2-D and 3-D Shapes
Teaching Tips: Kindergarten

Using Best Instructional Practices with Educational Media to Enhance Learning
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# Unit Overview

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**Maintain Brisk Pacing**
Research demonstrates that “brisk” pacing is related to greater content coverage, increased motivation and engagement, and, in turn, higher levels of student achievement.

- **Note the time allocated to each component of the lesson.** Monitor the length of your teaching and children’s turns so that all activities are completed within the allocated time.
- **Establish a predetermined system for calling on children** to work at the whiteboard. For example, write each child’s name on a Popsicle stick and place the sticks in a jar. To call a child to the board, draw a stick from the jar. When a child’s name is selected, set that stick aside, leaving only the sticks of children not yet chosen.
- **Invite all selected children to the whiteboard at once** when more than one child will be playing.

**Engage All Children**
When children are highly focused and engaged, they attain higher levels of achievement.

- **Position children so they do not block the screen** when they stand at the whiteboard, so that everybody can see the videos, games, images, and activities.
- **Involve all children in thinking about the correct answers** even if it is not their turn at the whiteboard.
  - Use strategies such as “Turn and Talk.” For example, ask all children to tell a partner the answer they would choose, or if they agree/disagree with a stated choice.
  - When the child at the whiteboard gives an answer, invite all the others to show “thumbs up” if they agree with the answer or “thumbs down” if they disagree.
- **Observe children’s understanding of key concepts.** When most children demonstrate understanding by rapidly choosing correct responses, wrap up the lesson.

**Support Independent Learning**
When teachers notice and name the learning strategies children use, children are more likely to become strategic and independent learners.
Use Key Vocabulary Frequently
When children have many opportunities to hear and use new vocabulary words, they are more likely to acquire and use the words on their own.

- **Repeat key words as often as possible** during the lesson, as well as during other parts of the school day when use of these words is appropriate.
- **Ask children to use key words** while playing the games.
  - When children are at the whiteboard, encourage them to use key words to describe their actions. For example, “I **combined** two squares to make a rectangle.”
  - When children are invited to Turn and Talk, encourage them to use key words. For example, “The **artist** used really bright colors.”

Mediate Game Play
When well-developed educational media programs are effectively joined with a sound classroom curriculum, children demonstrate high levels of motivation and engagement as well as notable increases in early literacy and mathematics skills and knowledge.

- **Load the game on the computer and minimize it before you begin the lesson.** This allows you to optimize instructional time by beginning game play as soon as you and the children are ready.
- **Preview the screen to explain what children will do.** Point out game features such as selecting objects, moving objects, and repeating the game instructions.
- **Quickly mute/unmute the sound by using the mute button** on the top row of the computer keyboard. You can also use the volume down/up buttons on the keyboard, or the volume controls on the interactive whiteboard, to adjust the sound.
- **If the touch function doesn’t work, use your computer to click on the item the child touches.**
- **Prepare for the worst!** Have a dry erase board or manipulatives available to carry out activities intended for the interactive whiteboard (such as drawing 2-D shapes or sorting 2-D and 3-D shapes).
Lesson 1: Preview

**Video: Cat Likes Circles (1:35)**
Preview the video: pbskids.org/peg/videos/cat-likes-circles

Cat sings about why he only draws circles—he likes circles because they’re round. His friends show him other shapes he might draw, such as rectangles, squares, triangles, or spheres. But he just likes to draw circles.

The video features Cat as an artist, and his friends describe his circle art with interesting words such as awesome, inspiring, dazzling.

**Game: Paint-a-Long (Shapes)**
Preview the game: pbskids.org/peg/games/paint-a-long

This game has three options: Shapes, Characters, and Draw on Your Own. The lesson focuses on Shapes, which introduces the names and attributes of four shapes: circles, squares, triangles, and rectangles.

Peg names and describes each shape, then shows how to draw it. Players choose a paint color to draw the featured shape. They can draw the sides in any order, but the shape must be in the same orientation. The game randomly provides the first shape. At any time players can choose a shape by selecting an icon in the top left corner. The game does not increase in difficulty.

**Helpful Background**
Although the featured shapes may be familiar to most children, the game teaches the attributes of each shape and provides practice in drawing them.

Note that Peg shows two different kinds of triangles—an equilateral triangle and a right triangle (described as a special triangle with one corner that looks like a square). The game also features a rectangle in two different orientations. You may want to point this out to children as they play.

