**CHAPTER NINE**

**TRANSFORMATION**

**Introduction:**

There are various types of transformation and the types to be considered are:

1. Translation . 3. Rotation.
2. Reflection. 4. Enlargement.

**Translation:**

* This is the types of transformation in which every point moves the same distance, and in the same direction.
* Under translation, the lengths of lines and the sizes of angles do not change
* This implies that if a figure undergoes translation, its size as well

as its angles remain unchanged.

* If the point is translated by the vector , then

ie (x, y) tranlation by vector

Example (1)

If is translated by the vector then

.

Example (2)

If is translated by the vector then

.

N/B: The point (3, 8) is called the image of the point (2, 5).

**Reflection :**

The reflection of a point or a figure can only be described, only when the position of the mirror line is well defined or known.

Under this type of transformation, the sizes of angles as well as the lengths of lines remain unchanged.

N/B y

x= -2 x= -1 x= 0 x=1 x=2

X

-2 -1 1 2

* The graph whose equation is x = 1, is a straight lines which is perpendicular to the x-axis, and passes through the point 1 on the x-axis.
* Also the line x = -2 passes through the point -2 on the x-axis.
* The y axis is also the same as the line x = 0

**Types of reflections:**

There are various types of reflections, and those to be considered are:

1. **Reflection in the y-axis or line x = 0:**

* For such a reflection,

.

Example (1).

P (2, 5) reflection in the y- axis P1(-2,5).

Example (2)

If the Q(3, 8) undergoes a reflection in the line x = 0, then for its image Q1, .

1. **Reflection in the line y = b:**

For such a reflection, (x, y) (x, 2b – y).

Example (1)

If the point (2,4) undergoes a reflection in the line

y = 3, then

(2, 4) reflection in line y = 3 {2, 2(3) -4}

(2, 4) (2, 6 – 4)

(2, 4) (2, 2).

Example (2)

If the point Q(2,3) undergoes a reflection in the line y = 5, then for its image Q1,

(x, y) reflection in the line y = b (x, 2b – y),

Q1{2, 2(5) -3}

Q(2, 3) Q1(2,10 – 3)

Q(2, 3) Q1(2,7).

N/B: In this case, (x, y) = (2, 3) and y = b

becomes equal to y = 5.

.

There values are the substituted into the formula

(x, y) reflection in line y = b (x, 2b – y).

1. **Reflection in the x-axis or the line y = 0:**

* For such a reflection,

(x, y) reflection in x-axis (x, -y)

Example (1)

If P(4, 3) undergoes a reflection in the x-axis, then its image P1 is given by P(4,3) reflection in x-axis P1(4,-3).

Example (2)

If the point A(-3,-4) undergoes a reflection in the x-axis, then its image A1, is given by A(-3, -4) reflection in a-axis A1(-3, 4).

y - axis

3 y = 3

2 y = 2

1 y = 1

x - axis y = 0

-1 y = - 1

-2 y = - 2

- The line graph whose equation is y = 3, is a straight line which is perpendicular to the y-axis, and passes through the point 3 on they-axis.

- Also the line y = -2, passes through the point -2 on the y - axis.

- Lastly the x- axis is the same as the line y = 0.

1. **Reflection in line y = x, or the line y-x = 0, or line –y = -x:**

* The line y = x is the same as the line y-x = 0, or the line –y = - x
* For such a reflection,

(x,y) reflection in line y = x (y, x).

Example: if the point P(3, 5) undergoes a reflection in the line y = x, then for its image P1,

P(3,5) reflection in line y = x P1(5, 3).

The line y = x is shown next:

y = x

1. **Refle.ction in the line y = -x or the line y + x = 0 or the line – y = x:**

* The line y = -x is the same as the line y + x = 0, or the line -y = x.
* For such a reflection,

(x, y) reflection in line y = -x (-y,-x).

Example (1)

If the point B(2, 5) undergoes a reflection in the line y = -x, then for its image B1,

B(2,5) reflection in line y = -x B1(-5, -2).

Example (2)

If the point C(-3, -2) undergoes a reflection in the line  
 y + x = 0, then for its image

C(-3, -2) reflection in line y + x = 0 C1(2, 3).

* Next is a diagrammatic representation of the line

y = - x

y

y = -x

x

N/B: The line x = a is a straight which is perpendicular to the x-axis, and passes through the point a, on the x-axis.

