



Mathematical Melodies

Number Fanatics

Music and Lyrics by Graeme Thompson

Number Fanatics

Take a good look at the world today
You'll see numbers being used in a million ways
Wheels on bicycles and buses and cars
All circles and without them you won't get very far

Mathematics, number fanatics, mathematics, number gymnastics

Look out the window and you realize
Someone thought carefully about its size
They made a rectangle and they made it fit
The hole in the wall they prepared for it

Mathematics, number fanatics, mathematics, number gymnastics

Everything is made to measure
Everything precisely fits
Numbers are a builder's treasure
Needs them in his bag of tricks

Take a look at the stairs and think about it
They're all the same size so you don't trip
Each floor just the right number of steps
All of them identical in length, height and depth

Mathematics, number fanatics, mathematics, number gymnastics

On your street there's an even side and an odd side too
Counting up steps, skip-counting by two
2 4 6 8 10 12 14
1 3 5 7 9 11 13

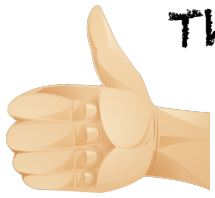
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Number Fanatics

PRIMARY/JUNIOR: Grade 2, Grade 3 and Grade 4



The Big Ideas

Measurement is a comparison of the size of one object

with the size of another. This idea is the foundation of all aspects of measurement.

Also, students need to understand that the same object can be described using different measurements and that units of different sizes; and, different tools, allow us to measure with different levels of precision.

The use of standard measurement units simplifies communication about the size of objects.

Estimation and developing benchmarks for frequently used units of measure is particularly important as it helps students increase their familiarity with units, prevents errors, and aids in meaning.



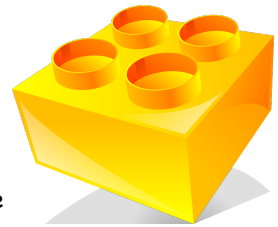
Curriculum Connections

Measurement

Attributes, Units and Measurement Sense

GRADE 2

- choose benchmarks – in this case, personal referents – for a centimetre and a metre.
- estimate and measure length, height, and distance, using standard units (i.e., centimetre, metre) and non-standard units;
- record and represent measurements of length, height, and distance in a variety of ways (e.g., written, pictorial, concrete)
- select and justify the choice of a standard unit (i.e., centimetre or metre) or a non-standard unit to measure length
- estimate, measure, and record the distance around objects, using non-standard units
- estimate, measure, and record area, through investigation using a variety of non-standard units
- estimate, measure, and record the capacity and/ or mass of an object, using a variety of non-standard units



GRADE 3

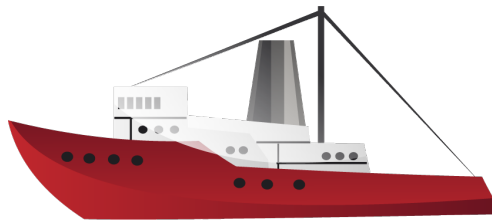
- estimate, measure, and record length, height, and distance, using standard units (i.e., centimetre, metre, kilometre) (Sample problem: While walking with your class, stop when you think you have travelled one kilometre.)
- draw items using a ruler, given specific lengths in centimetres (Sample problem: Draw a pencil that is 5 cm long);
- estimate, measure, and record the capacity of containers (e.g., juice can, milk bag), using the standard unit of the litre or parts of a litre (e.g., half, quarter).

GRADE 4

- estimate, measure, and record length, height, and distance, using standard units (i.e., millimetre, centimetre, metre, kilometre) (e.g., a pencil that is 75 mm long);
- draw items using a ruler, given specific lengths in millimetres or centimetres (Sample problem: Use estimation to draw a line that is 115 mm long. Beside it, use a ruler to draw a line that is 115 mm long. Compare the lengths of the lines.)

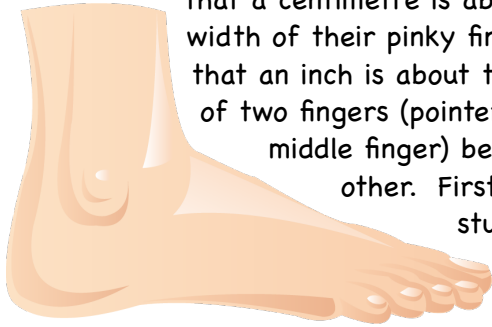
Inaugural Voyage

One way to transition from nonstandard to standard measurement



Using 'body benchmarks' as a referent for standard measurement is fun and memorable for students. For example, students may learn

that a centimetre is about the width of their pinky finger or that an inch is about the width of two fingers (pointer and middle finger) beside each

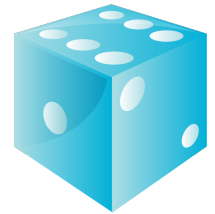


other. First, have students spend time using their

body (hand, feet, arm, leg) to measure common objects. Then relate each body part to a specific measurement. Making a large picture chart to show this would be invaluable.

