

Math 9 Enriched
2.4 Scientific Notations

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1. Write scientific notation for 32500.

$$= 325 \times 10^2 = \boxed{3.25 \times 10^4}$$

2. Write the standard numeral for 7.5×10^5 .

$$\boxed{750000}$$

3. Write scientific notation for 0.000489.

$$= \boxed{4.89 \times 10^{-4}}$$

4. Simplify: $(2.4)(2.4 \times 10^3) \div 1000$

$$= 2.4^2 = \boxed{5.76}$$

5. Express as a decimal: 51.362×10^2

$$= \boxed{5136.2}$$

6. Simplify: $(3.2 \times 10^3) \div (1.6 \times 10^2)$

$$2 \times 10^5 = \boxed{200000}$$

7. Express the following quotient as a number in scientific notation:

$$\frac{(3 \times 10^5) \times (6 \times 10^{-2}) \times (1.2 \times 10^6)}{5.4 \times 10^3} = \frac{3 \times 10^5 \times 6 \times 10^{-2} \times 1.2 \times 10^6}{5.4 \times 10^3} = \frac{216 \times 10^3}{5.4 \times 10^3} = \boxed{4 \times 10^6}$$

8. Express as a decimal:

$$36.85 \times 10^{-3} = \frac{36.85}{1000} = \boxed{0.03685}$$

9. When $\frac{168.5 \times 10^{-9}}{3816 \times 10^{-20}}$ is worked out, rounded to one decimal place, and written in the form $A \times 10^B$ for scientific notation, what is the value of A ?

a) 4.3

b) 4.4

c) 4.5

d) 4.6

e) 4.7

$$\frac{1685 \times 10^{-10}}{3816 \times 10^{-20}} = 0.44 \times 10^{10} = \underline{\underline{4.4}} \times 10^9$$

10. When $\frac{78.9 \times 10^{-12}}{0.0427 \times 10^{-30}}$ is worked out, rounded to one decimal place, and written in the form $A \times 10^B$ for scientific notation, what is the value of A ?

a) 1.6 b) 1.7 c) 1.8 d) 1.9 e) 2.0

$$\frac{789 \times 10^{-13}}{427 \times 10^{-34}} = 1.8 \times 10^2$$

11. A star is 3.4×10^8 light years away. In scientific notation, how far away is a star (in light years) that is only half as far away?

a) 1.7×5^8 b) 3.4×5^8 c) 1.7×10^4 d) 3.4×10^4 e) 1.7×10^8

$$\frac{3.4 \times 10^8}{2} = 1.7 \times 10^8$$

12. Approximately how many seconds has someone who has just turned 17 years old been alive?

$$17 \times 365 \times 24 \times 60 \times 60 = 536112000 \text{ s}$$

13. If $10^{0.845} \approx 7$, then what is the (approximate) value of $10^{1.69}$?

$$10^{1.69} = 10^{0.845 \cdot 2} = 7^2 = 49$$

14. $(0.000725)(0.008) = A.B \times 10^C$ where A and B are single digits, and C is an integer. Find the value of the sum $A + B + C$.

$$725 \cdot 10^6 \cdot 8 \cdot 10^3 = 5800 \cdot 10^9 = 5.8 \cdot 10^6 \quad 5 + 8 + 6 = 19$$

15. Write in scientific notation:

$$\frac{1}{5} \times 10^4 \times 35.7 \times 10^2$$

$$0.2 \times 10^4 \times 35.7 \times 10^2$$

$$= 7.14 \times 10^6$$

16. What is one half of 1.2×10^{30} ?

a) 6×10^{30} $\frac{1.2 \times 10^{30}}{2} = 0.6 \times 10^{30} = 6 \times 10^{29}$
 b) 6×10^{29}
 c) 0.6×5^{30}
 d) 1.2×10^{15}
 e) 1.2×5^{30}

17. In scientific notation, express y where $(5.37) \times (0.00000412) = 2.2124 \times 10^y$

$$5.37 \times 0.412 \times 10^5 = 2.2124 \times 10^5 \quad y = 5$$

18. Express in scientific notation:

$$\frac{3.64 \times 10^{12}}{0.04 \times 10^6} = 91 \times 10^6 = \boxed{9.1 \times 10^7}$$

19. $9,000,000 \times N = 9.9 \times 10^{-7}$. Find N and express your answer in scientific notation.

$$9 \times 10^6 \times N = 9.9 \times 10^{-7}$$

$$\uparrow 1.1 \times 10^{-13} \quad \boxed{N = 1.1 \times 10^{-13}}$$

20. Simplify, expressing your answer in scientific notation:

$$\frac{3.5 \times 10^{-3}}{1.75 \times 10^{-3}} \cdot \frac{1.44 \times 10^6}{1.2 \times 10^{-4}} = \frac{35 \times 10^{-4}}{175 \times 10^{-5}} \cdot \frac{144 \times 10^4}{12 \times 10^{-5}} = 0.2 \times 10^1 \times 12 \times 10^9 = \boxed{2.4 \times 10^{10}}$$

