

2-3 Study Guide and Intervention *(continued)*

Rate of Change and Slope

Slope

Slope m of a Line	For points (x_1, y_1) and (x_2, y_2) , where $x_1 \neq x_2$, $m = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$
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Example 1 Find the slope of the line that passes through $(2, -1)$ and $(-4, 5)$.

$$\begin{aligned}
 m &= \frac{y_2 - y_1}{x_2 - x_1} && \text{Slope formula} \\
 &= \frac{5 - (-1)}{-4 - 2} && (x_1, y_1) = (2, -1), (x_2, y_2) = (-4, 5) \\
 &= \frac{6}{-6} = -1 && \text{Simplify.}
 \end{aligned}$$

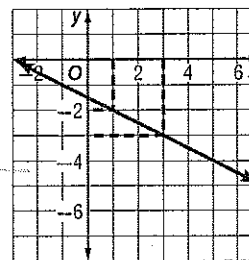
The slope of the line is -1 .

Example 2 Find the slope of the line.

Find two points on the line with integer coordinates, such as $(1, -2)$ and $(3, -3)$. Divide the difference in the y -coordinates by the difference in the x -coordinates:

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

The slope of the line is $-\frac{1}{2}$.

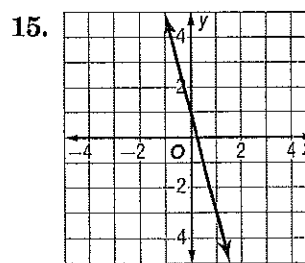
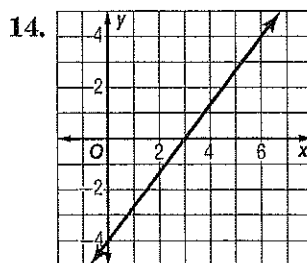
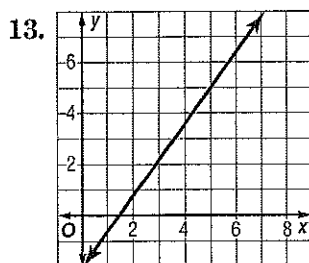
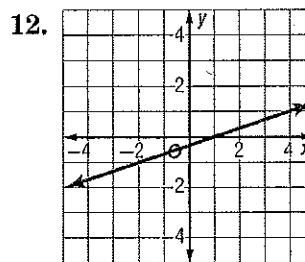
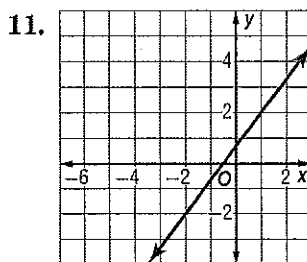
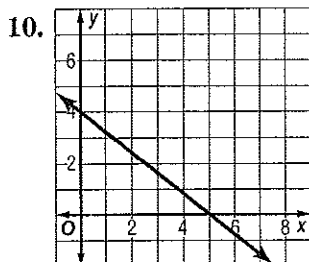


Exercises

Find the slope of the line that passes through each pair of points. Express as a fraction in simplest form.

- | | | |
|----------------------------|-----------------------------|------------------------------|
| 1. $(4, 7)$ and $(6, 13)$ | 2. $(6, 4)$ and $(3, 4)$ | 3. $(5, 1)$ and $(7, -3)$ |
| 4. $(5, -3)$ and $(-4, 3)$ | 5. $(5, 10)$ and $(-1, -2)$ | 6. $(-1, -4)$ and $(-13, 2)$ |
| 7. $(7, -2)$ and $(3, 3)$ | 8. $(-5, 9)$ and $(5, 5)$ | 9. $(4, -2)$ and $(-4, -8)$ |

Determine the rate of change of each graph.

