Resources for enjoyment!

Reference:

Neuschwander, C. (1997). Sir cumference and the first round table. Curriculum Connection: Moscow, ID.

Web Resources

http://www.mmdatasurvey.com/
A real world data project with M&M's created by a teacher and his students.

http://nlvm.usu.edu/en/nav/vlibrary.html
The national library of virtual manipulatives from Utah State University for grades K-12. A great site for students to practice math concepts using virtual manipulatives.
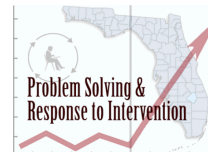
Edible Math
Hands on Math Strategies
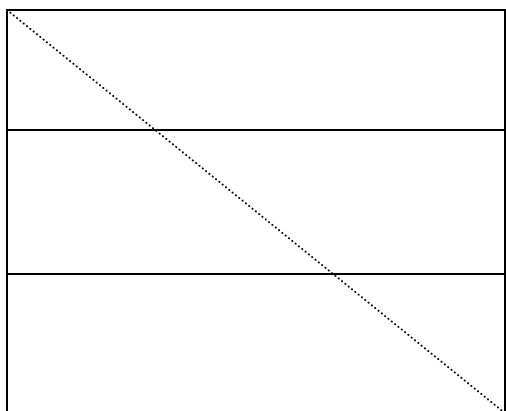
Secondary

Made possible through support from:

To be used with Candy Boxes page 17.

Candy Colors

Color	Number

Edible Math

To be used with fruity Cuts page 15.

To be used with Candy populations page 13.

Candy Tally Table

Color	Tally	Total of each color / Total number of experiments done	Percent of color	Predicted number in one bag	Actual number in one bag

To be used with counting on Chocolate page 12.

M & Ms® Data

Color	Number	Ratio to total	Percentage	% out of 360

Edible Math Secondary

Hands-on
Math Strategies

PS/RtI

To be used with Gumdrop Polygons page 10.

The lesson plans presented in this booklet represent lessons that occur at the concrete, representational and show the abstract level in mathematics.

Gumdrop Polygons Vertices Recording Ta-	Vertices Coordinates
Polygon transformation performed	
Original polygon	
Reflected over the X axis	
Reflected over the Y axis	
Translated (2,-3) two to the right three down	
Translated (-4, 1) four to the left one up	

*To be used with Sugar Cube Condos page 9.

Sugar Cube Condo Measurement Table

Condo Measurements	Scale Factor	Surface Area	Volume
Original Condo 2 X 2 X 3	1/1		
Second Condo	2/1		
Third Condo	3/1		

Contents

Dear Parent/Guardian/Educator,

PS/RtI, a project funded by the Bureau of Exceptional Education and Student Services, Florida Department of Education—would like to welcome you to *Edible Math*. This resource was designed as a tool to assist you in reinforcing mathematics concepts at home and in school using food. Research has shown that in order to reach the necessary level of abstract thinking in mathematics, students must start at the concrete level and gradually move through the representational level (Miller & Mercer, 1997, 1993). The activities presented in this workshop represent lessons that occur at the concrete and representational level in mathematics to foster important math skills for all children.

We recognize that parents are the first teacher(s) in the life of a child, and we hope that you will take these activities and expand on them to create rich, meaningful mathematic learning experiences for your children.

Sincerely,

PS/RtI

*To be used with proportionally Speaking page 7.

Proportion Table

Number of Skittles		
Candy Color ___		
Candy Color ___		

To be used with M&M&M page 6.

Class Chart

Student Name	Mean Number of each color	Median Number of each color	Mode number of each color	Range of number of each color						

LESSON PLANS

Lesson Plan Title: Fraction Fun

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.6.A.1.3) Solve real world problems involving multiplication and division of fractions and decimals.
NCTM: *Number and Operations*: Developing an understanding of and fluency with multiplication and division of fractions and decimals
Concept to Teach: Students explore dividing fractions and mixed numbers by fractions.
Required Materials:
> Red licorice rope
> Black licorice rope

Step-By-Step Procedures:
> Designate a denominator to be associated with each color of
> > licorice (i.e. red is fourths and black is thirds)

> Provide students with 5 ropes of each color.
> Have students divide two ropes of each color into the
> > appropriate fractional pieces. (i.e.- red into 4 equal pieces,
> > black into 3 equal pieces)

> Have students use ropes to explore problems like 2 1/3 divided
> > by ¼ and 4/3 divided by 2/3.

> Provide additional problems for students to explore or have
> > them create their own with the given materials.

