Sample Question Paper

Standard (Code 041)

ANSWERS

Section - A

1. (*c*)	2. (*a*)	3. (*c*)
4. (*b*)	5. (*d*)	6. (*a*)
7. (*b*)	8. (*d*)	9. (*b*)
10. (*c*)	11. (*c*)	12. (*a*)
13. (*c*)	14. (*a*)	15. (*c*)
16. (*c*)	17. (*a*)	18. (*b*)
19. (*c*)	20. (*b*)	

Section - B

21. We have,

$$\frac{3}{2}x - \frac{5}{3}y = -2$$

$$\Rightarrow \quad 9x - 10y = -12 \quad \ldots(1)$$

$$\frac{1}{3}x + \frac{1}{2}y = \frac{13}{6}$$

$$\Rightarrow \quad 2x + 3y = 13 \quad \ldots(2)$$

Multiplying eqn (1) by 3 and eqn (2) by 10, we get

$$\Rightarrow \quad 27x - 30y = -36 \quad \ldots(4)$$

$$20x + 30y = 130 \quad \ldots(5)$$

Adding equations (4) and (5), we get

$$47x = 94$$

$$\Rightarrow \quad x = \frac{94}{47} = 2$$

Putting value of $x = 2$ in equation (1), we get

$$9 \times 2 - 10y = -12$$

$$-10y = -30$$

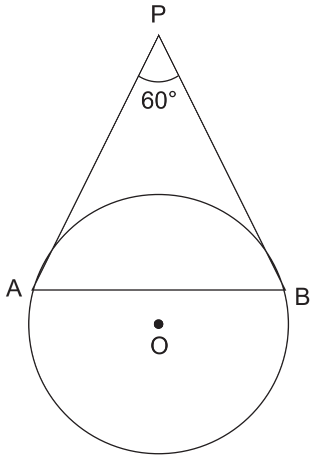
$$\Rightarrow \quad y = 3$$

22. In the figure, we have

$$PA = PB$$ [Tangents drawn from external point to a circle are equal in length]

$$\angle APB = 60°$$

$$\angle PAB = \angle PBA$$ [Angles opposite to equal sides are equal]



In ΔPAB

$$\angle PAB + \angle PBA + \angle APB = 180°$$ [Angle sum property]

$$\Rightarrow \quad 2\angle PAB + 60° = 180°$$

$$\Rightarrow \quad 2\angle PAB = 120°$$

$$\Rightarrow \quad \angle PAB = 60°$$

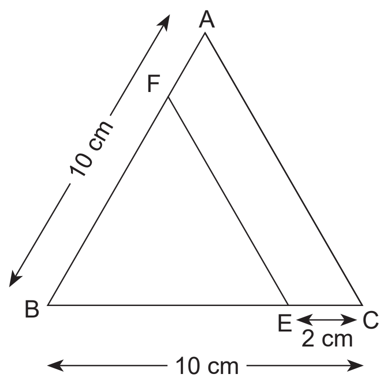
$\Rightarrow$ ΔPAB is an equilateral triangle.

We have, $AP = 5$ cm

$\therefore \quad AB = AP = 5$ cm

$\therefore$ Length of chord AB is 5 cm.

23. In Δ ABC, we have



$$EF \parallel AC$$

$$BC = 10 \text{ cm}, AB = 13 \text{ cm and } EC = 2 \text{ cm}$$

$$\frac{BE}{EC} = \frac{BF}{AF} \quad \text{[By B.P.T.]}$$

$$\Rightarrow \quad \frac{BC - EC}{EC} = \frac{AB - AF}{AF}$$

$$\Rightarrow \quad \frac{10 - 2}{2} = \frac{13 - AF}{AF}$$

$$\Rightarrow \quad \frac{8}{2} = \frac{13 - AF}{AF}$$

$$\Rightarrow \quad 8AF = 2(13 - AF)$$

$$\Rightarrow \quad 8AF = 26 - 2AF$$

$$\Rightarrow \quad 10AF = 26$$

$$\Rightarrow \quad AF = 2.6 \text{ cm}$$

24. The coordinates of the vertices of the given ΔABC are

$$A(x_1 = 2, y_1 = 3), B(x_2 = -2, y_2 = 1) \text{ and } C(x_3 = 3, y_3 = -2)$$

$$\text{Area of } \Delta ABC = \frac{1}{2}|[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]|$$

