

Scientific Notation for Huge and Tiny Numbers

Grade 8 math · Worksheet Answer Key · Standards: 8.EE.A.3, 8.EE.A.4

Solutions count how far the decimal point moves, compare exponents before coefficients, and normalize each coefficient at the end. Final answers appear in bold in scientific notation, with standard form added when the problem asks for it.

Standards: 8.EE.A.3, 8.EE.A.4 · **Level:** Grade 8

Problem 1 Large numbers

(a) The point moves 6 places left: 6.3×10^6 . (b) 2 places: 4.8×10^2 . (c) 10 places: 5.2×10^{10} .

(a) 6.3×10^6 (b) 4.8×10^2 (c) 5.2×10^{10}

Problem 2 Small numbers

(a) The point moves 4 places right: 4×10^{-4} . (b) 5 places: 7.15×10^{-5} . (c) 2 places: 6.2×10^{-2} .

(a) 4×10^{-4} (b) 7.15×10^{-5} (c) 6.2×10^{-2}

Problem 3 Back to standard form

(a) Move the point 5 places right: 390,000. (b) Move 3 places left: 0.00804. (c) 7 places right: 12,000,000.

(a) 390,000 (b) 0.00804 (c) 12,000,000

Problem 4 Is it scientific notation?

(a) 45 is not below 10: 4.5×10^4 . (b) 0.7 is below 1: 7×10^4 . (c) Correct. (d) 10 is not below 10: 1×10^3 .

(a) no, 4.5×10^4 (b) no, 7×10^4 (c) yes (d) no, 1×10^3

Problem 5 Calculator notation

(a) 3.2E5 means $3.2 \times 10^5 = 320,000$. (b) 7.5E-3 means $7.5 \times 10^{-3} = 0.0075$. (c) Replace $\times 10$ by E: 9.1E-6.

(a) 320,000 (b) 0.0075 (c) 9.1E-6

Problem 6 Follow the decimal point

The point travels 4 places right, so the exponent is -4 . The coefficient is 5.8.



Answer: 5.8×10^{-4} .

5.8×10^{-4}

Problem 7 Order small numbers

Compare exponents first. The -3 numbers are smaller: $4.2 < 5$, so $4.2 \times 10^{-3} < 5 \times 10^{-3}$. Then $1.1 \times 10^{-2} < 3.9 \times 10^{-2}$. In decimals: 0.0042, 0.005, 0.011, 0.039.

4.2×10^{-3} , 5×10^{-3} , 1.1×10^{-2} , 3.9×10^{-2}

Problem 8 Multiply

(a) $3 \cdot 2.5 = 7.5$ and $4 + 3 = 7$: 7.5×10^7 . (b) $4 \cdot 6 = 24$ and $-3 + 5 = 2$, so $24 \times 10^2 = 2.4 \times 10^3$.

(a) 7.5×10^7 (b) 2.4×10^3

Problem 9 Divide

(a) $8.4 \div 2.1 = 4$ and $9 - 4 = 5$: 4×10^5 . (b) $9 \div 3 = 3$ and $-2 - (-6) = 4$: 3×10^4 .

(a) 4×10^5 (b) 3×10^4

Problem 10 Add and subtract

(a) Rewrite 2.6×10^4 as 0.26×10^5 . Then $3.4 + 0.26 = 3.66$. (b) Rewrite 4×10^{-4} as 0.4×10^{-3} . Then $7.1 - 0.4 = 6.7$.

(a) 3.66×10^5 (b) 6.7×10^{-3}

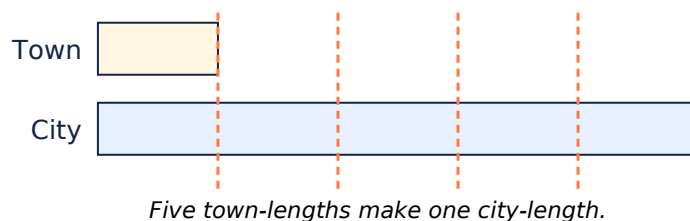
Problem 11 How many times as much

Divide: $(6 \times 10^7) \div (2 \times 10^4) = 3 \times 10^3$.

$3 \times 10^3 = 3,000$ times as many

Problem 12 Town and city

$(3 \times 10^5) \div (6 \times 10^4) = 0.5 \times 10^1 = 5$. Check: $300,000 \div 60,000 = 5$.



5 times as large

Problem 13 Which is larger?

The exponent 6 is greater than 5, and both coefficients are between 1 and 10, so 7.2×10^6 is larger. Standard form: 7,200,000 and 950,000.

7.2×10^6 is larger

Problem 14 Choosing a unit

$0.000007 = 7 \times 10^{-6}$ meter. Since 10^{-6} meter is 1 micrometer, the width is 7 micrometers.

$7 \times 10^{-6} \text{ m} = 7$ micrometers

Problem 15 Radio signal delay

Time = distance $\div$ speed = $(7.2 \times 10^7) \div (1.8 \times 10^5)$. Since $7.2 \div 1.8 = 4$ and $7 - 5 = 2$, time = $4 \times 10^2 = 400$ seconds. And $400 \text{ s} = 6 \text{ min } 40 \text{ s}$.

4×10^2 seconds = 6 minutes 40 seconds

Problem 16 Data center storage

$(2.4 \times 10^{12})(5 \times 10^3) = 12 \times 10^{15}$. Since 12 is not below 10, this is 1.2×10^{16} .

1.2×10^{16} bytes

Problem 17 Hair and paper

$(1 \times 10^{-4}) \div (8 \times 10^{-5}) = 0.125 \times 10^1 = 1.25$. Check: $0.0001 \div 0.00008 = 1.25$.

1.25 times as thick

Problem 18 Country and state

$3.3 \div 5.5 = 0.6$ and $8 - 6 = 2$, so $0.6 \times 10^2 = 6 \times 10^1$. Check: $330,000,000 \div 5,500,000 = 60$.

60 times as large

Problem 19 Concert revenue

$65 = 6.5 \times 10^1$. Multiply: $(4 \times 10^5)(6.5 \times 10^1) = 26 \times 10^6 = 2.6 \times 10^7$. In dollars: \$26,000,000.

2.6×10^7 dollars = \$26,000,000

Problem 20 Bacteria colony

Colony: $(1 \times 10^{-12})(2.5 \times 10^9) = 2.5 \times 10^{-3}$ gram. Rice $\div$ colony: $(2.5 \times 10^{-2}) \div (2.5 \times 10^{-3}) = 1 \times 10^1 = 10$.

2.5×10^{-3} gram; the rice grain is 10 times as heavy