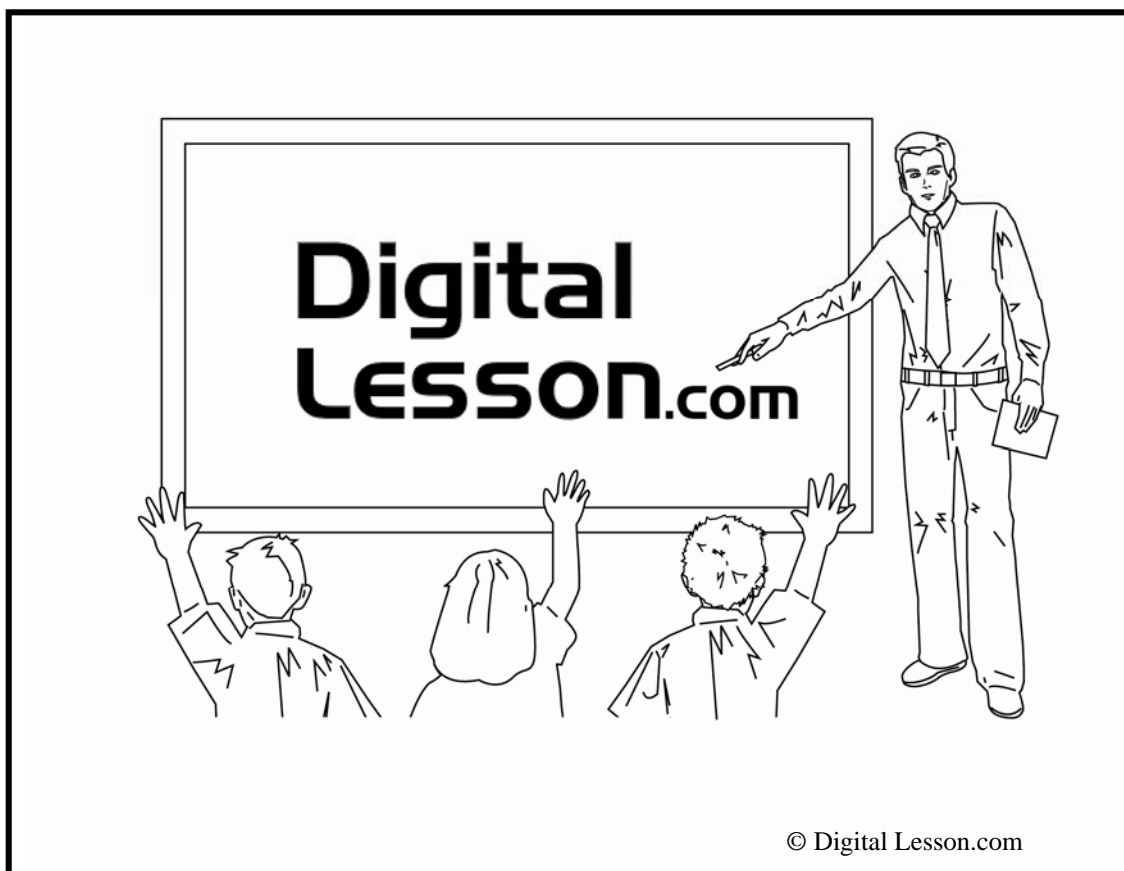


# Marvelous Middle School Math

Engaging Lessons and Projects  
to Enhance Your Middle School Math Program

Mark P. Tully



Fresh, New Classroom Activities  
Instantly “Print and Present”  
Standards Based Mathematics  
Teacher Tips Make You an Expert  
Full-Size Answer Keys

Mark Tully is a mathematics teacher at Oak Middle School in the Los Alamitos Unified School District, Los Alamitos, California. He has been teaching for nearly 20 years and during that time has served as Mathematics Department Chairman and as a Mathematics Mentor Teacher. He enjoys developing activities that are designed to present the prescribed mathematics curriculum and standards in a way that is active and engaging.

Mark's website, **www.DigitalLesson.com**, is designed to meet the needs of middle school math teachers. It specializes in providing instant, inexpensive, and engaging math lessons and projects to enhance the middle school math program. Also included on the site are free printable math games, math humor, math articles, and other math resources tailored to the middle school math teacher.

Mark also publishes the *Middle School Math Treasures* newsletter five times each school year. The newsletter includes a free printable math game, math articles, ideas for the mathematics classroom, math humor, and a featured math lesson or project from our website. A subscription to *Middle School Math Treasures* is free! Sign up on the home page of Digital Lesson.com. Unsubscribe at any time. We will never rent or sell your e-mail address. Enjoy this great, free resource!

We would love to hear about your experiences using this book, *Marvelous Middle School Math*, in your classroom. Please e-mail us with any comments at [digitallesson@yahoo.com](mailto:digitallesson@yahoo.com).

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## Preface

Digital Lesson.com is dedicated to being a valuable resource for middle school math teachers who not only want to excel in the teaching of mathematics, but also want to deliver the mathematical curriculum in a manner that engages and involves students. The collection of lessons and projects in this book strive to place mathematics into an active context that is inherently interesting. Constructing drawings of a house, creating proportional pictures, celebrating Pi Day, learning the most likely letters used when playing *Wheel of Fortune*, choosing and tracking stocks, and drawing a scale model of a humongous hero from his handprint are a few of the activities presented in *Marvelous Middle School Math*.

### Instant

The lessons and projects at Digital Lesson.com are instantly available. Upon receipt of payment, your lesson or project is automatically sent to you via e-mail. Save your lesson file to your computer for later use. Then, just “Print and Present” your lesson. No more waiting for delivery and no shipping costs.

### Inexpensive

The lessons on Digital Lesson.com are available for only a few dollars each. In book form you receive a substantial discount to the individual lesson price. Save yourself hours of time and effort by simply selecting and printing your lessons or projects within minutes. What is your time worth?

### Engaging

Our math lessons and projects offer students an interesting way to connect to the mathematics prescribed by your required curriculum. Hands-on activities and contextual lessons heighten the sense of usefulness and purpose students find in their mathematics.

### Teacher Friendly

All blackline masters for the math lessons and projects are included. We have seen far too many great ideas for lessons on the internet that would take hours of time and effort to format before actually being able to use them. All of our lessons come ready to implement in your classroom immediately. Just make a few copies and get ready to inspire your students!

*Teacher Tips* are provided with each lesson to eliminate as many of the “Oh, I’ll do that differently next time,” moments as possible. The goal of the *Teacher Tips* is to make you an expert in the lesson BEFORE you teach it, not after. Too many lesson plans and projects that we have seen and received over the years leave it up to teachers to use trial and error before they ever teach the lesson effectively. The tips will immediately empower the teacher to teach the lesson more effectively.

### Standards Based

Finally, the math lessons and projects on Digital Lesson.com have been designed to specifically meet the NCTM math standards and state math standards that teachers are expected to teach. Our intent is to provide more engaging activities, while still covering the same mathematical standards as the textbook. The lessons are intended to be served a la carte, to fill in curriculum holes or just to infuse some excitement and activity into your classroom as you teach a familiar math standard.

Wishing you inspiration and motivation to be an excellent math teacher!

Mark

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7. The Royal Reward Geometry Project.....59

The Royal Reward is a group project given in the context of a story about King Euclid and his nobles, who have recently triumphed in their battle against the neighboring kingdom of Ignorance. The project focuses on geometry and metric measurement. Students use measurement skills to calculate the area and perimeter of polygons (plots of land) including triangles, parallelograms, a trapezoid, a rhombus, and an irregular hexagon. They also classify polygons, measure angles, investigate the sum of the interior angles of various polygons, and use the concept of scale.

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Graphing Systems of Equations is a math lesson that requires students to read sentences, translate them into equations, and use t-tables to graph at least 5 ordered pairs for each equation. Students then graph these points and draw the line that represents all of the solutions for each equation. Finally, they write the slope, y-intercept, and the solution to each system of equations.

9. Humongous Hero Proportion and Scale Project.....88

Humongous Hero is a group project that involves proportions and the use of scale. Students use proportions and the handprint of the Humongous Hero to determine its height and body measurements. Then they make a scale model of the superhero that can be drawn on poster board. Finally, students use proportions to determine the dimensions of various items owned by the hero.

10. Stock Market Contest.....97

The Stock Market Contest is designed to teach students the basics of investing in the stock market. Students read two pages for basic background knowledge, choose two companies to invest in, track and graph their stocks using the worksheets provided, and reflect upon the learning that has taken place during the year. Promote this fun and educational contest with your students and award prizes to the top investors.

11. Tipping Lesson.....114

Tipping is a lesson designed to teach students how to mentally compute common tips (10%, 15%, and 20%) that are traditionally left when dining in a restaurant. It teaches students how to figure these tips, presents them with realistic restaurant tipping exercises, and looks at the earnings of a waiter working an evening shift at a first-class restaurant.

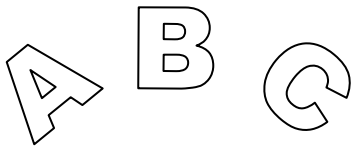
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“What’s the Point?” is a fun lesson that requires students to graph points (ordered pairs) on the coordinate plane in order to create a picture. The lesson includes three different graphing assignments and answer keys, as well as a template to allow students to create and graph their own pictures using ordered pairs.

# Grade Sheet



# Lesson



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# GRADE SHEET

No.	Date	Assignment	Score	Decimal	Percent	Grade	Class Total	Decimal	Percent	Class Grade	Parent Signature
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											



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# GRADE SHEET ASSIGNMENTS

## Basketball Star's Grades:

<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/12	Practicing Hard	49/50
2.	9/16	Signing Autographs	18/20
3.	9/19	Free Throws	32/35
4.	9/22	Commercials	10/10
5.	9/26	Acrobatic Dunks	53/50
6.	10/1	3-point Shooting	25/30
7.	10/3	Defense	44/45
8.	10/7	Layup Drills	9/10
9.	10/10	Team Leadership	39/40
10.	10/14	NBA Finals	97/100

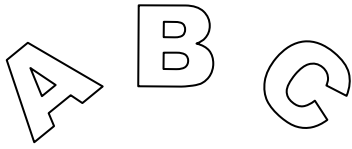
## Surf Dude's Grades:

<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/3	Wave Theory Quiz	19/20
2.	9/5	Surf Slang	42/50
3.	9/10	Weather Knowledge	24/25
4.	9/12	Wave Tricks	25/30
5.	9/17	Surf Competition	83/100
6.	9/22	Respect for Others	42/40
7.	9/26	Swimming Skills	46/50
8.	9/30	Mini Surf Competition	40/50
9.	10/2	Extra Credit: Rescue Swimmer	10/0
10.	10/7	Final Surf Competition	95/100

## Baddy Siszhon's Grades:

<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/5	Basic Facts Quiz	15/20
2.	9/9	Chapter 1 Test	83/100
3.	9/15	Chapter 1 Homework	20/44
4.	9/16	Fraction Project	29/30
5.	9/19	Chapter 2 Quiz	18/20
6.	9/23	Chapter 2 Test (cheated)	0/100
7.	9/26	Chapter 2 Homework	40/50
8.	9/30	Adding Decimals Quiz	30/30
9.	10/3	Decimal Project (not turned in)	0/30
10.	10/8	Chapter 3 Quiz	19/20





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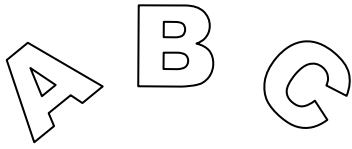
# GRADE SHEET QUIZ

No.	Date	Assignment	Score	Decimal	Percent	Grade	Class Total	Decimal	Percent	Class Grade	Parent Signature
1											
2											
3											
4											
5											

Using the grade sheet above, determine this student's final grade based on his individual scores.

## Student's Grades

<u>Number</u>	<u>Date</u>	<u>Assignment</u>	<u>Score</u>
1.	9/5	Basic Facts Quiz	27/35
2.	9/7	Chapter 1 Test	88/100
3.	9/9	Chapter 1 Homework	40/50
4.	9/16	Class Project	49/60
5.	9/19	Chapter 2 Quiz	39/45



# Grade Sheet Lesson Teacher Tips

Lesson Description: The Grade Sheet Lesson is a resource that enables students to track their grade in a class. It is also a tool used to communicate student progress to the home. Finally, it provides content practice in fractions, decimals, and percents.

Math Content: Fractions, Decimals, and Percents

The Grade Sheet Lesson includes:

- \* 2 Grade Sheet forms to track up to 30 grades in any grading period
- \* 1 assignment sheet with 3 sets of fictitious grades that can be used to learn the Grade Sheet
- \* 2 quizzes that can be administered to your class in order to assess understanding
- \* 2 answer keys for the Grade Sheet assignments and the Grade Sheet quizzes
- \* 1 Grade Sheet Teacher Tips sheet

Materials Needed: None

Suggested Grade Level: 5th - 12th

Teacher Tips:

- \* The most common error made by students is not rounding decimals to the nearest hundredth.
- \* You may need to alter the letter grade on the practice sheets or quizzes if your grading scale is different from the one used here.
- \* The parent signature box is optional, but I require it as proof that parents know class grades.
- \* I subtotal ten homework scores before students enter a homework score on their Grade Sheet. This keeps the amount of entries to a reasonable number while still providing the relevant information.
- \* For the Grade Sheet to be most effective, make it a part of the culture of your class. Share it with parents at Back-to-School Night, allow class time to enter grades, check frequently for parent signatures, and collect at times. I collect mine at mid-quarter and at the end of the quarter and grade them, comparing them to my own computer gradebook.

Testimonial:

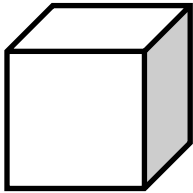
One of the first things I do each year with my students is teach them how to use my Grade Sheet. The students complete two or three practice Grade Sheets and then take a quiz to prove their ability to use this tool. For the remainder of the year, each time I give the students a grade they must enter it onto their Grade Sheet, calculate their new cumulative grade in my class, and then have their parent sign it. After a few assignments they will fill out their Grade Sheets with little prompting. I rarely hear parents say that they weren't aware of their child's grades!!

Most parents see and sign their child's Grade Sheet 10-15 times per quarter and are continually updated with their child's progress. The Grade Sheet also brings ownership of their grades to the students. As a math teacher I love to see the students learning the effect of each assignment on their cumulative grade. "I only need 5 more points for a B." or "This assignment really brought up my grade." are common types of comments I hear as students earnestly enter each grade to see its effect. In the past, students have often had trouble making the connection between their individual efforts and their final grade.

# Square



# Project



# SQUAREA

(Area and Volume)

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Note: All answers should include appropriate units such as square inches (in.<sup>2</sup>) or cubic feet (ft.<sup>3</sup>).

