

8th Grade – Summer Math Packet

Unit: Knowledge of Algebra, Patterns, and Functions

Objective: Complete a function table with a given two operation rule.

Examples:

The solution of an equation with two variables consists of two numbers, one for each variable, that make the equation true. The solution is usually written as an ordered pair.

The cost to rent a bicycle at the beach includes a rental fee of 5 dollars plus 3 dollars for each hour. The equation for the cost of renting a bicycle is:

$$C = 3H + 5$$

C is the total cost and H is the number of hours.

Bicycle Rentals		
Hours	$3H + 5$	Cost (dollars)
1	$3(1) + 5$	8
2	$3(2) + 5$	11
3	$3(3) + 5$	14
4	$3(4) + 5$	17

Complete the following tables:

1.)

$C = 3H + 4$		
H	$3H + 4$	C
2	$3(2) + 4$	
4		
6		
10		

2.)

$Y = 5X + 2$		
X	$5X + 2$	Y
3		
6		
9		
12		

3.)

$Y = 5X - 3$		
X	$5X - 3$	Y
1	$5(1) - 3$	2
2		
3		
4		

4.)

$A = 4B - 3$		
B	$4B - 3$	A
3		
4		
5		
6		

5.)

$Y = 2 + 10X$		
X	$2 + 10X$	Y
3	$2 + 10(3)$	32
4		
5		

6.)

$6B - 1 = A$		
B	$6B - 1$	A
8	$6(8) - 1$	47
10		
12		

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Unit: Knowledge of Algebra, Patterns, and Functions

Objective: Write an algebraic expression to represent unknown quantities with one unknown and 1 or 2 operations.

Examples:

The tables below show phrases written as mathematical expressions.

Phrases	Expression
9 more than a number the sum of 9 and a number a number plus 9 a number increased by 9 the total of x and 9	$X + 9$
Phrases	Expression
6 multiplied by g 6 times a number the product of g and 6	$6g$

Phrases	Expression
4 subtracted from a number a number minus 4 4 less than a number a number decreased by 4 the difference of h and 4	$h - 4$
Phrases	Expression
a number divided by 5 the quotient of t and 5 divide a number by 5	$\frac{t}{5}$

Write each phrase as an algebraic expression.

1.) 7 less than m

2.) The quotient of 3 and y

3.) 7 years younger than Jessica

4.) 3 times as many marbles as Bob has

5.) Let t = the number of tomatoes Tye planted last year. This year she planted 3 times as many. Write an algebraic expression to show how many tomatoes Tye planted this year.

6.) Last week Jason sold x number of hot dogs at the football game. This week he sold twice as many as last week, and then he sold 10 more. Write an expression to show how many hot dogs Jason sold this week.

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Unit: Knowledge of Algebra, Patterns, and Functions

Objective: Write equations and inequalities - A

Examples:

The table below shows sentences written as an equation.

Sentences	Equation
Sixty less than three times the amount is \$59. Three times the amount less 60 is equal to 59. 59 is equal to 60 subtracted from three times a number. A number times three minus 60 equals 59.	$3n - 60 = 59$

Write an equation for each of the following:

1.) 4 less than 3 times a number is 14.

2.) There are 5 people in Johnny's rock band. They made x dollars playing at a dance hall. After dividing the money 5 ways, each person got \$67.

3.) The Washington Monument is 555 feet tall. It is 75 feet shorter than the Gateway to the West Arch.

4.) The lifespan of a zebra is 15 years. The lifespan of a black bear is 3 years longer than the lifespan of a zebra. Write an addition equation that you could use to find the lifespan of a bear.

5.) A gardening expert recommends that flower bulbs be planted to a depth of three times their height. Suppose Jenna determines that a certain bulb should be planted at a depth of 4.5 inches. Write an equation to find the height of the bulb.

6.) The electric company charges \$0.06 per kilowatt hour of electricity used. Write a multiplication equation to find the number of kilowatt hours of electricity for which the Estevez family was charged if their electric bill was \$45.84.

