Sample Paper 15

Class- X Exam - 2022-23

Mathematics - Basic

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

SECTION - A **20 marks**

(Section - A consists of 20 questions of 1 mark each.)

1. The HCF of 40 and 54 is:

(a) 2 (b) 3

(c) 4 (d) 5 1

2. The value of k for which the polynomial $2kx^2 - 3kx + 7$ has real roots is:

(a) 35 (b) 34

(c) 19 (d) None of these 1

3. If the value of 'x' in the equation $2x + 3y = 13$ is 2, then the corresponding value of y is:

(a) 1 (b) 2

(c) 4 (d) 3 1

4. The ratio in which x-axis divides the join of points (2, – 3) and (5, 6) internally is:

(a) 2 : 1 (b) 1 : 3

(c) 1 : 2 (d) 1 : 4 1

5. The ratio of the height of a tower and the length of its shadow is $\sqrt{3}:1$. The angle of elevation of the Sun is:

(a) 60° (b) 30°

(c) 45° (d) 90° 1

6. The value of $\sec^2 60° \cos 45° - \text{cosec}^2 30° \tan 45°$ is:

(a) $2\sqrt{2}-4$ (b) $3\sqrt{2}+2$

(c) $2\sqrt{2}$ (d) $7\sqrt{2}-2$ 1

7. The 10^{th} term of the A.P.: 2, 7, 12, ... is:

(a) 47 (b) 36

(c) 45 (d) 30 1

8. The sum of the first 10 multiples of 2 is:

(a) 110 (b) 210

(c) 150 (d) 140 1

9. A quadratic polynomial whose zeros are 2 and –5 is:

(a) $x^2 + 10x - 3$ (b) $x^2 + 3x - 10$

(c) $x^2 - 3x - 10$ (d) $x^2 + 5x + 4$ 1

10. The sum of the digits of a 2-digit number is 10. A number is selected at random. The probability of the chosen number to be divisible by 3 is:

(a) 1 (b) 3

(c) 4 (d) 0 1

11. The median of the given data is:

2, 4, 6, 12, 3, 5, 10, 8, 2, 4, 9, 2, 10

(a) 4 (b) 9

(c) 5 (d) 10 1

12. In a single throw of an unbiased die with 6 faces, what is the probability of getting a prime number ?

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $\frac{1}{5}$ 1

13. If θ is the angle (in degrees) of a sector of a circle of radius 'r', then what is the area of the sector ?

(a) $\frac{\theta}{360°} \times \pi r^2$ (b) $\frac{\theta}{360°} \times 2\pi r$

(c) $\frac{360°}{\theta} \times \pi r^2$ (d) $\frac{360°}{\theta} \times 2\pi r$ 1

14. A cylindrical pencil sharpened at one edge is the combination of which two solid figures ?

(a) Sphere and cone

(b) Cone and triangle

(c) Cuboid and cone

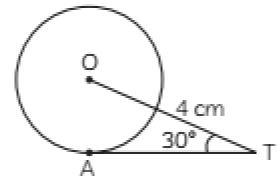
(d) Cylinder and cone 1

15. If one zero of $P(y) = 4y^2 - 8ky - 9$ is negative of other, then the value of 'k' is:

(a) 1 (b) 4

(c) 0 (d) 7 1

17. AT is a tangent to circle with centres such that OT = 4 cm and $\angle OTA = 30°$. The length of AT is:



(a) 2 cm (b) $\sqrt{3}$ cm

(c) $4\sqrt{3}$ cm (d) $2\sqrt{3}$ cm 1

18. If $\Delta ABC \sim \Delta PQR$, perimeter of ΔABC = 32 cm, perimeter of ΔPQR = 48 cm and PR = 6 cm, then the length of AC is:

(a) 3 cm (b) 6 cm

(c) 5 cm (d) 4 cm 1

Direction for questions 19 & 20: In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R).

Choose the correct option:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of Assertion (A)

(b) Both assertion (A) and reason (R) are true But reason (R) is not the correct explanation of assertion (A)

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

19. Assertion (A): The polynomial $2x^2 + 14x + 20$ have two zeroes.

Reason (R): A quadratic polynomial subtend equal angles at the centre.

Reason (R): A parallelogram circumscribing a circle is a rhombus. 1

SECTION - B **10 marks**

(Section - B consists of 5 questions of 2 mark each.)

