Westside

Summer
Enrichment Packet

Algebra 1

<u>Note to Student</u>: You've learned so much in the past years! It is important that you keep practicing your mathematical knowledge over the summer to be ready for the coming year. In this packet, you will find review topics from previous math courses that are important for your success in Algebra 1.

<u>Instructions:</u>

- Try to do all problems <u>without using a calculator.</u>
- Print and complete problems, using a separate sheet of paper to show your work as needed. Circle your answers. You may also complete all work on a separate sheet of paper without printing the packet.
- Turning in your completed packet with all of your work upon returning to school can earn you extra credit for the first cycle!

Here are some helpful websites you can check out if you get stuck on your summer packet ☺:

www.khanacademy.org

www.ixl.com

www.brainpop.com

www.math.com

www.purplemath.com

www.mathleague.com/index.php/about-the-math-league/mathreference

PACE YOURSELF AND HAVE FUN!

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Section 1

Algebraic expressions

Connecting with Algebra

A mathematical expression is a grouping of numbers that contains no equal sign. A numerical expression contains one or more numbers and/or one or more operations.

14 $\quad 5 + 4$ $\quad 8.9$ $\quad 13 - 6 + 10$ $\quad 12 \div 3 \cdot 5$

A variable is a symbol (usually a letter) that represents one or more numbers. An algebraic expression contains one or more variables and can also contain one or more operations.

$2n$ (meaning $2 \times n$) $\quad \frac{x}{y}$ (meaning x divided by y) $\quad s + 7 - t$

To evaluate an algebraic expression, replace each variable with a number and find its numerical value.

$7n$, $n = 4$ (4 is the value given for n)	$5rs$, $r = 2$, $s = 10$	$\frac{t}{e}$, $t = 4$, $e = 2$
$7 \cdot n = 7 \cdot 4$ (substitute 4 for n)	$5 \cdot r \cdot s = 5 \cdot 2 \cdot 10$	$\frac{t}{e} = 4 \div 2$
$= 28$ (the result)	$= 100$	$= 2$

Circle each problem that is an expression. Write an X if it is not an expression.

1) $5 + 4 - 2 = 7$	**2)** $10 \div 5 - 3$	**3)** $7 + t = 18$	**4)** $4 + r$

Evaluate each expression.

5) $6 + 10 - 5$	**6)** $\frac{a}{b}$; $a = 45, b = 15$	**7)** $8w$; $w = 3$
8) $e - f$; $e = 7, f = 21$	**9)** $j \cdot k \cdot h$; $j = 2, k = 6, h = 7$	**10)** $x + y$; $x = 21, y = 13$

Write an algebraic expression for each description below.

11) 9 *more than r*	**12)** *twice the number x*	**13)** *three times the number a divided by* 10

Section 2

Order of operations

Connecting with Algebra

To simplify an expression, use the order of operations to calculate the answer. The order of operations is as follows:

1. parentheses ( ) and brackets [ ], called grouping symbols (worked from the inside out)
2. exponents
3. multiplication and division (worked from left to right)
4. addition and subtraction (worked from left to right)

$5 + 12 \div 4$	$6[10 - (2 + 8)]$	$9 - 3y$, $y = 2$	$7a - 9b$, $a = 3$, $b = 2$
$5 + 3$	$6[10 - 10]$	$9 - 3 \bullet 2$	$7 \bullet 3 - 9 \bullet 2$
8	$6 \bullet 0$	$9 - 6$	$21 - 18$
	0	3	3

State the first operation to be performed in each expression.

1) $4 \cdot 7 - 5$	**2)** $(10 + 4) - 2 \cdot 5$	**3)** $9 + 8 \div 2$	**4)** $2(4(12 - 7) + 5$

Simplify each expression.

5) $2(5 - (3 + 1) + 13)$	**6)** $24 - (18 + 4 - 10 \cdot 2)$	**7)** $33 - 4(15 \div 3)$

Evaluate each algebraic expression.

8) $7a - 3 \cdot 5;\ a = 5$	**9)** $14 \cdot 4 \div r;\ r = 2$	**10)** $12x + 7;\ x = 5$
11) $18 - 3x;\ x = 4$	**12)** $16 + y \div 8;\ y = 48$	**13)** $22 - 22 \div t;\ t = 2$

Section 3

Exponents and powers

Connecting with Algebra

Exponents are used to represent repeated multiplication. An exponent represents the number of times the base is used as a factor. For example, 3^4 is an expression used to represent 3 that is a factor 4 times. The number 3 is the base, the number 4 is the exponent, and 3^4 is the power.

