

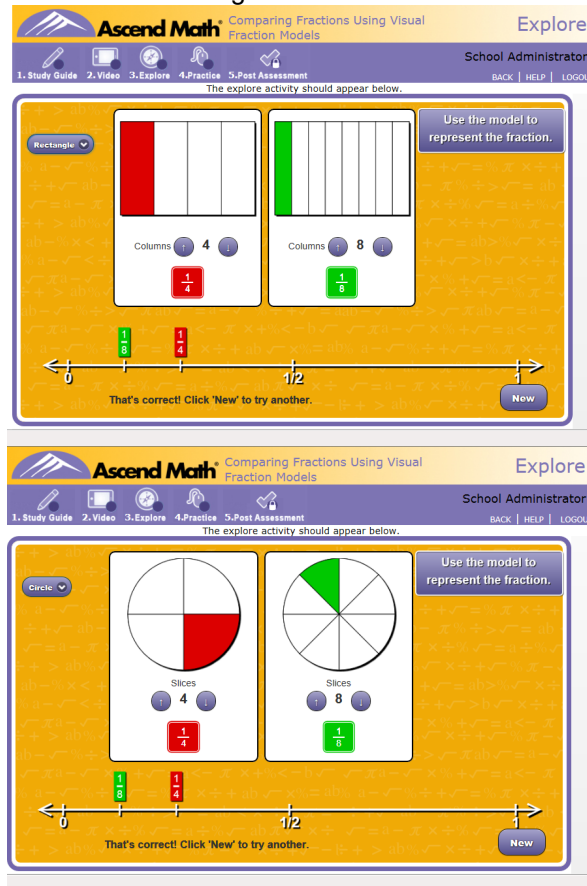


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1. Make sense of problems and persevere in solving them.

Ascend Math teaches flexible mathematical thinking by encouraging development of multiple tactics for similar problems. Students are encouraged to make sense of and understand the concept they are working on. See the example below – the numerical representation is compared to an area model which in turn is compared to a number line display. Students may explore the concept using either a pie chart or a rectangle.



The image shows two screenshots of the Ascend Math 'Explore' interface, which is titled 'Comparing Fractions Using Visual Fraction Models'. The interface includes a navigation bar with icons for Study Guide, Video, Explore, Practice, and Post Assessment, and a 'School Administrator' link. The main content area is divided into two sections: 'Rectangle' and 'Circle'.

**Rectangle Section:**

- Left Model:** A rectangle divided into 4 equal columns. The first column is shaded red. Below it, a slider shows 'Columns' set to 4, and a fraction  $\frac{1}{4}$  is displayed.
- Right Model:** A rectangle divided into 8 equal columns. The first column is shaded green. Below it, a slider shows 'Columns' set to 8, and a fraction  $\frac{1}{8}$  is displayed.
- Number Line:** A horizontal number line from 0 to  $\frac{1}{2}$ . A green tick mark is at  $\frac{1}{8}$  and a red tick mark is at  $\frac{1}{4}$ .
- Text:** 'That's correct! Click 'New' to try another.'
- Buttons:** 'New' and 'Use the model to represent the fraction.'

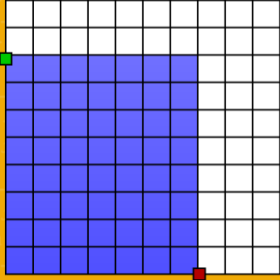
**Circle Section:**

- Left Model:** A circle divided into 4 equal slices. The first slice is shaded red. Below it, a slider shows 'Slices' set to 4, and a fraction  $\frac{1}{4}$  is displayed.
- Right Model:** A circle divided into 8 equal slices. The first slice is shaded green. Below it, a slider shows 'Slices' set to 8, and a fraction  $\frac{1}{8}$  is displayed.
- Number Line:** A horizontal number line from 0 to  $\frac{1}{2}$ . A green tick mark is at  $\frac{1}{8}$  and a red tick mark is at  $\frac{1}{4}$ .
- Text:** 'That's correct! Click 'New' to try another.'
- Buttons:** 'New' and 'Use the model to represent the fraction.'