Also the line x = b is perpendicular to the x-axis, and passes through the point b on the x-axis.

x= 0 x=a x=b

0 a b

1. **Reflection in the line x = a:**

If the point (x, y) undergoes a reflection in the line x = a, then (x, y) reflection in line x = a (2a – x, y).

Example (1)

If the point (4, 3) undergoes a reflection in the line x = 5, then (x, y) = (4, 3) and x = a becomes equal to x = 5. Therefore x = 4, y = 3 and a = 5

From (x, y) reflection in line x = a (2a-x, y).

(4, 3) reflection in line x = 5 {2(5)-4, 3}.

(4, 3) (10 – 4, 3)

(4, 3) (6, 3).

Example (2)

If the point p(-3, 4) undergoes a reflection in the line

y = 8, then for its image P1,

P(-3, 4) reflection in line y = 8 P1{2(8) – (-3), 4}

P(-3, 4) P1(16 + 3, 4).

P(-3, 4) P1(19, 4).

**Rotation :**

* This is measured in degrees and from the x-axis.
* It is either measured in a clockwise or an anticlockwise direction.
* Rotation in the clockwise direction is negative rotation, and that in the anticlockwise direction is positive rotation.

90

180 0

Anticlockwise Clockwise

+ -

270

The different types of rotation to be considered are:

1. **Clockwise rotation of 90 or rotation through -90:**

* This type of rotation is the same as an anticlockwise rotation through 270or rotation through 270.

Anticlockwise

Rotation through Clockwise rotation

270 through 90

From the sketch made, it can be seen that from the same starting point, a clockwise rotation through 90, and an anticlockwise rotation through 270, all meet on the same line or at the same point.

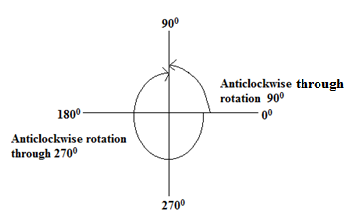
For this reason the two are the same. For a clockwise rotation through 90 or an anticlockwise rotation through 270, about the origin

(x, y) (y, -x).

The following rotations are all the same, and as such the formula given must be used:

1. (x, y) Clockwise rotation through 90 about the origin (y, -x).
2. (x, y) Rotation through -90 about the origin (y, -x).
3. (x, y) Anticlockwise rotation through 270 (y, -x).
4. (x, y) Rotation through 270 (y, x).
5. **Anticlockwise rotation through 90 or rotation 90**

* This types of rotation is the same as clockwise rotation through 270 or rotation through -270.



From the diagram drawn, it can be seen that an anticlockwise rotation through 90, and a clockwise rotation through 270, originating from the same starting point or line, all end at the same starting point or line.

For this reason, they are the same. If the point (x, y) undergoes an anticlockwise rotation through 90, or clockwise rotation through 270, then

(x, y) (-y, x).

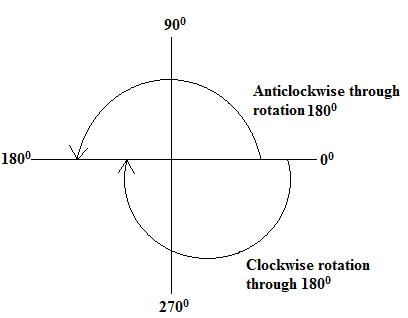
The following transformations are the same, and questions based on them must be solved using the given formula:

1. (x, y) Anticlockwise rotation through 90 about the origin (-y, x).
2. (x, y) rotation through 90 (-y, x)
3. (x, y) clockwise rotation through 270 (-y, x)
4. (x, y) rotation through -270 (-y, x)

Anticlockwise rotation through 90 or a clockwise rotation through 270 is known as or referred to as quarter turn.

**Clockwise rotation through 180 or rotation through -180**

This type of rotation through which is referred to as half turn, is the same as an anticlockwise rotation through 180 or rotation through 180



For this type of rotation (x, y) (-x, -y).

Example (1)

The image P1 of the point P(2, 5), which undergoes a clockwise rotation of 180 about the origin, is given by P(2,5) P1(-2, -5).