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^5$

$3 \cdot 3 \cdot 5 \cdot 5 \cdot 5 \cdot 5 = 3^2 5^4$

Evaluate x^3 when $x = 4$

$x^3 = 4 \cdot 4 \cdot 4$

$= 64$

$(2x)^2$, $x = 3$

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

$= 36$

It is important to remember the order of operations when evaluating expressions that involve exponents. Remember: parentheses, exponents, multiplication/division, and addition/subtraction.

Write each expression in exponent form.

1) $a \cdot a \cdot b \cdot b \cdot b$	**2)** $9 \cdot 9$	**3)** $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 5 \cdot 5 \cdot 5 \cdot 5$	**4)** $x \cdot x \cdot x \cdot y$

Simplify each expression.

5) 2^3	**6)** $(35 - 5)^2 + 15$	**7)** 6^2	**8)** $35 - 5^2$
9) $7^2 \cdot 2$	**10)** $6^2 - 3 \cdot 5$	**11)** $(8 + 2)^3$	**12)** $5^3 \cdot 3$

Evaluate each algebraic expression.

13) $4x^2 + 2x;\ x = 4$	**14)** $6r^2 + r;\ r = 5$	**15)** $k^2 - 2k + 12;\ k = 4$
16) $18 - 3x;\ x = 4$	**17)** $16 + y \div 8;\ y = 48$	**18)** $22 - 22 \div t;\ t = 2$

Section 4

Geometric formulas

Connecting with Algebra

Just as variables are used in algebra, they are also used in geometric situations. Geometric formulas often use letters to represent the sides of geometric shapes. The **perimeter** of a figure is the total distance around. The **area** of a figure is the number of square units it contains. The perimeter and area of geometric figures can be represented with formulas.

Perimeter of a square = $4s$, where s is the length of one side

Perimeter of a rectangle = $2\ell + 2w$, where ℓ is the length and w is the width

Area of a square = s^2, where s is the length of one side

Area of a rectangle = ℓw, where ℓ is the length and w is the width

Area of a triangle = $\frac{1}{2}bh$, where b is the base and h is the height

Look at these examples.

The area of a square with a side length of 4 inches:

$a = s^2 = 4^2 = 4 \bullet 4 = 16$ in.^{2}

The perimeter of a rectangle with a length of 10 cm and a width of 3 cm:

$P = 2\ell + 2w = 2 \bullet 10 + 2 \bullet 3 = 20 + 6 = 26$ cm

Use $P = 4s$ to find the perimeter of each square.

1) $s = 12\ ft$	**2)** $s = 20\ cm$	**3)** $s = 7\ in$	**4)** $s = 18\ mm$

Use $P = 2l + 2w$ to find the perimeter of each rectangle.

5) $l = 13\ in,\ w = 5\ in$	**6)** $l = 2\ cm,\ w = 20\ cm$

First identify the formula to use, then use it to find the area of the figure given its dimensions.

7) $b = 7\ in,\ h = 4\ in$	**8)** $s = 6\ cm$	**9)** $l = 15\ ft;\ w = 3\ ft$

Section 5

Commutative and associative properties

Connecting with Algebra

The commutative property of addition: For all numbers a and b, $a + b = b + a$.

The commutative property of multiplication: For all numbers a and b, $a \bullet b = b \bullet a$.

$8 + 10 = 10 + 8$	$8 \bullet 10 = 10 \bullet 8$
$x + y = y + x$	$x \bullet y = y \bullet x$
$\frac{1}{2} + \frac{3}{4} = \frac{3}{4} + \frac{1}{2}$	$\frac{1}{2} \bullet \frac{3}{4} = \frac{3}{4} \bullet \frac{1}{2}$

The associative property of addition: For all numbers a, b, and c, $(a + b) + c = a + (b + c)$.

The associative property of multiplication: For all numbers a, b, and c, $(a \bullet b) \bullet c = a \bullet (b \bullet c)$.

$(2 + 4) + 6 = 2 + (4 + 6)$

$(2 \bullet 4) \bullet 6 = 2 \bullet (4 \bullet 6)$

$(s + t) + u = s + (t + u)$

$(s \bullet t) \bullet u = s \bullet (t \bullet u)$

Label each of the following with the appropriate property: **associative property of addition, associative property of multiplication, commutative property of addition,** or **commutative property of multiplication.**

1) $c + d = d + c$	**2)** $(x \cdot 4) \cdot 2 = x \cdot (4 \cdot 2)$	**3)** $(1 + 2) + 3 = 1 + (2 + 3)$
4) $17 + 4 = 14 + 7$	**5)** $12.1 \cdot 3 = 3 \cdot 12.1$	**6)** $32 \cdot 24 = 24 \cdot 32$

Circle each expression that is equivalent.

