

## Video Games (IT)

### Overview

This instructional task requires students to use multiplication and division of rational numbers to purchase a video game system.

### Standards

**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

**7.NS.A.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

- a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as  $(-1)(-1) = 1$  and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
- c. Apply properties of operations as strategies to multiply and divide rational numbers.

**7.NS.A.3** Solve real-world and mathematical problems involving the four operations with rational numbers.

### Prior to the Task

**Standards Preparation:** The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
7.NS.A.2	<ul style="list-style-type: none"> <li>• 5.NF.B.3</li> <li>• 5.NF.B.4</li> <li>• 6.NS.A.1</li> </ul>	<ol style="list-style-type: none"> <li>1. <math>-46.28 \times 4</math> <ol style="list-style-type: none"> <li>a. <math>-185.12</math></li> </ol> </li> <li>2. <math>-234.8 \div -23.2</math> Round your answer to two decimal places.           <ol style="list-style-type: none"> <li>a. <math>10.12</math></li> </ol> </li> <li>3. <a href="http://www.illustrativemathematics.org/illustrations/604">http://www.illustrativemathematics.org/illustrations/604</a></li> <li>4. <a href="http://www.illustrativemathematics.org/illustrations/593">http://www.illustrativemathematics.org/illustrations/593</a></li> </ol>	<ul style="list-style-type: none"> <li>• <a href="http://www.illustrativemathematics.org/illustrations/858">http://www.illustrativemathematics.org/illustrations/858</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/321">http://www.illustrativemathematics.org/illustrations/321</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/965">http://www.illustrativemathematics.org/illustrations/965</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/50">http://www.illustrativemathematics.org/illustrations/50</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/407">http://www.illustrativemathematics.org/illustrations/407</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/464">http://www.illustrativemathematics.org/illustrations/464</a></li> <li>• <a href="http://learnzillion.com/lessonsets/281-extending-multiplication-of-fractions-to-rational-numbers">http://learnzillion.com/lessonsets/281-extending-multiplication-of-fractions-to-rational-numbers</a></li> <li>• <a href="http://learnzillion.com/lessonsets/18-multiply-and-divide-improper-fractions">http://learnzillion.com/lessonsets/18-multiply-and-divide-improper-fractions</a></li> <li>• <a href="http://learnzillion.com/lessonsets/600-convert-a-rational-number-to-a-decimal-using-long-division">http://learnzillion.com/lessonsets/600-convert-a-rational-number-to-a-decimal-using-long-division</a></li> </ul>
7.NS.A.3	<ul style="list-style-type: none"> <li>• 4.OA.A.3</li> <li>• 6.NS.B.3</li> </ul>	<ol style="list-style-type: none"> <li>1. You have to pay \$75 to your mom in equal payments over 6 months. If you are paying her from your savings account, how much will your account change each month?</li> </ol>	<ul style="list-style-type: none"> <li>• <a href="http://www.illustrativemathematics.org/illustrations/1289">http://www.illustrativemathematics.org/illustrations/1289</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/272">http://www.illustrativemathematics.org/illustrations/272</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/275">http://www.illustrativemathematics.org/illustrations/275</a></li> </ul>

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
		a. $-\$12.50$ 2. <a href="http://www.illustrativemathematics.org/illustrations/298">http://www.illustrativemathematics.org/illustrations/298</a>	<ul style="list-style-type: none"> <li>• <a href="http://www.illustrativemathematics.org/illustrations/374">http://www.illustrativemathematics.org/illustrations/374</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/274">http://www.illustrativemathematics.org/illustrations/274</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/1299">http://www.illustrativemathematics.org/illustrations/1299</a></li> <li>• <a href="http://www.illustrativemathematics.org/illustrations/1300">http://www.illustrativemathematics.org/illustrations/1300</a></li> <li>• <a href="http://learnzillion.com/lessonsets/193-solve-realworld-problems-involving-the-four-operations-with-rational-numbers-1">http://learnzillion.com/lessonsets/193-solve-realworld-problems-involving-the-four-operations-with-rational-numbers-1</a></li> <li>• <a href="http://learnzillion.com/lessonsets/20-simplify-expressions-with-order-of-operations">http://learnzillion.com/lessonsets/20-simplify-expressions-with-order-of-operations</a></li> </ul>

**Real-World Preparation:** The following questions will prepare students for some of the real-world components of this task:

What is a savings account? This question is designed to make sure that students understand the purpose of this task. A *savings account* is an account at a bank. You deposit money into an account, usually for a long period of time. A savings account is a good way of collecting money for a future purchase.

What is a Statement of Account? A *Statement of Account* is a listing of the activity occurring in an account over a period of time. Statements of account show money withdrawn and money deposited.

What is a balance? Students may be unfamiliar with banking terminology. A *balance* is the amount of money in your account.

What is the difference between a withdrawal and a deposit? Students may confuse these terms. A *deposit* is putting money into an account, and a *withdrawal* is taking money out of an account

### During the Task

Students may struggle with the idea of change and negative numbers. Remind students that they are starting with money in the account and taking money out each month. If they are starting with money and then taking out money, they can represent this situation with a negative number.

Students may struggle with creating a monthly statement. You can scaffold this task for them using the situation in problem 3. Have students create monthly statements for six months using a starting account balance of \$500. This will help students practice the process of creating a monthly statement before they have to start making decisions about how to spend money.

During the task, circulate around the room and look for groups who may be spending more money than they have in the account. The students may also have trouble calculating their totals with the tax included.

### After the Task

This task shows students how math is useful in their own lives. Savings accounts can be useful when they want to make a big purchase. Saving a little each month can allow them to purchase something expensive without having to pay interest.

## Student Instructional Task

1. David is purchasing an Xbox One. David's mom will buy the game system, but he will have to pay her back. He will pay her the same amount each month from his savings account. He will take six months to pay her back. If he does not deposit or withdraw any money from the account, the account balance will change by \$-499.00.
  - a. How much would David's account change each month? Explain.
  
  
  
  
  
  
  
  
  
  
  - b. Describe the change in the account after three months.
  
2. David wants to purchase three Xbox One games. The total for the three games is \$179.88
  - a. What is the price of each game if they are all the same price? Show your calculations.
  
  
  
  
  
  
  
  
  
  
  - b. If the games are paid for in equal amounts over six months, how much would David pay each month? Explain.
  
3. David decides to buy the three games with the Xbox One. His mom will pay for the games and the game console, and he will pay her back in equal payments over six months.
  - a. How much would David's account change each month? Show your calculations.
  
  
  
  
  
  
  
  
  
  
  - b. Describe the change in the account after three months.
  
4. You decide to purchase your own game system. You have \$950 saved. Research game systems and game prices. Decide which game system and which games you would like to purchase.
  - a. Create a total bill for your purchases. In addition to the game system and games, you must pay sales tax. Use the sales tax rate in the town where you will purchase your game system and games.

- b. You are going to pay for your purchases in equal monthly installments over six months. Create an Account Statement for your savings account each month. Each Statement of Account should show how you calculated the balance at the end of each month.
  
- c. Write a short narrative explaining how you chose your game system and games. Assume your beginning balance is \$950. Be sure to include your ending balance and a brief explanation of how you calculated your monthly balances. Be prepared to share your project with the class.

