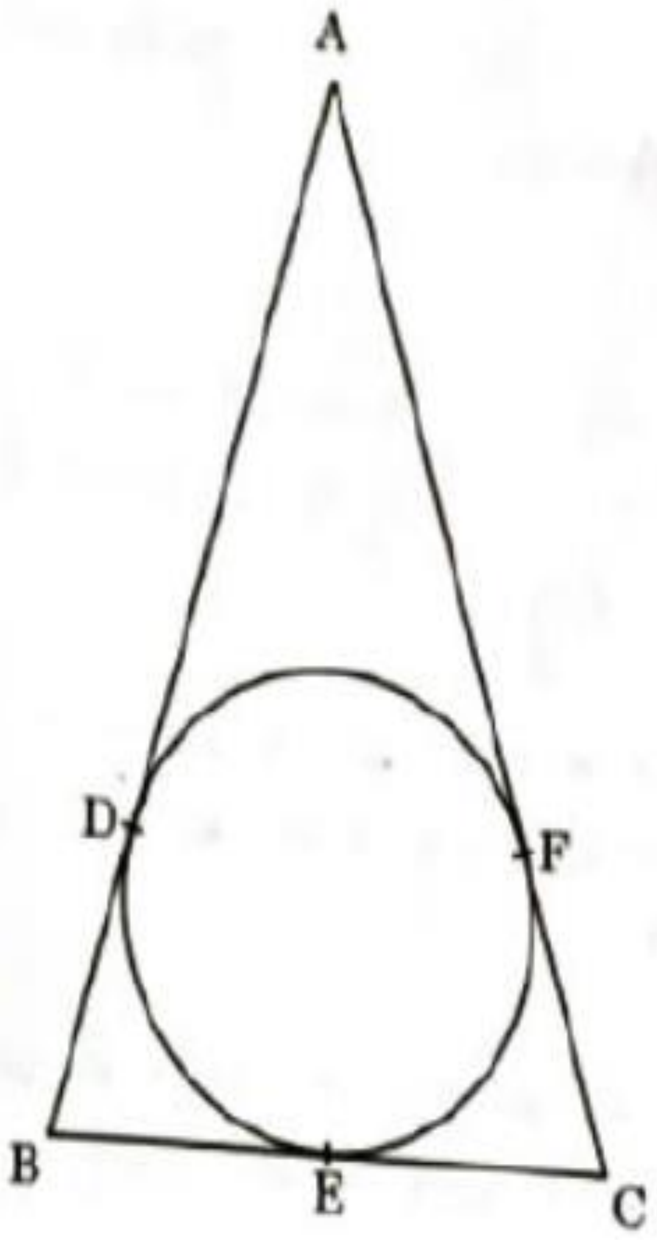
$AB = \sqrt{(4-2)^2 + 0^2} = 2$ $\Rightarrow$ $\frac{1}{2}$

$= \left(-1, -\frac{3}{2}\right)$

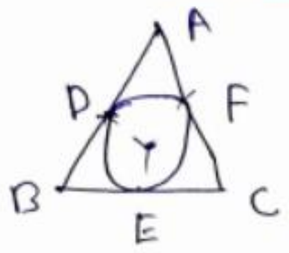
$AB \times \frac{1}{2} = DE$

proved

28. **ABC is an isosceles triangle with AB = AC, circumscribed about a circle. Prove that BC is bisected at E.**



(28)



Given $AB = AC$

$AD + DB = AF + FC$ — (1)

or $AD = AF$ (10.2)

$\Rightarrow DB = FC$ — (2)

Now, from (10.2) $BD = BE$ — (3)

and $CF = CE$ — (4)

from eq (2), (3), (4)

$\boxed{BE = EC}$

which means E is bisector of BC.