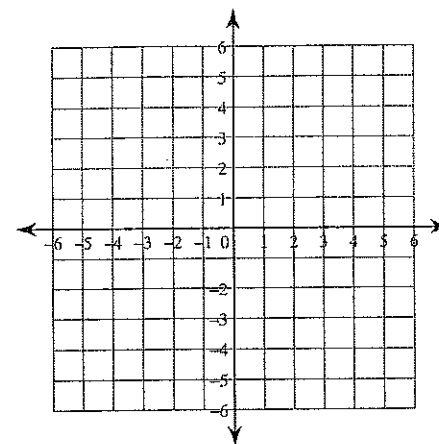


Graphing Horizontal and Vertical Lines

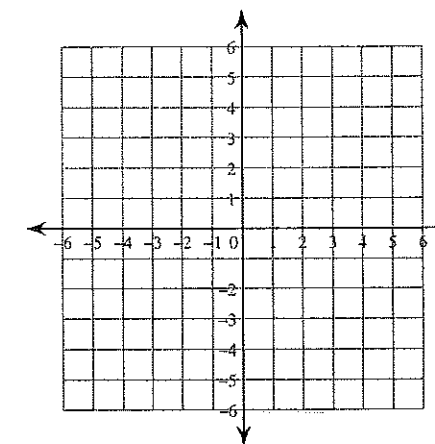
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Sketch the graph of each line.

