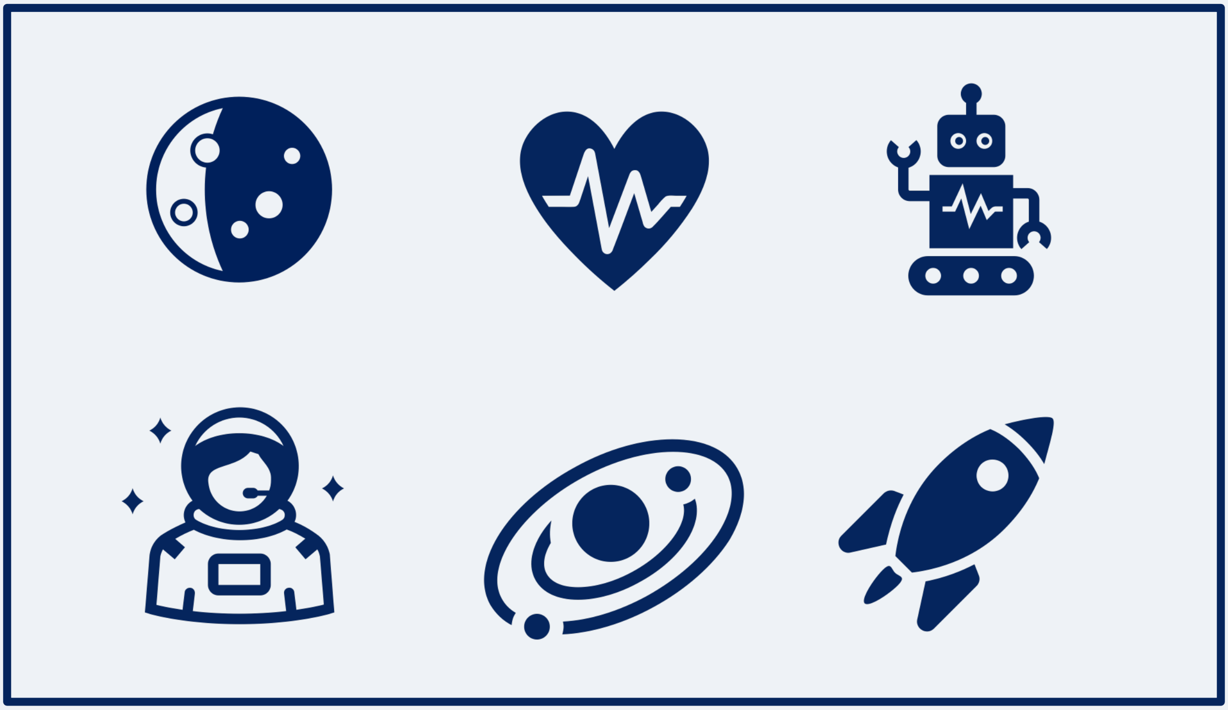
Can We Get Humans to Mars?



Student Workbook

Name: ______________________________

THE SCHOOLS' OBSERVATORY

FUNDED BY A PARTNERSHIP GRANT FROM THE ROYAL SOCIETY

PROUD TO BE PART OF LIVERPOOL JOHN MOORES UNIVERSITY

Table of Contents

Investigation 1

Where Should We Build a Moon Base?

Where Should We Build a Moon Base?

Introduction to your Mission

Humans want to go to Mars, but it's a big journey! First, we must practise living beyond Earth. The best place to start is the Moon.

In this mission, you are part of a team of geologists. Your job is to explore the surface of the Moon, learn about its features, and decide where to build a Moon base.

Activity: Explore the Moon's Surface

On your Moon section, try to spot these 3 features: Sea/Mare, Mountain/Mon, and Crater.

Find the best example of each feature and place the matching sticker on it (use the picture key below). Tick the box when it's done!

- **Sea / Mare** ☐
- **Mountain / Mon** ☐
- **Crater** ☐

Circle one feature and describe how it looks:

The Moon has…. **Seas/Mares** **Mountains/Mons** **Craters**

These look like…

____

____

____

____

____

Where Should We Build a Moon Base?

Stick your labelled piece of the Moon below:

Where Should We Build a Moon Base?

Activity: Choose a Moon Base Site

On the Moon map below, circle (or draw an arrow to point to) the place where you think your Moon base should go

Where Should We Build a Moon Base?

Why did you choose this site?

Circle one or more words in the boxes to complete the sentences.

I chose this site because it is…

flat | **sheltered** | **safe** | **easy to land on**

And it is near a…

Sea (mare) | **Mountain (mons)** | **crater**

Activity: Taking a Moon Observation

Write your username and password given to you by your teacher in the table below to log in to The Schools' Observatory website.

My username	My password

Follow the instructions given to you to take an observation of your Moon base site.

Name of Moon section:

Where Should We Build a Moon Base?

Once your Moon observation is ready, your teacher will help you print it. Then stick your Moon observation image below.

Investigation 2

What Do Humans Need to Survive?

What Do Humans Need To Survive?

Introduction to your Mission

Now that we have chosen the site for our Moon Base, we need to know what to put inside of it so humans can live there.

In this mission, you will be an engineer/architect. Your job is to think about the resources humans need to survive and include these in your design of a Moon Base.

Activity: Resources for Survival

Write down what resources are needed to survive in space.

Extension Task – circle which are easier to get on Earth vs the Moon or Mars.

____

____

____

Activity: Essential or Extra?

Put a tick in either the 'Essential' or 'Extra' column for each item.

Extension Task – Add 2 items and put a tick in one of the columns.

Item	Essential	Extra
Oxygen		
Pizza		
Pets		
Music		
Beds		
Hot Showers		
Plants		
Video Games		

Activity: Comparing the Earth, Moon, and Mars

Use the information in the table to complete the tasks.

Feature	Earth	Moon	Mars
Average Temperature (°C)	15	127 (day) –173 (night)	-59
Strength of Gravity (g)	1	0.16	0.38
Mass of Atmosphere (kg)	5.15×10^{18}	28 000	2.5×10^{16}
Gases in Atmosphere	Nitrogen: 78% Oxygen: 21% Others: 1%	Neon: 29% Helium: 26% Hydrogen: 23% Argon: 21% Others: 1%	Carbon Dioxide: 95% Nitrogen: 2.5% Argon: 2% Others: < 1%

1) Average Temperature

Put these labels on the scale:

- Earth
- Moon (day)
- Moon (night)
- Mars

Average Temperature

2) Strength of Gravity

Put these labels on the scale:

- Earth
- Moon
- Mars

Strength of Gravity

3) Mass of Atmosphere

Put these labels on the scale:

- Earth
- Moon
- Mars

Mass of Atmosphere

4) Why can't humans breathe on the Moon and Mars?

Complete the sentences using the words in the box:

The atmospheres of the Moon and Mars have ___________ mass than Earth. This means the air is thinner.

They also contain different ______________. Humans ___________ in oxygen. __________ has the most oxygen in its atmosphere. It has around _________ %. The other atmospheres may only have a small amount or even none at all!

gases	**breathe**	**Earth**	**less**	**21**

Activity: Caring for Planet Earth

List some ways we can be more sustainable and look after our planet.

