“When I added up all of my holiday checks from my relatives, I had $180,” bragged Michelle.

“Mine added up to $250, and I had a good idea! If I put it all in the bank and only take out $10 a week, I can make it last 'til my birthday!” replied her friend Jamila.

“Well then I’m only going to take out $7 a week... but I’ll bet pretty soon I’ll have as much money in my account as you do!”

Will Michelle and Jamila ever have equal account balances? Will Michelle ever have more money in her account than Jamila?

Extra: How long will Jamila’s money last? How long will Michelle’s money last?

Opinion: If you received around $200 for a holiday, how would you choose to save or spend the money? Why?

MATH STANDARDS ALIGNMENT

CCSS.MATH.CONTENT.6.EE.C.9: Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

CCSS.MATH.CONTENT.6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

CCSS.MATH.CONTENT.7.EE.B.3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Personal Finance Big Ideas:
What is Money, Time Value of Money, Scarcity
METHOD 1: I NOTICE, I WONDER™

After reading the problem, our group decided to write down everything we noticed.

- Jamila and Michelle got money
- Michelle got $180
- Jamila got $250
- Jamila is going to spend some of her money each week
- Michelle is going to spend some of her money each week too
- Michelle thinks she will catch up with Jamila
- Michelle is going to spend less than Jamila each week
- Michelle is going to spend $7 each week
- Jamila is going to spend $10 each week
- Jamila has $70 more dollars than Michelle
- Jamila is going to spend $3 more dollars than Michelle (each week)

We then wrote down everything we wondered about the problem.

- Why did Jamila get more money than Michelle?
- Is Michelle jealous?
- Will Jamila change her spending so she can keep having the most money?
- Will Michelle really be able to have the same amount of money as Jamila?
- Will they both be able to stick to their spending plans?
- Will they really spend all that money each week?
- What does Michelle spend her money on?
- What does Jamila spend her money on?
- Who will run out of money first?
- When is Jamila’s birthday?

We had noticed that since Jamila had $250 and Michelle had $180, then Jamila had $70 more dollars. We found that our by subtracting:

$$250 - 180 = 70$$

We had also noticed that since Jamila planned to spend $10 a week and Michelle planned to spend $7 a week, then Jamila spent $2 more dollars each week. We found that our by subtracting:

$$10 - 7 = 3$$

We then divided 70 by 3 to see how many weeks it would take them to have the same amount of money:

$$70 ÷ 3 = 23.3333$$
The result isn’t a whole number of weeks. So if they just take the money out once a week, they won’t have exactly the same balance. After 23 weeks of this plan we think that Jamila will still have more money, but after 24 weeks, Michelle will have the most. We checked our thinking for 23 weeks:

Jamila: $23 \times \$10 = \$230$ so Jamila would have spent $\$230$ of her $\$250$. $\$250 - \$230 = \$20$

Michelle: $23 \times \$7 = \$161$ and $\$180 - \$161 = \$19$

We noticed that the difference in money was only 1 dollar, but that Jamila still had the most money. So we checked our thinking for 24 weeks:

Jamila: $24 \times \$240 = \$240$ and $\$250 - \$240 = \$10$

Michelle: $24 \times \$7 = \$168$ and $\$180 - \$168 = \$12$

We noticed that now Jamila has $2 less than Michelle and so after looking at their bank balances for Week 23 and Week 24 we know that they’ll never have the same amount of money in the bank. The smallest difference will be one dollar, and after that Michelle will have more than Jamila, but they both will run out of money really soon. So Michelle did catch up, but maybe not as quickly as she hoped.

**Extra:** Since Jamila only has $10 left at week 24, and Michelle only has $12, by week 25 Jamila will have $0 in her bank account and Michelle will have $5 but not enough to make her full withdrawal in week 26. So their money lasts for 25 weeks for Jamila, and between 25 and 26 for Michelle.

**METHOD 2: MAKE A TABLE**

We decided to make a table with how much money each person had after every week. We started off with the first couple of weeks, but then realized there wasn’t much of a difference so we increased our weeks to 10, then again to 20.

