Hands On Activities and Projects in Algebra 1, Algebra 2, Geometry, & Personal Finance

Steve Durant
Wyandotte Public Schools

durants@wy.k12.mi.us

Follow me: http://twitter.com/mrdurant

MATH HISTORY HAPPY MEAL
This project is worth 30% of your midterm grade. This project has multiple due dates and you will not be able to rush through it all the week of midterms. Here is the scoop.

1. **Choose a Person**
   Use a physics book, math books, magazines, or try this web site:
   
   http://www-history.mcs.st-and.ac.uk/history/
   
   Click on the biographies tab and you will find endless mathematicians
   
   - Be sure to print out your material
   - Make your choice based on interest but also with an idea or what your design might be
   - Look for quotes, or good information but do a good search before you decide
   - The Web site has an abundance of people. Sign up with me. There will be no more than 2 persons per mathematician (may need to have 2 in case you have to change)
   
   **Due Date: Dec 18 2009 (no later)**

2. **HISTORICAL CONTENT AND DESIGN**
   
   - Gather all information about your person
   - You want quantity to provide most choices.
   - Most have led very interesting lives. Highlight important events and dates to simplify details. Xerox (copy), print all information so you have it all ready
   - A good idea would be to make 6 note cards representing the box and toy. Write out ideas for each
   - Bing in the hard copy of your research
   
   **Due Date: Jan 6 2010 (no later)**

3. **DESIGNING BOX AND TOY**
   
   - Accuracy Matters! You must follow the spec sheet for size
   - “Front” side is “Math History” featuring....
• Each side could be a time or accomplishment in his/her life or a continuous scene
• Be creative…puzzles, games, etc
• Historical content must be clearly displayed
• Dates are good
• Even the Bottom must be designed

Toy needs just as much planning

• Look around, find something and adapt it
• Must be a professional job
• Egyptian Pyramid, Cathedral Temples, Universe, Literature, Inventions

Due Date: Jan 15 2010

A copy of your design concept on the spec sheet and toy idea. The more detail you include the better. Projects are always better when you are not starting by looking at a blank paper. Notes and suggestions will be made to achieve the better grade

4. FINISHED PRODUCT IN GLORIOUS DETAIL!

• If your handwriting is bad, use a computer
• LAMINATE IT!! And then carefully cut out the tabs and slots
• Those achieving great success can earn “Extra Bonus” up to 110% (great to help off set a poor exam)

Due Date: The Day of your Semester 1 Final Exam
1, 2, 3 (1 x 5 tab)
4 (6 x 6) Bottom
5-8 (6 x 8) Sides
9 (1 x 7.5) Tab
10 (3.5 x 6) Top Flap
11 (2.5 x 1)
12 (4 x 6) Top Flap
With 2 inch slot
2 inches from each side
1.5 inch from top
This project is worth 30% of your Final Exam. This project is due the day of your exam.

For this project you are to conduct an interview with an Algebra I concept. The interview can not be a simple question answer format. You must come up with a situation where a question and answer discussion would be logical. I am looking for factual information as well as creativity. If sketches, graphs, or charts would aid in the discussion, they must be include. Some sample scenarios are:

Talk Show
Courtroom
Dating Game
New Neighbors
Therapist
Interrogation Room
Entertainment Tonight TV Show
Job Interview
Record Company
Interview a band called (Fill in Concept Here)
An interview with an alien (alien is the concept)

These are just sample ideas. Use these ideas to help inspire more creative scenarios. Good Luck!
Directions: You will be working with a group of 3 students to create a “Semester One” book that consists of everything that we have covered during the first semester of Geometry. The purpose of this book is to create a study guide to prepare you for the final exam. This book will demonstrate your mastery of chapters 1, 2, 3, 4, and 5. Your group will show their knowledge by creating pages on each chapter that explain formulas, display examples as well as real world applications, and give a basic understanding of concepts. Group members will be assessed on their individual chapter as well as the overall book. This project is 30% of your Final Exam Grade.

Part 1: Choose the chapters/sections that each group member will create and label below.

Chapter 1: ____________________________
Chapter 3: ____________________________
Chapter 2: ____________________________
Chapter 4: ____________________________
Chapter 5: ____________________________

Part 2: List the important concepts from each chapter. Use your notes and book to help. ** See attached sheets. These will be turned in with your book for a grade.**

Part 3: Create 2 – 4 pages per chapter that highlights ideas, formulas, and examples including real world applications. Your pages should be colorful and creative as well as informative. They can be typed or hand written, but must be neat. Each group member is responsible for providing copies of their chapter for each member of their group.

Part 4: Turn in your “Semester One” Book in the following order:

1. Title Page and Authors (alphabetical order)
2. Table of Contents
3. Chapter 1
4. Chapter 2
5. Chapter 3
6. Chapter 4
7. Chapter 5
8. Chapter Notes (numerical order)
# Geometry “Semester One” Book

## Individual Grading Rubric

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finalized Book Presentation</td>
<td>______ / 20</td>
</tr>
<tr>
<td>Chapter Notes</td>
<td></td>
</tr>
<tr>
<td>Information (15 points)</td>
<td>______ / 5</td>
</tr>
<tr>
<td>Chapter Pages</td>
<td></td>
</tr>
<tr>
<td>Adequate Information (10 points)</td>
<td>______ / 10</td>
</tr>
<tr>
<td>Formulas (10 points)</td>
<td>______ / 10</td>
</tr>
<tr>
<td>Examples/ Real World Applications (10 points)</td>
<td>______ / 10</td>
</tr>
<tr>
<td>Colorful/ Creative (10 points)</td>
<td>______ / 10</td>
</tr>
<tr>
<td>Neatness (10 points)</td>
<td>______ / 10</td>
</tr>
<tr>
<td>Usefulness (10 points)</td>
<td>______ / 10</td>
</tr>
<tr>
<td>Group Members</td>
<td></td>
</tr>
<tr>
<td>Participation (15 points)</td>
<td>______ / 15</td>
</tr>
</tbody>
</table>

**Total Points** ______ / 100

**Comments:** ____________________________________________________________
scavenger hunt is 30% of your final exam. If you share your results or answers with any other team you will be disqualified and a zero will be the score for the project portion of your final.

1) All students must participate. Three to six students may be on a team

2) Each team will be furnished with the following tools:
   i. A clinometer
   ii. Tape measure

3) Teams may also use texts, notes, and calculators

4) All members of a team do not have to work on the same problems. However, all solutions must be turned in together on an official entry form

5) Teams will meet in my room. As soon as a team receives its form and problems, it may begin the hunt.

6) To get credit for a solution to a math problem, a proper equation or formula must be written. Mere guesses will not be accepted. If a problem involves mental math or research, written work is not required

7) Time will be an important factor in the hunt. Teams should return to the room with about five minutes to go in the period to compile results. Entry forms must be turned in before the bell rings ending the period. Passes will not be written to get to your next class.

8) Winning teams will be selected by the number of correct solutions. There will be no partial credit. Teams which copy or exchange answers will be disqualified and receive a zero. Information cannot and should not be given to other classes. A winning team will be chosen from each class as well as an overall winner.
Geometry Scavenger Hunt

Find the following by measuring, calculating, or researching. Show your equation or formula on the ones requiring computation. Some of the questions are worth more than others. More difficult questions are worth between 3 and 5 points, whereas, easier questions are worth 1 or 2 points. Be sure to answer each question in the correct units. Teams cannot help each other or copy answers. Answers do not have to be perfect as long as they are calculated in the correct manner and are approximately right. You have to turn your answers in at the end of the period. Good hunting and good luck!

1) How many blue doors are in the A building?
2) How many grey doors are in the B building?
3) Who is Rusty? Where is he located?
4) What year was the science annex (B building) built?
5) What year was the shop hall added?
6) What year was the band hall added?
7) When was the original Roosevelt High School built?
8) What is the 30th digit of pi?
9) How many stairs do you have to climb in the old main entrance to get to the top of the third floor?
10) How many octagons are in the old main entrance?
11) What is the area of the trapezoidal table in the LMC? Sq in
12) What is the volume of a Dell base tower in the LMC lab? Cubic in
13) What is the circumference of the center court circle in the new gym? ft
14) How much surface area does any big blue garbage can have (without the lid)? Sq ft
15) What is the slope of the stairs at the 5th street entrance?
16) How tall is Rusty? ft
17) What is the volume of Rusty’s concrete base? Cubic ft
18) What is the volume of the water vending machine near the old gym? Cubic ft
19) What is the total area of the round tables in the LMC? Sq ft
20) What is the radius of the free throw circle in new gym? Ft
21) What is the height of the RHS Digital sign? ft
22) How tall is the A building? ft
23) What is the slope of the stairs outside of the old main entrance?
24) How tall is the B building? Ft
25) What is the perimeter of the football field?
26) What is the Total Area of the big flower bed on Eureka in front of the old main entrances? Sq ft
27) What is the perimeter of an octagon in the old main entrance? in
28) What is the area of a blue door with out the window? Sq ft
29) What is the area of the football field? Sq ft
30) What is the height of the goal posts? Ft

Tie Breaker: List as many common English words as possible that can be formed by the letters in the word “geometry”. No proper nouns are allowed. You can only use a letter as often as it appears in “geometry”. 
Math Valentines

Create a “Math” Valentine to be displayed in class. Your grade will be determined by the following.

Valentine message
Includes a math word or “math pun”------------------------20 points

Valentine message including geometry
Word or phrase------------------------------------------10 points

Valentine appearance
Creativity and Design-----------------------------------20 points

Please remember to write your name on the back of the Valentine

Example:
You’re My DoMain Squeeze
Our Love will parabolally last a long time
You are a function of my life
You are a Ray of Sunshine in my Life

Mall Project

Pretend your group is an architectural firm that is planning a one level mall. Using the provided chart give the dimensions of your stores. The mall must have at least 3 anchor stores, 2 restaurants, 2 department stores and one store from each category. Remember these are the minimums and you should try to be creative and designing your stores. Your group will draw the floor plan, create a 3 dimensional model, and give a presentation describing your mall to the rest of the class.

<table>
<thead>
<tr>
<th>Store</th>
<th>Size</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Make sure you choose reasonable sizes for the stores.
• Sketch the shape of each store on graph paper. One square can stand for 100 square feet. Cut out the shapes of each store and try various arrangements. You can always adjust the size of your store. Once you have an arrangement the group likes make a complete floor plan (don’t forget to include restrooms).
• Now you should build a 3 dimensional version of your mall. You should go to an office or art supply store to find materials or you can use cardboard, legos, glue, etc. Each store should be clearly labeled showing the name and area.
• Finally your group is to give a short 3 to 5 minute presentation about your mall. Why should people come to your mall? What is unique about your mall? Does your mall have any special features traditional malls do not? You can use Power Point, Windows Media programs, your group can make a television or radio commercial, a standard oral presentation, whatever fits the personality of your group.
Typical sizes of mall stores in square feet

<table>
<thead>
<tr>
<th>Store Type</th>
<th>Size Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mall Anchor Store</td>
<td>170000-280000</td>
</tr>
<tr>
<td>Discount Merchandise</td>
<td>20000-35000</td>
</tr>
<tr>
<td>Clothing Store</td>
<td>4000-15000</td>
</tr>
<tr>
<td>Shoe Store</td>
<td>2000-4000</td>
</tr>
<tr>
<td>Music Store</td>
<td>1500-4500</td>
</tr>
<tr>
<td>Sporting Goods</td>
<td>4000-6000</td>
</tr>
<tr>
<td>Book Store</td>
<td>2000-6000</td>
</tr>
<tr>
<td>Toy Store</td>
<td>3000-20000</td>
</tr>
<tr>
<td>Fast Food</td>
<td>500-1500</td>
</tr>
<tr>
<td>Restaurants</td>
<td>5000-16000</td>
</tr>
<tr>
<td>Theater</td>
<td>5000-7000</td>
</tr>
<tr>
<td>Restrooms</td>
<td>1000-15000</td>
</tr>
</tbody>
</table>

Durantdotte

The class will divide themselves into groups consisting of two or three people. Each group will be required to “construct” a section of the city we will call Durantdotte. The groups, using 8.5 by 11 sheets of paper will draw nets for three dimensional objects. They will cut out, decorate and fold, and tape these nets. Each group is responsible for creating a total of eight buildings for their section of the city. The buildings have to meet specific dimensions in terms of height, width, and length, as well as be creatively decorated. Each of the groups needs to have a spokesman to discuss their plans for building with the mayor (Mr. Durant) before constructing them. As mayor, I need to make sure that all our cities needs are met (i.e. schools, hospital, police, stores, housing, apartments, entertainment, churches, etc)

One of the best outcomes of this part of the assignment in terms of mathematics is the pre-planning which becomes necessary for the nets. Because the students are limited in their
dimensions and the amount of paper which they are allowed to use, they must figure out that a 4” tall building, that is 3” X 4” on the bottom, is impossible to draw due to limitations. They must plan the measurements out before they actually draw the figure. The other positive aspect of this part of the project is those students who are not necessarily great at math; really get involved in the creating, designing, and decorating of their group’s buildings. They continue to be involved with the equations part of the project, whereas many of these students would have “tuned out” at this part.

After completing their nets, decorating the buildings, folding and taping them up, the groups need to determine the following about each of their buildings:

Given 1 inch =10 feet

a) The amount of roofing materials need for each building, and the cost to roof all of them (given the price per square foot of roofing material)

b) The amount of paint needed to paint each of the building, ignoring doors and windows, and the total cost of painting all the buildings. (given the amount of square feet a gallon of paint covers and a price)

c) The size of the air conditioning unit needed for each of their individual buildings.

These applications above will require comprehension and application of scaling of measurements, conversions, volume, lateral area, surface area, and areas of specific sections.

Durantdotte

Over the next few days we will be constructing a model of a city. This city will be comprised of three dimensional objects made from two dimensional objects. Each group will be responsible for “constructing” their own section of Durantdotte.

Here are the requirements:
1. use only a 8.5 X 11 piece of paper, cut it into a shape which will be able to formed into a three dimensional building or combining other shapes to form a three dimensional building.

2. Your section must have examples of cylinders, pyramids, and a prisms. (you will have to have a few of each of these shapes to complete this project)

3. The buildings have the following size restrictions:
   a. Houses: 1-3 inches tall and a base of 1-4 inches on each side
   b. Stores: 1-2 inches tall and a base of 3-5 inches on each side
   c. Office buildings: 4-7 inches tall and a base of 2-3 inches on each side
   d. Churches, hospitals, schools: 2-4 inches tall and a base of 3-6 inches on each side
   e. Miscellaneous buildings not mentioned above: use your discretion as to what else we may need, and how big it should be.

4. before putting your building into our final model, it must be labeled and “decorated” appropriately

Please list below the portion of the city your group will design. Include in this list the specific building you will build along with their dimension. Some of your buildings will have to have more than one shape to be complete. These two piece buildings can come from two separate cut outs, but please itemize the dimensions of each of these parts. (you can use different shapes taped or glued together to make your buildings)

<table>
<thead>
<tr>
<th>Building</th>
<th>Height Base Dimensions</th>
<th>Base Shape</th>
<th>Width</th>
<th>Length</th>
<th>Radius (if applies)</th>
<th>Perimeter (if Polygon for base)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Durantdotte

City Managers Report

In our section of the city we have a total of _______ buildings.

We have calculated the following data:
Roofing material needed | Paint needed (1 gallon covers 100 ft²)  
(maybe Lateral or Surface Area) | (maybe Lateral or Surface Area)  
1)________ square feet | 1)________ gallons  
2)________ square feet | 2)________ gallons  
3)________ square feet | 3)________ gallons  
4)________ square feet | 4)________ gallons  
5)________ square feet | 5)________ gallons  
6)________ square feet | 6)________ gallons  
7)________ square feet | 7)________ gallons  
8)________ square feet | 8)________ gallons  
ex)________ square feet | ex)________ gallons  
ex)________ square feet | ex)________ gallons  
ex)________ square feet | ex)________ gallons  

Total of ______ square feet needed  
Total of ______ gallons needed at a cost of ______  
at a cost of $25.00 per square foot  
$25.00 per gallon.

