TOPIC 2

LESSON 2.3a
Tagging Sharks

7.RP.2c
7.RP.3

Objective: Solving Proportions Using Means and Extremes

Warm-Up

Solve each equation.

1. $w - 5 = 25$

2. $9x = 990$

3. $\frac{c}{12} = 48$

4. $1.15 + m = 10$

Mix-N-Match

A proportion can be written several ways. Each example shows three proportions using the same four quantities.

	Example 1	Example 2
Proportion 1	$\frac{2}{3} = \frac{4}{6}$	$\frac{5}{7} = \frac{15}{21}$
Proportion 2	$\frac{6}{3} = \frac{4}{2}$	$\frac{21}{7} = \frac{15}{5}$
Proportion 3	$\frac{2}{4} = \frac{3}{6}$	$\frac{5}{15} = \frac{7}{21}$

1. In each example, use arrows to show how the numbers were rearranged from the:

a. first proportion to the second proportion.

b. first proportion to the third proportion.

EXPLORE 1

Maintaining Equality with Proportions

Because it is impossible to count each individual animal, marine biologists use a method called the capture-recapture method to estimate the population of certain sea creatures. In certain areas of the world, biologists randomly catch and tag a given number of sharks. After a period of time, such as a month, they recapture a second sample of sharks and count the total number of sharks as well as the number of recaptured tagged sharks. Then, the biologists use proportions to estimate the population of sharks living in a certain area.

Biologists can set up a proportion to estimate the total number of sharks in an area.

$$\frac{\text{Original number of tagged sharks}}{\text{Total number of sharks in an area}} = \frac{\text{Number of recaptured tagged sharks}}{\text{Number of sharks caught in the second sample}}$$

Although capturing the sharks once is necessary for tagging, it is not necessary to recapture the sharks each time. At times, the tags can be observed through binoculars from a boat or at shore.

Biologists originally caught and tagged 24 sharks off the coast of Cape Cod, Massachusetts, and then released them back into the bay. The next month, they caught 80 sharks with 8 of the sharks already tagged. To estimate the shark population off the Cape Cod coast, biologists set up the following proportion:

$$\frac{\text{24 tagged sharks}}{\text{p total sharks}} = \frac{\text{8 recaptured tagged sharks}}{\text{80 total sharks}}$$

Notice the variable p in the proportion. In this proportion, let p represent the total shark population off the coast of Cape Cod.

1. Write three additional different proportions you could use to determine the total shark population off the coast of Cape Cod.

2. Estimate the total shark population using any of the proportions.

3. Did any of the proportions seem more efficient than the other proportions?

4. Wildlife biologists tag deer in wildlife refuges. They originally tagged 240 deer and released them back into the refuge. The next month, they observed 180 deer, of which 30 deer were tagged. Approximately how many deer are in the refuge? Write a proportion and show your work to determine your answer.

A proportion of the form $\frac{a}{b} = \frac{c}{d}$ can be written in many different ways.

Another example is $\frac{d}{b} = \frac{c}{a}$ or $\frac{c}{a} = \frac{d}{b}$.

5. Show how the variables were rearranged from the proportion in the "if" statement to each proportion in the "then" statement to maintain equality.

If $\frac{a}{b} = \frac{c}{d}$, then $\frac{d}{b} = \frac{c}{a}$.

If $\frac{d}{b} = \frac{c}{a}$, then $\frac{c}{a} = \frac{d}{b}$.

6. Write all the different ways you can rewrite the proportion $\frac{a}{b} = \frac{c}{d}$ and maintain equality.

EXPLORE 2

Solving Proportions with Means and Extremes

The Ready Steady Battery Company tests batteries as they come through the assembly line and then uses a proportion to predict how many of its total production might be defective.

On Friday, the quality controller tested every tenth battery and found that of the 320 batteries tested, 8 were defective. If the company shipped a total of 3200 batteries, how many might be defective?

Let's analyze a few methods.

John David

$$\frac{8 \text{ defective batteries}}{320 \text{ batteries}} = \frac{d \text{ defective batteries}}{3200 \text{ batteries}}$$

$$\frac{8}{320} \overset{\times 10}{=} \frac{d}{3200}$$

$$d = 80$$

So, 80 batteries might be defective.

Parker

$$\begin{matrix} 8 \text{ defective batteries} : 320 \text{ batteries} \\ \times 10 \\ d \text{ defective batteries} : 3200 \text{ batteries} \end{matrix} \quad \times 10$$

$$d = 80$$

About 80 batteries will probably be defective.

1. How are Parker's and John David's methods similar?

Name: _____ Date: _____ Class: _____

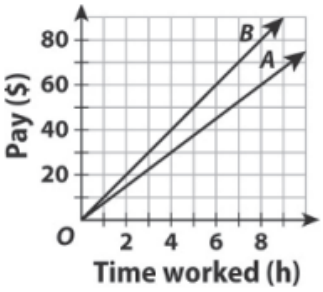
Homework HW

LESSON 2.3a
Tagging Sharks

Objective

Solving Proportions Using Means and Extremes

The graph shows the relationship between hours worked and money earned (in dollars) for two employees, A and B.



1. Suppose both employees work the same amount of time. Determine which employee earns more money. Explain.

   _____

   _____

2. Using the pay rates shown, determine the amount of money each employee earns for 15 hours of work.

   _____

   _____

3. The pay rate for employee C is less than the pay rate for employee B and greater than the pay rate for employee A. Write an equation for the possible pay y in dollars that employee C earns working x hours.

   _____

4. Two companies offer digital cable television as described below.

   Company A: $39.99 per month with no installation fee

   Company B: $34.99 per month with a $50 installation fee

   For each company, tell whether the relationship between months of service and total cost is a proportional relationship. Explain why or why not.

   _____

   _____

The table shows the relationship between the length and width of 5 different U.S. flags.

Width (ft), x	1.5	4.5	8	10.5	12.5
Length (ft), y	3	9	16	21	25

5. Is the relationship is a proportional relationship? If so, write an equation of the form $y = kx$ for the relationship.

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