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Jamila</th>
<th>Michelle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$250 - 10 = 240$</td>
<td>$180 - 7 = 172$</td>
</tr>
<tr>
<td>2</td>
<td>$250 - 10(2) = 250 - 20 = 230$</td>
<td>$180 - 7(2) = 180 - 14 = 166$</td>
</tr>
<tr>
<td>3</td>
<td>$250 - 10(3) = 250 - 30 = 220$</td>
<td>$180 - 7(3) = 180 - 21 = 159$</td>
</tr>
<tr>
<td>10</td>
<td>$250 - 10(10) = 250 - 100 = 150$</td>
<td>$180 - 7(10) = 180 - 70 = 110$</td>
</tr>
<tr>
<td>20</td>
<td>$250 - 10(20) = 250 - 200 = 50$</td>
<td>$180 - 7(20) = 180 - 140 = 40$</td>
</tr>
<tr>
<td>21</td>
<td>$250 - 10(21) = 250 - 210 = 40$</td>
<td>$180 - 7(21) = 180 - 147 = 33$</td>
</tr>
<tr>
<td>22</td>
<td>$250 - 10(22) = 250 - 220 = 30$</td>
<td>$180 - 7(22) = 180 - 154 = 26$</td>
</tr>
<tr>
<td>23</td>
<td>$250 - 10(23) = 250 - 230 = 20$</td>
<td>$180 - 8(23) = 180 - 396 = 104$</td>
</tr>
</tbody>
</table>

We decided to stop at 23 weeks because we noticed that this was only a 1 dollar difference. The next week Michelle and Jamila wouldn’t have the exact same amount of money, but Michelle would have more.

Instead of increasing from 20 weeks to 30 weeks we noticed that at the 20 week mark the difference in money between the two people was pretty close so we decided to just increase by 1 week instead of 10.
Extra: We wanted to figure out how many weeks it took Jamila to run out of all of her money. We divided:

250 ÷ 10 = 25

We got 25 weeks for Jamila to run out of money.

We did the same for Michelle:

180 ÷ 7 = 25.714285…

We noticed that Michelle wouldn’t run out of money at an exact week. After 25 weeks she would have some left over but not a full $7 so she wouldn’t be out of money until 26 weeks were up but she would only be able to do her plan of taking out $7 for 25 weeks.

METHOD 3: ALGEBRAIC REASONING

We wanted to know how many weeks it would take for the two people to have equal bank accounts. We knew that they each took out money weekly so based on the information given we were thinking:

$250 – 10(# of weeks) = $180 – 7(# of weeks)

The left side of the equation is Jamila’s money and the right side is Michelle’s money.

We subtracted 180 from both sides and added 10(# of weeks) to both sides leaving us with:

70 = 3(# of weeks)

We then divided 70 ÷ 3 and got 23.3333 weeks.

We saw that it didn’t come out with a whole number of weeks. We multiplied the money taken out for each person by the number of week:

Jamila: 23 x $10 = $230
Michelle: 23 x $7 = $161

Then we subtracted that from their starting amounts:

Jamila: $250 - $230 = $20
Michelle: $180 - $161 = $19.

We learned that after 23 weeks they don’t have the same amount of money, but Michelle is within one dollar of Jamila. After they make their next withdrawals, Jamila will have $10 and Michelle will have $12, so Michelle will start having more money in the 24th week.
METHOD 4: ALGEBRA

We decided to write an equation using a variable. We wanted to know how many weeks it would take for the two people to have equal bank accounts. We knew that they each took out money weekly so based on the information given we set up the equation, letting w equal the number of weeks.

\[ 250 - 10w = 180 - 7w \]

The left side of the equation represents Tamil’s money and the right side represents Nydiyah’s money. We subtracted 180 from both sides and added 10w to both sides leaving us with:

\[ 70 = 3w \]

We divided 70 by 3 and got 23.3333 weeks.

We saw that it didn’t come out as a whole number of weeks. We figured that meant Michelle would never have the exact same amount of money as Jamila, but we rounded up to check that after 24 weeks Michelle would have more than Jamila, and she did.

Jamila: 250 - 24 x $10 = $10
Michelle: 180 - 24 x $7 = $12