

Unit 5 (Structures): Flat Space

Concept

The space in a structure can be flattened out.

Content Objective

Predict shapes of boxes when flat by using cut paper rectangles.

Language Objectives

Students will learn the meaning of the word "blueprint" that is used for engineering design

Students will orally share predictions structures that are flattened out

Students will use high-frequency Math words necessary for describing structures that are flattened out: *shapes, rectangles, squares.*

Standards

• NGSS:

- **K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define problem that can be solved with a new or improved object or tool.
- **K-2-ETS1-2.** Make a drawing or physical model to illustrate how the shape of an object helps it to solve a problem.
- **K-PS2-1.** Conduct investigation comparing strengths and directions of pushes and pulls on motion of object.

• TEKS:

- **2E** communicate observations with others about simple descriptive investigations (communicate observations)
- **3B** make predictions based on observable patterns in nature such as the shapes of leaves (predict from patterns)
- **6C** observe and describe the location of an object in relation to another such as above, below, behind, in front of, and beside (relative location of objects)

• ELPS:

- **1A** Use prior knowledge and experiences to understand meanings in English. [Prior knowledge]
- **1D** Speak using learning strategies such as requesting assistance, employing nonverbal cues, using synonyms & circumlocution (conveying ideas by defining or describing when exact English words are not known) [Making Meaning]

- **3A:** Practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible. [Phonemic Production]
- **3E** Share information in cooperative learning interactions [Communicative Competence]

Suggested Literature Connections:

“The Birthday Box” by Leslie Patricelli

Materials:

Cardboard container boxes (cereal, etc.); cut construction paper shapes; paste; markers; newsprint paper; paper

Teacher Preparation

Arrange for a guest to come talk to the class about the importance of blueprints as planning tools. Also, take a cereal or other recycled box and peel it apart at the seam. Flatten it out, smoothing all of the faces. Then, lightly tape the sides so that it looks like a whole box again.

Suggested Activity Centers

- **Map-Making:** Let students work with maps as plans for how to get somewhere.
- **Teddy Bear House:** Students draw a picture plan of a house they would like to make for their teddy bear.
- **Make a Box:** Students try folding a piece of paper into a box, and number the faces.
- **Multimedia:** Students audio-record a plan for making a peanut butter sandwich and then try to follow someone else’s sandwich

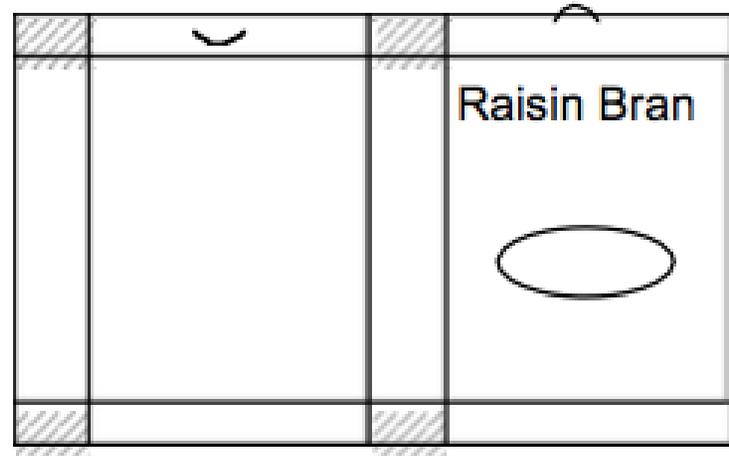
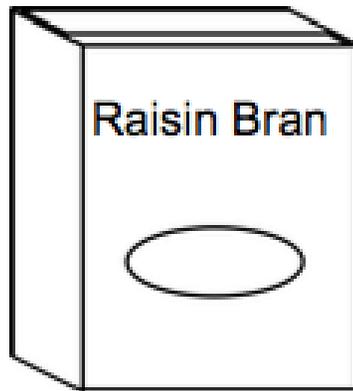
Teacher Says/Does	Student Says/Does	Language requirements
<p>may have a tab and a slit to connect the sides closed.) Ask the students to share in partners how the box top works, e.g. it connects and disconnects when you want it to. Analyze the opening and closing end of the box. Ask students to share in partners and pose the question: <i>What makes it work?</i> Ask the children to describe its features. Remind the children to observe closely.</p> <p>6. Ask the students to close their eyes and imagine what the box will look like if the box lies flat on the floor.</p> <p>7. Tell the students that you will open the box out flat because you have removed the glue from the sides, and display the opened-flat cereal box as seen in the figure in the handout. Ask student to raise their hands if the box matched what they imagined.</p>	<p>Students describe the features and analyze the workings of a cereal box</p>	

Day 2: Explore/Explain

Teacher Says/Does	Student Says/Does	Language requirements
<ol style="list-style-type: none">1. Blueprints. Tell the students that they can predict the shape of objects like this box with sketches using cut paper pieces. These pictures that help predict or plan are what engineers call “blueprints”. Chorally say the word together a few times with students. Guide students in creating a gesture for “blueprints” such as one hand symbolizing paper and another hand drawing on it. Inform students that they will get to create their own blueprints of the cereal box to imagine what that cereal box, or structure, will look like when it is flat.2. Briefly display the opened-flat cereal box and then remove it from view as students begin to work to encourage students’ predicting rather than copying. Remind students to use their imaginations and creativity in making their blueprints of the cereal box.3. Hand out cut paper shapes to engineering teams of two students. Each team should receive narrow rectangles and wide rectangles to work with. (Alternatively, you can ask students to trace their cereal box faces, then cut out the shapes, using those for their blueprint.)4. Have the student teams use the cut paper shapes and make pictures (blueprints) of what they think the box will look like when it’s laid flat. They can simply place the cut shapes onto the floor, moving them around until they are arranged as they wish. Then they can push the arrangement into the area in which the other groups can see what they have done. As teams are working, check in with them and model using the word “blueprints” when posing questions to them.		Vocabulary: blueprint/sketch

Day 3: Evaluate/Elaborate

Teacher Says/Does	Student Says/Does	Language requirements
<ol style="list-style-type: none"> 1. Gallery walk. Once all engineering pairs have finished their blueprints, tape them up on the walls around the room. Have students walk around the room to observe and analyze each blueprint. Ask them to think about which ones are the same and which are different. After the gallery walk, have students find a partner different from their engineering partner and share their observations/analysis. Students may interchange the words “pictures” and “blueprints” as they are analyzing the blueprints. 2. Come back together. Ask engineering pairs to bring their blueprints with them. Share out some observations and analysis of the blueprints. You may decide to encourage students to avoid saying students’ names when sharing observations and analysis whole group. Then lay the cut cereal box flat and compare the blueprints to the flattened box. Have the students, in their pairs, check their blueprints and see if they can find where the plans differ from the actual flat box. 3. Self-evaluate. Ask students to self-evaluate the teamwork in making the blueprints to find out how well they worked with their partner. Pose questions such as: Did both members contribute ideas? Did both members help trace or draw? Have students show fingers to kinesthetically respond: 3 fingers=Definitely, 2 fingers=Sometimes, 1 finger=No, we probably need to work on that. If any teams need to be re-configured, now is a good time to do it. 4. Using handout (K.5.2), have student pairs work on writing, drawing, giving a synonym and describing the meaning of the word "blueprint" 		



-  fold flaps – close gaps
-  glue flap – gives a surface to glue box at seam

Name: _____ Date: _____

<p>(Write the word)</p>	<p>(Give an example)</p>
<p>(Describe it in your own words)</p>	<p>(Another word with same meaning)</p>