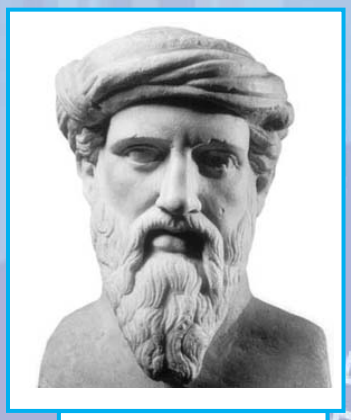
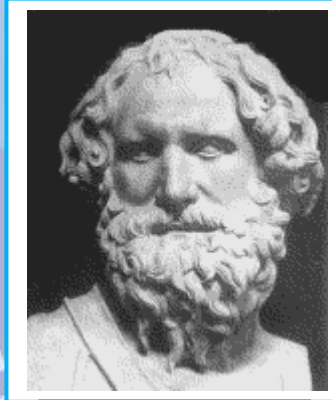


Pythagoras



Archimedes

Euclid

A MATHEMATICS Winter Number Land

Grade 6

Winter 2011-2012

Miami-Dade County Public Schools
Curriculum & Instruction

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WELCOME TO A MATHEMATICS WINTER NUMBER LAND

The realm of mathematics contains some of the greatest ideas of humankind. The *A Mathematics Winter Number Land* activities included in this packet are a mathematical excursion designed to be read, fun to do, and fun to think and talk about. These activities will assist you in applying the concepts you have studied. Additionally, each activity addresses a specific Next Generation Sunshine State Benchmark. Each benchmark is listed at the end of the activity.

The journey to true mathematics understanding can be difficult and challenging but be patient and stay the course. Mathematics involves profound ideas. As we make these ideas our own, they will empower us with strength, techniques, and the confidence to accomplish wonderful things. Enjoy working each activity.

Included as part of this packet, is a link to the Miami-Dade County Public Schools Student Portal *Links to Learning* technology activities. Individualized student learning paths have been designed based on FCAT scores and are aligned to the District's Pacing Guides. These online activities are supplemental and, as such, are not to be assigned or graded. All online activities are provided as a resource to both parents and students to engage learning using technology. Please log on just as you do at your school.

Tips for *A Mathematics Winter Number Land*

Read the activity and attempt to answer the questions that follow. The only rules are:

1. Make an earnest attempt to solve the problem. Record your attempts.
2. Be creative.
3. Don't give up. If you get stuck, look at the story and question a different way.
4. Discuss your story with your family.
5. HAVE FUN!

If you are in need of additional information about the *A Mathematics Winter Number Land* Winter Break Activity Packet, please contact the Division of Mathematics, Science, and Advanced Academics Programs, at 305 995-1934.

Who Were They?

Pythagoras was a Greek mathematical genius and often described as the first pure mathematician. He invented the Pythagorean Theorem which states that: "In any right triangle, the area of the square whose side is the hypotenuse (the side of a right triangle opposite the right angle) is equal to the sum of areas of the squares whose sides are the two legs (i.e. the two sides other than the hypotenuse)."

Euclid, the Greek mathematician, was known as the "Father of Geometry". He taught at the university in Alexandria, Egypt. While at the university, he compiled his famous 13 volume treatise called *Elements* that is still the basis of the geometry taught in schools to this day. He used axioms (accepted mathematical truths) to develop a deductive system of proof, which he wrote in his textbook *Elements*. Euclid's first three postulates, with which he begins his *Elements*, are familiar to anyone who has taken geometry: 1) it is possible to draw a straight line between any two points; 2) it is possible to produce a finite straight line continuously in a straight line; and 3) a circle may be described with any center and radius.

Euclid also proved that it is impossible to find the "largest prime number," because if you take the largest known prime number, add 1 to the product of all the primes up to and including it; you will get another prime number. Euclid's proof for this theorem is generally accepted as one of the "classic" proofs because of its conciseness and clarity. Millions of prime numbers are known to exist, and more are being added by mathematicians and computer scientists. Mathematicians since Euclid have attempted without success to find a pattern to the sequence of prime numbers.

