

DRAWBOT

IT GIRLS – FALL PROJECT



IT Girls

INSPIRING GIRLS TO PURSUE THEIR PASSIONS

IMPORTANT SCIENTIFIC PRINCIPLES

Force

A push or a pull that can cause the motion of an object to change. It has two important properties: strength and direction.

Balanced Forces

When two forces are of equal strength and there is no movement.

Unbalanced Forces

When one force is stronger than the other the result is motion.

Forces are all around us

Forces are needed to lift, turn, move, open, close, push, pull, and so on. When you throw a ball, you are using force to make the ball move through the air.



Force has strength and direction.

When a soccer player kicks the ball to another player, they are using a certain amount of strength to push the ball in a certain direction. Forces always have strength and direction.



Unbalanced forces can cause an object to change its direction.

Unbalanced forces change the motion of an object. This happens in 2 ways. If an object is at rest and an unbalanced force pushes or pulls the object it will move. Unbalanced forces can also change the speed or direction of an object that is already in motion.



Balanced Forces do not cause a change in motion.

When two forces are the same strength but act in an opposite direction, they are balanced forces.

IDENTIFY SOME FORCES

Balanced or Unbalanced?

Is a student sitting in a chair an example of balanced or unbalanced forces?

Balanced forces. Gravity is pulling the student down and the chair is pushing the student up with equal force, resulting in no motion.



If you throw a ball in the air, is it at rest or in motion?

The ball is in motion. The forces acting on the ball are **unbalanced** (Gravity is pulling it down).



IDENTIFY SOME FORCES

Balanced or Unbalanced?



Balanced
or
Unbalanced?



Balanced
or
Unbalanced?

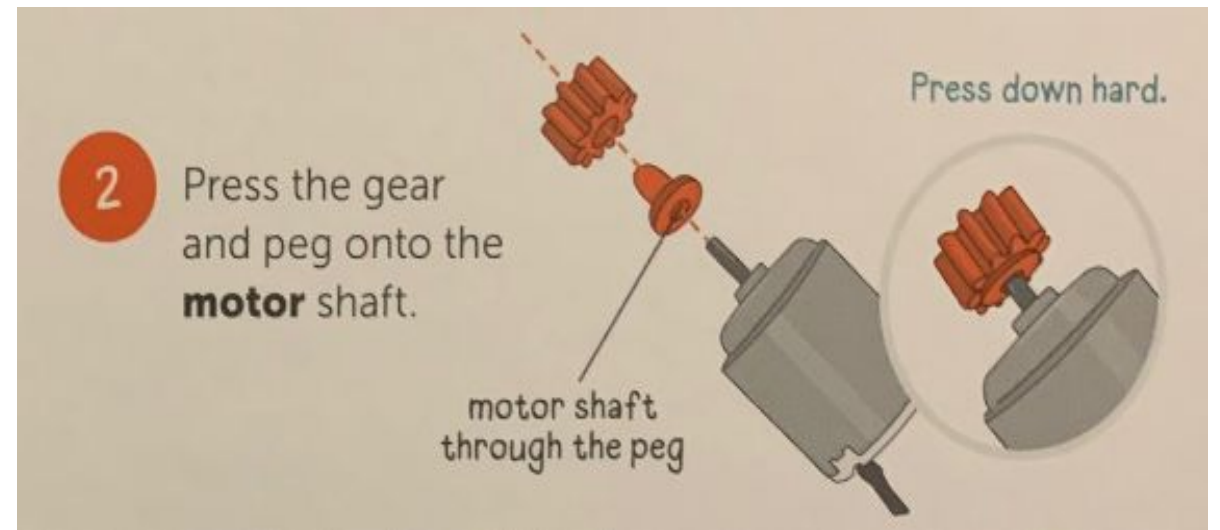
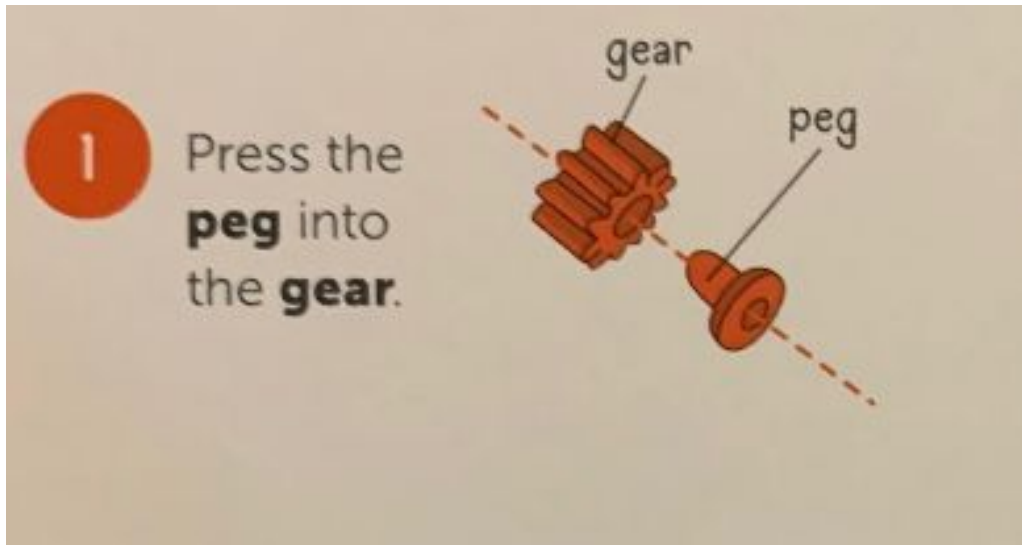