Total cost = $_______  
Total cost = $_______  
Total for all materials = $_______

Size of air conditioning units needed to cool each building  
(This is Volume)  
1)________ cubic feet | 5)___________________ cubic feet  
2)________ cubic feet | 6)___________________ cubic feet  
3)________ cubic feet | 7)___________________ cubic feet  
4)________ cubic feet | 8)___________________ cubic feet  
ex)___________________ cubic feet  
ex)___________________ cubic feet  
ex)___________________ cubic feet
This project is worth 100 points which is equal to one test. Geometric objects are found all around us. You will be creating a geometry notebook that will include some of the concepts we have studied so far.

1) Choose a theme for your notebook, (sports, nature, etc)
2) Look through magazines for pictures of the geometric terms that we have studied so far (you can take pictures as well)
3) For each term prepare a page in your notebook that includes the definition, the picture with the geometric source correctly identified in the picture, and the geometric term. I would highly recommend typing your pages
4) Make sure you have a design for your cover
5) Your pages can be on construction paper, typing paper, notebook paper, etc, be creative
6) There are a lot of terms in this chapter so... your notebook needs to be a minimum of 15 pages

Ex: Right Angle-

An angle whose measure is 90 degrees

Terms you must use

<table>
<thead>
<tr>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute angle</td>
<td>Angle bisector</td>
<td>Circumscribed Circle</td>
<td>Collinear angles</td>
<td>Complementary angles</td>
<td>Congruent angles</td>
<td>Coplanar angles</td>
<td>Endpoint angles</td>
<td>Inscribed circle</td>
<td>Intersection</td>
<td>Line</td>
<td>Linear pair</td>
</tr>
<tr>
<td>Intersection</td>
<td>Line</td>
<td>Linear pair</td>
<td>Midpoint</td>
<td>Obtuse angle</td>
<td>Parallel lines</td>
<td>Perpendicular bisector</td>
<td>Perpendicular lines</td>
<td>Plane</td>
<td>Point</td>
<td>Reflection</td>
<td>Rotation</td>
</tr>
<tr>
<td>Ray</td>
<td>Reflection</td>
<td>Rotation</td>
<td>Segment</td>
<td>Segment bisector</td>
<td>Supplementary angles</td>
<td>Translation</td>
<td>Vertex of angle</td>
<td>Median</td>
<td>Altitude</td>
<td>Circumcenter</td>
<td>concurrent</td>
</tr>
<tr>
<td>Center of rotation</td>
<td>Circumcenter</td>
<td>concurrent</td>
<td>Image and Preimage</td>
<td>Right Angle</td>
<td>Side of Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Beginning the Chapter Project**

Hundreds of billions of dollars are spent on advertising each year in the United States. Advertising on television, in magazines and newspapers, on billboards, and on the radio peppers us with images and slogans designed to entice us to purchase products or services. For the annual Super Bowl game telecast, a company may spend as much as $1–$2 million for a thirty-second advertising spot that is designed to dazzle millions of viewers with the glories of its products.

In this chapter project, you will analyze and create advertising to explore logical reasoning.

**Activities**

**Activity 1: Researching**

Collect at least five ads in several different media. Consider radio, television, magazines, newspapers, and other media. For each ad that is not in print, write a description of the ad, including both visual and spoken messages.

**Activity 2: Writing**

Some advertisements use specific if-then conditional statements, and others use statements that can be written as conditionals. Still others only imply conditional statements. For each ad, identify at least one conditional statement that the ad states explicitly or implies.

**Activity 3: Analyzing**

Although an ad may state or imply a conditional, the advertiser may want you to assume that the converse is true. Identify the converse of each of the conditionals you wrote for your ads. Analyze the truth value for each of the conditionals and converses you wrote.

**Activity 4: Creating**

Choose a product or service on the market, or create one of your own. Write a good definition of the product or service.

**Finishing the Chapter Project**

Prepare an advertisement for your product or service in the medium of your choice. Consider both print and non-print media. If you choose a non-print medium, create your ad on a tape or video. In addition, prepare a written description of the conditional(s) and converse(s) stated or implied in your advertising, and the truth value of each.
This assignment will give you practice using some of the principles of logic that are necessary in geometry. You will select 3 advertisements from a magazine as the focus of this project. Please choose ads for something that is considered legal, moral, and appropriate for high school students. You will mount your advertisements on pieces of construction paper without tape. Mount a separate sheet of computer paper on the reverse side of the construction paper. Write and label the following sentences:

1. A conditional statement of your choosing as suggested by your ad. Write the statement in if-then form. For example: If I pop Pringles, then the fun won’t stop.
2. The converse of your conditional statement.
3. The inverse of your conditional statement.
4. The contrapositive of your conditional statement.

Repeat for each advertisement.
**Bench**

Top dimensions:  
Side dimensions:

Surface area of bench calculations:

Total Surface area of all benches:

Volume of bench calculations:

Total volume of benches

**Aquafina Vending Machine**

Dimensions:
Surface area calculations

Total surface area of all Aquafina vending machines:

Volume of Aquafina machine calculations

Total Volume of Aquafina vending machines

**Food Vending Machines**

Dimensions:

Surface area calculations

Total surface area of all food vending machines:
Volume of food vending machine calculations

Total Volume of food vending machines

**Garbage Cans**

Dimension of blue garbage can

Volume of blue garbage can calculations

Dimensions of grey garbage can

Volume of grey garbage can calculations
With your group, students must create a 3D object using the following shapes.

- Rectangular prisms
- Cube
- Cylinder
- Cone
- Sphere
- Right angle Pyramids

You are required to

- Calculate the surface area of each created object
- Calculate the volume of each created object
- Complete all assigned worksheets
- Submit all work in an organized well presented manner

You must use a minimum of 5 created objects. This means that you must create the shape using nets. Your group may purchase an unlimited number 3D shapes for their project, but they are required to calculate the surface area and volume of the objects they have created.

If your group wishes to use a sphere you may purchase or use a pre-existing model (such as a tennis ball or styrofoam ball). This object may be considered a “created item”. The group must have at least 4 distinct shapes. You may not submit 4 different sizes of cubes!

Projects are due Friday March 11, 2011. If the person in your group with the project is absent, the group will lose marks. It is your responsibility to submit it on time. Submit it early if you are unsure if you can make it to class on Wednesday.

Extra points will be given to creativity of design and presentation of model.
Please do not make your projects too big!

How your group can get an excellent grade

✓ Start the project ASAP.

✓ Share and compare your worksheet calculations with your group members or peers. Make sure you include all your units and steps.

✓ Talk to other groups. You are not competing against each other! Share your ideas.

✓ Be original! You don’t have to use cardboard boxes. You can use chicken wire, pipe cleaners, straw, food, etc... If you would like to do the project using Flash, GSP or another program, talk to me.

✓ Submit your work early for constructive criticism.

✓ Discuss the group assessment with your group members. Assign the work accordingly. Poor group dynamics affect everyone’s mark!

✓ Write legibly! Include a title page, table of contents, and organize your answers and questions in a logical manner. Skip lines! Circle your answers! Reading your work should be easy!
## Surface Area and Volume of 3-D Shapes Project Rubric

<table>
<thead>
<tr>
<th>Knowledge (the worksheets)</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Worksheets are incomplete (approximately 50% complete)</td>
<td>- Most of the worksheets are complete (75%)</td>
<td>- All 4 worksheets are complete (90%)</td>
<td>- All 4 worksheets are complete</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>- Calculations are incomplete or done with numerous errors</td>
<td>- Some steps are shown</td>
<td>- Most steps are shown, and there are only a few minor errors</td>
<td>- All steps are shown, and there are only a few minor errors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Numerous steps are omitted</td>
<td>- There are some errors in the calculations</td>
<td>- Answers are clearly labelled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Units are incorrect or missing</td>
<td></td>
<td>- Word problems end with sentences</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application (The Model)</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Only 3 geometric shapes are created</td>
<td>- Only 4 geometric shapes are created, but models are not accurate (cube isn’t a cube)</td>
<td>- 5 geometric shapes are created, and most models are accurate</td>
<td>- 6 or more geometric shapes are created, and the volume and SA are calculated for each</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>- Model is created with little care for detail</td>
<td>- Some effort is apparent in model design</td>
<td>- Model is colourful and has a theme</td>
<td>- Model is colourful, and has a theme and well presented.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Calculations for geometric shapes are incorrect, or contain many mistakes</td>
<td>- Calculations for geometric shapes contain errors</td>
<td>- Calculations are correct</td>
<td>- Calculations are correct, and clearly labelled to corresponding objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Many steps are omitted</td>
<td>-Some steps are omitted</td>
<td>- Few steps are omitted</td>
<td>- All steps are shown</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication (Presentation and Organization)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Little effort is made to organize material</td>
<td>- Some effort is made to organize material.</td>
<td>- Written work is neat and well presented.</td>
<td>- Report is well presented, including a title page, table of contents question sheet with answers following it</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Answers are not clearly identified</td>
<td>- Some answers are clearly identified</td>
<td>- 3D objects are well labelled and identified</td>
<td>- Answers are clearly identified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Few 3D shapes are labelled and identified</td>
<td>- Some 3D are not all clearly labelled (missing dimensions)</td>
<td>- Answers are clearly identified.</td>
<td>- Your project makes me happy because it is organized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Your project makes me angry because it is dysfunctional and illegible</td>
<td>- Your project confuses me because it is disorganized.</td>
<td>- I proudly show your project to other teachers because it is well written and organized.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peer/Teacher Assessment</th>
<th>Group Assessment</th>
<th>Group Assessment</th>
<th>Group Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Your contribution was minimal relative to your group members</td>
<td>- Your contributed less when compared to your group members</td>
<td>- Your contribution was equal to your group members</td>
<td>- Your contribution was equal to your group members, and you displayed a leadership role in your areas.</td>
</tr>
<tr>
<td>- You did not meet regularly with your group members</td>
<td>- You sometimes met with your group members, but were not always prepared</td>
<td>- You regularly met with your group members and were prepared to work</td>
<td>- You always with your group members, with a ready action plan or agenda.</td>
</tr>
<tr>
<td>- You could not explain course content to the teacher (you cannot answer similar questions on a test).</td>
<td>- You could explain some of the course content to the teacher (you answer some similar questions on a test)</td>
<td>- You could explain most of the course content to the teacher (your test mark matches your knowledge/application mark).</td>
<td>- You could explain all of the course content to the teacher (your test mark matches or exceeds your knowledge/application mark).</td>
</tr>
</tbody>
</table>

| 100 | 10 | 10 | 100 |
# Formula Sheet

## Grade 9 Academic

<table>
<thead>
<tr>
<th>Geometric Figure</th>
<th>Perimeter</th>
<th>Area</th>
</tr>
</thead>
</table>
| **Rectangle**    | \( P = l + l + w + w \)  

or  
\( P = 2(l + w) \)  

\( A = lw \) |
| **Parallelogram** | \( P = b + b + c + c \)  

or  
\( P = 2(b + c) \)  

\( A = bh \) |
| **Triangle**      | \( P = a + b + c \)  

\( A = \frac{bh}{2} \)  

or  
\( A = \frac{1}{2} bh \) |
| **Trapezoid**     | \( P = a + b + c + d \)  

\( A = \frac{(a + b)h}{2} \)  

or  
\( A = \frac{1}{2} (a + b)h \) |
| **Circle**        | \( C = \pi d \)  

or  
\( C = 2\pi r \)  

\( A = \pi r^2 \) |
<table>
<thead>
<tr>
<th>Geometric Figure</th>
<th>Surface Area</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cylinder</strong></td>
<td>$A_{\text{base}} = \pi r^2$</td>
<td>$V = (A_{\text{base}})(\text{height})$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{lateral surface}} = 2\pi rh$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = A_{2 \text{ bases}} + A_{\text{lateral surface}}$</td>
<td>$V = \pi r^2 h$</td>
</tr>
<tr>
<td><strong>Sphere</strong></td>
<td>$A = 4\pi r^2$</td>
<td>$V = \frac{4}{3} \pi r^3$ or $V = \frac{4\pi r^3}{3}$</td>
</tr>
<tr>
<td><strong>Cone</strong></td>
<td>$A_{\text{lateral surface}} = \pi rs$</td>
<td>$V = \frac{(A_{\text{base}})(\text{height})}{3}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{base}} = \pi r^2$</td>
<td>$V = \frac{1}{3} \pi r^2 h$ or $V = \frac{\pi r^2 h}{3}$</td>
</tr>
<tr>
<td><strong>Square-based pyramid</strong></td>
<td>$A_{\text{triangle}} = \frac{1}{2} bs$</td>
<td>$V = \frac{(A_{\text{base}})(\text{height})}{3}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{base}} = b^2$</td>
<td>$V = \frac{1}{3} b^2 h$ or $V = \frac{b^2 h}{3}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = A_{4 \text{ triangles}} + A_{\text{base}}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 2bs + b^2$</td>
<td></td>
</tr>
<tr>
<td><strong>Rectangular prism</strong></td>
<td>$A = 2(wh + lw + lh)$</td>
<td>$V = (\text{area of base})(\text{height})$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V = lwh$</td>
</tr>
<tr>
<td><strong>Triangular prism</strong></td>
<td>$A_{\text{base}} = \frac{1}{2} bl$</td>
<td>$V = (A_{\text{base}})(\text{height})$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{rectangles}} = ah + bh + ch$</td>
<td>$V = \frac{1}{2} blh$ or $V = \frac{blh}{2}$</td>
</tr>
<tr>
<td></td>
<td>$A_{\text{total}} = A_{\text{rectangles}} + A_{2 \text{ bases}}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= ah + bh + ch + bl$</td>
<td></td>
</tr>
</tbody>
</table>
Knowledge Worksheet 1: Problems Involving Composite Shapes

1. Calculate the shaded area of the figures below. Round your answer to the nearest 10\(^{th}\) of a unit.

   a) \(4.5 \text{ cm}\)
   b) 3 cm \(2 \text{ cm}\)
   c) \(6.4 \text{ m}\)

2. Calculate the area and the perimeter of each of the following shapes. Round your answers to one decimal place.

   a) \(20.5 \text{ cm}\)
   b) 10.1 cm \(12.6 \text{ cm}\)
   c) \(12.4 \text{ cm}\) \(19.0 \text{ cm}\) \(h = 16.3 \text{ cm}\)
**The Pythagorean Theorem**

1. Determine the missing length. Round your answers to one decimal place

   ![Diagram a)

2. Determine the length of each missing side of the triangle. Round your answer to one decimal place.

   ![Diagram b)

   ![Diagram c)
Knowledge Worksheet 2: Surface Area of Right Pyramids and Cones

1. Find the surface area of the following right pyramids. Round your answers to one decimal place

   a) 
   b) 
   c) 

2. Find the surface area of the following cones

   a) 
   b) 

3. Find the surface area of a cone with a height of 4.0 km and a base area of 28.3 km$^2$
Volumes of Pyramids and Cones

1. Calculate the volume of the following regular pyramids

   a) \( h = 12.0 \text{ cm} \)
   b) \( h = 3.4 \text{ m} \)
   c) \( h = 11.0 \text{ m} \)

2. Calculate the volume of the following cones

   a) \( h = 12.6 \text{ cm} \)
   b) \( h = 15.0 \text{ cm} \)
3. Find the height of a cone that has a radius of 2 cm and a volume of 23 cm$^3$.
4. A cylinder has a volume of 2120.6 cm$^3$ and a base radius of 5 cm. What is the volume of a cone with the same height but a base radius of 2.5 cm?

**Knowledge worksheet 3: Volume and Surface Area of a Sphere**

1. Determine the surface area and volume of the following shapes

   a) ![Sphere with diameter](image)

   b) ![Sphere with radius](image)

2. Find the surface area and volume of the following shapes

   a) ![Cylinder and cone](image)

   b) ![Cone](image)
3. Eight basketballs are put into a holding container. The radius of each basketball is 10 cm. How much room will be left in the container if the container is shaped like a square based pyramid with each side of the base measuring 40 cm and with a height of 70 cm?
Object1 is called a ________________________________.

Include a drawing to the net of your object below (include the dimensions)

The surface area formula needed to calculate the surface area is ________________________________

Show your surface area calculations below:
The volume formula needed to calculate the volume is ________________________________

Show your surface area calculations below:

Object 2 is called a____________________________________________.

Include a drawing to the net of your object below (include dimensions)

The surface area formula needed to calculate the surface area is ________________________________

Show your surface area calculations below:
The volume formula needed to calculate the volume is______________________________

Show your surface area calculations below:

Object3 is called a_______________________________.

