Name: ______________________________ Rising Grade Level: _______

Summer Work: Rising Pre-Algebra **Due date:** First day of school

Important Information:

This summer work packet will be graded as your first quiz grade of the semester. The skills that are covered in this assignment are skills that are necessary to have mastered prior to starting Pre-Algebra. You are *not* permitted to use a calculator because you need to maintain your fact fluency and number sense. Please show work whenever possible.

To finish your summer work efficiently and effectively, we recommend working on your math packet for at least 60 minutes per week. Please strategize with your parents about how to best complete the work.

Have a great summer!

INTEGER OPERATIONS

Perform the indicated operation on the integers. Examples of problems involving integers are at the end of this packet.

1. $7 + (-12)$
2. $-9 + (-5)$
3. $27 + (-19)$
4. $6 + (-6)$
5. $-51 + 16$
6. $-7 + (-7)$
7. $7 - 12$
8. $-6 - 17$
9. $14 - (-12)$
10. $-13 - 13$
11. $8 - (-3)$
12. $-4 - (-15)$
13. $7 \cdot (-4)$
14. $-9 \cdot (-8)$
15. $-2 \cdot 16$
16. $-40 \div (-8)$
17. $27 \div (-3)$
18. $-56 \div 4$
19. $\frac{142}{-2}$
20. $\frac{0}{-3}$
21. $\frac{8}{0}$

ORDER OF OPERATIONS

Order of Operations (GEMS is a special acronym to help you remember)

1. Simplify expressions inside parentheses or brackets. (**G**rouping Symbols)
2. Simplify or evaluate any terms raised to powers or roots. (**E**xponents)
3. Do multiplication and division operations in order as you come to them from left to right. (**M**ultiply / Divide)
4. Finally, do all addition and subtraction operations in order as you come to them from left to right. (**S**ubtract / Add)

* Notice the words in the parentheses at the end of the lines make "GEMS".

Example #1. **$30 - 12 \div 2 + 4 \cdot 3 - 5 =$**

Since there are no grouping symbols or exponents, using GEMS we would begin by doing multiplication and division in order left to right. Leave all other operations alone. Let's group what we need to do.

$30 - (12 \div 2) + (4 \cdot 3) - 5 = 30 - 6 + 12 - 5$

Next we will do the addition and subtraction in order left to right. The steps are underlined in order.

$\underline{30 - 6} + 12 - 5 =$

$\underline{24 + 12} - 5 =$

$\underline{36 - 5} = 31$

Example #2.

$(8 + 4) \div (10 - 6) + 5^2$

We begin with parentheses: $12 \div 4 + 5^2$

Next evaluate the exponent term $12 \div 4 + 25$

Now do multiplication and division in order $3 + 25$

Finally, add and subtract in order 28

Simplify using the order of operations. Show your steps.

1. $9 \cdot 6 - 5 \cdot 8$

2. $\dfrac{49 - 11}{12 + 7}$

3. $6(14 + 4^2)$

4. $75 \div [(15 - 10) \cdot 3]$

5. $4(3^2 + 3) \times 2$

6. $8 - 8 \div 4 \cdot 2 + 7 \cdot 8$

7. $10 \div 2 \cdot 3 \div 15$

8. $5 + (25 \div 5)^2$

9. $27 \div 3^2 - 7$

10. $20 - 3 \cdot 4^2$

11. $8(5 - 2^3) - 28 \div (-4)$

12. Joe simplified $100 - 2(8 - 3)^2$. His steps are below. His teacher says his answer is incorrect. What did he do wrong? What is the correct answer?

$$100 - 2(8 - 3)^2$$

$$100 - 2(5)^2$$

$$100 - 2(25)$$

$$98 \cdot 25$$

$$2{,}450$$

PRIME FACTORIZATION

Example: Prime factor 24

Remember that prime factoring means writing the number as a product of only prime numbers (like 2, 3, 7, 11, 13, etc); the factors are written in order from least to greatest and using exponents as needed. Use the **L** method to help you find the prime factors.

$$\begin{array}{r|r} 2 & 24 \\ 2 & 12 \\ 2 & 6 \\ 3 & 3 \\ \hline & 1 \end{array}$$

The prime factorization of 24 is $2 \cdot 2 \cdot 2 \cdot 3$ which can be written as $2^3 \cdot 3$

Write the Prime Factorization of the following numbers. Show work using the "L method."

1. 36

2. 68

3. 56

4. 810

5. 140

6. 640

7. 2205

8. 780

GREATEST COMMON FACTOR (GCF)

GCF means the biggest number that both numbers are divisible by. If 2 numbers don't have any common factors, they are *relatively prime.*

Example: Find the GCF of 18 and 24.
Use the **L** method to help you! Divide both 18 and 24 by prime numbers until there are no more common factors.

$$\begin{array}{c|cc} 2 & 18 & 24 \\ 3 & 9 & 12 \\ \hline & 3 & 4 \end{array}$$

The GCF is the product of the common prime factors:

$$\mathbf{2 \cdot 3 = 6}$$

GCF = 6

1. GCF of 64 and 48

2. GCF of 45 and 108

3. GCF of 72 and 156

4. GCF of 75 and 120

5. Kiara has 80 lollipops and 32 Snicker bars. She is filling individual bags for Halloween and would like each bag to contain the same combination of lollipops and Snicker bars. How many bags can she fill if she wishes to have no candy leftover? How many lollipops and Snicker bars are in each bag?

