BRIDGES IN MATHEMATICS 5

GRADE 5 SUPPLEMENT

Set C3 Geometry: 3-Dimensional Shapes

Includes

Skills & Concepts

- ★ describe three-dimensional shapes by the number of edges, faces, and/or vertices as well as types of faces
- ★ identify and build a three-dimensional shape from two-dimensional representations of that object

Published by The MATH LEARNING CENTER *Salem, Oregon*

P201304

Bridges in Mathematics Grade 5 Supplement
Set C3 Geometry: 3-Dimensional Shapes

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Prepared for publication on Macintosh Desktop Publishing system.
Printed in the United States of America.

P201304

Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set C3 ★ Activity 1

ACTIVITY

3-Dimensional Shape Posters

Overview

After discussing some of the attributes of a prism, students work in groups of 4 to construct 3-dimensional figures and create posters about them.

Skills & Concepts

★ describe three-dimensional shapes by the number of edges, faces, and/or vertices as well as types of faces

You'll need

★ Nets A–F (pages C3.4–C3.9, see Advance Preparation)

★ blank transparencies

★ overhead pens

★ cereal box or something similar

★ 18" × 24" chart paper, 1 piece for every 4 students

★ $2\frac{1}{2}$" × $5\frac{1}{2}$" pieces of copy paper, 2–3 per student plus extra

★ poster supplies (scissors, tape, glue sticks, felt markers)

★ Student Math Journals

★ Word Resource Cards (congruent, edge, face, parallel lines, perpendicular lines, vertex)

★ math dictionaries or access to the Internet (optional)

Advance Preparation Run one copy of each Net blackline on heavy paper or cardstock. If you have more than 24 students, run an extra copy of one of the sheets for every 4 additional students. Place the Word Resource Cards on display before the activity.

Instructions for 3-Dimensional Shape Posters

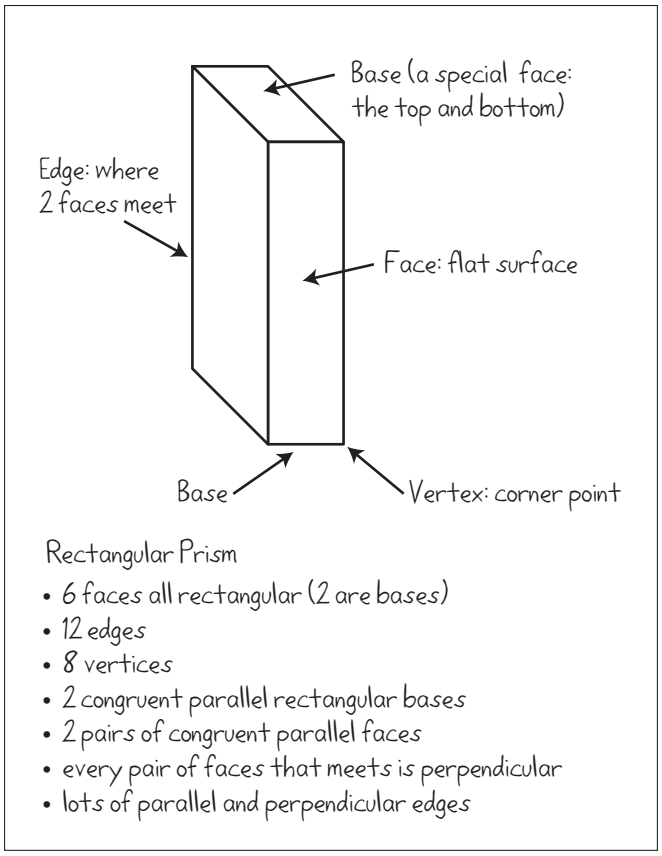
1. Tell the class that you're going to do some work with 3-dimensional figures, or *solids* today. Then hold up the cereal box and ask students to pair-share mathematical observations about it.

2. Make a rough sketch of the box on a transparency at the overhead. Work with student input to label the parts of the figure, and take the opportunity to review the meanings of the words *face*, *edge*, and *vertex*. Introduce the term *base* as well (a base is a "special face", often thought of as the top or the bottom of a 3-dimensional figure).

3. Ask volunteers to come to the front of the room and identify parallel, perpendicular, and congruent edges and faces on the box itself. Though many students may be familiar with parallel and perpendicular lines, the idea that edges and faces can be parallel may be new to some. As they find these parts, explain that the box is called a *rectangular prism* because it has 2 congruent rectangular bases and 4 faces that are quadrilaterals. Prisms always have 2 bases, while some other 3-dimensional figures have only 1

Activity 1 3-Dimensional Shape Posters (cont.)

(a pyramid) or even none (a sphere). Here is an example of how your overhead might look after labeling the sketch and recording some of the observations shared by the class.



4. Ask students to form groups of 4 or assign groups. Show them the Nets A–F sheets, along with a piece of chart paper. Explain that a *net* is a 2-dimensional shape that can be cut and folded to form a 3-dimensional shape. In a minute, each group will get a net to cut, fold, and tape. When they're finished, they'll cut and tape their figure and then create a poster about it, recording as many observations as they can, much as you've just done at the overhead.

5. Hold up a few of the copy paper strips. Explain that each student in the group will be responsible for writing at least 3 observations, each one on a separate strip, to glue onto the poster. They'll need to work together to make sure that their observations are true and different from all the others written by the group. Their poster needs to include the name of the figure as well as their observation strips. Their observations need to address all the terms on the Word Resource Cards you've posted, including *parallel*, *perpendicular*, and *congruent edges* and *faces*. Ask students *not* to attach the figures to the posters because you'll need them for another activity.