> Have students reflect upon what patterns they see with the
> > problems and their answers.
> > > When you divide by a fraction, what happens with your
> > > answer? Is it a larger or smaller number? Why?

Extension: May be used to figure out the rule for dividing by a fraction with multiple examples and exploration of patterns.

ATTACHMENTS

Lesson Plan Title: Candy Boxes

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.8.S.3.1) Select, organize and construct appropriate data displays, including box and whisker plots, scatter plots, and lines of best fit to convey information and make conjectures about possible relationships.
(MA.8.S.3.2) Determine and describe how changes in data values impact measures of central tendency.
NCTM: *Data Analysis*: Students use descriptive statistics, including mean, median, and range,, to summarize, and compare data sets, and they organize and display data to pose and answer questions.
Concept to Teach: Students construct a table and a box and whisker plot to organize and display collected data and then to compare results and determine how changes in data will effect mean, median, and mode.
Required Materials:
> 1 bag of M & Ms® or Skittles per student
> Candy recording table

Step-By-Step Procedures:
1. Have students record the number of each color of candy in their bag as a data entry in a table.
2. Have students combine data with a partner and together construct a box-and-whisker plot to represent the combined data totals. [i.e.- if one student's data is 8, 12, 12, 16, 17, 22 and the other student's is 10, 15, 16, 16, 21, 24, then the new data set is {8, 10, 12, 12, 15, 16, 16, 16, 21, 22, 24}].
3. Describe the distribution represented by the box-and-whisker plot.
   a. What is the range?
   b. What is the median?
   c. What is the mode?
   d. What is the median?
   e. What does the shape of the box-and-whisker plot tell you about the data distribution?
   f. How would the distribution change if you added 10 green candies to the data collected?

Lesson Plan Title: Pi Day

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.6.G.4.1) Understand the concept of π, know common estimates of π (3.14; 22/7) and use these values to estimate and calculate the circumference and the area of circles.
(MA.6.G.4.2) Find the perimeters and area of composite two-dimensional figures, including non-rectangular figures (such as semicircles) using various strategies.
NCTM: *Algebra*:Writing, interpreting, and using mathematical expressions and equations
Concept to Teach: Students explore the relationship of diameter, circumference and pi.
Required Materials:
> Rulers
> Spool of curling ribbon cut into 2-3 foot lengths
> Moon pies
> Oatmeal pies
> Chocolate Chip cookies
> Round waffles (toasted)
> (note: any number of *round* "treats" may be substituted in this activity)

Step-By-Step Procedures:
> Provide each student with a round "treat" and a length of ribbon
> Have students use the ribbon to "measure" the diameter across the center of their round treats. Cut the ribbon the length of this measurement.
> Have students use the remaining ribbon to measure around the outside (the circumference) of their round treat and cut the ribbon to this measurement. Discard remaining ribbon.
> Have students divide the circumference ribbon by the diameter ribbon and record the result in a class table.
> Compare everyone's results. (They should all be around 3.14)
> Discuss the value and its relationship to the circle. Discuss the reason for variances in the values found by students (i.e. measurement error)
> Extend the activity by using the diameter ribbon to find the radius of the circle and pi to find the area of each student's round treat.
> > How would the area change if the diameter were doubled?
> > How would it change if the diameter were half as long?

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Lesson Plan Title: The Magic Circle

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.6.G.4.2) Find the perimeters and areas of composite two-dimensional figures, including non-rectangular figures (such as semicircles) using various strategies.
NCTM: *Measurement and Geometry*: Problems that involve areas and volumes.
Concept to Teach: Students explore the area of a circle and the formula for it by decomposing the circle into a rectangle.
Required Materials:
> Small cooked pizzas (1 per group of 2-4 students) or Flour Tortillas
> Pizza cutter or plastic knife for each group
> Rulers

Step-By-Step Procedures:
> Have students cut eight diagonals across the pizza or tortilla cutting the pieces into approximately equivalent sizes.
> Have students lay the pieces out horizontally alternating the pointed end up, then down, then up, etc. forming a "rectangular" shape.
> Discuss the formula for finding the area of a rectangle and apply it on the pizza rectangle.
> Examine the sides of the rectangle and discuss the relationship of the length to the original circle (Students should see that the length is formed entirely by rounded pieces that use to be the circumference of the circle. They should see that the width of the rectangle corresponds to the radius of the circle).
> Students should be led to discover that in light of the relationships, the area of the circle when converted to a rectangle is length times width which is equivalent to ½ circumference times radius, and since circumference is pi times diameter and diameter is 2 times the radius, the area of a circle is then equal to ½ times pi times 2 times the radius times the radius. This is simplified to area = pi times radius squared.
> How is the length of the rectangle related to the original circle?
> How is the width of the rectangle related to the original circle?
> How is diameter related to radius?
> What formula do you get for the area of the circle based on the area of the rectangle?

