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Trash or Toys?

Trash or Toys

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Goals and Objectives

Standards:

MAFS.3G.1:
Reason with shapes and their attributes

MAFS.3.G.1.1:
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. (MP 2, 3, 5, 6, 7)

MAFS.3.G.1.2:
Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.

MAFS.3.G.1.1 MAFS.4.G.1:
Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

MAFS.4.G.1.3:
Recognize a line of symmetry for a two dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

SS.3.A.1.2
Utilize technology resources to gather information from primary and secondary sources

SS.3.G.2.6
Investigate how people perceive places and regions differently by conducting interviews, mental mapping, and studying news, poems, legends, and songs about a region or area.

SS.3.G.4.4
Identify contributions from various ethnic groups to the United States

SS.3.E.1.1
Give examples of how scarcity results in trade.

SS.3.E.1.3:
Recognize that buyers and sellers interact to exchange goods and services through the use of trade or money.

Course Overview

Children love toys! What they love even more is making their own toys. This project uses the natural affinity towards toys as a motivational tool. Students learn math, and social studies through the design and creation of a toy inspired by child-made toys from Uganda.

At the onset of this project, students are encouraged to bring recyclable water bottles, and other household items that will later be used to make their toy project. Students learn about pollution and how it comes from improper use of resources. They also learn about attempts to help the environment like recycling programs and the difference between reusing and recycling.

Next, students view several short segments about toys made out of “trash”. They learn about Uganda and about the plastic bottle cars and banana leaf dolls made by children there. They also learn about the inherent resourcefulness of the people in Uganda and how the definition of trash can depends on your own limitation to find a use for something.

With ideas from the videos fresh in their minds, students design their toys on paper using 2D shapes and labeling the shapes on their drawing. They also brainstorm about what 3D objects they would be able to use to actually build the toy. Students consider right, acute and obtuse angles while creating their designs.

a student might choose a rectangular prism to create a dog’s body and head connected with a right angle, but the legs might be connected using obtuse angles to provide support and balance.

As students build their robots, they are interviewed by the teacher and asked to explain the 3D forms that they have included in their project. They are taught several ways to connect the parts and students also brainstorm to decide how their project will come together. The toy is painted and then buttons, bottle caps, and beads are used to decorate it.

When the toys are complete, a video of them demonstrating their toys is posted on Schooltube.

Lesson Plans

Day 1

Vocabulary:

two dimensional shapes, shapes with curves, plane shape, open shape, polygons, square, rectangle, triangle, rhombus

Materials:

paper, pencils, scissors, rulers, envelopes (ziploc bags).

Procedure:

Math:

Discuss the different types of shapes.

Demonstrate how to use a ruler to draw several types of shapes and label them.

Tell students that they will be using shapes to create a toy so they have to draw them clearly and label them clearly.

Distribute construction paper and have students draw several shapes and label them. If there is time they can begin to cut them out and place them in envelopes.

Social studies

Students are introduced to the African continent and are shown various examples of geometric shapes in african art as a primary resource.

Day 2

Vocabulary:

polygon, pentagon, hexagon, octagon, decagon

Materials:
paper shapes from previous lesson

Procedure:

Math:

Introduce the concept of reusing materials and ask students to start bringing materials such as paper tubes, plastic bottles, and cereal boxes, from home

Demonstrate how to combine shapes in order to make a new shape and count the number of sides.

Demonstrate how to create some basic animal, car, or robot shapes by combining shapes together.

Have students create several new shapes using their shapes. Have them count the number of sides for each new shape they create. They can cut new shapes if they need to but encourage them to not use shapes with curves.

Social studies

Have students view pictures of African drums and discuss the geometric shapes that are used to make them. Students can listen to African drumming and then discuss how it is different from the music they are accustomed to.

Day 3

Vocabulary

right angle, acute angle, obtuse angle

Materials:

Shapes from previous day, paper, pencils

Procedure:

Math

Discuss right angles and obtuse angles and acute.

Demonstrate how to find the angles in shapes and identify the different angles.

Demonstrate how to combine shapes and identify the different angles that are formed.

Students use their shapes and combine them to form new shapes. They identify the different angles that are created by tracing them on a sheet of paper and labeling all the angles.

Social Studies

Introduce Uganda. View the travel guide for rock art of Uganda. Discuss that this is a secondary resource. Have students discuss the geometric shapes in Ugandan rock art.

Day 4

Vocabulary

symmetry, congruent, line of symmetry

Materials:

Paper shapes from previous day, construction paper, scissors.