LEAST COMMON MULTIPLE (LCM)

LCM means the lowest number that is a multiple of 2 or more numbers. Remember that multiples of a number are a list of numbers that are divisible by the given number. For example, the multiples of 7 are 14, 21, 28, 35, 42, 49, ...

Example: Find the LCM of 18 and 24.

Again, use the **L** method to help you! Divide both 18 and 24 by prime numbers until there are no more common factors.

$$\begin{array}{r|cc} 2 & 18 & 24 \\ 3 & 9 & 12 \\ \hline & 3 & 4 \end{array}$$

The LCM is the product of the common prime factors and the remainders:

$$\mathbf{2 \cdot 3 \cdot 3 \cdot 4 = 72}$$

LCM = 72

1. LCM of 15 and 6
2. LCM of 24 and 40
3. LCM of 12 and 28
4. LCM of 60 and 15

5. Corey is stacking 10-inch boxes while Dale is stacking 12-inch boxes. They plan to stop when their stacks are the exact same height. At what height will this be?

FRACTION OPERATIONS

Adding & Subtracting Fractions and Mixed Numbers

Get a common denominator by finding the LCM of the denominators. Then add or subtract the numerators and keep the denominator. Simplify your answer if needed. If you are adding/subtracting mixed numbers, rewrite them as improper fractions first.

Example 1: $\frac{7}{12}+\frac{8}{15}$

$\frac{7}{12}+\frac{8}{15}$ — *$12 = 2^2 \cdot 3$ and $15 = 3 \cdot 5$. The LCM of 12 and 15 is $2^2 \cdot 3 \cdot 5$ or 60.*

$\frac{35}{60}+\frac{32}{60}$ — *$\frac{7 \cdot 5}{12 \cdot 5} = \frac{35}{60}$ and $\frac{8 \cdot 4}{15 \cdot 4} = \frac{32}{60}$*

$\frac{67}{60}$ or $1\frac{7}{60}$ — *Rename $\frac{67}{60}$ as $1\frac{7}{60}$.*

Example 2: $2\frac{1}{12}-\frac{7}{12}$

$\frac{25}{12}-\frac{7}{12}$

$\frac{18}{12}$ — *Since the fractions have like denominators, subtract the numerators.*

$1\frac{6}{12}$ or $1\frac{1}{2}$ — *Rename as a mixed numeral and simplify.*

Multiplying Fractions and Mixed Numbers

Just multiply the numerators and denominators. To simplify, you may cancel out common factors before multiplying or divide out common factors after multiplying. If you are multiplying mixed numbers, first write them as improper fractions.

$2\frac{1}{3} \cdot 3\frac{3}{4}$ — *Rename $2\frac{1}{3}$ as $\frac{7}{3}$. Rename $3\frac{3}{4}$ as $\frac{15}{4}$.*

$\frac{7}{3} \cdot \frac{15}{4}$

$\frac{7}{\cancel{3}_{1}} \cdot \frac{\cancel{15}^{5}}{4}$ — *Divide 15 and 3 by 3. Why?* **3 is the GCF of 15 and 3**

$\frac{7 \cdot 5}{1 \cdot 4}$

$\frac{35}{4}$ or $8\frac{3}{4}$

Dividing Fractions and Mixed Numbers

Rewrite as MULTIPLICATION using keep, change, flip. Then multiply the numerators and denominators. To simplify, you may cancel out common factors before multiplying or divide out common factors after multiplying. If you are dividing mixed numbers, first write them as improper fractions and then keep, change, flip.

$\frac{4}{5} \div \frac{2}{3}$

$\frac{4}{5} \cdot \frac{3}{2}$ — *Dividing by $\frac{2}{3}$ is the same as multiplying by $\frac{3}{2}$.*

$\frac{\cancel{4}^{2}}{5} \cdot \frac{3}{\cancel{2}_{1}}$ — *Divide 4 and 2 by 2. Why?* **2 is the GCF of 4 and 2.**

$\frac{6}{5}$ or $1\frac{1}{5}$ — *Rename as a mixed numeral in simplest form.*

Perform the indicated operations on fractions.

1. $\frac{7}{16}+\frac{3}{8}$

2. $\frac{4}{9}-\frac{1}{12}$

3. $\frac{7}{8}-\frac{2}{3}$

4. $\frac{5}{24}+\frac{7}{32}$

5. $\frac{11}{30}-\frac{1}{18}$

6. $7\frac{5}{6}-2\frac{2}{3}$

7. $8\frac{3}{4}+3\frac{2}{5}$

8. $8-3\frac{2}{5}$

9. $\frac{1}{4}+4\frac{5}{6}$

10. $4\frac{1}{2}\cdot\frac{1}{3}$

11. $\frac{9}{13}\cdot\frac{26}{27}$

12. $\frac{4}{9}\cdot 5$

13. $3\frac{3}{4}\cdot 2\frac{4}{5}$

14. $5 \div \frac{3}{5}$

15. $\frac{9}{7} \div \frac{3}{14}$

16. $6\frac{4}{5} \div 17$

17. $\frac{3}{4} \div 5\frac{1}{2}$

18. $5 \div \frac{3}{5}$

DECIMAL OPERATIONS

Adding and Subtracting Decimals

Align the numbers vertically around the decimal point. Then just add or subtract.

