# Motivating Algebra Flipping the Script to Problem-Based Instruction

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# Mathematical Motivation

- Asking a question that necessitates the creation or usage of certain mathematics

- Unmotivated question:
  Find the vertex of a given parabola.

- Motivated question:
  If you throw a ball up in the air, how high will it go?

# Mathematical Motivation

- What mathematics is being motivated by the question is not always obvious!
- Good problems can motivate many different mathematical concepts
- In what ways can you extend the problem?
- Where do those extensions lead mathematically?

# Postage Stamp Problem

- What are some possible denomination-pairs that result in a postage amount of 62?
- Can you develop an algorithm which determines whether some number *A* can be generated by a certain combination of denominations?
- Other questions?

# Grid Puzzles

- Try to find a way to describe the pattern without using symbolic algebra.
- What does the sequence of puzzles force students to do?
- What math do students *need* to know to start this problem?
- What questions could you ask students which extend their thinking?
- Where do these questions lead mathematically?

# Problems

- Pick one problem to work on with your group.
- What mathematics *must* a student know in order to do the problem?
- What mathematics can this problem lead to?
- Develop a sequence of extending questions that lead from the mathematics to a certain algebraic concept.

# The Moral of the Story

- A well-motivated problem does not ask students to simply compute.
- Good problems (even in algebra) allow for students to begin working on a problem without “knowing” how to do it.
  - Different levels of entry
- A sequence of well-thought out questions can lead students from more elementary strategies to more algebraic strategies.

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# Thank You!