Activity 11

**OBJECTIVE**
To interpret geometrically the meaning of \( i = \sqrt{-1} \) and its integral powers.

**METHOD OF CONSTRUCTION**
1. Paste a chart paper on the cardboard of a convenient size.
2. Draw two mutually perpendicular lines \( X'X \) and \( Y'Y \) intersecting at the point \( O \) (see Fig. 11).
3. Take a thread of a unit length representing the number 1 along \( OX \). Fix one end of the thread to the nail at 0 and the other end at \( A \) as shown in the figure.
4. Set free the other end of the thread at \( A \) and rotate the thread through angles of 90°, 180°, 270° and 360° and mark the free end of the thread in different cases as \( A_1, A_2, A_3 \) and \( A_4 \), respectively, as shown in the figure.

**MATERIAL REQUIRED**
Cardboard, chart paper, sketch pen, ruler, compasses, adhesive, nails, thread.

---

**Fig. 11**
DEMONSTRATION

1. In the argand plane, OA, OA₁, OA₂, OA₃, OA₄ represent, respectively, 1, i, –1, –i, 1.

2. OA₁ = i = 1 × i, OA₂ = −1 = i × i = i², OA₃ = −i = i × i × i = i³ and so on. Each time, rotation of OA by 90° is equivalent to multiplication by i. Thus, i is referred to as the multiplying factor for a rotation of 90°.

OBSERVATION

1. On rotating OA through 90°, OA₁ = 1 × i = __________.

2. On rotating OA through an angle of 180°, OA₂ = 1 × __ × __ = __________.

3. On rotation of OA through 270° (3 right angles), OA₃ = 1 × _______ × ______× ______ = ______.

4. On rotating OA through 360° (4 right angles),

   OA₄ = 1 × _______ × ______× ______ × ______ = __________.

5. On rotating OA through n-right angles

   OAₙ = 1 × _______ × ______× ______ × ______ × ... n times = ______________.

APPLICATION

This activity may be used to evaluate any integral power of i.
**Activity 12**

**OBJECTIVE**
To obtain a quadratic function with the help of linear functions graphically.

**METHOD OF CONSTRUCTION**
1. Take two wires of equal length.
2. Fix them at O in a plane (on the plywood sheet) at right angle to each other to represent $x$-axis and $y$-axis (see Fig.12)
3. Take a piece of wire and fix it in such a way that it meets the $x$-axis at a distance of $a$ units from O in the positive direction and meets $y$-axis at a distance of $a$ units below O as shown in the figure. Mark these points as B and A, respectively.

**MATERIAL REQUIRED**
Plywood sheet, pieces of wires.

![Fig. 12](image-url)
4. Similarly, take another wire and fix it in such a way that it meets the $x$-axis at a distance of $b$ units from O in the positive direction and meets $y$-axis at a distance of $b$ units below O as shown in the Fig.12. Mark these points as D and C, respectively.

5. Take one more wire and fix it in such a way that it passes through the points where straight wires meet the $x$-axis and the wire takes the shape of a curve (parabola) as shown in the Fig.12.

**Demonstration**

1. The wire through the points A and B represents the straight line given by $y = x - a$ intersecting the $x$ and $y$-axis at $(a, 0)$ and $(0, -a)$, respectively.

2. The wire through the points C and D represents the straight line given by $y = x - b$ intersecting $x$ and $y$ axis at $(b, 0)$ and $(0, -b)$, respectively.

3. The wire through B and D represents a curve given by the function $y = k (x - a) (x - b) = k [x^2 - (a + b)x + ab]$, where $k$ is an arbitrary constant.

**Observation**

1. The line given by the linear function $y = x - a$ intersects the $x$-axis at the point ______ whose coordinates are _________.

2. The line given by the linear function $y = x - b$ intersects the $x$-axis at the point ______ whose coordinates are _________.

3. The curve passing through B and D is given by the function $y = ______$, which is a _______ function.

**Application**

This activity is useful in understanding the zeroes and the shape of graph of a quadratic polynomial.
Activity 13

**Objective**
To verify that the graph of a given inequality, say $5x + 4y - 40 < 0$, of the form $ax + by + c < 0$, $a, b > 0$, $c < 0$ represents only one of the two half planes.

**Method of Construction**
1. Take a cardboard of a convenient size and paste a white paper on it.
2. Draw two perpendicular lines $X'OX$ and $Y'OY$ to represent $x$-axis and $y$-axis, respectively.
3. Draw the graph of the linear equation corresponding to the given linear inequality.
4. Mark the two half planes as I and II as shown in the Fig. 13.

