Equations of Linear Relations Lesson #5: Further Practice with Linear Equations

Writing Linear Equations

Linear equations can be written in different forms:

$Ax + By + C = 0$	$\rightarrow$	General form of a linear equation.
$y = mx + b$	$\rightarrow$	Slope y-intercept form of a linear equation.
$y - y_1 = m(x - x_1)$	$\rightarrow$	Point-slope form of a linear equation.

The slope y-intercept form is used when we are given the slope of a line and the y-intercept.
The point-slope form is used when we are given the slope of a line and any point on the line.
In many cases, either the point or the slope of the line must be determined from the information given before the equation can be used.

Given $P(3,-1)$ and $Q(-2,-6)$, determine the equation, in general form, of a line passing through the two points.

slope: $\frac{y_2 - y_1}{x_2 - x_1}$ $\frac{-6-(-1)}{-2-3} = \frac{-5}{-5} = 1$

point slope: $y - y_1 = m(x - x_1)$

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

$y + 1 = x - 3$ $\rightarrow$ $Ax + By + C = 0$

$0 = x - y - 4$

Determine the equation, in general form, of a line through the point $(5,0)$ and perpendicular to the line with equation $3x - 5y + 17 = 0$.

*have a point, must solve for slope

$3x - 5y + 17 = 0 \Rightarrow y = mx + b$

$-5y = -3x - 17$

$y = \frac{3}{5}x + \frac{17}{5}$

$\frac{3}{5}$ $\rightarrow$ perp $\rightarrow$ $-\frac{5}{3}$

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

$y - 0 = -\frac{5}{3}(x - 5)$

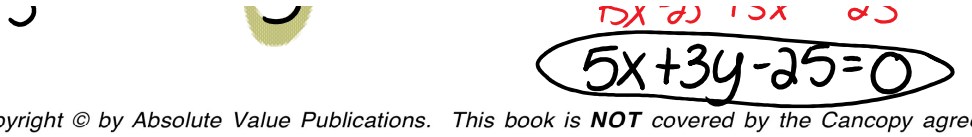
*convert to general form

$3y = -5(x - 5)$

$3y = -5x + 25$

$+5x \quad -25 \quad +5x \quad -25$

$5x + 3y - 25 = 0$



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Find the equation, in general form, of the line perpendicular to the line $5x - 7y - 10 = 0$ and with the same x-intercept as $x - 2y - 12 = 0$.

slope

$5x - 7y - 10 = 0$

$-7y = -5x + 10$

$y = \frac{5}{7}x - \frac{10}{7}$

$\frac{5}{7} \rightarrow \text{perp} \rightarrow \frac{-7}{5}$

point

$x - 2y - 12 = 0$

x-int $\rightarrow y = 0$

$x - 2(0) - 12 = 0$

$x - 12 = 0$

$x = 12$

$(12, 0)$

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

$y - 0 = \frac{-7}{5}(x - 12)$

general form

$5y = -7(x - 12)$

$5y = -7x + 84$

$7x + 5y - 84 = 0$

Complete Assignment Questions #1 - #14

#1-6 ↑↑ with a partner

Assignment

1. Find the equation, in general form, of the line through each pair of points.

a) (7, 5) and (6, 1)

b) (3, –7) and (–5, 9)

c) (–3, 4) and (11, 25)

d) (10, –15) and (–2, –12)

e) (4, –7) and (3, –7)

f) (–5, –8) and (–4, –10)

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2. Identify the lines in **1.** which are
i) parallel **ii)** perpendicular

3. Write the equation of each line in general form

a) with slope $\frac{2}{7}$ and an x-intercept of -6 **b)** with a y-intercept of $-\frac{8}{3}$ and a slope of 7

c) through the point $(2, 0)$ and perpendicular to $3x - 5y + 19 = 0$

d) through the point $(3, -6)$ and parallel to $5x + 3y + 9 = 0$

4. Write the equation of each line in general form

a) perpendicular to $y = x$ and with the same x-intercept as $y = 2x + 10$

b) parallel to $2x - 3y + 7 = 0$ and with the same y-intercept as $5x - 3y - 12 = 0$

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5. Write the equation of each line in general form

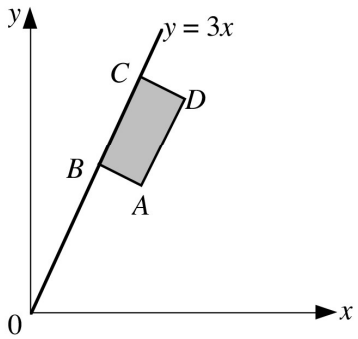
a) perpendicular to $6x - 2y + 5 = 0$ and with the same y-intercept as $x - y + 8 = 0$

b) with the same x-intercept as $9x - 2y + 18 = 0$ and through the point $(4, -5)$

6. Line l contains the point $A(7, 9)$ and is parallel to a line which contains the points $B(-4, 5)$ and $C(8, -1)$. Determine the equation of line l in the form $y = mx + b$.

