

SAT: Math - Problem solving and data analysis

* Ratios, rates, and proportions:

For part-to-part and part-to-whole:

Identify whether something is part of the whole item or is being compared to another ingredient. Important for identifying the ratio of a missing item.

Part-to-part:
(10) ~~apples~~ to oranges (5)

$$\downarrow$$

$$\frac{10}{5} = 2:1$$

$$\downarrow$$

$$\boxed{\frac{2}{1}}$$

Part-to-whole:
(10) apples to fruits (15)

$$\downarrow$$

$$\frac{10}{15} = 2:3$$

$$\downarrow$$

$$\boxed{\frac{2}{3}}$$

=> Important examples: Lemonade requires: water sugar lemon juice

• uses $\frac{1}{6}$ ~~sugar~~ and $\frac{1}{6}$ lemon juice. How much water?

Part-to-whole: 1:6 sugar | 1:6 lemon juice | 2:6 sugar + lemon juice

$$\frac{1}{6} + x = \frac{2}{6} \Rightarrow x = \frac{1}{6} \text{ water (Answer)}$$

* Proportions

Proportions ~~are~~ showcase an increase or decrease from one ratio to another of the same units. I got x/y , if I have $2x$, how much y ?

Set up a proportion:

- 1) Write the two ratios as fractions equal to one another
- 2) Keep the unidentified value as a variable
- 3) Ensure the following:

$$\frac{5x}{2y} = \frac{9x}{ay}$$

✓

$$\frac{75x}{9x} = \frac{ay}{2y}$$

✓

$$\frac{5x}{9x} = \frac{2y}{9y}$$

✗

$a = \text{constant}$
 $x/y = \text{unit}$

4) Rearrange to find $[a]$

⇓

7 pounds of plums give 8 rolls. How many rolls for 20 ~~pounds~~ ^{pounds}?

$$\frac{7}{8} = \frac{20}{x}$$

↓

$$x = \frac{20}{7/8}$$

↓

$$x = 22.8 \rightarrow 23$$

* Units and conversion:

This section is mostly self-explanatory, but there are some things that would be helpful to remember:

1) Cancel out the units:

1 pint = 16 ounces, so if you want to do the conversion quickly:

$$3 \times \frac{16}{1} = \frac{3 \times 16}{1} = 3 \times 16 = 48 \text{ ounces}$$

Keep the initial unit as the denominator to "cancel it out"

2) Same above principle for rates:

$$1 \text{ cm}^3 = 1 \text{ ml} \quad | \quad 1 \text{ ounce} = 29.57 \text{ ml} \rightarrow 1 \text{ cm}^3 \cdot \frac{1 \text{ ml}}{29.57 \text{ ml}} = \frac{1}{29.57} \checkmark$$

or

$$1 \text{ m} = 0.001 \text{ km} \quad | \quad 1 \text{ h} = 60 \text{ min} \rightarrow 4 \text{ min to km/h} \rightarrow \frac{4 \text{ min}}{1} \cdot \frac{1 \text{ h}}{60 \text{ min}} = \frac{4}{60} = 0.11 \checkmark$$

3) Don't forget squared and cubed values

$$1 \text{ m} = 3.28 \text{ feet} \Rightarrow 1 \text{ m}^2 = (3.28)^2 \text{ feet} = 35.29 \text{ feet}^2$$

2.1 blocks / feet², how about per m²?

$$\frac{2.1}{1} = \frac{x}{35.29} \rightarrow x = 74.1 \text{ blocks}$$

m² → feet²

* Percentages:

There are two ways to think about percentages:

Finding the percentage:

This is when you're given a value (the whole) and are asked to increase or decrease it via a percentage

⇓

Simply multiply the value by the percentage

⇓

The stock increased by 30% from \$6

$$6 \times 1.3 = \$7.8$$

⇓

Stock lost 50% yesterday from \$18.

$$18 \times 0.5 = \$9$$

Finding the whole:

When you are given a) A portion of the whole and have to find the whole or b) given the decreased value / change in percentage of the whole and need to find the whole

⇓

Have the value / percentage as a portion and ratio

⇓

The price is 30% off and is \$12.6. The sale ended, what is the new price?

$$\frac{70}{100} = \frac{12.6}{x} \rightarrow x = 18$$

⇓

A class voted 5 for apples, 7 for bananas, 10 for oranges, and 3 for grapes. What percentage chose apples?

$$\frac{5}{5+7+10+3} = \frac{x}{100} \rightarrow x = 25\%$$