When playing the Peg + Cat games, children are sometimes rewarded with a “hidden rock.” They can use these rocks to make pictures in the Rock Art game.
Lesson 1: Objectives

1. Build Background
Conduct a teacher-led activity that activates and builds children’s background knowledge.

2. Watch Together
View a short video to introduce or review math concepts and to hear new vocabulary in context.

3. Get Ready to Play
Use the interactive whiteboard to preview the game in a teacher-led lesson.

4. Play Together
Play the game as a teacher-led activity.

5. Explore with a Friend
Practice alone or with a partner at a learning station.

In this lesson, children will:

- attend to precision (mathematical practice)
- name and describe the attributes of circles, squares, triangles, and rectangles
- draw circles, squares, triangles, and rectangles
- learn new vocabulary, such as artist and attributes, and use these words in context
- use technology to learn, working individually and in groups
Lesson 1: Build Background

Time: 5 minutes

**Teacher Prep**

1. Open the SMART Notebook™ file called Vocab–Artist. You may want to preview the four examples of art (see instructions in the lesson).

2. If you don’t have individual whiteboards, you can make them by putting a white piece of paper in a transparent sheet protector and providing dry erase markers.

3. Launch the video, then press the pause button to stop it from playing. Minimize the video to place it on the dock for easy access.

   pbskids.org/peg/videos/cat-likes-circles

4. Launch the game Paint-a-Long and minimize it for easy access when it’s time to play the game.

   pbskids.org/peg/games/paint-a-long

5. Create the classroom chart shown on page 12 for display near the whiteboard or at a learning center.

Tell children that in the video they will watch, *Cat Likes Circles*, Peg reveals Cat’s drawing of circles. Cat’s friends admire his drawing, calling him a great artist. Help children understand the meaning of the word **artist**:

- Explain that an **artist** creates something beautiful or interesting for people to see or hear.
- Point out that some **artists** paint or draw; some build with clay, wood, or other materials; some dance or sing; some make music.
- Display an example of art from the Vocab–Artist file by selecting and dragging one of the top or side arrows to the center of the screen. (To remove the artwork, select the reset button on the toolbar, then confirm that you want to reset the page.)
- Point to the art and model a response, such as: *This artist chose such beautiful colors. I feel happy when I look at it.*
- Display another example and say: *Turn and talk to a friend about what the artist did to make this beautiful or interesting. Invite a few children to share their ideas.*
- Let children know that Cat is an **artist** who only draws circles. Say: *After watching, I’ll ask you why Cat likes circles so much and to name the other shapes you saw.*
- Close the Vocab–Artist file.
Lesson 1: Watch Together

Display the video called Cat Likes Circles. Press the play button and watch the video together. After viewing:

- Ask: Why does Cat like circles? (because they are round and flat)
- Have children talk with their partners about what other shapes they saw in the video. (square, rectangle, triangle)
- Tell children that you are going to draw some of the shapes that were in the video.
- On the whiteboard, use the pen tool to draw a square.
- Invite children to raise their hands if they know the name of the shape. Call on a child to name the shape.
- Repeat for the rectangle, circle, and triangle.
- Close the video screen.
Display the Paint-a-Long game. After you press the play button, Peg describes the three game options. Tell children they will play the Shapes option.

- Point out that the mute button turns the sound on and off, and the check mark means the sound is on.
- Explain that Peg is going to demonstrate how to draw several different shapes. Note that Peg will name the shape, describe the shape, and show how to draw it.
- Tell children that they need to listen closely as Peg describes each shape. Explain that the information she provides about whether the lines are straight or round, the number of sides, the length of the sides, and how many corners the shape has are the attributes of each shape. Knowing the attributes will help children draw shapes on their own.
- Tell children that after Peg demonstrates each shape, they will draw it on whiteboards or paper. One child will describe the attributes of that shape and draw the shape on the interactive whiteboard.
- Provide children with individual whiteboards or paper and pencils.
Lesson 1: Play Together

Time: 10 minutes

Remind children to listen closely as Peg names and describes each shape she draws. Press the Shapes icon to begin the game.

• Sweep your finger under the name of the shape and ask children to say the name with you. Have them repeat the shape’s name two or three times.
• Tell them to draw the shape on their whiteboards.
• Point to Peg’s shape and ask children to check if the shape they drew looks like Peg’s. If not, have them try again.
• Invite a child to the whiteboard to point to and describe the shape’s attributes. Then have the child choose a paint color and draw the shape.
• If the child does not draw it correctly, have the child use the eraser to clear the screen. Review the attributes of the shape and ask the child to redraw it. Once the child draws the shape correctly, the narrator will say, “Cool.”
• Say: That’s a great [shape]. You are an artist, just like Cat!
• Invite different children to the whiteboard to select a shape, describe its attributes, and draw the shape, while other children draw the shape on their individual whiteboards.

