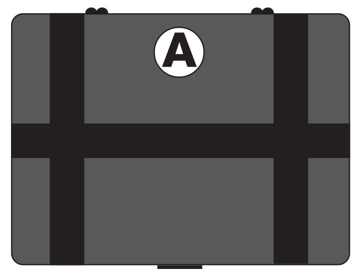
LETTER TO PARENTS

Cut here and paste onto school letterhead before making copies.

Science News

Dear Parents,



Our class is beginning a new science unit using the **FOSS Models and Designs Module.** We will assume the roles of scientists as we try to figure out what hidden systems look like and how they work. Then we will change into engineers as we try to design self-propelled carts from simple construction materials. We have an interesting and exciting couple of months ahead.

In this module, children 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 our planet 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.

After we tackle models and expand our points of view and ways of thinking about systems, we will become engineers who design and create products. We will be designing and building carts from sticks, paper clips, wire, rubber bands, and the like. With each passing investigation students face more demanding engineering challenges, and I expect to see a lot of creativity brought to bear on the problems.

From time to time I will be sending home/school connection sheets home with your child. These describe activities for the whole family, to share a little bit of the fun we will be having at school with models and designs. If you have any questions or comments, call or come in and visit our class.

Comments ____

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Name ____________________

Date ____________________

PROJECT IDEAS

- Research the Ptolemaic system of the universe and later modifications that brought our model of the solar system to its present form.
- Produce a blueprint of your fantasy house, including precise measurements for all dimensions. Build a three-dimensional model from your drawings.
- Make a model to explain any of the many black boxes in our everyday world, such as a door lock, camera, toy, and toaster. Your model could be a conceptual or a physical model to explain how the black box works or how it looks inside.
- The same materials that were used to make a hum dinger can be used to construct a model doorbell. The doorbell should ring as long as the string is pulled, and turn off when the string is released. Write directions for constructing your doorbell.
- Design and engineer a propulsion mechanism that will allow you to take a short ride on a wagon.
- Choose any household device to study and improve. Does it function the best it could? What other functions could it perform? Would a design improvement make it more appealing? Write a letter to the manufacturer.
- Design a boat that can be self-propelled by a rubber band or something else.
- Design and construct a vehicle that uses the air pressure from a balloon. Make one that flies, slides, rolls, or floats.
- Collect a variety of small springs (available in various sizes and strengths at hardware stores) to use as power sources for your cart. New designs should take advantage of the springs.
- One variable that engineers continually struggle with is the mass (weight) of the vehicle being propelled. Design an experiment to test the relationship between the distance a cart will go with ten winds of the rubber bands and the amount of mass it is carrying. Graph the results.
- Rollers powered by rubber bands can be made from plastic film canisters, empty thread spools, oatmeal boxes, cans, and other cylindrical containers. Investigate roller variables: rubber-band size and number, size of the roller, length or thickness of the rod, lubricants, and so forth.
- There are many branches of engineering. Find out what different engineers do and write a help-wanted ad describing what the job entails.
- mechanical engineer
- electrical engineer
- civil engineer
- mining engineer
- genetic engineer
- chemical engineer
- locomotive engineer
- sanitation engineer

Name ______________________________

Date ______________________________

PROJECT PROPOSAL

1. **What is the question or the project that you are proposing?**

2. **What materials or references will you need to complete the project?**

3. **What steps will you follow to complete the project?**

Name ____________________________

Date ____________________________

PRESENTATION GUIDELINES

You will have exactly 3 minutes to present your project to the class. In those 3 minutes you should answer these questions.

- What were you trying to find out (your question)?
- What materials or references did you need to do your project?
- What procedure did you follow to complete your project?
- What did you learn from doing your project?

When you begin speaking, you will see the *green card* held up for 2 1/2 minutes. When you see the *yellow card,* you have 30 seconds left. When you see the *red card,* it means you can finish your sentence, but you must stop within the next few seconds.

Practice your presentation so you will be sure it is at least 2 1/2 minutes long, but not more than 3 minutes long. Be sure you have included all of the information asked for above.

Name ____________________________

Date ____________________________

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Name ____________________________________

Date ____________________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 1: BLACK BOXES

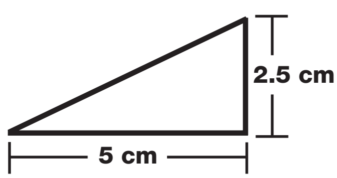
A class wanted to make their own black boxes, using small cereal boxes and cardboard shapes, to send to another class. They plan to make 24 boxes.

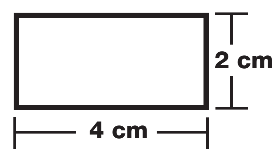
- One-half of the boxes will have one triangle inside.
- One-third of the boxes will have two rectangles inside.
- The rest of the boxes will have one triangle and one rectangle inside.

