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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

activity	amount
do my chores	30.00
babysit my cousin	45.00
buy my lunch	-10.80
get my allowance	15.00
buy a shirt	-18.69
pet my dog	0.00

What do you notice? What do you wonder?

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5.2: The Concession Stand

The manager of the concession stand keeps records of all of the supplies she buys and all of the items she sells. The table shows some of her records for Tuesday.

item	quantity	value in dollars
doughnuts	-58	37.70
straws	3,000	-10.35
hot dogs	-39	48.75
pizza	13	-116.87
apples	-40	14.00
french fries	-88	132.00

1. Which items did she sell? Explain your reasoning.
2. How can we interpret -58 in this situation?
3. How can we interpret -10.35 in this situation?
4. On which item did she spend the most amount of money? Explain your reasoning.

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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 record shows the changes for every 5-minute period over one hour.

time	number of bottles
8:00–8:04	-1
8:05–8:09	+12
8:10–8:14	-4
8:15–8:19	-1
8:20–8:24	-5
8:25–8:29	-12
8:30–8:34	-2
8:35–8:39	0
8:40–8:40	0
8:45–8:49	-6
8:50–8:54	+24
8:55–8:59	0
service	

1. What might a positive number mean in this context? What about a negative number?
2. What would a “0” in the second column mean in this context?
3. Which numbers—positive or negative—result in fewer bottles in the machine?
4. At what time was there the greatest change to 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, 8:05–8:09 or 8:25–8:29, 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?

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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 wound 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

Sometimes we represent changes in a quantity 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 she has increased. But her grandmother might see it as -20, because to her, the amount of money 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.

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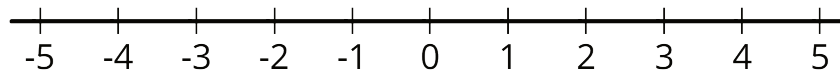
- Write a positive or negative number to represent each change in the high temperature.
 - Tuesday's high temperature was 4 degrees less than Monday's high temperature.
 - Wednesday's high temperature was 3.5 degrees less than Tuesday's high temperature.
 - Thursday's high temperature was 6.5 degrees more than Wednesday's high temperature.
 - Friday's high temperature was 2 degrees less than Thursday's high temperature.
- Decide which of the following quantities can be represented by a positive number and which can be represented by a negative number. Give an example of a quantity with the opposite sign in the same situation.
 - Tyler's puppy gained 5 pounds.
 - The aquarium leaked 2 gallons of water.
 - Andre received a gift of \$10.
 - Kiran gave a gift of \$10.
 - A climber descended 550 feet.
- Make up a situation where a quantity is changing.
 - Explain what it means to have a negative change.
 - Explain what it means to have a positive change.
 - Give an example of each.
- On the number line, label the points that are 4 units away from 0.

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- b. If you fold the number line so that a vertical crease goes through 0, the points you label would match up. Explain why this happens.
- c. On the number line, label the points that are $\frac{5}{2}$ units from 0. What is the distance between these points?



(from Unit 7, Lesson 2)

5. Evaluate each expression.

a. $2^3 \cdot 3$

d. $6^2 \div 4$

b. $\frac{4^2}{2}$

e. $2^3 - 2$

c. 3^1

f. $10^2 + 5^2$

(from Unit 6, Lesson 12)