பள்ளிக் கல்வித்துறை
செங்கல்பட்டு மாவட்டம்

10ஆம் வகுப்பு

கணிதம்

(ஆங்கில வழி)

மெல்ல மிளிரும் மாணவர்களுக்கான சிறப்புக் கையேடு

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வெளியீடு : முதன்மைக்கல்வி அலுவலகம், செங்கல்பட்டு

இதனை இதனால் இவன்முடிக்கும் என்றாய்ந்து
அதனை அவன்கண் விடல்.

– குறள்.

அன்பார்ந்த மாணவர்களே!

1. உங்களின் இயல்பினை அறிந்து, அனைவரும் வெற்றி பெறும் நோக்கத்துடன் எனது வழிகாட்டுதலின் பேரில் உருவாக்கப்பட்ட சிறப்பு வழிகாட்டி இது. இந்த வழிகாட்டி முழுமையும் படித்தால் நீங்கள் வெற்றி பெறுவது உறுதி.

2. படித்ததை எழுதிப் பழகுங்கள், மேலும் படித்த வினா விடைகளை, சக மாணவர்களோடு கலந்து பேசி தெளிவாகுங்குள் வெற்றி எளிது...

3. முயன்றால் முடியாதது எதுவுமே இல்லை. உங்களால் முடியாதது வேறு எவராலும் முடியாது என்பதை உணருங்கள்.

4. நாளைய நாட்கள் உங்களுக்காகவே காத்திருக்கின்றன. இச்சிறப்பு வழிகாட்டி உங்களை வெற்றிக்கு அழைத்துச் செல்ல இருக்கிறது. கல்வியிலும், வாழ்க்கையிலும் வசந்தம் பெற வாழ்த்துக்கள்.........!

முதன்மைக்கல்வி அலுவலர்,
செங்கல்பட்டு.

DAY - 1

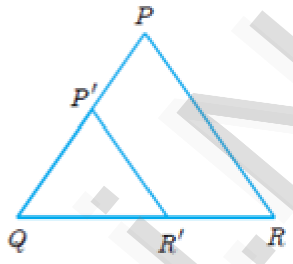
PRACTICAL GEOMETRY - SIMILAR TRIANGLES

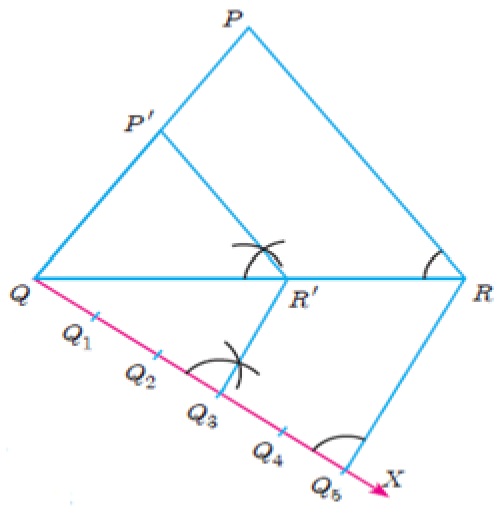
1) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{3}{5} < 1$).

Solution:-

Given, Scale factor $\frac{3}{5} < 1$

ROUGH DIAGRAM





$\Delta P'QR'$ is the required similar triangle.

FIVE MARKS QUESTIONS

UNIT – 1 : RELATIONS AND FUNCTIONS

1) $A = \{x \in \mathbb{W} / x < 2\}$, $B = \{x \in \mathbb{N} / 1 < x \leq 4\}$ and $C = \{3, 5\}$ then, verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$. **[PTA-2, Jun-23]**

Solution:-

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

LHS:

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

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

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

RHS:

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

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

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

∴ from (1) and (2) we see that, $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

2) $A = \{x \in \mathbb{W} / x < 2\}$, $B = \{x \in \mathbb{N} / 1 < x \leq 4\}$ and $C = \{3, 5\}$ then, verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$ **[PTA-5, Sep-21]**

Solution:-

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

LHS:

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

$A \times (B \cap C) = \{0,1\} \times \{3\} = \{(0,3),(1,3)\}$ → **(1)**

RHS:

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

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

$(A \times B) \cap (A \times C) = \{(0,3),(1,3)\}$ → **(2)**

∴ from (1) and (2) we see that, $A \times (B \cap C) = (A \times B) \cap (A \times C)$

3) $A = \{x \in \mathbb{W} / x < 2\}$, $B = \{x \in \mathbb{N}, 1 < x \leq 4\}$ and $C = \{3,5\}$ then, verify that $(A \cup B) \times C = (A \times C) \cup (B \times C)$.

Solution:-

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

LHS:

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

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

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

RHS:

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

$B \times C = \{2,3,4\} X \{3,5\} = \{(2,3),(2,5),(3,3),(3,5),(4,3),(4,5)\}$

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

∴ from (1) and (2) we see that, $(A \cup B) \times C = (A \times C) \cup (B \times C)$

4) $A = \{1,2,3\}$, $B = \{2,3,5\}$, $C = \{3,4\}$ and $D = \{1,3,5\}$ then verify that $(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$

Solution:-

Given, $A \cap C = \{1,2,3\} \cap \{1,2,3\} = \{3\}$

$B \cap D = \{2,3,5\} \cap \{1,3,5\} = \{3,5\}$

$(A \cap C) \times (B \cap D) = \{(3,3),(3,5)\}$ → (1)

RHS:-

$A \times B = \{1,2,3\} \times \{1,2,3\} = \{(1,2),(1,3),(1,5),(2,2),(2,3),(2,5),(3,2),(3,3),(3,5)\}$

$C \times D = \{3,4\} \times \{1,3,5\} = \{(3,1),(3,3),(3,5),(4,1),(4,3),(4,5)\}$

$(A \times B) \cap (C \times D) = \{(3,3),(3,5)\}$ → (2)

∴ from (1) and (2) we see that, $(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$

TWO MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

1) If $A = \{1,3,5\}$, $B = \{2,3\}$ then find (i) $A \times B$ and $B \times A$. (ii) Is $\times B = B \times A$? If not why? (iii) Show that $n(A \times B) = n(B \times A) = n(A) \times n(B)$. **[Sep-21]**

Solution:-

Given, $A = \{1,3,5\}$ and $B = \{2,3\}$

(i) $A \times B = \{1,3,5\} \times \{2,3\} = \{(1,2),(1,3),(3,2),(3,3),(5,2),(5,3)\}$ → (1)

$B \times A = \{2,3\} \times \{1,3,5\} = \{(2,1),(2,3),(2,5),(3,1),(3,3),(3,5)\}$ → (2)

(ii) From (1) and (2), (1) ≠ (2)

Also $A \times B \neq B \times A$ since $(1,2) \neq (2,1)$

(iii) $n(A) = 3$ and $n(B) = 2$

∙ (1) and (2) , we get, $n(A \times B) = n(B \times A) = 6$ →(3)

Here, $n(A) \times n(B) = 3 \times 2 = 6$ → (4)

$n(B) \times n(A) = 2 \times 3 = 6$ → (5)

From (3), (4) and (5), we see that,

$$n(A \times B) = n(B \times A) = n(A) \times n(B)$$

2) Let $A = \{1,2,3\}$ and $B = \{x|x$ is a prime number less than 10$\}$. Find $A \times B$and $B \times A$. **[May-22]**

Solution:-

$A = \{1,2,3\}$, $B = \{2,3,5,7\}$

$A \times B = \{1,2,3\} \times \{2,3,5,7\}$

$= \{(1,2),(1,3),(1,5),(1,7),(2,2),(2,3),(2,5),(2,7),(3,2),(3,3),(3,5),(3,7)\}$

$B \times A = \{2,3,5,7\} \times \{1,2,3\}$

$= \{(2,1),(2,2),(2,3),(3,1),(3,2),(3,3),(5,1),(5,2),(5,3),(7,1),(7,2),(7,3)\}$

3) If $A = \{2,-2,3\}$ and $B = \{1,-1\}$ then (i) A × B (ii) A × A and (iii) $B \times A$. **[PTA-1]**

Solution:-

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

(ii) $\mathrm{A} \times \mathrm{A} = \{2,-2,3\}\, \mathrm{X}\, \{2,-2,3\}$
$= \{(2,2),(2,-2),(2,3),(-2,2),(-2,-2),(-2,3),(3,2),(3,-2),(3,3)\}$

(iii) $\mathrm{B} \times \mathrm{A} = \{1,-1\}\, \mathrm{X}\, \{2,-2,3\} =$
$\{1,2),(1,-2),(1,3),(-1,2),(-1,-2),(-1,3)\}$

4) If $A = B = \{p,q\}$ then (i) A × B (ii) A × A and (iii) $B \times A$.

Solution:-

(i) A X B $= \{p,q\} \times \{p,q\} = \{(p,p),(p,q),(q,p),(q,q)\}$

(ii) A X A $= \{p,q\} \times \{p,q\} = \{(p,p),(p,q),(q,p),(q,q)\}$

(iii) B X A $= \{p,q\} \times \{p,q\} = \{(p,p),(p,q),(q,p),(q,q)\}$

5) If $A = \{m,n\}$ and $B = \emptyset$, then (i) A × B (ii) A × A and (iii) $B \times A$. **[PTA-1]**

Solution:-

(i) $\mathrm{A} \times \mathrm{B} = \{m,n\} \times \emptyset = \emptyset$

(ii) $\mathrm{A} \times \mathrm{A} = \{m,n\} \times \{m,n\} = \{(\mathrm{m},\mathrm{m}),(\mathrm{m},\mathrm{n}),(\mathrm{n},\mathrm{m}),(\mathrm{n},\mathrm{n})\}$

(iii) $\mathrm{B} \times \mathrm{A} = \emptyset\, \mathrm{X}\, \{m,n\} = \emptyset$

ONE MARK QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

1) If $n(AXB) = 6$ and $A = \{1,3\}$ then, $n(B)$ is	**Ans:- 3**
2) $A = \{a,b,p\}$, $B = \{2,3\}$, $C = \{p,q,r,s\}$ then, $n[(A \cup C) \times B]$ is	**Ans:- 12**

3) 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?	**Ans:-** $(AXC) \subset (BXD)$
4) If there are 1024 relations from a set $A = \{1,2,3,4,5\}$ to a set B, then the number of elements of B is	**Ans:- 2**
5) The range of the relation $R = \{(x, x^2)/$ x *is a prime number lessthan* $13\}$ is	**Ans:-** $\{4, 9, 25, 49, 121\}$

Slip Test – 1

I **Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer.** **(3 x 1 = 3)**

1) $A = \{a,b,p\}$, $B = \{2,3\}$, $C = \{p,q,r,s\}$ then, $n[(A \cup C)XB]$ is
   (A) 8 (B) 20 (C) 12 (D) 16
2) If there are 1024 relations from a set $A = \{1,2,3,4,5\}$ to a set B, then the number of elements of B is
   (A) 3 (B) 2 (C) 4 (D) 8
3) If $n(AXB) = 6$ and $A = \{1,3\}$ then, $n(B)$ is
   (A) 1 (B) 2 (C) 3 (D) 6

II Answer the following:- **(2 x 2 = 4)**

4) Let $A = \{1,2,3\}$ and $B = \{x|x$ is a prime number less than $10\}$. Find $A \times B$ and $B \times A$.
5) If $A = \{m,n\}$ and $B = \emptyset$, then (i) A × B (ii) A × A and (iii) $B \times A$.

III Answer the following:- **(1 x 5 = 5)**

6) $A = \{x \in \mathbb{W} / x < 2\}$, $B = \{x \in \mathbb{N} / 1 < x \leq 4\}$ and $C = \{3,5\}$ then, verify that $A \, X \, (B \cup C) = (A \, X \, B) \cup (A \, X \, C)$.

III Answer the following:- **(1 x 8 = 8)**

7) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{3}{5} < 1$).

DAY – 2

SPECIAL GRAPHS - DIRECTVARIATION

1) 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 $y = 7.5$.

Solution:-

VARIATION:- Direct Variation.

TABLE:-

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

POINTS:-

$(2,1), (4,2), (6,3), (8,4), (10,5)$

CONSTANT OF VARIATION:-

$$k = \frac{y}{x} = \frac{1}{2}$$

EQUATION :-

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

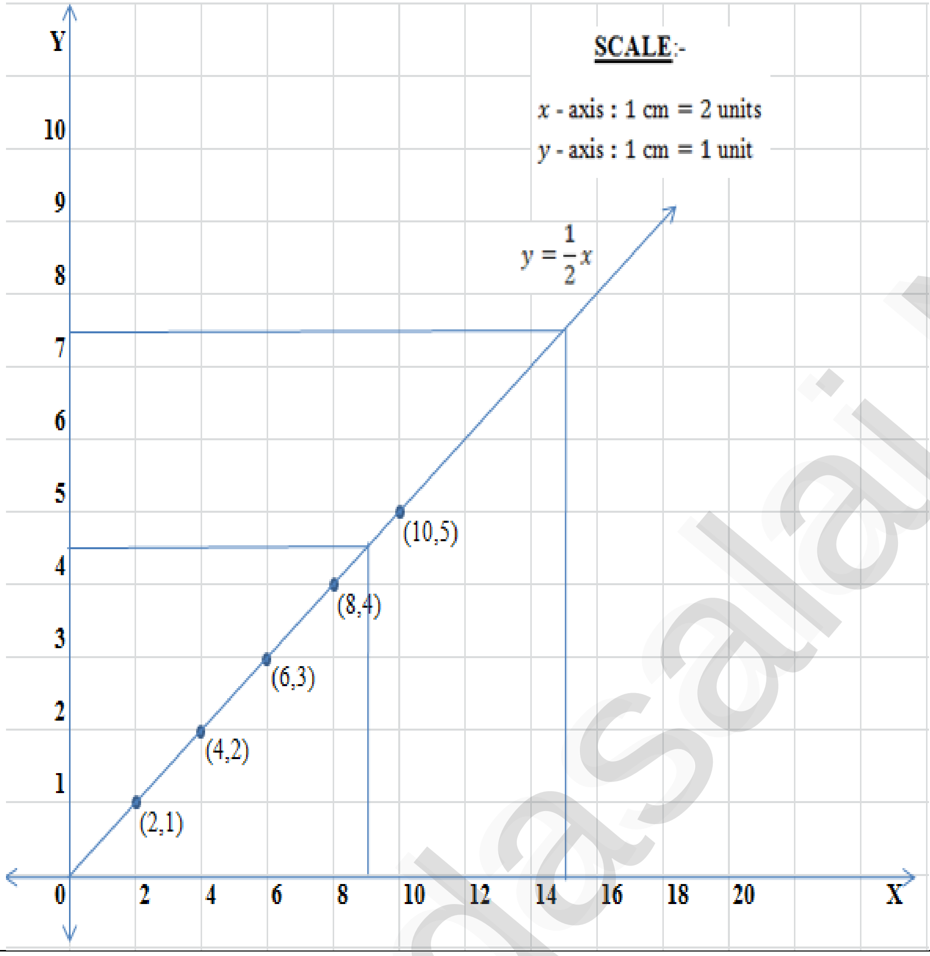
SCALE:-

x – axis : 1 cm = 2 units
y – axis : 1 cm = 1 unit

FROM THE GRAPH,

(i) If $x = 9$ then $y = 4.5$

(ii) If $y = 7.5$ then $x = 15$



FIVE MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

5) $A = \{x \in \mathbb{N} / 1 < x < 4\}$, $B = \{x \in \mathbb{W} / 0 \leq x < 2\}$ and $C = \{x \in \mathbb{N} / x < 3\}$ then verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$. **[Apr-24]**

Solution:-

Given, $A = \{2, 3\}$, $B = \{0, 1\}$, $C = \{1, 2\}$

LHS: $B \cup C = \{0, 1\} \cup \{1, 2\} = \{0, 1, 2\}$

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

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

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

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

∴ from (1) and (2) we see that, $A \times (B \cup C) = (A \times B) \cup (A \times C)$

6) $A = \{x \in \mathbb{N} / 1 < x < 4\}$, $B = \{x \in \mathbb{W} / 0 \leq x < 2\}$ and $C = \{x \in \mathbb{N} / x < 3\}$ then verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

Solution:-

Given, $A = \{2, 3\}$, $B = \{0, 1\}$, $C = \{1, 2\}$

LHS: $B \cap C = \{0, 1\} \cap \{1, 2\} = \{1\}$

$A \times (B \cap C) = \{2, 3\} \times \{1\} = \{(2, 1), (3, 1)\}$ → **(1)**

RHS: $A \times B = \{(2,0),(2,1),(3,0),(3,1)$

$A \times C = \{(2,1),(2,2),(3,1),(3,2)$

$(A \times B) \cap (A \times C) = \{(2,1),(3,1)\}$ → **(2)**

∴ from (1) and (2) we see that, $A \times (B \cap C) = (A \times B) \cap (A \times C)$

7) Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8 and C = The set of even prime number. Verify that $(A \cap B) \times C = (A \times C) \cap (B \times C)$. **[Sep-20]**

Solution:-

Given, $A = \{1,2,3,4,5,6,7\}$, $B = \{2,3,5,7\}$, $C = \{2\}$

LHS:

$A \cap B = \{1,2,3,4,5,6,7\} \cap \{2,3,5,7\} = \{2,3,5,7\}$

$(A \cap B +) \times C = \{2,3,5,7\} \times \{2\} = \{(2,2),(3,2),(5,2),(7,2)\}$ → (1)

RHS:

$A \times C = \{1,2,3,4,5,6,7\} \times \{2\} = \{(1,2),(2,2),(3,2),(4,2),(5,2),(6,2),(7,2)\}$

$B \times C = \{2,3,5,7\} \times \{2\} = \{(2,2),(3,2),(5,2),(7,2)$

$(A \times C) \cap (B \times C) = \{(2,2),(3,2),(5,2),(7,2)\}$ → (2)

∴ from (1) and (2) we see that, $(A \cap B) \times C = (A \times C) \cap (B \times C)$

8) Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8 and C = The set of even prime number. Verify that $A \times (B - C) = (A \times B) - (A \times C)$. **[PTA-1, May-22]**

Solution:-

Given, $A = \{1,2,3,4,5,6,7\}$, $B = \{2,3,5,7\}$, $C = \{2\}$

LHS:

$B - C = \{2,3,5,7\} - \{2\} = \{3,5,7\}$

$A \times (B - C) = \{1,2,3,4,5,6,7\} \times \{3,5,7\}$

$= \{(1,3),(1,5),(1,7),(2,3),(2,5),(2,7),(3,3),(3,5),(3,7),(4,3),(4,5),(4,7),$
$(5,3),(5,5),(5,7),(6,3),(6,5),(6,7),(7,3),(7,5),(7,7)\}$ → **(1)**

RHS:

$A \times B = \{1,2,3,4,5,6,7\} \times \{2,3,5,7\}$

$= \{(1,2),(1,3),(1,5),(1,7),(2,2),(2,3),(2,5),(2,7),(3,2),(3,3),(3,5),(3,7),$
$(4,2),(4,3),(4,5),(4,7),(5,2),(5,3),(5,5),(5,7),(6,2),(6,3),(6,5),(6,7),$
$(7,2),(7,3),(7,5),(7,7)\}$

$A \times C = \{1,2,3,4,5,6,7\} \times \{2\} = \{(1,2),(2,2),(3,2),(4,2),(5,2),(6,2),(7,2)\}$

$(A \text{ X } B) - (A \text{ X } C) = \{(1,3),(1,5),(1,7),(2,3),(2,5),(2,7),(3,3),(3,5),(3,7),$
$(4,3),(4,5),(4,7),(5,3),(5,5),(5,7),(6,3),(6,5),(6,7),$
$(7,3),(7,5),(7,7)\}$ → **(2)**

∴ from (1) and (2) we see that, $A \times (B - C) = (A \times B) - (A \times C)$.

TWO MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

6) If $A \times B = \{(3,2),(3,4),(5,2),(5,4)\}$ then find A and B. **[Sep-20 , Aug-22, Apr-24]**

Solution:-

$A = \{3,5\}$ and $B = \{2,4\}$

7) If $B \times A = \{(-2,3),(-2,4),(0,3),(0,4),(3,3),(3,4)\}$ find A and B. **[Apr-23]**

Solution:-

$A = \{3,4\}$ and $B = \{-2,0,3\}$

8) If A={5,6}, B={4,5,6}, C={5,6,7}, Show that $A \times A = (B \times B) \cap (C \times C)$. **[Aug-22]**

Solution:-

Given, $A = \{5,6\}$, $B = \{4,5,6\}$, C= $\{5,6,7\}$

LHS:-

$A \times A = \{5,6\} \times \{5,6\} = \{(5,5),(5,6),(6,5),(6,6)\}$ → (1)

RHS:-

$B \times B = \{4,5,6\} \times \{4,5,6\}$

$= \{(4,4),(4,5),(4,6),(5,4),(5,5),(5,6),(6,4),(6,5),(6,6)\}$

$C \times C = \{5,6,7\} \times \{5,6,7\}$

$= \{(5,5),(5,6),(5,7),(6,5),(6,6,),(6,7),(7,5),(7,6),(7,7)\}$

$(B \times B) \cap (C \times C) = \{(5,5),(5,6),(6,5),(6,6)\}$ → (2)

Therefore from (1) and (2) we see that, $A \times A = (B \times B) \cap (C \times C)$

9) Let A={1,2,3,4,…,45} and R be the relation defined as "is a square of" on A. Write R as a subset of A×A. Also, find the domain and range of R. **[Sep-21]**

Solution:-

Given, $A = \{1,2,3,4 \ldots ,45\}$

$A \times A = \{1,2,3 \ldots . ,45\} \times \{1,2,3 \ldots . ,45\}$

$= \{(1,1),(1,2) \ldots . . (2,1) \ldots . (3,1) \ldots \ldots . (45,45)\}$

R be the relation defined as "is a square of" on A.

$\therefore R = \{(1,1),(2,4),(3,9),(4,16),(5,25),(6,36)\}$

$R \subseteq A \times A$

Here, Domain of $R = \{1,2,3,4,5,6\}$

Range of $R = \{1,4,9,16,25,36\}$

10) Let A={1,2,3,4,…,100} and R be the relation defined as "is a cube of" on A. Write R as a subset of A×A. Also, find the domain and range of R. **[PTA-4]**

Solution:-

Given, $A = \{1,2,3,4 \ldots ,100\}$

$A \times A = \{1,2,3 \ldots . ,100\} \times \{1,2,3 \ldots . ,100\}$

$= \{(1,1),(1,2) \ldots . . (2,1) \ldots . (3,1) \ldots \ldots . (100,100)\}$

R be the relation defined as "is a cube of" on A.

$\therefore R = \{(1,1),(2,8),(3,27),(4,64)\}$

$R \subseteq A \times A$

Here, Domain of $R = \{1,2,3,4\}$

Range of $R = \{1,4,8,64\}$

ONE MARK QUESTIONS	
UNIT - 1 : RELATIONS AND FUNCTIONS	
6) If the ordered pairs $(a+2,4)$ and $(5,2a+b)$ are equal then (a,b) is	**Ans:- $(3,-2)$**
7) Let $n(A)=m$ and $n(B)=n$ then the total number of non-empty relations that can be defined from A to B is	**Ans:- $2^{mn}-1$**
8) If $\{(a,8),(6,b)\}$ represents an identity function, then the value of a and b are respectively	**Ans:- (8, 6)**
9) Let $A=\{1,2,3,4\}$ and $B=\{4,8,9,10$. A function $f:A\longrightarrow B$ given by $f=\{(1,4),(2,8),(3,9),(4,10)\}$ is a	**Ans:- One-to-one function**
10) If $f(x)=2x^2$ and $g(x)=\frac{1}{3x}$ then fog is	**Ans:- $\frac{2}{9x^2}$**

Slip Test - 2

I **Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer.** **(3 x 1 = 3)**

1) If $f(x)=2x^2$ and $g(x)=\frac{1}{3x}$ then fog is
   (A) $\frac{3}{2x^2}$ (B) $\frac{2}{3x^2}$ (C) $\frac{2}{9x^2}$ (D) $\frac{1}{6x^2}$
2) Let $n(A)=m$ and $n(B)=n$ then the total number of non-empty relations that can be defined from A to B is
   (A) m^n (B) n^m (C) $2^{mn}-1$ (D) 2^{mn}
3) If $\{(a,8),(6,b)\}$ represents an identity function, then the value of a and b are respectively
   (A) (8, 6) (B) (8, 8) (C) (6, 8) (D) (6, 6)

II Answer the following:- **(2 x 2 = 4)**

4) Let A={1,2,3,4,…,45} and R be the relation defined as "is a square of" on A. Write R as a subset of A×A. Also, find the domain and range of R.
5) If $A\times B=\{(3,2),(3,4),(5,2),(5,4)\}$ then find A and B.

III Answer the following:- **(1 x 5 = 5)**

6) Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8 and C = The set of even prime number. Verify that $AX(B-C)=(AXB)-(AXC)$.

III Answer the following:- **(1 x 8 = 8)**

7) 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 $y=7.5$.

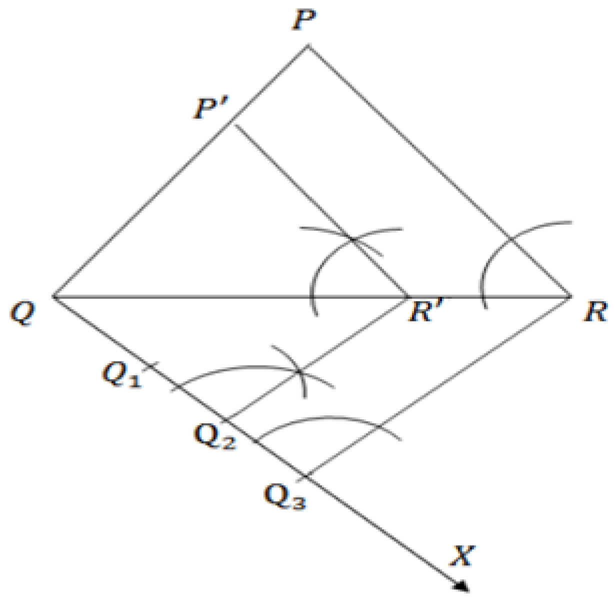
DAY – 3

PRACTICAL GEOMETRY - SIMILAR TRIANGLES

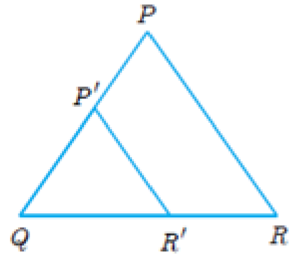
2) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{2}{3}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{2}{3}<1$).

Solution:-

Given, Scale factor $\frac{2}{3} < 1$



ROUGH DIAGRAM



$\Delta P'QR'$ is the required similar triangle.

FIVE MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

9) Let $A = \{1, 2, 3, 4\}$ and $B = \{2, 5, 8, 11, 14\}$ be two sets. Let $f : A \longrightarrow B$ be a function given by $f(x) = 3x - 1$. Represent this function (i) as a set of ordered pairs (ii) in a table form (iii) by arrow diagram (iv) in a graphical form **[PTA-3, Sep-20]**

Solution:-

Given, $f(x) = 3x - 1$

$f(1) = 3(1) - 1 = 3 - 1 = 2,$ $f(2) = 3(2) - 1 = 6 - 1 = 5,$

$f(3) = 3(3) - 1 = 9 - 1 = 8,$ $f(4) = 3(4) - 1 = 12 - 1 = 11$

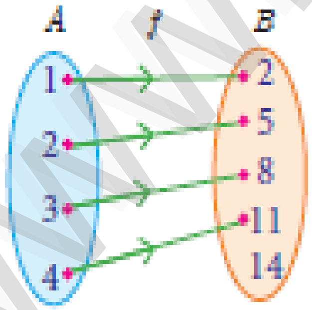
(i) A set of ordered pairs:-

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

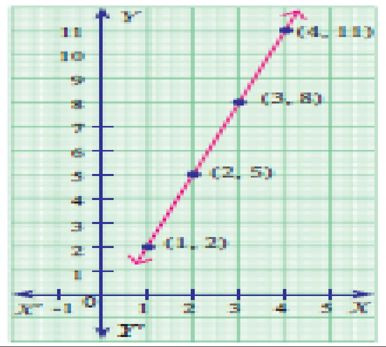
(ii) A table:-

x	1	2	3	4
$f(x)$	2	5	8	11

(iii) An arrow diagram:-



(iv) A Graph:-



10) Let $A = \{2, 4, 6, 10, 12\}$ and $B = \{0, 1, 2, 4, 5, 9\}$ be two sets. Let $f : A \longrightarrow B$ be a function given by $f(x) = \frac{x}{2} - 1$. Represent this function (i) as a set of ordered pairs (ii) in a table form (iii) by arrow diagram (iv) in a graphical form. **[GMQ, Apr-23]**

Solution:-

Given, $f(x) = \frac{x}{2} - 1$

$$f(2) = \frac{2}{2} - 1 = 1 - 1 = 0 \qquad f(4) = \frac{4}{2} - 1 = 2 - 1 = 1$$

$$f(6) = \frac{6}{2} - 1 = 3 - 1 = 2 \qquad f(10) = \frac{10}{2} - 1 = 5 - 1 = 4$$

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

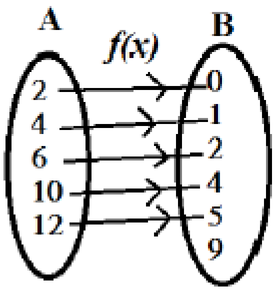
(i) A set of ordered pairs:-

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

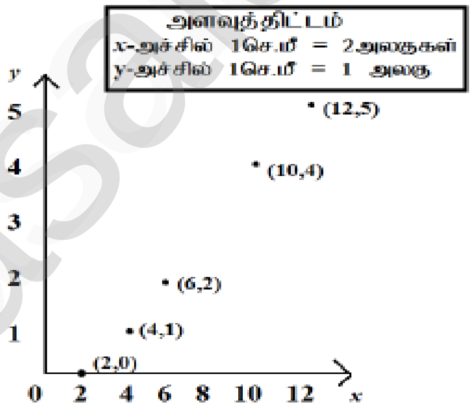
(ii) A table:-

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

(iii) **An arrow diagram:-**



(iv) **A graph:-**



TWO MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

11) 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. **[PTA-5, Jun-23]**

Solution:-

Given, Domain, $= \{0, 1, 2, 3, 4, 5\}$ and $y = f(x) = x + 3$

If $x = 0$, $y = 0 + 3 = 3$ If $x = 1$, $y = 1 + 3 = 4$

If $x = 2$, $y = 2 + 3 = 5$ If $x = 3$, $y = 3 + 3 = 6$

If $x = 4$, $y = 4 + 3 = 7$ If $x = 5$, $y = 5 + 3 = 8$

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

Domain of $R = \{0, 1, 2, 3, 4, 5\}$

Range of $R = \{3, 4, 5, 6, 7, 8\}$

12) A relation R is given by the set $\{(x,y)|y = x^2 + 3, x \in \{0,1,2,3,4.5\}\}$. Determine its domain and range. **[PTA-2]**

Solution:-

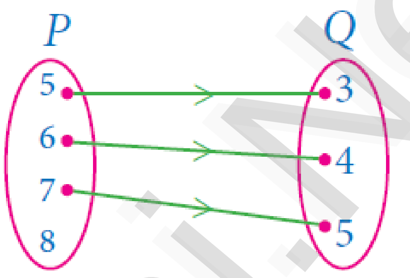
Given, $y = f(x) = x^2 + 3$, $x \in \{0,1,2,3,4.5\}$

$f(0) = (0)^2 + 3 = 0 + 3 = 3$
$f(1) = (1)^2 + 3 = 1 + 3 = 4$
$f(2) = (2)^2 + 3 = 4 + 3 = 7$
$f(3) = (3)^2 + 3 = 9 + 3 = 12$
$f(4) = (4)^2 + 3 = 16 + 3 = 19$
$f(5) = (5)^2 + 3 = 25 + 3 = 28$

Domain= $\{0, 1, 2, 3, 4, 5\}$
Range = $\{3, 4, 7, 12, 19, 28\}$

13) The arrow diagram shows a relationship between the sets P and Q. Write the relation in (i) Set builder form (ii) Roster form (iii) What is the domain and range of R.

[May-22]



Solution:-

(i) **Set builder form**:-

$R = \{(x, y) / y = x - 2, x \in P, y \in Q\}$

(ii) **Roster form**:-

$R = \{(5,3), (6,4), (7,5)\}$

(iii) Domain = $\{5,6,7\}$

Range = $\{3,4,5\}$

14) Represent the relation R = $\{(x, y) | x = 2y,\ x \in \{2,3,4,5\}, y \in \{1,2,3,4\}\}$ is given by (a) an arrow diagram (ii) a graph and (c) a set in roster form, wherever possible.

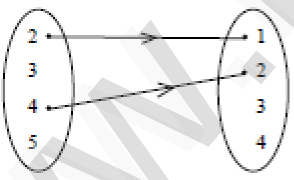
[PTA-5]

Solution:-

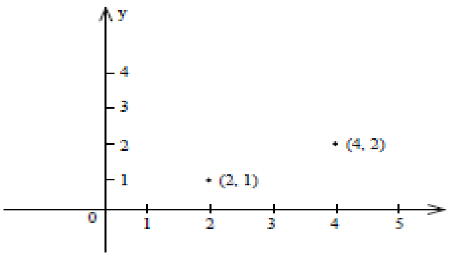
Given, $x = 2y,\ x \in \{2,3,4,5\},\ y = \{1,2,3,4\}$

If $y = 1$, $x = 2 \times 1 = 2$
If $y = 2$, $x = 2 \times 2 = 4$
If $y = 3$, $x = 2 \times 3 = 6$
If $y = 4$, $x = 2 \times 4 = 8$

(i) **An arrow diagram:-**



(ii) **A graph :-**



(iii) **A Roster form :-**

$R = \{(2,1), (4,2)\}$

15) Represent the relation R = $\{(x, y) | y = x + 3,\ x, y \text{ are natural numbers} < 10\}$ is given by (a) an arrow diagram (ii) a graph and (c) a set in roster form, wherever possible.

[Aug-22]

Solution:-

Given, $y = x + 3$; x, y *are natural numbers* < 10

$x = \{1,2,3,4,5,6,7,8,9\}$ and $y = \{1,2,3,4,5,6,7,8,9\}$

If $x = 1$, $y = 1 + 3 = 4$

If $x = 2$, $y = 1 + 3 = 5$

If $x = 3$, $y = 1 + 3 = 6$

If $x = 4$, $y = 1 + 3 = 7$

If $x = 5$, $y = 1 + 3 = 8$

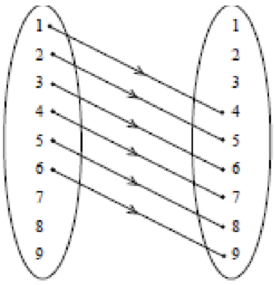
If $x = 6$, $y = 1 + 3 = 9$

If $x = 7$, $y = 1 + 3 = 10$

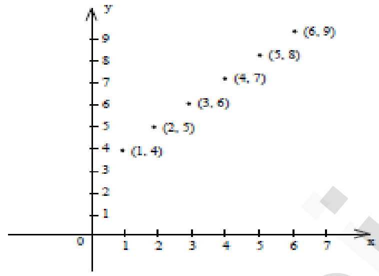
If $x = 8$, $y = 1 + 3 = 11$

If $x = 9$, $y = 1 + 3 = 12$

(i) An arrow diagram:-



(ii) A graph :-



(iii) A Roster form :-

$R = \{(1,4)), (2,5), (3,6), (4,7), (5,8), (6,9)\}$

ONE MARK QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

11) If $f: A \longrightarrow B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to	**Ans:- 7**
12) Let f and g be two functions given by $f = \{(0,1), (2,0), (3,-4), (4,2), (5,7)\}$, $g = \{(0,2), (1,0), (2,4), (-4,2), (7,0)\}$ then the range of fog is	**Ans:- $\{0, 1, 2\}$**
13) Let $f(x) = \sqrt{1 + x^2}$ then	**Ans:- $f(xy) \leq f(x).f(y)$**
14) 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	**Ans:- $(2, -1)$**
15) $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is	**Ans:- quadratic**

Slip Test - 3

I **Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer.** **(3 x 1 = 3)**

1) Let f and g be two functions given by $f = \{(0,1), (2,0), (3,-4), (4,2), (5,7)\}$, $g = \{(0,2), (1,0), (2,4), (-4,2), (7,0)\}$ then the range of fog is (A) $\{0, 2, 3, 4, 5\}$ (B) $\{-4, 1, 0, 2, 7\}$ (C) $\{1, 2, 3, 4, 5\}$ (D) $\{0, 1, 2\}$

2) 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 (A) $(-1, 2)$ (B) $(2, -1)$ (C) $(-1, -2)$ (D) $(1, 2)$

3) Let $f(x) = \sqrt{1 + x^2}$ then
(A) $f(xy) = f(x).f(y)$ (B) $f(xy) \geq f(x).f(y)$
(C) $f(xy) \leq f(x).f(y)$ (D) None of these

II Answer the following:- **(2 x 2 = 4)**

4) Represent the relation R = $\{(x, y) | y = x + 3,\ x, y are natural numbers < 10\}$ is given by (a) an arrow diagram (ii) a graph and (c) a set in roster form, wherever possible.

5) 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.

III Answer the following:- **(1 x 5 = 5)**

6) Let $A = \{2, 4, 6, 10, 12\}$ and $B = \{0, 1, 2, 4, 5, 9\}$ be two sets. Let $f : A \longrightarrow B$ be a function given by $f(x) = \frac{x}{2} - 1$. Represent this function (i) as a set of ordered pairs (ii) in a table form (iii) by arrow diagram (iv) in a graphical form.

III Answer the following:- **(1 x 8 = 8)**

7) 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 $\frac{2}{3} < 1$).

DAY – 4

SPECIAL GRAPHS - DIRECT VARIATION

1) Varshika drew 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference (approximately related) 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

Solution:-

VARIATION:- Direct Variation.

