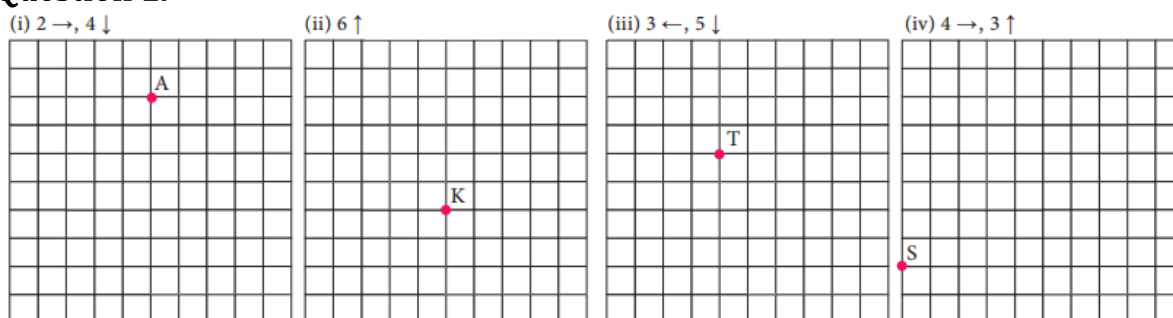


Chapter 4

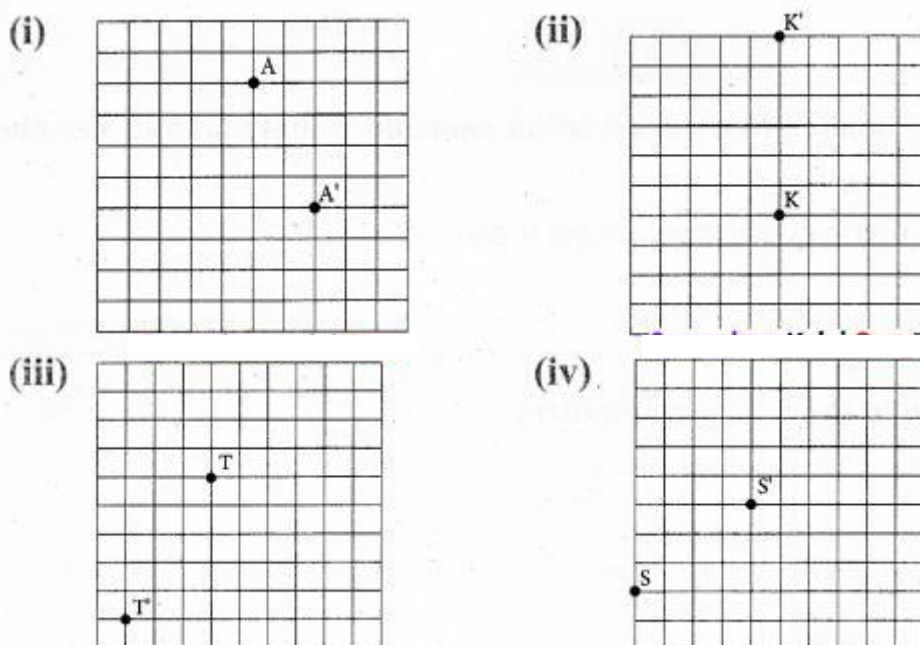
Geometry

Ex 4.1

Question 1.

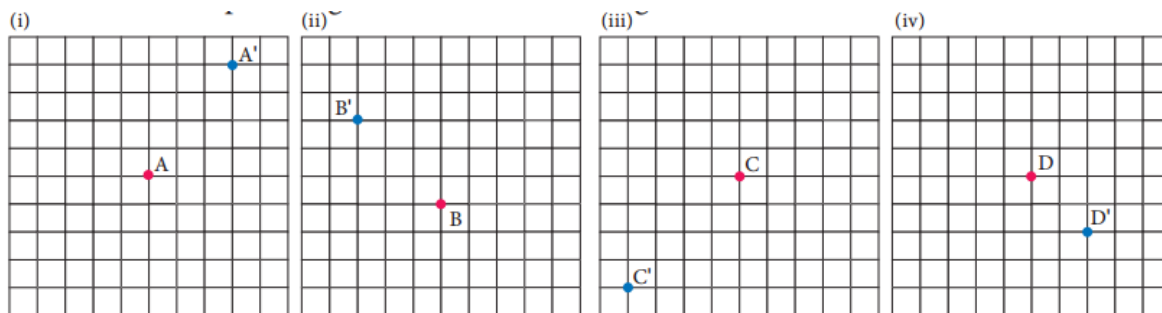


Solution:



Question 2.

How is the pre-image translated to the image?



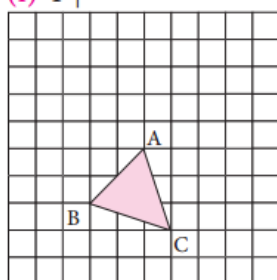
Solution:

- (i) $3 \rightarrow, 4 \uparrow$
- (ii) $3 \leftarrow, 3 \uparrow$
- (iii) $4 \leftarrow, 4 \downarrow$
- (iv) $2 \leftarrow, 2 \downarrow$

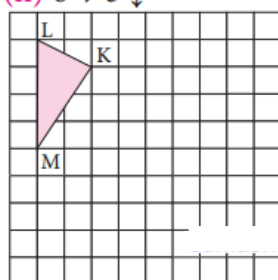
Question 3.

Find the image of the given triangle with given translation.

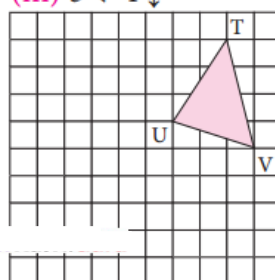
(i) $4 \uparrow$



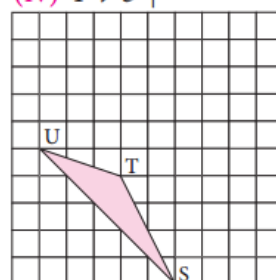
(ii) $6 \rightarrow 3 \downarrow$



(iii) $5 \leftarrow 4 \downarrow$

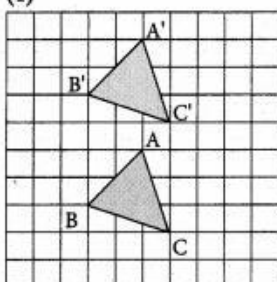


(iv) $4 \rightarrow 3 \uparrow$

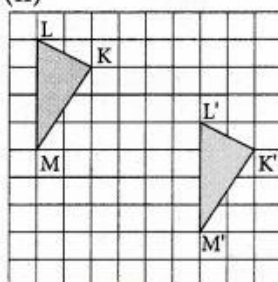


Solution:

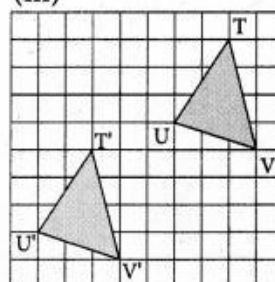
(i)



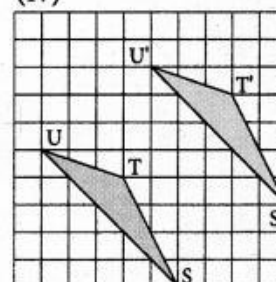
(ii)



(iii)



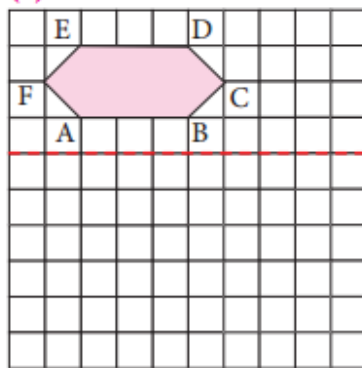
(iv)



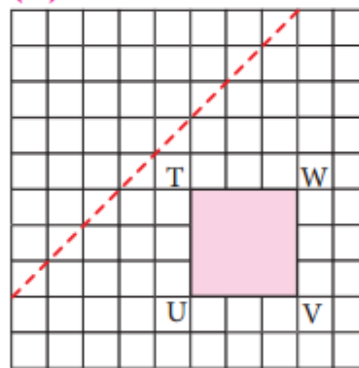
Question 4.

