

ALGEBRA 1 SUMMER PREPARATION

**** Bring this completed packet with you the first day you have math in September.****

If you are taking algebra next year, then your teacher for next year expects you to complete this packet.

A strong basic skills background will help you start the year off strong. This packet is filled with topics that you should already know. These topics are not taught in isolation or as separate lessons from the materials in the course. **You are expected to be able to add, subtract, multiply, and divide: whole numbers, fractions, decimals, and integers.**

Usually, your teachers would love you to do the work as soon as you get it. However, this packet is a little different, and it would be better if you spread it out throughout the summer and **NOT** do it all in June or the last week in August. If you practice some of it right before coming back to school, that will benefit you more.

SHOW ALL WORK NEEDED – ON THE PACKET! If you use scrap paper – staple it to the back of the packet. There are hyperlinks provided for each lesson as a self-guided review. Stay organized. As you work through the sections, a checklist is on the next page. Check off as you go to stay on track.

★ **Checking your work.**

★ **See how well you understood each concept.**

SELF CHECKING

Once you have completed the packet, open the answer key document. If you answered any questions incorrectly, please return to the problems and try them again to ensure you understand where you went wrong. Consider the summer packet your study guide for your first summative assessment in Algebra 1. Work is expected to be shown on these pages and simply copying the answers from the key will be taken as you have not completed the assignment. Please do not cheat yourself out of a learning opportunity. Since you will be assessed on this material it is incumbent on you to make sure you are prepared for the course as these skills are prerequisites for your success.

Student's Name: _____

Mathematical Basic Concepts for Algebraic Success

The following is a list of skills students should be proficient in before entering Algebra 1.

☐ **Section 1 - Variable and Written Expressions**

- ☐ Be able to read numerical expressions and translate them into numerical expressions
- ☐ Be able to read numerical expressions to solve a given expression - know what addition, subtraction, multiplication, and division look like in sophisticated expressions

☐ **Section 2 - Order of operations - the foundation for solving all math problems**

☐ **Section 3 - Solid understanding of rational number operations**

- ☐ Be able to add and subtract whole numbers
- ☐ Be able to multiply and divide whole numbers
- ☐ ALL Decimal Rules
- ☐ ALL Fraction Rules - ***know how to simplify fractions***
- ☐ Recognize common fractions and know their decimal equivalents
- ☐ Integer Rules

☐ **Section 4 - Evaluate and know basic exponent rules**

- ☐ Working knowledge of the first 20 perfect squares
- ☐ Working knowledge of the first 10 perfect cubes

☐ **Section 5 - Understand the concept of solving basic equations and inequalities**

- ☐ One-step equations
- ☐ Two-Step equations
- ☐ Graph a basic inequality

☐ **Section 6 - Distributive Property**

☐ **Section 7 - Combine like terms**

☐ **Section 8 - Calculating Perimeter and Area**

- ☐ Use knowledge of distributive property and combining like terms to solve for perimeter and area

☐ **Section 9 - Graph points on a coordinate plane**

- ☐ Working knowledge of how to graph (x,y) coordinate pair
- ☐ Know the parts and quadrants of a plane

Topics are arranged in order with hyperlinks to Khan Academy if you need a review or more practice.

Section 1 Variable and Written Expressions

[Writing expressions with variables & parentheses \(video\) | Khan Academy](#)

Translate each verbal expression into an algebraic expression.

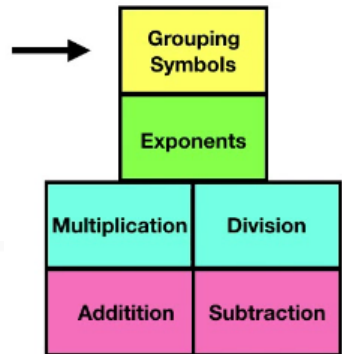
	Word Phrases	Expression
+	<ul style="list-style-type: none"> a number plus 5 sum of a number and 5 5 more than a number 	$n + 5$
-	<ul style="list-style-type: none"> subtract 11 from a number difference of a number and 11 11 less than a number 	$x - 11$
×	<ul style="list-style-type: none"> 3 multiplied by a number product of 3 and a number 	$3 \cdot m$ or $3m$
÷	<ul style="list-style-type: none"> 7 divided into a number quotient of a number and 7 	$\frac{a}{7}$ or $a \div 7$

- 1) 4 is subtracted from 8 times and number x _____
- 2) The product of 6 and a number x is increased by 7 _____
- 3) 5 decreased by the product of 3 and a number x _____
- 4) 3 times the number x plus 4 times the number y _____
- 5) 3 times the quantity of a number x added to 7 _____
- 6) The quotient of x and 2 is added to the product of 4 and x _____
- 7) A number y cubed plus x squared decreased by 7 _____
- 8) 5 times the difference of x and 4 is added by 2 _____
- 9) The difference between x and y increased by 8 _____
- 10) 2 times the sum of a number x and 4 subtracted by 1 _____

Section 2

ORDER OF OPERATIONS

📺 Order of operations examples: exponents | Arithmetic ope...



