DAYTONA STATE COLLEGE

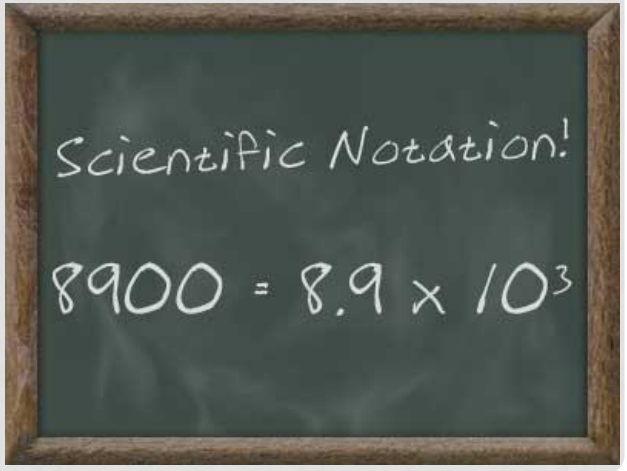
SCIENTIFIC NOTATION

HOW TO WRITE SCIENTIFIC NOTATION

SCIENTIFIC NOTATION

Scientific notation is used to write very large or very small numbers such as

- the width of a human hair, 0.000 008 m, which is also written as 8×10^{-6} m
- the number of hairs on a human scalp,100 000, which is also written as 1×10^{5} hairs

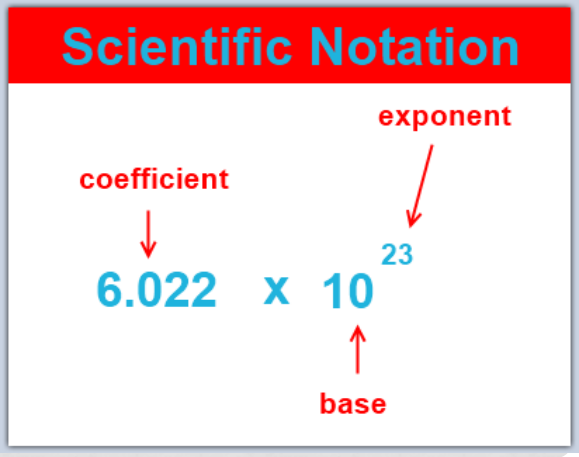


Writing Numbers in Scientific Notation

- A number written in scientific notation contains a coefficient and a power of ten.

coefficient		***power of ten***	***unit***
1.5	×	10^2	m

- The coefficient is at least 1 but less than 10.



Writing Numbers in Scientific Notation

- The number of spaces moved to obtain a coefficient between 1 and 10 is shown as a power of ten.

$52\,000. = 5.2 \times 10^{4}$

move decimal 4 spaces left

$0.003\,78 = 3.78 \times 10^{-3}$

move decimal 3 spaces right

Some Powers of Ten

TABLE 2.2 Some Powers of 10

Number	Multiples of 10	Scientific Notation	
1000	$10 \times 10 \times 10$	1×10^3	
100	10×10	1×10^2	Some positive powers of 10
10	10	1×10^1	
1	0	1×10^0	
0.1	$\frac{1}{10}$	1×10^{-1}	
0.01	$\frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$	1×10^{-2}	Some negative powers of 10
0.001	$\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} = \frac{1}{1000}$	1×10^{-3}	

Comparing Numbers in Standard and Scientific Notation

Standard Format	Scientific Notation
Diameter of the Earth	
12 800 000 m	1.28×10^{7} m
Mass of a human	
68 kg	6.8×10^{1} kg
Diameter of a virus	
0.000 000 3 cm	3×10^{-7} cm

To write a number in scientific notation:

1. Move the decimal to the right of the first non-zero number.

2. Count how many places the decimal had to be moved.

3. If the decimal had to be moved to the right, the exponent is negative.

4. If the decimal had to be moved to the left, the exponent is positive.

Learning Check

Write the following number in the correct scientific notation, 0.000 058 g.

Solution

Write the following number in the correct scientific notation, 0.000 058 g.

Step 1 Move the decimal point to obtain a coefficient that is at least 1 but less than 10.

0.000 058 $\longrightarrow$ 5.8

(The decimal moves 5 places to the right, giving a coefficient of 5.8)

Solution

Write the following number in the correct scientific notation, 0.000 058 g.

Step 2 Express the number of places moved as a power of 10.

Moving the decimal 5 places to the right gives a power of −5.

Solution

Write the following number in the correct scientific notation, 0.000 058 g.

Step 3 Write the product of the coefficient multiplied by the power of 10 with the unit.

$5.8 \times 10^{-5}\ \text{g}$

Learning Check

Select the correct scientific notation for each.

1. 0.000 008

   (a) 8×10^{6} (b) 8×10^{-6} (c) 0.8×10^{-5}

2. 72 000

   (a) 7.2×10^{4} (b) 72×10^{3} (c) 7.2×10^{-4}

Solution

Select the correct scientific notation for each.

1. 0.000 008

   (Move the decimal 6 places to right.)

