Statistics: Mars Line Graphs

Aim:	**Success Criteria:**	**Preparation:**
Solve comparison, sum and difference problems using information presented in a line graph. I can answer questions about data presented in a line graph.	I can interpret data in bar charts and line graphs. I can identify the features of a line graph. I can answer comparison, sum and difference questions about data presented in a line graph.	**Planet Temperatures Bar Chart Handout** – as required **Mars 24-Hour Temperature Line Graph Handout** – as required **Mars Day and Night Monthly Temperature Line Graph Handout** – as required Differentiated **Mars Line Graphs Activity Sheets** – one per child **Space Rocket Line Graph Handout** – as required
Key/New Words: Line graph, bar chart, data, axis, continuous data.	**Resources:** **Lesson Pack**	

Prior Learning: It will be helpful if children have experience of interpreting data in tables and plotting coordinates in all four quadrants.

Learning Sequence

	Planet Temperatures: Answer the questions about the bar chart shown on the **Lesson Presentation** and on the **Planet Temperatures Bar Chart Handout**, which shows the average temperatures of the eight planets in our solar system. Draw attention to the vertical axis, which has been extended below zero to show temperature measurements involving negative numbers.	
	Temperatures on Mars: Using the images and text on the **Lesson Presentation**, introduce the real-life context of the lesson, which is using line graphs showing data sent to Earth from the Mars rovers about the air temperature on the surface of Mars.	
	24-Hour Temperatures on Mars: Discuss the line graph shown on the **Lesson Presentation** and on the **Mars 24-Hour Temperature Line Graph Handout** which shows the temperature of Mars every hour over one day. Explain that the graph shows how the change in temperature on the vertical axis is being measured against hourly time on the horizontal axis. Draw attention to the vertical axis which has been extended below zero to show temperature measurements involving negative numbers, and because of this the horizontal axis runs across the top of the graph. Discuss how the data has been plotted and joined to create a continuous line, which gives approximate temperatures over the entire 24-hour period. The children then rehearse reading line graphs correctly by answering questions about the data contained in the line graph.	
	Yearly Temperatures on Mars: Discuss the double line graph shown on the **Lesson Presentation** and on the **Mars Day and Night Monthly Temperature Line Graph Handout**, which explains that scientists used the data collected by the Mars rovers over a whole year to calculate the average temperatures for each month at day and at night. Draw attention to the use of a key/legend to identify the different sets of data. Demonstrate how to answer a question comparing the two sets of data by reading the line graph correctly.	
	Mars Line Graphs: Children complete the differentiated **Mars Line Graphs Activity Sheets**, to show they can answer questions about data presented in a line graph. Interpret the line graph correctly to answer simpler questions about the temperature of Mars every hour over one day. Interpret the line graph correctly to answer more complex questions about the temperature of Mars every hour over one day. Interpret the double line graph correctly to answer questions about the average temperatures on Mars for each month at day and at night.	
	Diving into Mastery: Schools using a mastery approach may prefer to use the following as an alternative activity. These sheets might not necessarily be used in a linear way. Some children might begin at the 'Deeper' section and in fact, others may 'dive straight in' to the 'Deepest' section if they have already mastered the skill and are applying this to show their depth of understanding. Children read and interpret a double line graph to answer comparison, sum and difference questions. Children prove if the statements about the double line graph are true or false, explaining the mistakes they think have been made in reading and interpreting the line graph for the incorrect statements. The children use clues and a partially drawn line graph to find the answer to a problem.	

Space Rocket Pass the Beanbag: Displayed on the **Lesson Presentation** and on the **Space Rocket Line Graph Handout** is a line graph showing the change in altitude of a space rocket in km over the first sixty seconds from launch. The children take it in turns to say facts about the line graph as they pass a beanbag around the group. At the end of a countdown timer, the person left holding the beanbag loses a life.

Exploreit

Extendit: Create bar charts which show the duration of one rotation for the different planets in our solar system.

Plotit: Use this **Satellites in Space Activity Sheet** to plot a line graph of the number of satellites launched each year since 2006.

Maths

Statistics

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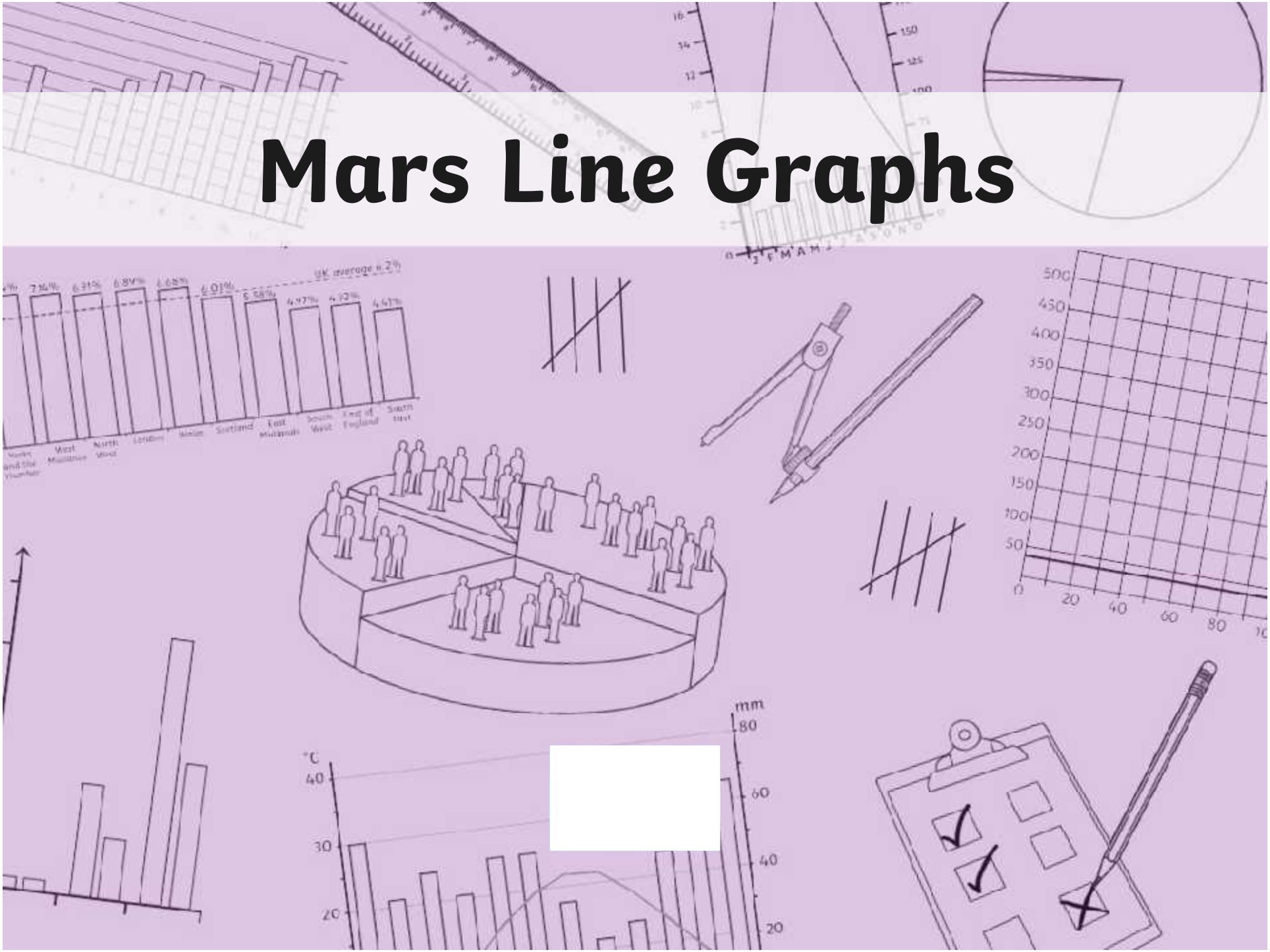
Mars Line Graphs



Aim

- I can answer questions about data presented in a line graph.

