Solved Paper–1

Class 10^{th}, Mathematics, SA–2

Time: 3hours **Max. Marks 90**

General Instructions

1. All questions are compulsory.
2. Draw neat labeled diagram wherever necessary to explain your answer.
3. Q.No. 1 to 8 are of objective type questions, carrying 1 mark each.
4. Q.No.9 to 14 are of short answer type questions, carrying 2 marks each.
5. Q. No. 15 to 24 carry 3 marks each. Q. No. 25 to 34 carry 4 marks each.

1. Which one of the following is not a quadratic equation?

(A) $(x + 2)^2 = 2(x + 3)$ (B) $x^2 + 3x = (-1)(1 - 3x)^2$

(C) $(x + 2)(x - 1) = x^2 - 2x - 3$ (D) $x^3 - x2 + 2x + 1 = (x + 1)^3$

2. In an AP, if $d = -4$, $n = 7$, $a_n = 4$, then a is

(A) 6 (B) 7

(C) 20 (D) 28

3. The sum of first five multiples of 3 is

(A) 45 (B) 55

(C) 65 (D) 75

4. At one end A of a diameter AB of a circle of radius 5 cm, tangent XAY is drawn to the circle. The length of the chord CD parallel to XY and at a distance 8 cm from A is

(A) 4 cm (B) 5 cm

(C) 6 cm (D) 8 cm

5. If the area of a circle is 154 cm^2, then its perimeter is

(A) 11 cm (B) 22 cm

(C) 44 cm (D) 55 cm

6. If the distance between the points (2, –2) and (–1, x) is 5, one of the values of x is

(A) –2 (B) 2

(C) –1 (D) 1

7. A solid piece of iron in the form of a cuboid of dimensions 49cm × 33cm × 24cm, is moulded to form a solid sphere. The radius of the sphere is

(A) 21cm (B) 23cm

(C) 25cm (D) 19cm

8. Twelve solid spheres of the same size are made by melting a solid metallic cylinder of base diameter 2 cm and height 16 cm. The diameter of each sphere is

(A) 4 cm (B) 3 cm

(C) 2 cm (D) 6 cm

9. A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30 °.

10. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is (i) red? (ii) not red?

11. Find two numbers whose sum is 27 and product is 182.

12. Find the 31st term of an A.P. whose 11th term is 38 and the 16th term is 73

13. Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. the construct another triangle whose sides are 5/3 times the corresponding sides of the given triangle. Give the justification of the construction.

14. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding: [Use π = 3.14]

(i) Minor segment (ii) Major sector

15. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy. $\left[\text{Use } \pi = \frac{22}{7}\right]$

16. Find the point on the *x*-axis which is equidistant from (2, − 5) and (− 2, 9).

17. Find the values of *y* for which the distance between the points P (2, − 3) and Q (10, *y*) is 10 units.

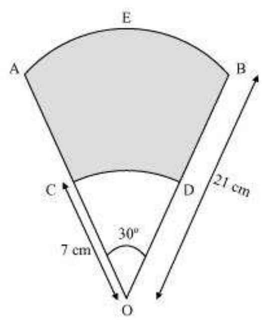
18. A die is thrown twice. What is the probability that
(i) 5 will not come up either time? (ii) 5 will come up at least once?
[**Hint:** Throwing a die twice and throwing two dice simultaneously are treated as the same experiment].

19. Is the following situation possible? If so, determine their present ages. The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48.

20. Find the sum of first 40 positive integers divisible by 6.

21. The length of a tangent from a point A at distance 5 cm from the centre of the circle is 4 cm. Find the radius of the circle.

22. AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm and centre O (see the given figure). If $\angle AOB = 30°$, find the area of the shaded region. $\left[\text{Use } \pi = \frac{22}{7}\right]$

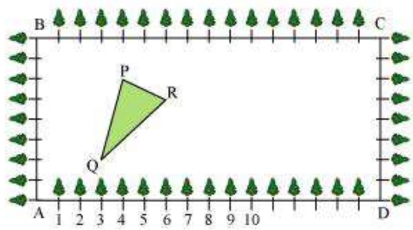


23. A 20 m deep well with diameter 7 m is dug and the earth from digging is evenly spread out to form a platform 22 m by 14 m. Find the height of the platform. $\left[\text{Use } \pi = \frac{22}{7}\right]$

24. Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and ∠ABC = 60°. Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the triangle ABC. Give the justification of the construction.

25. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

26. The class X students of a secondary school in Krishinagar have been allotted a rectangular plot of land for their gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1 m from each other. There is a triangular grassy lawn in the plot as shown in the following figure. The students are to sow seeds of flowering plants on the remaining area of the plot.



(i) Taking A as origin, find the coordinates of the vertices of the triangle.
(ii) What will be the coordinates of the vertices of Δ PQR if C is the origin?
Also calculate the areas of the triangles in these cases. What do you observe?

27. Find the area of the quadrilateral whose vertices, taken in order, are (− 4, − 2), (− 3, − 5), (3, − 2) and (2, 3)

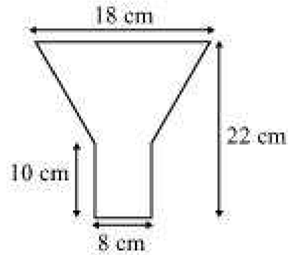
28. A box contains 12 balls out of which x are black. If one ball is drawn at random from the box, what is the probability that it will be a black ball? If 6 more black balls are put in the box, the probability of drawing a black ball is now double of what it was before. Find x.

29. The sum of the reciprocals of Rehman's ages, (in years) 3 years ago and 5 years from now is $\frac{1}{3}$. Find his present age.

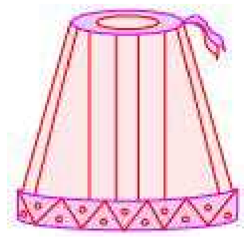
30. Sum of the areas of two squares is 468 m^2. If the difference of their perimeters is 24 m, find the sides of the two squares.

31. Prove that the parallelogram circumscribing a circle is a rhombus.

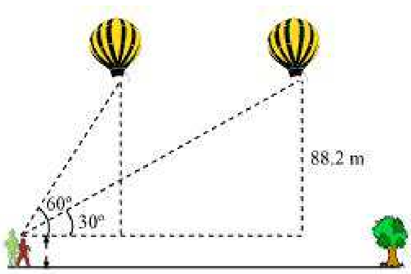
32. An oil funnel made of tin sheet consists of a 10 cm long cylindrical portion attached to a frustum of a cone. If the total height is 22 cm, diameter of the cylindrical portion is 8 cm and the diameter of the top of the funnel is 18 cm, find the area of the tin sheet required to make the funnel (see the given figure).



33. A *fez*, the cap used by the Turks, is shaped like the frustum of a cone (see the figure given below). If its radius on the open side is 10 cm, radius at the upper base is 4 cm and its slant height is 15 cm, find the area of material use for making it. $\left[\text{Use } \pi = \frac{22}{7}\right]$



34. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60°. After some time, the angle of elevation reduces to 30°. Find the distance travelled by the balloon during the interval.



Solved Paper–1

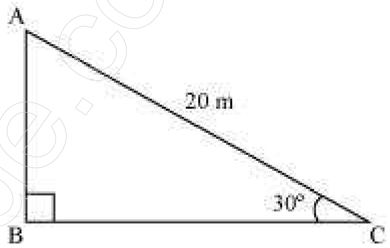
Class 10^{th}, Mathematics, SA–2

Solutions

1. C	2. C	3. A	4. D
5. C	6. B	7. A	8. C

9. It can be observed from the figure that AB is the pole.

In ΔABC,



$$\frac{AB}{AC} = \sin 30°$$

$$\frac{AB}{20} = \frac{1}{2}$$

$$AB = \frac{20}{2} = 10$$

Therefore, the height of the pole is 10 m.

10. (i) Total number of balls in the bag = 8

$$\text{Probability of getting a red ball} = \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}}$$

$$= \frac{3}{8}$$

(ii) Probability of not getting red ball

= 1 − Probability of getting a red ball

$$= 1 - \frac{3}{8}$$

$$= \frac{5}{8}$$

11. Let the first number be x and the second number is $27 - x$.

Therefore, their product = $x(27 - x)$

It is given that the product of these numbers is 182.

