Name_____

MATH SUMMER ASSIGNMENT

DUE FRIDAY SEPTEMBER 7TH, 2018

Name _____

RATIOS AND PROPORTIONS
INSTRUCTION SHEET

Ratios

A ratio is a comparison of two quantities that have the *same units*. You can express a ratio in any one of the following ways:

$\frac{18}{5}$ 18:5 18 to 5

Example #1: If one store has 360 items and another store has 100 of the same items, express the ratio of the items.

$\frac{360}{100}$ **or** 360:100 **or** 360 to 100

Ratios are usually written in lowest terms; therefore, the above example would reduce in this way:

$\frac{360}{100} \div 20$ (What is the largest number you can divide both values by?)

$\frac{18}{5}$

Example #2: John earns $350 a week. His take-home pay, however, is $295. What is the ratio of his gross pay to his take-home pay.

$$\frac{350}{295} = \frac{70}{59}$$

Rates

A rate is a comparison of two quantities that have *different units*. Rates are usually expressed in the fractional form.

Example: Francine paid $16 for her 12-month subscription to *Better Homes and Gardens* magazine. Express as a rate.

$$\frac{\$16.00}{12 \text{ magazines}} = \frac{\$4.00}{3 \text{ magazines}}$$

If Francine wants to know how much she pays for each (1) magazine, she can divide $4 by 3 magazines. This will give her the price per magazine (also called the **unit rate**).

$\frac{\$4.00}{3} = \$1.33/\text{magazine}$

Proportions

A proportion is a statement that two ratios or rates are equal. It can be given as a sentence in words, but most often a proportion is an algebraic equation.

The arithmetic equation $\frac{3}{5} = \frac{21}{35}$ is a proportion because its cross products are equal.

$3 \times 35 = \mathbf{105}$ and $5 \times 21 = \mathbf{105}$

Proportions are solved by using this cross-product rule.

Example #1: $\frac{4}{9} = \frac{x}{36}$

$4 \times 36 = 9x$

$144 = 9x$

$\frac{144}{9} = x$

$16 = x$

Example #2: $\frac{72}{1.5} = \frac{12}{x}$

$72x = 1.5 \times 12$

$72x = 18$

$x = \frac{18}{72}$

$x = .25$ or $\frac{1}{4}$

Applied Proportion Problems

Many problems can be solved by setting up a **direct proportion** (an increase in one quantity leads to a proportional increase in the other quantity) or by setting up **equivalent rates**.

Example: In one day you earn \$75 for 8 hours of work. If you work 37.5 hours for the week, what will your weekly pay be?