21. Simplify and express in scientific notation:

$$\frac{(6 \times 10^3)(7 \times 10^8)}{4.2 \times 10^5} = \frac{42 \times 10^{11}}{42 \times 10^4} = \boxed{10^7}$$

22. The distance from Pluto to the sun is about 3.67×10^9 mi, and from Neptune to the sun is about 2.79×10^9 mi. How many miles further from the sun is Pluto than Neptune? Express your answer in scientific notation.

$$3.67 - 2.79 = 0.88 = \boxed{8.8 \times 10^{-1}}$$

23. Simplify and express the result in scientific notation:

$$\frac{(0.0000009)^3 (9 \times 10^4)^2}{(3,000,000)^2 (0.00243)} = \frac{(9 \times 10^7)^3 (9 \times 10^4)^2}{(3000000)^2 (243 \times 10^5)} = \frac{9^5 \times 10^{29}}{9 \times 243 \times 10^{17}} = \frac{9^4 \times 10^{12}}{243} = 27 \times 10^{12} = \boxed{2.7 \times 10^{13}}$$

24. Write 0.007×0.00033 in scientific notation.

$$7 \times 10^{-3} \times 33 \times 10^{-5} = 231 \times 10^{-8} = \boxed{2.31 \times 10^{-6}}$$

25. Write 240 divided by 0.015 in scientific notation.

$$\frac{240}{0.015} = \frac{24 \times 10^1}{15 \times 10^{-3}} = \boxed{1.6 \times 10^{-2}}$$

26. If $B = \frac{A}{C}$ where $A = 10$ billion and $B = 25$ million, find the value of C . Express your answer in scientific notation.

$$B = \frac{A}{C} \quad 25 \times 10^6 = \frac{10^9}{C} \quad C = \frac{10^9}{25 \times 10^6} = \frac{10^3}{25} = 40 = \boxed{4 \times 10^1}$$

27. The numbers 123 456 789 and 999 999 999 are multiplied. How many of the digits in the final result are 9's?

- a) 0 b) 1 c) 2 d) 3 e) 17

28. When the product $(5^3)(7^{52})$ is expanded, the units digit (That is, the last digit) is:

- a) 5 b) 3 c) 9 d) 7 e) 0

$$7 \rightarrow 7, 9, 3, 1 \quad 52 \div 4 = 13$$

$$5 \times 1 = 5$$

29. If $w = 2^{129} \times 3^{81} \times 5^{128}$, $x = 2^{127} \times 3^{81} \times 5^{128}$, $y = 2^{126} \times 3^{82} \times 5^{128}$, and $z = 2^{125} \times 3^{82} \times 5^{129}$, then list them in order from the smallest to the largest.

$$\rightarrow 2^{125} \times 3^{81} \times 5^{128} = f$$

$$w = f \times \underbrace{2^4}_{=16} \quad x = f \times \underbrace{2^2}_{=4} \quad y = f \times \underbrace{2^1 \times 3^1}_{=6} \quad z = f \times \underbrace{3^1 \times 5^1}_{=15}$$

$$\boxed{x < y < z < w}$$

30. What is the number of ordered pairs (a, b) that satisfy the equation: $a^b = 64$

- a) 3 b) 5 c) 8 d) 6 e) 7

$$\begin{matrix} (64, 1) & (4, 3) & (-8, 2) \\ (8, 2) & (2, 6) & (-2, 6) \end{matrix} \quad \left. \vphantom{\begin{matrix} (64, 1) \\ (8, 2) \end{matrix}} \right\} 6$$

31. How many four-digit positive integers x are there with the property that x and $3x$ have only even digits? (One such number is $x = 8002$, since $3x = 24006$ and each of x and $3x$ has only even digits)

- a) 82 b) 84 c) 86 d) 88 e) 90

$$0, 2, 4, 6, 8$$

$$\text{only } 0, 2, 8 : \underline{2} \times \underline{3} \times \underline{3} \times \underline{3} = 54$$

$$\begin{matrix} 6 \text{ at front} : & 6 & 8 & \underline{3} & \underline{3} & = & 9 \\ (8 \text{ has to be} & & & & & & \\ \text{after } 6) & & & & & & \end{matrix}$$

$$6 \text{ at second} : \underline{2} & 6 & 8 & \underline{3} = 6$$

$$\text{third} : \underline{2} \times \underline{3} & 6 & 8 = 6$$

$$6 & 8 & 6 & 8 = 1$$

$$2 \text{ 6's} : 6 & 6 & 8 & \underline{3} = 3$$

$$\underline{2} & 6 & 6 & 8 = 2$$

$$3 \text{ 6's} =$$

$$6 & 6 & 6 & 8 = 1$$

$$54 + 9 + 6 + 6 + 1 + 3 + 2 + 1 = 82$$

$$999 \ 999 \ 999$$

$$= 1000 \ 000 \ 000 - 1$$

$$123456789 \times (1000 \ 000 \ 000 - 1)$$

$$\begin{array}{r} 123456789 \times 999999999 \\ \hline 123456789 \\ 123456789000000000 \\ 123456789000000000000 \\ \hline 123456789000000000000000 \\ - 123456789 \\ \hline 123456789000000000000000 - 123456789 \end{array}$$