

Use this 3-Act Math task any time after Lesson 13-3.

### 3-ACT MATH PREVIEW

**Page 480** This page gives students a preview of the 3-Act Math task for Topic 13. Read the robot's speech bubble with students.

**Generate Interest** Ask students if they know how water gets into a building. Say: [How does water get to a sink?](#) [How do cities and towns manage their water supply?](#) Have them share stories about water. Be prepared for students to talk about water-related issues such as drought.

### TASK OVERVIEW

**Essential Understanding** Many real-world problems can be represented with a mathematical model, but that model may not represent a real-world situation exactly.

Students use the 3-Act Math task to practice mathematical modeling. They:

- identify an important problem,
- identify the important information,
- develop a model that represents that situation,
- use the model to propose a solution, and
- test the appropriateness of that math model.

In the 3-Act Math for Topic 13, students draw on their conceptual understanding of calculating with units of weight and multiplication. They make use of representations and tools such as

- place-value blocks,
- number lines, and
- bar diagrams.

### TASK PLANNING

The following pages contain specific support for using this task with your class.

Before introducing the 3-Act Math task, consider when you'd prefer students to record their answers on their Recording Sheets and when they should share their answers verbally.

### TASK CONTENT

In every task, students apply a variety of concepts and skills.

Lesson	Concept/Skill
3-7	Use strategies to multiply
13-2	Using customary units of capacity
13-3	Using customary units of weight

They also combine conceptual understanding with math practices and processes in every step of the task.

3-ACT MATH PREVIEW
Math Modeling
A Pint's a Pound

Before watching the video, think:

Most water towers hold about 50 times as much water as a swimming pool. I got all geared up, and now I can't figure out how to get in!

**I can ...**

model with math to solve a problem that involves estimating and computing with units of weight and capacity.

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Topic 13 | 3-Act Math Preview



Video



Activity

## ACT 1: THE HOOK



### BRAINSTORM

#### **PLAY THE VIDEO** **WHOLE CLASS**

The first screen shows a video of a water tower filling with water. Take advantage of your students' initial reactions to watching the video. Ask [What do you notice about the video? What do you wonder?](#)

#### **BRAINSTORM QUESTIONS** **WHOLE CLASS**

**Item 1 Make Sense** Encourage students to share their questions in a class discussion. Record their questions and store them for later. Listen for interesting mathematical and *non*-mathematical questions.

To help students work on posing interesting, mathematical problems, ask [Which question do you find most interesting? Which questions could we use mathematics to answer?](#)



### PREDICTION

#### **POSE THE MAIN QUESTION** **WHOLE CLASS**

Use the Main Question screen in Act 1 to pose the problem situation students will be tasked with modeling and solving.

#### **MAIN QUESTION**

How many pounds of water are in the tower?

#### **MAKE PREDICTIONS** **INDIVIDUAL**

**Item 2** Point out that the prediction is only an estimate for the weight of the water. Do not give students time to make calculations.

#### **SURVEY PREDICTIONS** **WHOLE CLASS**

**Construct Arguments** You can survey the class for a range of predictions. Point out that, without any information, you expect a wide range of predictions. Ask [Why do you think your prediction is the answer to the Main Question? Who has a similar prediction? How many of you agree with that prediction? Who has a different prediction?](#)

Make sure students understand it is equally important to think about unreasonable predictions to the Main Question. Ask [What is a number too small to be the weight? What number is too many pounds?](#)

## 3-ACT MATH RECORDING SHEET

Name \_\_\_\_\_



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### 3-ACT MATH Recording Sheet

ACT 1

1. What questions do you have?



Brainstorm

**Students may say: Why is there a water tank outside the house? How does the water come into the tank? Is the water tank bigger than the house?**

2. Predict a reasonable answer to the Main Question. Explain your prediction.



Prediction

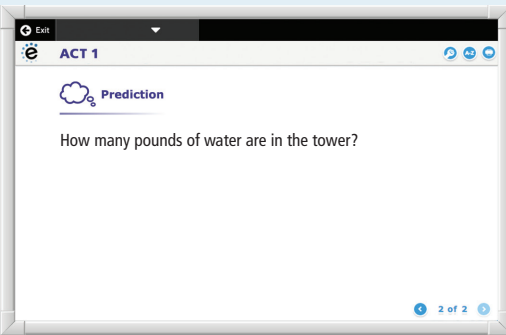
**Students will predict a range of numbers. Check students' explanations.**

3-Act Math Recording Sheet

1 of 3

Use any time after Lesson 13-3.

### CONSIDER THE MAIN QUESTION



Have students consider what they know about the scenario so far. Encourage students to think about how that information can help them make a prediction about the Main Question.

## ACT 2: THE MODEL

### INFO

#### IDENTIFY IMPORTANT INFORMATION WHOLE CLASS

**Item 3** Before showing any information, use the Information screen in Act 2 to give students time to think about what quantities are relevant to the problem situation. Ask [What information do you need to answer the Main Question?](#) I will only give you the information you ask for.

**Use Appropriate Tools** After discussing what information would be useful, ask [How could you get that information?](#) [How would you use it once you have it?](#) You can also have students complete the sentence frame “If I knew \_\_\_\_, then I could figure out \_\_\_\_.”

#### REVEAL THE INFORMATION WHOLE CLASS

Use the Image Gallery screen in Act 2 to reveal each piece of information. Record information as students identify it and keep the information where students can refer to it. Have students discuss whether this information matches their expectations.

