Whose Line is it Anyway? Using Line is Sports

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This curriculum unit is recommended for:
Kindergarten – Grade 2

Keywords: Sports, Math, Line, Line Segment, Ray, Parabola, Basketball, Yoga, Angry Birds.

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: In this unit, elementary teachers will explore ways to teach geometry with operations and algebraic thinking in an entertaining way using games and sports. Students will learn terms such as line, line segment, ray and parabola. Students will incorporate these terms in common games and sports through understanding the relationship between how lines, curves and geometry produce a winning athlete or a successful win. Students begin their understanding of straight and curved lines while practicing the art of yoga. Moving their bodies will reinforce the shapes and movement they will be learning within this unit. Students will analyze NBA players and their shot maps to determine the best angle to shoot a basketball from and if they can duplicate the method mathematically. The games of volleyball and corn hole will be used in a different way to practice parabola. The popular game, Angry Birds, will engage students in practicing parabola in a fun and entertaining way. Parabola is a mathematical term usually taught in upper elementary (third - fifth grade), but within this unit parabola is infused in many activities and taught for lower elementary (Kindergarten – second grade) to easily understand in preparation for the deeper understanding they will encounter throughout their mathematical education. This unit provides teachers with numerous activities to teach mathematical concepts through sports.

I plan to teach this unit during the coming year to 23 students in Grade 1.

Whose Line is it Anyway? Using Line in Sports

Susan A. Jones

Introduction and Rationale

The Math and Sports seminar is a wonderful opportunity for me to learn about various ways to teach math and for my students because it incorporates learning with fun, especially for boys learning math. I teach First Grade in a school with a population of mostly African American and Hispanic students. What better way to foster a love for math early for a population of students who historically score lower in this subject? At my school, the math curriculum is Math Investigations. This curriculum contains many hands on activities and games, but nothing that sparks the boys' attention. The ideas and activities I developed in this unit will help me create a curriculum unit that incorporates the math standards for First Grade and Math Investigations curriculum with exciting and engaging sports games. Addition and subtraction are prominent at this grade level, so I have ideas of using basketball to teach addition by having students tally points as another student shoots the ball.

I would suggest teaching this unit during the spring of the school year, although it can be taught anytime during the year. The Math Investigations unit on Geometry is taught in the spring, which aligns with this unit. Also, many students will have more experience and exposure to using lines and practicing sports in the spring. The P.E. teacher at my school also teaches a unit on basketball and baseball during the spring, so collaborating with the Special Area teacher would be a great way for students to learn and practice some concepts in both classes.

I developed some ideas that I would like to cultivate further using sports as a way to teach math. When I taught Kindergarten, I noticed that my students struggled with predicting where the ball or Frisbee would go during recess. In First grade, I assume their predicting skills will be improved, but this is a theory I would love to explore when teaching this unit. My introductory lesson may consist of a pre-test where students are given a paper with dots and short lines attached. Their assignment is the draw where they think the line will extend. This will also be used as a post-test at the end of the unit. I would like to infuse ideas about predicting line throughout the unit. I plan to practice kickball or soccer with students and ask them to predict in what direction to kick the ball to reach the goal. Students will also play the online game, Angry Birds. This games' basis is centered on using angles and projectile pulling to reach the goal. Before students

release the cord, they must predict where the bird will land and explain their reasoning. This prediction skill will also be used in basketball and determining the best spot to shoot the ball from. Does the ball go in the basket more times from one spot than another? Is this type of probability used in high school, college and professional sports? Students will also be using probability in basketball and graphing the number of shoots made. Students will engage in several math stations and math groups to allow all students to participate, learn and dialogue their experiences throughout this unit in a timely manner where all students have ample time to explore and share.

I would like to complete this unit with a myriad of games called Math Olympics or a Math Carnival. All the games will incorporate ideas we have learned throughout the unit and infuse sports that focus on lines and predicting. I hope to include a variety of games that excite girls and boys, those who are not athletic and games that are not focused on winning or being competitive. I would also like the games to vary in skill and ability, so all children feel successful. I plan to research other games and sports from around the world that incorporate prediction and lines to include multiculturalism and teach students various games from around the globe. The goal is to have fun but in the process learn math and make it applicable in their everyday lives.