## Instructional Task Exemplar Response

1. Your friend David is purchasing an Xbox One. David's mom will buy the game system, but he will have to pay her back. He will pay her the same amount each month from his savings account. He will take six months to pay her back. If he does not deposit or withdraw any money from the account, the account balance will change by \$-499.00.

- a. How much would your friend's account change each month? Explain.

$$\$ - 499 \div 6$$

$$\$ - 83.17$$

*David's account would change by -\$83.17 each month. The change is -\$83.17 each month because money is being withdrawn from the account.*

- b. Describe the change in the account after three months.

$$-\$83.17 \times 3$$

$$-\$249.51$$

*The account would change by -\$249.51 after three payments over three months.*

2. David wants to purchase three Xbox One games. The total for the three games is \$179.88

- a. What is the price of each game if they are all the same price? Show your calculations.

$$\$179.88 \div 3$$

$$\$59.96$$

*Each game would cost \$59.96.*

- b. If the games are paid for in equal amounts over six months, how much would David pay each month?

$$\$179.88 \div 6$$

$$\$29.98$$

*The total cost of the games is \$179.88, so that number must be divided by 6, the number of payments. He would pay \$29.98 each month.*

3. David decides to buy the three games with the Xbox One. His mom will pay for the games and the game console, and he will pay her back in equal payments over six months.

- a. How much would your friend's account change each month? Show your calculations.

$$\frac{499 + 179.88}{6}$$

$$\frac{678.88}{6}$$

\$113.15

*His account would change by -\$113.15 per month.*

- b. Describe the change in the account after three months.

$$-\$113.15 \times 3$$

-\$339.45

*The account would change by -\$339.45 after three payments over three months.*

4. You decide to purchase your own game system. You have \$950 saved. Research game systems and game prices. Decide which game system and which games you would like to purchase.

- a. Create a total bill for your purchases. In addition to the game system and games, you must pay sales tax. Use the sales tax rate in the town where you will purchase your game system and games.

*This portion of the task will take on many different looks. Students have multiple options to fulfill the requirements listed above. They will need to decide on the number of games they want to purchase. They also need to choose a game system.*

*This is a sample bill. The listed prices are from Walmart.com.*

<i>PlayStation 4:</i>	<i>\$458.00</i>
<i><u>Lego Marvel Super Heroes:</u></i>	<i>\$44.98</i>
<i><u>Skylanders Swap Force Start Pack:</u></i>	<i>\$51.65</i>
<i>Subtotal:</i>	<i>\$554.63</i>
<i>Tax (9%):</i>	<i>\$49.92</i>
<i>Total:</i>	<i>\$604.55</i>

- b. You are going to pay for your purchases in equal monthly installments over six months. Create an Account Statement for your savings account each month. Each Statement of Account should show how you calculated the balance at the end of each month.
- c. *This is a sample of the information needed in the monthly Statement of Account.*

$$\$604.55 \div 6 = \$100.76$$

*Month 1:*

*Beginning Balance: \$950*

*Withdrawal: \$100.76*

*\$950 - \$100.76 = \$849.24*

*Ending Balance: \$849.24*

- d. Write a short narrative explaining how you chose your game system and games. Assume your beginning balance is \$950. Be sure to include your ending balance and a brief explanation of how you calculated your monthly balances. Be prepared to share your project with the class.

*This is a sample narrative.*

*I chose to buy a PlayStation 4 for \$458.00. I chose this game system because I have an old PlayStation 2, so I thought that it would be nice to have the new PlayStation console. I don't have a lot of time to play games and didn't want to spend all of my money, so I chose two games. Lego Marvel Super Heroes was \$44.98, and Skylanders Swap Force Start Pack was \$51.65. My subtotal was \$554.63. The sales tax in Crowley, Louisiana, where I would make my purchases is 9%, so my sales tax is \$49.92. My total amount spent was \$604.55. My monthly payment for each of the six months is \$100.76. My savings account would have \$345.45 left after I finished paying for my PlayStation 4 and games.*

## Club Budget (IT)

### Overview

This instructional task requires students to use addition and subtraction of rational numbers to create a budget for a school club.

### Standards

**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

**7.NS.A.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

- b. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*
- c. Understand  $p + q$  as the number located a distance  $|q|$  from  $p$ , in the positive or negative direction depending on whether  $q$  is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
- d. Understand subtraction of rational numbers as adding the additive inverse,  $p - q = p + (-q)$ . Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
- e. Apply properties of operations as strategies to add and subtract rational numbers.

**7.NS.A.3** Solve real-world and mathematical problems involving the four operations with rational numbers.

### Prior to the Task

**Standards Preparation:** The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task's standards.

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
7.NS.A.1	<ul style="list-style-type: none"> <li>• 5.NF.A.1</li> <li>• 6.NS.C.5</li> <li>• 6.NS.C.6a</li> <li>• 6.NS.C.7c</li> </ul>	<ol style="list-style-type: none"> <li>1. <math>\\$123.64 + \\$243.75</math> <ol style="list-style-type: none"> <li>a. <math>\\$367.39</math></li> </ol> </li> <li>2. <math>\\$432.76 - \\$175.62</math> <ol style="list-style-type: none"> <li>a. <math>\\$257.14</math></li> </ol> </li> <li>3. <a href="http://www.illustrativemathematics.org/7.NS.A.1">http://www.illustrativemathematics.org/7.NS.A.1</a></li> </ol>	<ul style="list-style-type: none"> <li>• <a href="http://www.illustrativemathematics.org/5.NF.A.1">http://www.illustrativemathematics.org/5.NF.A.1</a></li> <li>• <a href="http://www.illustrativemathematics.org/6.NS.C.5">http://www.illustrativemathematics.org/6.NS.C.5</a></li> <li>• <a href="http://learnzillion.com/lessonsets/411-add-and-subtract-rational-numbers-represent-addition-and-subtraction-on-a-horizontal-or-vertical-number-line-diagram">http://learnzillion.com/lessonsets/411-add-and-subtract-rational-numbers-represent-addition-and-subtraction-on-a-horizontal-or-vertical-number-line-diagram</a></li> <li>• <a href="http://learnzillion.com/lessonsets/596-adding-and-subtracting-rational-numbers-using-distance-absolute-value-and-opposites">http://learnzillion.com/lessonsets/596-adding-and-subtracting-rational-numbers-using-distance-absolute-value-and-opposites</a></li> </ul>
7.NS.A.3	<ul style="list-style-type: none"> <li>• 4.OA.A.3</li> <li>• 6.NS.B.3</li> </ul>	<ol style="list-style-type: none"> <li>1. Your class is considering going on a field trip to a skating ring. The admission fee is \$12 per person. You have 25 students in your class. How much will it cost for your class to enter the skating ring?           <ol style="list-style-type: none"> <li>a. \$300</li> </ol> </li> <li>2. <a href="http://www.illustrativemathematics.org/7.NS.A.3">http://www.illustrativemathematics.org/7.NS.A.3</a></li> </ol>	<ul style="list-style-type: none"> <li>• <a href="http://www.illustrativemathematics.org/4.OA.A.3">http://www.illustrativemathematics.org/4.OA.A.3</a></li> <li>• <a href="http://www.illustrativemathematics.org/6.NS.B.3">http://www.illustrativemathematics.org/6.NS.B.3</a></li> <li>• <a href="http://learnzillion.com/lessons/1150-use-addition-and-subtraction-to-solve-realworld-problems-involving-decimals">http://learnzillion.com/lessons/1150-use-addition-and-subtraction-to-solve-realworld-problems-involving-decimals</a></li> </ul>



**Real-World Preparation:** The following questions will prepare students for some of the real-world components of this task:

What is a budget? This question is designed to make sure that students understand the purpose of this task. They need to figure out a plan to track how much money is deposited and how much money is spent to ensure that the account always has money.

