

For 7 to 11 year olds

Context

We don't yet have the technology to send humans to Mars but data collected by ESA's robot Rosalind Franklin will help scientists learn more about the planet to plan for missions in the future. If humans are to live on Mars one day, to survive its harsh conditions they will need shelter to protect themselves from radiation and the lack of atmospheric pressure; they will also need a supply of water, oxygen, food and energy. The European Space Agency (ESA) has plans to build a village on the Moon to be a stopover for robotic missions to Mars. NASA has plans to 3D print houses on Mars! In this maths-linked activity, the children investigate 2D nets to make 3D shapes; they then design and build a Martian village using the 3D shapes. They discuss shape, appropriate materials, and size. They generate mathematical questions related to shape based on their designs. Finally they present their ideas to ESA, justifying their choices.



National curriculum links

Maths - shape, space and measure:

- Recognise and name common 2D and 3D shapes
- Identify and describe the properties of 3D shapes including number of edges, vertices and faces
- Identify 2D shapes on the surface of 3D shapes
- Draw 2D shapes and make 3D shapes from modelling materials
- Recognise and build 3D shapes from 2D nets

Resources

- Activity sheet 1
 - 3D shapes for demonstration
 - Glue
 - Scissors
 - Printed nets for building 3D shapes
 - Card base for model village
- Activity sheet 1a can be used for extension work

Lesson starter

This is the surface of planet Mars; it is cold, and has dust storms. It is bombarded with radiation and lacks oxygen and liquid water. It is so far from Earth that it takes six months for a spacecraft to travel there. www.nasa.gov/sites/default/files/styles/full_width_feature/public/thumbnails/image/pia22313.jpg

One day, astronauts might travel to Mars. They will need self-contained homes to protect them from the harsh conditions. What might those homes look like? The children are going to use imagination and 3D shapes to build models of these homes. Show the 3D shapes. Encourage the children to identify and name the key features of each. How could we build these shapes from card? This amusing video clip introduces the idea of constructing solid shapes from 2D nets:

www.bbc.com/bitesize/clips/zwckq6f

Enlarge and print the nets for 3D shapes on Activity sheet 1, hiding the names. Can the children match each net to its corresponding solid?



Main activity

Each group is going to build a Martian village using nets to construct 3D shapes but first must make preliminary designs. List the features the homes or shelters would need to have. The children share their ideas. Each group prioritises five main features. It might be useful to have some key prompts on the whiteboard to aid planning.

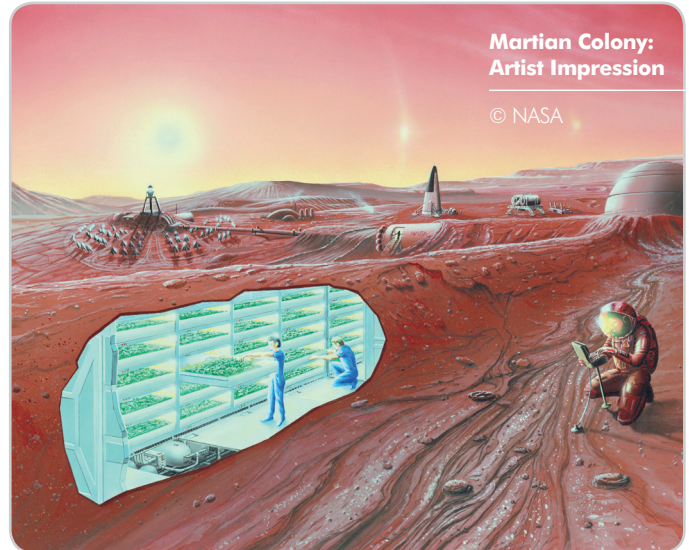
Things to think about! Protection from radiation, low outside pressure, need for an oxygen and water supply, place for growing food, areas of privacy, green spaces. Print copies of nets from Activity sheet 1. The children can use the nets to make multiple 3D shapes; they can then use the 3D shapes to build their models. Having agreed on one design, they choose the resources required and start construction. They arrange and attach the models to a large card base.

Plenary

The groups present their Martian homes and describe and explain the key features. Which 3D shapes did they use? Which 2D shapes can you name? Can you think of more questions related to the shapes used? How would they improve the constructions?

Show some internet images of artists' impressions of future designs for Mars settlements. (See support notes.) ESA is planning to build a base on the Moon as a stopping off point for space missions on their way to Mars. The children watch a short video from ESA showing building of a lunar village taking place: www.esa.int/esatv/Videos/2016/03/Moon_Village2/Animation_Moon_Village_Construction_-_Credit_Foster_Partners

Explain that the video features the Moon but maybe a similar method will be used on Mars one day. 3D printing will most certainly be used in constructing the buildings. What would the children 3D print on Mars to remind them of home back on Earth?



