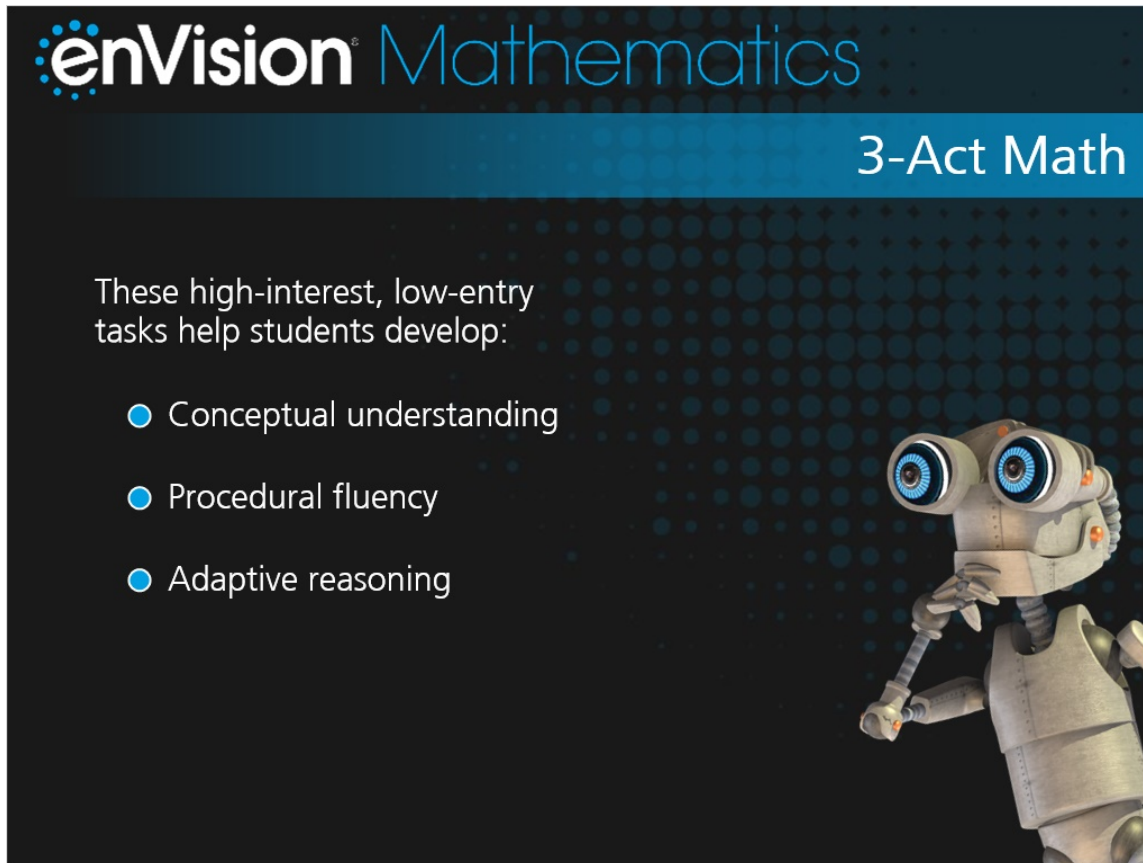


enVision Mathematics

3-Act Math

Introduction

A graphic with a dark blue background and a pattern of small, lighter blue dots. At the top left is the 'enVision Mathematics' logo. At the top right, the text '3-Act Math' is written in white. Below the logo, the text 'These high-interest, low-entry tasks help students develop:' is followed by a bulleted list of three items: 'Conceptual understanding', 'Procedural fluency', and 'Adaptive reasoning'. On the right side of the graphic is a 3D rendering of a friendly-looking robot with large, blue, circular eyes and a metallic body.

enVision Mathematics

3-Act Math

These high-interest, low-entry tasks help students develop:

- Conceptual understanding
- Procedural fluency
- Adaptive reasoning

Hi, **enVision** teachers! I'm glad you want to learn about 3-Act Math tasks.