Success Criteria

- I can interpret data in bar charts and line graphs.
- I can identify the features of a line graph.
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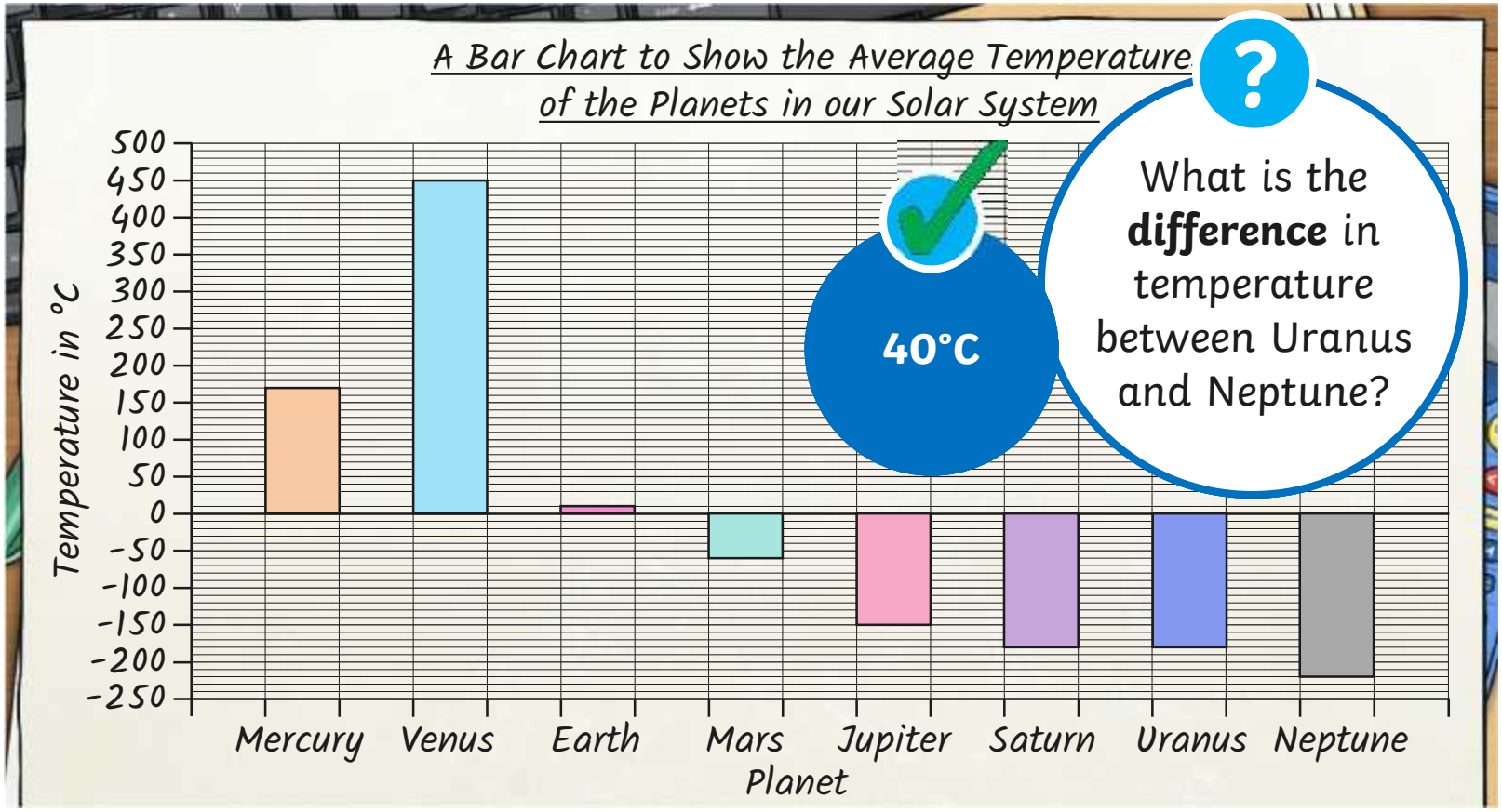
Planet Temperatures

Here is a bar chart which shows the average temperatures of the planets in our solar system.



Temperatures on Mars

In their topic lessons, Class 5 are learning about the planet Mars.

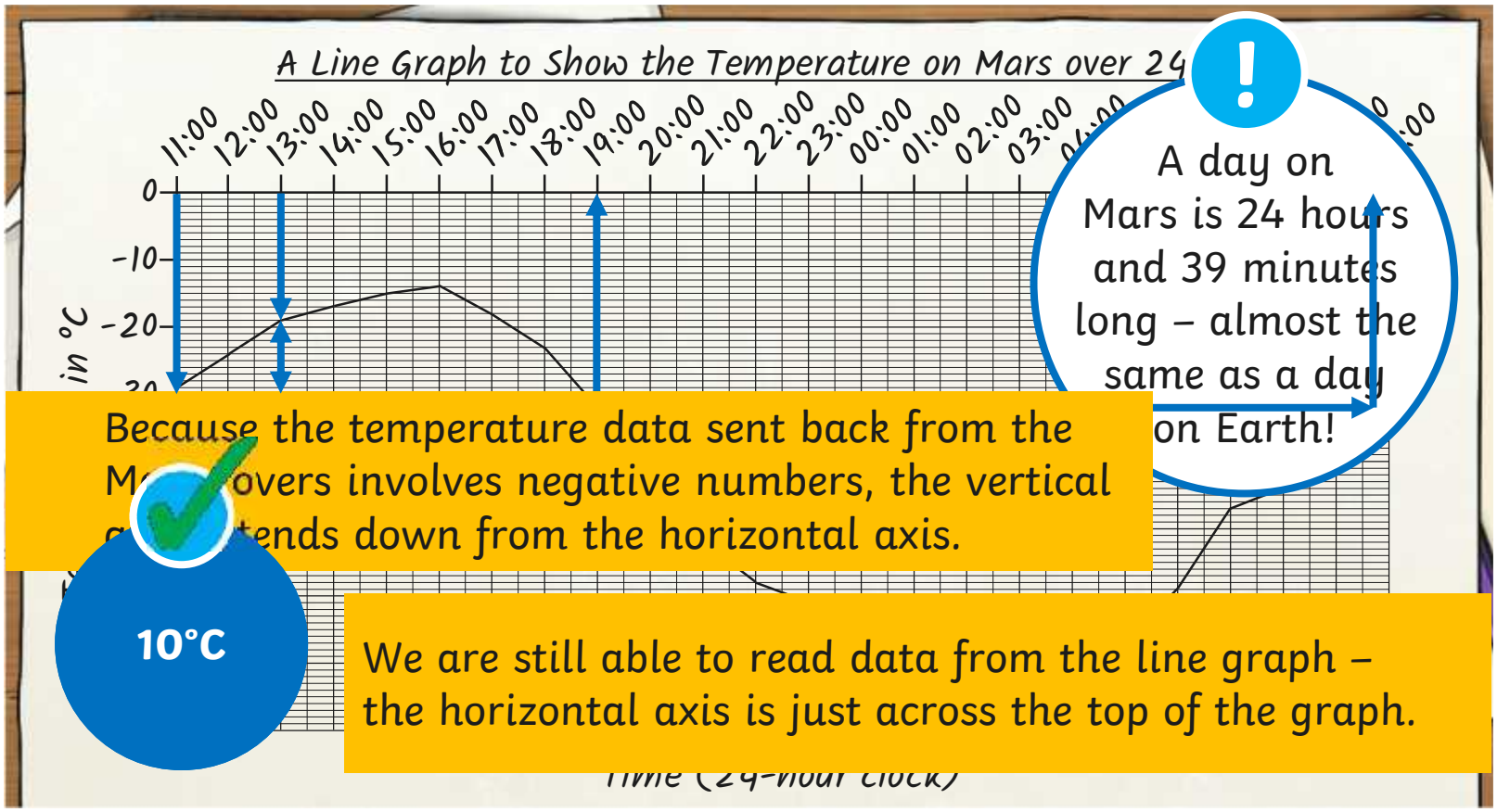
They have found out that there are two American space rovers exploring the surface of the planet. They are called Spirit and Opportunity.

The robots can tell us lots of information about Mars, including the air temperature at the surface.

24-Hour Temperatures on Mars

Here is a line graph showing data from the Mars rovers. It recorded the temperature of Mars once an hour over the course of one day.