Procedure:

Discuss symmetry and line of symmetry and show several examples of symmetrical shapes.

Discuss congruent shapes

Demonstrate how to make congruent shapes by tracing shapes and cutting out an exact match from construction paper

demonstrate how turning the shape doesn't change it and that the shapes are still congruent.
Demonstrate how to combine two congruent shapes by flipping one and reflecting it across a line of symmetry

Demonstrate how to trace the new shape onto a paper and then draw the line of symmetry.

Students practice making congruent shapes and then tracing symmetrical shapes on a paper, they then draw the lines of symmetry.

Social Studies

Discuss symmetry in masks. Show website about african masks. Explain that the website is a secondary source to learn about African culture. Tell students to look for symmetry in the masks.

Day 5

Vocabulary

quadrilateral, right triangle acute triangle, obtuse triangle

Materials:

Shapes from previous day, glue sticks, construction paper, pencils

Procedure:

Math

Discuss quadrilaterals and types of triangles

Demonstrate how to use quadrilaterals, and triangles to draw a toy car, doll, or robot

Explain that they will be gluing shapes to a paper to create a design.

Demonstrate how to use the sketch to select shapes and glue them onto a piece of paper.

Students create their sketch and glue them together for their design.

Tell students to label all quadrilaterals and triangles

Social Studies

Discuss scarcity, trade and exchange. Students read article about water scarcity in Uganda. Distribute remaining shapes. Give all the triangles to certain students. Give all the squares to a few students and provide only one square per student. Tell students to create a chart with shapes that have three sides, four sides and five sides. Explain that they will barter and trade their shapes and that their is a scarcity of certain shapes.

Day 6

Vocabulary

square, rectangle, triangle, rhombus, circle, oval

Materials:

a variety of recycled materials, paper, rulers, pencils

Procedure:

Math:

Discuss how some objects look like shapes.

Demonstrate some reusable objects and point out that it is made of geometric shapes. (a box viewed from the front is a rectangle for example)

Tell students that they will be using reused objects to design a toy but that they will first have to draw it using shapes.

Demonstrate how to use shapes to draw a simple doll, robot, car, plane, etc…

Explain that each shape will represent something that they will have to make

Divide students into groups and give each group a selection of reusable objects. Have them practice drawing each one using geometric shapes.

Social Studies:

Review the concept of scarcity and how things that were rare became more valuable leading to trade.

Show the video about making a toy car out of a plastic bottle

Have students discuss the value of a plastic bottle in Uganda compared to it's value in the United States.

Day 7

Vocabulary

square, rectangle, triangle, rhombus, circle, oval

Materials:

a variety of recycled materials, paper, rulers, pencils

Procedure:

Math

Remind students that they will be using reused objects to design a toy

Give them several examples of how reusable objects can be used to make toys.

Show students the book about making robots out of reusable materials.

Demonstrate how to draw a toy design using geometric shapes to represent reusable materials.

Students practice drawing their toy designs

Social Studies

Watch video about creating a banana leaf doll

Discuss how buyers and sellers interact by trading or using currency.

Ask students how much they would sell a banana leaf doll for.

Ask them what they would trade it for.

As a class, arrive at a price for a banana leaf doll.

Day 8

Vocabulary

right angle, acute angle, obtuse angle

Materials:

a variety of recycled materials, paper, rulers, pencils

Procedure:

Math

Remind students that they will be using reused objects to design a toy

Review the types of angles

Have students identify the angles in their toy design

Explain to students that angles add stability to objects.

Have students balance with their feet close together and spread apart to see the different angles.

Tell students to add angles to their toy designs to add stability

Students continue drawing their toy designs

Social Studies

Discuss Kenya

Locate Kenya on a map

Discuss how President Obama's father came from Kenya.

Explain that many ethnic groups have contributed to the History of the United States.

Have students read the Time article about the president.

