

Chapter 10. Reflection

Exercise 10

1) Find the co-ordinates of the images of the following points under reflection in the X-axis.

i) $(2, -5)$
→ The image of the point $(2, -5)$ under reflection in the X-axis is $(2, 5)$.

ii) $(-3/2, -1/2)$
→ The image of the point $(-3/2, -1/2)$ under reflection in the X-axis is $(-3/2, +1/2)$.

iii) $(-7, 0)$
→ The image of the point $(-7, 0)$ under reflection in the X-axis is $(-7, 0)$.

2) Find the co-ordinates of the images of the following points under reflection in the Y-axis is

i) $(2, -5)$
• The co-ordinates of the image of the point $(2, -5)$ under reflection in the Y-axis is $(-2, -5)$.

ii) $(-3/2, 1/2)$
• The co-ordinates of the image of the point $(-3/2, 1/2)$ under reflection in the Y-axis is $(3/2, 1/2)$.

iii) $(0, -7)$
• The co-ordinates of the image of the point $(0, -7)$ under reflection in the Y-axis is $(0, -7)$.

3.) Find the co-ordinates of the images of the following points under reflection in the origin:

i) $(2, -5)$

→ The co-ordinates of the images of the following point $(2, -5)$ under reflection in the origin is $(-2, 5)$.

ii) $(-3/2, 1/2)$

→ The co-ordinates of the image of the point $(-3/2, 1/2)$ under reflection in the origin is $(3/2, -1/2)$.

iii) $(0, 0)$

→ The co-ordinates of the image of the point $(0, 0)$ under reflection in the origin is $(0, 0)$.

4.) The image of a point P' under reflection in the X-axis is $(5, -2)$. Write down the co-ordinates of point P' .

→ As the image of a point P' under reflection in the X-axis is $P(5, -2)$ then the co-ordinates of the point $P' \equiv (5, 2)$.

s.) A point P' is reflected in the X-axis. Co-ordinates of its image are $(8, -6)$. i) Find the co-ordinates of P' .

ii) Find the co-ordinates of the image P under reflection in Y-axis.

→ Given that, the point P' is reflected in the X-axis. The co-ordinates of its image are $(8, -6)$.

i) Hence, the co-ordinates of point $P' \equiv (8, 6)$.

ii) Hence, the image of point P' under reflection in Y-axis having co-ordinates is $(-8, 6)$.

6) A point 'P' is reflected in the origin. Coordinates of the image are (2, -5) and find i) the co-ordinates of 'P'

ii) the co-ordinates of the image P in the X-axis.

→ Given that, a point 'P' is reflected in the origin. Coordinates of the image are (2, -5).

i) Then the co-ordinates of point 'P' $\equiv (-2, 5)$.

ii) And the co-ordinates of the image of point 'P' in the X-axis is (-2, -5).

7) i) The point P(2, 3) is reflected in the line $x=4$ to the point P'. Find the co-ordinates of the point P'.

ii) Find the image of the point P(1, -2) in the line $x=-1$.

→ (1) Initially, we follow the following steps

i) We will draw the axes XOX' and YOY' with origin 'O' and we will take $1\text{cm} = 1\text{unit}$.

ii) In XY-plane we will plot point P(2, 3) on it.

iii) Then we draw a line $x=4$ which is parallel to Y-axis.

iv) Now, we draw a perpendicular from point P(2, 3) on line $x=4$ which intersects at point Q.

v) Now, we will extend PQ upto P' so that $QP' = QP$.

Thus, the point P' is the reflection of P in the line $x=4$.

And hence, the co-ordinates of P' are (6, 3).

(2) ii) first we draw axes XOX' and YOY' with $1\text{cm} = 1\text{unit}$.

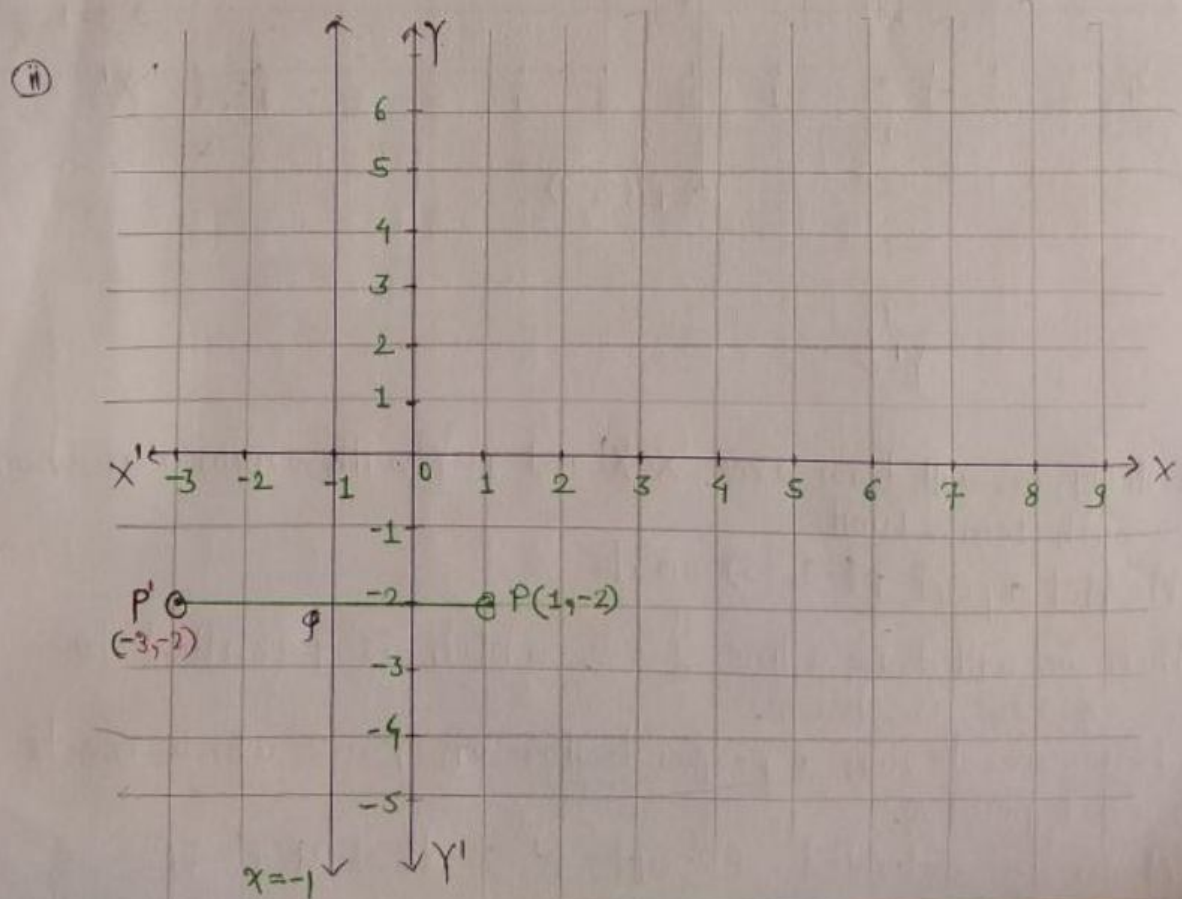
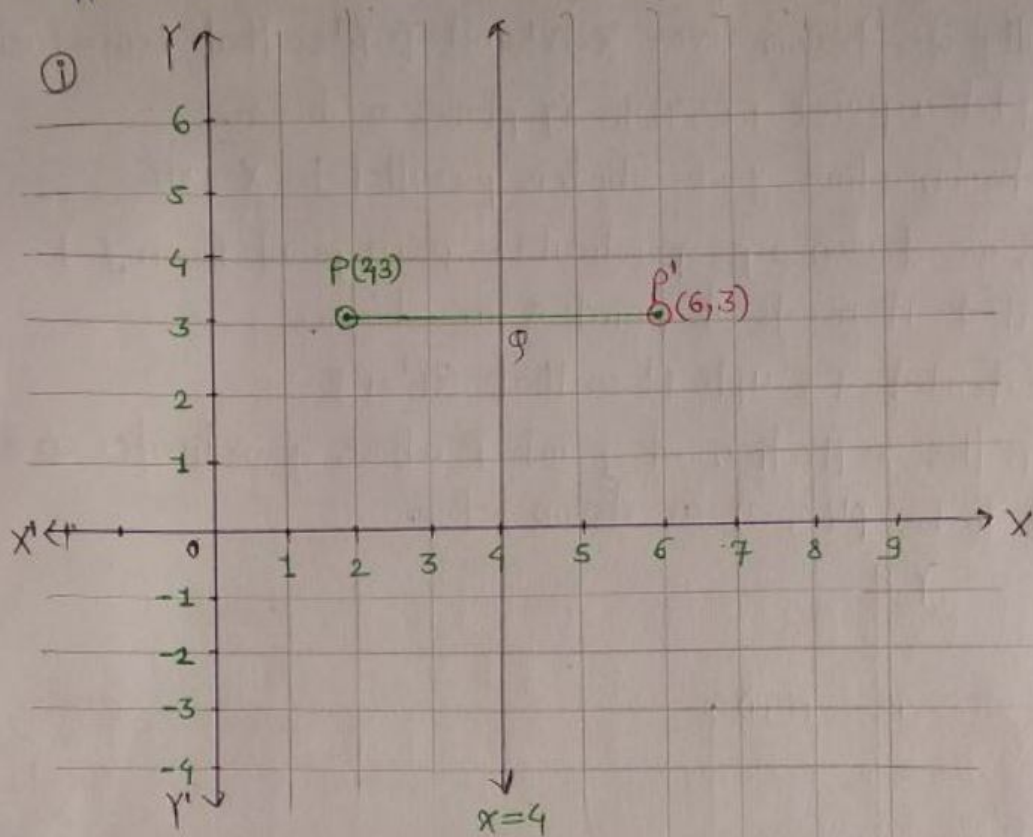
ii) We plot the point P(1, -2) on it as shown.

