Measurement, Sorting, and Data

Teaching Tips: Kindergarten

Using Best Instructional Practices with Educational Media to Enhance Learning

pbskids.org/lab
Choosing Games to Address CCSS: Mathematics

Alignment to CCSS: English Language Arts

Alignment to ISTE Technology Standards: Students

Alignment to ISTE Technology Standards: Teachers

Try Out the Games

Teaching Routines

Preview the Game

- Pan Balance
- Crystals Rule
- Sorting Box
- Hat Grab

Teaching Tips

- Pan Balance
- Crystals Rule
- Sorting Box
- Hat Grab

Credits
Choosing Games to Address CCSS: Mathematics

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Pan Balance</th>
<th>Crystals Rule</th>
<th>Sorting Box</th>
<th>Hat Grab</th>
</tr>
</thead>
<tbody>
<tr>
<td>K.MD.A.1</td>
<td>Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.</td>
<td>★</td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K.MD.A.2</td>
<td>Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.</td>
<td>★</td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K.MD.B.3</td>
<td>Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.</td>
<td></td>
<td></td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>K.OA.A.2</td>
<td>Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.</td>
<td></td>
<td></td>
<td>★</td>
<td>★</td>
</tr>
</tbody>
</table>
### Vocabulary Acquisition and Use

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

<table>
<thead>
<tr>
<th></th>
<th>Pan Balance</th>
<th>Crystals Rule</th>
<th>Sorting Box</th>
<th>Hat Grab</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Communication and Collaboration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<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>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>d. Contribute to project teams to produce original works or solve problems.</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>4. Critical Thinking, Problem Solving, and Decision Making</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Plan and manage activities to develop a solution or complete a project.</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>5. Digital Citizenship</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Advocate and practice safe, legal, and responsible use of information and technology.</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>6. Technology Operations and Concepts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Understand and use technology systems.</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>b. Select and use applications effectively and productively.</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>d. Transfer current knowledge to learning new technologies.</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
</tbody>
</table>
Alignment to ISTE Technology Standards: Teachers

<table>
<thead>
<tr>
<th>1. Facilitate and Inspire Student Learning and Creativity</th>
<th>Pan Balance</th>
<th>Crystals Rule</th>
<th>Sorting Box</th>
<th>Hat Grab</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Promote, support, and model creative and innovative thinking and inventiveness.</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
<tr>
<td>c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning, and creative processes.</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
<tr>
<td>d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments.</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Design and Develop Digital-Age Learning Experiences and Assessments</th>
<th>Pan Balance</th>
<th>Crystals Rule</th>
<th>Sorting Box</th>
<th>Hat Grab</th>
</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>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
<tr>
<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>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Model Digital-Age Work and Learning</th>
<th>Pan Balance</th>
<th>Crystals Rule</th>
<th>Sorting Box</th>
<th>Hat Grab</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations.</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
<tr>
<td>b. Collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation.</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
<tr>
<td>c. Communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats.</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Promote and Model Digital Citizenship and Responsibility</th>
<th>Pan Balance</th>
<th>Crystals Rule</th>
<th>Sorting Box</th>
<th>Hat Grab</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. Promote and model digital etiquette and responsible social interactions related to the use of technology and information.</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
<td>⭐</td>
</tr>
</tbody>
</table>
Try Out the Games

Pan Balance
Crystals Rule
Sorting Box
Hat Grab

NOTE: These links will take you away from the Teaching Tips. They will open a web browser that lets you play the featured game.
Teaching Routines

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 game play** (Build Background, Get Ready to Play, Play the Game). 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 images and game play.

• **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 game play.

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 game play, 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 am **weighing** things on a **pan balance**.”
  • When children are invited to Turn and Talk, encourage them to use key words. For example, “I agree. The **crystal** is three paperclips **long**.”

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 colored blocks for sorting, or crayons for measuring with non-standard units).
Description

Children weigh a variety of objects by adding or removing copper weights on a pan balance. The number and quantity of copper weights show up under the pan balance as they are added and removed.

Once players decide both sides of the pan balance are equal, they select the check mark. If the pan is balanced, the object then appears behind the correct number of copper weights on a table, arranged from lightest to heaviest. There are three rounds.

