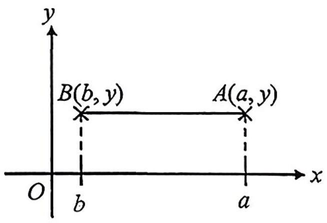
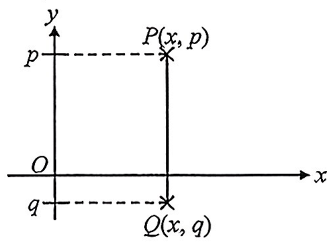
S3 Mathematics

Pre-lesson Worksheet: Coordinate Geometry of Straight Lines

A. Distance Formula

Key Points: Distance between Two Points on a Rectangular Coordinate Plane

If A and B lie on the same **horizontal line**, then $AB = a - b$.	If P and Q lie on the same **vertical line**, then $PQ = p - q$.
	

Quick Review

In each of the following, find the distance between the two given points. (1 – 6)

1. $A(1, 3)$, $B(5, 3)$

$AB = [(\qquad) - (\qquad)]$ units

$= (\qquad)$ units

2. $P(-5, -3)$, $Q(4, -3)$

3. $C(6, 1)$, $D(6, 9)$

4. $R(-2, -10)$, $S(-2, 4)$

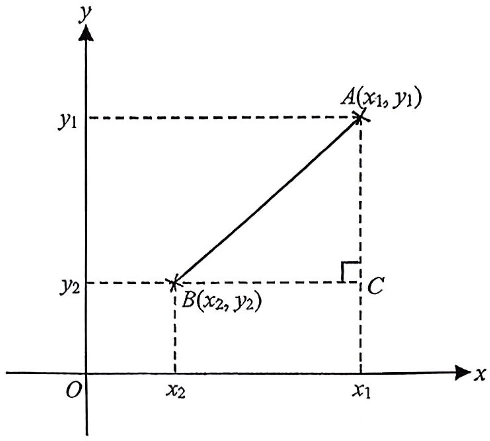
5. $A(-8, -4)$, $B(-1, -4)$

6. $P(-5, -15)$, $Q(-5, -7)$

Key Points: Distance Formula

The distance between any two points $A(x_1, y_1)$ and $B(x_2, y_2)$ on a rectangular coordinate plane is given by

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

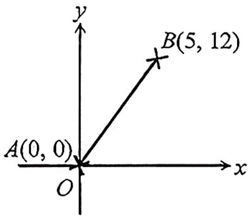


Let's Try

In each of the following, find the distance between the two given points. **(7 – 10)**

(*Leave the answers in surd form if necessary.*)

7.

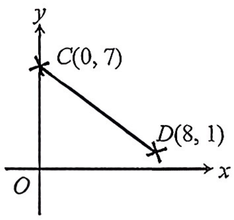


$AB = \sqrt{[5-(\quad\quad)]^2 + [12-(\quad\quad)]^2}$ units

$= \sqrt{(\quad\quad)^2 + (\quad\quad)^2}$ units

$=$ <u>(　　　) units</u>

8.



9. $E(8, -5)$, $F(-1, 7)$

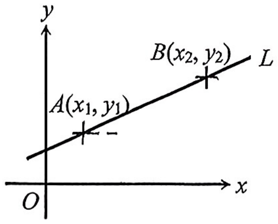
10. $G(11, 6)$, $H(4, -3)$

B. Slopes of Straight Lines

Key Points: Slope Formula

Consider a straight line L passing through the points $A(x_1, y_1)$ and $B(x_2, y_2)$, where $x_1 \neq x_2$. Then the slope m of L is given by

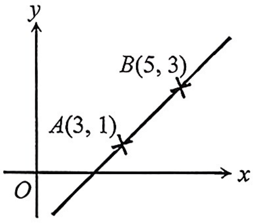
$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$



Let's Try

In each of the following, find the slope of the straight line passing through the points A and B. **(11 – 14)**

11.