Example 1: **12.5 + 13.7**

$$\begin{array}{r} 12.5 \\ +\ 13.7 \\ \hline 26.2 \end{array}$$

Align decimal points and place-value positions.
Add as with whole numbers.

Example 2: **119 − 105.7**

$$\begin{array}{r} 119.0 \\ -\ 105.7 \\ \hline 13.3 \end{array}$$

Place the decimal point and annex a zero.
Then, align the decimal points and subtract.

Multiplying Decimals

Multiply like they are whole numbers (you do NOT need to align the decimal points). When you get your answer, insert the proper number of decimal places. To find the proper number of decimal places, add the number of decimal places in both factors. (For example: $2.45 \cdot 1.7 = 4.165$. There are 3 decimal places in the answer because 2 + 1 = 3)

Example 1: $2.3 \cdot 3.5$

$$\begin{array}{r} 2.3 \\ \times\ 3.5 \\ \hline 1\,15 \\ 6\,9 \\ \hline 8.05 \end{array}$$

There is 1 place after the decimal point.
There is 1 place after the decimal point.
1 + 1 = 2 There are two places after the decimal point.

Example 2: $0.105 \cdot 0.03$

$$\begin{array}{r} 0.105 \\ \times\ \ 0.03 \\ \hline 0.00315 \end{array}$$

There are 3 places after the decimal point.
There are 2 places after the decimal point.
There are 5 places needed. Annex 2 zeros.

Dividing Decimals

Divide using long division. Before dividing, move the decimal point in the divisor to the right until it is a whole number and then move the decimal point in the dividend the same number of places.

Example 1:

50 ÷ 2.5

$2.5\overline{)50}$

$2.5 \cdot 10\overline{)50 \cdot 10}$ *Multiply both 2.5 and 50 by 10 to get a whole number divisor.*

$2.5\overline{)50.0}$ *Another way to multiply by 10 is to move the decimal point 1 place to the right.*

$\begin{array}{r} 20 \\ 25\overline{)500} \end{array}$ *The quotient is 20.*

Example 2:

0.0078 ÷ 0.003

$0.003\overline{)0.0078}$

$0.003\overline{)0.007\,8}$ *Multiply 0.003 and 0.0078 by 1000 to get a whole number divisor.*

$\begin{array}{r} 2.6 \\ 3\overline{)7.8} \end{array}$ *The quotient is 2.6.*

Perform the indicated operation on the decimal numbers. Examples of problems involving decimals are at the end of this packet.

1. $0.2 + 2.349$

2. $38.72 - 8.618$

3. $2.349 - 0.4$

4. $5.2 + 0.9635$

5. 8.1×5.6

6. 2.7×9.04

7. $2.45 \div 0.007$

8. $35.926 \div 2.3$

9. 2.349×100

10. $49.998 \div 10$

11. $0.345 \div 100$

12. $0.0062 \cdot 1000$

Convert a Fraction into a Decimal

Example: $\frac{6}{21}$ This is the starting problem.

$21\overline{)6}$ If the fraction-decimal equivalency is not memorized, or easily solved mentally. Set up the fraction as a long division problem.

$$\begin{array}{r} 0 \\ 21\overline{)6} \end{array}$$

21 goes into 6 zero times.

$$\begin{array}{r} 0. \\ 21\overline{)6.0} \end{array}$$

Place a decimal and a zero after the dividend, place a decimal in the quotient.

$$\begin{array}{r} 0.2 \\ 21\overline{)6.0} \end{array}$$

21 goes into 60 twice.

$$\begin{array}{r} 0.2 \\ 21\overline{)6.0} \\ \underline{-42} \\ 18 \end{array}$$

Multiply 2 by 21 and subtract it from 60.

$$\begin{array}{r} 0.285714 \\ 21\overline{)6.000000} \\ \underline{-42} \\ 180 \\ \underline{-168} \\ 120 \\ \underline{-105} \\ 150 \\ \underline{-147} \\ 30 \\ \underline{-21} \\ 90 \\ \underline{-84} \\ 6 \end{array}$$

Because the remainder is not zero, write another zero and continue.
Once the remainer is zero, or matches a previous remainder the process is finished.
Because the remainder, 6, matches the original remainder, 6, the entire result is repeated.

$\frac{6}{21} = 0.\overline{285714}$ The repetend is marked by a solid line over the entire repeated portion.

Convert each fraction to a decimal.

1. $\frac{3}{4}$

2. $\frac{5}{9}$

3. $\frac{7}{18}$

4. $\frac{29}{1000}$

Convert a Decimal into a Fraction

Example: 0.054 — This is the starting decimal. Note that the last digit (4) is in the thousandths place so the number is read *54 thousandths.*

$\frac{54}{1000}$ — The denominator reflects the place value of the decimal.

$\frac{27}{500}$ — Both 54 and 1000 are divisible by 2, so the fraction can be simplified.

Final answers should always be in simplified form.

Convert each decimal to a fraction

1. 0.2
2. 0.246
3. 0.0005
4. 0.042

Writing Percents as Fractions

Words A **percent** is the value of a part-to-whole ratio where the whole is 100. So, you can write a percent as a fraction with a denominator of 100. The symbol % is used to denote a percent.