Round 1: Players weigh 3 objects using 1, 2, or 3 copper weights.

Round 2: Players weigh 5 objects using 1, 2, 3, 4, or 5 copper weights.

Round 3: Players weigh 6 objects using 1, 2, 3, 4, or 5 copper weights.

Helpful Background

If players select the check mark when the objects are not balanced, a red X appears in place of the ✔ and the object doesn’t move to the table. May doesn’t prompt players to try again, but they need to add or remove copper weights to continue game play.

If children have played the Curious George games, they learned that when they click on the Man in the Yellow Hat, he repeats the directions. In this game, they click on the girl named May to hear the directions. If they click on Sid, they will exit the game.
Teaching Tips: Pan Balance

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

2. Get Ready to Play
   Use the interactive whiteboard to preview the game with the whole class.

3. Play the Game
   Play the game as a whole-class or small-group activity.

In this lesson, children will:

- learn about weighing and balancing objects on a pan balance
- describe and compare the weights of various objects
- learn and practice using new academic vocabulary, including the words weigh, weight, light, heavy, pan balance, balance
- use technology to learn, working individually and in groups, using common game navigation to solve problems
Teaching Tips: Pan Balance

Build Background

Time: 10 minutes

NOTE: Open the SMART Notebook™ file called Pan Balance, which automatically links to an online pan balance activity. Minimize the file to place it on the dock for easy access. (You can also link directly to this activity at http://illuminations.nctm.org/Activity.aspx?id=3531.)

To play this game successfully, children must understand the meanings of weight, light, and heavy. For this activity, you will need to gather at least four objects of different sizes and weights (e.g., a beach ball, an empty cereal box, a cereal box filled with marbles or stones, and a small, heavy rock).

To build children’s understanding of weight:

• Explain that weight is a measure of how light or heavy something is.
• Ask children to give a “thumbs up” if they have ever weighed anything or seen anything being weighed (e.g., themselves, pets, or fruits and vegetables at a market).
• Choose three of the objects you gathered and put them side-by-side. Invite children to tell their partners which one they think is the heaviest and which one they think is the lightest.
• Invite a pair of children to share their answer with the class, using the words heaviest and lightest. Have one child pick up those two objects, placing one in each hand and holding out each arm like a T.
• Ask: What happens to your arms when you hold the two objects? Which object is heavier? How can you tell?

Repeat with different objects and children. Each time, have children point to the objects they will pick up and ask the other children to tell their partners what they think will happen to the child’s arms and why. Encourage children to watch so they can check their predictions.

Emphasize that we cannot always tell the weight of an object by looking at it.
Teaching Tips: Pan Balance

Get Ready to Play

Time: 10 minutes

Display the pan balance activity linked to the SMART Notebook™ Pan Balance file.

Tell children that in this game they will use a pan balance, a type of scale that helps us figure out how much objects weigh, and whether one object is heavier or lighter than another. Help children understand how a pan balance works.

• Show children the pan balance on the interactive whiteboard and explain that when the objects on both sides weigh the same, the sides are balanced. When one side is higher or lower than the other, it is not balanced.
• Demonstrate by putting a square on each side of the pan balance (touch the shape and drag it onto the pan). Ask children to give a “thumbs up” if they think the two sides are balanced. Help them notice that one side is not lower than the other.
• Point out that when the objects on one side are heavier, that side will be lower. The side with lighter objects will be higher.
• Demonstrate by adding a square to one side. Ask: What happened to the pan balance? Now which side is heavier?
• Press the Reset Balance button under the scale and put a square on one side and circle on the other. Have children give a “thumbs up” or “thumbs down” as you ask: Is the scale balanced? Which is heavier: the square...or the circle?
• Invite a few children to explain their answers, prompting them to use the words heavier, lighter, weighs more, or weighs less.
• Remind children that even though the square and the circle are about the same size, they do not weigh the same. The circle is heavier than the square.

To start the game:
1. Make sure your computer is connected to the whiteboard and the Internet.
2. Find the game on your computer by going to pbskids.org/lab
3. Click on Games on the left.
4. Games are in alphabetical order.
5. When you find the game, select PLAY NOW.

