QUARTERLY EXAMINATION - 2022

காலாண்டுப் பொதுத் தேர்வு - 2022

திருவள்ளூர் மாவட்டம்.

STD: X 10-ஆம் வகுப்பு - கணிதம் - விடைக்குறிப்புகள். Maths.

— A K ராஜதுரை
கணித ஆசிரியர்.

பகுதி - அ

1. c) 3 2. அ) 7 3. ஈ) இருபடி quadratic

4. ஈ) 2520 5. அ) $\frac{1}{27}$ 6. அ) 1 7. அ) $x=1, y=2, z=3$.

8. ஈ) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$ 9. அ) 70 10. அ) 120°

11. அ) y அச்சுக்கு இணை Parallel to y-axis. 12. அ) இரு பக்கங்கள் இணை மற்றும் இரு பக்கங்கள் இணையற்றவை. Two Parallel and two non-parallel

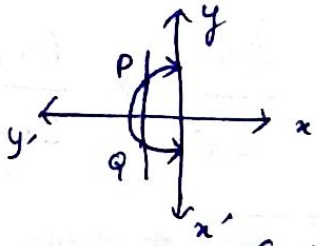
13. அ) $x+y=3$, $3x+y=7$ 14. அ) 1

பகுதி - ஆ

15. $A \times B = \{(2,1)(2,-4)(-2,1)(-2,-4)(3,1)(3,-4)\}$

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

16. இந்தக்கோடு வரைபடத்தை P மற்றும் Q ஆகிய இரு புள்ளிகளில் வெட்டுவதால் இது சார்பினைக் குறிக்காது.



Vertical line intersects at two pts

So it is not a function

17. $fog = f[g(x)]$

$= f(x^2-2)$

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

$= 2x^2-4+1$

$fog = 2x^2-3$

$gof = g[f(x)]$

$= g(2x+1)$

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

$= 4x^2+4x+1-2$

$gof = 4x^2+4x-1$

is a composite number

18. $7\times5\times3\times2+3$ ஒரு ஒற்றை எண் ஆகும்

$7\times5\times3\times2+3 = 3\times(7\times5\times2+1)$

$= 3\times71$ Product of two prime is a composite number

= இரு ஒற்றை எண்களின் பெருக்கல் ஒரு ஒற்றை எண் ஆகும்.

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19. $a = 8 \quad r = \frac{24}{8} = 3.$

$ar^3 = 8(3)^3 = 8\times27 = 216$

$ar^4 = 8(3)^4 = 8\times81 = 648$

$ar^5 = 8(3)^5 = 8\times243 = 1944$

அடுத்து வரும் மூன்று எண்கள் 216, 648, 1944.
Next three terms are

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20. $1+2+3+\cdots+60$

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

$1+2+3+\cdots+60 = \frac{60\times61}{2} = 30\times61 = \underline{1830}$

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21. மீ.பொ.வ = $48x^4y^4$.
LCM

8 | 8, 48
1, 6

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22. $\frac{4x^2y}{2x^4} \times \frac{6xz^3}{20y^4} = \frac{2y}{1} \times \frac{3xz^3}{10y^4} = \frac{3xz^3}{5y^3}$

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23. $\frac{\text{Area of } \triangle ABC}{\triangle ABC \text{ யின் பரப்பு}} = \frac{BC^2}{EF^2}$

$\frac{\text{Area of } \triangle DEF}{\triangle DEF \text{ யின் பரப்பு}}$

$\frac{54}{\triangle DEF \text{ யின் பரப்பு}} = \frac{3^2}{4^2}$

$\triangle DEF \text{ யின் பரப்பு} = 54\times\frac{16}{9} = \underline{96\ cm^2}$

Area of $\triangle DEF$

24. $\frac{AE}{AC} = \frac{2}{5.5} = \frac{4}{11}$

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

Triangles are not Similar

$\therefore \frac{AE}{AC} \neq \frac{AD}{AB}$

ஒத்தகோணங்கள் விகிதசமத்தில் இல்லை.

