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COMMON QUARTERLY EXAMINATION - 2023

Standard X

Reg.No.

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MATHEMATICS

Time : 3.00 hrs

Part - I

Marks : 100

1. Choose the correct answer:

14 x 1 = 14

- 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
 - 3
 - 2
 - 4
 - 8
- $n(A) = p$, $n(B) = q$, then $n(A \times B) =$ _____
 - $p + q$
 - $p - q$
 - $p \times q$
 - $\frac{p}{q}$
- $7^{4k} \equiv$ _____ (mod 100)
 - 1
 - 2
 - 3
 - 4
- $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \dots$ The next term of the sequence is
 - $\frac{1}{24}$
 - $\frac{1}{27}$
 - $\frac{2}{3}$
 - $\frac{1}{81}$
- $y^2 + \frac{1}{y^2}$ is not equal to
 - $\frac{y^4 + 1}{y^2}$
 - $\left(y + \frac{1}{y}\right)^2$
 - $\left(y - \frac{1}{y}\right)^2 + 2$
 - $\left(y + \frac{1}{y}\right)^2 - 2$
- The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to
 - $\frac{16}{5} \left| \frac{x^2z^4}{y^2} \right|$
 - $16 \left| \frac{y^2}{x^2z^4} \right|$
 - $\frac{16}{5} \left| \frac{y}{xz^2} \right|$
 - $\frac{16}{5} \left| \frac{xz^2}{y} \right|$
- Graph of a linear polynomial is a
 - straight line
 - circle
 - parabola
 - hyperbola
- In $\triangle LMN$ $\angle L = 60^\circ$, $\angle M = 50^\circ$, if $\triangle LMN \sim \triangle PQR$ then the value of $\angle R$ is
 - 40°
 - 70°
 - 30°
 - 110°
- If in $\triangle ABC$, $DE \parallel BC$, $AB = 3.6$ cm, $AC = 2.4$ cm and $AD = 2.1$ cm, then the length of AE is
 - 1.4 cm
 - 1.8 cm
 - 1.2 cm
 - 1.05 cm
- The area of triangle formed by the points $(-5, 0)$, $(0, -5)$, $(5, 0)$ is
 - 0 sq. units
 - 25 sq. u
 - 5 sq. u
 - none of these
- If $(5, 7)$, $(3, p)$ and $(6, 6)$ are collinear, then the value of p is
 - 3
 - 6
 - 9
 - 12

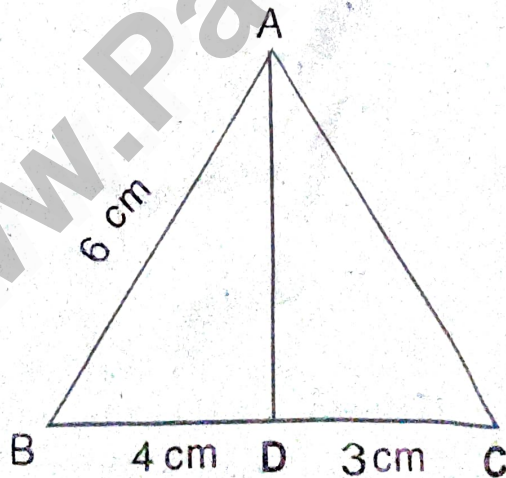
- 2
12. A sequence is a function defined on the set of _____
 a) real numbers b) natural numbers
 c) whole numbers d) integers
13. Value of $\tan\theta \operatorname{cosec}^2\theta - \tan\theta$
 a) $\sec\theta$ b) $\cot^2\theta$ c) $\sin\theta$ d) $\cot\theta$
14. $5x = \sec\theta$, $\frac{5}{x} = \tan\theta$. If $x^2 - \frac{1}{x^2}$ is equal to
 a) 25 b) $\frac{1}{25}$ c) 5 d) 1

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory)

10 x 2 = 20

15. $B \times A = \{(-2,3), (-2,4), (0,3), (0,4), (3,3), (3,4)\}$, find A and B.
16. Find fog and gof when $f(x) = 2x + 1$ and $g(x) = x^2 - 2$
17. Find the number of terms in the A.P 3,6,9,12 111
18. Find the sum of $2 + 4 + 6 + \dots + 80$
19. Find the LCM of $5x - 10$, $5x^2 - 20$
20. Find the excluded value of the following expression $\frac{t}{t^2 - 5t + 6}$
21. Determine the nature of the roots of the quadratic equation $9x^2 - 24x + 16 = 0$
22. AD is the bisector of $\angle A$. If $BD = 4$ cm, $DC = 3$ cm and $AB = 6$ cm, find AC