These high-interest, low-entry tasks help all students develop conceptual understanding, procedural fluency, and adaptive reasoning as they test out different models and conjectures.

Let's dig in so you can see how these tasks help students learn to use mathematical models to solve real-world problems.

Planning and Pacing

Preview, plan, and
generate student
interest

The screenshot shows a digital interface for a 3-Act Math Preview. At the top, it says '3-ACT MATH PREVIEW' and 'Math Modeling: What's the Point?'. A central text box asks, 'Before watching the video, think: I do a lot of my writing on a laptop or a tablet. When do you prefer to use a pencil? How about crayons, pens, and colored pencils? You probably own plenty of different writing tools. You can even find some interesting ways to use them.' Below this, a robot character is holding a large yellow pencil. At the bottom left, there is a 'I can...' section: 'model with math to solve a problem that involves computing with whole numbers.' To the right, it lists 'Mathematical Practices MP.4 Also MP.1, MP.2' and 'Content Standards: 3.OA.A.3 Also 3.OA.A.1, 3.OA.A.2, 3.OA.B.5'. The page number '4' and 'Topic 1 | 3-Act Math Preview' are at the bottom left, and '© Pearson Education, Inc. 3' is at the bottom right.

A 3-Act Math task is provided in each odd-numbered topic. Teach this task as the lesson for the day.

The task can be at the beginning, in the middle, or at the end of a topic, depending on when students will have learned the relevant content. Find pacing details in the Table of Contents of your Teacher's Edition.

Use the Topic Overview to preview and plan for the task. Use the 3-Act Math Preview page in the Student's Edition to generate student interest at the beginning of the topic.

When teaching the task, give students the 3-Act Math Recording Sheets so they can record their ideas at each step. Find the sheets in the Teaching Tools section of your *Teacher's Resource Masters* book or online on Savvas Realize™. Open the **Teacher Resources** menu and select **Teaching Tools** to download the masters.

Quick Tip

Name _____

3-ACT MATH Recording Sheet

ACT 1

1. What questions do you have?

Brainstorm


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

Prediction

3-Act Math Recording Sheet 1 of 3

Use the 3-Act Math Recording Sheets in any way that works for you and your students. Consider these ideas:

- Provide students with new copies for each task
- Put sets in sheet protectors for students to use over and over again
- Display the sheets on a projector so students can record their ideas in math journals or notebooks
- Assign the tasks to students online in the Interactive Student's Edition

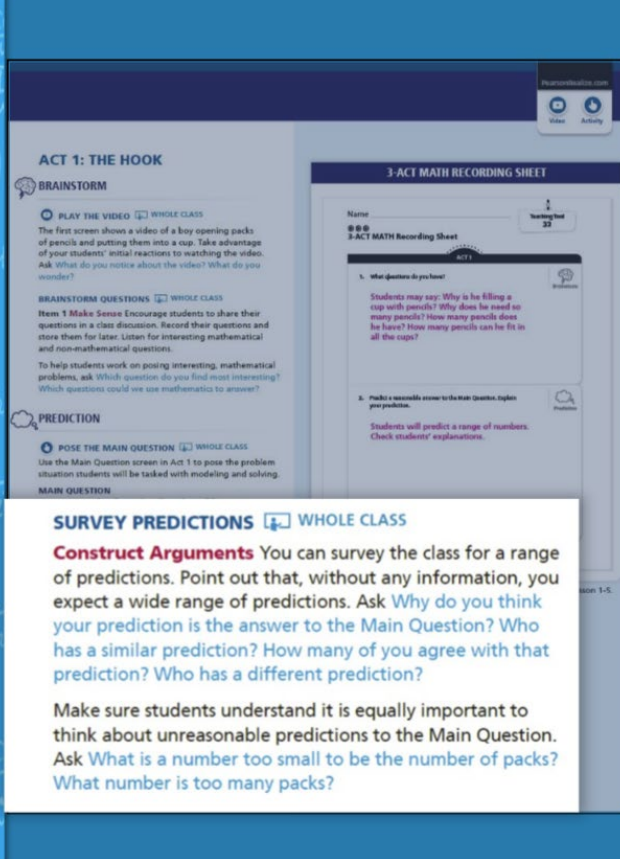


Click **Next** below to continue.

