1.3 Rates & Rates

Standards:

N.Q.1

N.Q.2

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$\boxed{\text{old}}$ Rewriting Radicals

[Examples] Simplify Radicals.

① $\sqrt{50}$
$= \sqrt{25} \cdot \sqrt{2}$
$= 5\sqrt{2}$

② $\sqrt{45}$
$= \sqrt{9} \cdot \sqrt{5}$
$= 3\sqrt{5}$

③ $\sqrt{8}$
$= \sqrt{4} \cdot \sqrt{2}$
$= 2\sqrt{2}$

[Examples] Convert between Radicals & Exponent Forms.

① $10^{\frac{1}{2}} = \sqrt{(10)^1}$

② $\sqrt[5]{(7)^3} = 7^{\frac{3}{5}}$

③ $100^{\frac{3}{2}} = \sqrt{(100)^3}$
$= \sqrt{100000}$

$\boxed{\text{new}}$ Ratios

What is a ratio?

A <u>ratio</u> is a comparison between 2 quantities.

For Instance

Lets say someone looks at a group, count ideas, & refer to "the <u>ratio</u> of boys to girls".

basically means someone is comparing the number of girls to the number of boys.

Ratios allow us to compare the relative sizes of 2 quantities. The comparison can be represented by ratio symbols:

$a:b$ or $\frac{a}{b}$ or a to b.

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There are two ways to express RATIOS:

1. Part to part ratios
2. Part to whole ratios.

1. Part to Part Ratios

This involves comparing <u>one part of the whole</u> to the <u>other part of the whole</u>.

[Example 1] The tennis team won 10 games of its 16 matches. Find the ratio of wins to losses.

Solution:

1st part: wins = 10

2nd part: losses = 6

$= \dfrac{10 \text{ wins}}{6 \text{ losses}}$ or 10 wins to 6 losses or 10 wins : 6 losses.

please note: order matters... Be mindful in how the ratio is asked for. That will determine how you will express the ratio.

[Example 2] Mr. Lee's 2nd period class has 24 students. He has 11 boys in the class. What is the ratio of girls to boys?

Solution:

1st part: boys = 11

2nd part: girls = 13

$= \dfrac{13 \text{ girls}}{11 \text{ boys}}$ or 13 girls to 11 boys or 13 girls : 11 boys

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What is the best interpretation of the ratio in Example 1?

Let's recall:

$\frac{10 \text{ wins}}{6 \text{ losses}}$ This fraction can be simplified!

$\frac{10 \text{ wins}}{6 \text{ losses}} \div \frac{2}{2} = \frac{5 \text{ wins}}{3 \text{ losses}}$.

Conclusion: For every 5 wins, there are 3 losses.

$\boxed{\text{Unit Rate}}$ is the simplified version of a fraction. It tells us the smallest quantity of "units" when comparing quantities.

$\boxed{2}$ Part to Whole Ratios

This involves comparing one part of the whole to the entirety of the whole.

[Example 3] LSHS has 7 administrators & 50 teachers. What is the ratio of administrators to school staff?

Solution:

part → 7 adm

whole → 50 + 7 = 57 school staff

$= \frac{7 \text{ adm}}{57 \text{ school staff}}$

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Proportions A proportion is a statement that sets 2 given ratios equal.

For instance Let's say a pizza has 8 slices. What if we have 2 pizzas? How many slices do we have?

= 16 slices.

Let's set up a mathematical argument expressing the answer.

$$\frac{1 \text{ pizza}}{8 \text{ slices}} = \frac{2 \text{ pizzas}}{x \text{ slices}}$$

cross multiply to solve for x.

$$1x = (2)(8)$$
$$x = 16 \text{ slices.}$$

Let's say there are 88 slices. How many pizzas?

$$\frac{1 \text{ pizza}}{8 \text{ slices}} = \frac{x \text{ pizzas}}{88 \text{ slices}}$$

$$8x = (88)(1)$$
$$8x = 88$$
$$x = 11 \text{ pizzas}$$

Conclusion To solve proportions, you must:

1. set the 2 ratios equal to each other (with units aligned)
2. cross multiply
3. solve for the unknown quantities.

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[Example 4] Terin & DaJon like to eat raisins and peanuts. Their favorite mix is 6 raisins for every 2 peanuts. How many raisins will they need for peanuts?

Solution:

6 peanuts = 2 peanuts

$$\frac{6 \text{ raisins}}{2 \text{ peanuts}} = \frac{x \text{ raisins}}{8 \text{ peanuts}}$$

$$(6)(8) = 2x$$

$$48 = 2x$$

$$24 \text{ raisins} = x.$$

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