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Solar Reflection & Absorption Hunt page 2 of 2

2 What temperature do you think it is outside in degrees Fahrenheit? Record your estimate and explain your thinking.

3 Use the formula below to find your estimated temperature in degrees Celsius.

$$C = (F - 32) \times \frac{5}{9}$$

4 At what time of day do you think it gets the hottest? Explain your reasoning.

5 Draw a diagram showing where the sun is in the sky in the morning, at noon, and in the afternoon. Label your diagram.

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Volume of Boxes page 1 of 2

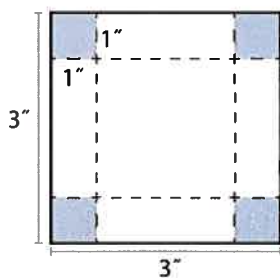
Mr. Ivy's class is conducting a solar collection experiment and wants to make boxes that have a volume of 32 cubic inches.

- List all the sets of dimensions (length, width, and height) a box with a volume of 32 cubic inches could have.

ex $1'' \times 1'' \times 32'' = 32$ cubic inches

- The class needs patterns to help them make the boxes. Choose one of the boxes you listed above. Sketch and label a model that would help someone know how to measure and cut a piece of tagboard that could be folded and taped to make a box (without a lid) with the dimensions you chose. You can include directions for making the box if you like.

Note: Your sketch will be smaller than the actual measurements. For example, here is a sketch that would help someone know how to measure and cut a piece of tagboard that could be folded and taped to make a $3'' \times 3'' \times 1''$ box.



Start with a square of tagboard 5" on each side. Cut a $1'' \times 1''$ square out of each corner. Fold along the dotted lines and tape the corners to make a box with a base of $3'' \times 3''$ and a height of $1''$.

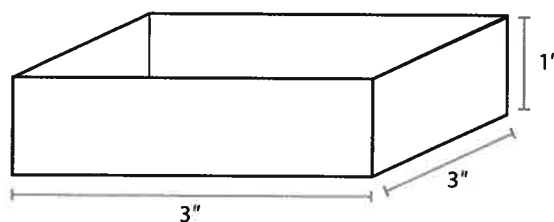
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Volume of Boxes page 2 of 2

Here is what the $3'' \times 3'' \times 1''$ box from the example sketch looks like after it is built.



- 3** Now draw and label a picture to show what the box you chose will look like after it is built.

- 4** Which of the sides of this box you just sketched will collect the most solar energy when the box is set out in the sun? Explain your reasoning.

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**Volume of Earth Materials** page 1 of 2

The students in Mr. Ivy's class decided to use boxes to test how earth materials collect and store solar energy.

- 1** A box in the classroom had a volume of 99 cubic inches. What were its dimensions, if no side had a length of 1 inch? Show your work using words, numbers, or labeled sketches.

- 2** Students in the class made several different boxes to help them decide which size to use. The dimensions of their boxes are listed. Find the volume of each.

Note Remember to label each answer with the correct units, cubic inches or in^3 .

a $7'' \times 12'' \times 9''$	b $7'' \times 12'' \times 4''$
c $5'' \times 10'' \times 8''$	d $1'' \times 6'' \times 3''$

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Volume of Earth Materials page 2 of 2

- 3** The class decided to use $7'' \times 12'' \times 4''$ boxes. They put rocks in 9 boxes. How many cubic inches of rocks did they need to fill the 9 boxes? Show your work.
- 4** After the students filled every box with an earth material, they placed each box in the sun so that the greatest possible surface area was exposed. What is the surface area of one of the box's earth material that is exposed to the sun?
- 5** **CHALLENGE** When they were preparing their experiment, one of the groups realized their box full of rocks was actually $7'' \times 11'' \times 4''$, and another group discovered theirs was $8'' \times 12'' \times 4''$. How many cubic inches of rocks had the class actually used to fill all 9 boxes? Show your work.

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Windows on a House page 2 of 2

4 Jeremy also made a model house over the weekend. Its dimensions were 25" wide by 22" long by 12" tall. Jeremy used his brother's new roll of blue duct tape to tape along all of the edges of the house. His brother complained that Jeremy used most of his 20-foot roll of tape. Did Jeremy really use most of his brother's tape? Explain your reasoning.

5 Jeremy's brother paid \$19.17 for three rolls of colored duct tape at the hardware store. How much did he pay per roll? Show your work.