Therefore, $x(27-x)=182$

$\Rightarrow x^2-27x+182=0$

$\Rightarrow x^2-13x-14x+182=0$

$\Rightarrow x(x-13)-14(x-13)=0$

$\Rightarrow (x-13)(x-14)=0$

12. Given that,

$a_{11} = 38$

$a_{16} = 73$

We know that,

$a_n = a + (n - 1)\, d$

$a_{11} = a + (11 - 1)\, d$

$38 = a + 10d$ (1)

Similarly,

$a_{16} = a + (16 - 1)\, d$

$73 = a + 15d$ (2)

On subtracting (1) from (2), we obtain

$35 = 5d$

$d = 7$

From equation (1),

$38 = a + 10 \times (7)$

$38 - 70 = a$

$a = -32$

$a_{31} = a + (31 - 1)\, d$

$= -32 + 30\,(7)$

$= -32 + 210$

$= 178$

Hence, 31st term is 178.

13. It is given that sides other than hypotenuse are of lengths 4 cm and 3 cm. Clearly, these will be perpendicular to each other.

The required triangle can be drawn as follows.

Step 1

Draw a line segment AB = 4 cm. Draw a ray SA making 90° with it.

Step 2

Draw an arc of 3 cm radius while taking A as its centre to intersect SA at C. Join BC. ΔABC is the required triangle.

Step 3

Draw a ray AX making an acute angle with AB, opposite to vertex C.

Step 4

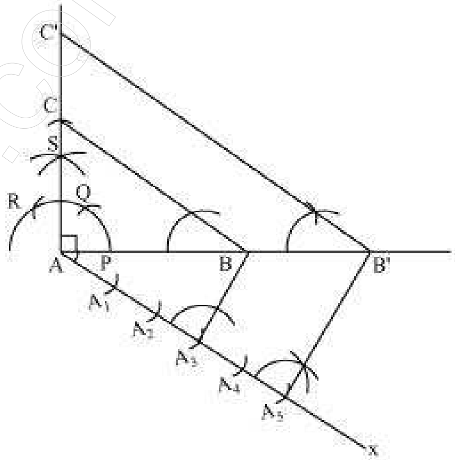
Locate 5 points (as 5 is greater in 5 and 3), A_1, A_2, A_3, A_4, A_5, on line segment AX such that $AA_1 = A_1A_2 = A_2A_3 = A_3A_4 = A_4A_5$.

Step 5

Join A_3B. Draw a line through A_5 parallel to A_3B intersecting extended line segment AB at B'.

Step 6

Through B', draw a line parallel to BC intersecting extended line segment AC at C'. ΔAB'C' is the required triangle.



Justification

The construction can be justified by proving that

$$AB' = \frac{5}{3}AB,\ B'C' = \frac{5}{3}BC,\ AC' = \frac{5}{3}AC$$

In ΔABC and ΔAB'C',

∠ABC = ∠AB'C' (Corresponding angles)

∠BAC = ∠B'AC' (Common)

∴ ΔABC ~ ΔAB'C' (AA similarity criterion)

$$\Rightarrow \frac{AB}{AB'} = \frac{BC}{B'C'} = \frac{AC}{AC'} \quad \dots (1)$$

In ΔAA_3B and $\Delta AA_5B'$,

$\angle A_3AB = \angle A_5AB'$ (Common)

$\angle AA_3B = \angle AA_5B'$ (Corresponding angles)

$\therefore \Delta AA_3B \sim \Delta AA_5B'$ (AA similarity criterion)

$\Rightarrow \frac{AB}{AB'} = \frac{AA_3}{AA_5}$

$\Rightarrow \frac{AB}{AB'} = \frac{3}{5}$ ...(2)

On comparing equations (1) and (2), we obtain

$\frac{AB}{AB'} = \frac{BC}{B'C'} = \frac{AC}{AC'} = \frac{3}{5}$

$\Rightarrow AB' = \frac{5}{3}AB,\ B'C' = \frac{5}{3}BC,\ AC' = \frac{5}{3}AC$

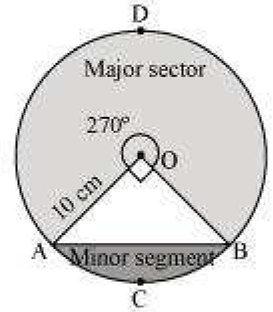
This justifies the construction.