Numbers

part

$$60\% = 60 \text{ out of } 100 = \frac{60}{100}$$

per one hundred (whole)

part

per

one hundred (whole)

Writing Percents as Decimals

Words Remove the percent symbol. Then divide by 100, which moves the decimal point two places to the left.

Numbers $82\% = .82\cancel{\%} = 0.82$ $\qquad$ $2.\overline{45}\% = 02.\overline{45}\cancel{\%} = 0.02\overline{45}$

Writing Decimals as Percents

Words Multiply by 100, which moves the decimal point two places to the right. Then add a percent symbol.

Numbers $0.47 = 0.47 = 47\%$ $\qquad$ $0.\overline{2} = 0.222\ldots = 22.\overline{2}\%$

Writing Fractions as Percents

Write each fraction as a decimal and a percent.

a. $\frac{4}{5}$

$$\frac{4}{5} = \frac{4 \times 20}{5 \times 20} = \frac{80}{100} = 80\% = 0.8$$

So, $\frac{4}{5}$ can be written as 0.8 or 80%.

b. $\frac{15}{11}$

Use long division to divide 15 by 11.

$$\frac{15}{11} = 1.\overline{36}$$

$$\begin{array}{r} 1.3636 \\ 11\overline{)15.0000} \\ -11 \\ 40 \\ -33 \\ 70 \\ -66 \\ 40 \\ -33 \\ 70 \\ -66 \\ 4 \end{array}$$

The remainder repeats. So, it is a repeating decimal.

Write $1.\overline{36}$ as a percent.

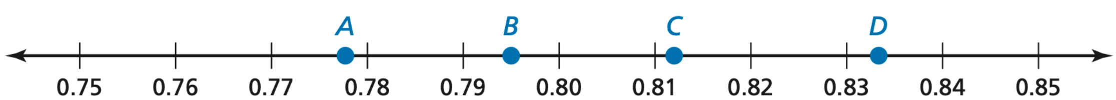
$$1.\overline{36} = 1.3636\ldots = 136.\overline{36}\%$$

Complete the table. Simplify fractions if you can.

Fraction	Decimal	Percent
$\frac{1}{5}$	0.2	20%
	0.6	
		75%
$\frac{1}{3}$		
$\frac{5}{8}$		
		98%
	1.25	
	0.002	

MATCHING **Tell which letter shows the graph of the number.**

1. $\frac{7}{9}$ **2.** 0.812 **3.** $\frac{5}{6}$ **4.** 79.5%



PERCENT OF A NUMBER

To find the "percent of" a number, convert the percent to a decimal and then multiply the decimal and the number.

Example: What is 24% of 50?

24% can be written as 0.24. 24% of 50 means $0.24 \cdot 50$ which is 12.

1. What is 80% of 120?

2. What is 70% of 35?

3. What is 20% of 150?

4. What is 110% of 95?

5. What is 25% of 16?

UNIT RATES

Unit Rate

Words A **unit rate** compares a quantity to one unit of another quantity.
Equivalent rates have the same unit rate.

Numbers You pay $27 for 3 pizzas.

Rate: $27 : 3 pizzas

Unit rate: $9 : 1 pizza

You can find the unit rate using equivalent fractions: $\frac{\$27 \div 3}{3\ pizzas \div 3} = \frac{\$9}{1\ pizza}$

Write a unit rate for each situation.

1. 24 animals in 2 square miles

2. $28 saved in 4 weeks

3. 270 miles in 6 hours

4. 2520 kilobytes in 18 seconds

5. 1080 miles on 15 gallons

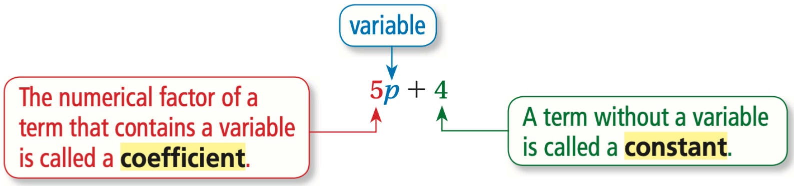
6. $100 for every 5 guests

7. 228 students in 12 classes

8. $12.50 for 5 ounces

ALGEBRAIC EXPRESSIONS

An **algebraic expression** is an expression that may contain numbers, operations, and one or more *variables*. A **variable** is a symbol that represents one or more numbers. Each number or variable by itself, or product of numbers and variables in an algebraic expression, is called a **term**.



Identify the terms, coefficients, and constants in each expression.

a. $5x + 13$

$5x + 13$

Terms: $5x$, 13

Coefficient: 5

Constant: 13

b. $-2z^2 + y + 3$

$-2z^2 + y + 3$

Terms: $-2z^2$, $1y$, 3

Coefficients: -2, 1

Constant: 3

Identify the terms, coefficients, and constants of each expression.

1. $-3k + 7k + 20$

Terms ____

Coefficients ________________________ Constants ______________________

2. $-11 - 4a + 3b - 5 - a$

Terms ____

Coefficients ________________________ Constants ______________________

EVALUATING EXPRESSIONS

To evaluate an algebraic expression, substitute a number for each variable. Then use the order of operations to find the value of the numerical expression.

a. Evaluate $k + 10$ when $k = 25$.

