Name________________________________ 7th Grade Teacher:____________________

Summer 2018

7th Grade Advanced Math into 8th Grade Algebra SUMMER REVIEW: MATH

The following packet will help you prepare for 8th grade math by reviewing the concepts you studied during 7th grade. If you need help to complete a problem the following websites are useful by searching the topic listed above the question.

http://www.virtualnerd.com/middle-math/all

http://www.purplemath.com/modules/index.htm

www.khanacademy.com

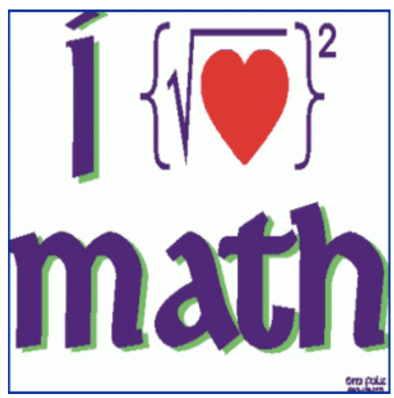
1. Summer Packets will be graded on completion and all work must be shown for full credit and is considered a Supportive Assignment. After reviewing the packet, there will be a minor assessment on the content.

2. This packet is due the first day of school August 29, 2018.

3. The purpose of this assignment is to reinforce concepts taught in 7th grade and prepare students to expand and build on previous knowledge.

If you have any questions, feel free to contact either Mrs. Shaffer at jshaffer@wtps.org (OVMS) ; Mrs. Westerby at mwesterby@wtps.org (BHMS) or Ms. Doyon at ddoyon@wtps.org (CRMS) or the math supervisor Mrs. English at cenglish@wtp.org

We are looking forward to a great school year.



# Fractions: Reducing No Calculator

**To reduce a simple fraction, follow the following three steps:**

1. **Factor the numerator.**
2. **Factor the denominator.**
3. **Find the fraction mix that equals 1.**

Reduce $\frac{15}{6}$

**First:** Rewrite the fraction with the numerator and the denominator factored: $\frac{5\ x\ 3}{2\ x\ 3}$

**Second:** Find the fraction that equals 1. $\frac{5\ x\ 3}{2\ x\ 3}$ can be written $\frac{5}{2}$ x $\frac{3}{3}$ which in turn can be written $\frac{5}{2}$ x $1$ which in turn can be written $\frac{5}{2}$.

**Third:** We have just illustrated that $\frac{15}{6}$ = $\frac{5}{2}$ Although the left side of the equal sign does not look identical to the right side of the equal sign, both fractions are equivalent because they have the same value. Check it with your calculator. 15 ÷ 6 = 2.5 and 5 ÷ 2 = 2.5. This proves that the fraction $\frac{15}{6}$ can be reduced to the equivalent fraction $\frac{5}{2}$.

Reduce:

1) $\frac{24}{36}$
2) $\frac{14}{18}$
3) $\frac{13}{26}$
4) $\frac{10}{50}$
5) $\frac{-36}{60}$

# Operations with Fractions: Multiplication No Calculator

**There are 3 simple steps to multiply fractions**

1. Multiply the top numbers (the *numerators*).
2. Multiply the bottom numbers (the *denominators*).
3. Simplify the fraction if needed.

$$\frac{1}{2} \times \frac{2}{5}$$

**Step 1**. Multiply the top numbers:

$$\frac{1}{2} \times \frac{2}{5} = \frac{1 \times 2}{\phantom{0}} = \frac{2}{\phantom{0}}$$

**Step 2**. Multiply the bottom numbers:

$$\frac{1}{2} \times \frac{2}{5} = \frac{1 \times 2}{2 \times 5} = \frac{2}{10}$$

**Step 3**. Simplify the fraction:

$$\frac{2}{10} = \frac{1}{5}$$

1) $^1/_2$ ( $^2/_4$ ) = _____

2) $^1/_3$ ( $^1/_4$ ) = _____

3) $^2/_5$ ( $^1/_2$ ) = _____

4) $^2/_5$ ( $^1/_3$ ) = _____

5) $^4/_6$ ( $^3/_5$ ) = _____

6) $^2/_3$ ( $^5/_6$ ) = _____

7) $^1/_2$ ( $^1/_4$ ) = _____

8) $^5/_6$ ( $^3/_6$ ) = _____

# Operations with Fractions: Division No Calculator

**There are 3 Steps to Divide Fractions:**

Step 1. Turn the second fraction *(the one you want to divide by)* upside-down (this is now a reciprocal).