Close the Pan Balance file. Start the game and listen to May’s introduction. Then mute the sound so you can point out items on the screen:
• The copper weights on the purple table are used to balance the pans and determine the weight of each object.
• The pan balance display shows how many copper weights are on the pan.
• After an object is weighed, it appears on the yellow table behind the correct number of weights, in order from lightest to heaviest.
Teaching Tips: Pan Balance

Play the Game

Play this game as a teacher-led, **Whole-Class** activity if children need guided support:

- understanding the concept of weight
- using a pan balance to weigh objects
- understanding the meaning of **balanced**, **heavier**, and **lighter**
- playing a game collaboratively
- using common game navigation

Play this game as an independent, **Small-Group** activity if children understand...

- the concept of weight
- the meaning of **balanced**, **heavier**, and **lighter**
- game navigation

...but need practice:

- using a pan balance to weigh objects
Teaching Tips: Pan Balance

Play the Game: Whole-Class Activity

Time: 10 minutes

Unmute the sound and invite a child to the interactive whiteboard to figure out the weight of the rock on the pan balance. Ask:

- Does this rock weigh more, less, or the same as the copper weights on the pan balance? How can you tell?
- How can you balance the two sides?

Have the child balance the pans by tapping the weights to move and place them on and off the pan balance. After each weight is added to or removed from the pan, ask the class to give a “thumbs up” if the pans are balanced or “thumbs down” if they aren’t. When the class agrees that the pans are balanced, have the child touch the check mark.

Provide feedback that helps the class understand why the answer is correct or not, such as:

- That’s right. You noticed that both sides are balanced. That means they weigh the same.
- Not quite. The side with the rock is lower than the other side. That means the rock is heavier. What should you do to make the sides the same, or balanced?

Have children take turns balancing and weighing objects. Once all the objects are on the table, ask:

- Which object is the lightest? Which is the heaviest? How can you tell?
- Is the [pink] rock heavier or lighter than the [green] rock? How can you tell?

When most children have mastered the game, stop playing and review key concepts. Ask:

- What did we learn about a pan balance or scale (it weighs objects and shows which are heavier, lighter, or the same)
- What new words did we learn and practice? (weigh, weight, light, heavy, pan balance, balance)

Tell children: To remember what you learned, look at objects around you and try to guess whether one is heavier or lighter than the other. Check your guess by holding an object in each hand and using your arms like a pan balance.
Teaching Tips: Pan Balance

Play the Game: Small-Group Activity

Time: 10 minutes

As children play the game, check in to see if they are using a strategy to decide whether to add or remove copper weights from the pan balance or are randomly moving them. If you observe that they are moving them randomly, ask questions such as:

• Why did you add/remove a copper weight?
• Which side of the pan is lower?
• Does that mean the objects on that side are heavier or lighter?
• What can you do to make the sides the same, or balanced?

When children are playing in small groups, assign each a different role. For example, one child controls the mouse or track pad; another child decides whether to add or remove copper weights; another tells when to select the check mark.

When all the objects are on the table, ask:

• Which object is the lightest?
• Which object is the heaviest?

Prompt children to use key vocabulary—such as weigh, weight, light, heavy, pan balance, and balance—when they explain their reasoning for adding or removing copper weights. Notice and name the strategies they use.

Show children that they can highlight the copper weights on the pan balance and on the purple table by placing the pointer over them, and that they can’t highlight the ones on the yellow table. Ask: Why can we highlight only some of the copper weights? (these are the ones that can be added or removed from the pan balance)
Description

Children help May collect rocks in her backpack by measuring their length using non-standard units such as crayons, toothbrushes, dice, blocks, shovels, and paper clips.

Children can move the object along the length of the rock to help them estimate the correct measurement. They click on the answer from a choice of two. Then May shows that number of objects under the rock and counts them to see if the measurement is correct.

The game has three rounds. Players measure three rocks in each round and receive a gold star for each correct answer.