____

____

____

____

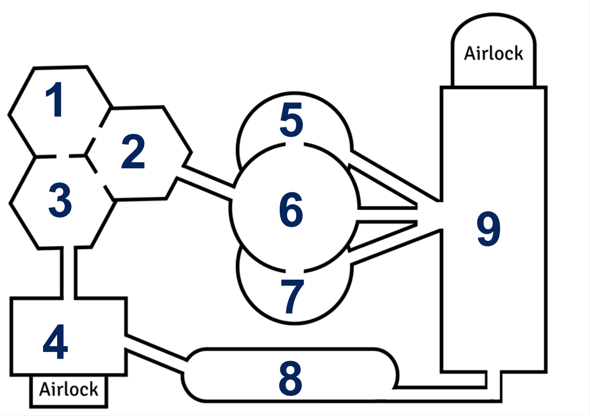
____

____

Activity: Moon Base Design

Use the template (on pages 24 and 25) to create a plan of your Moon Base. Draw everything that is needed to live and work there. You might want to add some labels to your diagram as well.

The template has 9 rooms in total.



Choose where in the base you will put each of these rooms:

- Food Supply Room
- Communications Room
- Water and Air Filtration Room
- Bathroom
- Bedroom
- Living Quarters with Kitchen
- Electricity/Power Supply Room
- Medical Room with Gym
- Science Lab

The rooms have different shapes and sizes. Some of them are connected while others are on their own.

Two of the rooms also have an airlock. This is where astronauts will put on their spacesuits and be able to leave the base.

Use the information and pictures on the following pages to help you choose where to put each room and what items/equipment to include inside of them!

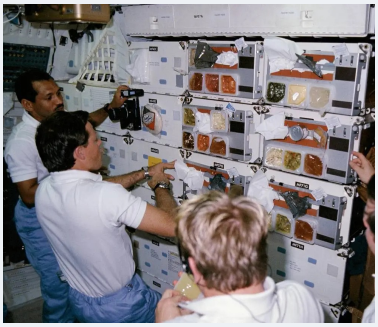
You should also think about how many people will live in your Moon Base. This will affect the amount of items and equipment you'll need.

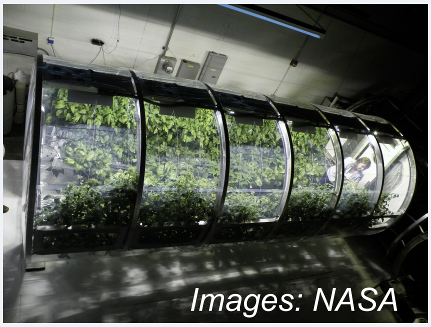
What Do Humans Need To Survive?

Food Supply Room

You might include:

- Food that won't go mouldy or rot quickly
- Shelves or cupboards for storing items
- Crops/plants to eat
- Equipment to care for plants (like lighting or water sprinklers)





Images: NASA

Useful rooms to have nearby:

- Living Quarters with Kitchen (so food is closer when cooking)
- Water and Air Filtration Room (so plants can be watered quickly)

Communications Room

You might include:

- Computers/Laptops
- Cameras
- Microphones
- Headsets/Headphones
- Satellite dishes
- Radio antennas

Image: ESA/NASA

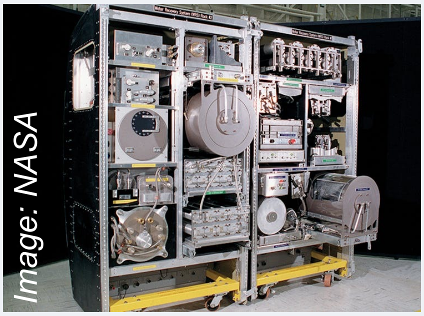
Image: NASA

What Do Humans Need To Survive?

Water and Air Filtration Room

You might include:

- Water tanks
- Water filters (to clean the water)
- Oxygen generators (to turn water into oxygen for breathing)
- Air filters (to clean the air)
- Fans
- Pipes for moving water and air to different places



This machine collects water from different places on the International Space Station and makes it clean and safe to drink!

These machines can make oxygen from water!

Useful rooms to have nearby:

- Water and Air Filtration Room (so plants can be watered quickly)
- Bathroom (to quickly collect wastewater that can be recycled)

Bathroom

You might include:

- Toilets
- Showers
- Sinks

Useful rooms to have nearby:

- Water and Air Filtration Room (so wastewater can be quickly recycled)
- Bedroom (so people can get there easily and quickly)

An example of a toilet on the International Space Station!

Bedroom

You might include:

- Sleeping bag/covers
- Mattress
- Pillows
- Bed frame
- Storage space (for clothes, personal items, and other things)
- Sleeping masks and earplugs

Image: SOM/ESA

Image: Hassell/ESA

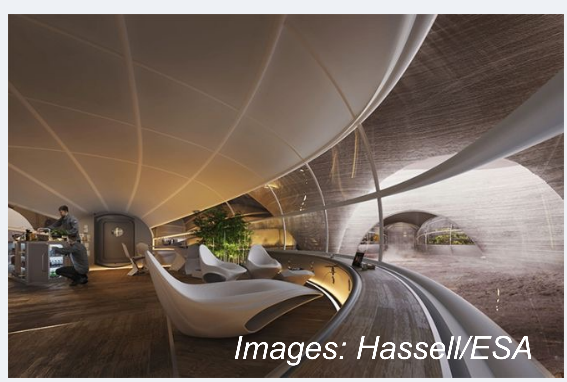
Useful rooms to have nearby:

- Bathroom (so people can get there easily and quickly)

Living Quarters with Kitchen

You might include:

- Kitchen appliances (like an oven or microwave)
- Kitchen items (like pans, utensils, cutlery, plates, or bowls)
- Tables and chairs
- Items for entertainment (like TV screens and books)



Images: Hassell/ESA

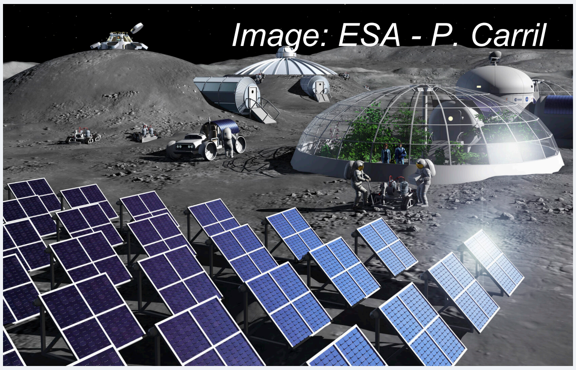
Useful rooms to have nearby:

- Food Supply Room (so food is closer when cooking)

Electricity/Power Supply Room

You might include:

- Fuel cells/batteries (to store extra electricity)
- Electrical circuits with wires/cables (to transport electricity)
- Solar panels (on the outside of the room)
- Nuclear reactor



Lots of solar panels to generate electricity!

Rolls-Royce are developing a small nuclear reactor that could generate electricity in space!