29. **Prove that :**

$$\sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}} + \sqrt{\frac{\sec\theta + 1}{\sec\theta - 1}} = 2\,\text{cosec}\,\theta$$

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(29)

$$LHS = \sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}} + \sqrt{\frac{\sec\theta + 1}{\sec\theta - 1}}$$

$$= \frac{\sqrt{\sec\theta + 1}}{\sqrt{\sec\theta + 1}} + \frac{\sqrt{\sec\theta + 1}}{\sqrt{\sec\theta - 1}}$$

$$= \frac{\left(\sqrt{(\sec\theta + 1)}\right)^2 + \left(\sqrt{\sec\theta + 1}\right)^2}{\sqrt{\sec^2\theta - 1}}$$

$$= \frac{\sec\theta - 1 + \sec\theta + 1}{\sqrt{\tan^2\theta}} = \frac{2\sec\theta}{\tan\theta} = \frac{2 \times \cos\theta}{\cos\theta \times \sin\theta}$$

$$= \frac{2}{\sin\theta} = 2\operatorname{cosec}\theta$$

$$= RHS$$

30. (a) Sabina went to a bank ATM to withdraw ₹ 2,000. She received ₹ 50 and ₹ 100 notes only. If Sabina got 25 notes in all, how many notes of ₹ 50 and ₹ 100 did she receive ?

OR

(b) Five years ago, Amit was thrice as old as Baljeet. Ten years hence, Amit shall be twice as old as Baljeet. What are their present ages ?

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(30) Given Let · 50₹ → x notes
100₹ → y notes

total notes x+y = 25 -①

Amount = 2000

50x + 100y = 2000 -②

eq ① × 50 ⇒ 50x + 50y = 1250

50x + 100y = 2000

— — —

0 - 50y = -750

y = +750/750 = 15

x = 10 notes | y = 15 notes

30 (b) AMIT'S present age = x, Baljeet's Present age = y

5 years ago, (x-5) = 3 (y-5) => x-3y = -10 -----(1)

10 years hence (x+10) = 2 (y+10) => x-2y = 10 ____(2)

On elimination, y = 20, x=50 so Amit's Age = 50 Yrs, Baljeet's Age = 20 Yrs

present ages ?

31. Prove that $11 + 3\sqrt{2}$ is an irrational number, given that $\sqrt{2}$ is an irrational number.

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(3) Given $\sqrt{2}$ is an irrational. Let $11+3\sqrt{2}$ is irrational

So $11+3\sqrt{2} = \frac{a}{b}$ (a & b coprime & integers) $b \neq 0$

$3\sqrt{2} = \frac{a}{b} - 11$ (rational - rational = rational

$\therefore \sqrt{2} = \left(\frac{a}{b} - 11\right) \div 3$ (rational ÷ rational = rational.)

In RHS rational divided by rational gives rational but in LHS $\sqrt{2}$ is ~~rational~~ irrational no. So our assumption is wrong bec ~~Hence~~ Irrational ≠ rational

Hence, $11+3\sqrt{2}$ is irrational no.

... questions of 3 marks each.

32. (a) Divide 16 into two parts such that twice the square of the greater part, exceeds the square of the smaller part by 164.

OR

(b) A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream, than to return to the same point. Find the speed of the stream and total time of the journey.

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(32) (a) Let two part be x and $16-x$

A/c to question

$$2x^2 - (16-x)^2 = 164$$

$$2x^2 - (256 + x^2 - 32x) = 164$$

$$2x^2 - 256 - x^2 + 32x = 164$$

$$x^2 + 32x - 256 - 164 = 0$$

~~$x^2 + 32x + 92 = 0$~~

~~$x = -32 \pm \sqrt{1024 - 4 \times 92}$~~

$$x^2 + 32x - 256 - 164 = 0$$

$$x^2 + 32x - 420 = 0$$

$$x = \frac{-32 \pm \sqrt{32^2 + 4 \times 420}}{2} = \frac{-32 \pm \sqrt{1024 + 1680}}{2}$$

$$= \frac{-32 \pm \sqrt{2704}}{2} = \frac{-32 \pm 52}{2} = \frac{-32+52}{2}, \frac{-32-52}{2}$$

$$= \frac{20}{2}, \frac{-84}{2} = 10, -42$$

first no is 10 and smaller no is $(16-10) = 6$. Ans

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(32) OR Let ~~x = 18 km/hr (Speed of man in still water)~~