**Round 1:** Rocks are 2 or 3 objects long.

**Round 2:** Rocks are 3 or 4 objects long.

**Round 3:** Rocks are 4 or 5 objects long.

Helpful Background

Informal measurement using familiar objects will help children develop a conceptual understanding of measurement. In this game, they will practice measuring using items such as toothbrushes and paper clips as a unit of length. In games and activities intended for later grades, they will measure using inches and feet, standard units of length.
In this lesson, children will:

- measure and describe the length of rocks (crystals) using non-standard units of measurement
- learn new vocabulary, including crystal and object, and use these words in context
- learn and practice using academic vocabulary, such as measure, length, long, short
- use technology to learn, working individually and in groups, using a finger, mouse, or track pad to highlight, select, and slide objects
Teaching Tips: Crystals Rule

Build Background

Time: 5 minutes

NOTE: Open the SMART Notebook™ file called Vocab–Crystals.

Point out the pictures on the screen and explain that these are all different kinds of crystals, a special kind of rock that may look like glass. Crystals are often pretty colors. Because they are so pretty, people like to collect them.

Tell children that in the game they are going to play, May is collecting crystals. Before she puts them in her backpack, she wants to measure them so she knows how long they are. Help children understand the concepts of measurement and length by measuring their arms.

Invite two children to come to the front of the room. Demonstrate how to use a common item (such as a small crayon) to measure the length of each child’s arm. After measuring, tell children:

• [Vijay’s] arm is [five] crayons long.
• [Kimberly’s] arm is [six] crayons long.
• [Kimberly’s] arm is [one] crayon longer than [Vijay’s].

 Invite two other children to the front of the room. Ask the class to look at the two children’s arms and tell their partners how many crayons long they think each arm is. Then have the two children measure each other’s arms with a crayon to tell how many crayons long they are. Have children give a “thumbs up” if their guesses were correct.

Close the Vocab–Crystals file and launch the game.
Teaching Tips: Crystals Rule

Get Ready to Play

Time: 5 minutes

Start the game and listen together as May explains the directions. Tell children that when May uses the word object she is referring to the things (e.g., paperclips, toothbrushes, dice, blocks, crayons) they will use to measure the length of the crystal.

Demonstrate how each object can be moved back and forth along the bottom of the crystal. Tell children that this will help them picture how many of the objects placed next to each other, without any gaps, will fit in the space under the crystal. Show them how to move the object so that they can make a good estimate—by noticing where the object ends and moving the object to that place on the line.

Remind children that you want them to figure out the answer by picturing how many of the objects will fit under the crystal, and by sliding the object to measure the length.

Tell children that some of the pictures on the screen can be highlighted, and these highlighted pictures are all helpful for playing the game. (To highlight these pictures on the SMART Board™, touch a non-interactive part of the screen, slide your finger onto the image, then lift your finger off the screen.) After you ask children about each of these pictures, demonstrate how they are used in the game.

- Highlight May and ask: What do you think will happen if I touch or click on May? (she repeats the instructions)
- Highlight the object under the rock and ask: Why do you think this object is highlighted? (because you can move it; note that nothing happens if you just touch or click on it)
- Ask: What do you think will happen if we highlight the boxes with the possible answers? (May will say the number; you need to touch or click on one of the boxes to select your answer)

Remind children that when they play this game on a computer, they can highlight these pictures by moving the pointer over them without clicking.
Teaching Tips: Crystals Rule

Play the Game

Play this game as a teacher-led, **Whole-Class** activity if children need guided support:

- measuring objects using non-standard units
- visually estimating length
- understanding the concepts of measurement, length, long, short
- playing a game collaboratively
- using common game navigation

Play this game as an independent, **Small-Group** activity if children understand...

- concepts of measurement, length, long, short
- game navigation

...but need practice:

- measuring objects using non-standard units
- visually estimating length
Teaching Tips: Crystals Rule

Play the Game: Whole-Class Activity

Time: 10 minutes

Ask children to look at the crystal and the object they will use to measure it.

• Say: Give a “thumbs up” if you think the crystal is [two crayons] long. Now give a “thumbs up” if you think the crystal is [three crayons] long.

• Invite a child to the whiteboard to move the object along the line under the crystal to measure it.

• Next, ask the child to select the number that matches the measurement.

• Ask the other children to give a “thumbs up” if they guessed correctly.

• Repeat these steps for all nine turns.

If children find this easy, increase the challenge with questions such as: If we measure this crystal with blocks instead of toothbrushes, will we need more, fewer, or the same number of blocks to describe the length? How do you know?

