IM 9–12 MATH v.1

Unit 2

Polynomials and Rational Functions

ALGEBRA 2

Lesson 1

Let's Make a Box

Illustrative Mathematics®

Kendall Hunt

Learning Goal

Let's investigate volumes of different boxes.

Algebra 2

Illustrative Mathematics®

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Boxes

Warm-up: Which One Doesn't Belong?

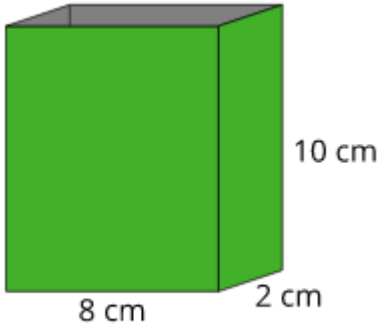
Which one doesn't belong?

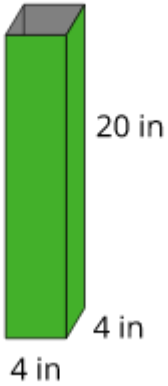
length: 4 cm

width: 8 cm

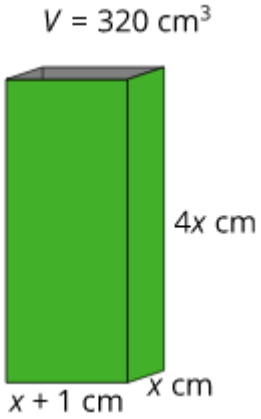
height: 10 cm

B.





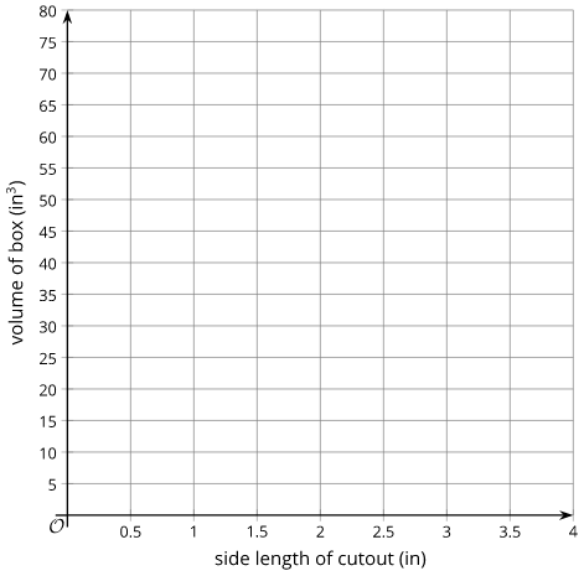
D.



Building Boxes

Your teacher will give you some supplies.

1. Construct an open-top box from a sheet of paper by cutting out a square from each corner and then folding up the sides.
2. Calculate the volume of your box, and complete the table with your information.



side length of square cutout (in)	length (in)	width (in)	height (in)	volume of box (in^3)
1				

Building the Biggest Box

1. The volume $V(x)$ in cubic inches of the open-top box is a function of the side length x in inches of the square cutouts. Make a plan to figure out how to construct the box with the largest volume.

   Pause here so your teacher can review your plan.

1. Write an expression for $V(x)$.
2. Use graphing technology to create a graph representing $V(x)$. Approximate the value of x that would allow you to construct an open-top box with the largest volume possible from one piece of paper.

Let's Make a Box

Lesson Synthesis

- What strategy did you use to answer the question?
- What are some side lengths for the square cutouts that don't make sense?

I can create and interpret a polynomial that models the volume of a box.

Learning Targets

Algebra 2

A Box's Domain

Cool-down

Outside of the United States, the common paper size is called A4 and measures 21 by 29.7 centimeters. Let $V(x) = (21 - 2x)(29.7 - 2x)(x)$ be the volume in cubic centimeters of a box made from A4 paper by cutting out squares of side length x in centimeters from each corner and then folding up the sides.

What is a reasonable domain for V in this context? Explain or show your reasoning.

polynomial

A polynomial function of x is a function given by a sum of terms, each of which is a constant times a whole number power of x. The word polynomial is used to refer both to the function and to the expression defining it.