Balanced
or
Unbalanced?

Drawbot Overview

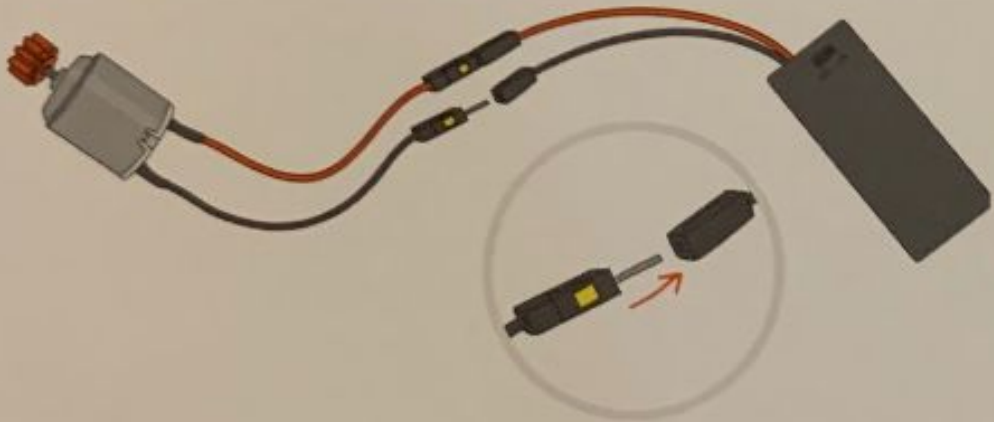
HERE WE GO!

BUILD THE MOTOR



3

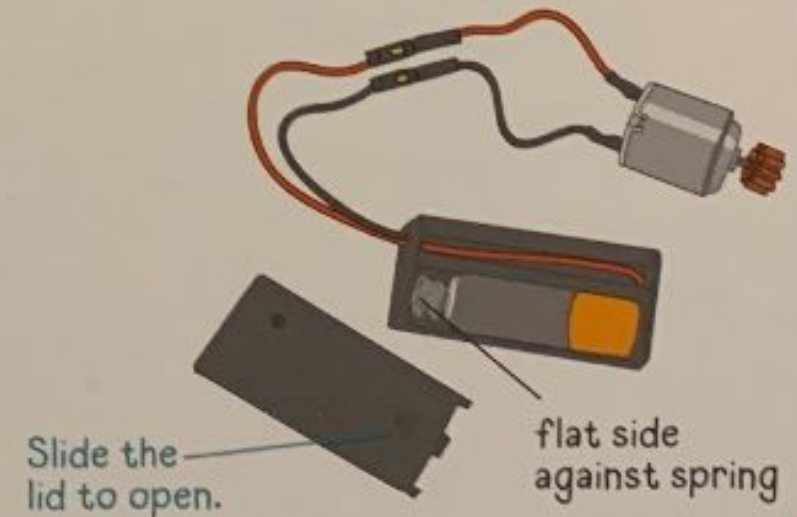
Slide the motor wires into the **battery pack** wires, matching **red to red** and **black to black**.