14. Let AB be the chord of the circle subtending 90° angle at centre O of the circle.

Area of major sector OADB $= \left(\frac{360° - 90°}{360°}\right) \times \pi r^2 = \left(\frac{270°}{360°}\right)\pi r^2$

$= \frac{3}{4} \times 3.14 \times 10 \times 10$

$= 235.5\text{ cm}^2$



Area of minor sector OACB $= \frac{90°}{360°} \times \pi r^2$

$= \frac{1}{4} \times 3.14 \times 10 \times 10$

$= 78.5\text{ cm}^2$

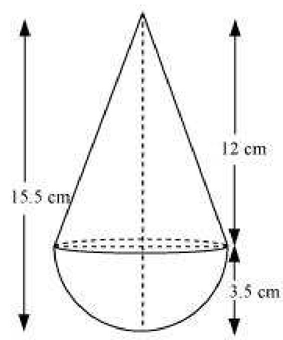
Area of $\Delta OAB = \frac{1}{2} \times OA \times OB = \frac{1}{2} \times 10 \times 10$

$= 50\text{ cm}^2$

Area of minor segment ACB = Area of minor sector OACB −

Area of $\Delta OAB = 78.5 - 50 = 28.5\text{ cm}^2$

15. It can be observed that the radius of the conical part and the hemispherical part is same (i.e., 3.5 cm).



Height of hemispherical part = Radius (r) = 3.5 = $\frac{7}{2}$ cm

Height of conical part (h) = 15.5 − 3.5 = 12 cm

Slant height (l) of conical part $=\sqrt{r^2+h^2}$

$$=\sqrt{\left(\frac{7}{2}\right)^2+(12)^2}=\sqrt{\frac{49}{4}+144}=\sqrt{\frac{49+576}{4}}$$

$$=\sqrt{\frac{625}{4}}=\frac{25}{2}$$

Total surface area of toy = CSA of conical part + CSA of hemispherical part

$$=\pi rl+2\pi r^2$$

$$=\frac{22}{7}\times\frac{7}{2}\times\frac{25}{2}+2\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}$$

$$=137.5+77=214.5\text{cm}^2$$

16. We have to find a point on *x*-axis. Therefore, its *y*-coordinate will be 0.

Let the point on *x*-axis be $(x,0)$.

Distance between $(x,0)$ and $(2,-5)=\sqrt{(x-2)^2+(0-(-5))^2}=\sqrt{(x-2)^2+(5)^2}$

Distance between $(x,0)$ and $(-2,9)=\sqrt{(x-(-2))^2+(0-(-9))^2}=\sqrt{(x+2)^2+(9)^2}$

By the given condition, these distances are equal in measure.

$$\sqrt{(x-2)^2+(5)^2}=\sqrt{(x+2)^2+(9)^2}$$

$$(x-2)^2+25=(x+2)^2+81$$

$$x^2+4-4x+25=x^2+4+4x+81$$

$$8x=25-81$$

$$8x=-56$$

$$x=-7$$

Therefore, the point is (− 7, 0).

17. It is given that the distance between (2, −3) and (10, *y*) is 10.

Therefore, $\sqrt{(2-10)^2+(-3-y)^2}=10$

$$\sqrt{(-8)^2+(3+y)^2}=10$$

$$64+(y+3)^2=100$$

$$(y+3)^2=36$$

$$y+3=\pm 6$$

$$y+3=6 \text{ or } y+3=-6$$

Therefore, $y=3$ or -9

18. Total number of outcomes = 6 × 6 = 36

(i) Total number of outcomes when 5 comes up on either time are (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (1, 5), (2, 5), (3, 5), (4, 5), (6, 5)

Hence, total number of favourable cases = 11

P (5 will come up either time) $= \frac{11}{36}$

P (5 will not come up either time) $= 1 - \frac{11}{36} = \frac{25}{36}$

(ii) Total number of cases, when 5 can come at least once = 11

P (5 will come at least once) $= \frac{11}{36}$

19. Let the age of one friend be x years.

Age of the other friend will be $(20 - x)$ years.

4 years ago, age of 1st friend = $(x - 4)$ years

And, age of 2nd friend = $(20 - x - 4)$

$= (16 - x)$ years

Given that,

$(x - 4)(16 - x) = 48$

$16x - 64 - x^2 + 4x = 48$

$-x^2 + 20x - 112 = 0$

$x^2 - 20x + 112 = 0$

Comparing this equation with $ax^2 + bx + c = 0$, we obtain

$a = 1, b = -20, c = 112$

Discriminant $= b^2 - 4ac = (-20)^2 - 4(1)(112)$

$= 400 - 448 = -48$

As $b^2 - 4ac < 0$,

Therefore, no real root is possible for this equation and hence, this situation is not possible.

