

Mission to Mars

Key Stage 2



Topics covered: living and working on Mars, features found on the planet.

Introduction

Mars is the fourth planet from the Sun and has fascinated humankind for centuries. Although no people have been to the planet, we have sent lots of spacecraft and rovers to explore this distant world.

This resource is aimed at KS2 and will explore what it will be like for astronauts to live and work on Mars. We will be starting off with a few teacher notes to give you an outline of the activities included and information you may find useful. You will then find a Mars fact file sheet and printable activity and answer sheets. For further exploration of Mars, we have included a link to NASA's Solar System website – enjoy!

Teacher's Notes:

We recommend that you start off by showing your students our 'Mission to Mars' video. It is available on our website (<https://www.rmg.co.uk/schools-communities/learning-resources/mission-mars>) and on our Vimeo page (<https://vimeo.com/398015506>).

The "Mars fact file!" handout on page 3 lists some facts about Mars. In the table, the value for the length of a day on Mars has not been included as students will get to calculate this in the "**Checking on your team**" activity. Once they've completed the activity, they can add the length of a day on Mars to the table.

There are six activities included in this resource for your students to try and they test a number of numeracy and literacy skills. Each activity includes written instructions for the students. We recommend printing the activities single-sided on A4 sheets of paper.

In "**Packing for Mars**" on page 4, students are told to imagine that they are part of the first group of astronauts that will be sent to Mars and are asked to write a list of all the items they'll need to take with them on this incredible mission.

On pages 5 – 7 you'll find the activity "**Help the rover on Mars**". By solving a series of mathematical problems, students will help to guide a rover on Mars. An advanced version of this activity can be found on pages 8 – 10.

In the activity "**Exploring Mars – Write your mission report**" on pages 11 – 13, students imagine that they are the first astronauts on Mars and have been sent out to explore it. They must pick a region of Mars and then write their mission report.

On page 14 you'll find the activity "**Rover weekly driving report**". Students need to use information provided in a bar chart to answer questions about a rover.

In "**Checking on your team**" (pages 15 – 16), students need to interpret information provided in different pie charts and answer a series of questions about the team of astronauts that they are responsible for.

In the activity "**Valles Marineris (Mariner Valley)**" on pages 17 – 18, students use the height of the tallest building on Earth to determine the depth of Valles Marineris, the largest canyon in the entire Solar System.

Solutions to the activities are provided at the end of the document.

Further exploration of the topic: Visit the NASA Solar System website:
<https://solarsystem.nasa.gov/>

Mars fact file!

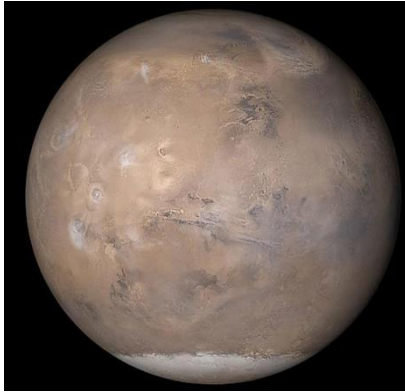


Image Credit: NASA/JPL

Mars is the fourth planet from the Sun and one of the rocky planets in our Solar System. The planet has a distinctive red colour which is due to a rusty dust that covers the surface of the planet. Mars is about half the size of the Earth and has a lower gravity compared to the Earth – on Mars you would be able to jump two-and-a-half times higher than you can here on the Earth! No humans have been to Mars but we have sent lots of rovers and spacecraft there to explore different regions of the planet.

Mars facts	
Average distance from the Sun	228 million kilometres (142 million miles)
Length of a year on Mars	687 Earth days
Length of a day on Mars	*
Atmosphere	Very thin, mostly Carbon Dioxide
Minimum temperature	−153°C
Maximum temperature	20°C
Average temperature	−63°C
Liquid water on surface	No
Number of moons	2 (Phobos and Deimos)

* You will calculate the length of a day on Mars in one of the activities.

Activity: Packing for Mars

In the “Mission to Mars” video, we saw that the astronauts will have to take a lot of items with them to Mars and when they get there, they will have to build a basecamp so that they have somewhere to live and work. If you were chosen as one of the first astronauts to be sent to Mars, what would you take with you? Think about the items that you would want inside your spacecraft as you travel to Mars – maybe you’ll want a few books to read or some movies to watch. What items would your basecamp need? Think about the what the conditions are like on Mars. Write all of your items onto the packing list below.

<p>EXPLORATION MARS</p>	 <h2>Packing List</h2>
<p>ITEMS NEEDED FOR MARS</p>	
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Activity: Help the rover on Mars

A rover has been sent out to explore a mountain range on Mars but it needs your help to get there! Follow Steps 1 to 3 below to send the rover to the mountains. To help you out, we have completed one part in each step for you.

Step 1: Problem solving

Solve the problems below and then move on to Step 2.

