

Money and Debts

Goals

- Apply addition of signed numbers to calculate an account balance after a deposit or withdrawal, and explain (orally and using other representations) the solution method.
- Explain (orally and in writing) how signed numbers can be used to represent situations involving money, including deposits or withdrawals and assets or debts.
- Write an equation with an unknown addend to represent a situation where the amount of change is unknown.

Learning Target

I understand what positive and negative numbers mean in a situation involving money.

Student Learning Goal

Let's apply what we know about signed numbers to money.

Lesson Narrative

In this lesson, students examine how negative numbers can be used in the context of money to represent debits or debts.

First, students consider a situation where one person owes money to another and explain why it could make sense to represent this amount with a negative number. Next, they examine a statement from a checking account. They see how representing transactions with signed numbers allows us to efficiently distinguish **deposits** (money put into an account) from **withdrawals** (money taken out of an account). As students interpret signed numbers that represent account balances and transaction amounts, they are making sense of problems.

Access for Students with Diverse Abilities

- Action and Expression (Activity 1)
- Engagement (Activity 2)

Access for Multilingual Learners

- MLR2: Collect and Display (Activity 1)

Instructional Routines

- Notice and Wonder

Required Preparation

Activity 2:

If the computation requirements might get in the way of understanding that money can be represented by positive and negative values, consider providing access to calculators.

Lesson Timeline

10
min

Warm-up

15
min

Activity 1

10
min

Activity 2

10
min

Lesson Synthesis

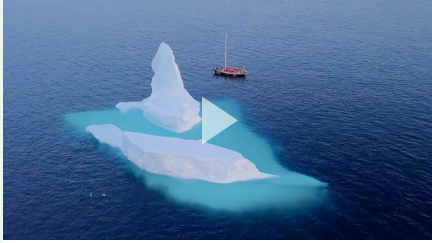
Assessment

5
min

Cool-down

Inspire Math

Icebergs video



Go Online

Before the lesson, show this video to introduce the real-world connection.

ilclass.com/1/614157

Please log in to the site before using the QR code or URL.



Student Workbook

LESSON 4

Money and Debts

Let's apply what we know about signed numbers to money.

Warm-up Concert Tickets

Priya wants to buy 3 tickets for a concert. Each ticket costs \$50. She has earned \$135.

1. What could Priya do in order to be able to buy the tickets?

2. One equation that represents this situation is $135 + 15 = 3 \cdot 50$. What do each of the numbers tell us about this situation?

3. Another equation that represents this situation is $135 - 3 \cdot 50 = -15$. What do each of the numbers tell us in this situation?

Earning and Spending

For each transaction:

- Use a variable to represent the unknown quantity, and write an equation.
- Represent the transaction on a number line.
- Find the unknown quantity.

144

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Warm-up

Concert Tickets

10 min

Activity Narrative

In this *Warm-up*, students consider different ways to think about a situation involving money. They encounter a situation where the items being purchased cost more than the amount available and think about ways to represent the situation using equations. They consider how the expressions and equations connect to the situation, including amount available, amount owed, and the amount it would take to return to 0.

This activity prepares students to represent bank account balances using expressions and equations and to represent debt using a negative number, which will be useful in upcoming activities.

Launch



Arrange students in groups of 2–3.

Listen for language students use to describe the amounts in the situation, such as “cost,” “owe,” “borrow,” “lend,” and “debt.”

Student Task Statement

Priya wants to buy 3 tickets for a concert. Each ticket costs \$50. She has earned \$135.

1. What could Priya do in order to be able to buy the tickets?

Sample response: She could work more first or borrow money.

2. One equation that represents this situation is $135 + 15 = 3 \cdot 50$. What do each of the numbers tell us about this situation?

Sample response: 135 is the amount Priya has, 15 is the additional amount she still needs, and $3 \cdot 50$ is the total amount the tickets cost.

3. Another equation that represents this situation is $135 - 3 \cdot 50 = -15$. What do each of the numbers tell us in this situation?

Sample response: 135 is the amount Priya has, $3 \cdot 50$ is the total cost of the tickets, and -15 is the amount she owes or has to borrow.

Activity Synthesis

The goal of this discussion is for students to understand that debt can be represented by a negative number and that the additive inverse tells how much money is needed to pay off the debt.

Tell students that sometimes banks let people borrow money and pay it back at a future time. We sometimes call the amount owed “debt.” The equation $135 - 3 \cdot 50 = -15$ could represent Priya’s account balance if she had \$135 and bought the 3 tickets.

