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MATHEMATICS

10

11 Question Papers with Full Answers

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GOVT. MODEL QUESTION PAPER - 2019-20

Question Paper 1

CLASS: X **MATHEMATICS**

Time allowed: 3 Hours Max. Marks: 100

Instructions : 1. Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
2. Use Blue (or) Black ink to write and underline and pencil to draw diagrams.

Note: This question paper contains four parts.

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**
(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. If n(A × B) = 6 and A = {1, 3} then n(B) is
1) 1 2) 2 3) 3 4) 4

2. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_S is
1) 3 2) 5 3) 8 4) 11

3. In an A.P, the first term is 1 and the common difference is 4. How many terms of the A.P must be taken for their sum to be equal to 120?
1) 6 2) 7 3) 8 4) 9

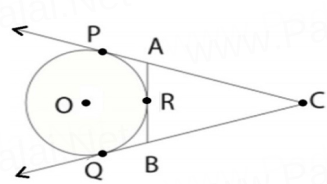
4. f = { (2, a), (3 , b), (4, b), (5, c)} is a ----------
1) Identity function 2) one - one function
3) many - one function 4) constant function

5. The number of points of intersection of quadratic polynomial $x^2 + 4x + 4$ with the x-axis is
1) 0 2) 1 3) 0 or 1 4) 2

6. The non-diagonal elements in any unit matrix are ----------
1) 0 2) 1 3) m 4) n

7. If A is a 2 × 3 matrix and B is a 3 × 4 matrix, how many columns does AB have?
1) 3 2) 4 3) 2 4) 5

8. In figure CP and CQ are tangents to a circle with centre at O. ARB is another tangent touching the circle at R. If CP = 11 cm and BC = 7 cm then the length of BR is



1) 6 cm 2) 5 cm 3) 8 cm 4) 4 cm

9. The slope of the line joining (12, 3), (4, *a*) is $\frac{1}{8}$. The value of '*a*' is -------.

1) 1 2) 4 3) – 5 4) 2

10. If x = a tanθ and y = b secθ then

1) $\frac{y^2}{b^2}-\frac{x^2}{a^2}=1$ 2) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ 3) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ 4) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=0$

11. A letter is chosen at random from the letter of the word "PROBABILITY", Find the probability that it is not a vowel

1) $\frac{4}{11}$ 2) $\frac{7}{11}$ 3) $\frac{3}{11}$ 4) $\frac{6}{11}$

12. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be

1) 12 cm 2) 10 cm 3) 13 cm 4) 5 cm

13. If the mean and co-efficient of variation of a data are 4 and 87.5% then the standard deviation is

1) 3.5 2) 3 3) 4.5 4) 2.5

14. Variance of first 20 natural numbers is

1) 32.25 2) 44.25 3) 33.25 4) 30

PART - II

Answer any 10 questions. Question No. 28 is compulsory. **10×2=20**

15. Define a function.

16. Compute x such that $10^4 \equiv x \pmod{19}$.

17. Simplify: $\frac{4x^2y}{2z^2}\times\frac{6xz^3}{20y^4}$

18. Pari needs 4 hours to complete the work. His friend Yuvan needs 6 hours to complete the work. How long will it take to complete if they work together?

19. Find the values of x, y and z from following equation $\begin{pmatrix}12 & 3\\ x & 5\end{pmatrix}=\begin{pmatrix}y & z\\ 3 & 5\end{pmatrix}$

20. What length of ladder is needed to reach a height of 7 *ft* along the wall when the base of the ladder is 4 *ft* from the wall ?

21. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}$ = cosecθ + cotθ

22. The radius of a sphere increases by 25 %. Find the percentage increase in its surface area.

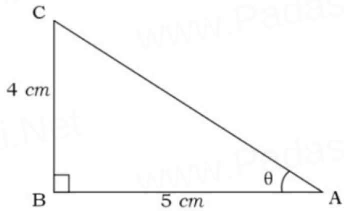
23. The Standard Deviation and Mean of a data are 6.5 and 12.5 respectively. Find the co-efficient of variation.

24. If f(x) = 3 + x, g(x) = x – 4 then check whether $f \circ g = g \circ f$

25. An organization plans to plant saplings is 25 streets in a town in such a way that one sapling for the first street, three for the second, nine for the third and so on. How many saplings are needed to complete the work?

26. Find the 19^{th} term of an A.P is –11, –15, –19, ………….

27. Find the value of $\angle BAC$ in the given triangle.



28. The vertices of a triangle are A (–1, 3), B (1, –1) and C (5, 1). Find the length of the median through the vertex C.

PART - III

Answer any 10 questions. Question No. 42 is compulsory. **10×5=50**

29. Let f be a function $f : N \rightarrow N$ be defined by $f(x) = 3x + 2, x \in N$
 i) Find the image of 1, 2, 3 ii) Find the pre-image of 29, 53 iii) Identify the type of function
30. Let $f : A \rightarrow B$ be a function defined by $f(x) = \frac{x}{2} - 1$, where A = {2, 4, 6, 10, 12}, B = {0, 1, 4, 5, 9} represent f by
 i) set of ordered pairs ii) a table iii) an arrow diagram iv) a graph
31. The ratio of 6^{th} and 8^{th} terms of an A.P is 7 : 9. Find the ratio of 9^{th} term to 13^{th} terms.
32. The sum of first n, 2n and 3n terms of an A.P are S_1, S_2 and S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$.
33. Find the values of m and n if the expression $\frac{1}{x^4} - \frac{6}{x^3} + \frac{13}{x^2} + \frac{m}{x} + n$ is a perfect square.
34. If a, b are the roots of the equation $2x^2 - x - 1 = 0$ then form the equation whose roots are a^2b, b^2a.
35. P and Q are the mid-points of the sides CA and CB respectively of a ΔABC, right angled at C. Prove that $4(AQ^2 + BP^2) = 5AB^2$.
36. Find the equation of a straight line passing through (1, –4) and has intercepts which are in the ratio 2 : 5.
37. From the top of the tower 60m high the angles of depression of the top and bottom of a vertical lamp post are observed to be 38o and 60o respectively. Find the height of the lamp post. ($\tan 38° = 0.7813$, $\sqrt{3} = 1.732$).
38. Calculate the weight of a hollow brass sphere if the inner diameter is 14 cm and thickness is 1 cm and whose density is 17.3 g/cm^3.
39. Find the co-efficient of variation of 24, 26, 33, 37, 29, 31.
40. Two dice, one blue and one grey are thrown at the same time. Write down all the possible outcomes. What is the probability that the sum of the two numbers appearing on the top of dice is
 i) 8 ii) 13 iii) less than or equal to 12
41. Find two consecutive positive integers, sum of whose squares is 365.
42. A cylindrical bucket of 32 cm high and with radius of base 18 cm, is filled with sand completely. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.

PART - IV

Answer all the questions. **2×8=16**

43. a) PQ is a chord of length 8 cm to a circle of radius 5 cm. The tangents at P and Q intersect at a point T. Find the length of the tangent TP.

(OR)

b) Draw a triangle ABC of base BC = 8 cm, ∠A = 60° and the bisector of ∠A meets BC at D such that BD = 6 cm.

44. a) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve $x^2 + 3x - 4 = 0$.

(OR)

b) A motor boat whose speed is 18 km/hr in still water takes 1 hour more to go to 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

***

ANSWERS **Govt. Model Question Paper - 2019-20** **Question Paper 1**

PART - I

1. 3) 3
2. 4) 11
3. 3) 8
4. 3) many one function
5. 2) 1
6. 1) 0
7. 2) 4
8. 4) 4 cm
9. 4) 2
10. 1) $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$
11. 2) $\frac{7}{11}$
12. 1) 12 cm
13. 1) 3.5
14. 3) 33.25

PART - II

15. A relation f between two non-empty sets X and Y is called a function from X to Y if, for each $x \in X$ there exist only one $y \in Y$.
such that $(x, y) \in f$
That is $f = \{(x, y) / \text{for all } x \in X, y \in Y\}$

16. $10^2 = 100 \equiv 5 \pmod{19}$

$$10^4 = (10^2)^2 \equiv 5^2 \pmod{19}$$
$$10^4 \equiv 25 \pmod{19}$$
$$10^4 \equiv 6 \pmod{19}$$
$$x = 6$$

17. $$\frac{\overset{2}{\cancel{4}}x^2}{\cancel{2}z^2} \times \frac{\overset{3}{\cancel{6}}xz^3}{\underset{\underset{5}{\cancel{10}}}{\cancel{20}}y^4} = \frac{3x^2xz^3}{5y^4z^2} = \frac{3x^3z}{5y^4}$$

18. Time required for Pari to complete a work = 4 hours
Time required for Yuvan to complete a work = 6 hours

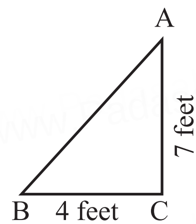
In 1 hour Pari complete = $\frac{1}{4}$ of the work; In 1 hour Yuvan complete = $\frac{1}{6}$ of the work

1 hour Pari and Yuvan complete = $\left(\frac{1}{4}+\frac{1}{6}\right)$ for the work = $\frac{5}{12}$

$\therefore$ Pari and Yuvan complete the full work = $\frac{1}{5/12} = \frac{12}{5}$ = 2.4 hours

19. $\begin{pmatrix} 12 & 3 \\ x & 5 \end{pmatrix} = \begin{pmatrix} y & z \\ 3 & 5 \end{pmatrix} \Rightarrow x = 3;\ y = 12;\ z = 3$

20. AC - wall; AB - ladder; $\angle C = 90°$



By Pythagoras theorem,

$$\begin{aligned} AB^2 &= AC^2 + BC^2 \\ &= 72 + 42 \\ &= 49 + 16 \\ &= 65 \\ AB &= \sqrt{65} = 8.1 \text{ feet} \end{aligned}$$

21. $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \cos ec\theta + \cot\theta$

LHS

$$\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \sqrt{\frac{1+\cos\theta}{1-\cos\theta}\times\frac{1+\cos\theta}{1+\cos\theta}} = \sqrt{\frac{(1+\cos\theta)^2}{\text{üüü}\ {}^2\theta}} = \sqrt{\frac{(1+\cos\theta)^2}{{}^2\theta}}$$

$$= \frac{1+\cos\theta}{\sin\theta} = \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$

= cosecθ + cotθ = RHS

$\therefore$ LHS = RHS

22. Let r be the radius of the sphere; r increased 25%

$\therefore$ the new radius = $r + \left(r\times\frac{25}{100}\right) = r\left(1+\frac{1}{4}\right) = \frac{5r}{4}$

New surface area of the sphere = $4\pi r^2 = 4\pi\left(\frac{5r}{4}\right)^2 = \frac{2525}{1616} \times 4\pi r^2$

Increased surface area = $\frac{25}{16} \times 4\pi r^2 - 4\pi r^2 = 4\pi r^2\left(\frac{25}{16}-1\right) = 4\pi r^2\left(\frac{9}{16}\right)$

Percentage of increases in surface area = $\frac{\frac{9}{16}\times 4\pi r^2}{4\pi r^2} \times 100 = \frac{9}{16} \times 100 = 56.25\%$

23. Standard deviation σ = 6.5; Mean $\bar{x}$ = 12.5

Coefficient of variation = $\frac{\sigma}{\bar{x}} \times 100\% = \frac{6.5}{12.5} \times 100\% = 52\%$

24. $f(x) = 3 + x,\; g(x) = x - 4$

$$\begin{aligned} f \circ g &= f(g(x)) \\ &= f(x-4) \\ &= 3 + x - 4 \\ &= x - 1 \text{ ----- (1)} \end{aligned} \qquad \begin{aligned} g \circ f &= g(f(x)) \\ &= g(3+x) \\ &= 3 + x - 4 \\ &= x - 1 \text{ ----- (2)} \end{aligned}$$

(1) and (2) we get, $f \circ g = g \circ f$

25. 1st street 1, 2nd street 3, 3rd street 9.

1 + 3 + 9, ..., 25 terms.

n = 25; d = 3 – 1 = 2; a = 1

$$S_n = \frac{n}{2}(2a + 1\,(n-1)d) \Rightarrow S_{25} = \frac{25}{2}(2(1) + (25-1)2)$$

$$= \frac{25}{2}(2 + 48) = \frac{25}{2} \times 50$$

$$= 25 \times 25 = 625$$

625 sapling are needed complete the work.

26. –11, –15, –19, ...

a = –11; d = –15 – (–11) = –15 + 11 = –4

$$t_n = a + (n-1)d$$

$$t_{10} = -11 + (19 - 1) - 4 = -11 + (18 \times -4) = -11 - 72$$

$$t_{19} = -83$$

19th term is –83.

27. $\tan\theta = \frac{4}{5} = 0.8$

$\theta = 38.7 \qquad (\because \tan 38.7 = 0.8011)$

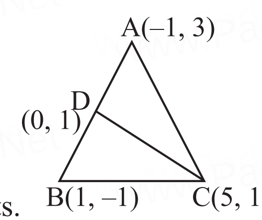
$\underline{|BAC} = 38.7$

28. A (–1, 3), B (1, –1), C (5, 1)

Midpoint of AB $= \left(\frac{-1+1}{2}, \frac{3-1}{2}\right) = (0, 1)$

Length of the median through the vertex C.

$$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(5-0)^2 + (1-1)^2} = \sqrt{5^2} = 5 \text{ units.}$$



PART – III

29. $f : N \to N$ be defined by $f(x) = 3x + 2$

i) image of 1, 2, 3

when x = 1, $f(1) = 3\,(1) + 2 = 5$

when x = 2, $f(2) = 3\,(2) + 2 = 8$

when x = 3, $f(3) = 3\,(3) + 2 = 11$

$\therefore$ The image of 1, 2, 3 are 5, 8, 11 respectively.

ii) pre image of 29, 53.

$$f(x) = 29 \qquad\qquad f(x) = 53$$
$$3x + 2 = 29 \qquad\qquad 3x + 2 = 53$$
$$3x = 27 \qquad\qquad 3x = 51$$
$$x = 9 \qquad\qquad x = 17$$

$\therefore$ The pre image of 29, 53 is 9, 17.

iii) Identify the type of function:

Since different element of N have different image in the co-domain, the function *f* is one-one function.

The co-domain of *f* is N.

But the range of *f* = {5, 8, 11, ...} is a proper subset of N.

$\therefore$ f is next onto function. That is *f* is into function.

Thus f is one - one and into function.

30. $f : A \to B, \; f(x) = \frac{x}{2} - 1$

A = {2, 4, 6, 10, 12}; B = {0, 1, 4, 5, 9}

$f(2) = \frac{\text{üi}}{2} - 1 = 1 - 1 = 0$

$f(4) = \frac{\text{ıü}}{2} - 1 = 2 - 1 = 1$

$f(6) = \frac{\;}{2} - 1 = 3 - 1 = 2$

$f(10) = \frac{\;}{2} - 1 = 5 - 1 = 4$

$f(12) = \frac{\;}{2} - 1 = 6 - 1 = 5$

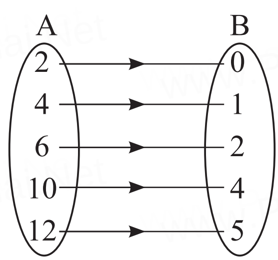
i) Set of Ordered pairs:

f = {(2, 0), (4, 1), (6, 2), (10, 4), (12, 5)}

ii) A table:

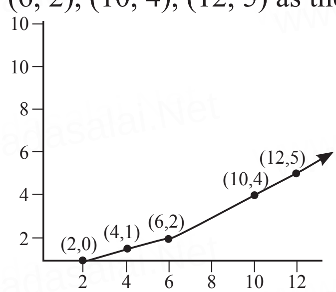
x	2	4	6	10	12
$f(x)$	0	1	2	4	5

i) Arrow Diagram:



iv) A graph:

Take a ordered pairs (2, 0), (4, 1), (6, 2), (10, 4), (12, 5) as the points



31. $t_n = a + (n - 1)d$

6th term $t_6 = a + (6–1)d = a + 5d$

8th term $t_8 = a + (8–1)d = a + 7d$

Given: $\frac{t_6}{t_8} = \frac{7}{9}$; $\frac{a+5d}{a+7d} = \frac{7}{9}$

$$9(a + 5d) = 7(a + 7d)$$
$$9a + 45d = 7a + 49d$$
$$9a - 7a = 49d - 45d$$
$$2a = 4d$$
$$a = 2d$$

9th term $t_9 = a + (a–1)d = a + 8d$

13th term $t_{13} = a + (13–1)d = a + 12d$

$$\frac{t_9}{t_{13}} = \frac{a+8d}{a+12d} = \frac{2d+8d}{2d+12d} = \frac{10d}{14d} = \frac{5}{7}$$

$$\frac{t_9}{t_{13}} = \frac{5}{7}$$

$t_9 : t_{13} = 5 : 7$

32. Given sum of first n, 2n and 3n of A.P are S_1, S_2 and S_3.

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

$$S_{2n} = \frac{2n}{2}(2a + (2n-1)d$$

$$S_{2n} = \frac{3n}{2}(2a + (2n-1)d$$

$$S_2 - S_1 = \frac{2n}{2}(2a + (2n-1)d - \frac{n}{2}(2a + (n-1)d$$

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

$$= \frac{n}{2}[4a + 4nd - 2d - 2a - nd + d]$$

$$= \frac{n}{2}[2a + 3nd - d]$$

$$= \frac{n}{2}[2a + (3n-1)d]$$

$$3(S_2 - S_1) = \frac{3n}{2}[2a + (3n-1)d]$$

$3(S_2 - S_1) = S_3$. Hence proved.

33. $\frac{1}{x^4} - \frac{6}{x^3} + \frac{13}{x^2} + \frac{m}{x} + n$

Quotient: $\frac{1}{x^2} - \frac{3}{x} + 2$

$$\frac{1}{x^2} \;\Big|\; \frac{1}{x^4} - \frac{6}{x^3} + \frac{13}{x^2} + \frac{m}{x} + n$$

$$\frac{1}{x^4}$$

$$\frac{2}{x^2} - \frac{3}{x} \;\Big|\; -\frac{6}{x^3} + \frac{13}{x^2}$$

$$-\frac{6}{x^3} + \frac{9}{x^2}$$

$$\frac{2}{x^2} - \frac{6}{x} + 2 \;\Big|\; \frac{4}{x^2} + \frac{m}{n} + n$$

$$\frac{4}{x^2} - \frac{12}{x} + 4$$

$$(m+12)\frac{1}{x} + (n-4) = 0$$

$m+12 = 0$ and $n-4 = 0$

$m = -12$ $\quad n = 4$

34. a, b are root of $2x^2 - x - 1 = 0$

a = 2, b = –1, c = –1

$a + b = \left(\frac{-1}{2}\right) = \frac{1}{2}$; $ab = \frac{-1}{2}$

Given roots are a^2b, b^2a

Sum of the roots $= a^2b + b^2a = ab(a+b)$

$$= \frac{-1}{2}\left(\frac{1}{2}\right) = \frac{-1}{4}$$

Product of the roots $= a^2b \times b^2a$

$$= a^3b^3 = (ab)^3 = \left(\frac{-1}{8}\right)$$

∴ The required equation

x^2 – (sum of the roots) ^{x} + product of roots = 0

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

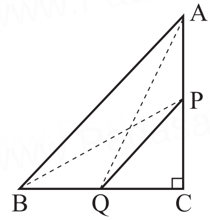
$$x^2 + \frac{1}{4}x - \frac{1}{8} = 0$$

$$8x^2 + 2x - 1 = 0$$

35. ABC is a triangle.

right angled at C, $C = \angle 90°$

$\therefore \quad AB^2 = BC^2 + AC^2 \quad$ ----- (1)



P and Q are the mid point of AC and BC.

ΔAQC is a right angle triangle.

$AQ^2 = AC^2 + QC^2 \quad$ ----- (2)

ΔBPC is right angle triangle.

$BP^2 = BC^2 + PC^2 \quad$ ----- (3)

From equation (2) and (3) we get,

$$\begin{aligned} AQ^2 + BP^2 &= AC^2 + QC^2 + BC^2 + PC^2 \\ 4(AQ^2 + BP^2) &= 4(AC^2 + QC^2 + BC^2 + PC^2) \\ &= 4AC^2 + 4QC^2 + 4BC^2 + 4PC^2 \\ &= 4AC^2 + (2QC)^2 + 4BC^2 + (2(PC))^2 \end{aligned}$$

P is the midpoint of AC

$$\begin{aligned} AP &= PC \\ AC &= AP + PC \\ AC &= PC + PC = 2PC \end{aligned}$$

Q is the midpoint of BC

$$\begin{aligned} BQ &= QC \\ BC &= BQ + QC = QC + QC \\ BC &= 2QC \end{aligned}$$

substituting in equation (3) we get

$$\begin{aligned} 4(AQ^2 + BP^2) &= 4AC^2 + BC^2 + 4BBC^2 + AC^2 \\ &= 5AC^2 + 5BC^2 \\ &= 5(AC^2 + BC^2) \\ 4(AQ^2 + BP^2) &= 5(AB^2) \quad \text{by equation (1)} \end{aligned}$$

---

36. Passing through (1, –4) and has intercepts which are in the ratio 2 : 5

X intercept be a = 2k

Y intercept be b = 5k

Equation of straight line $\frac{x}{a} + \frac{y}{b} = 1$

$$\frac{x}{2k} + \frac{y}{5k} = 1 \quad ---(1)$$

Given passing through the point (1, –4)

$$(1) \Rightarrow \frac{1}{2k} - \frac{4}{5k} = 1$$

$$\frac{5-8}{10k} = 1$$

$$-3 = 10k$$

$$k = \frac{-3}{10}$$

Value of k in (1)

$$\frac{x}{2\left(\frac{-3}{10}\right)} + \frac{y}{5\left(\frac{-3}{10}\right)} = 1$$

$$\frac{10x}{-6} + \frac{10y}{-15} = 1$$

$$\frac{5x}{-3} + \frac{2y}{-3} = 1$$

$$5x + 2y = -3$$

$$5x + 2y + 3 = 0$$

37. AB - tower, AB = 60 m, CD - lamp post

$\angle XBD = 38°$, $\angle XBC = 60°$

ΔABC,

$$\tan 60^0 = \frac{AB}{AC}$$

$$\sqrt{3} = \frac{60}{AC}$$

$$AC = \frac{60}{\sqrt{3}} = \frac{60\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}} = \frac{60\sqrt{3}}{3}$$

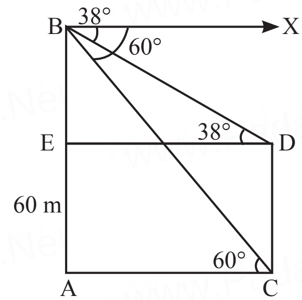
$$AC = 20\sqrt{3} \quad --- (1)$$

ΔBED

$$\tan 38^0 = \frac{BE}{ED} \qquad 0.7813$$

$$0.7813 = \frac{BE}{20\sqrt{3}}$$

$$\begin{aligned} BE &= 0.7813 \times 20\sqrt{3} \\ &= 0.7813 \times 20 \times 1.732 \\ &= 27.06 \\ AB &= 60 \\ BE + AE &= 60 \\ 27.06 + AE &= 60 \\ AE &= 32.94 \\ \text{But} \quad AE &= CD \\ \therefore \quad CD &= 32.94 \text{ m} \end{aligned}$$



The height of the lamp post = 32.94 m

38. Let r and R be the inner and outer radii of the hallow sphere.

Given the inner diameter d = 14 cm

$$\begin{aligned} \text{Inner radius } r &= 7 \text{ cm} \\ \text{Thickness} &= 1 \text{ mm} \\ &= \frac{1}{10} \text{ cm} = 0.1 \text{ cm} \\ \text{Outer radius} &= R = r + 0.1 \\ &= 7 + 0.1 = 7.1 \text{ cm} \end{aligned}$$

Volume of hollow sphere = $\frac{4}{3}\pi (R^3 - r^3)$ cu. cm

$$\begin{aligned} &= \frac{4}{3}\times\frac{22}{7}((7.1)^3 - 7^3) \\ &= \frac{4\times 22}{21}(357.91 - 343) \\ &= 6.48 \text{ cm}^3 \end{aligned}$$

1 cm^3 brass weight = 17.3 g

6.48 cm^3 brass weight = 17.3 × 6.48

= 1080.90 gm

Total weight = 1080.90 gms

39. The given data is 24, 26, 33, 37, 29, 31

$n = 6$

$$\bar{x} = \frac{\Sigma xi}{n}$$

$$= \frac{24+26+33+37+29+31}{6}$$

$$= \frac{180}{6} = 30$$

$$\bar{x} = 30$$

$$\sigma = \sqrt{\frac{\Sigma xi^2}{n} - \left(\frac{\Sigma xi}{n}\right)^2}$$

$$\frac{\Sigma xi^{\text{üüü}}}{n} = \frac{24 \ \ +26 \ \ +33 \ \ +37 \ \ +29 \ \ +31}{6}$$

$$= \frac{5512}{6} = 918.66$$

$$\sigma = \sqrt{918.66 - 30^2} = \sqrt{917.66 - 900}$$

$$= \sqrt{18.66}$$

$$\sigma = 4.319$$

Coefficient of variation = $\frac{\sigma}{\bar{x}} \times 100\%$

$$\begin{aligned} &= \frac{4.319}{30}\times 100\% \\ &= 14.39\% \\ C.V &= 14.40\% \\ C.V &= 14.4\% \end{aligned}$$

40. When two dice are rolled the same space is given by

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

i) 8

Let A be sum of outcomes value is 8.

$$A = \{(2, 6), (3, 5), (4, 4), (5, 3), (6, 2)\}$$
$$n(A) = 5$$
$$P(A) = \frac{n(A)}{n(S)} = \frac{5}{36}$$

ii) 13

Let B be the sum of outcomes value is 13.

$$(B) = \{0\}$$
$$n(B) = 0$$
$$p(B) = \frac{n(B)}{n(S)} = 0$$

iii) Less than or equal to 12.

