

A Trick That Always Works for Converting Units

The trick uses two principles of arithmetic. The first is that if we divide something by the itself the answer is one, The second if that if we multiply something by one the answer is unchanged.

For example, we know that one quart is the same as 32 ounces.

Therefore, if we divide the two like $\frac{32 \text{ oz}}{\text{quart}}$ or $\frac{\text{quart}}{32 \text{ oz}}$ they are equal to one. and if we multiply something by one of them it will be unchanged.

Now if we wanted to convert 6 quarts into ounces, we could multiply by $\frac{32 \text{ oz}}{\text{quart}}$ or $\frac{\text{quart}}{32 \text{ oz}}$, but which one to use?

Use the one that cancels the unit you want to change $6 \text{ quart} \times \left(\frac{32 \text{ oz}}{\text{quart}}\right)$

The answer is $6 \times 32 \text{ oz}$ or 192 oz

Now, a more complicated example. Suppose we we have a barrel with 15 psi water pressure in it and we want to find what the pressure is in tons per square yard. (The lid of a barrel is about a square yard.) We know that a yard is 36 inches and a ton is 2000 pounds.

$$15 \times \frac{\text{pounds}}{\text{inch} \times \text{inch}} \times \frac{\text{tons}}{2000 \text{ pounds}} \times \frac{36 \text{ inch}}{\text{yard}} \times \frac{36 \text{ inch}}{\text{yard}} = \frac{15 \times 36 \times 36}{2000} \times \frac{\text{tons}}{\text{yard} \times \text{yard}} = 9.72 \times \frac{\text{tons}}{\text{yard} \times \text{yard}}$$

The top speed of my tractor is 13 mph. How many furlongs per fortnight is that?

A furlong is 660 feet and a fortnight is 14 days.

$$13 \times \frac{\text{miles}}{\text{hour}} \times \frac{5280 \text{ feet}}{\text{mile}} \times \frac{\text{furlong}}{660 \text{ feet}} \times \frac{24 \text{ hour}}{\text{day}} \times \frac{14 \text{ day}}{\text{fortnight}} = \frac{5280 \times 24 \times 14}{660} \times \frac{\text{furlongs}}{\text{fortnight}} = 2688 \times \frac{\text{furlongs}}{\text{fortnight}}$$

Finally the question on the test.

T5B07 If a frequency readout is calibrated in megahertz shows a reading of 3.525 MHz, what would it show if it were calibrated in kilohertz?

$$3.525 \times \text{MHz} \times \frac{1000 \text{ kHz}}{\text{MHz}} = 3525 \text{ kHz}$$