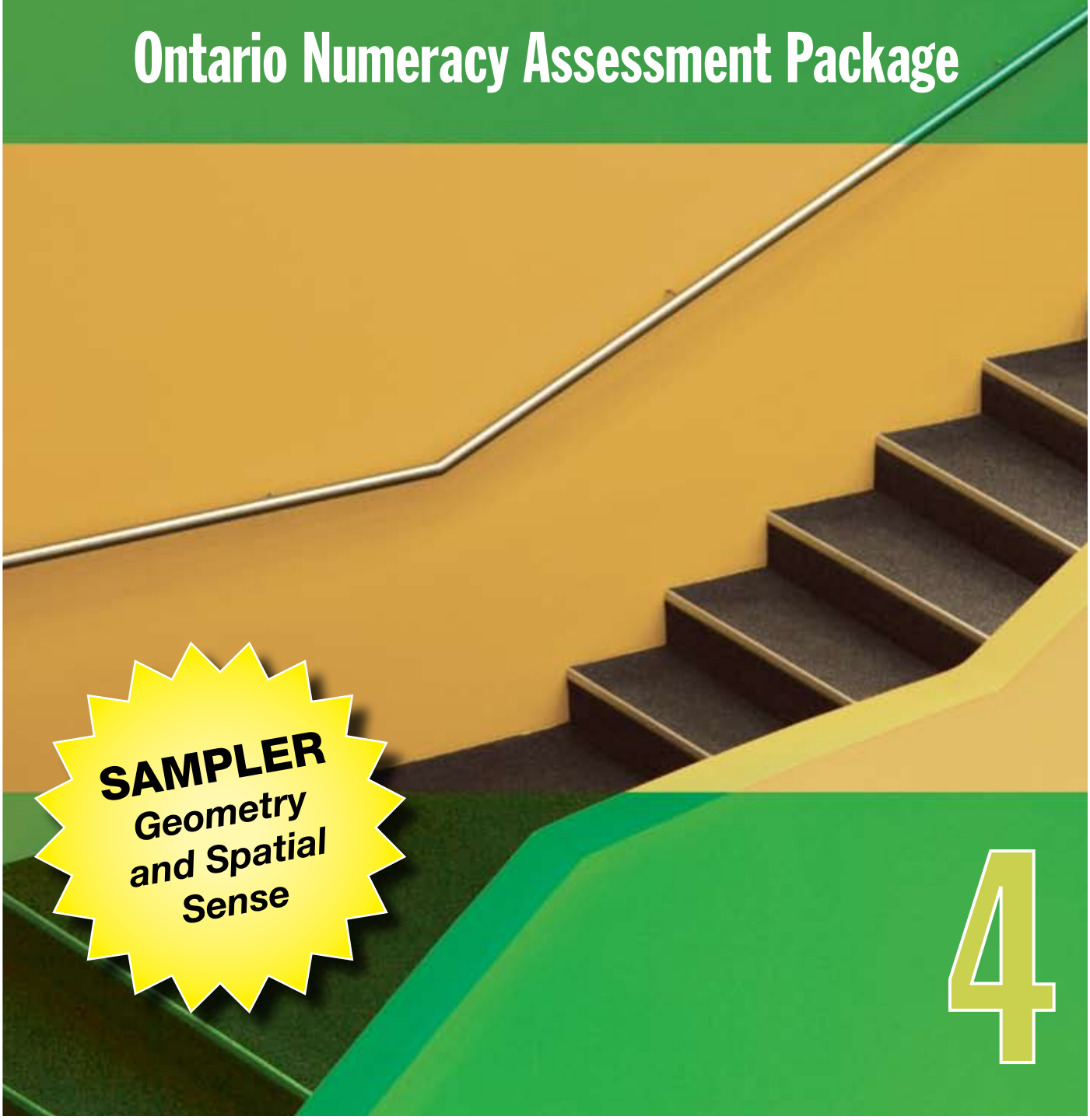
ONAP

Ontario Numeracy Assessment Package



SAMPLER
Geometry and Spatial Sense

4

GEOMETRY AND SPATIAL SENSE

The Geometry and Spatial Sense strand of the Ontario Curriculum for Grade 3 identifies seven Mathematical Process Expectations: problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. Using these process expectations, students study, learn, and apply concepts and skills organized under the big ideas/headings of Geometric Properties, Geometric Relationships, and Location and Movement.

The following chart highlights key knowledge and skill development as students move from Grade 3 to Grade 4.

GRADE 3	GRADE 4
• use a reference tool to identify right angles, and compare right angles to other angles	• identify benchmark angles (i.e., straight angle, right angle, half a right angle) and their measures in degrees and compare these to other angles
• identify, compare, and sort polygons by their geometric properties (e.g., number of sides, side lengths, number of interior angles)	• identify, compare, and sort quadrilaterals by their geometric properties (e.g., sides of equal length, parallel sides, symmetry, number of right angles)
• explain the relationships between different types of quadrilaterals	
• use two-dimensional shapes to compose a larger shape	
• compare and sort prisms and pyramids by geometric properties	• identify, describe, and sort prisms and pyramids by their geometric properties
• construct rectangular prisms and describe geometric properties of the prisms	• construct a three-dimensional figure from a picture or model of the figure using connecting cubes
	• construct skeletons of three-dimensional figures and sketch the skeletons
• identify and describe the two-dimensional shapes that can be found in a three-dimensional figure	• draw and describe nets of rectangular and triangular prisms
• describe and name prisms and pyramids by the shape of their base	• construct prisms and pyramids from nets
• identify congruent two-dimensional shapes by manipulating and matching concrete materials	• construct three-dimensional figures (e.g., cube, tetrahedron) using only congruent shapes
• describe movement from one location to another using a grid map	• identify and describe the general location of an object using a grid system
• identify reflections, translations, and rotations by using concrete materials	• identify, perform, and describe reflections
• complete and describe designs and pictures of images that have a vertical, horizontal, or diagonal line of symmetry	• create and analyze symmetrical designs that include reflecting shapes, and identify the congruent shapes
	• draw the lines of symmetry of two-dimensional shapes

For each strand of the curriculum, ONAP provides three types of assessment materials. Consider the following points when administering the assessments for the strand.

Part A: Activating Prior Knowledge (page 151)

- The activities in Part A have been created to activate students' knowledge before they complete the Part B assessment or the Part C performance tasks.
- No score is assigned during this part of the assessment.
- It is recommended that you spend one or two periods working on and discussing the activities provided in this part.

Part B: Concepts and Skills Assessment (page 160)

- The assessment in Part B addresses each of the specific expectations within the three overall expectations in the Geometry and Spatial Sense strand.
- Students will be responding to a mix of questions: short response, fill-in-the-blank, matching, and multiple choice.
- Most students will be able to complete the entire assessment in a 60-minute period. Individual students may be allowed additional time to complete the assessment if needed as long as they complete the assessment in one sitting.

Part C: Performance-Based Assessment (page 182)

- The two performance tasks in Part C are designed to provide insight into how well students are able to perform in terms of the categories of the Ontario Achievement Chart: Knowledge and Understanding, Thinking, Communication, and Application.
- All of the overall expectations for this strand have been assessed through the Concepts and Skills Assessment in Part B.
- It is recommended that students have an opportunity to complete both performance tasks in Part C.
- Each task is designed to be completed in a 45- to 60-minute period. If necessary, provide additional time as long as students complete the tasks in one sitting.

Part A: Activating Prior Knowledge

Administration

To activate students' knowledge of the Geometry and Spatial Sense strand, choose one or two of the following activities to work on prior to administering the assessments. Introductory and culminating suggestions have been provided for each. No score is assigned for these activities.

Timing

It is recommended that you spend one or two periods working on and discussing the activities provided in this part.

Accommodating Students with Special Needs

Observe students as they complete the activities. While the activities in this section are not designed as a formal diagnostic assessment, you may want to consider whether students who are having extreme difficulties with the activities are ready to participate in the full ONAP assessment for this grade level. Observations at this stage might also indicate students who will need special accommodations during the assessment, such as having someone read questions to them or scribe responses.

Activity 1: Shapes in the Wild

Materials

- BLM A1: *Activity 1: Shapes in the Wild* (one per student pair)
- scissors

Introducing the Activity

This activity requires students to work together to visualize and combine shapes to create an animal picture from tangram pieces. Encourage students to reflect on how they used visualization to complete the activity.

If available, read the story *Grandfather Tang's Story* by Ann Tompert (Dragonfly Books, 1997). Complete one of the tangram puzzles from BLM A1: *Activity 1: Shapes in the Wild* with the class using the overhead projector.

Have students work in pairs to solve at least two or three of the tangram puzzles provided on BLM A1: *Activity 1: Shapes in the Wild*. Students take turns placing tangram pieces inside the puzzle outline to complete each animal shape. After they have taken a turn placing a tangram piece, encourage students to discuss how they will choose which piece to use next or how they will decide if they need to rearrange the pieces they have already placed.

Culminating Discussion

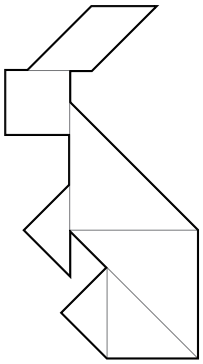
1. How did you decide where to place your first tangram piece?
   We looked for corners on the outline where one of the pieces might fit. If we saw a right angle, for example, we tried to place a square or the right angle part of a triangle into the square corner.

2. If you were not able to fit your last tangram piece into the puzzle, how did you solve this problem?
We just started over. Sometimes we tried to see which pieces could be switched around to better fit the outline of the puzzle. Sometimes we rotated the pieces or flipped them over to try another way to use the pieces.

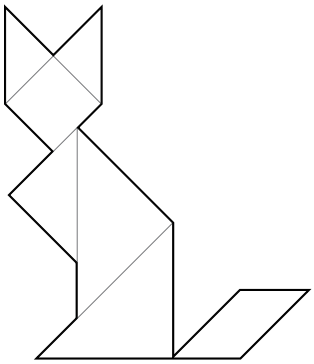
3. What tips would you give other students for solving a tangram puzzle?
We would tell them to think about turning the shapes in different ways to match angles or corners of the outline. We would also tell them to try putting two pieces together to create a different angle if they get stuck.

Answers

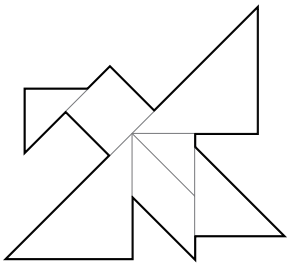
BLM A-1.2



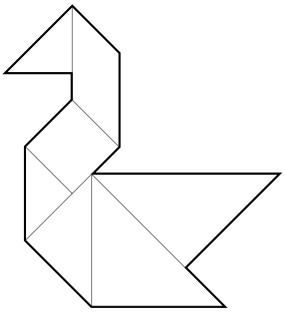
BLM A-1.3



BLM A-1.4



BLM A-1.5



Activity 2: 3-D Detectives

Materials

- BLM A2: *Activity 2: 3-D Detectives* (one per student group)
- 3-D models (pyramids and prisms)

Introducing the Activity

This activity is a game in which students identify a mystery 3-D figure by identifying its geometric properties.

Before students begin, model the game for them. Tell students they have to guess which 3-D figure you have selected. Write several property clues about your chosen 3-D figure on an overhead transparency, such as "My figure has parallel lines" or "My figure has four right angles." Place a sticky note over each clue. Reveal the clues one at a time, asking students to write down which 3-D figure they think you chose after each clue. After you have revealed all the clues, have students talk with a partner to see if they both guessed the same 3-D figure. Show the students your 3-D figure. Read through the clues again and demonstrate each property clue on the 3-D figure.

Provide copies of BLM A2: *Activity 2: 3-D Detectives* and have students play the game in groups of three.

Procedure

Number of players: three
Goal: to guess the 3-D figure
How to play:

- Step 1—Place books in front of you so that you cannot see the other players' 3-D figures.
- Step 2—If you are Player 1, select a 3-D figure and place it behind the book so that Player 2 cannot see it.
- Step 3—If you are Player 2, ask Player 1 questions about the 3-D figure that can be answered only by "Yes" or "No."
- Step 4—If you are Player 3, keep track of which property clues Player 2 uses in their questions and the number of questions asked until Player 1 correctly guesses the 3-D figure.
- Step 5—Play the game again. Take turns being Player 1, 2, and 3. The player who correctly guesses the 3-D figure using the least number of questions wins.

Culminating Discussion

1. Which 3-D figure was the most challenging to identify?
   The rectangular prism was difficult because it has almost all the same properties of the cube, except for the number of equal faces.

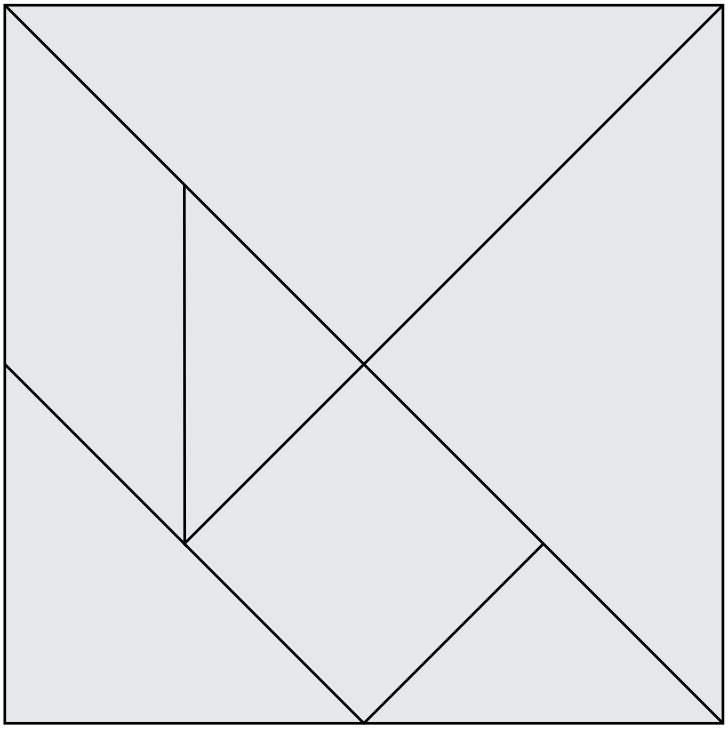
2. Which property did you find the most helpful for identifying the figures?
   I always asked about angles first, because then I knew if the figure was made of only rectangular faces or if it had triangle or parallelogram faces.

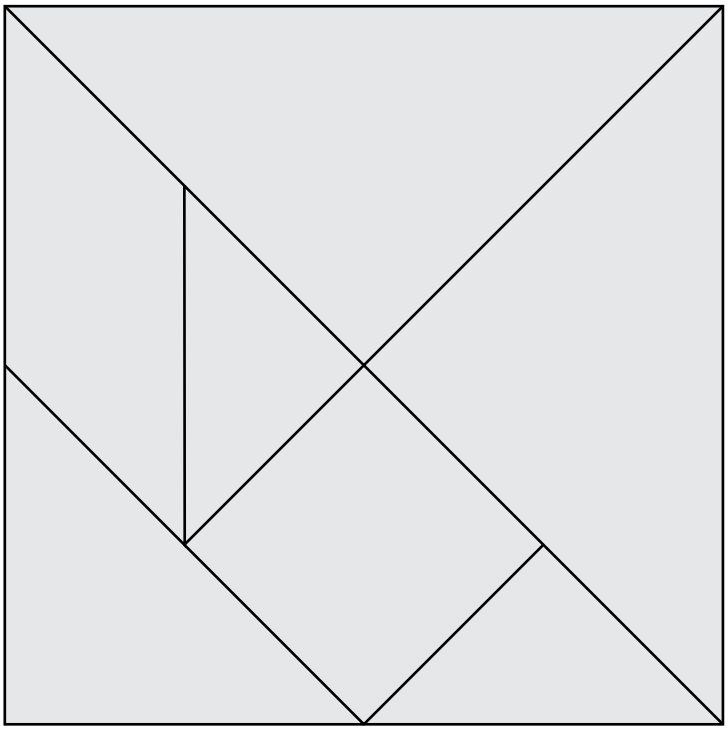
3. How did the answer to one question help you decide what to ask next?
   I asked whether the figure had five faces. It did, so I knew that it was a square-based pyramid or a triangular prism. Then, I knew I had to ask about angles to see if it had some that were 90° so I would know it was the square-based pyramid.

Name: _____ **Date:** _____

Activity 1: Shapes in the Wild (page 1)

Cut out these tangram sets. Use them to solve the tangram animal puzzles.

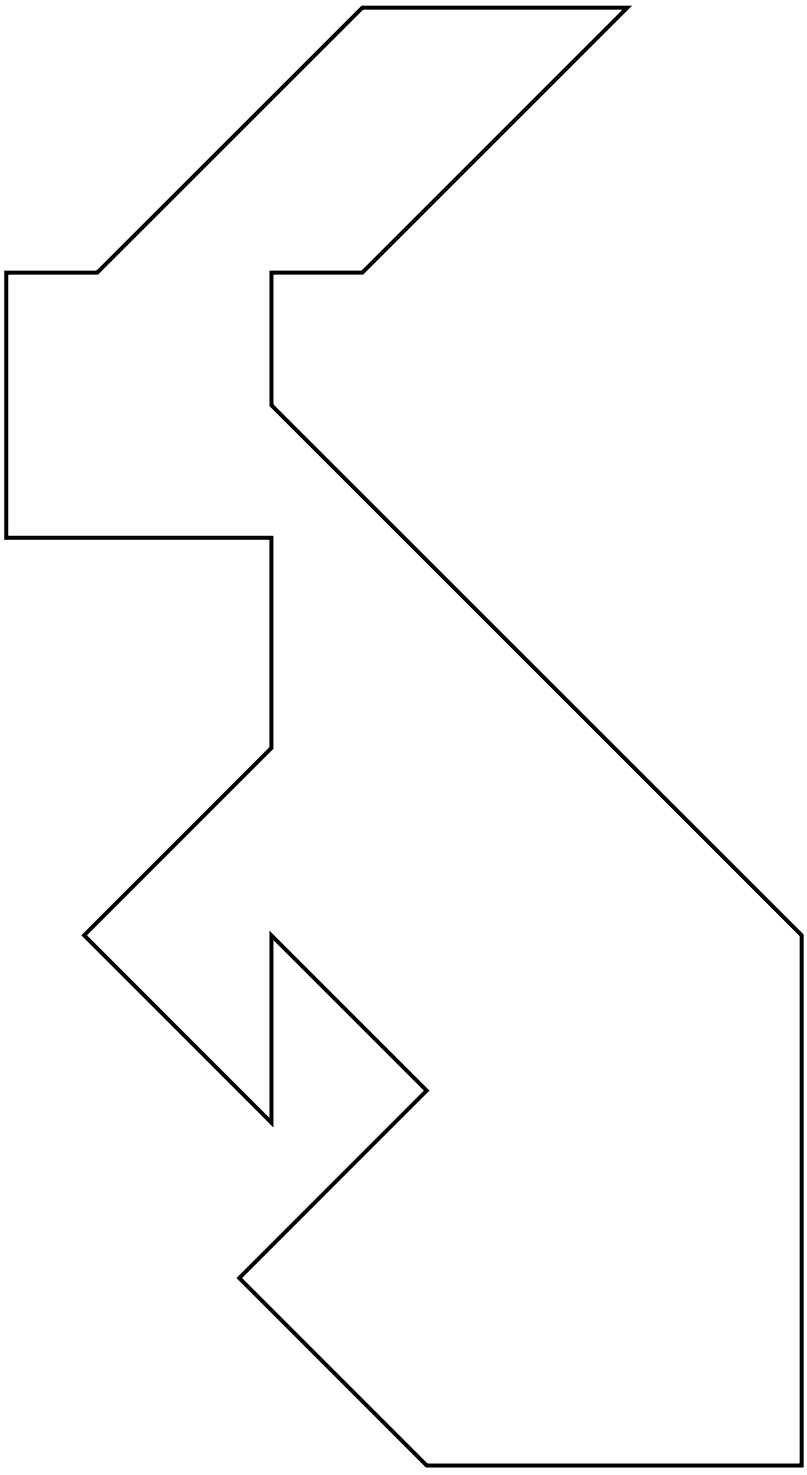




Name: _____ **Date:** _____

Activity 1: Shapes in the Wild (page 2)

