• Find the equation in slope-intercept form of the line through $(1, -4)$ that is parallel to $y = 3x+2$.

Solution:

Since $y = 3x + 2$ has slope 3, any line parallel to it also has slope 3.

To write the equation of the line that goes through $(1, -4)$ with slope 3 we use the point-slope form:

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

Replace (x_1, y_1) with $(1, -4)$ and slope with 3 in the equation above we get

$$y - (-4) = 3(x - 1)$$

or

$$y = 3x - 7$$

The line $y = 3x - 7$ goes through $(1, -4)$ and is parallel to $y = 3x + 2$.

• Find the equation of the line perpendicular to the line $3x - 4y = 8$ and containing the point $(-2, 1)$. Write the answer in slope-intercept form.

Solution:

Rewrite $3x - 4y = 8$ in slope-intercept form:

$$-4y = -3x + 8 \text{ or } y = \frac{3}{4}x - 2$$

Since the product of the slopes of perpendicular lines is -1, the slope of the line that we seek is -4/3.

Use the slope -4/3 and the point (-2, 1) in the point-slope form:

$$y - 1 = -\frac{4}{3}(x - (-2))$$

or

$$y - 1 = -\frac{4}{3}x - \frac{8}{3}$$

or

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

• Line p is defined by the equation:

$$2y + 18x = 9$$

Line r is perpendicular to line p in the xy-plane. What is the slope of line r?

(A.) -9
(B.) $-\frac{1}{3}$
(C.) $\frac{1}{9}$
(D.) 9

Solution:
Since line r is perpendicular to line p, the slope of line r is the negative reciprocal of the slope of line p.

Start by rewriting the equation of line p in slope-intercept form $y = mx + b$:

$2y + 18x = 9$	Original Equation
$2y = 9 - 18x$	Subtract $18x$ from both sides:
$y = -9x + \frac{9}{2}$	Divide both sides by 2

So, the slope of line p is -9. The negative reciprocal of -9 is: $\left(\frac{-1}{-9}\right) = \frac{1}{9}$

Therefore, the slope of line r is $\frac{1}{9}$.

• If the equation $y = \frac{1}{6}(x + 12)$ were graphed in the xy-plane, which of the following statements would be true of the graphed line?

(A) It would be perpendicular to the graph of $y = 1/6x + 3$

(B) It would be parallel to the graph of $12y = 2x + 3$

(C) It would have the same slope as the graph of $x + 6y = 18$

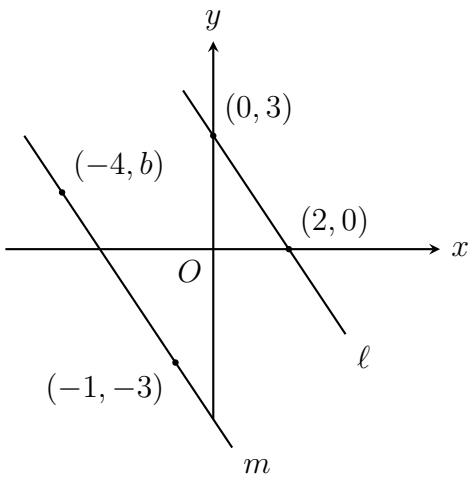
(D) It would have the same y-intercept as the graph of $y = 1/6x + 12$

Solution:

Equation $y = \frac{1}{6}(x + 12) = \frac{1}{6}x + 2$ which clear has slope $\frac{1}{6}$ and intercept 2.

Equation from option B $12y = 2x + 3$ or $y = \frac{1}{6}x + \frac{1}{4}$ has the same slope with given equation.
Correct answer is option (B)

• In the xy plane above, line l is parallel to line m. What is the value of b?



Solution:
Since the two line are parallel, their slope is the same

$$\frac{0-3}{2-0} = \frac{-3-b}{-1-(-4)}$$

or

$$\frac{-3}{2} = \frac{-3-b}{3}$$

Solving for b we have

$$3(-3) = 2(-3-b)$$

or

$$-9 = -6-2b$$

therefore

$$b = \frac{3}{2}$$

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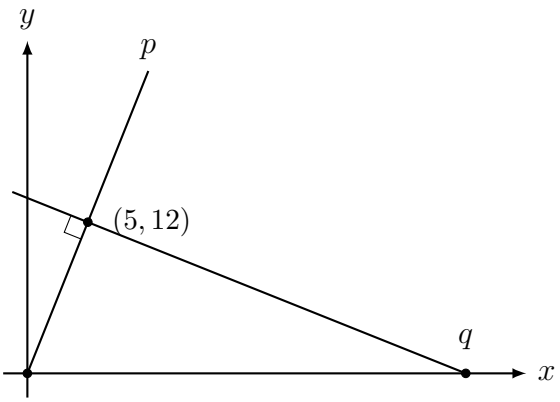

In the figure above, lines p and q are graphed on the xy-plane. What is the x-intercept of line q ?

(A) 24
(B) 27.6
(C) 33.8
(D) 38.4

Solution
The question asks for the x-intercept of line q, which is perpendicular to line p. Perpendicular lines have slopes that are negative reciprocals, so find the slope of line p.

The slope formula is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Since line p goes through both the origin and the point $(5, 12)$, substitute $(0, 0)$ for (x_1, y_1) and $(5, 12)$ for (x_2, y_2) to get

$$m = \frac{12 - 0}{5 - 0}$$

Since the slope of p is $m = \frac{12}{5}$, the slope of q is its negative reciprocal, or $-\frac{5}{12}$.

To find the x-intercept of line q, use the slope formula again with $(5, 12)$ and $(x, 0)$.

This becomes

$$-\frac{5}{12} = \frac{12 - 0}{5 - x}$$

Cross-multiply to get $12(12) = -5(5-x)$ or $144 = -25 + 5x$. Add 25 to both sides to get $169 = 5x$, then divide both sides by 5 to get $x = 33.8$.

The correct answer is (C).