2. Reason abstractly and quantitatively.

Mathematical reasoning requires attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. Ascend Math integrates visual approaches to acquisition of math skills. Please see examples below!

Drag the dots to change the product.



The product of 7 and 8 =  $w$

7 groups of 8

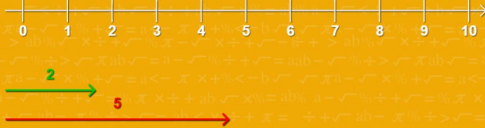
$7 \times 8 = 8 \times 7 = 56$

7 groups of 8

Represent the sum by dragging the addends to the number line.

2  
+ 5


7



Good work! Click "New".

2  
+ 5

7



New

Students are first asked to visualize the problem (abstract):

Ascend Math Formula D=RT Explore David Fox Home | Help | Logout


1. Study Guide 2. Video 3. Explore 4. Practice 5. Post Assessment

Study the problem.

Truckers Bill and Jim communicate by CB radio. CB radio signals have a range of one mile. Jim and Bill each begin driving in the same direction at the same time. If Bill drives at 70 mph, and Jim drives at 75 mph, how long will it be before they are one mile apart?


Next

Which one represents the problem?



Check

Set up the equations and then solve for the answer (quantitative).

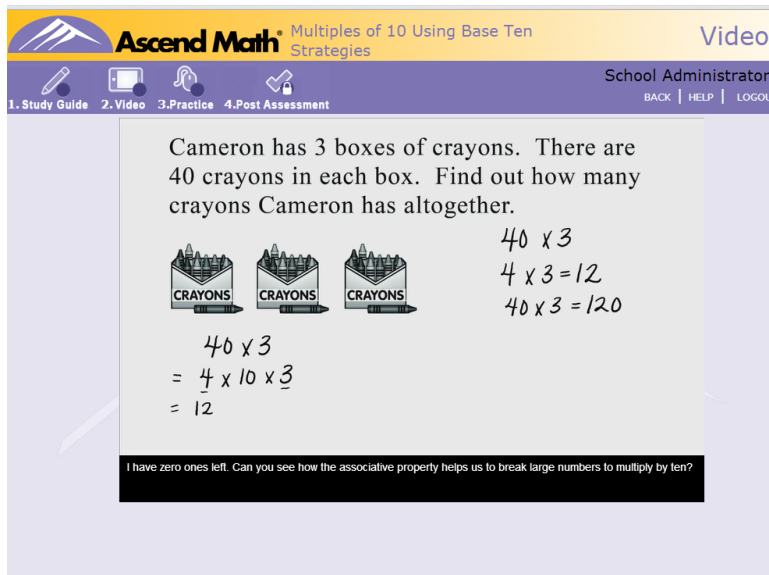


The screenshots show the following steps in the Ascend Math interface:

- Step 1:** Understanding the problem. Trucks Bill and Jim communicate by CB radio. CB radio signals have a range of one mile. Jim and Bill each begin driving in the same direction at the same time. If Bill drives at 70 mph, and Jim drives at 75 mph, how long will it be before they are one mile apart?
- Step 2:** Setting up a table for distance. The table has columns for Time (t), Rate (r), and Distance (d). Rows are for Jim and Bill.
- Step 3:** Choosing the equation. The equation  $75x = 70x + 1$  is selected.
- Step 4:** Solving the equation. The solution  $x = 1$  is found.
- Step 5:** Verifying the solution. After 1 hour, Bill and Jim will be one mile apart.

### 3. Construct viable arguments and critique the reasoning of others.

By offering a multi modal approach to instruction, using video, interactive explorations, practice problem video solutions, as well as study guides Ascend Math teaches a multitude of problem solving strategies for learners of varying aptitudes and affinities. Ascend provides real world applications throughout, such as tip-calculation, interest, wages, taxes, and task rates.



The video lesson shows the following content:

Cameron has 3 boxes of crayons. There are 40 crayons in each box. Find out how many crayons Cameron has altogether.

Three boxes of crayons are shown, each labeled "CRAYONS".

