Warm Up

How many of these bridges do you recognize?





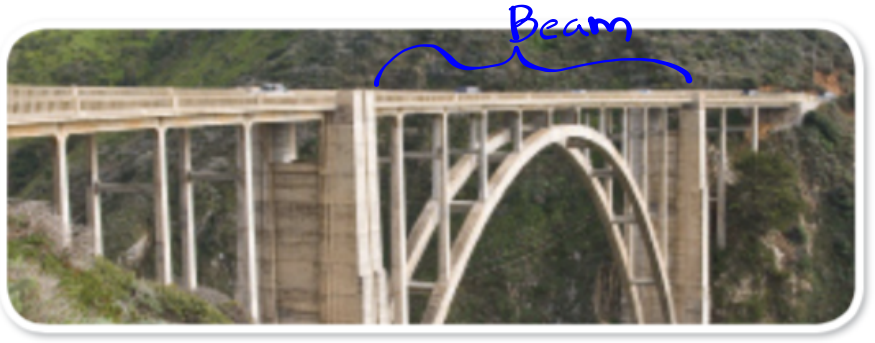



Investigation 1

Exploring Data Patterns

1.1 Bridge Thickness and Strength

Many bridges are built with frames of steel beams. Steel is very strong, but any beam will bend or break if you put too much weight on it.



- How do you think the strength of a beam is related to its thickness?
- What other variables might affect the strength of a bridge?

Set up your notebook:

1.1 Testing Bridge Thickness Date

Problem 1.1

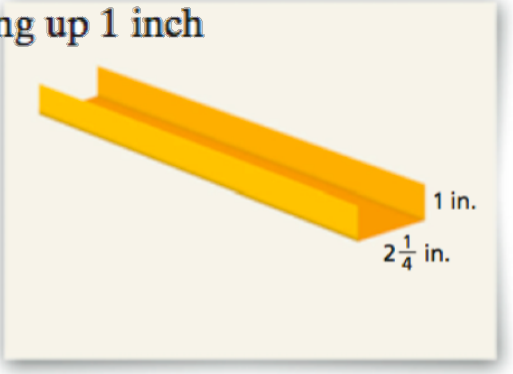
Engineers often use scale models to test their designs. You can do your own experiments to discover mathematical patterns involved in building bridges.

Today you will be the engineers!

Let's test how the strength of a bridge span is related to the thickness of the span.

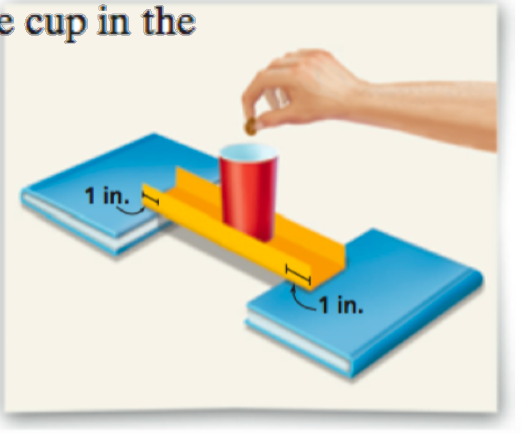
Instructions:

- Start with one of the paper strips. Make a "bridge" by folding up 1 inch on each long side.

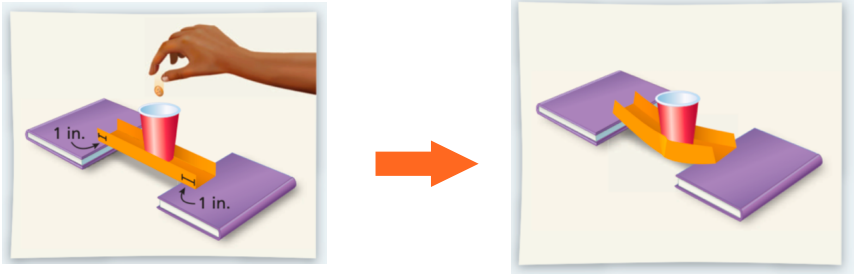


Fold all sheets of paper individually!

- Suspend the bridge between the books. The bridge should overlap each book by about 1 inch. Place the cup in the center of the bridge.



- Put pennies into the cup, one at a time, until the bridge collapses. Record the number of pennies you added to the cup. This number is the *breaking weight* of the bridge.



- Put two *new* strips of paper together to make a bridge with twice as many layers. Find the breaking weight for this bridge.

For bridges that are multiple thicknesses,
fold each paper **individually** and then stack them.

- Repeat this experiment to find the breaking weights of bridges made from three, four, and five strips of paper.

How do we set up our table?

What are we measuring units?

x	Thickness # of sheets	1	2	3	4	5
y	Breaking Weight # of pennies					

Note:

When working with coordinate pairs (x and y) they are always listed alphabetically.