21. If HCF (150, 210) = 30, then find LCM (150, 210). 2

22. Find the value of x for which $2x$, $(x + 10)$ and $(3x + 2)$ are three consecutive terms of an A.P.

OR

If the first term of on A.P. is P and its common difference is q. then find its 6^{th} term. 2

23. Find a relationship between x and y such that the point (x, y) is equidistant from the points (3, 6) and (–3, 4). 2

24. The shadow of a 5 m long stick is 2 m long. At the same time, find the length of the shadow of a 12.5 m high tree. 2

25. The area of a circle is 154 sq. cm. Find its circumference.

OR

A bag contains 3 red and 5 blue balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is:

(A) red?

(B) yellow? 2

SECTION - C **18 marks**

(Section - C consists of 6 questions of 3 mark each.)

26. Find the greatest 4-digit number which is divisible by 15, 24 and 36.

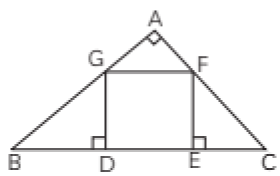
OR

Solve for x and y:

$3x + 2y = 11, \quad 2x + 3y = 4$ 3

27. Find the coordinates of the points of trisection of the line segment joining the points (2, –2) and (–7, 4). 3

28. In the figure, DEFG is a square and $\angle BAC = 90°$. Prove that



(A) $\triangle AGF \sim \triangle DBG$

(B) $\triangle AGF \sim \triangle EFC$

(C) $\triangle DBG \sim \triangle EFC$

OR

Determine the A.P. whose 3rd term is 5 and the 7th term is 9. 3

29. A quadrilateral ABCD circumscribe a circle. Prove that AB + CD = BC + DA. 3

30. A automobile has wheels that are each 80 cm in diameter. When the car is moving at a speed of 66 km/h, how many complete rotations do each wheel complete in 10 minutes? 3

31. A girl of height 90 cm is standing near a lamp-post. Now, she starts walking away from the base of a lamp post at a speed of 1.2 m/s.. If the lamp is 3.6 m above the ground, then what is the length of her shadow after 4 seconds? 3

SECTION - D **20 marks**

(Section - D consists of 4 questions of 5 mark each)

32. Solve for x :

$$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq -4, 7$$

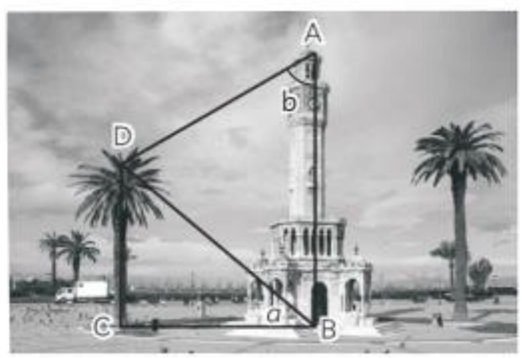
OR

Using quadratic formula, solve for x:

$3x^2 + 2\sqrt{5}x - 5 = 0.$ 5

33. Izmir Clock Tower is a historic clock tower in Konak Square in the center of Izmir, Turkey. The French architect Raymond Charles Pere designed the Izmir Clock Tower.

Let us assume that the height of the tower AB = 14 m, height of tree CD = 5 m and BD – BC = 1 m. As the tower is vertical $\angle ABC = 90°$. Further, let us denote $\angle CBD$ by 'a' and $\angle BAD$ by 'b'.

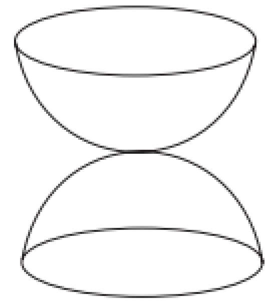


Find the value of sin a and tan b.

OR

The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower is 30°. Find the height of the tower. 5

34. As shown in the figure, two hemispheres of a solid metal ball are divided in half and joined. The solid is positioned in a water-filled, cylindrical tub such that it is completely submerged. The cylindrical tub has a radius of 4 cm and a height of 11 cm, respectively. Additionally, a spherical ball has a 3 cm radius. Calculate how much water is left in the cylindrical tub.



5

35. Find the mean, median and mode of the following frequency distribution:

Class	0-50	50-100	100-150	150-200	200-250	250-300	300-350
Frequency	2	3	5	6	5	3	1

5

SECTION - E

12 marks

(Case Study Based Questions)

(Section - E consists of 3 questions. All are compulsory.)

36. *Due to ongoing COVID-19 crises, Surbhi Medical store has started stocking up and sell masks of decent quality as sourced from a disposable medical device manufacturer. The owner of Surbhi Medical store is selling two types of masks currently - A and B. The cost of one type A mask is ₹ 10 and of one type B mask is ₹ 12. In the month of April, 2020, the store sold 100 masks for total sales of ₹ 1082.*

Due to great demand and short supply, the store has increased the price of each type by ₹ 1 from May 1, 2020 . In the month of May, 2020, the store sold 250 masks for total sales of ₹ 2920.

