

I. Order of Operations

1 Simplifying Numerical Expressions

Simplify each expression.

A $-4^2 + 24 \div 3 \cdot 2$

$-4^2 + 24 \div 3 \cdot 2$

$-16 + 24 \div 3 \cdot 2$

$-16 + 8 \cdot 2$

$-16 + 16$

0

There are no grouping symbols.

Simplify powers. The exponent applies only to the 4.

Divide.

Multiply.

Add.

B $4[25 - (5 - 2)^2]$

$4[25 - (5 - 2)^2]$

$4[25 - 3^2]$

$4[25 - 9]$

$4 \cdot 16$

64

There are two sets of grouping symbols.

Perform the operation in the innermost set.

Simplify powers within the brackets.

Subtract within the brackets.

Multiply.

Comprehension questions: part 1 (order of operations)

Answer each of the following questions on a separate sheet of paper.

Order of Operations		
Evaluate each expression.		
$6^2 + 3 \cdot 7 - 9$	$2[5^2 + (36 \div 6)]$	$\frac{(2 \cdot 5)10 + 4}{3^2 - 5}$
$2 + 6(9 - 3^2) - 2$	$5(14 - 39 \div 3) + 4 \cdot \frac{1}{4}$	$\frac{2 + 3(6)}{2^2}$
$8 \div \frac{1}{2} \times 3$	$5.4 - 3^2 + 6.2$	$-20 \div [-2(4 + 1)]$

Find, correct the error below and explain the error below:

Incorrect work:

$$\begin{aligned}4^2 - 2 \times 3 + 6 \\16 - 2 \times 3 + 6 \\16 - 6 + 6 \\16 - 12 \\4\end{aligned}$$

II. Simplifying Expressions (Using the Distributive Property)

The Distributive Property is used with addition to simplify expressions.



Distributive Property

WORDS	NUMBERS	ALGEBRA
You can multiply a number by a sum or multiply each addend by the number and then add. The result is the same.	$3(4 + 8) = 3(4) + 3(8)$	$a(b + c) = ab + ac$

Comprehension questions: part 2 (Simplifying Expressions Using the Distributive Property)

Answer each of the following questions on a separate sheet of paper.

The Distributive Property		
Use the Distributive Property to rewrite each expression.		
$9(7 + 8)$	$7(x - 1)$	$8(y - 2)$

$(9 - p)3$	$16(3b - 0.25)$	$(c - 4)d$
$-2(n - 6)$	$(3n - 7)6$	$-(2 - 7x)$
$(4(x + 14w - 6y))$	$4(6p + 2q - 2n)$	$2(3a^2 + 6a + 2b^2)$

Find, correct the error below and explain the error below:

Incorrect work:

PROBLEM

Rachel solved the problem below. Her work and answer is in **BOLD**.

Simplify the expression: $5(2x - 6)$

$$10x - 6$$

III. Simplifying Expressions (Combining Like Terms)

The **terms** of an expression are the parts to be added or subtracted. **Like terms** are terms that contain the same variables raised to the same powers. Constants are also like terms.

$$4x - 3x + 2$$

A **coefficient** is a number that is multiplied by a variable. Like terms can have different coefficients. A variable written without a coefficient has a coefficient of 1.

$$1x^2 + 3x$$

E 3 Combining Like Terms

Simplify each expression by combining like terms.

A $12x + 30x$

$$12x + 30x$$

$$42x$$

12x and 30x are like terms.

Add the coefficients.

B $6.8y^2 - y^2$

$$6.8y^2 - y^2$$

$$6.8y^2 - 1y^2$$

$$5.8y^2$$

A variable without a coefficient has a coefficient of 1.

6.8y^2 and 1y^2 are like terms.

Subtract the coefficients.

C $4n + 11n^2$

$$4n + 11n^2$$

4n and 11n^2 are not like terms. Do not combine.

Comprehension questions: part 3 (Simplifying expressions by combining like terms)

Answer each of the following questions on a separate sheet of paper.