7) $(4 + 6) \cdot 2 = (4 + 6) \div 2$	**8)** $5 + (b + 3) = (b + 3) + 5$	**9)** $\left(\frac{1}{4} \cdot 4\right)x = x + (\frac{1}{4} \cdot 4)$

Simplify the expression.

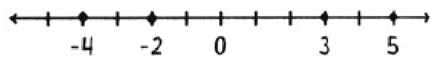
10) $4(3a)$	**11)** $8(7n)$	**12)** $4t(4)5$	**13)** $(5x)2$

Section 6

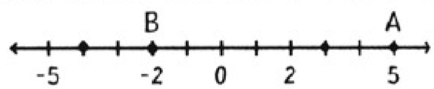
The real number line

Using Rules of Algebra

Real numbers are all of the numbers that are used in algebra. These numbers can be pictured as points on a horizontal line called a real number line. A starting point for all number lines is the origin, which is the point 0. The numbers to the left of 0 are the negative numbers. The numbers to the right of 0 are the positive numbers. Zero is neither positive nor negative. Below is an example of a number line with -4 and -2 as the negative numbers and 3 and 5 as the positive numbers.

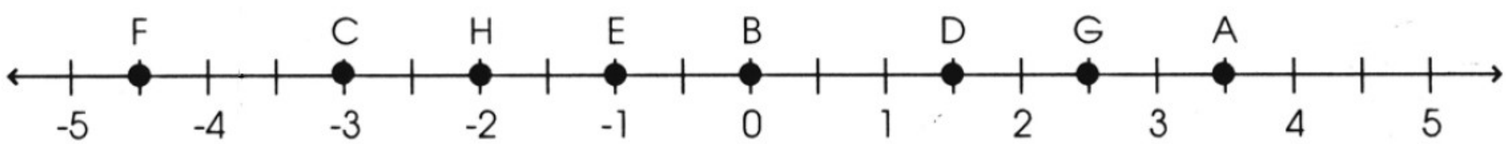


When graphing numbers on a line, the point is called the graph of the number, and the number that corresponds to the point is called the coordinate of the point.



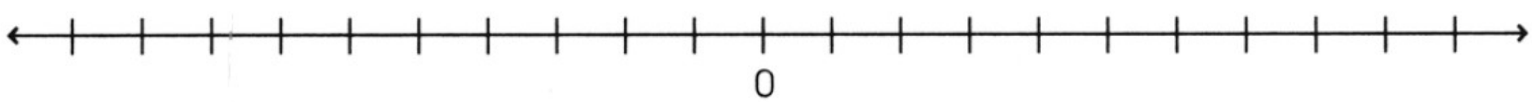
In the above graph, point A is the graph of the number 5. The number 5 is the coordinate of point A. Point B is the graph of the number -2. The number -2 is the coordinate of the point B.

Give the coordinate of each point graphed.



1) A	**2)** B	**3)** C	**4)** D	**5)** E	**6)** F	**7)** G	**8)** H

On the number line, graph each point whose coordinate is given.



9) A: -2	**10)** B: $3\frac{1}{2}$	**11)** C: $-4\frac{1}{2}$	**12)** D: 0	**13)** E: $-1\frac{1}{2}$	**14)** F: 5

Write each set of numbers in increasing order.

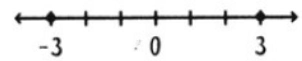
15) $2.1,\ -1.8,\ 3,\ 0,\ \frac{1}{3},\ -\frac{1}{3}$	**16)** $7.5,\ -\frac{1}{2},\ 7,\ -5.4,\ \frac{3}{4},\ \frac{1}{2}$

Section 7

Opposites (additive inverses) and absolute value

Using Rules of Algebra

Every real number has an opposite. Opposite numbers are the same distance from 0 on a number line and lie on the opposite sides of 0. The opposite of a positive number is a negative number. The opposite of a negative number is a positive number. The numbers 3 and -3 are opposites. Find their graphs on the real number line to the right. The additive inverse of a number is the same as the opposite of a number.



Remember, the opposite of 0 is simply 0 since it is neither positive nor negative.

The symbol $|x|$ is called the absolute value of x. The absolute value of a number is the distance between the number and 0 on a number line. The absolute value of a number, whether positive or negative, is always positive.

