# 10 TH MATHS ACTIVITY FULL

## SOLUTION 2024-2025

## CHAPTER – 1 (RELATIONS AND FUNCTIONS)

**1.**

**Activity 1**

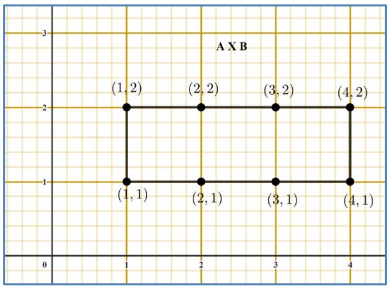
Let $A = \{x \mid x \in \mathbb{N}, x \le 4\}$, $B = \{y \mid y \in \mathbb{N}, y < 3\}$

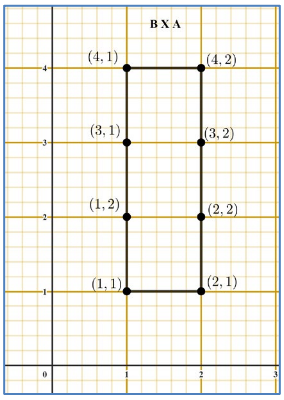
Represent $A \times B$ and $B \times A$ in a graph sheet. Can you see the difference between $A \times B$ and $B \times A$?

**Ans:** $A = \{1,2,3,4\}$ $B = \{1,2\}$

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

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



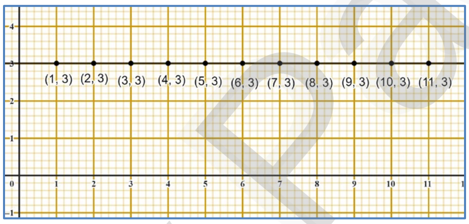

**2.**

**Activity 2**

Let $A$ and $B$ be the set of lines in $xy$-plane such that $A$ consists of lines parallel to $X$-axis. For $x \in A$, $y \in B$, let R be a relation from $A$ to $B$ defined by $xRy$ if $x$ is perpendicular to $y$. Find the elements of $B$ using a graph sheet.

**Ans:**

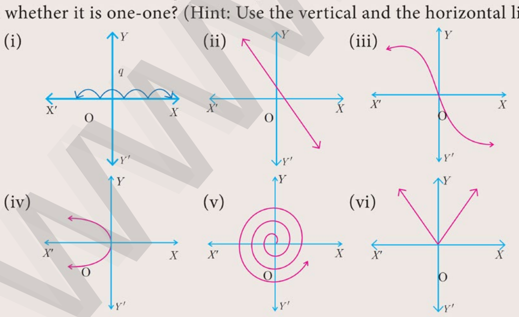
$B = \{9,8,7,6\}$




**3.**

**Activity 3**

Check whether the following curves represent a function. In the case of a function, check whether it is one-one? (Hint: Use the vertical and the horizontal line tests)




**Ans: (i)** It is a Function, but not One - one function. **(ii)** It is an One - one function. **(iii)** It is an One - one function. **(iv)** It is not at all a function. **(v)** It is not at all a function. **(vi)** It is a Function, but not One - one.

**4.**

**Activity 4**

Given that $h(x) = f \circ g(x)$, fill in the table for $h(x)$

| $x$ | $f(x)$ |
|---|---|
| 1 | 2 |
| 2 | 3 |
| 3 | 1 |
| 4 | 4 |

| $x$ | $g(x)$ |
|---|---|
| 1 | 2 |
| 2 | 4 |
| 3 | 3 |
| 4 | 1 |

| $x$ | $h(x)$ |
|---|---|
| 1 | 3 |
| 2 | - |
| 3 | - |
| 4 | - |

How to find $h(1)$ ?

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

$h(1) = f \circ g(1)$

$= f(2) = 3$

$\therefore h(1) = 3$

**Ans:** $h(2) = f \circ g(2) \Rightarrow f(4) = 4 \Rightarrow \boldsymbol{h(2) = 4}$

$h(3) = f \circ g(3) \Rightarrow f(3) = 1 \Rightarrow \boldsymbol{h(3) = 1}$

$h(4) = f \circ g(4) \Rightarrow f(1) = 2 \Rightarrow \boldsymbol{h(4) = 2}$

## CHAPTER – 2 (NUMBERS AND SEQUENCES)

**1.**

**Activity 1**

This activity helps you to find HCF of two positive numbers. We first observe the following instructions.

(i) Construct a rectangle whose length and breadth are the given numbers.

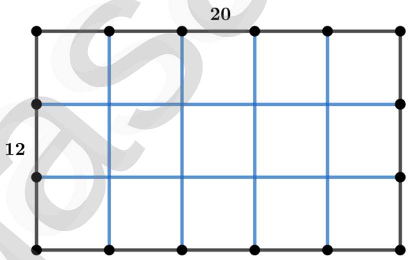
(ii) Try to fill the rectangle using small squares.

(iii) Try with $1 \times 1$ square; Try with $2 \times 2$ square; Try with $3 \times 3$ square and so on.

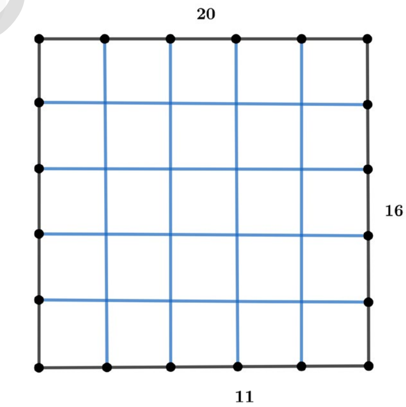
(iv) The side of the largest square that can fill the whole rectangle without any gap will be HCF of the given numbers.

(v) Find the HCF of (a) 12,20 (b) 16,24 (c) 11,9

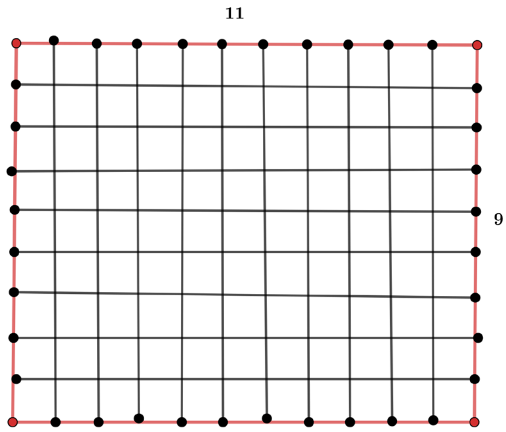
**Ans:**




**4 X 4 square fill with rectangle HCF = 4.**




**4 X 4 square fill with rectangle HCF = 4.**




**1 X 1 square fill with rectangle HCF = 1**

**2.**

**Activity 2**

This is another activity to determine HCF of two given positive integers.

(i) From the given numbers, subtract the smaller from the larger number.

(ii) From the remaining numbers, subtract smaller from the larger.

(iii) Repeat the subtraction process by subtracting smaller from the larger.

(iv) Stop the process, when the numbers become equal.

(v) The number representing equal numbers obtained in step (iv), will be the HCF of the given numbers.

