Rational Equations Word Problems

Name: _____

Directions: Set up and solve a system of equations to answer the following real world scenarios.

In order to do well with word problems you must:

1) Read the problem and understand what is being said and asked

2) Write down all the information that is important

3) Assign a variable to an unknown and put all other unknowns in terms of this one

4) Translate any equations given in the problem

5) Create your final algebraic expression

6) Solve

7) Check your answers

Types of word problems:

1) <u>Work rate</u>: Work rate problems usually involve two people that are trying to help each other finish a single job.

2) <u>Variation problems</u>: Variation problems should be done in steps. The starting equations will be direct or inverse variations.
   * a. Direct variation $y = kx$ means x and y are directly across from each other.
   * b. Inverse variation $y = \dfrac{k}{x}$ means that x is inverted on the other side of y.
   c. In both cases, k is always in the same position

3) <u>With or Against (wind or current)</u>: Once the equation is set up then the next step will require clearing fractions using the LCD. All solutions must be checked to avoid division by zero.

   a. Use a table to help organize all the information in the problem. Usually only two columns of the table need to be filled in. The goal is to create the equation using the table.

   b. The equations for rate (r), distance (d), and time (t) are $d = rt$, $r = \dfrac{d}{t}$, $t = \dfrac{d}{r}$

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1. Three times the reciprocal of a number equals 9 times the reciprocal of 6. Find the number.

$$\frac{3}{1} \cdot \frac{1}{X} = \frac{9}{1} \cdot \frac{1}{6}$$

$$\frac{3}{X} \diagdown \frac{9}{6}$$

$$18 = 9X$$

$$\boxed{2 = X}$$

(24)

2. In 2 minutes, a conveyor belt moves 300 pounds of tin from the delivery truck to a storage area. A smaller belt moves the same amount the same distance in 6 minutes. If both belts are used, find how long it takes to move the cans to the storage area.

$\dfrac{job}{time}$

$$B + S = T$$

$$6x\left(\dfrac{1}{2}\right) + 6x\left(\dfrac{1}{6}\right) = \left(\dfrac{1}{x}\right)6x$$

$$3x + x = 6$$

$$4x = 6$$

$$x = \boxed{1.5 \text{ mins}}$$

3. A cyclist rode the first 20-mile portion of his workout at a constant speed. For the 16-mile cooldown portion of his workout, he reduced his speed by 2 miles per hour. Each portion of the workout took the same time. Find the cyclist's speed during the first portion and find his speed during the cooldown portion.

	Distance	Rate	Time

4. Fran can clean the garage in 3 hours, but it takes Angie 4 hours to do the same job. How long would it take them to clean the garage if they worked together?.
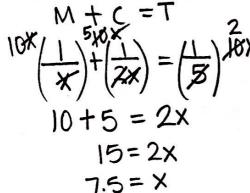
$$F + A = T$$

$$12x\left(\dfrac{1}{3}\right) + 12x\left(\dfrac{1}{4}\right) = \left(\dfrac{1}{x}\right)12x$$

$$4x + 3x = 12$$

$$7x = 12$$

$$x = \boxed{1.7 \text{ hrs}}$$

5. If m varies inversely as p, and m = 30 when p = 5, find m when p is 6.

$$m = \dfrac{k}{P}$$

$$5(30) = \dfrac{k}{5} \cdot 5$$

$$150 = k$$

$$m = \dfrac{k}{P}$$

$$m = \dfrac{150}{6}$$

$$\boxed{m = 25}$$

25

9. Marco can build a lap top twice as fast as Cliff. Working together, it takes them 5 hours. How long would it have taken Marco working alone?

$$M + C = T$$

$$10x\left(\frac{1}{x}\right) + \left(\frac{1}{2x}\right) = \left(\frac{1}{5}\right) 10x$$

$$10 + 5 = 2x$$

$$15 = 2x$$

$$7.5 = x$$

$$\boxed{\text{Marco } 7.5 \text{ hrs}}$$

10. If s varies inversely as t^2, and $s = 10$ when $t = 2$, find s when t is 10.

$$S = \frac{k}{t^2} \qquad 40 = k \qquad S = \frac{k}{t^2}$$

$$10 = \frac{k}{(2)^2} \qquad\qquad S = \frac{40}{(10)^2}$$

$$4 \cdot 10 = \frac{k}{4} \cdot 4 \qquad\qquad S = \frac{40}{100} = \boxed{\frac{2}{5}}$$

11. The time (t) traveled by Delmar in a car varies inversely as rate (r). If Delmar drives at a speed of 80 mph in 12 hours, what will be the time to travel if he drives at 60 mph?

$$t = \frac{k}{r} \qquad\qquad t = \frac{k}{r}$$

$$80 \cdot 12 = \frac{k}{80} \cdot 80 \qquad t = \frac{960}{60}$$

$$960 = k \qquad\qquad t = \boxed{16 \text{ hrs}}$$

12. For a given area of a triangle, the base varies inversely as its height. When the height is 10 in the base is 5 in. Find the base if the height is increased to 20 in.

$$b = \frac{k}{h} \qquad\qquad b = \frac{k}{h}$$

$$5 = \frac{k}{10} \qquad\qquad b = \frac{50}{20}$$

$$50 = k \qquad\qquad b = \boxed{2.5 \text{ in}}$$

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