

# GUESSTIMATE? NO ESTIMATE!

ITV SERIES

READING RAINBOW

#120: How Much is a Million

GRADES K-3

## PREVIEWING ACTIVITIES

Though this is an introductory lesson in estimating, it will be necessary to give the the students the opportunity to practice estimating with objects in order to set the tone for the video lesson.

This activity will be done in a whole group setting. Have the students sit around you on the floor as you present this lesson. Hold the jar in your hand and ask the following question: “How many nuts (walnuts or whatever kind you are using) do you think we could put into this jar? When we are finished we will need to be able to put the lid on the jar.” (The exact total will depend on the size of the jar. I recommend that you keep the number of nuts at less than 30; therefore, choose the jar and type of nuts accordingly.

For kindergarten students the jar should be smaller, or the materials should be larger, in order to work within the range of the students’ number sense and their ability to estimate (i.e. a few more, or a few less than ten). Their estimation task may be modified to ask only the following if the teacher feels it is necessary: “Do you think there will be more than ten or less than ten nuts in the jar when we finish?”

To provide a hint for the students before they estimate, offer to let them hold one of the nuts and check its size. Then, ask for volunteers to give their estimates. As they offer estimates, record each estimate on the chalkboard repeating the numbers given as you write. This reinforces numeral recognition for younger students. When everyone has given an estimate, begin putting the nuts into the jar.

As you put them into the jar, invite the students to count out loud with you as follows: “Let’s begin. How many are in the jar now?” The students should answer, “Zero.”

Put in one nut at a time as you say and they join in, “One, two, three, four, five.”

Stop to take another look at the estimates on the chalkboard

## OVERVIEW

In this lesson, the the students will discover the importance of estimation as it relates to our lives. They will learn that it is often advantageous to estimate rather than to attempt to find one right answer. They will practice estimating, rather than making guesses, and may begin to use number relationships to refine their estimates. They should conclude that estimation is a useful mathematical tool that most people use every day in many different ways.

## LEARNING OBJECTIVES

The students should be able to:

- Distinguish the differences between a guess and an estimate. Begin to estimate with increasing accuracy by using number relationships and by anchoring to significant numbers in our system such as 5’s and 10’s. (Kindergarten students may estimate if a quantity is more than, or less than ten; or, they may estimate using specific numbers to designate the quantity as is recommended for first, second and third grade students.)

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## LEARNING OBJECTIVES (cont.)

- Understand both the importance and usefulness of estimation in their personal lives, their school lives, and in the larger world around them. Specifically, they will learn how estimation is used in the ordering and preparing of school lunch. They will recognize their responsibilities to school employees who must estimate quantities of food to order and to prepare for them. They will help to avoid shortages or wasted food in their own cafeteria, which will help to provide a more ecologically friendly school environment.

## MATERIALS

For previewing activities:

- Walnuts, pecans, hazelnuts, or almonds in their shells (one type)
- Chalk and chalkboard for tallying the students' estimates

For kindergarten demonstration

- one small jar with a lid that holds ten to twelve objects when full

For first-third grades demonstration

- one straight-sided jar with a lid that holds twenty to thirty objects when full (example: olive jar)

For post viewing activities

Activity one:

- same jar as used in previewing activity

## PREVIEWING ACTIVITIES (continued)

and ask questions such as the following: "Is there anyone who has a different idea about how many nuts are in the jar?" Wait for replies such as comments on numbers that were too small.

Help them distinguish for themselves between useful estimates and those that are no longer applicable by saying: "Are there any numbers on the chalkboard that are not useful to us anymore? If there are we can erase them. Does anyone see a number that we can take off the chalkboard?" The numbers that may be erased are ones that were so low that they have already been counted while filling the jar, or so high that some students identify them as impossible to reach in this investigation due to the size of the jar. Do not lead this activity, rather ask questions while probing for developing understanding on the part of the students.

Continue by saying: "How many nuts were in the jar when we stopped?" They will answer (in this case five). Then, say: "We had five nuts, so this makes..." pausing slightly for them to intervene with the next number, "six" and so on.