1. $5 - 6 + 2(3)$	2. $4 + 5(7 - 1) + \frac{8}{2}$
3. $-9(4 + 2) - 2(3) + 4^2$	4. $7 - 2[-6 - (3 + 1)] - \frac{8 + 7}{3}$
5. $0.5(-8 - 4) + 3(8 - 2^2)$	6. $3 - 5(2) - 7(5^2 - 4^2)$
7. $2(3)^2 - 4(3) + 1$	8. $4(3 - 5)^3 + 5$

Section 3

Rational Number Operations

The most fundamental branch of math is arithmetic operations, which consist of adding, subtracting, multiplying, and dividing numbers. By this point, performing these operations on whole numbers should be a fluent skill. Make sure you are equally fluent with decimals and fractions.

[Arithmetic with rational numbers | 6th grade | Math | Khan Academy](#)

1	$\frac{1}{2} + \frac{1}{2} =$	10	$\frac{2}{9} + \frac{1}{3} =$
2	$\frac{1}{3} + \frac{1}{3} =$	11	$\frac{1}{4} + \frac{2}{16} =$
3	$\frac{1}{4} + \frac{2}{4} =$	12	$\frac{3}{6} - \frac{5}{4} =$
4	$\frac{2}{5} - \frac{1}{5} =$	13	$\frac{1}{2} - \frac{8}{7} =$
5	$\frac{3}{6} - \frac{5}{6} =$	14	$-\frac{5}{4} - \frac{1}{9} =$
6	$\frac{1}{7} - \frac{8}{7} =$	15	$-\frac{3}{10} + \frac{7}{3} =$
7	$\frac{5}{8} - \frac{7}{8} =$	16	$-\frac{3}{10} + \frac{7}{10} =$
8	$\frac{1}{2} + \frac{5}{4} =$	17	$-\frac{5}{9} - \frac{1}{9} =$
9	$\frac{2}{3} - \frac{1}{5} =$	18	$\frac{5}{8} - \frac{7}{5} =$

Simply your answers.

Multiply and Divide Fractions

[Multiplying positive and negative fractions \(video\) | Khan Academy](#)

[Dividing positive and negative fractions \(practice\) | Khan Academy](#)

1	$\frac{5}{2} \cdot \frac{1}{2} =$	6	$-\frac{1}{4} \cdot -\frac{8}{7} =$	11	$\frac{2}{9} \div \frac{1}{3} =$
2	$\frac{1}{3} \cdot \frac{1}{3} =$	7	$4(\frac{5}{8}) =$	12	$\frac{1}{4} \div \frac{2}{5} =$
3	$\frac{1}{4} \cdot \frac{2}{4} =$	8	$-3(\frac{2}{3}) =$	13	$-\frac{2}{3} \div \frac{1}{5} =$
4	$-\frac{2}{5} \cdot \frac{3}{5} =$	9	$-2(\frac{4}{9}) =$	14	$\frac{3}{6} \div -\frac{5}{4} =$
5	$\frac{3}{6} \cdot -\frac{5}{6} =$	10	$\frac{1}{2} \div \frac{5}{4} =$	15	$-\frac{1}{2} \div -\frac{8}{7} =$

Simply your answers.

Decimal Operations

[Multiplying decimals example \(video\) | Khan Academy](#)

[Adding decimals: 9.087+15.31 \(video\) | Khan Academy](#)

[Subtracting decimals: thousandths \(practice\) | Khan Academy](#)

[Dividing by a multi-digit decimal \(video\) | Khan Academy](#)

NO CALCULATORS - Solve. Show your work. Show how you lined up the decimal point for addition and subtraction and show your work for multiplication and division.

1) $5.2 + 6.4$

2) $93.1 + 1.24$

3) $634.78 + 53.982$

4) $8.2 - 3.7$

5) $19 - 12.31$

6) $492.617 - 236.35$

7) 6.3×4.7

8) 7.1×0.45

9) 91.2×5.36

10) $9.46 \div 0.2$

11) $96 \div 0.5$

12) $2.568 \div 0.12$

Common Fractions and Decimals to recognize.

