

Scientific Notation Chapter Questions

1. What is the purpose of scientific notation?
2. When would you use scientific notation?
3. How do you convert between standard form and scientific notation?
4. How do you compare numbers when they are written in scientific notation?
5. How do you multiply and divide numbers in scientific notation?
6. How do you add and subtract numbers in scientific notation with the same exponents?
7. How do you add and subtract numbers in scientific notation with different exponents?

Scientific Notation Chapter Problems

Purpose of Scientific Notation

Classwork

- Express the following powers of ten in standard form:
 - $10^1 =$
 - $10^2 =$
 - $10^3 =$
 - $10^4 =$
 - $10^5 =$
- Express the following answers as powers of 10.
 - $10^3 \times 10^5 =$
 - $10^{11} \times 10^6 =$
 - $10^{12} \times 10^{-8} =$
 - $10^{-4} \times 10^{-7} =$
 - $10^{-9} \times 10^3 =$

Homework

- Express the following powers of ten in standard form:
 - $10^9 =$
 - $10^8 =$
 - $10^7 =$
 - $10^6 =$
 - $10^5 =$
- Express the following answers as powers of 10.
 - $10^2 \times 10^4 =$
 - $10^3 \times 10^{12} =$
 - $10^{-6} \times 10^8 =$
 - $10^{-3} \times 10^{-9} =$
 - $10^{-7} \times 10^2 =$

How to Write Numbers in Scientific Notation

Classwork

- Which of the following are correctly written in scientific notation?
 - 3.0×10^5
 - 0.56×10^9
 - 0.103×10^3
 - 15×10^{-5}
 - 5.6×10^{-8}
 - 4×10^2
 - 0.345×10^{-2}

6. Write each number in scientific notation.

- a. 13,030,000
- b. 418,000
- c. 25,024,000
- d. 4,500,000
- e. 20,000
- f. 870,000,000
- g. 0.0325
- h. 0.0000564
- i. 0.00092
- j. 0.001002
- k. 0.00006
- l. 0.00965784

7. Write each number in scientific notation.

- a. Lightest blue whale: 418,000 lb
- b. Thinnest glass: 0.00098 in.
- c. Lightest bird egg: 0.0128 oz.
- d. Diameter of thinnest copper wire: 0.0005 in.
- e. Mass of Earth's atmosphere: 5,700,000,000,000,000 tons
- f. Amount of gold in Earth's crust: 120,000,000,000,000 metric tons

Homework

8. Which of the following are correctly written in scientific notation?

- a. 0.5×10^4
- b. 15×10^9
- c. 3.5567×10^{-7}
- d. 1×10^6
- e. 5.04×10^{-4}
- f. 0.05×10^{-2}
- g. 6.788432×10^8

9. Write each number in scientific notation.

- a. 4,566,000
- b. 17,000,300
- c. 35,000
- d. 1,078,000,000
- e. 4,560,700
- f. 943,000,000,000
- g. 0.000578
- h. 0.004598732
- i. 0.000000558744
- j. 0.0001000358
- k. 0.00045805
- l. 0.000000000000851

10. Write each number in scientific notation.
- Mass of smallest insect, a parasitic wasp: 0.00000492 g
 - Speed of light: 300,000,000 m/sec
 - Mass of a dust particle: 0.000000000753 kg
 - Distance from Earth to the Sun is approximately: 149,600,000 km
 - Earth's circumference: 40,000,000 m
 - Distance between the Sun and Neptune: 4,497,100,000 km

Converting to Standard Form

Classwork

11. Write each number in standard form.
- Temperature at the Sun's core: 1.55×10^6 K
 - Lowest temperature ever in a lab: 2×10^{-11} K
 - Radius of the neon atom is about 3.5×10^{-11} meters
 - Radius of Earth's orbit: 1.5×10^{11} meters
 - Avagadro's number: 6.022×10^{23}
 - Weight of a paper clip: 1.1×10^{-3} lb.
12. Write each number in standard form:
- 7.5×10^5
 - 9.765×10^{-10}
 - 1.27×10^{-8}
 - 4.56×10^6
 - 3.0×10^{-6}
 - 6.785168×10^8
 - 8.00045×10^{-4}