Reflect the shape with given line of reflection

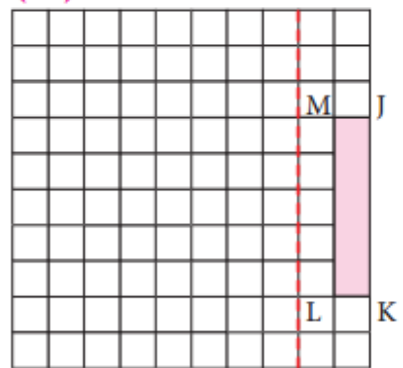
(i)



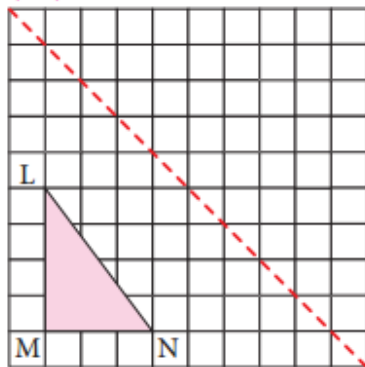
(ii)



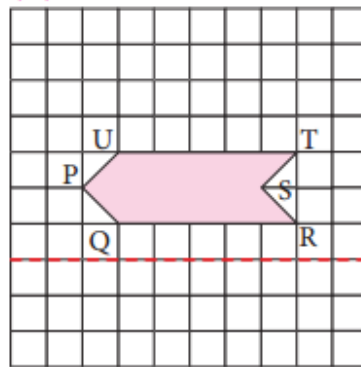
(iii)



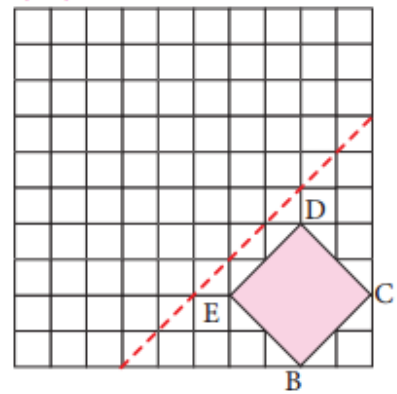
(iv)



(v)

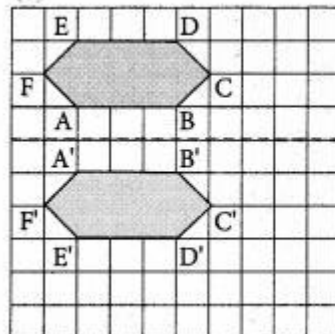


(vi)

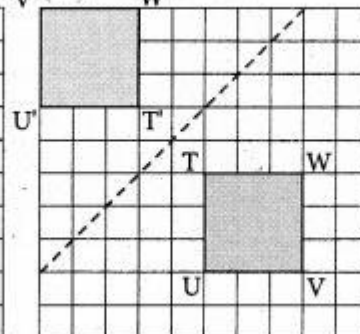


Solution:

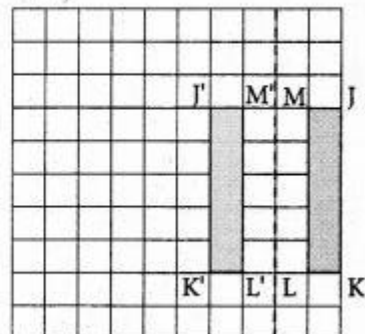
(i)



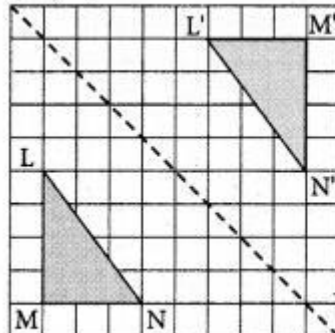
(ii)



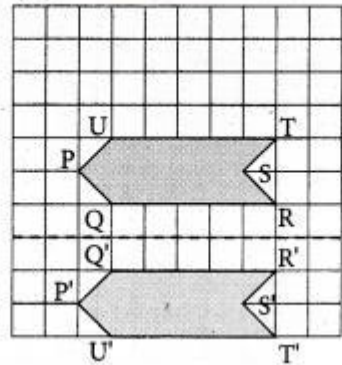
(iii)



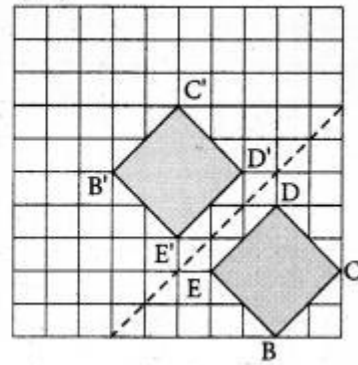
(iv)



(v)

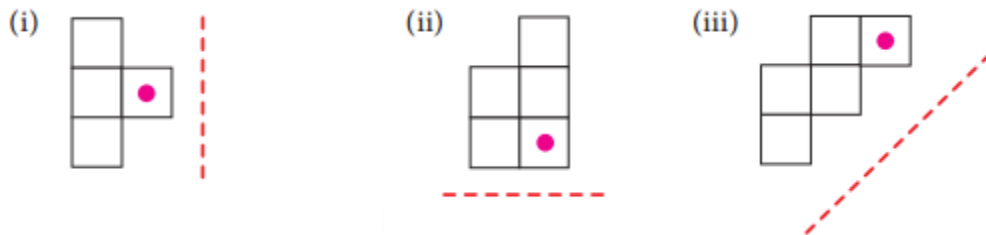


(vi)

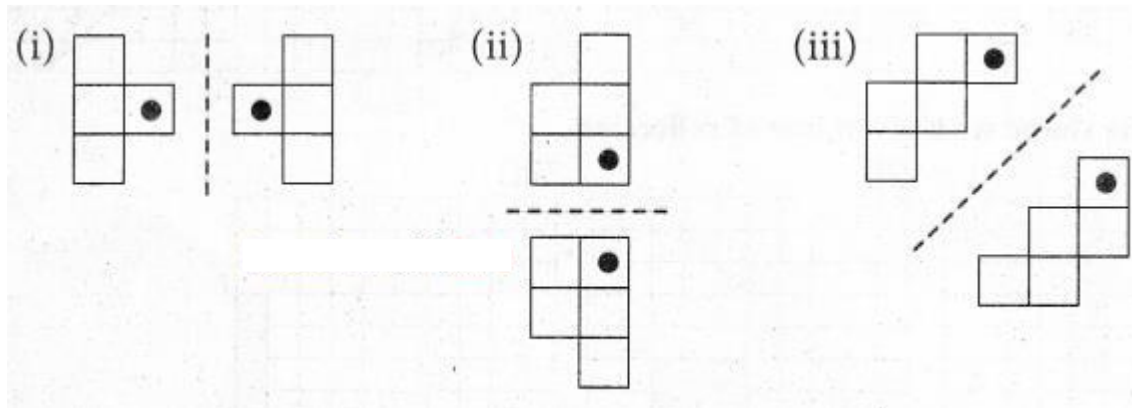


Question 5.