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Unit: Knowledge of Algebra, Patterns, and Functions

Objective: Write equations and inequalities - B

An **inequality** is a mathematical sentence that contains the symbols $<$, $>$, \leq , or \geq .

Words	Symbols
m is greater than 7.	$m > 7$
r is less than -4 .	$r < -4$
t is greater than or equal to 6.	$t \geq 6$
y is less than or equal to 1.	$y \leq 1$

Examples:

- 1) Two times a number is greater than 10 $2x > 10$
- 2) Three less than a number is less than or equal to 7. $x - 3 = 7$
- 3) The sum of a number and 1 is at least 5. $x + 1 \geq 5$
- 4) Cody has \$50 to spend. How many shirts can he buy at \$16.50 each? $16.50x \leq 50$

Write an inequality for each of the following:

1.) Five times a number is greater than 25.

2.) The sum of a number and 6 is at least 15.

3.) 24 divided by some number is less than 7.

4.) Five dollars less than two times Chris' pay is at most \$124.

5.) In Ohio, you can get your license when you turn 16.
Write an inequality to show the age of all drivers in Ohio.

6.) Suppose a DVD costs \$19 and a CD costs \$14. Write an inequality to find how many CDs you can buy along with one DVD if you have \$65 to spend.

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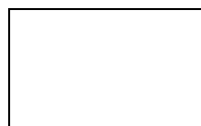
Unit: Knowledge of Algebra, Patterns, and Functions

Objective: Apply given formulas to a problem-solving situation using formulas having no more than three variables.

Example 1:

The perimeter of a rectangle is twice the length (L) plus twice the width (W). $P = 2L + 2W$

Use the given formula to find the perimeter of the rectangle.



10 cm

8 cm

$$P = 2L + 2W$$

$$P = 2(10) + 2(8)$$

$$P = 20 + 16$$

$$P = 36 \text{ cm}$$

Write the equation

Replace L and W with the length and width

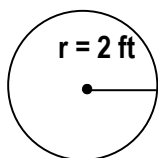
Multiply

Simplify and add the correct label

Example 2:

The area A of a circle equals the product of pi (π) and the square of its radius (r). $A = \pi r^2$ ($\pi \approx 3.14$)

Use the given formula to find the area of the circle.



$r = 2 \text{ ft}$

$$A = \pi r^2$$

$$A = 3.14 \cdot (2)^2$$

$$A = 3.14 \cdot 4$$

$$A = 12.56 \text{ ft}^2$$

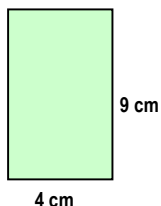
Write the equation

Replace π with 3.14 and r with 2

Square the 2

Simplify and add the correct label

- 1.) The formula for finding the area of a rectangle is $A = L \cdot W$. Use this formula to find the area of the rectangle.

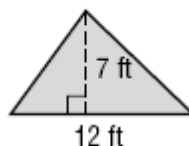


4 cm

9 cm

- 2.) The formula for finding the area of a triangle is

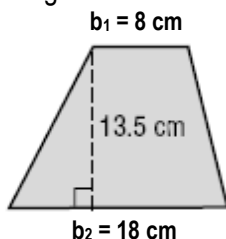
$$A = \frac{1}{2}bh. \text{ Find the area of the triangle below.}$$



12 ft

7 ft

- 3.) A trapezoid has two bases (b_1 and b_2). The formula for finding the area of a trapezoid is: $A = \frac{1}{2}h(b_1 + b_2)$



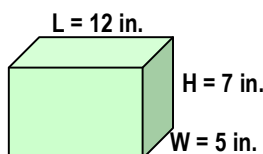
$b_1 = 8 \text{ cm}$

13.5 cm

$b_2 = 18 \text{ cm}$

Find the area of the trapezoid.

