GRADE ~~11~~ 12 ESSENTIAL

UNIT X

PRIOR STUDIES REVIEW

WORKBOOK 2

ALGEBRA READINESS

A complete and fundamental set of skills to help with all levels of algebra

Contents: Equations, *Properties of Numbers*, Evaluating, *Solving Equations*, Solving Inequalities, *Integers* (Negative Numbers), Exponents, ~~Negative Exponents~~, *Graphing Functions*

Workbooks are designed for *you* to study and complete primarily on your own

file: GR11ESS_X_AlgebraReady

PRISM PURPLE

ALGEBRA

READINESS

pp. 239 – 262

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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. $35 \times 25 = 875$ ____________________

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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:** $0 \div (8xy) =$ ______

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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.	$w \times (z + x + y) =$ ________	$(z \times w) + (z \times x) + (z \times y) =$ ________

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Evaluating Expressions

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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.	$24 - 10 - 3 \times 4 = 2$ ______	$42 \div 7 \times 6 = 1$ ______

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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.	$35 = n + 15$	________	$x + 18 = 19$	________

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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? ______________________

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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.	$\frac{n}{15} = 38$	______	$x \times 53 = 3445$	______

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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.	$\frac{n}{9} - 9 = 0$ ______	$\frac{a}{12} - 15 = 3$ ______	$18a - 6 = 30$ ______

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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. ______________________

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Solving Equations

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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.	$15 + 37 - 8 + 9b = 98$	$b =$ ______	$39 + \frac{z}{26+8-11} = 58$	$z =$ ______

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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.

$x - 3 > 10$

Add 3 to both sides of the inequality.

$x - 3 + 3 > 10 + 3$

$x > 13$

$a + 5 \leq 8$

Subtract 5 from both sides of the inequality.

$a + 5 - 5 \leq 8 - 5$

$a \leq 3$

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.	$a + 1 > 9$ ______	$n - 1 \leq 7$ ______

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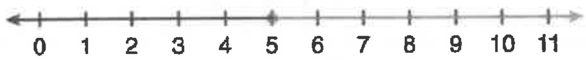
Inequalities on a Number Line

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

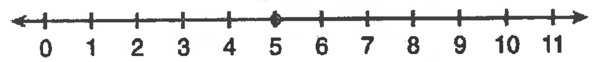
The following graphs compare x and 5.

An open dot means that 5 is not a solution.

$x > 5$

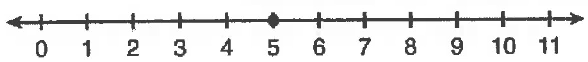


$x < 5$

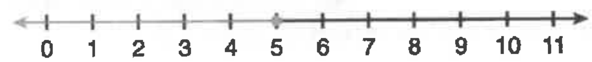


A closed dot means that 5 is a solution.

$x \geq 5$



$x \leq 5$

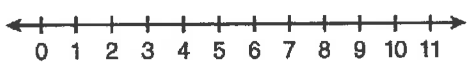


Graph each inequality on a number line.

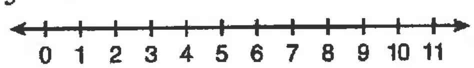
a

b

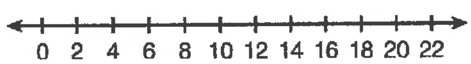
1. $d > 3$



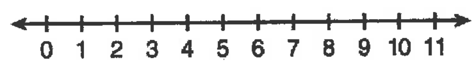
$y \leq 8$



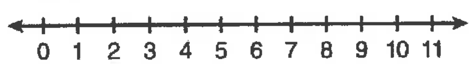
2. $x > 11$



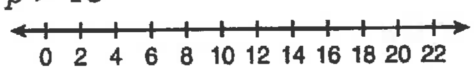
$n < 4$



3. $h \geq 0$



$p > 15$

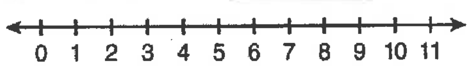


Solve each inequality. Graph the solution on a number line.