A	$\frac{3}{6} + \frac{1}{2}$	1
B	$200 \div 100$	
C	$\frac{120}{10} - 11$	
D	$456 + 232 - 687$	
E	$\frac{27}{3} - 6$	
F	$\frac{1}{2} + \frac{1}{4} + \frac{3}{12}$	
G	$\frac{12}{8} - \frac{8}{16}$	
H	$73 + 25 - 97$	

I	$\frac{66}{33}$	
J	$63 + 107 - 169$	
K	$\frac{4}{5} + \frac{11}{5}$	
L	$94 \div 47$	
M	$\frac{52}{26}$	
N	$13 - \frac{48}{4}$	
O	$\frac{1}{3} + \frac{2}{6} + \frac{4}{3}$	
P	$\frac{39}{13} - \frac{26}{13}$	

Step 2: Instructions for the rover

Fill your answers from Step 1 into the box below to complete the route the rover must follow. We have filled the first one in for you. Move to Step 3 as soon as you have filled in all of the answers.

Exploration Mars rover: Route instructions

<Route begin>

(1) Move **1** **(A)** West

(2) Move _____ **(B)** North

(3) Move _____ **(C)** East

(4) Move _____ **(D)** North

(5) Move _____ **(E)** West

(6) Move _____ **(F)** South

(7) Move _____ **(G)** West

(8) Move _____ **(H)** South

(9) Move _____ **(I)** West

(10) Move _____ **(J)** South

(11) Move _____ **(K)** West

(12) Move _____ **(L)** North

(13) Move _____ **(M)** East

(14) Move _____ **(N)** North

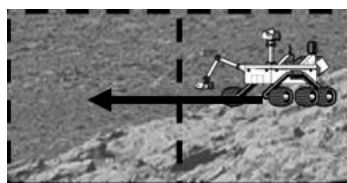
(15) Move _____ **(O)** East

(16) Move _____ **(P)** North

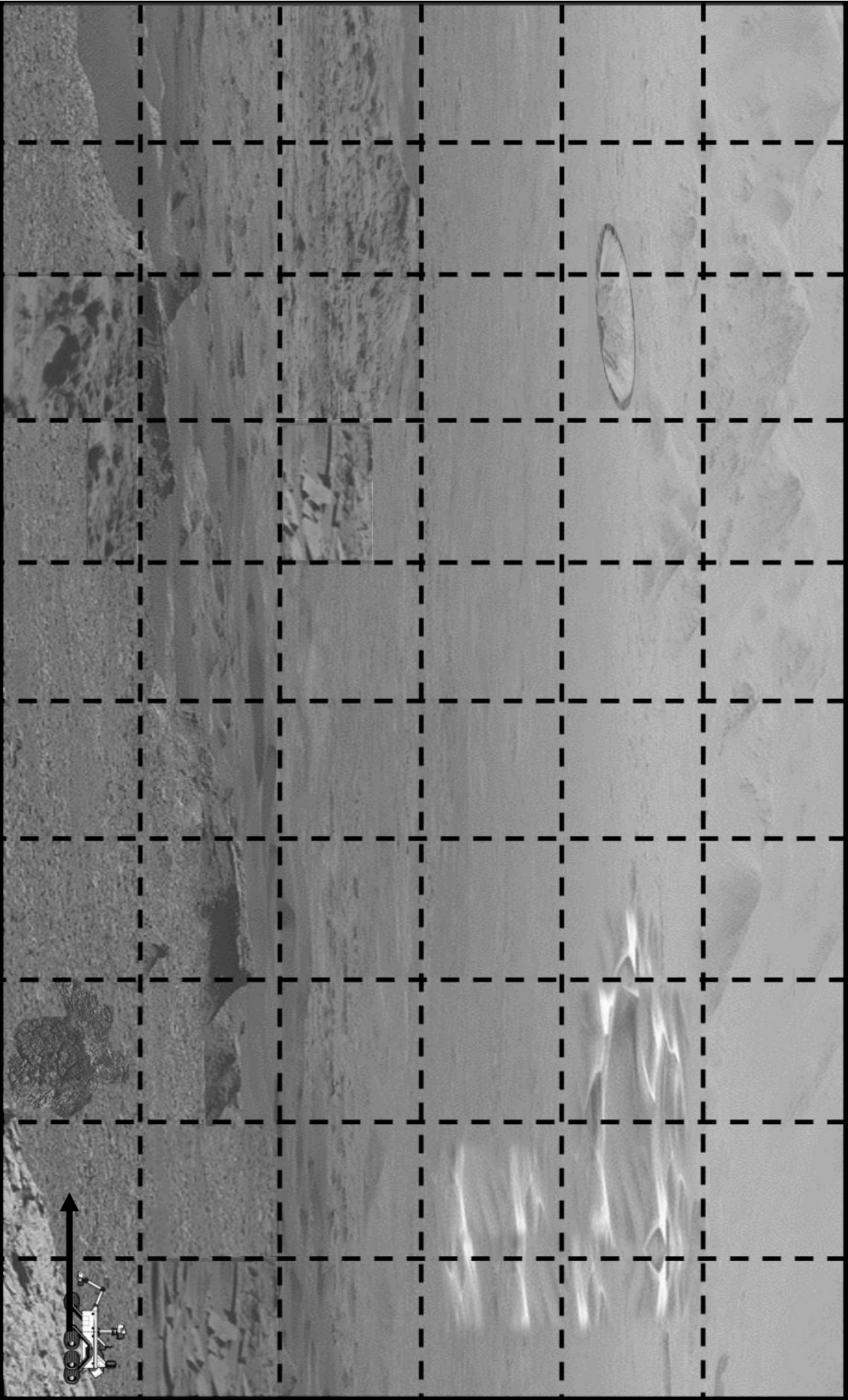
<Route end>

Step 3: Draw the route

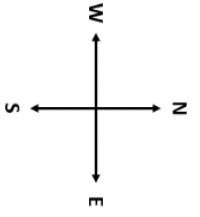
Use the instructions in Step 2 to draw the route the rover must follow. For the first part of the rover's journey to the mountain range, it must move **1 West**. This means the rover must **move one block West** which would be drawn on the map like this:



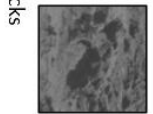
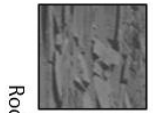
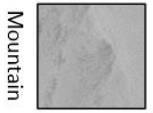
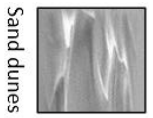
Draw the rest of the route for the rover!



The rover's route:



Map features:



Activity: Help the rover on Mars (Advanced)

A rover has been sent out to explore a mountain range on Mars but it needs your help to get there! Follow Steps 1 to 3 below to send the rover to the mountains. To help you out, we have completed one part in each step for you.

Step 1: Problem solving

Solve the problems below and then move on to Step 2.

A	0.5×2	1
B	$\frac{120}{10} - 10$	
C	$0.3 + 0.7$	
D	$\frac{1}{3}$ of 39 $-$ $\frac{3}{4}$ of 16	
E	$\frac{27}{3} - 6$	
F	$\frac{44}{66} + \frac{6}{18}$	
G	0.25×4	
H	$73 + 25 - 97$	

I	$\frac{1}{9}$ of 18	
J	$247 + 353 - 599$	
K	$180 \div 60$	
L	$\frac{5}{6}$ of 36 $-$ $\frac{4}{5}$ of 35	
M	$\frac{52}{26}$	
N	$46 - \frac{3}{4}$ of 60	
O	$9.8 - 4.5 - 3.3$	
P	$\frac{39}{13} - \frac{26}{13}$	

Step 2: Instructions for the rover

Fill your answers from Step 1 into the box below to complete the route the rover must follow. We have filled the first one in for you. Move to Step 3 as soon as you have filled in all of the answers.

Exploration Mars rover: Route instructions

<Route begin>

(1) Move **1** **(A)** West

(2) Move _____ **(B)** North

(3) Move _____ **(C)** East

(4) Move _____ **(D)** North

(5) Move _____ **(E)** West

(6) Move _____ **(F)** South

(7) Move _____ **(G)** West

(8) Move _____ **(H)** South

(9) Move _____ **(I)** West

(10) Move _____ **(J)** South

(11) Move _____ **(K)** West

(12) Move _____ **(L)** North

(13) Move _____ **(M)** East

(14) Move _____ **(N)** North

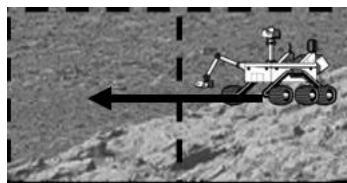
(15) Move _____ **(O)** East

(16) Move _____ **(P)** North

<Route end>

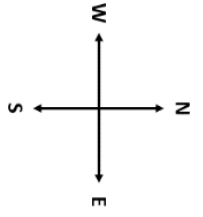
Step 3: Draw the route

Use the instructions in Step 2 to draw the route the rover must follow. For the first part of the rover's journey to the mountain range, it must move **1 West**. This means the rover must **move one block West** which would be drawn on the map like this:

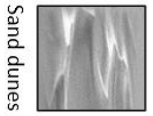


Draw the rest of the route for the rover!

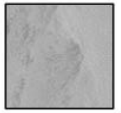
The rover's route:



Map features:



Sand dunes



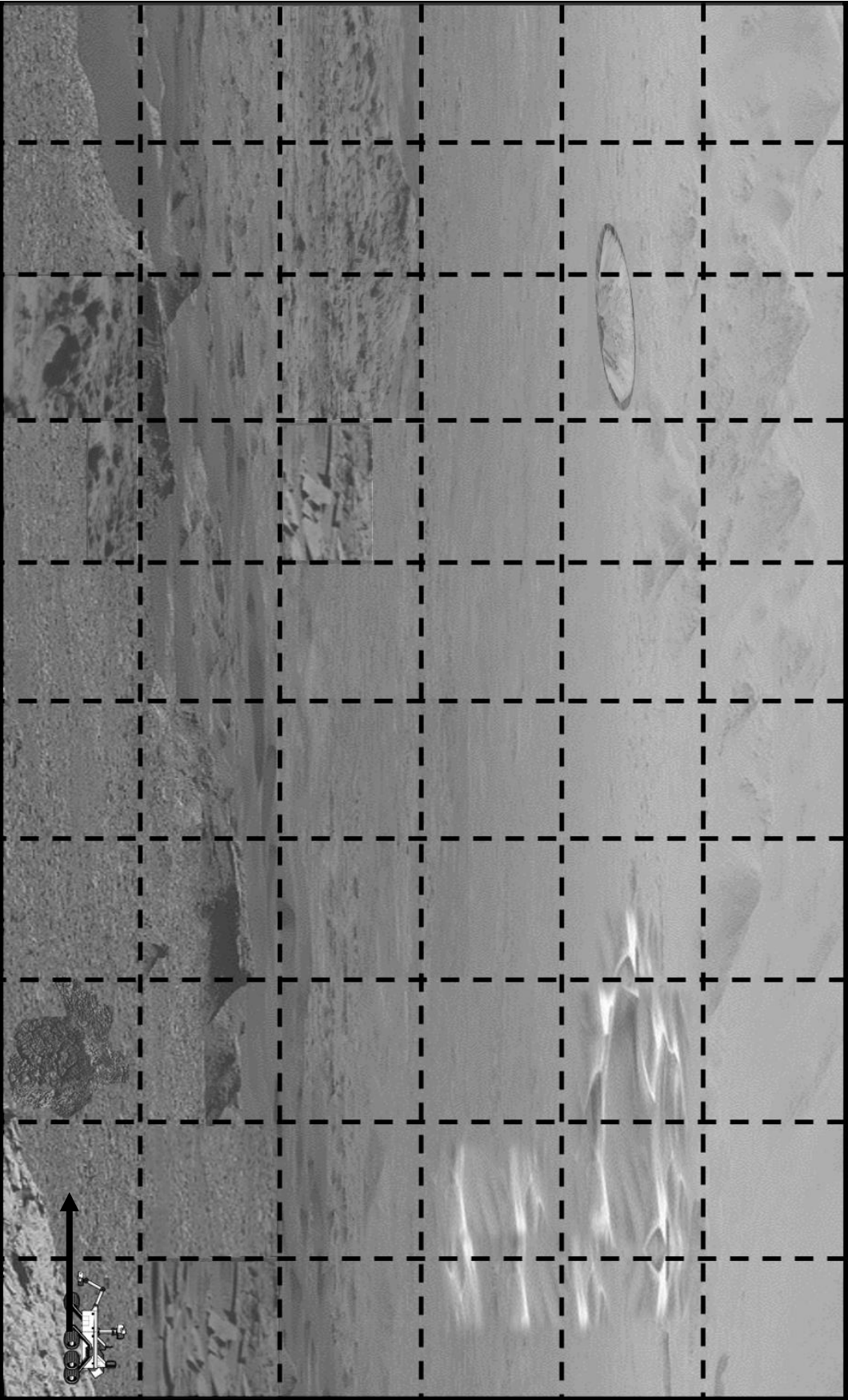
Mountain



Rocks



Impact crater



Activity: Exploring Mars – Write your mission report

There are many interesting regions on Mars that astronauts will get to explore. Some astronauts might climb up to the top of Olympus Mons, some might hike along Valles Marineris while others will explore craters. Imagine that you are part of a group of astronauts sent to Mars. Listed below are some regions of Mars that you will explore. Pick one of the regions below and fill in your mission report on the next two pages.

REGIONS TO EXPLORE

Olympus Mons (Mount Olympus)

With a height of 25 kilometres (16 miles), Olympus Mons is the tallest mountain, and the tallest volcano, in the entire Solar System. It is also an astonishing 624 kilometres (374 miles) wide! Although it is a shield volcano (a wide volcano with gently sloping sides), scientists believe that it is no longer active. At the top of Olympus Mons is a feature known as a caldera – it's similar to a crater and has a depth of 3 kilometres.

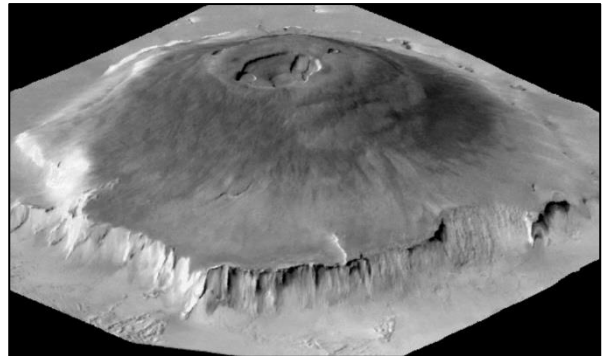


Image Credit: NASA

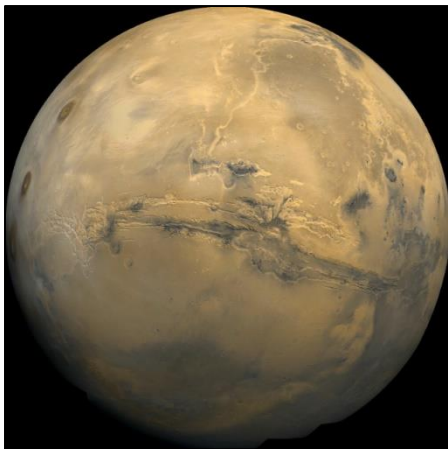


Image Credit: NASA

Valles Marineris (Mariner Valley)

We can see Valles Marineris, a giant canyon, as the dark streak stretching across the central part of Mars in the image on the left. This canyon has a length of 4,000 kilometres, much longer than the Grand Canyon on Earth which has a length of 445.8 kilometres. Astronauts who are sent to explore this region on Mars will use a rover to drive along the base of the canyon and will use drones to help them take images of the entire canyon.