Example (2)

The image C1 of the point C (-4, 7), after an anticlockwise rotation through 180, is given by C (-4, 7) C1(4, -7)

**Enlargement/ reduction:**

* An important issue in connection with enlargement or reduction, is the scale factor (S.F).
* This scale factor tells us the number of times each length of the object has to be increased or decreased, so as to get the image.
* If the scale factor is greater than 1, then the size of the image is larger than that of the object.
* But if the scale factor is less than 1 or is a fraction, then the size of the image is smaller than that of the object.
* For example if the scale factor is 4, then the implication is that each length of the object had to be increased four times, in order to get the lengths of the image.
* On the other hand if the scale factor is, then each length of the object had to be decreased to one quarter of its value, in order to get the lengths of the image.
* S.F = One length of the image

Corresponding length of the object

Example (1)

3cm 12cm

2cm enlargement 8cm

Object Image

S.F = .

Example 2

9cm 3cm

Object 6cm enlargement image 2cm

S.F =

S.F= .

- The type of enlargement in which the scale factor is a fraction, is referred to as a reduction.

- If the point (x, y) is enlarged with a scale factor of K, then (x, y) enlargement with S. F. K (kx, ky).

Example (1)

If (x, y) is enlarged with scale factor 2, then

(x, y) (2x, 2y).

Example (2)

If (2, 5) is enlarged with scale factor 4, then

(2, 5) {4(2), 4(5)}

(2,5) (8, 20).

**Summary**

A summary of formulae, which must be kept in memory are presented next.

1. (x, y) translation by vector () (x + a, y + b).
2. (x, y) reflection in the y – axis (-x , y).
3. (x, y) reflection in line y = b (x, 2b – y).
4. (x, y) reflection in the x-axis (x, -y)
5. (x, y) reflection in line y = x (y, x).
6. (x, y) reflection in line y = -x (-y, -x)
7. (x, y) reflection in line x = a (2a – x, y)
8. Clockwise or anticlockwise rotation through 180 about the origin

(x, y) (-x, y).

1. Clockwise rotation through 90 or anticlockwise rotation through 270, about the origin.

(x, y) (y, -x).

1. Anticlockwise rotation through 90 or clockwise rotation through 270, about the origin

(x, y) (-y, x).

Q1. i. Using a scale of 2cm to 2units on each axis, draw the line ox and oy for

1. Draw triangle ABC with vertices A(1,2), B(-3,4) and C(-4,1).
2. On the same axes, draw the image A1B1C1of ABC, after a reflection in the line x = 3.
3. Draw the image A2B2C2 of ABC under a reflection in the line y = 3..

Soln

1. Y

C2 6

5

B 4 A2 B1

3

B2 2 A1

1 A C1

C

-6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10

-1

-2

-3

-4  
 -5

(x, y) reflection in line x = a (2a – x, y)

(x, y) reflection in line x = 3 {2(3) – x , y}

(6 – x, y).

A A1A(1, 2) reflection in line x = 3 A1(6 - 1,2),

=>A(1, 2) A1(5,2)

B B1 (6 – x, y).

B(-3, 4) reflection in line x = 3 B1(6 - 4) ,

B(-3, 4) B1(6 + 3,4),

B(-3, 4) B1(9, 4).

C C1C(- 4, 1) C1(6-x, y),

C(- 4, 1) C1(6 - , 1),

C(- 4, 1) C1(6+4,1) C(- 4, 1) C1(10,1).

To get , we plot the point A1,B1 and C1and join one to the other.

1. (x, y) reflection in line y = b (x, 2b – y ),

(x, y) reflection in line y = 3 (x, 2(3) – y),

(x, y) (x, 6 – y).

A (1,2) A2(1, 6 – 2),

.Since B B2

(x, y) (x, 6 – y),

-3, 4) B2(-3, 6 – 4),

=>(-3, 4) B2(-3, 2).

- 4, 1) C2(- 4, 6 – 1),

(- 4, 1) C2(- s4, 5).

We finally draw using the points A2, B2 and C2.

Q2. i. Using a scale of 2cm to 2units on each axis, draw on a sheet of graph paper two perpendicular axes ox and oy, for the interval .

ii. Draw with vertices P(2, 8), Q(5, 8) and R(2, 4).

iii Draw the image of under a reflection in the line y = 2, where P P1, Q Q1 and R🡪R1.

1. Draw also the image after a half turn about the origin o, where P P2 ,Q Q2 and R R2

Soln.