Not only will the students learn math through sports, but other attributes of sports; fair play, sportsmanship, cooperation and teamwork. All necessary skills that First Graders need to learn and develop to interact throughout their school career. Just like in learning a new sport, it takes practice, consistency and determination to master the skills. I hope that my students will see that just like it's fun to learn a sport and get better by practice, it's the same for learning math. It takes practice and willpower to learn something new.

I also hope to gain my own zeal and love for math throughout this unit. I am very excited about this unit and look forward to developing new ideas as I teach and learn through this unit. When I originally applied for this seminar in spring 2013, I was teaching Kindergarten and had Kindergarten students in mind for this unit. Shortly before school ended in Spring 2013, I was moved to First Grade, so now I have a personal challenge of learning First Grade curriculum and creating a Math unit that is fun as well as challenging for First Graders. Math has always been a challenge of mine as a student, so I feel that as I begin to see my own fear of math diminish, the understanding and determination for my students to love math will grow. My goal for my students is that they see math in a new, fun and exciting way, and learn that math is useful and all around them.

Demographics

Steele Creek Elementary is a school containing grades K-5 in Charlotte, North Carolina. The school is one of 106 elementary schools in the district. The school is located in a suburban area within the Charlotte-Mecklenburg Schools district. It is a public school

that serves 725 students. We have a diverse population, which has grown and diversified in recent years. Our student background is 43.5% African American, 32.3% Hispanic, 14% White, 6.3% Asian and 3.9% other, with 73.5% economically disadvantaged.

As one of the oldest elementary schools in the district, Steele Creek has a wonderfully rich history and a fixture in the community. Students have many learning opportunities such as the Talent and Development Program, News Production Team, Basketball Team, Girls on the Run, English as a Second Language, Accelerated Reader and the After School Enrichment Program.

I am a First Grade teacher at Steele Creek Elementary. This is my 3rd year at this school, although I have four additional years teaching experience teaching First Grade and Kindergarten in the state of Kentucky. I have a wonderful group of students who come from diverse backgrounds and academic levels. I am one of six First Grade teachers in my school and we collaborate daily to develop engaging lessons for our students. I have used professional development opportunities such as Master Teacher observations, Math Investigations training and Common Core training to enhance knowledge in my classroom. I have also used online materials like Discovery Education, Raz-Kids, BrainPop Jr. and Accelerated Reader as resources for myself and my students. My classroom consists of Hispanic students, African American students, Speech students, ESL and ADHD students. With this diversity, I aim for this curriculum unit to exhibit differentiation so all students can participate regardless of reading level or learning disabilities.

Technology is lacking in our school and an area we are aware of that we should invest more money and resources in. Currently, the Fourth and Fifth grade classrooms have SMART boards and I-Pads next year due to a grade-level grant. Each teacher received one I-Pad this year for classroom use. Mimio boards are available for check-out through the Media Center, although enough are not available for each teacher to use. Each classroom has an average of 3-4 computers and use of the Computer Lab.

Objectives

CCSS.Math.Content.1.G.A.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

CCSS.Math.Content.1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

CCSS.Math.Content.1.OA.A.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem

Background of Instructional Content

The background of instructional content for my curriculum unit will be a presentation of the concepts that I intend to cover.