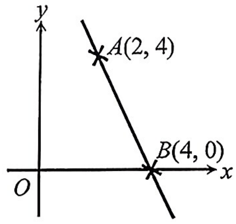


$$\text{Slope} = \frac{3-(\quad)}{5-(\quad)}$$

$$= \frac{(\quad)}{(\quad)}$$

$$= \underline{\underline{(\quad)}}$$

12.



$$\text{Slope} = \frac{(\quad)-(\quad)}{(\quad)-(\quad)}$$

$$=$$

13. $A(-3, 6)$, $B(9, 2)$

14. $A(-1, 7)$, $B(5, -2)$

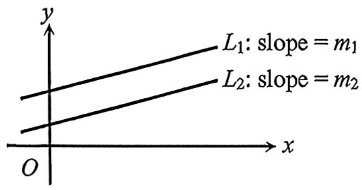
C. Slopes of Parallel Lines and Perpendicular Lines

Key Points: Properties of Parallel Lines

Consider two non-vertical straight lines L_1 and L_2 with slopes m_1 and m_2 respectively.

(a) If $L_1 // L_2$, then $m_1 = m_2$.

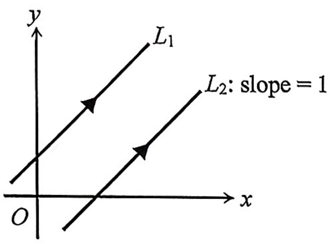
(b) If $m_1 = m_2$, then $L_1 // L_2$.



Let's Try

In each of the following, straight lines L_1 and L_2 are parallel. Find the slope of L_1. **(15 – 16)**

15.

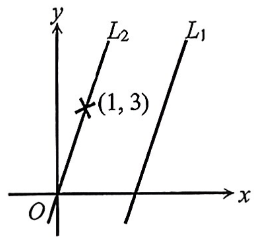


$\because$ $L_1 // L_2$

$\therefore$ Slope of L_1 = slope of L_2

$= (\underline{\qquad})$

16.



Slope of $L_2 = \dfrac{3-(\quad)}{1-(\quad)}$

$=$

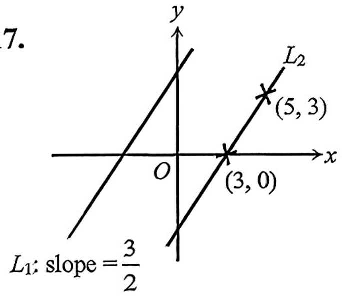
$\because$ $L_1 // L_2$

$\therefore$ Slope of L_1 = slope of (   )

$= (\underline{\qquad})$

In each of the following, determine whether L_1 and L_2 are parallel. **(17 – 18)**

17.



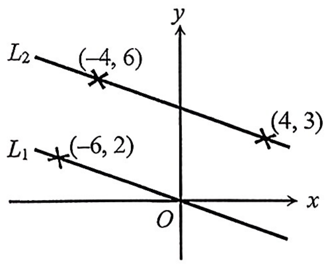
Slope of $L_2 =$

$=$

$\because$ Slope of L_1 (= / ≠) slope of L_2

$\therefore$ L_1 (is / is not) parallel to L_2.

18.



Slope of $L_1 =$

$=$

$=$

Slope of $L_2 =$

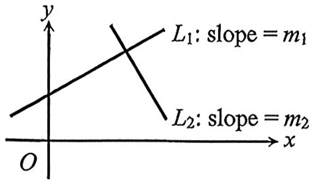
$=$

$\because$ Slope of L_1 (= / ≠) slope of L_2

$\therefore$ L_1 (is / is not) parallel to L_2.

Key Points: Properties of Perpendicular Lines

Consider two straight lines L_1 and L_2 with slopes m_1 and m_2 respectively, where $m_1, m_2 \neq 0$.