Medical Room with Gym

You might include:

- Medical equipment (like an ultrasound scanner or X-ray machine)
- Medical items (like bandages, gloves, needles, or thermometers)
- Medicines (like painkillers or antibiotics)
- Exercise equipment (like treadmills, weights, or rowing machines)

Science Lab

You might include:

- Microscope
- Glassware (like beakers, flasks, and test tubes)
- Glass slides (for looking at samples under a microscope)
- Measuring cylinders
- Funnels
- Bunsen burner
- Safety goggles and gloves
- Tweezers or forceps
- Droppers or pipettes
- Mixing rods
- Thermometers
- Stopwatches or timers
- Scales for measuring mass
- Notebooks for recording information/data

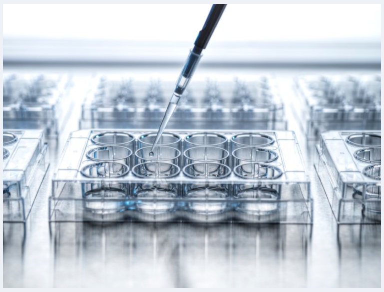
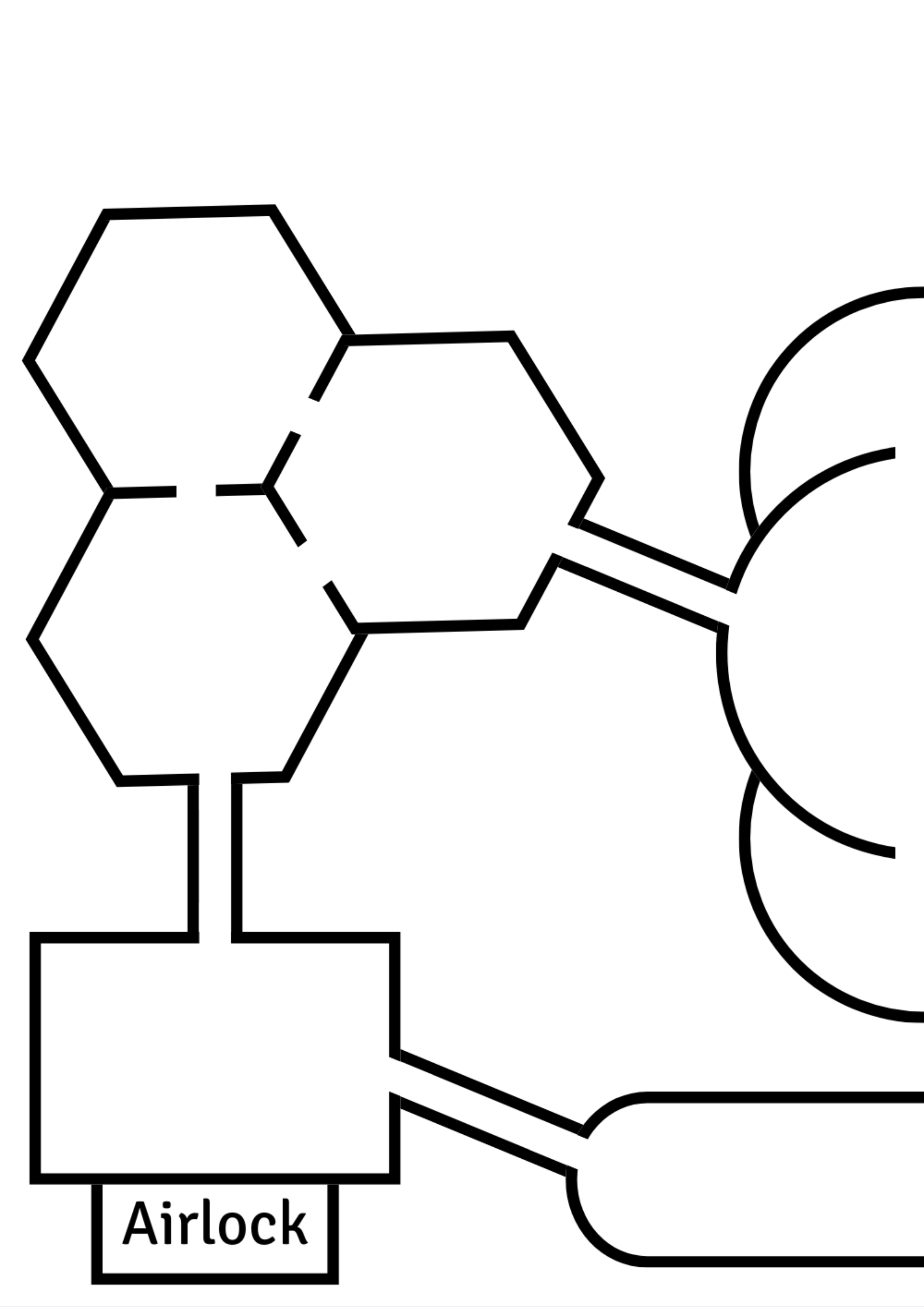
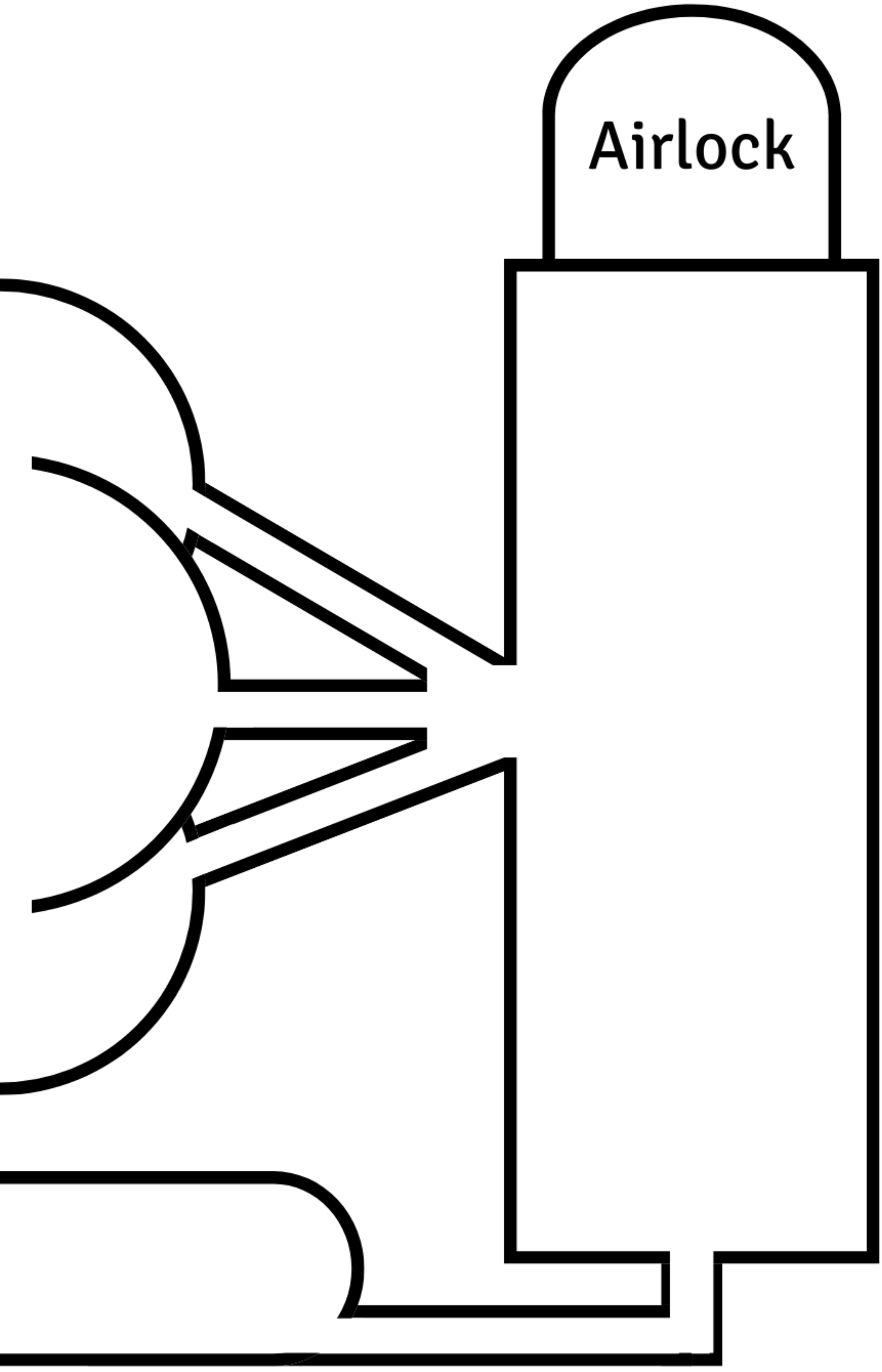