Lesson Plan Title: Crunchy Corners

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.8.G.2.3) Demonstrate the sum of the angles in a triangle in 180-degrees and apply this fact to find unknown measures of angles, and the sum of angles in polygons.
NCTM: *Geometry and Measurement:* Students explain why the sum of the measures of the angles in a triangle is 180 degrees and they apply this fact about triangles to find the unknown measures of angles.
Concept to Teach: Students explore the relationship between the angles of a triangle and a straight angle having 180 degrees.
Required Materials:
> Several triangle shaped corn chips or crackers per student
> 1 ruler per student

Step-By-Step Procedures:
1. Give each student several triangular corn chips or crackers to examine.
2. Have students break off the corners of the chips or crackers and line up together along the edge of a ruler to form a straight line demonstrating that the sum of the angles of the triangle is 180 degrees.
3. Have students repeat the process with different sizes of triangles.
   a. Does it make a difference what size triangle you use? Why or why not?
   b. Does it make a difference what size corner you break off? Why or why not?
   c. How can this relationship help you if you know the measure of 2 angles in a triangle? Does it make a difference what type of triangle you used?

Lesson Plan Title: Fruity Cuts

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.8.G.2.2) Classify and determine the measure of angles, including angles created when parallel lines are cut by transversals.
NCTM: *Geometry and Measurement*: Students prove that particular configurations of lines give rise to similar triangles because of the congruent angles created when a transversal cuts parallel lines.
Concept to Teach: Students investigate the relationship of angles formed by parallel lines cut by a transversal.
Required Materials:
　　1 Fruit Roll-up® square for each student
　　Plastic knife or scissors for each student
　　Ruler
Step-By-Step Procedures:
1. Have students roll out and flatten fruit squares.
2. Have students cut 2 parallel lines across the fruit squares.
3. Have students cut a transversal line across the fruit square through the parallel lines.
4. Have students explore the relationship of the angles and triangles created by lifted and comparing the pieces cut into the fruit square.
   a. Are any angles congruent? Which ones?
   b. Are any angles complementary? Which ones?
   c. Are any angles supplementary? Which ones?
   d. Why do these relationships exist?
5. Have students create a sketch of the parallel lines label Each angle.
6. Have students describe the relationships described between each of the angles.

Lesson Plan Title: M & M & M (Mean, Median and Mode)

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.6.S.6.1) Determine the measures of central tendency (mean, median, and mode) and variability (range) for a given set of data.
MA.6.S.6.2) Select and analyze the measures of central tendency or variability to represent, describe, analyze and/or summarize a data set for the purposes of answering questions appropriately.
NCTM: *Data Analysis*: Students use descriptive statistics, including mean, median, mode and range to summarize and compare data sets (Grades 5 and 8).
Concept to Teach: Students describe the mean, median, mode and range of an individual set of data and make comparisons to similar sets of data.
Required Materials:
　　Individual size bag of M&M® for each student
　　Class Chart
Step-By-Step Procedures:
　　Provide each student with an individual bag of candy.
　　Have students sort candy by color.
　　Have students determine the mean, median, and mode number of candies of each color in their bags and the range for the number of each color.
　　Have students record the mean, median, and mode numbers of candies in their bag on a class chart and compare results.
　　Discuss the variance in measures of central tendency and hypothesize on the reasons for the differences.
　　　　Is the variance in numbers within acceptable limits?
　　　　What might cause the numbers to be different?
　　　　Is it important for the numbers to be the same? Why or why not?

Lesson Plan Title: Proportionally Speaking

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.7.A.1.1) Distinguish between situations that are proportional or not proportional and use proportions to solve problems.
NCTM: *Number and Operations*: Developing an understanding of and applying proportionality.
Concept to Teach: Students practice creating proportional sets of candies.
Required Materials:
> Portion cups
> Skittles®
> Recording Sheet

Step-By-Step Procedures:
> Divide students into teams of 4-5 students.
> Provide each team with a vending size bag of Skittles®.
> Provide each team with a portion cup containing a "master mix" of Skittles with a pre-selected proportion of two colors (i.e. 3 red and 2 yellow).
> Provide each team with 4 partial sets of Skittles in four separate portion cups. (Each cup will have a given number of only 1 color- i.e. 4 green in one cup, 6 purple in one cup, etc.).
> Have teams use Skittles from their team's bag to complete the partial sets creating a mix that is proportionally equal to the "Master Mix" they received.
> Have students record their results in a proportion table.
> Have students explore self-created "master mixes" and complete additional proportion tables.
>> What are other ways that the information in the proportion tables can be expressed?
>> How can proportions be helpful in real-life problem solving situations?