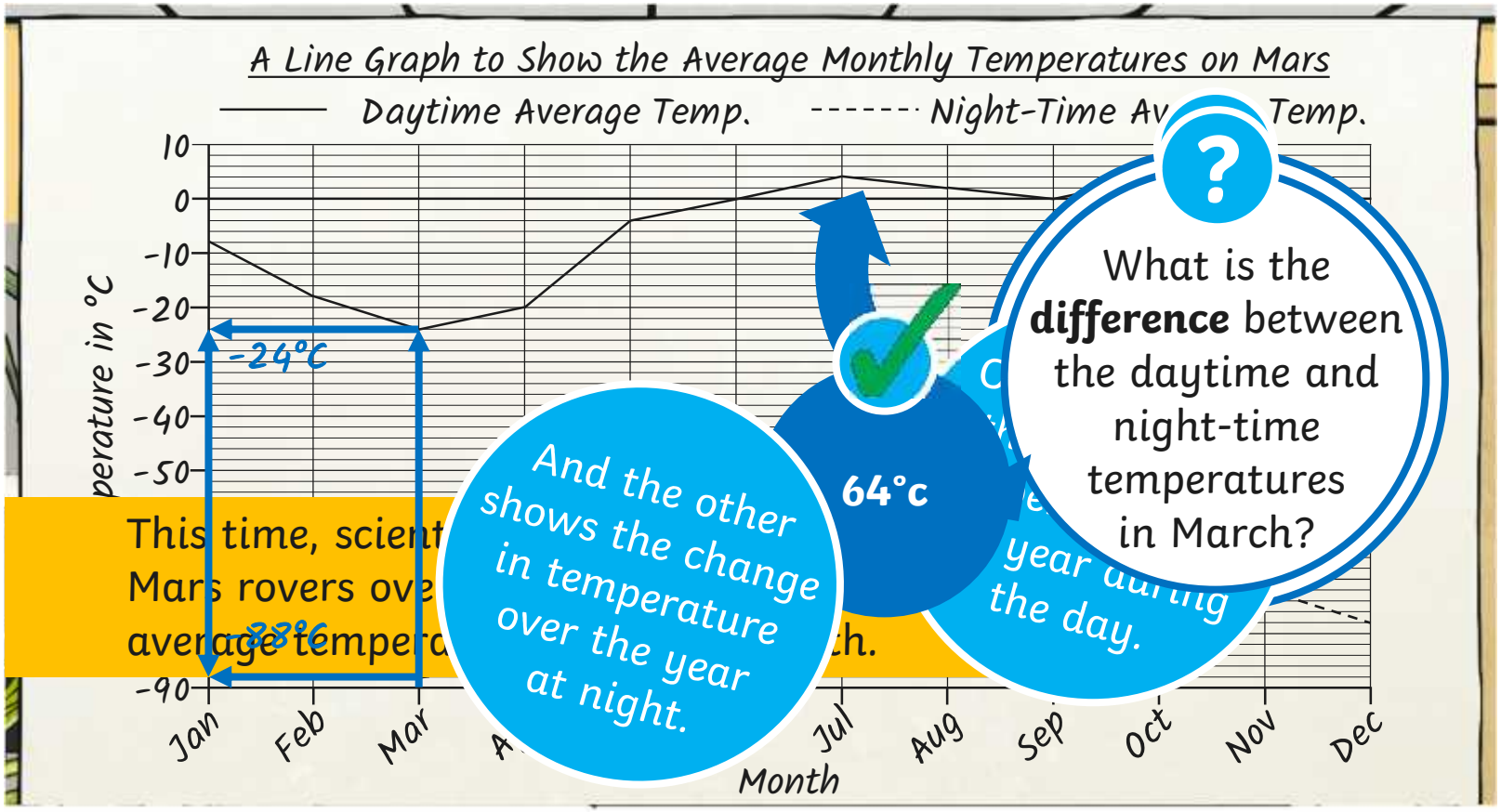
How many degrees warmer did it get between 11:00 and 13:00?



24-Hour Temperatures on Mars

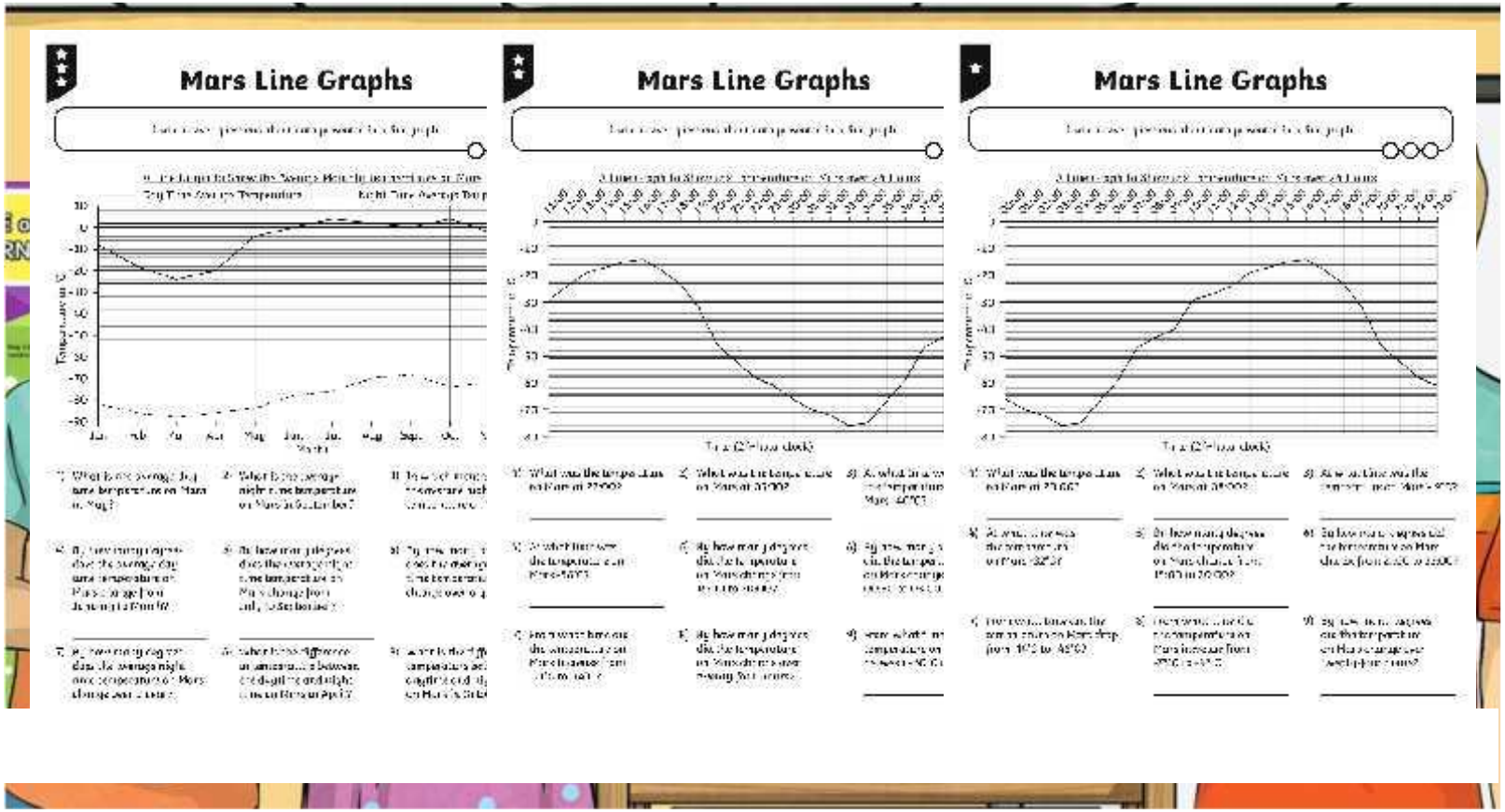
Whole Class

Here is another line graph showing data from the Mars rovers.