What is an account? Some students may be unfamiliar with accounts and using banks. You may need to explain that a bank is where you can bring money. The bank holds the money in an account until you are ready to spend it.

What is a balance? Students may be unfamiliar with banking terminology. A *balance* is the amount of money in your account.

What is the difference between a withdrawal and a deposit? Students may confuse these terms. A *deposit* is putting money into an account, and a *withdrawal* is taking money out of an account.

### **During the Task**

Students may struggle with creating a monthly statement. You can scaffold this task for them using the three months in part one. Have students create monthly statements for September, October, and November. This will help students practice the process of creating a monthly statement before they have to start making decisions about how to make and spend money.

During the task, as you circulate around the room, look for groups who may only be adding in unrealistic numbers for their fundraisers.

For example, students may only add in \$25 for a car wash fundraiser. Ask students guiding questions like the following:

1. If you made \$25 at your car wash, how many cars did you wash?
  - a. 5 cars at \$5 each
2. Would you have a car wash if you were only going to wash five cars all day?
  - a. Students at this point should discuss a car wash and about how many cars they might expect to wash.

### **After the Task**

This task shows students how math is useful in their own lives. Encourage students to think of ways creating a budget might be useful in their own lives. Students may mention creating budgets for clubs or budgets to track their personal money.

## Student Instructional Task

The members of your group have been selected as the officers for your school's Junior Beta Club. This executive committee is responsible for tracking all money deposited into the club's account as well as all money spent during the year. The committee also needs to create a budget for the remainder of the year. At the beginning of September, the balance in the account was \$253.24.

1. Listed below are the activities the club spent money on or collected money for:

Sept. 1–Sept. 30	Oct. 1–Oct. 31	Nov. 1–Nov. 30
Dues: 25 members at \$5 each	Gardening materials: \$–124.98	Supplies for Thanksgiving baskets: \$–40.43
Induction ceremony: \$–100.32	Bake sale: \$205.50	

a. Using the table above, create a number line to represent the amount of money added to the account during this three-month period.

b. Using the table above, create a number line to represent the amount of money spent during this three-month period.

c. How much money is in the account at the end of November? Show two different ways to find the balance of the account.

2. This year the club also voted to include some fun activities throughout the year and an end-of-year trip to celebrate the club's success. Below is a list of the suggested activities and fundraisers.

Fun Activities	Fundraisers
Bowling: \$60 per lane (up to 6 people per lane)	Candy sale: \$60 per member
Skating: \$12 per person	Wrapping paper: \$50 per member
Laser tag: \$15 per person	Holiday wreaths: \$65 per member
Water park: \$50 per person	Car wash: \$5 per car
Zoo visit: \$12 per student; \$17.50 per adult	Dress-down day: \$1 per student

a. Create a monthly budget for the remainder of the year. In your budget, you will propose which fun activity or activities your club should pursue. You will also propose which fundraisers your club should use to raise the money to finish the year. Keep the following points in mind:

- Begin with December 1 through December 31 and end with May 1 through May 31.
- Show the balance at the beginning of each month (use the ending balance from November as the beginning balance for December).
- Show any proposed expenses for the month as well as any proposed fundraisers.

- Budget \$75 per month for supplies for service projects.
- The club must also attend the Louisiana Jr. Beta Club Convention in Lafayette, Louisiana, in May. The cost of the trip for the convention is \$1,500. This includes transportation and hotel rooms.
- Include at least one Fun Activity from the list above.
- The balance at the end of May should be at least \$250 to begin the next school year.

Your budget should include a month by month statement as well as a short narrative explaining why you chose certain activities and fundraisers. Each monthly statement should show how you calculated the balance at the end of each month. In your narrative, be sure to explain how you determined which fundraisers to choose, which activity to choose, and when to conduct certain fundraisers. Also, be sure to state how much money will be remaining at the end of May. Be prepared to share your budget with the class.

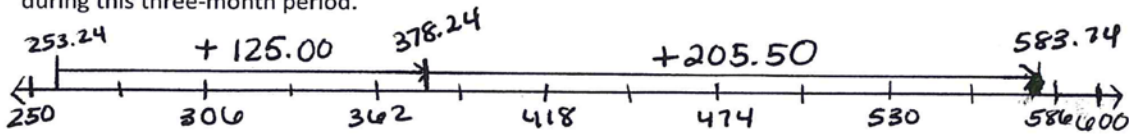
### Instructional Task Exemplar Response

The members of your group have been selected as the officers for your school’s Junior Beta Club. This executive committee is responsible for tracking all money deposited into the club’s account as well as all money spent during the year. The committee also needs to create a budget for the remainder of the year. At the beginning of September, the balance in the account was \$253.24.

1. Listed below are the activities the club spent money on or collected money for:

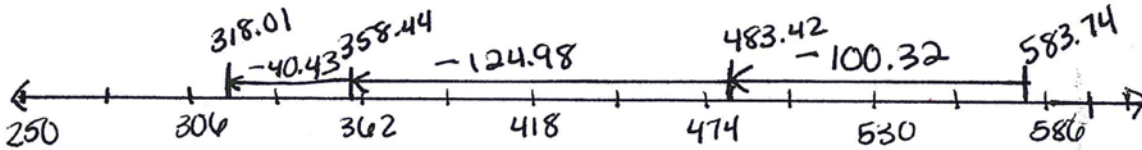
Sept. 1-Sept. 30	Oct. 1-Oct. 31	Nov. 1-Nov. 30
Dues: 25 members at \$5 each	Gardening materials: \$-124.98	Supplies for Thanksgiving baskets: \$-40.43
Induction ceremony: \$-100.32	Bake sale: \$205.50	

a. Using the table above, create a number line to represent the amount of money added to the account during this three-month period.



Due s:  $25 \times 5 = \$125$

b. Using the table above, create a number line to represent the amount of money spent during this three-month period.



c. How much money is in the account at the end of November? Show two different ways to find the balance of the account.

At the end of November, there is \$318.01 in the account.

①  $253.24 + 330.50 = 583.74$   
 $583.74 - 265.73 = 318.01$

②  $330.50 - 265.73 = 64.77$

$253.24 + 64.77 = 318.01$

Students may have different number lines for parts a and b as they may not use the beginning balance. The problem asks to show the amount added or spent; students may choose to start at zero. There may also be different methods shown in part c.

2. This year the club also voted to include some fun activities throughout the year and an end-of-year trip to celebrate the club’s success. Below is a list of the suggested activities and fundraisers.

