CLASS : 10

Register Number

COMMON QUARTERLY EXAMINATION-2024-25

Time Allowed : 3.00 Hours]

MATHEMATICS

[Max. Marks : 100

PART - I

I. **Choose the best answer:** 14x1=14

1. 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
   a) 3 b) 2 c) 4 d) 8
2. $f(x) = (x+1)^3 - (x-1)^3$ represents a function which is
   a) linear b) cubic c) reciprocal d) quadratic
3. Euclid's division lemma states that for positive integers a and b, there exists unique integers q and r such that a=bq+r, where r must satisfy.
   a) $1 < r < b$ b) $0 < r < b$ c) $0 \leq r < b$ d) $0 < r \leq b$
4. If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \ldots\ldots + 2^0$. 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. A system of three linear equations in three variables is inconsistents if their planes.
   a) Intersect only at a points b) Intersect in a line
   c) Coincides with each other d) Do not intersect
6. $y^2 + \frac{1}{y^2}$ is not equal to
   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. Graph of a quadratic equation is a ----------
   a) Straight line b) Circle c) Parabola d) Hyperbola
8. If in triangle ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar, when
   a) $\angle B = \angle E$ b) $\angle A = \angle D$ c) $\angle B = \angle D$ d) $\angle A = \angle F$
9. If in ΔABC, DE||BC, AB = 3.6 cm, AC = 2.4 cm and AD = 2.1cm then the length of AE is
   a) 1.4 cm b) 1.8 cm c) 1.2 cm d) 1.05 cm
10. 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)
11. If slope of the line PQ is $1/\sqrt{3}$ then slope of the perpendicular bisector of PQ is
    a) $\sqrt{3}$ b) $-\sqrt{3}$ c) $1/\sqrt{3}$ d) 0
12. Consider four straight lines: (i) l_1: 3y=4x+5 (ii) l_2: 4y=3x-1 (iii) l_3: 4y+3x=7 (iv) l_4: 4x+3y=2
    Which of the following statement is true?
    a) l_1 and l_2 are perpendicular b) l_1 and l_4 are parallel
    c) l_2 and l_4 are perpendicular d) l_2 and l_3 are parallel
13. 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
14. If $5x = \sec\theta$ and $\frac{5}{x} = \tan\theta$, then $x^2 - \frac{1}{x^2}$ is equal to
    a) 25 b) $1/25$ c) 5 d) 1

PART - II

Answer any 10 questions. Question No. 28 is compulsory. 10x2=20

15. If BxA = {(-2,3), (-2,4), (0,3), (0,4), (3,3), (3,4)} find A and B.
16. Represent the function f = {(1,2), (2,2), (3,2), (4,3),(5,4)} through (i) an arrow diagram (ii) a table form
17. Is 7x5x3x2+3 a composite number? Justify your answer.
18. Find the number of terms in the G.P. 4,8,16,............8192?

19. Find the LCM of $8x^4y^2$, $48x^2y^4$.
20. Solve the equation $4x^2-7x-2=0$ by factorizatoin method.
21. If ΔABC is similar to ΔDEF such that BC = 3 cm, EF = 4 cm and area of $\Delta ABC = 54cm^2$. Find the area of ΔDEF.
22. State the angle bisector theorem.
23. Show that the points P(-1.5,3), Q(6,-2), R(-3,4) are collinear.
24. Show that the straight lines $x - 2y + 3 = 0$ and $6x + 3y + 8 = 0$ aer perpendicular.
25. Find the equation of a line whose intercepts on the x and y axes are 4 and -6.
26. Prove that $\sqrt{\dfrac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$
27. Find the sum : 1 + 2 + 3 + ...+ 60.
28. If the difference between a number and its reciprocal is $^{24}/_{5}$, find the number.

PART - III

Answer the following any 10 questions. Q.No.42 is compulsory. **10x5=50**

29. Let $A = \{x \in W \mid x<2\}$, $B = \{x \in N \mid 1<x\leq 4\}$ and $C = \{3,5\}$. Verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$.
30. If the function $f:R\to R$ is defined by $f(x) = \begin{cases} 2x + 7; & x < -2 \\ x^2 - 2; & -2 \leq x < 3 \\ 3x - 2; & x \geq 3 \end{cases}$ find the values of

