Intro to Linear Equations

Linear Equations:

$$y = 2x - 7 \qquad\qquad y = \frac{1}{2}x - 5 \qquad\qquad 2x - 3y = 12$$

Linear Equations generally contain two variables: x and y.
In a linear equation,
y is called the dependent variable and
x is the independent variable.
This is because y is dependent on what you plug-in for x.
The **domain** of a linear equation is the set of all x-coordinates and the **range** is the set of all y-coordinates.

Examples:
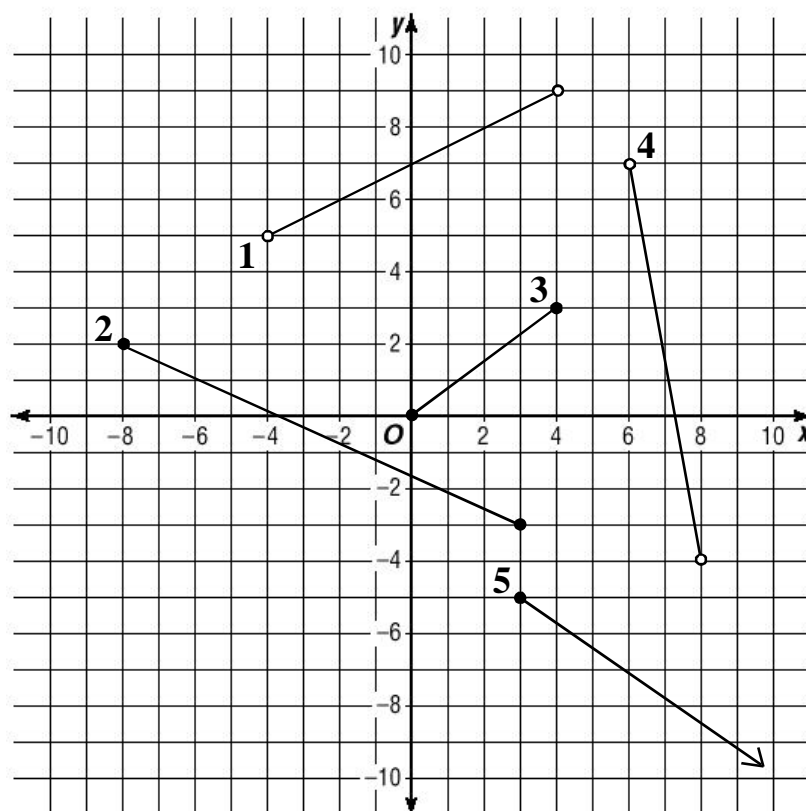State the range and the domain for each set of points below.

1. (-3, -3) (-1, 1) (1, 5) (3, 9) (5, 13)

2. (-5, 8) (-2, 5) (1, 5) (4, 9) (7, 13)

Practice:
State the range and domain for each set of points graphed below as an inequality:

Ex. #1 Domain -4 < x < 4   Range: 5 < y < 9

Intro to Linear Equations

Given a **domain**, it is easy to find the **range** for any linear equation.

Examples:

Find the range for the given domain:

1. $y = 2x - 3$ {D: -3, -2, -1, 0}

2. $y = 2x - 3$ {D: 6, 1, -4, -9}

Practice:

Find the range for the given domain:

1. $y = -3x - 7$ {D: -3, -2, -1, 0}

2. $y = \dfrac{2}{3}x - 1$ {D: 6, 3, 0, -3, -6}

3. $2y = 6x - 10$ {D: -1, 1, 3, 5}

In problems like #3 above, it helps a lot to solve for y before plugging in values for the domain.

Practice:

Find the range for the given domain. Begin by solving for y.

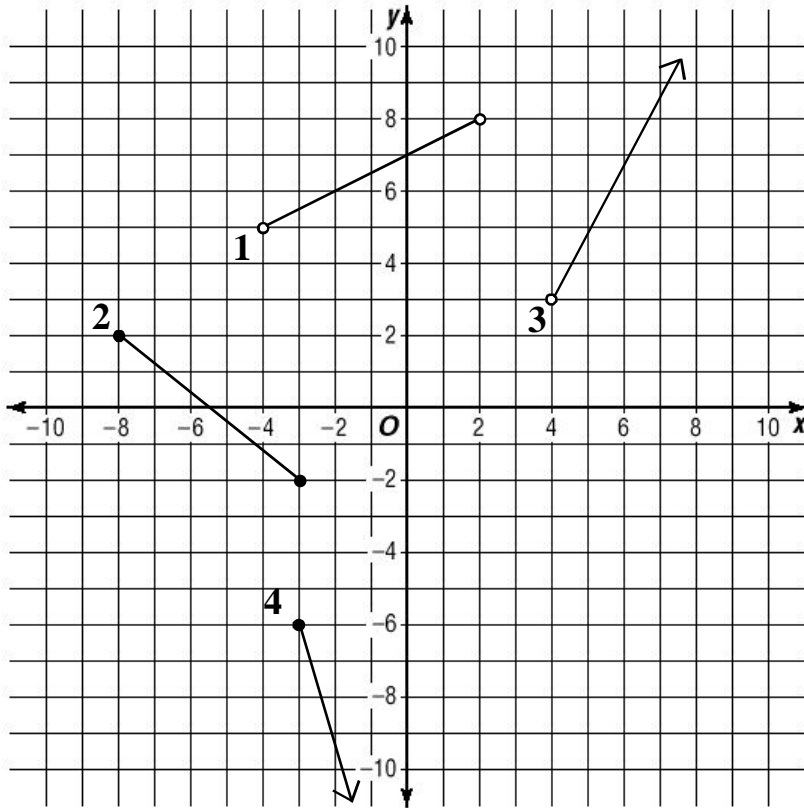**1.** $2y - 7 = 4x - 5$ {D: -3, -2, -1, 0}

2. $3y - 6 = -9x$ {D: 6, 3, 0, -3}

3. $5y = 3x - 10$ {D: x>5 }

Intro to Linear Equations

Algebra   6.0

For each graph below, state the domain and range using an inequality:

1. Domain: _____

    Range: _____

2. Domain: _____

    Range: _____

3. Domain: _____

    Range: _____

4. Domain: _____

    Range: _____

List the Domain and Range for each set of points listed below:

5. (9,1) (8,2) (7, 3) (6, 4) (5, 5)

5. Domain: _____

    Range: _____

6. (-3, -3) (-3, -4) (-3, -5) (-3, -6)

6. Domain: _____

    Range: _____

7. $y = x - 3$ for x = -3, -4, 5, and 6

7. Domain: _____

    Range: _____

8. $y = 2x + 5$ for x > 3

8. Domain: {D: x > 3}_____

    Range: _____

Intro to Linear Equations

Given each domain below, find the range for each equation. Solve for y where necessary.

9. $y = -2x + 3$ {D: -1, 0, 1, 2}

9. Range: _____

10. $y = \dfrac{1}{2}x - 5$ {D: -4, -2, 0, 2}

10. Range: _____

11. $3y = -6x + 12$ {D: -5, -3, 1, 5}

11. Range: _____

12. $x - y = 4$ {D: 4, 1, -1, -9}

12. Range: _____

13. $3y = x + 6$ {D: -3, 0, 3, 9}

13. Range: _____

14. $5y - 3x = 10$ {D: -15, -10, -5, 0}

14. Range: _____

15. $2x + y = 3x - 7$ {D: -4, 4, 12, 20}

15. Range: _____

Graphing A Linear Equation

To graph a Linear Equation:
1. Solve for y.
2. Setup a table of x and y values.
3. Plot at least three coordinates and connect them.
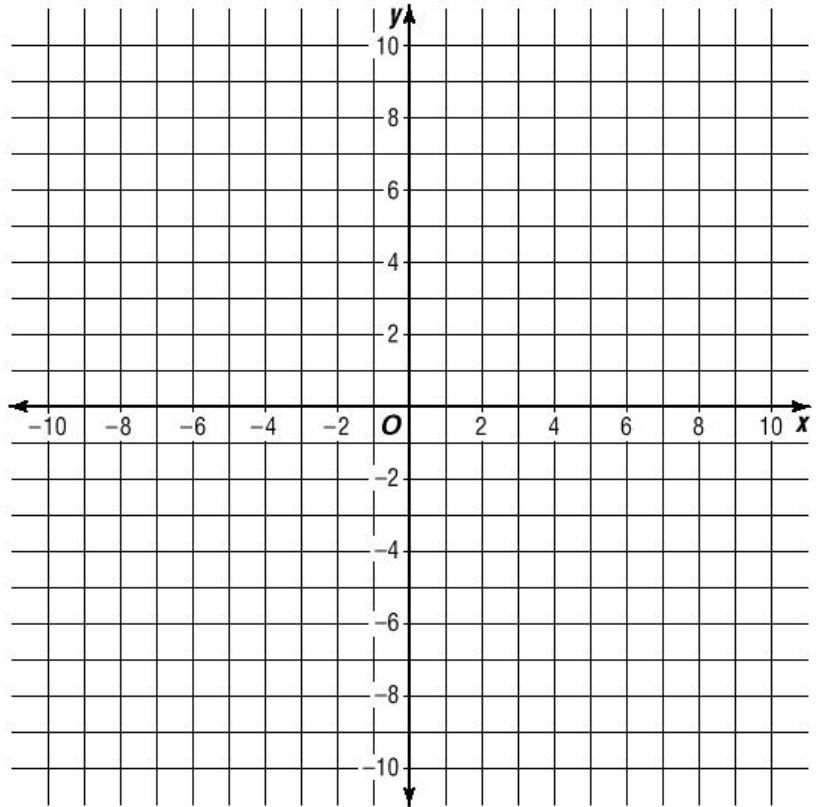
Ex.
Graph

$$y = 2x - 7$$

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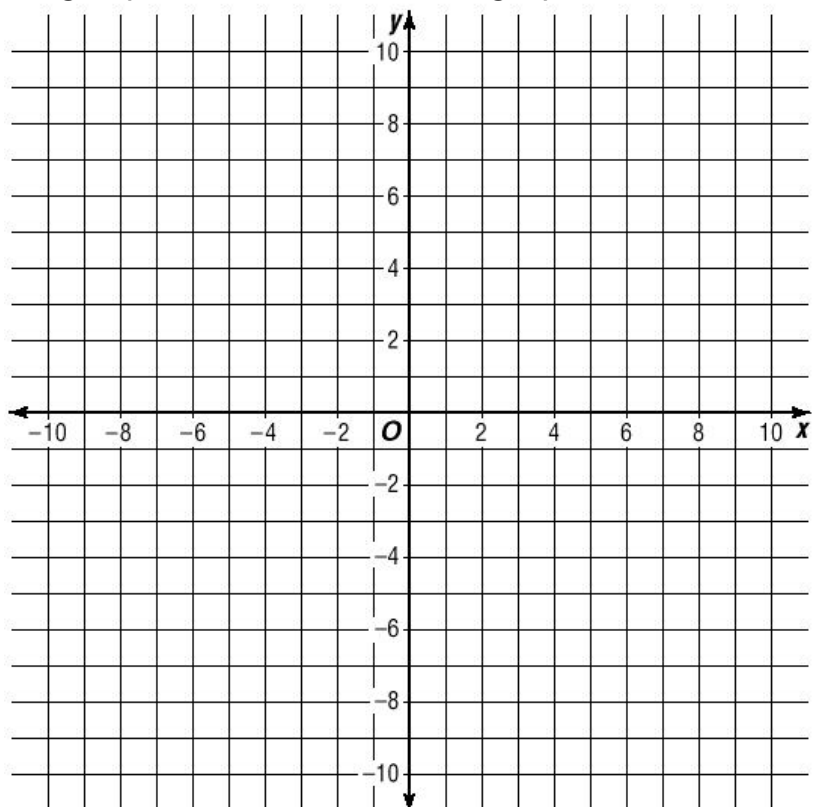
$$y = \frac{2}{3}x + 2$$

Practice
Plot each of the following equations on the same graph.

1. $y = -3x + 4$

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

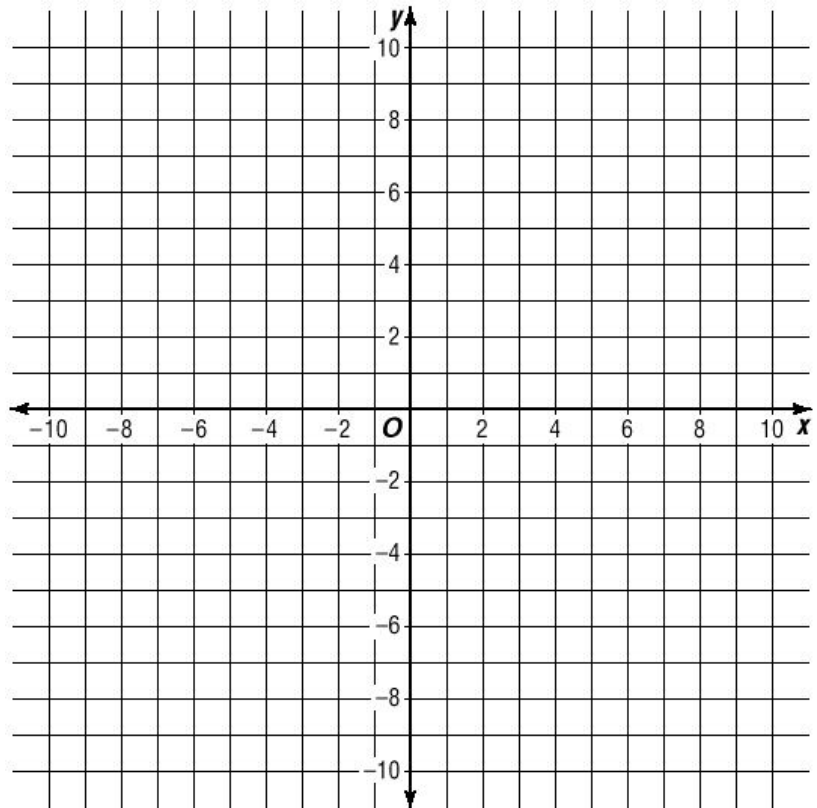3. $y + 3x = 9$

Graphing A Linear Equation

Practice

Plot each of the following equations on the same graph.

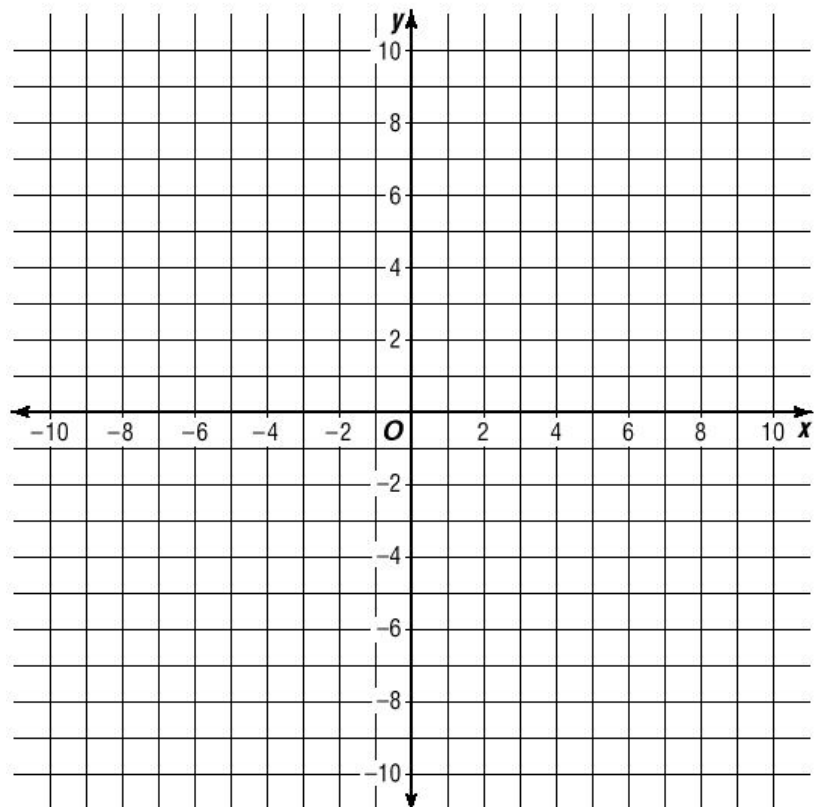1. $x - y = 5$

2. $3y = 2x - 9$

3. $3y - 12 = 2x$

Practice

Plot each of the following equations on the same graph.