Fun Activities	Fundraisers
Bowling: \$60 per lane (up to 6 people per lane)	Candy sale: \$60 per member
Skating: \$12 per person	Wrapping paper: \$50 per member
Laser tag: \$15 per person	Holiday wreaths: \$65 per member
Water park: \$50 per person	Car wash: \$5 per car
Zoo visit: \$12 per student; \$17.50 per adult	Dress-down day: \$1 per student

a. Create a monthly budget for the remainder of the year. In your budget, you will propose which fun activity or activities your club should pursue. You will also propose which fundraisers your club should use to raise the money to finish the year. Keep the following points in mind.

- Begin with December 1 through December 31 and end with May 1 through May 31.
- Show the balance at the beginning of each month (use the ending balance from November as the beginning balance for December).
- Show any proposed expenses for the month as well as any proposed fundraisers.
- Budget \$75 per month for supplies for service projects.
- The club must also attend the Louisiana Jr. Beta Club Convention in Lafayette, Louisiana, in May. The cost of the trip for the convention is \$1,500. This includes transportation and hotel rooms.
- Include at least one Fun Activity from the list above.
- The balance at the end of May should be at least \$250 to begin the next school year.

Your budget should include a month by month statement as well as a short narrative explaining why you chose certain activities and fundraisers. Each monthly statement should show how you calculated the balance at the end of each month. In your narrative, be sure to explain how you determined which fundraisers to choose, which activity to choose, and when to conduct certain fundraisers. Also, be sure to state how much money will be remaining at the end of May. Be prepared to share your budget with the class.

*This portion of the task will take on many different looks. Students have multiple options to fulfill the requirements listed above. They will need to make some assumptions about the number of chaperones needed for the activities they may wish to propose. They may also need to make some assumptions about the fundraisers, specifically the number of cars they would need to wash and how many students might buy a dress-down day pass. Students could research the rules about fundraisers in their school/district and check to see how many students participated in past dress-down events to attempt to determine values that make sense with this problem. At minimum, students must include fundraisers to cover \$1,950 for the service project supplies and convention. Additional fundraisers would be needed to cover the cost of the activity they chose to propose.*

## Birthday Shopping (IT)

### Overview

Students will demonstrate the ability to rewrite expressions in real-world situations.

### Standards

#### Use properties of operations to generate equivalent expressions.

**7.EE.A.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example,  $a + 0.05a = 1.05a$  means that “increase by 5%” is the same as “multiply by 1.05.”*

#### Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

**7.EE.B.3** Solve multistep 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. *For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional  $\frac{1}{10}$  of her salary an hour, or \$2.50, for a new salary of \$27.50 an hour. If you want to place a towel bar  $9\frac{3}{4}$  inches long in the center of a door that is  $27\frac{1}{2}$  inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

### Prior to the Task

**Standards Preparation:** The material in the chart below illustrates the standards and sample tasks that are prerequisites for student success with this task’s standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
7.EE.A.2		<ol style="list-style-type: none"> <li>What does the variable <math>d</math> without a coefficient mean?               <ol style="list-style-type: none"> <li>1 times <math>d</math></li> </ol> </li> <li>What is <math>d + 0.14d</math>?               <ol style="list-style-type: none"> <li><math>1.14d</math></li> </ol> </li> <li>What is <math>d - 0.34d</math>?               <ol style="list-style-type: none"> <li><math>0.66d</math></li> </ol> </li> <li><a href="http://www.illustrativemathematics.org/illustrations/1450">http://www.illustrativemathematics.org/illustrations/1450</a></li> </ol>	<ul style="list-style-type: none"> <li><a href="http://learnzillion.com/lessonsets/568-understand-that-rewriting-an-expression-in-different-forms-can-help-solve-the-problem">http://learnzillion.com/lessonsets/568-understand-that-rewriting-an-expression-in-different-forms-can-help-solve-the-problem</a></li> <li><a href="http://learnzillion.com/lessonsets/204-rewrite-an-expression-to-understand-how-the-quantities-are-related">http://learnzillion.com/lessonsets/204-rewrite-an-expression-to-understand-how-the-quantities-are-related</a></li> </ul>
7.EE.B.3	<ul style="list-style-type: none"> <li>7.NS.A.3</li> </ul>	<ol style="list-style-type: none"> <li>What is 8% of \$45?               <ol style="list-style-type: none"> <li>\$3.60</li> </ol> </li> <li>How much is 25% off of \$34?               <ol style="list-style-type: none"> <li>\$8.50</li> </ol> </li> <li>If a \$46 shirt is discounted 30%, what is the sale price of the shirt?               <ol style="list-style-type: none"> <li>\$32.20</li> </ol> </li> <li><a href="http://www.illustrativemathematics.org/illustrations/1450">http://www.illustrativemathematics.org/illustrations/1450</a></li> </ol>	<ul style="list-style-type: none"> <li><a href="http://www.illustrativemathematics.org/illustrations/298">http://www.illustrativemathematics.org/illustrations/298</a></li> <li><a href="http://learnzillion.com/lessonsets/680-solve-complex-problems-with-positive-and-negative-rational-numbers-in-all-forms-converting-between-forms-and-assessing-the-reasonableness-of-answers">http://learnzillion.com/lessonsets/680-solve-complex-problems-with-positive-and-negative-rational-numbers-in-all-forms-converting-between-forms-and-assessing-the-reasonableness-of-answers</a></li> <li><a href="http://learnzillion.com/lessonsets/135-solve">http://learnzillion.com/lessonsets/135-solve</a></li> </ul>

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
		5. <a href="http://www.illustrativemathematics.org/illustrations/108">http://www.illustrativemathematics.org/illustrations/108</a> 6. <a href="http://www.illustrativemathematics.org/illustrations/478">http://www.illustrativemathematics.org/illustrations/478</a> <a href="http://www.illustrativemathematics.org/illustrations/1588">http://www.illustrativemathematics.org/illustrations/1588</a>	<a href="#">multistep-reallife-and-mathematical-problems-with-positive-and-negative-rational-numbers-in-any-form</a>

**Real-World Preparation:** The following questions will prepare students for some of the real-world components of this task:

What does percent off mean? It is a markdown or amount taken off the original price.

What is sales tax? *Sales tax* is a percentage of the amount of money you pay for a purchase. It is added to the purchase price to create the final cost of an item.

How much is sales tax? It varies, depending on the region where the purchase is made.

### During the Task

- If students choose only two items to purchase, ask them to find how many items they could buy to spend as close to the total amount of \$250 without going over the price.
- Students may find the total savings without adding the sales tax to the original prices.
- When students write the total savings as a percentage, they may start trying to add the discount percentages from the given information in the problem. Discuss with them why adding the percentage values would not give them the correct percent savings.
- Students may struggle with writing two expressions for each situation. Ask students how they could write the expression using one operation rather than two.

### After the Task

Students will be able to relate this task to shopping for items that are on sale. Provide students with copies of sales papers from various stores and have students find the percent discount, the sales price, or the original price of a variety of items to provide more practice with this concept.

## Student Instructional Task

It's your birthday! You've received \$250 from your party guests. Your father takes you to a local department store to spend your money. Below are items that can be found, along with the current discount percentage.