Step 2. Multiply the first fraction by that reciprocal

Step 3. Simplify the fraction (if needed)

$$\frac{1}{2} \div \frac{1}{6}$$

Step 1. Turn the second fraction upside-down (it becomes a **reciprocal**):

$$\frac{1}{6} \text{ becomes } \frac{6}{1}$$

Step 2. Multiply the first fraction by that **reciprocal**:

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

Step 3. Simplify the fraction:

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

1) $^1/_2 \div {}^4/_5 =$ _____

2) $^3/_6 \div {}^1/_3 =$ _____

3) $^1/_3 \div {}^4/_5 =$ _____

4) $^1/_2 \div {}^1/_3 =$ _____

5) $^1/_6 \div {}^3/_5 =$ _____

6) $^1/_4 \div {}^2/_6 =$ _____

7) $^2/_4 \div {}^1/_2 =$ _____

8) $^4/_5 \div {}^1/_6 =$ _____

9) $^1/_3 \div {}^2/_4 =$ _____

10) $^1/_2 \div {}^3/_4 =$ _____

# Proportion

A proportion is a name we give to a statement that two ratios are equal. It can be written in two ways:

- two equal fractions, $\frac{a}{b} = \frac{c}{d}$
- using a colon, **a:b = c:d**

When two ratios are equal, then the cross products of the ratios are equal.

That is, for the proportion, **a:b = c:d ,  a** x **d = b** x **c**

Determine the missing value:

| | | |
|---|---|---|
| 1. $\frac{15}{p} = \frac{20}{8}$ | 2. $\frac{s}{10} = \frac{84}{20}$ | 3. $\frac{3}{y} = \frac{9}{12}$ |
| 4. $\frac{4}{12} = \frac{v}{3}$ | 5. $\frac{12}{28} = \frac{p}{21}$ | 6. $\frac{20}{12} = \frac{f}{9}$ |
| 7. $\frac{5}{9} = \frac{z}{27}$ | 8. $\frac{1}{4} = \frac{4}{q}$ | 9. $\frac{4}{h} = \frac{1}{2}$ |

State whether the ratios are proportional:

| | | | |
|---|---|---|---|
| 1. $\frac{35}{20} = \frac{7}{4}$ | 2. $\frac{3}{8} = \frac{32}{12}$ | 3. $\frac{5}{13} = \frac{40}{48}$ | 4. $\frac{9}{24} = \frac{3}{8}$ |
| 5. $\frac{52}{28} = \frac{40}{16}$ | 6. $\frac{10}{9} = \frac{20}{18}$ | 7. $\frac{10}{45} = \frac{2}{9}$ | 8. $\frac{8}{9} = \frac{2}{36}$ |

# Percentages

**Percent of a Number** To find the percent of a given number, convert the percent to a decimal and multiply.

Example: 30 percent of 400

1) Change 30% to a decimal by moving the decimal point 2 places to the left. 30% = 0.30
2) Multiply

0.30 x 400 = 120

Additional Examples:
100% of 58 -> 1.00 x 58 = 58 (One hundred percent of a number is just the number itself.)
200% of 24 -> 2.00 x 24 = 48 (Two hundred percent of a number is twice that number.)

Solve:

1) 25% of 20
2) 200% of 36
3) 56.25% of 16
4) 80% of 5
5) 12.5% of 16
6) 0.5% of 40
7) 56% of 25
8) 35% of 100
9) 75% of 8
10) 10% of 54
11) 100% of 23
12) 94% of 50

## The Proportion Method

Since percent statements always involve three numbers, given any two of these numbers, we can find the third using the proportion above. Let's look at an example of this.

In this method, we write a proportion: $\frac{PART}{WHOLE} = \frac{\%}{100}$

The percent is always over 100 because that's what percent means. The "part over whole" is the definition of a fraction. In this case, the number following "of" is the whole. The advantage to the proportion method is that converting to a decimal is not needed. (The division by 100 takes care of that.)

Example: What number is 75% of 4? (*or* Find 75% of 4.)
The PERCENT *always* goes over 100. (It's a part of the whole 100%.)
4 appears with the word *of*: It's the WHOLE and goes on the bottom.

$$\frac{\text{part}}{4} = \frac{75}{100}$$

Cross Multiply to solve:

4 times 75 = 100 (*part*)
300 = 100 (*part*)
$\frac{300}{100} = \frac{100}{100}$ (*part*)
3 = (*part*) 75% of 4 = 3

Solve:

1. What is 40% of 164?
2. 90 is 75% of what?
3. 40 is what percent of 20?
4. What is 85% of 600?
5. What percent of 60 is 28?
6. 1.5 is what percent of 3?
7. 16% of what number is 12?
8. 3 is 20% of what number?
9. What is 5% of 34?
10. 20% of what number is 24?
11. 17 is what percent of 51?
12. 50% of 188 is what?
13. 63% of what is 315?
14. 25 is what percent of 300?

