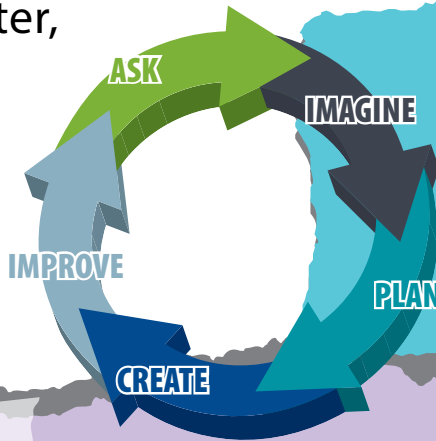


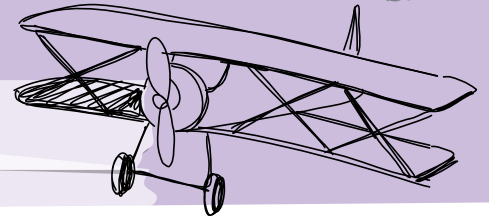
ACTIVITY 2

To solve problems, engineers use a process called the **engineering design loop**. This loop involves them creating a solution, testing it, and then changing it to make it better. Now that you have built three different paper airplane models, it's time to test them to see how they fly. Later, you will use this information to improve each model. Let's fly!



The engineering design loop is a set of repeating steps that engineers use to test and improve solutions to problems or challenges.

LET'S MAKE



WHAT YOU'LL NEED

INCLUDED

3 PAPER AIRPLANES FROM ACTIVITY 1



NOT INCLUDED



TAPE MEASURE

STOPWATCH



TAPE





STEP 1

Find a location that is fairly wide open to test your planes.



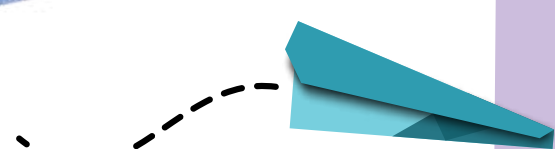
STEP 2

Use tape to create a starting line. This will be the location that you throw all paper airplanes from.



STEP 3

Practice throwing each plane from behind the starting line. Try different methods of tossing the planes until you find a method that works well for each model. Try to get your throws to be as **precise** as possible.



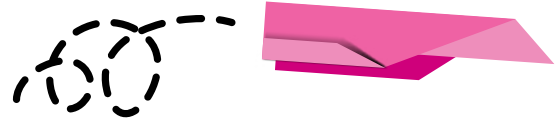
Precision is how close multiple measurements are to each other.



STEP 4

To gather data, choose one plane and throw it from behind the starting line. Use a stopwatch to record the plane's flight time. If needed, have someone help you time the flight as you throw the plane. Try to be as **accurate** as possible when taking measurements.

Accuracy is how close a measurement is to its true value.



ACCURACY AND PRECISION



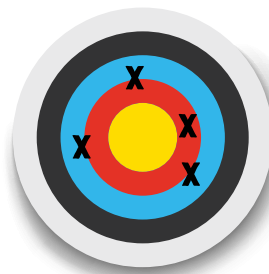
**ACCURATE
PRECISE**



**ACCURATE
NOT PRECISE**



**NOT ACCURATE
PRECISE**

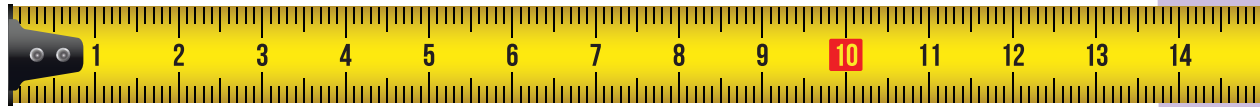


**NOT ACCURATE
NOT PRECISE**



STEP 5

Measure the distance the plane flew from the starting line using a tape measure.



STEP 6

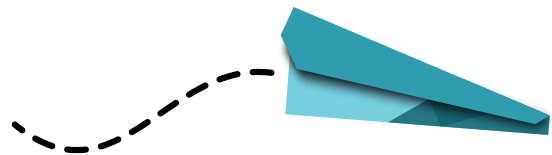
Complete the following chart by writing the name of the plane, the time of flight, and the distance the plane flew.

PLANE	TRIAL	FLIGHT TIME	FLIGHT DISTANCE
PLANE NAME:	1		
	2		
	3		
PLANE NAME:	1		
	2		
	3		
PLANE NAME:	1		
	2		
	3		



STEP 7

Complete two more trials for the chosen model. Record the data for each trial in the chart.





STEP 8

Repeat Steps 4-7 for each model of paper airplane. Record the data for each trial in the table.



STEP 9

In the data table, circle the longest flight distance of each plane.



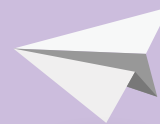
THINK ABOUT IT



Which measurement was harder to determine – flight time or flight distance? Why?

Write your thoughts about each plane's flight patterns. How do they fly? Which model flies the best and how do you know this?