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**Buying Materials** page 1 of 2**Note to Families**

In class, students have been making and insulating model houses. They can choose among several materials for their house's insulation: newspaper, felt, or fabric for walls and floors; weatherstripping, masking tape, or caulking for corners and edges; and storm windows or fabric curtains for windows. If your student isn't sure what materials to choose, suggest these possibilities.

Mr. Ivy's class made model houses with the dimensions of 11" wide by 10" long by 8" tall. Each house has 56 square inches of windows. Alex's team needs to buy some insulation materials for their house. They can spend \$4.50 on materials. The costs are listed in the table below.

Insulation Material	Cost
weatherstripping (electrician's tape)	$\frac{1}{2}$ yard @ \$0.25
storm windows (transparency film)	8.5" × 11" @ \$0.50 each
newspaper	1 sheet @ \$0.20
felt	8.5" × 5.5" @ \$0.35 each
polyester-blend fabric	\$0.40 per 42 square inches
masking tape	1 roll @ \$0.40
caulking (tacky glue)	1 bottle @ \$0.50

Help Alex and his team decide how to spend their \$4.50 to insulate their house.

- 1 Use the space below to make sketches and calculate the cost of different materials.

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Buying Materials page 2 of 2

- 2** Fill in the Insulation Cost Sheet below to show what you think Alex's team should buy. List each item and its cost per unit, the amount needed, and the total cost for that material. When you have listed all the materials, find the total cost, and make sure that you haven't gone over \$4.50.

Insulation Cost Sheet

Insulation Material	Cost per Unit (piece, sheet, etc.)	Amount Needed	Total Cost
Total Cost of All Materials			

- 3** Explain the reasoning behind your selection of materials. Why did you choose these particular materials?

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**Energy in Our Homes** page 1 of 2

Look around your home, and answer as many of the following questions as you can:

- 1** If you have an attic, ask an adult at home how much insulation it has.
 6 inches or less 7–11 inches 12 inches or more

- 2** How many layers of glass do your windows have?
 Single pane with no storm windows
 Single pane with storm windows or double pane
 Double pane with reflective coating or gas-filled

- 3** Hold your hands up near where the window meets the ledge and the edge. Do you feel a draft?
 Yes No

- 4** Hold your hand up against the window. Does it feel cold (in the winter) or hot (in the summer)?
 Yes No

- 5** Open your front door and check the condition of the weatherstripping between the door and the door frame.
 None Worn out Good condition

- 6** Do you use awnings or shades to cover your windows in the summer?
 Yes No

- 7** Are there deciduous trees on the south-facing side of your home?
 Yes No

- 8** Count the number of compact fluorescent light bulbs (CFLs) you have in your home.
 0 CFL bulbs 1–4 CFL bulbs 5 or more CFLs

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Energy in Our Homes page 2 of 2**9** How often do you turn lights off when you leave a room?

- Almost never Sometimes Always

10 At what temperature do you set your thermostat when you are home and awake?

In heating seasons (winter):

- 73° or more
 70°–72°
 69° or less

In cooling seasons (summer):

- 74° or less
 75°–77°
 78° or more

11 Ask an adult at home how often your furnace filters were cleaned or changed in the last year.

- Not at all 1–3 times 4 or more

12 At what water temperature do you wash your clothes?

- Mostly hot water Mostly warm water Mostly cold water

13 How much time do you spend in the shower?

- 15 minutes or more 10 minutes 5 minutes

14 What other things do you notice about how you use energy in your home?**15** Consider the information you have gathered. Write a note to your parents explaining in what ways your home is energy efficient and what could be done to improve its efficiency.adapted from Energy Scavenger Hunt. energyhog.org

**Drawing a House to Scale** page 1 of 2

- 1** One team in Ms. Vega's class made a model house with dimensions 7" wide by 10" long by 8" tall. They need to cut out windows that take up $\frac{1}{8}$ of the surface area of the four walls.
- a** How much area do they have for windows? Show your work.
- b** Decide on the size and placement of the windows on the four walls. Make a quick sketch of each wall with windows.

