Mathematics

Planning Guide

Grade 2 *2-D Shapes*

Shape and Space
(3-D Objects and 2-D Shapes)
Specific Outcomes 6, 8

This Planning Guide can be accessed online at:
http://www.learnalberta.ca/content/mepg2/html/pg2_2dshapes/index.html

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Strand: Shape and Space (3-D Objects and 2-D Shapes)
Specific Outcomes: 6, 8

This *Planning Guide* addresses the following outcomes from the Program of Studies:

Strand: Shape and Space (3-D Objects and 2-D Shapes)	
Specific Outcomes:	6. Sort 2-D and 3-D objects, using two attributes, and explain the sorting rule. 8. Describe, compare and construct 2-D shapes, including: • triangles • squares • rectangles • circles.

Curriculum Focus

This sample targets the following changes to the curriculum:

- For Grade 2 the former general outcome stated: "Name, describe and construct a variety of 3-D objects and 2-D shapes" (Alberta Learning 1997, p. 35). The shift in focus is apparent from the absence of "naming" and the addition of "analyze the relationships" and "characteristics." This change is to ensure that students are not just rote learning to name and describe 2-D shapes and 3-D objects. Now the focus is on a study of the attributes that students can use to compare the various shapes and objects.
- The specific outcomes have changed significantly. In the previous curriculum, Grade 2 specific outcomes focused on 3-D objects. The current curriculum has maintained the study of those objects, but with the shift to comparing and constructing from naming and identifying; however, it also includes the 2-D shapes that were previously a Grade 1 outcome. Again the change is in what should be learned about these shapes. No longer is the outcome to "identify, name and describe." Now the outcome is to describe, compare and construct these basic 2-D shapes.

What Is a Planning Guide?

Planning Guides are a tool for teachers to use in designing instruction and assessment that focuses on developing and deepening students' understanding of mathematical concepts. This tool is based on the process outlined in *Understanding by Design* by Grant Wiggins and Jay McTighe.

Planning Steps

The following steps will help you through the Planning Guide:

Step 1: Identify Outcomes to Address

Guiding Questions

- What do I want my students to learn?
- What can my students currently understand and do?
- What do I want my students to understand and be able to do based on the Big Ideas and specific outcomes in the program of studies?

Big Ideas

- Shapes can be distinguished based on geometric properties such as whether the figure is open or closed, the number of sides, the type of lines used (straight or curved, perpendicular or parallel), size or number of angles, symmetry, congruency and size.
- Shapes can be seen from various perspectives. The shape does not change when the orientation does.
- Shapes are named based upon various attributes or characteristics. These characteristics belong to all shapes with that name.
- Some shapes can belong to more than one category of shapes.

Sequence of Outcomes from the Program of Studies

See http://education.alberta.ca/teachers/core/math/programs.aspx for the complete program of studies.

Grade 1

Specific Outcomes

2. Sort 3-D objects and 2-D shapes, using one attribute, and explain the sorting rule.

3. Replicate composite 2-D shapes and 3-D objects.

Grade 2

Specific Outcomes

6. Sort 2-D shapes and 3-D objects, using two attributes, and explain the sorting rule.

8. Describe, compare and construct 2-D shapes, including:
   - triangles
   - squares
   - rectangles
   - circles.

Grade 3

Specific Outcomes

7. Sort regular and irregular polygons, including:
   - triangles
   - quadrilaterals
   - pentagons
   - hexagons
   - octagons

   according to the number of sides.

Step 2: Determine Evidence of Student Learning

Guiding Questions

- What evidence will I look for to know that learning has occurred?
- What should students demonstrate to show their understanding of the mathematical concepts, skills and Big Ideas?

Using Achievement Indicators

As you begin planning lessons and learning activities, keep in mind ongoing ways to monitor and assess student learning. One starting point for this planning is to consider the achievement indicators listed in the *Mathematics Kindergarten to Grade 9 Program of Studies with Achievement Indicators*. You may also generate your own indicators, and use them to guide your observation of students.