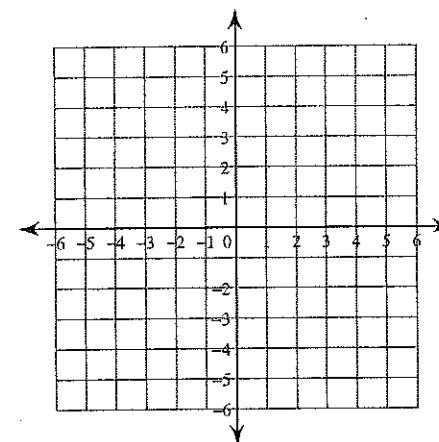
1) $y = -1$



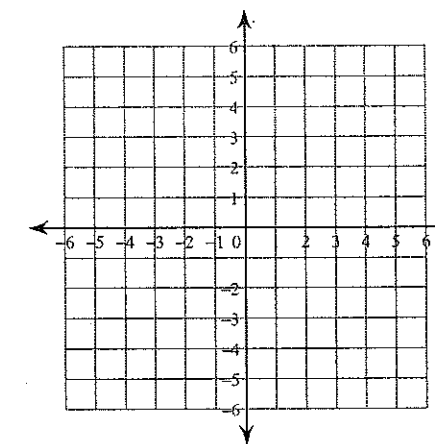
2) $y = -4$



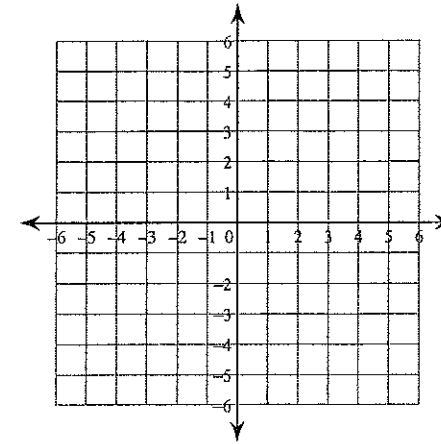
3) $x = -3$



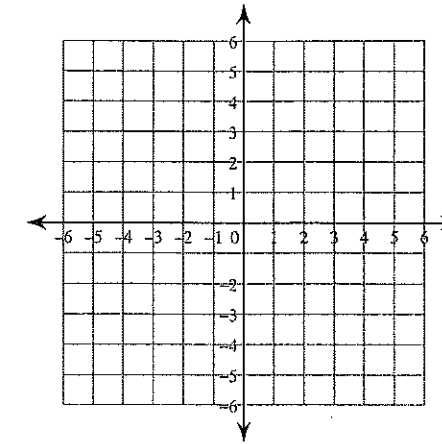
4) $x = -1$



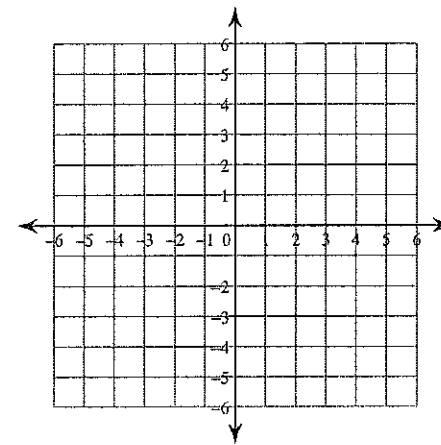
5) $y=0$



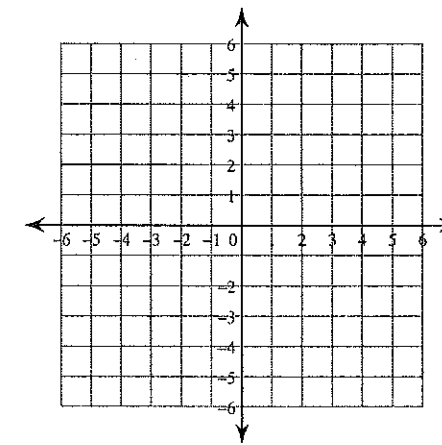
6) $y=2$



7) $x=-4$



8) $x=3$



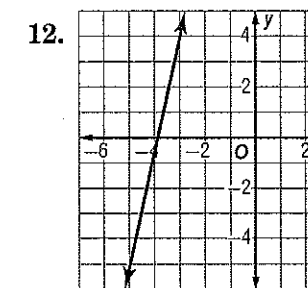
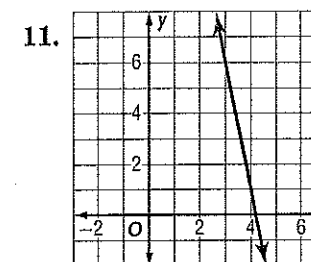
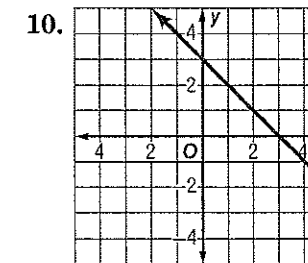
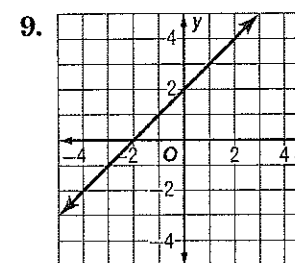
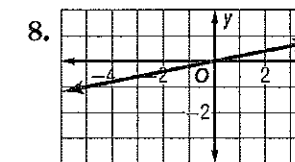
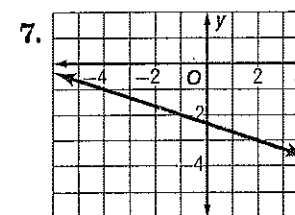
2-3 Practice

Rate of Change and Slope

Find the slope of the line that passes through each pair of points. Express as a fraction in simplest form.

1. $(3, -8), (-5, 2)$ 2. $(-10, -3), (7, 2)$ 3. $(-7, -6), (3, -6)$
 4. $(8, 2), (8, -1)$ 5. $(4, 3), (7, -2)$ 6. $(-6, -3), (-8, 4)$

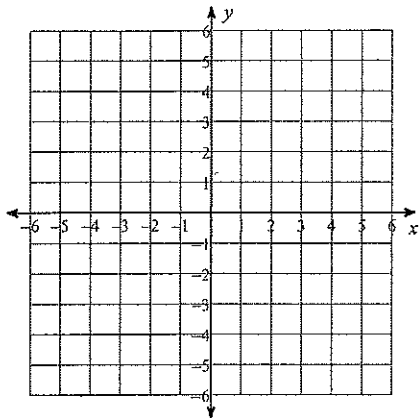
Determine the rate of change of each graph.



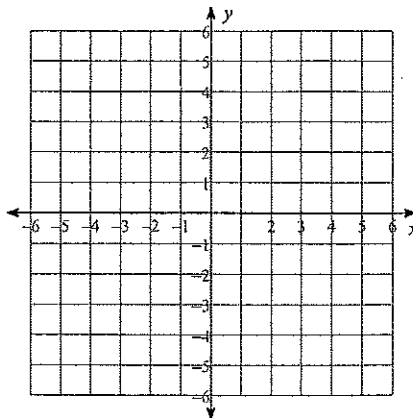
13. **DEPRECIATION** A machine that originally cost \$15,600 has a value of \$7500 at the end of 3 years. The same machine has a value of \$2800 at the end of 8 years.

