

Name: KeyEquation of a Line : $y = mx + b$

In order to tell what the slope and y-intercept of a line are, it must be in the form $y = mx + b$ therefore, the equation always needs to be solved for y or else you do not know the exact slope and you do not know the exact y-intercept

(b) (m)

1) What is the y-intercept of the line whose equation is $3y = 6x + 12$?

A) 1

B) 2

C) 3

D) 4

$$\begin{aligned} 3y &= 6x + 12 \\ \frac{3y}{3} &= \frac{6x}{3} + \frac{12}{3} \\ y &= 2x + 4 \end{aligned}$$

2) The slope of a line perpendicular to the line whose equation is $y = 3x - 4$ isA) $-\frac{1}{3}$

B) -3

C) $\frac{1}{3}$

D) -1

3) What is the slope of a line perpendicular to the line whose equation is $y = 2x + 7$?

A) 2

B) $\frac{1}{2}$

C) -2

D) $-\frac{1}{2}$ 4) What is the equation of a line parallel to the line whose equation is $3y = 2x + 3$?A) $y = \frac{3}{2}x - 3$ B) $2y = 3x + 3$ C) $y = \frac{2}{3}x + 3$ D) $3y = -2x + 1$ 5) Determine the slope (m) and the y-intercept (b) of the line $y = 2x - 3$.

$$m = 2 \quad b = -3$$

$$\begin{aligned} 3y &= 2x + 3 \\ \frac{3y}{3} &= \frac{2x}{3} + \frac{3}{3} \\ y &= \frac{2}{3}x + 1 \end{aligned}$$

6) Determine the slope (m) and the y-intercept (b) of the line $y = x$.

$$m = 1 \quad b = 0$$

7) Determine the slope (m) and the y-intercept (b) of the line $y + 2 = 3x$.

$$\begin{aligned} y + 2 &= 3x \\ y - 2 &= 3x - 2 \\ y &= 3x - 2 \end{aligned}$$

$$m = 3 \quad b = -2$$

8) Determine the slope (m) and the y-intercept (b) of the line $\frac{2y}{2} = \frac{x}{2} + \frac{4}{2}$.

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

$$m = \frac{1}{2} \quad b = 2$$

9) Determine the slope (m) and the y-intercept (b) of the line $x + 2y = 5$.

$$\begin{aligned} x + 2y &= 5 \\ -x - 2y &= -5 \\ \frac{2y}{2} &= \frac{-x}{2} + \frac{5}{2} \end{aligned}$$

$$y = -\frac{1}{2}x + \frac{5}{2}$$

$$m = -\frac{1}{2} \quad b = \frac{5}{2}$$

- 10) Write an equation of the line whose slope and y-intercept are 2 and 4 respectively.

$$Y = 2X + 4$$

- 11) Write an equation of the line whose slope and y-intercept are -1 and 1 respectively.

$$Y = -X + 1$$

- 12) Write an equation of the line whose slope and y-intercept are 0 and 3 respectively.

$$Y = 0X + 3$$

$$Y = 3$$

When you have to write the equation of a line given the slope and one point, you must use

Point - Intercept Form: $y - y_1 = m(x - x_1)$

In this equation, m =slope, you plug in the coordinates of the given point into x_1 and y_1 and x and y stay in the equation. For example,

- 13) Write an equation of the line whose slope is $\frac{2}{3}$ and that passes through the point (6,4).

$$Y - 4 = \frac{2}{3}(X - 6)$$

$$Y - 4 = \frac{2}{3}X - 4$$

$$Y = \frac{2}{3}X$$

- 4) Write an equation of the line whose slope is $\frac{1}{2}$ and that passes through the point (-6,0).

$$Y - 0 = \frac{1}{2}(X - (-6))$$

$$Y = \frac{1}{2}(X + 6)$$

$$Y = \frac{1}{2}X + 3$$

- 15) Write an equation of the line whose slope is $-\frac{3}{2}$ and that passes through the point (-2,1).

$$Y - 1 = -\frac{3}{2}(X - (-2))$$

$$Y - 1 = -\frac{3}{2}(X + 2)$$

$$Y - 1 = -\frac{3}{2}X - 3$$

$$Y = -\frac{3}{2}X - 2$$

- 16) Write an equation of the line whose slope is 0 and that passes through the point (-4,3).