Victoria Crater

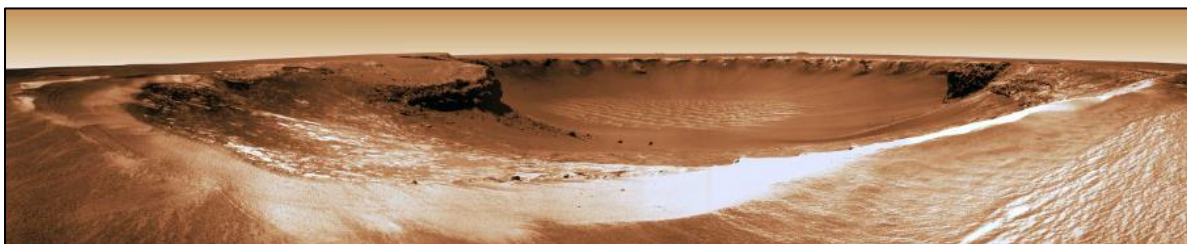


Image
Credit:
NASA/APOD

In this image taken by the NASA Mars Exploration Rover Opportunity, we can see Victoria crater. This crater was created when a space rock smashed into the surface of Mars. Victoria crater is around 800 metres (0.5 miles) wide and has sand dunes at its centre.

EXPLORATION
MARS

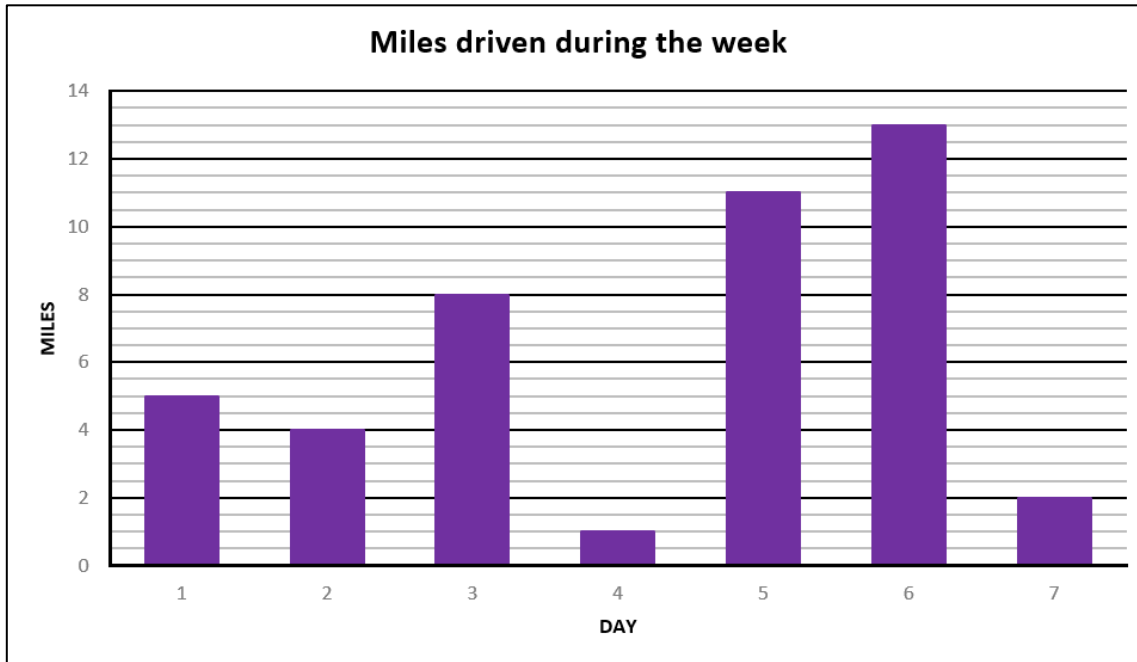
Mission Report

SECTION C – Pictures

Draw some pictures to show what you found and saw

Activity: Rover weekly driving report

The bar chart below shows how far a rover drove every day for one week. The total number of miles driven each day is for a roundtrip for the rover, in other words, the distance driven from basecamp to a destination, and then back to basecamp.

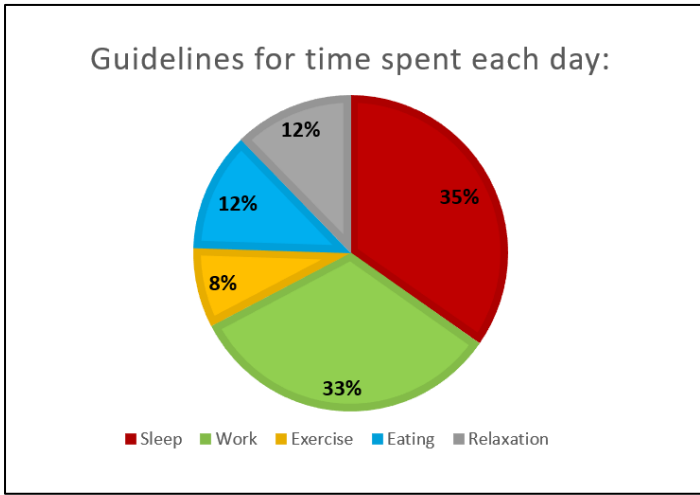


Use the bar chart to answer the following questions:

- Starting with the lowest number of miles driven in a day, write down the days in order of increasing miles driven per day.
- Calculate the total number of miles driven during the week.
- How many more miles did the rover drive on day 6 compared to day 1?
- On day 2, the rover drove a total of 4 miles. On which day did it travel half this distance?
- On one of the days, the rover's battery wasn't fully charged so it did not drive far from basecamp. Which day was this?
- On day 3, the rover drove out to explore an area covered in sand dunes. On the way to the sand dunes, it stopped to take images of some rocks. If the rocks were 1.5 miles from basecamp, how far were the sand dunes from the rocks?