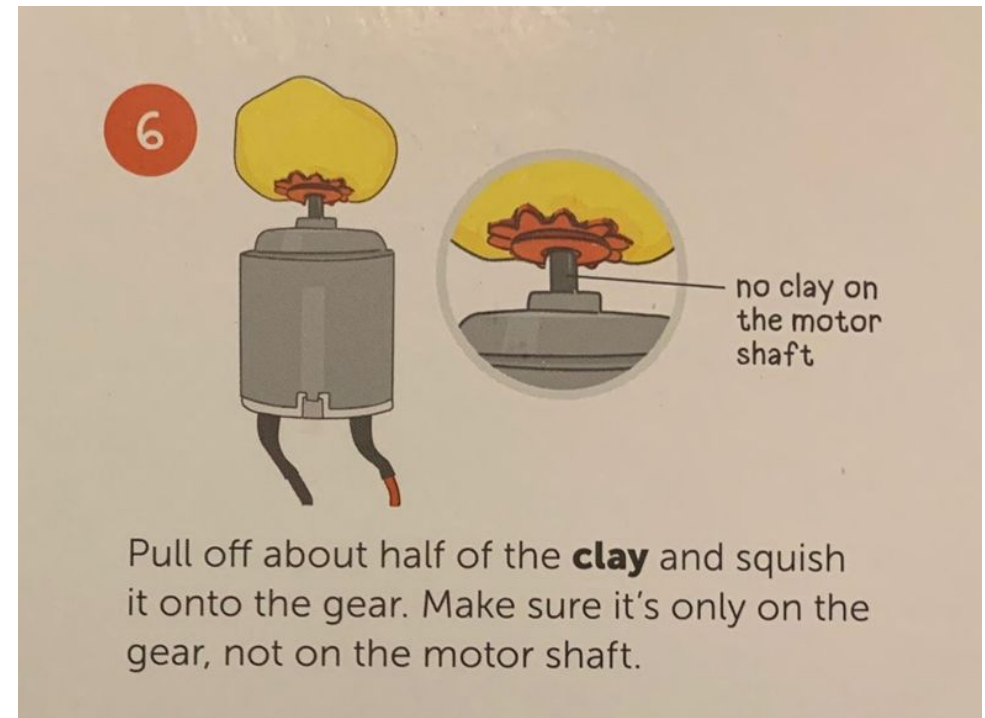
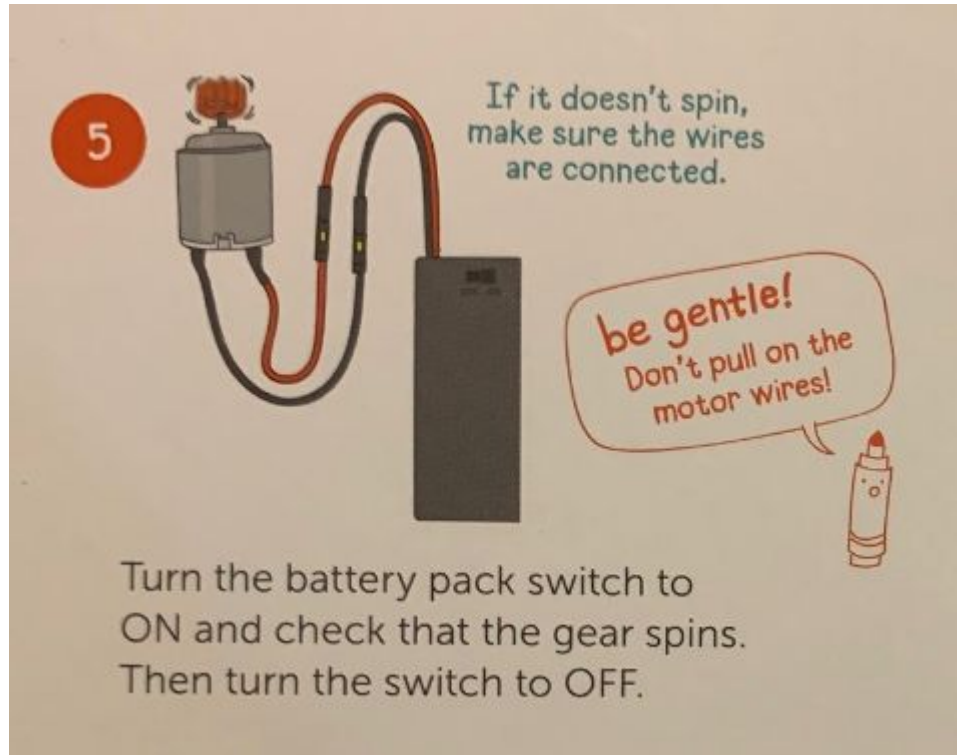
NEXT

