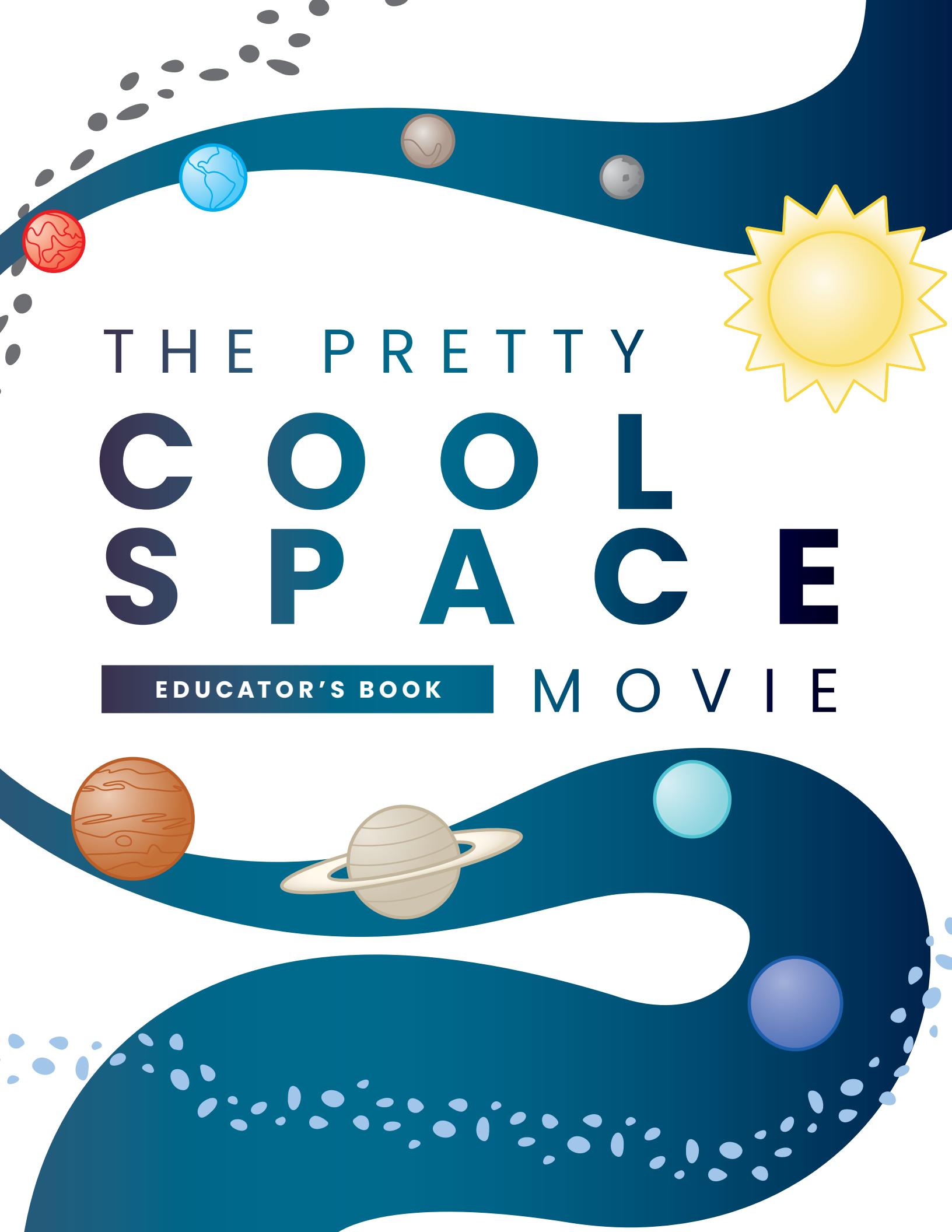




THE PRETTY
COOL
SPACE

EDUCATOR'S BOOK

MOVIE

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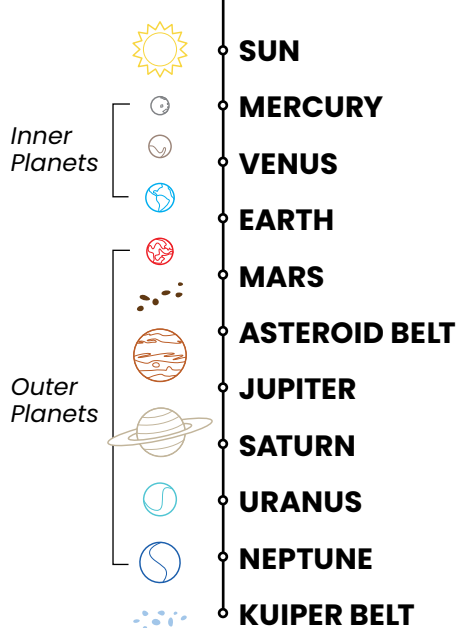
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How much