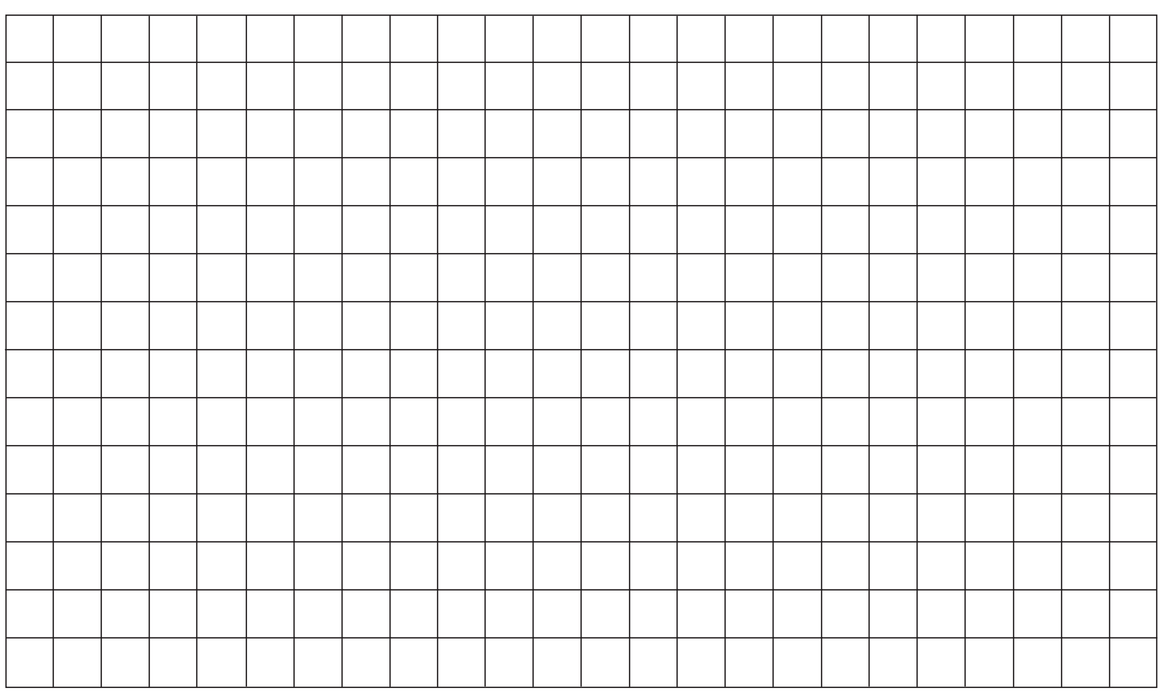
How many of each shape will they need? How do you know?

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 of the triangles and rectangles can be cut from?







Centimeter graph paper

Name ________________________________

Date ________________________________

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 2: HUM DINGERS

The students in Mr. Sylvester's class wanted to see how long it would take them to build hum dingers. They decided that all eight groups would start working on their hum dingers at the same time, and work until they all succeeded. At exactly 10:50 they started working.

Group 4 got its model hum dinger humming and dinging first and wrote down 11:45. Soon the other groups were having success as well. Here is a chart showing the time at which each group got their hum dinger working.

Group 1	12:20
Group 2	1:05
Group 3	12:40
Group 4	11:45
Group 5	12:05
Group 6	12:50
Group 7	12:00
Group 8	11:55

1. How long did it take the *fastest* group to make their hum dinger?

2. How long did it take the *slowest* group to make their hum dinger?

3. What was the *total* amount of time spent by all eight groups?

4. What was the *average* length of time needed to make a hum dinger?

Mrs. Jackson's class also wanted to find out how long it would take to make hum dingers. They timed the hum-dinger activity, too. The total time they spent making hum dingers was 9.5 hours. But Mrs. Jackson had only six groups in her class. Which students were faster, Mr. Sylvester's or Mrs. Jackson's? How do you know?

