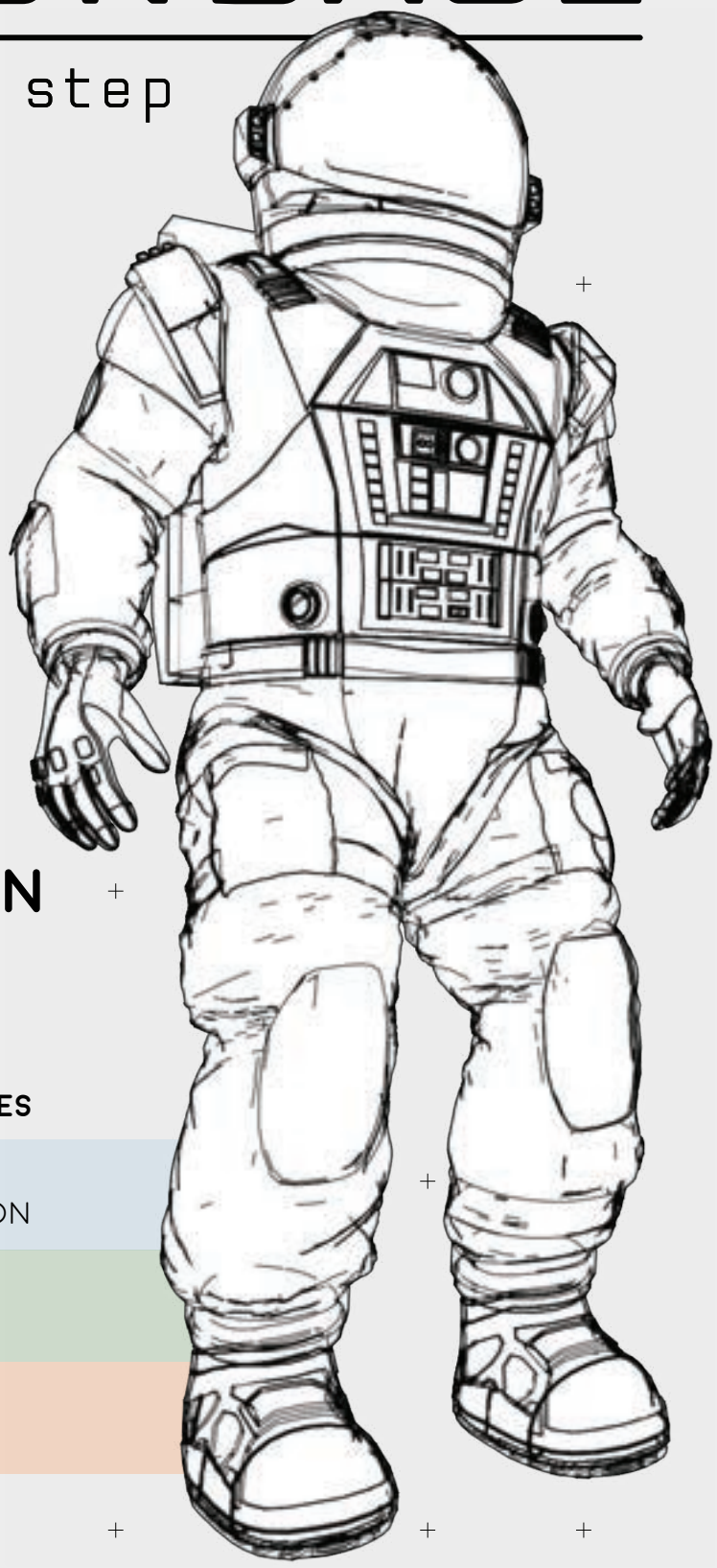
MOONBASE

the next step



EDUCATION GUIDE

CONTAINS THREE POST-VISIT ACTIVITIES

MISSION 01
HOW FAR IS THE MOON

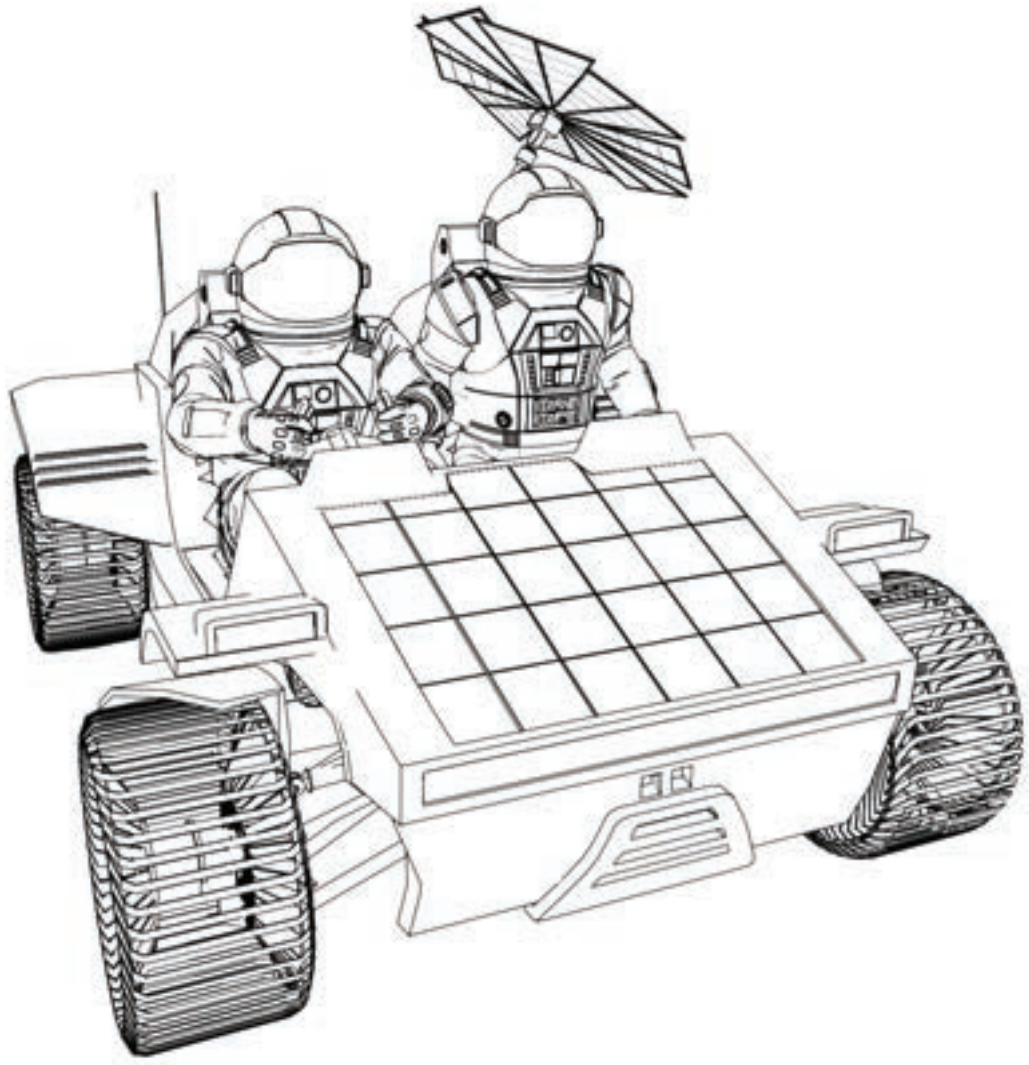
MISSION 02
LETTER TO EARTH

MISSION 03
MOON BUSINESS

MOON BASE + THE NEXT STEP

PRE-VISIT PREPARATION

Moon Base: The Next Step is a dramatic immersive experience that explores the challenges, dangers and rewards of building a permanent base on the Moon.



MOONBASE
the next step

CONTEXT OVERVIEW:

The US-led Artemis missions are the first step towards establishing an international, crewed Moon base. Over the coming years, there will be a lot of exciting news as these missions take place and new technologies are unveiled. The film looks a step beyond this immediate future to consider what is necessary to build a permanently inhabited base.

This vision of the future is created with consideration of current plans by the US and its international partners. The film shows technologies that are currently in development, or which have been proposed as realistic solutions to the challenges raised by the Moon environment.

The film focuses on challenges particular to the Moon. This unusual environment requires new solutions beyond those used by astronauts in the International Space Station.

MAJOR THEMES IN THE FILM:

Spacecraft take time and a lot of fuel to get the Moon. It's expensive to carry equipment there.

Astronauts so far from Earth will be exposed to dangerous space radiation unless this is blocked by shields.

Solar energy is a fantastically important resource and will power future Moon bases.

Robots will play a major role. Semi-autonomous robots will use artificial intelligence.

Moon dust/rock (regolith) is a serious hazard to both robots and humans. But it is also a valuable local resource that can be used for building structures.

Water. Mining Moon water is extremely difficult, but also very important as it allows local production of rocket fuel.

Economic potential (of fuel production and mining of rare minerals) is an important factor in the recent decision to develop a Moon base.

The future is unknown – but taking this next step will unlock some amazing possibilities.

PRIOR KNOWLEDGE:

Some background information about the Moon and previous astronaut activity would be helpful. If pupils can cover this content a little while before their visit, it will give them a head start in understanding the story.