Let C be the sum of the two number less than or equal to 12.

$$C = \{(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6) \text{ ....} (6, 6)\}$$
$$n(C) = 36$$
$$\frac{n(C)}{n(S)} = \frac{36}{36} = 1$$

41. x, $x+1$ are two consecutive numbers.

Given:

$$x^2+(x+1)^2 = 365$$
$$x^2+x^2+2x+1 = 365$$
$$2x^2+2x+1-365 = 0$$
$$x^2+x-182 = 0$$

a = 1, b = 1, c = –182

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$
$$= \frac{-1 \pm \sqrt{1+728}}{2}$$
$$= \frac{-1 \pm 27}{2}$$
$$= \frac{-1+27}{2} \text{ or } \frac{-1-27}{2}$$
$$= \frac{26}{2} \text{ or } \frac{-28}{2}$$

= 13 or (–14) not neglet

$\therefore$ the numbers are (13, 14)

42. Radius of cylinder = 18 cm; Height = 32 cm

$$\text{Volume of cylinder} = \pi r^2 h$$
$$= \pi \times 18 \times 18 \times 32$$
$$\text{Height of cone} = 24 \text{ cm}$$
$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 \times 24$$

$$\text{Volume of cylinder} = \text{Volume of cone}$$

$$\pi \times 18 \times 18 \times 32 = \frac{1}{3}\pi r^2 \times 24$$

$$r^2 = \frac{\pi \times 18 \times 18 \times 32}{\frac{1}{3} \times \pi \times 24} = 18 \times 18 \times 4$$

$$r = 18 \times 2 = 36 \text{ cm}$$

Slant height

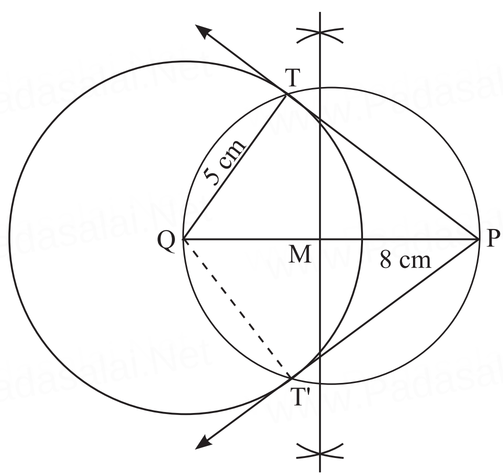
$$l^2 = h^2 + r^2 = 242 + 362 = 1872$$

$$l = 43.27 \text{ cm}$$

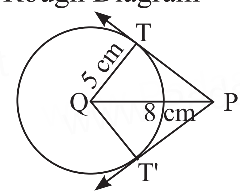
$\therefore$ radius = 36 cm ; slant height = 43.27 cm

PART IV

43.



Rough Diagram



Radius = 5 cm; Distance = 8 cm

Construction:

- ✦ With O as centre draw a circle with radius 5 cm.
- ✦ Draw a line QP which cuts QP at M.
- ✦ Draw a perpendicular bisector of OP which cuts OP at M.
- ✦ With M as centre and MQ as radius draw a circle which cuts previous circle at T and T'.
- ✦ Join PT and PT'. PT and PT' are the required tangents. Thus the length of the tangents are PT = PT'
- ✦ Verification:

$$OP^2 = OT^2 + TP^2$$

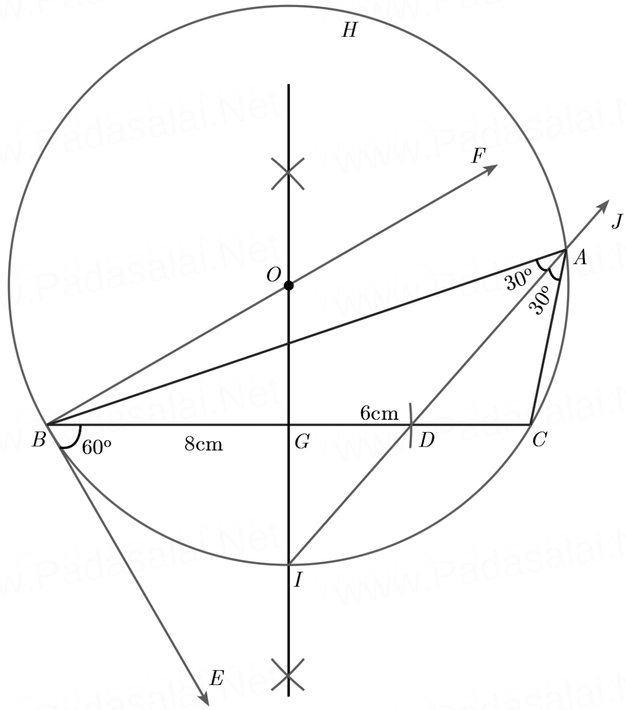
$$TP^2 = OP^2 - OT^2$$

$$TP^2 = 82 - 52 = 64 - 25$$

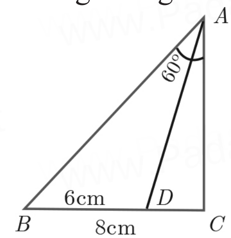
$$TP^2 = 39$$

$$TP = 6.2 \text{ cm (approximately)}$$

43. b)



Rough Diagram



Construction:

- ✦ Draw a line segment BC = 8 cm.
- ✦ At B draw BE, such that ∠CBE = 60°.
- ✦ At B draw BF, such that ∠EBF = 90°.
- ✦ Draw the perpendicular bisector to BC which intersects BF at O and BC at G.
- ✦ With O as centre and OB as radius draw a circle.
- ✦ From B, mark and arc at 6 cm on BC at D.
- ✦ The perpendicular bisector intersects the circle at I joint ID.
- ✦ ID produced meets the circle at A. Now join AB and AC. Then ΔABC is the required triangle.

44. a) First, we draw the graph of y = $x^2 + 3x - 4$.

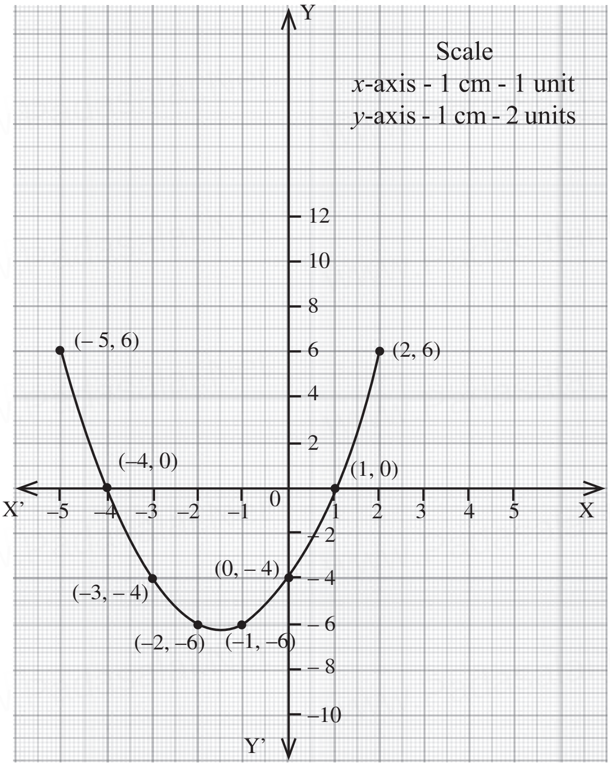
x	– 5	– 4	– 3	–2	– 1	0	1	2	3
x^2	25	16	9	4	1	0	1	4	9
$3x$	–15	–12	–9	–6	–3	0	3	6	9
– 4	– 4	–4	–4	–4	– 4	– 4	– 4	– 4	– 4
y	6	0	– 4	– 6	– 6	– 4	0	6	14

Points : (–5, 6), (–4, 0), (–3, – 4), (–2, – 6), (–1, – 6), (0, –4), (1, 0), (2, 6), (3, 14)

To Solve:

$$y = x^2 + 3x - 4$$
$$= x^2 + 3x + 4$$
$$y = -8$$

Then equation y = –8
No real roots.



44. b) Speed of the water = x km/hr
Speed of the boat = 18 km / hour
Speed of the boat in the direction of the water = $18 + x$
Speed of the boat in the opposite direction of the water = $18 - x$
Time taken by the boat to cross 24 km along the direction of the water

$$= \frac{Distance}{Speed} = \frac{24}{18+x}$$

Time taken by the boat to cross 24 km in the opposite direction of the water = $\frac{24}{18-x}$

By Given data

$$\frac{24}{18-x} - \frac{24}{18+x} = 1 \Rightarrow 24\left(\frac{1}{18-x} - \frac{1}{18+x}\right) = 1 \Rightarrow 24\left(\frac{18+x-18+x}{(18-x)(18+x)}\right) = 1$$

$$\Rightarrow 24\left(\frac{2x}{324-x^2}\right) = 1 \Rightarrow 48x = 324 - x^2 \Rightarrow x^2 + 48x - 324 = 0$$

$\Rightarrow (x + 54)(x - 6) = 0$

$\Rightarrow x + 54 = 0$ OR $x - 6 = 0$

$x = -54$ which is not possible (or) $x = 6$ $\therefore$ Speed of the water = 6 km/hour

PTA MODEL QUESTION PAPER - 1

Question Paper 2

CLASS: X **MATHEMATICS**

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. If {(a, 8), (6, b)} represents an identity function, then the value of a and b are respectively

1) (6, 8) 2) (8, 6) 3) (8, 8) 4) (6, 6)

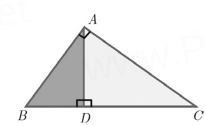
2. $7^{4k} \equiv$ ---------- (mod 100).

1) 4 2) 3 3) 2 4) 1

3. A system of three linear equations in three variables is inconsistent if their planes

1) intersect only at a point 2) intersect in a line
3) coincides with each other 4) do not intersect

4. In then adjacent figure $\angle BAC = 90°$ and $AD \perp BC$ then,



1) $BD.CD = BC^2$ 2) $AB.AC = BC^2$
3) $BD.CD = AD^2$ 4) $AB.AC = AD^2$

5. The straight line given by the equation x = 11

1) Passing through the origin 2) Passing through the point (0,11)
3) Parallel to X - axis 4) Parallel to Y - axis

6. If $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$ then the value of k is equal to

1) 3 2) 5 3) 7 4) 9

7. The total surface area of a cylinder whose radius is 1/3 of its height is

1) $\frac{8\pi h^2}{9}$ sq.units 2) $\frac{9\pi h^2}{8}$ sq. units 3) $\frac{56\pi h^2}{9}$ sq. units 4) $24\pi h^2$ sq. units

8. Which of the following is incorrect?

1) $P(A) + P(\overline{A}) = 1$ 2) $P(\varphi) = 0$ 3) $0 \le P(A) \le 1$ 4) $P(A) > 1$

9. The sequence –3, –3, –3 … is

1) an A.P. only 2) a G.P only 3) neither A.P nor G.P 4) both A.P and G.P

10. The L.C.M of $x^3 - a^3$ and $(x - a)^2$ is

1) $(x^3 - a^3)(x + a)$ 2) $(x^3 - a^3)(x - a)^2$ 3) $(x-a)^2(x^2+ax+a^2)$ 4) $(x+a)^2(x^2+ax+a^2)$

11. In n(A) = p, n(B) = q then the total number of relations that exists between A and B is

1) 2^p 2) 2^q 3) 2^{p+q} 4) 2^{pq}

12. If the HCF of 65 and 117 is expressible in the form of 65m – 117 than, the value of m is

1) 1 2) 3 3) 2 4) 4

13. **The sum of all deviations of the data form its mean is**
 1) always positive 2) always negative 3) zero 4) non-zero integer

14. **The angle of elevation and depression are usually measured by a device called**
 1) Theodolite 2) Kaleidoscope 3) Periscope 4) Telescope

PART – II

Answer any 10 questions. Question no. 28 is compulsory. 10×2=20

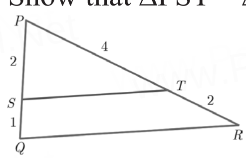
15. A man has 532 flower pots. He wants to arrange them in rows such that each row contains 21 flower pots. Find the number of completed rows and how many flower pots are left over

16. Solve: $x^4 - 13x^2 + 42 = 0$

17. If A is of order p × q and B is order q × r what is the order of AB and BA?

18. A relation 'f' is defined by $f(x) = x^2 - 2$ where, $x \in \{-2, -1, 0, 3\}$
 i) List the elements of f ii) Is f a function?

19. Show that ΔPST ~ Δ PQR



20. A tower stands vertically on the ground. From a point on the ground, which is 48m away from the foot of the tower, the angle of elevation of the top of the tower 30°. Find the height of the tower.

21. The volume of a solid right circular cone is 11088 cm^3. If its height is 24 cm then find the radius of the cone.

22. If $P(A) = \frac{2}{3}$, $P(B) = \frac{2}{5}$ and $P(A\cup B) = \frac{1}{3}$ then find $P(A\cap B)$.

23. Find A × B and A × A if A = {m, n}; B = ϕ

24. Find the middle terms of an A.P. 9, 15, 21, 27, ..., 183.

25. The product of Kumaran's age (in years) two years ago and his age four years from now is one more than twice his present age. What is his present age?

26. Find the equation of a line passing through the point (–4, 3) and having slope $-\frac{7}{5}$.

27. The standard deviations of 20 observations is $\sqrt{6}$. If each observation is multiplied by 3, find the standard deviation and variance of the resulting observations.

28. An organization plans to plant saplings in 25 streets in a town in such a way that one sapling for the first street, three for the second, nine for the third and so on. How many saplings are needed to complete the work?

PART – III

Answer any 10 questions. Question no. 42 is compulsory. 10×5=50

29. The function 't' which maps temperature in Celsius (C) into temperature in Fahrenheit (F) is defined by t(C) = F where (F = 9/5 C+32). Find (i) t(0) (ii) t(28) (iii) t(–10) (iv) the value

of C when t(C) = 212 (v) the temperature when the Celsius value is equal to the Farenheit value.

30. Rekha has 15 square colour papers of sizes 10cm, 11 cm, 12 cm, …. 24 cm. How much area can be decorated with these colour papers?

31. If A = $\begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$, B = $\begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$, C= $\begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$ verify that A(B+C) = AB + AC.

32. State and Prove Pythagoras Theorem.

33. As observed from the top of a 60m high light house from the sea level, the angles of depression of two ships are 28° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. (tan28° = 0.5317).

34. Find the number of coins, 1.5 cm in diameter and 2 mm thick, to be melted to form a right circular cylinder of height 10 cm and diameter 4.5 cm.

35. The marks scored by the students in a slip test are given below.

x	4	6	8	10	12
f	7	3	5	9	5

36. Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8, C = The set of even prime number. Verify that A × (B – C) = (A × B) – (A × C)

37. If $S_n = (x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \ldots$ n terms then prove that $(x - y)\ S_n = \dfrac{x^2\left(x^n - 1\right)}{x-1} - \dfrac{y^2\left(y^n - 1\right)}{y-1}$.

38. Solve: $\dfrac{1}{2x} + \dfrac{1}{4y} - \dfrac{1}{3z} = \dfrac{1}{4}$; $\dfrac{1}{x} = \dfrac{1}{3y}$; $\dfrac{1}{x} - \dfrac{1}{5y} + \dfrac{4}{z} = 2\dfrac{2}{15}$

39. A funnel consists of a frustum of a cone attached to a cylindrical portion 12 cm long attached at the bottom. If the total height be 20 cm, diameter of the cylindrical portion be 12 cm and the diameter of the top of the funnel be 24 cm. Find the outer surface area of the funnel.

40. In a class of 50 students, 28 opted for NCC, 28 opted for NSS and 10 opted both NCC and NSS. One of the students is selected at random, Find the probability that
i) The student opted for NCC but not NSS.
ii) The student opted for NSS but not NCC.
iii) The student opted for exactly one of them.

41. The base of a triangle is 4 cm longer than its altitude. If the area of the triangle is 48 sq.cm then find its base and altitude

42. The area of a triangle is 5 sq.units. Two of its vertices are (2, 1) and (3, –2). The third vertex is (x, y) where $y = x + 3$. Find the coordinates of the third vertex.

PART – IV

Answer the following. **2×8=16**

43. a) Draw the graph of $y = x^2 + x - 2$ and hence use it to solve the equation $x^2 + x - 2 = 0$.

(OR)

b) Varshika drew 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference of each circle as shown in the table and use it to find the circumference of a circle when its diameter is 6 cm.

Diameter (x) cm	1	2	3	4	5
Circumference (y) cm	3.1	6.2	9.3	12.4	15.5

44. a) Construct a triangle similar to a given triangle ABC with its sides equal to 6/5 of the corresponding sides of the triangle ABC.

(OR)

b) Construct a triangle PQR such that QR = 6.5 cm , $\angle$P = 60° and the altitude from P to QR is of length 4.5cm.

***

ANSWERS **PTA Model Question Paper - 1** **Question Paper 2**

PART - I

1. 2) (8, 6)
2. 4) 1
3. 4) do not intersect
4. 3) BD.CD = AD^2
5. 4) Parallel to Y - axis
6. 3) 7
7. 1) $\frac{8\pi h^2}{9}$ sq. units
8. 4) P(A)>1
9. 4) both A.P and G.P
10. 3) $(x - a)^2 (x^2 + ax + a^2)$
11. 4) 2^{pq}
12. 3) 2
13. 3) zero
14. 1) Theodolite

PART - II

15. Using Euclid's Division Algorithm

a = bq + r

532 = 21 q + r $\Rightarrow$ 532 = 21 × 25 + 7

The remainder is 7.

No. of completed rows = 25,

left over flower pots = 7 pots.

$$\begin{array}{r|l} & 25 \\ \hline 21 & 532 \\ & 42 \\ \hline & 112 \\ & 105 \\ \hline & 7 \end{array}$$

16. $x^4 - 13x^2 + 42 = 0$

Let $x^2 = y$

$y^2 - 13y + 42 = 0$

y = 6 (or) y = 7

$x^2 = 6$ (or) $x^2 = 7$

$\therefore x = \pm\sqrt{6}$ (or) $x = \pm\sqrt{7}$

17. Given: A is of order p×q, B is of order q×r

$\therefore$ Order of AB = p × r

Order of BA does not exists.

($\because$ No. of columns in B & No. of rows in A are not equal)

Steps of construction:

1. Draw a line segment QR = 6.5 cm.
2. At Q, draw QE such that $\angle RQE = 60°$.
3. At Q, draw QF such that $\angle EQF = 90°$.
4. Draw the perpendicular bisector XY to QR intersects QF at O & QR at G.
5. With O as centre and OQ as radius draw a circle.
6. XY intersects QR at G. On XY, from G, mark arc M such that GM = 4.5 cm.
7. Draw AB, through M which is parallel to QR.
8. AB meets the circle at P and S.
9. Join QP, RP. Then ΔPQR is the required triangle.

❖✸❖✸❖✸

PTA MODEL QUESTION PAPER - 2

Question Paper 3

CLASS: X **MATHEMATICS**

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. If f : A→B is a bijective function and if n(B) = 7, then n(A) is equal to

1) 1 2) 49 3) 14 4) 7

2. If there are 1024 relations from a set A ={1, 2, 3, 4, 5} to a set B, then the number of elements in B is

1) 2 2) 3 3) 4 4) 8

3. The next term of the sequence $\frac{3}{\text{üüü}}, \frac{1}{\;}, \frac{1}{\;}, \frac{1}{\;}$,….. is

1) $\frac{2}{3}$ 2) $\frac{1}{24}$ 3) $\frac{1}{27}$ 4) $\frac{1}{81}$

4. Which of the following should be added to make $x^4 + 64$ a perfect square?

1) $4x^2$ 2) $8x^2$ 3) $-8x^2$ 4) $16x^2$

5. The excluded value of the rational expression $\frac{x^3+8}{x^2-2x-8}$ is

1) 8 2) 2 3) 4 4) 1

6. Graph of a linear equation is a

1) straight line 2) circle 3) parabola 4) hyperbola

7. A Tangent is perpendicular to the radius at the

1) Centre 2) infinity 3) point of contact 4) chord

8. The area of triangle formed by the points(–5, 0), (0, –5)and (5, 0) is

1) 0 sq.units 2) 5 Sq .units 3) 25 sq.units 4) none of these

9. The point of intersection of $3x - y = 4$ and $x + y = 8$ is

1) (3, 5) 2) (2, 4) 3) (5, 3) 4) (4, 4)

10. If $5x = \sec\theta$ and $\frac{5}{x} = \tan\theta$ then, $x^2 - \frac{1}{x^2}$ is equal to

1) 1 2) 5 3) 25 4) $\frac{1}{25}$

11. $\frac{\sin(90-\theta)}{\tan\theta} + \frac{\cos(90-\theta)\cos\theta}{\cot\theta} =$

1) $\tan\theta$ 2) 1 3) –1 4) $\sin\theta$

12. The height and radius of the cone of which the frustum is a part are h_1 units and r_1 units respectively. Height of the frustum is h_2 units and radius of the smaller base is r_2 units if $h_2 : h_1 = 1:2$ then $r_2:r_1$ is

1) 1:2 2) 2:1 3) 1:3 4) 3:1

13. The range of the first 10 prime numbers is

1) 9 2) 20 3) 27 4) 5

14. The average of first 'n' natural numbers is

1) $\frac{n(n+1)}{2}$ 2) $\frac{n}{2}$ 3) $\frac{n+1}{2}$ 4) n

PART – II

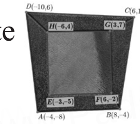
Answer any 10 questions. Question no. 28 is compulsory. 10×2 = 20

15. A relation R is given by the set $\{(x, y) / y = x + 3,\ x \in \{0, 1, 2, 3, 4, 5\}$. Determine its domain and range.
16. If $f(x) = x^2 - 1$, $g(x) = x - 2$, find a if $g \circ f(a) = 1$
17. If A and B are two mutually exclusive events of a random experiment and P (not A) = 0.45, $P(A \cup B) = 0.65$, then find P(B).
18. If a polynomial $P(x) = x^2 - 5x - 14$ is divided by another polynomial $q(x)$ we get $\frac{x-7}{x+2}$ find $q(x)$.
19. If $A = \begin{pmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{pmatrix}$ then find the transpose of –A.
20. If ΔABC is similar to DEF such that BC = 3 cm, EF = 4 cm and area of ΔABC = 54 cm^2. Find the area of ΔDEF.
21. Find the slope of a line joining the points (sinθ, –cosθ) and (–sinθ, cosθ)
22. The hill in the form of a right triangle has its foot at (19, 3). The inclination of the hill to the ground is 45°. Find the equation of the hill joining the foot and top.
23. Find x so that $x + 6$, $x + 12$ and $x + 15$ are consecutive terms of a Geometric progression.
24. If $1 + 2 + 3 + \ldots + n = 666$ then find n.
25. Find 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 a tower of height $10\sqrt{3}$ m.
26. The ratio of the radii of two right circular cones of same height is 1:3. Find the ratio of their curved surface area when the height of each cone is 3 times the radius of the smaller cone.
27. If two positive integers p and q are written as $p = a^2b^3$ and $q = a^3b$; a, b are prime numbers, then verify LCM (p, q) × GCD $(p, q) = pq$.
28. Find the number of spherical lead shots, each of diameter 6 cm that can be made from a solid cuboid of lead having dimensions 24 cm × 22 cm × 12 cm.