$$= \frac{1}{2}|[2(1+2) + (-2)(-2-3) + 3(3-1)]| \text{ sq units}$$

$$= \frac{1}{2}|[2(3) - 2(-5) + 3(2)]|$$

$$= \frac{1}{2}|[6 + 10 + 6]|$$

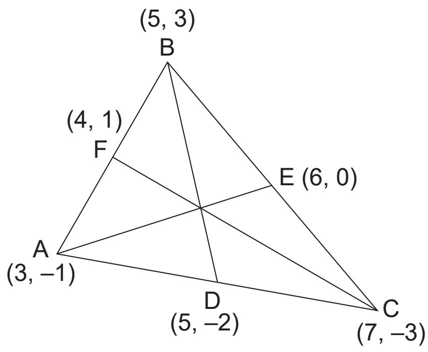
$$= \frac{1}{2}(22) = 11 \text{ sq units}$$

Hence, the area of the triangle is 11 sq units.

or

24. Let the points (3, –1), (5, 3) and (7, –3) be denoted by A, B and C respectively.

Let D, E and F be the mid-points of AC, BC and BA respectively.



The coordinates of D, E and F respectively are

$$D\left(\frac{3+7}{2}, \frac{-1-3}{2}\right), \quad E\left(\frac{5+7}{2}, \frac{3-3}{2}\right) \text{ and } F\left(\frac{5+3}{2}, \frac{3-1}{2}\right)$$

i.e. D(5, –2), E(6, 0), F(4, 1)

∴ The medians BD, CF and AE are given by

$$BD = \sqrt{(5-5)^2+(-2-3)^2} = \sqrt{0^2+(-5)^2} = \sqrt{25} = 5 \text{ units}$$

$$CF = \sqrt{(4-7)^2+(1+3)^2} = \sqrt{(-3)^2+(4)^2} = \sqrt{9+16} = \sqrt{25} = 5 \text{ units}$$

$$AE = \sqrt{(6-3)^2+(0+1)^2} = \sqrt{(3)^2+(1)^2} = \sqrt{9+1} = \sqrt{10} \text{ units}$$

Hence, length of the medians are 5 units, 5 units and $\sqrt{10}$ units.

25. Given: $x = a \cos \theta - b \sin \theta$, $y = a \sin \theta + b \cos \theta$

$$x^2 + y^2 = (a \cos \theta - b \sin \theta)^2 + (a \sin \theta + b \cos \theta)^2$$

$$= a^2 \cos^2 \theta + b^2 \sin^2 \theta - 2ab \sin \theta \cos \theta + a^2 \sin^2 \theta + b^2 \cos^2 \theta + 2ab \sin \theta \cos \theta$$

$$= a^2 \cos^2 \theta + b^2 \sin^2 \theta + a^2 \sin^2 \theta + b^2 \cos \theta$$

$$= a^2 (\cos^2 \theta + \sin^2 \theta) + b^2(\sin^2 \theta + \cos^2 \theta)$$

$$= a^2 + b^2 \qquad [\because \cos^2 \theta + \sin^2 \theta = 1]$$

Hence, proved.

or

25. Given: $\tan \theta = \frac{a}{b}$

L.H.S. $\quad \dfrac{a \sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta}$

Dividing numerator and denominator by $b \cos \theta$

$$\frac{\frac{a\sin\theta}{b\cos\theta} - \frac{b\cos\theta}{b\cos\theta}}{\frac{a\sin\theta}{b\cos\theta} + \frac{b\cos\theta}{b\cos\theta}} = \frac{\frac{a}{b}\tan\theta - 1}{\frac{a}{b}\tan\theta + 1}$$

$$= \frac{\left(\frac{a}{b}\right)\left(\frac{a}{b}\right) - 1}{\left(\frac{a}{b}\right)\left(\frac{a}{b}\right) + 1} = \frac{\frac{a^2}{b^2} - 1}{\frac{a^2}{b^2} + 1} \qquad \left[\because \tan\theta = \frac{a}{b}\right]$$

$$= \frac{a^2 - b^2}{a^2 + b^2} = \text{R.H.S}$$

Hence, proved.

