GEORGIA MIDDLE SCHOOL Instructional Resources

CAREER, TECHNICAL, & AGRICULTURAL EDUCATION

BUSINESS & COMPUTER SCIENCE

COURSE: Business & Computer Science

UNIT 4: Linear Equations and Slopes

INTRODUCTION

Annotation:

This unit includes lessons to help students demonstrate understanding in the use of linear algebra to represent, analyze and solve problems. Upon completion of this unit, students will use equations, tables, and graphs to investigate linear relations and functions, paying particular attention to slope as a rate of change.

Grade(s):

	6th
	7th
X	8th

Time:

5+ hours

Author:

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Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided appropriately. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation. Many students (both with and without disabilities) who struggle with reading may benefit from the use of text reading software or other technological aids to provide access to printed materials. Many of these are available at little or no cost on the internet.

FOCUS STANDARDS

GPS Focus Standards:

MSBCS-BCSII-3. **Student will examine educational requirements, job responsibilities, employment trends, and opportunities in the different career pathways in Business and Computer Science.**

a. Investigate the 21st Century career opportunities.
b. Evaluate several occupational interests, based on various criteria (educational requirements, starting salaries, trends, opportunities, and career ladders.)

MSBCS-BCSII-5. **Student will utilize spreadsheet skills.**

a. Identify uses of spreadsheet software and careers related to spreadsheet.
b. Identify and explain spreadsheet terminology.
c. Create and save basic spreadsheets and apply formulas related to business and computer science careers.
d. Retrieve, edit, manipulate, and print various spreadsheets.
e. Create various charts/graphs from spreadsheets.

GPS Academic Standards:

M8A1. **Students will use algebra to represent, analyze, and solve problems.**

a. Represent a given situation using algebraic expressions or equations in one variable.
b. Simplify and evaluate algebraic expressions.
d. Solve equations involving several variables for one variable in terms of the others.
e. Interpret solutions in problem contexts.

M8A4. **Students will graph and analyze graphs of linear equations and inequalities.**

a. Interpret slope as a rate of change.
b. Determine the meaning of the slope and y-intercept in a given situation.
c. Graph equations of the form $y = mx + b$.
d. Graph equations of the form $a + by = c$.
f. Determine the equation of a line given a graph, numerical information that defines the line or a context involving a linear relationship.
g. Solve problems involving linear relationships.

M8A5. **Students will understand systems of linear equations and inequalities and use them to solve problems.**

a. Given a problem context, write an appropriate system of linear equations or inequalities.
b. Solve systems of equations graphically & algebraically, using technology as appropriate.

M8P1. **Students will solve problems (using appropriate technology).**

c. Apply and adapt a variety of appropriate strategies to solve problems.

M8P4. **Students will make connection among mathematical ideas and to other disciplines.**

a. Recognize and use connections among mathematical ideas.
c. Recognize and apply mathematical in contexts outside of mathematics.

MCR. **Students will enhance reading in all curriculum areas by:**

c. Building vocabulary knowledge.
- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

National / Local Standards / Industry / ISTE:

MSBCS-BCSII-3. Student will develop and apply basic spreadsheet skills.

MSBCS-BCSII-5. Students will utilize spreadsheet skills.

UNDERSTANDING & GOALS

Enduring Understandings:

- To understand linear equations, students need to understand and be able to demonstrate graphing points. Therefore, students should understand and demonstrate the difference between horizontal and vertical, in regards to a coordinate plane. In addition, students should be able to label/number the coordinate plane, and identify the y-axis and x-axis.
- Points can be anywhere on the coordinate plane, and students should be able to give the exact address of a point. Students should also be able to identify which quadrant a point is located.
- The use of linear equations is utilized on a day-to-day basis and in various careers. Students should be able to research and identify careers utilizing linear equations and briefly describe how linear equations are used in that career.
- To find plot points, students should be able to draw, label and compute input (x-values) and output (y-values) for a T-chart.
- When solving for the slope, students should be able to come up with the equation of the line, even when only pieces of information is given.