TABLE:-

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

POINTS:-

$(1, 3.1), (2, 6.2), (3, 9.3), (4, 12.4), (5, 15.5)$

CONSTANT OF VARIATION:-

$$k = \frac{y}{x} = \frac{3.1}{1} = 3.1$$

EQUATION:- $y = kx$

$$y = (3.1)\,x$$

SCALE:-

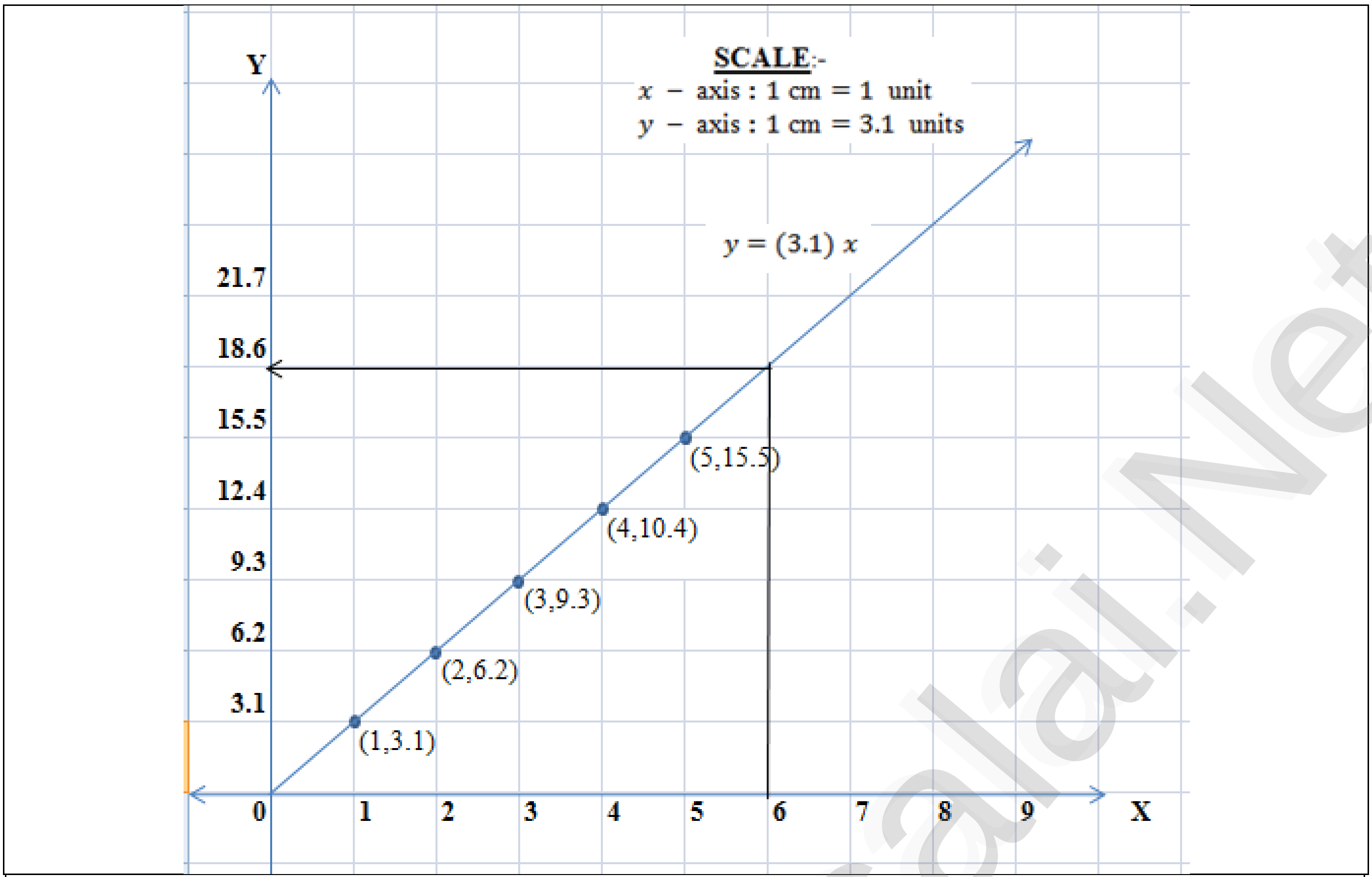
x – axis : 1 cm = 1 unit

y – axis : 1 cm = 3.1 units

FROM THE GRAPH,

If $x = 6$ then $y = 18.6$

The circumference of a circle when its diameter is 6 cm is 18.6 cm.



FIVE MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

11) If the function $f:\mathbb{R} \longrightarrow \mathbb{R}$ is defined by $f(x) = \begin{cases} 2x+7 & ; \quad x < -2 \\ x^2-2 & ; \quad -2 \le x < 3 \\ 3x-2 & ; \quad x \ge 3 \end{cases}$ then find the values of: **(i)** $f(4)$ **(ii)** $f(-2)$ **(iii)** $f(4)+2f(1)$ **(iv)** $\frac{f(1)-3f(4)}{f(-3)}$

Solution:-

$f(x) = 2x+7 \qquad x < -2 \qquad x = -3, -4, -5, \dots$

$f(x) = x^2-2 \qquad -2 \le x < 3 \qquad x = -2, -1, 0, 1, 2$

$f(x) = 3x-2 \qquad x \ge 3 \qquad x = 3, 4, 5, \dots$

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

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

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

$= 10 + 2[1-2]$

$= 10 + 2[-1]$

$= 10 - 2 = 8$

(iv) $\frac{f(1)-3f(4)}{f(-3)} = \frac{[(1)^2-2]-3[10]}{2(-3)+7} = \frac{[1-2]-30}{-6+7} = \frac{-1-30}{1} = -31$

12) If the function $f:\mathbb{R}\longrightarrow\mathbb{R}$ is defined by $f(x)=\begin{cases} x+2 & ; \quad x>1 \\ 2 & ; \quad -1\le x\le 1 \\ x-1 & ; \quad -3<x<-1 \end{cases}$ then find the values of : **(i)** $f(3)$ **(ii)** $f(0)$ **(iii)** $f(-1.5)$ **(iv)** $f(2)+f(-2)$

Solution:-

$f(x)=x+2$ $\quad x>1$ $\quad x=2,3,4,5,\ldots$

$f(x)=2$ $\quad -1\le x\le 1$ $\quad x=-1,0,1,$

$f(x)=x-1$ $\quad -3<x<-1$ $\quad x=-2$

(i) $f(3)=3+2=5$

(ii) $f(0)=2$

(iii) $f(-1.5)=-1.5-1=-2.5$

(iv) $f(2)+f(-2)=[2+2]+[-2-1]=4-3=1$

13) A function $f:[-5,9]\to\mathbb{R}$ is defined as follows. $f(x)=\begin{cases} 6x+1 & ; \quad -5\le x<2 \\ 5x^2-1 & ; \quad 2\le x<6 \\ 3x-4 & ; \quad 6\le x\le 9 \end{cases}$ Find: **[PTA-4]**

(i) $f(-3)+f(2)$ **(ii)** $f(7)-f(1)$ **(iii)** $2f(4)+f(8)$ **(iv)** $\frac{2f(-2)-f(6)}{f(4)+f(-2)}$

Solution:-

$f(x)=6x+1$ $\quad -5\le x<2$ $\quad x=-5,-4,-3,-2,-1,0,1$

$f(x)=5x^2-1$ $\quad 2\le x<6$ $\quad x=2,3,4,5$

$f(x)=3x-4$ $\quad 6\le x\le 9$ $\quad x=6,7,8,9$

(i) $f(-3)+f(2)=[6(-3)+1]+[5(2)^2-1]$

$=[-18+1]+[5(4)-1]$

$=[-17]+[20-1]$

$=-17+19$

$=2$

(ii) $f(7)-f(1)=[3(7)-4]-[6(1)+1]$

$=[21-4]-[6+1]$

$=17-7=10$

(iii) $2f(4)+f(8)=2[5(4)^2-1]+[3(8)-4]$

$=2[5(16)-1]+[24-4]$

$=2[80-1]+[20]$

$=2[79]+20$

$=158+20$

$=178$

(iv) $\frac{2f(-2)-f(6)}{f(4)+f(-2)}=\frac{2[6(-2)+1]-[3(6)-4]}{[5(4)^2-1]+[6(-2)+1]}$

$$= \frac{2[-12+1]-[18-4]}{[5(16)-1]+[-12+1]}$$

$$= \frac{2[-11]-[14]}{[80-1]+[-11]}$$

$$= \frac{-22-14}{79-11}$$

$$= \frac{-36}{68}$$

$$= \frac{-9}{17}$$

TWO MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

16) A company has four categories of employees given by Assistants (A), Clerks (C), Managers (M) and Executive Officer (E). The company provide Rs...10,000, Rs..25,000, Rs..50,000 and Rs..1,00,000 as salaries to the people who work in the categories A, C, M and E. If A_1, A_2, A_3, A_4 and A_5 were assistants, C_1, C_2, C_3 and C_4 are Clerks, M_1, M_2, and M_3 are Managers and E_1, E_2 are Executive Officers and if the relation R is defined by $x\,R\,y$, where x is the salary given to person y, express the relation R through an ordered pair and an arrow diagram.

Solution:-

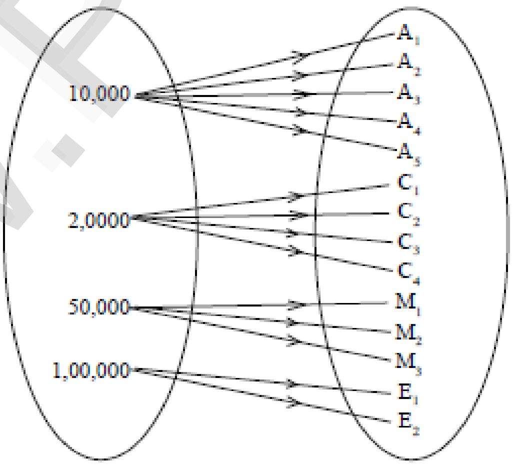
Given, Salaries, $S = \{10000, 25000, 50000, 100000\}$

Employees, $E = \{A_1, A_2, A_3, A_4, A_5, C_1, C_2, C_3, C_4, M_1, M_2, M_3, E_1, E_2\}$

A set of ordered pairs :-

$R = \{(10000, A_1), (10000, A_2), (10000, A_3), (10000, A_4), (10000, A_5), (25000, C_1), (25000, C_2),$
$(25000, C_3), (25000, C_4)(50000, M_1), (50000, M_2), (50000, M_3), (100000, E_1), (100000, E_2)\}$

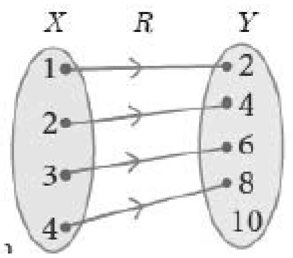
An arrow diagram :-



17) Let $X = \{1, 2, 3, 4\}$, $Y = \{2, 4, 6, 8, 10\}$ and $R = \{(1,2), (2,4), (3,6), (4,8)\}$. Show that R is a function and find its domain, co-domain and range.

Solution:-

Given, $X = \{1,2,3,4\}$, $Y = \{2,4,6,8,10\}$ and
$R = \{(1,2),(2,4),(3,6),(4,8)\}$.



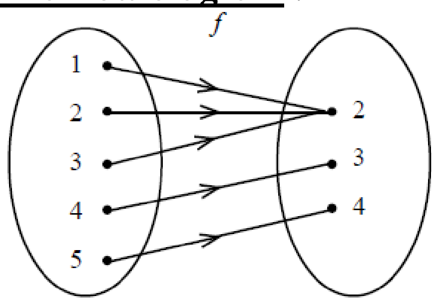
All elements in X have only one images in Y.
Therefore R is a function.
Domain $= \{1,2,3,4\}$
Co domain $= \{2,4,6,8,10\}$
Range $= \{2,4,6,8\}$

18) Represent the function $f = \{(1,2),(2,2),(3,2),(4,3),(5,4)\}$ through (i) an arrow diagram (ii) a table form (iii) a graph.

Solution:-

Given, $f = \{(1,2),(2,2),(3,2),(4,3),(5,4)\}$

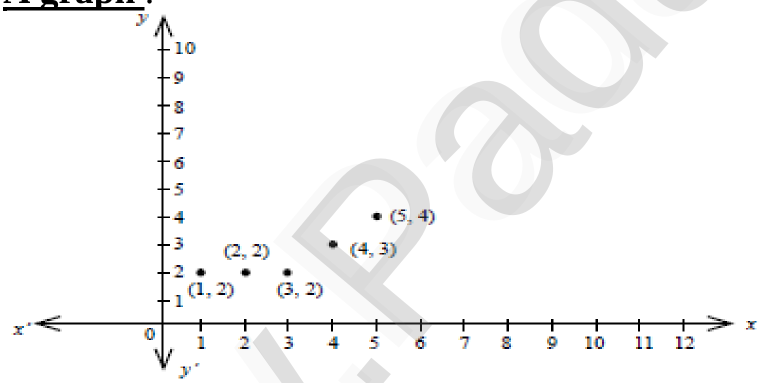
(i) **An arrow diagram** :-



(ii) **A table** :-

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

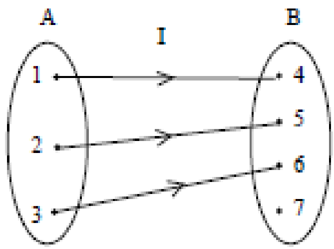
(iii) **A graph** :-



19) Let $A = \{1,2,3\}, B = \{4,5,6,7\}$ and $f = \{(1,4),(2,5),(3,6)\}$ be a function from A to B. Show that f is one-one but not onto function.

Solution:-

Given, $A = \{1,2,3\}$, $B = \{4,5,6,7\}$ and $f = \{(1,4),(2,5),(3,0)\}$



- Different elements in the domain A having different images in the co-domain B.
  Hence f is one – one function.
- The element 7 in the co-domain does not have any pre – image in the domain.
  Hence f is not an onto function.
  Therefore f is one – one function but not an onto function.

20) Let $A = \{1, 2, 3, 4\}$ and $B = \mathbb{N}$. Let $f : A \longrightarrow B$ be defined by $f(x) = x^3$ then , (i) find the range of f (ii) identify the type of function.

Solution:-

Given, $f(x) = x^3$,

$A = \{1, 2, 3, 4\}$ asnd $B = \mathbb{N} = \{1, 2, 3, ...\}$

If $x = 1$ then $f(1) = (1)^3 = 1$

If $x = 2$ then $f(2) = (2)^3 = 8$

If $x = 3$ then $f(3) = (3)^3 = 27$

If $x = 4$ then $f(4) = (4)^3 = 64$

(i) Range of f $= \{1, 8, 27, 64\}$

(ii) Distinct elements of the domain ℕ have distinct images in the codomain ℕ.
Also the range of f is the proper subset of the co – domain.
Therefore, f is a one – one and into function.

ONE MARK QUESTIONS

UNIT - 2 : NUMBERS AND SEQUENCES

16) Euclid's division lemma states that for positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy	**Ans:- $0 \le r < b$**
17) Using Euclid's division lemma, if the cube of any positive integer is divided by 9 then the possible reminders are	**Ans:- 0, 1, 8**
18) If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is	**Ans:- 2**
19) The sum of the exponents of the prime factors in the prime factorization of 1729 is	**Ans:- 3**
20) The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is	**Ans:- 2520**

Slip Test - 4

I **Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer.** **(3 x 1 = 3)**

1) 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
2) Euclid's division lemma states that for positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy
   (A) $1 < r < b$ (B) $0 < r < b$ (C) $0 \le r < b$ (D) $0 < r \le b$
3) 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

II Answer the following:- **(2 x 2 = 4)**

4) Let $X = \{1, 2, 3, 4\}$, $Y = \{2, 4, 6, 8, 10\}$ and $R = \{(1, 2), (2, 4), (3, 6), (4, 8)\}$. Show that R is a

function and find its domain, co-domain and range.

5) Let $A = \{1, 2, 3, 4\}$ and $B = \mathbb{N}$. Let $f : A \longrightarrow B$ be defined by $f(x) = x^3$ then, (i)find the range of f (ii) identify the type of function.

III Answer the following:- **(1 x 5 = 5)**

6) If the function $f: \mathbb{R} \longrightarrow \mathbb{R}$ is defined by $f(x) = \begin{cases} 2x+7 & ; \quad x < -2 \\ x^2 - 2 & ; \quad -2 \le x < 3 \\ 3x - 2 & ; \quad x \ge 3 \end{cases}$ then find the values of: **(i)** $f(4)$ **(ii)** $f(-2)$ **(iii)** $f(4) + 2f(1)$ **(iv)** $\frac{f(1)-3f(4)}{f(-3)}$

III Answer the following:- **(1 x 8 = 8)**

7) Varshika drew 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference (approximately related) 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

DAY – 5

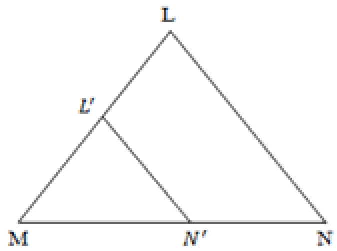
PRACTICAL GEOMETRY - SIMILAR TRIANGLES

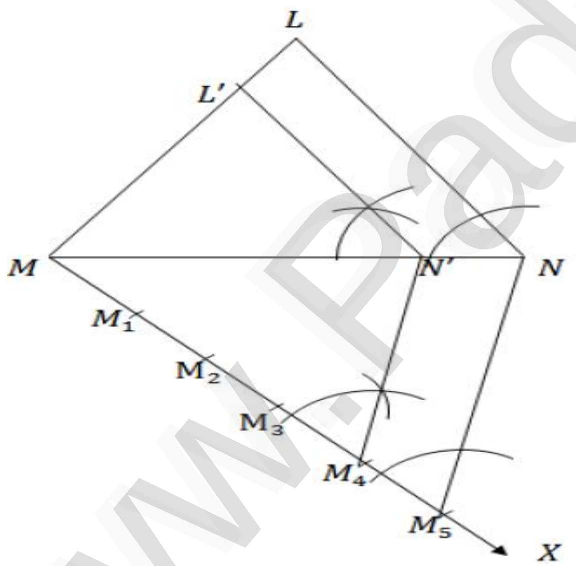
3) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{4}{5} < 1$).

Solution:-

Given, Scale factor $\frac{4}{5} < 1$

ROUGH DIAGRAM





$\Delta L'MN'$ is the required similar triangle.

FIVE MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

14) If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$. Prove that $fo(goh) = (fog)oh$. **[PTA-5]**

Solution:-

$fo(goh) = (2x+3)\ o\ [(1-2x)\ o\ (3x)]$ | $(fog)oh = [(2x+3)\ o\ (1-2x)]o(3x)]$

$= (2x+3)\ o\ [1-2(3x)]$ $= (2x+3)\ o\ (1-6x)$ $= 2(1-6x)+3$ $= 2-12x+3$ $= 5-12x$ → **(1)**	$= [2(1-2x)+3]\ o\ (3x)$ $= (2-4x+3) o\ (3x)$ $= (5-4x)+(3x)$ $= 5-4(3x)$ $= 5-12x$ → **(2)**

∴ from (1) and (2) we see that, $fo(goh) = (fog)oh$.

15) $f(x) = x-1,\ g(x) = 3x+1$ and $h(x) = x^2$ Prove that $fo(goh) = (fog)oh$

Solution:-

$fo(goh) = (x-1)\ o\ [(3x+1)\ o\ (x^2)]$ $= (x-1)\ o\ (3x^2+1)$ $= 3x^2+1-1$ $= 3x^2$ → **(1)**	$(fog)oh = [(x-1)\ o\ (3x+1)]o(x^2)]$ $= (3x+1-1)\ o\ (x^2)$ $= (3x)\ o\ (x^2)$ $= 3x^2$ → **(2)**

∴ from (1) and (2) we see that, $fo(goh) = (fog)oh$.

16) $f(x) = x^2,\ g(x) = 2x$ and $h(x) = x+4$ **என்ற சார்புகளுக்கு** $fo(goh) = (fog)oh$ Prove that $fo(goh) = (fog)oh$

Solution:-

$fo(goh) = (x^2)\ o\ [(2x)\ o\ (x+4)]$ $= (x^2)\ o\ 2(x+4)$ $= (x^2)\ o\ (2x+8)$ $= (2x+8)^2$ → **(1)**	$(fog)oh = [(x^2)\ o\ (2x)]\ o\ (x+4)]$ $= (2x)^2\ o\ (x+4)$ $= [2(x+4)]^2$ $= (2x+8)]^2$ → **(2)**

∴ from (1) and (2) we see that, $fo(goh) = (fog)oh$.

17) $f(x) = x-4,\ g(x) = x^2$ and $h(x) = 3x-5$. Prove that $fo(goh) = (fog)oh$ **[PTA-2]**

Solution:-

$fo(goh) = (x-4)\ o\ [\ (x^2)\ o\ (3x-5)]$ $= (x-4)\ o\ (3x-5)^2$ $= (3x-5)^2-4$ → **(1)**	$(fog)oh = [(x-4)\ o\ (x^2)]\ o\ (3x-5)]$ $= (x^2-4)\ o\ (3x-5)$ $= (3x-5)^2-4$ → **(2)**

∴ from (1) and (2) we see that, $fo(goh) = (fog)oh$.

TWO MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

21) If $R = \{(x,-2),(-5,y)\}$ represents the identity function, find the values of x and y. **[PTA-6]**

Solution:-

Given, $R = \{(x,-2),(-5,y)\}$ represents the identity function.

$x = -2$ and $y = -5$

22) Represent the function $f(x) = \sqrt{2x^2-5x+3}$ as a composition of two functions.

Solution:-

Let $f_1(x) = \sqrt{x}$ and $f_2(x) = 2x^2-5x+3$

$\cdot f(x) = \sqrt{f_2(x)} = f_1[f_2(x)] = f_1 f_2(x)$

ONE MARK QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

21) $7^{4k} \equiv$ ______ $(mod100)$	**Ans:- 1**
22) Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is	**Ans:- 11**
23) The first term of an arithmetic progression is unity and the common difference is 4 which of the following will be a term of this A.P?	**Ans:- 7881**
24) If 6 times of 6[th]term of an A.P. is equal to 7 times the 7[th], then the 13[th] term of the A.P. is	**Ans:- 0**
25) An A.P. consists of 31 terms. If its 16[th] term is m, then the sum of all the terms of this A.P. is	**Ans:- 31 m**

Slip Test - 5

I **Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer.** **(3 x 1 = 3)**

1) 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

2) An A.P. consists of 31 terms. If its 16[th] term is m, then the sum of all the terms of this A.P. is
(A) 16 m (B) 62 m (C) 31 m (D) $\frac{31}{2}m$

3) $7^{4k} \equiv$ ______ $(mod100)$
(A) 1 (B) 2 (C) 3 (D) 4

II Answer the following:- **(2 x 2 = 4)**

4) If $R = \{(x,-2),(-5,y)\}$ represents the identity function, find the values of $x$and y.

5) Represent the function $f(x) = \sqrt{2x^2 - 5x + 3}$ as a composition of two functions.

III Answer the following:- **(1 x 5 = 5)**

6) $f(x) = x - 1$, $g(x) = 3x + 1$ and $h(x) = x^2$ Prove that $fo(goh) = (fog)oh$.

III Answer the following:- **(1 x 8 = 8)**

7) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{4}{5} < 1$).

DAY – 6

WEEKLY TEST - 1

DAY – 7

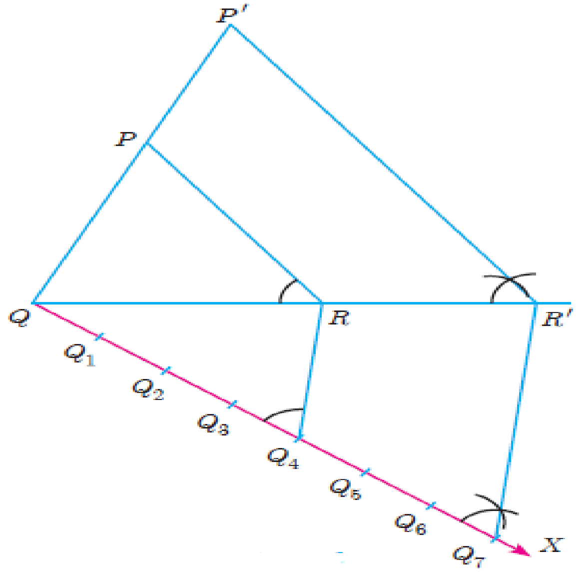
PRACTICAL GEOMETRY - SIMILAR TRIANGLES

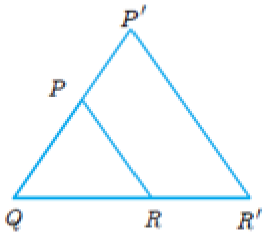
4) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{4}$ of the corresponding sides of the triangle PQR. (Scale factor $\frac{7}{4} > 1$)

Solution:-

Given, Scale factor $\frac{7}{4} > 1$

ROUGH DIAGRAM





$\Delta P'QR'$ is the required similar triangle.

FIVE MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

18) $f(x) = x^2$, $g(x) = 3x$ and $h(x) = x - 2$. Prove that $fo(goh) = (fog)oh$

Solution:-

$fo(goh) = (x^2)\, o\, [(3x)\, o\, (x-2)]$
$= (x^2)\, o\, [3(x-2)]$
$= [3(x-2)]^2$
$= 9(x-2)^2$ → **(1)**

$(fog)oh = [(x^2)\, o\, (3x)]\, o\, (x-2)]$
$= (3x)^2\, o\, (x-2)$
$= [3(x-2)]^2$
$= 9(x-2)^2$ → **(2)**

∴ from (1) and (2) we see that, $fo(goh) = (fog)oh$.

19) Let $f(x) = 3x + 1$, $g(x) = x + 3$ be any two functions. Also if $gff(x) = fgg(x)$, find the value of $'x'$.

Solution:-

$gff(x) = g\ o\ f\ o\ f$
$= (x+3)\, o\, (3x+1)\, o\, (3x+1)$
$= (x+3)\, o\, [3(3x+1)+1]$
$= (x+3)\, o\, (9x+3+1]$
$= (x+3)\, o\, (9x+4]$
$= 9x+4+3$
$= 9x+7$

$fgg(x) = f\ o\ g\ o\ g$
$= (3x+1)\, o\, (x+3)\, o\, (x+3)$
$= (3x+1)\, o\, (x+3+3)$
$= (3x+1)\, o\, (x+6]$
$= 3(x+6)+1$
$= 3x+18+1$
$= 3x+19$

Given, $gff(x) = fgg(x)$
$9x + 7 = 3x + 19$
$9x - 3x = 19 - 7$
$6x = 12$
$x = \frac{12}{6}$
$x = 2$

UNIT - 2 : NUMBERS AND SEQUENCES

20) Find the HCF of : 396, 504, 636 **[Sep-21]**

Solution:-

First we have to find HCF of 396 and 504

Here, $a = 504$ and $b = 396$

$504 = 396 \times 1 + 108$; Remainder $= 108 \neq 0$

$396 = 108 \times 3 + 72$; Remainder $= 72 \neq 0$

$108 = 72 \times 1 + 36$; Remainder $= 36 \neq 0$

$72 = 36 \times 2 + 0$

Here, Remainder = 0

Therefore, the HCF of 396 and 504 is 36

Then we have to find the HCF of 636 and 36

Here, $a = 636$ and $b = 36$

$636 = 36 \times 17 + 24$; Remainder $= 24 \neq 0$

$36 = 24 \times 1 + 12$; Remainder $= 12 \neq 0$

$24 = 12 \times 2 + 0$

Here, Remainder = 0

Therefore, the HCF of 636 and 36 is 12

Thus the HCF of 396, 504 and 636 is 12.

TWO MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

23) If $f(x) = 2x + 1, g(x) = x^2 - 2$ then find $f \, o \, g$ and $g \, o \, f$.

Solution:-

$fog = (2x + 1) \, o \, (x^2 - 2)$

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

$= 2x^2 - 4 + 1$

$= 2x^2 - 3 \rightarrow$ **(1)**

$gof = (x^2 - 2) \, o \, (2x + 1)$

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

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

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

$= 4x^2 + 4x - 1 \rightarrow$ **(2)**

· from (1) and (2) we see that, $fog \neq gof$

24) If $f(x) = 3 + x$, $g(x) = x - 4$ then find $f \, o \, g$ and $g \, o \, f$. **[GMQ, PTA-1]**

Solution:-

$fog = (3 + x) \, o \, (x - 4)$

$= 3 + (x - 4)$

$= 3 + x - 4$

$= x - 1 \longrightarrow (1)$

$gof = (x - 4) \, o \, (3 + x)$

$= (3 + x) - 4$

$= 3 + x - 4$

$= x - 1 \longrightarrow (2)$

∴ from (1) and (2) we see that, $fog = gof$

25) If $f(x) = x - 6$, $g(x) = x^2$ then find $f \, o \, g$ and $g \, o \, f$. Check whether $fog = gof$.

[Jun-23]

Solution:-

$fog = (x - 6) \, o \, (x^2)$

$gof = (x^2) \, o \, (x - 6)$

$= x^2 - 6 \quad \rightarrow$ **(1)**

$= (x-6)^2$

$= x^2 - 2(x)(6) + (6)^2$

$= x^2 - 12x + 36 \quad \rightarrow$ **(2)**

$\therefore$ from (1) and (2) we see that, $fog \neq gof$

26) If $f(x) = \frac{2}{x}$, $g(x) = 2x^2 - 1$ then find $f\ o\ g$ and $g\ o\ f$. Check whether $fog = gof$.

Solution:-

$fog = \left(\frac{2}{x}\right) o\ (2x^2 - 1)$

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

$gof = (2x^2 - 1)\ o \left(\frac{2}{x}\right)$

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

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

$= \frac{8}{x^2} - 1 \rightarrow$ **(2)**

$\therefore$ from (1) and (2) we see that, $fog \neq gof$

27) If $f(x) = \frac{x+6}{3}$, $g(x) = 3 - x$ then find $f\ o\ g$ and $g\ o\ f$. Check whether $fog = gof$.

Solution:-

$fog = \left(\frac{x+6}{3}\right) o\ (3 - x)$

$= \frac{(3-x)+6}{3}$

$= \frac{3-x+6}{3}$

$= \frac{9-x}{3} \rightarrow$ **(1)**

$gof = (3-x)\ o \left(\frac{x+6}{3}\right)$

$= 3 - \left(\frac{x+6}{3}\right)$

$= \frac{9-(x+6)}{3}$

$= \frac{9-x-6)}{3}$

$= \frac{3-x}{3} \rightarrow$ **(2)**

$\therefore$ from (1) and (2) we see that, $fog \neq gof$

ONE MARK QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

26) 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?	**Ans:- 8**
27) If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \ldots + 2^0$ which of the following is true?	**Ans:- A is larger than B by 1**
28) The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \ldots$ is	**Ans:-** $\frac{1}{27}$
29) If the sequence $t_1, t_2, t_3, \ldots$ are in A.P. then the sequence $t_6, t_{12}, t_{18}, \ldots$ Is	**Ans:- an Arithmetic Progression**
30) The value of $(1^3 + 2^3 + 3^3 + \ldots + 15^3) - (1 + 2 + 3 + \cdots + 15)$ is	**Ans:- 14280**

Slip Test - 6

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \dots + 2^{0}$ 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

2) If the sequence $t_1, t_2, t_3, \dots$ are in A.P. then the sequence $t_6, t_{12}, t_{18}, \dots$ is
(A) a Geometric Progression (B) an Arithmetic Progression
(C) neither an Arithmetic Progression nor a Geometric Progression (D) a constant sequence

3) The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \dots$ is
(A) $\frac{1}{24}$ (B) $\frac{1}{27}$ (C) $\frac{2}{3}$ (D) $\frac{1}{81}$

II Answer the following:- **(2 x 2 = 4)**

4) If $f(x) = \frac{x+6}{3}$, $g(x) = 3 - x$ then find $f \circ g$ and $g \circ f$. Check whether $fog = gof$.

5) If $f(x) = 3 + x$, $g(x) = x - 4$ then find $f \circ g$ and $g \circ f$.

III Answer the following:- **(1 x 5 = 5)**

6) Find the HCF of : $396, 504, 636$

IV Answer the following:- **(1 x 8 = 8)**

7) 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. (Scale factor $\frac{7}{4} > 1$).

DAY – 8

SPECIAL GRAPHS - DIRECT VARIATION

2) A two wheeler parking zone near bus stand charges as below.

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

Check if the amount charged are in direct variation or in inverse variation to the parking time. Graph the data. Also (i) find the amount to be paid when parking time is 6 *hr;* (ii) find the parking duration when the amount paid is ₹150.

Solution:-

VARIATION:- Direct Variation.

GIVEN:-

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

POINTS:-

$(4, 60), (8, 120), (12, 180), (24, 360)$

CONSTANT OF VARIATION:-

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

EQUATION:- $y = kx$

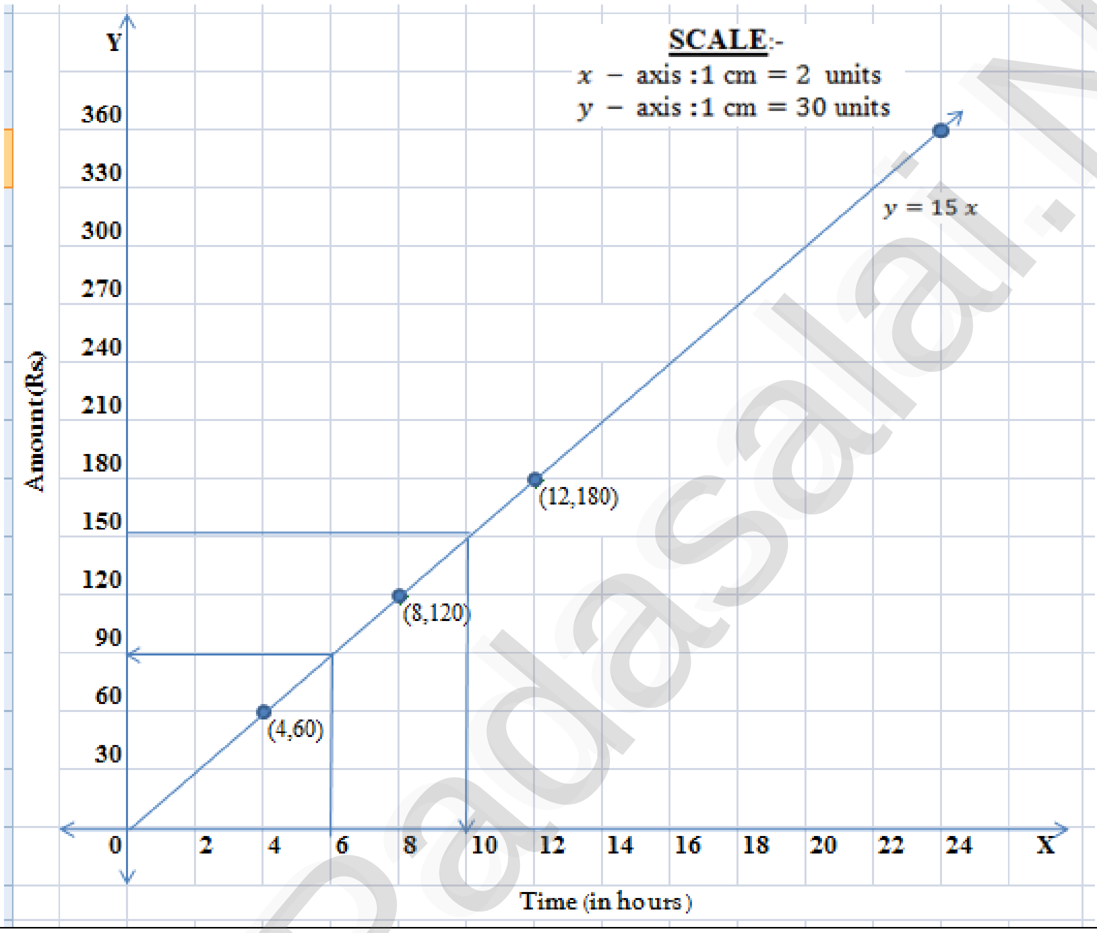
$y = 15\,x$

SCALE:-

$x-$axis : 1 cm = 2 units
$y-$axis : 1 cm = 30 units

FROM THE GRAPH,

(i) If $x = 6$ then $y = 90$. The amount to be paid when parking time is 6 hrs is Rs.90
(ii) If $y = 150$ then $x = 10$. The parking duration when the amount paid is ₹150 is 10 hours.



FIVE MARKS QUESTIONS

UNIT - 2 : NUMBERS AND SEQUENCES

21) The sum of three consecutive terms that are in A.P. is 27 and their product is 288. Find the three terms. **[Sep-21]**

Solution :-

Let the sum of three consecutive terms that are in A.P $a-d, a, a+d$

Given, $a-d+a+a+d = 27$

$3a = 27$

$a = \frac{27}{3}$

$a = 9$

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

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

$(9^2-d^2) \times 9 = 288$

$81 - d^2 = \frac{288}{9}$

$81 - d^2 = 32$

$81 - 32 = d^2$

$49 = d^2$

$d = \pm 7$

$\Rightarrow a = 9$ and $d = \pm 7$

(i) If $a = 9$ and $d = 7$, the required three terms are

$9-7, \quad 9, \quad 9+7$

$2, \quad 9, \quad 16$

(ii) If $a = 9$ and $d = -7$, the required three terms are

$9 - -7, \quad 9, \quad 9+(-7)$

$9+7, \quad 9, \quad 9-7$

$16, \quad 9, \quad 2$

22) Find the sum to n terms of the series: $5+55+555+\cdots$ **[PTA-4, Apr-23]**

Solution:-

$S_n = 5+55+555+\cdots n$ terms

$= 5(1+11+111+\cdots n$ terms)

$= 5 \text{ x } \frac{9}{9}(1+11+111+\cdots n$ terms)

$= \frac{5}{9}(9+99+999+\cdots n$ terms)

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

$= \frac{5}{9}[(10+100+1000+\cdots n$ terms) – $(1+1+1+\cdots n$ terms)]

WKT, $S_n = \frac{a(r^n-1)}{r-1}$ Here, $a = 10, r = 10$

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

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

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

23) Find the sum to n terms of the series: $3+33+333+\cdots$. **[Jun-23]**

Solution:-

$S_n = 3+33+333+\cdots n$ terms

$= 3(1+11+111+\cdots n$ terms)

$= 3 \text{ x } \frac{9}{9}(1+11+111+\cdots n$ terms)

$= \frac{1}{3}(9+99+999+\cdots n$ terms)

$= \frac{1}{3}[(10-1)+(100-1)+(1000-1)+\cdots n$ terms]

$= \frac{1}{3}[(10+100+1000+\cdots n$ terms) – $(1+1+1+\cdots n$ terms)]

WKT, $S_n = \frac{a(r^n-1)}{r-1}$ Here, $a = 10, \quad r = 10$

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

$$= \frac{1}{3}\left[\frac{10(10^n-1)}{9} - n\right]$$

$$= \frac{10(10^n-1)}{27} - \frac{n}{3}$$

TWO MARKS QUESTIONS

UNIT - 1 : RELATIONS AND FUNCTIONS

28) If $f(x) = 4x^2 - 1$, $g(x) = 1 + x$ then find $f\ o\ g$ and $g\ o\ f$. Check whether $fog = gof$.

Solution:-

-

$$fog = (4x^2-1)\ o\ (1+x)$$
$$= 4(1+x)^2 - 1$$
$$= 4[(1)^2 + 2(1)(x) + (x)^2] - 1$$
$$= 4(1 + 2x + x^2) - 1$$
$$= 4 + 8x + 4x^2 - 1$$
$$= 4x^2 + 8x + 3 \rightarrow \textbf{(1)}$$

$$gof = (1+x)\ o\ (4x^2-1)$$
$$= 1 + (4x^2-1)$$
$$= 1 + 4x^2 - 1$$
$$= 4x^2 \rightarrow \textbf{(2)}$$

∴ from (1) and (2) we see that, $fog \neq gof$

29) If $f(x) = 2x - 1$ and $g(x) = \frac{x+1}{2}$, show that $fog = gof = x$.

