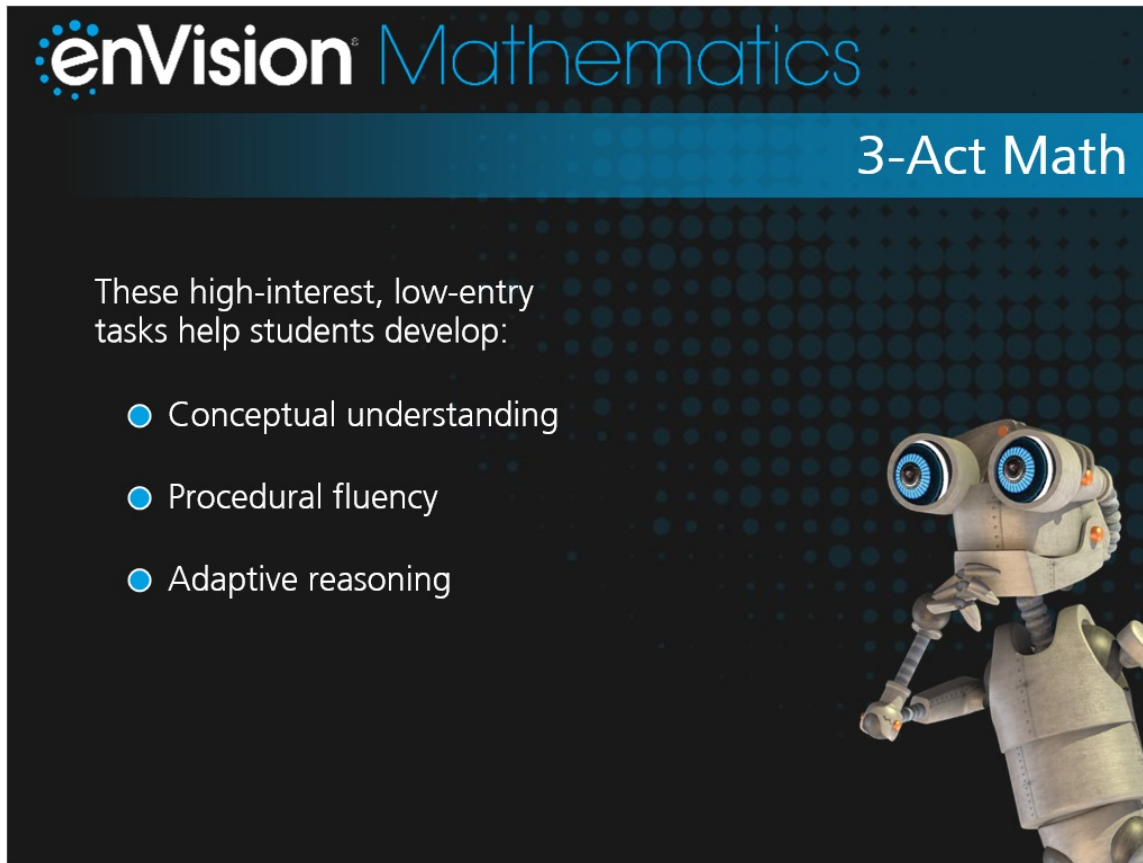


enVision Mathematics

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 rendered robot with large, blue, circular eyes and a metallic, grey 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?'. Below this is a large image of many colorful pencils. A white text box in the center 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.' At the bottom left, there is a 'I can...' section: 'model with math to solve a problem that involves computing with whole numbers.' To its right is a 'Mathematical Practices' section: 'MP.1, MP.2' and 'Content Standards: 3.OA.A.3 Also 3.OA.A.1, 3.OA.A.2, 3.OA.B.5'. At the bottom, it says 'Topic 1 | 3-Act Math Preview' and '© Pearson Education, Inc. 3'.

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 _____

Teaching Tool
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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?*

3-ACT MATH RECORDING SHEET

Name _____ Standard **3.5**

3-ACT MATH Recording Sheet

1. What questions do you have?

Students may say: Why is he filling a cup with pencils? Why does he need so many pencils? How many pencils does he have? How many pencils can he fit in all the cups?

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

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

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

The screenshot shows the '3-ACT MATH' interface. The top section is 'ACT 2: THE MODEL' with an 'INFO' icon. It contains instructions for teachers on how to reveal information and use appropriate tools. Below this is the 'ANALYZE STUDENT WORK' section, which displays two examples of student work: 'Huan's Work' and 'Sofia's Work'. Huan's work shows calculations for 12 pencils in a pack and 102 pencils in a cup, with a final conclusion that he needs 26 packs for 3 cups. Sofia's work shows an open number line and calculations for 102 pencils in a cup, concluding that she needs 25 whole packs and 6 extra pencils. The interface also includes a '3-ACT MATH RECORDING SHEET' on the right side.

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 two columns for student responses. The left column contains questions and student answers, while the right column contains teacher prompts and instructions. A 'SEQUEL' section is also visible, providing further context for the problem.

ACT 3: THE SOLUTION

ANSWER

REVEAL AN ANSWER WHOLE CLASS

Item 5 The Act 3 video shows three cups hold 282 pencils, which means the boy needs 28 packs to fill 3 cups. 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 answer in the video than others?

MAIN QUESTION ANSWER
It takes 24 packs of pencils to fill three cups.

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

Look for students to revise their models based on Act 3 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 used modeled with math to represent the situation. How did doing that help you answer the Main Question?

Attend to Precision How did you decide whether to use a whole number, a fraction, or a decimal to answer the Main Question?

REVISIT BRAINSTORMING WHOLE CLASS

Item 1 To acknowledge that students have important ideas, use remaining class time to return to students' list of questions. Answer as many questions as time allows.

3-ACT MATH RECORDING SHEET

ACT 3

6. What is the answer shown in the video?
It takes 24 packs of pencils to fill 3 cups.

7. Show how you would answer the Sequel.
Students may say: I used more than one operation to find the number of packs of pencils. Check students' work. Look for student answers of about 15 more packs of pencils.

SEQUEL INDIVIDUAL

POSE THE SEQUEL

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

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.

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



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

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 Savvas Realize.



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!**