Act 1: The Hook

Act 1: The Hook

- Play the Act 1 video on Pearson Realize
- Give students time to brainstorm questions
- Discuss students' questions
- Reveal the Main Question
- Give students time to make predictions
- Record student predictions



ACT 1: THE HOOK

BRAINSTORM

PLAY THE VIDEO WHOLE CLASS
The first screen shows a video of a boy opening packs of pencils and putting them into a cup. 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

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 number of packs? What number is too many packs?*

In Act 1: The Hook, play the Act 1 video. The video presents a problem situation and provides just enough information to get students thinking and talking.

Give students time to brainstorm possible questions they have about the video. Students can write their questions on the recording sheets.

Have students share some of their questions, and then reveal the Main Question. Give students time to predict answers to the Main Question. Finally, ask them to share their ideas and record their predictions for the whole class to see.

Act 2: The Model

Act 2: The Model

- Ask students to identify the information they need
- Reveal the information using the Act 2 images or video
- Have students discuss the information
- Give students time to individually develop a model and answer to the Main Question
- Have students share and discuss a variety of strategies, models, and solutions

ACT 2: THE MODEL

INFO

IDENTIFY IMPORTANT INFORMATION (WHOLE CLASS)
Items 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 know _____, then I could figure out _____."

REVEAL THE INFORMATION (WHOLE CLASS)
Use the Image Gallery screen in Act 2 to reveal each piece.

3-ACT MATH RECORDING SHEET

ACT 2

3. What do you need to answer the Main Question?
Students may say: The number of pencils that fit in one cup; the number of pencils he has; how large each cup is.

4. How many can fit the answer to the Main Question?
Students will predict a range of numbers. Check students' explanations.

ANALYZE STUDENT WORK

Huan's Work

12 pencils in 1 pack
102 pencils in 1 cup
 $12 \times 10 = 120$ (too many)
 $12 \times 9 = 108$ (close)
 $12 \times 8 = 96$ (not enough)
He needs more than 8 packs but not quite 9 packs for 1 cup.
 $8 \times 3 = 24$ $9 \times 3 = 27$
He needs 26 packs for 3 cups.

What operations did Huan use? Did he make a good estimate? [Huan multiplied and subtracted to check his estimate. It was close but too high. So he tried 8 packs. That estimate was close but too low. So he knows the answer is between 8 and 9. He multiplied each by 3 for the 3 cups to find a good answer.]

Sofia's Work

102 pencils in 1 cup

whole packs: $8 \times 3 = 24$ extra: $6 \times 3 = 18$
 $18 - 12 = 6$
whole pack.

He needs 25 whole packs and 6 extra pencils.

What strategy did Sofia use? Does her answer make sense in the situation? [Sofia used an open number line to find the number of pencils in 1 cup. Then she used multiplication to find the number of packs. She also figured out the number of extra pencils because the number of packs didn't go in evenly.]

In Act 2: The Model, ask students to identify information they need to answer the Main Question.

After you collect students' ideas, reveal the information in Act 2. Ask students to discuss whether this information matches their expectations and predictions.

Then ask students to work individually to develop a model and solution to the Main Question. Encourage them to use any model to arrive at a solution that makes sense to them.

Have students share and discuss their strategies. Make sure to discuss a variety of different models and solutions. You can project sample student work shown in the Teacher's Edition using the last page of Act 2 on Savvas Realize.