About the Moon:

- **Location:** it's really far away!
  Use the provided activity 'How Far is the Moon' to create a scale model of the Earth/Moon system

- **Craters:** the Moon has craters from where large space rocks have smashed into it. Photographs of the Moon show shadowing in these craters depending on the angle of the Sun.

- **Surface:** the Moon has a grey, rocky/dusty and barren surface.

- **Studies:** we have studied the Moon with telescopes, robotic landers, many uncrewed orbiters, and during the Apollo Missions.

About astronaut activities:

- The Apollo missions: people have orbited and walked on the Moon, but it was a long time ago. The Apollo missions were all relatively short (under 2 weeks including travel time).

- The International Space Station (ISS): since 2000, we have used the ISS to learn how to safely live and work in space. The ISS is very close to Earth [in Low Earth Orbit]. Individual astronauts have visited the ISS for many months at a time.

- No human has travelled further than the Moon. No human has ever visited another planet. Between the Apollo missions and Artemis, nobody [has] travelled further than Low Earth Orbit.

Vocabulary:

Specialist vocabulary used without explanation (starred words are important for understanding):

- Artificial Intelligence
- Orbit *
- Crater *
- Mineral

New vocabulary that is introduced/explained

- Regolith

- Habitation/Hab

Links to additional resources about the Moon

Here are some additional resources that may be of interest to use before viewing the film.

MOON MAP

Zoomable, photographic Moon map with links to further information including plenty about Apollo. It helps to spend a little time learning how to use the interface (there is a quick tutorial)
https://trek.nasa.gov/moon/

MEDIA

Huge repository of NASA images, video and audio:
https://images.nasa.gov/ . You can search by date, media type, and keyword to find what you need.

STORYTELLING

Five short traditional stories from around the world (audio and transcribed) from the Lunar Planetary Institute:
https://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=642

CRATERS

The classic activity where children drop/throw objects into a pan of flour to form craters.
https://www.jpl.nasa.gov/edu/teach/activity/make-a-crater/

APOLLO

A variety of educational resources for the 50th anniversary of the lunar landings:
https://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=639