S P A C E

is in space?

Solar System



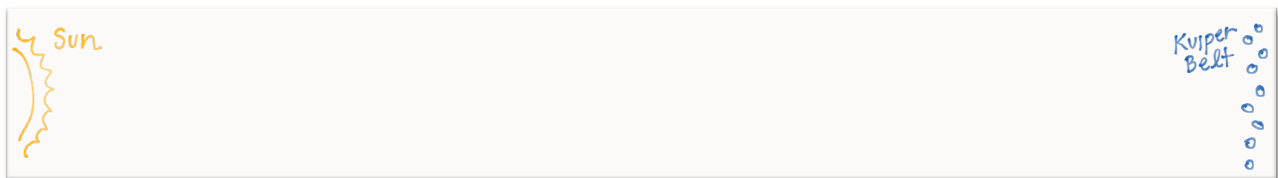
How far apart are the planets of our solar system? With this activity you can put your guess to the test! Determine the relative distances between the planets in our solar system using fractions.

Materials

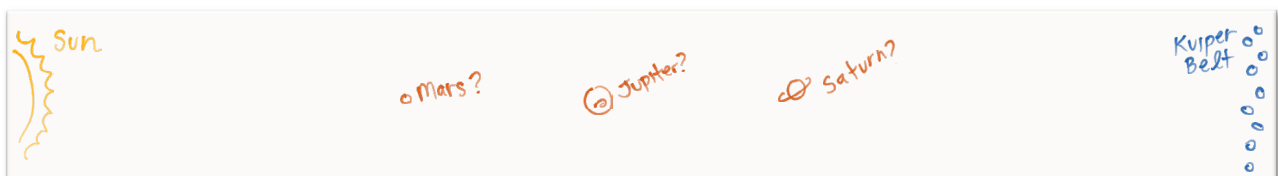
- **Long strips of paper.** We are finding relative distances, so the activity does not require a specific length. A strip equivalent to the length of your desk or one's arm length would be sufficient.
- **Markers and/or colored pencils.** Use different colors to differentiate your guesses from the answers.

PROCEDURE

1. On your strip of paper, draw and label the Sun on one end and the Kuiper Belt on the other, using colored pencils or markers.



2. Take a guess! Fill in the remaining objects of our solar system in the space between the Sun and the Kuiper Belt, paying attention to the relative distances between the objects. Are they evenly spaced? Or are some closer than others?

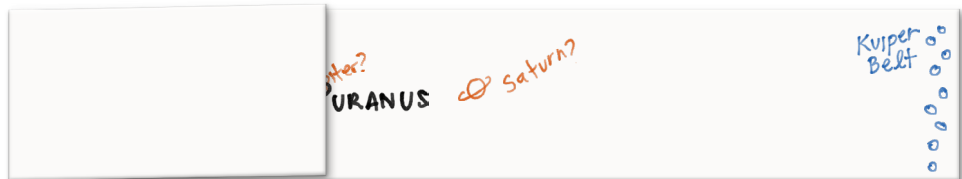


PROCEDURE

3. Now we will find the actual relative distance between planets. First, fold the paper strip in half, to find the midpoint of your strip. Reopen the strip and using a bold color, label the midpoint (1/2 mark) Uranus.



4. Now, take the side where you have the Sun labeled and fold it to the Uranus mark. The new crease (at the 1/4 mark) is where Saturn is located.



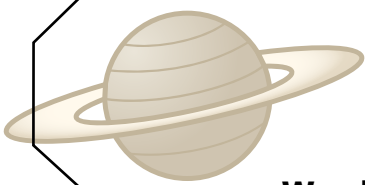
5. Repeat the last step but this time with the Kuiper Belt side. This crease (at the 3/4 mark) is Neptune.

