

WAMC Lab Template

Math Concept(s)

- Create equations that describe numbers or relationships
- Solving systems of equations by graphing

Source / Text: Cord Algebra 1 (Chapter 8, Section 1)

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Attach the following documents:

Lab Instructions: See attached

Student Handout(s): See attached

Rubric and/or Assessment Tool:

- Formative Assessment is a three question exit ticket asking them to analyze a graph of a system of equations.
- Summative Assessment is three contextual questions involving two variable systems of equation and solving them.

Short Description (Be sure to include where in your instruction this lab takes place):

Lab Plan

Lab Title: Shape It Up

Prerequisite skills:

- Write an equation in slope-intercept form from a contextual situation.
- Evaluate a function for a given input value.
- Plot points on a coordinate system.
- Label axes of a coordinate system.

Lab objective:

1. Given a contextual situation, write an equation in slope-intercept form.
2. Construct a table of values by choosing function inputs (domain) and calculating function outputs (range).
3. Plot points from the table of values on a coordinate system.
4. Identify y-intercepts, slope, and intersection points from multiple representations (context, equation, table of values and graph) and interpret their contextual meaning.
5. Explain which plan would be most cost effective at different months.

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Standards:

CCSS-M:

- A.CED.2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A.REI.6 - Solve systems of linear equations exactly and approximately (e.g., with graph), focusing on pairs of linear equations with two variables.

Standards for Mathematical Practice:

- 1 - Make sense of problems and persevere in solving them.
- 4 - Model with mathematics.
- 5 - Use appropriate tools strategically.
- 6 - Attend to precision.

State Standards addressed (2008 Washington State Mathematics Standards):

- A1.1.C-Solve problems that can be represented by a system of two linear equation or inequalities.
- A1.4.D-Write and solve systems of two linear equations and inequalities in two variables.

Reading:

- N/A

Writing:

- N/A

Leadership/21st Century Skills:

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input checked="" type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input checked="" type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<u>Accountability</u>
<input checked="" type="checkbox"/> Think Creatively	<input checked="" type="checkbox"/> Access and Evaluate Information	<input type="checkbox"/> Adapt to Change	<input checked="" type="checkbox"/> Manage Projects
<input checked="" type="checkbox"/> Work Creatively with Others	<input checked="" type="checkbox"/> Use and manage Information	<input type="checkbox"/> Be Flexible	<input checked="" type="checkbox"/> Produce Results
<input type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<u>Leadership and Responsibility</u>
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input checked="" type="checkbox"/> Manage Goals and Time	<input checked="" type="checkbox"/> Guide and Lead
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input type="checkbox"/> Work Independently	<input checked="" type="checkbox"/> Others
<input checked="" type="checkbox"/> Use Systems Thinking	<u>Information, Communications and Technology (ICT Literacy)</u>	<input checked="" type="checkbox"/> Be Self-Directed Learners	<input checked="" type="checkbox"/> Be Responsible to Others
<input checked="" type="checkbox"/> Make Judgments and Decisions	<input type="checkbox"/> Apply Technology Effectively	<u>Social and Cross-Cultural</u>	
<input checked="" type="checkbox"/> Solve Problems		<input checked="" type="checkbox"/> Interact Effectively with Others	
<u>Communication and Collaboration</u>		<input checked="" type="checkbox"/> Work Effectively in Diverse Teams	
<input checked="" type="checkbox"/> Communicate Clearly			
<input checked="" type="checkbox"/> Collaborate with Others			

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Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Gridded Flip Chart
- Colored Sticky Dots
- Colored Markers
- Meter Stick
- Scientific/Graphing Calculator

Set-Up Required:

- Pre-Label Coordinate System on Gridded Flip Chart
- Hang Pre-Labeled Coordinate System on Gridded Flip Chart on Wall
- Hang a Gridded Flip Chart Labeled Key
- Divide Colored Sticky Dots into Groups of 20
- Have Colored Markers Available that Match Colored Sticky Dots

Lab Organization Strategies:

Grouping/Leadership/Presentation Opportunities:

- Pre-assigned groups with mixed ability and understanding of linear equations

Cooperative Learning:

- Within each group,
 - Students will work together to create the cost equation for their health club plan
 - Students will work together to create their table of values for the health club plan costs
 - Students will help each other plot the points on the coordinate plane and draw their cost equation line
- Within the class, each group is responsible for their equation which is one-sixth of the class graph and allows each group to answer the last three questions on the lab

Expectations:

- Students talk using mathematical language as they solve their equation and create their table of values and graph
- Students help other members of their group understand the concepts and mathematics being used to answer each question
- Students will contribute to the class discussion and debrief about the lab results

Timeline:

- 50-minute lab
 - 10-minutes of groups work to write equation and create table of values
 - 5-minutes to plot points and draw graph
 - 25-minutes to find point of intersection and explain what each point means and answer questions at the end of the lab
 - 10-minutes to debrief lab as a class

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab:

Businesses are constantly looking for solutions that will reduce costs and conserve resources.

- Scientists write and solve systems of equations to determine how one set of conditions in an experiment or an environment affects an outcome.
- Business Owners use systems of equations to determine the cost of products or services they sell and to find break even points when revenue equals or exceeds those costs.
- Pharmacists use systems of equations to mix prescriptions to the appropriate strength.
- Bank Officers utilize systems of equations to establish the cost differences in payment plans.
- Consumer Advocates write and solve systems of equations to figure out which companies offer a better value.

