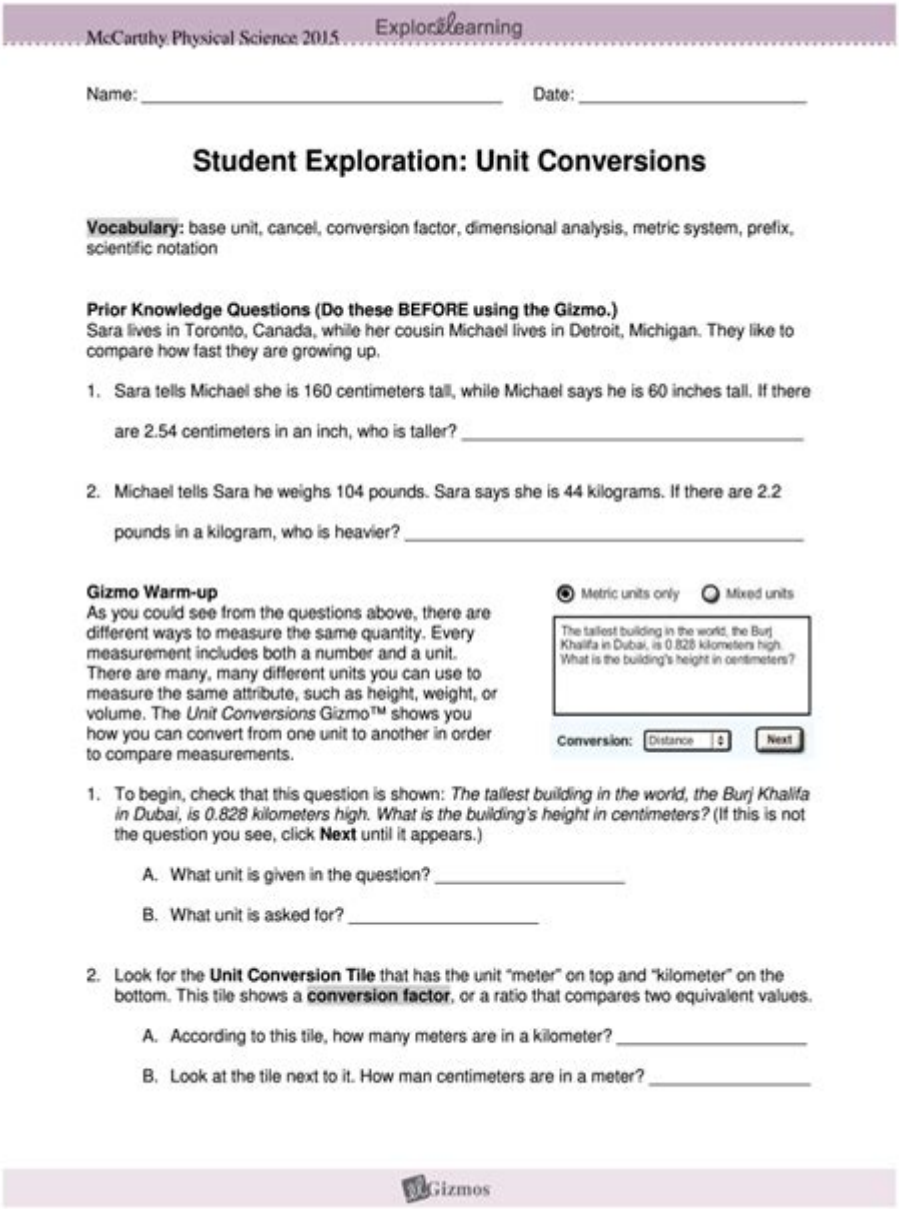
Student Exploration Unit Conversions Answer Key



McCarthy Physical Science 2015 Explore Learning

Name: _____ Date: _____

Student Exploration: Unit Conversions

Vocabulary: base unit, cancel, conversion factor, dimensional analysis, metric system, prefix, scientific notation

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)
Sara lives in Toronto, Canada, while her cousin Michael lives in Detroit, Michigan. They like to compare how fast they are growing up.