1. Y

10

8 P Q

6

4 R

2

R1 x

-10 -8 -6 -4 -2 2 4 6 8 10

-2

R2 -4

-6 P1 Q1

Q2 P2 -8

-10

1. (x, y) reflection in line y = b (x, 2b – y)

(x, y) reflection in line y = 2 {x, 2(2) – y}

(x, y) (x, 4 – y).

Since P P1,

Since Q Q1 and (x, y) (x, 4 – y),

Q (5, 8) Q1 (5, 4 – 8),

Q (5, 8) Q1 (5, -4).

Lastly R R1 and (x, y) (x, 4 – y), =>

R(2, 4) R1(2, 4 – 4),R1(2,0).

Using P1,Q1 and R1, we draw .

1. For a half turn about the origin (x, y) (-x, -y)

P P2 P(2, 8) P2(-2, -8)..

Q Q2 Q(5,8) Q2(-5, -8).

R R2R(2, 4) R2(-2, -4).

Q3. Using a scale of 2cm to 1unit on both axes, draw the x and the y axes for .

1. Plot A(3, 1), B(1, 1) and C(1, 5).
2. Find the equation of line AC.
3. Draw where A A1, B B1 and

C C1.

1. Draw which is the image of under the mapping where A A2,

B B2 and C C2.

. . Soln.

1. Y

7

6

5 C

4

3

2

1 B A

B2 A2

1 2 3 4 5 6 7 8

B1 A1

-1

-2

-3

-4 C2

-5 C1

-6

1. Line AC passes through the points

( 3 1) and (1, 5). Let (x1, y1) = (3, 1) and (x2, y2) = (1, 5) x1 = 3, y­1 = 1, x2 = 1 and y2 = 5.

Using y – y1 =

1. For a reflection in the x – axis, (x, y) (x, -y)

Since A A1 A1(3, -1)

Since B B1 B(1, 1) B1(1, -1)

Since C C1 C(1,5) C1(1, -5)

Using A1(3, -1), B1(1, -1) and C1(1, -5), we draw

1. .

Since A A2, then A(3, 1) A2 {2(3), 1 – 1},

A(3, 1) A26, 0).

Since B🡪B2, then B(1, 1) B2{2(1), 1 – 1},

B(1,1) B2(2, 0).

Since C C2, then C(1, 5) C2{2(1), 1 – 5)},

C2(1,5) C2(2, -4).

Using A2(6, 0), B2 (2, 0) and C2(2, -4), we draw .

Q4. Draw on a sheet of graph paper two perpendicular axes, ox and oy for using a scale of 2cm to 2units on both axes. Given the point A(1, 2) and the vector draw on the same graph

1. the quadrilateral ABCD.
2. the image A1B1C1D1 of ABCD under a clockwise rotation of 90 about the origin (0, 0), Where A A1, B B1, C C1 and D D1.
3. The image A2B2C2D2 of A1B1C1D1 under a reflection in the line y = x, where A1 A2, B1 B2, C1 C2 and D1 D2
4. Determine the length A2C2.

Soln.

1. Given A(1, 2), and

Now B(4, 4) and At this stage, since we now know the coordinates of A,B,C and D, we can now draw the quadrilateral ABCD

Y

10

C2 8 C

D2 6D

B2 4 B

A2 2A

-10 -8 -6 -4 -2 A1 2 4 D1 6 8 10

-2 C1

-4 B1

-6

-8

-10

1. Under a clockwise rotation of 90 about the origin (0,0),
2. (x, y) (y, -x). Since A A1, then

A(1, 2) A1(2, -1)

Since B B1, then B(4, 4) B1(4, -4). Also since

C C1 then C(3, 7) C1(7, -3).

Lastly since D D1, then D(1, 5) D1(5,-1). With the coordinate of A1B1C1 and D1 known, we can now draw quadrilateral A1B1C1D1.

1. Under a reflection in the line y = x, (x, y) (y, ,x)

Since A1 A2, then A1(2,-1) A2(-1,2). Since

B1 B2, then B1(4,- 4) B2(- 4, 4).

Also C1 C2, => C1(7,-3) C2(-3,7).

Lastly D1 D2, =>D1(5,-1) D2(-1,5)..

We then draw the quadrilateral A2B2C2D2.

N/B: If A1 A2, then the coordinates of A1 must be used but not those of A.