Ask students:

- ☞ “How much more money will Priya need to earn to pay back the money she borrowed from the bank?”

\$15

The negative amount tells us that’s how much she owes.

- ☞ “How much money will she have after she pays back the money she borrowed from the bank? How would you represent that as an equation?”

\$0

$-15 + 15 = 0$. That makes sense because if she owes money, then pays back the money, then it should be at 0.

Activity 1

Earning and Spending

15
min

Activity Narrative

In this activity, students solve problems about money that can be represented with addition and subtraction equations. Some problems ask students to calculate the total amount of money Kiran has, while others ask students to calculate the amount of the transaction. Students reason abstractly and quantitatively when they write equations and draw number lines to represent each situation.

Launch

If students do not read carefully, they may not realize that they are expected to write an equation and create a diagram for each question and only record a numerical answer. Ensure they understand what they are expected to do before they begin working.

Give students quiet work time, and follow with a whole-class discussion.

Student Task Statement

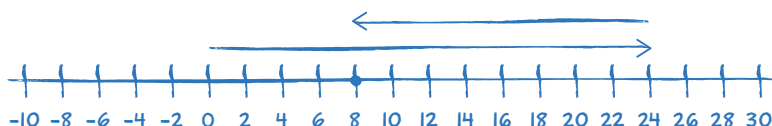
For each transaction:

- Use a variable to represent the unknown quantity, and write an equation.
- Represent the transaction on a number line.
- Find the unknown quantity.

1. At the beginning of the month Kiran had \$24. He spent \$16 at a craft fair. How much money did he have then?

Sample response:

- $24 + (-16) = m$
- $m = 8$



Access for Multilingual Learners (Activity 1, Launch)

MLR2: Collect and Display.

Collect the language that students use to describe Kiran owing more money than he has. Display words and phrases, such as “owe,” “borrow,” “lend,” and “debt.”. During the *Activity Synthesis*, invite students to suggest ways to update the display: “What are some other words or phrases we should include?” Invite students to borrow language from the display as needed.

Advances: *Conversing, Reading*

Building on Student Thinking

If some students struggle to write an equation for each problem, consider asking:

“What amount is unknown in this situation?”

“How is the unknown amount affected by Kiran’s activities?”

Access for Students with Diverse Abilities (Activity 1, Student Task)

Action and Expression: Provide Access for Physical Action.

Activate or supply background knowledge. Provide students with access to blank number lines that go from -10 to 30 to support them representing each transaction.

Supports accessibility for: *Visual-Spatial Processing, Organization*

Student Workbook

1 Earning and Spending

At the beginning of the month Kiran had \$24. He spent \$16 at a craft fair. How much money did he have then?

After he earned some money babysitting, he had a total of \$28. How much did he earn?

Then he pledged to donate \$30 to the local animal shelter. Kiran said, "Uh oh. Now I have -\$2." What do you think he meant by that?

Kiran spent \$5 on supplies to clean windows. How much money would he say he had after that?

Kiran washed some windows and earned enough money so that now he can pay off his pledge. How much money did he earn?

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55

2. After he earned some money babysitting, he had a total of \$28. How much did he earn?

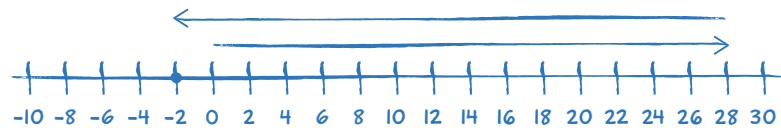
Sample response: $8 + n = 28$; $n = 20$



3. Then he pledged to donate \$30 to the local animal shelter. Kiran said, "Uh oh. Now I have -\$2." What do you think he meant by that?

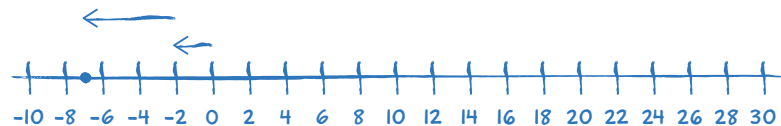
Sample response: $28 + (-30) = p$; $p = -2$

Kiran probably means that he owes more money than he has. He must earn more money to be able to pay off the pledge he made.