When most children have correctly drawn the featured shapes, stop playing and review key concepts. Ask:

• What shapes did we identify and draw? (circle, square, triangle, rectangle)
• What attributes of shapes did we use to describe them? (straight or round lines, the number of sides, the length of the sides, the number of corners)

Tell children: Practice drawing shapes at home. Like many artists, you can use shapes in your drawings and paintings. When you show your artwork to family and friends, name and describe the attributes of shapes you drew.
Lesson 1: Explore with a Friend

Time: 5–10 minutes

Set up a learning station where children can play Paint-a-Long alone or with a partner. Display the Classroom Chart: Shapes where children can see it.

As children play, check that they are making the connection between the featured shape and the shape they are drawing. Ask:

- **What shape are you making?**
- **What are the attributes of that shape?**
- **Where do you see that shape in our classroom?**
- **Point out the Classroom Chart: Shapes. Remind children that they can use this chart to remember the different shapes they will practice drawing.**

### Classroom Chart: Shapes

<table>
<thead>
<tr>
<th>Shape</th>
<th>Name</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="#">Circle</a></td>
<td>circle</td>
<td>perfectly round</td>
</tr>
<tr>
<td><a href="#">Triangle</a></td>
<td>triangle</td>
<td>3 corners 3 sides</td>
</tr>
<tr>
<td><a href="#">Right Triangle</a></td>
<td>right triangle</td>
<td>3 corners 3 sides 1 corner like a square</td>
</tr>
<tr>
<td><a href="#">Rectangle</a></td>
<td>rectangle</td>
<td>4 corners 4 sides opposite sides are the same length</td>
</tr>
<tr>
<td><a href="#">Square</a></td>
<td>square</td>
<td>4 corners 4 sides that are all the same length</td>
</tr>
</tbody>
</table>

### Teacher Reflection

- **Did you stay within the recommended time limits?** If not, review brisk pacing routines (page 4) to see if these might help.

- **Did most students name, describe, and accurately draw each shape?** If not, consider repeating this part of the lesson (page 11) in a small group for children who need extra help.

- **Did children use new vocabulary (artist, attributes) during and after playing the game?** If not, review the words briefly as you continue to play this and other games. Prompt children to use the words on their own.
Lesson 2: Preview

Video: Chickens in Space (:44)
Preview the video: pbskids.org/peg/videos/chickens-in-space

Peg and Cat are on the Purple Planet when they see a weird spaceship coming toward them. Could a monster be inside? The spaceship lands, but instead of a monster there are one hundred chickens...and a pig.

Game: Chicken Blast Off
Preview the game: pbskids.org/peg/games/chicken-blastoff

All the farm animals want to follow the chickens into space. Players first decide which spaceship is the best shape. They can try out each shape to see whether the animals completely fit inside.

Once players find the right shape, they select the check mark. Then they build the spaceship by selecting and placing various pieces into the rocket shape. A click sound means the piece is in the right place.

The game increases in difficulty as players build rockets for different groups of animals.

For example:
- The number of possible spaceship shapes increases from three to six.
- The number of pieces needed to build a spaceship increases from three to ten.
- The number of pieces shown increases from three to fourteen, and there are more pieces than needed.
- The pieces needed are no longer outlined in the spaceship shape.
- There are multiple solutions.
- A small model of the completed spaceship is no longer shown in the top left corner.

Helpful Background
Peg sometimes compliments children’s “piece placing” or calls them “expert” builders. Support additional vocabulary learning by defining and using these words during gameplay.

You can use this game to have children practice describing non-standard shapes. They can observe whether the lines are straight or curved, then count the number of sides and corners. They can compare the shape to a familiar shape. (“This looks like a trapezoid with a piece cut out.”)
Lesson 2: Objectives

In this lesson, children will:

• use appropriate tools—such as a model—strategically (mathematical practice)
• identify basic shapes within a larger, more complex shape
• combine basic shapes to form larger and different shapes
• describe relative positions of objects
• learn new vocabulary, such as weird, combine, and model, and use these words in context
• use technology to learn, working individually and in groups

1. Build Background
Conduct a teacher-led activity that activates and builds children’s background knowledge.

2. Watch Together
View a short video to introduce or review math concepts and to hear new vocabulary in context.

3. Get Ready to Play
Use the interactive whiteboard to preview the game in a teacher-led lesson.

4. Play Together
Play the game as a teacher-led activity.

5. Explore with a Friend
Practice alone or with a partner at a learning station.
Remind children that they have been learning how to draw shapes. Then draw a square, triangle, circle, and rectangle on the interactive whiteboard.