- 1 gallon of water weighs about 4 kg.
- 1 kg is about 2 lb.
- The water tower holds about 500,000 gallons of water.

### MODEL

#### DEVELOP A MODEL SMALL GROUP PARTNERS

**Item 4 Model with Math** To support productive struggle, observe. If needed, ask guiding questions that elicit thinking. [How can you describe the relationship between the capacity of the water tower and the weight of the water in it?](#) [Write an equation. The weight of the water in the tower is the number of gallons in the tank times the weight of one gallon.] [What assumption do you need to make to use a math model?](#) [Every gallon of water has the same weight.]

#### EXTEND THE TASK INDIVIDUAL

**Item 7** For early finishers, use the SEQUEL button on the Image Gallery screen to reveal the Sequel, shown on the next page. You can also assign the Sequel after Act 3 or as homework.

#### SHARE SOLUTION STRATEGIES WHOLE CLASS

**Critique Reasoning** Have students share their solution methods. If needed, use the Analyze Student Work screen in Act 2, also shown at the right.

## 3-ACT MATH RECORDING SHEET

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ACT 2

3. What information do you need to answer the Main Question?

**Students may say: the number of gallons in the tank, the number of gallons the tank holds, the weight of a gallon of water**

4. Show how you can find the answer to the Main Question.

**Check students' work. See sample solutions below.**

3-Act Math Recording Sheet 2 of 3

## ANALYZE STUDENT WORK

### Josh's Work

Weight in Tank

4 gal x 500,000 gallons in tank

$4 \times 500,000 = 2,000,000$

The water weighs about 2,000,000 Kg.

Josh says he used a bar diagram to solve the problem. How did Josh use a bar diagram? Does his answer make sense? [Josh used a bar diagram to show the relationship between the number of gallons of water in the tank and the weight of the water. His answer would make sense if the question asked about kilograms.]

### Josefina's Work

1 gallon of water weighs about  $4 \times 2 = 8$  pounds.

$8 \times 50,000 = 400,000$

The water weighs about 400,000 pounds.

Josefina says she used equations to solve the problem. How did Josefina use equations? Does her answer make sense? [Josefina correctly used an equation to find the weight of 1 gallon of water in pounds. But then Josefina found the weight of 50,000 pounds of water instead of the weight of 500,000 pounds of water.]



Video



Activity

ACT 3: THE SOLUTION

ANSWER

REVEAL AN ANSWER WHOLE CLASS

**Item 5** The Act 3 video shows the tower filling to capacity. The water’s weight is 2,000,000 kg, or 4,000,000 lb. Have students record this real-world answer.

At this point in the video, there is a stop point, after which the solution to the Sequel is shown. You may choose to share the Sequel answer immediately, or share it after students have worked on the Sequel.

To support the connection between variability and mathematical modeling, ask *Why does our class have a variety of answers, and the video has only one answer? Why are some predictions closer to the video answer than others?*

MAIN QUESTION ANSWER

There are 4,000,000 pounds of water in the tower.

REFLECT

VALIDATE CONCLUSIONS WHOLE CLASS

**Item 6 Model with Math** Encourage students to discuss possible sources of error involved in using math to model this real-world situation. Accept a model as useful even if it is not perfect. Use the Reflect screen in Act 3 to ask *How useful was your model at predicting the answer? Would you change your model after watching the video? How would you change it?*

**Reasoning** You can also use the following question to test students’ understanding of the problem situation. *An Olympic-size swimming pool holds 660,430 gallons of water. About how many pounds of water are in an Olympic-size swimming pool?* [5,283,440 pounds]

REVISE THE MODEL INDIVIDUAL

Look for students to revise their models before developing a model for the Sequel. Students may adopt a classmate’s model as a result of the discussion in Act 2.

DISCUSS MATH PRACTICES WHOLE CLASS

If time allows, ask students the following questions to discuss how they incorporated math practices during the task.

**Model with Math** Explain how you modeled with math to represent the situation. How did doing that help you answer the Main Question?

**Construct Viable Arguments** How could you use estimation to verify your answer to the Main Question?

REVISIT BRAINSTORMING WHOLE CLASS

**Item 1** To acknowledge that your students have important ideas, use remaining class time to return to students’ list of questions. Answer as many as time allows. You can also assign interesting questions for homework.

3-ACT MATH RECORDING SHEET

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ACT 3

5. What is the answer shown in the video?

There are 4,170,000 pounds of water in the tower.

Answer

6. Does your answer match the Act 3 video? If not, what is one reason that could explain the difference?

Students may say: I made a mistake when I multiplied, or I forgot to convert from kilograms to pounds.

Reflect

SEQUEL

7. Show how you would answer the Sequel.

Students may say: I used the number of pounds of water in the tank. Then I found the number of elephants that were equal to that number of pounds. Check students’ work. Look for student answers of about 320 elephants.

3-Act Math Recording Sheet 3 of 3

SEQUEL

POSE THE SEQUEL INDIVIDUAL

**Item 7** You can assign this similar problem situation involving converting and calculating with weights for early finishers or as homework.

Exit

SEQUEL

A full-grown elephant weighs about 12,500 pounds. About how many full-grown elephants does it take to equal the weight of the water in the tank?

1 of 1

**Sequel Answer** Look for student answers around of about 320 elephants.