BOW VALLEY COLLEGE — LEARNING RESOURCE SERVICES

Significant Digits

Definition: The number of digits used in a number to specify its precision.

Rules for Significant Digits:

1. Non-zero digits are significant.

✓✓✓ ✓✓✓
543.123 *6 significant digits*

✓✓✓
127 3 *significant digits*

2. Leading zeros are <u>NOT</u> significant

× ××× ✓
0 .0004 *one significant digit*

3. Trailing zeros to the right of a decimal are significant.

× ××× ✓✓
0 .00050 2 *significant digits*

✓✓ ✓✓
50.00 *4 significant digits*

4. Zeros between non-zero numbers are significant.

✓✓✓ ✓✓✓
520.003 *6 significant digits*

5. Final zeros are significant.

✓✓✓✓
(a) 4900 *4 significant digits*

OR

(b) Scientific notation

✓✓
4.9×10^3 2 *significant digits*

✓✓✓✓
4.900×10^3 *4 significant digits*

Rule for Addition and Subtraction

Check the decimal place and **round** off to the least precise digit.

Addition

1)

627.1
635 ← least precise
85.27
2.189
1350.189
Answer: 1350.

4.327
70.01
8.35
95.4 ← least precise
178.087
Answer: 178.1

When using scientific notation change to the larger exponent. Add the digits and keep the changed exponent. Be sure the answer is in proper scientific notation and significant digits.

1.47×10^3	+	1.78×10^2	□←	change smaller exponent to same value as larger exponent
1.47×10^3	+	0.178×10^2	=	1.648×10^3
		Answer: 1.65×10^3		

7.21×10^5	+	3.23×10^3	□←□	smaller exponent
7.21×10^5	+	0.0323×10^5	=	7.2423×10^5
		Answer: 7.24×10^5		

Subtraction

2)

536.1 ← least precise
- 64.039
472.061
Answer: 472.1

114.3 ← least precise
- 6.16
108.14
Answer: 108.1

When using scientific notation, change to the larger exponent, subtract the digits and keep the changed exponent.

3.98×10^{4}
-1.32×10^{3} ← smaller exponent

3.98×10^{4}
-0.132×10^{4}
3.848×10^{4}
Answer: 3.85×10^{4}

8.46×10^{-6}
-7.50×10^{-7} ← smaller exponent

8.46×10^{-6}
-0.750×10^{-6}
7.71×10^{-6}
Answer: 7.71×10^{-6}

Rule for Multiplication and Division

Count the significant digits in each item of data. The answer should have the same number of significant figures as the least precise measurement.

Multiplication

	23.90	4 significant digits	
	x 5.10	3 significant digits	← least precise
	121.89		
Answer:	122	3 significant digits	

	0.15	2 significant digits	← least precise
	x 3.940	4 significant digits	
	0.591		
Answer:	0.59	2 significant digits	

Division

27.50	□÷□	1.5	= 18.33	Answer: 18	(2 significant digits)
□		□			
4 significant digits		2 significant digits (least precise)			

$$\frac{0.036850}{0.135} \quad \frac{(5\ sig\ fig)}{(3\ sig\ fig)} = 0.27296$$

Answer: 0.273
(3 sig fig)

Rounding

1. When the first digit to be dropped is 5 or greater, the last digit should be raised by one.

454.49	454.5 rounded to 4 sig fig
732.9	733 rounded to 3 sig fig

2. When the first digit to be dropped is 4 or less, the last digit should not be changed.

93.39	93 rounded to 2 sig fig
44.04	44.0 rounded to 3 sig fig

Do not round off numbers that are used for additional calculations. The final answer is rounded to the correct number of significant figures.

3. Be sure the value is still the same after rounding. For example: round 135 to 2 significant digits

Answer: 1.4×10^2 **NOT** 14.

Exercises

Do the following questions and round to the appropriate number of significant digits.

(1)
$$\begin{array}{r} 8.125 \\ 0.625 \\ 3.4 \\ 7.83 \\ \underline{0.37} \end{array}$$

(2)
$$\begin{array}{r} 3.66 \\ 57.33 \\ 7.356 \\ \underline{5.12} \end{array}$$

(3)
$$\begin{array}{r} 15.0 \\ 94 \\ 0.87 \\ \underline{0.18} \end{array}$$

(4)
$$\begin{array}{r} 42.25 \\ \underline{-32.378} \end{array}$$

(5)
$$\begin{array}{r} 5.222 \\ \underline{-0.032} \end{array}$$

(6)
$$\begin{array}{r} 9.083 \\ \underline{-3.1} \end{array}$$

(7) 89.5 x 0.5 (8) 87.92 x 58 (9) 2.01 x 26.0

(10) 0.1046 ÷ 5.32 (11) 0.004284 ÷ 0.042

(12) 1005 ÷ 3.25 (13) 45 ÷ 0.08

Answers:

(1) 20.4
(2) 73.47
(3) 110.
(4) 9.87
(5) 5.190
(6) 6.0
(7) 4×10^1

(8) 5.1×10^3
(9) 52.3
(10) 0.0197
(11) 0.10
(12) 309
(13) 6×10^2

Prepared by

June Jeffery, Educational Assistant

Marion Tichler, Data Entry & Design

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