Significant Figures Practice Name: Solutions

1. How many significant figures are there in each of the following measurements?
   a. 5.62 m 3
   b. 0.056 m 2 Leading zeros are not significant
   c. 1500 cm 2 Trailing zeros are not significant if it isn't a decimal, you can't write the number without them
   d. 2.52×10^4 mL 3
   e. 1050 seconds 3
   f. 4.50 grams 3 Trailing zeros ARE significant in a decimal since the number can be written mathematically without them so the only reason to include them is to show percision
   g. 52.00 cm 4
   h. 0.00450 nm 3
   i. 5.600 m 4
   j. 0.005 m 1
   k. 100 cm 1
   l. 0.52×10^4 mL 2
   m. 1052 seconds 4
   n. 4.500 grams 4
   o. 502.00 cm 5

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2. Round each of the following to the indicated number of significant figures, note for some you may need to use scientific notation.

Measurement	Rounded to 1 sig fig	Rounded to 2 sig figs	Rounded to 3 sig figs
a. 57 290 cm	60 000cm since 7>5 we round the 5 up	57 000cm since 2<5 we do not roundup 7	57300cm since 9>5 we roundup the 2
b. 49 935 m	50 000m since 9>5 we round up the 4	49935 5.0×10^4m since 9>5 we round up but that makes it 50000 only 1 sig fig so we must use sci notation	49 900m
c. 0.2565 cm any trailing 0s would signal more sig figs	0.3 cm	0.26cm	0.257cm
d. 0.09725 m 7 causes 9 to roundup	0.1m	0.097m	0.0973m
e. 1.5524 kg	2kg	1.6kg	1.55kg
f. 19.95 m	20m	2.0×10^1m since it would round to 20 but that only has 1 sig fig	20.0m
g. 4505 grams	5000g	4500g	4510g

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3. Write the range of possible values for each of the following using the convention that a measurement is plus or minus the last significant figure. The first is done as an example:

a. 260 m

Uncertain in 10s

260m plus or minus 10m

250m—270m

b. 93 grams

Uncertain in 1s

$93g \pm 1g$

$92g - 94g$

c. 0.024 mL

Uncertain at 3rd decimal

$0.024mL \pm 0.001mL$

$0.023mL - 0.025mL$

d. 4300 mL

Uncertain at 100s

$4300mL \pm 100mL$

$4200mL - 4400mL$

e. 5625.3 grams

Uncertain at tenths

$5625.3g \pm 0.1g$

$5625.2g - 5625.4g$

f. 260.0 m

Uncertain at tenths

$260.0m \pm 0.1m$

$259.9m - 260.1m$

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4. Add or subtract with attention to sig figs.

a. $6.25 + 2$ = 8.25 ≈ 8 ← one sig fig

3 sig figs; least → 1 sig fig

b. $200 + 58$ = 258 ≈ 300 ← 1 sig fig

least → 1; 2

c. $65 + 27.3$ = 92.3 ≈ 92 ← 2 sig fig

least → 2; 3

d. $2.52 \times 10^7 - 7.21 \times 10^6$

3; 3

2.52 Exp 7 − 7.21 Exp 6 =

= 17990000

= 1.80×10^7 — 3 sig figs

We need to use scientific notation to show 3 sig figs.

5. Multiply or divide with attention to sig figs.

a. 56.3×0.03

3; 1 = 1.689 ≈ 2 — 1 sig fig

b. $(3.5 \times 10^8)(1.22 \times 10^{-3})$

2; 3 = 427000 ≈ 430000 = 4.3×10^5

2 sig figs

We do NOT need to use scientific notation to show 2 sig figs but we use it because it is a large number

c. $\frac{50}{9.23}$ — 1

3 = 5.41711... ≈ 5 — 1 sig fig

d. $0.0023 \div 2.02$

2; 3

= 0.0011386... ≈ 0.0011 = 1.1×10^{-3} — 2 sig figs

← Use scientific notation here because number is small

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6. Complete each calculation with attention to sig figs

