Unit 7, Lesson 5

Using Negative Numbers to Make Sense of Contexts

Let's make sense of negative amounts of money.

5.1 Notice and Wonder: It Comes and Goes

What do you notice? What do you wonder?

item	quantity	value in dollars
hammer	-12	85.14
washer	300	-15.00
bolt	-25	10.54
nail	500	-22.50
wrench	-4	51.88
flashlight	-18	123.23

5.2 The Hardware Store

The manager of a hardware store keeps records of all of the items purchased and sold. The table shows some of the records for Tuesday.

item	quantity	value in dollars
hammer	-12	85.14
washer	300	-15.00
bolt	-25	10.54
nail	500	-22.50
wrench	-4	51.88
flashlight	-18	123.23

1. Which items were sold at the hardware store on Tuesday? Explain your reasoning.

2. What does -25 mean in this situation?

3. What does -15.00 mean in this situation?

4. On which item did the manager spend the most amount of money? Explain your reasoning.

5.3 Drinks for Sale

A vending machine in an office building sells bottled beverages. The machine keeps track of all changes in the number of bottles from sales and from machine refills and maintenance. This table shows the changes for every 1-hour period over one day.

1. What does a positive number in the second column mean in this context? What does a negative number mean in this context?

time	number of bottles
8:00–8:59	-1
9:00–9:59	+12
10:00–10:59	-4
11:00–11:59	-1
12:00–12:59	-5
1:00–1:59	-12
2:00–2:59	-2
3:00–3:59	0
4:00–4:59	0
5:00–5:59	-6
6:00–6:59	+24
7:00–7:59	0
service	

2. What would a “0” in the second column mean in this situation?

3. Which numbers—positive or negative—result in fewer bottles in the machine?

4. At what time was there the greatest change in the number of bottles in the machine? How did that change affect the number of remaining bottles in the machine?

5. At which time period, 9:00–9:59 AM or 1:00–1:59 PM, was there a greater change to the number of bottles in the machine? Explain your reasoning.

6. The machine must be emptied to be serviced. If there are 40 bottles in the machine when it is to be serviced, what number will go in the second column in the table?

Are you ready for more?

Priya, Mai, and Lin went to a cafe on a weekend. Their shared bill came to $25. Each student gave the server a $10 bill. The server took this $30 and brought back five $1 bills in change. Each student took $1 back, leaving the rest, $2, as a tip for the server.

As she walked away from the cafe, Lin thought, "Wait—this doesn't make sense. Since I put in $10 and got $1 back, I ended up paying $9. So did Mai and Priya. Together, we paid $27. Then we left a $2 tip. That makes $29 total. And yet we originally gave the waiter $30. Where did the extra dollar go?"

Think about the situation and about Lin's question. Do you agree that the numbers didn't add up properly? Explain your reasoning.

Lesson 5 Summary

Changes in a quantity can be represented with positive and negative numbers. If the quantity increases, the change is positive. If it decreases, the change is negative.

- Suppose 5 gallons of water is put in a washing machine. We can represent the change in the number of gallons as +5. If 3 gallons is emptied from the machine, we can represent the change as -3.

It is especially common to represent money we receive with positive numbers and money we spend with negative numbers.

- Suppose Clare gets $30.00 for her birthday and spends $18.00 buying lunch for herself and a friend. To her, the value of the gift can be represented as +30.00 and the value of the lunch as -18.00.

Whether a number is considered positive or negative depends on a person's perspective. If Clare's grandmother gives her $20 for her birthday, Clare might see this as +20 because to her, the amount of money that she has increased. But her grandmother might see it as -20, because to her, the amount of money that she has decreased.

In general, when using positive and negative numbers to represent changes, we have to be very clear about what it means when the change is positive and what it means when the change is negative.