 <p>Jacket - \$45 20% off</p>	 <p>Tennis Shoes - \$75 15% off</p>	 <p>Purse - \$65 30% off</p>	 <p>Television - \$129 25% off</p>
 <p>Headphones - \$55 10% off</p>	 <p>Men's/Women's Boots - \$109 20% off</p>	 <p>Team Jersey - \$85 25% off</p>	 <p>Fishing Pole and Reel - \$158 35% off</p>
 <p>Men's/Women's Jeans \$45 20% off</p>	 <p>Tablet - \$189 40% off</p>	 <p>Bicycle - \$139 15% off</p>	 <p>MP3 Player - \$78 30% off</p>
	 <p>Book Collection - \$36 35% off</p>	 <p>Laptop - \$199 10% off</p>	



Use the information above to answer the following.

1. Calculate the sales price for each item.
2. What items could you buy with \$250? Choose at least two items. How much of your money would you spend purchasing the items at the discounted price after taxes are added? (Use the current sales tax in your area.) Show all your work.
3. What is your total savings based on what you would have paid if the items were not on sale? State the savings as a dollar amount and as a percentage. Explain your answer.
4. Choose an item from the store. Write two equivalent expressions that can be used to find the sale price. Explain how you know the two expressions are equivalent. Be sure to define your variable.

## Instructional Task Exemplar Response

It's your birthday! You've received \$250 from your party guests. Your father takes you to a local department store to spend your money. Below are items that can be found, along with the current discount percentage.

Use the information above to answer the following.

1. Calculate the sales price for each item.

*Jacket-\$36*

*Tennis Shoes-\$63.75*

*Purse-\$45.50*

*Television-\$96.75*

*Headphones-\$49.50*

*Men's/Women's Boots-\$87.20*

*Team Jersey-\$63.75*

*Fishing Pole and Reel-\$102.70*

*Men's/Women's Jeans-\$36*

*Tablet-\$113.40*

*Bicycle-\$118.15*

*MP3 Player-\$54.60*

*Book Collection-\$23.40*

*Laptop-\$179.10*

2. What items could you buy with \$250? Choose at least two items. How much of your money would you spend purchasing the items at the discounted price after taxes are added? (Use the current sales tax in your area.) Show all your work.

*This answer will vary by student. The explanation should include:*

- *The items the student would purchase*
- *The total spent after taxes (the tax should be correct for your area—you may need to provide this)*

*Sample response:*

*I decided to buy:*

*Jacket: \$36*

*Jeans: \$36*

*Tablet: \$113.40*

*Books: \$23.40*

*Total amount with discounts before taxes: \$208.80*

*Sales tax: 9%*

*$\$208.80 \times 0.09 = \$18.79$*

*Total with sales tax:  $\$208.80 + \$18.79 = \$227.59$*

3. What is your total savings based on what you would have paid if the items were not on sale? State the savings as a dollar amount and as a percentage. Explain your answer.

*This answer will vary by student. The explanation should include:*

- *The original price with the total spent subtracted to show the total savings.*

*Sample response:*

*Jacket: \$45*

*Jeans: \$45*

*Tablet: \$189*

*Books: \$36*

*Total amount before taxes: \$315*

*Sales tax: 9%*

*$\$315 \times 0.09 = \$28.35$*

*Total with sales tax:  $\$315 + \$28.35 = \$343.35$*

*Total savings in dollars:  $\$343.35 - \$227.59 = \$115.76$*

*Total savings as a percentage:  $\$115.76 \div \$343.35 \times 100 = 33.714$ , so approximately 34% savings*

4. Choose an item from the store. Write two equivalent expressions that can be used to find the sale price. Explain how you know the two expressions are equivalent. Be sure to define your variable.

*This item will vary by student.*

*Example: Jacket original price \$45 discounted 20%*

*$j$  = the original price of the jacket*

*$j - 0.20j$       and       $0.80j$*

*I know these two expressions are equivalent because 1 whole minus 0.20 leaves 0.80.*

*\*\*Students may also explain that they substituted the original price of the jacket (\$45) and found the same value for both expressions (\$36).*

## Field Trip (IT)

### Overview

Students are asked to make several decisions about a class trip, including where to go and which bus company to use. They are then asked to justify these decisions.

### Standards

**Apply and extend previous understandings of operations with fractions.**

**7.NS.A.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

- d. Apply properties of operations as strategies to add and subtract rational numbers.

**7.NS.A.3** Solve real-world and mathematical problems involving the four operations with rational numbers.

### Prior to the Task

**Standards Preparation:** The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
7.NS.A.1d	<ul style="list-style-type: none"> <li>5.NF.A.1</li> <li>7.NS.A.1b</li> <li>7.NS.A.1c</li> </ul>	<ol style="list-style-type: none"> <li>What is <math>25 \times 4.75</math>?               <ol style="list-style-type: none"> <li>118.75</li> </ol> </li> <li>If a van carries 15 students, how many vans are needed for 48 students?               <ol style="list-style-type: none"> <li>4</li> </ol> </li> </ol>	<ul style="list-style-type: none"> <li><a href="http://www.illustrativemathematics.org/illustrations/855">http://www.illustrativemathematics.org/illustrations/855</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/861">http://www.illustrativemathematics.org/illustrations/861</a></li> <li><a href="http://learnzillion.com/lessonsets/137-apply-properties-of-operations-to-add-and-subtract-rational-numbers-and-understanding-subtraction-of-rational-numbers-as-adding-the-additive-inverse">http://learnzillion.com/lessonsets/137-apply-properties-of-operations-to-add-and-subtract-rational-numbers-and-understanding-subtraction-of-rational-numbers-as-adding-the-additive-inverse</a></li> <li><a href="http://learnzillion.com/lessonsets/17-add-and-subtract-mixed-numbers">http://learnzillion.com/lessonsets/17-add-and-subtract-mixed-numbers</a></li> </ul>
7.NS.A.3	<ul style="list-style-type: none"> <li>4.OA.A.3</li> <li>6.NS.B.3</li> <li>7.NS.A.1d</li> <li>7.NS.A.2c</li> <li>7.NS.A.2d</li> </ul>	<ol style="list-style-type: none"> <li>If one chaperone can go on a trip free with six paid students, how many can go with 62 students?               <ol style="list-style-type: none"> <li>10</li> </ol> </li> <li>How much would the rental fee for a van be for 36 miles, if the van company charges \$15 for the rental fee and \$5 for each mile?               <ol style="list-style-type: none"> <li>\$195</li> </ol> </li> <li><a href="http://www.illustrativemathematics.org/illustrations/298">http://www.illustrativemathematics.org/illustrations/298</a></li> </ol>	<ul style="list-style-type: none"> <li><a href="http://www.illustrativemathematics.org/illustrations/1289">http://www.illustrativemathematics.org/illustrations/1289</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/273">http://www.illustrativemathematics.org/illustrations/273</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/604">http://www.illustrativemathematics.org/illustrations/604</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/604">http://www.illustrativemathematics.org/illustrations/604</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/593">http://www.illustrativemathematics.org/illustrations/593</a></li> <li><a href="http://learnzillion.com/lessonsets/193-solve-realworld-problems-involving-the-four-operations-with-rational-numbers-1">http://learnzillion.com/lessonsets/193-solve-realworld-problems-involving-the-four-operations-with-rational-numbers-1</a></li> </ul>

**Real-World Preparation:** The following questions will prepare students for some of the real-world components of this task:

What factors do you take into account when deciding where to go in order to plan a trip? Factors to take into account are the places people would like to go, the distance to drive, the cost of admission, time for travel and to visit the attraction, and how many people are going.