# Integers: Adding/Subtracting <u>No Calculator</u>

## Adding Integers

1. If the integers have the same sign, add the two numbers and use their common sign
a. 62 + 14 = 76 b. -29 + -13 = -42
2. If the integers have different signs, find the difference between the two values and use the sign of the number that is the greater distance from zero.
a. 15 + -8 = +7 b. 9 + -30 = -21

## Subtracting Integers

To subtract an integer, add its opposite
(-8) – (+9) = The opposite of +9 is –9. Change sign to opposite: (-8) + (-9) = -17 using integer addition rules
a. (+7) – (+4) = (+7) + (-4) = +3 b. (-3) – (+8) = (-3) + (-8) = -11
c. (+5) – (-6) = (+5) + (+6) = +11

**OR**

1. Change double negatives to a positive.
2. Get a sum of terms with like signs and keep the given sign, using the sign in front of the number as the sign of the number.
3. Find the difference when terms have different signs and use the sign of the larger numeral.

a. 7 – (-5) = 7 + 5 = 12 (a. Change double negatives to positive, use integer addition rules)
b. –5 – 9 = -14 (using the signs in front of the numbers, use only addition rules-signs are alike, add and keep the sign)
c. 6 – 7 = -1 (using the signs in front of the numbers, use addition rules-signs are different, subtract and take the sign of the largest numeral)
d. 6 – 7 + 3 – 4 – 2 = 9 – 13 = -4 (Get the sum of the terms with like signs, use addition rules)

1. -5 + -6 =
2. 9 + -4 =
3. -3 + 6 =
4. -4 + -4 =
5. -2 + 8 =
6. -7 - +1 =
7. -9 + 10 =
8. -8 + -5 =
9. 12 + 10 =
10. 13 + -17 =
11. -29 + -11 =
12. -36 - +24 =
13. 42 + -19 =
14. -33 - -42 =
15. 31 - -56 =
16. 65 + 15 =
17. -8 + 10 =
18. 7 + -18 =
19. 75 + -25 =
20. 33 + -22 =
21. 73 - 47 =
22. 86 + -58 =
23. 78 + -30 =
24. 100 + -50 =

# Integers: Multiplying / Dividing No Calculator

## Multiplying Integers

1. If the integers have the same sign, multiply the two numbers and the result is positive

a. 2 x 14 = 28 b. -9 x -2 = 18

2. If the integers have different signs, multiply the two numbers and the result is negative

a. 5 x -8 = -40 b. -9 x 3 = -27

## Dividing Integers

1. If the integers have the same sign, divide the two numbers and the result is positive

a. 21 ÷ 3 = 7 b. -24 ÷ -6 = +4

2. If the integers have different signs, divide the two numbers and the result is negative

a. -46 ÷ 2 = -23 b. 99 ÷ -3 = -33

| | |
|---|---|
| 1. -5 x -6 = | 2. 16 ÷ -4 = |
| 3. -3 ÷ 6 = | 4. -4 x -4 = |
| 5. -2 x 8 = | 6. -7 ÷ 1 = |
| 7. 9 x 10 = | 8. -8 x -5 = |
| 9. -12 x -10 = | 10. 3 x 17 = |
| 11. -121 ÷ -11 = | 12. -36 ÷ -2 = |
| 13. 2 x -9 = | 14. -33 x 2 = |
| 15. 3 x 56 = | 16. 16 x -5 = |
| 17. -80 ÷ 10 = | 18. 1 ÷ -18 = |
| 19. 75 ÷ -25 = | 20. 33 ÷ -3 = |
| 21. 7 x -14 = | 22. -6 x -8 = |
| 23. -90 ÷ -30 = | 24. 100 ÷ -50 = |

# Combining Like Terms: No Calculator

## What are Like Terms?

The following are like terms because each term consists of a single variable, x, and a numeric coefficient.
`2x, 45x, x, 0x, -26x, -x`

Each of the following are like terms because they are all constants.
`15, -2, 27, 9043, 0.6`