- Find the average rate of change in value (depreciation) of the machine between its purchase and the end of 3 years.
- Find the average rate of change in value of the machine between the end of 3 years and the end of 8 years.
- Interpret the sign of your answers.

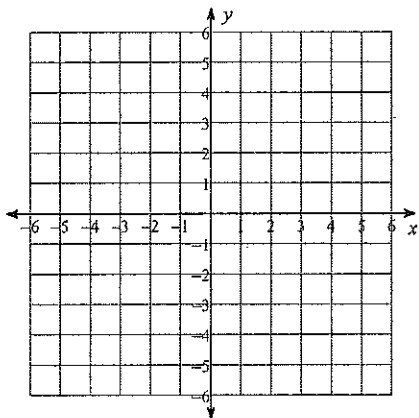
14) $y = -3$



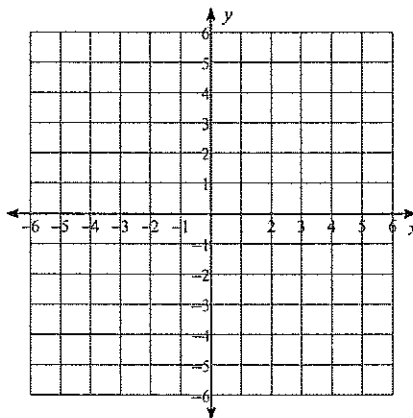
15) $x = 4$



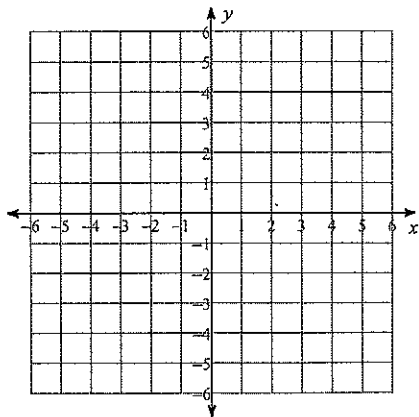
16) $y = 1$



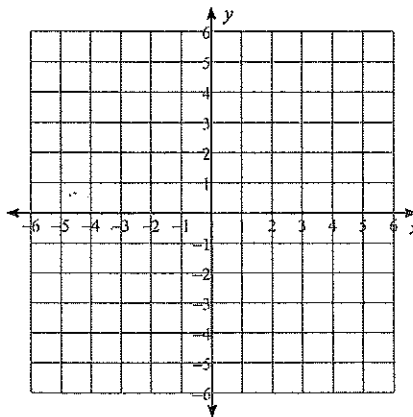
17) $x = -4$



18) $y = 5$



19) $x = 3$



Name: _____ Date: _____ Hour: _____

Guided Notes: Linear Equations, Slope-Intercept Form

So far, we've already talked about one form of linear equation (standard form). Now, we're going to talk about perhaps the most valuable of linear equations, _____ form. This form is useful when you are given the slope and the y-intercept.

Before we do that, let's review some vocabulary...