iii) Now, we draw a line $x=-1$ which is parallel to Y-axis.

iv) We draw a perpendicular on the line $x=-1$, which meets point Q.

v) Now, we extended PQ upto point P' so that $PQ = QP'$.

Thus, the point P' is the image or reflection of point P in the line $x = -1$.
 Hence the co-ordinates of point P' are $(-3, -2)$.

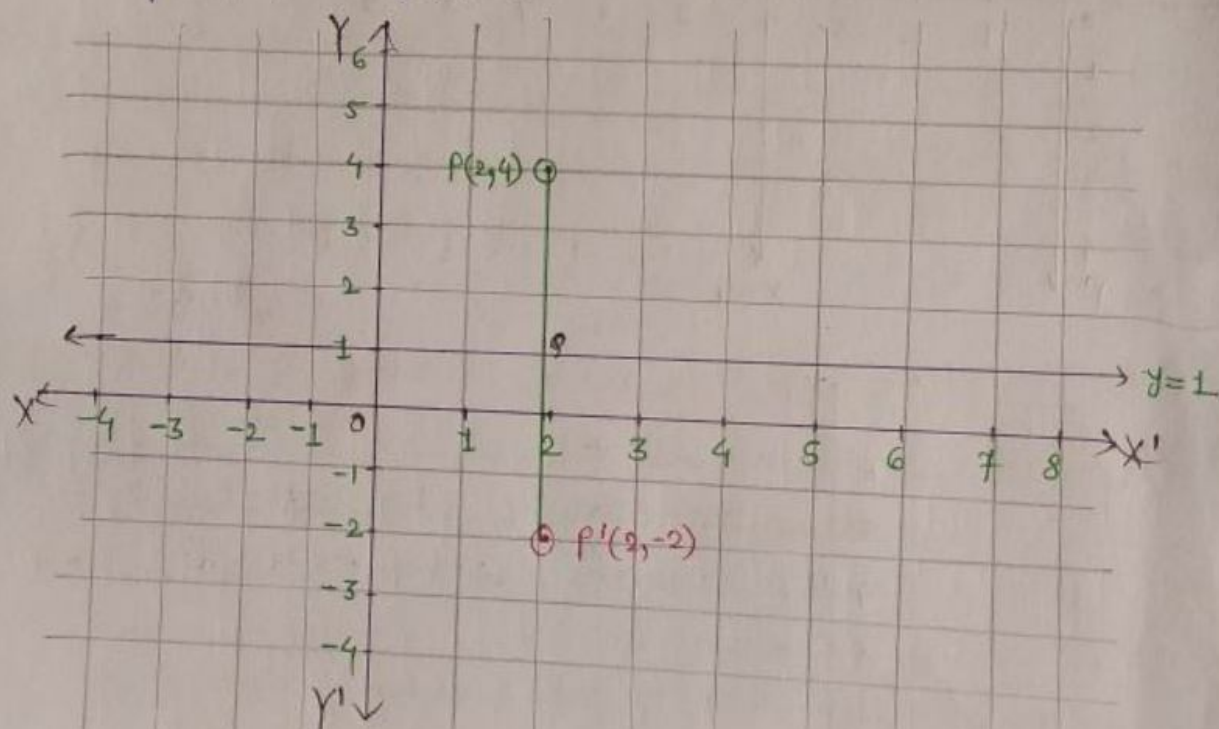


8) i) The point $P(2,4)$ on reflection in the line $y=1$ is mapped onto P' . Find the co-ordinates of P' .

ii) Find the image of the point $P(-3,-5)$ in the line $y=-2$.

- i) • Initially we draw axes XOX' and YOY' so that $1\text{cm} = 1\text{unit}$.
- We plot a point $P(2,4)$ in XY -plane as shown.
 - We draw a line $y=1$ which is parallel to X -axis.
 - Now, we draw a perpendicular from point P on $y=1$ so that it meets at point Q as shown.
 - We extended PQ upto P' so that $QP' = PQ$.

