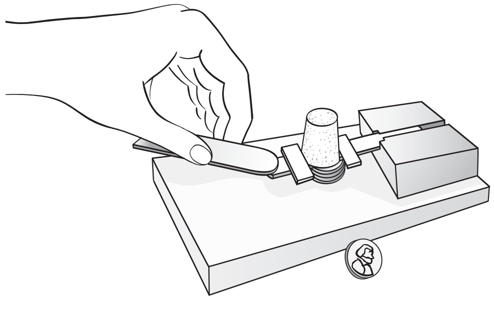
LETTER TO FAMILY

Cut here and paste onto school letterhead before making copies.

Science News



Dear Family,

Our class is beginning a new science unit using the **FOSS Motion, Force, and Models Module**. We will assume the roles of scientists as we try to figure out what causes things to move, stop moving, and change direction. We will manipulate variables as we make observations about force, energy, and work. We will investigate pendulum systems, ball-and-ramp systems, and leaf-spring systems. We have an interesting and exciting couple of months ahead.

We will also focus on conducting controlled experiments, an important scientific practice. We will be making a standard system, so we can then test variables and compare them to the original. With each passing investigation, students face more responsibility in controlling variables to observe how these systems work.

In this module, students also learn about scientific models. A scientific model explains a natural system or process that is not totally accessible to direct investigation. An example from geology is the ongoing struggle to figure out what Earth is like from crust to core. Each advance in scientific technology provides scientists with more information, and the model for the structure of Earth is refined. But it's still a model—no one knows for sure whether it's correct, because no one has been there for a firsthand look. In class, we will be confronting less-imposing systems, but the processes of gathering evidence, sharing ideas with peers, creating models, and modifying them based on additional evidence are the same. We will learn how to think productively about the unknown.

From time to time, I will be sending home/school connection sheets home with each student. These describe activities for the whole family, to share a little bit of the fun we will be having at school with motion, force, and models. You can get more information on this module by going to www.FOSSweb.com. If you have any questions or comments, call or come in and visit our class.

Sincerely,

Name ______________________________ Date ______________

MATH EXTENSION—PROBLEM OF THE WEEK

Investigation 1: Motion and Variables

Eight teams of students were experimenting with pendulums to find out how they work. Each team made a pendulum of a different length. Their teacher asked them to find out how many times their pendulum would swing. What the teacher forgot to tell the students was how long to count the swings. The table below shows the data collected by the eight teams. From this information, can you put the pendulums in order from shortest to longest?

Team	Number of cycles	Time (seconds)
1	9	20
2	11	12
3	9	15
4	36	30
5	10	10
6	10	15
7	8	20
8	10	12

Put the pendulums in order from shortest to longest by team number.

Shortest ______________

____

____

____

____

____

____

Longest ______________

HOME/SCHOOL CONNECTION

Investigation 1: Motion and Variables

There was a time when pendulums played an important role in everyday life as time regulators. The predictable swinging of the pendulum, when linked to the hands of a clock, kept the world on time. Now, for the most part, pendulum clocks are historical curiosities. Some clock collectors still have a cuckoo clock or grandfather clock as an interesting reminder of a time past.

Make a pendulum second timer

You can make a second timer at home with a mass, like a fishing weight or a big washer, and some string or thread. Strive to get it as accurate as possible. Fine-tune it until you can call 15 seconds at the same time another family member sees the second hand on a clock reach 15 seconds.

Make a minute timer

This might be a little more demanding, as pendulums tend to lose energy (because of friction at the pivot and air resistance) as they swing. What variables can you change to improve your chances of making the pendulum swing for a minute?

Ride a pendulum

A playground swing is a big pendulum you can ride. Can you guess how many cycles (complete swings back and forth) a swing will make in 30 seconds? Will longer swings complete more or fewer cycles in 30 seconds? Take a ride and find out.

