Solving Proportions

Solving a proportion is solving an equation of given ratios (Fractions)

- A proportion is when we have two things equal to one anther and one piece of information is unknown, ALGEBRA all over again

Example 1:

Solve the following proportions for a

$$\frac{a}{b}=\frac{c}{d} \quad \rightarrow \quad \frac{b\cdot a}{b}=\frac{c\cdot b}{d} \quad \rightarrow \quad \boldsymbol{a=\frac{cb}{d}}$$

Multiply both sides by b

Pretty straight forward when the unknown is in the numerator. Just multiply by the denominator you are trying to find!

Example 2:

$$\frac{3}{5}=\frac{d}{60} \quad \rightarrow \quad \frac{60\cdot 3}{5}=\frac{d\cdot 60}{60} \quad \rightarrow \quad \mathrm{d}=36$$

It may seem harder when the unknown is in the denominator...

$$\frac{3}{5}=\frac{9}{d}$$

But since the two fractions are equal to one another, if you flip one fraction, you can flip the other!

$$\frac{3}{5}=\frac{9}{d} \quad \rightarrow \quad \frac{5}{3}=\frac{d}{9}$$

This we can solve easily, just multiply by the denominator we are trying to cancel

$$\frac{9\cdot 5}{3}=\frac{d\cdot 9}{9} \quad \rightarrow \quad \frac{45}{3}=d \quad \rightarrow \quad d=15$$

Ratio/Proportion Word Problems Name KEY

Set up a proportion to solve each problem, show all work, and label all answers.

1. The ratio of boys to girls is 3 to 2. If there are 12 boys, how many girls are there?

$\frac{3b}{2g} = \frac{12b}{xg}$ Flip $\frac{12b}{3b} \cdot \frac{2g}{} = \frac{xg}{12b} \cdot 12b$ $x = 8$ girls

2. It takes one Super Giant Pizza to feed 3 people. If you invite 36 people, how many pizzas will you need?

$36 \text{ people} \cdot \frac{1 \text{ Pizza}}{3 \text{ people}} = \frac{x \text{ pizza}}{36 \text{ people}} \cdot 36 \text{ people} \rightarrow 12 \text{ pizza} = x$

3. At a recent party, it cost \$9.50 for refreshments for 10 guests. At this rate, how much would it cost to have refreshments for 80 guests?

$80 \text{ guests} \cdot \frac{\$9.50}{10 \text{ guests}} = \frac{\$x}{80 \text{ guests}} \cdot 80 \text{ guests}$ $x = \frac{80 \cdot 9.50}{10} = \$76$

4. Mary has saved \$17.50 in the past 3 weeks. At this rate, how much will she save in 15 weeks?

$15 \text{ weeks} \cdot \frac{17.50}{3 \text{ week}} = \frac{x}{15 \text{ weeks}} \cdot 15 \text{ weeks} \rightarrow \frac{15 \cdot 17.50}{3} = x$

$x = \$87.50$

5. Mr. Johnson was paid \$190 for a job that required 40 hours of work. At this rate, how much should he be paid for a job requiring 60 hours of work?

$60 \text{ hrs} \cdot \frac{\$190}{40 \text{ hrs}} = \frac{x}{60 \text{ hrs}} \cdot 60 \text{ hrs}$ $x = \frac{60 \cdot 190}{40} = \$285$

6. The park ranger stocks the children's fishing pond keeping a ratio of 4 sunfish to 3 perch. If he puts 300 sunfish into the pond, how many perch should be put into the pond?

$\frac{4\text{ sunfish}}{3\text{ perch}} = \frac{300\text{ sunfish}}{x\text{ perch}} \rightarrow \frac{3\text{ perch}}{4\text{ sunfish}} = \frac{x\text{ perch}}{300\text{ sunfish}}$ · 300 sunfish

$\frac{300 \cdot 3\text{ perch}}{4} = x$ $\quad$ $x = 225$ perch

7. If two pounds of meat will serve 5 people, how many pounds will be needed to serve 13 people?

$13\text{ people} \cdot \frac{2\text{ lbs}}{5\text{ people}} = \frac{x}{13\text{ people}} \cdot 13\text{ people}$ $\quad$ $x = \frac{26}{5} = 5.2$ lbs

8. Jack was planting a tree. He was to dig a hole that was 3 feet deep for every 5 feet of tree height. How deep should he dig the hole for a tree that is 17 feet high?

$17\text{ ft high} \cdot \frac{3\text{ ft deep}}{5\text{ ft high}} = \frac{x}{17\text{ ft high}}$ · 17 ft high

$\frac{17 \cdot 3}{5} = x$

$x = 10.2$ feet deep

9. A certain shade of green paint is made from 5 parts yellow mixed with three parts blue. If 2 cans of yellow are used, how many cans of blue should be used?

