

# Scientific Notation

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 18

## Quick Review and Helpful Hints

Scientific notation writes a number as  $a \times 10^n$ , where  $1 \leq a < 10$ . A *positive* exponent means a large number (move the decimal point right when expanding); a *negative* exponent means a small number (move it left). The exponent equals the number of places the decimal point moves.

► **Example:** Write 4500 in scientific notation. **Work:** Move the decimal point so one nonzero digit stays in front: 4.5. The point moved 3 places left, so the exponent is +3.   
 ★ **Answer:**  $4.5 \times 10^3$



Each place is one power of 10.

### Practice Problems

Write in scientific notation, or expand to a standard number, as needed.

- |                       |       |                          |       |
|-----------------------|-------|--------------------------|-------|
| 1. 3000               | _____ | 8. $9 \times 10^3$       | _____ |
| 2. 52000              | _____ | 9. 86000                 | _____ |
| 3. 0.006              | _____ | 10. $2.5 \times 10^{-3}$ | _____ |
| 4. $4.1 \times 10^2$  | _____ | 11. 0.0801               | _____ |
| 5. $7 \times 10^{-2}$ | _____ | 12. $6.3 \times 10^5$    | _____ |
| 6. 120000             | _____ | 13. 700                  | _____ |
| 7. 0.00045            | _____ | 14. $1.5 \times 10^{-1}$ | _____ |

### Word Problems

15. A bacterium is 0.000002 meter long. Write this in scientific notation. \_\_\_\_\_
16. A distance is  $3.0 \times 10^5$  km. Write it as a standard number. \_\_\_\_\_
17. A city has 8,400,000 people. Write this in scientific notation. \_\_\_\_\_
18. A wavelength is  $5 \times 10^{-7}$  meter. Write it as a decimal. \_\_\_\_\_



## Answer Keys

- |                       |                           |                          |
|-----------------------|---------------------------|--------------------------|
| 1. $3 \times 10^3$    | 7. $4.5 \times 10^{-4}$   | 13. $7 \times 10^2$      |
| 2. $5.2 \times 10^4$  | 8. 9000                   | 14. 0.15                 |
| 3. $6 \times 10^{-3}$ | 9. $8.6 \times 10^4$      | 15. $2 \times 10^{-6}$ m |
| 4. 410                | 10. 0.0025                | 16. 300000 km            |
| 5. 0.07               | 11. $8.01 \times 10^{-2}$ | 17. $8.4 \times 10^6$    |
| 6. $1.2 \times 10^5$  | 12. 630000                | 18. 0.0000005 m          |

### Step-by-Step Explanations

**1.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the decimal so one nonzero digit is in front: 3. It moved 3 places left, so the exponent is +3:  $3 \times 10^3$ . So the final answer is  $3 \times 10^3$ .

**2.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Place the point after the 5: 5.2. It moved 4 places left:  $5.2 \times 10^4$ . So the final answer is  $5.2 \times 10^4$ .

**3.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point right to get 6. It moved 3 places and the number is small, so the exponent is -3:  $6 \times 10^{-3}$ . So the final answer is  $6 \times 10^{-3}$ .

**4.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A positive exponent means expand: move the point 2 places right, 4.1 → 410. So the final answer is 410.

**5.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A negative exponent means a small number: move the point 2 places left, 7 → 0.07. So the final answer is 0.07.

**6.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Put the point after the 1: 1.2. It moved 5 places left:  $1.2 \times 10^5$ . So the final answer is  $1.2 \times 10^5$ .

**7.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point right to get 4.5. It moved 4 places:  $4.5 \times 10^{-4}$ . So the final answer is  $4.5 \times 10^{-4}$ .

**8.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point 3 places right: 9 → 9000. So the final answer is 9000.

**9.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Point after the 8: 8.6, moved 4 places left:  $8.6 \times 10^4$ . So the final answer is  $8.6 \times 10^4$ .

**10.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point 3 places left:  $2.5 \rightarrow 0.0025$ . So the final answer is 0.0025.

**11.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point right to 8.01, which is 2 places:  $8.01 \times 10^{-2}$ . So the final answer is  $8.01 \times 10^{-2}$ .

**12.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point 5 places right:  $6.3 \rightarrow 630000$ . So the final answer is 630000.

**13.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Point after the 7: 7, moved 2 places left:  $7 \times 10^2$ . So the final answer is  $7 \times 10^2$ .

**14.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point 1 place left:  $1.5 \rightarrow 0.15$ . So the final answer is 0.15.

**15.** Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point right to 2, which is 6 places, and the number is small:  $0.000002 = 2 \times 10^{-6}$  m. So the final answer is  $2 \times 10^{-6}$  m.

**16.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Expand by moving the point 5 places right:  $3.0 \rightarrow 300000$  km. So the final answer is 300000 km.

**17.** Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Point after the 8: 8.4, moved 6 places left:  $8.4 \times 10^6$ . So the final answer is  $8.4 \times 10^6$ .

**18.** A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Move the point 7 places left:  $5 \rightarrow 0.0000005$  m. So the final answer is 0.0000005 m.



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