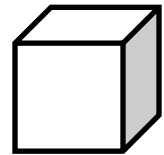
## I. SQUARE FOOT

1. Cut out a square foot.
2. Draw square inches on your square foot.
3. How many square inches are in a square foot? \_\_\_\_\_

## II. AREA TRACING/DRAWING

1. Trace or draw at least five objects on your square foot and color them.
2. Label each object and write its estimated area **on** your square foot.

<u>Object</u>	<u>Area</u>	<u>Object</u>	<u>Area</u>
A) _____	_____	D) _____	_____
B) _____	_____	E) _____	_____
C) _____	_____		



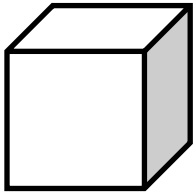
## III. WHITE BOARD/CHALK BOARD

1. Use your square foot to estimate the area of one white board in square feet.  
L = \_\_\_\_\_ W = \_\_\_\_\_ A = \_\_\_\_\_
2. Estimate the area of the white board in square inches.  
Equation: \_\_\_\_\_ A = \_\_\_\_\_

## IV. CLASSROOM FLOOR

1. Use your square foot to estimate the area of the classroom floor in square feet.  
L = \_\_\_\_\_ W = \_\_\_\_\_ A = \_\_\_\_\_
2. Estimate the area of the classroom floor in square yards.  
Equation: \_\_\_\_\_ A = \_\_\_\_\_
3. What would be the cost of carpeting the classroom at \$25 per square yard?  
Equation: \_\_\_\_\_ C = \_\_\_\_\_





# SQUAREA

(Area and Volume)

# TEACHER TIPS

**Lesson Description:** SQUAREA (a hybrid word I created which stands for “Square Area”) is a hands on math project that helps students to discover area, volume, and surface area in a very concrete, visual manner. Students measure objects in a classroom, create square feet, draw square inches, construct cubic feet, construct square yards and cubic yards, and investigate the surface area of a cube.

**Math Content:** Area, Volume, and Surface Area

**Time Required:** about 2 class periods

**The SQUAREA Project includes:**

- \* 2 SQUAREA Project worksheets
- \* 2 SQUAREA Project worksheet answer keys
- \* 1 SQUAREA Teacher Tips page

**Materials Needed:** Construction paper, tape

**Suggested Grade Level:** 5<sup>th</sup> - 8<sup>th</sup>

**Teacher Tips:**

- \* Construction paper should be used for this project. Students need to carefully measure the paper, draw guide lines, and cut off enough in order to create their square.
- \* When students draw their square inches on their square feet I usually have them do this lightly in pencil first, using a ruler. Many later outline their square inches with a black marker and ruler.
- \* Have the students draw and color the objects on their square feet **over** the square inch markings. This contrast makes it easier for the students to count the square inches.
- \* Teach students to estimate the area of objects that include partial squares. I encourage students to draw or trace objects that are irregular in shape.
- \* I find it easier to collect and grade page 1 and the square foot before completing page 2.
- \* It will take 162 square feet in order to create 27 stackable cubic feet that can be used to create your cubic yard. If you do not have this many students you can either cut out extra square feet (that have not been divided into square inches) or just model the answer for the class.
- \* Use a lot of clear tape to tape the six square feet together to create your cubic feet. Have students put their names on the front of their square feet since they will be taped together.
- \* Stack 27 cubic feet together to create a cubic yard. You can place them on tables in the center of the room for a nice Open House visual.

**Testimonial:**

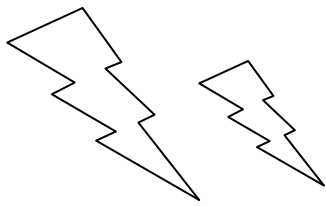
Since I developed this project I have used it several times with 6<sup>th</sup> and 7<sup>th</sup> grade students. The way in which it allows them to actively learn the concepts of area, volume, and surface area is truly remarkable. The students are able to visualize the concepts of a square inch, a square foot, and a square yard. They work cooperatively with others to incorporate their personal square foot with others to create a cubic foot. Then they combine these with the cubic feet from other classes to construct a cubic yard. I often have this cubic yard on display at Open House for the parents to see.



# Proportional



# Pictures



# Proportional Pictures

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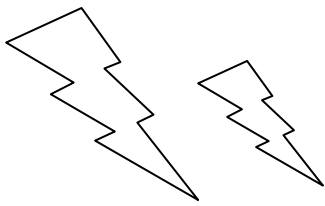
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7						
6						
5						
4						
3						
2						
1						
	A	B	C	D	E	F







## Proportional Pictures

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1. Are the two figures that you have drawn similar? Explain.
2. What scale have you used to make your larger drawing?
3. Using your two figures compare their perimeters and areas using the chart below. Use string to help you estimate the perimeter.

	SMALL PICTURE	LARGE PICTURE	RATIO: $\frac{\text{LARGE PICTURE}}{\text{SMALL PICTURE}} = \text{x.xx}$
PERIMETER			_____ =
AREA			_____ =

4. About how many times greater is the perimeter of the large figure? Why do you think that the perimeter is this many times greater?
5. About how many times greater is the area of the large figure? Why do you think that the area is this many times greater?
6. If we had made our large picture five times larger than the small picture, how many times larger would the area have been? Explain your reasoning. Can you generalize a rule for this relationship?

# Amateur



# Architect



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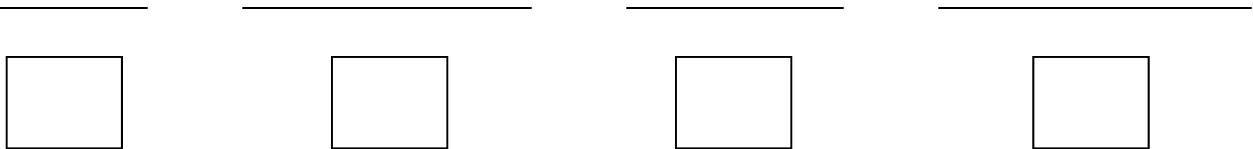
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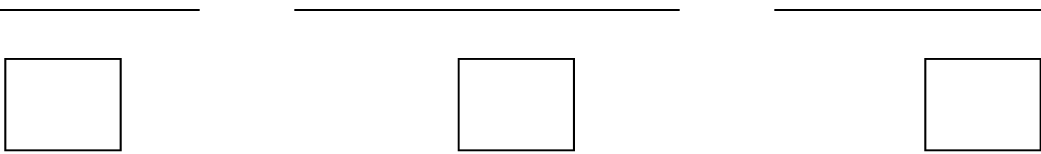
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# Amateur Architect - Ruler Skills 1


## Measuring Line Segments


Measure each line segment to the nearest  $\frac{1}{16}$ " and write the length in the box under the segment. Use mixed numbers when appropriate and write each number in simplest form.

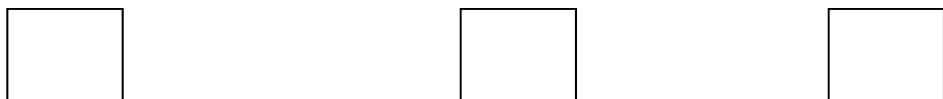
1. 

2. 

3. 

4. 

5. 

6. 





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# Amateur Architect - Ruler Skills 2

## Drawing Line Segments

Place a point at the beginning of each line segment. Then measure the given distance from the starting point and place an endpoint. Finally, shade in the segment between the two points.

1)  $4 \frac{5}{16}$ " \_\_\_\_\_

2)  $1 \frac{7}{16}$ " \_\_\_\_\_

3)  $5 \frac{3}{16}$ " \_\_\_\_\_

4)  $2 \frac{1}{8}$ " \_\_\_\_\_

5)  $3 \frac{3}{4}$ " \_\_\_\_\_

6)  $5 \frac{1}{16}$ " \_\_\_\_\_

7)  $4 \frac{1}{2}$ " \_\_\_\_\_

8)  $3 \frac{5}{8}$ " \_\_\_\_\_

9)  $\frac{15}{16}$ " \_\_\_\_\_





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# Amateur Architect

Use the following directions to construct your street, curb, house, and garage.  
(NOTE: All dimensions are given as length by width (l x w). Length is measured from left to right. Width is measured from top to bottom.) Use a clean, white sheet of paper turned to landscape mode.

## **I. Street and Curb**

1. The street is  $11'' \times 1 \frac{1}{2}''$  and is located at the very bottom of the page.
2. a) A broken median line runs the length of the street. Each median segment is  $1'' \times \frac{1}{8}''$  and segments are spaced  $1''$  apart.  
b) Center these segments between the street line and the bottom edge of the paper.  
c) The first median segment begins  $1''$  from the left edge of the paper.
3. The curb line rises  $\frac{1}{4}''$  above the street line and is parallel to the street line.

## **II. House**

1. The left side of the house is  $\frac{1}{2}''$  from the left edge of the paper.
2. The length of the front wall of the house is  $\frac{9}{16}$  of the length of the paper.
3. The width of the front wall of the house is  $2 \frac{15}{16}''$  less than the length of the house.
4. The distance between the top of the house's front wall and the top of the roof is ten times the width of one broken median segment in the street.
5. The roof angles in at  $40^\circ$  from each top corner of the house. The top of the roof is parallel to the top of the front wall.

## **III. Garage**

1. The distance between the right side of the house and the left side of the garage is  $\frac{36}{48}''$ .
2. The length of the garage is  $1 \frac{7}{8}''$  more than the distance from the top of the house wall to the top of the house roof.
3. The width of the garage is  $3 \frac{7}{16}''$  less than the length of the house.
4. The garage roof angles in at  $35^\circ$  from each top corner of the garage and meets at a point.





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# Amateur Architect - Fraction Calculations

The calculation numbers below correspond to the numbers on the Amateur Architect project. Show all of your work and then place the answer for each calculation in the answer box. Problems without answer boxes can be solved in more than one way. All fractions should be reduced to simplest form.

I-2 Centering Median Segments	II-2 Length of the Front Wall	II-3 Width of the Front Wall
II-4 Distance Between Top of Wall and Top of Roof	III-2 Length of the Garage	III-3 Width of the Garage
IV-1 Location of Door	IV-2 Width of House Door	V-1 Center Left Window
V-2 Center Right Window	VI-1 Center Garage Door	VI-3 Five Equal Garage Door Panels

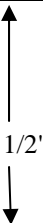
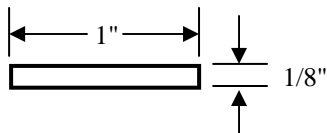
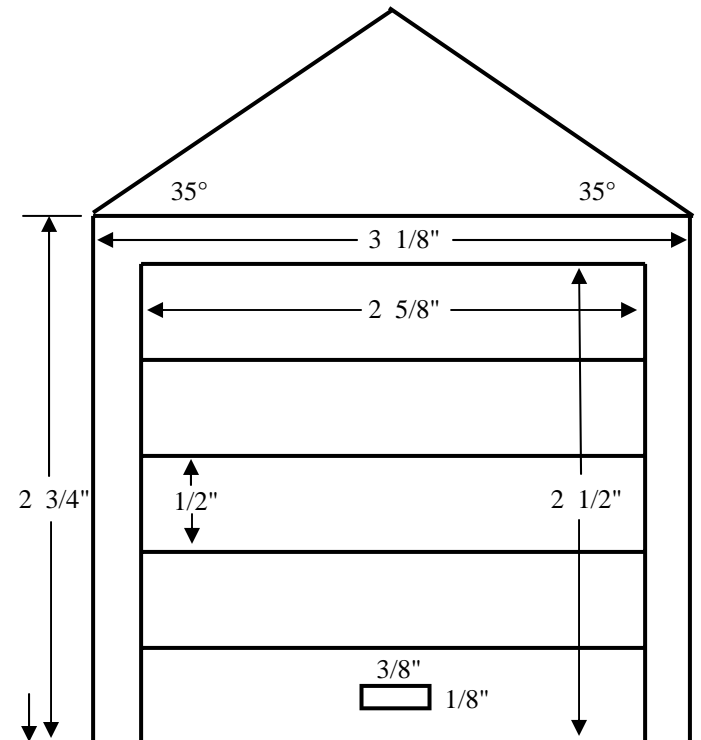
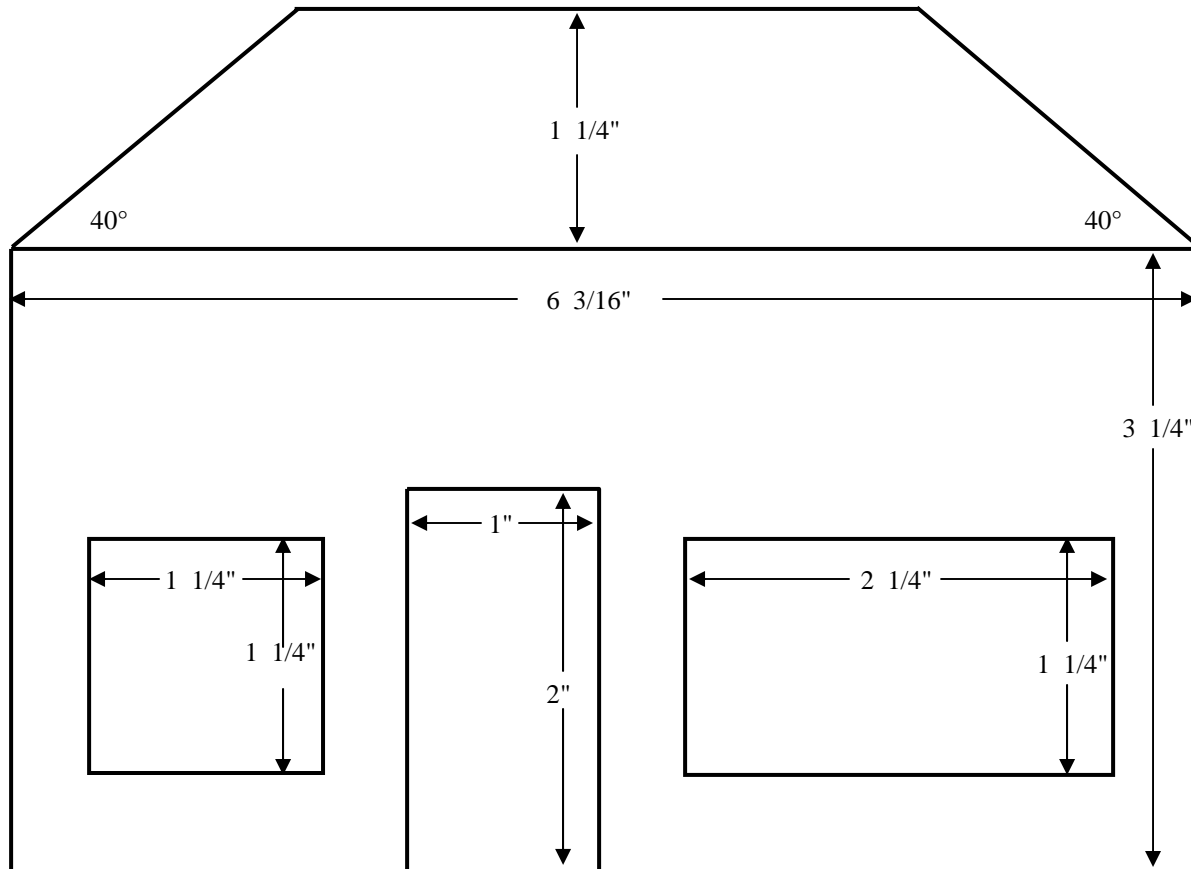


# Amateur Architect

## Grading Template



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## Teacher Tips

# Amateur Architect

Page 1

**Lesson Description:** Amateur Architect is a hands-on math project that requires students to compute fraction operations problems and use the resulting measurements to construct a house and garage. Students use pencil and ruler to draw and center parts of the house and garage. This project combines the foundational skill of solving fraction operation problems with the practical application of ruler measuring skills.