Solution:-

$$fog$$
$$= (2x-1)\ o\left(\frac{x+1}{2}\right)$$
$$= 2\left(\frac{x+1}{2}\right) - 1$$
$$= x + 1 - 1$$
$$= x \rightarrow \textbf{(1)}$$

$$gof = \left(\frac{x+1}{2}\right)\ o\ (2x-1)$$
$$= \frac{(2x-1)+1}{2}$$
$$= \frac{2x-1+1}{2}$$
$$= \frac{2x}{2}$$
$$= x \rightarrow \textbf{(2)}$$

∴ from (1) and (2) we see that, $fog = gof = x$

30) Find k if $fof(k) = 5$ where $f(k) = 2k - 1$. **[PTA-4, Apr-23]**

Solution:-

$$fof(k) = (2k-1)\ o\ (2k-1)$$
$$= 2(2k-1) - 1$$
$$= 4k - 2 - 1$$

$$= 4k - 3$$

Given, $fof(k) = 5$

$$4k - 3 = 5$$
$$4k = 5 + 3$$
$$4k = 8$$
$$k = \frac{8}{4}$$
$$k = 2$$

ONE MARK QUESTIONS

UNIT - 3 : ALGLEBRA

31) A system of three linear equations in three variables is inconsistent if their planes	**Ans:- do not intersect**
32) The solution of the system $x + y - 3x = -6, \; -7y + 7z = 7, \; 3z = 9$ is	**Ans:-** $\boldsymbol{x = 1, y = 2, z = 3}$
33) If $(x - 6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of k is	**Ans:- 5**
34) $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is	**Ans:-** $\frac{9y}{7}$
35) $y^2 + \frac{1}{y^2}$ is not equal to	**Ans:-** $\left(y + \frac{1}{y}\right)^2$

Slip Test - 7

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is

(A) $\frac{9y}{7}$ (B) $\frac{9y^3}{(21y-21)}$ (C) $\frac{21y^2-42y+21}{3y^3}$ (D) $\frac{7(y^2-2y+1)}{y^2}$

2) $y^2 + \frac{1}{y^2}$ 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) $\left(y + \frac{1}{y}\right)^2 - 2$

3) The solution of the system $x + y - 3x = -6, \; -7y + 7z = 7, \; 3z = 9$ is

(A) $x = 1, y = 2, z = 3$ (B) $x = -1, y = 2, z = 3$

(C) $x = -1, y = -2, z = 3$ (D) $x = 1, y = 2, z = -3$

II Answer the following:- **(2 x 2 = 4)**

4) If $f(x) = 2x - 1$ and $g(x) = \frac{x+1}{2}$, show that $fog = gof = x$.

5) Find k *if* $fof(k) = 5$ where $f(k) = 2k - 1$.

III Answer the following:- **(1 x 5 = 5)**

6) Find the sum to n terms of the series: $3 + 33 + 333 + \cdots$.

IV Answer the following:- **(1 x 8 = 8)**

7) A two wheeler parking zone near bus stand charges as below.

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

Check if the amount charged are in direct variation or in inverse variation to the parking time. Graph the data. Also (i) find the amount to be paid when parking time is 6 *hr;* (ii) find the parking duration when the amount paid is ₹150.

DAY – 9

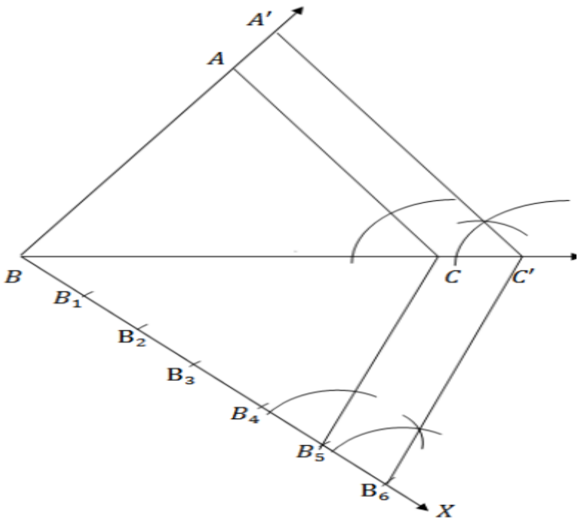
PRACTICAL GEOMETRY - SIMILAR TRIANGLES

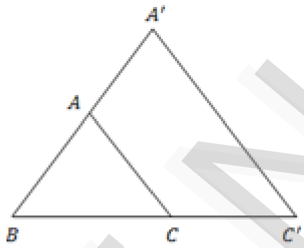
5) Construct a triangle similar to a given triangle ABC with its sides equal to $\frac{6}{5}$ of the corresponding sides of the triangle ABC. (Scale factor $\frac{6}{5}$>1). **[PTA-1, S-20]**

Solution:-

Given, Scale factor $\frac{6}{5} > 1$

ROUGH DIAGRAM





$\Delta P'QR'$ is the required similar triangle.

FIVE MARKS QUESTIONS

UNIT - 2 : NUMBERS AND SEQUENCES

24) Find the sum of : $15^2 + 16^2 + 17^2 + \cdots + 28^2$

Solution:-

WKT, $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$

$\cdot\ 15^2 + 16^2 + 17^2 + \cdots + 28^2 = (1^2 + 2^2 + 3^2 + \cdots + 28^2) - (1^2 + 2^2 + 3^2 + \cdots + 14^2)$

$= \frac{28 \text{ x } 29 \text{ x } 57}{6} - \frac{14 \text{ x } 15 \text{ x } 29}{6}$

$= 14 \text{ x } 29 \text{ x } 19 - 7\text{x } 5 \text{ x } 29$

$= 7714 - 1015$

$= 6699$

25) Rekha has 15 square colour papers of sizes 10 cm, 11 cm, 12 cm,…, 24 cm. How much area can be decorated with these colour papers? **[PTA-1, Jun-23]**

Solution:-

WKT, 1) Are of a square $= a^2$; **2)** $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$

Area can bedecorated with 15 square colour papers

$= 10^2 + 11^2 + 12^2 + \cdots + 24^2$

$= (1^2 + 2^2 + \cdots + 24^2) - (1^2 + 2^2 + 3^2 + \cdots + 9^2)$

$= \frac{24 \text{ x } 25 \text{ x } 49}{6} - \frac{9 \text{ x } 10 \text{ x } 19}{6}$

$= 100 \text{ x } 49 - 15 \text{ x } 19$

$= 4900 - 285$

$= 4615$ Sq.cm

26) Find the sum of : $10^3 + 11^3 + 12^3 + \cdots + 25^3$ **[PTA-5]**

Solution:-

WKT, $1^3 + 2^3 + 3^3 + \cdots + n^3 = \sum n^3 = \left(\frac{n(n+1)}{2}\right)^2$

$10^3 + 11^3 + 12^3 + \cdots + 20^3 = (1^3 + 2^3 + 3^3 + \cdots + 20^3) - (1^3 + 2^3 + 3^3 + \cdots + 9^3)$

$= \left(\frac{20 \text{ x } 21}{2}\right)^2 - \left(\frac{9 \text{ x } 10}{2}\right)^2$

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

$= 44100 - 2025$

$= 42075$

27) Find the sum of : $9^3 + 10^3 + \cdots + 21^3$ **[Apr-24]**

Solution:-

WKT, $1^3 + 2^3 + 3^3 + \cdots + n^3 = \sum n^3 = \left(\frac{n(n+1)}{2}\right)^2$

$9^3 + 10^3 + 11^3 + \cdots + 21^3 = (1^3 + 2^3 + 3^3 + \cdots + 21^3) - (1^3 + 2^3 + 3^3 + \cdots + 8^3)$

$= \left(\frac{21 \text{ x } 22}{2}\right)^2 - \left(\frac{8 \text{ x } 9}{2}\right)^2$

$= (231)^2 - (36)^2$

$= 53361 - 1296$

$= 52065$

TWO MARKS QUESTIONS

UNIT - 2 : NUMBERS AND SEQUENCES

31) 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$. Find a *and* b.

Solution:- **[Apr-24]**

Given, $a^b \text{x } b^a = 800$

$= 2 \text{ x } 2 \text{ x } 2 \text{ x } 2 \text{ x } 2 \text{ x } 5 \text{ x } 5$

$a^b \text{x } b^a = 2^5 \text{x } 5^2$

$\cdot\, a = 2,\ b = 5$ or $a = 5,\ b = 2$

2	800
2	400
2	200
2	100
2	50
5	25
5	5
	1

32) If $13824 = 2^a \times 3^b$ then find a and b. **[May-22]**

Solution:-

Given, $2^a x\, 3^b = 13824$

$\Longrightarrow 2^a x\, 3^b = 2^9 x\, 3^3$

$\cdot\ a = 9$ and $b = 3$

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

33) If $p_1^{x_1} \times p_2^{x_2} \times p_3^{x_3} \times p_4^{x_4} = 113400$ where, p_1, p_2, p_3, p_4 are primes in ascending order and x_1, x_2, x_3, x_4 are integers, find the value of p_1, p_2, p_3, p_4 and x_1, x_2, x_3, x_4. **[Apr-23]**

Solution:-

Given,

$p_1^{x_1} \times p_2^{x_2} \times p_3^{x_3} \times p_4^{x_4} = 113400$

$p_1^{x_1} \times p_2^{x_2} \times p_3^{x_3} \times p_4^{x_4} = 2^3 \times 3^4 \times 5^2 \times 7^1$

$p_1^{x_1} = 2^3$	$p_2^{x_2} = 3^4$	$p_3^{x_3} = 5^2$	$p_4^{x_4} = 7^1$
$p_1 = 2$	$p_2 = 3$	$p_3 = 5$	$p_4 = 7$
$x_1 = 3$	$x_2 = 4$	$x_3 = 2$	$x_4 = 1$

2	113400
2	56700
2	28350
3	14175
3	4725
3	1575
3	525
5	175
5	35
7	7
	1

$p_1 = 2,\ p_2 = 3,\ p_3 = 5,\ p_4 = 7$ and $x_1 = 3,\ x_2 = 4,\ x_3 = 2,\ x_4 = 1$

34) If $p^2 \times q^1 \times r^4 \times s^3 = 3{,}15{,}000$, then find the values of $p,\ q,\ r$ and s. **[Apr-23]**

Solution :-

Given,

$p^2 \times q^1 \times r^4 \times s^3 = 3{,}15{,}000$

$p^2 \times q^1 \times r^4 \times s^3 = 3^2 \times 7^1 \times 5^4 \times 2^3$

$\therefore\ p = 3,\ q = 7,\ r = 5,\ s = 2$

2	315000
2	157500
2	78750
5	39375
5	7875
5	1575
5	315
3	63
3	21
7	7
	1

ONE MARK QUESTIONS

UNIT - 3 : ALGEBRA

36) $\frac{x}{x^2-25} - \frac{8}{x^2+6x+5}$ gives	**Ans:-** $\frac{x^2-7x+40}{(x^2-25)(x+1)}$
37) The square root of $\frac{256\,x^8y^4z^{10}}{25\,x^6y^6z^6}$ is equal to	**Ans:-** $\frac{16}{5}\left\|\frac{xz^2}{y}\right\|$
38) Which of the following should be added to make $x^4 + 64$ a perfect square?	**Ans:-** $16x^2$
39) The solution of $(2x-1)^2 = 9$ is equal to	**Ans:-** $-1, 2$
40) The values of a and b if $4x^4 - 24x^3 + 76x^2 + ax + b$ is a perfect square	**Ans:-** $-120, 100$

Slip Test - 8

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) The solution of $(2x-1)^2 = 9$ is equal to

(A) -1 (B) 2 (C) $-1, 2$ (D) None of these

2) The values of a and b if $4x^4 - 24x^3 + 76x^2 + ax + b$ is a perfect square

(A) $100, 120$ (B) $10, 12$ (C) $-120, 100$ (D) $12, 10$

3) $\frac{x}{x^2-25} - \frac{8}{x^2+6x+5}$ gives

(A) $\frac{x^2-7x+40}{(x-5)(x+5)}$ (B) $\frac{x^2+7x+40}{(x-5)(x+5)(x+1)}$ (C) $\frac{x^2-7x+40}{(x^2-25)(x+1)}$ (D) $\frac{x^2+10}{(x^2-25)(x+1)}$

II Answer the following:- **(2 x 2 = 4)**

4) If $13824 = 2^a \times 3^b$ then find a and b.

5) If $p^2 \times q^1 \times r^4 \times s^3 = 3{,}15{,}000$, then find the values of p, q, r and s.

III Answer the following:- **(1 x 5 = 5)**

6) Find the sum of : $15^2 + 16^2 + 17^2 + \cdots + 28^2$.

IV Answer the following:- **(1 x 8 = 8)**

7) 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. (Scale factor $\frac{6}{5} > 1$).

DAY – 10

SPECIAL GRAPHS - DIRECT VARIATION

3) 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 90 minutes?

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

Solution:-

VARIATION:- Direct Variation.

TABLE:-

Time (in minutes)(x)	60	120	180	240	300
Distance (kms)(y)	50	100	150	200	250

POINTS:-

$(60, 50), (120, 100), (180, 150), (240, 200), (300, 250)$

CONSTANT OF VARIATION:-

$$k = \frac{y}{x} = \frac{50}{60} = \frac{5}{6}$$

EQUATION:- $y = kx$

$$y = \frac{5}{6}x$$

SCALE:-

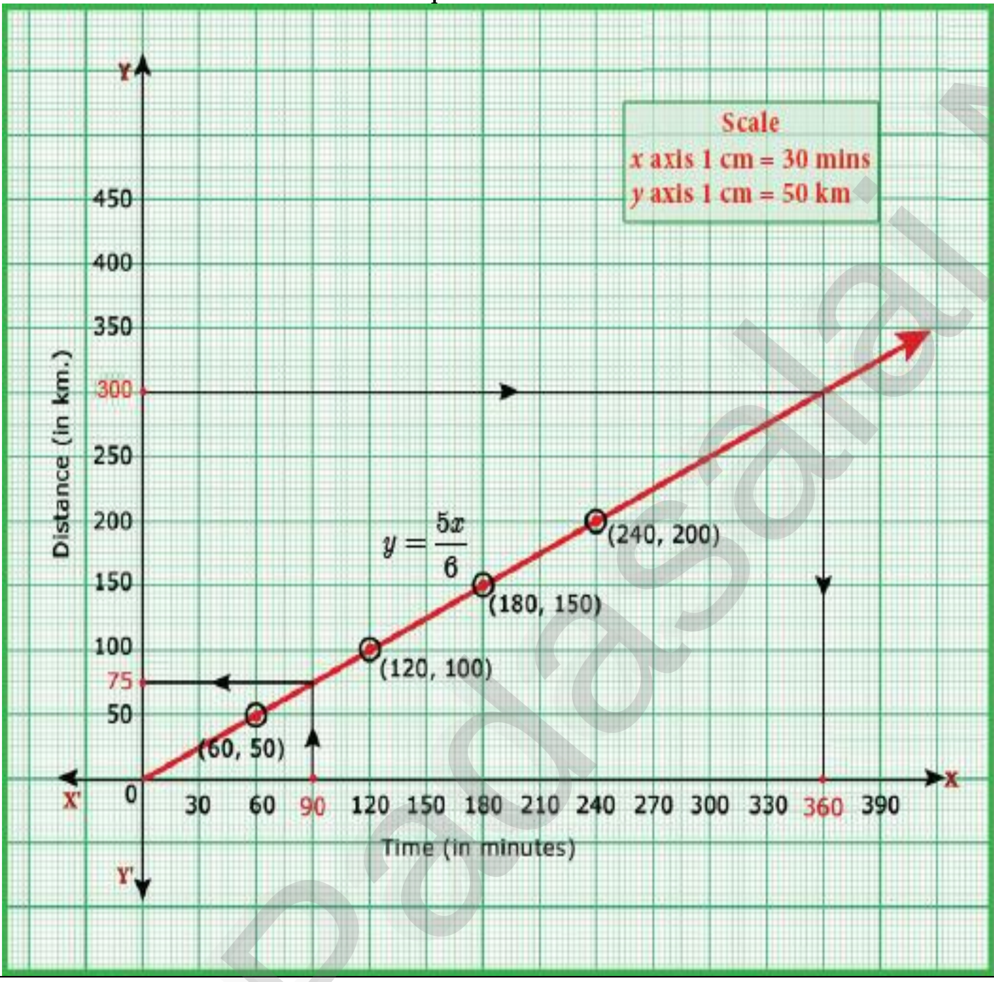
x – axis : 1 cm = 30 units

y – axis : 1 cm = 50 units

FROM THE GRAPH,

(i) If $x = 1\frac{1}{2}$ then $y = 90$. The bus will travel in $1\frac{1}{2}$ hours be 75 kms.

(ii) If $y = 360$ then $x = 6$. The time required to cover a distance of 300 km is 6 hours.



FIVE MARKS QUESTIONS

UNIT - 3 : ALGEBRA

28) Find the square root of : $64x^4 - 16x^3 + 17x^2 - 2x + 1$ **[Sep-21, Apr-24]**

Solution:-

Given, $64x^4 - 16x^3 + 17x^2 - 2x + 1$

	8	−1	1		
8	64	−16	17	−2	1
	64				
	(−)				
16 −1		−16	17		
		−16	1		

				(+)	(−)		
16	−2	1			16	−2	1
					16	−2	1
					(−)	(+)	(−)
							0

∴ $\sqrt{64x^4 - 16x^3 + 17x^2 - 2x + 1} = |8x^2 - x + 1|$

29) Find the square root of : $x^4 - 12x^3 + 42x^2 - 36x + 9$ **[Aug-22]**

Solution:-

Given, $x^4 - 12x^3 + 42x^2 - 36x + 9$

			1	−6	3		
		1	1	−12	42	−36	9
			1				
			(−)				
	2	−6		−12	42		
				−12	36		
				(+)	(−)		
2	−12	3			6	−36	9
					6	−36	9
					(−)	(+)	(−)
							0

∴ $\sqrt{x^4 - 12x^3 + 42x^2 - 36x + 9} = |x^2 - 6x + 3|$

30) Find the square root of : $4x^4 - 28x^3 + 37x^2 + 42x + 9$

Solution:-

Given, $4x^4 - 28x^3 + 37x^2 + 42x + 9$

			2	−7	−3		
		2	4	−28	37	42	9
			4				
			(−)				
	4	−7		−28	37		
				−28	49		
				(+)	(−)		
4	−14	−3			−12	42	9
					−12	42	9
					(−)	(+)	(−)
							0

∴ $\sqrt{4x^4 - 28x^3 + 37x^2 + 42x + 9} = |2x^2 - 7x - 3|$

TWO MARKS QUESTIONS

UNIT - 2 : NUMBERS AND SEQUENCES

35) Find the number of terms in the A.P. 3,6,9,12,…,111. **[Sep-21]**

Solution:-

Given, First Term, $a = 3$; Common Difference, $d = 6 - 3 = 3$; Last term, $l = 111$

WKT, Number of terms in an A.P, $n = \left(\frac{l-a}{d}\right) + 1$

$$\therefore \quad n = \left(\frac{111 - 3}{3}\right) + 1$$
$$= \left(\frac{108}{3}\right) + 1$$
$$= 36 + 1$$
$$= 37$$

∴ The number of terms in the given A.P is 37.

36) Which term of an A.P $16, 11, 6, 1, \ldots$ is -54? **[May-22]**

Solution:-

Here, $a = 16$, $d = 11 - 16 = -5$, $l = -54$

WKT, $n = \left(\frac{l-a}{d}\right) + 1$

$$n = \left(\frac{-54 - 16}{-5}\right) + 1$$
$$= \left(\frac{-70}{-5}\right) + 1$$
$$= 14 + 1$$
$$= 15$$

∴ -54 is the 15 th term of the given A.P.

37) Find the 19th term of an A.P $-11, -15, -19, \ldots$. **[GMQ , Aug-22]**

Solution:-

$a = -11$ and $d = -15 - (-11) = -4$

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

$$t_{19} = -11 + (19 - 1)(-4)$$
$$= -11 + 18 \times (-4)$$
$$= -11 + (-72)$$
$$t_{19} = -83$$

38) If $3 + k, 18 - k, 5k + 1$ are in A.P. then find k. **[Sep-21, PTA-3, PTA-5]**

Solution:-

Given, $a = 3 + k,\ b = 18 - k,\ c = 5k + 1$

WKT, a, b, c are in A.P. if and only if $2b = a + c$.

$$2(18 - k) = 3 + k + 5k + 1$$
$$36 - 2k = 6k + 4$$
$$-6k - 2k = -36 + 4$$
$$-8k = -32$$

$$k = \frac{-32}{-8}$$
$$k = 4$$

39) If $x+6,\ x+12$ and $x+15$ are in G.P, then find x. **[PTA-2, Apr-23]**

Solution:-

Given, $a = x+6,\ b = x+15,\ c = x+15$

WKT, a, b, c are in A.P. if and only if $b^2 = ac$.

$$(x+12)^2 = (x+6)\,(x+15)$$
$$x^2 + 2(x)(12) + 12^2 = x^2 + 15x + 6x + 90$$
$$x^2 + 24x + 144 = x^2 + 21x + 90$$
$$x^2 + 24x - x^2 - 21x = 90 - 144$$
$$3x = -54$$
$$x = \frac{-54}{3}$$
$$x = -18$$

40) Find the 8th term of the G.P. $9, 3, 1, \ldots$ **[Jun-23]**

Solution:-

Given, $a = 9,\ r = \frac{3}{9} = \frac{1}{3}\ ,\ n = 8$

WKT, $t_n = ar^{n-1}$

$\therefore$ 8th term $= t_8$

$$= ar^7$$
$$= (9)\left(\frac{1}{3}\right)^7$$
$$= \frac{9}{3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$$
$$= \frac{1}{3 \times 3 \times 3 \times 3 \times 3}$$
$$= \frac{1}{243}$$

ONE MARK QUESTIONS

UNIT - 3 : ALGEBRA

41) If the roots of the equation $q^2x^2 + p^2x + r^2 = 0$ are the squares of the roots of the equation $qx^2 + px + r = 0$, then q, p, r are in	**Ans:- G.P**
42) Graph of a linear polynomial is a	**Ans:- Straight line**
43) The number of points of intersection of the quadratic polynomial $x^2 + 4x + 4$ with the X-axis is	**Ans:- 1**
44) For the given matrix $A = \begin{pmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \\ 9 & 11 & 13 & 15 \end{pmatrix}$ the order of the matrix A^T is	**Ans:- 4 x 3**
45) If A is a 2 x 3 matrix and B is a 3 x 4 matrix, how many columns does AB have	**Ans:- 4**

Slip Test – 9

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) Graph of a linear polynomial is a
(A) Straight line (B) circle (C) parabola (D) hyperbola

2) If A is a 2 x 3 matrix and B is a 3 x 4 matrix, how many columns does AB have
(A) 3 (B) 4 (C) 2 (D) 5

3) 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 or1 (D) 2

II Answer the following:- **(2 x 2 = 4)**

4) Find the 8^{th} term of the G.P. $9, 3, 1, ...$

5) If $3 + k, 18 - k, 5k + 1$ are in A.P. then find k.

III Answer the following:- **(1 x 5 = 5)**

6) Find the square root of : $4x^4 - 28x^3 + 37x^2 + 42x + 9$.

IV Answer the following:- **(1 x 8 = 8)**

7) 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 90 minutes?
(iii) the time required to cover a distance of 300 km from the graph.

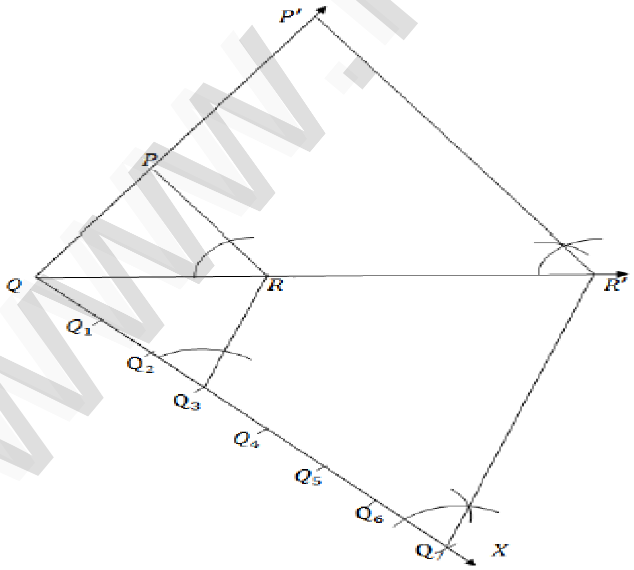
DAY – 11

PRACTICAL GEOMETRY - SIMILAR TRIANGLES

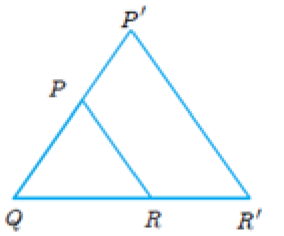
6) Construct a triangle similar to a given triangle ABC with its sides equal to $\frac{6}{5}$ of the corresponding sides of the triangle ABC. (Scale factor $\frac{7}{3} > 1$) **[A-22]**

Solution:-

Given, Scale factor $\frac{7}{3} > 1$



ROUGH DIAGRAM



$\Delta P'QR'$ is the required similar triangle.

FIVE MARKS QUESTIONS

UNIT - 3 : ALGEBRA

31) Find the square root of : $16x^4 + 8x^2 + 1$

Solution:-

Given, $16x^4 + 0x^3 + 8x^2 + 0x + 1$

	4	0	1		
4	16	0	8	0	1
	16				
	(−)				
8 0		0	8		
		0	0		
		(+)	(−)		
8 0 1			8	0	1
			8	0	1
			(−)	(+)	(−)
					0

∴ $\sqrt{16x^4 + 0x^3 + 8x^2 + 0x + 1} = |4x^2 + 1|$

32) Find the square root of : $121x^4 - 198x^3 - 183x^2 + 216x + 144$ **[Jun-23]**

Solution:-

Given, $121x^4 - 198x^3 - 183x^2 + 216x + 144$

	11	−9	12		
11	121	−198	−183	216	144
	121				
	(−)				
22 −9		−198	−183		
		−198	81		
		(+)	(−)		
22 −18 12			−264	216	144
			−264	216	144
			(−)	(+)	(−)
					0

∴ $\sqrt{121x^4 - 198x^3 - 183x^2 + 216x + 144} = |11x^2 - 9x - 12|$

33) Find the square root of : $289x^4 - 612x^3 + 970x^2 - 684x + 361$

Solution:-

Given, $289x^4 - 612x^3 + 970x^2 - 684x + 361$

17 −18 19

17	289	-612	970	-684	361
	289				
	$(-)$				
34 $\quad -18$		-612	970		
		-612	324		
		$(+)$	$(-)$		
34 $\quad -36 \quad$ 19			646	-684	361
			646	-684	361
			$(-)$	$(+)$	$(-)$
					0

ஃ $\sqrt{289x^4 - 612x^3 + 970x^2 - 684x + 361} = |17x^2 - 18x + 19|$

TWO MARKS QUESTIONS

UNIT - 2 : NUMBERS AND SEQUENCES

41) Find the sum of the series, $3 + 1 + \frac{1}{3} + \cdots \infty$

Solution:-

Given, $a = 3, \ r = \frac{1}{3}$

WKT, $S_\infty = \frac{a}{1-r}$

$$\therefore \ S_\infty = \frac{3}{1-\frac{1}{3}} = \frac{3}{\frac{3-1}{3}} = \frac{3}{\frac{2}{3}} = 3 \times \frac{3}{2} = \frac{9}{2}$$

42) Find the sum of the infinite series, $9 + 3 + 1 + \cdots$

Solution:-

Given, $a = 9, \ r = \frac{3}{9} = \frac{1}{3}$

WKT, $S_\infty = \frac{a}{1-r}$

$$\therefore \ S_\infty = \frac{9}{1-\frac{1}{3}} = \frac{9}{\frac{3-1}{3}} = \frac{9}{\frac{2}{3}} = 9 \times \frac{3}{2} = \frac{27}{2}$$

43) Find the sum of the infinite series, $21 + 14 + \frac{28}{3} + \cdots \infty$.

Solution:-

Given, $a = 21, \ r = \frac{14}{21} = \frac{2}{3}$

WKT, $S_\infty = \frac{a}{1-r}$

$$\therefore \ S_\infty = \frac{21}{1-\frac{2}{3}} = \frac{21}{\frac{3-2}{3}} = \frac{21}{\frac{1}{3}} = 21 \times \frac{3}{1} = 63$$

ONE MARK QUESTIONS

UNIT - 3 : ALGEBRA

46) If number of columns and rows are not equal in a matrix then it is said to be a	**Ans:- rectangular matrix**
47) Transpose of a column matrix is	**Ans:- row matrix**
48) Find the matrix X, if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$	**Ans:-** $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$
49) Which of the following can be calculated from the given matrices $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}, B = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$ (i) A^2 (ii) B^2 (iii) AB (iv) BA	**Ans:- (ii), (iv) only**
50) If $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 \\ 2 & -1 \\ 0 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} 0 & 1 \\ -2 & 5 \end{pmatrix}$. Which of the following statements are correct? (i) $AB + C = \begin{pmatrix} 5 & 5 \\ 5 & 5 \end{pmatrix}$ (ii) $BC = \begin{pmatrix} 0 & 1 \\ 2 & -3 \\ -4 & 10 \end{pmatrix}$ (iii) $BA + C = \begin{pmatrix} 2 & 5 \\ 3 & 0 \end{pmatrix}$ (iv) $(AB)C = \begin{pmatrix} -8 & 20 \\ -8 & 13 \end{pmatrix}$	**Ans:- (i) and (ii) only**

Slip Test – 10

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) Which of the following can be calculated from the given matrices $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}, B = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$

(i) A^2 (ii) B^2 (iii) AB (iv) BA

(A) (i), (ii) only (B) (ii), (iii) only (C) (ii), (iv) only (D) all of these

2) Transpose of a column matrix is

(A) Unit matrix (B) diagonal matrix

(C) column matrix (D) row matrix

3) If number of columns and rows are not equal in a matrix then it is said to be a

(A) diagonal matrix (B) rectangular matrix (C) square matrix (D) unit matrix

II Answer the following:- **(2 x 2 = 4)**

4) Find the sum of the infinite series, $21 + 14 + \frac{28}{3} + \cdots \infty$.

5) Find the sum of the infinite series, $9 + 3 + 1 + \cdots$

III Answer the following:- **(1 x 5 = 5)**

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

IV Answer the following:- **(1 x 8 = 8)**

7) 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. (Scale factor $\frac{7}{3} > 1$).

DAY – 12

WEEKLY TEST - 2

DAY – 13

PRACTICAL GEOMETRY - TANGENTS

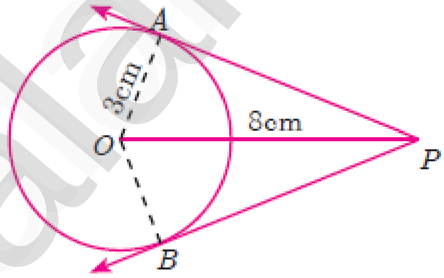
7) Draw a circle of diameter 6cm from a point P, which is 8cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths.

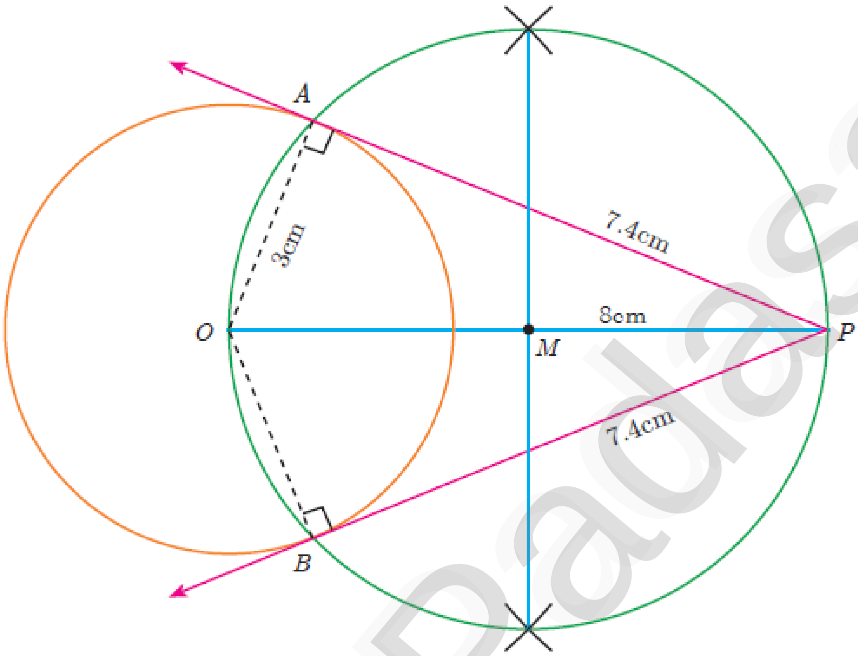
[PTA-6, Sep-21, Aug-22, Apr-24]

Solution:-

Gven, Diameter= 6 cm , Radius= $\frac{6}{2} = 3$ cm , Distance= 8 cm

ROUGH DIAGRAM





$\cdot$ PA and PB are the two required tangents.

Lengths of the tangents, $PA = PB = 7.4$ cm

FIVE MARKS QUESTIONS

UNIT - 3 : ALGEBRA

34) $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, then find the values of a, b.

[PTA-5]

Solution:- **Given,** $9x^4 + 12x^3 + 28x^2 + ax + b$ 16 is a perfect square.

			3	2	4		
	3		9	12	28	a	b
			9				
			(−)				
6	2			12	28		

		12	4		
		(−)	(−)		
6 4 4			24	a	b
			24	16	16
			(−)		
					0

$\therefore \quad a = 16$ and $b = 16$

35) $4x^4 - 12x^3 + 37x^2 + bx + a$ is a perfect square, then find the values of a, b. **[PTA-4]**

Solution:- **Given,** $4x^4 - 12x^3 + 37x^2 + bx + a$ 16 is a perfect square.

	2	−3	7		
2	4	−12	37	b	a
	4				
	(−)				
4 −3		−12	37		
		−12	9		
		(+)	(−)		
4 −6 7			28	b	a
			28	−42	49
			(−)	(+)	(−)
					0

$\therefore \quad a = 49$ and $b = -42$

36) $100 + 220x + 361x^2 + bx^3 + ax^4$ is a perfect square, then find the values of a, b.

Solution:- **Given,** $100 + 220x + 361x^2 + bx^3 + ax^4$ 16 is a perfect square.

	10	11	12		
10	100	220	361	b	a
	100				
	(−)				
20 11		220	361		
		220	121		
		(+)	(−)		
20 22 12			240	b	a
			240	264	144
			(−)	(+)	(−)
					0

$\therefore \quad a = 144$ and $b = 264$

37) $36x^4 - 60x^3 + 61x^2 - mx + n$ is a perfect square, then find the values of m, n. **[May-22]**

Solution:- **Given,** $36x^4 - 60x^3 + 61x^2 - mx + n$ 16 is a perfect square.

		6	−5	3	
6	36	−60	61	$-m$	n
	36				
	(−)				
12 −5		−60	61		
		−60	25		
		(+)	(−)		
12 −10 3			36	$-m$	n
			36	−30	9
			(−)	(+)	(−)
					0

$$\therefore \quad m = 30 \quad \text{and} \quad n = 9$$

38) $x^4 - 8x^3 + mx^2 + nx + 16$ is a perfect square, then find the values of $m,\ n$.

Solution:- **Given,** $x^4 - 8x^3 + mx^2 + nx + 16$ 16 is a perfect square.

		1	−4	4	
1	1	−8	m	n	16
	1				
	(−)				
2 −4		−8	m		
		−8	16		
		(+)	(−)		
2 −8 4			$m - 16$	n	16
			8	−32	16
			(−)	(+)	(−)
					0

$$\therefore m - 16 = 8 \quad \text{and} \quad n = -32$$

$$m = 16 + 8 \quad \text{and} \quad n = -32$$

$$m = 24 \quad \text{and} \quad n = -32$$

TWO MARKS QUESTIONS

UNIT - 3 : ALGEBRA - MATRICES

44) If a matrix has 16 elements, what are the possible orders it can have?

Solution:-

The possible orders of a matrix has 16elements are

1×16, 16×1, 2×8, 8×2, 4×4

45) If a matrix has 18 elements, what are the possible orders it can have? What if it has 6

elements?

Solution:-

The possible orders of a matrix has 18 elements are

1×18 18×1
2×9 9×2
3×6 6×3

The possible orders of a matrix has 6 elements are

1×6 6×1
2×3 3×2

46) Construct a 3×3 matrix whose elements are $a_{ij} = i^2 j^2$.

Solution:-

WKT, The general form of a matrix having order 3 X 3 is $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$

Given, $a_{ij} = i^2 j^2$

$a_{11} = 1^2 1^2 = 1 \times 1 = 1$
$a_{12} = 1^2 2^2 = 1 \times 4 = 4$
$a_{13} = 1^2 3^2 = 1 \times 9 = 9$

$a_{21} = 2^2 1^2 = 4 \times 1 = 4$
$a_{22} = 2^2 2^2 = 4 \times 4 = 16$
$a_{23} = 2^2 3^2 = 4 \times 9 = 36$

$a_{31} = 3^2 1^2 = 9 \times 1 = 9$
$a_{32} = 3^2 2^2 = 9 \times 4 = 36$
$a_{33} = 3^2 3^2 = 9 \times 9 = 81$

$\therefore$ The required matrix is, $A = \begin{pmatrix} 1 & 4 & 9 \\ 4 & 16 & 36 \\ 9 & 36 & 81 \end{pmatrix}$

47) Construct a 3×3 matrix whose elements are $A = (a_{ij}) = |i - 2j|$

Solution:-

WKT, The general form of a matrix having order 3 X 3 is $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$

Given, $a_{ij} = |i - 2j|$

$a_{11} = |1 - 2(1)| = |1 - 2| = |-1| = 1$
$a_{12} = |1 - 2(2)| = |1 - 4| = |-3| = 3$
$a_{13} = |1 - 2(3)| = |1 - 6| = |-5| = 5$
$a_{21} = |2 - 2(1)| = |2 - 2| = |0| = 0$
$a_{22} = |2 - 2(2)| = |2 - 4| = |-2| = 2$

$a_{23} = |2 - 2(3)| = |2 - 6| = |-4| = 4$
$a_{31} = |3 - 2(1)| = |3 - 2| = |1| = 1$
$a_{32} = |3 - 2(2)| = |3 - 4| = |-1| = 1$
$a_{33} = |3 - 2(3)| = |3 - 6| = |-3| = 3$

$\therefore$ The required matrix is, $A = \begin{pmatrix} 1 & 3 & 5 \\ 0 & 2 & 4 \\ 1 & 1 & 3 \end{pmatrix}$

48) Construct a 3×3 matrix whose elements are $A = a_{ij} = \frac{(i+j)^3}{3}$.