Continue pausing for discussion at significant intervals such as the benchmark numbers of five, ten, fifteen and twenty; or, stop when the jar is half full and ask the following: "Let's stop for a moment. Now, how many nuts do you think it will take to fill the rest of the jar to the top? Remember, we must be able to put the lid on and twist it down."

Take ideas; continue checking for obsolete numbers, and

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## PREVIEWING ACTIVITIES (continued)

continue filling the jar to the top. When it is full, put on the lid and discuss how the students adjusted their thinking as more information became available. Say something similar to the following: “Did you notice that we needed to change our estimates as we went along? Why did that happen?” (Invite ideas such as we had already counted that number, that number was too large for us to get to, etc.)

Emphasize that the reason we made adjustments in our estimates was that we could see the limitations of the jar more clearly as we put in more nuts. It helped us develop a range of numbers to think about. This is what builds understanding and distinguishes the difference between making estimates and making guesses.

## FOCUS FOR VIEWING

Give the students specific responsibilities while viewing the video segment by saying: “We just estimated in order to find out how many nuts we could put into the jar. Do you think that you have ever estimated before today?”

Some will probably say they never have while others may understand that they have. Keep this discussion short by simply accepting what they contribute without leading or suggesting ideas to them as to when they probably have estimated. Continue by asking: “Do you think the people who live at your house have ever needed to use estimation?” (I hesitate to say your family, or your parents as I do not have such luxuries in my classroom of children.) Then ask, “Do you think there are other people who use estimation?”

## MATERIALS (continued)

- nuts of a smaller size than used in previewing activities, to fill the same jar as used in the previewing activities

Activity two: (second or third grade use)

- One gallon and one snack-sized plastic Baggie for each group of four students
- Peanuts to fill the gallon and snack sized Baggies

Activity three: (second or third grade use)

- Crayola crayons (one new box of eight or more) per student or pairs of students

Activity four:

- Blacklines of matrices labeled 1 to 100 (about 50)
- One new crayon

Activity five:

- Stubs of broken crayons
- Blacklines of matrices labeled 1 to 100 (about 50)

Activity six:

- Adding machine tape
- One-inch crayon stub

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## ACTION PLAN

In the "How Much is a Million?" video, students are offered a vicarious visit to the Giant's Stadium in New Jersey. In this video segment the challenges of estimating food and items for creature comforts such as sufficient toilet paper for crowds of football fans are discussed.

Introduce the segment by saying, "You have all been to the grocery store. Right? I have a question for you. How does your family decide how much food to buy?" Invite a discussion about this question. Try to draw out information such as the following: the size of families, the number of meals being planned, the amount of money that can be spent, etc.

Then ask, "Have you ever been to McDonalds, Wendy's or Burger King?" Discuss this a moment. "I have been wondering how people at McDonalds (Burger King or Wendy's) know how much hamburger to order? Does anyone have an idea?" Invite discussion.

Then say, "I have another part of the video I'd like to watch that will show us how the people who run a huge football stadium estimate the amounts of food and drink they will need for all the football fans who come to Giant Stadium to watch the football game. Let's watch together to see how they do it! They have to estimate about other things, too.

## FOCUS FOR VIEWING (continued)

Accept contributions non-judgmentally as before. Continue by asking the students to watch the video to see if they can find anyone who might be using estimating.

"When we began school this year all of us had new crayons. Today, we're going to watch a piece of a video that shows how new crayons just like ours are packed into boxes at the Crayola factory. Since we have been talking about estimating, while you are watching I want you to listen to see if you can find anyone who is using estimating. Put your thumb up if you hear someone in the video who is estimating.

*Note to the teacher: This video uses very large numbers. It is not the purpose of this lesson to teach these numbers, but rather to let them be a part of the overall presentation. In a visit to the Crayola Crayon Factory, the students will see workers who have helped manufacture the over 100 billion crayons that have been made during 93 years at the factory.*

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## VIEWING ACTIVITIES

**START** the video at the point just after the reading of the story *How Much is a Million?* ends and LaVar Burton says, "Crayons come in all size boxes. I can remember my first box of eight perfect crayons."

