Lab Framework

Text: CORD

Unit number and title: Unit 23 – Factoring

Short Description: Students will be investigating the factors of a rectangle that maximize its area.

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Lab Title
Maximizing Area

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
  Students will understand that a square is the best type of rectangle to maximize the enclosed area within the rectangle.
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)
  Multiplication
  Measurement techniques
  Formula for area of a rectangle
- **Vocabulary**
  Factoring
  Area
  Perimeter
- **Materials List**
  Measuring tape
  Pieces of string in varying lengths
  Data recording sheet
- **State Standards addressed**
  Math:
  A1.1.B – Solve problems that can be represented by linear functions, equations, and inequalities.
  A1.2.E Use algebraic properties to factor and combine like terms in polynomials.
  Reading:
  2.1.4 Apply comprehension monitoring strategies for informational and technical materials, complex narratives, and expositions: use prior knowledge.
  Writing:
  1.3 Apply writing convention; know and apply correct spelling, grammar, sentence structure, punctuation, and capitalization
- **Leadership Skills**
  Group roles
  - Measurement Specialist – responsible to use multiple different trials to collect data
  - Recorder – responsible to record the data accurately for the group
- **SCAN Skills/Workplace Skills**

Writing – A, C
Arithmetic – A, B
Mathematics – B, C, D
Speaking – A, B, E

Set-up information

Before students arrive:

- Cut string into different lengths from 30 inches to 60 inches
- Provide a tape measure with each string for students

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required)**

  Students should work in pairs, but groups of 3 are also okay. Students will be using string and a measuring tape while collecting data to represent different sized rectangles. This lab should take about 20 minutes to collect data, 15 minutes to compile the data, with the remainder of the class period left for student presentations of findings.

- **Teacher Assessment of student learning** (scoring guide, rubric)

  Circulation and monitoring of progress
  Completion of lab worksheet
  Student presentation of findings

- **Summary of learning** (to be finished after student completes lab)

  -discuss real world application of learning from lab
  -opportunity for students to share/present learning
  -optimal rectangle is actually a square regardless of size

- **Optional activities**

  Extend the lab to have students use factoring to predict the size if a fixed amount of length is added to each side of their maximized rectangle. How does this affect the area of the rectangle?

- **Career Applications**

  -Landscaping – creating a maximized yard given a fixed amount of fencing
  -Surveying – maximization of land area of parcels
  -Sprinkler system installation

LAB TITLE: Maximizing Area
STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**
  Given a constant amount of fencing, what is the maximum yard area that you can create with that fencing?

- **Grouping instructions and roles**
  Students should work in pairs. One partner is in charge of setting up the different rectangles and measuring them; the second partner is in charge of recording the data on the lab data collection sheet.

- **Procedures** – steps to follow/instructions
  Use your string to create many different rectangles with varying lengths and widths. Measure the lengths of these rectangles and be sure to record your data on your lab collection sheet.

- **Outcome instructions**
  Students should determine that the best type of rectangle to maximize the area given a constant perimeter is a square. Students will then investigate what happens when the length and width are increased by a set amount, then by a variable amount.

- **Assessment instructions** (peer-teacher)
  -ensure that students are making accurate rectangles
  -ensure that students are using appropriate units of measurement
  -check for accurate data collection by asking about their procedure for collecting the data
  -look for students to use appropriate mathematical language during their presentation of findings

Lab Data Collection

Student: _____ **Date:** _____

Unit: Unit 23 - Factoring

Lab Title: Maximizing Area

Criteria: Determine and describe the rectangle with the largest area that can be created using the string given. Use the measuring tape to measure your side lengths. Try at least 5 different sets of dimensions.

Data Collection: Record your length, width and area here in cm.

Length of Rectangle (cm)	Width of Rectangle (cm)	Perimeter of Rectangle (cm)	Area of Rectangle (cm^2)

Calculations: Remember that area of a rectangle is calculated with *length X width.*

Summary Statement: What are your findings?

Other Assessment(s)

- What if we added 3 cm to each side of your optimal rectangle? How would that change the area and perimeter?

- What if we added x cm to each side? How could you model that using factoring?