PRISM PURPLE

ALGEBRA

READINESS

pp. 239 – 262

NAME ______________________

ALGEBRA READINESS
Variables, Expressions, Equations

In algebra,

- a **variable** is a symbol, usually a letter of the alphabet, that stands for an unknown number. x
- an **algebraic expression** is a combination of variables, numbers, and at least one operation. $x + 6$
- an **equation** is a sentence that contains an equal sign. $x + 6 = 13$

Write *expression* or *equation* for each of the following.

	a	b	c
1.	$n + 13 = 20$ equation	$6ab$ ________	$25 + x$ ________
2.	$9 \times n = 63$ ________	$8 + x - y$ ________	$34 + 79 = 113$ ________

Translate each phrase into an algebraic expression.

	a	b
3.	ten more than x $x + 10$	7 decreased by n ________
4.	twelve less than a ________	the product of 15 and 34 ________
5.	the sum of five and six ________	a number divided by 13 ________

Translate each sentence into an equation.

6. Eleven times a number is 132. $11 \times n = 132$

7. Twenty minus fourteen equals six. ________________

8. Ten less than a number equals forty. ________________

Write the following in words.

9. $n + 5$ ______________________________

10. $6 - a$ ______________________________

11. $35 \times 25 = 875$ ______________________________

ALGEBRA READINESS

NAME ____________

ALGEBRA READINESS
Properties of Numbers

Commutative Properties of Addition and Multiplication
The order in which numbers are added does not change the sum. $a + b = b + a$
The order in which numbers are multiplied does not change the product. $x \times y = y \times x$

Associative Properties of Addition and Multiplication
The grouping of addends does not change the sum. $(a + b) + c = a + (b + c)$
The grouping of factors does not change the product. $(x \times y) \times z = x \times (y \times z)$

Identity Properties of Addition and Multiplication
The sum of an addend and zero is that addend. $a + 0 = a$
The product of a factor and one is that factor. $a \times 1 = a$

Properties of Zero
The product of a factor and zero is zero. $a \times 0 = 0$
The quotient of zero and any non-zero number is zero. $0 \div a = 0$

Name the property shown by each statement.

	a	*b*
1.	$x \times 1 = x$ ____	$(12 \times a) \times b = 12 \times (a \times b)$ ____
2.	$54m + n = n + 54m$ ____	$0 \div 3xy = 0$ ____
3.	$(7a + b) + 5 = (b + 7a) + 5$ ____	$\frac{15x}{y} \times 0 = 0$ ____
4.	$(w + x) + 0 = (w + x)$ ____	$\frac{1}{3}c + \frac{2}{5}d = \frac{2}{5}d + \frac{1}{3}c$ ____

Rewrite each expression using the property indicated.

	a	*b*
5.	property of zero: $8a \times 0 =$ ____	commutative: $7d + 13e =$ ____
6.	identity: $1 \times (3x + 11) =$ ____	associative: $(x \times 2y) \times z =$ ____
7.	identity: $\frac{3}{5}w + 0 =$ ____	commutative: $m \times 2n =$ ____
8.	associative: $a + (4b + c) =$ ____	property of zero: $0 \div (8xy) =$ ____

NAME ____________________

ALGEBRA READINESS
The Distributive Property

Distributive Property

If one factor in a product is a sum, multiplying each addend by the other factor before adding does not change the product.

$a \times (b + c) = (a \times b) + (a \times c)$ **For example,** $4 \times (15 + 9) = (4 \times 15) + (4 \times 9)$

$4 \times 24 = 60 + 36$

$96 = 96$

Rewrite each expression using the distributive property.

	a	*b*
1.	$x \times (y + 15) =$ ________	$(35 \times 4x) + (35 \times 6y) =$ ________
2.	$(d \times 7) + (d \times 2e) =$ ________	$z \times (23 + 5y) =$ ________
3.	$j \times (3k + m) =$ ________	$(46 \times b) + (46 \times c) =$ ________
4.	$(17 \times s) + (17 \times t) =$ ________	$(42 \times x) + (42 \times y) =$ ________
5.	$132 \times (a + d) =$ ________	$(x + y) \times z =$ ________

Replace each w **with 11,** x **with 0,** y **with 7, and** z **with 20.**
Then evaluate each expression.

	a	*b*
6.	$z \times (w + x) =$ ________	$(x \times w) + (x \times z) =$ ________
7.	$y \times (w + x) =$ ________	$(y \times w) + (y \times z) =$ ________
8.	$w \times (x + y) =$ ________	$(w \times z) + (w \times y) =$ ________
9.	$(w \times z) + (w \times x) =$ ________	$x \times (z + y) =$ ________
10.	$(z \times y) + (z \times z) =$ ________	$(z \times x) + (z \times w) =$ ________
11.	$w \times (z + x + y) =$ ________	$(z \times w) + (z \times x) + (z \times y) =$ ________

ALGEBRA READINESS

ALGEBRA READINESS
Evaluating Expressions

NAME ____________

Algebraic expressions can be evaluated using the rules called **Order of Operations.**

1. Do all operations within parentheses. $(3 + 6) \times 3 = 27$
2. Do all multiplications and divisions from left to right. $5 \times 4 + 2 = 22$
3. Do all additions and subtractions from left to right. $12 - 3 + 5 = 14$

Name the operation that should be done first. Then find the value.

	a		*b*	
1.	$16 - (4 \times 2)$	multiply; 8	$8 + 6 \div 3$	________; ________
2.	$9 \times 6 - 3$	________; ________	$4 + 6 \times 7 - 1$	________; ________
3.	$(3 + 4) \times (6 - 3)$	________; ________	$8 \div 2 + (3 - 1)$	________; ________

Evaluate each expression if $a = 8$, $b = 4$, and $c = 2$.

	a		*b*	
4.	$b \times c - a$	0	$a \div b + c$	________
5.	$4 + b - c$	________	$3 \times a \div 4$	________
6.	$8 \times (b + c)$	________	$a + a \div c$	________
7.	$(a + a) \div c$	________	$(a + b) \div c$	________
8.	$9 - (a \div b)$	________	$(b + c) \times a$	________
9.	$b \div c + a - b$	________	$(b + c) \times (a + b)$	________
10.	$c \times (a + b)$	________	$(c \times a) + (c \times b)$	________

Write true or false.

	a		*b*	
11.	$8 + 24 \div 4 - 2 = 12$	________	$18 \div 3 + (5 - 2) = 3$	________
12.	$24 - 10 - 3 \times 4 = 2$	________	$42 \div 7 \times 6 = 1$	________