6. Starting with the Sun again, fold the strip of paper to the Saturn mark. This new crease is at the 1/8 mark and is where we would find Jupiter.

7. Repeat again, taking the Sun to the new Jupiter mark. This represents 1/16 and is where the asteroid belt is found.

8. Repeating once more, taking the Sun to the asteroid belt. Here at the 1/32 mark, we find Mars.

9. That means that all of the remaining inner planets (Earth, Venus and Mercury) are between Mars and the Sun.



GALACTIC

Word Find



Words are hidden diagonally, up, down, left and right.

J F U O E N U T P E N E R E H P S O M T A R M
A I F M A R S A A S A T U R N I M F X N N C I
M E N O Z E L B A T I B A H V O V Z E O E O L
E K D M M I C R O B I A L L I F E X L I B M K
S B L A C K H O L E Z G R A V I T Y B T U E Y
W F G S R A T S U E L S U N E V A S B A L T W
E N E J S P I R A L G A L A X Y A F U I A F A
B N O O M I V G T L E B R E P I U K H D V Y Y
B V G O O R T C L O U D P L U T O V Q A H G M
D D I O R E T S A Y R O X Y G E N N S R Z G E
E P E F I L L A I R T S E R R E T A R T X E R
A A T E N A L P F R A W D X J U P I T E R S C
R V Q T N R A L L E T S R E T N I C V F B T U
T Z T E U R O P A R T E M P E R A T U R E S R
H O K B S R A E Y T H G I L N V F T I T A N Y
X N P D A R K M A T T E R A E P O C S E L E T

Asteroid

Atmosphere

Black Hole

Comet

Dark Matter

Dwarf Planet

Earth

Europa

Extraterrestrial Life

Habitable Zone

Hubble

Interstellar

James Webb

Jupiter

Kuiper Belt

Light Years

Mars

Mercury

Microbial Life

Milky way

Moon

Nebula

Neptune

Oort Cloud

Oxygen

Pluto

Radiation

Saturn

Spiral Galaxy

Stars

Sun

Telescope

Temperature

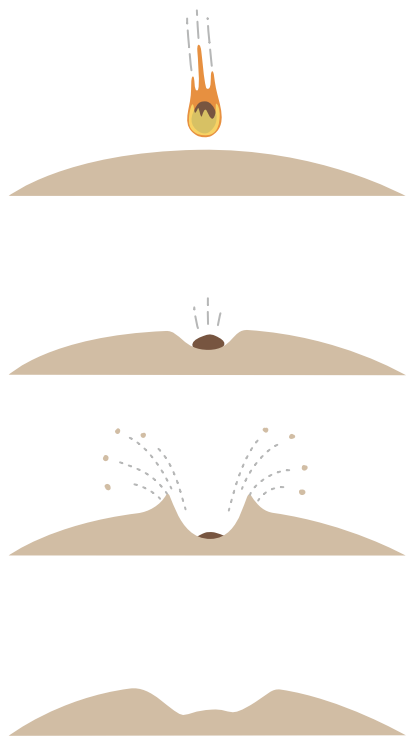
Titan

Venus

MAKE AN IMPACT

...crater!

Craters are created when an object—like a meteorite, asteroid, or comet—collides with a surface at high speed, usually on a planetary body such as the Moon, Earth, or Mars. This process is called impact cratering.



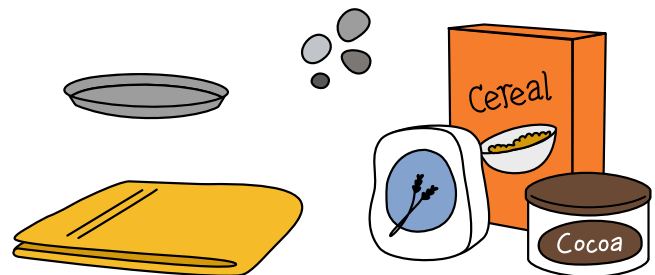
Here's how it works:

- 1. Impact:** A space object such as a meteoroid, asteroid, or comet hits the surface at a very high velocity (often tens of thousands of kilometers per hour).
- 2. Compression:** The energy from the impact compresses the surface and the object, generating extreme heat and pressure.
- 3. Excavation:** Material is ejected outward from the impact site, creating a circular hole or bowl shape.
- 4. Modification:** The crater can collapse slightly, forming central peaks or terraced walls, depending on the size of the impact.