Using this Activity, find the HCF of
(i) 90,15 (ii) 80,25 (iii) 40,16 (iv) 23,12 (v) 93,13

**Ans:** **Repeat subtraction method:**

**(i)** $90 - 15 = 75, 75 - 15 = 60, 60 - 15 = 45,$
$45 - 15 = 30, 30 - 15 = 15, 15 - 15 = 0, \boldsymbol{HCF} = \mathbf{15}$

**(ii)** $80 - 25 = 55, 55 - 25 = 30, 30 - 25 = 5,$
$25 - 5 = 15, 15 - 5 = 10, 10 - 5 = 5, 5 - 5 = 0,$
$\boldsymbol{HCF} = \mathbf{15}$

**(iii)** $40 - 16 = 24, 24 - 16 = 8, 16 - 8 = 8,$
$8 - 8 = 0, \boldsymbol{HCF} = \mathbf{8}.$

**(iv)** $23 - 12 = 11, 12 - 11 = 1, 1 - 1 = 0, \boldsymbol{HCF} = \mathbf{1}.$

**(v)** $93 - 13 = 80, 80 - 13 = 67, 67 - 13 = 43, 43 - 13 = 43, 43 - 13 = 30, 30 - 13 = 17, 17 - 13 = 4, 13 - 4 = 9, 9 - 4 = 5, 5 - 4 = 1, 1 - 1 = 0,$

$$\boldsymbol{HCF} = \mathbf{1}.$$

**3.**

**Activity 3**

Can you find the 4-digit pin number '*pqrs*' of an ATM card such that $p^2 \times q^1 \times r^4 \times s^3 = 3{,}15{,}000$?

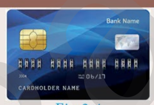


Fig.2.4

**Ans:**

| | |
|---|---|
| 5 | 3,15,000 |
| 5 | 63,000 |
| 5 | 12,600 |
| 5 | 2520 |
| 3 | 504 |
| 3 | 168 |
| 2 | 56 |
| 2 | 28 |
| 2 | 14 |
| | 7 |

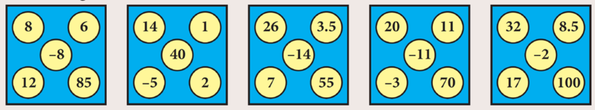
$315000 = 5^4 \times 3^2 \times 2^3 \times 7^1,$

$\boldsymbol{p = 3, q = 1, r = 5, s = 2}$

**4.**

**Activity 4**

There are five boxes here. You have to pick one number from each box and form five Arithmetic Progressions.




**Ans: A.P : 1 box** $= \mathbf{-2, -5, -8, -11, -14.}$

**A.P : 2 box** $= \mathbf{-3, 2, 7, 12, 17.}$

**A.P : 3 box** $= \mathbf{1, 3.5, 6, 8.5, 11.}$

**A.P : 4 box** $= \mathbf{8, 14, 20, 26, 32.}$

**A.P : 5 box** $= \mathbf{40, 55, 70, 85, 100.}$

**5.**

**Activity 5**

The sides of a given square is 10 cm. The mid points of its sides are joined to form a new square. Again, the mid points of the sides of this new square are joined to form another square. This process is continued indefinitely. Find the sum of the areas and the sum of the perimeters of the squares formed through this process.

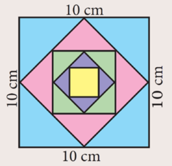


Fig.2.15

**Ans:**

| Square | Area (cm$^2$) | Perimeter (cm) |
|---|---|---|
| 1 | 100 | 40 |
| 2 | 50 | $20\sqrt{2}$ |
| 3 | 25 | 20 |
| 4 | 12.5 | $10\sqrt{2}$ |
| 5 | 6.25 | 10 |

**6.**

**Activity 6**

Take a triangle like this

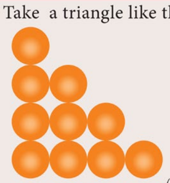


Fig.2.16 $(1+2+3+4)$

Make another triangle like this.

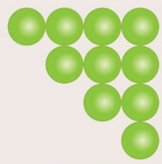


Fig.2.17 $(4+3+2+1)$

Join the second triangle with the first to get

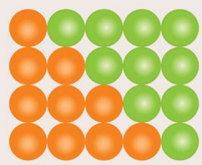


Fig.2.18

Thus, two copies of $1+2+3+4$ provide a rectangle of size $4 \times 5$.

We can write in numbers, what we did with pictures.

Let us write, $(4+3+2+1)+(1+2+3+4) = 4\times 5$

$2(1+2+3+4) = 4 \times 5$

Therefore, $1+2+3+4 = \frac{4\times 5}{2} = 10$

In a similar, fashion, try to find the sum of first 5 natural numbers. Can you relate these answers to any of the known formula?

**Ans:** Sum of $n$ natural Number $= \frac{n(n+1)}{2}$.

$$1+2+3+4+5 = \frac{5(5+1)}{2}$$
$$= \frac{5 \times 6}{2}$$
$$= 15$$

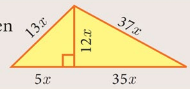
# CHAPTER – 3 (ALGEBRA)

**1.**

**Activity 1**

(i) The length of a rectangular garden is the sum of a number and its reciprocal. The breadth is the difference of the square of the same number and its reciprocal. Find the length, breadth and the ratio of the length to the breadth of the rectangle.

(ii) Find the ratio of the perimeter to the area of the given triangle.




**Ans:** **(i) Length** $= x + \frac{1}{x} = \frac{x^2+1}{x}$.

**Breadth** $= x^2 - \frac{1}{x^2} = \frac{x^4-1}{x^2}$.

$$L:B = \frac{L}{B} = \frac{x^2+1}{x} \times \frac{x^2}{x^4-1} = \frac{x}{x^2-1} = x : x^2 - 1.$$

**(ii) Perimeter** $= 13x + 37x + 40x = 90x$

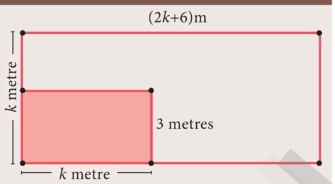
**Area** $= \frac{1}{2} \times 40x \times 12x = 240x^2$.

$$P:A = 90x : 240x^2 = 3 : 8x$$

**2.**

**Activity 2**

Consider a rectangular garden in front of a house, whose dimensions are $(2k+6)$ metre and $k$ metre. A smaller rectangular portion of the garden of dimensions $k$ metre and 3 metres is leveled. Find the area of the garden, not leveled.




**Ans:** Area of Garden $= k(2k+6) = 2k^2 + 6k$.

Area of levelled Portion $= 3k$.

Unlevelled Garden Area $= (2k^2 + 6k - 3k)$

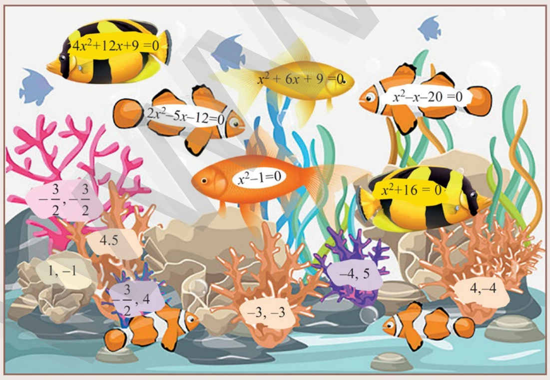
$= 2k^2 + 3k$

$= k(2k+3)$.

**3.**

**Activity 3**

Serve the fishes (Equations) with its appropriate food (roots). Identify a fish which cannot be served?




**Ans:** (i) $4x^2 + 12x + 9 = 0, (2x+3)^2, x = -\frac{3}{2}, -\frac{3}{2}$

**It has solution.**

(ii) $x^2 + 6x + 9 = 0, (x+3)^2, x = -3, -3.$

**It has solution.**

(iii) $x^2 - x - 20 = 0, (x-5)(x+4), x = 5, -4.$

**It has solution.**

(iv) $2x^2 - 5x - 12 = 0, (2x+3)(x-4), x = 4, -\frac{3}{2}.$

**It has solution.**

(v) $x^2 - 1 = 0, (x-1)(x+1), x = 1, -1.$

**It has solution.**

(vi) $x^2 + 16 = 0, x = -16$, x value not real.

**It has no solution.**

**4.**

**Activity 4**

(i) Take calendar sheets of a particular month in a particular year.
(ii) Construct matrices from the dates of the calendar sheet.
(iii) Write down the number of possible matrices of orders $2\times2$, $3\times2$, $2\times3$, $3\times3$, $4\times3$, etc.
(iv) Find the maximum possible order of a matrix that you can create from the given calendar sheet.
(v) Mention the use of matrices to organize information from daily life situations.