On the basis of the above information, answer the following questions:

(A) How many masks of each type were sold in the month of April?

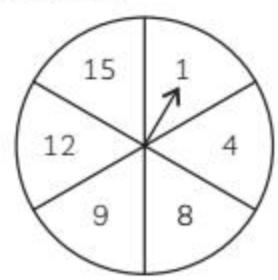
OR

How many masks of each type were sold in the month of May? 2

(B) If the store had sold 125 masks of each type, what would be its sale in month of May? 1

(C) What percent of masks of each type sale was increased in the month of May, compared with the sale of month April? 1

37. *A game at a stall in Diwali fare involves using a spinner first as a pre-cursor to complete the game with certain rules. If the spinner stops at a particular number, then the player is allowed to roll a 6-faced unbiased die.*



Rules:

(1) *If the spinner stops at a particular number, then the player is allowed to roll a 6- faced unbiased dice.*

(2) *If the spinner stops at any other number, you get to try again and only two tries allowed maximum.*

(3) *If you reach the next stage and roll a dice, the shopkeeper will open a chit to disclose the number if it matches, the player gets a prize.*

On the basis of the above information, answer the following questions:

(A) What is the probability of getting an odd number on the spinner? 1

(B) If getting an even number on the spinner allows a player to roll the die, then find the probability of his rolling the die. 1

(C) If the player is allowed to roll the die and getting a prime number entitles him to get prize, then find the probability of his winning the prize and if getting a square number on the spinner allows a player to roll the die, then find the probability of his rolling the die.

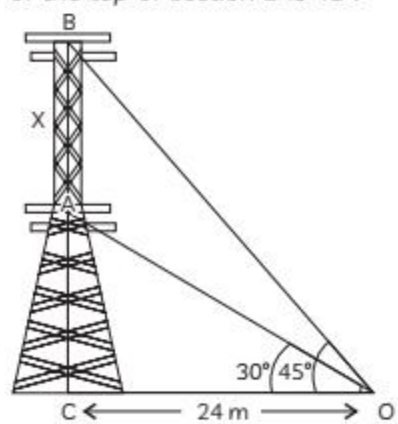
OR

If the player is allowed to roll the die and getting a number greater than 5 entitles him to get prize, then find the probability of his winning the prize. 2

38. *Radio towers are typically tall structures designed to support antennas for tele-communications and broadcasting, including television. There are 2 main types: guyed and self-supporting structures.*

They are among the tallest human-made structures. Masts are often named after the broadcasting organizations that originally built them or currently use them.

On a similar concept, a radio - station tower was built in two sections A and B. From a point 24 m from the base of the tower, the angle of elevation of the top of section A is 30º and the angle of elevation of the top of section B is 45º.



On the basis of the above information, answer the following questions:

(A) Find the height of the section A. 1

(B) Find the height of the section B. 1

(C) Find the length of the wire structure from the point O to the top of section A.

OR

Find the length of the wire structure from the point O to the top of section B. 2

SOLUTION

SECTION - A

1. *(a) 2*

Explanation: The prime factorisations of 40 and 54 are:

$$40 = 2 \times 2 \times 2 \times 5, \text{ or } 2^3 \times 5^1$$
$$54 = 2 \times 3 \times 3 \times 3, \text{ or } 2^1 \times 3^3$$

So, HCF (40, 54) = 2^1, *i.e.* 2.

2. *(d) None of these*

Explanation: For real roots,

Discriminant ≥ 0

$\Rightarrow \quad b^2 - 4ac \geq 0$

Here, $a = 2k$, $b = -3k$ and $c = 7$.

$\therefore \quad (-3k)^2 - 4 \times 2k \times 7 \geq 0$

$\Rightarrow \quad 9k^2 - 56k \geq 0$

$\Rightarrow \quad k(9k - 56) \geq 0$

$\Rightarrow \quad k \geq 0 \text{ or } k \geq \frac{56}{9}$

But k ≠ 0

$\Rightarrow \quad k > 0 \text{ or } k \geq \frac{56}{9}$

Caution

➥ *While finding the discriminant of quadratic equation, always compare the equation with standard equation.*

3. *(d) 3*

Explanation: Putting the value of x in the equation $2x + 3y = 13$, we have

$2(2) + 3y = 13$

$\Rightarrow \quad 4 + 3y = 13$

$\Rightarrow \quad 3y = 13 - 4 = 9$

$\Rightarrow \quad y = 3$

4. *(c) 1 : 2*

Explanation: Let P (x, 0) be a point on x-axis which divides A (2, – 3) and B (5, 6) in the ratio k : 1.