Further activities

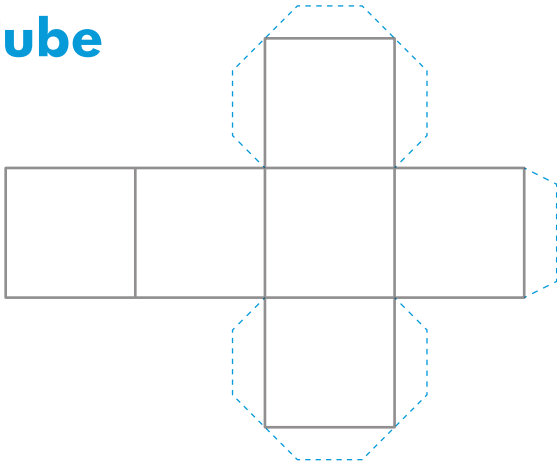
- Design a poster to send to the UK Space Agency or ESA, explaining your design of Martian homes, choice of shapes or materials, using what you have learned about Mars.
- You are estate agents. Advertise your Martian home. Design a leaflet, poster, blog.
- If you were to leave the Earth to live on Mars what would you miss most? Write a letter or postcard from Mars to send to Earth.
- Using squared paper, draw more nets to match solid shapes. How many different nets can you draw that will make a cube? Can you draw more than one net to make a cuboid? Did all your designs work?

STEM Vocabulary

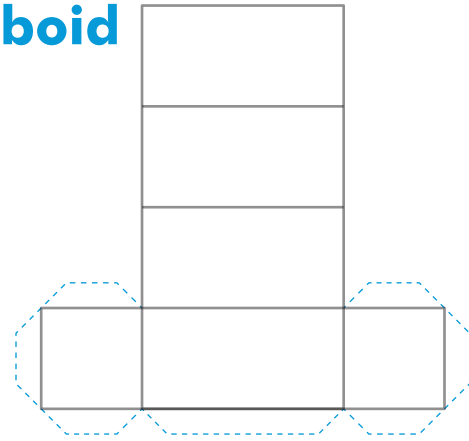
Square	Cube	Square pyramid
Triangle	Cuboid	Face, edge, vertex, vertices
Rectangle	Triangular Prism	

Use these nets to make solid 3D shapes

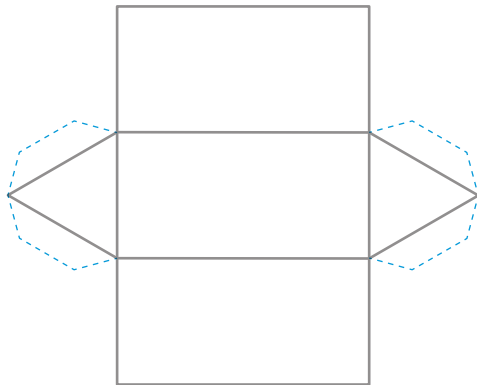
Cube



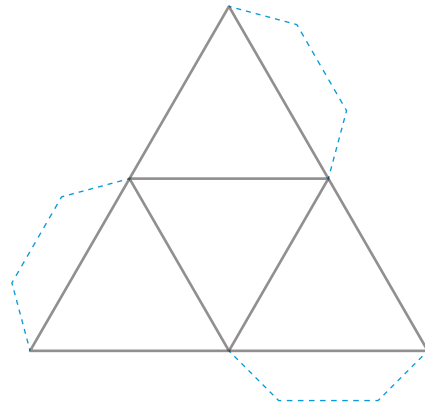
Cuboid



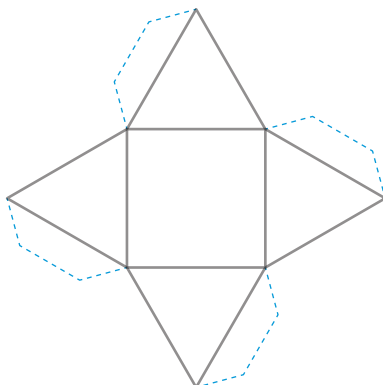
Triangular prism



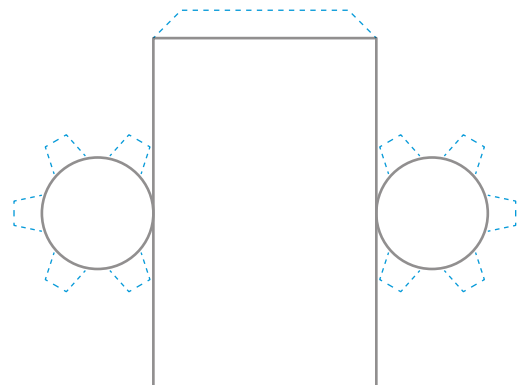
Triangular pyramid



Square pyramid



Cylinder



Further activity: Can you draw nets that will make these solid shapes?