Image: NASA/ASI

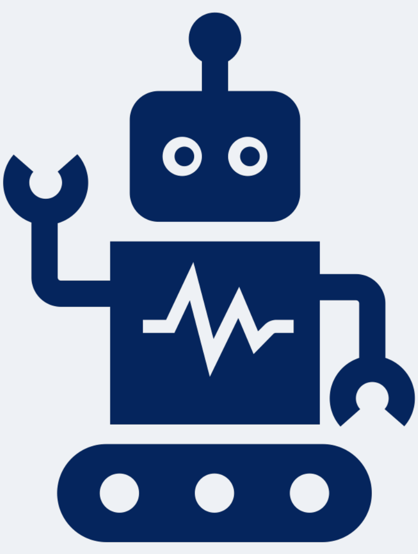
Design your basecamp on the next pages!


Airlock


Airlock

Investigation 3

How Do You Control a Robot Rover?



How Do You Control a Robot Rover?

Introduction to your mission

Now that we know how to make bases beyond Earth, we need to learn more about Mars and what is on the planet!

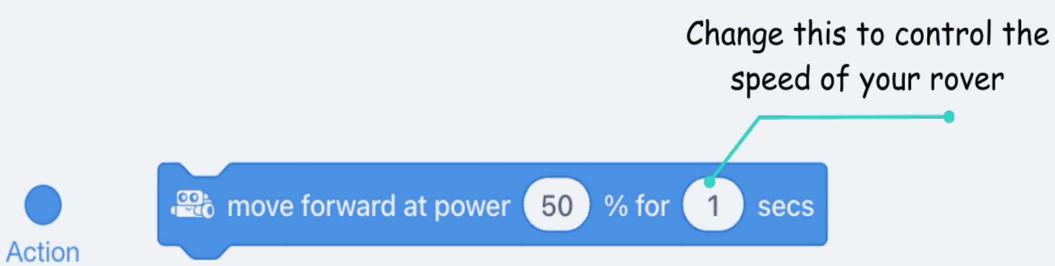
In this mission, your team will become engineers and programmers, coding rovers to complete missions on Mars.

Activity: Quick Rover Tests

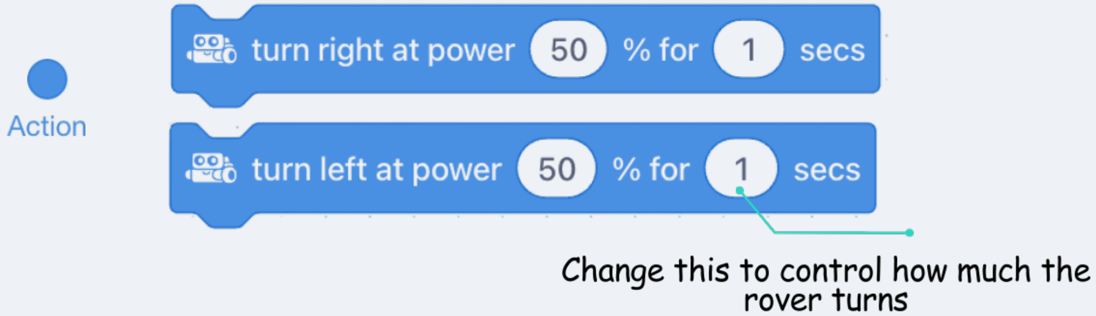
Open the coding software on your device. Use the code examples to complete these quick tests on the Mars canvas.

Tick each box when your team has successfully completed the test.

Test 1: Move forward
Make your rover move one square forward.



Test 2: Turn 90°
Make your rover turn 90° left or 90° right.



Test 3: Sound or light signal
Make your rover play a sound or show a light. ☐

Activity: Mission on Mars

- Talk with your team and choose a name for your rover.
- Check the mission title on your mission card.

Write this information in the boxes below:

Rover Name: ____________________

Mission Title: ____________________

Step-by-step
Read your mission card, then complete the sentences:

Step 1: I will place my rover on the Base at **A1 / B1 / D1 / E1** and make sure it is facing up the grid.