20. The positive integers that are divisible by 6 are

6, 12, 18, 24 …

It can be observed that these are making an A.P. whose first term is 6 and common difference is 6.

$a = 6$

$d = 6$

$S_{40} = ?$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

$$S_{40} = \frac{40}{2}[2(6) + (40-1)6]$$

= 20[12 + (39) (6)]

= 20(12 + 234)

= 20 × 246

= 4920

21. Let us consider a circle centered at point O.

AB is a tangent drawn on this circle from point A.

Given that,

OA = 5cm and AB = 4 cm

In ΔABO,

OB ⊥ AB (Radius ⊥ tangent at the point of contact)

Applying Pythagoras theorem in ΔABO, we obtain

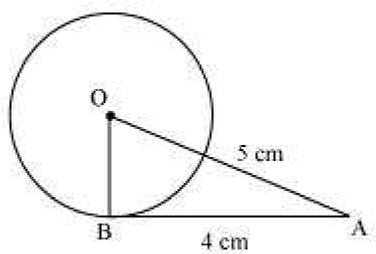
$AB^2 + BO^2 = OA^2$

$4^2 + BO^2 = 5^2$

$16 + BO^2 = 25$

$BO^2 = 9$

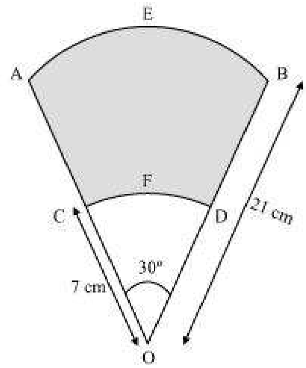
$BO = 3$



Hence, the radius of the circle is 3 cm.

22. Area of the shaded region = Area of sector OAEB − Area of sector OCFD

$$= \frac{30^\circ}{360^\circ} \times \pi \times (21)^2 - \frac{30^\circ}{360^\circ} \times \pi \times (7)^2$$
$$= \frac{1}{12} \times \pi \left[(21)^2 - (7)^2 \right]$$
$$= \frac{1}{12} \times \frac{22}{7} \times \left[(21-7)(21+7) \right]$$
$$= \frac{22 \times 14 \times 28}{12 \times 7}$$
$$= \frac{308}{3}\ \text{cm}^2$$



23. The shape of the well will be cylindrical.

Depth (h) of well = 20 m

Radius (r) of circular end of well = $\frac{7}{2}$ m

Area of platform = Length × Breadth = 22 × 14 m^2

Let height of the platform = H

Volume of soil dug from the well will be equal to the volume of soil scattered on the platform.

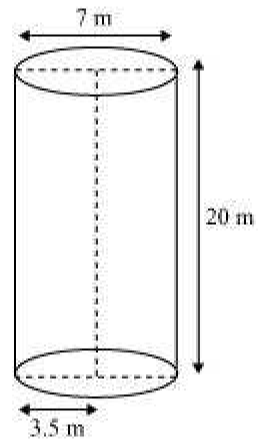
Volume of soil from well = Volume of soil used to make such platform

$\pi \times r^2 \times h$ = Area of platform × Height of platform

$$\pi \times \left(\frac{7}{2}\right)^2 \times 20 = 22 \times 14 \times H$$

$$\therefore H = \frac{22}{7} \times \frac{49}{4} \times \frac{20}{22 \times 14} = \frac{5}{2}\ \text{m} = 2.5\ \text{m}$$

Therefore, the height of such platform will be 2.5 m.



24. A ΔA'BC' whose sides are $\frac{3}{4}$ of the corresponding sides of ΔABC can be drawn as follows.

Step 1

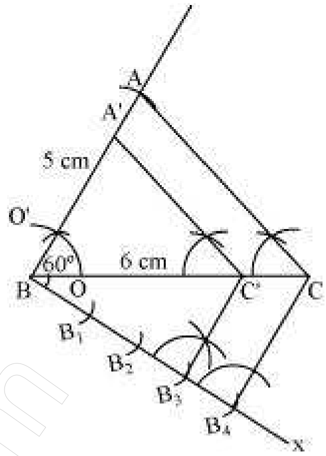
Draw a ΔABC with side BC = 6 cm, AB = 5 cm and ∠ABC = 60°.

