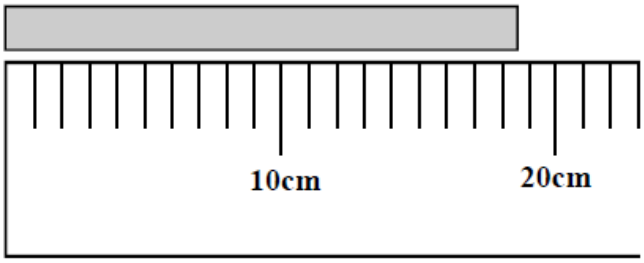
Significant Figures

Significant figures are all the known numbers in a measurement plus one estimated digit. Significant figures are important for accurate and precise measurements. The tool that you are using will determine how many significant figures the measurement you make will have.

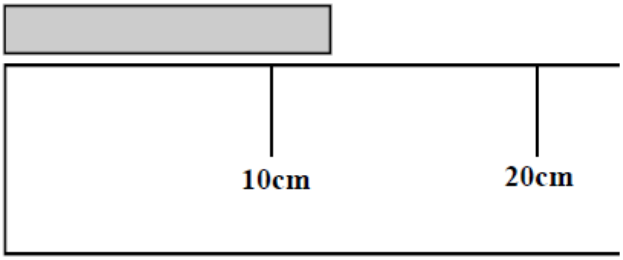
Measuring with Sig Figs

You can always estimate between the lines (gradations) of a measuring instrument. Therefore, the right most digit (sig fig) is considered an estimate and is not exact

This ruler has many markings on it, therefore it is more precise. The length looks to be between the 18 and 19cm. So we can estimate the last digit to be 18.5cm or 18.6cm. This will give the measurement 3 sig figs.



*This ruler is not as precise (due to having less markings). The length looks to be between the 10 and 20cm. So we can estimate the last digit to be 12cm or 13cm. This will give the measurement 2 sig figs. **The last number is the estimated digit*



Significant Figure Rules

There are 4 major rules you must follow to determine the significant digits that are in a measurement.

1. All nonzero numbers are considered significant. (ex. Every number 1-9)
2. Zeros that are between two nonzero numbers are significant. (ex. 305 = 3 sig figs)
3. Zeros at the end of a number and to the right of a decimal are significant. (ex. 23.0 = 3 sig figs, 67.20 = 4 sig figs)
4. Zeroes that are place holders are **not** significant. Left most zeros appearing in front of nonzero numbers. (ex. 0.0024 = 2 sig figs, 1400 = 2 sig figs)
5. All numbers in a scientific notation # are significant besides the x10 and the exponent(ex. 2.020×10^{12} = 4 sig figs)

Math and Sig Figs

In any mathematical problem using measurements, the least precise measurement rules.

Addition and Subtraction - Round to the least amount of places to the right of the decimal. If there is no decimal then round to the whole number.

Ex.1: 12.1 + 2.002 = 14.102 (calculator answer)
With sig figs = 14.1

Ex.2 3500 + 22.5 = 3522.5 (calculator answer)
With sig figs = 3523

Multiplication and Division – Round to the least number of sig figs.

Ex.1: 31 × 2 = 62 (calculator answer)
With sig figs = 60 (1 sig fig)

Ex.2 4.22 ÷ 2.1 = 2.009 (calculator answer)
With sig figs = 2.0 (2 sig fig)

Easy way to count Sig Figs

Pacific/Present  Atlantic/Absent

Is the decimal Present? YES

Start from the pacific side of the number, go to the first non-zero number then count the rest of the numbers going towards the Atlantic side

Is the decimal Present? NO

Start from the Atlantic side of the number, go to the first non-zero number then count the rest of the numbers going towards the Pacific side

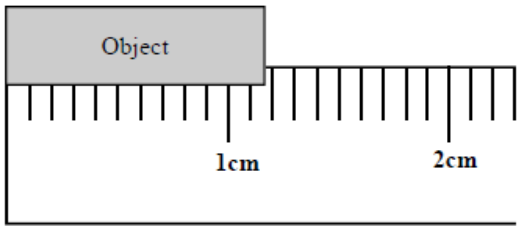
Name: _____

1. How Many Significant Figures do the following have?

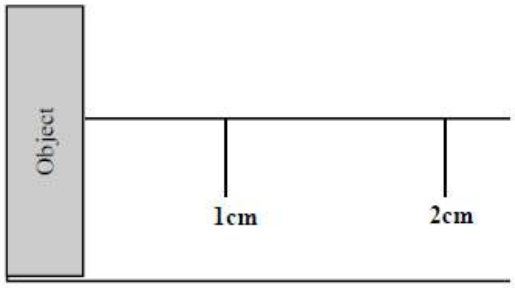
A. 3040	E. 6.0500	I. 1306.00
B. 4,500,000	F. 9,002.00	J. 5020
C. 12,001	G. 0.0045	K. 980
D. 15.06	H. 1.010×10^{5}	L. 9.11×10^{-31}

2. Measure the gray object to the correct number of Significant figures. Remember the estimated digit!!

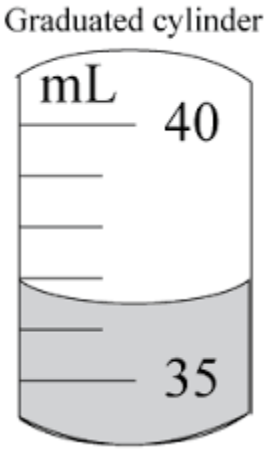
A. _____



B. _____



C. _____



3. Complete the following math problems and round them to the correct number of significant digits.

Problem	Calculator Answer	Answer with correct Sig Figs
A. 16.5 + 8 + 4.37	_____	_____
B. 13.25 + 10.00 + 9.6	_____	_____
C. 23.27 - 12.058	_____	_____
D. 13.57 - 6.	_____	_____
E. 2.6 x 3.78	_____	_____
F. 6.54 x 0.37	_____	_____
G. 35 / 0.62	_____	_____
H. 0.58 / 2.1	_____	_____