General Form of Equations of Straight Lines

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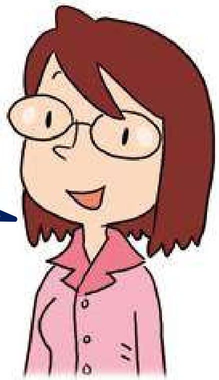
Let's have a Math Chat

General Form of Equations of Straight Lines

Below is the general form of the equation of a straight line.



The equation of a straight line can be expressed in the form

$$Ax + By + C = 0$$

where A, B and C are constants with A and B not both zero. It is called the **general form** of the equation of a straight line.

General Form of Equations of Straight Lines

Example 1

Convert the following equations of straight lines into the general form.

(a) $3y = 7x - 2$

(b) $y = \frac{1}{4}x - 5$

(c) $y + 2 = 6(x + 1)$

(a)
$$\begin{aligned} 3y &= 7x - 2 \\ 7x - 3y - 2 &= 0 \end{aligned}$$

(b)
$$\begin{aligned} y &= \frac{1}{4}x - 5 \\ 4y &= x - 20 \\ x - 4y - 20 &= 0 \end{aligned}$$

(c)
$$\begin{aligned} y + 2 &= 6(x + 1) \\ y + 2 &= 6x + 6 \\ 6x - y + 4 &= 0 \end{aligned}$$

General Form of Equations of Straight Lines

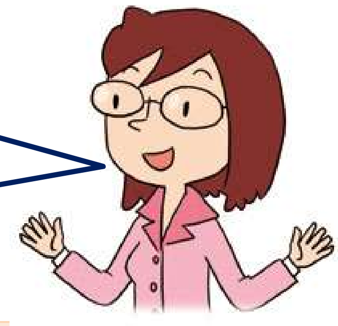
Consider the equation of a straight line L written in the general form $Ax + By + C = 0$.

Let us look at the three cases below.

Case	Equation of L	Remark
(1) $A = 0$, $B \neq 0$	$By + C = 0$, i.e. $y = -\dfrac{C}{B}$	L is a horizontal line and its slope is 0.
(2) $B = 0$, $A \neq 0$	$Ax + C = 0$, i.e. $x = -\dfrac{C}{A}$	L is a vertical line and its slope is undefined.
(3) $C = 0$, $B \neq 0$, $A \neq 0$	$Ax + By = 0$	L passes through the origin.

General Form of Equations of Straight Lines

We can get the intercepts and the slope easily from the general form of the equation of a straight line.



Consider the equation of a straight line in general form:

$$Ax + By + C = 0 \text{ ...... (1)} \qquad \text{, where } A \neq 0 \text{ and } B \neq 0.$$

To find the x-intercept, we put $y = 0$ into (1).

$$Ax + B(0) + C = 0$$

$$x = -\frac{C}{A}$$

The x-intercept of the straight line $= -\dfrac{C}{A}$

General Form of Equations of Straight Lines

Consider the equation of a straight line in general form:

$$Ax + By + C = 0 \text{ ...... (1)} \qquad \text{, where } A \neq 0 \text{ and } B \neq 0.$$

To find the y-intercept, we put $x = 0$ into (1).

$$A(0) + By + C = 0$$

$$y = -\frac{C}{B}$$

The y-intercept of the straight line $= -\dfrac{C}{B}$

General Form of Equations of Straight Lines

Consider the equation of a straight line in general form:

$$Ax + By + C = 0 \;......\; (1) \qquad \text{, where } A \neq 0 \text{ and } B \neq 0.$$

Since the straight line cuts the x-axis at $\left(-\frac{C}{A}, 0\right)$, and the y-axis at $\left(0, -\frac{C}{B}\right)$,

The slope of the line = $\dfrac{-\frac{C}{B} - 0}{0 - \left(-\frac{C}{A}\right)} = -\dfrac{A}{B}$

Slope of the straight line $= -\dfrac{A}{B}$

General Form of Equations of Straight Lines

Example 2

(a) Find the slope, the x-intercept and the y-intercept of the straight line L: $3x - 5y + 2 = 0$.

(b) Does the point $P(1, -1)$ lie on L?

(c) L passes through a point Q $(h, 1)$. Find the value of h.

(a) Since $A = 3$, $B = -5$ and $C = 2$,

$$\text{slope of } L = -\frac{3}{-5} = \underline{\frac{3}{5}}$$

$$x\text{-intercept} = \underline{-\frac{2}{3}}$$

$$y\text{-intercept} = -\frac{2}{-5} = \underline{\frac{2}{5}}$$

General Form of Equations of Straight Lines

Example 2

(a) Find the slope, the x-intercept and the y-intercept of the straight line L: $3x - 5y + 2 = 0$.

(b) Does the point $P(1, -1)$ lie on L?

(c) L passes through a point Q $(h, 1)$. Find the value of h.

(b) Put $x = 1$ and $y = -1$ into $3x - 5y + 2 = 0$.

L.H.S. $= 3(1) - 5(-1) + 2 = 10$

R.H.S. $= 0$

$\therefore$ L.H.S. $\neq$ R.H.S.

i.e. $(1, -1)$ does not satisfy the equation $3x - 5y + 2 = 0$.

$\therefore$ $P(1, -1)$ does not lie on L.

General Form of Equations of Straight Lines

Example 2

(a) Find the slope, the x-intercept and the y-intercept of the straight line L: $3x - 5y + 2 = 0$.

(b) Does the point $P(1, -1)$ lie on L?

(c) L passes through a point $Q\ (h, 1)$. Find the value of h.

(c) Put $x = h$ and $y = 1$ into $3x - 5y + 2 = 0$.

$$\begin{aligned} 3h - 5(1) + 2 &= 0 \\ 3h - 3 &= 0 \\ h &= \underline{1} \end{aligned}$$