

# SIGNIFICANT FIGURES

Name Key

A measurement can only be as accurate and precise as the instrument that produced it. A scientist must be able to express the accuracy of a number, not just its numerical value. We can determine the accuracy of a number by the number of significant figures it contains.

- 1) All digits 1-9 inclusive are significant.  
Example: 129 has 3 significant figures.
- 2) Zeros between significant digits are always significant.  
Example: 5,007 has 4 significant figures.
- 3) Trailing zeros in a number are significant only if the number contains a decimal point.  
Example: 100.0 has 4 significant figures.  
100 has 1 significant figure.
- 4) Zeros in the beginning of a number whose only function is to place the decimal point are not significant.  
Example: 0.0025 has 2 significant figures.
- 5) Zeros following a decimal significant figure are significant.  
Example: 0.000470 has 3 significant figures.  
0.47000 has 5 significant figures.

Determine the number of significant figures in the following numbers.

- |          |          |             |          |
|----------|----------|-------------|----------|
| 1. 0.02  | <u>1</u> | 6. 5,000.   | <u>4</u> |
| 2. 0.020 | <u>2</u> | 7. 6,051.00 | <u>6</u> |
| 3. 501   | <u>3</u> | 8. 0.0005   | <u>1</u> |
| 4. 501.0 | <u>4</u> | 9. 0.1020   | <u>4</u> |
| 5. 5,000 | <u>1</u> | 10. 10,001  | <u>5</u> |

Determine the location of the last significant place value by placing a bar over the digit.  
(Example: 1.700̄)

- |                        |                                            |                          |                                              |
|------------------------|--------------------------------------------|--------------------------|----------------------------------------------|
| 1. 8040                | <u>804̄0</u> (4)                           | 6. 90,100                | <u>90,1̄00</u> (3)                           |
| 2. 0.0300              | <u>0.030̄0</u> (3)                         | 7. $4.7 \times 10^8$     | <u><math>4.7̄ \times 10^8</math></u> (2)     |
| 3. 699.5               | <u>699.5̄</u> (4)                          | 8. 10,800,000.           | <u>10,800,000̄.</u> (8)                      |
| 4. $2.000 \times 10^2$ | <u><math>2.000̄ \times 10^2</math></u> (4) | 9. $3.01 \times 10^{21}$ | <u><math>3.01̄ \times 10^{21}</math></u> (3) |
| 5. 0.90100             | <u>0.90100̄</u> (5)                        | 10. 0.000410             | <u>0.000410̄</u> (3)                         |

# CALCULATIONS USING SIGNIFICANT FIGURES

Name Key

When multiplying and dividing, limit and round to the least number of significant figures in any of the factors.

**Example 1:**  $23.0 \text{ cm} \times 432 \text{ cm} \times 19 \text{ cm} = 188,784 \text{ cm}^3$   
The answer is expressed as  $190,000 \text{ cm}^3$  since  $19 \text{ cm}$  has only two significant figures.

When adding and subtracting, limit and round your answer to the least number of decimal places in any of the numbers that make up your answer.

**Example 2:**  $123.25 \text{ mL} + 46.0 \text{ mL} + 86.257 \text{ mL} = 255.507 \text{ mL}$   
The answer is expressed as  $255.5 \text{ mL}$  since  $46.0 \text{ mL}$  has only one decimal place.

Perform the following operations expressing the answer in the correct number of significant figures.

- $1.35 \text{ m} \times 2.467 \text{ m} = \underline{3.33 \text{ m}^2}$   
(3) (4)
- $1,035 \text{ m}^2 + 42 \text{ m} = \underline{25 \text{ m}}$   
(4) (2)
- $12.01 \text{ mL} + 35.2 \text{ mL} + 6 \text{ mL} = \underline{53 \text{ mL}}$
- $55.46 \text{ g} - 28.9 \text{ g} = \underline{26.6 \text{ g}}$
- $.021 \text{ cm} \times 3.2 \text{ cm} \times 100.1 \text{ cm} = \underline{6.7 \text{ cm}^3}$   
(2) (2) (4)
- $0.15 \text{ cm} + 1.15 \text{ cm} + 2.051 \text{ cm} = \underline{3.35 \text{ cm}}$
- $150 \text{ L}^3 + 4 \text{ L} = \underline{40 \text{ L}^2}$   
(2) (1)
- $505 \text{ kg} - 450.25 \text{ kg} = \underline{55 \text{ kg}}$
- $1.252 \text{ mm} \times 0.115 \text{ mm} \times 0.012 \text{ mm} = \underline{0.0017 \text{ mm}^3}$   
(4) (3) (2)
- $1.278 \times 10^3 \text{ m}^2 + 1.4267 \times 10^2 \text{ m} = \underline{8.958 \text{ m}}$   
(4) (5)