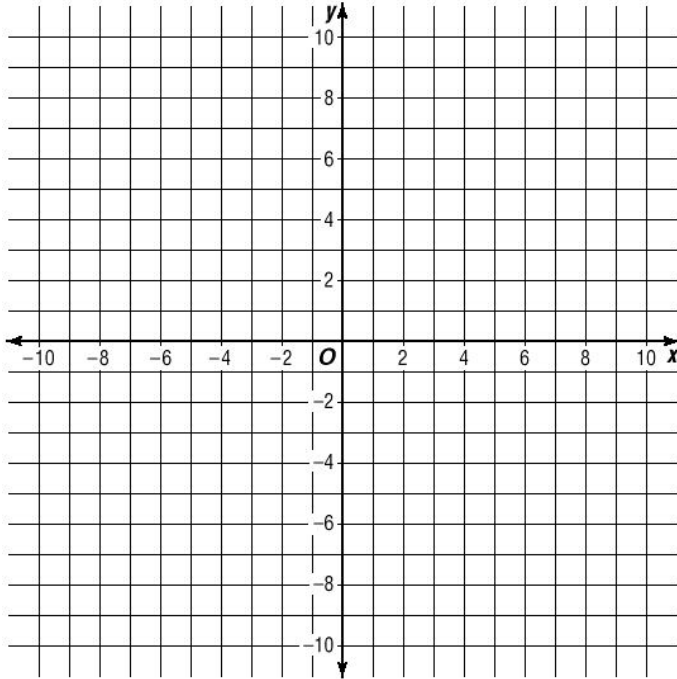1. $-3x = y - 5$

2. $3 = 4x - y$

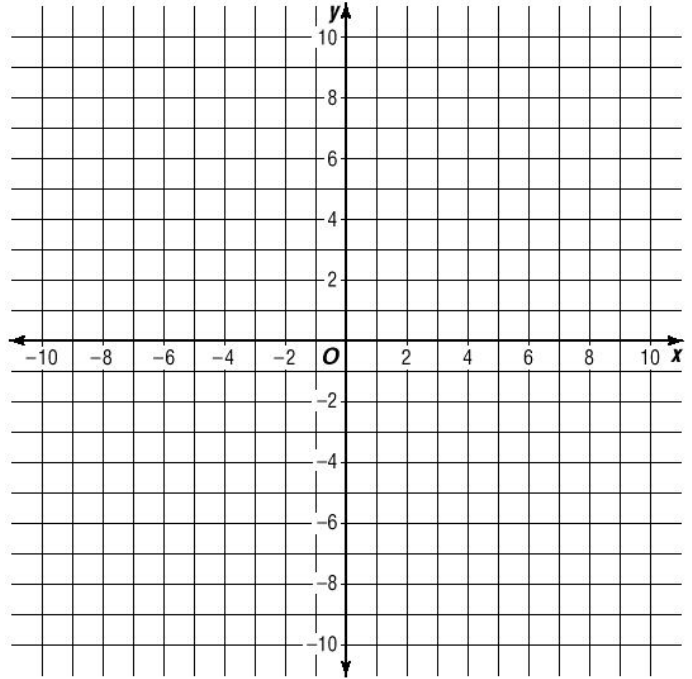3. $y - 5 = \dfrac{2}{3}(x+3)$

Graphing Linear Equations
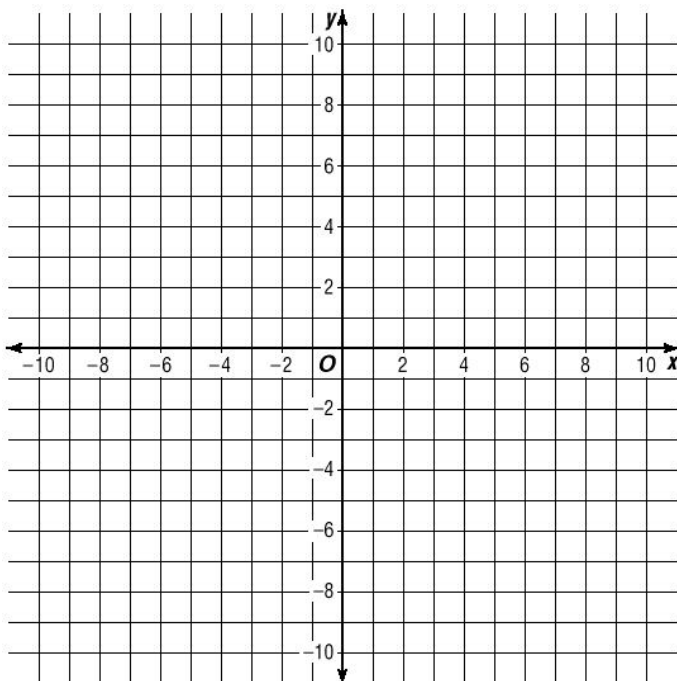
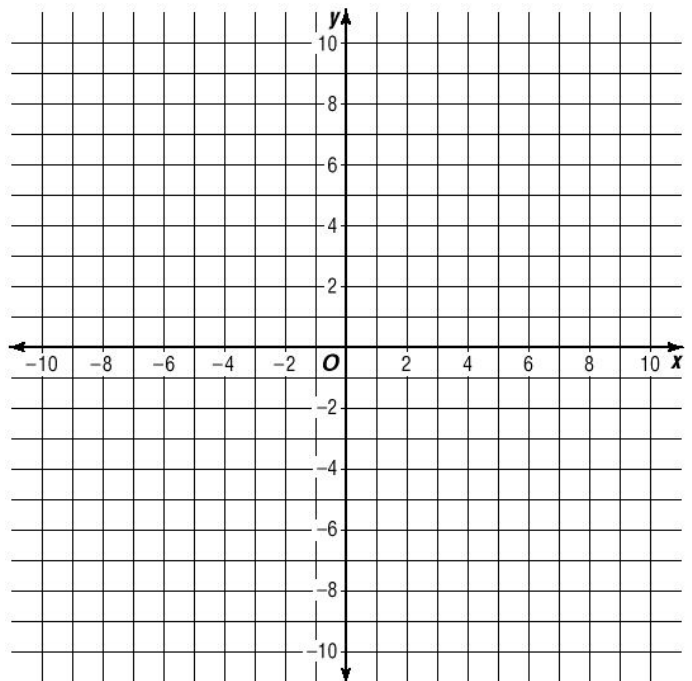Graph each equation below on the graphs provided.

1. $y = x - 9$

2. $3y = 2x - 12$
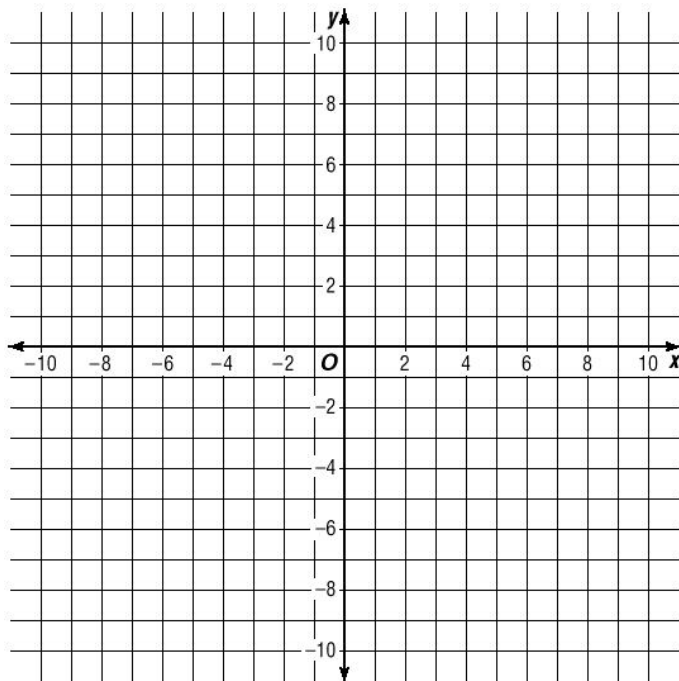
3. $6x - 2y = 4$

4. $y - 3 = \dfrac{1}{2}(x-6)$
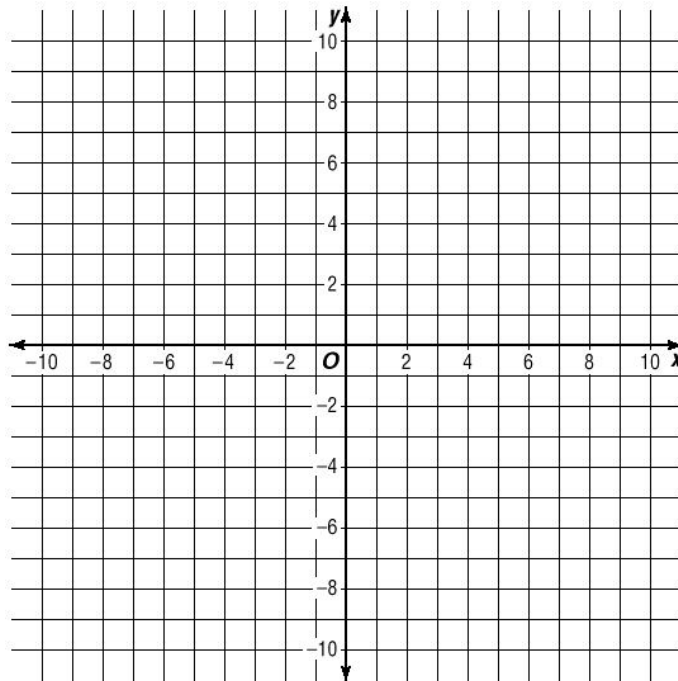
Graphing Linear Equations
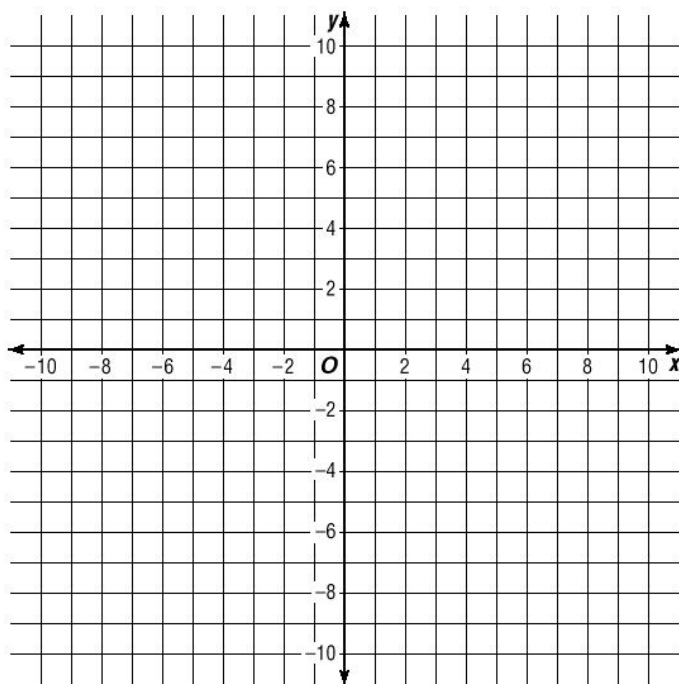
Graph each equation below on the graphs provided.
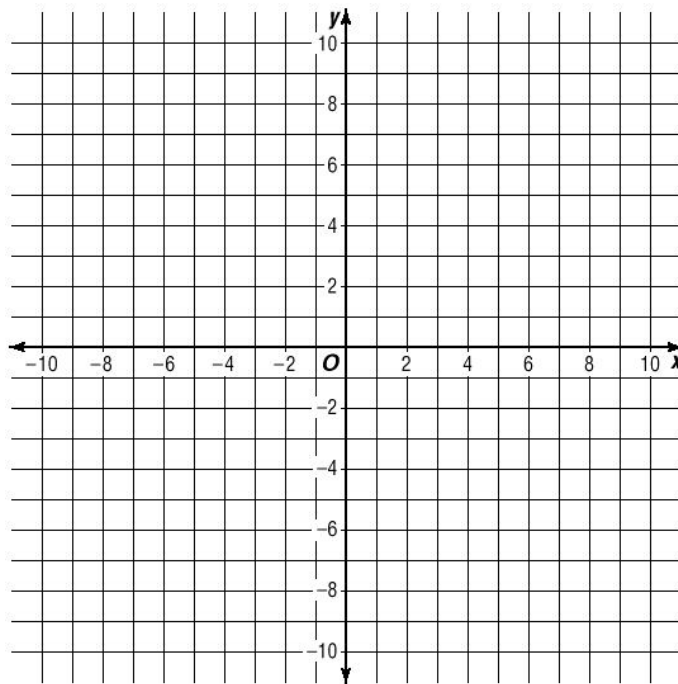
5. $4y + 11 = 3x - 1$

6. $2x - 6 = 3y + x$

7. $\dfrac{3}{4}x = 2y$

8. $y = 5$

Standard Form

Standard Form of a linear equation:

$$2x - y = 6 \qquad 3x - 7y = 21 \qquad 2x - 6y = 1$$

Examples above are **Linear Equations written in Standard Form**. Here is **Standard Form. MEMORIZE THIS.**

$$Ax + By = C$$

1. No absolute value, exponents, square roots, etc.
2. 1 or 2 variables (A and B cannot both be zero).
3. All linear equations can be written in Standard Form.
4. A, B, and C are Integers (not fractions). A should be positive.

Practice:
Label the values for A, B, and C in each linear equation below.

1. $2x - y = 6$ 2. $3x - 7y = 21$ 3. $x = 7$

Examples:
Convert each equation below into Standard Form if possible.
Get both variables ON THE SAME SIDE OF THE EQUATION.

1. $y = 3x - 5$ 2. $\dfrac{1}{2}y = \dfrac{2}{3}x - \dfrac{3}{4}$ 3. $\dfrac{x}{3} = \dfrac{5}{y}$

Practice:
Convert each equation below into Standard Form if possible.

1. $y - 5 = x$ 2. $\dfrac{3}{5}y = \dfrac{1}{4}x$ 3. $x(x + 1) = y$

Standard Form

Convert each equation below into Standard Form.
Remember to remove all fractional coefficients.

1. $x = y - 3$

2. $-3y = 7 - 2x$

3. $\dfrac{7 - x}{4} = y$

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

5. $x = 7$

6. $-2y = 12$

7. $x = 4y$

8. $5y = 2x$

9. $\dfrac{2}{3}x - \dfrac{1}{4}y = 3$

10. $\dfrac{1}{2}x + \dfrac{1}{5}y = 2$

11. $\dfrac{1}{6}x = \dfrac{2}{3}y - 7$

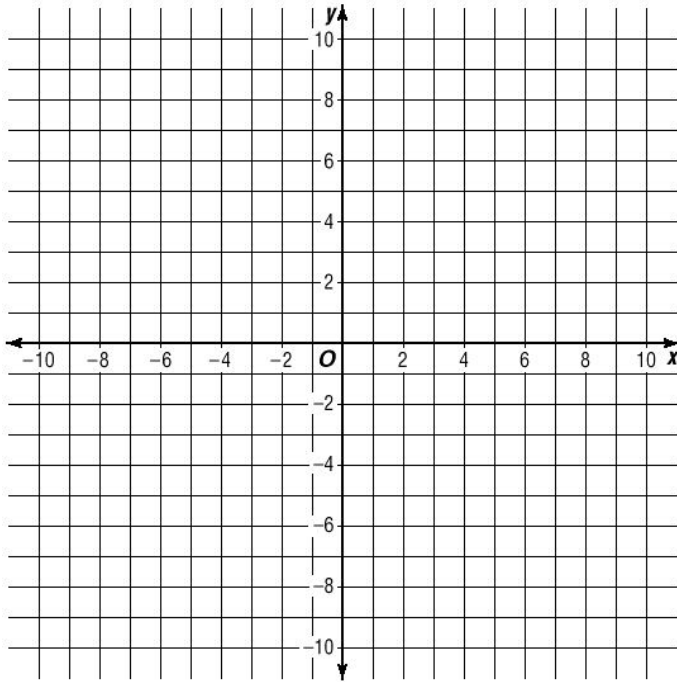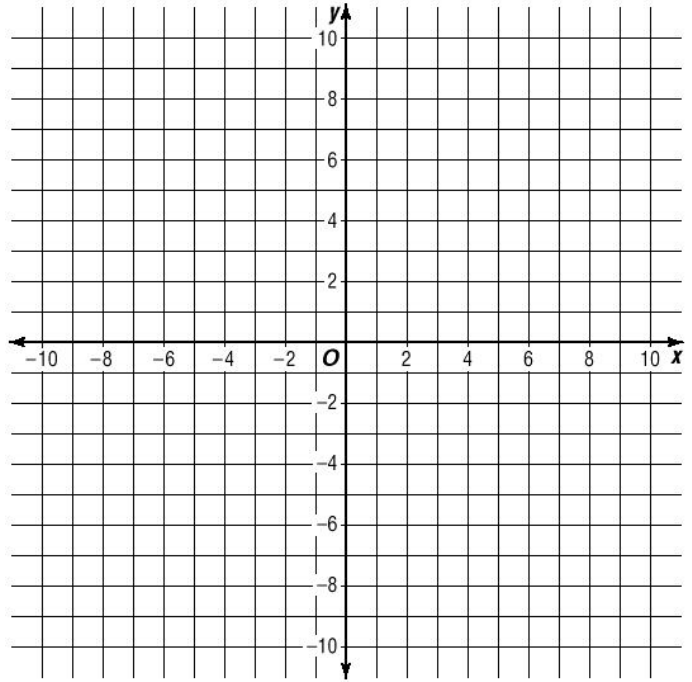**12.** $\dfrac{3}{4}x = \dfrac{1}{8}y$