Then, by section formula

$\Rightarrow \quad P(x, 0) = \left(\frac{5k+2}{k+1}, \frac{6k-3}{k+1}\right)$

$\Rightarrow \quad \frac{6k-3}{k+1} = 0$

$\Rightarrow \quad 6k - 3 = 0$

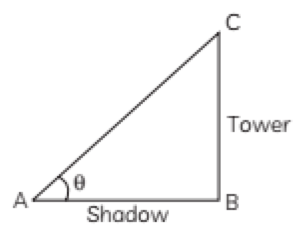
$\Rightarrow \quad k = \frac{1}{2}$

$\Rightarrow \quad$ Required ratio $= k : 1 = \frac{1}{2} : 1 = 1 : 2.$

5. *(a) 60°*

Explanation: Let the angle of elevation be θ.

Then, $\quad \tan\theta = \frac{BC}{AB}$



$\Rightarrow \quad \tan\theta = \frac{\sqrt{3}}{1}$

$\Rightarrow \quad \theta = 60°$

So, the angle of elevation of the sun is 60°.

6. *(a)* $2\sqrt{2}-4$

Explanation: $\sec^2 60° \cos 45° - \text{cosec}^2 30° \tan 45°$

$= (2)^2 \times \frac{1}{\sqrt{2}} - (2)^2 \times 1$

$= 2\sqrt{2} - 4$

Caution

➥ *Learn the table of trigonometric ratios for specific angles properly for solving such types of questions.*

7. *(a) 47*

Explanation: Here, $a = 2$, $d = 5$

So, $\quad a_{10} = a + 9d$

$= 2 + 45 = 47$

8. *(a) 110*

Explanation: First 10 multiple of 2 are

2, 4, 6, 8, ... 20.

This is an A.P. with $a = 2$ and $d = 2$.

So, their sum $= \frac{10}{2}[2 \times 2 + 9 \times 2] = 110$

9. *(b)* $x^2 + 3x - 10$

Explanation: A quardratic polynomial with sum and product of zeroes as S and P, respectively is given as,

$x^2 - Sx + P$

$\therefore$ Required polynomial is

$x^2 + 3x - 10$.

[$\because$ sum of zeroes = –3 and product of zeroes = – 10]

10. *(d) 0*

Explanation: 2-digit numbers, where the sum of the digits is 10, are 19, 28, 37, 46, 55, 64, 73, 82 and 91.

Of these nine numbers, no number is divisible by 3.

So, the required probability $= \frac{0}{9}$ *i.e.* 0.

11. *(c) 5*

Explanation: Rearranging the given data in ascending order, we have,

2, 2, 2, 3, 4, 4, 5, 6, 8, 9, 10, 10, 12

Here, number of terms (n) = 13

$$\therefore \quad \text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{ term}$$

$$= 7^{th} \text{ term} = 5.$$

12. *(a)* $\frac{1}{2}$

Explanation: Out of the six numbers 1, 2, 3, 4, 5, 6, three are prime numbers, namely 2, 3 and 5.

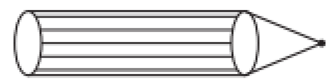
So, P (a prime number) $= \frac{3}{6}$, *i.e.* $\frac{1}{2}$

13. *(a)* $\frac{\theta}{360°} \times \pi r^2$

Explanation: Area of sector with angle θ and radius r is $\frac{\theta}{360°} \times \pi r^2$.

14. *(d) Cylinder and Cone*

Explanation:



So, it a combination of cylinder and a cone.

15. *(c) 0*

Explanation: Since one zero is the negative of the other zero, so the sum of two zeroes is 0.

$$\Rightarrow \quad \frac{8k}{4} = 0 \quad \Rightarrow \quad k = 0$$

16. *(a) 10*

Explanation: A pair of system of equations is inconsistent, it

Now, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Here, $a_1 = 5$, $b_1 = k$, $c_1 = 7$,

and, $a_2 = 1$, $b_2 = 2$, $c_2 = -3$.

$$\Rightarrow \quad \frac{5}{1} = \frac{k}{2} \neq -\frac{7}{3}$$

$$\Rightarrow \quad k = 10$$

Caution

➥ *While comparing the given equation with standard equation, always consider the signs of constant.*

17. *(d)* $2\sqrt{3}$ *cm*

Explanation: *Join OA,*

Then $\angle OAT = 90°$

(Since, $OA \perp AT$)

