



Afterschool Adventure!



Measuring How Much

Powered by a Ready To Learn Grant



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Afterschool Adventure!



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Topic: Measurement
(Volume, Capacity, Weight)
Theme: Measuring How Much
Ages: 4-5

Introduction

Measuring fun is here! In this week's adventure, children will explore **volume, capacity, and weight** and learn new **math vocabulary words** as they practice measurement with real and virtual measuring tools. Each section of this weeklong adventure is introduced by a video clip or online game that encourages children to explore math concepts and skills related to measurement.

Math Overview

This unit focuses on measurement skills involving volume, capacity, and weight for children ages 4-5. Refer to **More About Math** to learn additional information about these math topics as they relate to the **Measuring How Much** learning activities.

Before You Begin

Create a free account on **PBS LearningMedia** to access videos for this **Afterschool Adventure** at <http://www.pbslearningmedia.org/>.

Use the following link to download and install the most recent version of QuickTime on your computer at no charge. This will allow you to view the Curious George video in Part 2. **[Download Quicktime.](#)**





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Handy Resource Guide

Get Ready! Your Afterschool Adventure includes videos, online games and mobile apps, hands-on activities and books. Use this resource chart to plan ahead.

WATCH

PBS KIDS Videos

Part 2: Exploring Shape

- [Curious George: Volume and Shapes \(1:27\)](#)

Part 4: Investigating Weight

- [Peg + Cat: Peg Finds Her Marble \(3:10\)](#)
- [Peg + Cat: The Balancing Act \(4:12\)](#)



PLAY

Online Games & Mobile Downloads

Part 1: Exploring Volume

- [Dinosaur Train: Dino Dive](#)

Part 2: Exploring Shape

- [FETCH! with Ruff Ruffman: Bluff's Game](#)
- [Curious George: Chock-a-Block Zoo](#)

Part 3: Exploring Capacity

- [Dinosaur Train: Hydration Station](#)

Part 4: Investigating Weight

- [Sid the Science Kid: Pan Balance](#)
- [Dinosaur Train: Classic in the Jurassic, Jr.](#)

Part 5: Balancing Weight

- [Dinosaur Train: Leaf Leader](#)



EXPLORE

Hands-on Activities

Part 1: Exploring Volume

- Small marble and a rock (the rock should be larger than the marble)
- Clear cup filled partway with water (the cup should be big enough to fit both the marble and the rock)
- Permanent marker
- **Arthur: Water Experiment**
- Aesop's Fable "The Crow and the Pitcher"
- Container
- Pebbles or marbles
- Clear pitchers of water
- Tray
- Water
- Golf Balls, nuts and bolts, Large or medium sized rocks, etc. (or multiple items of any object that will sink)
- Paper to record student responses

Part 2: Exploring Shape

- Unifix cubes, Legos, or other connecting blocks that are all the same size (12 for each child)

Part 3: Exploring Capacity

- **Fill It Up!**
- 3-6 recycled plastic containers or (clear) empty food storage containers (small, medium, and large sizes)
- Pitchers of water (to fill each plastic container)
- Tray or something that will contain water spillage

Part 4: Investigating Weight:

- 12 inch ruler
- Crayon
- 2 cups
- 2 bags of beans
- Hanger
- 2 small containers such as a Dixie cup or empty applesauce cup
- Yarn
- Hole punch
- Beans or other small objects to balance

Part 5: Balancing Weight

Dinosaur Train: Balancing Act

- Objects from nature (or from around the house)
- Pan balance
- Rope
- Tape or marker to mark a line to cross



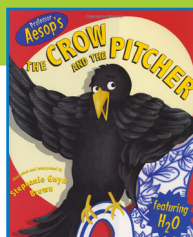
READ

Related Books

Part 1: *Aesop's The Crow and the Pitcher* by Stephanie Gwyn Brown

Part 3: *No More Water in the Tub!* by Tedd Arnold

Part 5: *Who Sank the Boat?* by Pamela Allen





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Part 1: Exploring Volume (20 minutes)

PLAY

Dinosaur Train: Dino Dive

Cannonball! In this game, children will fill up the dinosaurs' swimming hole by choosing the right-sized dinosaur to dive in and raise the volume of water to the target.

