Mathematics: The Language of STEM
Let's go Camping!
Mrs. Long

CONTENT AND TASK DECISIONS

Grade Level(s): 4th

Description of the Task: Students will work together in groups of 3 to explore which combinations of camping equipment they can have based upon their limit of area available. Each group will design a campsite with a specified area of 120 square feet. Students will determine what equipment to include in their campsite. Students will calculate the area of each piece of equipment in a data table. Groups will determine which equipment options to use based upon their available campsite area and will need to justify their choices to the class.

Indiana Mathematics Content Standards:
4.M.4: Apply the area and perimeter formulas for rectangles to solve real-world problems and other mathematical problems. Recognize area as additive and find the area of complex shapes composed of rectangles by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts; apply this technique to solve real-world problems and other mathematical problems.

Indiana Mathematics Process Standards:
PS.1- Students will make sense of the problem and persevere in solving them by looking at the problem and the constraints on the problem in order to identify possible combinations.
PS.2- Students will reason abstractly and quantitatively by representing combinations using manipulatives and charts.
PS.3- Students will construct viable arguments and critique the reasoning of others by making possible combinations of items and justifying why they think it works best and by analyzing others reasoning in their group.
PS.4- Students will model with mathematics by using manipulatives to represent items and quantities.
PS.6- Students will attend to precision as they are using the area formula to determine the total area needed for the problem.

Mathematics Content Goals:
The goal is for students to be able to calculate area based upon given dimensions in a real-world problem. Additionally, students need to understand that there are many things to consider when designing a campsite and that it is important to look at the options available to determine the how best to use their area. Students need to be able to explain their reasoning to others.

Language Objectives:
Calculate area of different objects to solve real-world problems using formulas, grid paper, manipulatives and charts.

The teacher will focus on the content vocabulary, such as calculate, area, dimensions, total, combination, and the additional vocabulary such as equipment, campsite, and sketch.

Materials:

- Camping Equipment Chart
- Half Inch Graph Paper
- Total Area Chart
- Pencil and Paper
- Colored Pencils
- Scissors

THE LESSON

Before: The teacher will peak students interest by stating that the students will be going on a camping trip next week with 2 of their friends. They will need to design their campsite with a total area of 120 square feet and determine which camping equipment to include.

- **Activate prior knowledge** Teacher will ask students "Has anyone been camping in a tent?" (Some students should raise their hand). The teacher will then ask students to describe what the experience was like with prompts as needed so that all students can understand that the camping experience requires a campsite and tent and that there are other items needed such as a campfire, seating, and a cooler.
- **Be sure the problem is understood** Students will work together in groups of 3 using the manipulatives, graph paper, and data chart to create their campsite area with a total area of 120 square feet. Groups will explore the various combinations of camping equipment that can be used based on their area limit. Teacher will demonstrate what the manipulatives, graph paper (For this activity, each ½ inch square represents 1 foot.), and data chart look like and how to use them. Students must include enough space for sleeping and sitting for every member of the group.The group must present their campsite sketch and data to the class and be able to justify their choices.
- **Establish clear expectations** Students should discuss possible campsite shapes and combinations of equipment with their group. Once a campsite shape and combination have been identified, students should sketch their campsite and equipment on the graph paper by either using the manipulatives to trace or by shading in squares. Students should label their camping equipment on their sketch. Students should complete the data sheets to calculate the area of the campsite and the camping items. Students must show their work in the work space. Students should then discuss and agree upon which combination would be best for their group and the reasons why. Groups will then present their combination to the class and justify why they chose their combination.

During: During this time students will be given the materials and asked to complete the task. Remind students that they must create their campsite and calculate the areas within the time given. Students may continue to find more combinations and record their information on the back of the graph and charts if time permits.

- **Let go,** Teacher will distribute materials to groups of students and allow students to begin discussing and exploring possible combinations.
- **Listen actively,** Teacher will walk around and visit with groups to monitor discussions and listen for student thinking. If teacher notices errors in thinking then teacher will provide additional support.
- **Provide appropriate support** Teacher may need to clarify directions, (make sure that students have created their initial campsite before placing equipment on the graph), model discussion techniques (ensuring that everyone in the group is participating), ask questions to prompt student

thinking (Is it a need or a want?, Should everyone have their own _____ or can you share?) Teacher may need to clarify how to use the area formula.

- **Important**: During the group work time, the teacher should give students an idea of a time frame so that they will have time to discuss their combinations and think about their reasons before being asked to present to the class.(For example: "You have 35 minutes to sketch your campsite design, calculate the area, and complete the data charts." Then the teacher could say, "At this point, look at your possible campsite combination and as a group determine what equipment you would include and why? Be sure to discuss your reasoning because you will be asked to present to the class in about 10 minutes.)
- **Provide worthwhile extensions**. For groups that complete the task with extra time, teacher could extend the problem by asking what would happen to their combinations if a fourth student were to join them. Another extension might be to change the area of the campsite and see if the students could still use their equipment or if they would need to adjust their ideas.

After: At this time, students exploration time will end. Teacher will have students come together as a whole group to discuss possible combinations and provide reasons for their choice.

- **Promote a mathematical community of learners** Teacher will remind students to be good audience members by sitting still, eyes on the speaker, and listening attentively. Groups will present their campsite to the class using the document camera so that the rest of the students will be able to see their combination choice. Groups will explain why they chose this combination to the class. Each group will present.
- **Listen actively without evaluation** Teacher will listen attentively to each group as they present.
- **Make connections** Teacher will help students to make connections by discussing needs and wants (need=tent, wants=chairs), discussing the various options (sharing vs. own), discussing ways of finding area (some students used the formula, some counted the squares, etc), and discussing the connection between area and perimeter.
- **Summarize main ideas** Teacher will summarize the lesson by reminding students that area can be calculated in a variety of ways. You can count the squares on the graph paper or you can use the dimensions of the equipment and the area formula of length times width to solve. Area is in a format that uses units squared.

ASSESSMENT

Observe: Teacher will observe groups as they work to ensure that students are finding area using appropriate strategies and using the correct labels in their answers. Teacher will observe students to ensure that all students are actively participating in the group. Teacher will observe groups as they justify their reasoning for choosing their combination.

Ask: What shape did your group come up with for the campsite? Which combination of equipment did your group choose and why?