Archimedes is one of the great scientists of antiquity also known for his mathematical work. It is believed he studied under followers of Euclid. He proved that an object plunged into liquid becomes lighter by an amount equal to the weight of liquid it displaces. Popular tradition has it that Archimedes made the discovery when he stepped into the bathtub, then celebrated by running through the streets shouting "Eureka!" ("I have found it!"). He also worked out the principle of levers, developed a method for expressing large numbers, discovered ways to determine the areas and volumes of solids, and calculated an approximation of pi (π).

Table of Contents

The Largest Animal Group – Arthropods

Adopted from Holt Middle School Math, 2004 edition, Course 1

Arthropods are animals with segmented bodies and six or more jointed legs. They are the largest animal group on Earth. In fact, more than three out of four of all animals are arthropods. They are found everywhere - on land, in trees, in freshwater and saltwater, and even underground. Arthropods are generally small. Most are less than 1 cm long. Some arthropods, however, are quite large. The giant king crab, for example, measures over 3.2 m from the tip of one outstretched leg to another. Some of the most familiar arthropods are butterflies, beetles, flies, ants, bees, spiders, scorpions, shrimp, and crabs.

Six Legs, Eight Legs, Ten Legs, or More!

Arthropods belong to one of three major groups: insects, crustaceans, or arachnids.

Insects are the only arthropods capable of powered flight. Some dragonflies can fly at speeds over 40 mph! Insects have six legs. They are the only arthropods capable of powered flight. Dragonflies are the most spectacular. Some can fly at speeds over 40 mph! Every year, scientists discover and describe thousands of new arthropod species. Most are new insects.

Spiders, like this tarantula, are arachnids. Arachnids make up the second-largest group of arthropods. Arachnids have eight legs. Spiders are, perhaps, the best-known arachnid. Most arachnids live on land, although a few live in freshwater. Scorpions, mites, and ticks are also arachnids.

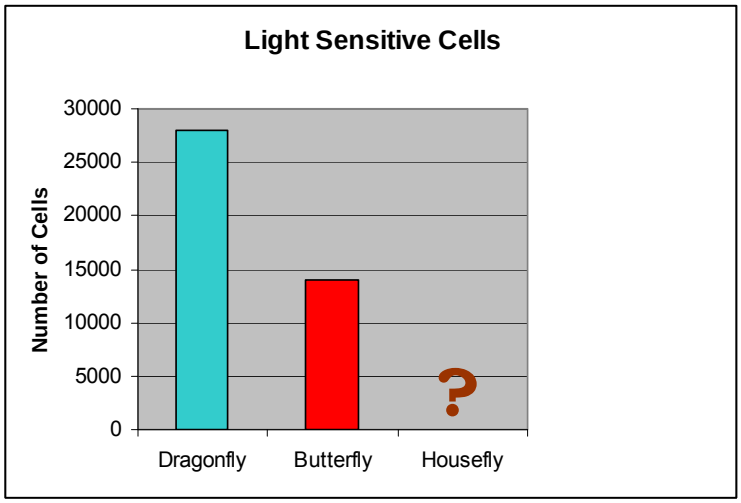
This spiny lobster is a crustacean. Most crustaceans live in the ocean or in freshwater. Crustaceans have ten or more legs. Most are aquatic, which means they live in water. Most aquatic crustaceans - crabs, lobsters, and shrimp - live in the sea. A few crustaceans live in freshwater streams and lakes. Some, like woodlice, live on land. Both the largest and smallest arthropods in the world are crustaceans.

Arthropods and People

Many people do not understand the vital role arthropods play in keeping the world alive and healthy. Life on Earth would end very quickly without arthropods. Arthropods are great recyclers and decomposers and they are a super food source. They also help pollinate the plants that provide food and keep the air and water clean.

