Name_____ School_____

INTERMEDIATE DIVISION
Category 1: Ratios and Proportions

1. (2 pts.) Poor Pluto, planet or not, travels at an average orbital speed of 4.67 kilometers per second. Using the fact that 1 mile = 1.61 kilometers, calculate Pluto's average orbital speed in miles per hour.

1. _____ miles per hour

2. (3 pts.) The ratio of apples to oranges in a fruit salad is $\frac{6}{11}$. If this fruit salad requires 901 total apples and oranges, calculate how many oranges are in the salad. (Who says you cannot compare apples and oranges?)

2. _____ oranges

3. (5 pts.) Calculate the value of the ratio $\frac{a}{b}$ given $\frac{2a+1}{4b-1}=5$ and $\frac{2a-1}{4b+1}=3$.

3. _____

Name_____ School_____

INTERMEDIATE DIVISION
Category 1: Ratios and Proportions

1. (2 pts.) Candy corn costs $4.25 per pound. Find the cost of a ton of candy corn.

1. _____

2. (3 pts.) The ratio of boys to girls in a school is 4:5. There are 720 total students in the school. How many girls are in the school?

2. _____

3. (5 pts.) The number of watts of power generated by a windmill varies directly with the cube of the wind speed in miles per hour. The variation constant is 0.015. Suppose a wind is blowing at 35 mph. Find the number of watts of power generated by a windmill in this wind.

3. _____

Name_____ School_____

INTERMEDIATE DIVISION
Category 1: Ratios and Proportions

1. (2 pts) A Toyota Prius drove 208 miles on 5 gallons of gas. How far should it be able to go on a full 11 gallon tank?

1. _____miles

2. (3 pts) If your pace on a treadmill is 65 meters per minute, how many minutes will it take for you to walk a distance of 7500 feet? (Use 1 meter $\approx$ 39 inches)

2. _____minutes

3. (5 pts) If $\frac{a+1}{b-1}=5$ and $\frac{a-1}{b+1}=1$, find the value of $\frac{b}{a}$.

3. _____

Name _____ School _____

Intermediate Division

Category 1 Ratios and Proportions

1. (2pts) What is the ratio of 25 quarters to 5 ten dollar bills?

ANS _____

2. (3pts) A university has an enrollment of 21,300 students. The ratio of male students to female students is $\frac{8}{7}$. How many males and how many females are enrolled?

ANS _____ males

ANS _____ females

3. (5pts) I have two circles, one has a diameter of 8 inches, the other a radius of 1 foot. What is the ratio of the area of the bigger circle to that of the smaller circle?

ANS _____

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Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1. (2 Pts.) What is the ratio of a nickel to a five-dollar bill?

ANS. _____

2. (3 Pts.) The ratio of counselors to campers is 2:15. There are 102 people at a camp. How many are counselors?

ANS. _____

3. (5 Pts.) Mr. Framer has 34 inches of beautiful oak molding he would like to use for a picture frame. The photo he wants to frame measures 8 inches by 10 inches. Find the dimensions of a reduced photo that would have the same shape as the original and would have a perimeter of exactly 34 inches.

ANS. _____

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1. (2 Pts.) Six feet of steel wire weighs 0.7 lbs. How much does 100 feet of THE SAME steel wire weigh?

ANS. _____

2. (3 Pts.) If 5 red chips = 2 blue chips and 1 blue chip = 3 green chips, how many green chips would you need to make 500 red chips?

ANS. _____

3. (5 Pts.) The frequency of a vibrating string is inversely proportional to its length. Use this info to solve this problem. A violin string 10 inches long vibrates at a frequency of 512 cycles per second. Find the frequency of an 8-inch string.

ANS. _____ cycles per second

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1. (2 Pts.) If $\frac{x}{y} = \frac{c}{D}$ what does y equal?

ANS. _____

2. (3 Pts.) If y varies directly as x, and x = 4 when y = 0.5, find y when x = 9.

ANS. _____

3. (5 Pts.) If y varies inversely as x, and x = 20 when y = 10, find x when y = 14.

ANS. _____

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1. (2 Pts.) Express 100 yards in 10 seconds as a ratio in simplest form.

ANS. _____

2. (3 Pts.) Find two numbers in the ratio of 3 to 5 whose sum is 96.

ANS. _____

3. (5 Pts.) The sides of a triangle are in the ratio 8:9:10. The perimeter of the triangle is 135 inches. Find the length, in inches, of the shortest side.

ANS. _____

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N
Category 1 Ratio Proportion

1. (2 Pts.) If $\frac{x}{y} = \frac{t}{s}$ does

x, y, t, s are any real numbers not equal to zero

$xy + xs = yx + yt$

$xs = yt$

a) $\frac{y}{x} = \frac{s}{t}$ (YES) or NO

b) $\frac{x}{t} = \frac{y}{s}$ (YES) or NO

c) $\frac{x}{y} = \frac{xt}{y+s}$ (YES) or NO

(Circle the correct response.)