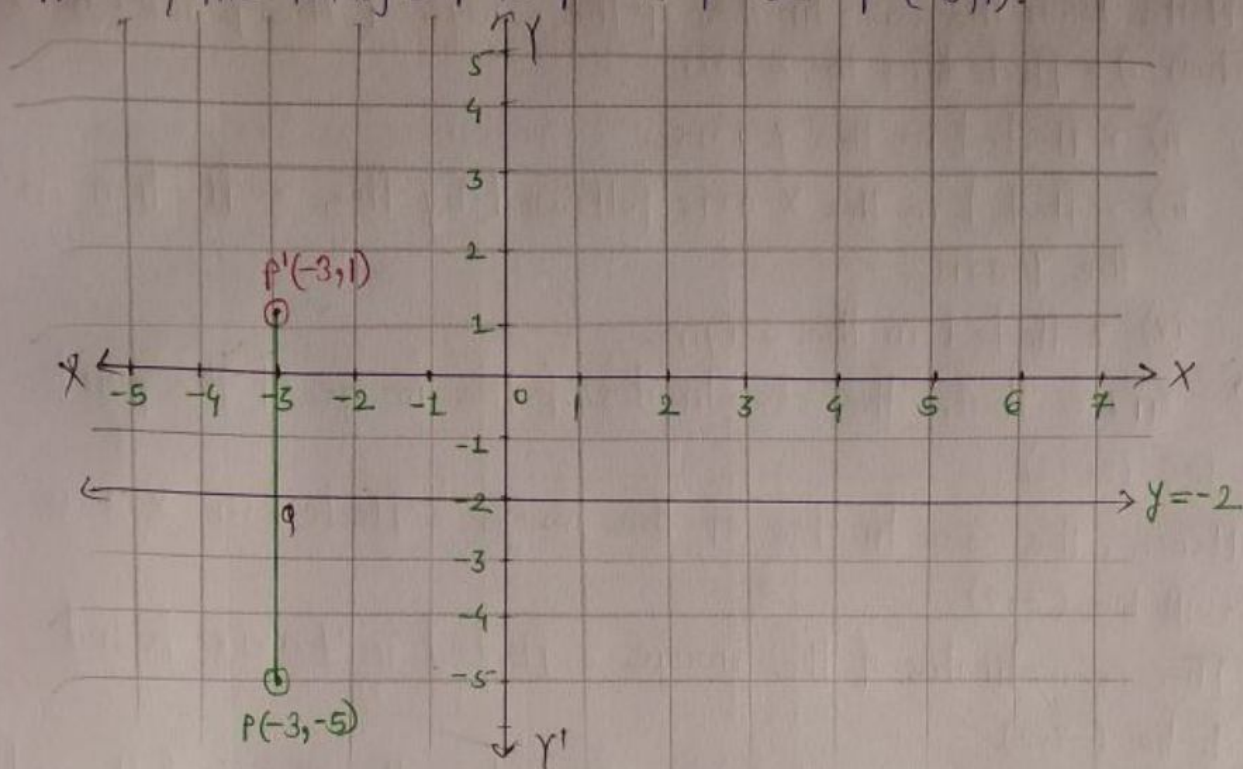
Thus, P' is the reflection of point P whose co-ordinates are found to be $P'(2,-2)$ as shown below.



ii) • Initially, we will draw axes XOX' and YOY' with origin 'o' as shown with $1\text{cm} = 1\text{unit}$.

- We plot a point $P(-3,-5)$ on it.
- Then we will draw a line $y=-2$ which is parallel to X -axis as shown.
- Now, we draw a perpendicular on $y=-2$ which meets at point Q .
- Now, we extended PQ upto P' so that $PQ' = QP$.

Hence, the image P is found to be $P'(-3, 1)$.



9.) The point $P(-4, -5)$ on reflection in Y -axis is mapped on P' . The point P' on reflection in the origin is mapped on P'' . Find the co-ordinates of P' and P'' . Write down a single transformation that maps P onto P'' .

→ Given that, P' is the image of point $P(-4, -5)$ in Y -axis.

Thus, co-ordinates of P' will be $P'(4, -5)$.

Again, given that P'' is the image P of point P' under reflection in origin will be $(-4, 5)$.

Thus, the single transformation that maps P onto P'' is the X -axis only.

- 10) Write down the co-ordinates of the image of the point $(3, -2)$ when
- reflected in the X-axis
 - reflected in the Y-axis
 - reflected in the X-axis followed by the reflection in the Y-axis.
 - reflected in the origin.

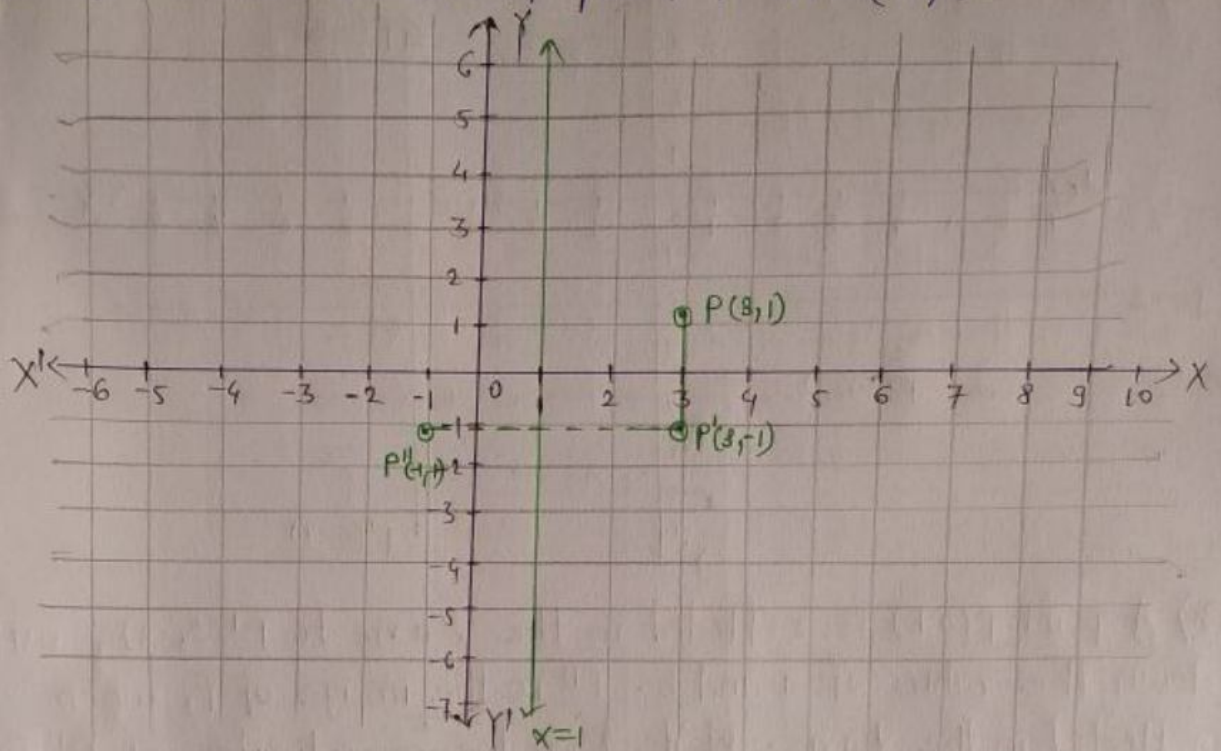
→ Given that, the co-ordinates of the image of the point are $(3, -2)$