$|10| = 10$ $\quad |-2| = 2$ $\quad |-102| = 102$ $\quad -|12| = -12$

Note: The answer to $-|12|$ is -12 because the absolute value of 12 is 12 but then it is multiplied by a negative, which resulted in -12.

Write the opposite of each number.

1) 5	**2)** -2.6	**3)** $-\frac{3}{4}$	**4)** 0	**5)** -40	**6)** 2.8

Write a real number to represent each situation.

7) *a gain of 12 yards*	**8)** *a temperature drop of* 8°
9) *a deposit of $89.26*	**10)** *a withdrawal of $75*

Write the absolute value of each number.

11) $\lvert 10 \rvert$	**12)** $\lvert 23 \rvert$	**13)** $\lvert 0 \rvert$	**14)** $\lvert -42 \rvert$

Compare the following numbers. Use <, >, or = to make each statement true.

15) $\lvert 3.5 \rvert$ ______ $\lvert -3.5 \rvert$	**16)** $\lvert -4.2 \rvert$ ______ $\lvert 3.1 \rvert$	**17)** $-\lvert -4 \rvert$ ______ $-\lvert 4 \rvert$

Simplify the expression.

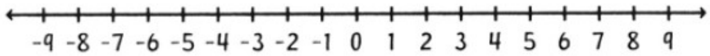
18) $-\lvert -15 \rvert$	**19)** $-\lvert 30 \div 6 \rvert$	**20)** $-\lvert 5 \rvert \cdot \lvert -4 \rvert$	**21)** $\lvert -8 \rvert + \lvert 8 \rvert$

Section 8

Addition of real numbers

Using Rules of Algebra

A number line is a great way to model the addition of real numbers.



Add 3 + 5. (Start at 3 and move 5 places to the right since 5 is positive.) The answer is 8.

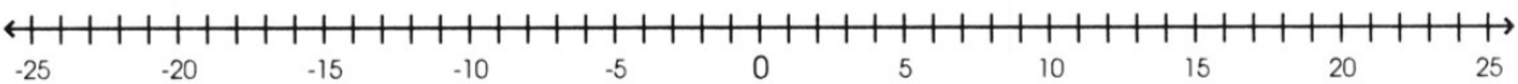
Add 3 + (-5). (Start at 3 and move 5 places to the left since 5 is negative.) The answer is -2.

When adding a number that is positive, move to the right. When adding a number that is negative, move to the left.

Explain how to add the following numbers using a number line and tell the result.

1) $7 + 8$	Explain:
2) $-5 + 9$	Explain:
3) $10 + (-7)$	Explain:
4) $-11 + (-6)$	Explain:

Use the number line to add the numbers.



5) $4 + 9$	**6)** $-5 + 13 + (-11)$
7) $14 + 10 + (-3)$	**8)** $-7 + (-6)$
9) $0 + (-5)$	**10)** $-6 + (-9) + 10$
11) $-3 + 3$	**12)** $8 + (-2) + (-4) + 6$
13) $7 + (-12)$	**14)** $-11 + 5 + (-13) + 8$

Section 9

Addition of real numbers

Using Rules of Algebra

To add two real numbers with the same sign:

1. Add their absolute values.
2. Determine the sign of the answer.
   a. If both numbers are positive, then the answer is positive.
   b. If both numbers are negative, then the answer is negative.

$-2 + (-3) = -5$ $\quad 4 + 5 = 9$ $\quad -10 + (-21) = -31$

To add two real numbers with different signs, if the numbers are not opposites:

1. Subtract their absolute values, the larger number minus the smaller number.
2. The sign of the answer will be the same sign of the number with the larger absolute value.

$3 + (-10)$	$-12 + 4$	$-9 + 13$
$\lvert -10 \rvert - \lvert 3 \rvert$	$\lvert -12 \rvert - \lvert 4 \rvert$	$\lvert 13 \rvert - \lvert -9 \rvert$
$10 - 3 = 7$	$12 - 4 = 8$	$13 - 9 = 4$
answer: -7	answer: -8	answer: 4

Add.

1) $4 + 3$	**2)** $-12 + 4$	**3)** $19 + (-3) + 6$
4) $11 + 12$	**5)** $-21 + 0$	**6)** $-1 + (-4) + 18$
7) $-2 + 5$	**8)** $23 + (-15)$	**9)** $-7 + 8 + (-5)$
10) $7 + (-8)$	**11)** $-11 + 11$	**12)** $32 + (-15) + (-6)$

Write an expression to represent each situation and solve.

