

Rounding Off Calculated Answers

- When the first digit dropped is **4 or less**, the retained numbers remain the same.

To round 45.832 to 3 significant figures
drop the digits 32 = 45.8

- When the first digit dropped is **5 or greater**, the last retained digit is increased by 1.

To round 2.4884 to 2 significant figures
drop the digits 884 = 2.5 (*increase by 0.1*)

Significant Figures

- Any digit that is not zero is significant

1.234 kg 4 significant figures

- Zeros between nonzero digits are significant

606 m 3 significant figures

- Zeros to the left of the first nonzero digit are **not** significant

0.08 L 1 significant figure

- If a number is greater than 1, then all zeros to the right of the decimal point are significant

2.0 mg 2 significant figures

- If a number is less than 1, then only the zeros that are at the end and in the middle of the number are significant

0.00420 g 3 significant figures

Addition and Subtraction

When **adding or subtracting**, use

- the same number of decimal places as the measurement with the fewest decimal places
- rounding rules to adjust the number of digits in the answer

25.2

one decimal place

+ 1.34

two decimal places

26.54

calculated answer

26.5

final answer (with one decimal place)

Multiplication and Division

When **multiplying or dividing** use

- the same number of significant figures (SF) as the measurement with the fewest significant figures
- rounding rules to obtain the correct number of significant figures

Example:

$$110.5 \times 0.048 = 5.304 = 5.3 \text{ (rounded)}$$

4SFs

2SFs

calculator

2SFs

Significant Figures

Exact Numbers

Numbers from definitions or numbers of objects are considered to have an infinite number of significant figures

The average of three measured lengths; 6.64, 6.68 and 6.70?

$$\frac{6.64 + 6.68 + 6.70}{3} = 6.67333 = 6.67 = \cancel{7}$$

Because 3 is an ***exact number***

Significant Figures

Rule	Measured Number	Number of Significant Figures
1. A number is a <i>significant figure</i> if it is		
a. not a zero	4.5 g	2
	122.35 m	5
b. a zero between nonzero digits	205 m	3
	5.082 kg	4
c. a zero at the end of a decimal number	50. L	2
	25.0 °C	3
	16.00 g	4
d. any digit in the coefficient of a number written in scientific notation	4.0×10^5 m	2
	5.70×10^{-3} g	3
2. A zero is <i>not significant</i> if it is		
a. at the beginning of a decimal number	0.0004 lb	1
	0.075 m	2
b. used as a placeholder in a large number without a decimal point	850 000 m	2
	1 250 000 g	3

Significant Figures

- When addition or subtraction is performed, answers are rounded to the least significant **decimal place**. *For whole numbers you can't have a number that is more accurate than the least accurate number.*
- When multiplication or division is performed, answers are rounded to the number of digits that corresponds to the *least* number of significant figures in any of the numbers used in the calculation.