1. A2 = (-1, 2) and C2 = (-3, 7). Let (x1, y1) = (-1, 2) and (x2, y2) = (-3, 7), x1 = -1, y1 = 2, x2 = -3 and y2 = 7. If l = the length of A2C2

Q5. Draw on the graph sheet, using a scale of 2cm to 2units, two perpendicular axes ox and oy for

1. Plot the points A(4,3), B(6, 3), C(3,5) and D(1,3).
2. Draw the image A1B1C1D1 of ABCD under an enlargement from the origin (0, 0) with a scale factor of where A A1, B B1, C C1 and D D1.
3. Draw the image A2B2C2D2 of A1B1C1D1 under an anticlockwise rotation of 90 about origin 0(0,0), where A1 A2, B1  B2, C1🡪 C2 and D1 D2..

Soln.

1. Y

10

8

6 C

4

2 D A B

-10 -8 -6 -4 -2 2 4 6 8 10

D2

-2

B1 A1 D1 -4 C2

-6 A2

C1 -8 B2

-10

1. If (x,y) undergoes an enlargement with scale factor k, then

(x, y) (kx, ky),

if (x, y) undergoes an enlargement with scale factor then . (x, y) ().

Since A A1, then A(4, 3) A1{).

Since B B1, then B(6, 3) B1C C1

Lastly D

1. For an anticlockwise rotation of 90 about the origin 0(0, 0), (x, y) (-y, x)’

Since .

.

.

We then draw figure A2B2C2D2.

Q6. Using a scale of 1cm to 1 unit on each axis, draw the x and y axes.

1. Draw quadrilateral ABCD whose vertices are A(3, 4), B(5,4), C(5, 2) and D(3, 2).
2. Draw the quadrilateral A1B1C1D1 which is the image of ABCD, after a reflection in the y-axis, where A
3. Draw the image A2B2C2D2 of ABCD after a translation by the vector .
4. Draw quadrilateral A3B3C3D3 which is the image of A1B1C1D1, after a rotation through 270 about the origin in the clockwise direction.

Soln

Y

10 A2 B2

8 D2 C2

6

B1 A1 4 A B

C1 D1 2 D C

-10 -8 -6 -4 -2 2 4 6 8 10

A3 D3 -2

* - 4

B3 C3

-6

-8

(ii) For a reflection in the y- axis, (x,y) (-x,y). Since

A A(-3,4).

B . Since C then

C(5 ,2) . Lastly D

.

We then draw quadrilateral

1. If (x, y) undergoes a translational by the vector , then

(x, y) (x + a, y+ b).

If (x, y) undergoes a translation by the vector, then

(x, y) (x + 2, y + 6).

Since

C

Since A A(3, 4)

A(3, 4) ’

B B(5, 4) ,

B(5, 4) ..

C C(5, 2)

C(5,2) .

Lastly D D(3, 2)

D(3, 2) (5, 8).

With these coordinates, draw .

(iv) Under a clockwise rotation through 27,

(x, y) (-y, x).

Since is the image of , then

, ,

Since then.

Since , then

Since then

Lastly Since then (-3, 2) (-2,-3)

Q7)(i). Using a scale of 1cm to 1 unit on each axis, draw the quadrilateral whose vertices are A(-5, 3), B(0, 3), C(-1,2) and D(-4,2).

(ii) Construct which is a reflection of the line y – x= 0, where A 🡪 B 🡪, C🡪 and D 🡪

(iii)Draw which is the image of after a reflection in the line x= 5, where,

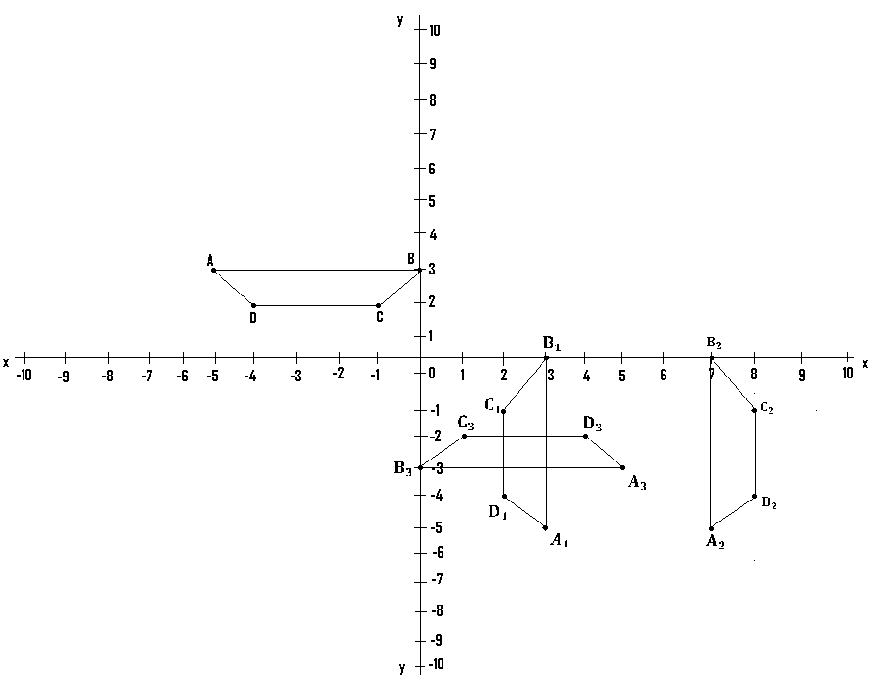
..