PARCC-type Questions: Circle the correct answer

13. Which number represents the number $2.3E-4$?
- 230,000
 - 23,000
 - 0.00023
 - 0.000023
14. Which number represents the number $6.29E10$
- 6,290,000,000,000
 - 62,900,000,000
 - 0.000000000629
 - 0.0000000000629

Homework

15. Write each number in standard form.
- Width of a human hair: 7.5×10^{-5} meter
 - Distance between Jupiter and the Sun: 4.836×10^{11}
 - Charge on a Proton/Electron: 1.602176×10^{-19} C

Homework

28. 7677 _____
29. 2489.02 _____
30. 4174381 _____
31. .00689 _____
32. .0002 _____
33. .000051 _____
34. If $M = 8924600043.67$ find the smallest power of 10 that will exceed M.
35. If $M = 3.162$ find the smallest power of 10 that will exceed M.
36. If $M = 4536$ find the smallest power of 10 that will exceed M.

Comparing Numbers in Scientific Notation

Classwork

37. Place the appropriate inequality symbols between the following numbers:
- | | | |
|----|------------------------|-------------------------|
| a. | 9.5×10^4 | 8.2×10^7 |
| b. | 6.231×10^7 | 2.34×10^3 |
| c. | 4.567×10^{-2} | 7.32×10^5 |
| d. | 1.0×10^{-4} | 2.0×10^{-5} |
| e. | 5.66×10^{-7} | 6.54×10^{-9} |
| f. | 8.32×10^{-6} | 7.236×10^{-11} |
| g. | 4.52×10^4 | 7.532×10^4 |
| h. | 6.5431×10^8 | 6.32×10^8 |
| i. | 3.5×10^{-6} | 1.0×10^{-6} |
| j. | 4.509×10^{10} | 3.45×10^{10} |
38. Order the following sets of numbers from least to greatest.
- | | | | | |
|----|-----------------------|-----------------------|----------------------|----------------------|
| a. | 2.3×10^3 | 4.5×10^5 | 7.8×10^2 | 1.3×10^4 |
| b. | 4.0×10^9 | 5.0×10^7 | 6.0×10^{10} | 7.0×10^5 |
| c. | 4.3×10^4 | 7.5×10^{-2} | 1.9×10^6 | 3.3×10^{-4} |
| d. | 2.5×10^{-12} | 5.5×10^{-25} | 8.2×10^2 | 9.5×10^{-9} |
| e. | 5.4×10^4 | 3.2×10^4 | 9.9×10^4 | 2.1×10^4 |
| f. | 9.2×10^{-5} | 8.2×10^{-6} | 9.2×10^{-6} | 8.2×10^{-5} |

Homework

39. Place the appropriate inequality symbols between the following numbers:
- | | | |
|----|------------------------|----------------------|
| a. | 3.2×10^6 | 4.2×10^9 |
| b. | 5.41×10^4 | 6.54×10^7 |
| c. | 9.875×10^{-8} | 1.0345×10^8 |

- d. 3.0×10^{-6} 4.0×10^{-9}
- e. 4.35×10^{-4} 7.21×10^{-3}
- f. 8.369×10^{-8} 4.1×10^{-13}
- g. 3.98×10^6 5.98×10^6
- h. 1.65×10^4 1.56×10^4
- i. 8.3×10^{-8} 3.0×10^{-8}
- j. 6.8999×10^{15} 7.43×10^{15}

40. Order the following sets of numbers from least to greatest.

- a. 4.7×10^3 8.9×10^7 6.5×10^5 6.7×10^4
- b. 2.0×10^{12} 3.0×10^6 4.0×10^8 5.0×10^3
- c. 9.9×10^5 5.7×10^{-3} 1.8×10^{-7} 4.4×10^6
- d. 1.9×10^{-10} 3.6×10^{-6} 9.7×10^3 4.5×10^{-23}
- e. 9.3×10^8 5.0×10^8 8.9×10^8 6.7×10^8
- f. 5.5×10^{-7} 4.5×10^{-7} 9.0×10^{-7} 2.7×10^{-7}

