

## ACT Study Modules

Topic: Finding slope from parallel and perpendicular lines

Khan Academy Link: <https://www.khanacademy.org/math/geometry-home/analytic-geometry-topic/parallel-perpendicular-lines-coordinate-plane/v/classify-lines>

To determine the slope of parallel lines from an equation:

Step one: arrange the equation in the form,  $y = mx + b$

Step two: determine the slope ( $m$  value)

Step three: compare the slopes

Step four: compare the " $b$ " values

If the  $b$  values are different and the slope is the same, then the lines are parallel.

Example:  $-3x + y = -9$

Add  $3x$  to both sides  
of the equation  
 $y = 3x - 9$

$$y - 5 = 3x$$

add 5 to both sides  
of the equation  
 $y = 3x + 5$

In the functions,  $y = 3x - 9$  &  $y = 3x + 5$  the slope is 3, and the  $b$  values are different, making the lines parallel.

To determine the slope of perpendicular lines from an equation:

Step one: arrange the equation in the form  $y = mx + b$

Step two: determine the slope ( $m$  value)

Step three: compare the slopes

If the slopes are negative reciprocals, the lines are perpendicular.

Example:  $y - 5x = -4$

Add  $5x$  to both sides  
of the equation  
 $y = 5x - 4$

$$y + 8 = -1/5x$$

Subtract 8 from both sides  
of the equation  
 $y = -1/5x - 8$

Slopes are 5 and  $-1/5$ , the slopes are negative reciprocals, making the lines perpendicular.

Example: In the standard  $(x, y)$  coordinate plane which of the lines are perpendicular to the line  $y = -2x + 2$  that passes through the point  $(0, 3)$

Step one: determine the slope of the perpendicular line:.. The slope of the original line is  $-2$  the negative reciprocal of  $-2$  is  $\frac{1}{2}$

Step two:  $y = \frac{1}{2}x + b$

Step three: to determine  $b$ , substitute the  $x$  and  $y$ - values of the point,  $(0, 3)$

$$3 = \frac{1}{2}(0) + b$$

$$3 = b$$

Step four: write the equation,  $y = \frac{1}{2}x + 3$

Practice:

Line	Equation of a parallel line (same SLOPE!) Different y-intercept	Equation of a perpendicular line Negative reciprocal SLOPE!
$y = 2x - 5$ Slope = 2 y-int = -5	$y = 2x + \text{Any \# except } (-5)$ $y = 2x + 5$ $y = 2x - 2$ $y = 2x + 3$ $y = 2x - 4$	$m = -1/2$ $y = -1/2x + 3$ $y = -1/2x + 4$ $y = -x/2 - 5$ $y = -x/2 + 3$
$2x - 3y = 12$ $-3y = -2x + 12$ $y = 2/3x - 4$	$y = 2/3x + \text{Any \# except } (-4)$ $y = 2/3x + 6$ $y = 2/3x - 5$ $y = 2/3x + 2$	$m = -3/2$ $y = -3/2x + 6$ $2y = -3x + 12$ $y = -3/2x - 4$ $3x + 2y = 8$
$y = -\frac{3}{4}x - 1$ Slope = -3/4 y-int = -1	$y = -3/4 + \text{any \# except } -1$ $y = -3/4x + 6$ $y = -3/4x - 7$	$m = 4/3$ $y = 4/3x + 7$ $y = 4/3x - 6$ $y = 4/3x + 2$
$5x + 2y = 15$ $2y = -5x + 15$ $y = -5/2x + 15/2$	$y = -5/2x + \text{any \# except } 15/2$ $y = -5/2x + 6$ $y = -5/2x + 2$	$m = 2/5$ $y = 2/5x + 8$ $y = 2x/5 + 6$

$$2y = -5x + 4$$

$$5x + 2y = 6$$

SLOPE = 2/3  
y-int = -4

SLOPE = -5/2  
y-int = 15/2