Direct Proportion

Lesson 4

Objective

Students will be able to represent proportional relationships between quantities.

Definition

Two quantities have a **direct proportion** relationship when an **increase or decrease in one quantity** causes the **same kind of change** in the other quantity.

In order to be proportional they have to have a **constant** ratio or **unit** rate.

- Direct proportion is also called ==direct variation==.
- The constant ratio is also called the ==constant of variation==.
- The constant of variation is also known as the ==constant of proportionality==.

Method 1 Use Unlike units for each Ratio

ex. $\dfrac{\text{hours worked}}{\text{dollars earned}} = \dfrac{\text{hours worked}}{\text{dollars earned}}$

$$\dfrac{5 \text{ hours}}{\$70} = \dfrac{h}{\$630} \quad \longleftarrow \text{Direct proportion}$$

Method 2 Use Like Units for Each Ratio

ex. $\dfrac{\text{hours worked}}{\text{hours worked}} = \dfrac{\text{dollars earned}}{\text{dollars earned}}$

$\dfrac{5 \text{ hours}}{h} = \dfrac{\$70}{\$630}$

Example

A sample of paint contains 3 ounces of blue paint and 8 ounces of yellow paint. If you have a 24-ounce can of the blue paint, how much yellow paint should you mix with it in order to make the same color as the sample?

Method 1

$$\frac{\text{blue paint}}{\text{yellow paint}} = \frac{\text{blue paint}}{\text{yellow paint}}$$

$$\frac{3 \text{ oz}}{8 \text{ oz}} = \frac{24 \text{ oz}}{x}$$

$$3x = 8(24)$$
$$3x = 192$$

$$x = 64$$

Method 2

$$\frac{\text{blue paint}}{\text{blue paint}} = \frac{\text{yellow paint}}{\text{yellow paint}}$$

$$\frac{3 \text{ oz}}{24 \text{ oz}} = \frac{8 \text{ oz}}{x}$$

$$3x = 24(8)$$
$$3x = 192$$

$$x = 64$$

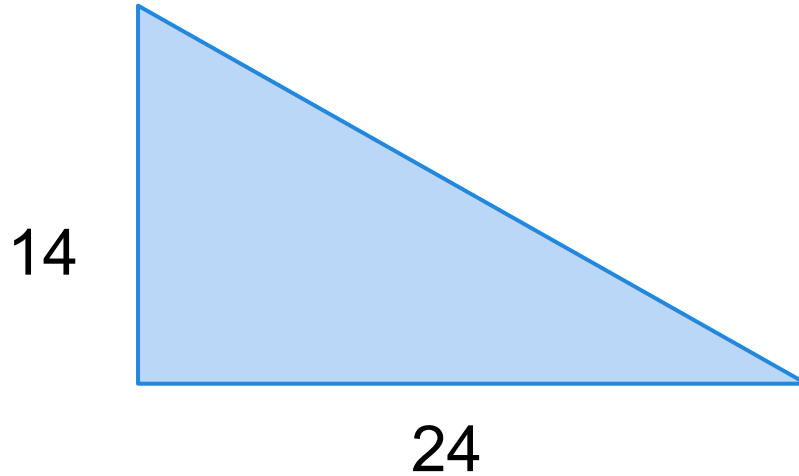You need to mix 64 ounce of yellow paint to make the same color as the sample.
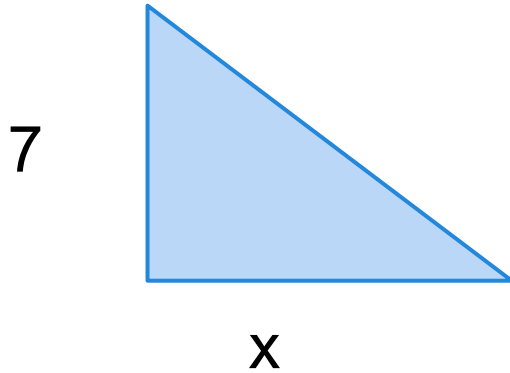
Example

The cost of an order is proportional to the number of pizzas ordered.

$$\frac{\text{cost of order}}{\text{pizzas ordered}} = \frac{8}{1} = \frac{16}{2} = \frac{24}{3} = \frac{32}{4} = \frac{40}{5}$$

or $8 per pizza

All the ratios are equivalent ratios because they all have the same value.
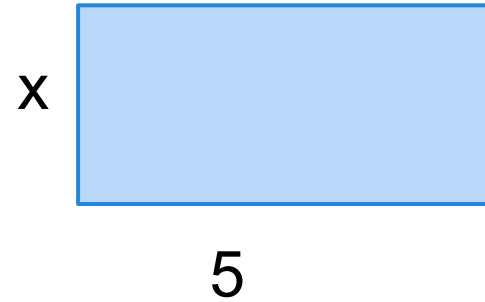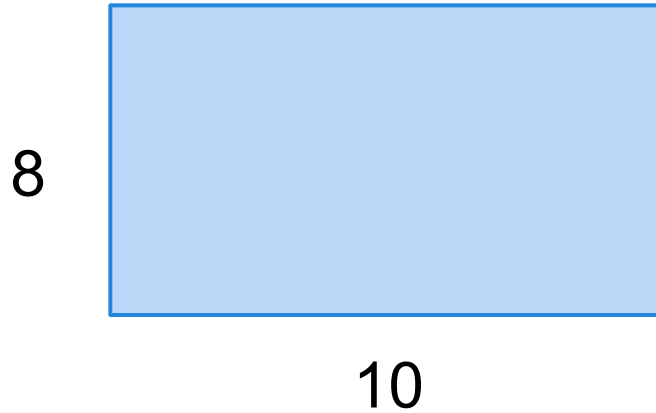
Use proportions to find missing sides

7

x

14

24

$$\frac{7}{x} = \frac{14}{24}$$ **OR** $$\frac{7}{14} = \frac{x}{24}$$ x = 12

Find the missing side.

$$\frac{8}{x} = \frac{10}{5}$$ **OR** $$\frac{8}{10} = \frac{x}{5}$$ x = 4

Important

For relationships in which the ratio is **not constant**, the two quantities are **nonproportional**.

Example

1. Andrew earns $18 per hour for mowing lawns. Is the amount of money he earns proportional to the number of hours he spends mowing? Explain.

➢ To find the amount of money he earns for working a different numbers of hours. Make a table to show these amounts.

Earnings ($)	18			
Time (h)	1	2	3	4

For each number of hours worked, write the relationship of the amount he earned an hour as a ratio in simplest form.