Career Applications

- Scientists
- Business Owners
- Pharmacists
- Bank Officers
- Consumer Advocates and/or Consumers

Optional or Extension Activities

Battleships and Mines Game

- You are navigating a battleship during war games. Your course will take you across several enemy shipping lanes. Your mission is to lay mines at the points where you cross the enemy lanes. The enemy shipping lanes are represented by the following equations:
 - Enemy # 1: $x + 3y = 42$
 - Enemy # 2: $10y - 2x = 20$
 - Enemy # 3: $3x - 8y = -40$
- Assign each group a different battleship and represent its course by an equation:
 - Battleship # 1: $y - x = 1$
 - Battleship # 2: $4x + y = 17$
 - Battleship # 3: $8y = 5x$
 - Battleship # 4: $2x + y = 20$
 - Battleship # 5: $4x + 7y = 405$
 - Battleship # 6: $-12x - 7y = -154$
- Each group will calculate the points where their battleships cross the path of each enemy ship and mark that point on the class graph on the wall or floor.
- After all groups have “dropped their mines”, use a meter stick or string to check the classes work since each line of mines will form a line which is the enemy ship’s path.

Learning Target:

1. Given a contextual situation, write an equation in slope-intercept form.
2. Construct a table by choosing function inputs and calculating function outputs.
3. Plot points from the table on a coordinate system.
4. Identify y-intercepts, slope, and intersection points from multiple representations (context, equation, table and graph) and interpret their contextual meaning.
5. Explain which plan would be most cost effective at different months.

Materials Needed:

- Group of four
- 20 colored sticky dots
- Matching color marker
- Scientific/Graphing Calculator

Health Club Membership Options**A. Vision Quest Fitness Membership**

- \$40.00 enrollment fee (one time)
- \$60.00 processing fee (one time)
- \$25.00 per month charge

B. Vision Quest Regular Membership

- \$25.00 enrollment fee (one time)
- \$50.00 per month charge

C. CrossFit Results Plus Membership

- \$40.00 enrollment fee (one time)
- \$60.00 processing fee (one time)
- \$35.00 per month charge

D. CrossFit Basic Membership

- \$25.00 enrollment fee (one time)
- \$40.00 per month charge

E. LA Fitness Full Fitness Membership

- \$75.00 enrollment fee (one time)
- \$35.00 per month charge

F. LA Fitness Introduction Fitness Membership

- \$75.00 enrollment fee (one time)
- \$25.00 per month charge

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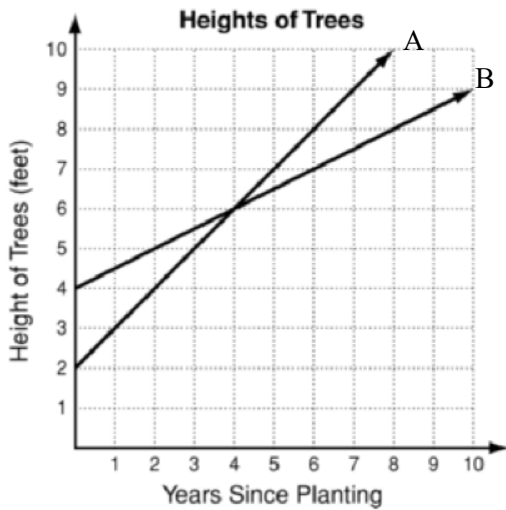
Lab Instructions

- Each group will be assigned one of the above six health club memberships
- Each group then needs to
 - Write the linear equation that represents the cost of the health club membership
 - Complete a table of values for the cost of belonging to the health club for zero to twenty months
 - Take their colored sticky dots and place them on the coordinate system for each ordered pair from their table of values
 - Use the meter stick and their colored marker to draw the line that represents the linear equation of their cost equation
 - Record on the key page for the graph what the equation of their cost equation and plan name in its color
 - Record the slope and y-intercept of their cost equation and explain what the slope and y-intercept represent for their cost equation
- After all groups have plotted their points and drawn their line that represents the linear equation of their cost equation, each group needs to
 - Find and record the point where each set of lines intersect and write the two equations that form the intersection
 - Explain what the point represents
 - Explain which of the two plans would be most cost effective depending on how long they planned to be members of each health club that has a point of intersection

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Use the following graph about two trees to answer the questions:



1.) How many years after planting will the two trees be the same height? What will that height be?

2.) During what years after planting will tree A be taller than tree B?

3.) During what years after planting will tree B be taller than tree A?

Kingston Applied Math Council

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Show all work for full credit!!

1. Christiana and Marlena opened savings accounts on the same day. Christiana opened her account with \$150 and plans to deposit \$10 every month. Marlena opened her account with \$30 and plans to deposit \$15 every month. At how many months will their two accounts have the same amount of money? How much money will they have at that point?

Use the chart below to answer question #2.

Dried Fruit Price List			
Pineapple	Apple	Mango	Papaya
\$7.50/lb	\$7.00/lb	\$8.00/lb	\$7.25/lb

2. A customer bought 5 pounds of mango and papaya for \$37.75. How many pounds of each fruit did the customer buy?

3. Sam needs to make a long-distance call from a pay phone. With his prepaid phone card, he will be charged \$1.00 to connect and \$0.50 per minute. If he places a collect call with the operator, he will be charged \$3.00 to connect and \$0.25 per minute. In how many minutes will the phone card and the collect call cost the same?

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