Let's Play a Game Guesstimation

During your unit on measurement play the guesstimate game to begin each lesson. Decorate a shoebox and inside place a name of an object/animal/thing on an index card. First, give a few clues to focus your students' questions then have your class guess what the object is by asking questions that can result in either a yes, no or maybe answer. The questions; however, can only be related to measurement. Encourage questions based on comparisons and using all the units of measurement.



Hands On...

Cooking with Class

Cooking is an ideal way to teach concepts about non-standard measurements (big and small, thick and thin, more or less, bigger/smaller, approximation and estimation) and standard measurement (time, temperature, weight, capacity, length). It is also a great way to connect math with other areas of the curriculum (social studies, science, language). Bon Appetite!

Resources:

- Pastry School in Paris: An Adventure in Capacity by Cindy Neuschwander (2009)
- Eat Your Math Homework by Ann McCallum (2011)
- Fairy Tale Feasts For Young Readers and Eaters by Jane Yolen (2009)

How Full is Your Bucket? Capacity!

MATERIALS:

- Buckets of varying size for each group (5 groups x 3 buckets = 15 buckets)
- Large container full of water (5).
- Plastic measuring cups (5).
- Chart paper for recording results. The chart paper has columns on it to help the students organize their ideas using three headings: diagram, estimation, actual measurement and strategies used.

Given a series of three buckets of different sizes and shapes, the task is to order them from least capacity to most. Students are expected to estimate their answers then check their estimations by measuring each container using a measuring cup and water. Measurements are to be recorded on the provided chart paper.



Book Connection:
How Full is Your Bucket for Kids by Tom Rath and Mary Reckmeyer.



Too Big for your Bridges!

Supplies: Newspaper, masking tape, weights (.5 kg, .9 kg and 2.3 kg), chart paper, markers

"Does anyone know what a load is? (forces that act on structures). All structures must withstand loads or they will fall apart. The weight of the objects on the structure is called the live load. Things that move in or on a structure. The live load that is exerted is dependent on the mass of the object. What is mass? Different objects exert different live loads. Some objects are heavy, therefore exert a large live load. Other objects are light, therefore exert a small live load. I want you to think of a bridge now. When an object crosses a bridge it exerts a live load. The extent of the live load depends on the mass of the object. For example, which object would have a heavier live load on a bridge, a person riding a bike? or a transport truck? (Transport truck). Today you are going to create a bridge and test its capacity to withstand different live loads using these weights measured in kilograms.

In small groups (3-4), students are given 35 minutes to build a bridge using newspapers and masking tape. Students are encouraged to use the newspaper in the manner that they feel best fits. Once completed they are asked to make predictions how much weight they feel their bridge will hold.

Then, students will set out to test their bridge using each individual measure. A recording of the amount of kilograms their structure was able to support is expected. Each group will then discuss why they felt their bridge was unable to support a certain weight as well as discuss changes that they might make to their bridge to make it stronger. Students will share their bridges with each other as a group. The discussion here will focus on why each bridge was designed the way it was. Results will be compared and students will have an opportunity to test each other's bridges.

Resources:

- Building Math by John Perritano (2008)
- Using 3D Shapes to Build Houses by Moira Anderson (2010)
- Building BIG (PBS) <http://www.pbs.org/wgbh/buildingbig/index.html>
- Richmond Hill Library Curriculum Connections <http://www.rhpl.richmondhill.on.ca/kids/ProjectDetail.cfm?projectID=24>

Multi-Media

Websites:

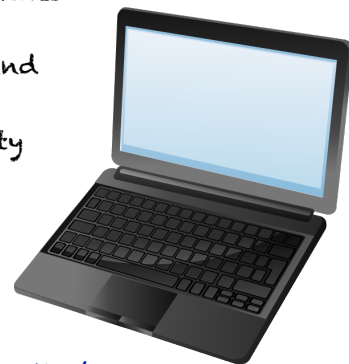
Non-Standard Measurement from PBS
<http://pbskids.org/cyberchase/games/bodymath/>

Time to Move from PBS - measure using units
http://www.pbs.org/parents/earlymath/grades_games_timetomove.html

