Geometry Unit 7

7-1 and 7-2: Ratio and Proportion Properties.

DO NOT MESS WITH THE DESKS!!!

LEAVE THEM AS THEY ARE

Warm-up

- Discussing Winter break

- New Seating Chart

Ratio and Proportion Properties

- **Content Objective:** Students will be able to identify and use the properties of ratios and proportions.

- **Language Objective:** Students will be able to use the properties of proportions to write equations.

Ratios

- The **Ratio** of one number to another is the quotient when the first number is divided by the second.

- This quotient is expressed in simplest form

- Ex:

  - The ratio of 8 to 12 is $\frac{8}{12}$, or $\frac{2}{3}$

  - If $y \neq 0$, then the ratio of x to y is $\frac{x}{y}$

*For any ratio $\frac{x}{y}$, you may assume $y \neq 0$, even if it is not given.

*A ratio can also be expressed using ":"

    Ex: $\frac{x}{y} \rightarrow x : y$

Ratios with Shapes

Use trapezoid ZOID and the given measures to solve the examples.
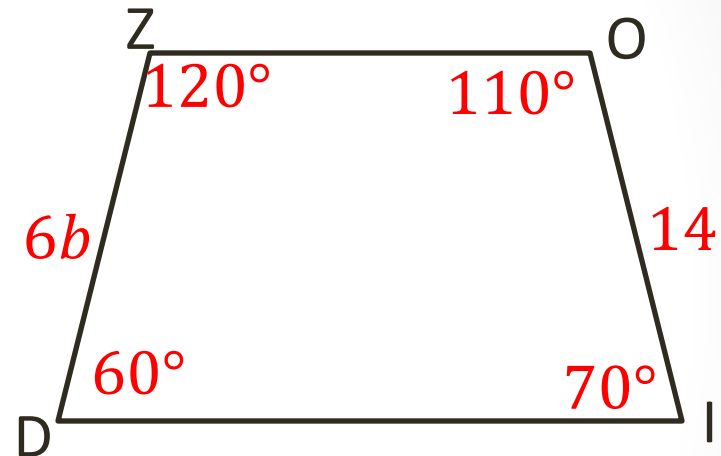
a.) Find the ratio of *OI* to *ZD*

Solution:

$$\frac{OI}{ZD} = \frac{14}{6b} = \frac{7}{3b}$$

b.) Find the ratio of the measure of the smallest angle of the trapezoid to that of the largest angle.

Solution: The smallest is < D and the largest is < Z. Thus

$$\frac{m < D}{m < Z} = \frac{60}{120} = \frac{1}{2}$$

Z   120°   110°   O

6b   14

60°   70°

D   I

Proportions

- A **Proportion** is an equation stating that two ratios are equal.

- Ex:
    - $\frac{a}{b} = \frac{c}{d}$ which also means $a:b = c:d$

- The first and last terms (a and d) are called the extremes.

- The middle terms (b and c) are called the means.

Properties of Proportions

- All proportions have this property, known as the means-extremes property:

$$\frac{a}{b} = \frac{c}{d} \text{ is } \textit{equivalent} \text{ to } ad = bc$$

- Ex: In the proportion $6 : 9 = 2 : 3,$
  - The extremes are 6 and 3, and
  - The means are 9 and 2
  - Thus, by the means-extremes property, $6 \cdot 3 = 9 \cdot 2$

- It is often necessary, and helpful, to replace one proportion by an equivalent proportion.

Properties of Proportions

- The following properties are commonly used as equivalent replacements $\dfrac{a}{b} = \dfrac{c}{d}$

a) $ad = bc$

b) $\dfrac{a}{c} = \dfrac{b}{d}$

c) $\dfrac{b}{a} = \dfrac{d}{c}$

d) $\dfrac{a+b}{b} = \dfrac{c+d}{d}$

- <u>Additional property</u>: in the case of 3 or more ratios in a proportion,

If $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = \cdots$, then $\dfrac{a}{b} = \cdots = \dfrac{a+c+e+\cdots}{b+d+f+\cdots}$

Using the properties

- Use the properties, along with the proportion $x: y = 5: 2$ to complete each statement.

a) $5y = 2x$

b) $\dfrac{x+y}{y} = \dfrac{7}{2}$

c) $\dfrac{2}{5} = \dfrac{y}{x}$

d) $\dfrac{x}{5} = \dfrac{y}{2}$

Ratios in Real Life

- Use ratios to solve the problem: A poster is 1 m long and 52 cm wide. Find the ratio of width to length using

A.) Centimeters

<u>Solution</u>: First note that 1 m = 100 cm

Then $\dfrac{\text{Width}}{\text{Length}} = \dfrac{52}{100} = \dfrac{13}{25}$

B.) Meters

<u>Solution</u>: Note that 52 cm = 0.52 m (Why?)

Then $\dfrac{\text{Width}}{\text{Length}} = \dfrac{0.52}{1} = \dfrac{52}{100} = \dfrac{13}{25}$