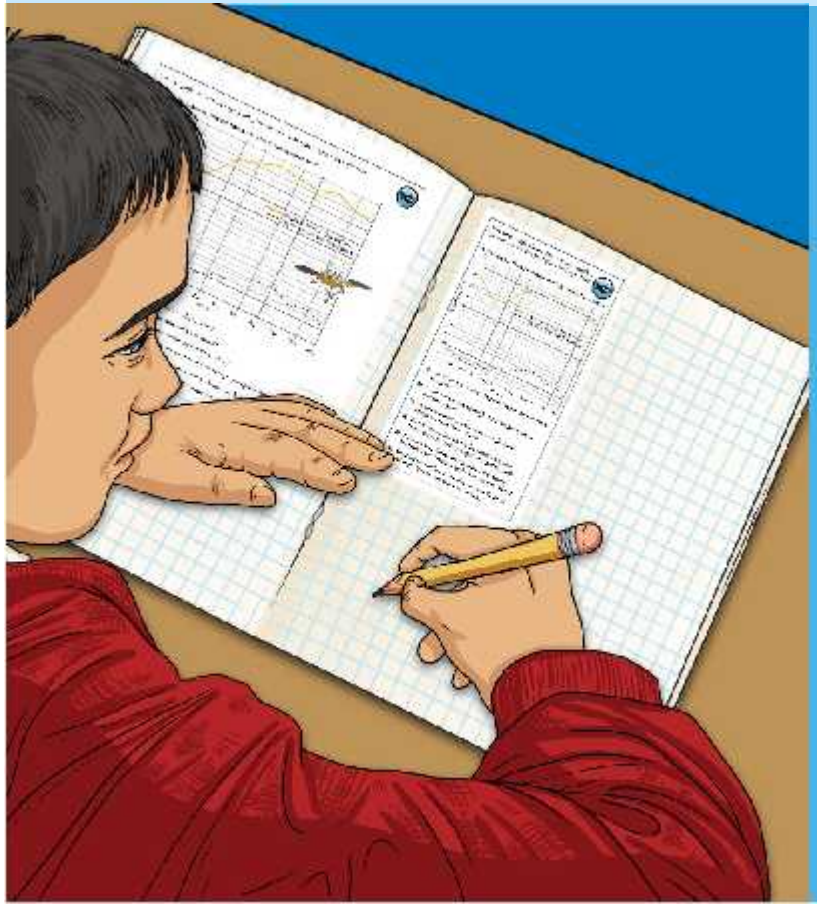
Mars Line Graphs

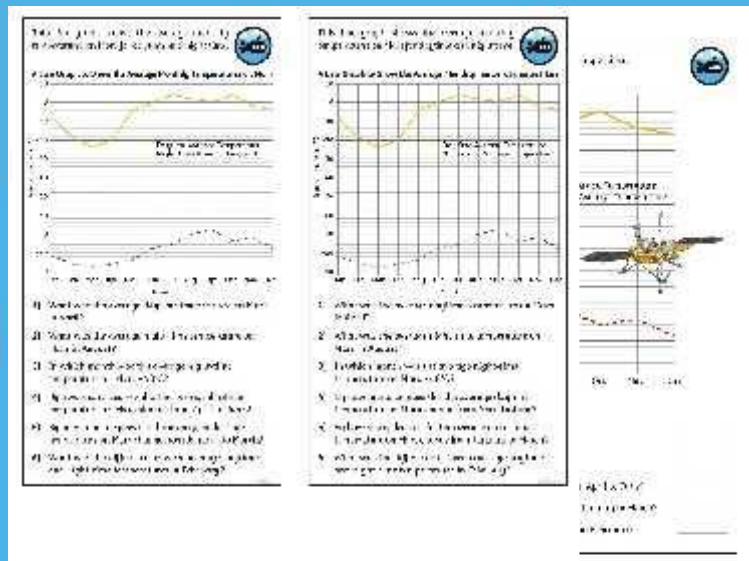
Use your stunning statistics skills to complete these activity sheets:



Diving into Mastery

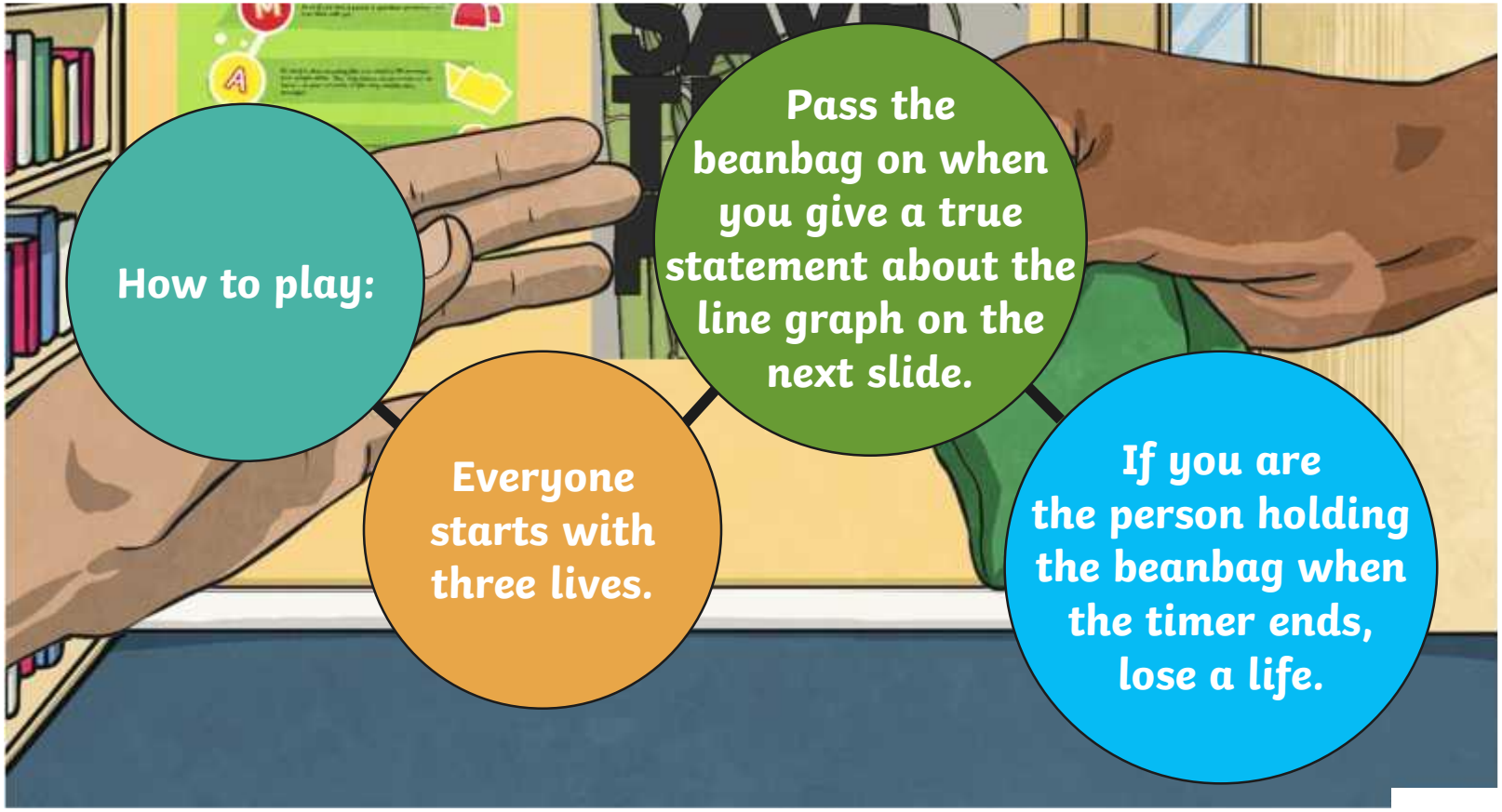
Dive in by completing your own activity!