    i) $f(4)$ ii) $f(-2)$ iii) $f(4) + 2f(1)$ iv) $\dfrac{f(1) - 3f(4)}{f(-3)}$
31. Rekha has 15 square colour papers of sizes 10 cm, 11 cm, 12 cm.....24cm. How much area can be decorased with these colour papers?
32. Find the GCD of $6x^3 - 30x^2 + 60x - 48$ and $3x^3 - 12x^2 + 21x - 18$.
33. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b.
34. If $A = \dfrac{2x+1}{2x-1}$, $B = \dfrac{2x-1}{2x+1}$ find $\dfrac{1}{A-B} - \dfrac{2B}{A^2-B^2}$
35. State and prove Basic Proportionality theorem.
36. A boy height 90 cm is walking away from the base of a lamp post at a speed of 1.2m/sec. If the lamp post is 3.6 m above the ground. Find the length of his shadow cast after 4 seconds.
37. Find the Area of the quadrilateral whose vertices are at (-9,0), (-8,6),(-1,-2) and (-6,-3)
38. Let A(3,-4), B(9,-4), C(5,-7) and D(7,-7). Show that ABCD is a trapezium.
39. A line makes positive intercepts on coordinate axes whose sum is 7 and it passes through (-3,8). Find its equation.
40. Prove that $\sin^2A \cos^2B + \cos^2A \sin^2B + \cos^2A \cos^2B + \sin^2A \sin^2B = 1$.
41. If $\dfrac{\cos\alpha}{\sin\beta} = m$ and $\dfrac{\cos\alpha}{\sin\beta} = n$, then prove that $(m^2+n^2)\cos^2\beta = n^2$
42. If $S_1, S_2, S_3, \ldots\ldots S_m$ are the sum of n terms of m A.P's. Whose first terms are 1,2,3.......m and whose common difference are 1,3,5,........(2m-1) respectively. Then show that $S_1+S_2+S_3+\ldots\ldots+S_m = \frac{1}{2}mn(mn+1)$.

PART - IV

Answer all of the following. **2x8=16**

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to $^7/_3$ of the corresponding sides of the triangle PQR (scale factor $^7/_3 > 1$) **(OR)**

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

    b) Nishanth is the winner in a Marathon race of 12 km distance. He ran at the uniform speed of 12 km/hr and reached the distination in 1 hour. He was followed by Aradhana, Jayanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3 km/hr and 2 km/hr and they covered the distance in 2 hrs, 3 hrs, 4 hrs and 6 hours respectively. Draw the speed - time graph and use it to find the time taken to Kanshik with his speed of 2.4 km/hr.

10th Std

COMMON QUARTERLY EXAMINATION -2024-25

MATHEMATICS

Part – I

Q.No.	Option	Answer
1.	b	2
2.	d	quadratic
3.	c	$0 \leq r \leq b$
4.	d	A is larger than B by 1.
5.	d	Do not intersect.
6.	b.	$\left(y + \frac{1}{y}\right)^2$
7.	c.	Parabola.
8.	c	$\angle B = \angle D$
9.	a	1.4 cm.
10.	b.	Parallel to Y axis.
11.	b	$-\sqrt{3}$
12.	c	l_2 and l_4 are perpendicular.
13.	b	1.
14.	b	$1/25$.

Part – II

15. Solution:-

Given: $B\times A = \{(-2,3), (-2,4), (0,3), (0,4), (3,3), (3,4)\}$.

B = Set of all first co ordinates of element of $B\times A$.

$B = \{-2, 0, 3\}$.

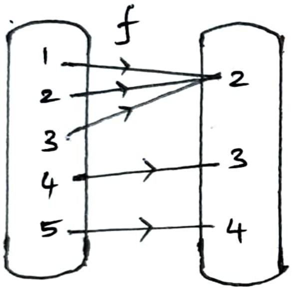
A = set of all second co ordinates of element of $B\times A$.

$A = \{3,4\}$.

Hence, $\boxed{A=\{3,4\},\ B=\{-2,0,3\}}$.

16. Solution:-

i] AN ARROW DIAGRAM.



ii] A TABLE FORM.

x	1	2	3	4	5
$f(x)$	2	2	2	3	4

17. Solution:-

Yes, the given number is a composite number, because.

$$7\times5\times3\times2+3 = 3\times(7\times5\times2+1)$$
$$= 3\times71$$

since, the given number can be factorized in terms of two primes, it is a composite number.

18. Solution:-

The Given G.P is $4, 8, 16, \ldots, 8192$.

$r = \dfrac{t_2}{t_1} = \dfrac{8}{4} = 2 \Rightarrow \boxed{r=2}$, $\boxed{a=4}$

Let the n^{th} term be 8192.

$t_n = 8192$

$t_n = ar^{n-1}$

$8192 = 4(2)^{n-1}$

$\dfrac{8192}{4} = 2^{n-1}$

$2^{n-1} = 2048$

$2^{n-1} = 2^{11}$

Since, the base are equal, Powers are also equal,

$n-1 = 11$

Hence, $n = 12$

There are 12 terms in the given sequence.

19. Solution:-

To FIND: LCM of $8x^4y^2, 48x^2y^4$.

$8x^4y^2 = 2\times2\times2\times x^2\times x^2\times y^2$

$48x^2y^4 = 2\times2\times2\times2\times3\times x^2\times y^2\times y^2$

$\therefore$ LCM of $8x^4y^2, 48x^2y^4$ is

$8\times6\times x^2\times x^2\times y^2\times y^2$

$\Rightarrow 48x^4y^4$ Ans.

Hence,

$\boxed{\therefore \text{LCM of } 8x^4y^2, 48x^2y^4 \text{ is } 48x^4y^4}$ Ans.

20. Solution:-

by using factorization method,

$4x^2-7x-2=0$.

