


Ratio and Proportion

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Computing Ratios

- If a and b are two quantities that are measured in the *same* units, then the *ratio of a to b* is $\frac{a}{b}$.
- The ratio of a to b can also be written as $a : b$.



Computing Ratios


- The ratio of a to b is $\frac{a}{b}$ or $a : b$.
- Because a ratio is a quotient (or fraction), its denominator **CANNOT BE ZERO**.
- Ratios are usually expressed in simplified form. For instance, the ratio of $6 : 8$ is usually simplified as $3 : 4$.




Simplify the Ratios

$$\frac{12cm}{4m}$$

The first step is to make the units match.
How many centimeters are in a meter?
(Hint: how many cents in a dollar?)



Simplify the Ratios

$$\frac{12cm}{4m * 100cm}$$


Simplify the Ratios

$$\frac{3yd}{6ft}$$

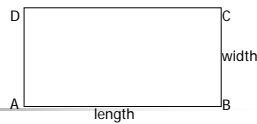
Simplify the Ratios

$$\frac{10\text{ ft}}{2\text{ in}}$$

Simplify the Ratios

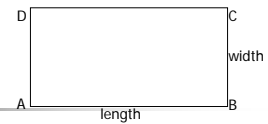
$$\frac{9\text{ in}}{2\text{ yd}}$$

Using Ratios



- The perimeter of rectangle $ABCD$ is 60 centimeters. The ratio of $AB : BC$ is 3 : 2. Find the length and width of the rectangle.

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Using Ratios



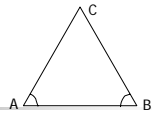
- The perimeter of rectangle $ABCD$ is 60 centimeters. The ratio of $AB : BC$ is 3 : 2. Find the length and width of the rectangle.
- Since the ratio of $AB : BC$ is 3:2, you can write AB as $3x$ and BC as $2x$.
- Then substitute the known information into the perimeter formula.

Using Ratios



- The perimeter of rectangle $ABCD$ is 60 centimeters, AB is $3x$ and BC is $2x$.
- $P = 2l + 2w$
- $60 = 2(3x) + 2(2x)$

Using Ratios



- The perimeter of the isosceles triangle shown is 56 in. The ratio of CB : BA is 5:4. Find the lengths of the sides and the base of the triangle.

Using Extended Ratios

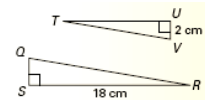
- An extended ratio compares more than two measures. For example, an extended ratio can compare the three angles of a triangle.

Using Extended Ratios

- The measures of the angles in $\triangle ABC$ are in the extended ratio of 3:4:8. Find the measures of the angles.

Using Ratios Between Two Figures

- The ratios of the side lengths of $\triangle QRS$ to $\triangle VTU$ are 3:2. Find the unknown lengths.



Proportions

- An equation that equates two ratios is a *proportion*,
- For instance, if the ratio $\frac{a}{b}$ is equal to the ratio $\frac{c}{d}$, then the following proportion can be written:

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

Proportions

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b and c are the means of the proportion – the numbers in the middle

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

a and d are the extremes of the proportion – the smallest and the largest numbers

Properties of Proportions

- **CROSS PRODUCT PROPERTY**
- The product of the extremes equals the product of the means.
- If $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

- We could have used this property to solve the triangles property.

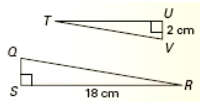
Properties of Proportions

- **RECIPROCAL PROPERTY**
- If two ratios are equal, then their reciprocals are also equal.
- If $\frac{a}{b} = \frac{c}{d}$, then $\frac{b}{a} = \frac{d}{c}$

Solving Proportions

The ratios of the side lengths of $\triangle QRS$ to $\triangle VTU$ are 3:2. Find the unknown lengths.

$$\frac{3}{2} = \frac{18}{x} \quad \text{and} \quad \frac{3}{2} = \frac{x}{2}$$



Solving Proportions

$$\frac{9}{14} = \frac{6}{x}$$

Solving Proportions

$$\frac{s-5}{4} = \frac{s}{10}$$

Solving Proportions

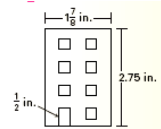
$$\frac{8}{b} = \frac{14}{5}$$

Solving Proportions

$$\frac{3-x}{6} = \frac{x}{2}$$

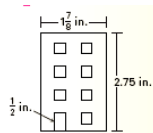
Solving Proportions

- A photo of a building has the measurements given in the sketch below. The actual building is 26 $\frac{1}{4}$ feet wide. How tall is it?



Solving Proportions

- A photo of a building has the measurements given in the sketch below. The actual building is 26 $\frac{1}{4}$ feet wide. How tall is it?
- How tall is the door?



Solving Proportions

- In a photograph taken from an airplane, a section of a city street is 3.5 inches long and $\frac{1}{8}$ of an inch wide.
- If the actual street is 30 feet wide, how long is it?