



Mathematical Melodies

Measuring the World

Music and Lyrics by Graeme Thompson

Measuring the World

A foot has 12 inches
A foot has 5 toes
A foot has 30 centimeters
As your ruler knows

1 foot 12 inches 30 centimeters ruler knows

We're measuring the world

Your little pinkie finger
Is a centimeter wide
A meter has one hundred
centimeters stored inside

1 meter one hundred centimeters all a pinkie wide

We're measuring the world

A kilometer is one thousand
Meters laid out straight
We use them when the distance
We are measuring is great

1 kilometer is 1000 meters laid out side by side

We're measuring the world

A millimeters less than
A centimeter long
10 millimeters
And your centimeters strong

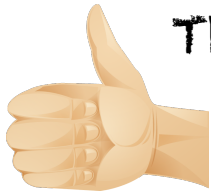
10 millimeters are a centimeter long

We're measuring the world



Measuring the World

Junior: Grade 5 and Grade 6



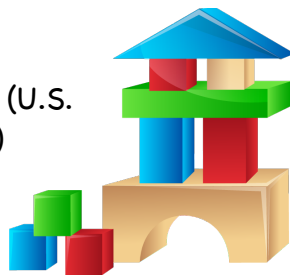
The Big Ideas

Teaching metric conversion can be particularly tricky. Creating opportunities for students to practice purposeful conversion is the key. Helping students engage through activities that are meaningful and encourage decision making around picking which unit to use in a reasonable way is helpful. Pointing out common or practical uses for metric conversion in the students' daily lives encourages problem solving and reinforces a relevant personal connection. Introducing new aspects of measurement through direct comparison and ordering is important as well.

Hands On

The National Institute of Standards and Technology (U.S. Department of Commerce) provides a Metric Pyramid that students can assemble and keep at their desks. The

pyramid provides information on metric symbols, mass or weight, energy, area, length, etc. Each edge of the pyramid measures 10 cm an accurate scale for children to refer to.



<http://ts.nist.gov/WeightsAndMeasures/Metric/upload/pyramid.pdf>

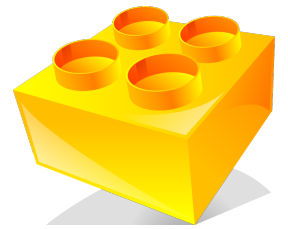
Curriculum Connections

Measurement

Measurement Relationships

Grade 5

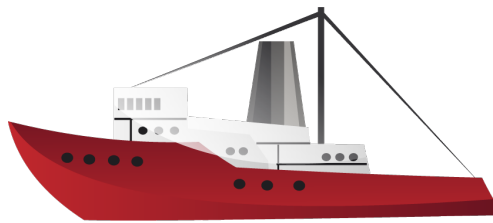
- select and justify the most appropriate standard unit (i.e., millimetre, centimetre, decimetre, metre, kilometre) to measure length, height, width, and distance, and to measure the perimeter of various polygons;
- solve problems requiring conversion from metres to centimetres and from kilometres to metres (Sample problem: Describe the multiplicative relationship between the number of centimetres and the number of metres that represent a length. Use this relationship to convert 5.1 m to centimetres.);



Grade 6

- select and justify the appropriate metric unit (i.e., millimetre, centimetre, decimetre, metre, decametre, kilometre) to measure length or distance in a given real-life situation (Sample problem: Select and justify the unit that should be used to measure the perimeter of the school.);
- solve problems requiring conversion from larger to smaller metric units (e.g., metres to centimetres, kilograms to grams, litres to millilitres) (Sample problem: How many grams are in one serving if 1.5 kg will serve six people?);

Inaugural Voyage



Slip Sliding Away - Understanding Metric Conversion Through Number Slides

The metric system is based on multiples or powers of 10, either increasing or decreasing tenfold from one unit to the next.

A number slide is a handy tool for learning to multiply and divide by ten and its powers. For this reason, it can be used to teach students metric conversion.

As a visual tool, students quickly learn that when you change from a larger unit to a smaller unit, there will be more units (multiply by 10, 100 or 1,000) and that when you change from a smaller unit to a larger unit there will be fewer units. (divide by 10, 100 or 1,000).