Include a drawing to the net of your object below (include the dimensions)

The surface area formula needed to calculate the surface area is ____________________________

Show your surface area calculations below:
The volume formula needed to calculate the volume is ______________________________

Show your surface area calculations below:

Object 4 is called a ____________________________________________________________.

Include a drawing to the net of your object below (include dimensions)

The surface area formula needed to calculate the surface area is ______________________________
Show your surface area calculations below:

The volume formula needed to calculate the volume is 

Show your surface area calculations below:

Object5 is called a ____________________________________________________________.

Include a drawing to the net of your object below (include the dimensions)
The surface area formula needed to calculate the surface area is ________________________________

Show your surface area calculations below:

The volume formula needed to calculate the volume is ________________________________

Show your surface area calculations below:

What is the total surface area of the object that your group has created? (show calculations below)
What is the total volume of the object your group created? (show calculations below)

**Poly, Poly, Polygons**

This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. However, you will not be able to finish this project if you do not start it early. This project looks at polygons in architecture. You will need to make a polygon notebook. Remember a building does not have to have the shape or name of a polygon in order to have polygons in it.

1. Look through magazines or newspapers, or take pictures yourself of buildings with polygons in them. (look for ones that encompass entire structures, overlapping polygons, and polygons that make up parts of the buildings). This may include shapes that form or are parts of windows, doors, roofs, patios, decks, and chimneys.

2. In each picture trace out the polygon(s) and identify its name. Each picture should be a page in your polygon notebook.

3. Try to find different types of polygons.

4. Design a cover for your notebook

5. Your pages can be on construction paper, typing paper, or notebook paper

6. Make sure it is stapled three times

7. be creative

You will be graded as follows:

- Having a cover for your notebook _____________________________ 15pts
- Having it stapled correctly _____________________________ 10pts
- Having different pictures of polygons _____________________________ 25pts
- Having each picture outlined _____________________________ 25pts
Creativity

25pts
**Ohio Standards Connection:**

**Measurement**

**Benchmark D**
Use proportional reasoning and apply indirect measurement techniques, including right triangle trigonometry and properties of similar triangles, to solve problems involving measurements and rates.

**Indicator 7**
Apply proportional reasoning to solve problems involving indirect measurements or rates.

**Geometry and Spatial Sense**

**Benchmark B**
Describe and apply the properties of similar and congruent figures; and justify conjectures involving similarity and

---

**Lesson Summary:**

Students explore three different indirect measurement techniques in this lesson that include using shadows and concepts of similarity, using mirrors to see reflected images and applying concepts of similarity to those images, and using a device and technique modeled after that used by real-life surveyors called a stadia. Students work together in small groups to solve problems and discuss solutions. Students reflect on the use of indirect measurement techniques and apply to real-world situations. Students use these techniques in the post-assessment to measure structures in their environment.

---

**Commentary:**

This lesson provides real-world applications for using proportional reasoning and the trigonometric principle of similar triangles. It assumes that students have prior knowledge of these concepts. A stadia is a surveying tool used to make rapid and efficient topographical measurements. Contact a local engineering firm to provide experiences with surveying tools and

**Instructional Tip:**

This lesson may be used as a whole, in parts or with other lessons when there is a need for indirect measurement using proportional reasoning. The lesson consists of three different methods of indirect measurement for gauging things that are otherwise difficult or impossible to measure directly.

**Pre-Assessment:**

- Direct the students to complete *Indirect Measurement Pre-Assessment*, Attachment A. Review the student responses and discuss solution methods.
Solves two measurement problems, using strategies with minor errors.

Explanation provides rational for methods, but presents major flaw in thinking.

---

Mathematical Processes

Benchmarks

A. Formulate a problem or mathematical model in response to a specific need or situation, determine information required to solve the problem, choose method for obtaining this information, and set limits for acceptable solutions.

B. Apply mathematical knowledge and skills routinely in other content areas and practical situations.

Scoring Guidelines:

The pre-assessment activity is designed to be used as instructional review material. Informally evaluate students’ strengths and weaknesses during the lesson. If all students struggle with a part of the pre-assessment, that may indicate the need for a mini-lesson targeted on that specific topic prior to continuing with this lesson.

Post-Assessment:

- Develop a measurement assignment, using things from the students’ environment in which they may have an interest (e.g. the height of the top of the basketball backboard in the gym, the height of their favorite ice cream shop, the flag-pole in front of the school, etc.).
- Instruct the students to measure three things that cannot be easily measured, make decisions to determine which technique should be used to measure each of the selected objects and report their findings in a written format.
- The writing should include the following discussions:
  a. Document any challenges encountered while using each of the measurement techniques and the steps they to overcome them;
  b. A record of the measurements and opinions about whether the indirect measurement technique used yielded a reasonable result. They should include supporting statements;
  c. Determine which approach provided the most accurate measurement and the rationale for their selection.

Scoring Guidelines:

Assessments scored as a 0, 1 or 2, indicate intervention is necessary for students. Provide sufficient intervention as necessary.

4 Solves three measurement problems accurately, using appropriate strategies.

Explanation clearly describes rationales for methods
1. Solves one measurement problem correctly or several with many errors.
   Explanation is not provided or is insufficiently communicated.

0  Problems are not solved correctly and little mathematical understanding is communicated.
   No attempt is made.

**Instructional Procedures:**

**Part One**

1. Distribute Attachment B, Activity *Using Shadows*.
   a. Take the class outside on a sunny day. Select three volunteers. Have the taller and shorter volunteers stand beside each other.
   b. Have the final volunteer use a tape measure to measure the shadow of each (from back of the foot to the end of the shadow). Measure the height of the two students to the nearest inch.
   c. Each student records the heights on the worksheet. (Example: Student one is 62 inches tall and casts a shadow which is 93 inches in length. Student two casts a shadow which is 100 inches in length.)

**Instructional Tip:**

If you are unable to go outside or it is not a sunny day, use the numbers from the example or use shadows that are in the classroom. Use flashlights or an overhead projector to create shadows. Use straws or golf tees to measure and create shadows.

2. Ask the students to make a scale drawing and establish the problem (not solve yet) as a proportion. After a couple of minutes, talk about the two categories: height and shadow.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Student 1</th>
<th>Student 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height in cm</td>
<td>62</td>
<td>x</td>
</tr>
<tr>
<td>Shadow in cm</td>
<td>93</td>
<td>100</td>
</tr>
</tbody>
</table>
3. After the proportion is established, ask the students what a reasonable answer would be. In the discussion stress that the answer must be more than 62 inches because a longer shadow at the same time of day would mean the height is greater.

4. Solve and round. (Example answer is \(x = 67\) inches or five ft. seven in.).

5. Provide students with practice measuring several objects using shadows.

6. Summarize the lesson and the procedures. Ask the questions listed below. Students think about the questions, share their ideas with a partner and respond to the teacher when called upon.
   - What is an indirect measurement?
   - How can we use indirect measurements?
   - Who might use indirect measurements?

**Part Two**

7. *Using a Mirror and Similar Triangles, Attachment C*

   a. Place an X on the wall, approximately seven feet from the floor, (do not measure) using two six-inch pieces of masking tape drawn on a sheet of paper.

   b. Put a dot of masking tape in the center of a compact mirror and place it on the floor six feet (72 inches) away from the wall with the X.

   c. Select a student to stand on the other side of the mirror.

   d. Looking down at the mirror, the student should slowly move backwards until the tape on the mirror is in the middle of the reflection of X on the wall.

   e. The student should “freeze” while the teacher measures the distance from the eyes to a spot directly below on the floor (mark with masking tape), and from that spot to the center of the mirror. Measurements should be rounded to the nearest inch. (Example: 72 inches from wall to center of the mirror, 60 inches from the center of the mirror to the spot on the floor below the student’s eyes, and 66 inches from the student’s eye level looking down to the floor.)

   ![Diagram](image)

   Eg. \(x = 66\)
Instructional Tip:

The diagram is provided to assist in the understanding of the activity set-up. The example for this diagram is explained in Instructional Procedure #7.

8. Ask the student to attempt to sketch a scale drawing, name the corresponding sides of the similar triangles, and establish the problem (not solve yet) as a proportion. After a few minutes, ask for a volunteer to share his/her work on the board. Ask questions such as:

- What do you know about the reflection of light and the angle of incidence?
- Why is this relevant to solve the height of the X?
- What measurements are used to prove that the triangles are similar?

9. After the proportion is established, ask the students what a reasonable answer would be. In the discussion, stress that the answer must be more than 66 inches because the $x$ height is greater than the height of the student’s eyes.

10. Solve and round. (Example: answer is about 79 inches or six ft. seven in.)

11. Provide students with practice measuring several objects using shadows.

12. Summarize the lesson and the procedures. Ask the following questions listed below. Students will think about the questions, share their ideas with a partner and respond to the teacher when called upon.

- Can I show understanding of indirect measurement? (Student writing prompt.)
- How can we use indirect measurements?
- Who might use indirect measurements?

Part Three

13. Activity Using Stadia, Attachment D

14. Move the $X$ from the previous activity down the wall approximately one foot. Select a student and give him/her a stadia-type instrument. (Use a cardboard tube from a toilet paper roll.) The student should look through the stadia and move closer or further away from the wall, until the bottom edge of the stadia is aligned with where the wall connects to the floor, and the top edge of the stadia is aligned with the intersection of the $X$.

15. To the nearest inch, measure the distance between the student (at a point directly below where the eye meets the stadia) and the wall. Measure the length and diameter of the stadia. For example: stadia length is 4 ½ inches or 4.5 and diameter is 1 5/8 inches or 1.625. The distance between the student and the wall is 15 feet or 180 inches.

16. The teacher will draw a diagram on the board as described below.
17. Ask students to list the similar sides. After a minute, describe and read the measurements to the class (such as, the length of the stadia is 4 ½ inches) For example:

18. After a few minutes, explain that AB is proportional to AE and BC is proportional to DF

Set-up the problem: \[ \frac{AB}{AE} = \frac{BC}{DF} \]

Eg. \[ \frac{4.5}{180} = \frac{1.625}{x} \]

19. Solve and round. (Example answer is 65 inches or five ft. five in.)

20. Complete practice activities on Using a Stadia (Attachment D)

Organize the students in groups of two or three and ask them to complete black-line master. (Note: the solution for the example is five ft. five in.).

21. Facilitate a discussion to allow students the opportunity to share their solutions and questions. Conclude with a discussion about how this indirect measurement technique might be used. Direct students to do a “quick write” on their understanding of the indirect measurements studied. Collect and use them as a formative assessment.

**Differentiated Instructional Support:**

Instruction is differentiated according to learner needs, to help all learners either meet the intent of the specified indicator(s) or, if the indicator is already met, to advance beyond the specified indicator(s).

- Have students measure both shadow lengths and heights for two people the first time, and use the numbers to set up the initial proportion. Then, measure the shadow length only of another person and use the proportion to determine for the missing height.
• Working in groups, completing real-world experiences and using mathematical tools, provide students with various learning pathways to access new information. Because of the novelty of the activity taking place outside of the classroom, students will be engaged and more likely to retain the information and concepts supported by the activity.

• Organize students into groups that will include peer-tutoring during the task.

**Extension:**

These ideas can be used by all students to continue their learning on this topic – in the classroom or outside of the classroom.

• Create increasingly complex problem situations for the students to solve such as the following: How can you use a clinometer to find the length of the shortest ladder which could be used to change the light bulbs in the lamp post in a parking lot?

• Research occupations that would use indirect measurement techniques. Invite an engineer from the local county government or a firm to share career information and tools they use.

**Homework Options and Home Connections:**

• Find heights of common structures or trees in and around the home. Use indirect measurement techniques to measure the height of an old tree, flag-pole, building, etc.

**Materials and Resources:**

*The inclusion of a specific resource in any lesson formulated by the Ohio Department of Education should not be interpreted as an endorsement of that particular resource, or any of its contents, by the Ohio Department of Education. The Ohio Department of Education does not endorse any particular resource. The Web addresses listed are for a given site’s main page, therefore, it may be necessary to search within that site to find the specific information required for a given lesson. Please note that information published on the Internet changes over time, therefore the links provided may no longer contain the specific information related to a given lesson. Teachers are advised to preview all sites before using them with students.*

For the teacher: A cardboard tube (from bathroom tissue roll), mirror (small compact size), tape measure (100 ft.), masking tape

For the student: Cardboard tube, mirrors, tape measure, masking tape, highlighter or colored pencils, chalk

**Vocabulary:**

• corresponding sides
- indirect measurement
- proportion
- ratio
- similar triangles
- stadia

**Technology Connections:**

- A calculator would make the lesson more manageable and decrease the variations in time needed for the students to solve problems created by individual differences in the speed of performing calculations. Interactive calculators are available on the Internet.
- Using word processing and productivity software, students could report their findings visually.
Indirect Measurement Pre-Assessment

Directions: Solve the following problems. Show your work and put the answer in the space provided.

1. \( \frac{2}{x} = \frac{6}{10} \) \( x = \) ______

2. \( \frac{12}{5} = \frac{a}{12} \) \( a = \) ______

3. Cheryl is trying to bake cookies and the recipe calls for 6 cups of flour and 4 cups of sugar. She only has 5 cups of flour. How much sugar, \( s \), does Cheryl need for her cookie recipe?

\( s = \) ______

4. Triangle ABC is similar to triangle XYZ. List the corresponding sides.

Corresponding Sides:

1. _________  __________
2. _________  __________
3. _________  __________

5. Find two similar triangles in the figure below and name their corresponding sides.

Corresponding Sides:

1. _________  __________
2. _________  __________
3. _________  __________
1. The shorter person and taller person should stand side-by-side and be turned so that they each cast a shadow behind them.

2. The data collector will measure the length of each person’s shadow (measure from the person’s heel to the top of his/her shadow) and round to the nearest inch. The recorder should write the data below. Be sure to include the units.

   Length of shorter person’s shadow: _______  Length of taller person’s shadow: _______

3. Select one person (shorter or taller) and circle your choice below. The selected person should move to a wall and put his/her back against it. The data collector will mark the person’s height on the wall. (Use chalk outside or masking tape inside.) The data collector will measure the person’s height from the mark on the wall to the ground and round to the nearest inch. The recorder writes the measurements.

   Height of shorter or taller person: _______  (Circle one of the above)

4. Make a sketch of the situation, label the items in the drawing and show the measurements that have been recorded. Include the following in your sketch: the shorter and taller people, their shadows and the height of the person measured. Use variables to represent any unknown measures in your sketch. Put your sketch on the back of this worksheet or a separate sheet of paper.

5. Describe the relationship between the shorter or taller person’s shadow and his/her height?

6. Set up a proportion that could be used to find the other person’s height and write it below. Do not solve the proportion until you have made a prediction about what a reasonable answer would be. Measure the other person to validate your solution. Describe a situation in your life when this measurement technique would be useful. Write about it on the back of this worksheet or on a separate sheet of paper.

<table>
<thead>
<tr>
<th>Proportion to find missing height</th>
<th>Prediction: ______________</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Calculated height: _______</td>
</tr>
<tr>
<td></td>
<td>Measured height: _________</td>
</tr>
</tbody>
</table>
7. Describe a situation in your life when this measurement technique would be useful. Write about it on the back of this worksheet or on a separate sheet of paper.

**Indirect Measurement Technique #2-Using a Mirror and Similar Triangles**

**Directions:** Complete the demonstration and tasks..
1. Use the table below to collect the data from the demonstration. Write a description of the distances to be measured.

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The distance from the wall to the center of the mirror</td>
<td>72</td>
</tr>
<tr>
<td>The distance from the floor to the “X”</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Make a sketch of the situation, label the items in the drawing and show the measurements given in the table. Include the following in your sketch: the wall, the mirror, and the student. Use variables to represent any unknown measurements in your sketch.

Are there two similar triangles in this situation? Explain your reasoning. Use your sketch.

3. Set up a proportion that could be used to find the distance from the floor to the “X” and write it below. Do not solve the proportion until you have made a prediction about what a reasonable answer would be.

| Proportion to find missing distance: | Prediction: ____________ | Calculated Distance: ____________ |

4. Describe a situation in your life when this measurement technique would be useful. Write about it on the back of this worksheet or on a separate sheet of paper.