Name ______________________________ Date ______________

MATH EXTENSION—PROBLEM OF THE WEEK

Investigation 2: Balls, Ramps, and Energy

A major league baseball pitcher can throw a fastball at about 90 miles per hour, which is equal to 40 meters (m) per second. A really fast tennis serve was clocked at 73 m per second.

A standard baseball has a mass of 145 grams (g).
A standard tennis ball has a mass of 57 g.

If a major league fastball were to meet a tennis-ball serve head on, what would happen? Why do you think that would happen?

To calculate momentum, use the following formula:

momentum = mass X speed

HOME/SCHOOL CONNECTION

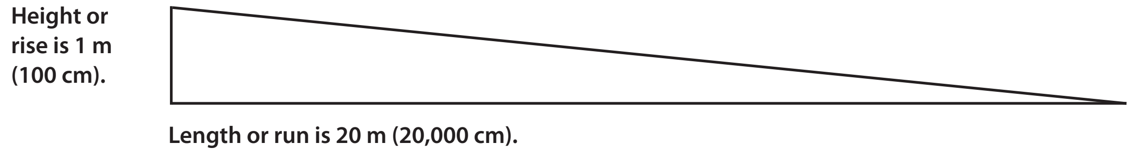
Investigation 2: Balls, Ramps, and Energy

Wheelchair ramps provide a long, gradual slope that makes it easier for a person in a wheelchair to get into or out of a building.

Engineers have set recommendations for ramp construction, using the relationship between the height of the entrance and the length of the ramp. For every 1 unit of height, the ramp should be 20 units long. That relationship can be described as a ratio. The ratio is 1:20.

If the entrance is 1 meter (m) high, the ramp should be 20 m long.

The height is called the **rise**. The length is called the **run**.



The steepest ramp allowed is one that has a ratio of 1:16.

Determine how long the ramps would need to be for the height of the entrances listed in the table. Calculate the length for both ratios.

Height of entrance to building	Ramp 1:20	Ramp 1:16
50 cm		
80 cm		
120 cm		
150 cm		
200 cm		

1. What if you had to make a ramp with a rise of 80 centimeters (cm), but it could not be longer than 15 m. Which ramp ratio would you use, 1:20 or 1:16?

2. If you had to create a ramp using a 1:20 ratio for an entrance that was 150 cm high, but you only had a space that was 10 meters long, how else could you construct the ramp so it fits in your space?

Name ____ Date ___________________

MATH EXTENSION—PROBLEM OF THE WEEK

Investigation 3: Springs and Energy

Using the FOSS website (www.FOSSweb.com), two teams of students from different states decided to collaborate on a project to test variables. They designed a controlled experiment to investigate how far a skateboard would roll across flat ground when released from the top of a 2 meter slope. The angle of the slope could be changed incrementally to conduct additional trials. This is what the experimental setup looked like.

The two classes conducted the same sets of experiments and compared results. The Texas class conducted four trials at each angle; the Massachusetts class conducted three trials. Help them analyze the results of their experiments. The two tables show the data they recorded.