- 4.) The formula for finding the volume of a rectangular prism is $V = L \cdot W \cdot H$. Find the volume of the box.



$L = 12 \text{ in.}$

$H = 7 \text{ in.}$

$W = 5 \text{ in.}$

- 5.) Margot planted a rectangular garden that was 18 feet long and 10 feet wide. How many feet of fencing will she need to go all the way around the garden? $P = 2L + 2W$

- 6.) Juan ran all the way around a circular track one time. The diameter (d) of the track is 60 meters. The formula for circumference of a circle is $C = \pi d$. Use this formula to find out how far Juan ran.

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Unit: Knowledge of Algebra, Patterns, and Functions

Objective: Graph ordered pairs in a coordinate plane.

The **coordinate plane** is used to locate points. The horizontal number line is the **x-axis**. The vertical number line is the **y-axis**. Their intersection is the **origin**.

Points are located using **ordered pairs**. The first number in an ordered pair is the **x-coordinate**; the second number is the **y-coordinate**.

The coordinate plane is separated into four sections called **quadrants**.

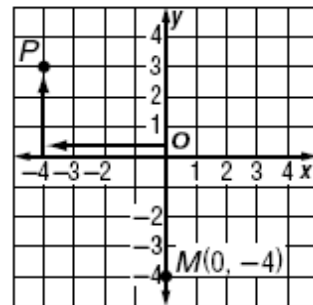
Example 1: Name the ordered pair for point P. Then identify the quadrant in which P lies.

- Start at the origin.
- Move 4 units left along the x-axis.
- Move 3 units up on the y-axis.

The ordered pair for point P is (-4, 3).

P is in the upper left quadrant or quadrant II.

Quadrant 2 Quadrant 1



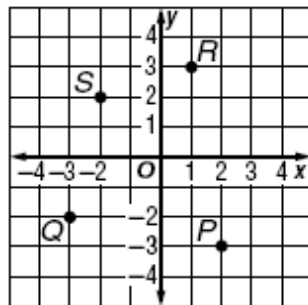
Quadrant 3 Quadrant 4

Example 2: Graph and label the point M (0, -4).

- Start at the origin.
- Move 0 units along the x-axis.
- Move 4 units down on the y-axis.
- Draw a dot and label it M(0, -4).

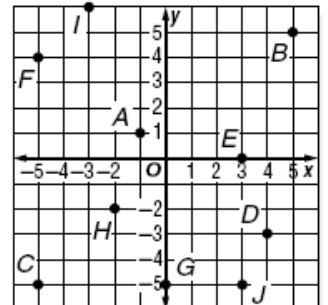
1.) Name the ordered pair for each point graphed at the right. Then identify the quadrant in which each point lies.

Coordinates	Quadrant
P (__, __)	__
Q (__, __)	__
R (__, __)	__
S (__, __)	__



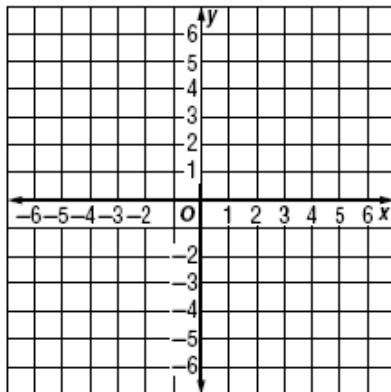
2.) Find each of the points below on the coordinate plane. Then identify the quadrant in which each point lies.

Coordinates	Quadrant
A (__, __)	__
J (__, __)	__
B (__, __)	__
H (__, __)	__



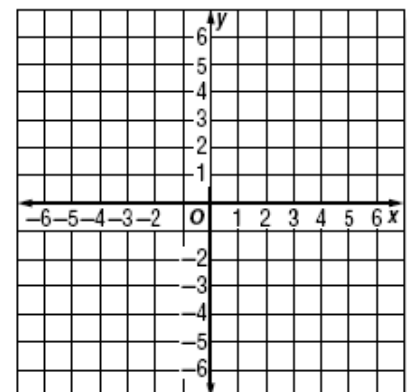
3.) Graph and label each point on the coordinate plane.