Section - C

26. Let $6 + 7\sqrt{5}$ be rational. Then, there exist coprime a and b ($b \neq 0$), such that

$$\Rightarrow \quad 6 + 7\sqrt{5} = \frac{a}{b}, \quad a \text{ and } b \text{ are integers}$$

$$\Rightarrow \quad 7\sqrt{5} = \frac{a}{b} - 6$$

$$\Rightarrow \quad 7\sqrt{5} = \frac{a-6b}{b}$$

$$\Rightarrow \quad \sqrt{5} = \frac{a-6b}{7b}$$

Since, a and b are integers

$$\therefore \quad \frac{a-6b}{7b} \text{ is an integer}$$

$\Rightarrow$ $\sqrt{5}$ is a rational, which is a contradiction because $\sqrt{5}$ is an irrrational.

Hence, our asumption is wrong. $\therefore$ $6 + 7\sqrt{5}$ is an irrational number.

27. Let $p(y) = 6y^2 - 7y + 2$

α and β are zeroes of the above polynomial.

Here, $a = 6$, $b = -7$ and $c = 2$.

$$\Rightarrow \quad \text{Sum of the roots} = \alpha + \beta = \frac{-b}{a} = \frac{-(-7)}{6} = \frac{7}{6}$$

$$\text{Product of zeroes} = \alpha\beta = \frac{c}{a} = \frac{2}{6} = \frac{1}{3}$$

We are required to find quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

$$\text{Sum of zeroes} = \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{7 \times 3}{6 \times 1} = \frac{7}{2}$$

$$\text{Product of zeroes} = \frac{1}{\alpha} \times \frac{1}{\beta} = \frac{1}{\alpha\beta} = \frac{1}{\frac{1}{3}} = 3$$

$$\text{Polynomial } p(x) = x^2 - (\text{Sum of zeroes})x + \text{product of zeroes}$$

$$\Rightarrow \quad p(x) = x^2 - \frac{7x}{2} + 3$$

28. Let the present ages of two children be x and y.

Then according to question:

$$\text{Present age of father} = 2(x + y) \qquad \ldots(1)$$

After 20 years,

$$\text{Ages of the children} = x + 20 \text{ and } y + 20$$

$$\text{Age of the father} = 2(x + y) + 20$$

$\Rightarrow$ According to Question:

$$\text{Age of the father} = \text{Sum of the ages of the two children}$$

$$2(x + y) + 20 = (x + 20) + (y + 20)$$

$$\Rightarrow \quad 2x + 2y + 20 = x + y + 40$$
$$\Rightarrow \quad x + y = 20$$
Father's age will be $2(x + y) = 2(20) = 40$ years

or

28. Let fixed charge be ₹ x and charge for distance covered by ₹ y/km.

According to the questionn,
$$x + 13y = 129 \quad ...(1)$$
$$x + 22y = 210 \quad ...(2)$$
Subtracting equation (1) from equation (2), we get
$$9y = 81$$
$$\therefore \quad y = \frac{81}{9} = 9$$
Putting $y = 9$ in (1) we get
$$x + 13(9) = 129$$
$$\Rightarrow \quad x = 129 - 117 = 12$$
$\therefore$ For travelling 32 km, a person will have to pay = ₹ $(x + 32y)$

= ₹ [12 + 32(9)] = ₹ 300

29.
$$\sec\theta - \tan\theta = x \quad ...(1)$$
$$\Rightarrow \quad \frac{(\sec\theta - \tan\theta)}{(\sec\theta + \tan\theta)} \times (\sec\theta + \tan\theta) = x$$
$$\Rightarrow \quad \frac{\sec^2\theta - \tan^2\theta}{\sec\theta + \tan\theta} = x$$
$$\Rightarrow \quad \frac{1}{\sec\theta + \tan\theta} = x \quad [\because \sec^2\theta - \tan^2\theta = 1]$$
$$\Rightarrow \quad \sec\theta + \tan\theta = \frac{1}{x} \quad ...(2)$$
Hence, proved.

