

Problem-Based Learning

Fenced In

Sixth Grade

Math

MA12613



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Math

Overview

You are a college intern on a ranch in Montana, and you've been asked to redesign fencing for the animals! Students will explore concepts related to geometry and the number system.

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PBL Problem Guide

FOR FACILITATOR USE ONLY

Timeframe

This lesson plan will take approximately 1 hour.

Step-by-step guide

- Put students into teams of three to five members.
- Ask for a volunteer to read the STUDENT PROBLEM aloud [page 6].
- As a whole group, ask students to list What We Know [FACTS, page 7].
- Have each team create a list of What We Need to Know [NEED TO KNOWS & LEARNING ISSUES, page 8].
- Have each team begin a list of POSSIBLE HYPOTHESES [page 10].
- Provide ADDITIONAL INFORMATION for NEED TO KNOWS, allow teams to research LEARNING ISSUES [pages 9 & 11].
- Teams re-evaluate POSSIBLE HYPOTHESES [page 10] and determine one DEFENDABLE SOLUTION for Final Product [page 12].
- Teams create and present DEFENDABLE SOLUTION and individual students write ACTION PLAN [page 12].

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PBL Resources

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Resources provided

Included with this case are:

- Area and Perimeter website
- Parts to Whole website

Resources to assemble

You may wish to assemble the following resources ahead of time:

- GeoBoards
- Fraction tower cubes
- Math textbook

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Student Problem

FOR STUDENT USE

You are a college student at the end of your sophomore year, and you have just declared a major in agricultural engineering. You and three classmates have just landed an awesome internship as part of a work-study program on a ranch in Montana!

When you arrive at the ranch, the rancher tells you that your first duty is to design the fencing around the pastures for sheep, cattle, and horses. He needs you to use the least amount of fencing possible and to consider the needs of his animals and the road access on the ranch.

Consider:

- How will you maximize your space?

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Key Facts

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- You are a college student at the end of your sophomore year.
- You have just declared a major in agricultural engineering.
- You and three classmates have landed an internship as part of a work-study program on a ranch in Montana.
- Your first duty is to design the fencing around the rancher's pastures for sheep, cattle, and horses.
- You need to use the least amount of fencing possible.

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Need-to-knows / Learning Issues

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NEED TO KNOWS

- How much land does the farmer have?
- How much land will we need to fence?
- Is the fencing new, or is there existing fencing?
- How much room does each type of animal need?

LEARNING ISSUES

- How do we calculate area?
- How do we calculate perimeter?
- How do we use parts to a whole and fractions?
- How do we convert acreage to square feet?

NEED TO KNOW ANSWERS

- For all Need to Knows at the left, verbally give teams answers from Additional Information [page 9] as they ask or list the corresponding Need to Know.

LEARNING ISSUE RESOURCES

- Students will investigate using the Learning Issue Resource Guide, page 11.

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Additional Information

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About the ranch:

(Only give teams answers ask they ask for this information)

- 1) There are 275 acres of land, of which you will only fence in 225 acres.
- 2) The pasture to be fenced in is square.
- 3) The sheep will need $\frac{1}{3}$ of the pasture, the cattle will need $\frac{2}{5}$, and the remainder will be for the horses.
- 4) Fencing must be bought by the foot.

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Hypotheses

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- Hypotheses will vary by the design of the fencing.
- Hypotheses will vary by the length of fencing required.

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Learning Issue Resource Guide

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WEBSITES

Area and Perimeter Activity

www.mathplayground.com/area_perimeter.html

Parts To Whole

www.brainpopjr.com/math/fractions/basicpartsofawhole/grownups.weml

TEXT RESOURCE

Math textbook

MANIPULATIVES

GeoBoards

Fraction tower cubes

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Final Product and Writing Guide

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Team

- Each team will create a map or diagram of the fencing for each animal, with length measurements included, and a total amount of fencing to be purchased.

Individual

- Each student will write a letter to the rancher explaining how they came up with their diagram.

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Rubric**FOR FACILITATOR USE ONLY**

AREA	ABOVE AVERAGE Three points each	AVERAGE Two points each	BELOW AVERAGE One point each	NO EVIDENCE Zero points each	POINTS
Final Product	<ul style="list-style-type: none"> All Learning Issues addressed Three or more hypotheses present High quality final product 	<ul style="list-style-type: none"> Most Learning Issues addressed Two hypotheses present Roles somewhat defined Fair quality final product 	<ul style="list-style-type: none"> Few learning issues addressed One hypothesis present Low quality final product 	<ul style="list-style-type: none"> No learning issues addressed No hypotheses present No final product 	
Writing Assessment	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated well presented Hypotheses well presented Solution and Defense well presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated presented Hypotheses presented Solution and Defense presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated poorly presented Hypotheses poorly presented Solution and Defense poorly presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated not presented Hypotheses not presented Solution and Defense not presented 	
Collaboration	<ul style="list-style-type: none"> Individual works well with group members Individual communicates well with group members Individual carries out their individual responsibilities 	<ul style="list-style-type: none"> Individual works acceptably with group members Individual communicates acceptably with group Individual mostly carries out their individual responsibilities 	<ul style="list-style-type: none"> Individual does not work well with group members Individual does not communicate well with group members Individual attempts but fails to carry out their individual responsibilities 	<ul style="list-style-type: none"> Individual interferes with group members Individual does not communicate at all Individual does not attempt to carry out their individual responsibilities 	

24 – 27 Points = Above Average

15 – 23 = Average

6 – 14 = Below Average

0 – 6 = Failing

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provides essential case studies to K–12 teachers across the United States. Access useful and easy-to implement case studies on Math, English Language and other STEM topics online at www.wakeproblembasedlearning.com.



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