Line

To understand the concept of a line, I first had to research the definition. According to the dictionary, the definition of "line" means "a continuous extent of length, straight or curved, without breadth or thickness; the trace of a moving point."[1] That definition is a little general for what I would like to teach the students. In addition, a YouTube video that I used in this unit defines line this way: "A line is a mark that joins two points."[2] Both definitions explain a line well, but I realized I did not want the students to understand a continuous point in both directions, but instead only going in one direction. I would modify the definition slightly to define a line as a continuously straight with no break in between. In my further research I found that my teaching point is really focusing on a ray, which incorporates a line. "A line goes without end in both directions. A ray has 1 endpoint and goes without end in 1 direction. A line segment has 2 endpoints."[3]

Discussing these terms with your students and discovering the definition of ray may also be beneficial to your students as you teach this unit. A line is part of a ray, but the ray is the focus of this unit and most of the activities.
Line Segment
"A line segment has 2 endpoints."[4]

Ray

"A ray has 1 endpoint and goes without end in 1 direction."[5]

Parabola

A curved line that has an axis of symmetry called the vertex. There are many mathematical definitions for parabola, but for the purposes of the word in this unit, the definition will suffice for students. The following definition will be more helpful for the teacher: "In nature, approximations of parabolas and paraboloids are found in many diverse situations. The most well-known instance of the parabola in the history of physics is the trajectory of a particle or body in motion under the influence of a uniform gravitational field without air resistance (for instance, a baseball flying through the air, neglecting air friction). The parabolic trajectory of projectiles was discovered

experimentally by Galileo in the early 17th century, who performed experiments with balls rolling on inclined planes. The parabolic shape for projectiles was later proven mathematically by Isaac Newton. For objects extended in space, such as a diver jumping from a diving board, the object itself follows a complex motion as it rotates, but the center of mass of the object nevertheless forms a parabola. As in all cases in the physical world, the trajectory is always an approximation of a parabola. The presence of air resistance, for example, always distorts the shape, although at low speeds, the shape is a good approximation of a parabola. At higher speeds, such as in ballistics, the shape is highly distorted and does not resemble a parabola."[6]

Classroom Activities

Activity One: Introduction to Line

As a former Kindergarten teacher, I noticed that many students did not grasp the concept of the endpoint of lines especially when throwing a ball to a friend or tossing an object from across the room. The child would see the goal, but not follow through with reaching the goal. This was very apparent in Kindergarten, which may have been an issue of arm control or the inability to angle the object to the goal. With First Graders, I am interested to see if they understand line and endpoint better. Students will begin the study of lines with a pre-test (See Worksheet 1). The pre-test will have rays starting from different points of the paper. Students must extend the line to where they think it will end at the edge of the paper. This will give me information as to their ability to see the line and where it can go. The two essential questions will be: What is a line? What isn't a line? During this first activity students will learn about lines, rays and line segments.

Take a long piece of string and ask a student to hold one end and one student to hold the other end. Explain that this is a line. Then ask students how we could cut the string to change it into a ray. Cut the string in the middle and now there are two pieces. Explain that now each piece of string has an endpoint and the rest of it goes on in one direction. Push one end of the string into a play dough ball to indicate the endpoint. Then ask students to change the two rays into line segments. Cut the ray on the other end and add a play dough ball to the end of the string. Now the string has two endpoints and has become a line segment. Reinforce that lines are straight and continuous.

Complete the lesson with a closure activity called What's the Line (see Worksheet 2). Students are given a sheet of paper with several types of "lines". Students will determine with drawings are lines or not and explain why. Review the activity as a whole group and discuss their reasoning as a class.

Activity Two: Yoga Lines

We will begin to explore lines by practicing yoga poses and emphasizing how the body creates lines in yoga. Review lines that we learned in Activity One and the definitions of line, line segment and ray. Discuss curved lines and ask students how it is different form straight lines. Give students the Curved Line Pre Test (see Worksheet 3). Students will independently decide how to connect the two dots or endpoints without using the middle. Allow students to ponder and make mistakes. Gather the class as students show responses. If students did not make a curved line, gather papers and let them try again with guidance and help. This pretest will help in determining if students can create and see a curve without one being there. This pretest will lead us into yoga and the use of straight and curved lines. An essential part of yoga is positioning one's body. Many times, someone's body is put into straight lines. To get a sense of this, we will stand straight. We will look at each other's bodies and see how the back looks straight and how the arms look straight. Yoga can teach you how to do this in much more difficult positions. Consider the picture below:

Fig. 1

This is a much harder position to do. Strength and muscles help her to complete this straight pose. That's why yoga is used for exercise and practiced around the world.