13) A football team had a 5-yard loss followed by an 8-yard gain. Find the resulting gain or loss.

14) In one month, Jeff lost 8 pounds. The next month he gained 5 pounds. He lost 4 more pounds in the third month. Find the net gain or loss.

Section 10

Subtraction of real numbers

Using Rules of Algebra

For all real numbers a and b, $a - b = a + (-b)$. Simply stated: To subtract a number, add its opposite.

$7 - 10 = 7 + (-10)$
$= -3$

$5 - 8 + 3 - 1 = 5 + (-8) + 3 + (-1)$
$= 5 + 3 + (-8) + (-1)$ (group the + and – numbers)
$= 8 + (-9)$
$= -1$

$-4 - (-12)$
$= -4 + 12$
$= 8$

Change each problem into an addition problem.

1) $7 - 9$	**2)** $-6 - (-4)$	**3)** $-11 - 5$
4) $12 - (-15)$	**5)** $8 - 3$	**6)** $22 - 5$
7) $4 - 11$	**8)** $-4 - (-9)$	**9)** $-7 - (-5)$

Subtract.

10) $9 - 11$	**11)** $0 - (-12)$	**12)** $-5 - 4$
13) $6 - (-6)$	**14)** $-1 - (-1)$	**15)** $-7 - 6$
16) $3 - (-5)$	**17)** $17 - 23$	**18)** $-9 - 7$

Evaluate when $x = -2,\ y = -5,\ and\ z = 12$

19) $x - y$	**20)** $y - x$
21) $x - z$	**22)** $z - y$

Section 11

Multiplication of real numbers

Using Rules of Algebra

The property of zero for multiplication: For all real numbers a, $a \cdot 0 = 0$ and $0 \cdot a = 0$.
Simply stated, any real number multiplied by 0 is 0. For example, $0 \cdot 20 = 0$ and $13 \cdot 0 = 0$
To multiply two real numbers with same signs:

1. Multiply their absolute values.
2. The sign of their product is positive.

positive • positive = positive (+) (+) (+)

$3 \cdot 12 = 36$

negative • negative = positive (-) (-) (+)

$-7 \cdot -8 = 56$

To multiply two real numbers with opposite signs:

1. Multiply their absolute values.
2. The sign of their product is negative.

negative • positive = negative (–) (+) (-)

$-2 \cdot 5 = -10$

positive • negative = negative (+) (–) (–)

$4 \cdot -8 = -32$

Write the sign of the product for each number.

1) $(-10)4$	**2)** $8(-1)$	**3)** $(-2)(-3)$	**4)** $(7)(5)(-3)$
5) $5(6)$	**6)** $(-2)(-7)$	**7)** $(-12)(-4)(-1)$	**8)** $(-6)(4)(-2)$

Multiply to find each product.

9) $4(6)(-1)$	**10)** $(-1)(-4)(-3)$	**11)** $(-\frac{1}{2})(2)$
12) $(7)(-3)(0)$	**13)** $(5)(3)$	**14)** $(-\frac{1}{8})(-16)(4)$
16) $(-9)(-4)$	**17)** $(-7)(7)$	**18)** $(-5)(-8)$

Evaluate when $x = -3,\ y = -5,\ and\ z = 0$

19) xy	**20)** $-3yz$	**21)** xy^2	**22)** $4x^2y^2z^2$

Section 12

Division of real numbers

Using Rules of Algebra

The multiplicative inverse property states that for each nonzero a, there is exactly one number $\frac{1}{a}$ such that: $a \cdot \frac{1}{a} = 1$ and $\frac{1}{a} \cdot a = 1$.

The number $\frac{1}{a}$ is called the reciprocal of a.

For example, the reciprocal of 9 is $\frac{1}{9}$ and the reciprocal of $\frac{1}{2}$ is 2. Simply flip the number to find its reciprocal.

To divide the number a by the number b, multiply a by the reciprocal of b.

$a \div b = a \cdot \frac{1}{b}$ (The result will be the quotient of a and b.)

Here are some examples.

$12 \div 4 = 12 \cdot \frac{1}{4} = 3$ $\quad$ $4x \div \frac{1}{4} = 4x \cdot 4 = 16x$ $\quad$ $15 \div \frac{3}{2} = 15 \cdot \frac{2}{3} = 10$

To divide two nonzero real numbers, remember:

1. The quotient is positive if both numbers have the same sign.
2. The quotient is negative if both numbers have different signs.

