SIGNIFICANT DIGITS WORKSHEET ANSWERS

Significant Digits

Significant figures are the digits in any measurement that are known with certainty plus one digit that is uncertain.

Rule 1: In numbers that do not contain zeros, all the digits are significant.

3.1428	[5]
3.14	[3]
469	[3]

Rule 2: All zeros between significant digits are significant.

7.053	[4]
7053	[4]
302	[3]

Rule 3: Zeros to the left of the first nonzero digit serve only to fix the position of the decimal point and are not significant.

0.0056	[2]
0.0456	[3]
0.0000001	[1]

Rule 4: In a number with digits to the right of a decimal point, zeros to the right of the last nonzero digit are significant.

43	[2]
43.0	[3]
43.00	[4]
0.00200	[3]
0.40050	[5]

A. How many significant digits are in each of the following numbers?

1837	**4**	205.8	**4**
3.1415×10^4	**5**	1900	**2**
6005	**4**	1200.13	**6**
0.08206	**4**	6000	**1**
0.000014	**2**	632	**3**
149356	**6**	14.163000	**8**
8.7300	**5**	14.000	**5**
0.00743	**3**	302400.00	**8**
302400	**4**	0.0019872	**5**
8.732	**4**	20000	**1**
14.000	**5**	426.1	**4**
19.7324	**6**	60.0	**3**

Scientific Notation

B. Convert the following numbers into or out of scientific notation:

142.63	**1.4263×10^2**
1 500 000	**1.5×10^6**
0.00336	**3.36×10^{-3}**
1.63×10^7	**16 300 000**
3.11×10^{-4}	**0.000 311**
0.00125	**1.25×10^{-3}**
86 400	**8.64×10^4**
1.01×10^6	**1 010 000**
9.81×10^1	**98.1**
0.000000000000144	**1.44×10^{-13}**
4 663 310.56	**4.66331056×10^6**

Rounding

General Rules for Rounding:
Digit after place you are rounding to is ≥5, round up
Digit after place you are rounding is <5, don't change
Digit after place you are rounding is 5, make even

C. Round each of the following numbers to four significant digits.

6.16782	**6.168**
6.19648	**6.196**
0.0019872	**0.001987 OR 1.987×10^{-3}**
3.14146×10^4	**3.141×10^4**
213.25	**213.2 (rounds even)**
17.163000	**17.16**
90210	**90210 OR 9.021×10^4**
234.4	**234.4**
1200.43	**1.200×10^3**
0.0022475	**0.002248 OR 2.248×10^{-3}**
14.16300	**14.16**
0.02315	**0.02315**
13.462	**13.46**
135.67	**135.7**
152.00	**152.0**
395.55	**395.6**

Significant Digits in Operations

D. Add or subtract as indicated and state the answer with the correct number of significant digits.(USE LEAST NUMBER OF DECIMALS)

85.26 cm + 4.6 cm	**= 89.9cm**
1.07 m + 0.607 m	**= 1.68 m**
186.4 g – 57.83 g	**= 128.6 g**
60.08 s – 12.2 s	**= 47.9 s**
4 285.75 m – 520.1 m – 386.255 m	**= 3 379.4 m**
72.60 L + 0.0950 L	**= 72.70 L**

E. Multiply or divide as indicated and state the answer with the correct number of significant digits.(USE LEAST NUMBER OF SIGNIFICANT FIGURES) We will use this rule for addition and subtraction from now on in this course. ***Always use least number of significant digits for answer from here on.***

(5.5 m)(4.22 m)	**= 23 m^2**
(0.0167 km)(8.525 km)	**= 0.142 km^2**
2.6 kg ÷9.42 m^3	**= 0.28 kg/m^3**
0.632 m ÷ 3.8 s	**= 0.17 m/s**
(8.95)(9.162) / (4.25)(6.3)	**= 3.1**
0.0045 mm^2 ÷ 0.90 mm	**= 5.0×10^{-3} mm**

F. Evaluate the following with answers expressed to the proper number of significant digits in ***scientific notation****.*

$4.22 \times 10^5 + 3.11 \times 10^7 + 6.003 \times 10^6$	**= 3.75×10^7**
$(9.11 \times 10^{-28})(6.02 \times 10^{23})$	**= 5.48×10^{-4}**
$2.160 \times 10^3 + 6.20 \times 10^4 + 5.2 \times 10^1$	**= 6.4×10^4**
$8.4 \times 10^7 \div 2.1 \times 10^4$	**= 4.0×10^3**
$8.4 \times 10^{-7} \div 2.1 \times 10^4$	**= 4.0×10^{-11}**
$8.4 \times 10^7 \div 2.1 \times 10^{-4}$	**= 4.0×10^{11}**
$8.4 \times 10^{-7} \div 2.1 \times 10^{-4}$	**= 4.0×10^{-3}**
$(3.652 \times 10^8)(42.8 \times 10^{-6})$	**= 1.56×10^4**
$\frac{(30 \times 10^{-4})(40 \times 10^4)}{3.6 \times 10^7}$	**= 3×10^{-5}**

G. Given the following numbers (a – e), solve the following problems, expressing the answer to the proper number of significant digits.

a. 1.72 cm
b. 0.15 cm
c. 627.1 cm
d. 0.007 cm
e. 704.050 cm

a + b + c + d + e	**1 333.0 cm**
a + c + e	**1 332.9 cm**
c – a	**625.4 cm**
e – b	**703.90 cm**
(a + c) – (b + d)	**628.6 cm**
(a)(e)	**1 210 cm^2**
(c)(d)	**4 cm^2**
(a + b)(b + e)	**1 320 cm^2**
c ÷ b	**4 200 OR 4.2×10^3**
e ÷ d	**100 000 OR 1×10^5**
(b + c) ÷ (e – c)	**8.15**
$(b)^3$	**3.4×10^{-3} cm^3**