[Fraction, decimal, and percent from visual model \(video\) | Khan Academy](#)

Complete the table.

Fraction	Decimal	Percent
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$		
$\frac{2}{3}$		
$\frac{1}{4}$		
$\frac{3}{4}$		
$\frac{1}{5}$		
$\frac{2}{5}$		
$\frac{1}{10}$		
$\frac{1}{100}$		

Integer Operations

[Adding numbers with different signs \(video\) | Khan Academy](#)

[Multiplying and dividing negative numbers \(video\) | Khan Academy](#)

Using an integer is the basis of the algebraic learning domain in primary school mathematics teaching, and it is considered an important precondition for any higher-level mathematics course. Additionally, this concept symbolizes the transition from concrete thinking to abstract thinking. You will succeed more in Algebra 1 if you are fluent in these concepts.

Adding and Subtracting Integers

Adding or subtracting integers with like signs, add and keep the sign.

$$(4 + 2 = 6) \quad (-6 + -8 = -14) \quad (-9 - 4 = -13)$$

Adding or subtracting integers with unlike signs, subtract and keep the sign of the higher integer.

$$(-6 + 3 = -3) \quad (8 + -4 = 4)$$

*when subtracting a negative, it turns into a positive and then follows one of the two rules above.

$$(8 - -4 = 12 \text{ becomes } 8 + 4 = 12)$$

$$(-8 - -4 = -4 \text{ becomes } -8 + 4 = -4)$$

Multiplying and Dividing Integers

If the signs of the integers are the **same**, the product/quotient is **positive**.

$$(4 \times 4 = 16) \quad (8 \div 4 = 2)$$

If the signs of the integers are **different**, the product/quotient is **negative**.

$$(7 \times -6 = -42) \quad (6 \div -3 = -2)$$

Addition and Subtraction with integers.

DO NOT USE A CALCULATOR

1) $-4 + (-7)$

2) $-3 + (-1)$

3) $6 + 9$

4) $(-2) + (-3)$

5) $3 + 11$

6) $(-6) + (-10)$

7) $-7 + (-7)$

8) $-6 + (-4)$

9) $-13 + (-3)$

10) $-4 + 7$

11) $3 + (-9)$

12) $-2 + 9$

Simplify by performing the operation. Do not use a calculator:

1)

1) $4 - 7$

2) $-3 - (-1)$

3) $6 - 9$

Multiplication and division of integers

1) $-5 \cdot 2$

2) $(-7)(-3)$

3) $(-10)(5)$

4) $-3 \cdot 12$

5) $9(-2)$

6) $(-1)(-3)$

7) $6(8)$

8) $(-10)(-5)$

9) $-5 \cdot 8$

Multiplication and division of integers continued.

10) $-2 \cdot 7$

11) $2(-2)$

12) $(11)7$

13) $35 \div (-5)$

14) $42 \div (-3)$

15) $-28 \div 7$

Mixed Review

Add, subtract, multiply, and divide the following integers. Do NOT use a calculator.

1) $2 + (-7)$

2) $4 - (-3)$

3) $15 \div 3$

4) $(-9)(-7)$

5) $-3 - (-6)$

6) $-4 - 5$

7) $7 + 3$

8) $-2 + (-6)$

9) $-4 \cdot 5$

10) $-12 - (-7)$

11) $-15 + 7$

12) $11 \cdot 5$

13) $8 - (-21)$

14) $(3)(-9)$

15) $-24 \div 4$

16) $-9 + (-13)$

17) $(-2)(-25)$

18) $-50 - 30$

19) $\frac{-56}{-8}$

20) $32 + (-37)$

Evaluating Expressions

[Evaluating expressions with two variables \(article\) | Khan Academy](#)

Use your knowledge of integer rules and order of operations to evaluate expressions.

