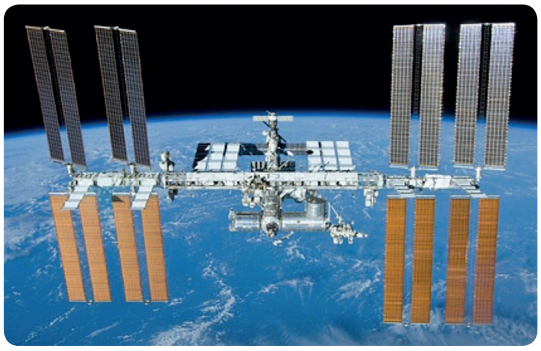
Space Challenge (1)

Did you know?

Astronauts have been travelling to and working on the International Space Station (ISS) since November 2000.

The astronauts on the ISS carry out many experiments such as to find out if crops such as lettuce can grow in space.



Space Station Challenge

The European Space Agency is sending astronauts to the ISS to carry out experiments. Design and construct a free standing space rocket with a door or doors which can open and close remotely.

You will also build a remotely operated transportation device to allow the astronauts to travel a horizontal distance of 30cm to the rocket door(s) before blast off.

Rules

- You can only use the materials provided.
- You will have 2½ hours to design and construct your model.
- Your design will be awarded points if the doors open and close remotely and the astronaut moves to the rocket on a remotely operated device.
- You can achieve up to 30 points for design and 30 points for construction and efficient use of materials.

Note: remotely means you cannot touch the doors to open or close them.

Materials and tools available for each team

- Jumbo plastic straws x 10
- A4 card x 5
- Blu tack
- Glue stick
- Masking tape x 1m
- Plastic tubing x ½m
- 20ml syringes
- 10 ml syringes
- Tee splitter
- Aluminium foil
- Gold/silver foil
- Astronaut/Engineer
- Scissors
- Design sheets

Space Challenge (2)

Did you know?

The Mars Rover was designed to explore the surface of Mars and to search for rocks and soils that hold clues to past water activity on Mars. Because the surface of Mars is covered in sand and rocks, it makes driving difficult and so the Mars Rover has been specially designed for the surface of Mars.

Mars Rover Challenge

To design and construct a Mars Rover so that it travels most efficiently over the track. The winning team will build the best designed Mars Rover that travels from the starting line to finishing line in the shortest time.

Rules

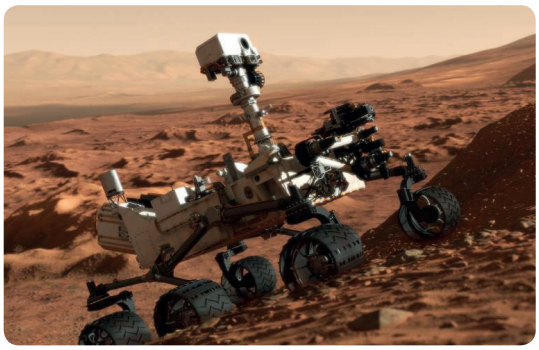
- You can only use the materials provided.
- You will have 1 hour to design and construct your model.
- Decorate and give your Rover a name.

Hints

- What happens when you use the different sizes and types of wheel?
- Try out the different propellers.
- How does the position of the motor and batteries affect the performance?

Materials and tools available for each team

- Corriflute (250mm x 130mm) x 1
- Corriflute (130mmx 20mm) x 3
- Corriflute joiners
- Motor x 1
- Motor clip x 1
- Batteries x 2
- Wheels 75mm x 4
- Wheels 7539mm x 8
- Spiked tyres x 4
- Axles 190mm x 2
- 3-blade propeller x 1
- 1-blade propeller x 1
- Design sheets



Marble Roller Coaster Challenge (1)

Did you know?

All roller coasters involve going round loops bends and twists at high speeds. Most roller coasters work by gravity. During the ride no motors are used to power it. After the ride, a motorised system is used to return the car to its original position ready for the next ride.