Encourage and model the use of key vocabulary (measure, length, longer, shorter, crystal, object) during the game.

• After children select the answer on the whiteboard, have them use full sentences to describe how they measured, how long the crystal was, or whether the crystal was longer or shorter than they thought. For example: “I used crayons to measure the crystal.” Or: “The crystal is three paperclips long.”

• Notice and name children’s use of these words as they play the game. For example: I noticed you used the word measure to say what you did.

When most children have mastered the game, stop playing and review key concepts. Ask:

• What did we do to measure each crystal? (used an object to describe the length of the crystal)

• What new words did we learn and practice? (crystal, measure, long, short, length, object)

Tell children: This game helps us describe the length of different things. Try using other objects (such as a spoon or small toy) to measure the length of things at home or school, such as your parents’ arms, a book, or a table.
Teaching Tips: Crystals Rule

Play the Game: Small-Group Activity

Time: 10 minutes

Observe to see if children are choosing the answer by measuring, visually estimating the measurement, or guessing randomly. If you observe random guessing, remind them how to use the mouse or trackpad to move the object along the bottom of the crystal to see how many objects will fit along the line. If children have difficulty playing on their own, the activities for whole-class instruction will provide guidance.

If children find this game easy, increase the challenge with questions such as:

- If you measure this crystal with blocks instead of toothbrushes, will you need more, fewer, or the same number of blocks to describe the length?
- How do you know?

When you check in with children, use key words (measure, length, longer, shorter, crystal, object) to describe what they are doing as they play the game. Prompt them to use these words as they talk about the game. For example: “I used crayons to measure the crystal.” Or: “This crystal is three paperclips long.”

As you watch children playing, check to see if they know how to use the different features of the game (e.g., clicking on May to repeat the instructions, highlighting the answer choices to hear the numbers, moving the object under the crystal). If not, show them how to use these features and spend a few minutes guiding their practice before they resume independent play.
Preview the Game: Sorting Box

Description
Children help May sort a collection of rocks (crystals) by color. She tells children what color rock to place in each column of boxes. The color is shown below each column with a paint splash, and the correct column is highlighted.

Players select and move the rock to the highlighted column. If they choose the correct color rock, it is placed in the boxes from top to bottom regardless of where in the column they put the rock.

There are three rounds that increase in the number of rocks and colors.

Round 1: Players sort 6 rocks of 3 different colors into a 3x2 array.

Round 2: Players sort 12 rocks of 4 different colors into a 4x3 array.

Round 3: Players choose from 15 rocks of 4 different colors to sort 12 rocks of 3 colors into a 4x3 array.

Helpful Background
This game is best for children who have not had much experience with classifying or sorting objects. Children do not have to figure out how to sort the rocks, and they must sort them in a specific order. To provide a greater challenge, create a "sorting center" in your classroom where children organize and group different types of objects by something other than color (e.g., eating utensils, writing utensils, objects of different sizes).

Some children may be confused by the color of the rocks, since a yellow rock may look slightly green, a red rock may look somewhat pink or orange, and a purple rock may look pinkish.
In this lesson, children will:

- develop an understanding of sorting
- practice sorting objects by color
- identify different ways to sort objects
- learn new vocabulary, including *collection* and *shades of color*, and use these words in context
- learn and practice using academic vocabulary, such as *sorting* and *column*
- use technology to learn, working individually and in groups, highlighting, selecting, and moving objects

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

2. **Get Ready to Play**
   Use the interactive whiteboard to preview the game with the whole class.

3. **Play the Game**
   Play the game as a whole-class or small-group activity.
NOTE: Open the SMART Notebook™ file called Sorting–Intro.

Develop children’s understanding of the concept of sorting:
• Point out the four pictures on the interactive whiteboard. Have children talk with their partners about how they could organize these objects into two groups.
• Invite a child to sort the objects on the whiteboard by touching and dragging them into the two different boxes.
• Explain that when they put objects in groups based on the ways they are the same or similar, it’s called sorting.
• Notice and name the attribute the child used to sort. For example: I noticed you sorted by type of object; you put the blocks on one side and the crayons on the other.
• Invite another child to sort the objects a different way. Again, notice and name the attribute the child used to sort. For example: I noticed you sorted by color.
• Ask children to tell their partners the names of some objects at home or school that can be sorted (e.g., eating utensils such as forks, spoons, knives; writing utensils such as pencils, markers, crayons). Then invite a few children to share their ideas with the class.