**Ans:**

| DECEMBER - 2024 | | | | | | |
|---|---|---|---|---|---|---|
| **Sun** | **Mon** | **Tue** | **Wed** | **Thu** | **Fri** | **Sat** |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | | | | |

$$A_{2\times2} = \begin{vmatrix} 1 & 2 \\ 8 & 9 \end{vmatrix} \begin{vmatrix} 2 & 3 \\ 9 & 10 \end{vmatrix} \begin{vmatrix} 3 & 4 \\ 10 & 11 \end{vmatrix}, \dots, \begin{vmatrix} 23 & 24 \\ 30 & 31 \end{vmatrix}$$

$$B_{3\times2} = \begin{vmatrix} 1 & 2 \\ 8 & 9 \\ 15 & 16 \end{vmatrix} \begin{vmatrix} 2 & 3 \\ 10 & 11 \\ 17 & 18 \end{vmatrix} \begin{vmatrix} 3 & 4 \\ 11 & 12 \\ 18 & 19 \end{vmatrix}, \dots, \begin{vmatrix} 16 & 17 \\ 23 & 24 \\ 30 & 31 \end{vmatrix}$$

$$C_{2\times3} = \begin{vmatrix} 1 & 2 & 3 \\ 8 & 9 & 10 \end{vmatrix} \begin{vmatrix} 2 & 3 & 4 \\ 9 & 10 & 11 \end{vmatrix}, \dots, \begin{vmatrix} 22 & 23 & 24 \\ 29 & 30 & 31 \end{vmatrix}$$

$$D_{3\times3} = \begin{vmatrix} 1 & 2 & 3 \\ 8 & 9 & 10 \\ 15 & 16 & 17 \end{vmatrix} \begin{vmatrix} 2 & 3 & 4 \\ 9 & 10 & 11 \\ 16 & 17 & 18 \end{vmatrix}, \dots, \begin{vmatrix} 15 & 16 & 17 \\ 22 & 23 & 24 \\ 29 & 30 & 31 \end{vmatrix}$$

$$E_{4\times3} = \begin{vmatrix} 1 & 2 & 3 \\ 8 & 9 & 10 \\ 15 & 16 & 17 \\ 22 & 23 & 24 \end{vmatrix}, \dots, \begin{vmatrix} 8 & 9 & 10 \\ 15 & 16 & 17 \\ 22 & 23 & 24 \\ 29 & 30 & 31 \end{vmatrix}$$

$$F_{3\times4} = \begin{vmatrix} 1 & 2 & 3 & 4 \\ 8 & 9 & 10 & 11 \\ 15 & 16 & 17 & 18 \end{vmatrix}, \dots, \begin{vmatrix} 14 & 15 & 16 & 17 \\ 21 & 22 & 23 & 24 \\ 28 & 29 & 30 & 31 \end{vmatrix}$$

$$G_{4\times4} = \begin{vmatrix} 1 & 2 & 3 & 4 \\ 8 & 9 & 10 & 11 \\ 15 & 16 & 17 & 18 \\ 22 & 23 & 24 & 25 \end{vmatrix}, \dots, \begin{vmatrix} 7 & 8 & 9 & 10 \\ 14 & 15 & 16 & 17 \\ 21 & 22 & 23 & 24 \\ 28 & 29 & 30 & 31 \end{vmatrix}$$

**Similarly we make $2\times4, 2\times5, 2\times6, 3\times5, 3\times6, 3\times7, 4\times2, 4\times6, 5\times2, 5\times3$ matrices.**

The Highest order of Matrix is

$$H_{4\times 6} = \begin{vmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 8 & 9 & 10 & 11 & 12 & 13 \\ 15 & 16 & 17 & 18 & 19 & 20 \\ 22 & 23 & 24 & 25 & 26 & 27 \end{vmatrix}$$

5.

**Activity 5**

| No. | Elements | Possible orders | Number of possible orders |
|---|---|---|---|
| 1. | 4 | | 3 |
| 2. | | $1\times9,\ 9\times1,\ 3\times3$ | |
| 3. | 20 | | |
| 4. | 8 | | 4 |
| 5. | 1 | | |
| 6. | 100 | | |
| 7. | | $1\times10,\ 10\times1,\ 2\times5,\ 5\times2$ | |

Do you find any relationship between number of elements (second column) and number of possible orders (fourth column)? If so, what is it?

**Ans: Yes,** No.of possible order is equal to the No.of Factors of elements number.

| Elements | Possible orders | No. of Possible orders |
|---|---|---|
| 4 | $1\times4, 2\times2, 4\times1$ | 3 |
| **9** | $1\times9, 3\times3, 9\times1$ | 3 |
| 20 | $1\times20, 2\times10, 4\times5, 5\times4, 10\times2, 20\times1$ | 6 |
| 8 | $1\times8, 2\times4, 4\times2, 8\times1$ | 4 |
| 1 | $1\times1$ | 1 |
| 100 | $1\times100, 2\times50, 5\times20, 10\times10, 20\times5, 25\times4, 4\times25, 100\times1, 50\times2$ | 9 |
| **10** | $1\times10, 2\times5, 5\times2, 10\times1$ | 4 |

## CHAPTER – 4 (GEOMETRY)

**1.**

**Activity 1**

Let us try to construct a line segment of length $\sqrt{2}$.

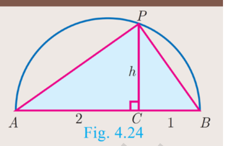


Fig. 4.24

For this, we consider the following steps.

**Step1:** Take a line segment of length 3 units. Call it as AB.

**Step2:** Take a point $C$ on $AB$ such that $AC=2$, $CB=1$.

**Step3:** Draw a semi-circle with AB as diameter as shown in the diagram

**Step4:** Take a point '$P$' on the semi-circle such that $CP$ is perpendicular to $AB$.

**Step5:** Join $P$ to $A$ and $B$. We will get two right triangles $ACP$ and $BCP$.

**Step6:** Verify that the triangles $ACP$ and $BCP$ are similar.

**Step7:** Let $CP = h$ be the common altitude. Using similarity, find $h$.

**Step8:** What do you get upon finding $h$?

Repeating the same process, can you construct a line segment of lengths $\sqrt{3}, \sqrt{5}, \sqrt{8}$.

**Ans:**

**Step -6:** $\angle ACP = \angle PCB = 90°$ **.** Since $\angle C$ is common. $\angle PAC = \angle BPC, \angle CPA = \angle CPB$.

By AA Similarity Triangles are similar $\Delta\, ACP \sim \Delta PCB$

Let $CP = h.\ \frac{AC}{PC} = \frac{CP}{CB} \to \frac{2}{h} = \frac{h}{1} \to h^2 = 2 \to \boldsymbol{h = \sqrt{2}}$.

**Step-8:** $\boldsymbol{h = \sqrt{AC \times CB}}$ .

Yes we can construct a line segments of lengths $\sqrt{3}, \sqrt{5}, \sqrt{8}$ by taking a line segment of length $3+1, 5+1, 8+1$ units respectively.

**2.**

**Activity 2**

Take any ruled paper and draw a triangle $ABC$ with its base on one of the lines. Several parallel lines will cut the triangle $ABC$.

Select any one line among them and name the points where it meets the sides $AB$ and $AC$ as $P$ and $Q$.

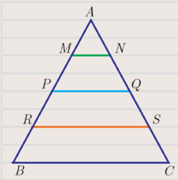


Fig. 4.28

Can we find the ratio of $\frac{AP}{PB}$ and $\frac{AQ}{QC}$. By measuring $AP$, $PB$, $AQ$ and $QC$ through a scale, verify whether the ratios are equal or not? Try for different parallel lines, say $MN$ and $RS$.