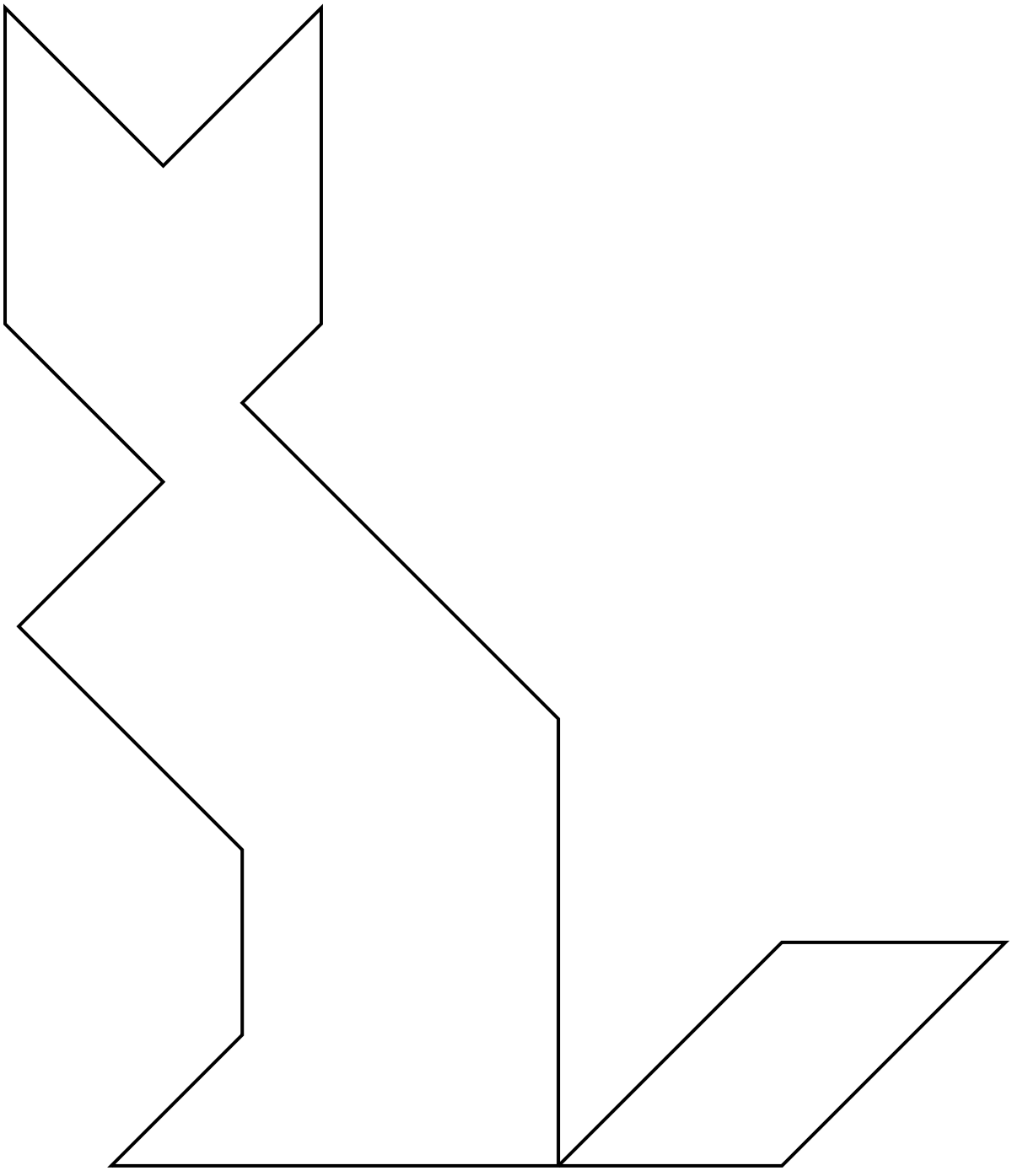
Solve the tangram animal puzzle. Take turns with your partner to put pieces into the puzzle.



Name: _____ **Date:** _____

Activity 1: Shapes in the Wild (page 3)

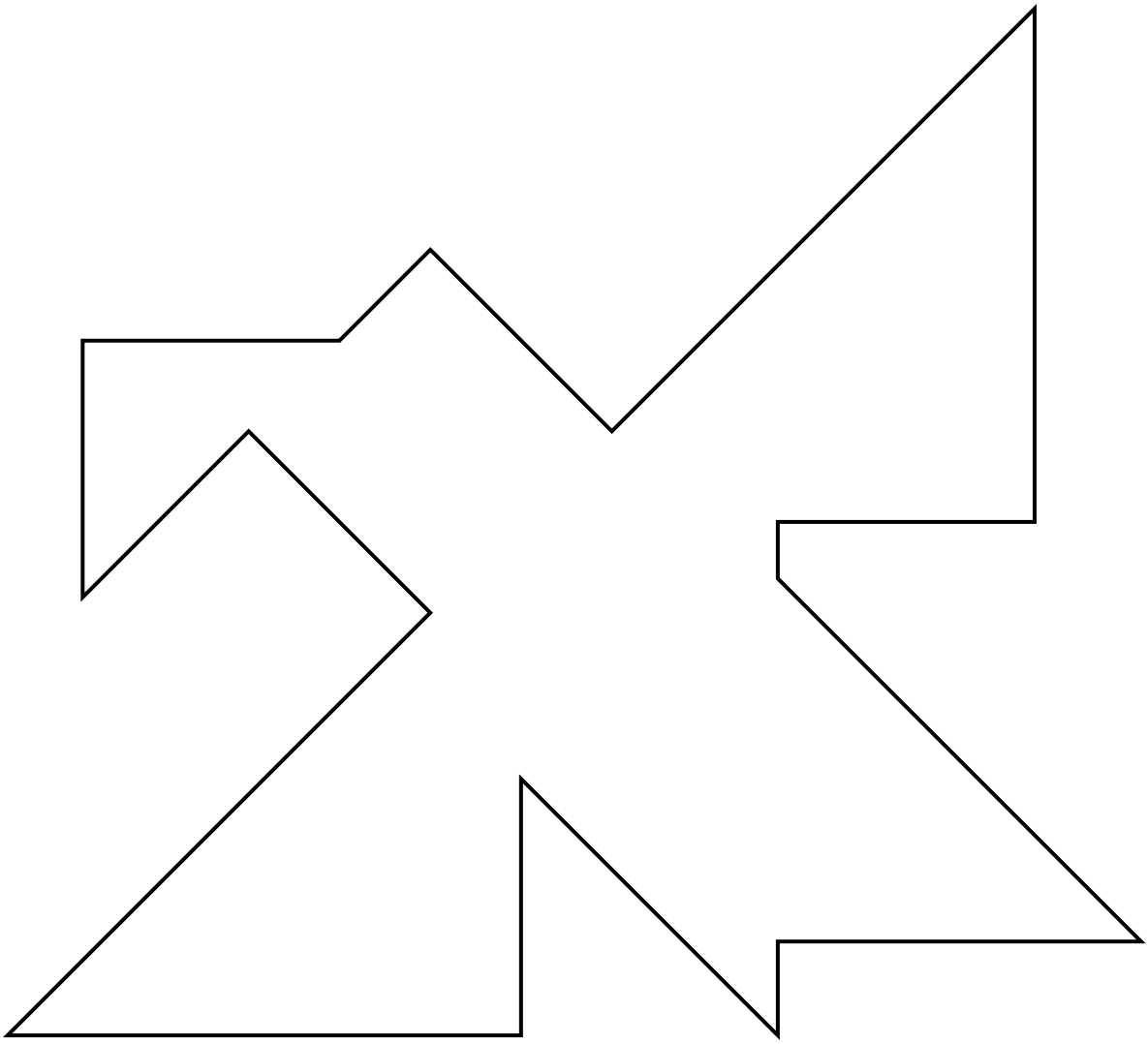
Solve the tangram animal puzzle. Take turns with your partner to put pieces into the puzzle.



Name: _____ **Date:** _____

Activity 1: Shapes in the Wild (page 4)

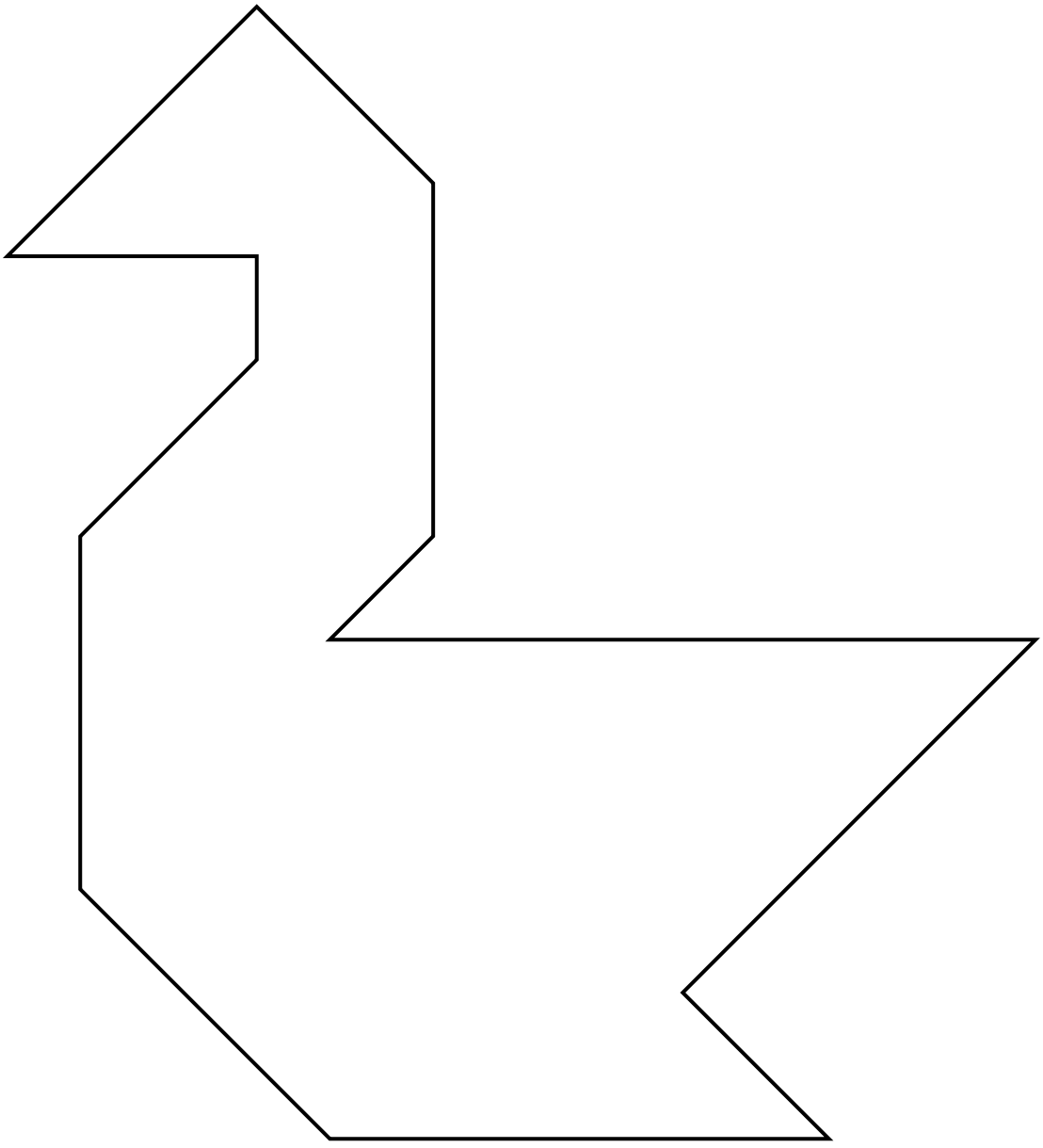
Solve the tangram animal puzzle. Take turns with your partner to put pieces into the puzzle.



Name: _____ **Date:** _____

Activity 1: Shapes in the Wild (page 5)

Solve the tangram animal puzzle. Take turns with your partner to put pieces into the puzzle.



Name: _____ **Date:** _____

Activity 2: 3-D Detectives

Goal: to guess the 3-D figure

How to play:

Step 1 Place books in front of you so that you cannot see the other players' 3-D figures.

Step 2 If you are Player 1, select a 3-D figure and place it behind your book so that Player 2 cannot see it.

Step 3 If you are Player 2, ask Player 1 questions about the 3-D figure that can be answered only by "Yes" or "No."

Step 4 If you are Player 3, keep track of which property clues Player 2 uses in their questions and the number of questions asked until Player 2 correctly guesses the 3-D figure.

Step 5 Play the game again. Take turns being Player 1, 2, and 3. The player who correctly guesses the 3-D figure using the least number of questions wins.

Score Sheet:

Player 1's Questions	Player 2's Questions	Player 3's Questions
Number of Questions Asked	Number of Questions Asked	Number of Questions Asked
Tally: _____ Total: _____	Tally: _____ Total: _____	Tally: _____ Total: _____
Property Clues Used	Property Clues Used	Property Clues Used
_____ number of faces _____ number of parallel edges _____ number of right angles _____ number of edges _____ number of corners _____ number of angles less than 90° _____ number of angles greater than 90° _____ number of _____ _____ _____	_____ number of faces _____ number of parallel edges _____ number of right angles _____ number of edges _____ number of corners _____ number of angles less than 90° _____ number of angles greater than 90° _____ number of _____ _____ _____	_____ number of faces _____ number of parallel edges _____ number of right angles _____ number of edges _____ number of corners _____ number of angles less than 90° _____ number of angles greater than 90° _____ number of _____ _____ _____

Part B: Concepts and Skills Assessment

Administration

This assessment addresses each of the specific expectations within the three overall expectations in the Geometry and Spatial Sense strand. Part B includes several styles of questions: short response, fill-in-the-blank, matching, and multiple choice.

Timing

Most students will be able to complete the entire assessment in a 60-minute period. If necessary, provide students with additional time to complete the assessment as long as they complete it in one sitting.

Materials

FOR THE TEACHER	FOR EACH STUDENT	OPTIONAL MATERIALS
• Individual Student Scoring Guide: pp. 175–177 • Class Tracking Sheet: pp. 178–179 • ONAP 4 CD-ROM (optional)	• Assessment Part B: pp. 162–173 • pencil • eraser • ruler • scissors	• pattern blocks

Introducing the Assessment

Inform students that they will be completing an assessment to help you get to know what they have learned about math in earlier grades. Tell students that it is important that they answer the questions as fully as possible. To communicate effectively, they can use pictures, numbers, words, and/or diagrams to represent their thinking.

Have pattern blocks available and encourage students to use them as they answer the questions. Tell students they can use other materials available in the classroom that they think might help them to answer questions and/or solve problems.

Note: *Calculators are not recommended during this assessment.*

Accommodating Students with Special Needs

If individuals or groups of students have difficulties with reading, consider reading the questions aloud as they complete the assessment.

If individual students have difficulties explaining their thinking in writing, consider providing scribes to record for the students or encourage students to show and explain their thinking using concrete materials.

Some students will require additional time to complete the assessment. You may want to note this accommodation in your anecdotal notes about the students. However, there should be no reduction of the student's overall score in terms of the amount of time it takes the student to complete the assessment.

Scoring the Assessment

A detailed Individual Student Scoring Guide is provided on pages 175 to 177. The guide is designed to be completed for each student. The individual scores can then be used to fill in the Class Tracking Sheet on pages 178 and 179. Alternatively, you may record student results directly on the Class Tracking Sheet. The results may also be recorded electronically using the ONAP 4 CD-ROM.

While great care has been taken to consider the range of possible answers for each question, there will be times when you will need to apply your professional judgment to score an individual answer. You may use the Curriculum Correlation chart provided on pages 180 and 181 to help you to determine whether the student has demonstrated the intended concept knowledge or skill based on the overall and specific expectations being assessed by the particular question.

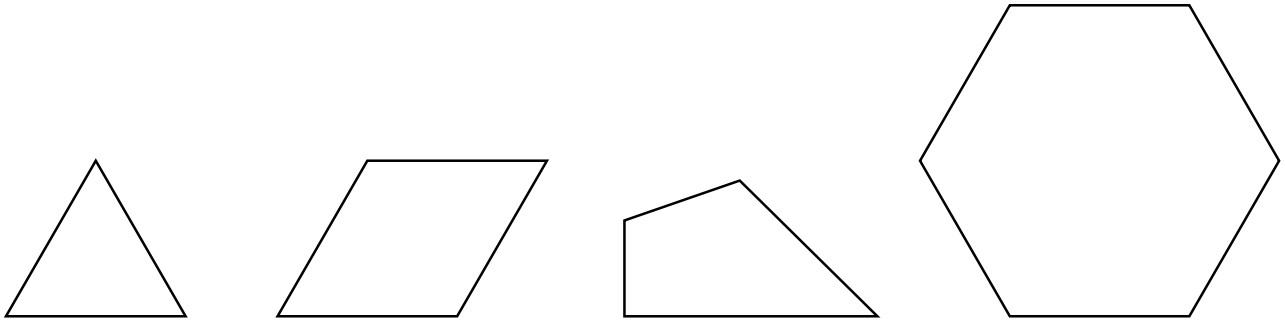
At times a student may provide an answer that you think does not completely represent his or her knowledge and skill level. You may ask probing questions to better assess the student's overall understanding.

Some questions are delivered in more than one part (a and b) and are given more than one point. Should a student's answer in one part reveal that a correct answer in the other part was arrived at for the wrong reason, a score of zero should be given for both parts.

