MATH
Can Take You Places

LESSON 13
"Get on Board"
by Betty Lewis

CONCEPT AREA Patterns

GRADE LEVEL 4-6

TIME ALLOTMENT 60 minutes

LESSON OVERVIEW Students will make a table showing the relationship between the number of tickets that are needed for the basketball team to travel from Dallas/Fort Worth to New York City. In the process, students become familiar with developing and using number sentences.

LESSON ACTIVITIES OVERVIEW Students will:
- Create charts to display patterns relating to the number of passengers and cost of tickets for a bus ride, train ride and airfare.
- Develop a number sentence from the data they develop.
- Work an extension problem using a given number sentence.

LEARNING OBJECTIVES Students will be able to:
- Determine missing elements in a pattern.
- Select an appropriate operation and/or strategy to solve a problem and justify the solution.
- Use mathematical language to represent the relationships in a table.
- Discuss and elaborate upon the reasonableness of a solution.
- Recognize the pattern in the table.
- Extend the pattern and generalize.
- Understand and present the values in a table with the ordered pairs of numbers.
- Recognize mathematical symbols that represent relationships in a table.

STANDARDS (TEKS) **From the Texas Essential Knowledge and Skills for Math for grades 4-6:**

Grade 4
    4.1A, D; 4.5B
Grade 5
    5.1A, D; 5.4B, E
Grade 6
    6.3A, C; 6.5; 6.11A, C; 6.13A

MEDIA COMPONENTS Video: *Math Can Take You Places* #005 "Patterns"

Internet:
    American Airlines:
    www.aa.com

    Amtrak Trains:
    www.amtrak.com

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General travel Web site:
www.travelocity.com

Buses:
www.greyhound.com

MATERIALS
- Calculators
- Overhead projector
- Overhead calculator (optional)
- Pencil and paper
- Internet access (optional)

PREP FOR TEACHERS

Prior to teaching this lesson, preview the video.

Note:
The following concepts will be covered during this lesson: **patterns**, **number sentences**, **skip counting and function**. Students may need to review the concepts prior to beginning the activities.

If your class includes students who are acquiring English as a second language (ESL), you may also need to brainstorm problem-solving strategies or offer a list of possible strategies for students to refer to while completing the activities.

INTRODUCTORY ACTIVITY: SETTING THE STAGE

1. Have the students skip count aloud by fives. Remind students that skip counting is patterning. Stop and discuss how they determined the next number in the pattern. As a class, create the chart below to emphasize the concept:

Order the pattern (n)	Actual number (a)
1st	5
2nd	10
3rd	15

 (Repeat activity with skip counting by 25s, etc., if needed.)

2. Inform them that mathematics is described as the science of patterns and order, and is especially useful when it helps to predict outcomes. Using number patterns will develop this skill. In later math classes, students will use patterning to solve functions.

3. Ask students to discuss some of the patterns they discovered while participating in the skip-counting activity. Develop an understanding that discovering a pattern requires them to look systematically at specific examples. Once the "rule" or function is discovered, it can be used to determine the remaining solutions to the problem.

4. Ask the students to describe how they would find the 50th number in the pattern. Discuss their suggestions. Work together to write a number sentence to state it mathematically (for example, $50 * 5 = n$, $n = 250$). Then, work together to write a number sentence to describe how you would find any number in the pattern (Answer: $n * 5 = a$).

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LEARNING ACTIVITIES

1. Give the students the following scenario: "The New York Yorkies are a pro basketball team that has traveled to Dallas by bus for a game. Unfortunately, their bus broke down, and they now need a way back to New York City. Help the Yorkies return home by researching the cost for traveling to New York City by airplane, train and bus. We do not know exactly how many players will be traveling, so we will need to use patterns to create three different charts to display our data."

2. Offer the students a set amount for each of the costs of one passenger's bus, airplane and train fare or use the Web sites listed under "Media Components" to calculate actual costs from a town near you to New York City. Students will use those figures to create different patterns for various tickets using various modes of transportation. Allow students to decide how their chart should look. Students should extend the pattern at least to five passengers.

3. The students' answers will vary. Students make tables showing the relationship between the number of bus tickets bought and the total cost. Students can record the relationship shown in the table as a set of ordered pairs:
   For example, *(0, 0), (1, $312), (2, $624), (3, $936).*

CULMINATING ACTIVITY

1. Ask the students to use their charts to calculate the cost for 20 travelers by bus, airplane or train. Discuss the strategies that students used to calculate their totals. Students should respond with answers such as, "I multiplied the total for two tickets by ten" or "I multiplied the answer for four tickets by five."

2. Then, ask them to find the totals for harder multiples, such as 55, 72 or even 120 passengers. Ask students to develop as many different ways as possible to come up with the total number of passengers.

3. Ask students to write in words how they would find the ticket costs for any number of passengers on any of the different modes of transportation. Allow them to work alone to develop their sentence. Check students' work as they think through the question. Discuss the answers. Students' responses should say something similar to the following: The total cost of the tickets for any passengers is equal to the number of passengers times the cost of the ticket.

4. Allow students to brainstorm ways that patterns are used in everyday life (for example: counting money, buying grocery items such as eggs, etc.). Ask, "What if we were going to start a restaurant at our school? What are some ways that we would need to use patterns?" Record some of the student responses on the board. Watch the *Math Can Take You Places* video #005 "Patterns." Before the video begins, say: "The students in Ms. Garcia's class are actually going to plan a kids' café. Be able to discuss how they used patterns to help them with purchasing the food." Brainstorm with the students after the video is completed.

5. Write the equation that Mrs. Garcia's students developed in the video on the board:

Number of People / Number of Servings per Package = Number of Packages
Number of Packages x Cost per Package = Total Cost

Tell the students that they are going to work in groups to use the above equation to solve a problem. Tell them that one hot dog package costs $3.50 and serves ten people. Have students use the number sentences to calculate how many packages will be needed to serve 150 people, and how much the hot dogs will cost. (Answer: Number of packages needed 15; 15 packages cost $52.50)

6. If time permits, discuss how variables are helpful when you have long number sentences such as the one listed above. A letter can be used to stand for each of the different parts of the equation. For example, "P" could stand for the "Number of People," "C" could stand for the "Cost per Package." Rewrite the number sentence using variables.

CROSS-CURRICULAR EXTENSIONS

Art
Students can design the look and feel of their own pretend currency, then create it using markers, paint, construction paper, etc. (Also, see "Real-World Connections"). Create a chart that explains how their new currency relates to United States currency.

Language Arts
Have students investigate patterns in other disciplines, such as patterns in music, nature, sports or other areas of interest. Students can interview an expert or teacher in the area of interest to see how the person uses patterns in his/her work. Students would then write a short report of their findings and present it to the class.

REAL-WORLD CONNECTIONS
Invite a local banker to speak to the students about currency exchange rates. Ask students to create their own "currency." They can work in groups or individually to assign the different forms of their currency creative names and create a chart with specific values as compared to the dollar. Students share their currency charts with the class.

ASSESSMENT
Monitor student responses to the "Culminating Activity" number three to check for understanding of patterns.

STUDENT HANDOUTS
None