- N (3, -1)
- P (-2, 4)
- Q (-3, -4)
- R (0, 0)
- S (-5, 0)



4.) Graph and label each point on the coordinate plane.

- D (0, 4)
- E (5, 5)
- G (-3, 0)
- H (-6, -2)
- J (0, -2)



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Unit: Knowledge of Algebra, Patterns, and Functions

Objective: Identify and describe the change represented in a table of values; identify increase, decrease, or no change.

Example: Look at the table below. How are Wages (y) affected by the number of Hours Worked (x)? Identify the change as **increasing**, **decreasing**, or **no change**. Describe the changes in y -values.

Hours Worked (x)	Wages (y)
2	\$14
4	\$28
6	\$42
8	\$56



**As the Hours Worked (x) increase, the wages (y) increase.
Wages increase by \$14 dollars for every 2 hours worked (or \$7 for every hour worked).**

Identify the change in each table of values as **increasing**, **decreasing**, or **no change**. Describe the changes in y -values.

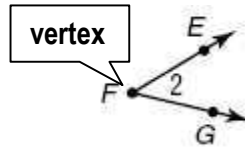
<p>1.)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Homework Minutes (x)</th> <th style="text-align: center;">Test Grades (y)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">25</td> <td style="text-align: center;">61</td> </tr> <tr> <td style="text-align: center;">35</td> <td style="text-align: center;">74</td> </tr> <tr> <td style="text-align: center;">45</td> <td style="text-align: center;">87</td> </tr> <tr> <td style="text-align: center;">55</td> <td style="text-align: center;">100</td> </tr> </tbody> </table>	Homework Minutes (x)	Test Grades (y)	25	61	35	74	45	87	55	100	<p>2.)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Time Hours (x)</th> <th style="text-align: center;">Distance Miles (y)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">50</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">100</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">150</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">200</td> </tr> </tbody> </table>	Time Hours (x)	Distance Miles (y)	1	50	2	100	3	150	4	200
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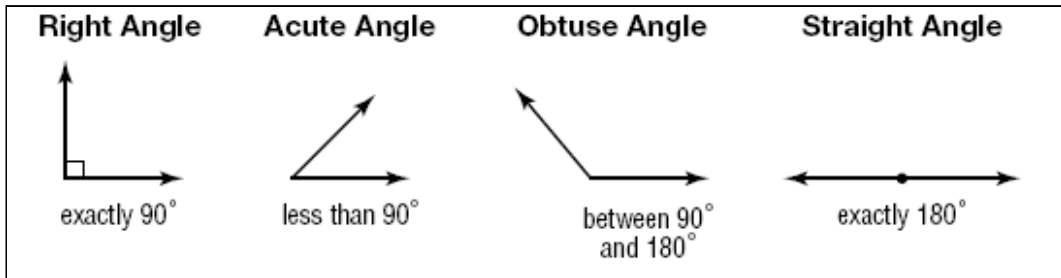
Unit: Knowledge of Geometry

Objective: Identify and describe angles formed by intersecting lines, rays, or line segments - A

An **angle** is formed by two rays with a common vertex.
 Angles are also formed by intersecting lines or line segments.
 Angles are measured in **degrees**.
 Angles are classified according to their measures.



$\angle 2$ (also called $\angle EFG$)
 $\rightarrow \quad \rightarrow$
 is formed by rays FE and FG



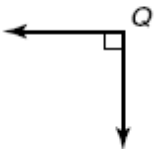
1.) Classify the angle as **acute**, **obtuse**, **right**, or **straight**.



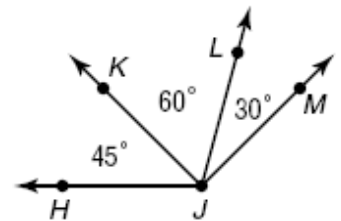
2.) Classify the angle as **acute**, **obtuse**, **right**, or **straight**.