Discuss how the President contributes to the country

Day 9

Materials:

a variety of recycled materials, paper, rulers, pencils

Procedure:

Math

Demonstrate several methods of gluing, or attaching parts to build out of reusable objects

Demonstrate how to choose objects that match the shapes of their designs

Have students choose several objects for their project

Tell students to follow the shapes in their designs in order to build a toy

Allow students to begin building toys

Day 10

Materials:

a variety of recycled materials, sketches, low temperature glue guns, scissors

Procedure:

Math

Demonstrate several methods of gluing, or attaching parts to build out of reusable objects

Demonstrate how to choose objects that match the shapes of their designs

Have students choose several objects for their project

Tell students to follow the shapes in their designs in order to build a toy

Students continue to build toys

Day 11

Materials:

a variety of recycled materials, sketches, low temperature glue guns, scissors

Procedure:

Math

Students continue to build toys

Interview students and assist them with problems they may be encountering

Ask students to identify the shapes in their toys

Day 12

Materials:

a variety of recycled materials, sketches, low temperature glue guns, scissors

Procedure:

Math

Students continue to build toys

Interview students and assist them with problems they may be encountering

Ask students to identify the angles in their toys

Day 12

Vocabulary

quadrilateral, right triangle acute triangle, obtuse triangle

Materials:

a variety of recycled materials, sketches, low temperature glue guns, scissors

Procedure:

Math:

Students continue to build toys

Interview students and assist them with problems they may be encountering

Ask students to categorize the shapes in their toys on a chart

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Day 13

Vocabulary

symmetry, congruent, line of symmetry

Materials:

a variety of recycled materials, sketches, low temperature glue guns, scissors

Procedure:

Math:

Students complete toys

Interview students and assist them with problems they may be encountering

Ask students how they balanced their toys using symmetry

Day 14

Vocabulary

quadrilateral, right triangle acute triangle, obtuse triangle

Materials:
a variety of recycled materials, sketches, low temperature glue guns, scissors

Procedure:

Math:

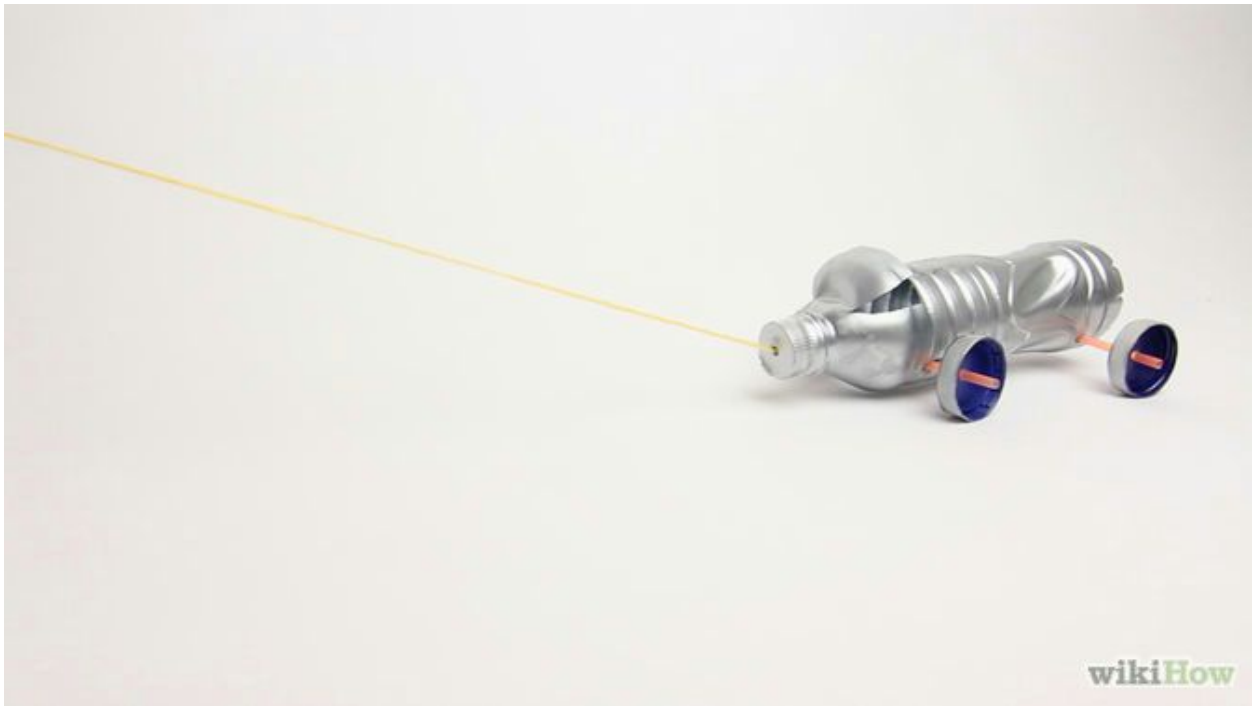
Students complete toys

Students demonstrate their toys to the class and identify the shapes and angles that they used

Step-by-Step Guide

Three Methods to Make a Toy from Reusables

First method: Toy car from plastic water bottle



1. Clean the plastic bottle. Take the label off the bottle. Let the bottle soak in hot water and dish soap for ten minutes. This will make it easier to remove any residue left on the bottle as well as cleaning off any bacteria.

