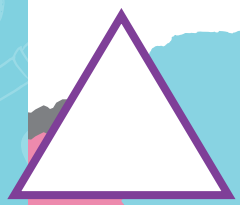
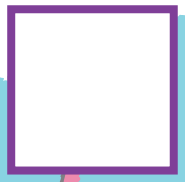
ACTIVITY 1

Finding out how strong some shapes are can be useful when getting ready to build a structure. If you want to build a structure that is strong, it is a good idea to know which of the shapes is the strongest. Just as important though is how much material gets used to build a shape. Let's get ready to find out about three shapes: **triangles**, **squares**, and **hexagons**!



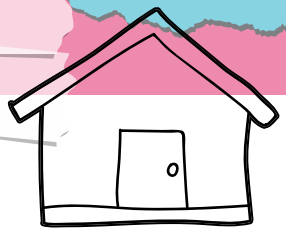
A triangle is a shape with three straight sides.



A square is a shape with four straight sides that are the same length.

A hexagon is a shape with six straight sides.

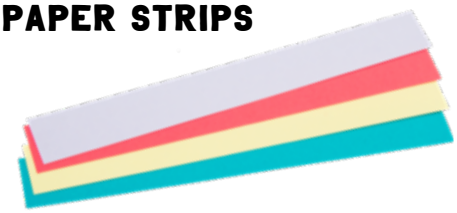
LET'S MAKE



WHAT YOU'LL NEED

INCLUDED

ONE-INCH-WIDE PAPER STRIPS



RULER

TRANSPARENT TAPE

NOT INCLUDED

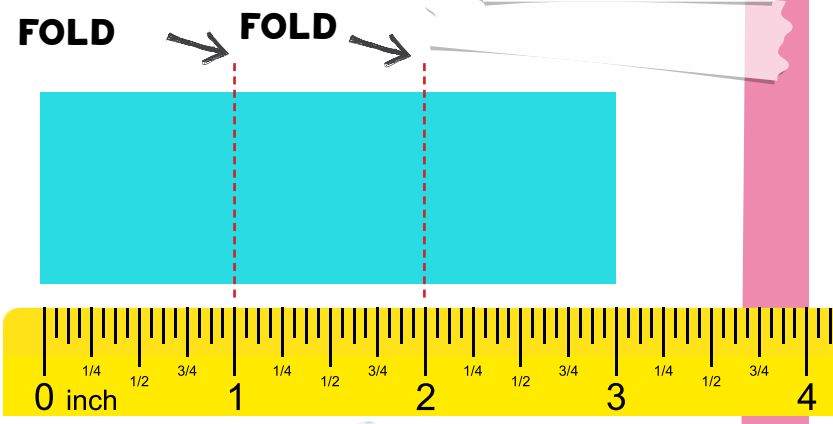
WEIGHTS OR MASSES TO USE IN TESTING
(coins, paper clips, washers, and other items)

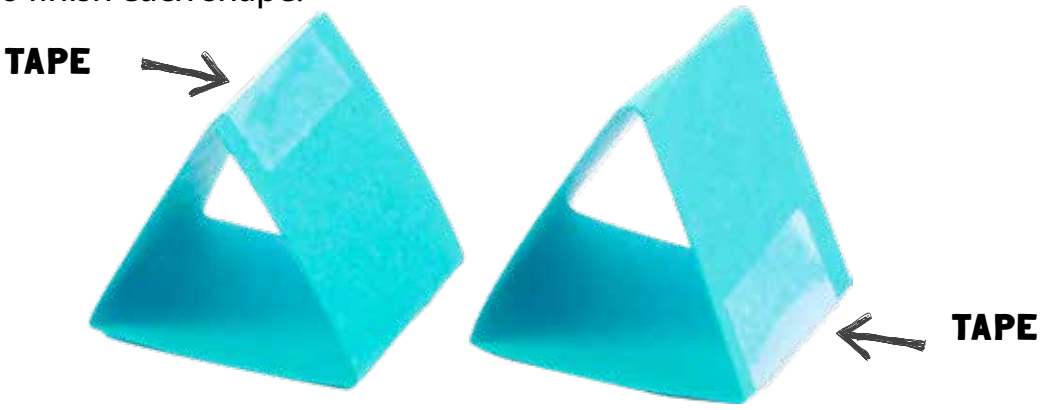
CARDBOARD OR CHIPBOARD WITH A STRAIGHT EDGE