The Largest Animal Group – Arthropods

Adopted from Holt Middle School Math, 2004 edition, Course 1



1. Centipedes have 2 legs per segment. The record number of legs on a millipede is 752. Find a range for the number of segments a centipede can have.

2. A dragonfly has 7 times as many light-sensitive cells as a housefly. How many of these cells does a housefly have?

3. Find how many times more light-sensitive cells a dragonfly has than a butterfly.

4. A trapdoor spider can pull with a force that is 140 times its own weight. What other information would need to find the spider's weight? Explain.

5. There are about 6 billion humans in the world. Scientists estimate that there are a billion billion arthropods in the world. About how many times larger is the arthropods population than the human population?

The Largest Animal Group – Arthropods

Adopted from Holt Middle School Math, 2004 edition, Course 1

BENCHMARKS:

MA.6.S.6.1
Determine the measures of central tendency (mean, median, mode) and variability (range) for a given set of data.

MA.6.A.5.3
Estimate the results of computations with fractions, decimals, and percents, and judge the reasonableness of the results.

The Language of Algebra

People use language to communicate with each other. English is the language most commonly spoken in the United States. There are at least fifteen other languages, each of which is spoken by more than 100,000 Americans. All languages have at least two things I common. First, they let words stand for objects and ideas. Second, they have rules that tell speakers how to put words together.

Top 10 Non-English Languages Spoken at Home by Americans (1990 Census)	
Language	**Number of Speakers**
Spanish	**17,339,000**
French	**1,703,000**
German	**1,547,000**
Italian	**1,309,000**
Chinese	**1,249,000**
Tagalog	**843,000**
Polish	**723,000**
Korean	**626,000**
Vietnamese	**507,000**
Portugese	**430,000**

Mathematics has been called the ***universal language*** and Algebra is the gatekeeper of mathematics. To compare Algebra to a language, we must look at the two common things a language must have. Does Algebra have those two attributes?

- First, Algebra uses letters to stand for objects and ideas
- Second, It has universal rules that tell how to put mathematical ideas together

Based on these criteria, Algebra can be considered a language. In fact, no matter where a student is born in the world, when they take Algebra, they learn the same rules about using variables and formulas and they also learn other rules that are universal such as the order of operations. In fact, whatever mathematical rules apply in America, they also apply in Europe, Canada, Central American and every other place on the face of the Earth.

Since the 16th century, variables and formulas have been the key concepts and instruments of algebra. Formulas offer an easy example of connected variables and therefore provide a helpful preparation for the further study of functions in calculus. Formulas, together with the related concepts of introducing variables and solving equations, are a cornerstone for the further study of mathematics.

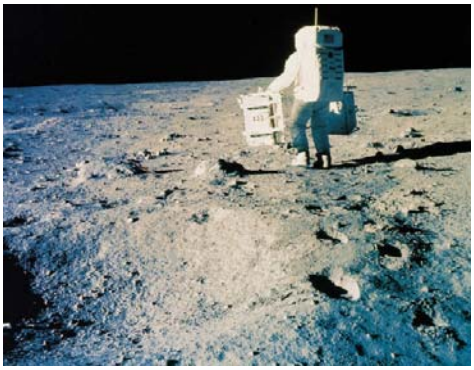
In this activity, you will be using Algebraic relationships to answer questions write formulas and to complete patterns.

The Language of Algebra

ACTIVITY SHEET

1. In a certain rectangle, the length is 10 inches more than the width. Complete the table below:

Width (in.)	5	11		15	w		x + 21
Length (in.)			34			n	



2. Astronauts who travel to the moon weigh six times as much on Earth as they weigh on the moon. Complete the table below:

Weight on moon (pounds)	10		50	n	2n	
Weight on Earth (pounds)		180				X

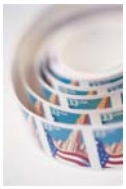
3. An apartment rents for $800 a month. The monthly rent is expected to increase $15 each year. What will be the rent at the end of 9 years?