How to make your own crater:

Materials

- **Cake tins.**
- **3-4 small rocks.**
- **2-3 different baking ingredients.** Flour, cocoa, sprinkles, rice cereal, or similar.
- **Newspaper or Towels.** To cover work surface for easy clean-up.

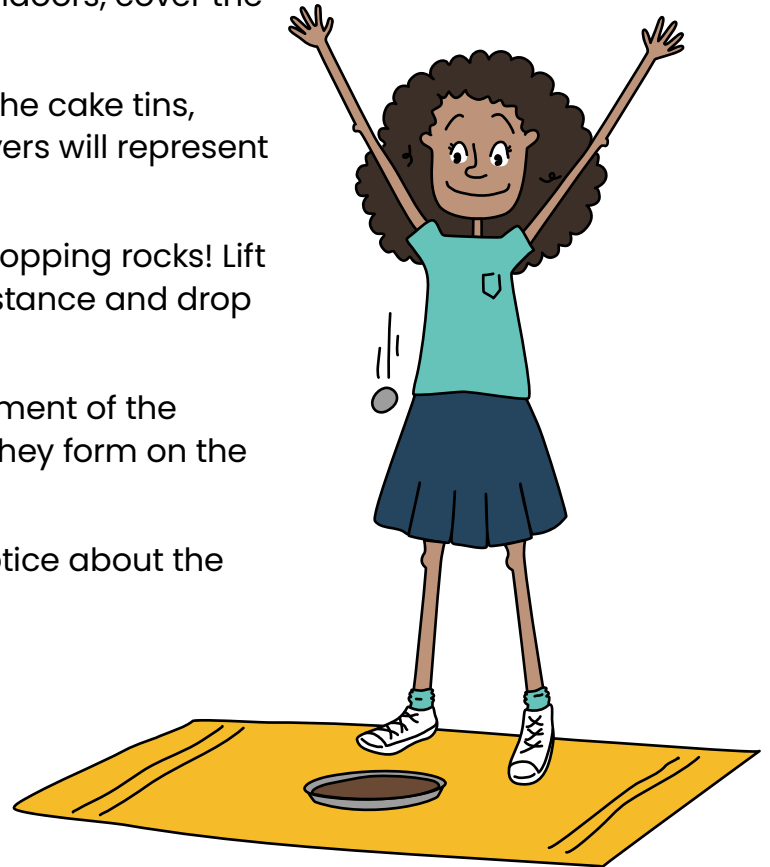


How to make your own crater:

Procedure

1. Prepare your workspace. This experiment can be messy, so working outside is ideal. If indoors, cover the floor with newspapers or towels.
2. Place your baking ingredients into the cake tins, forming one layer at a time. These layers will represent soil and rock strata.
3. Once your space is set up, begin dropping rocks! Lift your arms overhead for maximum distance and drop the rock directly into the tin.
4. Observe the **ejecta**. Note the movement of the baking ingredients and the patterns they form on the surrounding surfaces.
5. Observe the crater. What do you notice about the shape of the crater?

ejecta: material that is expelled or thrown out due to an impact.