**PAUSE** the video after LaVar says, "She's been packing for ten years. Do you think she could have packed a million crayons by now?" Talk about the question LaVar has just asked. Focus the students on the video once again by asking them to listen to Betty calculate whether or not she has packed a million crayons. She will make an estimate based on the length of time she has worked and the number of crayons she is able to pack each year. They should put their thumbs up if her estimate tells the students that she has packed a million crayons.

**RESUME** the video.

**PAUSE** the video after LaVar says, "Crayola crayon factories have made over a billion crayons. Now that's a big number!" Take time at this point to show the students how the numbers can grow from 1 to 10, 10 to 100 and on up to the 100 billion mentioned on the video simply by adding zeros. Use the chalkboard to demonstrate this process.

*Note to the teacher: An alternate way to make this point would be to rewind the video to the point just prior to the reading of the story. In this segment, apples are used to demonstrate the multiples of ten. If you use this alternate method, you will want to make special preparations for ease of use. Either, pre-record this segment onto another piece of tape, or pre-set the counter at 0000 using the following cues before you begin your presentation. Then **RESUME** the video when LaVar says, "I just love enormous colossal, gigantic numbers. Just saying their names tickles my brain." You should **PAUSE** the video when the student narrator concludes the segment saying, "...Ten one hundred thousands, count no higher. You've got a million in this high flyer." By making note of the point where you stopped in the previous segment when LaVar said, "Crayola crayon factories..." as above, then you can fast forward back to that point after the short video segment and resume your lesson in sequence.)*

**RESUME** the video.

## ACTION PLAN (continued)

Put your thumb up when you hear them estimating about something that you cannot eat. Remember what it was and I will ask you when I stop the video." They will be listening for the workers to talk about the paper rolls that they must use for this stadium. They are very large indeed! I suggest that you continue viewing and use the video segment intact without pause points.

**RESUME** the video when LaVar says, "Estimating comes in handy for professionals, too. Take, for example, the people in charge of a huge football stadium. How do you think they feed and take care of thousands of hungry and thirsty football fans?" **STOP** the video when LaVar says, "And once in a while an exact number comes along that's fun to know about." Wait for the screen to read "Congratulations Steven. You are Giants' fan number 10,600,000."

With this background of information on the need for using estimation skills on the job, it is time to address the action plan. Discuss people the students might know who need to use estimation in their jobs. For example: the principal, when she/he orders paper and other supplies for the school; the custodian, when she/he orders cleaning supplies; the cooks, when they order food to prepare for breakfast or lunch in the cafeteria.

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## ACTION PLAN (continued)

Choose one school worker and invite him/her into the classroom to discuss how and when estimating skills are needed on the job.

Help students plan good questions to ask in advance of the date of the interview. Include ideas for asking what the students can do to help make this school worker's estimates more accurate. For example, if the head cook is interviewed, students will discover that they have a part in the accuracy of estimating achieved. They will find that the cook must estimate food and cleaning supplies ordered from central supply, and food quantities prepared for the day's meals. If the students do not make sure they are included in the morning lunch count, they could make the food amounts come out short leaving the staff to scramble for alternate menu items in order to feed the last students eating that day. On the contrary, if a class decides to make a field trip and brings cold lunch from home they could disrupt the usual lunch counts, too, causing an oversupply of food items that day which could lead to waste.

Encourage the students to conclude that they should always let the staff know if they will be eating lunch. Other ideas may include that the

## VIEWING ACTIVITIES (continued)

**PAUSE** the video after LaVar says, "Those are the times that knowing how to estimate comes in handy." In the previewing activity, the students were asked if they had ever estimated. Ask the question again, now that the students have accumulated more information about when estimates occur in real life. Redirect the students to the video by saying, "Let's listen to LaVar as he asks us some questions where we must estimate in order to answer." **RESUME** the video.