_____

The Language of Algebra

ACTIVITY SHEET

4. In 2002, the first class rate was changed to 37¢ for the first ounce of mail and 23¢ for each additional ounce. A chart showing the postage for weight up to 5 ounces is shown below. What is the cost for an 8 ounce letter?



Weight	1 oz.	2 oz.	3 oz.	4 oz.	5 oz.	6 oz.	7 oz.	8 oz.
Postage	$.37	$.60	$.83	$1.06	$1.29			

5. The input and output values are listed in the table below. What is the rule for this set of values?

Input	3	4	5	6	7	8
Output	12	14	16	18	20	

_____

6. Determine the pattern.

   a. 1, 2, 3, 4, ___, ___, ___

   b. 1, 3, 5, 7, ___, ___, ___

   c. 2, 4, 6, 8, ___, ___, ___

   d. 7, 6.3, 5.6, 4.9, ___,___, ___

   e. 5, 13, 21, 29, ___, ___, ___

   f. 24, 12, 6, 3, ___, ___, ___

BENCHMARK: **MA.6.A.3.6**
Construct and analyze tables, graphs, and equations to describe linear functions and other simple relations using both common language and algebraic notation.

FRACTIONS - DECIMALS – PERCENTS

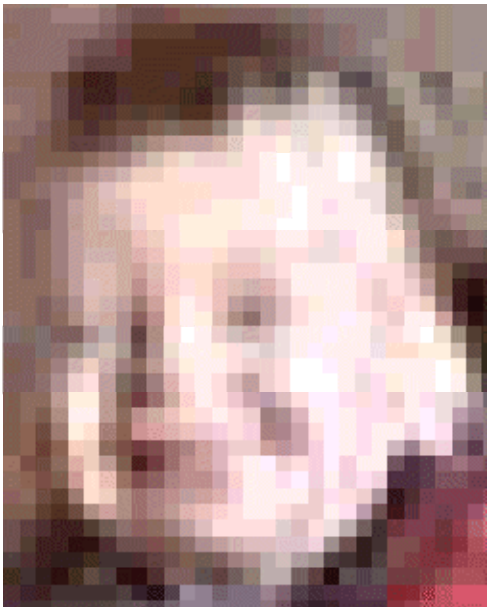
Adopted fromNCTM Journal "Mathematics teaching in the Middle Schools", August 2007

Television is certainly one of the most influential forces of our time. Through the device called a television set or TV, you are able to receive news, sports, entertainment, information and commercials. The average American spends between two and five hours a day glued to "the tube"!

Have you ever wondered about the technology that makes television possible? How it is that dozens or hundreds of channels of full-motion video arrive at your house, in many cases for free? How does your television decode the signals to produce the picture?

There are two amazing things about your brain that make television possible. By understanding these two facts, you gain a good bit of insight into why televisions are designed the way they are. The first principle is this: If you divide a still image into a collection of small colored dots, your brain will reassemble the dots into a meaningful image. The human brain's second amazing feature relating to television is this: If you divide a moving scene into a sequence of still pictures and show the still images in rapid succession, the brain will reassemble the still images into a single, moving scene.

Televisions and computer screens (as well as newspaper and magazine photos) rely on this fusion-of-small-colored-dots capability in the human brain to chop pictures up into thousands of individual elements. On a TV or computer screen, the dots are called ***pixels***. The picture below is magnified to show the ***pixels*** that make up an image on a television.