**Math Content:** Fraction Operations, Measuring and Constructing Drawings with a Ruler

**Time Required:** This project usually takes about 4 - 7 class periods, depending on whether or not the Ruler Skills worksheets are used and if you allow any part of the project (such as the final title and drawing) to be done at home.

**Amateur Architect includes:**

- \* 1 Amateur Architect project cover sheet
- \* 3 Ruler Skills worksheets (for optional preparation prior to the Amateur Architect project)
- \* 3 Ruler Skills answer keys
- \* 2 Amateur Architect project pages
- \* 1 Amateur Architect project Fraction Calculations worksheet
- \* 1 Amateur Architect project Fraction Calculations worksheet answer key
- \* 2 Amateur Architect Grading Templates (one with dimensions included)
- \* 1 Amateur Architect Project Terms Transparency
- \* 2 Amateur Architect Teacher Tips pages
- \* 1 Amateur Architect Grading Rubric

**17 pages in all!!**

**Materials Needed:** Rulers (class set), two transparencies, construction paper (optional)

**Suggested Grade Level:** 5th -8th

**Teacher Tips:**

- \* **Before printing** make sure “**NONE**” is selected for Page Scaling. Otherwise templates of project and lengths of segments on Ruler Skills pages will not be accurate.
- \* Have students calculate and draw simultaneously. Some students want to solve all of the problems first. **Some calculations depend on previous calculations**, so it is important to be able to visualize the reasonableness of math calculations by drawing them.
- \* Calculations should be shown, with all work, on the Fraction Calculations worksheet.
- \* Teach, and encourage students to use, at least two guide points when constructing lines.
- \* Grading for the project is very fast!! Simply check the main calculations using the answer key and then **place a transparency of the project over the student’s work** to check for accuracy. Line up the left side of the house and the curb line as reference points, **not** the edge of the transparency. (Note: Projects will not be perfectly accurate but look at the number and degree of miscalculations or incorrect drawings.) See Grading Rubric.

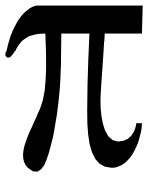




# Discovering



# Pi Day



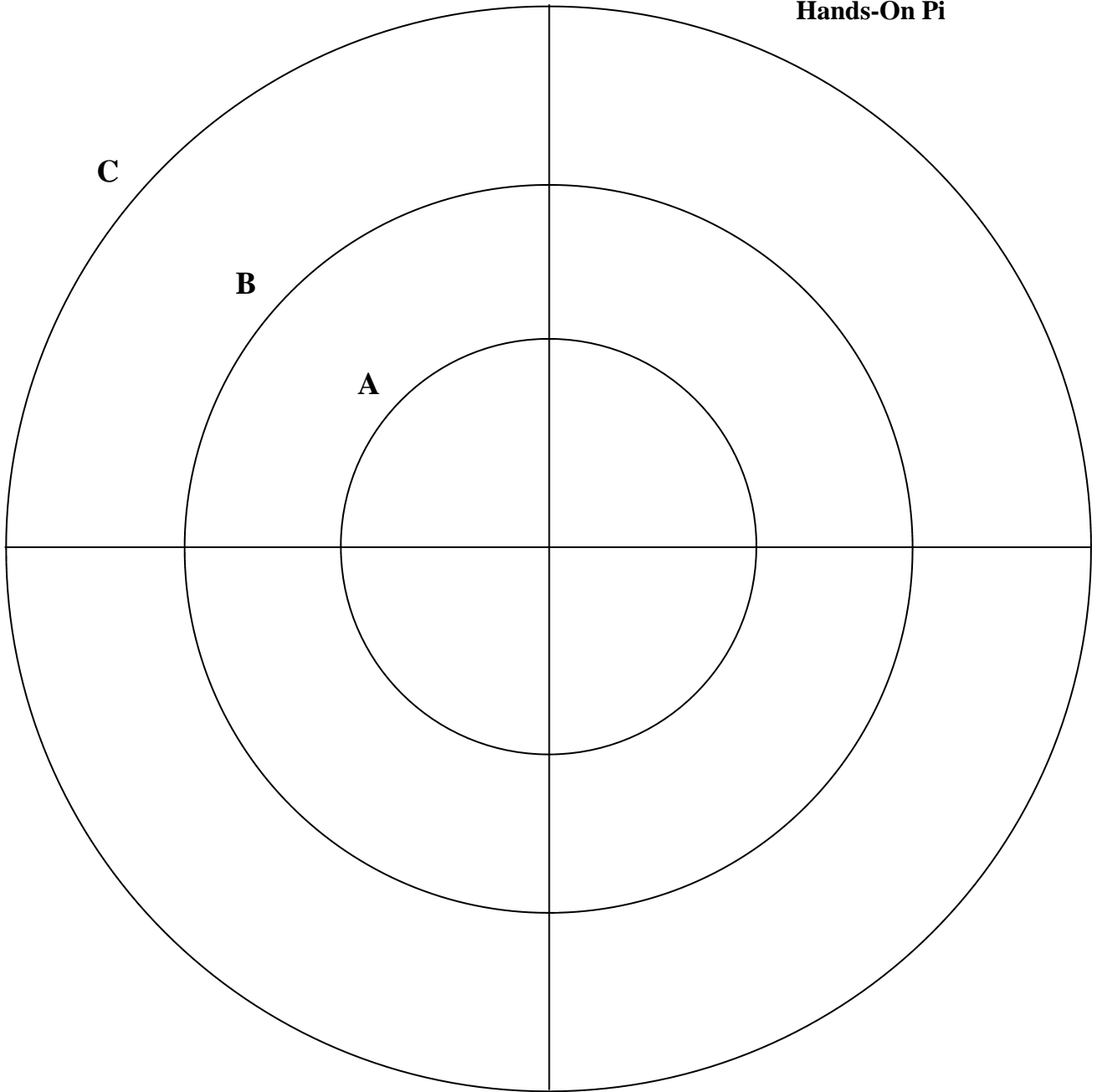
# Discovering Pi

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## Hands-On Pi



Use **string** and a **ruler** to measure in millimeters. Round the division answer to the **hundredths** place.

Circle A: Circumference: \_\_\_\_\_ Diameter: \_\_\_\_\_ Circumference  $\div$  Diameter = \_\_\_\_\_

Circle B: Circumference: \_\_\_\_\_ Diameter: \_\_\_\_\_ Circumference  $\div$  Diameter = \_\_\_\_\_

Circle C: Circumference: \_\_\_\_\_ Diameter: \_\_\_\_\_ Circumference  $\div$  Diameter = \_\_\_\_\_



# $\pi$ Discovering Pi

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## Pi Basics

Pi is a number that expresses the constant ratio of the circumference of a circle to its diameter. The Greek letter  $\pi$  is used to represent this ratio. Pi is an infinite decimal. Since its digits never repeat in a pattern and never end it is called an irrational number. The decimal 3.14 and the fraction  $\frac{22}{7}$  are frequently used approximations of pi.

Ancient civilizations discovered the concept of pi thousands of years ago. Since then people have worked hard to calculate as many digits of pi as they were able. In the eighteenth and nineteenth centuries pi was successfully calculated to hundreds of digits. In the twentieth century, thanks to computers, pi has been calculated to billions and even trillions of digits.

Pi Day is often celebrated on March 14 (3.14) with some celebrations beginning at 1:59 (3.14159). On Pi Day students can participate in a number of pi-related activities. Enter “pi” or “Pi Day” into an internet search engine and you will find pi history, pi jokes, pi poems, pi facts, and other pi activities. Bring some in to share with your class!

One pi joke by John Evans goes like this:

Q: What do you get if you divide the circumference of a jack-o-lantern by its diameter?

A: \_\_\_\_\_

While it is interesting to know that the **circumference of a circle divided by its diameter always equals pi**, there are several practical uses for pi. Pi can be used to find the circumference and the area of a circle. It is also used in more advanced mathematical studies.

Pi is used to find the circumference of a circle. The formula for the circumference of a circle is  $C=2\pi r$  or  $C=\pi d$ , where  $r$  is the radius of the circle and  $d$  is the diameter of the circle. These two formulas are similar since two times the radius is equal to the diameter. Using 3.14 for pi, what would be the approximate circumference of a circle with a diameter of 5 feet? Show your equation and answer on the line that follows.

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Pi is also used to find the area of a circle. The formula for the area of a circle is  $A=\pi r^2$ . Using 3.14 for pi, what is the approximate area of a circle with a radius of 4 inches? Show your equation and answer on the line that follows.

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The first 100 digits of pi are 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510  
58209 74944 59230 78164 06286 20899 86280 34825 34211 70679

Now that you've had a **piece of pi** you can share some with others! Share some of the pi jokes, songs, facts or history that you have found in your research of pi.

# $\pi$ Discovering Pi

## Teacher Tips (1 of 2)

**Lesson Description:** Discovering Pi is a lesson designed to give students a hands-on experience that will help them truly grasp the concept of pi. The students use string and a ruler to measure the circumference and diameter of three different circles. They then calculate the ratio of circumference to diameter, perhaps not realizing that they are really calculating pi. Students also read and complete the Pi Basics sheet. Finally, if you celebrate Pi Day on March 14th, have students share pi jokes, pi songs, pi facts, and pi history before EATING PIE. Of course students love this last part!!

**Math Content:** Pi, Area of a Circle, Circumference of a Circle, Millimeter Measurement

**Time Required:** 1-2 Class Periods (Celebrate Pi Day on March 14th!!)

**Discovering Pi includes:**

- \* 1 Discovering Pi Hands-On worksheet and 1 Hands-On answer key
- \* 1 Discovering Pi Basics sheet and 1 Basics answer key
- \* 2 Discovering Pi Teacher Tips pages
- \* 1 Discovering Pi Cover Page

**Materials Needed:** String, Metric Rulers, Pie (optional), and Pi Day research, jokes, songs, etc.

**Suggested Grade Level:** 5th - 8th

**Teacher Testimonial:**

Pi Day (March 14) was one of the biggest hits with my students last year! We learned about pi, told pi jokes, sang pi songs (that's a first in my math class!), and learned pi facts and pi history. Best of all, WE ATE PIE!! The students learned how to find the circumference and area of a circle. They also learned where pi comes from. Most importantly, we created a special day to have fun while we were learning. I believe that many of my students will remember March 14th in a special way from now on.

**Teacher Tips:**

- \* Have students complete the Hands-On Pi worksheet the day before Pi Day. Then have them do the Pi Basics worksheet for homework. Also, tell them in advance if you will give extra credit for Pi Day jokes, songs, facts, history, etc.
- \* Use string that does not fray or come apart if at all possible on the Hands-On Pi worksheet. Teach students to mark the string and then measure it using their ruler.
- \* Try the Hands-On Pi worksheet measurements yourself, ahead of time. You will be better prepared to help the students and to anticipate measurement questions. Make sure students understand that each centimeter on the ruler is actually 10 millimeters and that these measurements are done in millimeters. Help them to see that when they divide the circumference by the diameter they should have gotten close to pi (3.14). Discuss the fact that their calculations will not be exact, or even the same as another student's, since the measurements are not exact.

# Likely



# Letters



# Likely Letters

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## Statistics and Probability Project

Whether you are watching the game show Wheel of Fortune or playing Hangman with a friend, it helps to know which letters have the highest probability of use in words. During this project you will conduct an experiment and collect statistical data to discover which letters are the most commonly used in written English language.

Probability, or the likelihood that a specific event will occur, can be determined theoretically or experimentally. Theoretical probability is a ratio that compares the number of specific outcomes to the total number of outcomes possible. For example, to calculate the probability of rolling the number 2 on a number cube, divide 1 (the number of specific outcomes that are a 2) by 6 (the number of total possible outcomes) to determine the theoretical probability of  $1/6$  or about 16.7%. Theoretical probability can only be determined by mathematical calculation.

Experimental probability is based on performing an actual experiment to collect data. To determine the experimental probability simply divide the number of times that an actual event occurs by the number of times that the experiment is done. For instance, if you flip a coin and it lands on tails 27 out of 50 times, then the experimental probability of getting tails is  $27/50$  or 54%.

If we took the 26 letters of the alphabet and placed them in a hat and then asked you to choose one without looking, the theoretical probability of choosing each letter would be 1 out of 26 or about 3.8%. However, if we choose a letter at random out of a book or other written material, does each letter still have an equal probability of being chosen? Explain.

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To find the probability of choosing any letter in the alphabet (at random) out of a book or other written source, would you use theoretical or experimental probability? Why?

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To find the experimental probability of each letter in the alphabet being used, you will collect 100 letters randomly by selecting a small reading passage and then recording your data on the following page. Use 100 consecutive letters. Do not skip around on the page.

Before beginning, **predict** what you think the **top five most-used letters** will be.

1.       2.       3.       4.       5.





# Likely Letters

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## Data Entry Sheet

Using the 100 letters from your randomly selected reading passage, fill in the individual data in the chart below. Then enter the data for your group. Finally, enter the data for the entire class.

Letter	Individual			Group			Class		
	Number In Sample	% of $\frac{100}{\text{Letters}}$	Letter Rank	Number In Sample	% of $\frac{100}{\text{Letters}}$	Letter Rank	Number In Sample	% of $\frac{100}{\text{Letters}}$	Letter Rank
A									
B									
C									
D									
E									
F									
G									
H									
I									
J									
K									
L									
M									





# Likely Letters

## Teacher Tips (1 of 3)

**Lesson Description:** Likely Letters is a statistics and probability project that requires students to use experimental probability to determine the letters with the highest frequency of use in written English. The students differentiate between theoretical and experimental probability, make predictions, collect and organize data, and analyze their results to discover which letters of the alphabet are used the most.

