Standard Benchmarks and Values

Standards for Mathematical Practice: MP1, MP2, MP3, MP4


Vocabulary

• Input and output variable
• Dependent and independent variable
• Function
• Line of best fit
• Discrete and continuous data

Materials Needed

• Lei Making Handout
• 2 different colors of Ribbon 50cm each ribbon per group
RIBBON LEI MODEL FOR LINEAR FUNCTIONS

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Lesson Plan for MOW1 (Modeling Our World) or Algebra 1

How can we predict the length of each lei and how much ribbon needs to be purchased to be able to make leis for 40 seniors?

Prerequisite skills or knowledge to think about for a pre-assessment:
- Students need to know how to measure using centimeters.
- Students need to be able to plot points on a coordinate plane.
- The slope-intercept formula of a linear equation.

Anticipated Student Strategies
- Students will not think of the amount of ribbon used to begin the lei making. This will be the part of the equation that is the y-intercept.

Student thinking/possible responses and concerns:
Students will measure the length of the one ribbon after each braid. Having two ribbons may confused students, guide them to record the data for only one ribbon. Have students work in groups of two with roles: a recorder and a braider. The recorder should measure lengths and record data.

What should students discover on their own?
Students should discover the usefulness of writing function rules for large input values.
This lesson has students modeling data gathered from making a ribbon lei. The context of the problem involves planning the material for lei making as gifts for the graduating seniors. Students will model the data using a scatter plat and describe how the variables relate.

The following video demonstrates how to make a lei.

*Image from https://www.youtube.com/watch?v=ckqcUxEKZf0

- Students are able to make a ribbon lei.
- Students will relate real life experiences with linear equations.
- Students will record data in a table and determine the line of best fit.

Introduction

What recommendations can you make for purchasing material for making leis?

The seniors will be expecting leis from their math teacher. To plan for the cost, your teacher needs your help. In order to estimate how much ribbon to buy, plan needs to be created for a design of the lei. Conduct an experiment with the given lengths of ribbon.

Have students brainstorm about methods and designs for lei making. If students do not know how to make a lei use the video link or have another student lead others on a design for making a lei. It is better to have a large pattern; it will be easier for students to graph and to notice a pattern. If a small pattern is used then it is recommended to change the measurements to millimeters. If students use a pattern that uses more of one ribbon, have them add a column to the table. If possible, have students record data for each ribbon with a matching colored pencil. When they graph the sets of data, use the same colored pencil for the points. This can also be done as an extension to challenge gifted students.

They should create two equations for each set of data. Have them label each function with a different function notation such as b(x) for blue or r(x) for red. Another suggestion for labeling the equations is yb for blue and yr for red.

In your group, discuss ways to experiment with the ribbons and design. Then predict how the length of the ribbon will change as you make the design.

Guide students to think about what are the variables. Encourage students to discuss which data will be the input (independent variable) and which will be the output (dependent variable). Provide each group with two ribbons of the same length but each group should have different widths of pairs. Make the ribbons 50cm.

Measure the length of one of your ribbons before you braid and record it in a table like the one below. Make one design, measure the
length of the same ribbon. Repeat the pattern and measure the length again. Continue braiding, measuring and recording data.

Ask groups what type of function do they think best represents the data? Why?

How will their equation differ from groups with wider ribbons? How did they decide?

**Implementing the Task**

**Students are doing what?**
- Students will work in their groups and answer questions.
- Students will record answers on their handout.
- Students will complete questions for their exit pass.

**How will students record and /or report their work?**
- Students will be given a Lei Making Handout.
- On a separate paper on the back, students should write a reflection from the lesson.

Did they include the tail of the lei in their equation?

Ask groups if the points should be connected? Discuss with the class the discrete and continuous data.

**After the Lesson**

**Students answer the following:**
- Describe the experiment, design of lei, and explain each group member’s contribution to the activity.
- Write a summary of your findings.
- What did you learn from the activity?
- What did you struggle to do?
- What should be changed about the lesson to improve it?
- Describe another real-world use for this study.
LEI MAKING LESSON

What recommendations can you make for purchasing material for making leis?

The seniors will be expecting leis from their math teacher. To plan for the cost, your teacher needs your help. In order to estimate how much ribbon to buy, a plan needs to be created for a design of the lei or use the one we learned. Conduct a study with the given lengths of ribbon.

In your group, discuss ways to collect data to determine the effect the design has on the given length of ribbon. Then predict how the length of the ribbon will change as you make the design.

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<th>Number of Patterns</th>
<th>Length of Ribbon (cm)</th>
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<tbody>
<tr>
<td>0</td>
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<td>6</td>
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</tbody>
</table>

The following method is suggested to collect data. Measure the length of one of your ribbons before you braid and record it in a table like the one below. Use your composition book to record the data. Make one design, measure the length of the same ribbon. Repeat the pattern and measure the length again. Continue braiding, measuring and recording data.

In your composition book answer the following questions.

1. What patterns do you notice in the data?
2. Plot your corresponding pairs of data on a coordinate plane. Based on your graph, make a prediction of the length of the ribbon after 10 patterns have been made.
3. Validate your prediction by continuing to braid and measure until you have braided 10 patterns.
4. Based on the data in your table, was your method accurate? Explain your answer.
5. What type of equation best describes your data?
6. Make an equation that best describes your data.
7. Are there some points on your graph that do not match the equation? Circle those points and list possible reasons for the discrepancy.
8. Create another model that would show the length of ribbon needed to make a lei. Make two or more models to support your conclusion/s.
9. Based on the results of your experiment, what recommendations can you make about the making of each lei to your teacher? What recommendation would you have for your teacher to make 40?