Reflect the shape in each of the following pictures with given line of reflection.



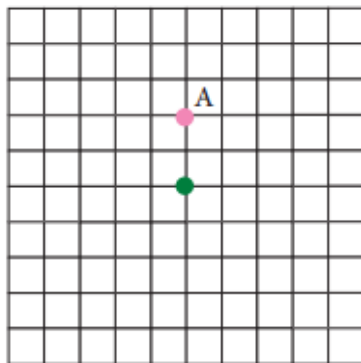
Solution:



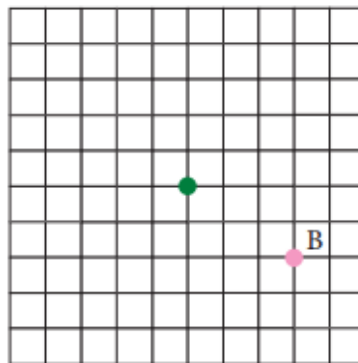
Question 6.

Rotate the preimages in each case as directed about the red point.

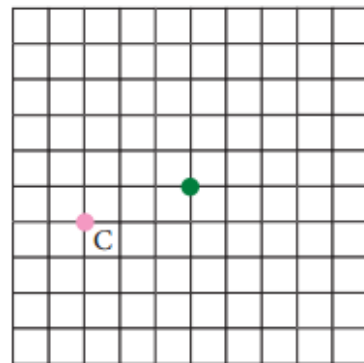
(i) 90° clockwise



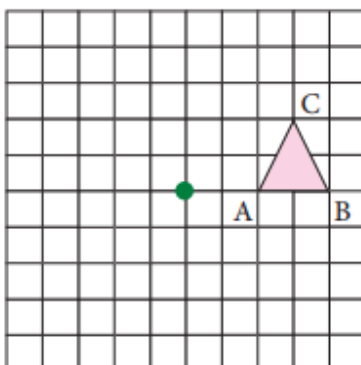
(ii) 180°



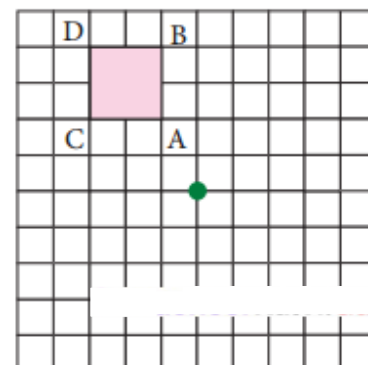
(iii) 270° counter clockwise



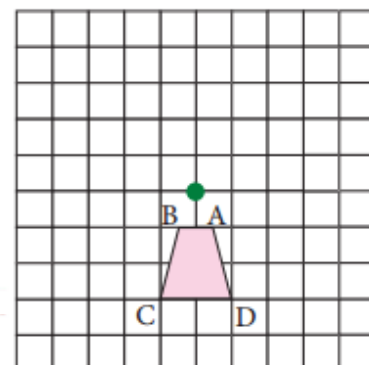
(iv) 90° counter clockwise



(v) 90° clockwise

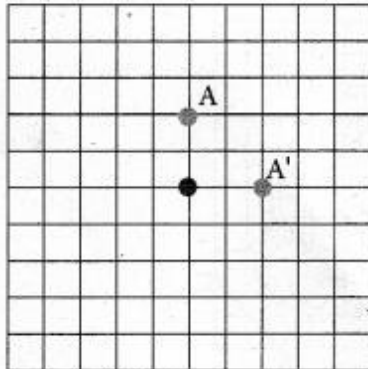


(vi) 180°

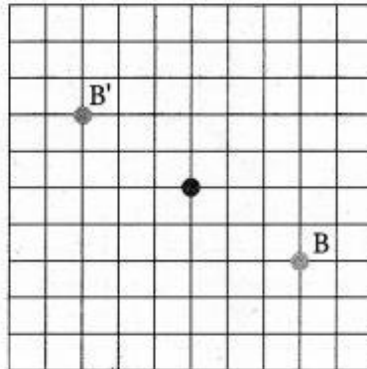


Solution:

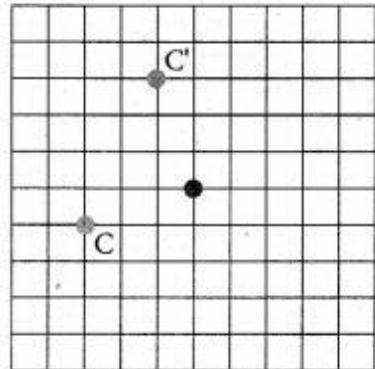
(i)



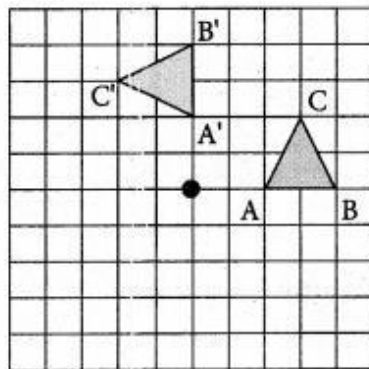
(ii)



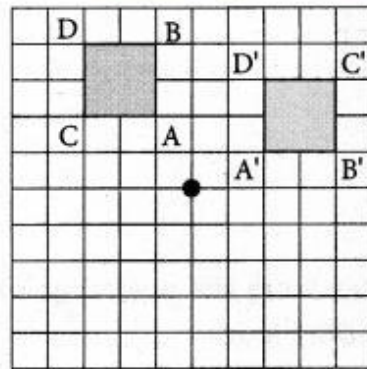
(iii)



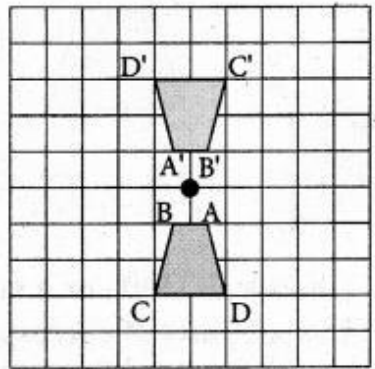
(iv)



(v)

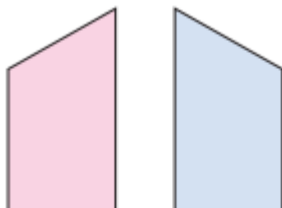


(vi)



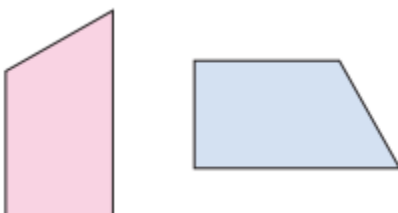
Identify the transformation:

Question 7.