What is group pricing? Group pricing is a special discount given when there is a large group being admitted to an attraction. Usually, it is a few dollars cheaper to encourage groups to visit.

### **During the Task**

- This task is designed for students to complete in a group. A group of three or four is optimal.
- When students are calculating costs, they should consider the 28 students in the class **plus** the number of students in the group (three or four).
- Students have numerous choices to make. They may have a hard time deciding where to start. They need to understand that they are going to have to figure out the pricing for each place based on the total number of students going, plus the cost of travel. They will also need to figure in the cost for the chaperones to attend.
- When students are considering the distance to the different attractions, they may assume that the given distance is the round-trip distance. Other students may assume the given distance is one-way. Ask probing questions to have students explain their reasoning about this concept. Technically the distance given is meant to be the distance to the attraction only—they would double the distance to include the return trip.

### **After the Task**

A follow-up to this task may be the planning of a real field trip in which the students get to help determine the destination based on several factors. It can also be related to the choices their parents have to make in going on a summer vacation trip.

## Student Instructional Task

Mr. Falting, a teacher at Roosevelt Middle School, is planning to take his middle school students on a field trip to some nearby attractions. Help Mr. Falting decide where he should take his class.

Here are some of the choices.

Place	Price Per Person	Price Per Student for Groups over 10	Chaperones and Teachers
Aquarium	\$12.00	\$10.00	One free for every 10 students; \$5.00 each after that
Zoo	\$13.00	\$9.00	One free for every eight students; \$6.00 each after that
Space Museum	\$15.00	\$11.00	One free for every five students; \$5.00 each after that

Below are the results of a poll of each class member's top two choices.

Attraction	Number of Students First Choice	Number of Students Second Choice
Aquarium	10	7
Zoo	10	11
Space Museum	8	10

Here are some other things Mr. Falting must take into account when planning the trip:

- Bus company A charges a \$20 rental fee and \$7 per mile for each bus. Each bus holds 25 people.
  - Bus company B charges \$7.75 per mile for each bus. Each bus holds 20 people.
  - Distance from the school:
    - Zoo: 32.9 miles
    - Space museum: 22.7 miles
    - Aquarium: 28.3 miles
  - The school fund will pay the first \$250 of the trip.
  - In addition to Mr. Falting, there will be two teachers and five chaperones. Any costs for the teachers and chaperones will be divided equally among the students.
  - Each student will pay the same amount.
1. Taking all factors into account, where should the class go for the field trip? Give supporting evidence for your choice. Remember to account for all students in the class (including you and your group members).
  2. How much will each person need to pay to go on the trip you have chosen? Explain carefully how you decided.

## Instructional Task Exemplar Response

Mr. Falting, a teacher at Roosevelt Middle School, is planning to take his middle school students on a field trip to some nearby attractions. Help Mr. Falting decide where he should take his class.

Here are some of the choices.

Place	Price Per Person	Price Per Student for Groups over 10	Chaperones and Teachers
Aquarium	\$12.00	\$10.00	One free for every 10 students; \$5.00 each after that
Zoo	\$13.00	\$9.00	One free for every eight students; \$6.00 each after that
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Attraction	Number of Students First Choice	Number of Students Second Choice
Aquarium	10	7
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Here are some other things Mr. Falting must take into account when planning the trip.

- Bus company A charges a \$20 rental fee and \$7 per mile for each bus. Each bus holds 25 people.
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  - Distance from the school:
    - Zoo: 32.9 miles
    - Space museum: 22.7 miles
    - Aquarium: 28.3 miles
  - The school fund will pay the first \$250 of the trip.
  - In addition to Mr. Falting, there will be two teachers and five chaperones. Any costs for the teachers and chaperones will be divided equally among the students.
  - Each student will pay the same amount.
1. Taking all factors into account, where should the class go for the field trip? Give supporting evidence for your choice. Remember to account for all students in the class (including you and your group members).

*Sample response (there will likely be different responses based on personalities in the class):*

*\*\*Note: This sample response is based on the 28 students polled (see table above) plus four students in the group working this problem.*

*The teacher should take the class to the space museum. It is the second favorite choice. I chose it over the favorite choice of the zoo, because it is the cheaper trip.*

*For 32 students to attend the museum at \$11.00 a person for admission, the admission cost would be \$352.00. The cost for chaperones would be 2 times \$5.00, which is \$10.00. The first six would go for free, because for every five students one teacher/chaperone would be free. Thirty-two divided by 5 equals 6.4—therefore only six chaperones would go for free because there can't be 0.4 of a chaperone. They would need to take two buses from Bus Company A. The charge would be \$675.60. One bus from Bus Company A would cost \$337.80 because the total mileage would be 2 times 22.7 miles (to go there and back) multiplied by \$7 per mile and added to the \$20 rental fee. This is cheaper than Company B, which would be \$7.75 times 45.4 miles, which is equal to \$351.85 for one bus. The total for admission and the two buses would be \$1,037.60. The school fund would pay the first \$250, leaving \$787.60.*

1. How much will each person need to pay to go on the trip you have chosen? Explain carefully how you decided.  
*Sample response (students' responses will need to be based on their decision for the first part):*

*The amount left to pay by the class is \$787.60. This total should be divided by the 32 students, since they are sharing all costs equally. Each student will pay \$24.61 to go to the space museum.*



## Park Area (IT)

### Overview

Students will apply their understanding of scale drawings and unit rate to solve a problem involving finding the area of a park and deciding which company to use for the proposed work on the park.

