Proportions

Unit 1 Lesson 5

Math 6

Students will be able to:

Define proportions.

Determine whether a given proportion is true or false.

Find the unknown value in a proportion.

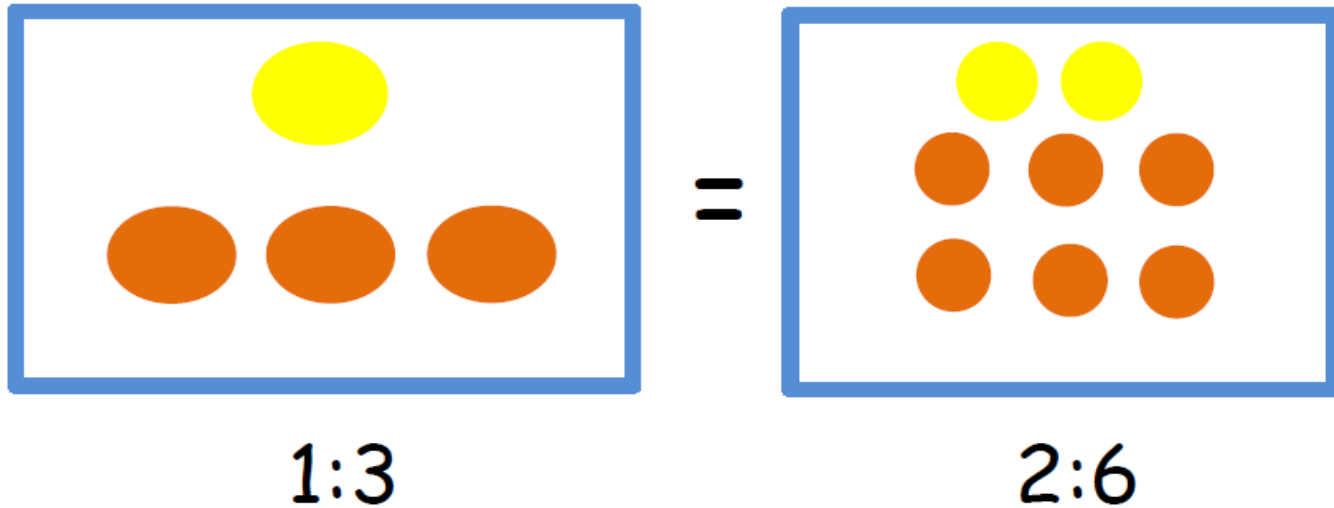Solve problems using proportions.

Key Vocabulary:

Ratio

Proportion

Cross Multiplication

Equality

Fractions

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Proportions

A **proportion** is the equality of two ratios (or fractions).

1:3 = 2:6

How do we write proportions?

Proportions can be written as follows:

A.   Two equal fractions

$$\frac{1}{3} = \frac{2}{6}$$

B.   Using a colon

$$1:3 = 2:6$$

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Is the proportion TRUE or FALSE?

To determine whether given proportion is TRUE or FALSE, we use the process of "cross multiplication".

Example: Tell whether the given proportion 3:4 = 15:20 is true or false.

Example: Tell whether the given proportion
3:4 = 15:60 is true or false.

Step 1: Rewrite the ratio in fraction form.

$$\frac{3}{4} = \frac{15}{20}$$

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Step 2:   Multiply the numerator of the first ratio by the denominator of the other ratio, and the numerator of the second ratio by the denominator of the first ratio.

$$\frac{3}{4} = \frac{15}{20}$$

Step 3: If the product are equal, then the proportion is TRUE. If not then the proportion is false.

$$\frac{3}{4} = \frac{15}{20}$$

$$(3)(20) = (15)(4)$$

$$60 \quad = \quad 60$$

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Sample Problem 1:

Tell whether the given proportions are TRUE or FALSE,

a. $2:4 = 15:30$

Solution: TRUE

$60 = 60$

b. $32:24 = 36:20$

Solution: FALSE

$640 \neq 864$

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Finding the Unknown in a Proportion

If it is known that the given ratios are proportional, then you can easily find the unknown quantity in a proportion.

Example:

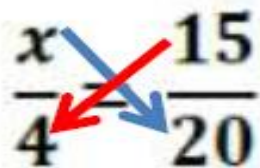Solve for x in the proportion x:4 = 15:20.

Example:

Solve for **x** in the proportion x:4 = 15:20.

Step 1: Write the given proportion in fraction form.

$$\frac{x}{4} = \frac{15}{20}$$

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Step 2: Cross Multiply

$$\frac{x}{4} = \frac{15}{20}$$

Step 3: Solve for the unknown.

$20x = 60$

$x = 30$

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Sample Problem 2:

Find the unknown in the proportion 15:a = 25:5.

Solution:

$$(25)(a) = (15)(5)$$

$$25a = 75$$

$$a = 3$$

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Solving Problems Using Proportions

A lot of real life problems can be solved using the concept of proportions.

Example:

A photographer wants to enlarge a photograph with width 6 inches and length 9 inches. He wants to make the length of the new photograph 12 inches, but still want to keep the proportion of the width to length. What is the width of the enlarged photograph?

Solution:

Step 1:   Determine the relationship of the ratio in the given problem.

width : length

Step 2: Write a ratio that compares the quantities given in the problem.

Original photo - 6 inches : 9 inches

Enlarged photo – x : 12 inches

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Step 3: Write a proportion that reflects the equality of the ratios in fraction form.

$$\frac{6}{9} = \frac{x}{12}$$

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Step 4: Solve for *x*.

9x = 72

x = 8

Therefore the enlarged photo has a width of 8 inches and 12 inches length.

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Sample Problem 3:

Chris can type 5 pages in an hour. How long will it take him to complete 100 pages?

Solution:

5 pages : 1 hour = 100 pages : b

$$\frac{5}{1} = \frac{100}{b} \longrightarrow 5b = 100 \longrightarrow b = 20 \text{ hours}$$

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