Speed of man = 18 km/hr

Speed of river = x

Speed in upstream = (18 − x) km/hr

Speed in downstream = (18 + x) km/hr

A/C to question

$$\frac{24}{18-x} - \frac{24}{18+x} = 1$$

$$24\left[\frac{1}{18-x} - \frac{1}{18+x}\right] = 1$$

$$\left[\frac{18+x-18+x}{18^2 - x^2}\right] = \frac{1}{24}$$

$$2x \times 24 = 324 - x^2$$

$$48x = 324 - x^2$$

$$x^2 + 48x - 324 = 0$$

$$x = \frac{-48 \pm \sqrt{48^2 + 4 \times 324 \times 1}}{2} = \frac{-48 \pm \sqrt{3600}}{2}$$

$$x = \frac{-48 \pm 60}{2} = \frac{60-48}{2}, \frac{-60-48}{2}$$

$$= \frac{12}{2}, \frac{-108}{2}$$

speed = 6 km/hr

for river

time for upstream $= \frac{24}{18-6} = \frac{24}{12} = 2$ hr

time for downstream = 1 hr

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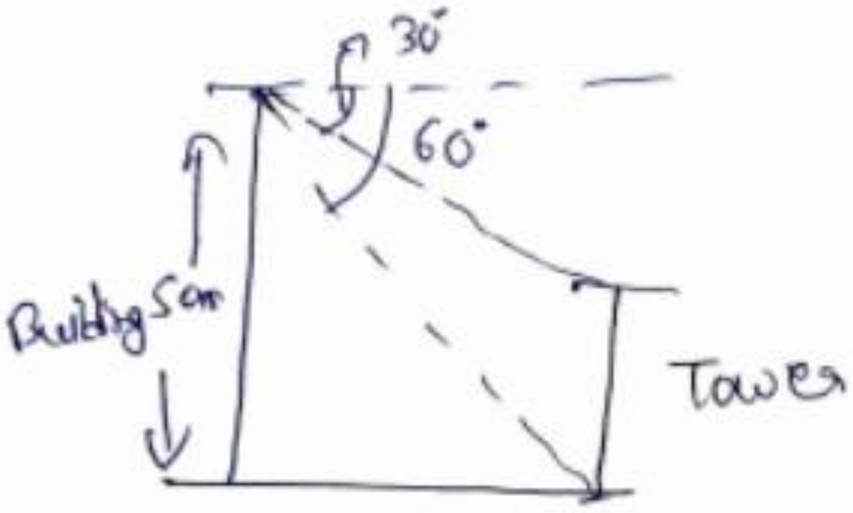
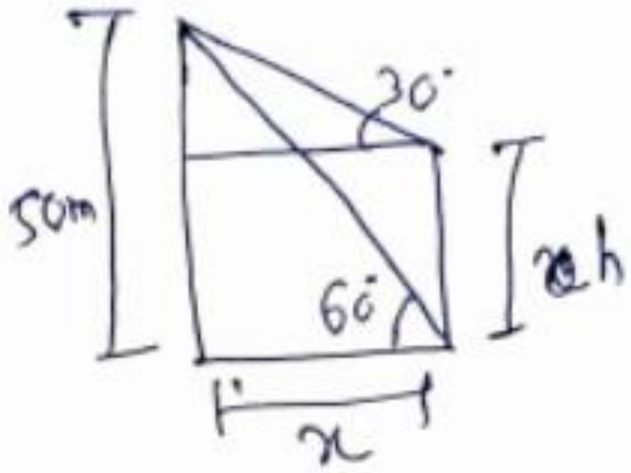
33. If a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then prove that the other two sides are divided in the same ratio.

