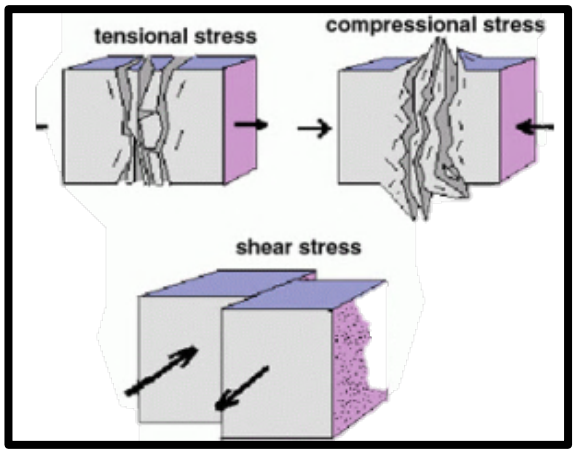
Earthquakes

Materials Per 2 students

2 pieces of Bubbilicous gum, not sticks
Twizzlers
Milky Way snack size
Earthquake table or cookie sheets
bag
Toothpicks 3 dozen
Wooden blocks
Legos
Paper towels
Marshmallows 1 small

Essential question: What events on earth can cause the Earth's surface to change quickly?

Engage: What is this a picture of? What do you wonder? What do you think caused this road to buckle?

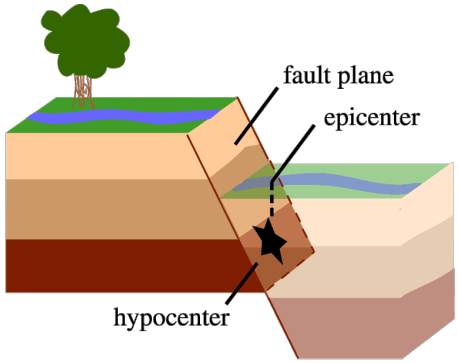


Standard 2.1.2

Explore: Explore the force behind earthquakes with students. Using a Milky Way bar, gum, and Twizzlers, students will demonstrate the effects of deformational forces on the earth's crust. Deformation is when the Earth's crust is stressed by pressure which causes an area of the Earth's crust to change their shape over time.

There are three basic deformational forces: tensional, compressional, and sheer. Tensional forces are forces that **pull** crustal rocks apart. Compressional forces are forces that **squeeze** crustal rock together. Sheer forces are forces that **push** crustal rock horizontally and in different directions. Have students take a piece of bubble gum (not stick) and tell them they will apply pressure to the gum as if it were the Earth's crust.

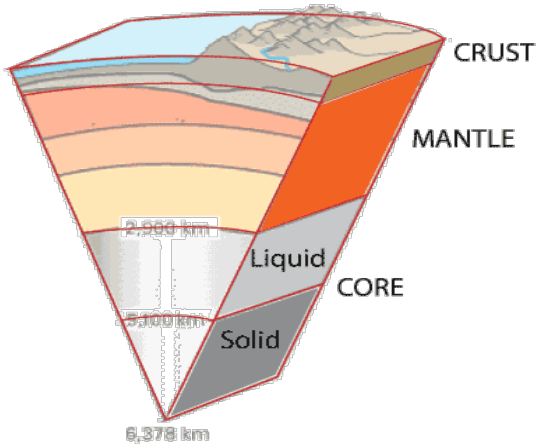
1. Have students unwrap one piece of gum and apply a tensional (stretching) force with their fingers on the gum. Do not pull it totally apart. Record your observations. Explain this is how valleys are created because the Earth's crust is pulled.
2. Have students reshape the gum back to its original shape and then apply compressional forces with their fingers on the gum. Record your observations. Explain that when the Earth's crust collides with each other mountains are formed.
3. Unwrap second piece of gum and apply a transversal shear force (plates rub against each other in the opposite direction) with the other piece of gum. Record your observations. Explain these create fault lines.



4. This time, using your Milky War bar, repeat Step 1-3. Explain that the chocolate coating on the candy bar cracks and moves like tectonic plates on the earth's crust move. The caramel is like the magma that can rise to the earth's surface. Leave your candy bar on the napkin. Observe the effects of tensional forces on different candy bars by looking at the candy bars of at least five other students. Record your observations on the five different candy bars. Have students notice if any "mountains ranges" have formed after applying compressional stress to any of the candy bars. Have any of the candy bars outer layers show signs of subduction? Where the mantle (one piece of chocolate) has slid under the other mantle (piece of chocolate).

5. Take your Twizzlers and stack them horizontally on top of each other, supporting them with your hands. Apply compressional forces by pushing in towards the center. How do these forces cause earthquakes?

Explain: What is an earthquake? An **earthquake** is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the **fault** or **fault plane**. The location below the earth's surface where the earthquake starts is called the **hypocenter**, and the location directly above it on the surface of the earth is called the **epicenter**.



What causes Earthquakes?

The earth has four major layers: the inner core, outer core, mantle and crust. The crust and the top of the mantle make up a thin skin on the surface of our planet. But this skin is not all in one piece – it is made up of many pieces like a puzzle covering the surface of the earth. Not only that, but these puzzle pieces keep slowly moving around, sliding past one another and bumping into each other. We call these puzzle pieces **tectonic plates**, and the edges of the plates are called the **plate boundaries**. The plate boundaries are made up of many faults, and most of the earthquakes around the world occur on these faults. Since the edges of the plates are rough, they get stuck while the rest of the plate keeps moving. Finally, when the plate has moved far enough, the edges unstick on one of the faults and there is an earthquake.

Optional activity: Have teacher demonstrate to the class whole group how each tectonic plate moves using graham crackers. Take a paper plate and spread a layer of Cool Whip on top. Take one large graham cracker break it down the middle into two pieces. Place crackers on top of the Cool Whip next to each other. Pull the crackers apart demonstrating tensional forces, push them back together to demonstrate compressional stress. Some Cool Whip will form showing students how mountains form. Next, push one cracker below the other

to represent subduction zone. Slide graham crackers opposite of each other to show transversal sheer force.

Elaborate: Engineering activity. Divide students into 6 groups. Have one group build a tall structure with Legos. One group builds a tall structure with marshmallows and toothpicks. One group builds a tall structure in wooden blocks. One group builds a short structure with Legos. One group builds a short structure with marshmallows and toothpicks. One group build a short structure with wooden blocks. Have students test their structure on an earthquake table or cookie sheet sliding between 2 lines.

Evaluate: Which structure withstood the earthquake best? What could we do to improve the structure to withstand an earthquake?

Name_____

Earthquakes

Draw what your candy looked like after tensional (stretching) forces.	Draw what your candy looked like after compressional (pushing) forces.
Did your candy have any mountain ridges form? If so, draw them.	Draw what your candy looked like after shear (rubbing) forces.
Draw what the Twizzlers looked like after applying compressional forces on them.	How do these forces cause earthquakes?

Do earthquakes change the surface of the land slowly or quickly? Write 3-4 sentences explaining your thinking.

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