Adding equations (1) and (2)
$$2\sec\theta = x + \frac{1}{x}$$
$$\Rightarrow \quad \sec\theta = \frac{x^2 + 1}{2x}$$
$$\Rightarrow \quad \cos\theta = \frac{2x}{x^2 + 1}$$
$$\sin^2\theta = 1 - \cos^2\theta$$
$$= 1 - \frac{4x^2}{(x^2 + 1)^2}$$
$$= \frac{(x^2 + 1)^2 - 4x^2}{(x^2 + 1)^2}$$

$$= \frac{x^4 + 1 + 2x^2 - 4x^2}{(x^2+1)^2}$$

$$= \frac{x^4 - 2x^2 + 1}{(x^2+1)^2}$$

$$= \frac{(x^2-1)^2}{(x^2+1)^2}$$

$$\Rightarrow \quad \sin^2\theta = \frac{(x^2-1)^2}{(x^2+1)^2}$$

$$\Rightarrow \quad \sin\theta = \frac{x^2-1}{x^2+1}$$

30. Let number of black balls be x.

$\Rightarrow$ Number of white balls = 15

Total balls = $x + 15$

$$\text{P(getting a black ball)} = \frac{x}{x+15}$$

$$\text{P(getting a white ball)} = \frac{15}{x+15}$$

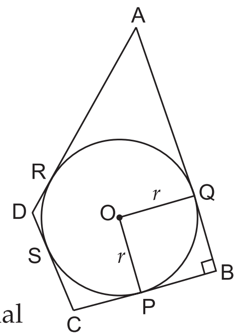
According to the question,

$$\frac{x}{x+15} = 3\left(\frac{15}{x+15}\right)$$

$$\Rightarrow \quad x = 45$$

$\therefore$ There are 45 black balls.

31. Since the tangent to a circle is perpendicular to the radius through the point of contact.



$\therefore$ $\angle OQB = \angle OPB = 90°$ ... (1)

$\angle B = 90°$ [Given] ... (2)

$OQ = OP = r$ [Radii of a circle] ... (3)

$\therefore$ OQBP is a square. [Using (1), (2) and (3)] ... (4)

Since the tangents from an external point to a circle are equal

$\therefore$ AQ = AR [Tangents from A] ... (5)

and DR = DS [Tangents from D]

Now, DR = DS [From (5)] $\Rightarrow$ DR = 5 cm

$\Rightarrow$ AD – AR = 5 cm $\Rightarrow$ 23 cm – AR = 5 cm

$\Rightarrow$ AR = (23 – 5) cm $\Rightarrow$ AR = 18 cm

$\Rightarrow$ AQ = 18 cm [Using (5)]

$\Rightarrow$ AB – BQ = 18 cm

$\Rightarrow \quad 29 \text{ cm} - BQ = 18 \text{ cm}$

$\Rightarrow \quad BQ = (29 - 18) \text{ cm}$

$\Rightarrow \quad BQ = 11 \text{ cm}$ ... (6)

OQBP is a square [From (4)]

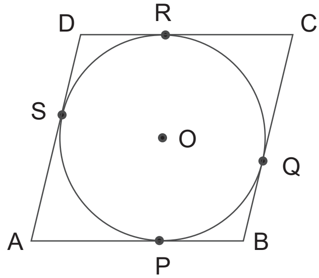
$\therefore$ Its sides OQ and BQ are equal

$\Rightarrow$ Radius OQ = BQ = 11 cm [Using (6)]

Hence, the radius (r) of the circle is 11 cm.

or

31. Let ABCD be a parallelogram circumscribing a circle with centre O.



AP = AS ...(1)

BP = BQ ...(2)

CR = CQ ...(3)

DR = DS ...(4)

[Tangents drawn to a circle from an exterior point are equal in length]

Adding (1), (2), (3), and (4) we get

AP + BP + CR + DR = AS + BQ + CQ + DS

AB + CD = AD + BC ...(5)

Since ABCD is a parallelogram

$\therefore$ AB = CD and AD = BC

from (5) we get

2 AB = 2 AD

AB = AD

$\therefore$ AB = AD = BC = DC

Since a parallelogram with all sides equal is a rhombus.