Essential Questions:

- Demonstrate the difference between horizontal and vertical by drawing a coordinate plane.
- Explain how to use the coordinate plane to give the exact address of a point.
- Which direction(s) are indicated by a negative sign?
- Which direction(s) are indicated by a positive sign?
- What is a quadrant? How many quadrants are there? How is each quadrant represented?
- Explain the contents of each quadrant. What coordinates will be found in each quadrant?
- What is a linear equation?
- Explain and demonstrate the x-intercept and y-intercept.
- Give some examples of how the use of linear equations go beyond every-day problem solving. Name at least three (3) careers that you are interested in, which use linear equations. Can you give at least one (1) example of how this job/career utilizes linear equation skills?
- What is a T-chart? Demonstrate drawing a T-chart and how it is used in graphing linear equations.
- Explain how the values of x are selected and at least how many should be selected. Why? Explain and demonstrate in which situation(s) you should pick x-values that are multiples of three (3).
- What is a scale and demonstrate how it should be labeled?
- Demonstrate plotting computed T-chart points.
- In what situation will the graph always be a horizontal line? Explain.
- In what situation will the graph always be a vertical line? Explain.
- What is the formula for the slope-intercept form?
- In the equation y = mx + b, what does each variable represent?
- Explain and demonstrate what should be done when an exercise only gives ‘pieces’ of information about a line.
- What is the slope formula?

- Explain why it does not matter which point you choose to 'plug-in' when finding the line of an equation.

Knowledge from this Unit:

- Understand coordinate planes.
- Understand address of a point.
- Understand how linear equations are used in every day living.
- Understand the use of linear equations beyond every day living.
- Understand T-charts.
- Understand the formula for computing the slope.
- Understand finding the equation of a line that passes through two points.
- Understand graphing points using 'stair-stepping'.
- Understand creating a data table in Excel.
- Understand the purpose of formulas in Excel and how they are applied.
- Understand chart types.

Skills from this Unit:

- Demonstrate drawing and labeling coordinate planes and quadrants.
- Demonstrate identifying exact address points.
- Identify and research various careers which use linear equations.
- Demonstrate drawing, labeling, and computing T-chart values.
- Demonstrate using the formula for computing the slope.
- Demonstrate using the formula(s) for finding the equation of a line.
- Demonstrate graphing points and using 'stair-stepping'.
- Demonstrate creating and formatting a data table in Excel.
- Demonstrate applying/inserting Excel formulas for computing the slope and y-values.
- Demonstrate creating a 'scatter' chart displaying the graphing of pairs of linear equations.
- Demonstrate formatting an Excel chart.

ASSESSMENTS

Assessment Method Type:

____ Pre-test
X Objective assessment - multiple-choice, true- false, etc.
  X Quizzes/Tests
  X Unit test
____ Group project
X Individual project
____ Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
  X Self-check rubrics (written direction sheet)
  __ Self-check during writing/planning process
  __ Journal reflections on concepts, personal experiences and impact on one's life
  __ Reflect on evaluations of work from teachers, business partners, and competition judges
  __ Academic prompts
  X Practice quizzes/tests
____ Subjective assessment/Informal observations
  __ Essay tests
  X **Observe students working** (with partners **or** without partners)
  __ Observe students role playing

_____ Peer-assessment
__ Peer editing & commentary of products/projects/presentations using rubrics
__ Peer editing and/or critiquing
_____ Dialogue and Discussion
__ Student/teacher conferences
__ Partner and small group discussions
X_ Whole group discussions
__ Interaction with/feedback from community members/speakers and business partners
_____ Constructed Responses
__ Chart good reading/writing/listening/speaking habits
X_ Application of skills to real-life situations/scenarios
_____ Post-test

Assessment(s) Title:

Objective Assessment #1:	**Graphing Quiz**
Objective Assessment #2:	**Graphing Linear Equations**
Project Assessment Part 2:	**Create An Excel Data Table**
Project Assessment Part 3:	**Create An Excel 'Scatter' Chart**
UNIT Assessment:	**Linear Equations**

Assessment(s) Description/Directions:

Objective Assessment #1 consists of coordinate points lettered and plotted on a coordinate plane. Students are given the points in 'random' form and asked to identity/match the numbered coordinate points with the correct letters.

Objective Assessment #2 consists of equations where students are asked to (1) complete the T-chart of ordered pairs; (2) graph the points; and (3) connect the dots. The x-values are given for this assessment.

Project Assessment Part 2 consist of students being assessed on his/her ability to use spreadsheet formatting features, to create a data table with formulas for calculating/computing the slope and y-values. The x-values are given for this assessment.

Project Assessment Part 3 consist of students being assessed on his/her ability to use existing spreadsheet data to identify and create an appropriate 'scatter' spreadsheet chart for displaying graphed pairs of linear equations.

UNIT Assessment is designed to assess students on their understanding of (1) identifying plotted points; (2) identifying point location in quadrants and/or on an axis; (3) graphing equations; (4) finding the y-intercept of an equation; (5) finding the slope of a line; and (6) identifying various Excel features.

