

Title: The Blue Diamond Ranch

Brief Overview:

Students will improve their ability to recognize spatial relationships through visualization awareness activities. Students will gain an understanding of area and perimeter and the relationship between the two. They will make mathematic decisions in real-life situations. All subject areas will be integrated into this unit so students will gain global awareness of problem solving.

Links to NCTM Standards:

- **Mathematics as Problem Solving**
Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.
- □ **Mathematics as Communication**
Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.
- □ **Mathematics as Reasoning**
Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- □ **Mathematical Connections**
Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.
- **Estimation**
Students will demonstrate their ability to apply estimation strategies in computation, with the use of technology, in measurement, and in problem solving. They will demonstrate the reasonableness of solutions. Use calculators as appropriate.
- **Number Sense and Numeration**
Students will demonstrate their ability to solve problems using arithmetic operations with technology when appropriate. Students will use applications which may include fractions.
- **Concepts of Whole Number Operations**
Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials. They will choose appropriate operations and describe effects of operations on numbers.

- **Measurement and Geometry**

Students will demonstrate and apply concepts of measurement using non-standard and standard units and metric and customary units. They will estimate and verify measurements. They will apply measurement to interdisciplinary and real-world problem-solving situations.

Students will demonstrate their ability to apply geometric relationships using one-, two-, and three-dimensional objects. They will demonstrate congruency, similarity, symmetry, and reflection and apply these concepts to the solution of the geometric problems.

Grade/Level:

Grades 4-5

Duration/Length:

Approximately 5 class periods, 45 minutes to 1 hour in length.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Measuring
- Computation
- Fractions
- Addition of money
- Decision making
- Use of graph paper for drawing maps
- Problem solving

Objectives:

Students will:

- add and subtract whole numbers, fractions, and decimals.
- choose an appropriate operation to solve problems.
- estimate before calculating.
- be able to use various strategies to solve problems.
- estimate and verify perimeter of polygons.
- estimate and verify area of squares and rectangles.
- distinguish between area and perimeter.
- select the appropriate unit of measurement and the tool to find the measurement.
- apply measurement of interdisciplinary and real-world, problem-solving situations.

Materials/Resources:

- Graph paper
- Pattern blocks
- Twizzlers
- Dice
- Lined paper
- Pencils and colored pencils
- Markers
- 11x17 white drawing paper
- Miniature marshmallows
- One package of Oreo cookies
- One box graham crackers
- 4 Hershey's chocolate bars
- 4 index cards
- Overhead projector
- Overhead pattern blocks

Development/Procedures:

Day 1:

- Give each student a sheet of 8 ½" x 11 white paper.
- Ask students to visualize the items you will name and draw an outline of each item on their papers.
- □ Read the following list (see teacher resource one - could be used as an overhead, revealing one item at a time), giving time between items for students to draw.
The following items will be needed: miniature marshmallows (1 bag), Graham crackers (1 box), Hershey's chocolate bars (3), Oreo's Cookies (1 pkg.), 2 index cards, 2 assorted magic markers, and 2 large paper clips.
- Pass the actual items for students to check their drawings. Have these items in zip-lock bags for easy distribution to the students. The students may eat their designs.
Discuss with students that some people have a more developed visual memory than others. Ask students to name what types of occupations would be best suited to a person with a well-developed visual memory.

Day 2:

- □ Introduce/Review perimeter.
- □ Distribute pattern blocks and paper and markers.
- □ Each student should have 2 yellow blocks 8 blue blocks.
- □ Use the overhead to explain the process for finding total number of units in each block they'll be using.

- □ Demonstrate how to count by marking where they have begun counting so as not to over count.
- □ Students will be creating designs which will use the largest perimeter possible with the blocks provided. The perimeter will be measured in units of one side of the green triangle.
- □ Demonstrate this technique on the overhead.
- □ After students feel they have created a design which has the largest perimeter they should trace around their design and color with markers.
- □ Students present designs to class and discuss their reasoning.
- □ Challenge students to arrive at the smallest perimeter possible and share with their neighbor.
- □ Discuss the difference in the designs and how each student approached the task differently.
- □ Students' drawing should be saved for the following day.

Day 3:

- Review perimeter/Discuss area.
- □ Students will use drawings from previous day to measure area using the green triangle pattern blocks.
- □ First ask student to guess which of their drawings will have the largest area. Then, predict how many green triangles will fit in the design.
- □ Distribute pattern blocks.
- □ Have the students measure the area of the design they chose.
- □ Discuss what happened! Students share their findings.

Day 4:

- □ Review perimeter and area.
- □ Students will play a game using dice to determine the dimensions of rectangles they will claim on graph paper
- □ Group students in pairs.
- □ Distribute 1/4" square graph paper, two different colored pencils and two dice to each pair of students.
- □ Demonstrate on over head how students will play the game. Roll dice, use numbers showing to determine dimensions of your rectangle. Use colored pencils to "claim" your rectangle. (ex. roll two and four) at the end of the game the students should calculate the total area they have claimed. The student with the most area claimed is the winner.