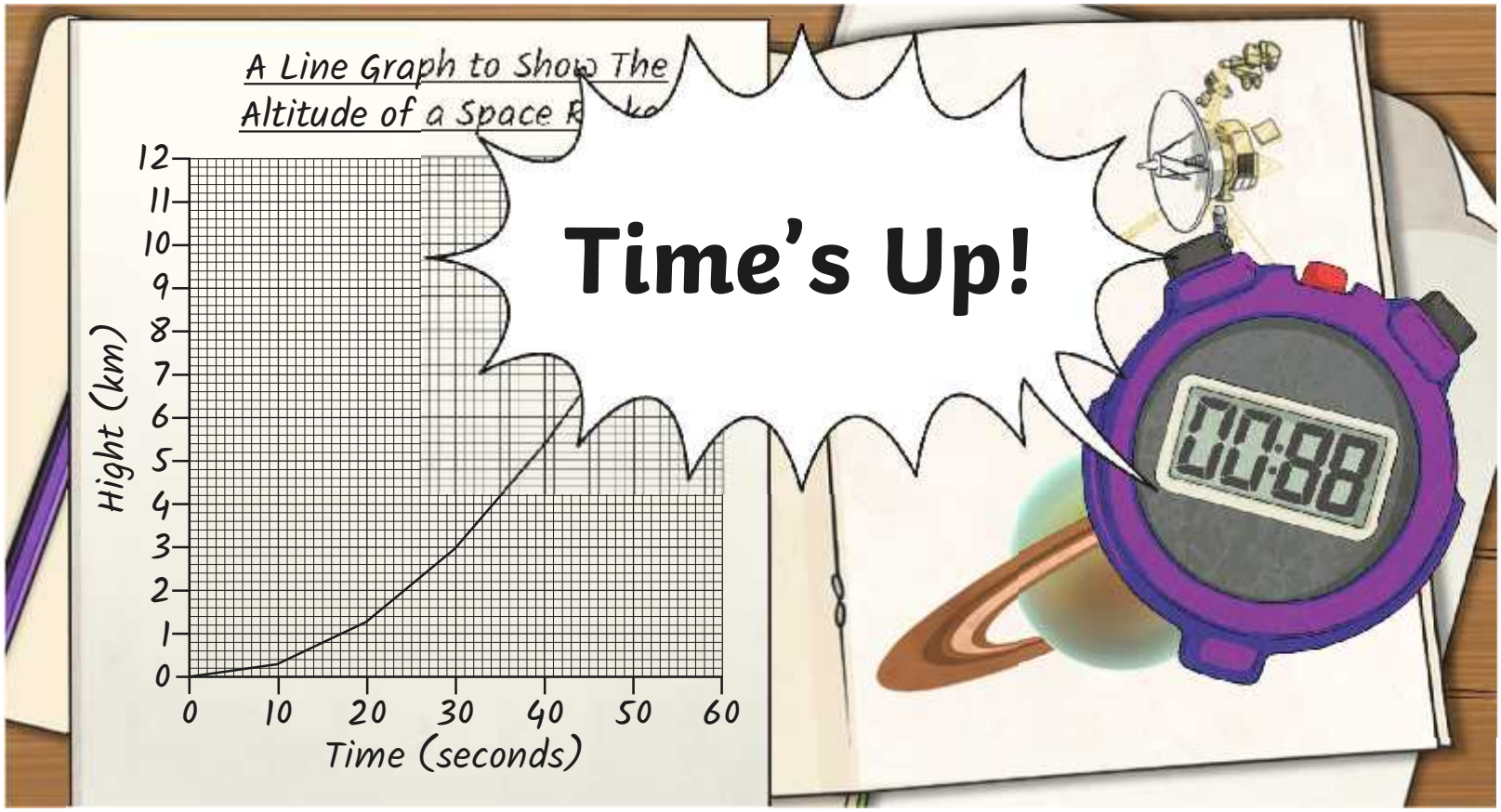
Space Rocket Pass the Beanbag

Aim of the game:
Don't be the person holding the beanbag when the timer stops!



Space Rocket Pass the Beanbag

Click on the stopwatch for a one-minute countdown.



Aim

- I can answer questions about data presented in a line graph.

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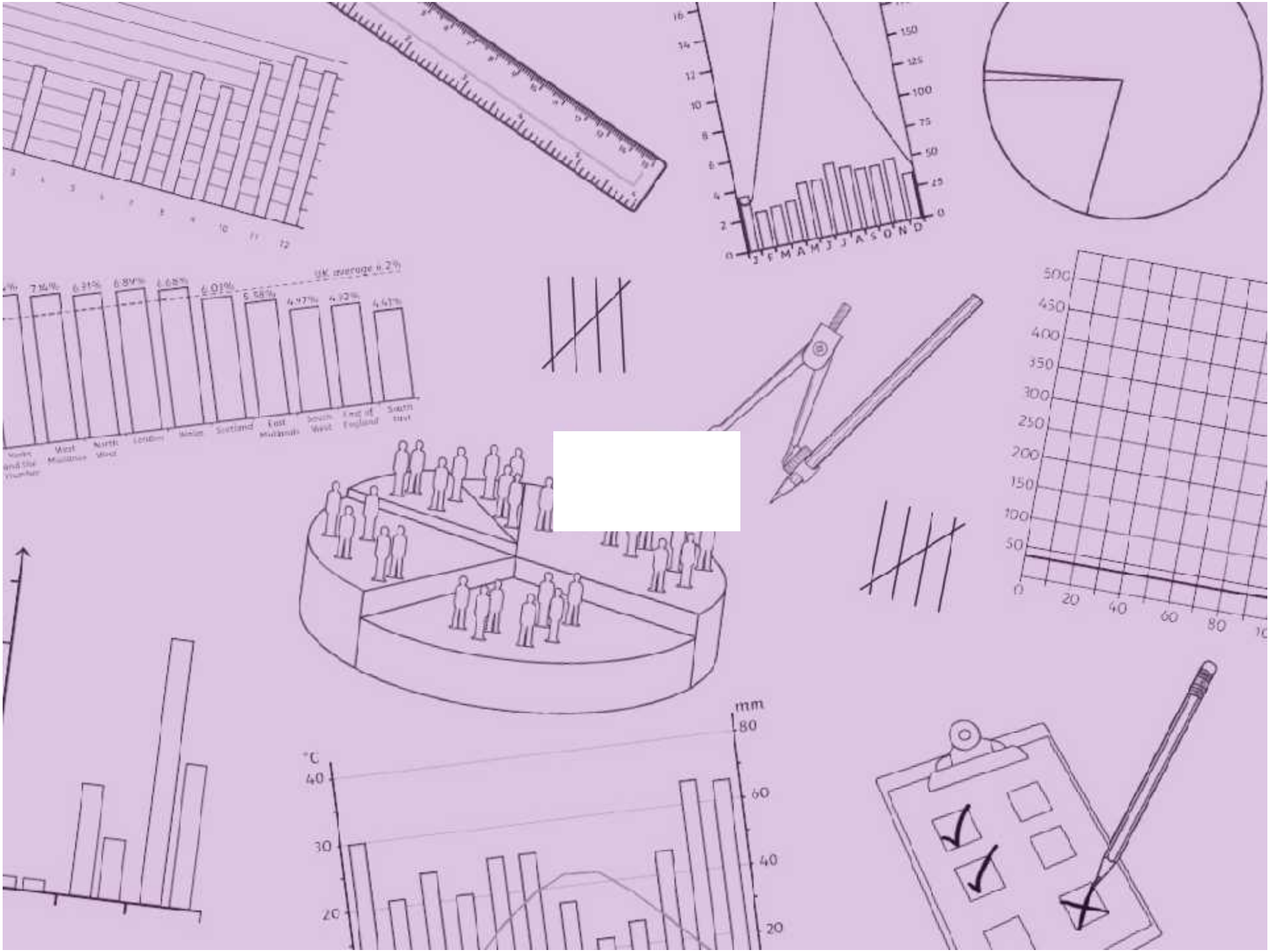
J F M A M J J A S O N D
UK average = 2%
mm
°C

Aim: I can answer questions about data presented in a line graph.				**Date:**					
				Delivered By:			**Support:**		
Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can interpret data in bar charts and line graphs.				**Notes/Evidence**					
I can identify the features of a line graph.									
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Next Steps

- _____
- _____

T	Teacher	**I**	Independent
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S	Supply	**GP**	Guided Practice

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Next Steps

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- _____

T	Teacher	**I**	Independent
PPA	Planning, Preparation and Assessment	**AL**	Adult Led
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1) *−20°C*
2) *−70°C*
3) *September*
4) *20°C*
5) *6°C*
6) *68°C*

1) **a)** Mars had the coolest average daytime temperature in March. ***True.***

   b) The difference between the warmest and coolest average night-time temperatures was 18°C.
   False – the difference is 20°C.

   c) The difference between average daytime and night-time temperatures in July was 72°C.
   False – the difference is 80°C.