23. If $\triangle ABC$ is similar to $\triangle DEF$ such that $BC = 3$ cm, $EF = 4$ cm and area of $\triangle ABC = 54 \text{ cm}^2$.
 Find the area of $\triangle DEF$.
24. Show that the points $P(-1.5,3)$, $Q(6,-2)$, $R(-3,4)$ are collinear.
25. Find the slope of the line joining the points $(5, \sqrt{5})$ with the origin.

26. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

27. Solve $2x^2 - 3x - 3 = 0$ by formula method.

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

Part - III

III. Answer any 10 questions. (Q.No.42 is compulsory)

10 x 5 = 50

29. Let $A = \{3, 4, 7, 8\}$, $B = \{1, 7, 10\}$ which of the following sets are relations from A to B?

i) $R_1 = \{(3, 7), (4, 7), (7, 10), (8, 1)\}$

ii) $R_2 = \{(3, 1), (4, 12)\}$

iii) $R_3 = \{(3, 7), (4, 10), (7, 7), (7, 8), (8, 11), (8, 7), (8, 10)\}$

30. If the function f is defined by $f(x) = \begin{cases} x+2 & ; & x > 1 \\ 2 & ; & -1 \leq x \leq 1 \\ x-1 & ; & -3 < x < -1 \end{cases}$, find the values of

i) $f(3)$

ii) $f(0)$

iii) $f(-1.5)$

iv) $f(2) + f(-2)$

31. The ratio of 6th and 8th term of an A.P is 7 : 9. Find the ratio of 9th and 13th term.

32. Find the sum to n terms of the series

$$5 + 55 + 555 + \dots$$

33. If $1^3 + 2^3 + 3^3 + \dots + k^3 = 44100$, then find $1 + 2 + 3 + \dots + k$

34. Find the GCD of the polynomial $x^3 + x^2 - x + 2$ and $2x^3 - 5x^2 + 5x - 3$

35. State and prove Basic proportionality theorem.

36. Find the square root of $x^4 - 12x^3 + 42x^2 - 36x + 9$

37. Find the area of the quadrilateral whose vertices are $(-9, -2)$, $(-8, -4)$, $(2, 2)$ and $(1, -3)$

38. Without using Pythagoras theorem, show that the points $(1, -4)$, $(2, -3)$, $(4, -7)$ form a right angled triangle.

39. If $\sin\theta + \cos\theta = p$ and $\sec\theta + \operatorname{cosec}\theta = q$, then prove that $q(p^2 - 1) = 2p$

40. Let $f:A \rightarrow B$ be a function defined by $f(x) = \frac{x}{2} - 1$ where $A = \{2, 4, 6, 10, 12\}$,

$B = \{0, 1, 2, 4, 5, 9\}$ represent f by

i) set of ordered pairs

ii) table

iii) an arrow diagram

iv) a graph

41. Find the sum of all natural numbers between 300 and 600 which are divisible by 7.

42. Solve*: $\sqrt{y+1} + \sqrt{2y-5} = 3$

Part - IV

IV. Answer all the questions.

2 × 8 = 16

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{2}{3}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{2}{3}$)

(OR)

- b) Construct a triangle PQR such that QR = 5 cm, $\angle P = 30^\circ$ and the altitude from P to QR is of length 4.2 cm.
44. a) Draw the graph of $xy = 24$, $x, y > 0$ using the graph
- If $x = 3$, find y
 - If $y = 6$, find x .

(OR)

- b) A Two wheeler parking zone near bus stand charges as below.

Time in hrs. (x)	4	8	12	24
Amount ₹ (y)	60	120	180	360

Check If the amount charged are in direct or inverse variation to the parking time.