Texas

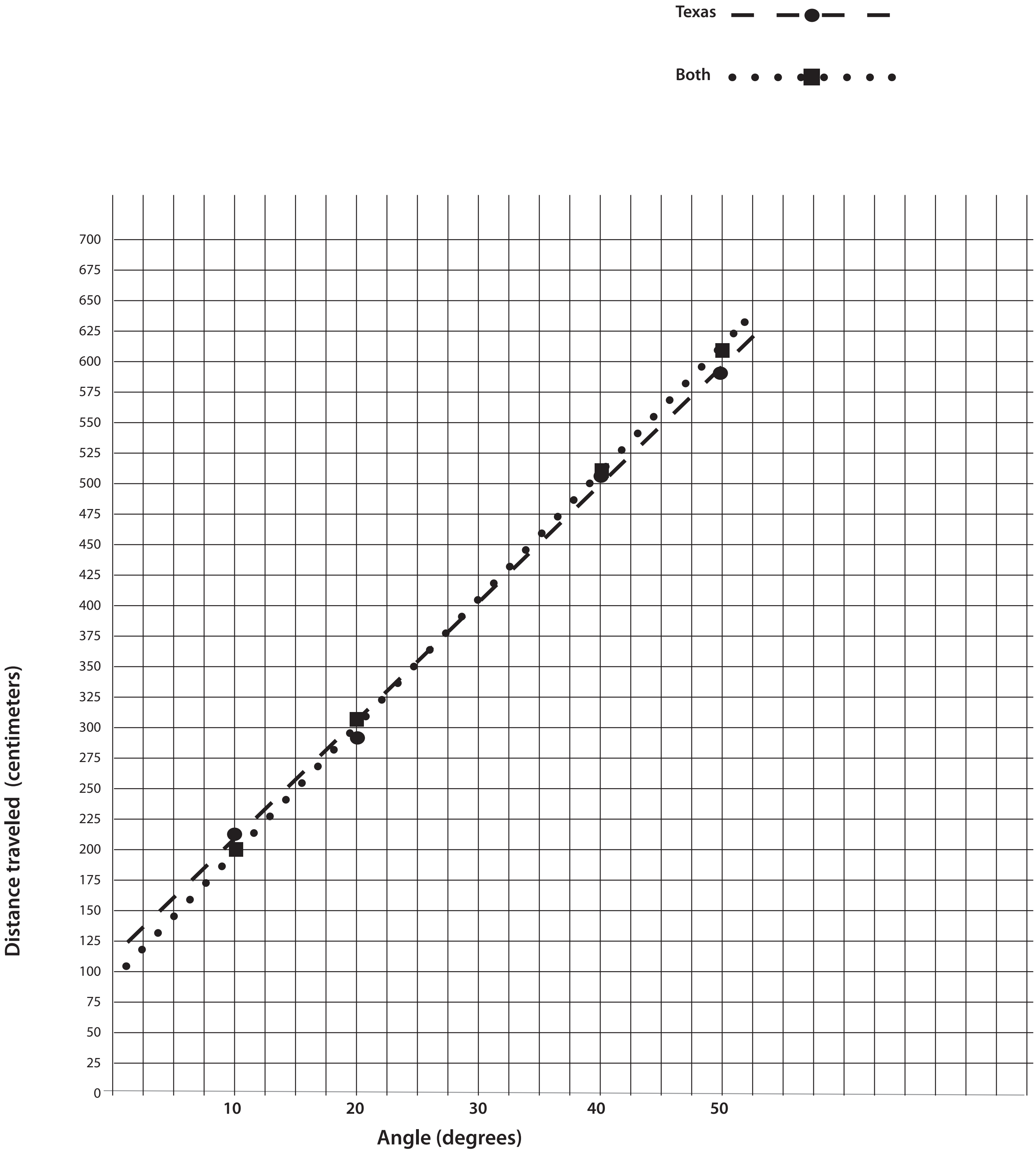
Angle	10°	20°	40°	50°
Distance	105 cm	270 cm	530 cm	610 cm
	370 cm	310 cm	490 cm	550 cm
	210 cm	250 cm	540 cm	630 cm
	185 cm	340 cm	460 cm	580 cm

Massachusetts

Angle	10°	20°	40°	50°
Distance	75 cm	280 cm	480 cm	625 cm
	240 cm	360 cm	570 cm	710 cm
	230 cm	310 cm	490 cm	600 cm

- What is the average distance the Texas team's board traveled at each angle? Plot the results of the Texas team's experiments on a two-coordinate graph.
- Add together both teams' results and average the distances. Graph the averages. What happens to the graph?
- If your class did the same experiment but launched your skateboard at a 30° angle, predict how far the board would travel.