NAME ______________________

ALGEBRA READINESS
Solving Equations Using Addition and Subtraction

Subtraction Property of Equality
If you subtract the same number from each side of an equation, the two sides remain equal.

$$x + 8 = 14$$

To undo the addition of 8, subtract 8.

$$x + 8 - 8 = 14 - 8$$
$$x + 0 = 6$$
$$x = 6$$

Addition Property of Equality
If you add the same number to each side of an equation, the two sides remain equal.

$$n - 6 = 7$$

To undo the subtraction of 6, add 6.

$$n - 6 + 6 = 7 + 6$$
$$n - 0 = 13$$
$$n = 13$$

Write the operation that would undo the operation in the equation.

	a	*b*
1.	$x - 16 = 20$ addition	$24 + n = 38$ ________
2.	$14 = n - 32$ ________	$a + 50 = 84$ ________

Solve each equation.

	a		*b*	
3.	$n - 7 = 12$	19	$x + 17 = 25$	______
4.	$a - 11 = 6$	______	$32 + b = 40$	______
5.	$x + 9 = 18$	______	$n - 45 = 90$	______
6.	$16 + a = 54$	______	$12 + x = 24$	______
7.	$b - 15 = 0$	______	$83 + n = 83$	______
8.	$16 + b = 32$	______	$52 = a - 5$	______
9.	$35 = n + 15$	______	$x + 18 = 19$	______

Write and solve an equation for each situation.

10. A total of 97 students tried out for the debate team. If 45 of the students were girls, how many were boys? ______________________

11. Three members left the debate team during the year. If 12 members remained, how many were on the team originally? ______________________

ALGEBRA READINESS

NAME ____________________

ALGEBRA READINESS
Solving Equations Using Multiplication and Division

Division Property of Equality
If you divide each side of an equation by the same nonzero number, the two sides remain equal.

$$3 \times n = 15$$

To undo multiplication by 3, divide by 3.

$$\frac{3 \times n}{3} = \frac{15}{3}$$
$$n = 5$$

Multiplication Property of Equality
If you multiply each side of an equation by the same number, the two sides remain equal.

$$\frac{a}{3} = 9$$

To undo division by 3, multiply by 3.

$$\frac{a}{3} \times 3 = 9 \times 3$$
$$a = 27$$

Write the operation that would undo the operation in the equation.

	a		*b*	
1.	$6 \times a = 24$	division	$\frac{x}{4} = 16$	________
2.	$4 = \frac{n}{3}$	________	$42 = 7 \times a$	________
3.	$x \times 8 = 56$	________	$\frac{a}{8} = 16$	________

Solve each equation.

	a		*b*	
4.	$\frac{x}{3} = 4$	12	$6 \times a = 54$	________
5.	$x \times 12 = 144$	________	$\frac{n}{6} = 16$	________
6.	$\frac{x}{8} = 24$	________	$9 \times n = 81$	________
7.	$54 = x \times 6$	________	$8 = \frac{n}{7}$	________
8.	$72 = 9 \times a$	________	$n \times 16 = 160$	________
9.	$356 \times n = 356$	________	$34 \times a = 544$	________
10.	$\frac{n}{15} = 38$	________	$x \times 53 = 3445$	________

NAME ______________________

ALGEBRA READINESS
Solving Two-Step Equations

A **two-step equation** is solved by undoing each operation in the equation.

$$4n + 5 = 17$$

To undo the addition of 5, subtract 5.

$$4n + 5 - 5 = 17 - 5$$

$$4n = 12$$

To undo the multiplication of 4, divide by 4.

$$\frac{4n}{4} = \frac{12}{4}$$

$$n = 3$$

$$\frac{n}{4} - 1 = 2$$

To undo the subtraction of 1, add 1.

$$\frac{n}{4} - 1 + 1 = 2 + 1$$

$$\frac{n}{4} = 3$$

To undo the division by 4, multiply by 4.

$$\frac{n}{4} \times 4 = 3 \times 4$$

$$n = 12$$

Solve each equation.

	a	*b*	*c*
1.	$2x + 5 = 11$ 3	$3a - 5 = 7$ ________	$6n + 8 = 50$ ________
2.	$2b - 9 = 7$ ________	$5x + 15 = 35$ ________	$\frac{a}{5} - 3 = 0$ ________
3.	$\frac{n}{6} + 12 = 15$ ________	$7 + 3x = 28$ ________	$2n - 4 = 6$ ________
4.	$\frac{a}{12} - 10 = 2$ ________	$\frac{n}{10} - 9 = 1$ ________	$6n - 12 = 18$ ________
5.	$\frac{n}{6} - 12 = 0$ ________	$\frac{a}{7} - 3 = 1$ ________	$4 + 10x = 74$ ________
6.	$8a - 50 = 6$ ________	$\frac{a}{3} - 6 = 6$ ________	$12 = 9x - 15$ ________
7.	$\frac{n}{9} - 9 = 0$ ________	$\frac{a}{12} - 15 = 3$ ________	$18a - 6 = 30$ ________

Write the equation. Then solve.

8. Seven more than two times a number is 23. ______________________

9. Three times a number, increased by 4, equals 31. ______________________

10. Eight less than five times a number is 27. ______________________

11. Twice a number, decreased by 16, is 54. ______________________

ALGEBRA READINESS

NAME ____________

ALGEBRA READINESS
Solving Equations

Some equations contain multiple steps.