Tell children that in this game, May has a collection, or group, of rocks. Explain that:
• A collection is a group of things that are kept together and may be alike in some ways (such as crayons) or different (for example, in size or color).
• May wants them to sort her collection of rocks by color.

Close the Sorting–Intro file and launch the game.
Teaching Tips: Sorting Box

Get Ready to Play
Time: 5 minutes

Start the game and have children listen to May’s instructions. To develop their understanding of the word column, point to the highlighted section of the sorting box. Explain that in this game, column means each stack of boxes that go up and down. When they sort the rocks, they will be putting each group of the same-colored rocks in a column.

Point to the rocks and ask children to name the color of each. Help children notice that sometimes rocks that are in the same color group are a bit different from each other—there are different shades of color. For example, there may be dark purple and light purple rocks. Explain that when they are sorting rocks for the box, all shades of the same color go together.

During game play, if children try to move the wrong-colored rock into a column, May says, “Oops. That’s not the right rock.” After a pause, she provides helpful feedback: “Put only [blue] rocks in this column.”

If they select the correct color rock but try to move it to the wrong column, May also says, “Oops. That’s not the right rock.” To prepare children to play this game alone or with a small group, let them know:

• When they select the right color rock, they must put it in the column that is highlighted.
• They can only put a rock into the column that is highlighted, even if they are trying to put the right color rock into the correct color column.
Teaching Tips: Sorting Box

Play the Game

Play this game as a teacher-led, **Whole-Class** activity if children need guided support:

- understanding the concept of sorting
- sorting objects by color
- identifying different ways to sort objects
- playing a game collaboratively
- using common game navigation

Play this game as an independent, **Small-Group** activity if children understand...

- the concept of sorting
- game navigation

...but need practice:

- sorting objects by color
Teaching Tips: Sorting Box

Play the Game: Whole-Class Activity

Time: 10 minutes

Round 1
• Have children take turns at the whiteboard to move the rocks into the appropriate columns.
• When children view and move the rocks, invite the children who are watching to talk to their partners and describe the shapes (e.g., round, pointy, uneven) and shades of color (light, dark, mixed) of each rock. As children turn and talk, notice and name the attributes they describe.
• Just before the final rock is placed in the box, have children tell their partners:
  - how many rocks will be in each column when the last rock is placed
  - how many rocks altogether will be in the sorting box
• Invite a child to place the final rock in the box.

Rounds 2 and 3
Before playing each round, develop children’s understanding that there are many ways to sort things. Encourage them to look carefully at the collection of rocks. Ask:
• What else, besides the color, do you notice about these rocks?
• How else could we sort them? (e.g., triangles or circles; round or pointy; light or dark shades of color)
• Do you think there will be a space for every rock? How can you tell?

When most children have mastered the game, stop playing and review key concepts. Ask:
• What did we help May do in this game? (sort rocks by color)
• What new words did we learn and practice? (collection, sorting, column, shades of color)

Tell children: When you notice how objects are alike or different, it helps you organize and describe things. At home, choose a collection of objects (such as crayons or toys) and sort them into different columns by color or size.
Teaching Tips: Sorting Box

Play the Game: Small-Group Activity

Time: 10 minutes

As you check in with children, ask questions that prompt them to use key vocabulary, such as:
• What are you doing with the rocks? (“I’m sorting them by color.”)
• How many rocks are in this collection? (“There are ___ rocks in this collection.”)
• How many rocks go in each column? (“___ rocks go in each column.”)

As you watch them play, ask questions that build their understanding of sorting. For example:
• How do you know that rock goes there?
• What else, besides the color, do you notice about this collection of rocks?
• What other ways could you sort them? (If children are unsure, call their attention to shapes and shades of color.)
• Do you think there will be a space for every rock?
• How can you tell? (count the number of rocks and boxes; compare the sorting box colors and the colors of the rocks)

If children are unsure how to play the game, show them how to click on May to hear the directions. If they are having difficulty sorting rocks, show them how to click, drag, and release a rock into the sorting box.
Description
Children help George collect and graph two different color hats worn by people passing by in an airport. When players select the correct color hat, George grabs it and places it in a graph at the top of the screen. The graph shows how many of each color hat have been collected.