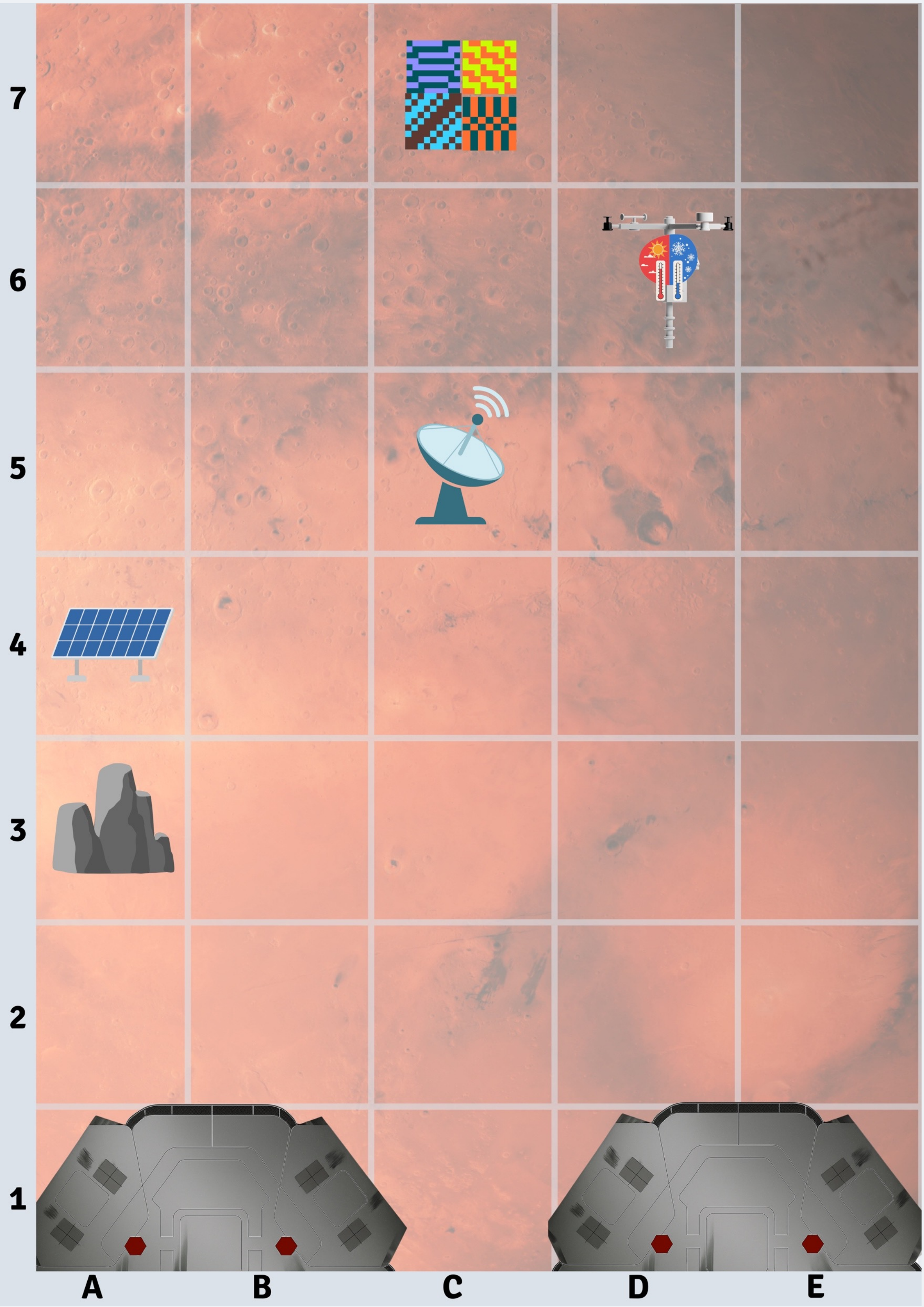
Step 2: I will drive my rover to the ____________________ (*object name*) at __________ (*grid square*) then stop the rover fully inside.

Step 3: I will run the check using **light / sound** .

Step 4: If I have time, I will drive the rover to the Base, which is located at **A1 / B1 / D1 / E1** .

How Do You Control a Robot Rover?

Use the Mars canvas grid below to plan your rover's journey. Draw your best planned path here to complete your mission.



Results

You will be given readings for your mission. Write these below.

Our Readings:

I think our readings represent…

Investigation 4

How Do We Stay Healthy in Space?

How Do We Stay Healthy in Space?

Introduction to your Mission

Now that we know how to create bases beyond Earth and use rovers to help us, we now must understand how our bodies will be affected by travelling to and living on Mars!

In this mission, you will act as health professionals (like medics, nutritionists, physical trainers) to explore how we stay healthy in space.

Activities

You will be completing activities based different training exercises that real astronauts do!

Astronauts spend lots of time doing activities like these – it's part of their job. Sadly, we don't have the same amount of time as they do! This means you might only complete a few activities in the booklet.

But that's okay! Each activity is important by itself. They all focus on skills that astronauts need.

Your teacher will tell you which activities to complete.

Some Dangers of Human Space Exploration

Our bodies aren't made to live in space. Being in environments different to Earth's changes how our bodies function. Astronaut training helps to minimise the risks of these changes.

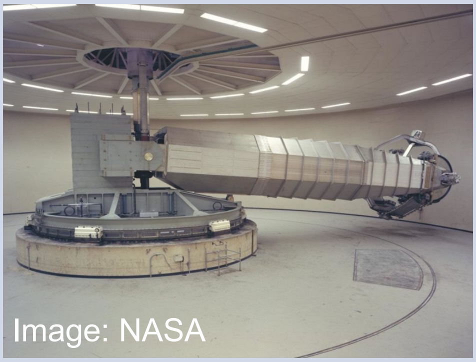


Image: NASA

Travelling in a Rocket:

Large forces act on rockets during launches and landings. Astronauts feel a weight pressing into their bodies, and this risks them losing consciousness.

That's why they train in a big piece of equipment (human centrifuge) which spins them around, so they get used to feeling these forces.

Low Gravity:

Our bodies always work against gravity. If there's less gravity, less force pulls down on the body. Bones and muscles lose strength over time.

Astronauts spend hours exercising each day. Cycling and running on treadmills keep bones strong, and weight-lifting is good for muscles.


Image: NASA

Space Environment:

There's no air to breathe in space, and it can be extremely hot when facing the Sun and freezing cold in the shade.

Spacesuits protect astronauts. But they're big and thickly padded, so limit movement. Astronauts train and perform drills in spacesuits to get used to moving around in them.

Activity: Mission Control

1. Raise your left foot behind you to around knee-height.
2. Get another person to start the stopwatch.
3. Bounce the ball off the wall and catch it whilst balancing on your right leg.
4. Stop the stopwatch when the ball is dropped or if you lose balance.
5. Record the number of seconds in the results table.
6. On your next turn, repeat the steps again, but balance on your left leg instead.
7. Keep switching legs and repeating until you've completed 3 attempts or until you move on to the next activity.

	Left Leg	Right Leg
Time: 1st attempt (seconds)		
Time: 2nd attempt (seconds)		
Time: 3rd attempt (seconds)		
Average Time (seconds)		

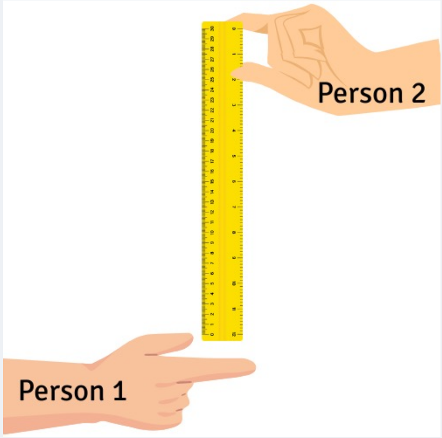
How Do We Stay Healthy in Space?

Did you balance better on your left leg or right leg?

How do your results show that you balanced better on that leg?

Why might your balance be better on that leg compared to the other?

Activity: The Speed of Light



1. Hold out your dominant hand with your arm straight. Make a fist and then point your thumb and index finger forwards (shown in the picture as Person 1).

2. Have another person hold the ruler between your thumb and finger (shown in the picture as Person 2). The 0cm line of the ruler should be level with the top of your thumb.