**Math Content:** Statistics; Probability; Predicting; Collecting, Organizing, and Analyzing Data; Drawing Conclusions based on their data

**Time Required:** 1-2 Class Periods

**Likely Letters includes:**

- \* 2 Likely Letters assignment sheets
- \* 2 Likely Letters Data Entry Sheets
- \* 3 Likely Letters Teacher Tips pages
- \* 1 Likely Letters Cover Page

**Materials Needed:** Reading materials (books, magazines, etc.) for data collection

**Suggested Grade Level:** 5th - 8th

**Teacher Testimonial:**

Likely Letters is a lesson that makes statistics and data collection relevant to the students. Most students have watched Wheel of Fortune or played the game Hangman. Both games require a knowledge of letters that are likely to be used in the unknown words. This gives purpose to the data collection. You can also add suspense to the assignment by posting a covered list of the most frequently used letters that will only be revealed after the students complete their investigation.

**Teacher Tips:**

- \* On the Data Entry Sheet the students will write in the number of each letter found in their written English sample of 100 letters.
- \* Make sure that students understand how to fill in the total number of letters in their collected data where it says “**Percent of \_\_\_\_\_ Letters**” in the middle column of their data sheet. The number **100** has already been filled in under the “Individual” column since each student is recording the data for 100 letters. If there are three other students in their group then **400** would be written under the “Group” column. Finally, if the number of students in the class is 32, then **3200** would be written in under the “Class” column.
- \* Students will calculate the “Percent of \_\_\_\_\_ Letters” column by taking the number of each letter that they have recorded (from the first column under each heading) and dividing it by the total number of letters recorded. Have students convert the decimal to a percent and **round the percent probability on their data entry sheets to the nearest tenth of a percent.**





# The Royal



# Reward





# The Royal Reward

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## Group Geometry Project

King Euclid is a man who is very fond of geometry, especially polygons. After conquering the neighboring kingdom of Ignorance he decides to reward the greatest knights and ladies of his kingdom. He divides a large rectangular piece of land into smaller plots of land, shaped like polygons, and awards them to his top knights and a few prominent noble ladies.

Those who are to receive land from the king for their support in the war against Ignorance include Sir Fibonacci, Lady Andrini, Sir Pascal, Sir Galileo, Sir Escher, Lady Burns, Sir Bernoulli, and Sir Pythagoras. The king decides to keep the largest plot of land. Before giving the remainder of the land to his loyal royal subjects King Euclid creates the Royal Reward Chart. Complete this chart and label the Royal Land Map in order to help the king to decide who will be the new owner for each piece of land.

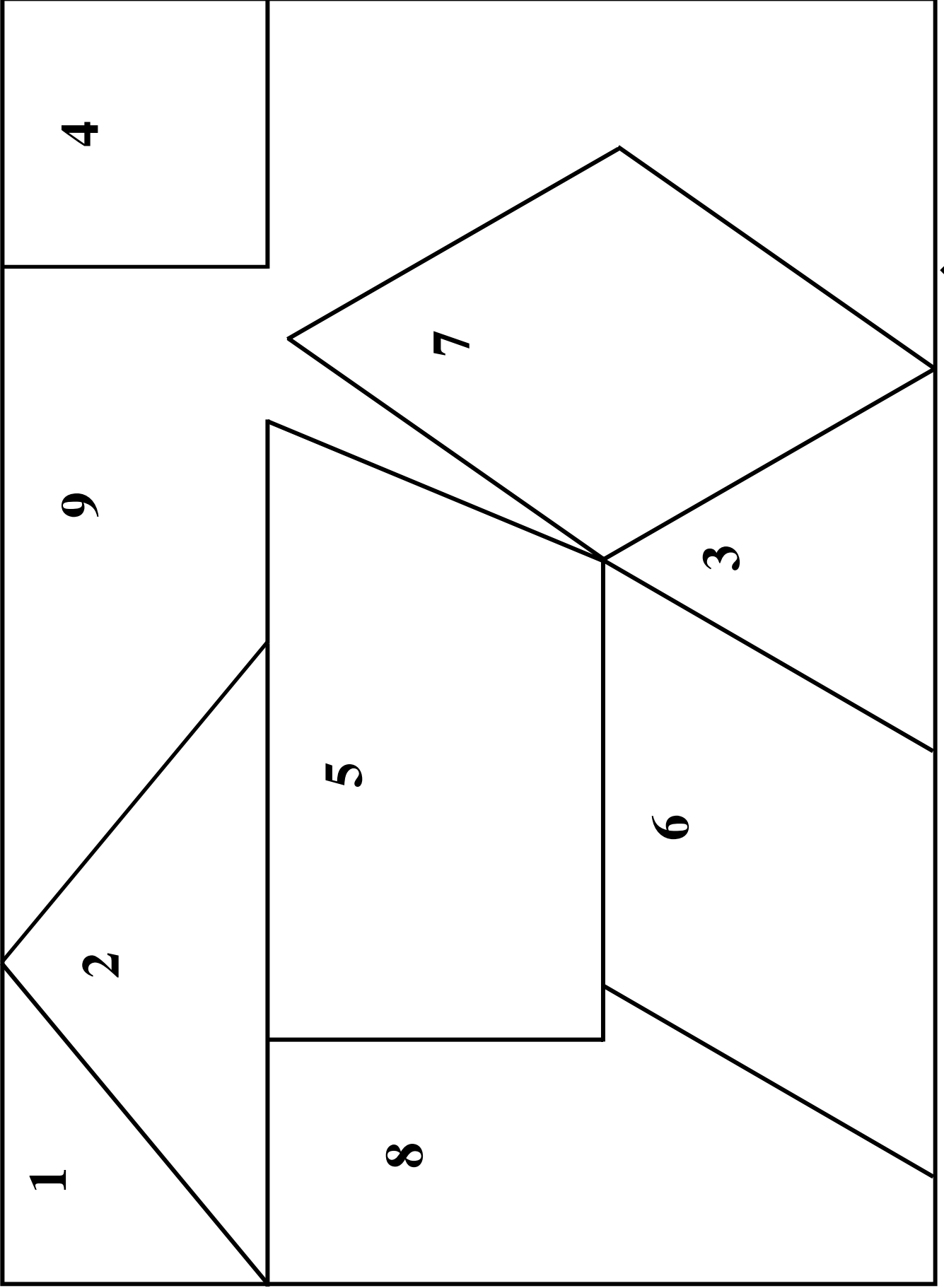
If you are successful in this venture you will not only learn a great deal of geometry and become very wise, but King Euclid has promised to recommend that you receive three segments with three intersections. Of course he may recommend one segment and two arcs, a curve, one segment and one arc, or even the dreaded three segments with two intersections, depending upon the quality of your service.

As you complete the chart and the map:

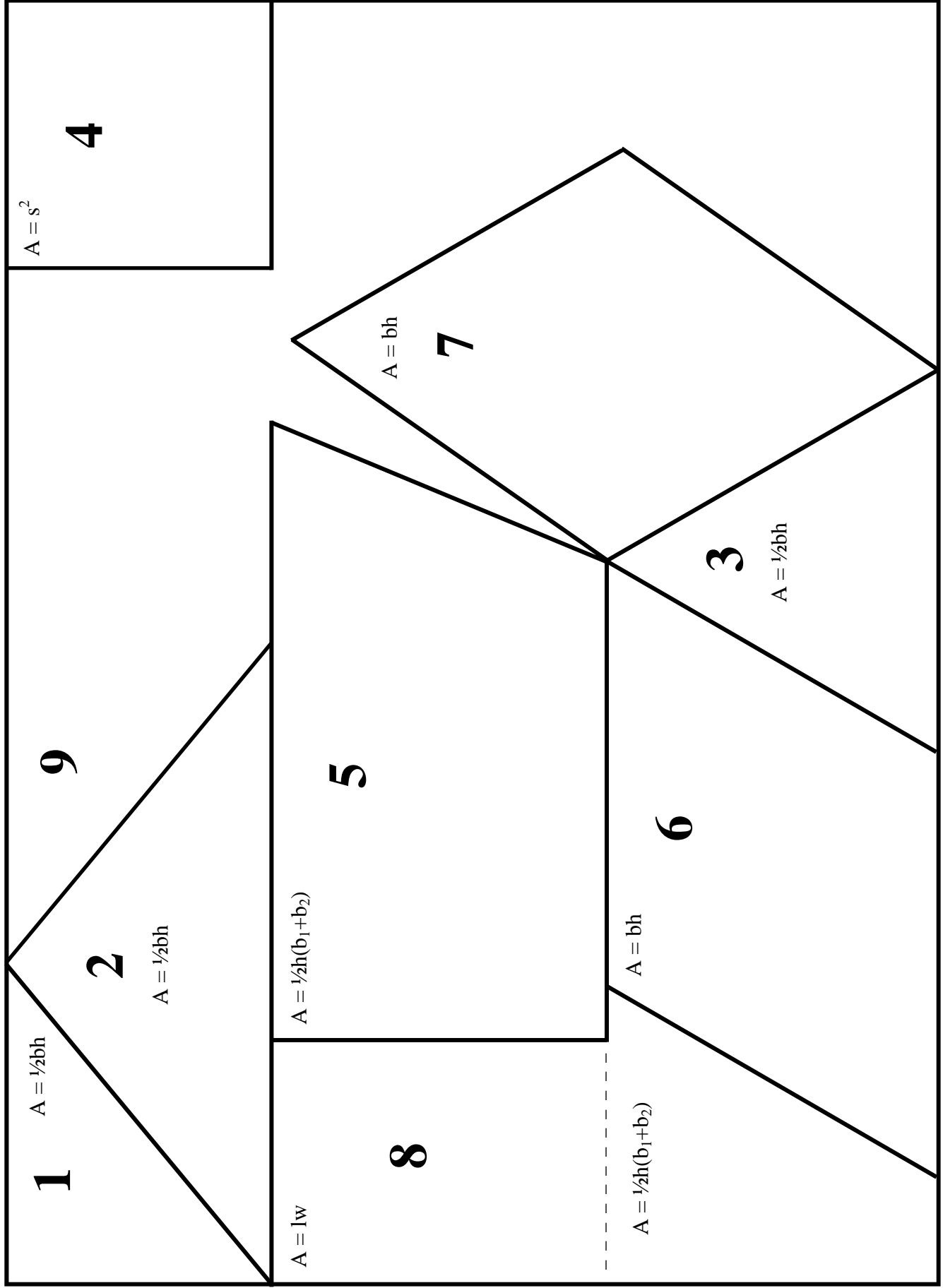
1. Measure and then label each of the angles for each piece of land on the Royal Land Map. Include this data on your chart.
2. Measure, and then label (in kilometers) each boundary line of each plot of land. The scale being used on the Royal Land Map is 1 centimeter (cm) = 1 kilometer (km). Place the boundary lengths on the inside of each polygon next to the corresponding segment. Measurements are only necessary on one side of a segment if two owners share the exact same length boundary. Include this data on your chart.
3. Label each piece of land with the name of the polygon that **best** describes it. Place the label a little below the center of the polygon (and in parentheses).
4. On your Royal Reward Chart calculate the sum of the angle measures and the perimeter of each piece of land. Pay attention to any patterns that you discover.
5. Use the Royal Land Map Area Worksheet and the area formulas given to find the approximate area of each piece of land. Record these area measurements on your chart.
6. After completing the Royal Reward Chart, King Euclid decides to reward the largest remaining piece of land to the noble that has served the king for the longest period of time. Each noble, in turn, will receive his or her piece of land according to the amount of time he or she has served the king. Using the **perimeter data** that has been collected, the king asks you to notify each noble and tell them which plot of land they have been given.
7. Lady Burns has served the king for the longest period of time, followed in order by Sir Fibonacci, Lady Andrini, Sir Pythagoras, Sir Escher, Sir Bernoulli, Sir Galileo, and finally Sir Pascal, who has only served the king for a very short period of time. On the Royal Land Map write the name of the noble that will receive each piece of land above the polygon label in the appropriate polygon.



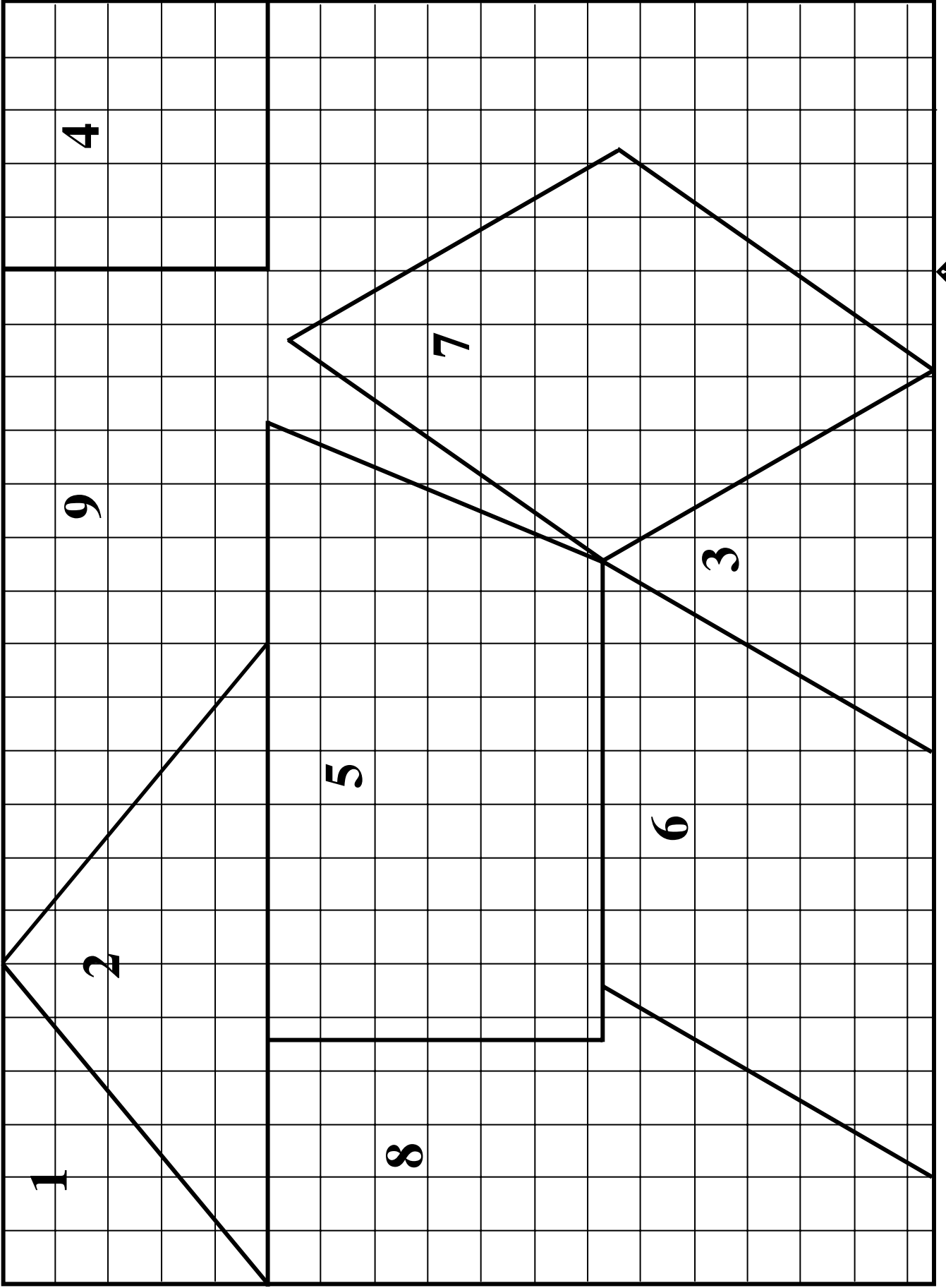
# Royal Land Map



# Royal Land Map Area Worksheet



# Royal Land Map



# The Royal Reward Chart

#	Polygon Name (specific)	Angle Measures (small to large)	Sum of Angle Measures (degrees)	Boundary Lengths (km) (small to large)	Perimeter (km)	Rank	Area (km <sup>2</sup> )	Rank
1								
2								
3								
4								
5								
6								
7								
8								