3.) Classify the angle as **acute**, **obtuse**, **right**, or **straight**.



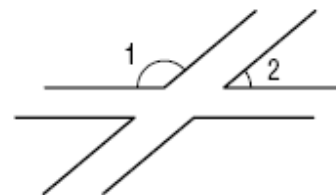
4.) Name all of the acute angles.



5.) The time shown on the clock is 11:05. Starting at this time, approximately what time will it be when the hands form an obtuse angle?



6.) The runways at a local airport are sketched in the figure. Classify $\angle 1$ and $\angle 2$ as acute, obtuse, right, or straight.



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Unit: Knowledge of Geometry

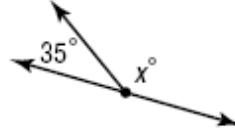
Objective: Determine the measure of angles formed by intersecting lines, line segments, and rays.

Example 1: Find the value of x in the figure.

The two angles are supplementary, so the sum of their measures is 180° .

$$\begin{array}{r} x + 35 = 180 \\ - 35 \quad - 35 \\ \hline x = 145 \end{array}$$

Write the equation
Subtract 35 from both sides
Simplify
The angle is 145°

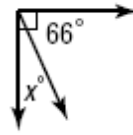


Example 2: Find the value of x in the figure.

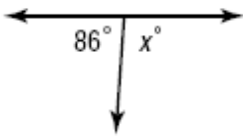
The two angles are complementary, so the sum of their measures is 90° .

$$\begin{array}{r} x + 66 = 90 \\ - 66 \quad - 66 \\ \hline x = 24 \end{array}$$

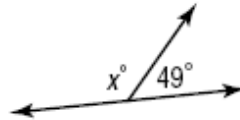
Write the equation
Subtract 66 from both sides
Simplify
The angle is 24°



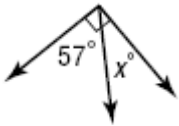
1.) Find the value of x .



2.) Find the value of x .



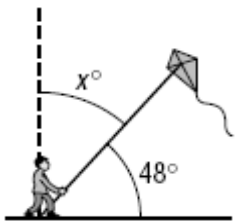
3.) Find the value of x .



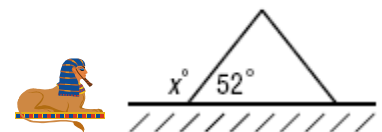
4.) Find the value of x .



5.) A kite string makes an angle of 48° with respect to the ground as shown below. The dashed line is vertical and the ground is horizontal. How are the 48° angle and the unknown angle related? What is the value of x ?



6.) A side view of the Great Pyramid at Giza is shown below. The sides of the pyramid make an angle of 52° with respect to the ground. What is the value of x ?



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Unit: Knowledge of Geometry

Objective: Identify the result of one **translation**, reflection, or rotation – A

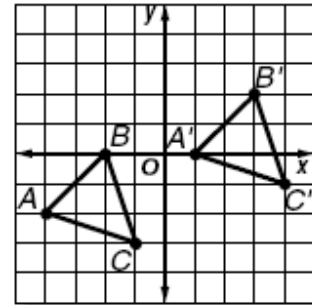
A **translation** is the movement of a geometric figure in some direction without turning the figure. When translating a figure, every point of the original figure is moved the same distance and in the same direction. To graph a translation of a figure, move each vertex of the figure in the given direction. Then connect the new vertices.

Example: Triangle **ABC** has vertices **A**(- 4, - 2), **B**(- 2, 0), and **C**(- 1, - 3). Find the vertices of triangle **A'B'C'** after a translation of 5 units right and 2 units up.