(iv) Draw which is the image of ABCD after a half turn, where A and D ..

(v) Find the gradient of the line ..

(vi) Find the equation of the line.

(vii) Determine also the equation of line AD.

****

(ii) Line y – x =0 is the same as the line y = x. If (x, y) is reflected in the line y = x, (x , y) (y, x).

Since A then A(-5, 3) .

Since B then B(0, 3)

Also C C(-1, 2) .

Lastly D D(-4, 2) )

We then draw .

(iii)

****

****

**(x, y) (10 – x, y).**

,

,

.

10 - 2, -4),

.

We then draw .

(iv) If (x, y) undergoes a half turn, then

(x,y) (-x,-y).

Since A , then A(-5, 3) {-(-5), -3},

A(-5, 3)

Also B B(0, 3)

C C(-1, 2) .

Lastly since D then D(-4, -2)

We now draw

(v) The line has coordinatedes and (2, -1).

Let ( = (3, 0) and ( = (2, -1)

The gradient of

(vi) The line has a gradient of 1 and passes through the point = 2 and

Using y - = m(x - ) y –(1) = 1(x – 2),

y - 1 = -x - 2 y = x - 2 + 1

y = x + 1.

(vii) The line AD passes through the points A(-5, 3) and D(-4, 2). Let (

= (- 4, 2) =-5,

Now y- = ,

y – 3 =

y -3 = ,

y – 3 =

y=-x – 5+3, y = -x – 2.

Q8) Using a scale of 2cm to 2 units on both axes, draw on a sheet of graph paper two perpendicular axes ox and oy for -10 ≤ x ≤ 10 and -12 ≤ y 12. Draw

1. on the same graph sheet the PQR with P(4, 8), QR= and .
2. which is the image of PQR under a reflection in the line y = -2, whereP and .
3. the image of PQR under a translation by the vector , where P P2, Q Q2 and R R2.
4. the image of PQR under a rotation through 18 about the origin.

Soln.

1. We are given P(4, 8) and RP =.

From RP = PR = - =.

Now P(4, 8) and PR = R(4 + - 2, 8+ - 4),

R(2, 4) the coordinates of R = (2, 4).

Now R = (2, 4) and we are also given that QR =.

From QR = RQ = - , = = .

Since R= (2, 4) and RQ =

Q(2+2, 4+-2) => Q(4, 2) => Q has coordinates (4,2)

using P(4, 8), R(2, 4) and Q(4, 2) we draw PQR .

1. 

(x, y) reflection in the line y = -2, {(x, 2(-2) – }

(x, y) (x, - 4 – y).

P P(4,8)(4, -4 – 8),

p(4, 8) (4,-12).

R 🡪 R(2, 4) (2, - 4 - 4),

R(2, 4) (2, - 8).

Q Q(4, 2) (4, - 4-2), Q(4, 2) (4,- 6).

Now using , and we draw .

iii.) (x, y) translation by the vector (x+a, y+b),

(x, y) translation by the vector (x+- 8 , y+2),

(x - 8, y+2)

P P(4, 8) (4-8, 8+2),

P(4, 8) (- 4, 10).

R R(2, 4) (2-8, 4+2),

(- 6, 6).

Q Q(4, 10) (4 – 8, 10 + 2),

Q(4, 10) (- 4, 12).

(iv) If (x, y) undergoes a rotation through 18 about the origin, then (x, y). (-x, -y).

