THE JCB ACADEMY

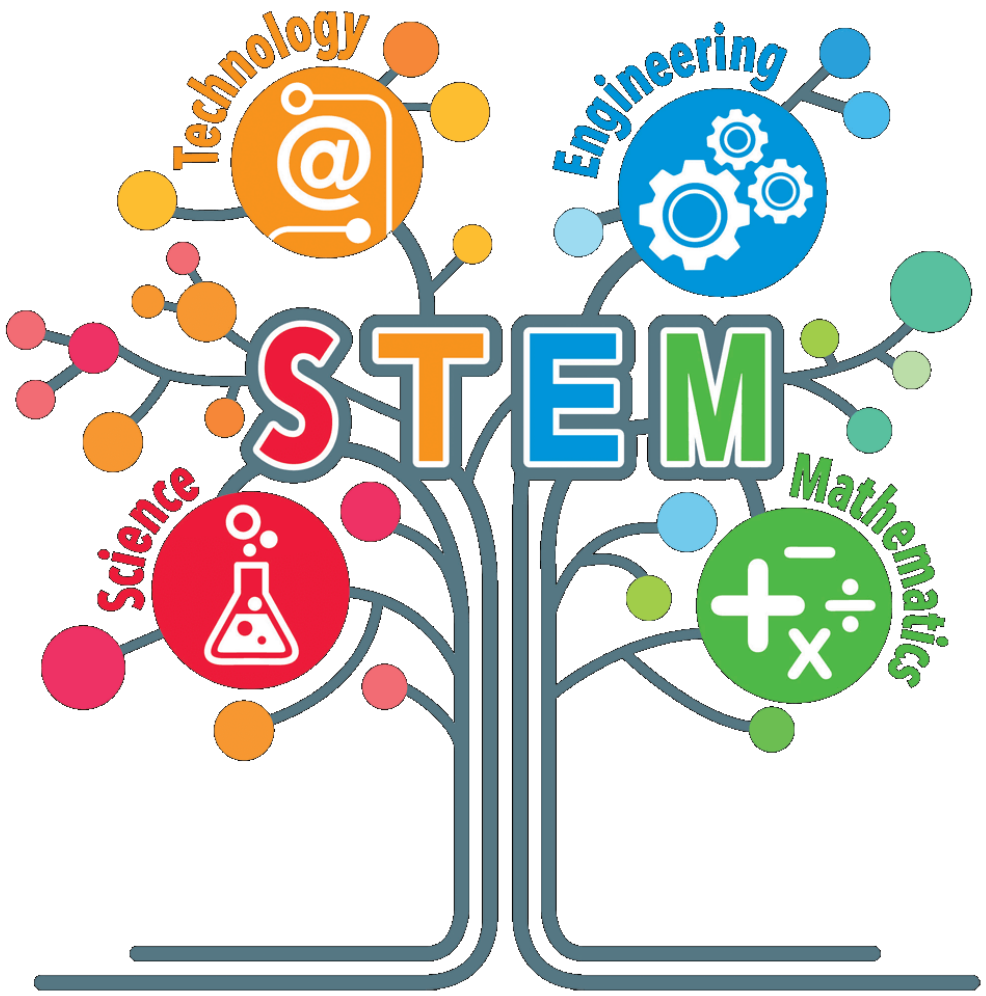
STEM Challenges

What's it like at the JCB Academy?

https://jcb-academy.com/

STEM Challenge

What is STEM?



STEM stands for -

Science

Technology

Engineering

Mathematics

These subjects are linked directly to each other and this task will highlight your skills in each of these subject areas.

Objectives To understand what is meant by STEM. To understand how STEM skills are used when completing a manufacturing

Classroom STEM Challenge

Build and test a 4 – wheel balloon car

The Challenge

You are going to manufacture an balloon car using household objects.

You can think about additions to your design to make it run better. You could have a theme to make it interesting.

Did you know?

Your balloon car uses jet power to move. The stored air in the balloon pushes through the straw, creating **thrust**—the force that pushes the car forward. So when air from the balloon moves in one direction, it pushes the car in the opposite direction.

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Build and test a 4 – wheel balloon car

Here's what you need to make your 4-Wheel Balloon Car!