**Indirect Measurement Technique #3 – Using a Stadia**

1. Use the table below to collect the data from the demonstration. Write a description of distance to be measured.

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Use the sketch below to label the things in the drawing and record the measurements shown in the table. Label the following in your sketch: the wall, the cardboard tube, and the student’s eye position.

3. There are two similar triangles in this situation. Find them in the sketch above and trace them with a highlighter.

4. Set up a proportion that could be used to find the distance from the floor to the “X” and write it below. Do not solve the proportion until you have made a prediction about what a reasonable answer would be.

   | Proportion to find missing height | Prediction: ____________ |
   | Calculated distance: ____________ | |
   | Measured distance: ____________  |

5. Describe a situation in your life when this measurement technique would be useful. Write about it on the back of this worksheet or on a separate sheet of paper.

You have learned 3 different indirect measuring techniques to find the height of very tall objects. You know must use the methods learned to find the height of 3 of the following:

Light post in the teacher parking log
Light poles for the football field
The flag pole in near the football field
Height of the goal post

| Light post in the teacher parking log |
| Light poles for the football field   |
| The flag pole in near the football field |
| Height of the goal post             |
Make a decision to determine which technique should be used to measure the objects. For each object, tell me which method you have chosen. Be sure to include detailed drawings and equations.

Object 1: ______________________________________
Method used:____________________________________
Show work here:

Do you think your answer makes sense? Why or why not?

Object 2:_______________________________________
Method used:____________________________________
Show work here:
Do you think your answer makes sense? Why or why not?

Object 3: ____________________________________

Method used: __________________________________

Show work here:

Do you think your answer makes sense? Why or why not?
Follow up:

What challenges did you encounter while using measuring each object? What did you do to overcome them?

Which method do you think produced the most accurate measurement? Why?

Now you are ready to find the height with your clinometer. Pick out 2 objects from the list below that you wish to measure and go to it! Make sure to record your information carefully and take into account what we discussed about measuring the angle of elevation.

Find the height of...

The flag pole in front of school on Eureka   The flag pole in front of the football field
The RHS digital sign   The A building   The B building   Rusty the Bear

Item #1:_________________________
Measurements_________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
Calculations:_________________________

Height:___________________________
Directions: Use the two column Proofs to write a flow chart proof.

1. Given: $\angle 2$ and $\angle 3$ are complementary
   $\angle 1$ and $\angle 3$ are congruent

Prove: $\angle 2$ and $\angle 1$ are complementary
<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $\angle 2$ and $\angle 3$ are comp. $\angle 1 \cong \angle 3$</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. $m\angle 2 + m\angle 3 = 90^\circ$</td>
<td>2. Def. of comp. $\angle$s</td>
</tr>
<tr>
<td>3. $m\angle 1 = m\angle 3$</td>
<td>3. Def. of $\cong \angle$s</td>
</tr>
<tr>
<td>4. $m\angle 2 + m\angle 1 = 90^\circ$</td>
<td>4. Subst.</td>
</tr>
<tr>
<td>5. $\angle 2$ and $\angle 1$ are comp.</td>
<td>5. Def. of comp. $\angle$s</td>
</tr>
</tbody>
</table>
2. Given: B is the midpoint of segment AC

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. B is the midpoint of AC</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. AB ≅ BC</td>
<td>2. Def. of mdpt</td>
</tr>
<tr>
<td>3. AB = BC</td>
<td>3. Def. of ≅ segs.</td>
</tr>
</tbody>
</table>
Prove: 2AB = AC

3. Write a Flow Chart Proof for the Vertical Angles Theorem (find the two column in your notes) Make sure to include drawing, given and proof statements!

4. Write a Flow Chart Proof for the Overlapping Angles Theorem (find the two column in your notes) Make sure to include drawing, given and proof statements!
5. Write a Flow Chart Proof for the Overlapping Segments Theorem (find the two column in your notes) Make sure to include drawing, given and proof statements!
Interview with Pythagoras

Use the library or Internet to do some research on Pythagoras. Conduct an interview in which you, the interviewer, ask Pythagoras questions about his work. Write the interview as if it were to be printed in a magazine. You can actually make a magazine with advertisements and articles if you desire. (Extra credit can be given this way) You may want to take a look at a interview in a traditional magazine such as Spin, Rolling Stone, Cosmo, ESPN magazine, etc. Include responses you think Pythagoras might have given. You should have at least 20 questions. Most interviews are actually discussions so be creative! I would recommend the use of mathematic history books as a basis for information. Some books that might be helpful Men of Mathematics by Eric Temple Bell, A History of Mathematics by Victor J. Katz, and An Introduction to the History of Mathematics by Howard Eves. A website that might be helpful http://www-history.mcs.st-and.ac.uk/history/ Encyclopedias provide sufficient, limited information. Please submit a bibliography or reference page.
This project is worth 100 points and is factored as a test grade. You will be given ONE class period to work on this project.

- Research other math books or encyclopedias to find dates for the invention of many of the symbols of arithmetic (addition +, subtraction -, multiplication X *, and ÷, division the fraction bar : / ÷ ). Organize this information on a number line of dates (also known as a timeline)
- ON the timeline, put dates of at least ten other important events that happened around these times.
- Make your time line big enough so that it is easy for someone else to read (you can use the big rolls of paper)
  - Make sure the dates of invention of arithmetic symbols on one side of the time line and the ten other important dates on the other side
  - Look at your history books for the important dates

You will be graded as follows:

Having all the arithmetic symbols ____________________________ 20 pts

Having 10 other dates ________________________________ 20 pts

Creativity _________________________________________ 60 pts
For your first official assignment I would like you to write a fictional creative story about the title of this class...Advanced Algebra. No research is allowed. The story must minimum of one page double spaced 12 point typed space (2 pages double spaced written by hand). This story must be math related. This paper is due Monday, September 8. In order to get full credit you must have this paper typed.

Please follow the writing process, prewriting, rough draft, revising, and final draft. Webbing, clustering, or brainstorming can help with the prewriting process. You could also use the five senses: Sight, Sound, Smell, Touch, and Taste to gather information. Ask yourself: Who? What? When? Where? How? Please be sure to have a topic sentence, supporting details and clincher statement for each paragraph. The paper should have an introduction, body and conclusion. Make sure you revise and edit and spell check. The rough draft does not have to be typed; however, the final draft has to be typed.

Please turn in the prewriting notes, rough and final drafts

Correct format/length_________________________________________ 70 pts

Typed_____________________________________________________ 15 pts

Creativity__________________________________________________ 15 pts
This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. However, you will not be able to finish this project if you do not start it early. The purpose of this project is to get you all comfortable with solving for parts of formulas. You probably may need to refer to a geometry book.

1. Below you will find the formulas for the areas of various common figures. You will devote on page of your notebook to each figure.

2. On each page for each formula, find a picture from the Internet, take a digital picture, magazine, newspaper, etc. If you use a picture from a camera trace out the figure.

3. On the figure indicate what each variable represents (ie A=lw is the area formula for a rectangle. The l stands for the length and the w stands for the width)

4. Solve every formula for each of the other variables in it.(ie. You will need to solve A=lw for length and width). This should fit on each page of your notebook!

a. Triangle \[ A = \frac{1}{2} hb \]

b. Parallelogram \[ A = bh \]

c. Kite (rhombus) \[ A = \frac{1}{2} d_1 d_2 \]

d. Trapezoid \[ A = \frac{1}{2} h(b_1 + b_2) \]

e. Cone \[ V = \frac{1}{3} \pi r^2 h \]

f. Circle \[ A = \pi r^2 \]

g. Rectangle \[ A = lw \]
This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. The purpose of this project is to get you all comfortable with solving for parts of formulas. You will work in groups, each having a role for completing the assignment. Each group will turn in one collaborative piece of work. Group roles are as follows:

**Researcher:** It is your responsibility to find the formulas for the group.

**Image Finder:** It is your responsibility to find pictures of the shapes for the formulas.

**Matcher:** It is your responsibility to match the formulas found to the pictures found. You will also be responsible for listing what each variable stands for in each formula.

**Work Assigner:** It is your responsibility to assign 3 shapes to each group member (including yourself) for solving. You are also responsible for collecting all parts of the project and placing them in order for turning in.

Below is a list of shapes in which your group will find a formula and picture for. After finding the formulas, your group is responsible for solving each formula for all the variables in that formula. For example: for a cube $A=lwh$, solving for $w$ $w = A/lh$, solving for $l$ $l = A/wh$, and solving for $h$ $h = A/lw$.

- Triangle: Area and Perimeter
- Parallelogram: Area and Perimeter
- Kite (rhombus): Area and Perimeter
- Trapezoid: Area and Perimeter
- Circle: Area and Circumference
- Rectangle: Area and Perimeter
- Rectangular Prism: Surface Area and Volume
Cone: Volume and Surface Area
Pyramid: Surface Area and Volume
Sphere: Surface Area and Volume
Regular Polygon: Perimeter and Area
Cylinder: Surface Area and Volume

You will be graded as follows:

Having pictures: ______________________20pts

Having what each variable means:____________________20pts

Having each variable solved:____________________50pts

Having the group member’s names on the parts they made:____________________5pts

Having a packet prepared neatly for turning in:_________________________5pts

How-to Book
This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. However, you will not be able to finish this project if you do not start early! The purpose of this project is for you to show me the skills you have learned throughout this chapter.

You will be the author of a new how-to book on algebra. Your book will provide step-by-step instructions for solving certain problems. Your book must include examples and illustrations. Your book may be hand written or typed and must include a title page and an about the author page. The length of your book depends on how much paper it takes you to give your instructions, but you must include instructions on how to solve the following types of equations:

- **Distributive property**
- **Rational equations**
- **Proportions**
- **Equations with variables on both sides**
- **Absolute value**
- **Transforming equations**

Write your book as if you were writing a book for future algebra students. This is your opportunity to show me and others what you've learned. Be creative and HAVE FUN!!!

You will be graded as follows:

Instructions for all 6 types of equations:_________________________60pts
Pictures and examples for each type of equation:_________________________20pts

Cover page:_______________________________10pts

About the author page:_______________________________10pts
Consider the graph above. Tell a story in words and pictures for your graph. For each labeled point (A, B, C, D, E, F), you must write a label, draw a picture or cartoon, and tell what is happening at that point. You can also include what is happening between the points. Your story must be related to the graph and make sense in terms of the graph. You should be clear and creative. Your graph must be transferred to a small poster board. The graph itself must have the following:

- A title
- Scales (in numbers) for the horizontal and vertical axes
- The horizontal axis must be scaled over time: seconds, minutes, hours, days, etc
- The vertical axis must be scaled in a measurement related to your story: miles, depth in inches, height in feet, loudness in decibels, etc
- Labels (in words) for the horizontal and vertical axes

With the graph should be your pictogram relating to the lettered points on the graph.

- Each point must represent and event in your story
- Each point must correspond to a letter in the graph
- Each point must relate to (x, y)
- Your pictogram must have the following elements for each point:
  - A title
  - A picture
  - A sentence or two of the story
Consider the graph above. Tell a story in words and pictures for your graph. For each labeled point (A, B, C, D, E, F), you must write a label, draw a picture or cartoon, and tell what is happening at that point. You can also include what is happening between the points. Your story must be related to the graph and make sense in terms of the graph. You should be clear and creative. Your graph must be transferred to a small poster board. The graph itself must have the following:

- A title
- Scales (in numbers) for the horizontal and vertical axes
- The horizontal axis must be scaled over time: seconds, minutes, hours, days, etc
- The vertical axis must be scaled in a measurement related to your story: miles, depth in inches, height in feet, loudness in decibels, etc
- Labels (in words) for the horizontal and vertical axes

With the graph should be your pictogram relating to the lettered points on the graph.

- Each point must represent and event in your story
- Each point must correspond to a letter in the graph
- Each point must relate to (x,y)
- Your pictogram must have the following elements for each point:
  - A title
  - A picture
  - A sentence or two of the story
Consider the graph above. Tell a story in words and pictures for your graph. For each labeled point (A, B, C, D, E, F), you must write a label, draw a picture or cartoon, and tell what is happening at that point. You can also include what is happening between the points. Your story must be related to the graph and make sense in terms of the graph. You should be clear and creative. Your graph must be transferred to a small poster board. The graph itself must have the following:

- A title
- Scales (in numbers) for the horizontal and vertical axes
- The horizontal axis must be scaled over time: seconds, minutes, hours, days, etc
- The vertical axis must be scaled in a measurement related to your story: miles, depth in inches, height in feet, loudness in decibels, etc
- Labels (in words) for the horizontal and vertical axes

With the graph should be your pictogram relating to the lettered points on the graph.

- Each point must represent and event in your story
- Each point must correspond to a letter in the graph
- Each point must relate to (x,y)
- Your pictogram must have the following elements for each point:
  - A title
  - A picture

A sentence or two of the story
Mississippi River Activity

Did you know that the Mississippi River touches 10 of the United States! It is the second longest river in the U.S. with a length of 2340 miles from its start in Minnesota to its mouth in the Gulf of Mexico. We all know that water takes the path of least resistance, which usually means it flows downhill (from a high elevation to a lower elevation). This means that the water flows over a slope. Since the Mississippi River is so long, we cannot assume that it has the same slope for the whole distance of the river, rather the river flows fast in some parts on slow in others. It will be your job today to discover the fastest and slowest parts of the Mississippi River by using your knowledge of slope and the information provided.
<table>
<thead>
<tr>
<th>Cities along the Mississippi</th>
<th>Elevation above sea level</th>
<th>Miles between cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twin Cities</td>
<td>834ft</td>
<td></td>
</tr>
<tr>
<td>LaCrosse</td>
<td>651ft</td>
<td>Twin Cities to LaCrosse 144 miles</td>
</tr>
<tr>
<td>Dubuque</td>
<td>620ft</td>
<td>LaCrosse to Dubuque 129 miles</td>
</tr>
<tr>
<td>Quad Cities</td>
<td>560ft</td>
<td>Dubuque to Quad Cities 70 miles</td>
</tr>
<tr>
<td>St. Louis</td>
<td>470ft</td>
<td>Quad Cities to St. Louis 312 miles</td>
</tr>
<tr>
<td>Wickliffe</td>
<td>401ft</td>
<td>St. Louis to Wickliffe 154 miles</td>
</tr>
<tr>
<td>Memphis</td>
<td>331ft</td>
<td>Wickliffe to Memphis 171 miles</td>
</tr>
<tr>
<td>Helena</td>
<td>250ft</td>
<td>Memphis to Helena 48 miles</td>
</tr>
<tr>
<td>Vicksburg</td>
<td>180ft</td>
<td>Helena to Vicksburg 133 miles</td>
</tr>
<tr>
<td>New Orleans</td>
<td>-4ft</td>
<td>Vicksburg to New Orleans 161 miles</td>
</tr>
</tbody>
</table>

Total: 1322 Miles

What is the slope (in fraction form) of the river between:

Twin Cities and LaCrosse: __________________________
LaCrosse and Dubuque: ________________

Dubuque and Quad Cities: ________________

Quad Cities and St. Louis: ________________

St. Louis and Wickliffe: ________________

Wickliffe and Memphis: ________________

Memphis and Helena: ________________

Helena and Vicksburg: ________________

Vicksburg and New Orleans: ________________

Now that you have the slope of the river between the cities and the elevation of each city, construct a graph on graph paper showing the steepness of the river from the Twin Cities all the way to New Orleans. Do this by making your x-axis miles and your y-axis elevation. You will then be able to clearly see which parts of the river are fastest and slowest. Be sure to label points as cities on your graph.

The Mississippi River is fastest between _____________________________ and
The Mississippi River is slowest between ______________________ and ______________________

Key

What is the slope (in fraction form) of the river between:

Twin Cities and LaCrosse: \(\frac{-183}{144}\)

LaCrosse and Dubuque: \(\frac{-31}{129}\)

Dubuque and Quad Cities: \(\frac{-60}{70}\)
Quad Cities and St. Louis: \[\frac{-90}{312}\]

St. Louis and Wickliffe: \[\frac{-69}{154}\]

Wickliffe and Memphis: \[\frac{-70}{171}\]

Memphis and Helena: \[\frac{-81}{48}\]

Helena and Vicksburg: \[\frac{-70}{133}\]

Vicksburg and New Orleans: \[\frac{-184}{161}\]

The Mississippi River is fastest between ________Memphis____________________ and

_____________Helena________________________

The Mississippi River is slowest between ________LaCrosse____________________ and

_____________Dubuque____________________
Quadratic “Chutes and Ladders”

1. Draw a card
2. Roll the die
3. If you roll a 1 or a 6, then solve your quadratic equation by factoring if possible, if not, then solve it another way.
4. If you roll a 2 or a 5, then solve your quadratic equation by using the quadratic formula
5. If you roll a 3, then solve your quadratic equation by graphing.
6. If you roll a 4, then solve your quadratic equation by completing the square
7. If you solve your equation correctly, then you may move on the board the number of spaces that corresponds to your roll of the die.
8. If you answer the question incorrectly, then the person to your left has the opportunity to answer your question and move your roll of the die.
9. The first person to reach the end of the board first wins the game!
10. Good luck!