GRAPH OF DATA FOR SKATEBOARD DISTANCE

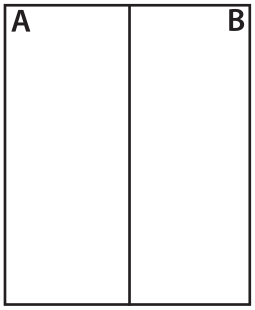


HOME/SCHOOL CONNECTION

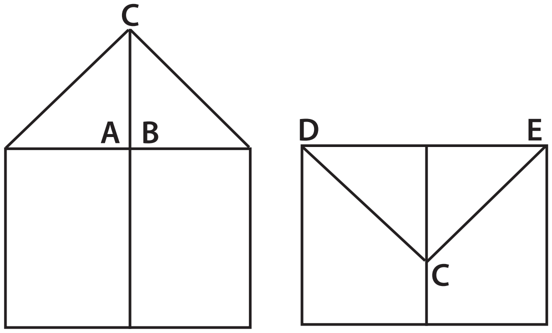
Investigation 3: Springs and Energy

What makes a paper airplane fly straight? Do loops? Fly in a circle and come back to you? A number of variables affect the flight of a paper airplane. Here's a model that lends itself to experimenting with the variables.

Step 1

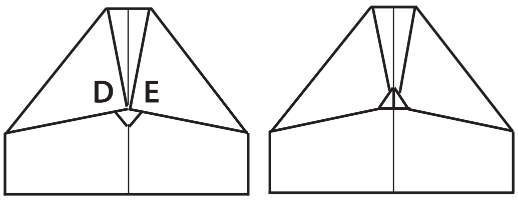


Step 2

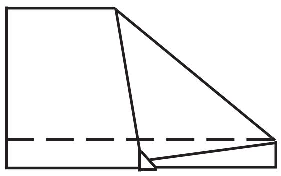


1. Fold a standard sheet of paper down the middle to create a midline.
2. Fold corners A and B to the midline, then point C down to the midline.

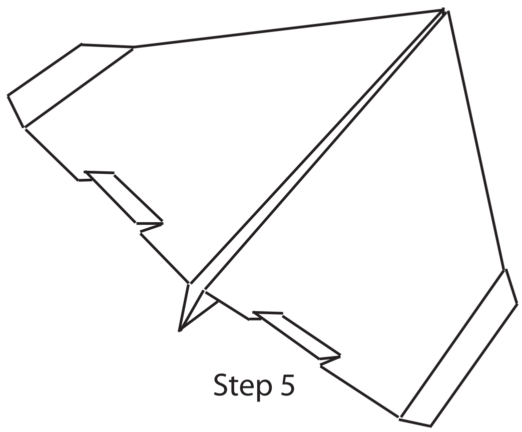
Step 3



Step 4



3. Fold points D and E to the midline, and then fold the little point up to hold points D and E down.
4. Fold the plane in half on the midline. Fold the wings down on the dashed line.
5. Turn the last 1 centimeter of the wing up at an angle to create stabilizers, and cut a couple of flaps on the trailing edges of the wings.



Step 5

Now adjust the variables to get the plane to do a number of tricks. After you master the variables, try some new ones. What happens to the plane if you make it half scale? Make it out of thinner paper, like magazine paper or newspaper? Let your imagination be your guide into uncharted variable territory.

MATERIALS LETTER

Science News

Dear Family,

Our class will be participating in an engineering-design challenge. We will need many clean, reusable materials from home to complete our work. We could use plastic containers, lids, foam trays, packing peanuts, shredded paper, cardboard boxes (not broken down), bubble wrap, etc. We will need the materials by

____________________________________.

We could also use the following new materials:

____

Thank you for your support.

Sincerely,

Science News

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Thank you for your support.

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Name ______________________________ Date ______________

MATH EXTENSION—PROBLEM OF THE WEEK

Investigation 4: Models and Design

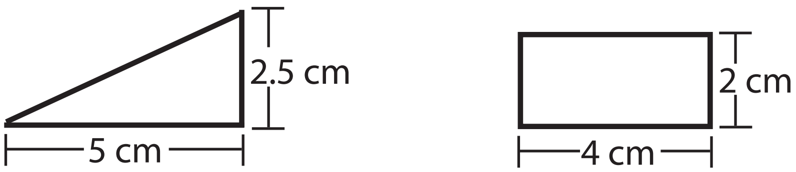
A class wanted to make their own black boxes, using small cereal boxes and cardboard shapes, to send to another class. They plan to make 24 boxes.