4

Open the battery pack and match the (+) side of the **battery** with the (+) side of the battery pack. Then close the lid.



CONNECT THE MOTOR



LAST STEP – MOTOR COMPLETE!

7

Turn the switch to ON and check that the gear still spins. Then turn the switch to OFF.



If it doesn't spin, make sure there's no clay on the motor shaft.



MOTOR EXPERIMENT

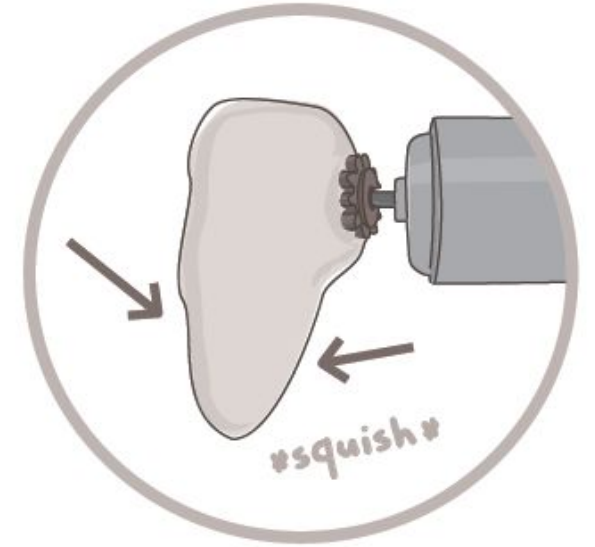


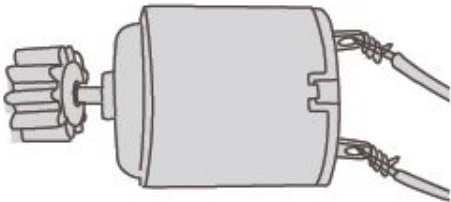
	1. Draw the clay. Is the clay squished or round?	2. Make a prediction. How do you think the motor will move?	3. Test and observe. Is it slow or fast? Does it vibrate a lot or a little?
A	<p>Try this example to get started!</p>	<p>Speed: fast slow</p> <p>Vibration: big small</p> <p>Mark what you think will happen.</p>	<p>Speed: fast slow</p> <p>Vibration: big small</p> <p>I observe: Record what happened.</p>

Motor Experiment



Experiment with pulling, stretching, and shaping the clay to change how your motor moves! Pay attention to how quickly the motor spins (fast or slow) and how large the vibrations are (big or small). Then use the table below to make a prediction and record your results.



B		<p>Speed: fast <input type="range"/> slow</p> <p>Vibration: big <input type="range"/> small</p>	<p>Speed: fast <input type="range"/> slow</p> <p>Vibration: big <input type="range"/> small</p> <p>I observe:</p>
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WHAT TO KNOW!