a. $(4.31 + 4.56) \times (0.14)$

3 3 2

$= 1.2418 \approx 1.2$ ← 2 sig figs

b. $\frac{453-250}{100.0}$

3 4 2

$= 2.03 \approx 2.0$ ← 2 sig figs

c. $(32 + 4523) \times (76 - 25)$

2 4 2 2

$= 232\,305 \approx 230000$

2 sig figs → 2.3×10^5

Use scientific notation because it is large number

d. $\frac{5.62 \times 10^{19}}{500}$

3 1

$= 1.124 \times 10^{17} \approx 1 \times 10^{17}$ ← 1 sig fig

e. $\frac{0.00599}{5.6 \times 10^{21}}$

3 2

$= 1.06964... \times 10^{-24}$

$\approx 1.1 \times 10^{-24}$ ← 2 sig figs

f. $\frac{0.0921 \times 5666}{(622-414)}$

3 4 1 1

3 3

$= 2.5088...$

≈ 2.51 ← 3 sig figs

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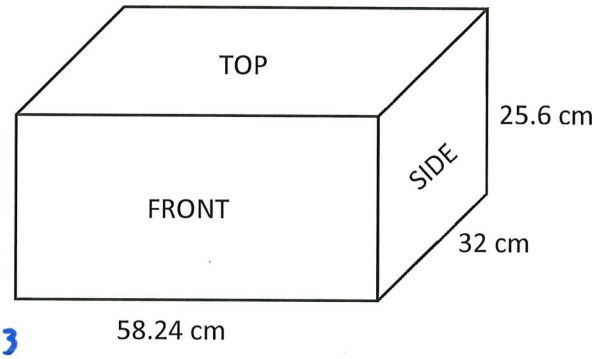
7. As student measures the dimensions of a box as shown



a. Determine the volume of the box.

$V = l \times w \times h$ (4)

$= 58.24\text{cm} \times 32\text{cm} \times 25.6\text{cm}$ (2, 3)

$= 47\,710.208\text{cm}^3 \approx 48000\text{cm}^3$

$4.8 \times 10^4\text{cm}^3$

b. Determine the perimeter of the side.

P = all sides added together (distance around it)

$= 32 + 25.6 + 32 + 25.6 = 115.2\text{cm} \approx 120\text{cm}$ (2, 3, 2, 3)

2 sig figs

c. Determine the area of the front of the box.

$A = l \times w$

$= 58.24\text{cm} \times 25.6\text{cm} = 1490.944\text{cm}^2$ (4, 3)

$\approx 1490\text{cm}^2 = 1.49 \times 10^3\text{cm}^2$

$\approx 1500\text{cm}^2$

$1.5 \times 10^3\text{cm}^2$

d. Determine the area of the top of the box.

$58.24\text{cm} \times 32\text{cm} = 1863.68\text{cm}^2$

$\approx 1900\text{cm}^2$

$1.9 \times 10^3\text{cm}^2$

e. How many times greater is the area of the top compared to the area of the side?

* Use all decimals from c and d but round to least sig figs = 2 at end

$$\frac{1863.68\text{cm}^2}{1490.944\text{cm}^2} = 1.25 \approx 1.3 \text{ times greater}$$

Rounded to 2 sig figs because 32cm measurement was part of calculation

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8. The formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$. Determine the volume of a sphere with radius of 4.56 cm.

$$V = \frac{4}{3} \times \pi \times (4.56)^3$$

$$= 397.1761...$$

round to 3 sig figs since only measurement had 3 and we do not count values in formulas units are cubed as it is a volume.

$397\ cm^3$

9. The formula for the surface area of a cube is $SA = 6s^2$. Where s is the side length. What is the surface area of a cube with side lengths of 0.0030 mm?

$$SA = 6 \times (0.0030)^2$$

$$= 0.000054\ mm^2$$

Since it is very small use ~~sig figs~~ scientific notation

$5.4 \times 10^{-5}\ mm^2$

10. There are 3 beakers which each contain, 35.6 mL, 37.3 mL and 35.2 mL of a solution respectively. What is the average volume of solution in each beaker?

$$\text{Average} = \frac{\text{Total}}{\text{number}}$$

$$= \frac{35.6mL + 37.3mL + 35.2mL}{3}$$

$$= 36.0mL$$

* round to 3 sig figs as counted values do not apply to sig figs