- Say: Now we are going to learn how we can **combine** these shapes to make new shapes.
- Draw a triangle on top of a square and say: Look! I made a house!
- Distribute individual whiteboards and tell children to draw a square and a triangle together to make a house.
- Explain that artists often use shapes when they draw or paint, putting them together to make new shapes.
Lesson 2: Watch Together

Display the video called Chickens in Space. Press the play button and watch the video together. After viewing:

- Ask: *How did the chickens and pig travel to space?* (they built a spaceship)
- Close the video screen and display the Chicken Blast Off game. Point out the rocket on the opening screen.
- Say: *Peg described the spaceship as weird. When we say something is weird we mean that it is strange or unusual.*
- Have children look at the spaceship. Then have them turn and talk to their partners about why Peg might think the spaceship looks weird. Invite a few children to share their answers. (e.g., unusual colors, barn door)
- Point out that the spaceship was made by putting different shapes together. Ask: *What shapes did they use?* (triangle, rectangle)
Lesson 2: Get Ready to Play

Press the play button and have children watch Peg’s introduction. After the introduction, the game screen appears and Peg provides the first instruction for playing the game.

Point out that there are several steps for building spaceships for the farm animals:

• First, they must choose the spaceship that is the right size for the animals. Ask: What will happen if the spaceship is too small? What might happen if it’s too big?

• Demonstrate how they can pick a shape to see whether it’s big enough for the animals. Choose one of the incorrect shapes and ask children to give a “thumbs up” or “thumbs down” if they think the animals fit inside this spaceship. Ask: How can you tell? (part of the animal is outside the shape)

• Point to the check mark. Tell children that once they choose the spaceship that is the right size, they will select this check mark.

• Next, they will select shapes and put them together, or combine them, to build the spaceship.
Lesson 2: Play Together

Time: 10 minutes

Choosing a Spaceship
• Remind children that they need to find the shape that is just the right size to fit the animals.
• Invite a child to the whiteboard (standing to the side so other children can see the screen).
• Ask: Which shape will make the perfect-size spaceship? Have the child point to (but not select) a shape.
• Invite the class to show “thumbs up” (agree) or “thumbs down” (disagree).
• Tell the child to touch the shape to see if all of the animals fit.
• If they do, have the child touch the check box. If not, have the child choose another shape until the correct shape is selected.

Building a Spaceship
• Point out the shapes at the bottom of the screen. Tell children they need to combine these shapes to build the spaceship.
• Explain that they can compare the shapes at the bottom with the outlined shapes in the spaceship to figure out which shapes they need and where to put them. They may not need to use all the shapes.
• Point to the picture of the spaceship in the top left corner and say: It’s like putting together a puzzle. If you need help, you can look at this model, a smaller version of the finished spaceship. Note that as they keep playing there will be more shapes to combine. The spaceship won’t have outlines showing where the shapes go and there won’t be a model to look at.
• Have children talk with their partners about where each spaceship shape should go. Prompt them to use positional words.
• Invite several children to the whiteboard and have them take turns moving a shape into the right place.

Continue playing until most children have correctly selected the shapes to build spaceships, then review key concepts. Ask:
• What happened when we combined shapes? (we made new shapes—spaceships for the farm animals)
• What new words did we learn? (weird, combine, model)

Tell children: Practice combining shapes to create new shapes, objects, and even some weird designs. When you show your artwork to family and friends, point out the shapes you combined.
Lesson 2: Explore with a Friend

Help children choose between two activities:

1. **Play Chicken Blast Off at a learning station, alone or with a partner.**
   As children play, check that they are not choosing shapes randomly. Ask:
   - How did you decide which shape to pick for your spaceship?
   - How did you choose the shapes for the spaceship and where to put them?
   If children are randomly choosing or placing shapes, point out the outlines on the spaceship and the model that shows a completed spaceship.

2. **Create new shapes and designs at the interactive whiteboard.**
   Display the SMART Notebook™ file called Shapes 2D–Replicating.
   - Show children how they can drag a shape to move it somewhere else on the whiteboard. They can also touch a shape, then diagonally drag the gray circle in the bottom corner to change the size. Use the green circle to rotate a shape.
   - Have children take turns creating new shapes and pictures by combining shapes.
   - Ask: What did you make by combining shapes? What shapes did you use?
   - You can use the camera feature on the interactive whiteboard toolbar to take a picture of the screen, to capture the shapes and pictures children make.

