

# Solving Proportions

The contents of this content module were developed by special educator Bethany Smith, PhD and validated by content expert Drew Polly, PhD at University of North Carolina at Charlotte under a grant from the Department of Education (PR/Award #: H373X100002, Project Officer, [Susan.Weigert@Ed.gov](mailto:Susan.Weigert@Ed.gov)). However, the contents do not necessarily represent the policy of the Department of Education and no assumption of endorsement by the Federal government should be made

# What is proportion?

- A proportion is an equation that says two ratios are equivalent

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

# Solving Proportions

- One way to solve a proportion is to multiply and use the cross products
- The cross products will always equal each other in a proportion.

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

$$a \times d = b \times c$$



Cross products

# Solving proportions with a missing variable: An example

Problem: 6 cups of flour are needed to make 8 cakes. How many cups of flour are needed to make 12 cakes?

Step 1: rewrite using cross products

$$\frac{6}{8} = \frac{x}{12}$$
$$6 \times 12 = 8 \times x$$

Step 2: find the products of both sides

$$72 = 8x$$

Step 3: isolate variable solving for x (dividing both sides by 8)

$$9 = x$$

# Solving Proportions: Using scale factor

- Problem:
- Figure out  $8 \times \_ = 12$  and using that number in
- $6 \times \_ = \_$

# Solving proportional word problems

Problem: A bicyclist rides the first 60 km in 1.5 hours, how many miles will he ride in 6 hours?

Step 1: set up the ratios  $\rightarrow \frac{60 \text{ km}}{1.5 \text{ hr}} = \frac{x}{6}$

$360 = 1.5x$   $\leftarrow$  Step 2: find the cross products

$540 = x$   $\leftarrow$  Step 3: complete the operation

# Ideas for application

- Create personally relevant word problems and use manipulatives to solve...
  - Bethany has 225 boxes to ship at work. She takes 30 minutes to ship the first 25 boxes. If she continues at the same rate, how long will it take her to ship the rest of the boxes
  - You need to catch the bus to the mall. The bus travels at a rate of 10 miles in 20 minutes. At that rate of speed, how long will it take to get to the mall 45 miles away?

# Making connections

- Solving proportions addresses the following 6<sup>th</sup> and 7<sup>th</sup> grade Core Content Connectors
  - 6.PRF.2a3 Use variables to represent two quantities in a real-world problem that change in relationship to one another
  - 6.PRF.2b5 Use ratios and reasoning to solve real-world mathematical problems
  - 7.ME.1d1 Solve problems that use proportional reasoning with ratios of length and area
  - 7.PRF.1e1 Determine unit rates associated with ratios of lengths, areas, and other quantities measured in like units
  - 7.PRF.2a5 Use variables to represent two quantities in a real-world problem that change in relationship to one another
  - 7.PRF.1f1 Use proportional relationships to solve multistep percent problems
  - 7.PRF.1g1 Solve real-world multistep problems using whole numbers
  - 7.PRF.1g2 Use variables to represent quantities in a real-world or mathematical problems, and construct simple equations and inequalities to solve problems by reasoning about the quantities