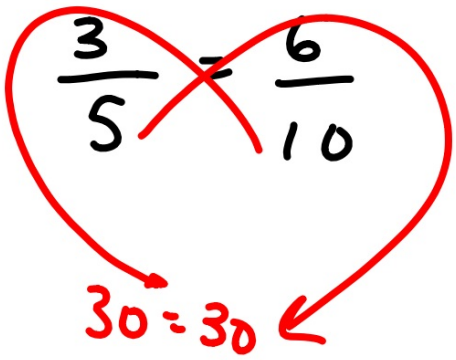
Geometry 7.1
Write ratios*
Write and solve proportions
ratio
extended ratio
* proportion
extremes/means
cross product =

*7th grade standard



$\frac{w}{h}$ $\frac{4}{3}$ 4:3 $\frac{16}{9}$ 16:9

Why?

- The aspect ratio of a television or computer screen is the screen's width divided by its height. A standard television screen has an aspect ratio of $\frac{4}{3}$ or 4:3, while a high definition television screen (HDTV) has an aspect ratio of 16:9.

Real-World Example 1 Write and Simplify Ratios

SPORTS A baseball player's batting average is the ratio of the number of base hits to the number of at-bats, not including walks. Minnesota Twins' Joe Mauer had the highest batting average in Major League Baseball in 2006. If he had 521 official at-bats and 181 hits, find his batting average.

$\frac{181}{521}$ H : B 0.347

181 : 521

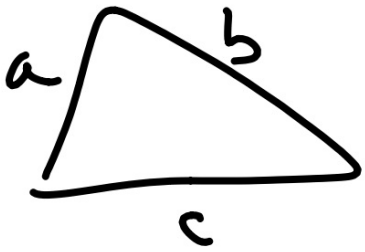
$\frac{181}{521}$ $\frac{5}{15} = \frac{1}{3}$ always simplify

5 : 15 → 1 : 3

$a:b:c$

Look at only two parts at a time...

Extended ratios can be used to compare three or more quantities. The expression $a:b:c$ means that the ratio of the first two quantities is $a:b$, the ratio of the last two quantities is $b:c$, and the ratio of the first and last quantities is $a:c$.



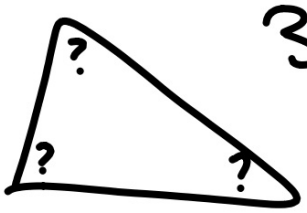
$$\frac{a}{b} : \frac{b}{c} : \frac{c}{a}$$

45, 60, 75

Angle sum?

Example 2 Use Extended Ratios

The ratio of the measures of the angles in a triangle is 3:4:5. Find the measures of the angles.



$3x + 4x + 5x = 180$

$\frac{12x}{12} = \frac{180}{12}$ $x = 15$ (SF)

GuidedPractice

Sum of sides?

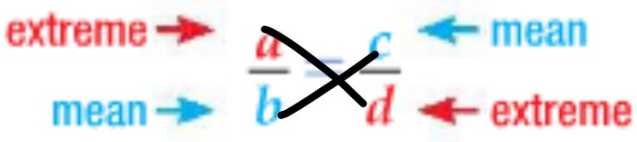
2. In a triangle, the ratio of the measures of the sides is 3:3:8 and the perimeter is 392 inches. Find the length of the longest side of the triangle.

$3x + 3x + 8x = 392$

$14x = 392$

$84, 84, 224 \quad x = 28$

a:b = c:d



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

means

a : b = c : d

extremes

$ad = bc$

extremes: means

KeyConcept Cross Products Property

Words	In a proportion, the product of the extremes equals the product of the means.
Symbols	If $\frac{a}{b} = \frac{c}{d}$ when $b \neq 0$ and $d \neq 0$, then $ad = bc$.
Example	If $\frac{4}{10} = \frac{6}{15}$, then $4 \cdot 15 = 10 \cdot 6$.

Reminder: the fraction bar is also a grouping symbol!

Example 3 Use Cross Products to Solve Proportions

Solve each proportion.

a. $\frac{6}{x} = \frac{21}{31.5}$

$\frac{21x}{21} = \frac{6(31.5)}{21}$

b. $\frac{x+3}{2} = \frac{4x}{5}$

$\frac{(x+3)}{2} = \frac{4x}{5}$

$5(x+3) = 2 \cdot 4x$

$5x + 15 = 8x$

$15 = 3x$

$x = 5$

GuidedPractice

3A. $\frac{x}{4} = \frac{11}{-6}$

3B. $\frac{-4}{7} = \frac{6}{2y + 5}$

3C. $\frac{7}{(z - 1)} = \frac{9}{(z + 4)}$

$z = \frac{37}{2} = 18.5$

$y = -\frac{31}{4} = -7.75$

$\frac{D}{C} = \frac{D}{C}$

Consistent order

Real-World Example 4 Use Proportions to Make Predictions

CAR OWNERSHIP Fernando conducted a survey of 50 students driving to school and found that 28 owned cars. If 755 students drive to his school, predict the total number of students who own cars.

$\frac{50}{28} = \frac{775}{c}$ $\frac{50}{28} = \frac{c}{775}$

$\frac{B}{T} = \frac{B}{T}$

GuidedPractice

4. BIOLOGY In an experiment, students netted butterflies, recorded the number with tags on their wings, and then released them. The students netted 48 butterflies and 3 of those had tagged wings. Predict the number of butterflies that would have tagged wings out of 100 netted.

$\frac{48}{3} = \frac{100}{T}$

Equivalent forms of a proportion all have identical cross products.

KeyConcept Equivalent Proportions

Symbols The following proportions are equivalent.

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

WB 7.1 prac.

Are the cross products still the same?