$\frac{5\text{ yellow}}{3\text{ blue}} = \frac{2\text{ yellow}}{x}$

$2\text{ yellow} \cdot \frac{3\text{ blue}}{5\text{ yellow}} = \frac{x}{2\text{ yellow}}$ · 2 yellow $\quad$ $x = \frac{6}{5}$ blue $= 1$ can and $\frac{1}{5}$ blue paint

10. If a 4-pound roast takes 150 minutes to cook, how long should a five-pound roast take?

$\frac{4\text{ lbs}}{150\text{ mins}} = \frac{5\text{ lbs}}{x}$

$5 \cdot \frac{150}{4} = \frac{x}{5} \cdot 5$

$x = 187.5$ mins

11. If a jogger runs 2 miles and burns 185 calories, how many calories would he burn jogging 3 miles?

$\frac{2 \text{ miles}}{185 \text{ calories}} = \frac{3 \text{ miles}}{x}$

$\frac{185 \text{ calories}}{2 \text{ miles}} = \frac{x}{3 \text{ miles}}$

$\frac{3 \text{ miles} \cdot 185 \text{ calories}}{2 \text{ miles}} = \frac{x \cdot 3 \text{ miles}}{3 \text{ miles}}$

$x = 277.5 \text{ calories}$

12. The ratio of the cost of a tennis racket to tennis balls is 18:1. If a can of balls cost $5.35, what is the cost of the racket?

$\$5.35 \cdot \frac{18}{1} = \frac{x}{\$5.35} \cdot \$5.35$

$x = \$96.30$

13. Curtis School has 1,575 students. The student to teacher ratio is 15 to 1. How many teachers are at Curtis School?

$\frac{15 \text{ students}}{1 \text{ teacher}} = \frac{1575 \text{ students}}{x}$

$1575 \cdot \frac{1}{15} = \frac{x}{1575} \cdot 1575$

$x = 105 \text{ teachers}$

14. A recipe calls for 2 $\frac{1}{2}$ cups of flour to make 2 dozen cookies. How many cups of flour would be required to bake 15 dozen cookies?

$15 \cdot \frac{2.5 \text{ cups}}{2 \text{ dozen}} = \frac{x}{15 \text{ dozen}} \cdot 15$

$x = 18.75 \text{ cups}$

15. A meteorologist reports that the ratio of snowfall in January to total snowfall during the average winter is 2 to 5. If 34 inches have fallen in January of the current year, find the predicted total snowfall for the entire winter.

$\frac{2}{5} = \frac{34}{x}$

$34 \cdot \frac{5}{2} = \frac{x}{34} \cdot 34$

$x = 85 \text{ in}$

16. Because of slumping sales, a small company had to lay off some of its employees. The ratio of total employees to employees laid off is 5 to 1. Find the total number of employees if 22 are laid off.

$22 \cdot \frac{5}{1} = \frac{x}{22} \cdot 22$

$x = 110$ employees

17. A crew of loggers cleared $\frac{1}{2}$ acre of lumber in 4 days. How long will it take the same crew to clear $2\frac{3}{4}$ acres of lumber?

$\frac{0.5}{4} = \frac{2.75}{x}$

$2.75 \cdot \frac{4}{0.5} = \frac{x}{2.75} \cdot 2.75$

$x = 22$ days

18. A person who weighs 200 pounds on Earth would weigh about 32 pounds on the moon. Find the weight of a person on Earth who would weigh 15 pounds of the moon.

$15 \text{ moon} \cdot \frac{200 \text{ lbs}}{32 \text{ moon}} = \frac{x}{15 \text{ moon}} \cdot 15 \text{ moon}$

$x = 93.75$ lbs

19. A pump can fill a 750-gallon tank in 35 minutes. How long will it take to fill a 1000-gallon tank with this same pump?

$\frac{750 \text{ gal}}{35 \text{ mins}} = \frac{1000 \text{ gal}}{x}$

$1000 \text{ gal} \cdot \frac{35 \text{ mins}}{750 \text{ gal}} = \frac{x}{1000 \text{ gal}} \cdot 1000 \text{ gal}$

$x = 46.7$ mins

20. In a public opinion poll, 624 people from a sample of 1,100 indicated they would vote for a specific candidate. How many votes can the candidate expect to receive from a population of 40,000?

$40000 \cdot \frac{624}{1100} = \frac{x}{40000} \cdot 40000$

$x = 22690.9$ votes