### Standards

**Analyze proportional relationships and use them to solve real-world and mathematical problems.**

**7.RP.A.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units.

**Draw, construct, and describe geometrical figures and describe the relationships between them.**

**7.G.A.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

### Prior to the Task

**Standards Preparation:** The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
7.RP.A.1	<ul style="list-style-type: none"> <li>6.RP.A.2</li> </ul>	<ol style="list-style-type: none"> <li>What is the unit rate in miles per hour if Mandy walks <math>\frac{1}{4}</math> mile in 12 minutes?               <ol style="list-style-type: none"> <li><math>1\frac{1}{4}</math> miles per hour</li> </ol> </li> <li>If the ratio of scaled length to actual length is 1 inch to 35 feet, what is the ratio of scaled area (square inches) to actual area (square feet)?               <ol style="list-style-type: none"> <li>1 sq. in. to 1225 sq. ft.</li> </ol> </li> <li><a href="http://www.illustrativemathematics.org/illustrations/470">http://www.illustrativemathematics.org/illustrations/470</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/828">http://www.illustrativemathematics.org/illustrations/828</a></li> </ol>	<ul style="list-style-type: none"> <li><a href="http://www.illustrativemathematics.org/illustrations/77">http://www.illustrativemathematics.org/illustrations/77</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/549">http://www.illustrativemathematics.org/illustrations/549</a></li> <li><a href="http://learnzillion.com/lessonsets/521-compute-unit-rates-associated-with-ratios-of-fractions">http://learnzillion.com/lessonsets/521-compute-unit-rates-associated-with-ratios-of-fractions</a></li> <li><a href="http://learnzillion.com/lessonsets/459-compute-unit-rates-using-fractions">http://learnzillion.com/lessonsets/459-compute-unit-rates-using-fractions</a></li> <li><a href="http://learnzillion.com/lessonsets/107-compute-unit-rates-associated-with-ratios-of-fractions">http://learnzillion.com/lessonsets/107-compute-unit-rates-associated-with-ratios-of-fractions</a></li> </ul>
7.G.A.1	<ul style="list-style-type: none"> <li>6.G.A.1</li> <li>7.RP.A.2</li> </ul>	<ol style="list-style-type: none"> <li>The given ratio on a scaled drawing of the Eiffel Tower is 1 centimeter:50 meters. If the height of the drawing is 6.48 centimeters, what is the actual height of the Eiffel Tower?               <ol style="list-style-type: none"> <li>324 meters</li> </ol> </li> <li><a href="http://www.illustrativemathematics.org/illustrations/107">http://www.illustrativemathematics.org/illustrations/107</a></li> <li><a href="http://www.illustrativemathematics.org/illustrations/1082">http://www.illustrativemathematics.org/illustrations/1082</a></li> </ol>	<ul style="list-style-type: none"> <li><a href="http://www.illustrativemathematics.org/illustrations/647">http://www.illustrativemathematics.org/illustrations/647</a></li> <li><a href="http://learnzillion.com/lessonsets/604-apply-scale-factor-to-realworld-problems">http://learnzillion.com/lessonsets/604-apply-scale-factor-to-realworld-problems</a></li> <li><a href="http://learnzillion.com/lessonsets/451-solve-problems-involving-scale-drawings-of-geometric-figures">http://learnzillion.com/lessonsets/451-solve-problems-involving-scale-drawings-of-geometric-figures</a></li> <li><a href="http://learnzillion.com/lessonsets/199-solve-problems-involving-scale-drawings-of-geometric-figures">http://learnzillion.com/lessonsets/199-solve-problems-involving-scale-drawings-of-geometric-figures</a></li> </ul>

**Real-World Preparation:** The following questions will prepare students for some of the real-world components of this task:

What is a landscape contractor? A *landscape contractor* is a company people might hire to improve the appearance of a piece of land by adding features like gravel, pavement, flower beds, etc.

What does it mean to “bid out” a project? “Bidding out” is a process where a purchaser looks for a company to complete a specific project. The companies interested in completing the work create a price list based on the work to be done for the project then present their proposals to the purchaser in order to convince the purchaser to use their services.

What are “labor costs”? Labor costs are how much a company pays their workers for the amount of time their workers would be working on a project.

How many hours do people normally work in a day? A week? Discuss with students that this really depends on the type of job. Students will need to think about the work that would happen for this project, the time of day, and possibly time of year. This will be one assumption students would have to make for this task.

### **During the Task**

- This task could be completed in groups or as individuals. Completing the task in groups would allow for more discussion among students. In their groups, students can determine how to start working the problem and what other factors need to be considered.
- Students may stop at finding the area of the park in square inches rather than finding the actual area. Ask probing questions to help students understand the connection between the scaled area and the actual area.
- Students may think that the cost for materials for Parks Plus, LLC, is based on the area rather than the linear measure. Ask students to identify the difference between the costs of the materials for the two companies.
- Students may wish to find the cost for both companies to complete the project for both park designs. Ask students to identify ways they might be able to identify which company would be better regardless of the park design.
- There are multiple ways students can find the area of the figures. Encourage students to share with each other their plans for finding the area.

### **After the Task**

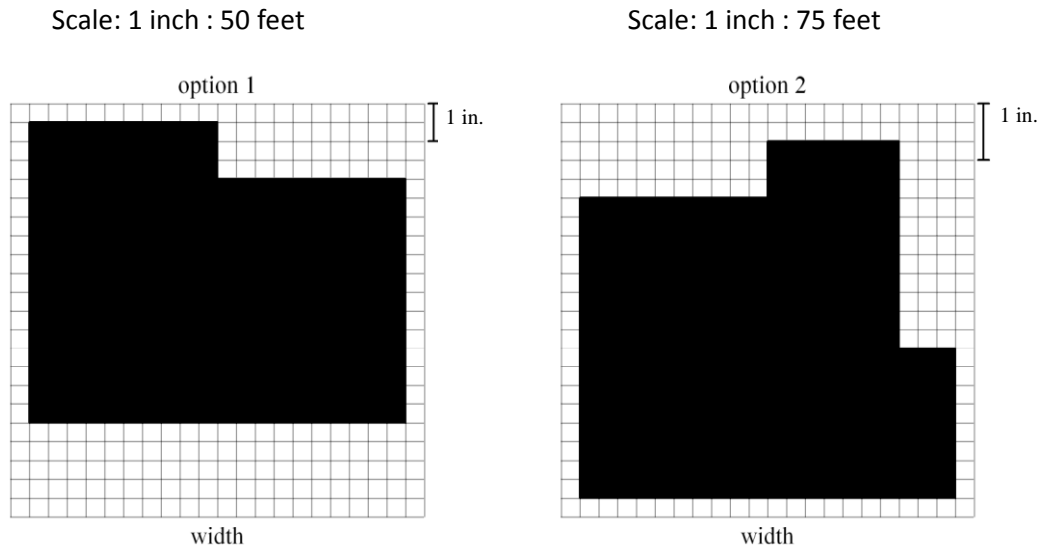
Have students present their recommendations to the class. Have students keep track of which options each group/student recommends. Discuss as a class which seems to be the best option.

Teachers can also ask students to find the total cost per square foot for this task based on the option and company they recommended.

Students can connect this task to work that might be happening on the school grounds or at their own homes. Teachers may wish to choose an area of the school grounds that students can plan to landscape (an existing flower bed, a new flower bed, planting trees, etc.) and use the concepts here to determine how much it would cost. Then they could complete the project.

## Student Instructional Task

The Parks and Recreation Committee plans to build a new park for young children. The members are determining where the park should be located; however, the committee members disagree on the design of the park. Two designs have been presented to the committee to vote on, but no decision could be reached; thus, the committee is seeking your help. The two options for the design of the new park are shown below:



The committee has to select a landscape contractor to cover the ground of the park with a combination of grass, gravel, mulch, and other child-friendly play surfaces. After bidding out the project to multiple landscape contractors, the committee narrows it down to two contractors. The bids are shown below:

	Parks Plus, LLC	Masterscapers, LLC
Costs for Materials	\$25 per $\frac{1}{2}$ scaled inch	\$100 for every $\frac{1}{3}$ scaled square inch
Labor Costs	\$175 per hour	\$1,000 per day
Estimated Completion Time	45 days	60 days