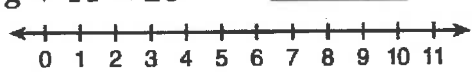
a

b

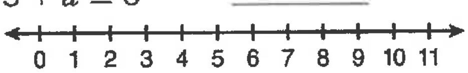
4. $a - 3 \geq 5$ ________



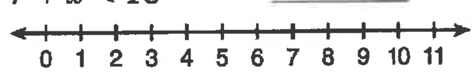
$g + 11 < 20$ ________



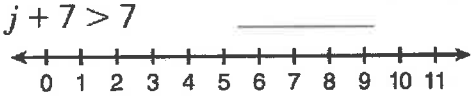
5. $3 + u \leq 6$ ________



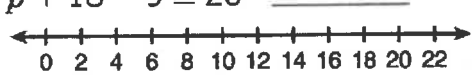
$7 + x < 15$ ________



6. $j + 7 > 7$ ________



$p + 18 - 9 \geq 20$ ________



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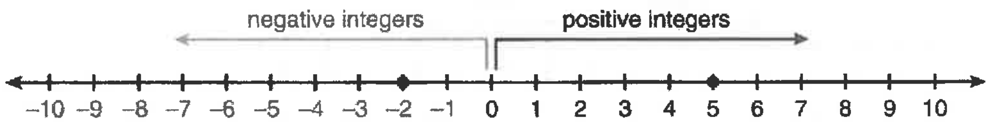
ALGEBRA READINESS
Integers

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

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

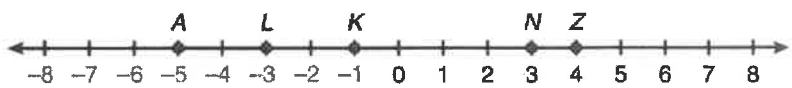


The greater of two integers is always the one farther to the right on a number line.

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

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

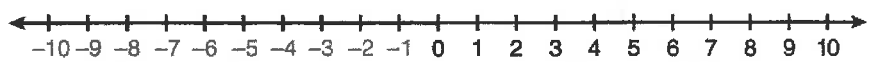
Use integers to name each point on a number line.



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

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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 ____________

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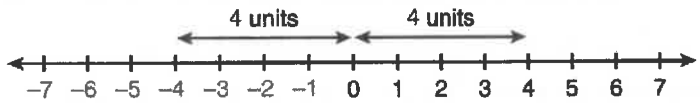
ALGEBRA READINESS
Absolute Value

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 □.

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

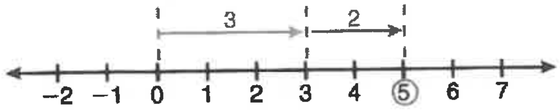
List in order from least to greatest.

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

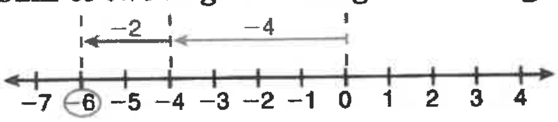
NAME ______________________

ALGEBRA READINESS
Adding and Subtracting Integers

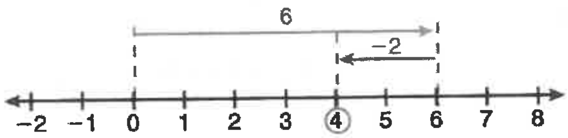
The sum of two positive integers is a **positive** integer. $3 + 2 = 5$



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.**
The product of two integers with unlike signs is negative.

$3 \times 5 = 15$ $\quad -3 \times (-5) = 15$

$-6 \times 3 = -18$ $\quad 6 \times (-3) = -18$

The quotient of two integers with **like** signs is **positive.**
The quotient of two integers with unlike signs is negative.

$8 \div 4 = 2$ $\quad -8 \div (-4) = 2$

$6 \div (-3) = -2$ $\quad -6 \div 3 = -2$

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.