Gather children at your computer or interactive whiteboard so everyone can see.



Leader: Welcome to the Measuring How Much Afterschool Adventure! This week, we're going to investigate how much space different objects and containers take up, how much stuff they can hold, and how much they weigh. And to do that, we're going to have to do some measuring!

Let's start by looking at this marble. How much space do you think it takes up? How do you think we can measure that?

Pause to allow children to answer.

Leader: The amount of space something takes up is called its volume. For instance, a pumpkin takes up a lot more space than a blueberry, therefore the pumpkin has more volume than the blueberry. Can you think of some other examples?

Pause to allow children to answer.

Leader: Great examples. It's true that you can tell a lot about volume just by looking at an object. But you can also measure the volume of an object—by dunking it in water! Watch what happens to the level of the water in this cup when I drop in the marble.

Mark the water level on the cup with the marker. Then drop the marble in and compare the level to what it was before. Your children should notice that the water level has changed – it has gone up! Mark the new level with the marker.

Leader: When we put the marble in the water, it pushed the water out of the way to make room for itself, and the water level in the cup went up.

Show the children the rock.

Leader: Now, what do you think will happen when we drop in this big rock?

Pause to allow children to answer. Then drop in the rock and invite the children to share their reactions.

Leader: When we dropped in the rock, the water level went up even more! That's because the bigger an object is, the more water it has to push out of the way to make room for itself – and the higher the water level goes up.

Now let's try different objects in a larger container of water. Let's see what will happen when we try to place golf balls in this pitcher.

Mark a line on the pitcher. (Use the object you have selected to experiment with water displacement. You may have selected medium sized rocks, coins, nuts and bolts, or golf balls. The description below uses golf balls as the example, but you can substitute for any sinkable objects that are available to you.)



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Part 1: (continued)

Leader: Let's explore more! Ask:

- How many golf balls will it take to make the water rise to this line?
- What is your prediction? How many golf balls do you think it will take? Record the number on a piece of paper or create a tally chart recording each student's response.

Drop the golf balls individually into the water and record the number it took to make the water reach the line. Have the students compare their prediction with the actual number.

Once completed, try different sized rocks or other suggested objects and record the students' predictions (guesses) and actual number.

Leader: We have seen that when we drop objects of different sizes into water, the water will rise depending on the object's size. We're going to play a game to find out more.

Access the **Dino Dive** game and listen to the introduction. Call on children to choose two dinosaurs to test out, and then continue calling on volunteers as you play a few rounds of Dino Dive. As the children play, ask questions like:

- Do you notice a pattern in the way the dinosaurs have lined up on the cliff? (There is a group of large dinosaurs, a group of medium dinosaurs, and a group of small dinosaurs.)
- What happens to the water each time a dinosaur dives? (The water rises. The dinosaur pushes water out of the way to make room for itself, and the water level goes up.)
- What do you notice about the size of the dinosaurs and how much water they move? (The small dinosaurs move a small volume of water, the medium dinosaurs move a medium volume of water, and the large dinosaurs move a large volume of water.)
- What do you notice about the numbers under the groups of dinosaurs? (The bigger the dinosaur, the larger the number, and the greater the volume of water moved.)

When the children are finished, congratulate them on a job well done and conclude for the day.

Leader: Nice job today, children! You've explored how to measure volume, or the amount of space that something takes up. Next time we're together, we will explore a new way to measure how much there is in an object or container.

Keep Going! If you have more time, explore the following resources:

EXPLORE

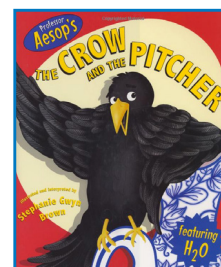
Arthur: Water Experiment

In this activity, children will experiment with volume using their own containers of water. They may wish to compare how different objects raise the level of the water in their containers to differing degrees, or to count the number of objects they can add to a container before it overfills. Encourage children to compare the number of marbles that it takes to overfill each of the containers. What could cause the difference? (The size of the container, the size of the marbles, how full the water is in the container, etc.)