$k + 10 = 25 + 10$ — Substitute 25 for *k*.

$= 35$ — Add 25 and 10.

b. Evaluate $4n$ when $n = 12$.

$4n = 4 \cdot 12$ — Substitute 12 for *n*.

$= 48$ — Multiply 4 and 12.

Let $n = 10,\ m = 5,\ x = -2,\ y = -8,$ and $z = \frac{3}{4}$. Evaluate the expressions using these values. Show your work.

1. $-5n + 2$

2. $m + x - y$

3. $\frac{y}{2} + 3x$

4. m^2

5. $\frac{3m+y}{n-9}$

6. $16z$

7. x^3

8. $\frac{4m}{y+x}$

9. $x^2 + 12z$

SIMPLIFYING EXPRESSIONS

To simplify an expression, add any like variable terms and add any constants. Rewrite subtraction as adding a negative number to make simplification easier.

Example 1: Simplify $\mathbf{5x+9x+1}$
You may add variable terms but you can't add variable terms and constants.
$\mathbf{14x+1}$

Example 2: Simplify $\mathbf{3x-5+2x+7}$
First rewrite the expression as
$\mathbf{3x+(-5)+2x+7}$
Rearrange so like variable terms are together and constants are together:
$\mathbf{3x+2x+(-5)+7}$
Add the variables and add the constants:
$\mathbf{5x+2}$

Simplify each expression.

1. $4x+6x$

2. $2x+20-5$

3. $10+6x+15$

4. $5x+2x-9x$

5. $11x-9+3x+2$

6. $-7-2y+3y+10$

WRITING EXPRESSIONS

Some words can imply math operations.

Operation	Addition	Subtraction	Multiplication	Division
Key Words and Phrases	added to plus sum of more than increased by total of and	subtracted from minus difference of less than decreased by fewer than take away	multiplied by times product of twice	divided by quotient of

Write each phrase as an expression.

a. 14 more than a number x

$x + 14$ The phrase *more than* means *addition*.

b. a number y minus 75

$y - 75$ The word *minus* means *subtraction*.

c. the quotient of 3 and a number z

$3 \div z$, or $\frac{3}{z}$ The phrase *quotient of* means *division*.

Write each phrase as an expression. Use "x" for each unknown number.

1. 16 subtracted from a number

2. The product of −9 and a number.

3. Twice a number increased by 7.

4. The sum of a number and 4.

5. The difference of 17 and a number.

6. The quotient of a number and 7.

Distributive Property

Words To multiply a sum or difference by a number, multiply each term in the sum or difference by the number outside the parentheses. Then simplify.

Numbers $3(7 + 2) = 3 \times 7 + 3 \times 2$ **Algebra** $a(b + c) = ab + ac$

$3(7 - 2) = 3 \times 7 - 3 \times 2$ $a(b - c) = ab - ac$

Use the Distributive Property to simplify each expression.

a. $4(n + 5)$

$4(n + 5) = 4(n) + 4(5)$ Distributive Property

$= 4n + 20$ Multiply.

b. $12(2y - 3)$

$12(2y - 3) = 12(2y) - 12(3)$ Distributive Property

$= 24y - 36$ Multiply.

1. $3(2x - 5)$

2. $-5(4x + 1)$

3. $9(k + 3)$

4. $-2(5x - 3)$

5. $\frac{1}{2}(6x + 2)$

6. $\frac{3}{4}(24 - 12x)$

7. $4(x - 2) + 10$

8. $5 + 2(x + 9)$

9. $6 - 7(3x - 3)$

EQUATIONS

To solve an equation means to ***find the value*** of the variable. We solve equations by isolating the variable using opposite operations.

> ***Opposite Operations:***
> Addition (+) & Subtraction (–)
> Multiplication (x) & Division (÷)

Example:

Solve.

$3x - 2 = 10$	
$+2 \quad +2$	Isolate 3x by adding 2 to each side.
$\frac{3x}{3} = \frac{12}{3}$	Simplify Isolate x by dividing each side by 3.
$x = 4$	Simplify

> ***Please remember…***
> to do the same step on each side of the equation.

> **Always check your work by substitution!**

Check your answer.

$3(4) - 2 = 10$	Substitute the value in for the variable.
$12 - 2 = 10$	Simplify
$10 = 10$	Is the equation true? If yes, you solved it correctly!

Example 2: Solving proportions

Solve the proportion $\frac{8}{x} = \frac{6}{15}$.

$\frac{8}{x} = \frac{6}{15}$	**Write original proportion.**
$8 \cdot 15 = x \cdot 6$	**Cross products property**
$120 = 6x$	**Simplify.**
$20 = x$	**Divide each side by 6.**

Solve for x. The first 3 are done for you. Show work like the examples even if you can mentally figure out the value of x.