Linear Systems “Chutes and Ladders”

11. Draw a card
12. Roll the die
13. If you roll a 1 or a 6, then solve your system of equations by matrices
14. If you roll a 2 or a 5, then solve your system of equations by using elimination
15. If you roll a 3, then solve your system of equations by graphing.
16. If you roll a 4, then solve your system of equation by substitution
17. If you solve your equation correctly, then you may move on the board the number of spaces that corresponds to your roll of the die.
18. If you answer the question incorrectly, then the person to your left has the opportunity to answer your question and move your roll of the die.
19. The first person to reach the end of the board first wins the game!
20. Good luck!
<table>
<thead>
<tr>
<th>Equation 1</th>
<th>Equation 2</th>
<th>Equation 3</th>
<th>Equation 4</th>
<th>Equation 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x^2 - 25 = 0)</td>
<td>(x^2 + 5x - 24 = 0)</td>
<td>(x^2 + 8x - 9 = 0)</td>
<td>(3x^2 - 21x + 30 = 0)</td>
<td>(x^2 + 6x - 7 = 0)</td>
</tr>
<tr>
<td>(3x^2 - x + 3 = 0)</td>
<td>(-2x^2 - 4x + 1 = 0)</td>
<td>(-x^2 + 6x - 9 = 0)</td>
<td>(x^2 + 3x = -25)</td>
<td>(x^2 - 2x + 4 = 0)</td>
</tr>
<tr>
<td>(-x^2 + x - 7 = 0)</td>
<td>(2x^2 + 3x = 8)</td>
<td>(x^2 + 2x - 8 = 0)</td>
<td>(x^2 - 3x - 4 = 0)</td>
<td>(3x^2 - 14x + 8 = 0)</td>
</tr>
<tr>
<td>(x^2 - 7x = 0)</td>
<td>(x^2 + x = 12)</td>
<td>(-\frac{1}{2}x^2 + 5 = 0)</td>
<td>(2x^2 + 8x - 3 = 0)</td>
<td>(x^2 = 2x + 2)</td>
</tr>
<tr>
<td>Equation 1</td>
<td>Equation 2</td>
<td>Equation 3</td>
<td>Equation 4</td>
<td>Equation 5</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>$x^2 = 11x - 10$</td>
<td>$5x^2 = 210x$</td>
<td>$4x^2 + 4x = 3$</td>
<td>$2x^2 + 4x = 10$</td>
<td>$x^2 - 2x + 2 = 0$</td>
</tr>
<tr>
<td>$x^2 - 3x - 8 = 0$</td>
<td>$-3x^2 + 147 = 0$</td>
<td>$x^2 + 8x = 4$</td>
<td>$x^2 = 6x - 11$</td>
<td>$x^2 + 10x = -25$</td>
</tr>
<tr>
<td>$x^2 - 2x + 3 = 0$</td>
<td>$x^2 + 6x - 5 = 0$</td>
<td>$x^2 - 6x + 11 = 0$</td>
<td>$9x^2 + 12x - 5 = 0$</td>
<td>$x^2 - 4x + 3 = 0$</td>
</tr>
<tr>
<td>$2x^2 + 8x + 12 = 0$</td>
<td>$3x^2 + 2x - 1 = 0$</td>
<td>$-x^2 + 5x - 7 = 0$</td>
<td>$x^2 - 3x = 28$</td>
<td>$x^2 - 3x = 4$</td>
</tr>
<tr>
<td>Equation</td>
<td>Equation</td>
<td>Equation</td>
<td>Equation</td>
<td>Equation</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>$6x - 3x^2 = -12$</td>
<td>$x^2 + 6x + 41 = 0$</td>
<td>$x^2 - 2x = -2$</td>
<td>$x^2 + 25 = 0$</td>
<td>$2x^2 + 1 = 0$</td>
</tr>
<tr>
<td>$x^2 + 5x + 4 = 0$</td>
<td>$x^2 - 7x = -12$</td>
<td>$2x^2 - x = 3$</td>
<td>$6x^2 = -19x - 15$</td>
<td>$3x^2 - 5x - 4 = 0$</td>
</tr>
<tr>
<td>$5x^2 - 7x - 3 = 8$</td>
<td>$6x^2 + 31x = 12$</td>
<td>$1 = 4x^2 + 3x$</td>
<td>$1/2x^2 - x = 8$</td>
<td>$2x^2 + 18 = 9x$</td>
</tr>
<tr>
<td>$x^2 + 6x + 8 = 0$</td>
<td>$x^2 - 2x = 3$</td>
<td>$x^2 + 8x = 0$</td>
<td>$2x^2 + 6x = -4$</td>
<td>$3x^2 = 16x + 12$</td>
</tr>
<tr>
<td>Equation 1</td>
<td>Equation 2</td>
<td>Equation 3</td>
<td>Equation 4</td>
<td>Equation 5</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>( 5x^2 = 80 )</td>
<td>( x^2 + 6x + 5 = 45 )</td>
<td>( x^2 - 11x + 24 = 0 )</td>
<td>( x^2 + 4x = 0 )</td>
<td>( 12x^2 - 154 = 0 )</td>
</tr>
<tr>
<td>( 6x^2 + 4x = 0 )</td>
<td>( 2x^2 - 5x - 3 = 0 )</td>
<td>( x^2 + 2x = 6 - 6x )</td>
<td>( 6x^2 + 13x + 6 = 0 )</td>
<td>( 3x^2 + 7x = 9 )</td>
</tr>
</tbody>
</table>
| 2x-y=-1  
4x-y=5 | x-y=-4  
-2x-y=-3 | X=8  
x-y=2 | x+y=5  
x-y=-5 | 3x-y=1  
2x+y=14 |
|---|---|---|---|---|
| 3x+2y=12  
X+y=3 | x-4y=16  
x+2y=4 | Y=2x+5  
Y=4-x | Y=5x-1  
Y=14 | X+y+z=6  
X=2y  
Z=x+1 |
| 3x+y-z=15  
x-y+3z=-19  
2x+2y+z=4 | x-y=3  
x+y=5 | x-2y=7  
x+3y=12 | 2x+5y=10  
X+y=2 | Y=5x-2  
Y=x+4 |
| x-y=-3  
x+y=4 | 3x+2y=9  
X+y=4 | Y=7  
Y=x+1 | x-y+z=0  
3x-2y+6z=9  
-x+y-2z=21 | 2x+y+z=8  
X+2y-z=-5  
Z=2x-y |
| X+2y+z=-1  
4x-y-z=-1  
2z=-3y | 2x-y=5 | 4x+5y=20 | -3x+2y=10 | X+5y=10  
3x-y=8 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4x-y=7</td>
<td>7x-y=11</td>
<td>2x+3y=12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| x-y=7  
4x+y=38 | -2x+7y=19 | 3x+5y=10 | 2x+y=13  
Y=-4 | 4x+3y=12  
x-5y=-20 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X+3y=10</td>
<td>Y=-4</td>
<td>x-y=-4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 8x+y=17  
X+4y=37 | 3x-y=2 | Y=-x+1  
Y=3/4x - 6 | 4x-y=6  
-2x+3y=12 | X+y=4  
Y=6 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2x+y=8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| X+3y=5  
X+4y=6 | p-3q=-1  
-5p+16q=5 | 300x-y=130  
200x+y=120 | X+y=5  
x-2y=-4 | Y=3x-7  
X=2 |
<p>| [3a+5b=0] | [x+y=3] | [5a+3b=7] | [3x+2y=6] | [4x+7y=28] |
| [a+b=2]  | [x-y=7]  | [3a+2b=5]  | [x-2y=10]  | [y=2x-14]  |
| [7x-2y=20] | [4x+5y=-12] | [5x+4y=5] | [2r=4t+6] | [3x+y=4] |
| [6y=3]   | [3x-4y=22] | [y=5x]  | [5r-4t=6]  | [2x-y=6]  |
| [6m-3n=3] | [V=9t+300] | [y=2/3x-3] | [0.02a-1.5b=4] | [0.03x+.02y=-1] |
| [3m+n=4] | [V=7t+400] | [2x-3y=9] | [0.5b-0.02a=1.8] | [0.02x+.05y=14] |
| [2m=-4n-4] | [5x+y=0] | [0.25p+0.1q=4] | [80x+60y=85] | [x+y=12] |
| [3m+5n=-3] | [5x+2y=30] | [P+q=31]  | [100x-40y=20] | [x-y=2]   |</p>
<table>
<thead>
<tr>
<th>X+2y=10</th>
<th>2w+5y=-24</th>
<th>3u+3v=15</th>
<th>2a+3b=12</th>
<th>6x-2y=11</th>
</tr>
</thead>
<tbody>
<tr>
<td>X+y=6</td>
<td>3w-5y=14</td>
<td>-2u+3v=-5</td>
<td>5a-b=13</td>
<td>-9x+3y=16</td>
</tr>
</tbody>
</table>

| 9a-3d=3  | X+3y=7    | 3a+b=3    | T=2r+3   | X+6y=2    |
| 3a+8d=-17| 2x-4y=24  | 2a-5b=-15 | 5r-4t=6  | 5x+4y=36  |
This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. The purpose of this project is to find out really how many possibilities there are for a phone number in one area code. The only restrictions are that no phone number can start with 911. (Hint: In the past U.S. phone numbers consisted of a sequence of two letters followed by five digits)

1. Calculate the possibilities (show all your work)

2. Now that you have the number of possibilities, answer the following questions.

   a. How many possibilities are there for area codes in the nation?
   b. Why do you think we needed to add the 734, 810, and 248 area codes?
   c. What would happen if we ran out of numbers?
   d. What is the possibilities of a 10 digit number (that means including the area code)

You will be graded as follows:

Calculation of possible numbers__________________________40 pts

Effective answering of all questions_______________________60 pts

Time-Series Data
This project is worth 100 points and is worth just as much as one test. I expect that students in this class have the desire, capabilities, and responsibility to complete these projects. You will be given one class period to complete this project; however, you will not finish it if you do not start it early. For this project you will need an Almanac or books of sports statistics or you can go to www.infoplease.com. This project will look at world records and periods of time. Here is the scoop:

When the value of a dependent variable, such as a world’s record in a particular sport (100 meter dash, long jump, basketball, baseball, etc), changes over time the data are called time-series data.

1. Find an example of time-series data in which the dependent variable appears to vary linearly with time. (I suggest men’s or women’s 100 meter dash or something similar)
2. Make a scatter plot of the data ( you may use a calculator or Excel)
3. Using the calculator or Excel find the line that best fits and draw it on the graph with the scatter plot.
4. According to your model, what will the value of the variable be in the years 2025, 2075, and 3000?
5. Do your predictions seem reasonable? Why or why not?

Your will be graded like this:

Example of Time-Series Data_____________________________________________20 pts
Making scatter plot____________________________________________________20 pts
Find best fit line____________________________________________________10 pts
Predictions________________________________________________________20 pts
Explanations of predictions__________________________________________ 30 pts

<table>
<thead>
<tr>
<th>Year</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948</td>
<td>24.4</td>
</tr>
</tbody>
</table>
This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. However, you will not be able to finish this project if you do not start it early. This project is not really that easy. We are looking at two people and trying to figure out how long it will take to make so money for retirement. Here’s the scoop:

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>23.7</td>
</tr>
<tr>
<td>1956</td>
<td>23.4</td>
</tr>
<tr>
<td>1960</td>
<td>24.0</td>
</tr>
<tr>
<td>1964</td>
<td>23.0</td>
</tr>
<tr>
<td>1968</td>
<td>22.5</td>
</tr>
<tr>
<td>1972</td>
<td>22.4</td>
</tr>
<tr>
<td>1976</td>
<td>22.37</td>
</tr>
<tr>
<td>1980</td>
<td>22.03</td>
</tr>
<tr>
<td>1984</td>
<td>21.81</td>
</tr>
<tr>
<td>1988</td>
<td>21.34</td>
</tr>
<tr>
<td>1992</td>
<td>21.81</td>
</tr>
</tbody>
</table>
Sara and Sheila are twins who begin to work at age 20 with identical jobs and identical salaries. At the end of each year they received identical bonuses of $2000. In other ways the twins were not identical. Early in life Sara was conservative. Each year she invested the $2000 bonus in a savings program earning 9% interest compounded annually. At age 30, Sara decided to have some fun and began spending her $2000 bonus, but she left her earlier investment continue to earn interest. This continued until she was 65.

In contrast, for the first 10 years she worked, Shelia spent her $2000 bonuses. At age 30, she began to invest here bonus every year in an account paying 9% annual interest. This continued until Sheila was 65 years old.

1. Which sister deposited more of her own money into her account? How much more was this?
2. Make an Excel spreadsheet to determine how much each sister had in her account in each year.
3. How much did each sister have accumulated at age 65?
4. What are the advantages of Sara’s savings plan?
5. What are the advantages of Shelia’s savings plan?
6. What do you think the moral of the story is? (based on the data and your calculations)

Population and Growth

This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. However, you will not be able to finish this project if you do not start it early.
Not all populations grow exponentially. From an almanac or other source, examine the population of one of the following areas over the given time period. Graph the data to determine if the growth is approximately exponential. Summarize what you have found.

a. the United States population each decade from 1790 to the present
b. the world population since 1900
c. the world population over the past two thousand years
d. the population of a continent other than North America over the past 100 years

The growth factor for each decade is found by dividing the population of a given decade by the population of the previous decade. You might want to use a spreadsheet to generate the growth factor for each decade or a graphing calculator. Your summary should include graphs, tables, and several paragraphs. Again, this project is easily done with excel (you will be able to cut and paste your graphs and tables), however, if you have a graph link for the TI calculator you can cut and past the screen shot.

Have fun and good luck!

Interest and Loans

This project is worth 100 points which is equal to one test. This project will look into many financial decisions you will be making in the very near future. For this project you can use www.bankrate.com for
all financial information. If you do not have access to a computer you will need to stop into a bank and get some information. When using the bankrate site use the national average of each loan.

**Part 1-New Vehicle**

You are shopping for a brand new car. That is a 2011 model. Go on the web or call dealerships for the price of your new car. Now go on to **www.bankrate.com** to get the interest rates for a 36 month, 48 month, and 60 month loan. Calculate your total amount paid for the car at the end of each loan term. (Assume it is compounded monthly)

**Step 1:** Go to **www.kbb.com** or any dealership’s website and select any new vehicle.

**Step 2:** Find the purchase price of the vehicle and print out the car’s advertisement.

*New Car Name (Make and Model): ________________________________*

*New Car Price: ____________________________________________*

**Step 3:** Go to **www.bankrate.com** and obtain the current average interest rate for a 3, 4, and 5 year loan on a new vehicle.

<table>
<thead>
<tr>
<th>3 Year Interest Rate</th>
<th>4 Year Interest Rate</th>
<th>5 Year Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 4:** Assuming the loan is compounded monthly, use the following formula to calculate the total price for each loan term (3 years, 4 years, and 5 years).

\[
A = p \left(1 + \frac{r}{n}\right)^{nt}
\]
Where $A =$ amount of the loan, $r =$ the annual interest rate (expressed as a decimal),
and $n =$ the number of months of the loan.

<table>
<thead>
<tr>
<th>3 Year Loan</th>
<th>4 Year Loan</th>
<th>5 Year Loan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Price after 3 Years</th>
<th>Total Price after 4 Years</th>
<th>Total Price after 5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 5:** Graph the three functions you found from Step 4 on the graph below.
Reflection:

1. Based on the graph, which term would be the best loan option and why?

2. Most people go with a 60 month loan. Is this the best option? Why or why not?

Part 2 - A New House

Now that you have a new car it is time to start looking for a new home. Again use www.bankrate.com to find the mortgage rates. You can search for your house on www.realtor.com the loan types are fixed at 15 year and fixed 30 year. (Again assume interest is compounded monthly)
Step 1: Go to www.realtor.com and find your dream house in this area

Step 2: Find the purchase price of the house and print out the listing.