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25. $(-3, 5)\ (5, 6)\ (5, -2)$
$x_1\ y_1 \quad x_2\ y_2 \quad x_3\ y_3$

Δன் பரப்பு $= \frac{1}{2}\begin{Bmatrix} -3 & 5 & 5 & -3 \\ 5 & 6 & -2 & 5 \end{Bmatrix}$

$= \frac{1}{2}[(-18 - 10 + 25) - (25 + 30 + 6)]$

$= \frac{1}{2}[-3 - 61]$

$= 32$ ச.அ. Sq. Units

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26. A $(-3, -4)$ B $(7, 2)$ C $(12, 5)$

AB ன் சாய்வு $= \frac{y_2 - y_1}{x_2 - x_1}$
Slope of AB

$= \frac{2 + 4}{7 + 3}$

$= \frac{6}{10}$

$= \frac{3}{5}$

Slope of BC
BC ன் சாய்வு $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{5 - 2}{12 - 7}$

$= \frac{3}{5}$

AB ன் சாய்வு = BC ன் சாய்வு

B ஒரு பொது புள்ளி

$\therefore$ A, B, C ஆகிய புள்ளிகள் ஒரு கோட்டமைந்த புள்ளிகள்

A, B, C are collinear

27) LHS

$\tan^2\theta - \sin^2\theta = \frac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta$

$= \sin^2\theta\,(\sec^2\theta - 1)$

$= \sin^2\theta \cdot \tan^2\theta$ RHS

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28) $(2,3)$ $(-7,-1)$
$x_1\ y_1$ $x_2\ y_2$

Equation of st. line

இரு புள்ளிகள் வழிச் செல்லும் $\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$

$\frac{y-3}{-1-3} = \frac{x-2}{-7-2} \Rightarrow \frac{y-3}{-4} = \frac{x-2}{-9}$

$9(y-3) = 4(x-2) \Rightarrow 9y-27 = 4x-8$

$4x - 9y + 19 = 0$

(Ans)

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28) LHS $\frac{\cos\theta}{1+\sin\theta} = \frac{\cos\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}$

$= \frac{\cos\theta - \sin\theta\cos\theta}{1-\sin^2\theta}$

$= \frac{\cos\theta}{\cos^2\theta} - \frac{\sin\theta\cos\theta}{\cos^2\theta}$

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

$= \sec\theta - \tan\theta$ RHS

UNIT - 2

29. $A = \{0, 1\}$ $B = \{2, 3, 4\}$ $C = \{3, 5\}$

LHS $B \cup C = \{2, 3, 4, 5\}$

$A \times (B \cup C) = \{(0,2)(0,3)(0,4)(0,5)(1,2)(1,3)(1,4)(1,5)\}$ — ①

RHS

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

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

$(A \times B) \cup (A \times C) = \{(0,2)(0,3)(0,4)(0,5)(1,2)(1,3)(1,4)(1,5)\}$ — ②

①, ② இரண்டும்

$A \times (B \cup C) = (A \times B) \cup (A \times C)$

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30. $f(x) = \frac{x}{2} - 1$

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

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

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

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

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

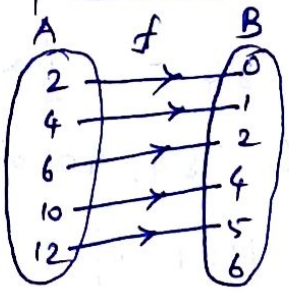
(i) வரிசை இணைகளின் தொகுப்பு Set of ordered pairs

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

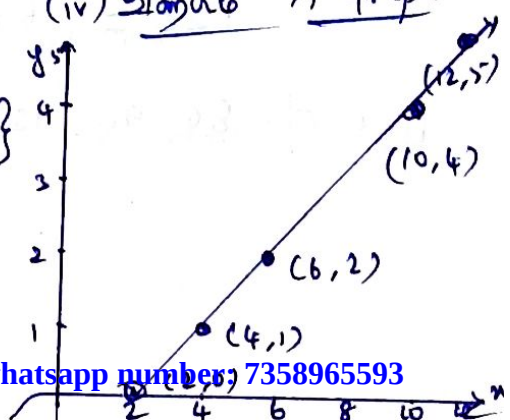
(ii) அட்டவணை A table

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

(iii) அம்புக்குறி படம் An arrow diagram



(iv) வரைபடம் A Graph



31. LHS $= (f \circ g) \circ h$

$f \circ g = f[g(x)] = f(x^2) = x^2 - 4$

$(f \circ g) \circ h = (f \circ g)[h(x)] = (f \circ g)(3x-5)$

$= (3x-5)^2 - 4$ — (1)

