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Tectonic Plates

Lexile 840L

1 On March 11, 2011, an earthquake measuring 8.9 on the Richter scale rocked the sea floor. It made a giant wave, which grew as tall as 30 feet (9.14 meters) high. The huge ocean wave, called a tsunami, sped toward the coast of eastern Japan. It hit the coast, tearing apart buildings and homes, and flooding rice fields. The tsunami also took human lives with it.



2 Sadly, this wasn't the first time that a disaster like this has happened in the world. It won't be the last time, either. Over Earth's history, tectonic plates have always moved. This movement has reshaped continents, created and destroyed ocean basins, and caused earthquakes. Tectonic plate movements have also formed a variety of landforms. These include volcanoes, mountain ranges, and oceanic trenches. To find out how and why these things happen, Earth scientists have studied the movement of plates.

3 Earth is made of three different layers: crust, mantle, and core. The crust and the thin, solid upper section of the mantle together form the lithosphere. Under the rigid lithosphere is a section of the mantle called the asthenosphere. The asthenosphere is soft and putty-like. The lithosphere is broken into separate pieces much like a cracked egg shell. These pieces are called plates. There are seven major tectonic plates. North of the equator are the Eurasian and North American plates. Most or all of the South American, Indo-Australian and Antarctic plates lie south of the equator. The equator crosses the middle of the Pacific and African plates.

4 The plates glide on the flexible asthenosphere. They creep along, moving in different directions and at different speeds. Plates move toward (or away from) one another very slowly. They may move from less than one centimeter per year to as much as ten centimeters per year. This top speed is about as fast as fingernails grow. Because plates move in different directions, there is a lot of tearing and crunching where any two plates meet. Thus, scientists research plate boundaries in order to understand tectonic movement.

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- 5 There are three types of plate boundaries: divergent, convergent, and transform. Boundary type is based on the way the plates move compared to one another. Different landforms result from different boundary types. Different sets of events, such as earthquakes, tsunamis, or volcanic eruptions, can happen at each boundary. What the plate is made of is important also. The plate could be made of denser, ocean basin rock or of less dense, continental rock. The landforms and types of events that result depend on the direction of motion and the types of plates.
- 6 Divergent boundaries occur when two plates pull away from each other. When this happens, a rift or tear is made in the lithosphere. Magma from the asthenosphere seeps up through the rift. As magma cools, new crust is made. The new material builds up along the rift. It forms volcanic ridges or individual volcanoes. This type of boundary is found in the Mid-Atlantic Ridge. This type of boundary can form a new ocean.
- 7 Convergent boundaries occur when two plates run into each other. When both are made of continental rock, the land is pressed together and pushed upward. This can form massive mountain ranges like the Himalayan Mountains. It is different if one or both of the plates are made of dense oceanic rock. In that case, the denser plate will plunge under the other. This is how deep ocean trenches are made. Volcanic mountain chains can form as some of the plunging plate heats up and melts. This is the type of boundary found along the coast of Japan.
- 8 Transform boundaries occur when two plates slide horizontally past one another. Transform boundaries are different than the other boundary types. They do not usually form mountains, volcanoes, or trenches. However, movement along transform boundaries can trigger earthquakes. The San Andreas Fault in California is a transform boundary. There have been many San Andreas earthquakes. These have resulted in a great loss of life and property over history. Transform faults are also found in ocean basins as part of mid-oceanic ridge structures.
- 9 The broken pieces of Earth's plates are like a patchwork quilt in motion. Over the past 50 years, Earth scientists have learned many basic principles of tectonic plate movement. They can better explain the way that Earth's crust has changed over time. Scientists also understand more about how plate movements can result in earthquakes, tsunamis, and volcanic eruptions. Scientists still must learn more before they can predict these events before they happen.

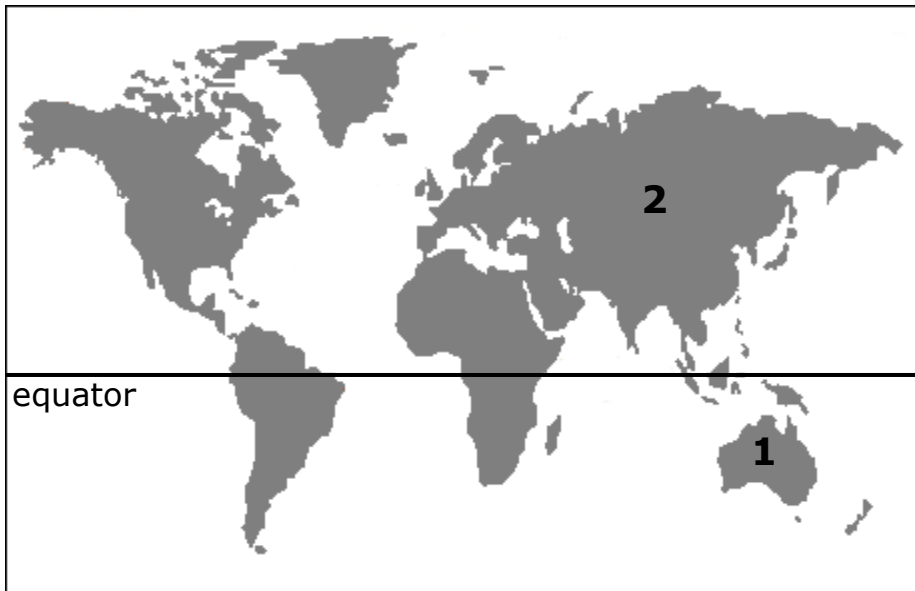
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- 1** What is the difference between a divergent boundary and a convergent boundary?
- A** Divergent boundaries slide past each other horizontally, and convergent boundaries form mountain ranges and ocean trenches.
 - B** Divergent boundaries run into each other, and convergent boundaries pull away from each other.
 - C** Divergent boundaries pull away from each other, and convergent boundaries run into each other.
 - D** Divergent boundaries form mountain ranges, and convergent boundaries slide past each other horizontally.
- 2** Which of the following statements best summarizes the main points of the passage?
- A** There are three types of plate boundaries: divergent, convergent, and transform.
 - B** In 2011, an earthquake measuring 8.9 on the Richter scale shook the ocean floor. It made a giant wave which grew up to 30 feet (9.14 meters) tall.
 - C** Tectonic plates have always moved and always will.
 - D** Scientists study plate boundaries in order to understand tectonic movement, understand more about how plate movements can result in earthquakes, tsunamis, and volcanic eruptions, and explore how to predict these events.

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- 3** If a convergent boundary involves a continental landmass and an ocean basin, what is the result?
- A** A chain of volcanic mountains will form on the edge of the continent or just off shore; a deep ocean trench will form off shore.
 - B** The land will fold and fault, forming high mountain ranges.
 - C** The land at the edge of the continent will buckle, causing the formation of a trench.
 - D** There will be frequent earthquakes, but no other evidence of crustal movement.
- 4** Which statement can be made about the above passage?
- A** Scientists can predict earthquakes, but not tsunamis.
 - B** Tectonic plates have moved and reshaped continents, created and destroyed ocean basins, and caused earthquakes.
 - C** Meteorologists can broadcast news quickly about approaching disasters.
 - D** Shifting of tectonic plates never affect people's lives.

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- 5** Examine the diagram shown. Which are the correct labels for continental plates **1** and **2**?
- A** 1 = Antarctic, 2 = African
 - B** 1 = Indo-Australian, 2 = Eurasian
 - C** 1 = North American, 2 = Pacific
 - D** 1 = South American, 2 = Antarctic