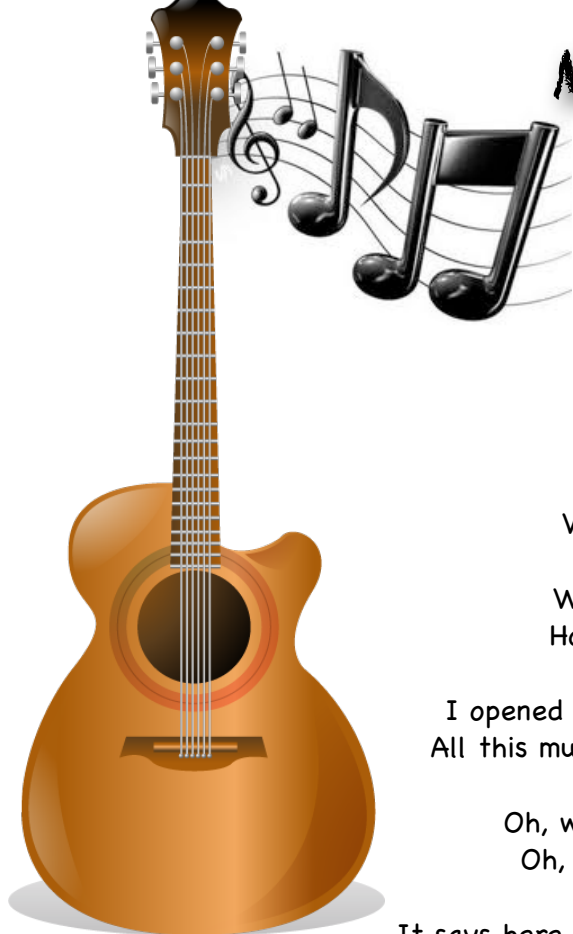# Mathematical Melodies

What Does It Mean?
Music and Lyrics by Freeyon Chung

What Does It Mean?

I think I'm kind of confused...don't you see
About this thing they call...Central Tendency
Apparently, it's used to summarize...lots of data
Without it all that's collected is just....blah, blah, blah

What does it mean? I've got to go find out somewhere
How, how can it be? I guess I'll go check my book now

I opened it and here's what I see... lots of mumbo jumbo staring at me
All this mumbo jumbo's really scary...but I really need to start and study

Oh, what, what does it mean? I've got to go find out somehow
Oh, how, how can it be? I guess I should start reading now

It says here that something is mean...Or is it a someone they're referring to?
Oh wait! It's the name of a term!...I need to go find more clues
So the mean is like the average...We add up all the values we got
Then we divide by how many they are...That's it? I'm surprised I forgot

Oh, I think I get what it means! Let's see what else is there
Now that that part is done...What else do I have to prepare?

So the median is a bit more work...line the numbers up in order
From least to greatest or greatest to least...if you feel like it, you can even draw a border
Go find the middle number...that's what I have to do
If there is no middle number...Find the mean of the middle two

Oh I think I get what it means! Let's see what else is there
Now that that part is done...what else do I have to prepare?

There's one more type out there...and it is called the mode
It's very easy to find...just look at all the numbers showed
The number that shows up the most...that number is the one
Sometimes you might get more...but sometimes you might have none

So these are the central tendencies...mean and average are just the same
Medians the middle one...the one that shows up most, the mode is the name

Oh! Now I get what it means!...finally, it all makes sense
Central tendencies aren't that hard...I guess I'm not really that dense!
Oh! Now I get what it means!...I'm gonna do my best
With the mean, median and mode...Boy! I'm gonna ace this test!

What Does It Mean?

JUNIOR: Grade 4, Grade 5 and Grade 6
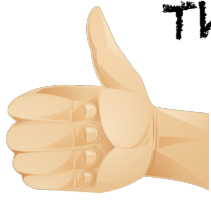
The Big Ideas

Sometimes a large set of data can be usefully described by using a summary statistic, which is a single meaningful number that describes the entire set of data. The number might describe the values of individual pieces of data or how the data are distributed or spread out. The most common numerical descriptions of a set of data relate to the centre of the data. This is also called the measures of central tendency. There are three key measurements:

1. The **mean** is computed by adding all the numbers in the set and dividing the sum by the number of elements added.

2. The **median** is the middle value in an ordered set of data.

3. The **mode** is the value that occurs most often.

Hands On – Intro to Average

Students work in pairs using a coin and a data sheet. First, one student will toss the coin and one student will keep track on the tally sheet. Students are encouraged to guess/estimate which will have more tallies (heads or tails). Students should experiment and observe what happens when they:

1. Toss coin 5 times.

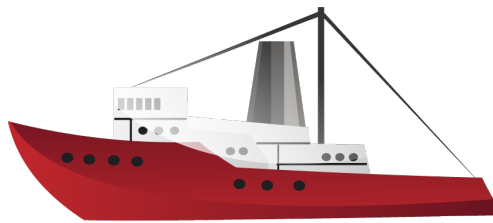2. Toss coin 10 times.