**PAUSE** the video when LaVar asks, "How much time do you need to get ready for school in the morning?" Tell the students that you want them to turn to a partner and compare estimates of about how long it takes each to get ready for school in the morning. Let the students answer informally. Some may share with the class if you wish. **RESUME** the video.

**PAUSE** the video after the one sentence segment when LaVar asks, "How many peanut butter sandwiches would it take to fill you up at lunchtime?" Again, let the students answer informally by telling their partners. **RESUME** the video.

**STOP** the video after the one sentence segment when LaVar asks, "Roughly, how many pizzas will you need to feed the class for your birthday party?" Allow students to talk it over once more in the partner format. Ask, "Did you both answer all three of LaVar's questions the same way? Why or why not?" Discuss how different people might take longer to get ready for school than their friends, that some might have different appetites for peanut butter sandwiches, and that the number of pizzas you need would depend on how many the students were in class that day and how hungry each of them was at party time.

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Say, “LaVar asked us to make estimates about peanut butter sandwiches, and pizzas. Were all our answers the same when we estimated? If not, were some of us wrong and the others right? Were all of us right, or were all of us wrong? Could there be more than one right answer?” Help the students identify what they have learned about making estimates.

### Activity one:

“Now that we know more about what an estimate is, let’s practice estimating. We’re going to use the same jar we used just before we saw the video when we estimated with nuts (walnuts or whatever kind you used). This time I want you to estimate using these pecans instead of walnuts. Notice the size of these pecans. Think about how large the walnut was.

Can you use what you learned when we estimated using the walnuts to help you when you estimate using the pecans?” Estimating activities help students see relationships and can give them the opportunity to use what they know to figure out something they don’t know. By remembering what they learned in the previewing activity when they estimated walnuts, they can use this information to estimate the total number of pecans it will take to fill the same jar a second time. Show the jar and a pecan. Continue by asking: “How many pecans will it take to fill this same jar that we filled with walnuts the first time. Do you think it will take more pecans than walnuts to fill the jar? or do you think it will take less pecans to fill the jar? Could it take the same number? Why? Why not?” Invite discussion, and then take estimates on the chalkboard. Continue as before. See the previewing activities section for details on how to proceed.

## ACTION PLAN (continued)

teacher should let the head cook know if the class will be off-campus for lunch well in advance of food-ordering day. They may want to take it a step further and deliver the message to the rest of the school. They could make a short skit, a bulletin board, or simply put a message in the morning bulletin that could be read to all classes.

### EXTENSION

#### Art and Science (Ecology):

The students can recycle stubs of crayons into crayon cupcakes. Because crayons are made of wax, they will melt readily. The students can peel the paper from the crayon stubs and combine them into mini cupcake tins. Under adult supervision, by putting them into the oven and melting them, new crayons of many colors can be created. These are fun to make, ecologically sound and it gives those undesirable orphan stubs a recycled life. They make nice gifts, too.

#### Language Arts and Mathematics:

Read the book, “If You Made a Million.” This is a second book in the series by the same author. Plan to collect a million pennies to see what a million looks like. This is an extensive project that could be used as an action plan as well. You will need to have a container constructed to hold the pennies.

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## EXTENSIONS (continued)

Devise a plan for collection so that all pennies are counted before they are put into the container. Estimate how long it will take your school to complete this project. After the million pennies are collected, celebrate by helping the students devise a plan for spending the \$10,000. One suggestion would be that half of the money goes to the school for improvement projects, and the other half goes to a charity chosen by the students.

Another idea would be to use the second half as a college scholarship fund for high school seniors who had attended your school as elementary students. This will probably be a three to six year project depending on the rate of collection. (This is a very interesting project that I helped start at Sawtooth School. It is now in its fourth year. It helps students understand how big a million really is! If you are interested in this plan, you may contact the principal at Sawtooth Elementary School, 1771 Stadium Boulevard, Twin Falls, Idaho 83301, 208-733-8454. He has plans for the collection box.)

The students may estimate how many books the entire student body of the school can read in one week. Choose a week that they will be checking their estimate. A good week to use would be Children's Book Week which is the second week in November.

