

- Learning Target(s):**
- I am able to simplify ratios, including those involving conversions.
 - I am able to use ratios to solve problems.
 - I am able to solve proportions.
 - I am able to calculate the geometric mean of 2 numbers.

Notes: 6.1 Ratios, Proportions, and the Geometric Mean

ratio: a comparison of 2 numbers using division

*can be written as a to b or as $a:b$ or as $\frac{a}{b}$, $b \neq 0$

*expressed in simplest form

- 1) same unit
- 2) divide out greatest common factor (GCF)

Ex. 1 Simplify the ratio.

a. $64 \text{ m} : 6 \text{ m}$

GCF: 2 $\frac{64}{2} = 32$ $\frac{6}{2} = 3$

$32:3$

b. $\frac{5 \text{ ft}}{20 \text{ ft}}$ GCF: 5

$\frac{5}{5} = 1$ $\frac{20}{5} = 4$

$\frac{1}{4}$

c. 24 yds to 3 yds GCF: 3

$8:1$

$3 \text{ ft} : 9 \text{ ft}$

$1:3$

d. 150 cm : 6 m convert!

GCF: 150 $6 \text{ m} \cdot \frac{100 \text{ cm}}{1 \text{ m}} = 600 \text{ cm}$

$150 \text{ cm} : 600 \text{ cm}$ $1:4$

e. 12 km : 3 km GCF: 3

$4:1$

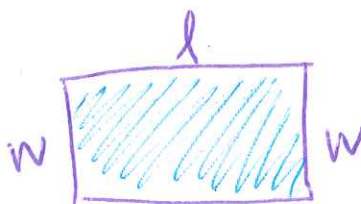
f. 36 in : 9 ft

$36 \text{ in} \cdot \frac{1 \text{ ft}}{12 \text{ in}} = 3 \text{ ft}$

equivalent ratios: when 2 ratios have the same simplified form

$10:20 = 5:10$
 $1:2 = 1:2$

Ex. 2 You are planning to paint a mural on a rectangular wall. You know that the perimeter of the wall is 484 feet and that the ratio of its length to its width is 9:2. Find the area of the wall.



$P = 2l + 2w$

$484 = 2l + 2w$

$484 = 2(9x) + 2(2x)$

$484 = 18x + 4x$

$484 = \frac{22x}{22}$ $x = 22$

$l:w$

$9:2$

$9x:2x$

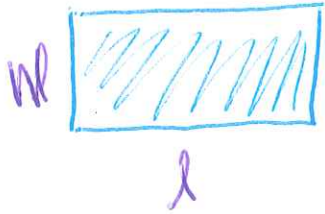
$l: 9 \cdot 22 = 198$

$w: 2 \cdot 22 = 44$

$A = l \cdot w$

$A = 198 \cdot 44 = 8712 \text{ ft}^2$

Ex. 3 The area of a rectangular garden is 108 sq. ft., and the ratio of the length to the width is 4:3. Find the length and the width of fence needed to enclose the garden.



$$A = 108 \text{ ft}^2$$

$$A = l \cdot w$$

$$l : w$$

$$108 = 4x \cdot 3x$$

$$4 : 3$$

$$\frac{108}{12} = \frac{12x^2}{12}$$

$$4x : 3x$$

$$l : 4(3) = 12 \text{ ft}$$

$$w : 3(3) = 9 \text{ ft}$$

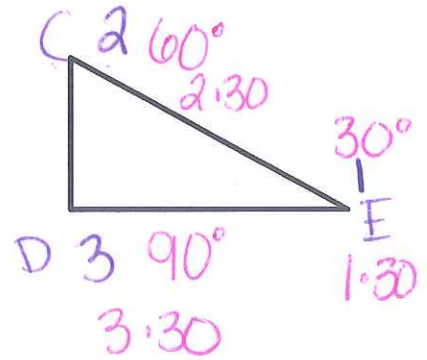
$$\sqrt{9} = \sqrt{x^2} \quad x = 3$$

Ex. 4 The measures of the angles in $\triangle CDE$ are in the extended ratio of 1:2:3. Find the measures of the angles.

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

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

$$x = 30$$



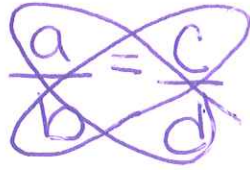
Try it!

1. A triangle's angle measures are in the extended ratio of 1:3:5. Find the measures of the angles.

2. The perimeter of a room is 48 ft and the ratio of its length to its width is 7:5. Find the length and width of the room.

proportion: an equation that states 2 ratios are equal

means:



extremes:

CROSS MULTIPLYING:

$$ad = bc, b \neq 0, d \neq 0$$

Ex. 5 Solve the proportion.

a. $\frac{5}{10} \times \frac{x}{16}$

$$\begin{aligned} 5 \cdot 16 &= 10x \\ 80 &= 10x \\ \frac{80}{10} &= \frac{10x}{10} \\ 8 &= x \end{aligned}$$

b. $\frac{1}{y+1} \times \frac{2}{3y}$

$$\begin{aligned} 1 \cdot 3y &= 2(y+1) \\ 3y &= 2y + 2 \\ -2y & \quad -2y \\ \hline y &= 2 \end{aligned}$$

c. $\frac{2}{x} = \frac{5}{8}$

$$x = 3.2$$

d. $\frac{1}{x-3} \times \frac{4}{3x}$

$$\begin{aligned} 3x &= 4(x-3) \\ 3x &= 4x - 12 \\ -3x & \quad -3x \quad +12 \\ \hline 12 & \quad \quad \quad 12 = x \\ x &= 12 \end{aligned}$$

e. $\frac{y-3}{7} = \frac{y}{14}$

$$y = 6$$

f. $\frac{8}{24} = \frac{x}{27}$

$$x = 9$$

g. $\frac{2}{x+3} \times \frac{5}{4x}$

$$\begin{aligned} 2(4x) &= 5(x+3) \\ 8x &= 5x + 15 \\ -5x & \quad -5x \\ \hline 3x &= 15 \\ x &= 5 \end{aligned}$$

Ex. 6 You score a 65 out of 72 on an exam, what is your score out of 100?

Ex. 7 As part of an environmental study, you need to estimate the number of trees in a 150 acre area. You count 270 trees in a 2 acre area and you notice that the trees seem to be evenly distributed. Estimate the total number of trees.

$$\frac{\text{trees}}{\text{acres}} = \frac{270}{2} \neq \frac{x}{150}$$

$$\frac{40500}{2} = \frac{2x}{2}$$

20,250 trees

geometric mean:

$$\frac{a}{x} = \frac{x}{b}$$

$$x = \sqrt{ab}$$

Ex. 8 Find the geometric mean of 16 and 18.

$$\sqrt{16 \cdot 18}$$

$$\frac{16}{17} = \frac{17}{18}$$

$$\sqrt{288}$$

$$x \approx 17$$

Ex. 9 Find the geometric mean of 24 and 48.

$$\sqrt{24 \cdot 48}$$

$$\sqrt{1152}$$

$$x \approx 33.9$$

$$\frac{24}{33.9} = \frac{33.9}{48}$$

Try it!

3. As part of a science project, you need to estimate the number of blue spruce trees in a 50 acre forest. You count 36 trees in 3 acres and you notice that the trees seem to be evenly distributed. Estimate the total number of blue spruce trees.

4. Find the geometric mean of 12 and 27.

5. Find the geometric mean of 18 and 54.