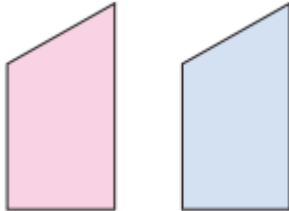
Solution:
Reflection

Question 8.



Solution:
Rotation

Question 9.

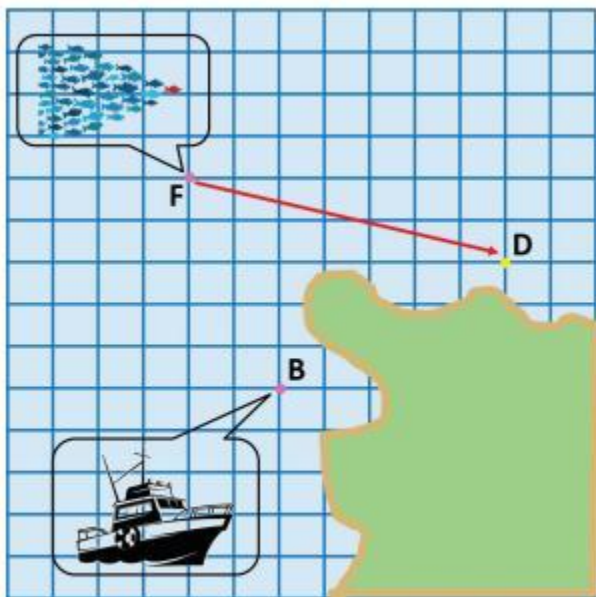


Solution:
Translation

Question 10.

A pool of fish translates from point F to point D.

- Describe the translation of the pool of fish.
- Can the fishing boat make the same translation? Explain.
- Describe a translation the fishing boat could make to get to point D.

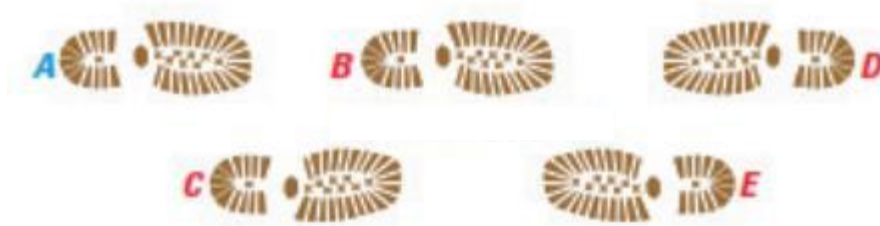


Solution:

- Translation of pool of fish is $7 \rightarrow, 2 \downarrow$
- No, the fishing boat will be landed on the island if translated.
- To get point D, the translation will be $5 \rightarrow, 3 \downarrow$

Question 11.

Name the transformation that will map footprint A onto the indicated footprint.



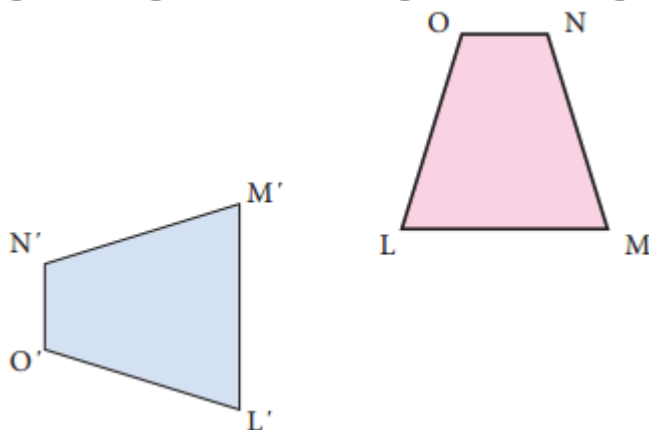
- (i) Footprint B
- (ii) Footprint
- (iii) Footprint D
- (iv) Footprint E

Solution:

- (i) It is translation
- (ii) Reflection about horizontal line.
- (iii) Reflection about vertical line.
- (iv) Rotation about the heel.

Question 12.

In given diagram, the blue figure is an image of the pink figure.



- (i) Choose an angle or a vertex from the preimage and name its image.
- (ii) List all pairs of corresponding sides.

Solution:

- (i) Image of $\angle L$ is $\angle L'$, Image of $\angle M$ is $\angle M'$,
Image of $\angle N$ is $\angle N'$, Image of $\angle O$ is $\angle O'$
Image of vertex L is L' , Image of vertex M is M'
Image of vertex N is N' , Image of vertex O is O'

- (ii) Corresponding sides are LM and $L'M'$, MN and $M'N'$, NO and $N'O'$ and OL and $O'L'$

Question 13.

In the diagram at the right, the green figure is a translation image of the pink figure. Write a coordinate rule that describes the translation.



Solution:

The rule bind here in $3 \rightarrow, 1 \downarrow$

Objective Type Questions

Question 1.

A _____ is a turn about a point.

- (i) Translation
- (ii) Rotation
- (iii) Reflection
- (iv) Glide Reflection

Answer:

- (ii) Rotation

Question 2.

A _____ is a flip over a line.

- (i) Translation
- (ii) Rotation
- (iii) Reflection
- (iv) Glide Reflection

Answer:

- (iii) Reflection

Question 3.

A _____ is a slide; move without turning or flipping the shape.

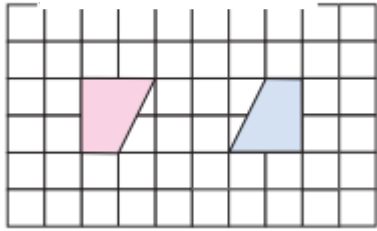
- (i) Translation
- (ii) Rotation
- (iii) Reflection
- (iv) Glide Reflection

Answer:

- (i) Translation

Question 4.

The transformation used in the picture is



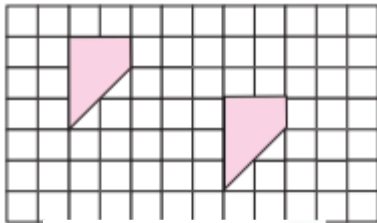
- (i) Translation
- (ii) Rotation
- (iii) Reflection
- (iv) Glide Reflection

Answer:

- (ii) Rotation

Question 5.

The transformation used in the picture is



- (i) Translation
- (ii) Rotation
- (iii) Reflection
- (iv) Glide Reflection

Answer:

- (i) Translation

Question 6.

You must rotate the puzzle piece 270° clockwise about point P to fit it into a puzzle. Which piece fits in the puzzle as shown?

(i)



(ii)



(iii)



(iv)





• *P*

Solution:

(iii)



Ex 4.2

Question 1.

Draw circles for the following measurements of radius (r)/ diameters(d).

(i) $r = 4 \text{ cm}$

(ii) $d = 12 \text{ cm}$

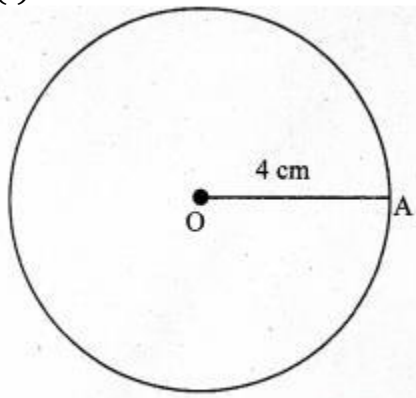
(iii) $r = 3.5 \text{ cm}$

(iv) $r = 6.5 \text{ cm}$.