Standard Form

Each Equation below is written in Standard Form.
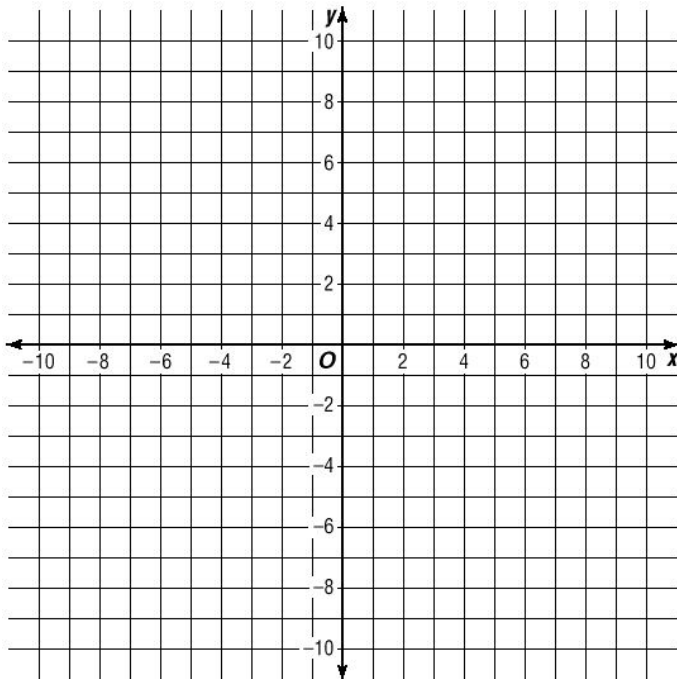Solve each for y, create a table of values, and graph each.

13. $x - y = -3$

14. $6x - 3y = -12$

15. $3x + y = 6$

16. $x + 2y = 6$
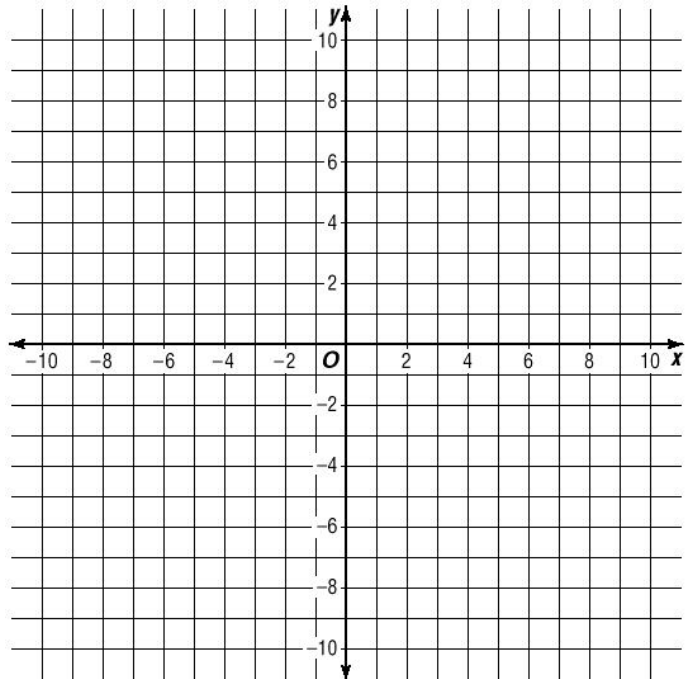
Standard Form and Intercepts   Algebra   6.0

On a graph, the **x-intercept** is where the line crosses the x-axis.
The **y-intercept** is where a line crosses the y-axis.

Practice:
Look at the graphs below and give the coordinates of
the x and y-intercepts.

1.
x-int. _____

y-int. _____

2.
x-int. _____

y-int. _____

3.
x-int. _____

y-int. _____
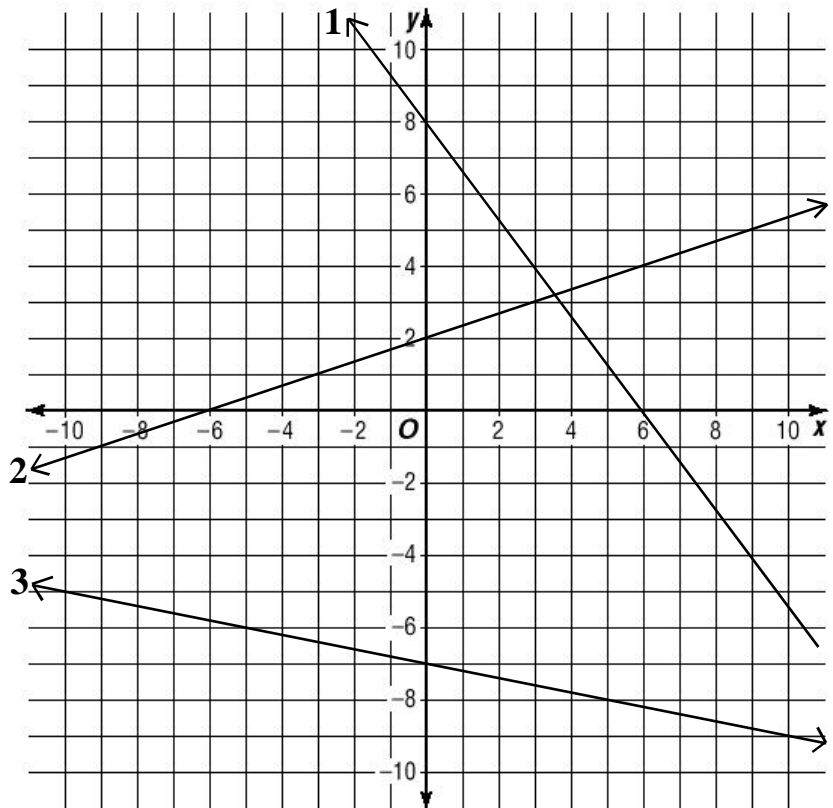
notes:
The x-intercept always occurs where y equals _____.
The y-intercepts always occurs where x equals _____.

Set y=0 to find the x-intercept.
Set x=0 to find the y-intercept.

Examples: Find the x and y-intercepts of each.
We will call this the coverup method.

1. $3x - y = 12$ 2. $2x - 5y = 4$ 3. $2x - 3y = 8$

Practice: Find the x and y-intercepts of each.

1. $5x + 3y = 30$ 2. $x - 7y = 11$ 3. $\dfrac{3}{4}x - \dfrac{2}{3}y = 7$

Standard Form and Intercepts

Practice:
Each line below goes with one of the linear equations on the left.
Match each equation with its graph by finding the intercepts.

1. $2x + 3y = 12$

2. $3x - 5y = 10$

3. $3x - y = 7$

Practice: Graph each of the following using the intercepts:

1. $5x - 3y = 15$

2. $2x - y = 8$

3. $x - 3y = 9$
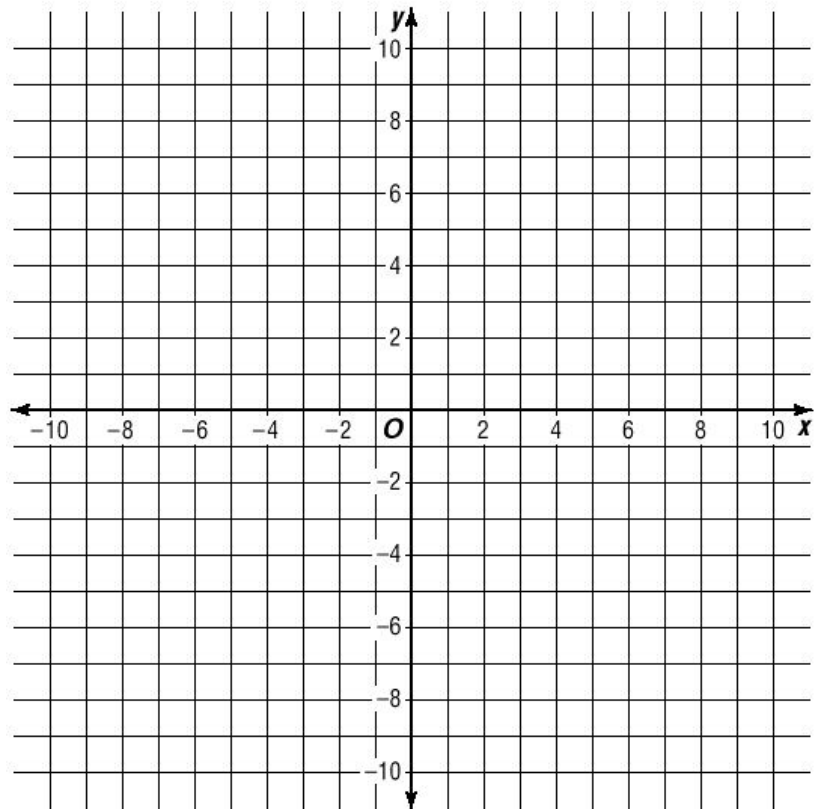
Standard Form and Intercepts   Algebra   6.0

Determine the x and y-intercepts for each equation below.
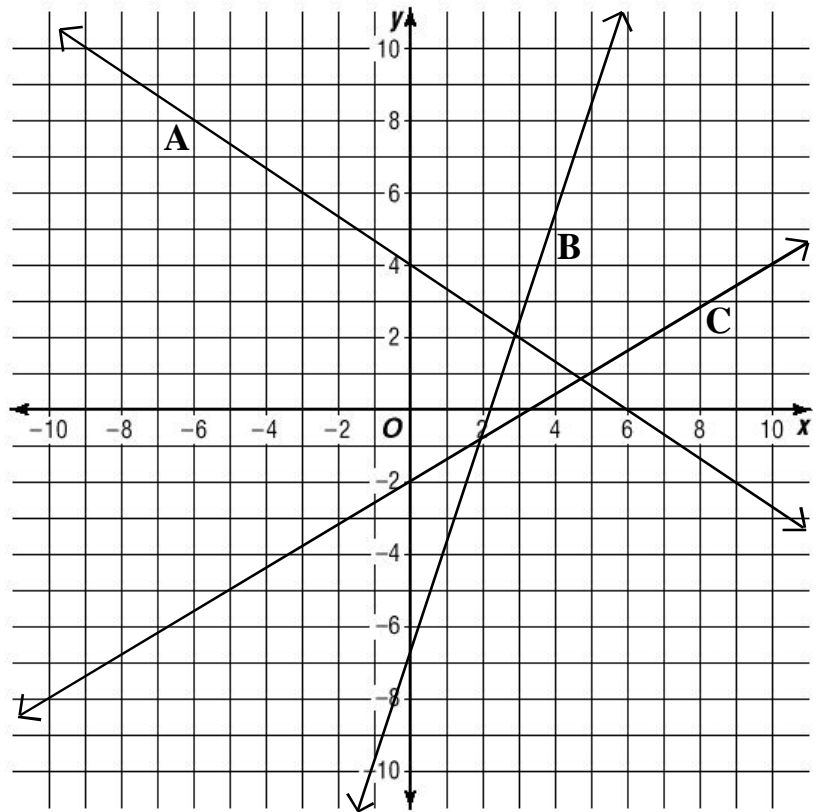**Convert to Standard Form where necessary.**

1. $x - 3y = -9$

    x-int.: _____

    y-int. _____

2. $5x - 2y = 10$

    x-int.: _____

    y-int. _____

3. $x - 9y = 7$

    x-int.: _____

    y-int. _____

4. $2x - 7y = 3$

    x-int.: _____

    y-int. _____

5. $x + 9 = 3y$

    x-int.: _____

    y-int. _____

6. $3y = 2x - 5$

    x-int.: _____

    y-int. _____

7. $y = 2x - 3$

    x-int.: _____

    y-int. _____

8. $2x - 12 = 4y$

    x-int.: _____

    y-int. _____

9. $\dfrac{y - 2}{3} = x$

    x-int.: _____

    y-int. _____

10. $\dfrac{3}{4}y = x - 5$

    x-int.: _____

    y-int. _____

11. $y = \dfrac{x - 9}{5}$

    x-int.: _____

    y-int. _____

12. $\dfrac{1}{2}y = \dfrac{2}{9}x - \dfrac{1}{3}$

    x-int.: _____

    y-int. _____

Standard Form

Graph each equation below using the intercepts.
Connect the intercepts. Intercepts are all whole numbers.

13. $x + 2y = 6$
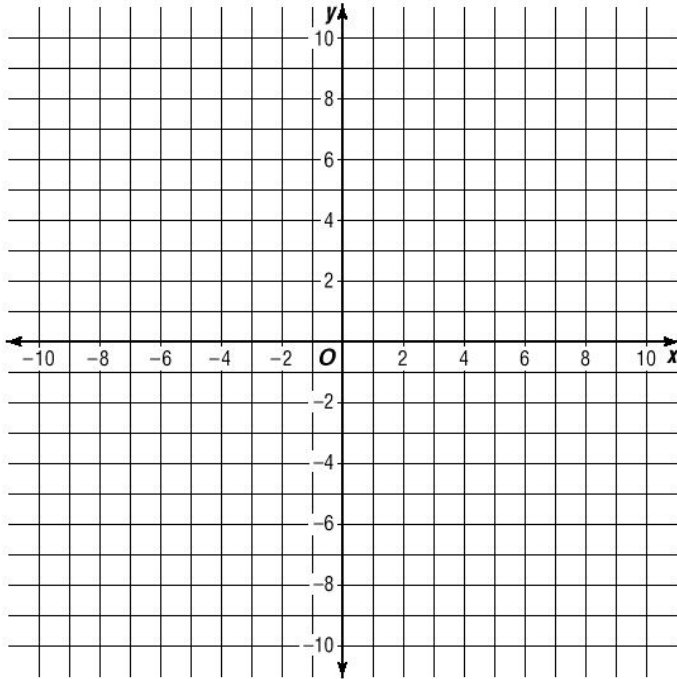
14. $6x - 3y = -12$
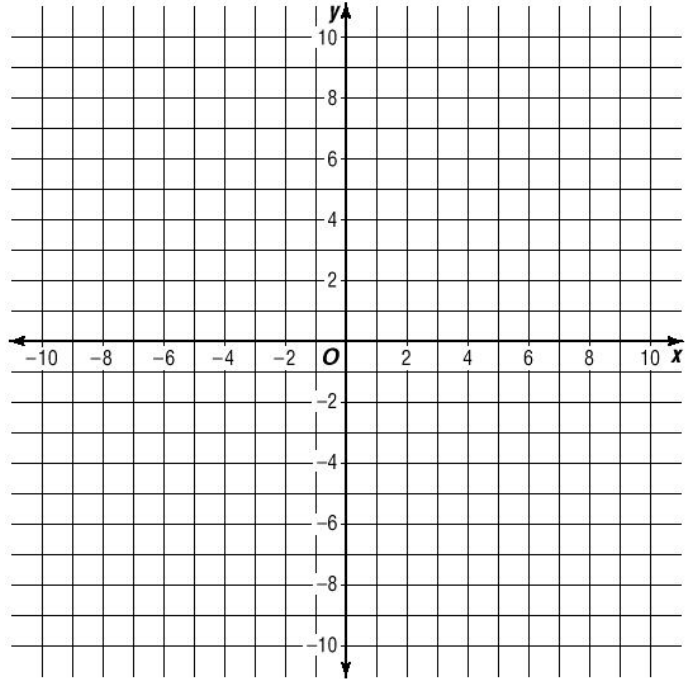
15. $3x - y = 6$
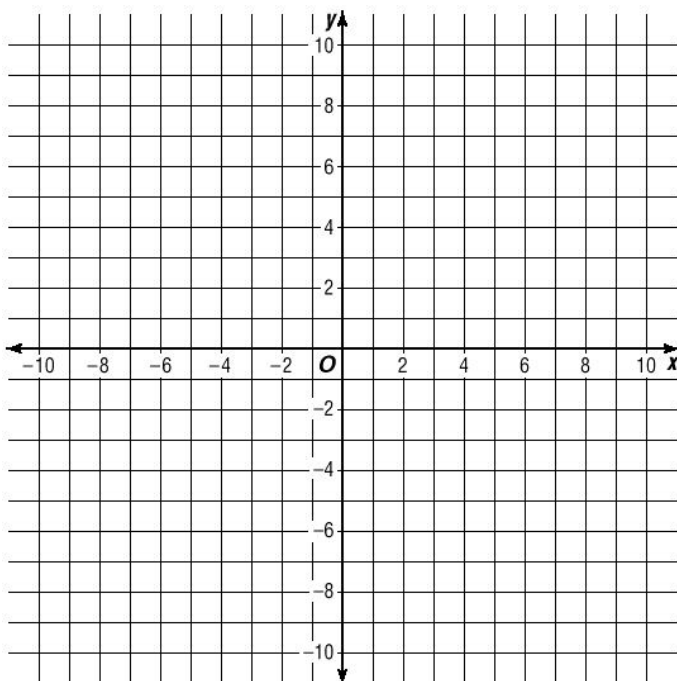
16. $x - 2y = -10$
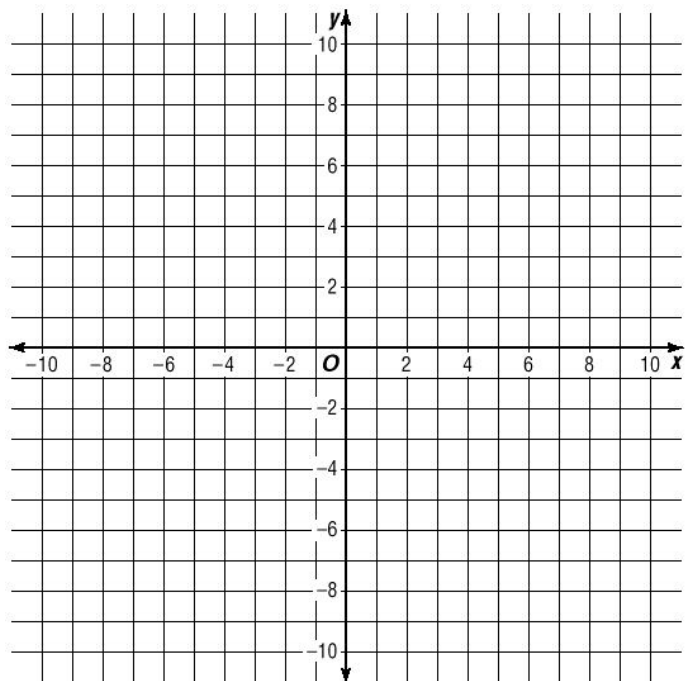
Slope

