

LANCASTER
SCIENCE FACTORY

Scientific Achievement Badge
Activity Packet
Girl Scout Cadettes

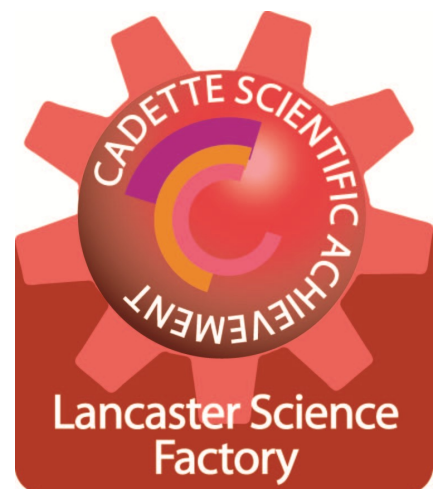
To get your special Lancaster Science Factory badge:

Complete all 5 required experiments
at these exhibits:

1. Roller Coaster
2. Dam the Creek
3. Electrical Circuits
4. Puzzles & Brain Teasers
5. MiniRacers

Plus complete 4 out of the 7 experiments
at these exhibits:

1. Crank Power
2. Earthquake
3. Magnetic Sculpture
4. Flight Deck
5. Light & Vision Room
6. Mechanical Advantage
7. Parachute Launch



You must get a signature from your troop leader for each experiment that you do and answer a few questions!

Turn the page and read on to find out what you have to do!

REQUIRED EXPERIMENTS



1. Roller Coaster

Build a roller coaster consisting of at least six pieces of track (including loops). Be sure that the ball reaches the end.

Sketch the design that worked the best and label the points where potential and kinetic energy are the greatest.

Do you think you could have the same amount of potential and kinetic energy at the same time?

Leader's Initials _____

2. Dam the Creek

Build a dam that keeps back almost all of the water using as few bricks as possible.

What is a drainage channel?

What happens if you build over the pre-cut drainage channels in the bottom (closer to the water flow) so that absolutely no water can get through?

How many different combinations of dam structures can you come up with?

Is it better to stagger the bricks or line them up evenly?

Leader's Initials _____

3. Electrical Circuits

Wire a circuit that makes at least two lights shine brightly.

What is necessary to have a complete circuit?

How are amps different from volts?

Assemble a series circuit then a parallel circuit. Which do you think is better and why?

Leader's Initials _____

REQUIRED EXPERIMENTS



4. Puzzles & Brain Teasers

Puzzle scavenger hunt! Find a puzzle or exhibit that:

1. Makes you use an algorithm:

What's an algorithm?

2. Must be completed in a particular sequence:

What's a sequence?

3. Requires a space to be filled:

4. Forces you to create a three-dimensional geometric shape:

Leader's Initials _____

5. MiniRacers

Build a K'NEX dragster that races to the finish line.

What propels the car forward when you set it in place on the track?

Build, race, and compare the Sprint Racer to the Gear Head Racer.
Which is easier?

Faster?

Went farther?

Leader's Initials _____

ELECTIVE EXPERIMENTS



1. Crank Power

Work as a team to light up the headlights, make the radio play music, and spin the fans and mixer all at once.

List the parts inside a generator.

Which part moves with the crank?

What type of energy goes into a generator and what type goes out?

What kind of machine does the opposite?

Leader's Initials _____

2. Earthquake

Use all of the blocks and support rods to build the tallest structure possible to withstand an earthquake. How long did the building stand?

Is it better to put the connecting rods in the holes in the blocks or to use the horizontal grooves?

Leader's Initials _____

3. Magnetic Sculpture

See how many nuts you can get to stick together.

The hex nuts are not originally magnetized. How can such long chains of nuts be created?

Can the hex nuts still stick together like magnets even if they're not attached to the horns?

Borrow a spring scale from the front desk to measure how much force it takes to pry a hex nut that is directly stuck to a horn (place the hook inside the nut while its attached). How much force did it take? How about a hex nut stuck to that nut? Does the magnetic force get weaker the farther you get from the horns?

Leader's Initials _____

4. Flight Deck

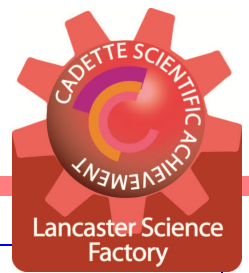
What are the four forces that must be considered to make something fly?

Make, fly, and compare two types of paper airplanes in the book provided.

Can you guess why one flew better than the other (for example, sharper, thinner, more or less folds)?

Leader's Initials _____

ELECTIVE EXPERIMENTS



5. Light & Vision Room

What are the primary colors of light? How is a lens different from a mirror?

How is a convex shape different from a concave shape?

Why does it seem like Einstein's face is convex when it is really concave?

How many mirrors do you think are inside the Infinity Mirror?

Leader's Initials _____

6. Mechanical Advantage

Try to lift each 100 pound stack of weights.

How much force (in pounds) is needed to lift each set of pulleys?

If we had a pulley with a 10-to-1 mechanical advantage, how many wheels would it have and how many pounds of force would you need to be able to lift the 100 pounds?

If we had a pulley with just one wheel but it was flipped upside down, how many pounds of force do you think you would need to be able to lift the 100 pounds?

Leader's Initials _____

7. Parachute Launch

Propel a paratrooper up to the ceiling.

How do parachutes slow the descent of a person or object?

Borrow a spring scale from the front desk to measure how much force the parachute is capturing when you hold it partially inside the air pressure tube (hook the paratrooper string to the scale hook and let the parachute hang in the tube without letting go).

Leader's Initials _____

BONUS QUESTIONS!



1. What was your favorite exhibit or experiment? Why?

2. Which exhibit or experiment was the most difficult? Why?