**Material Required**
Cardboard, thick white paper, sketch pen, ruler, adhesive.

![Fig. 13](image-url)
DEMONSTRATION

1. Mark some points O(0, 0), A(1, 1), B(3, 2), C(4, 3), D(–1, –1) in half plane I and points E(4, 7), F(8, 4), G(9, 5), H(7, 5) in half plane II.

2. (i) Put the coordinates of O (0,0) in the left hand side of the inequality.

\[
\text{Value of LHS} = 5(0) + 4(0) - 40 = -40 < 0
\]

So, the coordinates of O which lies in half plane I, satisfy the inequality.

(ii) Put the coordinates of the point E (4, 7) in the left hand side of the inequality.

\[
\text{Value of LHS} = 5(4) + 4(7) - 40 = 8 \not< 0 \text{ and hence the coordinates of the point E which lie in the half plane II does not satisfy the given inequality.}
\]

(iii) Put the coordinates of the point F(8, 4) in the left hand side of the inequality. Value of LHS = 5(8) + 4(4) - 40 = 16 \not< 0

So, the coordinates of the point F which lies in the half plane II do not satisfy the inequality.

(iv) Put the coordinates of the point C(4, 3) in the left hand side of the inequality.

\[
\text{Value of LHS} = 5(4) + 4(3) - 40 = -8 < 0
\]

So, the coordinates of C which lies in the half plane I, satisfy the inequality.

(v) Put the coordinates of the point D(–1, –1) in the left hand side of the inequality.

\[
\text{Value of LHS} = 5(-1) + 4(-1) - 40 = -49 < 0
\]

So, the coordinates of D which lies in the half plane I, satisfy the inequality.
(iv) Similarly points A (1, 1) lies in a half plane I satisfy the inequality. The points G (9, 5) and H (7, 5) lies in half plane II do not satisfy the inequality.

Thus, all points O, A, B, C, satisfying the linear inequality $5x + 4y - 40 < li$ only in the half plane I and all the points E, F, G, H which do not satisfy the linear inequality lie in the half plane II.

Thus, the graph of the given inequality represents only one of the two corresponding half planes.

**Observation**

Coordinates of the point A _________ the given inequality (satisfy/does not satisfy).

Coordinates of G _________ the given inequality.

Coordinates of H _________ the given inequality.

Coordinates of E are _________ the given inequality.

Coordinates of F _________ the given inequality and is in the half plane____.

The graph of the given inequality is only half plane _________.

**Application**

This activity may be used to identify the half plane which provides the solutions of a given inequality.

**Note**

The activity can also be performed for the inequality of the type $ax + by + c > 0$. 

24/04/2018
Activity 14

**Objective**
To find the number of ways in which three cards can be selected from given five cards.

**Method of Construction**
1. Take a cardboard sheet and paste white paper on it.
2. Cut out 5 identical cards of convenient size from the cardboard.
3. Mark these cards as C₁, C₂, C₃, C₄ and C₅.

**Demonstration**
1. Select one card from the given five cards.
2. Let the first selected card be C₁. Then other two cards from the remaining four cards can be : C₂C₃, C₂C₄, C₂C₅, C₃C₄, C₃C₅ and C₄C₅. Thus, the possible selections are : C₁C₂C₃, C₁C₂C₄, C₁C₂C₅, C₁C₃C₄, C₁C₃C₅, C₁C₄C₅. Record these on a paper sheet.
3. Let the first selected card be C₂. Then the other two cards from the remaining 4 cards can be : C₁C₃, C₁C₄, C₁C₅, C₂C₃, C₂C₄, C₂C₅, C₃C₄, C₃C₅, C₄C₅. Thus, the possible selections are: C₂C₁C₃, C₂C₁C₄, C₂C₁C₅, C₂C₃C₄, C₂C₃C₅, C₂C₄C₅. Record these on the same paper sheet.
4. Let the first selected card be C₃. Then the other two cards can be : C₁C₂, C₁C₄, C₁C₅, C₂C₃, C₂C₄, C₂C₅, C₃C₄, C₃C₅, C₄C₅. Thus, the possible selections are : C₃C₁C₂, C₃C₁C₄, C₃C₁C₅, C₃C₂C₄, C₃C₂C₅, C₃C₃C₅, C₃C₄C₅. Record them on the same paper sheet.
5. Let the first selected card be C₄. Then the other two cards can be : C₁C₂, C₁C₃, C₂C₃, C₂C₄, C₂C₅, C₃C₄, C₃C₅. Thus, the possible selections are: C₄C₁C₂, C₄C₁C₃, C₄C₁C₄, C₄C₁C₅, C₄C₂C₃, C₄C₂C₄, C₄C₂C₅, C₄C₃C₄, C₄C₃C₅. Record these on the same paper sheet.