(v) $d = 6 \text{ cm}$

Solution:

(i) $r = 4 \text{ cm}$



Step 1 : Mark a point 'O' on the paper.

Step 2 : Extended the compass distance equal to radius 4 cm.

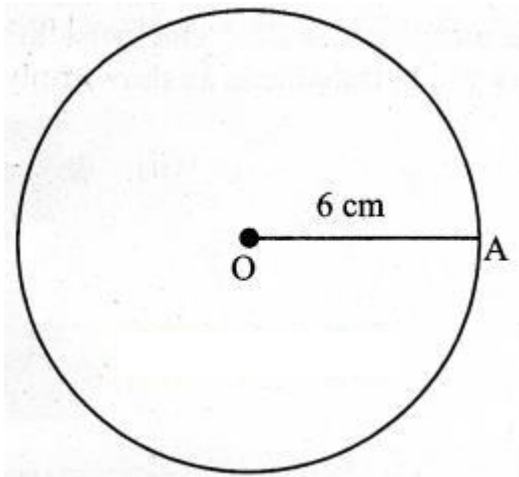
Step 3 : At center 'O', held the compass firmly and placed the pointed end of the compass.

Step 4 : Slowly rotated the compass around to get the circle.

(ii) $d = 12 \text{ cm}$

given $d = 12 \text{ cm}$

\therefore radius $r = \frac{d}{2} = \frac{12}{2} = 6 \text{ cm}$



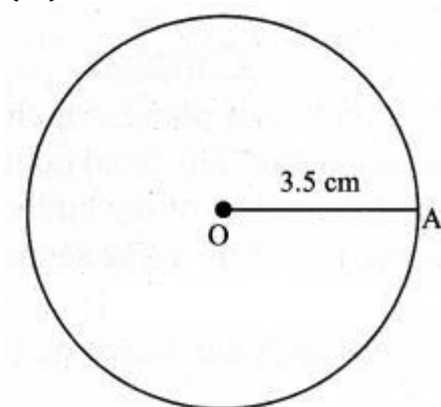
Step 1: Marked a point 'O' on the paper.

Step 2: Extended the compass distance equal to radius 6 cm.

Step 3: At center 'O', held the compass firmly and placed the pointed end of the compass.

Step 4: Slowly rotated the compass around to get the circle.

(iii) $r = 3.5 \text{ cm}$



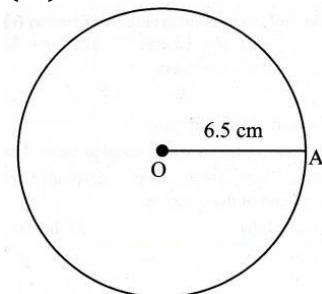
Step 1: Marked a point 'O' on the paper.

Step 2: Extended the compass distance equal to radius 3.5 cm.

Step 3: At center 'O', held the compass firmly and placed the pointed end of the compass.

Step 4: Slowly rotated the compass around to get the circle.

(iv) $r = 6.5 \text{ cm}$



Step 1: Mark a point 'O' on the paper.

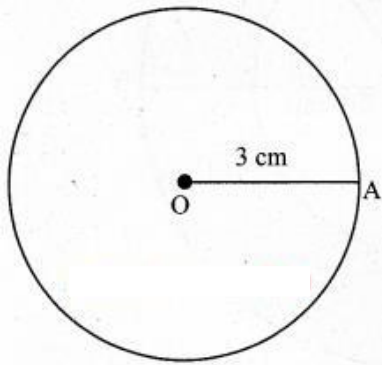
Step 2: Extended the compass distance equal to radius 6.5 cm.

Step 3: At center 'O', held the compass firmly and placed the pointed end of the compass.

Step 4: Slowly rotated the compass around to get the circle.

(v) $d = 6 \text{ cm}$

$\therefore \text{radius } r = \frac{d}{2} = \frac{6}{2} = 3 \text{ cm}$



Step 1: Mark a point 'O' on the paper.

Step 2: Extended the compass distance equal to radius 3 cm.

Step 3: At center 'O', held the compass firmly and placed the pointed end of the compass.

Step 4: Slowly rotated the compass around to get the circle.

Question 2.

Draw concentric circles for the following measurements of radii / diameters.

Find out the width of each circular ring.

(i) $r = 3 \text{ cm}$ and $r = 5 \text{ cm}$.

(ii) $r = 3.5 \text{ cm}$ and $r = 6.5 \text{ cm}$.

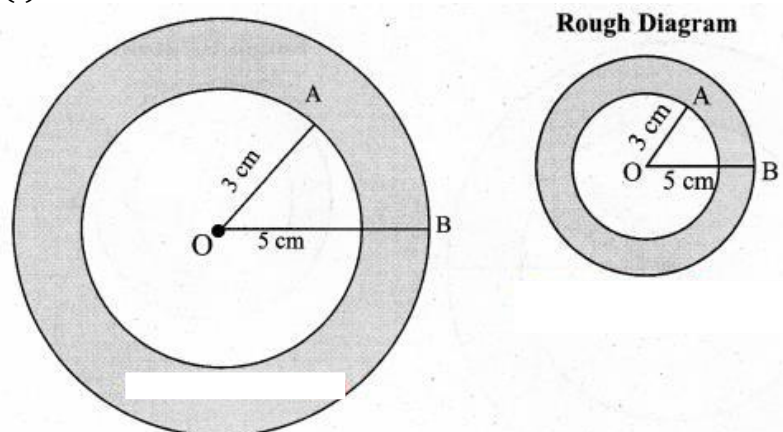
(iii) $d = 6.4 \text{ cm}$ and $d = 11.6 \text{ cm}$.

(iv) $r = 5 \text{ cm}$ and $r = 7.5 \text{ cm}$.

(vi) $r = 7.1 \text{ cm}$ and $d = 12 \text{ cm}$.

Solution:

(i) $r = 3 \text{ cm}$ and $r = 5 \text{ cm}$.



Width of the circular ring = $OB - OA = 5 - 3 = 2$ cm

Step 1: Drawn a rough diagram and marked the given measurements

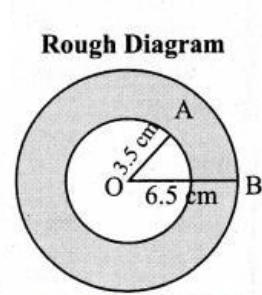
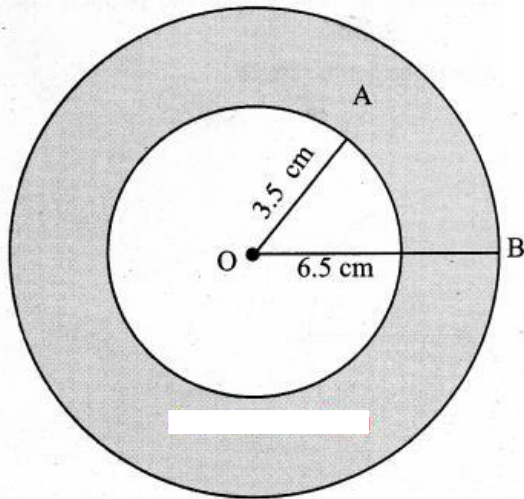
Step 2: Taken any point O and marked it as center.