SCISSORS

STEP 1

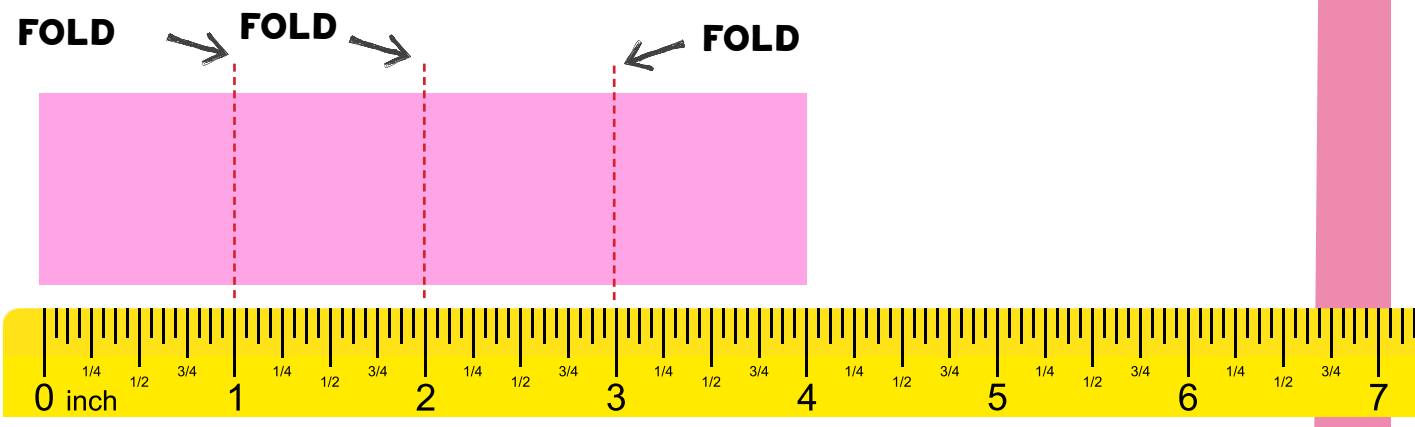
Make two triangles. You will need a paper strip three inches long and one inch wide for each triangle. Fold the strip every inch to make the three sides. Use tape to join the two ends together to finish each shape.

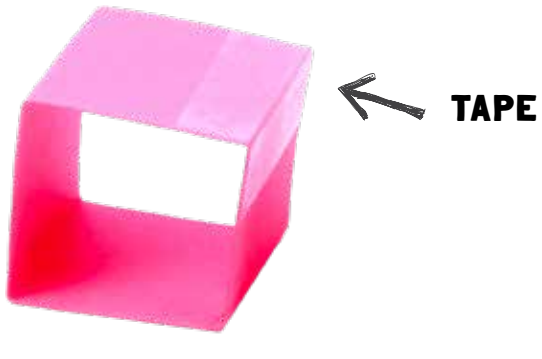




STEP 2

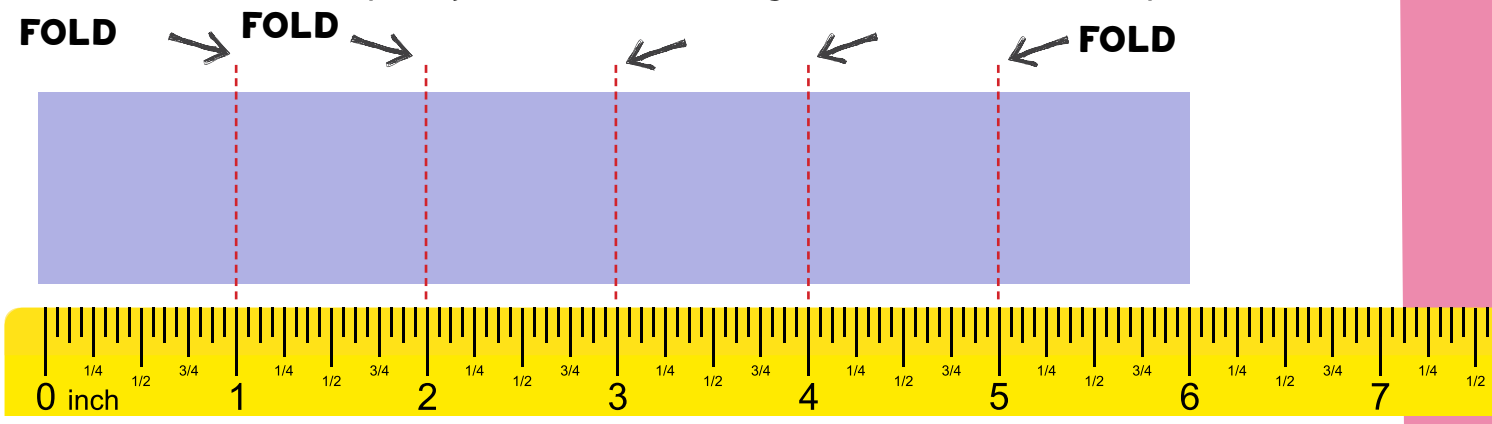
Make two squares. You will need a paper strip four inches long and one inch wide for each square. Fold the strip every inch to make the four sides. Use tape to join the two ends together to finish each shape.

