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Conceptual Physics: _____
Date: _____

Unit I
Introduction to Conceptual Physics
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I

No Need to Count Your Pennies

Have you ever saved pennies, nickels, or dimes? If you have, you probably took them to the bank in paper wrappers provided by the bank. Tellers at the bank could take the time to open each roll and count the coins to determine their dollar value. However, counting is not necessary because tellers use a better system. They use the properties of the coins instead.

A penny, a nickel, and a dime each has a particular mass and thickness. Therefore, a roll of coins will have a certain mass and length. These two properties—mass and length of a roll of coins—are often used to determine the dollar value of the coins in the roll.

Objectives

In this experiment, you will

- develop measuring skills using a balance and a metric ruler,
- use graphing skills to make interpretations about your data, and
- compare the relationships among the mass, length, and number of coins in a roll.

Equipment

- 10 coins (all of the same type)
- balance
- metric ruler
- roll of coins

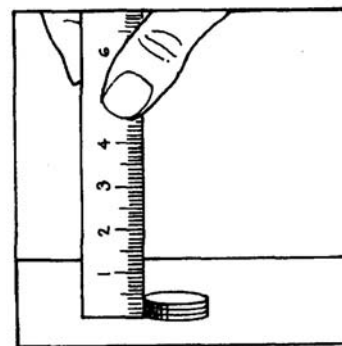


Figure 2-1.

Procedure

1. Using the balance, determine the mass of 1 coin, 2 coins, 3 coins, 4 coins, 6 coins, 8 coins, and 10 coins to the nearest 0.1 g. Record the masses in Data Table.
2. Measure the thickness of 1 coin, 2 coins, 3 coins, 4 coins, 6 coins, 8 coins, and 10 coins to the nearest 0.5 mm. See Figure 2-1. Record these values in the table.
3. Record the number of coins in the roll in the table. Use the balance to find the mass of the roll of coins. Measure the length of the roll. Record these values in the table.

Data Table

# of Coins	Mass (0.1 g)	Thickness (mm)
1		
2		
3		
4		
6		
8		
10		
Roll (# _____)		(length)

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Analysis

1. Make two graphs of the information in Table 2-1. On the first graph, show the number of coins on the x axis and the mass of the coins on the y axis. The second graph should compare the number of coins (x axis) to the total thickness of the stacked coins (y axis). Be sure to label each axis.
2. Draw a line connecting the points on each graph.

Conclusions

1. Describe the appearance of the curve or line in each graph.
2. What errors could exist in your measurement of the mass and the length of the coin roll?
3. Which of the errors in question 2 would have real importance for a bank teller?
4. Do your data show a difference in the mass of different coins? Explain your answer.
5. Do your data show a difference in the thickness of different coins? Explain your answer.
6. Could you use the mass of 1 coin to determine the mass of 2, 3, 4, 6, 8, and 10 coins? Why or why not?

Going Further

Describe a procedure in which you could determine the number of coins using the mass of the coins and one of your graphs.

Discover

Which method is used to count wrapped coins at your local bank? Find out why your bank uses this particular method.