$a = 2$	$b = -3$	$c = 4$	$d = -5$	$e = 6$	$f = -7$
---------	----------	---------	----------	---------	----------

1. $2a + 3d$	2. $b^2 - e^2$
3. $-3c - (a + d) + f$	4. $2(b - e) + (f + c)^2$
5. $\frac{d - c}{3} - 4(ab + f)$	6. $c(ab - 1) + de - f^2$

Section 4

Basic Exponent Knowledge

[Exponents review \(article\) | Khan Academy](#)

[Intro to Square Roots \(video\) | Radicals | Khan Academy](#)

Let's try it! Simplify $3^2 \cdot 3^4$ using the Product of Powers Property.

$$3^2 \cdot 3^4 = 3^{2+4} = 3^6$$

You can see why this property works by expanding each power and simplifying.

$$3^2 \cdot 3^4 = (3 \cdot 3) \cdot (3 \cdot 3 \cdot 3 \cdot 3) = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^6$$

$4^3 \cdot 4^2 =$ _____	$2^5 \cdot 2^4 =$ _____	$5^2 \cdot 5^5 =$ _____
$9^3 \cdot 9^1 =$ _____	$11^4 \cdot 11^7 =$ _____	$3^7 \cdot 3^5 =$ _____
$7^8 \cdot 7^6 =$ _____	$6^{10} \cdot 6^{10} =$ _____	$13^7 \cdot 13^{15} =$ _____

Evaluate each exponent. Show your work.

Introduction to Exponents: Understanding the Key Terms

When you multiply the same number over and over, you can write the problem using an exponent. Take a closer look at the terms we use when talking about exponents.

$2^3 = 2 \times 2 \times 2 = 8$

Base: the factor that is repeatedly multiplied

Exponent: tells how many times the base is used as a factor

Expanded form: uses the base and exponent to write out the repeated multiplication

Value: the result of your calculation, or your answer

$6^2 =$ _____	$4^3 =$ _____
$2^4 =$ _____	$7^3 =$ _____
$3^5 =$ _____	$5^4 =$ _____
$\left(\frac{1}{3}\right)^3 =$ _____	$\left(\frac{2}{5}\right)^2 =$ _____
$0.9^2 =$ _____	$0.6^3 =$ _____

Working Knowledge of the first 20 Perfect Squares and the first 10 perfect cubes

Do not use a calculator. If you need to find the a solution for a double digit number squared then multiply the the numbers
- use standard math skills.

$$\begin{array}{r} 22 \\ \times 43 \\ \hline 66 \\ + 880 \\ \hline 946 \end{array}$$

Calculate the value of each squared number.

$3^2 = \underline{\quad}$

$14^2 = \underline{\quad}$

$8^2 = \underline{\quad}$

$4^2 = \underline{\quad}$

$12^2 = \underline{\quad}$

$11^2 = \underline{\quad}$

$13^2 = \underline{\quad}$

$10^2 = \underline{\quad}$

$2^2 = \underline{\quad}$

$17^2 = \underline{\quad}$

$9^2 = \underline{\quad}$

$18^2 = \underline{\quad}$

$20^2 = \underline{\quad}$

$19^2 = \underline{\quad}$

$1^2 = \underline{\quad}$

$7^2 = \underline{\quad}$

$16^2 = \underline{\quad}$

$15^2 = \underline{\quad}$

Solve for the first 10 perfect cubes.

Again, do not use a calculator. Try mental math for the first few, then solve using standard math skills.

$$1^3 =$$

$$1 \times 1 \times 1 =$$

$$2^3 =$$

$$2 \times 2 \times 2 =$$

$$3^3 =$$

$$3 \times 3 \times 3 =$$

$$4^3 =$$

$$4 \times 4 \times 4 =$$

$$5^3 =$$

$$5 \times 5 \times 5 =$$

$$6^3 =$$

$$6 \times 6 \times 6 =$$

$$7^3 =$$

$$7 \times 7 \times 7 =$$

$$8^3 =$$

$$8 \times 8 \times 8 =$$

$$9^3 =$$

$$9 \times 9 \times 9 =$$

$$10^3 =$$

$$10 \times 10 \times 10 =$$

Find each square root or cube root.

1.

$$\sqrt{81} = \underline{\hspace{2cm}}$$

2.

$$\sqrt[3]{64} = \underline{\hspace{2cm}}$$

3.

$$\sqrt{16} = \underline{\hspace{2cm}}$$

4.

$$\sqrt[3]{216} = \underline{\hspace{2cm}}$$

5.

$$\sqrt{49} = \underline{\hspace{2cm}}$$

6.

$$\sqrt{225} = \underline{\hspace{2cm}}$$

7.

$$\sqrt[3]{27} = \underline{\hspace{2cm}}$$

8.

$$\sqrt{100} = \underline{\hspace{2cm}}$$

9.

$$\sqrt{169} = \underline{\hspace{2cm}}$$

10.

$$\sqrt{256} = \underline{\hspace{2cm}}$$

11.

$$\sqrt[3]{1,000} = \underline{\hspace{2cm}}$$

12.

