DATE: NAME: CLASS:

GENERAL
MATH-RELATED SCIENCE SKILLS

BLM G-25

Scientific Notation

Goal • Practise writing very small and very large numbers using scientific notation.

Background

Extremely large or small numbers are awkward to record in full. Scientists find it easier to report such numbers in a standard form referred to as scientific notation.

For scientific notation, one digit (other than 0) is placed before the decimal point. The other significant digits are placed after the decimal point.

What to Do

- Read page 587 in *SCIENCEPOWER™ 10*.
- Use the information from there to help you answer the questions below.

Questions

1. Using scientific notation, you can show the distance between Mercury and the Sun as 5.8×10^7 km rather than as 58 000 000 km. Explain what 10^7 means.

$10^7 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$

2. Describe the effect on the exponent of moving a decimal the following directions:

(a) to the left becomes smaller → a decimal number (less than 1)

(b) to the right becomes greater

3. Rewrite the following measurements in scientific notation:

(a) 0.000045 km 4.5×10^{-5}

(b) 456 000 000 g 4.56×10^8

(c) 90 200 s 9.02×10^4

(d) 0.0076 cm 7.6×10^{-3}

(e) 290 000 N 2.9×10^5

(f) 0.00457 W 4.57×10^{-3}

(g) 0.000042 km 4.2×10^{-5}

(h) 456 L 4.56×10^2

(i) 20 s 2.0×10^1

(j) 0.0623 W 6.23×10^{-2}

4. Rewrite the following in full.

(a) 9.6×10^4 m 96000

(b) 0.56×10^{-4} cm 0.000056

(c) 3.4×10^{-3} m 0.0034

(d) 1.6×10^2 m 160

(e) 4.56×10^{-1} cm 0.456

(f) 3×10^0 m $3 \times 1 = 3$

SCIENTIFIC NOTATION

Name _____

Scientists very often deal with very small and very large numbers, which can lead to a lot of confusion when counting zeros! We have learned to express these numbers as powers of 10.

Scientific notation takes the form of $M \times 10^n$ where $1 \leq M < 10$ and n represents the number of decimal places to be moved. Positive n indicates the standard form is larger than zero, whereas negative n would indicate a number smaller than zero.

Example 1: Convert 1,500,000 to scientific notation.
Move the decimal point so that there is only one digit to its left, a total of 6 places.

$1{,}500{,}000 = 1.5 \times 10^6$

Example 2: Convert 0.00025 to scientific notation.
For this, move the decimal point 4 places to the right.

$0.00025 = 2.5 \times 10^{-4}$

(Note that when a number starts out less than one, the exponent is always negative.)

Convert the following to scientific notation.

1. 0.005 = 5×10^{-3}
2. 5,050 = $5{,}05 \times 10^3$
3. 0.0008 = 8×10^{-4}
4. 1,000 = 1×10^3
5. 1,000,000 = 1×10^6
6. 0.25 = $2{,}5 \times 10^{1}$
7. 0.025 = $2{,}5 \times 10^{-2}$
8. 0.0025 = $2{,}5 \times 10^{-3}$
9. 500 = 5×10^2
10. 5,000 = 5×10^3

Convert the following to standard notation.

1. 1.5×10^3 = 1500
2. 1.5×10^{-3} = 0.0015
3. 3.75×10^{-2} = 0,0375
4. 3.75×10^2 = 375
5. 2.2×10^5 = 220000
6. 3.35×10^{-1} = 0.335
7. 1.2×10^{-4} = 0.00012
8. 1×10^4 = 10000
9. 1×10^{-1} = 0.1
10. 4×10^0 = 4