- Hence, the co-ordinates of the image reflected in X-axis will be $(3, 2)$
- The co-ordinates of the image reflected in Y-axis found to be $(-3, 2)$.
- The coordinates of the point reflected in the X-axis followed by reflection in the Y-axis found to be $(-3, 2)$.
- The co-ordinates of the point reflected in the origin are found to be $(-3, 2)$.

11) Find the co-ordinates of the image of $(3, 1)$ under reflection in X-axis followed by a reflection in the line $x=1$.

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- Initially, we will draw axes XOX' and YOY' taking $1\text{cm} = 1\text{unit}$.
 - We will plot a point $P(3, 1)$ in this XY -plane.
 - Then we will draw a line $x=1$, which is parallel to Y-axis.
 - Now, we will draw a perpendicular on X-axis meeting at Q as shown.
 - We will extend PQ to P' so that $QP' = PQ$ and here P' is found to be image of the point 'P' in X-axis.
Thus, co-ordinates of point P' are $P'(3, -1)$
 - Now, draw a perpendicular from P' which meets at point R on the line $x=1$.

- Join $P'R$ and P'' so that $RP'' = P'R$
And hence P'' is the image of P' in the line $x=1$.
Hence, the co-ordinates of point P'' are $(-1, 1)$.



- 12) If $P'(-4, -3)$ is the image of a point P under reflection in the origin, find
- the co-ordinates of P .
 - the co-ordinates of the image of P under reflection in the line $y=-2$.

→ Given that, point $P'(-4, -3)$ is the image of a point P under reflection in the origin.

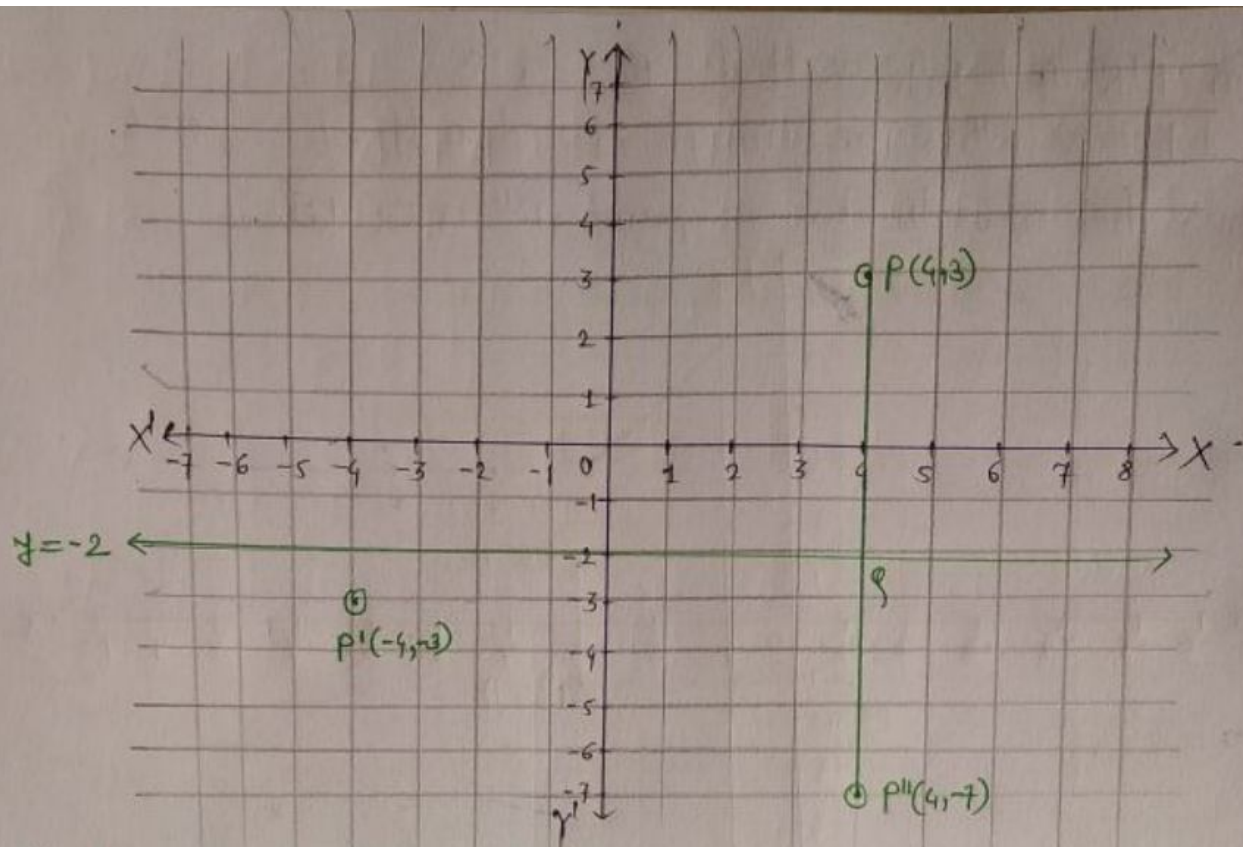
- As the reflection of point P is found to be $P'(-4, -3)$ in the origin & hence the co-ordinates of point P found to be $P(4, 3)$.

• Now, we will draw a perpendicular from point P on the line $y=-2$ which intersects at point Q .

• Now, produce PQ upto point P'' so that $QP'' = PQ$.

• Thus, the P'' is the image of point P in the line $y=-2$.

Hence, the co-ordinates of point P'' are $P''(+4, -7)$



13.) A point $P(a, b)$ is reflected in the x -axis to $P'(2, -3)$, write down the values of a and b . P'' is the image of P , when reflected in the y -axis. Write down the co-ordinates of P'' . Find the co-ordinates of P''' when P is reflected in the line parallel to y -axis so that $x=4$.

→ Given that, a point $P(a, b)$ is reflected in the x -axis to $P'(2, -3)$.

And P'' is the image of P , when reflected in the y -axis.

Thus, co-ordinates of P' are found to be $P'(a, -b)$ but here

$P'(2, -3)$. Thus, on comparing $\Rightarrow \boxed{a=2, b=3}$

• Hence, co-ordinates of point P are found to be $(2, 3)$.

