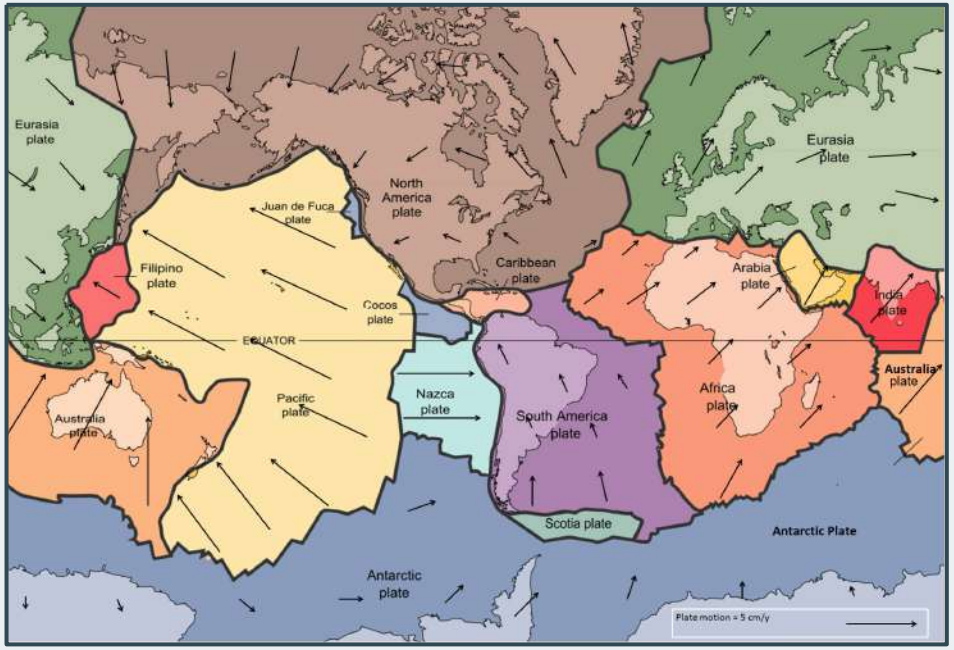
Warm Up

1. What could be causing the land to move or crack?
2. Does land only move and crack during an earthquake, or could it happen when or where there is no perceptible shaking?

Consider Vectors

Individual Think Time

Analyze the Plate Motion map.



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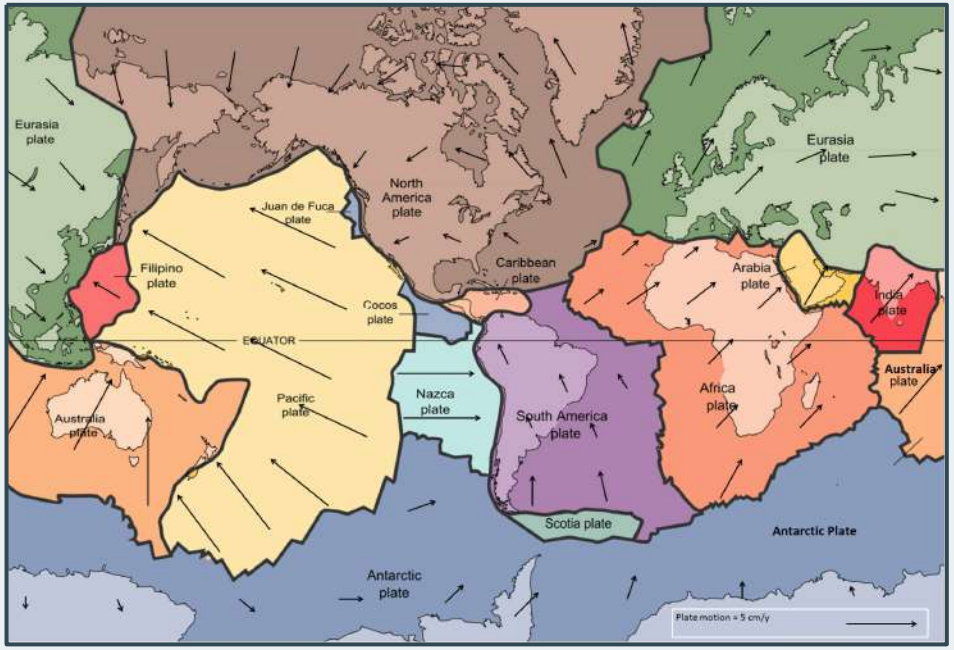
- What do the arrows represent?
- Why are some arrows longer than others?

➔ Be ready to share your ideas with the class!

Analyze Plate Motion Data

With your class

Analyze the Plate Motion map.