Step 2

Draw a ray BX making an acute angle with BC on the opposite side of vertex A.

Step 3

Locate 4 points (as 4 is greater in 3 and 4), B_1, B_2, B_3, B_4, on line segment BX.



Step 4

Join B_4C and draw a line through B_3, parallel to B_4C intersecting BC at C'.

Step 5

Draw a line through C' parallel to AC intersecting AB at A'.

ΔA'BC' is the required triangle.

Justification

The construction can be justified by proving

$$A'B = \frac{3}{4}AB,\ BC' = \frac{3}{4}BC,\ A'C' = \frac{3}{4}AC$$

In ΔA'BC' and ΔABC,

∠A'C'B = ∠ACB (Corresponding angles)

∠A'BC' = ∠ABC (Common)

∴ ΔA'BC' ~ ΔABC (AA similarity criterion)

$$\Rightarrow \frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} \quad \ldots (1)$$

In $\Delta BB_3C'$ and ΔBB_4C,

$\angle B_3BC' = \angle B_4BC$ (Common)

$\angle BB_3C' = \angle BB_4C$ (Corresponding angles)

∴ $\Delta BB_3C' \sim \Delta BB_4C$ (AA similarity criterion)

$$\Rightarrow \frac{BC'}{BC} = \frac{BB_3}{BB_4}$$

$$\Rightarrow \frac{BC'}{BC} = \frac{3}{4} \quad \ldots (2)$$

From equations (1) and (2), we obtain

$$\frac{A'B}{AB} = \frac{BC'}{BC} = \frac{A'C'}{AC} = \frac{3}{4}$$

$\Rightarrow \quad A'B = \frac{3}{4}AB,\ BC' = \frac{3}{4}BC,\ A'C' = \frac{3}{4}AC$

This justifies the construction.

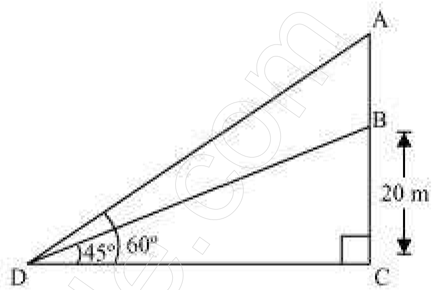
25. Let BC be the building, AB be the transmission tower, and D be the point on the ground from where the elevation angles are to be measured.

In ΔBCD,

$\frac{BC}{CD} = \tan 45°$

$\frac{20}{CD} = 1$

$CD = 20\text{ m}$



In ΔACD,

$\frac{AC}{CD} = \tan 60°$

$\frac{AB + BC}{CD} = \sqrt{3}$

$\frac{AB + 20}{20} = \sqrt{3}$

$AB = \left(20\sqrt{3} - 20\right)\text{m}$

$= 20\left(\sqrt{3} - 1\right)\text{m}$

Therefore, the height of the transmission tower is $20\left(\sqrt{3}-1\right)$ m.

26. (i) Taking A as origin, we will take AD as *x*-axis and AB as *y*-axis. It can be observed that the coordinates of point P, Q, and R are (4, 6), (3, 2), and (6, 5) respectively.

$$\text{Area of triangle PQR} = \frac{1}{2}\left[x_1\left(y_2 - y_3\right) + x_2\left(y_3 - y_1\right) + x_3\left(y_1 - y_2\right)\right]$$

$$= \frac{1}{2}\left[4(2-5) + 3(5-6) + 6(6-2)\right]$$

$$= \frac{1}{2}\left[-12 - 3 + 24\right]$$

$$= \frac{9}{2}\text{ square units}$$

(ii) Taking C as origin, CB as *x*-axis, and CD as *y*-axis, the coordinates of vertices P, Q, and R are (12, 2), (13, 6), and (10, 3) respectively.

$$\text{Area of triangle PQR} = \frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 + y_2)\right]$$

$$= \frac{1}{2}\left[12(6-3) + 13(3-2) + 10(2-6)\right]$$

$$= \frac{1}{2}\left[36 + 13 - 40\right]$$

$$= \frac{9}{2} \text{ square units}$$

It can be observed that the area of the triangle is same in both the cases.