1. $x + 2 = 9$

2. $5x = 15$

3. $x - 3 = 6$

4. $x + 14 = 41$

5. $8x = 96$

6. $x - 10 = 31$

7. $\frac{x}{9} = 10$

8. $x - 3.5 = 9.5$

9. $x + \frac{2}{7} = \frac{9}{14}$

10. $2x - 3 = 11$

11. $5x + 2 = 37$

12. $-3x + 1 = 91$

13. $\frac{x}{3} - 2 = -6$

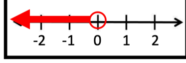
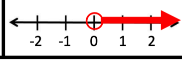
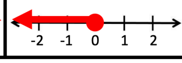
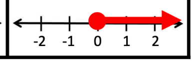
14. $\frac{x}{2} + 4 = 15$

15. $\frac{1}{6}x + 2 = 18$

16. $\frac{9}{x} = \frac{15}{20}$

17. $\frac{11}{14} = \frac{x}{5}$ (write your answer as a mixed number)

INEQUALITIES

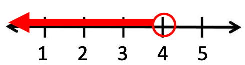
"IS LESS THAN"	"IS GREATER THAN"	"IS LESS THAN OR EQUAL TO"	"IS GREATER THAN OR EQUAL TO"
$x < 0$	$x > 0$	$x \leq 0$	$x \geq 0$
			

How to Solve an Inequality: Solve it just like an equation (show work) and then graph the solution on a number line. Please see the note below about solving inequalities with multiplication or division!

Examples:

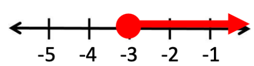
1) $m - 5 < 1$

$m - 5 < -1$
$+5 \quad +5$
$m < 4$



2) $h + 7 \geq 4$

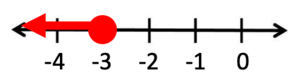
$h + 7 \geq 4$
$-7 \quad -7$
$h \geq -3$



3) $4c < -12$

$\frac{4c}{4} \leq \frac{-12}{4}$

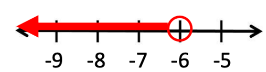
$c \leq -3$



4) $\frac{b}{2} < -3$

$2 \cdot \frac{b}{2} < -3 \cdot 2$

$b < -6$

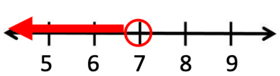


5) $-8p > -56$

$\frac{-8p}{-8} > \frac{-56}{-8}$

$p < 7$

*SWITCH the inequality when multiplying by a negative!

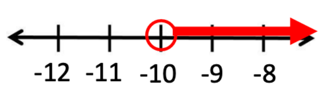


6) $\frac{n}{-5} < 2$

$-5 \cdot \frac{n}{-5} < 2 \cdot -5$

$n > -10$

*SWITCH the inequality when dividing by a negative!



Special Rule - Just for Inequalities

Whenever you **multiply or divide** by a **negative** number, you **MUST reverse** the sign.

Example

$-3x < 9$

Divide by a negative 3

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

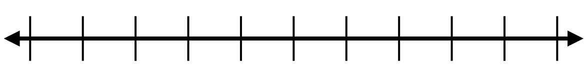
Reverse the sign

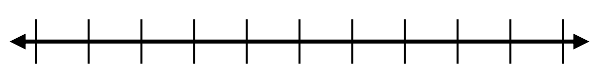
$x > -3$

Solve the inequality (show work like the examples) and then graph the solution on the number line.

1. $x + 14 \leq 9$

2. $\frac{x}{5} > 2$





3. $x - 9 < 3$

4. $-3n \leq 24$

5. $5x \geq 25$

6. $-\frac{x}{9} > 3$

7. $-12 + x \geq -7$

8. $7x \leq -49$

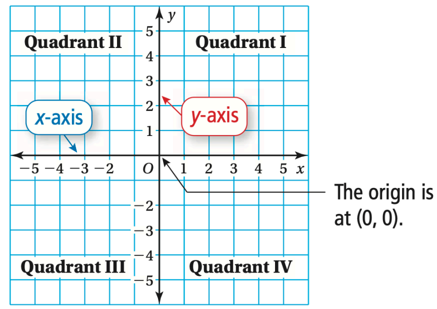
9. $\frac{x}{3} - 4 > 2$

10. $-2x + 1 \leq 25$

COORDINATE PLANE

The Coordinate Plane

A **coordinate plane** is formed by the intersection of a horizontal number line and a vertical number line. The number lines intersect at the **origin** and separate the coordinate plane into four regions called **quadrants**.



An *ordered pair* is used to locate a point in a coordinate plane.

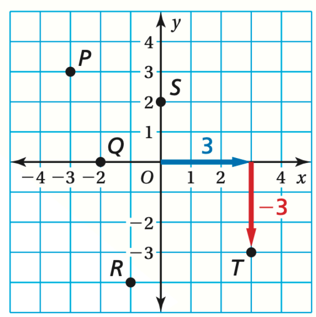
ordered pair: (4, −2)

x-coordinate — *y*-coordinate

Which ordered pair corresponds to Point *T*?

A. (−3, −3) **B.** (−3, 3)

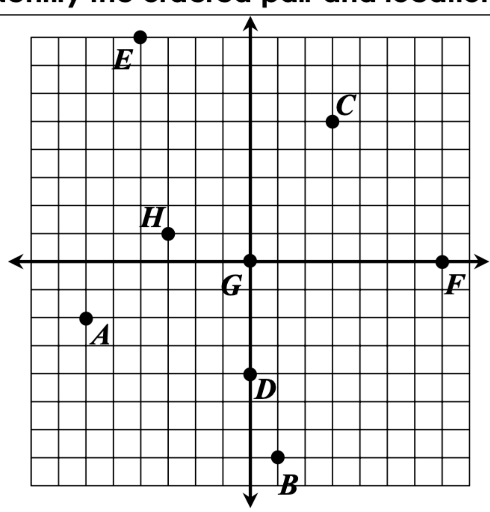
C. (3, −3) **D.** (3, 3)



Point *T* is 3 units to the right of the origin and 3 units down. So, the *x*-coordinate is 3 and the *y*-coordinate is −3.