3. Without warning, have the other person let go of the ruler so it falls between your thumb and index finger.

4. Catch the ruler between your thumb and index finger.

5. Measure the distance between the bottom of the ruler and the top of your thumb.

6. Record the distance in the results table.

7. Use the Distance-Time Chart to find your reaction time. Choose the distance that is closest to your measurement.

8. Record the reaction time in the results table.

9. Repeat again when it's your turn until you've completed 3 attempts or until you move on to the next activity.

How Do We Stay Healthy in Space?

Attempt	Distance (centimetres)	Reaction Time (seconds)
1		
2		
3		
Average		

Distance-Time Chart

Distance (centimetres)	Reaction Time (milliseconds)
5	100
7.5	120
10	140
12.5	160
15	180
17.5	190
20	200
22.5	220
25	230
27.5	240
30	250

The standard unit of distance is metres (m). 1 metre = 100 centimetres. Calculate your average distance in metres.

The standard unit of time is seconds (s). 1 seconds = 1000 milliseconds. Calculate your average time in seconds.

What could have a bad effect on your reaction time and make it worse?

Activity: Planet You Go, Gravity You Find

1. Stand on the start line.
2. Squat while holding Ball A with your arms extended out in front of you.
3. Get another person to start the stopwatch.
4. Jump forwards and lift the ball above your head as you jump.
5. Land and squat again while holding the ball out in front of you.
6. Keep performing the jumps until you reach the end line.
7. Stop the stopwatch.
8. Record the time in the results table.
9. On your next turn, repeat the steps 1 to 8 with Ball B.
10. On your third turn, repeat steps 1 to 8 with ball C.

Ball	Time (seconds)
A	
B	
C	

How Do We Stay Healthy in Space?

Which ball was the easiest to jump with?

How do your results show which ball was the easiest to jump with?

Imagine you lifted the same object on Earth, the Moon, and Mars. Which ball matches what it would feel like to lift the object in these places?

Write the correct letter next to each one.

Earth: Moon: Mars:

Explain your answers. Include data from your results table.

Activity: Crew Assembly Training

1. Stand in a line with your teammates at Basecamp.
2. Have one team member start the stopwatch.
3. The last person in the line picks up a building piece.
4. Pass the piece to the team member in front until it reaches the person at the front of the line.
5. Take the piece to the Assembly Area and put it down.
6. Return to Basecamp and join the back of the line.
7. Pick up another piece and repeat the process, building your structure on each turn. If your structure falls at any point, follow the steps below:
    i. All team members return to Basecamp and add a tally mark in the '*Number of Penalties*' row.
    ii. The team nominate one person to go to the Assembly Area and rebuild the structure.
    iii. The nominated person returns and goes to the back of the line.
8. Repeat until the structure is finished.
9. Stop the stopwatch and record the time in the '*Time to Complete*' row.
10. Every penalty is 10 seconds. Calculate and record the '*Penalty Time*'.
11. Add this to your original time and record in the '*Total Time*' row.

How Do We Stay Healthy in Space?

Time to Complete (seconds)	
Number of Penalties	
Penalty Time (seconds)	
Total Time (seconds)	

Give one way your team worked well together and one way you could improve as a team.

Activity: Astro Agility Course

1. Lie face down at the starting line. Place your hands by your shoulders, like you are about to do a push-up.

2. Have another student start the stopwatch and say “Go”.

3. Jump to your feet.

4. Complete the course without knocking over or moving any of the equipment out of place. (Another student can keep count of how many times this happens – each is a penalty).

5. Have the student stop the stopwatch and record your time in the ‘*Time to Complete*’ column.

6. Record your number of penalties in the results table.

7. Every penalty is 2 seconds. Work out the time for all your penalties and record this in the ‘*Penalty Time*’ column.

8. Add this to your original time and record this in the ‘*Total Time*’ column.

9. Repeat again when it’s your turn until you’ve completed 3 attempts or until you move on to the next activity.

How Do We Stay Healthy in Space?

Attempt	Time to Complete (seconds)	Number of Penalties	Penalty Time (seconds)	Total Time (seconds)
1				
2				
3				
Average				

What was the most challenging part of the Astro Agility Course? How could you improve your performance on this part?

Activity: Crew Strength Training

1. Stand up straight with feet shoulder-width apart and arms at your side.

2. Have another student start the stopwatch/timer.

3. Complete squats for 30 seconds, counting each time. Keep your back straight and don't extend knees over toes. Lower until thighs are parallel to the floor and then lift again.

4. Record how many squats you did in the results table.

5. On your next turn, get into a plank position with your arms straight. Your hands should be shoulder-width apart.

6. Have another student start the stopwatch/timer.

7. Complete push-ups for 30 seconds, counting each time. Only your hands and feet should ever touch the floor. Lower until your body is parallel to the floor and then lift again.

8. Record how many push-ups you did in the results table.

9. Repeat the steps until you've completed 3 attempts for each or until you move on to the next activity.

How Do We Stay Healthy in Space?

Attempt	Number of Squats	Number of Push-ups
1		
2		
3		
Average		

Do you have better upper-body or lower-body strength? Use your results to explain your answer.

What exercises would improve the strength in the weaker part of your body?

Activity: Jump For The Moon

1. Find your pulse on your wrist or neck.
2. Start the stopwatch and count your heartbeat for 10 seconds.
3. Record this in the '*Before: Heartbeats in 10 seconds'* column.
4. Multiply the number by 6 and record this in the '*Before: Heart Rate*' column.
5. Restart the stopwatch and skip with the rope for 1 minute.
6. Repeat steps 1 to 4, but record your results in the '*After: Heartbeats in 10 seconds*' and '*After: Heart Rate*' columns.
7. On your next turn, repeat the steps until you've completed 3 attempts or until you move on to the next activity.

How Do We Stay Healthy in Space?

	Attempt 1	Attempt 2	Attempt 3	Average
Before: Heartbeats in 10 seconds				
Before: Heart Rate (beats per minute)				
After: Heartbeats in 10 seconds				
After: Heart Rate (beats per minute)				
Change in Heart Rate (beats per minute)				

How did your heart rate change after skipping for 1 minute?

___

Why did this change happen?

___

___

___

___

___

Activity: Do a Spacewalk

1. Sit at the starting point with your knees bent. Place your arms behind you with your hands touching the floor.

2. Lift up from the ground (facing upwards) so only your hands and feet are on the ground.

3. Walk forwards in this crab position. If you reach the edge of the activity area, turn around and walk to the opposite end. Repeat again whenever you reach the edge.

4. Stop when you're too tired or if anything other than your hands and feet touch the floor.

5. Place a marker where you stopped.

6. Measure the distance from the starting point to the marker. If you turned around, include the length of the activity area as well (if you did more than 1 turn, you'll need to add the total number of lengths you covered).

7. Record the distance in the results table.

8. On your next turn, repeat the steps until you've completed 3 attempts or until you move on to the next activity.

How Do We Stay Healthy in Space?

Attempt	Distance
1	
2	
3	
Average	

What exercises might help you to improve and travel a further distance?

Investigation 5

Why Does Mars Change Size?

Why Does Mars Change Size?

Introduction to your Mission

Now that we know what we need to create a basecamp on Mars, and to stay healthy on the journey, we need to work out how to get there!