## POST VIEWING ACTIVITIES (continued)

### Activity two:

This activity is more suitable for second or third grade students. In this activity the students may take the idea of relative size further by estimating with a large quantity of peanuts. Bag ten peanuts into a snack-sized Baggie, and loosely fill a gallon-sized Baggie with peanuts. Using the smaller bag of ten peanuts as a referent, the students can estimate and then check to see how many peanuts are in the larger bag. This is a good activity for groups of two or four students to investigate.

### Activity three:

Use crayons as a non-standard unit of measure. First the students will estimate how many new crayons it would take to span the top of a student desk. After estimating they may then lay out the crayons across the desk top end-to-end to measure the actual number of crayons they needed. This is a good activity to use when students have brought new crayons to school. Otherwise, you will need to provide a box of unused crayons to use in this activity. Other ideas that may be investigated are: "How many crayons tall are you?" or, "How many crayons long is your arm?" Do not provide all the ideas. Simply invite suggestions and let the students decide for themselves what they want to measure. It may be done in pairs of students.

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## POST VIEWING ACTIVITIES (continued)

### Activity four:

Have the students estimate, individually, how many of the boxes on the attached reproducible matrix they could color using only one new crayon. Put one crayon and several copies of the matrix in the math learning center. Then, individual students may work to complete the investigation. Encourage the students to decide how many boxes each student may color before leaving the center and allowing another student to continue. (I suggest that each child color ten boxes because ten is such a significant number in our system.) You may want to discuss that each investigator should try to use the same amount of pressure on the crayon.

### Activity five:

Adapt activity four by using stubs instead of a new crayon. In this way the students can learn that crayons can have a much longer life than some of the students believe they have! You may wish to use both sides of the page as well. This video lesson has a science focus emphasizing using our resources wisely. This would extend the ecology focus of the learning activities into the classroom.

## EXTENSIONS (continued)

The students will need to notify the other classes about their investigation, devise a system for collecting data and a recording system. After collecting the data, they may want to make a graph to display the information on an all school bulletin board.

An alternate plan would be to create a Millionaire Readers' Club. In this club, members have the goal of helping the students in the school read a million pages. Estimate how long this might take based on the number of students participating, rates of reading, etc.

### Mathematics and Technology:

Using the video "See You Later Estimator," watch a different segment every day for a week. Challenge your students to see if they can raise their estimating "batting averages" during the week.

### Technology:

Invite other classes by e-mail to join your class in estimating using some of the activities your class is experiencing. See if the estimates they make are similar to those of your class. Is the data they get when they check different from your students' data? Why, or why not?

### Do-at-home Activity:

Estimate how many pieces of popcorn (or other favorite snack item) the family, or special people at your house, eat in one year.

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VIDEO AVAILABLE FROM

May be taped off air. Check with your local PBS station for broadcast schedule.

*"How Much is a Million?"*

Reading Rainbow  
GPN P.O. Box 80669  
Lincoln, NE 68501  
1-800-228-4630

*"See You Later Estimator"*

Tom Snyder Productions  
80 Coolidge Hill Road  
Watertown, PA 02172-2817  
1-800-342-0236  
Free 45 day trial period

Bibliography

*"How Much is a Million?"*

Author: David M. Schwartz  
Illustrator: Steven Kellogg  
Publisher: Lothrop, Lee & Shepard

*"If You Made A Million"*

Author: David M. Schwartz  
Illustrator: Steven Kellogg  
Publisher: Lothrop, Lee & Shepard

POST VIEWING ACTIVITIES (continued)

**Activity six:**

To encourage students to continue using small pieces of crayon which they usually believe have lost their usefulness, have the students first estimate how many feet an approximately one inch stub of crayon will draw. Then, show the students how to measure off ten-foot lengths of adding machine tape. Put these in a learning center so they can draw five lines on each side of the length of the tape (this will equal a 100 foot length of crayon line) to check their estimates. They may then count by tens to see how many hundred feet it can draw. An option would be to try using a new crayon for the same investigation.

Lesson plan created by Master Teacher Sue Pack, Bickel  
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