4.1 Ratios & Proportions   Name: **Key**
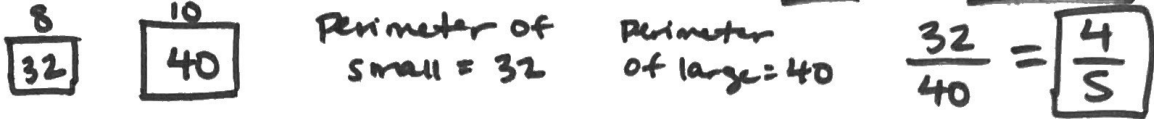
What is a ratio?
A ratio compares values. It says how much of one thing there is compared to another thing.
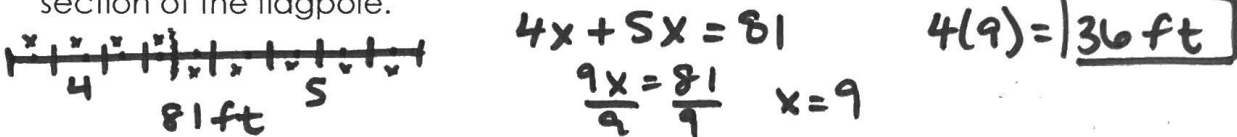
It can be represented multiple ways: $\dfrac{2}{3}$ or $2:3$ or $2\ to\ 3$
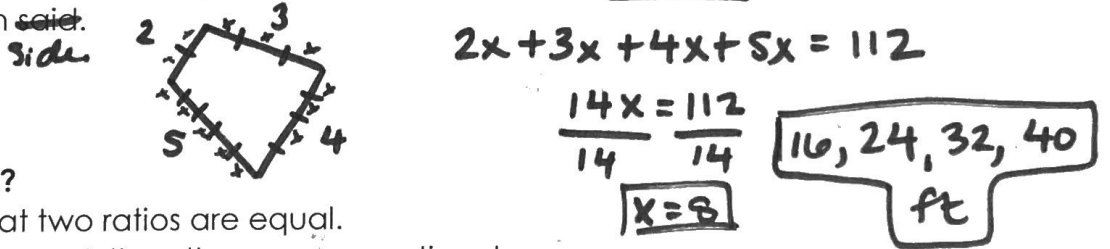＊

Examples:

1) Two squares had side lengths of 8 and 10. What is the <u>ratio</u> of their <u>perimeters</u>?

8 → $\boxed{32}$ 10 → $\boxed{40}$ Perimeter of small = 32   Perimeter of large = 40 $\dfrac{32}{40} = \boxed{\dfrac{4}{5}}$

2) A flagpole that is 81 feet tall breaks in a ratio of 4:5. What is the length of the shorter section of the flagpole.

81 ft   4   5

$4x + 5x = 81$
$\dfrac{9x}{9} = \dfrac{81}{9}$ $x = 9$

$4(9) = \boxed{36\ ft}$

3) The ratio of the measures of a quadrilateral is 2:3:4:5. If the <u>perimeter</u> is 112 feet, what is the length of each ~~said.~~ side.

2   3   5   4

$2x + 3x + 4x + 5x = 112$
$\dfrac{14x}{14} = \dfrac{112}{14}$
$\boxed{x = 8}$ $\boxed{16, 24, 32, 40}$ ft

What is a proportion?
A proportion says that two ratios are equal.
So...if two ratios are equal, then they are proportional.

$\dfrac{4}{12} = \dfrac{1}{3}$ ✓ $\dfrac{2}{4} = \dfrac{1}{2}$ ✓ $\dfrac{8}{12} = \dfrac{2}{3}$ ✓

✓ $.333 = .333$ $.5 = .5$ ✓ $.6666 = .6666$ ✓

Solve for x: **In order to solve for x, Cross multiply!**

3) $\dfrac{x}{18} \diagup\!\!\!\!\diagdown \dfrac{3}{7}$

$x(7) = 18(3)$
$\dfrac{7x}{7} = \dfrac{54}{7}$
$\boxed{x = 7.71}$ $\dfrac{7.71}{18} = \dfrac{3}{7}$
$.428 = .428$ ✓

4) $\dfrac{8}{x+7} \diagup\!\!\!\!\diagdown \dfrac{2}{x+1}$

$8(x+1) = 2(x+7)$
$8x + 8 = 2x + 14$
$-2x \quad\quad -2x$
$\dfrac{6x + 8 = 14}{-8 \quad -8}$ $\dfrac{6x = 6}{}$ $\boxed{x = 1}$

$\dfrac{8}{1+7} = \dfrac{2}{1+1}$
$\dfrac{8}{8} = \dfrac{2}{2}$
$1 = 1$ ✓

***If corresponding sides of polygons are <u>proportional</u> and their angles are <u>congruent</u>, then they are similar!

Similar Polygons

DEFINITION	DIAGRAM	STATEMENTS
Two polygons are **similar polygons** if and only if their <u>corresponding angles</u> are <u>congruent</u> and their <u>corresponding side lengths</u> are <u>proportional</u>.	(diagram of ABCD and EFGH) $ABCD \sim EFGH$	$\angle A \cong \angle E$ $\angle B \cong \angle F$ $\angle C \cong \angle G$ $\angle D \cong \angle H$ $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE} = \frac{1}{2}$

Symbol for Similarity: $\sim$

*** use Similarity statement to help set up proportions.**

5) If △CAT~△DOG, find DO.

* order matters when setting up proportions.

(triangle CAT with 14, 16; triangle DOG with x, 10)

$\frac{14}{x} \bowtie \frac{16}{10}$

$16(x) = 14(10)$

$16x = 140$ $\boxed{x = 8.75}$

$\frac{14}{8.75} = \frac{16}{10}$ ✓
$1.6 = 1.6$ ✓

$\underline{OR}$ $\frac{x}{14} = \frac{10}{16}$

$\underline{OR}$ $\frac{14}{16} \bowtie \frac{x}{10}$

7) Are the corresponding sides of the rectangles proportional?

(rectangle ABCD with 9, 6; rectangle EFGH with 6, 4)

$\frac{9}{6} = \frac{6}{4}$ $\underline{OR}$ $\frac{4}{6} = \frac{6}{9}$

$\frac{3}{2} = \frac{3}{2}$ ✓ $\frac{2}{3} = \frac{2}{3}$ ✓

8) What is the length of the model car to the nearest tenth?

5 m

1.8 m

Racing Car

x

6.3 cm   **Model**
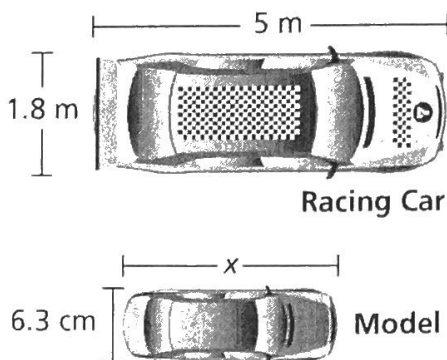
$\frac{5}{x} \bowtie \frac{1.8}{6.3}$ $\underline{OR}$ $\frac{1.8}{5} \bowtie \frac{6.3}{x}$

$5(6.3) = 1.8(x)$

$\frac{31.5}{1.8} = \frac{1.8x}{1.8}$

$\boxed{17.5 cm}$

$17.5 = x$