$-15 \div 5 = -15 \cdot \frac{1}{5} = -3$ $\quad$ $3 \div \frac{1}{4} = 3 \cdot 4 = 12$ $\quad$ $1 \div -\frac{4}{5} = 1 \cdot -\frac{5}{4} = -\frac{5}{4}$

Write the reciprocal of each number. Write **none** if it does not exist.

1) 2	**2)** 1	**3)** 0	**4)** $-\frac{1}{9}$
5) $-\frac{1}{4}$	**6)** $\frac{4}{3}$	**7)** -8	**8)** 10

Divide.

9) $\frac{9}{3}$	**10)** $-\frac{28}{7}$	**11)** $-15 \div 0$	**12)** $-\frac{7}{8} \div \frac{1}{8}$
13) $\frac{36}{-4}$	**14)** $\frac{-8}{-8}$	**15)** $44 \div (-11)$	**16)** $0 \div \frac{4}{5}$

Simplify.

17) $-50 \div (40 \div (-20))$	**18)** $(-38 \div 19) \div (-2)$	**19)** $-45 \div (-20 \div (-4))$

Section 13

Scientific notation

Working with Powers, Exponents, and Polynomials

Scientific notation uses powers of 10 to write decimal numbers. Numbers written in scientific notation contain a number between 1 and 10 multiplied by a power of 10.
For example, the number, 3.1×10^2, is in scientific notation.
The number 45×10^2 is not written in scientific notation.

1. Change 450 to scientific notation.

   4.5×10^2 A number between 1 and 10 is needed. Move the decimal two places to get 4.5. Therefore, the power of 10 is 2, since we moved the decimal two places to get 4.5.

2. Rewrite 3.4×10^3 in decimal form.

   3,400 Since there is a positive power of 3, move the decimal 3 places to the right. (Note: If the power is negative, move the decimal to the left.)

3. Multiply $(5.4 \times 10^3)(2.2 \times 10^5)$

$(5.4 \times 2.2)(10^3 \times 10^5)$	Regroup into decimals and powers of 10.
$(11.88)(10^8)$	Simplify by multiplying decimals and adding powers.
$1.188 \times 10^{8+1}$	Add 1 to the 8 power since decimal moved 1 place.
1.188×10^9	Put in scientific notation.

Note: When multiplying, dividing, or finding the powers of numbers in scientific notation, simply use the properties of exponents.

Rewrite each scientific notation in decimal form.

1) 2.08×10^5	**2)** 4.5×10^3	**3)** 7.68×10^{-2}
4) 3.12×10^{-4}	**5)** 6.25×10^{-6}	**6)** 9.5765×10^4

Rewrite each decimal in scientific notation.

7) 68,000,000	**8)** 0.004953	**9)** 0.0975

Evaluate each expression in scientific notation without using a calculator.

10) $(7 \times 10^{-3})(4 \times 10^5)$	**11)** $(5 \times 10^5)(3 \times 10^{-2})$	**12)** $(3 \times 10^{-4})(6 \times 10^2)$

Section 14

Square roots

All positive real numbers have two square roots; one that is positive and one that is negative. A square root can be defined as follows:

If $b^2 = a$, then b would be the square root of a and $-b$ would be a square root of a.

The symbol $\sqrt{\ }$ means the principal square root of a number (the positive square root).

Find the square root of 36. Answers 6, -6 or ±6

$\sqrt{36}$ Answer: 6

$-\sqrt{36}$ Answer: -6

$\pm\sqrt{\frac{9}{16}} = \pm\frac{3}{4}$

In evaluating an expression containing square roots, use what is known about square roots.

Evaluate $\sqrt{b^2 - 4ac}$ for $a = 1$, $b = -6$, and $c = 5$.

$$\sqrt{(-6)^2 - 4(1)(5)} = \sqrt{36 - 20} = \sqrt{16} = 4$$

note: The square root of a negative number is undefined so it has no square root. The square root of 0 is 0.

Find all the square roots of each number.

1) 81	**2)** 0	**3)** $\frac{9}{16}$
4) 0.25	**5)** 121	**6)** $\frac{36}{25}$

Evaluate each expression. Round to 2 decimal places when necessary.

7) $-\sqrt{196}$	**8)** $\sqrt{121}$	**9)** $-\sqrt{50}$

Evaluate $\sqrt{b^2 - 4ac}$ for the given values of $a, b, and\ c$.