6. Review the poster requirements with the class by jotting them on the overhead. You may want to add others, such as using complete sentences; making their work neat, organized, and attractive; labeling the poster with their names; and so on.

Activity 1 3-Dimensional Shape Posters (cont.)

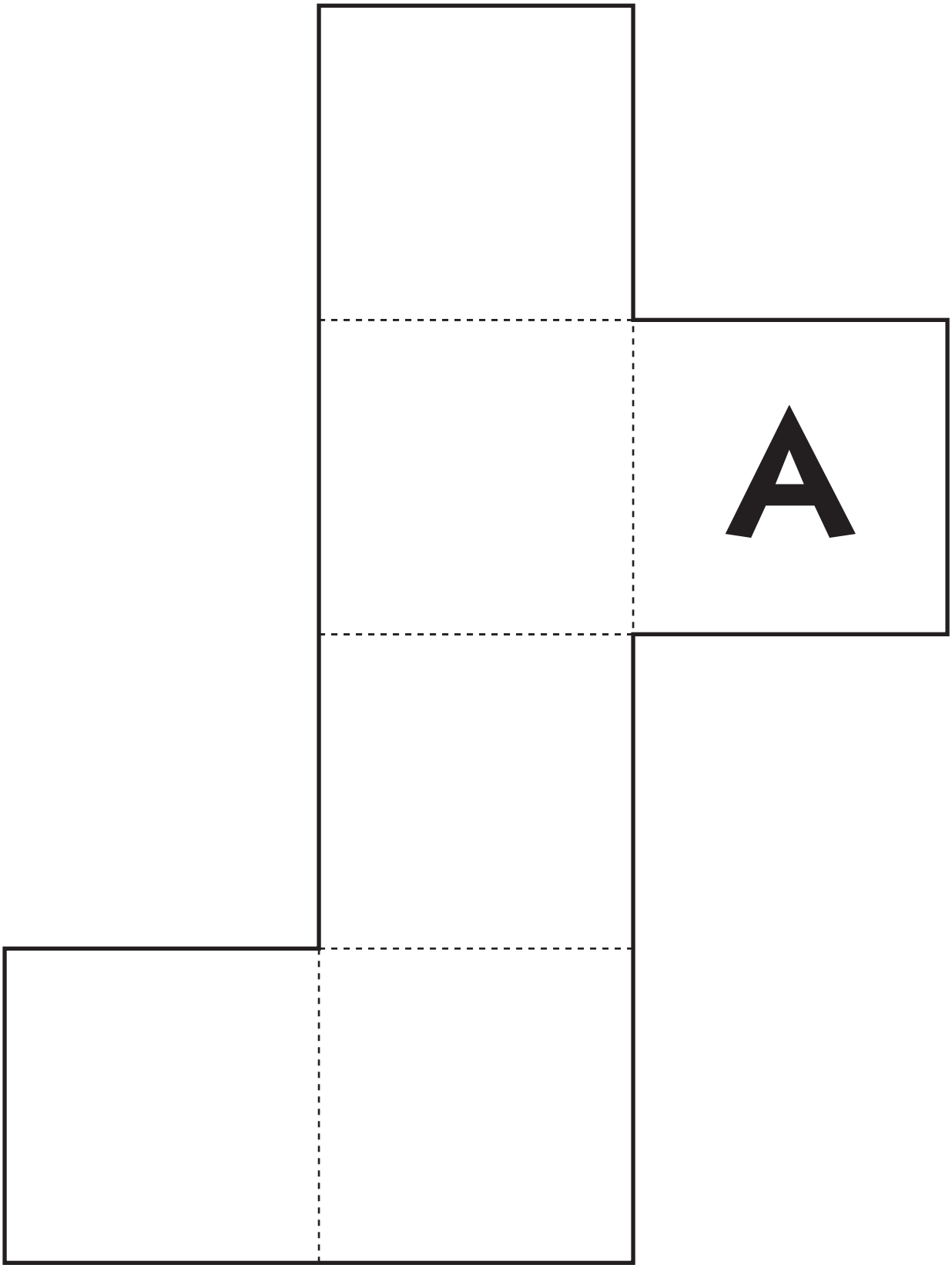
Net Posters
- Cut, fold, and tape your shape.
- Each write at least 3 different observations, 1 per paper strip.
- Observations need to include comments about parallel, perpendicular, and congruent edges and faces.
- Glue strips to poster.
- Label poster with the name of your shape.
- Do not attach shape to the poster.

7. When students understand what to do, give each group a Net sheet, a piece of chart paper, and a handful of paper strips, and let them go to work. If they don't know the name of the shape they've made, have them look it up at the back of their math journal. You might also encourage them to use any math dictionaries you have on hand or go online to find shape names and also more information to add to their posters. Students might also be interested in listing some of the places their shape could be found in the environment and adding some drawings or even photos of real-life examples.