Multiplying and Dividing with Scientific Notation

Classwork

41. Evaluate the following. Express the result in scientific notation.

- a. $(3.0 \times 10^{-5})(2.0 \times 10^9) =$
- b. $(4.0 \times 10^3)(5.0 \times 10^5) =$
- c. $(6.0 \times 10^{-5})(3.0 \times 10^8) =$
- d. $(1.5 \times 10^8)(3.2 \times 10^{-4}) =$
- e. $(2.7 \times 10^{-3})(1.1 \times 10^8) =$
- f. $(1.3 \times 10^{-4})(2.0 \times 10^{-6}) =$
- g. $(8.4 \times 10^6) \div (2.0 \times 10^3) =$
- h. $(9.3 \times 10^8) \div (3.0 \times 10^{-2}) =$
- i. $(5.4 \times 10^{10}) \div (2.0 \times 10^4) =$
- j. $\frac{7.35 \times 10^5}{2.1 \times 10^8} =$
- k. $\frac{4.5 \times 10^5}{9.0 \times 10^9} =$
- l. $\frac{3.6 \times 10^{-8}}{6.0 \times 10^{-12}} =$

42. A tiny space inside a computer chip has been measured to be 2.56×10^{-6} meters wide, 1.4×10^{-7} meters long, and 2.75×10^{-4} meters high. What is its volume?

43. In one year about 478 billion telephone calls were placed by 145 million United States telephone subscribers. What was the average number of calls placed per subscriber?

Homework

44. Evaluate the following. Express the result in scientific notation.

- a. $(3.0 \times 10^{-5})(3.0 \times 10^8) =$
- b. $(4.0 \times 10^2)(4.0 \times 10^7) =$
- c. $(7.0 \times 10^{-3})(6.0 \times 10^6) =$

- d. $(1.2 \times 10^7)(2.2 \times 10^{-3})=$
 e. $(2.0 \times 10^{-4})(7.1 \times 10^9)=$
 f. $(4.4 \times 10^{-7})(3.0 \times 10^{-3})=$
 g. $(6.6 \times 10^8) \div (2.0 \times 10^4)=$
 h. $(2.7 \times 10^6) \div (3.0 \times 10^{-4})=$
 i. $(7.5 \times 10^{12}) \div (2.0 \times 10^5)=$
 j. $\frac{6.6 \times 10^5}{3.3 \times 10^{15}}=$
 k. $\frac{5.4 \times 10^4}{9.0 \times 10^8}=$
 l. $\frac{4.8 \times 10^{-4}}{8.0 \times 10^{-10}}=$

45. A tiny space inside another computer chip has been measured to be 3.5×10^{-7} meters wide, 1.8×10^{-8} meters long, and 6.45×10^{-5} meters high. What is its volume?
46. The point on a pin has a diameter of approximately 1×10^{-4} meters. If a neon atom has a diameter of about 7.0×10^{-11} meters, about how many neon atoms could fit across the diameter of the point of a pin?

Adding and Subtracting with Scientific Notation

Classwork

47. Evaluate the following. Express the result in scientific notation.
- a. $(2.1 \times 10^5) + (2.7 \times 10^5)=$
 b. $(3.7 \times 10^8) + (4.6 \times 10^8)=$
 c. $(6.8 \times 10^{-6}) - (3.4 \times 10^{-6})=$
 d. $(6.1 \times 10^6) + (3.5 \times 10^7)=$
 e. $(8.5 \times 10^{10}) - (1.5 \times 10^9)=$
48. What is the difference between the mass of Earth (5.98×10^{24} kg) and the mass of Venus (4.87×10^{24} kg)?
49. What is the difference between the mass of Jupiter (1.90×10^{27} kg) and the mass of Saturn (5.69×10^{26} kg)?

Homework

50. Evaluate the following. Express the result in scientific notation.
- a. $(5.8 \times 10^9) + (3.1 \times 10^9)=$
 b. $(3.5 \times 10^6) + (5.8 \times 10^6)=$
 c. $(7.5 \times 10^{-4}) - (4.2 \times 10^{-4})=$
 d. $(5.4 \times 10^7) + (2.2 \times 10^8)=$
 e. $(6.5 \times 10^{12}) - (3.4 \times 10^{11})=$
51. What is the difference between the mass of Mars (6.42×10^{23} kg) and the mass of Mercury (3.3×10^{23} kg)?
52. What is the difference between the mass of Earth (5.98×10^{24} kg) and the mass of Mars (6.42×10^{23} kg)?