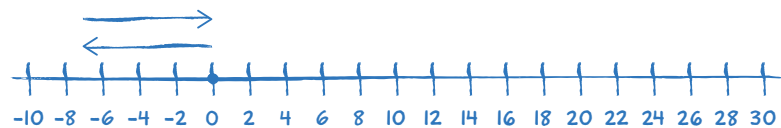
4. Kiran spent \$5 on supplies to clean windows. How much money would he say he had after that?

Sample response: $-2 + -5 = q$; $q = -7$



5. Kiran washed some windows and earned enough money so that now he can pay off his pledge. How much money did he earn?

Sample response: $(-7) + r = 0$; $r = 7$



Activity Synthesis

The goal of this discussion is for students to connect the different types of computations they have been doing to Kiran's situations involving money. A key idea is for students to understand that the rules they have learned for adding and subtracting signed numbers still work when applied to the context of negative amounts of money.

For each type of computation, ask students to connect it to one of Kiran's situations:

☞ "Adding numbers with the same sign"

Kiran had -\$2 and then spent \$5 on cleaning supplies.

“Adding numbers with opposite signs”

Kiran started with \$24 and spent \$16 at the craft fair. Kiran started out with a positive amount of money and then donated some to charity. Kiran owed money and then earned enough to pay off his pledge.

“Adding opposites makes 0”

Kiran earned enough money to pay off his pledge and ended up with \$0.

“Subtracting as addition with a missing addend”

Kiran earned \$20 babysitting.

“Subtracting as adding the additive inverse”

Kiran spent money at the craft fair; Kiran pledged money to the animal shelter.

Activity 2

Bank Statement

10
min

Activity Narrative

In this activity, students use addition and subtraction to solve problems about debts and withdrawals. They make sense of a bank statement and the possible ways to represent deposits, withdrawals, balances, and debt. As they persevere in solving problems with the bank statement, they compare representations of withdrawals with representations of debt, using two methods: addition with negative numbers and subtraction. Monitor for students who express their reasoning as addition and subtraction equations or expressions.

Launch

Tell students to close their books or devices (or to keep them closed). Display the image of the bank statement for all to see. Give students 1 minute of quiet think time, and ask them to be prepared to share at least one thing they notice and one thing they wonder. Record and display responses without editing or commentary for all to see. If possible, record the relevant reasoning on or near the image.

If the terms “deposit” and “withdrawal” do not come up during the conversation, make sure students understand the meaning of these terms. A **deposit** is money put into an account, and a **withdrawal** is money taken out of an account.

Give students 3–4 minutes of quiet work time, and follow with a whole-class discussion.

Instructional Routines

Notice and Wonder

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Access for Students with Diverse Abilities (Activity 2, Launch)

Engagement: Develop Effort and Persistence.

Provide tools to facilitate information processing or computation, enabling students to focus on key mathematical ideas. For example, allow students to use calculators to support their reasoning.

Supports accessibility for: Memory, Conceptual Processing

Student Workbook

2 Bank Statement

Here is a bank statement.

Responsible Bank
 210 2nd Street
 Anytown, MH 06930

Checking Account Statement
 Page: 1 of 1

Andre Person
 1729 Euclid Ave
 Anytown, MH 06930

Statement Period
 2017-10-01 to 2017-11-01

Account No.
 1120635978

| Date | Description | Withdrawals | Deposits | Balance |
|------------|---------------------------------|-------------|----------|---------|
| 2017-10-03 | Previous Balance | | | 39.87 |
| 2017-10-05 | Check Number 256 | 28.50 | | 11.37 |
| 2017-10-06 | ATM Deposit – Cash | | 45.00 | 56.37 |
| 2017-10-10 | Wire Transfer | 37.91 | | 18.46 |
| 2017-10-17 | Point of Sale – Grocery Store | 16.43 | | 2.03 |
| 2017-10-25 | Funds Transfer from Savings | | 50.00 | 52.03 |
| 2017-10-28 | Check Number 257 | 42.00 | | 10.03 |
| 2017-10-29 | Online Payment – Phone Services | 72.50 | | -62.47 |

1 Andre makes a **withdrawal** of \$40 to buy a music player. What is his new balance?

2 If Andre makes a **deposit** of \$100 into this account, will he still be in debt? Explain your reasoning.

3 If withdrawals and deposits were in the same column, how could each be represented using signed numbers?

Student Workbook

2 Bank Statement

Are You Ready for More?

The national debt of a country is the total amount of money the government of that country owes. Imagine everyone in the United States were asked to help pay off the national debt. How much would each person have to pay?

