EST 4

Measuring using Significant Figures

Multiplying and Dividing → Rule: The answer has to have the same # of sig figs as the measurement with the least # of sig figs

1. What is the volume of a box with the following dimensions:
   Height = 25 mm
   Length = 15.0 mm
   Width = 0.5 mm

   1 sig fig

   volume = L x W x h
   volume = 15.0 x 0.5 x 25
   volume = 187.5 mm^3 → 200 m^3

2. What is the area of a circle that has a radius of 14.25 cm?

   4 sig figs
   π = constant * not used for sig figs

   area = $\pi \cdot r^2$
   area = 3.14 x 14.25^2
   area = 637.616 → 637.6 cm^2

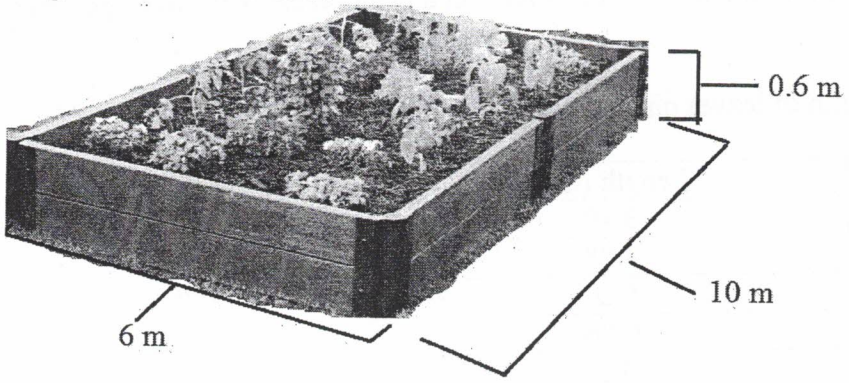
3. William measures the height and base of a triangle in class. If the height of the triangle is 7.5 cm and its base is 12.0 cm, what is its area?

   2 sig figs

   $$\text{area} = \frac{b \times h}{2}$$

   $$\text{area} = \frac{12.0 \times 7.5}{2} = 45 \rightarrow 45\ cm^2$$

4. A gardener needs to figure out how much soil he needs to fill his raised garden bed. He makes a picture of his raised bed and fills in the measurements he has taken in a diagram as shown below.



When he arrives at the store, he asks for 40 m^3 of soil to fill the bed. Had he taken more accurate measurements, he could have only bought 36 m^3 of soil and saved some money. Explain why.

volume = L x W x h
volume = 10 x 6 x 0.6
volume = 36 m^3 → but the measurements that were taken were inaccurate. They

36 m^3 needs to be rounded off to 40 m^3
* too much soil is bought

Adding and Subtracting

Rule: The answer has to have the same # of decimal places as the measurement with the least # of decimal places

1. The following items are placed in a beaker weighing 39.457 g: 2.689 g of NaCl, 1.26 g of sand and 5.0 g water. What is the final mass of the beaker?

1 decimal place

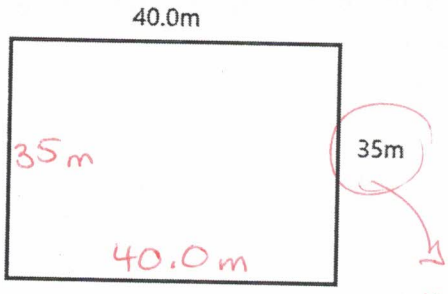
$$\begin{array}{r} 39.457 \\ + \ 2.689 \\ + \ 1.26 \\ + \ 5.0 \\ \hline \end{array} = 48.406\text{ g} \rightarrow \boxed{48.4\text{ g}}$$

2. If a beaker containing a sample of alcohol weighs 49.8767 g and the empty beaker weighs 49.214 g, what is the weight of the alcohol?

3 decimal places

$$\begin{array}{r} 49.8767 \\ - 49.214 \\ \hline 0.6627 \end{array} \rightarrow \boxed{0.663\text{ g}}$$

3. Karen has a new puppy and must install a fence around her yard. What is the measure of the perimeter of her yard?



perimeter = 40.0 + 40.0 + 35 + 35

perimeter = 150 m → 150 m

* no decimal places!

no decimal places

4. A botanist measures the length of 8 leaves on a plant. What is the average length of the leaves?

Table 1 – Length of leaves on Citrofortunella mitis.

Leaf #	Length (cm)
1	3.40
2	4.88
3	5.20
4	0.06
5	1.2
6	0.11
7	4.2
8	3.9

→ 1 decimal place

$22.95 \div 8 = 2.86875$

↓

keep only 1 decimal place

↓

2.9 cm