

Finding the Equation of a Line Given the Slope and Intercepts

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Review

What is the x-intercept and y-intercept?

- ▶ If a line crosses the x-axis at the point $(a, 0)$, then the number a is the x-intercept of the line.

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What is the x-intercept and y-intercept?

- ▶ If a line crosses the x-axis at the point $(a, 0)$, then the number a is the x-intercept of the line.
- ▶ If a line crosses the y-axis at the point $(0, b)$, then the number b is the y-intercept of the line.

How to Find the Equation of a Line?

Use the formulae:

1. Slope-intercept form: $y = mx + b$

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Use the formulae:

1. Slope-intercept form: $y = mx + b$
2. Two-intercept form: $\frac{x}{a} + \frac{y}{b} = 1$

How to Find the Equation of a Line Given the Slope and the y-intercept?

Use the slope-intercept form: $y = mx + b$

Example 1

Find the equation of the line with a slope equal to $\frac{2}{3}$ and a y-intercept equal to 5.

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Find the equation of the line with a slope equal to $\frac{2}{3}$ and a y-intercept equal to 5.

$$\text{Given: } m = \frac{2}{3}, \quad b = 5$$

$$y = mx + b$$

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

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Find the equation of the line with a slope equal to $\frac{2}{3}$ and a y-intercept equal to 5.

$$\text{Given: } m = \frac{2}{3}, \quad b = 5$$

$$y = mx + b$$

$$y = \frac{2}{3}x + 5 \quad \text{Substitution}$$

\therefore the equation of the line is $y = \frac{2}{3}x + 5$.

Example 2

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Given: $m = 4$, $(x_1, y_1) = (0, 0)$, $b = 0$

$$y = mx + b$$

Example 2

If the slope of a line is 4 and it passes through the origin, what is its equation?

Given: $m = 4$, $(x_1, y_1) = (0, 0)$, $b = 0$

$$y = mx + b$$

$$y = 4x + 0$$

Example 2

If the slope of a line is 4 and it passes through the origin, what is its equation?

Given: $m = 4$, $(x_1, y_1) = (0, 0)$, $b = 0$

$$y = mx + b$$

$$y = 4x + 0 \quad \text{Substitution}$$

\therefore the equation of the line is $y = 4x$.

Example 3

A line that passes through $(0, -2)$ has a slope equal to 6. Find its equation.

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Given: $m = 6$, $b = -2$

$$y = mx + b$$

$$y = 6x - 2$$

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Given: $m = 6$, $b = -2$

$$y = mx + b$$

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

\therefore the equation of the line is $y = 6x - 2$.

How to Find the Equation of a Line Given the Intercepts?

Use the two-intercept form: $\frac{x}{a} + \frac{y}{b} = 1$.

Example 1

Find equation of a line that has with an x-intercept $a = 3$ and y-intercept $b = 4$.

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Find the LCM:

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Find the LCM:

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$$\text{LCM} = (3) (2^2) = 12$$

Example 1

Find equation of a line that has with an x-intercept $a = 3$ and y-intercept $b = 4$.

Given: $a = 3$, $b = 4$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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

Substitution

$$12 \left[\frac{x}{3} + \frac{y}{4} \right] = 12(1)$$

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Given: $a = 3$, $b = 4$

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$$\frac{x}{3} + \frac{y}{4} = 1 \quad \text{Substitution}$$

$$12 \left[\frac{x}{3} + \frac{y}{4} \right] = 12(1) \quad \text{MPE}$$

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Substitution

$$12 \left[\frac{x}{3} + \frac{y}{4} \right] = 12(1) \quad \text{MPE}$$

$$4x + 3y = 12$$

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

Substitution

$$12 \left[\frac{x}{3} + \frac{y}{4} \right] = 12(1) \quad \text{MPE}$$

$$4x + 3y = 12$$

Distributive Property

Example 1

Find equation of a line that has with an x-intercept $a = 3$ and y-intercept $b = 4$.