4 Lesson Summary

Banks use positive numbers to represent money that gets put into an account and negative numbers to represent money that gets taken out of an account. When money is put into an account, it is called a **deposit**. When money is taken out of an account, it is called a **withdrawal**. People also use negative numbers to represent debt. If we take out more money from our account than we put in, then we owe the bank money, and our account balance will be a negative number to represent that debt. For example, if we had \$200 in our bank account, and then we wrote a check for \$300, we would owe the bank \$100, and our account balance would be -\$100.

| starting balance | deposits and withdrawals | new balance |
|------------------|--------------------------|--------------|
| 0 | 50 | 0 + 50 |
| 50 | 150 | 50 + 150 |
| 200 | -300 | 200 + (-300) |
| -100 | | |

In general, we can find a new account balance by adding the value of the deposit or withdrawal to it. We can also tell how much money is needed to repay a debt using the fact that to get from a value to 0, we need to add its opposite.

Student Task Statement

Here is a bank statement.

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1. Andre makes a **withdrawal** of \$40 to buy a music player. What is his new balance?

-\$102.47, because $-62.47 + (-40) = -102.47$

2. If Andre makes a **deposit** of \$100 into this account, will he still be in debt? Explain your reasoning.

Yes, he will still be in debt

Sample reasoning: $-102.47 + 100 = -2.47$.

3. If withdrawals and deposits were in the same column, how could each be represented using signed numbers?

Sample response: Withdrawals would be represented by positive numbers, and withdrawals would be represented by negative numbers.

Are You Ready for More?

The national debt of a country is the total amount of money the government of that country owes. Imagine everyone in the United States were asked to help pay off the national debt. How much would each person have to pay?

Answers vary as the population and national debt of the United States changes. If the population of the United States were about 326 million and the national debt were about \$19.9 trillion, each person would have to pay about \$61,000.

Activity Synthesis

The goal of this discussion is for students to see the different ways that withdrawals, deposits, and debts can be represented using signed numbers. Begin by inviting previously selected students to share their responses and reasoning to the first two questions.

Then ask students to share their responses to the last question. The decision about which numbers to represent with positive versus negative values hinges on whether you are thinking from the perspective of the person or the perspective of the account. Point out that the final balance is represented with a negative number to show that the person owes the bank money. Therefore, from the perspective of the account, deposits are positive values and withdrawals are negative values.

Lesson Synthesis

Share with students,

“Today we saw how signed numbers can be used to represent money.”

To review these concepts, consider asking:

- “What does it mean if an account balance is positive?”
The account owner has money.
- “What does it mean if an account balance is negative?”
The account owner owes money. It’s a debt.
- “What does it mean if a transaction amount is positive?”
The person put money into their account. It’s a deposit.
- “What does it mean if a transaction amount is negative?”
The person took money out of their account. It’s a withdrawal.

Lesson Summary

Banks use positive numbers to represent money that gets put into an account and negative numbers to represent money that gets taken out of an account. When money is put into an account, it is called a **deposit**. When money is taken out of an account, it is called a **withdrawal**.

People also use negative numbers to represent debt. If we take out more money from our account than we put in, then we owe the bank money, and our account balance will be a negative number to represent that debt. For example, if we had \$200 in our bank account, and then we wrote a check for \$300, we would owe the bank \$100, and our account balance would be -\$100.

| starting balance | deposits and withdrawals | new balance |
|------------------|--------------------------|--------------|
| 0 | 50 | 0 + 50 |
| 50 | 150 | 50 + 150 |
| 200 | -300 | 200 + (-300) |
| -100 | | |

In general, we can find a new account balance by adding the value of the deposit or withdrawal to it. We can also tell how much money is needed to repay a debt using the fact that to get from a value to 0, we need to add its opposite.

Student Workbook

2 Bank Statement

Are You Ready for More?
The national debt of a country is the total amount of money the government of that country owes. Imagine everyone in the United States were asked to help pay off the national debt. How much would each person have to pay?

4 Lesson Summary

Banks use positive numbers to represent money that gets put into an account and negative numbers to represent money that gets taken out of an account. When money is put into an account, it is called a **deposit**. When money is taken out of an account, it is called a **withdrawal**. People also use negative numbers to represent debt. If we take out more money from our account than we put in, then we owe the bank money, and our account balance will be a negative number to represent that debt. For example, if we had \$200 in our bank account, and then we wrote a check for \$300, we would owe the bank \$100, and our account balance would be -\$100.

| starting balance | deposits and withdrawals | new balance |
|------------------|--------------------------|--------------|
| 0 | 50 | 0 + 50 |
| 50 | 150 | 50 + 150 |
| 200 | -300 | 200 + (-300) |
| -100 | | |

In general, we can find a new account balance by adding the value of the deposit or withdrawal to it. We can also tell how much money is needed to repay a debt using the fact that to get from a value to 0, we need to add its opposite.