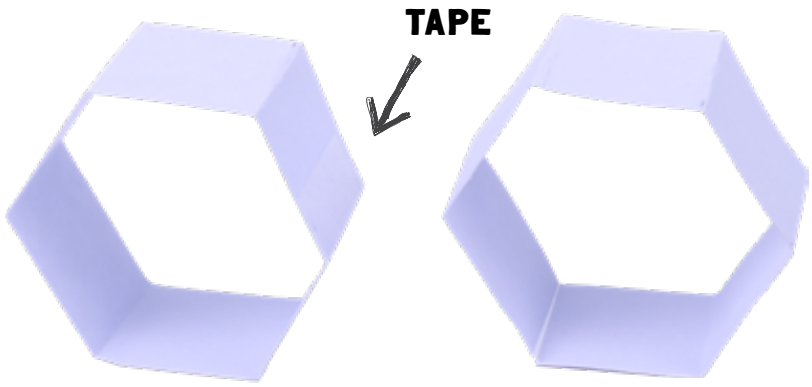




STEP 3

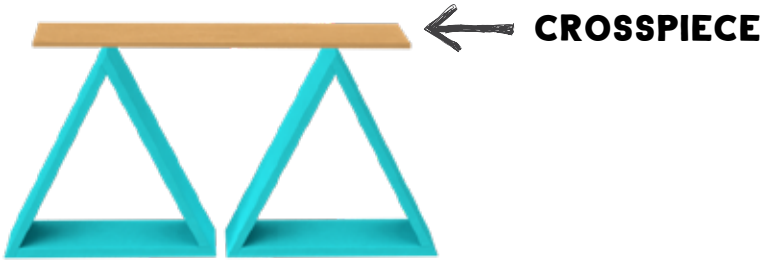
Make two hexagons. You will need a paper strip six inches long and one inch wide for each hexagon. Fold the strip every inch to make the six sides. Use tape to join the two ends together to finish each shape.

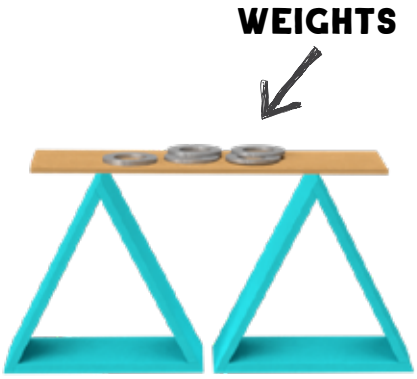




STEP 4

Line up the two triangles and place a ruler or stiff piece of cardboard or chipboard across the two triangles. Stack your weights on the crosspiece one at a time. Continue to stack the weights until the triangles collapse. Record how much weight the triangles hold.





