**Sample Mathematics Learning Plan – Shape Categories**

<table>
<thead>
<tr>
<th>Big Idea(s) / Topic(s)</th>
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<tbody>
<tr>
<td>Reason with and classify shapes based on their attributes.</td>
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<table>
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<tr>
<th>Standard(s) Alignment</th>
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<tr>
<td>MGSE3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.</td>
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<th>Diagnostic Assessment</th>
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<tr>
<td>In the <a href="#">attached diagnostic assessment</a>, students are asked to provide examples and non-examples of a rectangle, then share the reasoning used to determine whether or not a shape is a rectangle.</td>
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Instructional Design

Desmos Polygraph: Shape Bucket

Description:

Teachers will deliver the aforementioned Desmos lesson synchronously (preferred) as students will be paired with a partner in real-time to engage in the online task. Students will be paired in a, “Guess Who” type game in which students will use appropriate math vocabulary to determine the chosen picture by their partner. The purpose of this Polygraph is to spark vocabulary-rich conversations about shapes and their characteristics. After sparking this conversation, students will complete an additional Desmos activity in which students will learn about classifying shapes into categories and identifying shared attributes of shapes.

- **Materials**: Electronic device, Desmos Polygraph: Shape Bucket and Desmos: Classifying Shapes.

- **Teacher Directions**: Deliver Desmos lesson by providing students with a join code. Students will engage in the activity in which they ask “Yes or No” questions to determine the selection by the other student. (Similar to “Guess Who.” See further directions on the Directions page of the activity.) Monitor student questions via the Teacher Dashboard to ensure students are exercising appropriate Digital Citizenship.

- **Description of Learning**: In Desmos: Shape Bucket, students will see pictures of shapes that have different characteristics/attributes. Students will use this knowledge to transition into how shapes can be categorized based on their attributes (ie. squares and rectangles can be classified as quadrilaterals).

- **Synchronous** – Students will work collaboratively with a partner to engage in the activity in real-time. Students ask “Yes or No” questions to determine the item selected by their partner. Students will need their own device and will need to be separated enough so students cannot see the screen of their possible partners.

- **Asynchronous** – Students may be given a designated time to meet with a partner to complete the activity. The teacher may also complete this activity as the partner of the student if synchronous delivery is not a viable option. Students may also play with a parent or guardian to engage in this task.
Unplugged/ Offline - Shape Bucket Task Cards can be printed for at home use (see concluding pages). The same instructions can be applied in a face-to-face setting. (Person A chooses a card while Person B asks “Yes or No” questions to determine the chosen card. Turns are taken (Guesser or Chooser) to ensure that each person is using appropriate math vocabulary.)

DESMOS Polygraph: Shape Bucket

Engage

In this activity, students engage in an online game similar to that of the game, “Guess Who?” Students ask “Yes or No” questions to determine the card chosen by their classmate. This allows students to engage in the standard, develop appropriate math vocabulary, and allows students the opportunity to apply current knowledge and clues to determine an unknown selected card.

How Polygraph Works:

1. Practice
   Each student pays a practice round against the computer to learn how the game works.

2. Play
   Next, students are paired with a classmate to play polygraph with mathematical cards. One person chooses a card, their partner asks yes/no questions in order to narrow a field of cards down to one.

3. Reflect
   Between rounds, students answer questions that focus their attention on vocabulary and strategy.

The Cards
- **Synchronous** - When administering the activity, assign a “Single Session Code.” Students logon at student.desmos.com and enter the code provided by the teacher. Students are randomly paired with a classmate to engage in the activity. Partners may be paired with a new partner at the conclusion of each round.

- **Asynchronous** - If implementing without teacher monitoring, provide the session code to students at a designated meeting time. This could be useful as it provides flexibility for students engaged in virtual learning. Student collaboration can be monitored by the teacher from the Teacher Dashboard.

- **Unplugged/Offline** - Shape Bucket Task Cards can be printed for at home use. The same instructions can be applied in a face-to-face setting. (Person A choose a card while Person B asks “Yes or No” questions to determine the chosen card. Turns are taken.)