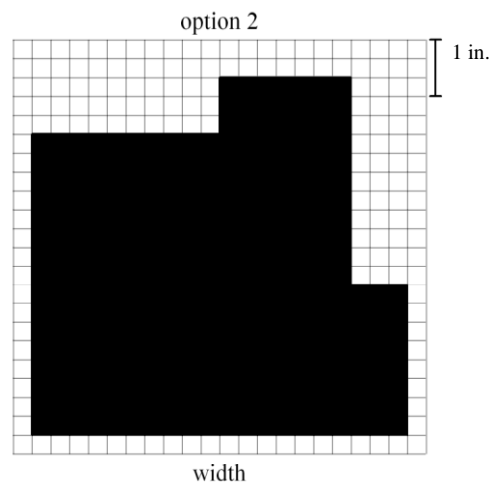
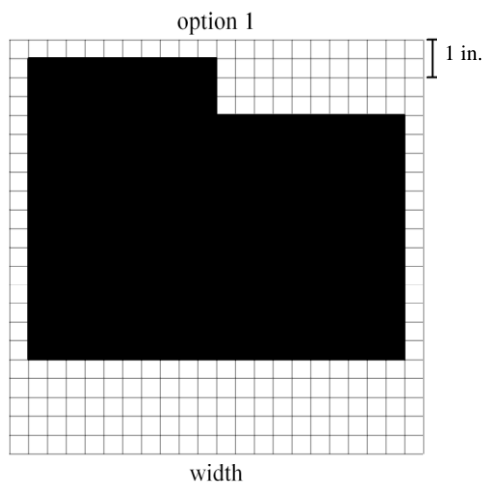


## Instructional Task Exemplar Response

The Parks and Recreation Committee plans to build a new park for young children. The members are determining where the park should be located; however, the committee members disagree on the design of the park. Two designs have been presented to the committee to vote on, but no decision could be reached; thus, the committee is seeking your help. The two options for the design of the new park are shown below:

Scale: 1 inch : 50 feet

Scale: 1 inch : 75 feet



The committee has to select a landscape contractor to cover the ground of the park with a combination of grass, gravel, mulch, and other child-friendly play surfaces. After bidding out the project to multiple landscape contractors, the committee narrows it down to two contractors. The bids are shown below:

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1. Which park design should the committee choose? Be sure to explain your choice and show all work that would support your choice. In your explanation, include the actual area of the park design you are recommending and any other factors you considered when making your choice.

Students should consider many factors including the size of the park and the cost by both contractors to complete the work for each park. There will be some assumptions that students may need to make, and those assumptions should be stated in the students' explanations.

Sample response:

Park Option #1:

Scale: 1 inch to 50 feet

Scaled area:

$(1 \text{ in})(1 \text{ in}) = 1 \text{ in}^2$ ;  $(50 \text{ ft})(50 \text{ ft}) = 2500 \text{ ft}^2$   
So  $1 \text{ in}^2$  on the drawing represents  $2500 \text{ ft}^2$  in actual area.

Area of Park Option #1:

$(8 \text{ in})(10 \text{ in}) - (1.5 \text{ in})(5 \text{ in})$   
 $80 \text{ in}^2 - 7.5 \text{ in}^2$   
 $72.5 \text{ in}^2$

$$\frac{1 \text{ in}^2}{2500 \text{ ft}^2} = \frac{72.5 \text{ in}^2}{(2500 \text{ ft}^2)(72.5)} = \frac{72.5 \text{ in}^2}{181,250 \text{ ft}^2}$$

Area of Park Option #1 is  $181,250 \text{ ft}^2$ .

Park Option #2:

Scale: 1 inch to 75 feet

Scaled area:

$(1 \text{ in})(1 \text{ in}) = 1 \text{ in}^2$ ;  $(75 \text{ ft})(75 \text{ ft}) = 5625 \text{ ft}^2$   
So  $1 \text{ in}^2$  on the drawing represents  $5625 \text{ ft}^2$  in actual area.

Area of Park Option #2:

$\left(\frac{16}{3} \text{ in}\right)\left(\frac{20}{3} \text{ in}\right) - (1 \text{ in})\left(\frac{1}{3} \text{ in}\right)$

$$\frac{320}{9} \text{ in}^2 - \frac{1}{3} \text{ in}^2$$

$$\frac{317}{9} \text{ in}^2$$

$$\frac{1 \text{ in}^2}{5625 \text{ ft}^2} = \frac{\frac{317}{9} \text{ in}^2}{(5625 \text{ ft}^2)\left(\frac{317}{9}\right)} = \frac{\frac{317}{9} \text{ in}^2}{198,125 \text{ ft}^2}$$

Area of Park Option #2 is  $198,125 \text{ ft}^2$ .

I would advise the committee to choose park option #1 because it has the smaller area. While that may reduce some of the play area, I think it would make it easier for parents to watch their children in a smaller area.

- Which contractor should the committee choose? Be sure to explain your choice and show all work that would support your choice. In your explanation, include all factors you considered when making your choice.

Sample response: (Answers here will likely be based on work from the first question. If students had incorrect work in question one, the previous work should be taken into account when assessing their understanding in this question.)

My work is based on my recommendation of park option #1.

Parks Plus, LLC, cost:

Materials: \$25 per scaled  $\frac{1}{2}$  inch—I have to find the price per square inch in order to find the price per square foot.  $\frac{\$25}{\frac{1}{2} \text{ in}} = \frac{\$50}{1 \text{ in}}$  so this would mean the cost for  $1 \text{ in}^2$  would be  $(\$50)(\$50)$ , which is \$2,500 per square inch.

From the work to find the area I did in question 1, I know that 1 square inch represents 2,500 square feet. So,  $\frac{\$2500}{1 \text{ in}^2} = \frac{\$2500}{2500 \text{ ft}^2} = \frac{\$1}{1 \text{ ft}^2}$ . This means it costs \$1 per square foot. The area of the first park is 181,250 square feet so the cost for materials is \$181,250.

Labor Costs for Parks Plus, LLC:

\$175 per hour and 45 days to complete the work—I'll assume they will work 8 hours a day.

45 days x 8 hours per day = 360 hours total

360 hours x \$175 per hour = \$63,000

Total costs for Parks Plus, LLC: \$181,250 + \$63,000 = \$244,250.

Masterscapers, LLC, Costs:

Materials: \$100 per  $\frac{1}{3}$  scaled square inch—I have to find the price per square inch in order to find the price per square foot.  $\frac{\$100}{\frac{1}{3} \text{ in}^2} = \frac{\$300}{1 \text{ in}^2}$ . Since 1 in<sup>2</sup> represents 2500 ft<sup>2</sup>,  $\frac{\$300}{1 \text{ in}^2} = \frac{\$300}{2500 \text{ ft}^2}$ ; this is equal to \$3 per 25 square feet.

$$\frac{\$3}{25 \text{ ft}^2} = \frac{x}{181,250 \text{ ft}^2}$$

$$181,250 \text{ ft}^2 \left( \frac{\$3}{25 \text{ ft}^2} \right) = \left( \frac{x}{181,250 \text{ ft}^2} \right) 181,250 \text{ ft}^2$$

$$\frac{\$543,750}{25} = x$$

$$\$21,750 = x$$

So, materials for Masterscapers, LLC, will cost \$21,750.

Labor Costs: \$1,000 per day and 60 days to complete the work.

60 x \$1000 = \$60,000

Total costs for Masterscapers, LLC: \$21,750 + \$60,000 = \$81,750.

Even though Parks Plus, LLC, seemed cheaper in the chart, after finding the actual costs, Parks Plus will cost more. So, I would recommend the committee choose Masterscapers, LLC.