Solution:-

WKT, The general form of a matrix having order 3 X 3 is $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$

Given, $a_{ij} = \frac{(i+j)^3}{3}$

$$a_{11} = \frac{(1+1)^3}{3} = \frac{(2)^3}{3} = \frac{8}{3}$$

$$a_{12} = \frac{(1+2)^3}{3} = \frac{(3)^3}{3} = \frac{27}{3} = 9$$

$$a_{23} = \frac{(2+3)^3}{3} = \frac{(5)^3}{3} = \frac{125}{3}$$

$$a_{31} = \frac{(3+1)^3}{3} = \frac{(4)^3}{3} = \frac{64}{3}$$

$$a_{13} = \frac{(1+3)^3}{3} = \frac{(4)^3}{3} = \frac{64}{3}$$

$$a_{21} = \frac{(2+1)^3}{3} = \frac{(3)^3}{3} = \frac{27}{3} = 9$$

$$a_{22} = \frac{(2+2)^3}{3} = \frac{(4)^3}{3} = \frac{64}{3}$$

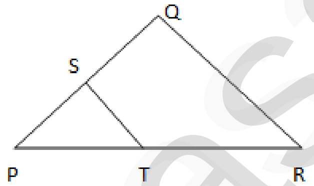
$$a_{32} = \frac{(3+2)^3}{3} = \frac{(5)^3}{3} = \frac{125}{3}$$

$$a_{33} = \frac{(3+3)^3}{3} = \frac{(6)^3}{3} = \frac{216}{3} = 72$$

$\therefore$ The required matrix is, $A = \begin{pmatrix} \frac{8}{3} & 9 & \frac{64}{3} \\ 9 & \frac{64}{3} & \frac{125}{3} \\ \frac{64}{3} & \frac{125}{3} & 72 \end{pmatrix}$

ONE MARK QUESTIONS

UNIT - 4 : GEOMETRY

51) If in triangles ABC and EDF, $\frac{AB}{DE} = \frac{BC}{FD}$ then they will be similar, when		**Ans:-** $\angle B = \angle D$
52) In ΔLMN, $\angle L = 60^o$, $\angle M = 50^o$. If $\Delta LMN \sim \Delta PQR$ then the value of $\angle R$ is		**Ans:- 70^o**
53) If ΔABC is an isosceles triangle with $\angle C = 90^o$ and AC = 5 cm, then AB is		**Ans:- $5\sqrt{2}$ cm**
54) In a given figure ST ∥ QR, PS = 2 cm and SQ = 3 cm. Then the ratio of the area of ΔPQR to the area of ΔPST is		**Ans:- 25 : 4**
55) The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If PQ =10 cm, then the length of AB is		**Ans:- 15 cm**

Slip Test - 11

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) If in triangles ABC and EDF, $\frac{AB}{DE} = \frac{BC}{FD}$ then they will be similar, when
(A) $\angle B = \angle E$ (B) $\angle A = \angle D$ (C) $\angle B = \angle D$ (D) $\angle A = \angle F$

2) The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If PQ=10 cm, then the length of AB is
(A) $6\frac{2}{3}$cm (B) $\frac{10\sqrt{6}}{3}$cm (C) $66\frac{2}{3}$cm (D) 15 cm

3) In ΔLMN, $\angle L = 60^o$, $\angle M = 50^o$. If $\Delta LMN \sim \Delta PQR$ then the value of $\angle R$ is
(A) 40^o (B) 70^o (C) 30^o (D) 110^o

II Answer the following:- **(2 x 2 = 4)**

4) If a matrix has 18 elements, what are the possible orders it can have? What if it has 6 elements?

5) Construct a 3 × 3 matrix whose elements are $A = (a_{ij}) = |i - 2j|$.

III Answer the following:- **(1 x 5 = 5)**

6) $36x^4 - 60x^3 + 61x^2 - mx + n$ is a perfect square, then find the values of m, n.

IV Answer the following:- **(1 x 8 = 8)**

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

DAY – 14

SPECIAL GRAPHS – DIRECT VARIATION

4) 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

Solution:-

VARIATION:- Direct Variation.

TABLE:-

Marked Price (Rs.)(x)	1000	2000	3000	4000	5000	6000	7000
Discount (Rs.)(y)	500	1000	1500	2000	2500	3000	3500

CONSTANT OF VARIATION:-

$$k = \frac{y}{x} = \frac{500}{1000} = \frac{1}{2}$$

EQUATION:- $y = kx$

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

POINTS:-

$(1000, 500), (2000, 1000), (3000, 1500), (4000, 2000), (5000, 2500)$

SCALE:-

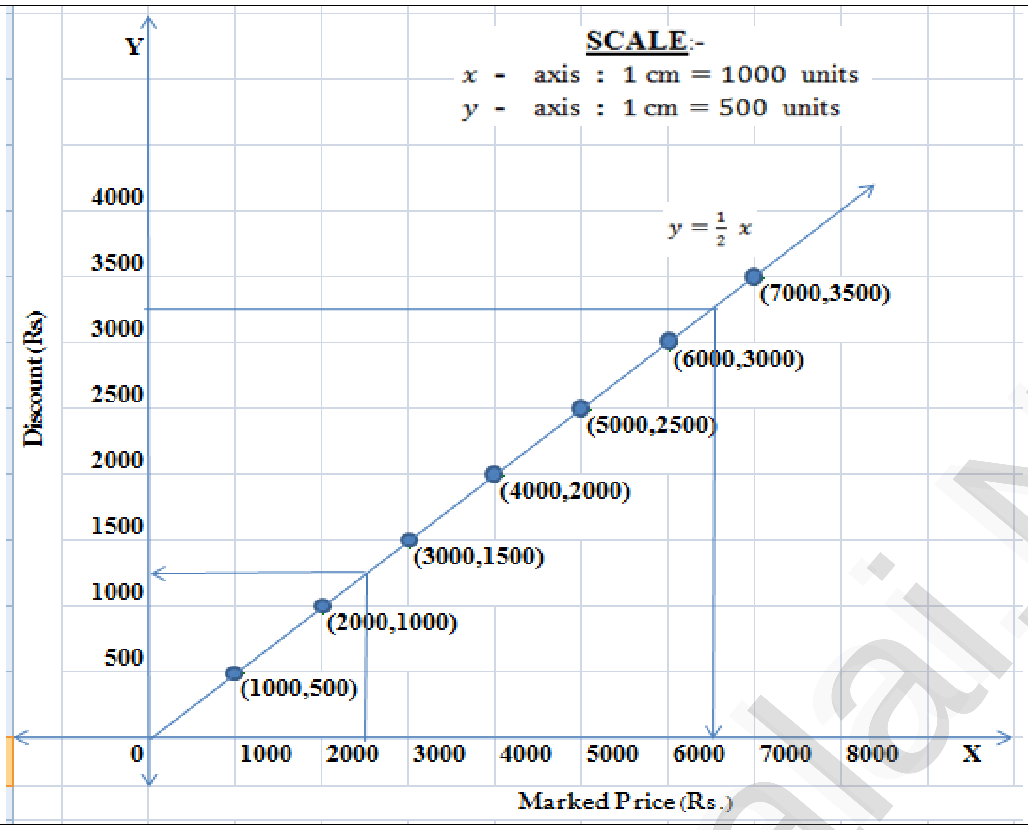
x - axis : 1 cm = 1000 units

y - axis : 1 cm = 500 units

FROM THE GRAPH,

(i) If $y = 3250$ then $x = 6500$. When a customer gets a discount of ₹3250 the marked price is Rs. 6500

(ii) If $x = 2500$ then $y = 1250$. When the marked price is ₹2500the discount is Rs. 1250.



FIVE MARKS QUESTIONS

UNIT - 3 : ALGEBRA - MATRICES

39) If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ then Prove that $A^2 - 5A + 7I_2 = 0$. **[Jun-23, Apr-24]**

Solution:-

$$A^2 = A \times A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix} \times \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix} = \begin{bmatrix} (3 \quad 1)\begin{pmatrix} 3 \\ -1 \end{pmatrix} & (3 \quad 1)\begin{pmatrix} 1 \\ 2 \end{pmatrix} \\ (-1 \quad 2)\begin{pmatrix} 3 \\ -1 \end{pmatrix} & (-1 \quad 2)\begin{pmatrix} 1 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 9-1 & 3+2 \\ -3-2 & -1+4 \end{pmatrix} = \begin{pmatrix} 8 & 5 \\ -5 & 3 \end{pmatrix}$$

$$-5A = -5\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix} = \begin{pmatrix} -15 & -5 \\ 5 & -10 \end{pmatrix}$$

$$7I_2 = 7\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 7 & 0 \\ 0 & 7 \end{pmatrix}$$

$$A^2 - 5A + 7I_2 = \begin{pmatrix} 8 & 5 \\ -5 & 3 \end{pmatrix} + \begin{pmatrix} -15 & -5 \\ 5 & -10 \end{pmatrix} + \begin{pmatrix} 7 & 0 \\ 0 & 7 \end{pmatrix}$$

$$= \begin{pmatrix} 8-15+7 & 5-5+0 \\ -5+5+0 & 3-10+7 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

$\therefore A^2 - 5A + 7I_2 = 0$

Hence proved.

40) If $A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ then prove that $A^2 - 4A + 5I_2 = 0$. **[PTA-5]**

Solution:-

$$A^2 = A \times A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix} \times \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix} = \begin{bmatrix} (1 \quad -1)\begin{pmatrix} 1 \\ 2 \end{pmatrix} & (1 \quad -1)\begin{pmatrix} -1 \\ 3 \end{pmatrix} \\ (2 \quad 3)\begin{pmatrix} 1 \\ 2 \end{pmatrix} & (2 \quad 3)\begin{pmatrix} -1 \\ 3 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 1-2 & -1-3 \\ 2+6 & -2+9 \end{pmatrix} = \begin{pmatrix} -1 & -4 \\ 8 & 7 \end{pmatrix}$$

$$4A = 4\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix} = \begin{pmatrix} 4 & -4 \\ 8 & 12 \end{pmatrix}$$

$$5I_2 = 5\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$$

$$A^2 - 4A + 5\,I = \begin{pmatrix} -1 & -4 \\ 8 & 7 \end{pmatrix} - \begin{pmatrix} 4 & -4 \\ 8 & 12 \end{pmatrix} + \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$$

$$= \begin{pmatrix} -1 & -4 \\ 8 & 7 \end{pmatrix} + \begin{pmatrix} -4 & +4 \\ -8 & -12 \end{pmatrix} + \begin{pmatrix} 5 & 0 \\ 0 & 5 \end{pmatrix}$$

$$= \begin{pmatrix} -1-4+5 & -4+4+0 \\ 8-8+0 & 7-12+5 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

$$= 0$$

∴ $A^2 - 4A + 5I_2 = 0$

Hence proved.

41) If $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}$ verify that $(AB)^T = B^T A^T$. **[Sep-20]**

Solution:-

LHS:-

$$AB = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix} \times \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix} = \begin{bmatrix} (1 \quad 2 \quad 1)\begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix} & (1 \quad 2 \quad 1)\begin{pmatrix} -1 \\ 4 \\ 2 \end{pmatrix} \\ (2 \quad -1 \quad 1)\begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix} & (2 \quad -1 \quad 1)\begin{pmatrix} -1 \\ 4 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 2-2+0 & -1+8+2 \\ 4+1+0 & -2-4+2 \end{pmatrix} = \begin{pmatrix} 0 & 9 \\ 5 & -4 \end{pmatrix}$$

$$(AB)^T = \begin{pmatrix} 0 & 5 \\ 9 & -4 \end{pmatrix} \rightarrow \textbf{(1)}$$

RHS:-

$$B^T = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 4 & 2 \end{pmatrix} \quad \text{and} \quad A^T = \begin{pmatrix} 1 & 2 \\ 2 & -1 \\ 1 & 1 \end{pmatrix}$$

$$B^TA^T = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 4 & 2 \end{pmatrix} \text{x} \begin{pmatrix} 1 & 2 \\ 2 & -1 \\ 1 & 1 \end{pmatrix} = \begin{bmatrix} (2 \quad -1 \quad 0)\begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix} & (2 \quad -1 \quad 0)\begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} \\ (-1 \quad 4 \quad 2)\begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix} & (-1 \quad 4 \quad 2)\begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 2-2+0 & 4+1+0 \\ -1+8+2 & -2-4+2 \end{pmatrix}$$

$B^TA^T = \begin{pmatrix} 0 & 5 \\ 9 & -4 \end{pmatrix}$ → **(2)**

∴ from (1) and (2) we see that $(AB)^T = B^TA^T$.

42) $A = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix}$ verify that $(AB)^T = B^TA^T$

[PTA-3, Apr-23]

Solution:-

LHS:-

$$\text{AB} = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix} \text{x} \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix} = \begin{bmatrix} (5 \quad 2 \quad 9)\begin{pmatrix} 1 \\ 1 \\ 5 \end{pmatrix} & (5 \quad 2 \quad 9)\begin{pmatrix} 7 \\ 2 \\ -1 \end{pmatrix} \\ (1 \quad 2 \quad 8)\begin{pmatrix} 1 \\ 1 \\ 5 \end{pmatrix} & (1 \quad 2 \quad 8)\begin{pmatrix} 7 \\ 2 \\ -1 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 5+2+45 & 35+4-9 \\ 1+2+40 & 7+4-8 \end{pmatrix} = \begin{pmatrix} 52 & 30 \\ 43 & 3 \end{pmatrix}$$

$(AB)^T = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix}$ → **(1)**

RHS:-

$B^T = \begin{pmatrix} 1 & 1 & 5 \\ 7 & 2 & -1 \end{pmatrix}$ and $A^T = \begin{pmatrix} 5 & 1 \\ 2 & 2 \\ 9 & 8 \end{pmatrix}$

$$B^TA^T = \begin{pmatrix} 1 & 1 & 5 \\ 7 & 2 & -1 \end{pmatrix} \text{x} \begin{pmatrix} 5 & 1 \\ 2 & 2 \\ 9 & 8 \end{pmatrix} = \begin{bmatrix} (1 \quad 1 \quad 5)\begin{pmatrix} 5 \\ 2 \\ 9 \end{pmatrix} & (1 \quad 1 \quad 5)\begin{pmatrix} 1 \\ 2 \\ 8 \end{pmatrix} \\ (7 \quad 2 \quad -1)\begin{pmatrix} 5 \\ 2 \\ 9 \end{pmatrix} & (7 \quad 2 \quad -1)\begin{pmatrix} 1 \\ 2 \\ 8 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 5+2+45 & 1+2+40 \\ 35+4-9 & 7+4-8 \end{pmatrix}$$

$B^TA^T = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix}$ → **(2)**

∴ from (1) and (2) we see that $(AB)^T = B^TA^T$.

TWO MARKS QUESTIONS

UNIT - 3 : ALGEBRA - MATRICES

49) If $A = \begin{pmatrix} 5 & 4 & 3 \\ 1 & -7 & 9 \\ 3 & 8 & 2 \end{pmatrix}$ then find the transpose of A.

Solution:-

$$A^T = \begin{pmatrix} 5 & 1 & 3 \\ 4 & -7 & 8 \\ 3 & 9 & 2 \end{pmatrix}$$

50) If $A = \begin{pmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{pmatrix}$ then find the transpose of $(-A)$. **[PTA-2 , Sep-20]**

Solution:-

$$-A = \begin{pmatrix} -\sqrt{7} & 3 \\ \sqrt{5} & -2 \\ -\sqrt{3} & 5 \end{pmatrix}$$

The transpose of $(-A) = (-A)^T = \begin{pmatrix} -\sqrt{7} & \sqrt{5} & -\sqrt{3} \\ 3 & -2 & 5 \end{pmatrix} = \begin{pmatrix} -\sqrt{7} & \sqrt{5} & -\sqrt{3} \\ 3 & -2 & 5 \end{pmatrix}$

51) If $A = \begin{pmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & \frac{5}{2} \\ 8 & 3 & 1 \end{pmatrix}$ then verify (A^T)=A. **[Jun-23]**

Solution:-

$$A^T = \begin{pmatrix} 5 & -\sqrt{17} & 8 \\ 2 & 0.7 & 3 \\ 2 & \frac{5}{2} & 1 \end{pmatrix}$$

$$(A^T)^T = \begin{pmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & \frac{5}{2} \\ 8 & 3 & 1 \end{pmatrix}$$

$\therefore (A^T)^T = A$

Hence verified.

52) If $A = \begin{pmatrix} 7 & 8 & 6 \\ 1 & 3 & 9 \\ -4 & 3 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 11 & -3 \\ -1 & 2 & 4 \\ 7 & 5 & 0 \end{pmatrix}$ then find $2A + B$. **[PTA-3]**

Solution :-

$$2A + B = 2\begin{pmatrix} 7 & 8 & 6 \\ 1 & 3 & 9 \\ -4 & 3 & -1 \end{pmatrix} + \begin{pmatrix} 4 & 11 & -3 \\ -1 & 2 & 4 \\ 7 & 5 & 0 \end{pmatrix}$$

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

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

$$= \begin{pmatrix} 18 & 27 & 9 \\ 1 & 8 & 22 \\ -1 & 11 & -2 \end{pmatrix}$$

53) If $A = \begin{pmatrix} 0 & 4 & 9 \\ 8 & 3 & 7 \end{pmatrix}$ and $B = \begin{pmatrix} 7 & 3 & 8 \\ 1 & 4 & 9 \end{pmatrix}$ then find $3A - 9B$. **[PTA-5]**

Solution :-

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

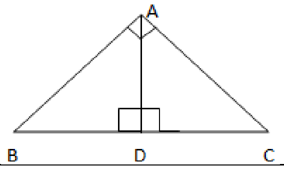
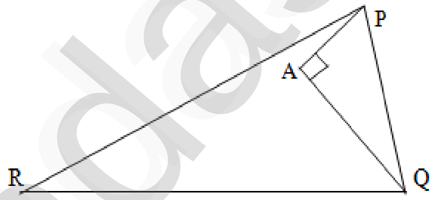
$$= \begin{pmatrix} 0 & 12 & 27 \\ 24 & 9 & 21 \end{pmatrix} - \begin{pmatrix} 63 & 27 & 72 \\ 9 & 36 & 81 \end{pmatrix}$$

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

$$= \begin{pmatrix} -63 & -15 & -45 \\ 15 & -27 & -60 \end{pmatrix}$$

ONE MARK QUESTIONS

UNIT - 4 : GEOMETRY

56) If in ΔABC,DE || BC, AB = 3.6 cm, AC = 2.4 cm andAD = 2.1 cm then the length of AE is		**Ans:- 1.4 cm**
57) In a ΔABC, ADis the bisector of $\angle BAC$. IfAB = 8cm, BD = 6cm and DC = 3cm. The length of the side AC is		**Ans:- 4 cm**
58) In the adjacent figure, $\angle BAC = 90^o$ and $AD \perp BC$ then		**Ans:-** $BD \, . CD = AD^2$
59) Two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m, what is the distance between their tops?		**Ans:- 13 m**
60) In the given figure, PR= 26 cm, QR = 24 cm, $\angle PAQ = 90^o$, PA = 6 cm and QA = 8 cm. Find $\angle PQR$.		**Ans:-** 75^o

Slip Test - 12

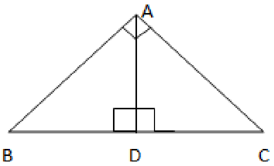
I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) If in 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

2) In the adjacent figure, $\angle BAC = 90^o$ and $AD \perp BC$ then

(A) $BD \, . CD = BC^2$ (B) $AB \, . AC = BC^2$

(C) $BD \, . CD = AD^2$ (D) $AB \, . AC = AC^2$



3) Two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m, what is the distance between their tops?
(A) 13 m (B) 14 m (C) 15 m (D) 12.8 m

II Answer the following:- **(2 x 2 = 4)**

4) If $A = \begin{pmatrix} 0 & 4 & 9 \\ 8 & 3 & 7 \end{pmatrix}$ and $B = \begin{pmatrix} 7 & 3 & 8 \\ 1 & 4 & 9 \end{pmatrix}$ then find 3A – 9B.

5) If $A = \begin{pmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{pmatrix}$ then find the transpose of $(-A)$.

III Answer the following:- **(1 x 5 = 5)**

6) If $A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ then prove that $A^2 - 4A + 5I_2 = 0$.

IV Answer the following:- **(1 x 8 = 8)**

7) 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.

DAY – 15

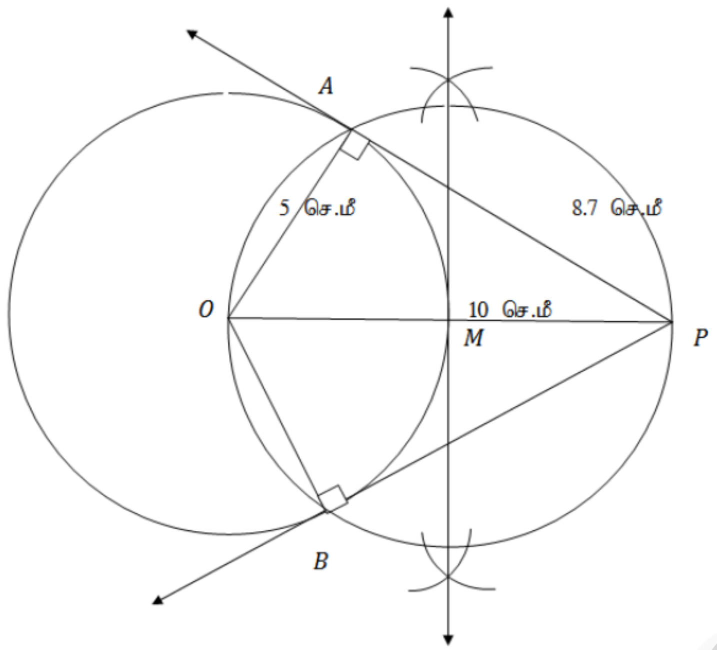
PRACTICAL GEOMETRY - TANGENTS

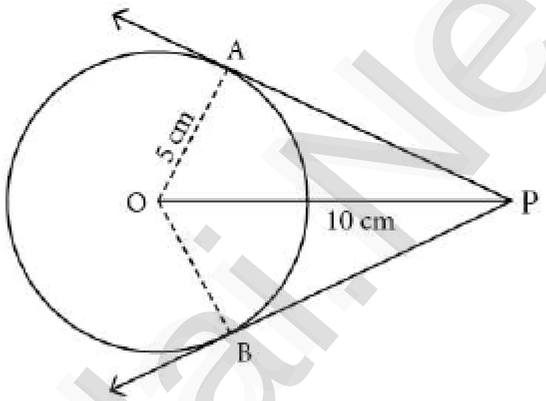
8) Draw the two tangents from a point which is 10 cm away from the centre of a circle of radius 5 cm. Also measure the lengths of the tangents. **[Sep-20]**

Solution:-

Gven, Radius = 5 cm ; Distance = 10 cm

ROUGH DIAGRAM





∙ PA and PB are the two required tangents.

Lengths of the tangents, $PA = PB = 8.$ cm

FIVE MARKS QUESTIONS

UNIT - 3 : ALGEBRA - MATRICES

43) If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}, B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$ then prove that $A(B + C) = AB + AC$. **[PTA-1]**

Solution:-

LHS:-

$$B + C = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix} + \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix} = \begin{pmatrix} 1-7 & 2+6 \\ -4+3 & 2+2 \end{pmatrix} = \begin{pmatrix} -6 & 8 \\ -1 & 4 \end{pmatrix}$$

$$A(B + C) = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix} \text{x} \begin{pmatrix} -6 & 8 \\ -1 & 4 \end{pmatrix} = \begin{bmatrix} (1 \quad 1)\begin{pmatrix} -6 \\ -1 \end{pmatrix} & (1 \quad 1)\begin{pmatrix} 8 \\ 4 \end{pmatrix} \\ (-1 \quad 3)\begin{pmatrix} -6 \\ -1 \end{pmatrix} & (-1 \quad 3)\begin{pmatrix} 8 \\ 4 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} -6-1 & 8+4 \\ 6-3 & -8+12 \end{pmatrix}$$

$$= \begin{pmatrix} -7 & 12 \\ 3 & 4 \end{pmatrix} \rightarrow \textbf{(1)}$$

RHS:-

$$AB = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix} \text{x} \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$$

$$= \begin{bmatrix} (1 \quad 1) \begin{pmatrix} 1 \\ -4 \end{pmatrix} & (1 \quad 1) \begin{pmatrix} 2 \\ 2 \end{pmatrix} \\ (-1 \quad 3) \begin{pmatrix} 1 \\ -4 \end{pmatrix} & (-1 \quad 3) \begin{pmatrix} 2 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 1-4 & 2+2 \\ -1-12 & -2+6 \end{pmatrix}$$

$$= \begin{pmatrix} -3 & 4 \\ -13 & 4 \end{pmatrix}$$

$$AC = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix} \text{x} \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$$

$$= \begin{bmatrix} (1 \quad 1) \begin{pmatrix} -7 \\ 3 \end{pmatrix} & (1 \quad 1) \begin{pmatrix} 6 \\ 2 \end{pmatrix} \\ (-1 \quad 3) \begin{pmatrix} -7 \\ 3 \end{pmatrix} & (-1 \quad 3) \begin{pmatrix} 6 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} -7+3 & 6+2 \\ 7+9 & -6+6 \end{pmatrix}$$

$$= \begin{pmatrix} -4 & 8 \\ 16 & 0 \end{pmatrix}$$

$$AB + AC = \begin{pmatrix} -3 & 4 \\ -13 & 4 \end{pmatrix} + \begin{pmatrix} -4 & 8 \\ 16 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} -3-4 & 4+8 \\ -13+16 & 4+0 \end{pmatrix}$$

$$= \begin{pmatrix} -7 & 12 \\ 3 & 4 \end{pmatrix} \rightarrow \mathbf{(2)}$$

$\therefore$ from (1) and (2) we see that $A(B+C) = AB + AC$

44) If $A = \begin{pmatrix} 1 & 3 \\ 5 & -1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & -1 & 2 \\ 3 & 5 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} 1 & 3 & 2 \\ -4 & 1 & 3 \end{pmatrix}$ then prove that $A(B+C) = AB + AC$

Solution:-

LHS:-

$$B + C = \begin{pmatrix} 1 & -1 & 2 \\ 3 & 5 & 2 \end{pmatrix} + \begin{pmatrix} 1 & 3 & 2 \\ -4 & 1 & 3 \end{pmatrix} = \begin{pmatrix} 1+1 & -1+3 & 2+2 \\ 3-4 & 5+1 & 2+3 \end{pmatrix}$$

$$= \begin{pmatrix} 2 & 2 & 4 \\ -1 & 6 & 5 \end{pmatrix}$$

$$A(B+C) = \begin{pmatrix} 1 & 3 \\ 5 & -1 \end{pmatrix} \text{x} \begin{pmatrix} 2 & 2 & 4 \\ -1 & 6 & 5 \end{pmatrix}$$

$$= \begin{bmatrix} (1 \quad 3) \begin{pmatrix} 2 \\ -1 \end{pmatrix} & (1 \quad 3) \begin{pmatrix} 2 \\ 6 \end{pmatrix} & (1 \quad 3) \begin{pmatrix} 4 \\ 5 \end{pmatrix} \\ (5 \quad -1) \begin{pmatrix} 2 \\ -1 \end{pmatrix} & (5 \quad -1) \begin{pmatrix} 2 \\ 6 \end{pmatrix} & (5 \quad -1) \begin{pmatrix} 4 \\ 5 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 2-3 & 2+18 & 4+15 \\ 10+1 & 10-6 & 20-5 \end{pmatrix}$$

$$= \begin{pmatrix} -1 & 20 & 19 \\ 11 & 4 & 15 \end{pmatrix} \rightarrow \mathbf{(1)}$$

RHS:-

$$AB = \begin{pmatrix} 1 & 3 \\ 5 & -1 \end{pmatrix} \text{x} \begin{pmatrix} 1 & -1 & 2 \\ 3 & 5 & 2 \end{pmatrix}$$

$$= \begin{bmatrix} (1 \quad 3) \begin{pmatrix} 1 \\ 3 \end{pmatrix} & (1 \quad 3) \begin{pmatrix} -1 \\ 5 \end{pmatrix} & (1 \quad 3) \begin{pmatrix} 2 \\ 2 \end{pmatrix} \\ (5 \quad -1) \begin{pmatrix} 1 \\ 3 \end{pmatrix} & (5 \quad -1) \begin{pmatrix} -1 \\ 5 \end{pmatrix} & (5 \quad -1) \begin{pmatrix} 2 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 1+9 & -1+15 & 2+6 \\ 5-3 & -5-5 & 10-2 \end{pmatrix}$$

$$= \begin{pmatrix} 10 & 14 & 8 \\ 2 & -10 & 8 \end{pmatrix}$$

$$AC = \begin{pmatrix} 1 & 3 \\ 5 & -1 \end{pmatrix} \times \begin{pmatrix} 1 & 3 & 2 \\ -4 & 1 & 3 \end{pmatrix}$$

$$= \begin{bmatrix} (1 \quad 3)\begin{pmatrix} 1 \\ -4 \end{pmatrix} & (1 \quad 3)\begin{pmatrix} 3 \\ 1 \end{pmatrix} & (1 \quad 3)\begin{pmatrix} 2 \\ 3 \end{pmatrix} \\ (5 \quad -1)\begin{pmatrix} 1 \\ -4 \end{pmatrix} & (5 \quad -1)\begin{pmatrix} 3 \\ 1 \end{pmatrix} & (5 \quad -1)\begin{pmatrix} 2 \\ 3 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 1-12 & 3+3 & 2+9 \\ 5+4 & 15-1 & 10-3 \end{pmatrix}$$

$$= \begin{pmatrix} -11 & 6 & 11 \\ 9 & 14 & 7 \end{pmatrix}$$

$$AB + AC = \begin{pmatrix} 10 & 14 & 8 \\ 2 & -10 & 8 \end{pmatrix} + \begin{pmatrix} -11 & 6 & 11 \\ 9 & 14 & 7 \end{pmatrix}$$

$$= \begin{pmatrix} 10-11 & 14+6 & 8+11 \\ 2+9 & -10+14 & 8+7 \end{pmatrix}$$

$$= \begin{pmatrix} -1 & 20 & 19 \\ 11 & 4 & 15 \end{pmatrix} \rightarrow \mathbf{(2)}$$

$\therefore$ from (1) and (2) we see that $A(B + C) = AB + AC$

45) If $A = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}, B = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 2 & 0 \\ 1 & 2 \end{pmatrix}$ then prove that $(A - B)C = AC - BC$.

Solution:-

LHS:-

$$A - B = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix} - \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix} + \begin{pmatrix} -4 & 0 \\ -1 & -5 \end{pmatrix} = \begin{pmatrix} 1-4 & 2+0 \\ 1-1 & 3-5 \end{pmatrix}$$

$$= \begin{pmatrix} -3 & 2 \\ 0 & -2 \end{pmatrix}$$

$$(A - B)C = \begin{pmatrix} -3 & 2 \\ 0 & -2 \end{pmatrix} \times \begin{pmatrix} 2 & 0 \\ 1 & 2 \end{pmatrix} = \begin{bmatrix} (-3 \quad 2)\begin{pmatrix} 2 \\ 1 \end{pmatrix} & (-3 \quad 2)\begin{pmatrix} 0 \\ 2 \end{pmatrix} \\ (0 \quad -2)\begin{pmatrix} 2 \\ 1 \end{pmatrix} & (0 \quad -2)\begin{pmatrix} 0 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} -6+4 & 0+4 \\ 0-2 & 0-4 \end{pmatrix}$$

$$= \begin{pmatrix} -4 & 4 \\ -2 & -4 \end{pmatrix} \rightarrow \mathbf{(1)}$$

RHS:-

$$AC = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix} \times \begin{pmatrix} 2 & 0 \\ 1 & 2 \end{pmatrix}$$

$$= \begin{bmatrix} (1 \quad 2)\begin{pmatrix} 2 \\ 1 \end{pmatrix} & (1 \quad 2)\begin{pmatrix} 0 \\ 2 \end{pmatrix} \\ (1 \quad 3)\begin{pmatrix} 2 \\ 1 \end{pmatrix} & (1 \quad 3)\begin{pmatrix} 0 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 2+2 & 0+4 \\ 2+3 & 0+6 \end{pmatrix}$$

$$= \begin{pmatrix} 4 & 4 \\ 5 & 6 \end{pmatrix}$$

$$BC = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix} \times \begin{pmatrix} 2 & 0 \\ 1 & 2 \end{pmatrix}$$

$$= \begin{bmatrix} (4 \quad 0)\begin{pmatrix} 2 \\ 1 \end{pmatrix} & (4 \quad 0)\begin{pmatrix} 0 \\ 2 \end{pmatrix} \\ (1 \quad 5)\begin{pmatrix} 2 \\ 1 \end{pmatrix} & (1 \quad 5)\begin{pmatrix} 0 \\ 2 \end{pmatrix} \end{bmatrix}$$

$$= \begin{pmatrix} 8+0 & 0+0 \\ 2+5 & 0+10 \end{pmatrix}$$

$$= \begin{pmatrix} 8 & 0 \\ 7 & 10 \end{pmatrix}$$

$$AC - BC = \begin{pmatrix} 4 & 4 \\ 5 & 6 \end{pmatrix} - \begin{pmatrix} 8 & 0 \\ 7 & 10 \end{pmatrix}$$
$$= \begin{pmatrix} 4 & 4 \\ 5 & 6 \end{pmatrix} + \begin{pmatrix} -8 & 0 \\ -7 & -10 \end{pmatrix}$$
$$= \begin{pmatrix} 4-8 & 4+0 \\ 5-7 & 6-10 \end{pmatrix}$$
$$= \begin{pmatrix} -4 & 4 \\ -2 & -4 \end{pmatrix} \rightarrow \textbf{(2)}$$

$\therefore$ from (1) and (2) we see that $(A - B)C = AC - BC$

TWO MARKS QUESTIONS

UNIT - 3 : ALGEBRA - MATRICES

54) If $A = \begin{pmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{pmatrix}$, $B = \begin{pmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{pmatrix}$ then verify that

(i) $A + B = B + A$ (ii) $A + (-A) = (-A) + A = 0$.

Solution :-

(i)
$$A + B = \begin{pmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{pmatrix} + \begin{pmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{pmatrix}$$
$$= \begin{pmatrix} 1+5 & 9+7 \\ 3+3 & 4+3 \\ 8+1 & -3+0 \end{pmatrix}$$
$$= \begin{pmatrix} 6 & 16 \\ 6 & 7 \\ 9 & -3 \end{pmatrix} \longrightarrow (1)$$
$$B + A = \begin{pmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{pmatrix} + \begin{pmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{pmatrix}$$
$$= \begin{pmatrix} 5+1 & 7+9 \\ 3+3 & 3+4 \\ 1+8 & 0-3 \end{pmatrix}$$
$$= \begin{pmatrix} 6 & 16 \\ 6 & 7 \\ 9 & -3 \end{pmatrix} \longrightarrow (2)$$

$\therefore$ from (1) and (2) we see that, $A + B = B + A$.

(ii)
$$-A = -\begin{pmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{pmatrix} = \begin{pmatrix} -1 & -9 \\ -3 & -4 \\ -8 & 3 \end{pmatrix}$$
$$A + (-A) = \begin{pmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{pmatrix} + \begin{pmatrix} -1 & -9 \\ -3 & -4 \\ -8 & 3 \end{pmatrix}$$
$$= \begin{pmatrix} 1-1 & 9-9 \\ 3-3 & 4-4 \\ 8-8 & -3+3 \end{pmatrix}$$
$$= \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$
$$= O \longrightarrow (1)$$

$$(-A)+A=\begin{pmatrix}-1 & -9\\ -3 & -4\\ -8 & 3\end{pmatrix}+\begin{pmatrix}1 & 9\\ 3 & 4\\ 8 & -3\end{pmatrix}$$
$$=\begin{pmatrix}-1+1 & -9+9\\ -3+3 & -4+4\\ -8+8 & 3-3\end{pmatrix}$$
$$=\begin{pmatrix}0 & 0\\ 0 & 0\\ 0 & 0\end{pmatrix}$$
$$=O \quad \dashrightarrow (2)$$

$\therefore$ from (1) and (2) we see $A+(-A)=(-A)+A=O$.

55) If $A=\begin{pmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{pmatrix}$ then prove that $AA^{T}=I$.

Solution:-

Given, $A=\begin{pmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{pmatrix}$

$$A^{T}=\begin{pmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{pmatrix}^{T}$$
$$=\begin{pmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{pmatrix}$$
$$AA^{T}=\begin{pmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{pmatrix}\begin{pmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{pmatrix}$$
$$=\begin{pmatrix}\cos^2\theta+\sin^2\theta & -\sin\theta\cos\theta+\sin\theta\cos\theta\\ -\sin\theta\cos\theta+-\sin\theta\cos\theta & \sin^2\theta+\cos^2\theta\end{pmatrix}$$
$$=\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}$$
$$AA^{T}=I$$

Hence proved.

56) If $A=\begin{pmatrix}5 & -4\\ 6 & -5\end{pmatrix}$ then prove that $A^2=I$.

Solution:-

Given, $A=\begin{pmatrix}5 & -4\\ 6 & -5\end{pmatrix}$

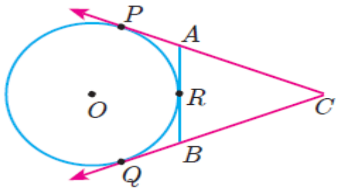
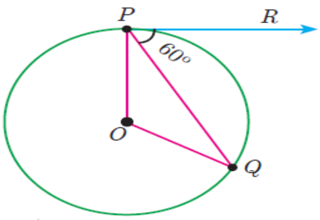
$$A^2=A\times A=\begin{pmatrix}5 & -4\\ 6 & -5\end{pmatrix}\begin{pmatrix}5 & -4\\ 6 & -5\end{pmatrix}$$
$$=\begin{pmatrix}25-24 & -20+20\\ 30-30 & -24+25\end{pmatrix}$$
$$=\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}$$
$$A^2=I$$

Hence proved.

ONE MARK QUESTIONS

UNIT - 4 : GEOMETRY

61) A tangent is perpendicular to the radius at the	**Ans:-** **point of contact**
62) How many tangents can be drawn to the circle from an exterior	

point?		**Ans:- two**
63) The two tangents from an exterior points P to a circle with centre at O are PA and PB. $\angle APB = 70^o$ then the value of $\angle AOB$ is		**Ans:- 110^o**
64) 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		**Ans:- 4 cm**
65) In figure if PR is tangent to the circle at P and O is the centre of the circle, then $\angle POQ$ is		**Ans:- 120^o**

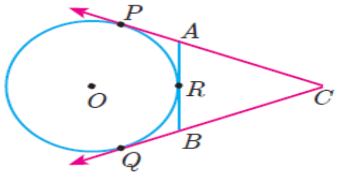
Slip Test - 13

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) How many tangents can be drawn to the circle from an exterior point?
(A) one (B) two (C) infinite (D) zero

2) The two tangents from an exterior points P to a circle with centre at O are PA and PB. $\angle APB = 70^o$ then the value of $\angle AOB$ is (A) 100^o (B) 110^o (C) 120^o (D) 130^o

3) 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
(A) 6 cm (B) 5 cm C) 8 cm (D) 4 cm



II Answer the following:- **(2 x 2 = 4)**

4) If $A = \begin{pmatrix} 5 & -4 \\ 6 & -5 \end{pmatrix}$ then prove that $A^2 = I$.