Name ____________________

Date ____________________

MATH EXTENSION—PROBLEM OF THE WEEK

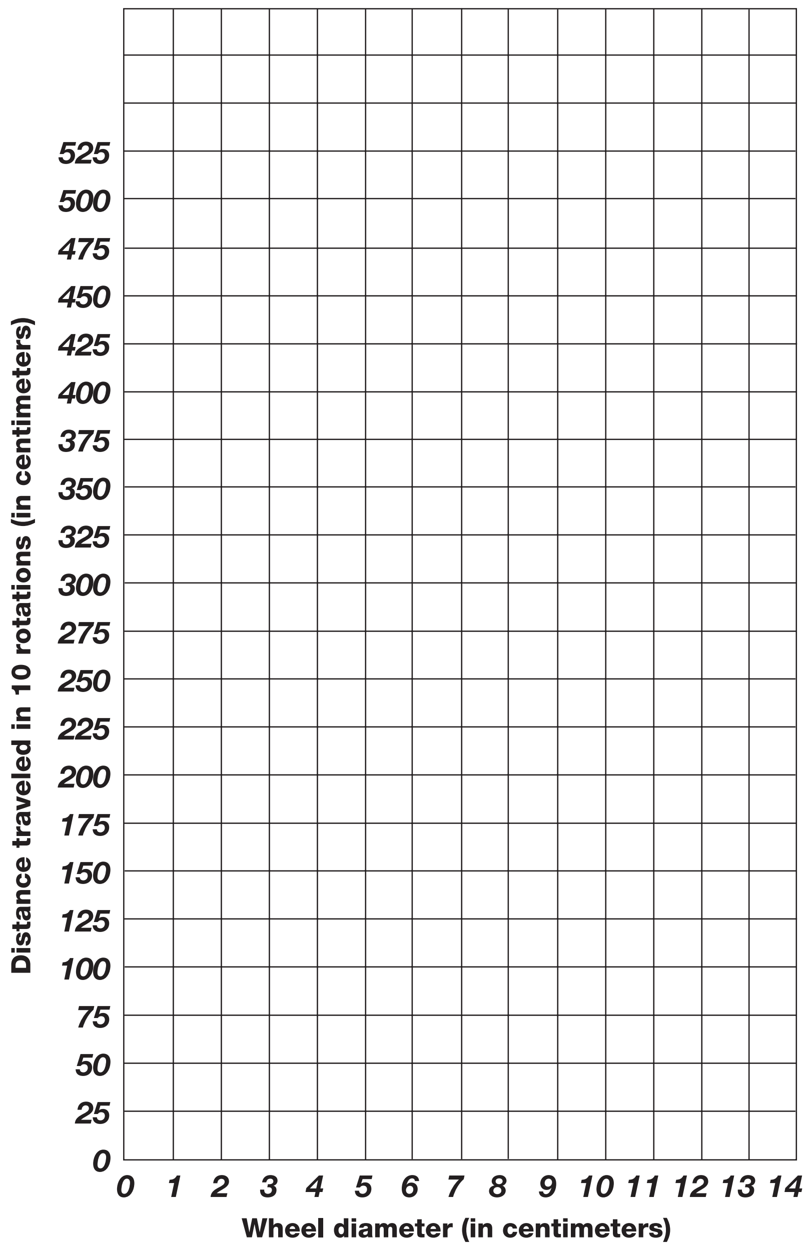
INVESTIGATION 3: GO-CARTS

How far does a cart go each time its wheel makes one rotation (goes around one time)? It goes a distance equal to the wheel's circumference. Circumference *(C)* is the distance around the outside of a circle (or wheel). You can calculate the circumference of any circle by multiplying the diameter *(D)* of a circle (the distance from one side to the other) by the constant pi (π). Pi (pronounced "pie") can be rounded off to 3.14. So the formula for calculating the circumference of a circle is $C = \pi \times D$.

Engineers often have charts and tables with useful information at their fingertips when they are designing a new product. A graph that shows how far a cart will travel with wheels of various sizes would be just such a convenient table.

Starting with wheels of 4, 8, and 12 cm, make a graph that tells you how far a cart will go when the *wheels rotate ten times.* Then answer the questions below.

1. What size wheel will go exactly 2 m on ten winds?
2. How far would a cart with 10-cm wheels go in ten rotations?
3. What size wheel will go exactly 6 m in ten rotations?
4. What size wheel will go exactly 2 m in five rotations?



Name ______________________________

Date ______________________________

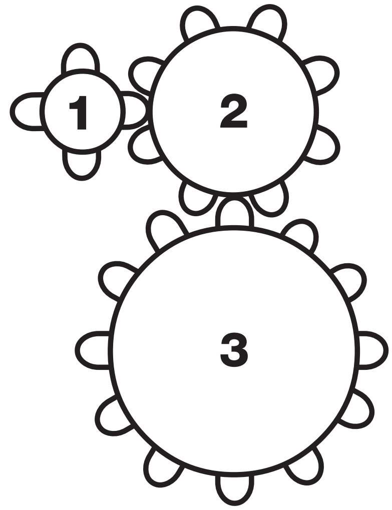
MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 4: CART TRICKS

You may have heard about gears. Some bikes have gears, and so do cars and go-carts. But why do vehicles have gears? Let's see if we can figure it out.

A gear is a wheel with knobs sticking out. The knobs are called teeth. When the teeth on one gear interlock with the teeth on another gear, we say that they mesh.

Part 1. When two or more gears are meshed, if one of them turns, they all turn. Each time one tooth on a gear moves, one tooth also moves on all the other gears meshed to it. When gear 2 goes clear around once, how many times will gear 1 go around?