## What are Unlike Terms?

These terms are not alike since different variables are used.
`17x, 17z`

These terms are not alike since each y variable in the terms below has a different exponent.
$15y,\ 19y^2,\ 31y^5$

Although both terms below have an x variable, only one term has the y variable, thus these are not like terms either.
`19x, 14xy`

## Examples - Simplify
Group like terms together first, and then simplify.

$\mathbf{2x^2 + 3x - 4 - x^2 + x + 9}$

$$2x^2 + 3x - 4 - x^2 + x + 9$$
$$= (2x^2 - x^2) + (3x + x) + (-4 + 9)$$
$$= \mathbf{x^2 + 4x + 5}$$

$\mathbf{10x^3 - 14x^2 + 3x - 4x^3 + 4x - 6}$

$$10x^3 - 14x^2 + 3x - 4x^3 + 4x - 6$$
$$= (10x^3 - 4x^3) + (-14x^2) + (3x + 4x) - 6$$
$$= \mathbf{6x^3 - 14x^2 + 7x - 6}$$

**Directions:** *Simplify each expression below* by combining like terms.

1) $-6k + 7k$
2) $12r - 8 - 12$
3) $n - 10 + 9n - 3$
4) $-4x - 10x$
5) $-r - 10r$
6) $-2x + 11 + 6x$
7) $-v + 12v$
8) $x + 2 + 2x$
9) $5 + x + 2$
10) $2x^2 + 13 + x^2 + 6$
11) $2x + 3 + x + 6$
12) $2x^3 + 3x + x^2 + 4x^3$

# Order of Operations: <u>No Calculator</u>

***"Operations"*** means things like add, subtract, multiply, divide, squaring, etc. But, when you see an expression: $7 + (6 \times 5^2 + 3)$ ... what part should you calculate first?

*Warning: Calculate them in the wrong order, and you will get a wrong answer !*

So, long ago people agreed to follow rules when doing calculations, and they are:

**First:** Do things in Parentheses Example:

✓ $6 \times (5 + 3) = 6 \times 8 = \mathbf{48}$

✗ $6 \times (5 + 3) = 30 + 3 = 33$ (wrong)

**Next: Exponents (Powers, Roots)** Example:

✓ $5 \times 2^2 = 5 \times 4 = \mathbf{20}$

✗ $5 \times 2^2 = 10^2 = 100$ (wrong)

**Then: Multiply or Divide before you Add or Subtract**. Example:

✓ $2 + 5 \times 3 = 2 + 15 = \mathbf{17}$

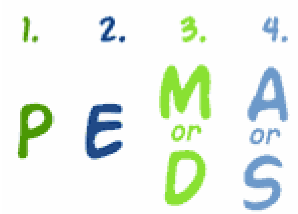
✗ $2 + 5 \times 3 = 7 \times 3 = 21$ (wrong)

**HINT: go left to right**. Example:

✓ $30 \div 5 \times 3 = 6 \times 3 = \mathbf{18}$

✗ $30 \div 5 \times 3 = 30 \div 15 = 2$ (wrong)

**Remember it by PEMDAS = "Please Excuse My Dear Aunt Sally"**




After you have done "P" and "E", just go from left to right doing any "M" ***or*** "D" as you find them.

Then go from left to right doing any "A" ***or*** "S" as you find them.

Simplify:

1. $4+10 - (5+7) =$
2. $4 \times 2( 4^2 + 6) =$
3. $3 \times 4^2 + 8 =$
4. $6(2+1) + 1^3 - 2 =$
5. $1 - ( 8^2 + 6 ) =$
6. $(10+2 - 3)^2 =$
7. $5 \times 4 + 9 =$
8. $18 - 7^2 + 5 =$
9. $7 + (6 \times 5^2 + 3) =$
10. $8 + 3( 3 - 4 ) \div 2 =$

# Distributive Property: No Calculator

In algebra, the use of parentheses is used to indicate operations to be performed. For example, the expression $4(2x-y)$ indicates that *4 times the binomial* $2x-y$ is $8x- 4y$

**Additional Examples:**

1. $2(x+y) = 2x+2y$
2. $-3(2a+b-c) = -3(2a)-3(b)-3(-c)=-6a-3b+3c$
3. $3(2x+3y) = 3(2x)+3(2y)=6x+9y$