- Find the amount to be paid when parking time is 6 hrs.
- Find the parking duration when the amount paid is ₹150

QUARTERLY EXAM - 202310TH - MATHS ANSWER KEYRANIPET DIST.S. SANTHOSH KUMAR,
GHS - CHETTITHANGAL,
RANIPET DIST - 632 404.I. CHOOSE THE CORRECT ANSWER :

1	(b)	2
2	(c)	$P \times Q$
3	(a)	1
4	(b)	$\frac{1}{27}$
5	(b)	$(y + \frac{1}{y})^2$
6	(d)	$\frac{16}{5} \left \frac{2x^2}{y} \right $
7	(a)	Straight line
8	(b)	70°
9	(a)	1.4 cm
10	(b)	25 Sq. Units
11	(c)	9
12	(b)	natural numbers
13	(d)	$\cot \theta$
14	(b)	$\frac{1}{25}$

(18)	$2(1+2+3+\dots+40)$ $2 \left[\frac{n(n+1)}{2} \right]$ $2 \times \left[\frac{40 \times 41}{2} \right] = 1640$
(19)	$5x-10 = 5(x-2)$ $5x^2-20 = 5(x+2)(x-2)$ $\therefore \text{LCM} = 5(x+2)(x-2)$
(20)	$t^2-5t+6=0$ $(t-3)(t-2)=0$ $t=3 \quad t=2$
(21)	$\Delta = b^2-4ac$ $\Delta = (-24)^2-4(9)(16)$ $\Delta = 0$ \therefore The roots are real and equal <div style="float: right; border: 1px solid black; padding: 5px; margin-top: 10px;"> $a=9$ $b=-24$ $c=16$ </div>
(22)	By Angle Bisector theorem, $\frac{AB}{AC} = \frac{BD}{DC}$ $\frac{6}{AC} = \frac{4}{3}$ $AC = \frac{9}{2} = 4.5 \text{ cm}$

II. ANSWER ANY 10 QUESTIONS :

(15)	$A = \{3, 4\}$ $B = \{-2, 0, 3\}$
(16)	$f \circ g = 2(x^2-2)+1 = 2x^2-3$ $g \circ f = (2x+1)^2-2 = 4x^2+4x-1$
(17)	$a=3 \quad d=6-3=3 \quad l=111$ $n = \left(\frac{l-a}{d} \right) + 1$ $= \left(\frac{111-3}{3} \right) + 1$ $n = 37$

(23)	$\frac{\text{Area}(\Delta ABC)}{\text{Area}(\Delta DEF)} = \frac{BC^2}{EF^2}$ $\frac{54}{\text{Area}(\Delta DEF)} = \frac{3^2}{4^2}$ $\text{Area}(\Delta DEF) = \frac{16 \times 54}{9} = 96 \text{ cm}^2$
(24)	$\text{Area of } \Delta PQR = \frac{1}{2} \begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$ $= \frac{1}{2} [(3+24-9) - (18+6-6)]$ $= 0$ \therefore The given points are collinear

$$(25) \text{ Slope } m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{0 - \sqrt{5}}{0 - 5} = \frac{\sqrt{5}}{5} = \frac{1}{\sqrt{5}}$$

$$(26) \frac{1 + \cos \theta}{1 - \cos \theta} = \sqrt{\frac{(1 + \cos \theta)}{(1 - \cos \theta)}} \times \frac{(1 + \cos \theta)}{(1 + \cos \theta)}$$

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

$$= \operatorname{cosec} \theta + \cot \theta$$

$$(27) a = 2 \quad b = -3 \quad c = -3$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{3 \pm \sqrt{33}}{4}$$

$$\therefore x = \frac{3 + \sqrt{33}}{4}, \quad \frac{3 - \sqrt{33}}{4}$$

$$(28) y - y_1 = m(x - x_1)$$

$$y + 4 = -\frac{5}{7}(x - 3)$$

$$5x + 7y + 13 = 0$$

III ANSWER ANY 10 QUESTIONS:

$$(29) A \times B = \{(3, 1), (3, 7), (3, 10), (4, 1), (4, 7), (4, 10), (7, 1), (7, 7), (7, 10), (8, 1), (8, 7), (8, 10)\}$$

(i) $R_1 \subseteq A \times B$
 $\Rightarrow R_1$ is a relation from A to B.

(ii) $(4, 12) \in R_2$ but $(4, 12) \notin A \times B$
 $\Rightarrow R_2$ is not a relation from A to B.