Slope: _____

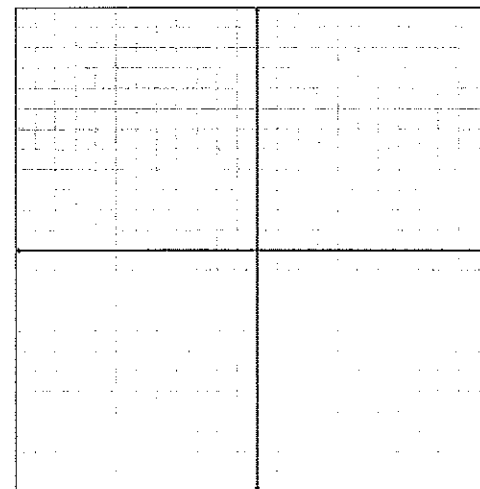
Y-intercept: _____

Slope-Intercept Form

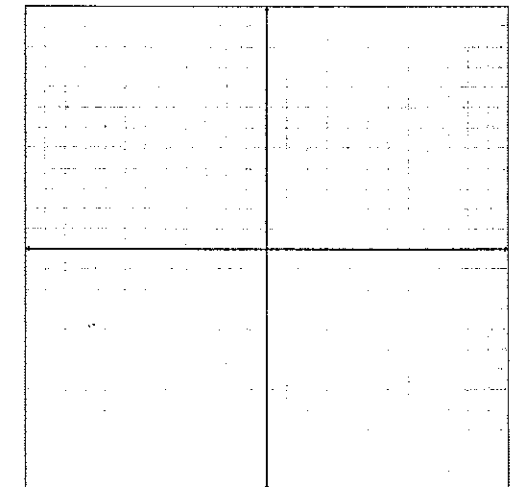
$$y = mx + b$$

Given the following information, write an equation in slope-intercept form. Then, graph the equation on the coordinate grid provided.

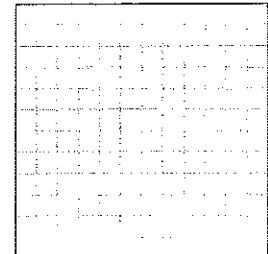
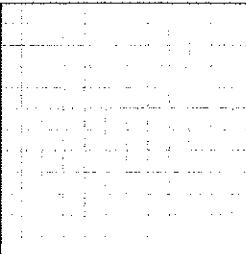
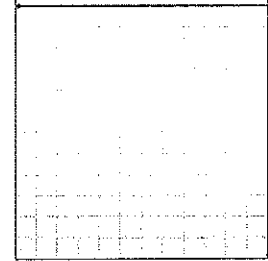
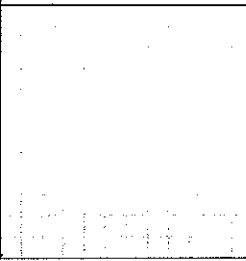
1) Slope: $\frac{2}{3}$, y-intercept: 4



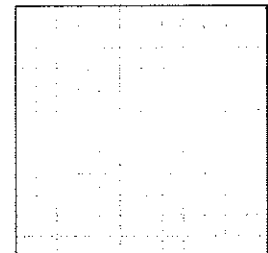
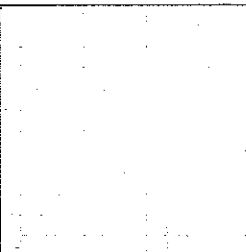
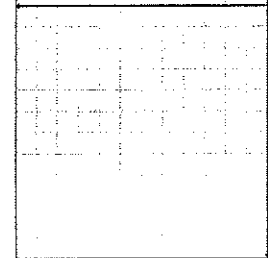
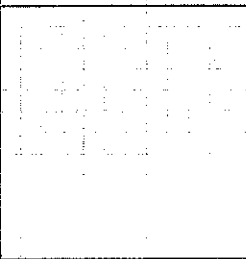
2) Slope: -4 , and the point (0, 8)



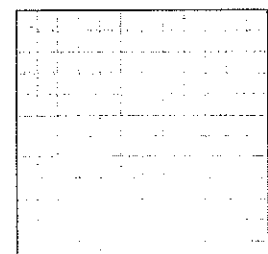
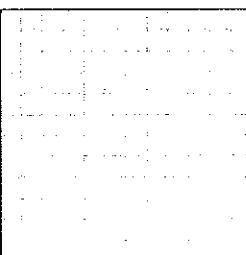
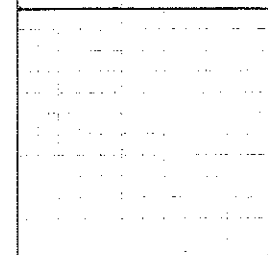
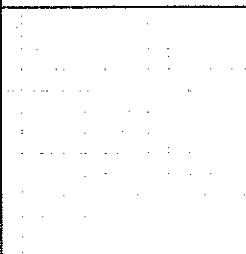
3) Slope: $\frac{-4}{3}$, and the point (0, 3)

4) Points (4, 5) and (0, 10)

5) Passes through (1, 2), slope = -2

2-4 Study Guide and Intervention

Writing Linear Equations

Forms of Equations

Slope-Intercept Form of a Linear Equation	$y = mx + b$, where m is the slope and b is the y -intercept
Point-Slope Form of a Linear Equation	$y - y_1 = m(x - x_1)$, where (x_1, y_1) are the coordinates of a point on the line and m is the slope of the line

Example 1 Write an equation in slope-intercept form for the line that has slope -2 and passes through the point $(3, 7)$.