The **Slope** of a line is its **RISE over RUN**.
1. Read graphs **left to right**, just like sentences.
2. Find a point on the graph of a line.
3. Count how far you must go UP AND OVER to get to the next point.
4. Write this as a fraction: Ex.

$$Slope = \frac{up\ 2}{over\ 3} = \frac{2}{3}$$

Examples: State the slope of each line:
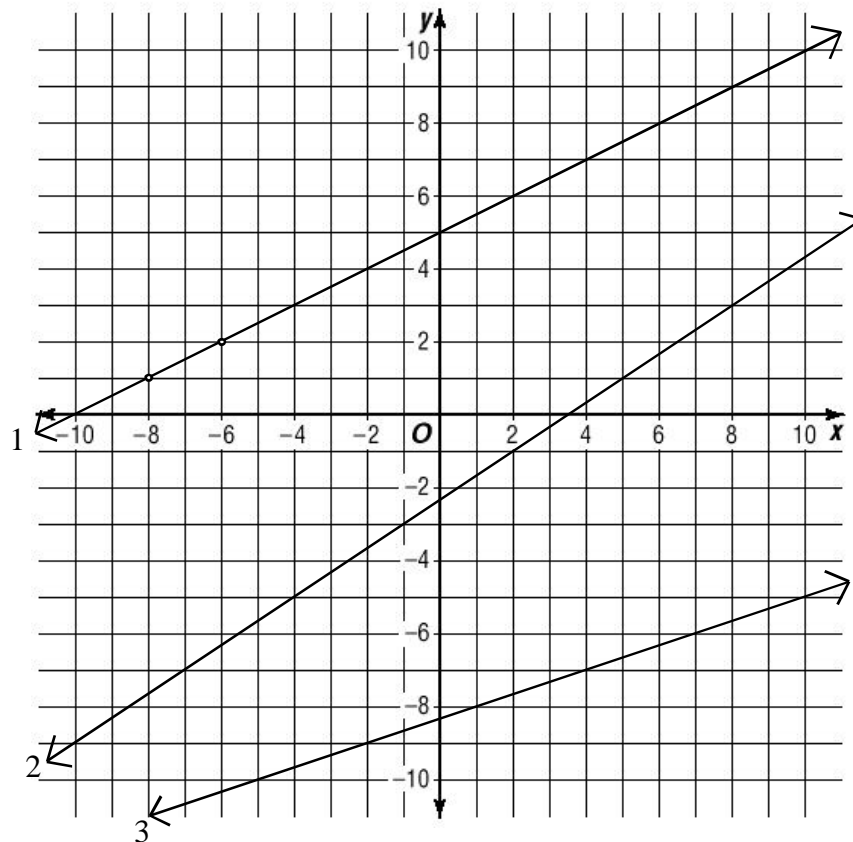
Slope

Slope is not always positive. Working from left to right, if you go **down and over**, this is negative slope.

Examples: State the slope of each line:
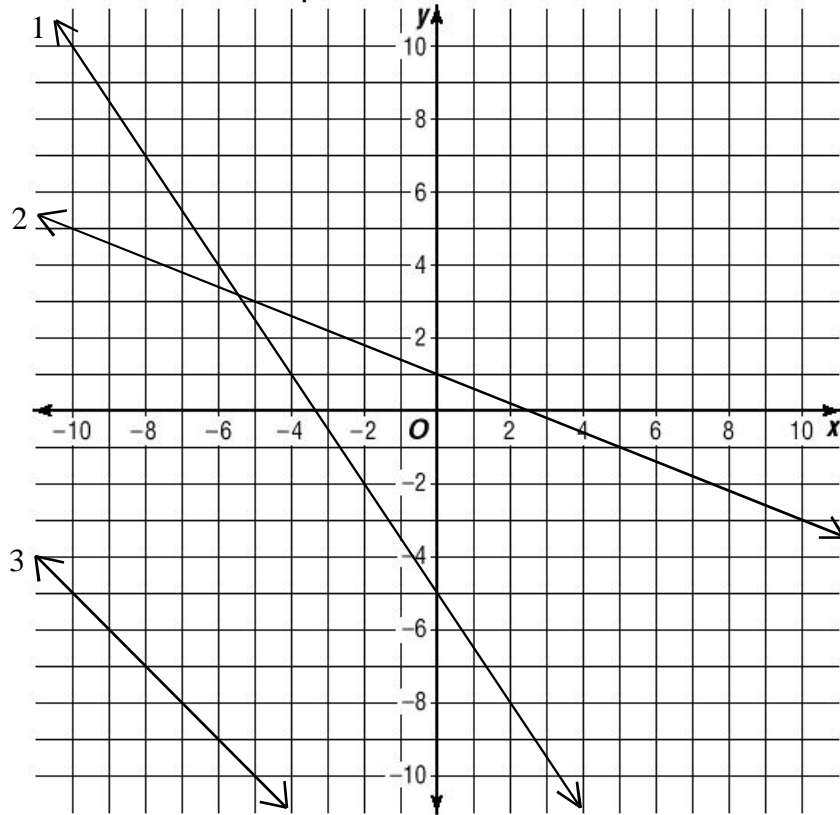
Practice: State the slope of each line:
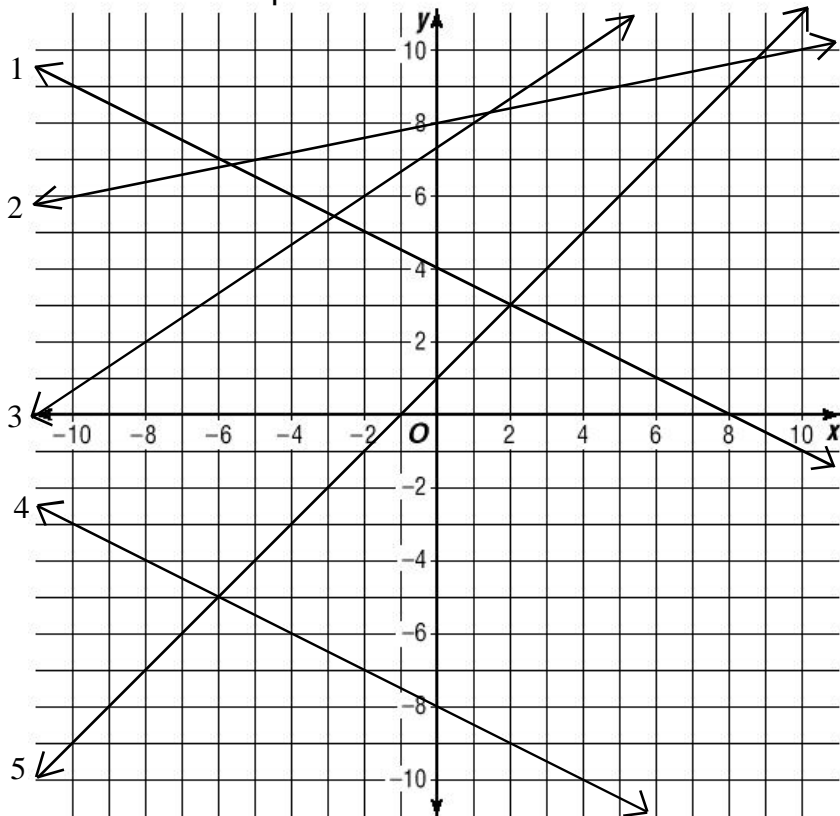
Slope

You do not need a graph to find the slope of a line.
How could you find the RISE given two coordinates? **ex.** (4, 2) and (8, 10)
How could you find the RUN given two coordinates?
Example:
Find the slope of the line passing through (3, 5) and (7, 7).
How far UP?
How far OVER?

notes:

Given two coordinates: (x_1, y_1) and (x_2, y_2)

Slope Formula: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ **memorize this!**

To find the slope you must divide the y's and the x's.
y minus y over x minus x.
Rise over run.
That's how you find the slope.

Examples:
Find the slope of a line passing through each given pair of points:

1. (9, 4) (7, 10)   **2.** (-2, -5) (4, 1)

Practice:
Find the slope of a line passing through each given pair of points.
Simplify all slopes and LEAVE IMPROPER FRACTIONS:

1. (-3, 0) (1, 2)   **2.** (3, 4)   (4, -1)

3. (6, -2) (7, -7)   **4.** (1, -5) (-9, 1)

5. (8, 4) (-5, 15)   **6.** (-1, -5) (4, -10)

Slope-Intercept Form

Graphing a Linear Equation:
Method 1: x/y Chart
Method 2: Intercepts (from Standard Form)

Use one of the methods above to graph each of the following equations. Then, list the slope and the y-intercept of each equation.

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

slope: _____

y-int: _____

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

slope: _____

y-int: _____
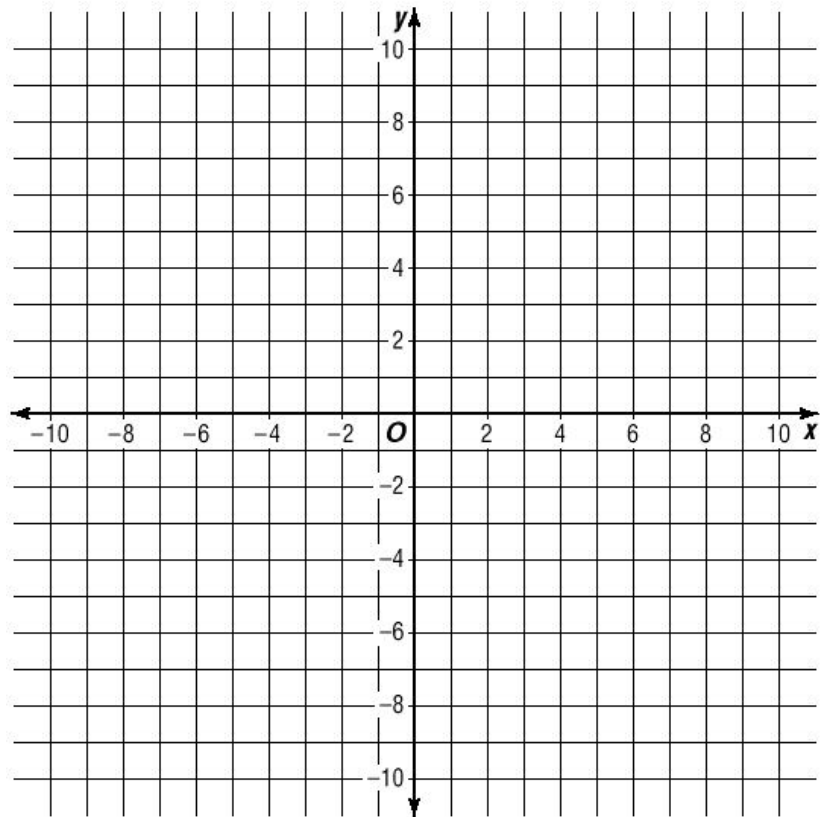
Guess what form we are going to learn next....

Slope-Intercept Form
MEMORIZE THIS:

$$y = mx + b$$ Where m is the slope and b is the y-intercept.

This is the most useful form of a linear equation, especially for graphing.

Slope-Intercept Form

Practice: Graph each using Slope-Intercept Form.

1. $y=-\dfrac{2}{3}x+5$
2. $y=-2x-5$
3. $3y=5x-12$

Practice: Convert each into Slope-Intercept Form, then graph.

1. $x-7y=-21$
2. $x+3y=30$
3. $x+5y=-25$

(Why is Standard Form less useful for graphing these equations?)

Practice: Write an equation for each line graphed below in Slope-Intercept Form.
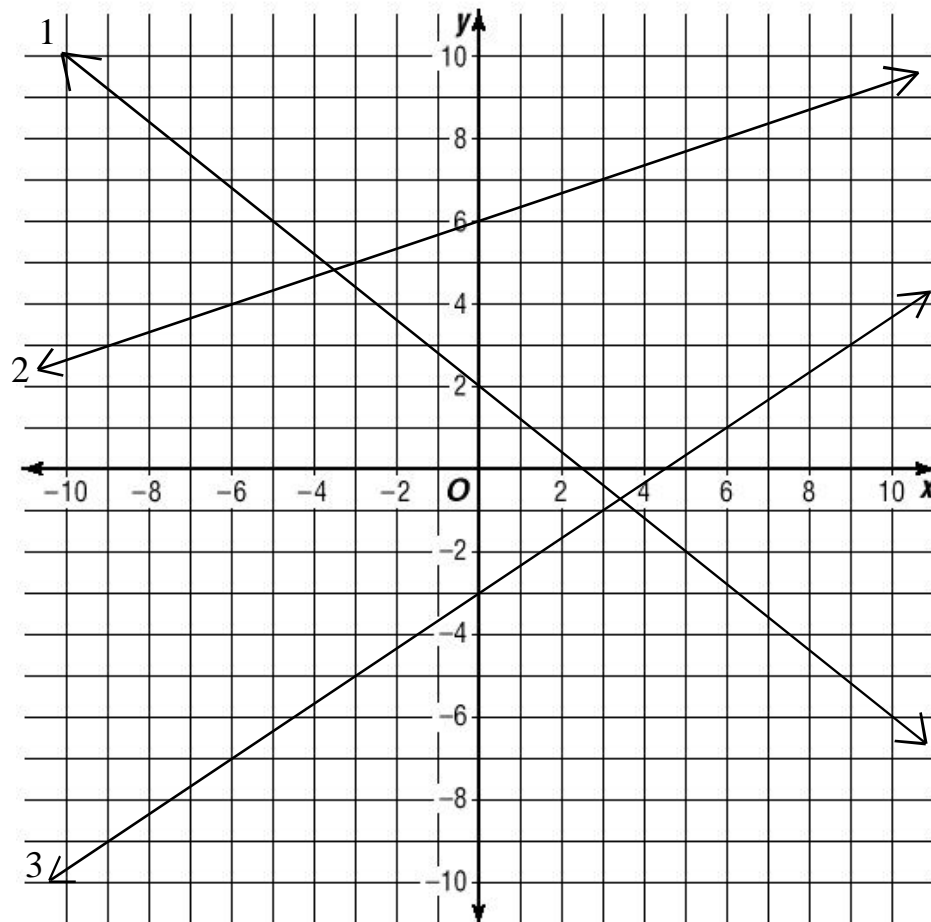
Practice: Convert these answers to Standard Form.