Now find the ratios $\frac{AM}{MB}, \frac{AN}{NC}$ and $\frac{AR}{RB}, \frac{AS}{SC}$.

Check if they are equal? The conclusion will lead us to one of the most important theorem in Geometry, which we will discuss below.

**Ans: Yes,** Equal . By BPT or Thales Theorem. The Parallel line divides the sides in the Same Ratio.

$$\frac{AP}{PB} = 2, \frac{AQ}{QC} = 2 \to 2:2 = \mathbf{1:1}$$

$$\frac{AM}{MB} = \frac{AN}{NC} \to \frac{AR}{RB} = \frac{AS}{SC}$$

**3.**

**Activity 3**

**Step 1:** Take a chart and cut it like a triangle as shown in Fig.4.34(a).

**Step 2:** Then fold it along the symmetric line $AD$. Then C and B will be one upon the other.

**Step 3:** Similarly fold it along CE, then $B$ and $A$ will be one upon the other.

**Step 4:** Similarly fold it along BF, then $A$ and $C$ will be one upon the other.

Find $AB$, $AC$, $BD$, $DC$ using a scale.

Find $\frac{AB}{AC}, \frac{BD}{DC}$ check if they are equal?

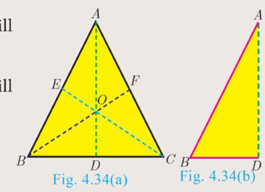


Fig. 4.34(a) Fig. 4.34(b)

In the three cases, the internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the corresponding sides containing the angle.

What do you conclude from this activity?

**Ans:**

$$AB = 3.8, AC = 3.8, BD = 1.7, DC = 1.7.$$

$$\frac{AB}{AC} = \frac{BD}{DC} \rightarrow \frac{3.8}{3.8} = \frac{1.7}{1.7} = 1.$$

Yes, Equal. By **ABT .**

**4.**

**Activity 4**

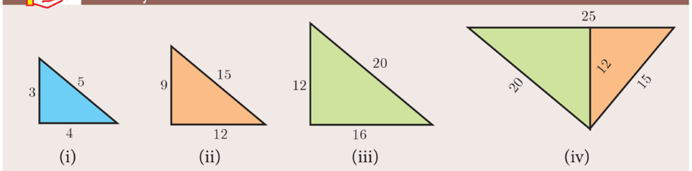


Fig. 4.45

**Step 1:** Take a chart paper, cut out a right angled triangle of measurement as given in triangle (i) .

**Step 2:** Take three more different colour chart papers and cut out three triangles such that the sides of triangle (ii) is three times of the triangle (i), the sides of triangle (iii) is four times of the triangle (i), the sides of triangle (iv) is five times of triangle (i).

**Step 3:** Now keeping the common side length 12 place the triangle (ii) and (iii) over the triangle (iv) such that the sides of these two triangles [(ii) and (iii)] coincide with the triangle (iv).

Observe the hypotenuse side and write down the equation. What do you conclude?

**Ans:** From (ii) $15^2 = 9^2 + 12^2$. From (iii) $20^2 = 12^2 + 16^2$. From (iv) $\mathbf{25^2 = 20^2 + 15^2}$.

**Sub in (iii)** $\mathbf{(16+9)^2 = 12^2 + 16^2 + 9^2 + 12^2}$.

$$16^2 + 9^2 + 2 \times 16 \times 9 = 12^2 + 16^2 + 9^2 + 12^2.$$

$$2 \times 16 \times 9 = 2 \times 12^2. \rightarrow \mathbf{144 = 144}.$$

$$\boxed{BD^2 = AD \times DC}$$

**5.**

**Activity 5**

(i) Take two consecutive odd numbers.

(ii) Write the reciprocals of the above numbers and add them. You will get a number of the form $\frac{p}{q}$.

(iii) Add 2 to the denominator of $\frac{p}{q}$ to get $q+2$.

(iv) Now consider the numbers $p, q, q+2$. What relation you get between these three numbers? Try for three pairs of consecutive odd numbers and conclude your answer.

**Ans:**

Let Taking Two odd numbers. 5 and 7. Reciprocal are $\frac{1}{5}$ $and \frac{1}{7}$. $\frac{1}{5} + \frac{1}{7} = \frac{7+5}{35} = \frac{12}{35} \rightarrow \mathbf{p = 12, q = 35}$.

$\mathbf{q + 2 = 37}$. The relation is

$$12^2 + 35^2 = 37^2.$$

$$\mathbf{144 + 1225 = 1369}$$

$1369 = 1369$. $\boldsymbol{P, q, q+2}$ are Pythagorean triplet.

## CHAPTER – 5 (COORDINATE GEOMETRY)

**1.**

**Activity 1**

(i) Take a graph sheet.

(ii) Consider a triangle whose base is the line joining the points (0,0) and (6,0)

(iii) Take the third vertex as (1,1), (2,2), (3,3), (4,4), (5,5) and find their areas. Fill in the details given.

(iv) Do you see any pattern with $A_1, A_2, A_3, A_4, A_5$ ? If so mention it.

(v) Repeat the same process by taking third vertex in step (iii) as (1,2), (2,4), (3,8), (4,16), (5,32).

(vi) Fill the table with these new vertices.

(vii) What pattern do you observe now with $A_1, A_2, A_3, A_4, A_5$?

| Third vertex | Area of Triangle |
|---|---|
| (1,1) | $A_1 =$ |
| (2,2) | $A_2 =$ |
| (3,3) | $A_3 =$ |
| (4,4) | $A_4 =$ |
| (5,5) | $A_5 =$ |

| Third vertex | Area of Triangle |
|---|---|
| (1,2) | $A_1 =$ |
| (2,4) | $A_2 =$ |
| (3,8) | $A_3 =$ |
| (4,16) | $A_4 =$ |
| (5,32) | $A_5 =$ |

**Ans:**

(iv) It is an **A.P** Sequence.(vii) It is an **G.P** Sequence.

| **Third vertex** | Area of Triangle (Sq.Units) | **Third vertex** | Area of Triangle (Sq.Units) |
|---|---|---|---|
| **(1,1)** | 3 | **(1,2)** | 6 |
| **(2,2)** | 6 | **(2,4)** | 12 |
| **(3,3)** | 9 | **(3,8)** | 24 |
| **(4,4)** | 12 | **(4,16)** | 48 |
| **(5,5)** | 15 | **(5,32)** | 96 |

**2.**

**Activity 2**

Find the area of the shaded region

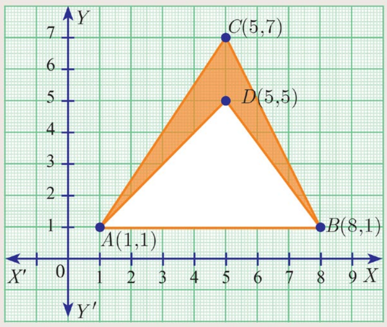


Fig. 5.15

**Ans:**

Let take a Points A(1,1), B(8,1), C(5,7).

Area of $\Delta ABC$ $= \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$

$$= \frac{1}{2}\begin{vmatrix} 1 & 8 & 5 & 1 \\ 1 & 1 & 7 & 1 \end{vmatrix}$$

$$= \frac{1}{2}\{(1+56+5) - (8+5+7)\}$$

$$= \frac{1}{2}\{62 - 20\} = \frac{1}{2}\{42\} = \mathbf{21\ sq.units}.$$

Let take a Points A(1,1), B(8,1), D(5,5).