Name: _____ **Date:** _____

Geometry and Spatial Sense

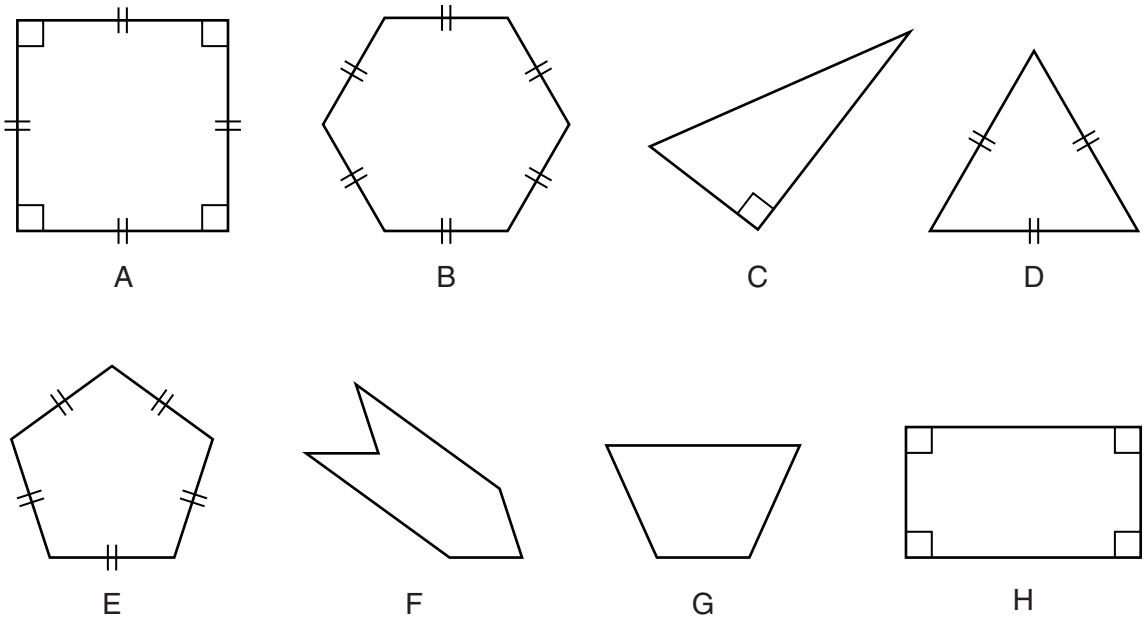
1. Compare the angles of these four shapes with a right angle.
Use a square pattern block or the corner of a piece of paper.
List all of the shapes that have at least one angle greater than a right angle. _____



2. **a)** List all of the shapes below that have exactly three sides. _____

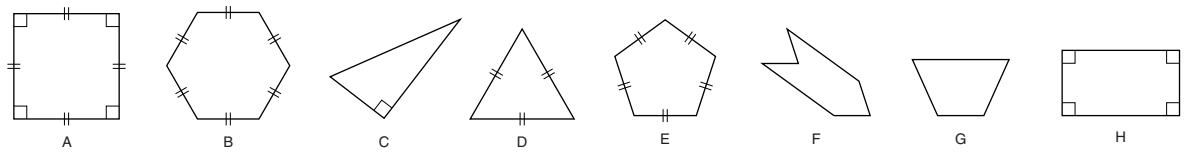
b) List all of the shapes below that have one or more square corners. _____

c) List all of the shapes below that have all sides equal. _____

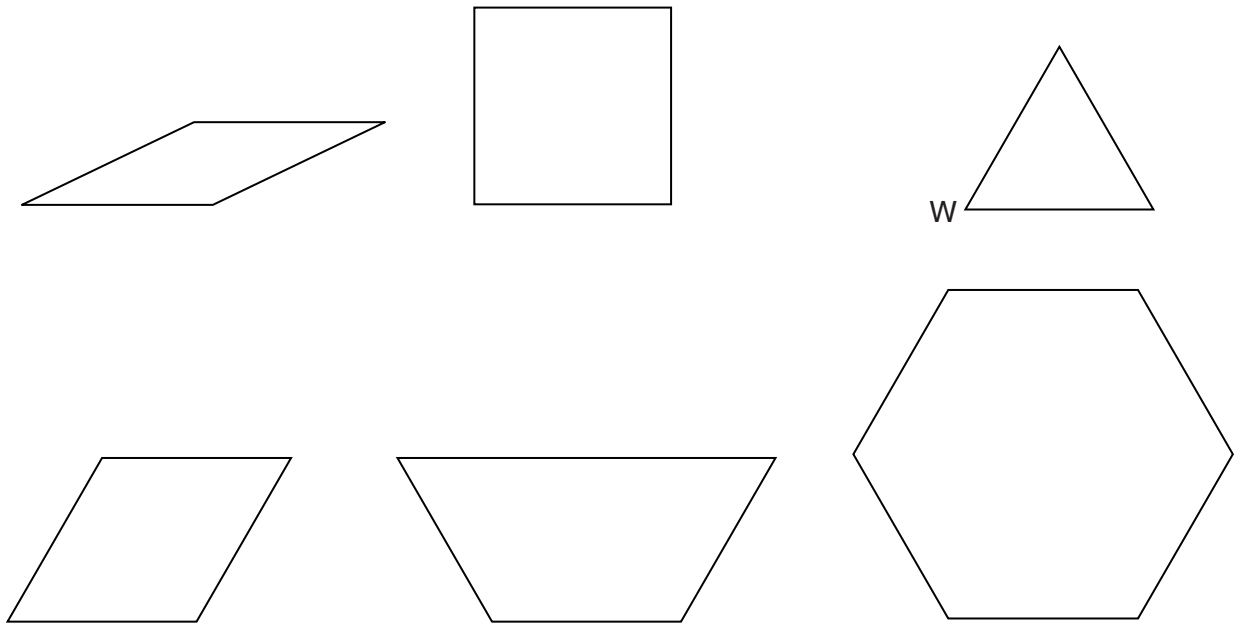


Name: _____ **Date:** _____

2. d) You could sort these shapes using the ideas in parts a), b), and c). Describe a **different** way to sort the shapes into groups. Which shapes would be in each group?



3. Use the shapes below.



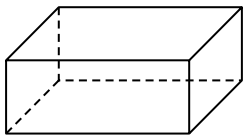
a) Locate an angle in another shape that is greater than or equal to angle W in the triangle. Label the angle with an X.

b) Locate an angle in another shape that is smaller than angle W in the triangle. Label the angle with a Y.

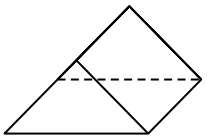
Name: _____ **Date:** _____

4. a) List all of the 3-D figures below that have more than 10 edges. _____

b) List all of the 3-D figures below that have one or more triangular faces. _____



A



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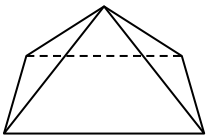
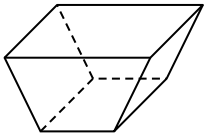


C



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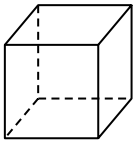
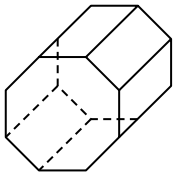


E



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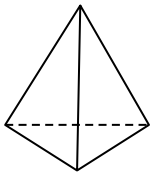
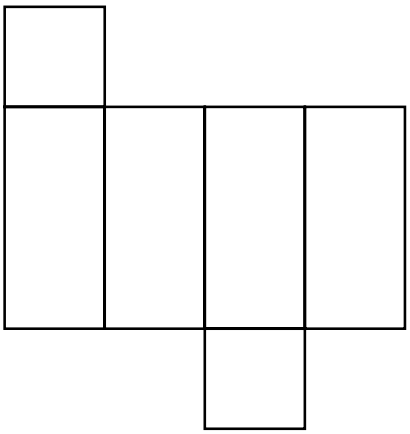


G

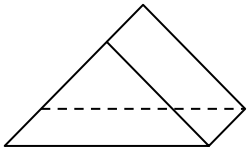
c) You could sort these figures using the ideas in parts a) and b).
Describe a **different** way to sort the figures into groups.
Which figures would be in each group?

Name: _____ **Date:** _____

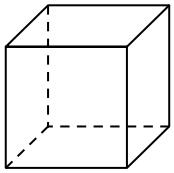
5.



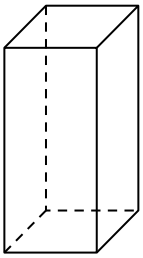
a) Which of these prisms could be made from the net above? Circle your answer.



A



B



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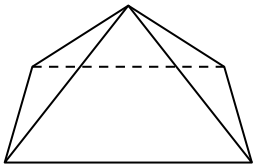


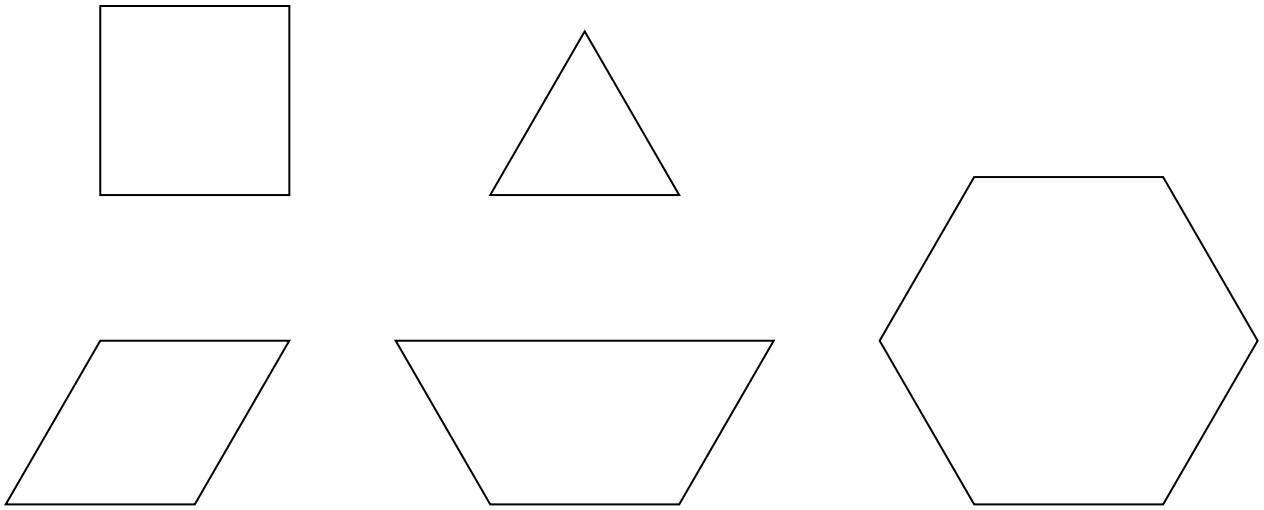
D

b) How many edges does a rectangular prism have? _____

How many vertices does a rectangular prism have? _____

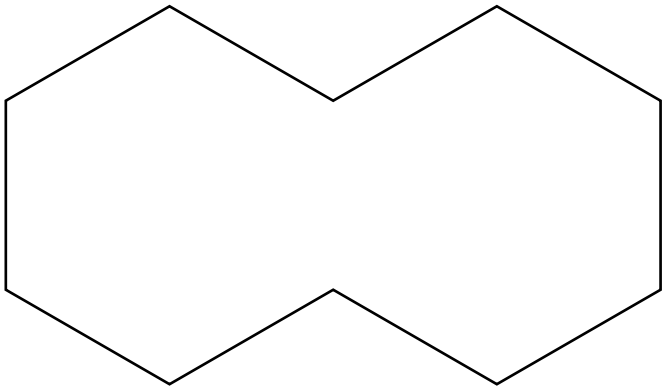
Name: _____ **Date:** _____

6. Use these pattern blocks.



a) What is the least number of pattern blocks that could be used to cover the shape below? Circle your answer.

2 3 4 5



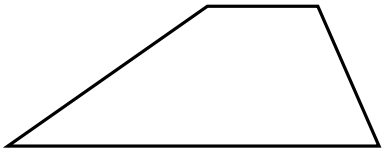
b) What pattern block unit could you use to cover the shape in part a) with the greatest number of pattern blocks?

_____

Name: _____ **Date:** _____

7. a) A rectangle is a type of parallelogram.
What are the properties that make a rectangle a parallelogram?

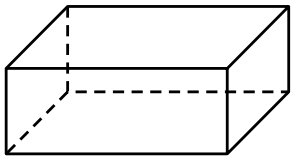
b) This shape is not a parallelogram. How do you know?



Name: _____ **Date:** _____

8. Which shapes make up the faces of each 3-D figure?
Circle your answer for each.

a)



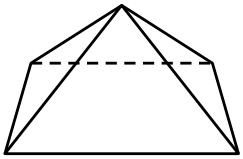
A four quadrilaterals

B two squares and two rectangles

C six rectangles

D four triangles

b)



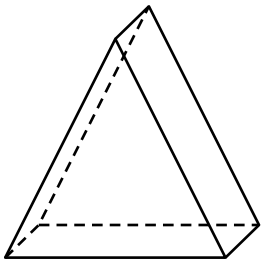
A five triangles

B two squares and a triangle

C three triangles and a square

D four triangles and a rectangle

c)



A two squares and a triangle

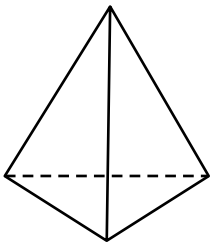
B two triangles and three rectangles

C two triangles and four rectangles

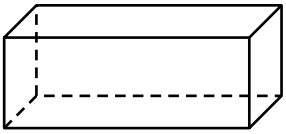
D three triangles and a rectangle

Name: _____ **Date:** _____

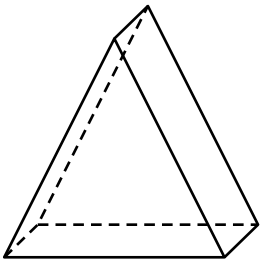
9. a) Match the name to each 3-D figure.

i) 

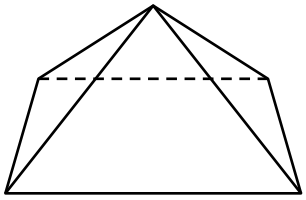
rectangular prism

ii) 

rectangle-based pyramid

iii) 

triangular prism

iv) 

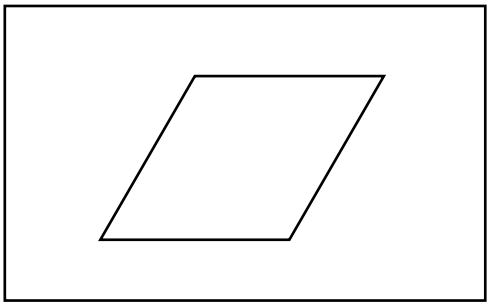
triangle-based pyramid

b) Describe the faces of a square-based pyramid.

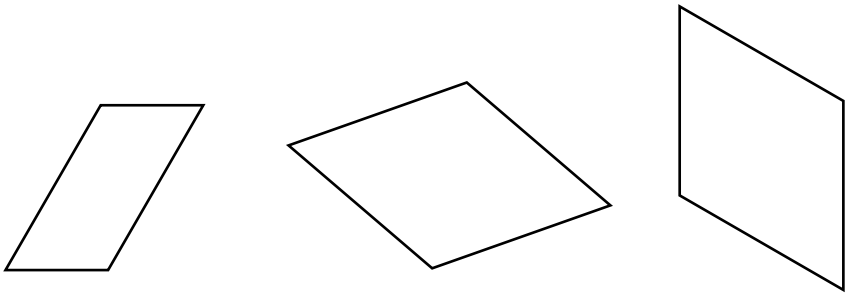
Name: _____ **Date:** _____

10. Use a blue parallelogram pattern block.

It is congruent to the parallelogram in the box below.



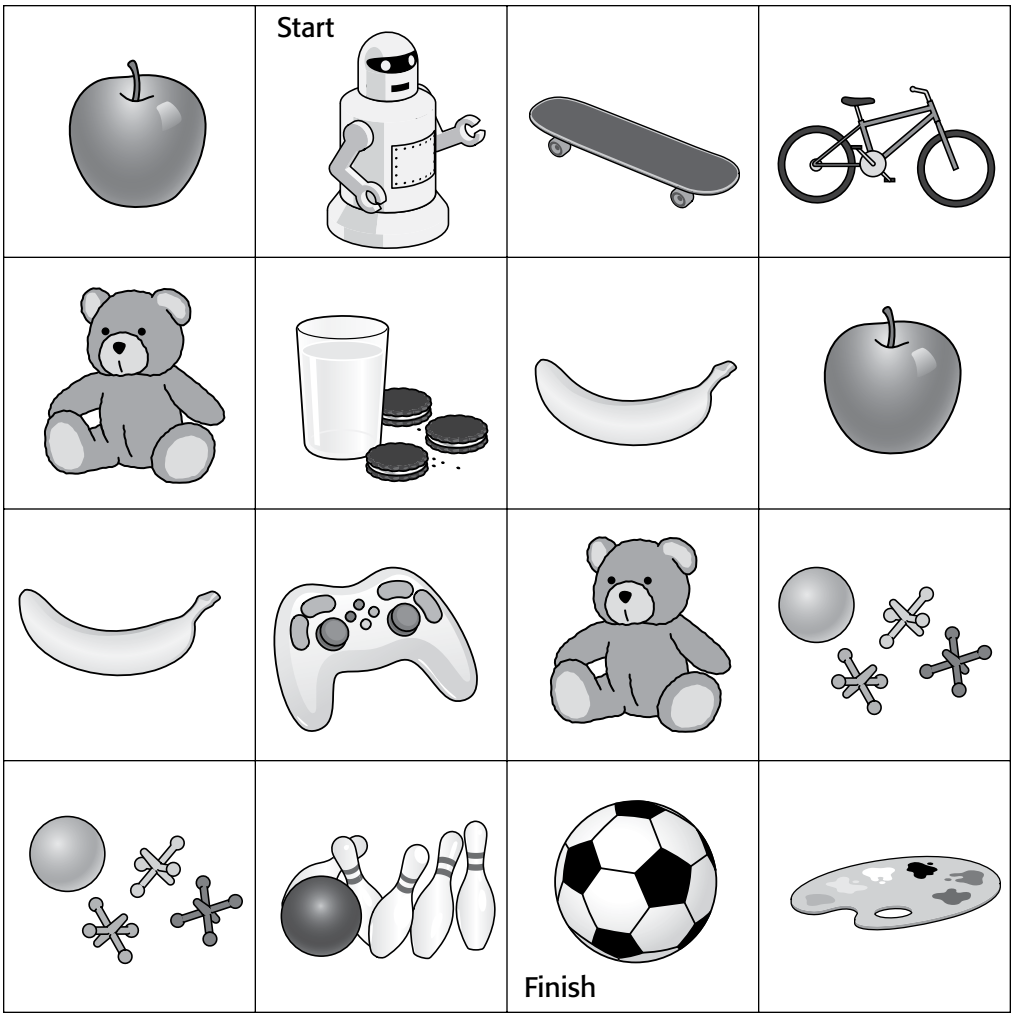
Which parallelograms below are congruent to the one in the box? _____



A B C

Name: _____ **Date:** _____

11. Describe how to move from the robot to the soccer ball on the coordinate grid below. Use words such as **up, down, left,** and **right.**



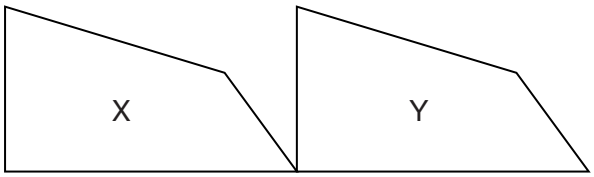
Name: _____ **Date:** _____

12. a) Match the word on the left with the word on the right.

slide	reflection
flip	rotation
turn	translation

b) Use the cutout to help you. Circle the word that describes how to move each quadrilateral from X to Y.

i)

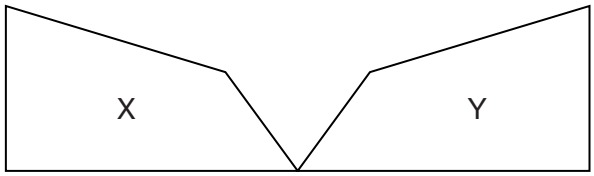


rotation

translation

reflection

ii)

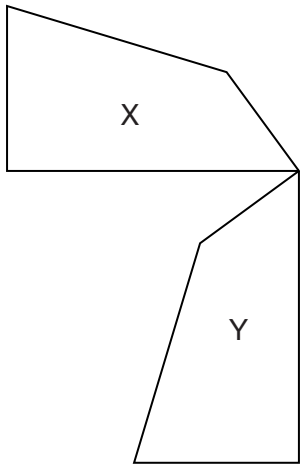


rotation

translation

reflection

iii)



rotation

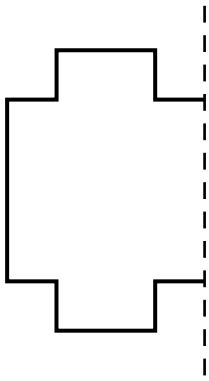
translation

reflection

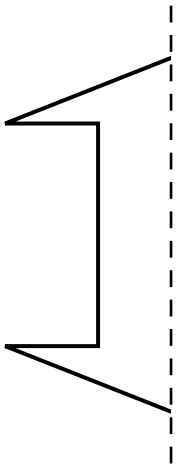
Name: _____ **Date:** _____

13. Half of three shapes are shown below. The dotted line is a line of symmetry for each shape. Draw the other half of each shape.