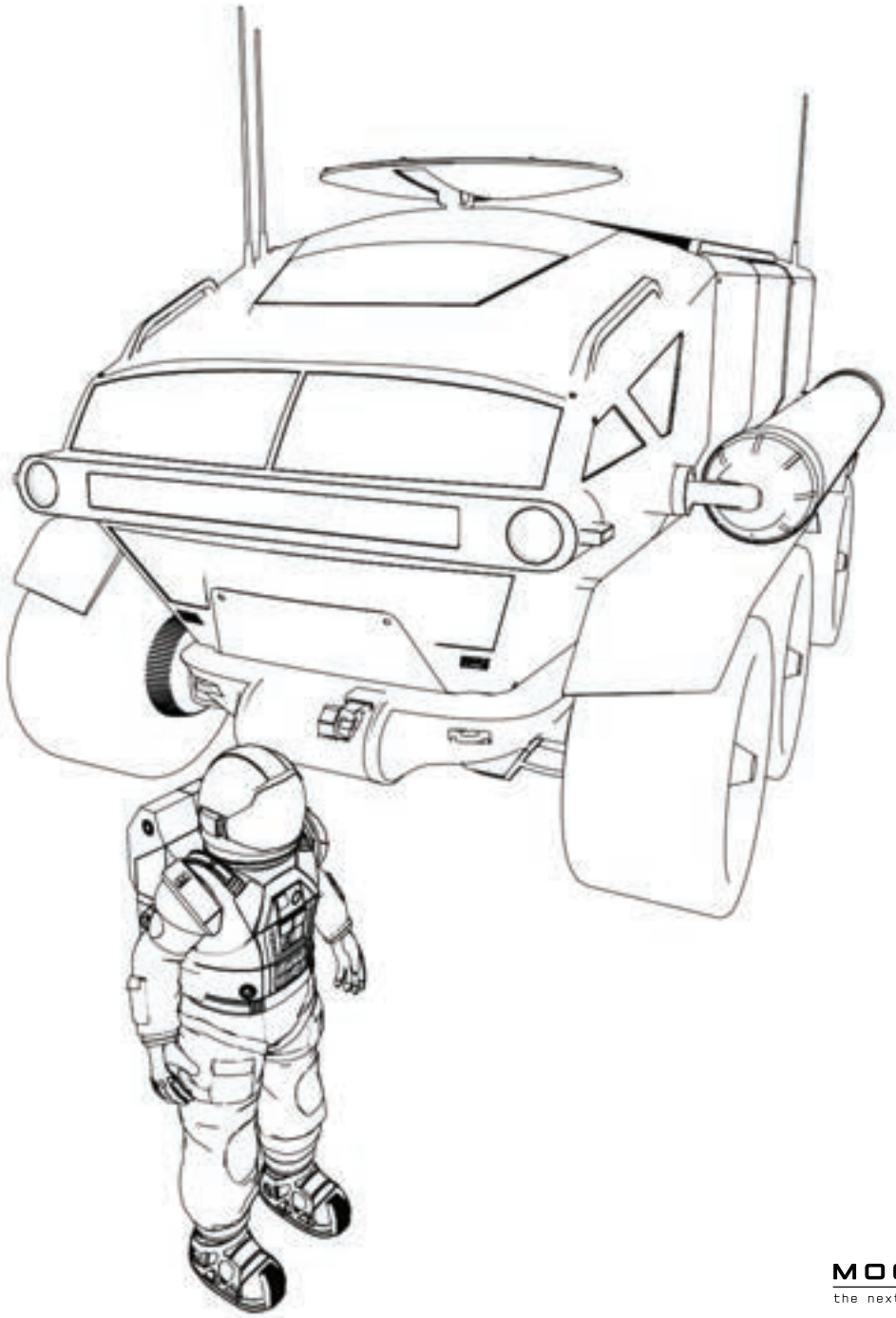
The full list of NASA educational resources for schools can be found at
https://www.nasa.gov/stem/foreducators/k-12/index.html.

MOON BASE + THE NEXT STEP

POST-VISIT ACTIVITIES

After watching the film, it is useful to refer back to the experince in order to practice retrieval of concepts and help solidify memory.This is ideally done at least one day and up to a week after watching the film.

A pack of images from the film is provided, to help spark memory and encourage discussion.



MOONBASE
the next step

MAJOR THEMES IN THE FILM

Spacecraft take time and a lot of fuel to get the Moon. It's expensive to carry equipment there.

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Economic potential (of fuel production and mining of rare minerals) is an important factor in the recent decision to develop a Moon base.

The future is unknown – but taking this next step will unlock some amazing possibilities.

PROVIDED ACTIVITIES

This pack includes two activities that are designed to give purpose to retrieving knowledge about the Moon and practicing use of vocabulary. Recalling prior knowledge to complete useful tasks is a great way to embed it in long-term memory.

Letter to Earth – a writing activity from an imagined perspective of the student as a Moon immigrant. Creating personal links to information is another way to aid long-term memory.

Moon Business – an activity where children assess the likelihood of different lunar business proposals succeeding. Requires them to repetitively recall prior knowledge about the lunar environment to complete the task.

How Far is the Moon? - an activity where children use a fun finger-trick and some simple maths to create a scale model of the Earth/Moon system.

LINKS TO EXTERNAL RESOURCES ABOUT THE MOON

Here are some additional resources you might find useful, for use before or after seeing the film.

Moon rock
In the UK and US (and likely other countries), educators can borrow real Moon rock samples from the Apollo Missions:

UK:
www.ukri.org/what-we-offer/teaching-resources/borrow-the-moon

US:
https://ares.jsc.nasa.gov/interaction/lmdp/

Here are the activities that were also recommended as pre-film.

MOON MAP

Zoomable photographic Moon map with links to further information including plenty about Apollo. It helps to spend a little time learning how to use it (there is a quick tutorial)
https://trek.nasa.gov/moon/

MEDIA

Huge repository of NASA images, video and audio:
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You can search by date, media type, and keyword to find what you need.