WEIGHT _____

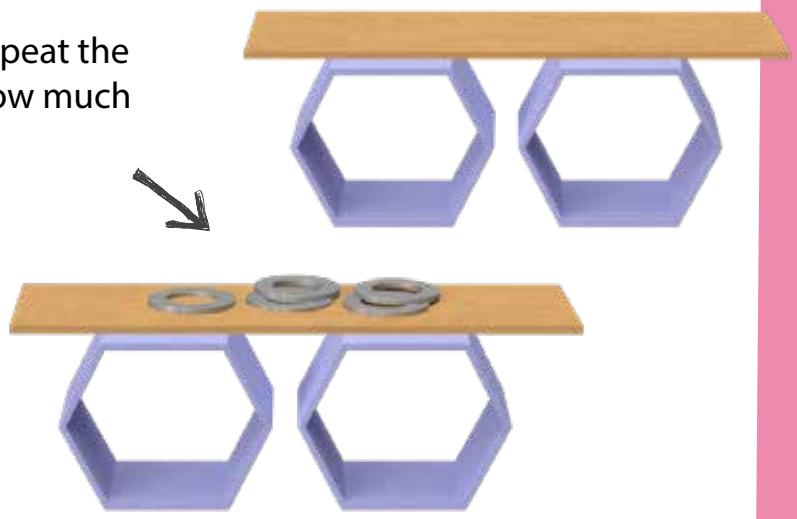
STEP 5

Line up the two squares and repeat the process to add weight. Record how much weight the two squares hold.

WEIGHT _____

STEP 6

Line up the two hexagons and repeat the process to add weight. Record how much weight the two hexagons hold.

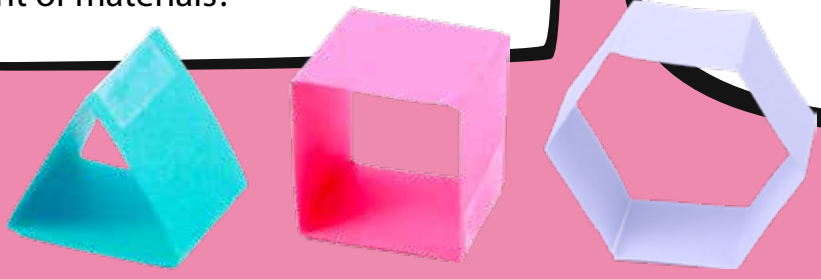


WEIGHT _____

THINK ABOUT IT

One of the things a builder has to do is use the least amount of materials possible. Which shape uses the least amount of materials?

Another thing a builder has to think about is making a structure strong enough. Of the shapes you built, which was the strongest? How could you tell?

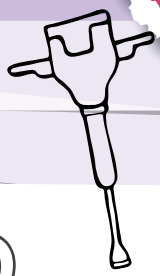


ACTIVITY 1

Hydraulics and **pneumatics** are very similar. Hydraulics use liquids and pneumatics use air; both use cylinders to capture those things and use pressure to create mechanical advantage. You are going to use syringes and tubing to create and compare hydraulic and pneumatic systems.

Hydraulics is the science of the transfer of energy through the effects of liquid in motion.

Pneumatics is the mechanics dealing with the mechanical properties of gases.



LET'S MAKE

WHAT YOU'LL NEED

INCLUDED

SYRINGES

TUBING

NOT INCLUDED

WATER

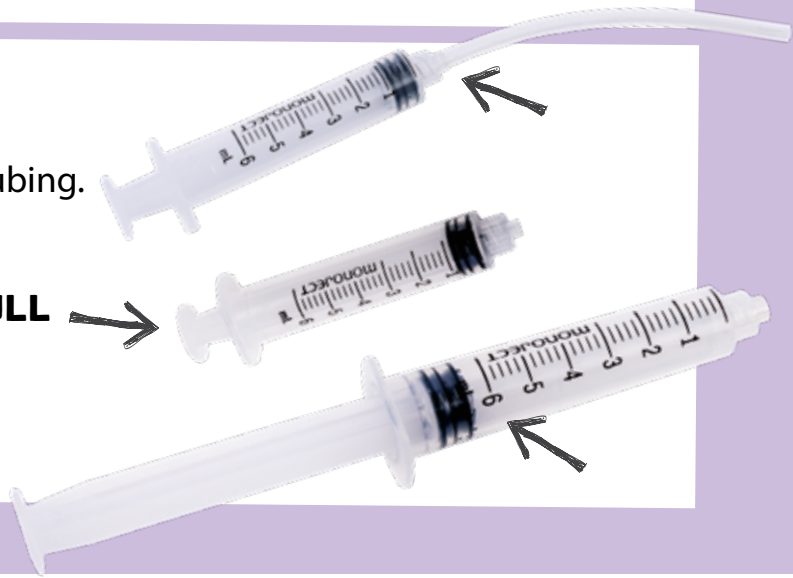
☐ **STEP 1**

Connect one of the syringes to the tubing.

☐ **STEP 2**

Pull the other syringe's plunger until it is filled with air to the 6 cc mark on the side of the syringe.