$4x^2-8x+x-2=0$

$4x[x-2]+[x-2]=0$.

$(x-2)(4x+1)=0$.

$x-2=0 \qquad 4x+1=0$.

$x=2 \qquad x=-\frac{1}{4}$.

-8

$1 \mid -8$

-7

Hence,

$\boxed{\text{The roots are } 2 \text{ and } -\tfrac{1}{4}}$ Ans.

21. Solution:-

Since, the ratio of area of two similar triangles is equal to the ratio of the squares of any two corresponding sides,

we have, $\frac{\text{Area}(\Delta ABC)}{\text{Area}(\Delta DEF)} = \frac{BC^2}{EF^2}$.

$\Rightarrow \frac{54}{\text{Area}\,\Delta DEF} = \frac{3^2}{4^2}$

Hence,

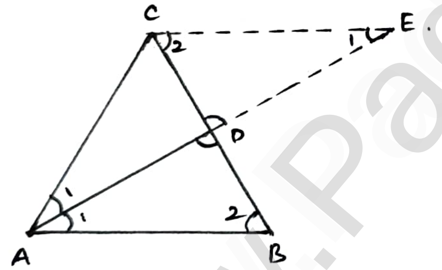
$\boxed{\text{Area}\,\Delta DEF = \frac{54 \times 16}{9} = 96\,cm^2}$ Ans.

22. Solution:-

STATEMENT: Angle Bisector Theorem.

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the corresponding sides containing the angle.

DIAGRAM:



23. Solution:-

The points are $P(-1.5, 3)$, $Q(6, -2)$, $R(-3, 4)$.
$x_1\ y_1 \quad x_2\ y_2 \quad x_3\ y_3$

Area of $\Delta PQR = \frac{1}{2}\{(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\}$ sq.units

$= \frac{1}{2}\{(3 + 24 - 9) - (18 + 6 - 6)\}$

$= \frac{1}{2}\{(18 - 18)\} = 0$ Ans.

Hence,

$\boxed{\therefore \text{ they given points are collinear.}}$

24. Solution:-

slope of st. line $x - 2y + 3 = 0$ is

$m_1 = \frac{-\text{co.eff of } x}{\text{co.eff of } y} = \frac{-1}{-2} = \frac{1}{2}$

slope of st. line $6x + 3y + 8 = 0$ is.

$m_2 = \frac{-6}{3} = -2$.

Now,

$m_1 \times m_2 = -1$.

$m_1 \times m_2 = \frac{1}{2} \times -2 = -1$ Ans.

Hence,

$\boxed{\text{the two st. lines are perpendicular}}$

25. Solution:-

Given, x-intercept $\Rightarrow a = 4$

y-intercept $\Rightarrow b = -6$.

Intercepts form,

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

$\frac{x}{4} + \frac{y}{-6} = 1$.

$\frac{-6x + 4y}{-24} = 1$.

$-6x + 4y = -24$

$\times$ by '-1'

$6x - 4y = 24$.

$\Rightarrow 3x - 2y = 12$.

Hence,

$\boxed{\text{they required equation is } 3x - 2y = 12}$ Ans.

26. Solution:-

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

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

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

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

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

Hence Proved.

27. Solution:-

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

$$\boxed{n=60}$$

$$1+2+3+\cdots+60 = \frac{60\times 61}{2} = 30\times 61$$

$$= 1830$$

Hence,

$$\boxed{1+2+3+\cdots+60 = 1830}$$

28. Solution:-

Let the number be x & its reciprocal is $\frac{1}{x}$.

$$\therefore \quad x-\frac{1}{x} = \frac{24}{5}$$

$$\frac{x^2-1}{x} = \frac{24}{5}.$$

$$5(x^2-1) = 24x.$$

$$5x^2-24x-5 = 0.$$

$$(x-5)(5x+1) = 0.$$

$$x=5, \quad x=-\tfrac{1}{5}.$$

Hence, The required numbers are 5 & $-\frac{1}{5}$.

Part – III

29. Solution:-

Given that,

$A=\{x\in W \mid x<2\} = \{0,1\}.$

$B=\{x\in N \mid 1<x\le 4\} = \{2,3,4\}.$

$C=\{3,5\}$

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

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

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

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

$= \{(0,2),(0,3)(0,4)(1,2)(1,3)(1,4)\}.$

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

$= \{(0,3)(0,5)(1,3)(1,5)\}.$

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

$= \{(0,2)(0,3)(0,4)(1,2)(1,3)(1,4)\}\cup\{(0,3)(0,5)(1,3)(1,5)\}$

$= \{(0,2)(0,3)(0,4)(0,5)(1,2)(1,3)(1,4)(1,5)\}$ → ②.

From ① & ②, we get.

$\boxed{A\times(B\cup C) = (A\times B)\cup(A\times C)}$ Hence Proved.

30. Solution:-

Given function $f: R\to R$ is defined by

$$f(x)=\begin{cases} 2x+7; & x<-2 \\ x^2-2; & -2\le x<3 \\ 3x-2; & x\ge 3. \end{cases}$$

i] $f(4) \Rightarrow$ lie third interval $x=4$.