READ

Aesop's The Crow and the Pitcher by Stephanie Gwyn Brown

In this retelling of the classic fable, a clever crow explains how to use the scientific method to solve a problem. Read the book aloud to children, and encourage them to share how they have solved a problem by thinking like a scientist.





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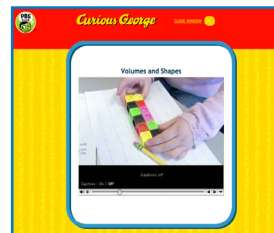
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Part 2: Exploring Shapes (35 minutes)

WATCH

Curious George: Volume and Shapes (1:27)

In this video from Curious George, students take part in a classroom activity about volume. By experimenting with different combinations of Unifix cubes, they learn that volume is the amount of space that something takes up and that, no matter how they are configured, objects made using the same number of cubes will have the same volume.



Make sure you have downloaded **Quicktime** on your computer in order to view the video. Gather children at your computer or interactive whiteboard so everyone can see.

Leader: It's time to continue with the Measuring How Much Afterschool Adventure! Last time we were together, we investigated volume and found out that volume is the amount of space something takes up. Today we're going to see how shape is related to volume. Let's start by watching this video.

Access the video and press play. After the video, ask:

- What is volume? (the amount of space something takes up)
- When the children changed how the cubes were connected, did the volume change? (no)
- What did the children have to do to get the cubes to fit in the new boxes? (change the shape)

Next, give the children twelve Unifix cubes, Legos, or other connecting blocks that are all the same size. Challenge them to connect the blocks in different ways in order to make as many different shapes as they can. Afterwards, have children share their shapes with the entire group. Ask:

- Do you think the different shapes take up the same or different amounts of space? (same)
- Do you think there is a way to combine the cubes so that they take up a different amount of space? (no—no matter how you connect them, the cubes have the same volume)

Now have the children match up together as pairs and allow each child to combine their blocks with another. Allow 2-3 minutes to create new shapes. After the time has concluded, invite the children to present their configurations to the entire group. Applaud the children for their unique configurations. Ask:

- Do you think that any group has more volume? Again be sure to have them notice that no matter how you connect them, the cubes will all have the same volume. Each group configured the blocks in a different manner, yet they each have the same volume.

Show children the container in which all of the Unifix cubes will be placed in for cleanup. Ask:

- How can we determine the volume of the container of this box used to keep all of the cubes?

Students may offer suggestions such as *line up the block in rows* to determine the volume, and then encourage discussion of the process.

Have students predict the volume of the container. Conclude and clean up activity by having each group bring their blocks and place the Unifix cubes in a container, shoe box, or other storage container. Record the volume of all of the blocks used for the day.



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Part 2: (continued)

Leader: You worked hard at exploring volume and shape – and now you’ve completed the second part of our Measuring How Much investigation. Congratulations! Next time, we’ll explore a new way to measure how much – using capacity.

Keep Going! If you have more time, explore the following resources:

PLAY

FETCH! with Ruff Ruffman: Bluff’s Game

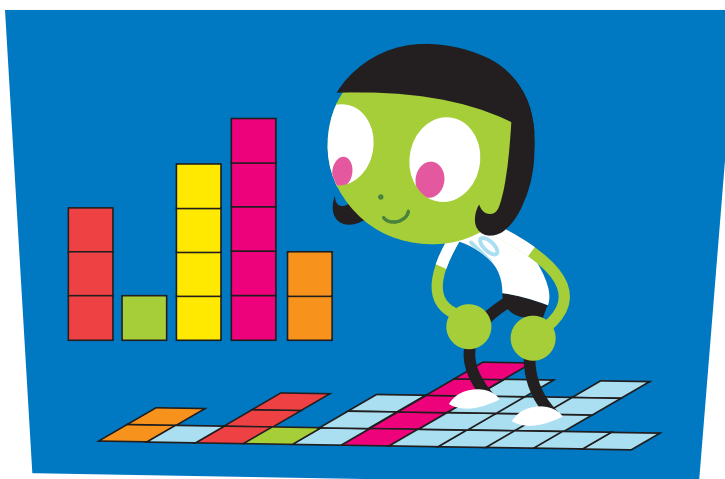
In this game, children will need to change the shape of a container in order to hold an exact number of boxes. Start by demonstrating how the capacity of the container can be changed by pulling the handles up or sideways. Challenge the children to find more than one shape that will hold the same number of boxes. Once you have decided on a shape, select the truck to load the container.



PLAY

Curious George: Chock-a-Block Zoo

Cubes can be used to explore area as well as volume. In this game, children must use colored blocks of different lengths to fill in pictures of zoo animals.





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Part 3: Exploring Capacity (30 minutes)

Leader: Today we're going to continue with the Measuring How Much Afterschool Adventure! So far, we've learned about volume and shape. Today, we're going to investigate another way of measuring "how much" of something there is. We're going to measure capacity. Does anyone know what that word means?

Pause to allow children to answer.

Leader: Capacity is the amount of stuff a container can hold. Let's explore the capacity of water by looking at these various containers.

Have the children investigate the amount of water that a container will hold. On the tray place two small cups (could be Dixie cup size), two medium size containers, and two larger containers, and one large pitcher or gallon of water. Note: Some classrooms may prefer using rice or sand to explore capacity.

Leader: Which container do you think will hold the most amount of water? Which one the least? Pause for responses and invite all the children to explain their thinking.

Use the gallon container and pour water into a small cup, medium size cup and a large container. Now invite the children to guess what may happen if you pour the small cup of water into the large or medium size cup of water. Pour the water and show the children how full each cup is.

Now invite the children to guess what may happen if you pour a middle size cup of water into the small cup. Pour it and let it overflow. It is important for the children to experience that the larger container has more capacity and its capacity will not fit into a smaller capacity container. Ask:

- What happened when the container with the larger capacity of water was poured into the smaller container?
- What do you think will happen if we poured the large container of water into the small container or the medium sized container? It will overflow. Be sure that children understand that each container has a certain capacity. No matter how much you pour into a container it will only hold a certain amount of water. The capacity of each cup remains the same, anything extra will not fit (it will overflow).

Continue to explore capacity. Ask children what they would like to see next. Suggest pouring a different combination, perhaps a medium amount into a large cup or reversed. It is important to elicit their thinking to gauge their understanding of capacity.

Leader: Fantastic job working with water and capacity! Now we will help thirsty dinosaurs get a drink of water. Let's use our knowledge of capacity to help them!

PLAY

Dinosaur Train: Hydration Station

The dinosaurs are thirsty! In this game, children will fill up eggshells with water and dump them in the right-sized watering holes to give the dinosaurs a drink.

Gather children at your computer or interactive whiteboard so everyone can see.

Leader: As you just experienced, capacity is the amount of stuff a container can hold. Let's learn more by playing this Dinosaur Train game together.

Access the game and listen to the directions. Then reiterate the instructions for the children.





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Part 3: (continued)

Leader: The dinosaurs are thirsty and need water! To help them, you will need to fill eggshells with water and pour them into the dinosaurs' watering holes. Be sure to match the capacity of the eggshells with the size of the hole.

Before playing the game, children should know that the capacity of the eggshells is the same thing as the amount of water the eggshells can hold. The bigger the eggshell, the more water it can hold, and the greater its capacity. Small eggshells have small capacities, and they may not hold enough water to fill the larger water holes. Big eggshells have large capacities, and they may overflow the water in the smaller holes.

