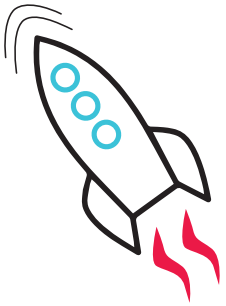
nanogirl's LAB

SUPER POWER: Flight!

ROCKET LAUNCHER



Today, I'm building a ROCKET! Rockets and planes both need to launch, and as part of my superhero training, I need somewhere to test out and launch my rockets, like a secret cave... OR A SUPER SECRET SCIENCE LAB!

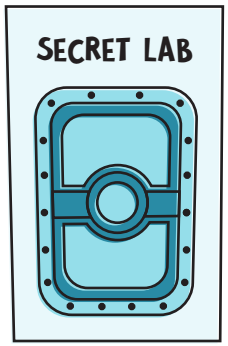
I've created a SECRET LAB in a corner of the room, do you have a space that could be your secret lab too?

Why don't you make a sign to let everyone know where your lab is and what it's called—mine is called NANOGIRL'S LAB. OK, let's start our first superhero training session!

FOR THIS EXPERIMENT YOU WILL NEED

- Empty, clean plastic bottle ◯
- Small plate to draw around ◯
- Plain paper ◯
- Scissors ◯
- Tape ◯
- Ruler ◯
- Pencil ◯
- Colouring supplies ◯

SUPERHERO CHECKLIST



☐ Super-secret SUPERHERO LAB

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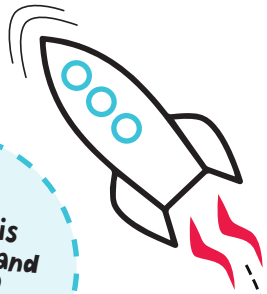
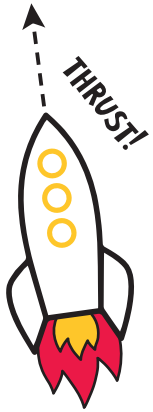


JOKE:
Q: What is fast, loud and crunchy?
A: A rocket chip!

LAB NOTES...

HOW DOES A ROCKET TAKE OFF?



When a rocket takes off, it needs to create the force of 'THRUST' to be pushed up into space. Rockets create their thrust by setting off a huge controlled explosion.

This creates a build-up of pressure and when the pressure is released, the thrust it creates helps the rocket to overcome the force of gravity.

In this experiment, you forced air to come out of the tube when you squeezed the bottle. This created AN INCREASE IN THE PRESSURE underneath the cone and if that pressure was enough, it should have overcome gravity enough to launch upwards!

TO MAKE YOUR ROCKET...

WATCH & BUILD 15 MINS

1. Watch Nanogirl making her own bottle rocket!
2. Take the top off your bottle. You won't need this.
3. Place the plate on your paper, and draw around it
4. Cut out the circle, then fold it in half and cut along the fold to give you two semicircles.
5. Take the two corners and curl inwards to make the semicircle into a cone shape. Tape it in place. You can experiment with how pointy each cone needs to be to help it fly.
6. Take the leftover paper and cut a rectangular strip off the bottom.
7. Roll this around the neck of the bottle to make a fat straw and tape along the length.
8. Find the middle of the tube, and draw a small cross by making a horizontal and vertical line. Now draw a diagonal line through the middle of that cross.
9. Cut along the diagonal line, this is called a mitre cut.
10. Take one of the cut ends and rotate so that it makes a right angle with the other end.
11. Tape the two half-straws in place making sure no air can escape this joint.
12. Tape one end of the tube over the neck of the bottle, making sure that there are no spaces for air to escape.
13. Hold your bottle with the tube pointing upwards.
14. Place one of your cones onto the open end of the straw.
15. Squeeze the middle of the bottle to launch the cone!

DID YOU KNOW?

Changing the amount of FORCE that you use to squeeze the bottle will change the amount of THRUST you create which affects how high your rocket flies.

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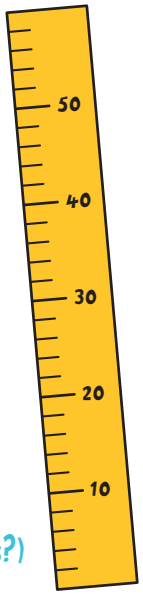
ROCKET LAUNCHER

YOUR MISSION:

SEE HOW HIGH YOUR ROCKET CAN FLY!

MISSION 1: HOW HIGH DID YOUR ROCKET FLY?