Attachments for Assessment(s):

Objective Assessment #1 (with answer key)
Objective Assessment #2 (with answer key)
Project Assessment Part 2 (with **adaptable** answer key)
Project Assessment Part 3 (with **adaptable** answer key)
UNIT Assessment (with **adaptable** answer key)

Sequence of Instruction

- **INTRODUCTION (DELETE THIS SAMPLE)**

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

MSBCS-BCSII-3. **Student will examine educational requirements, job responsibilities, employment trends, and opportunities in the different career pathways in Business and Computer Science.**

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e. Create various charts/graphs from spreadsheets.

2. Review Essential Questions

3. Identify and review the unit vocabulary

point	plane	coordinate
x-axis	y-axis	negative
address	positive	coordinate plane
quadrant	horizontal	vertical
linear equation	y-intercept	x-intercept
ordered pair	slope	coefficient
value	plotting	scale
slope-intecept	formula	rise-over-run
convert	straight-line equation	

- **LESSON 1: GRAPHING POINTS**

Discussion: Introduction and Demonstration to linear equations

1. Review and have students draw a horizontal line at the center of their graphing paper. Then, have the students to count as they put the numbers on the line ('zero, one, two, three…'). Next, have students to draw a vertical line - crossing the horizontal line.

2. Remind students to make sure that they evenly space the numbers, since the distance from 1 to 2 should be the same as the distance from 2 to 3, etc…

3. Explain to students that this is a coordinate plane and have them to label the x-axis, y-axis, and the 4 quadrants.

4. Demonstrate to students how to graph a point -- **(2, 3)** -- explain that the first number is **left - right** and the second number is **up - down**.

5. Also explain/remind students: a 'negative' sign means either **left or down** *(if a point is -2, -3 -- go two steps to the left, and then three steps down)*.

6. Identify each of the four quadrants and what points/coordinates (positive or negative) they will contain.

7. **CHECK-UP:** Have students to identify/name the number lines.
   Have students to describe how to identify an address point.

8. **Have students to complete 'Warm-Up #1'**
   Discuss and review 'Warm-Up #1'

9. **Have students take 'Assessment #1: Graphing Quiz'**

• LESSON 2: GRAPHING LINEAR EQUATIONS

Discussion

1. Explain to students that we solve linear equations in our heads all of the time without even noticing or thinking about it.

   Review the example: *You bought 2 CDs for the same price, and a book - you spent $20 total, and know that the book was $6 - You solve the linear equation (2x + 6 = 20) to find out that the price of each CD was $7.*

2. Explain and provide examples of how the use of linear equations go far beyond every day problems. Give some examples of the various jobs/careers which use linear equations.

   *Make students a copy of the list of careers which use linear equations.

OR

   *Have students visit the Web site **http//www.xpmath.com** to explore careers.

3. Introduce and explain T-charts. Have students draw and label a T-chart. Explain how the input (x-values) are selected; and how the output (y-values) are computed.

   Demonstrate with example: **y = 2x + 3**

4. Review - have students draw and appropriately label the coordinate plane.

5. Have students to plot the points computed in the T-chart. Next, have students connect the dots.

6. Have the students practice with the equation below:

   y = (-5/3)x -2

*Use the following x-values to compute y-values: **-6, -3, 0, 3**

*Review and correct.

7. Explain and demonstrate how equations with no 'x' will **always** be a horizontal line.

8. Explain and demonstrate how equations with no 'y' will **always** be a vertical line.

9. **Have students complete 'Warm-Up #2: Graphing Linear Equations'.**
   ***Discuss and review 'Warm-Up #2'**

10. **Have students take 'Assessment #2: Graphing Linear Equations'**

• LESSON 3: STRAIGHT-LINE (SLOPE-INTERCEPT FORM)

Discussion

1. Review straight-line equations or 'linear' equations.

2. Introduce and explain the 'slope-intercept form' equation: **y = mx + b** and what each part of the formula represent.