$$Y - 3 = 0(X - (-4))$$

$$Y - 3 = 0$$

$$Y = 3$$

- 17) Write an equation of the line parallel to $y = 3x - 5$ and that passes through the point $(1, 6)$. $m = 3$

$$y - 6 = 3(x - 1)$$

$$\begin{array}{r} y - 6 = 3x - 3 \\ +6 \quad +6 \end{array}$$

$$\boxed{y = 3x + 3}$$

- 18) Write an equation of the line parallel to the line $5y + 6x = 11$ and passing through the point $(-3, 7)$. $m = -\frac{6}{5}$

$$\begin{array}{r} -6x - 6x \\ 5y = -6x + 11 \\ \hline 5y = -6x + 11 \\ \hline y = -\frac{6}{5}x + \frac{11}{5} \end{array}$$

$$y = -\frac{6}{5}x + \frac{11}{5}$$

$$y - 7 = -\frac{6}{5}(x - (-3))$$

$$y - 7 = -\frac{6}{5}(x + 3)$$

$$\begin{array}{r} y - 7 = -\frac{6}{5}x - \frac{18}{5} \\ +7 \quad +7 \end{array}$$

- 19) Write an equation of the line parallel to the line $2y - x = 8$ and passing through the point $(5, 7)$.

$$y - 7 = \frac{1}{2}(x - 5)$$

$$\begin{array}{r} y - 7 = \frac{1}{2}x - \frac{5}{2} \\ +7 \quad +7 \end{array}$$

$$\boxed{y = \frac{1}{2}x + \frac{9}{2} \text{ or } y = \frac{1}{2}x + 4.5}$$

$$\begin{array}{r} +x +x \\ 2y = x + 8 \\ \hline 2y = x + 8 \\ \hline y = \frac{1}{2}x + 4 \end{array}$$

$$y = \frac{1}{2}x + 4$$

$$m = \frac{1}{2}$$

$$\boxed{y = -\frac{6}{5}x + \frac{17}{5} \text{ or } y = -\frac{6}{5}x + 3.4}$$

- 20) Write an equation of the line parallel to the line $x + 7 = 0$ and passing through the point $(5, -9)$.

$$x = -7$$

$$\boxed{x = 5}$$

- 21) Write an equation of the line perpendicular to the line $y = -2x + 3$ and passes through the origin. $m = \frac{1}{2}$

$$y - 0 = \frac{1}{2}(x - 0)$$

$$\boxed{y = \frac{1}{2}x}$$

- 22) Write an equation of the line perpendicular to the line $y = -\frac{1}{2}x + 10$ and passes through $(0, 3)$. $m = 2$

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

$$\begin{array}{r} y - 3 = 2x \\ +3 \quad +3 \end{array}$$

$$\boxed{y = 2x + 3}$$

- 23) Write an equation of the line perpendicular to the line $5x - 2y = -3$ and passing through the point $(2, -1)$. $m = -\frac{2}{5}$

$$\frac{-5x}{-5x} \quad \frac{-5x}{-2}$$

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

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

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

$$y - (-1) = -\frac{2}{5}(x - 2)$$

$$y + 1 = -\frac{2}{5}x + \frac{4}{5}$$

$$y = -\frac{2}{5}x - \frac{1}{5} \text{ or } y = \frac{2}{5}x - \frac{1}{5}$$

- 24) Write an equation of the line perpendicular to the line $2x + y = 12$ and passing through the point $(0, -5)$. $m = \frac{1}{2}$

$$\frac{-2x}{-2x} \quad \frac{-2x}{-2x}$$

$$y = -2x + 12$$

$$y - (-5) = \frac{1}{2}(x - 0)$$

$$y + 5 = \frac{1}{2}x$$

$$y = \frac{1}{2}x - 5$$

When you need to write the equation of a line and you are given two points, first you must find the slope (using the slope formula) and then you follow the same steps as in #13.

- 25) Write an equation of the line that passes through the points $(0, -1)$ and $(2, 3)$.

$$m = \frac{-1 - 3}{0 - 2} = \frac{-4}{-2} = 2$$

$$y - (-1) = 2(x - 0)$$

or

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

$$y + 1 = 2x$$

$$y = 2x - 1$$

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

$$y = 2x - 1$$

- 26) Write an equation of the line that passes through the points $(5, 2)$ and $(2, 8)$.

$$m = \frac{2 - 8}{5 - 2} = \frac{-6}{3} = -2$$

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

or

$$y - 8 = -2(x - 2)$$

$$y - 2 = -2x + 10$$

$$y = -2x + 12$$

$$y - 8 = -2x + 4$$

$$y = -2x + 12$$

- 27) Write an equation of the line that passes through the points $(-6, 0)$ and $(0, 4)$.

$$m = \frac{0 - 4}{-6 - 0} = \frac{-4}{-6} = \frac{2}{3}$$

$$y - 0 = \frac{2}{3}(x - (-6))$$

or

$$y - 4 = \frac{2}{3}(x - 0)$$

$$y = \frac{2}{3}(x + 6)$$

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

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

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

- 28) Write an equation of the line that passes through the points $(-1, -2)$ and $(3, 2)$.

$$m = \frac{-2 - 2}{-1 - 3} = \frac{-4}{-4} = 1$$

$$y - (-2) = 1(x - (-1))$$

or

$$y - 2 = 1(x - 3)$$

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

$$y + 2 = x + 1$$

$$y = x - 1$$

$$y - 2 = x - 3$$

$$y = x - 1$$

When you need to write the equation of the perpendicular bisector,

step 1: find the slope

step 2: find the perpendicular slope

step 3: find the midpoint

step 4: follow the directions to #13 but you must use the midpoint that you found in step 3 as your point to plug in.