$f(x) = 3x-2.$

$f(4) = 3(4)-2 = 12-2 = 10.$

ii] $f(-2) \Rightarrow$ lie second interval $x=-2$.

$f(x) = x^2-2$

$f(-2) = (-2)^2-2 = 4-2 = 2.$

iii] $f(4)+2f(1) = 10+2(1^2-2)$

$= 10+2(1-2)$

$= 10+2(-1) = 10-2$

$= 8.$

iv] $\frac{f(1)-3f(4)}{f(-3)} = \frac{-1-3(10)}{2(-3)+7} = \frac{-1-30}{1}$

$= -31$

Hence.

i] $f(4)=10$, ii] $f(-2)=2$ iii] $f(4)+2f(1)=8$

iv] $\frac{f(1)-3f(4)}{f(-3)} = -31$

Prepared By, M.S.Mahendira Rajan, M.Sc.,M.Phil.,B.Ed., Vanmathi Matric Hr.Sec. School-Vadakkanandal.

31. Solution:-

Total area can be decorated $= 10^2+11^2+12^2+\dots+24^2$.

$= (1^2+2^2+\dots+24^2) - (1^2+2^2+\dots+9^2)$.

$\left[\because 1^2+2^2+\dots+n^2 = \dfrac{n(n+1)(2n+1)}{6}\right]$

$= \dfrac{24\times25\times49}{6} - \dfrac{9\times10\times19}{6}$.

$= \dfrac{\cancel{24}^{\cancel{12}\,4}\times25\times49}{\cancel{2}\times\cancel{3}} - \dfrac{\cancel{9}^{3}\times\cancel{10}^{5}\times19}{\cancel{2}\times\cancel{3}}$

$= 4900 - 285$

$= 4615\text{cm}^2$.

Hence

Rekha has covered, area can be decorated with these colour papers $= 4615\text{cm}^2$ Ans.

32. Solution:-

Let $f(x) = 6x^3-30x^2+60x-48$

$= 6(x^3-5x^2+10x-8)$ and.

$g(x) = 3x^3-12x^2+21x-18$.

$= 3(x^3-4x^2+7x-6)$.

$$\begin{array}{r|l}
 & 1 \\
x^3-5x^2+10x-8 & x^3-4x^2+7x-6. \\
 & x^3-5x^2+10x-8 \quad (-) \\
\hline
 & x^2-3x+2.
\end{array}$$

$$\begin{array}{r|l}
 & x-2 \\
x^2-3x+2 & x^3-5x^2+10x-8 \\
 & x^3-3x^2+2x \quad (-) \\
\hline
 & -2x^2+8x-8 \\
 & -2x^2+6x-4 \quad (-) \\
\hline
 & 2x-4. \quad = 2(x-2)
\end{array}$$

$$\begin{array}{r|l}
 & x-1 \\
x-2 & x^2-3x+2 \\
 & x^2-2x \quad (-) \\
\hline
 & -x+2 \\
 & -x+2 \quad (-) \\
\hline
 & 0 \quad \text{remainder as zero.}
\end{array}$$

GCD of leading co-eff's 3&6 is 3.

Hence,

GCD $[(6x^3-30x^2+60x-48,\ 3x^3-12x^2+21x-18)] = 3(x-2)$ Ans.

33. Solution:-

$$\begin{array}{r|l}
 & 3x^2+2x+4 \\
3x^2 & 9x^4+12x^3+28x^2+ax+b \\
 & 9x^4 \quad (-) \\
\hline
6x^2+2x & 12x^3+28x^2 \\
 & 12x^3+4x^2 \quad (-) \\
\hline
6x^2+4x+4 & 24x^2+ax+b \\
 & 24x^2+16x+16 \quad (-) \\
\hline
 & 0
\end{array}$$

Because, the given polynomial is a perfect square.

Equating x-co-efficients, we get.

$\boxed{a=16}$

Equating constant term, we get.

$\boxed{b=16}$

Hence,

$\boxed{a=16,\ b=16}$ Ans.

34. Solution:-

Given, $A = \frac{2x+1}{2x-1}$, $B = \frac{2x-1}{2x+1}$.

$$\frac{1}{A-B} - \frac{2B}{A^2-B^2} = \frac{1}{A-B} - \frac{2B}{(A+B)(A-B)}$$

$$= \frac{1}{A-B}\left[1 - \frac{2B}{A+B}\right]$$

$$= \frac{1}{A-B}\left[\frac{A+B-2B}{A+B}\right]$$

$$= \frac{1}{A-B}\left[\frac{A-B}{A+B}\right]$$

$$= \frac{1}{A+B} = \frac{1}{\left(\frac{2x+1}{2x-1}\right) + \left(\frac{2x-1}{2x+1}\right)}$$

$$= \frac{1}{\frac{(2x+1)^2 + (2x-1)^2}{(2x)^2 - 1^2}}$$

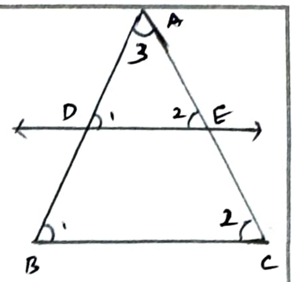
$$= \frac{4x^2-1}{4x^2+1+4x + 4x^2+1-4x}$$

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

$$= \frac{4x^2-1}{2(4x^2+1)}$$

Hence,

$$\boxed{\frac{1}{A-B} - \frac{2B}{A^2-B^2} = \frac{4x^2-1}{2(4x^2+1)}}$$



GIVEN:-

In ΔABC,

D is a point on AB
& E is a point on AC.