Location of new home): __________________________________________

Asking Price: __________________________________________________

Step 3: Go to www.bankrate.com and obtain the current average interest rate for a 15 and 30 year fixed rate mortgage.

<table>
<thead>
<tr>
<th>15 Year Interest Rate</th>
<th>30 Year Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 4: Assuming the loan is compounded monthly, use the following formula to calculate the total price for each loan term (3 years, 4 years, and 5 years).

\[ A = p \left(1 + \frac{r}{n}\right)^{nt} \]

Where \( A \) = amount of the loan, \( r \) = the annual interest rate (expressed as a decimal), and \( n \) = the number of months of the loan.

<table>
<thead>
<tr>
<th>15 Year Loan</th>
<th>30 Year Loan</th>
</tr>
</thead>
</table>
Total Price after 15 Years | Total Price after 30 Years
---|---
 |  

**Step 5:** Graph the functions you found from Step 4 on the graph below.

**Reflection:**

1. *Based on the graph, which term would be the best loan option and why?*
2. Most people go with a 30 year fixed rate. Why do you think this is true?

3. When should you go with a 15 year fixed mortgage?

4. Based on these total prices what annual salary do you think you would need to make the monthly payments on both your new car and home?

5. Research the internet or some other source for jobs that would pay this salary what are they?

Population Growth

How much will the world’s population grow in the next 40 years? It depends on a number of factors, birth rates, death rates, life expectancy, current population estimates, just to name a few. Scientists use all this information and more to determine a country’s average rate of population increase, or growth rate. By knowing a country’s growth rates, scientist can then mathematically model growth over by using an exponential function. In this activity we will look at the top 10 most populated countries in the world.
Go to the following website [https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html](https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html) fill out the 3rd and 4th columns of the table below and answer the questions that follow.

### Population Data and Functions for 10 Most Populated Countries in the World Today

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>India</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>United States</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Indonesia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Brazil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pakistan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bangladesh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Nigeria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Russia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. For each country write an exponential function (decay or growth) using the current population as your initial amount. Write these functions in 5th column.

2. Using your prediction functions from the table. Estimate the population size for each country in the year 2050 and record in the last column.

### Population Analysis

**Based on the population size predictions you made for the year 2050. In the following table re list the countries in rank order starting with the most populated (based on predicted 2050 population). The answer the questions that follow.**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Percent Change (Current Year to 2050)</th>
<th>United Nations Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>
3. Calculate the percent change \( \frac{\text{new} - \text{old}}{\text{old}} \times 100 \) for each country between the current year and 2050 and record this in the 3\(^{rd}\) column of this table.

4. Which country had the largest percentage change in population?

5. What country had the largest increase in population?

6. Explain why or why not your countries are the same for largest percentage change and largest increase in population.

7. Go to the following site http://www.census.gov/ipc/www/idb/ and list the population size ranking for each country in the last column (please put the country name)

8. How does the UN’s rankings differ from yours? Are there any differences? Explain. What could be the reasons for this difference?

**Interest Rates**

This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. However, you will not be able to finish this project if you do not start it early. For this project you will have to contact banks or look on the Internet or find stuff in a newspaper. This project is
very easy. There are many kinds of interest rates, including mortgage rates, rates on car loans, rates on credit cars, and savings rates of various kinds. Use a newspaper, look online or call banks to find at least three examples of current rates of each kind.

1. Find 3 rates on car loans for 2008 models. Find out how often the interest is compounded. Do the calculations for a 20,000 40,000 and 60,000 car the life of the loan will be 36 months, 48 months, and 60 months
2. Find 3 rates on mortgage you will be looking at 15 year and 30 year mortgages with fixed rate. Find out when they compound the interest. You will do this for a 100,000 house, 200,000 houses, and 300,000 houses.
3. Find rates on credit cards you will have different rates for a regular credit card, gold credit card, and platinum credit card. Find out when they compound the interest and figure out with balances of 15,000, 10,000, and 5,000 look to pay off these debts in 5 years.
4. Find 3 rates of savings account and when the interest is compounded. Use 5,000 10,000 and 100,000. Find out how much money you would have after 10 years.

You may want to make a table using excel or word. I suggest you get your information as soon as possible. I will be able to help you with calculations or using excel.

**QUADRATIC EQUATIONS PROJECT**

We have spent some time talking about quadratic equations and parabolas. We discussed how to graph them, how to factor them, and how to solve them. This project you can choose to make a small poster (or glogster), a scrapbook, flip-book, wiki spaces, or whatever style you choose. Regardless, it needs to have information on all topics.

Each project must include the following:
How to graph quadratics in standard form \((y=ax^2+bx+c)\), including finding the axis of symmetry, the vertex, making a small table and an example (this is from before spring break)

How to solve quadratics by taking square roots, include some examples!

How to solve quadratics by factoring, include some examples!

How to solve quadratics by using the quadratic formula, include some examples.

Describe what the solutions of quadratics look like on a graph. What does a quadratic with no solutions graph look like? What about a quadratic with two solutions? One solution? Be sure to include example of each

Create and solve a real world problem that can be solved by using quadratics (look at your Notes)

---

**Quadratic Project Rubric**

<table>
<thead>
<tr>
<th>Graphing Standard Form</th>
<th>Explanation of standard quadratic form (3pts)</th>
<th>Explanation of finding the axis of symmetry (3pts)</th>
<th>Explanation of finding the vertex (3pts)</th>
<th>Clear &amp; correct example of graphing a quadratic in standard form (6pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solving Quads with Square Roots</td>
<td>Explanation of what a “root” or “solution” is (3pts)</td>
<td>Explanation of how square roots can be used to solve quadratics</td>
<td>Example of solving quadratic equation using square roots</td>
<td>Example of solving quadratic equation with no real solution</td>
</tr>
</tbody>
</table>
Man, when I was your age I was married.

This project is worth 100 points which is equal to one test. You will be given one class period to work on this project. However, you will not be able to finish this project if you do not start it early. This project extends the fitting a line to data exercises. You will need to go to the library or search the Internet for some additional information. We take a look at the age people got married.

<table>
<thead>
<tr>
<th>Solving Quads with Factoring</th>
<th>Explanation of what a “root” or “solution” is (3 pts)</th>
<th>Explanation of factoring methods (3 pts)</th>
<th>List of factoring “shortcuts” (3 pts)</th>
<th>2 Examples of solving quadratics using factoring (6 pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solving Quads with the QF</td>
<td>Explanation of what a “root” or “solution” is (3 pts)</td>
<td>Correct Quadratic Formula (3 pts)</td>
<td>Example of solving quad formula with 2 solutions (3 pts)</td>
<td>Example of solving quad formula with no solution (3 pts)</td>
</tr>
<tr>
<td>Description of Graph</td>
<td>Explanation of what a solution looks like on the graph (3 pts)</td>
<td>Example of a graph and equation with one solution (3 pts)</td>
<td>Example of a graph and equation with two solutions (3 pts)</td>
<td>Example of a graph and equation with no solution (3 pts)</td>
</tr>
<tr>
<td>Real Life Example</td>
<td>Clear and creative word problems that uses a quadratic equations (3 pts)</td>
<td>Graph/picture of situation (3 pts)</td>
<td>Step by step solution to problem (3 pts)</td>
<td>Interpretation of answer in context to problem (3 pts)</td>
</tr>
</tbody>
</table>

| Overall Project             | Is the project clear, easy to read, colorful, and overall something to proud of? (10 pts) |

**Median Age (in years) at First Marriage**
<table>
<thead>
<tr>
<th>Year</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>22.8</td>
<td>20.3</td>
</tr>
<tr>
<td>1960</td>
<td>22.8</td>
<td>20.3</td>
</tr>
<tr>
<td>1970</td>
<td>23.2</td>
<td>20.8</td>
</tr>
<tr>
<td>1980</td>
<td>24.7</td>
<td>22.0</td>
</tr>
<tr>
<td>1990</td>
<td>26.1</td>
<td>23.9</td>
</tr>
</tbody>
</table>

1. Plot all the data on one graph. (you will have two different lines (man and women), use the x-axis for the year and y-axis for the age)
2. Find the lines that best fit the data. (you will have to do this for men and women separately)
3. When will the ages be the same for men and women? How old will they be?

4. Find some earlier data (for years like 1900, 1910,...1940) on the age of first marriages (here’s where you need to use the Internet or go to the library
5. Repeat the other steps. How does this new info affect your predictions?

The original data

1) The two points for the men’s data are (_____,_____) and (_____,_____)  
2) The equation for the men’s line is (show work below)

3) The two points for the women’s data are (_____,_____) and (_____,_____)  
4) The equation for the women’s line is (show work below)
5) The year and age that men and women will be the same is (_______,______) (show work below)

6) Do you think this is accurate? Why or Why not?

The expanded data

Median Age (in years) at First Marriage

<table>
<thead>
<tr>
<th>Year</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>22.8</td>
<td>20.3</td>
</tr>
<tr>
<td>1960</td>
<td>22.8</td>
<td>20.3</td>
</tr>
<tr>
<td>1970</td>
<td>23.2</td>
<td>20.8</td>
</tr>
<tr>
<td>Year</td>
<td>Number 1</td>
<td>Number 2</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>1980</td>
<td>24.7</td>
<td>22.0</td>
</tr>
<tr>
<td>1990</td>
<td>26.1</td>
<td>23.9</td>
</tr>
</tbody>
</table>

7) The two points for the men’s data are (____,____) and (____,____)  
8) The equation for the men’s line is (show work below)

9) The two points for the women’s data are (____,____) and (____,____)  
10) The equation for the women’s line is (show work below)

11) The year and age that men and women will be the same is (____,____) (show work below)

12) Are the results the same when the expanded data is used? Why or Why not?
How big are some states?

This project is worth 100 points and is worth just as much as one test. I expect that students in this class have the desire, capabilities, and responsibility to complete these projects. You will be given one class period to complete this project, however, you will not finish it if you do not start it early. For this project you will need to buy or consult an Atlas of the United States. We will be predicting the areas of certain states. Here is the scoop:

In a square with area A and side s, \( s^2 = A \) exactly. The length of a side of shapes that are close to squares can be a good predictor of area, even if the prediction is not exact.

1. Use an atlas to find lengths of sides of the following states: Arizona, Arkansas, Colorado, Kansas, New Mexico, and Wyoming (you will have to measure its length and width, don’t forget to use the scale)
   - To approximate the dimensions of the square, take the average of the length and width of each state (length of Arizona + width of Arizona)/ 2 = side length of Arizona
2. For each state, look up it area in the atlas (sometimes this is actually on the same page, if not, look for it in the index or back of atlas)
3. Fit a model to the data (Avg side length vs. Area from your calculations)
4. Compare the predicted and actual areas (an bar chart in excel would be nice)
5. Write a report, which will include a table, your graphs, your model, an visual explanation of the comparison of the predicted with the actual. Does your model fit any states actual areas? If so, which ones? What conclusions can you make?
You will be graded like this:

Finding length and area of each state_________________________ 20 pts

Finding actual information_________________________________ 10 pts

Fitting Model and comparing data___________________________ 10 pts

Report___________________________________________________ 60 pts

<table>
<thead>
<tr>
<th>State</th>
<th>Est. Avg Side</th>
<th>Est. Area</th>
<th>Actual Area</th>
<th>Predicted area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>350</td>
<td>122,500</td>
<td>113,510</td>
<td>114,439</td>
</tr>
<tr>
<td>Arkansas</td>
<td>200</td>
<td>40,000</td>
<td>52,082</td>
<td>52,182</td>
</tr>
<tr>
<td>Colorado</td>
<td>333</td>
<td>110,889</td>
<td>103,598</td>
<td>105,659</td>
</tr>
<tr>
<td>Kansas</td>
<td>323</td>
<td>104,329</td>
<td>81,783</td>
<td>100,700</td>
</tr>
<tr>
<td>New Mexico</td>
<td>330</td>
<td>108,900</td>
<td>121,336</td>
<td>104,155</td>
</tr>
<tr>
<td>Wyoming</td>
<td>305</td>
<td>93,025</td>
<td>96,988</td>
<td>92,158</td>
</tr>
</tbody>
</table>
This project is worth 100 points and is equal to a test grade. I will not be allowing any time during class to work on this project. However, I will be available for any advice or suggestions. Please do not wait until the last minute to start this project.

Durantvision Productions is a new movie production company. All of their films will be designed around a “math” theme, to satisfy the intellectual craving of the general public. To help them out, you have been hired as part of a creative team to come up with movies that fit what they are looking for in their films. Your job is to create a movie poster announcing an upcoming movie for Durantvision Productions. You have seen movie posters in movie theaters and video stores, so use them as a guideline for yours.

The requirements for this poster are:

1. It is based on a movie currently out or popular one from years past
2. It now has a “math” theme associated with it.

You may wish to include in your movie poster actors/actresses involved in the movie, brief description of the plot, reviews of movie critics, sketch of an important scene in the movie.

Extra points will be awarded for creativity (sweet drawings, “good puns”, etc)

Off limits movie titles include: The Matrix, The Matrix Reloaded, Matrix Revolutions, American Pie 1 and 2, and Pi (these are way to easy!)
In this project you will use what you learned to create a personal budget to help you meet your financial goals. You will have to choose a job that interests you. Investigate rent, utilities, transportation and grocery costs. Learn about effective decision making for building a budget and make and use a monthly spreadsheet. You will have to do a 3-5 minute presentation.

**Step 1 Brainstorm**

- List several careers that interest you. Choose one.
- Brainstorm monthly living expenses, monthly fixed expenses, and annual expenses. Include rent, utilities, transportation, and groceries.

**Step 2 Research**

- Use the Internet and/or newspapers to search for job openings in your chosen career.
- Research the cost of monthly living expenses, monthly fixed expenses, and annual expenses in Wyandotte or your home city.

**Step 3 Explore Your Community**

Interview two adults in your community about the decision-making process they use when developing a personal budget. Ask them how they prioritize expenses and to share any tips they might have for sticking to their budgets.

**Step 4 Create Your Budget**

- Calculate your monthly net income. Assume your annual gross pay is $40,000 you are unmarried, and paid monthly, and have no exemptions. Use the tax tables in the back of the book A2-A5.
- Use Excel and create a Monthly Manager spreadsheet to determine your monthly budget.
- Adjust personal spending, entertainment, and other expenses as needed to live with your monthly net income.
- Develop a pie chart showing your monthly expenses.

**Step 5 Develop Your Presentation**

- Use Word to write a one page report:
  - List the job you chose and explain why
  - Summarize your conversations about a budget
  - Describe any adjustments you might have make to personal spending, entertainment, and other expenses
  - Share your thoughts or observations about the experience of preparing a budget
- Create a 3-5 slide presentation to share with the class. Include your pie chart. Print your completed Monthly Manager spreadsheet or include it in your presentation.
With the holidays approaching you are thinking of having a holiday dinner for you and 9 guests. You are going to shop for and cook the meal. You are also thinking about purchasing a TV for the “Big Holiday Day Game”. Go to a grocery store and comparison shop. Please give at least 2 sizes of each item (if applicable). Be sure to include the price and the unit price. You will also be comparison shopping for a 52” HD Plasma TV. For the TV just list the stores and prices or you can produce the ads.

You will need the following:

<table>
<thead>
<tr>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
</tr>
<tr>
<td>Pumpkin Pie</td>
</tr>
<tr>
<td>Ham</td>
</tr>
<tr>
<td>Apple Pie</td>
</tr>
<tr>
<td>Mashed Potatoes</td>
</tr>
<tr>
<td>Stuffing</td>
</tr>
<tr>
<td>Corn</td>
</tr>
<tr>
<td>Carrots</td>
</tr>
<tr>
<td>Green Beans</td>
</tr>
<tr>
<td>Biscuits</td>
</tr>
<tr>
<td>Sweet Potatoes</td>
</tr>
<tr>
<td>Macaroni and Cheese</td>
</tr>
<tr>
<td>Cranberries</td>
</tr>
<tr>
<td>Tofurkey</td>
</tr>
<tr>
<td>Milk</td>
</tr>
<tr>
<td>Soda</td>
</tr>
<tr>
<td>Apple Juice</td>
</tr>
<tr>
<td>Coffee</td>
</tr>
<tr>
<td>Egg Nog</td>
</tr>
<tr>
<td>Chocolate Syrup</td>
</tr>
<tr>
<td>Cheesecake</td>
</tr>
<tr>
<td>Veggie stuffing</td>
</tr>
</tbody>
</table>

Don’t forget to include the plastic cups, forks, spoons, knives, and napkins, coffee filters, etc.