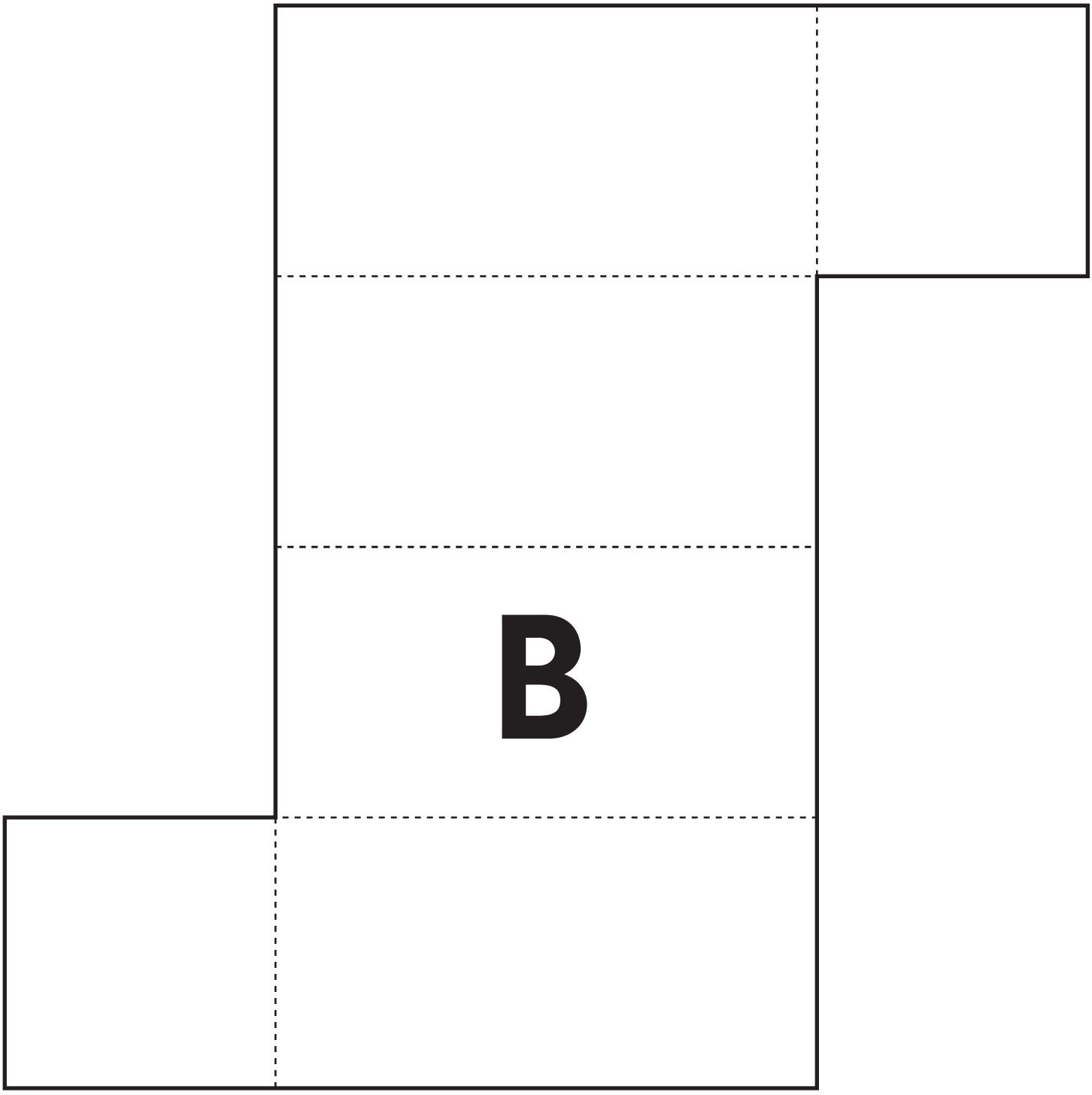
8. When students are finished, display the posters along with the shapes. Pin the shapes on or near their posters in such a way that you can take them down when you do Activity 10, and then put them back up.

Note *Here is a list of the 3-dimensional shapes formed by the Net blacklines:*
Net A—Cube
Net B—Rectangular Prism
Net C—Hexagonal Prism
Net D—Triangular Pyramid
Net E—Square Pyramid
Net F—Triangular Prism