5) If $A = \begin{pmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{pmatrix}$, $B = \begin{pmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{pmatrix}$ then verify that $A + (-A) = (-A) + A = 0$.

III Answer the following:- **(1 x 5 = 5)**

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

IV Answer the following:- **(1 x 8 = 8)**

7) Draw the 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.

DAY – 16

SPECIAL GRAPHS – INDIRECT VARIATION

5) Draw the graph of $xy = 24,\ x, y > 0$,. Using the graph find, **[Apr-24]**

(i) y when $x = 3$ and

(ii) x when $y = 6$.

Solution:-

VARIATION:- Indirect Variation

TABLE:-

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

POINTS:-

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

EQUATION:- $xy = 24$

SCALE:-

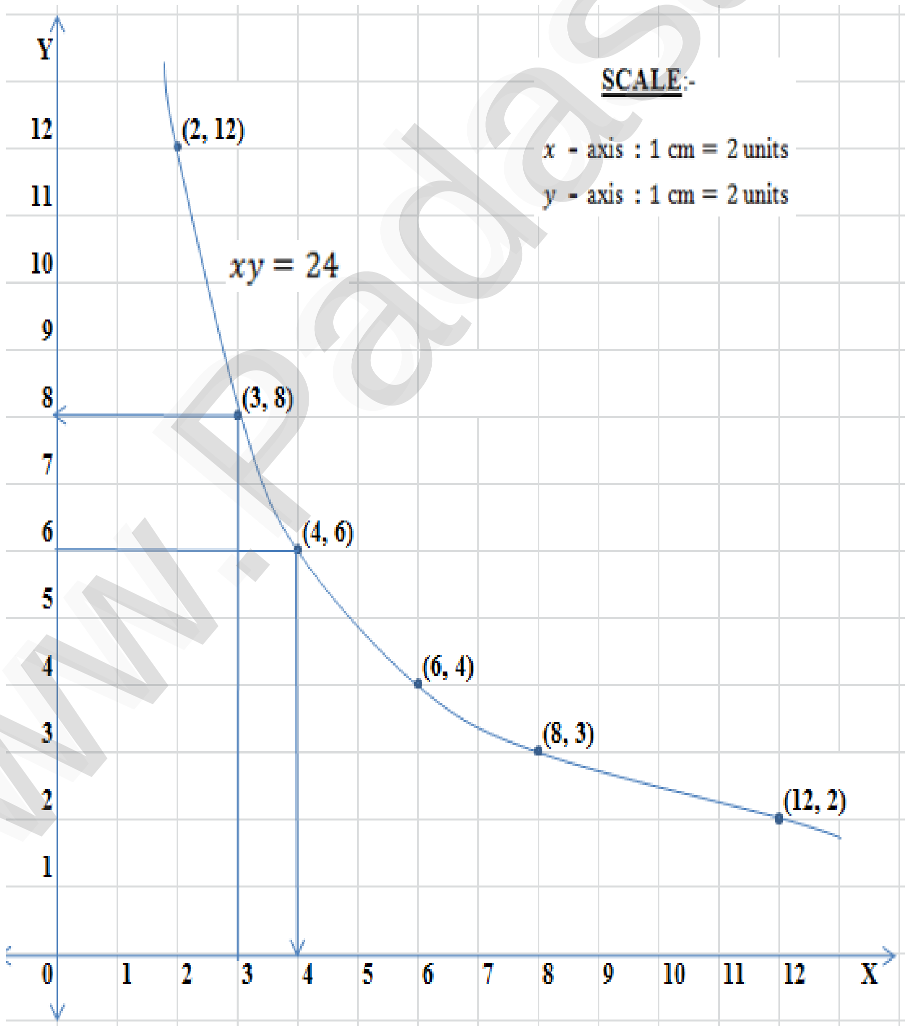
x – axis : 1 cm = 2 units

y – axis : 1 cm = 2 units

FROM THE GRAPH,

(i) If $x = 3$ then $y = 8$

(ii) If $y = 6$ then $x = 4$



FIVE MARKS QUESTIONS

UNIT - 3 : ALGEBRA - MATRICES

46) If $A = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}$ then prove that $(A-B)^T = B^T - A^T$.

Solution:-

LHS:-

$$A - B = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix} - \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix} + \begin{pmatrix} -4 & 0 \\ -1 & -5 \end{pmatrix} = \begin{pmatrix} 1-4 & 2+0 \\ 1-1 & 3-5 \end{pmatrix}$$

$$= \begin{pmatrix} -3 & 2 \\ 0 & -2 \end{pmatrix}$$

$$(A-B)^T = \begin{pmatrix} -3 & 2 \\ 0 & -2 \end{pmatrix}^T = \begin{pmatrix} -3 & 0 \\ 2 & -2 \end{pmatrix} \quad \rightarrow \textbf{(1)}$$

RHS:-

$$A^T = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}^T = \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix} \quad \text{ÁüÚõ} \quad B^T = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}^T = \begin{pmatrix} 4 & 1 \\ 0 & 5 \end{pmatrix}$$

$$A^T - B^T = \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix} - \begin{pmatrix} 4 & 1 \\ 0 & 5 \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix} + \begin{pmatrix} -4 & -1 \\ 0 & -5 \end{pmatrix}$$

$$= \begin{pmatrix} 1-4 & 1-1 \\ 2+0 & 3-5 \end{pmatrix}$$

$$A^T - B^T = \begin{pmatrix} -3 & 0 \\ 2 & -2 \end{pmatrix} \quad \rightarrow \textbf{(2)}$$

∴ from (1) and (2) we see that $(A-B)^T = A^T - B^T$

47) If $A = \begin{pmatrix} 4 & 3 & 1 \\ 2 & 3 & -8 \\ 1 & 0 & -4 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 3 & 4 \\ 1 & 9 & 2 \\ -7 & 1 & -1 \end{pmatrix}$ and $C = \begin{pmatrix} 8 & 3 & 4 \\ 1 & -2 & 3 \\ 2 & 4 & -1 \end{pmatrix}$ then prove that $A + (B + C) = (A + B) + C$.

Solution:-

LHS:-

$$B + C = \begin{pmatrix} 2 & 3 & 4 \\ 1 & 9 & 2 \\ -7 & 1 & -1 \end{pmatrix} + \begin{pmatrix} 8 & 3 & 4 \\ 1 & -2 & 3 \\ 2 & 4 & -1 \end{pmatrix} = \begin{pmatrix} 2+8 & 3+3 & 4+4 \\ 1+1 & 9-2 & 2+3 \\ -7+2 & 1+4 & -1-1 \end{pmatrix}$$

$$= \begin{pmatrix} 10 & 6 & 8 \\ 2 & 7 & 5 \\ -5 & 5 & -2 \end{pmatrix}$$

$$A + (B + C) = \begin{pmatrix} 4 & 3 & 1 \\ 2 & 3 & -8 \\ 1 & 0 & -4 \end{pmatrix} + \begin{pmatrix} 10 & 6 & 8 \\ 2 & 7 & 5 \\ -5 & 5 & -2 \end{pmatrix} = \begin{pmatrix} 4+10 & 3+6 & 1+8 \\ 2+2 & 3+7 & -8+5 \\ 1-5 & 0+5 & -4-2 \end{pmatrix}$$

$$= \begin{pmatrix} 14 & 9 & 9 \\ 4 & 10 & -3 \\ -4 & 5 & -6 \end{pmatrix} \longrightarrow (1)$$

RHS:-

$$A + B = \begin{pmatrix} 4 & 3 & 1 \\ 2 & 3 & -8 \\ 1 & 0 & -4 \end{pmatrix} + \begin{pmatrix} 2 & 3 & 4 \\ 1 & 9 & 2 \\ -7 & 1 & -1 \end{pmatrix} = \begin{pmatrix} 4+2 & 3+3 & 1+4 \\ 2+1 & 3+9 & -8+2 \\ 1-7 & 0+1 & -4-1 \end{pmatrix}$$

$$= \begin{pmatrix} 6 & 6 & 5 \\ 3 & -6 & -6 \\ -6 & 1 & -5 \end{pmatrix}$$

$$(A + B) + C = \begin{pmatrix} 6 & 6 & 5 \\ 3 & 12 & -6 \\ -6 & 1 & -5 \end{pmatrix} + \begin{pmatrix} 8 & 3 & 4 \\ 1 & -2 & 3 \\ 2 & 4 & -1 \end{pmatrix} = \begin{pmatrix} 6+8 & 6+3 & 5+4 \\ 3+1 & 12-2 & -6+3 \\ -6+2 & 1+4 & -5-1 \end{pmatrix}$$

$$= \begin{pmatrix} 14 & 9 & 9 \\ 4 & 10 & -3 \\ -4 & 5 & -6 \end{pmatrix} \dashrightarrow (2)$$

$\therefore$ from (1) and (2) we see that $A + (B + C) = (A + B) + C$

48) If $A = \begin{pmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{pmatrix}, B = \begin{pmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{pmatrix}$ then show that $A^2 + B^2 = I_2$ **[PTA-2]**

Solution:-

$$A^2 = A \text{ x } A = \begin{pmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{pmatrix} \text{x} \begin{pmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{pmatrix}$$

$$= \begin{pmatrix} (\cos\theta \quad 0)\begin{pmatrix} \cos\theta \\ 0 \end{pmatrix} & (\cos\theta \quad 0)\begin{pmatrix} 0 \\ \cos\theta \end{pmatrix} \\ (0 \quad \cos\theta)\begin{pmatrix} \cos\theta \\ 0 \end{pmatrix} & (0 \quad \cos\theta)\begin{pmatrix} 0 \\ \cos\theta \end{pmatrix} \end{pmatrix}$$

$$= \begin{pmatrix} \cos^2\theta + 0 & 0 + 0 \\ 0 + 0 & 0 + \cos^2\theta \end{pmatrix}$$

$$= \begin{pmatrix} \cos^2\theta & 0 \\ 0 & \cos^2\theta \end{pmatrix}$$

$$B^2 = B \text{ x } B$$

$$= \begin{pmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{pmatrix} \text{x} \begin{pmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{pmatrix}$$

$$= \begin{pmatrix} (\sin\theta \quad 0)\begin{pmatrix} \sin\theta \\ 0 \end{pmatrix} & (\sin\theta \quad 0)\begin{pmatrix} 0 \\ \sin\theta \end{pmatrix} \\ (0 \quad \sin\theta)\begin{pmatrix} \sin\theta \\ 0 \end{pmatrix} & (0 \quad \sin\theta)\begin{pmatrix} 0 \\ \sin\theta \end{pmatrix} \end{pmatrix}$$

$$= \begin{pmatrix} \sin^2\theta + 0 & 0 + 0 \\ 0 + 0 & 0 + \sin^2\theta \end{pmatrix}$$

$$= \begin{pmatrix} \sin^2\theta & 0 \\ 0 & \sin^2\theta \end{pmatrix}$$

$$A^2 + B^2 = \begin{pmatrix} \cos^2\theta & 0 \\ 0 & \cos^2\theta \end{pmatrix} + \begin{pmatrix} \sin^2\theta & 0 \\ 0 & \sin^2\theta \end{pmatrix}$$

$$= \begin{pmatrix} \cos^2\theta + \sin^2\theta & 0 + 0 \\ 0 + 0 & \cos^2\theta + \sin^2\theta \end{pmatrix}$$

$$= \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$= I_2$$

Hence Proved.

TWO MARKS QUESTIONS

UNIT - 5 : COORDINATE GEOMETRY

57) If the area of the triangle formed by the vertices $A(-1,2), B(k,-2)$ and $C(7,4)$ (taken in order) is 22 sq.units, find the value of k. **[Aug-22]**

Solution:-

Given, $(x_1,y_1) = A(-1,2), (x_2,y_2) = B(k,-2), (x_3,y_3) = C(7,4)$

Area of the ΔABC = 22 sq.units

$$22 = \frac{1}{2}\begin{Bmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{Bmatrix}$$

$$22 \text{ x } 2 = \begin{Bmatrix} -1 & k & 7 & -1 \\ 2 & -2 & 4 & 2 \end{Bmatrix}$$

$$44 = 2 + 4k + 14 - 2k + 14 + 4$$
$$44 = 34 + 2k$$
$$44 - 34 = 2k$$
$$10 = 2k$$
$$\frac{10}{2} = k$$
$$k = 5$$

58) Show that the given points are collinear. (−3,−4),(7,2) and (12,5). **[Sep-21]**

Solution:-

Given, $(x_1,y_1) = (-3,-4)\ ;\ (x_2,y_2) = (7,2)\ ;\ (x_3,y_3) = (12,5)$

∴ Area of the triangle

$$= \frac{1}{2}\begin{Bmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{Bmatrix}$$
$$= \frac{1}{2}\begin{Bmatrix} -3 & 7 & 12 & -3 \\ -4 & 2 & 5 & -4 \end{Bmatrix}$$
$$= \frac{1}{2}(-6 + 35 - 48 + 28 - 24 + 15)$$
$$= \frac{1}{2}(-78 + 78)$$
$$= 0$$

∴ The given points are collinear.

59) Show that the given points are collinear. $(P(-1.5,3), Q(6,-2), R(-3,4)$. **[PTA-4, May-22]**

Solution:-

Given, $(x_1,y_1) = P(-1.5,3),\ (x_2,y_2) = Q(6,-2),\ (x_3,y_3) = R(-3,4)$

∴ Area of the triangle

$$= \frac{1}{2}\begin{Bmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{Bmatrix}$$
$$= \frac{1}{2}\begin{Bmatrix} -1.5 & 6 & -3 & -1.5 \\ 3 & -2 & 4 & 3 \end{Bmatrix}$$
$$= \frac{1}{2}(3 + 24 - 9 - 18 - 6 + 6)$$

$$= \frac{1}{2}(27 - 27)$$
$$= 0$$

∴ The given points are collinear.

ONE MARK QUESTIONS

UNIT - 5 : COORDINATE GEOMETRY

66) The area of triangle formed by the points $(-5,0)$, $(0,-5)$ and $(5,0)$ is	**Ans:- 25 sq.units**
67) A man walks near a wall, such that the distance between him and the wall is 20 units. Consider the wall to be the Y axis. The path travelled by the man is	**Ans:- $x = 10$**
68) The straight line given by the equation $x = 11$is	**Ans:- parallel to Y – axis**
69) If $(5,7), (3,p)$ and $(6,6)$ are collinear, then the value of p is	**Ans:- 9**
70) The point of intersection of $3x - y = 4$ and $x + y = 8$ is	**Ans:- $(3,5)$**

Slip Test - 14

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) The area of 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

2) If $(5,7), (3,p)$ and $(6,6)$ are collinear, then the value of p is
(A) 3 (B) 6 (C) 9 (D) 12

3) The point of intersection of $3x - y = 4$ and $x + y = 8$ is
(A) $(5,3)$ (B) $(2,4)$ (C) $(3,5)$ (D) $(4,4)$

II Answer the following:- **(2 x 2 = 4)**

4) If the area of the triangle formed by the vertices $A(-1,2), B(k,-2)$ and $C(7,4)$ (taken in order) is 22 sq.units, find the value of k.

5) Show that the given points are collinear. $P(-1.5,3), Q(6,-2), R(-3,4)$.

III Answer the following:- **(1 x 5 = 5)**

6) If $A = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}$ then prove that $(A - B)^T = B^T - A^T$.

IV Answer the following:- **(1 x 8 = 8)**

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

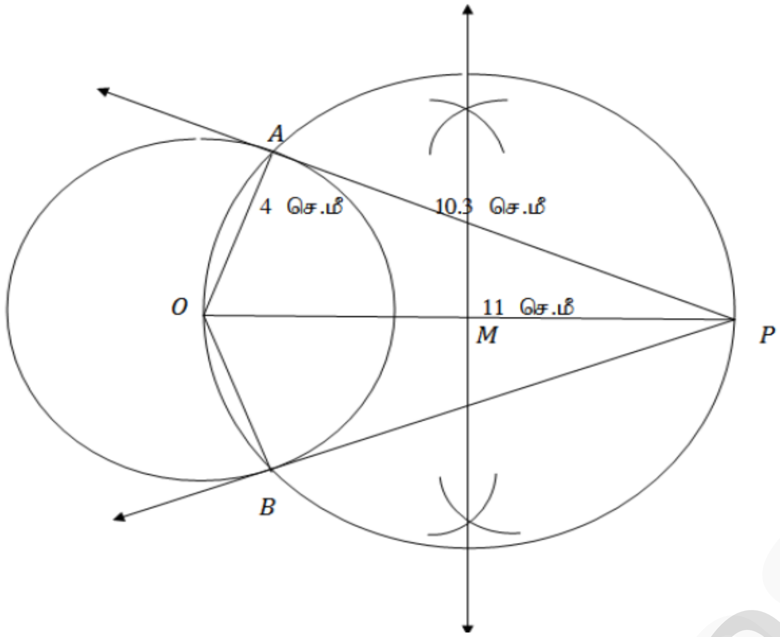
DAY – 17

PRACTICAL GEOMETRY - TANGENTS

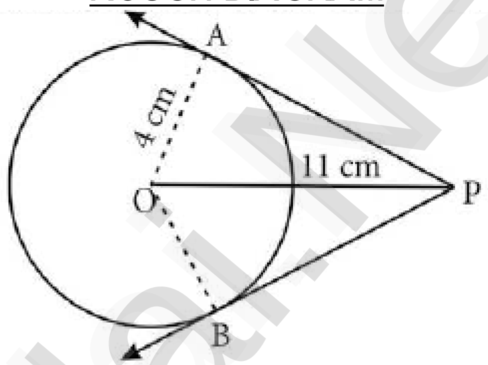
9) Take a point which is 11 cm away from the centre of a circle of radius 4 cm and draw the two tangents to the circle from that point. **[PTA-2]**

Solution:-

Gven, Radius = 4 cm ; Distance = 11 cm



ROUGH DIAGRAM



∴ PA and PB are the two required tangents.

Lengths of the tangents, $PA = PB = 10.2$ cm

FIVE MARKS QUESTIONS

UNIT - 4 : GEOMETRY

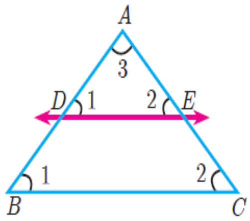
49) **Thales Theorem or Basic proportionality Theorem (BPT)**:- **[PTA-2, May-22]**

Statement:-

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

Given:-

In ΔABC, $D$is point on AB $E$is a point on AC.



To Prove:-

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

Construction:-

Draw a kube $DE \parallel BC$.

Proof:-

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 angles 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
	$\frac{DB}{AD} = \frac{EC}{AE}$	Cancelling 1 on both sides
	$\frac{AD}{DB} = \frac{AE}{EC}$	Taking reciprocals

Hence proved.

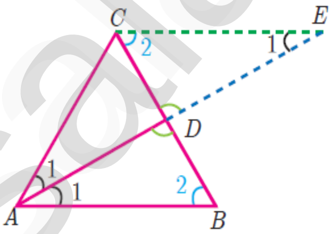
50) <u>Angle Bisector Theorem (ABT)</u>:- [PTA-5, Sep-20 , Aug-22, Apr-23]

<u>Statement</u>:-

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

<u>Given</u>:-

In ΔABC, AD is the internal bisector.



<u>To Prove</u>:-

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

<u>Construction</u>:-

Draw a line through C parallel to AB.

Extend AD to meet the line through C at E.

<u>Proof</u>:-

No	Statement	Reason
1.	$\angle AEC = \angle BAE = \angle 1$	Two parallel lines cut by a transversal make alternate angles equal..
2.	ΔACE is an 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.

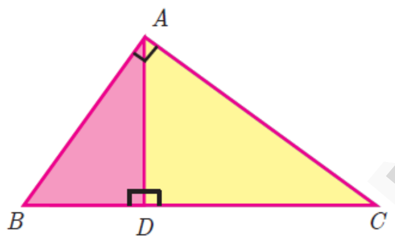
51) **PYTHAGORAS THEOREM**:- **[PTA-1, Sep-21, Jun-23]**

Statement:-

In a right angled triangle, the square of the hypotenuse is equal to the sum of the squares on the other two sides.

Given:-

In ΔABC , $\angle A = 90^o$



To Prove:-

$AB^2 + AC^2 = BC^2$

Construction:-

Draw $AD \perp BC$

Proof:-

No	Statement	Reason
1.	Compare ΔABC and ΔDBA $\angle B$ is common. $\angle BAC = \angle BDA = 90^o$ Therefore, $\Delta ABC \sim \Delta DBA$ $\frac{AB}{BD} = \frac{BC}{AB}$ $AB^2 = BC \times BD$ **→(1)**	Given $\angle BAC = 90^o$ and by construction $\angle BDA = 90^o$ By AA Similarity
2.	Compare ΔABC and ΔDAC $\angle C$ common. $\angle BAC = \angle ADC = 90^o$ Therefore, $\Delta ABC \sim \Delta DAC$ $\frac{BC}{AC} = \frac{AC}{DC}$ $AC^2 = BC \times DC$ **→(2)**	Given $\angle BAC = 90^o$ and by construction $\angle BDA = 90^o$ By AA Similarity

(1) + (2) : $AB^2 + AC^2 = BC \times BD + BC \times DC$

$= BC(BD + DC)$

$= BC \times BC = BC^2$

Hence Proved.

TWO MARKS QUESTIONS

UNIT - 5 : COORDINATE GEOMETRY

60) Find the slope of a line joining the points $(14, 10)$ and $(14, -6)$ **[Sep-20]**

Solution:-

Given, $(x_1, y_1) = (14, 10)$ and $(x_2, y_2) = (14, -6)$

WKT, Slope, $m = \frac{y_2 - y_1}{x_2 - x_1}$

$\therefore$ Slope, $m = \frac{-6-10}{14-14} = \frac{-16}{0} = \infty$

The slope is undefined.

61) Find the slope of a line joining the points $(5, \sqrt{5})$ with the origin. **[Aug-22, Jun-23]**

Solution:-

$(x_1, y_1) = (5, \sqrt{5})$ and $(x_2, y_2) = (0, 0)$

WKT, Slope, $m = \frac{y_2 - y_1}{x_2 - x_1}$

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

62) If the line passes r theough the points $(-2, 2), (5, 8)$ and the line s passes through the points $(-8, 7)$, $(-2, 0)$. Is the line r perpendicular to s? **[M-22 , A-22]**

Solution:-

Slope $= \frac{y_2 - y_1}{x_2 - x_1}$

Slope of a straight line r

$$m_1 = \frac{8-2}{5+2} = \frac{6}{7}$$

$x_1 \to -2$ $y_1 \to 2$	$x_2 \to 5$ $y_2 \to 8$

Slope of a straight line s

$$m_2 = \frac{0-7}{-2+8} = \frac{-7}{6}$$

$x_1 \to -8$ $y_1 \to 7$	$x_2 \to -2$ $y_2 \to 0$

$$m_1 \times m_2 = \frac{6}{7} \times \frac{-7}{6} = -1$$

$\therefore$ The straight lines r and s are perpendicular.

63) If the line passes p theough the points $(3, -2)$ and $(12, 4)$ and the line q passes through the points $(6, -2)$ and $(12, 2)$. Is the line p parallel to q? **[May-22 , Aug-22]**

Solution:-

Slope $= \frac{y_2 - y_1}{x_2 - x_1}$

Slope of a straight line p

$$m_1 = \frac{4+2}{12-3} = \frac{6}{9} = \frac{2}{3}$$

$(x_1, y_1) = (3, -2)$ $(x_1, y_1) = (12, 4)$

Slope of a straight line q

$$m_2 = \frac{2+2}{12-6} = \frac{4}{6} = \frac{2}{3}$$

$(x_1, y_1) = (6, -2)$ $(x_1, y_1) = (12, 2)$

$$m_1 = m_2 = \frac{2}{3}$$

$\therefore$ The straight lines p and q are parallel.

ONE MARK QUESTIONS

UNIT - 5 : COORDINATE GEOMETRY

71) The slope of the line joining $(12, 3)$, $(4, a)$ is $\frac{1}{8}$. Then value of $'a'$ is	**Ans:- 2**
72) The slope of the line which is perpendicular to line joining the points $(0, 0)$and$(-8, 8)$is	**Ans:- 1**
73) If slope of the line PQ is$\frac{1}{\sqrt{3}}$then the slope of the perpendicular	**Ans:- $-\sqrt{3}$**

bisector of PQ is	
74) If A is a point on the Y axis whose ordinate is 8 and B is a point on the X axis whose abscissa is 5 then the equation of the line AB is	**Ans:-** $\mathbf{8x + 5y = 40}$
75) The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is	**Ans:-** $\mathbf{3x + 7y = 0}$

Slip Test - 15

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. (3 x 1 = 3)

1) The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is
(A) $7x - 3y + 4 = 0$ (B) $3x - 7y + 4 = 0$
(C) $3x + 7y = 0$ (D) $7x - 3y = 0$

2) The slope of the line which is perpendicular to line joining the points $(0, 0)$ and $(-8, 8)$ is
(A) -1 (B) 1 (C) $\frac{1}{3}$ (D) -8

3) If A is a point on the Y axis whose ordinate is 8 and B is a point on the X axis whose abscissa is 5 then the equation of the line AB is
(A) $8x + 5y = 40$ (B) $8x - 5y = 40$ (C) $x = 8$ (D) $y = 5$

II Answer the following:- (2 x 2 = 4)

4) If the line passes p theough the points $(3, -2)$ and $(12, 4)$ and the line q passes through the points $(6, -2)$ and $(12, 2)$. Is the line p parallel to q?

5) Find the slope of a line joining the points $(5, \sqrt{5})$ with the origin.

III Answer the following:- (1 x 5 = 5)

6) State and Prove Pythagoras theorem.

IV Answer the following:- (1 x 8 = 8)

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

DAY – 18

WEEKLY TEST - 3

DAY – 19

PRACTICAL GEOMETRY - TANGENTS

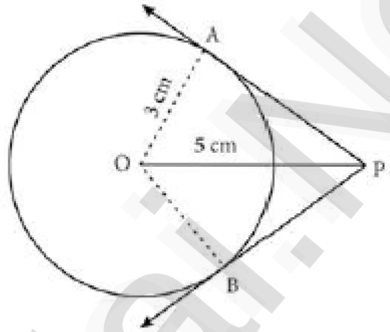
10) Draw the two tangents from a point which is 5 cm away from the centre of a circle of diameter 6 cm. Also, measure the lengths of the tangents. **[S-22 , M-22]**

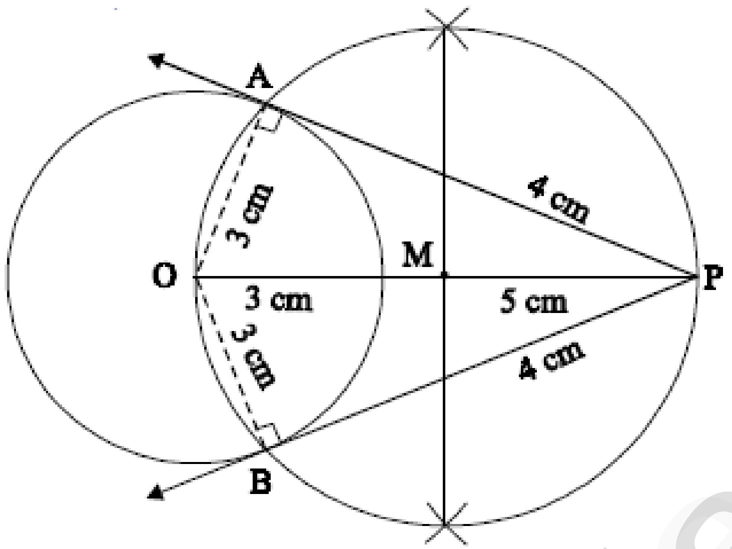
Solution:-

Gven, Diameter = 6 cm , Radius= $\frac{6}{2} = 3$ cm cm,

Distance= 5 cm

ROUGH DIAGRAM





∴ PA and PB are the two required tangents.

Lengths of the tangents, $PA = PB = 4$ cm

FIVE MARKS QUESTIONS

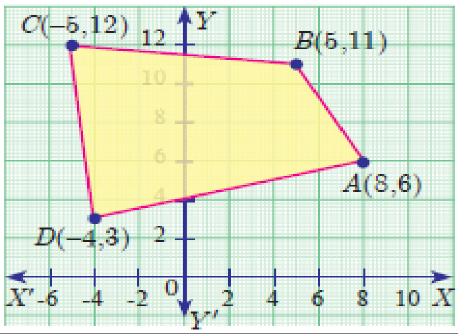
UNIT - 5 : COORDINATE GEOMETRY

52) Find the area of the quadrilateral whose vertices are at $(8, 6), (5, 11), (-5, 12)$ and $(-4, 3)$. **[Aug-22, Apr-23]**

Solution:-

Given,

$(x_1, y_1) = (8,6)$
$(x_2, y_2) = (5, 11)$
$(x_3, y_3) = (-5, 12)$
$(x_4, y_4) = (-4, 3)$



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

$= \frac{1}{2}\begin{Bmatrix} 8 & 5 & -5 & -4 & 8 \\ 6 & 11 & 12 & 3 & 6 \end{Bmatrix}$

$= \frac{1}{2}(88 + 60 - 15 - 24 - 30 + 55 + 48 - 24)$

$= \frac{1}{2}(251 - 93)$

$= \frac{158}{2}$

$= 79$ Sq. units

53) Find the area of the quadrilateral whose vertices are at $(-9,-2), (-8,-4), (2,2)$ and $(1,-3)$. **[Jun-23, Apr-24]**

Solution:-

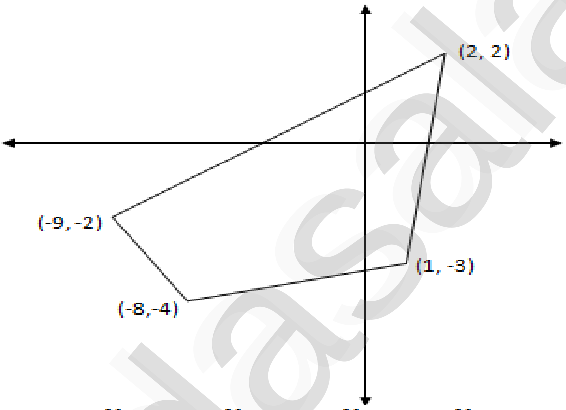
Given,

$(x_1, y_1) = (-9,-2)$

$(x_2, y_2) = (-8,-4)$

$(x_3, y_3) = (1,-3)$

$(x_4, y_4) = (2,2)$



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

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

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

$= \frac{1}{2}(90 - 20)$

$= \frac{70}{2}$

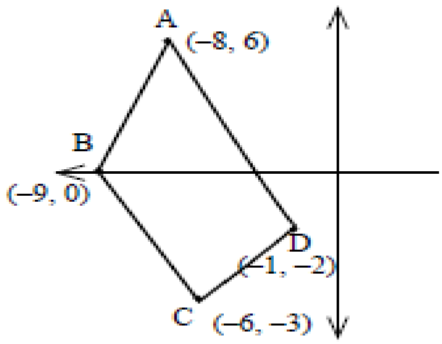
$= 35$ Sq. units

54) Find the area of the quadrilateral whose vertices are at $(-9,0), (-8,6), (-1,-2)$ and $(-6,-3)$.

Solution:-

Given,

$(x_1, y_1) = (-9,0)$
$(x_2, y_2) = (-6, -3)$
$(x_3, y_3) = (-1, -2)$
$(x_4, y_4) = (-8, 6)$



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

$= \frac{1}{2}\begin{Bmatrix} -9 & -6 & -1 & -8 & -9 \\ 0 & -3 & -2 & 6 & 0 \end{Bmatrix}$

$= \frac{1}{2}(27 + 12 - 6 + 0 + 0 - 3 - 16 + 54)$

$= \frac{1}{2}(93 - 25)$

$= \frac{68}{2}$

$= 34$ Sq. units

55) Find the value of k, if the area of a quadrilateral is 28 Sq. Units, whose vertices are $(-4, -2), (-3, k), (3, -2)$ and $(2, 3)$. **[PTA-5 , Sep-20]**

Solution:-

Given, $(x_1, y_1) = (-4, -2)$, $(x_2, y_2) = (-3, k)$; $(x_3, y_3) = (3, -2)$; $(x_4, y_4) = (2, 3)$

Area of a quadrilateral $= 28$ Sq. units

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

$28 = \frac{1}{2}\begin{Bmatrix} -4 & -3 & 3 & 2 & -4 \\ -2 & k & -2 & 3 & -2 \end{Bmatrix}$

$2 \text{ x } 28 = -4k + 6 + 9 - 4 - 6 - 3k + 4 + 12$

$56 = -7k + 31 - 10$

$56 = -7k + 21$

$7k = 21 - 56$

$7k = -35$

$k = \frac{-35}{7}$

$k = -5$

56) If vertices of a quadrilateral are at $A(-5,7)$, $B(-4, k)$, $C(-1, -6)$ and ; $D(4, 5)$ and its area is 72 sq.units. Find the value of k.

Solution:-

Given, $(x_1, y_1) = A(-5,7)$; $(x_2, y_2) = B(-4, k)$;

$(x_3, y_3) = C(-1, -6)$; $(x_4, y_4) = D(4,5)$

Area of a quadrilateral $= 72$ Sq. units

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

$$72 = \frac{1}{2}\begin{Bmatrix} -5 & -4 & -1 & 4 & -5 \\ 7 & k & -6 & 5 & 7 \end{Bmatrix}$$

$$2 \text{ x } 72 = -5k + 24 - 5 + 28 + 28 + k + 24 + 25$$

$$144 = -4k + 129 - 5$$

$$144 = -4k + 124$$

$$4k = 124 - 144$$

$$4k = -20$$

$$k = \frac{-20}{4}$$

$$k = -5$$

TWO MARKS QUESTIONS

UNIT - 5 : COORDINATE GEOMETRY

64) Calculate the slope and y intercept of the straight line $8x-7y+6=0$. **[Sep-21]**

Solution:-

The given straight line, $8x - 7y + 6 = 0$

$$-7y = -8x - 6$$

$$7y = 8x + 6$$

$$y = \frac{8}{7}x + \frac{6}{7}$$

Compare this with $y = mx + c$, we see that

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

65) Find the intercepts made by the line $3x - 2y - 6 = 0$ on the co-ordinate axes. **[Sep-21]**

Solution:-

The given straight line, $3x - 2y - 6 = 0$

$$3x - 2y = 6$$

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

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

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

Compare this with $\frac{x}{a}+\frac{y}{b}=1$, we see that

x - intercept, $a=2$ and

y - intercept, $b=-3$

66) Show that the straight lines $2x+3y=8=0$ and $4x+6y+18=0$ are parallel.

Solution:-

Slope $=\frac{-\text{co efficient of x}}{\text{co efficient of y}}$

Slope of the line $2x+3y+8=0$ is, $m_1=\frac{-2}{3}$

Slope of the line $4x+6y+18=0$ is, $m_2=\frac{-4}{6}=\frac{-2}{3}$

Here, $m_1=m_2=\frac{-2}{3}$

$\therefore$ Two lines are parallel.

67) Show that the straight lines $3x-5y+7=0$ and $15x+9y+4=0$ are perpendicular. **[PTA-3]**

Solution:-

WKT, Slope of $ax+by+c=0$ is, $m=\frac{-a}{b}$

Slope of the line $3x-5y+7=0$ is, $m_1=\frac{-3}{-5}=\frac{3}{5}$

Slope of the line $15x+9y+4=0$ is, $m_2=\frac{-15}{9}=\frac{-5}{3}$

$\therefore\quad m_1\times m_2=\frac{3}{5}\times\frac{-5}{3}=-1$

$\therefore$ Two lines are perpendicular.

68) Show that the straight lines $x-2y+3=0$ and $6x+3y+8=0$ are perpendicular.

[PTA-5]

Solution:-

WKT, Slope of $ax+by+c=0$ is, $m=\frac{-a}{b}$

Slope of the line $x-2y+3=0$ is, $m_1=\frac{-1}{-2}=\frac{1}{2}$

Slope of the line $6x+3y+8=0$ is, $m_2=\frac{-6}{3}=-2$

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

$\therefore$ Two lines are perpendicular.

ONE MARK QUESTIONS

UNIT - 5 : COORDINATE GEOMETRY

76) 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?	**Ans:- l_2 and l_4 are perpendicular**
77) A straight line has equation $8y=4x+21$. Which of the following is true?	**Ans:- The slope is 0.5 and y–intercept 2.6**
78) When proving that a quadrilateral is a trapezium, it is	**Ans:- Two parallel and two**

necessary to show	**non-parallel sides**
79) When proving that a quadrilateral is a parallelogram by using slopes you must find	**Ans:- The slopes of two pair of opposite sides**
80) (2, 1) is the point of intersection of two lines	**Ans:-** $x + y = 3\,;3x + y = 7$

Slip Test - 16

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) 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

2) When proving that a quadrilateral is a parallelogram by using slopes you must find
(A) The slopes are parallel (B) The slopes of two pair of opposite sides
(C) The lengths of all sides (D) Both the lengths and slopes of two sides

3) (2, 1) is the point of intersection of two lines
(A) $x - y - e = 0\,;3x - y - 7 = 0$ (B) $x + y = 3\,;3x + y = 7$
(C) $3x + y = 3\,;x + y = 7$ (D) $x + 3y - 3 = 0\,;x - y - 7 = 0$

II Answer the following:- **(2 x 2 = 4)**

4) Find the intercepts made by the line $3x - 2y - 6 = 0$ on the co-ordinate axes.

5) Show that the straight lines $x - 2y + 3 = 0$ and $6x + 3y + 8 = 0$ are perpendicular.

III Answer the following:- **(1 x 5 = 5)**

6) If vertices of a quadrilateral are at $A(-5,7)$, $B(-4,k)$, $C(-1,-6)$ and ; $D(4,5)$ and its area is 72 sq.units. Find the value of k.

IV Answer the following:- **(1 x 8 = 8)**

7) Draw the two tangents from a point which is 5 cm away from the centre of a circle of diameter 6 cm. Also, measure the lengths of the tangents.

DAY – 20

SPECIAL GRAPHS – INDIRECT VARIATION

6) 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.
(ii) From the graph, find the number of days required to complete the work if the company decides to opt for 120 workers?
(iii) If the work has to be completed by 200 days, how many workers are required?

Solution:-

VARIATION:- Indirect Variation.