2. Drill the two holes into each side of the bottle. These holes will be where the axles will go. The holes should be parallel with each other.

3. Find your axles. You can use a variety of objects for your axles: straws, sticks, toothpicks, or wire (like that from a wire hanger), etc. If the object is long, like a pencil, then you will only need two pieces. If it is short, like a toothpick, then you will need four pieces.

4. Gather four bottle caps. You will use these caps as your wheels.

5. Paint the car and wheels. You can paint the outside of the bottle and the wheels. It's easier to paint bottle and bottle caps before you fully assemble the car.

6. Place the axles into the plastic bottle. Depending on the material you chose, this might be two or four axles. For a longer object, run the axle all the way through the set of holes on the other side. For a shorter object, like a toothpick, place one in each hole.

7. Drill a hole into the lid. Knot a string and then thread it through the lid. Make sure the knot is on the inside of the lid. Screw the lid onto the plastic bottle.

8. Cut the top of the bottle to make a windshield. Using a sharp object like a box cutter, cut a rectangle or square into the top of the bottle. Only cut three sides of the shape so that you can fold it up. Cut it so that when you flip it up the windshield faces the lid of the bottle.

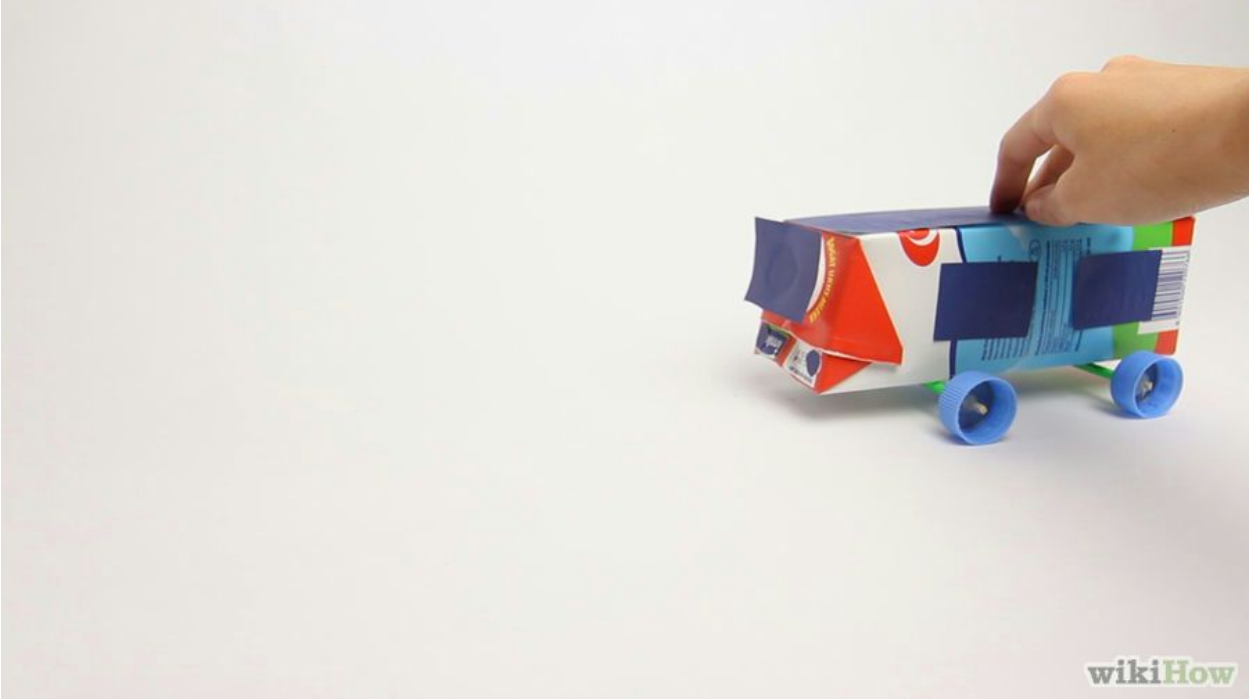
9. Drill a hole through each of the four plastic lids. Using a drill or sharp object, create a hole in the center of the lids.

