Problem

Xiaomei has four coins in her pocket: a penny, a dime, a nickel, and a quarter. Suppose she reaches in and pulls out one coin, without looking.

a) What is the probability that the coin in her hand is a dime?

b) In the table at right, list the possible sets of coins remaining in Xiaomei's pocket. (One possibility is given.)

Coin in hand	Remaining coins
5¢	1¢, 10¢, 25¢

c) What is the probability that the total value of the coins remaining in her pocket is greater than 30 cents? less than 30 cents? Explain how you arrive at your answer.

Extension:

1. Suppose instead that Xiaomei has two pennies, a nickel, a dime, and a quarter in her pocket.

   (i) Would your answers to a) and c) change? Explain.

   (ii) If she reaches in and pulls out one coin, what is the probability that the change in her pocket totals more than 40 cents?

Hints

Suggestion: Before students begin this problem, you may wish to review the idea that the probability of a desired outcome or event is the ratio of the number of ways the desired event can occur to the total number of outcomes possible.

Part c)

Hint 1 - What are the possible total values of the different sets of remaining coins?

Hint 2 - How many of these total values exceed 30 cents?

Extension:

Hint 1 - How does the fact that there are now two pennies affect the probabilities?

Solution

a) Since only one of the four coins in Xiaomei's pocket is a dime, the probability that she has pulled out a dime is one in four, or $\frac{1}{4}$. (This assumes that she does not look at or feel the coins, but just reaches into her pocket and pulls out the first coin she touches.)

b) The completed table is shown at right.

c) Since the total value of the remaining coins is greater than 30 cents for 3 of the 4 outcomes, the probability is $\frac{3}{4}$. Thus only 1 outcome has a total value less than 30 cents, giving a probability of $1 - \frac{3}{4} = \frac{1}{4}$.

Coin in hand	Remaining coins
5¢	1¢, 10¢, 25¢
1¢	5¢, 10¢, 25¢
10¢	1¢, 5¢, 25¢
25¢	1¢, 5¢, 10¢

Extension:

(i) Since there are now 5 possible outcomes (there are 2 ways to choose a penny), the probability of choosing a dime is now $\frac{1}{5}$. Similarly, there are now 4 ways she can end up with the value of the remaining coins greater than 30 cents, so that probability is now $\frac{4}{5}$, and the probability the total is less than 30 cents is now $\frac{1}{5}$.

(ii) The remaining value is greater than 40 cents only if she pulls out a penny. Thus the probability is $\frac{2}{5}$, since there are 2 ways this desired outcome can occur, given that there are two different pennies.