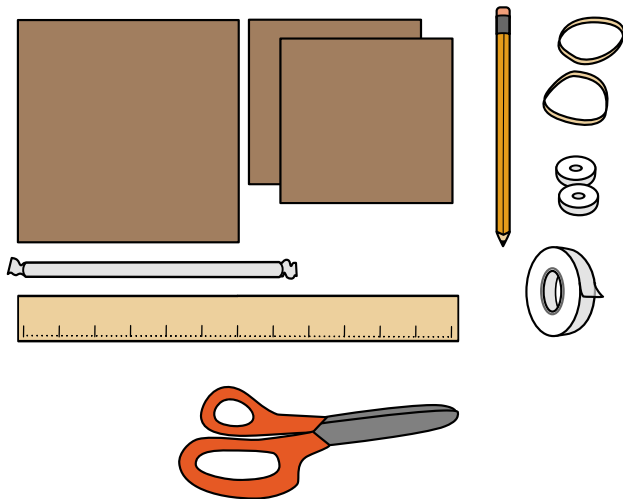
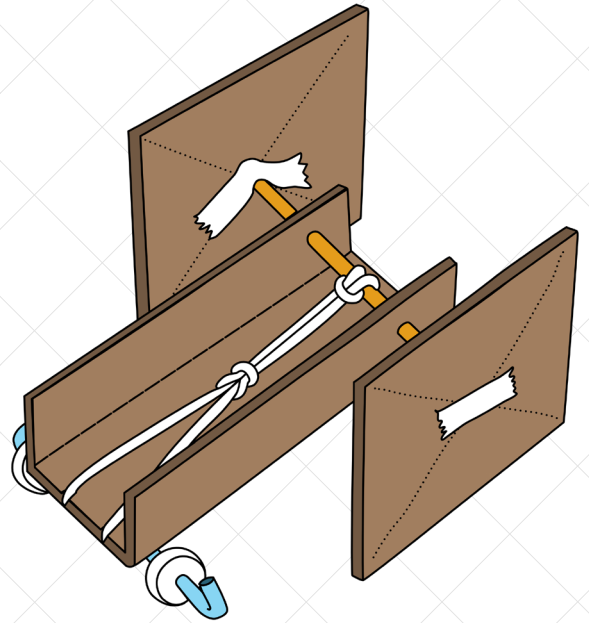


Sketch and/or describe your observations:

BUILD

A Mini Rover

Construct a rubber band-powered rover capable of traversing a room. Use the engineering design process to build the rover from cardboard, then test, evaluate and refine your design.



Materials (For each rover)

- **Corrugated cardboard body:** 6-inch (15-cm) square.
- **2 corrugated cardboard wheels:** 5-inch (13-cm) square.
- **1 sharpened round pencil.**
- **2 rubber bands.**
- **2 round hard candies with a hole in the middle.**
- **1 plastic drinking straw**
- **Ruler**
- **Tape**
- **Scissors**

Procedure

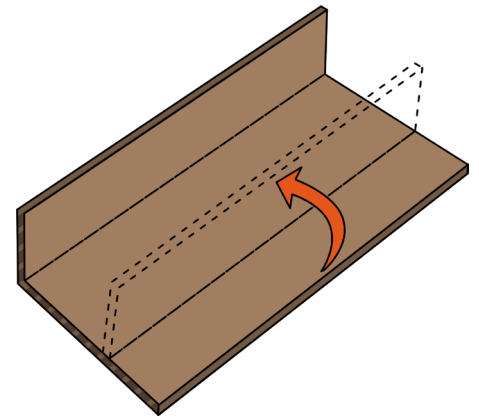
1. Brainstorm! Take a close look at the drawing of a rover to the right.

Ask yourself these questions:

- What do you have to do to make the rover move?
- How do you think square wheels affect how the rover moves across the floor?
- How can you make improvements to the wheels?

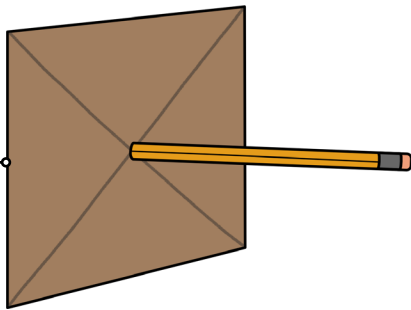
2. Make the rover body

Fold the 6 inch cardboard square into thirds *along* – not across – the corrugation (the open veins inside the piece of cardboard), pushing up the sides of the rover body to form a trench. Each section will be about 2 inches (5 cm) across.



3. Make the front wheels

On the two 5-inch (13-cm) cardboard squares, draw diagonal lines from each of the corners, forming an "X". Poke a small hole in the center with a pencil, where the lines cross.