The following indicators may be used to determine whether or not students have met this specific outcome. Can students:

- determine the differences between two given pre-sorted sets, and explain the sorting rule?
- identify and name two common attributes of items within a given sorted group?
- sort a given set of 2-D shapes (regular and irregular), according to two attributes, and explain the sorting rule?
- identify common attributes of triangles, squares, rectangles and circles from given sets of the same 2-D shapes?
- identify given 2-D shapes with different dimensions?
- identify given 2-D shapes with different orientations?
- create a model to represent a given 2-D shape?
- create a pictorial representation of a given 2-D shape?

Sample behaviours to look for related to these indicators are suggested for some of the activities listed in **Step 3, Section C: Choosing Learning Activities** (p. 10).

Step 3: Plan for Instruction

Guiding Questions

- What learning opportunities and experiences should I provide to promote the learning of the outcomes and permit students to demonstrate their learning?
- What teaching strategies and resources should I use?
- How will I meet the diverse learning needs of my students?

A. Assessing Prior Knowledge and Skills

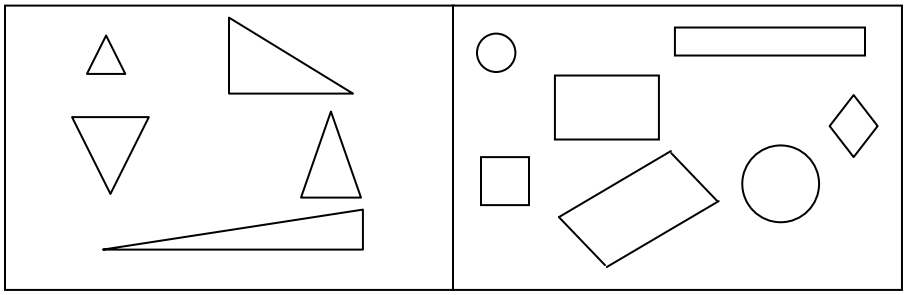
Before introducing new material, consider ways to assess and build on students' knowledge and skills related to 2-D shapes. Examples of assessments include the following:

- Can the students sort 2-D shapes given a sorting rule based upon one attribute? Given a set of attribute blocks, can students sort the shapes into those:
  - with straight sides and those without straight sides?
  - thin/thick shapes?
  - a specified colour or not the colour?
  - big/little shapes?
  - shapes with points?
  - triangles or not triangles?
  - squares or not squares?
  - circles or not circles?
- Given a set of 2-D shapes, can the students sort the set using one attribute and explain the sorting rule they used? This activity may best be applied as a small group activity after its introduction. Observations made while student groups are working will help you decide if you would want to conduct a structured interview with a specific student. Ask the students, in groups of three or four, to choose a single attribute to sort their shapes, sort them and then explain their sorting rule. When they have done so, they can be asked to re-sort them according to a different attribute and rule.

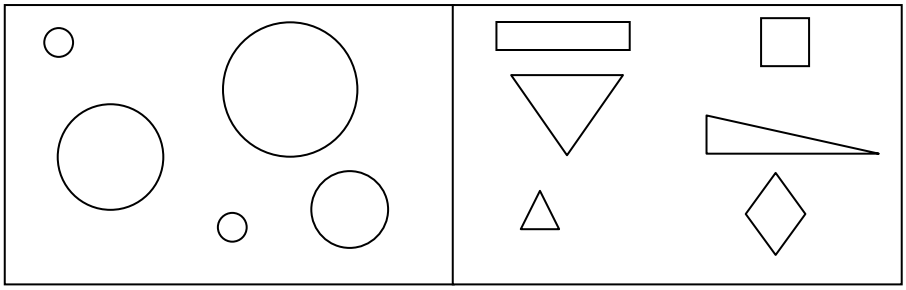
- When shown pre-sorted sets of 2-D shapes, can students explain the sorting rule? This may be done with the whole class first on paper and then with those who are unsuccessful in a structured interview with manipulatives. It may be that a lack of success is based upon written language problems, rather than discrimination and categorization issues. The following is a sample of the type of problem given:

  Look at the two sets of 2-D shapes below and print the rule they were sorted by under each:

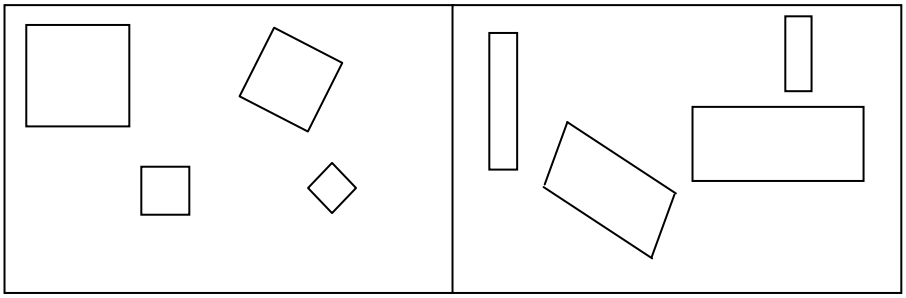
  a.