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

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

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 $n = 3$	________

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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.

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

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

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 $m = 4$	______

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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.	$4^4 \div 4$ ______	$7^6 \div 7^5$ ______	$15^4 \div 15^3$ ______

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

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ALGEBRA READINESS
Scientific Notation

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	________

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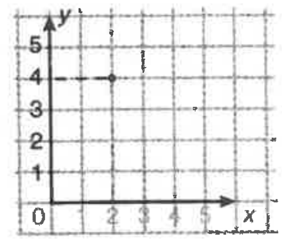
ALGEBRA READINESS
Ordered Pairs

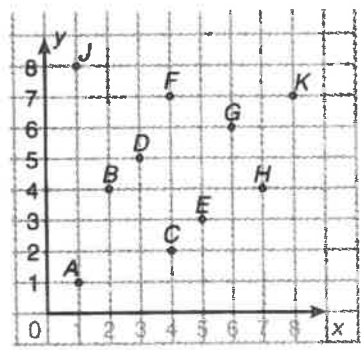
The location of any point on a grid can be indicated by an **ordered pair** of numbers. Point *A* on the grid at the right is indicated by the ordered pair (2, 4) because it is located at 2 on the horizontal scale *x*, and at 4 on the vertical scale *y*. The number on the horizontal scale *x* is always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



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

	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)	________

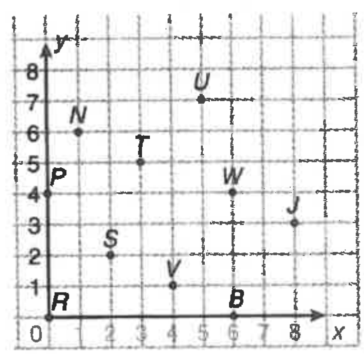
Grid 1



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

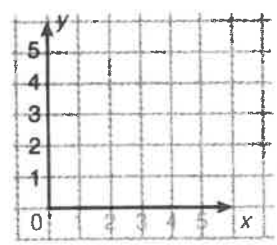
	a		*b*	
6.	*J*	(8, 3)	*N*	________
7.	*S*	________	*W*	________
8.	*R*	________	*B*	________
9.	*T*	________	*V*	________
10.	*U*	________	*P*	________

Grid 2



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

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



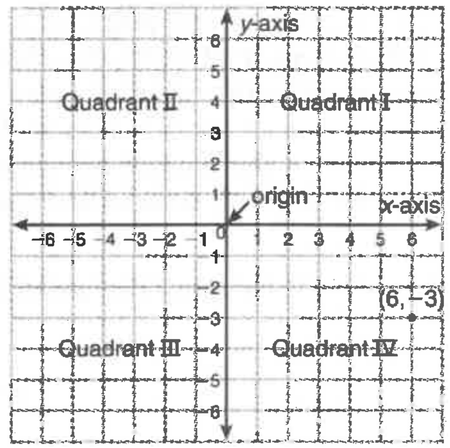
ALGEBRA READINESS

ALGEBRA READINESS
Graphing in Four Quadrants

NAME ______________________

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.**

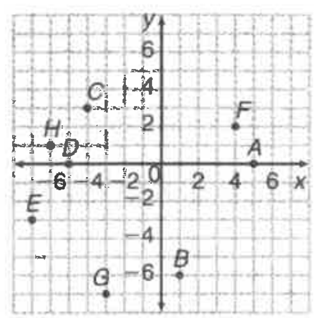
To plot the point (6, −3) on a coordinate plane, start at 0 and move 6 units right then 3 units down.