1. $3(4x + 6) + 7x =$

2. $7(2 + 3x) + 8 =$

3. $9 - (4x + 4) =$

4. $12 - 3(x + 8) =$

5. $3(7x + 2) + 8x =$

6. $6m + 3(2m + 5) + 7 =$

7. $- 5(m + 9) - 4 + 8m =$

8. $3m + 2(5 + m) + 5m =$

9. $6m + 14 + 3(3m + 7) =$

10. $4(2m + 6) + 3(3 + 5m) =$

# Solving Equations: <u>No Calculator</u>

An equation is a mathematical statement that has two expressions separated by an equal sign. The expression on the left side of the equal sign has the same value as the expression on the right side. To *solve an equation* means to determine a numerical value for a variable that makes this statement true by isolating or moving everything except the variable to one side of the equation. To do this, combine like terms on each side, then add or subtract the same value from both sides. Next, clear out any fractions by multiplying **every** term by the denominator, and then divide every term by the same nonzero value. Remember to keep both sides of an equation equal, you must do exactly the same thing to each side of the equation.

Examples:

a. $x + 3 = 8$

$\underline{\quad -3 \quad -3}$

$x \quad = 5$

3 is being added to the variable, so to get rid of the added 3, we do the opposite, subtract 3.

b. $5x - 2 = 13$

$\underline{\quad +2 \quad +2}$

$5x \quad = 15$

$\frac{5x}{5} = \frac{15}{5}$

$x = 3$

First, undo the subtraction by adding 2.

Then, undo the multiplication by dividing by 5.

Solve

1.) $4x = -32$

2.) $-7x + 7 = -70$

3.) $5x + 1 = 26$

4.) $2x + 7 = 31 + x$

5.) $-3x + 2 = -13 + 5x - 1$

6.) $8 + 7x = -15$

7.) $-3x = 18$

8.) $5x + 5 = 35 - x$

# Evaluating Expressions: No Calculator

**Simplify the expression first. Then evaluate the resulting expression for the given value of the variable.**

Example $3x + 5(2x + 6) =$ _____ if $x = 4$

$3x + 10x + 30 =$

$13x + 30 =$

$13(4) + 30 =$ 82

1. $y + 9 - x =$ ____; if $x = 1$, and $y = -3$

2. $8 - 5(9 - 4x) =$ _____ if $x = 2$

3. $6(4x + 1) + x =$ _____ if $x = -5$

4. $8(2m + 1) + 3(5m + 3) =$ _____ if $m = 2$

5. $7(3 + 5m) + 2(m + 6) =$ _____ if $m = 2$

6. $2(4m + 5) + 2(4m + 1) =$ _____ if $m = -5$

7. $5(8 + m) + 2(m - 7) =$ ______ if $m = 3$

8. $\frac{y}{2} + x =$ ____; if $x = -1$, and $y = 2$

# Tables of Values (T – Charts): <u>No Calculator</u>

Any equation can be graphed using a table of values. A table of values is a graphic organizer or chart that helps you determine two or more points that can be used to create your graph.

In order to graph a line, you must have two points. For any given linear equation, there are an infinite number of solutions or points on that line. Every point on that line is a solution to the equation.

In a T – Chart:

- The first column is for the x coordinate. For this column, you can choose any number.
- The second column is for the y value. After substituting your x value into the equation, your answer is the y coordinate.
- The result of each row is an ordered pair. Your ordered pair is the x value and the y value. This is the point on your graph.

Example: Determine solutions to the equation $y = 3x + 2$

1) Draw a T-chart

| $x$ | $y$ |
|---|---|
| | |

2) Select values for $x$:

| $x$ | $y$ |
|---|---|
| -1 | |
| 0 | |
| 1 | |

3) Evaluate the equation for each $x$ value:

$y = 3x + 2 \quad x = -1$
$y = 3(-1) + 2$
$y = -3 + 2$
$y = -1$

$y = 3x + 2 \quad x = 0$
$y = 3(0) + 2$
$y = 0 + 2$
$y = 2$

$y = 3x + 2 \quad x = -1$
$y = 3(1) + 2$
$y = 3 + 2$
$y = 5$

4) Complete the chart with the values:

| $x$ | $y$ |
|---|---|
| -1 | -1 |
| 0 | 2 |
| 1 | 5 |

Determine three solutions to each equation:

1. y = 2x+1

| $x$ | $y$ |
|---|---|
| -1 | |
| 0 | |
| 1 | |

2. y = 3x – 6

| $x$ | $y$ |
|---|---|
| -1 | |
| 0 | |
| 1 | |

3. 2y = 4x +10

| $x$ | $y$ |
|---|---|
| -1 | |
| 0 | |
| 1 | |

4. 3y = -24

| $x$ | $y$ |
|---|---|
| -1 | |
| 0 | |
| 1 | |