Play one round as a whole group, and then allow the children to play in pairs or small groups on their own. As they play, circulate through the room to monitor understanding. Ask questions like:

- Which eggshell is the largest? Which is the smallest?
- Which do you think will hold the most water? Why?
- Which water hole is the largest? Which is the smallest?
- Which water hole do you think will hold the least water? Why?
- Which water hole has a biggest capacity?

When children are finished, congratulate them on investigating another way to measure "how much."

Leader: Great job investigating capacity, kids! You've now completed the third part of our Measuring How Much investigation.

Keep Going! If you have more time, explore the following resources:

EXPLORE

Fill It Up!

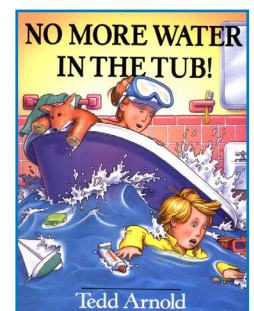
Different containers hold different amounts. Have children estimate the capacity of different containers and then measure to find out which holds the most and least amount of water. After they measure, children should place the containers in order of highest to lowest capacity. (If you are worried about making a mess, you may wish to have the children use beans or rice to measure capacity instead of water.)



READ

No More Water in the Tub! by Tedd Arnold

What would happen if you were taking a bath, the faucet broke, and the bathtub was swept away in a torrent of water? Read this book aloud to your children to find out!





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Part 4: Investigating Weight (35 minutes)

WATCH

Peg + Cat: Peg Finds Her Marble (3:10)

Peg has lost her marbles! Well, she's lost one marble anyway. Now it's up to Peg and Cat to figure out how to find it again.



Gather children at your computer or interactive whiteboard so everyone can see.

Leader: It's time to continue with the Measuring How Much Afterschool Adventure! So far, we've explored how to measure amounts like volume and capacity. Now we're going to measure something new – weight. Does anyone know what weight is?

Pause to allow children to answer.

Leader: Weight is a measure of how heavy something is. You may have been weighed when you went to the doctor's office, or you may have helped your mom or dad weigh fruits and vegetables at the grocery store. In this video, Peg and Cat are going to weigh things, too! Let's watch and find out more.

Access the video and watch with your children. Pause at :52 after Peg says, "but how can I find my marble?" Ask:

- How do you think Peg will use the pan balance to figure out which bowl has the marble?

Play the video and pause again at :20, after Peg says, "Not the same!" Ask:

- Which of the bowls has the marble?

Children should recognize that the lower side of the balance has the bowl with the marble in it. That side of the pan balance moved lower because the marble made the bowl heavier.

PLAY

Sid the Science Kid: Pan Balance

Children will help May weigh stones using a pan balance scale, then order each stone from lightest to heaviest.



Children will add and take away copper weights to weigh May's rocks on a pan balance. Children will know that the scale is balanced when both pans are level (at the same height). If two objects are not balanced, the heavier one will tip toward the ground.

Have children take turns playing in small groups. As they play, circulate through the room to ensure that children understand how to play. Ask them to explain what they are doing, using words like weight, heavier, and lighter.

EXPLORE

When children have had enough turns with the game and have demonstrated they understand the concept, have children begin the next task of creating their own balance.

Leader: It was fun to work with Sid's friends to create a balance, now let's use our knowledge to create our own type of balance. We will use a 12 inch ruler, a crayon, 2 cups, and a handful of beans.



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Part 4: (continued)

Begin by showing the children how to create a balance. Place the crayon under the center of the ruler.

Now, I am going to fill each cup with a few beans. Would someone like to tell me how many beans to place in each cup?

(Note: It is best to start off with an uneven number of beans in each cup). I am now going to place the cups on each end of the ruler.

(Note: The ruler will tilt to one side since it is unbalanced.)

The ruler is down on one side with the cup that has more beans. How do you think that we can make it balanced so that the ruler is straight and each side is balanced? (Children should realize or respond that we need to have equal beans in each cup to balance each side.)

Add beans to balance the cups and demonstrate that what happens to one side will effect the other side. In order for something to be balanced there needs to be equal weight on each side.