- ❑ The **Motor** applies forces to the clay
- ❑ As the motor spins, the heavy side and the light side have to switch places
 - ❑ The unbalanced forces cause the motor to vibrate!
- ❑ If the clay is mostly **even**, the forces on the motor are more balanced.

NEXT WEEK!

You Will:

- Build the body of the Drawbot
- Assemble the motor to the body of the Drawbot
- Have some fun!

Drawbot- Week 2

MOTOR BODY BUILD

CONCEPTS FROM LAST WEEK

Force

A push or a pull that can cause the motion of an object to change. It has two important properties:

Strength & Direction

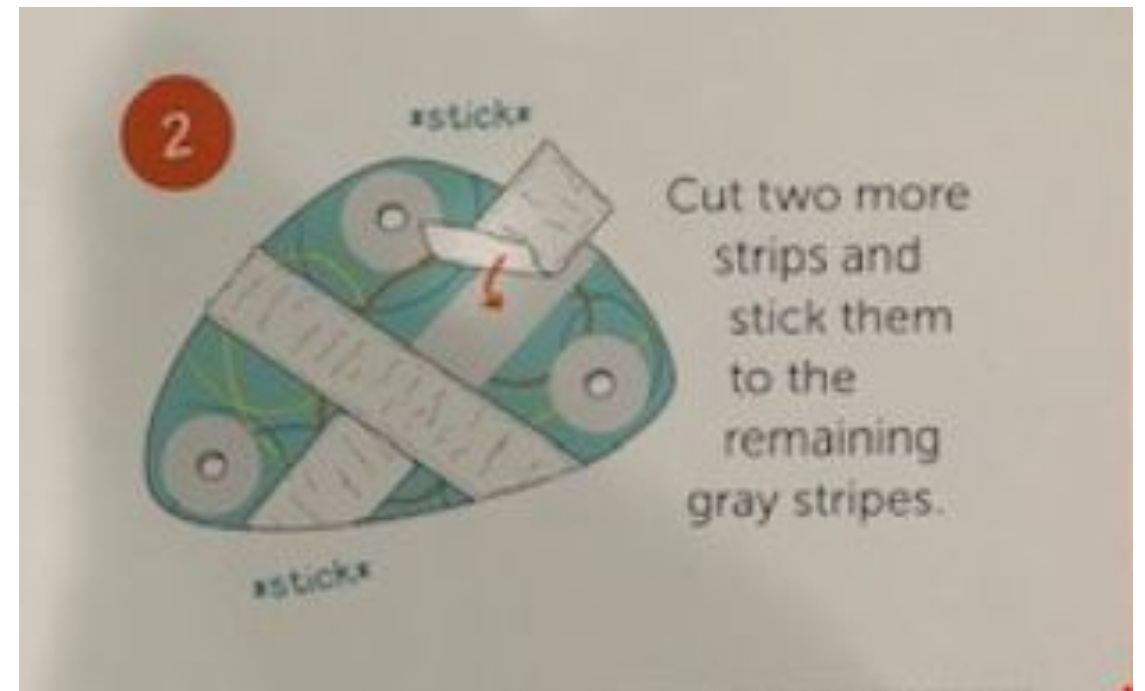
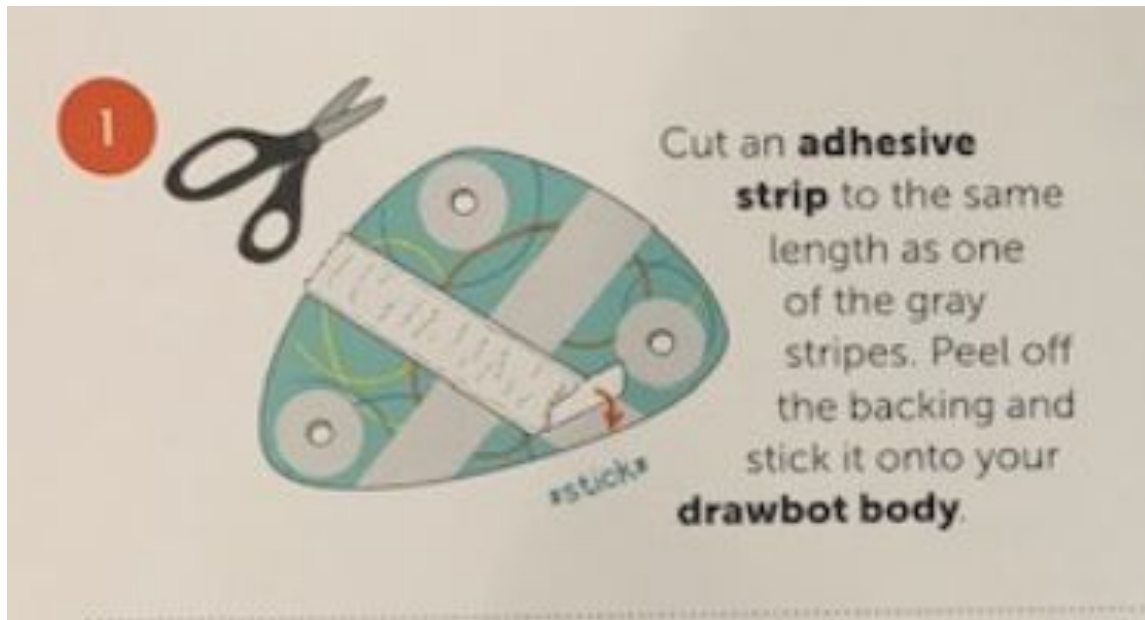
Balanced Forces