Combining Like Terms		
Combine like terms to simplify each expression		
$7y + y + 8y$	$3t - t + 2t$	$-9w^3 - 3w^3$

$3x^2 + 5x^2$	$8d + d$	$-18v^2 + 23v^2$
Simplify each expression by first distributing and then combining the like terms.		
$9(5 + t) - 6(t + 3)$	$4(r + 8) - 5(2r - 1)$	$-(m + 3) - 2(m + 3)$
$a[2 + b(2 + c)]$	$7b[8 + 6(b - 1)]$	$-[-5(y + 2z) - 3z]$

IV. Simplifying Expressions (Using Properties of Exponents)

2 Zero and Negative Exponents

Simplify.

A 2^{-3}

$$2^{-3} = \frac{1}{2^3} = \frac{1}{2 \cdot 2 \cdot 2} = \frac{1}{8}$$

B 5^0

$$5^0 = 1 \quad \text{Any nonzero number raised to the zero power is 1.}$$

C $(-3)^{-4}$

$$(-3)^{-4} = \frac{1}{(-3)^4} = \frac{1}{(-3)(-3)(-3)(-3)} = \frac{1}{81}$$

D -3^{-4}

$$-3^{-4} = -\frac{1}{3^4} = -\frac{1}{3 \cdot 3 \cdot 3 \cdot 3} = -\frac{1}{81}$$

Finding Products of Powers

Simplify.

A $2^5 \cdot 2^6$

$$2^5 \cdot 2^6$$

$$2^{5+6}$$

$$2^{11}$$

Since the powers have the same base, keep the base and add the exponents.

B $4^2 \cdot 3^{-2} \cdot 4^5 \cdot 3^6$

$$4^2 \cdot 3^{-2} \cdot 4^5 \cdot 3^6$$

$$(4^2 \cdot 4^5) \cdot (3^{-2} \cdot 3^6)$$

$$4^{2+5} \cdot 3^{-2+6}$$

$$4^7 \cdot 3^4$$

Group powers with the same base together.

Add the exponents of powers with the same base.

3 Finding Powers of Powers

Simplify.

A $(7^4)^3$

$$7^{4 \cdot 3}$$

$$7^{12}$$

Use the Power of a Power Property.

Simplify.

B $(3^6)^0$

$$3^{6 \cdot 0}$$

$$3^0$$

$$1$$

Use the Power of a Power Property.

Zero multiplied by any number is zero.

Any number raised to the zero power is 1.

Finding Powers of Products

Simplify.

A $(-3x)^2$

$$(-3)^2 \cdot x^2$$

$$9x^2$$

Use the Power of a Product Property.

Simplify.

B $-(3x)^2$

$$-(3^2 \cdot x^2)$$

$$-(9 \cdot x^2)$$

$$-9x^2$$

Use the Power of a Product Property.

Simplify.

C $(x^{-2} \cdot y^0)^3$

$$(x^{-2})^3 \cdot (y^0)^3$$

$$x^{-2 \cdot 3} \cdot y^{0 \cdot 3}$$

$$x^{-6} \cdot y^0$$

$$x^{-6} \cdot 1$$

$$\frac{1}{x^6}$$

Use the Power of a Product Property.

Use the Power of a Power Property.

Simplify.

Write y^0 as 1.

Write with a positive exponent.

1 Finding Quotients of Powers

Simplify.

$$\begin{aligned} \text{A } \frac{3^8}{3^2} \\ \frac{3^8}{3^2} &= 3^{8-2} \\ &= 3^6 = 729 \end{aligned}$$

$$\begin{aligned} \text{B } \frac{x^5}{x^5} \\ \frac{x^5}{x^5} &= x^{5-5} \\ &= x^0 = 1 \end{aligned}$$

$$\begin{aligned} \text{C } \frac{a^5b^9}{(ab)^4} \\ \frac{a^5b^9}{(ab)^4} &= \frac{a^5b^9}{a^4b^4} \\ &= a^{5-4} \cdot b^{9-4} \\ &= a^1 \cdot b^5 \\ &= ab^5 \end{aligned}$$

$$\begin{aligned} \text{D } \frac{2^3 \cdot 3^2 \cdot 5^7}{2 \cdot 3^4 \cdot 5^5} \\ \frac{2^3 \cdot 3^2 \cdot 5^7}{2 \cdot 3^4 \cdot 5^5} &= 2^{3-1} \cdot 3^{2-4} \cdot 5^{7-5} \\ &= 2^2 \cdot 3^{-2} \cdot 5^2 \\ &= \frac{2^2 \cdot 5^2}{3^2} \\ &= \frac{4 \cdot 25}{9} = \frac{100}{9} \end{aligned}$$

Comprehension questions: Part 4

(Simplifying Expressions Using properties of exponents)

Answer each of the following questions on a separate sheet of paper.