Also, the co-ordinates of point P'' are found to be $P''(-2, 3)$.

• Now, we will draw a line $x=4$ which is parallel to y -axis.

• Here P''' is the image of point P when it is reflected in the line $x=4$.

• Thus, co-ordinates of point P''' are found to be $P'''(6, 3)$.

14.) i) Point $P(a, b)$ is reflected in the X -axis to $P'(5, -2)$.
Write down the values of a and b .

ii) P'' is the image of P when reflected in the Y -axis. Write down the coordinates of P'' .

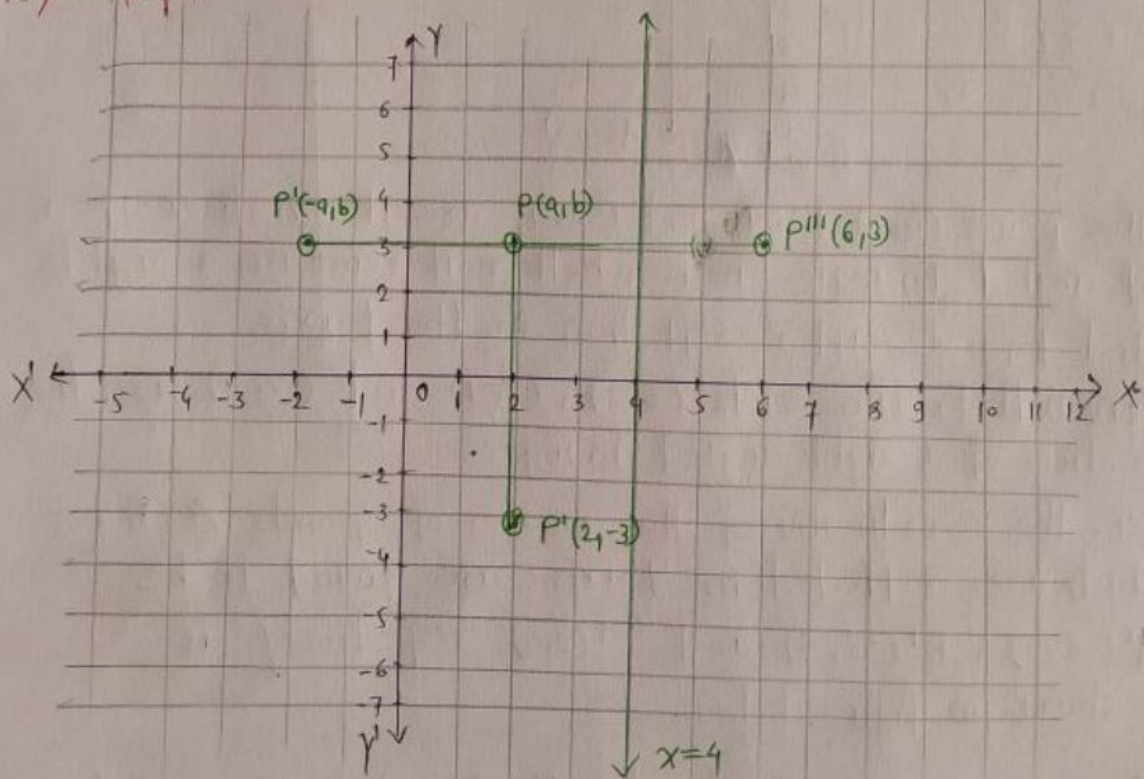
iii) Name a single transformation that maps P' to P'' .

→ i) Hence, given that point $P(a, b)$ is the reflection in the X -axis to $P'(5, -2)$. Hence, $\boxed{a=5 \text{ and } b=2}$

ii) Hence, P'' is the image of P when reflected in the Y -axis. Hence, co-ordinates of point P'' are found to be $P''(-5, 2)$.

iii) A single transformation that maps P' to P'' is the origin.

13.) → Graph



15.) Points A and B have co-ordinates (2,5) and (0,3). Find

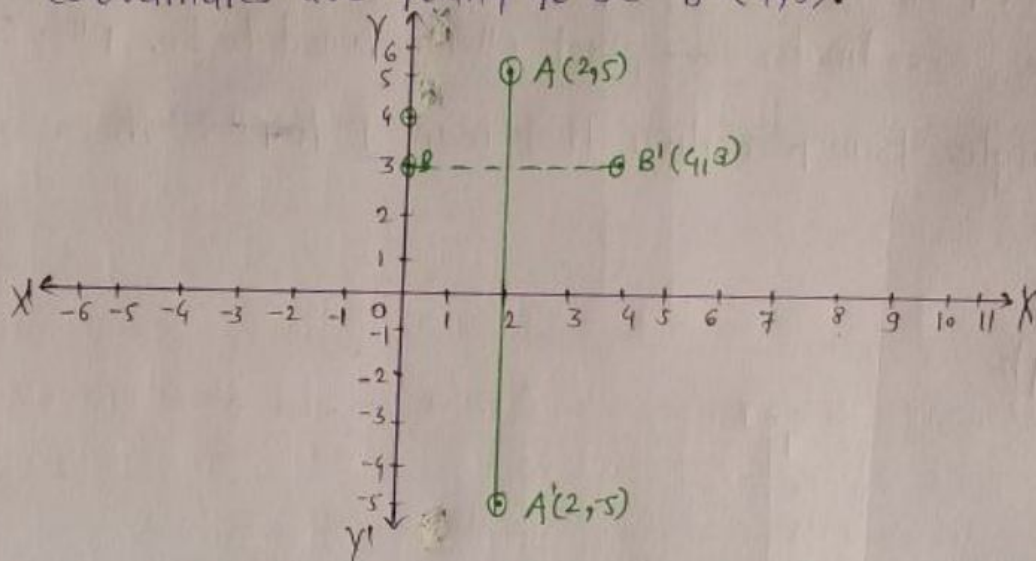
i) the image A' of A under reflection in the X-axis.

ii) the image B' of B under reflection in the line AA' .

→ Given that, co-ordinates of points A and B are (2,5) and (0,3) respectively.

i) A' is the image of A reflected in the X-axis having co-ordinates $A'(2,-5)$.

ii) B' is the image of B reflected in the line AA' whose co-ordinates are found to be $B'(4,3)$.



