

<b>Student Name:</b> _____	<b>Grade:</b> _____
<b>Date:</b> _____	<b>Score:</b> _____

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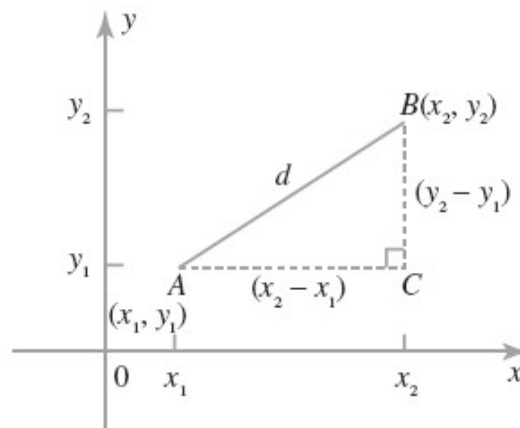
## 5 Year 9 Term 4 Week 5 Homework

### 5.1 Co-ordinate geometry

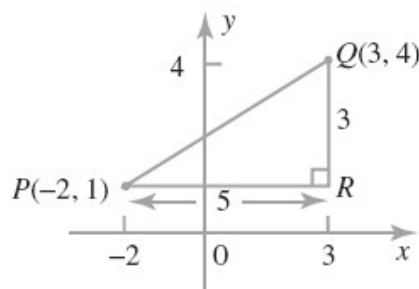
#### 5.1.1 The distance between two points

- In  $\triangle ABE$ ,  $c^2 = a^2 + b^2$ , where  $c$  is the length of the hypotenuse and  $a, b$  are the length of the shorter sides.
- The distance between the points  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is given by:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



**Exercise 5.1.1** Use Pythagoras' theorem to find the distance  $P(-2, 1)$  and  $Q(3, 4)$ . and hence find the perimeter of  $\triangle PRQ$ , correct to 2 decimal places.




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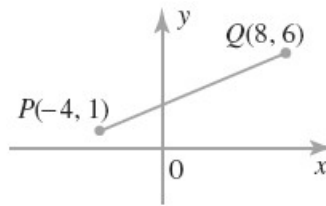


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**Exercise 5.1.2 Use the distance formula to calculate the length of each interval.**



a.)

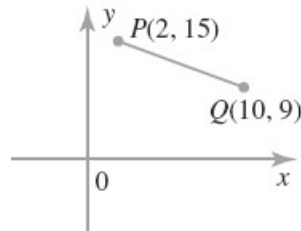
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b.)

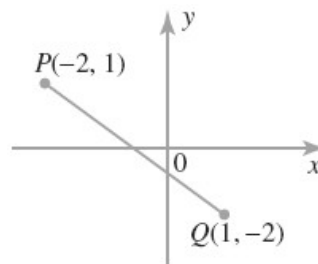
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c.)

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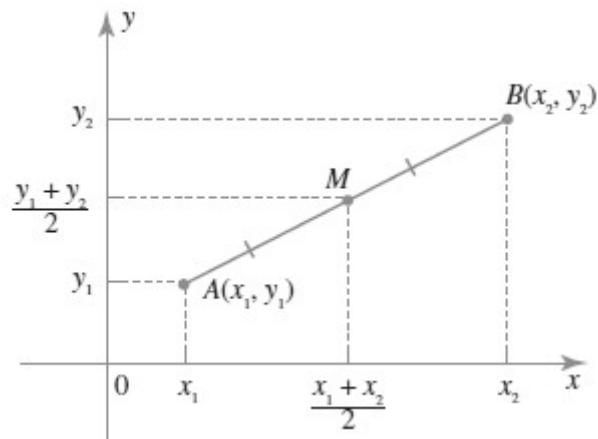
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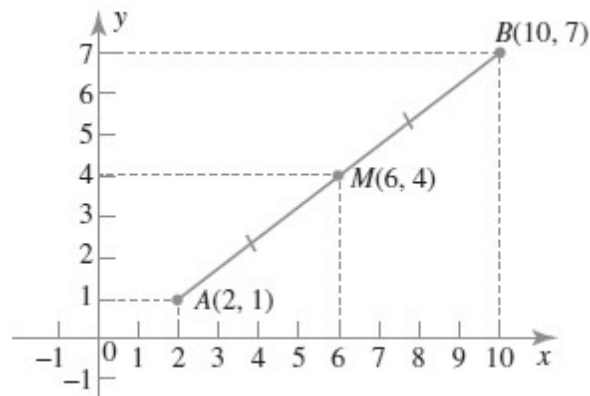
### 5.1.2 The midpoint of an interval

- The point that lies halfway between the two end points of an interval is called the midpoint of the interval.
- The midpoint  $M(x, y)$  of the interval  $AB$  where  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is given by:

$$M(x, y) = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$



**Example 5.1.1** Find the midpoint  $M$  of interval  $AB$  for the diagram shown below



**Solution:** In the diagram shown above,

the  $x$ -value halfway between  $x = 2$  and  $x = 10$  is  $x = \frac{2+10}{2} = 6$

the  $y$ -value halfway between  $y = 1$  and  $y = 7$  is  $y = \frac{1+7}{2} = 4$

$\therefore$  The midpoint of  $A(2, 1)$  and  $B(10, 7)$  is  $M(6, 4)$ .