**Material Required**
Cardboard sheet, white paper sheets, sketch pen, cutter.
6. Let the first selected card be $C_5$. Then the other two cards can be: $C_1C_2$, $C_1C_3$, $C_1C_4$, $C_2C_3$, $C_2C_4$, $C_3C_4$. Thus, the possible selections are: $C_5C_1C_2$, $C_5C_1C_3$, $C_5C_1C_4$, $C_5C_2C_3$, $C_5C_2C_4$, $C_5C_3C_4$. Record these on the same paper sheet.

7. Now look at the paper sheet on which the possible selections are listed. Here, there are in all 30 possible selections and each of the selection is repeated thrice. Therefore, the number of distinct selections \( = 30 \div 3 = 10 \) which is same as \( 5C_3 \).

**Observation**

1. $C_1C_2C_3$, $C_2C_1C_3$ and $C_3C_1C_2$ represent the ______ selection.

2. $C_1C_2C_4$, ____________ , __________ represent the same selection.

3. Among $C_2C_1C_5$, $C_1C_2C_5$, $C_1C_2C_3$, ______ and ______ represent the same selection.

4. $C_2C_1C_5$, $C_1C_2C_3$, represent ______ selections.

5. Among $C_3C_1C_5$, $C_1C_4C_3$, $C_5C_2C_4$, $C_4C_2C_5$, $C_2C_4C_3$, $C_1C_3C_5$

   $C_3C_1C_5$, ______ represent the same selections.

   $C_3C_1C_5$, $C_1C_4C_5$, ______, ______, represent different selections.

**Application**

Activities of this type can be used in understanding the general formula for finding the number of possible selections when \( r \) objects are selected from given \( n \) distinct objects, i.e., \( \binom{n}{r} = \frac{n!}{r!(n-r)!} \).
**Activity 15**

**OBJECTIVE**
To construct a Pascal's Triangle and to write binomial expansion for a given positive integral exponent.

**MATERIAL REQUIRED**
Drawing board, white paper, matchsticks, adhesive.

**METHOD OF CONSTRUCTION**
1. Take a drawing board and paste a white paper on it.
2. Take some matchsticks and arrange them as shown in Fig.15.

![Pascal's Triangle Diagram](image-url)
3. Write the numbers as follows:
   - 1 (first row)
   - 1 1 (second row)
   - 1 2 1 (third row)
   - 1 3 3 1 (fourth row), 1 4 6 4 1 (fifth row) and so on (see Fig. 15).

4. To write binomial expansion of \((a + b)^n\), use the numbers given in the \((n + 1)\)th row.

**Demonstration**

1. The above figure looks like a triangle and is referred to as Pascal’s Triangle.
2. Numbers in the second row give the coefficients of the terms of the binomial expansion of \((a + b)^1\). Numbers in the third row give the coefficients of the terms of the binomial expansion of \((a + b)^2\), numbers in the fourth row give coefficients of the terms of binomial expansion of \((a + b)^3\). Numbers in the fifth row give coefficients of the terms of binomial expansion of \((a + b)^4\) and so on.

**Observation**

1. Numbers in the fifth row are ___________, which are coefficients of the binomial expansion of __________.
2. Numbers in the seventh row are _____________, which are coefficients of the binomial expansion of _______.
3. \((a + b)^3 = ___ a^3 + ___ a^2b + ___ ab^2 + ___ b^3\)
4. \((a + b)^5 = ___ + ___ + ___ + ___ + ___ + ___.
5. \((a + b)^6 = ___ a^6 + ___ a^5b + ___ a^4b^2 + ___ a^3b^3 + ___ a^2b^4 + ___ ab^5 + ___ b^6\).
6. \((a + b)^8 = ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___.
7. \((a + b)^10 = ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___ + ___.

