Independent Practice

eHelp

9. The United States has the most miles of roads in the world at about 4×10^6 miles. Japan has about 7.3×10^5 miles. How many more miles of roads does the United States have than Japan? Write in scientific notation. (Example 1)

[handwritten: $10^6 = 1,000,000$]

[handwritten right margin: 4,009000 730,000 3,270,000 3.27 × 10⁶]

10. The speed of light is about 1.9×10^5 miles per second. It takes about 500 seconds for light to travel from the sun to Earth. What is the approximate distance between Earth and the sun? Write in scientific notation. (Example 1)

Evaluate each expression. Express the result in scientific notation. (Examples 1, 2, and 4)

11. $(5.32 \times 10^8)(3.54 \times 10^3)$

12. $(1.48 \times 10^{-5})(6.5 \times 10^{-6})$

13. $(9.5 \times 10^{-4})(28,400)$

14. $(0.042)(3.15 \times 10^4)$

15. $\dfrac{4.97 \times 10^6}{7.1 \times 10^{-8}}$

16. $\dfrac{1.86 \times 10^8}{3.1 \times 10^{-4}}$

17. $\dfrac{4.7 \times 10^9}{376}$

18. $\dfrac{99,500}{5 \times 10^2}$

19. $(3.205 \times 10^3) + (5.83 \times 10^5)$

20. $6,263,000 + (5.4 \times 10^8)$

21. $(2.764 \times 10^8) - (6.2 \times 10^7)$

22. $(9.518 \times 10^7) - 22,000$

23. $(4.21 \times 10^{-3})(56,200)$

24. $(8.08 \times 10^6)(3.34 \times 10^3)$

25. $(7.57 \times 10^2)(1.10 \times 10^5)$

26. $(0.0159)(5.19 \times 10^{-3})$

27. The diameter of Mars is about 7×10^6 meters. A standard table tennis ball is 0.04 meter in diameter. About how many times greater is the diameter of Mars than that of a table tennis ball? (Example 3)

28. The United States has a total area (including water) of about 9,826,630 square kilometers. Rhode Island is the smallest state with an area (including water) of about 4×10^3 square kilometers. About how many times greater is the area of the United States than the area of Rhode Island? (Example 3)

29. Earth is 1.55×10^8 kilometers from the sun. Mercury is 5.80×10^7 kilometers from the sun. Find the difference in distances and express your answer in scientific notation.

30. **STEM** Each minute, there are approximately 6×10^3 flashes of lightning around the world. The air around a lightning bolt is heated to about 5.4×10^4 degrees Fahrenheit, which is about five times hotter than the sun. Write each answer in scientific notation and in standard form.

    a. About how many flashes of lightning are there in a day?

    b. About how hot is the sun in degrees Fahrenheit?

31. A music Web site recently announced that over 4×10^9 songs have been downloaded. It also announced that it has 5×10^7 registered users. Find the average number of downloads per user and express your answer in scientific notation.

32. ![CCSS] **Use Math Tools** The table shows the weights of various marine and land animals.

Mammal	Weight (lb)
African elephant	1.44×10^4
blue whale	2.87×10^5
fin whale	9.92×10^4
right whale	8.82×10^4
white rhinoceros	7.94×10^3
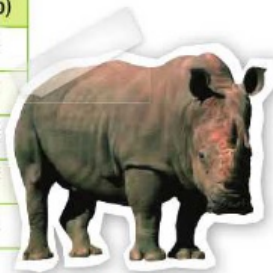
a. Which animal is about 10 times lighter than a right whale?

b. About how many times heavier is the blue whale than the African elephant?

c. Estimate the combined weight of the fin whale, right whale, and white rhinoceros. Write the combined weight in scientific notation and in standard form.

33. The average width of a human hair is 4×10^{-3} centimeter. If the cross section of the average hair is round, use the formula $A = 3.14r^2$ to find the approximate area of the cross section of a hair. Write your answer in scientific notation.

34. A contractor is using a blend of two different types of sand for a new sand volleyball court. He is using 1.6×10^3 cubic feet of sand that weighs 95 pounds per cubic foot and 1.25×10^3 cubic feet of sand that weighs 88 pounds per cubic foot. How many tons of sand is being used for the vollyball court?

Evaluate each expression. Express the result in scientific notation.

35. $\dfrac{(2.8 \times 10^{-7})(14{,}000{,}000{,}000)}{3.92 \times 10^4}$

36. $\dfrac{(9.6 \times 10^{20})(3 \times 10^6)}{2 \times 10^5}$

37. $\dfrac{1.86 \times 10^8}{3.1 \times 10^{-4}} + 5.4 \times 10^{10}$

38. $\dfrac{4.5 \times 10^4}{75{,}000{,}000} \times (4.9 \times 10^6)$

39. $\left(\dfrac{6 \times 10^{-100}}{2.5 \times 10^{-60}}\right)(3.7 \times 10^{15})$

40. $\left(\dfrac{180{,}000}{5 \times 10^8}\right)(9 \times 10^2)$

41. $(8.2 \times 10^4 + 8{,}249) \times 10^8$

42. $(5.29 \times 10^4 - 52{,}000) \times 10^5$

![handwritten: $\dfrac{3^5}{3^2} = 3^{5-2} = 3^3$]   ![handwritten: $\dfrac{18}{6} = 3$]

🔥 **H.O.T. Problems** Higher Order Thinking

43. ![CCSS] **Identify Structure** Write an addition expression and a subtraction expression, each with a value of 2.4×10^{-3}.

