6.1 Part 1 Ratio and Proportion

ratio- a comparison of two quantities

$\frac{2}{3}$ 2:3 2 to 3

Example 1

change larger unit

Simplify each ratio.

a) $\frac{6 \text{ in}}{2 \text{ ft}}$ ← $\frac{6 \text{ in} \div 6}{24 \text{ in} \div 6}$ $\frac{1}{4}$

b) $\frac{50 \text{ cm}}{2 \text{ m}}$ ← $\frac{50 \text{ cm} \div 50}{200 \text{ cm} \div 50}$ $\frac{1}{4}$

Example 2

1 yd = 3 ft

Simplify each ratio.

a) $\frac{4 \text{ ft}}{3 \text{ yd}}$ ← $\frac{4 \text{ ft}}{9 \text{ ft}}$ $\frac{4}{9}$

b) $\frac{2 \text{ km}}{800 \text{ m}}$ ← $\frac{2000 \text{ m} \div 4}{800 \text{ m} \div 4}$ $\frac{5}{2}$

Example 3

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

$2x = 2 \cdot 6 = 12$ cm

$3x : 2x$

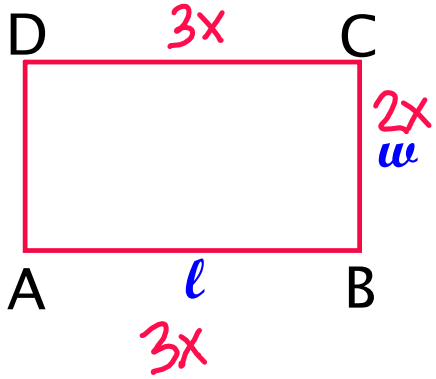
$3x = 3 \cdot 6 = 18$ cm

$3x + 2x + 3x + 2x = 60$

$\frac{10x}{10} = \frac{60}{10}$

$x = 6$

12cm x 18cm



Example 4

The perimeter of the isosceles triangle shown is 56 in. The ratio of LM:MN is 5:4. Find the lengths of all sides of the triangle.

$5x : 4x$

$5x + 5x + 4x = 56$

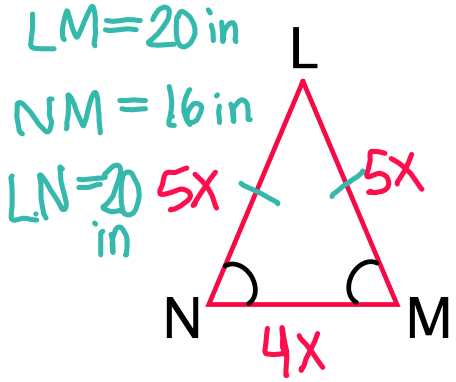
$\frac{14x}{14} = \frac{56}{14}$

$x = 4$

$LM = 20$ in

$NM = 16$ in

$LN = 20$ in



Example 5

The ratio of the measures of the angles of a triangle are 1:2:3. Find the measures of the angles.

$1x : 2x : 3x$

$1x + 2x + 3x = 180$

$\frac{6x}{6} = \frac{180}{6}$

$x = 30$

$1x = 30°$

$2x = 60°$

$3x = 90°$

Example 6

The ratio of the measures of the angles of a triangle are 3:4:8. Find the measures of the angles.

$3x : 4x : 8x$

$3x + 4x + 8x = 180$

$\frac{15x}{15} = \frac{180}{15}$

$x = 12$

$3x \rightarrow 36°$

$4x \rightarrow 48°$

$8x \rightarrow 96°$

An equation that equates two ratios is a proportion.

To solve proportions, you will cross multiply.

Example 7

Solve each proportion.

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

$9x = 84$ ÷3 ÷3

$\frac{9x}{9} = \frac{84}{9}$

$x = \frac{28}{3}$

b) $\frac{3}{y+2} = \frac{2}{y}$

$3y = 2(y+2)$

$3y = 2y + 4$

$-2y \quad -2y$

$y = 4$

Example 8

Solve each proportion.

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

$6x = 2(3-x)$

$6x = 6 - 2x$

$+2x \quad +2x$

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

$x = \frac{3}{4}$

b) $\frac{4w-1}{2w-3} = \frac{2}{3}$

$3(4w-1) = 2(2w-3)$

$12w - 3 = 4w - 6$

$-4w \quad -4w$

$8w - 3 = -6$

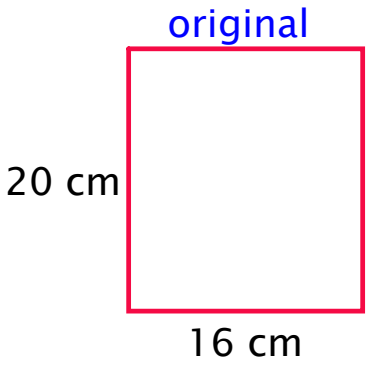
$+3 \quad +3$

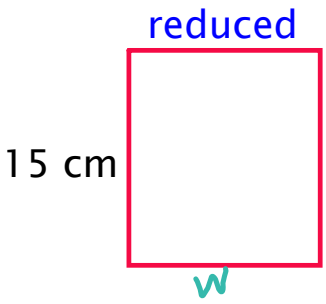
$\frac{8w}{8} = \frac{-3}{8}$

$w = -\frac{3}{8}$

Example 9

A diagram measuring 20 cm long is reduced on a copy machine to 15 cm long. If the width of the original copy is 16 cm, what is the width of the reduced copy?





$\frac{20}{16} = \frac{15}{w}$ $\frac{16}{20} = \frac{w}{15}$

$\frac{20}{15} = \frac{16}{w}$ $\frac{15}{20} = \frac{w}{16}$

$\frac{20w}{20} = \frac{240}{20}$

$w = 12$ cm!

Example 10

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?

$\frac{\ell}{w} \quad \frac{3.5}{\frac{1}{8}} = \frac{\ell}{30}$

$8 \cdot \frac{1}{8}\ell = 105 \cdot 8$

$\ell = 840$ ft

Example 11

Lee is reading a 374-page novel. It takes her 6 days to read the first 132 pages. At this rate, how many more days will it take her to finish the novel?

$$\frac{132 \text{ pages}}{6 \text{ days}} = \frac{242 \text{ pages}}{x \text{ days}}$$

$$\frac{132x}{132} = \frac{1452}{132}$$

$$\boxed{x = 11 \text{ days}}$$

Example 12

The ratio of an object's weight on Earth to its weight on the moon is 6:1. The first person to walk on the moon was Neil Armstrong. He weighted 165 pounds on Earth. What was his weight on the moon?

$$\begin{matrix} E \\ M \end{matrix} \quad \frac{6}{1} = \frac{165}{x}$$

$$\frac{6x}{6} = \frac{165}{6}$$

$$\boxed{x = 27.5 \text{ lb}}$$