7. A Cartesian plane is placed on the plan of a farm. The farmhouse is at the origin, and $ABCD$ represents a rectangular field of wheat. A farm road, with equation $y = 3x$, runs from the farmhouse along one side of the field.

a) If the point A has coordinates $(2, 4)$, determine the equation of AD.



b) Determine the equation of AB.

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8. A child with a fixed amount of money can buy 2 bags of chips and 5 cans of pop, or 3 bags of chips and 2 cans of pop. A linear relationship exists between the number of bags of chips, x, and the number of cans of pop, y, which can be bought.

a) Write the coordinates of two points which lie on the graph of this linear relationship.

b) Determine the equation of the linear relationship.

Multiple Choice

9. The equation of the line through the point $(7, -4)$ and perpendicular to the line with equation $5x - 4y + 13 = 0$, can be written in the form

A. $y + 4 = \frac{5}{4}(x - 7)$

B. $y = -\frac{4}{5}(x + 7)$

C. $y + 4 = -\frac{4}{5}(x - 7)$

D. $y + 4 = \frac{4}{5}(x - 7)$

10. A line passing through the point $(0, 3)$ is perpendicular to the line $x - 2y - 5 = 0$. The equation of the line is

A. $2x + y - 3 = 0$

B. $2x + y + 3 = 0$

C. $x - 2y + 6 = 0$

D. $2x - y + 3 = 0$

11. Which of the following linear relations is not equivalent to the other three?

A. $y - 4 = -\frac{1}{3}(x + 6)$

B. $x + 3y + 2 = 0$

C. the line passing through $(0, 2)$ and $(6, 0)$

D. $y = -\frac{1}{3}x + 2$

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12. A line passing through the point $(0, 3)$ is parallel to the line $x - 2y - 5 = 0$. The equation of the line is

A. $2x + y - 3 = 0$
B. $2x + y + 3 = 0$
C. $x - 2y + 6 = 0$
D. $2x - y + 3 = 0$

13. The image of $y = 2x + 7$ after a counterclockwise rotation of $90°$ about the origin is

A. $y = -\frac{1}{2}x + \frac{7}{2}$
B. $y = \frac{1}{2}x - \frac{7}{2}$
C. $y = -\frac{1}{2}x - \frac{7}{2}$
D. $y = -2x - 7$

Numerical Response

14. The line through the points $(-3, 4)$ and $(-1, -2)$ has equation $y + ax + b = 0$, where a and b are integers. The value of $a + b$ is _____.
(Record your answer in the numerical response box from left to right)

Answer Key

1. **a)** $4x - y - 23 = 0$ **b)** $2x + y + 1 = 0$ **c)** $3x - 2y + 17 = 0$
d) $x + 4y + 50 = 0$ **e)** $y + 7 = 0$ **f)** $2x + y + 18 = 0$
2. **i)** b and f **ii)** a and d
3. **a)** $2x - 7y + 12 = 0$ **b)** $21x - 3y - 8 = 0$ **c)** $5x + 3y - 10 = 0$ **d)** $5x + 3y + 3 = 0$
4. **a)** $x + y + 5 = 0$ **b)** $2x - 3y - 12 = 0$
5. **a)** $x + 3y - 24 = 0$ **b)** $5x + 6y + 10 = 0$ **6.** $y = -\frac{1}{2}x + \frac{25}{2}$
7. **a)** $y = 3x - 2$ or $3x - y - 2 = 0$ **b)** $y = -\frac{1}{3}x + \frac{14}{3}$ or $x + 3y - 14 = 0$
8. **a)** (2, 5) and (3, 2) **b)** $3x + y - 11 = 0$
9. C **10.** A **11.** B **12.** C **13.** C **14.**

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