TO PROVE:-

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

CONSTRUCTION:

Draw a line $DE \parallel BC$.

$\angle ABC = \angle ADE = \angle 1$ (corresponding angles are equal, $DE \parallel BC$)

$\angle ACB = \angle AED = \angle 2$ (corresponding angles are equal, $DE \parallel BC$)

$\angle DAE = \angle BAC = \angle 3$ (Both triangles have a common angle).

$\Delta ABC \sim \Delta ADE$ by AAA similarity.

$\frac{AB}{AD} = \frac{AC}{AE}$ [Corresponding sides are proportional]

$\frac{AD+DB}{AD} = \frac{AE+EC}{AE}$ [Split AB & AC using the point D & E]

$1 + \frac{DB}{AD} = 1 + \frac{EC}{AE}$ on simplification.

$\frac{DB}{AD} = \frac{EC}{AE}$ Cancelling 1 on both sides.

$\frac{AD}{DB} = \frac{AE}{EC}$ Taking reciprocals.

Hence Proved.

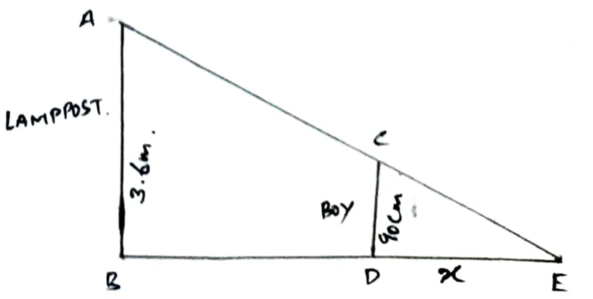
35. Solution:-

Basic Proportionality Theorem (or) Thales Theorem

STATEMENT :-

A st. line drawn parallel to a side of triangle intersecting the other two sides, divides the sides in the same ratio.

36. Solution:-



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Given, speed $= 1.2 m/s$,

time $= 4$ seconds.

distance $=$ speed $\times$ time.

$= 1.2 \times 4 = 4.8 m$.

distance $= 4.8m$.

Let x be the length of the shadow after 4 seconds.

since, $\Delta ABE \sim \Delta CDE$,

$\frac{BE}{DE} = \frac{AB}{CD}$ [90cm = 0.9m].

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

$\frac{4.8+x}{x} = 4$.

$4.8 + x = 4x$.

$\Rightarrow 3x = 4.8$

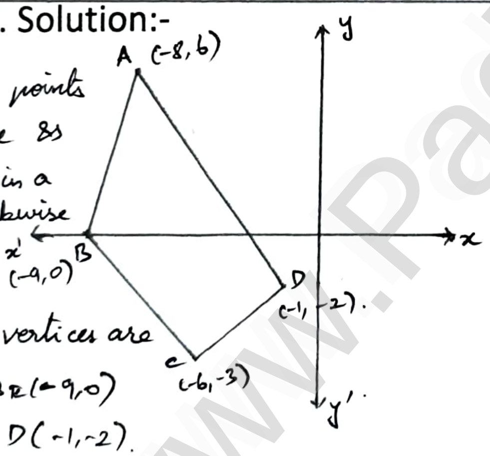
$x = 1.6m$.

Hence,

$\boxed{\text{The length of his shadow } DE = 1.6m}$

37. Solution:-

* Plot the points on the plane & take them in a counter clockwise direction.



* Let the vertices are A(-8,6) B(-9,0) C(-6,-3) D(-1,-2).

Area of a quadrilateral ABCD $= \frac{1}{2}\{(x_1-x_3)(y_2-y_4) - (x_2-x_4)(y_1-y_3)\}$

$= \frac{1}{2}\{(-8+6)(0+2) - (-9+1)(6+3)\}$

$= \frac{1}{2}[(-2)(2) - (-8)(9)]$

$= \frac{1}{2}[-4+72] = \frac{1}{2}[68] = 34$.

Hence,

$\boxed{\text{Area of a quadrilateral } ABCD = 34 \text{ sq.units}}$

38. Solution:-

by using $m = \frac{y_2-y_1}{x_2-x_1}$.

Given: A(3,-4) B(9,-4) C(5,-7) D(7,-7)

slope of AB $= \frac{-4+4}{9-3} = \frac{0}{6} = 0$.

$\boxed{\text{slope of } AB = 0} \rightarrow (1)$

slope of BC $= \frac{-7+4}{5-9} = \frac{-3}{-4} = \frac{3}{4}$.