Thus, ABCD is a rhombus.

Section - D

32. Let length be x units and breadth be y units.

$\Rightarrow$ Area of the rectangle $= xy$ sq units.

According to the question,

$$(x + 2)(y - 2) = xy - 28$$

$$\Rightarrow \quad xy - 2x + 2y - 4 = xy - 28$$

$$\Rightarrow \quad -2x + 2y + 24 = 0$$
$$\Rightarrow \quad 2x - 2y = 24 \qquad \ldots(1)$$

Also,

$$(x - 1)(y + 2) = xy + 33$$
$$\Rightarrow \quad xy + 2x - y - 2 = xy + 33$$
$$\Rightarrow \quad 2x - y = 35 \qquad \ldots(2)$$

Subtracting equation (2) from equation (1), we get

$$-y = 11$$
$$\therefore \quad y = 11 \text{ units}$$

Putting $y = 11$ in eqn. (2),

$$2x - 11 = 35$$
$$2x = 46$$
$$x = \frac{46}{2} = 23$$

$$\therefore \quad \text{Length of rectangle} = 23 \text{ units}$$
$$\text{breadth of rectangle} = 11 \text{ units}$$
$$\therefore \quad \text{Area of the rectangle} = l \times b$$
$$= 23 \times 11 = 253 \text{ sq units}$$

or

32. Let the two numbers be x and y respectively.

According to the question

$$x + y = 1000 \qquad \ldots(1)$$

Also, $$(x^2 - y^2) = 144000 \qquad \ldots(2)$$

Solving eqn (2),

$$\Rightarrow \quad (x - y)(x + y) = 144000$$
$$\Rightarrow \quad (1000)(x - y) = 144000 \qquad \text{[From eqn (1)]}$$
$$\Rightarrow \quad x - y = 144 \qquad \ldots(3)$$

Adding eqns (1) and (3) we get

$$2x = 144 + 1000$$
$$\Rightarrow \quad 2x = 1144$$
$$\therefore \quad x = 572$$

Putting the value of $x = 572$ in eqn (1), we get

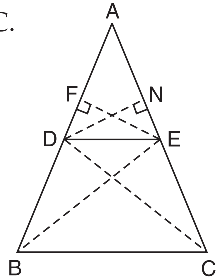
$$572 + y = 1000$$
$$\Rightarrow \quad y = 1000 - x$$
$$= 1000 - 572$$
$$= 428$$

Hence, the two numbers are 572 and 428.

33. **GIVEN:** ΔABC in which DE $\parallel$ BC and DE intersects AB at D and AC at E.

TO PROVE: $$\frac{AD}{DB} = \frac{AE}{EC}$$

CONSTRUCTION: Join BE, CD and draw EF ⊥ AB, DN ⊥ AC.



PROOF:
$$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2}\times AD\times EF}{\frac{1}{2}\times BD\times EF} = \frac{AD}{BD} \quad \dots (1)$$

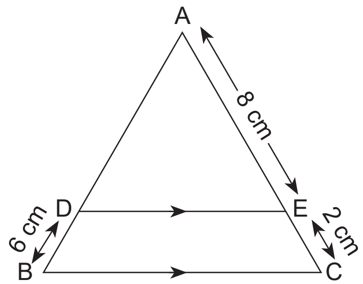
and
$$\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{\frac{1}{2}\times AE\times DN}{\frac{1}{2}\times EC\times DN} = \frac{AE}{EC} \quad \dots (2)$$

But ΔBDE and ΔCDE are on the same base DE and between the same parallels DE and BC.