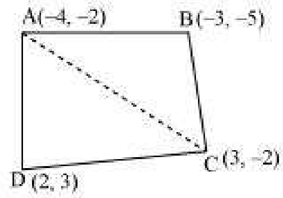
27. Let the vertices of the quadrilateral be A (−4, −2), B (−3, −5), C (3, −2), and D (2, 3).

Join AC to form two triangles ΔABC and ΔACD.

$$\text{Area of a triangle} = \frac{1}{2}\left\{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right\}$$

$$\text{Area of } \Delta ABC = \frac{1}{2}\left[(-4)\{(-5)-(-2)\} + (-3)\{(-2)-(-2)\} + 3\{(-2)-(-5)\}\right]$$

$$= \frac{1}{2}(12 + 0 + 9) = \frac{21}{2} \text{ square units}$$



$$\text{Area of } \Delta ACD = \frac{1}{2}\left[(-4)\{(-2)-(3)\} + 3\{(3)-(-2)\} + 2\{(-2)-(-2)\}\right]$$

$$= \frac{1}{2}\{20 + 15 + 0\} = \frac{35}{2} \text{ square units}$$

$$\text{Area of } \square ABCD = \text{Area of } \Delta ABC + \text{Area of } \Delta ACD$$

$$= \left(\frac{21}{2} + \frac{35}{2}\right) \text{square units} = 28 \text{ square units}$$

28. Total number of balls = 12

Total number of black balls = x

P (getting a black ball) = $\frac{x}{12}$

If 6 more black balls are put in the box, then

Total number of balls = 12 + 6 = 18

Total number of black balls = $x + 6$

P (getting a black ball now) $= \frac{x+6}{18}$

According to the condition given in the question,

$$2\left(\frac{x}{12}\right)=\frac{x+6}{18}$$
$$3x=x+6$$
$$2x=6$$
$$x=3$$

29. Let the present age of Rehman be x years.

Three years ago, his age was $(x - 3)$ years.

Five years hence, his age will be $(x + 5)$ years.

It is given that the sum of the reciprocals of Rehman's ages 3 years ago and 5 years from now is $\frac{1}{3}$.

$$\therefore \frac{1}{x-3}+\frac{1}{x+5}=\frac{1}{3}$$
$$\frac{x+5+x-3}{(x-3)(x+5)}=\frac{1}{3}$$
$$\frac{2x+2}{(x-3)(x+5)}=\frac{1}{3}$$
$$\Rightarrow 3(2x+2)=(x-3)(x+5)$$
$$\Rightarrow 6x+6=x^2+2x-15$$
$$\Rightarrow x^2-4x-21=0$$
$$\Rightarrow x^2-7x+3x-21=0$$
$$\Rightarrow x(x-7)+3(x-7)=0$$
$$\Rightarrow (x-7)(x+3)=0$$
$$\Rightarrow x=7,-3$$

However, age cannot be negative.

Therefore, Rehman's present age is 7 years.

30. Let the sides of the two squares be x m and y m. Therefore, their perimeter will be $4x$ and $4y$ respectively and their areas will be x^2 and y^2 respectively.

It is given that

$4x - 4y = 24$

$x - y = 6$

$x = y + 6$

Also, $x^2 + y^2 = 468$

$\Rightarrow (6+y)^2 + y^2 = 468$

$\Rightarrow 36 + y^2 + 12y + y^2 = 468$

$\Rightarrow 2y^2 + 12y - 432 = 0$

$\Rightarrow y^2 + 6y - 216 = 0$

$\Rightarrow y^2 + 18y - 12y - 216 = 0$

$\Rightarrow y(y+18) - 12(y+18) = 0$

$\Rightarrow (y+18)(y-12) = 0$

$\Rightarrow y = -18$ or 12.

However, side of a square cannot be negative.

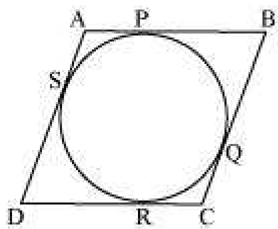
Hence, the sides of the squares are 12 m and (12 + 6) m = 18 m

31. Since ABCD is a parallelogram,

AB = CD …(1)

BC = AD …(2)

It can be observed that



DR = DS (Tangents on the circle from point D)

CR = CQ (Tangents on the circle from point C)

BP = BQ (Tangents on the circle from point B)

AP = AS (Tangents on the circle from point A)

Adding all these equations, we obtain

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

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

CD + AB = AD + BC

On putting the values of equations (1) and (2) in this equation, we obtain

2AB = 2BC

AB = BC …(3)

Comparing equations (1), (2), and (3), we obtain

AB = BC = CD = DA

Hence, ABCD is a rhombus.