Step 3: With O as center drawn a circle of radius $OA = 3$ cm.

Step 4: With O as center drawn a circle of radius $OB = 5$ cm. Thus concentric circles C_1 and C_2 are drawn.

Width of the circular ring = $OB - OA = 5 - 3 = 2$ cm

(ii) $r = 3.5$ cm and $r = 6.5$ cm



Step 1: Drawn a rough diagram and marked the given measurements

Step 2: Taken any point O and marked it as the center.

Step 3: With O as center drawn a circle of radius $OA = 3.5$ cm.

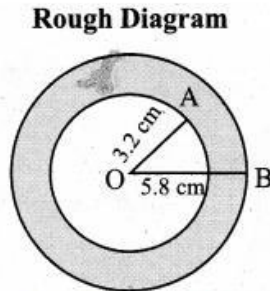
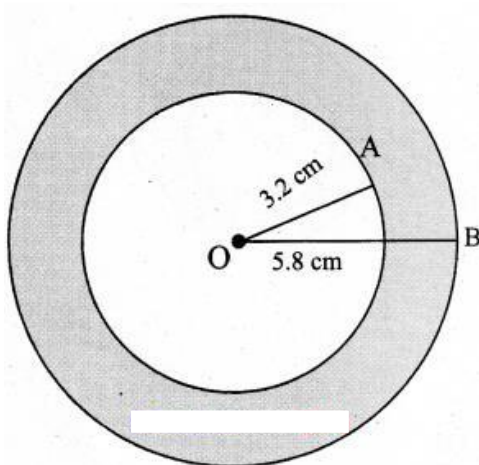
Step 4: With O as center drawn a circle of radius $OB = 6.5$ cm. Thus the concentric circles C_1 and C_2 are drawn.

Width of the circular ring = $OB - OA = 6.5 - 3.5 = 3$ cm

(iii) $d = 6.4$ cm and $d = 11.6$ cm

$r = d/2$

$r = 6.4/2 = 3.2$ cm; $r = 11.6/2 = 5.8$ cm



Step 1: Drawn a rough diagram and market the given measurements

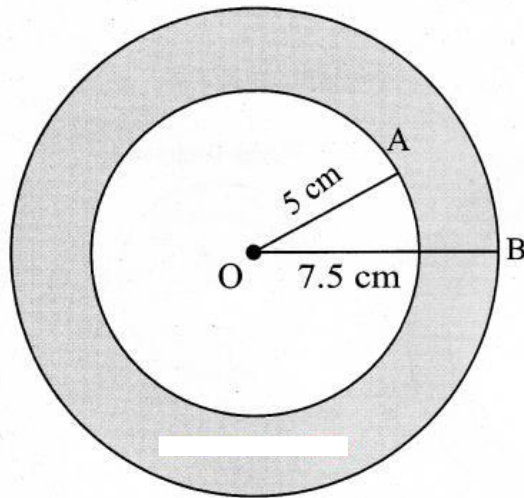
Step 2: Taken any point O and marked it as the center.

Step 3: With O as center drawn a circle of radius $OA = 3.2$ cm.

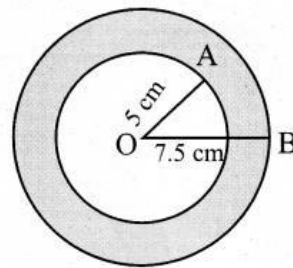
Step 4: With O as center and drawn a circle of radius $OB = 5.8$ cm. Thus the concentric circles C_1 and C_2 are drawn.

Width of the circular ring = $OB - OA = 5.8 - 3.2 = 2.6$ cm

(iv) $r = 5$ cm and $r = 7.5$ cm



Rough Diagram



Step 1 : Drawn a rough diagram and market the given measurements

Step 2 : Taken any point O and marked it as the center.

Step 3 : With O as center drawn a circle of radius $OA = 5$ cm.

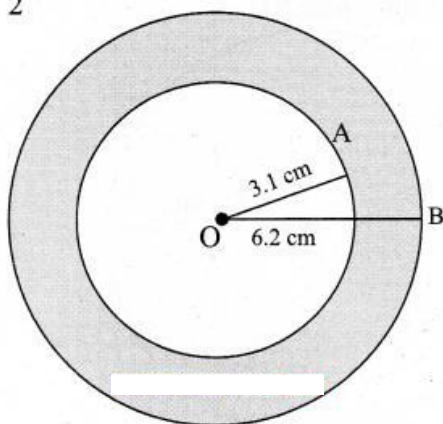
Step 4 : With O as center drawn a circle of radius $OB = 7.5$ cm. Thus the concentric circles C_1 and C_2 are drawn.

Width of the circular ring = $OB - OA = 7.5 - 5 = 2.5$ cm

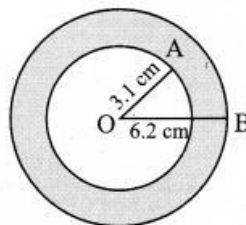
(v) $d = 6.2$ cm and $r = 6.2$ cm.

$r = \frac{d}{2}$

$\therefore r = \frac{6.2}{2} = 3.1$ cm and $r = 6.2$ cm



Rough Diagram



Step 1: Drawn a rough diagram and marked the given measurements

Step 2: Taken any point O and marked it as the center.

Step 3: With O as center, drawn a circle of radius $OA = 3.1$ cm.

Step 4: With O as center, drawn a circle of radius $OB = 6.2$ cm.

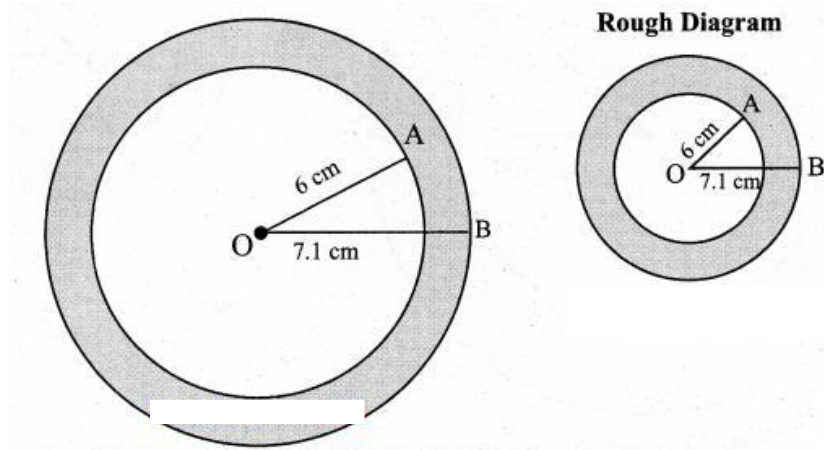
Thus the concentric circles C_1 and C_2 are drawn.

Width of the circular ring = $OB - OA = 6.2 - 3.1 = 3.1$ cm

(vi) $r = 7.1$ cm and $d = 12$ cm.

$r = \frac{d}{2}$

$\therefore r = \frac{12}{2} = 6$ cm and $r = 7.1$ cm



Step 1: Drawn a rough diagram and marked the given measurements

Step 2 : Taken any point O and marked it as center.

Step 3 : With O as center, drawn a circle of radius $OA = 6$ cm.

