ALL LEARNERS NETWORK

Math for Every Student

Middle School Tasks

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Grade 8
May 21, 2020

Goals

- To engage in problem solving
- To explore ways to modify problems

All Learners Lesson Structure

- Launch
- Main Lesson
- Menu
- Closure

Implementing Tasks that Promote Reasoning and Problem Solving

Characteristics of Tasks:

- The mathematics is problematic for students,
- The task connects with student prior knowledge,
- The task engages students in thinking about important mathematics.

Spangler, D. A., Wanko, J. J., & National Council of Teachers of Mathematics. (2017). *Enhancing classroom practice with research behind Principles to actions*.

Problem solving can be understood as a process where previously acquired data are used in a new and unknown situation. (NCSM, 1989)

Benefits of Problem Solving

There are several benefits to having students engage in productive struggle as they solve mathematics problems:

- a sense of accomplishment;
- knowledge and understanding;
- improved achievement; and
- mastery and long-term retention.

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ALN Problem Solving Protocol

- Chorally read the problem.
- Ask, “What is this problem trying to figure out?”
    - This can be written on the board for everyone or each learner can write it on their paper. Have students rephrase into their own words.
- Ask, “What would an answer to this problem look like?” You can also ask, “What would a wrong answer look like?”
    - Identify the correct unit.
    - Probe for reasonableness.
- Brainstorm potential strategies.
- Express encouragement and ambivalence about each suggestion.

The Great Race

Mika has three snails named Ernie, Bernie, and Clyde.

Ernie moves at a rate of 4 inches per minute.

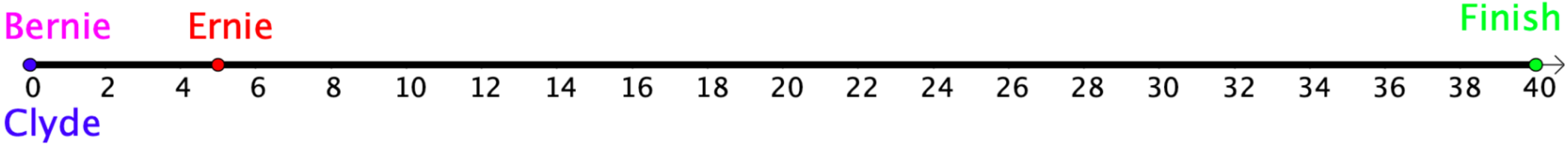
Bernie is a bit faster, and can move at 5 inches per minute.

Clyde is the fastest of the three snails, and moves at 6 inches per minute.

One day, Mika decides to have a snail race on the track shown below. To make it a fairer race, Mika does the following:

Ernie and Bernie start at the same time, but Ernie gets a head start of five inches.

Clyde starts at the same place as Bernie, but starts one minute later.



Grab a Text Box: Write a question that could be answered with the information:

Ernie moves at a rate of 4 inches per minute.
Bernie is a bit faster, and can move at 5 inches per minute.
Clyde is the fastest of the three snails, and moves at 6 inches per minute.

Ernie and Bernie start at the same time, but Ernie gets a head start of five inches.
Clyde starts at the same place as Bernie, but starts one minute later.

	at what point will they all meet	What is the distance	
At what point will they end at the same time?	By making these changes, is there an obvious winner?	Are they moving in te same direction?	
Will plotting the information on a coordinate plane be useful in determining the winner?	Who finishes first?	is the rate constant? Do they stop?	

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f) If Mika wants Bernie to win, where should the finish line be?