Handout(s):

Metric Number Slide

Mental Math

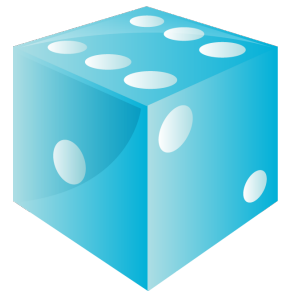
One way students can become better estimators is to learn the sizes of specific reference items. Students should be encouraged to do this for length, mass and capacity and then to relate other estimates to these:

- A child's finger is about 1 cm long
- Student rulers are 30 cm long
- A sheet of white bond paper (computer paper) is about 21.5 cm by 28 cm
- A child's arm span is approximately 1m
- A standard pop can has a capacity of 350mL
- A standard carton of milk or juice hold 1 L
- A liter of water has a mass of a kilogram



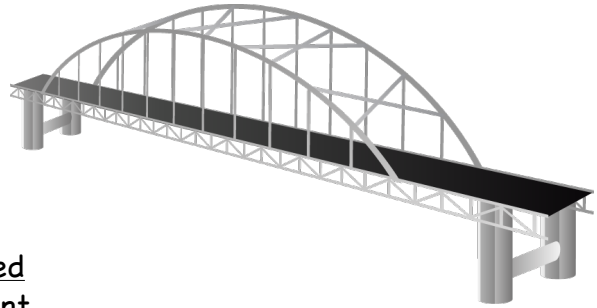
Let's Play a Game... Metric Mania

Giving students a variety of opportunities to practice real life estimation of lengths, heights, widths and distances, capacity and mass is important. In their lives outside school, encourage them to notice which items are sold by mass and which by volume. Playing a game where students estimate the mass or volume of various items then check their estimates against package labels hidden in the classroom helps students gain experience in metric measurement.



Cross Curricular

(Grade 5 Social Studies - Ancient Civilizations)



Kathryn Lasky's book The Librarian Who Measured the Earth is excellent fodder for exploring ancient civilizations and mathematics with your class.

The book describes the life and work of Eratosthenes, the Greek geographer and astronomer who accurately measured the circumference of the Earth.



The challenge given to your students could be to reproduce the measurements used to determine the size of the Earth made more than 2,000 years ago by the Ancient Greeks.

Eratosthenes (273 - 194 BC) used the shadows cast on the earth to help determine his calculations.

Working with a sister school, two classes could simultaneously measure the length of the shadow cast by a stick when the Sun is at its highest elevation over the horizon.

The students could then apply the concepts of basic geometry (as described in the book) to determine the circumference of the Earth.

Resource: The Size of the Earth Project is a helpful website that describes how two classes worked together to apply Eratosthenes' calculations and determine the circumference of the Earth with an error of only 7%!

<http://astroverada.com/earth/>

Multi-Media

Websites:

Estimating Metric Length

<http://www.hbschool.com/activity/elab2004/gr3/23.html>

U.S. Metric Association

<http://lamar.colostate.edu/~hillger/ideas.html>

Learn 360:

Math in Our Lives:

• Measuring-Metric

• Measuring - Standard

Measurement Mania

www.learn360.com

SmartBoard:

<http://exchange.smarttech.com/search.html?q=measurement+%2B+conversion>





Thematic Imaginings

Terry Fox

The Making of a Hero, One Step at a Time

Did you know that Terry Fox ran 5,373 km during his Marathon of Hope?

Try to imagine how far that is in your mind. It may be a bit tough to imagine such a big number in relation to an unfamiliar measurement (kilometers) so let's look at a map for a visual clue. Maps can be useful in helping us to figure out distance travelled but it can still be hard to imagine how far 5,373 km actually is.



It might be helpful to think of his journey using a different measurement - steps. Yes, steps! I wonder how many steps Terry took on his Marathon of Hope? In order to figure this out we are going to have to do some calculations.

First, let's figure out the length of a single step. For most adult men their step (or stride) is typically 1.2m. Terry, ran using an artificial leg

so let's approximate his step at being 1m. So, we know that 1 step = 1m and that Terry travelled a total distance of 5,373 km.

Our problem now has two measurements that are difficult to compare because they are not the same (we have km and m). So, we need to convert the distance travelled into meters. We do this by taking the total km travelled 5,373 km and x 1000 (students could use their sliders here also) = 5,373,000 meters. Because 1 step = 1 m the total number of steps is 5,373,000.

Can you imagine taking that many steps!

Now it is your turn, if Terry ran 2,973 km in Ontario, how many steps would that be? Please remember that 1 step = 1m.



Picture This!

More Literature Links for measurement.



Non-Fiction:

Area, Distance and Volume by Navin Sullivan (2006)

Discusses area, distance, and volume, the science behind measuring area, distance, and volume, and the different devices used to measure them.

For Good Measure: The Ways We Say How Much, How Far, How Heavy, How Big, How old by Ken Robbins (2010)

Delves into the past to show where words such as pound, quart, feet, yard, mile, and other terms of measurement originated and why.

Incredible Comparisons by Russell Ash (1996)

Offers a visual guide, with brief explanatory text, to comparative sizes, heights, weights, and numbers in such areas as capacity, population, growth, weather, disasters, speed, and others.

Millions to Measure by David Schwarz (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.

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.

The Story of Weights and Measures by Anita Ganeri (1997)

Describes the development of various systems of measurement, from early methods using parts of the body, to maps and map scales, gravity, light years, and modern balances and scales.

References

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