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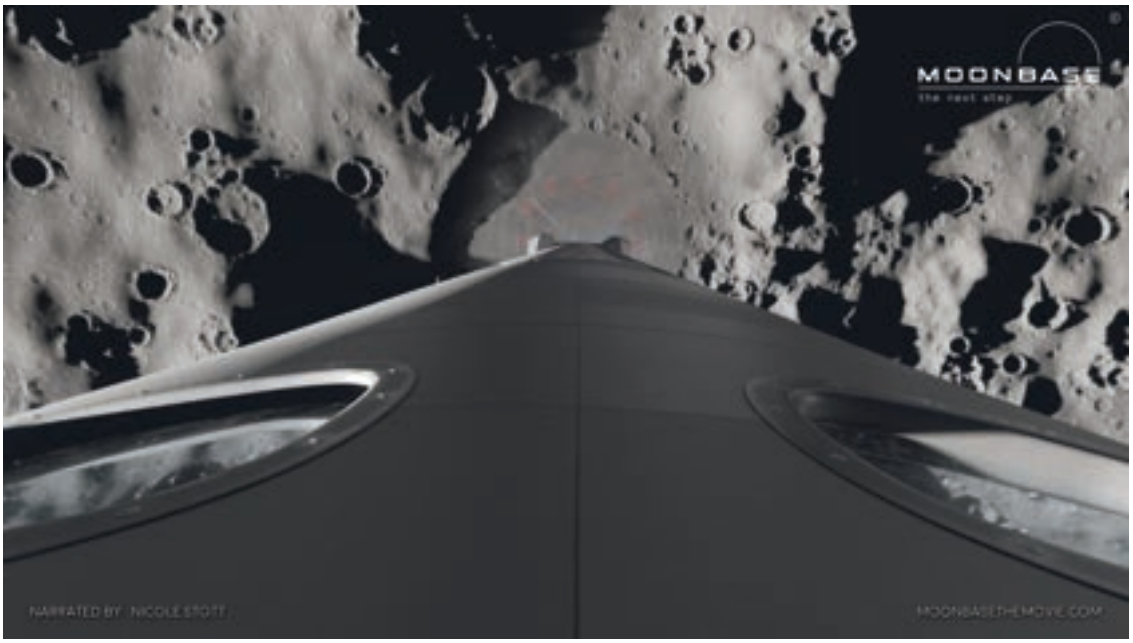
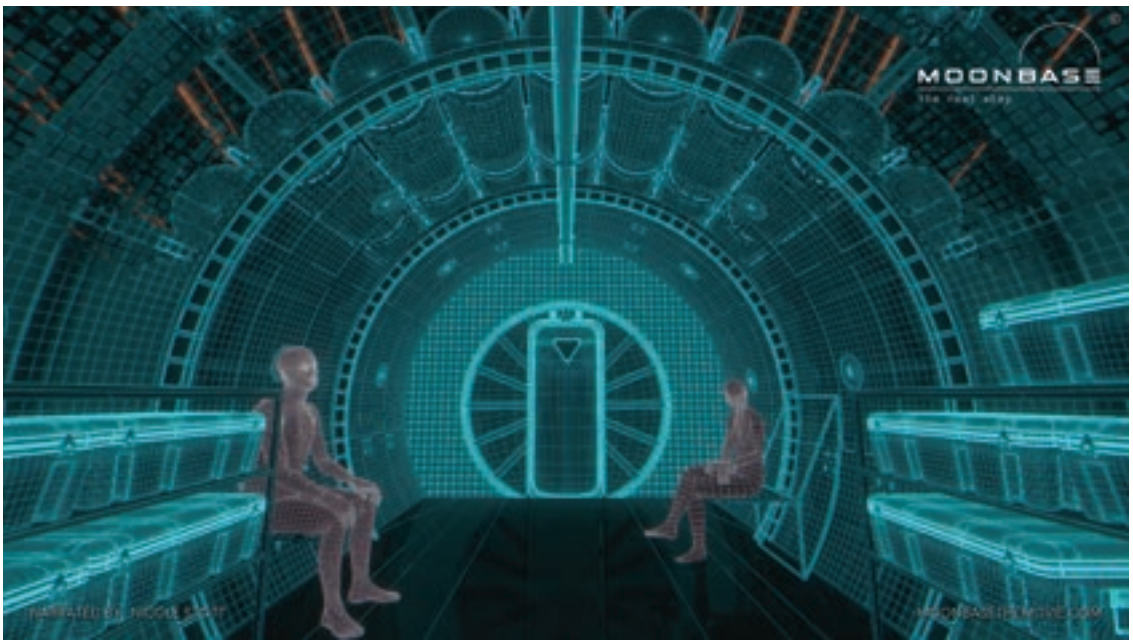
MOONBASE


MOONBASE
NARRATED BY NICOLE STOTT
MOONBASETHEMOVIE.COM


MOONBASE


MOONBASE
the next step


MOONBASE
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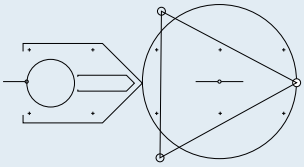
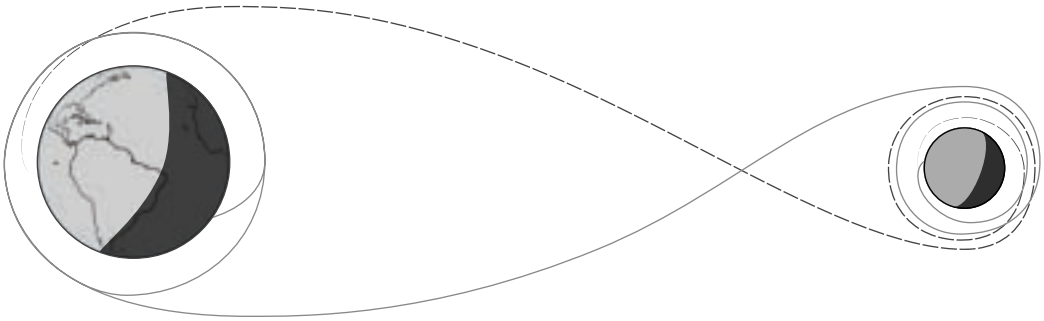


MISSION 01 + HOW FAR IS THE MOON

TITLE OF ACTIVITY	How far is the Moon
TYPE OF ACTIVITY	Use a fun trick and some maths to create a scale model.
SUGGESTED AGE	8 – 12 years



MOONBASE
the next step

ACTIVITY OUTLINE

Using knowledge of how big the Moon looks in our sky, and its actual size relative to Earth, use a scale model to work out approximately how far away it is. Then use its actual distance to calculate and model how far away it should be in an accurate scale model.

Ideally the children should observe the real Moon before carrying out this activity.

LEARNING OBJECTIVES

The Moon is smaller than Earth and very far away. It is much further than most people expect.

EQUIPMENT

Printed worksheets (one for each group of 3-4 pupils).

Model objects for Earth and Moon (one set for each group):

EQUIPMENT (PART II)	The Moon must be about a quarter the diameter of Earth. Ideal sizes are 8cm/2cm. The Moon must not be smaller than 1.5cm diameter. Eg: slowpitch softball and marble; polystyrene balls; ball-pit ball and wooden bead. Flat circles cut from stiff card could also be used. Tape-measure or other measuring tool (one for each group): If using a 8cm/2cm scale model, measurements may be up to 2 metres. If using basketball/tennis-ball, it could be up to 8 metres! **Do not use a retracting tape measure** due to the risk of this retracting while being held near the Earth-holder's eye. Enough space for the children to create/measure their scale models. Calculators (one for each group).
PRIOR KNOWLEDGE	A general awareness of the Moon in the sky and as a sphere in space. An understanding of the concept of a scale model. Confidence to use a calculator to add and divide numbers.
VOCABULARY	Scale model; represent; diameter; measure; cm; km; average; calculate; conversion factor.
PRE-ACTIVITY (OPTIONAL):	Find a date when when the Moon is between first quarter and full, for instance by using the website tool at **www.timeanddate.com/moon/phases/** When full, the Moon will rise at sunset and set at sunrise – this means it may be difficult for children to observe in mid-summer. A first quarter Moon (lit from the right) rises around midday. Stargazing astronomers often use their hand/fingers at arm's length to help them measure angles across the sky. The children will use this technique to measure the Moon. Direct the children to put one hand over an eye, and compare the size of different projected images (or objects in the classroom) with their hand/fingers. Check that they understand the principle. Ask them to look out for the Moon, and if they see it they can measure it with their fingers/hand and report back. They will likely be surprised by the result, as there is an optical illusion (the Moon illusion) that makes the Moon appear larger to us than it really is.