Area of $\Delta ABC = \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$

$$= \frac{1}{2}\begin{vmatrix} 1 & 8 & 5 & 1 \\ 1 & 1 & 5 & 1 \end{vmatrix}$$

$$= \frac{1}{2}\{(1 + 40 + 5) - (8 + 5 + 5)\}$$

$$= \frac{1}{2}\{46 - 18\} = \frac{1}{2}\{28\} = \mathbf{12\ sq.units.}$$

Area of Unshaded region $= 21 - 12 = \mathbf{7\ sq.units}$

**Aliter:**

By Using Quadrilateral Area Formula

Let Take Shaded Region Points in Counter clockwise

**A(1,1), D(5,5), B(8,1), C(5,7).**

Area of ADBC$= \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{vmatrix}$

$$= \frac{1}{2}\begin{vmatrix} 1 & 5 & 8 & 5 & 1 \\ 1 & 5 & 1 & 7 & 1 \end{vmatrix}$$

$$= \frac{1}{2}\{(5 + 5 + 56 + 5) - (5 + 40 + 5 + 7)\}$$

$$= \frac{1}{2}\{71 - 57\} = \frac{1}{2}\{14\} = \mathbf{7\ sq.units.}$$

**3.**

**Activity 3**

The diagram contain four lines $l_1$, $l_2$, $l_3$ and $l_4$.

(i) Which lines have positive slope?

(ii) Which lines have negative slope?

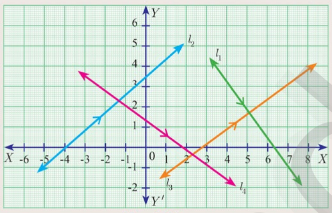


Fig. 5.19

**Ans:**

(i) $l_2, l_3$ have positive slopes, because they make acute angles with X -axis.

(ii) $l_1, l_4$ have negative slopes, because they make obtuse angles with X- axis.

**4.**

**Activity 4**

If line $l_1$ is perpendicular to line $l_2$ and line $l_3$ has slope 3 then

(i) find the equation of line $l_1$

(ii) find the equation of line $l_2$

(iii) find the equation of line $l_3$

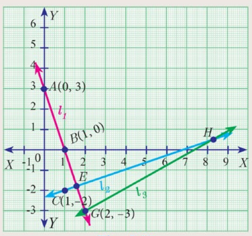


Fig. 5.38

**Ans:**

(i) Line $l_1$ Equation: X - intercept = 1, Y intercept =3,

Using two intercept form. $\frac{x}{a} + \frac{y}{b} = 1 \rightarrow \frac{x}{1} + \frac{y}{3} = 1.$

$$\mathbf{3x + y - 3 = 0}$$

(ii) Line $l_2$ Equation: Since, $l_2$ is perpendicular to $l_1$.

Slope $l_1 = -3, and\ l_2 = \frac{1}{3}$. Passing point $(1, -2)$

Using Slope point form $y - y_1 = m(x - x_1)$

$$y + 2 = \frac{1}{3}(x - 1) \rightarrow 3y + 6 = x - 1$$

**Equation of S.L** $\mathbf{x - 3y - 7 = 0}$

(iii) Line $l_3$ Equation: Slope $l_3 = 3$ Passing $(2, -3)$

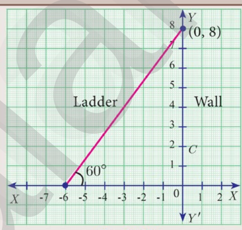
Using Slope point Form $y - y_1 = m(x - x_1)$

$y + 3 = 3(x - 2) \rightarrow \mathbf{3x - y - 9 = 0}.$

**5.**

**Activity 5**

A ladder is placed against a vertical wall with its foot touching the horizontal floor. Find the equation of the ladder under the following conditions.

| No. | Condition | Picture | Equation of the ladder |
|---|---|---|---|
| (i) | The ladder is inclined at 60° to the floor and it touches the wall at (0,8) |  Fig. 5.39 | ________ |
| (ii) | The foot and top of the ladder are at the points (2,4) and (5,1) | ________ | ________ |

**Ans:**

(i) Slope of the Ladder is $\frac{8}{6} = \boldsymbol{m} = \frac{\mathbf{4}}{\mathbf{3}}$.

Point - slope form (0,8) $m = \frac{4}{3}(y - y_1) = m(x - x_1)$

$$y - 8 = \frac{4}{3}(x - 0) \rightarrow 3(y - 8) = 4x$$

$$\mathbf{4x - 3y - 24 = 0}$$

(ii) Two point are (2,4) and (5,1)

Two point form $\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1} = \frac{y-4}{1-4} = \frac{x-2}{5-2}$

$$\frac{y-4}{-3} = \frac{x-2}{3} \rightarrow 3y - 12 = -3x + 6$$

$$\mathbf{3x + 3y - 18 = 0, x + y - 6 = 0}$$

**6.**

**Activity 6**

Find the equation of a straight line for the given diagrams

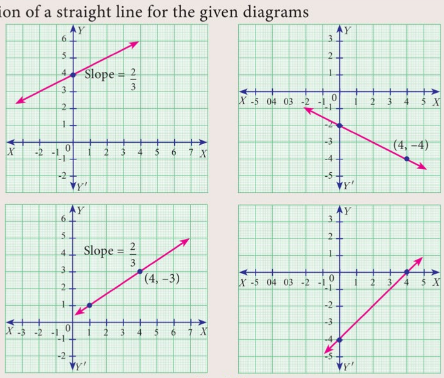


Fig. 5.41

**Ans:**

**(i)** Point (0,4) , slope $m = \frac{2}{3}$. Using Point slope form

$$(y - y_1) = m(x - x_1) \rightarrow (y - 4) = \frac{2}{3}(x - 0)$$

$$3y - 12 = 2x \rightarrow \mathbf{2x - 3y + 12 = 0.}$$

**(ii)** Two points $(0, -2), (4, -4)$. Two point form

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1} = \frac{y + 2}{-4 + 2} = \frac{x - 0}{4 - 0}$$

$$\frac{y+2}{-2} = \frac{x}{4} \rightarrow 4y + 8 = -2x, \mathbf{2x + 4y + 8 = 0.}$$

**(iii)** Point (4,3) , slope $m = \frac{2}{3}$. Using Point slope form

$$(y - y_1) = m(x - x_1) \rightarrow (y - 3) = \frac{2}{3}(x - 4)$$

$$3y - 9 = 2x - 8 \rightarrow \mathbf{2x - 3y + 1 = 0}$$

**(iv)** Points $(4,0), (0, -4)$. Two point form

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

$$\frac{y}{-4} = \frac{x - 4}{-4} \rightarrow -4y = -4x + 16$$

$$\mathbf{4x - 4y - 16 = 0}$$

## CHAPTER – 6 (TRIGONOMETRY)

**1.**

**Activity 1**

Take a white sheet of paper. Construct two perpendicular lines $OX$, $OY$ which meet at $O$, as shown in the Fig. 6.4(a).

Considering $OX$ as $X$ axis, $OY$ as $Y$ axis.

We will verify the values of $\sin\theta$ and $\cos\theta$ for certain angles $\theta$.

Let $\theta = 30°$

Construct a line segment $OA$ of any length such that $\angle AOX = 30°$, as shown in the Fig. 6.4(b).

Draw a perpendicular from $A$ to $OX$, meeting at $B$.

Now using scale, measure the lengths of $AB$, $OB$ and $OA$.

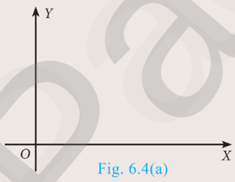


Fig. 6.4(a)

Find the ratios $\frac{AB}{OA}, \frac{OB}{OA}$ and $\frac{AB}{OB}$.

What do you get? Can you compare these values with the trigonometric table values? What is your conclusion? Carry out the same procedure for $\theta = 45°$ and $\theta = 60°$. What are your conclusions?