Scientific Notation Unit Review

Multiple Choice– Choose the correct answer for each question.

- Which of the following powers of 10 is not correctly written in standard form?
 - $10^5 = 100,000$
 - $10^3 = 1,000$
 - $10^6 = 1,000,000$
 - $10^1 = 1$
- Express the following as a power of ten: $10 \times 10^7 =$
 - 10^8
 - 10^7
 - 10^6
 - 100^8
- Express the following as a power of ten: $10^{-5} \times 10^{-10} =$
 - 10^{50}
 - 10^{-50}
 - 10^{-15}
 - 10^{15}
- The temperature at the Sun's core can reach as high as 13,600,000 kelvins. What is this number correctly written in scientific notation?
 - 136×10^5
 - 1.36×10^7
 - 1.36×10^5
 - 1.36×10^6
- What is the number .00000002 correctly written in scientific notation?
 - 2.0×10^{-8}
 - 2.0×10^{-9}
 - 0.2×10^{-8}
 - 2.0×10^{-10}
- What is 4.56×10^5 in standard form?
 - 0.00000456
 - 0.0000456
 - 0.000456
 - 456,000

7. What is 9×10^6 in standard form?

- a. 9,000,000
- b. 90,000,000
- c. 900,000,000
- d. 9,800,000,000

8. 5.89×10^8 6.4×10^8

- a. >
- b. =
- c. <

9. 3.87×10^{-4} 5.0×10^{-3}

- a. >
- b. =
- c. <

10. 7.21×10^7 3.45×10^8

- a. >
- b. =
- c. <

11. Which of the following is correctly ordered from greatest to least?

- a. 2.0×10^2 3.0×10^6 4.0×10^{-7} 5.0×10^{12}
- b. 4.0×10^{-7} 2.0×10^2 3.0×10^6 5.0×10^{12}
- c. 3.0×10^7 3.0×10^6 3.0×10^2 3.0×10^{-7}
- d. 4.0×10^{-7} 5.0×10^{12} 2.0×10^2 3.0×10^6

12. Which of the following is correctly ordered from greatest to least?

- a. 3.59×10^6 4.8×10^9 5.4×10^{-5} 6.9×10^{-8}
- b. 5.49×10^{-5} 6.9×10^{-8} 3.5×10^6 4.8×10^9
- c. 6.99×10^{-8} 5.4×10^{-5} 3.5×10^6 4.8×10^9
- d. 1.8×10^9 1.5×10^6 1.4×10^{-5} 1.9×10^{-8}

13. $(1 \times 10^{-4}) / (3 \times 10^{-8})$ is approximately

- a. 3,000
- b. 30,000
- c. 300,000
- d. 333,000

14. Identify the number that is not in scientific notation

- a. 3.2×10^4
- b. 4.0×10
- c. 52×10^3
- d. 9×10^{-2}

15. $(4.1 \times 10^3) \times (1.6 \times 10^{-2}) =$

- a. 6.56×10
- b. 6.56×10^5
- c. 6.56×10^{-5}
- d. 656×10^1

16. What is the magnitude of the number 462,000?

- a. 6
- b. 3
- c. 5
- d. 2

17. What is the magnitude of the number .000871

- a. 6
- b. -6
- c. 4
- d. -4

18. If $M = 817,004.621$, what is the smallest power of 10 that will exceed M?

- a. 6
- b. -6
- c. 3
- d. 5

Short Constructed Response – Write the correct answer for each question. No partial credit will be given.

For problems 19-23, evaluate and express the result in scientific notation.

19. $(2.0 \times 10^3)(2.0 \times 10^6) =$ _____

20. $(9 \times 10^{-6}) - (3 \times 10^{-6}) =$ _____

21. $(9.6 \times 10^{12}) \div (3.2 \times 10^6) =$ _____

22. $(3.3 \times 10^6) + (6.6 \times 10^6) =$ _____

23. $(4.2 \times 10^{-1}) + (2.4 \times 10^{-1}) =$ _____

Extended Constructed Response - Solve the problem, showing all work. Partial credit may be given.

24. Your body is creating and killing 15 million red blood cells per second.

- Express 15 million in scientific notation.
- How many red blood cells are created in one hour? Express your answer in scientific notation.
- How many are created in one day? Express your answer in scientific notation.