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) ________

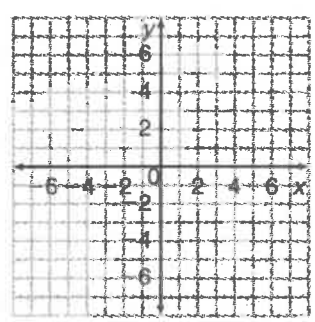
Grid 1



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 $x = -9, -3, 0, 6, 12$

ALGEBRA READINESS

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

____

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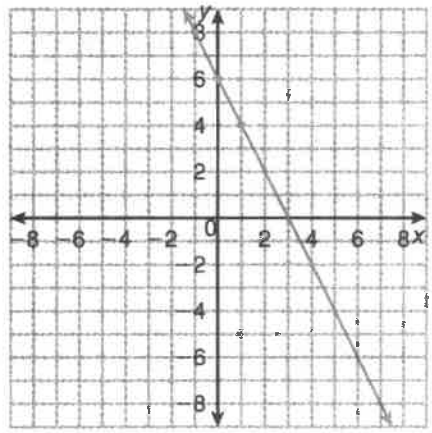
ALGEBRA READINESS
Graphing Linear Functions

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.

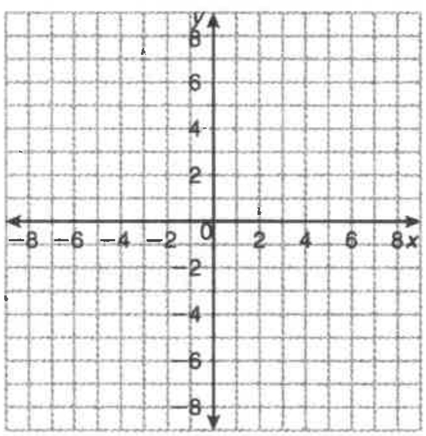
Graph the linear function $y = 6 - 2x$.

x	y
−1	8
0	6
1	4

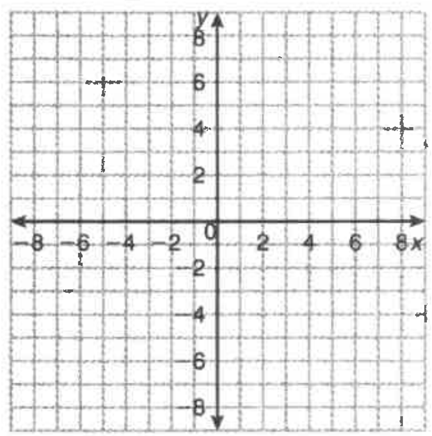


Graph each linear function.

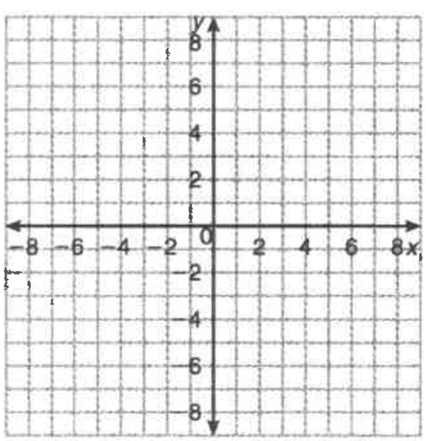
1. *a* $y = -2x$



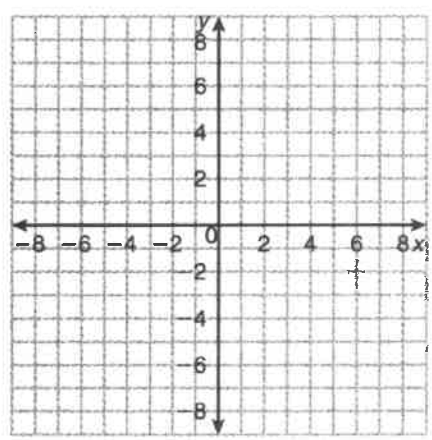
b $y = 7 - \frac{x}{2}$



2. *a* $y = 5x - 4$



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



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ALGEBRA READINESS
Slope

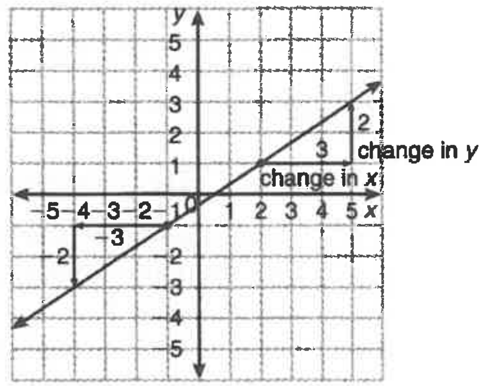
The slope of a line is the ratio of the change in y to the corresponding change in x.