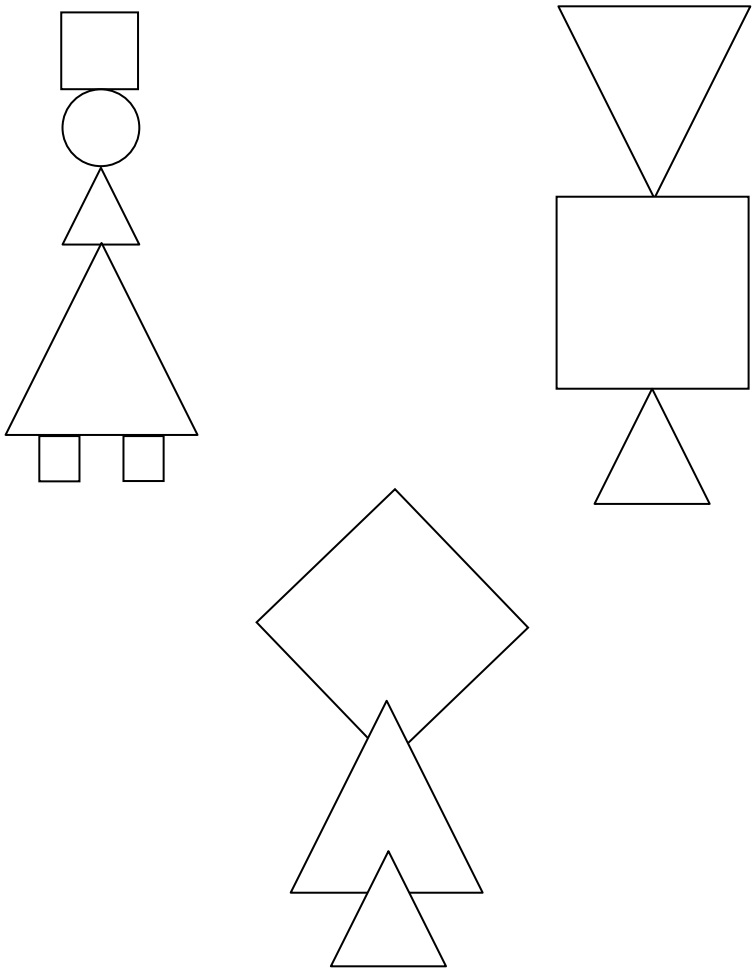
  b.



  c.



- Can a student reproduce a given composite 2-D shape with attribute blocks such as follows?



If a student appears to have difficulty with these tasks, consider further individual assessment, such as a structured interview, to determine the student's level of skill and understanding. See **Sample Structured Interview: Assessing Prior Knowledge and Skills** (p. 9).

Sample Structured Interview: Assessing Prior Knowledge and Skills

Directions	Date:	
	Not Quite There	**Ready to Apply**
Give the student a set of familiar 2-D shapes such as a heart, star, crescent moon, circle, square, triangle and rectangle. Say, **"Please make up your own rule for sorting these shapes and then sort them. When you are done, please share your sorting rule with me."**	• Student separates the shapes into two groups, but does not use a mathematical property for the sorting (for example, the student may state that the one group is the shapes they like) or the sort is random. • The student may have sorted correctly by a property such as "made up of straight sides" or "has a curve," but the student is unable to verbalize the rule used.	• The student sorts appropriately and states the rule used clearly.