10. Place the bottle caps onto the axles of the car. Run the axles through the holes you drilled in the bottle caps. See how the car sits. If the lids are too big or too small,

then the car may not move. Have the top of the lids face the car so that it has more stability.

11. Use the string to pull the car. If you don't want to use the string, then you can push the car to make it move.

Method 2: Toy car from juice or milk carton



1. Find four bottle caps. Poke holes into the caps with a sharp object like a box cutter, a pair of scissors, or a knife. The caps will be your wheels.

2. Place two bamboo skewers on a milk carton. Cut the skewers so that they are slightly longer than the width of the milk carton. The skewers will act as the axles

for the car. If you want the axles to run through the milk carton, take this time to puncture two parallel holes on each side of the carton.

3. Push one end of the skewers through bottle caps. Make sure the top of the lid is facing towards the milk carton as this provides better stability. Use glue where the skewer and cap meet to make it sturdier. Be sure to let the glue dry before proceeding.

4. Place straws on the skewers. Slide the free end of each skewer through a straw. Cut the straws down until they are slightly shorter than the skewer. Having the skewers inside of the straw will make your car move faster.

5. Push the skewers through the remaining bottle caps. If you punctured holes in the milk carton, run the free end of the skewer through the holes before adding the other wheel. This completes your axles.

6. Tape the axles horizontally across the milk carton. They should be parallel to the width of the carton.

7.Customize the car. Use construction paper, paint, or markers to decorate the carton. You can also cut shapes into the milk carton to give it character.

Method 3: Balloon car

1.Measure and cut a piece of cardboard. The piece should measure 8 cm by 10 cm. Take a piece of measuring tape and trace the measurements onto the cardboard using a pen or a pencil. Use a box cutter the cut along the traced line.

2. Drill a hole into 4 plastic lids. Using a drill or sharp object, create a hole in the center of the lids. These will create the wheels for the car.

3. Cut a straight straw in half. Take each half of the straw and tape them horizontally across the cardboard piece. Make sure the straws are parallel to the width of the cardboard piece.

4. Run a skewer through each of the straws. The skewers will act as your axles.

5. Attach the lids to the skewers. Make sure that the top of the bottle cap is facing towards the cardboard. This will prevent the lid from catching on the cardboard.

6. Cut the flexible drinking straw in half. Make sure the pieces are of equal length. Discard the part of the straw that doesn't bend.

7. Stretch the balloon. Inflate and deflate the balloon a few times to stretch the rubber.

8. Secure the balloon to the flexible drinking straw with a rubber band. Place the elastic part of the balloon over one side of the straw. Take a rubber band and wrap it over the elastic part of the balloon with the straw inside.

- Blow into the straw to test if the rubber band is tight enough. No air should be able to escape the balloon.

9. Tape the balloon and straw to the cardboard piece. Flip the cardboard piece over so that the axles are on the bottom. Place the balloon and straw on the cardboard, parallel to the length of the piece. Make sure the end of the straw is hanging over the edge of the cardboard. Tape the end of the straw to the cardboard.

10. Blow into the straw. Pick the car up and blow into the balloon through the straw. Pinch the straw so that no air escapes it. Place the car on a flat surface and let go of the straw. The air will escape the balloon and push the car.

- You may have to straighten the wheels a few times to get the best movement.

Resources

Links:

https://vimeo.com/78522041
video: Make a Homemade Banana Leaf Doll

https://www.youtube.com/watch?v=S66P0bonAT8

video: Make a toy car out of a plastic bottle- With Dennis from Uganda

http://water.org/post-p/catching-rain/
An article about water scarcity in Uganda

http://www.artyfactory.com/africanmasks/
A site about African masks

http://africanrockart.org/wp-content/uploads/2013/12/Nyero-booklet.pdf
A travel guide to visit rock art in Uganda

http://kidsactivitiesblog.com/17867/homemade-toys

A site about homemade toys of Uganda

http://www.inhabitots.com/martine-camillieri-creates-toy-automobiles-from-recycled-bottles/
Pictures of recycled toy cars

https://www.sendacow.org/uganda

A site with several videos about Uganda

http://www.timeforkids.com/news/meet-barack-obama/44386
Article about President Obama

http://www.metmuseum.org/toah/works-of-art/1996.403.5
Picture: Bust of Man by: Pablo Picasso

http://www.metmuseum.org/toah/works-of-art/1997.149.10
Picture: Woman's Head by: Modigliani

http://www.wikihow.com/Make-a-Toy-Car
step-by-step guide to building a toy car

books:

Recycled Robots by Robert Malone

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