Lesson Plan Title: Paws and Fins and Bears, Oh My!

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.8.A.1.3) Use tables, graphs, and models to represent, analyze, and solve real-world problems related to systems of linear equations.
NCTM: *Algebra*: Students use linear functions, linear equations, and systems of linear equations to represent, analyze, and solve a variety of problems.
Concept to Teach: Students model the relationship in a system of equations.
Required Materials:
> 25-30 teddy bear shaped cookies per student pair
> 25-30 Swedish fish per student pair

Step-By-Step Procedures:
1. Have students work with a partner to use cookies and candy fish to model the following situation:
   > A theme park sells stuffed character dolls that include bears with 4 paws each and fish with 3 fins. If the last order of bears and fish included 33 stuffed characters with a total of 120 paws and fins, how many of each character are included in the order?
2. Have students write a system of equations to model the situation.
3. How is using a system of equations different from modeling the situation with concrete objects? Which method is simpler? Why?

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Lesson Plan Title: Candy Populations

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.7.P.7.2) Determine, compare, and make predictions based on experimental or theoretical probability of independent or dependent events.
NCTM: *probability*: Students understand that when all outcomes of an experiment are equally likely, the theoretical probability of an event is the fraction of outcomes in which the event occurs. Students use theoretical probability and proportions to make approximate predictions.
Concept to Teach: Students use experimental probability to make predictions.
Required Materials:
    1 bag of M & Ms® or Skittles®. per student
    Candy recording tables
Step-By-Step Procedures:
1. Conduct an experiment of independent variable probability by having students draw one piece of candy at a time from a bag, record its color and replace the candy to the bag.
2. Repeat the procedure 25, 50, 75 and 100 times recording the results as tally marks after each draw of candy.
3. Make a prediction about the color of the candies in the bag based on the results of the experimentation.
   a. How does the prediction change as the number of experiments increases?
   b. How many experiments is enough to get a reliable estimate for the color proportions in the bag?
4. Empty the bag and compare the actual color numbers to the predicted numbers.

Lesson Plan Title: Cracker Tiles

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.7.A.1.6) Apply proportionality to measurement in multiple contexts, including scale drawings and constant speed.
NCTM: *Measurement and Geometry*: Students connect their work on proportionality with their work on area and volume by investigating imilar objects.
Concept to Teach: Students explore proportionality and measurement by creating a scale model of their classroom floor.
Required Materials:
    Tape measure/meter sticks
    Saltine crackers
    Cheese crackers (squares)
    Graham cracker squares
Step-By-Step Procedures:
    Students work with a partner or small team to measure the dimensions of their classroom floor and determine its area.
    Students use a given set of crackers to create a model of the classroom floor and find the area of the model.
    Students should determine the scale factor created between the cracker's measurements and the real floor's measurements.
    Students should discuss and compare the scale factors created by different types of crackers.
        Which type of cracker represented the largest scale factor? Why?
        What is the ratio of the area of the cracker floor to the real floor? How does this relate to the scale factor between the two floors?

Lesson Plan Title: Sugar Cube Condos

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.7.G.4.1) Determine how many changes in dimensions affect the perimeter, area, and volume of common geometric figures and apply these relationships to solve problems.
NCTM: *Measurement and Geometry*: Students connect their work on proportionality with their work on area and volume by investigating similar objects. They understand that if a scale factor describes how orresponding lengths are related, then the square of the scale factor describes how corresponding areas are related, and the cube of the scale factor describes how corresponding volumes are related.
Concept to Teach: Students explore the relationship between scale factor, area, and volume.
Required Materials:
    Sugar Cubes (Approximately 100 cubes per student group)
    Recording Sheet
Step-By-Step Procedures:
    Have students work in small groups.
    Provide each group of students with a set of sugar cubes.
    Have students build a rectangular prism (sugar cube condo) with the sugar cubes that measures 2 X 2 X 3.
    Have students record measurements in a table and determine the surface area and volume of the "condo".
    Record these measurements in the table also.
    Have students build another "condo" with a scale factor of 2/1 (all of the original lengths should be doubled).
    Record the new measurements in the table and determine the surface area and volume of the new figure.
    Have student groups pair together to share materials and create a third "condo" in which the scale factor is 3/1 in relation to the original condo (all the original lengths are tri-pled).
    Record the new measurements in the table and determine the surface area and volume of this final figure.
    Reflect upon the relationships between the scale factor, lengths, surface areas and volumes of the three figures (sugar cube condos).
    How does the change in surface area relate to the original lengths and scale factors?
    How does the change in volume relate to the original lengths and scale factors?
    What would the surface area be for a sugar cube condo if the scale factor were 4/1? What would the volume be for a sugar cube condo if the scale factor were 4/1?