Q33. Sol :- Refer NCERT (Theorem: BPT)
Ch-6 Triangles

34. From the top of a building 50 m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 60°. Find the height of the tower and distance between the building and the tower. (Take $\sqrt{3} = 1{\cdot}73$)

Q34





$\tan 30° = \frac{(50-h)}{x}$

$\frac{1}{\sqrt{3}} = \frac{(50-h)}{x}$

$x \times \frac{1}{\sqrt{3}} = 50-h$

$\frac{50}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = 50-h$

$\frac{50}{3} = 50-h$

$50 = 150-3h$

$3h = 100$

$\boxed{h = \frac{100}{3}\text{ m}}$

$\tan 60° = \frac{50}{x} = \sqrt{3}$

$x\sqrt{3} = 50$

$x = \frac{50}{\sqrt{3}}$

$= \frac{50\sqrt{3}}{3}$

$= \frac{50 \times 1.73}{3}$

$\boxed{x = 28.833\text{m}}$ distance b/w tower & building

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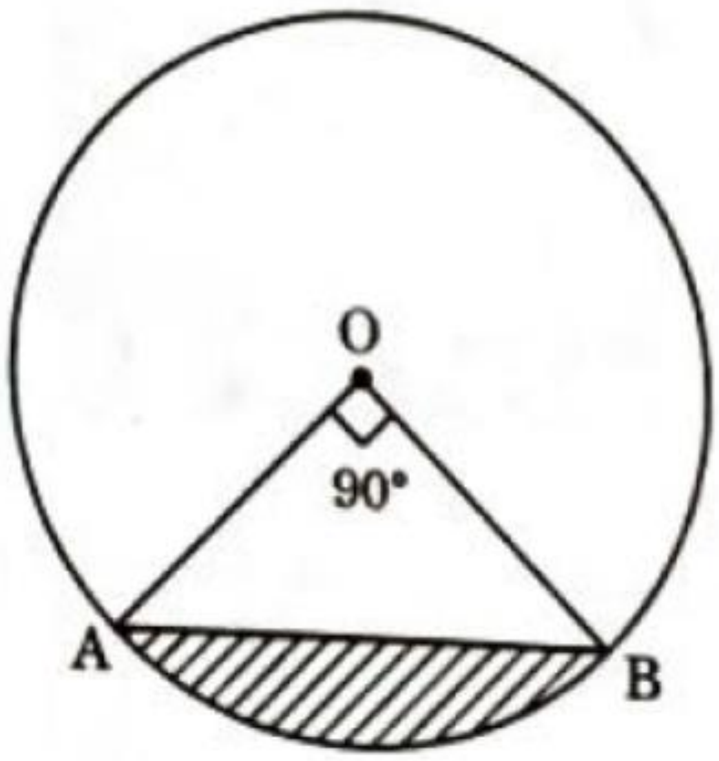
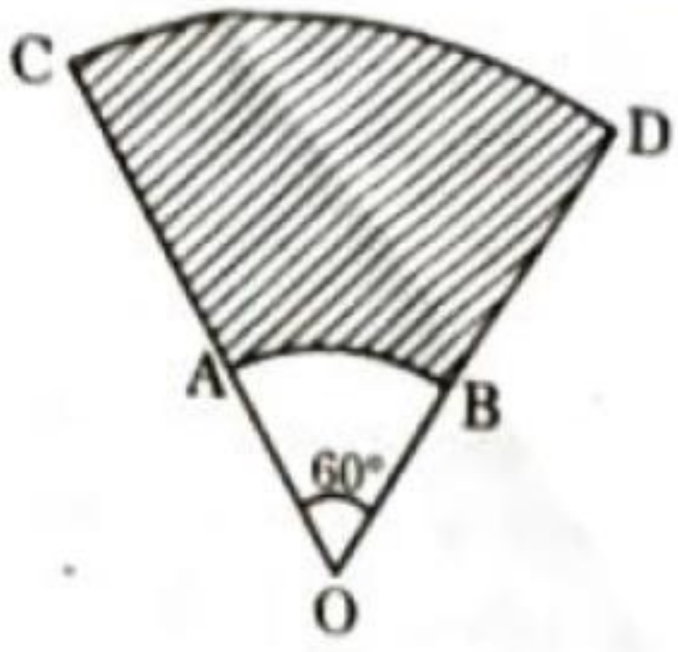
35. (a) In the given figure, AB is a chord of a circle of radius 7 cm and centred at O. Find the area of the shaded region if $\angle AOB = 90°$. Also, find length of minor arc AB.