$\frac{8 \text{ hours}}{37.5 \text{ hours}} = \frac{\$75}{x}$

$8x = 75 \times 37.5$

$8x = 2812.5$

$x = \frac{2812.5}{8}$

$x = \$351.56$

or

$\frac{8 \text{ hours}}{\$75} = \frac{37.5 \text{ hours}}{x}$

$8x = 75 \times 37.5$

$8x = 2812.5$

$x = \frac{2812.5}{8}$

$x = \$351.56$

RATIOS AND PROPORTIONS
PRACTICE SHEET

A. Write each ratio as a fraction in lowest terms.

1. 2 to 4

2. $\frac{15}{20}$

3. 6:18

4. 21:15

5. $\frac{12}{18}$

6. 3 to 12

7. 7:4

8. $\frac{18}{12}$

9. 20:16

10. 15 to 36

11. 35:7

12. $\frac{8}{28}$

13. 24 to 96

14. 9:27

15. $\frac{11}{88}$

B. Write each of the following rates as a unit rate.

1. $\frac{3 \text{ Tbsp}}{2 \text{ tsp}}$

2. $\frac{135 \text{ pitches}}{45 \text{ strikes}}$

3. $\frac{128 \text{ miles}}{4 \text{ hours}}$

4. $\frac{2250 \text{ pencils}}{18 \text{ boxes}}$

5. $\frac{\$450}{18 \text{ shares}}$

6. $\frac{2500 \text{ meters}}{15 \text{ seconds}}$

7. $\frac{\$5,082}{475 \text{ sq.yds.}}$

8. $\frac{750 \text{ gallons}}{14 \text{ minutes}}$

C. Solve each proportion and give the answer in simplest form.

1. $6 : 8 = n : 12$

2. $\frac{2}{7} = \frac{8}{n}$

3. $\frac{n}{6} = \frac{11}{3}$

4. $4 : n = 6 : 9$

5. $\frac{3}{n} = \frac{2}{5}$

6. $\frac{0.4}{1.5} = \frac{12}{n}$

7. $2\frac{1}{2} : 3\frac{1}{2} = n : 2$

8. $1 : 2 = n : 9$

9. 4 to 8 = 15 to n

10. $18 : n = 3 : 11$

11. $\frac{5}{6} = \frac{n}{30}$

12. $\frac{12}{40} = \frac{n}{25}$

13. $8 : 19 = 14 : n$

14. $\frac{10}{n} = \frac{2}{1.7}$

15. $24 : \frac{1}{4} = n : \frac{1}{3}$

16. 44 to 121 = n to 11

D. Solve by using a proportion. Round answers to the nearest hundredth if necessary.

1. You jog 3.6 miles in 30 minutes. At that rate, how long will it take you to jog 4.8 miles?

2. You earn $33 in 8 hours. At that rate, how much would you earn in 5 hours?

3. An airplane flies 105 miles in ½ hour. How far can it fly in 1 ¼ hours at the same rate of speed?

4. What is the cost of six filters if eight filters cost $39.92?

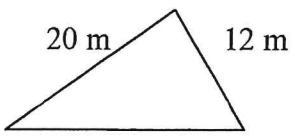
5. If one gallon of paint covers 825 sq. ft., how much paint is needed to cover 2640 sq. ft.?

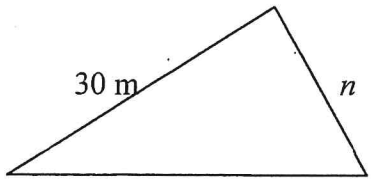
6. A map scale designates 1" = 50 miles. If the distance between two towns on the map is 2.75 inches, how many miles must you drive to go from the first town to the second?

7. Bob is taking his son to look at colleges. The first college they plan to visit is 150 miles from their home. In the first hour they drive at a rate of 60 mph. If they want to reach their destination in 2 ½ hours, what speed must they average for the remainder of their trip?

8. Four employees can wash 20 service vehicles in 5 hours. How long would it take 5 employees to wash the same number of vehicles?

9. These two figures are similar. Use a proportion to find the length of side *n*.





What Fun!

It's Practice with Scientific Notation!

Review of Scientific Notation

Scientific notation provides a place to hold the zeroes that come after a whole number or before a fraction. The number 100,000,000 for example, takes up a lot of room and takes time to write out, while 10^8 is much more efficient.

Though we think of zero as having no value, zeroes can make a number much bigger or smaller. Think about the difference between 10 dollars and 100 dollars. Even one zero can make a big difference in the value of the number. In the same way, 0.1 (one-tenth) of the US military budget is much more than 0.01 (one-hundredth) of the budget.

The small number to the right of the 10 in scientific notation is called the exponent. Note that a negative exponent indicates that the number is a fraction (less than one).

The line below shows the equivalent values of decimal notation (the way we write numbers usually, like "1,000 dollars") and scientific notation (10^3 dollars). For numbers smaller than one, the fraction is given as well.

	smaller			bigger		
Fraction	1/100	1/10				
Decimal notation	0.01	0.1	1	10	100	1,000
Scientific notation	10^{-2}	10^{-1}	10^0	10^1	10^2	10^3

Practice With Scientific Notation

Write out the decimal equivalent (regular form) of the following numbers that are in scientific notation.

Section A: Model: $10^1 = 10$

1) 10^2 = _____

2) 10^4 = _____

3) 10^7 = _____

4) 10^{-2} = _____

5) 10^{-5} = _____

6) 10^0 = _____

Section B: Model: $2 \times 10^2 = 200$

7) 3×10^2 = _____

8) 7×10^4 = _____

9) 2.4×10^3 = _____

10) 6×10^{-3} = _____

11) 900×10^{-2} = _____

12) 4×10^{-6} = _____

Section C: Now convert from decimal form into scientific notation.