$\therefore$ $$ar(\Delta BDE) = ar(\Delta CDE) \quad \dots (3)$$

$\therefore$ $$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{ar(\Delta ADE)}{ar(\Delta CDE)} \quad \text{[Using (3)]} \quad \dots (4)$$

Hence, $$\frac{AD}{DB} = \frac{AE}{EC} \quad \text{[From (1), (2) and (4)]}$$



$$\frac{AE}{EC} = \frac{AD}{DB} \quad \text{[By Basic Proportionality theorem]}$$

$\Rightarrow$ $$\frac{8}{2} = \frac{AD}{6}$$

$\Rightarrow$ $$AD = 24 \text{ cm}$$

34. Radius of cylindrical tank, $r = \frac{2}{2}$ m = 1 m

Height of cylindrical tank, h = 5 m

Volume of cylindrical tank,

$$V = \pi r^2 h = \frac{22}{7} \times (1)^2 \times 5 \text{ m}^3 = \frac{22}{7}\times 5 \text{ m}^3$$

Length of the park, l = 25 m

Breadth, b = 20 m

Let h be height of standing water in the park

$\Rightarrow$ Volume of cylindrical tank = Volume of water in the park

$\Rightarrow$ $$\frac{22}{7}\times 5 = l\times b\times h$$

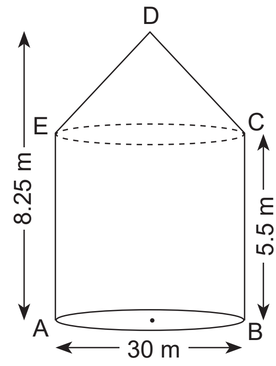
$$= 25 \times 20 \times h$$

$$\Rightarrow \quad h = \frac{22 \times 5}{7 \times 25 \times 20}$$

$$= \frac{11}{350} = 0.031 \text{ m}$$

Hence, height of standing water in the park is 0.031 m.

or



34. Radius of the tent $= \frac{30}{2} = 15$ m

Height of cylindrical part $= 5.5$ m

Height of conical part $= 8.25 \text{ m} - 5.5 \text{ m}$

$= 2.75$ m

Slant height of the conical part,

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

$$= \sqrt{(2.75)^2 + (15)^2}$$

$$= \sqrt{\left(\frac{11}{4}\right)^2 + (15)^2} = \sqrt{\frac{121}{16} + 225}$$

$$= \sqrt{\frac{3721}{16}} = \frac{61}{4} \text{ m}$$

Total surface area of the tent = CSA of cylindrical part + CSA of conical part

$$= 2\pi rh + \pi rl$$

$$= \pi r + (2h + l)$$

$$= \frac{22}{7} \times 15 \left(2 \times \frac{11}{2} + \frac{61}{4}\right)$$

$$= \frac{22}{7} \times 15 \left(11 + \frac{61}{4}\right)$$

$$= \frac{22}{7} \times 15 \left(\frac{44 + 61}{4}\right)$$

$$= \frac{22}{7} \times 15 \times \frac{105}{4} = \frac{2475}{2} \text{ m}^2$$

Area of canvas used $= \frac{2475}{2}$ m^2

Length of canvas used $= \frac{\text{Area of canvas}}{\text{Breadth of canvas}}$

$$= \frac{2475}{2 \times 1.5} = 825 \text{ m}$$

35. We prepare the cumulative frequency table, as given below.

Class Interval	*Frequency* f_i	*Cumulative frequency (cf)*
0 – 10	5	5
10 – 20	x	$5 + x$
20 – 30	6	$11 + x$
30 – 40	y	$11 + x + y$
40 – 50	6	$17 + x + y$
50 – 60	5	$22 + x + y$

Since, the total number of observations is 40,

$\therefore \quad 22 + x + y = 40$

$\Rightarrow \quad x + y = 18$ ...(1)

Median is 31. So median class is 30–40

$$l = 30,\ cf = 11 + x,\ f = y \text{ and } h = 10$$

$$\text{Median} = l + \frac{\left[\frac{n}{2} - cf\right] \times h}{f}$$

$$\Rightarrow \quad 31 = 30 + \left(\frac{20 - (11 + x)}{y}\right) \times 10$$

$$\Rightarrow \quad 31 - 30 = \frac{20 - 11 - x}{y} \times 10$$

$$\Rightarrow \quad \frac{1}{10} = \frac{9 - x}{y}$$

$\Rightarrow \quad y = 90 - 10x$ ...(2)

Putting the value of y in eqn (1), we get

$$x + 90 - 10x = 18$$

$$-9x = -72$$

$$x = \frac{72}{9} = 8$$

$$\therefore \quad y = 90 - 10x$$
$$= 90 - 80$$
$$= 10$$

Hence, the values of x and y are 8 and 10 respectively.