OR

(b) AB and CD are arcs of two concentric circles of radii 3·5 cm and 10·5 cm respectively and centred at O. Find the area of the shaded region if $\angle AOB = 60°$. Also, find the length of arc CD.



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(35)

$r = 7\,cm$

area of shaded region $= \frac{90}{360} \times \pi (7)^2 - \frac{1}{2} \times 7 \times 7$

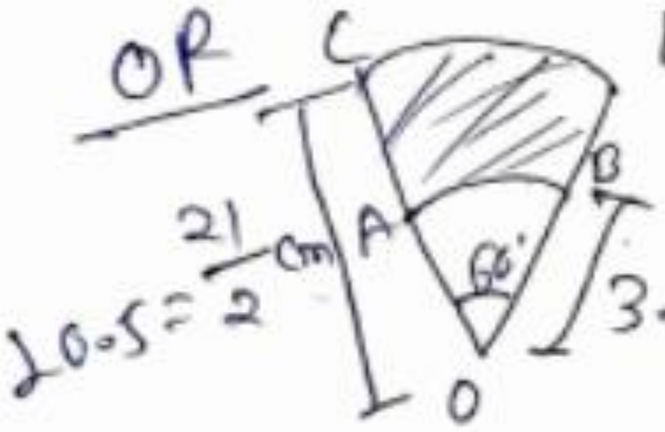
$= \frac{1}{4} \times \frac{22}{7} \times 7 \times 7 - \frac{49}{2}$

$= \frac{77}{2} - \frac{49}{2} = \frac{28}{2} cm^2$

$= 14 cm^2$

Length of minor arc $= \frac{1}{4} \times 2 \times \frac{22}{7} \times 7 = 11\,cm$.

OR



area of shaded region

$= \frac{60°}{360°} \pi \left(\frac{21}{2}\right)^2 - \frac{60}{360} \pi \left(\frac{7}{2}\right)^2$

$= \frac{60}{360} \times \pi \left[\left(\frac{21}{2}\right)^2 - \left(\frac{7}{2}\right)^2\right]$

$= \frac{1}{6} \times \frac{22}{7} \left[\frac{21}{2} + \frac{7}{2}\right]\left[\frac{21}{2} - \frac{7}{2}\right]$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{28}{2} \times \frac{14}{2}$

$= \frac{14 \times 11}{3} = \frac{154}{3} = 51.33 cm^2$

Length of arc CD $= \frac{60}{360} \times 2 \times \frac{22}{7} \times \frac{21}{2} = 11\,cm$

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SECTION E

This section comprises 3 case study based questions of 4 marks each.

Case Study - 1

36. Singing bowls (hemispherical in shape) are commonly used in sound healing practices. Mallet (cylindrical in shape) is used to strike the bowl in a sequence to produce sound and vibration.

One such bowl is shown here whose dimensions are :

Hemispherical bowl has outer radius 6 cm and inner radius 5 cm.

Mallet has height of 10 cm and radius 2 cm.

Based on the above, answer the following questions :

(i) What is the volume of the material used in making the mallet ? 1

(ii) The bowl is to be polished from inside. Find the inner surface area of the bowl. 1

(iii) (a) Find the volume of metal used to make the bowl. 2

OR

(b) Find total surface area of the mallet. (Use $\pi = 3{\cdot}14$) 2

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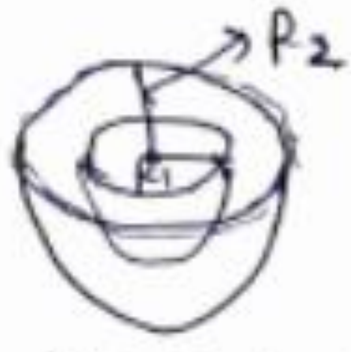
Section E