**Application**

The activity can be used to write binomial expansion for \((a + b)^n\), where \(n\) is a positive integer.
Activity 16

**Objective**
To obtain formula for the sum of squares of first \( n \)-natural numbers.

**Material Required**
Wooden/plastic unit cubes, coloured papers, adhesive and nails.

**Method of Construction**
1. Take 1 (\( = 1^2 \)) wooden/plastic unit cube Fig.16.1.
2. Take 4 (\( = 2^2 \)) wooden/plastic unit cubes and form a cuboid as shown in Fig.16.2.
3. Take 9 (\( = 3^2 \)) wooden/plastic unit cubes and form a cuboid as shown in Fig.16.3.
4. Take 16 (\( = 4^2 \)) wooden/plastic unit cubes and form a cuboid as shown in Fig. 16.4 and so on.
5. Arrange all the cube and cuboids of Fig. 16.1 to 16.4 above so as to form an echelon type structure as shown in Fig.16.5.
6. Make six such echelon type structures, one is already shown in Fig. 16.5.
7. Arrange these five structures to form a bigger cuboidal block as shown in Fig. 16.6.
Demonstration

1. Volume of the structure as given in Fig. 16.5
   $= (1 + 4 + 9 + 16)$ cubic units $= (1^2 + 2^2 + 3^2 + 4^2)$ cubic units.
2. Volume of 6 such structures $= 6 (1^2 + 2^2 + 3^2 + 4^2)$ cubic units.
3. Volume of the cuboidal block formed in Fig. 16.6 (which is cuboid of dimensions $= 4 \times 5 \times 9$) $= 4 \times (4 + 1) \times (2 \times 4 + 1)$.
4. Thus, $6 (1^2 + 2^2 + 3^2 + 4^2) = 4 \times (4 + 1) \times (2 \times 4 + 1)$
   \hspace{1cm} i.e., \hspace{1cm} $1^2 + 2^2 + 3^2 + 4^2 = \frac{1}{6} [4 \times (4+1) \times (2\times 4+1)]$

Observation

1. $1^2 + 2^2 + 3^2 + 4^2 = \frac{1}{6} (\underline{\hspace{2cm}}) \times (\underline{\hspace{2cm}}) \times (\underline{\hspace{2cm}})$.
2. $1^2 + 2^2 + 3^2 + 4^2 + 5^2 = \frac{1}{6} (\underline{\hspace{2cm}}) \times (\underline{\hspace{2cm}}) \times (\underline{\hspace{2cm}})$.
3. $1^2 + 2^2 + 3^2 + 4^2 + \ldots + 10^2 = \frac{1}{6} (\underline{\hspace{2cm}}) \times (\underline{\hspace{2cm}}) \times (\underline{\hspace{2cm}})$. 
4. \(1^2 + 2^2 + 3^2 + 4^2 \ldots + 25^2 = \frac{1}{6} (_____) \times (_____ \times (_____)).\)

5. \(1^2 + 2^2 + 3^2 + 4^2 \ldots + 100^2 = \frac{1}{6} (_____ \times (_____ \times (_____)).\)

**Application**

This activity may be used to obtain the sum of squares of first \(n\) natural numbers as \(1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{1}{6} n (n + 1)(2n + 1).\)
Activity 17

Objective
An alternative approach to obtain formula for the sum of squares of first $n$ natural numbers.

Material Required
Wooden/plastic unit squares, coloured pencils/sketch pens, scale.

Method of Construction
1. Take unit squares, 1, 4, 9, 16, 25 ... as shown in Fig. 17.1 and colour all of them with (say) Black colour.

Fig. 17.1

Fig. 17.2
2. Take another set of unit squares 1, 4, 9, 16, 25 ... as shown in Fig. 17.2 and colour all of them with (say) green colour.

3. Take a third set of unit squares 1, 4, 9, 16, 25 ... as shown in Fig. 17.3 and colour unit squares with different colours.

4. Arrange these three set of unit squares as a rectangle as shown in Fig. 17.4.

\[ \text{DEMONSTRATION} \]

1. Area of one set as given in Fig. 17.1

\[ = (1 + 4 + 9 + 16 + 25) \text{ sq. units} \]

\[ = (1^2 + 2^2 + 3^2 + 4^2 + 5^2) \text{ sq. units}. \]

2. Area of three such sets = 3 \((1^2 + 2^2 + 3^2 + 4^2 + 5^2)\)
3. Area of rectangle = 11 \times 15 = [2 (5) + 1] \left(\frac{5 \times 6}{2}\right)

\therefore 3 (1^2 + 2^2 + 3^2 + 4^2 + 5^2) = \frac{1}{2} [5 \times 6] [2 (5) + 1]

or 1^2 + 2^2 + 3^2 + 4^2 + 5^2 = \frac{1}{6} [5 \times (5 + 1)] [2 (5) + 1].