2. (3 Pts.) If 2 Z's are worth 5 X's and 3 X's are worth 7 K's. What is a Z worth in K's?

$\frac{2}{5}Z = X$ $2Z = 5X$

$3X = 7K$

$\frac{6}{5}Z = 7K$

$Z = \frac{35}{6} = 5\frac{5}{6}$

ANS. $5\frac{5}{6}K$ or $\frac{35}{6}K$

3. (5 Pts.) If a is 75% of b, express in simplest form, the ratio of b to a + b.

ANS. $\frac{4}{7}$

$a = .75b$

$\frac{b}{.75b+b} = \frac{1}{1.75} = \frac{1}{\frac{7}{4}} = \frac{4}{7}$

KEY

Name _____ No. ____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

CALCULATORS MAY BE USED IN THIS CATEGORY

1. (2 Pts.) What is the ratio of the $\frac{\text{run}}{\text{rise}}$ in the equation $x + 2y = 3$?

$2y = 3 - x$

$y = \frac{3}{2} - \frac{x}{2}$

ANS. $\frac{-2}{1}$ $\frac{-2}{1}$

2. (3 Pts.) Five ounces of medicine are mixed with 30 ounces of water. How much water should be mixed with 14 ounces of medicine?

$\frac{5}{30} = \frac{14}{x}$ $5x = 84$

ANS. 84 oz 84 oz

3. (5 Pts.) To make the perfect pickle brine use 3 parts cider vinegar, 2 parts brown sugar, 1 part spices, (thyme, dill, rosemary in equal parts). If I need 5 quarts of brine, how much brown sugar should I use?

$6 \frac{1}{3} \cdot 5$

ANS. 5/3 quarts 5/3 qt

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio and Proportion

Calculators may be used in this category

1. (2 Pts.) Divide 148 into two parts so that a ratio of 1 to 3 exists.

ANS. _____

2. (3 Pts.) If $x:y = 3:4$, find the value of $\frac{4x^2 - y^2}{x^2 + y^2}$

ANS. _____

3. (5 Pts.) A watch was 2 minutes slow at 8am and one minute fast at 6pm on the same day. Find when it was right, if it gained time uniformly.

ANS. _____

A farmer mixed gasoline and oil to have 2 gallons of mixture for his two-cycle chain saw engine. This mixture was 32 parts gasoline and 1 part oil. How much gas must be added to bring the mixture to 40 parts gas and 1 part oil?

Ratio & Proportion

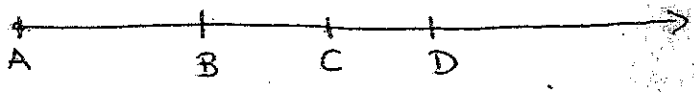
1. If 4 typists can complete typing a paper in 9 days, how many typists are needed to complete the typing in 6 days?
2. y varies inversely as x. If $y = 10$ when $x = 2$, find y when $x = 7$.

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio and Proportion
(May use calculator in this category)

1. (2 Pts.)



AB, BC, CD are in the ratio 4 to 3 to 2.

What is the ratio of AB to AC?

ANS. _____

2. (3 Pts.) Solve for y. $\frac{y}{3} = \frac{2/3}{4/5}$

ANS. _____

3. (5 Pts.) A photographer found that the exposure time needed for making an enlargement from a negative varies as the area of the enlargement. If he takes 10 seconds for a print 2 1/2 in. by 3 1/2 in., how long will it take for an enlargement 6 in. by 8 in.?

ANS. _____

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio and Proportion

1. (2 Pts.) What is the ratio of 1000 pennies to 50 ten-dollar bills?

ANS. _____

2. (2 Pts.) Solve for x in this proportion: $\frac{5}{x+4} = \frac{6}{x+5}$

ANS. _____

3. (5 Pts.) If 150 men make 2750 articles in a 44-hour week, how many men are needed to make 3000 articles in a 40-hour week?

ANS. _____

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1. (2 Pts.) If x:y as 3:4, then y = ?

ANS. _____

2. (3 Pts.) If x:x+2 as 1:4, then x = ?

ANS. _____

3. (5 Pts.) If x+3:x-4 as $\frac{2}{3}+3 : \frac{2}{3}-4$ then x = ?

ANS. _____

Ratio & Proportion Name_____

(2) For the perfect pickles, I mix 3 parts vinegar, 2 parts brown sugar, and $\frac{1}{2}$ part spice. I need 2 gallons of this brine. How many quarts of vinegar do I add? Give answer as an exact fraction and as a decimal rounded to hundredths.

