

1. A triangle has vertices  $P$ ,  $Q$  and  $R$ .

The coordinates of  $P$  are  $(-3, -6)$

The coordinates of  $Q$  are  $(1, 4)$

The coordinates of  $R$  are  $(5, -2)$

$M$  is the midpoint of  $PQ$ .

$N$  is the midpoint of  $QR$ .

Prove that  $MN$  is parallel to  $PR$ .

You must show each stage of your working.

$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \text{midpoint}$$

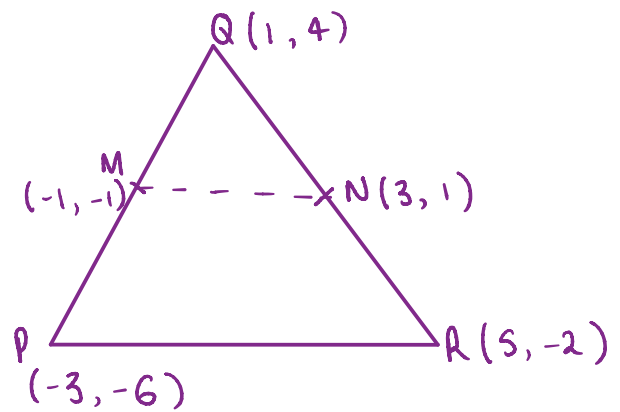
$$M = \left( \frac{(1) + (-3)}{2}, \frac{(4) + (-6)}{2} \right)$$

$$= (-1, -1)$$

$$\frac{y_2 - y_1}{x_2 - x_1} = \text{gradient}$$

$$MN = \frac{(1) - (-1)}{(3) - (-1)}$$

$$= \frac{1}{2}$$



$$N = \left( \frac{(1) + (5)}{2}, \frac{(4) + (-2)}{2} \right)$$

$$= (3, 1)$$

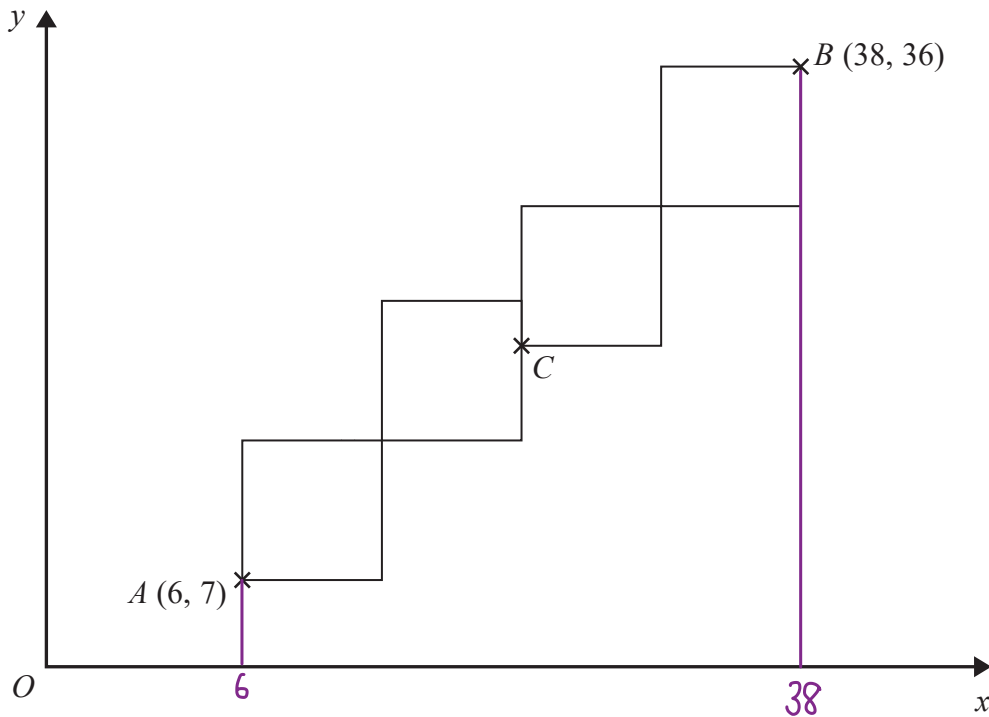
$$PR = \frac{(-2) - (-6)}{(5) - (-3)}$$

$$= \frac{1}{2}$$

$MN$  and  $PR$  are parallel because they both have a gradient of  $\frac{1}{2}$

2. A pattern is made from four identical squares.

The sides of the squares are parallel to the axes.