# The Royal Reward

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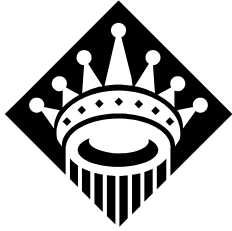
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## Interior Angles of Polygons

King Euclid notices a pattern in the sum of the interior angles of a polygon. What pattern does he notice? You have already determined the sum of the interior angles of triangles, quadrilaterals, and hexagons. What will the sum of the interior angles of a pentagon be? An octagon? A nonagon? If you do not see the pattern, draw these polygons using straight line segments and measure their interior angles to determine the sum. Once you discover the pattern use it to develop a formula for finding the sum of the interior angles of a polygon with  $x$  sides. Then use this formula for the final three polygons!

Polygon	Number of Sides	Sum of Interior Angles
Triangle		
Quadrilateral		
Pentagon		
Hexagon		
Heptagon		
Octagon		
Nonagon		
Decagon		
Hendecagon		
Dodecagon		
Any Polygon	$x$	
Icosagon	20	
Pentacontagon	50	
Hectogon	100	





# The Royal Reward

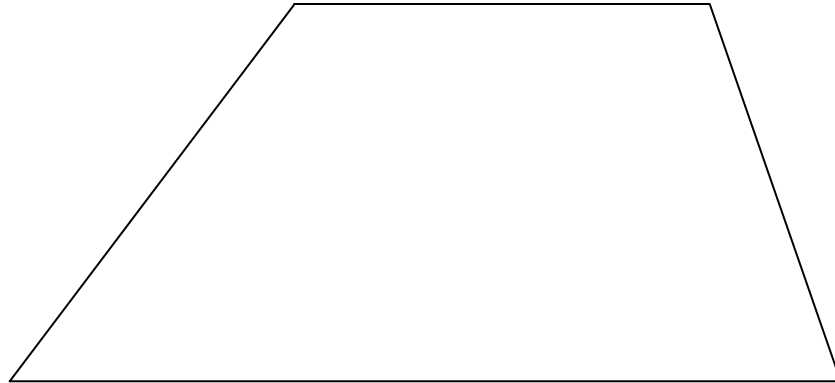
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## The Royal Reward - Quiz A

Use the scale map of a plot of land below to complete the quiz. Label the measures of the polygon and place the answers in the answer blanks below. The map scale is 1 cm = 1 km. Show all work for numbers 2, 4, and the extra credit problem. Use the back of the paper if necessary.



- 1) List the measures of the angles, in order, from least to greatest.  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_
  
- 2) What is the sum of the interior angle measures of this polygon? \_\_\_\_\_
  
- 3) List the measures of each segment, in order, from least to greatest. Give answers in kilometers.  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_
  
- 4) What is the perimeter of this polygon? \_\_\_\_\_
  
- 5) What is the area of this polygon (in square kilometers)? \_\_\_\_\_
  
- 6) What is the name of the polygon above? \_\_\_\_\_

Extra Credit: If the cost of fencing is 5.7 rolems per kilometer, how much would it cost to build a fence around this plot of land?

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# The Royal Reward

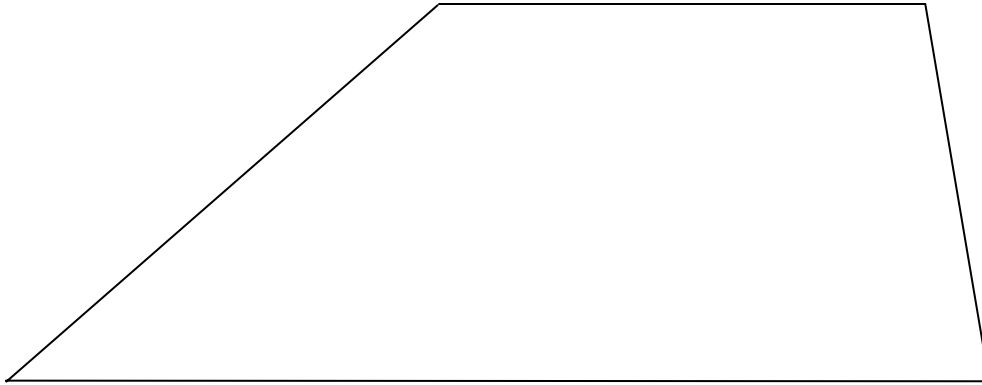
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## The Royal Reward - Quiz B

Use the scale map of a plot of land below to complete the quiz. Label the measures of the polygon and place the answers in the answer blanks below. The map scale is 1 cm = 1 km. Show all work for numbers 2, 4, and the extra credit problem. Use the back of the paper if necessary.



- 1) List the measures of the angles, in order, from least to greatest.  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_
- 2) What is the sum of the interior angle measures of this polygon? \_\_\_\_\_
- 3) List the measures of each segment, in order, from least to greatest. Give answers in kilometers.  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_
- 4) What is the perimeter of this polygon? \_\_\_\_\_
- 5) What is the area of this polygon (in square kilometers)? \_\_\_\_\_
- 6) What is the name of the polygon above? \_\_\_\_\_

Extra Credit: If the cost of fencing is 5.7 rolems per kilometer, how much would it cost to build a fence around this plot of land?

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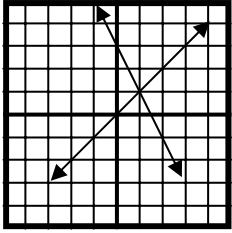


# Graphing



# Systems of Equations





# Graphing Systems of Equations

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## Systems of Equations 2

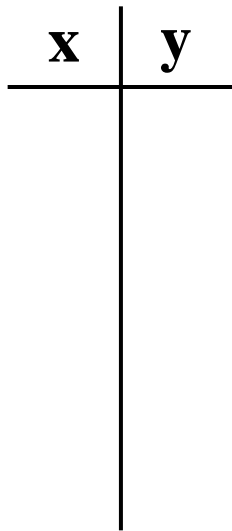
Directions: Read each set of words below, write the corresponding equations, and use the t-table to graph at least five ordered pairs that are solutions to each equation. Then graph these points and draw the line that represents all of the solutions for each equation. Finally, write the slope, y-intercept, and the solution to this system of equations.

Words: Sally is fifteen years less than three times as old as her brother Joe.

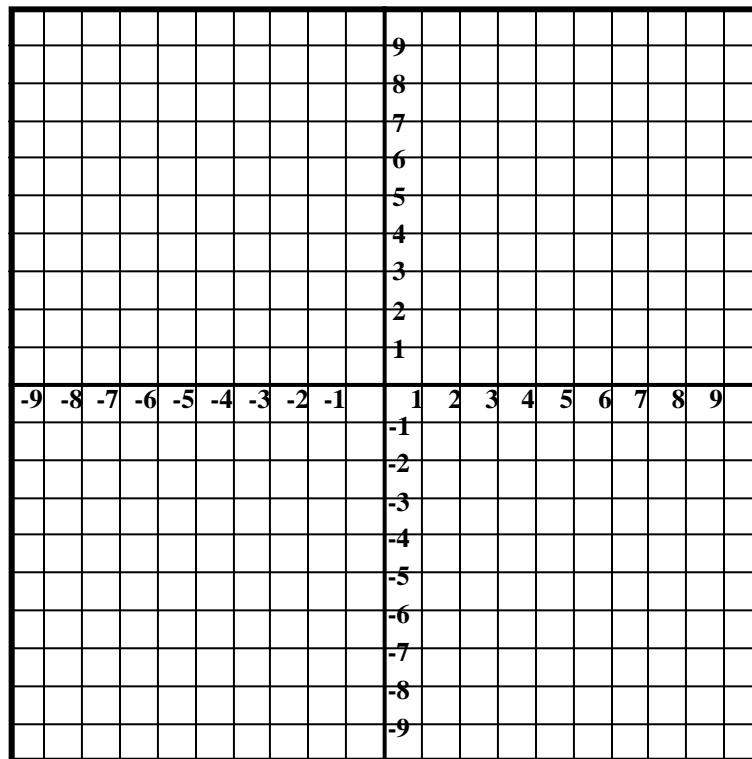
Words: The sum of Joe's age and Sally's age is 13.

(Let  $x$  = Joe's age) (Let  $y$  = Sally's age)  
Equation:

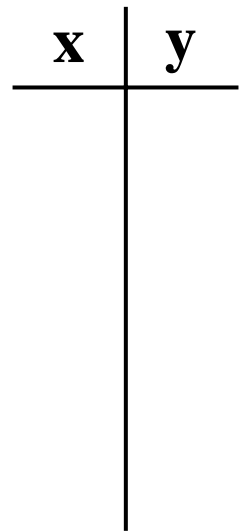
(Let  $x$  = Joe's age) (Let  $y$  = Sally's age)  
Equation:



Slope \_\_\_\_\_  
y-intercept \_\_\_\_\_

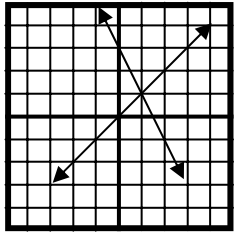


**Solution:** (\_\_\_\_, \_\_\_\_)



Slope \_\_\_\_\_  
y-intercept \_\_\_\_\_





# Graphing Systems of Equations

## Answer Key

### Systems of Equations 2

Directions: Read each set of words below, write the corresponding equations, and use the t-table to graph at least five ordered pairs that are solutions to each equation. Then graph these points and draw the line that represents all of the solutions for each equation. Finally, write the slope, y-intercept, and the solution to this system of equations.

Words: Sally is fifteen years less than three times as old as her brother Joe.

Words: The sum of Joe's age and Sally's age is 13.

(Let  $x$  = Joe's age) (Let  $y$  = Sally's age)  
Equation:

$$y = 3x - 15$$

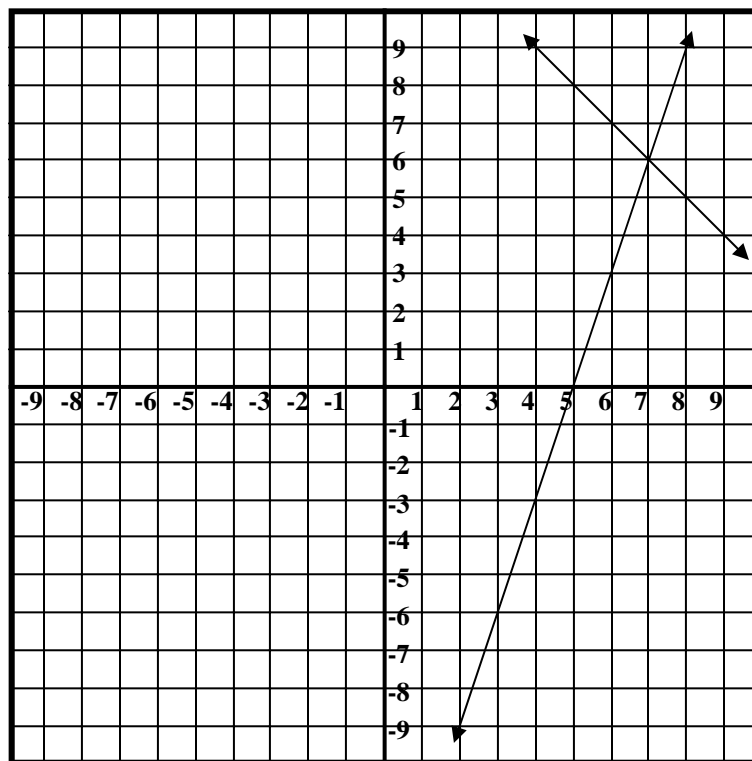
(Let  $x$  = Joe's age) (Let  $y$  = Sally's age)  
Equation:

$$x + y = 13$$

<b>x</b>	<b>y</b>
2	-9
3	-6
4	-3
5	0
6	3
7	6
8	9

Slope   3  

y-intercept  -15 



**Solution: (7, 6)**

<b>x</b>	<b>y</b>
4	9
5	8
6	7
7	6
8	5
9	4

Slope   -1  

y-intercept  13 





# Humongous



# Hero



# Humongous Hero

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## Project Directions

### **I. Determine the Height of the Humongous Hero**

1. Complete the “Hero’s Height” worksheet to calculate the hero’s height.
2. Select one group member to be the “measurement model” for your hero’s measurements.

### **II. Find the Scale for Your Drawing of the Humongous Hero**

1. Which student is your group going to measure to complete this project? \_\_\_\_\_
2. What is the hero’s height according to this student’s proportion? \_\_\_\_\_
3. How tall is the space (in centimeters) that you will draw your hero in? \_\_\_\_\_
4. Divide the hero’s actual height (see #2) by the space you will draw it in (see #3) and round down to the nearest centimeter to determine the scale factor that you will use to draw the hero. Show your work below.

Scale: 1 cm = \_\_\_\_\_ cm

### **III. Determine the Dimensions of the Humongous Hero**

1. Complete the “Hero Dimensions” worksheet pages to determine the dimensions of the hero.
2. Calculate the dimensions of the scale model of the hero using the same worksheets.