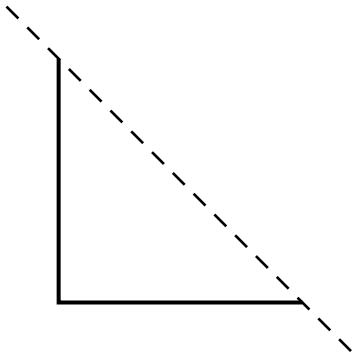
a)



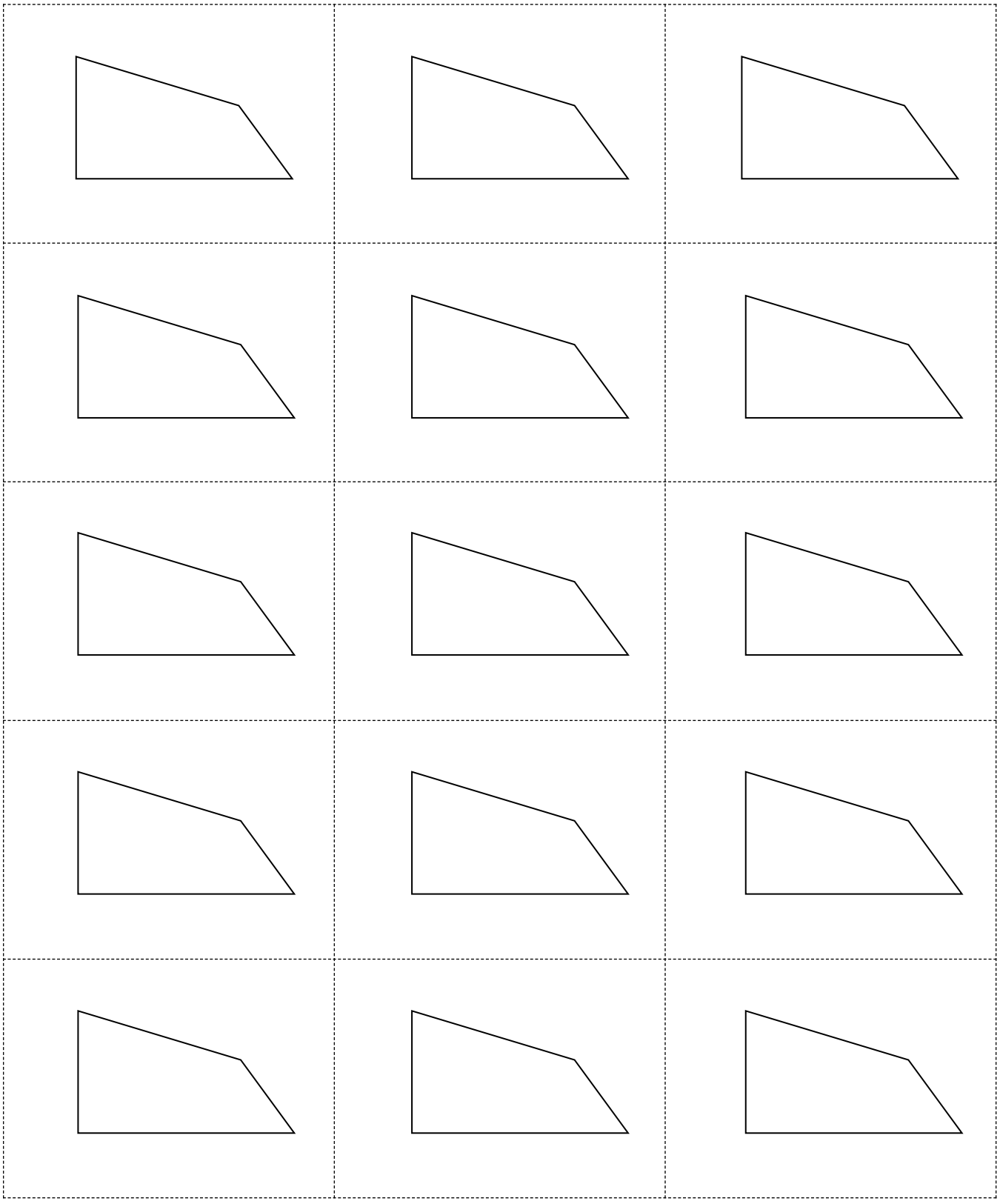
b)



c)



Use this page for question 12. Provide one cutout and a pair of scissors to each student.

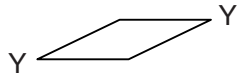


ONAP INDIVIDUAL STUDENT SCORING GUIDE
GRADE 4: GEOMETRY AND SPATIAL SENSE—PART B

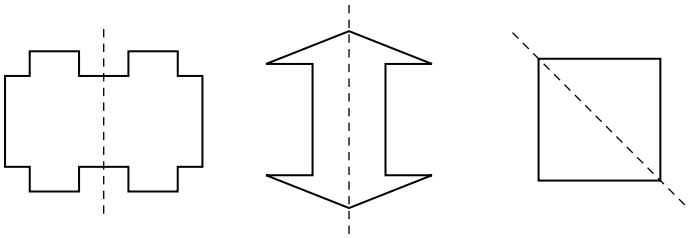
Name: _____ **Date:** _____

Overall Expectation 3m47 (Geometric Properties):

Compare two-dimensional shapes and three-dimensional figures and sort them by their geometric properties.

3m50 1.	B, C, D **1 point**	
3m51 2. a)–c)	a) C, D b) A, C, H c) A, B, D, E **1 point** for two correct **2 points** for all three correct	
3m51 2. d)	**1 point** for correctly naming a sorting attribute and identifying the shapes with that attribute; e.g., *Which shapes have four or more sides? A, B, E, F, G, H*	
3m52 3. a)	**1 point** for correctly identifying any angle except those marked in Question 3 b) below as greater than or equal to angle W	
3m52 3. b)	 **1 point** for correctly identifying one of these angles	
3m53 4. a)	A, D, E, F **1 point**	
3m53 4. b)	B, C, G **1 point**	
3m53 4. c)	**1 point** for correctly naming a sorting attribute and identifying the figures with that attribute; e.g., *Which 3-D figures have one or more rectangular faces? A, B, C, D, E, F*	
3m54 5. a)	C (the rectangular prism) **1 point**	
3m54 5. b)	12 edges; 8 vertices **1 point**	
	Total for Overall Expectation	11

Overall Expectation 3m48 (Geometric Relationships): **Describe relationships between two-dimensional shapes, and between two-dimensional shapes and three-dimensional figures.**		
3m55 6. a)	2 **1 point**	
3m55 6. b)	triangle **1 point**	
3m56 7. a)	**1 point** for a reasonable explanation; e.g., *It has two pairs of parallel sides.*	
3m56 7. b)	**1 point** for a reasonable explanation; e.g., *It has only one pair of parallel sides.*	
3m57 8. a)	C six rectangles **1 point**	
3m57 8. b)	D four triangles and a rectangle **1 point**	
3m57 8. c)	B two triangles and three rectangles **1 point**	
3m58 9. a)	i) triangle-based pyramid ii) rectangular prism iii) triangular prism iv) rectangle-based pyramid **1 point** for two or three correct OR **2 points** for all correct	
3m58 9. b)	**1 point** for a reasonable explanation; e.g., *A square-based pyramid has one square and four triangles as faces.*	
3m59 10.	B, C **1 point**	
	Total for Overall Expectation	11

Overall Expectation 3m49 (Location and Movement): **Identify and describe the locations and movements of shapes and objects.**		
3m60 11.	**1 point** for a partial answer that demonstrates some understanding; e.g., *right and down*; or describing entire route correctly in the reverse direction, from soccer ball to robot OR **2 points** for complete answer that demonstrates full understanding; e.g., *3 down and 1 right, 1 right and 3 down;* or any path that begins at the robot and ends at the soccer ball	
3m61 12. a)	slide – translation; flip – reflection; turn – rotation **1 point** for all correct	
3m61 12. b)	i) translation ii) reflection iii) rotation **1 point** for two correct **2 points** for all correct	
3m62 13.	 **1 point** for all three correct	
	Total for Overall Expectation	6

ONAP GRADE 4: GEOMETRY AND SPATIAL SENSE

Date: _____ **Grade:** _____ **School:** _____

Overall Expectation			**3m47 (Geometric Properties)** Compare two-dimensional shapes and three-dimensional figures and sort them by their geometric properties.										
Specific Expectation #			3m50	3m51		3m52		3m53			3m54		Total
Question #			1.	2.a)–c)	2. d)	3. a)	3. b)	4. a)	4. b)	4. c)	5. a)	5. b)	
Student Name	Gender (M/F)	IEP/ ELL	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**11**

CLASS TRACKING SHEET – PART B

Board: _____ **Teacher Name:** _____

3m48 (Geometric Relationships) Describe relationships between two-dimensional shapes, and between two-dimensional shapes and three-dimensional figures.											**3m49 (Location and Movement)** Identify and describe the locations and movements of shapes and objects.				
3m55		3m56		3m57			3m58		3m59	Total	3m60	3m61		3m62	Total
6. a)	6. b)	7. a)	7. b)	8. a)	8. b)	8. c)	9. a)	9. b)	10.		11.	12. a)	12. b)	13.	
1	1	1	1	1	1	1	2	1	1	11	2	1	2	1	6

ONTARIO CURRICULUM CORRELATION TO ONAP GEOMETRY AND SPATIAL SENSE 4 — PART B
NOTE: This correlation is to the Grade 3 Ontario Curriculum Expectations

Overall Expectation 3m47 (Geometric Properties):
Compare two-dimensional shapes and three-dimensional figures and sort them by their geometric properties.

Question Number	Specific Expectation
1.	**3m50:** use a reference tool (e.g., paper corner, pattern block, carpenter's square) to identify right angles and to describe angles as greater than, equal to, or less than a right angle
2. a)–d)	**3m51:** identify and compare various polygons (i.e., triangles, quadrilaterals, pentagons, hexagons, heptagons, octagons) and sort them by their geometric properties (i.e., number of sides; side lengths; number of interior angles; number of right angles)
3. a)–b)	**3m52:** compare various angles, using concrete materials and pictorial representations, and describe angles as bigger than, smaller than, or about the same as other angles (e.g., "Two of the angles on the red pattern block are bigger than all the angles on the green pattern block.")
4. a)–c)	**3m53:** compare and sort prisms and pyramids by geometric properties (i.e., number and shape of faces, number of edges, number of vertices), using concrete materials
5. a)–b)	**3m54:** construct rectangular prisms (e.g., using given paper nets; using Polydrons), and describe geometric properties (i.e., number and shape of faces, number of edges, number of vertices) of the prisms

Overall Expectation 3m48 (Geometric Relationships):
Describe relationships between two-dimensional shapes, and between two-dimensional shapes and three-dimensional figures.

Question Number	Specific Expectation
6. a)–b)	**3m55:** solve problems requiring the greatest or least number of two-dimensional shapes (e.g., pattern blocks) needed to compose a larger shape in a variety of ways (e.g., to cover an outline puzzle)
7. a)–b)	**3m56:** explain the relationships between different types of quadrilaterals (e.g., a square is a rectangle because a square has four sides and four right angles; a rhombus is a parallelogram because opposite sides of a rhombus are parallel)
8. a)–c)	**3m57:** identify and describe the two-dimensional shapes that can be found in a three-dimensional figure
9. a)–b)	**3m58:** describe and name prisms and pyramids by the shape of their base (e.g., rectangular prism, square-based pyramid)
10.	**3m59:** identify congruent two-dimensional shapes by manipulating and matching concrete materials (e.g., by translating, reflecting, or rotating pattern blocks)

Overall Expectation 3m49 (Location and Movement): **Identify and describe the locations and movements of shapes and objects.**	
Question Number	**Specific Expectation**
11.	**3m60:** describe movement from one location to another using a grid map (e.g., to get from the swings to the sandbox, move three squares to the right and two squares down)
12. a)–b)	**3m61:** identify flips, slides, and turns, through investigation using concrete materials and physical motion, and name flips, slides, and turns as reflections, translations, and rotations (e.g., a slide to the right is a translation; a turn is a rotation)
13.	**3m62:** complete and describe designs and pictures of images that have a vertical, horizontal, or diagonal line of symmetry

Part C: Performance-Based Assessment

Administration

The two performance tasks in Part C are designed to provide insight into how well students are able to perform in terms of the categories of the Ontario Achievement Chart: Knowledge and Understanding, Thinking, Communication, and Application.

All of the specific and overall expectations for this strand have been assessed through the Concepts and Skills Assessment in Part B. However, it is recommended that both performance tasks for the Geometry and Spatial Sense strand be completed.

Read all parts of the problem aloud to students. Tell students that they should provide detailed answers to the problem, including showing how they solved the problem. Remind students that they may use pictures, numbers, words, diagrams, and/or charts to explain effectively how they solved the problem.

Timing

Each task is designed to be completed in a 45- to 60-minute period. If necessary, provide additional time as long as students complete the task in one sitting.

Accommodating Students with Special Needs

If individual students have difficulties explaining their thinking in writing, consider providing scribes to record for the students or encourage students to show and explain their thinking using concrete materials.

Scoring the Assessment

A generic rubric based on the Ontario Achievement Chart for Mathematics is provided on page 191 to assist with scoring student responses to the tasks. Spend some time reviewing the anchors and rationales provided for each level of achievement on pages 192 to 207. The four categories should be considered as interrelated, reflecting the wholeness and interconnectedness of learning. Each student's performance should therefore be determined holistically by selecting the level that best describes the student's overall achievement.

Sometimes a student will not achieve at the same level for each criterion within a category or across categories. For example, a student may perform at Level 3 on Knowledge and Understanding, Thinking, and Application but at Level 2 on Communication. While you may determine that, overall, the student performed most consistently at Level 3, you may want to make a note that this student would benefit from additional instruction in the area of Communication.

Note: *When scoring student work on the performance tasks, it is appropriate to note what you observed and heard while the student worked on the task.*

Once you have completed scoring the students' assessments, you may record the results directly on the Class Tracking Sheet. The results may also be recorded electronically using the ONAP 4 CD-ROM.

Next Steps

Strategies for improving performance in the four areas of the Achievement Chart are provided in the ONAP introduction, pages 18 and 19.

Performance Task 1: Hexagon Challenge

Materials

FOR THE TEACHER	FOR EACH STUDENT	OPTIONAL MATERIALS
• Performance Task Class Tracking Sheet: p. 190 • Performance Task Rubric: p. 191 • Anchors and rationales: pp. 192 to 207 • ONAP 4 CD-ROM (optional)	• BLM C1: *Performance Task 1: Hexagon Challenge:* pp. 186–188 • pencil • eraser • pattern blocks	

Introducing the Task

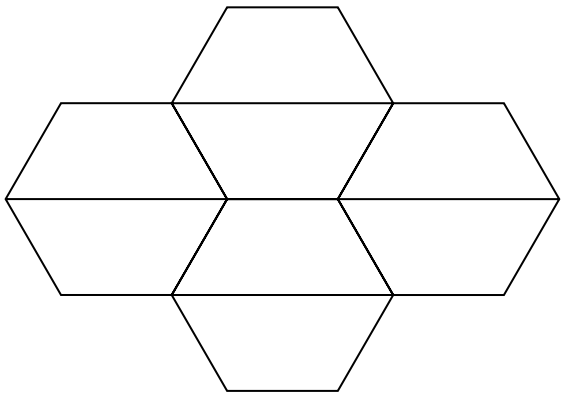
For this task, students combine pattern blocks to create different designs within a shape outline.

Tell students that they will
- find different ways to fill an outline using pattern blocks
- explain their answers

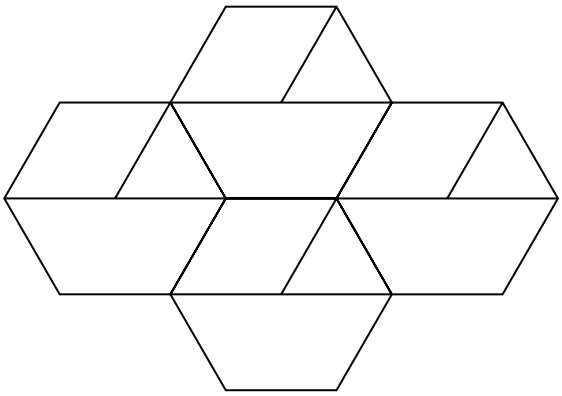
Have students use BLM C1: *Performance Task 1: Hexagon Challenge* to complete this activity.

Answers

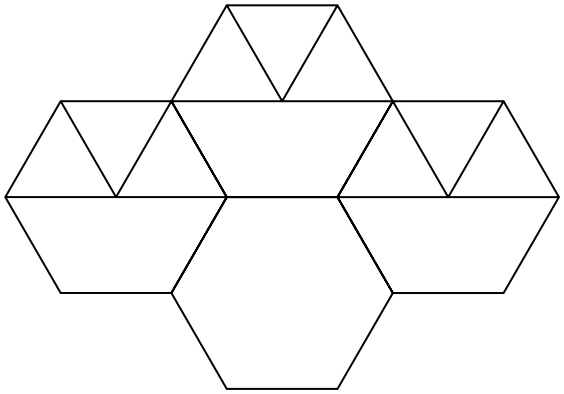
1. a) For example,



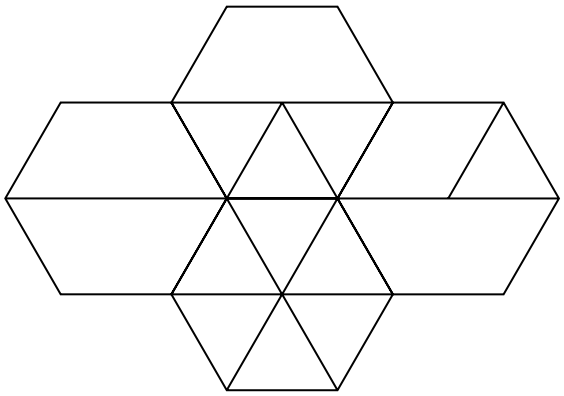
b) For example,



c) For example,



d) For example,



2. *I kept trying blocks to see how I could fill the outline using different numbers of blocks. For example, to fill the outline using exactly eight blocks, I figured I needed to use a larger block, so I started with the trapezoid and saw that I could use exactly eight of them.*

3. *No, I couldn't. The most I can use is 24 blocks because the triangle pattern block is the smallest pattern block and I can completely fill the outline with 24 of them.*

Performance Task 2: Building Up 3-D!

Materials

FOR THE TEACHER	FOR EACH STUDENT	OPTIONAL MATERIALS
• Performance Task Class Tracking Sheet: p. 190 • Performance Task Rubric: p. 191 • Anchors and Rationales: pp. 192–207 • ONAP 4 CD-ROM (optional)	• BLM C2: *Performance Task 2: Building Up 3-D!:* p. 189 • pencil • eraser • toothpicks • modelling clay	

Introducing the Task

For this task, students work in pairs to either provide directions or follow directions to build a 3-D figure.

Tell students that they will

- build a 3-D figure from the directions their partners provide
- compare 3-D shapes and discuss the directions and math vocabulary used

Have students use BLM C2: *Performance Task 2: Building Up 3-D!* to complete this task.