In this mission, you will be an astronomer. Your job is to explore our Solar System and find out why Mars appears to change size in the sky when we look at it from Earth.

First, we need to understand where Mars sits in the Solar System…

Activity: Order the Planets

The planets are large, spherical objects that move around the Sun. But they are all positioned at different distances from it.

Name the planets in order of distance (near to far) from the Sun:

1.	5.
2.	6.
3.	7.
4.	8.

Why Does Mars Change Size?

Activity: Map the Solar System

Follow the instructions and then stick your map below:

Note the scale size of your Solar System map:

1 mm =	km

Activity: Planetary Motion

Complete the sentences using the words in the box:

An ____________ is a regular, repeating path that one object takes around another. The _________ is at the centre of our Solar System, and the ____________ orbit around it. The paths of the planets are _________ shaped.

planets	**oval**	**orbit**	**Sun**

Activity: Orbit Maths

Distance from the Sun to:

- Earth's orbit – **149 million km**
- Mars's orbit (closest) – **204 million km**
- Mars's orbit (furthest) – **247 million km**

Calculate the shortest distance between Earth and Mars.

Mars's closest orbit (million km)	–	*Earth's orbit (million km)*	=	*Shortest distance (million km)*

Calculate the longest distance between Earth and Mars.

Mars's furthest orbit (million km)	+	*Earth's orbit (million km)*	=	*Longest distance (million km)*

Why Does Mars Change Size?

Calculate how much further away Mars is at its longest distance from Earth compared to its shortest distance.

Give your answer as a decimal.

Longest distance (million km)	÷	*Shortest distance (million km)*	=	*How many times further away*

Lastly, round your answer to the nearest whole number.

Activity: Measure Mars

The next few pages have images taken of Mars from the Liverpool Telescope – the telescope you used to look at the Moon!

It lives on La Palma, one of the Canary Islands of Spain.

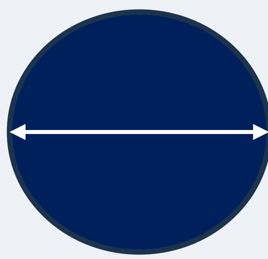
The same telescope took all these images of Mars from the same place. We are showing you the images zoomed in to the same amount.

Can you work out why they look different?

Step 1: Record the Data

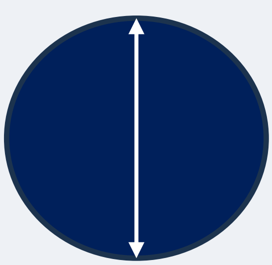
There are 8 observations (images) of Mars taken on different dates.

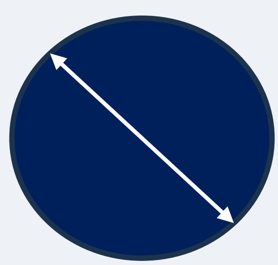
Use your ruler to measure the size of Mars in centimetres (cm). You need to measure across Mars, from left to right, at the widest point.



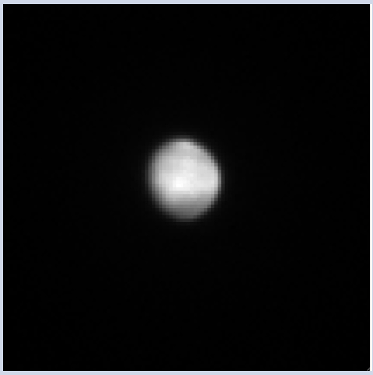
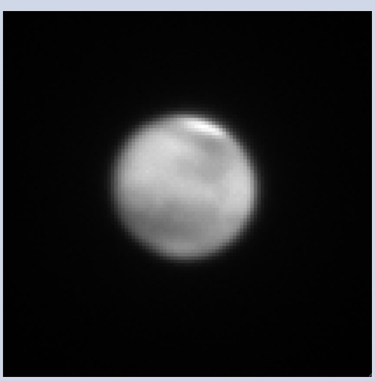
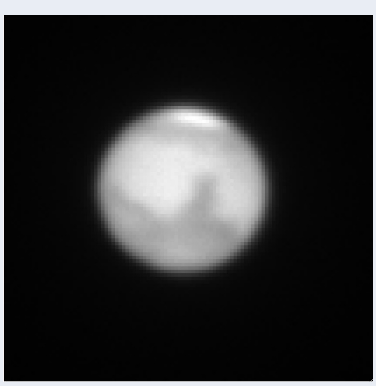
Record the data in the table on page 62. Write your numbers to 1 decimal place.

If you have time, remeasure the size of Mars from top to bottom and diagonally. Record this data in the table as well.

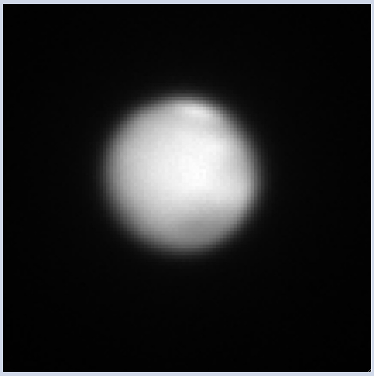
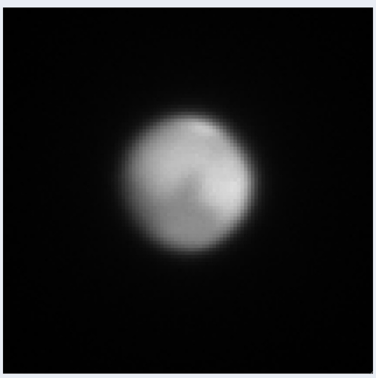
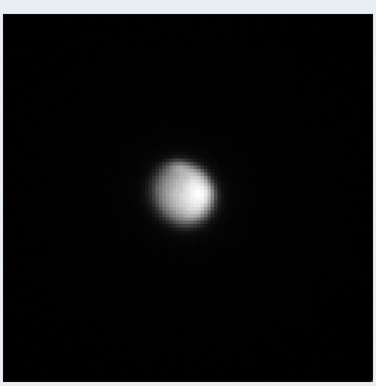




Why Does Mars Change Size?

Mars Observation	Observation Details
	**Observation 1** Date: 10/11/2024 Telescope: Liverpool Telescope Location: La Palma, Spain
	**Observation 2** Date: 2/12/2024 Telescope: Liverpool Telescope Location: La Palma, Spain
	**Observation 3** Date: 23/12/2024 Telescope: Liverpool Telescope Location: La Palma, Spain
	**Observation 4** Date: 16/1/2025 Telescope: Liverpool Telescope Location: La Palma, Spain

Why Does Mars Change Size?

Mars Observation	Observation Details
	**Observation 5** Date: 2/2/2025 Telescope: Liverpool Telescope Location: La Palma, Spain
	**Observation 6** Date: 21/2/2025 Telescope: Liverpool Telescope Location: La Palma, Spain
	**Observation 7** Date: 9/3/2025 Telescope: Liverpool Telescope Location: La Palma, Spain
	**Observation 8** Date: 28/3/2025 Telescope: Liverpool Telescope Location: La Palma, Spain

Why Does Mars Change Size?

