

1.1 Proportional Reasoning - Simplify

Name: _____

BUILD YOUR SKILLS

1. Simplify these fractions to their lowest terms.

a) $\frac{4}{16} =$

b) $\frac{3}{12} =$

c) $\frac{25}{75} =$

d) $\frac{15}{21} =$

e) $\frac{8}{18} =$

f) $\frac{45}{100} =$

g) $\frac{20}{50} =$

h) $\frac{3}{21} =$

i) $\frac{7}{56} =$

BUILD YOUR SKILLS

2. Solve for x .

a) $\frac{x}{10} = \frac{40}{50}$

b) $\frac{12}{16} = \frac{18}{x}$

c) $\frac{56}{64} = \frac{x}{8}$

d) $\frac{18}{27} = \frac{36}{x}$

e) $\frac{x}{2056} = \frac{3}{4}$

f) $\frac{3}{12} = \frac{15}{x}$

NEW SKILLS: WORKING WITH RATIO AND PROPORTION

When a carpenter bonds two pieces of wood with epoxy resin, she must first mix the epoxy with a hardener. She mixes these materials in a **ratio** of 10 to 1, where there are 10 parts of epoxy to 1 part of hardener. This ratio can be written as 10:1 or as a fraction, $\frac{10}{1}$.

If the carpenter wanted to use 150 parts of epoxy, she would need 15 parts of hardener. This would give her a ratio of 150 to 15 between the amount of epoxy and the amount of hardener. You can write this as 150:15 or as $\frac{150}{15}$.

The ratio $\frac{150}{15}$ can be simplified to $\frac{10}{1}$.

$$\frac{150}{15} = \frac{150 \div 15}{15 \div 15}$$

$$\frac{150 \div 15}{15 \div 15} = \frac{10}{1}$$

$$\frac{150}{15} = \frac{10}{1}$$

It is common to express ratios as fractions when doing calculations.

When you state that two ratios are equal, as they are in the following equation,

you have written a **proportion**.

$$\frac{150}{15} = \frac{10}{1}$$

Example 3

Charles works as a cook in a restaurant. His chicken soup recipe contains:

- 11 cups of seasoned broth
- 5 cups of diced vegetables
- 3 cups of rice
- 3 cups of chopped chicken

He wants to make the recipe at home for his parents. To reduce the recipe yield, he needs to know what the ratios are between the quantities of ingredients.

a) What is the ratio of vegetables to chicken?

- b) What is the ratio of broth to vegetables?
- c) What is the ratio of chicken to rice?
- d) What is the ratio of the chicken to the total ingredients in the recipe?

SOLUTION

- a)
- b)
- c)
- d)

3. For a silk screening project, Jan mixes a shade of orange ink. She uses a ratio of red ink to yellow ink of 2:3 and yellow ink to white ink of 3:1.

a) How many mL of yellow ink would she need if she used 500 mL of white ink?

b) How many mL of red ink would she need if she used 750 mL of yellow ink?

Example 4

Tom and Susan make \$180.00 from holding a garage sale. Because Tom contributed fewer items to the sale, the money is to be divided between Tom and Susan in the ratio of 1:2. How much money will each person receive?

Try this:

The ratio of flour to shortening in a recipe for piecrust is 2:1. If a baker makes 30 cups of piecrust, how many cups of flour and shortening does he use?

NEW SKILLS: WORKING WITH RATE

A **rate** is a ratio comparing two numbers measured in different units.

Some examples of rates are:

• \$1.69/100 g or $\frac{\$1.69}{100gm}$ for the cost of ham at the deli

• 80 km/h or $\frac{80km}{1h}$ for how fast a car travels

• \$38.00/4 h or $\frac{\$38.00}{4h}$ for how much you earn at work

For more information, see page 17 of *MathWorks 10*.

Example 5

The amount of fuel consumed by a vehicle when it is driven 100 km is referred to as the rate of fuel consumption. Write a rate statement that indicates that a car uses 6.3 litres of gas for every 100 km driven.

SOLUTION

Try this:

Write a rate statement that indicates how much you earn in an 8-hour day if you are paid \$9.25 for each hour you work.

Example 6

If you earn \$150.00 in 12 hours, how much will you earn if you work 40 hours? (hint - set up equal ratios)

SOLUTION

$$\frac{\$150.00}{12 \text{ h}} = \frac{\$x}{40 \text{ h}}$$

Try this:

If a type of salami at the deli costs \$1.59 per 100 g, how much will you pay for 350 g?

Equal Ratio :

Calculate:

PRACTISE YOUR NEW SKILLS

1. Find the unknown value in each of the following proportions. Give answers to the nearest tenth of a unit (to one decimal place).

While calculating,
omit the units.

a) $\frac{24}{18} = \frac{x}{12}$

b) $\frac{168 \text{ km}}{2 \text{ h}} = \frac{548 \text{ km}}{x \text{ h}}$

c) $\frac{40}{28} = \frac{60}{x}$

d) $\frac{6 \text{ pizza slices}}{2 \text{ people}} = \frac{x \text{ pizza slices}}{21 \text{ people}}$

e) $\frac{87 \text{ blankets}}{x \text{ bundles}} = \frac{24 \text{ blankets}}{8 \text{ bundles}}$

f) $\frac{12}{25} = \frac{25}{x}$

g) $\frac{7}{15} = \frac{x}{1}$

h) $\frac{12}{45} = \frac{16}{x}$

2. A hairdresser mixes brunette hair colouring for a client using 20 mL hair colour, 40 mL colour developer, 15 mL conditioner, and 3 mL thickener. Find the following ratios and simplify them to their lowest terms. Express your answers as fractions.

a) The ratio of hair colour to thickener.

b) The ratio of thickener to conditioner.

c) The ratio of colour developer to hair colour.

d) If this treatment costs the customer \$68.00 and the cost of labour and materials used is \$14.20, what is the ratio of customer price to actual cost?

3. If the ratio of yellow pigment to blue pigment in a shade of green paint is 2:3, how many drops of yellow pigment will be needed if 12 drops of blue are used?

4. If 5 cm on a map represents 2.5 km of actual ground, how many centimetres would 15 km of actual ground be on the map?

5. If a can of paint will cover 48 m² of wall space, how many cans will you need to paint 220 m²?

6. The ratio of teeth on a pair of driving gears is 13:6, with the larger gear having more teeth. If the larger gear has 52 teeth, how many does the smaller gear have?

7. If Stephie can type 75 words per minute, how long will it take her to type an 800-word term paper? Is the solution a rate or a ratio? Explain your answer.

8. If the ratio of flour to sugar in a recipe is 3:2, how much flour would you need if you used 1.5 cups of sugar?

9. If a machine can produce 85 parts in 40 minutes, how many parts can it produce in 8 hours?