Answers

6. *First we compared the overall figures, then the shapes of the faces and the number of faces. If our figures have the same number of faces and the same face shapes, then our figures are the same.*
7. *I used words like* triangle, square, rectangle, faces, edge, corner *or* vertex, flat, *and* pointing up.
8. *Directions like "use three toothpicks and join them to make a triangle face" were really clear.*

Name: _____ **Date:** _____

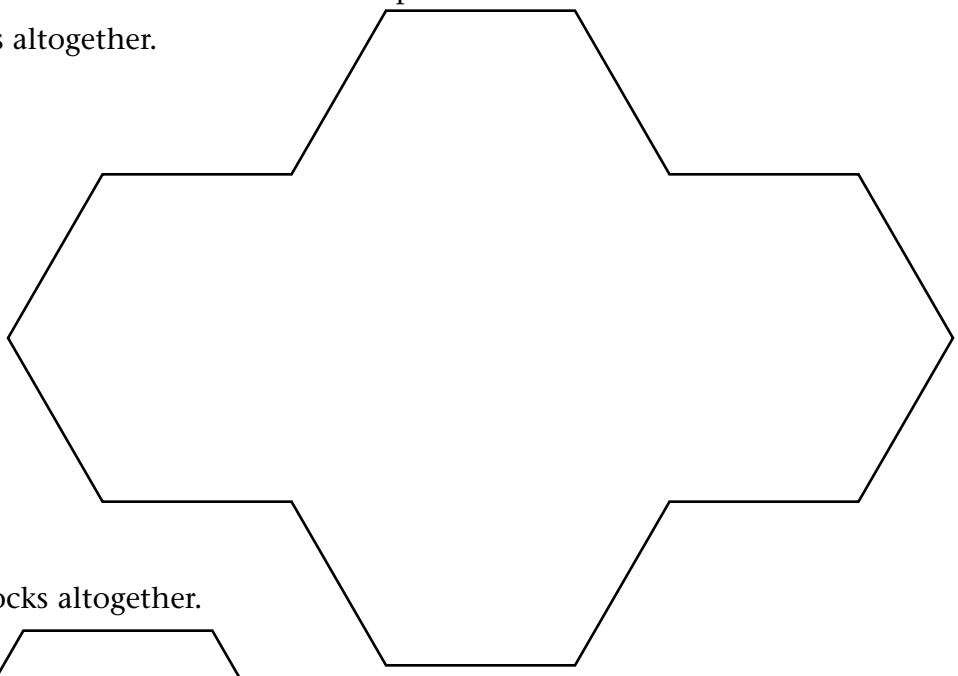
Performance Task 1: Hexagon Challenge

(page 1)

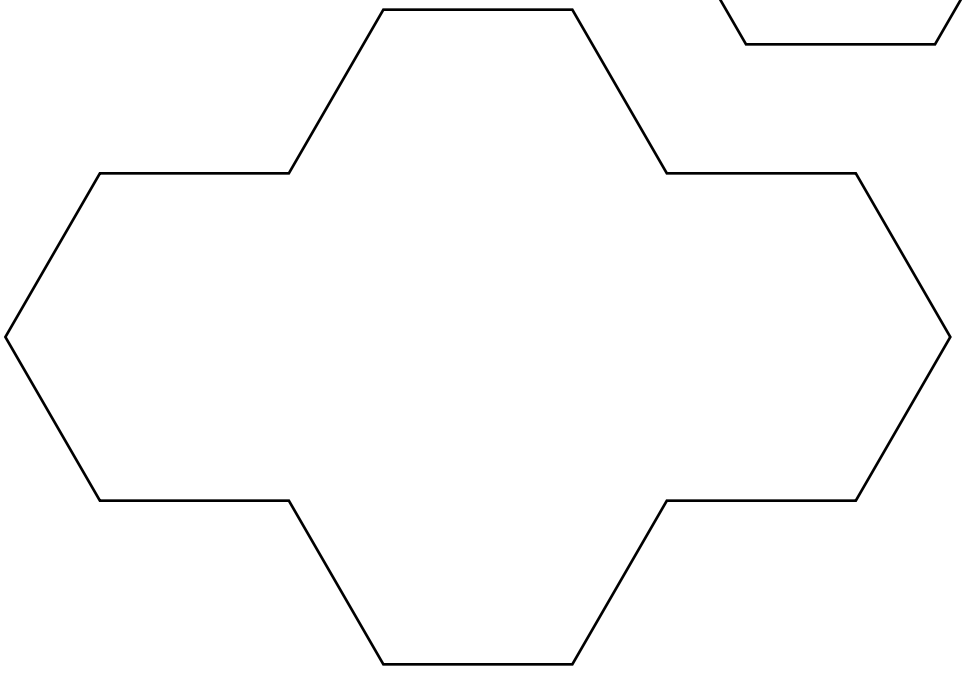
Your class has been asked to design the logo for a new soccer dome. The logo must fit exactly into an outline of four hexagons joined together.

1. Your challenge is to fill the outline with different numbers of pattern blocks.
Show how to fill the outline with these numbers of pattern blocks.

a) Use exactly 8 blocks altogether.



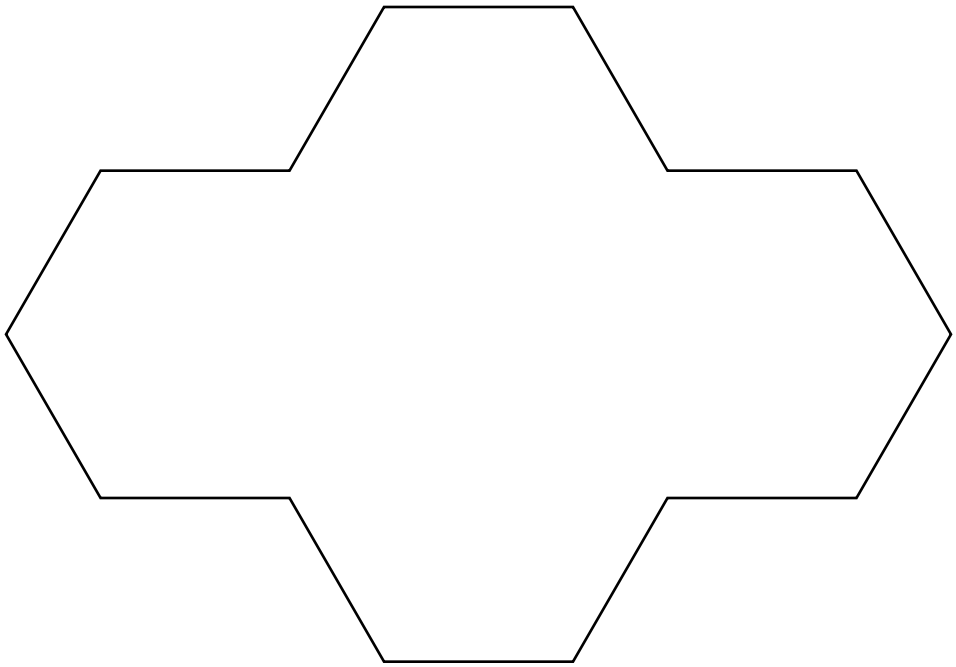
b) Use exactly 12 blocks altogether.



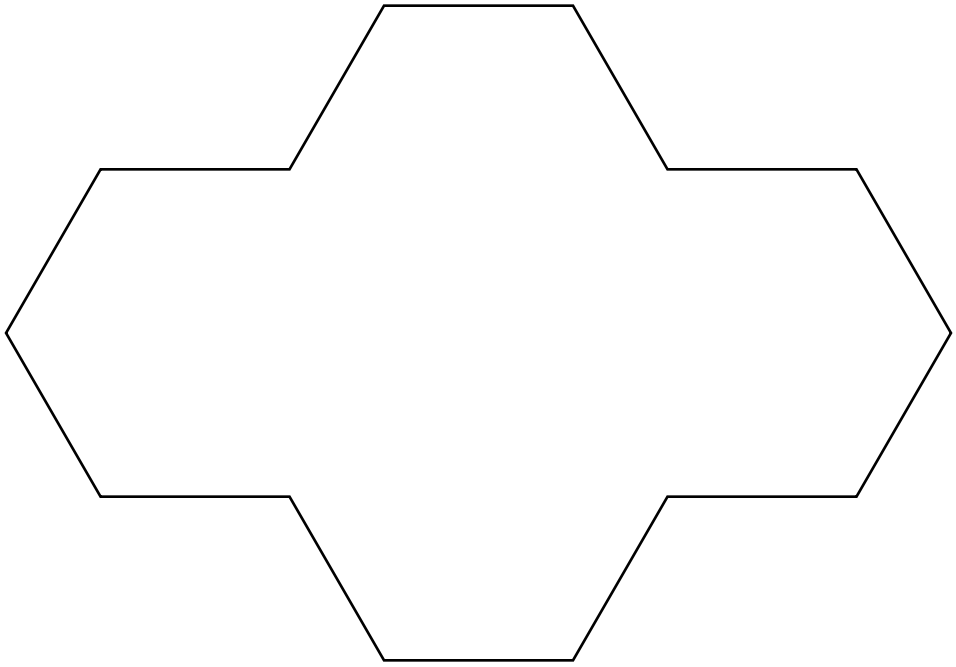
Name: _____ **Date:** _____

Performance Task 1: Hexagon Challenge
(page 2)

c) Use exactly 13 blocks altogether.



d) Use exactly 15 blocks altogether.



Name: _____ **Date:** _____

Performance Task 1: Hexagon Challenge
(page 3)

2. Explain how you figured out each answer.

3. Could you use 25 pattern blocks to cover the design? Explain.

Name: _____ **Date:** _____

Performance Task 2: Building Up 3-D!

1. Work in pairs. Decide who will be Partner A and who will be Partner B.

2. If you are Partner A, use the materials your teacher provides to build a 3-D figure. Keep your figure hidden from your partner.

3. Describe the figure to your partner. (Remember to keep it hidden.) Use math vocabulary, but do not use the words **prism**, **cube**, or **pyramid**.

4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.

5. Compare your 3-D figures.

6. How do you know if your 3-D figures are the same?

   a) Partner A's answer: _____

   _____

   b) Partner B's answer: _____

   _____

7. What math words did you use to help your partner build your 3-D figure?

   Partner A's answer: _____

   _____

8. What directions were most helpful when you were listening and building?

   Partner B's answer: _____

   _____

ONAP PERFORMANCE TASK CLASS TRACKING SHEET GRADE 4: GEOMETRY AND SPATIAL SENSE PART C

Date: _____ **Grade:** _____

School: _____ **Board:** _____

Teacher Name: _____

Performance Task Title: _____

Student Name	Level 1–4	Comments

Performance Task Rubric

Assessment of Learning — What to Look For in Student Work				
CATEGORY	**LEVEL 1**	**LEVEL 2**	**LEVEL 3**	**LEVEL 4**
Knowledge and Understanding	• demonstrates a limited or inaccurate understanding of the concepts needed to solve the problem • demonstrates a limited or inaccurate knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates some understanding of the concepts needed to solve the problem • demonstrates some knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates considerable understanding of the concepts needed to solve the problem • demonstrates considerable knowledge of the specific concepts, terms, or procedural skills that have been taught	• demonstrates a thorough understanding of the concepts needed to solve the problem • demonstrates a thorough knowledge of the specific concepts, terms, or procedural skills that have been taught
Thinking	• demonstrates a limited understanding of the problem • shows little or no evidence of a plan • uses a strategy and attempts to solve the problem but does not arrive at an answer	• demonstrates some understanding of the problem • shows some evidence of a plan • carries out the plan to some extent by using a strategy and develops a partial and/or incorrect solution	• demonstrates considerable understanding of the problem • shows evidence of an appropriate plan • carries out the plan effectively by using an appropriate strategy and solving the problem	• demonstrates a thorough understanding of the problem • shows evidence of a thorough plan • shows flexibility and insight when carrying out the plan by trying and adapting when necessary one or more strategies to solve the problem
Communication	• provides a limited or inaccurate explanation/ justification that lacks clarity or logical thought • communicates with limited effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a partial explanation/justification that shows some clarity and logical thought • communicates with some effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a complete, clear, and logical explanation/ justification • communicates with considerable effectiveness (may include words, pictures, symbols, and/or numbers)	• provides a thorough, clear, and insightful explanation/justification • communicates with a high degree of effectiveness (may include words, pictures, symbols, and/or numbers)
Application	• demonstrates a limited ability to apply mathematical knowledge and skills	• demonstrates some ability to apply mathematical knowledge and skills	• demonstrates considerable ability to apply mathematical knowledge and skills	• demonstrates a sophisticated ability to apply mathematical knowledge and skills

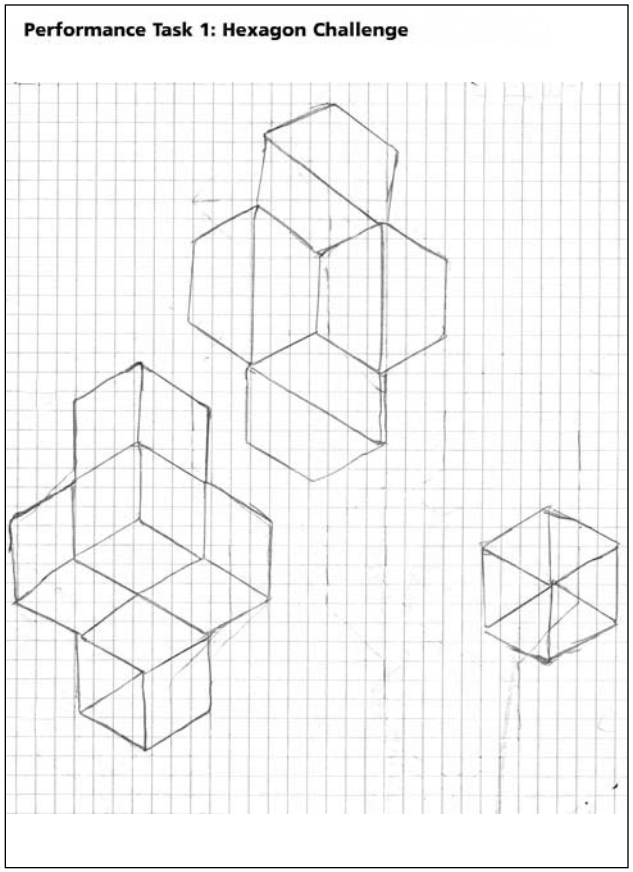
Performance Task 1: Hexagon Challenge LEVEL 1 (Anchor 1)

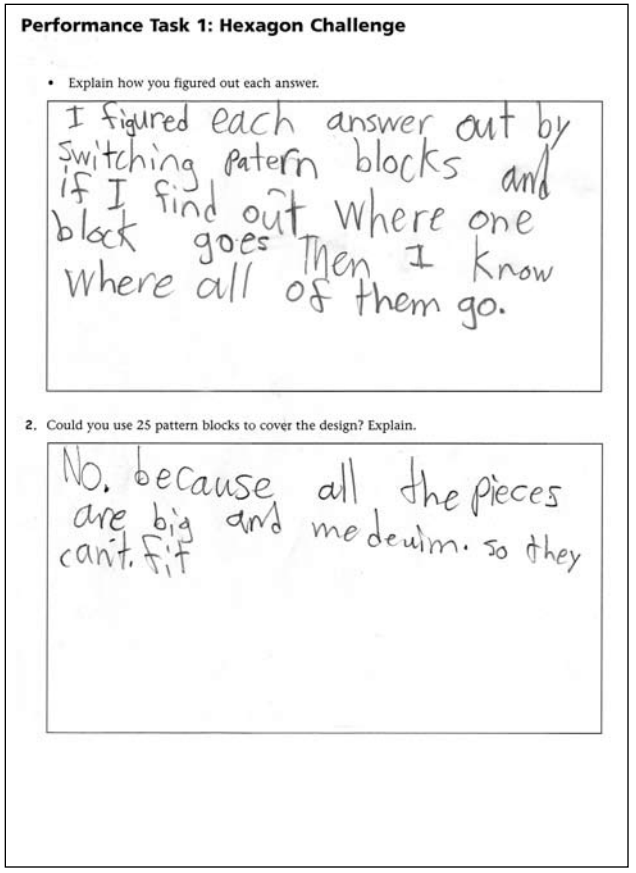
Knowledge and Understanding
- demonstrates a limited understanding of the relationships among pattern block units
- shows a limited understanding of size and shape relationships

Communication
- provides a limited explanation of how the problem was solved by replacing (switching) blocks
- communicates with limited effectiveness by referring to blocks as big or medium, rather than using their shape names (hexagon, trapezoid, rhombus, square, triangle)

Thinking
- demonstrates a limited understanding of the problem with the sketched outlines
- provides evidence of using a trial-and-error strategy to fill the outlines

Application
- demonstrates a limited ability to apply knowledge of relationships among pattern blocks to solve the problem
- shows a limited ability to apply fractional or multiplicative thinking to answer the 25-block question (e.g., if 1 hexagon can be filled with 6 triangles, then 4 hexagons can be filled with 24 triangles)





Performance Task 1: Hexagon Challenge LEVEL 1 (Anchor 2)

Knowledge and Understanding

- demonstrates some knowledge of the relationships among pattern block units and how the blocks can fill the outline
- shows a limited understanding of pattern block relationships to answer the 25-block question and instead uses estimation (i.e., you would probably only fit 18)

Communication

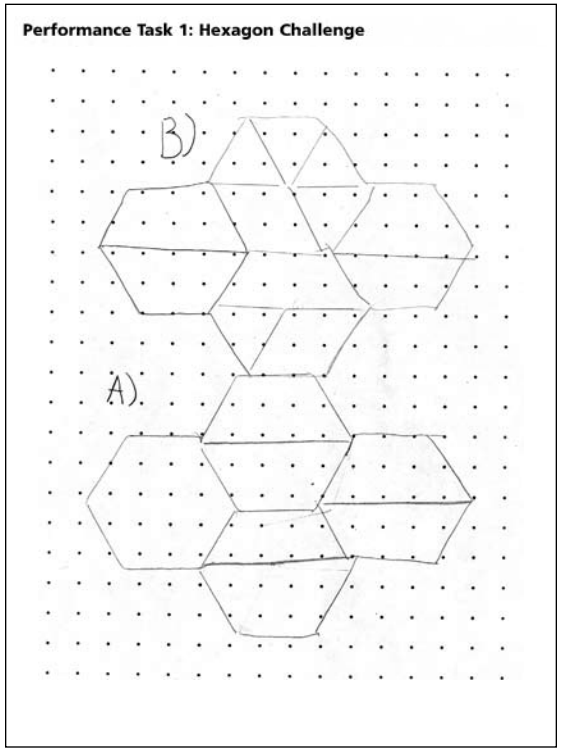
- provides a limited explanation for the procedure used
- communicates with some effectiveness by sketching the filled outlines and numbering two of the four outlines to demonstrate thinking

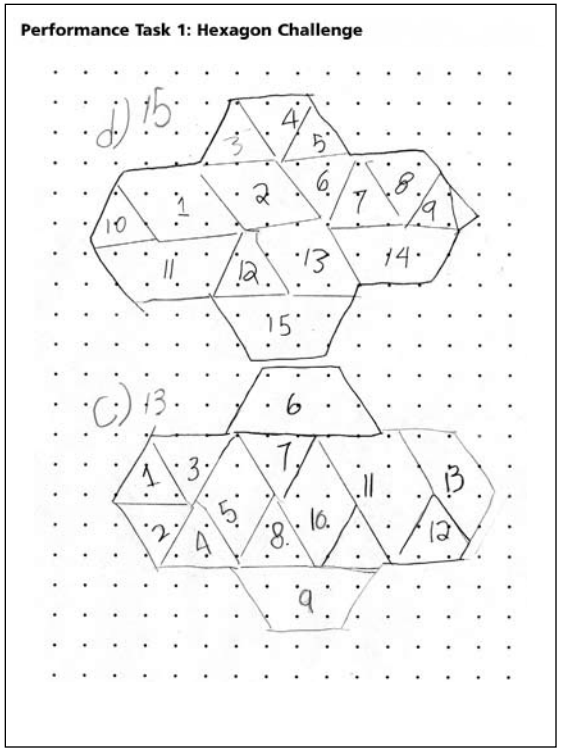
Thinking

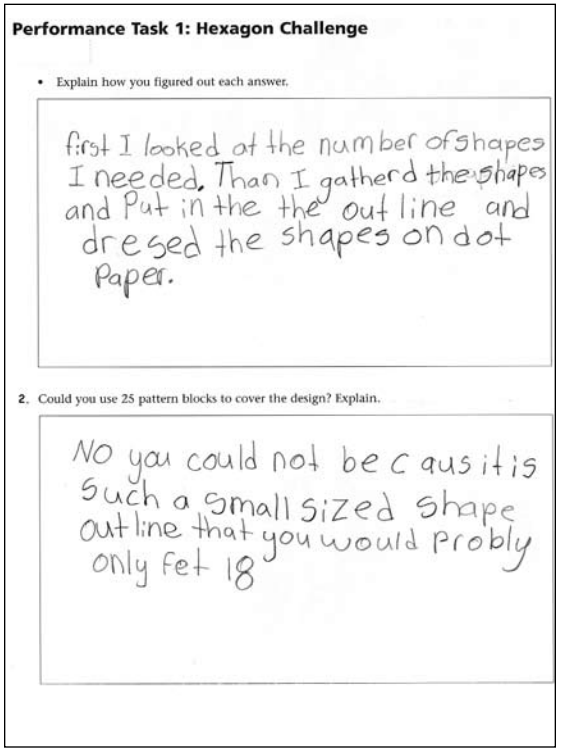
- uses a counting strategy to solve the outline problems but does not arrive at a completely correct solution
- demonstrates a limited understanding of question 2 by estimating rather than using a more precise strategy to work toward a solution