Body (Select one)

- Water bottle
- Toilet-paper tube
- Juice box
- Disposable cup (paper or plastic)
- Fast-food or deli “clamshell” container (where the top and bottom connect with a seam in the back)
- Ice cream container (pint or quart)
- Milk carton (individual size)
- Cardboard sheet
- Orange-juice can

Jet

Balloon

- Flexible straw
- Rubber band or tape

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Here's what you need to make your 4-Wheel Balloon Car!

Connector for attaching wheels to an axle (Select one)

- Dry sponge
- Foam
- Clay
- Marshmallow (cut in half)

Axles (Select one)

- Straws
- Barbeque skewers
- Chopsticks

Wheels (Select one)

- Bottle caps
- Candy mints (with a hole in the middle)
- CDs
- Cardboard circles

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Make the jet

Put the long end of a flexible straw into a balloon.

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Build and test a 4 – wheel balloon car

Make the jet (cont'd)

Attach the straw and balloon so that no air can escape, using either a rubber band or tape.

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Insert two axles

•Poke two holes in the bottle's sides, on the part of the bottle that will be the bottom of the car. Make the holes directly across from each other so the axle goes straight across.
•Slide a straw through the two holes. Adjust so the axle goes straight across.
•Repeat for the second axle.
•Slide a barbeque skewer through each straw.

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Make the wheels

Wedge a square of sponge (or foam or marshmallow) into a bottle cap to make a wheel.

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Make the wheels (cont'd)

Make four of these wheels.

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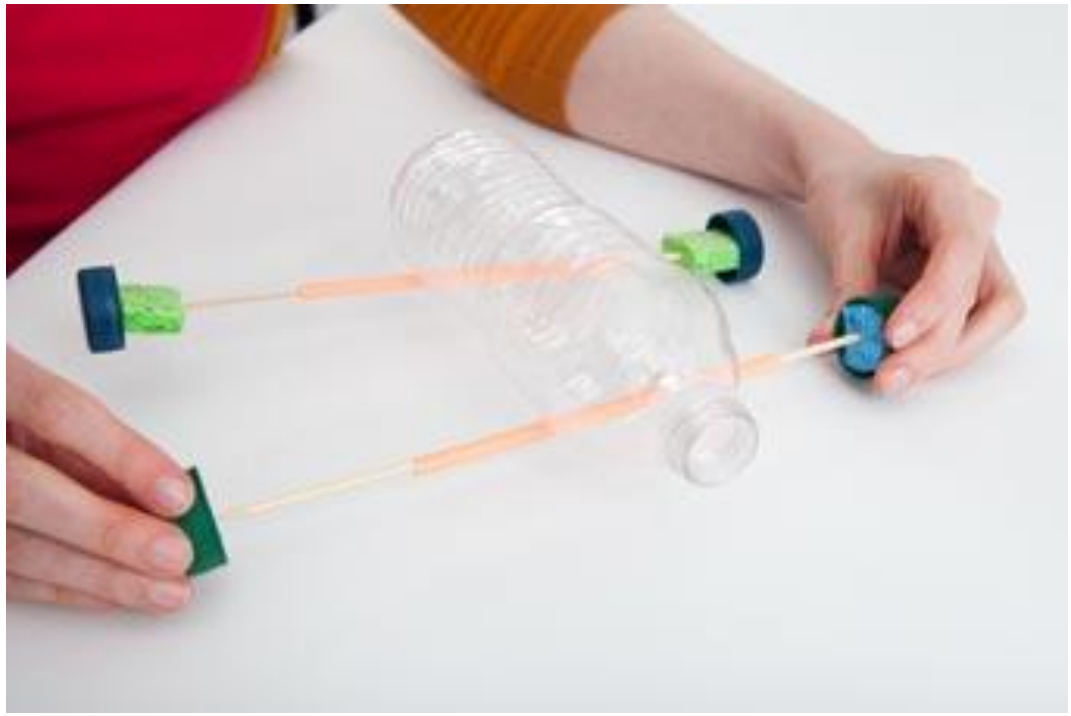

Add wheels

To make it easy to push a skewer into a sponge, use the skewer's point to poke holes in the sponges.