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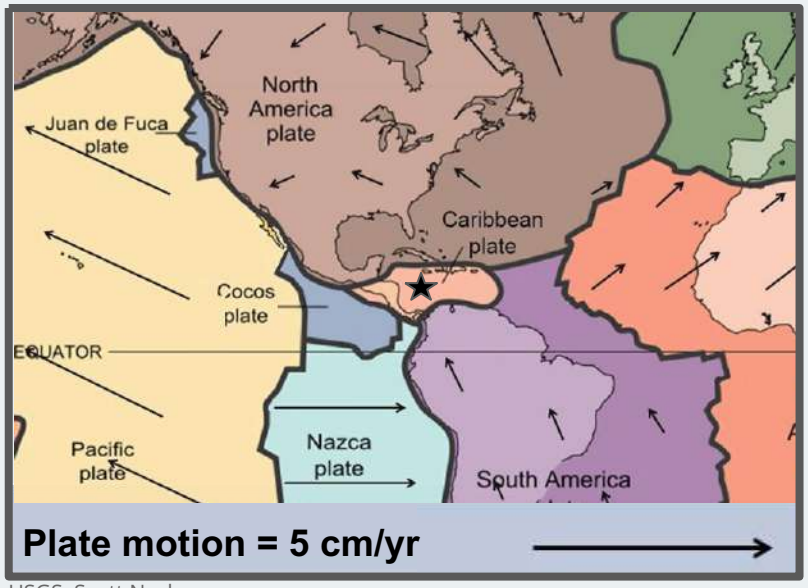
What does this data tell us about what is happening to Earth's plates?

Interpret Data

Turn and Talk

Why might a plate that we are living on appear to us to be stable, even though it is moving at a scale of a few centimeters per year?



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➔ Be ready to share your ideas with the class!

Consider Scale of Changes

Choose an object in the room that is stable:

- Under what conditions is it stable (not moving)?
- Under what conditions is it not stable (moving)?
- What if we changed the temperature in the room?
- What if we left the object here for hundreds of years? Would it still be stable?

Revise Ideas about Contact Forces

Anytime 2 objects are in contact, they exert **contact forces** on each other. Let's make sense of how contact force interactions on *any* solid object might affect it.

Individual Think Time

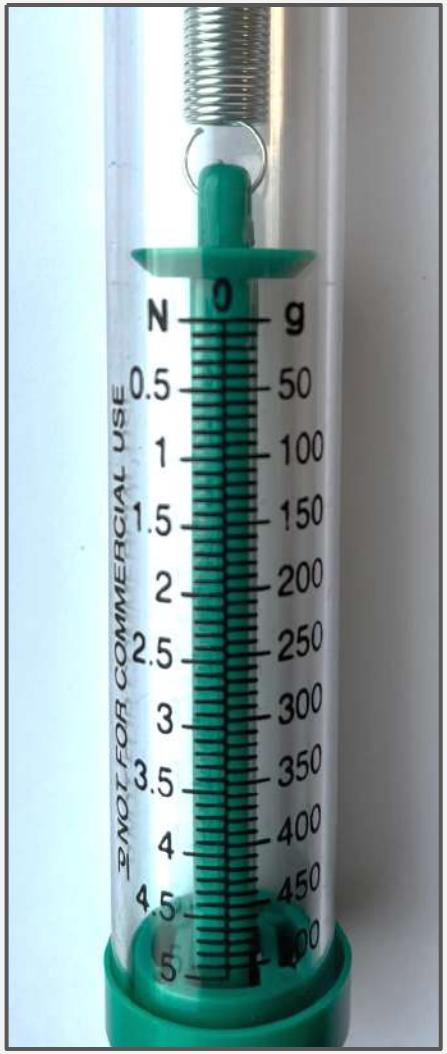
Consider *any* piece of matter at *any* scale (e.g., a small piece of foam or a large plate).

What are all the different things that can happen to solid matter when contact forces in different directions are acting on it?

Orient to Force Measurement Scales

With your class

1. What units does a spring scale measure?
2. What do you notice is different between your three scales?
3. Which one is the easiest to pull? Hardest?