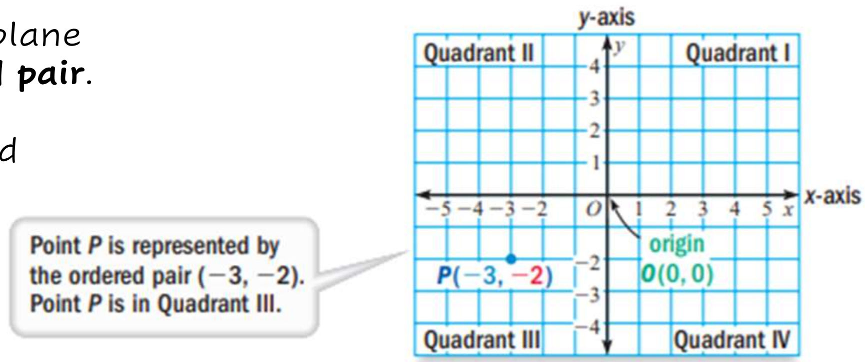
10) $a = -5,\ b = 4,\ c = 1$	**11)** $a = 6,\ b = 4,\ c = 2$	**12)** $a = -7,\ b = 5,\ c = 2$

Section 15

The Coordinate Plane

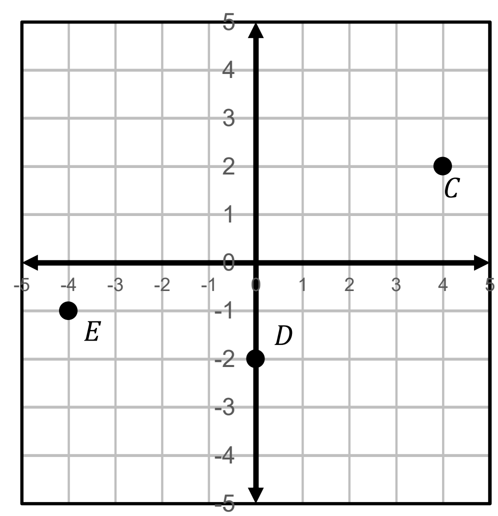
A **coordinate plane** is formed by the intersection of a horizontal number line called the **x-axis** and a vertical number line called the **y-axis**. The axes meet at a point called the **origin** and divide the coordinate plane into four **quadrants**.

Each point in a coordinate plane is represented by an **ordered pair**. The first number is the **x-coordinate**, and the second number is the **y-coordinate**.



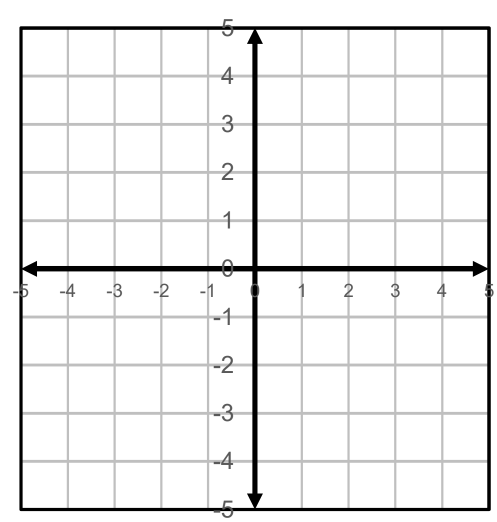
Use the coordinate plane shown. Give the coordinates of the point.

1) C	**2)** D	**3)** E



Plot the point on the coordinate plane. Label the point accordingly.

4) $H\ (5,5)$	**5)** $\mathrm{J}\ (-1,0)$	**6)** $K\ (3,-4)$
7) $L\ (0,\ 3)$	**8)** $M\ (-5,-2)$	**9)** $N\ (0,0)$



Section 16

Solving addition and subtraction equations

Integer Exploration

To find a solution to an equation, the equation must be solved. To solve addition and subtraction equations you must isolate the variable. Simply subtract if it is an addition problem and add if it is a subtraction problem to get the given variable by itself. Remember the following two properties of equality:

1. If the same number is subtracted from each side of an equation, the two sides remain equal.

   Solve $r + 12 = 67$

   $r + 12 - 12 = 67 - 12$ Subtract 12 from each side of equation.

   $r = 55$ Solve for r.

2. If the same number is added to each side of an equation, the two sides remain equal.

   Solve $x - 16 = 32$

   $x - 16 + 16 = 32 + 16$ Add 16 to each side of equation.

   $x = 48$ Solve for x.

note: It is always a good idea to check each solution by putting it back into the original equation and making sure it creates a true sentence.

Solve the equation. Show all your work.

