Geometry Resource

Information Regarding This Resource The following resource will help to unify the concepts of Congruence, Similarity and Geometric Shapes by allowing students the opportunity to analyze data in a real-world scenario. Students will also collaborate, create and reflect on their learning.

The Format of This Resource This resource is organized into flexible components which can be utilized by educators, parents or students in its entirety or can be fragmented based on desired knowledge. Each text box contains the process skills students will use in the lesson to explore the mathematical content within the Geometry Curriculum. The focus of each lesson is highlighted for easy reference. The lessons have been designed to allow multiple entry points to accommodate for different levels of understanding.

Throughout this resource, students are asked to justify or explain their answers, thought process or understanding. The intent is for students to reflect on their mathematical thoughts. Students should keep in mind that justifications or explanations can take multiple forms, including, but not limited to, diagrams, graphs, text, or pictures. These are not meant to be right or wrong, rather a means of making learning visible.

Connection of Standards:

Process Standard(s): Students will show their understanding of **proving circles are similar** by making sense of problems, persevering, reasoning and making sense of relationships, using critical thinking skills to justify their mathematical reasoning, and connecting ideas to real world situations through modeling.

Content Standard(s):

G.GCI.1 Prove that all circles are similar.

a. **Find at least two examples of circles in your house that are different sizes.**
b. **How can you use these circles to prove that all circles are similar?**
c. **Will circles ALWAYS be similar?**
d. **Justify your answer.**
e. **What other shapes are similar?**
f. **Explain why these other shapes are similar.**

Geometry Resource

Connection of Standards:
Process Standard(s): Students will show their understanding of **proving triangles are congruent** by making sense of problems, persevering, reasoning and making sense of relationships, using critical thinking skills to justify their mathematical reasoning, and connecting ideas to real world situations through modeling.
Content Standard(s):
G.GCO.7* Prove two triangles are congruent by applying the Side-Angle-Side, Angle-SideAngle, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions.

a. **Locate two identical triangles somewhere in your environment. (If you cannot find two, you can construct them on paper.)**
b. **Use these triangles and what you know about SAS, ASA, AAS to prove they are congruent.**
c. **Model your thinking in a way that makes sense to you.**

Connection of Standards:
Process Standard(s): Students will show their understanding of **parallel, perpendicular and skew lines** by making sense of problems, persevering, reasoning and making sense of relationships, using critical thinking skills to justify their mathematical reasoning, and connecting ideas to real world situations through modeling.
Content Standard(s):
G.GCO.1* Define angle, perpendicular line, parallel line, line segment, ray, circle, and skew in terms of the undefined notions of point, line, and plane. Use geometric figures to represent and describe real-world objects.

a. **Look at your surroundings and find examples of lines that appear parallel. Diagram this example.**
b. **Look at your surroundings and find examples of lines that appear perpendicular. Diagram this example.**
c. **Explain how you could prove the lines are parallel.**
d. **Explain how you could prove the lines are perpendicular.**
e. **Look at your surroundings and find an example of lines that are skew?**
f. **Justify that these lines are skew.**
g. **Which was the easiest to find, lines that appear parallel, perpendicular or skew?**
h. **Explain why you think this is the case.**

Geometry Resource

Connection of Standards:

Process Standard(s): Students will show their understanding of **representing translations, reflections, rotations and dilations** by making sense of problems, persevering, reasoning and making sense of relationships, using critical thinking skills to justify their mathematical reasoning, and connecting ideas to real world situations through modeling.

Content Standard(s):

G.GCO.2* Represent translations, reflections, rotations, and dilations of objects in the plane by using paper folding, sketches, coordinates, function notation, and dynamic geometry software, and use various representations to help understand the effects of simple transformations and their compositions.

You will need 4 pieces of paper for this activity.

a. **Fold one piece of paper in half and then in half again in the other direction. When unfolded, there should be 4 evenly sized rectangles on the paper.**
b. **Fold 3 additional pieces of paper in the same way.**
c. **Draw one object in the upper left rectangle on each piece of paper. You can draw the same object on each or different objects.**
d. **On the first piece of paper, write TRANSLATION on the top of the paper. Now translate the object to another location on the paper. Use another color or dashed lines to represent the translated object.**
e. **On the second piece of paper, write REFLECTION on the top of the paper. Now reflect the object over the horizontal line made by the fold. Then reflect the original object over the vertical line made by the fold. Use two different colors or differing dashed lines to represent the two reflected objects.**
f. **On the third piece of paper, write ROTATION on the top of the paper. Now rotate the object 90 degrees clockwise. Use another color or dashed line to represent the rotated object.**
g. **On the fourth piece of paper, write DILATION on the top of the paper. Now dilate the object by 2 and then by 1/2. Use two different colors or differing dashed lines to represent the two dilated objects.**
h. **Which was the most difficult to represent? Explain why it was more difficult.**

Geometry Resource

Connection of Standards:

Process Standard(s): Students will show their understanding of **proving triangles are similar** by making sense of problems, persevering, reasoning and making sense of relationships, using critical thinking skills to justify their mathematical reasoning, and connecting ideas to real world situations through modeling.

Content Standard(s):

G.GSRT.4* Prove, and apply in mathematical and real-world contexts, theorems involving similarity about triangles, including the following: a. A line drawn parallel to one side of a triangle divides the other two sides into parts of equal proportion. b. If a line divides two sides of a triangle proportionally, then it is parallel to the third side. c. The square of the hypotenuse of a right triangle is equal to the sum of squares of the other two sides.

On a piece of paper, draw a triangle. Label the vertices A, B and C. Use the below statements regarding similar triangles to design a model that represents these statements using the triangle you have drawn.

a. ***A line drawn parallel to one side of a triangle divides the other two sides into parts of equal proportion.***
b. ***If a line divides two sides of a triangle proportionally, then it is parallel to the third side.***

Do you see the two superimposed triangles on your paper?

Using a separate sheet of paper, trace over the newly created small triangle and label its vertices D, E, and F. Then trace the original large triangle A, B, C separately.

Use correct notation to show that $\triangle$ ABC and $\triangle$ DEF are similar. Show this using proportionality and any Similarity Theorems you know.

Geometry Resource

Connection of Standards:

Process Standard(s): Students will show their understanding of **surface area and volume of 3-dimensional objects** by making sense of problems, persevering, reasoning and making sense of relationships, using critical thinking skills to justify their mathematical reasoning, and connecting ideas to real world situations through modeling.

Content Standard(s):

G.GGMD.3* Apply surface area and volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems and justify results. Include problems that involve algebraic expressions, composite figures, geometric probability, and real-world applications.

a. **Find a 3-dimensional representation of at least one cube, one rectangular prism, one cone and one sphere in your house. (If you cannot find one of the listed objects, you can replace it with a pyramid or create one or more using paper or cardboard.)**
b. **Measure the necessary lengths to calculate the surface are and volume of each. (If you do not have a ruler or tape measure, estimate the lengths.)**
c. **Calculate the surface area and volume for each of the four objects.**
d. **Diagram or explain how the objects helped in your calculations.**

Reflection:

a. **Collaborate with someone in your family, a friend, or a neighbor. Ask them to look over your mathematical reasoning and ask you at least 5 guiding questions. Document the 5 questions they asked.**
b. **Document the answers you gave to the 5 questions.**
c. **Reflect on your work. Where did you struggle? Where did you triumph? What do you still wonder?**
d. **Look over the content you covered, the processes that guided you through your discoveries, and think about your collaboration. Write down your thoughts and allow your reflection to move you forward in your mathematical thinking.**