Properties of Exponents		
Simplify.		
$(-7x^2)(x^4)$	$\frac{1}{3}(2a^3b)(6b^3)$	$(-4x^5y)^2(-2x)^3$
$\frac{5^2}{5^5}$	$\frac{-2y^7}{14y^5}$	$\left(\frac{4p^4q^4}{3p^2q^2}\right)^3$
$\frac{p^{-8}}{p^3}$	$\frac{(-x^{-1}y)^0}{4w^{-1}y^2}$	$\frac{(-2mn^2)^{-3}}{4m^{-6}n^4}$

j^0	$7vx^2z^0$	$(6x^4)^2$
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V. Identifying Functions

Identifying Functions

Give the domain and range of each relation. Tell whether the relation is a function. Explain.

A

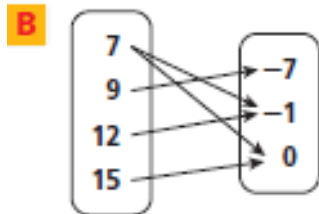
Field Trip	
Students x	Buses y
75	2
68	2
125	3

D: $\{75, 68, 125\}$

R: $\{2, 3\}$

Even though 2 appears twice in the table, it is written only once when writing the range.

This relation is a function. Each domain value is paired with exactly one range value.



Use the arrows to determine which domain values correspond to each range value.

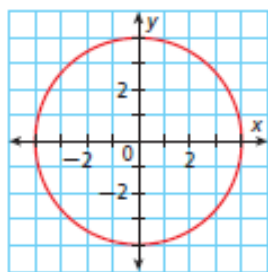
D: $\{7, 9, 12, 15\}$

R: $\{-7, -1, 0\}$

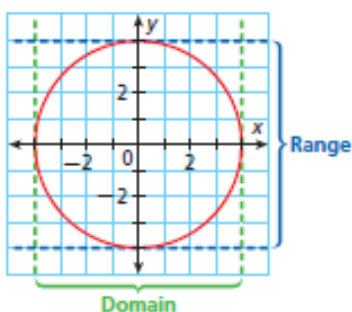
This relation is not a function. Each domain value does not have exactly one range value. The domain value 7 is paired with the range values -1 and 0 .

Give the domain and range of each relation. Tell whether the relation is a function. Explain.

C



Draw lines to see the domain and range values.



D: $-4 \leq x \leq 4$ R: $-4 \leq y \leq 4$

x	4	0	0	-4
y	0	4	-4	0

To compare domain and range values, make a table using points from the graph.

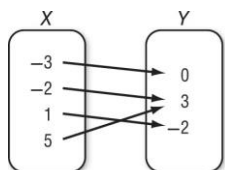
This relation is not a function because there are several domain values that have more than one range value. For example, the domain value 0 is paired with both 4 and -4.

Comprehension questions: Part 5

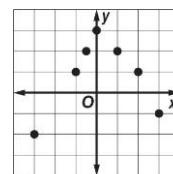
Identifying Functions

Functions

On a separate piece of paper: determine whether each relation is a function. Write yes if it is a function or no if it not a function. Be sure to explain your answer. Also identify the domain and range of each function.