**Teacher Reflection**

- Did you stay within the recommended time limits? If not, review brisk pacing routines to see if these might help (page 4).
- Are most students able to identify basic shapes within a larger, more complex shape? If not, consider repeating this part of the lesson (page 15) in a small group for children who need extra help.
- Are most children able to combine basic shapes to form larger and different shapes? If not, consider repeating this part of the lesson (page 18) in a small group for children who need extra help.
- Did most children use new vocabulary (weird, combine, model) during and after playing the game? If not, review the words briefly as you continue to play this and other games and prompt children to use the words on their own.
Lesson 3: Preview

**Game: Paint-a-Long (Characters)**
Preview the game: pbskids.org/peg/games/paint-a-long

This game has three options: Shapes, Characters, and Draw on Your Own. The lesson focuses on the Characters option, which shows how to use shapes to draw four Peg + Cat characters: Cat, a chicken, Big Mouth, and Peg.

The game randomly selects the first character for players to draw. Peg names a shape to draw and shows how to make it. Players select a paint color to draw the shape. If the shape is drawn correctly, Peg gives instructions for the next shape. If not, players can use the eraser to remove the last thing they drew. The <button> button advances the game to the next instruction.

Once players have drawn all the shapes, Peg finishes her picture by drawing hair, ears, and other features. She tells players to “add some detail” to their drawings.

Players can select one of the icons at the top at any time to draw a different character.

**Helpful Background**
For this lesson to be successful, children should be able to draw shapes on the whiteboard that match the shapes that are shown.

In addition to circles, triangles, squares, and rectangles, this game features ovals and trapezoids—two shapes that children did not name in previous lessons. You may want to call attention to these shapes when Peg draws them.
Lesson 3: Objectives

1. **Build Background**
   Conduct a teacher-led activity that activates and builds children’s background knowledge.

2. **Get Ready to Play**
   Use the interactive whiteboard to preview the game in a teacher-led lesson.

3. **Play Together**
   Play the game as a teacher-led activity.

4. **Explore with a Friend**
   Practice alone or with a partner at a learning station.

**In this lesson, children will:**

- attend to precision (mathematical practice)
- name shapes of different sizes and in different orientations: circle, oval, square, rectangle, triangle, trapezoid
- draw shapes
- combine basic shapes to make pictures of people and animals
- learn new vocabulary, such as **character** and **curvy**, and use these words in context
- use technology to learn, working individually and in groups
Lesson 3: Build Background

Time: 5 minutes

Teacher Prep

1. Have individual whiteboards on hand.

2. Launch the game Paint-a-Long and minimize it for easy access when it’s time to play the game. pbskids.org/peg/games/paint-a-long

• Remind children that they have learned to combine shapes to make new shapes and objects, such as the spaceships they built for the farm animals in Chicken Blast Off.

• Explain that shapes can also be combined to draw people and animals.

• Display the Paint-a-Long game screen, and point out the Peg + Cat characters (Peg, Cat, and Big Mouth). Explain that characters are the people, animals, or creatures in books, TV shows, movies, plays, and games.

• Point to Peg and ask children to identify shapes that were put together to make this character. For example, Peg’s head and buttons are circles, her eyes are ovals, and her legs are rectangles.

• Explain that in the game they are going to play, they will use shapes to draw Peg + Cat characters.
Display the game. Press the play button and have children listen to Peg’s introduction. Point out the three options.

- Remind children that in a previous lesson they selected the first box to learn to draw shapes.
- Explain that in this lesson they will choose the second box to learn how to make and combine shapes to draw Cat, a chicken, Big Mouth, or Peg.
- Point out that they will draw circles, ovals, squares, rectangles, triangles, and trapezoids. Some of these shapes will be in different orientations.
- Tell them they will also use straight and *curvy* lines—lines that bend without any corners.
- Select the second box and tell children to listen to Peg’s instructions.
- Next, point to the paint cans and explain that they can pick any color to copy each shape that Peg draws.
- Point to the eraser and explain that they can use it to undo the last shape they drew if it doesn’t match Peg’s shape.
- Point out the `next →` button. Explain that if the game doesn’t recognize a shape they drew correctly, they can press that button to get the next instruction.
- Provide children with individual whiteboards or paper and pencils.
Lesson 3: Play Together

Time: 10 minutes

Remind children which character Peg is going to teach them how to draw first.

