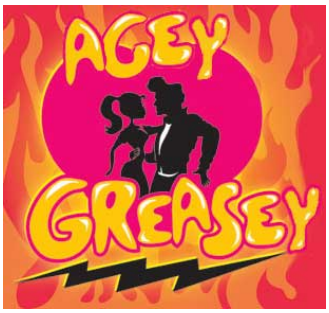
Problem



Axel pays with a $20.00 bill to buy the new Acey-Greasey CD, which costs $19.59, including tax. Eager to get home so he can rip the CD onto his MP3 player, he pockets the change without counting it.

a) If Axel has at least two dimes, what are the possible combinations of coins in his pocket?

b) If all types of coins (quarters, dimes, nickels and pennies) are available, what combination of coins would the cashier most likely give to Alex?

Extensions :

1. Axel discovers he has 10 coins in his pocket. Could he have the correct change? Explain. (You need not assume he has only two dimes.)

2. Could he have the correct change with 18 coins? Explain.

Hints

Part a)

Hint 1 - How much change did Axel get?

Hint 2 - Make a chart/table (as shown at right).

Hint 3 - Given that he has at least 2 dimes, how much change consists of other coins?

Dimes	Nickels	Pennies	Total No. of Coins
2	?	?	
2	?	?	
⋮			
3	?	?	
⋮			
4	?	?	

Part b)

Hint 1 - Would the cashier give as many coins as possible, or the fewest coins possible?

Suggestion: Give the students mock coins to work with.

Solution

a) Axel should have a total of 41¢ in change. If he has two dimes, he must have 21¢ in nickels and pennies; if he has three dimes, he must have 11¢ in nickels and pennies; if he has four dimes, he can have just one penny. The possible combinations are shown in the table to the right.

Suggestion: You many wish to discuss with students the patterns in the total number of coins (e.g., when one nickel is replaced by five pennies, the number of coins increases by four.)

Dimes	Nickels	Pennies	Total No. of Coins
2	0	21	23
2	1	16	19
2	2	11	15
2	3	6	11
2	4	1	7
3	0	11	14
3	1	6	10
3	2	1	6
4	0	1	5

b) Without assuming he has two dimes, the most likely combination would be one quarter, one dime, one nickel, and one penny, which gives the fewest number of coins.

Extensions:

1. If Axel has 10 coins, he could have the correct change, with 3 dimes, 1 nickel, and 6 pennies.
2. If Axel has 18 coins, then he must have incorrect change. Adding to the table in part a) the possibilities for one quarter, and for no quarters (with no dimes, or 1 dime), reveals that no combination of 18 coins has a value of 41¢.