Step 4 : with O as center, drawn a circle of radius $OB = 7.1$ cm. Thus concentric circles

C_1 and C_2 are drawn.

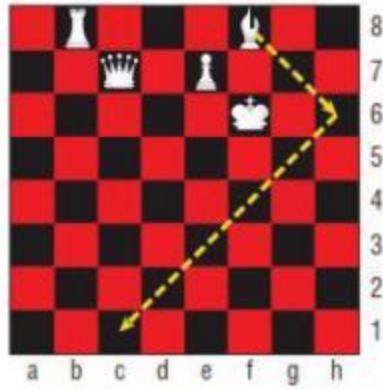
Width of the circular ring = $OB - OA = 7.1 - 6 = 1.1$ cm

4.3

Miscellaneous Practice problems

Question 1.

The bishop, in given picture of chess board, can move diagonally along dark squares. Describe the translations of the bishop after two moves as shown in the figure.



Solution:

For first: $2 \rightarrow, 2\downarrow$; For second move: $5 \leftarrow, 5\downarrow$

Question 2.

Write a possible translation for each of chess piece for a single move.



Solution:

Pawn – $1 \uparrow$ or $2\uparrow$

Rook – 1 to $8 \uparrow$

Knight – $2 \rightarrow, 1 \uparrow$ or $2 \leftarrow, 1 \uparrow$ or $1 \rightarrow, 2 \uparrow$ or $1 \leftarrow, 2\uparrow$

Bishop – $1 \rightarrow, 1 \uparrow$ or $2 \rightarrow, 2\uparrow$ or $3 \rightarrow, 3\uparrow$ or $4 \rightarrow, 4\uparrow$ or $5 \rightarrow, 5\uparrow$ or $1 \leftarrow, 1\uparrow$ or $2 \leftarrow, 2\uparrow$ or $3 \leftarrow, 3\uparrow$ or $4 \leftarrow, 4\uparrow$ or $5 \leftarrow, 5\uparrow$

Queen – 1 to $8, 1 \rightarrow, 1 \uparrow$ or $2 \rightarrow, 2\uparrow$ or $3 \rightarrow, 3\uparrow$ or $4 \rightarrow, 4\uparrow$ or $5 \rightarrow, 5\uparrow$ or $1 \leftarrow, 1\uparrow$ or $2 \leftarrow, 2\uparrow$ or

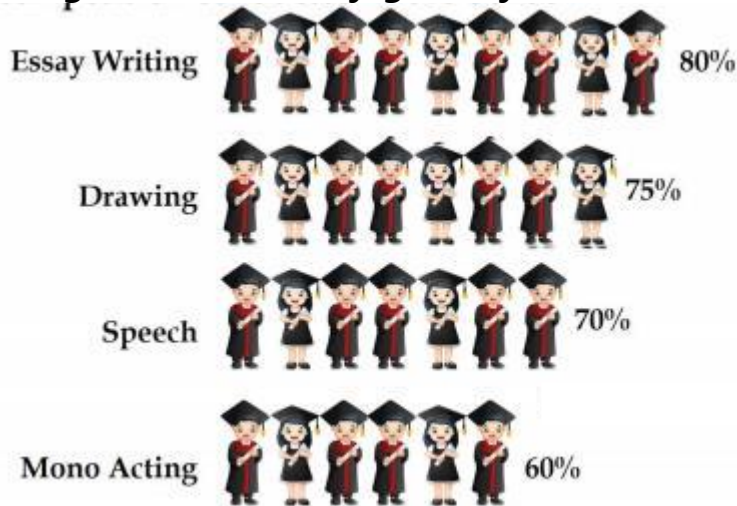
$3 \leftarrow, 3\uparrow$ or $4 \leftarrow, 4\uparrow$ or $5 \leftarrow, 5\uparrow$

King – $1 \rightarrow$ or \leftarrow or \uparrow

Question 3.

Referring the graphic given, answer the following questions. Each bar of the category is made up of boy-girl-boy unit, (i) Which categories show a boy- girl-boy unit that is translation within the bar? (ii) Which

categories show a boy-girl-boy unit that is reflected within the bar?

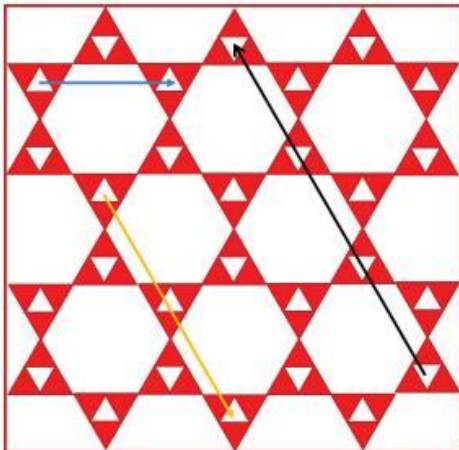


Solution:

- (i) Essay Writing category shows translation
- (ii) Essay Writing and Mono Acting categories shows reflection

Question 4.

Given figure is a floor design in which the length of the small red equilateral triangle is 30 cm. All the triangles and hexagons are regular. Describe the translations in cm, represented by the (i) yellow line (ii) black line (iii) blue line.

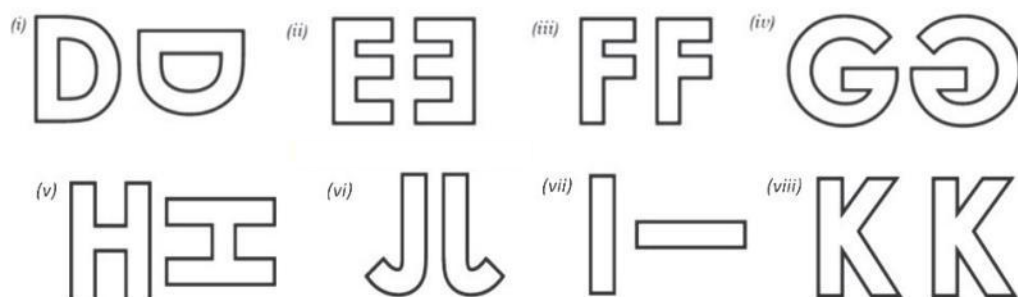


Solution:

- (i) 120cm \rightarrow , 210cm \downarrow
- (ii) 270cm \leftarrow , 330cm \uparrow
- (iii) 150 cm \rightarrow

Question 5.

Describe the transformation involved in the following pair of figures (letters). Write translation, reflection or rotation.



Solution:

- (i) rotation
- (ii) reflection
- (iii) translation
- (iv) reflection
- (v) rotation
- (vi) reflection
- (vii) rotation
- (viii) translation

Challenge problems

Question 1.

In chess, a knight can move only in an L-shaped pattern:



- two vertical squares, then one horizontal square;
- two horizontal squares, then one vertical square;
- one vertical square, then two horizontal squares; or
- one horizontal square, then two vertical squares.