   (b) 8×10^{-6}

2. 72 000

   (Move the decimal 4 places to the left.)

   (a) 7.2×10^{4}

Learning Check

Write each as a standard number.

1. 2.0×10^{-2}

   (a) 200 (b) 0.0020 (c) 0.020

2. 1.8×10^{5}

   (a) 180 000 (b) 0.000 018 (c) 18 000

Solution

Write each as a standard number.

1. 2.0×10^{-2}

   (c) 0.020

2. 1.8×10^{5}

   (a) 180 000

To write a number in scientific notation:

1. Move the decimal to the right of the first non-zero number.

2. Count how many places the decimal had to be moved.

3. If the decimal had to be moved to the right, the exponent is negative.

4. If the decimal had to be moved to the left, the exponent is positive.

Express the following in Scientific Notation

PROBLEMS	ANSWERS
1) .00012	
2) 1000	
3) 0.01	
4) 12	
5) .987	
6) 596	
7) .000 000 7	
8) 1,000,000	
9) .001257	
10) 987,653,000,000	
11) 8	

Express the following in Scientific Notation

PROBLEMS	ANSWERS
1) .00012	1) 1.2×10^{-4}
2) 1000	2) 1×10^{3}
3) 0.01	3) 1×10^{-2}
4) 12	4) 1.2×10^{1}
5) .987	5) 9.87×10^{-1}
6) 596	6) 5.96×10^{2}
7) .000 000 7	7) 7.0×10^{-7}
8) 1,000,000	8) 1.0×10^{6}
9) .001257	9) 1.26×10^{-3}
10) 987,653,000,000	10) 9.88×10^{11}
11) 8	11) 8×10^{0}

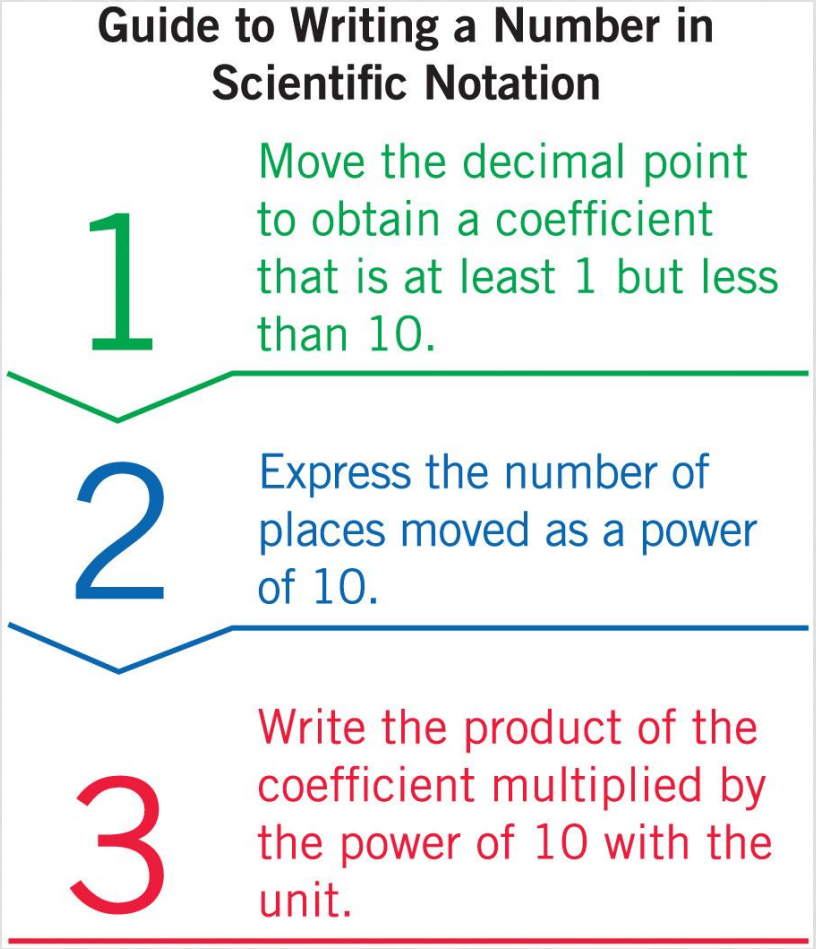
Express the following as whole numbers or decimals

PROBLEMS	ANSWERS
1) 4.9×10^{2}	
2) 3.75×10^{-2}	
3) 5.95×10^{-4}	
4) 9.46×10^{3}	
5) 3.87×10^{1}	
6) 7.10×10^{0}	
7) 8.2×10^{-5}	

Express the following as whole numbers or decimals

PROBLEMS	ANSWERS
1) 4.9×10^{2}	1) 490
2) 3.75×10^{-2}	2) .0375
3) 5.95×10^{-4}	3) .000595
4) 9.46×10^{3}	4) 9460
5) 3.87×10^{1}	5) 38.7
6) 7.10×10^{0}	6) 7.10
7) 8.2×10^{-5}	7) .000082

Guide to Writing a Number in Scientific Notation



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Questions

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