TABLE:-

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

POINTS:-

$(40, 150), (50, 120), (60, 100), (75, 80)$

CONSTANT OF VARIATION:-

$$k = x40 \text{ x } 150 = 6000$$

EQUATION:-

$$xy = k$$
$$xy = 6000$$

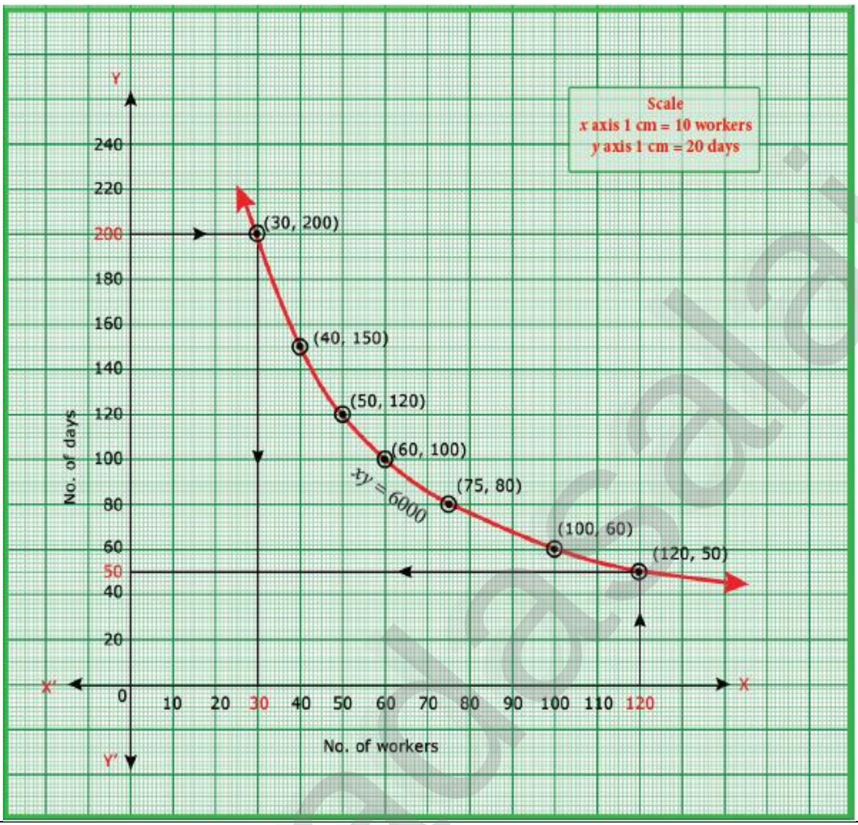
SCALE:-

x – axis : 1 cm = 10 units
y – axis : 1 cm = 20 units

From the graph,

(i) If $x = 120$ then $y = 50$. 120 days are required to complete the work if the company decides to opt for 120 workers.

(ii) If $y = 30$ then $x = 200$. 200 workers are required to complete the work by 30 days.



FIVE MARKS QUESTIONS

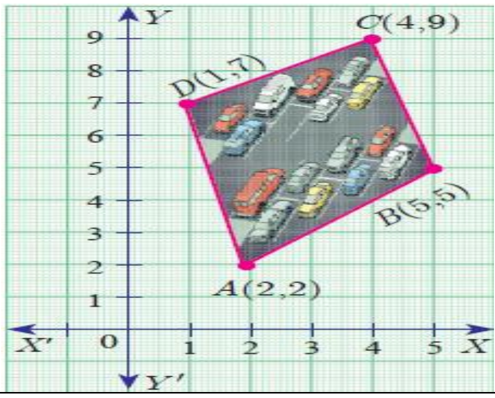
UNIT - 5 : COORDINATE GEOMETRY

57) The given diagram shows a plan for constructing a new parking lot at a campus. It is estimated that such construction would cost Rs.1300 per square feet. What will be the total cost for making the parking lot?

Solution:-

Given,

$(x_1, y_1) = A(2,2)$
$(x_2, y_2) = B(5,5)$
$(x_3, y_3) = C(4,9)$
$(x_4, y_4) = D(1,7)$



$$\text{Area of the parking} = \frac{1}{2}\begin{Bmatrix} x_1 & & x_2 & & x_3 & & x_4 & & x_1 \\ y_1 & \times & y_2 & \times & y_3 & \times & y_4 & \times & y_1 \end{Bmatrix}$$

$$= \frac{1}{2}\begin{Bmatrix} 2 & & 5 & & 4 & & 1 & & 2 \\ 2 & \times & 5 & \times & 9 & \times & 7 & \times & 2 \end{Bmatrix}$$

$$= \frac{1}{2}(10 + 45 + 28 + 2 - 10 - 20 - 9 - 14)$$

$$= \frac{1}{2}(85 - 53)$$

$$= \frac{32}{2}$$

$= 16$ Square feet

Given , Construction rate per square feet = Rs.1300.

∴ Total cost for constructing the parking lot $= 16 \times 1300 = $ Rs.20800

58) In the fig, the quadrilateral swimming pool shown is surroundedby concrete patio. Find the area of the patio. **[PTA-2]**

Solution:-

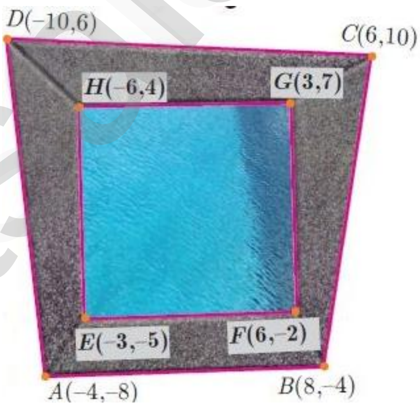
Given,

$(x_1, y_1) = A(-4, -8)$

$(x_2, y_2) = B(8, -4)$

$(x_3, y_3) = C(6, 10)$

$(x_4, y_4) = D(-10, 6)$



$$\text{Area of the quadrilateral ABCD} = \frac{1}{2}\begin{Bmatrix} x_1 & & x_2 & & x_3 & & x_4 & & x_1 \\ y_1 & \times & y_2 & \times & y_3 & \times & y_4 & \times & y_1 \end{Bmatrix}$$

$$= \frac{1}{2}\begin{Bmatrix} -4 & & 8 & & 6 & & 10 & & -4 \\ -8 & \times & -4 & \times & 10 & \times & 6 & \times & -8 \end{Bmatrix}$$

$$\text{Area of the quadrilateral EFGH} = \frac{1}{2}\begin{Bmatrix} x_1 & & x_2 & & x_3 & & x_4 & & x_1 \\ y_1 & \times & y_2 & \times & y_3 & \times & y_4 & \times & y_1 \end{Bmatrix}$$

$$= \frac{1}{2}\begin{Bmatrix} -3 & & 6 & & 3 & & -6 & & -3 \\ -5 & \times & -2 & \times & 7 & \times & 4 & \times & -5 \end{Bmatrix}$$

$$= \frac{1}{2}(16 + 80 + 36 + 80 + 64 + 24 + 100 + 24)$$

$$= \frac{424}{2}$$

$= 212$ Sq. units

Given,

$(x_1, y_1) = E(-3, -5)$; $(x_2, y_2) = F(6, -2)$; $(x_3, y_3) = G(3, 7)$; $(x_4, y_4) = H(-6, 4)$

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

$= \frac{1}{2}\begin{Bmatrix} -3 & 6 & 3 & -6 & -3 \\ -5 & -2 & 7 & 4 & -5 \end{Bmatrix}$

$= \frac{1}{2}(6 + 42 + 12 + 30 + 30 + 6 + 42 + 12)$

$= \frac{180}{2}$

$= 90$ Sq. units

The area of the patio $=$ Area of the Quadrilateral **ABCD** $-$ Area of the Quadrilateral **EFGH**

$= 212 - 90$

$= 122$ Sq.units.

59) The floor of a hall is covered with identical tiles which ae in the shapes of triangles. One such triangle has the vertices at $(-3, 2), (-1, -1)$ and $(1, 2)$. If the floor of the hall is completely by 110 tiles, find the area of the floor.

Solution:-

Given, $(x_1, y_1) = (-3,2),\ (x_2, y_2) = (-1, -1),\ (x_3, y_3) = (1, 2)$

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

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

$= \frac{1}{2}(3 - 2 + 2 + 2 + 1 + 6\}$

$= \frac{12}{2}$

$= 6$ Sq. units

$\therefore$ The area of the floor $= 110 \times 6 = 660$ Sq. units

60) A triangular shaped glass with vertices at $A(-5, -4),\ B(1,\ 6)$ and $C(7, -4)$ has to be painted. If one bucket of paint covers 6 square feet, how many buckets of paint will be required to paint the whole glass, if only one coat of paint is applied.

Solution:-

Given, $(x_1, y_1) = A(-5, -4),\ (x_2, y_2) = B(1,\ 6),\ (x_3, y_3) = C(7, -4)$

Area of a triangular shaped glass $= \frac{1}{2}\begin{Bmatrix} x_1 & x_2 & x_3 & x_4 \\ y_1 & y_2 & y_3 & y_4 \end{Bmatrix}$

$= \frac{1}{2}\begin{Bmatrix} -5 & 1 & 7 & -5 \\ -4 & 6 & -4 & -4 \end{Bmatrix}$

$= \frac{1}{2}(-30 - 4 - 28 + 4 - 42 - 20)$

$= \frac{1}{2}(-124 + 4)$

$$= \frac{-120}{2}$$
$$= -60$$
$$= 60 \quad \text{square feets}$$

∴ If one bucket of paint covers 6 square feet, number of buckets of paint will be required to paint the whole glass $= \frac{60}{6} = 10$

TWO MARKS QUESTIONS

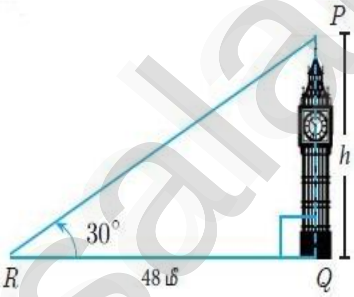
UNIT - 6 : TRIGONOMETRY

69) A tower stands vertically on the ground. From a point on the ground which is 48 m away from the foot of the tower, the angle of elevation of the top of the tower is 30^0. Find the height of the tower. **[PTA-1]**

Solution:-

PQ = Height of the tower = h என்க.

In a ΔPQR,



$$tan30^o = \frac{Opposite\ Side}{Adjacent\ Side} = \frac{PQ}{QR}$$
$$\frac{1}{\sqrt{3}} = \frac{h}{48}$$
$$\frac{48}{\sqrt{3}} = h$$
$$h = \frac{48}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$
$$h = \frac{48 \times \sqrt{3}}{3}$$
$$h = 16\sqrt{3}\ \text{m}$$

∴ Height of the tower = $16\sqrt{3}$ m

70) A kite is flying at a straight of 75m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60^0. Find the length of the string, assuming that there is no slack in the string.

Solution:-

AB = Kite flying height from the ground = 75 m

AC = Length of the thread = x

In a ΔABC,

$$\sin 60^o = \frac{Opposite\ Side}{Hypotenuse} = \frac{AB}{AC}$$

$$\frac{\sqrt{3}}{2} = \frac{75}{x}$$

$$x = \frac{75 \text{ x } 2}{\sqrt{3}}$$

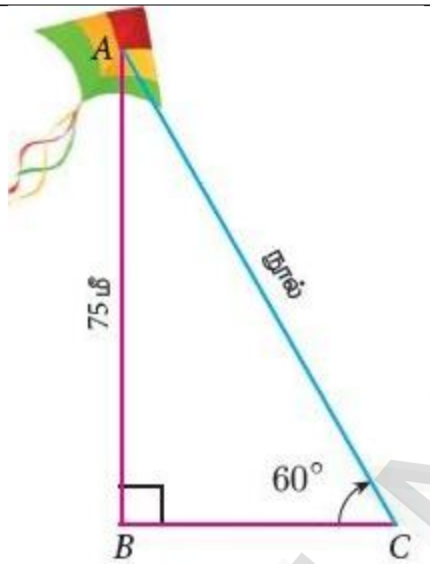
$$x = \frac{150}{\sqrt{3}} \text{ x } \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \frac{150\sqrt{3}}{\sqrt{3}^2}$$

$$x = \frac{150\sqrt{3}}{3}$$

$$x = 50\sqrt{3} \text{ மீ}$$

∴ Length of the thread $= 50\sqrt{3}$ m



71) 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. **[Sep-21, Aug-22 , PTA-2]**

Solution:-

AB = Height of the tower $= 10\sqrt{3}$ m

BC = Distance from foot of the tower to a point $= 30$ m

θ = The angle of elevation of the top of a tower

In a ΔABC, $\tan\theta = \frac{Opposite\ Side}{Adjacent\ Side} = \frac{AB}{BC}$

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

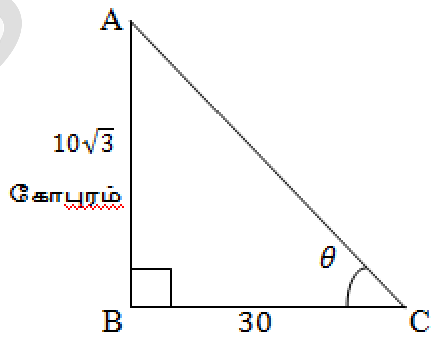
$$\tan\theta = \frac{\sqrt{3}}{3}$$

$$\tan\theta = \frac{\sqrt{3}}{\sqrt{3}\sqrt{3}}$$

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

$$\theta = 30^o$$

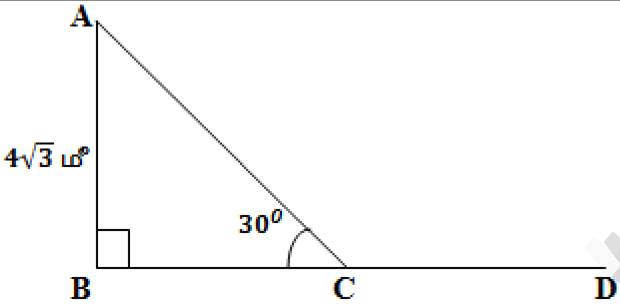
∴ The angle of elevation of the top of a tower, $\theta = 30^o$



72) A road is flanked on either side by continuous rows of houses of height $4\sqrt{3}$m with no space in between them. A pedestrian is standing on the median of the road facing a row house. The angle of elevation from the pedestrian to the top of the house is 30^0. Find the width of the road.

Solution:-

$AB =$ Height of the house $= 4\sqrt{3}$ m
$BD =$ Width of the road $= x$
Let C be the centre point of the road.
Therefore, $BC = CD = x$
In a ΔABC,

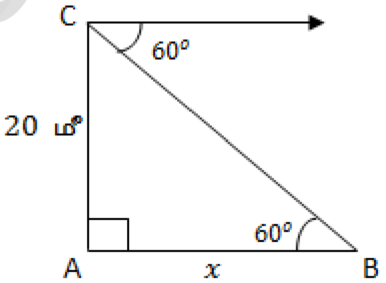


$$tan30^o = \frac{Opposite\ Side}{Adjacent\ Side} = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{4\sqrt{3}}{x}$$
$$x = 4\sqrt{3}\sqrt{3}$$
$$x = 4 \times 3$$
$$x = 12 \text{ m}$$
$\therefore$ Width of the road $= BD = BC + CD = x + x = 12 + 12 = 24$ m

73) A player siting on the top of a tower of height 20 m observes the angle of depression of a ball on the ground as 60^0. Find the distance between the foot of the tower and the ball. $(\sqrt{3} = 1.732)$ **[PTA-3]**

Solution:-
$AC =$ Height of the tower $= 20$ m
$AB =$ the distance between the foot of the tower and the ball $= x$
In a ΔABC,

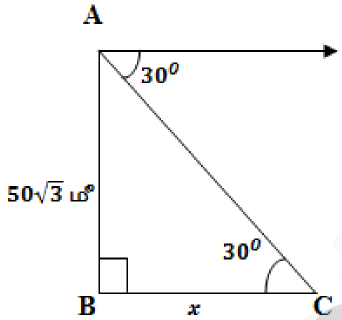


$$tan60^o = \frac{Opposite\ Side}{Adjacent\ Side} = \frac{AC}{AB}$$
$$\sqrt{3} = \frac{20}{x}$$
$$x = \frac{20}{\sqrt{3}}$$
$$= \frac{20}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{20\sqrt{3}}{3}$$
$$= \frac{20 \times 1.732}{3}$$
$$= \frac{34.640}{3}$$
$$x = 11.55 \text{ m}$$
$\therefore$ The distance between the foot of the tower and the ball $= 11.55$ m

74) From the top of a rock $50\sqrt{3}$ m high, the angle of depression of a car on the ground is observed to be 30^0. Find the distance of the car from the rock.
[PTA-6 , May-22]

Solution:-

AB = Height of a rock from the ground $= 50\sqrt{3}$ m
BC = the distance of the car from the rock $= x$



In a ΔABC,

$$tan30^o = \frac{Opposite\ Side}{Adjacent\ Side} = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{50\sqrt{3}}{x}$$

$$x = 50\sqrt{3}\sqrt{3}$$
$$x = 50 \times 3$$
$$x = 150 \text{ m}$$

$\therefore$ The distance of the car from the rock $= 150$ m

75) The horizontal distance between two buildings is 70 m. The angle of depression of the top of the first building when seen from the top of the second building is 45^o. If the height of the second building is 120 m, find the height of the first building.

Solution:-

AB = Height of the first building $= h$
CD = Height of the second building $= 120$ m
$BD = AE$ = The horizontal distance between two buildings $= 70$ m

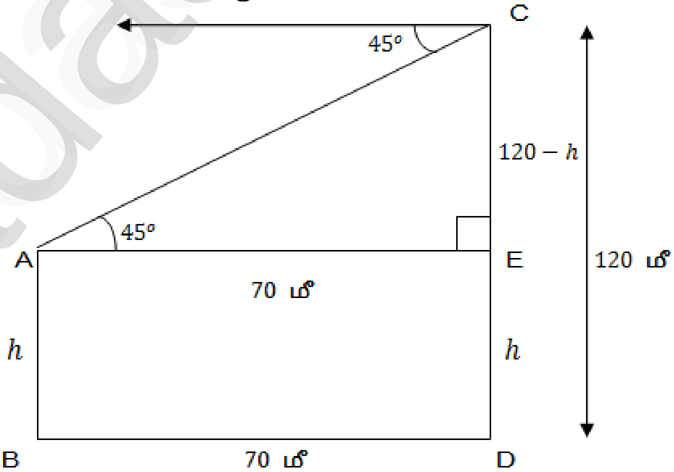
In a ΔACE,

$$tan45^o = \frac{Opposite\ Side}{Adjacent\ Side} = \frac{CE}{AE}$$

$$1 = \frac{120 - h}{70}$$

$$70 = 120 - h$$
$$h = 120 - 70$$
$$h = 50 \text{ m}$$

$\therefore$ Height of the first building , $h = 50$ m



ONE MARK QUESTIONS

UNIT - 6 : TRIGONOMETRY

81) The value of $sin^2\theta + \frac{1}{1+tan^2\theta}$ is equal to	**Ans:- 1**
82) The value of $tan\theta cosec^2\theta - tan\theta$ is equal to	**Ans:- $cot\theta$**
83) If $(sin\alpha + cosec\alpha)^2 + (cos\alpha + sec\alpha)^2 = k + tan^2\alpha + cot^2\alpha$, then k is equal to	**Ans:- 7**
84) If $sin\theta + cos\theta = a$ and $sec\theta + cosec\theta = b$, then $b\ (a^2 - 1)$ is equal to	**Ans:- $2a$**
85) If $5x = sec\theta$ and $\frac{5}{x} = tan\theta$ then $x^2 - \frac{1}{x^2}$ is equal to	**Ans:- $\frac{1}{25}$**

Slip Test - 17

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) The value of $tan\theta cosec^2\theta - tan\theta$ is equal to

(A) $sec\theta$ (B) $cot^2\theta$ (C) $sin\theta$ (D) $cot\theta$

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

(A) 25 (B) $\frac{1}{25}$ (C) 5 (D) 1

3) 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

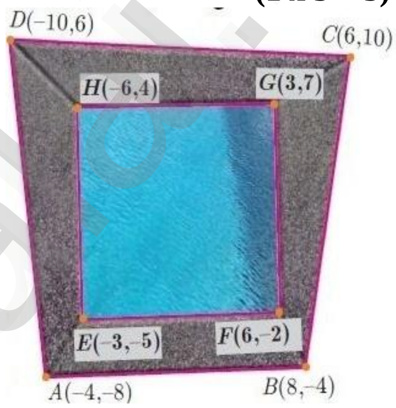
II Answer the following:- **(2 x 2 = 4)**

4) 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.

5) From the top of a rock $50\sqrt{3}$m high, the angle of depression of a car on the ground is observed to be 30^0. Find the distance of the car from the rock.

III Answer the following:- **(1 x 5 = 5)**

6) In the fig, the quadrilateral swimming pool shown is surrounded by concrete patio. Find the area of the patio.



IV Answer the following:- **(1 x 8 = 8)**

7) 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.

(ii) From the graph, find the number of days required to complete the work if the company decides to opt for 120 workers?

(iii) If the work has to be completed by 200 days, how many workers are required?

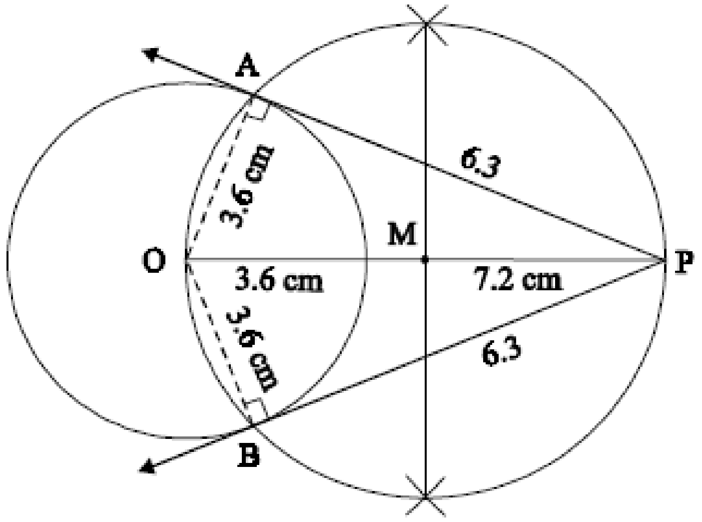
DAY – 21

PRACTICAL GEOMETRY - TANGENTS

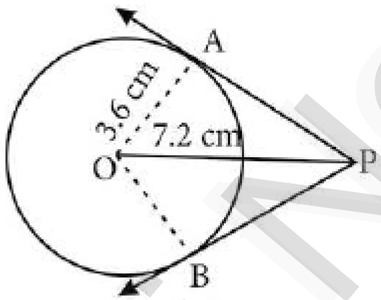
11) Draw a tangent to the circle from the point P having radius 3.6 cm, and centre at O. Point P is at a distance 7.2 cm from the centre.

Solution:-

Gven, Radius = 3.6 cm ; Distance = 7.2 cm



ROUGH DIAGRAM



∴ PA and PB are the two required tangents.

Lengths of the tangents, $PA = PB = 6.3$ cm

FIVE MARKS QUESTIONS

UNIT - 6 : TRIGONOMETRY

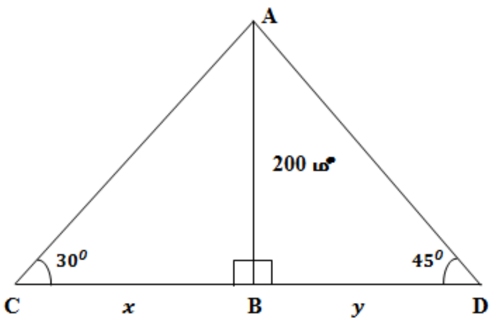
61) Two ships are sailing in the sea on either sides of a lighthouse. The angle of elevation of the top of the lighthouse as observed from the ships are 30^o and 45^o respectively. If the lighthouse is 200 m high, find the distance between the two ships. ($\sqrt{3} = 1.732$)

[PTA-5 , Sep-21, Jun-23, Apr-24]

Solution :-

$AB =$ Height of the lighthouse $= 200$ m

$CD =$ Distance between the two ships $= x + y$



In the right triangle ΔABC ,,

$$tan30^o = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{200}{x}$$

$$x = 200\sqrt{3}$$

$$= 200 \times 1.732$$

$$x = 346.4 \text{ m}$$

In right the triangle ΔABD ,

$$tan45^o = \frac{AB}{BD}$$

$$1 = \frac{200}{y}$$

$$y = 200 \text{ m}$$

∴ Distance between two ships $= x + y$

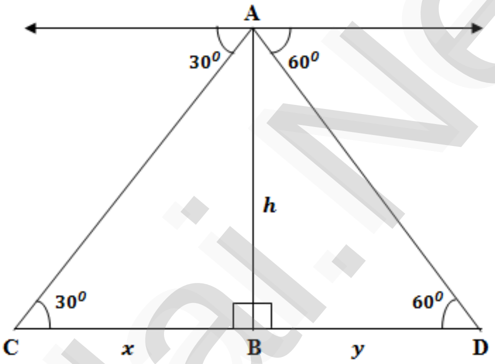
$= 346.4 + 200$
$= 546.4$ m

62) From the top of a lighthouse, the angle of depression of two ships on the opposite sides of it are observed to be 30^o and 60^o. If the height of the lighthouse is h metres and the line joining the ships passes through the foot of the lighthouse, show that the distance between the ships is $\frac{4h}{\sqrt{3}}$ m. **[Apr-23]**

Solution :-

AB = Height of the lighthouse $= h$ m

CD = Distance between the two ships $= x + y$



In the right triangle ΔABC,

$$tan30^o = \frac{AB}{BC}$$
$$\frac{1}{\sqrt{3}} = \frac{h}{x}$$
$$x = h\sqrt{3}$$

In the right triangle ΔABD,

$$tan60^o = \frac{AB}{BD}$$
$$\sqrt{3} = \frac{h}{y}$$
$$y = \frac{h}{\sqrt{3}}$$

$\therefore$ Distance between the two ships $= x + y$

$$= h\sqrt{3} + \frac{h}{\sqrt{3}}$$
$$= \frac{h\sqrt{3}^2 + h}{\sqrt{3}}$$
$$= \frac{3h + h}{\sqrt{3}}$$
$$= \frac{4h}{\sqrt{3}} \text{ m}$$

TWO MARKS QUESTIONS

UNIT - 7 : MENSURATION

76) The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2. Find the diameter of the cylinder. **[Jun-23]**

Solution:-

Given, Height, $h = 14$ cm

Curved surface area of a right circular cylinder $= 88$ cm^2

Radius $= r$

WKT, Curved surface area of a right circular cylinder $= 2\pi rh$

$$\Rightarrow 2\pi rh = 88$$

$$2 \text{ x} \frac{22}{7} \text{x } r \text{ x } 14 = 88$$

$$r = \frac{88}{2 \text{ x } 22 \text{ x } 2}$$

$$r = 1 \text{ cm}$$

$\therefore$ Diameter of the cylinder $= 2r = 2 \text{ x } 1 = 2$ cm

77) The radius and height of a cylinder are in the ratio 5:7 and its curved surface area is 5500 sq. cm. Find its radius and height. **[Aug-22, Apr-23]**

Solution:-

Given, $r : h = 5 : 7$

Let the radius $r = 5x$ and the height $h = 7x$

Given,

Curved surface area of a right circular cylinder $= 5500$ sq. cm

$$\Rightarrow 2\pi rh = 5500$$

$$2 \times \frac{22}{7} \times 5x \times 7x = 5500$$

$$x^2 = \frac{5500}{2 \times 22 \times 5}$$

$$x^2 = 25$$

$$x = 5$$

$\therefore$ Radius of the cylinder $= 5x = 5 \times 5 = 25$ cm

Height of the cylinder $= 7x = 7 \times 5 = 35$ cm

78) If the total surface area of a cone of radius 7 cm is 704 cm^2, then find its slant height. **[Aug-22]**

Solution:-

Given, Radius, $r = 7$cm

Total surface area of a cone $= 704$ cm^2

WKT, Total surface area of a cone $= \pi r(l + r)$

$$\Rightarrow \pi r(l + r) = 704$$

$$\frac{22}{7} \times 7 \times (l + 7) = 704$$

$$l + 7 = \frac{704}{22}$$

$$l + 7 = 32$$

$$l = 32 - 7$$

$$l = 25 \text{ cm}$$

79) Find the diameter of a sphere whose surface area is 154 m^2. **[Sep-20]**

Solution:-

WKT, Surface area of a sphere $= 4\pi r^2$

Let the radius of a sphere be r.

Given, Surface area of a sphere $= 154$ m^2

$$4\pi r^2 = 154$$

$$4 \text{ x } \frac{22}{7} \times r^2 = 154$$

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

$$r^2 = \frac{7 \text{ x } 7}{2 \text{ x } 2}$$

$$r = \frac{7}{2}$$

$\therefore$ Diameter of a sphere$= 2r = 2 \text{ x} \frac{7}{2} = 7$ cm

80) If the base area of a hemispherical solid is 1386 sq. metres, then find its total surface area? **[Sep-20, Apr-24]**

Solution:-

Given, Base area of a hemispherical solid $= 1386$sq. m

$$\Longrightarrow \pi r^2 = 1386$$

$\therefore$ Total surface area hemispherical solid $= 3\pi r^2$

$= 3 \text{ x } 1386$

$= 4158$ sq. m

81) Find the volume of a cylinder whose height is 2 m and whose base area is 250 m^2 **[Sep-21, Apr-24]**

Solution:-

Given, Height, $h = 2$ m

Base area of a cylinder $= 250$ m^2

$\pi r^2 = 250$ m^2

$\therefore$ Volume of a cylinder $= \pi r^2 h$

$= 250 \text{ x } 2$

$= 500$ m^3

ONE MARK QUESTIONS

UNIT - 6 : TRIGONOMETRY

86) If $sin\theta = cos\theta$, then $2tan^2\theta + sin^2\theta - 1$ is equal to	**Ans:-** $\frac{3}{2}$
87) If $x = atan\theta$ and $y = bsec\theta$ then	**Ans:-** $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$
88) $(1 + tan\theta + sec\theta)(1 + cot\theta - cosec\theta)$ is equal to	**Ans:-** 2
89) $acot\theta + bcosec\theta = p$ and $bcot\theta + acosec\theta = q$ then $p^2 - q^2$ is equal to	**Ans:-** $b^2 - a^2$
90) 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	**Ans:-** 60^o

Slip Test - 18

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) If $x = atan\theta$ and $y = bsec\theta$ then

(A) $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ (B) $)\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ (C) $)\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (D) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

2) $acot\theta + bcosec\theta = p$ and $bcot\theta + acosec\theta = q$ then $p^2 - q^2$ is equal to

(A) $a^2 - b^2$ (B) $b^2 - a^2$ (C) $a^2 + b^2$ (D) $b - a$

3) 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^o (B) 30^o (C) 90^o (D) 60^o

II Answer the following:- **(2 x 2 = 4)**

4) The radius and height of a cylinder are in the ratio 5:7 and its curved surface area is 5500 sq. cm. Find its radius and height.

5) If the base area of a hemispherical solid is 1386 sq. meters, then find its total surface area?

III Answer the following:- **(1 x 5 = 5)**

6) 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^o and 45^o respectively. If the lighthouse is 200 m high, find the distance between the two ships. $(\sqrt{3} = 1.732)$.

IV Answer the following:- **(1 x 8 = 8)**

7) Draw a tangent to the circle from the point P having radius 3.6 cm, and centre at O. Point P is at a distance 7.2 cm from the centre.

DAY – 22

SPECIAL GRAPHS – INDIRECT VARIATION

7) The following table shows the data about the number of pipes and the time taken to fill the same tank.

No. of Pipes (x)	2	3	6	9
Time taken(y) (in minutes)	45	30	15	10

Draw the graph for the above data and hence

(i) find the time taken to fill the tank when five pipes are used

(ii) Find the number of pipes when the time is 9 minutes.

Solution:-

VARIATION:- Indirect Variation.

TABLE:-

No. of Pipes (x)	2	3	6	9
Time taken (y) (in minutes)	45	30	15	10

CONSTANT OF VARIATION:-

$$k = xy = 2 \text{ x } 45 = 90$$

EQUATION:-

$$xy = k$$
$$xy = 90$$

POINTS:-

$(2, 45), (3, 30), (6, 15), (9, 10)$

SCALE:-

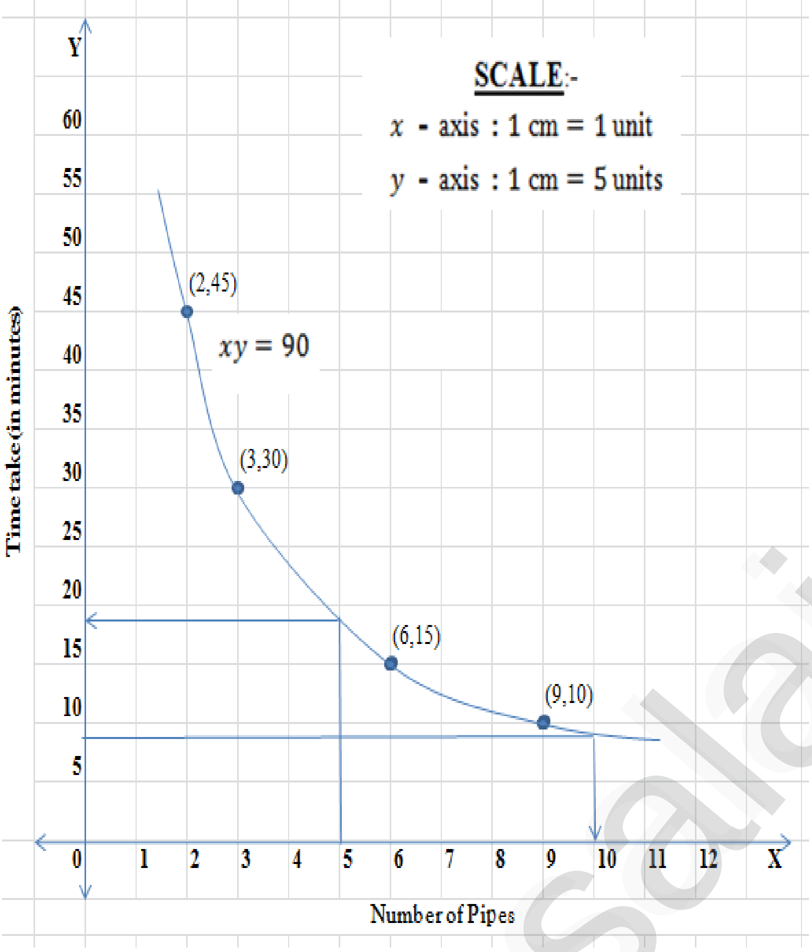
x - axis : 1 cm = 1 unit

y - axis : 1 cm = 5 units

From the graph,

(i) If $x = 5$ then $y = 18$. The time taken to fill the tank when five pipes are used = 18 minutes.

(ii) If $y = 9$ then $x = 10$. 10 pipes are required to fill the tank when the time is 9 minutes.



FIVE MARKS QUESTIONS

UNIT - 6 : TRIGONOMETRY

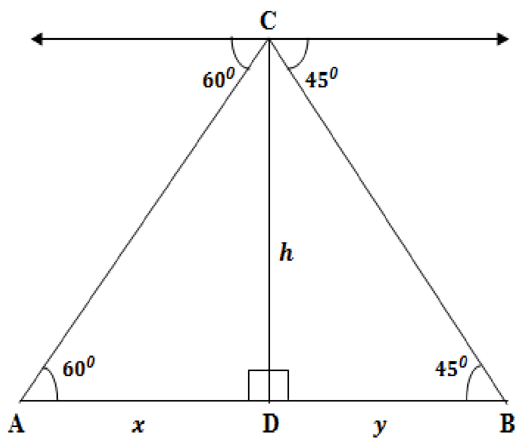
63) Two ships are sailing in the sea on either side of the lighthouse. The angles of depression of two ships as observed from the top of the lighthouse are 60^o and 30^o respectively. If the distance between the ships is $200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$ metres, find the height of the lighthouse.

Solution :-

$CD =$ Height of the lighthouse $= h$

$AB =$ Distance between the two ships

$= 200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$ m



In the right triangle ΔADC,

$$tan60^o = \frac{CD}{AD}$$

$$\sqrt{3} = \frac{h}{x}$$

$$x = \frac{h}{\sqrt{3}}$$

In the right triangle ΔBDC,

$$\tan 45^o = \frac{CD}{BD}$$

$$1 = \frac{h}{y}$$

$$y = h$$

Given, Distance between the two ships $= 200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$

$$x + y = 200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$$

$$\frac{h}{\sqrt{3}} + h = 200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$$

$$\frac{h+\sqrt{3}h}{\sqrt{3}} = 200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$$

$$h + \sqrt{3}h = 200(\sqrt{3}+1)$$

$$h(1+\sqrt{3}) = 200(\sqrt{3}+1)$$

$$h = \frac{200(\sqrt{3}+1)}{(\sqrt{3}+1)}$$

$$h = 200 \text{ m}$$

$\therefore$ Height of the lighthouse $= 200$ m

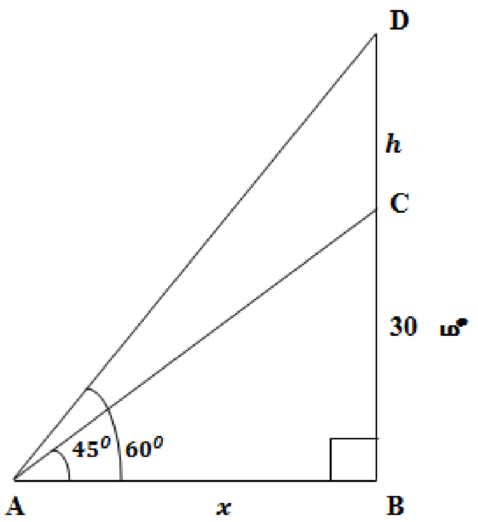
64) From a point on the ground, the angles of elevation of the bottom and top of a tower fixed at the top of a 30m high building are 45° and 60° respectively. Find the height of the tower. ($\sqrt{3} = 1.732$) **[May-22]**

Solution :-

BC = Height of the building $= 30$ m

CD = Height of the tower $= h$

Let $AB = x$



In the right triangle ΔABC,

$$\tan 45^o = \frac{BC}{AB}$$

$$1 = \frac{30}{x}$$

$$x = 30$$

In the right triangle ΔABD,

$$\tan 60^o = \frac{BD}{AB}$$

$$\sqrt{3} = \frac{30+h}{x}$$

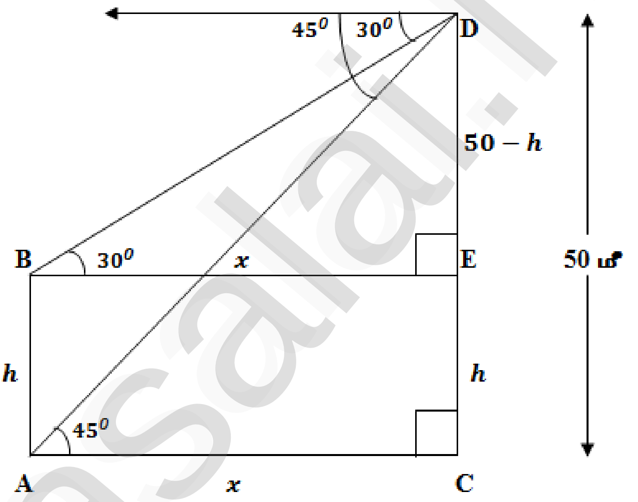
$$x\sqrt{3} = 30 + h$$

$$30\sqrt{3} = 30 + h$$
$$30\sqrt{3} - 30 = h$$
$$30(\sqrt{3} - 1) = h$$
$$h = 30(1.732 - 1)$$
$$h = 30(0.732)$$
$$h = 21.96 \text{ m}$$
$\therefore$ Height of the tower, $h = 21.96$ m

65) From the top of a tower 50 m high, the angles of depression of the top and bottom of a tree are observed to be 30^o and 45^o respectively. Find the height of the tree. $(\sqrt{3} = 1.732)$

Solution :-

$AB = CE =$ Height of the tree $= h$
$CD =$ Height of the tower $= 50$ m
$AC = BE =$ Distance between the tower and the tree $= x$.