1. $y=-\dfrac{4}{5}x+2$
2. $y=\dfrac{1}{3}x+6$
3. $y=\dfrac{2}{3}x-3$

Slope-Intercept Form

Convert Each into Slope-Intercept Form

1. $x - 3y = -9$

    slope: _____

    y-int. _____

2. $5x - 2y = 10$

    slope: _____

    y-int. _____

3. $x - 9y = 18$

    slope: _____

    y-int. _____

4. $2x - 7y = 21$

    slope: _____

    y-int. _____

5. $x + 9 = 3y$

    slope: _____

    y-int. _____

6. $3y = 2x - 15$

    slope: _____

    y-int. _____

7. $5y - 2x = -30$

    slope: _____

    y-int. _____

8. $2x - 12 = 4y$

    slope: _____

    y-int. _____

9. $\dfrac{y - 2}{3} = x$

    slope: _____

    y-int. _____

10. $\dfrac{3}{4}y = x - 6$

    slope: _____

    y-int. _____

11. $y = \dfrac{x - 9}{5}$

    slope: _____

    y-int. _____

12. $\dfrac{1}{2}y = \dfrac{2}{9}x - \dfrac{1}{3}$

    slope: _____

    y-int. _____

Slope-Intercept Form

Graph each equation below using slope-intercept form.

13. $y = -\dfrac{2}{3}x - 5$
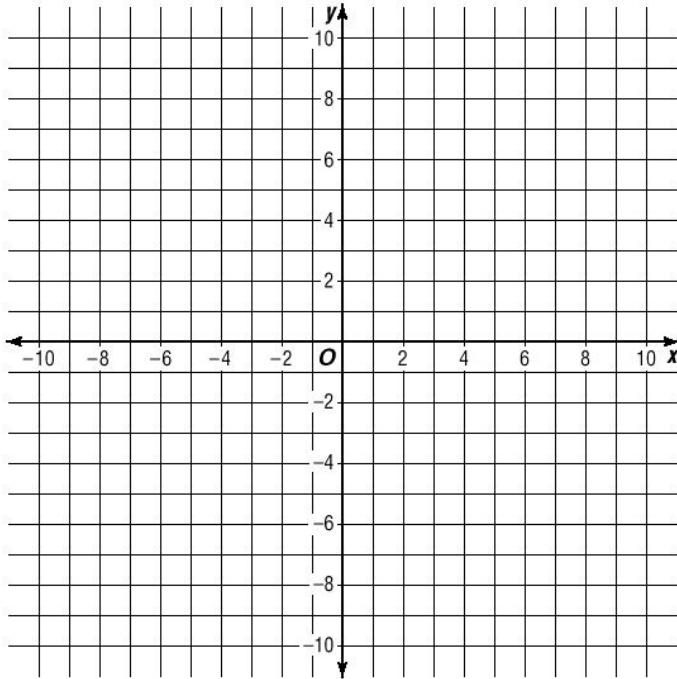
14. $5x - 3y = 18$
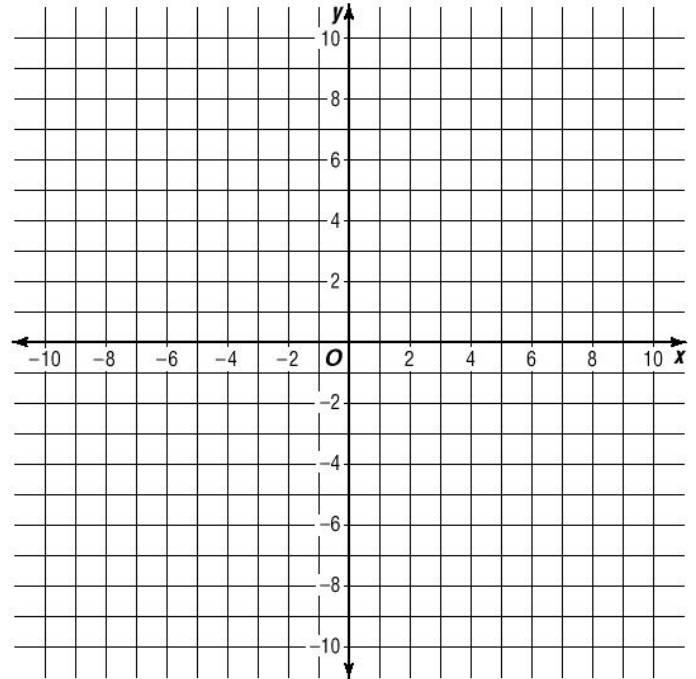
15. $2x - y = 6$
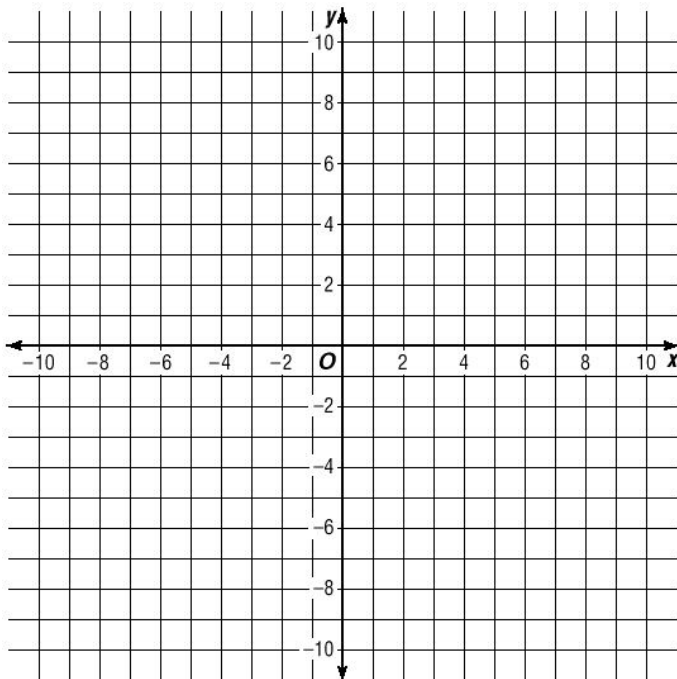
16. $\dfrac{1}{2}x - \dfrac{3}{4}y = 6$
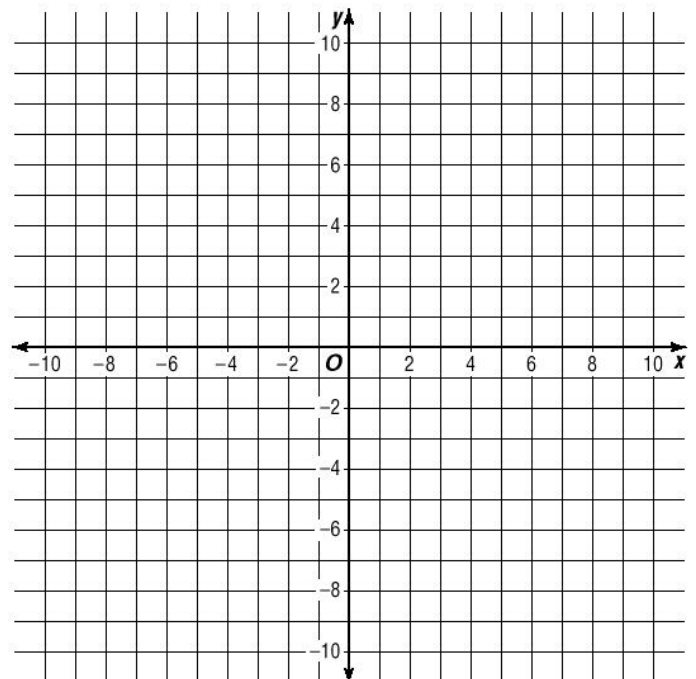
Slope:

100. $y = -\dfrac{2}{3}x - 5$

200. $5x - 3y = 18$

300. $(1,3)$ and $(5,13)$

400. $(2,-5)$ and $(-3,4)$

500. $\dfrac{5}{9}x - \dfrac{3}{4}y = 2$

600. $y = \dfrac{7(x-3)}{3} + x$

Intercepts:

100. $2x - 3y = 6$

200. $5x - 4y = 15$

300. $3y = 8x - 7$

400. $\dfrac{1}{2}x = \dfrac{3}{4}y - 5$

500. $2(x - y) = y - 5x$

600. $\dfrac{1}{2}x - \dfrac{3}{11}y = \dfrac{2}{7}$

Quiz Review

Slope-Intercept Form:

100. $y - 3 = x$

200. $-\dfrac{3}{4}y = x + 1$

300. $\dfrac{1}{2}y - \dfrac{1}{3}x = 2$

400. $y - 3 = \dfrac{4}{5}(x - 5)$

500. $2x - \dfrac{1}{5}y = \dfrac{1}{3}$

600. $2 = \dfrac{x - 3}{y - 2}$

Standard Form:

100. $y = x - 5$

200. $\dfrac{1}{2}y - x = 5$

300. $y - 3 = \dfrac{2}{5}x$

400. $-2x = \dfrac{y - 5}{3}$

500. $\dfrac{x}{2} + \dfrac{y}{5} = \dfrac{3}{10}$

600. $\dfrac{1}{2}(x - y) = \dfrac{2}{7}(x + y)$

Practice Quiz: Linear Equations   Algebra   6.2

Convert Each to Standard Form and list values for A, B, and C.

1. $y - x = 6$

1. A=____B=____C=____

2. $y - 2 = 7x$

2. A=____B=____C=____

3. $-\dfrac{1}{2}x + \dfrac{2}{5} = y$

3. A=____B=____C=____

4. $2 = \dfrac{1}{4}y$

4. A=____B=____C=____

5. $\dfrac{x + 3}{y} = 2$

5. A=____B=____C=____

State the y-intercept of each equation below:

6. $x - y = 4$

6. y-int. _____

7. $y = \dfrac{1}{4}x + 3$

7. y-int. _____

8. $x - 3 = \dfrac{1}{2}y$

8. y-int. _____

9. $2x - 5y = 3$

9. y-int. _____

10. $5 - x = y$

10. y-int. _____

Practice Quiz: Linear Equations

Algebra 6.2

Write an equation in slope-intercept form for each:
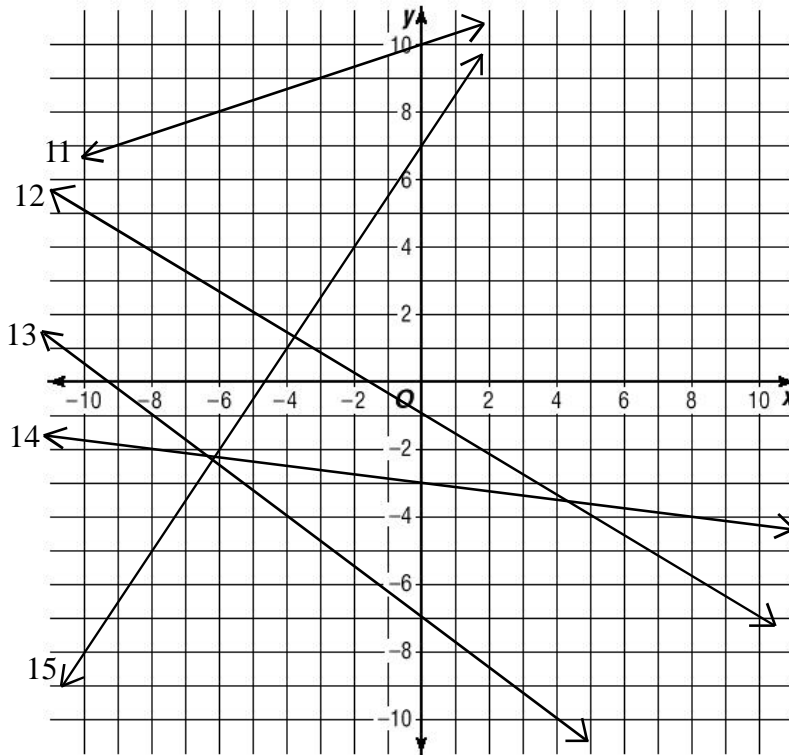
11. _____

12. _____

13. _____

14. _____

15. _____

State the slope for each equation or pair of points:

16. $2x - 5y = 10$

16. m=_____

17. $\frac{2}{3}y = x$

17. m=_____

18. $(9, 10)$ and $(-1, -5)$

18. m=_____

19. $(-3, -1)$ and $(4, 5)$

19. m=_____

20. $(4, -12)$ and $(-4, 12)$

20. m=_____

Practice Quiz: Lin. Equations (4)

State the slope of each line graphed below:

11. m=_____

12. m=_____

13. m=_____

14. m=_____

15. m=_____

State the slope for each equation or pair of points:

16. $2x-5y=10$

16. m=_____

17. $\dfrac{2}{3}y = x$

17. m=_____

18. $(9,10)$ and $(-1,-5)$

18. m=_____

19. $(-3,-1)$ and $(4,5)$

19. m=_____

20. $(4,-12)$ and $(-4,12)$

20. m=_____

Self-Check: Linear Equations

Graph each. Remember to extend your lines to the edge of the graphs.
Label each graph with a 1, 2, or 3.

1. $y = 2x - 9$

2. $3x - y = 6$

3. $2x - 3y = 18$
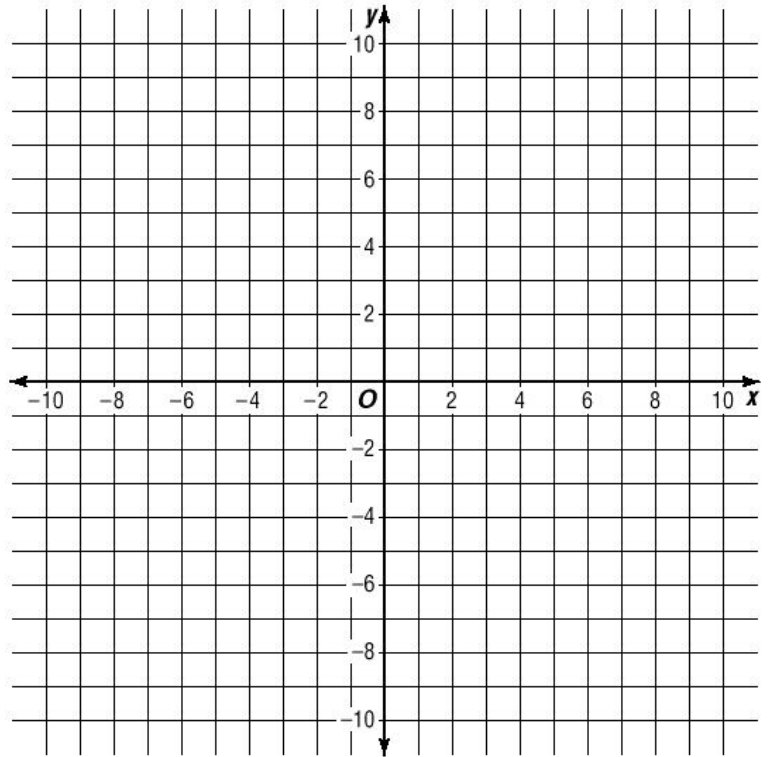
Self-Check: Linear Equations

Graph each. Remember to extend your lines to the edge of the graphs.
Label each graph with a 1, 2, or 3.

4. $x = 4y - 8$ (careful!)

5. $2x - 7y = 6$ (think!)