### **IV. Draw and Label the Dimensions of the Humongous Hero**

1. Draw the hero and label its dimensions on the right side of the poster board.
2. Leave room for the hero’s name at the top and the worksheets to be attached on the left side.

### **V. Find the Measurements of the Humongous Hero’s Possessions**

1. Draw and label the dimensions of four objects that are owned by the hero.
2. Show all work (proportions) used to determine the dimensions of these objects.





# Humongous Hero

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## Hero Dimensions 1

Use the table below to determine the dimensions of the Humongous Hero. All measurements should be rounded to the nearest tenth of a centimeter. Use the hero height that was determined using the height of your group's measurement model (see page 2).

Body Part	Measurements		Scaled Measurements	
			(1 cm = _____ cm)	
<b>Sample:</b> <u>neck to finger tip</u> height (model's hero)	Student Model $\frac{94 \text{ cm}}{189.2 \text{ cm}}$	Hero $= \frac{x}{975 \text{ cm}}$	$x =$ <u>484.4 cm</u>	$484.4 \div 19 =$ (19 is sample scale factor.) <u>25.5 cm</u>
<u>length of face</u> height				
<u>width of face</u> height				
<u>shoulder to shoulder</u> height				
<u>base of neck to waist</u> height				
<u>waist width</u> height				
<u>waist to knee</u> height				
<u>knee to foot</u> height				
<u>length of foot</u> height				







# Humongous Hero

## Teacher Tips (1 of 3)

**Lesson Description:** Humongous Hero is a group project that involves proportions and the use of scale. Students use proportions and the handprint of the Humongous Hero to determine its height and body measurements. Then they make a scale model of the superhero that can be drawn on poster board. Finally, students use proportions to determine the dimensions of various items owned by the hero.

**Math Content:** Writing and Solving Proportions; Using Proportional Reasoning to Create a Scale Model; Metric Measurement; Using Proportions to Solve Problems

**Time Required:** 3-5 Class Periods

**Humongous Hero includes:**

- \* 5 Humongous Hero assignment sheets
- \* 3 Humongous Hero Teacher Tips pages
- \* 1 Humongous Hero Cover Page

**Materials Needed:** Centimeter measuring tapes, poster board, butcher paper, large hand cutouts

**Suggested Grade Level:** 5th - 8th

**Teacher Testimonial:**

Humongous Hero is a group project that the students really enjoy. They measure each other to help determine the size of the Humongous Hero and then use a scale to reduce the superhero down to a size that can be drawn on their poster board. When I have used this project before, the students really enjoyed designing the look of the person (superhero) and used mathematics to keep him in proportion.

**Teacher Tips:**

- \* The Humongous Hero project should be completed in groups. I have always used groups of four, but a group of three would also be acceptable. Larger groups allow too many spectators.
- \* Using an overhead projector and sheets of white butcher paper, create a “Humongous Hero hand” for each group. Tape the butcher paper to the wall and then use a tracing of your hand to draw the “humongous hands”. Simply move the overhead further away from the butcher paper to make the hand bigger. (**Note: I have always used hands that are about 102 centimeters from the base of the palm to the tip of the longest finger. This is A little more than 5 times the length of my hand and so creates a Humongous Hero that is about 900 centimeters, nearly 30 feet, tall.**)
- \* Of course you may use a different “humongous hand” size if you want students to calculate the size of a larger or smaller Humongous Hero.



# Financial Foundations



# Stock Market Contest

# Financial Foundations

## Stock Market



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The Basics (1 of 2)

### Why Invest in Stocks?

People invest in the stock market in order to get a return on their money. By investing in a company with excellent future growth prospects, individuals hope to increase the size of their assets in order to fund their retirement or other expenses. Stocks have traditionally provided a better return than parking your money in a savings account.

When you own stock in a company, you are actually a part-owner of that company. You may become an owner of McDonalds, Starbucks, eBay, Amazon.com, or any other publicly traded company. When you own the stock of a company you have the right to vote on certain company issues and you may also share in the profits of your company if they pay a dividend. A dividend is a portion of the profits of a company that are distributed to the shareholder for each share owned. Most stocks are traded on either the New York Stock Exchange (NYSE) or the NASDAQ market.

### Supply and Demand in the Stock Market

The price of a stock is determined by supply and demand. When a company is doing well and its future outlook is bright, many investors may want to buy the stock and demand for the stock will increase. Since there are a limited number of shares available, the price will rise. Often times those who follow the company will see the price rising and will want to purchase the stock to get in on the action. This pushes the price even higher.

If the company reports problems or company earnings decline, investors often sell their stock and take their money elsewhere. In such cases, demand decreases while the supply of available shares will increase. The price naturally will fall. This often leads to further selling as other investors watch the price fall and decide to get out. The price falls even further.

### Risk and Reward in the Stock Market

You could have bought eBay stock in 2001 at a split-adjusted price of under \$20.00 per share. At the time of this writing eBay was trading at about \$80.00 per share. Therefore, an investment of \$2,000.00 (100 shares) in 2001 would have been worth about \$8,000 in July of 2004. A return of \$6,000, or 300%, in 3 years is terrific! However, many people who had heard of eBay chose not to buy the stock in 2001. Investing would be simple if we could see the future.

The truth is that investing in the stock market is risky business. Sure, companies like eBay show us the profit that can be made when we choose to invest in a company that skyrockets in price. The other side of the coin is that many people invest in companies whose stocks earn a smaller profit, stay about the same price, or even lose money. If a company goes bankrupt your shares of stock in that company could become worthless. Even professionals are often unsuccessful in picking which stocks will rise in price. High risk stocks may offer a great potential reward, but you may also suffer a great loss.



# Financial Foundations

## Stock Market



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The Basics (2 of 2)

### Mutual Funds

Mutual Funds are another way to invest in the stock market. A mutual fund is a basket of many different stocks that are chosen and actively managed by an investing professional. One benefit of owning a mutual fund is that since the fund owns a number of different stocks your risk as an investor is lessened. Your results depend on the performance of many companies, not just one. Your total return (profit or loss) is more likely to be average when you invest in mutual funds. The disadvantages of mutual funds may include high purchase fees (called loads) and professional management fees.

### Exchange Traded Funds

Exchange Traded Funds, or ETFs, are a very popular alternative to selecting individual stocks or buying mutual funds. ETFs are a type of index fund that usually have lower fees than mutual funds and can be traded anytime during the day, just like a stock. They provide diversification also, which means that you enjoy the benefit of owning a group of stocks. This decreases your risk.

An example of an ETF is the Select Sector SPDR - Technology which has the ticker symbol XLK. This ETF focuses on holding stock in the technology sector. Some of its top holdings recently included Microsoft, Intel, Cisco, IBM, Verizon Communications, Dell, Hewlett Packard, and Oracle. You can own all of these stocks, and more, with this ETF and at the same time lower your risk and expenses. Another popular ETF is the NASDAQ-100 Index Tracking Stock (ticker symbol QQQ), which includes eBay, Pixar, Staples, Starbucks, Yahoo, and Ross Stores among its holdings. With one purchase you own a fund that owns many different companies. Learn more about ETFs at [www.amex.com](http://www.amex.com).

### Research Your Investments

Two simple ratios that you can use to learn about a stock's value are Earnings Per Share (EPS) and the Price/Earnings Ratio (P/E). Earnings Per Share tells how much money the company has made in the last year for each share of its stock that is available. At the time of this writing eBay had Earnings Per Share of \$0.95. Find out whether \$0.95 per share is an improvement over the previous year and whether or not analysts expect Earnings Per Share to increase over the next several years.

The Price/Earnings Ratio is simply the price of the stock divided by the earnings in the last year. For example, eBay recently had a price of \$79.51. Divide that by eBay's earnings (\$0.95) and you get a P/E ratio of 83.7. This is a very high P/E and shows that eBay is a more risky stock to invest in. An average P/E might be closer to 20.

When picking stocks for a school contest it is always fun to choose a company that you like. Just remember, when investing your real, hard-earned cash, always thoroughly research your investment choices!! You may be better off investing in an index fund or ETF which does not require you to be a master stock picker. Good luck!!



# Financial Foundations

## Stock Market



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### Ticker Symbols

Below is a list of ticker symbols that are used when searching for the price of a share of stock. Ticker symbols with 1-3 characters represent companies listed on the New York Stock Exchange (NYSE). Four characters are used for symbols listed on the NASDAQ stock exchange. Identify the company represented by each stock market ticker symbol.

- |                |                |                |
|----------------|----------------|----------------|
| 1. EBAY _____  | 16. SBUX _____ | 31. ZQK _____  |
| 2. WMT _____   | 17. PEP _____  | 32. G _____    |
| 3. DELL _____  | 18. SPLS _____ | 33. LUV _____  |
| 4. OO _____    | 19. GE _____   | 34. RBK _____  |
| 5. YHOO _____  | 20. NKE _____  | 35. HDI _____  |
| 6. COST _____  | 21. MSFT _____ | 36. JNJ _____  |
| 7. BKS _____   | 22. XRX _____  | 37. YUM _____  |
| 8. FDX _____   | 23. TASR _____ | 38. WWY _____  |
| 9. HD _____    | 24. MCD _____  | 39. UPS _____  |
| 10. DIS _____  | 25. INTC _____ | 40. WEN _____  |
| 11. F _____    | 26. ET _____   | 41. HSY _____  |
| 12. AAPL _____ | 27. TOY _____  | 42. PIXR _____ |
| 13. CC _____   | 28. KO _____   | 43. BBY _____  |
| 14. K _____    | 29. NOK _____  | 44. AXP _____  |
| 15. AMZN _____ | 30. IBM _____  | 45. TGT _____  |



# Financial Foundations

Stock Market



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## Company Spotlight

1. Company Name: \_\_\_\_\_

2. What is the ticker symbol for this company? \_\_\_\_\_

3. Does this company primarily provide a product or service? \_\_\_\_\_

4. In a short paragraph, describe the product or service provided by this company? \_\_\_\_\_

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5. Last Trade: \_\_\_\_\_

6. 52-Week Range: \_\_\_\_\_

7. Average Volume: \_\_\_\_\_

8. Price/Earnings Ratio (P/E): \_\_\_\_\_

9. Earnings Per Share (EPS): \_\_\_\_\_

10. Why did you decide to invest in this company? Be specific and give more than one reason.

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# Financial Foundations

Stock Market



## Answer Key

Company Spotlight Sample

1. Company Name: \_\_\_\_\_ **eBay** \_\_\_\_\_
2. What is the ticker symbol for this company? \_\_\_\_\_ **EBAY** \_\_\_\_\_
3. Does this company primarily provide a product or service? \_\_\_\_\_ **service** \_\_\_\_\_
4. In a short paragraph, describe the product or service provided by this company? **eBay is a** \_\_\_\_\_  
\_\_\_\_\_ **company that provides the technology and services that allow people to buy and sell** \_\_\_\_\_  
\_\_\_\_\_ **goods using the internet. They receive a fee for listing the items to be sold and a** \_\_\_\_\_  
\_\_\_\_\_ **percentage of the selling price.** \_\_\_\_\_
5. Last Trade: \_\_\_\_\_ **\$79.51** \_\_\_\_\_
6. 52-Week Range: \_\_\_\_\_ **\$49.87-\$94.13** \_\_\_\_\_
7. Average Volume: \_\_\_\_\_ **8,909,181 shares** \_\_\_\_\_
8. Price/Earnings Ratio (P/E): \_\_\_\_\_ **83.34** \_\_\_\_\_
9. Earnings Per Share (EPS): \_\_\_\_\_ **.954** \_\_\_\_\_
10. Why did you decide to invest in this company? Be specific and give more than one reason.

\_\_\_\_\_ **Answers will vary.** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# Financial Foundations

## Stock Market




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Stock Picks (1 of 2)

### I. Stock Purchases:

Date: \_\_\_\_\_

Beginning Cash: \$10,000

	Company Name	Ticker Symbol	Price	# of Shares	
1)	_____	_____	_____	x _____	= _____
2)	_____	_____	_____	x _____	= _____
			Commission (\$15.00 each trade)	-	_____
			Remaining Cash		_____

### II. Stock Portfolio Value if Stocks Were Sold Today: (Mid-Year Check)

Date: \_\_\_\_\_

	Company Name	Ticker Symbol	Price	# of Shares	
1)	_____	_____	_____	x _____	= _____
2)	_____	_____	_____	x _____	= _____
			Commission (\$15.00 each trade)	-	_____
			Remaining Cash (see above)	+	_____
			Total Cash if Stocks Were Sold		_____

### Financial Results of Selling Today:

Total Cash - Beginning Cash = Profit (Loss)