In the right triangle ΔACD,

$$tan45^o = \frac{DC}{AC}$$
$$1 = \frac{50}{x}$$
$$x = 50$$

In the right triangle ΔBED,

$$tan30^o = \frac{DE}{BE}$$
$$\frac{1}{\sqrt{3}} = \frac{50 - h}{x}$$
$$x = \sqrt{3}(50 - h)$$
$$50 = \sqrt{3}(50 - h)$$
$$50 = 50\sqrt{3} - \sqrt{3}h$$
$$\sqrt{3}h = 50\sqrt{3} - 50$$
$$h = \frac{50(\sqrt{3} - 1)}{\sqrt{3}}$$
$$h = \frac{50(\sqrt{3} - 1)}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$
$$h = \frac{50\left(\sqrt{3}^2 - \sqrt{3}\right)}{\sqrt{3}^2}$$
$$h = \frac{50(3 - 1.732)}{3}$$

$$h = \frac{50(1.268)}{3}$$
$$h = \frac{63.4}{3}$$
$$h = 21.13 \text{ m}$$

∴ Height of the tree, $h = 21.13$ m .

TWO MARKS QUESTIONS

UNIT - 7 : MENSURATION

82) 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. **[PTA-1, Jun-23]**

Solution:-

WKT, Volume of a solid right circular cone = $\frac{1}{3}\pi r^2 h$

Given, Height, $h = 24$ cm

Let the radius be r

Volume of a solid right circular cone = 11088 cm^3

$$\Rightarrow \frac{1}{3}\pi r^2 h = 11088$$
$$\frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 11088$$
$$r^2 = \frac{11088 \times 3 \times 7}{22 \times 24}$$
$$r^2 = 441$$
$$r^2 = 21 \times 21$$
$$r = 21 \text{ cm}$$

∴ Radius of the cone, $r = 21$ cm

83) The ratio of the volumes of two cones is 2 : 3. Find the ratio of their radii of the height of second cone is double the height of the first.

Solution:-

Given,

Cone -1:-	**Cone -2**:-
Radius = r_1.	Radius = r_2
Height = h_1	Height = $2h_1$

Given, The ratio of the volumes of two cones = 2 : 3

$$\frac{1}{3}\pi {r_1}^2 h_1 : \frac{1}{3}\pi {r_2}^2 2h_1 = 2 : 3$$
$$\frac{\frac{1}{3}\pi {r_1}^2 h_1}{\frac{1}{3}\pi {r_2}^2\, 2h_1} = \frac{2}{3}$$
$$\frac{{r_1}^2}{{r_2}^2} = \frac{4}{3}$$
$$\frac{r_1}{r_2} = \frac{2}{\sqrt{3}}$$

$$r_1 : r_2 = 2 : \sqrt{3}$$

84) The volumes of two cones of same base radius are 3600 cm^3 and 5040 cm^3. Find the ratio of height. **[PTA-4 , May-22]**

Solution:-

Given,

Cone-1:-	**Cone-1**:-
Radius $= r$	Radius $= r$
Height $= h_1$	Height $= h_2$

Given, Volumes of two cones of same base radius $= 3600 : 5040$

$$\frac{1}{3}\pi r^2 h_1 : \frac{1}{3}\pi r^2 h_2 = 3600 : 5040$$

$$\frac{\frac{1}{3}\pi r^2 h_1}{\frac{1}{3}\pi r^2 h_2} = \frac{3600}{5040}$$

$$\frac{h_1}{h_2} = \frac{360}{504}$$

$$\frac{h_1}{h_2} = \frac{30}{42}$$

$$\frac{h_1}{h_2} = \frac{5}{7}$$

$$h_1 : h_2 = 5 : 7$$

ONE MARK QUESTIONS

UNIT - 6 : TRIGONOMETRY

91) The electric pole subtends an angle of 30^o at a point on the same level as its foot. At a second point $'b'$metres above the first, the depression of the foot of the tower is 60^o. The height of the tower (in metres) is equal to	**Ans:-** $\frac{b}{3}$
92) A tower is 60 m height. Its shadow is x metres shorter when the sun's altitude is 45^othan when it has been 30^o, then x is equal to	**Ans:- 43.92 m**
93) The angle of depression of the top and bottom of 20 m tall building from the top of a multistoried building are 30^o and 60^orespectively. The height of the multistoried building and the distance between two buildings (in metres) is	**Ans:-** $30, 10\sqrt{3}$
94) Two persons are standing $'x'$metres apart from each other and the height of the first person is double that of the other. If from the middle point of the line joining their feet an observer finds the angular elevations of their tops to be complementary, then the height of the shorter person (in metres) is	**Ans:-** $\frac{x}{2\sqrt{2}}$
95) The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is 45^o. The height of location of the cloud from the lake is	**Ans:-** $\frac{h(1+tan\beta)}{1-tan\beta}$

Slip Test - 19

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) A tower is 60 m height. Its shadow is x metres shorter when the sun's altitude is 45^o than when it has been 30^o, then x is equal to

(A) 41.92 m (B) 43.92 m (C) 43 m (D) 45.6 m

2) The angle of depression of the top and bottom of 20 m tall building from the top of a multistoried building are 30^o and 60^o respectively. The height of the multistoried building and the distance between two buildings (in metres) is

(A) $20, 10\sqrt{3}$ (B) $30, 5\sqrt{3}$ (C) $20, 10$ (D) $30, 10\sqrt{3}$

3) The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is 45^o. The height of location of the cloud from the lake is

(A) $\frac{h(1+tan\beta)}{1-tan\beta}$ (B) $\frac{h(1-tan\beta)}{1+tan\beta}$ (C) $h\tan(45^o - \beta)$ (D) None of these

II Answer the following:- **(2 x 2 = 4)**

4) 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.

5) The volumes of two cones of same base radius are 3600 cm^3 and 5040 cm^3. Find the ratio of height.

III Answer the following:- **(1 x 5 = 5)**

6) From a point on the ground, the angles of elevation of the bottom and top of a tower fixed at the top of a 30m high building are 45° and 60° respectively. Find the height of the tower. ($\sqrt{3} = 1.732$).

IV Answer the following:- **(1 x 8 = 8)**

7) The following table shows the data about the number of pipes and the time taken to fill the same tank.

No. of Pipes (x)	2	3	6	9
Time taken(y) (in minutes)	45	30	15	10

Draw the graph for the above data and hence

(i) find the time taken to fill the tank when five pipes are used

(ii) Find the number of pipes when the time is 9 minutes.

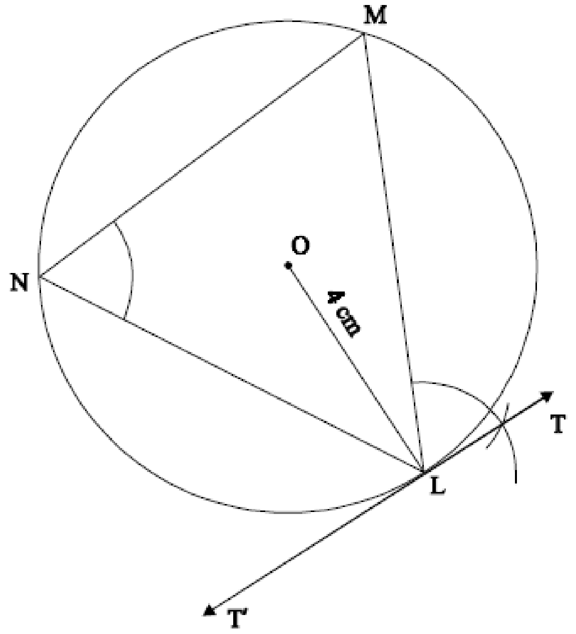
DAY – 23

PRACTICAL GEOMETRY - TANGENTS

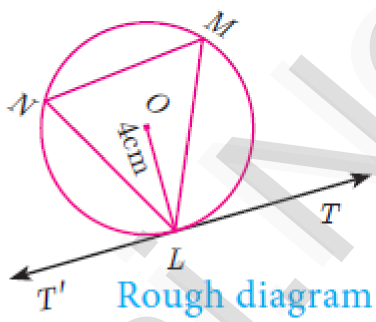
12) Draw a circle of radius 4 cm. At a point L on it draw a tangent to the circle using the alternate segment.

Solution:-

Gven, Radius = 4 cm



ROUGH DIAGRAM



$\cdot$ TPT' is the required tangent.

FIVE MARKS QUESTIONS

UNIT - 7 : MENSURATION

66) If the circumference of a conical wooden piece is 484 cm then find its volume when its height is105 cm. **[Aug-22]**

Solution:-

Let the radius be r.

Given, Height,$h = 105$ cm

Circumference of a conical wooden piece = 484 cm

$$2\pi r = 484$$

$$2 \times \frac{22}{7} \times r = 484$$

$$r = \frac{484 \times 7}{2 \times 22}$$

$$r = 11 \times 7$$

$$r = 77 \text{ cm}$$

$\therefore$ Volume of the cone $= \frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} \times \frac{22}{7} \times 77 \times 77 \times 105$$

$$= 22 \times 11 \times 77 \times 35$$

$$= 652190 \text{ cu.cm}$$

67) 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. **[PTA-5, Sep-21, Apr-24]**

Solution:-

Given, $R = 28$ cm

$r = 7$ cm

$h = 45$ cm

Volume of the frustum $= \frac{\pi h}{3}(R^2 + r^2 + Rr)$

$= \frac{22 \text{ x } 45}{7 \text{ x } 3}(28^2 + 7^2 + 28 \text{ x } 7)$

$= \frac{22 \text{ x } 15}{7}(784 + 49 + 196)$

$= \frac{22 \text{ x } 15 \times 1029}{7}$

$= 22 \times 15 \text{ x } 147$

$= 48510$ cu.cm

$\therefore$ Volume of the frustum $= 48510$ cu.cm

68) A container open at the top is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends are 8 cm and 20 cm respectively. Find the cost of milk which can completely fill a container at the rate of Rs.40 per litre. **[May-22]**

Solution:-

Given, $R = 20$ cm, $r = 8$ cm, $h = 16$ cm

Volume of the frustum $= \frac{\pi h}{3}(R^2 + r^2 + Rr)$

$= \frac{22 \text{ x } 16}{7 \text{ x } 3}(20^2 + 8^2 + 20 \text{ x } 8)$

$= \frac{352}{21}(400 + 64 + 160)$

$= \frac{352 \times 624}{21}$

$= \frac{352 \times 208}{7}$

$= \frac{73216}{7}$

$= 10459.4$ cu.cm

$= \frac{10459.4}{1000}$ litres [$\because$ 1000 cu.cm = 1 litre]

$= 10.4594$ litres

Given, Cost of 1 litre milk = Rs.40

The cost of milk which can completely fill a container $=$ Rs.40 $\times$ 10.4594

$=$ Rs.418.38

TWO MARKS QUESTIONS

UNIT - 7 : MENSURATION

85) The radius of a spherical balloon increases from12 cm to 16 cm as air being pumped into it. Find the ratio of the surface area of the balloons in the two cases. **[May-22]**

Solution:-

Given, $r_1 = 12$ cm , $r_2 = 16$ cm

Ratio of the surface area of the balloons in the two cases

$$= \frac{4\pi {r_1}^2}{4\pi {r_1}^2}$$

$$= \frac{4\pi \text{ x } 12 \text{ x } 12}{4\pi \text{ x } 16 \text{ x } 16}$$

$$= \frac{9}{16}$$

$$= 9 : 16$$

86) If the ratio of radii of two spheres is 4 : 7, find the ratio of their volumes. **[Apr-23]**

Solution:-

Given, $r_1 : r_2 = 4 : 7$

The ratio of the volume of two spheres $= \frac{\frac{4}{3}\pi {r_1}^3}{\frac{4}{3}\pi {r_2}^3}$

$$= \frac{\frac{4}{3} \times \pi \times 4 \times 4 \times 4}{\frac{4}{3} \times \pi \times 7 \times 7 \times 7}$$

$$= \frac{64}{343}$$

$$= 64 : 343$$

ONE MARK QUESTIONS

UNIT - 7 : MENSURATION

96) The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is	**Ans:- $136\pi \ cm^2$**
97) 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	**Ans:- $4\pi r^2 cm^2$**
98) The height of a right circular cone whose radius 5 cm and slant height is 13 cm will be	**Ans:- 12 cm**
99) If the radius of the base of a right circular cylinder is halved keeping the same height, then the ratio of the volume of the cylinder thus obtained to the volume of original cylinder is	**Ans:- 1 : 4**
100) The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is	**Ans:- $\frac{8\pi h^2}{9}$ sq.units**

Slip Test - 20

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is
(A) $60\pi \ cm^2$ (B) $68\pi \ cm^2$ (C) $120\pi \ cm^2$ (D) $136\pi \ cm^2$

2) The height of a right circular cone whose radius 5 cm and slant height is 13 cm will be
(A) 12 cm (B) 10 cm (C) 13 cm (D) 5 cm

3) The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is

(A) $\frac{9\pi h^2}{8}$ sq.units (B) $24\pi h^2$ sq.units (C) $\frac{8\pi h^2}{9}$ sq.units (D) $\frac{56\pi h^2}{9}$ sq.units

II Answer the following:- **(2 x 2 = 4)**

4) The radius of a spherical balloon increases from12 cm to 16 cm as air being pumped into it. Find the ratio of the surface area of the balloons in the two cases.

5) If the ratio of radii of two spheres is $4 : 7$, find the ratio of their volumes.

III Answer the following:- **(1 x 5 = 5)**

6) 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.

IV Answer the following:- **(1 x 8 = 8)**

7) Draw a circle of radius 4 cm. At a point L on it draw a tangent to the circle using the alternate segment.

DAY – 24
WEEKLY TEST - 4

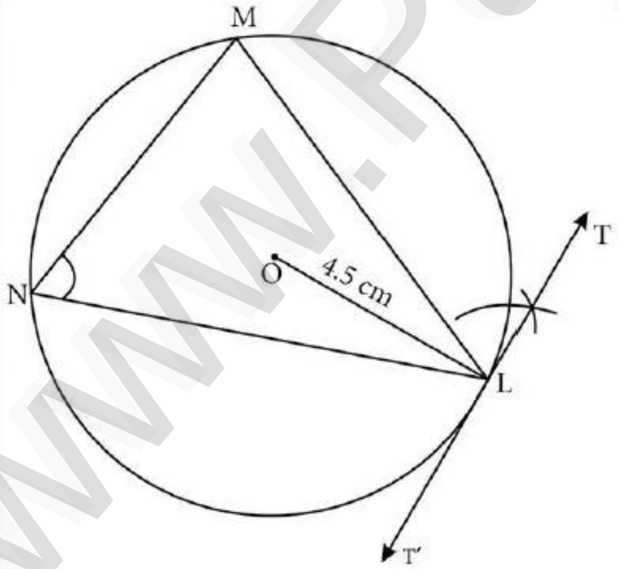
DAY – 25
PRACTICAL GEOMETRY - TANGENTS

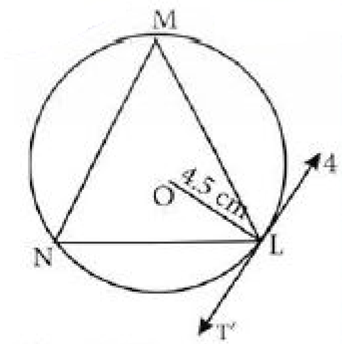
13) Draw a circle of radius 4.5 cm. At a point L on it draw a tangent to the circle using the alternate segment.

Solution:-

Gven, Radius = 4.5 cm

ROUGH DIAGRAM





$\cdot\ TPT'$ is the required tangent.

FIVE MARKS QUESTIONS

UNIT - 7 : MENSURATION

69) 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.
[PTA-5, PTA-6, Apr-24]

Solution:-

Given,

Cylinder:-

Radius, $r = 6$ cm

Height, $h = 15$ cm

Volume $= \pi r^2 h$

$= \pi \times (6)^2 \times 15$

$= \pi \times 6 \times 6 \times 15$

Ice cream cone:-

Radius, $r = 3$ cm

Height, $h = 9$ cm

Volume $= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi r^2 (2r + h)$

$= \frac{1}{3}\pi (3)^2 [2(3) + 9]$

$= \pi \times 3 \times 15$

∴ The number of cones needed $= \frac{\text{Volume of the ice cream in the container}}{\text{Volume of the ice cream in a cone}}$

$= \frac{\pi \times 6 \times 6 \times 15}{\pi \times 3 \times 15}$

$= 12$

70) A metallic sphere of radius 16 cm is melted and recast into small spheres each of radius 2 cm. How many small spheres can be obtained? **[Jun-23]**

Solution :-

Given,

Bigger Sphere :-

Radius, $r = 16$ cm

Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi (16)^3$

$= \frac{4}{3}\pi \times 16 \times 16 \times 16$

Smaller Sphere :-

Radius, $r = 2$ cm

Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi (2)^3$

$= \frac{4}{3}\pi \times 2 \times 2 \times 2$

∴ Number of smaller spheres can be obtained $= \frac{\text{Volume of the bigger sphere}}{\text{Volume of the smaller sphere}}$

$= \frac{\frac{4}{3}\pi \times 16 \times 16 \times 16}{\frac{4}{3}\pi \times 2 \times 2 \times 2}$

$= 8 \times 8 \times 8$

$= 512$

71) An aluminium sphere of radius 12 cm is melted to make a cylinder of radius 8 cm. Find the height of the cylinder.

Solution :-

Aluminium sphere :-

Radius , $r = 12$ cm

Volume $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times (12)^3$

$= \frac{4}{3} \times \pi \times 12 \times 12 \times 12$

$= 4 \times \pi \times 4 \times 12 \times 12$

Cylinder :-

Radius, $r = 8$ cm

Height, $= h$ cm

Volume $= \pi r^2 h$

$= \pi \times r^2 \times h$

$= \pi \times 8 \times 8 \times h$

Here, Volume of the cylinder = Volume of the aluminium sphere

$$\pi \times 8 \times 8 \times h = 4 \times \pi \times 4 \times 12 \times 12$$

$$h = \frac{4 \times \pi \times 4 \times 12 \times 12}{\pi \times 8 \times 8}$$

$$h = 36 \text{ cm}$$

$\therefore$ Height of the cylinder, $h = 36$ cm

TWO MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

87) Find the range and coefficient of range of the following data : **[Apr-24]**

25, 67, 48, 53, 18, 39, 44.

Solution:-

Given, Largest value, $L = 67$; Smallest value, $S = 18$

Range $= L - S = 67 - 18 = 49$

Coefficient of Range $= \frac{L-S}{L+S} = \frac{67-18}{67+18} = \frac{49}{85} = 0.576$

88) Find the range and coefficient of range of the following data :

63,89,98,125,79,108,117, 68. **[Sep-20, Apr-23]**

Solution:-

Given, Largest value, $L = 125$; Smallest value, $S = 63$

Range $= L - S = 125 - 63 = 62$

Coefficient of Range $= \frac{L-S}{L+S} = \frac{125-63}{125+63} = \frac{31}{94} = \frac{62}{188} = 0.33$

89) Find the range and coefficient of range of the following data :

43.5, 13.6, 18.9, 38.4, 61.4, 29.8.

Solution:-

Given, Largest value, $L = 61.4$; Smallest value, $S = 13.6$

Range $= L - S = 61.4 - 13.6 = 47.8$

Coefficient of Range$= \frac{L-S}{L+S} = \frac{61.4-13.6}{61.4+13.6} = \frac{47.8}{75} = 0.64$

90) If the range and the smallest value of a set of data are 36.8 and 13.4 respectively, then find the largest value.

Solution:-

Given, Range = 36.8 ; Smallest value, $S = 13.4$; Largest value $= L$

WKT, Range $= L - S$

$36.8 = L - 13.4$

$36.8 + 13.4 = L$

$L = 50.2$

91) The range of a set of data is 13.67 and the largest value is 70.08. Find the smallest value. **[PTA-4]**

Solution:-

Given, Range $= 13.67$; Largest value , $L = 70.08$; Smallest value $= S$

WKT, Range $= L - S$

$13.67 = 70.08 - S$

$S = 70.08 - 13.67$

$S = 56.41$

ONE MARK QUESTIONS

UNIT - 7 : MENSURATION

101) 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	**Ans:-** $1120\pi cm^3$
102) If the radius of the base of a cone is tripled and the height is doubled then the volume is	**Ans:- made 18 times**
103) The total surface area of hemi-sphere is how much times the square of its radius.	**Ans:-** 3π
104) A solid sphere of radius $x$cm is melted and cast into a shape of a solid cone of same radius. The height of the cone is	**Ans:-** $4x$ **cm**
105) A frustum of a right circular cone is of height 16 cm with radii of its ends as 8 cm and 20 cm. Then, the volume of the frustum is	**Ans:-** $3328\pi\ cm^3$

Slip Test - 21

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) The total surface area of hemi-sphere is how much times the square of its radius.
(A) π (B) 4π (C) 3π (D) 2π

2) A solid sphere of radius $x$cm is melted and cast into a shape of a solid cone of same radius. The height of the cone is
(A) $3x$ cm (B) x cm (C) $4x$ cm (D) $2x$ cm

3) If the radius of the base of a cone is tripled and the height is doubled then the volume is
(A) made 6 times (B) made 18 times (C) made 12 times (D) unchanged

II Answer the following:- **(2 x 2 = 4)**

4) Find the range and coefficient of range of the following data : 43.5, 13.6, 18.9, 38.4, 61.4, 29.8.

5) The range of a set of data is 13.67 and the largest value is 70.08. Find the smallest value.

III Answer the following:- **(1 x 5 = 5)**

6) A metallic sphere of radius 16cm is melted and recast into small spheres each of radius 2 cm. How many small spheres can be obtained?

IV Answer the following:- **(1 x 8 = 8)**

7) Draw a circle of radius 4.5 cm. At a point L on it draw a tangent to the circle using the alternate segment.

DAY – 26

SPECIAL GRAPHS – INDIRECT VARIATION

8) A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as show below

No. of Participants (x)	2	4	6	8	10
Amount for each participant (Rs.) (y)	180	90	60	45	36

(i) Find the constant of variation.

(ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12.

Solution:-

VARIATION:- Indirect Variation.

TABLE:-

No. of Participants (x)	2	4	6	8	10
Amount for each participant (Rs.) (y)	180	90	60	45	36

POINTS:-

$(2, 180), (4, 90), (6, 60), (8, 45), (10, 36)$

CONSTANT OF VARIATION:-

$$k = xy = 2 \text{ x } 180 = 360$$

EQUATION:-

$$xy = k$$
$$xy = 360$$

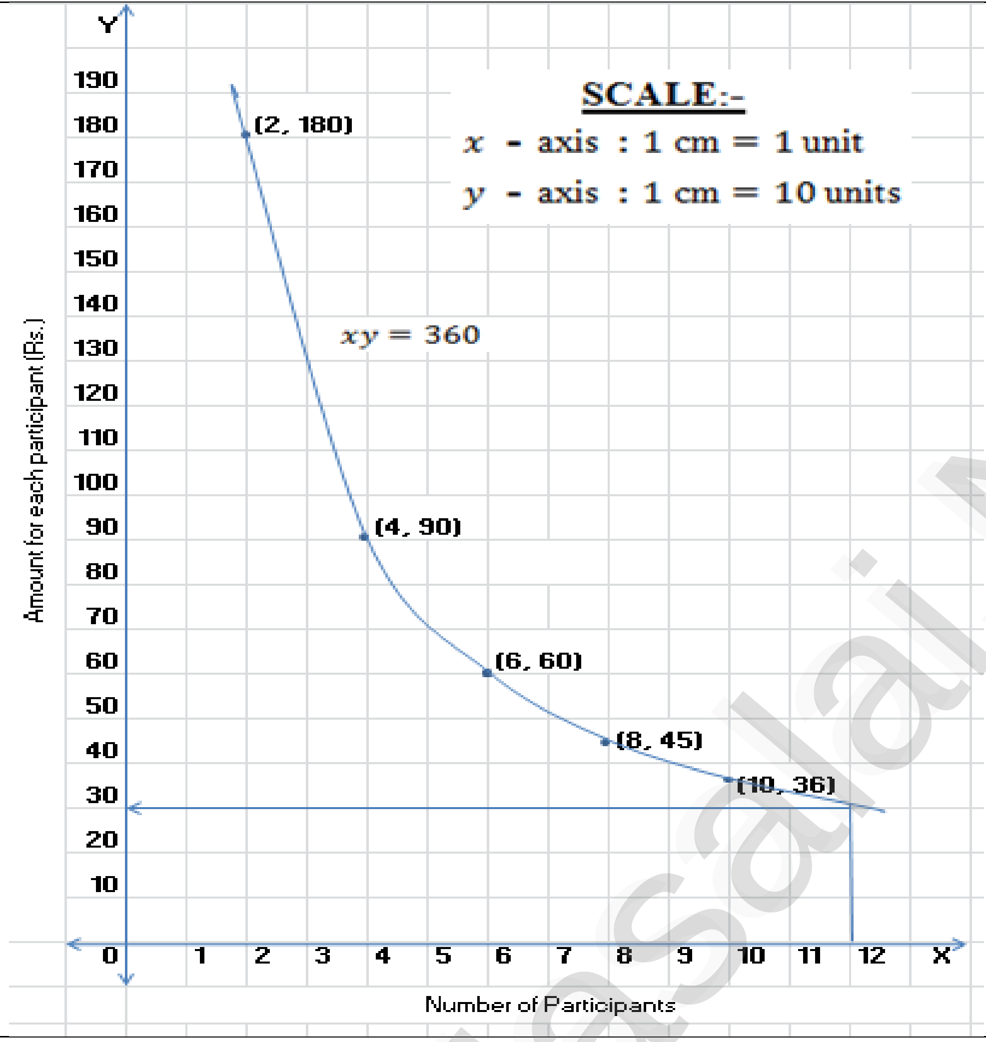
SCALE:-

x - axis : 1 cm = 1 unit

y - axis : 1 cm = 10 units

From the graph,

If $x = 12$, then $y = 30$. If The number of participants are 12, each participant will get Rs.30.



FIVE MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

72) Find the coefficient of variation of : 24, 26, 33, 37, 29, 31. **[GMQ, Jun-23, Apr-24]**

Solution :-

$$\bar{x} = \frac{\sum x}{n} = \frac{180}{6}$$
$$= 30$$

x	$d = x - \bar{x}$	d^2
24	-6	36
26	-4	16
33	3	9
37	7	49
29	-1	1
31	1	1
180	$\sum d^2 = 112$	

Here,

$$\sum d^2 = 112$$
$$n = 6$$

$$\cdot \sigma = \sqrt{\frac{\sum d^2}{n}}$$
$$= \sqrt{\frac{112}{6}}$$
$$= \sqrt{18.666}$$
$$= \sqrt{18.67}$$
$$= 4.32$$

$\therefore$ Co-efficient of vatiation,

$$C.V = \frac{\sigma}{\bar{x}} \times 100\ \%$$
$$= \frac{4.321}{30} \times 100$$
$$= \frac{43.21}{3}$$
$$= 14.4\ \%$$

73) Find the coefficient of variation of : 38, 40, 34, 31, 28, 26, 34

Solution :-

x	$d = x - \bar{x}$	d^2
38	5	25
40	7	49
34	1	1
31	−2	4
28	−5	25
26	−7	49
34	1	1
231	$\sum d^2 = 154$	

$$\bar{x} = \frac{\sum x}{n} = \frac{231}{7} = 33$$

Here,

$$\sum d^2 = 154$$

$$n = 7$$

$$\therefore \sigma = \sqrt{\frac{\sum d^2}{n}} = \sqrt{22} = 4.69$$

$\therefore$ Co-efficient of variation,

$$C.V = \frac{\sigma}{\bar{x}} \times 100\,\% = \frac{4.69}{33} \times 100 = \frac{469}{33} = 14.21\,\%$$

TWO MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

92) Find the range of the following distribution. **[PTA-6]**

Age (in years)	16– 18	18–20	20– 22	22– 24	24–26	26–28
Number of students	0	4	6	8	2	2

Solution:-

Here,
Largest value , $L = 28$
Smallest value, $S = 18$
WKT, Range $= L - S$
$= 28 - 18$
$= 10$ years

Note:- If the frequency of initial class is zero, then the next class will be considered for the calculation of range.

93) Find the range of the following distribution.

Income	400-450	450-500	500-550	550-600	600-650
Number of workers	8	12	30	21	6

Solution:-

Given, Largest value , $L = 650$
Smallest value , $S = 400$
Range $= L - S = 650 - 400 = 250$

94) If the standard deviation of a data is 4.5 and if eachvalue of the data is decreased by 5, then find the new standard deviation.

Solution:-

Given, Standard deviation, $\sigma = 4.5$
WKT, We see that the standard deviation will not change when we subtract some fixed constant k to all the values.
$\therefore$ New standard deviation, $\sigma = 4.5$

95) If the standard deviation of a data is 3.6 and each value of the data is divided by 3, then find the new variance and new standard deviation.

Solution:-

Given, Standard deviation, $\sigma = 3.6$

WKT, We see that when we multiply each data by some fixed constant k the standard deviation also get multiplied by k.

$\therefore$ New standard deviation, $\sigma = \frac{3.6}{3} = 1.2$

New variance, $\sigma^2 = (1.2)^2 = 1.44$

96) The standard deviation of 20 observations is $\sqrt{6}$. If each observation is multiplied by 3, find the standard deviation and variance of the resulting observations. **[PTA-1]**

Solution:-

Given, Standard deviation, $\sigma = \sqrt{6}$

Each observation is multiplied by 3

$\therefore$ New standard deviation $= 3\sqrt{6}$

New variance $= (3\sqrt{6})^2 = 9 \text{ x } 6 = 54$

ONE MARK QUESTIONS

UNIT - 7 : MENSURATION

106) A shuttle cock used for playing badminton has the shape of the combination of	**Ans:- frustum of a cone and a hemisphere**
107) A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2 units. Then $r_1 : r_2$ is	**Ans:- 2 : 1**
108) The volume (in cm^3) of the greatest sphere that can be cut off from a cylindrical log of wood of base radius 1 cm and height 5 cm is	**Ans:-** $\frac{4}{3}\pi$
109) 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 r_2 units. If $h_2 : h_1 = 1 : 2$ then, $r_1 : r_2$ is	**Ans:- 1 : 2**
110) The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is	**Ans:- 3 : 1 : 2**

Slip Test – 22

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. **(3 x 1 = 3)**

1) A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2 units. Then $r_1 : r_2$ is (A) 2 : 1 (B) 1 : 2 (C) 4 : 1 (D) 1 : 4

2) A shuttle cock used for playing badminton has the shape of the combination of
(A) a cylinder and a sphere (B) a hemisphere and a cone
(C) a sphere and a cone (D) frustum of a cone and a hemisphere

3) The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is (A) 1 : 2 : 3 (B) 2 : 1 : 3 (C) 1 : 3 : 2 (D) 3 : 1 : 2

II Answer the following:- **(2 x 2 = 4)**

4) Find the range of the following distribution.

Age (in years)	16– 18	18–20	20– 22	22– 24	24–26	26–28
Number of students	0	4	6	8	2	2

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

III Answer the following:- **(1 x 5 = 5)**

6) Find the coefficient of variation of : 24, 26, 33, 37, 29, 31.

IV Answer the following:- **(1 x 8 = 8)**

7) A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as show below

No. of Participants (x)	2	4	6	8	10
Amount for each participant (Rs.) (y)	180	90	60	45	36

(i) Find the constant of variation.

(ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12.

DAY – 27

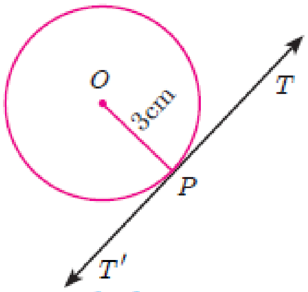
PRACTICAL GEOMETRY - TANGENTS

14) Draw a circle of radius 3 cm. Take a point P on this circle and draw a tangent at P. (Using the centre)

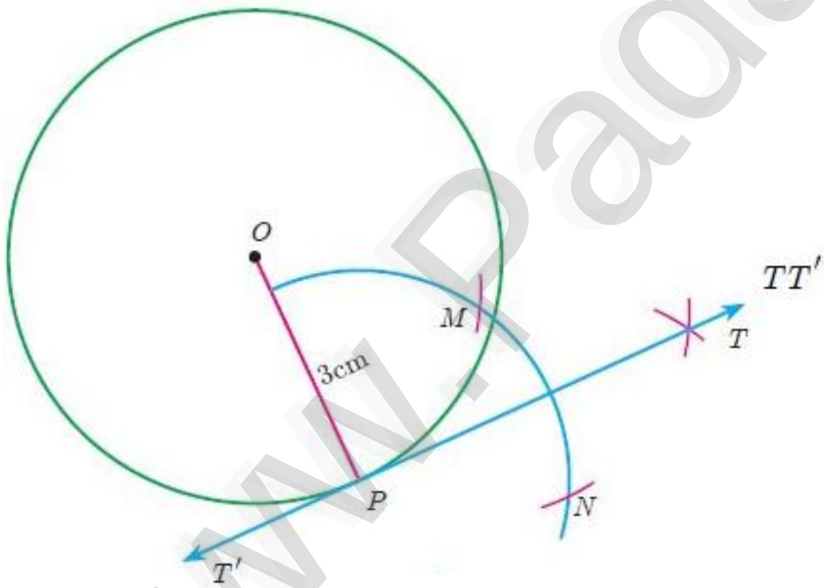
Solution:-

Gven, Radius = 3 cm

ROUGH DIAGRAM



Rough diagram



TPT' is the required tangent.

FIVE MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

74) Two dice are rolled. Find the probability that the sum of outcomes (i) equal to 4 (ii) greater than 10 (iii) less than 13. [Sep-21]

Solution :-

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

$\therefore \quad n(S) = 36$

Let A be the event of getting the sum of outcome values equal to 4.

$A = \{(1,3),(2,2),(3,1)\}$

$n(A) = 3$

$P(A) = \frac{n(A)}{n(S)} = \frac{3}{36} = \frac{1}{12}$

Let B be the event of getting the sum of outcome values greater than 10.

$B = \{(5,6),(6,5),(6,6)\}$

$n(B) = 3$

$P(B) = \frac{n(B)}{n(S)} = \frac{3}{36} = \frac{1}{12}$

Let C be the event of getting the sum of outcome values less than 13.

Here, $C = S$

$n(C) = n(S) = 36$

$P(C) = \frac{n(C)}{n(S)} = \frac{36}{36} = 1$

75) Two unbiased dice are rolled once. Find the probability of getting (i) the 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. **[Sep-20 , Aug-22]**

Solution :-

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

$\therefore \quad n(S) = 36$

(i) Let A be the event of getting the doublet.

$A = \{(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)\}$

$n(A) = 6$

$P(A) = \frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

(ii) Let B be the event of getting 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 be the event of getting the sum as a prime number.

$C = \begin{Bmatrix} (1,1),(1,2),(1,4),(1,6),(2,1),(2,3),(2,5),(3,2), \\ (3,4),(4,1),(4,3),(5,2),(5,6),(6,1),(6,5) \end{Bmatrix}$

$n(C) = 15$

$P(C) = \frac{n(C)}{n(S)} = \frac{15}{36} = \frac{5}{12}$

(iv) Let D be the event of getting the sum as 1.

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

76) Two dice of blue clor and grey color are rolled simultaneously. Write all the outcomes of this. What is the probability of getting the following addition of numbers rolled on the dice? (i) 8 (ii) 13 (iii) less than or equal to 12. **[GMQ, PTA-2]**

Solution :-

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

$\therefore \quad n(S) = 36$

(i) Let A be the event of getting the sum of outcome values equal to 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) Let B be the event of getting the sum of outcome values equal to 13.

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

(iii) Let C be the event of getting the sum of outcome values less than or equal to 12.

$$C = S$$
$$n(C) = 36$$
$$P(C) = \frac{n(C)}{n(S)} = \frac{36}{36} = 1$$

77) Three fair coins are tossed together. Find the probability of getting (i) all heads (ii) at least one tail (iii) at most one head (iv) at most two tails. **[PTA-5]**

Soln:-

Sample Space, $S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

$$n(S) = 8$$

(i) Let A be the event of getting all heads.

$$A = \{HHH\}$$
$$n(A) = 1$$
$$P(A) = \frac{n(A)}{n(S)} = \frac{1}{8}$$

(ii) Let B be the event of getting at least one tail.

$B = \{HHT, HTH, HTT, THH, THT, TTH, TTT\}$

$n(B) = 7$

$P(B) = \frac{n(B)}{n(S)} = \frac{7}{8}$

(iii) Let C be the event of getting at most one head.

$C = \{HTT, THT, TTH, TTT\}$

$n(C) = 4$

$P(C) = \frac{n(C)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

(iv) Let D be the event of getting at most two tails.

$D = \{HHH, HHT, HTH, HTT, THH, THT, TTH\}$

$n(D) = 7$

$P(D) = \frac{n(D)}{n(S)} = \frac{7}{8}$

TWO MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

97) Find the standard deviation of first 21 natural numbers. **[PTA-6, Jun-23]**

Solution:-

WKT, The standard deviation of first n natural numbers, $\sigma = \sqrt{\frac{n^2 - 1}{12}}$

$\therefore \sigma = \sqrt{\frac{21^2 - 1}{12}} = \sqrt{\frac{441 - 1}{12}} = \sqrt{\frac{440}{12}} = \sqrt{36.67} = 6.06$

98) The standard deviation and coefficient of variation of a data are 1.2 and 25.6 respectively. Find the value of mean. **[PTA-3]**

Solution:-

Given, $\bar{x} = 25.6$, $C.V = 18.75$

WKT, $C.V = \frac{\sigma}{\bar{x}}$ x 100%

$18.75 = \frac{\sigma}{25.6}$ x 100

$\frac{18.75 \text{ x } 25.6}{100} = \sigma$

$\sigma = \frac{480}{100} = 4.8$

99) The standard deviation and the mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation. **[GMQ]**

Solution:-

Given, $\sigma = 6.5$, $\bar{x} = 12.5$

WKT, $C.V = \frac{\sigma}{\bar{x}}$ x 100%

$$C.V = \frac{6.5}{12.5} \text{ x } 100 = \frac{650}{12.5} = \frac{6500}{125} = 52\ \%$$

100) The standard deviation and coefficient of variation of a data are 1.2 and 25.6 respectively. Find the value of mean.