$$\sqrt[3]{512} = \underline{\hspace{2cm}}$$

13.

$$\sqrt[3]{343} = \underline{\hspace{2cm}}$$

14.

$$\sqrt{324} = \underline{\hspace{2cm}}$$

15.

$$\sqrt[3]{125} = \underline{\hspace{2cm}}$$

16.

$$\sqrt[3]{1,331} = \underline{\hspace{2cm}}$$

17.

$$\sqrt[3]{729} = \underline{\hspace{2cm}}$$

18.

$$\sqrt[3]{1,728} = \underline{\hspace{2cm}}$$

19.

$$\sqrt{196} = \underline{\hspace{2cm}}$$

20.

$$\sqrt{361} = \underline{\hspace{2cm}}$$

Section 5

Solving Basic Equations

[One-step equations review \(article\) | Khan Academy](#)

Use inverse operations to solve each equation.
Show all of your steps.

$$x + 7 = 9$$

$$5 + x = -3$$

$$6 = x + 8$$

$$x - 9 = 1$$

$$-5 + x = -2$$

$$4 = x - 7$$

$$5x = 75$$

$$-2x = -64$$

$$-7.5 = 1.25x$$

$$\frac{x}{4} = 7$$

$$-\frac{x}{2} = 8$$

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

$$\frac{3}{4}x = 7$$

$$-\frac{1}{2}x = 8$$

$$-5 = -\frac{2}{9}x$$

Solving Two-step Equations

1. Add or subtract to isolate the variable term.
2. Multiply or divide to solve for the variable.
3. Check your solutions.

Example:

$$3x + 5 = -16$$

$$\begin{array}{r} -5 \quad -5 \end{array} \text{ Subtract}$$

$$3x = -21$$

$$\frac{3x}{3} = \frac{-21}{3} \text{ Divide}$$

$$x = -7$$

$$3(-7) + 5 = -16 \text{ Check}$$

$$2x + 7 = 9$$

$$5 + 4x = -3$$

$$6 = 2x + 8$$

$$4x - 9 = 1$$

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

$$4 = -x - 7$$

$$5x + 10 = 75$$

$$-2x + 8 = -64$$

$$-7.5 = 1.25x + 2.5$$

$$\frac{x}{4} - 6 = 7$$

$$-\frac{x}{2} + 3 = 8$$

$$-3 = 8 - \frac{x}{9}$$

$$\frac{3}{4}x + 5 = 7$$

$$-\frac{1}{2}x - 4 = 8$$

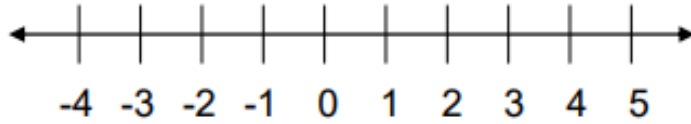
$$-5 = -\frac{2}{9}x + 2$$

Graphing Inequalities

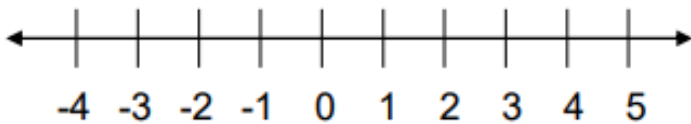
[Plotting inequalities \(video\) | Khan Academy](#)

Graph each inequality on the number line shown.