25. There are 18 different animal shapes in the Animal Crackers Cookie Zoo.
- Express this number in scientific notation
 - If there are 306 cookies in a package, how many full cookie zoo's are in the package?
 - A case of cookies contains 24 packages. How many sets of animal shapes are there? Express your answer in scientific notation.
26. Every day, 20 banks are robbed. The average take is \$2,500.
- Express the amount stolen in one robbery in scientific notation.
 - Express the average amount stolen in one day in scientific notation.
 - Express the average amount stolen in one week in scientific notation.
27. A Boeing 747 holds 57,285 gallons of fuel.
- Express the amount of fuel in scientific notation.
 - If there are 10 fully fueled Boeing 747s on the tarmac, how much total fuel is in the tanks? Express your answer in scientific notation.
 - What is the advantage of using scientific notation for this problem?

Answer Key

Chapter Questions

1. To make very large and very small numbers easier to read and write.
2. When you want to write very large numbers small, and very small numbers large.
3. Scientific to Standard: Write the coefficient-Add the number of zeros equal to the exponent-Move the decimal the number of places indicated by the exponent.
Standard to Scientific: Write the number without the decimal point-Place the decimal so that the first number is greater than one but less than 10-Count how many places you moved the decimal point; use this as the exponent.
4. First, compare the exponents. If the exponents are different, the coefficients do not matter. Whichever number has the larger exponent is the larger number.
5. Multiply: Multiply the coefficients. Multiply the powers of ten. Combine those results. Put in proper form.
Divide: Divide the coefficients. Divide the powers of ten. Combine those results. Put in proper form.
6. Add or Subtract with same exponents: Add or subtract the coefficients. Rewrite the power of ten. Put in proper form.
7. Add or Subtract with different exponents: Rewrite one of the numbers to have the same exponent as the other number. Add or subtract the coefficients. Rewrite the power of ten. Put in proper form.

Chapter Problems

1.
 - a. 10
 - b. 100
 - c. 1000
 - d. 10000
 - e. 100000
2.
 - a. 10^8
 - b. 10^{17}
 - c. 10^4
 - d. 10^{-11}
 - e. 10^{-6}

3.
 - a. 1000000000
 - b. 100000000
 - c. 10000000
 - d. 1000000
 - e. 100000
4.
 - a. 10^6
 - b. 10^{15}
 - c. 10^2
 - d. 10^{-12}
 - e. 10^{-5}
5. A, E, F
6.
 - a. 1.303×10^7
 - b. 4.18×10^5
 - c. 2.5024×10^7
 - d. 4.5×10^6
 - e. 2×10^4
 - f. 8.7×10^8
 - g. 3.25×10^{-2}
 - h. 5.64×10^{-5}
 - i. 9.2×10^{-4}
 - j. 1.002×10^{-3}
 - k. 6×10^{-5}
 - l. 9.65784×10^{-3}
7.
 - a. 4.18×10^5
 - b. 9.8×10^{-4}
 - c. 1.28×10^{-2}
 - d. 5×10^{-4}
 - e. 5.7×10^{15}
 - f. 1.2×10^{14}
8. C, D, E, G
9.
 - a. 4.566×10^6
 - b. 1.70003×10^7
 - c. 3.5×10^4
 - d. 1.078×10^9
 - e. 4.5607×10^6
 - f. 9.43×10^{11}
 - g. 5.78×10^{-4}
 - h. 4.598732×10^{-3}
 - i. 5.58744×10^{-7}
 - j. 1.000358×10^{-4}
 - k. 4.5805×10^{-4}
 - l. 8.51×10^{-13}

10. a. 4.92×10^{-6}
 b. 3×10^8
 c. 7.53×10^{-10}
 d. 1.496×10^8
 e. 4×10^7
 f. 4.4971×10^9
11. a. 1550000
 b. .00000000002
 c. .000000000035
 d. 150000000000
 e. 602200000000000000000000
 f. .0011
12. a. 750000
 b. .0000000009765
 c. .0000000127
 d. 4560000
 e. .000003
 f. 678516800
 g. .000800045
13. c
 14. b
 15. a. .000075
 b. 483600000000
 c. .00000000000000000001602176
 d. 96490
 e. 10000000000000
 f. .00000055
16. a. .0008445
 b. 5256544000
 c. .00001
 d. 745207000
 e. .0000267
 f. 6000500
 g. .00400896
17. a
 18. d
 19. 2
 20. 3
 21. 6
 22. -3
 23. -2
 24. -6
 25. 12