$2 + 6 + 4x = 80$

Combine $2 + 6 = 8$.

$$8 + 4x = 80$$
$$8 - 8 + 4x = 80 - 8$$
$$4x = 72$$
$$\frac{4x}{4} = \frac{72}{4}$$
$$x = 18$$

$$\frac{a}{4+6} - 3 = 11$$

Simplify the denominator.

$$\frac{a}{10} - 3 = 11$$
$$\frac{a}{10} - 3 + 3 = 11 + 3$$
$$\frac{a}{10} = 14$$
$$10 \times \frac{a}{10} = 14 \times 10$$
$$a = 140$$

Solve each equation.

	a		*b*	
1.	$\frac{n}{15-8} + 31 = 45$	$n =$ ______	$7 + 18 + 3x = 34$	$x =$ ______
2.	$\frac{x}{11-3} + 7 = 16$	$x =$ ______	$5d + 15 + 5 = 45$	$d =$ ______
3.	$6a - 37 = 3 + 2$	$a =$ ______	$8 + 4b + 21 = 33$	$b =$ ______
4.	$7 + \frac{u}{24-18} = 12$	$u =$ ______	$33 - 15 + 3z = 57$	$z =$ ______
5.	$8c + 108 - 95 = 45$	$c =$ ______	$\frac{h}{34-17} - 27 = 3$	$h =$ ______
6.	$\frac{w}{8-5} - 21 = 14$	$w =$ ______	$11y + 53 - 30 = 78$	$y =$ ______
7.	$27 + 23 + 10d = 60$	$d =$ ______	$49 - 44 + 13x = 96$	$x =$ ______
8.	$123 + \frac{r}{7+9} = 131$	$r =$ ______	$85 - 67 = 9 + \frac{w}{14}$	$w =$ ______
9.	$\frac{m}{36-19} - 11 = 6$	$m =$ ______	$24 - 11 = \frac{n}{3} + 6$	$n =$ ______
10.	$15 + 37 - 8 + 9b = 98$	$b =$ ______	$39 + \frac{z}{26+8-11} = 58$	$z =$ ______

NAME ______________

ALGEBRA READINESS
Solving Inequalities

An **inequality** is a mathematical sentence that contains an inequality symbol ($>$, $<$, $\geq$, $\leq$).

$>$ means *is greater than.* $<$ means *is less than.*

$\geq$ means *is greater than or equal to.* $\leq$ means *is less than or equal to.*

An inequality is solved the same way an equation is solved.

$x - 3 > 10$	$a + 5 \leq 8$
Add 3 to both sides of the inequality.	*Subtract 5 from both sides of the inequality.*
$x - 3 + 3 > 10 + 3$	$a + 5 - 5 \leq 8 - 5$
$x > 13$	$a \leq 3$

An inequality can have more than one solution.

x is any number greater than 13. a is any number less than or equal to 3.

Write *true* or *false*.

	a	b	c
1.	$7 > 2$ ________	$5 < 3$ ________	$4 \geq 2$ ________
2.	$6 \leq 5$ ________	$0 > 2$ ________	$9 \leq 9$ ________

Use the given value to tell if each inequality is *true* or *false*.

	a	b
3.	$n + 2 \geq 7$ if $n = 6$ ________	$14 \geq x + 6$ if $x = 4$ ________
4.	$3a \geq 7$ if $a = 0$ ________	$2 < 2x - 5$ if $x = 3$ ________

Give a value for the variable in each inequality.

	a	b
5.	$n + 4 > 5$ a number greater than 1	$x - 3 < 7$ ________
6.	$a + 8 < 11$ ________	$n - 5 > 3$ ________
7.	$x + 6 > 8$ ________	$a - 6 < 9$ ________
8.	$n \leq 5$ ________	$x \geq 12$ ________
9.	$a \geq 3$ ________	$n \leq 10$ ________
10.	$a + 1 > 9$ ________	$n - 1 \leq 7$ ________

ALGEBRA READINESS

NAME ______________________

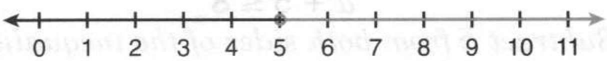
ALGEBRA READINESS
Inequalities on a Number Line

You can graph the solution of an inequality on a number line.

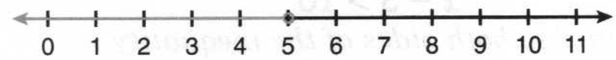
The following graphs compare x and 5.

An open dot means that 5 is not a solution.

$x > 5$

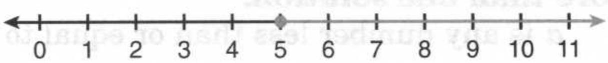


$x < 5$

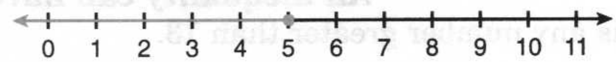


A closed dot means that 5 is a solution.

$x \geq 5$



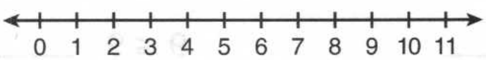
$x \leq 5$



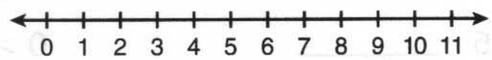
Graph each inequality on a number line.

a *b*

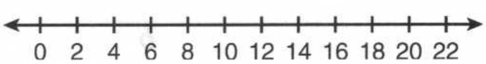
1. $d > 3$



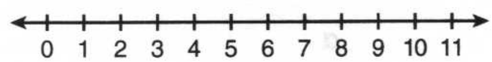
$y \leq 8$



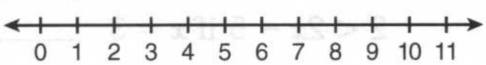
2. $x > 11$



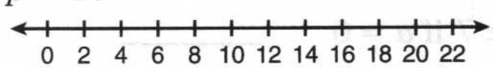
$n < 4$



3. $h \geq 0$



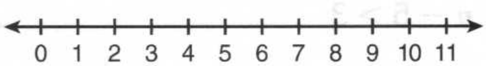
$p > 15$



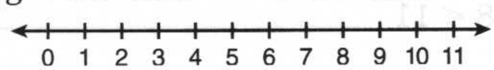
Solve each inequality. Graph the solution on a number line.

a *b*

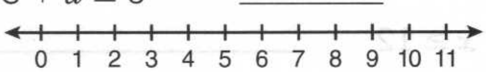
4. $a - 3 \geq 5$ ________



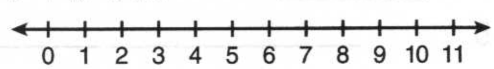
$g + 11 < 20$ ________



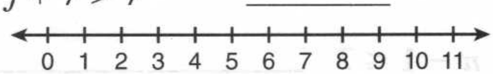
5. $3 + u \leq 6$ ________



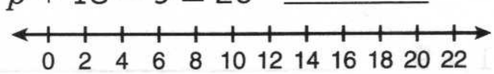
$7 + x < 15$ ________



6. $j + 7 > 7$ ________



$p + 18 - 9 \geq 20$ ________

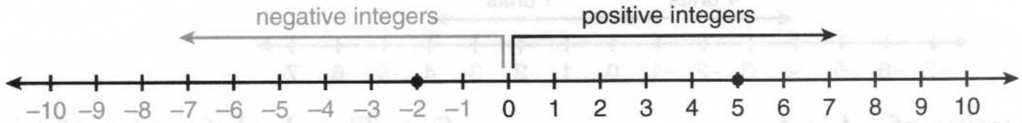


NAME ______________________

ALGEBRA READINESS
Integers

Negative and positive whole numbers are called **integers.**

Integers are often shown on a number line with zero as a starting point.