Substitute for m , x , and y in the slope-intercept form.

$$y = mx + b \quad \text{Slope-intercept form}$$

$$7 = (-2)(3) + b \quad (x, y) = (3, 7), m = -2$$

$$7 = -6 + b \quad \text{Simplify.}$$

$$13 = b \quad \text{Add 6 to both sides.}$$

The y -intercept is 13. The equation in slope-intercept form is $y = -2x + 13$.

Example 2 Write an equation in slope-intercept form for the line that has slope $\frac{1}{3}$ and x -intercept 5.

$$y = mx + b \quad \text{Slope-intercept form}$$

$$0 = \left(\frac{1}{3}\right)(5) + b \quad (x, y) = (5, 0), m = \frac{1}{3}$$

$$0 = \frac{5}{3} + b \quad \text{Simplify.}$$

$$-\frac{5}{3} = b \quad \text{Subtract } \frac{5}{3} \text{ from both sides.}$$

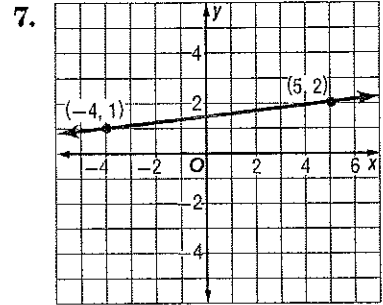
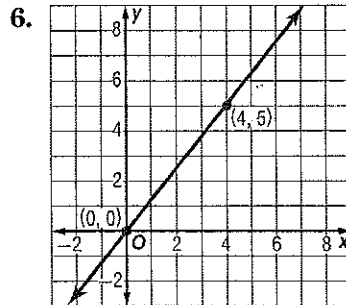
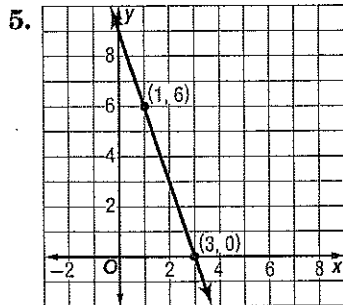
The y -intercept is $-\frac{5}{3}$. The slope-intercept form is $y = \frac{1}{3}x - \frac{5}{3}$.

Exercises

Write an equation in slope-intercept form for the line described.

- slope -2 , passes through $(-4, 6)$
- slope $\frac{3}{2}$, y -intercept 4
- slope 1, passes through $(2, 5)$
- slope $-\frac{13}{5}$, passes through $(5, -7)$

Write an equation in slope-intercept form for each graph.



1. slope 1.5, passes through (0, 5)

2. passes through (-2, 3) and (0, 1)

3. passes through (3, 5); $m = -2$

4. passes through (-8, -2); $m = \frac{5}{2}$

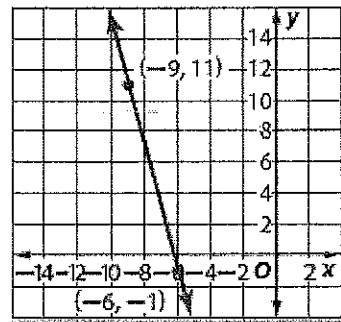
5. **MULTIPLE CHOICE** Which is an equation of the line?

A $y = -4x - 25$

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

C $y = \frac{4}{5}x + \frac{29}{25}$

D $y = 6x + 35$



6. Each week, Carmen earns a base pay of \$15 plus \$0.17 for every pamphlet that she delivers. Write an equation that can be used to find out much Carmen earns each week. How much will she earn the week that she delivers 300 pamphlets?

7. The sales of a sandwich store increased approximately linearly from \$52,000 to \$116,000 during the first five years of business. Write an equation that models the sales y after x years. Determine what the sales will be at the end of 12 years if the pattern continues.

Name: _____ Date: _____ Hour: _____

Guided Notes: Point-Slope Form

Finally, the last form of linear equation is _____. As you can guess by its name, this form is especially useful when you are given a point and the slope.