Now, $\cos 30° = \frac{AT}{OT}$

$$\Rightarrow \quad \frac{\sqrt{3}}{2} = \frac{AT}{4}$$

$$\Rightarrow \quad AT = 2\sqrt{3} \text{ cm}$$

18. *(d) 4 cm*

Explanation:

$\therefore \triangle ABC \sim \triangle PQR$ (Given)

$$\therefore \quad \frac{P(\triangle ABC)}{P(\triangle PQR)} = \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

$$\Rightarrow \quad \frac{32}{48} = \frac{AC}{6}$$

$$\Rightarrow \quad AC = \frac{32 \times 6}{48} = 4 \text{ cm}$$

⚠ Caution

➥ *While finding the length of any figure, always check for both the condition of similarity, do not evuluate on the basis of one condition only.*

19. *(c) Assertion (A) is true but reason (R) is false.*

Explanation: Here,

$$2x^2 + 14x + 20 = 0$$

$$\Rightarrow \quad x^2 + 7x + 10 = 0$$

$$\Rightarrow \quad x^2 + 5x + 2x - 10 = 0$$

$$\Rightarrow \quad (x + 5)(x + 2) = 0$$

$$\Rightarrow \quad x = -5, -2$$

20. *(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)*

Explanation: From an external point the two tangents drawn subtend equal angles at the centre. So A is true. Also, a parallelogram circumscribing a circle is a rhombus.

SECTION - B

21. We know that

$$\text{LCM}(150, 210) = \frac{150 \times 210}{\text{HCF}(150, 210)}$$

$$= \frac{150 \times 210}{30} = 1050$$

⚠ Caution

➥ *The relation between LCM and HCF for two numbers is not similar for three numbers.*

22. Since, $2x$, $(x + 10)$ and $(3x + 2)$ are three consecutive terms of A.P.

$$\therefore \quad (x + 10) - 2x = (3x + 2) - (x + 10)$$

$$\Rightarrow \quad 10 - x = 2x - 8$$

$$\Rightarrow \quad 3x = 18$$

$$\Rightarrow \quad x = 6$$

OR

Let a be the first term and d be the common difference of the A.P.

Then, $a = p$ and $d = q$

$$\therefore \quad 6^{th} \text{ term} = a + 5d$$

$$= p + 5q$$

23. Let P (x, y), A $(3, 6)$ and B $(-3, 4)$.

As P is equidistant from A and B,

So $\quad PA = PB$ or $PA^2 = PB^2$

i.e. $\quad (x - 3)^2 + (y - 6)^2 = (x + 3)^2 + (y - 4)^2$

$$\Rightarrow (x^2 - 6x + 9) + (y^2 - 12y + 36) = (x^2 + 6x + 9) + (y^2 - 8y + 16)$$

$$\Rightarrow \quad 12x + 4y - 20 = 0,$$

or $\quad 3x + y - 5 = 0$

which is the required relationship between x and y.

⚠ Caution

➥ *If distancebetween two lines are equal, then the square of these distances are also equal*

24. Let the length of a shadow of 12.5 m high tree x m

Now, ratio of lengths of objects = Ratio of lengths of their shadows

$$\frac{5}{12.5} = \frac{2}{x}$$

$$x = \frac{2 \times 12.5}{5} = \frac{25}{5} = 5 \text{ m}$$

25. Let 'r' cm be the radius of the circle.

Then, $\quad \pi r^2 = 154$

$$\Rightarrow \quad r^2 = \frac{154 \times 7}{22} = 49 \quad \Rightarrow \quad r = 7 \text{ cm.}$$

So, Circumference

$$= 2\pi r = 2 \times \frac{22}{7} \times 7 = 44 \text{ cm.}$$

OR

Total balls = 3 + 5 = 8

(A) P (red ball) = $\frac{3}{8}$

(B) P (yellow ball) = $\frac{0}{8}$, *i.e.* 0. (As there is no yellow ball in the bag.)

SECTION - C

26. LCM (15, 24, 36) is the smallest number which is divisible by 15, 24, 36.

Also, every multiple of the LCM (15, 24, 36) is also divisible by 15, 24 and 36.

Now,

$$15 = 3 \times 5$$

$$24 = 2^3 \times 3$$

$$36 = 2^2 \times 3^2$$

$$\therefore \quad \text{LCM}(15, 24, 36) = 2^3 \times 3^2 \times 5 \text{ i.e. } 360$$

The greatest 4-digit number which is the multiple of 360, is 9720 (27 × 360), which is the required number.