•Center the holes so the wheels will spin evenly and not wobble up and down.

•Push the wheels onto the ends of the skewers.

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Insert the jet

Poke a hole in the top and back of the bottle.

•Push the jet into place so that the straw's balloon end pokes out the top and the open end pokes out the back.
•Make sure the straw at the back is as parallel to the floor or tabletop as possible. If it points up, down, or to the side, your car won't move as fast or far as if the jet points straight back.

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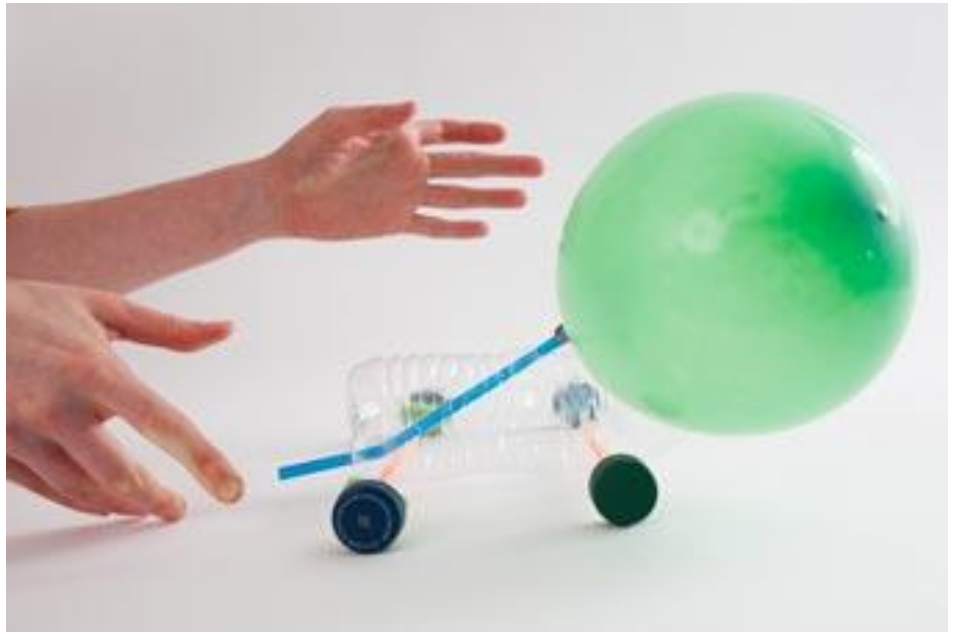

Power the jet

- Blow up the balloon by blowing through the straw.
- Put your finger over the end of the straw to stop air from escaping.
- Put the car on a smooth surface. Then let go. ZOOM!

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Try this next!

•**Go for the record**. How far can your car go? Try to double the distance by reducing friction (rubbing), lightening the car, pointing the jet back straighter, and straightening the axles.
•**Decorate and have a parade**. Give your cars personalities by using different-shaped containers and by decorating them. Have a parade to show off everyone's balloon cars.
•**Demolition derby**. Whose car is the toughest? See whose car still runs after five head-on collisions.

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Questions

Do the cars go faster on a smooth floor or carpet?

If your car were to travel 4 metres in 4 seconds, calculate its average speed (in metres/second).

What was the average speed of your car?

Did you make any improvements to your car? What effect did these have?

Suggest possible reasons why some cars go faster than others.

Why do you think cars have rubber tyres?

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Extension questions

When you blow up the balloon you store energy in it. What is another name for stored energy?

Most of the stored energy is converted to movement energy as the car zooms across the floor. What is another name for movement energy?

What made the car accelerate across the floor?

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Manufacture an igloo from card by following a production plan

Time to evaluate

Engineers always evaluate a process when they have completed it. It helps them to improve their processes next time. Here are some things to think about -

Did you enjoy making it?

Why?

How accurate is your structure?

Did it fit together?

What went well?

How could you improve?

Is it sturdy enough?

How could you increase the strength?

Is your structure creative?

Did you add decoration?

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What's next?

- **Share your achievements**
  - Send pictures or videos of your activities to us. Make sure its clear what school you are from.

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Please let us know if you are **not** happy with us sharing your images on our own social media forums and website.

- **Try some more Challenges from our website!**