After as few as none or as many as six hats of either color have been collected, the Man in the Yellow Hat asks players to select which color hat was collected the most or the least. If players collect the same number of both color hats, he asks how many of each were collected. Players select one of two possible answers.

During the first two rounds, there are only two colors of hats. In the following rounds, there is a third color that George doesn’t grab if players select it, since the graph displays only two hat colors.

Helpful Background
The people pass by slowly, so children who need time to think or are not adept with clicking on the hats have time to play successfully. There is not a set number of hats that children have to select in each round. If they don’t select any hats, the Man in the Yellow Hat prompts them to grab hats that are the right color.

There is no set ending to the game. Children can continue choosing to play again and collect different colors and quantities of hats each time.
Teaching Tips: Hat Grab

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

2. Get Ready to Play
   Use the interactive whiteboard to preview the game with the whole class.

3. Play the Game
   Play the game as a whole-class or small-group activity.

In this lesson, children will:

- recognize and select items based on color
- count and compare the number of items in each color category
- learn how information can be shown on a graph
- learn new vocabulary, such as grab, and use this word in context
- learn and practice using academic vocabulary, such as graph, most, least
- use technology to learn, working individually and in groups, and gain familiarity with common help features
Teaching Tips: Hat Grab

Build Background
Time: 10 minutes

NOTE: Open the SMART Notebook™ file called Pictograph–Survey. Minimize the file to place it on the dock for easy access. Mute the sound and launch the game to display the title screen.

Point to the title of the game and tell children that the game they’re going to play is called Hat Grab.
• Have them read the title with you as you move your finger under the words: point.
• Explain that the word grab means “to take something quickly.” In the game, they will help Curious George grab hats from people who are on a moving walkway. George needs to grab the hats (get them quickly) before the people move past him.
• Point out that grab is different from simply saying “to get” or “to take” because it is a quick or sudden action.
• Demonstrate this sudden action by grabbing a pen, for example, from your desk.

Next, tell children that the hats George grabs will be sorted by color on a graph. Explain that a graph is a kind of picture that can make it easy to compare different amounts or quantities. To demonstrate, create a graph with the class.
• Display the Pictograph–Survey file on the whiteboard.
• Think of a question with two answer choices that you can ask the class. For example: Would you rather play inside or outside?
• Use the pen tool to write the two answer choices in the boxes on the left side of the graph. Put the pen back.
• Have each child touch and drag a stick figure person into the first open box on the row with their answer choice. (If a child places the stick figure into the wrong box by accident, use the undo button in the toolbar. You can also start over by selecting the reset page button in the toolbar.)
• After the graph is completed, ask: How does this graph help us see which answer was chosen by the most children (a bigger number than the other group) and which was chosen the least (the smaller number)?
• Erase the whiteboard, close the file, and display the game screen again. Unmute the sound.
Get Ready to Play

Time: 5 minutes

Encourage children to listen closely as the Man in the Yellow Hat gives instructions when you start the game. Mute the sound and ask a child to repeat the directions.

Remind children that computer games usually have buttons or features that provide help if they need it.
• Ask: What can you do if you can’t remember what color hats to grab? (select the yellow hat; look at the colors on the graph)
• Have children tell their partners about the help features they have seen on other games. Invite a few children to share their answers. Answers might include:
  - highlighting possible answers to hear the choices
  - highlighting pictures in the game to see if you can move or count them
  - clicking on characters to get directions or hints

Point to the graph and ask: What is the greatest number of each color hat George can grab?
Have children tell their answers to their partners. Then invite a few children to share their responses and explain their reasoning. Help them connect the answer to the number of spaces for each color hat in the graph.

Tell children that after George is done grabbing hats, the Man in the Yellow Hat will ask which color hat was collected the most or the least. Ask: How does the graph help you answer? (Look for the row with the most squares filled with hats.)

