Name _____ Class _____ Date _____

Skills Worksheet

Math Skills

Using Scientific Notation

After you study each sample problem and solution, work out the practice problems on a separate sheet of paper. Write your answers in the spaces provided.

PROBLEM

The Concorde, a supersonic passenger jet that flies from the East Coast of the United States to London and Paris, must fly at the speed of a regular jet while flying over land. This lower speed is used to avoid problems associated with the sonic boom of supersonic jets. Once over the Atlantic Ocean, the Concorde can increase its speed. If the Concorde flies at 8.85×10^2 km/h over land and 2.300×10^3 km/h over sea, what is the difference in these speeds?

SOLUTION

Step 1: List the given and unknown values.

Given: *land speed* = 8.85×10^2 km/h

sea speed = 2.300×10^3 km/h

Unknown: *difference in speeds* = ? km/h

Step 2: Write the equation for the difference in speeds.

Difference in speeds = sea speed – land speed

Step 3: Insert the known values into the equation, and solve.

Difference in speeds = $(2.300 \times 10^3$ km/h$) - (8.85 \times 10^2$ km/h$)$

Rewrite either value so that the exponent term of both numbers is the same.

2.300×10^3 km/h = 23.00×10^2 km/h

Difference in speeds = $(23.00 - 8.85) \times 10^2$ km/h

Difference in speeds = 14.15×10^2 km/h

Rewrite the value with only one nonzero digit to the left of the decimal point.

Difference in speeds = 1.415×10^3 km/h

PRACTICE

1. The heaviest commonly used United States coin is the half dollar, which has a mass of 11.340 g. The lightest United States coin is the dime, which has a mass of 2.268 g. Report the sum of these masses in scientific notation.

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2. A signal is transmitted between four microwave signal towers. The distances between the towers is 2.50 km, 2.500×10^{1} km, and 5.0×10^{-1} km. What is the total distance traveled by the signal?

3. ~~The adult house fly lives for only about 1 month, or 8×10^{-2} y. The oldest~~ recorded age of a tortoise was 1.8800×10^{2} y. What is the difference between these two ages?

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4. The ink needed to dot an *i* in this book has a mass of around 0.000000001 kg. What is the mass of ink needed to dot all of the *i*'s in this problem?

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PROBLEM

The Friends of St. Catherine's Hospice, from Crawley, United Kingdom, made a blanket that measured 4.5×10^{3} cm by 7.7×10^{3} cm. It was later split into more than 1,450 smaller blankets, which were donated to charity. What was the overall area of the original blanket in square centimeters (cm^2)?

SOLUTION

Step 1: List the given and unknown values.

Given: *length,* $l = 4.5 \times 10^{3}$ cm

width, $w = 7.7 \times 10^{3}$ cm

Unknown: *area,* $A = ?$ cm^2

Step 2: Write the equation for area.

$$A = l \times w$$

Step 3: Insert the known values into the equation, and solve.

$$A = (4.5 \times 10^{3}\ \text{cm})\ (7.7 \times 10^{3}\ \text{cm})$$

Regroup the values and units as follows.

$$A = (4.5 \times 7.7)(10^{3} \times 10^{3})(\text{cm} \times \text{cm})$$

When multiplying, add the powers of 10.

$$A = (4.5 \times 7.7)(10^{3+3})(\text{cm} \times \text{cm})$$

$$A = 35 \times 10^{6}\ \text{cm}^2$$

$$A = 3.5 \times 10^{7}\ \text{cm}^2$$

PRACTICE

5. The Republic of China presented one of the world's largest flags to the city of Kaohsiung in 1989. The flag of the Republic of China measured 1.26×10^4 cm by 8.40×10^3 cm. What is the area of this flag in square centimeters?

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6. Certain large cardboard boxes are manufactured by a packaging plant for an appliance outlet store. Each box has dimensions of $1.88 \times 1.65 \times 1.25$ m. What is the volume of the box in cubic centimeters (cm^3)?

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7. One of the greatest meteor showers ever recorded occurred on the night of November 17, 1966. The Leonid meteors, so called because they appear to originate in the constellation Leo, were visible from western North America to eastern Russia. Scientists calculated that meteors passed over Arizona at a rate of 1.38×10^5 per hour for 3.33×10^{-1} hours. Calculate how many meteors passed over Arizona that night.

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8. The moon is Earth's closest neighbor and its only natural satellite. The moon has an average orbital speed of 1.03×10^3 m/s. If the mass of the moon is 7.35×10^{22} kg, calculate its momentum using the equation *momentum = mass × speed.*

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PROBLEM

Gold, one of the densest elements, is so dense that 1.0 cm^3 of the element has a mass of 1.93×10^1 g. If you have a sample of gold with a mass of 2.54×10^2 g, what is its volume?

SOLUTION

Step 1: List the given and unknown values.

Given: *mass,* $m = 2.54 \times 10^2$ g

density, $D = 1.93 \times 10^1$ g/cm^3

Unknown: *volume,* $V = ?$ cm^3

Step 2: Write the equation for volume.

$V = m/D$

Step 3: Insert the known values into the equation, and solve.

$$V = \frac{2.54 \times 10^2 \text{ g}}{1.93 \times 10^1 \text{ g/cm}^3}$$

Regroup the values and units as follows:

$$V = \left(\frac{2.54}{1.93}\right)\left(\frac{10^2}{10^1}\right)\left(\frac{g}{g/cm^3}\right)$$

When dividing, subtract the denominator's power of 10 from the numerator's power of 10.

$$V = \left(\frac{2.54}{1.93}\right) \times \left(\frac{10^{2-1}}{1}\right)\left(\frac{g}{g/cm^3}\right)$$

$$V = 1.32 \times 10^1 \text{ cm}^3$$

PRACTICE

9. Use the equation *speed = distance/time* to find the speed of a freight train that travels 3.7×10^6 m in 3.13×10^5 s.

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10. On November 1, 1965, the first high-speed Japanese bullet trains, called *Shinkansen,* provided regular scheduled service at speeds averaging over 45 m/s. Calculate the average speed of a *Shinkansen* that traveled between the Japanese cities of Tokyo and Osaka, a distance of 5.17×10^5 m, in 1.14×10^4 s.

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11. One of the longest nonstop delivery flights by a commercial jet occurred August 16–17, 1989, when a Boeing 747-400 jet flew 1.81×10^7 m from London, England, to Sydney, Australia. The average speed of the jet was 2.49×10^2 m/s. Calculate how long it took this commercial airliner to reach its destination, using the equation *time = distance/speed.*

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12. Any long piece of wire, rope, or cable that is made of an unchanging substance and has a uniform thickness is said to have a constant linear density. Linear density is measured in units of mass per unit length. Suppose you have a copper wire that has a linear density of 1.75×10^2 g/m. If the mass of the wire is 4.85×10^3 g, how long is the wire? (**Hint:** Use the equation *length = mass/linear density.*)