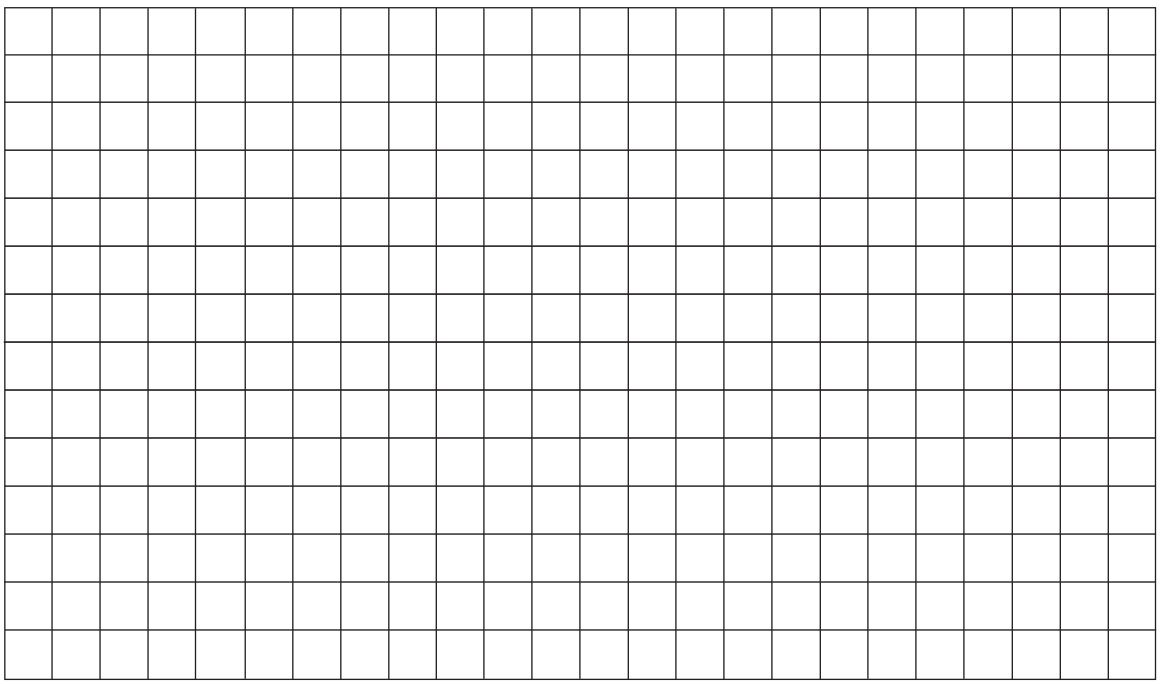
- One-half of the boxes will have one triangle inside.
- One-third of the boxes will have two rectangles inside.
- The rest of the boxes will have one triangle and one rectangle inside.

How many of each shape will they need? How do you know?

The dimensions of the triangles and rectangles are shown below. Use the centimeter grid to make a drawing to show how you would cut all the shapes from one piece of cardboard. (The shapes and grid are smaller than reality but are drawn to scale.)

What is the smallest piece of cardboard that all the triangles and rectangles can be cut from?





Centimeter graph paper

HOME/SCHOOL CONNECTION

Investigation 4: Models and Design

Black box is a general term scientists and engineers use to describe a system that works in mysterious or unknown ways. For most people, a television is a black box. Electricity goes in, and a picture miraculously appears on the screen. Even the cell phone is a black box. We dial a number to speak with a person across the continent, never questioning how this is possible.

What black boxes do you have in or around your home, in your neighborhood, in your car? What black boxes have you read about, seen on TV, or seen in a movie? Make a list with the help of other family members. Be prepared to share your list. Do you think you can come up with any black boxes that no one else will think of?

Black boxes
