

Understanding Scientific Notation

Name: _____ Date: _____ Score: _____ / 24

Q Quick Review

Scientific notation writes a number as $a \times 10^n$, where a is at least 1 and less than 10, and n is an integer. It is a tidy way to handle very large or very small numbers. For a *large* number, the exponent n is **positive** and counts how many places the decimal moves left: $52,000 = 5.2 \times 10^4$. For a *small* number, n is **negative** and counts how many places the decimal moves right: $0.0007 = 7 \times 10^{-4}$. To go back to standard form, just slide the decimal the other way. Keeping a between 1 and 10 is the part students forget — check it every time.

◇ **Example:** Write 0.00041 in scientific notation.

⇒ We need the form $a \times 10^n$ with a between 1 and 10. Start at the decimal point in 0.00041 and slide it right until you get a number in that range: moving 4 places gives 4.1. Because the original number was *small*, the exponent is **negative**, and it equals the number of places we moved: -4 . So the answer is 4.1×10^{-4} . A quick check: a negative exponent always means a number less than 1, which matches.

Answer: 4.1×10^{-4}

PRACTICE

Convert between standard form and scientific notation.

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|---|---|
| 1. Write 7000 in scientific notation _____ | 11. Write 2.5×10^3 in standard form _____ |
| 2. Write 41000 in scientific notation _____ | 12. Write 6.04×10^5 in standard form _____ |
| 3. Write 360000 in scientific notation _____ | 13. Write 1.7×10^6 in standard form _____ |
| 4. Write 9200000 in scientific notation _____ | 14. Write 9×10^4 in standard form _____ |
| 5. Write 58000000 in scientific notation _____ | 15. Write 3.2×10^{-2} in standard form _____ |
| 6. Write 0.0006 in scientific notation _____ | 16. Write 7.5×10^{-4} in standard form _____ |
| 7. Write 0.00029 in scientific notation _____ | 17. Write 4×10^{-5} in standard form _____ |
| 8. Write 0.000051 in scientific notation _____ | 18. Write 6.1×10^{-1} in standard form _____ |
| 9. Write 0.0000072 in scientific notation _____ | 19. Is 47×10^3 in proper scientific notation? _____ |
| 10. Write 0.83 in scientific notation _____ | 20. Is 0.6×10^5 in proper scientific notation? _____ |

◆ Word Problems

21. Light travels about 300,000,000 meters per second. Write this speed in scientific notation. _____
22. A red blood cell has a diameter of about 0.000008 meters. Write this diameter in scientific notation. _____
23. A country's national park system covers about 5.2×10^7 acres. Write this area in standard form. _____
24. The mass of a grain of fine sand is about 1.5×10^{-5} grams. Write this mass in standard form. _____



Answer Keys

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|--------------------------|---------------------------------------|
| 1. 7×10^3 | 13. 1700000 |
| 2. 4.1×10^4 | 14. 90000 |
| 3. 3.6×10^5 | 15. 0.032 |
| 4. 9.2×10^6 | 16. 0.00075 |
| 5. 5.8×10^7 | 17. 0.00004 |
| 6. 6×10^{-4} | 18. 0.61 |
| 7. 2.9×10^{-4} | 19. no; 4.7×10^4 |
| 8. 5.1×10^{-5} | 20. no; 6×10^4 |
| 9. 7.2×10^{-6} | 21. 3×10^8 meters per second |
| 10. 8.3×10^{-1} | 22. 8×10^{-6} meters |
| 11. 2500 | 23. 52,000,000 acres |
| 12. 604000 | 24. 0.000015 grams |

Step-by-Step Explanations

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| <p>1. Move the decimal 3 places left to get 7; large number, so exponent is +3.</p> <p>2. Slide the decimal 4 places left to reach 4.1; the exponent is +4.</p> <p>3. Move the decimal 5 places left to get 3.6, so the power is 10^5.</p> <p>4. The decimal moves 6 places left to reach 9.2, giving 10^6.</p> <p>5. Slide the decimal 7 places left to 5.8; exponent is +7.</p> <p>6. Move the decimal 4 places right to get 6; small number, so exponent is -4.</p> <p>7. Slide the decimal 4 places right to reach 2.9; the exponent is -4.</p> <p>8. Move the decimal 5 places right to 5.1, so the power is 10^{-5}.</p> <p>9. The decimal moves 6 places right to 7.2, giving 10^{-6}.</p> <p>10. Move the decimal 1 place right to get 8.3; exponent is -1.</p> <p>11. A positive exponent moves the decimal 3 places right: 2500.</p> <p>12. Slide the decimal 5 places right: 604,000.</p> <p>13. Move the decimal 6 places right: 1,700,000.</p> <p>14. A power of 10^4 moves the decimal 4 places right: 90,000.</p> | <p>15. A negative exponent moves the decimal 2 places left: 0.032.</p> <p>16. Slide the decimal 4 places left: 0.00075.</p> <p>17. Move the decimal 5 places left: 0.00004.</p> <p>18. Move the decimal 1 place left: 0.61.</p> <p>19. The factor 47 is not between 1 and 10; rewrite as 4.7×10^4.</p> <p>20. The factor 0.6 is less than 1; rewrite as 6×10^4.</p> <p>21. Move the decimal 8 places left to get 3. Since the number is large, the exponent is positive: 3×10^8.</p> <p>22. Slide the decimal 6 places right to reach 8. The number is small, so the exponent is negative: 8×10^{-6}.</p> <p>23. A positive exponent of 7 moves the decimal 7 places right, giving 52,000,000 acres.</p> <p>24. A negative exponent of 5 moves the decimal 5 places left, giving 0.000015 grams.</p> |
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