Not every pose is straight. Consider the pose below. Part of it is straight and part of it isn't. Which part is and isn't?

Fig. 2

We will then look at various poses and find where things are straight and where they are not. Consider the 3 poses below.

Fig. 3

Then, I will teach the children poses. They will learn poses such as Warrior 2 and Extended Side Angle. I will demonstrate first and they will look for where my body is straight and where it is curved. This also helps students understand and feel with their bodies the lines that we will be discussing in this unit.

Activity Three: Line Games

Kickball is a game that uses an object to reach a defined goal. With kickball, students will use a ball (can be foam or other soft object) to reach the goal. Students will engage in kickball to learn that lines have an endpoint or goal. The "kicker" will determine where the ball will land and then kick it to the goal. Allow students to discover which technique will work best. For students who struggle with kicking, maybe they can roll the ball. Is that easier because our hands give us better control? Students will learn the game of soccer and reemphasize that the person kicking is the spot where the line begins and they have to kick it to the endpoint, which is the goal.

Another line game is the egg relay. The person holding the egg on the spoon has to balance it without dropping it until he/she gets to the goal. Students will be taught that the best way to play this game is to create an imaginary line in your mind as you walk.

A similar game may be students on two teams, one sitting behind the other, in a line on the ground. The students will raise a beanbag or water balloon over their head to their partner behind them. It is a passing game that requires cooperation and moving the object straight back. This kinesthetic game will allow students to feel the straight movement of their hand to the next student until it reaches the endpoint. Try the same game, but have the students sit in a curved or zigzag line and pass the beanbag or water balloon. Does it feel different? Is the game easier when played in a straight line?

Activity Four: Understanding Parabola

Lines are used to create parabolas. We will begin this study with a KWL Chart to assess their knowledge of parabolas. The KWL chart tracks what a student knows (K), wants to know (W), and has learned (L) about a topic. Ask students what they already know about parabolas and what they want to know about parabolas. Save what they have learned (L) for the end of the unit when students can explain their new knowledge of parabolas. Students may have very little knowledge of what a parabola is, which is expected. The goal at the end of the unit is for students to have an understanding of parabolas and where they may see them and how to use them.

Then we will watch a PowerPoint (teacher created) or YouTube video of what real life parabolas are around us (basketball, rainbow, etc.). There are many excellent pictures on the Internet of things curved like a parabola in nature and in our everyday environment. The teacher will create a slideshow of parabolas around us (maybe 6-8 slides) and ask students what they notice is the same about each slide. Such as Fig. 4 and Fig. 5 below:

Fig. 4

Fig. 5

If the PowerPoint can be projected, ask students to use a pointer to trace the curve in the picture. This exercise will provide an excellent introduction about the shape of parabolas and what we are looking for.

Activity Five: Let's Find Parabolas!

Where can we find parabolas? Everywhere! Review the parabola PowerPoint and explain that parabolas are not only found in pictures, but there may be parabolas in our school, your home or in your neighborhood. Take a walk around the school in search of parabolas. Have students point them out and take pictures of the parabolas they find.

Next, explain to students that they will be looking for parabolas at home and in their

community. Students will use digital cameras from home or a digital camera borrowed from school to take pictures of real life parabolas (1-3 images per student) they see at home or around their neighborhood. Activity Five may take several days to complete if limited cameras as available, so each student can use the camera to find parabolas at home. Students will bring in the digital file and the teacher will upload them to a PowerPoint slide or print them to display. If digital cameras are not available, another option may be to draw and label the parabolas they see or cut out pictures from magazines and attach them to pieces of paper. Then display these pictures on the board. Students will discuss and sort which pictures are parabolas and which are not and reason why or why not. This would be a great home-to-school project for parents to be involved in, although even with parent assistance there may be misunderstandings. If misunderstandings arise and students bring in pictures that are not parabolas, it creates an awesome learning experience! Use some of these pictures to create a sorting activity that students will complete independently or as a whole group. Discuss why or why not these images are of parabolas. Gather the pictures and/or print the PowerPoint slides and create a book that the students may refer to throughout the unit.