On the roller coaster you also experience acceleration and this produces a strong g-force. This can either press you into your seat or make you feel that you are about to fly out of it. This occurs when the roller coaster is travelling at a high speed when the riders are going round a loop or twisting around a bend in the track.

Challenge – How high can you build a tower?

To construct the highest tower you can using 1 pack of playing cards.

The tower must remain free standing after the 10 minutes construction time has ended.

Materials available for each team

- 1 pack of cards
- 1 piece of masking tape – 20 cm
- 1 ruler

Rules

- You can only use the materials provided, in the most efficient way.
- You will have 5 minutes to discuss the design of your tower.
- You will have 10 minutes to construct your tower.
- The tower must remain free standing after the 10 minutes construction time.
- The team that has built the highest tower with be the winning team.

Design

In your planning you should discuss your ideas and decide on which of your ideas will meet the challenge.

Performance

Does the tower perform the task as stated in the Challenge?

Marble Roller Coaster Challenge (2)

Which has the strongest g-force?

Look at the list below. Which one has the strongest g-force? Put them in order, with the highest at the top, using the picture cards.

- Loop roller coaster
- Space Shuttle on take-off
- Fighter jet
- Washing machine
- Commercial aircraft on take-off

Challenge – Design a slow marble run

To design and construct a slow marble run. Your 3 marbles must travel as slowly as possible and for as long as possible. They must be deposited, and stay, in a container at the end of their run. A bulb must be lit when three marbles are in the container. (2 hours)

Rules

- You can only use the materials provided, in the most efficient way.
- You will have 2 hours to design and construct your model.
- Your design will score 5 points for every second that the marbles take to complete the run.
- The marbles must travel without assistance once released.
- 10 points will be awarded if the marble is deposited and stays in the container – max 30 points.
- 30 points will be awarded if the third marble is deposited and stays in the container and the bulb lights.

Materials and tools available for each team

- A3 card x 1
- A4 card x 4
- Plastic straws x 10
- Paper clips x 6
- Tin foil
- Blu Tack
- Pipe cleaners X 6
- Treasury tags x 6
- Polystyrene/plastic cup x 1
- Marble x 3
- AA battery holder x 1
- AA batteries x 2
- Bulb x 1
- Bulb holder x 1
- Wire
- Design sheets
- Hole punches (Front)
- Scissors
- Glue stick
- Masking tape
- Design sheets

Marble Roller Coaster Challenge (3)

Background

The typical roller coaster works by gravity. There are no motors used to power it during the ride. Starting from rest, it simply descends down a steep hill, and converts the (stored) gravitational potential energy into kinetic energy. A small amount of energy is lost due to friction, which is why it is impossible for a roller coaster to return to its original height.

Challenge – how much height to loop the loop?

Design and construct a marble roller coaster to loop the loop. Your roller coaster must have at least 1 loop. Find out how much height is needed in order for the marble to run through a loop in the range of 30–50cm. (30 minutes)

Materials available for each team

- Masking tape
- Foam pipe insulation
- Ruler
- Marble x 1

Rules

- You can only use the materials provided.
- You will have 30 minutes to design and construct your model.
- Your model will have at least ONE loop.
- The marble must travel without assistance once released.
- The marble must reach the end of the run.
- You will explain your design and construction, and how you could improve up on it when it is tested.

Instructions

1. Set up the track
   Curl the track into a loop – hold in place using masking tape
   Raise up one end of the track to make a ramp coming down into the loop
   Tape the top of the ramp in place to the wall or other piece of furniture.
2. Measure the diameter of the loop, height of the starting point for the track (rise) and the horizontal distance from the track starting point to the beginning of the loop (run)
3. Run a single marble down the track 10 separate times. How many times does it successfully go through the loop?
4. Change the height and repeat. What starting height was needed for the marble to make it through the loop most of the time? Write your results in this table.

Loops	Height of starting point (rise)	Distance from starting point to start of the loop (run)
1 loop diameter …cm		
1 loop diameter …cm		
2 loops diameter …..cm and …cm		

Extension – 30 minutes

5. Repeat with a different diameter loop.
6. Repeat with 2 loops.