**Observation**

\[3 (1^2 + 2^2 + 3^2 + 4^2 + 5^2) = \frac{1}{2} ( \underline{\_} \times \underline{\_}) (\underline{\_} + 1)\]

\[\Rightarrow 1^2 + 2^2 + 3^2 + 4^2 + 5^2 = \frac{1}{6} ( \underline{\_} \times \underline{\_}) (\underline{\_} + 1)\]

\[\therefore 1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 = \frac{1}{6} ( \underline{\_} \times \underline{\_}) (\underline{\_} + 1)\]

\[1^2 + 2^2 + 3^2 + 4^2 + \ldots + 10^2 = \frac{1}{6} ( \underline{\_} \times \underline{\_}) (\underline{\_} + 1).\]

**Application**

This activity may be used to establish

\[1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{1}{6} n (n + 1) (2n + 1).\]
Activity 18

OBJECTIVE
To demonstrate that the Arithmetic mean of two different positive numbers is always greater than the Geometric mean.

METHOD OF CONSTRUCTION
1. From chart paper, cut off four rectangular pieces of dimension $a \times b$ ($a > b$).
2. Arrange the four rectangular pieces as shown in figure. 18.

DEMONSTRATION
1. ABCD is a square of side $(a + b)$ units.
2. Area ABCD = $(a + b)^2$ sq. units.
3. Area of four rectangular pieces = $4(ab) = 4ab$ sq. units.

MATERIAL REQUIRED
Coloured chart paper, ruler, scale, sketch pens, cutter.
4. PQRS is a square of side \((a - b)\) units.

5. Area \(ABCD\) = Sum of the areas of four rectangular pieces + area of square PQRS.

\[
\therefore \text{Area ABCD} > \text{sum of the areas of four rectangular pieces}
\]

i.e., \((a + b)^2 > 4ab\)

or \(\left(\frac{a+b}{2}\right)^2 > ab\)

\[
\therefore \frac{a+b}{2} > \sqrt{ab}, \text{ i.e., A.M. > G.M.}
\]

**Observation**

Take \(a = 5\text{cm}, b = 3\text{cm}\)

\[
\therefore AB = a + b = \underline{\text{_______}} \text{ units.}
\]

Area of ABCD = \((a + b)^2 = \underline{\text{_______}} \text{ sq. units.}
\]

Area of each rectangle = \(ab = \underline{\text{_______}} \text{ sq. units.}
\]

Area of square PQRS = \((a - b)^2 = \underline{\text{_______}} \text{ sq. units.}
\]

Area ABCD = 4 (area of rectangular piece) + Area of square PQRS

\[
\underline{\text{_______}} = 4 (\underline{\text{_______}}) + (\underline{\text{_______}})
\]

\[
\therefore \underline{\text{_______}} > 4 (\underline{\text{_______}})
\]

i.e. \((a + b)^2 > 4ab\) or \(\left(\frac{a+b}{2}\right)^2 > ab\)

\[
\therefore \frac{a+b}{2} > \sqrt{ab} \quad \therefore \text{AM} > \text{GM}
\]
Activity 19

**OBJECTIVE**
To establish the formula for the sum of the cubes of the first \( n \) natural numbers.

**MATERIAL REQUIRED**
Thermocol sheet, thermocol balls, pins, pencil, ruler, adhesive, chart paper, cutter.

**METHOD OF CONSTRUCTION**

1. Take (or cut) a square sheet of thermocol of a convenient size and paste a chart paper on it.

2. Draw horizontal and vertical lines on the pasted chart paper to form 225 small squares as shown in Fig. 19.

3. Fix a thermocol ball with the help of a pin at the square on the upper left most corner.

![Fig. 19](image-url)
4. Fix $2^3$, i.e., 8, thermocol balls with the help of 8 pins on the same square sheet in 8 squares adjacent to the previous square as shown in the figure.

5. Fix $3^3$, i.e., 27 thermocol balls with the help of 27 pins on the same square sheet in 27 squares adjacent to the previous 8 squares.