PART – IV

Answer the following. **10×5=50**

29. In the figure, the quadrilateral swimming pool shown is surrounded by concrete patio. Find the area of the patio.



30. State and Prove Basic Proportionality Theorem (BPT) or Thales Theorem.
31. If $f(x) = x - 4$, $g(x) = x^2$ and $h(x) = 3x - 5$ then Show that $(f \circ g) \circ h = f \circ (g \circ h)$.
32. Find the least positive value of x such that (i) $67 + x \equiv 1 \pmod 4$ (ii) $98 \equiv (x+4) \pmod 5$
33. The houses of a street are numbered from 1 to 49. Senthil's house is numbered such that the sum of numbers of the houses prior to Senthil's house is equal to the sum of numbers of the houses following Senthil's house. Find Senthil's house number?
34. A coin is tossed thrice. Find the probability of getting exactly two heads or atleast one tail or two consecutive heads.
35. The temperature of two cities A and B in a winter season are given below.

Temperature of city A (in degree Celsius)	18	20	22	24	26
Temperature of city B (in degree Celsius)	11	14	15	17	18

Find which city is more consistent in temperature changes?

36. $A = \{x \in W / x < 2\}$, $B = \{x \in N / 1 < x \leq 4\}$ and $C = \{3, 5\}$. Verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$.
37. Vani, her father and her grandfather have an average age of 53. One - half of her grand father's age plus one-third of her father's age plus one fourth of Vani's age is 65. Four years ago if Vani's grandfather was four times as old as Vani then how old are they all now?
38. If $A = \begin{bmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{bmatrix}$ $B = \begin{bmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{bmatrix}$ then show that $A^2 + B^2 = 1$.
39. A metallic sheet in the form of a sector of a circle of radius 21 cm has central angle of 216°. The sector is made into a cone by bringing the bounding radii together. Find the volume of the cone formed.
40. A shuttle cock used for playing badminton has the shape of a frustum of a cone is mounted on a hemisphere. The diameters of the frustum are 5 cm and 2 cm. The height of the entire shuttle cock is 7 cm. Find its external surface area.
41. A motor Boat whose speed is 18 km/hr in still water lakes 1 hour more to go to 24 km upstream than to return downstream to the same spot. Find the speed of the stream.
42. A 1.2 m tall girl Jasmine 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 baloon from the eyes of the girl at an instant is 60°. After some time the angle of elevation reduces to 30°. Find the distance travelled by the balloon during the interval.

PART – IV

Answer the following. **2×8 = 16**

43. a) Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$

(OR)

b) Draw the graph of $xy = 24$, x, y > 0. Using the graph find,
(i) y when x =3 and (ii) x when y = 6.

44. a) Take a point which is 11cm away from the centre of a circle of radius 4 cm and draw two tangents to the circle from the point.

(OR)

b) Draw a triangle ABC of base BC = 5.6 cm, $\angle A = 40°$ and the bisector of $\angle A$ meets BC at D such that CD = 4 cm.

***

ANSWERS **PTA Model Question Paper - 2** **Question Paper 3**

PART - I

1. 4) 7
2. 1) 2
3. 3) $\frac{1}{27}$
4. 4) $16x^2$
5. 3) 4
6. 1) straight line
7. 3) point of contact
8. 3) 25 sq.units
9. 1) (3, 5)
10. 4) $\frac{1}{25}$
11. 2) 1
12. 1) 1 : 2
13. 4) 5
14. 3) $\frac{n+1}{2}$

15. $x = \{0, 1, 2, 3, 4, 5\}$
$f(x) = y = x + 3$; $f(0) = 3$; $f(1) = 4$; $f(2) = 5$; $f(3) = 6$; $f(4) = 7$; $f(5) = 8$
$\therefore R = \{(0, 3), (1, 4), (2, 5), (3, 6), (4, 7), (5, 8)\}$
Domain of R = $\{0, 1, 2, 3, 4, 5\}$ Range of R = $\{3, 4, 5, 6, 7, 8\}$

16. $f(x) = x^2 - 1$, $g(x) = x - 2$

$$g \circ f(a) = 1$$
$$g[f(a)] = 1$$
$$g[a^2 - 1] = 1$$
$$a^2 - 1 - 2 = 1$$
$$a^2 - 3 = 1$$
$$a^2 = 4$$
$$\therefore a = \pm 2$$

17. Given A and B are mutually exclusive events.
P(not A) = 0.45 $\Rightarrow P(\overline{A}) = 0.45 \Rightarrow P(A) = 1 - P(\overline{A}) = 1 - 0.45 = 0.55$

$$P(A \cup B) = 0.65$$
$$P(A \cup B) = P(A) + P(B)$$
$$0.65 = 0.55 + P(B)$$
$$P(B) = 0.10$$

18. $P(x) = x^2 - 5x - 14$

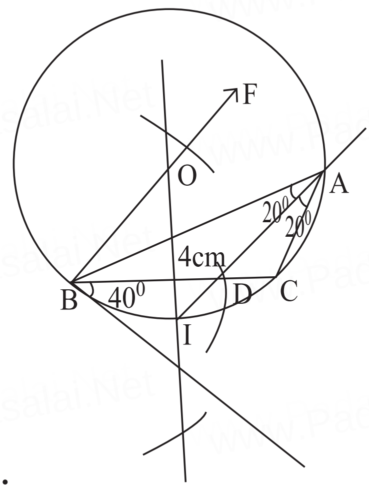
Given $\frac{P(x)}{q(x)} = \frac{x-7}{x+2}$

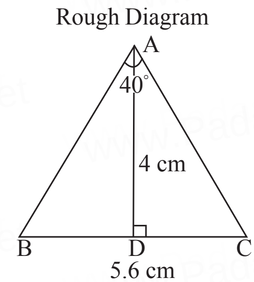
3. Draw a perpendicular bisector of OP, which cuts OP at M.
4. With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
5. Join AP and BP. They are the required tangents AP = BP = 10.3 cm.

Verification : In the right angle triangle ΔOAP ,

$$AP = \sqrt{OP^2 - OA^2}$$
$$= \sqrt{121-16} = \sqrt{105} = 10.3 \text{ cm}$$

b)





Steps of Construction:

1. Draw a line segment BC = 5.6 cm.
2. At B, draw BE such that $\angle CBE = 40°$.
3. At B, draw BF such that $\angle CBF = 90°$.
4. Draw the perpendicular bisector to BC meets BF at O & BC at G.
5. With O as centre and OB as radius draw a circle.
6. From B, mark an arc of 4 cm on BC at D.
7. The $\perp$r bisector meets the circle at I & Join ID.
8. ID produced meets the circle at A. Join AB & AC.
9. Then ΔABC is the required triangle.

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PTA MODEL QUESTION PAPER - 3

Question Paper 4

CLASS: X **MATHEMATICS**

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. **A ={a, b, p}, B ={2, 3}, C ={p, q, r, s}, then n[(A ∪ C) × B] is ------------.**
   1) 8 2) 12 3) 16 4) 20

2. **Given $f(x) = (-1)^x$ is a function from N to Z. Then the range of f is**
   1) {1} 2) N 3) {1, –1} 4) Z

3. **The value of $(1^3 + 2^3 + 3^3 + \ldots. + 15^3) - (1 + 2 + 3 + \ldots.. + 15)$ is**
   1) 14200 2) 14280 3) 14400 4) 14520

4. **If $2 + 4 + 6 + \ldots + 2k = 90$, then the value of k is**
   1) 8 2) 9 3) 10 4) 11

5. **A Straight line has equation 8y = 4x + 21, Which of the following is true?**
   1) The slope is 0.5 and the y intercept is 1.6
   2) The slope is 0.5 and the y intercept is 2.6
   3) The slope is 5 and the y intercept is 2.6
   4) The slop is 5 and y intercept is 1.6

6. **GCD of $6x^2y$, $9x^2yz$, $12x^2y^2z$ is**
   1) $36xy^2z^2$ 2) $36x^2y^2z$ 3) $36x^2y^2z^2$ (4) $3x^2y$

7. **In ΔABC, DE || BC, AB = 3.6 cm, AC = 2.4 cm and AD = 2.1cm then the length of AE is**
   1) 1.05 cm 2) 1.2 cm 3) 1.4 cm 4) 1.8 cm

8. **The slope of the line joining (1, 2, 3), (4, a) is $\frac{1}{8}$ The value of a is**
   1) 1 2) 2 3) 4 4) –5

9. **(2, 1) is the point of intersection of two lines.**
   1) $x + 3y - 3 = 0; x - y - 7 = 0$ 2) $3x + y = 3; x + y = 7$
   3) $x + y = 3; 3x + y = 7$ 4) $x - y - 3 = 0; 3x - y - 7 = 0$

10. **The value of $\tan\theta \operatorname{cosec}^2\theta - \tan\theta$ is equal to**
    1) $\cot\theta$ 2) $\cot^2\theta$ 3) $\sin\theta$ 4) $\sec\theta$

11. **The total surface area of a hemi-sphere is how much times the square of its radius.**
    1) 4π 2) 3π 3) 2π 4) π

12. **If the volume of sphere is 36π cm^3, then its radius is equal to**
    1) 3 cm 2) 2 cm 3) 5 cm 4) 10 cm

13. The range of the data 8, 8, 8, 8, 8, …., 8 is

1) 8 2) 3 3) 1 4) 0

14. If a letter is chosen at random from the English alphabets (a, b, …., z) then the probability that the letter chosen precedes x?

1) $\frac{1}{13}$ 2) $\frac{12}{13}$ 3) $\frac{3}{26}$ 4) $\frac{23}{26}$

PART – II

Answer any 10 questions. Question no. 28 is compulsory. **10×2=20**

15. Let f be a function and $f: \mathrm{N} \rightarrow \mathrm{N}$ be defined by $f(x) = 3x + 2, x \in \mathrm{N}$. Find the pre-image of 29, 53.
16. Is 7 × 5 × 3 × 2 + 3, a composite number? Justify your answer.
17. If 3 + k, 18 – k, 5k + 1are in A.P, then find k.
18. If $1^3 + 2^3 + 3^3 + \ldots\ldots k^3 = 16900$, then find $1 + 2 + 3 + \ldots\ldots + k$.
19. If $A = \begin{pmatrix} 7 & 8 & 6 \\ 1 & 3 & 9 \\ -4 & 3 & -1 \end{pmatrix}$, $B = \begin{pmatrix} 4 & 11 & -3 \\ -1 & 2 & 4 \\ 7 & 5 & 0 \end{pmatrix}$ then find 2A + B
20. If one root of the equation $3x^2 + kx + 81 = 0$ (having real roots) is the square of the other then find k.
21. If $x = \frac{a^2 + 3a - 4}{3a^2 - 3}$ and $y = \frac{a^2 + 2a - 8}{2a^2 - 2a - 4}$ find the value of x^2y^{-2}
22. In ΔABC, AD is the bisector of ∠A meeting side BC at D, if AB = 10 cm, AC = 14 cm and BC = 6 cm, find BD and DC.
23. What is the inclination of a line whose slope is 1?
24. A player sitting on the top of a tower of height 20m observes the angle of depression of a ball lying on the ground as 60°. Find the distance between the foot of the tower and the ball.($\sqrt{3} = 1.732$)
25. A cone of height 24cm is made up of modeling clay. A child reshapes it in the form of a cylinder of same radius as cone. Find the height of the cylinder.
26. If A is an event of a random experiment such that $P(A) : P(\overline{A}) = 17 : 15$ and n(S) = 640 then find (i) $P(\overline{A})$ (ii) n(A) .
27. The mean of a data is 25.6 and its coefficient of variation is 18.75. Find the standard deviation.
28. Show that the straight lines $3x - 5y + 7 = 0$ and $15x + 9y + 4 = 0$ are perpendicular.

PART – III

Answer any 10 questions. Question no. 42 is compulsory. **10×5=50**

29. Let A = {1, 2, 3, 4} and B = {2, 5, 8, 11, 14} be two sets. Let $f: A \rightarrow B$ be a function given by $f(x) = 3x - 1$. Represent this function. (i) by Arrow Diagram (ii) in a table form (iii) as a set of ordered pairs (iv) in a graphical form
30. The distance S an object travels under the influence of gravity in time t seconds is given by

$S(t) = \frac{1}{2}gt^2 + at + b$ where, (g is the acceleration due to gravity), a, b are constants. Check if the function $S(t)$ is one – one.

31. $A = \{x \in W / 0 < x < 5\}$, $B = \{x \in W / 0 \le x \le 2\}$ and $C = \{x \in W / x < 2\}$ Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
32. Find the sum of the Geometric Series $3 + 6 + 12 + ... + 1536$
33. Find the sum of all 3 digit natural numbers which are divisible by 9.
34. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b.
35. Solve the following quadratic equation by completing the square method $\frac{5x+7}{x-1} = 3x + 2$.
36. $A = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix}$ verify that $(AB)^T = B^T A^T$
37. The hypotenuse of a right triangle is 6 m more than twice of the shortest side the third side is 2 m less than the hypotenuse, find the sides of the triangle.
38. Find the equation of a straight line joining the point of intersection of $3x + y + 2 = 0$ and $x - 2y - 4 = 0$ to the point of intersection of $7x - 3y = -12$ and $2y = x + 3$.
39. If $\sqrt{3}\sin\theta - \cos\theta = 0$, then show that $\tan 3\theta = \frac{\text{üüü}\ \theta - {}^{3}\theta}{1 - 3\tan^2\theta}$
40. The radius of a conical tent is 7 m and the height is 24 m. Calculate the length of the canvas used to make the tent if the width of the rectangular canvas is 4 m?
41. A card is drawn from a pack of 52 cards. Find the probability of getting a King or a Heart or a Red card.
42. Find the coefficient of variation of 18, 20, 15, 12, 25.

PART – IV

Answer the following. **2×8=16**

43. a) Draw the graph of $y = 2x^2 - 3x - 5$ and hence solve $2x^2 - 4x - 6 = 0$.

(OR)

b) A bus is travelling at a uniform speed of 50 km/hr. Draw the distance-time graph and hence find (i) the constant of variation (ii) how far will it travel in $1\frac{1}{2}$ hr (iii) the time required to cover a distance of 300 km from the graph.

44. a) Construct a ΔPQR in which PQ = 8 cm, $\angle R = 60°$ and the median RG from R to PQ is 5.8cm. Find the length of the altitude from R to PQ.

(OR)

b) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{4}$ of the corresponding sides of the triangle PQR. $\left(\textit{scale factor } \frac{7}{4} > 1\right)$

***

$$\Rightarrow \begin{pmatrix} 14+4 & 16+11 & 12-3 \\ \text{üüüi} & + & + \\ -8+7 & 6+5 & -2+0 \end{pmatrix} = \begin{pmatrix} 18 & 27 & 9 \\ 1 & 8 & 22 \\ -1 & 11 & -2 \end{pmatrix}$$

20. Let α, β be the roots of $3x^2 + kx + 81 = 0$

$\alpha+\beta = -\dfrac{b}{a} = -\dfrac{k}{3}$ ------ (1) $\qquad \alpha\beta = \dfrac{c}{a} = 27$ ------ (2)

Given $\alpha = \beta^2 \Rightarrow$ From (2) $\Rightarrow \beta^3 = 27 \Rightarrow \beta = 3 \Rightarrow \therefore \alpha=9$

(1) $\Rightarrow 9 + 3 = -\dfrac{k}{3} \Rightarrow 12 = -\dfrac{k}{3} \Rightarrow k= -36$

21. $x = \dfrac{a^2+3a-4}{3a^2-3} = \dfrac{(a+4)(a-1)}{\text{üüüi}+ \quad a-} = \dfrac{(a+4)}{3(a+1)} \Rightarrow x^2 = \dfrac{(a+4)^2}{9(a+1)^2}$

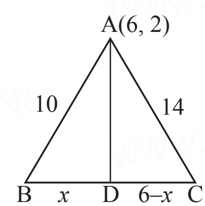
$y = \dfrac{a^2+2a-8}{2a^2-2a-4} = \dfrac{(a+4)(a-2)}{2(a+1)(a-2)} = \dfrac{(a+4)}{2(a+1)} \Rightarrow y^2 = \dfrac{(a+4)^2}{4(a+1)^2} \Rightarrow y^{-2} = \dfrac{4(a+1)^2}{(a+4)^2}$

$x^2 y^{-2} = \dfrac{(a+4)^2}{9(a+1)^2} \cdot \dfrac{4(a+1)^2}{(a+4)^2} = \dfrac{4}{9}$

22. AD is the bisector of ∠BAC

AB = 10 cm, AC = 14 cm, BC = 6 cm

By Angle Bisector Theorem



$\dfrac{BD}{DC} = \dfrac{AB}{AC} \Rightarrow \dfrac{x}{6-x} = \dfrac{10}{14} \Rightarrow \dfrac{x}{6-x} = \dfrac{5}{7}$

$\Rightarrow 7x = 30 - 5x \Rightarrow 12x = 30 \Rightarrow x = \dfrac{30}{12} \Rightarrow x = 2.5$ cm

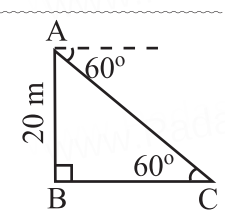
$\therefore$ BD = 2.5 cm $\qquad$ DC = 3.5 cm

23. Slope, m = 1

Slope, m = tanθ ⇒ tanθ = 1 ⇒ tanθ = tan 45° ⇒ θ = 45°

∴ Inclination of a line = 45°

24. Height of the tower = 20 m



In ΔABC , $\tan\theta = \dfrac{AB}{BC} \Rightarrow \tan 60° = \dfrac{20}{BC} \Rightarrow \sqrt{3} = \dfrac{20}{BC}$

$\Rightarrow BC = \dfrac{20}{\sqrt{3}} \Rightarrow BC = \dfrac{20\sqrt{3}}{3} = 11.55$ cm

25. Height of the cone = 24 cm, Radius are same

$\dfrac{1}{3}\pi r^2 h_1 = \pi r^2 h_2 \Rightarrow \dfrac{1}{3} \times 24 = h_2 \Rightarrow h_2 = 8$ cm

26. $\dfrac{P(A)}{P(\overline{A})} = \dfrac{17}{15}$

$\dfrac{1-P(\overline{A})}{P(\overline{A})} = \dfrac{17}{15} \Rightarrow 15\,[1 - P((\overline{A})] = 17\,P(\overline{A}) \Rightarrow 15 - 15\,P(\overline{A}) = 17\,P(\overline{A})$

$\Rightarrow 15 = 15\,P(\overline{A}) + 17\,P(\overline{A}) \Rightarrow 32\,P(\overline{A}) = 15 \Rightarrow P(\overline{A}) = \dfrac{15}{32}$

$\Rightarrow P(A) = 1 - P(\overline{A}) = 1 - \dfrac{15}{32} = \dfrac{32-15}{32} = \dfrac{17}{32}$

We have $P(A) = \dfrac{n(A)}{n(S)}$; $\dfrac{17}{32} = \dfrac{n(A)}{640} \Rightarrow n(A) = \dfrac{17\times 640}{32}$ $\therefore n(A) = 340$

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27. Given: $\overline{x} = 25.6$, C.V = 18.75

Coefficient of variation $= \dfrac{\sigma}{\overline{x}} \times 100 \Rightarrow 18.75 = \dfrac{\sigma}{25.6} \times 100 \Rightarrow \sigma = \dfrac{18.75\times 25.6}{100} = 4.8$

---

28. $3x - 5y + 7 = 0$ $\qquad$ $15x + 9y + 4 = 0$

$m_1 = -\left[\dfrac{a}{b}\right] = -\left[\dfrac{3}{-5}\right] = \dfrac{3}{5}$ $\qquad$ $m_2 = -\left[\dfrac{a}{b}\right] = -\left[\dfrac{15}{9}\right] = -\dfrac{5}{3}$

$m_1 \times m_2 = \dfrac{3}{5} \times \left(-\dfrac{5}{3}\right) \Rightarrow m_1 \times m_2 = -1$

$\therefore$ $3x - 5y + 7 = 0$ and $15x + 9y + 4 = 0$ are perpendicular to each other.