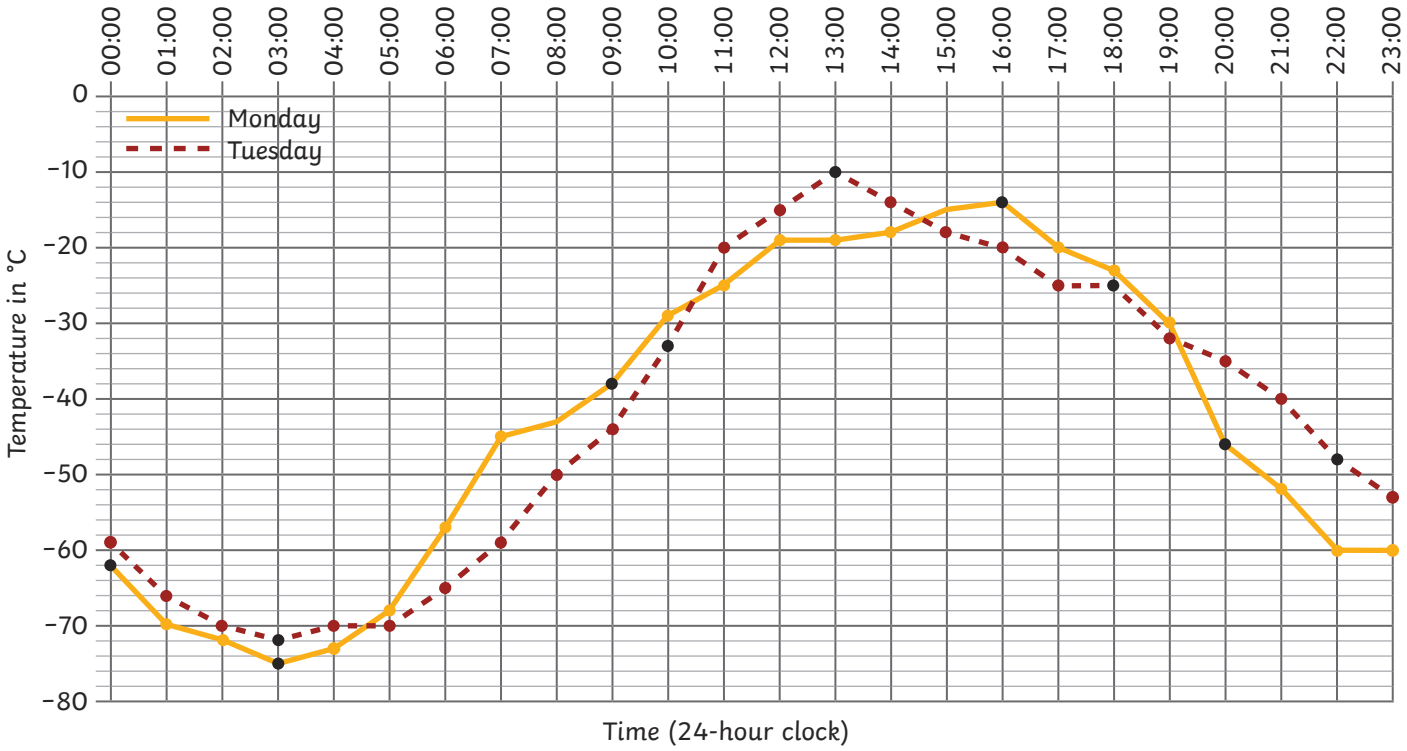
   d) From any one month to the next month, the average night-time temperature didn't increase by more than 6°C.
   True.

1) −75°C
2) −14°C
3) −72°C
4) −10°C
5) 3°C
6) 4°C
7) 4°C
8) 07:00
9) 14°C

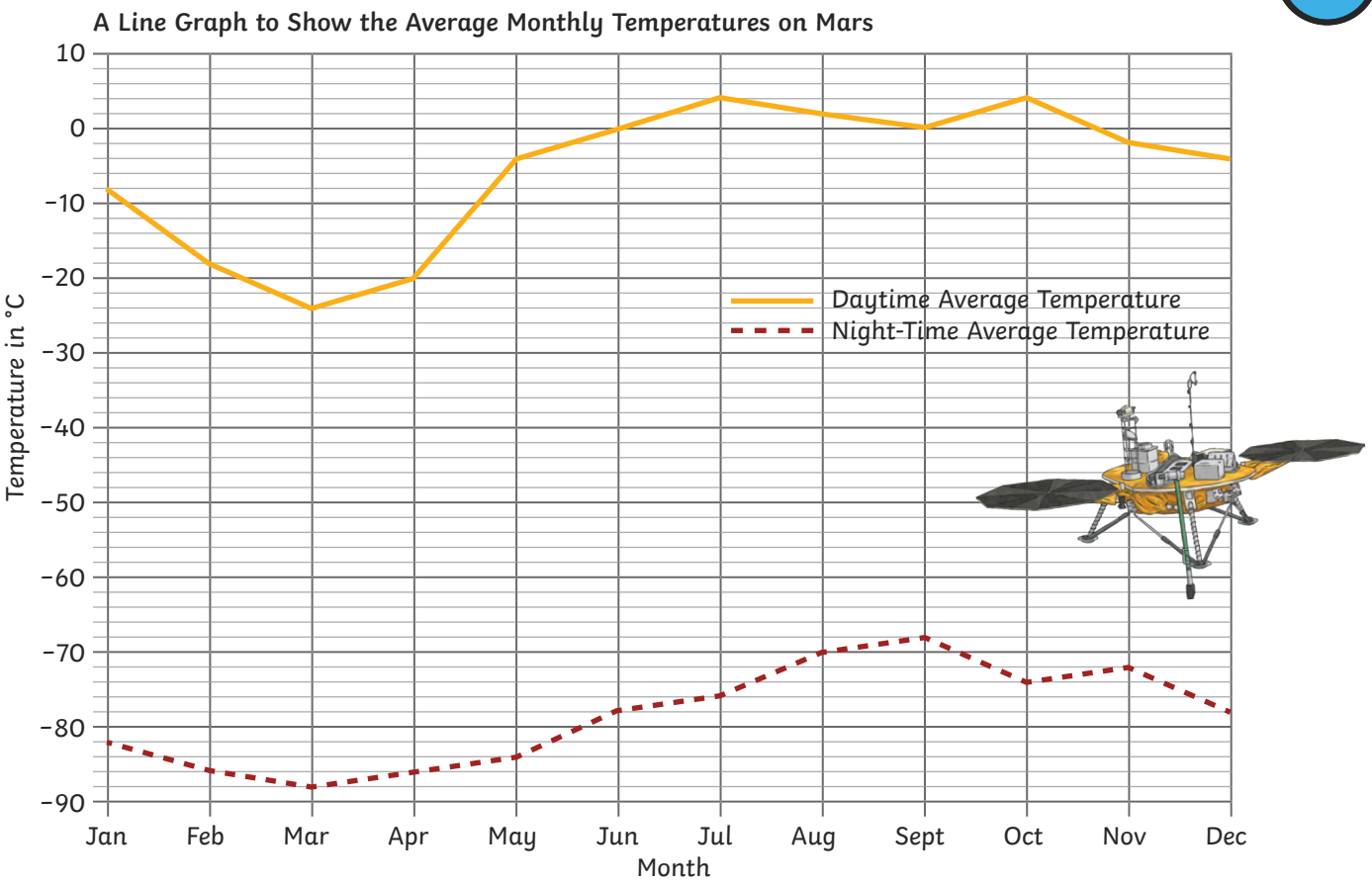
Missing Data:

Time	Temperature in °C	
	Monday	Tuesday
00:00	**−62**	−59
01:00	−70	−66
02:00	−72	−70
03:00	**−75**	**−72**
04:00	−75	−70
05:00	−68	−70
06:00	−57	−65
07:00	−45	−59
08:00	−43	−50
09:00	**−38**	−44
10:00	−29	**−33**
11:00	−25	−20
12:00	−19	−15
13:00	−19	**−10**
14:00	−18	−14
15:00	−15	−18
16:00	**−14**	−20
17:00	−20	−25
18:00	−23	**−25**
19:00	−30	−32
20:00	**−46**	−35
21:00	−52	−40
22:00	−60	**−48**
23:00	−60	−53

A Line Graph to Show the Temperature on Mars over 24 Hours



This line graph shows the average monthly temperatures on Mars for daytime and night time.