6. Continue fixing the thermocol balls in this way till all the squares are filled (see. Fig. 19).

**DEMONSTRATION**

1. Number of balls in Enclosure I $= 1^3 = 1 = \left( \frac{1 \times 2}{2} \right)^2$.

2. Number of balls in Enclosure II $= 1^3 + 2^3 = 9 = \left( \frac{2 \times 3}{2} \right)^2$.

3. Number of balls in Enclosure III $= 1^3 + 2^3 + 3^3 = 36 = \left( \frac{3 \times 4}{2} \right)^2$.

4. Number of balls in Enclosure IV $= 1^3 + 2^3 + 3^3 + 4^3 = 100 = \left( \frac{4 \times 5}{2} \right)^2$.

5. Total number of balls in Enclosure V $= 1^3 + 2^3 + 3^3 + 4^3 + 5^3 = 225 = \left( \frac{5 \times 6}{2} \right)^2$.

**OBSERVATION**

By actual counting of balls

1. Number of balls in Enclosure I $= 1^3 = \left( \frac{1 \times 2}{2} \right)^2$. 
2. Number of balls in Enclosure II = \( =1^3 + 2^3 = \_\_\_ = \left( \frac{\_ \times \_}{\_} \right)^2 \).

3. Number of balls in Enclosure III
   \[ =1^3 + 2^3 + \_\_\_ = \_\_\_ = \left( \frac{\_ \times \_}{2} \right)^2 \] .

4. Number of balls in Enclosure IV
   \[ =1^3 + 2^3 + (\_)^3 + (\_)^3 = \_\_\_ = \left( \frac{\_ \times \_}{2} \right)^2 \] .

5. Number of balls in Enclosure V
   \[ = (\_)^3 + (\_)^3 + (\_)^3 + (\_)^3 + (\_)^3 = \_\_\_ = \left( \frac{\_ \times \_}{2} \right)^2 \] .

**APPLICATION**

This result can be used in finding the sum of cubes of first \( n \) natural numbers, i.e.,

\[ 1^3 + 2^3 + 3^3 + \ldots + n^3 = \left( \frac{n(n+1)}{2} \right)^2 . \]
**Activity 20**

**Objective**
To verify that the equation of a line passing through the point of intersection of two lines \(a_1x + b_1y + c_1 = 0\) and \(a_2x + b_2y + c_2 = 0\) is of the form \((a_1x + b_1y + c_1) + \lambda(a_2x + b_2y + c_2) = 0\).

**Method of Construction**
1. Take a cardboard of convenient size and paste a white paper on it.
2. Draw two perpendicular lines \(XOX\) and \(Y'Y\) on the graph paper. Take same scale for marking points on \(x\) and \(y\)-axes.
3. Draw the graph of the given two intersecting lines and note down the point of intersection, say \((h, k)\) (see Fig. 20.1)

**Material Required**
Cardboard, sketch pen, white paper, adhesive, pencil, ruler.

![Fig. 20.1](image-url)
Demonstration

1. Let the equations of the lines be \(3x - 2y = 5\) and \(3x + 2y = 7\).

2. The point of intersection of these lines is \(\left(\frac{1}{2}, \frac{1}{2}\right)\) (See Fig. 20.2).

3. Equation of the line passing through the point of intersection \(\left(\frac{1}{2}, \frac{1}{2}\right)\) of these lines is \((3x - 2y - 5) + \lambda (3x + 2y - 7) = 0\) \((1)\)

4. Take \(\lambda = 1, -1, 2, \frac{1}{2}\).

5. (i) For \(\lambda = 1\), equation of line passing through the point of intersection is \((3x - 2y - 5) + 1 (3x + 2y - 7)\), i.e., \(6x - 12 = 0\), which is satisfied by the point of intersection \(\left(\frac{2}{3}, \frac{1}{3}\right)\), i.e., \(6 (2) - 12 = 0\)
(ii) For $\lambda = -1$, the equation of line passing through the point of intersection is

$$(3x - 2y - 5) - 1 (3x + 2y - 7) = 0$$

is $-4y + 2 = 0$, which is also satisfied by the point of intersection $\left(2, \frac{1}{2}\right)$.

(iii) For $\lambda = 2$, the equation is $(3x - 2y - 5) + 2 (3x + 2y - 7) = 0$, i.e.,

$9x + 2y - 19 = 0$, which is again satisfied by the point $\left(2, \frac{1}{2}\right)$.

**Observation**

1. For $\lambda = 3$, the equation of the line passing through intersection of the lines is ________ which is satisfied by the point $\left(2, \frac{1}{2}\right)$.

2. For $\lambda = 4$, the equation of the line passing through point of the intersection of the lines is ________ which is satisfied by the point of intersection ________ of the lines.

3. For $\lambda = 5$, the equation of the line passing through the intersection of the lines is _____ which is satisfied by the point of intersection ________ of the lines.

**Application**

The activity can be used in understanding the result relating to the equation of a line through the point of intersection of two given lines. It is also observed that infinitely many lines pass through a fixed point.