The ordered pair (3, −3) corresponds to Point *T*. The correct answer is **C.**

Identify the ordered pair and location (quadrant or axis) for each point on the graph.



Point	Ordered Pair	Location
A		
B		
C		
D		
E		
F		
G		
H		

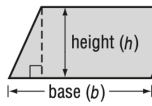
AREA

Parallelograms

Words The area A of a parallelogram is the product of any base b and its height h.

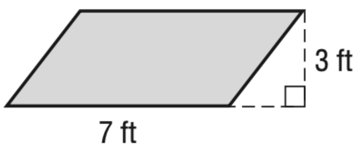
Symbols $A = bh$

Model

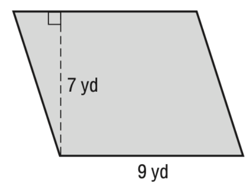


Find the area of each parallelogram. Remember to show work & write units (square units are used for area!)

1.



2.

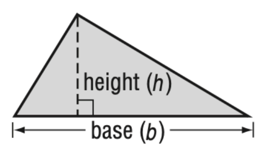


Triangles

Words The area A of a triangle is one half the product of any base b and its height h.

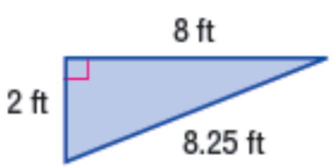
Symbols $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Model

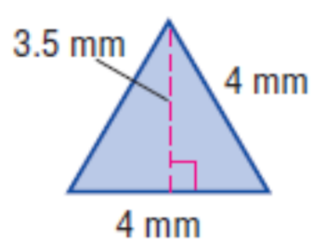


Find the area of each triangle. Remember to show work & write units (square units are used for area!)

3.



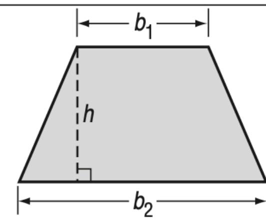
4.



Trapezoids

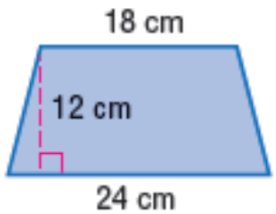
A trapezoid has two bases, b_1 and b_2. The height of a trapezoid is the distance between the two bases. The area A of a trapezoid equals half the product of the height h and the sum of the bases b_1 and b_2.

$$A = \frac{1}{2}h(b_1 + b_2)$$

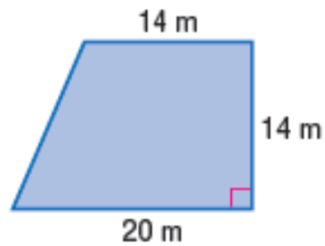


Find the area of each trapezoid. Remember to show work & write units (square units are used for area!)

5.

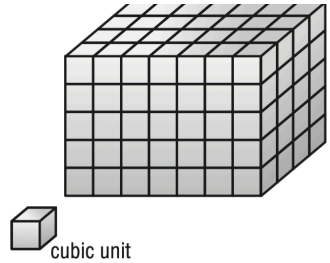


6.



VOLUME OF PRISMS

The amount of space inside a three-dimensional figure is the **volume** of the figure. Volume is measured in **cubic units**. This tells you the number of cubes of a given size it will take to fill the prism.



Formula: Use $V = Bh$.

$V = Bh$

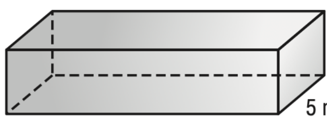
$V = 50 \times 2$

$V = 100$

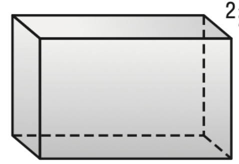
The volume is 100 ft^3.

Find the volume of each prism. Show work and put units on your answer.

1.



2.

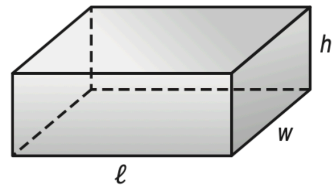


SURFACE AREA OF PRISMS

The **surface area** *S.A.* of a rectangular prism with length ℓ, width w, and height h is the sum of the areas of the faces.

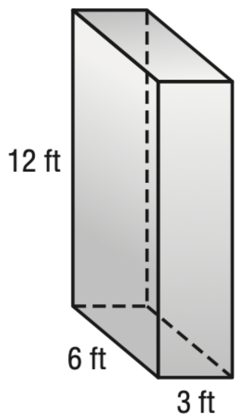
Symbols $S.A. = 2\ell h + 2\ell w + 2hw$

Model

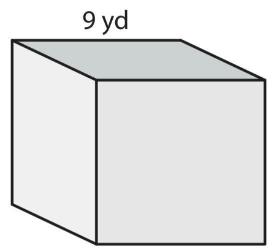


Find the surface area of each prism. Remember to show work & write units (square units are used for area!)