Point A has coordinates (6, 7)  
 Point B has coordinates (38, 36)  
 Point C is marked on the diagram.

Work out the coordinates of C.

1) Side length of one square :

Width of 4 squares (x-axis)  $\div 4$

$$(38 - 6) \div 4 = \frac{32}{4} = 8$$

x co-ordinate of C

2) C is 2 sidelengths to the right of A (along the x axis)

$$6 + 8 + 8 = 22$$

So the x co-ordinate of C is 22

3) y co-ordinate of C

C is 2 side lengths below B (down the y axis)

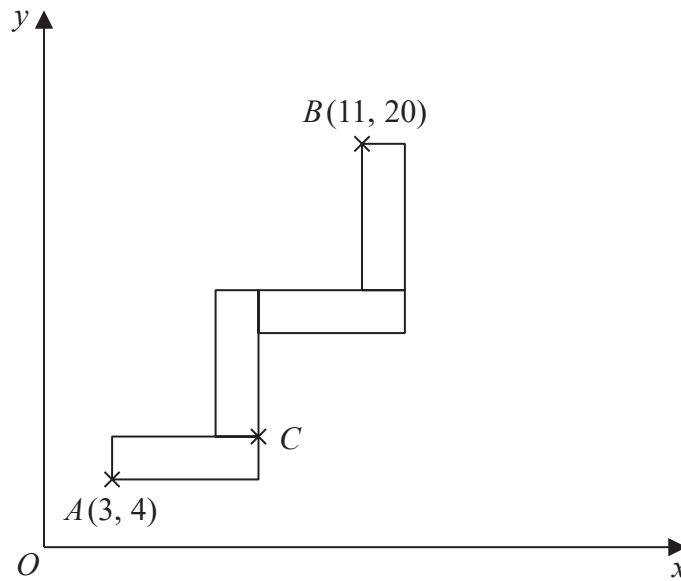
$$36 - 8 - 8 = 20$$

So the y co-ordinate of C is 20

( 22 , 20 )

(Total for Question is 5 marks)

3. A pattern is made from **four identical rectangles**.  
The sides of the rectangles are parallel to the axes.



Point A has coordinates (3, 4)  
Point B has coordinates (11, 20)  
Point C is marked on the diagram.

Work out **the coordinates of C**.  
You must show all your working.



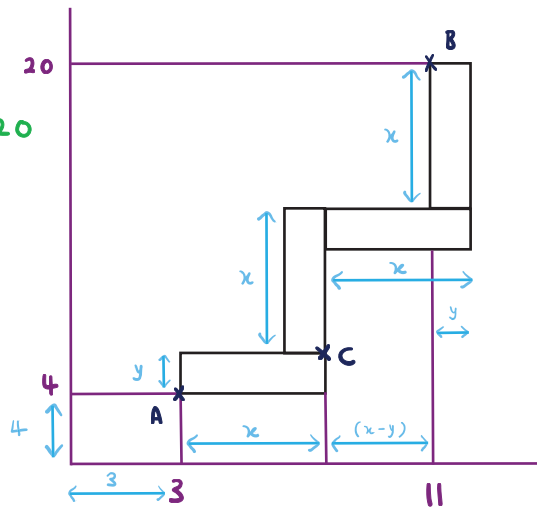
$$4 + y + x + x = 20$$

$$4 + y + 2x = 20$$

$$2x + y = 16.$$

$$2x = 16 - y.$$

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$$3 + x + (x - y) = 11.$$

$$3 + 2x - y = 11.$$

$$2x - y = 8.$$

$$\textcircled{1} \quad 2x = 8 + y.$$

$$16 - y = 8 + y.$$

$$8 = 2y.$$

$$y = 4.$$

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$$2x = 8 + y$$

$$2x = 8 + 4 = 12.$$

$$x = 6.$$



$$C = ((3+x), (4+y))$$

$$= (9, 8)$$

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(..... 9 ..... , ..... 8 .....)

(Total for Question is 5 marks)