3. Toss coin 20 times.

Handout(s):

Tally Sheet

At each interval students are encouraged to refer back to their data sheet and discuss which column has more tallies. Noting the progress of their data through each step will either confirm or contradict their earlier results. How did the results change as the tosses increased? The overall goal is to help students understand that the numbers will average out with enough tosses. It helps students understand that with more coin tosses the more accurate the results. Which is why when a data sample is small it may not be a true representation of the real average.

Curriculum Connections
Data Management and Probability

- Demonstrate, through investigation, an understanding of **median** (e.g.,"The median is the value in the middle of the data. If there are two middle values, you have to calculate the middle of those two values."), and determine the median of a set of data (e.g.,"I used a stem-and-leaf plot to help me find the median.").
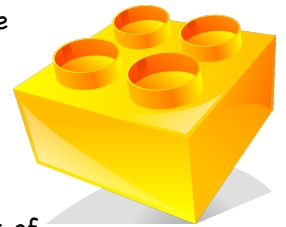
- Calculate the **mean** for a small set of data and use it to describe the shape of the data set across its range of values, using charts, tables, and graphs (e.g.,"The data values fall mainly into two groups on both sides of the mean."; "The set of data is not spread out evenly around the mean.").

- Demonstrate an understanding of **mean** (e.g., mean differs from **median** and **mode** because it is a value that "balances" a set of data – like the centre point or fulcrum in a lever), and use the mean to compare two sets of related data, with and without the use of technology (Sample problem: Use the mean to compare the masses of backpacks of students from two or more Grade 6 classes.).

Inaugural Voyage

(One way to introduce mean, median and mode)

Creating a Data Set Using Gigantic Dice

Materials Needed:
- 2 cube-shaped cardboard boxes of similar size
- Masking tape
- Black felt tipped marker
- Paint
- Brushes

Divide class in half and give each side one box, paint, brushes, black tipped marker. The students will do the following:

Using the tape securely close the box flaps. Paint the box and lay to dry. Once ready, use the black marker to make dots on each side. Remember that on a traditional die, the numbers on opposite faces always add up to seven.

The dice can now be used to create two sets of data. Have each side throw their die seven times and record the numbers on the board. Using the data set introduce the class to median, mean and mode.

Let's Play a Game - M3

Once your students are familiar with mean, median and mode playing this card game will help them practice their calculations. Make sure the students use only the ace (counts as 1) through 10 and a maximum of 4 players. Each player gets 7 cards. Players must arrange their cards in sequential order.

- **Finding the Mean Game**. Each player finds the total value of the digits on their cards, then divides the total by 7 (the total number of cards) to find the mean. For example, if the cards in your hand are Ace, 3, 2, 6, 7, 8, 9, then the sum of those digits is 36 . Dividing the sum by 7 yields 5 (rounding to the nearest whole number). If this was your hand, you'd have scored 5 points in this round. Students are allowed to use pencil and paper.

- **Finding the Median Game.** Each player finds the median card in their hand and that number is their point value for that round. Thus, using the hand above, the median of the cards is 6, since it's the value of the middle card.

- **Finding the Mode Game**. Each player finds the mode in their hand of cards, which represents their point value for that round. If there is no mode, then they don't score any points in that round. However, if there are two modes (two numbers occur the same number of times), then the player snags the point values for both modes! In the example above, there is no mode.
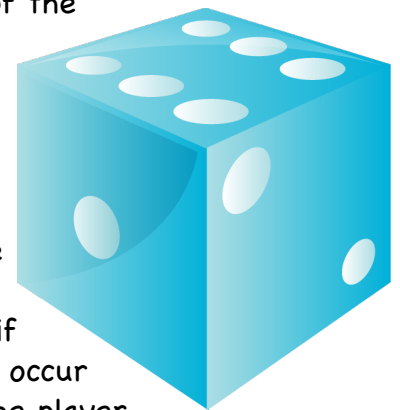
The winner of each game is the first person who scores 21 points.
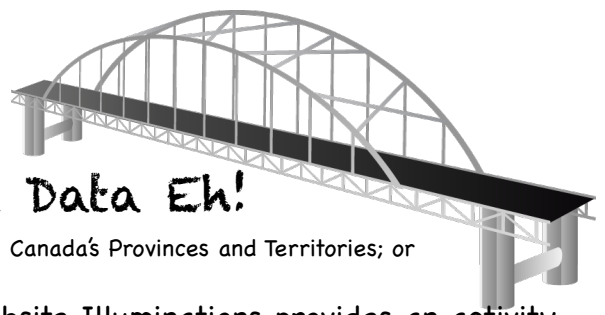
Cross Curricular: Canadian Data Eh!