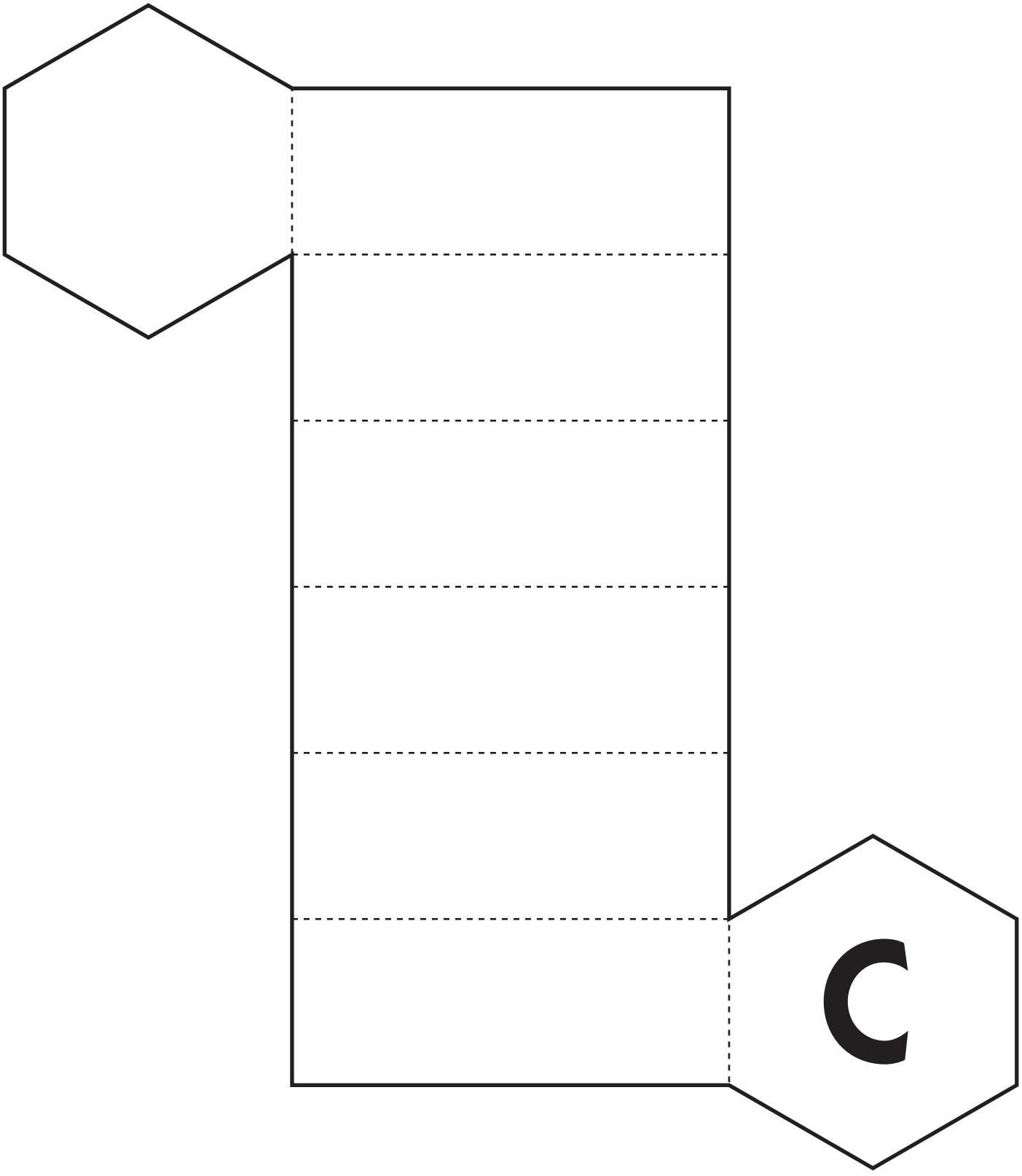
Net A



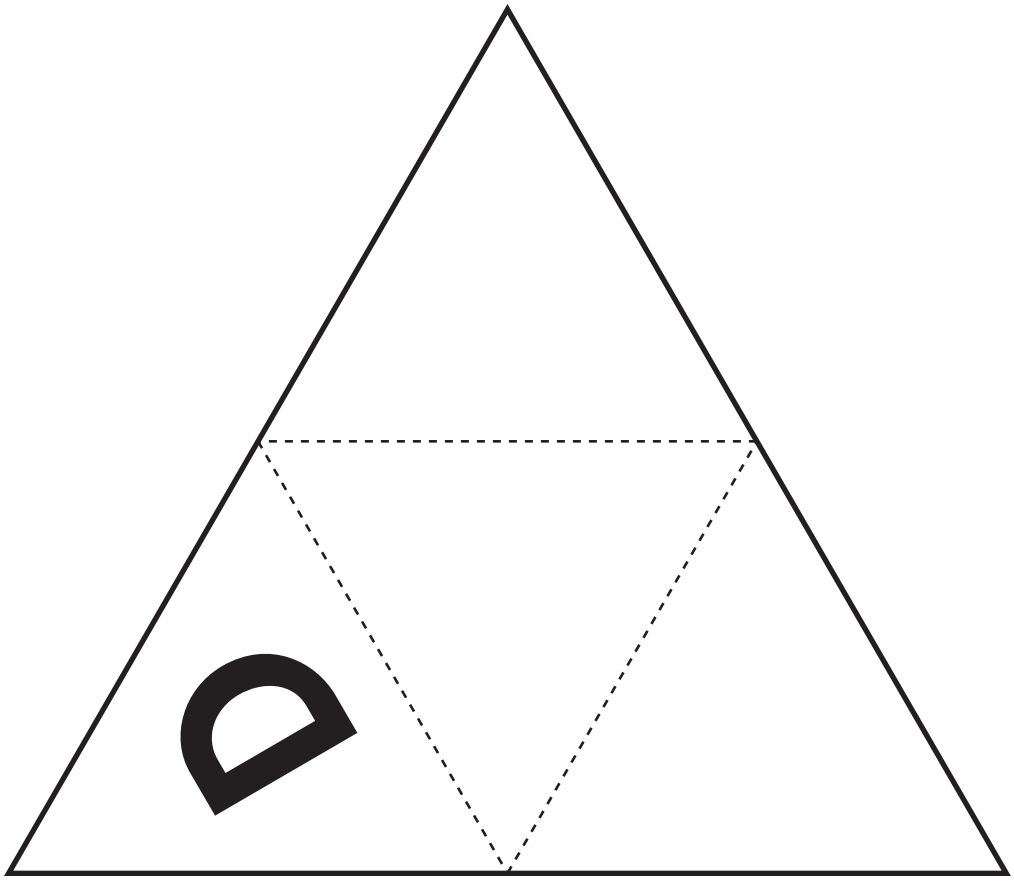
Net B



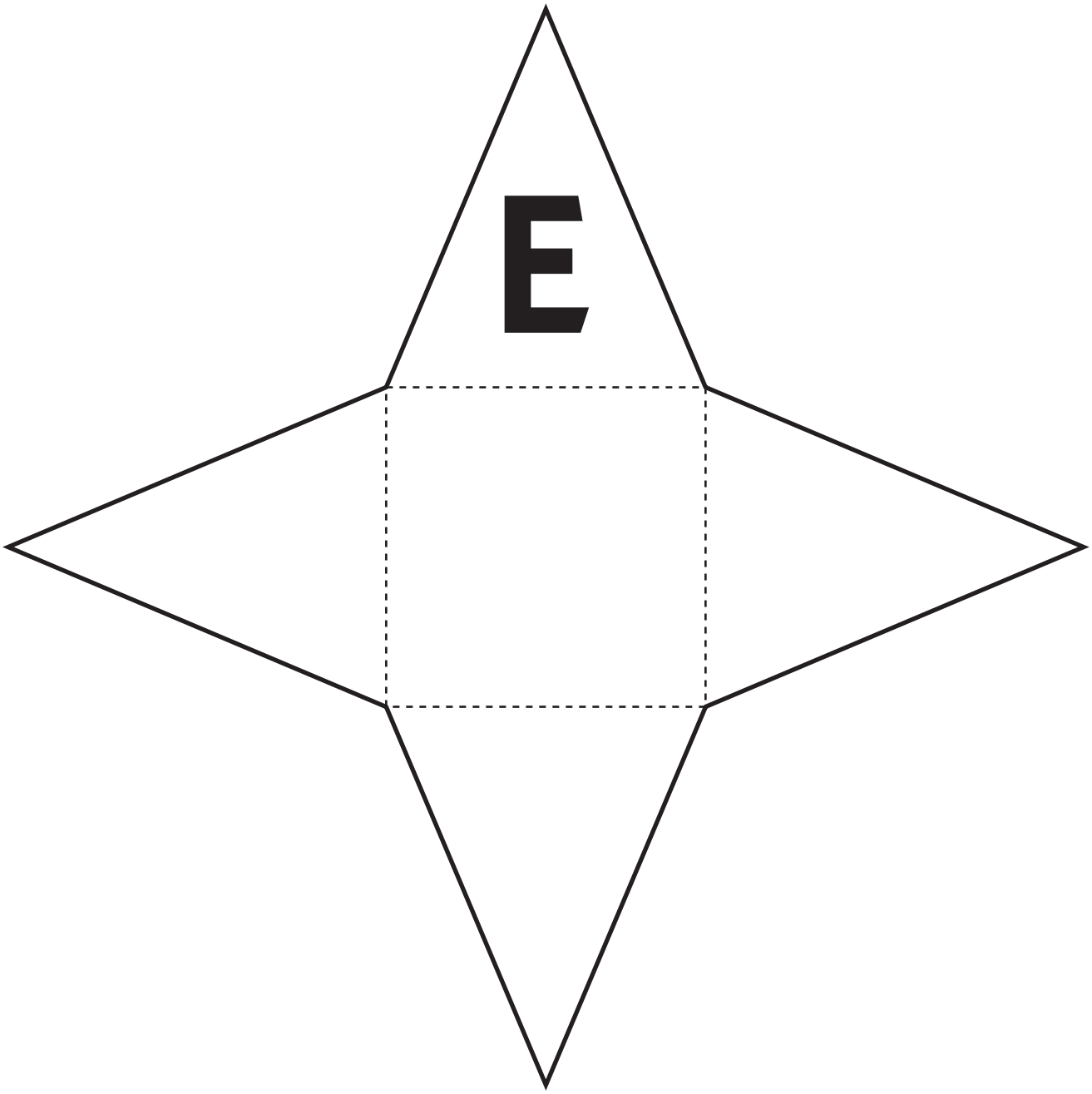
Net C



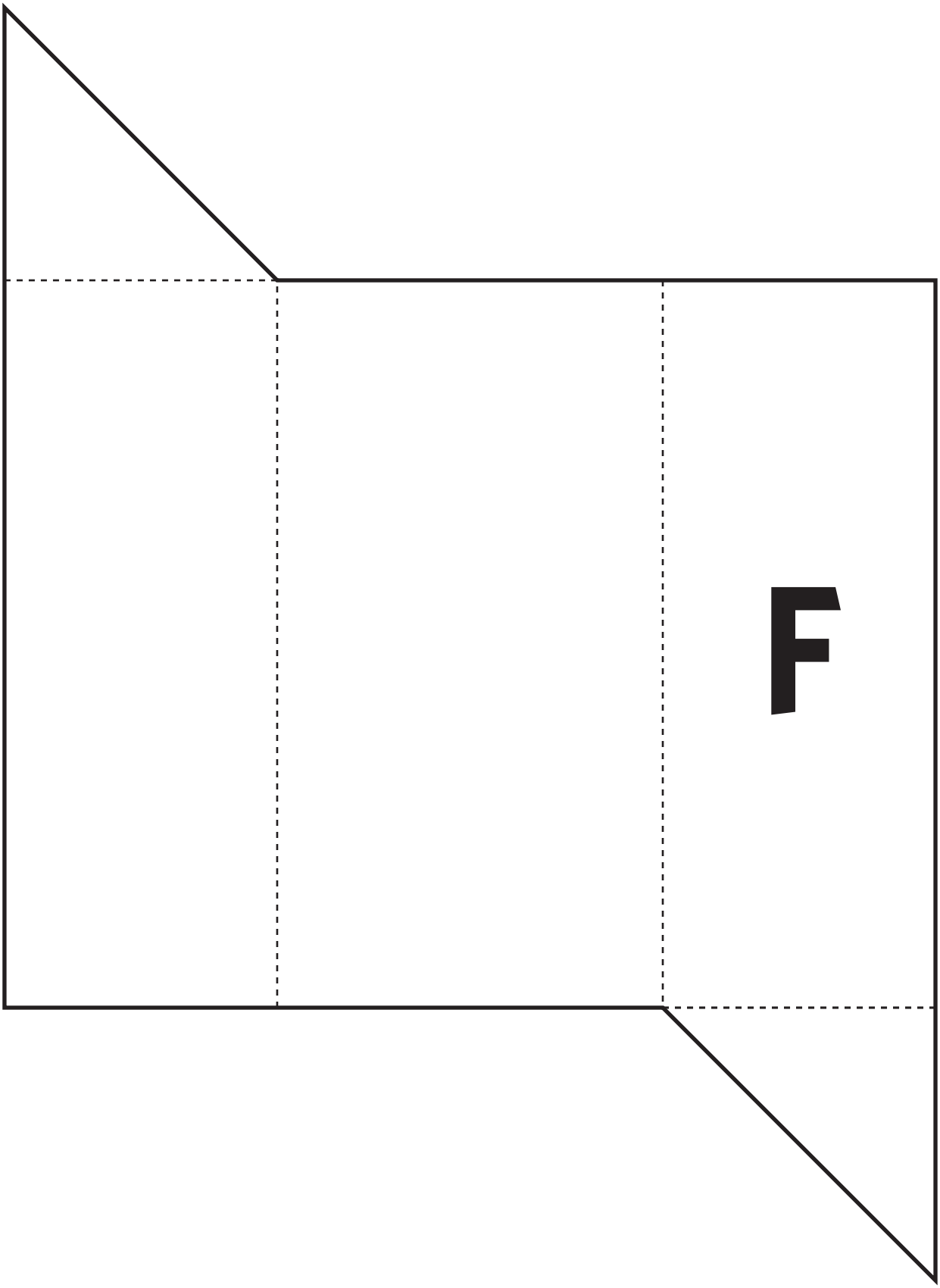
Net D



Net E



Net F



Set C3 ★ Activity 2

ACTIVITY

Faces, Edges & Vertices

Overview

This activity features a whole-group game in which students identify various attributes of 6 different geometric shapes.

Skills & Concepts

★ describe three-dimensional shapes by the number of edges, faces, and/or vertices as well as types of faces

Recommended Timing

Anytime after Set C3 Activity 1

You'll need

★ Faces, Edges & Vertices Game Board (page C3.14, run 1 copy on a transparency)

★ paper shapes from Set C3 Activity 1

★ overhead pens

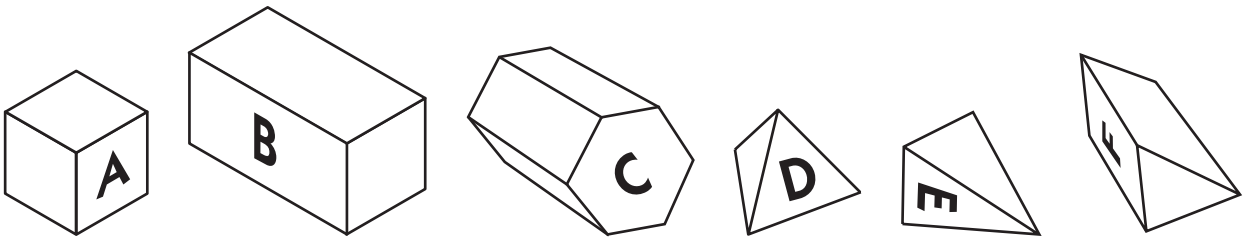
★ double overhead spinner overlay

★ geoblocks (optional, see note)

Note It would be ideal if each group of 4 students could have a set of 3-dimensional shapes to examine as you're playing this game with the class. If your entire school is using Bridges, you may want to borrow sets of wooden 3-D shapes called geoblocks from a third or fourth grade teacher for this purpose. If you're able to borrow some sets, pull the 6 matching shapes from each set and put the rest of the blocks away for now.