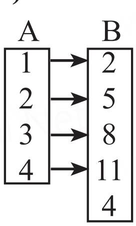
PART – III

29. $A = \{1, 2, 3, 4\}$, $B = \{2, 5, 8, 11, 14\}$ $\quad f(x) = 3x - 1$

$f(1) = 3(1) - 1 = 3 - 1 = 2$; $f(2) = 3(2) - 1 = 6 - 1 = 5$; $f(3) = 3(3) - 1 = 9 - 1 = 8$;

$f(4) = 3(4) - 1 = 12 - 1 = 11$; $R = \{(1, 2), (2, 5), (3, 8), (4, 11)\}$

i) Arrow Diagram:



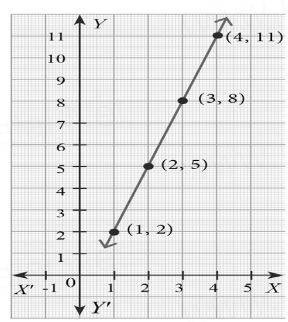
ii) Table:

x	1	2	3	4
y	2	5	8	11

iii) Set of Ordered pairs:

$\{(1, 2), (2, 5), (3, 8), (4, 11)\}$

iv) Graphical Form:



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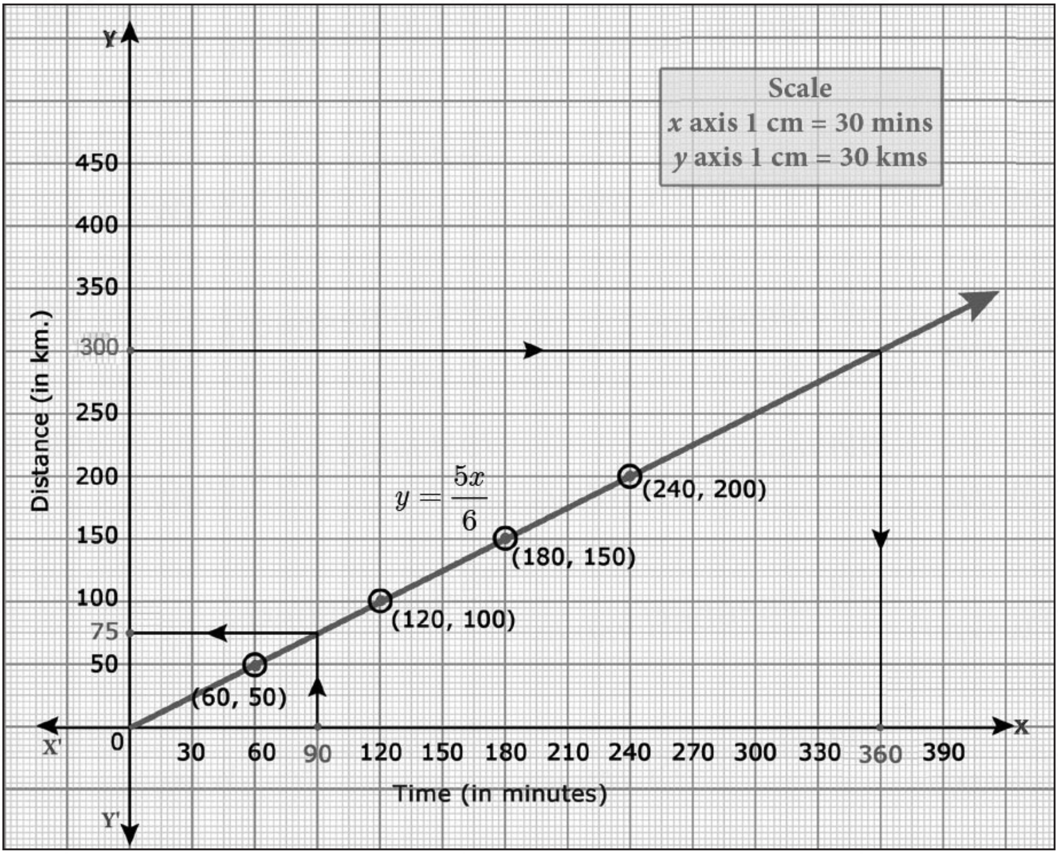
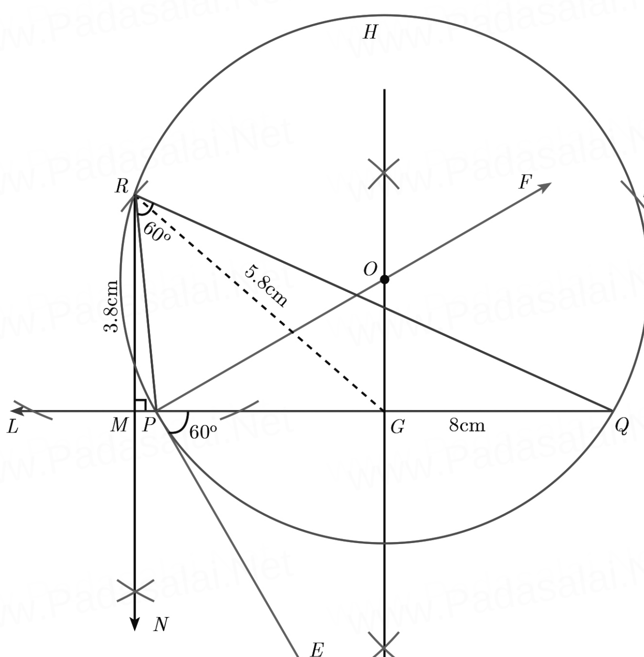
30. $s(t) = \dfrac{1}{2}gt^2 + at + b$

Let t be 1, 2, 3, …… seconds

$s(t_1) = s(t_2) \Rightarrow \dfrac{1}{2}gt_1^{\,2} + at_1 + b = \dfrac{1}{2}gt_2^{\,2} + at_2 + b$


Scale
x axis 1 cm = 30 mins
y axis 1 cm = 30 kms
Distance (in km.)
Time (in minutes)
$y = \frac{5x}{6}$
(60, 50)
(120, 100)
(180, 150)
(240, 200)
0 30 60 90 120 150 180 210 240 270 300 330 360 390
50 75 100 150 200 250 300 350 400 450

44. a)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P
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G
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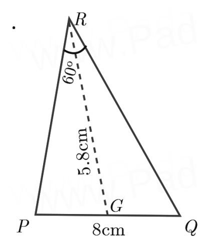

R
60°
5.8cm
P
G
8cm
Q

PTA MODEL QUESTION PAPER - 4

Question Paper 5

CLASS: X MATHEMATICS

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. The range of R={(x, x^2) | x is a prime number less than 13} is

1) {4, 9, 25, 49, 121} 2) {1, 4, 9, 25, 49, 121}

3) { 2, 3, 5, 7} 4) {2, 3, 5, 7, 11}

2. Let A = {1, 2, 3, 4}, B = {4, 8, 9, 10}. A function f : A→B given by f ={(1, 4), (2, 8), (3, 9), (4, 10)} is a

1) Many–one function 2) Identity function

3) One to One function 4) Into function

3. If 6 times of 6th term of an A.P., is equal to 7 times the 7th term, then the 13th term of the A.P. is

1) 0 2) 6 3) 7 4) 13

4. The sum of the exponents of prime factors in the prime factorization of 1729 is

1) 4 2) 3 3) 2 4) 1

5. If a and b are two positive integers where a>0 and b is a factor of a, then HCF of a and b is

1) b 2) a 3) 3ab 4) $\frac{a}{b}$

6. If (x – 6) is the HCF of $x^2 - 2x - 24$ and $x^2 - kx$ - 6 then the value of k is

1) 8 2) 6 3) 5 4) 3

7. If a polynomial is a perfect square then its factors will be repeated ______ number of times.

1) Odd 2) Zero 3) Even 4) None of the above

8. If ΔABC-is an isosceles triangle with ∠C = 90°and AC = 5cm, then AB is

1) $5\sqrt{2}$ cm 2) 10 cm 3) 2.5 cm 4) 5 cm

9. When proving that a quadrilateral is a trapezium ,it is necessary to show

1) Two parallel and two non-parallel sides 2) Two sides are parallel.

3) Opposite sides are parallel 4) All sides are of equal length

10. The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is

1) $7x - 3y + 4 = 0$ 2) $3x - 7y + 4 = 0$ 3) $7x - 3y = 0$ 4) $3x + 7y = 0$

11. If sinθ = cosθ and 2tan^2 θ + sin^{2}θ – 1 is equal to

1) $\frac{3}{2}$ 2) $-\frac{3}{2}$ 3) $\frac{2}{3}$ 4) $-\frac{2}{3}$

12. In a hollow cylinder, the sum of the external and internal radii is 14 cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is

1) 56π cm^3 2) 3600π cm^3 3) 5600π cm^3 4) 11200π cm^3

13. Which of the following is incorrect?

1) $P(A) + P(\overline{A}) = 1$ 2) $P(\varphi) = 0$ 3) $0 \le P(A) \le 1$ 4) $P(A) > 1$

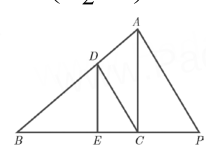
14. Probability of getting 3 heads or 3 tails in tossing a coin 3 times is

1) $\frac{1}{8}$ 2) $\frac{1}{4}$ 3) $\frac{3}{8}$ 4) $\frac{1}{2}$

PART – II

Answer any 10 questions. Question no. 28 is compulsory. **$10 \times 2 = 20$**

15. Find k if $f \circ f(k) = 5$ where $f(k) = 2k - 1$.
16. Let A = {1, 2, 3, ... 100} and R be the relation defined as "is cube of " on A. Find the domain and the range of R.
17. In a theatre, there are 20 seats in the front row and 30 rows were allotted. Each successive row contains two additional seats than its front row. How many seats are there in the last row?
18. In a G.P $\frac{1}{4}, -\frac{1}{2}, 1, -2, ...$ Find t_{10}.
19. Which rational expression should be subtracted from $\frac{x^2+6x+8}{x^3+8}$ to get $\frac{3}{x^2-2x+4}$
20. Determine the quadratic equations , whose sum and products of roots are $\left(-\frac{3}{2}, -1\right)$
21. State Pythagoras Theorem.
22. In a figure DE || AC and DC || AP Prove that $\frac{BE}{EC} = \frac{BC}{CP}$.



23. Show that the points P(–1.5, 3), Q(6, –2) and R(–3, 4) are collinear.
24. Prove that $\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\operatorname{cosec} A - 1}{\operatorname{cosec} A + 1}$
25. The volumes of two cones of same base radius are 3600 cm^3 and 5040 cm^3. Find the ratio of heights.
26. The range of a set of data is 13.67 and the largest value is 70.08. Find the smallest value.
27. Write the sample space for selecting two balls from a bag containing 6 balls numbered 1 to 6 using tree diagram (with replacement).
28. Find the sum and product of the roots of equation $8x^2 - 25 = 0$.

PART – III

Answer any 10 questions. Question no. 42 is compulsory. **$10 \times 5 = 50$**

29. The data in the adjacent table depicts the length of a woman's forehand and her corresponding height. Based on this data, a student finds a relationship between the height (y) and the forehand length (x) as y = ax + b, where a, b are constants

Length x of forehand (in cm)	Height 'y' (in inches)
35	56
45	65
50	69.5
55	74

i) Check if this relation is a function ii) Find a and b.
iii) Find the height of a woman whose forehand length is 40 cm.
iv) Find the length of forehand of a woman if her height is 53.3 inches.

30. A function f : [–5, 9] → R is defined as follows.

$$f(x) = \begin{cases} 6x+1 & -5 \le x < 2 \\ 5x^2-1 & 2 \le x < 6 \\ 3x-4 & 6 \le x \le 9 \end{cases}$$. Find (i) $f(7) - f(1)$ and (ii) $\dfrac{\text{üýfü}- \quad - f}{f(4)+f(-2)}$

31. Find the sum to n terms of the series 5 + 55 + 555 + ...

32. A girl is twice as old as her sister. Five years hence, the product of their ages (in years) will be 375. Find their present ages.

33. Find the non-zero values of x satisfying the matrix equation

$$x\begin{pmatrix} 2x & 2 \\ 3 & x \end{pmatrix} + 2\begin{pmatrix} 8 & 5x \\ 4 & 4x \end{pmatrix} = 2\begin{pmatrix} x^2+8 & 24 \\ 10 & 6x \end{pmatrix}$$

34. Find the values of a and b if the following polynomials are perfect squares
$4x^4 - 12x^3 + 37x^2 + bx + a$

35. State and Prove Alternate Segment Theorem.

36. Find the Equation of a straight line through the point of intersection of the lines $8x$+3y = 18, $4x$+5y = 9 and bisecting the line segment joining the points (5, –4) and (–7, 6).

37. A building and a statue are in opposite side of a street from each other 35m apart. From a point on the roof of building the angle of elevation of the top of statue is 24° and the angle of depression of base of the statue of 34°. Find the height of the statue.
(tan24° = 0.4452, tan 34° = 0.6745)

38. A cylindrical bucket, 32 cm high and with radius of base 18 cm, is filled with sand completely. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.

39. The consumption of number of guava orange on a particular week by a family are given below.

Number of Guavas	3	5	6	4	3	5	4
Number of Oranges	1	3	7	9	2	6	2

Which fruit is consistently consumed by the family?

40. In a class of 50 students, 28 opted for NCC, 30 opted for NSS and 1 opted both NCC and NSS. 8 One of the students is selected at random, Find the probability that

i) The student opted for NCC but not NSS.
ii) The student opted for NSS but not NCC.
iii) The student opted for exactly one of them.

41. By using slopes, show that the points (1, –4), (2, –3) and (4, –7) form a right angled triangle.

42. A man saved ₹ 16,500 in ten years. In each year after the first he saved 100 more than he did in the preceding year. How much did he save the first year?

PART – IV

Answer the following. **2×8=16**

43. a) Draw the graph of $y = 2x^2$ and hence solve $2x^2 - x - 6 = 0$.

(OR)

b) Graph the following linear function $y = \frac{1}{2}x$. Identify the constant of variation and verify it with the graph. Also (i) find y when $x = 9$ (ii) find x when $y = 7.5$.

44. a) Draw a ΔPQR such that PQ = 6.8 cm, vertical angle is 50° and the bisector of the vertical angle meets the base at D, where PD = 5.2 cm.

(OR)

b) Draw a ΔPQR in which QR = 5cm, $\angle P = 40°$ and the median PG from P to QR is 4.4 cm. Find the length of the altitude from P to QR.

***

ANSWERS

PTA Model Question Paper - 4

Question Paper 5

PART - I

1. 1) {4, 9, 25, 49, 121}
2. 3) One to One function
3. 1) 0
4. 2) 3
5. 1) b
6. 3) 5
7. 3) even
8. 1) $5\sqrt{2}$ cm
9. 1) Two parallel and two non-parallel sides
10. 4) $3x + 7y = 0$
11. 1) $\frac{3}{2}$
12. 4) $11200\pi\ cm^3$
13. 4) P(A) > 1
14. 2) $\frac{1}{4}$

PART - II

15. $f \circ f(k) = f(f(k)) = 2(2k-1) - 1 = 4k - 2 - 1 = 4k - 3$
Thus , $f \circ f(k) = 4k - 3$. But, it is given that $f \circ f(k) = 5$.
Therefore $4k - 3 = 5 \Rightarrow 4k = 8 \Rightarrow k = 2$

16. Range= {1, 2, 3, 4}   Domain = {1, 8, 27, 64}

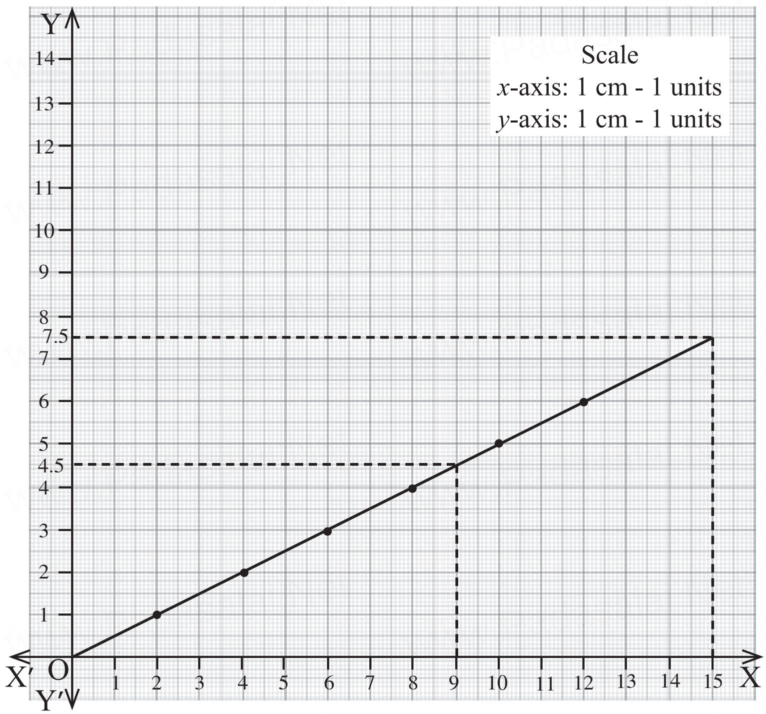
17. First Term, $a = 20$; Common Difference, $d = 2$
$\therefore$ Number of seats in the last row $= t_{30} = a + 29d = 20 + 29(2) = 20 + 58 = 78$

b) $y = \frac{1}{2}x$

x	2	4	6	8	10	12
y	1	2	3	4	5	6

From the table we see that as x increases, y decreases. So it is inverse variation.

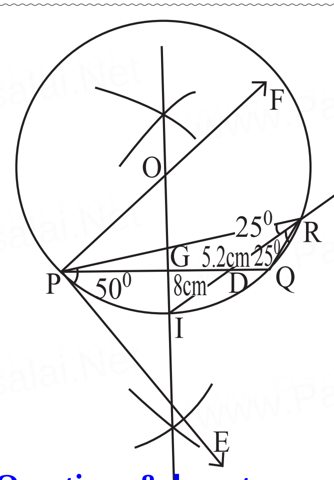
$k = \frac{1}{2}$ Points to be plotted: {(2, 1), (4, 2), (6, 3), (8, 4), (10, 5), (12, 6)}

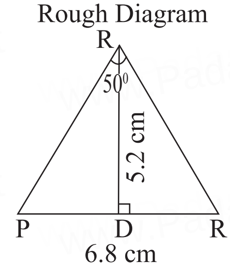


(i) When $x = 9$ we've y = 4.5

(ii) When y = 7.5 we've $x = 15$

44. a)





PTA MODEL QUESTION PAPER - 5

Question Paper **6**

CLASS: X **MATHEMATICS**

Time allowed: 3 Hours | Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. **$f(x) = (x+1)^3 - (x-1)^3$ represents a function which is**
   1) Quadratic 2) cubic 3) linear 4) reciprocal

2. **Using Euclids' division lemma, if the cube of any positive integer is divided by 9 then the possible remainders are**
   1) 1, 3, 5 2) 1, 4, 8 3) 0, 1, 3 4) 0, 1, 8

3. **An A.P. consists of 31 terms. if its 16th term is m, then the sum of all the terms of this A.P. is**
   1) 16 m 2) 62 m 3) $\frac{31}{2}$ m 4) 31 m

4. **$\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is**
   1) $\frac{9y^3}{(21y-21)}$ 2) $\frac{9y}{7}$ 3) $\frac{21y^2-42y+21}{3y^3}$ 4) $\frac{7(y^2-2y+1)}{y^2}$

5. **The solution of $x^2 - 25 = 0$ is**
   1) No real roots 2) Real and equal roots
   3) Real and unequal roots 4) Imaginary roots

6. **For the given matrix A = $\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$ the order of the matrix $(AT)^T$ is**
   1) 2×3 2) 3×2 3) 3×4 4) 4×3

7. **The perimeters of two similar triangles ΔABCand ΔPQR are 36 cm and 24 cm respectively. If PQ = 10 cm, then length of AB is**
   1) $6\frac{2}{3}$ cm 2) $66\frac{2}{3}$ cm 3) $\frac{10\sqrt{6}}{3}$ cm 4) 15 cm

8. **If (5, 7), (3, p) and (6, 6) are collinear, then the value of, p is**
   1) 9 2) 12 3) 3 4) 6

9. **If the points A(6, 1), B(8, 2), C(9, 4) and D(p, 3) are the vertices of a parallelogram, taken in order then the value of p is**
   1) –7 2) 7 3) 6 4) – 6

10. **a$\cot\theta$ + b$\text{cosec}\theta$ = p and b$\cot\theta$ + a$\text{cosec}\theta$ = q then , $p^2 - q^2$ is equal to**
    1) $a^2 + b^2$ 2) $a^2 - b^2$ 3) $b^2 - a^2$ 4) $b - a$

PART – III

Answer any 10 questions. Question no. 42 is compulsory. **10×5=50**

29. Let A = $\{x \in W / x < 2\}$, B = $\{x \in N / 1 < x \leq 4\}$ and C = $\{3, 5\}$.
Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

30. If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$. Prove that $f \circ (g \circ h) = (f \circ g) \circ h$.

31. A man repays a loan of ₹ 65,000 by paying ₹ 400 in the first month and then increasing the payment by ₹ 300 every month. How long will it take for him to clear the loan?

32. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.

33. Solve the following system of linear equations in three variables
$x + y + z = 5$, $2x - y + z = 9$, $x - 2y + 3z = 16$.

34. Find the square root of $289x^4 - 612x^3 + 970x^2 - 684x + 361$.

35. If $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ then, Prove that $A^2 - 4A + 5I_2 = 0$

36. State and Prove Angle Bisector Theorem.

37. Find the value of k, if the area of quadrilateral is 28 sq.units, whose vertices are (–4, –2), (–3, k), (3, –2) and (2, 3).

38. Two ships are sailing in the sea on either sides of a light house. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is 200m high, find the distance between the two ships. ($\sqrt{3} = 1.732$)

39. A right circular cylindrical container of base radius 6cm and height 15 cm is full of ice cream. The ice creams to be filled in cones of height 9cm and base radius 3 cm, having a hemispherical cap. Find the number of cones needed to empty the container.

40. A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4m to form an embankment. Find the height of the embankment.

41. The time taken by 50 students to complete a 100 meter race are given below. Find its standard deviation.

Time taken (sec)	8.5 – 9.5	9.5 – 10.5	10.5 – 11.5	11.5 – 12.5	12.5 – 13.5
Number of students	6	8	17	10	9

42. A card is drawn from a pack of 52 cards. Find the probability of getting a Queen or a diamond or a black card.

PART – IV

Answer the following. **2×8=16**

43. a) A company initially started with 40 workers to complete the work by 150 days. Later, it decided to fasten up the work increasing the number of workers as shown below.

Number of workers (x)	40	50	60	75
Number of days (y)	150	120	100	80

(i) Graph the above data and identify the type of variation.

19. First term, a = 21; Common Difference, d = –3; Last term, l = – 81

$$\text{Number of terms,}\quad n = \left[\frac{l-a}{d}\right]+1 = \left[\frac{-81-21}{-3}\right]+1 = \left[\frac{-102}{-3}\right]+1$$

$$= 34 + 1 = 35$$

$\therefore$ – 81 is the 35^{th} term

$t_n = a + (n-1)(d) \Rightarrow 0 = 21 + (n-1)(-3) \Rightarrow 0 = 21 - 3n + 3 \Rightarrow 3n = 24 \Rightarrow n = \frac{24}{3}$

$\Rightarrow n = 8$

$\therefore$ 0 is the 8^{th} term of the given Arithmetic Progression.

20. $x = \{0, 1, 2, 3, 4, 5\}$

$f(x) = y = x + 3 \Rightarrow f(0) = 3;\ f(1) = 4;\ f(2) = 5;\ f(3) = 6;\ f(4) = 7;\ f(5) = 8$

$\therefore R = \{(0, 3), (1, 4), (2, 5), (3, 6), (4, 7), (5, 8)\}$

Domain of R = {0, 1, 2, 3, 4, 5}; Range of R = {3, 4, 5, 6, 7, 8}

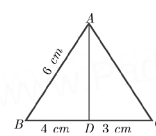
21.
$$3A - 9B = 3\begin{pmatrix}0 & 4 & 9\\ 8 & 3 & 7\end{pmatrix} - 9\begin{pmatrix}7 & 3 & 8\\ 1 & 4 & 9\end{pmatrix}$$

$$= \begin{pmatrix}0 & 12 & 27\\ 24 & 9 & 21\end{pmatrix} - \begin{pmatrix}63 & 27 & 72\\ 9 & 36 & 81\end{pmatrix} = \begin{pmatrix}0 & 12 & 27\\ 24 & 9 & 21\end{pmatrix} + \begin{pmatrix}-63 & -27 & -72\\ -9 & -36 & -81\end{pmatrix}$$

$$= \begin{pmatrix}0-63 & 12-27 & 27-72\\ 24-9 & 9-36 & 21-81\end{pmatrix} = \begin{pmatrix}-63 & -15 & -45\\ 15 & -27 & -60\end{pmatrix}$$

22. In ΔABC, AD is the bisector of d$\angle A$.

Therefore by Angle Bisector Theorem



$$\frac{BD}{DC} = \frac{AB}{AC}.$$

$\frac{4}{3} = \frac{6}{AC}$ gives 4AC = 18.Hence AC = $\frac{9}{2}$ = 4.5 cm

23. Slope of the straight line $x - 2y + 3 = 0$ $\quad m_1 = -\left(\frac{a}{b}\right) = -\left(\frac{1}{-2}\right) = \frac{1}{2}$

Slope of the straight line $6x + 3y + 8 = 0$ $\quad m_2 = -\left(\frac{a}{b}\right) = -\left(\frac{6}{3}\right) = -2$

$$m_1 \times m_2 = \frac{1}{2} \times (-2) = -1$$

Hence, the two straight lines are perpendicular.

24.
$$\text{LHS} = \sqrt{\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta}} = \sqrt{\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} \times \frac{\sec\theta - \tan\theta}{\sec\theta - \tan\theta}} = \sqrt{\frac{(\sec\theta - \tan\theta)^2}{\sec^2\theta - \tan^2\theta}}$$

$$\Rightarrow \sqrt{(\sec\theta - \tan\theta)^2} = \sec\theta - \tan\theta = \frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta} = \frac{1 - \sin\theta}{\cos\theta} = \text{RHS}$$

25. $10^3 + 11^3 + 12^3 + ... + 20^3 = 1^3 + 2^3 + 3^3 + ... + 20^3 - 1^3 + 2^3 + 3^3 + ... + 9^3$

$$= \left[\frac{n(n+1)}{2}\right]^2 - \left[\frac{n(n+1)}{2}\right]^2 = \left[\frac{\text{üüü}\times}{2}\right]^2 - \left[\frac{\times}{2}\right]^2$$

$$= [210]^2 - (45)^2$$

$$= 44100 - 2025 = 42075$$

26. Here Largest value, L = 28; Smallest Value, S = 18

Range R = L – S ⇒ R = 28 – 18 = 10 Years.