x	y
1	5
-4	-3
7	6
1	-2

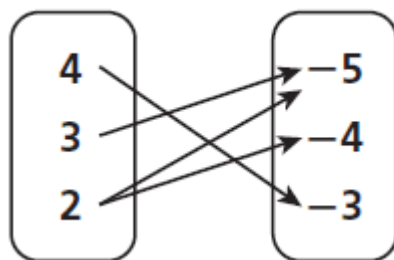


$\{(1, 4), (2, -2), (3, -6), (-6, 3), (-3, 6)\}$

$x = -2$

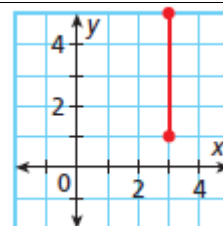
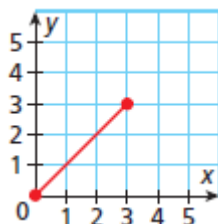
$y = 2$

$$\{(8, 2), (-4, 1), (-6, 2), (1, 9)\}$$



x	-2	-1	0	1	2
y	1	1	1	1	1

x	3	5	2	8	6
y	9	25	4	81	36



VI. Solving Equations

Solve each equation.

A $x - 10 = 4$

$$x - 10 = 4$$

$$\begin{array}{r} +10 \\ x - 10 = 4 \\ \hline x = 14 \end{array}$$

Since 10 is subtracted from x , add 10 to both sides to undo the subtraction.

Check $x - 10 = 4$

$$\begin{array}{r|l} 14 - 10 & 4 \\ \hline 4 & 4 \checkmark \end{array}$$

To check your solution, substitute 14 for x in the original equation.

Solve each equation. Check your answer.

A $x + 7 = 9$

$$x + 7 = 9$$

$$\begin{array}{r} -7 \\ x + 7 = 9 \\ \hline x = 2 \end{array}$$

Since 7 is added to x , subtract 7 from both sides to undo the addition.

Check $x + 7 = 9$

$$\begin{array}{r|l} 2 + 7 & 9 \\ \hline 9 & 9 \checkmark \end{array}$$

To check your solution, substitute 2 for x in the original equation.

Solving Equations by Adding the Opposite

Solve $-8 + b = 2$.

$$-8 + b = 2$$

$$\begin{array}{r} +8 \\ -8 + b = 2 \\ \hline b = 10 \end{array}$$

Since -8 is added to b , add 8 to both sides.

$$\mathbf{A} \quad -4 = \frac{k}{-5}$$

$$\begin{array}{l} (-5)(-4) = (-5)\left(\frac{k}{-5}\right) \\ 20 = k \end{array}$$

Since k is divided by -5 , multiply both sides by -5 to undo the division.

$$\begin{array}{r} \text{Check} \quad -4 = \frac{k}{-5} \\ \hline -4 \quad | \quad \frac{20}{-5} \\ -4 \quad | \quad -4 \quad \checkmark \end{array}$$

To check your solution, substitute 20 for k in the original equation.

Solving Equations by Using Division

Solve each equation. Check your answers.

$$\mathbf{A} \quad 7x = 56$$

$$\begin{array}{l} \frac{7x}{7} = \frac{56}{7} \\ x = 8 \end{array}$$

Since x is multiplied by 7, divide both sides by 7 to undo the multiplication.

$$\begin{array}{r} \text{Check} \quad 7x = 56 \\ \hline 7(8) \quad | \quad 56 \\ 56 \quad | \quad 56 \quad \checkmark \end{array}$$

To check your solution, substitute 8 for x in the original equation.

1 Solving Two-Step Equations

Solve $10 = 6 - 2x$. Check your answer.

$$\begin{array}{l} 10 = 6 - 2x \\ \underline{-6 \quad -6} \end{array}$$

First x is multiplied by -2 . Then 6 is added.

Work backward: Subtract 6 from both sides.

$$\begin{array}{l} 4 = -2x \\ \underline{\frac{4}{-2} = \frac{-2x}{-2}} \end{array}$$

Since x is multiplied by -2 , divide both sides by -2 to undo the multiplication.

$$\begin{array}{l} -2 = 1x \\ -2 = x \end{array}$$

$$\begin{array}{r} \text{Check} \quad 10 = 6 - 2x \\ \hline 10 \quad | \quad 6 - 2(-2) \\ 10 \quad | \quad 6 - (-4) \\ 10 \quad | \quad 10 \quad \checkmark \end{array}$$

Solve each equation.

$$\begin{aligned} \mathbf{A} \quad 6x + 3 - 8x &= 13 \\ 6x + 3 - 8x &= 13 \\ 6x - 8x + 3 &= 13 \\ -2x + 3 &= 13 \\ \underline{-3} \quad \underline{-3} & \\ -2x &= 10 \\ \frac{-2x}{-2} &= \frac{10}{-2} \\ x &= -5 \end{aligned}$$

Use the Commutative Property of Addition.

