

A linear equation will always be in

the form

$$ax + by = c$$

OR

$$ax + by + c = 0$$

a is coefficient of x
 b " " " " y
 c is the constant.
 a, b, c ∈ Q

or

$$y = mx + c \quad \text{Log Tables Pg 18}$$

m = slope.

c = (0, c) y intercept

1) To find the equation of a line when given the slope and a point.

Log table page 18

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

NOTE : m = slope
 point (x₁, y₁)

Eg 1) Find the equation of the line which has a slope ^m 2 and passes through the point (x₁, y₁) (3, 4)

m = 2
 point (x₁, y₁) (3, 4) } sub into formula

$$y - 4 = 2(x - 3)$$

$$y - 4 = 2x - 6 \quad \text{multiply}$$

$$\begin{array}{l|l} -y & -4 = 2x - y - 6 \\ +4 & 0 = 2x - y - 2 \end{array} \quad \text{hide up}$$

$$2x - y - 2 = 0$$

H/W Pg 214 Q 1 (ii) and (iii)



T&T2 11.3
The...



T&T2 11.3
The...

chapter

11

Coordinate Geometry – The Line

Section 11.3 The equation of a line

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Example 1

Find the equation of the line containing the point $(-3, 2)$ and whose slope is $\frac{2}{3}$.

Example 2

Find the equation of the line containing the points $(-2, 3)$ and $(3, 1)$.

Exercise 11.3

1. Find the equations of the following lines, given the slope and a point on the line in each case:

(i) slope = 2; point = (3, 4)

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

(ii) slope = 4; point = (1, 5)

$$y - 5 = 4(x - 1)$$

$$y - 5 = 4x - 4$$

$$y = 4x + 1$$

$$0 = 4x - y + 1$$

$$0 = \underbrace{ax + by + c}_{= 0}$$

1. Find the equations of the following lines, given the slope and a point on the line in each case:

(iii) slope = 5; point = (-2, 3)

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

$$y - 3 = 5(x - (-2))$$

$$y - 3 = 5x + 10$$

$$0 = 5x - y + 13$$

$$5x - y + 13 = 0$$

(iv) slope = -3; point = (-2, 0)

$$y - 0 = -3(x - (-2))$$

$$y - 0 = -3(x + 2)$$

$$y - 0 = -3x - 6$$

$$0 = 3x + y - 6$$

$$0 = 3x + y + 6$$

1. Find the equations of the following lines, given the slope and a point on the line in each case:

(v) slope = -5 ; point = $(-3, -2)$

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

$$y - (-2) = -5(x - (-3))$$

$$y + 2 = -5(x + 3)$$

$$y + 2 = -5x - 15$$

$$\begin{array}{r|l} +5x & 5x + y + 2 = -15 \\ +15 & 5x + y + 17 = 0 \end{array} \quad \begin{array}{l} +5x \\ +15 \end{array}$$

$$ax + by + c = 0$$

(vi) slope = $\frac{2}{3}$; point = $(3, -1)$.

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

$$y - (-1) = \frac{2}{3}(x - 3)$$

$$3(y + 1) = \frac{2}{3}(x - 3) \quad \text{multiply } \times 3$$

$$3y + 3 = 2x - 6$$

$$\begin{array}{r|l} -3y & 2x - 3y - 6 \\ +3 & 0 = 2x - 3y - 9 \end{array} \quad \begin{array}{l} -3y \\ +3 \end{array}$$

with a fractional slope

$$y - y_1 = \frac{\square}{\square}(x - x_1)$$

multiply

Multiply the denominator to the 'y' parts
multiply the numerator to the 'x' parts.

2. Find the equations of the following lines, given the slope and a point on the line in each case:

(i) slope = $\frac{3}{4}$; point = $(1, -4)$

$$y - (-4) = \frac{3}{4}(x - 1)$$

$$y + 4 = \frac{3}{4}(x - 1)$$

$$4y + 16 = 3x - 3$$

$$\begin{array}{r|l} -4y & 16 = 3x - 4y - 3 \\ -16 & 0 = 3x - 4y - 19 \end{array} \quad \begin{array}{l} -4y \\ -16 \end{array}$$

(ii) slope = $\frac{3}{5}$; point = $(-4, 2)$.