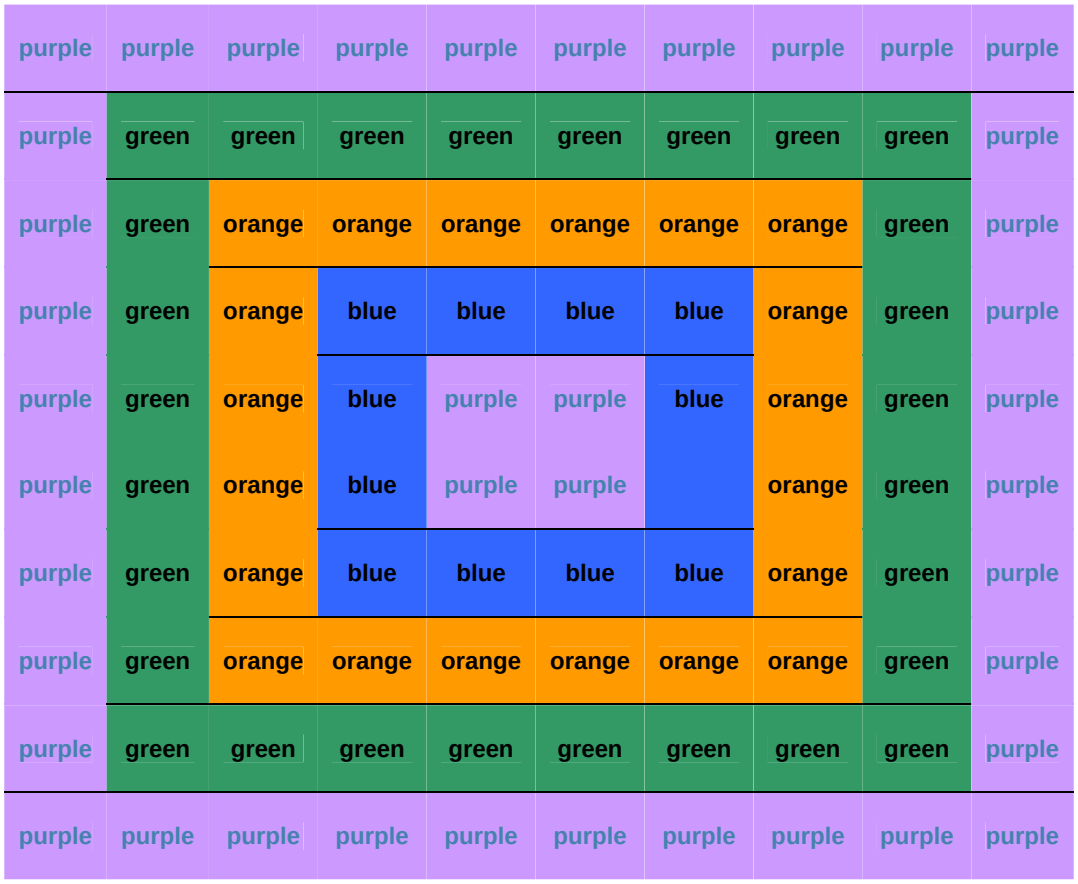


In this activity, you will use a grid of 100 squares to create images by coloring squares using four or more colors (Squares left blank are considered white). You will then count the number of squares that contain a particular color and write the totals. You will use this to determine the percent of each color used to create the image. You will then write the equivalent decimal and fractional form for each of the colors used in the example.

FRACTIONS - DECIMALS – PERCENTS

Adopted fromNCTM Journal "Mathematics teaching in the Middle Schools", August 2007

EXAMPLE



Color Table Example

Color	Number	Fraction	Decimals	Percent
Green	28	$\frac{28}{100}$ or $\frac{7}{25}$	0.28	28%
Blue	12	$\frac{12}{100}$ or $\frac{3}{25}$	0.12	12%
Purple	40	$\frac{40}{100}$ or $\frac{2}{5}$	0.40	40%
Orange	20	$\frac{20}{100}$ or $\frac{1}{5}$	0.20	20%

FRACTIONS - DECIMALS – PERCENTS

Adopted fromNCTM Journal "Mathematics teaching in the Middle Schools", August 2007

ACTIVITY SHEET

Use four or more colors to create a boat, car, ship or any other inanimate object in the grid of 100 squares below. Then use the Color Table to record the number of times you used a color in making your picture. Then change the value to its equivalent fractional, decimal and percent forms.

Reminder: Blank spaces are considered white.