ACTIVITY STRUCTURE:

Introduce the activity:

- We are going to be thinking about how big the Moon looks in the sky, and work out how far away it must be to look like that.
- You will be using scale models of Earth and Moon. (Explain/recap the concept of a scale model as required.)
- You will be working in groups of three people (extras can form groups of four).
- As a class, discuss seeing the Moon in the sky. Try to remember how big it looks. Show how in photographs it often looks ridiculously huge because of the way they zoom in on it.

  How big is it really in the sky?
- Little finger trick: everyone show me your little finger. Now stretch your arm out in front of you, holding your little finger as far away as you can. Put your spare hand over one eye. Now look at your little finger. Its tip will look the same size as the Moon does in the sky.

  (If they haven't been able to observe the Moon in this way themselves, they will be very surprised and perhaps dubious that this is true – this is why it's best if at least some of the group can do so in advance.)

  The little-finger trick works just as well with a scale model as it does with the real Earth and Moon. If you look from a scale-model Earth, then your little finger will just cover the scale-model Moon when it is at the correct scale-model distance.

INTRODUCE THE ACTIVITY

↓

- Each group will be given a scale-model Earth and Moon. The model Moon is about a quarter the width of the model Earth,
- You will use the little finger trick to work out roughly how far apart these should be your scale model.
- We will then work it out using the real distance to see how close you were and how well the finger-tricked worked.
- Demonstrate the measuring activity by directing some children to model the activity (see activity details below) using a different object.
- Hand out model Earth/Moon models and worksheets.
- Using part one of the worksheet to structure the activity, children view their scale-model Moon from the location of their scale-model Earth.

- Tell the children the object diameters, as these may be difficult to measure. They should enter these on their worksheet.

- Now they can try the activity, with everyone having a turn being 'Earth'. They should be aware this is only a rough trick, so different people will likely get different distances.

- The person holding Earth holds it next to their eye (for an Earth's-eye-view).

- They direct the person holding the Moon to move it closer or further away until it looks the same size as their outstretched little finger.

- A third person then measures the distance between the two.

- Everyone takes a turn being Earth. Then work out the average of your recorded distances. Help groups with calculating their average value if necessary.

- As a group: the teacher asks each group to report their average, and calculates a class average from these values. From here on, use part two of the worksheet.

- Calculate an estimated distance to the Moon using the class average. If the children have calculators, they can follow/check each calculation, or even do these themselves. They will likely need support with appropriate use of significant figures.

  But how is it possible to know the real distance? There are a few different ways, but one is that the Apollo astronauts left a mirror on the Moon. Astronomers can time how long it takes a laser fired from Earth to travel to the mirror, reflect from it, and return to them.

- Tell the children the real (average) distance between Earth and Moon. Now they can calculate how far away their model Moon should be for it to be an accurate representation.

- A volunteer group can stand up and model the accurate distance. This gives everyone a clear view of the relative distances and is quicker than every group rebuilding their models.

- Think about how long it takes astronauts to reach the Moon (about 3-4 days). This is why – it is a very long way!

- Encourage them to try the finger-trick next time they see the Moon, especially if they did not do this prior to the activity.

How far is the Moon?

Part one

Our model Earth has a diameter of …….. cm

Our model Moon has a diameter of …… cm

Take turns to hold the Earth by your eye. How far away is it when it looks the size of your little finger tip?

1. Name …… Distance ……cm

2. Name …… Distance ……cm

3. Name …… Distance ……cm

4. Name …… Distance ……cm

Adding all our measured distances together gives a total of ……...…….. cm

Calculate our group average by dividing our total distance by the number of measurements:

…….. ÷ …….. = …… cm
Total of all distances | number of measurements | average distance (the mean)

Part two

The average distance for the whole class was …… cm

The real Moon has a diameter of 3,475 km

3,475 km ÷ our model's diameter in cm = …….. km/cm

This is our conversion factor. Every cm in our model represents this many km in real life.

If the finger trick works:

the real Moon's distance (in km) would be

…….. cm × …… = …… km
whole class average distance | conversion factor | our estimate

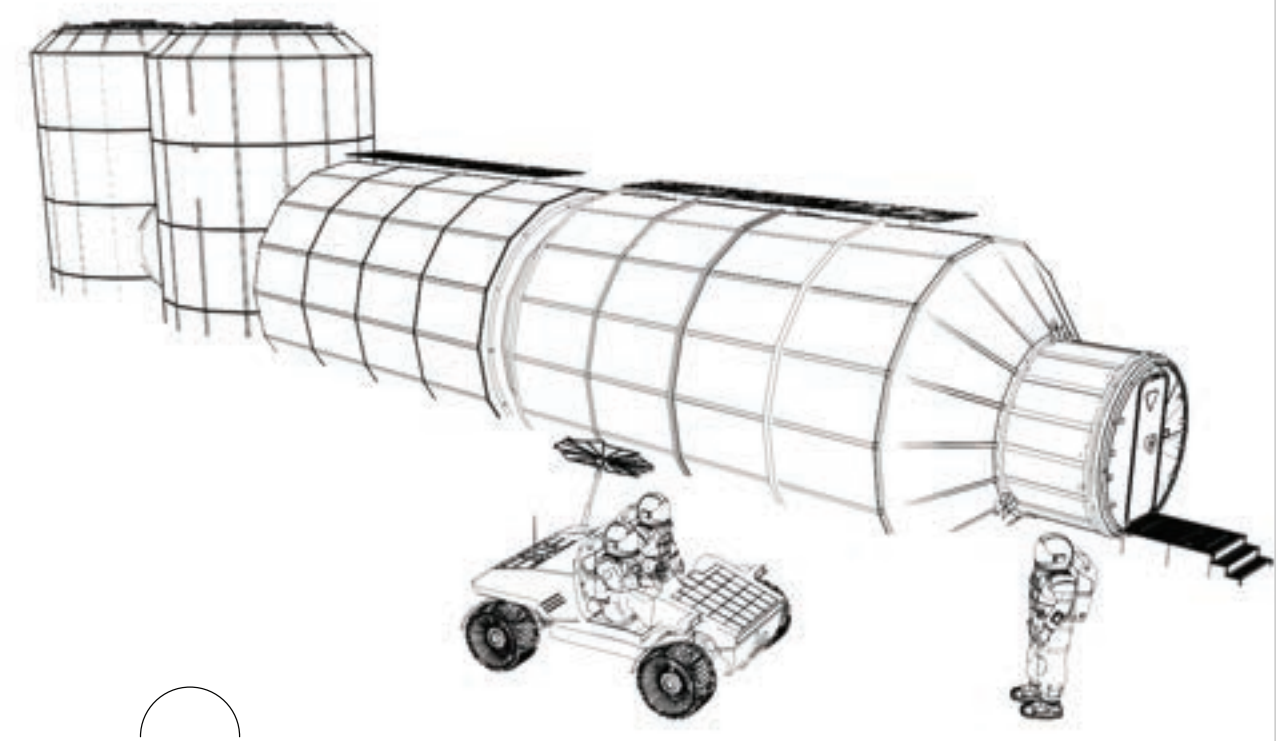
The real Moon's average distance as measured by scientists is: …… km