B. Choosing Instructional Strategies

Consider the following general strategies:

- Structure learning situations in which students use the language they have to describe and compare 2-D shapes. The mathematical terminology can then be given, but the emphasis is on students constructing their analysis, not on how well they can use terminology that they may not completely understand. For example, the students may speak of shapes that are "dented in" or "stick out" and only then should the terms "concave" or "convex" be introduced. Similarly, the terms "vertex" or "vertices" may follow the students' description of "points" or "corners."
- Through exploration, provide opportunities for the students to generalize the Big Idea that change in orientation does not change the shape.
- Have the students share their ideas about sorting various sets of 2-D shapes and provide follow-up activities to address any misconceptions that may arise.
- Have the students explain their sorting rules.
- Encourage flexible thinking by having the students sort sets in more than one way.
- Vary the students' medium by using manipulatives, drawings and computer programs to study 2-D shapes.
- Vary manipulatives from pattern blocks, attribute blocks, paper shapes and discovery blocks to include geoboards.
- Give the students lots of opportunities to manipulate 2-D shapes by providing activities with tangrams or other such manipulatives that require changing the orientation of the pieces and using varying pieces to complete a composite shape. Encourage the students to develop their visualization skills in shape and space, as these skills are not innate.
- Be sure that the triangles students see are not all equilateral or isosceles and that the students see them on paper in a variety of orientations so that the base is not always parallel to the bottom of the page. Likewise, squares need to be seen in a variety of orientations.
- Students need to have a wider scope of 2-D shapes than just the regular shapes listed in the specific outcome. They need some closed and open figures. They need ones with curves, which are unfortunately limited to circles in most manipulatives sets. They need to see regular and irregular polygons. Even though they do not need to be able to name parallelograms, they should be included in the shapes they see and handle.

C. Choosing Learning Activities

The following learning activities are examples that could be used to develop student understanding of the concepts identified in Step 1.

Sample Activities:

1. **What's My Rule?** (p. 11)
2. **Sorting 2-D Shapes** (p. 12)
3. **Recognizing Similar Shapes and Identifying Attributes** (p. 13)
4. **Creating Models of 2-D Shapes** (p. 14)
5. **Creating Pictorial Representations of 2-D Shapes** (p. 15)

Sample Activity 1: What's My Rule?

Use a varied set of 2-D shapes, including those that have curved edges and concave shapes, as well as parallelograms, rectangles, triangles and squares. This will mean that you will have to create your own set of shapes. A good resource is the blackline masters 20 through 26 in Van de Walle and Lovin's *Teaching Student-Centered Mathematics: Grades K–3* (2006).

Look For …

Do students:

- ☐ describe shapes as seeming alike or by their properties?
- ☐ recognize the properties of the shapes and those for which they have the standard terminology?
- ☐ consider two attributes at once?

Show the students a set of 2-D shapes. Decide upon a rule that includes two common attributes, such as has a curved side and a straight side. Pick shapes and indicate whether or not they follow your rule and are in the set. As more shapes are sorted into those that follow your rule and those that don't, allow the students to guess your rule. You may want to limit the number of guesses before placing another shape in one of the sets. The objective is to have students focus on the features of the shapes so they begin to recognize properties of 2-D shapes. Van de Walle and Lovin (2006) believe that "in any sorting activity the students should decide how to sort, not the teacher" (p. 194). To facilitate student focus on features of the shapes, Van de Walle and Lovin have students begin by selecting shapes and describing two interesting things about their shapes. Then the students progress to selecting two shapes and identifying a way they are alike and a way they are different. From there the students, in small groups, begin to sort their shapes based on which belong with the target shape and which do not. Finally, the teacher or student can do a "secret sort" as done in "What's My Rule?" with some pieces belonging in the group left in the pile of yet unsorted pieces for the students to find and add to the sorted group.

Sample Activity 2: Sorting 2-D Shapes

Provide small groups of students with cutouts of 2-D shapes such as those used in "What's My Rule?" and ask the students to sort them according to a rule and then explain their rule. When they are done, ask them to sort another way. If they are only sorting by one attribute, ask them to use two attributes to sort.

Sample Activity 3: Recognizing Similar Shapes and Identifying Attributes

Shapes that are the same shape but a different size are called "similar" shapes. If they are the same size and shape, they are said to be "congruent" shapes. Students will study congruency in Grade 4. To make shapes of varying sizes, take your shape blackline master and either enlarge or reduce it to make sets of shapes that are similar. Have the students sort these shapes into groups and ask them to explain the properties of the group or how they knew that the figures all belonged in the sets of triangles, squares, rectangles or circles.