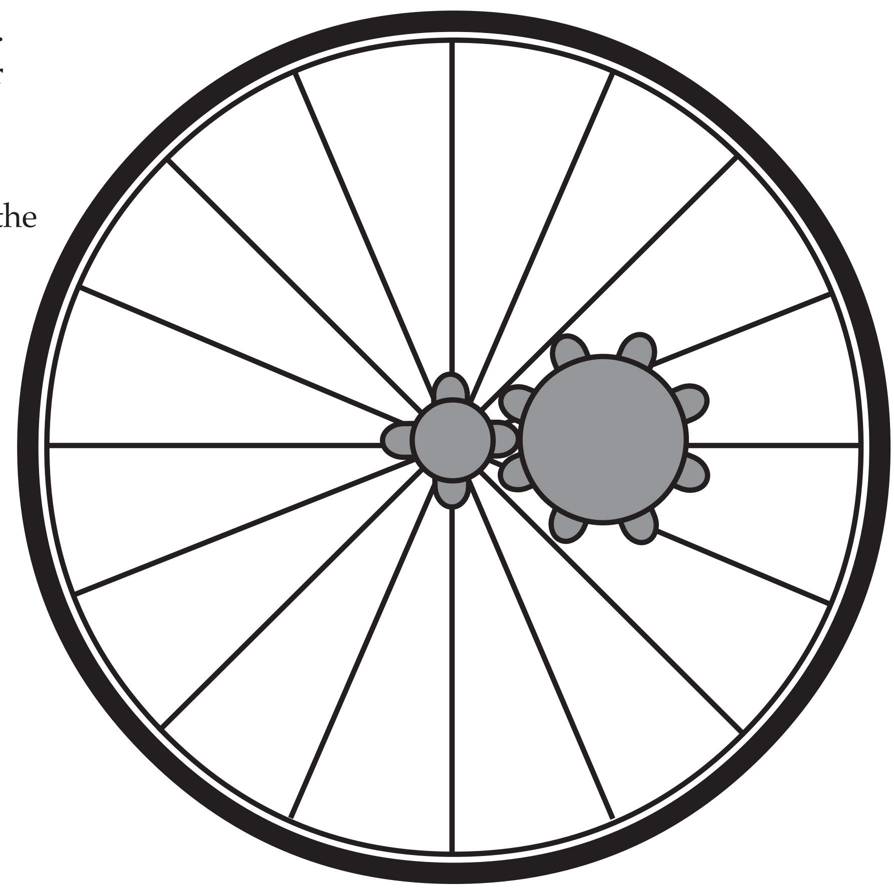


When gear 3 goes clear around twice, how many times will gear 2 go around?

How many times will gear 1 go around?

Part 2. Three students got some big wheels for a cart they built. The wheels had a 150-cm circumference (48-cm diameter). The wheel had a four-tooth gear attached to the hub.

They got an eight-tooth gear to drive the wheel. How far does the wheel roll over the ground each time the eight-tooth gear goes clear around once?



Part 3. When the students got their cart going, they counted the number of times the eight-tooth gear rotated. It went around 250 times in 5 minutes. Can you help them figure out how fast the cart was going in kilometers per hour?

Name ___________________________________

Date ___________________________________

HOME/SCHOOL CONNECTION

INVESTIGATION 1: BLACK BOXES

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 color TV is a black box. Electricity goes in and a picture miraculously appears on the screen. Even the telephone 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 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

Name ________________________________

Date ________________________________

HOME/SCHOOL CONNECTION

INVESTIGATION 2: HUM DINGERS

When you made a model hum dinger in class, a motor made the hum. Usually motors do a little more than just hum. For instance, you've probably seen a portable tape player. What do you suppose makes the tape advance so you can hear the music? A motor. See if you can find any motors around your home or in your car. What are they being used for? List locations of motors and what they are doing.

Some students used a lever to make a reliable switch on their model hum dinger. A rod or bar that pivots at one point is a lever. Levers are also found around homes and cars. A pair of scissors is one example of a lever system. A bottle opener is another example. Go on a lever hunt with a family member and list objects that are or that include levers.

Location of motor	Motor function

Location of lever	Lever function

Name ___________________________________

Date___________________________________

HOME/SCHOOL CONNECTION

INVESTIGATION 3: GO-CARTS

You know what a toaster is...you put a couple of slices of your favorite bread in the slots, push down on the little plunger handle, and 2 minutes later, up pops hot toast. Not dark enough? Twist the darkness dial and plunge it down again. Perfecto!

How does a toaster work? What holds it down? What actually toasts the bread? How does the darkness gizmo work? What makes toast pop up? How does it know when to pop up?

Try to figure out how a toaster might work. Talk it over with family members. Do you think there are any motors in there? Any levers? Magnets? Draw a model of a toaster. Try to include an explanation in your model for all the features described above.