RHS $= f \circ (g \circ h)$

$g \circ h = g[h(x)] = g(3x-5) = (3x-5)^2$

$f \circ (g \circ h) = f[(g \circ h)(x)] = f[(3x-5)^2]$

$= (3x-5)^2 - 4$ — (2)

(1), (2) ல் இருந்து

$(f \circ g) \circ h = f \circ (g \circ h)$

32.

HCF of 84, 90

$90 = 84 \times 1 + 6$

$84 = 6 \times 14 + 0$

HCF of 84, 90 ன் மீப்பெரு = 6

HCF of 120, 6

$120 = 6 \times 20 + 0$

HCF of 84, 90, 120 ன் மீப்பெரு = 6

33. Three Consecutive terms of A.P

$a-d, a, a+d$

Sum = 27

$a-d+a+a+d = 27$

$3a = 27$

$\boxed{a = 9}$

Product = 288

$(a-d)\,a\,(a+d) = 288$

$a(a^2-d^2) = 288$

$9(81-d^2) = 288$

$d^2 = 49$

$\boxed{d = \pm 7}$

$a = 9, d = 7$

$a-d = 9-7 = 2$

$a = 9$

$a+d = 9+7 = 16$

2, 9, 16

$a = 9, d = -7$

$a-d = 9+7 = 16$

$a = 9$

$a+d = 9-7 = 2$

16, 9, 2

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34)

$1+2+3+\ldots\ldots+n = 666$

$\frac{n(n+1)}{2} = 666$

$n^2+n = 1332$

$n^2+n-1332 = 0$

$(n+37)(n-36) = 0$

$n = -37$ Not possible

$\boxed{n = 36}$

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35)

$x+2y-z = 6$ — (1)

$-3x-2y+5z = -12$ — (2)

$-2x+4z = -6$ — (4)

(3) × 2 ⇒ $2x-4z = 6$

(4) = (5)

ஒரே மாறிகளை கொண்ட ஒரே மாதிரியான சமன்பாடுகள் எண்ணிக்கை சமன்பாடுகளின் எண்ணிக்கையை விட குறைவாக இருந்தால் Infinitely Many Solutions

36)

$2x^2 - 3x + 7$

$2x^2$ | $4x^4 - 12x^3 + 37x^2 + bx + a$

$4x^4$

(−)

$-12x^3 + 37x^2$

$4x^2 - 3x$

$-12x^3 + 9x^2$

(+) (−)

$28x^2 + bx + a$

$4x^2 - 6x + 7$

$28x^2 - 42x + 49$

(−) (+) (−)

0

$a - 49 = 0$

$\boxed{a = 49}$

$b + 42 = 0$

$\boxed{b = -42}$

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37. Theorem - Diagram - Proof

தேற்றம் - படம் - நிரூபணம் -

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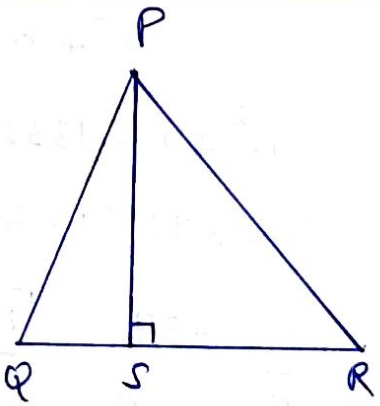
38. $QS = 3SR$ — (1)

$QR = QS + SR$

(1) லிருந்து

$QR = 4SR$

$SR = \frac{1}{4} QR$ — (2)