27. Sample "S" = {HHH, TTT, HHT, HTH, THH, HTT, THT, TTH}

n(S) = 8

i) Let A be the event of getting atleast one tail

A = {HHT, HTH, THH, HTT, THT, TTH, TTT}

n(A) = 7

$\therefore$ P(A) = $\dfrac{n(A)}{n(S)} = \dfrac{7}{8}$

ii) Let B be the event of getting atmost one head

A = {HTT, THT, TTH, TTT}

n(A) = 4

$\therefore$ P(A) = $\dfrac{n(A)}{n(S)} = - = \dfrac{1}{2}$

28. Given $px^2 + (\sqrt{3} - \sqrt{2})x - 1 = 0$

Sum of the roots $= -\dfrac{b}{a} \Rightarrow \alpha + \dfrac{1}{\sqrt{3}} = \dfrac{-\left(\sqrt{3}-\sqrt{2}\right)}{p}$ ------(1)

Product of the roots $= \dfrac{c}{a} \Rightarrow \alpha \,.\, \dfrac{1}{\sqrt{3}} = -\dfrac{1}{p} \Rightarrow \alpha = -\dfrac{\sqrt{3}}{p}$

Sub $\alpha = -\dfrac{\sqrt{3}}{p}$ in eqn (1) $-\dfrac{\sqrt{3}}{p} + \dfrac{1}{\sqrt{3}} = \dfrac{\sqrt{2}}{p} - \dfrac{\sqrt{3}}{p} \Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{\sqrt{2}}{p} \Rightarrow p = \sqrt{3}\ \sqrt{2}$

$\Rightarrow p = \sqrt{6}$

PART – III

29. $A = \{x \in W / x < 2\} \Rightarrow A = \{0, 1\}$

$B = \{x \in N / 1 \le x \le 4\} \Rightarrow B = \{2, 3, 4\}$

C = {3, 5}

To Prove: A × (B ∩ C) = (A × B) ∩ (A × C)

B∩C = {3} A × (B∩C) = {0, 1} × {3}

A × (B∩C) = {(0, 3), (1, 3)} ----- (1)

A × B = {(0, 2), (0, 3), (0, 4), (1, 2), (1, 3), (1, 4)}

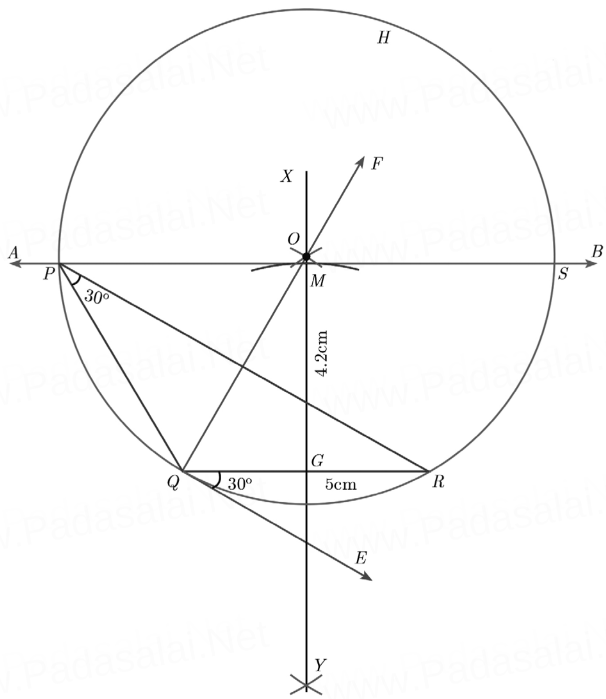
A × C = {(0, 3), (0, 5), (1, 3), (1, 5)}

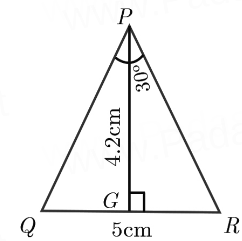
$\therefore$ (A × B) ∩ (A × C) = {(0, 3), (1, 3)} ----- (2)

$\therefore$ (1) = (2) Hence Proved

b) **Refer Govt. Model Question Paper 2019 - 20 - Question Paper 1 - Q.No. 44. (a)**

44. a)

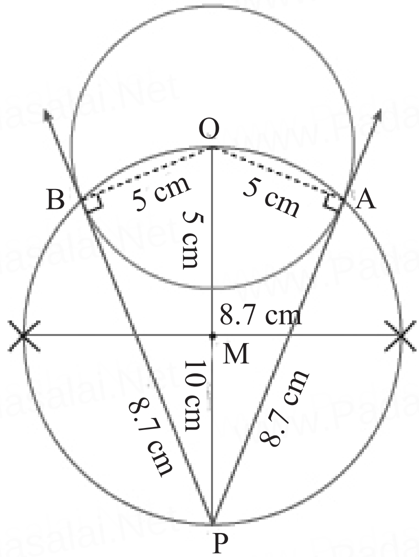




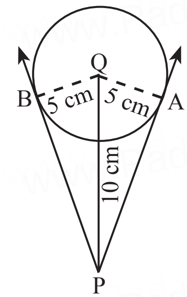
Steps of Construction:

1. Draw a line segment QR = 5 cm.
2. At Q, draw QE such that $\angle RQE = 30°$.
3. At Q, draw QF such that $\angle EQF = 90°$.
4. Draw the perpendicular bisector XY to QR, which intersects QF at O and QR at G.
5. With O as centre and OQ as radius draw a circle.
6. From G mark an arc in the line XY at M, such that GM = 4.2 cm.
7. Draw AB through M which is parallel to QR.
8. AB meets the circle at P and S.
9. Join QP and RP. Then ΔPQR is the required triangle.

b)



Rough Diagram



Construction:

1. With centre at O, draw a circle of radius 5 cm.
2. Draw a line OP = 10 cm.
3. Draw a perpendicular bisector of OP, which cuts OP at M.
4. With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
5. Join AP and BP. AP and BO are the required tangents. Thus length of the tangents are PA = PB = 8.7 cm.

   Proof:

   In ΔOPA

   $PA^2 = OP^2 - OA^2$

   $= 10^2 - 5^2 = 100 - 25 = 75$

   $PA = \sqrt{75} = 8.7$ cm. (approx)

❖✸❖✸❖✸

PTA MODEL QUESTION PAPER - 6

CLASS: X **MATHEMATICS**

Question Paper **7**

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. **If $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ is a function given by $g(x) = \alpha x + \beta$ then the values of α and β are**

1) (1, 2) 2) (–1, 2) 3) (2, –1) 4) (–1, –2)

2. **The given diagram represents**

1) an onto function 2) a constant function

3) an one-one function 4) not a function

3. **If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \dots + 2^{0}$ which of the following is true?**

1) B is 2^{64} more than A 2) B is larger then A by 1

3) A and B are equal 4) A is larger then B by 1

4. **If a, b, c are in A.P then $\frac{a-b}{b-c}$ is equal to**

1) $\frac{a}{b}$ 2) $\frac{b}{c}$ 3) $\frac{a}{c}$ 4) 1

5. **$y^2 + \frac{1}{y^2}$ is not equal to**

1) $\left[y - \frac{1}{y}\right]^2 + 2$ 2) $\left[y + \frac{1}{y}\right]^2 - 2$ 3) $\left[y + \frac{1}{y}\right]^2$ 4) $\frac{y^4+1}{y^2}$

6. **Find the matrix x if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$**

1) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$ 2) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ 3) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ 4) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$

7. **On dividing $\frac{x^2-25}{x+3}$ by $\frac{x+5}{x^2-9}$ is equal to**

1) $(x - 5)(x - 3)$ 2) $(x - 5)(x + 3)$ 3) $(x + 5)(x - 3)$ 4) $(x + 5)(x + 3)$

8. **In a ΔABC, AD is the bisector of, $\angle BAC$ If AB = 8cm BD = 6 cm and DC = 3 cm. The length of the side AC is**

1) 3 cm 2) 4 cm 3) 6 cm 4) 8 cm

27. A and B are two candidates seeking admission to IIT. The probability that A getting selected is 0.5 and the probability that both A and B getting selected is 0.3. Prove that the probability of B being selected is atmost 0.8.
28. P and Q are points on sides AB and AC respectively of ΔABC. If AP = 3 cm, PB = 6 cm, AQ = 5 cm and QC = 10 cm, show that BC = 3PQ.

PART – III

Answer any 10 questions. Question no. 42 is compulsory. **10 × 5 = 50**

29. Write the domain of the following functions: (i) $f(x) = \dfrac{(2x+1)}{x-9}$ ii) $g(x) = \sqrt{x-2}$
30. If $f : R \to R$ and $g : R \to R$ are defined by $f(x) = x^5$ and $g(x) = x^4$ then check if f and g are one-one and fog is one - one?
31. If the sum of the first p terms of an A.P is $ap^2 + bp$. Find its common difference.
32. A man joined a company as Assistant Manager. The company gave him a starting salary of ₹ 60,000 and agreed to increase his salary 5% annually. What will be his salary after 5 years?
33. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ are real and equal prove that either $a = 0$ (or) $a^3 + b^3 + c^3 = 3abc$.
34. Find the LCM of the following polynomical $a^2 + 4a - 12$, $a^2 - 5a + 6$ whose GCD is $a - 2$.
35. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 3 \\ -1 & 5 \end{pmatrix}$, $C = \begin{pmatrix} -1 & 5 \\ 1 & 3 \end{pmatrix}$, Prove that A(BC) = (AB) C.
36. The perpendicular PS on the base QR of a Δ PQR intersects QR at S, such that QS = 3 SR. Prove that $2PQ^2 = 2PR^2 + QR^2$
37. Find the equation of the median and altitude of ΔABC through A where the vertices are A(6, 2), B(–5, –1) and C(1, 9).
38. Prove that $\left(\dfrac{\cos^3 A - \sin^3 A}{\cos A - \sin A}\right) - \left(\dfrac{\cos^3 A + \sin^3 A}{\cos A + \sin A}\right) = 2 \sin A \cos A$
39. If the slant height of the frustum cone is 10 cm and perimeters of its circular base are 18 cm and 28 cm respectively. What is the curved surface area of a the frustum?
40. A right circular cylindrical container of base radius 6 cm and height 15 cm is full of ice cream. The ice cream is to be filled in cones of height 9 cm and base radius 3 cm, having a hemispherical cap. Find the number of cones needed to empty the container.
41. The following table gives the values of mean and variance of heights and weights of the 10th standard students of a school

	Height	Weight
Mean	155 cm	46.50 cm
Variance	72.25 cm	28.09 cm

Which is more varying than the other?

42. A coin is tossed thrice. Find the probability of getting exactly two heads or atleast one tail or two consecutive heads.

18. $3x \equiv 1 \pmod{15}$ can be written as

$$3x - 1 = 15k \text{ for some integer } k$$
$$3x = 15k + 1$$
$$x = \frac{15k+1}{3} \Rightarrow x = 5k + \frac{1}{3}$$

Since $5k$ is an integer, $5k + \frac{1}{3}$ cannot be an integer.

So there is no integer solution.

---

19. $1 + 3 + 5 + \ldots. + l = \left(\frac{l+1}{2}\right)^2 \Rightarrow 1 + 3 + 5 + \ldots. + 55 = \left(\frac{55+1}{2}\right)^2 = \left(\frac{56}{2}\right)^2 = 28^2 = 784$

---

20. $$2x^2 - 2\sqrt{6}\,x + 3 = 0 = 2x^2 - \sqrt{6}\,x - \sqrt{6}\,x + 3 \text{ (by splitting the middle term)}$$
$$= \sqrt{2}\,x\,(\sqrt{2}\,x - \sqrt{3}) - \sqrt{3}\,(\sqrt{2}\,x - \sqrt{3})$$
$$= (\sqrt{2}\,x - \sqrt{3})(\sqrt{2}\,x - \sqrt{3})$$

Now equating the factors to zero to we get

$(\sqrt{2}\,x - \sqrt{3})(\sqrt{\ }\,x - \sqrt{3}) = 0 \Rightarrow (\sqrt{2}\,x - \sqrt{3})^2 = 0 \Rightarrow \sqrt{2}\,x - \sqrt{3} = 0$

Therefore the solution is $x = \frac{\sqrt{3}}{\sqrt{2}}$ twice.

---

21. Let x be the required number

$\frac{1}{x}$ be its reciprocal

Given $$x - \frac{1}{x} = \frac{24}{5} \Rightarrow \frac{x^2-1}{x} = \frac{24}{5}$$
$$5x^2 - 5 = 24x$$
$$5x^2 - 24x - 5 = 0$$
$$5x^2 - 25x + x - 5 = 0$$
$$x = 5, -\frac{1}{5}$$

---

22. α and β are the roots of equation $7x^2 + ax + 2 = 0$

$$\alpha + \beta = -\frac{a}{7} \Rightarrow \alpha\beta = \frac{2}{7} \Rightarrow \beta - \alpha = -\frac{13}{7} \Rightarrow \alpha - \beta = \frac{13}{7} \Rightarrow (\alpha - \beta)^2 = \frac{169}{49}$$

$$\Rightarrow (\alpha + \beta)^2 - 4\alpha\beta = \frac{169}{49} \Rightarrow \left(\frac{-a}{7}\right)^2 - 4\left(\frac{2}{7}\right) = \frac{169}{49} \Rightarrow \frac{a^2}{49} - 4\left(\frac{2}{7}\right) = \frac{169}{49}$$

$$\Rightarrow \frac{a^2}{49} - \frac{8}{7} = \frac{169}{49} \Rightarrow \frac{a^2-56}{49} = \frac{169}{49} \Rightarrow a^2 = 169 + 56 \Rightarrow a^2 = 225 \Rightarrow a = 15$$

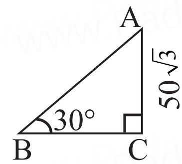
23. Slope of line joining (–2, 6), (4, 8) $m_1 = \frac{8-6}{4+2} = \frac{2}{6} = \frac{1}{3}$

Slope of line joining (8, 12) (x, 24) $m_2 = \frac{24-12}{x-8} = \frac{12}{x-8}$

Since two lines are perpendicular $m_1 \times m_2 = -1$

$\frac{1}{3} \times \frac{12}{x-8} = -1 \Rightarrow \frac{4}{x-8} = -1 \Rightarrow x - 8 = -4 \Rightarrow x = 4$

24. In ΔABC $\tan\theta = \frac{\textit{opposite side}}{\textit{adjacent side}}$



$\tan 30° = \frac{50\sqrt{3}}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{50\sqrt{3}}{BC} \Rightarrow BC = 50\sqrt{3} \times \sqrt{3} = 50(3) = 150$ m

25. Given Total Surface Area of a solid Sphere = Total surface Are of a solid hemisphere

$\Rightarrow 4\pi R^2 = 3\pi r^2 \Rightarrow \frac{R^2}{r^2} = \frac{3}{4} \Rightarrow \frac{R}{r} = \frac{\sqrt{3}}{2}$

Ratio of their volumes $= \dfrac{\frac{4}{3}\pi R^3}{\frac{2}{3}\pi r^3} = \frac{2R^3}{r^3} = 2\left[\frac{R}{r}\right]^3 = 2\left[\frac{\sqrt{3}}{2}\right]^3 = 2 \times \frac{3\sqrt{3}}{8} = \frac{3\sqrt{3}}{4}$

$\therefore$ Ratio of their volumes $= 3\sqrt{3} : 4$

26. Standard Deviation of first 21 natural numbers,

$\sigma = \sqrt{\frac{n^2-1}{12}} = \sqrt{\frac{(21)^2-1}{12}} = \sqrt{\frac{441-1}{12}} = \sqrt{\frac{440}{12}} = \sqrt{36.66} = 6.05$

27. $P(A) = 0.5$ $\quad P(A \cap B) = 0.3$

We have $P(A \cup B) \leq 1 \Rightarrow P(A) + P(B) - P(A \cap B) \leq 1 \Rightarrow 0.5 + P(B) - 0.3 \leq 1$

$\Rightarrow P(B) \leq 1 - 0.2 \Rightarrow P(B) \leq 0.8$

Therefore, probability of B getting selected is atmost 0.8.

28. $\frac{AB}{AP} = \frac{AC}{AQ} = \frac{BC}{PQ} \Rightarrow \frac{9}{3} = \frac{15}{5} = \frac{BC}{PQ} \Rightarrow \frac{BC}{PQ} = 3 \Rightarrow BC = 3PQ$

PART – III

29. i) $f(x) = \frac{2x+1}{x-9}$

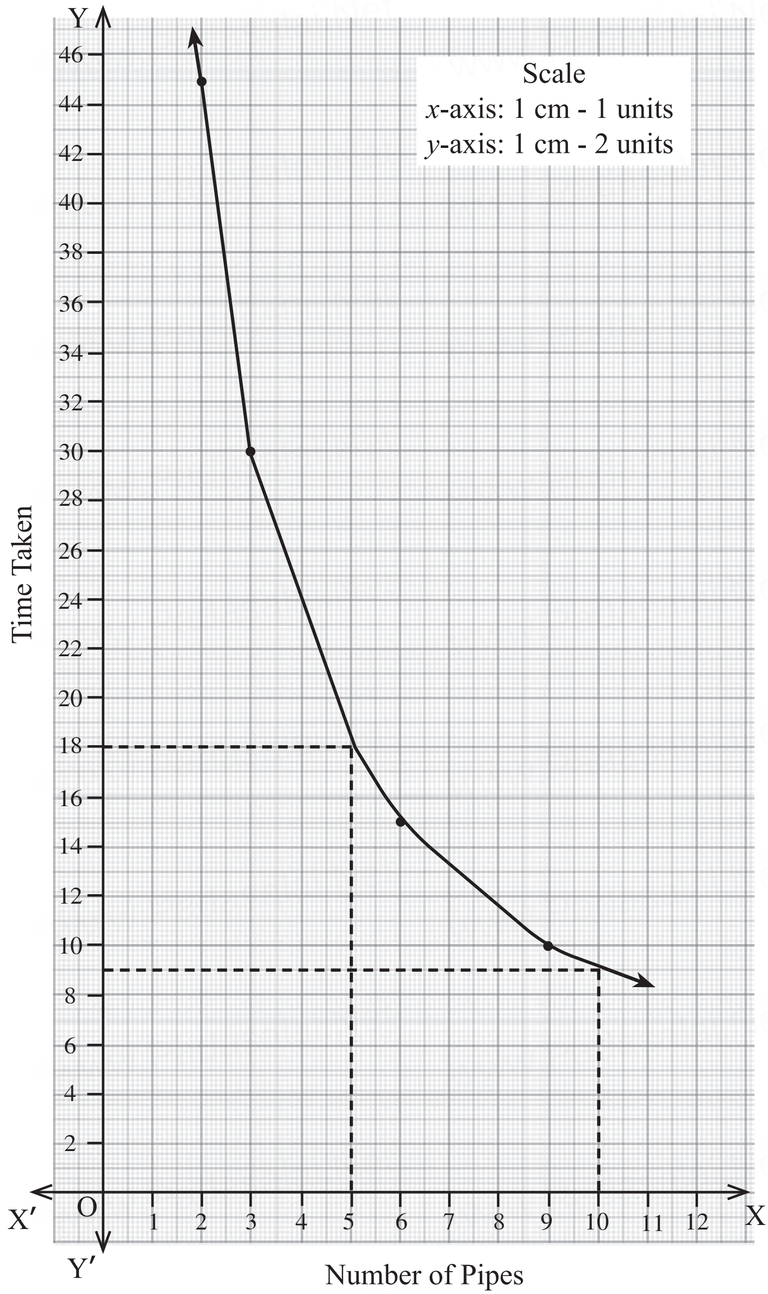
$f(x)$ is not defined at $x = 9$

$\therefore$ Range $= R - \{9\}$

ii) $g(x) = \sqrt{x-2}$

When $x < 2$, we get only the (-)ve value inside the square root

$\therefore$ Range $= [2, \infty)$


Y
Scale
x-axis: 1 cm - 1 units
y-axis: 1 cm - 2 units
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
Time Taken
X′
O
1
2
3
4
5
6
7
8
9
10
11
12
X
Y′
Number of Pipes

❖✸❖✸❖✸

Govt. QUESTION PAPER - Sep. 2020

Question Paper 8

CLASS: X MATHEMATICS

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. **If A = {1, 2}, B = {1, 2, 3, 4}, C = {5, 6} and D = {5, 6, 7, 8}, then state which of the following statement is true?**
   a) (A×C) ⊂ (B×D) b) (B×D) ⊂ (A×C) c) (A×B) ⊂ (A×D) d) (D×A) ⊂ (B×A)

2. **Let $f(x) = x^2 - x$, then $f(x-1) - f(x+1)$ is**
   a) $4x$ b) $2 - 2x$ c) $2 - 4x$ d) $4x - 2$

3. **Using Euclid's division lemma, if the cube of any positive integer is divided by 9, then the possible remainders are**
   a) 0, 1, 8 b) 1, 4, 8 c) 0, 1, 3 d) 1, 3, 5

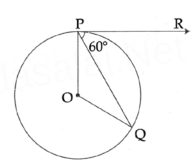
4. **If A = 2^{65} and B = $2^{64} + 2^{63} + 2^{62} + ... + 2^0$, which of the following is true?**
   a) B is 2^{64} more than A b) A and B are equal
   c) B is larger than A by 1 d) A is larger than B by 1

5. $\dfrac{a^2}{a^2 - b^2} + \dfrac{b^2}{b^2 - a^2} =$
   a) a – b b) a + b c) $a^2 - b^2$ d) 1

6. **Transpose of a column matrix is**
   a) unit matrix b) diagonal matrix c) column matrix d) row matrix

7. **In ΔLMN, ∠L=60°, ∠M = 50°. If ΔLMN ~ ΔPQR, then the value of ∠R is**
   a) 40° b) 70° c) 30° d) 110°

8. **In the figure, if PR is tangent to the circle at P and O is the centre of the circle, then ∠POQ is**
   a) 120° b) 100°
   c) 110° d) 90°



9. **The straight line given by the equation $x = 11$ is**
   a) Parallel to x-axis b) Parallel to y-axis
   c) Passing through the origin d) Passing through the point (0, 11)

10. **If tanθ + cotθ = 2, then the value of $\tan^2\theta + \cot^2\theta$ is**
    a) 0 b) 1 c) 2 d) 4

11. **A child reshapes a cone made up of clay of height 24 cm and radius 6 cm into a sphere, then the radius of sphere is**
    a) 24 cm b) 12 cm c) 6 cm d) 48 cm

PART - III

Answer any 10 questions. Question No. 42 is compulsory. **10×5=50**

29. Let A = The set of all natural numbers less than 8
    B = The set of all prime numbers less than 8
    C = The set of even prime number. Verify that $(A \cap B) \times C = (A \times C) \cap (B \times C)$

30. Let A = {1, 2, 3, 4} and B = {2, 5, 8, 11, 14} be two sets. Let $f : A \rightarrow B$ be a function given by $f(x) = 3x - 1$. Represent this function i) by arrow diagram ii) in a table form iii) as a set of ordered pairs iv) in a graphical form.

31. Find the sum of all natural numbers between 100 and 1000 which are divisible by 11.

32. Solve: $6x + 2y - 5z = 13$; $3x + 3y - 2z = 13$; $7x + 5y - 3z = 26$

33. Find the GCD of the polynomials, $x^4 + 3x^3 - x - 3$ and $x^3 + x^2 - 5x + 3$.

34. Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$

35. If $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}$ show that $(AB)^T = B^T A^T$.

36. State and prove Angle Bisector theorem.

37. Find the value of k, if the area of a quadrilateral is 29 sq. units, whose vertices are $(-4, -2)$, $(-3, k)$, $(3, -2)$ and $(2, 3)$.

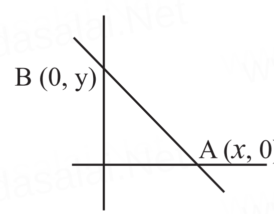
38. From the top of a tower 60 m high, the angles of depression of the top and bottom of a vertical lamp post are observed to be 38° and 60° respectively. Find the height of the lamp post. ($\tan 38° = 0.7813$, $\sqrt{3} = 1.732$)

39. A cylindrical glass with diameter 20 cm has water to a height of 9 cm. A small non-hollow cylindrical metal of radius 5 cm and height 4 cm is immersed in it completely. Calculate the rise of water in the glass.

40. The scores of a cricketer in 7 matches are 70, 80, 60, 50, 40, 90, 95. Find the standard deviation.

41. Two unbiased dice are rolled once. Find the probability of getting:
    i) a doublet (equal numbers on both dice) ii) the product as a prime number
    iii) the sum as a prime number iv) the sum as 1

42. A straight line AB cuts the co-ordinate axes at A and B.
    If the mid-point of AB is (2, 3),
    find the equation of AB.



PART - IV

Answer all the questions. **2×8=16**

43. a) Construct a triangle similar to a given triangle ABC with its sides equal to $\frac{6}{5}$ of the corresponding sides of the triangle ABC. $\left(\textit{scale factor } \frac{6}{5}\right)$

(OR)

b) Draw two tangents from a point which is 10 cm away from the centre of a circle of radius 5 cm. Also measure the lengths of the tangents.