1. Sara tells Michael she is 160 centimeters tall, while Michael says he is 60 inches tall. If there are 2.54 centimeters in an inch, who is taller? _____

2. Michael tells Sara he weighs 104 pounds. Sara says she is 44 kilograms. If there are 2.2 pounds in a kilogram, who is heavier? _____

Gizmo Warm-up
As you could see from the questions above, there are different ways to measure the same quantity. Every measurement includes both a number and a unit. There are many, many different units you can use to measure the same attribute, such as height, weight, or volume. The *Unit Conversions* Gizmo™ shows you how you can convert from one unit to another in order to compare measurements.

Metric units only Mixed units

The tallest building in the world, the Burj Khalifa in Dubai, is 0.828 kilometers high. What is the building's height in centimeters?

Conversion: Distance Next

1. To begin, check that this question is shown: *The tallest building in the world, the Burj Khalifa in Dubai, is 0.828 kilometers high. What is the building's height in centimeters?* (If this is not the question you see, click **Next** until it appears.)
   A. What unit is given in the question? _____
   B. What unit is asked for? _____

2. Look for the **Unit Conversion Tile** that has the unit "meter" on top and "kilometer" on the bottom. This tile shows a **conversion factor**, or a ratio that compares two equivalent values.
   A. According to this tile, how many meters are in a kilometer? _____
   B. Look at the tile next to it. How man centimeters are in a meter? _____

Gizmos

Student exploration unit conversions answer key is an essential resource for assisting students in understanding the concept of unit conversions in various scientific and mathematical contexts. Unit conversions are a fundamental skill that allows students to work with different measurement systems, which is particularly important in fields such as physics, chemistry, and engineering. This article will delve into the significance of unit conversions, methods for performing them, common units used, and provide an example answer key for a typical student exploration activity on unit conversions.

Understanding Unit Conversions

Unit conversions involve changing a quantity expressed in one unit to another unit without altering its value. For instance, converting 10 kilometers to meters involves multiplying by a conversion factor, since 1 kilometer is equal to 1,000 meters. Understanding how to convert between units is crucial for various reasons:

1. Interdisciplinary Relevance: Unit conversions are necessary across multiple disciplines, including science, engineering, and everyday life situations.
2. Enhancing Problem-Solving Skills: Mastering unit conversions enhances students' problem-solving capabilities by encouraging them to think critically about the relationships between different measurements.
3. Real-World Applications: Many professions require knowledge of unit conversions, such as healthcare (dosage calculations), construction (measurement of materials), and automotive industries (fuel efficiency).

Methods of Unit Conversion

There are several methods to perform unit conversions:

1. Using Conversion Factors

A conversion factor is a ratio that expresses how many of one unit are equal to another unit. To use conversion factors effectively, follow these steps:

- Identify the given quantity and its unit.
- Determine the desired unit for the conversion.
- Find the appropriate conversion factor that connects the two units.
- Multiply the original quantity by the conversion factor.

For example, to convert 5 meters to centimeters:

- Given: 5 meters
- Desired unit: centimeters
- Conversion factor: 1 meter = 100 centimeters
- Calculation: 5 meters × (100 centimeters / 1 meter) = 500 centimeters

2. Dimensional Analysis

Dimensional analysis involves using units as fractions to cancel out units and convert between them. This method can be visually appealing and helps in ensuring accuracy. Here's how it works:

- Write the original measurement with its unit.

- Set up the conversion factors as fractions that will cancel out the original unit.
- Multiply across the numerators and denominators to get the final answer.

For instance, converting 3.5 kilograms to grams:

- Original measurement: 3.5 kg
- Conversion factor: 1 kg = 1,000 g
- Setup: 3.5 kg × (1,000 g / 1 kg) = 3,500 g

3. Using Proportions

Another method involves setting up a proportion based on the relationship between the two units. This approach is particularly useful for students who are familiar with solving equations.