During this exploration of each category, press the students to examine what makes a circle a circle, a triangle a triangle, a rectangle a rectangle and a square a square? During the exploration of triangles, ensure that all triangle types are included: equilateral (all sides equal, all angles equal 60˚), isosceles (two sides and two angles equal) and scalene (no sides or angles equal). Triangles can also be sorted by their angle size.

Students at this level are not expected to be familiar with this terminology, but it may help them to organize the various types of triangles. Grade 2 students may look for whether or not there is a square corner or right angle in some triangles. Grade 2 and 3 students use a square corner to determine whether angles are 90˚. Not all notebook pages have square corners, so it is suggested that students use an index card to test for a square corner or right angle.

It is hard to recognize the properties of a shape unless the set you are examining has some shapes that do not have that special property or are non-examples. For example, if the shapes being considered all have four sides that are straight lines and all have four right angles, the students are unlikely to take note of the angles or the parallel nature of the sides. However, if the set of shapes includes parallelograms and irregular quadrilaterals, then the students are likely to pick out correctly which ones are rectangles and add to their list of the properties of a rectangle that opposite sides are parallel and the four angles are right angles. The concept of parallel to students at this stage is best described as like railroad tracks in that they stay the same distance apart, no matter how far they go. When examining squares, students should begin to see that all squares meet all their criteria for a rectangle, but that rectangles do not meet all the criteria for a square, since they do not have four equal sides.

During the exploration of circles, you will want to have some curved shapes that are not circles, such as egg shapes or saucer shapes, ellipses or parabolas. During these explorations, move the shapes to other orientations and ask the students if it is still the same shape. Through these repeated manipulations, students will recognize that orientation does not affect the shape, just as dimension did not affect the properties and thus the shape, only the size.

Sample Activity 4: Creating Models of 2-D Shapes

Students can make shapes from glue, yarn, string, paper, pipe cleaners, Plasticine, straws, stir sticks or mini marshmallows and toothpicks. Other manipulatives that assist students in their modelling of 2-D shapes are geoboards and pegboards. Note that circles are the one shape that students cannot easily construct.

A transparent geoboard overhead is a good means of studying shapes whose orientations have changed. Students can be asked to replicate a figure from one geoboard on another. They can then learn to make figures on geoboards from a diagram on a card. This is more complicated if the dots representing the nails or pegs are not shown. For students to do this successfully, some may need help learning how to identify the vertices and mark them, or pick a starting point and move systematically from that point to all others in the figure. Making a paper copy of a design that is on a geoboard is yet another skill that students can learn.

Sample Activity 5: Creating Pictorial Representations of 2-D Shapes

Students may draw 2-D shapes freehand, but some will find it very hard to draw them accurately. Students will learn to make lines with a ruler and square corners with the corner of an index card. Students can learn to trace circles around plastic lids or coins and to use circle templates. They can also be taught to tie a string around a pencil and, holding the string at a point that will become the centre of the circle, draw a line around the centre point by moving the pencil in a 360˚ arc with the string taut.

Step 4: Assess Student Learning

Guiding Questions

- Look back at what you determined as acceptable evidence in Step 2.
- What are the most appropriate methods and activities for assessing student learning?
- How will I align my assessment strategies with my teaching strategies?

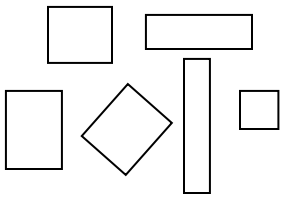
In addition to ongoing assessment throughout the lessons, consider the following sample activities for evaluating students' learning at key milestones. Suggestions are given for assessing all students as a class or in groups, individual students in need of further evaluation, and individual or groups of students in a variety of contexts.

A. Whole Class/Group Assessment

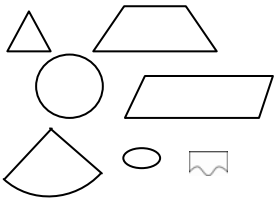
Provide the students with straight edges, string and index cards.