OR

$$3x + 2y = 11 \quad ...(i)$$

$$2x + 3y = 4 \quad ...(ii)$$

Adding (i) and (ii), we get

$$5x + 5y = 15$$

$$\Rightarrow \quad x + y = 3 \quad ...(iii)$$

Also, subtracting (ii) from (i), we get

$$x - y = 7 \quad ...(iv)$$

Adding (iii) and (iv), we get

$$2x = 10$$

$$\Rightarrow \quad x = 5$$

Putting the value of x in equation (iii), we get

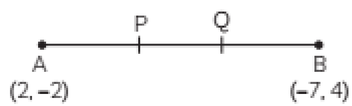
$$5 + y = 3$$

$$\Rightarrow \quad y = -2$$

$\therefore$ $x = 5$ and $y = -2$.

27. Let, the given points be A and B. Then, A (2, −2) and B (−7, 4).

Let, P and Q be the two points of trisection of $\overline{AB}$ such that, P divides $\overline{AB}$ in the ratio 1 : 2; and Q divides $\overline{AB}$ in the ratio 2 : 1.



$\therefore$ P$\left(\dfrac{-7+4}{3}, \dfrac{4-4}{3}\right)$, *i.e.* P (−1, 0)

and Q$\left(\dfrac{-14+2}{3}, \dfrac{8-2}{3}\right)$, *i.e.* Q (−4, 2).

28. (A) Consider Δs AGF and DBG.

Here, GF || BD and AB is a transversal

So, $\angle AGF = \angle DBG$

(corresponding angles are equal)

Also, $\angle GAF = \angle GDB$ (each is 90°)

So, by AA similarity criteria,

$$\Delta AGF \sim \Delta DBG$$

(B) Consider Δ's AGF and EFC.

Here FG || CE and AC is a transversal

So, $\angle AFG = \angle FCE$

(corresponding angles are equal)

Also, $\angle FAG = \angle FEC$ (each is 90°)

So, by AA similarity criteria,

$$\Delta AGF \sim \Delta EFC$$

(C) Since $\Delta DBG \sim \Delta AGF$ [by (i)]

and $\Delta EFC \sim \Delta AGF$, [by (ii)]

we get $\Delta DBG \sim \Delta EFC$

OR

Let a be the first term and d be the common difference of A.P.

Then, $a_3 = a + 2d = 5$

and $a_7 = a + 6d = 9$

Solving these simultaneously, we get:

$$a = 3 \quad \text{and} \quad d = 1$$

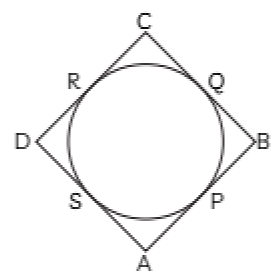
Thus, the required A.P. is 3, 4, 5, 6, ...

29. We know, length of tangents, drawn from a same external points are equal.

So here,

AP = AS; BP = BQ; CQ = CR

and DS = DR. ...(i)



Now, AB + CD = (AP + BP) + (CR + DR)

= (AS + BQ) + (CQ + DS)

[By eqn. (i)]

= (AS + DS) + (BQ + CQ)

= AD + BC, or BC + DA.

30. Diameter of wheel = 80 cm

$\Rightarrow$ Radius of wheel (r) = 40 cm

Distance covered by wheel in one revolution

$$= 2\pi r = 2 \times \frac{22}{7} \times 40 = \frac{1760}{7} \text{ cm}$$

$\because$ Distance covered by wheel in 1 hour = 66 km = 66000 m = 6600000 cm

Distance covered by wheel in 10 minutes

$$= \frac{6600000}{60} \times 10 = 1100000 \text{ cm}$$

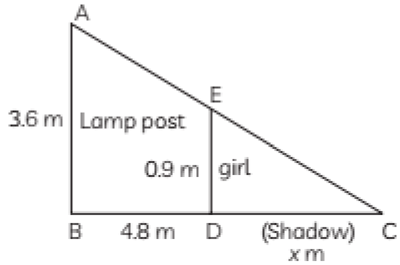
No. of revolutions

$$= \frac{\text{Total distance}}{\text{distance of one revolution}} = \frac{1100000 \times 7}{1760}$$

= 4375

31. Speed of girl = 1.2 m/s

$\therefore$ In 4 seconds, travels



distance= $1.2 \times 4 = 4.8$ m

$\therefore$ After 4 seconds, she reaches at D.

$\therefore \quad BD = 4.8$ m

Let CD be the length of her shadow.