Leader: Now it is time for you to create your own balance.

Break the group into pairs or in groups of three. Distribute the materials to each group (a 12 inch ruler, a crayon, 2 cups, and a handful of beans) and let them investigate weight and balance. After 5 minutes, clean up and collect the materials. Conclude by asking what they learned about weight. Try to encourage use of words that describe weight such as: heavier, lighter, balanced, etc.

When the discussion has concluded, congratulate the children on their insightful responses and working cooperatively.

Leader: Nice work exploring weight, children – now you've completed the fourth part of our Measuring How Much investigation. Only one more to go!

Keep Going! If you have more time, explore the following resources:

WATCH

Peg + Cat: The Balancing Act (4:12)

As you watch the video, turn on the Closed Captioning so you can learn the words to this catchy song. Children can sing and do the “pan balance” dance along with Peg, Cat, and Cleopatra.



EXPLORE

Creating a Hanger Balance

Have children create a balance using a hanger, 2 small containers such as a Dixie cup or empty applesauce containers, yarn, hole punch, and beans or other small objects to balance. Hole punch the cups or applesauce containers in 3 equally distributed spots on the rim of the cups. Tie equal length strings of yarn from the holes to the sides of the hanger. Make sure the cups are tied from equal lengths and are the same distance from the center of the hanger. Place the hanger and dangling cups on a door knob or somewhere that will allow the hanger to hang easily. Add beans to each side of the cups and allow children to explore how to keep the hanger balanced by adding or removing beans from the cups.

PLAY

Dinosaur Train: Classic in the Jurassic, Jr.

Download the Dinosaur Train app and select the “Chow Time” game. Children will practice using a pan balance scale as they weigh food for hungry dinosaurs.





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Part 5: Balancing Weight (20 minutes)

PLAY

Dinosaur Train: Leaf Leader

There's a hungry dinosaur caught in the middle of this tug-o-war game! Children will need to balance the weight of the dinosaurs on each side of the tug-o-war rope to move the leaf to the middle so the hungry dinosaur can grab a snack.



Gather children at your computer or interactive whiteboard so everyone can see.

Leader: It's time to continue with the Measuring How Much Afterschool Adventure! Last time we were together, we learned about weight. You probably remember that weight is a measure of how heavy something is. Today, we're going to learn how to balance weight. Let's get started!

Access the game, listen to the introduction, and reiterate the directions for children: they will need to balance the weight on either side of the rope so that the leaf can move to the middle and the hungry dinosaur can get a snack.

Play the first round yourself, modeling for the children how to think out loud about weight distribution.

Leader: I see that the other team has three medium dinosaurs. I wonder if one large dinosaur will equal the weight of three medium dinosaurs. It didn't! I just need a little more weight on my team. I'll try a small dinosaur. That did it! The leaf moved to the middle and the hungry dinosaur ate it!

Next, call on children to play a few rounds while the rest of the group watches. Encourage them to think aloud and describe their reasoning, as you did.

Ask questions like:

- Why did you add a large dinosaur to your team? (Prompt children to recognize that the size of the other team can help them determine the size of dinosaurs that they need on their team.)
- Which dinosaur do you think weighs more, the small dinosaur or the big dinosaur?
- What do you need to do to make the weights on each team equal?

After all the children have had a chance to play, congratulate them on completing the final part of their pattern investigation.

Leader: We are finished! We measured "how much" in different ways this week—by exploring shape and volume, measuring capacity, and investigating and balancing weight. Great work, children. Be sure to share your discoveries with your families!

Keep Going! If you have more time, explore the following resources on the next page.



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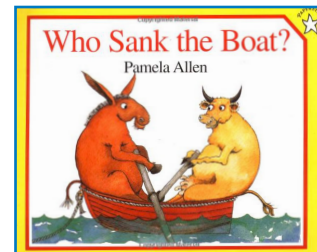
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Part 5: (continued)

READ

Who Sank the Boat? by Pamela Allen

Read this book aloud to children and start a discussion about floating and balance. Ask: Which of the animals do you think sank the boat? Why?



