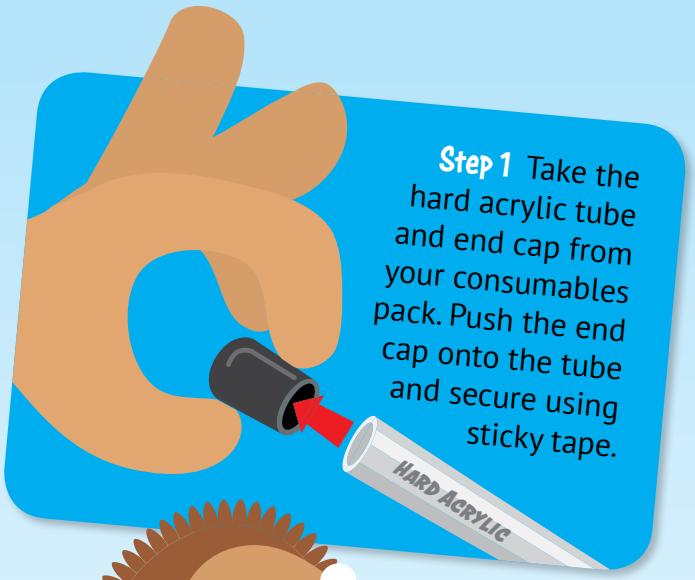
PUPIL WORKSHEETS

STEM CLASSROOM ACTIVITY

PRIMARY STEM PROJECT
POWERED BY DENFORD

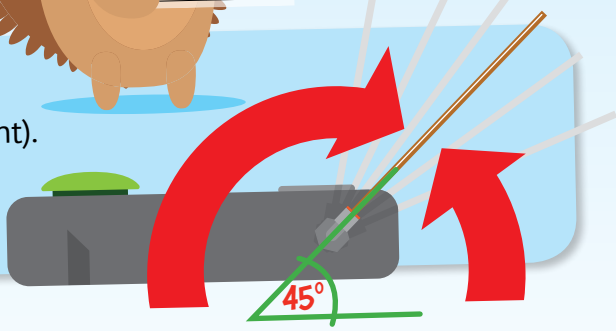
PAPER AEROPLANE CHALLENGE

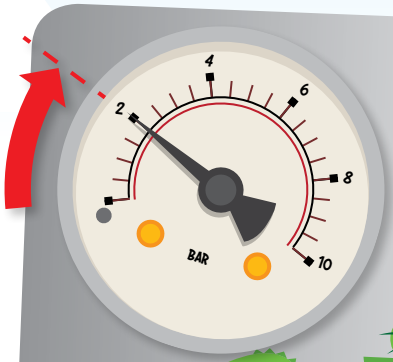
Step 2 Using one piece of A4 paper design and make a paper aeroplane and stick it securely to the acrylic tube.



Step 1 Take the hard acrylic tube and end cap from your consumables pack. Push the end cap onto the tube and secure using sticky tape.

Step 3 Set up the launch system and pump.
(There is no need to attach the tether lines for this experiment).
Using a protractor, set the angle of the brass launch tube to 45 degrees from the floor.



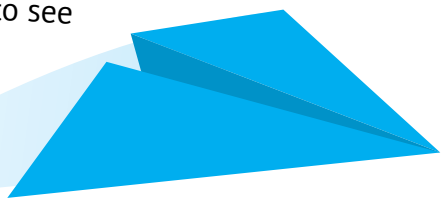


Step 4 Pump up the launch box to 2 bar and slide your paper aeroplane onto the brass launch tube.

Now use the launch system to fire your paper aeroplane into the air and measure how far each one has travelled.

Compete against other members of the class to see which aeroplane goes the furthest.

WHOOSSH!



SAFETY WARNING! Always remember that everyone should stand well back, behind the aeroplanes, when they are being launched.

Things to think about...

What forces are acting on the paper aeroplane?

How does the shape of the aeroplane affect the distance it travels?

How can you modify your design to make it go further?

INSTRUCTION SHEET NO. 3

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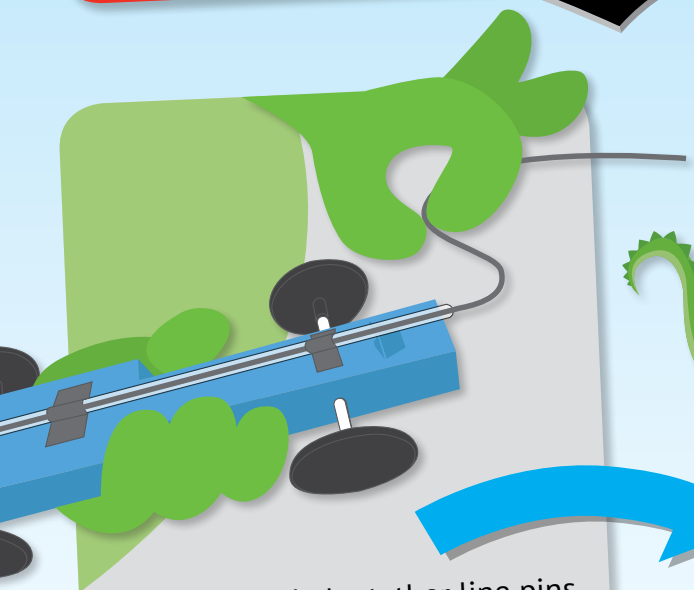
LET'S RACE!