1. For the sorts below, find the differences and explain the sorting rule.

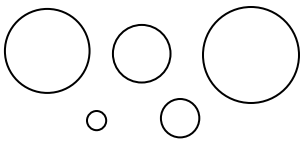
   a. Follows the Rule



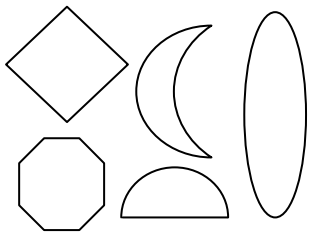
   Does Not Follow the Rule



   b. Follows the Rule



   Does Not Follow the Rule

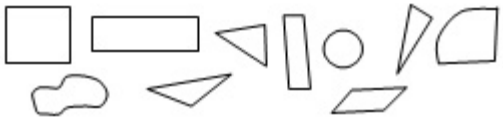


2. Identify two attributes or characteristics of the following set of shapes.

a. _____

b. _____

3. Place an R on the ones that follow the rule and an X on those that do not follow the rule. My sorting rule is the shapes all have a right angle or square corner and at least two straight edges.



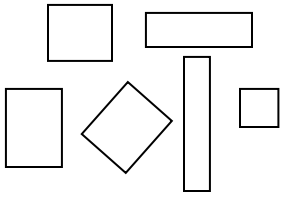
4. Copy the written assessment GO4–1 on pages 33 and 34 of *Diagnostic Mathematics Program, Division I, Geometry.*

Whole Class/Group Assessment Answer Key

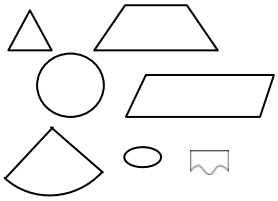
Provide the students with straight edges, string and index cards.

1. For the sorts below, find the differences and explain the sorting rule.

   a. Follows the Rule

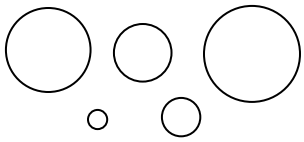


   Does Not Follow the Rule

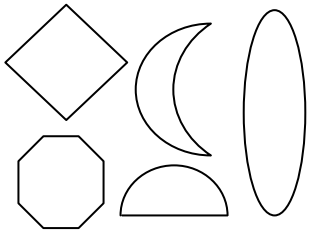


   The shapes all have four straight sides (two marks, one for four sides and one for straight sides), opposite sides parallel or same distance apart (one mark – notes students at advanced stage), and have four right angles (three marks – one for noting four angles and two for noting that they are square or right angles). Total marks possible is six. Students with one to two marks need further development. Students with three to four marks are developing well. Students with five to six marks have an exceptional grasp of the properties of rectangles and squares.

   b. Follows the Rule



   Does Not Follow the Rule



   All are circles (one mark). They have only curved edges, no straight edges (one mark). Circles are made of connecting dots that are all the same distance from the centre of the circle (two marks for this type of explanation, one is in place of the curved edges description and the other is for the recognition of equidistant points from the centre for a total possible of three marks). If students have one mark, they may have limited vocabulary and/or comprehension of the properties of circles. If they have two marks, their recognition of the properties of a circle is developing nicely. If they have three marks, they have an exceptional understanding of the properties of circles.

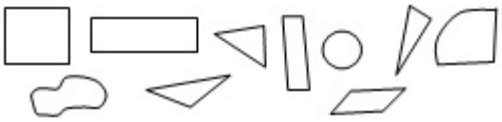
2. Identify two attributes or characteristics of the following set of shapes.

a. _____ Have a curved edge._____

(If students only identify one attribute of these two, they may be having difficulty considering more than one property at a time. They may require analogies to other things, such as students that may belong to the group of girls and the group of students in running shoes at the same time.)

b. _____ Have a straight edge._____

3. Place an R on the ones that follow the rule and an X on those that do not follow the rule. My sorting rule is the shapes all have a right angle or square corner and at least two straight edges.



(Allow a point each for including the square, two rectangles, the right-angled triangle and the arc of a circle for a maximum of five points. Deduct one point for every additional shape that is included in error. Students with zero to one mark need work on what a right angle is and recognizing one. Students with two to three marks are likely seeing right angles only in rectangles and perhaps squares. They need work on seeing right angles in a variety of 2–D shapes with different orientations. A very similar question could be asked again with the square shown rotated 45˚.)