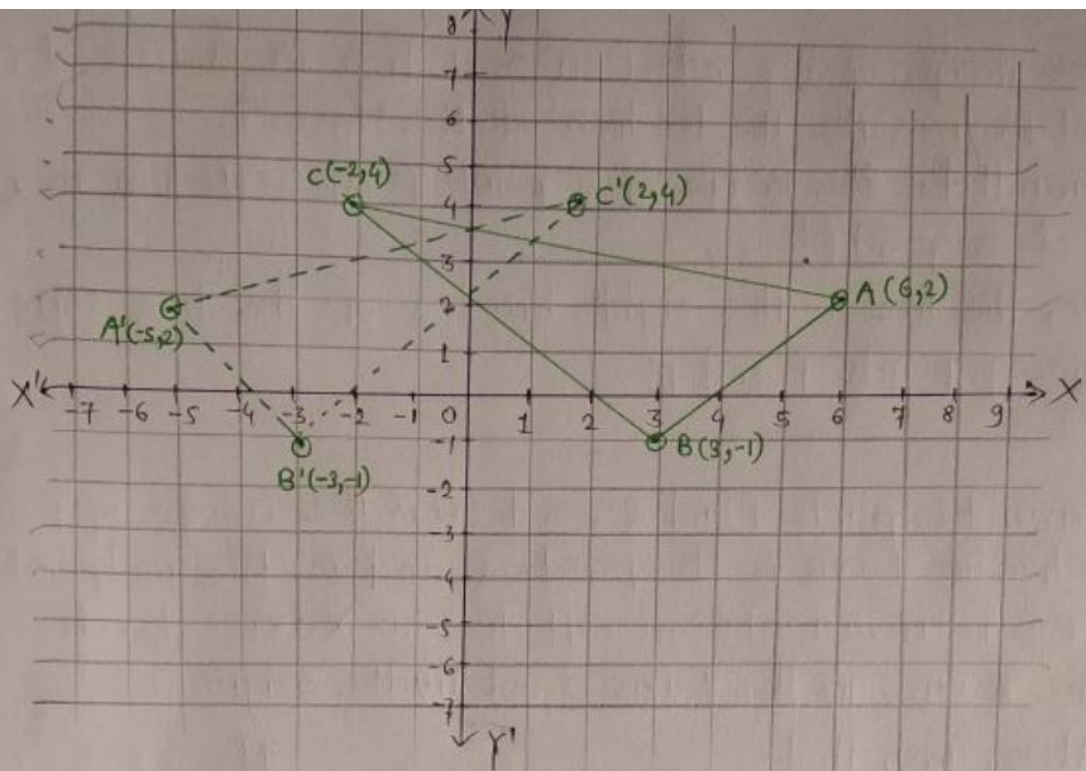
17.) The points (6,2), (3,-1) and (-2,4) are the vertices of a right angled triangle. Check whether it remains a right angled triangle after reflection in the Y-axis.

→ • Given that, the points (6,2), (3,-1) and (-2,4) are the vertices of a right angled triangle.

• Then, the co-ordinates of the images of points A, B, C which are reflected in Y-axis are found to be

• $A'(-6,2)$, $B'(-3,-1)$ and $C'(2,4)$ respectively as shown in figure below.

• Now, by joining the points A' , B' and C' we found a triangle $\Delta A'B'C'$ which is also a right angled triangle.



18.) The triangle ABC where $A(1,2)$, $B(4,8)$, $C(6,8)$ is reflected in the x -axis to triangle $A'B'C'$. The triangle $A'B'C'$ is then reflected in the origin to triangle $A''B''C''$. Write down the co-ordinates of A'' , B'' , C'' . Write down a single transformation that maps ABC to $A''B''C''$.

→ Here, given that

- The co-ordinates of vertices of a $\triangle ABC$ are found to be $A(1,2)$, $B(4,8)$ and $C(6,8)$ which are reflected in the x -axis to the points A' , B' and C' respectively.
- Hence, the co-ordinates of points $A'(1,-2)$, $B'(4,-8)$ and $C'(6,-8)$ respectively.
- Again points A' , B' and C' are reflected in origin to form a $\triangle A''B''C''$.
- Thus, the co-ordinates of point A'' , B'' and C'' are found to be $A''(-1,2)$, $B''(-4,8)$ and $C''(-6,8)$ respectively.
- And the single transformation which maps ABC onto $A''B''C''$ is y -axis only.

19.) The image of a point P on reflection in a line l is point P' . Describe the location of the line l .

→ Given that, the image of a point P on reflection in a line l is point P' .

Hence, the line is the right bisector of the line segment joining points P and P' .

20.) Given two points P and Q , and (1) is the image of P on reflection in Y -axis is the point Q and (2) the midpoint of PQ is invariant on reflection in X -axis. Locate i) the X -axis ii) the Y -axis and iii) the origin.

→ Here, Given that

The two points P and Q , (1) is the image P on reflection in Y -axis and (2) is the midpoint of PQ is invariant on reflection in X -axis.

i) Here, X -axis is the line joining the points P and Q as shown.

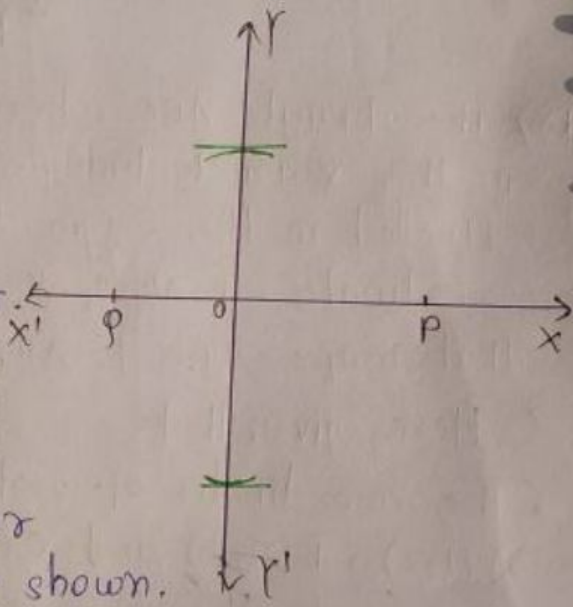
ii) Y -axis is the line perpendicular bisector of line segment PQ as shown.

iii) The origin is the mid-point of line segment PQ .

21.) The point $(-3, 0)$ on reflection in a line is mapped as $(3, 0)$ and the point $(2, -3)$ on reflection in the same line is mapped as $(-2, -3)$.

i) Name the mirror line.

ii) Write the coordinates of the image of $(-3, 4)$ in the mirror line.



→ Given that, the point $(-3, 0)$ on reflection in a line mapped as $(3, 0)$ and the point $(2, -3)$ on reflection in the same line is mapped as $(-2, -3)$.

i) Thus, here the mirror line is found to be Y -axis.

ii) The co-ordinates of the image of point $(-3, -4)$ in the mirror line is found to be $(3, -4)$.

23) Use a graph sheet for this question.

Take $1\text{cm} = 1\text{unit}$ along both X and Y -axes.

i) Plot the following points: $A(0, 5)$, $B(3, 0)$, $C(1, 0)$ and $D(1, -5)$.

ii) Reflect the points B , C and D on the Y -axis and name them as B' , C' , D' respectively.

iii) Write down the co-ordinates of B' , C' and D' .

iv) Join the points A, B, C, D', C', B', A' in order and give a name to the closed figure $ABCDD'C'B'$.