1.



2. Cube

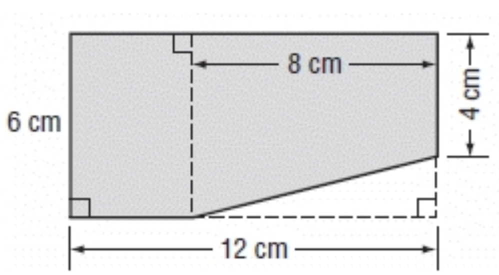


MIXED PROBLEM SOLVING

1. A sewing club used 48 feet of fabric to make 8 blankets. At this rate, how many blankets can be made from 12 yards of fabric?

2. Brandon has $7\frac{1}{2}$ gallons of paint. He plans on using $1\frac{1}{2}$ gallons on each room. How many rooms will he be able to paint?

3. Find the area of the figure.



4. During a basketball game, Greg attempted 40 shots and made 18. He says he made 40% of the shots he took. Is Greg correct? Explain your reasoning.

5. Joan bought 22 boxes of crayons for $28.16. How much did she pay for each box of crayons?

6. Soup A has 8 grams of sodium in 10 cups. Soup B has 7 grams of sodium in 14 cups. Which soup has more sodium per cup?

7. A recipe uses 7 parts of milk for every 5 parts of sugar. How much sugar do you use when you use 28 cups of milk?

8. You earn $28 for washing 7 cars. How much do you earn for washing 6 cars?

9. An online retailer allows customers to rate items. An item receives scores of 2.75, -4.75, -1, 2.25, -4, 0.25, 4.75, and -2.25. Find the median and mean score.

INTEGER OPERATION EXAMPLES

Adding Integers

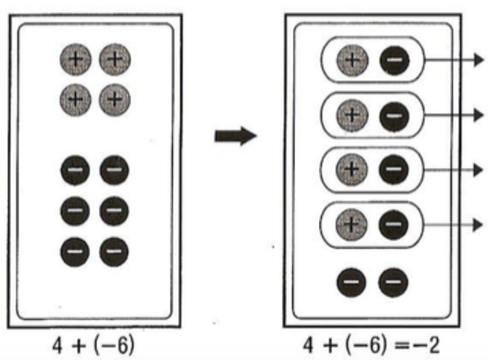
For integers with the same sign:
- the sum of two positive integers is positive.
- the sum of two negative integers is negative.

For integers with different signs, subtract their absolute values. The sum is:
- positive if the positive integer has the greater absolute value.
- negative if the negative integer has the greater absolute value.

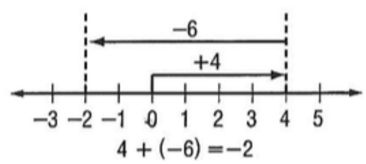
To add integers, it is helpful to use counters or a number line.

EXAMPLE 1 **Find $4 + (-6)$.**

Method 1 Use counters.
Combine a set of 4 positive counters and a set of 6 negative counters on a mat.



Method 2 Use a number line.
- Start at 0.
- Move 4 units right.
- Then move 6 units left.



Subtracting Integers

To subtract an integer, add its opposite.

EXAMPLE 1 **Find $6 - 9$.**

$6 - 9 = 6 + (-9)$ To subtract 9, add -9.
$= -3$ Simplify.

EXAMPLE 2 **Find $-10 - (-12)$.**

$-10 - (-12) = -10 + 12$ To subtract -12, add 12.
$= 2$ Simplify.

EXAMPLE 3 **Evaluate $a - b$ if $a = -3$ and $b = 7$.**

$a - b = -3 - 7$ Replace a with -3 and b with 7.
$= -3 + (-7)$ To subtract 7, add -7.
$= -10$ Simplify.

Multiplying Integers

> The product of two integers with **different** signs is **negative**.
> The product of two integers with the **same** sign is **positive**.

EXAMPLE 1 **Multiply $5(-2)$.**

$5(-2) = -10$ The integers have different signs. The product is negative.

EXAMPLE 2 **Multiply $-3(7)$.**

$-3(7) = -21$ The integers have different signs. The product is negative.

EXAMPLE 3 **Multiply $-6(-9)$.**

$-6(-9) = 54$ The integers have the same sign. The product is positive.

EXAMPLE 4 **Multiply $(-7)^2$.**

$(-7)^2 = (-7)(-7)$ There are 2 factors of -7.
$= 49$ The product is positive.

EXAMPLE 5 **Simplify $-2(6c)$.**

$-2(6c) = (-2 \cdot 6)c$ Associative Property of Multiplication.
$= -12c$ Simplify.

EXAMPLE 6 **Simplify $2(5x)$.**

$2(5x) = (2 \cdot 5)x$ Associative Propery of Multiplication.
$= 10x$ Simplify.

Dividing Integers

> The quotient of two integers with different signs is negative.
> The quotient of two integers with the same sign is positive.

EXAMPLE 1 **Divide $30 \div (-5)$.**

$30 \div (-5)$ The integers have different signs.

$30 \div (-5) = -6$ The quotient is negative.

EXAMPLE 2 **Divide $-100 \div (-5)$.**

$-100 \div (-5)$ The integers have the same sign.

$-100 \div (-5) = 20$ The quotient is positive.