6. $x - 4y = 3$ (think!)
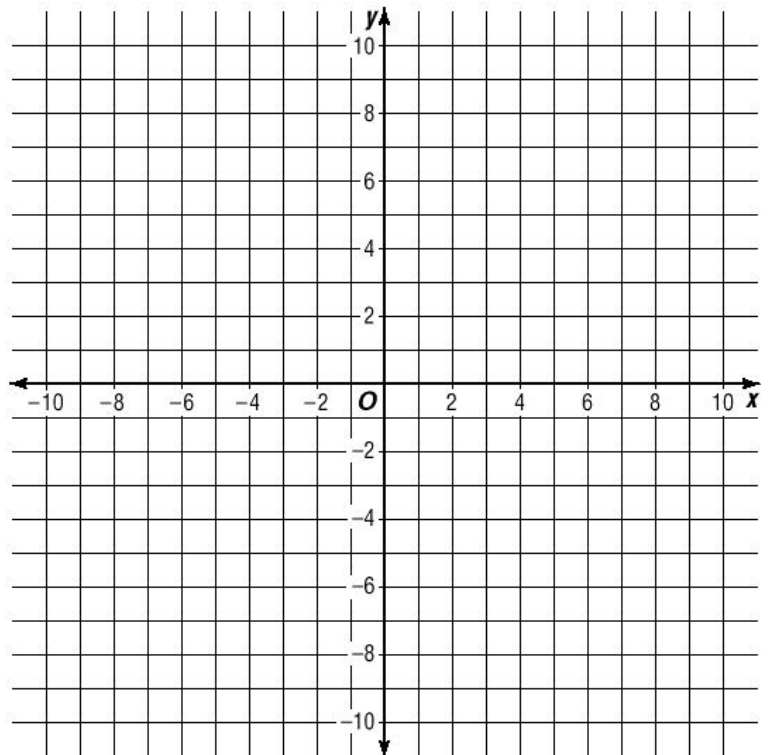
Slope and Standard Form   Algebra

Practice: Convert each of the following Standard-Form equations into Slope-Intercept Form. State the slope of each.

1. $2x + y = -2$ 2. $4x + 3y = 12$ 3. $2x + 5y = -8$

There is a simple formula that can be used to find the slope of any Standard Form equation. Try to find it be solving Standard Form for Slope-Intercept Form:

$$Ax + By = C \quad \text{becomes} \quad y = -x + -$$

Examples: State the slope of each equation:

1. $2x - 3y = 4$ 2. $x - y = 5$ 3. $7x - y = 3$

Practice: State the slope of each equation:

1. $3x - 5y = 9$ 2. $3x - y = 1$ 3. $2x - 5y = 3$

4. $8x - 13y = 41$ 5. $9x - 9y = 7$ 6. $x - 4y = 35$

Practice: For each of the following, find the slope and one intercept without converting. Graph each:

1. $2x - 5y = 8$ 2. $x - 3y = 6$ 3. $2x - 7y = -2$

Slope and Standard Form

Graph each. Remember to extend your lines to the edge of the graphs.
Clearly label each graph with a 1, 2, 3, or 4.

1. $2x - 3y = 10$

m=

2. $3x + 2y = 10$

m=

3. $x - 4y = 3$

m=

4. $2x - 7y = 2$

m=
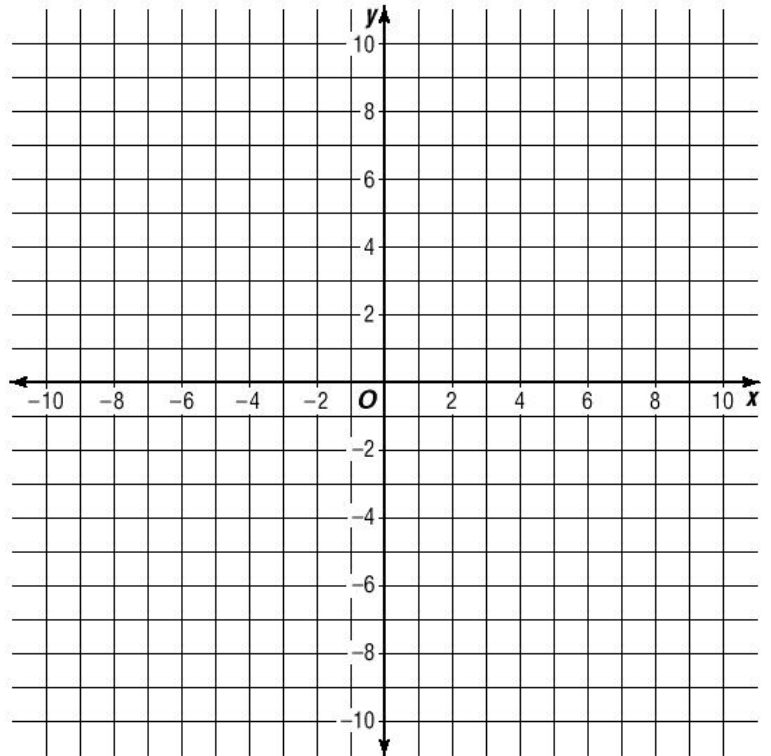
Graph each. Remember to extend your lines to the edge of the graphs.
Clearly label each graph with a 5, 6, 7, or 8.

5. $x - 2y = 7$

m=

6. $4x + 3y = 8$

m=

7. $9x - 2y = 27$

m=

8. $8x - 9y = -24$

m=
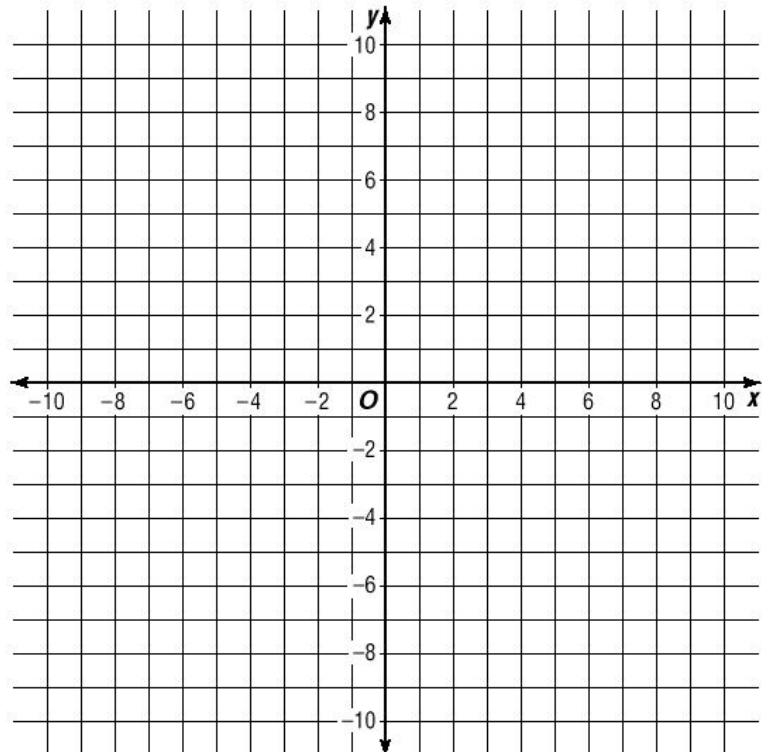
Point-Slope Form

Practice: Write an equation for each in Slope-Intercept Form:
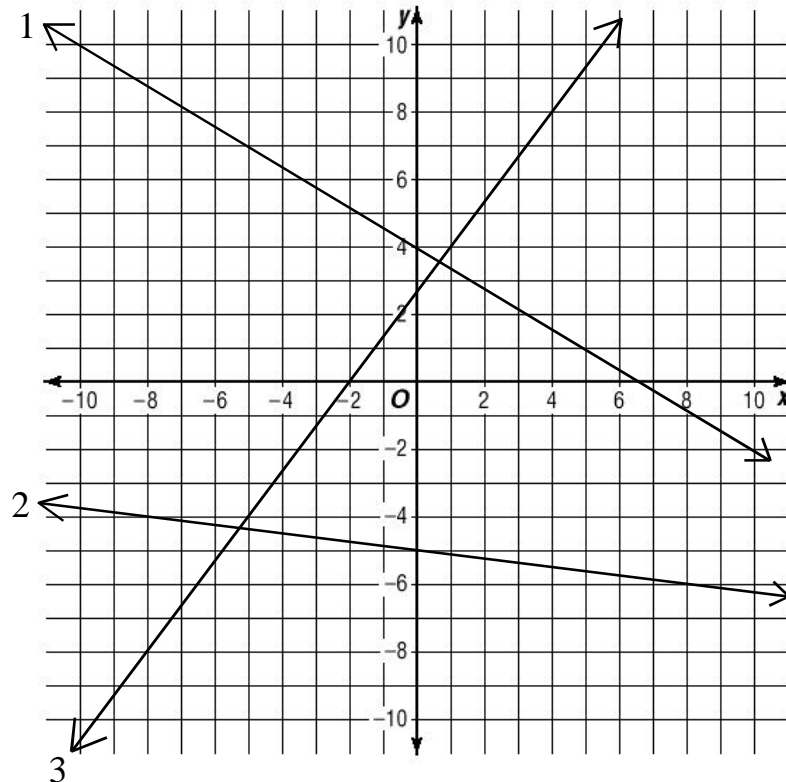
We need a new form!
POINT-SLOPE FORM

Given any point on the line (x_1, y_1)

and the slope of the line m

$$y - y_1 = m(x - x_1)$$ **MEMORIZE THIS!**

Examples:
Write an equation in Point-Slope Form using the information given.

1. $(-5,3)$ $m = \dfrac{1}{2}$

2. $(5,-9)$ $m = -\dfrac{2}{5}$

Practice:
Write an equation in Point-Slope Form using the information given.

1. $(4,-1)$ $m = -\dfrac{1}{8}$

2. $(-6,-3)$ $m = -2$

Point-Slope Form

You can write a Point-Slope equation given any two points.

Try it on your own: Write a Point-Slope equation

for the line that passes through $(-1,7)$ and $(2,-5)$.

Practice:
Write an equation in Point-Slope Form using the information given.

1. $(6,2)$ $(-1,-3)$ 2. $(14,-11)$ $(-6,5)$

Practice:
Write an equation in Point-Slope Form for each graph.
Use the darkened point.
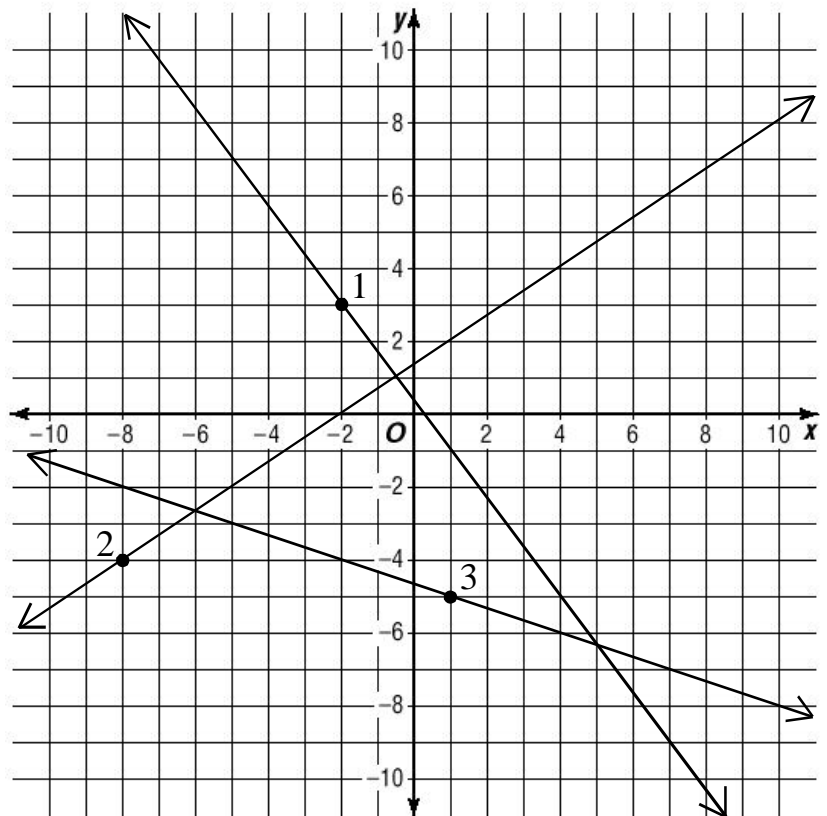
Practice:
Convert each equation you got for the lines above into Standard Form:

1. $y - 3 = -\dfrac{4}{3}(x+2)$ 2. $y + 5 = -\dfrac{1}{3}(x-1)$ 3. $y - 2 = \dfrac{2}{3}(x+7)$

Slope Mazes

Algebra   6.1

Review:

To solve each maze, **you must find the nearest point using the slope given below each blank.**

Example: Start at point A. Which point would come next if the slope were -3?
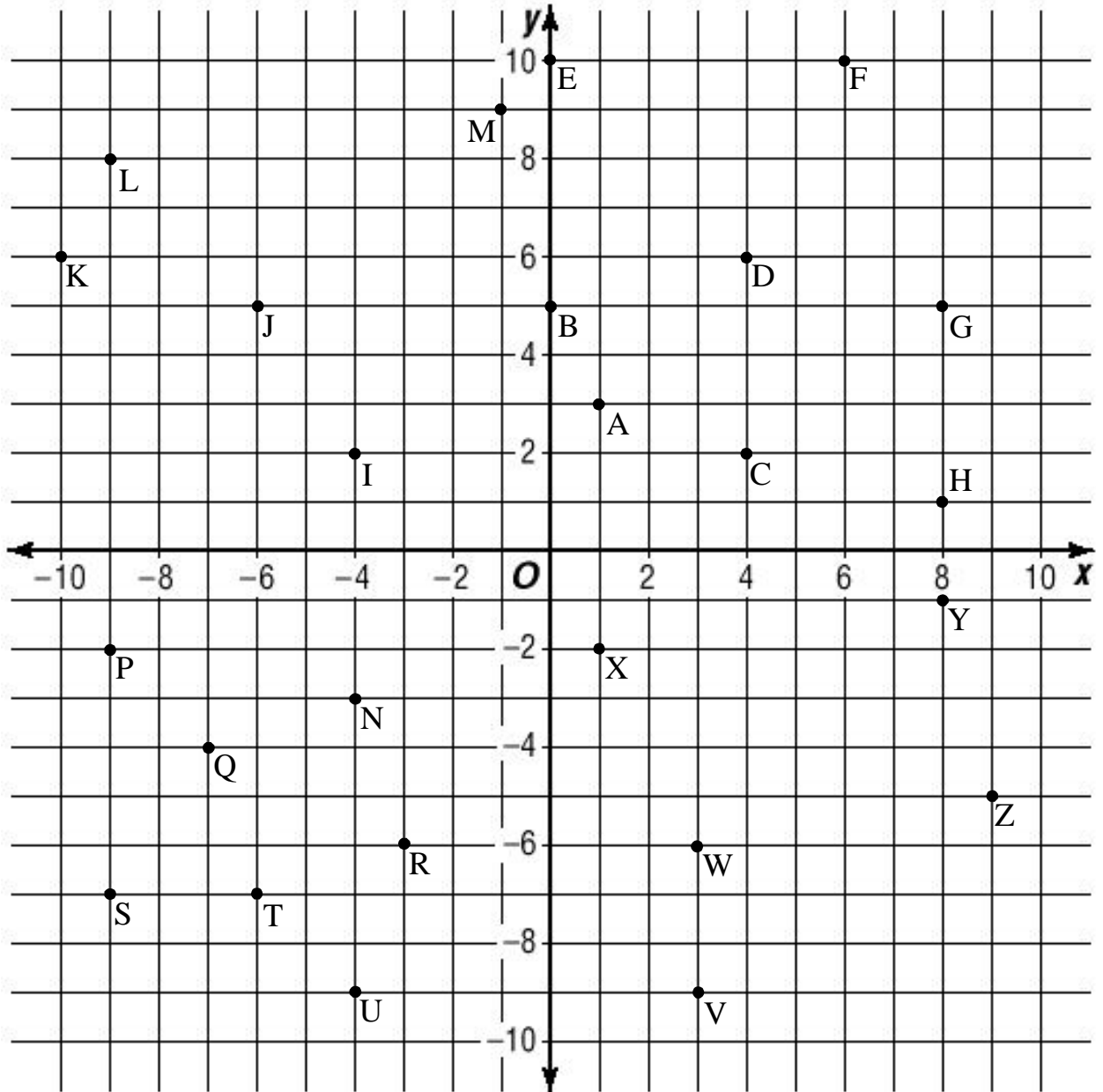
Practice: Start at point G. Follow the slopes and write the sequence of letters you use.
There will not be a word spelled.