Boxing Weigh In/Alien Weigh In (from the UK)
<http://www.crickweb.co.uk/ks2numeracy-shape-and-weight.html%23fruitbalance3>

Measures (teaches units of measurement and reading mass, volume, capacity and length)

http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/measures/index.htm



Measuring Length:
<http://www.funbrain.com/cgi-bin/meas.cgi?A1=s&A2=1&A3=2>

SmartBoard: <http://exchange.smarttech.com/search.html?q=measurement>



CORN MAIZE MATH

(Connecting Measurement with Grade 3 Social Studies: Early Settlements of Upper Canada)

Supplies: 10 corn stalks and 10 ears of corn (farmers are more than willing to give up a few stalks and ears for teachers), work sheet entitled Corn Maze Math, popcorn for measuring and popcorn for eating, recipe ingredients for “3 sisters” soup, utensils and cups marked out in 1, 1/4, 1/2 litres, hot plate (I have made soup in class using a hot plate, please be sure to talk about safety with your students before you plug it in), plastic bowls and spoons.

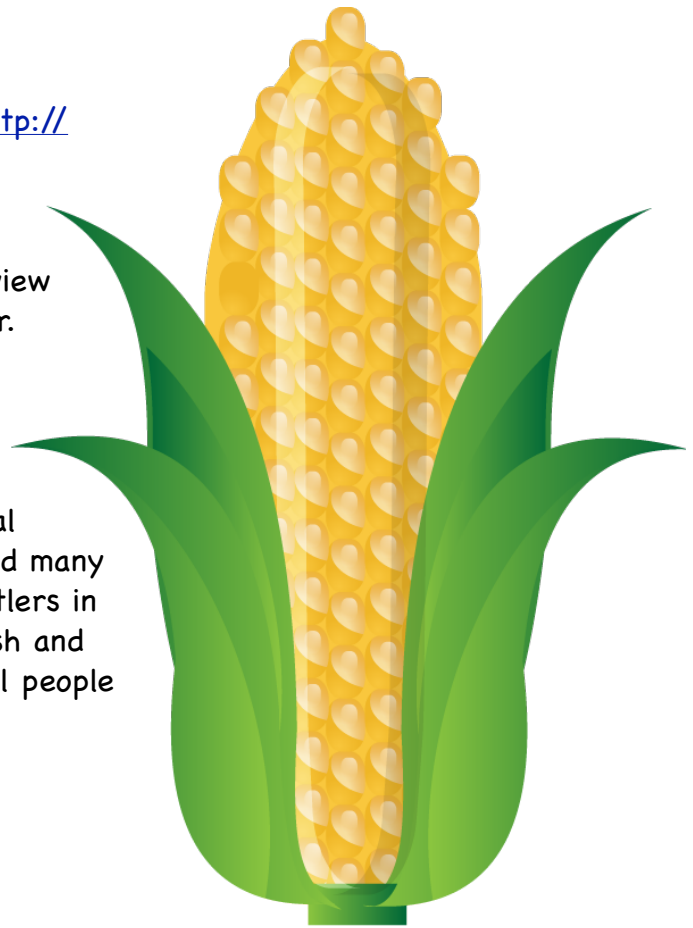
Aboriginal Innovations: Food Preservation

Aboriginal people have contributed many innovations in art, science and technology. This is a three part lesson that connects innovations in food growth and preservation to Early Settlers’ lives. Students will understand what the “three sisters” are and why they were important to the aboriginal people and to early settlers. Students will then use one of the three sisters ‘corn’ to complete a lesson on non-standard measurement. Final activity will be making “3 sister soup.”

Lesson 1

Read the web story *Claire and her Grandfather* http://www.beatstudios.ca/inac/eng/2000_e.html.

Highlight some of the inventions that aboriginal people created: lacrosse, canoes, kayaks, snow goggles, the ulu, corn, beans and squash. Then review which inventions helped Early Settlers in particular. Discuss the human interactions during the early settlement period and what aboriginal and early settlers learned from each other. Highlighting, how food growth and preservation was important for survival (long winters, using plants for medicinal purposes). Next, share how aboriginal people shared many of their innovations and techniques with Early Settlers in food growth and preservation. Growing corn, squash and beans, which early settlers learned from aboriginal people helped the pioneer to survive.