Activity Six: Let's Try Parabolas!

This is where the sports comes into play! I will teach how parabolas are found in many sports that we play and watch. First we will begin with creating parabolas with pipe cleaners or play dough to visually see what a parabola looks like. Students will begin with a straight piece of pipe cleaner or play dough. Guide students through the steps to change the straight pipe cleaner or play dough to a curved object with the teacher modeling how to do so. These can be shared in a whole group and displayed for reference through the unit.

In the next activity, students will learn about catapults and make a class catapult that the class will test to view the parabolic motion. Catapults help to emulate and create the parabola with the object in the catapult. Catapults are easy to make with simple items found in the classroom or at home. Most homemade catapults are made from Popsicle sticks, rubber bands and a spoon. With the recent popularity of Angry Birds, many of the game play sets include a plastic catapult in the game. The play sets range from $9.99 to $39.99 in many retail stores. The Angry Birds play sets may also be worth purchasing as a connection to the game the students will play online. Having the opportunity to use some of the game pieces will excite students and create a connection to the animated game they will play in Activity 8. Below are examples of a homemade catapult and a store bought version.

Fig. 6

Fig. 7

This idea of parabola will be the closest to the Angry Birds game that I will introduce later. As the students practice with the catapult, refer to the parabolas the students made with pipe cleaners and play dough to reinforce the curved motion.

Activity Seven: Parabola Games

Students will practice parabolas with the game of corn hole. Corn hole is a game that requires a beanbag and a slated wooden board with a hole in the middle. Students have to throw the beanbag in a curved motion in order to get it into the hole. The teacher will model the game first, explaining how to throw the beanbag and emphasizing the curve as he/she throws. The teacher will also demonstrate throwing the beanbag in a straight motion. This will cause the beanbag to slide across the ground or hit the bottom of the board, not hitting the hole in the middle. Discuss the strategy and form used to create the arc and curve to allow the beanbag to make the goal. Encourage students to discuss their form and strategy before they throw and provide students who struggle with the strategy.

Then students will try the game of volleyball. Most students are not tall enough for a regulation size net, so using a piece of rope held by two students or a child's volleyball net will work. Students must hit the ball in a curved angle in order to move the ball over the net. A volleyball may be too hard for students to throw, so I suggest a beach ball or foam ball. Before playing the game, show students pictures of volleyball players and the form they use to create the curve needed to go over the net. The teacher will then show the volleyball technique (shown below in Figure 8)

Fig. 8

Emphasize the curve needed to hit the ball over the net. Have some students volunteer to demonstrate the technique for the class as you explain what they are doing. Some students may want to throw the ball straight up in the air or throw at the net. Reinforcing parabola may help some students try to create a curve to clear the net.

Finally, students will practice shooting a basketball and throwing a baseball. In the article about basketball and shooting angle (1.), the author states that “Parabolas have been extensively studied since people started throwing stuff at each other, and they shape the outcome of many ballistic sports, such as baseball, golf, football, shot put and more. But they reach their apex in basketball, where field goals and free throws demand precision control of parabolas.” The game of basketball requires the use of precise parabolas to play the game. The article I refer to would be an excellent resource prior to teaching about basketball and parabolas to students. Show students pictures of NBA players (Michael Jordan and Stephen Curry are favorites in this area!) as they are shooting the ball. Discuss how the type of shooting using the parabolic motion is used by NBA players to make sure they angle the ball into the hoop. Have students practice shooting a ball (foam ball or kids basketball) into a lowered basketball rim. Emphasize the shots that go in and what technique the student used. Ask the student to try and replicate the shot in the same area and see if the ball goes in the hoop. After several rounds of shooting the ball, introduce the basketball floor diagram. Explain that NBA players plot their shots and use different colors and symbols to show shots made and shots missed on a diagram called a shot map. Examples of this are in Figure 9 and Figure 10 below.