\_\_\_\_\_ - \_\_\_\_\_ =



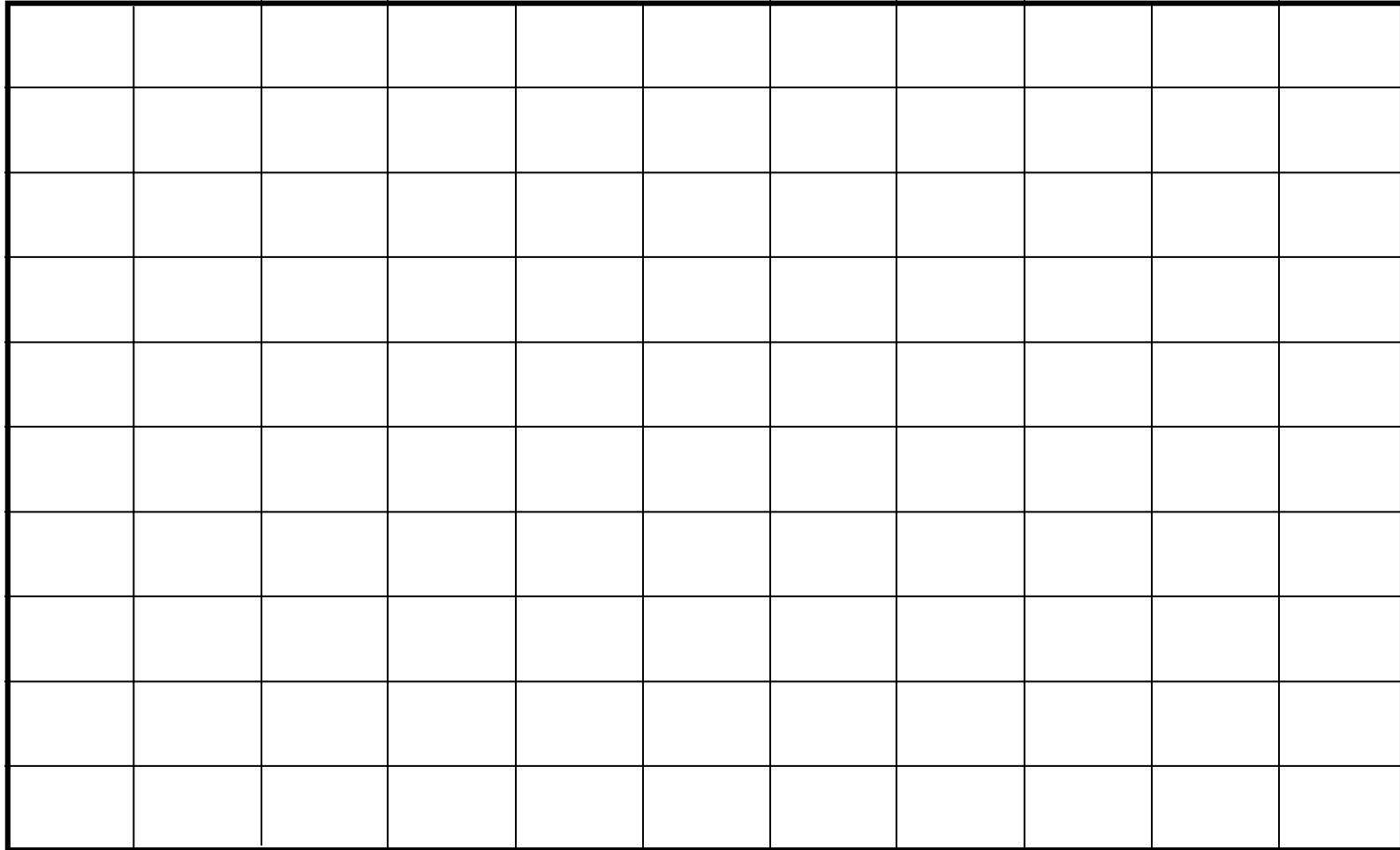


# Stock Performance Line Graph

Company Name \_\_\_\_\_

Dates: From \_\_\_\_\_ to \_\_\_\_\_

Share Price



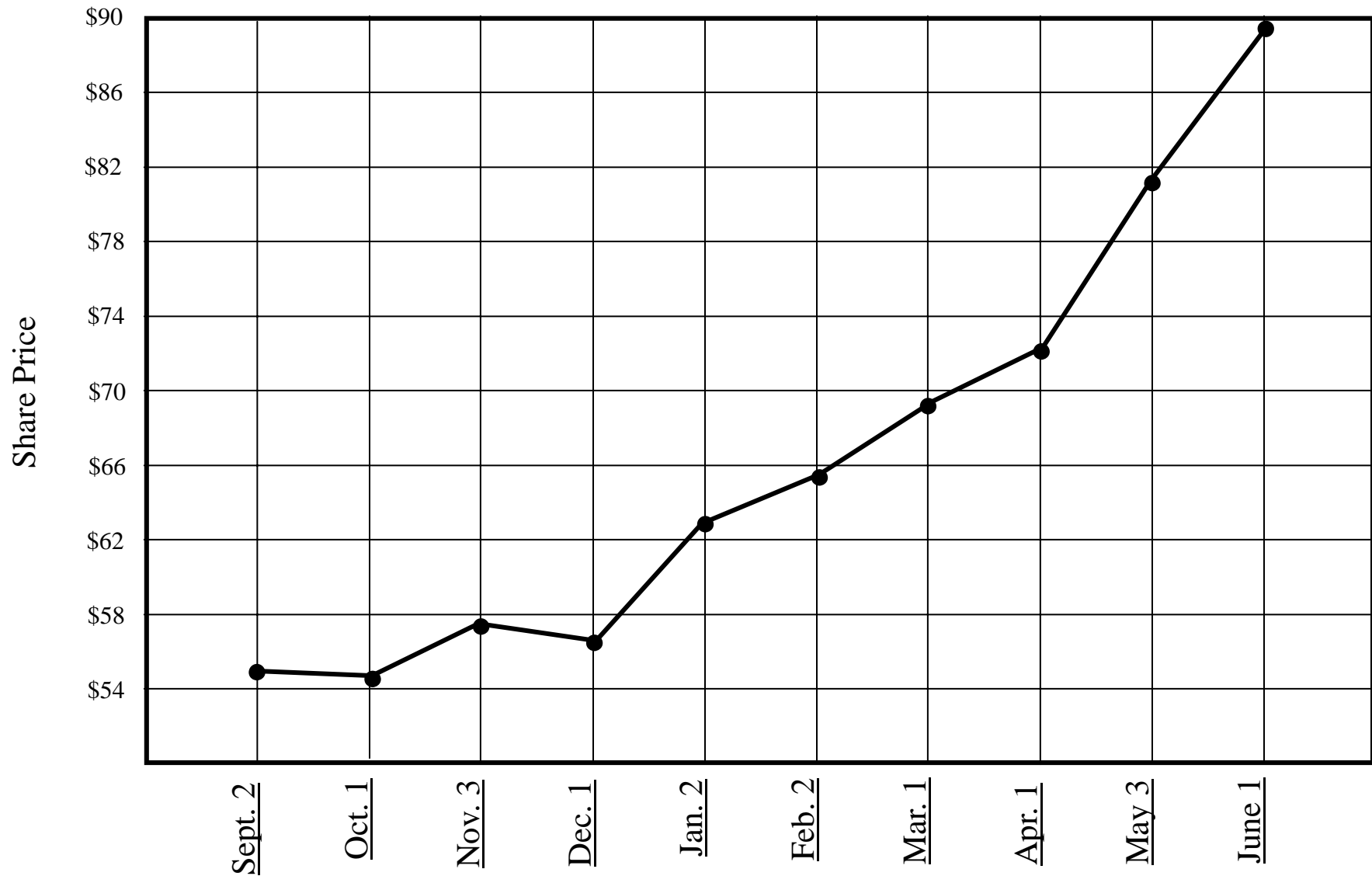
Sept. —      Oct. —      Nov. —      Dec. —      Jan. —      Feb. —      Mar. —      Apr. —      May —      June —

Months

# Stock Performance Line Graph - Sample Key

Company Name       eBay      

Dates: From   9/2/2003   to   6/1/2004  



# Financial Foundations

Stock Market



## Teacher Tips

(1 of 3)

**Financial Foundations Curriculum:** Financial Foundations is a set of lessons designed to promote financial literacy within the context of the mathematics curriculum. The lessons are designed to be used individually or as part of an overall financial literacy program. Lessons focus on some of the key topics related to the earning, saving, spending, investing, and giving of money.

**Lesson Description:** The Stock Market Contest is designed to teach students the basics of investing in the stock market. Students read two pages for basic background knowledge, choose two companies to invest in, track and graph their stocks using the worksheets provided, and reflect upon the learning that has taken place during the year. Students may work individually or in groups of two. Promote this fun and educational contest with your students and award prizes to the top investors.

**Math Content:** Percents, Decimals, Line Graphs

**Time Required:** 1-2 hours spent in class and at home throughout the year

**Stock Market includes:**

- \* 2 Stock Market Basics sheets
- \* 1 Stock Market Ticker Symbols sheet and 1 Answer Key
- \* 1 Stock Market Company Spotlight and 1 sample Company Spotlight
- \* 2 Stock Picks recording sheets and 1 Stock Market Contest Rules sheet
- \* 2 Stock Performance Line Graphs (one not labeled) and 1 Sample Graph
- \* 1 Stock Market Performance Evaluation sheet
- \* 3 Stock Market Teacher Tips sheets

**Materials Needed:** None

**Suggested Grade Level:** 5th - 8th +

**Teacher Testimonial:**

The Stock Market lesson teaches students the mechanics of stock market investing and allows them to watch, track, graph, and evaluate their investment choices. Students enjoy investing in some of their favorite companies and I try to reward those whose stocks have outperformed the rest.

**Teacher Tips:**

- \* The Stock Market lesson is designed to be used at the beginning, middle, and end of the year.
- \* Use all of the components of the Stock Market lesson or just choose the parts that seem most useful to you.
- \* Use the Stock Market Basics pages to provide investment background as necessary.
- \* The Stock Market Ticker Symbols sheet is a fun activity that will introduce students to the idea of representing company stocks with ticker symbols. I usually allow students to work in groups to try and figure out the name of the company from its symbol. Many of the companies can be guessed from their symbols. I then allow students to share their answers and I reveal to them any that they cannot figure out (or give them hints). This activity is optional but the students have always enjoyed it. Use this activity after The Basics pages.



# Financial Foundations



## Tipping

# Financial Foundations

## Tipping



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- I. The Basics: When dining at a sit-down restaurant, it is customary to leave a tip for the waiter who has served you during the meal. Traditionally, this tip is understood to be 15%. For superior service a diner may tip 20% or more and inferior service may lead to a tip of 10% or less.

Remember that waiters depend on tips for a large part of their income. They often make a minimum hourly wage, with the majority of their pay coming from tips.

Since most people do not carry a calculator when they go out to eat, it is helpful to know how to figure out a tip using mental math. Suppose that a restaurant bill, for a family of four, was \$29.82 before tax.

Estimate a 10% tip mentally:

It is actually quite easy to determine 10% of the bill. Since tips do not need to be exact numbers, first round \$29.82 off to \$30.00. To find 10% of this number, simply move the decimal point one place to the left. What you are actually doing is dividing the number by 10. Thus, 10% of \$30.00 is \$3.00.

Estimate a 15% tip mentally:

To find a 15% tip, take the amount of a 10% tip and add another 5% (half of the 10% amount) to this amount. In the above example, 10% of a \$30.00 meal is \$3.00. Another 5% of \$30.00 would be half of \$3.00, or \$1.50. Adding 10% (\$3.00) and another 5% (\$1.50) gives you a total of 15% or \$4.50.

Estimate a 20% tip mentally:

To find a 20% tip simply figure 10% of the bill and then double that amount. Since 20% is twice as much as 10%, it follows that a 20% tip will be twice as much as a 10% tip. In like manner, a 30% tip can be found by determining a 10% tip and then multiplying this amount by three.

- II. Work through the following example using the “tips on tips” above.

The Johnson family had dinner at a fancy restaurant. Before taxes, the bill was \$118.64. In the space below round off the bill and then determine an appropriate estimate for a 10% tip, a 15% tip, and a 20% tip.

Round off the bill.

10% Tip

15% Tip

20% Tip



# Financial Foundations

## Tipping




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Jon Bell is a waiter at The Royal Crown, a popular five-star restaurant. This first-class restaurant serves expensive meals and Jon was thrilled to have gotten a job there. He knows that 15% of a meal at The Royal Crown will earn him significantly more money than 15% of a meal at his former restaurant, The Burger Barn. Jon is paid \$5 per hour plus tips.

On a recent 4-hour evening shift at The Royal Crown, Jon served the following tables. Use mental math to estimate the tip he received from each party he served. Then calculate his total tip earnings that night. He leaves 10% of his tip for the busboys and takes home the rest.

<u>Table Number</u>	<u>Bill before tax</u>	<u>% Tip</u>	<u>Tip Amount (\$)</u>
Table 1	\$84.32	20%	_____
Table 2	\$99.75	15%	_____
Table 3	\$63.60	15%	_____
Table 4	\$77.89	10%	_____
Table 1	\$109.72	15%	_____
Table 2	\$53.42	20%	_____
Table 3	\$87.91	5%	_____
Table 4	\$47.59	15%	_____
Table 2	\$36.24	15%	_____
Table 4	\$132.14	20%	_____

Total amount of tips earned by Jon: \_\_\_\_\_

Less 10% of tips left for busboys: \_\_\_\_\_

**Jon's take home tip total:** \_\_\_\_\_

Including tips, about how much did Jon make per hour that evening? \_\_\_\_\_



# Financial Foundations

## Tipping



## Teacher Tips

**Financial Foundations Curriculum:** Financial Foundations is a set of lessons designed to promote financial literacy within the context of the mathematics curriculum. The lessons are designed to be used individually or as part of an overall financial literacy program. Lessons focus on some of the key topics related to the earning, saving, spending, investing, and giving of money.

**Lesson Description:** Tipping is a lesson designed to teach students how to mentally compute common tips (10%, 15%, and 20%) that are traditionally left when dining in a restaurant. It teaches students how to figure these tips, presents them with realistic restaurant tipping exercises, and looks at the earnings of a waiter working an evening shift at a first-class restaurant.

**Math Content:** Mental Math, Percents

**Time Required:** 1 class period or homework assignment

**Tipping includes:**

- \* 3 Tipping worksheets
- \* 3 Tipping worksheet Answer Keys
- \* 1 Tipping Teacher Tips page

**Materials Needed:** None

**Suggested Grade Level:** 5th - 8th

**Teacher Testimonial:**

Teaching students mathematics in a practical context, such as leaving an appropriate tip at a restaurant, will increase the financial literacy and life skills of students. Student number sense will also increase as they mentally calculate 10, 15, and 20 percent tips. As we have discussed high school and college jobs, many students are surprised to see the potential earning power of a waiter at a nice restaurant. For all of these reasons, Tipping is a lesson that will serve your students well.

**Teacher Tips:**

- \* Review and discuss Tipping page 1 with students.
- \* As an extension activity, have the students find the total cost of a meal with tax and tip.
- \* Make the lesson relevant to students by discussing their experiences in restaurants with waiters. Have they experienced terrible or excellent service? Discuss tips.