If George grabs the same number of both colors, the Man in the Yellow Hat will ask how many hats George collected of each color.
Teaching Tips: Hat Grab

Play the Game

Play this game as a teacher-led, Whole-Class activity if children need guided support:

- recognizing items based on color
- counting and comparing the number of items in each color category
- understanding how information can be shown on a graph
- understanding the meaning of most and least
- playing a game collaboratively
- using common game navigation

Play this game as an independent, Small-Group activity if children understand...

- how to recognize items based on color
- the meaning of most and least
- how information can be shown on a graph
- game navigation

...but need practice:

- counting and comparing the number of items in different color categories
Teaching Tips: Hat Grab

Play the Game: Whole-Class Activity

Time: 10 minutes

Unmute the sound. Invite two children to the whiteboard and assign each child a color hat to touch so that George will grab it. As George grabs hats, point out that they appear in the graph sorted by color.

When George is done grabbing hats, have children listen as the Man in the Yellow Hat asks the next question. Invite one of the children at the whiteboard to say the answer, using the words most and least to explain how they decided. Notice and name the strategy the child used to figure out the answer. Have the child select the answer.

If a child chooses the wrong answer, the Man in the Yellow Hat says, “That’s not right. Look at the hats in the graph.” Help children understand why the answer is wrong by providing more explanatory feedback. For example, say: The Man in the Yellow Hat asked which color hat was collected the most. That means the color hat that has more, or a bigger number than, the other. Let’s count the hats in each color and see which has the most.

As you continue playing the game with different children at the whiteboard, challenge the class to figure out how many more or less there are of each color. Have them tell their partners their answers and how they know. Invite a few children to share their answers with the class, using the words most and least. Help them see that they can answer easily by counting just the hats that don’t line up with each other to form a pair.

When most children have mastered the game, stop playing and review key concepts. Ask:

* What did we do in this game? (helped George grab hats; used a graph to see which color had the most or least)
* What new words did we learn and practice? (grab, graph, most, least)

Tell children: At home, collect two groups of objects, such as forks and spoons, or blocks of two different colors. Make a graph to show your mom or dad which group has the most or least.
Teaching Tips: Hat Grab

Play the Game: Small-Group Activity
Time: 10 minutes

As children play the game, ask questions that prompt them to use key vocabulary. For example:

• What happens when you click on the right color hat? (George grabs it)
• Where does the hat go after George grabs it? (on a graph)

Observe children to see if they are using the graph (rather than guessing) to answer which color hat was collected the most or least. Ask: How does the graph help you answer the question?
If they don’t know, show them how to use the graph to tell which color has the most or the least.

Challenge children to figure out how many more or less there are of each color. Ask:
• How many more [green] hats did you help George grab?
• How did you figure that out? (Help children see that they can answer easily by counting just the hats that don’t line up with each other to form a pair.)

Ask children to tell you what they will do if:
• they want to hear the instructions again
• they accidentally exit the game
  - click on the back button at the top left corner of the screen, or
  - click on the picture of the bubbles at the top, then select the picture of the hat in the next screen.
These Teaching Tips were developed by PBS in partnership with the Boston University School of Education.

**Boston University**
Dr. Jeanne R. Paratore, Professor of Education and Program Coordinator, Reading/Literacy and Language Education  
Dr. Alejandra Salinas, Assistant Professor, Math Education  
Dr. Julie Dwyer, Assistant Professor, Early Childhood Education  
Lisa O’Brien, Advanced Doctoral Candidate, Literacy and Language Education  
Chu Ly, Doctoral Candidate, Literacy and Language Education  

**Consulting Producer and Editor**  
Beth Kirsch  

**Curious George** is a production of Imagine, WGBH and Universal. Curious George and related characters, created by Margret and H.A. Rey, are copyrighted and trademarked by Houghton Mifflin Harcourt and used under license. Licensed by Universal Studios Licensing LLC. Television Series: ©2014 Universal Studios. All Rights Reserved.  
**Sid the Science Kid**—the name, characters, and elements are registered trademarks of The Jim Henson Company.  
**SMART Notebook** is a trademark of SMART Technologies.

The contents of these Teaching Tips were developed under a grant from the U.S. Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government. [PR/Award No. U295A100025, CFDA No. 84.295A]  

© 2014 Public Broadcasting Service (PBS). All rights reserved.