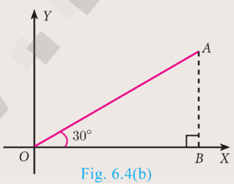
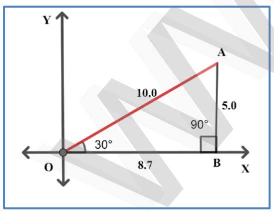


Fig. 6.4(b)

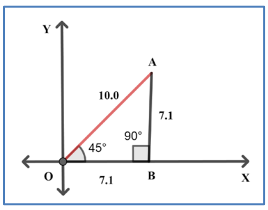
**Ans:**




$$\frac{AB}{OA} = \frac{5}{10} = \frac{1}{2} = \sin 30°$$

$$\frac{OB}{OA} = \frac{8.7}{10} = 0.87 = \cos 30°$$

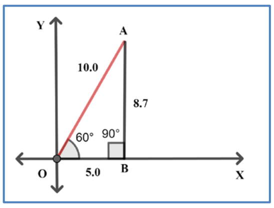
$$\frac{AB}{OB} = \frac{5}{8.7} = 0.57 = \tan 30°$$




$$\frac{AB}{OA} = \frac{7.1}{10} = 0.71 = \sin 45°$$

$$\frac{OB}{OA} = \frac{7.1}{10} = 0.71 = \cos 45°$$

$$\frac{AB}{OB} = \frac{7.1}{7.1} = 1 = \tan 45°$$




$$\frac{AB}{OA} = \frac{8.7}{10} = 0.87 = \sin 60°$$

$$\frac{OB}{OA} = \frac{5}{10} = \frac{1}{2} = \cos 60°$$

$$\frac{AB}{OB} = \frac{8.7}{5} = 1.74 = \tan 60°$$

We conclude that

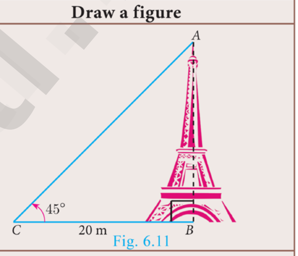
$$\sin 30° = \cos 60°, \sin 60° = \cos 30°$$

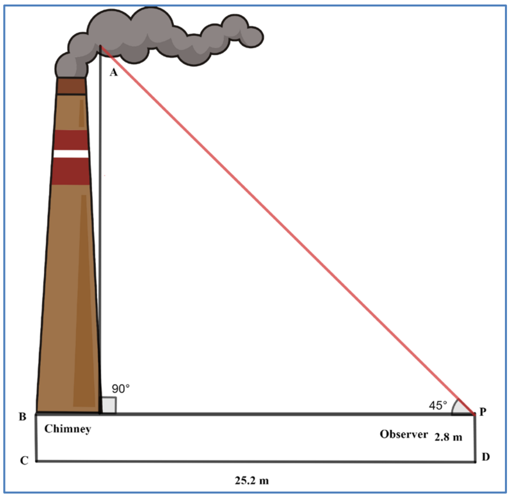
$$\sin 45° = \cos 45°, \tan 30° = \frac{1}{\tan 60°} = \cot 60°$$

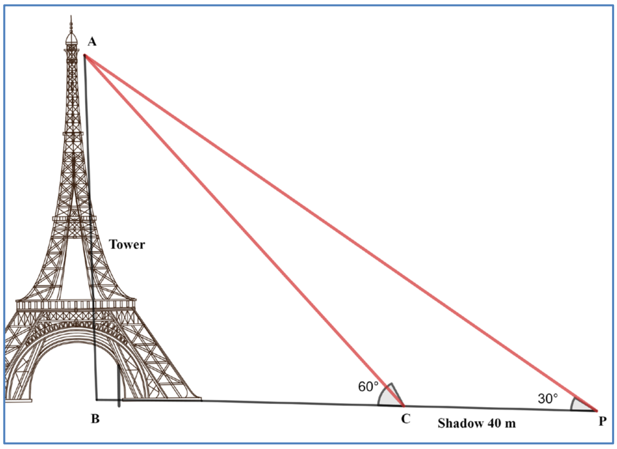
**2.**

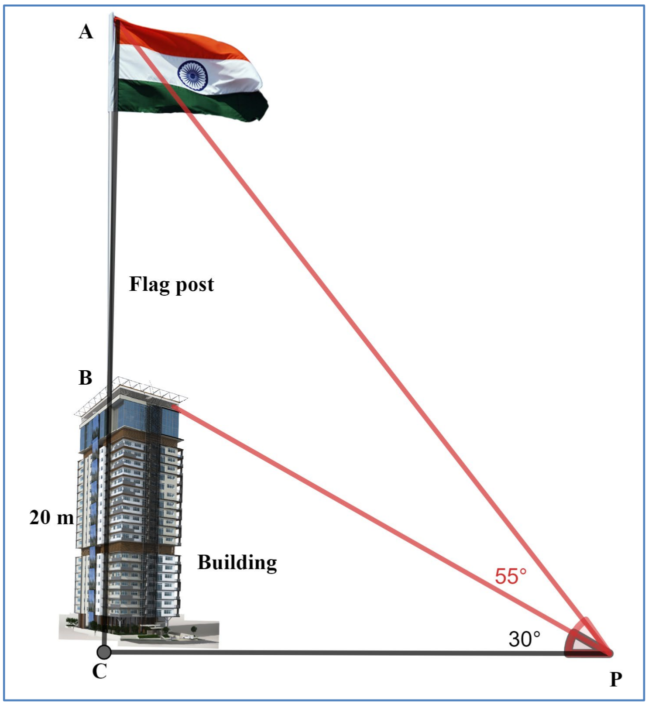
**Activity 2**

Representation of situations through right triangles. Draw a figure to illustrate the situation.

| Situations | Draw a figure |
|---|---|
| A tower stands vertically on the ground. From a point on the ground, which is 20m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 45°. |   Fig. 6.11 |
| An observer of 1.8 m tall is 25.2 m away from a chimney. The angle of elevation of the top of the chimney from her eyes is 45°. | ………………………………… |
| From a point $P$ on the ground the angle of elevation of the top of a 20 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from $P$ is 55°. | ………………………………… |
| The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it is 60°. | ………………………………… |






## CHAPTER – 7 (MENSURATION)

**1.**

**Activity 1**

(i) Take a semi-circular paper with radius 7 cm and make it a cone. Find the C.S.A. of the cone.

(ii) Take a quarter circular paper with radius 3.5 cm and make it a cone. Find the C.S.A. of the cone.

**Ans:**

(i) The C.S.A of cone = The Area of the Semi-Circular Paper.

$$= \frac{1}{2}(\pi r^2) = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$$

$$= 77\ cm^2.$$

(ii) The C.S.A of the cone = The Area of the Quadrant Paper

$$= \frac{1}{4}(\pi r^2) = \frac{1}{4} \times \frac{22}{7} \times 3.5 \times 3.5$$

$$= 9.625\ cm^2.$$

**2.**

**Activity 2**

(i) Take a sphere of radius 'r'.

(ii) Take a cylinder whose base diameter and height are equal to the diameter of the sphere.

(iii) Now, roll thread around the surface of the sphere and the cylinder without overlapping and leaving space between the threads.

(iv) Now compare the length of the two threads in both the cases.

(v) Use this information to find surface area of sphere.

**Ans:**

Given, Sphere Radius = $r$.

Cylinder radius = $r$, it's height = $2r$.

The length of the threads are equal.

The S.A of the sphere = The CSA of the cylinder.

$$= 2\pi rh = 2\pi r(2r)$$

$$= 4\pi r^2.$$

**3.**

**Activity 3**

Using a globe, list any two countries in the northern and southern hemispheres.

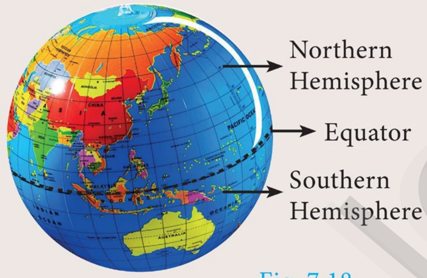



Fig. 7.18

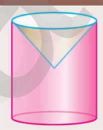
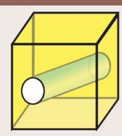
**Ans:**

Northern Hemisphere Countries: **India, Japan.**

Southern Hemisphere Countries: **Australia, New Zealand**.