Warm Up 10/24

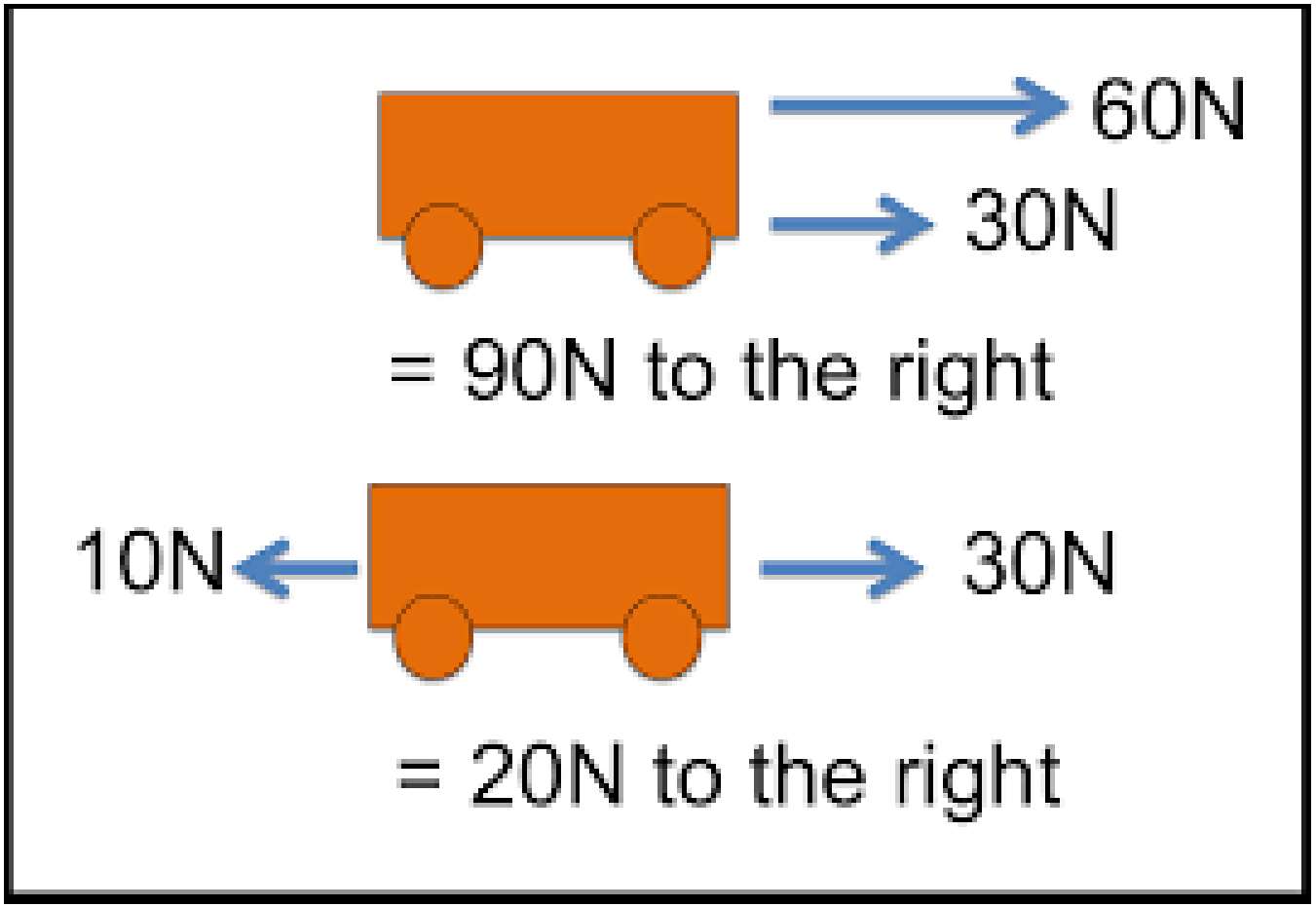
You calculate that an object is being moved with a force of 10 N to the right and 45 N up

- Draw out the situation
- Which way is the object going to move? Why?
- What is the net force in the x (left/right) and y (up/down)?
- Is the object balanced or unbalanced?