Add 5 to each x-coordinate

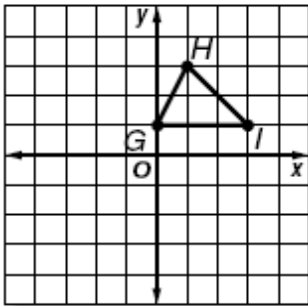
Add 2 to each y-coordinate

Vertices of $\triangle ABC$	$(x + 5, y + 2)$	Vertices of $\triangle A'B'C'$	
$A(-4, -2)$	$(-4 + 5, -2 + 2)$	$A'(1, 0)$	
$B(-2, 0)$	$(-2 + 5, 0 + 2)$	$B'(3, 2)$	
$C(-1, -3)$	$(-1 + 5, -3 + 2)$	$C'(4, -1)$	

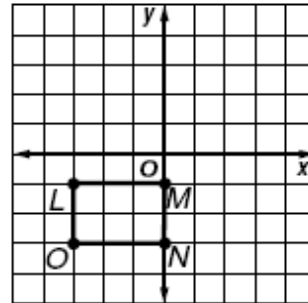


The coordinates of the vertices of $\triangle A'B'C'$ are $A'(1, 0)$, $B'(3, 2)$, and $C'(4, - 1)$.

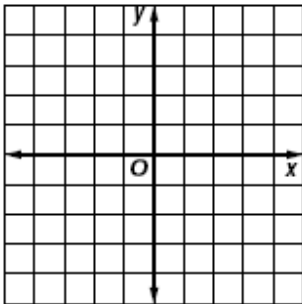
1.) Translate $\triangle GHI$ 1 unit left and 5 units down.



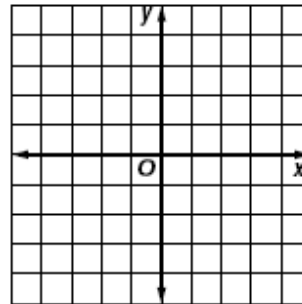
2.) Translate rectangle LMNO 3 units up and 4 units right.



3.) $\triangle XYZ$ has vertices **X**(- 4, 5), **Y**(- 1, 3), and **Z**(- 2, 0). Find the vertices of $\triangle X'Y'Z'$ after a translation of 4 units right and 3 units down. Then graph the figure and its translated image.



4.) Parallelogram **RSTU** has vertices **R**(- 1, - 3), **S**(0, - 1), **T**(4, - 1), and **U**(3, - 3). Find the vertices of $\mathbf{R'S'T'U'}$ after a translation of 3 units left and 3 units up. Then graph the figure and its translated image.



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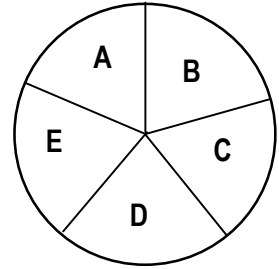
Unit: Knowledge of Probability

Objective: Determine the probability of an event comprised of 2 independent events.

Examples:

- **INDEPENDENT EVENTS:** the outcome of one event does NOT affect the outcome of the 2nd event.
- The probability of two independent events can be found by multiplying the probability of the first event by the probability of the second event.
- $P(A \text{ and } B) = P(A) \cdot P(B)$

A number cube is rolled, and the spinner at the right is spun.
Determine the probability of rolling a 2 and spinning a vowel.



$$P(2 \text{ and vowel}) = P(2) \times P(\text{vowel})$$

$$\frac{1}{6} \times \frac{2}{5} = \frac{2}{30} = \frac{1}{15}$$

A coin is tossed and a number cube is rolled. Find the probability of tossing tails and rolling a 5.

$$P(\text{tails}, 5) = P(\text{tails}) \times P(5)$$

$$\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$$

1.) A coin is tossed, and a number cube is rolled. What is the probability of tossing heads, and rolling a 3 or a 5?

2.) A red and a blue number cube are rolled. Determine the probability that an odd number is rolled on the red cube and a number greater than 1 is rolled on the blue cube.

3.) One letter is randomly selected from the word PRIME and one letter is randomly selected from the word MATH. What is the probability that both letters selected are vowels?