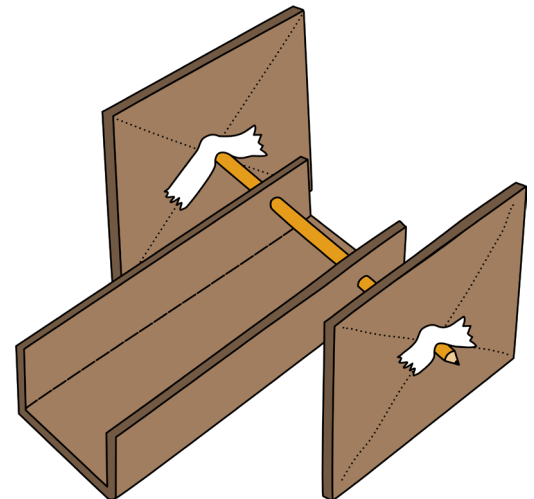


Important! Avoid accidentally poking yourself with the pencil. Keep your hands away from where the pencil will go through the cardboard.

4. Attach the rear axle and wheels

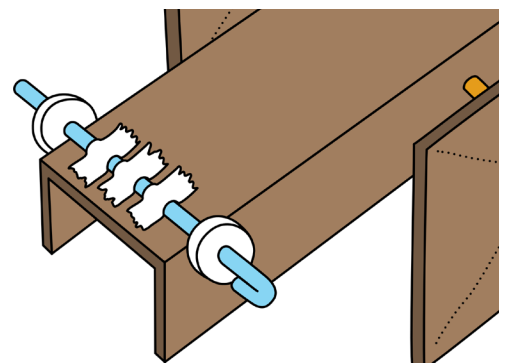
Use a pencil to carefully poke a hole near the top of each of the two outermost sections on the rover body. Again, keep your hands away from where the pencil will go through the cardboard. Make sure the holes are directly across from each other and are big enough for the pencil to spin freely. This is where your axle will go.

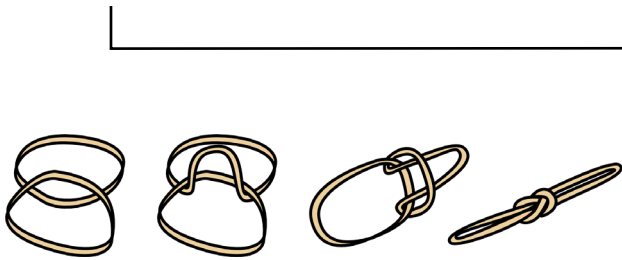
Slide the pencil through the axle holes. Carefully slide the cardboard wheels onto each end of the pencil and secure them with tape.



5. Make the front axle and wheels

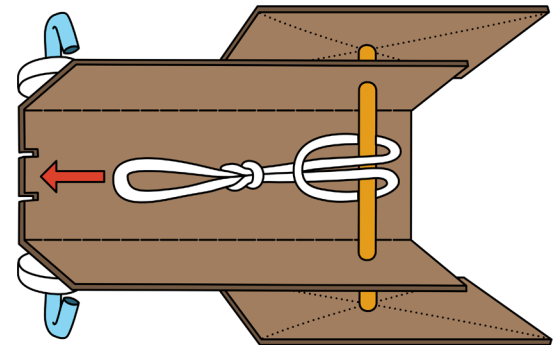
Tape the straw across the bottom of the rover body on the opposite side from the pencil. Slip a candy onto each end of the straw. Bend and tape the ends of the axle to stop the candies from coming off.





6. Make a rubber-band chain

Create a chain with the two rubber bands as shown in the image to the left.



7. Attach the rubber band

Loop one end of the rubber band chain around the pencil, as shown in the image. Cut small slits into the front end of the rover body. Slide the free end of the rubber band chain into the slits.

8. Put your rover to the test!

- Turn the back wheels to wind the rubber band around the axle and power up your rover.
- With the rover on the floor, let go! Observe what the rover does. Measure the distance it traveled.

9. Evaluate the design

Think about how your rover performed and what could be improved. Ask yourself these questions:

- Did the wheels turn freely?
- Did the rover travel in a straight line?
- How far did it go?
- Did the wheels spin out without the rover moving much, or did they have traction on the ground and cause the rover to move?

10. Redesign and test it again

Make changes to your rover to improve its performance. After you've made changes, test your rover to see if the improvements worked!

11. Graph your results

The more energy in your rubber band, the more energy goes to spinning your rover's axle. Test your rover after three, six, and nine turns of the rubber band around your axle. Measure the distance the rover travels in each trial. Graph the number of rotations versus the distance travelled.