So the distance in the model should be

…… km ÷ …… = …… cm
real distance | conversion factor

MISSION 02 + LETTER TO EARTH

TITLE OF ACTIVITY	Letter to Earth
TYPE OF ACTIVITY	Plan and write an informal letter from an imagined viewpoint
SUGGESTED AGE	8 – 12 years



MOONBASE
the next step

ACTIVITY OUTLINE	Plan and write a letter from the Moon to Earth describing what it's like to live on the Moon.
LEARNING OBJECTIVES	Retrieve and use prior knowledge of the lunar environment. Practice use of vocabulary relating to the lunar environment. Create an individualised imagined scenario about life on the Moon, to aid future recall of concepts.
EQUIPMENT	Sticky notes (may be substituted with paper). Printed vocabulary sheets (optional). Writing materials (paper/pen or computer).

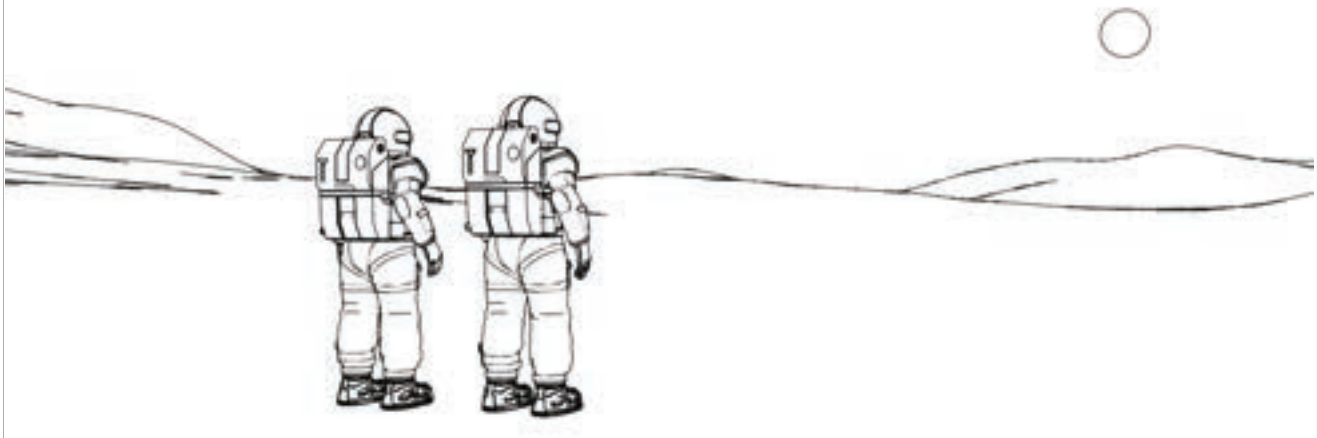
PRIOR KNOWLEDGE

The Moon is far from Earth, has low gravity, no air to breathe, and experiences temperature extremes. It has a barren, cratered landscape covered in rocky dust. It is exposed to dangerous space radiation.

Prior experience of seeing images of an imagined Moon base. A base needs to provide air and environmental protection to the astronauts.

VOCABULARY

Lunar; regolith (loose rock/dust on the Moon's surface); gravity; atmosphere; insulation; radiation, crater; vacuum, habitat.



ACTIVITY STRUCTURE:

Introduce the activity.

- Show image(s) of artists impressions of what crewed Moon bases might look like.
- Explain they will be imagining that they have recently moved to live on the Moon.
- They will be writing a letter back to a friend or family member on Earth, explaining how life on the Moon is different from on Earth.
- The person they are writing to does not know what the Moon is like, so they will need to explain everything.
- The letter is from them (not from an imagined character).
- They can make up anything they like about their life on the Moon, so long as the science information about the Moon environment is correct.
- As a group: discuss ideas for the types of information that might be appropriate to include in such a letter. During this discussion, recall the Moon environment and previously learned specialist vocabulary.

↓

Create a list of topic ideas, and also a word list that they can use during the activity (or use the vocabulary sheets provided).

Suggested topics might be related to:

- The journey to the Moon.
- How the Moon environment is different from Earth.
- Everyday life on the Moon.
- Good things about living on the Moon.
- Bad things about living on the Moon.
- How it feels to be so far from Earth.

Tell the children how many topics you would like them to choose for their letter. Each topic will be one paragraph.

In pairs, choose their topics:

- Discuss which topics they would like to choose (each person chooses their own topics). Write each topic on a separate sticky note.

- Discuss ideas about what they might say about these topics.

- Each person write their chosen topics down, one topic on each sticky note. Note down any ideas for useful words, especially adjectives.

Individually, order the topics:

- Arrange the sticky notes in chosen order.

As a group:

- Explain they will be writing one paragraph for each topic.

- Share ideas for ways to start/end the letter. This can be kept brief, it's fine if they all use the same format for these sections.

Individually: write the letter:

- Begin the letter.

- Write one paragraph for each topic.

- End the letter.

In pairs:

- Read their letter out loud to their partner.

Individually:

- A little time to make any desired improvements, then neatly copy the finished letter into finished form (eg onto a piece of writing paper).

Optional time-filler activity: add a drawing related to something mentioned in the letter.

