

5. a) One yard is defined as equal to 36 inches. We also know that one inch equals 2.54 cm. Again we will use a ratio to solve the problem.

$$\frac{x}{36 \text{ inch}} = \frac{2.54 \text{ cm}}{1 \text{ inch}}$$

In order to get the x term alone on the left hand side of the equation we multiply both sides of the equation by 36 inch

$$x \frac{(36 \text{ inch})}{(36 \text{ inch})} = \frac{2.54 \text{ cm} (36 \text{ inch})}{1 \text{ inch}}$$

$$x = 91.44 \text{ cm}$$

Note that the inch units canceled out on the right hand side leaving the desired unit of centimeters.

b) $1 \text{ m} = 100 \text{ cm}$, so we can convert 91.44 cm to meters by multiplying the right hand side of the equation by unity expressed in the form $1 = 1 \text{ m} / (100 \text{ cm})$

$$x = 91.44 \text{ cm} \frac{(1 \text{ m})}{100 \text{ cm}}$$

$$x = 0.9144 \text{ m}$$

You may have been able to complete this conversion in your head by recognizing that one meter is 100 times larger than one centimeter, so the same length expressed in meters will have a number 100 times smaller. This means you move the decimal point two places to the left. Note that the cm units cancel.

c) There are one thousand millimeters to a meter, so if we take the answer in meters from part b) and multiply it by 1000 we get the length in millimeters to be $x = 914.4 \text{ mm}$.

An alternate solution would be to recognize that there are 10 millimeters in one centimeter, so that we can obtain the answer by multiplying the length expressed in centimeters in part a) by 10 to again get

$$x = 914.4 \text{ mm}.$$