- 29) Write an equation of the line that is the perpendicular bisector of the line segment having endpoints of $(-4, 4)$ and $(0, -6)$.

$$m = \frac{4 - (-6)}{-4 - 0} = \frac{10}{-4} \perp \frac{4}{10}$$

$$\text{midpt} = \left(\frac{-4+0}{2}, \frac{4+(-6)}{2} \right) \\ \left(-\frac{4}{2}, \frac{-2}{2} \right) = (-2, -1)$$

$$y - (-1) = \frac{4}{10}(x - (-2))$$

$$y + 1 = \frac{4}{10}(x + 2)$$

$$y + 1 = \frac{4}{10}x + \frac{8}{10}$$

$$y = \frac{4}{10}x - \frac{1}{5} \text{ or } y = \frac{4}{5}x - 2$$

- 30) Write an equation of the line that is the perpendicular bisector of the line segment having endpoints of $(-3, 3)$ and $(1, 13)$.

$$m = \frac{3 - 13}{-3 - 1} = \frac{-10}{-4} = \frac{10}{4} \perp \frac{-4}{10}$$

$$\text{midpt} = \left(\frac{-3+1}{2}, \frac{3+13}{2} \right) \\ \left(-\frac{2}{2}, \frac{16}{2} \right) = (-1, 8)$$

$$y - 8 = \frac{-4}{10}(x - (-1))$$

$$y - 8 = \frac{-4}{10}(x + 1)$$

$$y - 8 = \frac{-4}{10}x - \frac{4}{10}$$

$$y = \frac{-4}{10}x + \frac{38}{5} \\ \text{or} \\ y = \frac{-4}{10}x + 7.6$$

- 31) Write an equation of the line that is the perpendicular bisector of the line segment having endpoints of $(-4, -2)$ and $(8, 4)$.

$$m = \frac{-2 - 4}{-4 - 8} = \frac{-6}{-12} = \frac{6}{12} = \frac{1}{2} \perp -2$$

$$\text{midpt} = \left(\frac{-4+8}{2}, \frac{-2+4}{2} \right) \\ \left(\frac{4}{2}, \frac{2}{2} \right) = (2, 1)$$

$$y - 1 = -2(x - 2)$$

$$y - 1 = -2x + 4$$

$$y = -2x + 5$$

- 32) Write an equation of the line that is the perpendicular bisector of the line segment having endpoints of $(-3, 7)$ and $(5, -3)$.

$$m = \frac{7 - (-3)}{-3 - 5} = \frac{10}{-8} \perp \frac{8}{10}$$

$$\text{midpt} = \left(\frac{-3+5}{2}, \frac{7+(-3)}{2} \right) \\ \left(\frac{2}{2}, \frac{4}{2} \right) \\ (1, 2)$$

$$y - 2 = \frac{8}{10}(x - 1)$$

$$y - 2 = \frac{8}{10}x - \frac{8}{10}$$

$$y = \frac{8}{10}x + \frac{6}{5} \text{ or } y = \frac{8}{10}x + 1.2$$

M is the midpoint of \overline{AB} . Find the coordinates of the third point

① A(2,7)

M(1,6)

B(x,y)

$(0,5)$

$$\left(\frac{2+x}{2}, \frac{7+y}{2}\right) = (1,6)$$

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

$$\frac{7+y}{2} = \frac{6}{1}$$

$$2+x=2$$

$$7+y=12$$

$$x=0$$

$$y=5$$

② A(x,y)

M($\frac{3}{2}$, 0)

B(4,-2)

$(-1,2)$

$$\left(\frac{x+4}{2}, \frac{y-2}{2}\right) = \left(\frac{3}{2}, 0\right)$$

$$\frac{x+4}{2} = \frac{3}{2}$$

$$\frac{y-2}{2} = 0$$

$$2(x+4)=6$$

$$y-2=0$$

$$2x+8=6$$

$$y=2$$

$$2x=-2$$

$$x=-1$$

Find the center and radius

① $(x-2)^2 + (y+5)^2 = \frac{16}{9}$

② $x^2 + y^2 = 14$

$C=(2,-5)$ $r=\frac{4}{3}$

$C=(0,0)$ $r=\sqrt{14}$

Write an equation of a circle given:

① $C=(0,-9)$ $r=\sqrt{3}$

② $C=(-1,4)$ $d=7$

$r=\frac{7}{2}=3.5$

$x^2 + (y+9)^2 = 3$

$(x+1)^2 + (y-4)^2 = 3.5^2$
 $(x+1)^2 + (y-4)^2 = 12.25$