Activity: Checking on your team

As part of your duties as the Commander of a mission on Mars, you need to make sure that your team members are completing their daily tasks, exercising to keep fit, resting, eating all their meals and sleeping well. For your team, you have created the following guidelines for each working day on Mars:

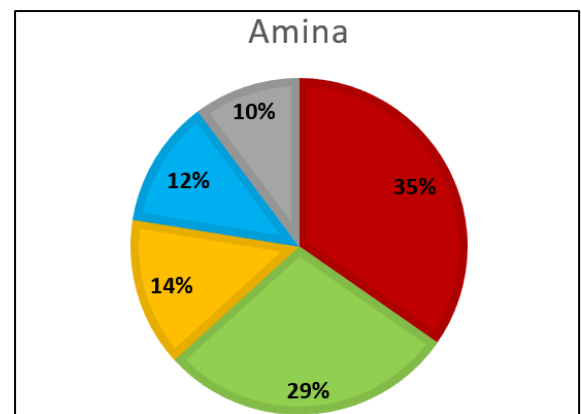
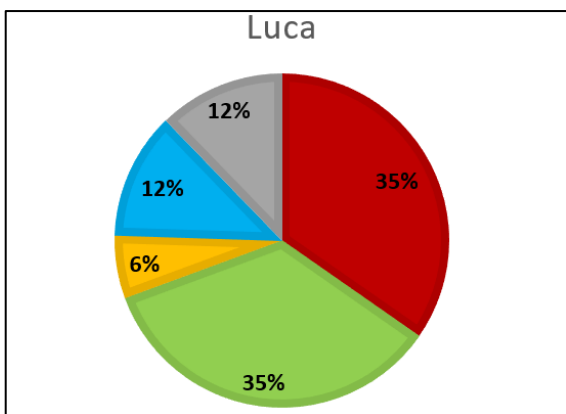
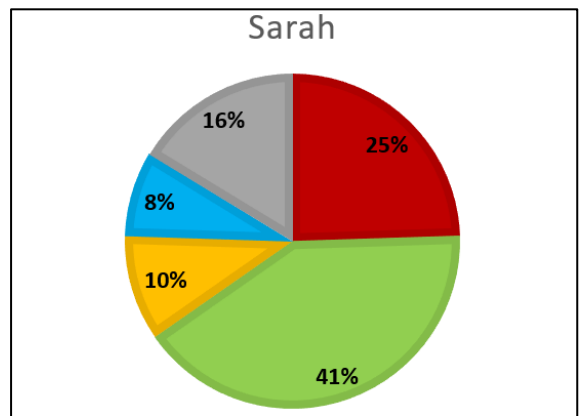
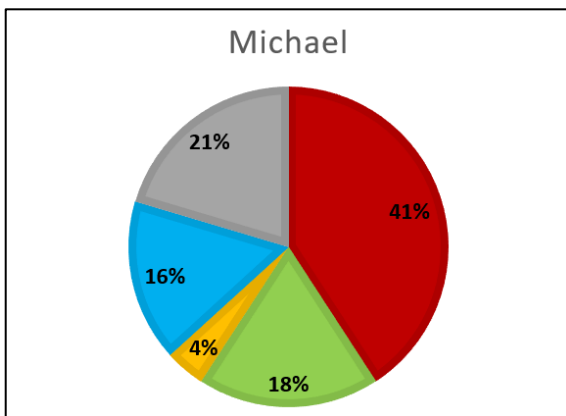


- Get 8-and-a-half hours of sleep.
- Work for a total of 8 hours.
- Exercise for 2 hours.
- Eating breakfast, lunch and dinner – a combined total of 3 hours.
- Relaxation time – 3 hours

The pie chart alongside gives a breakdown of the guidelines listed above.

Shown in the pie charts below is the breakdown of the hours spent for one day in the week for some members your team.

■ Sleep ■ Work ■ Exercise ■ Eating ■ Relaxation



Use the pie charts to answer the following questions:

1. Based the guidelines, calculate how many hours there are in a day on Mars.
2. Which team members' pie chart is the closest match to the guidelines pie chart?
3. One member of your team started to feel unwell towards the end of the day and was advised by the doctor to rest. Based on the pie charts, which team member was this most likely to be?
4. Which team member exercised for almost double the recommended amount of time?
5. During the replacement of a solar panel at basecamp, a member of your team found that another solar panel needed to be repaired. Both tasks took a long time to complete. Which team member most likely worked on the solar panels?
6. One member of your team has sprained a leg muscle from doing too much exercise. They should have also spent some more time relaxing. Which team member is this?
7. Which member of the team forgot to set their alarm and overslept?
8. Which team member spent 41% of their time relaxing and sleeping?
9. Which team member spent 2% more than the recommended guideline for the amount of time that should be spent working?