Color Table

Color	Number	Fraction	Decimals	Percent

FRACTIONS - DECIMALS – PERCENTS

Adopted fromNCTM Journal "Mathematics teaching in the Middle Schools", August 2007

ACTIVITY SHEET

Fill in the missing percent, decimal, and/or fraction for each of the following:

	Number of Squares out of 100	Fraction	Decimal	Percent	Equivalent Dollar Amount
1	**75**	$\frac{3}{4}$	**0.75**	**75%**	**$0.75**
2		$\frac{1}{5}$	**0.2**		
3	**30**		**0.3**		
4		$\frac{12}{25}$		**48%**	
5	**60**				
6				**37%**	
7			**0.56**		
8	**44**				
9		$\frac{23}{25}$			
10		$\frac{7}{10}$			
11				**91%**	

Explain how you would change a fraction to a percent, decimal, and equivalent dollar amount:

FRACTIONS - DECIMALS – PERCENTS

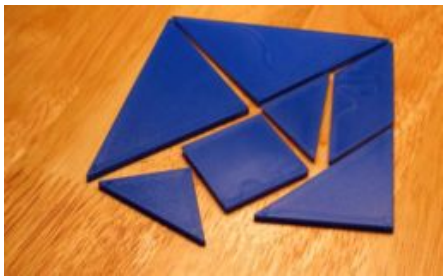
Adopted fromNCTM Journal "Mathematics teaching in the Middle Schools", August 2007

BENCHMARK:

MA.6.A.5.1
Use equivalent forms of fractions, decimals, and percents to solve problems.

What's My Mean

Tangram (Chinese: literally "seven boards of skill") is a dissection puzzle. It consists of seven pieces, called ***tans*****,** which fit together to form a shape of some sort. The objective is to form a specific shape with seven pieces. The shape has to contain all the pieces, which may not overlap.

Tans Sorted as a Rectangle	Tangrams	A Tangram Man
		

The **Tangram** very possibly originated from the yanjitu furniture set during the Chinese Song Dynasty. According to historical Chinese records, the furniture set was originally a set of 6 rectangular tables. Later, an additional triangular table was added to the set, and people can arrange the 7 tables into a big square table. There is some variation to such furniture set during the Ming Dynasty, and later became a set of wooden blocks for playing.

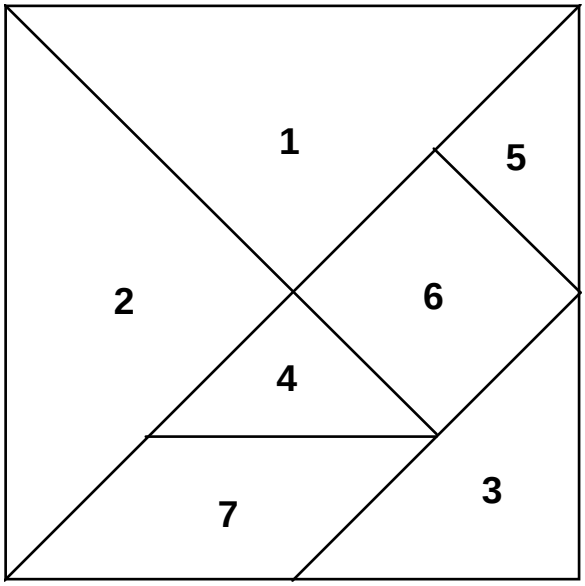
The word **"tangram"** is built from TANG + GRAM. The word **"Tangram"** was first used by Thomas Hill, later President of Harvard, in his book Geometrical Puzzle for the Youth in 1848. The author and mathematician Lewis Carroll reputedly was a great enthusiast of **tangrams** and possessed a Chinese book with tissue-thin leaves containing 323 **tangram** designs. Napoleon owned a **Tangram** set and Chinese problem and solution books while he was imprisoned on the island of St. Helena

Tangrams were brought to America by Chinese and American ships during the first part of the nineteenth century. The earliest example known is made of ivory in a silk box and was given to the son of an American ship owner in 1802.

