## Big Idea(s):

Students use prior understanding of the four operations with rational numbers and apply the operations in measurement contexts to solve real-world problems.

## Content Standard(s):

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.

## Learning Intention(s):

## Mathematical Learning Intentions

We are learning to:

- Represent equivalent forms of numbers
- Write an equation to represent a realworld problem
- Apply properties of operations


## Language Learning Intentions

We are learning to:

- Use the terms relationship and equation
- Explain how an equation represents a real-world problem


## Social Learning Intentions

We are learning to:

- Listen to the ideas of others
- Respectfully disagree with the mathematical arguments of others


## Essential Question(s):

Can an expression or equation be written to represent a reallife mathematical problem?

## Mathematical Practice or Process Standards:

Model with mathematics.
Look for and make use of structure.
Critique the reasoning of others.

## Success Criteria (written in student voice):

I know that I am successful when I can:

- Write an equation, table, and graph for a linear relationship
- Recognize a linear, nonlinear, and no relationship from a graph
- Use the terms relationship and equation
- Explain how an equation represents a real-world problem
- Listen to the ideas of others
- Respectfully disagree with the mathematical arguments of others


## Purpose:

Conceptual UnderstandingProcedural Fluency Transfer

## Task:

## Taking Care of Teddy

Congratulations! You have just been hired for your first pet-sitting job! You have agreed to take care of Teddy the Toy Poodle for four days. You never imagined a 10-pound toy poodle would cause so many problems! You must solve every problem before Teddy's owners get back from vacation. However, Teddy's owners are very intense about Teddy's care. Each day they will text you to make sure you know what you are doing. They have also asked you to keep a journal for them to read when they get back. You must be able to answer their questions or they will find a new pet sitter!

## Day One: Teddy Gets a Haircut

Today, Teddy has an appointment with the groomer to get his fur trimmed. Teddy's owners left \$50 for you to pay the groomer. The cost of the grooming is $\$ 35.50$. You have been instructed by the owners to leave a $15 \%$ tip on the cost of the grooming. You also want to buy a chew toy for $\$ 5.99$. The tax rate in Teddy's state is $7.5 \%$. Do you have enough money to get the chew toy? Write an equation to represent this situation. Then explain how the equation matches the story.

Teddy's owner texts to check on how you are doing. You tell her all about the grooming and chew toy. She texts:


## Day Two: Keeping Teddy Out of the Living Room

Every time you leave Teddy, he chews up something in the living room. Yesterday, it was a pillow in the living room. Today, he knocked over a picture frame. You notice a dog gate in a box and decide to put up a gate to block Teddy from getting into the living room. You need to make sure the gate is centered correctly in the middle of the doorway. The doorway is $34 \frac{3}{4}$ inches wide. The gate is $22 \frac{1}{2}$ inches. How long will the bars that attach to the gate need to be? Write an equation to represent this situation. Then explain how the equation matches the story.

Teddy's owner texts to check on how you are doing. You tell her all about the gate!


Day Three: Teddy's Special Food
Teddy needs special food to stay healthy. You must mix his food in just the right way or Teddy will have terrible tummy troubles.

Directions: Get the 3-gallon container of DOGGY dry dog mix, which has $20 \%$ chicken, which is Teddy's favorite ingredient. Then, add the bag of PUPPY dry mix that has $30 \%$ chicken. You should now have a 10-gallon container mixed with DOGGY and PUPPY dry mix. Write an equation to describe the relationships between the different dog mixes. Then explain how the equation matches the story. What percent of the final dog food mixture is chicken?

Teddy's owner texts to check on how you are doing.


## Day Four: Teddy Goes to the Dog Park

You promised Teddy's owners you would take Teddy to the dog park, but you have been warned that Teddy cannot walk more than three miles or his little joints will ache. The owners want Teddy to walk as close to three miles as possible. When you get to the dog park, there are four paths.

