Foundations of Algebra

Notes

NB: _____

Day 2: Proportions

As stated yesterday, a **proportion** states that two ratios are equal to each other. You spent yesterday creating equivalent rates using various models. A proportion allows you to create equivalent ratios using algebra. In order to solve proportions, you need to be able to solve a one-step equation.

Solve the following equations:

a. $3x = 9$

$\frac{3 \cdot x}{3} = \frac{9}{3}$

$\boxed{x = 3}$

b. $12x = 60$

$\frac{12x}{12} = \frac{60}{12}$

$\boxed{x = 5}$

c. $2x = 10$

$\frac{2x}{2} = \frac{10}{2}$

$\boxed{x = 5}$

d. $4x = 14$

$\frac{4x}{4} = \frac{14}{4}$

$x = \frac{14 \div 2}{4 \div 2} = \boxed{\frac{7}{2}}$

Creating Equivalent Ratios Using Proportions

When creating proportions, you can set up your proportions several ways. The key to creating them is to always match up corresponding parts or wholes. Take a look at the following scenario:

In a Valentine's Day bouquet, 2 out of every 5 roses are pink. If there are 6 pink roses, how many total roses are in the bouquet?

$\frac{2 \text{ pink roses}}{5 \text{ total}} = \frac{6 \text{ pink roses}}{x \text{ total}}$

$2 \cdot x = 6 \cdot 5$

$\frac{2x}{2} = \frac{30}{2}$

$\boxed{x = 15 \text{ total roses}}$

Practice: Solve each problem by using a proportion.

a. Rita made 12 pairs of earrings in 2 hours. How many pairs of earrings could she make in 3 hours?

$\frac{12 \text{ earrings}}{2 \text{ hours}} = \frac{x \text{ earrings}}{3 \text{ hours}}$

$12 \cdot 3 = 2 \cdot x$

$\frac{36}{2} = \frac{2x}{2}$

$\boxed{x = 18 \text{ earrings in 3 hours}}$

b. Perry earned $96 shoveling snow from 8 driveways. How much would Perry have earned if he had shoveled 10 driveways?

$\frac{\$96}{8 \text{ driveways}} = \frac{\$x}{10 \text{ driveways}}$

$\frac{960}{8} = \frac{8x}{8}$

$x = \$120$

c. Marlene is planning a trip. She knows that her car gets 38 miles to the gallon on the highway. If her trip is going to be 274 miles and one gallon of gas is $2.30, how much should she expect to pay for gas?

1 gallon = $2.30

$\frac{38 \text{ miles}}{1 \text{ gallon}} = \frac{38 \text{ miles}}{\$2.30}$

$\frac{38 \text{ miles}}{\$2.30} = \frac{274 \text{ miles}}{\$x}$

$38x = 630.2$

$\boxed{x = \$16.58 \text{ for gas}}$

Foundations of Algebra

3:2 3+2=5 whole

NB _____

Multi-Step with Proportions

a. For every 3 boys at soccer camp, there are 2 girls. If there are 20 children at soccer camp, how many are girls?

$\frac{3 \text{ boys}}{2 \text{ girls}}$ $\frac{2 \text{ girls}}{5 \text{ whole}} \neq \frac{x \text{ girls}}{20 \text{ whole}}$

$20 \cdot 2 = 5 \cdot x$

$\frac{40}{5} = \frac{5x}{5}$

$x = 8$ girls

b. It takes Ryan about 8 minutes to type a 500 word document. How long will it take him to type a 12 page essay with 275 words per page?

minutes!

$\frac{8 \text{ min.}}{500 \text{ words}} = \frac{x \text{ minutes}}{275 \text{ words} \times 12 \text{ pages}}$

$\frac{8}{500} \neq \frac{x}{3300}$

$3300 \cdot 8 = 500x$

$\frac{26{,}400}{500} = \frac{500x}{500}$

$x = 52.8$ minutes

c. Josie took a long multiple choice test. The ratio of the number of problems she got incorrect to the number of problems she got correct was 2:9. If Josie missed 8 questions, how many did she get correct? How many questions were there total?

$\frac{2 \text{ incorrect}}{9 \text{ correct}} \neq \frac{8 \text{ incorrect}}{x \text{ correct}}$

$\frac{4 \cdot x}{4} = \frac{72}{2}$

$x = 36$ correct

Total $= 36 + 8 =$ 42 total

d. Sammy and David were selling water bottles to raise money for new football uniforms. Sammy sold 5 water bottles for every 3 water bottles David sold. Together, they sold 160 water bottles. How many did each boy sell?

$\frac{5 \text{ Sam}}{3 \text{ David}}$

$5 + 3 = 8$ whole

to

$\frac{5 \text{ Sam}}{8 \text{ total}} \neq \frac{x \text{ Sam}}{160 \text{ total}}$

$160 \cdot 5 = 8 \cdot x$

$800 = 8x$

$x = 100$ SAM

$\frac{3 \text{ David}}{8 \text{ total}} \neq \frac{x \text{ David}}{160 \text{ total}}$

$160 \cdot 3 = 8x$

$480 = 8x$

$x = 60$ DAVID

e. The student faculty ratio at a small college is 17:3. The total number of students and faculty is 740. How many faculty and students are there at the college?

$\frac{17 \text{ students}}{3 \text{ faculty}}$

$\frac{17 \text{ students}}{20 \text{ total}} \neq \frac{x \text{ Stu.}}{740 \text{ total}}$

$740 \cdot 17 = 20 \cdot x$

$12{,}580 = 20x$

$x = 629$ students

$\frac{3 \text{ faculty}}{20 \text{ total}} = \frac{x \text{ fac.}}{740 \text{ total}}$

$740 - 629 =$ 111 faculty