36

Cylinder (mallet)



Hemispherical bowl

$R_1 = 5\text{cm}$

$R_2 = 6\text{cm}$

(i) Vol. of mallet $= \pi r^2 h = \frac{22}{7} \times 2 \times 2 \times 10 = \frac{880}{7}\ cm^3$

(ii) Area of Bowl $= 2\pi r^2 = 2 \times \frac{22}{7} \times (5)^2 = \frac{44 \times 25}{7} = \frac{1100}{7}\ cm^2$

(iii) Vol. of Bowl $= \frac{2}{3}\pi R_2^3 - \frac{2}{3}\pi R_1^3$

$= \frac{2}{3}\pi (R_2^3 - R_1^3)$

$= \frac{2}{3} \times \frac{22}{7} (6^3 - 5^3) = \frac{44}{21} \times 3 + 13 = \frac{572}{3}\ cm^3$

OR TSA of mallet $= 2\pi r(r+h)$

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

$= 2 \times \frac{22}{7} \times 2 \times 12$ ~~$= \frac{880}{7}\ cm^2$~~

$= \frac{1056}{7} = 150.85\ cm^2$

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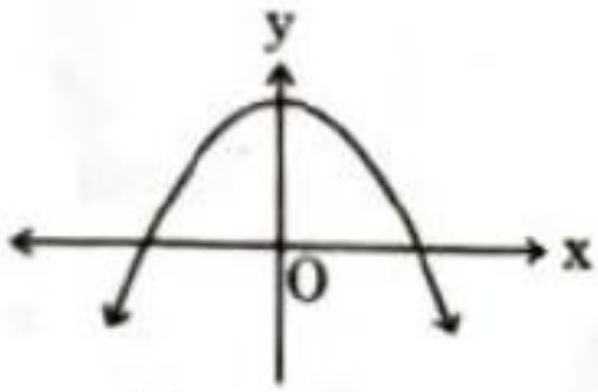
Case Study – 2

37. Rainbow is an arch of colours that is visible in the sky after rain or when water droplets are present in the atmosphere. The colours of the rainbow are generally, red, orange, yellow, green, blue, indigo and violet. Each colour of the rainbow makes a parabola. We know that any quadratic polynomial $p(x) = ax^2 + bx + c\ (a \neq 0)$ represents a parabola on the graph paper.



Based on the above, answer the following questions :

(i) The graph of a rainbow $y = f(x)$ is shown in the figure. Write the number of zeroes of the curve. *1*

(ii) If the graph of a rainbow does not intersect the x-axis but intersects y-axis at one point, then how many zeroes will it have ? *1*

(iii) (a) If a rainbow is represented by the quadratic polynomial $p(x) = x^2 + (a + 1)x + b$, whose zeroes are 2 and – 3, find the value of a and b. *2*

OR

(iii) (b) The polynomial $x^2 - 2x - (7p + 3)$ represents a rainbow. If – 4 is a zero of it, find the value of p.

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(37) (i) No. of zeros = 2

(ii) No zeros. (0)