Letter to Earth

Moon Vocabulary

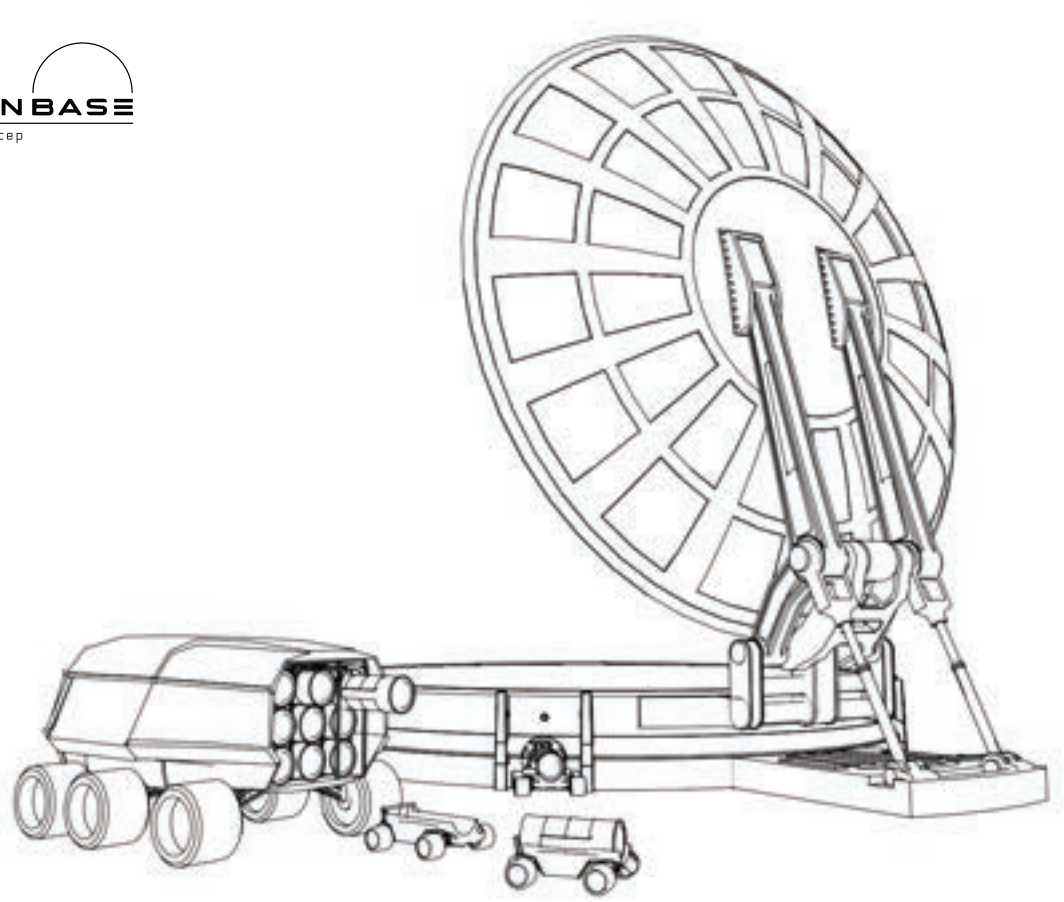
Here are some useful words you might like to use when writing about the Moon.

Useful nouns	**Interesting adjectives**
Launch pad	Lunar
Spacecraft	
Lander	
Habitation	
Air lock	
Moon buggy	
	Empty, barren, lifeless, desolate
	Sharp, spiky, glassy, jagged
	Dusty, rocky, dry, arid
Crater	
Mountain	
Wilderness	
Regolith	
Micrometeorite	
	Shadow, dark, pitch black
	Freezing, chilly, sub-zero, cold, hot,
	Boiling, sweaty, scorching
Gravity	
	Dangerous, risky, deadly, perilous
	Claustrophobic, cramped
	Scary, frightening, terrifying
	Boring, repetitive, dull, tedious
	Distant, far, lonely, isolated
Vacuum	
Pressurised	
Oxygen	
	Exciting, fun, entertaining, enjoyable
	Fantastic, wonderful, awesome
Temperature	
Insulation	
	Surprising, unexpected, shocking, amazing, confusing, strange,weird, bizarre
Radiation	
Shielding	

MISSION 03 + MOON BUSINESS

TITLE OF ACTIVITY	Moon Business
TYPE OF ACTIVITY	Paired discussions / report back to group
SUGGESTED AGE	8 – 12 years

MOONBASE
the next step



ACTIVITY OUTLINE	Discuss how the lunar environment would affect proposed business activities at a Moon Base.
LEARNING OBJECTIVES	Retrieve and use knowledge of the environment on the Moon. Practice use of vocabulary relating to the lunar environment. Appreciate that the Moon is a potential base for economic activity.
EQUIPMENT	Video projection. Printed work sheets, pen/pencil.

PRIOR KNOWLEDGE	The Moon is far from Earth, has low gravity, no air to breathe, and experiences temperature extremes. It has a barren, cratered landscape covered in rocky dust. It is also exposed to dangerous space radiation.
VOCABULARY	Regolith; gravity; atmosphere; insulation; crater; vacuum.
ACTIVITY STRUCTURE:	• Introduction: explain they will be thinking about how the Moon's environment would affect businesses hoping to set up at a Moonbase. They will first discuss as a group what the environment is like, then work in pairs to consider how these would affect the proposed businesses. • Starting activity: watch a short video of Apollo astronauts on the Moon, during which they should observe as many things as possible about the Moon environment. Explain that by 'environment' you mean what the surroundings are like. Give an example using the room you are in (eg it might be warm, dry, and bright, with flat walls/floor and humid, breathable air). Video (3 min 12 s, gives temperature in °F): **https://www.pbslearningmedia.org/resource/ess05.sci.ess.eiu. extemp/extreme-temperatures-on-the-moon/** • Allow a short time for them to share with their partner the things they spotted in the video. • Group discussion about the repace with lunar environment. Start by asking what they spotted in the video, but expand beyond this as necessary to cover the topics on the teacher information sheet. Objectives of discussion: Recall and activate prior knowledge. Practice using vocabulary. Correct misconceptions. • Introduce the idea that a permanent Moonbase will create opportunities for businesses to set up operations on the Moon (as shown in the planetarium film). As transport becomes cheaper and technologies improve, more opportunities will arise. • Explain the activity: they will look at proposed business ideas and consider how factors including the Moon environment would affect these. • Why is being on the Moon a good idea for this business? • Why is being on the Moon difficult for this business? • What will they need (eg new/specialist technologies) to make their business work?

↓

- Do they think this type of business should consider setting up on the Moon?
- Go through a worked example to show them what a completed worksheet might look like.
- Hand out worksheets. Independent work in pairs, using worksheets to record their thoughts.