Solution:-

Given, $\sigma = 1.2\ ,\ \ C.V = 25.6$

WKT, $C.V = \frac{\sigma}{\bar{x}} \text{ x } 100\%$

$$25.6 = \frac{1.2}{\bar{x}} \text{ x } 100$$

$$\bar{x} = \frac{1.2 \text{ x } 100}{25.6} = \frac{120}{25.6} = 4.6875$$

101) If the mean and coefficient of variation of a data are 15 and 48 respectively, the find the value of standard deviation.

Solution:-

Given, $\bar{x} = 15\ ,\ C.V = 48$

WKT, $C.V = \frac{\sigma}{\bar{x}} \text{ x } 100\%$

$$48 = \frac{\sigma}{15} \text{ x } 100$$

$$\frac{48 \text{ x } 15}{100} = \sigma$$

$$\sigma = \frac{720}{100} = 7.2$$

ONE MARK QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

111) Which of the following is not a measure of dispersion?	**Ans:- Arithmetic Mean**
112) The range of the data 8, 8, 8, 8, 8, . . . , 8 is	**Ans:- 0**
113) The sum of all deviations of the data from its mean is	**Ans:- zero**
114) The mean of 100 observations is 40 and their standard deviations is 3. The sum of squares of all deviations is	**Ans:- 160900**
115) Variance of first 20 natural numbers is	**Ans:- 33.25**

Slip Test - 23

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. (3 x 1 = 3)

1) Which of the following is not a measure of dispersion?
(A) Range (B) Standard Deviation (C) Arithmetic Mean (D) Variance

2) The range of the data 8, 8, 8, 8, 8, . . . , 8 is (A) 0
(B) 1 (C) 8 (D) 3

3) The mean of 100 observations is 40 and their standard deviations is 3. The sum of squares of all deviations is (A) 40000
(B) 160900 (C) 160000 (D) 30000

II Answer the following:- (2 x 2 = 4)

4) Find the standard deviation of first 21 natural numbers.

5) If the mean and coefficient of variation of a data are 15 and 48 respectively, the find the value of standard deviation.

III Answer the following:- **(1 x 5 = 5)**

6) Two unbiased dice are rolled once. Find the probability of getting
(i) the 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.

IV Answer the following:- **(1 x 8 = 8)**

7) Draw a circle of radius 3 cm. Take a point P on this circle and draw a tangent at P. (Using the centre)

DAY – 28

SPECIAL GRAPHS – INDIRECT VARIATION

1) 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 destination in 1 hour. He was followed by Aradhana, Jeyanth, 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 Kaushik with his speed of 2.4 km/hr.

Solution:-

VARIATION:- Direct Variation.

TABLE:-

Speed(x)(Km/Hr)	12	6	4	3	2
Time(y)(Hour)	1	2	3	4	6

POINTS:-

$(12, 1), (6, 2), (4, 3), (3, 4), (2, 6)$

CONSTANT OF VARIATION:-

$$k = xy = 12 \times 1 = 12$$

EQUATION:-

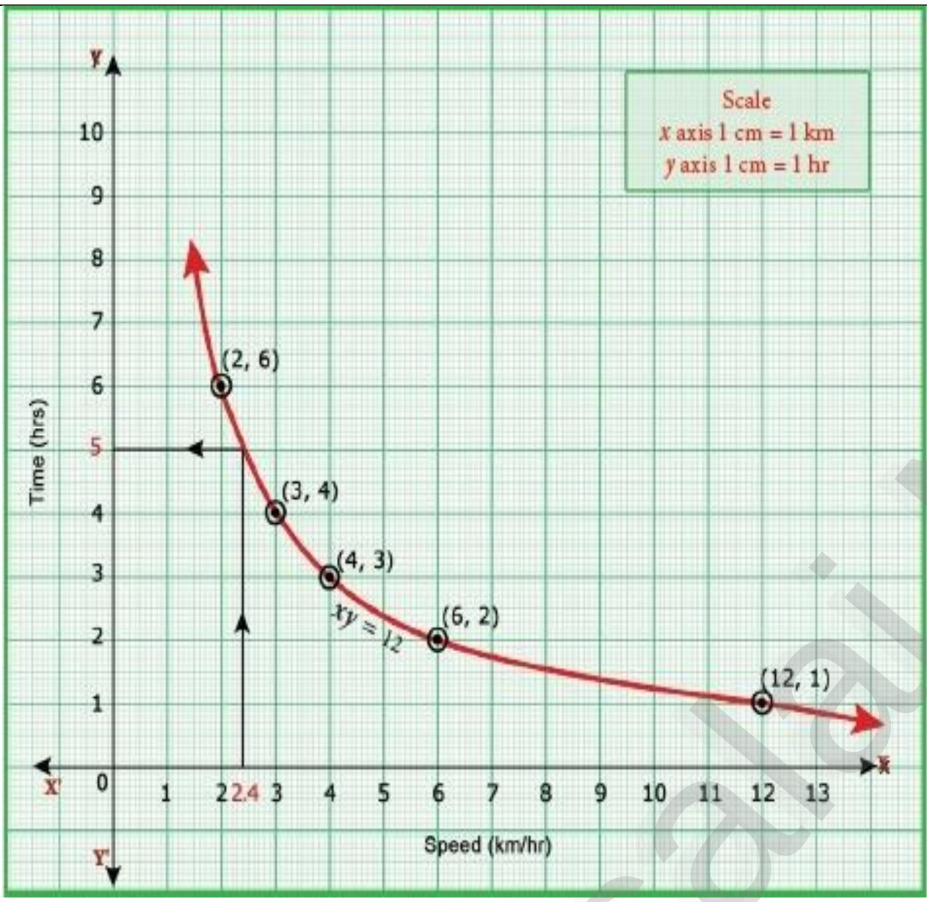
$$xy = k$$
$$xy = 12$$

SCALE:-

x - axis : 1 cm = 1 unit
y - axis : 1 cm = 1 unit

From the graph,

If $x = 2.4$, then $y = 5$. Kaushik takes 5 hrs with a speed of 2.4 km/hr



FIVE MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

78) Two dice are rolled once. Find the probability of getting an even number on the first die or total of ace sum 8. **[Jun-23, Apr-24]**

Solution :-

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

$\therefore \quad n(S) = 36$

Let A be the event of getting an even number on the first die.

$A = \{(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),$
$(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$

$n(A) = 18$

$$P(A) = \frac{n(A)}{n(S)} = \frac{18}{36}$$

Let B be the event of getting the total of face sum 8.

$B = \{(2,6),(3,5),(4,4),(5,3),(6,2)\}$

$n(B) = 5$

$$P(B) = \frac{n(B)}{n(S)} = \frac{5}{36}$$

Here, $A \cap B = \{(2,6),(4,4),(6,2)\}$

$n(A \cap B) = 3$

$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{3}{36}$$

∴ By the addition theorem on probability, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{18}{36} + \frac{5}{36} - \frac{3}{36}$$
$$= \frac{18 + 5 - 3}{36}$$
$$= \frac{23 - 3}{36}$$
$$= \frac{20}{36}$$
$$= \frac{5}{9}$$

79) Two dice are rolled together. Find the probability of getting a doublet or sum of faces as 4.

Solution :-

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

∴ $n(S) = 36$

Let A be the event of getting a doublet.

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

Let B be the event of getting the sum of faces as 4.

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

Here, $A \cap B = \{(2,2)\}$

$$n(A \cap B) = 1$$
$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{1}{36}$$

∴ By the addition theorem on probability, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{6}{36} + \frac{3}{36} - \frac{1}{36}$$
$$= \frac{6 + 3 - 1}{36}$$
$$= \frac{9 - 1}{36}$$
$$= \frac{8}{36}$$

$$= \frac{2}{9}$$

80) If two dice are rolled, then find the probability of getting the product of face value 6 or the difference of face value 5.

Solution :-

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

$\therefore \quad n(S) = 36$

Let A be the event of getting the product of face value 6.

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

Let B be the event of getting the difference of face value 5.

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

Here, $A \cap B = \{(1,6),(6,1)\}$

$$n(A \cap B) = 2$$
$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{2}{36}$$

$\therefore$ By the addition theorem on probability, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{4}{36} + \frac{2}{36} - \frac{2}{36}$$
$$= \frac{4}{36}$$
$$= \frac{1}{9}$$

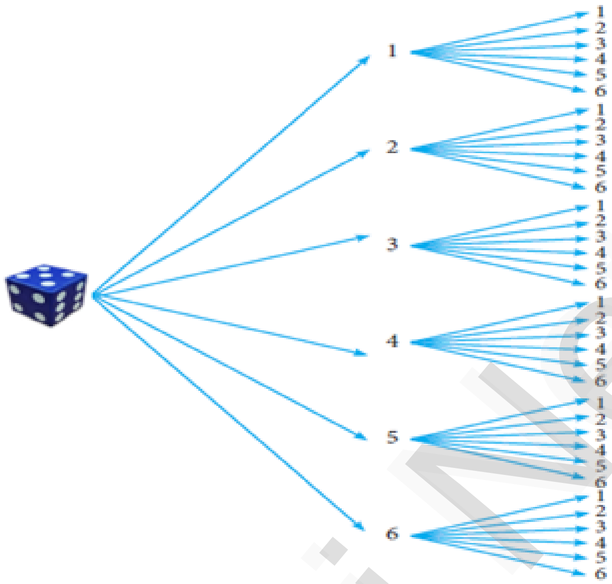
TWO MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

102) Express the sample space for rolling two dice using tree diagram.

Solution:-.

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

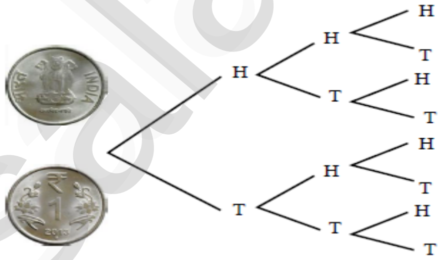


$\therefore n(S) = 36$

103) Write the sample space for tossing three coins using tree diagram.

Solution:-

$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

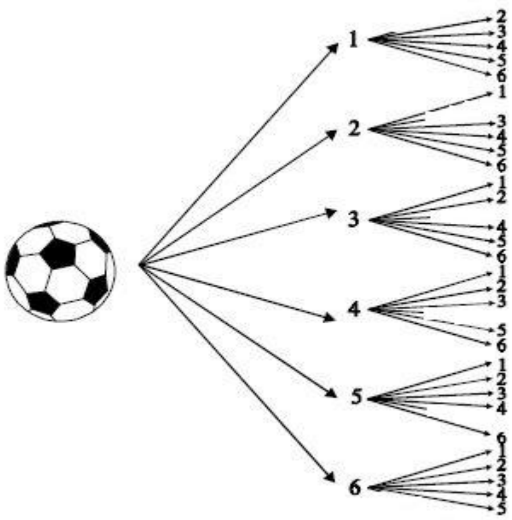


$\therefore n(S) = 8$

104) Write the sample space for selecting two balls from a bag conaining 6 balls numbered 1 to 6 (using tree diagram) **[PTA-4]**

Solution:-

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



$\therefore n(S) = 30$

105) Two coins are tossed together. What is the probability of getting different faces on the coins? **[May-22]**

Solution:-

Sample Space, $S = \{HH, HT, TH, TT\}$

$n(S) = 4$

Let A be the event of getting different faces on the coins.

$$A = \{HT, TH\}$$
$$n(A) = 2$$
$$P(A) = \frac{n(A)}{n(S)} = \frac{2}{4} = \frac{1}{2}$$

106) In a two children family, find the probability that there is at least one girl in a family.

Solution:-

Sample Space, $S = \{BB, BG, GB, GG\}$

$$n(S) = 4$$

Let A be the event of getting at least one girl in a family.

$$A = \{BG, GB\}$$
$$n(A) = 2$$
$$P(A) = \frac{n(A)}{n(S)} = \frac{2}{4} = \frac{1}{2}$$

107) A coin is tossed thrice. What is the probability of getting two consecutive tails?

Solution:-

$$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$$
$$n(S) = 8$$

Let A be the event of getting two consecutive tails.

$$A = \{HTT, TTH, TTT\}$$
$$n(A) = 3$$
$$P(A) = \frac{n(A)}{n(S)} = \frac{3}{8}$$

ONE MARK QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

116) The standard deviation of a data is 3. If each value is multiplied by 5 then the new variance is	**Ans:- 225**
117) If the standard deviation of x, y, z is p then the standard deviation of $3x+5, 3y+5, 3z+5$ is	**Ans:- $3p$**
118) If the mean and coefficient of variation of a data are 4 and 87.5% then the standard deviation is	**Ans:- 3.5**
119) Which of the following is incorrect?	**Ans:- $P(A) > 1$**
120) The probability a red marble selected at random from a jar containing p red, q blue and r green marbles is	**Ans:- $\frac{p}{p+q+r}$**

Slip Test - 24

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. (3 x 1 = 3)

1) If the standard deviation of x, y, z is p then the standard deviation of $3x+5, 3y+5, 3z+5$ is

(A) $3p+5$ (B) $3p$ (C) $p+5$ (D) $9p+15$

2) If the mean and coefficient of variation of a data are 4 and 87.5% then the standard deviation is

(A) 3.5 (B) 3 (C) 4.5 (D) 2.5

3) Which of the following is incorrect?

(A) $P(A) > 1$ (B) $0 \leq P(A) \leq 1$ (C) $P(\varphi) = 0$ (D) $P(A) + P(\bar{A}) = 1$

II Answer the following:- **(2 x 2 = 4)**

4) A coin is tossed thrice. What is the probability of getting two consecutive tails?

5) Write the sample space for selecting two balls from a bag conaining 6 balls numbered 1 to 6 (using tree diagram)

III Answer the following:- **(1 x 5 = 5)**

6) If two dice are rolled, then find the probability of getting the product of face value 6 or the difference of face value 5.

IV Answer the following:- **(1 x 8 = 8)**

7) 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 destination in 1 hour. He was followed by Aradhana, Jeyanth, 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 Kaushik with his speed of 2.4 km/hr.

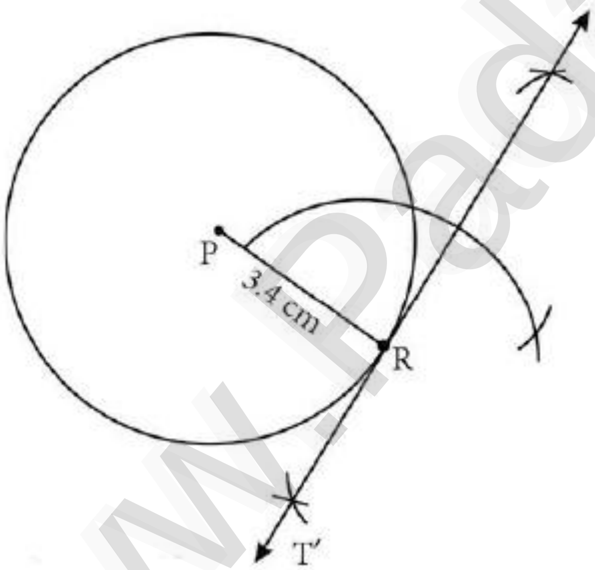
DAY – 29

PRACTICAL GEOMETRY - TANGENTS

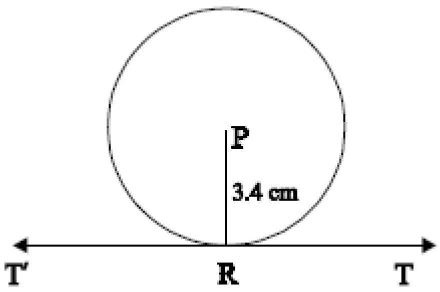
15) Draw a circle of radius 3.4 cm. Take a point P on this circle and draw a tangent at P. (Using the centre)

Solution:-

Gven, Radius = 3.4 cm



ROUGH DIAGRAM



$\cdot\, TPT'$ is the required tangent.

FIVE MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

81) A box contains cards numbered 3, 5, 7, 9, …, 35, 37. A card is drawn at random from the box. Find the probability that the drawn card have either multiples of 7 or a prime number.

Soln:-

$$S = \{3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37\}$$

$\therefore\ n(S) = 18$

Let A be the event of getting the drawn card have multiples of 7.

$$A = \{7,21,35\}$$

$$n(A) = 3$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{3}{18}$$

Let Bbe the event of getting the drawn card have a prime number.

$$B = \{3,5,7,11,13,17,19,23,29,31,37\}$$

$$n(B) = 11$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{11}{18}$$

Also, $A \cap B = \{7\}$

$$n(A \cap B) = 1$$

$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{1}{18}$$

$\therefore$ By the addition theorem on probability, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{3}{18} + \frac{11}{18} - \frac{1}{18}$$

$$= \frac{3 + 11 - 1}{18}$$

$$= \frac{14 - 1}{18}$$

$$= \frac{13}{18}$$

82) Three unbiased coins are tossed once. Find the probability of getting atmost 2 tails or at least 2 heads.

Soln:-

$$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$$

$\therefore n(S) = 8$

Let A be the event of getting at most 2 tails.

$$A = \{HHH, HHT, HTH, HTT, THH, THT, TTH\}$$

$$n(A) = 7$$

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

Let B be the event of getting at least 2 heads.

$$B = \{HHH, HHT, HTH, THH\}$$

$n(B) = 4$

$$P(B) = \frac{n(B)}{n(S)} = \frac{4}{8}$$

Also, $A \cap B = \{HHH, HHT, HTH, THH\}$

$n(A \cap B) = 4$

$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{4}{8}$$

∴ By the addition theorem on probability, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{7}{8} + \frac{4}{8} - \frac{4}{8}$$

$$= \frac{7}{8}$$

83) In class of 50 students, 28 opted for NCC, 30 opted for NSS and 18 opted for NCC and NSS. One of the students is selected at random. Find the probability that,

(i) The selected student opted for NCC but not NSS

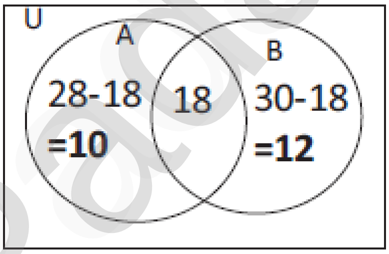
(ii) The selected student opted for NSS but not NCC

(iii) The selected student opted for exactly one of them. **[PTA-1, PTA-4, May-22]**

Solution:-

A = Students opted for NCC ; B = Students opted for NSS

Given, $\boldsymbol{n(S)} = 50$, $\boldsymbol{n(A)} = 28$, $\boldsymbol{n(B)} = 30$, $\boldsymbol{n(A \cap B)} = 18$



(i) Probablity that the selected student opted for NCC but not NSS,

$$P(A \quad only) = \frac{10}{50} = \frac{1}{5}$$

(ii) Probablity that the selected student opted for NSS but not NCC

$$P(B\ only) = \frac{12}{50} = \frac{6}{25}$$

(iii) Probablity that the selected student opted for exactly one of them

$$P(A \ \text{only}) + P(B \ \text{only}) = \frac{10}{50} + \frac{12}{50} = \frac{10+12}{50} = \frac{22}{50} = \frac{11}{25}$$

TWO MARKS QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

108) A die is rolled and a coin is tossed simultaneously. Find the probability that the die shows an odd number and the coin shows a head. **[Sep-21, Jun-23]**

Solution:-

Sample Space, $S = \{1H, 1T, 2H, 2T, 3H, 3T, 4H, 4T, 5H, 5T, 6H, 6T\}$

$n(S) = 12$

Let A be the event of getting the die shows an odd number and the coin shows a head.

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

$n(A) = 3$

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

109) What is the probability that a leap year selected at random will contain 53 Saturdays.

Solution:- **[Apr-24]**

Leap year 366 = 52 weeks + 2 days

S = {(sun,mon), (mon, tue), (tue.wed), (wed,thu), (thu,fri), (fri,sat), (sat,sun)}

$n(S) = 7$

A = {getting 53 Saturdays in a leap year} = {(fri,sat),(sat,sun) }

$n(A) = 2$

$P(A) = \frac{n(A)}{n(S)} = \frac{2}{7}$

110) If $P(A) = 0.37,\ P(B) = 0.42,\ P(A \cap B) = 0.09$ then, find $P(A \cup B)$.

Solution:-

Given, $P(A) = 0.37,\ P(B) = 0.42,\ P(A \cap B) = 0.09$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= 0.37 + 0.42 - 0.09 = 0.79 - 0.09 = 0.7$

111) If $P(A) = \frac{2}{3},\ P(B) = \frac{2}{5},\ P(A \cap B) = \frac{1}{3}$ then find $P(A \cap B)$ **[PTA-1]**

Solution:-

Given, $P(A) = 0.37,\ P(B) = 0.42,\ P(A \cap B) = 0.09$

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

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

$= \frac{10 + 6 - 5}{15}$

$= \frac{16 - 5}{15}$

$= \frac{11}{15}$

112) The probability of happening of an event A is 0.5 and that of B is 0.3. If A and B are mutually exclusive events, then the probability that neither A nor B happen.

Solution:-

Given, $P(A) = 0.5,\ P(B) = 0.3,\ P(A \cap B) = 0$

WKT, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = 0.5 + 0.3 - 0 = 0.8$

∴ The probability that neither A nor B happen, $= P(\overline{A \cup B})$

$= 1 - P(A \cup B)$

$= 1 - 0.8$

$= 0.2$

ONE MARK QUESTIONS

UNIT - 8 : STATISTICS AND PROBABILITY

121) A page is selected at random from a book. The probability that the digit at units place of the page number chosen is less than 7 is	**Ans:-** $\frac{7}{10}$
122) The probability of getting a job for a person is $\frac{x}{3}$. If the probability of not getting the job is $\frac{2}{3}$ then the value of x is	**Ans:- 1**
123) Kamalam went to play a lucky draw contest. 135 tickets of the lucky draw were sold. If the probability of Kamalam winning is $\frac{1}{9}$, then the number of tickets bought by Kamalam is	**Ans:- 15**
124) If a letter is chosen at random from the English alphabets $\{a, b, c, \ldots, z\}$, then the probability that the letter chosen precedes x	**Ans:-** $\frac{23}{26}$
125) A purse contains 10 notes of Rs.2000, 15 notes of Rs.500 and 25 notes of Rs.200. One note is drawn at random. What is the probability that the note is either a Rs.500 note of Rs.200 note?	**Ans:-** $\frac{4}{5}$

Slip Test - 25

I Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. (3 x 1 = 3)

1) A page is selected at random from a book. The probability that the digit at units place of the page number chosen is less than 7 is(A) $\frac{3}{10}$ (B) $\frac{7}{10}$ (C) $\frac{3}{9}$ (D) $\frac{7}{9}$

2) If a letter is chosen at random from the English alphabets $\{a, b, c, \ldots, z\}$, then the probability that the letter chosen precedes x(A) $\frac{12}{13}$ (B) $\frac{1}{13}$ (C) $\frac{23}{26}$ (D) $\frac{3}{26}$

3) The probability of getting a job for a person is $\frac{x}{3}$. If the probability of not getting the job is $\frac{2}{3}$ then the value of x is(A) 2 (B) 1 (C) 3 (D) 1.5

II Answer the following:- (2 x 2 = 4)

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

5) What is the probability that a leap year selected at random will contain 53 Saturdays.

III Answer the following:- (1 x 5 = 5)

6) Three unbiased coins are tossed once. Find the probability of getting at most 2 tails or at least 2 heads.

IV Answer the following:- (1 x 8 = 8)

7) Draw a circle of radius 3.4 cm. Take a point P on this circle and draw a tangent at P. (Using the centre)

DAY – 30

WEEKLY TEST - 5

UNIT - 1 : RELATIONS AND FUNCTIONS

1) If f and g are any two functions, then in general $f \, o \, g \neq g \, o \, f$. (So, composition of functions is not commutative.)

2) If f , g and h are any three functions, then $f \, o \, (g \, o \, h) = (f \, o \, g) \, o \, h$. (Composition of three functions is always associative)

UNIT - 2 : NUMBERS AND SEQUENCES

- **Euclid's division lemma** :-

  If a and b are two positive integers then there exist unique integers q and r such that $a = bq + r, 0 \leq r < |b|$.

- **Fundamental theorem of arithmetic :-**

  Every composite number can be expressed as a product of primes and this factorization is unique except for the order in which the prime factors occur.

- **Arithmetic Progression (A.P) :-**

  (i) General Form : $a, a + d, a + 2d, a + 3d, \dots \dots \dots$

  (ii) n – th term, $t_n = a + (n - 1)d$.

  Here n = first term, d = common difference $= t_2 - t_1$

  (iii) Number of terms, $n = \left(\frac{l-a}{d}\right) + 1$. Here, l is the last term.

  (iv) Three non-zero numbers a, b, c are in A.P, if and only if $2b = a + c$.

  (v) Three consecutive terms of an A.P : $a - d$, a , $a + d$.

  (vi) Four consecutive terms of an A.P $a - 3d$, $a - d$, $a + d, a + 3d$.

  (vii) Sum to first n terms of an A.P. is

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

  (ii) $S_n = \frac{n}{2}(a + l)$

- **Geometric Progression (G.P) :-**

  (i) General form : $a, ar, ar^2, ar^3, ar^4, ar^5, \dots \dots \dots \dots$

  (ii) n – th term, $t_n = ar^{n-1}$,

  Here, a = first term, r = common ratio $= \frac{t_2}{t_1}$

  (iii) Three non-zero numbers a, b, c are in G.P, if and only if $b^2 = ac$.

  (iv) Three consecutive terms of an A.P : $\frac{a}{r}$, a, ar.

  (v) Sum to first n terms of an G.P. is,

  (i) $S_n = \frac{a(r^n-1)}{r-1}$ $(if \;\; r > 1)$

  (ii) $S_n = \frac{a(1-r^n)}{1-r}$ $(if \;\; r < 1)$

  (iii) $S_n = na$ $(if \;\; r = 1)$

  (vi) Sum to infinite terms of a G.P,

  $$S_\infty = \frac{a}{1 - r} (-1 < r < 1)$$

- **Special Series :-**

(i) The sum of first n natural numbers is,

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

(ii) The sum of squares of first n natural numbers is,

$$1^2 + 2^2 + 3^2 + \cdots + n^2 = \sum n^2 = \frac{n(n+1)(2n+1)}{6}$$

(iii) The sum of squares of first n natural numbers is,

$$1^3 + 2^3 + 3^3 + \cdots + n^3 = \sum n^3 = \left(\frac{n(n+1)}{2}\right)^2$$

(iv) The sum of first n odd natural numbers is,

(a) $1 + 3 + 5 + \cdots\ n$ terms $= n^2$

(b) $1 + 3 + 5 + \cdots + l = \left(\frac{l+1}{2}\right)^2$, Here l is the last term.

UNIT - 3 : ALGEBRA

- **IDENTITIES :-**
  - **(i)** $(a+b)^2 = a^2 + 2ab + b^2$
  - **(ii)** $(a-b)^2 = a^2 - 2ab + b^2$
  - **(iii)** $(a+b)(a-b) = a^2 - b^2$
  - **(iv)** $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
  - **(v)** $a^3 + b^3 = (a+b)^3 - 3ab(a+b)$
  - **(vi)** $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
  - **(vii)** $a^3 - b^3 = (a-b)^3 + 3ab(a-b)$

- If $f(x)$ and $g(x)$ are any two polynomials then, $f(x)$ x $g(x)$ = G.C.D $\times$ L.C.M.

- **QUADRATIC EQUATIONS:-**

(i) The roots of the quadratic equation $ax^2 + bx + c = 0$, $(a \neq 0)$ are given by

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

(ii) Nature of roots, $\Delta = b^2 - 4ac$

$\Delta = b^2 - 4ac$	Nature of roots
$\Delta > 0$	Real and unequal.
$\Delta = 0$	Real and equal.
$\Delta < 0$	Unreal or imaginary.

(iii) If α and β are the two roots of the quadratic equation, $ax^2 + bx + c = 0$, then

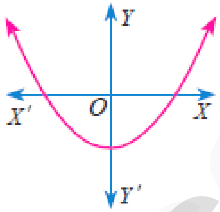
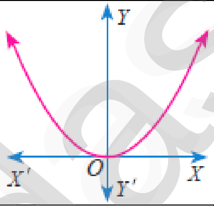
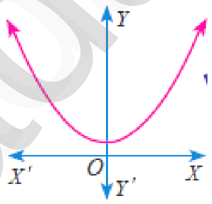
- Sum of the roots, $\alpha + \beta = \frac{-b}{a}$
- Product of the roots, $\alpha\beta = \frac{c}{a}$

(iv) If α and β are the two roots of the quadratic equation, then the equation is given by $x^2 -$ (Sum of the roots) $x +$ Product of the roots = 0
That is, $x^2 - (\alpha+\beta)x + \alpha\beta = 0$.

(v) **SOME MORE USEFUL IDENTITIES:**

(i) $\alpha^2+\beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$
(ii) $\alpha^3+\beta^3 = (\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)$
(iii) $\alpha-\beta = \sqrt{(\alpha+\beta)^2 - 4\alpha\beta}$
(iv) $\alpha^4+\beta^4 = (\alpha^2+\beta^2)^2 - 2\alpha^2\beta^2$

- **Finding the Nature of Solution of Quadratic Equations Graphically:-**

Number of points of intersection of X – axis	Graphs	Nature of solutions
2		Real and un equal
1		Real and equal
0		Unrel or Imaginary.

- **MATRICES :-**

(i) The general 3 X 3 matrix is givey by, $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$

(ii) A unit matrix of order 2 X 2 is, $I_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(iii) If A, B and C are any three matrices, then
(1) $A + B = B + A$ (Commutative property of matrix addition)
(2) $(A+B)+C = A+(B+C)$ (Associative property of matrix addition)
(3) $A + O = O + A = A$ (Additive Identity)
(4) $A + (-A) = (-A) + A = O$ (Additive Inverse)
(5) In general, $AB \neq BA$
(6) $(AB)C = A\,(BC)$ (Associative property of matrix multiplication)
(7) $A\,(B+C) = AB + AC$(Distributive Property)

(8) $(A+B)C = AC + BC$ (Distributive Property)
(9) $(A-B)C = AC - BC$ (Distributive Property)
(10) $AI = IA = A$ (Multiplicative Identity)
(11) If A and B are the two multiplicative inverse matrices, then $AB = BA = I$.
(12) If AB is defined, $(AB)^T = B^T A^T$
(13) $(A^T)^T = A$
(14) $(A-B)^T = A^T - B^T$
(15) $AA^T = I$

UNIT - 4 : GEOMETRY

(i) Thales Theorem or Basic Proportionality Theorem :-

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

In ΔABC, DE || BC, then $\frac{AD}{DB} = \frac{AE}{EC}$

(ii) 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.

In ΔABC, AD is the internal angle bisector of $\angle A$, then $\frac{AB}{AC} = \frac{BD}{DC}$

(iii) Pythagoras Theorem :-

In a right angle triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

(iv) Alternate Segment Theorem or Tangent-chord Theorem :-

If a line touches a circle and from the point of contact a chord is drawn, the angles between the tangent and the chord are respectively equal to the angles in the corresponding alternate segments.

(v) Ceva's Theorem :-

Let ABC be a triangle and let D, E and F be points on lines BC, CA and AB respectively. Then the cevians AD, BE and CF are concurrent if and only if $\frac{BD}{DC} \times \frac{CE}{EA} \times \frac{AF}{FB} = 1$ where the lengths are directed. This also works for the reciprocal of each of the ratios as the reciprocal of 1 is 1.

UNIT - 5 : CO ORDINATE GEOMETRY

- **SECTION FORMULA :-**

(i) Distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is,

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

(ii) The mid point of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is, $= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

(iii) The coordinates of the centroid G of a triangle with vertices $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ are given by, $G = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$

(iv) The area of a triangle with vertices $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ is,

$$\Delta = \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$$

(v) The area of a quadrilateral with vertices $A(x_1, y_1), B(x_2, y_2), C(x_3, y_3)$ and $D(x_4, y_4)$ is,

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

(vi) If $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ are collinear points, then,

$$\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix} = 0$$

- **Slope of a straight line :-**

(i) If θ is the angle of inclination of a non-vertical straight line, then the slope of the straight line is , $m = tan\theta$.

(ii) If $A(x_1, y_1)$ and $B(x_2, y_2)$ are any two points on a straight line, then the slope of the straight line is, $m = \frac{y_2 - y_1}{x_2 - x_1}$

(iii) If $ax + by + c = 0$ is the equation of the straight line, then the slope of the straight line is, $m = \frac{-a}{b}$

(iv) Two non-vertical lines are parallel if and only if their slopes are equal. That is, $m_1 = m_2$

(v) Two non-vertical lines are perpendicular if and only if the product of their slopes are equal to -1. That is , $m_1 x m_2 = -1$

- **Equation of a straight line :-**

(i) Equation of the X – axis is, $y = 0$

(ii) Equation of a straight line parallel to Y – axis is, $y = k$

(iii) Equation of the Y – axis is, $x = 0$

(iv) Equation of the straight line parallel to Y – axis is, $x = k$

(v) Equation of the straight line passing through the origin is, $y = mx$

(vi) Slope – Intercept Form, $y = mx + c$

(vii) Slope – Point Form, $y - y_1 = m(x - x_1)$

(viii) Two Points Form, $\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$

(ix) Intercepts Form, $\frac{x}{a} + \frac{y}{b} = 1$

(x) The equation of the straight line parallel to $ax + by + c = 0$ is of the form $x + by + k = 0$.

(xi) The equation of the straight line perpendicular to $ax + by + c = 0$ is of the the form $bx - ay + k = 0$.

UNIT - 6 : TRIGONOMETRY

- **TRIGONOMETRIC IDENTITIES.**

(1) $sin^2\theta + cos^2\theta = 1$
$sin^2\theta = 1 - cos^2\theta$
$cos^2\theta = 1 - sin^2\theta$

(2) $1 + tan^2\theta = sec^2\theta$
$tan^2\theta - sec^2\theta = -1$
$sec^2\theta - tan^2\theta = 1$

(3) $1 + cot^2\theta = cosec^2\theta$
$cot^2\theta - cosec^2\theta = -1$
$cosec^2\theta - cot^2\theta = 1.$

- **TRIGONOMIC RATIOS :-**

1) $sin\theta = \frac{\text{OPPOSITE SIDE}}{\text{HYPOTENUS}}$ 2) $cos\theta = \frac{\text{ADJACENT SIDE}}{\text{HYPOTENUS}}$ 3) $tan\theta = \frac{\text{OPPOSITE SIDE}}{\text{ADJACENT SIDE}}$

- **TABLE OF TRIGONOMETRIC RATIOS.**

θ	0°	30°	45°	60°	90°
$sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞

UNIT - 7 : MENSURATION

S.No.	FIGURE	Curved Surface Area	Total Surface Area	Volume
1	CYLINDER	$2\pi rh$	$2\pi r(h+r)$	$\pi r^2 h$
2	CONE	πrl	$\pi r(l+r)$	$\frac{1}{3}\pi r^2 h$
3	SPHERE	$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$
4	HEMISPHERE	$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$
5	FRUSTUM (BUCKET)	$\pi l(R+r)$ $l = \sqrt{h^2 + (R-r)^2}$	$\pi l(R+r) + \pi(R^2 + r^2)$	$\frac{\pi h}{3}(R^2 + r^2 + Rr)$
6	HOLLOW CYLINDER	$2\pi(R+r)h$	$2\pi(R+r)(R-r+)h$	$\pi h(R^2 - r^2)$
7	HOLLOW SPHERE	$4\pi R^2$	$4\pi(R^2 + r^2)$	$\frac{4}{3}\pi(R^3 - r^3)$
8	HOLLOW HEMISPHERE	$2\pi(R^2 + r^2)$	$\pi(3R^2 + r^2)$	$\frac{2}{3}\pi(R^3 - r^3)$

(i) Slant height of the Cone, $l = \sqrt{r^2 + h^2}$
(ii) Radius of the Cone, $r = \sqrt{l^2 - h^2}$

(iii) Height of the Cone, $h = \sqrt{l^2 - r^2}$

(iv) Number of new figures produced by melting, $= \frac{Volume\ of\ melted\ Solid}{Volume\ of\ recasting\ Solid}$

UNIT - 8 : STATISTICS AND PROBABILITY

- **STATISTICS :-**

(i) Range = Largest Value – Smallest Value $(Range\ = L - S)$.

(ii) Co-efficient of Range = $\frac{L-S}{L+S}$.

(iii) Average, $\bar{x} = \frac{\sum x}{n}$

(iv) **Standard Deviation for ungrouped data (σ).**

(1) Direct Method : $\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$

(2) Mean Method : $\sigma = \sqrt{\frac{\sum d^2}{n}}$, $d = x - \bar{x}$

(3) Assumed Mean Method : $\sigma = \sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2}$

$d = x - A$, $A =$ Assumed Mean

(v) **Standard Deviation for grouped data (σ).**

$\sigma = \sqrt{\frac{\sum fd^2}{\sum f} - \left(\frac{\sum fd}{\sum f}\right)^2}$, $d = x - A$, $A =$ Assumed Mean

(vi) The standard deviation of the n natural numbers, $\sigma = \sqrt{\frac{n^2 - 1}{12}}$.

(vii) Co-efficient of Variation, $C.V = \frac{\sigma}{\bar{x}} \times 100\%$.

- **PROBABILITY :-**

(i) The probability of an event A is, $P(A) = \frac{n(A)}{n(S)}$

(ii) The probability of sure event A is 1. That is $P(S) = 1$.

(iii) The probability of impossible event A is 0. That is , $P(\emptyset) = 0$.

(iv) The probability value always s lies from 0 to 1. That is, $0 \le P(A) \le 1$.

(v) The probability of an event not happening is, $P(\bar{A}) = 1 - P(A)$.

- **ADDITION THEOREM OF PROBABILITY :-**

(i) If A and B are any two events, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

(ii) If A and B are any two impossible events,

$$P(A \cup B) = P(A) + P(B)$$

(iii) If A, B and C are any three events,

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(A \cap C) + P(A \cap B \cap C)$$

(iv) If $A\ B$ and C are any three impossible events,

$$P(A \cup B \cup C) = P(A) + P(B) + P(C)$$

(v) $P(A\ only) = P(A \cap \bar{B}) = P(A) - P(A \cap B)$ and

$P(B\ only) = P(\bar{A} \cap B) = P(B) - P(A \cap B)$