

Money Problems

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Part I:

I have pennies (1¢), nickels (5¢), dimes (10¢), and quarters (25¢).

You are allowed to take as many coins from me as you would like, however, no subset of coins you take can add to \$1.00.

What is the largest amount of money you can take from me? \$ ____.

Part II:

This time, you are allowed to take as many coins from me as you would like, however, no more than one subset of coins you take can add to \$1.00.

What is the largest amount of money you can take from me? \$ ____.

Part III:

In how many distinct ways can you take coins that sum to 25¢ ? ____

Solutions:

Part I:

The largest amount of money that can be made with quarters (Q), dimes (D), nickels (N), and pennies (P), such that no subset of coins add to \$1.00 is \$1.19. There are two possible solutions:

$$\begin{array}{rclclcl} 3Q & 4D & 0N & 4P & = & \$1.19 \\ 1Q & 9D & 0N & 4P & = & \$1.19. \end{array}$$

Part II:

The largest amount of money that can be made with quarters (Q), dimes (D), nickels (N), and pennies (P), so that no more than one subset of coins add to \$1.00 is \$1.44. The only possible solution in this instance is

$$4Q \quad 4D \quad 0N \quad 4P \quad = \quad \$1.44.$$

Part III:

There are 13 ways to construct 25¢ using quarters (Q), dimes (D), nickels (N), and pennies (P):

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|-----|----|----|----|------|
| 1. | 1Q | | | |
| 2. | | 2D | 1N | |
| 3. | | 2D | | 5P |
| 4. | | 1D | 3N | |
| 5. | | 1D | 2N | 5PP |
| 6. | | 1D | 1N | 10P |
| 7. | | 1D | | 15P |
| 8. | | | 5N | |
| 9. | | | 4N | 5P |
| 10. | | | 3N | 10P |
| 11. | | | 2N | 15P |
| 12. | | | 1N | 20P |
| 13. | | | | 25P. |