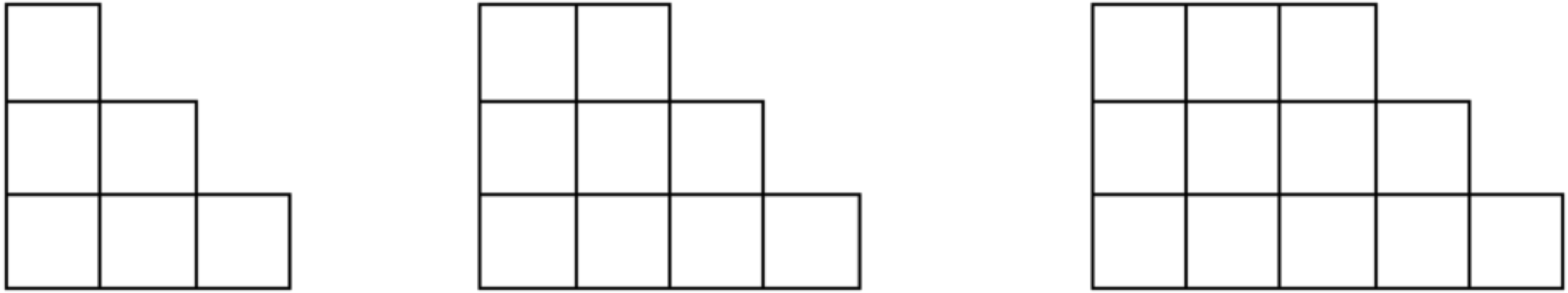
g) Graph this situation and make sure to label the axes.

Menu

- Look at the Menu Tasks
- Examine the question: what is a first step you might take to solve this problem?

Figure out where the finish line has to be.	Create a table or chart	Make a graph and play around with it.

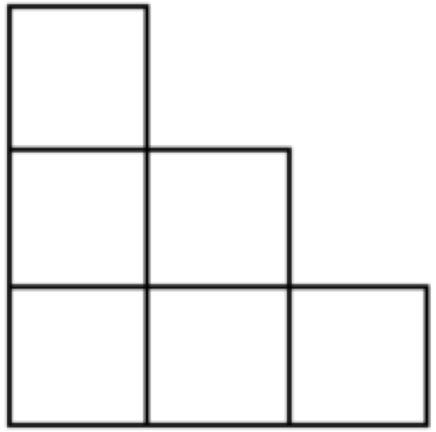
Patterns

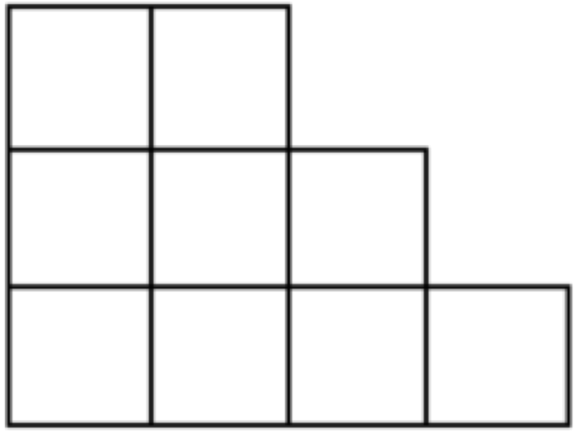


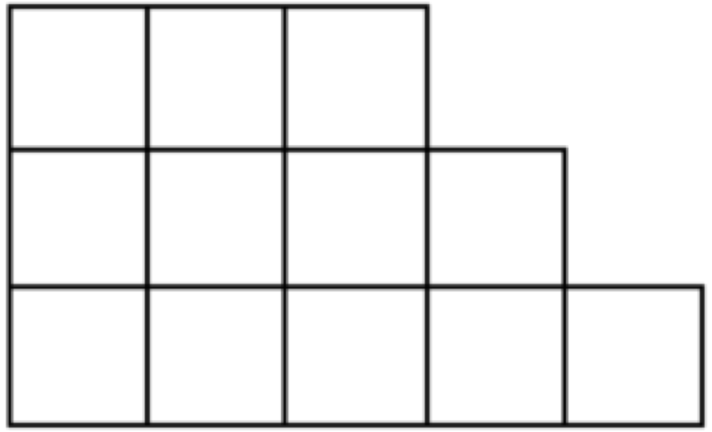
The pictures above show the first three steps of a growing pattern of boxes.

1) Describe how the pattern is growing.
2) Sketch the 4th and 5th steps in the pattern.

Patterns







3) How many squares would you need for the 10th step? 20th step? *n*th step?

4) What step would have 120 squares?

5) Draw a graph that shows the number of boxes needed for each step.

Menu

- Look at the Menu Tasks
- Examine the Penguin Pattern.
  - How is it different than the previous pattern?

Feedback

Please click on the title to give feedback.

Thank you for participating!