Application

- demonstrates some ability to apply knowledge of pattern block relationships to fill the outlines
- shows a limited ability to apply fractional or multiplicative thinking to answer the 25-block question







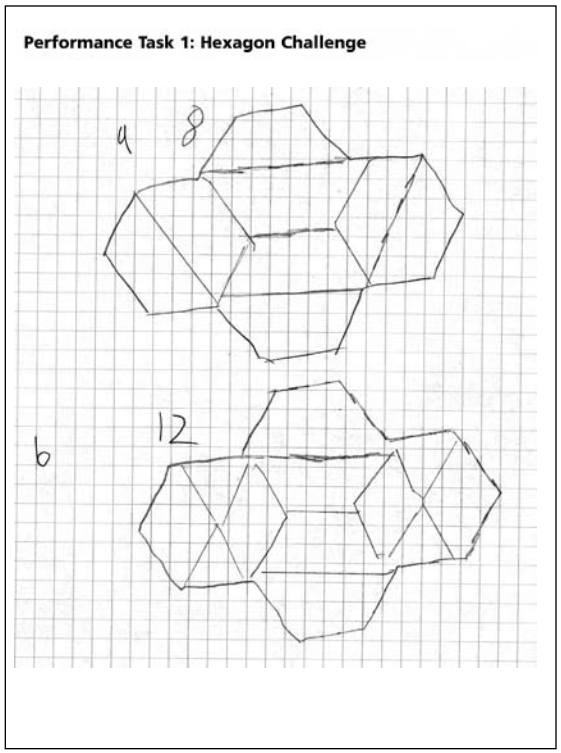
Performance Task 1: Hexagon Challenge LEVEL 2 (Anchor 1)

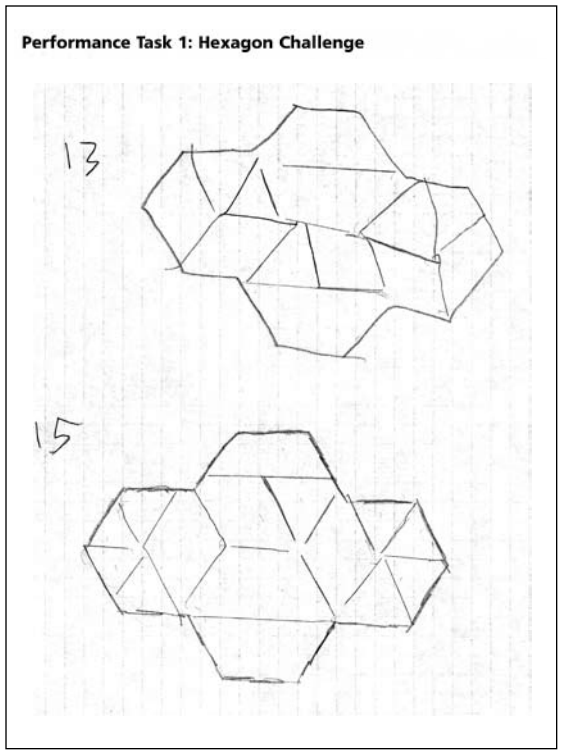
Knowledge and Understanding
- demonstrates some understanding of the relationships among pattern blocks units and how the blocks can fill the outline
- shows a limited understanding of pattern block relationships to answer the 25-block question

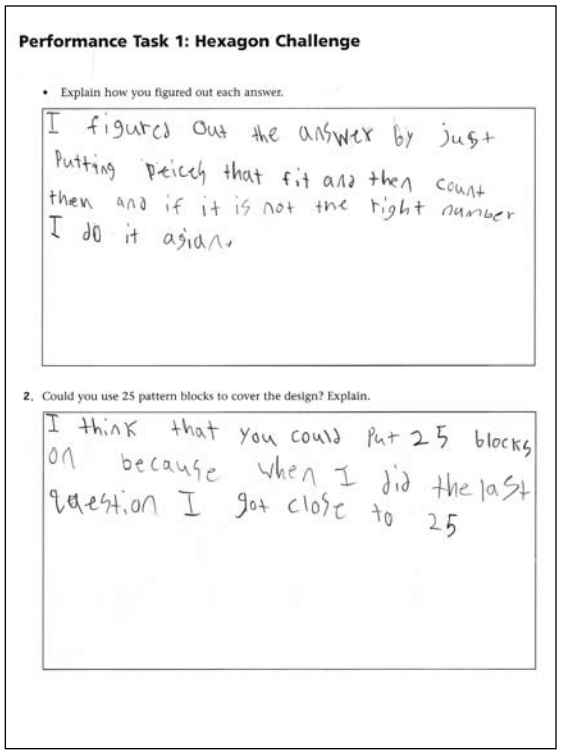
Communication
- provides a partial explanation of the sketches
- communicates in a limited manner using text only; does not use numbers or pattern block names to explain thinking

Thinking
- demonstrates some understanding of the outline problems by arriving at a correct solution
- shows a limited employment of strategies by using counting only; shows no evidence of fractional or multiplicative thinking

Application
- demonstrates some ability to apply knowledge of pattern block relationships to fill the outlines
- shows a limited ability to apply fractional or multiplicative thinking to answer the 25-block question







Performance Task 1: Hexagon Challenge LEVEL 2 (Anchor 2)

Knowledge and Understanding

- demonstrates some understanding of the relationships among pattern blocks units and how the blocks can fill the outlines, though with some errors in the sketches (e.g., the scale of triangles to other shapes is incorrect)
- shows considerable understanding of pattern block relationships and multiplication/skip counting to answer the 25-block question

Communication

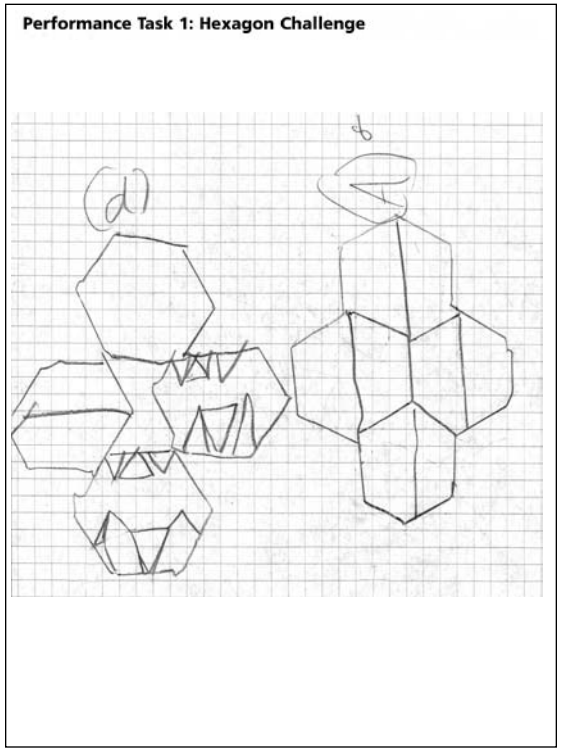
- provides a partial explanation using general terms (e.g., little, high)
- communicates a logical justification for the answer to the 25-block question, using multiplication/skip counting (6, 12, 18, 24) to exclude 25 as a solution

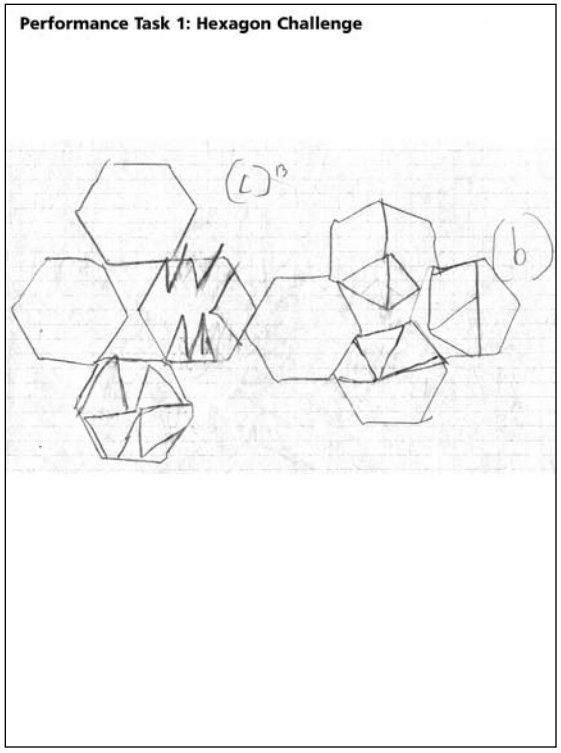
Thinking

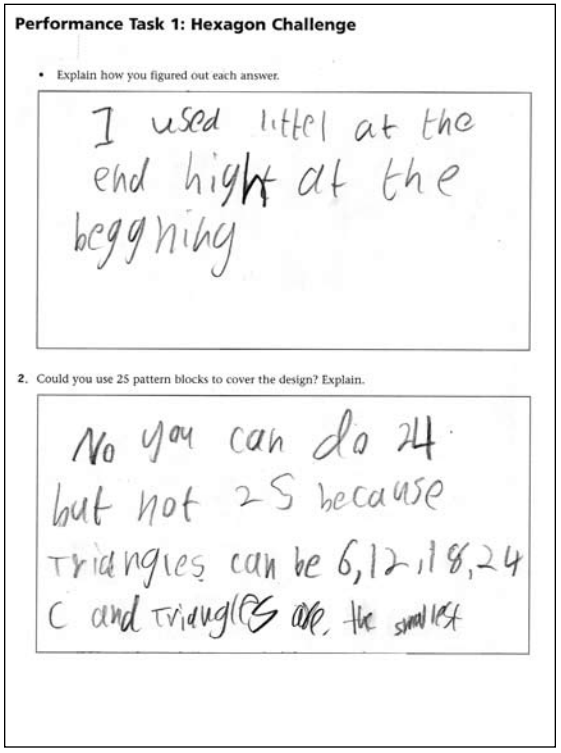
- demonstrates some understanding of the problem but limited ability to describe the process
- shows some evidence of a plan to solve the problem by using larger blocks when fewer blocks were asked for and smaller blocks when more blocks were asked for

Application

- demonstrates some ability to apply knowledge of pattern block relationships to fill the outlines
- shows considerable ability to apply multiplicative thinking to answer the 25-block question







Performance Task 1: Hexagon Challenge LEVEL 3 (Anchor 1)

Knowledge and Understanding

- demonstrates considerable understanding of the relationships among pattern block units and how the blocks can fill the outlines
- shows multiplicative understanding when answering the 25-block question

Communication

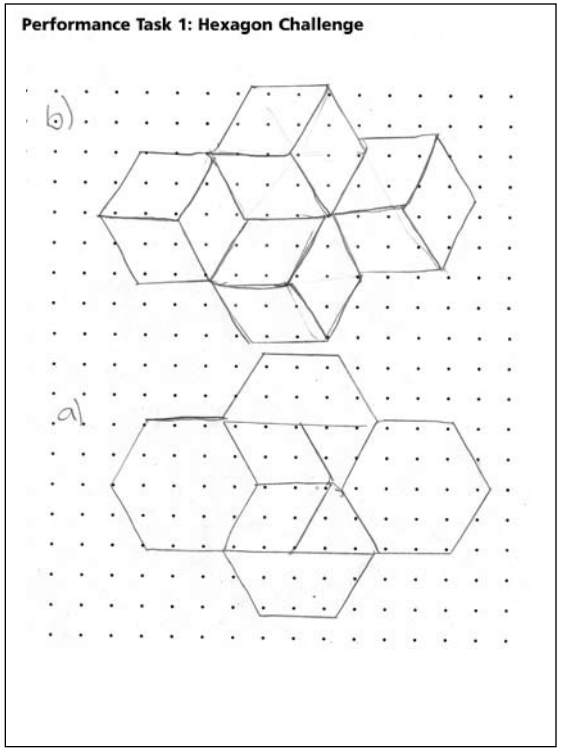
- provides effective explanations of the sketches and strategies used to fill the outlines
- communicates a clear and logical justification of the answer for the 25-block question using multiplication

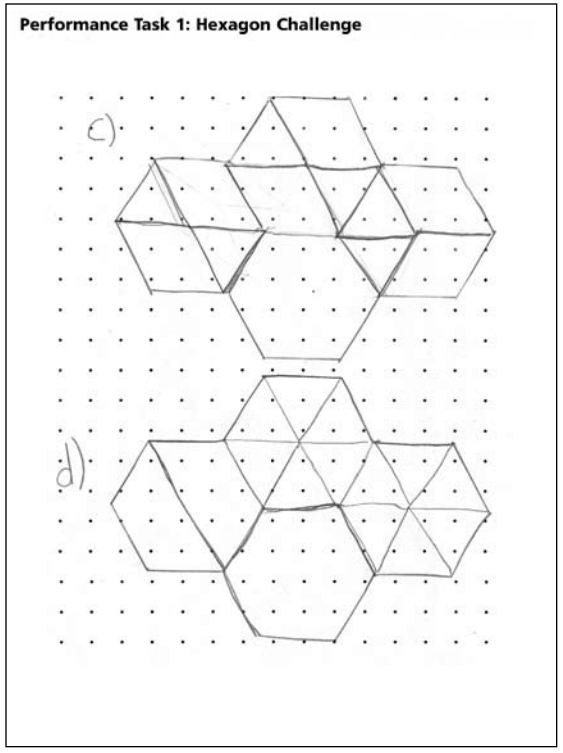
Thinking

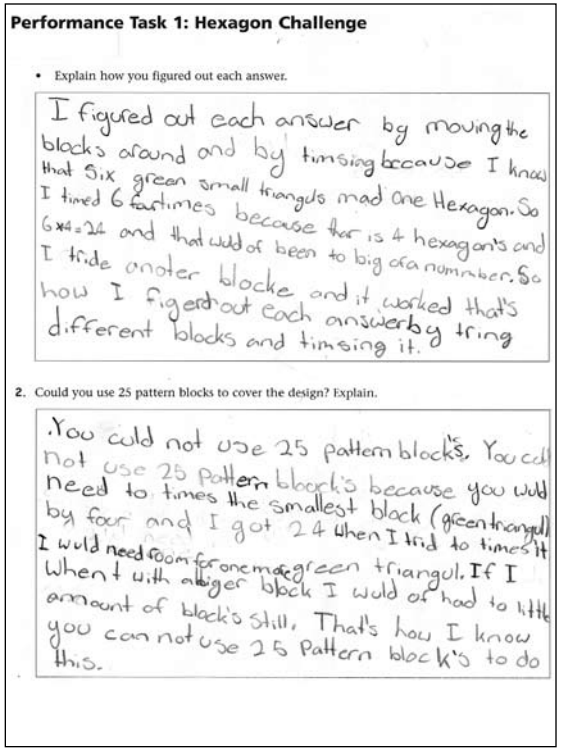
- demonstrates considerable understanding of the problem
- shows evidence of an appropriate plan by replacing (or moving) the blocks and using multiplication to solve the problem

Application

- demonstrates the ability to apply knowledge of the relationships among pattern blocks to solve a problem
- shows the ability to use multiplication to solve a geometric problem







Performance Task 1: Hexagon Challenge LEVEL 3 (Anchor 2)

Knowledge and Understanding

- demonstrates considerable understanding of the relationships among pattern block units and how the blocks can fill the outlines
- shows considerable understanding of pattern block relationships and multiplication to answer the 25-block question

Communication

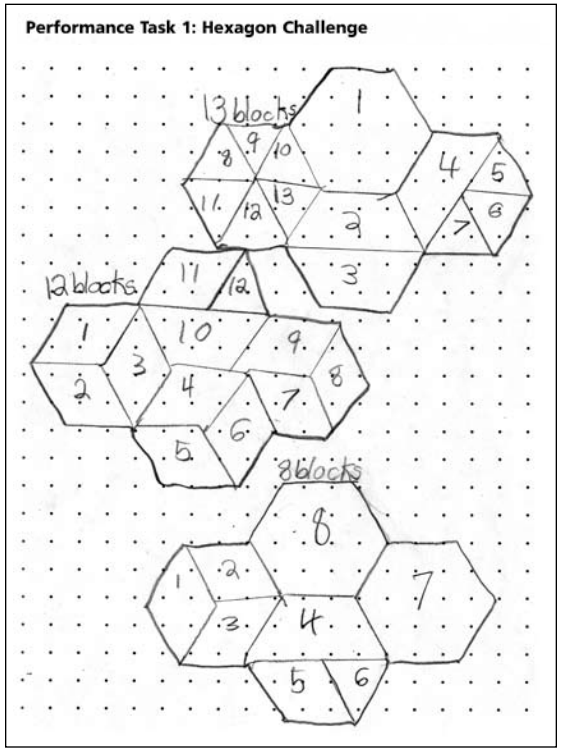
- communicates clearly with descriptions of the steps used to fill the outlines
- provides a complete explanation of why 25 pattern blocks would not fit in the shape

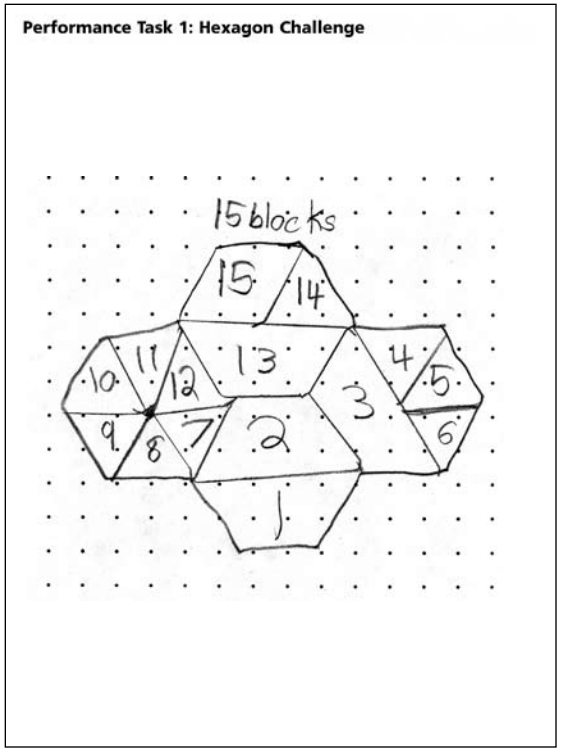
Thinking

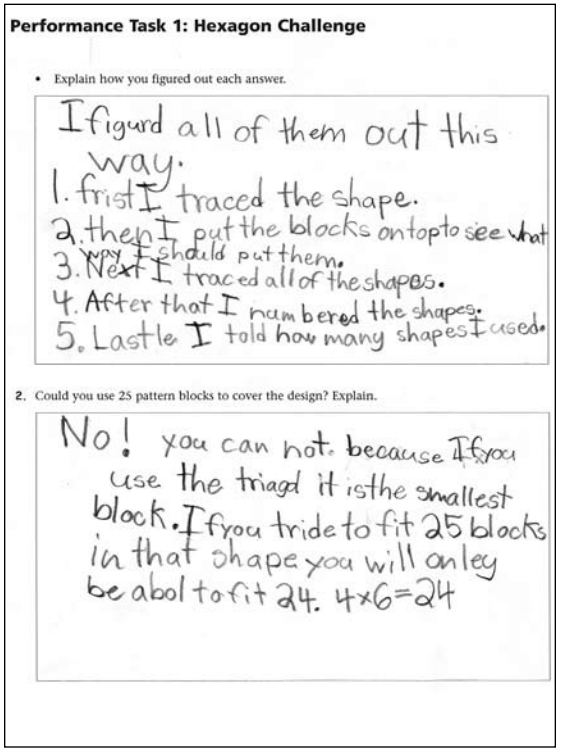
- shows evidence of a plan by providing the steps used to solve the problem
- demonstrates considerable understanding of the problem and how it relates to multiplicative thinking

Application

- demonstrates considerable ability to apply knowledge of the relationships among pattern blocks to solve the problem
- shows the ability to use multiplication to solve a geometric problem