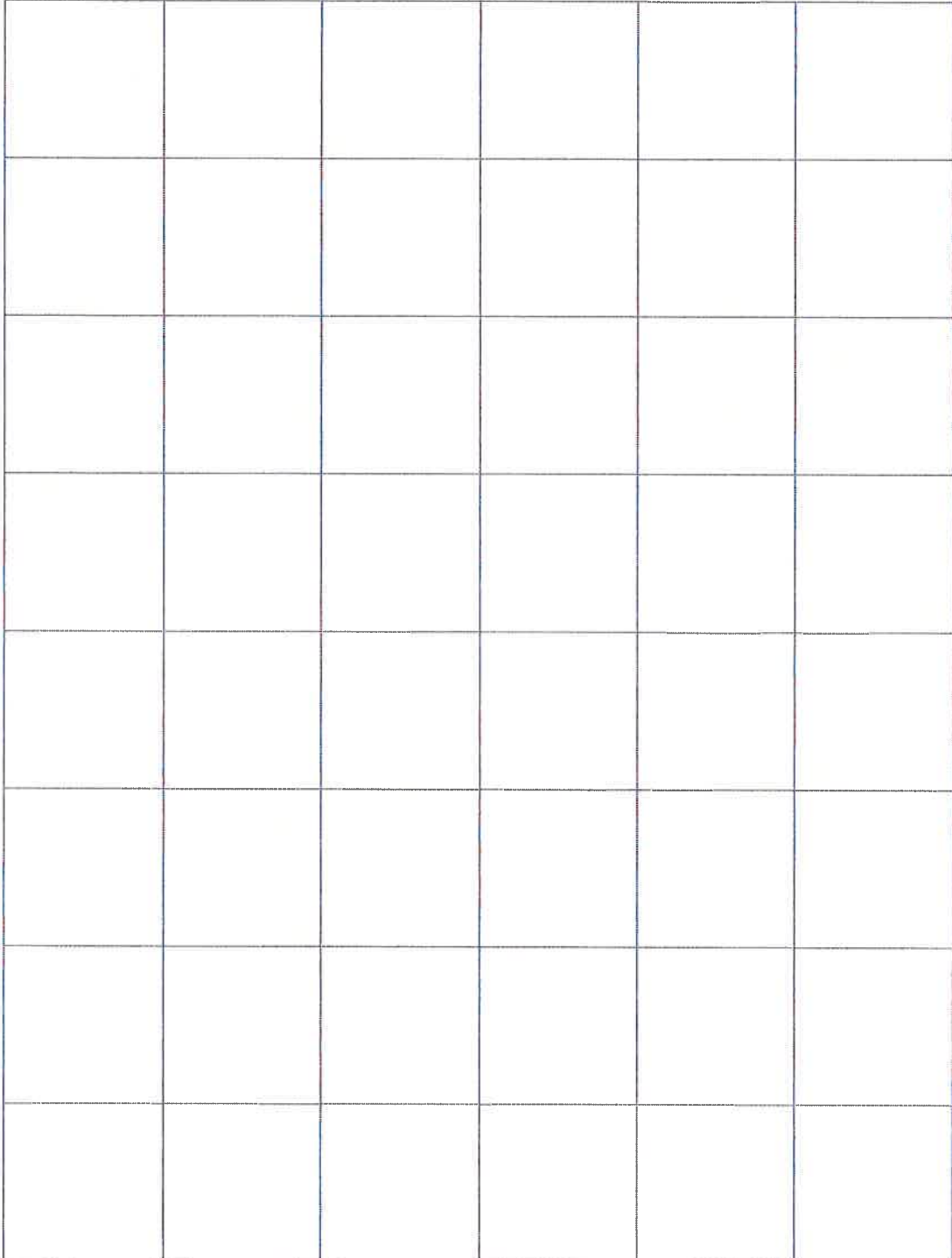
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Drawing a House to Scale page 2 of 2

- 2** Draw side views of the 4 walls and a bird's-eye view roof for this team of students, using a scale factor of $\frac{1}{3}$.



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Designing a Solar House page 1 of 2

- 1 Design and sketch several views of a solar house. Include and label at least three solar energy features. The features can be active or passive. On the next page, describe how you incorporated the solar energy features into your design.

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Designing a Solar House page 2 of 2

2 Describe how you incorporated solar energy features into your house design.

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Design Their House page 1 of 2

- 1** A team in Mr. Ivy's class made a model house with dimensions 15" wide by 18" long by 4" tall. What is the total volume of their house? Show your work.
- 2** Design a floor plan for the team that includes at least 4 rooms, and sketch it below. Label the dimensions of each room, and label your sketch with the scale factor you used.

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Design Their House page 2 of 2

- 3** If the dimensions of the entire floor of the model house are $15'' \times 18''$, what is the area of the floor in each room? Show your work.
- 4** Find the volume of each room in the house. Then show that the volume of all the rooms added together equals the total volume of the house. Remember that the model house is $4''$ tall. Show your work.
- 5** **CHALLENGE** What is the volume of each room in the actual house if the scale is 25:1? Show your work.