Once you have complied your information it might be helpful to put it all in an Excel Spreadsheet. (there is a very handy file on moodle)

What is the total cost for your meal?

Did you go with the largest size of everything? Why or why not? (think unit cost)

What was the best price for your TV?

Let’s assume you charged the meal and TV on your credit card. What would be the finance charge and the new balanced owed if you did not pay it off at the end of the month. Assume your card has an 18% annual interest rate (Do both unpaid and average daily balance methods)
In this project you will use choose three companies that offer products or services that interest you. You will go online to research the performance of each company’s stock over the past three months. Next you will determine your potential profit or loss. Lastly, create a 3-5 minute presentation.

**Step 1 Do your Research**

- Choose 3 companies that you like or offer products that interest you
- Research the performance of each company’s stock over the last three months. Use the following link [http://www.businessweek.com/magazine/news/articles/business_news.htm](http://www.businessweek.com/magazine/news/articles/business_news.htm) (click on companies and industries tab) There is a resource for corporate data, charts, and profiles for more than 42,000 publicly traded companies and 320,000 privately held companies
- Record the stock prices three months ago, two months ago, one month ago, and currently.

**Step 2 Determine Your Stock Performance**

- If you had $50,000 in each company’s stock three months ago, how many shares could you have purchased then?
- With the initial investment, currently what would be your profit or loss for each stock?
- What is the annual yield of each stock?
- You may find the following link to a spreadsheet application helpful [http://glencoe.mcgraw-hill.com/sites/0078805058/student_view0/unit4/unit_thematic_project_resources.html](http://glencoe.mcgraw-hill.com/sites/0078805058/student_view0/unit4/unit_thematic_project_resources.html)

**Step 3 Develop Your Presentation**

Prepare a presentation about your findings. You may use Power Point, Prezi, or any other presentation mediums make sure the following is met:

- Summarize the performance of the three companies’ stock prices
- Explain why you chose the companies and if their stock performances surprised you
- Share your thoughts on picking stocks yourself as an investment strategy. Why some investors might instead chose to hire a stockbroker?
- With spreadsheet software, create a chart that shows the profit or loss over the past three months had you invested $50,000 in each company’s stock
Finding a Job

Using the internet or local newspaper find three to five ads for employment based on your profile: cars, educational/work background. Be sure to print or cut out your ads. Using what you have learned in this course, calculate the monthly gross and net income. (You may have to use the tax tables in the book and use chapters 1 and 2)

1. What is your job?
2. What is your monthly gross income? (Please show your work)

3. What is your monthly net income? (Please show your work)

Building a budget

The second step of this project is to find a house you can afford. Remember no more than 35% of your total gross monthly income should be used for monthly housing expenses. It is also suggested that no more than 50% of your monthly housing expenses should be used for the mortgage. Calculate your total monthly budget for housing and what should be allocated for the mortgage.

4. What is your budget for monthly housing expenses (according to your monthly gross income)?

5. What is the targeted monthly payment for a mortgage? (Be sure to show calculations)
The Dream House

For the third step, go to www.realtor.com and search for homes in the area. You are looking for a home that fits your profile and budget. The real estate listing will not tell you your monthly payment. So for now you look for something you estimate is in your price range. Find three to five homes that suit your needs and style. Be sure to print out listings. The listings should have the property tax information.

But How Much?

Banks and other lending institutions investigate people before loaning them money. Banks check your salary, your work history and your credit report and the percentage down. Your will be using Durant Bank and Trust to finance your home. In order to qualify for a 5% interest rate you will need very good to excellent credit scores (a score 720 or higher) and at least a 20% down payment. Applicants need to have good credit (score of 660 to 719) and a down payment of at least 10% to qualify for 6% interest loan. If you have poor credit or have less than 5% down payment the interest rate will be 7%.

6. A. What is your credit score?
   B. What is the payment amount and percentage down?

7. What is the interest rate, based on your profile card, do you qualify for?

Now calculate your monthly payment using the apps feature of the graphing calculator or the following formula: Monthly payment = \( \frac{P(1+r)^n}{(1+r)^n-1} \)

P= principal r= rate per payment, that is, divided by 12
n= number of payment, or www.bankrate.com

Assume you are going with a 30 year fixed rate mortgage.

8. What is the cost of your monthly mortgage payment? (Be sure to include all calculations)

9. What is the total amount paid to the lender?

10. How much of this is in interest?

Repeat your calculations using a 15 year fixed mortgage.

11. What is the cost of your monthly mortgage payment? (Be sure to include all calculations)

12. What is the total amount paid to the lender?
13. How much of this is interest?

**Getting Insured**

The fourth step will be to get an insurance quote for your home. Go online and fill out the appropriate information. If you do not feel comfortable call an insurance office to get a quote. Your replacement value will be the actual amount of your mortgage. You are looking at insuring your home for 80% replacement value. You want a 5% deductible.

14. What is the amount of coverage?
15. What are your property, loss of use, and other building coverage?
16. How much are you paying in annual insurance premiums? (Be sure to print out the quote)

**But can I afford it?**

The next step will be looking at calculating your monthly housing expenses. Look at your real estate listing and find the total amount for taxes. We will also assume your estimated utilities are $200/month per 1000 square feet (if you have a home bigger or smaller you will need to set up a proportion) You also have a sprint cell phone with a $69.99 simply everything plans. You pay 7260 per year in water. The cable/internet bill is $99.95 per month.

<table>
<thead>
<tr>
<th>Type</th>
<th>Yearly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable/Internet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortgage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. What are your monthly housing expenses?

18. Does this fit within the maximum of 35% of monthly gross income rule?

If not, you are living outside your means and you need to go back to [www.realtor.com](http://www.realtor.com) and find a similar square foot home for rent. Be sure to print this listing out as well. Renting could be significantly cheaper, you are no longer paying for water, taxes, or insurance. Find a home and recalculate your monthly living expenses if you rented.

We will still assume your estimated utilities are $200/month per 1000 square feet. You also have a sprint cell phone with a $69.99 simply everything plans. The cable/internet bill is $99.95 per month.

<table>
<thead>
<tr>
<th>Type</th>
<th>Yearly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable/Internet</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
19. What are your new monthly housing expenses?
20. Are you now within the 35% budget?
21. If not what are some ways you can make living with in this budget based on your profile card?

Let’s Reflect

Choosing to buy or rent a home depends on many factors. What do you think these factors are?

What type of housing would most likely attracts your personal profile card?

The interest paid on your home mortgage is huge! What are some ways you could eliminate paying so much interest?

Write a paragraph explaining your opinions about the advantages and disadvantages of buying and renting. Please write a paragraph for each (buying and renting)
<table>
<thead>
<tr>
<th>Age</th>
<th>Family</th>
<th>Education and Training</th>
<th>Years of Experience</th>
<th>Down Payment Available</th>
<th>Credit Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>single</td>
<td>high school graduate-no other training.</td>
<td>2 years part-time at a fast-food restaurant.</td>
<td>$9,000</td>
<td>660</td>
</tr>
<tr>
<td>19</td>
<td>engaged</td>
<td>high school graduate &amp; 1 year of computer training</td>
<td>none</td>
<td>$5,000</td>
<td>650</td>
</tr>
<tr>
<td>20</td>
<td>single</td>
<td>junior college graduate — associate degree in restaurant management</td>
<td>4 years part-time in local restaurant</td>
<td>$9,000</td>
<td>700</td>
</tr>
<tr>
<td>21</td>
<td>married</td>
<td>completed an electrician apprentice program</td>
<td>3 years</td>
<td>$9,500</td>
<td>710</td>
</tr>
<tr>
<td>22</td>
<td>single</td>
<td>high school drop-out working on GED</td>
<td>6 years as wait staff</td>
<td>$3,000</td>
<td>610</td>
</tr>
<tr>
<td>23</td>
<td>married with one child</td>
<td>College degree with accounting major</td>
<td>1 year as book keeper</td>
<td>$10,000</td>
<td>720</td>
</tr>
<tr>
<td>Age</td>
<td>Family</td>
<td>Education and Training</td>
<td>Years of Experience</td>
<td>Down Payment Available</td>
<td>Credit Score</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------</td>
<td>-------------------------------------------------------------</td>
<td>-----------------------------------------------------------</td>
<td>-------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>24</td>
<td>married with one child</td>
<td>college degree in communications</td>
<td>4 years part-time as a radio DJ</td>
<td>$9,000</td>
<td>710</td>
</tr>
<tr>
<td>25</td>
<td>single</td>
<td>associate degree with a chef major</td>
<td>5 years as an assistant chef</td>
<td>$10,000</td>
<td>730</td>
</tr>
<tr>
<td>26</td>
<td>engaged</td>
<td>high school graduate with truck driver technical school</td>
<td>2 years at gas station and 5 years as truck driver</td>
<td>$15,000</td>
<td>740</td>
</tr>
<tr>
<td>27</td>
<td>married with 2 children</td>
<td>college degree in banking and finance</td>
<td>2 years as head teller and 3 years as loan officer</td>
<td>$20,000</td>
<td>750</td>
</tr>
<tr>
<td>28</td>
<td>married with no children</td>
<td>college degree in art and design</td>
<td>6 years as designer in an ad agency</td>
<td>$11,000</td>
<td>730</td>
</tr>
<tr>
<td>29</td>
<td>divorced with one child</td>
<td>GED and 1 year of computer training</td>
<td>10 years in data entry</td>
<td>$5,000</td>
<td>660</td>
</tr>
<tr>
<td>Age: 30</td>
<td>Age: 31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family: married with 2 children</td>
<td>Family: married with 3 children</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education and Training: masters in business administration</td>
<td>Education and Training: completed apprentice program in plumbing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of Experience: 5 years as finance officer of small computer firm</td>
<td>Years of Experience: 8 years as an independent plumber</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down Payment Available: $25,000</td>
<td>Down Payment Available: $22,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit Score: 760</td>
<td>Credit Score: 750</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age: 32</th>
<th>Age: 33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: married with 1 children</td>
<td>Family: single</td>
</tr>
<tr>
<td>Education and Training: college degree—major in nursing</td>
<td>Education and Training: completed law school and passed bar exam</td>
</tr>
<tr>
<td>Years of Experience: 8 years</td>
<td>Years of Experience: 9 years experience as public defender</td>
</tr>
<tr>
<td>Down Payment Available: $12,500</td>
<td>Down Payment Available: $21,000</td>
</tr>
<tr>
<td>Credit Score: 730</td>
<td>Credit Score: 740</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age: 34</th>
<th>Age: 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: married with 1 children</td>
<td>Family: married with no children</td>
</tr>
<tr>
<td>Education and Training: teacher with masters degree in education</td>
<td>Education and Training: completed medical school with a residency in pediatrics</td>
</tr>
<tr>
<td>Years of Experience: 12 years</td>
<td>Years of Experience: 5 years</td>
</tr>
<tr>
<td>Down Payment Available: $19,500</td>
<td>Down Payment Available: $15,000</td>
</tr>
<tr>
<td>Credit Score: 730</td>
<td>Credit Score: 720</td>
</tr>
<tr>
<td>Age</td>
<td>Family</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>22</td>
<td>single</td>
</tr>
<tr>
<td>23</td>
<td>married with no children</td>
</tr>
<tr>
<td>24</td>
<td>single</td>
</tr>
<tr>
<td>25</td>
<td>married with no children</td>
</tr>
<tr>
<td>26</td>
<td>married with 1 children</td>
</tr>
<tr>
<td>27</td>
<td>divorced with no children</td>
</tr>
</tbody>
</table>
Age: 28  
Family: married with no children  
Education and Training: high school  
Years of Experience: 10 years at a large copy service  
Down Payment Available: $9,000  
Credit Score: 650

Age: 39  
Family: married with 2 children  
Education and Training: high school diploma and military training  
Years of Experience: retiring after 20 years in the army  
Down Payment Available: $25,000  
Credit Score: 770

Age: 30  
Family: married with 3 children  
Education and Training: high school and associate degree in structures  
Years of Experience: 10 years as a foreman for construction company  
Down Payment Available: $12,500  
Credit Score: 690

Age: 31  
Family: divorced with 1 child  
Education and Training: college degree in business and real estate course  
Years of Experience: 9 years as real estate agent  
Down Payment Available: $13,000  
Credit Score: 700
In this project you will create a marketing presentation for the CEO of Monster. The new drink is called “Burst” and is a low carb, low calorie, healthy energy drink based on your market research and analysis; you will make suggestions on how best market this product to students.

**Step One  Do your Research**

- Research competing energy drinks and list the three you believe to be the closest competitor.
- Consider the best media outlets for promotion. List the three outlets you would expect to reach the greatest number of students (give reasons for your choices)
- Use the Internet to research opinion surveys. Look for tips on writing effective questions

**Step Two  Explore your Community**

Write a 10 question opinion survey for your classmates and collect their answers. How often do they purchase Monster or its competitors? Which energy drink flavors and brands do they prefer?

When writing your survey question make sure the questions lead to clear, measurable results (sometimes multiple choices is good)

**Step Three  Calculate Sales Potential**

- Calculate the sales potential for this product among the student in your entire school (assume there are 1400 students here)
- Analyze the competitiveness of your product
  (Use the results from your surveys to calculate sale potential and market share)

**Step Four  Develop Your Marketing Presentation**

Prepare a report of your findings using the following tools

- Use Microsoft word, Google Docs, etc to write a 2 page report
  ✓ Describe the demographics represented by your school’s student body
  ✓ Explain the energy drink consumption of students at RHS
  ✓ Summarize the sales potential and competitive landscape
  ✓ Identify the benefits and features of your product
  ✓ Based on the results of your opinion survey, suggest a new flavor or type that students would like to see offered
  ✓ Make recommendation for promotional activities directed at students at RHS
- Using Prezi, PowerPoint, Google Doc, etc create a 5 slide presentation for the CEO of Monster.
  Include a pie chart or bar graph of the opinion survey results

**Step Five  the Advertising**

Create a script and storyboard for a 30 second television commercial for your new product (A storyboard is a series of panels showing rough drawings of scenes) Present this commercial by acting out in class (using props), actual videotaping, or simply sharing your script and storyboard
Your Budget Project will require you to create a “Summer Vacation” Budget.

**Project Scenario:** You are a senior in high school and you are planning to go away for the summer of 2011. To go away on your summer trip, you have saved $1,500 from your summer job and your after school part-time job. You may go alone or with one other friend on your summer trip. You are not sure where you are going but you are definitely not staying in New Jersey. You must be gone for a minimum of 5 nights. Under this scenario you are allowed to rent a car.

**Project Requirements:**

**Due Date:** Friday June 3, 2011

**Budget Spreadsheet:** You are required to submit a budget spreadsheet in Microsoft Excel. The spreadsheet will include your income ($1,500 saved from your summer and part-time job) and outflows, (Fixed and Variable Expenses). Your fixed expenses may include a car rental, lodging, plane fare, etc. Variable expenses may include food, entertainment, etc. Be as specific as you can be in all of your expenses.

**Spring Break Description:** You are required to submit at least 5 slides, including pictures, of what your summer vacation 2011 Budget includes. If you are flying, tell me what airline, what flight, destination and roundtrip cost? If you are renting a car, what rental company are you using, what type of a car, what is the cost? What do you plan on spending for meals for breakfast, lunch, dinner and snacks….are there particular places you are going to eat? Entertainment: Do you plan to see shows, rent jet skis, or go to an amusement park? What is the cost for your entertainment? You are to provide as much detail as possible about your budget and your vacation. List the sources that you obtained your information from. Provide web site information in which you gained your information.
Insurance is all about protecting you from financial disaster in case of theft, fire, injury, or other calamity. But what if you make your living doing something unusual? Can you buy insurance to protect the parts of your body responsible for your success? You can. Surgeons routinely insure their hands, and performers insure whichever part of their body is most valuable. "Lord of the Dance" Michael Flatley bought leg insurance. Bruce Springsteen insured his voice for $6 million, and British food critic Egon Ronay has insured his taste buds for $400,000.