Day 5:

- Your grandparents have recently purchased a large piece of property for the purpose of raising horses. According to the research you've read, each horse will need 1 ½ acres each for grazing. Your grandparents have decided that in order to make money, they'll have to keep at least thirty horses. Some horses will have to be separated at times so they'll need at least five different pastures.

One ten acre exercise field will also be needed to allow the horses space to run. Your job is to design a pasture layout so that the fencing company can do it's job and, so that you can make a recommendation to your grandparents.

- A map of the farm is attached. The house and barn areas are marked. You must leave this area unfenced. Design a layout for the pasture areas that will suit your grandparents and, label it according to the number of horses which can be kept in each field. Don't forget to include the ten acre exercise field and, be sure to leave space between the pastures for walking the horses and opening the gates.
- Now calculate the total area of the horse ranch. Is there a more expensive configuration for the fence?
 - How much fencing will be needed to fence the ten acre exercise field?
 - How did you find the answer?
 - Some students could represent the fencing company to decide on more fence. Some students could represent the farm owners to decide on less fence.
 - How much fencing will be needed to fence the five pastures?
 - Tell how you determined this amount.
 - What is the total amount of fencing?
 - The oak fencing your family prefers costs \$4.76 a unit. Determine the amount of money needed to fence all the pasture areas and the exercise field.
 - A less expensive pine fence costs \$3.98 a unit. Figure out how much money your family could save by using the pine fence.
 - Gates will cost \$9.75 each with either type of fencing. Determine the number of gates needed and come up with a total cost for each type of fence.
 - Write a letter to persuade your grandparents to use your plan. See writing prompt.

Performance Assessment:

Students should complete the writing to persuade prompt on Student Resource 3. The scoring rubric is found on Teacher Resource 2.

Extension/Follow Up:

Students will share their work daily through classroom discussion. On the fifth day, the students will complete the performance assessment. As closure, students will present their plans to the class. Students will vote for the most cost effective design for fencing the ranch.

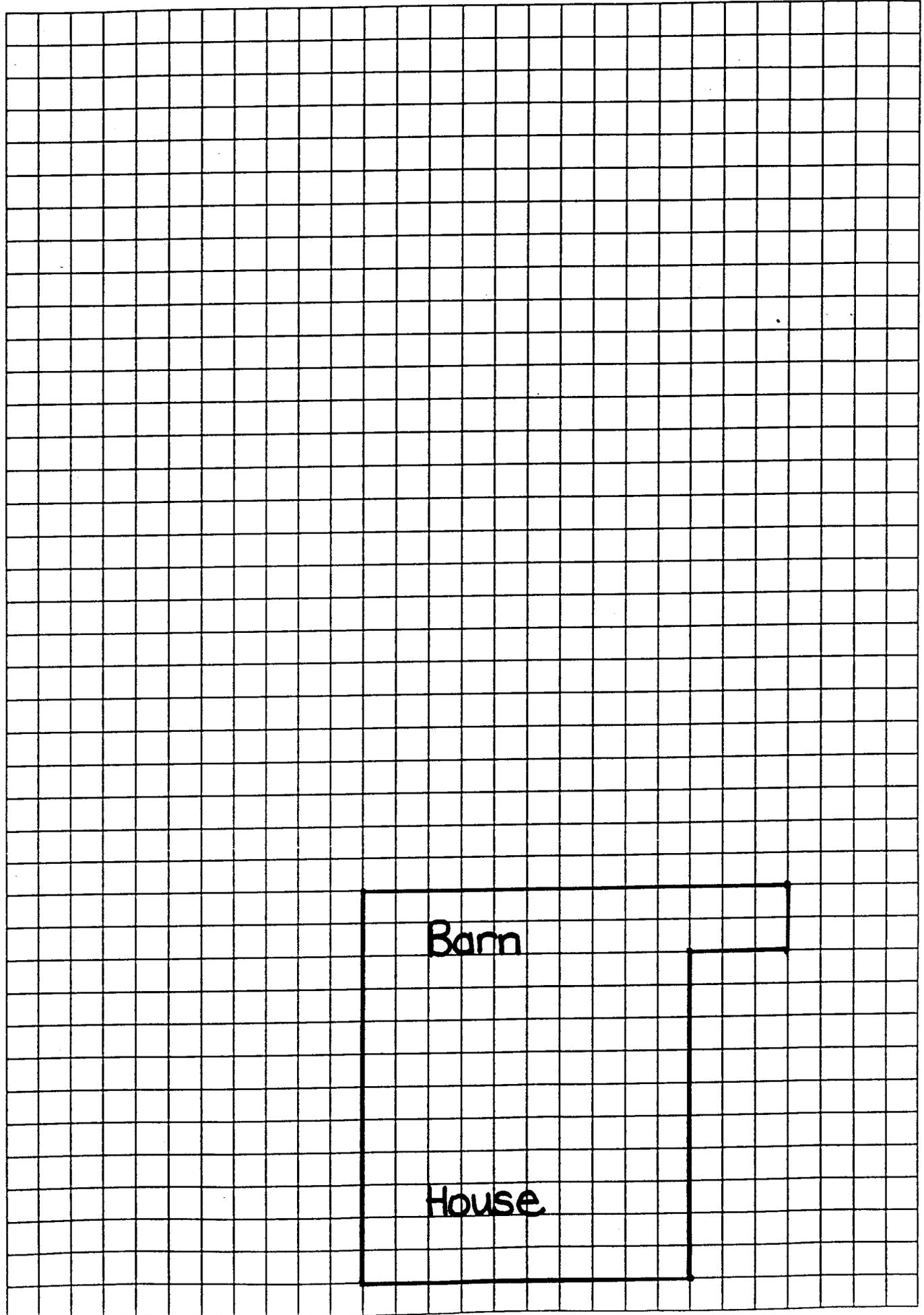
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Name _____