4. Copy the written assessment GO4–1 on pages 33 and 34 of *Diagnostic Mathematics Program, Division I, Geometry.*

Give a mark for each correctly placed X and subtract a mark for any shape marked with an X in error, for a total possible points of eleven. A student who has two marks in numbers one through six has a good intuition at least of a circle's properties. If the student has zero to one in the first six items, it is likely that the student is considering curved edges as a property of a circle and needs some clarification.

In numbers seven through twelve if a student has three marks, they have a good understanding of the properties of a triangle and recognize them regardless of orientation or type. Those with zero to one mark likely do not have a firm grasp of the properties of a

triangle. If they missed identifying numbers eight and eleven as triangles, they are either only recognizing triangles when their bases are parallel to the bottom of the page or a few types such as equilateral and right-angled triangles. If students identified numbers ten and twelve as triangles, then they clearly have not achieved an understanding of the properties of triangles. Instead they are identifying shapes that are triangle-like in some way. In either case, for students who have zero to one mark in this section more work is needed on the properties of triangles.

In numbers thirteen to eighteen students with a good recognition of the properties of squares will have three marks. Those with two marks are likely missing identifying sixteen due to its orientation. Additional work on shape conservation when orientation changes is needed, as well as reinforcing the ways to test if a questionable shape is in fact a square. Students with zero to one mark are likely focusing on four sides and missing the necessity of having four right angles. Help them see the difference between rectangles, squares and parallelograms. This may be done with a section cut from a flattened box. When it is held up like a bookcase with right angles, it is either a rectangle or a special subset of rectangles, a square. When you let the angles move to less than 90˚, the shape becomes a parallelogram instead.

In the last section, numbers nineteen to twenty-four, students who have three marks have a clear recognition of the features required to make a rectangle. If they have two marks because they identified twenty-three as a rectangle, the same follow-up as in the previous section for those not discriminating between parallelograms and rectangles or squares is needed. If the students have one mark, chances are they are focusing on the four-sided nature of rectangles and need work on the recognition of the opposite pairs of parallel lines and how that means all four angles are right angles.

If another activity is needed to check on this knowledge, students could be given "Written Assessment Task GO6-2" on pages 47 and 48 of *Diagnostic Mathematics Program, Division I, Geometry.*

B. One-on-one Assessment

Sample Structured Interview for Grade 2 Shape and Space 2-D Objectives 6 and 8

Name: **Directions**	Date: **Not Quite There**	**Ready to Apply**
Place a set of 2-D shapes in front of the student, preferably a teacher-made set with a variety of triangle types, parallelograms, as well as squares, rectangles, ovals and circles. Say, **"Sort these using two attributes or characteristics and explain your sorting rule to me."** If the student is not quite there, you may elect to repeat this step with fewer and more diverse 2-D shapes until the student can be successful or you know more about the gaps or missing concepts/knowledge.	• Sorts with only one attribute. • Places some incorrectly. • Sorts correctly, but cannot verbalize the rule clearly or explain it.	• Sorts with two attributes. • Sorts correctly. • Clearly states the rule used and explains it sufficiently.
From a set of 2-D shapes, preferably a teacher-made set with a variety of triangle types, parallelograms, as well as squares, rectangles, ovals and circles, do a pre-sort, but leave some unsorted that do and do not fit the category. Say, **"I have begun to sort these shapes by a rule with two attributes. Can you finish the sort for me? When you are done, can you tell me the rule I was using?"**	• Sorts the remainder incorrectly. • Sorts the remainder all or mostly correctly, but cannot verbalize the rule or only identifies one of the properties by which the shapes were sorted.	• Sorts the remainder correctly. • Identifies both properties by which the shapes were sorted.

