Introduction: In this lab, you will be building bridges between desks out of raw spaghetti noodles. You will place washers in a cup hanging from the bridge to test the bridge's strength with string. To do this, we need to practice a few skills and organize our experimental ideas. Some of the experimental design has been done for you and some of it you will determine with your group.

Materials:
Raw spaghetti noodles
Two desks
One meter stick/ ruler
One cup "bucket"
Tape
Scissors
String
One cup of washers

Prelab Question (Designing your experiment):
1. How far apart will we separate our tables at the beginning of the experiment?

2. If you do more than one trial, how will you decide which data to use?

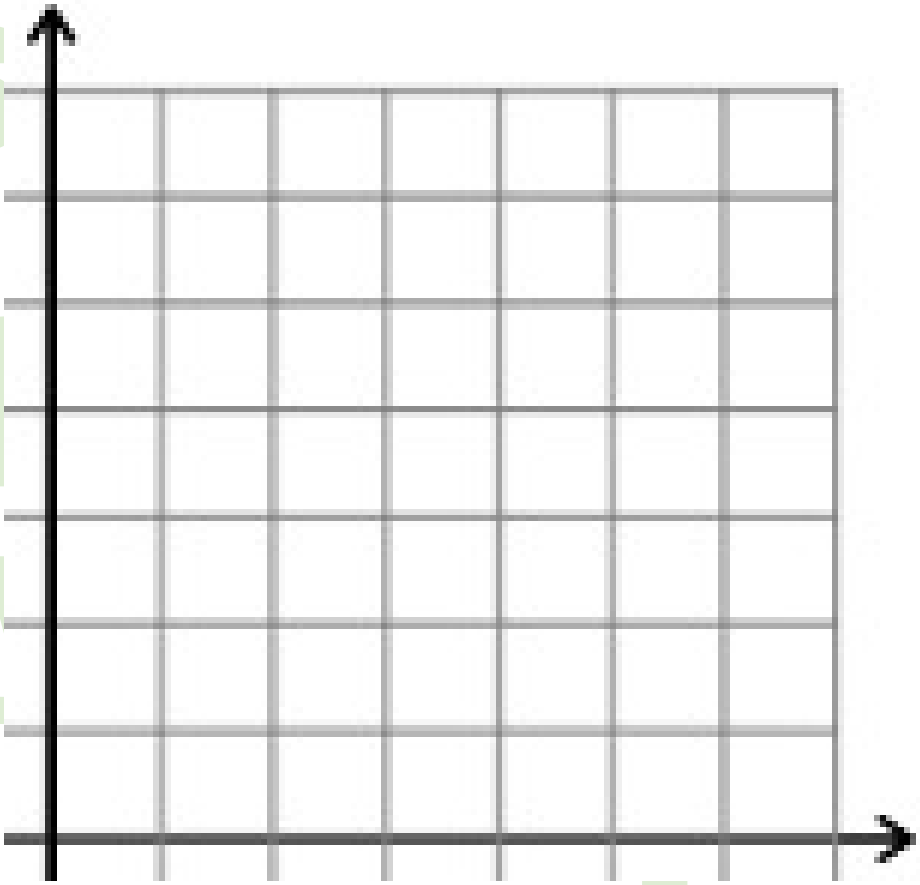
Instructions:
1. Create one bucket out of a cup, tape, and string.
2. Please gather a Tape 4 noodles together at the ends to make your first bridge.
3. Place approximately 4 noodles between the two desks at the designated distance with your bucket in the middle.
4. Add washers 1 at a time until the bridge breaks. Record the data in the table below. *Leave the slope spaces open for now.

Number of Spaghetti Noodles (x)	4	8	12	16
Number of Washers (y)				

Slope			

5. Repeat until you have measured for 16 noodles.

6. Graph the relationship between *Number of Washers* and *Number of Noodles*.



7. Calculate the rate of change (slope) for each transition by using the slope formula. Round this to nearest <u>hundredth</u>. *Record these calculations in the table above.

8. Find the average of these different rate of changes. Round to the nearest <u>tenth</u>. We will call this the *average rate of change*.

9. Explain what your average rate of change means in sentence form.

WAMC Lab Template
Math Concept(s): Calculating and interpreting slope.
Source / Text: **CORD Algebra 1**
Adapted by: Karl Loree E-Mail: kloree@touchet.k12.wa.us
Developed by: Dave Devoe
Date: Summer In-Service 2021

Attach the following documents:
Lab Instructions: See attached

Student Handout(s): See attached

Rubric and/or Assessment Tool: See attached summative assessment that will be given to students after the lab and continued practice slope. We will be using formative assessment throughout the entire lab by asking scaffolding questions throughout the lab to help students recognize this familiar function. We will also make sure to ask questions that will allow the students to extend their understanding.

Short Description (Be sure to include where in your instruction this lab takes place):
When students are finished with this investigation, they will be able to describe the relationship between the variables and the pattern of change shown in the table and graph, specifically exponential equations, and their properties. The instructions for this lab are located on the worksheet students will be given to collect their data, graph it, and then calculate the regression equation.

Lab Plan
Lab Title: **Spaghetti Noodle Slope**

Prerequisite skills:
Have seen and worked with graphing, scatterplots, and slope.

Lab objective:
This lab would be used to reinforce the topics of slope the graph and equation of an exponential decay function.

Standards:
CCSS-M:

- **Create Equations that describe numbers or relationships A-CED (Domain)**
  - 2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Interpreting Categorical and Quantitative Data:
7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Standards for Mathematical Practice:

- 4. Model with mathematics.

Writing:

- Communicate using words the relationship between two variables; the independent and dependent variable.

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☒ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☒ Think Creatively
☒ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☐ Make Judgments and Decisions
☒ Solve Problems
Communication and Collaboration
☒ Communicate Clearly
☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☒ Access and Evaluate Information
☐ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☒ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☒ Adapt to Change
☐ Be Flexible
Initiative and Self-Direction
☒ Manage Goals and Time
☒ Work Independently
☐ Be Self-Directed Learners
Social and Cross-Cultural
☒ Interact Effectively with Others
☒ Work Effectively in Diverse Teams

Productivity and Accountability
☒ Manage Projects
☒ Produce Results
Leadership and Responsibility
☒ Guide and Lead Others
☒ Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Raw spaghetti noodles
- Two desks
- One meter stick/ ruler
- One cup "bucket"
- String
- One cup of Washers

Set-Up Required:

- Students must place two desks at an appropriate distance apart

Lab Organization Strategies:

Grouping/Leadership/Presentation Opportunities:

- Students will be working in groups of two by their choosing or if the teacher wants to group certain students together. They can make groups themselves.

Cooperative Learning:

- Students will be working together to collect data, graph points, calculate slope, and interpret slope. They will be sharing their discoveries with their peers as well as the teacher when they are asked scaffolding questions.

Expectations:

- All students will be breaking the bridges as well as graphing points, calculating the slope, and interpreting the slope.

Timeline:

- 50 min period.

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab.

- Connecting to science.

Career Applications

- Scientist, engineering.