![handwritten: $\dfrac{3}{1} \times \dfrac{6}{6}$]   ![handwritten: $\dfrac{3 \times 6}{1 \times 6} = \dfrac{3}{1} = 3$]

44. ![CCSS] **Which One Doesn't Belong?** Identify the expression that does not belong with the other three. Explain your reasoning.

| 5.25×10^7 | $(2.1 \times 10^2)(2.5 \times 10^5)$ | 52.5×10^8 | $(2.1)(2.5) \times 10^{(2+5)}$ |

![handwritten: SPLIFFF = 12]   ![handwritten: $\dfrac{12}{3}$]

45. ![CCSS] **Persevere with Problems** There are about 2.5×10^{10} red blood cells in the average adult. A googol is 1×10^{100}. About how many adults would it take to have a total of 1 googol red blood cells?

![handwritten: $\dfrac{1 \times 10^{100}}{2.5 \times 10^{10}}$]

46. ![e] **Building on the Essential Question** How does writing numbers in different ways help to make it easier to compute with very large or very small numbers?

![handwritten: $\dfrac{1 \times 10^{90}}{2.5} =$]   ![handwritten: $\dfrac{1}{2.5} \times \dfrac{10^{100}}{10^{10}}$]

$$\frac{3^5}{3^2} = 3^{5-2} = 3^3$$

$$\frac{18}{6} = 3$$

CCSS Identify Structure Write an addition expression and a subtraction expression, each with a value of 2.4×10^{-3}.

$$\frac{3}{1} \times \frac{6}{6}$$

$$\frac{3 \times 6}{1 \times 6} = \frac{3}{1} = 3$$

CCSS Which One Doesn't Belong? Identify the expression that does not belong with the other three. Explain your reasoning.

5.25×10^7 $(2.1 \times 10^2)(2.5 \times 10^5)$ 52.5×10^8 $(2.1)(2.5) \times 10^{(2+5)}$

SPLIFFF = 12

$$\frac{12}{3}$$

45 **CCSS Persevere with Problems** There are about 2.5×10^{10} red blood cells in the average adult. A googol is 1×10^{100}. About how many adults would it take to have a total of 1 googol red blood cells?

$$\frac{1 \times 10^{100}}{2.5 \times 10^{10}}$$

e Building on the Essential Question How does writing numbers in different ways help to make it easier to compute with very large or very small numbers?

$$\frac{1 \times 10^{90}}{2.5} =$$

$$\frac{1}{2.5} \times \frac{10^{100}}{10^{10}}$$

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$$\frac{1 \times 10^{90}}{2.5} \times \frac{4}{4} = \frac{4 \times 10^{90}}{1 \times 10^1} = \frac{4}{1} \times \frac{10^{90}}{10^1} = 4 \times 10^{89}$$
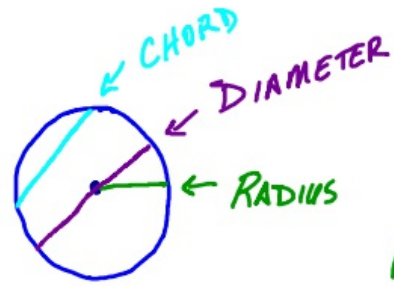
Area of Circles

$$A = \pi r^2$$

$\uparrow$
3.14

$\dfrac{22}{7}$

CHORD
DIAMETER
RADIUS

$r = \dfrac{d}{2}$

$d = 2r$

4×10^{-3} ← DIAMETER   0.004

$\dfrac{4 \times 10^{-3}}{2} =$ ← RADIUS   0.002

$4 \times 10^{-3} = 0.004$

$4 \times 10^{-3} = \dfrac{4}{10^3} = \dfrac{4}{1000} = 0.004$

$A = 3.14(0.002)^2$

$A = 3.14(0.000004)$

$A = 0.000013 \text{ cm}$

$\dfrac{13}{1,000,000} \text{ cm}$

33. The average width of a human hair is 4×10^{-3} centimeter. If the cross section of the average hair is round, use the formula $A = 3.14r^2$ to find the approximate area of the cross section of a hair. Write your answer in scientific notation.

$\dfrac{4 \times 10^{-3}}{2}$

4×10^{-3}
WIDTH →
(DIAMETER)

AREA OF CIRCLES
$A = \pi r^2$
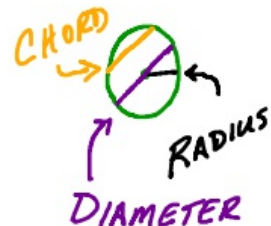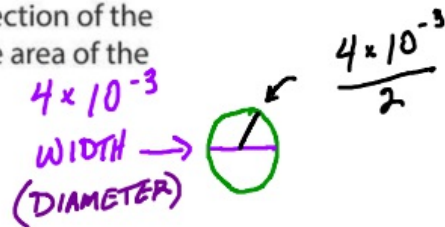
$A = 3.14(0.002)^2$

$= 3.14(0.000004)$

$A = 0.000013$

$\dfrac{4 \times 10^{-3}}{2} = 2 \times 10^{-3} = 0.002$

$4 \times 10^{-3} = 0.004$

$\dfrac{0.004}{2} = 0.002$

$4 \times 10^{-3} = \dfrac{4}{1000}$

CHORD →

RADIUS

DIAMETER

$r = \dfrac{d}{2}$

$d = 2r$

$\dfrac{\frac{4}{1000}}{2} = \dfrac{2}{1000}$