Instructions for Faces, Edges & Vertices

1. Divide the class into 2 teams and explain that they're going to play a game with the 3-D shapes they made during Geometry—3-D Shapes Activity 1. Set the 6 shapes with their letters facing outward on the whiteboard ledge or a small table near the overhead and review the name of each shape with the class.



Cube | Rectangular Prism | Hexagonal Prism | Regular Triangular Pyramid | Square Pyramid | Triangular Prism

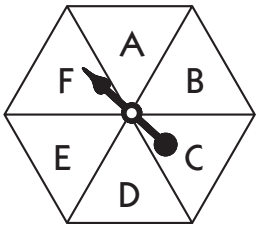
2. Place the gameboard on display at the overhead and set the double spinner overlay on top of the spinners. Explain that the letters on the first spinner correspond to the letters on the 6 shapes. Review the terms on the second spinner and introduce the symbols for congruent, parallel, and perpendicular:

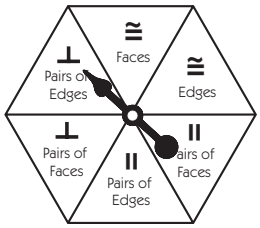
≅ congruent ∥ parallel ⊥ perpendicular

Activity 2 Faces, Edges & Vertices (cont.)

Set C3 Geometry: 3 Dimensional Shapes Blackline Run 1 copy on a t ansparency

Faces, Edges, and Vertices Gameboard





Team 1

Figure Name	Points

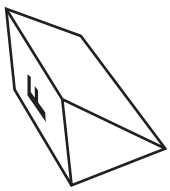
Team 2

Figure Name	Points

3. Ask a volunteer from the first team to spin both spinners and record the name of the shape spun. Then invite a volunteer from the second team to come up. Have both students examine the shape very carefully to count the number of congruent faces or edges or determine how many pairs of parallel or perpendicular faces or edges there are. (What they count depends on the spin.) If there is disagreement, invite a second pair of students to examine the shape until both teams agree.

Note *If a shape has a set of 2 or 3 congruent faces or edges, each face or edge in the set counts. For instance, the triangular prism below has 2 congruent triangular faces and 3 congruent rectangular faces. That's 5 in all. It has 3 congruent edges on each base and 3 congruent edges in between the bases. That's 9 in all.*

David *We spun F, which is the triangular prism, and we're supposed to find pairs of perpendicular edges.*



Teacher *Camila, you're on the other team. Please come up and examine this shape carefully with David to see how many pairs of perpendicular edges the two of you can find. Both teams have to agree before we can award any points.*

Activity 2 Faces, Edges & Vertices (cont.)