- Invite one child to the interactive whiteboard to draw the shape Peg made. Tell the other children to draw the shape on their own whiteboards.
- Have children continue drawing as Peg gives each new instruction.
- After the children follow Peg’s instruction to “add some detail,” review the steps they followed, naming each shape and the order in which they added each.
- To sum up, say: Now we know how to combine shapes to draw [character name]! We are artists!
- Repeat these steps as you invite different children to pick one of the other characters to draw (by choosing an icon at the top left corner of the screen).

When children have combined shapes to draw some or all of the featured characters, stop playing and review key concepts. Ask:

- What did we learn about shapes? (we can combine shapes to draw people and animals)
- What new words did we learn? (character, curvy)

Tell children: Practice combining shapes together to draw pictures of people, animals, and other characters. Show your artwork to family and friends and ask them to find all the shapes you combined to make each drawing. Point out the straight and curvy lines.

NOTE: Children may need teacher guidance to draw the shapes so that the game continues. For example:

- Make sure they draw the shape in the correct location.
- If the game doesn’t recognize a shape that is drawn correctly, children can select the button to continue drawing.
- If a shape isn’t drawn correctly, children can select the eraser to remove the last shape they drew.
- If the eraser doesn’t erase the shape, have children draw it again anyway.
- Sometimes the eraser wipes out more than one shape or just part of a shape. Help children redraw whatever lines or shapes are needed for the picture.
- Note that once Peg moves on to the next instruction, you can’t erase the previous shape.
Lesson 3: Explore with a Friend

Set up a learning station where children can play Paint-a-Long (Characters) alone or with a partner.

As children play, check that they are making a connection between the attributes of each shape and the character they are drawing. Ask:

- What character from Peg + Cat are you drawing?
- What are the attributes of the shape you just drew?
- What other shapes did you use to make this character?
- What kinds of lines did you use? (straight, curvy)

Teacher Reflection

- Did you stay within the recommended time limits? If not, review brisk pacing routines to see if these might help (page 4).
- Are most students able to name and recognize shapes in different orientations? If not, consider repeating this part of the lesson (page 24) in a small group for children who need extra help.
- Are most children able to draw and combine shapes to make characters? If not, consider repeating this part of the lesson (page 24) in a small group for children who need extra help.
- Did most children use new vocabulary (character, curvy) during and after playing the game? If not, review the words briefly as you continue to play this and other games and prompt children to use the words on their own.
Lesson 4: Preview

Video: Building a Rocket with Shapes (1:00)
Preview the video: pbskids.org/peg/videos/building-a-rocket-with-shapes

In this Math in the Bath segment, Peg and Cat have built a rocket to blast Cat into space, using objects commonly found in the bathroom. When Peg describes how they built the rocket, she gives the mathematical names for the 3-D shapes.

For example, Peg says they built the rocket’s engine with rectangular prisms (tissue boxes). They stacked cylinders (toilet paper rolls) to make “massive columns.” Cat is fastened into a cylinder seat (trash can), ready for blastoff. At the end, both Peg and Cat land in the bathtub.

Helpful Background
Instead of a Peg + Cat game, this lesson features a teacher-led activity using a SMART Notebook™ file to help children practice recognizing and sorting 2-D and 3-D shapes.

There are two options for the Explore with a Friend activity. Each uses a SMART Notebook™ file that needs to be set up on the interactive whiteboard, not at a computer. The first option gives children additional practice in sorting shapes. The second option lets children combine images of 3-D shapes to make new shapes.

Before beginning the lesson, you may want to preview these two files to decide which one you plan to use. Be sure to open the file on the whiteboard (and minimize it) so it will be available for independent learning.
Lesson 4: Objectives

1. **Build Background**
   Conduct a whole-class activity that activates and builds children’s background knowledge.

2. **Watch Together**
   View a video to introduce or review math concepts and to hear new vocabulary in context.

3. **Get Ready to Play**
   Use the interactive whiteboard to preview a teacher-led activity.

4. **Play Together**
   Play a teacher-led activity.

5. **Explore with a Friend**
   Practice alone or with a partner at a learning station.