<u>G</u>   _____   _____   _____   _____   _____   _____   _____

$-\dfrac{1}{4}$ $\dfrac{1}{10}$ -7 -1 0 $\dfrac{1}{2}$ 1

Slope Mazes

Challenge:
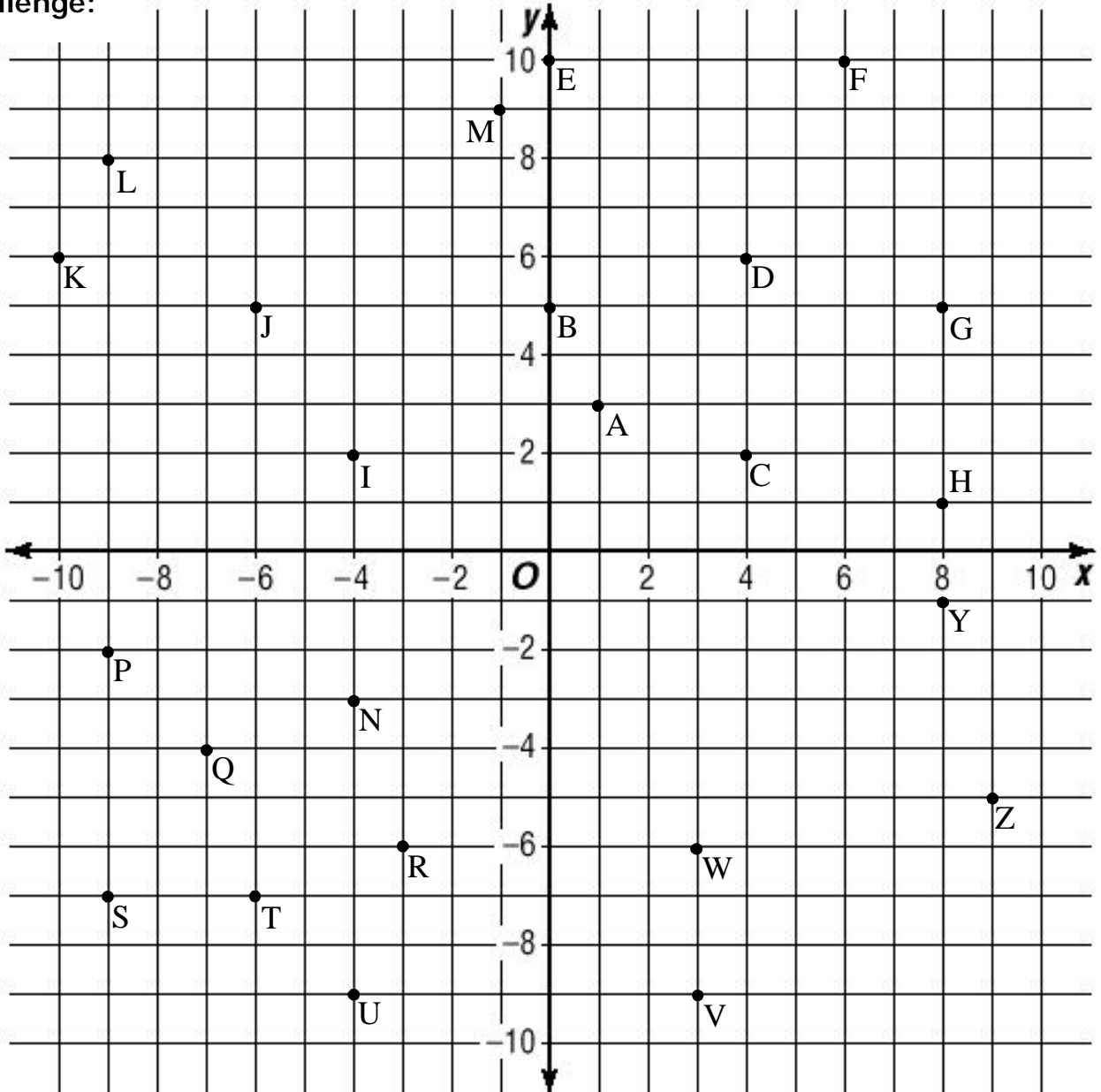
Practice: Start at point H. You will make a phrase.

H _____   _____   _____   _____   _____   _____
 $-\dfrac{2}{7}$ -6 $-\dfrac{19}{3}$ -7 $\dfrac{2}{7}$ 1

_____   _____   _____   _____   _?_   _L_
 $\dfrac{16}{3}$ -7 $\dfrac{10}{7}$ $\dfrac{4}{7}$ 1 -2

_____   _____   _____   _____   Challenge: What are the coordinates
 $-\dfrac{6}{5}$ $\dfrac{1}{2}$ 1 $-\dfrac{4}{7}$ of the missing letter? _____

Self Check: Four Formulas

Review:
Write each of the four formulas listed below in the blank provided:

Slope: _____   **Slope-Intercept Form:** _____

Standard Form: _____   **Point-Slope Form:** _____

Self Check: Four Formulas

Write an equation for each in
Standard Form:

1. _____

2. _____

3. _____
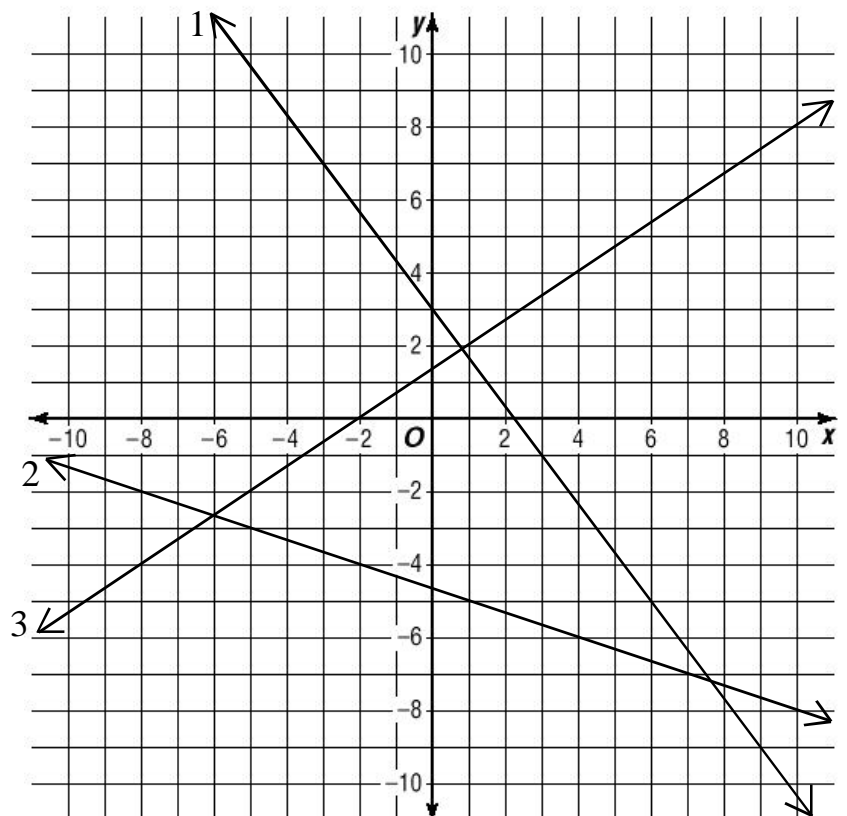
Review

Practice:
Write an equation for each line graphed below in the form listed.

1. Slope-Intercept:
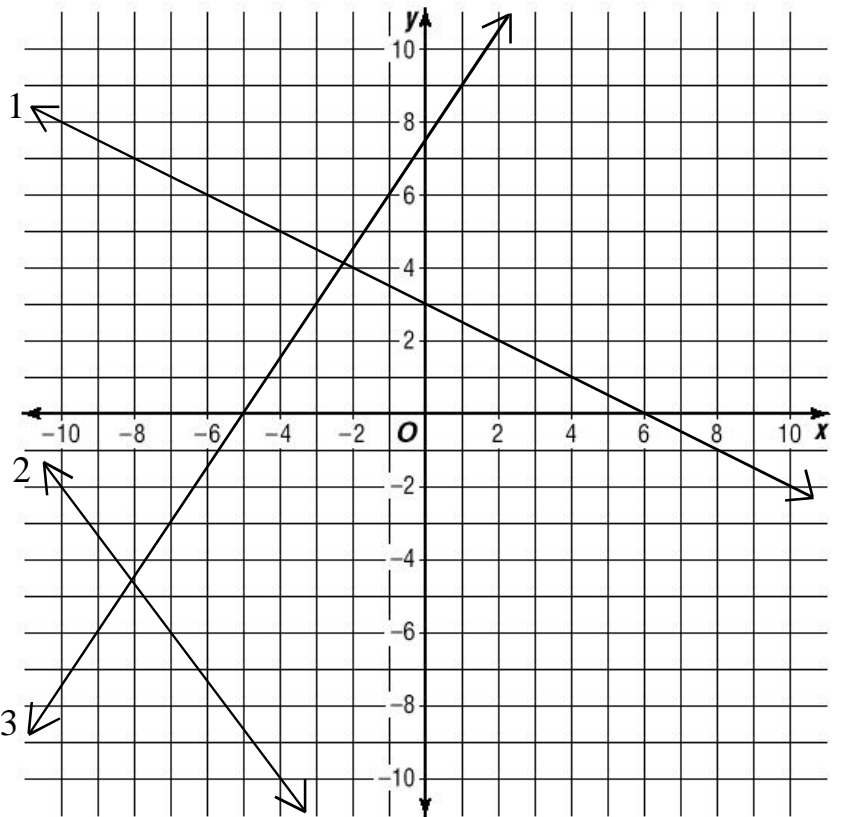
2. Point-Slope Form:

3. Standard Form:

Practice:
Write an equation for each line graphed below in all three forms:

1.

2.

3.
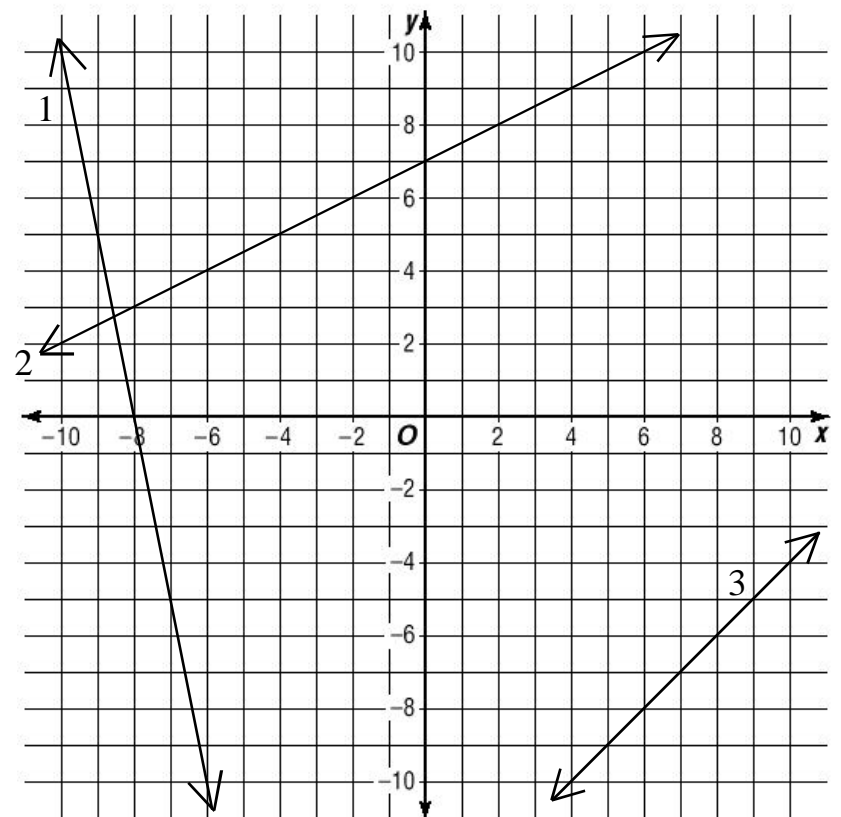
Review: Four Formulas

Find the slope between each pair of points:

1. $(-4,-3)$ $(5,-7)$

2. $(9,-1)$ $(-2,0)$

3. $(6,-7)$ $(-3,-7)$

4. $(-8,4)$ $(-8,-10)$

5. $(7,-1)$ $(-11,2)$

6. $(2,-3)$ $(-2,3)$

Write an equation for each pair of points below in Point-Slope Form, then convert it into both Standard and Slope-Intercept Forms:

7. $(1,-1)$ $(6,-11)$

8. $(5,-3)$ $(-2,4)$

Point-Slope: _____

Standard: _____

Slope-Intercept: _____

Point-Slope: _____

Standard: _____

Slope-Intercept: _____

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

10. $(-2,5)$ $(-9,15)$

Point-Slope: _____

Standard: _____

Slope-Intercept: _____

Point-Slope: _____

Standard: _____

Slope-Intercept: _____

Review: Four Formulas

Write an equation for each in the form listed:

11. Standard

12. Slope-Intercept

13. Standard

14. Point-Slope
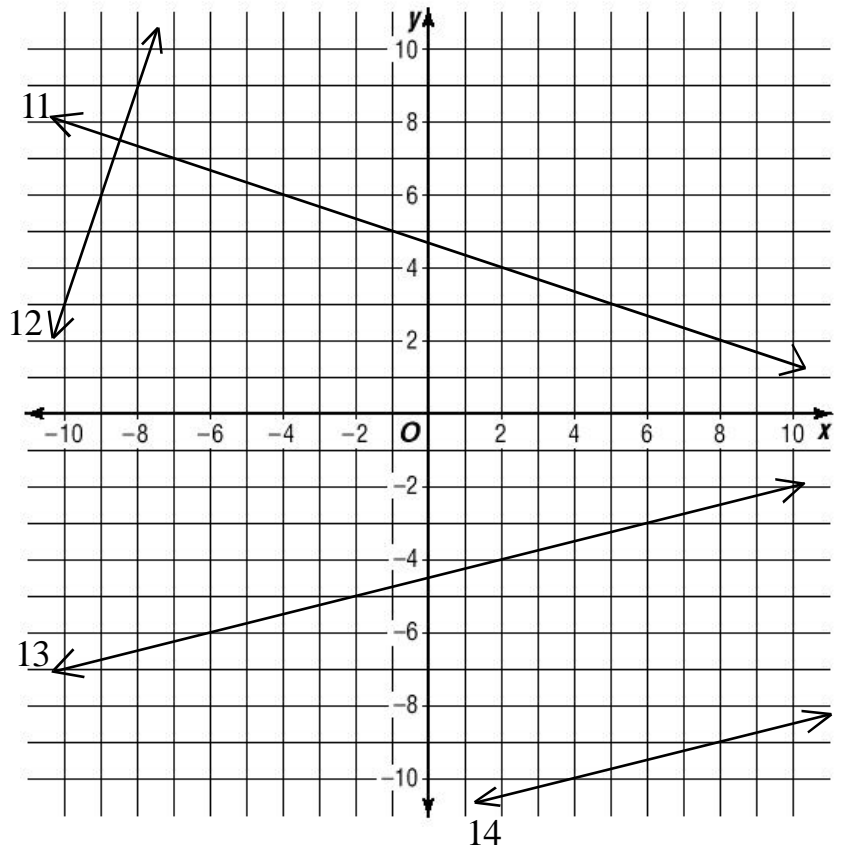
Name both Intercepts for each equation:

15. $2x-5y=40$

x-int.: _____

y-int. _____

16. $7x-3y=10$

x-int.: _____

y-int. _____

17. $x-7y=11$

x-int.: _____

y-int. _____

18. $20x-17y=34$

x-int.: _____

y-int. _____

19. $x+15=5y$

x-int.: _____

y-int. _____

20. $y=2x-5$

x-int.: _____

y-int. _____

Parallel/Perpendicular Lines   Algebra   6.5

Graph the following linear equations on the SAME GRAPH:

A. $y = \dfrac{3}{4}x + 5$

B. $3x - 4y = 16$

C. $y = -\dfrac{4}{3}x + 1$

D. $y + 6 = \dfrac{4}{3}(x + 9)$
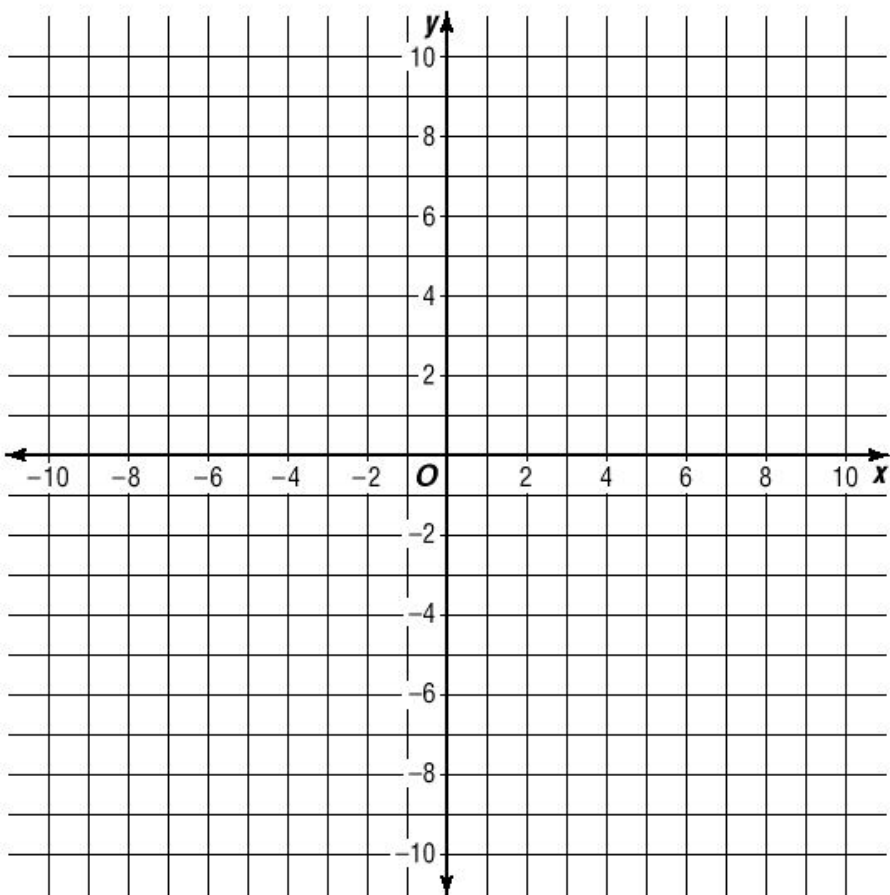
The slopes of lines that are **<u>parallel</u>** are _____.