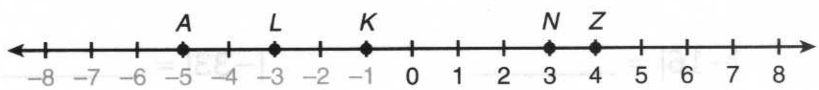


The greater of two integers is always the one farther to the right on a number line.

Say: −2 is less than 5.
Write: $-2 < 5$

Say: 5 is greater than −2.
Write: $5 > -2$

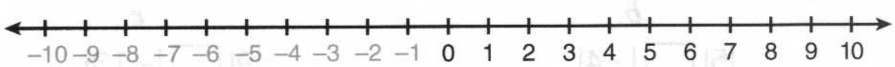
Use integers to name each point on a number line.



1. *N* ________ *L* ________ *Z* ________ *K* ________ *A* ________

Graph each point on the number line below.

2. *B*, −7 *F*, 1 *M*, 4 *P*, −4 *S*, 5



Write < or > in each ☐.

	a	*b*	*c*	*d*
3.	−1 ☐ −3	4 ☐ 2	0 ☐ 5	0 ☐ −1
4.	−4 ☐ −2	−8 ☐ 0	4 ☐ −4	−1 ☐ −7
5.	−6 ☐ 1	2 ☐ −6	−5 ☐ 0	−7 ☐ −8

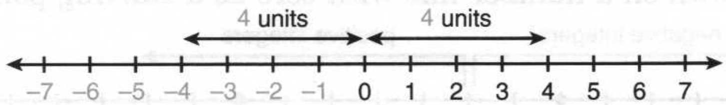
List each set of integers in order from least to greatest.

	a	*b*
6.	4, 0, −2, −1 ____________	−6, −1, 1, −5 ____________
7.	1, 0, −1, −7, −3 ____________	−2, 2, 0, −3, 3 ____________

ALGEBRA READINESS

ALGEBRA READINESS
Absolute Value

The **absolute value** of a number is the distance that number is from zero on the number line. The absolute value of a number is always positive.



Say: The absolute value of −4 is 4.
Write: $|-4| = 4$

Say: The absolute value of 4 is 4.
Write: $|4| = 4$

Write the absolute value of each number.

	a	*b*	*c*
1.	$|-7| =$ ______	$|14| =$ ______	$|0| =$ ______
2.	$|25| =$ ______	$|-16| =$ ______	$|-33| =$ ______
3.	$|-78| =$ ______	$|118| =$ ______	$|-250| =$ ______

Write < or > in each $\square$.

	a	*b*	*c*
4.	$|-6| \square |4|$	$|5| \square |-4|$	$|9| \square |-13|$
5.	$|0| \square |-5|$	$|-6| \square |-3|$	$|11| \square |15|$
6.	$|-25| \square |-23|$	$|-10| \square |0|$	$|-7| \square |-9|$
7.	$|35| \square |47|$	$|55| \square |-45|$	$|-34| \square |37|$
8.	$|-84| \square |-81|$	$|103| \square |-98|$	$|-138| \square |-157|$

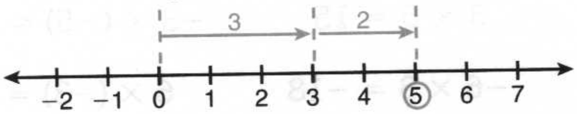
List in order from least to greatest.

	a	*b*
9.	$-5, 7, |-9|, 0$ ______________	$|-3|, -8, 5, |-7|$ ______________
10.	$0, |5|, -7, |-6|$ ______________	$-11, 10, |-9|, 11$ ______________

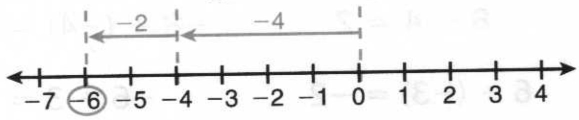
NAME ______________________

ALGEBRA READINESS
Adding and Subtracting Integers

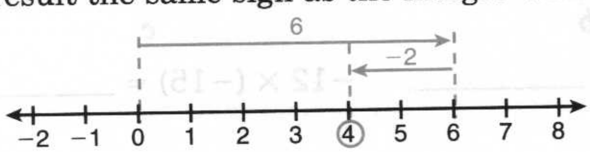
The sum of two positive integers is a **positive** integer. $3 + 2 = 5$



The sum of two negative integers is a **negative** integer. $-4 + (-2) = -6$



To add integers with different signs, **subtract** their absolute values. Give the result the same sign as the integer with the greatest absolute value. $6 + (-2) = 4$



To subtract an integer, **add** its opposite.
The subtraction problem $-8 - 3 = -11$ can be rewritten as the addition problem $-8 + (-3) = -11$. -3 is the opposite of 3.

Add.

	a	*b*	*c*	*d*
1.	$7 + (-3) =$ 4	$5 + 3 =$ ____	$-9 + 4 =$ ____	$-6 + (-2) =$ ____
2.	$-12 + 9 =$ ____	$-4 + (-6) =$ ____	$3 + 18 =$ ____	$3 + (-9) =$ ____
3.	$-1 + (-6) =$ ____	$12 + 14 =$ ____	$8 + (-6) =$ ____	$-4 + 8 =$ ____
4.	$-12 + 0 =$ ____	$-14 + (-2) =$ ____	$0 + (-1) =$ ____	$14 + (-14) =$ ____
5.	$68 + (-42) =$ ____	$-97 + 38 =$ ____	$-16 + (-16) =$ ____	$48 + 52 =$ ____

Subtract.