26. 5
 27. 2
 28. 3
 29. 3
 30. 6
 31. -3
 32. -4
 33. -5
 34. 10
 35. 1
 36. 4
 37. a. <
 b. >
 c. <
 d. >
 e. >
 f. >
 g. <
 h. >
 i. >
 j. >
38. a. $7.8 \times 10^2, 2.3 \times 10^3, 1.3 \times 10^4, 4.5 \times 10^5$
 b. $7.0 \times 10^5, 5.0 \times 10^7, 4.0 \times 10^9, 6.0 \times 10^{10}$
 c. $3.3 \times 10^{-4}, 7.5 \times 10^{-2}, 4.3 \times 10^4, 1.9 \times 10^6$
 d. $5.5 \times 10^{-25}, 2.5 \times 10^{-12}, 9.5 \times 10^{-9}, 8.2 \times 10^2$
 e. $2.1 \times 10^4, 3.2 \times 10^4, 5.4 \times 10^4, 9.9 \times 10^4$
 f. $8.2 \times 10^{-6}, 9.2 \times 10^{-6}, 8.2 \times 10^{-5}, 9.2 \times 10^{-5}$
39. a. <
 b. <
 c. <
 d. >
 e. <
 f. >
 g. <
 h. >
 i. >
 j. <
40. a. $4.7 \times 10^3, 6.7 \times 10^4, 6.5 \times 10^5, 8.9 \times 10^7$

- b. 5.0×10^3 , 3.0×10^6 , 4.0×10^8 , 2.0×10^{12}
 c. 1.8×10^{-7} , 5.7×10^{-3} , 9.9×10^5 , 4.4×10^6
 d. 4.5×10^{-23} , 1.9×10^{-10} , 3.6×10^{-6} , 9.7×10^3
 e. 5.0×10^8 , 6.7×10^8 , 8.9×10^8 , 9.3×10^8
 f. 2.7×10^{-7} , 4.5×10^{-7} , 5.5×10^{-7} , 9.0×10^{-7}
41.
 a. 6×10^4
 b. 2×10^9
 c. 1.8×10^4
 d. 4.8×10^4
 e. 2.97×10^5
 f. 2.6×10^{-10}
 g. 4.2×10^3
 h. 3.1×10^{10}
 i. 2.7×10^6
 j. 3.5×10^{-3}
 k. 5×10^{-5}
 l. 6×10^3
42. 9.856×10^{-17}
 43. 3.296×10^3
 44.
 a. 9×10^3
 b. 1.6×10^{10}
- c. 4.2×10^4
 d. 2.64×10^4
 e. 1.42×10^6
 f. 1.32×10^{-9}
 g. 3.3×10^4
 h. 9×10^9
 i. 3.75×10^7
 j. 2×10^{-10}
 k. 6×10^{-5}
 l. 6×10^5
45. 4.0635×10^{-20}
 46. 1.428571×10^6
 47.
 a. 4.8×10^5
 b. 8.3×10^8
 c. 3.4×10^{-6}
 d. 4.11×10^7
 e. 8.35×10^{10}
48. 1.11×10^{24}
 49. 1.331×10^{27}
 50.
 a. 8.9×10^9
 b. 9.3×10^6
 c. 3.3×10^{-4}
 d. 2.74×10^8
 e. 6.16×10^{12}
51. 3.12×10^{23}
 52. 5.338×10^{24}

Unit Review Answer Key

1. D
2. A
3. C
4. B
5. A
6. D
7. A
8. C
9. C
10. C
11. C
12. D
13. A
14. C
15. A
16. C
17. D
18. A
19. 4.0×10^9
20. 6×10^{-6}
21. 3×10^6
22. 9.9×10^6
23. 6.6×10^{-1}
24. 1.5×10^7
 5.4×10^{10}
 1.296×10^{12}
25. 1.8×10
17
 4.08×10^2
26. 2.5×10^3
 5×10^4
 3.5×10^5
27. 5.7285×10^4
 5.7285×10^5

The mathematical computations can be done mentally.