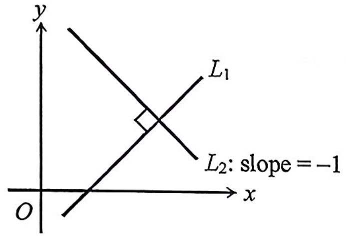
(a) If $L_1 \perp L_2$, then $m_1 \times m_2 = -1$.

(b) If $m_1 \times m_2 = -1$, then $L_1 \perp L_2$.

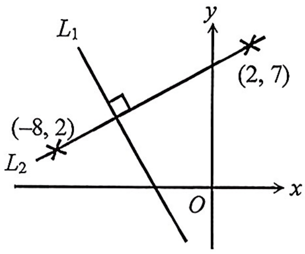
Let's Try

In each of the following, straight lines L_1 and L_2 are perpendicular to each other. Find the slope of L_1. **(19 – 20)**

19.



20.



$\because$ $L_1 \perp L_2$

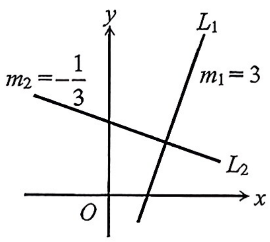
$\therefore$ Slope of L_1 × slope of L_2 = ( )

Slope of L_1 × ( ) = ( )

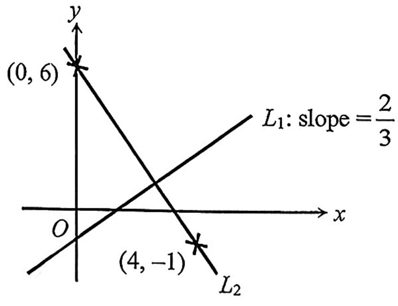
Slope of L_1 = ( )

In each of the following, determine whether L_1 and L_2 are perpendicular. **(21 – 22)**

21.



22.



The slopes of straight lines L_1 and L_2 are m_1 and m_2 respectively.

$m_1 \times m_2$ = ( ) × ( )

= ( )

$\because$ $m_1 \times m_2$ (= / ≠) –1

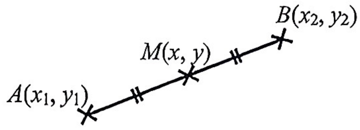
$\therefore$ L_1 (is / is not) perpendicular to L_2.

D. Point of Division

Key Points: Mid-point Formula

If $M(x, y)$ is the mid-point of the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$, then

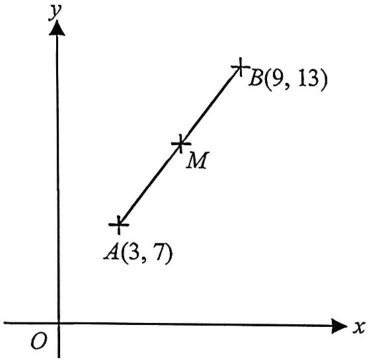
$$x = \frac{x_1 + x_2}{2} \quad \text{and} \quad y = \frac{y_1 + y_2}{2}.$$



Let's Try

In each of the following, find the coordinates of the mid-point M of the given line segment. **(23 – 26)**

23.

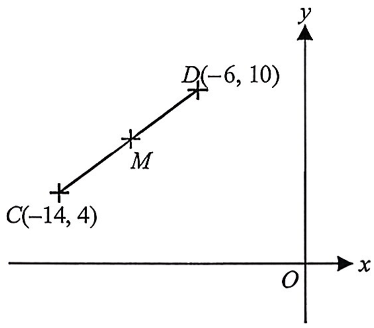


Coordinates of M

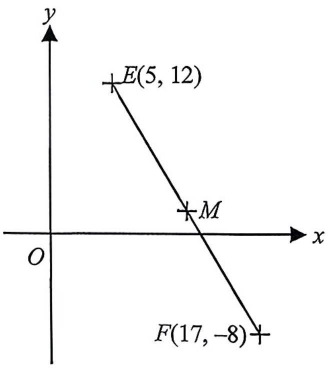
$$= \left(\frac{(\quad) + (\quad)}{2}, \frac{(\quad) + (\quad)}{2} \right)$$