6.	$8 - (-4) =$ 12	$10 - 6 =$ ____	$-8 - 5 =$ ____	$9 - (-6) =$ ____
7.	$21 - 15 =$ ____	$18 - (-9) =$ ____	$10 - (-5) =$ ____	$-6 - (-5) =$ ____
8.	$-4 - 9 =$ ____	$-8 - 6 =$ ____	$-12 - (-7) =$ ____	$5 - 11 =$ ____
9.	$16 - 31 =$ ____	$-8 - 12 =$ ____	$-4 - 0 =$ ____	$-5 - 2 =$ ____
10.	$2 - (-15) =$ ____	$-8 - (-18) =$ ____	$9 - (-17) =$ ____	$0 - 8 =$ ____

NAME ____________________

ALGEBRA READINESS
Multiplying and Dividing Integers

The product of two integers with **like** signs is **positive.** $3 \times 5 = 15$ $-3 \times (-5) = 15$

The product of two integers with **unlike** signs is **negative.** $-6 \times 3 = -18$ $6 \times (-3) = -18$

The quotient of two integers with **like** signs is **positive.** $8 \div 4 = 2$ $-8 \div (-4) = 2$

The quotient of two integers with **unlike** signs is **negative.** $6 \div (-3) = -2$ $-6 \div 3 = -2$

State whether each answer is positive or negative.

	a	*b*	*c*
1.	$18 \times (-7) =$ negative	$6 \times (-48) =$ ______	$-12 \times (-15) =$ ______
2.	$-18 \div (-9) =$ ______	$54 \div (-6) =$ ______	$-56 \div 7 =$ ______

Multiply or divide.

	a	*b*	*c*
3.	$8 \times (-9) =$ -72	$-9 \times (-6) =$ ______	$-12 \times 8 =$ ______
4.	$-56 \div (-7) =$ ______	$-54 \div 9 =$ ______	$96 \div (-8) =$ ______
5.	$11 \times (-8) =$ ______	$72 \div 9 =$ ______	$10 \times (-10) =$ ______
6.	$63 \div (-9) =$ ______	$-35 \div 5 =$ ______	$126 \times (-1) =$ ______
7.	$7 \times (-7) =$ ______	$235 \div (-1) =$ ______	$-634 \times 0 =$ ______
8.	$-64 \div (-8) =$ ______	$0 \div (-147) =$ ______	$-12 \times (-12) =$ ______

Write *true* or *false*. If false, state the reason.

9. The product of two positive integers is never negative. ____________________

10. The product of two negative integers is always negative. ____________________

11. The quotient of two negative integers is always positive. ____________________

NAME ____________________

ALGEBRA READINESS
Powers and Exponents

Numbers can be expressed in different ways. $10\,000 = 10 \times 10 \times 10 \times 10$
A shorter way to express 10 000 is by using **exponents.** $10\,000 = 10^4$
An exponent tells how many times a number, called the **base,** is used as a factor.

$$\text{base} \rightarrow 10^6 \;(\leftarrow \text{exponent}) = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1\,000\,000$$

$$2^4 = 2 \times 2 \times 2 \times 2 = 16$$

Numbers that are expressed using exponents are called **powers.**

Write each power as the product of the same factor.

	a		*b*	
1.	8^4	$8 \times 8 \times 8 \times 8$	9^3	______
2.	23^2	______	1^6	______
3.	10^5	______	2^7	______
4.	6^3	______	49^4	______

Use exponents to express the following.

	a		*b*	
5.	$3 \times 3 \times 3 \times 3$	3^4	$9 \times 9 \times 9$	______
6.	15×15	______	$2 \times 2 \times 2 \times 2 \times 2 \times 2$	______
7.	$1 \times 1 \times 1 \times 1$	______	$4 \times 4 \times 4 \times 4 \times 4$	______
8.	$12 \times 12 \times 12$	______	$10 \times 10 \times 10$	______

Evaluate each expression.

	a		*b*	
9.	x^3 if $x = 5$	125	n^2 if $n = 9$	______
10.	a^5 if $a = 2$	______	b^7 if $b = 10$	______
11.	x^2 if $x = 15$	______	n^4 if $n = 3$	______

ALGEBRA READINESS

NAME ______________________

ALGEBRA READINESS
Negative Exponents

Numbers between 0 and 1 can be expressed using **negative exponents.**

Any nonzero number raised to a negative power is the same as 1 divided by that number raised to the absolute value of the power.

$$x^{-a} = \frac{1}{x^a}$$

$$10^{-3} = \frac{1}{10^3} = \frac{1}{10 \times 10 \times 10} = \frac{1}{1000} \qquad 3^{-5} = \frac{1}{3^5} = \frac{1}{3 \times 3 \times 3 \times 3 \times 3} = \frac{1}{243}$$

Rewrite each expression using a positive exponent. Then write it in expanded form.

	a	*b*
1.	$10^{-2} = \frac{1}{10^2} = \frac{1}{10 \times 10}$	$8^{-4} =$ ________
2.	$6^{-3} =$ ________	$11^{-4} =$ ________
3.	$5^{-5} =$ ________	$18^{-3} =$ ________
4.	$2^{-7} =$ ________	$12^{-5} =$ ________

Use negative exponents to rewrite the following.

	a		*b*	
5.	$\frac{1}{5 \times 5 \times 5}$	5^{-3}	$\frac{1}{3 \times 3 \times 3 \times 3}$	________
6.	$\frac{1}{14 \times 14 \times 14 \times 14}$	________	$\frac{1}{8 \times 8 \times 8}$	________
7.	$\frac{1}{10 \times 10 \times 10 \times 10 \times 10}$	________	$\frac{1}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}$	________
8.	$\frac{1}{24 \times 24 \times 24 \times 24}$	________	$\frac{1}{15 \times 15 \times 15 \times 15 \times 15 \times 15}$	________

Evaluate each expression.

	a		*b*	
9.	a^{-2} if $a = 3$	$\frac{1}{9}$	x^{-4} if $x = 2$	________
10.	b^{-3} if $b = 5$	________	m^{-4} if $m = 4$	________

NAME ______________________

ALGEBRA READINESS
Multiplying and Dividing Powers

To **multiply** powers *that have the same base,* **add** the exponents.

$$a^m \times a^n = a^{m+n}$$
$$10^3 \times 10^2 = 10^{3+2} = 10^5$$

To **divide** powers *that have the same base,* **subtract** the exponents.

$$a^m \div a^n = a^{m-n}$$
$$10^3 \div 10^2 = 10^{3-2} = 10^1$$

Find each product.

	a		*b*		*c*	
1.	$5^3 \times 5^6$	5^9	$3^2 \times 3^4$	______	$n^6 \times n^2$	______
2.	$9^3 \times 9^1$	______	$x \times x$	______	$10^4 \times 10^4$	______
3.	$12^3 \times 12^4$	______	$a \times a^5$	______	$15^5 \times 15^3$	______

Verify each product by replacing the powers with their values.