(iii) $p(x) = x^2 + (a+1)x + b$ $\alpha = 2, \beta = -3$

$\alpha + \beta = 2 - 3 = -1$ $\quad \alpha\beta = 2 \times -3 = -6$

$\alpha + \beta = -(a+1) = -1$

$a + 1 = 1$

$\boxed{a = 0}$

$\alpha\beta = b$

$-6 = b$

$\boxed{b = -6}$

OR $p(x) = x^2 - 2x - (7p+3)$. If -4 is a zero then

$p(-4) = 0$

$0 = (-4)^2 - 2(-4) - (7p+3)$

$= 16 + 8 - 7p - 3 = 0$

$21 - 7p = 0$

$21 = 7p \Rightarrow \boxed{p = 3}$

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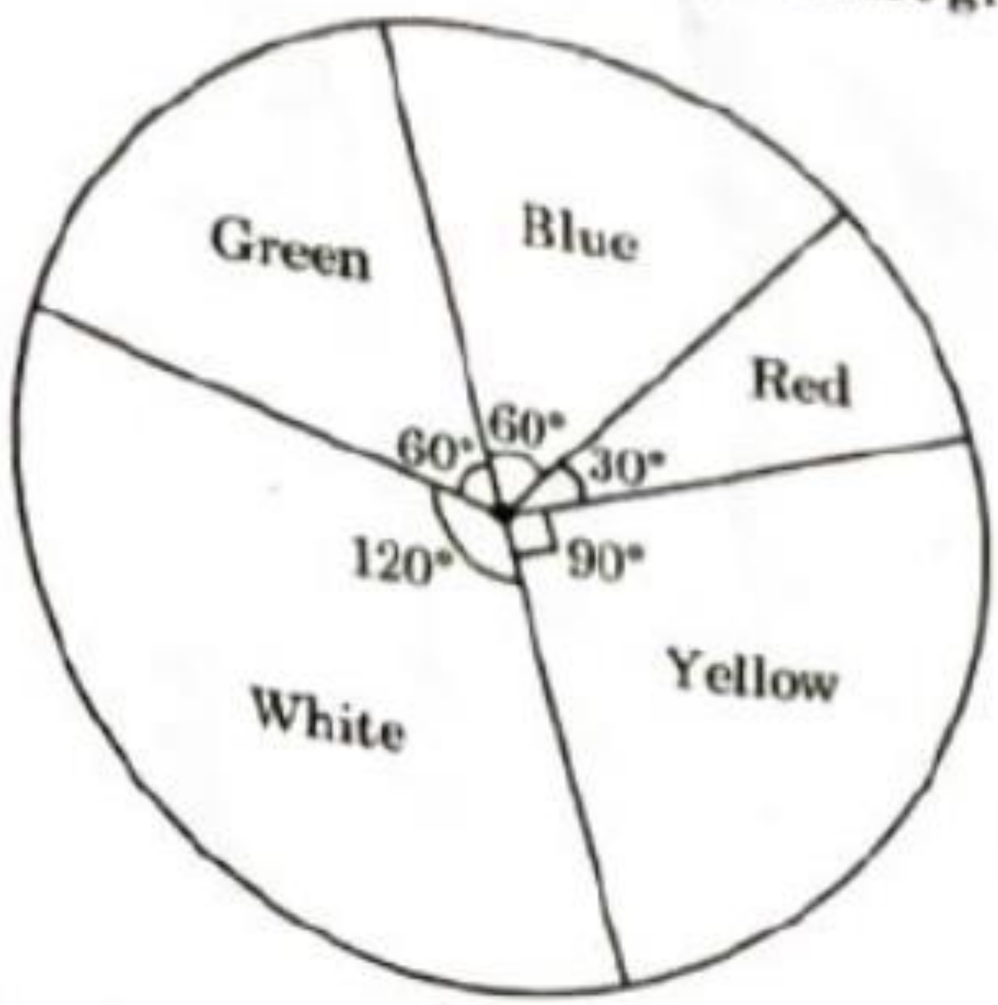
Case Study – 3

38 Some students were asked to list their favourite colour. The measure of each colour is shown by the central angle of a pie chart given below :



study the pie chart and answer the following questions :

(i) If a student is chosen at random, then find the probability of his/her favourite colour being white ? *1*

(ii) What is the probability of his/her favourite colour being blue or green ? *1*

(iii) (a) If 15 students liked the colour yellow, how many students participated in the survey ? *2*

OR

(iii) (b) What is the probability of the favourite colour being red or blue ? *2*

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(i) $P(\text{Cowlite}) = \frac{120}{360} = \frac{1}{3}$

(ii) $P(\text{Blue or green}) = \frac{60+60}{360} = \frac{120}{360} = \frac{1}{3}$

(iii) No. of students like yellow = $15 \sim 90°$

OR for $360° \rightarrow$ total students $= 15 \times 4 = 60$

(iii) $P(\text{Red or Blue}) = \frac{90°}{360°} = \frac{1}{4}$