(iii) $(7, 8) \in R_3$ but $(7, 8) \notin A \times B$
 $\Rightarrow R_3$ is not a relation from A to B.

$$(30) \text{ (i) } f(3) \quad \text{(ii) } f(-1.5)$$

$$f(x) = x + 2 \quad f(x) = x - 1$$

$$f(3) = 5 \quad f(-1.5) = -2.5$$

$$\text{(ii) } f(0) \quad \text{(iv) } f(2) + f(-2) = 4 + (-3) = 1$$

$$f(x) = 2 \quad (f(x) = x + 2 \quad f(x) = x - 1)$$

$$f(0) = 2 \quad f(2) = 4 \quad f(-2) = -3$$

$$(31) t_6 : t_8 = 7 : 9 \Rightarrow \frac{t_6}{t_8} = \frac{7}{9}$$

$$\frac{a + 5d}{a + 7d} = \frac{7}{9} \quad \boxed{a = 2d}$$

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

$$(32) 5 + 55 + 555 + \dots + n \text{ terms}$$

$$5(1 + 11 + 111 + \dots + n \text{ terms})$$

$$\frac{5}{9} [9 + 99 + 999 + \dots + n \text{ terms}]$$

$$\frac{5}{9} [(10 - 1) + (100 - 1) + (1000 - 1) + \dots + n \text{ terms}]$$

$$\frac{5}{9} [(10 + 100 + 1000 + \dots + n \text{ terms}) - n]$$

$$\frac{5}{9} \left[\frac{10(10^n - 1)}{(10 - 1)} - n \right] = \frac{50(10^n - 1)}{81} - \frac{5n}{9}$$

$$(33) \left[\frac{k(k+1)}{2} \right]^2 = 44100 = (210)^2$$

$$\frac{k(k+1)}{2} = 210$$

$$1 + 2 + 3 + \dots + k = 210$$

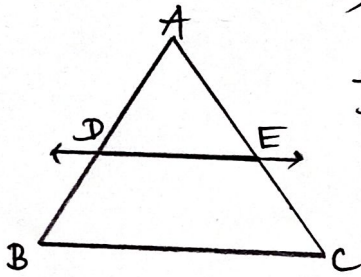
$$(34) \begin{array}{r} 2x^3 - 5x^2 + 5x - 3 \\ \underline{2x^3 + 2x^2 - 2x + 4} \\ -7x^2 + 7x - 7 \\ \underline{-7x^2 + 7x - 7} \\ 0 \end{array}$$

$$= -7(x^2 - x + 1)$$

$$\begin{array}{r} x^2 - x + 1 \\ \underline{x^3 + x^2 - x + 2} \\ x^3 - x^2 + x \\ \underline{2x^2 - 2x + 2} \\ 2x^2 - 2x + 2 \\ \underline{2x^2 - 2x + 2} \\ 0 \end{array}$$

$$\therefore \text{GCD} = x^2 - x + 1$$

35) Basic proportionality theorem
(Thales theorem)



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

39)

$$\begin{aligned} 2(p^2-1) &= (\sec\theta + \csc\theta)(\sin\theta + \cos\theta)^2 - 1 \\ &= (\sec\theta + \csc\theta)(\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta - 1) \\ &= (\sec\theta + \csc\theta)(1 + 2\sin\theta\cos\theta - 1) \\ &= \left(\frac{1}{\cos\theta} + \frac{1}{\sin\theta}\right)(2\sin\theta\cos\theta) \\ &= \frac{\sin\theta + \cos\theta}{\sin\theta\cos\theta} \times 2\sin\theta\cos\theta \\ &= 2(\sin\theta + \cos\theta) \\ &= 2p \end{aligned}$$

36)

$$\begin{array}{r|rrrr} 1 & -6 & +3 & & \\ \hline 1 & -12 & +42 & -36 & +9 \\ \hline 2 & -6 & & & \\ \hline & & -12 & +42 & \\ & & \oplus & \ominus & \\ & & -12 & +36 & \\ \hline 2 & -12 & +3 & & \\ \hline & & & 6 & -36 & +9 \\ & & & \ominus & \oplus & \ominus \\ & & & 6 & -36 & +9 \\ \hline & & & & & 0 \end{array}$$