The calculation  $40 \times 3 = 120$  is shown, along with a breakdown of the calculation using base ten blocks:

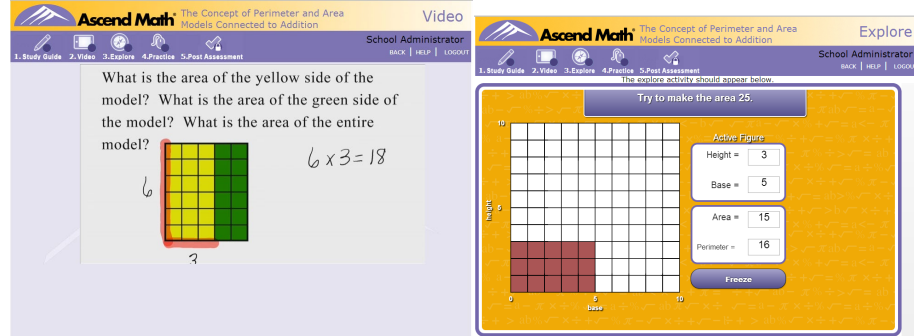
$$40 \times 3 = 4 \times 10 \times 3 = 120$$

A note at the bottom states: "I have zero ones left. Can you see how the associative property helps us to break large numbers to multiply by ten?"

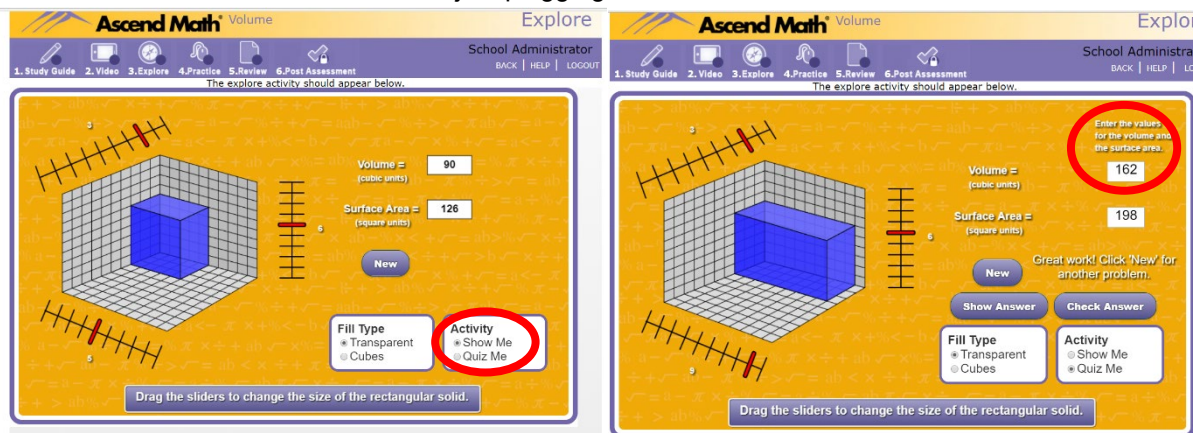
#### 4. Model with mathematics.

Ascend Math provides opportunities to discover formulas and processes discussed in the instructional video portion by connecting these to models.

E.g. solving an area-of-a-square problem with an interactive exploration by seeing the area and how it changes as the student changes the side lengths vs using the area formula vs using unit squares.

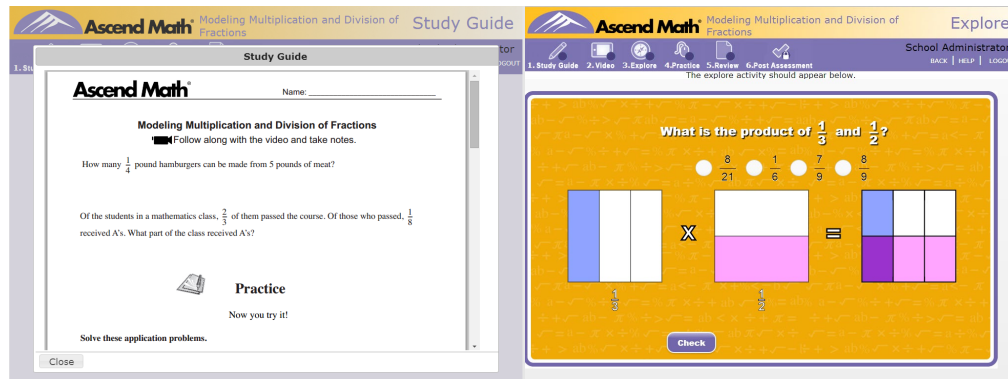


E.g. Visualizing the volume formula and watch the end result change as side length are manipulated, not just plugging answer into a formula.