$\boxed{\text{slope of } BC = 3/4} \rightarrow (2)$

slope of CD $= \frac{-7+7}{7-5} = \frac{0}{2} = 0$.

$\boxed{\text{slope of } CD = 0} \rightarrow (3)$

slope of AD $= \frac{-7+4}{7-3} = \frac{-3}{4} = \frac{-3}{4}$

$\boxed{\text{slope of } AD = -\frac{3}{4}} \rightarrow (4)$.

From (1), (2), (3) & (4), we get,

slope of AB = slope of CD.

since, one pair of opposite sides are parallel,

Hence,

$\therefore$ ABCD is trapezium.

39. Solution:-

If a & b are the intercepts then $a+b=7$

$\Rightarrow \boxed{b = 7-a}$

By intercept form, $\frac{x}{a} + \frac{y}{b} = 1$,

we have, $\frac{x}{a} + \frac{y}{7-a} = 1$. $\rightarrow (1)$

As this line passes through the point $(-3, 8)$,

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

$\Rightarrow -3(7-a) + 8a = a(7-a)$

$-21 + 3a + 8a = 7a - a^2$

$\Rightarrow a^2 + 4a - 21 = 0$.

$a^2 - 3a + 7a - 21 = 0$.

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

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

$a = 3$ (or) $a = -7$.

Put $\boxed{a=3}$, $b = 7-a = 7-3 = 4 \Rightarrow \boxed{b=4}$

Put $\boxed{a=-7}$, $b = 7-(-7) = 7+7 = 14 \Rightarrow \boxed{b=14}$

Since, a is positive,
So, $a = 3$ & $b = 4$

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

$\therefore 4x + 3y = 12 \Rightarrow 4x + 3y - 12 = 0$ is the required equation.

40. Solution:-

$L.H.S = \sin^2 A \cos^2 B + \cos^2 A \sin^2 B + \cos^2 A \cos^2 B + \sin^2 A \sin^2 B$.

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

$= \sin^2 A [\cos^2 B + \sin^2 B] + \cos^2 A [\sin^2 B + \cos^2 B]$

[since, $\sin^2 B + \cos^2 B = 1$]

$= \sin^2 A [1] + \cos^2 A [1]$.

$= \sin^2 A + \cos^2 A$.

$= 1$. $[\because \sin^2 A + \cos^2 A = 1]$

$= R.H.S.$

$\therefore L.H.S = R.H.S.$

$\therefore \sin^2 A \cos^2 B + \cos^2 A \sin^2 B + \cos^2 A \cos^2 B + \sin^2 A \sin^2 B = 1$

41. Solution:-

Given that,

$\frac{\cos\alpha}{\cos\beta} = m$ / $\frac{\cos\alpha}{\sin\beta} = n$.

[Question Paper mistake in this sum].

$\therefore m^2 + n^2 = \left[\frac{\cos\alpha}{\cos\beta}\right]^2 + \left[\frac{\cos\alpha}{\sin\beta}\right]^2$

$= \frac{\cos^2\alpha}{\cos^2\beta} + \frac{\cos^2\alpha}{\sin^2\beta}$

$= \cos^2\alpha \left[\frac{1}{\cos^2\beta} + \frac{1}{\sin^2\beta}\right]$.

$= \cos^2\alpha \left[\frac{\cos^2\beta + \sin^2\beta}{\cos^2\beta \sin^2\beta}\right]$

$= \cos^2\alpha \left[\frac{1}{\cos^2\beta \sin^2\beta}\right]$.

$$= \frac{1}{\cos^2\beta}\left[\frac{\cos^2\alpha}{\sin^2\beta}\right]$$

$$m^2+n^2 = \frac{1}{\cos^2\beta}[n^2].$$

$$\boxed{(m^2+n^2)\cos^2\beta = n^2}$$

Hence Proved.

42. Solution:-

S_1 denotes the sum of n terms,

$a=1$, $d=1$.

$$S_1 = \frac{n}{2}[2(1)+(n-1)(1)].$$

S_2 denotes the sum of n terms,

$a=2$, $d=3$.

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

S_3 denotes the sum of n terms,

$a=3$, $d=5$.

$$S_3 = \frac{n}{2}[2(3)+(n-1)5].$$

⋮

$||^{ly}$

S_m denotes the sum of n terms,

$a=m$ $d=2m-1$.

$$S_m = \frac{n}{2}[2(m)+(n-1)(2m-1)].$$

$\therefore S_1+S_2+\dots+S_m$

$$= \frac{n}{2}\left[2(1+2+\dots+m) + (n-1)(1+3+5+\dots+(2m-1))\right]$$

$$= \frac{n}{2}\left[2\frac{m(m+1)}{2} + (n-1)\frac{m}{2}[1+(2m-1)]\right]$$

$a=1$, $l=2m-1$

$n=m$.

