


# MATH DOESN'T SUCK



## Solution Guide – Chapter 19 Unit Conversions

### Doing the Math from p. 234

2) We need to convert 6 miles, so the equality we use is:

1 mile  $\approx$  1.61 kilometers.

Since we're converting from *miles*, we want to build a unit multiplier with *miles* (or *m*) on the bottom:  $\frac{1.61 \text{ km}}{1 \text{ m}}$ .

Now let's write 6 miles as a fraction:  $\frac{6 \text{ m}}{1}$ , and multiply it times our unit multiplier, and

$$\text{cancel the miles: } \frac{6 \text{ m}}{1} \times \frac{1.61 \text{ km}}{1 \text{ m}} = \frac{6 \cancel{\text{ m}}}{1} \times \frac{1.61 \text{ km}}{1 \cancel{\text{ m}}} = \frac{6 \times 1.61 \text{ km}}{1}$$

$$= 6 \times 1.61 \text{ km} = 9.66 \text{ km}$$

**Answer:** 6 miles  $\approx$  9.66 kilometers

(We put the " $\approx$ " symbol in since the original "equality" between miles and kilometers had one ; it's to indicate that the two things are not *exactly* equal – just approximately equal.)

3) We need to go from 5 feet to meters, so we'll use the equality: 1 foot  $\approx$  0.305 meters.

Since we're converting from feet, we'll want feet on the bottom of our unit multiplier, so it cancels away:

$$\frac{0.305 \text{ meter}}{1 \text{ ft.}}$$

Now we'll write "5 feet" as a fraction:  $\frac{5 \text{ ft.}}{1}$ , multiply it by our unit multiplier, and

$$\text{cancel the "feet": } \frac{5 \text{ ft.}}{1} \times \frac{0.305 \text{ meter}}{1 \text{ ft.}} = \frac{5 \cancel{\text{ft.}}}{1} \times \frac{0.305 \text{ meter}}{1 \cancel{\text{ft.}}} = \frac{5 \times 0.305 \text{ meter}}{1}$$

= 1.525 meters.

**Answer:** 5 feet  $\approx$  **1.525 meters**

4) If 3 purses = 10 nail polishes, then that's the equality we'll use to build our unit multiplier. Since we're converting *from* purses, we'll want purses to be on the *bottom*:

$$\frac{10 \text{ nail polishes}}{3 \text{ purses}}$$

We're starting with 42 purses, so let's write it as a fraction:  $\frac{42 \text{ purses}}{1}$ . Now we can

multiply it by our unit multiplier, and cancel the "purses":

$$\frac{42 \text{ purses}}{1} \times \frac{10 \text{ nail polishes}}{3 \text{ purses}} = \frac{42 \cancel{\text{purses}}}{1} \times \frac{10 \text{ nail polishes}}{3 \cancel{\text{purses}}} = \frac{42 \times 10 \text{ nail polishes}}{3}$$

=  $\frac{420 \text{ nail polishes}}{3}$ . Now divide: (or you could reduce, too – it gives the same answer)

=140 nail polishes.

**Answer:** 42 purses = **140 nail polishes**.

5) Since we're moving from pints to gallons, we'll use two unit multipliers, based on the equalities: 2 pints = 1 quart and 4 quarts = 1 gallon.

Since we're converting from pints, we'll want a unit multiplier with pints on the bottom:

$\frac{0.5 \text{ quart}}{1 \text{ pint}}$ . And since we'll want our final answer to be in gallons, we'll want the other

unit multiplier to have gallons on top:  $\frac{0.25 \text{ gallon}}{1 \text{ quart}}$ .

Now let's write 36 pints as a fraction:  $\frac{36 \text{ pints}}{1}$ , and let's line up the unit multipliers so

we cancel the appropriate units:

$$\frac{36 \text{ pints}}{1} \times \frac{0.5 \text{ quart}}{1 \text{ pint}} \times \frac{0.25 \text{ gallon}}{1 \text{ quart}} = \frac{36 \cancel{\text{ pints}}}{1} \times \frac{0.5 \cancel{\text{ quart}}}{1 \cancel{\text{ pint}}} \times \frac{0.25 \text{ gallon}}{1 \cancel{\text{ quart}}}$$

Notice how units are diagonal from themselves, so we can cancel *everything* except the

“gallon” and we get:  $\frac{36 \times 0.5 \times 0.25 \text{ gallon}}{1} = 4.5 \text{ gallons}$ .

**Answer:** 36 pints = **4.5 gallons**