Just a reminder...

Slope: _____

Point-Slope Form

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

Given the following information, write the following as a linear equation in point slope form.

1) (6, -2) with the slope of -4

2) passes through (2, 3), slope $\frac{-1}{2}$

Is there more we can do with these equations?

Which is an equation of the line that passes through $(-2, 7)$ and $(3, -3)$?

A $y = -\frac{1}{2}x - \frac{3}{2}$

C $y = \frac{1}{2}x + 8$

B $y = -2x + 3$

D $y = 2x + 11$

Which is an equation of the line that passes through $(4, -9)$ and $(2, -4)$?

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

H $y = -\frac{2}{5}x + \frac{37}{5}$

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

J $y = -\frac{2}{5}x - \frac{37}{5}$

Name: _____

2.4 Writing Linear Equations Day 2

Point Slope Form:

$y - y_1 = m(x - x_1)$, where m is the slope and x_1 and y_1 are an ordered pair.

Learning Target: I can write the equation of a line given the slope and point on the line.

Identify the slope and point from the point slope form equation.

1. $y - 6 = 3(x - 2)$

Slope:

Point: (,)

2. $y + 7 = \frac{1}{2}(x - 6)$

Slope:

Point: (,)

3. $y - 8 = -2(x + 2)$

Slope:

Point: (,)

Write an equation of a line that passes through the given point and the given slope.

4. $(2, 7); m = -4$

5. $(12, 5); m = -3$

6. $(4, -5); m = 6$

Learning Target: I can write an equation of a line given two points.

Write an equation of the line that passes through the two points give.

Use the first point to write the equation.

7. $(4, 7)$ and $(5, 1)$

8. $(9, -2)$ and $(-3, 2)$

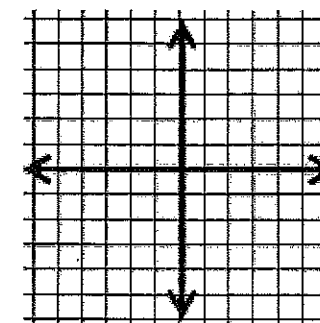
9. $(3, -8)$ and $(7, 2)$

Graph the equations below.

10. $y + 4 = -3(x + 2)$

Slope:

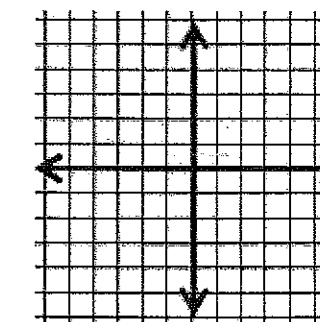
Point:



11. $y + 3 = -2(x - 2)$

Slope:

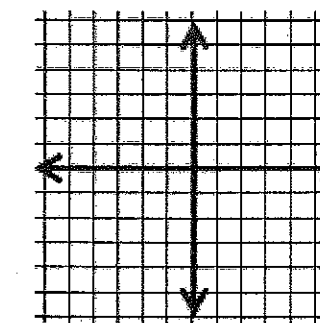
Point:



12. $y + 3 = -2(x - 2)$

Slope:

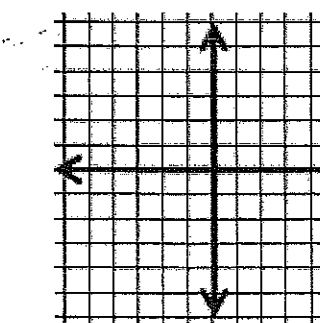
Point:



13. $y + 3 = -2(x - 2)$

Slope:

Point:



Name: _____ Date: _____ Hour: _____

Guided Notes: Parallel and Perpendicular Lines

_____ can help you determine whether two lines are parallel or perpendicular.

<u>Parallel Lines</u>	<u>Perpendicular Lines</u>
Two lines are parallel if they have the _____ slope.	Two lines are perpendicular if the product of the slopes is -1.
Examples:	Examples:

Write an equation in slope-intercept form for the line that satisfies each set of conditions.