4.) What is the probability of spinning a number greater than 5 on a spinner numbered 1 to 8 and tossing a tail on a coin?

5.)

Kid's Carnival Meals	
Choose 1 from each column	
Chicken Nuggets	French Fries
Hamburger	Apple slices
Cheeseburger	
Pizza	

What is the probability that Joey will choose a hamburger and apple slices?

6.)

For his probability experiment, Ryan is going to spin a spinner and roll a six-sided number cube. What is the probability of spinning "Red" and rolling a "2"?

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Unit: Knowledge of Number Relationships & Computation

Objective: Add, subtract, and multiply positive fractions and mixed numbers. - A

Examples:

- To add unlike fractions (fractions with different denominators), rename the fractions so there is a common denominator.

Add: $\frac{1}{6} + \frac{2}{5} =$	$\frac{1}{6} = \frac{1 \times 5}{6 \times 5} = \frac{5}{30}$	$\frac{2}{5} = \frac{2 \times 6}{5 \times 6} = \frac{12}{30}$	$\frac{5}{30} + \frac{12}{30} = \frac{17}{30}$
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Add: $12\frac{1}{2} + 8\frac{2}{3} =$	$12\frac{1}{2} = 12\frac{1 \times 3}{2 \times 3} = 12\frac{3}{6}$	$8\frac{2}{3} = 8\frac{2 \times 2}{3 \times 2} = 8\frac{4}{6}$
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$12\frac{3}{6} + 8\frac{4}{6} = 20\frac{7}{6}$	$\frac{7}{6}$ is improper so we must change it to proper. 7 divided by 6 = $1\frac{1}{6}$
--	---

$20 + 1\frac{1}{6} = 21\frac{1}{6}$

1.) Add: $\frac{1}{3} + \frac{1}{9}$

2.) Add: $7\frac{4}{9} + 10\frac{2}{9}$

3.) Add: $1\frac{5}{9} + 4\frac{1}{6}$

4.) Add: $2\frac{1}{2} + 2\frac{2}{3}$

5.) A quiche recipe calls for $2\frac{3}{4}$ cups of grated cheese.

A recipe for quesadillas requires $1\frac{1}{3}$ cups of grated cheese. What is the total amount of grated cheese needed for both recipes?

6.) You want to make a scarf and matching hat. The pattern calls for $1\frac{7}{8}$ yards of fabric for the scarf and

$2\frac{1}{2}$ yards of fabric for the hat. How much fabric do you need in all?

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Unit: Knowledge of Number Relationships & Computation

Objective: Add, subtract, and multiply positive fractions and mixed numbers. - C

Examples:

- To multiply fractions – Multiply the numerators & denominators.
- Be sure to change mixed numbers to improper fractions before multiplying.

$$\frac{1}{3} \times \frac{5}{8} = \frac{5}{24}$$

$$1\frac{1}{3} \times 3\frac{2}{5} = \frac{4}{3} \times \frac{17}{5} = \frac{68}{15} = 4\frac{8}{15}$$

****Remember:** Changing mixed numbers to improper fractions. $2\frac{3}{4} = 4 \times 2 + 3 = \frac{11}{4}$

$$1\frac{1}{3} \times 21 = \frac{4}{3} \times \frac{21}{1} = \frac{4 \times 21}{3 \times 1} = \frac{84}{3} = 28$$

1.) $\frac{2}{3} \times \frac{4}{5} =$

2.) $\frac{7}{3} \times 4\frac{1}{2} =$

3.) $2\frac{1}{2} \times 2\frac{1}{3} =$

4.) $3 \times 5\frac{2}{9} =$

5.) Anna wants to make 4 sets of curtains. Each set requires $5\frac{1}{8}$ yards of fabric. How much fabric does she need?

6.) One sixth of the students at a local college are seniors. The number of freshmen students is $2\frac{1}{2}$ times that amount. What fraction of the students are freshmen?