(x , y)

coordinate pair

x	y

x
y

Graphing Guidelines

Graphs should occupy <u>at least</u> 1/2 of the height of the page.

Each graph should contain:

- Title
- Axis Labels
- Units for each axis
- Scale indicated with tick marks

Before you begin to graph:

What will go on the x-axis (x-variable):

What will go on the y-axis (y-variable):

What is the range of your x values?

0 - 5

What are easy intervals?

1's

How long does the x-axis need to be?

(Divide the highest number by the interval size)

What is the range of your y values?

ex/ 0 - 42

What are easy intervals?

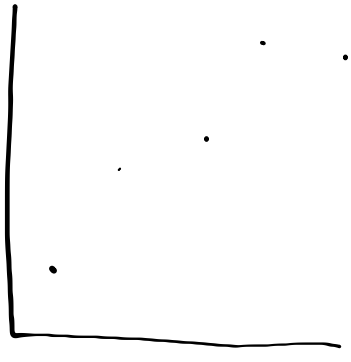
2's, 5's

How long does the y-axis need to be?

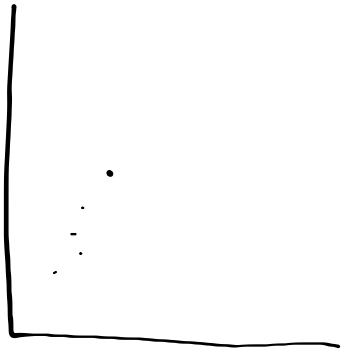
(Divide the highest number by the interval size)

We want to spread our data out as much as possible in our graph.

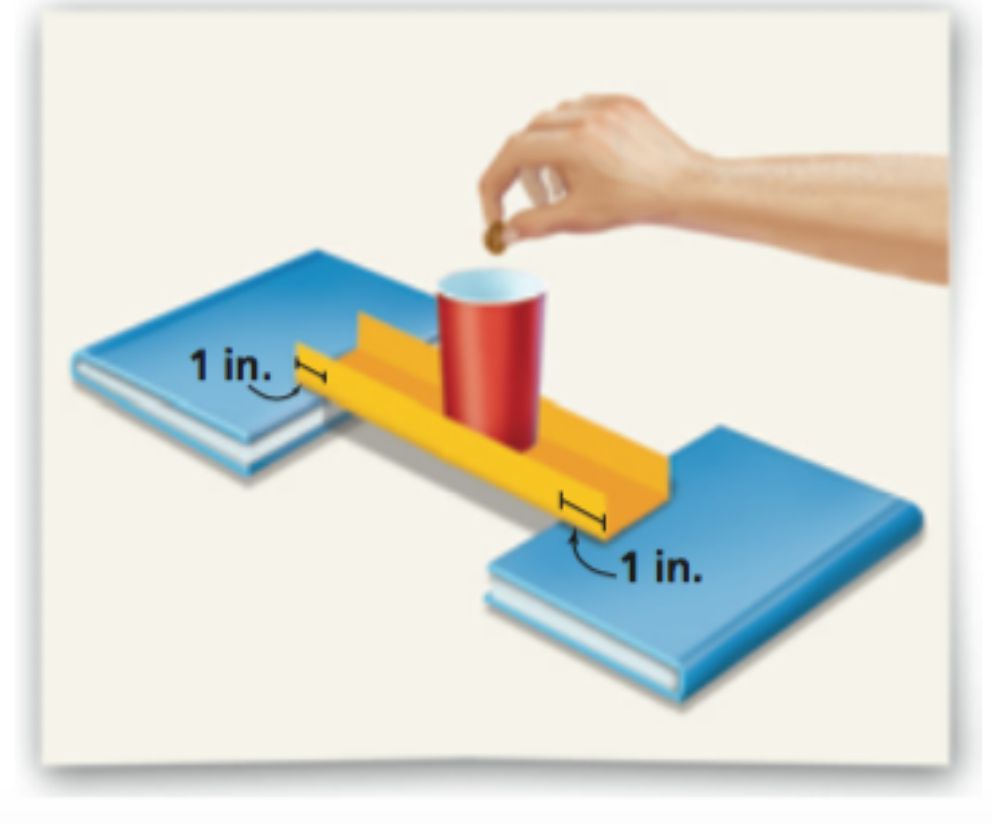
Like this



Not this



Don't forget ...



Complete Problem 1.1 A-D (NOT E!)

Problem 1.1

Engineers often use scale models to test their designs. You can do your own experiments to discover mathematical patterns involved in building bridges.

A Make a table and a graph of your (bridge layers, breaking weight) data.

B Does the relationship between the number of layers and the breaking weight seem to be linear or nonlinear? How do the graph and the table show this relationship?

C Suppose you could split layers of paper in half. What breaking weight would you predict for a bridge 2.5 layers thick? Explain.

D Predict the breaking weight for a bridge 6 layers thick. Explain your reasoning.

Homework

Finish Classwork