PULL



STEP 3

Connect that syringe to the other end of the tubing.

STEP 4

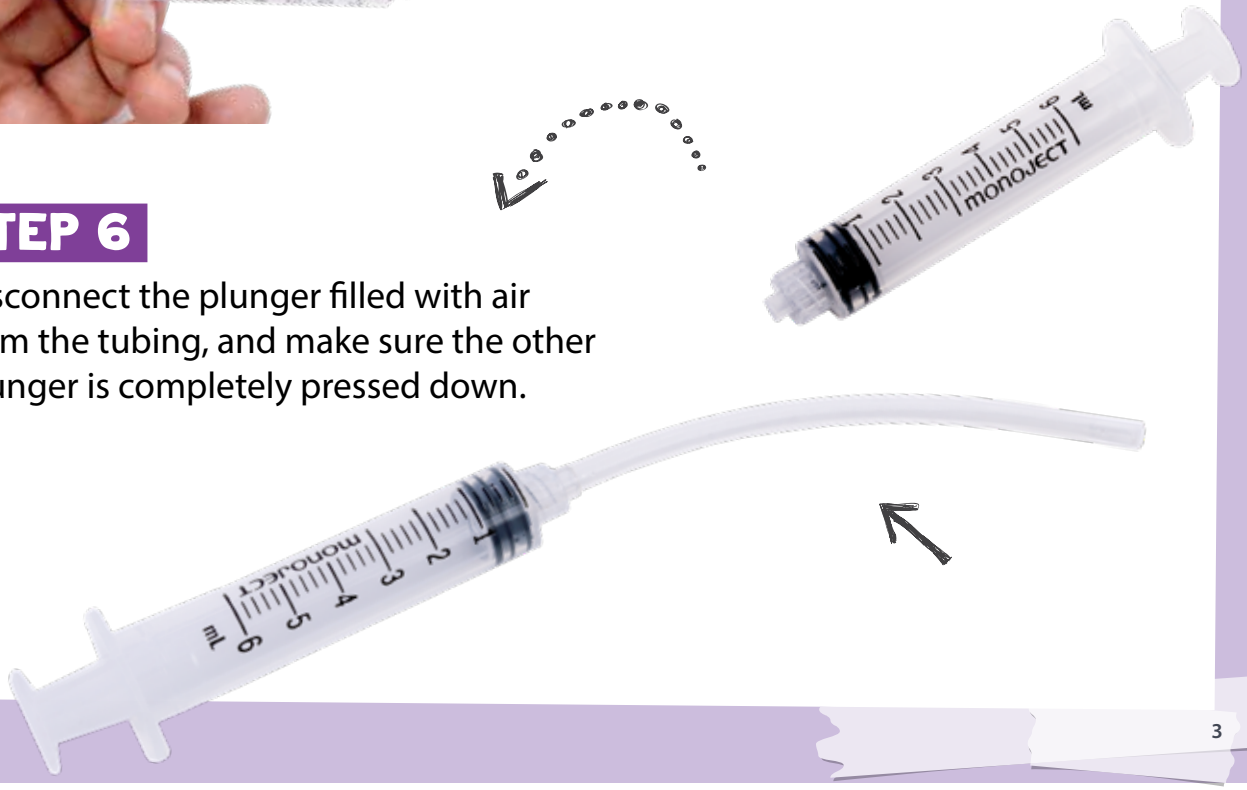
Press the plunger on the syringe filled with air, and note what happens.

STEP 5

Hold down the plunger on the syringe without air and press the plunger on the syringe with air at the same time. Note what happens.

STEP 6

Disconnect the plunger filled with air from the tubing, and make sure the other plunger is completely pressed down.



STEP 7

Fill the syringe that is disconnected with water to the 6 cc mark on the side of the syringe.

STEP 8

Reconnect that syringe to the tubing.

STEP 9

Press the plunger on the syringe filled with water, and note what happens.

STEP 10

Hold down the plunger on the syringe without water and press the plunger on the syringe with water at the same time. Note what happens.

THINK ABOUT IT

What happened to the system when you pressed on the syringe with air in it?

What happened when you pressed on the syringe with air in it while holding the other syringe's plunger down?

What happened to the system when you pressed on the syringe with water in it?

What happened when you pressed on the syringe with the water in it while holding the other syringe's plunger down?