_____

_____

(3) Suppose the ratio of male participants to female participants in our math league is approximately 6 to 4. If there are a total of 12 schools, each with an intermediate and a senior team, and there are 7 people on a team, about how many females enter the math contests?

_____

(5) The strength of a radio signal is inversely proportional to the square of the distance of the receiver from the transmitter. A signal received from a certain transmitter at a point 50 miles away is rated 90% of a standard strength. What would be the rating of the same signal at a point 75 miles from the transmitter?

_____

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1. (2 Pts.) Of the following ratios, which is the greatest?

a) $\frac{6}{7\frac{1}{2}}$ b) $\frac{7}{8\frac{1}{2}}$ c) $\frac{8}{9\frac{1}{2}}$ d) $\frac{9}{10\frac{1}{2}}$ e) all the same

ANS. _____

2) (3 Pts.) The numbers of pennies, nickels, dimes, and quarters in a collection of money are in the ratio 25:20:16:15. The collection is worth $72.60. Find how many pennies there are.

ANS. _____

3. (5 Pts.) The ratio of two numbers is 5. Their difference is 12 4/5. Find the numbers.

ANS. _____

Name _____ No. ____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category I. Ratio & Proportion

1. (2 Pts.) Mr. Chin's will states that $1 million of his estate is to be divided among his three sons in the ratio 7:4:3. Approximately how much does each child inherit?

ANS. _____

_____

_____

2. (3 Pts.) Under certain conditions the stopping distance of a car is proportional to the square of the speed. If a car traveling 20 mph stops in 35 ft., how many feet will it take to stop at 55 mph?

ANS. _____

3. (5 Pts.) Solve this proportion.

$$\frac{4\frac{2}{3}}{x} = \frac{5\frac{1}{2}}{.777}$$

ANS. _____

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1.) (2 Pts.) A truck can pump 800 liters of oil in 25 min. How much oil can it pump in 2 hours?

ANS. _____

2.) (3 Pts.) Solve for x. x:y as x + y : z

ANS. _____

3.) (5 Pts.) A cubic centimeter of gold has a mass of 19.3 grams, while a cubic centimeter of silver has a mass of 10.5 grams. Which of the following has the greater mass: a cube of gold 1.2 cm on an edge or a cube of silver 1.4 cm on an edge? By how much?

ANS. _____
(Greater mass)
ANS. _____
(By how much?)

Name _____ No. _____ School _____

I-N-T-E-R-M-E-D-I-A-T-E D-I-V-I-S-I-O-N

Category 1. Ratio & Proportion

1. (2 Pts.) If it takes 1 1/2 hours to dry a shirt on the clothes line on a 75°- sunny day, how many minutes would it take to dry 3 shirts on the same line the same day?

ANS. _____

2. (3 Pts.) Which equation(s) best describes an *inverse* proportion; where k is some constant and x and y are variables?

a) $x + y = k$

b) $xy = k$

c) $x - y = k$

d) $y = \frac{x}{k}$

e) $\frac{x}{y} = k$

ANS. _____

3. (5 Pts.) Solve this proportion for x.

$$\frac{6x - 2}{7} = \frac{5x + 7}{8}$$

ANS. _____

Ratio and Proportion

Def.: A ratio is the quotient of two quantities.

Ex.: $\frac{60 \text{ minutes}}{1 \text{ hour}}$ (This ratio happens to equal one!)

Ex.: $\frac{6 \text{ feet}}{5 \text{ yards}} = \frac{6 \text{ feet}}{15 \text{ feet}} = \boxed{\frac{2}{5}}$

Notation: $\frac{2}{5} \Leftrightarrow 2:5 \Leftrightarrow 2 \text{ to } 5$

Def.: A proportion states the equality of two ratios.

Ex.: $\frac{1}{2} = \frac{3}{6}$

To solve a proportion, we cross-multiply:

Given: $\frac{a}{b} = \frac{c}{d}$ Then: $a \cdot d = b \cdot c$

Ex.: $\frac{1}{2} = \frac{x}{6} \Rightarrow 1 \cdot 6 = 2 \cdot x \Rightarrow 6 = 2x \Rightarrow \boxed{x = 3}$

N.B.: There are many forms of equivalent ratios and proportions due to the cross-multiplication relationship.

Given: $\frac{a}{b} = \frac{c}{d}$, then the following are equivalent:

(1) $\frac{b}{a} = \frac{d}{c}$ (2) $\frac{a}{c} = \frac{b}{d}$

(3) $\frac{a+b}{b} = \frac{c+d}{d}$ (4) $\frac{a}{b+a} = \frac{c}{d+c}$

N.b.: If you don't believe it yet, you can use cross-multiplication to confirm. ☺