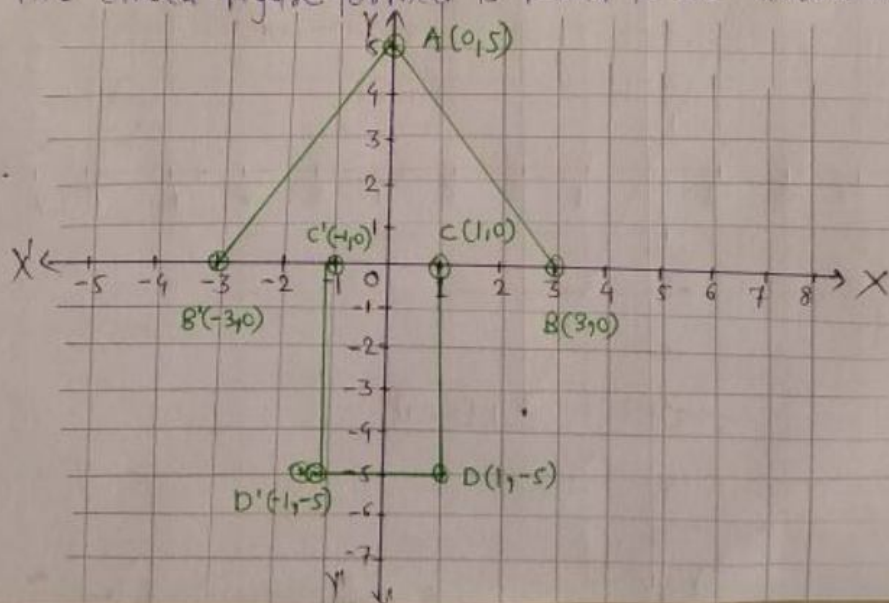
→ We draw a graph by taking $1\text{cm} = 1\text{unit}$ along both X and Y -axes.

i) We plotted the points $A(0, 5)$, $B(3, 0)$, $C(1, 0)$ and $D(1, -5)$ as shown.

ii) We located the points B' , C' and D' also.

iii) The co-ordinates are found to be $B'(-3, 0)$, $C'(-1, 0)$ and $D'(-1, -5)$.

iv) The closed figure formed is found to be arrow head.



24) Use graph paper for this question.

- i) The point $P(2, -4)$ is reflected about the line $x=0$ to get the image Q . find the coordinates of Q .
- ii) Point Q is reflected about line $y=0$ to get the image R . find the co-ordinates of R .
- iii) Name the figure PQR
- iv) find the area of fig. PQR

→ i) Given that, the point $P(2, -4)$ is reflected about the line $x=0$ to get the image Q .

Hence, the co-ordinates of point Q are found to be $(2, 4)$.

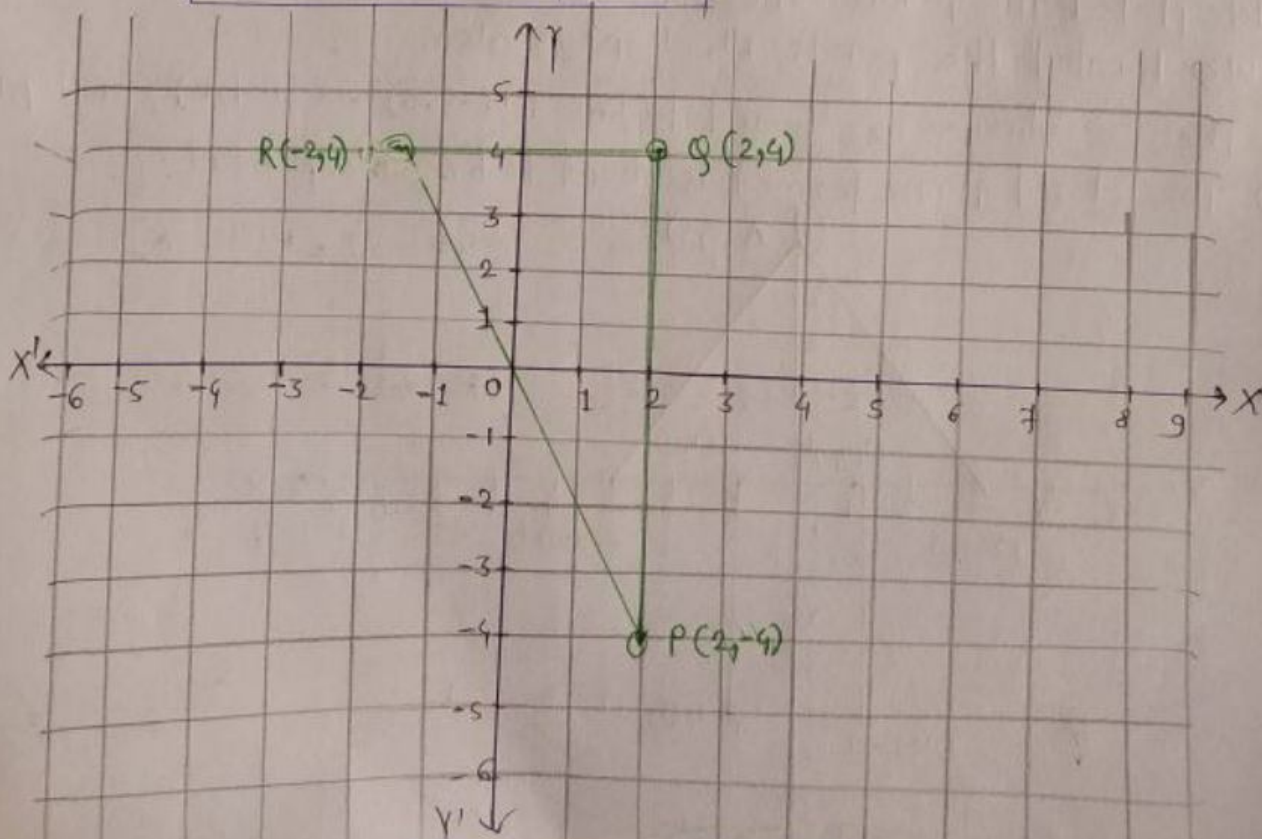
ii) Given that, point Q is reflected about line $y=0$ to get the image R .

Hence, the co-ordinates of point R are found to be $(-2, 4)$.

iii) The figure formed PQR is the right angled triangle as shown.

iv) Then $A(\Delta PQR) = \frac{1}{2} \times QR \times PQ$
 $= \frac{1}{2} \times 4 \times 8$

$A(\Delta PQR) = 16 \text{ sq. units}$



- 25) Using a graph paper, plot the points $A(6,4)$ and $B(0,4)$.
- Reflect A and B in the origin to get the image A' and B' .
 - Write down the co-ordinates of A' and B' .
 - State the geometrical name of the figure $ABA'B'$.
 - Find its perimeter.