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

$$y - 2 = \frac{3}{5}(x - (-4))$$

$$y - 2 = \frac{3}{5}(x + 4)$$

$$5y - 10 = 3x + 12$$

$$\begin{array}{r|l} -5y & -10 = 3x - 5y + 12 \\ +10 & 0 = 3x - 5y + 22 \end{array} \quad \begin{array}{l} -5y \\ +10 \end{array}$$

$$3x - 5y + 22$$

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

3. Find the equation of the line through $(-2, 3)$ with slope

(i) 4

$$y - 3 = 4(x + 2)$$

$$y - 3 = 4x + 8$$

$$\begin{array}{r|l} -4y & 3 = 4x - 4y + 8 \\ +3 & 0 = 4x - 4y + 11 \end{array} \quad \begin{array}{l} -4y \\ +3 \end{array}$$

(ii) -2

$$y - 3 = -2(x + 2)$$

$$y - 3 = -2x - 4$$

$$\begin{array}{r|l} +4 & y + 1 = -2x \\ +2x & 2x + y + 1 = 0 \end{array} \quad \begin{array}{l} +4 \\ +2x \end{array}$$

(iii) $\frac{3}{4}$

$$y - 3 = \frac{3}{4}(x + 2)$$

$$4y - 12 = 3x + 6$$

$$\begin{array}{r|l} -4y & 3x + 6 \\ +12 & 0 = 3x - 4y + 18 \end{array} \quad \begin{array}{l} -4y \\ +12 \end{array}$$

(iv) $-\frac{2}{3}$

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

$$3y - 9 = -2x - 4$$

$$\begin{array}{r|l} +4 & 3y - 5 = -2x \\ +2x & 2x + 3y - 5 = 0 \end{array} \quad \begin{array}{l} +4 \\ +2x \end{array}$$

3. Find the equation of the line through $(-2, 3)$ with slope

(i) 4

$$y - 3 = 4(x + 2)$$

$$y - 3 = 4x + 8$$

$$\begin{array}{l} -y \quad | \quad 3 = 4x - y + 8 \quad | \quad -y \\ +3 \quad | \quad 0 = 4x - y + 11 \quad | \quad +3 \end{array}$$

(ii) -2

$$y - 3 = -2(x + 2)$$

$$y - 3 = -2x - 4$$

$$\begin{array}{l} +4 \quad | \quad y + 1 = -2x \\ +2x \quad | \quad 2x + y + 1 = 0 \end{array}$$

(iii) $\frac{3}{4}$ m

$$y - 3 = \frac{3}{4}(x + 2)$$

$$4y - 12 = 3x + 6$$

$$\begin{array}{l} +4 \quad | \quad 4y = 3x + 18 \quad | \quad +12 \\ +2x \quad -4y \quad | \quad 0 = 3x - 4y + 18 \end{array}$$

(iv) $-\frac{2}{3}$ m

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

$$3y - 9 = -2x - 2$$

$$\begin{array}{l} +4 \quad | \quad 3y - 5 = -2x \\ +2x \quad | \quad 2x + 3y - 5 = 0 \end{array}$$

4. Find the equation of the line through $(0, 0)$ and whose slope is -3 .

5. Find the equation of the line through (0, 0) and whose slope is
 (i) 3 (ii) -5 (iii) $\frac{1}{3}$ (iv) $-\frac{3}{2}$
 What do you notice about the equation of each of these lines?

To find the equation of a line when given TWO Points.

Step 1. Find the slope of the line through A(3, -4) and B(1, 2).
 Hence find the equation of the line AB.
 ① Slope $m = \frac{y_2 - y_1}{x_2 - x_1}$ Sub values into the formula.

$$m = \frac{2 - (-4)}{1 - 3} = \frac{6}{-2} = -3 \quad \begin{matrix} m \\ \text{slope} \end{matrix}$$

C/W
 pg 214
 Q7.