When two forces are of equal strength and there is **NO** movement.

Unbalanced Forces

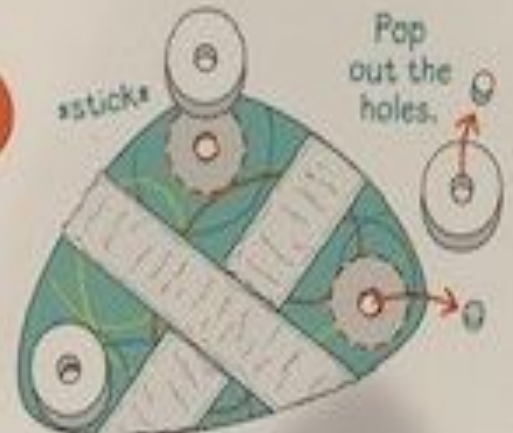
When one force is stronger than the other the result is **motion**

HERE WE GO!




NEXT...

3 **sticks** Pop out the holes.



Peel off the backing from three **sticky foam donuts**. Line them up with the circles on the body and stick them on.

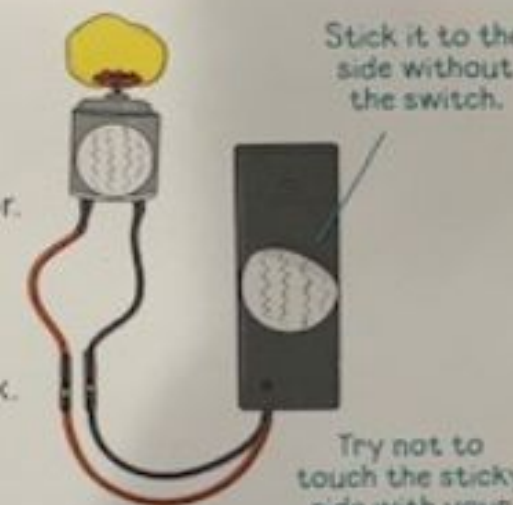
4 Press the **markers** up through the holes in the drawbot body to make legs. Slide them about halfway up.



The markers should point down.

Make sure all the legs are even.

5 Stick one **adhesive dot** onto your motor. Stick the other **adhesive dot** to the back of the battery pack.



Stick it to the side without the switch.

Try not to touch the sticky side with your fingers.

FINAL STEP....

6

Stick the battery pack and motor onto the drawbot body. Adjust them to make your drawbot stand by itself.