Combine like terms.

Since 3 is added to $-2x$, subtract 3 from both sides to undo the addition.

Since x is multiplied by -2 , divide both sides by -2 to undo the multiplication.

$$\mathbf{B} \quad 9 = 6 - (x + 2)$$

$$9 = 6 + (-1)(x + 2)$$

Write subtraction as addition of the opposite.

$$9 = 6 + (-1)(x) + (-1)(2)$$

Distribute -1 on the right side.

$$9 = 6 - x - 2$$

Simplify.

$$9 = 6 - 2 - x$$

Use the Commutative Property of Addition.

$$9 = 4 - x$$

Combine like terms.

$$\begin{array}{r} -4 \quad -4 \\ 9 = 4 - x \\ \hline 5 = -x \end{array}$$

Since 4 is added to $-x$, subtract 4 from both sides to undo the addition.

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

Since x is multiplied by -1 , divide both sides by -1 to undo the multiplication.

$$-5 = x$$

$$\mathbf{B} \quad 5x - 2 = 3x + 4$$

$$5x - 2 = 3x + 4$$

$$\begin{array}{r} -3x \quad -3x \\ 5x - 2 = 3x + 4 \\ \hline 2x - 2 = 4 \end{array}$$

To collect the variable terms on one side, subtract $3x$ from both sides.

$$\begin{array}{r} +2 \quad +2 \\ 2x - 2 = 4 \\ \hline 2x = 6 \end{array}$$

Since 2 is subtracted from $2x$, add 2 to both sides to undo the subtraction.

$$\frac{2x}{2} = \frac{6}{2}$$

Since x is multiplied by 2, divide both sides by 2 to undo the multiplication.

$$x = 3$$

Comprehension questions: Part 6 (solving Equations)

Solving Equations

Solve the following equations. Show all of your work.

$$2y = 8$$

$$\frac{y}{3} = -9$$

$$x + 6 = 12$$

$$g - 8 = 21$$

$$3(c - 2) = 21$$

$$\frac{x}{5} - 9 = 14$$

$$3x - 5x + 7 = 19$$

$$-4d + 15 = 3d - 13$$

$$4b + 2 = 3b$$

$$2(y + 6) = 3y$$

$$2k - 5 = 3(1 - 2k)$$

$$3x + 15 - 9 = 2(x + 2)$$

$$28 = 8x + 12 - 7x$$

$$4t + 7 - t = 19$$

$$15y + 31 = 61$$

$$15 = \frac{a}{3} - 2$$

VII. Multiplying Binomials

	$2x^2$	$+ 10x$	$- 6$
$5x$	$10x^3$	$50x^2$	$-30x$
$+ 3$	$6x^2$	$30x$	-18

Write the product of the monomials in each row and column.

To find the product, add all of the terms inside the rectangle by combining like terms and simplifying if necessary.

$$10x^3 + 6x^2 + 50x^2 + 30x - 30x - 18$$

$$10x^3 + 56x^2 - 18$$

Answer each of the following questions on a separate sheet of paper.

$(x + 1)(x - 1)$

$(x + 1)(x - 2)$

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

$(x + 4)(x - 1)$

$(x - 5)(x + 1)$

$(x + 6)(x - 1)$

$(x + 1)(x - 7)$

$(x - 8)(x + 1)$

$(x + 1)(x - 9)$

$(2x - 1)(2x - 1)$

$(2x - 1)(2x - 2)$

$(2x - 1)(3x - 3)$

$(2x - 4)(4x - 1)$

$(2x - 5)(5x - 1)$

$(2x - 6)(6x - 1)$

$(2x - 1)(7x - 7)$

$(2x - 8)(8x - 1)$

$(2x - 1)(9x - 9)$

$(9x - 2)(2x - 2)$

$(8x - 2)(2x - 3)$

$(7x - 2)(2x - 4)$

VIII. Graphing Lines

3 Using Slope-Intercept Form to Graph

Write each equation in slope-intercept form. Then graph the line described by the equation.