$= (\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_)$

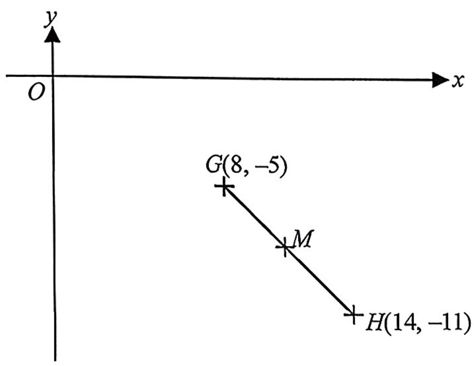
24.



25.



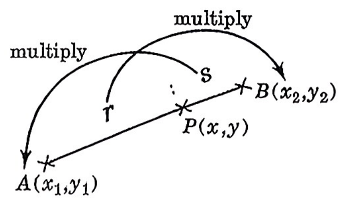
26.



Key Points: Section Formula

If $P(x, y)$ is a point on the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ such that $AP : PB = r : s$, then

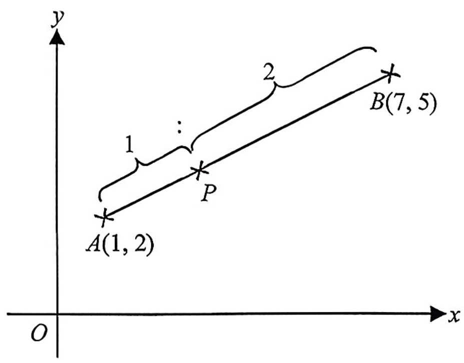
$$x = \frac{sx_1 + rx_2}{r+s} \quad \text{and} \quad y = \frac{sy_1 + ry_2}{r+s}.$$



Let's Tr

In each of the following, find the coordinates of P. **(27 – 30)**

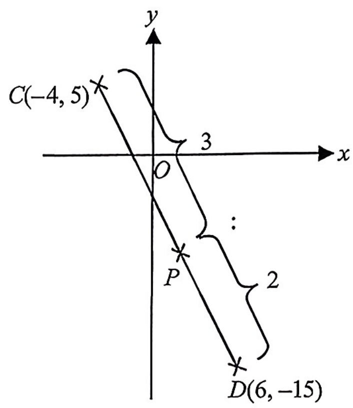
27.



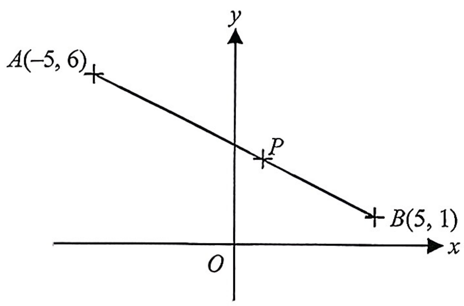
Coordinates of P

$$= \left(\frac{2\times(\quad)+1\times(\quad)}{1+2}, \frac{2\times(\quad)+1\times(\quad)}{1+2} \right)$$

28.

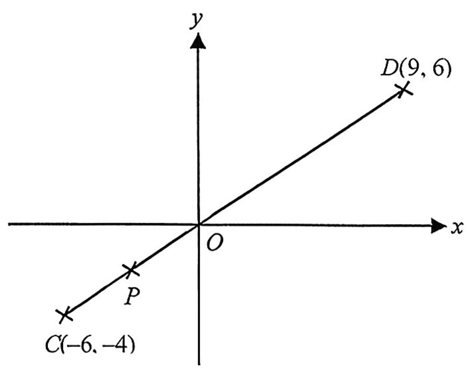


29.



$AP : PB = 3 : 2$

30.



$CP : PD = 1 : 4$