Given: $a = 3,$ $b = 4$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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

Substitution

$$12 \left[\frac{x}{3} + \frac{y}{4} \right] = 12(1) \quad \text{MPE}$$

$$4x + 3y = 12$$

Distributive Property

\therefore the equation of the line is $4x + 3y = 12$.

Example 2

What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

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Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

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Substitution

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Substitution

Find the LCM:
 $7 = (7)$

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Substitution

Find the LCM:

$$7 = (7)$$

$$2 =$$

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$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

Find the LCM:

$$7 = (7)$$

$$2 =$$

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What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

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Substitution

Find the LCM:

$$7 = (7)$$

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$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

Find the LCM:

$$7 = (7)$$

$$2 = (2)$$

$$\text{LCM} =$$

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What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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Substitution

Find the LCM:

$$7 = (7)$$

$$2 = (2)$$

$$\text{LCM} = (7)$$

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What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

Find the LCM:

$$7 = (7)$$

$$2 = (2)$$

$$\text{LCM} = (7)(2) =$$

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What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

Find the LCM:

$$7 = (7)$$

$$2 = (2)$$

$$\text{LCM} = (7) (2) = 14$$

Example 2

What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

$$14 \left[\frac{x}{7} + \frac{y}{2} \right] = 14(1)$$

Example 2

What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

$$14 \left[\frac{x}{7} + \frac{y}{2} \right] = 14(1) \quad \text{MPE}$$

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What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

$$14 \left[\frac{x}{7} + \frac{y}{2} \right] = 14(1) \quad \text{MPE}$$

$$2x + 7y = 14$$

Example 2

What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

Given: $P_1(0, 2)$, $b = 2$, $P_2(7, 0)$, $a = 7$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

$$14 \left[\frac{x}{7} + \frac{y}{2} \right] = 14(1)$$

MPE

$$2x + 7y = 14$$

Distributive Property

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What is the equation of the line that passes through points $(0, 2)$ and $(7, 0)$?

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$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{7} + \frac{y}{2} = 1$$

Substitution

$$14 \left[\frac{x}{7} + \frac{y}{2} \right] = 14(1)$$

MPE

$$2x + 7y = 14$$

Distributive Property

\therefore the equation of the line is $2x + 7y = 14$.

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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

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$$\frac{x}{a} + \frac{y}{b} = 1$$

Example 3

Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{-3} = 1$$

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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

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$$\frac{x}{a} + \frac{y}{b} = 1$$

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Find the LCM:

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Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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Find the LCM:
 $6 =$

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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{-3} = 1 \quad \text{Substitution}$$

Find the LCM:
 $6 = (2)$

Example 3

Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{-3} = 1 \quad \text{Substitution}$$

Find the LCM:
 $6 = (2) (3)$

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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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Find the LCM:
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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

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$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{-3} = 1 \quad \text{Substitution}$$

Find the LCM:
 $6 = (2) (3)$
 $-3 =$

Example 3

Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

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$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{-3} = 1 \quad \text{Substitution}$$

Find the LCM:

$$\begin{array}{rcl} 6 & = & (2) \quad (3) \\ -3 & = & (3) \end{array}$$

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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

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Find the LCM:

$$\begin{array}{rcl} 6 & = & (2) \quad (3) \\ -3 & = & (3) \quad (-1) \end{array}$$

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Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{-3} = 1 \quad \text{Substitution}$$

Find the LCM:

$$6 = (2) (3)$$

$$-3 = (3) (-1)$$

$$\text{LCM} =$$

Example 3

Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

Given: $a = 6$, $b = -3$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{6} + \frac{y}{-3} = 1 \quad \text{Substitution}$$

Find the LCM:

$$6 = (2) (3)$$

$$-3 = (3) (-1)$$

$$\text{LCM} = (2)$$

Example 3

Find the equation of the line with 6 and -3 as its x - and y -intercepts respectively.

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\therefore the equation of the line is $x - 2y = 6$.

Thank you for watching.