- Path A: 0.24 mile
- Path B: $\frac{1}{2}$ mile
- Path C: 0.6 mile
- Path D: 500 yards

Select the paths or combination of paths that will allow you to walk Teddy as close to 3 miles as possible.
Write an equation to represent this situation. Then explain how the equation matches the story.
Teddy's owner texts to check on how you are doing. You tell her all about dog walk. She texts:


## Materials (representations, manipulatives, other):

| Teddy's Pet-Sitting Problem-Solving Journal (see Figure A.3) |
| :--- |
| Larger chart paper sectioned into four parts |
| DAY ONE |
|  |
| DAY THREE |

## Misconceptions or Common Errors:

- Students may struggle with multistep problems. You may scaffold the problems by focusing on the first part of the problem.
- Encourage the students to use number lines, such as in the dog park problem. Students can also use drawings to solve.
- Students may struggle to convert measurements. Provide measurement conversions as needed.
- Students may struggle to represent the situation using an equation.
- Students may find the tax on individual items and/or compute tax incorrectly.
- Students might be challenged by the Day Three problem because they will have to buy more to increase the percentage of chicken.

An additional blank text frame is added to the resources for the teacher to add an additional question as an extension for a group that ends early.

## Format:

$\square$ Four-Part LessonGame Format Small-Group InstructionPairsOther

## Formative Assessment:

Interview:

- How do you know your equation matches the problem?
- Is there another way to represent the problem?


## Launch:

Ask the students to brainstorm all the things they might need to know to pet sit. Record the students' ideas.

Pose questions such as:

- What kinds of situations might come up while pet sitting where math might be helpful?
- What kinds of math might you need to know?
- How might the math we have been learning in the expressions and equations unit help us solve problems?


## Facilitate:

Say, "You thought of some great situations where you might need to use knowledge about expressions and equations. In this lesson, we are going to get an opportunity to see how we transfer what we have learned to a new situation."

Arrange the students in pairs and introduce the context for the problem:
Congratulations! You have just been hired for your first pet-sitting job! You have agreed to take care of Teddy the Toy Poodle for four days. You never imagined a 10-pound toy poodle would cause so many problems! You must solve every problem before Teddy's owners get back from vacation. However, Teddy's owners are very intense about Teddy's care. Each day they will text you to make sure you know what you are doing. They have also asked you to keep a journal for them to read when they get back. You must be able to answer their questions or they will find a new pet sitter!
Explain to the students that they will have an opportunity to work in pairs to problem solve, but each will be responsible for recording their ideas in the pet-sitting journal. Depending on the amount of time you have for instruction, this lesson might take two days. Distribute the Teddy's Pet-Sitting Problem-Solving Journals, larger poster paper, and markers. As the groups begin solving, ask questions such as the following:

- How can you represent this problem?
- What will you do first?
- What equation might represent this problem?
- Is there another equation that might also work?
- Would drawing a picture help? Why or why not?

After the pairs have finished the first problem, hand them a slip of paper with the text from the owner (see Figure A.4). Encourage the students to solve the new problem and discuss the reasonableness of the solution.

Once the pair completes their work, arrange the students in a pair-to-pair share. (A pair-to-pair share is when two pairs form a group of four.) This is a good opportunity to strategically match pairs to share alternative ideas, solutions, and strategies. Have the pairs share their solutions and then decide on which solution to represent on the large chart paper for DAY ONE.
Repeat the same process for the next three problems (days).

1. The students will complete each problem (days) in pairs.
2. The students will receive a "text message" from the teacher at the completion of the problem. Students will then add the additional solution.
3. Pairs will be in groups to conduct a pair-to-pair share (group of four) to decide which of the solutions to represent on the large chart paper.

## Closure:

Conduct an extended closure by asking students to participate in a gallery walk. Then, select student groups to share particular representations for each of the problems. Encourage students to ask questions during the presentations. Ask questions such as the following:

- Explain how your equation represents the problem.
- Is there only one equation that will represent this problem?
- What kinds of drawings helped you solve?

Finally, ask individual students to complete the closure prompt on the back page of their journal.

Think about all the problems you solved for the pet-sitting business. Describe when you could solve the same kind of problem in a different situation in your life.

Retrieved from the companion website for The Mathematics Lesson-Planning Handbook, Grades 6-8: Your Blueprint for Building Cohesive Lessons by Lois A. Williams, Beth McCord Kobett, and Ruth Harbin Miles. Thousand Oaks, CA: Corwin, www.corwin.com. Copyright © 2019 by Corwin. All rights reserved. Reproduction authorized for educational use by educators, local school sites, and/or noncommercial or nonprofit entities that have purchased the book.