Write a series of translations to move the knight from g8 to g5 (at most two moves)

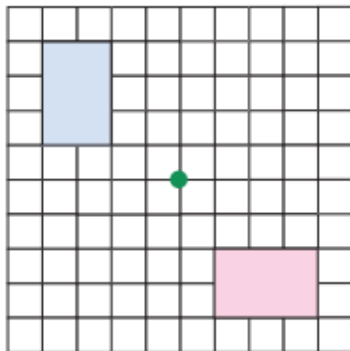
Solution:

2 \leftarrow , 1 \downarrow and then 1 \leftarrow , 2 \downarrow (or) 2 \leftarrow , 1 \downarrow and then 1 \leftarrow , 2 \downarrow

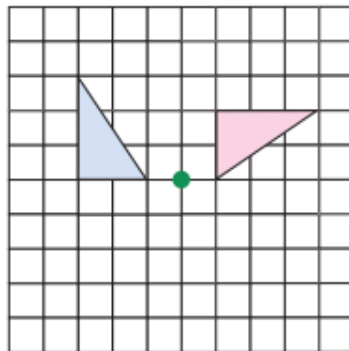
Question 2.

The pink shape is congruent to blue shape. Describe a sequence of transformations in which the blue shape is the image of pink shape.

(i)



(ii)



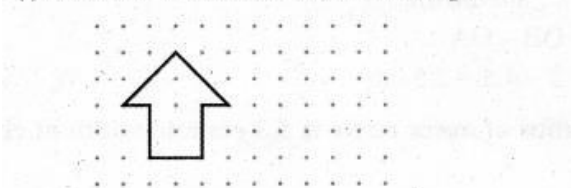
Solution:

(i) Translation 3 \leftarrow , 5 \uparrow and 90° counter clockwise rotation about the green point and translates 5 \leftarrow , 2 \downarrow ,

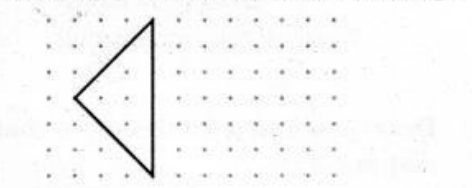
(ii) Translation 2 \leftarrow 90° counter clockwise rotation about the green point and translates 2 \leftarrow , 2 \downarrow .

Question 3.

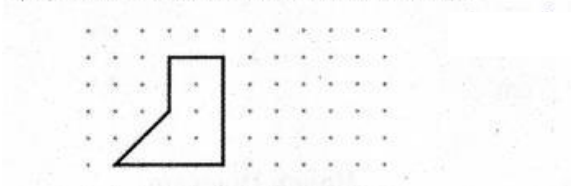
(i) Draw the translation of the shape



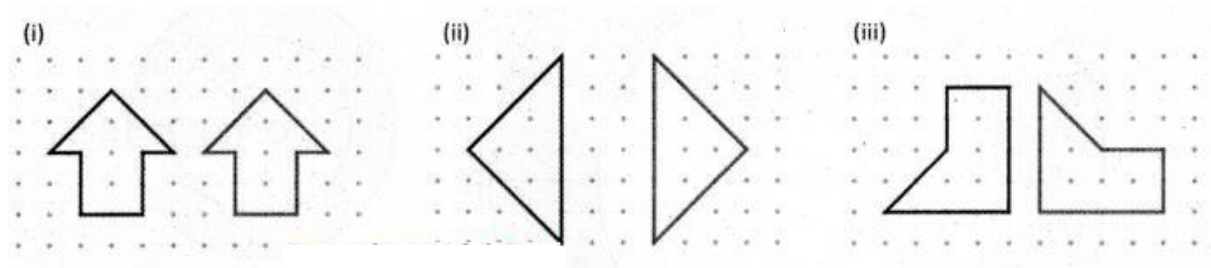
(ii) Draw the reflection of the shape



(iii) Draw the Rotation of the shape



Solution:



Question 4.

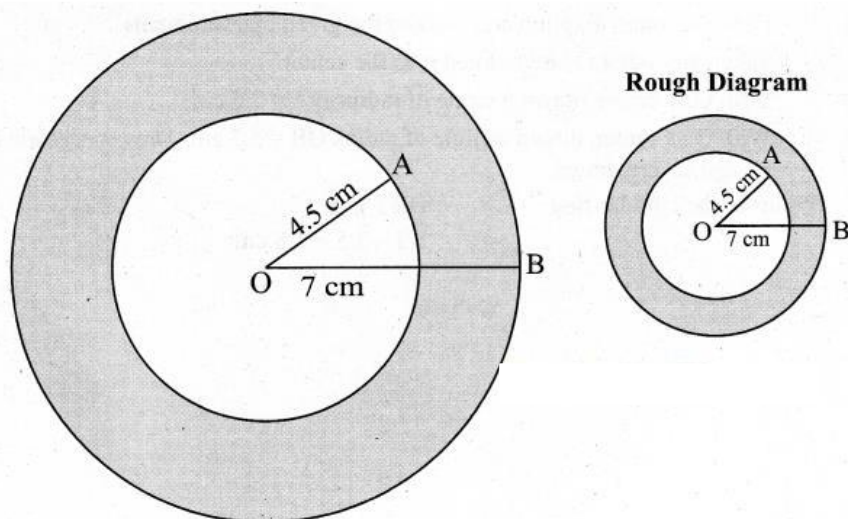
Draw concentric circles given that radius of inner circle is 4.5 cm and width of circular ring is 2.5 cm.

Solution:

Give radius of inner circle = 4.5 cm

Width of circular ring is 2.5 cm

Radius of outer circle = $4.5 + 2.5 = 7$ cm



Step 1 : Drawn a rough diagram and marked the given measurements

Step 2 : Taken any point O and marked it as the center.

Step 3 : With O as center and drawn a circle of radius $OA = 4.5$ cm.

Step 4 : With O as center drawn a circle of radius $OB = 4.5 + 2.5 = 7$ cm.

Thus the concentric circles C_1 and C_2 are drawn.

Width of the circular ring = $OB - OA$

$= 7 - 4.5 = 2.5$ cm

Question 5.

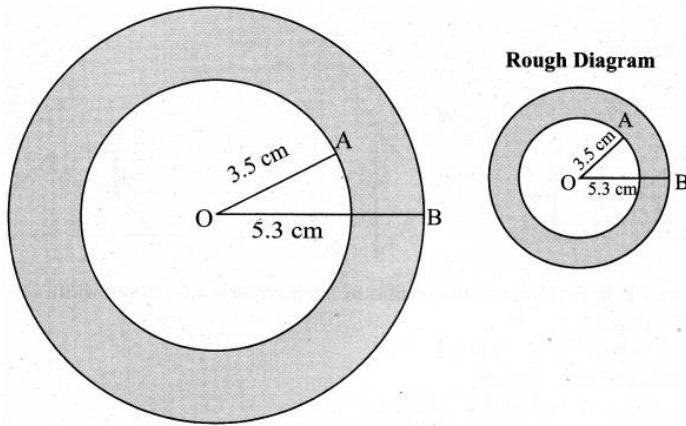
Draw concentric circles given that radius of outer circle is 5.3 cm and width of circular ring is 1.8 cm.

Solution:

Give radius of outer circle = 5.3 cm

Width of circular ring = 1.8 cm

Radius of the inner circle = $5.3 - 1.8$
= 3.5 cm



Step 1: Draw a rough diagram and marked the given measurements

Step 2 : Taken any point O and marked it as the center.

Step 3 : With O as center drawn a circle of radius $OA = 3.5$ cm.

Step 4 : With O as center, drawn a circle of radius $OB = 5.3$ cm. Thus concentric circles

C_1 and C_2 are drawn.

Width of the circular ring = $OB - OA$

= $5.3 - 3.5 = 1.8$ cm