For example, to convert 60 miles to kilometers (1 mile ≈ 1.60934 km):

- Setup the proportion:
$$
\frac{60 \text{ miles}}{x \text{ km}} = \frac{1 \text{ mile}}{1.60934 \text{ km}}
$$
- Cross-multiply and solve for x:
$$
x = 60 \times 1.60934 \approx 96.5604 \text{ km}
$$

Common Units Used for Conversion

Understanding the common units used in conversions is vital. Below are some categories and examples of units that students often encounter:

Length

- Inches to centimeters (1 inch = 2.54 cm)
- Feet to meters (1 foot = 0.3048 m)
- Miles to kilometers (1 mile ≈ 1.60934 km)

Weight

- Ounces to grams (1 ounce = 28.3495 g)
- Pounds to kilograms (1 pound ≈ 0.453592 kg)
- Tons to kilograms (1 ton = 1,000 kg)

Volume

- Gallons to liters (1 gallon ≈ 3.78541 L)
- Quarts to liters (1 quart ≈ 0.946353 L)
- Pints to milliliters (1 pint ≈ 473.176 mL)

Temperature

- Celsius to Fahrenheit (F = C × 9/5 + 32)
- Fahrenheit to Celsius (C = (F - 32) × 5/9)

Example of a Student Exploration Unit Conversions Activity

A typical student exploration unit conversion activity might involve various problems that require students to practice converting between different units. Below is a sample list of problems along with a corresponding answer key:

Sample Problems

1. Convert 1500 milliliters to liters.
2. Convert 5.5 feet to inches.
3. Convert 100 grams to pounds.
4. Convert 2 hours to minutes.
5. Convert 45 miles to kilometers.

Answer Key

1. 1500 milliliters to liters:
- Calculation: 1500 mL × (1 L / 1000 mL) = 1.5 L

2. 5.5 feet to inches:
- Calculation: 5.5 ft × (12 in / 1 ft) = 66 in

3. 100 grams to pounds:
- Calculation: 100 g × (1 lb / 453.592 g) ≈ 0.2205 lb

4. 2 hours to minutes:
- Calculation: 2 hr × (60 min / 1 hr) = 120 min

5. 45 miles to kilometers:
- Calculation: 45 miles × (1.60934 km / 1 mile) ≈ 72.4203 km

Conclusion

The student exploration unit conversions answer key serves as a vital educational tool that enhances students' understanding of unit conversions. By mastering the techniques of using conversion factors, dimensional analysis, and proportions, students can confidently navigate various scientific and mathematical problems involving different measurement systems. Understanding common units and their conversions is not only essential for academic success but also for practical applications in everyday life and numerous professions. As students engage with these concepts, they develop critical thinking and problem-solving skills that will benefit them throughout their academic and professional journeys.

Frequently Asked Questions

What is the importance of unit conversions in scientific experiments?

Unit conversions are crucial in scientific experiments as they ensure that measurements are comparable and accurate, allowing scientists to communicate findings effectively and maintain consistency in data analysis.

What types of units are commonly converted in student exploration activities?

Commonly converted units include length (meters to feet), mass (grams to pounds), volume (liters to gallons), and temperature (Celsius to Fahrenheit), among others.

How can students practice unit conversions effectively?

Students can practice unit conversions through hands-on activities, online simulations, and worksheets that involve real-life scenarios, enhancing their understanding and application of the concepts.

What tools are available for students to check their unit conversion answers?

Students can use calculators, conversion charts, online conversion tools, and educational software that provide instant feedback and explanations for their unit conversion answers.

What common mistakes do students make when performing unit conversions?

Common mistakes include forgetting to convert all units appropriately, miscalculating the conversion factors, and not paying attention to the dimensional analysis, leading to incorrect final results.

How does understanding unit conversions benefit students in real-world applications?

Understanding unit conversions benefits students in real-world applications by enabling them to solve practical problems in cooking, construction, travel, and science, where accurate measurements are essential.

Student Exploration Unit Conversions Answer Key

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