Now, $\angle ABD = \angle EDC = 90°$

$\therefore \quad AB \parallel ED$

Hence, by BPT

$$\frac{AB}{ED} = \frac{BC}{DC}$$

$$\frac{3.6}{0.9} = \frac{4.8+x}{x}$$

$$\Rightarrow \quad 4x = 4.8 + x$$

$$\Rightarrow \quad x = 1.6 \text{ m}$$

SECTION - D

32. We have,

$$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$$

$$\Rightarrow \quad \frac{x-7-(x+4)}{(x+4)(x-7)} = \frac{11}{30}$$

$$\Rightarrow \quad \frac{-11}{(x+4)(x-7)} = \frac{11}{30}$$

$$\Rightarrow \quad \frac{-1}{(x+4)(x-7)} = \frac{1}{30}$$

$$\Rightarrow \quad (x+4)(x-7) = -30$$

$$\Rightarrow \quad x^2 - 3x - 28 = -30$$

$$\Rightarrow \quad x^2 - 3x + 2 = 0$$

$$\Rightarrow \quad x^2 - 2x - x + 2 = 0$$

$$\Rightarrow \quad x(x-2) - 1(x-2) = 0$$

$$\Rightarrow \quad (x-1)(x-2) = 0$$

$$\Rightarrow \quad x = 1 \text{ or } 2$$

OR

Using the quadratic formula, we have:

$$x = \frac{-2\sqrt{5} \pm \sqrt{(-2\sqrt{5})^2 - 4(3)(-5)}}{2 \times 3}$$

$$= \frac{-2\sqrt{5} \pm \sqrt{20+60}}{6}$$

$$= \frac{-2\sqrt{5} \pm 4\sqrt{5}}{6}$$

$$= \frac{2\sqrt{5}}{6}, \text{ or } \frac{-6\sqrt{5}}{6}$$

$$= \frac{\sqrt{5}}{3}, \text{ or } -\sqrt{5}$$

Thus, $x = \frac{\sqrt{5}}{3}$, or $-\sqrt{5}$.

33. To find sin a, we will first find BD. It is given that BD – BC = 1 m and CD = 5 m. Therefore, applying Pythagoras theorem in triangle BCD, we get :

$$BD^2 = BC^2 + CD^2$$

$$\Rightarrow \quad BD^2 = (BD-1)^2 + 5^2$$

$$\Rightarrow \quad BD^2 = BD^2 - 2BD + 1 + 25$$

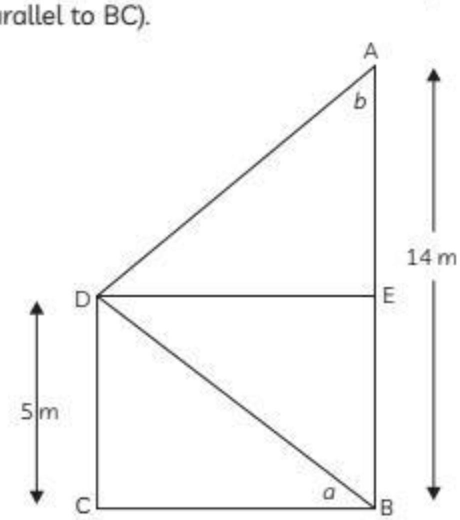
Solving further, 2BD = 26, or BD = 13 m

Therefore, BC = 12 m.

In ΔBCD, $\sin a = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

$$= \frac{CD}{BD} = \frac{5}{13}$$

To find tan b, we will find AE and DE (drawn parallel to BC).



We construct DE || BC and we get a rectangle.

$\therefore \quad AB = BE + AE$

or $14 = 5 + AE$

Therefore, $AE = 9$ m

and $DE = BC = 12$ m

Therefore, $\tan b = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$

$$\frac{DE}{AE} = \frac{12}{9}$$

OR

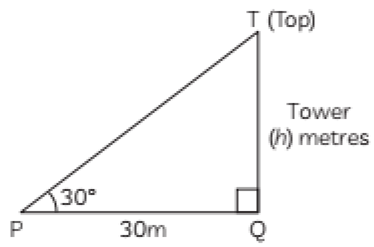
Let P be the point of observation on the ground and TQ be the tower.

So, PQ = 30 m and $\angle TPQ = 30°$.

Let $TQ = h$ metres

From rt . $\angle d$ ΔPQT,

$$\frac{TQ}{PQ} = \tan 30°$$



$$\Rightarrow \quad \frac{h}{30} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow \quad h = \frac{30}{\sqrt{3}}$$

$$= 10\sqrt{3} \text{ metres.}$$

34. Radius of spherical ball, $r = 3$ cm

$\therefore$ Radius of each hemisphere, $r = 3$ cm

Radius of cylinderical tub, R = 4 cm

Height of cylinderical tub, H = 11 cm

Volume of water left in tub

= volume of water in cylinderical tub – Volume of the solid

$$= \pi R^2 H - 2 \times \frac{2}{3}\pi r^3$$

$$= \frac{22}{7} \times 4 \times 4 \times 11$$

$$- \frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3$$

$$= \frac{22}{7}(176 - 36)$$

$$= \frac{22}{7} \times 140$$

$$= 22 \times 20$$

$$= 440 \text{ cm}^2$$

35. Given, distribution is:

Class	Class-mark (x_i)	Frequency (f_i)	$f_i x_i$	c.f.
0-50	25	2	50	2
50-100	75	3	225	5
100-150	125	5	625	10
150-200	175	6	1050	162
200-250	225	5	1125	21
250-300	275	3	825	24
300-350	325	1	325	25
Total		25	4225	