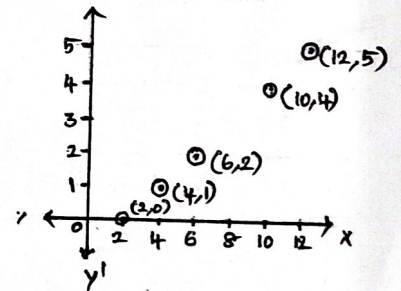
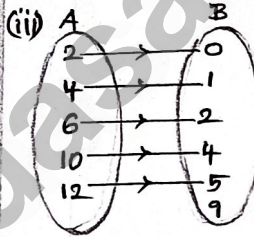
$$= |x^2 - 6x + 3|$$

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

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

(ii)

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



37) A(2,2) B(9,-2) C(-8,-4) D(1,-3)

$$\begin{aligned} \text{Area of } ABCD &= \frac{1}{2} \begin{vmatrix} 2 & -9 & -8 & 1 & 2 \\ 2 & -2 & -4 & -3 & 2 \end{vmatrix} \\ &= \frac{1}{2} [(-4+36+24+2) - (-18+16-4-6)] \\ &= \frac{1}{2} (58+2) = \frac{1}{2} (70) = 35 \text{ Sq. Units} \end{aligned}$$

41) $301 + 308 + 315 + \dots + 595$

$$\begin{aligned} a &= 301 \quad d = 7 \quad l = 595 \\ n &= \frac{(l-a)}{d} + 1 \\ n &= \frac{(595-301)}{7} + 1 \\ n &= 43 \end{aligned}$$

$$\begin{aligned} S_n &= \frac{n}{2} [a+l] \\ S_{43} &= \frac{43}{2} [301+595] \\ &= 19264 \end{aligned}$$

38) let A(1,-4) B(2,-3) C(4,-7)

$$\begin{aligned} \text{Slope of } AB &= \frac{-3+4}{2-1} = 1 \\ \text{Slope of } BC &= \frac{-7+3}{4-2} = -2 \\ \text{Slope of } AC &= \frac{-7+4}{4-1} = -1 \\ \text{Slope of } AB \times \text{Slope of } AC &= (1)(-1) = -1 \\ \therefore AB \perp AC \quad \angle A &= 90^\circ \\ \therefore \triangle ABC \text{ is a rt. } \triangle. \end{aligned}$$