$PQ^2 = PS^2 + QS^2$

$PR^2 = PS^2 + SR^2$

$PQ^2 - PR^2 = QS^2 - SR^2$

$= (3SR)^2 - SR^2$

$PQ^2 - PR^2 = 8SR^2$

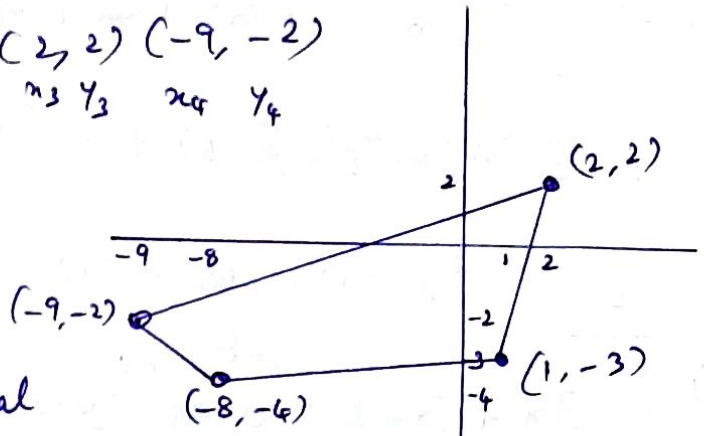
$= 8 \times \frac{1}{16} QR^2$

$= \frac{1}{2} QR^2$

$2PQ^2 = 2PR^2 + QR^2$

39)

$(-8,-4)$ $(1,-3)$ $(2,2)$ $(-9,-2)$
$x_1\ y_1$ $x_2\ y_2$ $x_3\ y_3$ $x_4\ y_4$



Area of Quadrilateral

$$= \frac{1}{2}\begin{Bmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{Bmatrix}$$

$$= \frac{1}{2}\begin{Bmatrix} -8 & 1 & 2 & -9 & -8 \\ -4 & -3 & 2 & -2 & -4 \end{Bmatrix}$$

$$= \frac{1}{2}\left[(24+2-4+36) - (-4-6-18+16)\right]$$

$$= \frac{1}{2}[58+12] = 35 \text{ sq. units}$$

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40)

$a+b=7$

$b = 7-a$

Equ. of St. line

$$\frac{x}{a}+\frac{y}{b}=1$$

$$\frac{x}{a}+\frac{y}{7-a}=1 \quad \text{—①}$$

(-3, 8) through it passes

$$\frac{-3}{a}+\frac{8}{7-a}=1$$

$$\frac{-21+3a+8a}{a(7-a)}=1$$

$$11a-21 = 7a-a^2$$

$$a^2+4a-21=0$$

$$(a+7)(a-3)=0$$

$a = -7, 3$

$\therefore a = 3.$

Positive intercepts

① ⇒

$$\frac{x}{3}+\frac{y}{4}=1$$

$$\frac{4x+3y}{12}=1$$

$$4x+3y-12=0$$

41) LHS $\sin^2 A \cos^2 B + \cos^2 A \sin^2 B + \cos^2 A \cos^2 B + \sin^2 A \sin^2 B$

$= \sin^2 A(\cos^2 B + \sin^2 B) + \cos^2 A(\sin^2 B + \cos^2 B)$

$= \sin^2 A\,(1) + \cos^2 A\,(1) = 1 = \text{RHS}$

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42) Let α, β be the roots

$3x^2 + 7x - 2 = 0$ où α et β.