  There are ten different businesses; it is suggested that each group is given three businesses to start. Groups that finish early may then be given additional businesses
- Group discussion. Leading questions could include:
- Does anyone have a business they think would do well? What are the main advantages / challenges for this business?
- Does anyone have a business they think would fail?
- The previous business failed because of [a certain factor]. Are there any other businesses that would be affected by this factor?
- Are any of these businesses stongly affected by [a certain factor, eg reduced gravity]?
- What businesses did you have? Can you share one? [to a group that has not yet participated]

  Optional extension activity: create their own idea for a business plan. This could be presented to the group in a 'Dragon's Den' style presentation, allowing others to ask questions (ie as if to potential investors).

TEACHER INFORMATION SHEET

BACKGROUND INFORMATION

The Lunar Environment

Environmental factors:

- Big, open, barren landscape
- Dry, dusty ground
- Less gravity than on Earth
- (Almost) no air
- Bright sunlight and dark shadows
- Very hot and very cold

- Very far from Earth
- Space radiation
  (this factor is less important for the activity)
- Generally, it is dangerous!

Environmental factor observed in video	**Notes**
1. Big, open, barren landscape	It looks like a desert on Earth. No forests, rivers, oceans, houses.
2. Dry, dusty ground	The dust clings to their spacesuits. It is sharp, toxic dust and they have to be careful not to breathe it in when they take the spacesuit off. The proper word for loose rocks and dust on the surface of the Moon is “regolith”. Do we have regolith on Earth too? Yes - but we call it things like soil, sand and ash. It’s not uncommon to see lunar regolith called “soil”, but this isn’t really right. Proper soil contains organic matter (decomposing leaves, worms etc). The Moon looks very dry although there are ice particles hiding among the dust. Bigger deposits of ice are present in permanently-shadowed craters.
3. Less gravity than on Earth ↓	Yes there is still gravity: when they jump up astronauts come back down again. All planets and Moons* have their own gravity. Massive things have more gravity than small, light things. Our Moon is smaller than Earth (1/4 the width) so has less gravity than Earth (1/6 the gravity). The astronauts can lift large rocks and jump high. Their spaceship doesn’t need a big rocket to take off again. Spacesuits are heavy on Earth but weigh less on the Moon. It was easier for the Apollo astronauts to jump than walk as their spacesuits were not very flexible. * everything has gravity, even you! But you are very small compared to the Earth or Moon, and so your gravity is far too weak to affect objects around you.

4. (Almost) no air	The Moon has so very little air that it would feel to us like being in a vacuum. (The gases in its very thin atmosphere are also very different from those on Earth.) No blue sky, nor weather. The astronaut in the video says it's a lovely cloudless day – why is this a joke? (There are no clouds on the Moon.) They have to wear spacesuits to provide air to breathe.
5. Bright sunlight and dark shadows	On Earth, our atmosphere scatters sunlight in all directions. This scattered light partly lights up our shadows. On the Moon there is no air, so this doesn't happen, and so the shadows are much darker. On the Moon, sunlight is strong/bright because it hasn't been filtered through an atmosphere.
6. Very hot and very cold	The rock in the video is very cold on one side. The shadows are completely dark so don't receive any warmth at all from the Sun. The Moon spins very slowly and so it has very long days and nights. Shadows move more slowly than on Earth. This gives more time for things to heat up or cool down. On Earth, air carries heat from warmer to cooler areas. On the Moon, there is no air to do this.
ADDITIONAL FACTORS ABOUT THE MOON	
7. Very far from Earth	It takes about three or four days to get there.

8. Space radiation (this factor is less important for this activity)	Earth has a magnetic field that protects us from harmful radiation coming from the Sun and from deep space. Usually it's not too dangerous. The Apollo astronauts had little protection but their missions were under two weeks long so they didn't worry too much about this. But – rarely, there are solar proton storms (the Sun does a big burp). These are much more dangerous. The Apollo astronauts were lucky the Sun was quiet while they were outside the Earth's magnetic field; a solar storm would have made them very unwell. (A storm did happen in 1972, between Apollo 16 and 17.)
9. Generally, it is dangerous!	The astronauts have to wear complex spacesuits to protect them from the vacuum, temperature and toxic dust. The spacesuits take a long time to put on and take off. They wear them for a long time. So the suits must allow them to communicate with each other, to drink water and urinate.

Example

Business idea: School

Description: It's a normal school, but on the Moon.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Example (completed)

Business idea: School

Description: It's a normal school, but on the Moon.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape	Lots of space for a playground. Nothing distracting outside	Nowhere for outdoor nature activities
No air or weather	No wet coats. No snow days.	The school needs to be filled with breathable air. Children must wear spacesuits if they go outside.
Sharp Moon dust (regolith)	Great geology lessons!	Need to carefully clean spacesuits after time outside.
Weaker gravity than Earth	The opportunity to get a new schools' High Jump record.	You can't play normal sports because you can't run the same way as you can on Earth.
Far from Earth		This business idea wouldn't work because it would take too long to get pupils to/from school each day.
Great view of space and Earth	Great for astronomy lessons.	Not possible to observe Moon Phases.

Business idea: Moon Buggy Adventure

Description: Fun group activity for visitors to the Moon. They ride Moon Buggies away from the base to visit interesting craters. They can race each other, do skids and jumps.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Astronomy School

Description: Short courses where you learn about things you can see in the sky using your eyes, binoculars, and telescopes.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Mining rare minerals

Description: Extracting rare minerals from regolith, for use in high-tech technologies back on Earth. Many tons of regolith must be processed by robots to extract a small amount of these rare minerals.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Growing Moon Fruit for sale on Earth.

Description: Grow fruit on the Moon, then sell them on Earth. People will pay extra because they're rare.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Physiotherapy centre

Description: A place for people with injuries to come to recover. Especially to build up weak muscles.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Flying lessons

Description: Full-week course to earn your Lunar Pilots Licence. Includes learning to use a jet-pack, and also how to fly a helicopter.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Horse-racing events

Description: Professional long-distance horse racing across the lunar surface. The events are televised for viewers back on Earth.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Moon Beach holiday hotel

Description: Hotel with grounds set out in holiday style. Enjoy the beach umbrellas, deckchairs, barbecue and ice-cream stalls with balloons. Come for a romantic break, sipping your drink as you watch the Earthset.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Tractor assembly plant

Description: Large solar-powered factories where robots move heavy tractor parts into position to assemble them into finished vehicles.

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		

Business idea: Spacecraft test facility

Description: A place to test new spacecraft before they are launched from Earth

Record your thoughts:

Factor	Better than Earth because …	But difficult because …
Barren landscape		
No air or weather		
Sharp Moon dust (regolith)		
Weaker gravity than Earth		
Far from Earth		