Gold Seal Lesson:

Copernicus Education Gateway

Author(s): ***David Nohara***			***Lesson Title:*** ***Insulating windows***			
Grade Span			***ICLE Application Model***			
K-4	***5-8*** ***XX***	***9-12*** ***XX***	***A***	***B***	***C***	***D*** ***XX***

Instructional Focus:

Measurement
Students use a variety of tools and techniques of measurement in a problem-solving situation. Students communicate the reasoning used in solving these problems.

Geometry
Students apply geometric concepts, properties, and relationships in a problem-solving situation. Students communicate the reasoning used in solving these problems.

Problem-solving and Mathematical Reasoning
Students apply a variety of problem-solving strategies to investigate and solve problems from across the curriculum as well as from practical applications.

Performance Task

You are going to insulate the windows of a house with sheets of clear plastic sealed around the edges of the window. You call the hardware store and they tell you they sell window insulation kits that contain the following:

3 sheets of clear plastic measuring 42" x 62"
21 plastic locking strips to make a re-usable seal around the windows for the plastic measuring 2.5' each

The chart below lists the windows in your house and their dimensions. Ideally, you want to use one continuous sheet of plastic for each window, but since some windows may be too big, it may be necessary to tape two pieces of plastic together to cover a window. For the plastic locking strips, you can cut them and combine different pieces to seal a side, but the seal should be continuous (no gaps between the ends of the strips).

If you wanted to seal all the windows, how many insulation kits would you need to buy? Approximately how many square inches of plastic and how many inches of plastic strips would be left over? Please describe, in writing, each of the steps you take to solve the problem and include and label all relevant calculations.

When showing your work, you do not need to show how the locking strips would be combined, but you do need to indicate which windows would require multiple sheets of plastic to be taped together. You may illustrate your explanation with charts or drawings.

The hardware store is VERY far away from your house, so you want to buy enough that you don't have to go back to buy more but not too much so that you would have to go back and return the kits you didn't need.

Teacher's note: After students have completed their calculations and found their solutions, you can have them demonstrate, verify, and compare their answers by making scale models of the windows and plastic sheets with paper.

Room	Windows and dimensions (w x h)
Living room	33" x 51" 33" x 51" 33" x 51"
Family room	131" x 51"
Kitchen	57" x 34"
Dining room	33" x 51"

Room	Windows and dimensions (w x h)
	33" x 51"
Master bedroom	29" x 41" 29" x 41" 61" x 41"
Bedroom #2	29" x 41" 29" x 41"
Bedroom #3	29" x 41" 29" x 41"
Bedroom #4	61" x 41"
Bathroom	21" x 26"

ICLE Essential Skills

Compute the ***perimeter and area of two-dimensional figures*** (m13)
Perform operations with signed (positive and negative) numbers, including decimals, ratios, percents, and fractions (m 1)

Scoring Guide:

Approach and solution 35 points	Student's explanation identifies an appropriate approach that considers the following: • dimensions of windows and plastic sheets are more important than area (meaning that one cannot simply calculate the number of kits needed by dividing the total surface areas of the windows by the total surface areas of the sheets in the kits) • the number of kits required to provide enough plastic locking strips may be different from the number of kits required to simply cover the windows with plastic sheets Approach may use trial and error, but goal of trial and error process should be clear and logical.
Presentation 25 points	Student presents work logically, making steps taken and reasons for taking them clear. Student illustrates explanation with appropriate charts or diagrams, which may include: • a system of labeling the windows and the sheets of plastic • the window perimeters • how the plastic would be divided • which pieces of plastic would be used to cover which windows
Calculations 40 points	Appropriate formulas and correct calculations for: • conversion from feet to inches • perimeter of windows • total length of plastic strips in kits • total length of plastic locking strips needed and corresponding number of kits • amount of unused plastic sheeting (difference of total surface area of windows and total surface areas of plastic sheets) • amount of unused locking strips (difference of total length of strips in kits and sum of window perimeters)

Keywords

English Language Arts	Mathematics	Science
Reading	**Algebra**	**Earth Science**
Writing	**Geometry** area perimeter geometry in daily life problem solving spatial sense surface area	**Life Science**
Communications	**Statistics**	**Chemistry**
Literature	**Calculus**	**Physics**
Other	**Trigonometry**	**Other**
	Other	