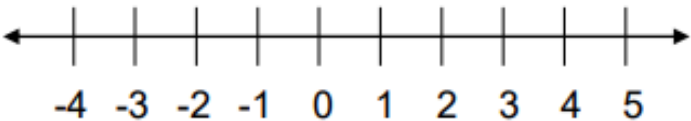
$$x > 2$$



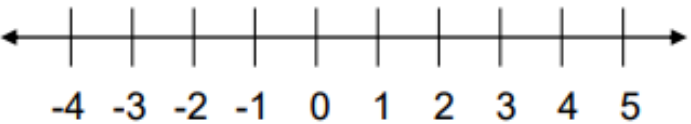
$$x < -3$$



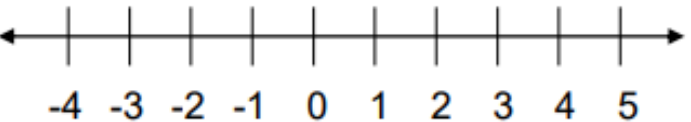
$$x \geq -1$$



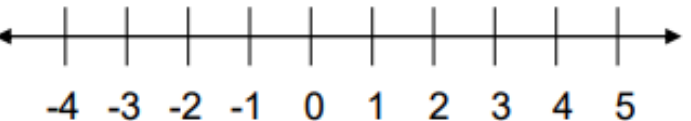
$$x \leq 4$$



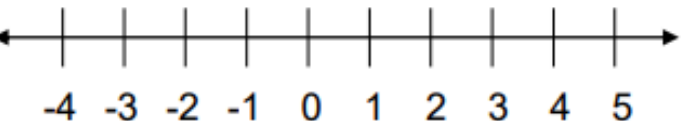
$$x < 0$$



$$x \geq 0$$



$$x > -2$$



Section 6

Distributive Property

[Distributive property explained \(article\) | Khan Academy](#)

Use the distributive property to simplify the expressions.

$$4(x + 3) = 4x + 12$$

1) $5(x + 4)$

2) $-5(x + 4)$

3) $8(x - 2)$

4) $8(3x - 4)$

5) $2(5 - x)$

6) $-2(5 + 2b)$

7) $4(2x - 5)$

8) $-4(2b - 5)$

Section 7

Combine Like Terms

[Intro to combining like terms \(video\) | Khan Academy](#)

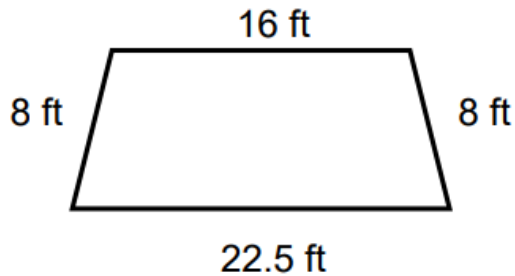
EXPRESSION	SIMPLIFIED
$x + x + 3x + y$	
$y + 2y + 5x + x$	
$5 + z + z + 4z - 6$	
$3x + 4x - 5$	
$5c + 2b - 3c$	
$x + y + 2x$	
$6a - 5b + a$	
$4 + 3x - 7 - 8x$	
$3(x + 2) - 4$	
$-5(x - 3) + 7x$	
$5m - 6n - 9m$	
$-8a - 9b - 10a + 9b$	
$2(x + 4) + 5x - 3$	
$-10(2 + x) - 3x$	

Section 8

Calculating Perimeter and Area

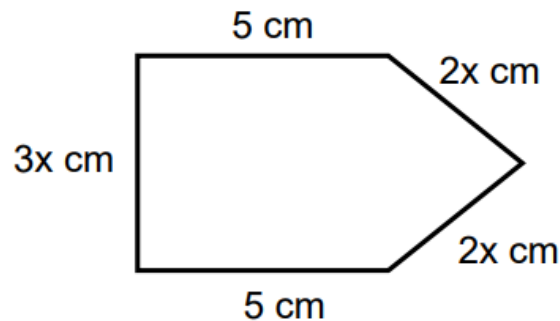
Apply the knowledge from combining like terms and distributive property to complete the perimeter and area work below.

Determine the perimeter of each figure.

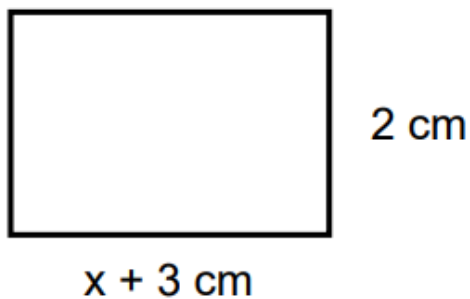


$P =$

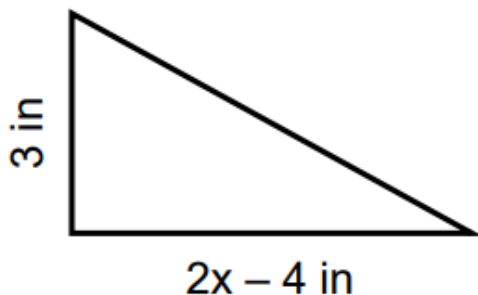
$P =$



Determine the area of each figure.



$A =$



$A =$

Section 9

Plotting and Graphing on a Plane

[Points on the coordinate plane examples \(video\) | Khan Academy](#)

Plot each point on the coordinate plane and name the quadrant the point is in.

POINT	QUADRANT
A(3, 4)	
B(5, -7)	
C(0, -5)	
D(-9, 2)	

POINT	QUADRANT
E(-1, -2)	
F(-8, 0)	
G(10, 3)	
H(-4, 8)	