EXPLORE

Dinosaur Train: Balancing Act

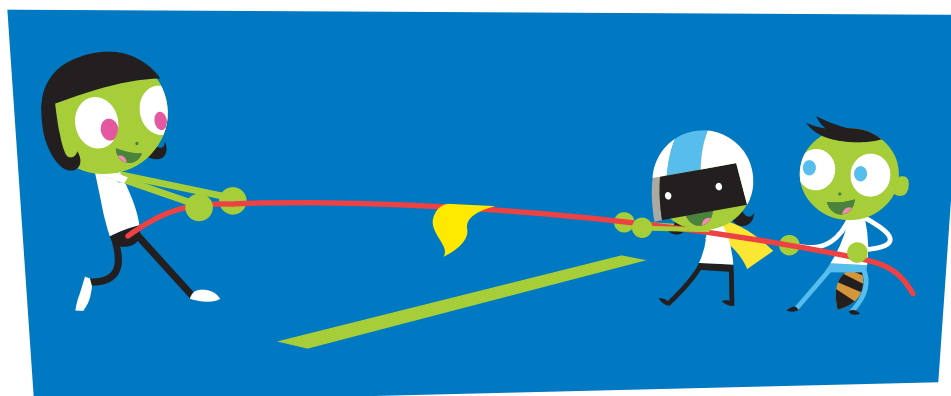
Have children hold different objects in either hand, and tilt their bodies to show which object they think is heavier. Then check the objects on a pan balance to see if the children were right!



EXPLORE

Tug-O-War

The object of tug-o-war is to pull the other player or team across the center line. Use a rope and pull against one another until they come across the line. Each side must have an equal amount of players.





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Professional Development Extension



More About Math

Measuring How Much

Background for Leaders

This unit focuses on pattern skills for 4-5-year-olds. Children will learn that patterns consist of a “core” or “unit” that repeats as they identify, complete and create patterns.

Volume and Capacity

Volume is the amount of space that a 3-dimensional object takes up. In these activities, two methods are used to measure volume; using connecting cubes and water displacement. When volume is measured using connecting cubes children put cubes inside the shape to see how many will fit in it. To measure volume using water displacement, the amount of water that an object displaces is directly proportional to its size. A small dinosaur will raise the water level in a swimming hole by just a little bit, while a large dinosaur will raise the water level in the swimming hole by much more.

Capacity is the amount a 3-dimensional object can hold. At this age children need to know that a small container holds a small amount of water and a large container holds a large amount of water. Children should be able to match up containers that hold similar amounts, based on relative size, such as the small egg and the small hole, the medium egg and the medium hole, and the large egg and the large hole. Important vocabulary to use when dealing with capacity is **more, less, most, and least**. Which container will hold the most water? Which container will hold the least? Does this container have more or less capacity than that other one? Comparisons between containers should be limited to two to three containers at this age.

Weight and Pan Balances

Children at this age should be able to tell if something is **heavier or lighter** than another object. One way to weigh an object is to use a pan balance. When nothing is on the pan balance it is parallel to the ground, when a heavy object is placed on it that side of the balance will move down towards the ground, while the other side will move up into the air. To balance the pan balance objects must be added to or removed from each side until the balance is parallel to the ground once more; this makes the weight on each side equal.



As the children play **Dinosaur Train: Leaf Leader**, they are comparing the weight or force of the dinosaurs on a rope; which unlike the other activities requires the leaf to center over the dinosaur rather than balance the scale. In this activity the dinosaurs are added to or removed from only one side of the rope to “balance” the force of the other side of the rope. In each of these activities there is a combination of small, medium, or large objects that have a supposed weight or force relative to their size. Essential vocabulary to use with children in these activities is: **heavy, light, heavier, and lighter**. Which object weighs more? Which object weighs less? Do you need to add more weight or take weight away from the pan balance?



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