A $y = 4x - 3$

$y = 4x - 3$ is in the form $y = mx + b$.

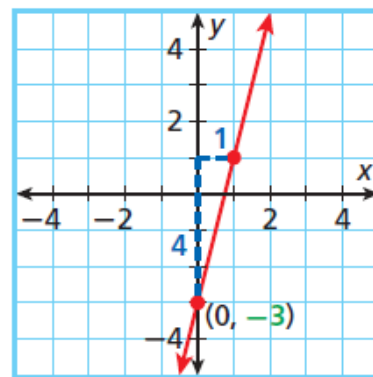
slope: $m = 4 = \frac{4}{1}$

y-intercept: $b = -3$

Step 1 Plot $(0, -3)$.

Step 2 Count **4 units up** and **1 unit right** and plot another point.

Step 3 Draw the line connecting the two points.



points.

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

$y = -\frac{2}{3}x + 2$ is in the form $y = mx + b$.

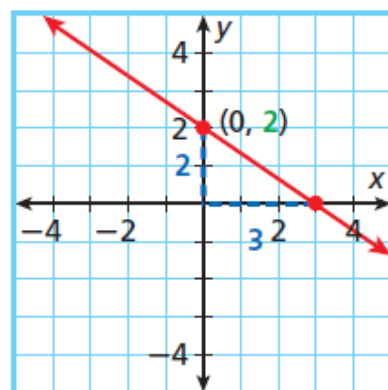
slope: $m = -\frac{2}{3} = \frac{-2}{3}$

y-intercept: $b = 2$

Step 1 Plot $(0, 2)$

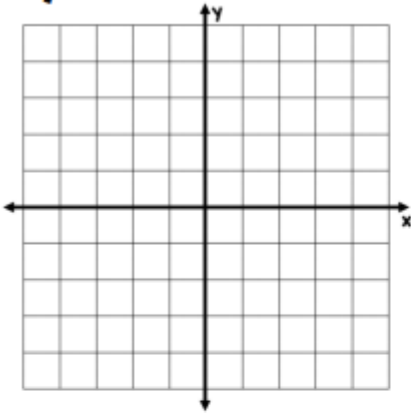
Step 2 Count **2 units down** and **3 units right** and plot another point.

Step 3 Draw the line connecting the two points.

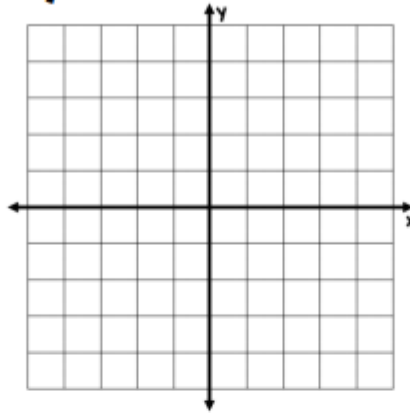


Answer each of the following questions on a separate sheet of paper. If you have the ability to print, you might want to print this section.