Activity: Valles Marineris (Mariner Valley)

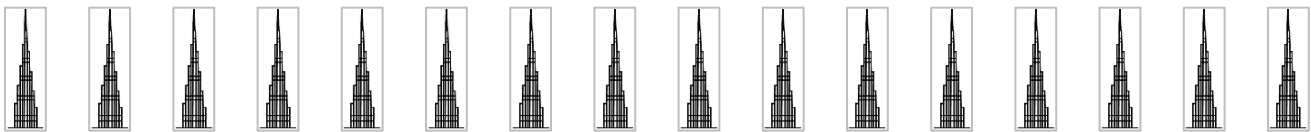
Valles Marineris is a giant canyon on Mars and it is the largest canyon in the entire Solar System. The Grand Canyon on the Earth has a maximum depth close to 1.9 kilometres, but Valles Marineris reaches depths of up to 7 kilometres! Currently, the tallest building on the Earth is the Burj Khalifa in Dubai which has a height of 828 metres.

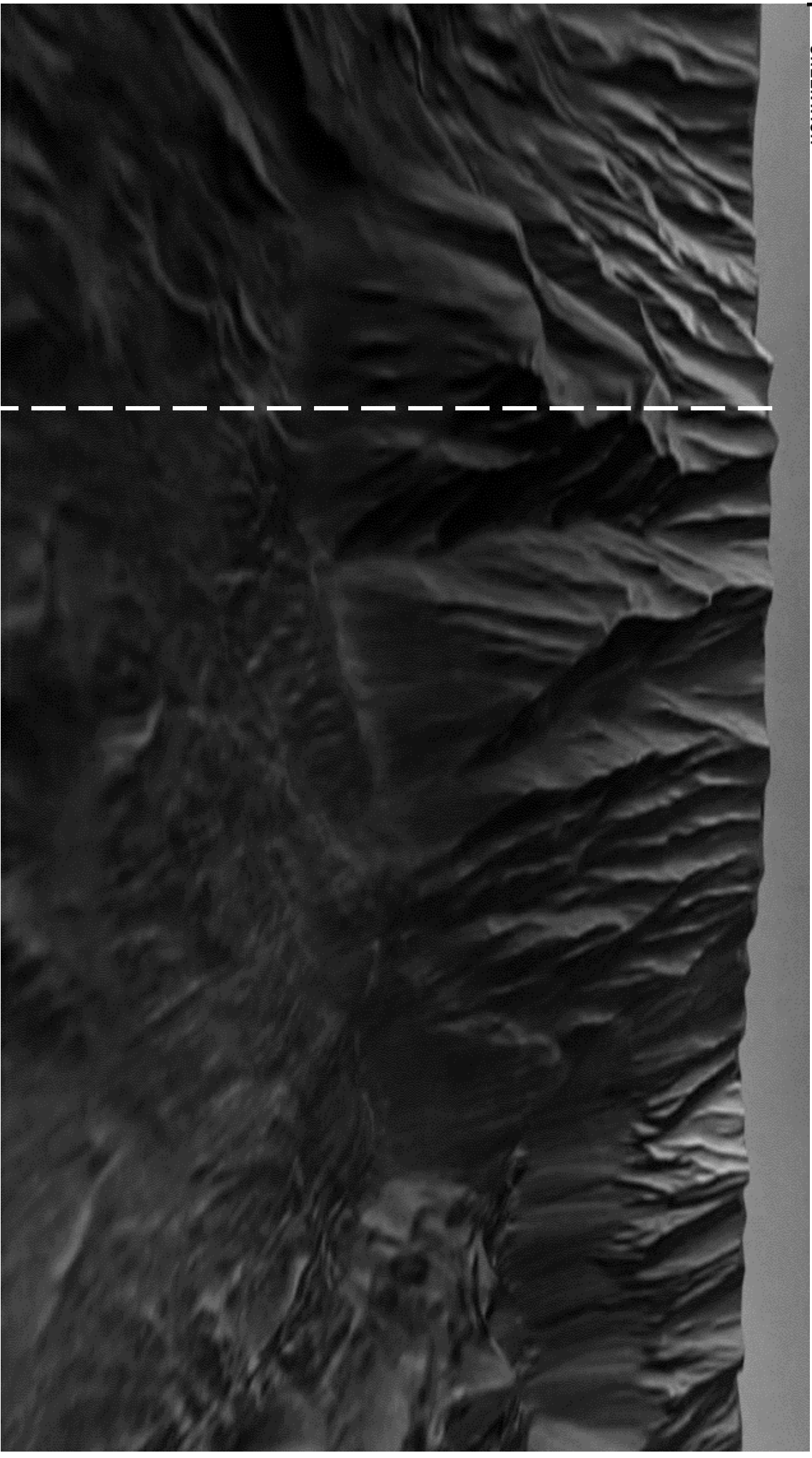
Step 1:

Calculate how many Burj Khalifa buildings we would be able to stand on top of each other to fill the deepest part of Valles Marineris (use a depth of 7 kilometres).

Step 2:

To check if your answer from step 1 is correct, cut out the corresponding number of Burj Khalifa buildings below and stick them along the dashed line on the image of Valles Marineris on the next page. The dashed line marks the tallest part of Valles Marineris. We have labelled the top and base of the canyon.