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**In this lesson, children will:**

- construct viable arguments and critique the reasoning of others
- differentiate between flat, 2-D shapes and solid, 3-D shapes
- name and describe 3-D shapes (cylinder, rectangular prism)
- compose two or more solids to create a new shape
- learn new academic vocabulary, such as **flat, solid, two-dimensional (2-D), three-dimensional (3-D), rectangular prism, cylinder, and sort**, and use these words in context
- use technology to learn, working individually and in groups
Lesson 4: Build Background

Time: 5 minutes

Introduce the difference between **two-dimensional** and **three-dimensional** shapes:

- Hold up the paper cut-out of a circle and ask children to name it. Then hold up and name a sphere.
- Ask children to look carefully at the circle and sphere. Using Turn and Talk, have them tell a partner how the shapes are the same and different. (They are both round; the circle is **flat** and the sphere is **solid**.) Invite a few children to share their responses.
- Explain that **flat** shapes like the circle are called **two-dimensional**, or **2-D**, shapes. **Solid** shapes like the sphere are called **three-dimensional**, or **3-D**, shapes.
- Repeat these steps with a square and a cube, a rectangle and a tissue box, a circle and a toilet paper roll.

**Teacher Prep**

1. Prepare paper cut-outs of a square, rectangle, and circle. (Make sure to make the shapes with paper so that they are flat.)

2. Collect tissue boxes, cubes, toilet paper rolls, and spheres (any kind of ball).


4. Open two SMART Notebook™ files: Shape Sort–2D and 3D, Shapes 3D–Replicating. Minimize the files to place them on the dock for easy access.
Lesson 4: Watch Together

Time: 5 minutes

Display the video called Math in the Bath: Building a Rocket with Shapes. Tell children:

- In the video they are going to watch, Peg and Cat have built a rocket using solid, three-dimensional shapes that are often found in a bathroom.
- After they watch the video, you will ask them to name the objects Peg and Cat used to build the rocket and the mathematical names for the shapes of those objects.

Press the play button and watch the video together. After viewing, ask:

- What did Peg and Cat do in the bathroom? (built a rocket)
- What objects did they use to build the rocket? (toilet paper rolls, tissue boxes, trash can)
- What did Peg call these solid, three-dimensional shapes? (tissue box: rectangular prism; toilet paper roll and trash can: cylinder)

Close the video screen.
Lesson 4: Get Ready to Play

Time: 5 minutes

Display the SMART Notebook™ file called Shape Sort–2D and 3D.

- Tell children that in this activity they will sort objects into two groups: flat (2-D) and solid (3-D) shapes.
- Explain that sort means to put objects that are alike into groups.
- Provide some examples, such as sorting blocks by color or sorting toy vehicles into groups of cars and trucks.
- As you point to the first column, say: The objects in this group should include only flat, 2-D shapes.
- Next, point to the second column and say: This group should include only solid, 3-D shapes.
Lesson 4: Play Together

Have children take turns at the whiteboard sorting an object into the correct column until all the objects have been sorted:

- Ask the child at the whiteboard to choose an object (e.g., toilet paper roll) and say the mathematical name of the shape (cylinder).
- Next, have the child move the shape to the correct box.
- After each shape is sorted, have the rest of the class give a “thumbs up” or “thumbs down” to agree or disagree with the choice.
- When children have sorted all the objects, select the “Check” button at the top. Items sorted correctly are marked with a green ✔. Incorrectly sorted items are marked with a red X. Invite children to move any incorrectly sorted items to the correct column.

Once all objects have been sorted correctly, stop playing and review key concepts. Ask:

- What two different types of shapes did we learn about today? (solid, three-dimensional shapes and flat, two-dimensional shapes)
- What are two types of solid, three-dimensional shapes? (cylinders, rectangular prisms)

Tell children: Practice identifying shapes as flat (2-D) or solid (3-D) at home. With a friend or family member, tour (walk around) each room in your house and point out flat, 2-D shapes and solid, 3-D shapes.
Lesson 4: Explore with a Friend

Time: 10 minutes

Choose one of these activities for independent learning time:

1. Set up a learning station at the interactive whiteboard with the SMART Notebook™ file called Shape Sort–2D and 3D.
   Remind children that as they sort the shapes, they should name each object (e.g., tissue box) and say the mathematical name of the shape (e.g., rectangular prism).

2. Set up a learning station at the interactive whiteboard with the SMART Notebook™ file called Shapes 3D–Replicating.
   As children play:
   - Remind them about previous lessons when they combined flat, or 2-D, shapes to make new shapes. Explain that they can also combine solid, or 3-D, shapes to build new shapes just like Peg did when she made a rocket.
   - Show children how they can drag a shape to move it somewhere else on the whiteboard. They can also touch a shape, then diagonally drag the gray circle in the bottom corner to change the size. They can use the green circle to rotate a shape.
   - Have children take turns creating new shapes and pictures by combining shapes.
   - Use the camera feature on the interactive whiteboard toolbar to take a picture of the screen, to capture and display the shapes and pictures children make.