Step 1 Roll out the Primary STEM Project Track or use tape and string to mark out a race track on a smooth floor (not carpet).

The track **must be 10 metres long**, but you will need extra space at the beginning and the end of the track for the start line and to allow for the cars to run off at the finish.



Step 2 Ask your teacher to assemble the launch system according to instructions provided with the Race System.

Step 3 Unhook the tether line pins and thread through the tether guides underneath the chassis. Resecure the tether lines.

Reverse the car, threading the hard acrylic tube car back on to the brass launch pipe.

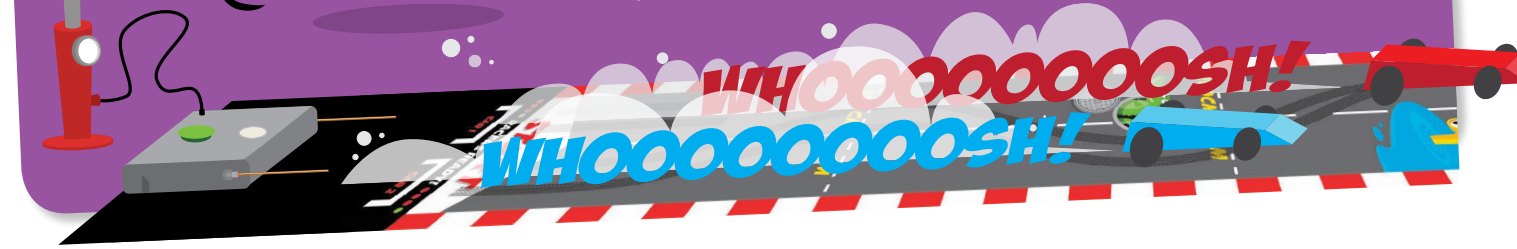
Line each car up at the start line and pump the launch system to 6 bar.

Start the race by pressing down on the big green launch button.

Step 4 After racing, you will need to bring the cars back to the start line to unthread them from the tether line and put 2 new cars on the track.

Use a knockout system to race cars in pairs, with the fastest car going through to the next round.

Repeat this process until you have only one car remaining.



CAR EVALUATION SHEET

Which parts of the car performed well?	
Is there any part of the car that needs to be changed or modified?	
Ideas for improvements	1 2 3
How do you think the **modifications** will improve the performance of your car?	1 2 3

Things to consider:

Weight
Aerodynamics
Friction
Strength
Overall appearance

FACTS & ACTIVITIES

PRIMARY STEM PROJECT
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Air Pressure
How Does The Air Launch System Work?

What is Air Pressure?

When you blow up a balloon, your breath is squeezed into a small space.

What happens when you stop blowing and let go of the balloon?

The air launch system works in the same way.

The air is squashed (or compressed) into a smaller space than it likes. As you release the button the air gushes out.

This acts as thrust to propel your car forward.

The speed at which the air rushes out depends on how much air has been squeezed into the space.

This is called air pressure and is measured in Bar or PSI.

Bar is a metric unit of pressure. One bar is equal to the amount of atmospheric pressure on earth at sea level.

PSI stands for **Pounds per Square Inch**.

One **PSI** is equal to the amount of pressure exerted by 1 pound of weight on a 1 inch square.

How is air pressure used in everyday life?

Classroom Activity

Experiment with Air Pressure

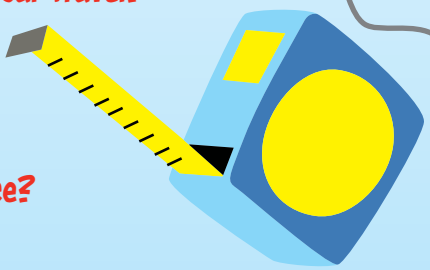
You will need:

1. Assembled car chassis or completed car
2. Primary STEM Project Launch System
3. Race Track or marked out race area
4. Some card and scissors
5. Measuring tape

Step 1

Using the Air Launch System, pump until the dial reads 6 Bar.

How far down the track did your car travel?



Step 2

Try different air pressures and measure where the car stops.

Why does this make a difference?

Step 3

Cut shapes out of cardboard to create a 'hazard' on the track. Be creative with ideas for this. It could be anything from a stop sign to a row of bins! Think about how you can make them stand up.

Can you stop the car before the hazard?

Experiment with different amounts of air pressure?

AIR PRESSUE CHALLENGE

Team Name	1st try	2nd try	3rd try	Best Result

LESSON 2-ESTIMATING

BACK TO THE DRAWING BOARD

- As a team discuss how you might be able to make improvements to your car bodyshell design.
- Has watching the other teams race helped you decide what makes a car go faster?
- Build a new car chassis and then design and make a new and improved bodyshell.
- Keep your original car as a spare, in case of a track disaster!

SUMMARY & EVALUATION

Have you completed the following tasks?

How well have you done?

Have you…….	y/n	How well did you perform this task?
Added to the glossary?		
Estimated air pressure?		
Worked well as a team?		
Made improvements to the car bodyshell?		
Add other things that you have done here.		
Add other things that you have done here.		
Add other things that you have done here.		

In this box write down one thing that you think you did well and one way that you could make improvements.

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FORCES

LIFT

DRAG

GRAVITY

FRICTION

AIR RESISTANCE

ROLLING RESISTANCE

Show where these forces are acting upon this moving racing car.

FORCES

Label the forces that are acting on this moving racing car.