3. Explain and demonstrate how to find the equation when only 'pieces' of information are given.

*Demonstrate and review with Example #1: **slope is m = 4**
x-value = -1
y-value = -6
solve for 'b'

*Demonstrate and review with Example #2: **points (-2, 4) and (1, 2)**
use the 'slope formula'

4. Introduce and demonstrate how to find the intercepts of a linear equation

5. Introduce and demonstrate how to use slope and y-intercepts to graph lines.

6. Have students do a 'practice' equation: **y = -2x + 3**
   ***check and review**

7. Have students complete 'Activity #3: Line Equations'
   ***Discuss and review Activity #3**

• LESSON 4: PROJECT 'SLOPES' PART 1

Demonstrate

1. Have students to complete PROJECT 'SLOPES' PART 1: *Finding the Slope and Intercepts of a Linear Equation.*

• LESSON 5: PROJECT 'SLOPES' PART 2 *(Excel Data Table)*

Demonstrate

1. Review basic Excel formatting features.

2. Set-up a data table to include data from the completed PROJECT 'SLOPES' PART 1 worksheet: (1) equations 1 & 2; (2) x-coefficients; (3) y-coefficients; (4) constants; (5) slopes; (6) T-chart values *(using x-values -10, 10, -10 & 10).*

3. Insert/Apply Excel formulas in the data table to calculate slopes and y-values.

• LESSON 6: PROJECT 'SLOPES' PART 3 *(Excel 'Scatter' Chart)*

Demonstrate

1. Utilize data in existing PROJECT 'SLOPES' PART 2 data table to create, label and format a 'scatter' chart to display the graphing of pairs of linear equations.

• ATTACHMENTS FOR LESSON PLANS

- Standards [BCS-8-3-Standards)]
- Lesson 1: Graphing Points [1-BCS-8-3]
- Warm-Up #1 [2-BCS-8-3]
- Assessment #1: Graphing Quiz [3-BCS-8-3]
- Assessment #1: Graphing Quiz **(Answer Key)** [4-BCS-8-3]
- Lesson 2: Graphing Linear Equations (Pgs. 1-5) [5-BCS-8-3]
- List of Jobs/Careers Using Linear Equations (Pgs. 1-6) [6-BCS-8-3]
- Warm-Up #2 [7-BCS-8-3]
- Warm-Up #2 **(Answer Key)** [8-BCS-8-3]
- Assessment #2: Graphing Linear Equations [9-BCS-8-3]
- Assessment #2: Graphing Linear Equations **(Answer Key)** [10-BCS-8-3]
- Lesson #3: Slopes (Pgs 1-5) [11-BCS-8-3]
- Activity #3: Line Equations [12-BCS-8-3]
- Activity #3: Line Equations **(Answer Key)** [13-BCS-8-3]
- ***PROJECT 'SLOPES' PART 1*** ***[14-BCS-8-3]***
- ***PROJECT 'SLOPES' PART 1 (Answer Key)*** ***[15-BCS-8-3]***
- ***PROJECT 'SLOPES' PARTS 2 & 3 (Pgs 1-5)*** ***[16-BCS-8-3]***
- UNIT Assessment [17-BCS-8-3]
- UNIT Assessment **(Answer Key)** [18-BCS-8-3]

• NOTES & REFLECTION:

Students should have prior skills with accessing and utilizing the Internet/Web sites. Have students to research 1 or 2 careers of interest, to find out some basics (educational requirements, starting salary, demand in U. S., etc…).

Students should be able to perform basic algebraic functions, such as solving equations.

Students should have prior knowledge and skills for creating and formatting an Excel spreadsheet. Including the insertion of appropriate formulas.

Students should have prior knowledge and skills for using existing Excel data to create a chart/graph.

CULMINATING PERFORMANCE TASK

Culminating Unit Performance Task Title:

Students demonstrate graphing points, graphing linear equations, and finding the slopes in effort to utilize the data to create data tables with T-chart, in Excel. Students will complete and save the Excel data table with inserted formulas for computing slopes and y-values.

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

Students will utilized the saved data table in PART 2, to create a 'scatter' graph displaying the graphed pairs of linear equations.

Attachments for Culminating Performance Task: Please list.

- **PROJECT 'SLOPES' PART 1** **[14-BCS-8-3]**
- **PROJECT 'SLOPES' PART 1 (Answer Key)** **[15-BCS-8-3]**
- **PROJECT 'SLOPES' PARTS 2 & 3 (Pgs 1-5)** **[16-BCS-8-3]**

UNIT RESOURCES

Web Resources:

http://www.bls.gov/OCO/
http://www.xpmath.com

Materials & Equipment:

- Computer
- Pencil
- Graph paper
- Internet assess
- Microsoft Office software
- Handouts
- Overhead and transparency, or 'smart-board'

21st Century Technology Used:

	Slide Show Software	X	Graphing Software		Audio File(s)
X	Interactive Whiteboard	X	Calculator		Graphic Organizer
	Student Response System		Desktop Publishing	X	Image File(s)

	Web Design Software		Blog		Video
	Animation Software		Wiki		Electronic Game or Puzzle Maker
	Email	X	Website	___	
X	Microsoft Excel				