Camila *Okay, perpendicular edges are the ones that meet at right angles, right? So none of the edges on the triangle-shaped faces are perpendicular.*

David *I agree. I think each of the rectangle faces has 4 pairs of perpendicular edges. That would be 12 pairs in all because there are 3 rectangles. I think we get 12 points, unless I'm missing some.*

Camila *I agree with David. I think Team One gets 12 points on this one.*

4. Award the agreed upon number of points to Team One for their first turn. Have Team Two take their turn. Then play back and forth until both teams have taken 5 turns in all. Ask students to add their points at the end of the game to determine the winner.

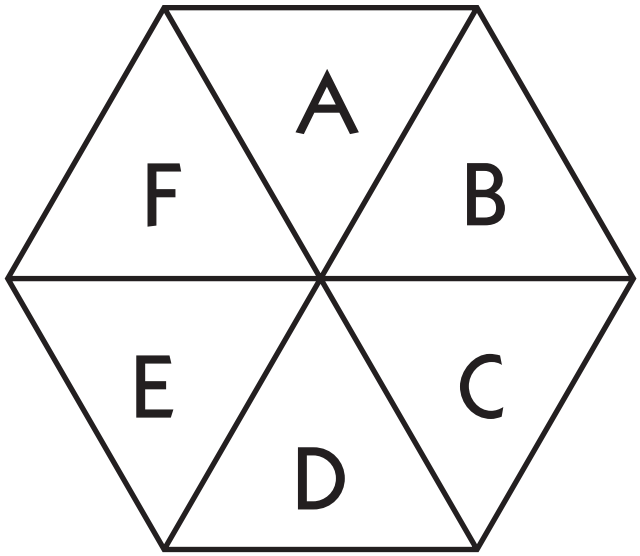
KEY

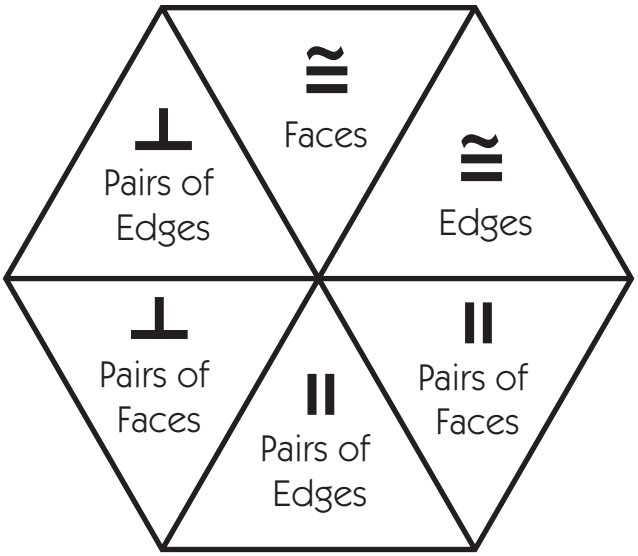
Shape	Congruent Faces	Congruent Edges	Pairs of Parallel Faces	Pairs of Parallel Edges	Pairs of Perpendicular Faces	Pairs of Perpendicular Edges
Cube	6	12	3	12	8	24
Rectangular Prism	6	12	3	12	8	24
Hexagonal Prism	8	18	4	18	12	24
Regular Triangular Pyramid	4	6	0	0	0	0
Square Pyramid	4	8	0	2	0	4
Triangular Prism	5	9	1	6	6	12

INDEPENDENT WORKSHEET

See Set C3 Independent Worksheet 1 for more practice identifying essential attributes including parallel, perpendicular, and congruent parts of three-dimensional geometric shapes.

Faces, Edges & Vertices Game Board





Team 1

Figure Name	Points

Team 2

Figure Name	Points

NAME _____ **DATE** _____

Set C3 ★ Independent Worksheet 1

INDEPENDENT WORKSHEET

Nets & 3-Dimensional Shapes

1 Predict the 3-dimensional figure each net on the next 2 pages represents. Record your predictions on the chart below.

Net	Prediction	Actual 3-D Figure
z	cube	cube
a		
b		
c		
d		
e		

2 Before you cut them out, follow the instructions below for each of the nets:

a Mark the congruent faces with a red dot. If there are 2 different sets of congruent faces, like 4 congruent rectangles and 2 congruent squares on one net, mark the second set with blue dots.

b Trace in purple along the lines between any pairs of faces you think will be perpendicular when you cut out the net and make the figure.

c Lightly color in each pair of faces you think will be parallel when you cut out the net and make the figure. Use a different color for each pair.

