1.3 How Do Scientists Report Numbers – Significant Figures

1.3 Example_1

When 36.456 is added to 74.2 the result is –

*

A)		110.656
B)	✗	110.6
C)		110
D)	✓	110.7
E)		I have no clue!

36.456
74.2
110.6(56)

↳ 56 > 50

110.7

When adding and subtracting the result should be recorded with the same number of decimals as the number with the fewest number of decimal places.

Note :- The result may have to be rounded up... this is often forgotten and is the most common mistake and is the likely reason some of you picked B.

1.3 How Do Scientists Report Numbers – Significant Figures

1.3 Example_2

When 18.44 is multiplied by 36.1 the answer should be reported to ___ significant figures –

A) 1
B) 2
C) 3 ✓
D) 4
E) I have no clue!

When multiplying or dividing the result should be recorded with the same number of significant figures as the number with the fewest significant figures.

18.44 has 4 significant figures
whereas
36.1 has just 3 significant figures. ✓

1.3 How Do Scientists Report Numbers – Significant Figures

1.3 Example_3

MAIN QUESTION

Question

Carry out the following calculation and report the answer in the correct number of significant figures.

$$(168)\left[\frac{23.56 - 2.3}{1.248 \times 10^3}\right] =$$

(168) → 3 sig figs; $23.56 - 2.3$ → 3 sig figs; 1.248×10^3 → 4 sig figs

Significant figures

A) 1
B) 2
C) 3 ✓
D) 4
E) I have no clue!

In a complex series of manipulations

a) ANY addition or subtraction should be carried out first ... and the rules governing this applied to the answer.

b) Then and only then should the multiplication and or division be done.

$$\begin{array}{r} 23.56 \\ -\ \ 2.3 \\ \hline 21.2(6) \end{array}$$

3 sig figs.

Note the use of Scientific Notation.

1.248×10^3 has 4 sig. figs
100 has 1 sig. fig
1.00×10^2 has 3 sig. figs.

1.5 Factor-Label Method – Dimensional Analysis – The Mathematics of Chemistry

What is a Handy Way to Convert from One Unit to Another?

1.5 Example_1

Prior to the metric system, the common unit of weight was the pound (lb). Under the S.I. System, 1 lb = 453.5g. If an old recipe calls for 9 ounces of flour (16 oz = 1 lb), how many grams of flour is this equivalent to?

Real world ... Internet access !!

$$9 \text{ ounces} \left| \frac{\text{g}}{\text{ounces}} \right. = ? \text{ g}$$

Google the desired conversion factor

Exam situation ... have to use what is given :

16 ounces = 1 lb

1 lb = 453.5 g

$$9 \text{ ounces} \left| \frac{1 \text{ lb}}{16 \text{ ounces}} \right. = 0.56 \text{ lb}$$

$$0.56 \text{ lb} \left| \frac{453.5 \text{ g}}{1 \text{ lb}} \right. = 255 \text{ g}$$

1.5 Dimensional Analysis – The Mathematics of Chemistry

What is a Handy Way to Convert from One Unit to Another?

1.5 Example_2

A field is 100m long by 45m wide. What is the area in cm^2? (1m = 100cm)

To illustrate the power of dimensional analysis, first find the area in m^2 and then do the conversion to cm^2.

A)	4.5×10^5	B)	4.5×10^7 ✓
C)	45	D)	0.45
E)	Oops … I must have made a mistake		

$$\text{AREA} = 100\,m \times 45\,m = 4.5 \times 10^3\,m^2$$

$$4.5 \times 10^3\,m^2 = 4.5 \times 10^3\,m.m$$

$$4.5 \times 10^3\,mm \left|\frac{100\,cm}{1\,m}\right|\frac{100\,cm}{1\,m} = 4.5 \times 10^7\,cm.cm$$

$$= 4.5 \times 10^7\,cm^2$$