→ i) Given points are $A(6,4)$ and $B(0,4)$, after reflection of points A and B in the origin we got the images A' and B' as shown below.

$$A(6,4) \longrightarrow A'(-6,-4)$$

$$\text{and } B(0,4) \longrightarrow B'(0,-4)$$

ii) Thus, the co-ordinates of points A' and B' are found to be $A'(-6,-4)$ and $B'(0,-4)$.

iii) The geometrical figure $ABA'B'$ formed is the parallelogram.

$$\begin{aligned} \text{iv) Here, } AB' &= \sqrt{(AB)^2 + (BB')^2} \\ &= \sqrt{6^2 + 8^2} = \sqrt{36+64} = \sqrt{100} = 10 \text{ units} \end{aligned}$$

Thus, the perimeter of parallelogram is found to be

$$\text{Perimeter} = 6 + 10 + 6 + 10 = 32 \text{ units.}$$

26) Use graph paper to answer this question.

- Plot the points $A(4,6)$ and $B(1,2)$.
- If A' is the image of A when reflected in x -axis, write the co-ordinates of A' .
- If B' is the image of B when B is reflected in the line AA' , write the co-ordinates of B' .
- Give the geometrical name for the figure $ABA'B'$.

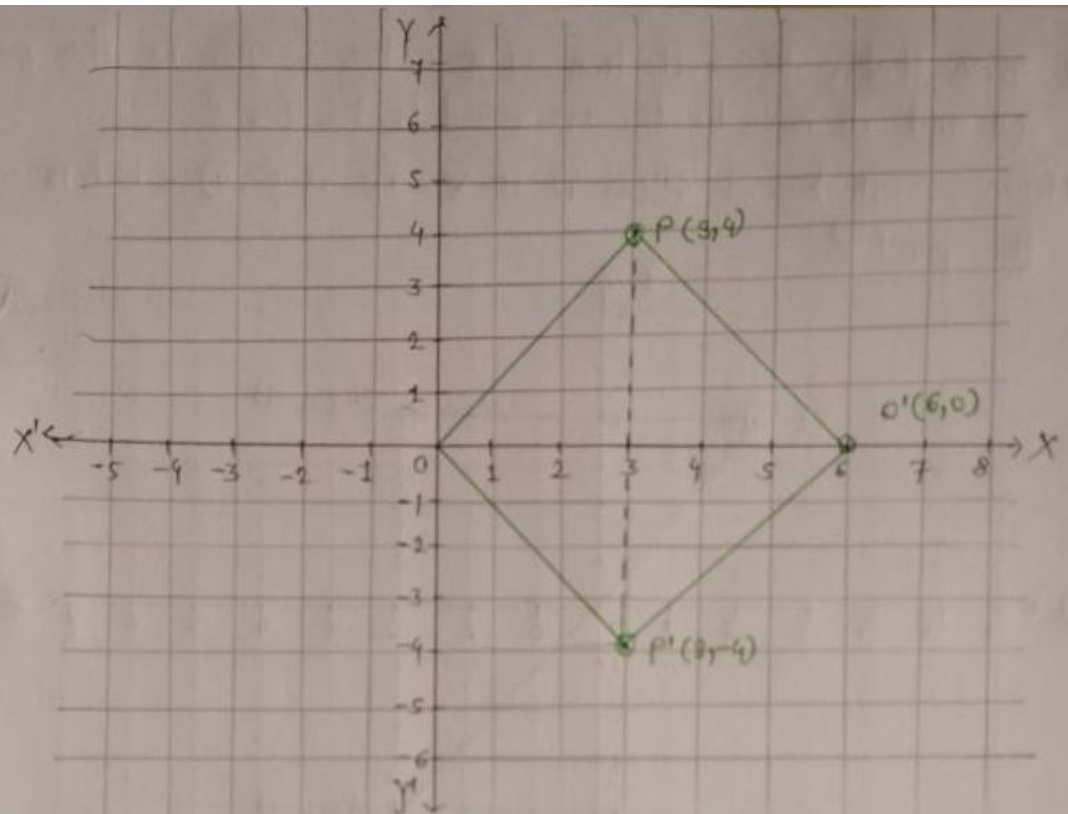
- i) We plotted the given points $A(4, 6)$ and $B(1, 2)$ on the graph as shown in fig.
- ii) Given that, A' is the image of A when reflected in X -axis, then co-ordinates of A' are found to be $A'(4, -6)$.
- iii) Given that, B' is the image of B when reflected in the line AA' & hence the co-ordinates of B' are found to be $B'(7, 2)$.
- iv) Here, $ABA'B'$ is the quadrilateral formed in which $AB = AB'$ and $A'B = A'B'$.
Hence, the geometrical figure $ABA'B'$ formed is a kite.

28.) The point $P(3, 4)$ is reflected to P' in the X -axis and O' is the image of O (origin) in the line PP' . Find

- i) the co-ordinates of P' and O' .
 - ii) the lengths of segments PP' and OO' .
 - iii) The perimeter of the quadrilateral $POP'O'$.
- Given that, the point $P(3, 4)$ is reflected to P' in the X -axis and O' is the image of origin in the line PP' .
- i) Hence, the co-ordinates of P' are found to be $P'(3, -4)$ and co-ordinates of O' reflected in PP' are found to be $O'(6, 0)$.
 - ii) the length of segment $PP' = 8$ units and the length of segment $OO' = 6$ units
 - iii) The perimeter of quadrilateral $POP'O'$ is found to be

$$\begin{aligned}
 \text{Perimeter} &= 4 \times OP \\
 &= 4 \times \sqrt{(Ox)^2 + (Py)^2} \\
 &= 4 \sqrt{3^2 + 4^2} \\
 &= 4 \sqrt{9 + 16} \\
 &= 4 \sqrt{25} = 4 \times 5
 \end{aligned}$$

$$\boxed{\text{Perimeter} = 20 \text{ units}}$$



29) Use a graph paper for this question. (Take 20 small divisions = 1 unit on both axes). P and Q have coordinates (0,5) and (-2,4).

- i) P is invariant when reflected in an axis. Name the axis.
- ii) Find the image of Q on reflection in the axis found in (i).
- iii) $(0,k)$ on reflection in the origin is invariant. Write the value of k.
- iv) Write the coordinates of the image of Q, obtained by reflecting it in the origin followed by reflection in X-axis.

→ Given points are P and Q having coordinates (0,5) and (-2,4).

i) Given that, P is invariant when reflected in an axis.

The points P(0,5) and Q(-2,4) are given where abscissa is of P is 0. Hence, the required axis is Y-axis.

ii) Let us consider the point Q' is the image of Q on reflection in Y-axis. Hence, the coordinates of Q' are found to be Q'(2,4).

iii) $(0,k)$ on reflection in the origin is invariant.

And hence the coordinates of the image are found to be $(0,0)$ where $k=0$.

iv) Given that, the reflection of Q in the origin is the point Q'' and its coordinates are found to be $(2, -4)$.

Hence, reflection of $Q''(2, -4)$ in X -axis is $(2, 4)$ which is the point Q' .

