

Exercise 2.3b

Significant Figures (Sig Figs)

Name: _____

Date: _____ Per: _____

In an attempt to get away from the mathematical burden of uncertainties, scientists have gone to the use of established rules for significant digits that have greatly simplified calculations. These rules are:

- 1) Significant digits are always measurements and thus should always be accompanied by the measurement's unit. (*For simplicity, units are not included in the following examples.*)
- 2) Digits other than zero are always significant – thus **123.45** contains five significant digits.
- 3) Zeros between non-zero digits are always significant – thus **1002.05** contains six significant digits.
- 4) Leading zeros (zeros to the left of the first non-zero) are never significant. These zeros are place holders to put digits in the right decimal places – thus **0.00123** has three significant digits (e.g., **0.00123 grams = 1.23 milligrams** ; since **1.23** has three significant digits, **0.00123** must also have three significant digits).
- 5) Trailing zeros (zeros following the last non-zero) are significant when the measurement contains a decimal point – thus **921000** contains three significant digits, **921000.** has six significant digits, and **0.012300** and **25.000** both contain five significant digits. These zeros indicate to what decimal place the measurement was made.

DIRECTIONS: Give the number of significant digits in each of the following measurements.

- | | | |
|-----------------------------|------------------------------|----------------------------|
| 1. 1278.50 -- _____ | 7. 8.002 -- _____ | 13. 43.050 -- _____ |
| 2. 120000 -- _____ | 8. 823.012 -- _____ | 14. 0.147 -- _____ |
| 3. 90027.00 -- _____ | 9. 0.005789 -- _____ | 15. 6271.91 -- _____ |
| 4. 0.0053567 -- _____ | 10. 2.60 -- _____ | 16. 6 -- _____ |
| 5. 670 -- _____ | 11. 542000. -- _____ | 17. 3.47 -- _____ |
| 6. 0.00730 -- _____ | 12. 2653008.0 -- _____ | 18. 387465 -- _____ |

DIRECTIONS: Round off the following numbers to three significant digits.

- | | | |
|--------------------------------|----------------------------------|-------------------------------|
| 19. 1225000 -- _____ | 21. 0.0008769 -- _____ | 23. 43.659 -- _____ |
| 20. 5.457 -- _____ | 22. 4.53619 -- _____ | 24. 876493 -- _____ |

Significant figures in derived quantities (Calculations)
In all calculations, the answer must be governed by the least significant figure employed.

ADDITION AND SUBTRACTION: The answer should be rounded off so as to contain the same number of decimal places as the number with the *least number of decimal places*. In other words, *an answer can be only as accurate as the number with the least accuracy*.

Thus: **11.31 + 33.264 + 4.1 = 48.674 Rounded off to 48.7**

MULTIPLICATION AND DIVISION: The answer should be rounded off to contain the same number of digits as found in the measurement with the **FEWEST** significant digits.

Thus: **5.282 x 3.42 = 18.06444 Rounded off to 18.1**

DIRECTIONS: Perform the following operations giving the proper number of significant figures in the answer.

- | | |
|----------------------------------|---|
| 25. 23.4 x 14 = _____ | 30. 0.2 ÷ 0.0005 = _____ |
| 26. 7.895 + 3.4 = _____ | 31. 3.5x10 ³ ÷ 2.75 = _____ |
| 27. 0.0945 x 1.47 = _____ | 32. 8.25x10 ¹² x 2.11x10 ⁻¹⁷ = _____ |
| 28. 0.005 - 0.0007 = _____ | 33. 67.89 x 23.6 / 42.8 = _____ |
| 29. 7.895 / 34 = _____ | 34. 0.0012 + 1.3 + 0.0184 = _____ |