Lesson Plan Title: Counting on Chocolate

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.7.S.6.2) Construct and analyze histograms, stem-and-leaf plots, and circle graphs.
NCTM: *Data Analysis*: Students use proportions to make estimates relating to a population on the basis of a sample. They apply percentages to make and interpret histograms and circle graphs.
Concept to Teach: Students practice constructing and analyzing circle graphs and stem-and-leaf-plots.
Required Materials:
    1 bag of M & Ms® per student
    1 protractor per student
    Candy recording tables
Step-By-Step Procedures:
1. Have each student count the number of each color of candy in their bag and record in the table.
2. Have students determine the proportion of each color to the total number of candies and convert this to a percentage. Record the percentage in the table.
3. Have students use percentages to determine the number of degrees to use when constructing a wedge in a circle graph that will represent the candy color. Repeat this for each of the colors. Record the degrees in the table.
4. Use the information from the table and a protractor to construct a circle graph representing all of the candy colors in the bag.
5. Have students transfer all of the data numbers related to the number of pieces of each color into a whole class stem and leaf plot. Discuss the range, median, and mode related to the data.
    a. What factors account for the range in the data set?
    b. Is there more than one mode? Why or why not?

Lesson Plan Title: Marshmallow Madness

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.7.G.4.3) Identify and plot ordered pairs in all four quadrants of the coordinate plane.
NCTM: *Measurement and Geometry*: No middle grade connections.
Concept to Teach: Students practice identifying and plotting ordered pairs in a coordinate plane.
Required Materials:
> Mini Marshmallows
> Gridded Chart paper

Step-By-Step Procedures:
1. Have students work with a partner to construct an X and Y coordinate system on a piece of gridded chart paper.
2. Provide each group a small bag of mini marshmallows (approx. 10-15) in a paper cup.
3. Part 1– Gives students a chance to determine ordered pairs to match given locations.
- Have students hold cup of marshmallows about 1-2 feet over the origin on the gridded chart paper and empty the marshmallows onto the coordinate system.
- Have students determine the location of each marsh mallow on the coordinate system and record the
- ordered pairs associated with each location.
- Compare results achieved by other groups. Are there any connections? Why or why not? Part 2– Gives students a chance to determine location of given ordered pairs.
- Have students collect marshmallows from chart paper.
- Provide each group with the following list of ordered pairs and have students use the marshmallows to mark each location. {(-2,0), (1,2), ((2,-1), (2,1), (-2,-2), (0,0), (-1,2), (2,0), (0,1), (-2, -1), (2, -2), (-2, 1)}.
- What letter is created by the marshmallows?

Lesson Plan Title: Gumdrop Polygons

Sunshine State Standards Addressed/NCTM Focal Point:
(MA.7.G.4.2) Predict the results of transformations and draw transformed figures, with and without the coordinate plane.
NCTM: *Measurement and Geometry*: Students select appropriate two-dimensional shapes to model real-world situations and solve a variety of problems.
Concept to Teach: Students explore the relationship between coordinates of the vertices of two-dimensional polygons transformed on a coordinate plane.
Required Materials:
> Gumdrops
> Toothpicks/wooden skewers
> Gridded chart paper

Step-By-Step Procedures:
1. Have students break into small groups of 2-3.
2. Provide each group of students with about 10 gumdrops, 8-10 skewers, and a sheet of gridded chart paper labeled with an X and Y axis. (Students can label the axis themselves.)
3. Have students use the gumdrops to mark the vertices of a given polygon on the gridded chart paper. (Students may design the polygon in anyway they choose with a given number of vertices.)
4. Have students connect the vertices with the skewers to create a two-dimensional figure.
5. Students should record the coordinates of the vertices.
6. Using the gumdrop polygon, students should perform a reflection over X or Y axis and a translation in the coordinate plane and then record the new coordinates. Students should return the polygon to the original location before performing each transformation.
7. What relationship exists between the original coordinates and the coordinates of each transformation? Did other groups have similar relationships with different polygons? Why or why not?