44. a) Graph the quadratic equation $x^2 - 8x + 16 = 0$ and state the nature of their solution.

(OR)

b) A garment shop announces a flat 50% discount on every purchase of items for their customers. Draw the graph for the relation between the Marked Price and the Discount. Hence find,
(i) the marked price when a customer gets a discount of ₹ 3250 (from graph)
(ii) the discount when the marked price is ₹ 2500.

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ANSWERS — **Govt. Question Paper - Sep. 2020** — **Question Paper 8**

PART - I

1. a) (A×C) ⊂ (B×D)
2. c) $2 - 4x$
3. a) 0, 1, 8
4. d) A is larger than B by 1
5. d) 1
6. d) row matrix
7. b) 70°
8. a) 180°
9. b) Parallel to y-axis
10. c) 2
11. c) 6 cm
12. a) 2 : 1
13. b) 160900
14. c) $\frac{23}{26}$

PART - II

15. A × B = {(3, 2), (3, 4), (5, 2), (5, 4)}
A = {Set of all first co-ordinates of elements of A×B} ∴ A = {3, 5}
B = {Set of all second co-ordinates of elements of A×B} ∴ B = {2, 4}
∴ A = {3, 5} B = {2, 4}

16. f is defined by f: N → N
$f(m) = m^2 + m + 3$
$f(1) = (1)^2+1+3 = 1+1+3 = 5$; $f(2) = (2)^2+2+3 = 4+2+3 = 9$; $f(3) = (3)^2+3+3 = 9+3+3 = 15$
Every domain has different co-domain.
∴ f is one - one function.

17. The factor of $2^n \times 5^m$ is 2. $2^n \times 5^m$ is even number.
Any number end with 5 is an odd number.
In $2^n \times 5^m$, values is not end with 5.

18. $a_n = n^2$
$a_3 = (3)^2 = 9$ [∵ n is an odd number]
$a_n = \frac{n^2}{2} \Rightarrow a_4 = \frac{(4)^2}{2} = \frac{16}{2} = 8$ [∵ n is even number]

$$r^2 = \frac{154}{4} \times \frac{7}{22} = \frac{49}{4} \quad \Rightarrow r = \frac{7}{2}$$

radius of sphere $r = \frac{7}{2}$ m diameter of sphere d = 7 m

26. base area of solid hemisphere, $\pi r^2 = 1386$ sq.m
Total surface area of hemisphere $= 3\pi r^2 = 3 \times 1386 = 4158$ sq.m
So, Total surface area of solid hemisphere = 4158 sq.m

27. L = 125, S = 63
Range, R = L – S = 125 – 63 = 62
Coefficient of Range $= \frac{L-S}{L+S} = \frac{\text{üüü}-}{125+63} = \frac{}{188} = 0.33$

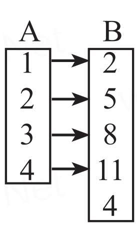
28. Height of the hollow cylinder h = 9 cm
Internal radius r = 3 cm; External radius R = 5 cm
Volume of the hollow cylinder V $= \pi h[R^2 - r^2]$
$= 9\pi[5^2 - 3^2] = 9\pi\,[25 - 9] = 9\pi \times 6$
$= 144\pi$ cu.cm

PART – III

29. A = {1, 2, 3, 4, 5, 6, 7}; B = {2, 3, 5, 7}; C = {2}
$(A \cap B) \times C = (A \times C) \cap (B \times C)$
$(A \cap B)$ {2, 3, 5, 7}
$\therefore (A \cap B) \times C$ = {(2, 2), (3, 2), (5, 2), (7, 2)} ---- (1)
A × C = {(1, 2), (2, 2), (3, 2), (4, 2), (5, 2), (6, 2), (7, 2)}
B × C = {(2, 2), (3, 2), (5, 2), (7, 2)}
$(A \times C) \cap (B \times C)$ = {(2, 2), (3, 2), (5, 2), (7, 2)} ---- (2)
From (1) and (2), L.H.S = R.H.S

30. A = {1, 2, 3, 4}, B = {2, 5, 8, 11, 14}
$f(1) = 3(1) - 1 = 3-1 = 2$; $f(2) = 3(2) - 1 = 6-1 = 5$; $f(3) = 3(3) - 1 = 9-1 = 8$;
$f(4) = 3(4) - 1 = 12 - 1 = 11$
function R = {(1, 2), (2, 5), (3, 8), (4, 11)}

i) Arrow Diagram

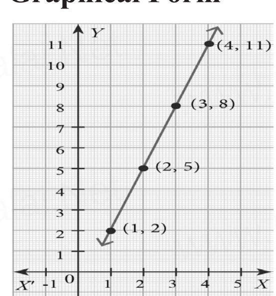


ii) Table

x	1	2	3	4
y	2	5	8	11

iii) Set of Ordered pairs
{(1, 2), (2, 5), (3, 8), (4, 11)}

iv) Graphical Form



31. a = 100 + 11 – 1 = 110; d = 11; l = 1000 – 10 = 990

$$n = \frac{l-a}{d} + 1 = \frac{990-110}{11} + 1 = \frac{880}{11} + 1 = 80 + 1 = 81$$

$$S_n = \frac{n}{2}[a + l]$$

$$S_{81} = \frac{81}{2}[110 + 990] = \frac{81}{2}[1100] = 44550$$

Sum of all natural numbers between 100 and 1000 which are divisible by 11 is 44550.

32. $6x + 2y - 5z = 13$ ----- (1)
$3x + 3y - 2z = 13$ ----- (2)
$7x + 5y - 3z = 26$ ----- (3)

From (1), (2)

$$\begin{array}{lrl} (1) \Rightarrow & 6x+2y-5z & = 13 \\ (2)\times 2 \Rightarrow & 6x+6y-4z & = 26 \\ & (-)\ (-)\ (+) & \ (-) \\ \hline & -4y-z & = -13 \text{ ----- (4)} \end{array}$$

From (2), (3)

$$\begin{array}{lrl} (2)\times 7 \Rightarrow & 21x+21y-14z & = 91 \\ (3)\times 3 \Rightarrow & 21x+15y-9z & = 78 \\ & (-)\ (-)\ (+) & \ (-) \\ \hline & -6y-5z & = -13 \text{ ----- (5)} \end{array}$$

From (4), (5)

$$\begin{array}{lrl} (4)\times 5 \Rightarrow & 20y-5z & = -65 \\ (5)\times 1 \Rightarrow & 6y-5z & = 13 \\ & (-)\ (+) & \ (-) \\ \hline & -26y & = -78 \\ & y & = 3 \end{array}$$

Substitute y = 3 in (4)

$$\begin{aligned} -4(3)-z &= -13 \\ -12-z &= -13 \\ -z &= 12-13 \\ -z &= -1 \\ z &= 1 \end{aligned}$$

Substitute y = 3 and z = 1 in equation (1)

$$6x+2(3)-5(1) = 13$$
$$6x+6-5 = 13 \Rightarrow 6x+1 = 13$$
$$\Rightarrow 6x = 12 \Rightarrow x = 2$$

Solution = {2, 3, 1}

33. $f(x) = x^4 + 3x^3 + x - 3$ and $g(x) = x^3 + x^2 - 5x + 3$

$$\begin{array}{r|ll} & x + 2 & \\ \hline x^3+x^2-5x+3 & x^4 + 3x^3 + 0 + x - 3 & \\ & x^4 + x^3 - 5x^2 + 3x & (-) \\ \hline & 2x^3 + 5x^2 - 4x - 3 & \\ & 2x^3 + 2x^2 - 10x + 6 & (-) \\ \hline & 3x^2 + 6x - 9 & \end{array}$$

$= 3(x^2+2x-3)$

$$\begin{array}{r|ll} & x - 1 & \\ \hline x^2+2x-3 & x^3 + 3x^2 - 5x + 3 & \\ & x^3 + 2x^2 - 3x & (-) \\ \hline & -x^2 - 2x + 3 & \\ & -x^2 - 2x + 3 & (-) \\ \hline & 0 & \end{array}$$

H.C.F of $(f(x), g(x)) = x^2 + 2x - 3$

37. Area of quadrilateral, $\frac{1}{2}\begin{pmatrix} -4 & -3 & 3 & 2 & -4 \\ -2 & k & -2 & 3 & -2 \end{pmatrix} = 28$

$\Rightarrow \quad (-4k + 6 + 9 - 4) - (6 + 3k - 4 - 12) = 56$

$\Rightarrow \quad (11 - 4k) - (3k - 10) = 56$

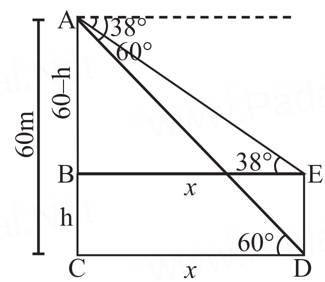
$\Rightarrow \quad 21 - 7k = 56$

$\Rightarrow \quad 7k = -35$

$\Rightarrow \quad k = -5$

38. Let AB = height of the tower; ED = height of the lamp post = h m = BC

AB = 60 – h CD = BE = x



In ΔABE, $\tan 38° = \frac{AB}{BE}$

$\Rightarrow \quad 0.7813 = \frac{60-h}{x} \quad \Rightarrow \quad x = \frac{60-h}{0.7813}$

In ΔACD, $\tan 60° = \frac{AC}{CD}$

$\Rightarrow \quad \sqrt{3} = \frac{60}{x} \quad \Rightarrow \quad x = \frac{60}{1.732}$

(1) = (2) $\Rightarrow \quad \frac{60-h}{x} = \frac{60}{1.732} \quad \Rightarrow \quad 60 - h = \frac{60}{1.732} \times 0.7813$

$\Rightarrow \quad 60 - h = 27.066$

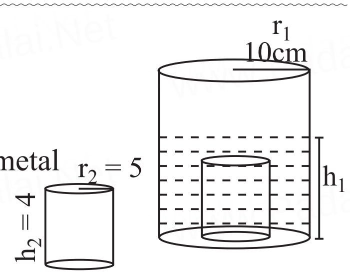
$\Rightarrow \quad h = 60 - 27.066 = 32.934$ m

Height of the lamp post = 32.934 m

39. Radius of Cylindrical glass $r_1 = 10$ cm

In Cylindrical glass, height of the water = h_1

Radius of non-hollow cylindrical metal $r_2 = 5$ cm, $h_2 = 4$ cm



Volume of raised water = Volume of non-hollow cylindrical metal

$$\pi r_1^2 h_1 = \pi r_2^2 h_2$$

$$h_1 = \frac{r_2^2 h_2}{r_1^2} = \frac{5 \times 5 \times 4}{10 \times 10} = 1$$

Height of the water = 1 cm

40. A = 70, n = 7, c = 5

x	$d = \frac{x-70}{5}$	d^2
40	–6	36
50	–4	16
60	–2	4
70	0	0
80	2	4
90	4	16
95	5	25
	–1	101

$$\sigma = \sqrt{\frac{\Sigma d^2}{n} - \left(\frac{\Sigma d}{n}\right)^2} \times c = \sqrt{\frac{101}{7} - \left(\frac{-1}{7}\right)^2} \times 5 = \sqrt{14.43 - 0.02} \times 5 = \sqrt{14.41} \times 5 \simeq 3.5 \times 5$$

$\sigma \simeq 19.0$

Standard deviation = 19 (approx.)

41. S = {(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,1), (3,2), (3,3), (3,4), (3,5), (3,6), (4,1), (4,2), (4,3), (4,4), (4,5), (4,6), (5,1), (5,2), (5,3), (5,4), (5,5), (5,6) (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)}; n(S) = 36

i) Let A = a doublet (equal numbers on both dice)

A = {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}; n(A) = 6 $P(A) = \frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

ii) Let B = the product as a prime number

B = {(1, 2), (1, 3), (1, 5), (2, 1), (3, 1), (5, 1)}; n(B) = 6 $P(B) = \frac{n(B)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

iii) Let C = the sum as a prime number

C = {(1, 1), (1, 2), (1, 4), (1, 6), (5, 6)}; n(C) = 5 $P(C) = \frac{n(C)}{n(S)} = \frac{5}{36}$

iii) Let D = the sum as 1

n(D) = 0; $P(D) = \frac{n(D)}{n(S)} = \frac{0}{36} = 0$

42. A (x, 0) B (0, y)

Mid point of AB = (2, 3)

$$\left[\frac{x_1+x_2}{2}\ \frac{y_1+y_2}{2}\right] = [2, 3] \Rightarrow \left[\frac{x+0}{2}, \frac{0+y}{2}\right] = [2, 3] \Rightarrow \left[\frac{x}{2}, \frac{y}{2}\right] = [2, 3]$$

$\frac{x}{2} = 2$; $\frac{y}{2} = 3$

$x = 4$; $y = 6$

∴ A (4, 0), B (0, 6)

Equation of AB is

$$\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1} \Rightarrow \frac{y-0}{6-0} = \frac{x-4}{0-4} \Rightarrow \frac{y}{6} = \frac{x-4}{-4}$$

$\Rightarrow$ 4y = $6x$–24 $\Rightarrow$ $6x + 4y - 24 = 0$

$\therefore$ Equation of AB is $6x + 4y - 24 = 0$

PART IV

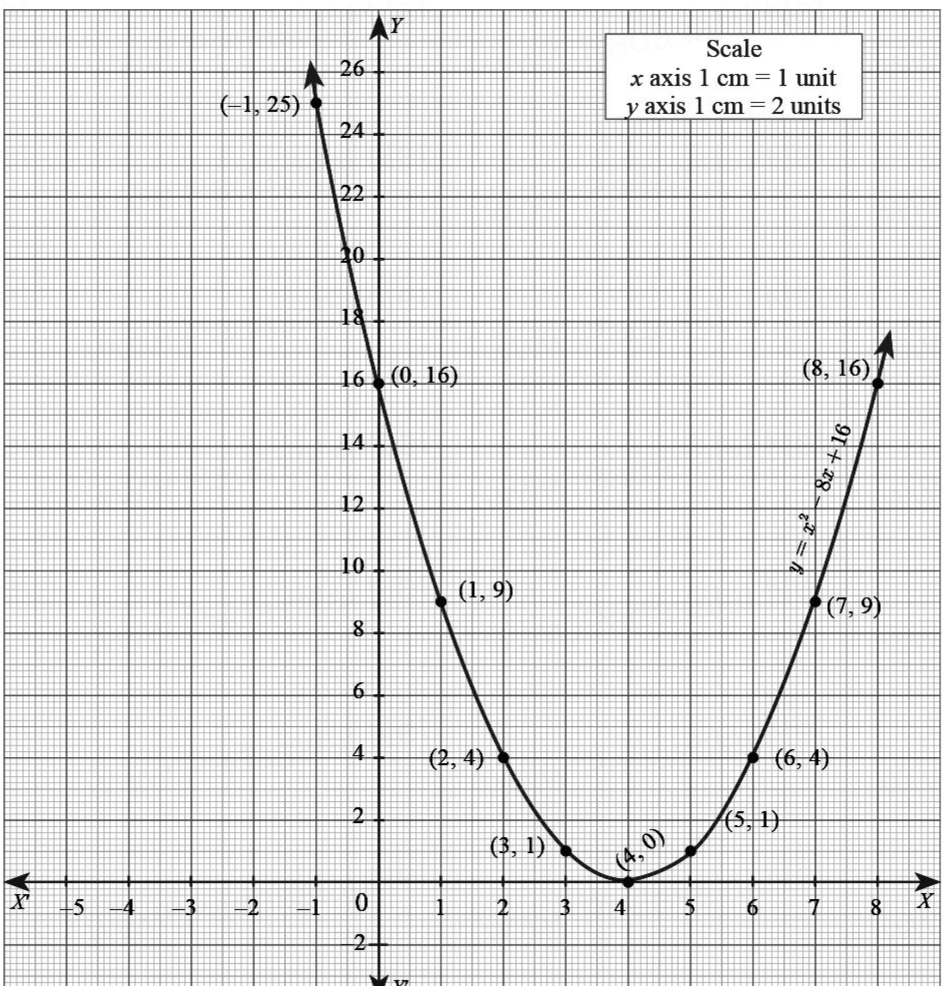
43. a) **Refer PTA Model Question Paper 1 - Question Paper 2 - Q.No. 44 (a).**

43. b) **Refer PTA Model Question Paper 6 - Question Paper 7 - Q.No. 44 (b).**

44. a) Step 1: Prepare the table of values for the equation $y = x^2 - 8x + 16$

x	−1	0	1	2	3	4	5	6	7	8
y	25	16	9	4	1	0	1	4	9	16

Step 2: Plot the points for the above ordered pairs (x, y) on the graph using suitable scale.



Govt. QUESTION PAPER - Sep. 2021

CLASS: X **MATHEMATICS**

Question Paper 9

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. If n(A × B) = 6 and A = [1, 3] then n(B) is

a) 1 b) 2 c) 3 d) 6

2. The sum of the exponents of the prime factors in the prime factorization of 1729 is

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

3. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is

a) 3 b) 5 c) 8 d) 11

4. The square root of $\dfrac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to

a) $\dfrac{16}{5}\left|\dfrac{x^2z^4}{y^2}\right|$ b) $16\left|\dfrac{y^2}{x^2z^4}\right|$ c) $\dfrac{16}{5}\left|\dfrac{y}{xz^2}\right|$ d) $\dfrac{16}{5}\left|\dfrac{xz^2}{y}\right|$

5. Graph of a linear equation is a _______.

a) Straight line b) Circle c) Parabola d) Hyperbola

6. The G.C.D of a^m, a^{m+1}, a^{m+2} is

a) a^m b) a^{m+1} c) a^{m+2} d) 1

7. If in ΔABC, DE || BC, AB = 3.6 cm, AC = 24 cm and AD = 2.1 cm then, the length of AE is

a) 1.4 cm b) 1.8 cm c) 1.2 cm d) 1.05 cm

8. How many tangents can be drawn to the circle from an exterior point?

a) one b) two c) infinite d) zero

9. The area of a triangle formed by the points (–5, 0), (0, –5) and (5, 0) is

a) 0 sq. units b) 25 sq. units c) 5 sq. units d) none of these

10. The perimeter of a triangle formed by the points (0, 0), (1, 0) and (0, 1) is

a) $\sqrt{2}$ b) 2 c) $2+\sqrt{2}$ d) $2-\sqrt{2}$

11. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3}$: 1 then, the angle of elevation of the sun has measure

a) 45° b) 30° c) 90° d) 60°

12. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be

a) 12 cm b) 10 cm c) 13 cm d) 5 cm

36. Find the equation of the median of ABC through A where the vertices are A (6, 2), B (–5, –1) and C (1, 9).
37. If the points P (–1, –4), Q (b, c) and R (5, –1) are collinear and if 2b + c = 4, then find the values of b and c.
38. Two ships are sailing in the sea on either sides of a lighthouse. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is 200 m high, find the distance between the two ships. ($\sqrt{3} = 1.732$)
39. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.
40. A toy is in the shape of a cylinder surmounted by a hemisphere. The height of the toy is 25cm. Find the total surface area of the toy if its common diameter is 12 cm.
41. Two dice are rolled. Find the probability that the sum of outcome is (i) equal to 4 (ii) greater than 10 (iii) less than 13.
42. If the equation $(1 + m^2)x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots, then prove that $c^2 = a^2(1 + m^2)$.

PART - IV

Answer all the questions. **2×8=16**

43. a) Construct a PQR whose base PQ = 4.5 cm, R = 35° and the median from R to RG is 6 cm.

(OR)

b) Draw a circle of diameter 6 cm from a point P, which is 8 cm away from its centre. Draw two tangents PA and PB to the circle and measure their lengths.

44. a) Draw the graph of $x^2 + x - 12 = 0$ and state the nature of their solution.

(OR)

b) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve $x^2 + 3x - 4 = 0$

***

ANSWERS **Govt. Question Paper - Sep. 2021** **Question Paper 9**

PART - I

1. c) 3
2. c) 3
3. d) 11
4. d) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$
5. a) Straight line
6. a) a^m
7. a) 1.4 cm
8. b) two
9. b) 25 sq. units
10. c) $2+\sqrt{2}$
11. d) 60°
12. a) 12 cm
13. c) 3π
14. b) $\frac{7}{10}$

Given: $\frac{AD}{DB} = \frac{3}{4}$, AC = 15 cm

Let AE = x, ⇒ EC = 15 – x

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{3}{4} = \frac{x}{15-x}$$

$$4x = 45 - 3x$$

$$7x = 45$$

$$x = \frac{45}{7} = 6.43 \text{ cm}$$

AE = 6.43 cm

22. Given the points are (–3, –4), (7, 2), (12, 5)

Area of triangle = $\frac{1}{2}\{(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\}$

$$= \frac{1}{2}\{(-6 + 35 - 48) - (-28 + 24 - 15)\}$$

$$= \frac{1}{2}\{(-19) - (-19)\} = \frac{1}{2}(-19 + 19) = 0$$

∴ The given points are collinear.

23. Equation of the given straight line is $8x - 7y + 6 = 0$

$$7y = 8x + 6$$

$$y = \frac{8}{7}x + \frac{6}{7} \quad \text{----- (1)}$$

Comparing (1) with $y = mx + c$

Slope m = $\frac{8}{7}$ and y intercept c = $\frac{6}{7}$

24. Equation of given line $3x - 2y - 6 = 0$

$$3x - 2y = 6$$

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

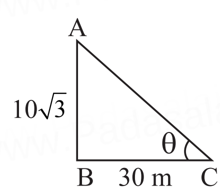
$$\frac{x}{2} + \frac{y}{-3} = 1$$

x intercept a = 2; y intercept b = –3

25. $\tan\theta = \frac{10\sqrt{3}}{30} = \frac{1}{\sqrt{3}}$

$$\theta = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$$

$$\theta = 30°$$



26. Given: h = 2m, base area = 250 m^2

Volume of cylinder = $\pi r^2 h$ cu.units

$$= \text{base area} \times h$$

$$= 250 \times 2 = 500 \text{ m}^3$$

27. Sample space

S = {(1H, 1T, 2H, 2T, 3H, 3T, 4H, 4T, 5H, 5T, 6H, 6T)}

n(S) = 12

Let A = be the event getting an odd number and a head.

A = {1H, 3H, 5H}

n(A) = 3

$$P(A) = \frac{n(A)}{n(B)} = \frac{3}{12} = \frac{1}{4}$$

28. Given: ratio of height = 1 : 2

Perimeter of base *s* are in ratio = 3 : 4

Let r_1 and h_1 be radius and height

cone I and r_2 and h_2 be radius and height of the cone II

$$\frac{2\pi r_1}{2\pi r_2} = \frac{3}{4} \Rightarrow \frac{r_1}{r_2} = \frac{3}{4}$$

$$\frac{\text{Volume of cone I}}{\text{Volume of cone II}} = \frac{\frac{1}{3}\pi {r_1}^2 h_1}{\frac{1}{3}\pi {r_2}^2 h_2} = \frac{\frac{1}{3}\pi 3^2(1)}{\frac{1}{3}\pi 4^2(2)} = \frac{9}{32}$$

$\therefore$ ratio of volume = 9 : 32

PART - III

29. Given: A = $\{x \in W / x < 2\}$ = {0, 1}, B = $\{x \in N / 1 < x \leq 4\}$ = {2, 3, 4}, C = {3, 5}

Verify $A \times (B \cap C) = (A \times B) \cap (A \times C)$

$$B \cap C = \{3\}$$

$$A \times (B \cap C) = (0, 3), (1, 3)\} \quad \text{----- (1)}$$

$$A \times B = \{(0, 2), (0, 3), (0, 4), (1, 2), (1, 3), (1, 4)\}$$

$$A \times C = \{0, 3), (0, 5), (1, 3), (1, 5)\}$$

$$(A \times B) \cap (A \times C) = \{(0, 3), (1, 3)\} \quad \text{----- (2)}$$

From (1) and (2) we get $A \times (B \cap C) = (A \times B) \cap (A \times C)$

30. Let the three consecutive terms of the A.P is a–d, a, a+d

Given:

$$(a-d) + a + (a+d) = 27$$
$$3a = 27$$
$$a = 9$$

Also given

$$(a-d)(a)(a+d) = 288$$
$$a(a^2 - d^2) = 288$$
$$9(81 - d^2) = 288$$
$$81 - d^2 = \frac{288}{9}$$
$$81 - d^2 = 32$$
$$-d^2 = 32 - 81$$
$$d^2 = 49$$
$$d = \pm 7$$

when d = 7

9–7, 9, 9+7 = 2, 9, 16

when d = –7

9+7, 9, 9–7 = 16, 9, 2

$\therefore$ The three consecutive terms of A.P are 2, 9, 16.