Math and Social Studies (Grade 3: Urban and Rural; Grade 4: Canada's Provinces and Territories; or Grade 5: Aspects of Citizenship and Government in Canada)

The National Council of Teachers of Mathematic's website Illuminations provides an activity specific to Canada. Entitled, The Canada Data Map it can be used to explore data sets geared to Canadian social studies, including: land area, population, population density, seats in the house of commons per province, etc. It also calculates the mean, median and upper/lower quartile of the data it provides. http://illuminations.nctm.org/ActivityDetail.aspx?ID=175

Character Education

Average Joe, Average Jane: Is being Different OK?

This question helps commence a class discussion about self-confidence and accepting and respecting differences. Exploring children's similarities and differences using Venn diagrams is a great way to extend this theme.

Discussion questions to explore:
What does it mean when someone is said to be 'average'?
Have you ever felt different, not average?

Group Activity:
Assemble several objects in a basket. Items such as a: toy car, can of soup, teddy bear, can opener, pencil, etc. Have the students pick an object. The student then states how they are like the item and how they are unlike the item. The answers may surprise you and will help highlight everyone's uniqueness.

A Fantastic picture book that discusses children around the world:

This Child, Every Child: A Book About the World's Children by David J. Smith

This Child, Every Child uses statistics and stories to draw kids into the world beyond their own borders and provide a window into the lives of their fellow children. As young readers will discover, there are striking disparities in the way children live. Some children lack opportunities that others take for granted. What is it like to be a girl in Niger? How are some children forced into war? How do children around the world differ in their home and school lives? This Child, Every Child answers such questions and sets children's lives against the rights they are guaranteed under the United Nations Convention on the Rights of the Child.

Multi-Media

Interactive Computer Game from the UK entitled Mode, Median, Mean, Range
http://www.bbc.co.uk/schools/ks2bitesize/maths/data/mode_median_mean_range/play.shtml

Kids Math Game for Understanding Mean, Median, Mode and Range
http://www.brainpop.com/math/dataanalysisandprobability/meanmedianmodeandrange/preview.weml

and http://w.kidsmathgamesonline.com/numbers/meanmedianmode.html

Uses race times to show how to calculate mean, median and mode.
http://www.crickweb.co.uk/ks2numeracy-money-and-mean.html#MeanRunnersCW

SmartBoard:
http://exchange.smarttech.com/search.html?q=mean+median+and+mode

Is Your Family Average?

Thematic Imaginings

BOOK: <u>Phantom Tollbooth</u> by Norton Juster (1961)
(Ages 9-12)

**Supplies:** Interlocking Cubes, a copy of the <u>Phantom Tollbooth</u>

This magical book will entrance your students and may even create a greater interest in math! Here is a quick synopsis: A bored young boy, Milo, drives his small electric car through a toy tollbooth and finds himself in the Land Beyond. Milo's journey takes him through a land where he learns the importance of words and numbers providing a cure for his boredom. In fact, one of the cities, Digitpolis, is very 'mathematical.' Here Milo meets the dodecahedron, a character with 12 faces each showing a different emotion and the mathemagician. One theme that Juster explores in Digitpolis, is the idea of 'average.'

After reading this book aloud to your class everyday this lesson is best completed when you get to the part when Milo meets a child that tells him, that being a fraction of a person is really quite lucky. He says, "Every average family has 2.58 children, so I always have someone to play with."

How does this make sense? Here is the fun part.

Start by discussing the meaning of averaging as a 'leveling' process. Ask students to identify situations where they have experienced averaging (grades, hockey scores, population data and so on). Link their thoughts to this idea: That average is a number that represents what all the data items would be if they were leveled out. Essentially, the mean represents all the data items. This idea relates strongly with the measure of the 'centre' of the data or a measure of central tendency.

Demonstrating the 'leveling' process using different colored unifix cubes is recommended. First establish your data set. "Lets say we asked the question, How many children are in your family? and had each student write on a piece of paper the number and place it in a bucket. Then six pieces of paper were selected (as our random sampling). The data set selected was 2, 4, 4, 3, 5, 2. Each child will be represented by one cube and each family will have their own color. As shown below:
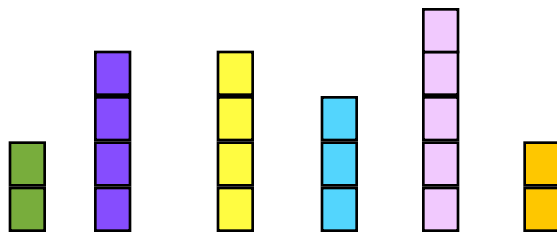

Again, keeping in mind that each block represents one child. Therefore, the green cubes represent a family with 2 children. The dark purple cubes represent a family with 4 children and the bright yellow cubes represent a family with 4 children, etc.