② Equation of the line
 $y - y_1 = m(x - x_1)$

$$\begin{aligned} y - (-4) &= -3(x - 3) \\ y + 4 &= -3x + 9 \\ -9 & \quad | \quad y - 5 = -3x \quad | \quad -9 \\ +3x & \quad | \quad 3x + y - 5 = 0 \quad | \quad +3x \end{aligned}$$

H/W
 pg 214
 Q7 (i)(ii)(iii)
 23/9/19

7. Find the equations of the lines through the following pairs of points:

H/W (i) (2, 3) and (4, 6)

H/W (ii) (-1, 2) and (2, -4)

7. Find the equations of the lines through the following pairs of points:

HW

(i) (2, 3) and (4, 6)

HW

(ii) (-1, 2) and (2, -4)

7. Find the equations of the lines through the following pairs of points:

HW

(iii) (-5, 1) and (1, 0)

(iv) (-2, 3) and (3, -1)

7. Find the equations of the lines through the following pairs of points:

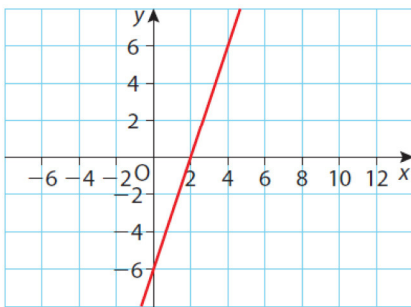
(v) $(2, 7)$ and $(0, 5)$

(vi) $(-3, -5)$ and $(-1, -1)$.

8. Find the equation of the line through $(-2, 3)$ and the midpoint of the line segment joining $(1, -3)$ and $(3, -1)$.

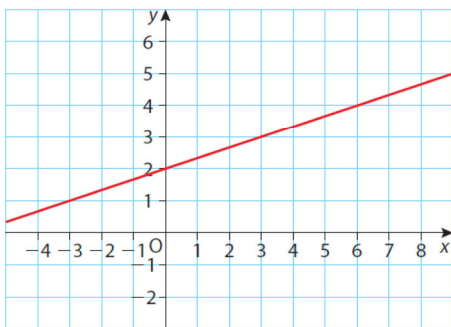
9. Using any two points on each line, find the slopes of the lines shown below. Hence find the equation of each line.

(i)

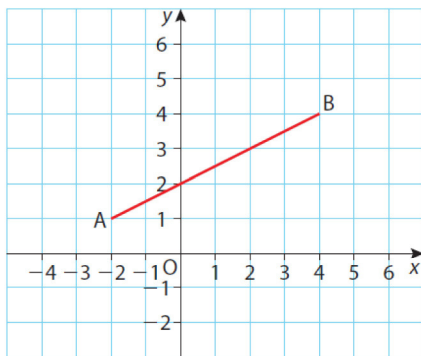


9. Using any two points on each line, find the slopes of the lines shown below. Hence find the equation of each line.

(ii)



10. Use two different ways to find the slope of the given line AB.
Hence find the equation of the line.



Answers

Exercise 11.3

1. (i) $2x - y - 2 = 0$ (ii) $4x - y + 1 = 0$
 (iii) $5x - y + 13 = 0$ (iv) $3x + y + 6 = 0$
 (v) $5x + y + 17 = 0$ (vi) $2x - 3y - 9 = 0$
2. (i) $3x - 4y - 19 = 0$ (ii) $3x - 5y + 22 = 0$
3. (i) $4x - y + 11 = 0$ (ii) $2x + y + 1 = 0$
 (iii) $3x - 4y + 18 = 0$ (iv) $2x + 3y - 5 = 0$
4. $3x + y = 0$
5. (i) $3x - y = 0$ (ii) $5x + y = 0$
 (iii) $x - 3y = 0$
 (iv) $3x + 2y = 0$; no constant number
6. -3 ; $3x + y - 5 = 0$
7. (i) $3x - 2y = 0$ (ii) $2x + y = 0$
 (iii) $x + 6y - 1 = 0$ (iv) $4x + 5y - 7 = 0$
 (v) $x - y + 5 = 0$ (vi) $2x - y + 1 = 0$
8. $5x + 4y - 2 = 0$
9. (i) 3 , $3x - y - 6 = 0$
 (ii) $\frac{1}{3}$, $x - 3y + 6 = 0$
10. $x - 2y + 4 = 0$