When it comes to the oddest insurance policies, though, everyday people take the prize. They are the ones buying the Alien All Risks policy offered by London-based insurance company Goodfellows. The policy applies if an alien abducts you or inserts a microchip into your body. Half the policies are bought as jokes, but the other buyers are serious, says Goodfellows managing partner Simon Burgess.

Goodfellows also insures people against being attacked by the Loch Ness Monster or Bigfoot, and offers policies that will protect you from financial ruin in case you are transformed into an alien, werewolf, or vampire. You can even purchase a policy that will help support your family if you are killed by a ghost or poltergeist.

Some insurance policies are taken out by people who seem extremely optimistic about their future. For example, Japanese golfers purchase "hole-in-one" insurance. In Japan, whoever gets a hole in one is expected to send gifts to all his or her friends, a custom that can end up costing thousands of dollars. It takes a confident golfer to buy hole-in-one insurance, considering that the odds of an amateur making a hole in one are 1 in 12,000. Meanwhile, optimistic British employers buy insurance to protect the company in case two or more employees win the UK national lottery and decide to quit their jobs.

Insurance policies are available to protect people against their own personalities. The comedy team Abbott and Costello had a policy that would pay benefits if they had an argument and refused to work with each other. Finally, the People's Insurance Company of China offers married couples a policy that encourages them to work out their differences: If they divorce, they lose all their premiums, but if the marriage lasts 25 years, they get a big payout.

- Make a list of five historical figures and the body parts that you think each would have found the most valuable to insure. For each figure, write a sentence explaining your choice.
Investing in stocks always involves some risk, so it makes sense to research a company before you buy shares of its stock. Invest prudently, and you should see a decent return on your investment. Some people, however, view the stock market as a kind of lottery—if only you could figure out what the next Starbucks, Google, or Microsoft was going to be, you could buy the stock and strike it rich. When a lot of people decide that a certain company is the next big thing, the price of that stock can go up so high that it is hard to tell how much the company is actually worth. This effect is called a bubble. Unfortunately, what goes up usually comes down, leaving a lot of investors broke. This is called a crash. While Starbucks, Microsoft, and other legendary companies did make early stockholders very wealthy, those instances are rare.

The most dramatic stock bubble of all time took place more than three centuries ago and involved a simple flower. In 1593, tulips were first brought to Holland from Turkey. They soon became very popular collector's items among the upper classes. At that point tulips were pricey, but no more so than other fads enjoyed by the rich. After a few years, tulips that were cultivated by the Dutch contracted a virus that caused their petals to "flame," or turn multicolored. The flames made tulips even more expensive, depending on the rarity of the colors.

In 1634, tulip prices began to soar to unreasonable heights. The Dutch were convinced that other Europeans would love tulips as much as they did, and that the price of the flowers would never decline. In fact, there was a wave of "tulipmania" in England and France, but it never reached the level it did in Holland, where much of the
population, even the poor, neglected traditional industries and investments and got caught up in the tulip trade.

In 1637 a few smart, upper-class investors figured that the price of tulips could not rise forever. Understanding how markets rise and fall, they decided to hold on to their money and stop buying and selling tulips. Prices began to fall immediately, and panic struck. People who had agreed to buy bulbs at a particular price now decided to hold on to their money. The Dutch courts refused to get involved, stating that bulb-trading was nothing more than gambling. People who sold their bulbs at the beginning of the crash managed to recover their assets, but those who moved too slowly were ruined. The nation as a whole suffered because so many citizens lost not only their savings but also their homes and businesses.

The Dutch never forgot the lessons of tulipmania, yet their love for tulips was clearly genuine. Today, tulip production contributes more than $750 million to the Dutch economy each year, and over nine billion tulip bulbs are produced annually—seven billion of them exported to other countries.

- Imagine you have $2,000 in a savings account. A friend advises you to use the money to buy stock in a hot new computer company, saying that they make a product that is going to be a huge seller in the near future. Write a short paragraph explaining whether you would buy the stock or invest more cautiously.
The Game of Life® vs. LIFE

In *The Game of Life®,* players start out with a set amount of money and travel along the game board in little plastic cars—“experiencing” life by following directions on cards with life events on them. The winner is the player with the most money at the end of the game. In real life, random cards do not determine your life—you do. One of the most important skills you need for success is to be able to set up and live within a realistic budget. You will create--

- An Excel Monthly Budget Worksheet AND
- A PowerPoint / Prezi Presentation which explains and justifies your choices

**In order to complete the tasks, you must:**

1. Complete the *Career Cruising* activity in order to determine your career
2. Use your career choice to determine the *Life Scenario* you will follow
3. Research all components of the criteria
4. Determine and justify all expenditures
5. Complete the *Excel Monthly Budget Worksheet*, ending with a ZERO or overage balance
6. Complete a *PowerPoint/Prezi Presentation* according to all requirements

You are to create a detailed, realistic personal finance plan (budget). The required components of your finished product are:

- A PowerPoint/Prezi presentation to include—
  - Title page slide (beginning slide)
  - Information requested — see *Criteria sheet* — and the source of the specific information by copying and pasting the URL in the notes section of each slide. (or a separate citation sheet if using prezi) Be sure to label/designate what each URL refers to.
  - Rationalize your decisions on each slide
  - Pictures of specific expenditures (car, housing, personal expenses, etc.)
  - Reflections and final thoughts slide
- Excel budget spreadsheet (template will be provided)

**Step #1:**
- Download the Excel template to your u drive/dropbox/ etc

**Step #2: Career Cruising** – [www.careercruising.com](http://www.careercruising.com) your login is roosevelths use bears for password

  You must print out the report and have your choice approved me
  - pay scale for state of residence
  - job availability for chosen state
  - education requirements for chosen job
  - career path

**Step #3:** Complete the *Scenario Worksheet.* ONLY YOU HAVE DECIDED ON YOUR CAREER, YOU ARE NOW READY TO BEGIN INFORMATION GATHERING!
Scenario Worksheet

You have selected your occupation and determined your state of residence. You will use the starting salary provided by Career Cruising under the section Career Futures - Looking at Occupations and find the starting pay. Using the information complete the scenario that applies to your situation:

Scenario #1: Post-Secondary Graduate: You have just graduated from college (2-year, 4-year, master’s program) or a training/licensing program and have landed an entry-level job in your career track. You currently have $5,000 in your savings account (thanks to those generous graduation gifts). You need to research and create a detailed personal finance plan (budget) using all the categories listed on the Criteria Page PLUS you have monthly student loan payments:

- $250 if you’ve completed 5+ years of college
- $150 if you have completed 4 years of college
- $100 if you have completed 2 years of college
- $50 if you have completed training/licensing program

Your Job: Education required:

Annual salary: $_______ ÷ 12 = monthly salary $_______ (You must put monthly salary in Excel worksheet)

You will live in (city & state):

Scenario #2: Workforce

You have just graduated from high school and have chosen to begin work rather than go to college at this time. Thanks to generous parents, friends, and relatives, you have $5,000 in your savings account. You need to research and create a detailed personal finance plan (budget) using all the categories listed on the Criteria Page.

Your Job: You will live in:

Annual salary: $_______ ÷ 12 = monthly salary $_______ (You must put monthly salary in Excel worksheet)
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4 = 100%</th>
<th>3 = 85%</th>
<th>2 = 70%</th>
<th>1 = 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Covers topic in-depth with details and examples. Subject knowledge is excellent.</td>
<td>Includes essential knowledge about the topic. Subject knowledge appears to be good, but there are 1-2 factual errors</td>
<td>Includes essential information about the topic but there are 3-4 factual errors.</td>
<td>Content is minimal OR there are 5 or more factual errors.</td>
</tr>
<tr>
<td>NOTE:</td>
<td>CONTENT IS COUNTED TWICE!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>Content is well organized using headings and appropriately used bulleted lists to group related material.</td>
<td>Uses headings and bulleted lists to organize, but the overall organization of topics appears flawed.</td>
<td>Content is logically organized for the most part.</td>
<td>There was no clear or logical organizational structure, just lots of facts.</td>
</tr>
<tr>
<td>Rationalization</td>
<td>All decisions are fully explained and justified. Impact of choices has been explicitly addressed.</td>
<td>Explained and justified most decisions. Some impact has been considered.</td>
<td>Explained and justified some decisions.</td>
<td>Very few if any decisions were explained and/or justified.</td>
</tr>
<tr>
<td>Attractiveness</td>
<td>Makes excellent use of font, color, graphics, effects, etc. to enhance the presentation.</td>
<td>Makes good use of font, color, graphics, effects, etc. to enhance the presentation.</td>
<td>Makes use of font, color, graphics, effects, etc. but occasionally these detract from the presentation content.</td>
<td>Use of font, color, graphics, effects etc. but these often distract from the presentation content.</td>
</tr>
<tr>
<td>Requirements</td>
<td>All requirements are met and exceeded.</td>
<td>All requirements are met.</td>
<td>One requirement was not completely met.</td>
<td>More than one requirement was not completely met.</td>
</tr>
<tr>
<td>Mechanics</td>
<td>No misspellings or grammatical errors.</td>
<td>Three or fewer misspellings and/or mechanical errors.</td>
<td>Four misspellings and/or grammatical errors.</td>
<td>More than 4 errors in spelling or grammar.</td>
</tr>
</tbody>
</table>
JOB / INCOME

Go to Career Cruising

Take the interactive Career Matchmaker

Explore your options from the results; use income found under Earnings and Career Path

HOUSING

APARTMENTS

APARTMENT GUIDE - USE ADVANCE SEARCH TO SPECIFY PROPERTY FEATURES (EG: INCLUDE HEAT, ELECTRICITY, ETC.).

CRAIGSLIST - FIRST CLICK ON YOUR STATE, THEN YOUR CITY/AREA AND THEN CLICK ON APTS/HOUSING UNDER HOUSING; THESE ARE APTS IN HOUSES AS OPPOSED TO APARTMENT COMPLEXES.

Rent.net: Apartments - search by city or zip code; modify by amenities, broaden by searching around an area.

GAS / ELECTRIC

Natural Gas Statistics - average consumer prices and expenditures (BASED ON 6 MONTHS SO BE SURE TO DIVIDE BY 6 FOR YOUR MONTHLY AMOUNT).

ELECTRIC POWER MONTHLY - AVERAGE RETAIL PRICE BY STATE-OFFICIAL ENERGY STATISTICS FROM THE US GOVERNMENT (BASED ON ELECTRICITY USE OF 600 KILOWATT-HOURS PER MONTH PER FEDSTATS • USA.GOV • DEPT. OF ENERGY). THIS GIVES YOU THE COST IN CENTS PER KILOWATT HOUR. GO TO http://www.consumerspower.org/home_energy/billestimator.php TO ESTIMATE HOW MANY KILOWATT HOURS YOU WILL USE.

INSURANCE

Renter's Insurance - Geico's will do an online quote--select your state, put in your zip code and follow the prompts. (IF YOU LIVE IN FLORIDA OR NORTH CAROLINA, THIS LINK WILL NOT WORK FOR YOU. SEE ME.)

Telephone

Frontier Online - local Rochester telephone services--products and pricing.

AT&T - check out local phone costs and long distance plans.

Bell Telephone - select your area and look at residential new phone service costs.

Mobileburn - compares U.S. wireless phone plans.

Satellite/Cable

Time Warner - click on TimeWarner Cable, AOL for online services, Roadrunner and more; you'll need the zip code to search for prices in your area.

Direct TV - satellite cost per month.

TRANSPORTATION

FINDING A CAR

Edmunds Automobile Info - new and used car information from Edmunds.com; information on financing and insurance.
Cars.com - new and used car information; financing and insurance information.
AutoTrader - new and used cars; car loans and insurance.

**LOANS**
capital one bank - go here first to get the loan rate (APR)
Auto Loan Calculator - calculate your approximate monthly payments for your car.
Remember: Car websites offer insurance AND loan information, too.

**AUTO INSURANCE**
Auto Insurance - calculate your annual premium using Yahoo!Finance.
Auto Insurance - "ballpark" quote for insurance from Allstate, just respond to the prompts.
Remember: Car websites offer insurance AND loan information, too.

**COLLEGE LOANS**
This is determined for you in your task:
- $250 if you've completed 5+ years of college
- $150 if you have completed 4 years of college
- $100 if you have completed 2 years of college
- $50 if you have completed training/licensing program

**SAVINGS / INVESTMENTS**
5% of your net pay is automatically deposited.

**ESSENTIALS**

**Food**
NetGrocer.com - create a typical grocery list and check out prices; also has prices for health & beauty needs.
My Grocery Checklist - quick checklist helps your remember all the items you may need; compile your list and then go to NetGrocer.com for pricing.

Insurance - click on links below provided by Yahoo! for quick estimates:
- Renter
- Auto
- Dental
- Term Life - search by zip code for free quotes from Our Health Agent
- Health - see Scenario sheet

**NON-ESSENTIALS**

**Phone**
Cell Phone Service Plans - compare wireless phone plans
Wireless Plans Reviews: Product Reviews Cell Phone Comparison Reports - ConsumerSearch reviews cell phone plans and costs

Magazines
Discount Magazine Subscriptions - magazine subscription prices

Amazon Magazine Subscription - use the drop down menu under Search, click on magazines - look for magazine subscriptions by title or subject

Movies

Movie Tickets - price movie tickets online through Fandango

NetFlix - monthly video plans; click on How much does it cost? (first question under FAQ sidebar to right)

MISCELLANEOUS

Search on your own:
**Location** - Where are you going to live (city and state) and why did you choose this location?

**Job/Income** – Job title, starting salary (annual ÷ 12), benefits

**Housing** – No Roommates!

a. Apartment: (studio, 1 or 2 bedroom)

b. Rent

c. Security deposit

d. Utilities – (heat, electric, water, garbage pick up)

e. Renter’s insurance (You must have!)

**Transportation** – You must purchase or lease a vehicle, new or used (no more than 3-4 years old) and purchased from a dealer.

f. Make, model and year

g. Purchase price

h. Terms of loan: years and interest rate

i. Monthly payments

j. Auto insurance (company and cost)

k. Deduct $30/m for car repairs

l. Gas - figuring 1,000 miles a month, calculate your gas consumption based

m. If you live in a large city (NYC, Boston, or Washington DC) and choose public transportation, deduct $65/m for an unlimited pass

**Essentials** – These are things that are a must. You have to have some money set aside for them, but the actual amount may vary per person.

n. Food – groceries (breakfast, lunches, dinners, snacks) everyday household products/cleaning supplies and dining out.

Are you bringing lunch to work or eating out?
- How about coffee and a bagel in the morning?

Fast food once a week? What about weekends?

o. Medical Insurance – See Scenario Worksheet to help determine your insurance

1. • Health Insurance cost

   • Physician co-pay ($15 per visit)

   • Rx’s – co-pays generally $5 per prescription each time it is filled.

p. Dental

   • Insurance cost

   • Dental cost (insurance covers all cleanings and x-rays; you still need to pay a % for fillings, root canals, crowns, orthodontia, etc.)

q. Clothing – a professional occupation needs appropriate clothing.

   • Does your job require a uniform? You usually have to pay some of the cost.

   • Shoes/sneakers/coats/swimsuits/underwear etc.

r. Health and Beauty (just the basics)

s. Household/Cleaning supplies

**Non-Essentials** – These are optional, your choice:

v. Pager/Cell phone

w. Gifts – Birthdays, Christmas

x. Hair Cuts – hair cuts, coloring, perms, straightening etc.
Health Benefits:

To make it easier for you, we have figured out what a basic, single, health coverage would be (this does not include dental).

- Union job (blue or white collar) – $60.82/month
- White Collar non-union job – $174.77/month
- Entrepreneur, blue collar worker with no union, attorney or doctor in own practice - $287/month

Remember to consider how often you need to go to determine monthly amount

y. Other beauty – tanning, manicures, pedicures, etc.

z. Pets – food, litter, snacks, toys, vet

aa. Subscriptions – magazines, newspapers.

bb. Memberships – health club, AAA ???

c. Entertainment – What do you do during your free time and on weekends? Vacations? Movies, video and game rentals?

dd. Internet

ee. Cable/Satellite

ff. Donations – religious, humanitarian ???