

Significant Figures

Practice Sheet #4

1. State the amount of sig figs (significant figures) in each of the following:

_____	a	0.356 m	_____	f	0.000087 in	_____	k	2300. kg
_____	b	48.369 mg	_____	g	0.000700 L	_____	l	90.04 dL
_____	c	3.001 cm	_____	h	357.090 dg	_____	m	0.700 m
_____	d	0.60060 cL	_____	i	0.800 mL	_____	n	5.4×10^2 m
_____	e	465.0 km	_____	j	2300 kg	_____	o	3.00×10^6 g

2. Calculate the answers to these equations and round the answer to the CORRECT number of sig figs.

a $2.6 \times 3.78 =$	e $3.08 \times 5.2 =$
b $6.54 \times 0.37 =$	f $0.036 - 0.02$
c $0.58 + 2.1 =$	g $5.0 \times 10.0 =$
d $40.8 / 5.05 =$	h $0.0040 / 0.0020$

3. Determine, to the correct number of sig figs, the volume of a box ($l \cdot w \cdot h$) that measures 200.0 m by 150.0 mm by 10.0 mm:

4. Express the value 5000 to

a 1 sig fig= _____	b 2 sig figs= _____
c 3 sig figs = _____	d 4 sig figs= _____

5. Determine from each of these measurements *what the graduations on the measurement tool* must have been:

- a. 0.359 L was measured in a graduated cylinder that is graduated to the _____ of a liter.
- b. 1.00 g was measured by a balance that is set to the _____ of a gram.

Estimated digit

Ex. 0.35

Graduations:
must be to the
1/10 of a meter

6. REAL WORLD PROBLEM

On February 25, 1991, during the Gulf War, an American Patriot Missile battery in Dhahran, Saudi Arabia, failed to intercept an incoming Iraqi Scud missile. The Scud struck an American Army barracks and killed 28 soldiers. A report of the General Accounting office, GAO/IMTEC-92-26, entitled *Patriot Missile Defense: Software Problem Led to System Failure at Dhahran, Saudi Arabia* reported on the cause of the failure.

It turns out that the cause was an inaccurate calculation of the time due to rounding errors. You will do the calculations yourself to see how a sig fig error can be the cause of a fatal mistake and disaster.

The facts (for your calculations)

- The Iraqi Scud missile was launched **1.522 x 10⁶ meters** away from the Dhahran base
 - The Iraqi soldiers knew that the missile travelled **1.68 $\frac{km}{s}$**
 - The American soldiers at the barracks calculated the missile arrival using a speed of **1.7 $\frac{km}{s}$**
- a. Calculate the time (in seconds) that it took the missile to get to the barracks in Dhahran using the two speeds. Make sure that your units cancel!

Missile arrival time according to the Iraqis:

$$1.522 \times 10^6 \text{ m} \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} =$$

Missile arrival time according to the Americans:

$$1.522 \times 10^6 \text{ m} \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} =$$

- b. Write a brief statement **EXPLAINING** why the Americans were not able to intercept the missile in time and decide if sig figs are important or not. You must use *evidence* from your calculations to support your *claims*.

Use the following words in your statement:

Missile speed rounding significant figures accuracy
