Section 10.1 Objective: Ratios and Proportion

Ratio: A comparison of a number ***a*** and a nonzero number ***b*** using division.

Example: Ratios can be written in three forms: As a fraction $\frac{a}{b}$, or $a:b$, or a to b.

Simplify the following ratios:

60 cm:200 cm $\rightarrow$ $\frac{60cm}{200cm} = \frac{3}{10}$

$\frac{3\,ft}{18in}$ (units must be the same) so, $\frac{3\,ft}{18in} = \frac{36in}{18in} = \frac{2}{1}$

Using ratios:

Using the figure at the right,

Find AB and BC, if AB:BC is 4:1. or $\frac{4}{1}$

AB + BC = AC → 4x + x = 30

AC=30

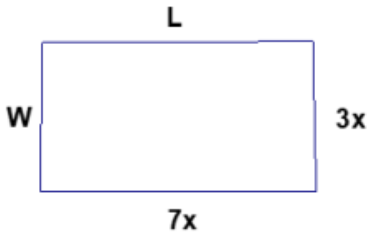
Example:

The perimeter of a rectangle is 80 ft. The ratio of the length to the width is 7:3. or $\frac{7}{3}$

Find the length and the width of the rectangle.

Perimeter of a rectangle = 2w + 2L so, 2(width)+2(length)

perimeter = 2w + 2L



P = 2(3x) + 2(7x)

80 = 6x + 14x

80 = 20x

4 = x

Dimensions of rectangle 7(4)= 28
3(4)= 12

check work: P= 2w + 2L

P = 2 (12)+ 2(28)

P = 24 +56

P = 80

Solving a proportion

Proportion: **an equation** that states that two ratios are equal.

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

Means of a proportion: numbers *b* and *c*. Extremes of a proportion: numbers *a* and *d*.

Cross product property: In a proportion the product of the extremes is equal to the product of the means.

Example: If $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

Solve each proportion.

a. $\frac{15}{9} = \frac{10}{x}$

$15x = 9(10)$

$15x = 90$

$\frac{15x}{15} = \frac{90}{15}$

$x = 6$

b. $\frac{7}{10} = \frac{a}{4}$

$7(4) = 10a$

$28 = 10a$

$\frac{28}{10} = \frac{10a}{10}$

$\frac{14}{5} = a$

or $2.8 = a$

c. $\frac{9}{6} \not= \frac{m}{3}$

$9(3) = 6m$

$\frac{27}{6} = \frac{6m}{6}$

$\frac{27}{6} = m$

or $\frac{9}{2} = m$

d. $\frac{8}{7} \not= \frac{k}{10}$

$8(10) = 7k$

$80 = 7k$

$\frac{80}{7} = \frac{7k}{7}$

$\frac{80}{7} = k$

e. $\frac{2}{x-1} \not= \frac{4}{8}$

$2(8) = 4(x-1)$ Distribute

$16 = 4x - 4$

$+4 \quad +4$

$\frac{20}{4} = \frac{4x}{4}$

$5 = x$

f. $\frac{k+5}{6} \not= \frac{2}{3}$

$3(k+5) = 2(6)$

$3k + 15 = 12$

$-15 \quad -15$

$3k = -3$

$\frac{3k}{3} = \frac{-3}{3}$

$k = -1$

g. $\frac{8}{2x+5} \not= \frac{5}{3}$

$8(3) = 5(2x+5)$

$24 = 10x + 25$

$-25 \quad -25$

$-1 = 10x$

$\frac{-1}{10} = \frac{10x}{10}$

$\frac{-1}{10} = x$

h. $\frac{2}{9} \not= \frac{4}{3x+2}$

$2(3x+2) = 4(9)$

$6x + 4 = 36$

$-4 \quad -4$

$6x = 32$

$\frac{6x}{6} = \frac{32}{6}$

$x = \frac{32}{6}$ or $\frac{16}{3}$

Solve each problem using a proportion. Show your work.

a. The money used in Western Samoa is called the Tala. The exchange rate is 17 Tala to $6. How many dollars would you receive if you exchanged 51 Tala?

$\frac{\text{Tala}}{\$}$ $17\text{ Tala} = \$6$

$\frac{17}{6} = \frac{51}{x}$ $\frac{\text{Tala}}{\$}$

$17x = 6(51)$

$17x = 306$

$\frac{17x}{17} = \frac{306}{17}$

$x = \$18$

b. A model satellite has a scale of 3 cm: 2 m. If the model satellite is 24 cm wide, then how wide is the real satellite?

$\frac{3\text{cm}}{2\text{m}} = \frac{24\text{cm}}{x}$

$3x = 24(2)$

$3x = 48$

$\frac{3x}{3} = \frac{48}{3}$

$x = 16\text{m}$

c. A baby giraffe standing near a flagpole casts a shadow that is 25.5 ft. long. If the 17.4-ft.-tall flagpole casts a shadow that is 76.6 ft. long, how tall is the baby giraffe?

$\frac{\text{giraffe}}{\text{giraffe shadow}} = \frac{\text{flagpole}}{\text{flagpole shadow}}$

$\frac{G}{25.5\text{ft}} = \frac{17.4\text{ft}}{76.6\text{ft}}$

$76.6G = 17.4(25.5)$

$76.6G = 443.7$

$\frac{76.6G}{76.6} = \frac{443.7}{76.6}$

$G = 443.7 \div 76.6$

height of giraffe = 5.79 ft