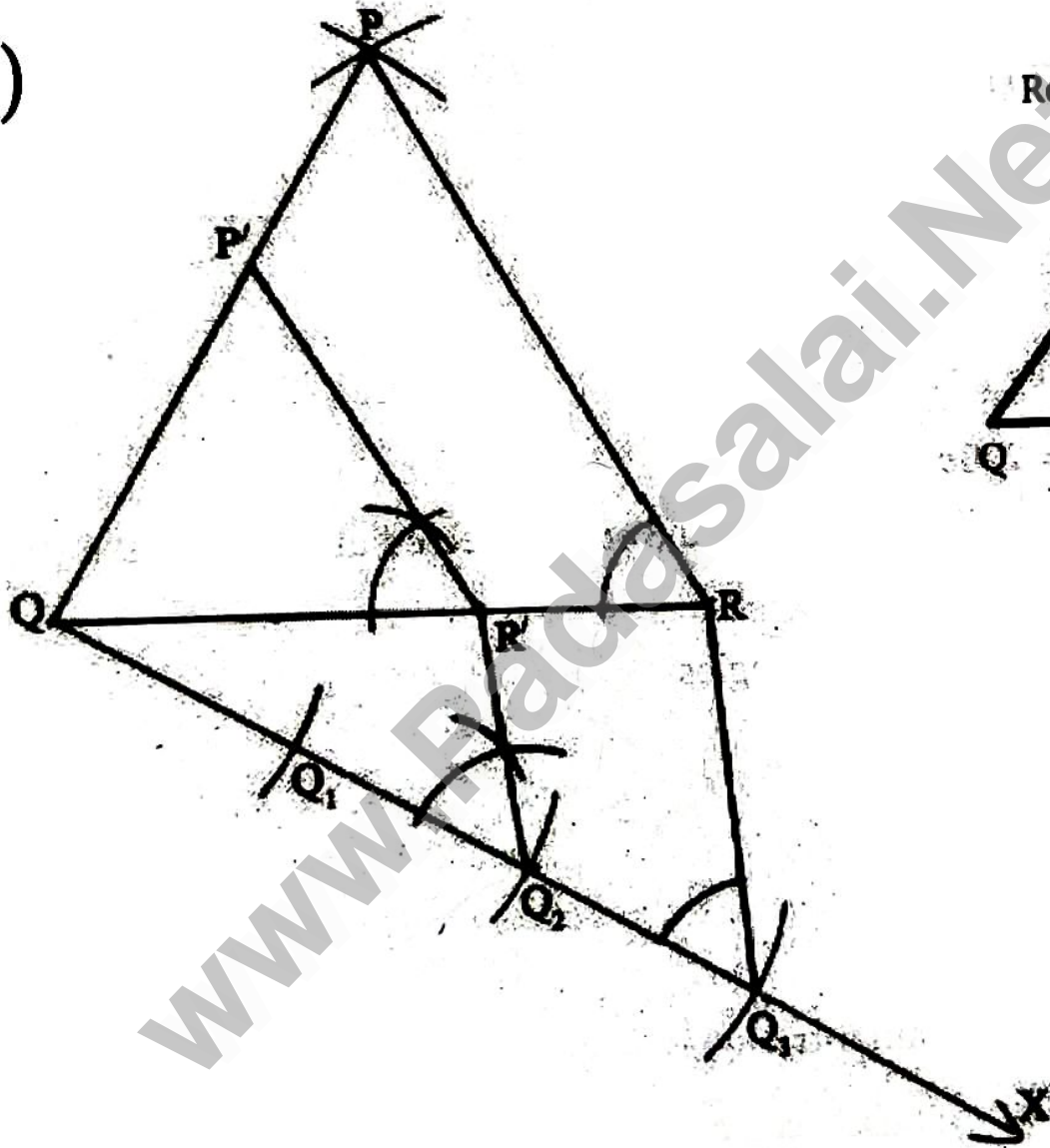
42) $\sqrt{y+1} + \sqrt{2y-5} = 3$

$$\begin{aligned} \sqrt{2y-5} &= 3 - \sqrt{y+1} \\ \text{Taking square on both sides,} \\ 2y-5 &= (3 - \sqrt{y+1})^2 \\ 2y-5 &= 9 + y+1 - 6\sqrt{y+1} \\ y-15 &= -6\sqrt{y+1} \\ \text{Taking square on both sides,} \\ (y-15)^2 &= (-6\sqrt{y+1})^2 \\ y^2 - 30y + 225 &= 36(y+1) \\ y^2 - 66y + 189 &= 0 \\ (y-3)(y-63) &= 0 \\ y &= 3 \quad y = 63 \end{aligned}$$