Section - E

36. (*a*) Total length of silver wire required

$$= \text{Circumference} + 4d$$
$$= 2\pi r + 4d$$

$$= 2 \times \frac{22}{7} \times 14 \text{ mm} + 4 \times 28 \text{ mm}$$

$$= 88 + 112 = 200 \text{ mm}$$

(*b*) $\theta = 45°$

$$\text{Area of sector} = \frac{\theta}{360°} \times \pi r^2$$

$$= \frac{45}{360} \times \frac{22}{7} \times 14 \times 14 \text{ mm}^2$$

$$= 77 \text{ mm}^2$$

(*c*) Let the number of revolutions = x

Number of revolutions × circumference = 112 π

$\Rightarrow$ $x \times 2\pi r = 112\pi$

$$x = \frac{112\pi}{2\pi r} = \frac{112}{2 \times 14} = 4$$

$\therefore$ Number of revolutions = 4

or

(*c*) The circumference of silver part = 44 mm

Let radius of silver part = r_1

$\therefore$ $2\pi r_1 = 44$ mm

$$r_1 = \frac{44 \times 7}{2 \times 22} \text{ mm}$$

$$r_1 = 7 \text{ mm}$$

The gold part is 3 mm wide everywhere.

$\therefore$ Radius of brooch B = 7 mm + 3 mm = 10 mm

Number of revolutions × Circumference = 80π

$\Rightarrow$ $x \times 2\pi r = 80\pi$

$\Rightarrow$ $x = \frac{80\pi}{2\pi r} = \frac{80\pi}{2\pi \times 10} = 4$

$\therefore$ Number of revolutions = 4

37. (*a*) The time taken to run 200 m forms the following series.

51, 49, 47, 45, …

In the above series

$$a_2 - a_1 = a_3 - a_2 = d$$

$\therefore$ It is an AP.

(*b*) The *n*th term of an AP is given by

$$a_n = 2n + 3$$

$\therefore$ $a_1 = 2 \times 1 + 3 = 5$

$$a_2 = 2 \times 2 + 3 = 7$$

Common difference, $d = a_2 - a_1 = 7 - 5 = 2$

(*c*) $a_n = a + (n-1)d$

$\Rightarrow\quad 31 = 51 + (n-1)(-2)$

$\Rightarrow\quad 31 - 51 = -2n + 2$

$\Rightarrow\quad -20 = -2n + 2$

$\Rightarrow\quad -20 - 2 = -2n$

$\Rightarrow\quad -22 = -2n$

$\Rightarrow\quad 11 = n$

He needs to practice for 11 days.

or

(*c*) $n = 9,.\ a_n = 31,\ a = 51$

We need to find *d*.

$31 = 51 + (9-1)d$

$31 - 51 = (9-1)d$

$\Rightarrow\quad -20 = 8d$

$\Rightarrow\quad \frac{-20}{8} = d$

$\Rightarrow\quad d = 2.5$

He should reduce 2.5 s each day.

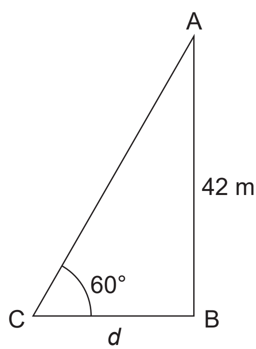
38. (*a*) Angle of Depression

(*b*) $\tan 60^\circ = \frac{42}{d}$

$\Rightarrow\quad d = \frac{42}{\sqrt{3}}$

$= \frac{42\sqrt{3}}{3}$

$= 14\sqrt{3}$ m



(*c*) $\tan 60^\circ = \frac{h}{d}$

$\Rightarrow\quad \sqrt{3} = \frac{h}{20}$

$h = 20\sqrt{3}$ m

or

(*c*) $\tan\theta = \frac{h}{d}$

$\Rightarrow\quad \tan\theta = \frac{42}{42}$

$\Rightarrow\quad \tan\theta = 1$

$\theta = 45^\circ$