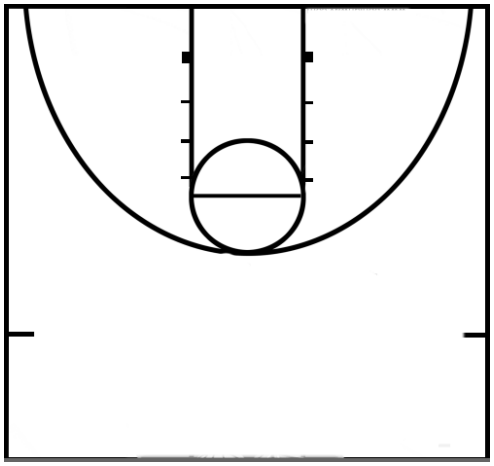


Fig. 9

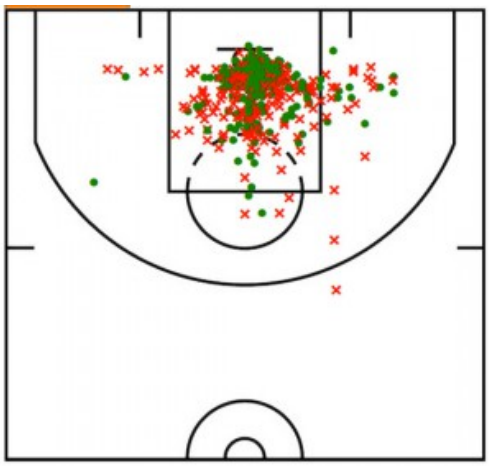


Fig. 10

Again, students will engage in the discussion of how parabolas can determine where the basketball will land and how to win the game using different strategies and methods like professional NBA players use.

Activity Eight: Angry Birds!

Angry Birds is an interactive game that uses a projectile launcher that creates parabolic motion. This is a popular game that can be downloaded on a computer, iPhone, iPad or Android device. The Angry Birds game will be played on the projector as a whole class or preferably a Smart Board to allow students to touch the screen to simulate the catapult and object flying through the air. The Angry Birds game uses birds that move in a catapult to knock large structures down. As the birds fly through the air, the parabola is visually highlighted through the air. Students will determine where the "bird" will land before they play the game, much like the game of kickball. Ask the student to point to the spot where they would like the object to land. Students will share their strategy of the direction to pull the catapult to get to the goal much like the game of basketball. Students will see and discuss how parabolas can determine where the "bird" will land and how to win the game. Trial and error would be the best way to teach this game. As students play, they will determine their own shot map and the position of the catapult to reach the goal. Students will visually see the parabolas by playing the Angry Birds game.

Activity Nine: Line Olympics

Students will play several games that they learned in this unit in stations that highlight line and parabola. I would set up games such as basketball (and maybe a few students to plot the shot map), volleyball, egg relay and line games with beanbags. Other games to include may be javelin throw, an obstacle course and bowling, which all involve an

endpoint or goal and use lines and/or parabola to compete. A gym or a large playground would be ideal to play these stations. Help with set up and procedures would be necessary, so parent volunteers, assistants or older student helpers would be used. Review the games and the rules prior to students participating in stations. Remind students that our goal is using our knowledge about lines and parabolas to play the games.

Activity Ten: Angry Birds 2!

As our final activity, students will return to the Angry Birds game and play it again. In this experience you may choose to play the original Angry Birds game or choose a different version (which still uses the same parabolic concept). Hopefully their experience playing the physical games using parabolas will improve their ability to use parabolas in the Angry Birds game the second time. I am very interested to see how students see and use parabolas now they have experienced it visually and physically.

I hope that by students learning about lines, line segments, rays and parabolas they will see the endpoint and be more accurate when aiming for a basket, catching a ball, kicking toward a goal or throwing a Frisbee. I also want students to understand that there is math behind every game they play or watch on TV.