GRADE 7 • UNIT 5 • SECTION A | LESSON 4

Responding To Student Thinking**Press Pause**

By this point in the unit, there should be some student mastery of adding signed numbers. If students struggle, make time to revisit related work in the lessons referred to here. See the Course Guide for ideas to help students re-engage with earlier work.

Grade 7, Unit 5, Lesson 3 Changing Elevation

Grade 7, Unit 5, Lesson 2 Changing Temperatures

Cool-down**Buying a Bike****5**
min**Student Task Statement**

1. Clare has \$150 in her bank account. She buys a bike for \$200. What is Clare's account balance now?
-\$50
2. If Clare earns \$75 the next week from delivering newspapers and deposits it in her account, what will her account balance be then?
\$25

Practice Problems

6 Problems

Problem 1

When the table here is complete, it shows five transactions and the resulting account balance in a bank account. Fill in the missing numbers.

| | transaction amount | account balance |
|---------------|--------------------|-----------------|
| transaction 1 | 200 | 200 |
| transaction 2 | -147 | 53 |
| transaction 3 | 90 | 143 |
| transaction 4 | -229 | -86 |
| transaction 5 | 86 | 0 |

Problem 2

- a. Clare has \$54 in her bank account. A store credits her account with a \$10 refund. How much does she now have in the bank?
\$64, because $54 + 10 = 64$
- b. Mai's bank account is overdrawn by \$60, which means her balance is -\$60. She gets \$85 for her birthday and deposits it into her account. How much does she now have in the bank?
\$25, because $-60 + 85 = 25$
- c. Tyler is overdrawn at the bank by \$180. He gets \$70 for his birthday and deposits it. What is his account balance now?
-\$110, because $-180 + 70 = -110$
- d. Andre has \$37 in his bank account and writes a check for \$87. After the check has been cashed, what will the bank balance show?
-\$50, because $37 - 87 = -50$

Student Workbook

LESSON 4
PRACTICE PROBLEMS

- 1 When the table here is complete, it shows five transactions and the resulting account balance in a bank account. Fill in the missing numbers.

| | transaction amount | account balance |
|---------------|--------------------|-----------------|
| transaction 1 | 200 | 200 |
| transaction 2 | -147 | 53 |
| transaction 3 | 90 | |
| transaction 4 | -229 | |
| transaction 5 | | 0 |

- 2 a. Clare has \$54 in her bank account. A store credits her account with a \$10 refund. How much does she now have in the bank? _____
- b. Mai's bank account is overdrawn by \$60, which means her balance is -\$60. She gets \$85 for her birthday and deposits it into her account. How much does she now have in the bank? _____

Student Workbook

Practice Problems

c. Tyler is overdrawn at the bank by \$180. He gets \$70 for his birthday and deposits it. What is his account balance now? _____

d. Andre has \$37 in his bank account and writes a check for \$87. After the check has been cashed, what will the bank balance show? _____

from Unit 4, Lesson 8
Last week, it rained g inches. This week, the amount of rain decreased by 5%. Which expressions represent the amount of rain that fell this week? Select **all** that apply.

☐ $g - 0.05$

☒ $g - 0.05g$

☐ $0.95g$

☐ $0.05g$

☒ $(1 - 0.05)g$

GRADE 7 • UNIT 5 • SECTION A | LESSON 4

Student Workbook

Practice Problems

from Unit 2, Lesson 8
Decide whether or not each equation represents a proportional relationship.

a. Volume measured in cups (c) vs. the same volume measured in ounces (z): $c = \frac{1}{8}z$

b. Area of a square (A) vs. the side length of the square (s): $A = s^2$

c. Perimeter of an equilateral triangle (P) vs. the side length of the triangle (s): $3s = P$

d. Length (L) vs. width (w) for a rectangle whose area is 60 square units: $L = \frac{60}{w}$

from Unit 5, Lesson 3
Add.

a. $5\frac{3}{4} + (-\frac{1}{4})$

b. $-\frac{2}{3} + \frac{1}{6}$

c. $-\frac{8}{5} + (-\frac{3}{4})$

GRADE 7 • UNIT 5 • SECTION A | LESSON 4

Problem 3

from Unit 4, Lesson 8

Last week, it rained g inches. This week, the amount of rain decreased by 5%. Which expressions represent the amount of rain that fell this week? Select **all** that apply.