	a		*b*	
4.	$3^3 \times 3^2 = 3^5$	$27 \times 9 = 243$	$2^2 \times 2^3 = 2^5$	______
5.	$3 \times 3^4 = 3^5$	______	$5 \times 5 = 5^2$	______
6.	$2^4 \times 2^2 = 2^6$	______	$3^2 \times 3^2 = 3^4$	______

Find each quotient.

	a		*b*		*c*	
7.	$7^7 \div 7^2$	7^5	$a^4 \div a^2$	______	$8^3 \div 8^1$	______
8.	$9^5 \div 9^2$	______	$6^{12} \div 6^6$	______	$5^8 \div 5^3$	______
9.	$4^4 \div 4$	______	$7^6 \div 7^5$	______	$15^4 \div 15^3$	______

ALGEBRA READINESS

Verify each quotient by replacing the powers with their values.

	a		*b*	
10.	$3^4 \div 3^2 = 3^2$	$81 \div 9 = 9$	$2^5 \div 2^3 = 2^2$	______
11.	$4^3 \div 4 = 4^2$	______	$5^2 \div 5 = 5$	______
12.	$3^3 \div 3 = 3^2$	______	$10^5 \div 10^2 = 10^3$	______

ALGEBRA READINESS
Scientific Notation

NAME ____________________

A number written in **scientific notation** is shown as the product of a factor between 1 and 10 and a power of 10.

30 000 — Move the decimal point 4 places to the left. Multiply by 10^4.	0.0003 — Move the decimal point 4 places to the right. Multiply by 10^{-4}.
3×10^4	3×10^{-4}
$5\ 780\ 000 = 5.78 \times 10^6$	$0.006\ 23 = 6.23 \times 10^{-3}$

Express each of the following in scientific notation.

	a		*b*		*c*	
1.	6300	6.3×10^3	7000	______	540	______
2.	0.5	______	0.006	______	0.0007	______
3.	690	______	0.20	______	50 000	______
4.	0.0017	______	0.064	______	8 000 000	______
5.	0.609	______	0.003	______	0.0852	______

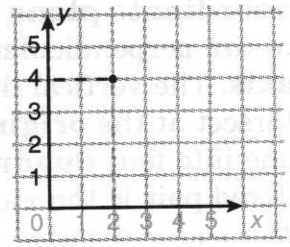
Express each scientific notation as indicated.

	a		*b*		*c*	
6.	7.5×10^2	750	3×10^3	______	9×10^4	______
7.	5×10^{-3}	______	8×10^{-1}	______	4×10^{-2}	______
8.	6.5×10^2	______	9.04×10^3	______	7×10^{-1}	______
9.	6.47×10^2	______	1.2×10^3	______	5.8×10^{-2}	______
10.	2×10^{-2}	______	0.2×10^3	______	8.1×10^3	______

NAME ______________________

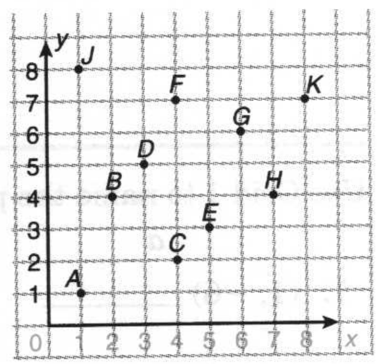
ALGEBRA READINESS
Ordered Pairs

The location of any point on a grid can be indicated by an **ordered pair** of numbers. Point *A* on the grid at the right is indicated by the ordered pair (2, 4) because it is located at 2 on the horizontal scale *x*, and at 4 on the vertical scale *y*. The number on the horizontal scale *x* is always named first in an ordered pair. (0, 0) is called the **origin**.



Use Grid 1 to name the point for each ordered pair.

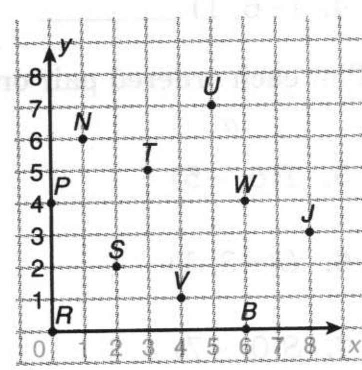
Grid 1



	a		*b*
1.	(4, 2) C		(7, 4) ______
2.	(8, 7) ______		(2, 4) ______
3.	(6, 6) ______		(3, 5) ______
4.	(5, 3) ______		(1, 1) ______
5.	(4, 7) ______		(1, 8) ______

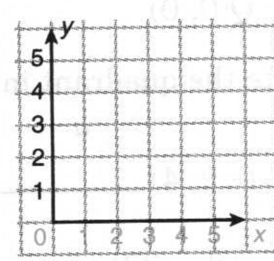
Use Grid 2 to find the ordered pair for each labelled point.

Grid 2



	a		*b*
6.	*J* (8, 3)		*N* ______
7.	*S* ______		*W* ______
8.	*R* ______		*B* ______
9.	*T* ______		*V* ______
10.	*U* ______		*P* ______

Locate four points on the grid and name each ordered pair.



	a		*b*
11.	*A* ______		*C* ______
12.	*Z* ______		*R* ______

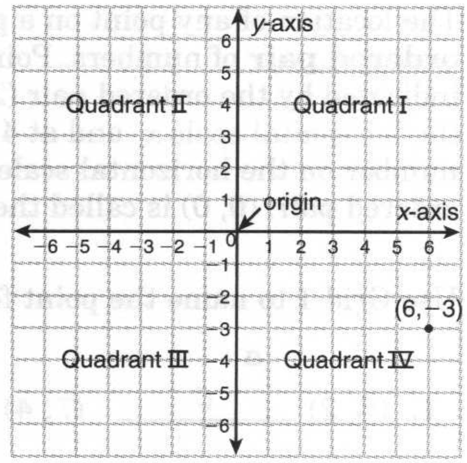
ALGEBRA READINESS

NAME ______________________

ALGEBRA READINESS
Graphing in Four Quadrants

A **coordinate plane** is formed by two number lines that are perpendicular. The horizontal line is the ***x*-axis.** The vertical line is the ***y*-axis.** The axes intersect at the **origin.** The axes divide the coordinate plane into four **quadrants.** The first number in an ordered pair is the ***x*-coordinate.** The second number is the ***y*-coordinate.**

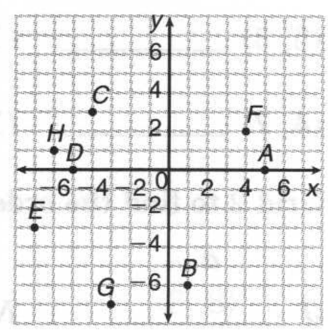
To plot the point (6, −3) on a coordinate plane, start at 0 and move 6 units right then 3 units down.