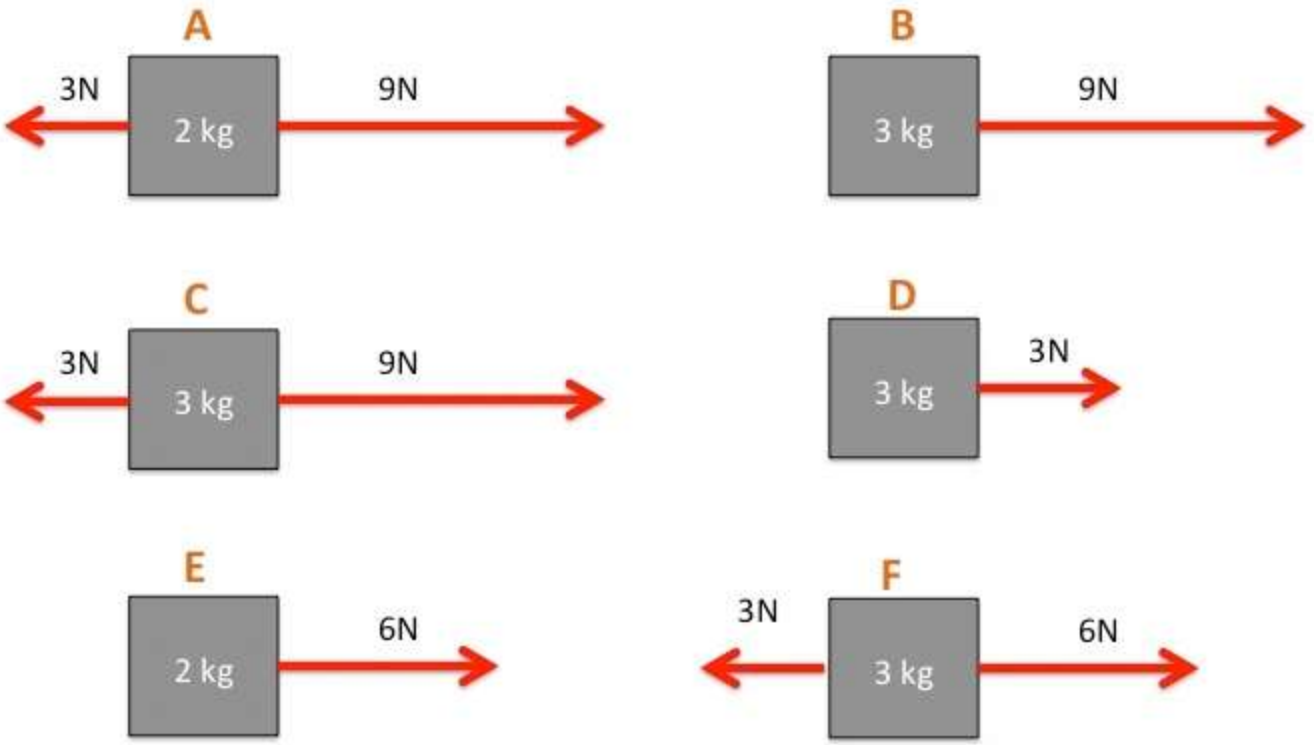
Free Body Diagram and Net Force

- Free Body Diagram (FBD)
  - Arrows in the direction of the force
  - Labeled with the force amount and unit
- Net Force (Sum of Forces)
  - Seperate in the x and y
  - To the right and up is positive
  - To the left and down is negative
  - Answer with directions and unit
- Vectors
  - Direction, number and units

Net Force



Find the Net Force



Mini Lab

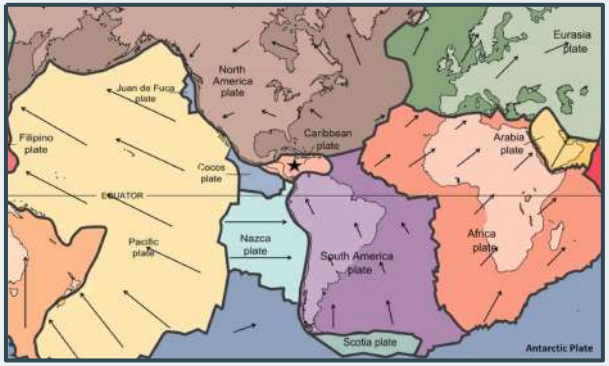
- You and your group of 5-6 students will create situations listed on your page using the provided materials. You can create holes by piercing with the spring scale or pencil.
- You ARE NOT breaking the bubble wrap or stretching the holes, you will pull until the object moves or does not move.

Develop and Use a Model

On your own

Create a free-body diagram to represent a stationary object with 3 contact forces acting on it in the horizontal direction (along the *x-axis*).

Do you think your free-body diagram is a reasonable model for explaining why the Caribbean plate appears to be stable (not moving)? Why or why not?



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Analyzing and Interpreting Data

Stable: Stationary → Change: Object moves → Stable: Stationary

With your class

- What was the net force on the object initially, when it was stable?
- Why did adding or taking away a force make the object move?
- What was the net force on the object when it reached a new stable state?

Update Personal Glossary

On your own

Use words and drawings to add meanings of new terms, such as:

- *Vector*
- *force*
- *Newton (N)*
- *magnitude*
- *net force*
- *balanced forces*
- *unbalanced forces*

Navigate

In the first set of investigations we carried out, balanced forces on a stationary object appeared to produce no change in its motion. It remained stationary.

With your class

- If we keep increasing the magnitude of these forces acting on a solid object, what do you predict would happen to it?
- What additional investigations does this suggest we need to do next time?

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