In this activity, you will construct your own **tangrams** and identify properties of the seven **tangram** pieces and explore area relationships with **tangrams.**

What's My Mean

Directions for Making Tangrams



1) Fold the lower right corner to the upper left corner along the diagonal. Crease sharply. Cut along the diagonal.

2) Fold the upper triangle formed in half, bisecting the right angle, to form Piece 1 and Piece 2. Crease and cut along this fold. Label these two triangles "1" and "2."

3) Connect the midpoint of the bottom side of the original square to the midpoint of the right side of the original square. Crease sharply along this line and cut. Label the triangle "3."

4) Fold the remaining trapezoid in half, matching the short sides. Cut along this fold.

5) Take the lower trapezoid you just made and connect the midpoint of the longest side to the vertex of the right angle opposite it. Fold and cut along this line. Label the small triangle "4" and the remaining parallelogram "7."

6) Take the upper trapezoid you made in Step 4. Connect the midpoint of the longest side to the vertex of the obtuse angle opposite it. Fold and cut along this line. Label the small triangle "5" and the square "6."

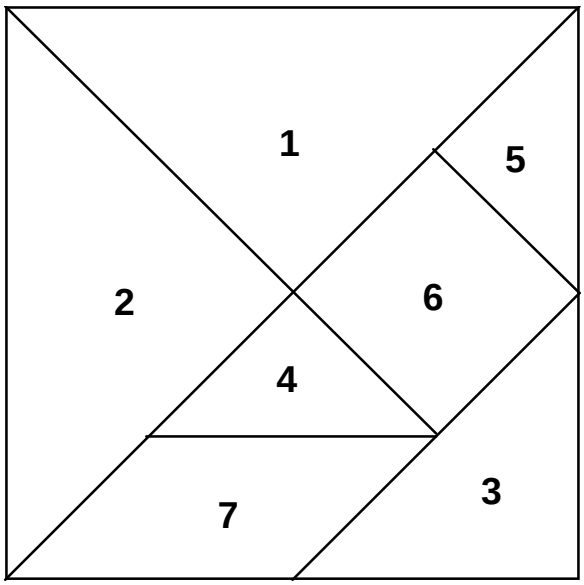
Area and Perimeter with Tangrams

1) If the area of the composite square (all seven pieces -- see below) is one unit, find the area of each of the separate pieces in terms of the area of the composite square.

Piece #	area
1	
2	
3	
4	
5	
6	
7	

2) If the smallest triangle (piece #4 or #5) is the unit for area, find the area of each of the separate pieces in terms of that triangle.

Piece #	area
1	
2	
3	
4	
5	
6	
7	



Area and Perimeter with Tangrams (Continued)

3) If the smallest square (piece #6) is the unit for area, find the area of each of the separate pieces in terms of that square. Enter your findings in the table below.

4.) If the side of the small square (piece #6) is the unit of length, find the perimeter of each piece and enter your findings in the table.

piece #	area	perimeter
1		
2		
3		
4		
5		
6		
7		

What's My Mean

Spatial Problem Solving with Tangrams

Use the number of pieces in the first column to form each of the geometric figures that appear in the top of the table. Make a sketch of your solution(s). Some have more than one solution while **some have no solution**.