1) What was the average daytime temperature on Mars in April? _____

2) What was the average night-time temperature on Mars in August? _____

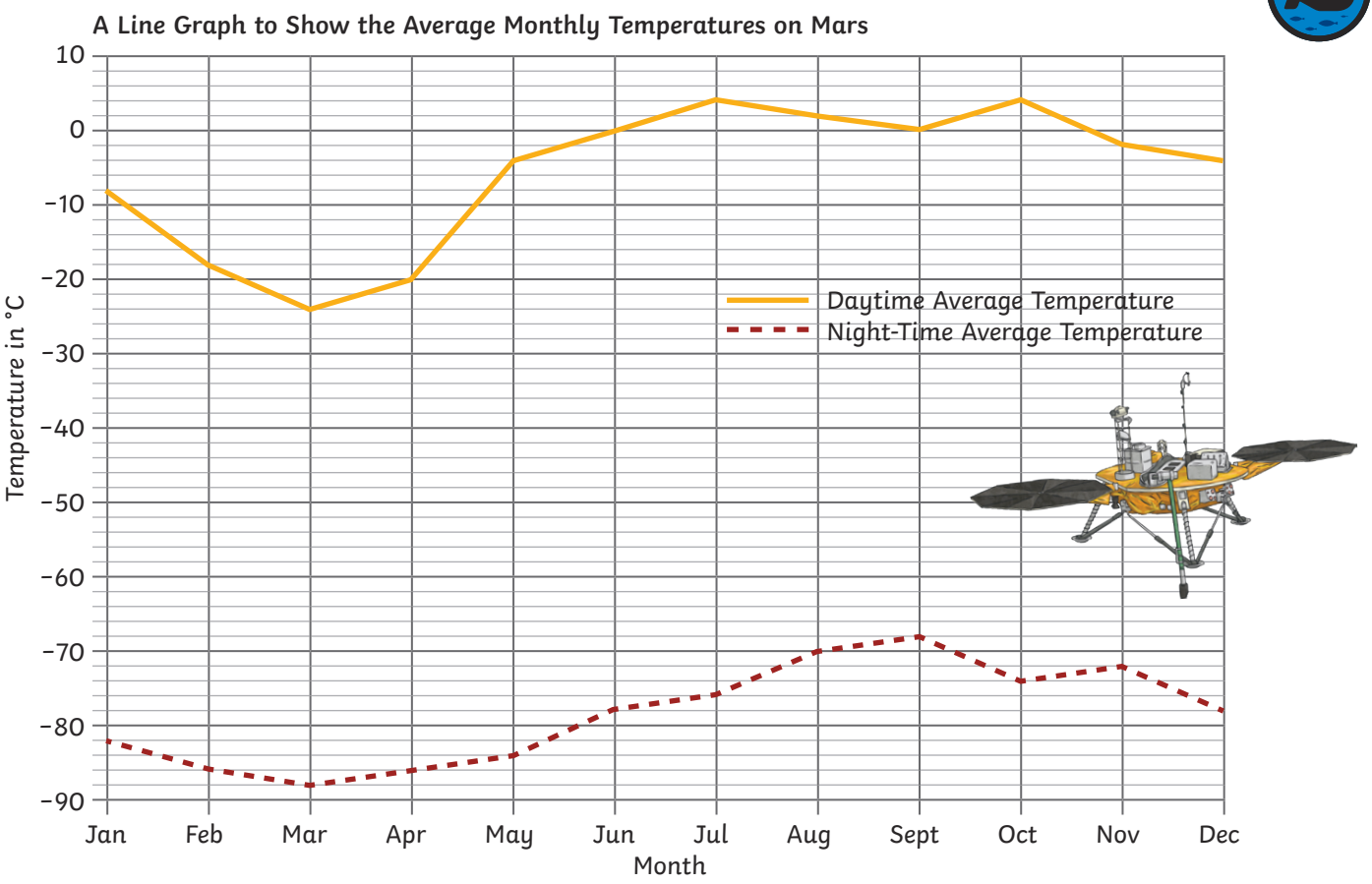
3) In which month was the average night-time temperature on Mars −68°C? _____

4) By how many degrees did the average daytime temperature on Mars change from April to June? _____

5) By how many degrees did the average night-time temperature on Mars change from January to March? _____

6) What was the difference between average daytime and night-time temperatures in February? _____

This line graph shows the average monthly temperatures on Mars for daytime and night time.



1) Decide whether each statement is true or false.
If you think the statement is false, explain how to change it to make it true.

Mars had its coolest average daytime temperature in March.

The difference between the warmest and coolest average night-time temperatures was 18°C.

The difference between average daytime and night-time temperatures in July was 72°C.

From any one month to the next month, the average night-time temperature didn't increase by more than 6°C.

2) Write your own true or false statements about the data for a friend to solve.

Some NASA scientists want to find out the answer to this question:

How does the temperature change on Mars?

They program the Mars rover to collect data for the temperature on Mars on two different days to find out.

Use the clues and the partial line graph to fill in the table and find out the difference in temperatures between Monday and Tuesday.

1) Coolest temperature on Monday:	
2) Warmest temperature on Monday:	
3) Coolest temperature on Tuesday:	
4) Warmest temperature on Tuesday:	
5) Difference in coolest temperatures between Monday and Tuesday:	
6) Difference in warmest temperatures between Monday and Tuesday:	
7) The difference between the temperature at 11:00 on Monday and on Tuesday was 5°C. What was the difference between the temperatures of the two days at 12:00?	
8) At what time did the temperatures on Monday and Tuesday have the greatest difference?	
9) What was the difference between the two temperatures at this time?	