32. Radius (r_1) of upper circular end of frustum part $= \frac{18}{2} = 9$ cm

Radius (r_2) of lower circular end of frustum part = Radius of circular end of cylindrical part $= \frac{8}{2} = 4$ cm

Height (h_1) of frustum part = 22 − 10 = 12 cm

Height (h_2) of cylindrical part = 10 cm

Slant height (l) of frustum part $= \sqrt{(r_1 - r_2)^2 + h^2} = \sqrt{(9-4)^2 + (12)^2} = 13$ cm

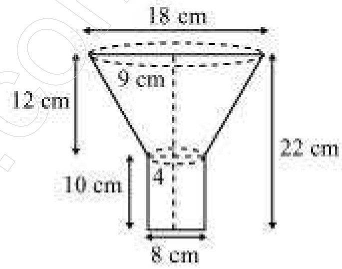
Area of tin sheet required = CSA of frustum part + CSA of cylindrical part

$= \pi(r_1 + r_2)l + 2\pi r_2 h_2$

$= \frac{22}{7} \times (9+4) \times 13 + 2 \times \frac{22}{7} \times 4 \times 10$

$= \frac{22}{7}[169 + 80] = \frac{22 \times 249}{7}$

$= 782\frac{4}{7}$ cm^2

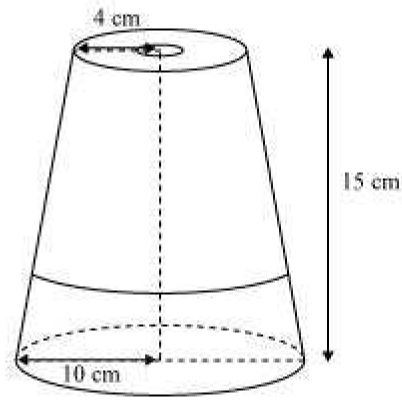


33. Radius (r_2) at upper circular end = 4 cm

Radius (r_1) at lower circular end = 10 cm

Slant height (l) of frustum = 15 cm

Area of material used for making the fez = CSA of frustum + Area of upper circular end



$= \pi\ (r_1 + r_2)l + \pi r_2^2$

$= \pi\ (10 + 4)\ 15 + \pi\ (4)^2$

$= \pi\ (14)\ 15 + 16\ \pi$

$= 210\pi + 16\pi = \frac{226 \times 22}{7}$

$= 710\frac{2}{7}$ cm^2

Therefore, the area of material used for making it is $710\frac{2}{7}$ cm^2.

34. Let the initial position A of balloon change to B after some time and CD be the girl.

In ΔACE,

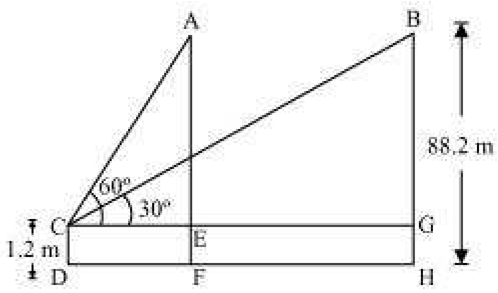
$$\frac{AE}{CE} = \tan 60°$$

$$\frac{AF - EF}{CE} = \tan 60°$$

$$\frac{88.2 - 1.2}{CE} = \sqrt{3}$$

$$\frac{87}{CE} = \sqrt{3}$$

$$CE = \frac{87}{\sqrt{3}} = 29\sqrt{3}\ \text{m}$$



In ΔBCG,

$$\frac{BG}{CG} = \tan 30°$$

$$\frac{88.2 - 1.2}{CG} = \frac{1}{\sqrt{3}}$$

$$87\sqrt{3}\ \text{m} = CG$$

Distance travelled by balloon = EG = CG − CE

$$= \left(87\sqrt{3} - 29\sqrt{3}\right)\text{m}$$

$$= 58\sqrt{3}\ \text{m}$$