**Exercise 5.1.3 Find the co-ordinates of M, the midpoint of the interval AB with:**

1.  $A(7, 3)$  and  $B(3, 13)$

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2.  $A(-6, 3)$  and  $B(8, -11)$

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3.  $A(-2, 6)$  and  $B(6, -2)$

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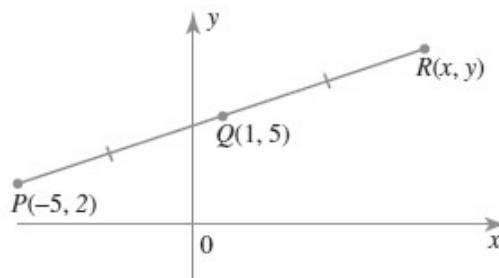


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**Exercise 5.1.4 Find the co-ordinates of R if Q is the midpoint of PR and  $P(-5, 5)$  and  $Q(1, 5)$  as shown in the diagram below.**




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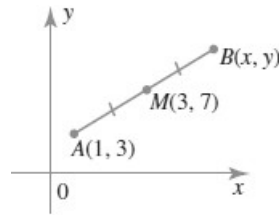
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**Exercise 5.1.5 Find the co-ordinate of B, given that M is the midpoint of AB.**

a.)




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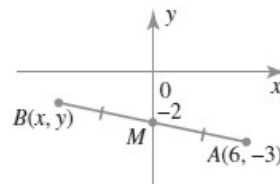


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b.)




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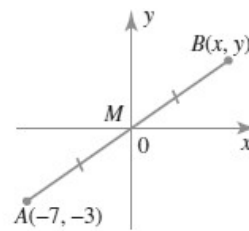


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c.)




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**5.1.3 The gradient formula**

- The gradient or slope of a line is a measure of how steep it is.
- The gradient of the line that passes through the points  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is given by:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

- If a line  $l$  is inclined to the position direction of the x-axis at an angle  $\theta$  then its gradient is given by:

$$m = \tan\theta$$

**Exercise 5.1.6 Find the gradient of the line that passes through the points:**

1.  $A(3, 2)$  and  $B(11, 8)$

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2.  $C(4, -6)$  and  $D(-1, 4)$

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3.  $E((-4, -6)$  and  $F(-1, -2)$

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**Exercise 5.1.7 The gradient of a line passing through the points:**

1.  $(1, 2)$  and  $(x, 10)$  is 2. Find the value of  $x$ .

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2.  $(-6, y)$  and  $(24, -25)$  is  $\frac{3}{5}$ . Find the value of  $y$ .

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**Exercise 5.1.8 Consider the points E(2, 3), F(0, 7) and G(-3, 13).**

1. Find the gradient of EF.

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2. Find the gradient of FG.

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3. What can you say about E, F and G?

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**5.1.4 General form of the equation of a line**

- The equation of a straight line in general form is:

$$\mathbf{ax + by + c = 0}$$
, where a, b and c are integers and  $a > 0$ .

- The equation of a straight line in the gradient-intercept form is:

$$\mathbf{y = mx + b}$$
, where m is the gradient and b is the y-intercept.

**Exercise 5.1.9**

1. Express the equation  $2x + 3y - 12 = 0$  in the gradient-intercept form and hence find the gradient and the y-intercept.

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2. Express each equation in the general form:

(a)  $y = \frac{3}{2}x + 5$

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(b)  $y = -\frac{3}{4}x - 6$

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3. Write down the gradient and y-intercept of each line.

(a)  $y = \frac{2}{3}x - 5$

gradient = \_\_\_\_\_ , y-intercept = \_\_\_\_\_

(b)  $y = 2 - \frac{5}{6}x$

gradient = \_\_\_\_\_ , y-intercept = \_\_\_\_\_

(c)  $y = -8 - x$

gradient = \_\_\_\_\_ , y-intercept = \_\_\_\_\_

**5.1.5 The equation of a line given by the gradient and a point**

The equation of the straight line that passes through the point  $(x_1, y_1)$  with gradient is given by:

$$y - y_1 = m(x - x_1)$$

**Exercise 5.1.10** By substituting into  $y = mx + b$ , find the equation of the line that passes through the given point with the given gradient. Give your answer on the general form.

1.  $(1, 5), m = 2$

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2.  $(-5, -3), m = -2$

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3.  $(4, -3), m = -\frac{1}{2}$

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**Exercise 5.1.11** Use the point-gradient formula to find the equation of the line that passes through the given point with the given gradient. Give your answer in the gradient-intercept form.

1.  $(-2, 0), m = \frac{1}{2}$

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2.  $(\frac{3}{4}, 5), m = -8$

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3.  $(\frac{1}{2}, 5), m = 2$

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