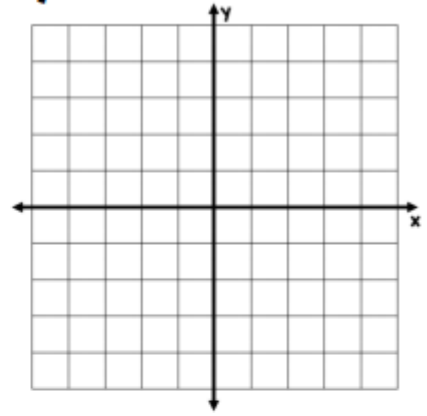
$$y = x + 1$$



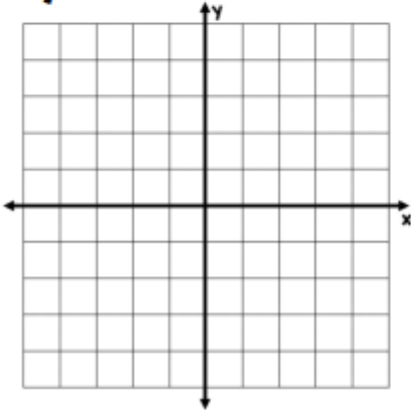
$$y = x + 2$$



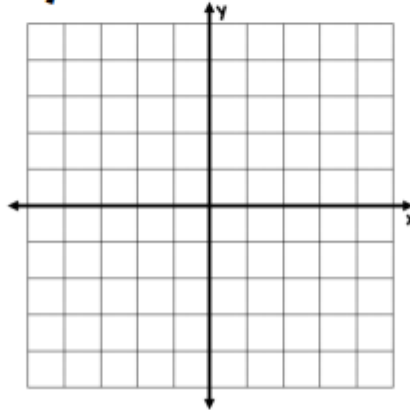
$$y = x + 3$$



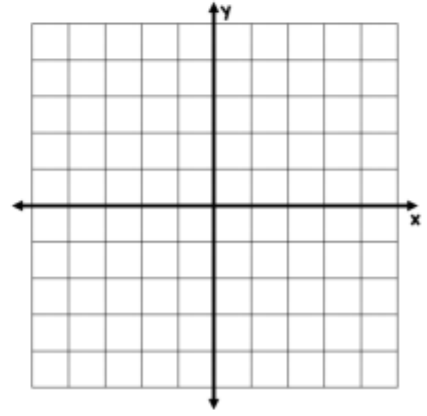
$$y = x + 4$$



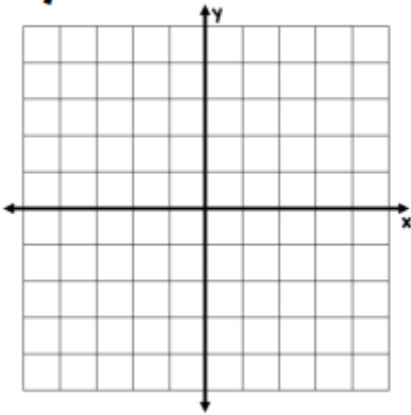
$$y = x + 5$$



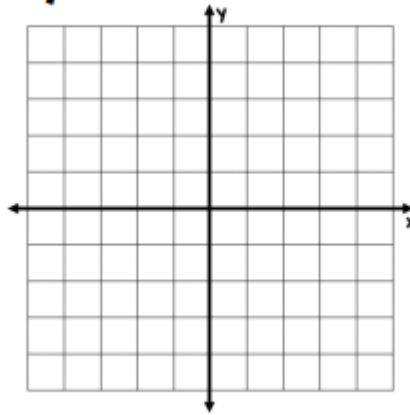
$$y = x - 1$$



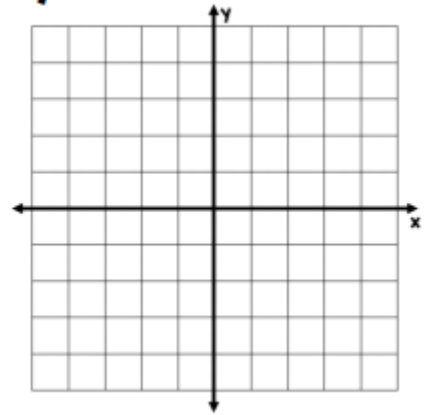
$$y = -2x + 1$$



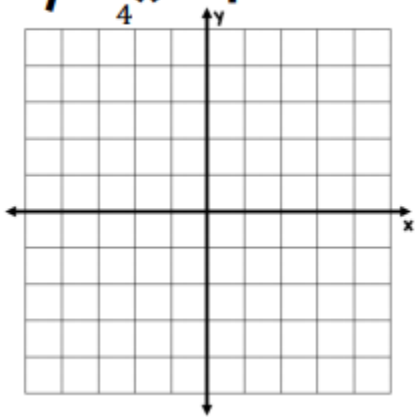
$$y = -2x + 2$$



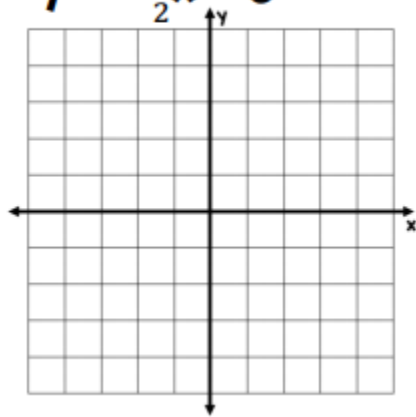
$$y = -2x + 3$$