**4.**

**Activity 4**

| Combined solids |  |  |  |  |
|---|---|---|---|---|
| List out the solids in each combined solid | | | | |
| Total Surface Area of the combined solid | | | | |

**Ans:**

(i) Solid Cylinder and Circular Cone.

TSA= $2\pi rh + \pi r^2 + \pi rl = \pi r(2h + r + l)$.

(ii) Solid cylinder, Hemisphere, Circular cone

TSA $= 2\pi rh + 2\pi r^2 + \pi rl = \pi r(2h + 2r + l)$

(iii) Solid cylinder and Circular cone

TSA $= 2\pi rh + \pi r^2 + \pi rl = \pi r(2h + r + l)$

(iv) Cube and Solid cylinder and

TSA $= 6a^2 + 2\pi rh - 2\pi r^2 = 6a^2 + 2\pi r(h - r)$

**5.**

**Activity 5**

The adjacent figure shows a cylindrical can with two balls. The can is just large enough so that two balls will fit inside with the lid on. The radius of each tennis ball is 3 cm. Calculate the following

(i) height of the cylinder.

(ii) radius of the cylinder.

(iii) volume of the cylinder.

(iv) volume of two balls.

(v) volume of the cylinder not occupied by the balls.

(vi) percentage of the volume occupied by the balls.

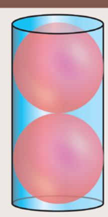


Fig. 7.43

**Ans:**

(i) Height of the cylinder = $4 \times 3 = 12\ cm$.

(ii) Radius of the cylinder = $3\ cm$.

(iii) Volume of the cylinder. $\pi r^2 h = \pi \times 3^2 \times 12$

$= 108\pi\ cm^3$

(iv) Volume of two balls. $2 \times \frac{4}{3} \times \pi r^3 = 2 \times \frac{4}{3} \times \pi 3^3$

$= 72\pi\ cm^3$

(v) Volume of the cylinder occupied by the balls

$= 36\pi\ cm^3$.

(vi) Percentage of the volume by the balls $= 66.67\%$

$$\%\text{ of Volume} = \frac{\text{Volume of 2 balls}}{\text{Volume of cylinder}} \times 100 = \frac{72\pi}{108\pi} \times 100$$

$$= \mathbf{66.67\%}$$

## CHAPTER – 8 (STATISTICS AND PROBABILITY)

**1.**

**Activity 1**

Find the standard deviation of the marks obtained by you in all five subjects in the quarterly examination and in the midterm test separately. What do you observe from your results.

**Ans:**

| **Test** | Tamil | English | Maths | Science | S.S |
|---|---|---|---|---|---|
| Mid Term | **80** | **81** | **100** | **92** | **97** |
| Quart | **92** | **88** | **90** | **90** | **90** |

**Mid Term : Mean**

$$\bar{x} = \frac{80+81+100+92+97}{5} = \frac{450}{5} = 90$$

| $x_i$ | $d_i = x_i - \bar{x}$ $= x_i - 90$ | $d_i^2$ |
|---|---|---|
| 80 | −10 | 100 |
| 81 | −9 | 81 |
| 100 | 10 | 100 |
| 92 | 2 | 4 |
| 97 | 7 | 49 |
| | $\sum d_i^2$ | 334 |

**S.D**

$$\sigma = \sqrt{\frac{\sum d_i^2}{n}} = \sqrt{\frac{334}{5}} = \sqrt{66.8} = \mathbf{8.17}$$

**Quarterly Exam : Mean**

$$\bar{x} = \frac{92+88+90+90+90}{5} = \frac{450}{5} = 90$$

| $x_i$ | $d_i = x_i - \bar{x}$ $= x_i - 90$ | $d_i^2$ |
|---|---|---|
| 92 | −2 | 4 |
| 88 | −2 | 4 |
| 90 | 0 | 0 |
| 90 | 0 | |
| 90 | 0 | 0 |
| | $\sum d_i^2$ | 4 |

**S.D**

$$\sigma = \sqrt{\frac{\sum d_i^2}{n}} = \sqrt{\frac{4}{5}} = \sqrt{0.8} = \mathbf{0.89}$$

We observe that total and Mean are both same, there are much difference in standard deviation. Because the mark obtained in the mid term are scatted towards the central value of the Quarterly exam.

**2.**

**Activity 3**

There are three routes $R_1$, $R_2$ and $R_3$ from Madhu's home to her place of work. There are four parking lots $P_1$, $P_2$, $P_3$, $P_4$ and three entrances $B_1$, $B_2$, $B_3$ into the office building. There are two elevators $E_1$ and $E_2$ to her floor. Using the tree diagram explain how many ways can she reach her office?

**Activity 4**

Collect the details and find the probabilities of

(i) selecting a boy from your class.

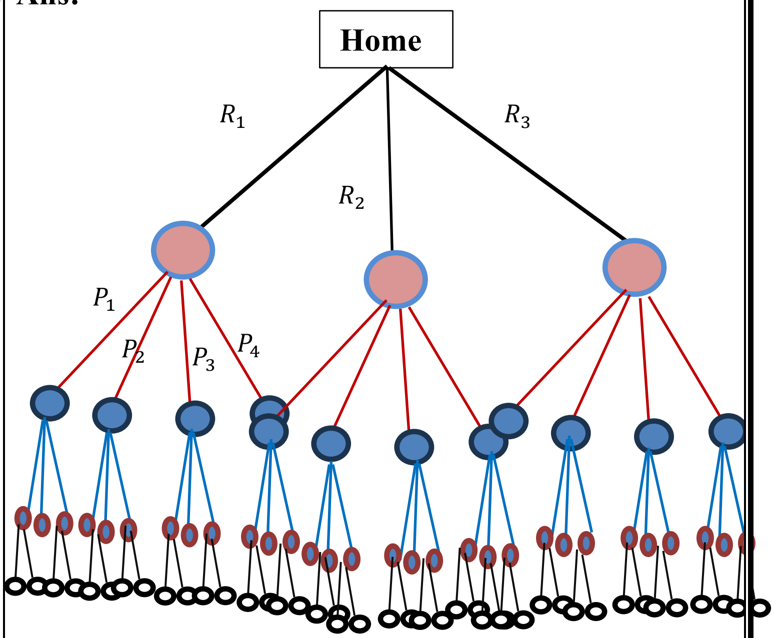
(ii) selecting a girl from your class.

(iii) selecting a student from tenth standard in your school.

(iv) selecting a boy from tenth standard in your school.

(v) selecting a girl from tenth standard in your school.

**Ans:**



No. of Ways to Reach the office:

$= 3(R_1, R_2, R_3) \times 4(P_1, P_2, P_3, P_4) \times$

$= 3(B_1, B_2, B_3) \times 2(E_1, E_2)$

$= 72$ ways.

**Activity : 4**

Let 10th Boys = 16. Girls =8 . Total = 24.

Total strength =800.Sample space for 10 Std =24.