Use Grid 1 to name the point for each ordered pair.

	a	*b*
1.	(1, −6) ________	(−3, −7) ________
2.	(−5, 0) ________	(4, 2) ________
3.	(−7, −3) ________	(5, 0) ________
4.	(−6, 1) ________	(−4, 3) ________

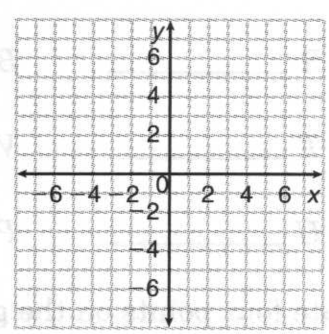
Grid 1



Plot each ordered pair on Grid 2.

	a	*b*
5.	*T*(6, −5)	*R*(−4, 0)
6.	*U*(−3, 1)	*P*(−7, 2)
7.	*S*(0, −7)	*W*(1, −2)
8.	*Q*(0, 0)	*V*(2, 7)

Grid 2



State the quadrant in which each ordered pair would be located.

	a	*b*	*c*
9.	(−9, 4) __________	(5, −1) __________	(−3, −3) __________
10.	(18, −33) __________	(12, 20) __________	(−34, 42) __________

NAME ____________________

ALGEBRA READINESS
Making Function Tables

A **function** is a rule that states for each value of one variable that there is exactly one related value for the other variable.

For example, $y = 3x - 6$ is a function.

A **function table** organizes values of a function.

Each x-value and its corresponding y-value can be thought of as ordered pairs.

x	y
1	−3
2	0
3	3
4	6

$y = 3x - 6$
let $x = 1, 2, 3, 4$
$y = 3(1) - 6$
$y = -3$

Make a function table for each function and the given values of x.

a *b* *c*

1. $y = 8 + 2x$
let $x = -4, -2, 0, 2, 4$

$y = \frac{3x}{2}$
let $x = -2, -1, 0, 1, 2$

$y = 12 - 8x$
let $x = 0, 1, 2, 3, 4$

2. $y = 5x - 15$
let $x = -5, 0, 1, 3, 8$

$y = \frac{x}{4} - 5$
let $x = -8, -4, 0, 4, 8$

$y = \frac{x}{3} + 4$
let $x = -9, -3, 0, 6, 12$

Write the function that is represented by each function table.

3.

x	y
−2	−9
−1	−8
0	−7
1	−6
2	−5

____

x	y
0	0
2	−6
4	−12
6	−18
8	−24

____

x	y
−1	−1
0	1
1	3
2	5
3	7

____

ALGEBRA READINESS

ALGEBRA READINESS
Graphing Linear Functions

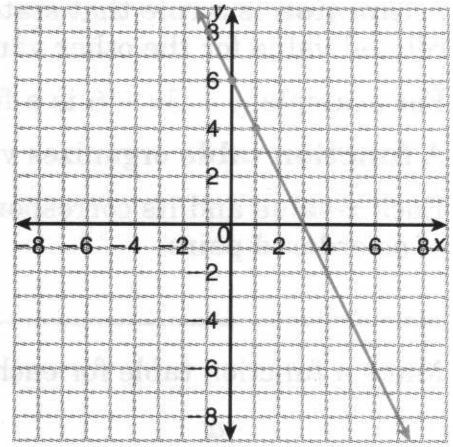
NAME ______________________

A **linear function** is one that can be represented on a coordinate plane as a straight line.

To graph a linear function, create a function table with at least two ordered pairs. Then plot these ordered pairs on a coordinate plane and draw a line through the points.

Graph the linear function $y = 6 - 2x$.

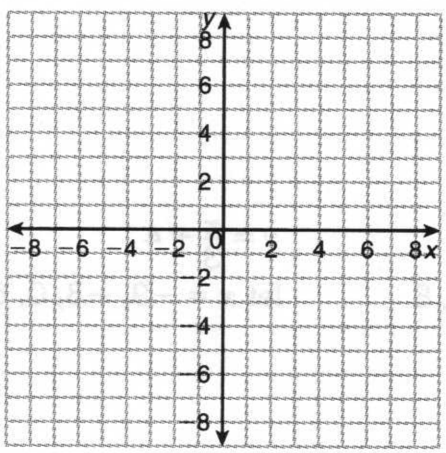
x	y
−1	8
0	6
1	4



Graph each linear function.