Place a set of 2-D shapes before the student, preferably a teacher-made set with a variety of triangle types, parallelograms, as well as squares, rectangles, ovals and circles. Say**, "Decide upon a sorting rule with two attributes and sort the shapes."** After the student has sorted the shapes, say, **"Now please tell me your sorting rule."**	• Sorts by only one attribute. • Makes sorting errors. • Sorts correctly by two attributes, but is unable to state the rule used.	• Sorts correctly by two attributes and clearly states the attributes in the rule.
Place a set of 2-D shapes that include two or three similar shapes (e.g., circles, squares, rectangles and triangles) in front of the student. Give the student labels for each of these groups. Say, **"Please sort these shapes into the correct groups."** After the student completes this task, ask, **"If you had to make just three sets out of these four, what would you do?"** This test can be made more difficult by adding in shapes such as ovals and parallelograms and even triangle-like figures such as in number four of the whole class assessment.	• Does not sort all of the items correctly. • Cannot make the four sets into just three or suggests a way that would not work.	• Sorts all the items correctly or just misses an item to be sorted due to sheer volume and waning attention. • Makes the four sets into three by placing the squares with the rectangles.
To test a student on constructing shapes, provide drinking straws, scissors and pipe cleaners to join the straws as sides in 2-D shapes. Say, **"Please make a triangle, square and rectangle using the straws for the sides of these shapes and the pipe cleaners inserted in the ends to make the corners or vertices."** Note that the student cannot make a circle unless you provide a pencil and string, glue and yarn.	• Cannot make the shapes correctly. The attempted rectangle may have unequal opposite parallel sides, for example.	• Makes all three shapes accurately. The triangle may have three, two or no equal sides, but will have three sides.

C. Applied Learning

Provide opportunities for the students to use their recognition of geometric shapes and their properties in their daily life and the environment. For example, have the students look at instructive drawing books in which the students are taught based upon a composite of 2-D shapes that are then adapted. Have them identify the basic 2-D shapes as the faces of 3-D shapes in the study of those. Proceed on to identifying the 3-D shapes in the environment at school, home and in the community.

Step 5: Follow-up on Assessment

Guiding Questions

- What conclusions can be made from assessment information?
- How effective have instructional approaches been?
- What are the next steps in instruction?

A. Addressing Gaps in Learning

If students are still struggling with recognizing the properties of 2-D shapes, try activities such as "What's My Shape?" in which a shape is pasted inside a piece of construction paper that is folded in half. A set of shapes, including the "secret shape" are spread out on a table or desk. Students ask the student leader, with the secret shape, questions that can be answered "yes" or "no." The question cannot be, "Is this one the secret shape?" As they are given answers, the students can eliminate shapes from the group until they are down to one remaining shape, which they may test against the secret shape hidden inside the folded construction paper.

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B. Reinforcing and Extending Learning

Students who have achieved or exceeded the outcomes will benefit from ongoing opportunities to apply and extend their learning. These activities should support students in developing a deeper understanding of the concept and should not progress to the outcomes in subsequent grades. Consider strategies, such as the following.

- Provide tips for parents on how to reinforce the students' knowledge of the properties of 2-D shapes. These properties are often not part of the parents' daily life and so they are not likely to be able to reinforce their students' learning in this strand unless you provide them information about what the students are doing and the learning objectives of these sorting activities. Make sure they understand that it is the concepts that the students are developing, not the mathematical terminology, such as "parallel", "perpendicular," or "concave." They may need to be reminded of some of the discoveries about shapes that are so easily taken for granted, such as that the points on the circumference of a circle are all equidistant from its centre point and how one can draw a circle with a pencil and piece of string.
- Have the students sort other objects such as buttons, stones or trading cards using two attributes.

- Have the students do activities with pattern blocks or tangrams, to compose or decompose composite figures. There are books available with composite shapes to reproduce in order of difficulty. There are some "tangram tangles" puzzles provided in the *Diagnostic Mathematics Program, Division I, Geometry* book on pages 116 to 124. If you do not have commercial tangrams for students, the tangram tangles are preceded by directions for tearing a square into the seven tangram shapes. There is also one example that can be used for tracing them onto plastic lids or a plastic sheet, then the shapes can be cut apart. Students like the commercial shapes, particularly the translucent ones made for overhead use as well as individual use. There are also tangram activities on Web sites.
- Integrate the work from patterns with geometry by having students review repeating patterns using squares, circles and triangles. In simple patterns, each of these three repeating shapes is the same size, colour and is in the same orientation. Later, make the patterns more complex by varying the size, colour and orientation (Del Grande and Morrow 1993).
- Have the students explore squares on the geoboard. Did they discover ones that have four, eight and twelve pegs on the boundaries? A similar exploration of rectangles may follow. Explain what is meant by pegs on the inside of the shape (only the ones that are not touching the bands). Then challenge students to make triangles with one peg inside, two pegs inside, then three and search for others, such as six inside pegs.

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