(i) Probability of selecting a boy from 10 Std

$$= \frac{16}{24} = 0.666$$

(ii) Probability of selecting a Girl from 10 Std

$$= \frac{8}{24} = 0.333$$

(iii) Probability of selecting a Student from 10 Std

$$= \frac{24}{800} = 0.03$$

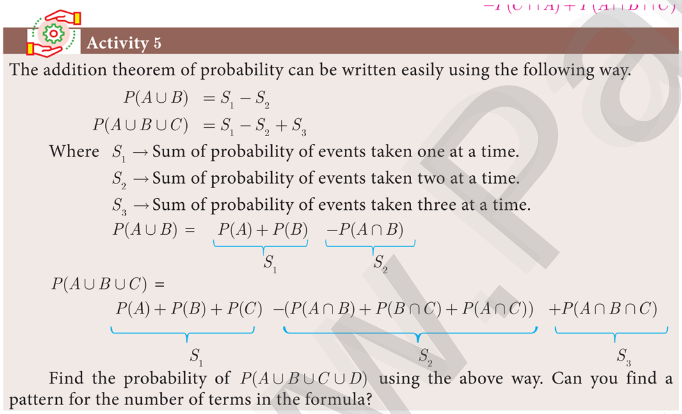
(iv) Probability of selecting a boy from 10 Std in school

$$= \frac{16}{800} = 0.02$$

(v) Probability of selecting a Girl from 10 Std in school

$$= \frac{8}{800} = 0.01$$

**Activity : 5**


Activity 5

The addition theorem of probability can be written easily using the following way.

$P(A \cup B) = S_1 - S_2$

$P(A \cup B \cup C) = S_1 - S_2 + S_3$

Where $S_1 \rightarrow$ Sum of probability of events taken one at a time.

$S_2 \rightarrow$ Sum of probability of events taken two at a time.

$S_3 \rightarrow$ Sum of probability of events taken three at a time.

$P(A \cup B) = \underbrace{P(A) + P(B)}_{S_1} \underbrace{-P(A \cap B)}_{S_2}$

$P(A \cup B \cup C) = \underbrace{P(A) + P(B) + P(C)}_{S_1} \underbrace{-(P(A \cap B) + P(B \cap C) + P(A \cap C))}_{S_2} \underbrace{+P(A \cap B \cap C)}_{S_3}$

Find the probability of $P(A \cup B \cup C \cup D)$ using the above way. Can you find a pattern for the number of terms in the formula?

**Ans:**

Let

$S_1 \rightarrow$ Sum of Probability of events taken one at a time.

$S_2 \rightarrow$ Sum of Probability of events taken two at a time.

$S_3 \rightarrow$ Sum of Probability of events taken three at a time.

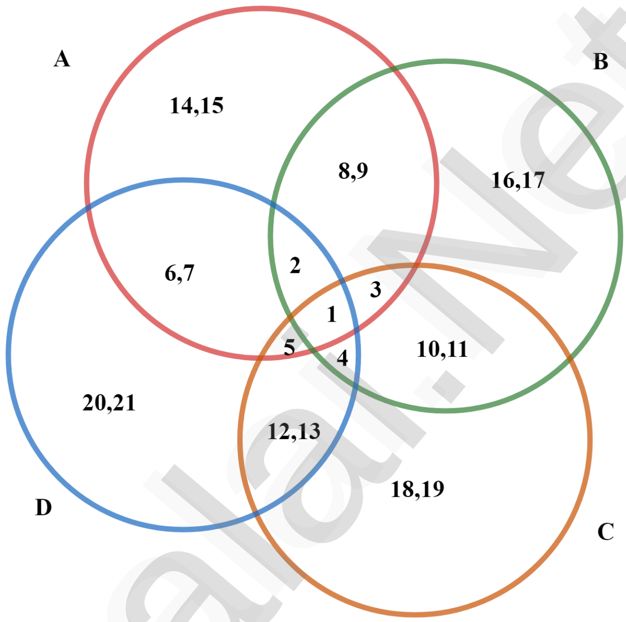
$S_4 \rightarrow$ Sum of Probability of events taken four at a time.

$S_5 \rightarrow$ Sum of Probability of events taken five at a time.

And so on…..

Let numbers from 1 to 21. $n(S) = 21$.

$(A \cup B \cup C \cup D) = \{1,2,3 \ldots ,21\}$,




$n(A \cup B \cup C \cup D) = 21$

$$P(A \cup B \cup C \cup D) = \frac{n(A \cup B \cup C \cup D)}{n(S)} = \frac{21}{21} = 1$$

From venn diagram.

**Taking One at a time.**

$A = \{1,2,3,5,6,7,8,9,14,15\}, n(A) = 10, P(A) = \frac{10}{21}$

$B = \{1,2,3,4,8,9,10,11,16,17\}, n(B) = 10, P(B) = \frac{10}{21}$

$C = \{1,3,4,5,10,11,12,13,18,19\}, n(C) = 10, P(C) = \frac{10}{21}$

$D = \{1,2,4,5,6,7,12,13,20,21\}, n(D) = 10, P(D) = \frac{10}{21}$

$$\therefore \boldsymbol{P(A) + P(B) + P(C) + P(D) = S_1 = \frac{40}{21}}$$

**Taking Two at a time.**

$(A \cap B) = \{1,2,3,8,9\}; n(A \cap B) = 5; P(A \cap B) = \frac{5}{21}$

$(B \cap C) = \{1,3,4,10,11\}; n(B \cap C) = 5; P(B \cap C) = \frac{5}{21}$

$(C \cap D) = \{1,4,5,12,13\}; n(C \cap D) = 5; P(C \cap D) = \frac{5}{21}$

$(D \cap A) = \{1,2,5,6,7\}; n(D \cap A) = 5; P(A \cap B) = \frac{5}{21}$

$(A \cap C) = \{1,3,5\}; n(A \cap C) = 3; P(A \cap B) = \frac{3}{21}$

$(B \cap D) = \{1,2,4\}; n(A \cap C) = 3; P(A \cap B) = \frac{3}{21}$

$$\boldsymbol{P(A\cap B)+P(B\cap C)+P(C\cap D)+P(D\cap A)+P(A\cap C)+P(B\cap D)=S_2=\frac{26}{21}}$$

**Taking Three at a time.**

$(A\cap B\cap C)=\{1,3\};\ n(A\cap B\cap C)=2;$

$P(A\cap B\cap C)=\frac{2}{21}$

$(B\cap C\cap D)=\{1,4\};\ n(B\cap C\cap D)=2;$

$P(B\cap C\cap D)=\frac{2}{21}$

$(C\cap D\cap A)=\{1,5\};\ n(C\cap D\cap A)=2;$

$P(C\cap D\cap A)=\frac{2}{21}$

$(D\cap A\cap B)=\{1,2\};\ n(D\cap A\cap B)=2;$

$P(D\cap A\cap B)=\frac{2}{21}$

$P(A\cap B\cap C)+P(B\cap C\cap D)+P(C\cap D\cap A)+P(D\cap A\cap B)=S_3=\frac{8}{21}.$

**Taking Four at a time.**

$(A\cap B\cap C\cap D)=\{1\}; n(A\cap B\cap C\cap D)=1;$

$P(A\cap B\cap C\cap D)=S_4=\frac{1}{21}.$

$P(A\cup B\cup C\cup D)=P(A)+P(B)+P(C)+P(D)-P(A\cap B)+P(B\cap C)+P(C\cap D)+P(D\cap A)+P(A\cap C)+P(B\cap D)+P(A\cap B\cap C)+P(B\cap C\cap D)+P(C\cap D\cap A)+P(D\cap A\cap B)-P(A\cap B\cap C\cap D).$

$P(A\cup B\cup C\cup D)=\frac{40}{21}-\frac{26}{21}+\frac{8}{21}-\frac{1}{21}=\frac{21}{21}=1.$

$$P(A\cup B\cup C\cup D)=S_1-S_2+S_3-S_4$$

The Probability pattern follow as.

$$P(A\cup B)=S_1-S_2$$

$$P(A\cup B\cup C)=S_1-S_2+S_3$$

$$P(A\cup B\cup C\cup D)=S_1-S_2+S_3-S_4$$

$$P(A\cup B\cup C\cup D\cup E)=S_1-S_2+S_3-S_4+S_5$$

And so on like this

The probability pattern for the number of terms = Sum of odd terms − sum of even terms.

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**ALL THE BEST STUDENTS**

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