Model: $1{,}000 = 10^3$

13) 10 = _____

14) 100 = _____

15) 100,000,000 = _____

16) 0.1 = _____

17) 0.0001 = _____

18) 1 = _____

Section D: Model: $2{,}000 = 2 \times 10^3$

19) 400 = _____

20) 60,000 = _____

21) 750,000 = _____

22) 0.005 = _____

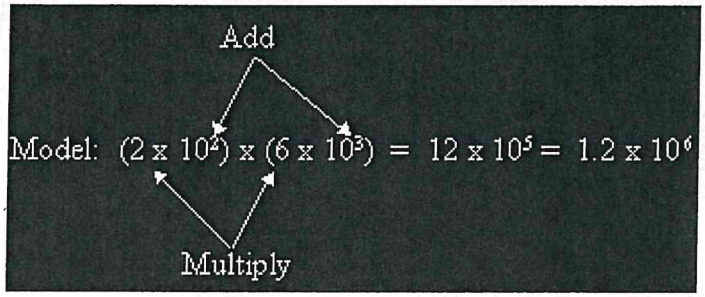
23) 0.0034 = _____

24) 0.06457 = _____

More Practice With Scientific Notation

Perform the following operations in scientific notation. Refer to the introduction if you need help.

Section E: Multiplication (the "easy" operation - remember that you just need to multiply the main numbers and add the exponents).

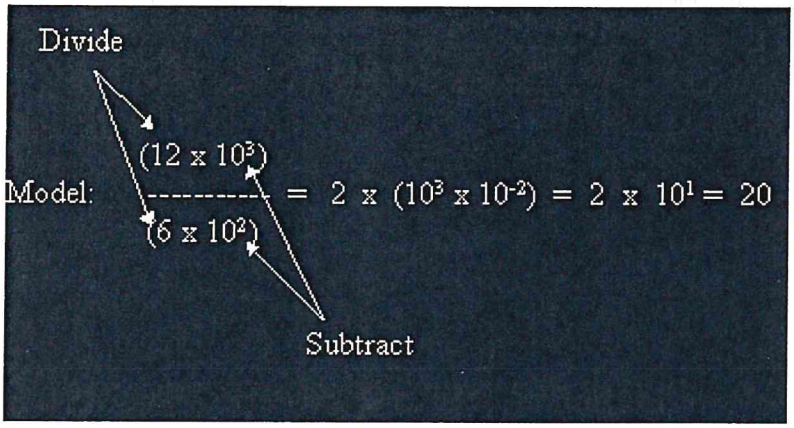


Model: $(2 \times 10^2) \times (6 \times 10^3) = 12 \times 10^5 = 1.2 \times 10^6$

Remember that your answer should be expressed in two parts, as in the model above. The first part should be a number less than 10 (eg: 1.2) and the second part should be a power of 10 (eg: 10^6). If the first part is a number greater than ten, you will have to convert the first part. In the above example, you would convert your first answer (12×10^5) to the second answer, which has the first part less than ten (1.2×10^6). For extra practice, convert your answer to decimal notation. In the above example, the decimal answer would be 1,200,000

	scientific notation	decimal notation
25) $(1 \times 10^3) \times (3 \times 10^1) =$	_____	_____
26) $(3 \times 10^4) \times (2 \times 10^3) =$	_____	_____
27) $(5 \times 10^{-5}) \times (11 \times 10^4) =$	_____	_____
28) $(2 \times 10^{-4}) \times (4 \times 10^3) =$	_____	_____

Section F: Division (a little harder - we basically solve the problem as we did above, using multiplication. But we need to "move" the bottom (denominator) to the top of the fraction. We do this by writing the negative value of the exponent. Next divide the first part of each number. Finally, add the exponents).



$$\text{Model: } \frac{(12 \times 10^3)}{(6 \times 10^2)} = 2 \times (10^3 \times 10^{-2}) = 2 \times 10^1 = 20$$

Write your answer as in the model; first convert to a multiplication problem, then solve the problem.

	multiplication problem	final answer (in sci. not.)
29) $(8 \times 10^6) / (4 \times 10^3)$ =	_____	_____
30) $(3.6 \times 10^8) / (1.2 \times 10^4)$ =	_____	_____
31) $(4 \times 10^3) / (8 \times 10^5)$ =	_____	_____
32) $(9 \times 10^{21}) / (3 \times 10^{19})$ =	_____	_____

Section G: Addition The first step is to make sure the exponents are the same. We do this by changing the main number (making it bigger or smaller) so that the exponent can change (get bigger or smaller). Then we can add the main numbers and keep the exponents the same.