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

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.

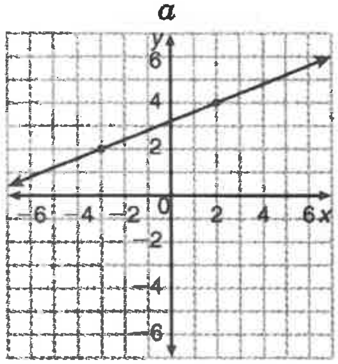
Find the slope of the line passing through (6, −4) and (3, 2).

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

Find the slope of each graphed line.

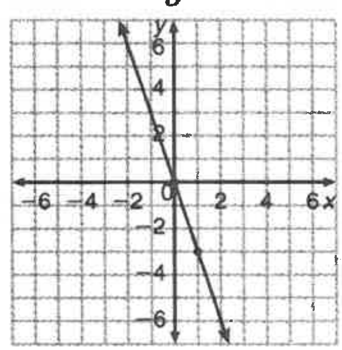
1.

a



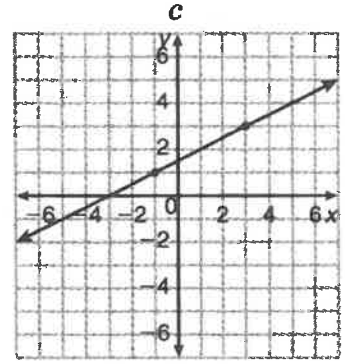
slope = ________

b



slope = ________

c



slope = ________

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

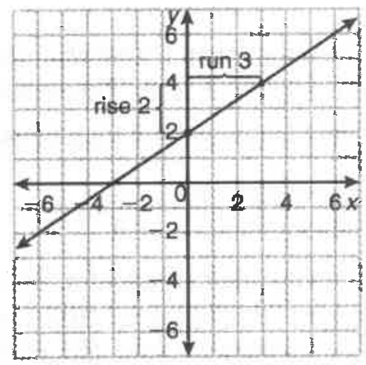
	a	*b*	*c*
2.	(5, −7), (3, 2)	(3, −1), (−3, −4)	(−4, −2), (8, −6)
	slope = ________	**slope =** ________	**slope =** ________
3.	(6, −5), (7, −3)	(−4, 1), (0, 0)	(1, −3), (4, −1)
	slope = ________	**slope =** ________	**slope =** ________

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.



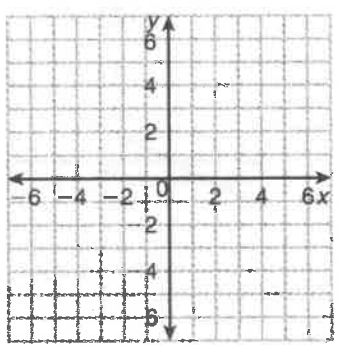
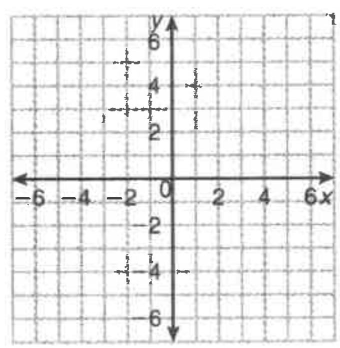
Graph the line $y = \frac{2}{3}x + 2$.

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

	a	*b*
2.	$y = \frac{3}{4}x - 5$	$y = -4x + 1$
	slope = ______ y-intercept = ______	slope = ______ y-intercept = ______