$\alpha + \beta = \frac{-7}{3} \qquad \alpha\beta = \frac{-2}{3}$

(i) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2+\beta^2}{\alpha\beta} = \frac{(\alpha+\beta)^2 - 2\alpha\beta}{\alpha\beta}$

$= \left[\frac{49}{9} - 2\left(\frac{-2}{3}\right)\right] \times \frac{3}{-2}$

$= \frac{49+12}{9_3} \times \frac{3}{-2} = -\frac{61}{6}$

(ii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{\alpha^3+\beta^3}{\alpha\beta}$

$= \frac{(\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)}{\alpha\beta}$

$= \left[\frac{-343}{27} + 2\left(\frac{-7}{3}\right)\right] \times \frac{3}{-2}$

$= \frac{-343 - 126}{27_9} \times \frac{3}{-2} = \frac{469}{18}$

(Missing)

43) $a : b = 2 : 5$

$\frac{a}{b} = \frac{2}{5}$

$a = \frac{2b}{5}$

Equation of the St. line

$\frac{x}{a} + \frac{y}{b} = 1$

$\frac{x}{2b/5} + \frac{y}{b} = 1$

$\frac{5x}{2b} + \frac{y}{b} = 1$ ——— (1)

line passing through (1, -4)

(1, -4) அதன் வழியாக செல்கிறது,

$$\frac{5}{2b} - \frac{4}{b} = 1$$

$$\frac{5-8}{2b} = 1$$

$$2b = -3$$

$$b = -\frac{3}{2}$$

① ⇒

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

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

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

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QUARTERLY EXAMINATION - 2022

Standard - X

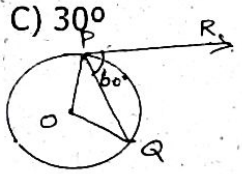
Reg.No.

Time: 3.00 hrs. **MATHS** *Marks: 100*

PART - I

Answer all the questions: **14×1=14**

1. If n(A ×B) = 6 and A = {1, 3} then n(B) is
   A) 1 B) 2 C) 3 D) 6
2. If f : A → B is a bijective function and if n(B) = 7, then n(A) is equal to
   A) 7 B) 49 C) 1 D) 14
3. $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is
   A) linear B) cubic C) reciprocal D) quadratic
4. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
   A) 2025 B) 5220 C) 5025 D) 2520
5. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \ldots$ is
   A) $\frac{1}{24}$ B) $\frac{1}{27}$ C) $\frac{2}{3}$ D) $\frac{1}{81}$
6. $7^{4k} \equiv$ _____ (mod 100)
   A) 1 B) 2 C) 3 D) 4
7. The solution of the system x + y -3z = -6, -7y + 7z = 7, 3x = 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
8. The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to
   A) $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ B) $16\left|\frac{y^2}{x^2z^4}\right|$ C) $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ D) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$
9. In ΔLMN, ∠L = 60°, ∠M = 50°. If ΔLMN ~ ΔPQR then the value of ∠R is
   A) 40° B) 70° C) 30° D) 110°
10. In figure if PR is tangent to the circle at P and O is the centre of the circle, then ∠POQ is

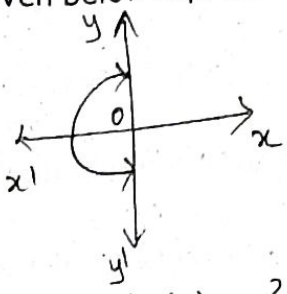


   A) 120° B) 100° C) 110° D) 90°
11. The straight line given by the equation x = 11 is
   A) parallel to x axis B) parallel to y axis
   C) passing through the origin D) passing through the point (0,11)
12. When proving that a quadrilateral is a trapezium, it is necessary to show
   A) Two sides are parallel B) Two parallel and two non-parallel sides
   C) Opposite sides are parallel D) All sides are of equal length
13. (2, 1) is the point of intersection of two lines.
   A) x - y - 3 = 0, 3x - y - 7 = 0 B) x + y = 3, 3x + y = 7
   C) 3x + y = 3, x + y = 7 D) x + 3y - 3 = 0, x - y - 7 = 0
14. The value of $\sin^2\theta + \frac{1}{1+\tan^2\theta}$ is equal to
   A) $\tan^2\theta$ B) 1 C) $\cot^2\theta$ D) 0

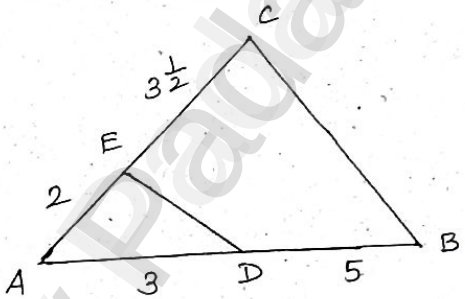
PART - II

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

15. Find A × B and B × A if A = {2, -2, 3} and B = {1, -4}
16. Determine whether the graph given below represent function. Give reason for your answer.