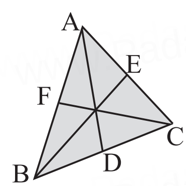
No.	Statement	Reason
1.	Compare ΔABC and ΔABD $\angle B$ is common $\angle BAC = \angle BDA = 90°$ Therefore, $\Delta ABC \sim \Delta ABD$ $\frac{AB}{BD} = \frac{BC}{AB}$ $AB^2 = BC \times BD$ ...(1)	Given $\angle BAC = 90°$ and by construction $\angle BDA = 90°$ By AA similarity.
2.	Compare ΔABC and ΔADC $\angle C$ is common $\angle BAC = \angle ADC = 90°$ Therefore, $\Delta ABC \sim \Delta ADC$ $\frac{BC}{AC} = \frac{AC}{DC}$ $AC^2 = BC \times DC$ ... (2)	Given $\angle BAC = 90°$ and by construction $\angle CDA = 90°$ By AA similarity.

Adding (1) and (2) we get

$$\begin{aligned} AB^2 + AC^2 &= BC \times BD + BC \times DC \\ &= BC\,(BD + DC) \\ AB^2 + AC^2 &= BC \times BC = BC^2 \end{aligned}$$

Hence the theorem is proved.

35. Show that in a triangle, the medians are concurrent.



Medians are line segments joining each vertex to the midpoint of the corresponding opposite sides.

Thus medians are the cevians where D, E, F are midpoints of BC, CA and AB respectively.

Since D is midpoint of BC,

BD = DC. So $\frac{BD}{DC} = 1$ ----- (1)

Since E is midpoint of CA,

CE = EA. So $\frac{CE}{EA} = 1$ ----- (2)

Since F is midpoint of AB,

AF = FB. So $\frac{AF}{FB} = 1$ ----- (3)

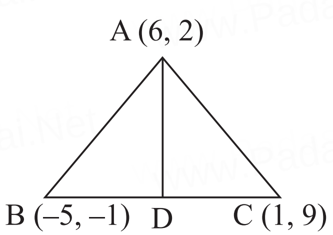
Thus, multiplying (1), (2), (3) we get

$$\frac{BD}{DC} \times \frac{CE}{EA} \times \frac{AF}{FB} = 1 \times 1 \times 1 = 1$$

And so, Ceva's theorem is satisfied.

Hence the Medians are concurrent.

36.



Equation of median through A.

Midpoint of BC $= \left(\frac{-5+1}{2}, \frac{-1+9}{2}\right)$

$D = (-2, 4)$

Equation of AD is

$$\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1} \quad A\,(6, 2) \quad D(-2, 4)$$

$$\frac{y-2}{4-2} = \frac{x-6}{-2-6}$$

$$\frac{y-2}{2} = \frac{x-6}{-8}$$

$$2x - 12 = -8y + 16$$

$$2x + 8y - 28 = 0 \quad \Rightarrow x + 4y - 14 = 0$$

Construction:

- ✦ With centre at O, draw a circle of radius 3 cm.
- ✦ Draw a line OP = 8 cm.
- ✦ Draw a perpendicular bisector of OP which ends OP at M.
- ✦ With M as centre and MO as radius, draw a circle which cuts previous circle at A and B.
- ✦ Join AP and BP/ AP and BP are the required tangents. Thus length of tangents are PA = PB = 7.4 cm

Verification:

In the right angle triangle OAP.

$PA^2 = OP^2 - OA^2 = 8^2 - 3^2$

$= 64 - 9 = 55$

$PA = \sqrt{55} = 7.4$ cm (approximately)

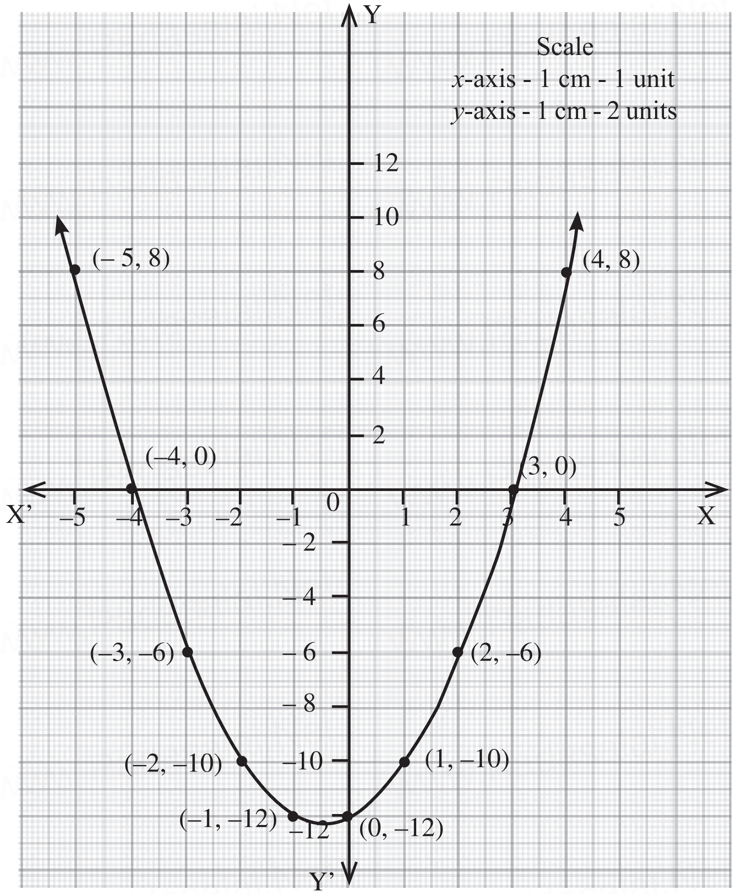
44. a) $x^2 + x - 12 = 0$

x	–5	–4	–3	–2	–1	0	1	2	3	4
x^2	25	16	9	4	1	0	1	4	9	16
x	–5	–4	–3	–2	–1	0	1	2	3	4
–12	–12	–12	–12	–12	–12	–12	–12	–12	–12	–12
y	8	0	–6	–10	–12	–12	–10	–6	0	8

Points: (–5, 8), (–4, 0), (–3, –6), (–2, –10), (–1, –12), (0, –12), (1, –10), (2, –6), (3, 0), (4, 8)

- ✦ Plot the points for the above ordered pairs (x . y).
- ✦ Draw the parabola and make the co-ordinates of the parabola which intersects with the x-axis.
- ✦ The roots of the equation are the x coordinates of the intersecting points of the parabola with x-axis (–4, 0) and (3, 0) which are –4 and 3.

Since there are two points of intersection with the x-axis the quadratic equation $x^2 + x - 12 = 0$. They real and unequal roots.



b) **Refer Govt. Model Question Paper 19-20 - Question Paper 1 - Q.No. 44. a.**

❖✸❖✸❖✸

Govt. QUESTION PAPER - May. 2022

Question Paper **10**

CLASS: X **MATHEMATICS**

Time allowed: 3 Hours Max. Marks: 100

PART - I

Note: (i) Answer all the 14 questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code with the corresponding answer.

1. If the ordered pairs (a+2, 4) and (5, 2a+b) are equal then (a, b) is

a) (2, –2) b) (5, 1) c) (2, 3) d) (3, –2)

2. If the HCF of 65 and 117 is expressible in the form of 65m – 117, then the value of 'm' is

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

3. If t_n is the n^{th} term of an A.P., then $t_{8n} - t_n$ is

a) (8n – 1)d b) (8n – 2)d c) (7n – 2)d d) (7nd)

4. If $(x - 6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$, then the value of k is

a) 3 b) 5 c) 6 d) 8

5. Which of the following should be added to make $x^4 + 64$ a perfect square?

a) $4x^2$ b) $16x^2$ c) $8x^2$ d) $-8x^2$

6. The number of points of intersection of the quadratic polynomial $x^2 + 4x + 4$ with the X-axis is

a) 0 b) 1 c) 0 or 1 d) 2

7. If ΔABC is an isosceles triangle with ∠C = 90° and AC = 5cm, then AB is

a) 2.5 cm b) 5 cm c) 10 cm d) $5\sqrt{2}$ cm

8. In a ΔABC, AD is the bisector of ∠BAC. If AB = 8 cm, BD = 6 cm and DC = 3 cm, the length of the side AC is

a) 6 cm b) 4 cm c) 3 cm d) 8 cm

9. If (5, 7), (3, p) and (6, 6) are collinear, then the value of 'p' is

a) 3 b) 6 c) 9 d) 12

10. The slope of the line which is perpendicular to a line joining the points (0, 0) and (–8, 8) is

a) –1 b) 1 c) $\frac{1}{3}$ d) –8

11. A tower is 60 m high. Its shadow is x metres shorter when the sun's altitude is 45° than when it had been 30°, then 'x' is equal to

a) 41.92 m b) 43.92 m c) 43 m d) 45.6 m

12. If two solid hemispheres of same base radius 'r' units are joined together along their bases, then curved surface area of this new solid is

a) $4\pi r^2$ sq. units b) $6\pi r^2$ sq. units c) $3\pi r^2$ sq. units d) $8\pi r^2$ sq. units

44. a) Draw the graph of $y = x^2 - 4x + 3$ and use it to solve $x^2 - 6x + 9 = 0$

(OR)

b) Draw the graph of $x^2 - 4x + 4 = 0$ and state the nature of their solution.

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ANSWERS — Govt. Question Paper - May 2022 — Question Paper 10

PART - I

1. d) (3, –2)
2. b) 2
3. d) (7nd)
4. b) 5
5. b) $16x^2$
6. b) 1
7. d) $5\sqrt{2}$ cm
8. b) 4 cm
9. c) 9
10. b) 1
11. d) 45.6 m
12. a) $4\pi r^2$ sq. units
13. c) 4
14. b) 1

PART - II

15. A = {1, 2, 3} B = {2, 3, 5, 7}

A×B = {1, 2, 3} × {2, 3, 5, 7}

= {(1, 2), (1, 3), (1, 5), (1, 7), (2, 2), (2, 3), (2, 5), (2, 7), (3, 2), (3, 3), (3, 5), (3, 7)}

B×A = {2, 3, 5, 7} × {1, 2, 3}

= {(2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3), (5, 1), (5, 2), (5, 7), (7, 1), (7, 2), (7, 3)}

16. (i) Set builder form

$\{(x, y) \,/\, y = (x - 2), x \in P, y \in Q\}$

(ii) Roster form {(5, 3), (6, 4), (7, 5)}

17. $13824 = 2^a \times 3^b = 2^9 \times 3^3$

a = 9, b = 3

18. 16, 11, 6, 1 ..... is –54

$t_1 = 16$, $t_2 = 11$, $t_n = -54$, $d = 11 - 16 = -5$

$$t_n = a + (n-1)d$$
$$-54 = 16 + (n-1)\,-5$$
$$-54 = 16 - 5n + 5$$
$$-54 = 21 - 5n$$

$$5n = 21 + 54$$
$$n = \frac{75}{5}$$
$$n = 15$$

$\therefore 15^{th}$ term of the A.P is –54.

19. $$\frac{7p+2}{8p^2+3p+5} = \frac{7p+2}{\text{üüµ} + \quad p -}$$

$8p^2 + 13p + 5$ is $(8p+5)(p-1) = 0$

$\Rightarrow p = \frac{-5}{8}$, $p = -1$ $\therefore$ excluded value $\frac{-5}{8}$ and –1

$$\frac{3600}{5040} = \frac{h_1}{h_2} \qquad \Rightarrow \frac{5}{7} = \frac{h_1}{h_2}$$

$h_1 : h_2 = 5 : 7$

∴ the ratio of their heights = 5 : 7

27. When two coins are together the sample space is S = {HH, HT, TH, TT}

n(S) = 4

Let A be the event of getting different face on coins.

A = {HT, TH}

n(A) = 2

Probability of getting different face on the coin

$$P(A) = \frac{n(A)}{n(S)} = \frac{2}{4} = \frac{1}{2}$$

28. $P = \frac{x}{x+y}$, $Q = \frac{y}{x+y}$

$$P^2 - Q^2 = \left(\frac{x}{x+y}\right)^2 - \left(\frac{y}{x+y}\right)^2 = \frac{x^2}{(x+y)^2} - \frac{y^2}{(x+y)^2} = \frac{x^2-y^2}{(x+y)^2} = \frac{\cancel{(x+y)}(x-y)}{(x+y)^{\cancel{2}}} = \frac{x-y}{x+y}$$

$$\frac{1}{P^2-Q^2} = \frac{1}{\frac{x-y}{x+y}} = \frac{x+y}{x-y}$$

PART – III

29. A = {1, 2, 3, 4, 5, 6, 7} B = {2, 3, 5, 7} C = {2}

A × (B – C) = (A × B) – (A × C)

B – C = {2, 3, 5, 7} – {2} = {3, 5, 7}

A × (B – C) = {1, 2, 3, 4, 5, 6, 7} × {3, 5, 7}

= {(1, 3), (1, 5), (1, 7), (2, 3), (2, 5), (2, 7), (3, 3), (3, 5), (3, 7), (4, 3), (4, 5), (4, 7), (5, 3), (5, 5), (5, 7), (6, 3), (6, 5), (6, 7), (7, 3), (7, 5), (7, 7)} ----- (1)

(A×B) = {1, 2, 3, 4, 5, 6, 7} × {2, 3, 5, 7}

= {(1, 2), (1, 3), (1, 5), (1, 7), (2, 2), (2, 3), (2, 5), (2, 7), (3, 2), (3, 3), (3, 5), (3, 7), (4, 2), (4, 3), (4, 5), (4, 7), (5, 2), (5, 3), (5, 5), (5, 7), (6, 2), (6, 3), (6, 5), (6, 7), (7, 2), (7, 3), (7, 5), (7, 7)}

(A × C) = {1, 2, 3, 4, 5, 6, 7} × {2}

= {(1, 2), (2, 2), (3, 2), (4, 2), (5, 2), (6, 2), (7, 2)}

(A×B) – (A×C) = {(1, 3), (1, 5), (1, 7), (2, 3), (2, 5), (2, 7), (3, 3), (3, 5), (3, 7), (4, 3), (4, 5), (4, 7), (5, 3), (5, 7), (6, 3), (6, 5), (7, 3), (7, 5), (7, 7)} ----- (2)

(1) and (2) we get,

A × (B – C) = (A × B) – (A × C)

30. i) In an A.P first term a, and common difference d.

Let $t_l = x$, $t_m = y$, $t_n = z$

$a + (l - 1)d = x$ ----- (1)

$a + (m - 1)d = y$ ----- (2)

$a + (n - 1)d = z$ ----- (3)

$x(m - n) + y(n - l) + z(l - m)$

$= [a+(l-1)d(m-n)] + [a+(m-1)d(n-l)] + [a+(n-1)d(l-m)]$

$= a[(m-n) + (n-l) + (l-m)] + d[(m-n)(l-1) + (n-l)(m-1) + (l-m)(n-1)]$

$= a[0] + d(lm - nl - m + n + mn - lm - n + l + ln - mn - l + m]$

$= a(0) + d(0) = 0$

ii) $a+(l-1)d = x$ ----- (1)

$a+(m-1)d = y$ ----- (2)

$(-)\quad(-) = (-)$

$(l-m)d = x-y$ ----- (4)

$x-y = (l-m)d$

$a+(m-1)d = y$ ----- (2)

$a+(n-1)d = z$ ----- (3)

$(-)\quad(-) = (-)$

$(m-n)d = y-z$

$y-z = (m-n)d$ ----- (5)

$a+(l-1)d = x$ ----- (1)

$a+(n-1)d = z$ ----- (3)

$(-)\quad(-) = (-)$

$(n-l)d = z-x$

$z-x = (n-l)d$ ----- (6)

(4), (5), (6) we get

$(x-y)n + (y-z)l + (z-x)m = [(l-m)n + (m-n)l + (n-l)m]d$

$= (ln - mn + lm - nl + nm - lm)d$

$= 0$

31. An A.P. first term a and common difference d.

$\therefore t_n = a + (n-1)d$

$t_6 = a+(6-1)d = a+5d$

$t_8 = a+(8-1)d = a+7d$

Given $\frac{t_6}{t_8} = \frac{7}{9} = \frac{a+5d}{a+7d} = \frac{7}{9}$

$9(a+5d) = 7(a+5d)$

$9a+45d = 7a+49d$

$2a = 4d$

$a = 2d$

9^{th} term $t_9 = a+(9-1)d = a+8d$

13^{th} term $t_{13} = a+13-1)d = a+12d$

$$\frac{t_9}{t_{13}} = \frac{a+8d}{a+12d} = \frac{2d+8d}{2d+12d} = \frac{10d}{14d} = \frac{5}{7}$$

$$\frac{t_9}{t_{13}} = \frac{5}{7}$$

$t_9 : t_{13} = 5:7$

$$\beta + \alpha = -\frac{a}{7}$$

$$2\beta = \frac{-13}{7} - \frac{a}{7} = \frac{-13-a}{7}$$

$$\beta = \frac{-(13+a)}{14}$$

β in (2)

$$\alpha - \left(\frac{13+a}{14}\right) = -\frac{a}{7}$$

$$\alpha = -\frac{a}{7} + \frac{13+a}{14}$$

$$= \frac{-2a+13+a}{14} = \frac{13-a}{14}$$

$$(3) \Rightarrow \frac{13-a}{14} \times \frac{-(13+a)}{14} = \frac{2}{7}$$

$$\frac{-(13^2-a^2)}{14 \times 14} = \frac{2}{7}$$

$$-(169 - a^2) = \frac{2}{7} \times 14 \times 14$$

$$169 + a^2 = 56$$

$$a^2 = 56 + 169 = 225$$

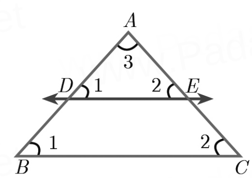
$$a = \pm 15$$

$\therefore$ The required value of a is (–15, 15)

35. **Thales Theorem.**

Statement:

A straight line drawn parallel to a side of triangle intersecting the other two sides, divides the sides in the same ratio.



Proof: Given In ABC, D is a point on AB and E is a point on AC.

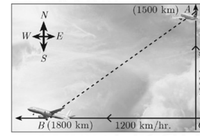
To prove $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Draw a line DE || BC.

No	Statement	Reason
1.	$\angle ABC = \angle ADE = \angle 1$	Corresponding angles are equal because DE || BC
2.	$\angle ACB = \angle AED = \angle 2$	Corresponding angles are equal because DE || BC
3.	$\angle DAE = \angle BAC = \angle 3$	Both triangle have a common angle.
4.	$\Delta ABC \sim \Delta ADE$	By AAA Similarity.
	$\frac{AB}{AD} = \frac{AC}{AE}$	Corresponding sides are proportional.
	$\frac{AD+DB}{AD} = \frac{AE+EC}{AE}$	Split AB and AC using the points D and E.
	$1+\frac{DB}{AD} = 1+\frac{EC}{AE}$	On Simplification.
	$\frac{DB}{AD} = \frac{EC}{AE}$	Canceling 1 on both side.
	$\frac{AD}{DB} = \frac{AE}{EC}$	Taking reciprocals.

Hence proved.

36. Let the first aeroplane start from O and goes upto A towards worth at a speed 1000km/hr



Speed = $\dfrac{Distance}{time}$

Distance = Speed × time

OA = 1000 × 1½ = 1000 × $\dfrac{3}{2}$ = 1500 km

Let the second aeroplane start from O at the same time and goes up to B towards west at a speed 1200 km/hr.

OB = 1200×1½ = 1200 × $\dfrac{3}{2}$ = 1800 km

AB is the distance between the two aeroplane after 1½ hour.

OA = 1500 km OB = 1800 km

$AB^2 = OA^2+OB^2 = 1500^2 + 1800^2 = 100^2\ (15^2+18^2) = 100^2 \times 549 = 100^2 \times 9 \times 61$

$AB = 100 \times 3 \times \sqrt{61} = 300\sqrt{61}$ km

---

37. The Vertices of the quadrilateral ABCD A(–4, –2), B(5, –1), C(6, 5) and D (–7, 6)

Let P, Q, R, S are the mid points of the side AB, BC, CD, AD.

Midpoint of AB = $\left(\dfrac{-4+5}{2}, \dfrac{-2-1}{2}\right) = \left(\dfrac{1}{2}, \dfrac{-3}{2}\right)$

Midpoint of BC = $\left(\dfrac{5+6}{2}, \dfrac{-1+5}{2}\right) = \left(\dfrac{11}{2}, \dfrac{4}{2}\right) = \left(\dfrac{11}{2}, 2\right)$

Midpoint of CD = $\left(\dfrac{6-7}{2}, \dfrac{5+6}{2}\right) = \left(\dfrac{-1}{2}, \dfrac{11}{2}\right)$

Midpoint of AD = $\left(\dfrac{-4-7}{2}, \dfrac{-2+6}{2}\right) = \left(\dfrac{-11}{2}, \dfrac{4}{2}\right) = \left(\dfrac{-11}{2}, 2\right)$

Slope of PQ $= \dfrac{\frac{-3}{2}-2}{\frac{1}{2}-\frac{11}{2}} = \dfrac{\frac{-3-4}{2}}{\frac{1-11}{2}}$

$= \dfrac{7}{10}$ ----- (1)

Slope of RS $= \dfrac{\frac{11}{2}-2}{\frac{-1}{2}+\frac{11}{2}} = \dfrac{\frac{11-4}{2}}{\frac{-1+11}{2}}$

$= \dfrac{7}{10}$ ----- (3)

Slope of QR $= \dfrac{2-\frac{11}{2}}{\frac{11}{2}+\frac{1}{2}} = \dfrac{\frac{4-11}{2}}{\frac{12}{2}}$

$= -\dfrac{7}{12}$ ----- (2)

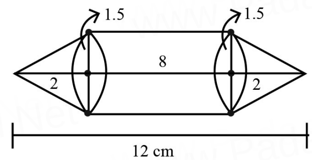
Slope of PS $= \dfrac{\frac{-3}{2}-2}{\frac{1}{2}+\frac{11}{2}} = \dfrac{\frac{-3-4}{2}}{\frac{12}{2}}$

$= -\dfrac{7}{12}$ ----- (4)

From (1) and (2)

Slope of PQ = Slope of RS

40. Let r be the common radius, h_1 and h_2 be the height of the cone and the cylinder.



Diameter of model = 3 cm

radius of model (r) = $\frac{3}{2}$ cm

h_1 = 2 cm, Total height = 12 cm

$h_2 = 12 - (2 + 2) = 12 - 4 = 8$ cm

Volume of model = Volume of cylinder + 2×Volume of the cone

$= \pi r^2 h_2 + 2\times \pi r^2 h_1 = \pi r^2 + (h_2 + \frac{2}{3} h_1)$

$= \frac{22}{7}\times\left(\frac{3}{2}\right)^2\times\left(8+\frac{2}{3}\times 2\right) = \frac{22}{7}\times\frac{9}{4}\times\frac{28}{3}$

$= 66 \text{ cm}^3$

Volume of the mode = 66 cm^3

41. Total number of students n(S) = 50

Let A and B be the events of students opted for NCC and NSS respectively.