Post-test

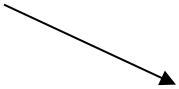
Students will be given a test where they must choose the parabolas in real life pictures. They will also retake the pre-test (see Appendix) and extend the line segment to create an endpoint. Review the KWL chart and complete the L portion (what was learned) about parabolas. Discuss and ask if there are any other questions we can add to the W portion (want to know) or if we can answer any of the questions that we had. Essential question: Can knowing where the endpoint will be help us in sports?

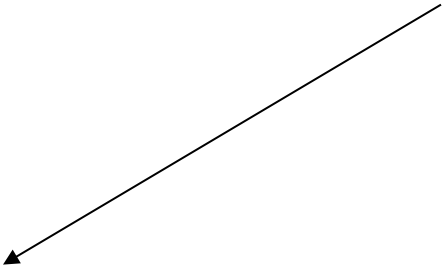
Worksheet 1

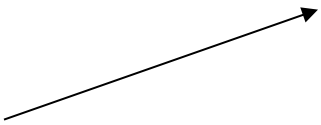
Name _____

Straight Line Pre Test

Extend the line segment to the end of the paper. Where do you think it will go?





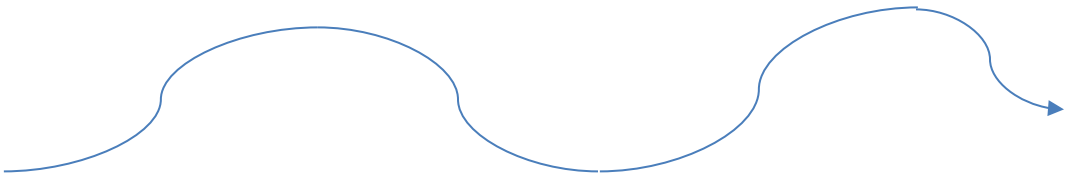


Worksheet 2

Name _____

What's the Line Pre Test

A line segment has an endpoint and continues straight in one direction without stopping.
Look at the line segments below. Are they line segments? Why or why not?



Is this a line segment? Why or why not?

_____

_____

Is this a line segment? Why or why not?

_____

_____

Draw a line segment below.

Worksheet 3

Name _____

Curved Line Pre Test

Draw a curved line from one circle to the other without using the middle.

List of Materials for Classroom Use

General Supplies
Paper
Pencils

Activity One
String
Play dough
Pretest (see Appendix)
Line Activity (see Appendix)

Activity Two
Yoga Poses (refer to Figure 1-3)

Activity Three
Foam ball or kick ball
Plastic eggs
Plastic spoons
Water balloons or bean bags

Activity Four
Chart paper
PowerPoint created by teacher (refer to Figure 4-5)
Computer and projector

Activity Five
Digital camera(s)
Printer
Magazines

Activity Six
Pipe cleaners
Play dough
Popsicle sticks
Rubber bands
Plastic spoons
Angry Birds play set with catapult

Activity Seven
Corn hole board
Bean bags
Adjustable volleyball net or heavy-duty rope
Beach ball or Foam ball
Adjustable basketball goal
Basketball or Foam ball

Activity Eight
Angry Birds game

Activity Nine
Adjustable basketball goal
Basketball or Foam ball
Adjustable volleyball net
Volleyball or Foam ball
Plastic egg
Plastic spoons
Bean bags
Plastic bowling pins and ball

Activity Ten
Angry Birds or Angry Birds 2 game

Annotated Bibliography for Teachers

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2. "Math in Basketball." Get the Math RSS. http://www.thirteen.org/get-the-math/the-challenges/math-in-basketball/introduction/181 (accessed November 5, 2013). A video of NBA player Elton Brand as he explains a number of variables that influences his shot. Videos of real students show how they solve the free throw challenge.