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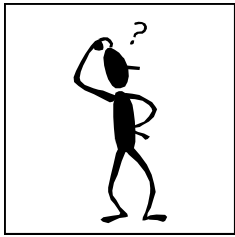
# What's



# the Point?







# What's the Point?

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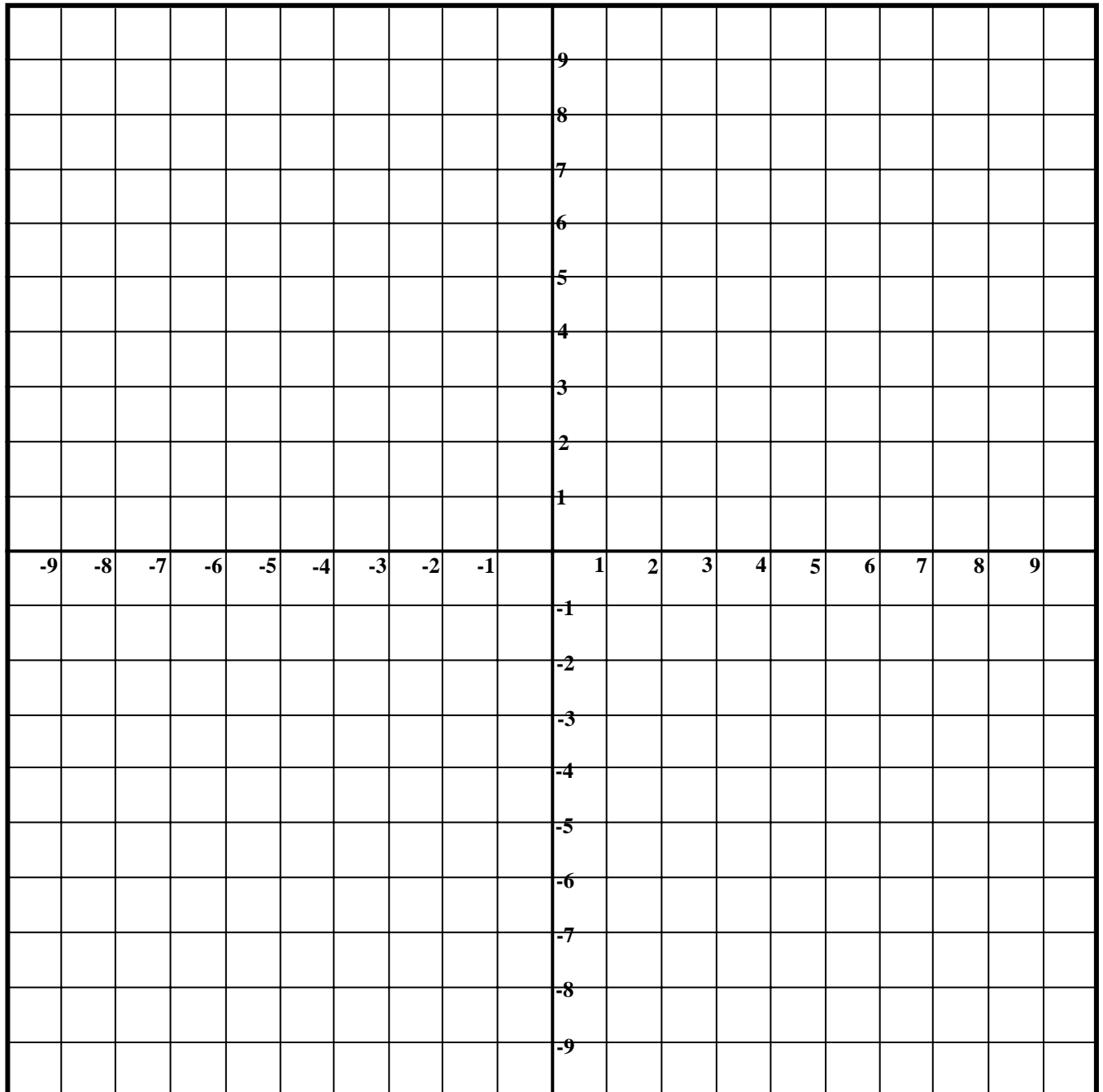
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## # 2 - Geo Fashion

Graph the points and connect them with line segments. Do not connect points with DNC between them.

**Start** (-4,1) (-5,5) (-2,2) (-4,1) DNC (2,-4) (3,-3) (4,-3) (5,-4) (5,-5) (4,-6) (3,-6) (2,-5) (2,-4) DNC  
(-5,-3) (-4,-2) (-1,-5) (-2,-6) (-5,-3) DNC (2,1) (2,4) (5,4) (5,1) (2,1) DNC (2,3.5) (5,3.5) DNC (-6,-8)  
(-6,2) (-9,0) (-9,5) (-6,7) (-3,8) (-2,9) (2,9) (3,8) (6,7) (9,5) (9,0) (6,2) (6,-8) (-6,-8) DNC (-6,-7.5)  
(6,-7.5) DNC (-3,8) (-1,5) (0,6) (-2,9) DNC (3,8) (1,5) (0,6) (2,9) DNC (-1.3,8) (1.3,8) DNC (-0.5,5.5)  
(-0.5,-7.5) DNC (0.5,5.5) (0.5,-7.5) **End**





# What's the Point?

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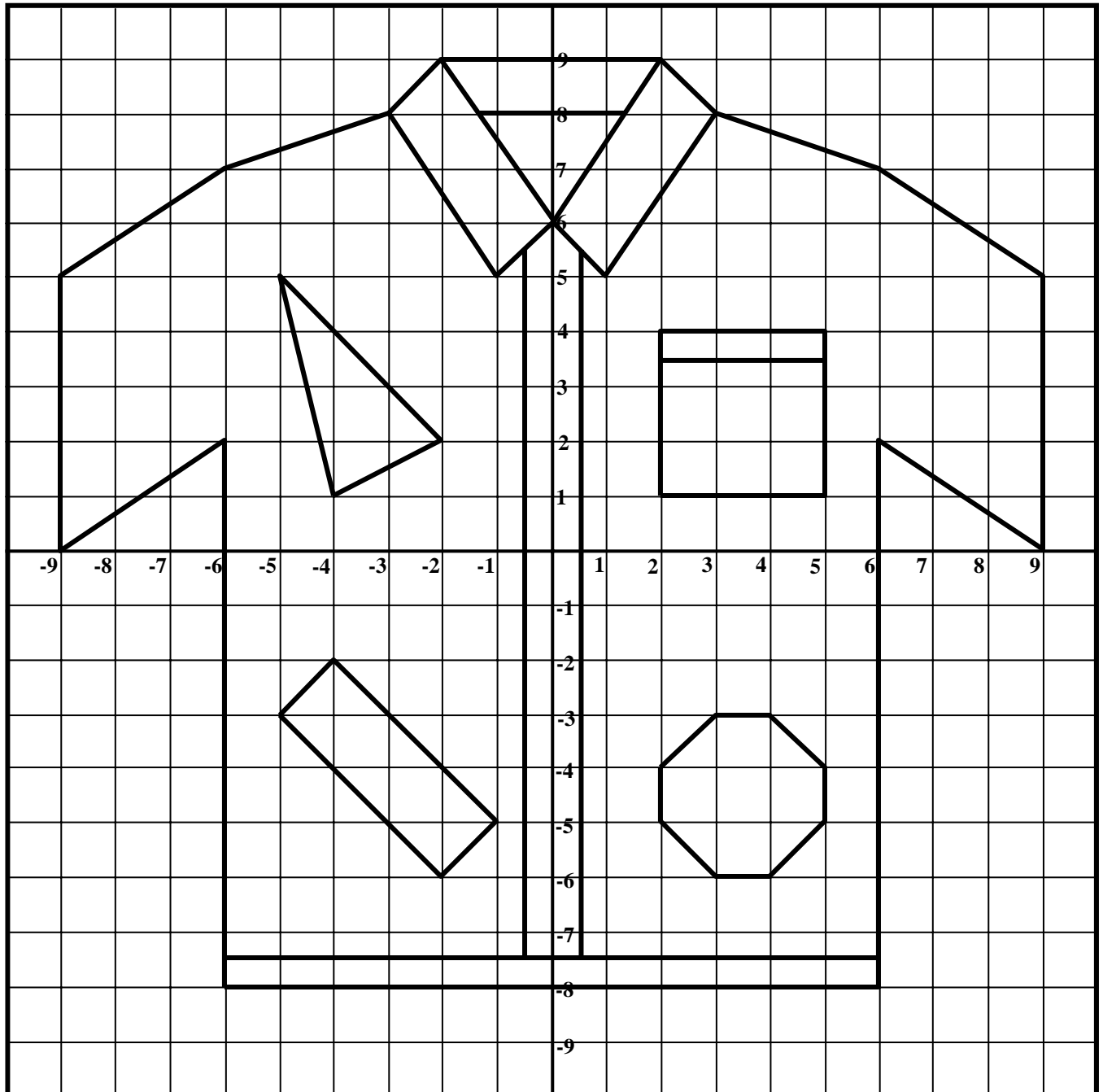
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## # 2 - Geo Fashion

Graph the points and connect them with line segments. Do not connect points with DNC between them.

**Start** (-4,1) (-5,5) (-2,2) (-4,1) DNC (2,-4) (3,-3) (4,-3) (5,-4) (5,-5) (4,-6) (3,-6) (2,-5) (2,-4) DNC  
(-5,-3) (-4,-2) (-1,-5) (-2,-6) (-5,-3) DNC (2,1) (2,4) (5,4) (5,1) (2,1) DNC (2,3.5) (5,3.5) DNC (-6,-8)  
(-6,2) (-9,0) (-9,5) (-6,7) (-3,8) (-2,9) (2,9) (3,8) (6,7) (9,5) (9,0) (6,2) (6,-8) (-6,-8) DNC (-6,-7.5)  
(6,-7.5) DNC (-3,8) (-1,5) (0,6) (-2,9) DNC (3,8) (1,5) (0,6) (2,9) DNC (-1.3,8) (1.3,8) DNC (-0.5,5.5)  
(-0.5,-7.5) DNC (0.5,5.5) (0.5,-7.5) **End**





# What's the Point?

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**Create Your Own!**

Graph the points and connect them with line segments. Do not connect points with DNC between them.

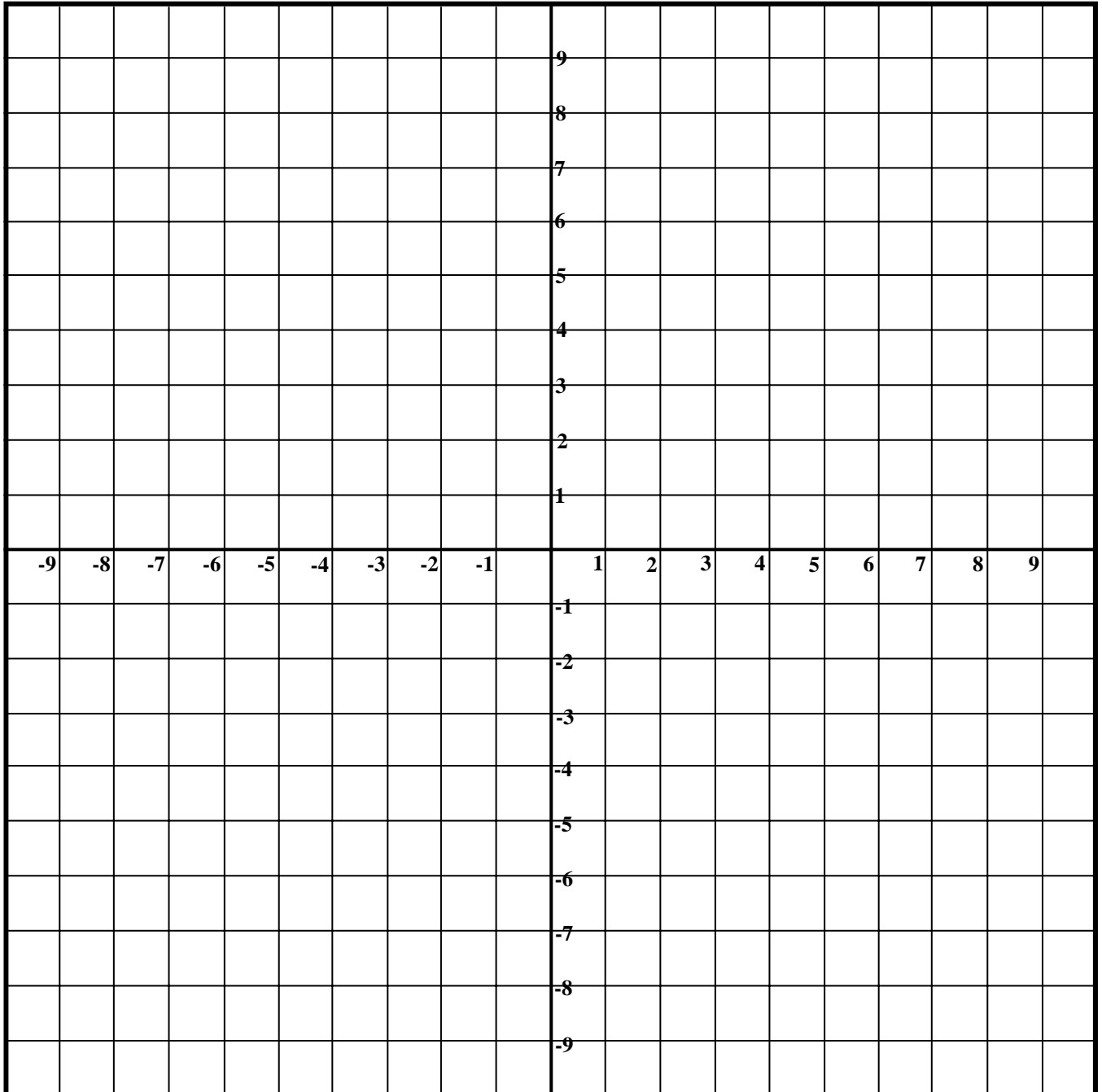
Start \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ **End**





# What's the Point?

## Teacher Tips (1 of 2)

**Lesson Description:** “What’s the Point?” is a fun lesson that requires students to graph points (ordered pairs) on the coordinate plane in order to create a picture. The lesson includes three different graphing assignments and answer keys, as well as a template to allow students to create and graph their own pictures using ordered pairs. Students really enjoy this lesson!

**Math Content:** Graphing Ordered Pairs (with possible extension activities in finding the area and perimeter of irregular geometric figures)

**Time Required:** 1 Class Period

**“What’s the Point?” includes:**

- \* 3 “What’s the Point?” worksheets
- \* 3 “What’s the Point?” worksheet Answer Keys
- \* 1 “What’s the Point?” Template to create your own (or have students create their own!)
- \* 2 “What’s the Point?” Teacher Tips pages
- \* 1 “What’s the Point?” Cover Sheet

**10 Pages in all!**

**Materials Needed:** Rulers (to draw line segments when connecting plotted points)

**Suggested Grade Level:** 5th - 8th

**Teacher Testimonial:** As they work through this more advanced version of “connect the dots,” the students enjoy trying to figure out what they are creating as they plot the ordered pairs in each quadrant. This lesson provides great practice in plotting points, a skill that is essential for students to have mastered when they graph equations and inequalities. It is also a terrific place to introduce mathematical vocabulary terms such as coordinate plane, origin, ordered pair, x-coordinate, y-coordinate, x-axis, y-axis, and quadrant.

**Teacher Tips:**

- \* The “What’s the Point?” lesson is a great opportunity to introduce or review many mathematical terms including those listed above in the Teacher Testimonial.
- \* Have the students cross out each ordered pair as they graph it. This keeps students from losing their place when they are working.
- \* Have the students color their finished assignments and then post them to create a colorful, mathematical bulletin board.
- \* There are points to be graphed in this lesson that include decimals. Most of them include the decimal .5 and should clearly be graphed in the exact middle of two lines. There are, however, a few points which include decimals such as .3. Where these occur, it is obvious that they are intended to connect to an already existing line segment.
- \* Consider giving a few extra credit points to students who create an original graphed picture.

