Significant Figures

Significant figures indicate the accuracy of a given scientific measurement. This worksheet includes some rules and guidelines to help you correctly calculate the appropriate number of significant figures in a measurement.

Rules

1.) A proper measurement contains **one** uncertain digit, which is estimated to the best of one's ability, some number of digits which are known exactly, and some insignificant digits which do not affect the accuracy of the measurement. The number of digits known exactly plus the estimated digit constitutes the number of significant digits in a measurement.

2.) All **nonzero** digits are significant.

3.) Zeros are significant when **between** nonzero digits.

4.) Zeros are insignificant when they **precede** nonzero digits.

5.) Zeros following a number can only be determined as significant if accuracy is implied, usually through the use of a decimal. Trailing zeros without any indication of significance are insignificant.

Guidelines

1.) When multiplying or dividing measurements, the answer should contain the same number of significant figures as the least accurate measurement involved.

2.) When adding or subtracting measurements, the answer should have the same number of significant digits to the right of the decimal point as the measurement with the smallest number these digits.

Significant Figure Examples
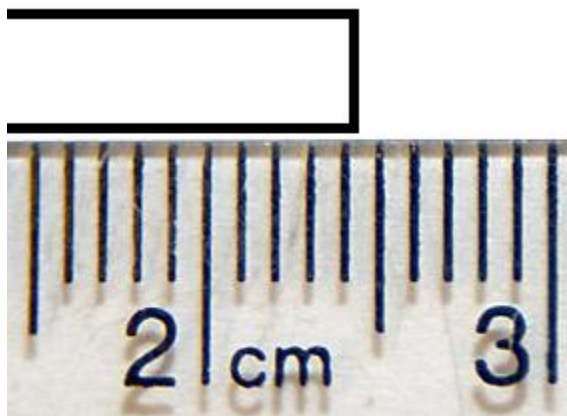
1.)

You measure a rectangle by aligning its left edge with the zero mark on your metric ruler and see the above. This ruler is accurate up to .1 cm increments so your measurement must include up to the tenths place and then needs an additional digit as a guess. I see this measurement as 2.44 cm, where the 4 in the hundredths place is my uncertain digit.

The following few examples provide a sample measurement. The explanations will explain how many significant figures the measurement contains by citing the rules contained on the first page of this handout.

2.) 186.3 mg

All nonzero digits are significant, so this quantity has 4 significant figures.

3.) 402.07 ml

Zeros between nonzero digits are significant, so this quantity has 5 significant figures.

4.) 0.00097 g

Zeros preceding nonzero digits are insignificant, so this quantity has 2 significant figures.

5.) <u>5</u>0 and <u>50.0</u>

For 50: trailing zeros without implied accuracy cannot be used, so there is 1 significant figure.

For 50.0: trailing zeros with implied accuracy are significant, so this value possesses 3 significant figures.

6.) 2.31 cm · 4.53 cm · 21.09 cm = <u>220.</u>692087 cm = 221. cm

Multiplication/division requires the use of the measure with the least number of significant figures so the answer is expressed with 3, note the decimal which indicates significance.

7.) 2.31 cm + 4.53 cm + 21.09 cm = <u>27.93</u> cm = 27.93 cm

Addition/subtraction requires the use of the measure with the least accurate digits place. This is the hundredths place so your answer includes up to the hundredths as well.

Significant Figures Practice Problems

Determine the number of significant figures in the value given or determine the answer to the arithmetic with appropriate significant figures.

1) 14.57 cm_____

2) 400 mm_____

3) 908070 kg_____

4) 18000.0 dL_____

5) 2.8962 g_____

6) 0.038 km_____

7) 0.00731 dL_____

8) 1.0000 L_____

9) 6070.09 m_____

10) 60.00 km_____

11) 207.6 L_____

12) 1380 cg_____

13) 95.2 mg_____

14) 1.02 mL_____

15) 0.00005 g_____

16) 19.20 g_____

17) 0.41 dm_____

18) 41.0897 cL_____

19) 40700 mg_____

20) 778.412 cm_____

21) 40.90 cg + 122.3 cg_____

22) 1872. g / 4.89 mL_____

23) 970. mL – 397.04 mL_____

24) 8.1 dm · 0.038 dm_____

25) 60.09 mg – 30.045 mg_____

26) 400.00 g + 260.8 g + 20.1 g_____

27) 326.45 dg – 36.5 dg – 24.171 dg_____

28) 93.2 mm · 45.10 mm · 1.374 mm_____

29) 90.000 L + 12.41 L + 76.5 L_____

30) 23.4 dL – 0.7 dL – 8. dL_____

31) 613.2 m / 0.54 m / 20.963 m_____

32) 50.3 mL – 6.1 mL – 0.09 mL_____

33) 90.509 kg / 14.6 kg / 190. kg / 0.00513 kg_____

34) 1457.2 km – 20.19 km – 641.35 km – 92.4 km_____

35) 0.049 g · 3.17 g · 19.2 g · 580. g_____

36) 800.0 cL + 80.00 cL + 8.000 cL + .8000 cL_____

37) 78931.53 dm / 4.3 dm / 6.17 dm / 8.97 dm_____

38) 4.1 cm · 40.1 cm · 400.1 cm · 0.410 cm_____

39) 73.2 dg + 703.2 dg + 0.0732 dg + 7.032 dg + 2.37 dg_____

40) 1.11 m x 1.09 m x 0.91 m x 1.90 m x 4. m_____

Significant Figures Answers

1.	4	21.	163.2 cg
2.	1	22.	383. g / mL
3.	5	23.	573. mL
4.	6	24.	.31 dm
5.	5	25.	30.05 mg
6.	2	26.	680.9 g
7.	3	27.	265.8 dg
8.	5	28.	5780 mm
9.	6	29.	178.9 L
10.	4	30.	15. dL
11.	4	31.	54. m
12.	3	32.	44.1 mL
13.	3	33.	6.36 kg
14.	3	34.	703.3 km
15.	1	35.	1700 g
16.	4	36.	888.8 cL
17.	2	37.	330 dm
18.	6	38.	27000 cm
19.	3	39.	785.9 dg
20.	6	40.	8 m