Since is the image of PQR, then P ,

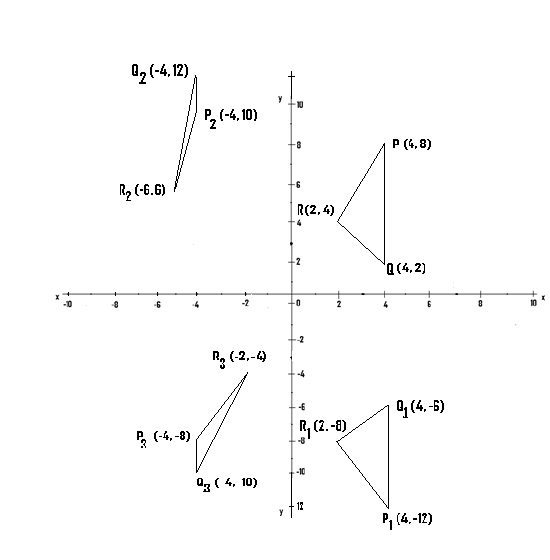
Q🡪 and R .

P 🡪 P(4,8) (- 4, - 8).

Q Q(4,10) (-4, -10).

R (-2, - 4).

Using (- 4, - 8), (- 4, -10) and (-2, - 4), we draw



Using (4, -2), (8, 2) and (10, 0­), we draw .

(d) Consider the line = .Multiply through using 2

=2 x = y. Therefore the reflection in the line = , is the same as the reflection in the line y = x, and for such a reflection, (x, y) (y, x).

Since, then (4, -2) (-2, 4).

Also since, then (8, 2) (2, 8).

Lastly since , then (10, 0) (0, 10).

Using (-2, 4), (2, 8) and (0, 10), we draw

..

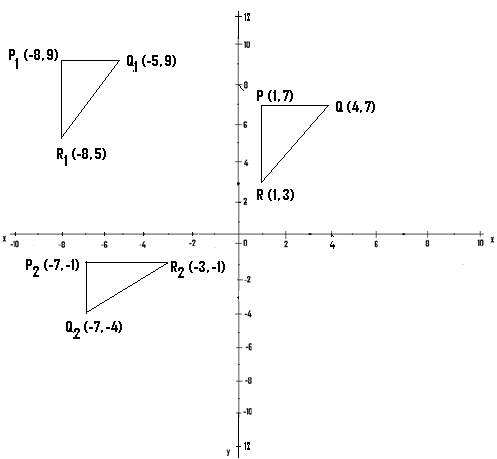
**Questions:**

Q1)(a) Using an appropriate scale, draw on a graph paper PQR with vertices P(1, 7), Q(4, 7) and R(1, 3).

(b) Draw which is the image of PQR after a translation by the vector , where P, Q and R .

(C) Draw also the image of PQR, after a reflection in the line y = -x, where P , Q and R .

Ans:



(Q2)(a) Using a scale of 2cm to 2units on both axes, draw ABC with the vertices A(4, 4), B(0, 7) and C(3, -6).

(b) Draw the image of ABC, after an anticlockwise rotation through about the origin, where A , B C .

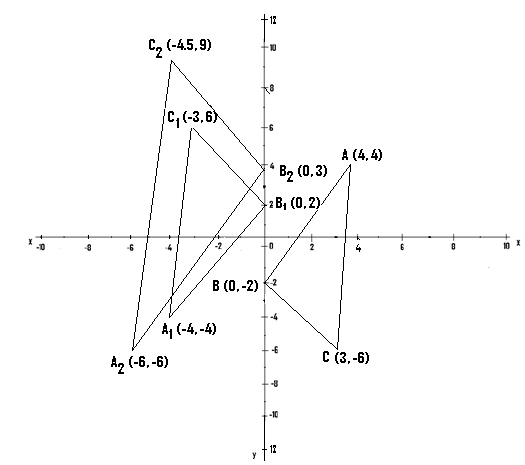
(c) Draw the image of after an enlargement with a scale factor of of 1.5, where ,. and so on

(d) Find the slope of the line .

Ans:

**N/B: (-4, -4), B1(0, 2) and C1(-3, 6)**

**A2(-6, -6), B2(0,3) and C2(-4.5, 9).**



(Q3)(i) Using a scale of 2cm to 2 units on each axis, draw on a sheet of graph paper two perpendicular axes ox and oy for the interval

-10 and -10 .