Performance Task 1: Hexagon Challenge LEVEL 4 (Anchor 1)

Knowledge and Understanding

- demonstrates a thorough understanding of the relationships among pattern block units and how the blocks can fill the outlines
- presents a thorough knowledge of multiplicative thinking (with a minor operation error of using a division sign instead of a multiplication sign) when answering the 25-block question

Communication

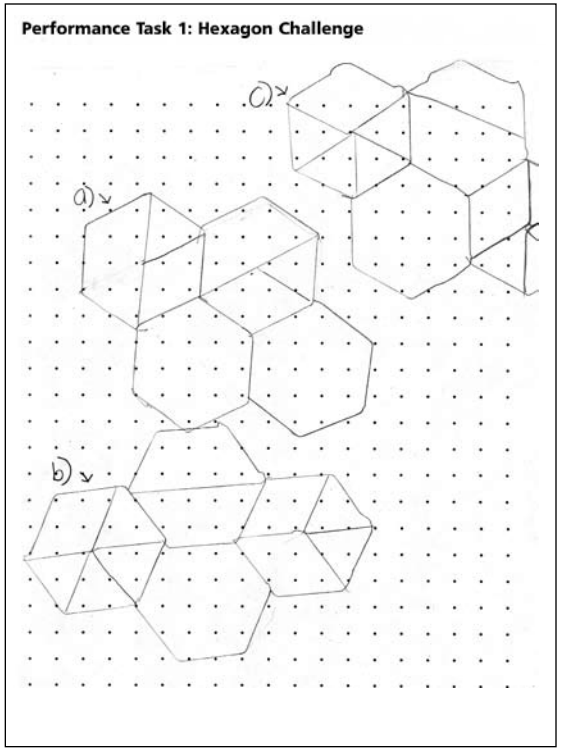
- provides a thorough explanation of the process and planning used to solve the problem
- communicates with a high degree of effectiveness how combinations of pattern blocks would exclude 25 as a solution to the last question (using addition and multiplication)

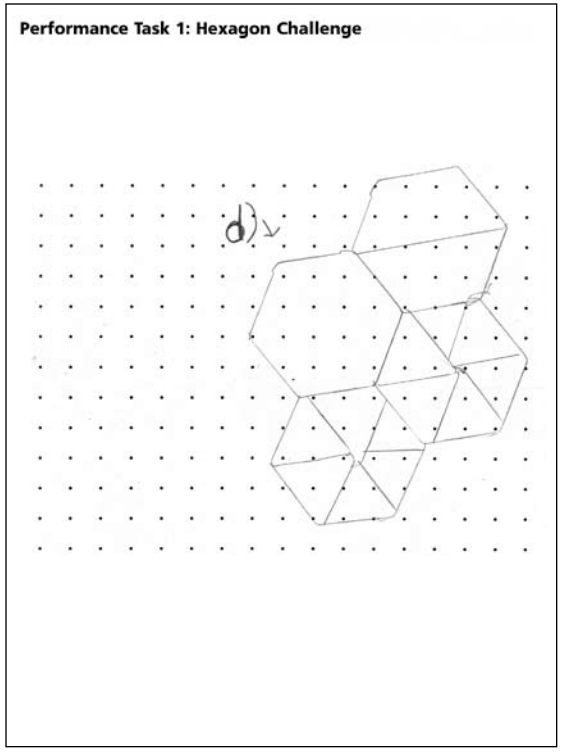
Thinking

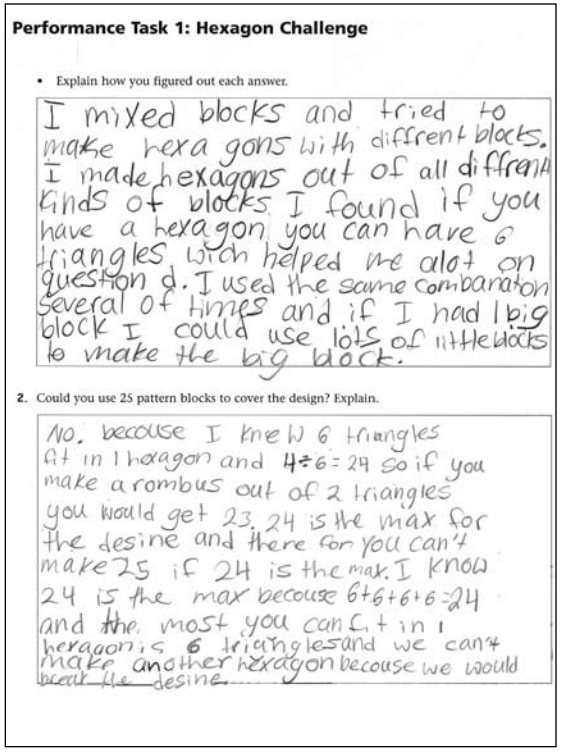
- demonstrates a thorough understanding of the problem
- shows evidence of a plan through explanations that include "I used the same combination several times" and "I could use lots of little blocks to make the big block"

Application

- demonstrates the ability to apply the concepts of multiplication and the numeric relationship between triangles and hexagons to solve the problem







Performance Task 1: Hexagon Challenge LEVEL 4 (Anchor 2)

Knowledge and Understanding

- demonstrates a thorough understanding of pattern block relationships in sketches and explanations
- shows an understanding of fraction/decimal equivalents as related to the relationships among the pattern blocks when answering the 25-block question

Communication

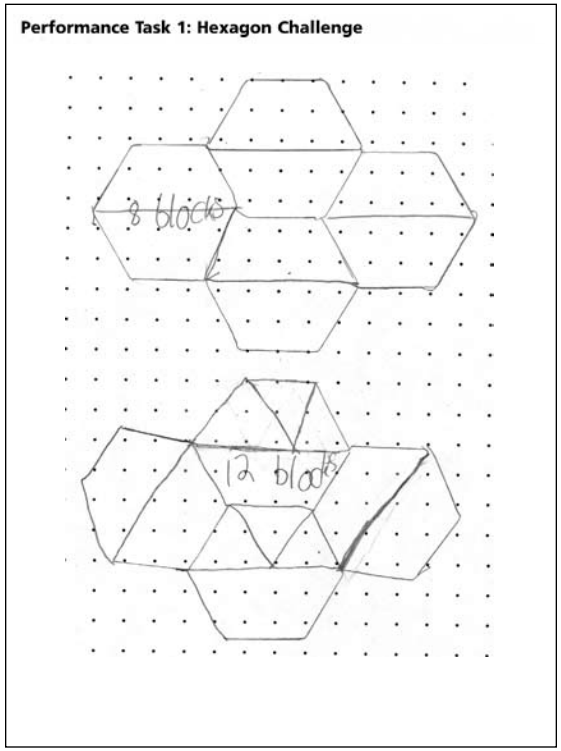
- provides a logical explanation of using a guess-and-test strategy to solve the first part of the problem and labels sketches
- communicates using text, a decimal value, and a drawing to justify the answer to the 25-block question

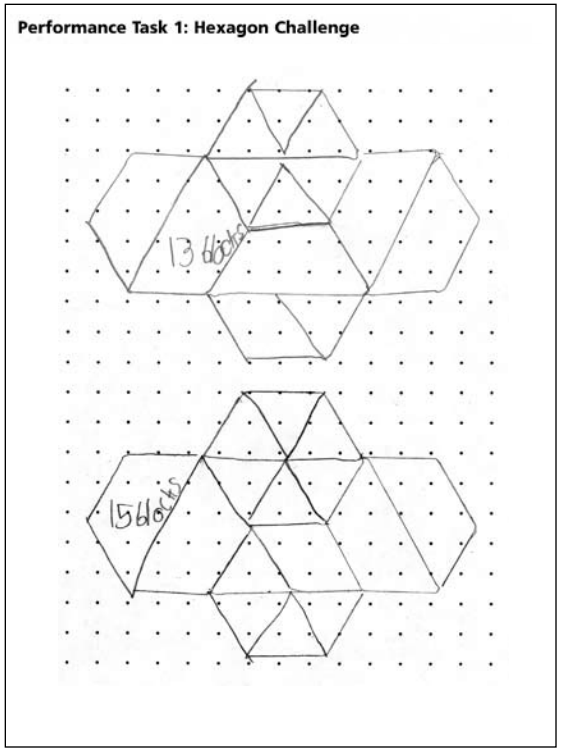
Thinking

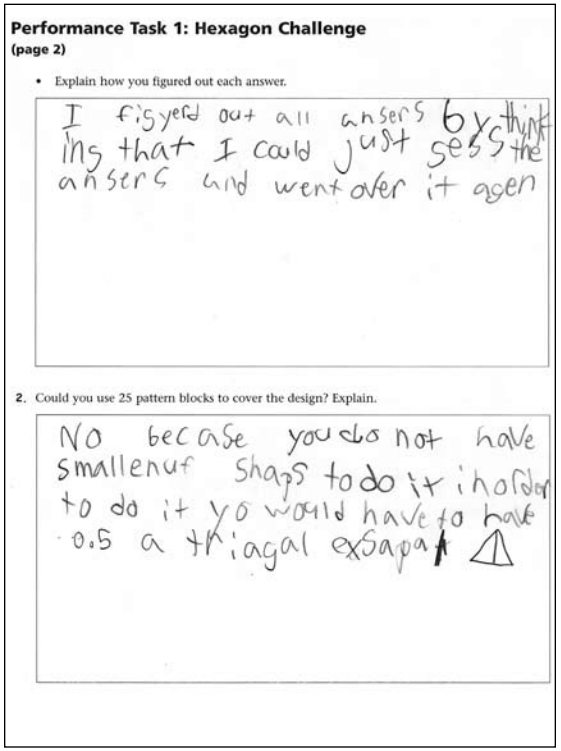
- the sketches show a thorough understanding of the problem of how to fill the outlines with each requested number of blocks
- demonstrates a thorough understanding of the 25-block question by showing that the use of half (0.5) of a triangle pattern block would be the only way to use 25 blocks

Application

- shows considerable ability to apply knowledge of pattern block relationships to fill in the outlines
- demonstrates a sophisticated ability to apply knowledge of fractions and decimals to explain the answer to the 25-block question







Performance Task 2: Building Up 3-D! LEVEL 1 (Anchor 1)

Knowledge and Understanding

- demonstrates a limited understanding of how to use math vocabulary to describe a 3-D figure
- shows a limited knowledge of what information and attributes would be necessary to replicate a 3-D figure

Communication

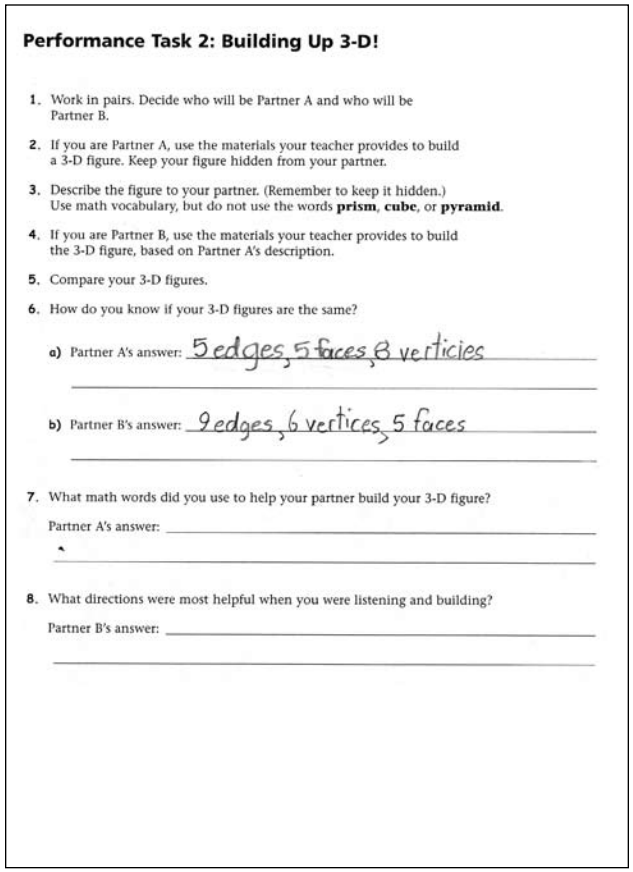
- provides limited explanations of the math vocabulary used to solve the problem
- communicates with little effectiveness about the figures created

Thinking

- demonstrates a limited understanding of the problem
- shows no evidence of a plan or strategy for how to replicate a 3-D figure

Application

- demonstrates a limited ability to apply math vocabulary and knowledge of 3-D figures to solve problems
- shows a limited ability to apply geometric vocabulary to describe a problem-solving process



Performance Task 2: Building Up 3-D!

1. Work in pairs. Decide who will be Partner A and who will be Partner B.
2. If you are Partner A, use the materials your teacher provides to build a 3-D figure. Keep your figure hidden from your partner.
3. Describe the figure to your partner. (Remember to keep it hidden.) Use math vocabulary, but do not use the words **prism**, **cube**, or **pyramid**.
4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

a) Partner A's answer: 5 edges, 5 faces, 8 vertices

b) Partner B's answer: 9 edges, 6 vertices, 5 faces

7. What math words did you use to help your partner build your 3-D figure?

Partner A's answer: _____

8. What directions were most helpful when you were listening and building?

Partner B's answer: _____

Performance Task 2: Building Up 3-D! LEVEL 1 (Anchor 2)

Knowledge and Understanding

- demonstrates a limited understanding of how to use math vocabulary to describe a 3-D figure
- shows a limited knowledge of what information and attributes would be necessary to replicate a 3-D figure

Communication

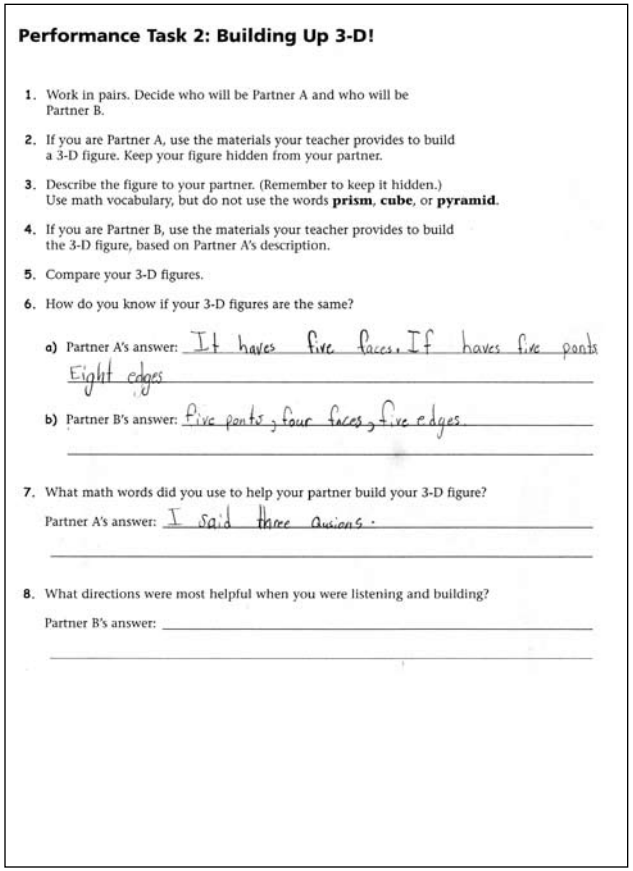
- provides limited explanations of the math vocabulary used to solve the problem
- communicates with little effectiveness about the figures created

Thinking

- demonstrates a limited understanding of the problem
- shows little evidence of a plan or strategy for how to replicate a 3-D figure

Application

- demonstrates a limited ability to apply math vocabulary to solve problems (e.g., I said three questions)
- shows a limited ability to apply geometric vocabulary to describe a problem-solving process



Performance Task 2: Building Up 3-D!

1. Work in pairs. Decide who will be Partner A and who will be Partner B.
2. If you are Partner A, use the materials your teacher provides to build a 3-D figure. Keep your figure hidden from your partner.
3. Describe the figure to your partner. (Remember to keep it hidden.) Use math vocabulary, but do not use the words **prism**, **cube**, or **pyramid**.
4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

a) Partner A's answer: It haves five faces. If haves five ponts Eight edges

b) Partner B's answer: Five ponts, four faces, five edges.

7. What math words did you use to help your partner build your 3-D figure?

Partner A's answer: I said three quions.

8. What directions were most helpful when you were listening and building?

Partner B's answer:

Performance Task 2: Building Up 3-D! LEVEL 2 (Anchor 1)

Knowledge and Understanding

- demonstrates some understanding of how to use math vocabulary to describe a 3-D figure (e.g., faces, edges, vertices, pyramid, cube)
- shows some knowledge of what information and attributes would be necessary to replicate a 3-D figure

Communication

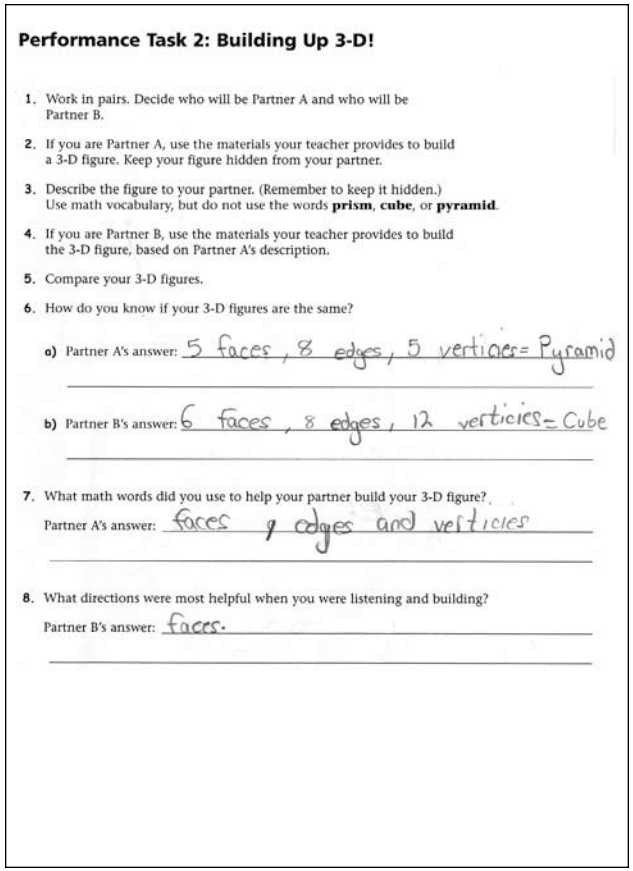
- provides some explanations of the math vocabulary used to solve the problem
- communicates with some effectiveness about the figures created (e.g., pyramid, cube)

Thinking

- demonstrates some understanding of the problem by identifying key geometry terms
- shows some evidence of a plan for how to replicate a 3-D figure by specifying information that would be helpful (e.g., faces, edges, and vertices)

Application

- demonstrates some ability to apply math vocabulary to solve problems
- shows some ability to apply geometric vocabulary (faces, edges, vertices) to describe a problem-solving process



Performance Task 2: Building Up 3-D!

1. Work in pairs. Decide who will be Partner A and who will be Partner B.
2. If you are Partner A, use the materials your teacher provides to build a 3-D figure. Keep your figure hidden from your partner.
3. Describe the figure to your partner. (Remember to keep it hidden.) Use math vocabulary, but do not use the words **prism**, **cube**, or **pyramid**.
4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

a) Partner A's answer: 5 faces, 8 edges, 5 vertices = Pyramid

b) Partner B's answer: 6 faces, 8 edges, 12 vertices = Cube

7. What math words did you use to help your partner build your 3-D figure?

Partner A's answer: faces, edges and vertices

8. What directions were most helpful when you were listening and building?

Partner B's answer: faces.