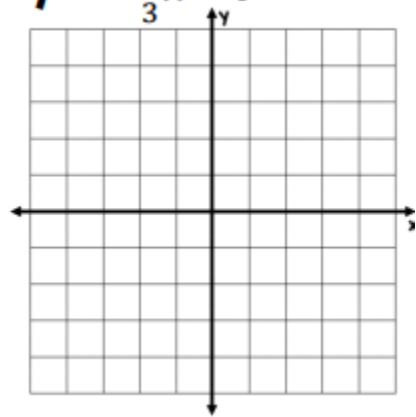
$$y = \frac{5}{4}x + 4$$



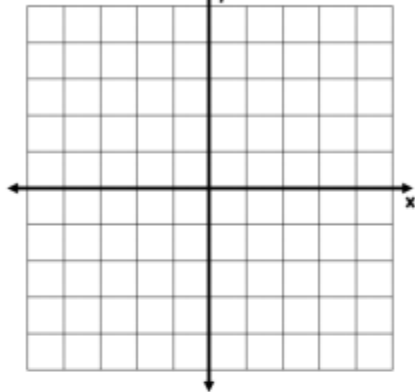
$$y = -\frac{3}{2}x + 5$$



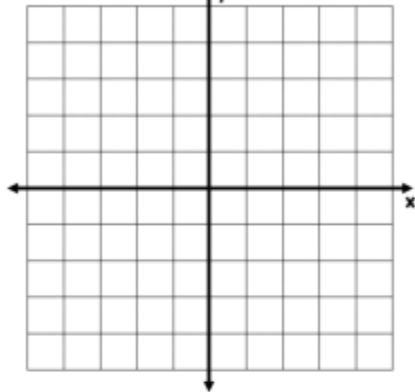
$$y = -\frac{4}{3}x - 1$$



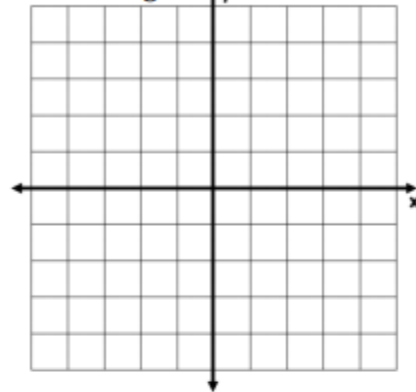
$$y = -\frac{1}{2}x + 1$$



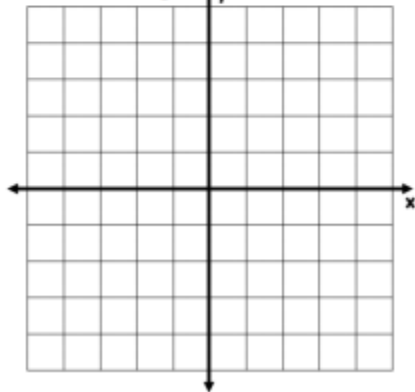
$$y = -\frac{1}{3}x + 2$$



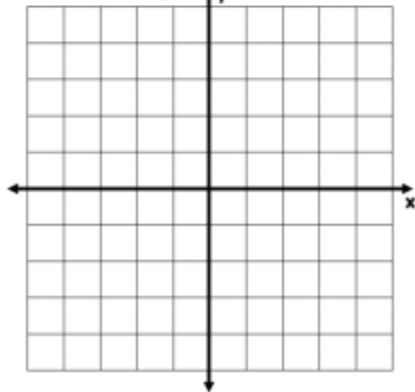
$$y = -\frac{2}{3}x + 3$$



$$y = -\frac{1}{4}x + 4$$



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



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