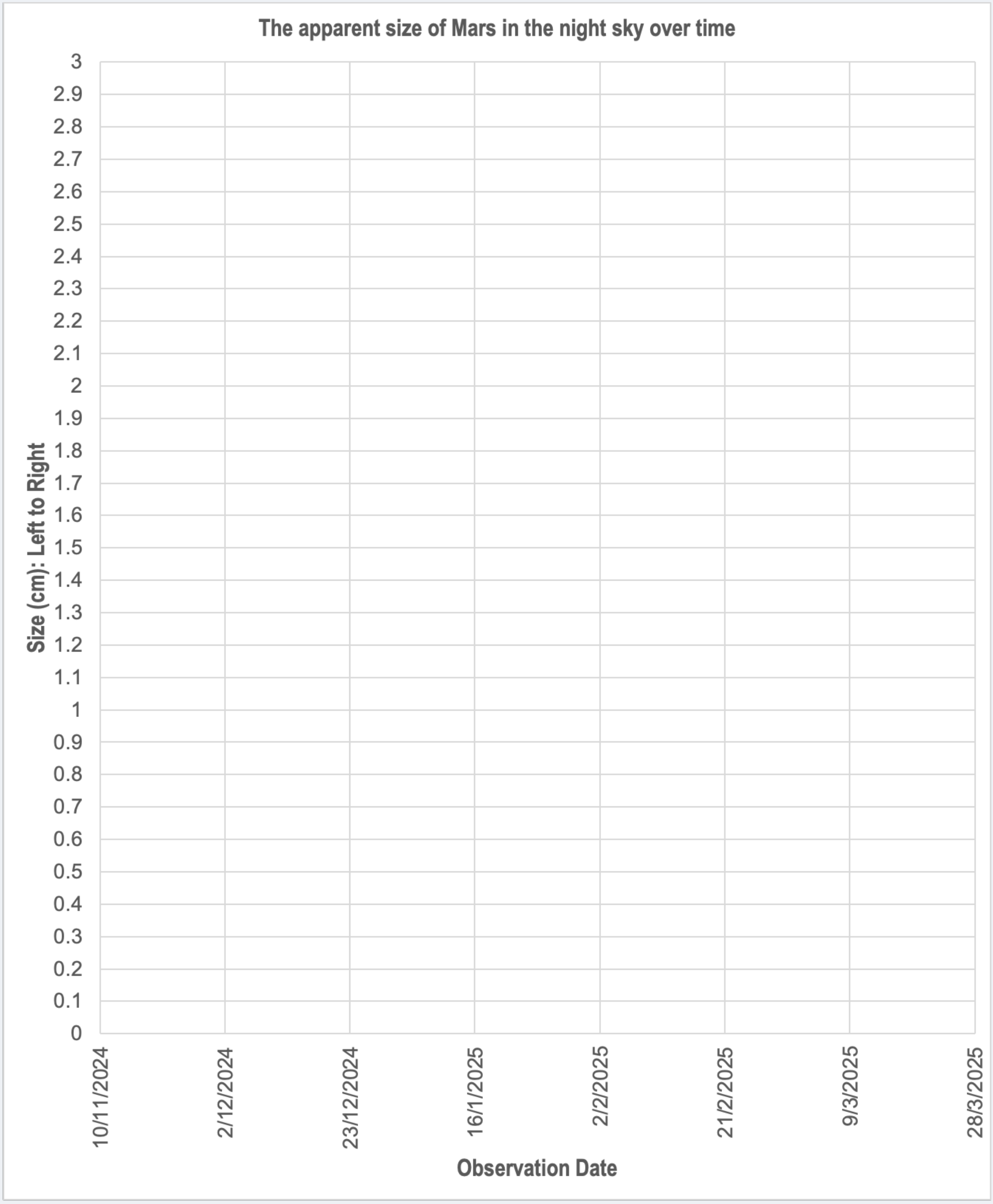
Observation Number and Date	Size (cm): Left to Right	Size (cm): Top to Bottom	Size (cm): Diagonally
Observation 1 10/11/2024			
Observation 2 2/12/2024			
Observation 3 23/12/2024			
Observation 4 16/1/2025			
Observation 5 2/2/2025			
Observation 6 21/2/2025			
Observation 7 9/3/2025			
Observation 8 28/3/2025			

Why Does Mars Change Size?

Step 2: Plot the Data

We will plot a graph to see how the size of Mars (measured from left to right) changes in the Earth's night sky over time.

Use a sharp pencil to plot your data. Plot each point with a small 'x'.



Step 3: Analyse the Results

Describe how the apparent size of Mars changes over time.

At the start of the observations…

____

____

____

The date that Mars reaches its largest apparent size is…

________________________ .

After this date, the size of Mars appears to…

____

____

____

Explain why the size of Mars appears to change.

The planets orbit the Sun at different distances and speeds.

Earth orbits the Sun **slower / faster** *than Mars.*

When Earth moves towards Mars, Mars appears to get bigger because…

____

____

____

When Earth moves away from Mars, Mars appears to get smaller because…

____

____

____

Investigation 6

When Should We Launch to Mars?

When Should We Launch to Mars?

Introduction to your Mission

Now that we're prepared for our mission and understand how the planets move in our Solar System, we need to plan our launch date!

In this mission, you will be be a mathematician. Your job is to analyse the movement of the planets and calculate a launch date for our mission to Mars.

Activity: Travelling to Mars

We found out in the last investigation that Mars is really far away. The shortest distance between Earth and Mars is around 55 million km!

How long do you think it would take to travel there in a spacecraft?

I think it takes ___________ (days/weeks/months/years) to get to Mars!

Travelling to Mars really takes

Calculate this in months – assume 30 days in each month.
Give your answer to 1 decimal place.

Lastly, round your answer to the nearest whole number.

When Should We Launch to Mars?

Activity: Electric Orrery

It's important to carefully plan a launch date to Mars to make sure that the distance the astronauts must travel is as short as possible – we do this by looking at models of the Solar System called orreries!

Since it will take time to build a rocket and train the astronauts, we will look at launch dates after 1st January 2035 (1/1/2035).

Date checked	Are Earth and Mars close together?	Notes
1/1/2035	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	
	Yes / No	

Date of next closest approach:

When should we launch to Mars?

Activity: The Launch Date

The planets are constantly moving. To reach Mars at a certain point in its orbit, we must leave Earth months earlier and travel towards where we know Mars will be on a specific date.

Work out which month we'd need to launch our rocket!
Hint: you already know the number of months it takes to get to Mars

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

The launch month is ____________________

What day of the month will you launch?

Pick a launch time! What time will you launch?

Using a 12-hour clock:

Using a 24-hour clock:

Activity: First Words

What you say can make a difference! Words are important – they can inspire, give thanks, or even just make us laugh and feel happier.

When the first person set foot on the Moon (Neil Armstrong in 1969), he had carefully planned his first words.

Around 650 million people tuned into the TV to watch the Moon landings live. Even more people might watch the future Mars landing – the population is bigger, and more people have access to TVs, tablets, phones, or other devices.

The words spoken on Mars will be just as important as those said on the Moon.

What would your first words be when you first set foot on Mars?

Extra Pages