Make sure the clay hangs off the side.



high five!
you made
your drawbot!



Is your drawbot tipping over?
Adjust the legs. The markers should be half way through the body, and the body should be flat, not tipped.

DRAWBOT COMPLETE!



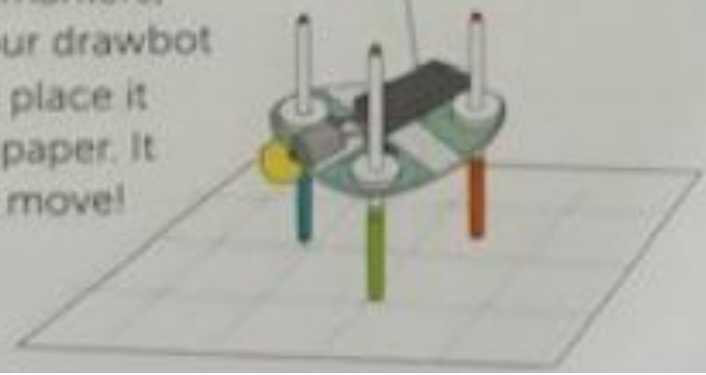
MESS ALERT!



2

With the caps still on the markers, turn your drawbot on and place it on the paper. It should move!

Turn the switch to ON.



3

If it doesn't move, turn the drawbot off and adjust it until it does. (Flip the card over for how.)

Motor off to adjust!

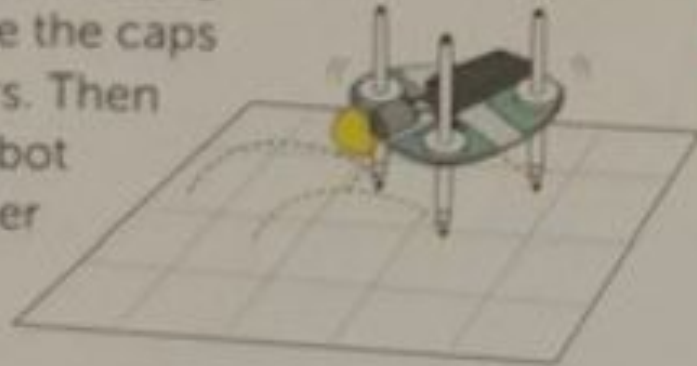


DRAWBOT ART

DRAW – AND MAKE A CHANGE

CHANGE THE SHAPE OF THE CLAY

- 4** Once you've got a moving drawbot, remove the caps from the markers. Then place your drawbot back on the paper and watch it draw!



If the markers get stuck on the creases, move the drawbot to a flat spot.

- 5** **Adjust the clay.** Squish the clay into a different shape and try it again. How does the drawing change?