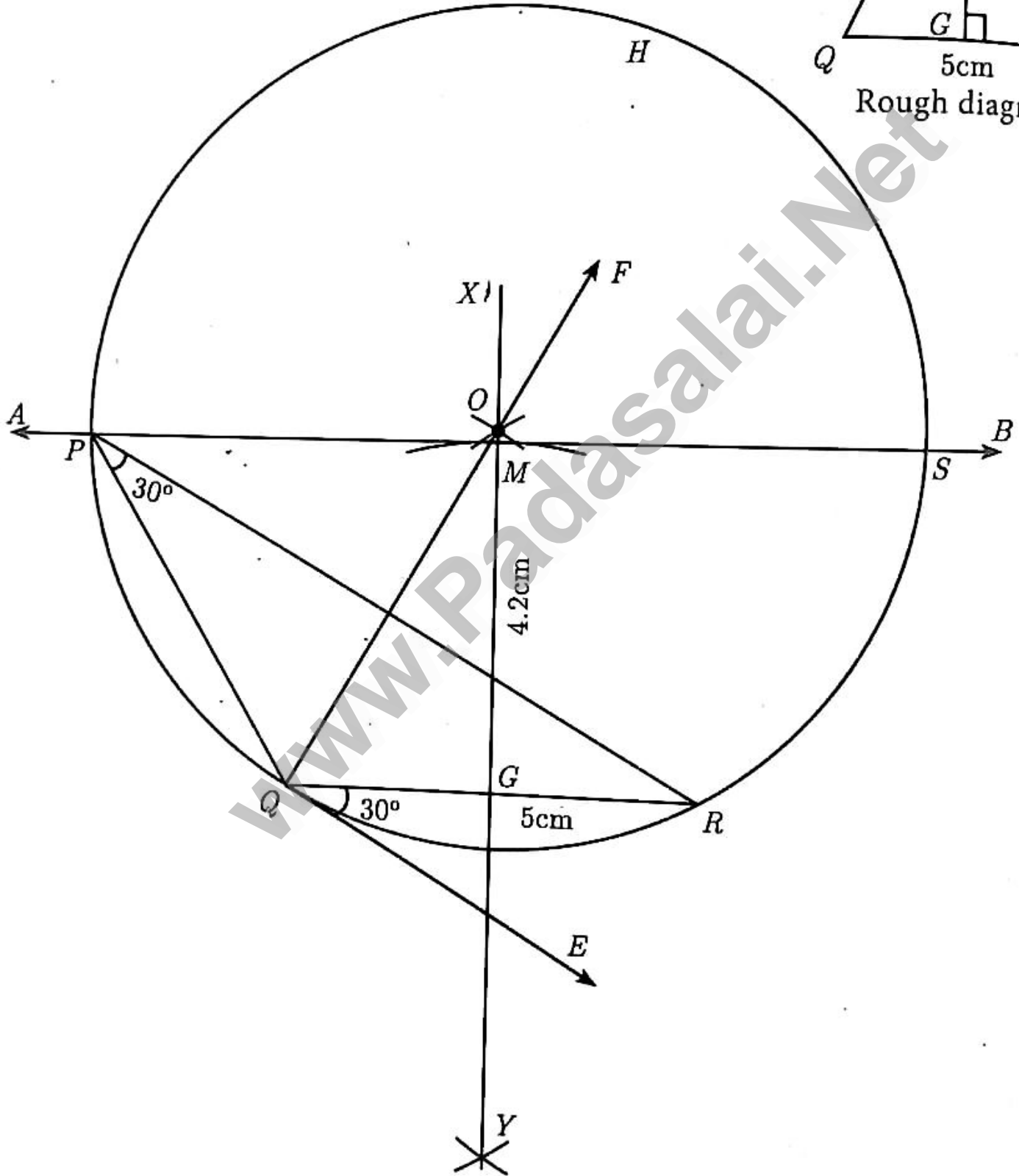
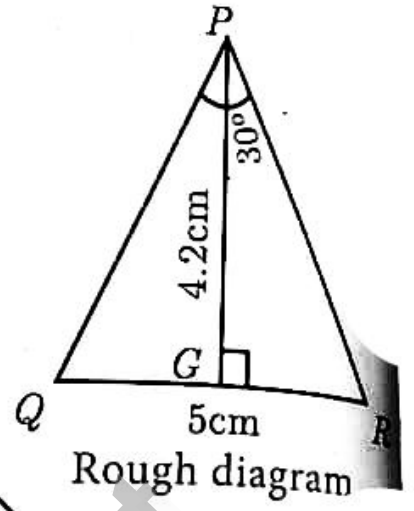
$\begin{array}{c} +189 \\ \swarrow \quad \searrow \\ -63 \quad -3 \\ \swarrow \quad \searrow \\ -66 \end{array}$

$y = 63$
 does not satisfy the equ.
 $\therefore y = 63$ is not a sol.
 \therefore only sol. is $y = 3$

43(a)



43 (b)



44(a)

1. Table:

x	24	12	8	6	4	3	2	1
y	1	2	3	4	6	8	12	24

2. Variation: Indirect Variation

3. Equation: $xy = k$

$$xy = 24 \times 1 = 12 \times 2 = \dots = 12$$

$$xy = 24$$

4. Points:

(24, 1), (12, 2), (8, 3), (6, 4),

(4, 6), (3, 8), (2, 12), (1, 24)

5. Solution:

(i) If $x = 3$ then $y = 8$ (ii) If $y = 6$ then $x = 4$

44(b)

1. Table:

Time in hrs (x)	4	8	12	24
Amount ₹ (y)	60	120	180	360

2. Variation: Direct Variation

3. Equation: $y = kx$

$$k = \frac{y}{x} = \frac{60}{4} = \frac{120}{8} = \dots = 15$$

$$y = 15x$$

4. Points: (4, 60), (8, 120), (12, 180), (24, 360)

5. Solution:

(i) If the parking time is 6 hours,
then the parking charge = ₹ 90(ii) If the amount ₹ 150 is paid,
then the parking time = 10 hours.