$$= \frac{n}{2}\, m\left[(m+1)+\frac{(n-1)(2m)}{2}\right].$$

$$= \frac{mn}{2}\left[m+1+\frac{2mn-2m}{2}\right].$$

$$= \frac{mn}{2}\left[\frac{\cancel{2m}+2+2mn-\cancel{2m}}{2}\right]$$

$$= \frac{mn}{2}\left[\frac{\cancel{2}[mn+1]}{\cancel{2}}\right]$$

$$= \frac{mn}{2}[mn+1].$$

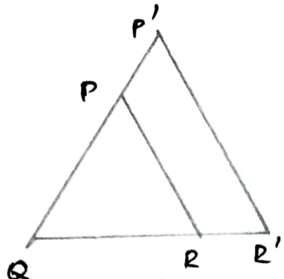
Hence,

$$\therefore S_1+S_2+S_3+\dots+S_m = \frac{mn}{2}[mn+1]$$

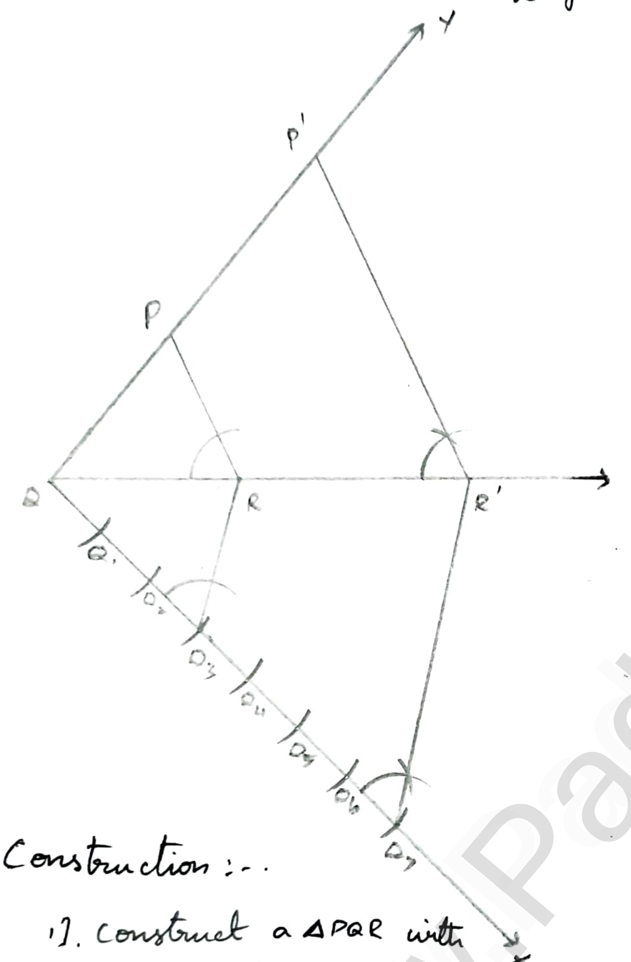
Part – IV

43.a) Solution:-

Given triangle PQR.
[scale factor $\frac{7}{3} > 1$].



Rough Diagram.



Construction:-

1]. Construct a ΔPQR with any measurement.

2]. Draw a ray QX making an acute angle with QR on the side opposite to vertex P.

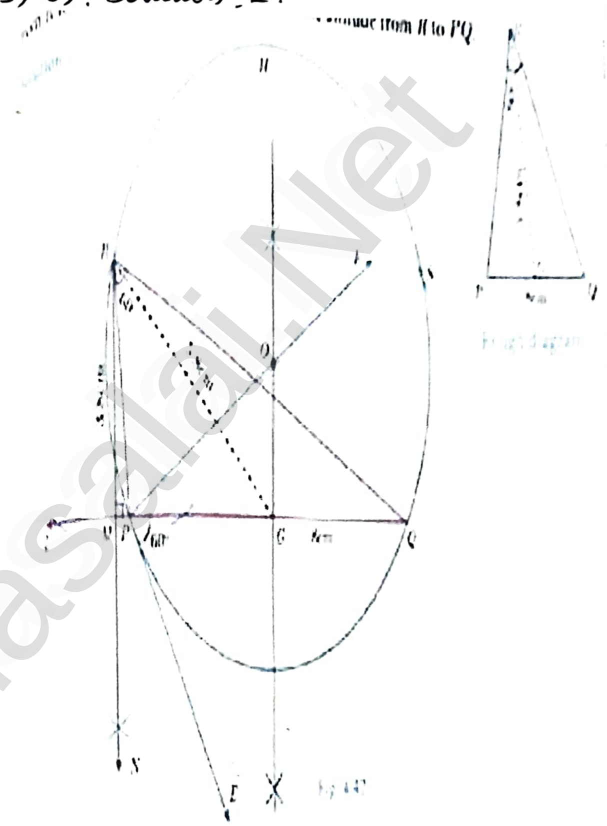
3]. Locate 7 points [the greater of 7 & 3 in $\frac{7}{3}$] $Q_1, Q_2, Q_3, Q_4, Q_5, Q_6$ and Q_7 on QX. $QQ_1 = Q_1Q_2 = Q_2Q_3 = Q_3Q_4 = Q_4Q_5 = Q_5Q_6 = Q_6Q_7$

4]. Join Q_3 to R and draw a line through Q_7 $\parallel^{el}$ to Q_3R, intersecting the extended line segment QR at R'

5]. Draw line through R' Parallel to the line RP intersecting the extending line segment QP at P'.