1) passes through (0, -3), parallel to $y = 3x + 4$

2) passes through (0, 9), perpendicular to $y = -5x + 2$

3) passes through (-4, 2), parallel to $y = 2x + 5$

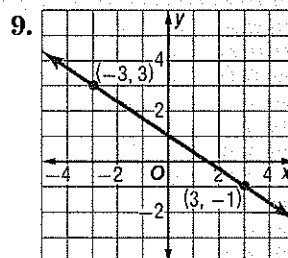
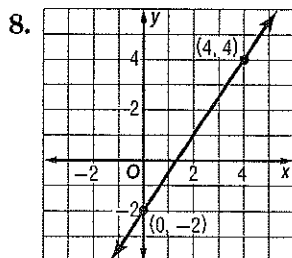
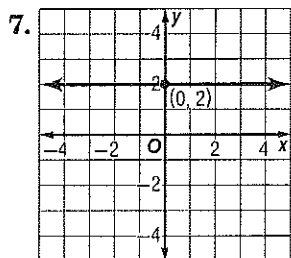
4) passes through (3, 1), perpendicular to $y = -3x + 2$

2-4 Practice**Writing Linear Equations**

Write an equation in slope-intercept form for the line described.

- slope 2, y-intercept at 0
- parallel to $y = 4x + 2$, y-intercept at 4
- perpendicular to $y = \frac{1}{4}x + 2$, passes through $(0, 0)$
- parallel to $y = -3x + 4$, x-intercept at 4
- perpendicular to $y = -\frac{1}{2}x + \frac{2}{3}$, passes through $(2, 3)$
- slope $-\frac{2}{3}$, x-intercept at 3

Write an equation in slope-intercept form for each graph.



Write an equation in slope-intercept form for the line that satisfies each set of conditions.

- slope -5 , passes through $(-3, -8)$
- slope $\frac{4}{5}$, passes through $(10, -3)$
- slope 0 , passes through $(0, -10)$
- slope $-\frac{2}{3}$, passes through $(6, -8)$
- parallel to $y = 4x - 5$, y-intercept at -6
- slope $\frac{1}{6}$, x-intercept at -1
- perpendicular to $y = 3x - 2$, passes through $(6, -1)$
- parallel to $y = \frac{2}{3}x - 10$, x-intercept at 9
- passes through $(-8, -7)$, perpendicular to the graph of $y = 4x - 3$
- RESERVOIRS** The surface of Grand Lake is at an elevation of 648 feet. During the current drought, the water level is dropping at a rate of 3 inches per day. If this trend continues, write an equation that gives the elevation in feet of the surface of Grand Lake after x days.

Review of Linear Equations

Standard Form

$$Ax + By = C$$

- Helpful if you need to find the x and y intercept
- x and y need to be on the same side of the equation, constant needs to be on the other side
- A and B must be integers (aka: no fractions or decimals)

Slope - Intercept Form

$$y = mx + b$$

- m = slope, b = y-intercept
- Helpful when you are given...
 - Slope and the y-intercept
 - Slope and a point on the line
 - Two points on the line

Point - Slope Form

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

- m = slope, (x_1, y_1) represents a point on the line
- Helpful when given...
 - Slope and any point on the line
 - Two points on the line

Example: Write an equation with slope -3 and passes through the point $(4, 2)$

OPTION 1

Slope - Intercept

$$y = mx + b$$

*Need to find b

$$2 = -3(4) + b$$

$$2 = -12 + b$$

$$14 = b$$

$$y = -3x + 14$$

OPTION 2

Point - Slope

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

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

↓ if the question asks for it to be in SI

$$y - 2 = -3x + 12$$

$$y = -3x + 14$$

Example: Write an equation ~~with~~ that passes through the points $(-2, -4)$ and $(1, 8)$

*Regardless of what option you choose, you need the slope!

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - (-4)}{1 - (-2)} = \frac{12}{3} = 4$$

OPTION 1

Slope - Int. Form

*Pick either point - doesn't matter which one

$$8 = 4(1) + b$$

$$8 = 4 + b$$

$$4 = b$$

$$y = 4x + 4$$

OPTION 2

Point - Slope Form

*Pick either point!

$$y - 8 = 4(x - 1)$$

↓ if the question asks for it in SI Form

$$y - 8 = 4x - 4$$

$$y = 4x + 4$$