3. The Washington Post. "In basketball, shooting angle has a big effect on the chances of scoring." Washington Post. http://www.washingtonpost.com/wp-dyn/content/article/2010/03/15/AR2010031502017.html (accessed October 25, 2013). This article discusses the importance of parabola in the game of basketball, especially how NBA players use the 45 degree projectile.

4. YouTube. "Basic Math: Learn about Lines." YouTube. http://www.youtube.com/watch?v=C-O_Kuuuv9c (accessed November 25, 2013). A video for grades K-2 about different types of lines and ways that we use lines.

Reading List for Students

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Appendix 1: Implementing Common Core Standards

The first grade operations and algebraic thinking standards and the geometry standards are the focus of the activities in my unit.

Common Core State Standard.Math.Content.1.G.A.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes. In my unit I use several ideas concerning line to help students understand how shapes are made and how lines are created. To extend this idea I would like to use something similar to a parabola to create the line segment. The plan is to use something like a use terms like obtuse and acute angle to show students how we can make shapes with lines and then to use Angry Birds show the parabola and distance. Students will also be used using a lot of triangles and other shapes within this unit.

Common Core State Standard.Math.Content.1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. In addition to students learning the games within the unit, students will also learn how to keep and track scores. In order for students to calculate their score, they will add and subtract numbers by using drawings and multiple strategies to compute the score.

Common Core State Standard.Math.Content.1.OA.A.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. Students will calculate their own score after shooting the basketball, as well as using strategies to calculate the shot map scores of student volunteers. Students will learn and practice strategies to add three or more whole numbers to complete those activities.

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Endnotes:

1Dictionary.com. "Line." Dictionary.com. http://dictionary.reference.com/ (accessed November 21, 2013).

2YouTube. "Basic Math: Learn about Lines." YouTube. http://youtu.be/C-O_Kuuuv9c (accessed October 21, 2013).

[3] "Lines, line segments and rays." IXL Math and English. http://www.ixl.com/math/grade-4/lines-line-segments-and-rays (accessed November 23, 2013).

[4] "Lines, line segments and rays." IXL Math and English. http://www.ixl.com/math/grade-4/lines-line-segments-and-rays (accessed November 23, 2013).

[5] "Lines, line segments and rays." IXL Math and English. http://www.ixl.com/math/grade-4/lines-line-segments-and-rays (accessed November 23, 2013).

6Wikimedia Foundation. "Paraolas in the Physical World." Wikipedia. http://en.wikipedia.org/wiki/Parabola#Parabolas_in_the_physical_world (accessed October 5, 2013).

Figure 1
http://commons.wikimedia.org/wiki/File:Paripurna-Navasana_Yoga-Asana_Nina-Mel.jpg

Figure 2
http://commons.wikimedia.org/wiki/File:Matsyasana_Yoga-Asana_Nina-Mel.jpg

Figure 3
http://commons.wikimedia.org/wiki/File:Parivrtta-Trikonasana_Yoga-Asana_Nina-Mel.jpg
http://commons.wikimedia.org/wiki/File:Parivrtta-Utkatasana_Yoga-Asana_Nina-Mel.jpg and
http://commons.wikimedia.org/wiki/File:Pasasana_Yoga-Asana_Nina-Mel.jpg

Figure 4
http://laurenctesblog.blogspot.com/2011/04/parabolas.html

Figure 5
http://abbemtesblog.blogspot.com/2011/04/real-world-parabolas.html

Figure 6
http://thehelpfulartteacher.blogspot.com/2012/02/medieval-castles.html

Figure 7
http://www.walmart.com/ip/K-NEX-Angry-Birds-Mission-Mayhem-Play-Set/21007386

Figure 8
http://visual.merriam-webster.com/sports-games/ball-sports/volleyball/techniques_2.php

Figure 9
http://www.guidetocoachingbasketball.com/tools.htm

Figure 10
http://www.truthaboutit.net/2012/07/whos-the-4-whos-the-5-the-collaboration-of-nene-kevin-seraphin-and-emeka-okafor.html/120726-emeka-okafor-shot-chart