Explore
A separate Desmos Activity, **Desmos: Classifying Shapes** may be used to allow students to explore the classification of shapes based on their attributes. Students work on this task independently to build on the understanding that shapes can share attributes and can be categorized based on their characteristics (closed, 4 sided figures with straight lines are quadrilaterals). In this activity, students continue to engage in interactives in which they must draw, sort, and often explain their thinking to engage in all of the components of the targeted math standard, MGSE3.G.1.

**Screens**

1. Quadrilaterals
2. Which One Doesn’t Belong?
3. What do all of these shapes have in common?
4. Which Shape Does Belong?
5. Choose any two shapes shown.
6. Quadrilaterals - Attributes
7. Is This a Quadrilateral?
8. Color the Quadrilaterals
9. Not Quadrilaterals
10. Sort The Shapes
11. Shape Mystery
12. Shape Mystery #2
13. What Shape is this?
14. Reflection

**Sorting Example**

- **Synchronous** - When administering the activity, assign a “Single Session Code.” Students logon at student.desmos.com and enter the code provided by the teacher. Completing this activity
synchronously with the class allows students to see response of other students as well as gives teacher instant feedback of the thought processes of students.

- **Asynchronous** - This activity may be assigned (via Single Session Code) to students asynchronously in which students work at their own pace to complete the tasks. The teacher may view student responses from the Teacher Dashboard to adjust instruction or intervene accordingly.

- **Unplugged/Offline** - The Desmos: Classifying Shapes Task Cards are available for printing at the conclusion of this plan. Students can answer all of the questions by drawing, written response, or shading which makes this activity easily accessible to offline students.

**Apply**

To apply this standard to real-world scenarios, allow students to engage in a Shape Hunt task. Assign students a quadrilateral, which include squares, rectangles, parallelograms, rhombuses, or trapezoids. Have students locate 3 real world examples and record them. Students will choose 1 of the found shapes to illustrate on a Wanted Poster. (See Example below) Students will record characteristics and attributes of the shapes to demonstrate understanding of that shape. Students may utilize the following question bank to help write information on their wanted poster.

- What can you tell me about your shape?
- How many sides and angles does your shape have?
- How can you describe your shape?
- What are all of the names of your shape?
- Is there anything else interesting about your shape that you would like to share?
- Can your shape be partitioned into other shapes? Which ones?

Encourage students to be creative with the images they choose to illustrate. (They may want to turn a trapezoid into a hat of a bandit for example). Lastly, students can share their wanted posters, compare and contrast how their shapes and wanted posters were similar or different, and relate to the big idea that shapes researched all fall under a greater category of Quadrilaterals.

- **Synchronous** - Complete with a whole group class by following the directions above. Student interaction is a great way of getting students to use vocabulary to describe shapes.

- **Asynchronous** - This activity lends itself to be completed asynchronously in a home or virtual setting. Students have access to all sorts of quadrilaterals at home that can easily be accessed and discussed. Online templates can be used for students to share their work digitally.

- **Unplugged/Offline** - This activity can ideally be completed at home with just the use of pencil and paper if needed. This activity type lends itself to be completed without the use of technology for
unplugged/offline students. Directions would need to be delivered to students to ensure that all criteria of the project are being met.

Reflect

Throughout this interactive, students have the opportunity to answer questions and reflect upon their answers (example below). Students are asked to justify and share their reasoning, in addition to illustrating their understanding of partitioning shapes into equal areas. Assessment results may be used to determine misconceptions or ideas that may need to be retaught or clarified to ensure student mastery of the standard.

Is This a Quadrilateral?

Yes No

Explain your thinking.

Reflect 1-1-1

Tell:

- 1 thing you learned.
- 1 thing you enjoyed.
- 1 thing you still have a question about.

Synchronous - When administering the activity, assign a “Single Session Code.” Students logon at student.desmos.com and enter the code provided by the teacher. Students are set to work at their own pace, or the teacher may control the pacing of the slides from the Teacher Dashboard.