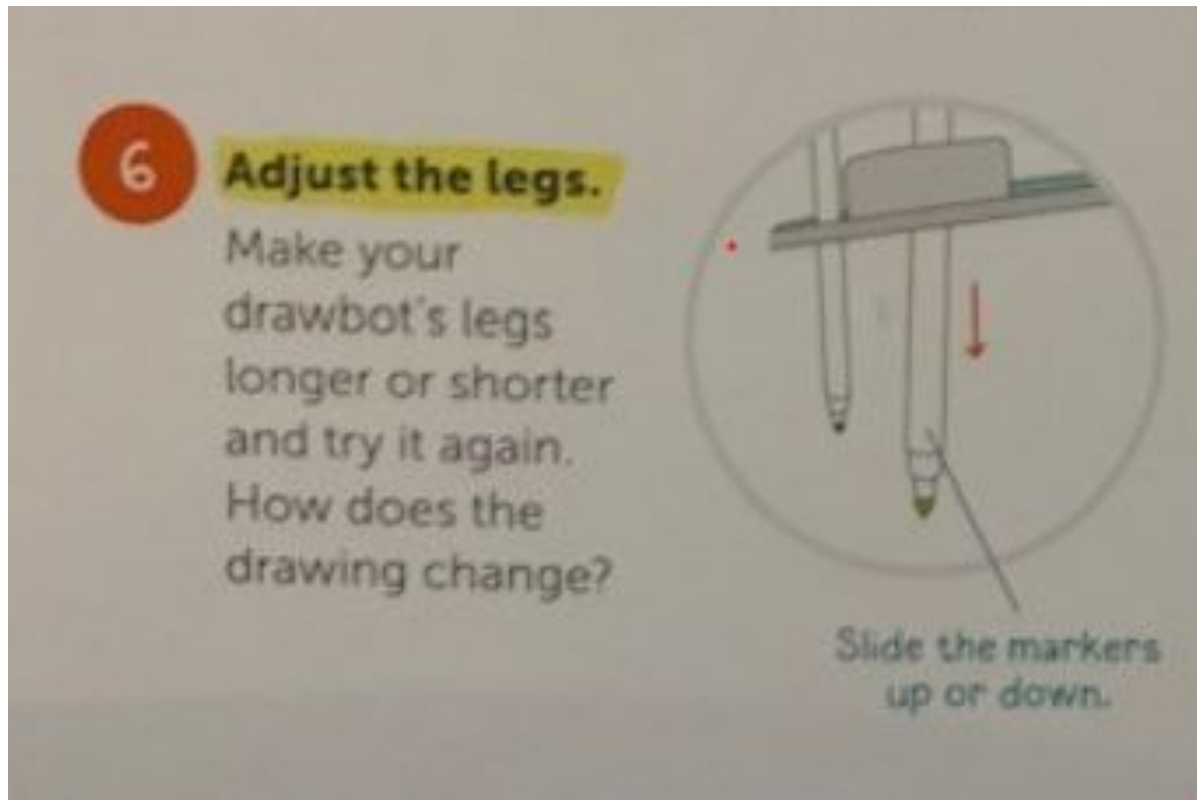


Motor off to adjust!



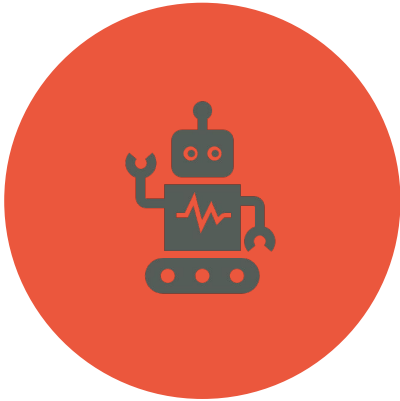
DRAW – AND MAKE A CHANGE

CHANGE THE HEIGHT OF THE MARKERS



WRAP UP

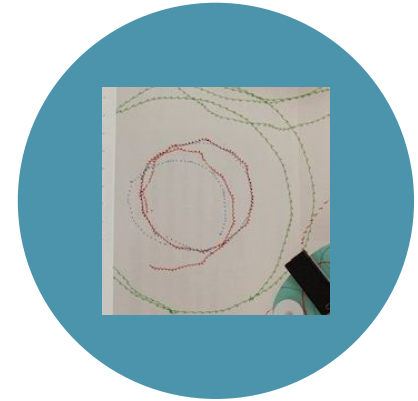
VARIATIONS TO YOUR DRAWBOT



**FORCES ACTING ON THE
MOTOR CAUSE THE
DRAWBOT TO VIBRATE**



**IF THE CLAY IS MOSTLY
SYMMETRICAL, IT
CREATES SMALLER
VIBRATIONS, (SHOWING
MOSTLY BALANCED
FORCES)**



**IF THE CLAY IS OFF
CENTER, IT CREATES
LARGER VIBRATIONS
(SHOWING UNBALANCED
FORCES)**

NEXT WEEK – FINAL PRESENTATIONS

- Tell us what YOU learned about the Drawbot.
 - What did you learn about the process?
 - How did you customize an experiment?
 - What did you predict and what actually happened?
- To create your presentation, you can create a video, PowerPoint presentation or any other form of media.
- Be prepared to present to IT Girls on December 13th
- Have some fun with your presentation!
- Ask your teacher how to submit your presentation before Next Week



Have A
Great
Day!

