Melissa started saving money last spring to take her family to the zoo during their family reunion. She collected $51. The cost of admission is $5 for adults (non-seniors), $2 for senior citizens, and $3 for children. She wants to take all eight of the children, including herself, and as many adults and senior citizens as possible. What are all the combinations of adults and senior citizens Melissa can take so that all of the money is spent on admissions?

**Extra:** What if she doesn’t need to spend all of the money? Is there a way she could take more people with her?

**MATH STANDARDS ALIGNMENT:**
Interpret products of whole numbers, e.g., interpret $5 \times 7$ as the total number of objects in 5 groups of 7 objects each.

**Personal Finance Big Ideas:**
*Opportunity Cost, Cost/Benefit Analysis, Scarcity, Setting Goals*

**METHOD 1: FINDING COMBINATIONS – GUESS AND CHECK**
First I multiplied $8 \times 3 = 24$ because there are 8 kids and each kid costs $3. Then I subtracted $51 - 24 = 27$. This is how much money I have to spend on adults and senior citizens. Each adult is $5$ and each senior citizen is $2$. Then I made a chart, see below to answer the question:

<table>
<thead>
<tr>
<th>Adult ($5$)</th>
<th>SC ($2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ($25$)</td>
<td>1 ($2$)</td>
</tr>
<tr>
<td>4 ($20$)</td>
<td>Can't equal $27$</td>
</tr>
<tr>
<td>3 ($15$)</td>
<td>6 ($12$)</td>
</tr>
<tr>
<td>2 ($10$)</td>
<td>Can't equal $27$</td>
</tr>
<tr>
<td>1 ($5$)</td>
<td>11 ($22$)</td>
</tr>
<tr>
<td>0 ($0$)</td>
<td>Can’t equal $27$</td>
</tr>
</tbody>
</table>

The answers are 3 combinations of (Adult, SC) 5,1 and 3,6 and 1,11.

**EXTRA BONUS:** Yes there is a way to take more people. Instead of taking an adult you can take 2 senior citizens and save $1. She can also take more children because 3 children cost $1 less than 2 adults.
METHOD 2
1) If Melissa brought 8 kids including herself you would need to multiply 8 x $3 because each child’s admission is $3. The product was $24.

2) Next I did $51 - $24 to get the amount of money Melissa had leftover. This money would be spent on adults and senior citizens. The difference was $27.

3) To go about solving the combinations of adults and seniors I made an organized list. I knew the most amounts of adults Melissa could bring were 5. Because each adult’s admission cost $5, $25 would be spent if Melissa brought 5 adults. This would leave $2, exactly enough to bring 1 senior.

4) 4 adults was the next possibility but that would mean $20 would be spent leaving $7. $2 (the amount per senior citizen) did not go into $7 evenly so Melissa would not spend all her money.

5) Bringing 3 adults would work because 3 x $5 = $15 and then she would have $12 left. $2 goes into $12 six times evenly meaning Melissa could bring 6 seniors along with the 3 adults.

6) I now knew Melissa could only bring an odd number of adults because she wanted to spend all the money. I also knew that you added 5 seniors every time you went to the next possible number of adults. So I went to my last possible number of adults, 1. And because the last possible number of seniors was 6, I added 5 to that and got 11.

EXTRA: If Melissa did not need to spend all the money, then she could bring 4, 2, or 0 adults. I needed to figure out how many seniors she would bring if she brought 4, 2, or 0 adults. I knew that once I knew how many seniors Melissa would bring if she brought 4 adults then I could use the pattern I used above. She would bring 3 seniors if she brought 4 adults. By subtracting 2 adults I got my answer. Melissa could bring 4 adults and 3 seniors, 2 adults and 8 seniors, or 0 adults and 13 seniors. Therefore Melissa could bring more people if she did not need to spend all the money.

METHOD 3
To figure out this problem I knew that all eight children including herself were $24 in all because I did 8 x $3 because there are 8 children and each child is three dollars each.

That equaled $24 so I did $51 - $24 because $51 is how much money she had in the beginning. That equaled $27.

That is how much she had to split between the senior citizens which are $2 each and the adults which are $5 each.

I first tried it with just one adult. I did 1 x 5 = $5 for 1 adult. Then I did $27 - $5 = $22 left.

So then I did $22 / $2 because I want to find how many senior citizens I can bring with $22. The answer is 11 senior citizens. Then I tried 2 adults.

I did the same process and got 8.5 senior citizens. Then I tried 3 adults and got 6 senior citizens. Then I found that five adults meant 1 senior citizen. I went through all the numbers of adults and senior citizens and found that there were only three ways that would make sense.
For example, you couldn't bring half of a person. The three ways are 8 children, 11 senior citizens, and 1 adult. That would be 20 people.

The second possibility would be 8 children, 6 senior citizens, and 3 adults. That would be 17 people in all.

The third and final way would be 8 children, 1 senior citizen, and 5 adults. That would be 14 people in all.

**EXTRA:** A way that she can take more people without spending all of her money is to bring all 8 children including herself and 13 senior citizens. That would be $24 for the kids and $26 for the senior citizens because each kid is $3 and $3 x 8 = $24 and each senior citizen is $2 dollars and $2 x 13 = $26. $24 + $26 = $50. If there is $51 in all then she would have $1 left.