$\frac{1}{4}$ inch = $\frac{1}{4}$ acre



Student Resource 2

- Your grandparents have recently purchased a large piece of property for the purpose of raising horses. According to the research you've read, each horse will need 1 ½ acres each for grazing. Your grandparents have decided that in order to make money, they'll have to keep at least thirty horses. Some horses will have to be separated at times so they'll need at least five different pastures. One ten acre exercise field will also be needed to allow the horses space to run. Your job is to design a pasture layout so that the fencing company can do it's job and, so that you can make a recommendation to your grandparents.
- A map of the farm is attached. The house and barn areas are marked. You must leave this area unfenced. Design a layout for the pasture areas that will suit your grandparents and, label it according to the number of horses which can be kept in each field. Don't forget to include the ten acre exercise field and, be sure to leave space between the pastures for walking the horses and opening the gates.
- Now calculate the total area of the horse ranch. Is there a more expensive configuration for the fence?
- How much fencing will be needed to fence the ten acre exercise field?
- How did you find the answer?
- Some students could represent the fencing company to decide on more fence. Some students could represent the farm owners to decide on less fence.
- How much fencing will be needed to fence the five pastures?
- Tell how you determined this amount.
- What is the total amount of fencing?
- The oak fencing your family prefers costs \$4.76 a unit. Determine the amount of money needed to fence all the pasture areas and the exercise field.
- A less expensive pine fence costs \$3.98 a unit. Figure out how much money your family could save by using the pine fence.
- Gates will cost \$9.75 each with either type of fencing. Determine the number of gates needed and come up with a total cost for each type of fence.
- Write a letter to persuade your grandparents to use your plan. See writing prompt.

WRITING TO PERSUADE

WRITING PROMPT

Now that you have completed your design and calculated the cost of the fence, you must “sell” your plan to your grandparents. Several other family members are submitting their own layouts and, your grandparents must choose the plan that best suits their needs.

Write a letter to your grandparents persuading them to use your design. Make sure you include a strong topic sentence, at least three supporting details, and a concluding sentence. You need to convince your grandparents to adopt your idea by explaining why it is the best and most cost effective idea. Submit a copy of your design with your idea. Be sure to use mathematical vocabulary in your letter. The information you provide to your grandparents will allow them to make a more informed decision.

List

1. Miniature marshmallows (1 bag)
2. Graham crackers (1 box)
3. Hershey's chocolate bars (4)
4. Oreo's cookies (1 pkg.)
5. Index cards (4)
6. Assorted magic markers (4)
7. Large paper clips (4)

WRITING TO PERSUADE

SCORING RUBRIC

3 PTS

- work is neatly written.
- contains a topic sentence, at least three supporting details, and a conclusion.
- uses correct grammar, capitalization, punctuation, and spelling.
- ideas flow naturally and logically.
- design submitted.
- uses correct letter format.

2 PTS

- work is neatly written.
- contains a topic sentence, at least three supporting details, and a conclusion.
- has no more than two errors in grammar, capitalization, punctuation, and spelling.
- ideas flow somewhat logically.
- design submitted.
- uses correct letter format.

1 PT

- work is neatly written.
- contains a topic sentence and at least two supporting details.
- has no more than four errors in grammar, capitalization, punctuation, and spelling.
- logical flow is questionable.
- design submitted.
- uses letter format with no more than two errors.

0 PTS

- work is illegible.
- does not meet standards for 1 pt (above).
- no design submitted.