

## Problem of the Month



### Courtney's Collection



#### Level A:

Courtney has a bank of pennies, nickels and dimes. Courtney pulled out three coins from the bank. Name the coins she picked. How much money does she have?

Show how you figured it out.

Show a different way that Courtney could pick three coins. How much does Courtney have now? Show how you figured it out.

## Level B:

How many different ways can Courtney pick three coins out of her bank? Show all the ways you can find.

What are the different amounts of money Courtney would have by picking any three coins?

How do you know you found all the possible ways?  
Explain your answer.

## Level C:

Courtney visited her grandmother. Her grandmother used to collect stamps. She had a shoebox full of 5 cents, 6 cents and 7 cents stamps. Courtney thought, "I could mail a lot of different size letters and postcards with these stamps." She tried to figure out the different amount of postage she could make with a combination of those stamps. What totals could she make and what totals are impossible?

Explain how you found your solution. How do you know your solution is correct?

## Level D:

Courtney's grandmother said, "Your grandpa has different shoe boxes with other stamps. His shoebox has just 4 cents, 6 cents and 8 cents stamps. Which totals can you make with these stamps?"

Courtney said, "I wonder why there is a difference between Grandma's and Grandpa's shoeboxes. I like finding the largest total I can't make, but Grandpa's box has an unlimited amount of totals I can't make. I wonder why it works for some and not for others?" She continues, "I am going to investigate which three stamp amounts are like the Grandma's shoebox and which three stamp amounts are like the Grandpa's shoebox. I am going to compare three different sets. I will try: 6 cents, 7 cents and 8 cents. Then I will try: 6 cents, 9 cents and 12 cents. Finally I will try: 6 cents, 8 cents and 9 cents."

Explain how the three different sets are like either Grandma's shoebox or Grandpa's shoebox.

## Level E:

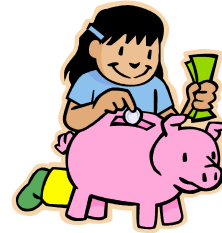
Determine a method for predicting whether a given set of any three stamps would have a largest impossible total or there isn't a largest impossible total, rather there are infinite impossible totals. Justify your method using mathematical reasoning.

For those sets of three stamps that have a largest impossible total, make a conjecture about how to find that total.

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**Materials:** A set of coins (pennies, nickels, dimes several of each kind) in a container for each pair of students. Paper and pencil, crayons, or markers to use, write or draw.

**Discussion on the rug:** "What is a piggy bank?" (Teacher asks the students questions about where there might be a collection of coins. If a bank is not familiar, then maybe introduce a jar of coins.) (Teacher holds a collection of coins in a container.) "Suppose I pick three coins from my bank/jar, name the coins I might pick." (The teacher encourages the students to find answers for different arrangement of three coins.)

**In small groups:** (Each group has a set of coins in a container.) (Teacher asks the following questions. Go on to the next question if students have success.)

1. Name the three coins you picked out of your bank/jar? How much money do you have in all? Show how you know?
2. Now name three more coins you can pick from your bank/jar. How much money do you have in all?

(At the end of the investigation, have students either draw a picture or dictate to you to represent their solutions.)