Now we want to figure out the average of this data set. The question we ask ourself is "What is the average amount of children in this class?" Let's level out the cubes to see.
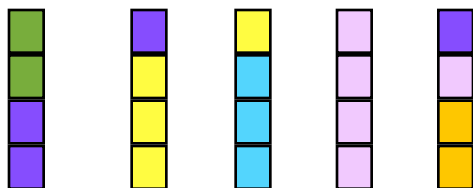
"So, according to the cubes what is the average number of children in the class?" (4)

Have the students practice with unifix cubes at their desk with another data set. Use a random sampling from another class (2,3,2,4,1,1,1,2). Once students have completed it and found the average (2) give them one last data set. This set is challenging because the children (numbers) are not evenly distributed. They will find that they have (2,1,3,3)
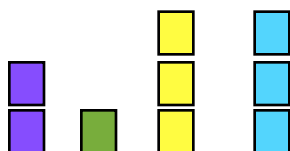
It looks like we have one child leftover. Does anyone have solution for this?
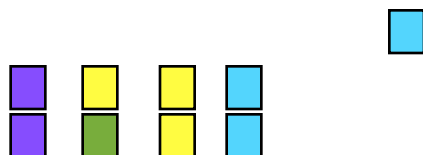
Does anybody know of one way to distribute it among all 4 groups? Using the board draw the cubes in their stacks and take the one leftover cube and draw it bigger. "In order to distribute this cube evenly between all 4 stacks could we divide it into 4 pieces so that each stack gets a piece. Demonstrate it on the board. This means that each stack will have ¼ of a piece. What is ¼ as a decimal? Yes, .25. So what is the average number of children per family in this class? 2.25. Does this mean we have part of a child? Yes!

¼

¼

¼

¼
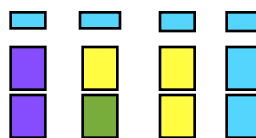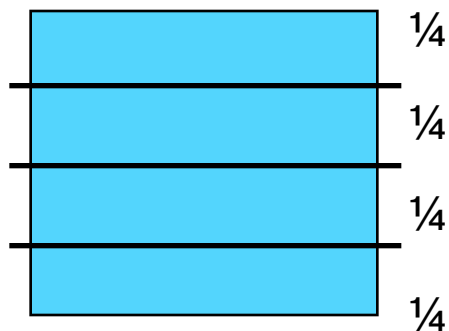
Picture This!
More Literature links for mean, median and mode.

Fiction:

<u>Centerfield Ballhawk</u> by Matt Christopher (1994)
Baseball player Jose Mendez worries about his poor performance with the bat and fears disappointing his father, a former ballplayer with an outstanding batting **average**.

Non-Fiction:

<u>Graphing and Probability Word</u> Problems by Rebecca-Nelson (2010)
Presents a step-by-step guide to understanding word problems with graphing and probability

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

References

Ontario Ministry of Education. (2006). <u>The Ontario curriculum grades 1-8: Language.</u>
Retrieved from September 8, 2010, from http://www.edu.gov.on.ca/eng/
curriculum/ elementary/language18currb.pdf

Ontario Ministry of Education. (2005).<u>The Ontario curriculum grades 1-8:</u>
Mathematics. Retrieved September 8, 2010 from http://
www.edu.gov.on.ca/ eng/curriculum/elementary/math18curr.pdf

Ontario Ministry of Education. (2004). <u>The Ontario curriculum grades 1-8: Social</u>
Studies. Retrieved on January 4, 2011, from http://www.edu.gov.on.ca/eng/
curriculum/elementary/sstudies18curr.pdf

Ontario Ministry of Education. (2009). <u>The Ontario curriculum grades 1-8: The Arts.</u>
Retrieved January 4, 2011, from http://www.edu.gov.on.ca/eng/
curriculum/ elementary/ arts18b09curr.pdf

Reys, R., Lindquist, M., Lambdin, D., Smith, N., & Colgan, L.(2010). <u>Helping Children</u>
<u>Learn Mathematics.</u> Toronto: John Wiley & Sons Canada, Ltd.

Small, M. (2009). <u>Good questions: Great ways to differentiate mathematics</u>
<u>instruction.</u> (2009). New York: Teacher's College Press.

Van de Walle, J.A., Folk, S., Karp, K., & Bay-Williams, J. (2011). <u>Elementary and middle</u>
<u>school mathematics: Teaching developmentally</u>. Toronto: Pearson.

All About Average - Tally Sheet....

Heads	Tails
Toss coin 5 times	
Toss coin 10 times	
Toss coin 20 times	