While it may be easy to see that your rocket flew up in the air, it's not easy to remember all of the flights they made to compare them.

How do you think you could measure and compare the height of different rocket launches? (Hint—could you use a phone camera and build a tape measure to record the flights?)

MISSION 2: CAN YOU MAKE YOUR ROCKET FLY HIGHER?

Engineers are always tinkering and trying new ways of doing things. Now that you have built your rocket launcher, what changes could you make to help your rocket FLY HIGHER?

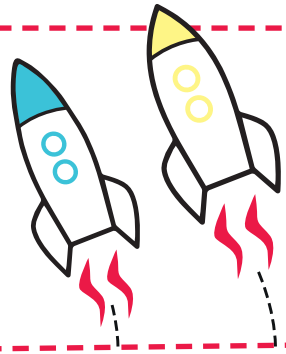
How do you think these changes might help? Why don't you write how these changes affect your rocket in your notebook?

MISSION 3: WHAT HAPPENS WHEN YOU CHANGE THE PRESSURE?

The amount of pressure you create to launch your rocket depends on the amount of air that you push through the nozzle and the speed that the air is moving.

You can change this pressure by changing the size of your bottle. What happens if you use a different size or shape of bottle?

What does that tell you about how the pressure you are creating changes?



MISSION 4: HOW DOES THE NOSE CONE AFFECT HOW THE ROCKET FLIES?

One of the forces that acts on your rocket to slow it down is called **DRAG**. Most rocket engineers try to reduce drag when they want their rocket to fly well and efficiently.

They try to increase drag when they want their rocket to return to earth slowly.

MISSION 5: FINS

If you look at a space rocket you should be able to see that it has fins at the bottom. These are used to help stabilise the rocket when it is flying in the air and prevent it from wobbling.

What happens to the way that your rocket flies if you make fins out of paper and stick them to the base of your rocket body?

Can you see a difference in the flight path of your rocket? You may need to colour in some dots onto your rocket body if you want to observe if your rocket spins during its flight.

DIFFERENT TYPES OF FINS!

You can change the drag force acting on your rocket by changing the shape and size of your **NOSE CONE**.

The more skinny and pointy the nose cone the less drag it should create. What happens if you change the shape of the cone you attach to the front of the rocket? Can you measure this difference?

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FUN FACTS!

NASA has launched a total of **166** crewed rockets on space missions.

Rockets have been used in space travel for over **70** years.

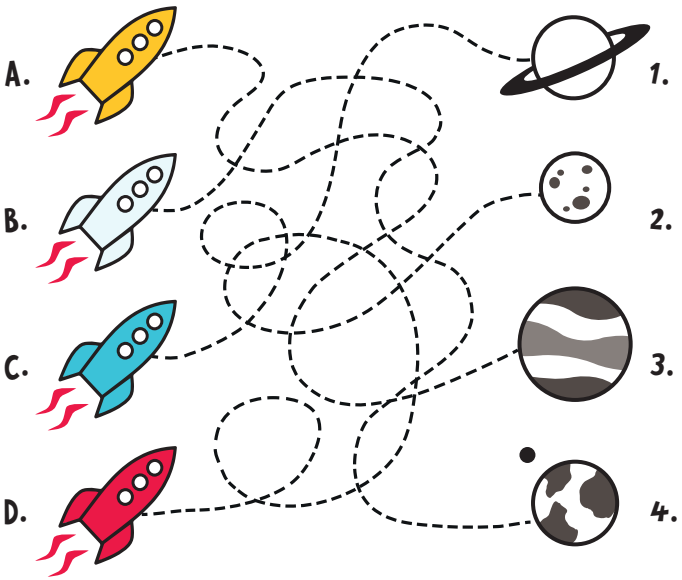
There are **4** types of rockets: solid fuel, liquid fuel, ion, and plasma rockets.

The first rockets were invented and launched around **800** years ago and used as fireworks.

ACTIVITIES

1. HOW MANY WORDS CAN YOU MAKE OUT OF THE LETTERS: ROCKET LAUNCHER?

2. WHICH ROCKET HAS LANDED ON WHICH PLANET?



3. IF YOU WERE NASA, HOW WOULD YOU DECORATE YOUR SPACE ROCKET?

How much paint do you think you would need to cover a whole space rocket?

How much do you think all of that paint would weigh?

4. LIST THE IMPORTANT THINGS THAT YOU THINK A ROCKET WOULD NEED TO HAVE INSIDE IF IT WERE CARRYING PEOPLE TO SPACE.

(Hint—would it need a kitchen?)