1) $x + 8 = 19$	**2)** $-7 = y + 13$	**3)** $n - 4 = -11$
4) $16 = a + 25$	**5)** $-70 = b - 30$	**6)** $t + 9 = -5$
7) $16 = a + 25$	**8)** $-70 = b - 30$	**9)** $t + 9 = -5$
10) $36 = d - 13$	**11)** $21 + y = 15$	**12)** $b - 14 = 51$

Section 17

Solving multiplication and division equations

Integer Exploration

To solve multiplication and division equations, simply divide or multiply on each side of the equation to get the given variable by itself. Remember the following two properties of equality:

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

   Solve $4x = 84$

   $\frac{4x}{4} = \frac{84}{4}$ Divide each side by 4 to isolate x.

   $x = 21$ Solve for x.

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

   Solve $\frac{x}{21} = 2$

   $\frac{x}{21} \times 21 = 2 \times 21$ Multiply each side by 21 to isolate x.

   $x = 42$ Solve for x.

Note: It is always a good idea to check each solution by putting it back into the original equation and making sure it creates a true sentence.

Solve each equation using the inverse operation. Show all your work.

1) $9x = 63$	**2)** $-96b = 96$	**3)** $\frac{a}{-6} = 2$
4) $4t = -36$	**5)** $-64 = -16y$	**6)** $-25x = -125$
7) $\frac{b}{40} = -3$	**8)** $\frac{r}{15} = 20$	**9)** $\frac{1}{4}x = -2$
10) $-6x = 24$	**11)** $4 = -\frac{x}{5}$	**12)** $18 = -3x$

Section 18

Slope of a line

Graphing Linear Equations

The slope of a line is the number of units a line rises or falls for each unit of horizontal change from left to right on its graph. The slope of a line is represented by the letter *m* and can be found given two points (x_1, y_1) and (x_2, y_2) on the line using the following formula.

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

If the slope is greater than 0 (which is positive), then the line rises from left to right.
If the slope is less than 0 (which is negative), then the line falls from left to right.
If the slope is equal to 0, then the line is horizontal.
If the slope is undefined, then the line is vertical.

Find the slope of the line passing through the points (-5, 6) and (-3, 10).

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - 6}{-3 - (-5)} = \frac{4}{-3 + 5} = \frac{4}{2} = \frac{2}{1} = 2$$

Thus, since the slope is a positive 2, then we know the line rises from left to right.

Determine whether the line **rises from left to right**, **falls from left to right**, is **vertical**, or is **horizontal**, given the following slopes.

1) $m = 2$	**2)** $m = -5$	**3)** $m = 62$
4) $m = undefined$	**5)** $m = 0$	**6)** $m = -7$

Find the slope of the line that passes through each set of points.

7) $(5, 4), (6, 9)$	**8)** $(-3, 4), (-1, 2)$	**9)** $(-6, -3), (-2, 9)$
10) $(-2, -1), (0, 3)$	**11)** $(6, -5), (3, 10)$	**12)** $(7, 8), (1, -16)$

Section 19

Graphing two-variable equations

Graphing Linear Equations

The graph of a linear equation with two variables, $y = mx + b$, is a straight line. The graph of an equation is the collection of all points (x, y) that are solutions of the equation. Two or more points are needed to graph a line. To construct a graph of a line, start by using a table of values. Follow these steps.

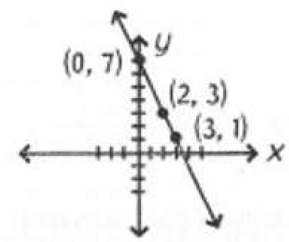
1. Choose several x-values.
2. Substitute these x-values into the equation.
3. Find the corresponding y-value.
4. Graph each point.
5. Connect the points to show the graph of the line containing all of these points.

Sketch the graph of $y = -2x + 7$.

Choose several values for x and solve for y to find some solutions of this equation.

When $x = 2$, $y = 3$. So (2, 3) is a solution.
When $x = 3$, $y = 1$. So (3, 1) is a solution.
When $x = 0$, $y = 7$. So (0, 7) is a solution.

x	$y = -2x + 7$	y
2	$y = -2(2) + 7$	3
3	$y = -2(3) + 7$	1
0	$y = -2(0) + 7$	7



Now, graph the line $y = -2x + 7$ using these three points that lie on the line.

Complete the table of possible solutions for each equation and then graph the points and connect them to form a separate line for each equation.

1) $y = 3x - 4$

x	0	1	2	3
y				

2) $y = -x + 6$

x	4	0	1	6
y				

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

x	-4	0	2	6
y