(ii) Draw quadrilateral ABCD with the vertices

A(3, 6), B(7, 6), C(9, 2) and D(2, 2).

(iii) Draw quadrilateral which is the image of quadrilateral ABCD after a clockwise rotation through , about the origin where A , B ,

C and D .

(iv) Draw quadrilateral which is the image of quadrilateral ABCD after a reflection in the line Y = -x, where A , B, C and

D .

(v) Lastly draw quadrilateral which is the image of quadrilateral , after a reflection in the line y = 0, where A2🡪 A3, B2🡪B3, C2🡪C3 and D2🡪D3.

, and .

1. Determine
2. the slope of the line AD. Ans: 4
3. the equation of line BC.

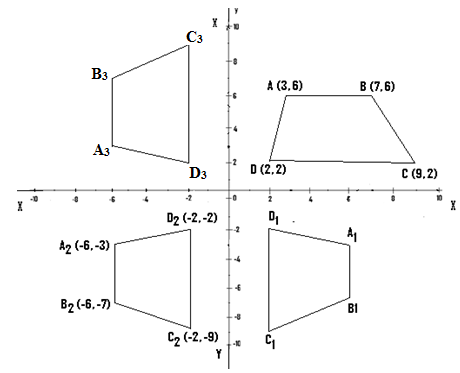
Ans: y = -2x + 20.

Ans:

**N/B:** A1(61, -3), B1(6, -7), C1(2, -9) and D1(2, -2)

A2(-6, -3), B2(-6, -7), C2(-2, -9) and D2(-2, -2)

A3(-6, 3), B3(-6, 7), C3(-2, 9) and D3(-2, 2)



(4) (a) Using a scale of 1cm to 1 unit on each axis, draw the ox and oy axes for the interval -5≤ x ≤8and -10≤ y ≤10. Draw

(b) the quadrilateral ABCD whose vertices are A(3, 4) B(5, 4), C(5, 2) and D(3, 2).

(c) draw the image of ABCD after a reflection in the line x = 1, where A ,B , C and D .

(d) the image of ABCD after a clockwise rotation through about the the origin, where

A, B and D .

(e) the image of after an enlargement with a scale factor of -2, where , , and .

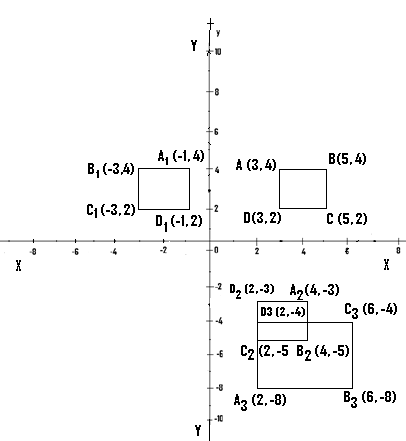
(f) Determine the length of line AD.

Ans:

**N/B:** A1(-1, 4) B1(-3, 4), C1(-3, 2) and D1(-1, 2)

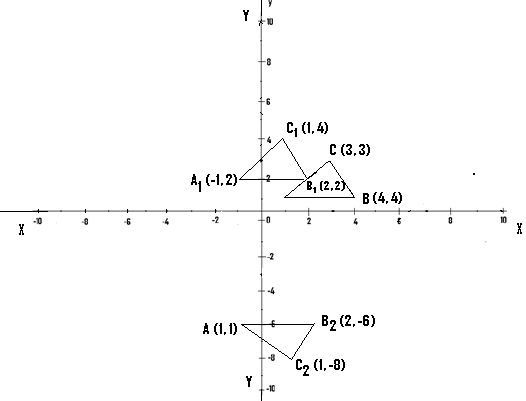
A2(4, -3), B2(4, -5), C2(2, -5) and D2(2, -3)

A3(2, -8), B3(6, -8), C3(6, -4) and D3(2, -4).



(Q5) By using an appropriate scale, draw

1. ABC with vertices A(1, 1), B(4, 1) and C(3, 3).
2. the image of ABC after a translation in which B(4, 1) (2, 2),A and C .
3. the image of after a reflection in the line y + 2 = 0, where , and

:

**N/B:** A1(-1, 2), B1(2, 2) and C1(1, 4).

A2(-1, -6), B2(2, -6) and C2(1, -8).