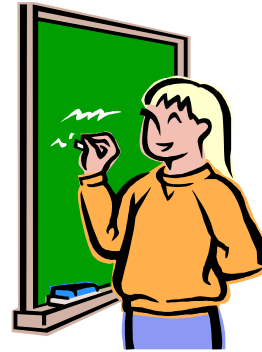


Unit Analysis

Unit Analysis is key to setting up an equation that yields the desired result.

Analyzing the units of measure ensures that the answer will be the appropriate one *before* you spend time calculating. This is especially important when creating Freeform equations that don't rely on Standard formulas, or when you can't remember a Standard formula.

In the following problems, you probably know that division is involved, but the dilemma is: "Which way do I divide?" Unit Analysis makes it much easier to decide.



**If 10 books cost \$5,
how much does one book cost?**

Unit Analysis Steps

- What am I solving for?
- Which unit goes in the Numerator?
- Which unit goes in the Denominator?

Cost per book
Cost
Books



per = divide →
$$\frac{\text{Cost}}{\text{Books}} = \frac{\$5}{10 \text{ books}} = \frac{\$0.50}{1 \text{ book}}$$

**If \$5 buys 10 books,
how many books does \$1 buy?**

Unit Analysis Steps

- What am I solving for?
- Which unit goes in the Numerator?
- Which unit goes in the Denominator?

Books per cost
Books
Cost



$$\frac{\text{Books}}{\text{Cost}} = \frac{10 \text{ books}}{\$5} = \frac{2 \text{ books}}{\$1}$$



In general, the item you are seeking goes on top (numerator) and the per-unit item goes on the bottom (denominator).

**In 5 hours, a car travels 100 miles.
How many miles will it go in 1 hour?**

Unit Analysis Steps

- What am I solving for? Miles per hour
- Which unit goes in the Numerator? Miles
- Which unit goes in the Denominator? Hours



$$\frac{\text{Miles}}{\text{Hours}} = \frac{100 \text{ miles}}{5 \text{ hours}} = \frac{20 \text{ miles}}{1 \text{ hour}}$$

**A car travels 100 miles in 5 hours.
How many hours does it take to go 1 mile?**

Unit Analysis Steps

- What am I solving for? Hours per mile
- Which unit goes in the Numerator? Hours
- Which unit goes in the Denominator? Miles



$$\frac{\text{Hours}}{\text{Miles}} = \frac{5 \text{ hours}}{100 \text{ miles}} = \frac{.05 \text{ hours}}{1 \text{ mile}}$$

**Unit Analysis also verifies Standard formulas,
like $D=RT$ (Distance = Rate • Time).**

**A car averages 20 miles per hour.
How far will it travel in 5 hours?**

Unit Analysis Steps

- What am I solving for? Miles (Distance)
- Which unit is used for Rate? Miles per hour
- Which unit is used for Time? Hours



$$D = R T$$

$$D = 20 \frac{\text{miles}}{\text{hour}} \cdot 5 \text{ hours} = 100 \text{ miles}$$

The hours dissolve,
leaving only miles.

Your Turn

Use Unit Analysis to set up and solve the following.

1. In 2 hours, Jon can assemble 4 toys. In 1 hour, how many toys can he assemble?
2. Sue can run 10 miles in 5 hours. On average, how long does it take her to run each mile?
3. Bob buys 12 donuts for \$6. How much is each donut?
4. If Jan drives 30 miles/hour for 3 hours, how far does she travel? (Use $D=RT$.)
5. If a class has 4 girls for every 8 boys, how many boys are there per girl?
6. If Jaz has 6 identical coins that total \$1.50, what is the value of each coin?

Answers: [1] $4 \text{ toys}/2 \text{ hours} = 2 \text{ toys}/1 \text{ hour}$ [2] $5 \text{ hours}/10 \text{ miles} = 0.5 \text{ hours}/1 \text{ mile}$ [3] $\$6/12 \text{ donuts} = \$0.50/1 \text{ donut}$
[4] $D = 30 \text{ miles/hour} \cdot 3 \text{ hours} = 90 \text{ miles}$ [5] $8 \text{ boys}/4 \text{ girls} = 2 \text{ boys}/1 \text{ girl}$ [6] $\$1.50/6 \text{ coins} = \$0.25/1 \text{ coin}$