Asynchronous - Teachers may provide a Single Session Code to administer this activity. Classes can also be created in the Desmos platform, which can receive assignments by selecting “Assign to Classes.”

Unplugged/Offline - Desmos: Classifying Shapes Task Cards can be accessed on the concluding pages below. These items can be printed or be used as discussion prompts when working with students offline.
Evidence of Student Success

Success of standard is evident when students can:

- Accurately describe shapes based on their attributes (This evident from the [Desmos: Shape Bucket Polygraph](https://www.desmos.com/g更y) activity.)
- Understand that shapes can have more than 1 classification. (Squares are also called Quadrilaterals)
- Accurately draw examples of quadrilaterals that fit or don’t fit into one or more categories. (Not all quadrilaterals are trapezoids.)
- Sort shapes into appropriate categories based on attributes.

Student Learning Supports

Establish mathematics goals to focus learning.

- Make instructions and expectations clear for the activities.
- Make explicit connections between current and prior lessons or units.

Facilitate meaningful mathematical discourse.

- Explicitly model and teach good “discussion board” etiquette.

Pose purposeful questions.

- Predetermine when you will call on the student or use the pause feature within the activities.
- Break class into small discussion groups to work collaboratively and then have groups report back to the whole group.

Support productive struggle in learning mathematics.

- Offer outlines and other scaffolding tools and share tips that might help students learn.
- Provide feedback using the feedback feature within activities and offer corrective opportunities.
- Consider the pacing of the lesson.

Elicit and use evidence of student thinking.

- Anticipate any misconceptions or questions students might have about the task, materials or technology. Proactively address them with readily available and accessible resources.

Engaging Families

Additional Activities for home:

- Create a sidewalk chalk art picture using nothing but quadrilaterals.
- Construct pictures using pattern blocks or Tangrams. Use these to discuss attributes of shapes as well as comparing and contrasting properties of shapes.
- Online Math Games - [Turtle Diary](https://turtle diary.com)
### Example or Non-Example

<table>
<thead>
<tr>
<th>List as many examples of Quadrilaterals as you can here:</th>
<th>List as many non-examples of Quadrilaterals as you can here:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

State the reasoning you used to decide if something is an example or non-example.
Desmos Task Cards for Unplugged/Offline
Desmos Task Cards for Unplugged/Offline:

1.)

Choose the shape that does NOT belong with the others.

![Shapes to choose from]

Explain your thinking.

2.)

Similar Attributes

What do all of these shapes have in common?

![Shapes with question]

Share with Class
3.)

Which Shape Does Belong?

In the space below, use the drawing tools to draw a shape that belongs with the other four shapes.

Try not to make it look like the other 4. (Be Precise!!)

4.)

Choose any two shapes shown. Tell 1 way they are the same and 1 way they are different. Use good math vocabulary in your answers.
5.)

**Quadrilaterals - Attributes**

Quadrilaterals have:

- Straight Lines
- 4 sides
- and closed.

In the space below, draw a shape that is NOT a Quadrilateral.

---

6.)

**Is This a Quadrilateral?**

Yes | No

Explain your thinking:

- [ ]

Share with Class
7.)

Color the Quadrilaterals

Look at the shapes.

Color ONLY the Quadrilaterals

Think about the shapes you did not color...

8.)

Not Quadrilaterals

Why are these shapes NOT quadrilaterals?

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9.) Cut and Paste the shapes into the appropriate category.

10.)

*What Shape am I?*

I have one less side than a pentagon.

All of my corners (angles) are the same size.

All of my sides are the same length.

What shape am I?

Type your answer in the box -->

Draw the shape below.
11.)

What shape am I?
- I have more than 3 sides.
- Two of my sides are the same length.
- My other two sides are the same length.
- I am not a square.

Type your answer in the box

Draw the shape below.
12.)

Draw it!

Use the drawing tools to color one of each Quadrilateral you find on the picture below.

Color these:
- Rectangle (This has been done for you, in orange, as an example)
- Square
- Rhombus
- Trapezoid
- Parallelogram
- A Quadrilateral that does not look like any of the others.