Replace the Script

"I, We, You"

with Algebrafied Problems

A man twice as old as his sister weighs 10 pounds more than his cousin and has 12 more dimes than quarters in his pocket. He rows 5 miles upstream to get to a candy store. When he left, a plane left for New York flying against a 50 MPH headwind. He uses the money to buy mixed nuts, of which 10 percent are cashews. How soon after the trains meet does he arrive at the store? What are the dimensions of the store?

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Candy Jar Problem

Suppose you have a new candy jar with the same ratio of Jolly Ranchers (JR) to jawbreakers (JB) as shown in the picture, but it contains 100 Jolly Ranchers.

How many jawbreakers do you have?

Justify your answer.

Note: In the picture, Jolly Ranchers are represented by 5 rectangles, and jawbreakers are shown by 13 circles.

Fig. 12. The Candy Jar task. Adapted from Smith et al. (2005).

Fun Tees
Version 1

Fun Tees is offering a 30% discount on all merchandise. Find the amount of discount on a T-shirt that was originally priced at $16.00.

Fun Tees
Version 2

Fun Tees is offering a 30% discount on all merchandise.

a. Find the amount of discount on a T-shirt that was originally priced at $16.00.

b. Suppose the T-shirt was originally priced at $17, $18, 19, 20, or $50. Describe the amount of discount on t-shirts at each price.

c. Write a number sentence that describes how much discount you will receive on any T-shirt that is offered at a 30% discount.

Hexagon Pattern Train Task

Trains 1, 2, 3, and 4 (shown below) are the first 4 trains in the hexagon pattern. The first train in this pattern consists of one regular hexagon. For each subsequent train, one additional hexagon is added.

train 1   train 2   train 3   train 4
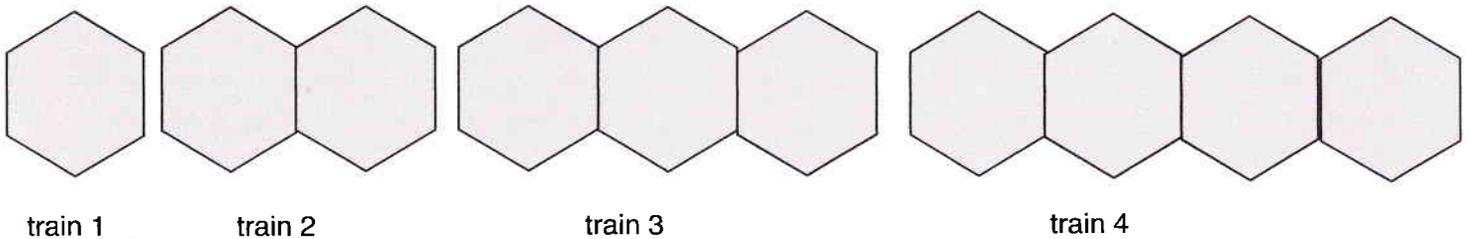
1. Compute the perimeter for each of the first four trains.

2. Draw the fifth train and compute the perimeter of the train.

3. Make some observations that could help you describe the perimeter of larger trains.

4. Determine the perimeter of the 25th train without constructing it.

5. Write a description that could be used to compute the perimeter of any train in the pattern. Explain how you know it will always work.

6. Write an equation that could be used to compute the perimeter of any train in the pattern.

7. What is the real world meaning of rate of change?

Extension: How could you find the perimeter of a train that consisted of triangles? Squares? Pentagons? Can you write a general description that could be used to find the perimeter of a train of any regular polygons?

The Hexagon Train Task has been adapted from *Visual Mathematics Course 1, Lesson 16-30* published by The Math Learning Center, Salem, Oregon, 1995.

Science Fair Booth
Version 1

Jeremiah and Haley use a piece of rope to mark a square space for their booth at the science fair. The area of their space is 49 square feet. What is the length of the rope that Jeremiah and Haley need to use?

Science Fair Booth
Version 2

Jeremiah and Haley use a piece of rope to mark a rectangular space for their booth at the science fair. They have a rope that is 28 feet long.

a. What is the area of largest rectangular space they can enclose? Explain how you know.

b. What if the rope was 36 feet long? 48 feet? What would be the area of largest rectangular space they could enclose? Explain how you know.

c. What are the dimensions of the largest rectangular space that can be enclosed with *any* amount of fence? How did you come to your conclusion?

Characteristics of mathematical tasks at four levels of Cognitive demand.

Lower-Level Demands	Higher-Level Demands
Memorization	Procedures With Connections
• involve either reproducing previously learned facts, rules, formulae or definitions OR committing facts, rules, formulae or definitions to memory.	• focus students' attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas.
• cannot be solved using procedures because a procedure does not exist or because the time frame in which the task is being completed is too short to use a procedure.	• suggest pathways to follow (explicitly or implicitly) that are broad general procedures that have close connections to underlying conceptual ideas as opposed to narrow algorithms that are opaque with respect to underlying concepts.
• are not ambiguous. Such tasks involve exact reproduction of previously-seen material and what is to be reproduced is clearly and directly stated.	• usually are represented in multiple ways (e.g., visual diagrams, manipulatives, symbols, problem situations). Making connections among multiple representations helps to develop meaning.
• have no connection to the concepts or meaning that underlie the facts, rules, formulae or definitions being learned or reproduced.	• require some degree of cognitive effort. Although general procedures may be followed, they cannot be followed mindlessly. Students need to engage with the conceptual ideas that underlie the procedures in order to successfully complete the task and develop understanding.
Procedures Without Connections	Doing Mathematics
• are algorithmic. Use of the procedure is either specifically called for or its use is evident based on prior instruction, experience, or placement of the task.	• require complex and non-algorithmic thinking (i.e., there is not a predictable, well-rehearsed approach or pathway explicitly suggested by the task, task instructions, or a worked-out example).
• require limited cognitive demand for successful completion. There is little ambiguity about what needs to be done and how to do it.	• require students to explore and understand the nature of mathematical concepts, processes, or relationships.
• have no connection to the concepts or meaning that underlie the procedure being used.	• demand self-monitoring or self-regulation of one's own cognitive processes.
• are focused on producing correct answers rather than developing mathematical understanding.	• require students to access relevant knowledge and experiences and make appropriate use of them in working through the task.
• require no explanations or explanations that focuses solely on describing the procedure that was used.	• require students to analyze the task and actively examine task constraints that may limit possible solution strategies and solutions.
	• require considerable cognitive effort and may involve some level of anxiety for the student due to the unpredictable nature of the solution process required.

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Stein, Smith, Henningsen, & Silver, 2000, p. 16