Teacher Reflection

- Did you stay within the recommended time limits? If not, review brisk pacing routines to see if these might help (page 4).
- Are most students able to differentiate between flat, 2-D shapes and solid, 3-D shapes? If not, consider repeating this part of the lesson (page 30) in a small group for children who need extra help.
- Are most children able to use the mathematical names to describe 3-D shapes? If not, consider repeating this part of the lesson (page 31) in a small group for children who need extra help.
- Did most children use new vocabulary during and after playing the game? If not, review the words (flat, solid, 2-D, 3-D, rectangular prism, cylinder, sort) as you continue to play this and other games and prompt children to use the words on their own.
### Alignment to CCSS: Mathematics

<table>
<thead>
<tr>
<th>Geometry</th>
<th>Lesson 1</th>
<th>Lesson 2</th>
<th>Lesson 3</th>
<th>Lesson 4</th>
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</thead>
<tbody>
<tr>
<td><strong>K.G.A.1</strong> Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as <strong>above, below, beside, in front of, behind, and next to</strong>.</td>
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<tr>
<td><strong>K.G.A.2</strong> Correctly name shapes regardless of their orientations or overall size.</td>
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<td><strong>K.G.A.3</strong> Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).</td>
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<tr>
<td><strong>K.G.B.4</strong> Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).</td>
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<tr>
<td><strong>K.G.B.5</strong> Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.</td>
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<tr>
<td><strong>K.G.B.6</strong> Compose simple shapes to form larger shapes. For example, “Can you join these two triangles with full sides touching to make a rectangle?”</td>
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</table>
## Vocabulary Acquisition and Use

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<tbody>
<tr>
<td>L.K.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on kindergarten reading and content.</td>
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<tr>
<td>L.K.5 With guidance and support from adults, explore word relationships and nuances in word meanings.</td>
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<td>L.K.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts.</td>
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</table>
## Alignment to ISTE Technology Standards: Students

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<tr>
<th></th>
<th>Lesson 1</th>
<th>Lesson 2</th>
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<tbody>
<tr>
<td><strong>2. Communication and Collaboration</strong></td>
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<tr>
<td>a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<tr>
<td>d. Contribute to project teams to produce original works or solve problems.</td>
<td>●</td>
<td>●</td>
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<tr>
<td><strong>4. Critical Thinking, Problem Solving, and Decision Making</strong></td>
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<tr>
<td>b. Plan and manage activities to develop a solution or complete a project.</td>
<td>●</td>
<td>●</td>
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<tr>
<td><strong>5. Digital Citizenship</strong></td>
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<tr>
<td>a. Advocate and practice safe, legal, and responsible use of information and technology.</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.</td>
<td>●</td>
<td>●</td>
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<tr>
<td><strong>6. Technology Operations and Concepts</strong></td>
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<tr>
<td>a. Understand and use technology systems.</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>b. Select and use applications effectively and productively.</td>
<td>●</td>
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</table>
## Alignment to ISTE Technology Standards: Teachers

### 1. Facilitate and Inspire Student Learning and Creativity

<table>
<thead>
<tr>
<th>Standard</th>
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<th>Lesson 2</th>
<th>Lesson 3</th>
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</tr>
</thead>
<tbody>
<tr>
<td>a. Promote, support, and model creative and innovative thinking and inventiveness.</td>
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<tr>
<td>c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning, and creative processes.</td>
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<tr>
<td>d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments.</td>
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</table>

### 2. Design and Develop Digital-Age Learning Experiences and Assessments

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<thead>
<tr>
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<th>Lesson 3</th>
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</tr>
</thead>
<tbody>
<tr>
<td>a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity.</td>
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<td>b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress.</td>
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### 3. Model Digital-Age Work and Learning

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<tr>
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<th>Lesson 2</th>
<th>Lesson 3</th>
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</thead>
<tbody>
<tr>
<td>a. Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations.</td>
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<tr>
<td>b. Collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation.</td>
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<tr>
<td>c. Communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats.</td>
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### 4. Promote and Model Digital Citizenship and Responsibility

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<tr>
<th>Standard</th>
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<th>Lesson 3</th>
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<tbody>
<tr>
<td>c. Promote and model digital etiquette and responsible social interactions related to the use of technology and information.</td>
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These lessons were developed by PBS in partnership with the Boston University School of Education.

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