17. Find fog and gof when f(x) = 2x + 1 and g(x) = x^2 - 2
18. Is 7 × 5 × 3 × 2 + 3 a composite number? Justify your answer.
19. Find the next three terms of the following sequence : 8, 24, 72, ...
20. Find the sum of the following series. 1 + 2 + 3 + ... + 60
21. Find the LCM of the following $8x^4y^2$, $48x^2y^4$
22. Simplify : $\frac{4x^2y}{2x^2} \times \frac{6xz^3}{20y^4}$
23. If ΔABC is similar to ΔDEF such that BC =3cm, EF = 4cm and area of ΔABC = 54cm^2. Find the area of Δ DEF.
24. Check whether the following traingles are similar and find the value of x.



25. Find the area of the triangle whose vertices are (-3, 5), (5, 6) and (5, -2).
26. Show that the given points are collinear (-3, -4) (7, 2) and (12, 5)
27. Prove that $\tan^2\theta - \sin^2\theta = \tan^2\theta . \sin^2\theta$
28. Find the equation of a line through the points (2, 3) and (-7, -1) **(OR)**

    Prove the identify : $\frac{\cos\theta}{1+\sin\theta} = \sec\theta - \tan\theta$

PART - III

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

29. Let A = {x ∈W / x < 2}, B = {x∈N /1< x ≤ 4} and C = {3, 5}. Verify that A× (B∪C) = (A×B) ∪(A×C)
30. Let f : A → 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, 6} Represent f by (i) set of ordered pairs (ii) a table (iii) an arrow diagram (iv) a graph

31. If $f(x) = x - 4$, $g(x) = x^2$ and $h(x) = 3x - 5$, show that $(fog)oh = fo(goh)$
32. Use Euclid's Division Algorithm to find the HCF of 84, 90 and 120.
33. The sum of three consecutive terms that are in A.P. is 27 and their product is 288. Find the three terms.
34. If $1 + 2 + 3 + \ldots\ldots\ldots\ldots + n = 666$ then find n.
35. Discuss the nature of solutions of the following system of equations $x + 2y - z = 6$, $-3x - 2y + 5z = -12$; $x - 2z = 3$
36. If the polynomial $4x^4 - 12x^3 + 37x^2 + bx + a$ is perfect square, then find the values of a and b.
37. State and prove Angle Bisector theorem.
38. The perpendicular PS on the base QR of a ΔPQR intersects QR at S, such that QS = 3SR. Prove that $2PQ^2 = 2PR^2 + QR^2$
39. Find the area of the quadrilateral whose vertices are (-9, -2), (-8, -4), (2, 2) and (1, -3)
40. A line makes positive intercepts on coordinate axes whose sum is 7 and it passes through (-3, 8). Find its equation.
41. Prove that $\text{Sin}^2A\ \text{Cos}^2B + \text{Cos}^2A\ \text{Sin}^2B + \text{Cos}^2A\ \text{Cos}^2B + \text{Sin}^2A\ \text{Sin}^2B = 1$
42. If α, β are the roots of the equation $3x^2 + 7x - 2 = 0$, find the values of i) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

    (ii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$

(OR)

Find the equation of a straight line passing through (1, -4) and has intercepts which are in the ratio 2 : 5.

PART - IV

Answer the following questions: **2×8=16**

43. 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.

(OR)

Construct a ΔPQR which the base PQ = 4.5cm, $\angle R = 35^\circ$ and the median RG from R to PQ is 6cm.

44. A bus is travelling at a uniform speed of 50km/hr. Draw the distance time graph and hence find

    i) the constant of variation ii) how far will it travel in 90 minutes?

    iii) the time required to cover a distance of 300km from the graph.

(OR)

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