Mean, $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{4225}{25}$

For median, $n = 25$

$$\frac{n}{2} = 12.5$$

Then, median class is 150 – 200.

we have, $l = 150$, $c.f. = 10$, $f = 6$, $h = 50$

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

$$= 150+\left(\frac{12.5-10}{6}\right)\times 50$$

$$= 150+\frac{2.5\times 50}{6}$$

$$= 170.8$$

For mode

modal class = 150 – 200

$f_0 = 5$, $f_i = 6$, $f_2 = 5$, $h = 50$, $l = 150$

$$\text{Mode} = l+\left(\frac{f_1-f_0}{2f_1-f_0-f_2}\right)\times h$$

$$= 150+\left(\frac{6-5}{12-5-5}\right)\times 50$$

$$= 150+\frac{50}{2}$$

$$= 150 + 25$$

$$= 175$$

SECTION - E

36. (A) Let, the mask of type A sold in April be x and type of mask B sold in April be y.

Then, $x + y = 100$ ...(i)

and $10x + 12y = 1082$ ...(ii)

Multiply equation (i) by 10 and subtract (ii) from (i).

$10x + 10y = 1000$

$10x + 12y = 1082$

– – –

$-2y = -82$

$y = 41$

Then, $x = 100 - 41 = 59$

OR

For May, Let, the mask of type A sold be x and type B be y.

Then, $x + y = 250$ ...(i)

and $11x + 13y = 2920$ ...(ii)

Multiply equation (i) by 11 and subtract it from equation (ii), we get

$11x + 11y = 2750$

$11x + 13y = 2920$

– – –

$-2y = -170$

$y = 85$

and $x = 250 - 85 = 165$

(B) $11 \times 125 + 13 \times 125 = 1375 + 1625$

= ₹ 3000

(C) Increase in type A $= \frac{165 - 59}{59} \times 100$

= 179.66%

= 180%

Increase in type B $= \frac{85 - 41}{41} \times 100$

= 107.31%

= 110%

37. (A) Total number of cases = 6

Favourable outcomes = (1, 9, 15) *i.e.*, 3

P (dice will be thrown) $= \frac{3}{6} = \frac{1}{2}$

(B) Even number = 4, 8, 12

$\therefore$ P(getting in even number) $= \frac{3}{6} = \frac{1}{2}$

(C) Prime no. on dice = 2, 3, 5, i.e., (3) outcomes

$\therefore$ Total outcomes = 6

$\therefore$ P(getting a prime no.) $= \frac{3}{6} = \frac{1}{2}$

Total outcomes = 6

Favourable outcomes = {1, 4, 9} *i.e.*, 3

P (dice will be thrown) $= \frac{3}{6} = \frac{1}{2}$

OR

Total outcomes = 6

Favorable outcomes is 6 i.e., 1

P(getting a no. greater than 5) $= \frac{1}{6}$

38. (A) In ΔAOC,

$$\tan 30° = \frac{AC}{OC}$$

$$\Rightarrow \quad AC = 24 \times \frac{1}{\sqrt{3}}$$

$$= 8\sqrt{3}$$

$$= 13.84 \text{ m}$$

(B) In ΔBOC

$$\tan 45° = \frac{BC}{OC}$$

$\Rightarrow$ $BC = OC$

$\Rightarrow$ $BC = 24$ m

Now, $AB = 24 - 13.84$

$= 10.16$ m

(C) In ΔOAC

$$\cos 30° = \frac{OC}{OA}$$

$$\Rightarrow \quad \frac{\sqrt{3}}{2} = \frac{24}{OA}$$

$$\Rightarrow \quad OA = \frac{48}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$= 16\sqrt{3}$

$= 27.68 = 27.7$ m

OR

In ΔOBC

$$\cos 45° = \frac{OC}{OB}$$

$$\Rightarrow \quad \frac{1}{\sqrt{2}} = \frac{24}{OB}$$

$\Rightarrow$ $OB = 24\sqrt{2}$

$= 33.84$ m