A. $g - 0.05$

B. $g - 0.05g$

C. $0.95g$

D. $0.05g$

E. $(1 - 0.05)g$

Problem 4

from Unit 2, Lesson 8

Decide whether or not each equation represents a proportional relationship.

- a. Volume measured in cups (c) vs. the same volume measured in ounces (z): $c = \frac{1}{8}z$
Yes
- b. Area of a square (A) vs. the side length of the square (s): $A = s^2$
No
- c. Perimeter of an equilateral triangle (P) vs. the side length of the triangle (s): $3s = P$
Yes
- d. Length (L) vs. width (w) for a rectangle whose area is 60 square units: $L = \frac{60}{w}$
No

Problem 5

from Unit 5, Lesson 3

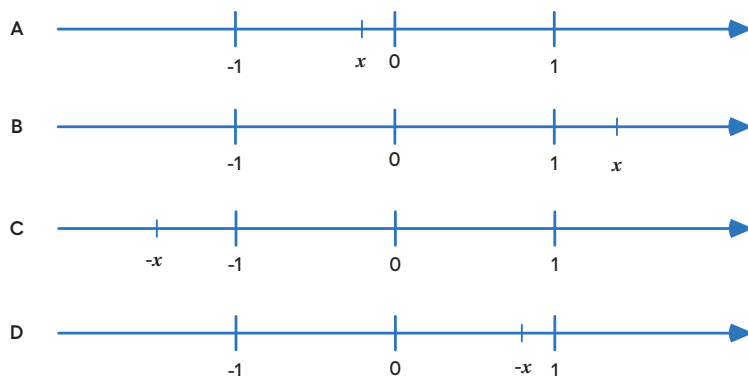
Add.

- a. $5\frac{3}{4} + (-\frac{1}{4})$
 $5\frac{1}{2}$ (or equivalent)
- b. $-\frac{2}{3} + \frac{1}{6}$
 $-\frac{3}{6}$ (or equivalent)
- c. $-\frac{8}{5} + (-\frac{3}{4})$
 $-\frac{47}{20}$ (or equivalent)

Problem 6

from Unit 5, Lesson 1

In each diagram, x represents a different value.



For each diagram,

a. What is something that is *definitely* true about the value of x ?

Sample responses:

- Diagram A:
 - The value of x is definitely negative.
 - The value of x is definitely greater than $-\frac{1}{2}$ and less than 0 since x is closer to 0 than it is to -1.
- Diagram B:
 - The value of x is definitely positive.
 - The value of x is definitely between 1 and 2 since x is a little greater than 1.
- Diagram C:
 - The value of x is definitely positive, because $-x$ is negative (for example, $-(-1.5) = 1.5$).
 - The value of x is definitely between 1 and 2, since the distance of $-x$ from 0 is a little greater than 1.
- Diagram D:
 - The value of x is definitely negative.
 - The value of x is definitely less than $-\frac{1}{2}$ and greater than -1 since $-x$ is farther away from 0 than it is from 1.

b. What is something that *could* be true about the value of x ?

Sample responses:

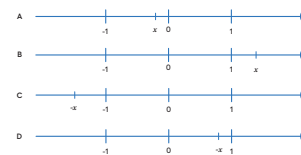
- Diagram A: The value of x could be $-\frac{1}{3}$ or -0.4; these values are negative and between 0 and $-\frac{1}{2}$.
- Diagram B: The value of x could be 1.4 or $1\frac{1}{3}$; these values are positive and between 1 and 1.5.
- Diagram C: The value of x could be $1\frac{1}{2}$ or 1.4; these values are halfway (or a little less than halfway) between 1 and 2.
- Diagram D: The value of x could be -0.7 or $-\frac{2}{3}$; these values are between 0 and -1 but closer to -1.

Student Workbook

Practice Problems

from Unit 5, Lesson 1

In each diagram, x represents a different value.



For each diagram,

- a. What is something that is *definitely* true about the value of x ?
- b. What is something that *could* be true about the value of x ?

Learning Targets

+ I understand what positive and negative numbers mean in a situation involving money.