Make These Polygons

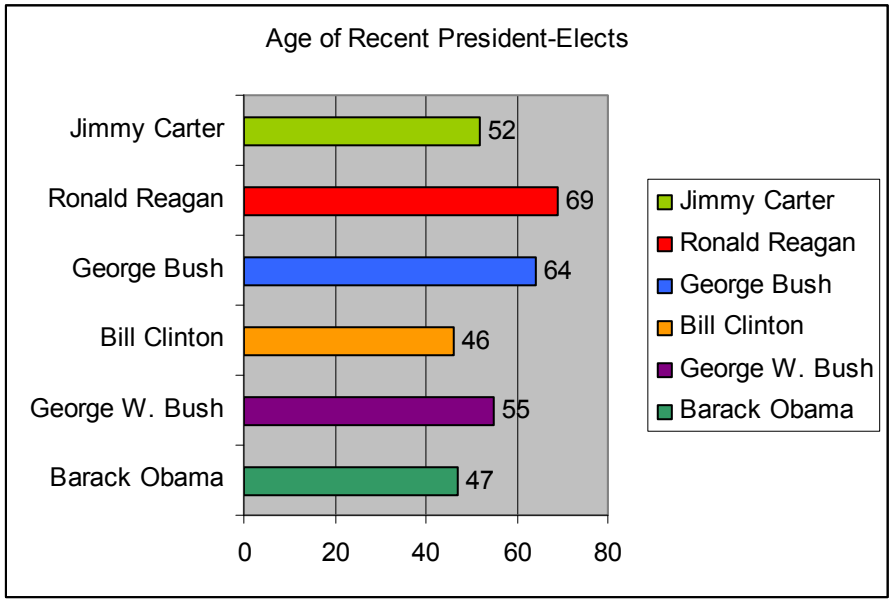
Use this many pieces	Square	Rectangle	Triangle	Trapezoid	Trapezoid	Parallelogram
2						
3						
4						
5						
6						
7						

BENCHMARK:

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.

What's My Mean

The chart below shows the age at which each winning candidate for President of the United States was elected.



1. Find the measures of central tendency for the data above:

Mean _____ Median _____

Mode _____ Range _____

2. Jorge says that the mean of the data set below is 23.5. Describe Jorge's Error.

Age of Miami Hurricane Students	25	20	21	22	25	25

_____

_____

_____

What's My Mean

3. **The four states with the longest coastlines are Alaska, Florida, California, and Hawaii. Alaska's coastline is 6,640 miles. Florida's coastline is 1,350 miles. California's coastline is 840 miles and Hawaii's 750 miles. Find the mean, median, and modes of the lengths with and without Alaska's coastline and explain the changes.**

With Alaska's Coastline:

_____ Mean _____ Median _____ Mode

Without Alaska's Coastline:

_____ Mean _____ Median _____ Mode

Explain the changes:

_____

_____

4. **In the Super Bowl from 1997 to 2007, the winning team won by a mean of $12\frac{1}{6}$ points. By how many points did the Green Bay Packers win in 1997?**

Year	Super Bowl Champion	Points Won By
2002	New England Patriots	3
2001	Baltimore Ravens	27
2000	St. Louis Rams	7
1999	Denver Broncos	15
1998	Denver Broncos	7
1997	Green Bay Packers	**?**

Green Bay Packers points: _____

Explain how you calculated Green Bay Points :

_____

_____

What's My Mean

BENCHMARK:

MA.6.S.6.1
Determine the measures of central tendency (mean, median, mode) and variability (range) for a given set of data.

ANTI-DISCRIMINATION POLICY

Federal and State Laws

The School Board of Miami-Dade County, Florida adheres to a policy of nondiscrimination in employment and educational programs/activities and strives affirmatively to provide equal opportunity for all as required by law:

Title VI of the Civil Rights Act of 1964 - prohibits discrimination on the basis of race, color, religion, or national origin.

Title VII of the Civil Rights Act of 1964, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

Title IX of the Educational Amendments of 1972 - prohibits discrimination on the basis of gender.

Age Discrimination in Employment Act of 1967 (ADEA), as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

The Equal Pay Act of 1963, as amended - prohibits gender discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

Section 504 of the Rehabilitation Act of 1973 - prohibits discrimination against the disabled.

Americans with Disabilities Act of 1990 (ADA) - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations and telecommunications.

The Family and Medical Leave Act of 1993 (FMLA) - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to “eligible” employees for certain family and medical reasons.

The Pregnancy Discrimination Act of 1978 - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

Florida Educational Equity Act (FEEA) - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

Florida Civil Rights Act of 1992 - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulates categorical preferences for employment.

Revised 9/2008