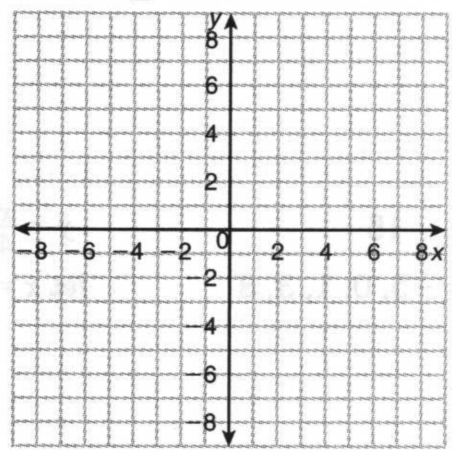
a

1. $y = -2x$

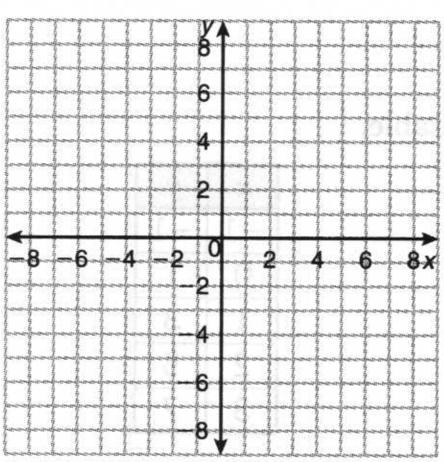


b

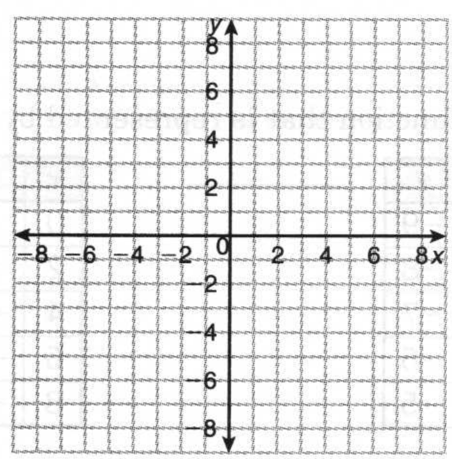
$y = 7 - \frac{x}{2}$



2. $y = 5x - 4$



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

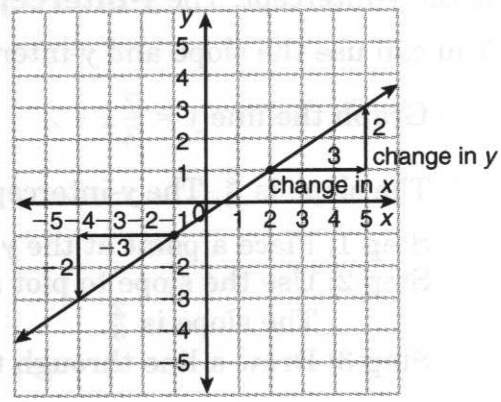


NAME ____________________

ALGEBRA READINESS
Slope

The slope of a line is the ratio of the change in y to the corresponding change in x.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$



In Quadrant I, the change in y is 2 and the corresponding change in x is 3. Therefore, the slope of the line is $\frac{2}{3}$.

The slope of the line is the same in Quadrant III.

$$\frac{\text{change in } y}{\text{change in } x} = \frac{-2}{-3} \text{ or } \frac{2}{3}$$

To find the slope of a line when given two ordered pairs on that line: find the ratio of the difference in the y-coordinates and the difference in the x-coordinates.

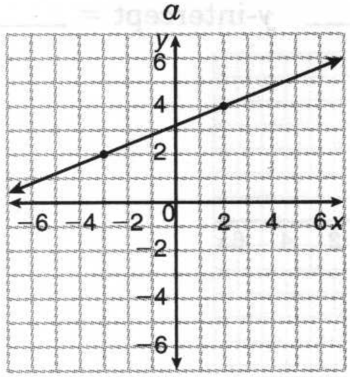
Find the slope of the line passing through (6, −4) and (3, 2).

$$\text{Slope} = \frac{-4-2}{6-3} = \frac{-6}{3} = \frac{-2}{1}$$

Find the slope of each graphed line.

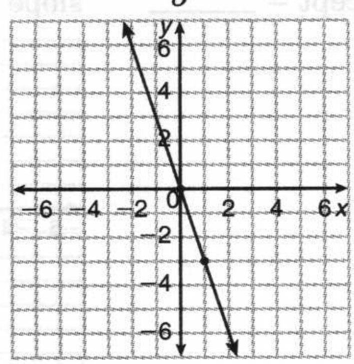
1.

a



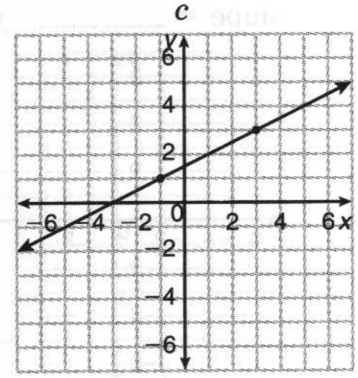
slope = ________

b



slope = ________

c



slope = ________

Find the slope of the line passing through each pair of points.

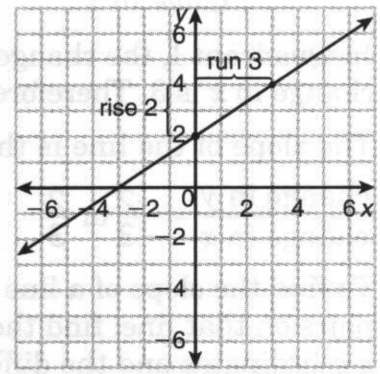
	a	*b*	*c*
2.	(5, −7), (3, 2)	(3, −1), (−3, −4)	(−4, −2), (8, −6)
	slope = ________	slope = ________	slope = ________
3.	(6, −5), (7, −3)	(−4, 1), (0, 0)	(1, −3), (4, −1)
	slope = ________	slope = ________	slope = ________

ALGEBRA READINESS

ALGEBRA READINESS
Slope-Intercept Form

The **slope-intercept form** of a linear equation is $y = mx + b$, where m is the slope and b is the y-intercept. The ***y*-intercept** of a line is the point where the line crosses the y-axis.

You can use the slope and y-intercept to graph a line.



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

The slope is $\frac{2}{3}$. The y-intercept is 2.

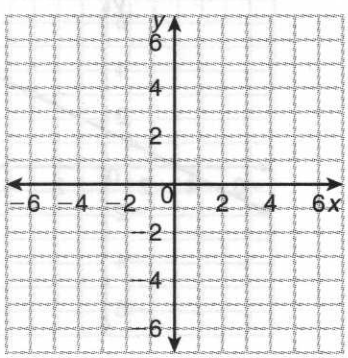
Step 1: Place a point at the y-intercept, 2.
Step 2: Use the slope to plot another point.
The slope is $\frac{2}{3}$.
Step 3: Draw a line through the two points.

Name the slope and y-intercept of each line. Then graph the line.

a | *b*

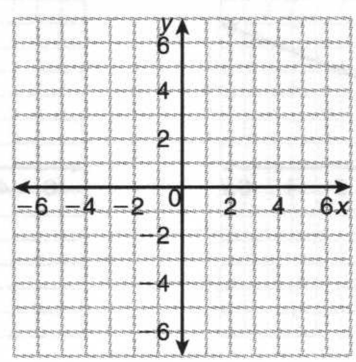
1. $y = -\frac{1}{2}x + 3$

slope = ________ y-intercept = ________



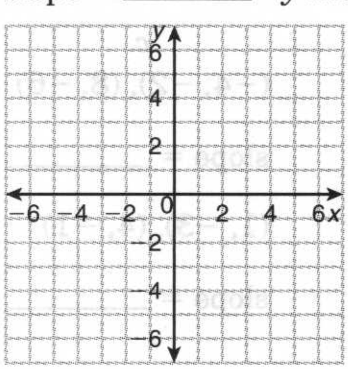
$y = 3x - 2$

slope = ________ y-intercept = ________



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

slope = ________ y-intercept = ________



$y = -4x + 1$

slope = ________ y-intercept = ________