

Let's Model in 3 Acts

Lesson

10-4

A Pint's a Pound

FOCUS

Mathematics Objective Use conceptual understanding of converting a customary measure to solve a real-world problem.

Language Objective Explain predictions and solutions for real-world problems in writing and verbally.

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

COHERENCE

Look Back Earlier in the topic, students learned equivalence with customary units.

This Lesson In this lesson, students learned to convert customary measures for length, capacity, and weight.

Look Ahead In later topics, students will learn to measure and draw angles.

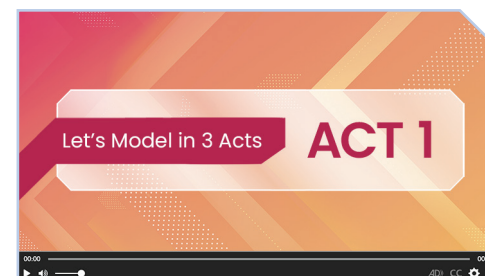
BALANCE

Conceptual Understanding Students draw on their conceptual understanding of conversions.

Application Students use math they know to solve a real-world problem.

Materials

Provide manipulatives and other tools that students request.



Teacher Resources

 Editable Lesson Plan

 enVision on the Go



Act 1 The Hook



10-15 min

Act 1



Name _____

A Pint's a Pound

I can ... model with math to solve a problem that involves conversions.

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ACT 1

- 1. Apply Math** What do you notice? What do you wonder?
Sample answer: Why is there a water tower outside the house?, How does the water come into the tower?, Is the water tower bigger than the house?
- 2.** Predict a reasonable answer to the Main Question.
Explain your prediction.
Students will predict a range of numbers.
Check students' explanations.

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Students are tasked with determining how many pounds of water are in a water tower given the number of tons of water in the tower.

Play the Video WHOLE CLASS

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 Apply Math 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?*

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.

Ask About Predictions WHOLE CLASS

Analyze 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?*

Act 2 The Model



20-30 min

Act 2

ACT 2

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

Sample answer: How many tons of water are in the tower, How many pounds are in a ton.

Build G.R.I.T.
Keep trying.

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

Check students' work. See sample solutions.



ACT 3

5. What is the answer shown in the video?

There are 18,000 pounds of water in the tower.

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

Sample answer: No, I made a mistake when I multiplied.

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Sample Student Work

8 tons 18,000 lbs									
1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs	1 ton 2,000 lbs

Water weighs 19,000 pounds.

Josh's Work

Josh used a strip diagram to solve the problem.

His diagram shows the relationship between tons and pounds.

Tons	Pounds
1	2,000
2	4,000
3	6,000
4	8,000
5	10,000
6	12,000
7	14,000
8	16,000
9	18,000

The water weighs about 18,000 pounds.

Josefina's Work

Josefina used a table to solve the problem.

Her table shows the relationship between tons and pounds.

Identify Important Information WHOLE CLASS

Item 3 Before showing any information, 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.

Connect 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 ton = 2,000 pounds
- The water tower holds about 9 tons of water.

Develop a Model SMALL GROUP

Item 4 Plan To support productive struggle, observe. If needed, ask guiding questions that elicit thinking. **How can you describe the relationship between tons and pounds?** [For every 1 ton there are 2,000 pounds.] **What assumption do you need to make to use a math model?** [Every ton has 2,000 pounds.]

Share Solution Strategies WHOLE CLASS

Communicate Have students share their solution methods. If needed, use the student work shown in Act 2, also shown here. Ask: **How did Josh solve the problem? How did Josefina solve the problem?**

Act 3 The Solution



15-30 min



Act 3

Use the Video to Reveal the Answer

WHOLE CLASS

Item 5 The Act 3 video shows the tower filling to capacity. The water's weight is 18,000 lb. Have students record this real-world answer. 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 18,000 pounds of water in the tower.

Validate Conclusions **SMALL GROUP**

Item 6 Check 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 Answer 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?*

Explain You can also use the following question to test students' understanding of the problem situation. *A backyard swimming pool might hold 5 tons of water. About how many pounds of water are in the pool? [10,000 pounds]*

Reflect on Thinking **WHOLE CLASS**

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

Represent Explain how you used math to represent the situation. How did doing that help you answer the Main Question?

Justify How could you use estimation to verify your answer to the Main Question?

Check How might you analyze and evaluate the efficiency of the approach you chose to solve the problem?

Create a Problem **INDIVIDUAL**

Have students create a problem. Write your own problem related to the video in Act 1. Include any additional information needed to solve your problem. Explain how you would use math to solve your problem. Then solve your problem. Remind students that they could use a question they came up with in Act 1.

*An elephant can weigh about 6,000 pounds.
About how many elephants does it take to
equal the weight of the water in the tank?*

*1 elephant = 6,000 pounds
2 elephants = 12,000 pounds
3 elephants = 18,000 pounds*

It takes 3 elephants.