The slopes of lines that are **<u>perpendicular</u>** are _____.

Examples:
Find the <u>parallel AND perpendicular</u> slopes for each:

1. $m = \dfrac{1}{2}$ 2. $(5,-9)\ (-4,6)$ 3. $3x - y = 5$

Practice:
Find the <u>parallel AND perpendicular</u> slope for each:

1. $m = -3$ 2. $(-2,7)\ (8,2)$ 3. $2x - 7y = 14$

Parallel/Perpendicular Lines

Examples:
Write the equation for each of the following:

1. Parallel to $y = \dfrac{1}{2}x - 3$ through $(-5,2)$ in Point-Slope Form:

2. Perpendicular to $x - 2y = 3$ through $(-3,-7)$ in Standard Form:

Practice:
Write the equation for each of the following:

1. Parallel to $y - 2 = \dfrac{2}{5}(x-3)$ through $(-3,-5)$ in Point-Slope Form:

2. Perpendicular to $3x - y = 5$ through $(-2,4)$ in Standard Form:

3. Perpendicular to $y - 3 = 5(x+1)$ through $(1,8)$ in Slope-Intercept Form:

Practice:

1. Write the Point- Slope equation for the line passing through both points to the right.

2. Write the equation for a perpendicular line passing through point A in Point-Slope Form.

3. Write the equation for a perpendicular line passing through point B in Standard Form.
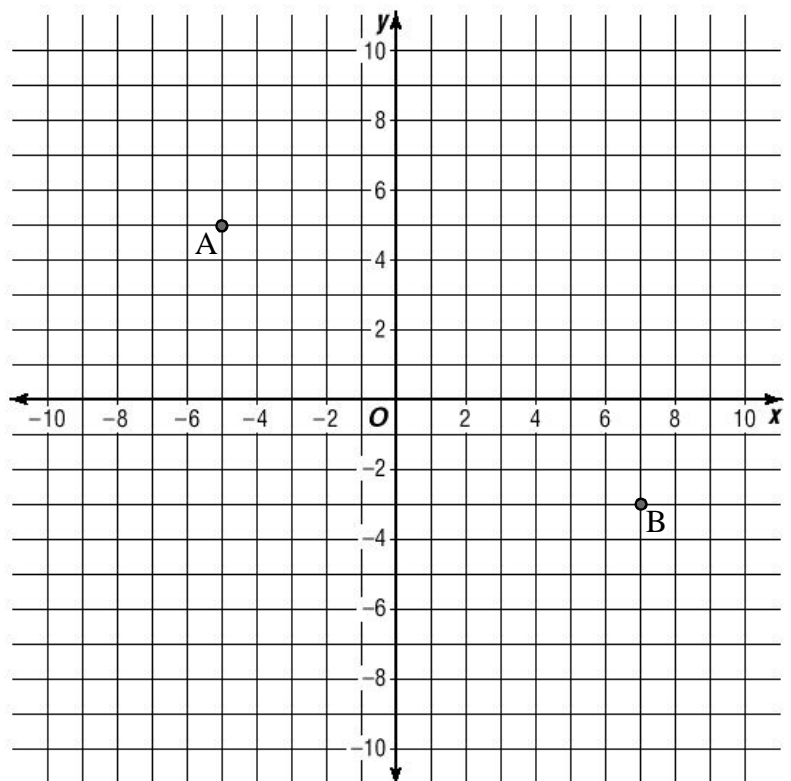
Linear Modeling (word problems)   Algebra   6.6

Try writing an equation and graphing some of the 'real-life' problems below:

It is VERY IMPORTANT to Remember: y is the dependent variable, x is the independent variable, y always depends on x.

Examples: Label your variables, then write an equation for each:

Slope-intercept form:
A bear cub weighs 8kg at birth and gains 3/4 kilogram per week.

Point-Slope Form:
Each of the Keebler elves can make 9 batches of cookies in 4 hours, and 15 batches in 6 hours. (to begin: write two points, then find the slope)

Slope-intercept form:
Expenses are $75 to rent the space and then $15 per guest.

Point-Slope Form:
In the same taxi, you went 5 miles for $13, while a 13-mile trip cost $29.

Practice: Write a linear equation for each:

1. Mailing a medium-sized package costs $5 plus $1.50 a pound.

2. A baby weighs 14 pounds at 5 months and 21 pounds at 10 months. Convert this equation to slope intercept form and answer:
    a. How much did the baby weigh at birth?
    b. How many pounds did the baby gain each month in its first year?

More Practice: Write an equation for each:

1. A restaurant delivers pizzas for $8.95 each plus a $4 charge for delivery.

2. Express-mailing a 12-pound package costs $13, while it costs $34 to mail a 40-pound package express.

3. A Sprint cell-phone plan charges a $0.50 connection fee and then $.05 a minute for each call.

4. With an AT&T cell-phone plan, you pay $.74 for a 7-minute call, and $3.05 for 40 minutes. What is the connection fee for AT&T?

WordProblems

Write an equation to represent each situation given below in the form listed. Convert each to the form listed.

1. Mario's Pizza charges $7 for a medium pizza plus $0.75 per additional topping.

Slope-Intercept Form: (use c for charge and t for toppings)

_____

Standard Form:

_____

2. A taxi ride in Boston costs $11 for 2 miles, and $18 for 4 miles.

Point-Slope Form: (use c for cost and m for miles)

_____

Slope-Intercept Form:

_____

3. A long distance company charges a $1 connection fee, plus $0.10 a minute.

Slope-Intercept Form: (use m for minutes and c for charge)

_____

Standard Form:

_____

4. It costs 85 cents for a 12-ounce beverage, and $1.25 for a 20-ounce beverage:

Point-Slope Form: (Use n for ounces and c for cost)

_____

Standard Form:

_____

Word Problems

Write an equation to represent each situation given below in the form listed. Convert each to the form listed.

5. A calf weighs 18 lbs when it is 2 months old, and after 8 months weighs 36 lbs.

Point-Slope Form: (use w for weight and m for months)

_____

Slope-Intercept Form:

_____

6. Shipping an internet purchase costs $3 plus $0.50 a pound.

Slope-Intercept Form: (use p for pounds and c for charge)

_____

Standard Form:

_____

7. An automotive factory makes 17 cars in 5 hours and in 8 hours can make 29 cars.

Point-Slope Form: (use h for hours and c for cars produced)

_____

Slope-Intercept Form:

_____

8. A rental car charges $29 to rent the car plus $45 a day:

Slope Intercept Form: (Use d for days and r for the rental fee)

_____

Standard Form:

_____

Other Shortcuts

You can write an equation in slope-intercept form given two points on the line without using point-slope form.

Example:
Write the equation of the line passing through (-5, -5) and (5, 1) in slope-intercept form.

Method 1: Use point-slope form and convert.
Method 2: Find the slope, then solve for b in slope-intercept form.

Practice:
Write a slope-intercept form equation for each pair of points.
(Practice method 2.)

1. (5, 14) (-1, -4)   **2.** (6, -4) (-2, -8)

3. (-8, -4) (4, 5)   **4.** (-2, 9) (11, -5)

You can write an equation in Standard Form given two points on the line without using point-slope form.

Example:
Write the equation of the line passing through (-5, -5) and (5, 1) in Standard Form.

Method 1: Use point-slope form and convert.
Method 2: Find the slope, use it for A and B, then solve for C.

Practice:
Write a Standard Form equation for each pair of points.
(Practice method 2.)

1. (5, 14) (-1, -4)   **2.** (6, -4) (-2, -8)

3. (-8, -4) (4, 5)   **4.** (-2, 9) (11, -5)

Using Shortcuts

Write an equation for each given the information listed in the form listed.

1. Write an equation in slope-intercept form for the line with slope 2/3 which passes through the point (6, -2).

slope-intercept form: _____

2. Write an equation in Standard form for the line with slope -4/5 which passes through the point (3, -5).

standard form: _____

3. Write an equation in slope-intercept form for the line which passes through the points (2, 5) and (6, 3).

slope-intercept form: _____

4. Write an equation in Standard form for the line which passes through (4, 6) and (2, -1).

standard form: _____

5. What is the standard form equation of the line parallel to 2x-7y=5 which passes through the point (3, -2).

standard form: _____

6. Write the slope-intercept form of the line perpendicular to y=3x+7 which passes through the point (6, -5).

slope-intercept form: _____

7. Write the standard form of the equation of a line passing through (7, -2) and (2, -3).

standard form: _____

8. Write a point-slope equation to represent the line that passes through the point (6, -2) and is perpendicular to teh line which passes through (7, 8) and (-2, 5).

slope-intercept form: _____

Test Review

Slope-Intercept Form:

100. Convert $y - 2 = -\frac{3}{4}(x+8)$ to Slope-Intercept Form.

200. Through $(-4,2)$ and $(-3,4)$ in Slope-Intercept Form.

300. Perpendicular to $15x - 4y = 59$ through $(-2,11)$ in Slope-Intercept Form.

Slope:

100. Find the slope between $(-4,2)$ and $(-3,4)$.

200. Find the perpendicular slope to the graph of: $y = 5$

300. Find the slope of a line parallel to: $\frac{2}{3}y = \frac{4}{5}x - 5$

Word Problems:

100. A tow truck charges $25 to pick you up plus $3 a mile for the tow. (c=charge, m=miles)

200. Michael made 5 pancakes in 30 minutes, and 10 pancakes in 40 minutes. (p=pancakes, m=minutes)

300. A phone company charges $0.50 the first minute and $0.15 for every minute after that. (c=charge, m=minutes)

Test Review

Point-Slope Form:

100. Through $(-1,5)$ and $(-3,4)$ in Point-Slope Form.

200. Parallel to $x-3y=4$ through $(2,-8)$ in Point-Slope Form.

300. Perpendicular to $\dfrac{2}{3}x-\dfrac{1}{2}y=5$ through $(-2,7)$ in Point-Slope Form.

Standard Form:

100. Convert $y-3=\dfrac{1}{2}(x+4)$ to Standard Form.

200. Parallel to $2x-y=4$ through $(1,-1)$ in Standard Form.

300. Write an equation in Standard Form for the line whose x-intercept is -2 and whose y-intercept is 13.

Practice Test: Linear Equations

State the x and y-intercepts of each:

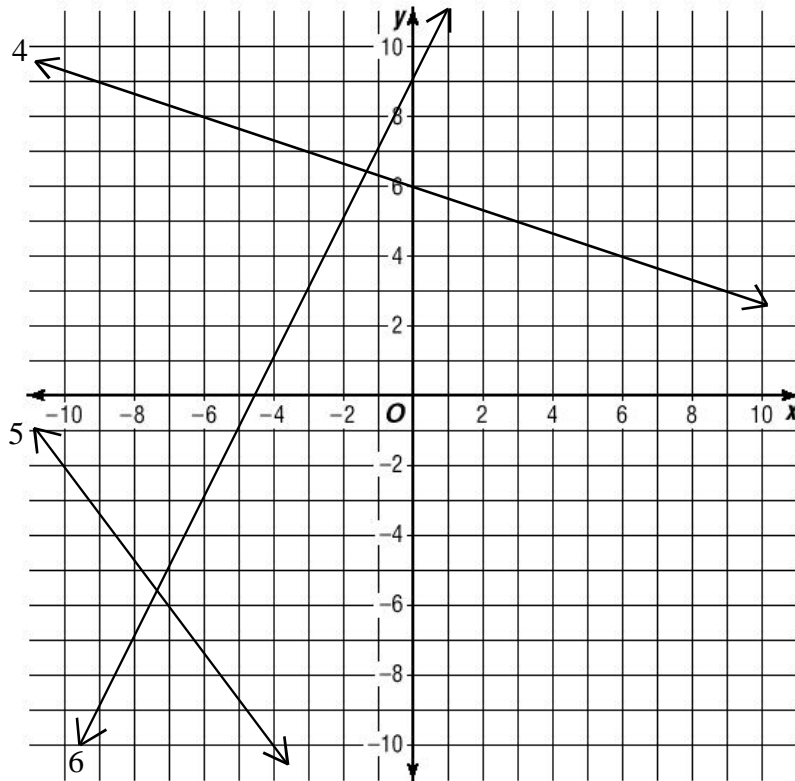1. $y = 4x - 1$

   1. x-int. _____ y-int. _____

2. $2x - y = 8$

   2. x-int. _____ y-int. _____

3. $x = \dfrac{1}{2}y - 5$

   3. x-int. _____ y-int. _____

Write an equation for each line graphed below in the form listed:

4. Standard Form:

   _____

5. Point-Slope Form:

   _____

6. Slope-Intercept Form:

   _____

Find the slope for each equation or pair of points:

7. $3y = 4x$

   7. slope: _____

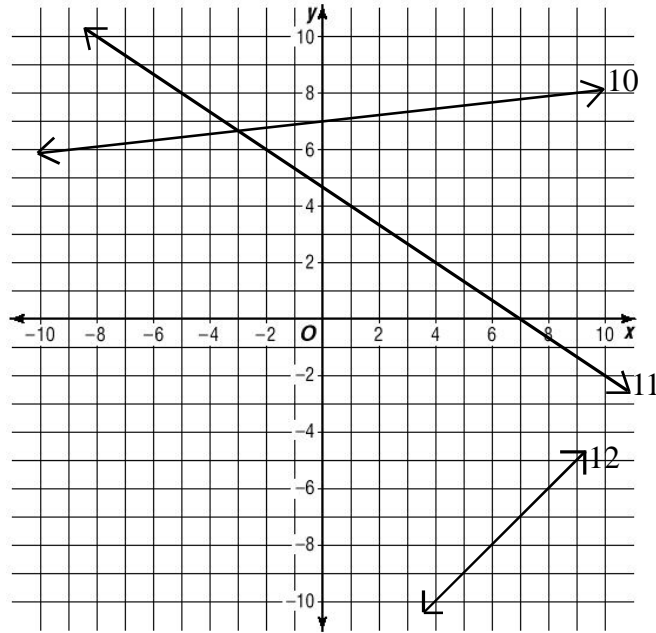8. $(2, -1) \ (5, -3)$

   8. slope: _____

9. $y = 7$

   9. slope: _____

Practice Test: Linear Equations   Algebra   6.6

Find the slope of each line:

10. slope: _____

11. slope: _____

12. slope: _____

Write a Point-Slope equation for each, then convert to the form listed:

13-14. $(-3,5)$ $(4,-2)$

13. Point-Slope Form: _____

14. Standard Form: _____

15-16. $(-4,9)$ $(5,6)$

15. Point-Slope Form: _____

16. Slope-Intercept Form: _____

Write an equation in <u>Standard Form</u> of a line *parallel* to the equation below which passes through the point given.

17. $2x-3y=20$ $(8,-3)$

17. Standard Form:_____

Write an equation in <u>Slope-Intercept Form</u> of a line *perpendicular* to the equation below which passes through the point given.

18. $x+5y=15$ $(-3,2)$

18. Slope-Intercept Form:_____