Answers

Scientific Notation/Significant Figures

1. Convert each of the following into scientific notation.

727 7.27×10^2

172000 1.72×10^5

0.000984 9.84×10^{-4}

200.0×10^2 2.0×10^4

0.014×10^2 $1.4 \rightarrow 1.4 \times 10^0$

25 600 000 000 000 000 000 000 000 000 2.560×10^{28} **(use 4 sig. fig.)**

2. Convert each into standard form.

1.56×10^4 15600

3.6×10^{-2} 0.036

736.9×10^5 73690000

0.0059×10^5 590

0.00059×10^{-1} 0.000059

3. Calculate the following. Give the answer in correct scientific notation.

a) $(2.34 \times 10^{65}) + (9.2 \times 10^{66})$

9.434×10^{66}

b) $(313.0) - (1.2 \times 10^3)$

-887 -8.87×10^2

4. Calculate the following. Give the answer in correct scientific notation.

a) $8.95 \times 10^{76} \div 1.25 \times 10^{56}$

7.16×10^{20}

b) $(4.5 \times 10^{29})(2.45 \times 10^{10})$

1.1025×10^{40}

5. Give the number of significant figures in each of the following.

a) 1.05 g 3

b) 0.0003040 mm 4

c) 29000 ft 2

d) 0.90×10^{45} L 2

6. Determine the answer for each of the following. *Be sure to use the correct number of significant figures.*

a)
$$\begin{array}{r} 17.34 \\ 4.900 \\ +\ 23.1 \\ \hline 45.34 \end{array} \rightarrow \boxed{45.3}$$

b)
$$\begin{array}{r} 9.80 \\ -\ 4.762 \\ \hline 5.038 \end{array} \rightarrow \boxed{5.04}$$

c) $3.9 \times 6.05 \times 420 =$

9909.9

$\boxed{9900}$

d) $14.1 \div 5 = 2.82 \rightarrow \boxed{2.}$

7. Round each of the following to 3 significant figures.

77.0653 77.0

6 300 178.2 6.30×10^6

0.00023350 0.000234

10.2030 10.2

2.895×10^{21} 2.90×10^{21}

Scientific Notation/Significant Digits Worksheet 1

1. Convert each of the following into scientific notation.

a) 3427 3.427×10^{3}

b) 0.00456 4.56×10^{-3}

c) 123,453 1.23453×10^{5}

d) 172 1.72×10^{2}

e) 0.000984 9.84×10^{-4}

f) 0.502 5.02×10^{-1}

g) 107.2 1.072×10^{2}

h) 0.0000455 4.55×10^{-5}

i) 2205.2 2.2052×10^{3}

j) 0.0473 4.73×10^{-2}

k) 650,502 6.50502×10^{5}

2. Determine the number of significant figures in each of the following:

a) 3427 **4**

b) 0.00456 **3**

c) 123,453 **6**

d) 172 **3**

e) 0.000984 **3**

f) 0.502 **3**

g) 3100.0 **5**

h) 0.0114 **3**

i) 107.2 **4**

j) 0.0000455 **3**

k) 2205.2 **5**

l) 30.0 **3**

m) 0.982 **3**

n) 0.0473 **3**

o) 650,502 **6**

3. Convert each into decimal form.

a) 1.56×10^{4} **15,600**

b) 5.6×10^{-2} **0.056**

c) 3.69×10^{-2} **0.0369**

d) 7.369×10^{5} **736,900**

e) 2.59×10^{5} **259000**

f) 1.369×10^{-2} **0.01369**

g) 6.9×10^{4} **69,000**

4. Calculate the following. Give the answer in correct scientific notation.

a) $\dfrac{3.95\times10^{2}}{1.5\times10^{6}}$ $=2.6\times10^{-4}$

b) $\dfrac{4.44\times10^{7}}{2.25\times10^{5}}$ $=1.97\times10^{2}$

c) $\dfrac{1.05\times10^{-26}}{4.2\times10^{56}}$ $=2.5\times10^{-83}$

d) $\dfrac{6.022\times10^{23}}{3.011\times10^{-56}}$ $=2.000\times10^{79}$

e) $(3.5\times10^{2})(6.45\times10^{10})$ $=2.2\times10^{13}$

f) $(4.50\times10^{-12})(3.67\times10^{-12})$ $=1.65\times10^{-23}$

g) $(2.5\times10^{9})(6.45\times10^{4})$ $=1.6\times10^{14}$

h) $(6.88\times10^{2})(3.45\times10^{-10})$ $=2.37\times10^{-7}$

5. Round each of the following to 3 significant figures.

a) 77.0653 77.1

b) $6,300,278.2$ 6.30×10^{6}

c) 0.00023350 0.000234

d) 10.2030 10.2

e) 2.895×10^{21} 2.90×10^{21}

6. Calculate the answer, use the correct number of significant figures.

a) $(0.32)(14.50)(120)=$ 556.8…….560

b) $(24.1)/(0.005)=$ 4820……. 4000

c) $(3.9)(6.05)(420)=$ 9909.9…… 9900

d) $(14.1)/5=$ 2.82----------2

200.0×10^{2} ……20000……. 2.0×10^{4}

2 more spaces…so add it to the $x10^{2+2}$ to get $x\ 10^{4}$