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## Proportions and Similar Triangles

Unit 2 Lesson 8

# PROPORTIONS AND SIMILAR FIGURES

## Students will be able to:

Understand the usage of proportions in similar figures and solve scale diagram problems

## Key Vocabulary:

- Proportion
- Similar figures
- Corresponding sides and angles
- Scale drawing

# PROPORTIONS AND SIMILAR FIGURES

## What is a Proportion?

A proportion is an equation having two ratios equal.

$$\frac{a}{b} = \frac{c}{d}$$

$b$  &  $c$



means

$a$  &  $d$

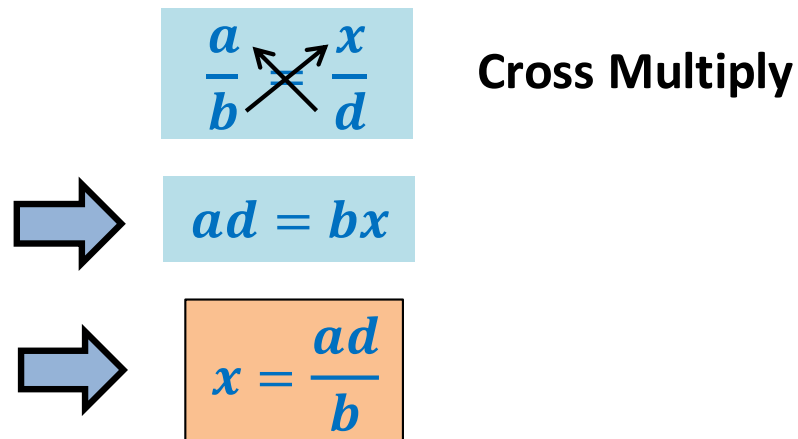


extremes

# PROPORTIONS AND SIMILAR FIGURES

## Solving proportions using Cross-Product property

In a proportion, the product of extremes is equal to the product of means i.e. we cross multiply the terms on both sides of equality and simplify to solve for the given variable.



The diagram illustrates the process of solving a proportion. It starts with a proportion  $\frac{a}{b} = \frac{x}{d}$  inside a light blue box. Two arrows cross each other, connecting the top-left term 'a' to the bottom-right term 'd' and the bottom-left term 'b' to the top-right term 'x'. To the right of this box is the text 'Cross Multiply'. A large blue arrow points from this box to a second light blue box containing the equation  $ad = bx$ . Another large blue arrow points from this second box to a third orange box containing the equation  $x = \frac{ad}{b}$ .

$$\frac{a}{b} = \frac{x}{d}$$

Cross Multiply

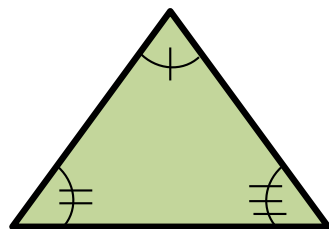
$$ad = bx$$
$$x = \frac{ad}{b}$$

# PROPORTIONS AND SIMILAR FIGURES

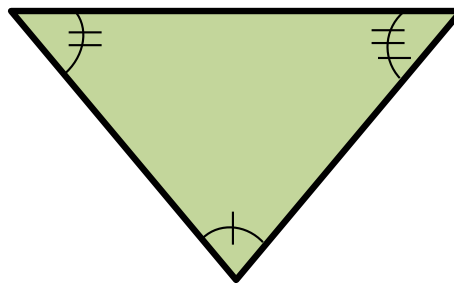
## Similar Figures

Two figures are similar if they have same shape but not the same size.

- The corresponding **angles** of the similar figures are **equal in measures**.
- The corresponding **sides** of the similar figures are **proportional**.



**Figure 1**

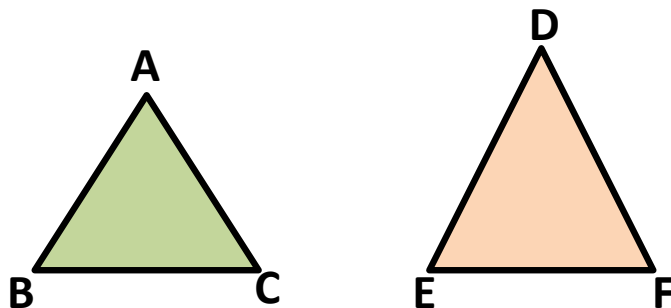


**Figure 2**

The **figure 1** and **figure 2** are similar since both shapes are triangles but their size is different. (Similarity represented as ' $\sim$ ')

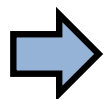
# PROPORTIONS AND SIMILAR FIGURES

**Problem 1:** Write the corresponding sides as proportions and list the corresponding angles of the triangles shown below.



**Corresponding Sides**

$$\frac{AB}{DE} \quad \frac{BC}{EF} \quad \frac{AC}{DF}$$



$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

**Corresponding Angles**

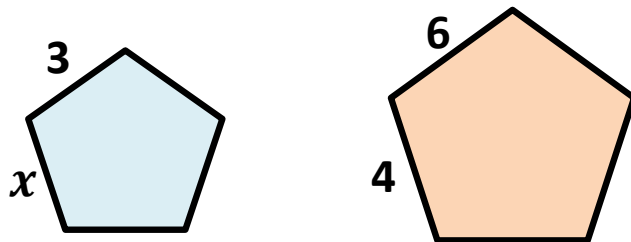
Angle A and Angle D

Angle B and Angle E

Angle C and Angle F

# PROPORTIONS AND SIMILAR FIGURES

**Problem 2:** The figures given below are similar. Find the missing length.



Since the two figures are similar, their corresponding sides are proportional.

$$\begin{aligned} \Rightarrow \frac{3}{6} &= \frac{x}{4} & \Rightarrow \frac{3 \times 4}{6} &= x \\ & & \Rightarrow x &= 2 \end{aligned}$$

# PROPORTIONS AND SIMILAR FIGURES

## Scale Drawing

A scale drawing of an object is a drawing on the paper using a certain scale which is similar to the actual shape of the object.

## Scale

A scale is the ratio of the drawing length on paper to the actual length.

**Example:** 1 cm represents 100 m, so the scale is **1 cm : 100 m**



## PROPORTIONS AND SIMILAR FIGURES

**Problem 3:** On a map, the scale is 1 inch : 11 km. If the distance between city A and city B on the map is 6 inches, what is the actual distance between the two cities?

We will write the proportion to find the unknown  $x$  representing the distance between city A and city B.



$$\frac{1 \text{ inch}}{11 \text{ km}} = \frac{6 \text{ inch}}{x \text{ km}}$$



$$\frac{11 \times 6}{1} = x$$



$$x = 66 \text{ km}$$