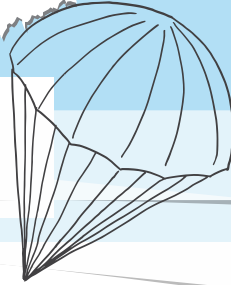
Do you think flight time or flight distance is more accurate? According to your data, which measurement is more precise?



ACTIVITY 1

In this activity, we'll learn some basics about what parachutes need to work and we'll even create a simple parachute.

LET'S MAKE



WHAT YOU'LL NEED

INCLUDED



STRING



TRANSPARENT TAPE

NOT INCLUDED

PLASTIC SHOPPING BAG



WEIGHTED OBJECTS (paper clips, pens, action figures, binder clips, or something else)



SCISSORS



STEP 1

Before we build a parachute, let's learn how one works with this example! Take a plastic bag and throw it up in the air. Try to throw it so that the air catches the bag and it expands, slowing its **descent**. **Tip:** This means the handles will be pointed toward the ground.



Descent means the act of falling to the ground.



STEP 2

Now, attach an object to the handles; a pen, a spoon, or an action figure would work. Just make sure it's not something breakable! Attach it using a piece of tape or string, or just wind the handles around the object.



STEP 3

Toss the bag in the air. How does the bag fall differently?



STEP 4

Remove the object attached to the handles and try a different object – something that is a different weight or shape.



STEP 5

Test the parachute bag again.



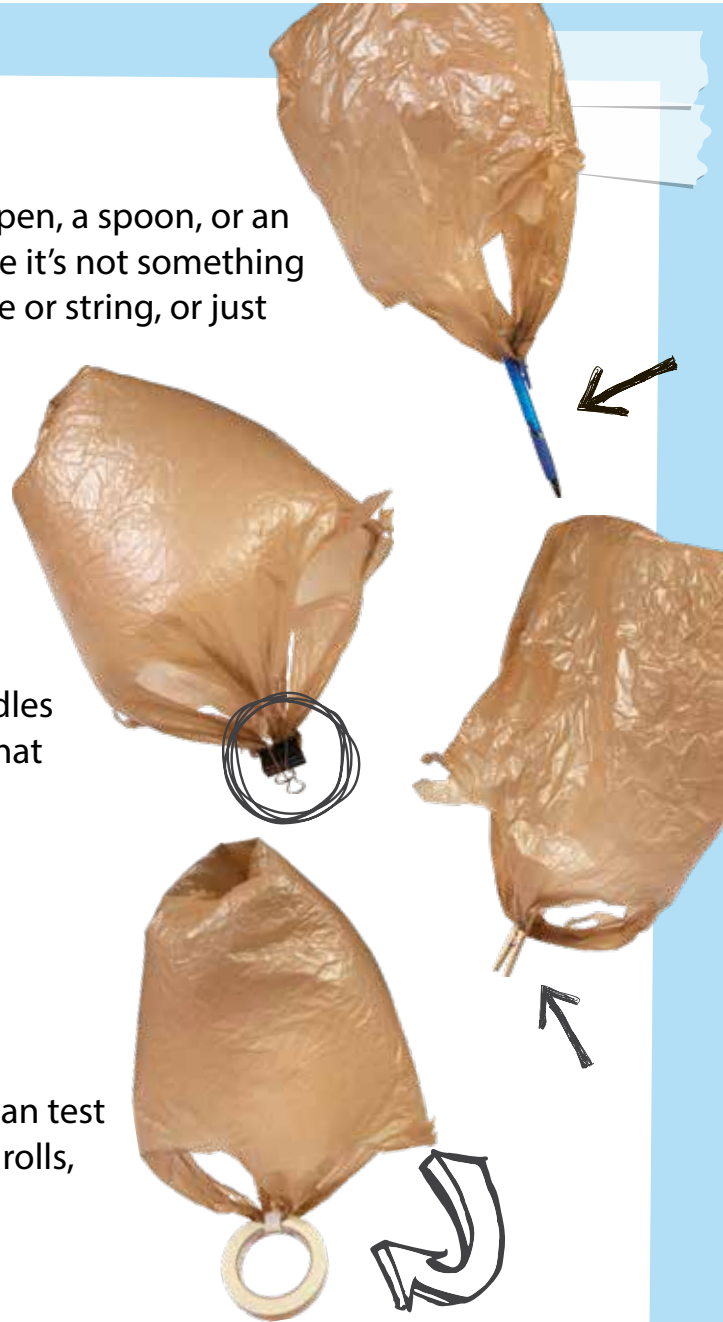
STEP 6

Try it out with a few other objects. You can test items such as paper clips, markers, tape rolls, sticks, or binder clips.



STEP 7

Try dropping your parachute from different heights. If you have permission, take it outside and toss it high in the air and watch it fall. Just make sure you watch where it's landing, and keep it away from other people, animals, or structures.



THINK ABOUT IT

Which item made the best weight for your parachute?

The word *descent* uses the prefix *de-*. Can you think of other words that use the prefix *de-*? What do their meanings all have in common?

Why do you think some items worked better as weights than others?