Quick Tip

The screenshot displays the 'ACT 3: THE SOLUTION' section of the Savvas Learning Company interface. It includes a '3-ACT MATH RECORDING SHEET' with a 'SEQUEL' section. The 'SEQUEL' section contains a 'POSE THE SEQUEL' task with a question: 'How many more packs of pencils would you need to fill 3 more cups?'. The interface also features a 'REASONING' section with a question: 'You can also use the following question to test students' understanding of the real-world situation. If you wanted to know how many cups you'd need to hold 100 packs of pencils, how would that change your answer? [Example: One hundred packs of pencils is 1,200 pencils. Since about 100 pencils fill one cup, I'd need 12 cups to hold 100 packs of pencils.]'.

You can use the Sequel in the Teacher's Edition in a variety of ways:

- Assign a challenge to early finishers in Act 2
- Assign practice to all students after Act 3
- Assign homework to the whole class



Click Next to continue.

Act 3: The Solution

Act 3: The Solution

- Reveal an answer to the Main Question
- Give students time to reflect, analyze, explain, and/or review their models
- Assign the Sequel as classwork or homework

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 real-world situation. If you wanted to know how many cups you'd need to hold 100 packs of pencils, how would that change your answer? [Sample: One hundred packs of pencils is 1,200 pencils. Since about 100 pencils fill one cup, I'd need 12 cups to hold 100 packs of pencils.]

REVISE THE MODEL INDIVIDUAL

SEQUEL

POSE THE SEQUEL INDIVIDUAL

Item 7 You can assign this similar problem situation involving two more cups for early finishers or as homework.

SEQUEL

How many more packs of pencils would you need to fill 2 more cups?

Sequel Answer Look for student answers of about 15 more packs.

In Act 3: The Solution, play the video to reveal an answer to the Main Question.

Give students time to reflect, analyze, and explain differences between their answers and the actual solution. Lead a discussion to help students develop the math practices and give students time to revise their models or work on the Sequel.

Quick Tip

Research
into Practice:
MATHEMATICS

3-ACT MATH Tasks: Authentic Engagement with Mathematical Ideas

BY ZACHARY CHAMPAGNE AND JENNIFER M. SUH

Part 1: What Is a 3-ACT MATH Task?

OVERVIEW AND STRUCTURE

3-ACT MATH Tasks are built upon this foundational idea: *Students are more engaged in mathematics when they are authentically invested in the task.* As will be detailed in this paper, this investment is far beyond that which students generally experience with a traditional "real-world" task.

The basic structure of a 3-ACT MATH Task is based on storytelling. Books and movies often tell their story in three parts: conflict is introduced, characters look for clues and resources, conflict is resolved. Mathematics educators (Meyer, 2011) have noticed that this framework for storytelling maps nicely onto high-quality math tasks. These tasks begin with "conflict": an intriguing image or video that is intended to pique the student's interest. From there students are encouraged to pursue questions that they have based on the video, consider what information they need to find the answers to those questions, and finally ("conflict resolved") use mathematics to answer the question.


WHAT HAPPENS IN ACT 1?

In ACT 1 of these tasks, the teacher presents a striking visual (image or video vignette) that is intriguing and engaging—intended to draw students into the problem. Important to ACT 1 is simplicity—but simplicity that requires students to want to know and to do more. Dan Meyer (2011) says, "Your first act should impose as few demands on the students as possible—either of language or of math. It should ask for little and offer a lot."

Most of the 3-ACT MATH Tasks in *enVision* have video vignettes for ACT 1. As an example, consider the following screen shots from a Kindergarten 3-ACT MATH Task.

As students watch the boy's fingers clutching at grapes in the

For more information, read the article, *3-ACT MATH Tasks: Authentic Engagement with Mathematical Ideas* by enVision authors Zachary Champagne and Jennifer M. Suh. The article is available for download on the Getting Started tab of Pearson Realize.






Figure 1. A boy first grabs a handful of grapes.

Click Next to continue.

Closing



Thanks for learning more about 3-Act Math tasks! These tasks provide an engaging way for students to learn mathematical modeling skills that they'll use throughout their lives!

Keep digging in to My Savvas Training to learn more about **enVision Mathematics!**