Burj Khalifa Image Credit:
Creative Mania

Valles Marineris Image
Credit: NASA

Mission to Mars: **ANSWERS**

Key Stage 2

Activity: Packing for Mars

This activity is designed to get students to think about the challenges of manned space exploration. Some of the items needed to live on Mars are mentioned in the “Mission to Mars” video, but here is a list of some of the items students might suggest:

- Material to build a basecamp
- Food
- Water
- Clothes and spacesuits
- Medical supplies
- Air supplies
- Solar panels to generate electricity
- Heaters
- Mars rover/car
- Communication equipment
- Exercise equipment
- Soil to grow plants
- Books to read
- Movies to watch
- Games to play
- Pens and pencils
- Paper and notebooks to write on
- Computers

Activity: Help the rover on Mars

A	$\frac{3}{6} + \frac{1}{2}$	1
B	$200 \div 100$	2
C	$\frac{120}{10} - 11$	1
D	$456 + 232 - 687$	1
E	$\frac{27}{3} - 6$	3
F	$\frac{1}{2} + \frac{1}{4} + \frac{3}{12}$	1
G	$\frac{12}{8} - \frac{8}{16}$	1
H	$73 + 25 - 97$	1

I	$\frac{66}{33}$	2
J	$63 + 107 - 169$	1
K	$\frac{4}{5} + \frac{11}{5}$	3
L	$94 \div 47$	2
M	$\frac{52}{26}$	2
N	$13 - \frac{48}{4}$	1
O	$\frac{1}{3} + \frac{2}{6} + \frac{4}{3}$	2
P	$\frac{39}{13} - \frac{26}{13}$	1

Advanced:

A	0.5×2	1
B	$\frac{120}{10} - 10$	2
C	$0.3 + 0.7$	1
D	$\frac{1}{3}$ of 39 $-$ $\frac{3}{4}$ of 16	1
E	$\frac{27}{3} - 6$	3
F	$\frac{44}{66} + \frac{6}{18}$	1
G	0.25×4	1
H	$73 + 25 - 97$	1

I	$\frac{1}{9}$ of 18	2
J	$247 + 353 - 599$	1
K	$180 \div 60$	3
L	$\frac{5}{6}$ of 36 $-$ $\frac{4}{5}$ of 35	2
M	$\frac{52}{26}$	2
N	$46 - \frac{3}{4}$ of 60	1
O	$9.8 - 4.5 - 3.3$	2
P	$\frac{39}{13} - \frac{26}{13}$	1

Both:

Exploration Mars rover: Route instructions

<Route begin>

- (1) Move **1** **(A)** West
- (2) Move **2** **(B)** North
- (3) Move **1** **(C)** East
- (4) Move **1** **(D)** North
- (5) Move **3** **(E)** West
- (6) Move **1** **(F)** South
- (7) Move **1** **(G)** West
- (8) Move **1** **(H)** South
- (9) Move **2** **(I)** West
- (10) Move **1** **(J)** South
- (11) Move **3** **(K)** West
- (12) Move **2** **(L)** North
- (13) Move **2** **(M)** East
- (14) Move **1** **(N)** North
- (15) Move **2** **(O)** East
- (16) Move **1** **(P)** North

<Route end>

Activity: Exploring Mars – Write your mission report

As this is a creative exercise, there is no formal answer for this activity, but we would recommend that students do a bit of research on their chosen region and read through the Mars fact file before writing their reports.

Activity: Rover weekly driving report

1. Day 4, Day 7, Day 2, Day 1, Day 3, Day 5, Day 6
2. Total number of miles driven in the week = $5 + 4 + 8 + 1 + 11 + 13 + 2 = 44$
3. Day 6 = 13 miles

Day 1 = 5 miles

$$\text{Difference} = 13 - 5 = 8 \text{ miles}$$

The rover drove 8 miles more on Day 6 than it did on Day 1.

4. Day 7 (2 miles)
5. Day 4 – on this day the rover only covered a total distance of 1 mile.
6. On Day 3 the rover drove a total of 8 miles. The distance from the basecamp to the sand dunes is half this distance – 4 miles. The rocks were 1.5 miles from basecamp, so the distance from the rocks to the sand dunes is

$$\text{Distance rocks to sand dunes} = 4 \text{ miles} - 1.5 \text{ miles} = 2.5 \text{ miles}$$

Activity: Checking on your team

1. Hours in a day on Mars = $8.5 + 8 + 2 + 3 + 3 = 24.5$
2. Luca
3. Michael
4. Amina
5. Sarah
6. Amina
7. Michael
8. Sarah
9. Luca

Activity: Valles Marineris (Mariner Valley)

The deepest part of Valles Marineris has a depth of 7 kilometres and the height of the Burj Khalifa is 828 metres (0.828 kilometres). The number of Burj Khalifa buildings we would be able to stand on top of each other in Valles Marineris is:

$$\begin{aligned}\text{Number of Burj Khalifa buildings} &= 7 \text{ kilometres} \div 0.828 \text{ kilometres} \\ &= 8.454 \approx 8.5\end{aligned}$$

As shown on the next page, about 8.5 Burj Khalifa buildings stacked on top of each other could fill Valles Marineris.

