Operations with Scientific Notation

Name: _____	Date: _____	Score: _____ / 24

Quick Review

To **multiply** numbers in scientific notation, multiply the front numbers and *add* the exponents: $(a \times 10^m)(b \times 10^n) = ab \times 10^{m+n}$. To **divide**, divide the front numbers and *subtract* the exponents. To **add or subtract**, the powers of 10 must **match** first — rewrite one number so both share the same exponent, then combine the front numbers. After any operation, check that your front number is still between 1 and 10; if it is not, slide the decimal and adjust the exponent to fix it.

◇ **Example:** Multiply $(3 \times 10^4)(2 \times 10^5)$.
⇒ Think of it as two separate jobs. First, multiply the front numbers: $3 \times 2 = 6$. Next, handle the powers of ten by **adding** the exponents: $10^4 \times 10^5 = 10^{4+5} = 10^9$. Put the pieces back together: 6×10^9. Last check — is 6 between 1 and 10? Yes, so we are done and the answer is already in proper form.

Answer: 6×10^9

PRACTICE

Compute each result. Write answers in proper scientific notation.

1. $(2 \times 10^3)(4 \times 10^2)$ _____
2. $(3 \times 10^5)(3 \times 10^4)$ _____
3. $(5 \times 10^6)(1 \times 10^2)$ _____
4. $(4 \times 10^{-3})(2 \times 10^5)$ _____
5. $(6 \times 10^2)(1.5 \times 10^3)$ _____
6. $(5 \times 10^4)(4 \times 10^3)$ _____
7. $(8 \times 10^6)(5 \times 10^2)$ _____
8. $\frac{8\times10^9}{2\times10^3}$ _____
9. $\frac{9\times10^7}{3\times10^2}$ _____
10. $\frac{6\times10^5}{2\times10^8}$ _____
11. $\frac{4.8\times10^6}{1.2\times10^2}$ _____
12. $\frac{1.5\times10^4}{5\times10^6}$ _____
13. $(2 \times 10^3) + (3 \times 10^3)$ _____
14. $(7 \times 10^5) - (4 \times 10^5)$ _____
15. $(6 \times 10^4) + (5 \times 10^4)$ _____
16. $(8 \times 10^6) + (2 \times 10^5)$ _____
17. $(5 \times 10^7) - (3 \times 10^6)$ _____
18. $(9 \times 10^3) - (8 \times 10^3)$ _____
19. $(1.2 \times 10^5)(3 \times 10^{-2})$ _____
20. $\frac{7.2\times10^{-1}}{2.4\times10^3}$ _____

Word Problems

21. A factory makes 3×10^4 bottle caps each day. How many caps does it make in 200 days? Write the answer in scientific notation. _____

22. A galaxy is about 9×10^{20} meters away. A spacecraft travels 3×10^4 meters per second. How many seconds would the trip take? Write the answer in scientific notation. _____

23. One city has a population of 5×10^5 people and a nearby city has 3×10^5 people. What is the total population? Write the answer in scientific notation. _____

24. A data center stored 7×10^8 files last year and 2×10^8 more were added this year. How many files are stored now? Write the answer in scientific notation. _____

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Answer Keys

1. 8×10^5
2. 9×10^9
3. 5×10^8
4. 8×10^2
5. 9×10^5
6. 2×10^8
7. 4×10^9
8. 4×10^6
9. 3×10^5
10. 3×10^{-3}
11. 4×10^4
12. 3×10^{-3}
13. 5×10^3
14. 3×10^5
15. 1.1×10^5
16. 8.2×10^6
17. 4.7×10^7
18. 1×10^3
19. 3.6×10^3
20. 3×10^{-4}
21. $(3 \times 10^4)(2 \times 10^2) = 6 \times 10^6$ caps
22. $\frac{9 \times 10^{20}}{3 \times 10^4} = 3 \times 10^{16}$ seconds
23. $(5 \times 10^5) + (3 \times 10^5) = 8 \times 10^5$ people
24. $(7 \times 10^8) + (2 \times 10^8) = 9 \times 10^8$ files

Step-by-Step Explanations

1. Multiply fronts $2 \cdot 4 = 8$, add exponents $3 + 2 = 5$.
2. $3 \cdot 3 = 9$ and $5 + 4 = 9$, so 9×10^9.
3. $5 \cdot 1 = 5$ and $6 + 2 = 8$.
4. $4 \cdot 2 = 8$ and $-3 + 5 = 2$.
5. $6 \cdot 1.5 = 9$ and $2 + 3 = 5$.
6. $5 \cdot 4 = 20 = 2 \times 10^1$, so $2 \times 10^{1+4+3} = 2 \times 10^8$.
7. $8 \cdot 5 = 40 = 4 \times 10^1$, then $4 \times 10^{1+6+2} = 4 \times 10^9$.
8. Divide fronts $8 \div 2 = 4$, subtract exponents $9 - 3 = 6$.
9. $9 \div 3 = 3$ and $7 - 2 = 5$.
10. $6 \div 2 = 3$ and $5 - 8 = -3$.
11. $4.8 \div 1.2 = 4$ and $6 - 2 = 4$.
12. $1.5 \div 5 = 0.3$ and $4 - 6 = -2$; fix $0.3 \times 10^{-2} = 3 \times 10^{-3}$.
13. The powers match, so just add the fronts: $2 + 3 = 5$.
14. Same power, subtract fronts: $7 - 4 = 3$, giving 3×10^5.
15. $6 + 5 = 11$, so $11 \times 10^4 = 1.1 \times 10^5$ after fixing.
16. Rewrite $2 \times 10^5 = 0.2 \times 10^6$, then $8 + 0.2 = 8.2$.
17. Rewrite $3 \times 10^6 = 0.3 \times 10^7$, then $5 - 0.3 = 4.7$.
18. Same power: $9 - 8 = 1$, so 1×10^3.
19. $1.2 \cdot 3 = 3.6$ and $5 + (-2) = 3$.
20. $7.2 \div 2.4 = 3$ and $-1 - 3 = -4$.
21. Write $200 = 2 \times 10^2$. Multiply fronts $3 \cdot 2 = 6$ and add exponents $4 + 2 = 6$, giving 6×10^6 caps.
22. Time is distance divided by speed. Divide fronts $9 \div 3 = 3$ and subtract exponents $20 - 4 = 16$, giving 3×10^{16} seconds.
23. The powers of 10 already match, so just add the front numbers: $5 + 3 = 8$, giving 8×10^5 people.
24. Both numbers share the power 10^8, so add the fronts: $7 + 2 = 9$. The total is 9×10^8 files.

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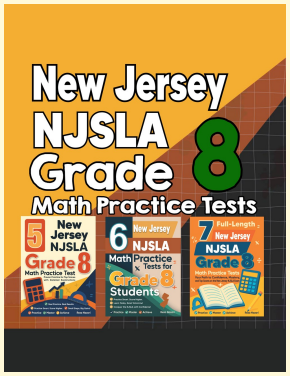

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