$n(A) = 28,\quad n(B) = 30,\quad n(A\cap B) = 18$

$P(A) = \frac{n(A)}{n(S)} = \frac{28}{50}\qquad P(B) = \frac{n(B)}{n(S)} = \frac{30}{50}\qquad P(A\cap B) = \frac{n(A\cap B)}{n(S)} = \frac{18}{50}$

i) Probability of the students opted for NCC but not NSS

$P(A\cap \overline{B}) = P(A) - P(A\cap B) = \frac{28}{50} - \frac{18}{50} = \frac{10}{50} = \frac{1}{5}$

ii) Probability of the students opted for NSS but not NCC

$P(\overline{A}\cap B) = P(B) - P(A\cap B) = \frac{30}{50} - \frac{18}{50} = \frac{}{25}$

iii) Probability of the students opted for exactly one of them

$= P[(A\cap\overline{B})\cup(\overline{A}\cap B)] = P(A\cap\overline{B})\cup P(\overline{A}\cap B) = \frac{1}{5} + \frac{6}{25} = \frac{11}{25}$

42. Let the equation of line be

$\frac{x}{a}+\frac{y}{b} = 1$

then a = b + 5

$\therefore \frac{x}{b+5}+\frac{y}{b} = 1$

It passes through (22, –6)

$\frac{22}{b+5}-\frac{6}{b} = 11$

$22b - 6b - 30 = b^2 + 5b$

$b^2 - 11b + 30 = 0$

b = 5 or 6

When b = 5 then a = 5+5 = 10

When b = 6 then a = 6+5 = 11

∴ a = 10, 11

equation of line

$\frac{x}{10}+\frac{y}{5} = 1$

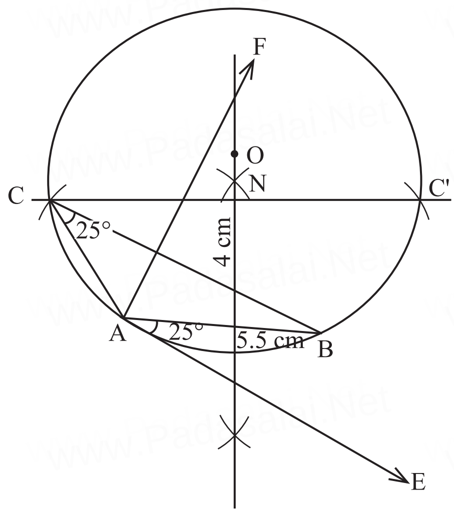
$x + 2y - 10 = 0$

$\frac{x}{11}+\frac{y}{6} = 1$

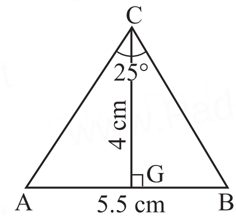
$6x + 11y = 66$

PART IV

43. a)



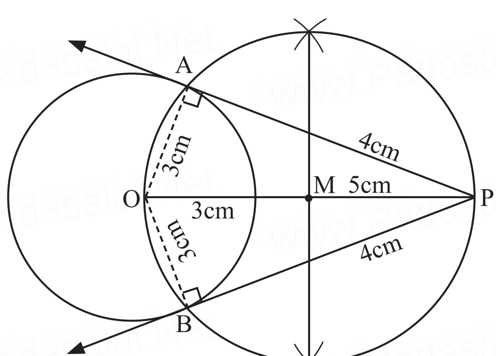
Rough Diagram



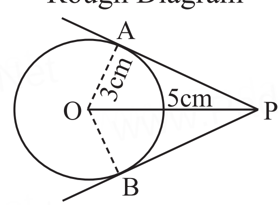
Steps of construction:

1. Draw a line segment AB = 5.5 cm
2. At A, draw AE such that ∠BAE = 25°
3. At A, draw AF such that ∠EAF = 90°
4. Draw the perpendicular bisector XY to AB intersects AF at O & AB at G.
5. With O as centre and OA as radius draw a circle.
6. XY intersects AB at G. On XY, From G mark arc M such taht GM = 4 cm
7. Draw PQ, through M parallel to AB. Meets the circle at C and D.
8. Join AC, BC. Then ΔABC is the required Δ.

43. b)



Rough Diagram



Steps of Construction:

1. With centre at O, draw a circle of radius 3cm with centre at O.
2. Draw a line OP = 5 cm.
3. Draw a perpendicular bisector of OP, which cuts OP at M.
4. With M as centre and OM as radius, draw a circle which cuts previous circle at A and B.

X	0	1	2	3	4	5
Y	–6	–4	–2	0	2	4

The line y = $2x – 6$ intersect y = $x^2 – 4x + 3$ only at one point.

Step 3: Mark the point of intersection of the curve y = $x^2 – 4x + 3$ and y = $2x – 6$ that is (3, 0)

Therefore the X coordinate 3 is the only solution for the equation $x^2 – 6x + 9 = 0$

44. b)

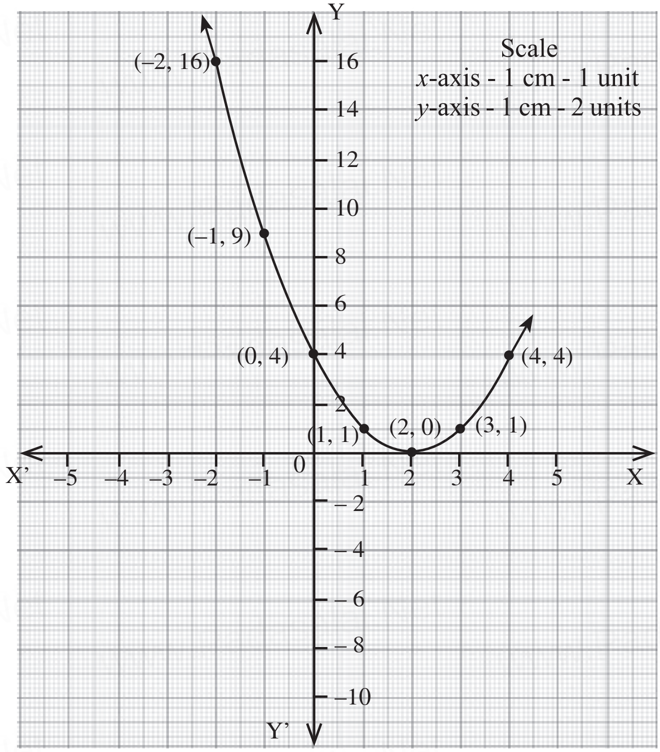


Table:

x	–2	–1	0	1	2	3	4
x^2	4	1	0	1	4	9	16
$–4x$	8	4	0	–4	–8	–12	–16
+4	4	4	4	4	4	4	4
y = x^2–$4x$+4	16	9	4	1	0	1	4

Plot the points (–2, 16), (–1, 9), (0, 4), (1,1), (2, 0), (3,1), (4, 4) on the graph.

Join all the points by a free-hand smooth curve, This curve as the graph of y = x^2–$4x$+4

Here, the curve meets x axis at (2, 0)

∴ The x – co ordinates of the points is $x = 2$.

∴ Solution = {2, 2}

❖✸❖✸❖✸

Govt. QUESTION PAPER - Aug. 2022

Question Paper 11

CLASS: X **MATHEMATICS**

Time allowed: 3 Hours | Max. Marks: 100

PART - I

Note: (i) Answer all the questions. **14×1=14**

(ii) Choose the most suitable answer from the given four alternative and write the option code and the corresponding answer.

1. **If there are 1024 relations from a set A = {1, 2, 3, 4, 5} to set B, then the number of elements in B is:**
   a) 3 b) 2 c) 4 d) 8

2. **The range of the relation R = {(x, x^2)/x is a Prime number less than 13} is :**
   a) {2, 3, 5, 7} b) {2, 3, 5, 7, 11} c) {4, 9, 25, 49, 121} d) {1, 4, 9, 25, 49, 121}

3. **The sum of the exponents of the Prime factors in the Prime factorization of 1729 is :**
   a) 1 b) 2 c) 3 d) 4

4. **A system of three linear equations in the three variables is inconsistent if their planes:**
   a) Intersect only at a point b) Intersect in a line
   c) Coincide with each other d) Do not intersect

5. **The solution of the system $x + y - 3z = -6$, $-7y + 7z = 7$, $3z = 9$ is :**
   a) x=1, y=2, z=3 b) x=–1, y=2, z=3 c) x=–1, y=–2, z=3 d) x=1, y=–2, z=3

6. $y^2 + \frac{1}{y^2}$
   a) $\frac{y^4+1}{y^2}$ b) $\left[y+\frac{1}{y}\right]^2$ c) $\left[y+\frac{1}{y}\right]^2+2$ d) $\left(y+\frac{1}{y}\right)^2-2$

7. **If ΔABC DE || BC, AB = 3.6 cm, AC = 2.4 cm and AD = 2.1 cm then, the length of AE is :**
   a) 1.4 cm b) 1.8 cm c) 1.2 cm d) 1.05 cm

8. **How many tangents can be drawn to the circle from an exterior point?**
   a) one b) two c) infinite d) zero

9. **The point of intersection of $3x - y = 4$ and $x + y = 8$ is :**
   a) (5, 3) b) (2, 4) c) (3, 5) d) (4, 4)

10. **In slope of the line PQ is $\frac{1}{\sqrt{3}}$ then, slope of the perpendicular bisector of PQ is :**
    a) $\sqrt{3}$ b) $-\sqrt{3}$ c) $\frac{1}{\sqrt{3}}$ d) 0

PART - III

Answer any 10 questions. Question No. 42 is compulsory. **10×5=50**

29. Represent the given relation by :
i) an arrow diagram ii) a graph and
iii) a set in roster form, wherever possible $\{(x, y) / y = x+3, x, y$ are natural number < 10
30. Find the largest number which divides 1230 and 1926 leaving remainder 12 in each case.
31. If nine times ninth term is equal to fifteen times fifteenth term show that six times twenty fourth term is zero.
32. Simplify: $\frac{b^2+3b-28}{b^2+4b+4} \div \frac{b^2-49}{b^2-5b-14}$
33. Find the square root of $x^4 - 12x^3 + 42x^2 - 36x + 9$.
34. Solve: $x^2 + 2x - 2 = 0$ by Formula method.
35. State and prove Angle Bisector Theorem.
36. A man goes 18 m due east and then 24 m due north. Find the distance of his current position from the starting point?
37. Find the area of the quadrilateral formed by the points (8, 6), (5, 11), (–5, 12) and (–4, 3).
38. To a man standing outside his house, the angles of elevation of the top and bottom of a window are 60° and 45° respectively. If the height of the man is 180 cm and if he is 5 m away from the wall. What is the height of the window? ($\sqrt{3} = 1.732$)
39. A cylindrical drum has a height of 20 cm and base radius of 14 cm. Find its curved surface area and the total surface area.
40. If the circumference of conical wooden piece is 484 cm then, find its volume when its height is 105 cm.
41. Two unbiased dice are rolled once. Find the probability of getting :
i) A doublet (equal numbers on both dice) ii) The product as a Prime number
iii) The sum as a Prime number iv) The sum as 1.
42. A Cat is located at the point (6, 4) in xy plane. A bottle of milk is kept at (–5, –11). The Cat wishes to consume the milk travelling through shortest possible distance. Find the equation of the path it needs to take its milk.

PART - IV

Answer all the questions. **2×8=16**

43. a) Construct a triangle similar to a triangle PQR with its sides equal to $\frac{7}{3}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{7}{3} > 1$)

(OR)

b) Draw a circle of diameter 6 cm. From a point P, which is 8 cm away from its centre, draw the two tangents PA and PB to the circle and measure their lengths.

44. a) Draw the graph of $x^2 - 9x + 20$ and state the nature of their solution.

(OR)

b) Draw the graph of $y = x^2 - 4x + 3 = 0$ and use it to solve $x^2 - 6x + 9 = 0$.

***

ANSWERS **Govt. Question Paper - Aug. 2022** **Question Paper 11**

PART - I

1. b) 2
2. c) {4, 9, 25, 49, 121}
3. c) 3
4. d) Do not intersect
5. a) x=1, y=2, z=3
6. b) $\left[y+\frac{1}{y}\right]^2$
7. a) 1.4 cm
8. b) two
9. c) (3, 5)
10. b) $-\sqrt{3}$
11. a) a) $\frac{h(1+\tan\beta)}{1-\tan\beta}$ 1 tan
12. b) 1 : 4
13. c) 3π
14. b) $\frac{7}{10}$

PART - II

15. A × B = {(3, 2), (3, 4), (5, 2), (5, 4)}

A = {Set of all first co-ordinates of elements of A×B} $\therefore$ A = {3, 5}

B = {Set of all second co-ordinates of elements of A×B} $\therefore$ B = {2, 4}

$\therefore$ A = {3, 5} B = {2, 4}

16. Given A = {5, 6}, B = {4, 5, 6}, C = {5, 6, 7}

LHS: A × A = {5, 6} × {5, 6}

= {(5, 5), (5, 6), (6, 5), (6, 6)} ----- (1)

RHS: (B × B) $\cap$ (C × C)

B × B = {4, 5, 6} × {4, 5, 6}

= {(4, 4), (4, 5), (4, 6), (5, 4), (5, 5), (5, 6), (6, 4), (6, 5), (6, 6)}

C × C = {5, 6, 7} × {5, 6, 7}

= {(5, 5), (5, 6), (5, 7), (6, 5), (6, 6), (6, 7), (7, 5), (7, 6), (7, 7)}

$\therefore$ (B × B) $\cap$ (C × C)

= {(5, 5), (5, 6), (6, 5), (6, 6)} ----- (2)

$\therefore$ From (1) and (2) LHS = RHS.

17. The required number = L.C.M of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

$2 = 2 \times 1$ $3 = 3 \times 1$

$4 = 2 \times 2 = 2^2$ $5 = 5 \times 1$

$6 = 2 \times 3$ $7 = 7 \times 1$

$8 = 2 \times 2 \times 2 = 2^3$ $9 = 3 \times 3 = 3^2$

$10 = 2 \times 5$

$\therefore$ L.C.M. = 23 × 32 × 5 × 7 = 8 × 9 × 5 × 7 = 2520

18. –11, –15, –19, ...

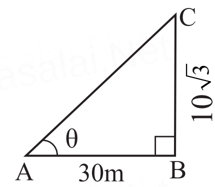
a = –11; d = –15 – (–11) = –15 + 11 = –4

t_n = a + (n–1)d

23. Given points are $\left(5, \sqrt{5}\right)$ and (0, 0); Slope = m

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - \sqrt{5}}{0 - 5} \Rightarrow \frac{\sqrt{5}}{5} = \frac{1}{\sqrt{5}}$$

24. In ΔABC, $\tan\theta = \dfrac{\textit{opposite side}}{\textit{adjacent side}}$



$$\tan\theta = \frac{10\sqrt{3}}{30}$$

$$\tan\theta = \frac{\sqrt{3}}{3} = \frac{\sqrt{3}}{\sqrt{3}\sqrt{3}} = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30^\circ$$

25. Total Surface Area = 704 cm^2

$$\pi r(l + r) = 704$$

$$\frac{22}{\cancel{7}} \times \cancel{7}(l + 7) = 704$$

$$l + 7 = \frac{704}{22} = \frac{64}{2} = 32$$

$l + 7 = 32$, $l = 32 - 7 = 25$ cm.

Therefore, slant height of the cone is 25 cm.

26. r : h = 5 : 7 $\Rightarrow$ r = 5x cm; h = 7x cm; CSA = 5500 sq.cm

$$2\pi rh = 5500 \Rightarrow 2 \times \frac{22}{7} \times 5x \times 7x = 5500$$

$$x^2 = \frac{5500}{2 \times 22 \times 5} = 25 \Rightarrow x = 5$$

Hence, Radius = 5 × 5 = 25 cm; Height = 7 × 5 = 35 cm.

27. S = {5 Red, 6 White, 7 Green, 8 Black}

n(S) = 26

i) A - probability of getting White Balls

$$n(A) = 6; \quad P(A) = \frac{6}{26} = \frac{3}{13}$$

ii) B - Probability of getting Black (or) Red Balls

$$n(B) = 8 + 5 = 13; \; P(B) = \frac{13}{26} = \frac{1}{2}$$

28. $x^2 - 4x - 12 = 0$

$(x - 6)(x + 2) = 0$

$x - 6 = 0$; $x + 2 = 0$

$x = 6$; $x = -2$ $\Rightarrow x = (6, -2)$

34. Compare $x^2 + 2x - 2 = 0$ with the standard form $ax^2 + bx + c = 0$

a = 1, b = 2, c = –2

Substituting the values of a, b and c in the formula we get,

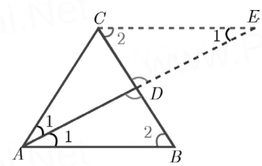
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \Rightarrow \frac{2 \pm \sqrt{(2)^2 - 4(1)(-2)}}{2(1)} = \frac{-2 \pm \sqrt{4+8}}{2}$$

$$= \frac{-2 \pm \sqrt{12}}{2} = \frac{-2 \pm 2\sqrt{3}}{2} = -1 \pm \sqrt{3} \quad \text{Therefore, } x = -1+\sqrt{3},\ x = -1-\sqrt{3}$$

35. **Statement:**

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the corresponding sides containing the angle.

Proof:



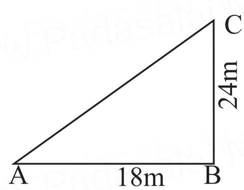
Given: In ΔABC, AD is the internal bisector

To Prove: $\frac{AB}{AC} = \frac{BD}{CD}$

Construction: Draw a line through C parallel to AB. Extend AD to meet line through C at E

No.	Statement	Reason
1.	$\angle AEC = \angle BAE = \angle 1$	Two parallel lines cut by a transversal make alternate angles equal.
2.	ΔACE is isosceles AC = CE ---- (1)	In ΔACE $\angle CAE = \angle CEA$
3.	$\Delta ABD \sim \Delta ECD$ $\frac{AB}{CE} = \frac{BD}{CD}$	By AA Similarity
4.	$\frac{AB}{AC} = \frac{BD}{CD}$	From (1) AC = CE. Hence Proved.

36. In ΔABC, $AC^2 = AB^2 + BC^2$



$AC^2 = (18)^2 + (24)^2 = 324 + 576$

$AC^2 = 900$

$AC = \sqrt{900} \Rightarrow AC = 30$ m

$\therefore$ The distance from the starting point is 30 m

37. Before determining the area of the quadrilateral, plot the vertices in a graph A (8, 6), B (5, 11), C (–5, 12) and D (–4, 3).

Therefore, area of the quadrilateral ABCD

$$\frac{1}{2}\left|\begin{array}{cc} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_4 & y_4 \\ x_1 & y_1 \end{array}\right| = \frac{1}{2}\left|\begin{array}{cc} 8 & 6 \\ 5 & 11 \\ -5 & 12 \\ -4 & 3 \\ 8 & 6 \end{array}\right|$$

$= \frac{1}{2}[(88 + 60 - 15 - 24) - (30 - 55 - 48 + 24)] = \frac{1}{2}[88 + 60 - 15 - 24 - 30 + 55 + 48 - 24]$

$= \frac{1}{2}[88 + 60 + 55 + 48 - 15 - 24 - 30 - 24] \quad = \frac{1}{2}[251 - 93]$

$= \frac{1}{2}[158] = 79$ sq.units.

38. In figure, AC - A man Standing; EF - Window; DF - House

From the figure,

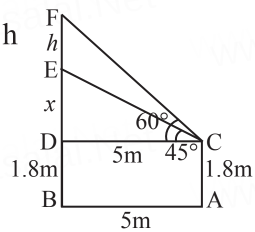
EF = h; ED = x; DF = x + h

In ΔCDE,

$\tan 45° = \frac{DE}{DC} \Rightarrow 1 = \frac{x}{5}$

$\Rightarrow \quad x = 5$

In ΔCDF,



$\tan 60° = \frac{DF}{DC} \Rightarrow \sqrt{3} = \frac{h+x}{5}$

$\Rightarrow h + x = \sqrt{3}(5) \Rightarrow h = (5 \times \sqrt{3}) - 5$

$= 5[\sqrt{3} - 1] = 5[1.732 - 1]$

$= 5[0.732] = 3.66$ m

Hence, Height of the window = 3.66 m

39. Given that, height of the cylinder h = 20 cm; radius r = 14 cm

Now, C.S.A. of the cylinder $= 2\pi rh$ sq. units

C.S.A. of the cylinder $= 2 \times \frac{22}{7} \times 14 \times 20 = 2 \times 22 \times 2 \times 20$

$= 1760 \text{ cm}^2$

T.S.A. of the cylinder $= 2\pi r(h + r)$ sq. units

$= 2 \times \frac{22}{7} \times 14 \times (20 + 14) = 2 \times \frac{22}{7} \times 14 \times 34$

$= 2992 \text{ cm}^2$

Therefore, C.S.A. = 1760 cm^2 and T.S.A. = 2992 cm^2

40. Given in cone, height = 105 cm; circumference = 484 cm

$\Rightarrow \quad 2\pi r = 484$

$\Rightarrow 2 \times \frac{22}{7} \times r = 484$

$r = \frac{484 \times 7}{2 \times 22} = 77\text{cm}$

$\therefore$ Volume of the cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 77 \times 77 \times 105$

$= 652190 \text{ cm}^3$

41. S = {(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,1), (3,2), (3,3), (3,4), (3,5), (3,6), (4,1), (4,2), (4,3), (4,4), (4,5), (4,6), (5,1), (5,2), (5,3), (5,4), (5,5), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)}; n(S) =36

i) Let A = a doublet (equal numbers on both dice)

A = {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}; n(A) = 6 $\quad P(A) = \frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

ii) Let B = the product as a prime number

B = {(1, 2), (1, 3), (1, 5), (2, 1), (3, 1), (5, 1)}; n(B) = 6 $\quad P(B) = \frac{n(B)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

44. $x^2 - 9x + 20 = 0$

Table:

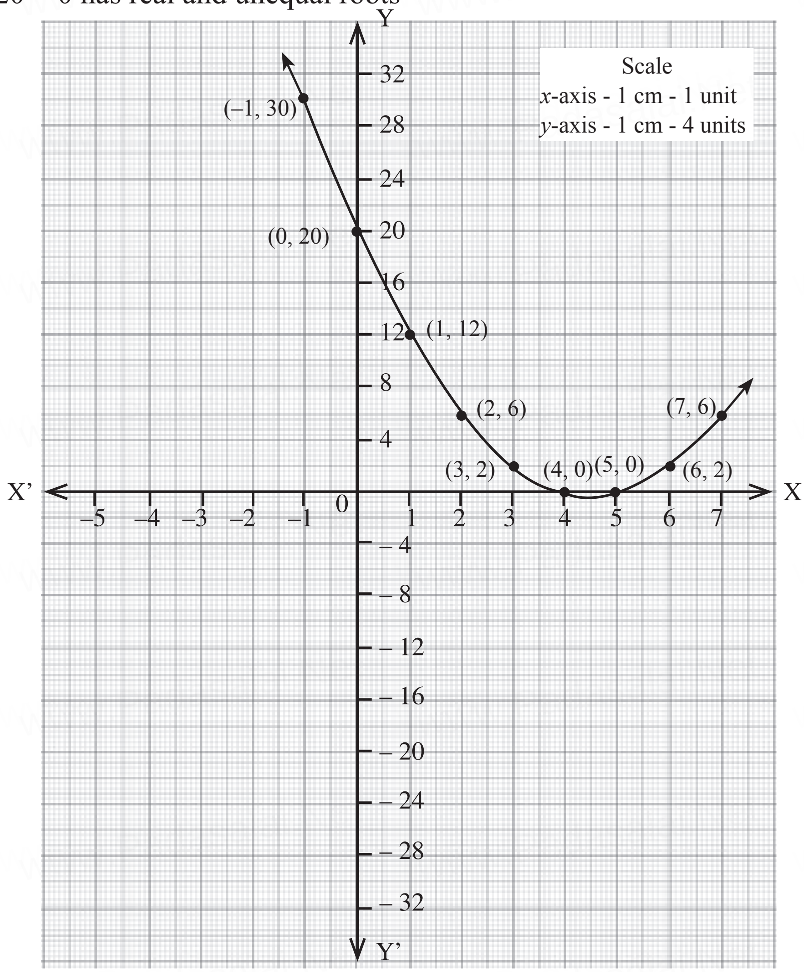
x	–4	–3	–2	–1	0	1	2	3	4	5
x^2	16	9	4	1	0	1	4	9	16	25
$-9x$	36	27	18	9	0	–9	–18	–27	–36	–45
+20	20	20	20	20	20	20	20	20	20	20
y	72	56	42	30	20	12	6	2	0	0

Points: (–4, 72), (–3, 56), (–2, 42), (–1, 30), (0, 20), (1,12), (2, 6), (3,2), (4, 0)

Point of intersection of Parabola at *x* axis: (4, 0) and (5, 0). X - Coordinates are 4 and 5.

Solution:

Since there are two points of intersection with the *x*-axis, the quadratic equation $x^2 - 9x + 20 = 0$ has real and unequal roots



b) **Refer Govt. Question Paper - May 2022 - Question Paper - 10 - Q.No. 44 (a).**

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