Performance Task 2: Building Up 3-D! LEVEL 2 (Anchor 2)

Knowledge & Understanding

- demonstrates some understanding of how to use math vocabulary to describe a 3-D figure (e.g., 12 edges, 6 faces, 8 vertices)
- shows some knowledge of what information and attributes would be necessary to replicate a 3-D figure

Communication

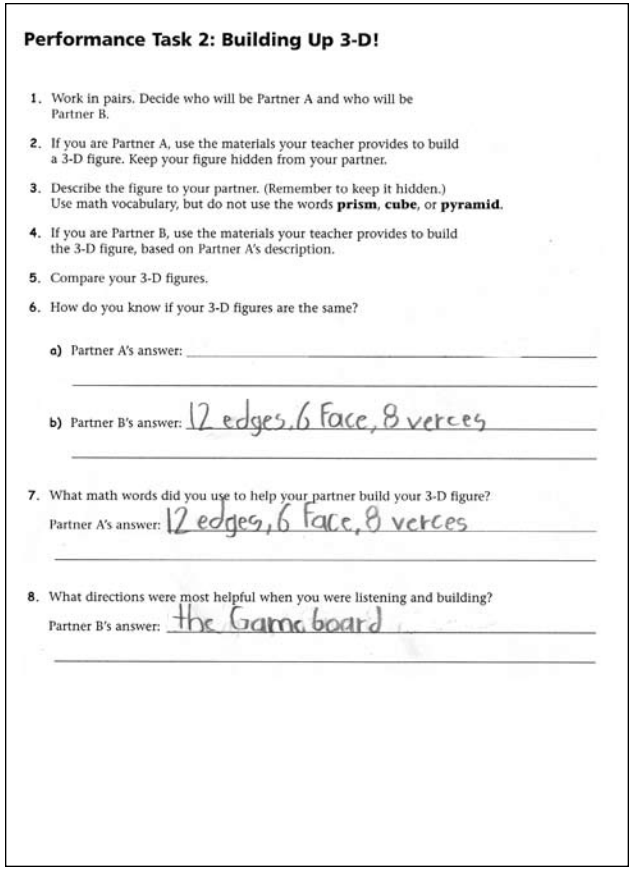
- provides some explanations of the math vocabulary used to solve the problem
- communicates with some effectiveness about the figures created by using math vocabulary

Thinking

- demonstrates some understanding of the problem by identifying key geometry terms
- shows some evidence of a plan for how to replicate a 3-D figure by specifying the information used

Application

- demonstrates some ability to apply math vocabulary to solve problems
- shows some ability to apply geometric vocabulary to describe a problem-solving process



Performance Task 2: Building Up 3-D!

1. Work in pairs. Decide who will be Partner A and who will be Partner B.
2. If you are Partner A, use the materials your teacher provides to build a 3-D figure. Keep your figure hidden from your partner.
3. Describe the figure to your partner. (Remember to keep it hidden.) Use math vocabulary, but do not use the words **prism**, **cube**, or **pyramid**.
4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

a) Partner A's answer: _____

b) Partner B's answer: 12 edges, 6 Face, 8 verces

7. What math words did you use to help your partner build your 3-D figure?
Partner A's answer: 12 edges, 6 Face, 8 verces

8. What directions were most helpful when you were listening and building?
Partner B's answer: the Game board

Performance Task 2: Building Up 3-D! LEVEL 3 (Anchor 1)

Knowledge and Understanding

- demonstrates a considerable understanding of how to use math vocabulary to describe a 3-D figure (e.g., 5 vertices, 1 vertex on the top, a square in it)
- shows considerable knowledge of what information and attributes would be necessary to replicate a 3-D figure

Communication

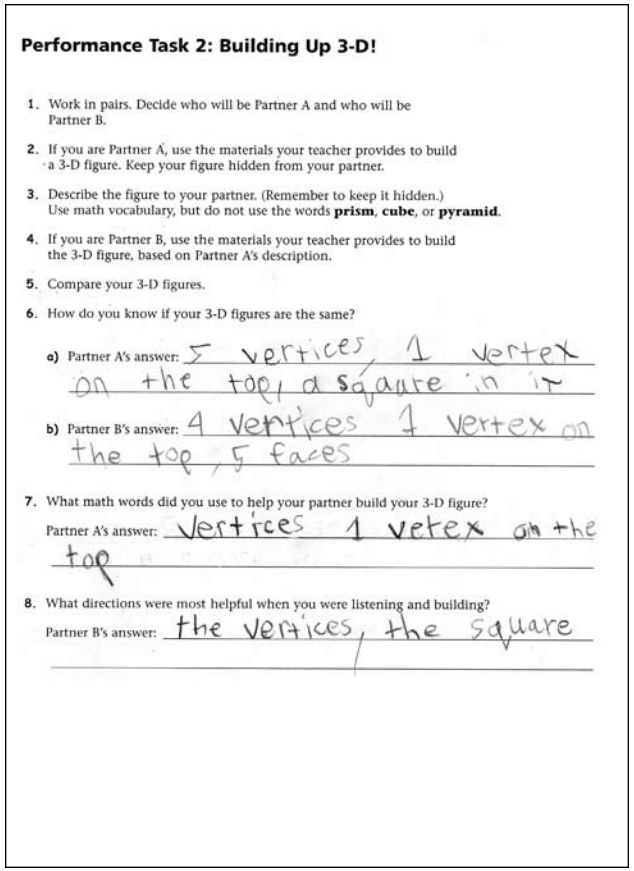
- provides clear explanations of the math vocabulary used to solve the problem
- communicates with considerable effectiveness about the figures created by using relevant math vocabulary

Thinking

- demonstrates considerable understanding of the problem
- shows evidence of a plan for how to replicate a 3-D figure by specifying the information used

Application

- demonstrates considerable ability to apply math vocabulary to solve problems
- shows some ability to apply geometric vocabulary (faces, edges, vertices, on the top) to describe a problem-solving process



Performance Task 2: Building Up 3-D!

1. Work in pairs. Decide who will be Partner A and who will be Partner B.
2. If you are Partner A, use the materials your teacher provides to build a 3-D figure. Keep your figure hidden from your partner.
3. Describe the figure to your partner. (Remember to keep it hidden.) Use math vocabulary, but do not use the words **prism**, **cube**, or **pyramid**.
4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

a) Partner A's answer: 5 vertices, 1 vertex on the top, a square in it

b) Partner B's answer: 4 vertices 1 vertex on the top, 5 faces

7. What math words did you use to help your partner build your 3-D figure?

Partner A's answer: vertices 1 vertex on the top

8. What directions were most helpful when you were listening and building?

Partner B's answer: the vertices, the square

Performance Task 2: Building Up 3-D! LEVEL 3 (Anchor 2)

Knowledge and Understanding

- demonstrates considerable understanding of how to use math vocabulary to describe a 3-D figure by stating the number of faces, edges, and vertices
- shows considerable knowledge of what information and attributes would be necessary to replicate a 3-D figure

Communication

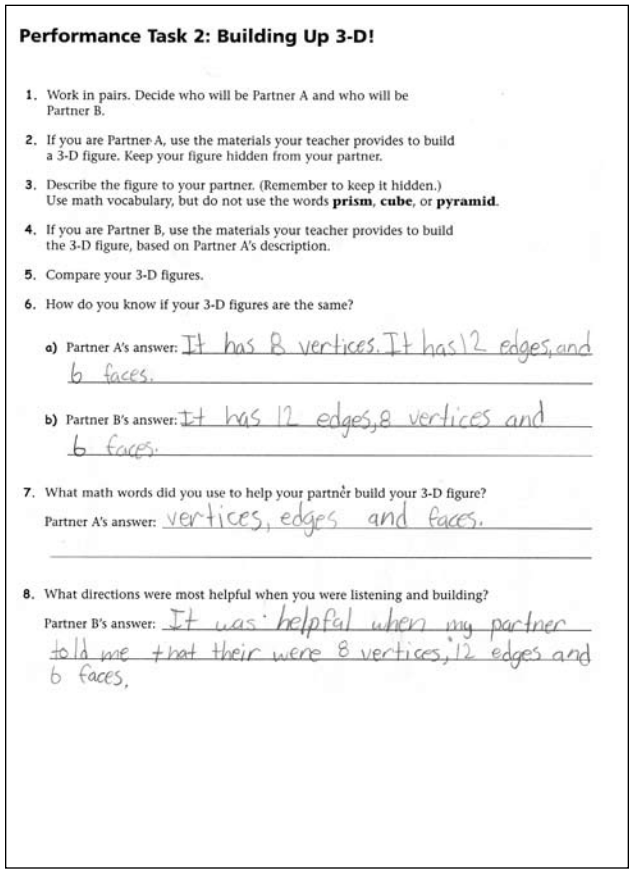
- provides clear and complete explanations of the math vocabulary used to solve the problem
- communicates with considerable effectiveness about the figures created by using relevant math vocabulary

Thinking

- demonstrates considerable understanding of the problem
- shows evidence of a plan for how to replicate a 3-D figure by specifying the information used

Application

- demonstrates considerable ability to apply math vocabulary to solve problems
- shows some ability to apply geometric vocabulary to describe a problem-solving process



Performance Task 2: Building Up 3-D!

1. Work in pairs. Decide who will be Partner A and who will be Partner B.
2. If you are Partner A, use the materials your teacher provides to build a 3-D figure. Keep your figure hidden from your partner.
3. Describe the figure to your partner. (Remember to keep it hidden.) Use math vocabulary, but do not use the words **prism**, **cube**, or **pyramid**.
4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

   a) Partner A's answer: It has 8 vertices. It has 12 edges, and 6 faces.

   b) Partner B's answer: It has 12 edges, 8 vertices and 6 faces.

7. What math words did you use to help your partner build your 3-D figure?

   Partner A's answer: vertices, edges and faces.

8. What directions were most helpful when you were listening and building?

   Partner B's answer: It was helpful when my partner told me that their were 8 vertices, 12 edges and 6 faces.

Performance Task 2: Building Up 3-D! LEVEL 4 (Anchor 1)

Knowledge and Understanding

- demonstrates a thorough knowledge of how to use math vocabulary to describe a 3-D figure
- shows a sophisticated understanding of what information and attributes are necessary to replicate a 3-D figure

Communication

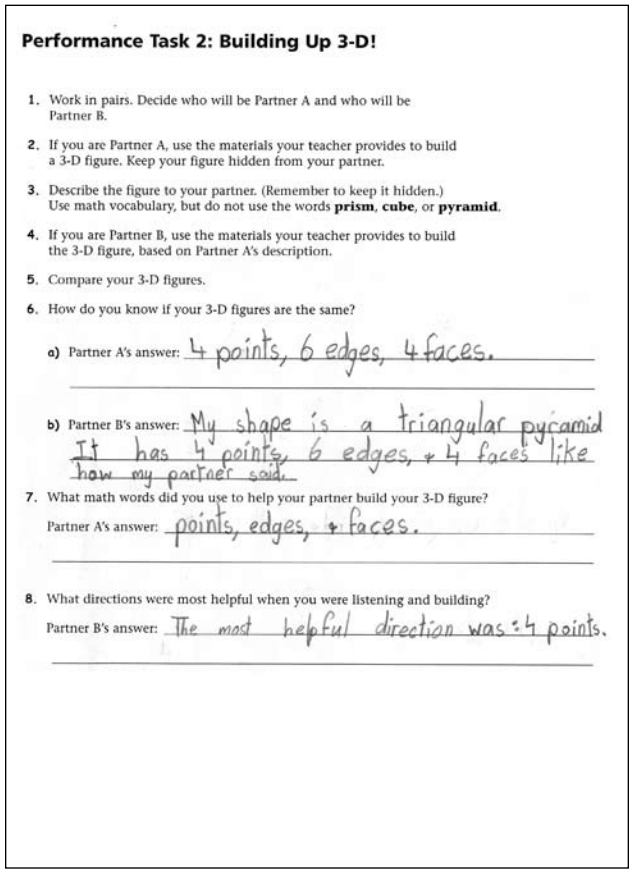
- provides a thorough description of the key terms used to solve the problem
- communicates with a high degree of effectiveness by using specific math vocabulary (e.g., triangular pyramid)

Thinking

- demonstrates a sophisticated understanding of the problem by stating the specific, numbered geometric terms used to replicate the 3-D figure

Application

- demonstrates a thorough understanding of how specific math vocabulary terms (e.g., 4 points) can lead to a solution
- demonstrates the ability to apply geometric vocabulary to describe a problem-solving process



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4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

a) Partner A's answer: 4 points, 6 edges, 4 faces.

b) Partner B's answer: My shape is a triangular pyramid It has 4 points, 6 edges, + 4 faces like how my partner said.

7. What math words did you use to help your partner build your 3-D figure?

Partner A's answer: points, edges, + faces.

8. What directions were most helpful when you were listening and building?

Partner B's answer: The most helpful direction was: 4 points.

Performance Task 2: Building Up 3-D! LEVEL 4 (Anchor 2)

Knowledge and Understanding

- demonstrates a thorough knowledge of how to use math vocabulary to describe a 3-D figure
- shows a sophisticated understanding of what information and attributes are necessary to replicate a 3-D figure

Communication

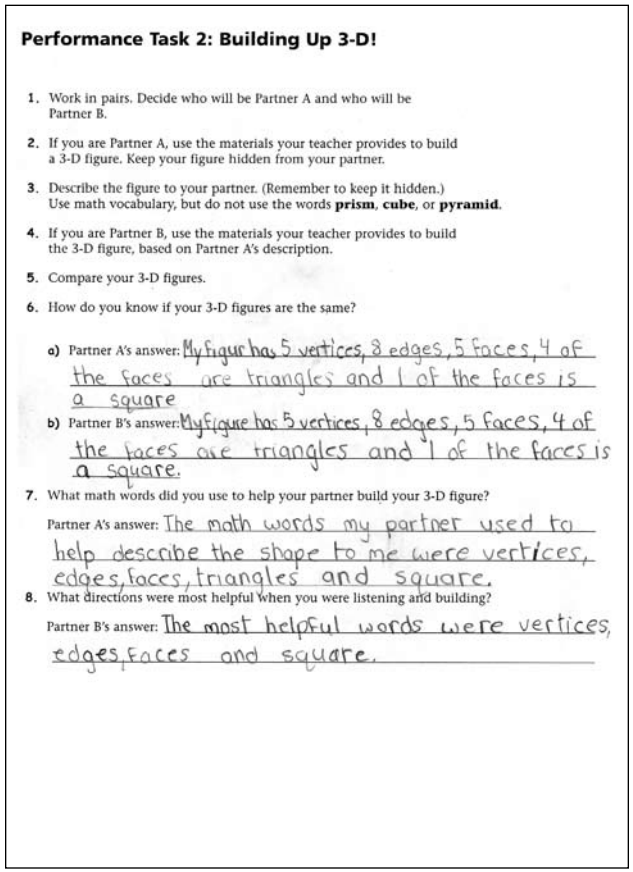
- provides a thorough description of the key terms used to solve the problem
- communicates with a high degree of effectiveness by using math vocabulary (e.g., triangle, square, vertices, edges, faces)

Thinking

- demonstrates a sophisticated understanding of the problem by stating the specific, numbered geometric terms used to replicate the 3-D figure

Application

- demonstrates a thorough understanding of how specific math vocabulary terms can lead to a solution (e.g., the word *square* is helpful because it indicates the shape of the base)
- shows the ability to apply geometric vocabulary to describe a problem-solving process



Performance Task 2: Building Up 3-D!

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4. If you are Partner B, use the materials your teacher provides to build the 3-D figure, based on Partner A's description.
5. Compare your 3-D figures.
6. How do you know if your 3-D figures are the same?

a) Partner A's answer: My figur has 5 vertices, 8 edges, 5 faces, 4 of the faces are triangles and 1 of the faces is a square

b) Partner B's answer: My figure has 5 vertices, 8 edges, 5 faces, 4 of the faces are triangles and 1 of the faces is a square.

7. What math words did you use to help your partner build your 3-D figure?

Partner A's answer: The math words my partner used to help describe the shape to me were vertices, edges, faces, triangles and square.

8. What directions were most helpful when you were listening and building?

Partner B's answer: The most helpful words were vertices, edges, faces and square.

Next Steps for Geometry and Spatial Sense

Instructional Next Steps for Overall Expectations

After summarizing individual and class performance on each overall expectation, you may find that there are areas that could be retaught to some students. The following suggestions have been provided to assist you in preparing tasks for individuals or small groups of students.

Overall Expectation 3m47 (Geometric Properties)

Compare two-dimensional shapes and three-dimensional figures and sort them by their geometric properties.

Background

This overall expectation is about geometric properties, or attributes. Understanding geometric properties provides the foundation for making comparisons and noting relationships between and among different shapes, designs, and structures. Students need to be able to visualize shapes and figures and identify their properties. For two-dimensional shapes, some properties are number of sides, side lengths, number of interior angles, and number of right angles. For three-dimensional figures, some properties are number and shapes of faces, number of edges, and number of vertices. Students will also benefit from many opportunities to compare two-dimensional shapes and three-dimensional figures.

Strategies

One of These Things Is Not Like the Other

Using an overhead projector or interactive whiteboard, show three shapes or figures that are similar in some way and one that is different; for example, three different triangles and a trapezoid. Ask students to identify which shape or figure does not belong and explain why. As students become more proficient, move on to more difficult comparisons. For example, show four triangles, three that are right and one that is equilateral.

Sorting Figures

Provide students with sorted sets of thee-dimensional figures. Ask students to identify the sorting rule (e.g., number of faces, number of vertices, etc.). Once students can sort based on one property, begin sorting thee-dimensional figures by more than one property using Venn diagrams.

Shape Patterns

Have students use pattern blocks or two-dimensional shape cut outs to create patterns that vary by geometric properties; for example, a pattern that changes by number of sides (triangle, square, square, triangle) or by number of right angles (square, right triangle, rectangle, right triangle). Have students write their pattern rules in terms of how a geometric property is changing.

Overall Expectation 3m48 (Geometric Relationships)

Describe relationships between two-dimensional shapes, and between two-dimensional shapes and three-dimensional figures.

Background

Students benefit from experience with a wide range of concrete materials to understand and describe various geometric relationships. Students should have many opportunities to practise composing shapes from smaller shapes, identifying congruency, and making connections among shapes, their names, and their properties (e.g., what makes a parallelogram a parallelogram). It is also important for students to make connections between two-dimensional shapes and properties of three-dimensional figures (e.g., three faces of this prism are rectangles).

Strategies

Face Off Boxes

Ask each student to bring two different containers or boxes from home. Group students so that each group has approximately eight boxes. Assign all face shapes a numeric value (e.g., square = 2, triangle = 3, rectangle = 4, octagon = 5) and ask students to add the face shape numbers to identify which box has the greatest sum. Ensure that students use the proper figure names when recording their results. Then have students walk around the classroom and identify which group they think would have the greatest sum if all their boxes' values were added together. Challenge students to find the box or container that has the greatest sum.

Foggy Figures

Name a three-dimensional figure for the students to construct using toothpicks and modelling clay. Prompt students to name all of the faces (i.e., two-dimensional shapes) and count the number of vertices and right angles in their figures. Students can complete a chart such as the one below to describe their figures.

Shape	Number of faces	Names of faces	Number of vertices	Number of right angles

Overall Expectation 3m49 (Location and Movement)

Identify and describe the locations and movements of shapes and objects.

Background

Students benefit from opportunities to move concrete materials on grids to practise describing movement, transformations, and symmetry.

Strategies

Missing Matter

Select shapes from a catalogue or newspaper and ask students to fold them in half on the line of symmetry. Then cut the shapes in half and glue the half image on blank paper. Ask students to draw the missing side of the picture and to describe how they drew the missing half.

Dazzling Designs

Provide picture books that have rich geometric designs. Have students select one page and then identify all the congruent shapes in the design. Ask students to describe to a partner how they would move one shape to a congruent shape at another location on the design using reflections (flips), translations (slides), and/or rotations (turns).

Checkerboard Trails

Place a barrier between the two halves of a checkerboard. Have two students sit on opposite sides of the checkerboard, each with one checker on the bottom right square of the board. One student rolls a die and moves their checker that number of places anywhere on the board. Then the student describes to the other student how to move their checker to the same spot on their side of the board, using the terms *up*, *down*, *left*, and *right*. After each turn, the barrier is removed to confirm the position of the checkers to see whether they are in the same place on both sides of the board in relation to the bottom right corner.