Model: $(3 \times 10^4) + (2 \times 10^3) = (3 \times 10^4) + (0.2 \times 10^4)$
$= 3.2 \times 10^4$ (*same exponent*)
$= 32{,}000$ (*final answer*)

First express the problem with the exponents in the same form, then solve the problem.

same exponent final answer

33) $(4 \times 10^3) + (3 \times 10^2) =$ _____

34) $(9 \times 10^2) + (1 \times 10^4) =$ _____

35) $(8 \times 10^6) + (3.2 \times 10^7) =$ _____

36) $(1.32 \times 10^{-3}) + (3.44 \times 10^{-4}) =$ _____

Section H: Subtraction Just like addition, the first step is to make the exponents the same. Instead of adding the main numbers, they are subtracted. Try to convert so that you will not get a negative answer.

Model: $(3 \times 10^4) - (2 \times 10^3) = (30 \times 10^3) - (2 \times 10^3)$
$= 28 \times 10^3$ (*same exponent*)
$= 2.8 \times 10^4$ (*final answer*)

same exponent final answer

37) $(2 \times 10^2) - (4 \times 10^1) =$ _____ _____

38) $(3 \times 10^{-6}) - (5 \times 10^{-7}) =$ _____ _____

39) $(9 \times 10^{12}) - (8.1 \times 10^9) =$ _____ _____

40) $(2.2 \times 10^{-4}) - (3 \times 10^2) =$ _____ _____

And Even MORE Practice with Scientific Notation

(Boy, are you going to be good at this!)

Positively positives!

41) What is the number of your street address in scientific notation?

42) 1.6×10^3 is what? Combine this number with Pennsylvania Avenue and what famous residence do you have?

Necessarily negatives!

43) What is 1.25×10^{-1}? Is this the same as 125 thousandths?

44) 0.000553 is what in scientific notation?

Operations without anesthesia!

45) $(2 \times 10^3) + (3 \times 10^2) =$

46) $(2 \times 10^3) - (3 \times 10^2) =$

47) $(32 \times 10^4) \times (2 \times 10^{-3}) =$

48) $(9.0 \times 10^4) / (3.0 \times 10^2) =$

Food for thought.....and some BIG numbers

49) The cumulative national debt is on the order of $4 trillion. The cumulative amount of high-level waste at the Savannah River Site, Idaho Chemical Processing Plant, Hanford Nuclear Reservation, and the West Valley Demonstration Project is about 25 billion curies. If the entire amount of money associated with the national debt was applied to cleanup of those curies, how many dollars per curie would be spent?

Name _____

Date _____

Class Period _____

Dimensional Analysis Worksheet

Set up and solve the following using dimensional analysis.

1 mile = 5,280 ft
1 inch = 2.54 cm
3 feet = 1 yard
454 g = 1lb
946 mL = 1 qt
4 qt = 1 gal

Don't forget: $\frac{\text{What you want}}{\text{What you've got}}$

1) 5,400 inches to miles

2) 16 weeks to seconds

3) 54 yards to mm

4) 36 cm/sec to mph

5) 1.09 g/mL to lbs/gal

6) 19 inches to feet

7) 840 inches to cm

8) 4.22 g/cm to lbs./ft

9) 32 ft/sec to meters/min

10) Write, and then solve your own dimensional analysis problem. Be creative!

11) You have the Heebie-Geebies. Your grandmother sends you a remedy for the Heebie-Geebies with the following instructions: "Take 1 drop per 10 lbs. of body weight per day divided into 4 doses until the Heebie-Geebies are gone." How many drops do you take per dose??

12) You're throwing a pizza party for 15 people and figure that each person will eat 4 slices. You call up the pizza place and larn that each pizza will cost you $14.78 and it will be cut into 12 slices. How much is the pizza going to cost you? You only have $70. Will you have enough money?

13) Every three times I clean my bedroom, my mother makes me an apple pie. I cleaned my bedroom 9 times. How many apple pies does she owe me? (What?! Your mother doesn't reward you for cleaning your bedroom? Aren't there child labor laws? To make up for that injustice, you may have this very easy problem.)

14) In my chemistry class, 28 students are each given 3 pens. If there are 8 pens in one package, priced at $1.88 per package, what is the total cost of giving away pens?

15) Convert 5.70 Kilograms to milligrams. Show your work!

16) You find 13,406,190 pennies. How many dollars did you actually find? If each penny weighs 4 grams, how much did all that loot weigh in lbs.?
(2.2 lbs = 1 Kilogram

17) Assume a movie ticket costs $9, how many movie tickets could you buy with the pennies you found in #8?