Then, $\Delta P'QR'$ is the required triangle each of whose sides is seven-third of the corresponding sides of ΔPQR.

43) b). Solution:-



Step 1: Draw a line segment $PQ = 8cm$

Step 2: At P, draw PE such that $\angle QPE = 60°$

Step 3: At P, draw PF such that $\angle EPF = 90°$

Step 4: Draw the perpendicular bisector to PQ, which intersects PF at O and PQ at G.

Step 5: With O as centre and OP as radius draw a circle.

Step 6: From G mark arcs of radius 5.8 cm on the circle. Mark them as R and S.

Step 7: Join PR and RQ. Then ΔPQR is the required triangle.

Step 8: From R draw a line RN perpendicular to LQ.
LQ meets RN at M

Step 9: The length of the altitude is $RM = 3.8$ cm.

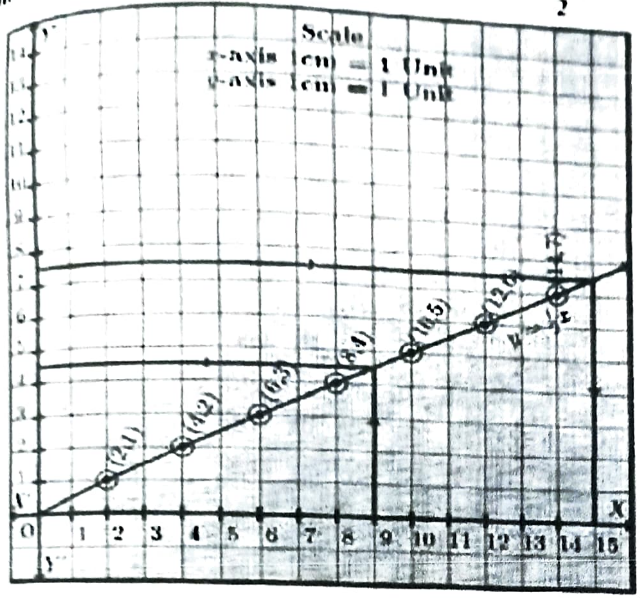
44)

a).

Let us form a table for the given function

x	2	4	6	8	10	12	14	16
y	1	2	3	4	5	6	7	8

From the table we observe that as x increases, y also increases. Therefore, **the variation is a** direct variation. Here, the constant of variation $k = \frac{1}{2}$



Plot the points (2,1), (4,2), (6,3), (8,4), (10,5), (12,6), (14,7) and (16,8) on the graph

We observe that the relation $y = \frac{1}{2}x$ forms a straight line.

From the graph,

(i) when $x = 9$, we have $y = 4.5$

(ii) when $y = 7.5$, we have $x = 15$

44)

b).

Let us form the table with the given details.

Speed x (km/hr)	12	6	4	3	2
Time y (hours)	1	2	3	4	6

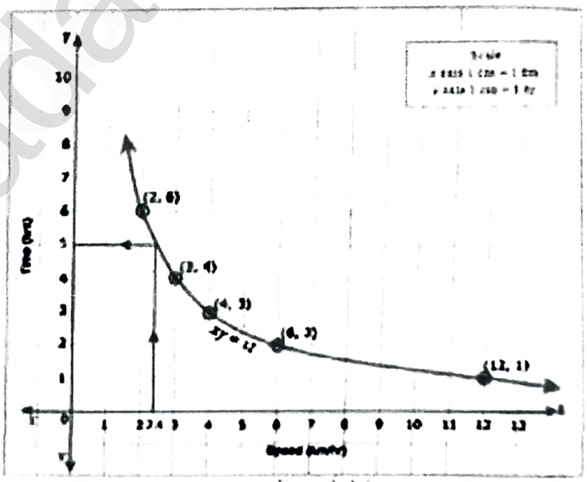
From the table, we observe that as x decreases, y increases. Hence, the type is **inverse variation.**

Let $y = \frac{k}{x}$

$\Rightarrow xy = k,\ k > 0$ is called the constant of variation.

From the table $k = 12 \times 1 = 6 \times 2 = \ldots$
$= 2 \times 6 = 12$

Therefore, $xy = 12$.



Plot the points (12,1), (6,2), (4,3), (3,4), (2,6) and join these points by a smooth curve (Rectangular Hyperbola).

From the graph, we observe that Kaushik takes 5 hrs with a speed of 2.4 km/hr.

...ALL THE BEST...

Prepared By,
M.S.Mahendira Rajan, M.Sc.,M.Phil.,B.Ed.,
Vice Principal & Dept. In Mathematics.
Vanmathi Matric Hr.Sec. School
Vadakkanandal. Chinnasalem(Tk),Kallakurichi(Dt).
contact Number: 9500499292.