Lesson 2

At the chalkboard there are 10 stalks of corn. Ask the students how tall the stalks of corn are? Make note if they use their body to compare. Next, discuss how measurement is really a comparison of one thing to another. Often, we use our body (our height, our hands, our feet) but today we are going to measure in ears of corn. Teacher models how to use an ear of corn to measure paying special attention to creating a base line and holding the place point with your finger so you can get a fairly accurate measure. Students work together in pairs to measure a variety of objects using their ears of corn. Please distribute the worksheet entitled "Corn Maize Math" and one ear of corn for every pair. Afterwards, students are brought together and given popcorn as their standard of measurement. Students return to the classroom to measure a variety of objects with the popcorn. As students munch on popcorn that has been reserved, discuss how measurement was different between the ears of corn and popcorn. Ask, "Which was easier to measure with?"



Handout(s):

Corn Maize Math

Lesson 3

Begin, by reading the Legend of the Three Sisters. Have students then join you to make 3 sister soup. Use your containers marked 1 litre, 1/2 litre, 1/4 litre to measure out the water for the soup. Ask students which measurement holds more, which holds less. Which cup would they use if the soup needs 1/2 a litre? What about just over 1 litre? Discussing approximations and estimating would be appropriate here as well as highlighting that different measurements make our jobs easier and some measurements are more accurate.

Resources:

Aboriginal Perspective: The Teacher's Tool kit

<http://www.edu.gov.on.ca/eng/aboriginal/strategygr03socpreservation.pdf>

Legend of the 3 Sisters <http://www.ncmuseumofhistory.org/collateral/articles/F05.legend.three.sisters.pdf>

3 Sister Soup recipe from Saint Marie Among the Hurons http://www.saintmarieamongthehurons.on.ca/stdprodconsume/groups/csc/@hph_dh/@contents/documents/webassets/hph_000632.pdf. Tips: Recipe on PAGE 6. [5 cups is a little over 1 litre (1.18)]. Prepare pork ahead of time and add in at the end.



Picture This!

More Literature Links for measurement.



Fiction:

Measuring Penny by Loreen Leedy (1998)

Lisa learns about the mathematics of measuring by measuring her dog Penny with all sorts of units, including pounds, inches, dog biscuits, and cotton swabs.

Ton by Taro Miura (2006)

Explains the concept of weights and measures by depicting how different weights are lifted differently, from a man lifting a 50 lb. girder to a forklift lifting one ton, and how they are measured differently according to metric and English systems.

How Big IS Big? by Stephen Strauss (1999)

Poetry and facts offer a look at the relativity of measurement terms, such as big and small, fast and slow, deep and high.

Millions to Measure by David Schwartz (2003)

Marvelosissimo the Magician explains the development of standard units of measure, and shows the simplicity of calculating length, height, weight, and volume using the metric system.

How Tall, How Short, How Far Away by David Adler (1999)

Introduces several measuring systems such as the Egyptian system, the inch-pound system, and the metric system.

Polly's Pen Pal by Stuart Murphy (2005)

When Polly's pen pal from Canada writes that she is 125 centimetres tall, weighs 25 kilograms, and lives 450 kilometres away, Polly needs a little help to understand just what that all means.

Non-Fiction:

Actual Size by Steve Jenkins (2004)

His torn paper illustrations created with handmade papers are exquisite and very engaging. In this title animals or parts of animals are shown life size. The eye of a giant squid fills a page and, believe it or not, is beautifully rendered with textured papers.

Measuring the Pond by Linda Bussell (2008)

On a field trip to the pond, the students in Miss Tosh's class look for insects, measure them in centimetres, and compare them with the descriptions in the field guide.

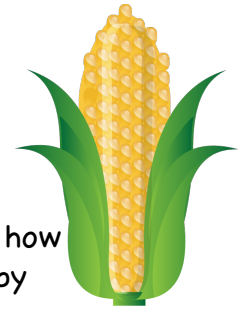
All content for Picture This was provided by Novelist (<http://www.ebscohost.com/novelist/>).

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Corn Maize Math



Measuring with an ear of corn

First, draw a picture of the object that you will be measuring. Then, estimate how tall the object will be in ears of corn. Then, measure how tall your object is by using your ear of corn.

Object	Estimate	Actual
Corn Stalk	_____ ears of corn.	_____ ears of corn.
Me	_____ ears of corn.	_____ ears of corn.
My Desk	_____ ears of corn.	_____ ears of corn.
My Chair	_____ ears of corn.	_____ ears of corn.

Corn Maize Math Measuring with popcorn

First, draw a picture of the object that you will be measuring. Then, estimate how tall the object will be in popcorn. Then, measure how tall your object is by using your popcorn.



Object	Estimate	Actual
Corn Stalk	_____ ears of corn.	_____ ears of corn.
Me	_____ ears of corn.	_____ ears of corn.
My Desk	_____ ears of corn.	_____ ears of corn.
My Chair	_____ ears of corn.	_____ ears of corn.