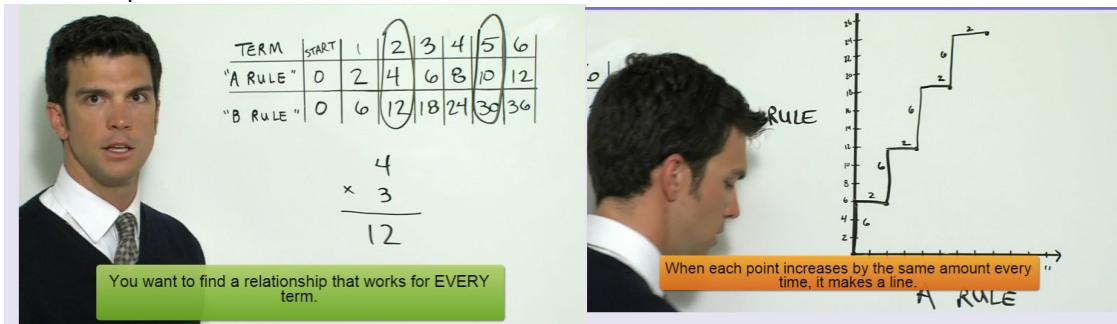
Ascend Math connects visual and symbolic learning throughout the entire study plan at all levels. See an example below. Fraction multiplication is taught not only by symbolic calculation, but also using visual representation.



5. Use appropriate tools strategically.

Ascend encourages use of tools, such as tables, models, steps, etc. to solve. Students respond differently to varying approaches.

See below for an example of a video. Patterns and relationships are discovered using different tools during the instruction portion.



6. Attend to precision.

Concrete, representational/pictorial, and abstract: Tool use is taught in many applicable areas, while encouraging precision as well as real life estimation.

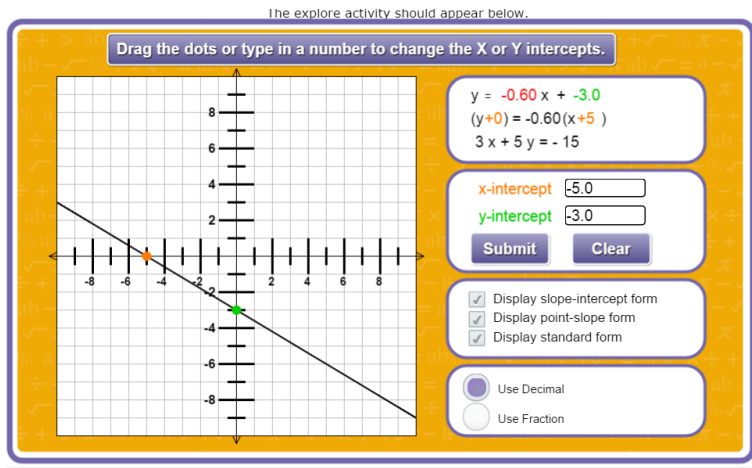
Q 1. Which picture is 2 inches high?





7. Look for and make use of structure.

Structure is present throughout math. Ascend utilizes this to teach students approaches to problem solving. As an example see below: The connection between the graph and the equation of a function are emphasized by color coding the parts involved, such as orange for the x-intercept.



8. Look for and express regularity in repeated reasoning.

Looking for repeated reasoning in mathematics allows for deeper understanding and easier calculations. Ascend shows instances of repeated reasoning to students, so they can make use of these.

**A certain dress requires 3 yards of material to make. How much fabric does a manufacturing company order to make 719 dresses?**

How would you set this problem up to solve it?

**a**  $719 \div 3$    **b**  $719 \times 3$    **c**  $719 \div 3$

Find  $\frac{1}{3}$  of 2 wholes.

What does the word "of" mean?

**a** multiply   **b** divide   **c** add   **d** subtract