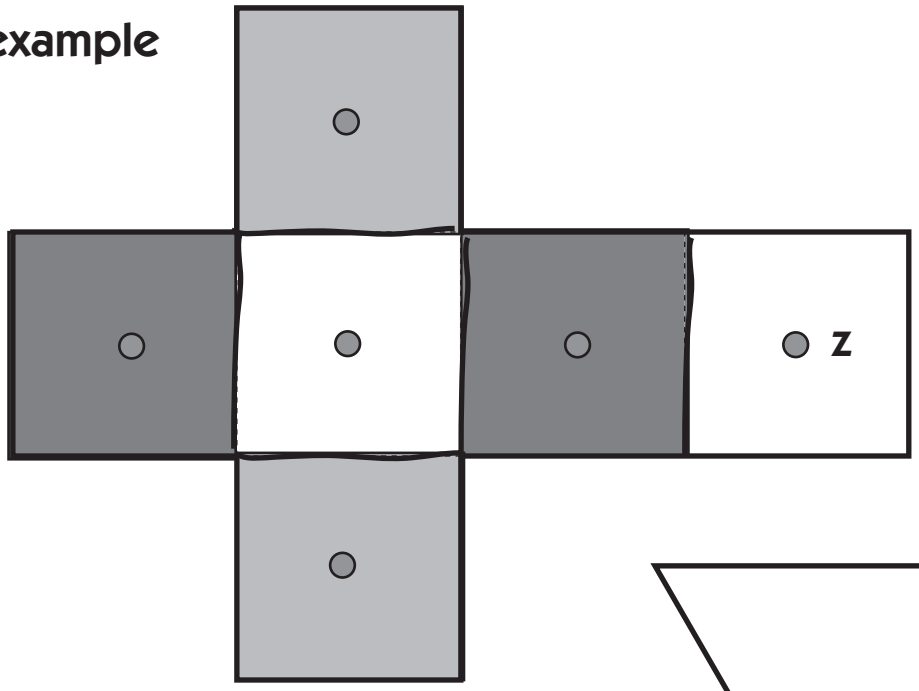
3 After you've made all the predictions listed above, cut out each net along the heavy outline, fold it on the dotted lines, and tape it together to form a 3-dimensional figure.

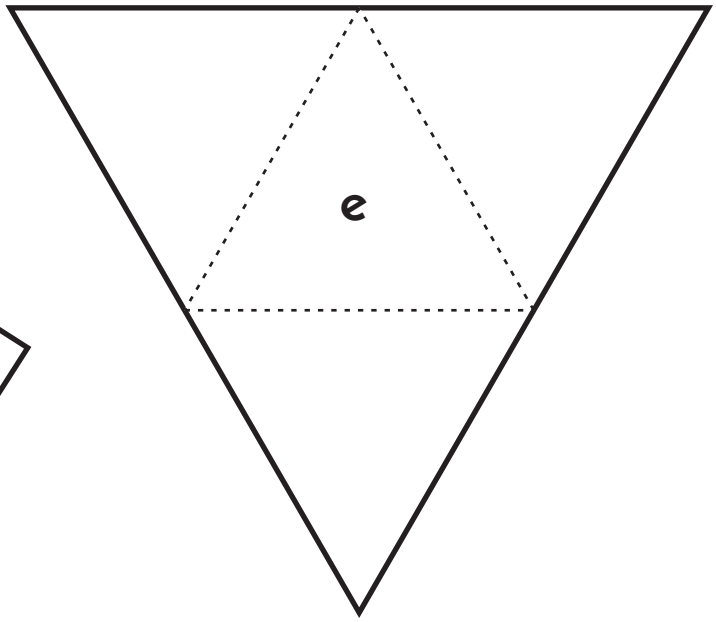
4 On the chart above, write in the actual 3-dimensional figure each net represents.

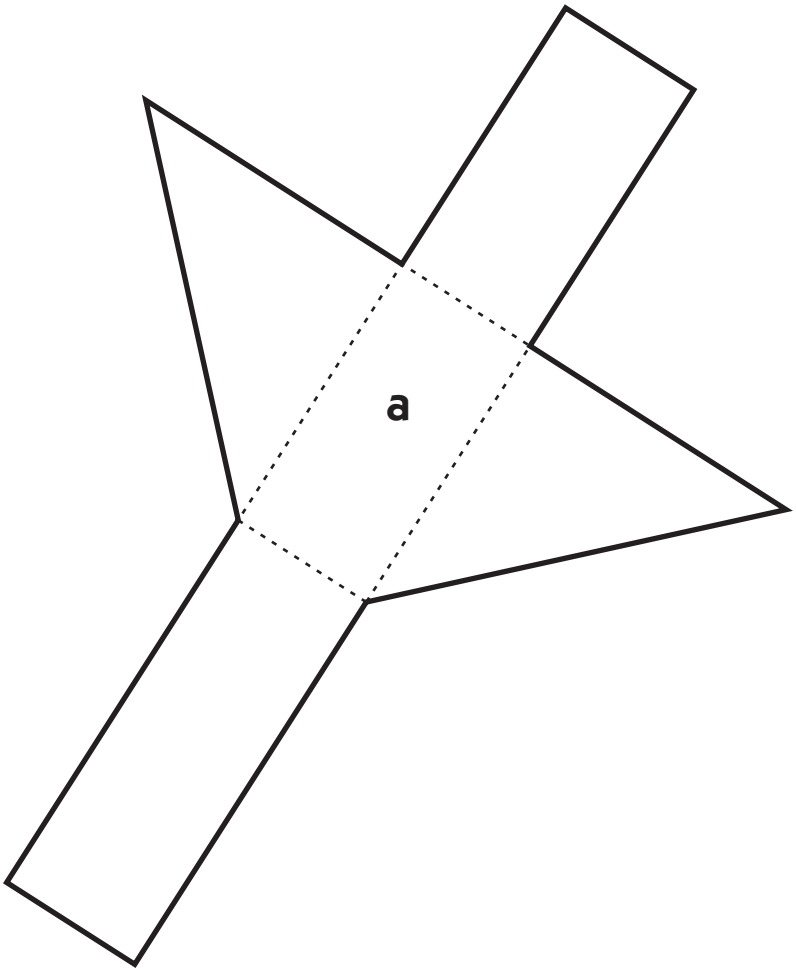
(Continued on next page.)

Independent Worksheet 1 Nets & 3-Dimensional Shapes (cont.)

example







(Continued on next page.)

NAME _____ **DATE** _____

Independent Worksheet 1 Nets & 3-Dimensional Shapes (cont.)