- At 13:00, the temperature on Tuesday was 9°C warmer than on Monday.
- At 16:00, the temperature on Tuesday was 6°C cooler than on Monday.
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- At midnight, the temperature on Tuesday was 3°C warmer than the same time on Monday. At 22:00, the temperature on Tuesday was 11°C warmer than it had been at midnight.
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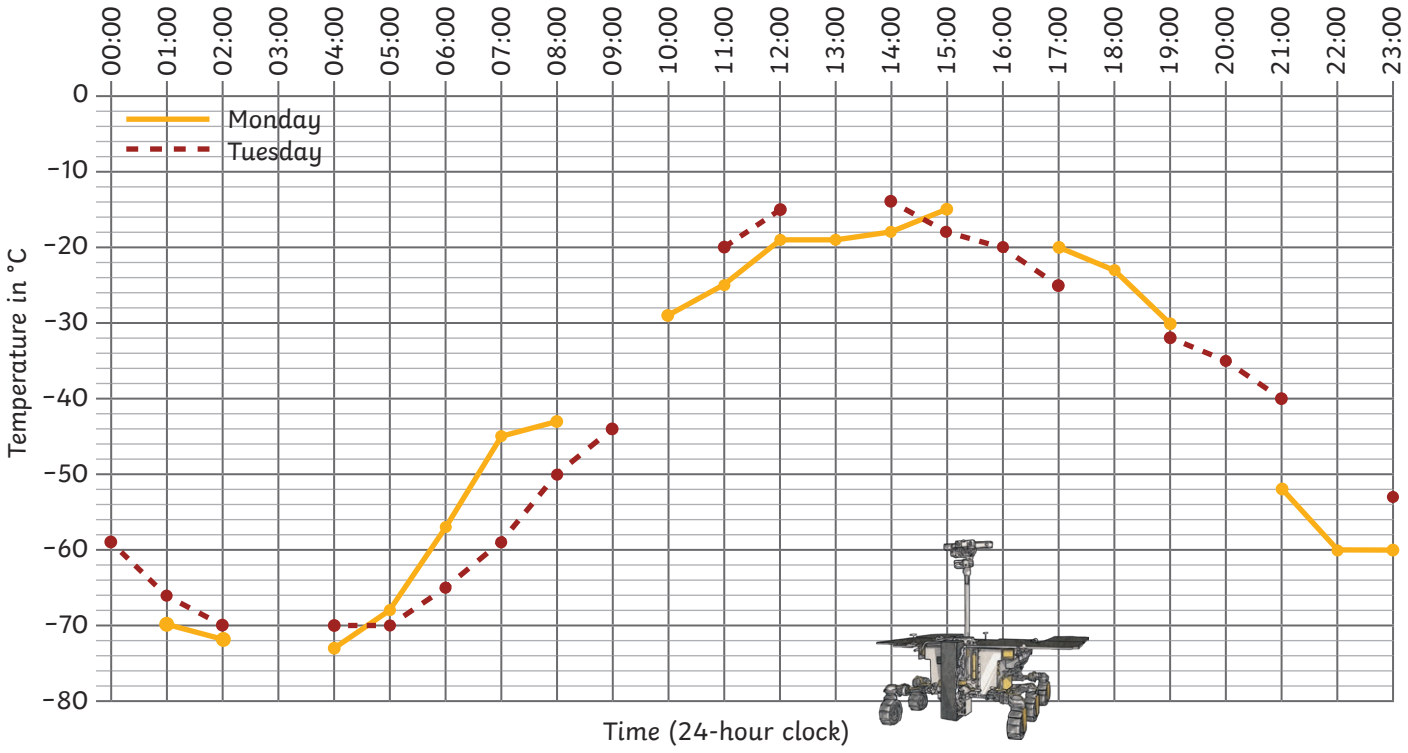
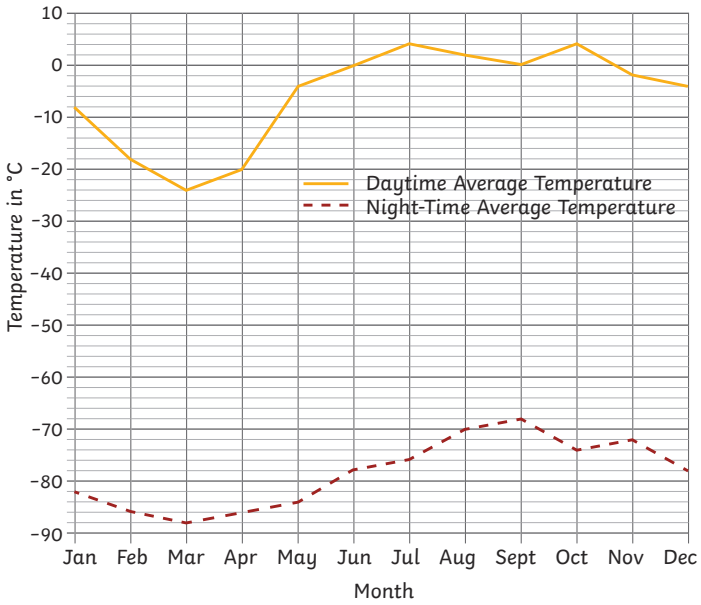


This line graph shows the average monthly temperatures on Mars for daytime and night time.

A Line Graph to Show the Average Monthly Temperatures on Mars



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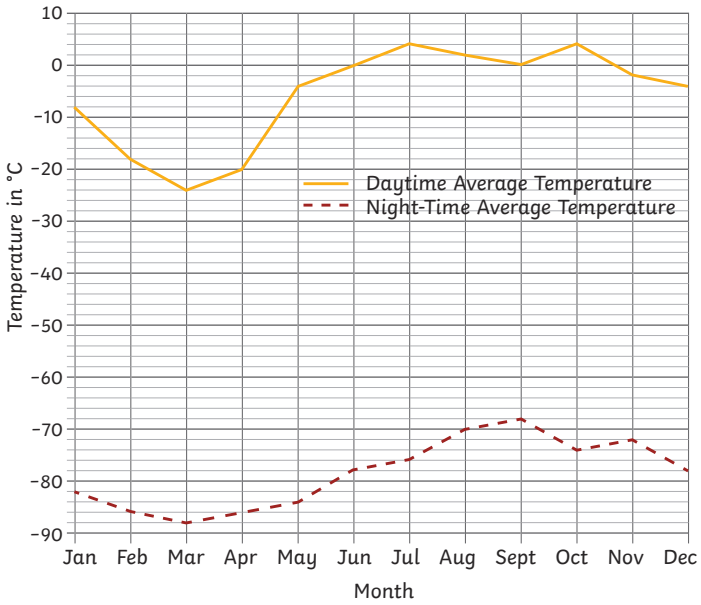

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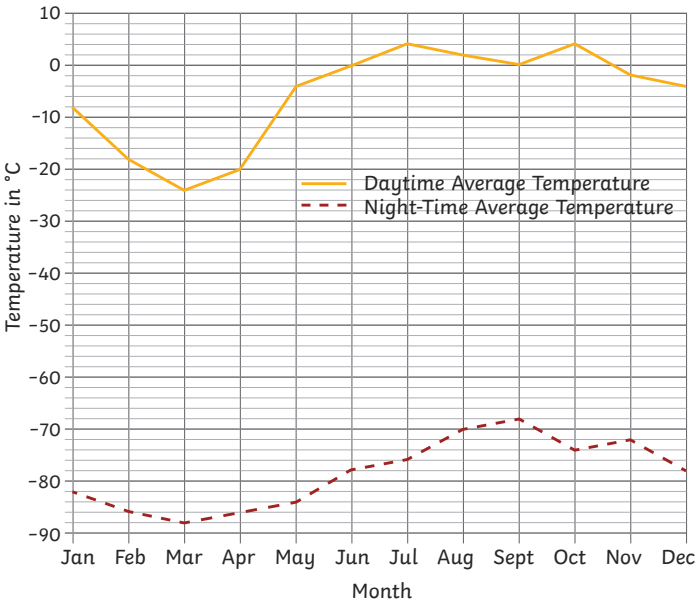

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The difference between average daytime and night-time temperatures in July is 72°C.

From any one month to the next month, the average night-time temperature doesn't increase by more than 6°C.

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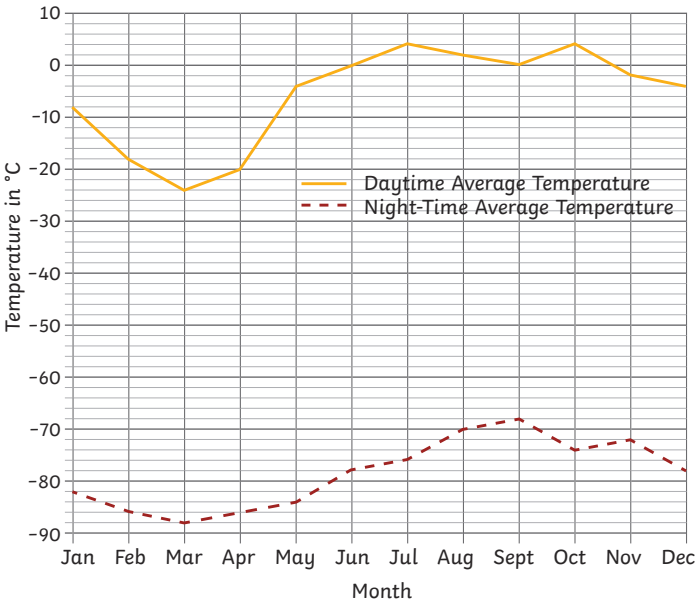

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5) What was the difference in coolest temperatures between Monday and Tuesday?

6) What was the difference in warmest temperatures between Monday and Tuesday?

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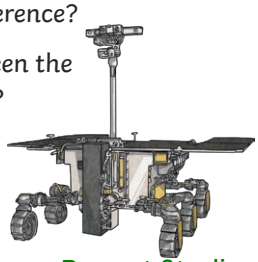

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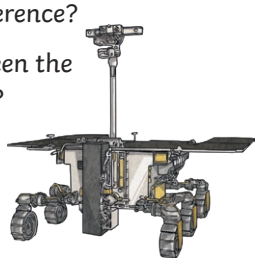

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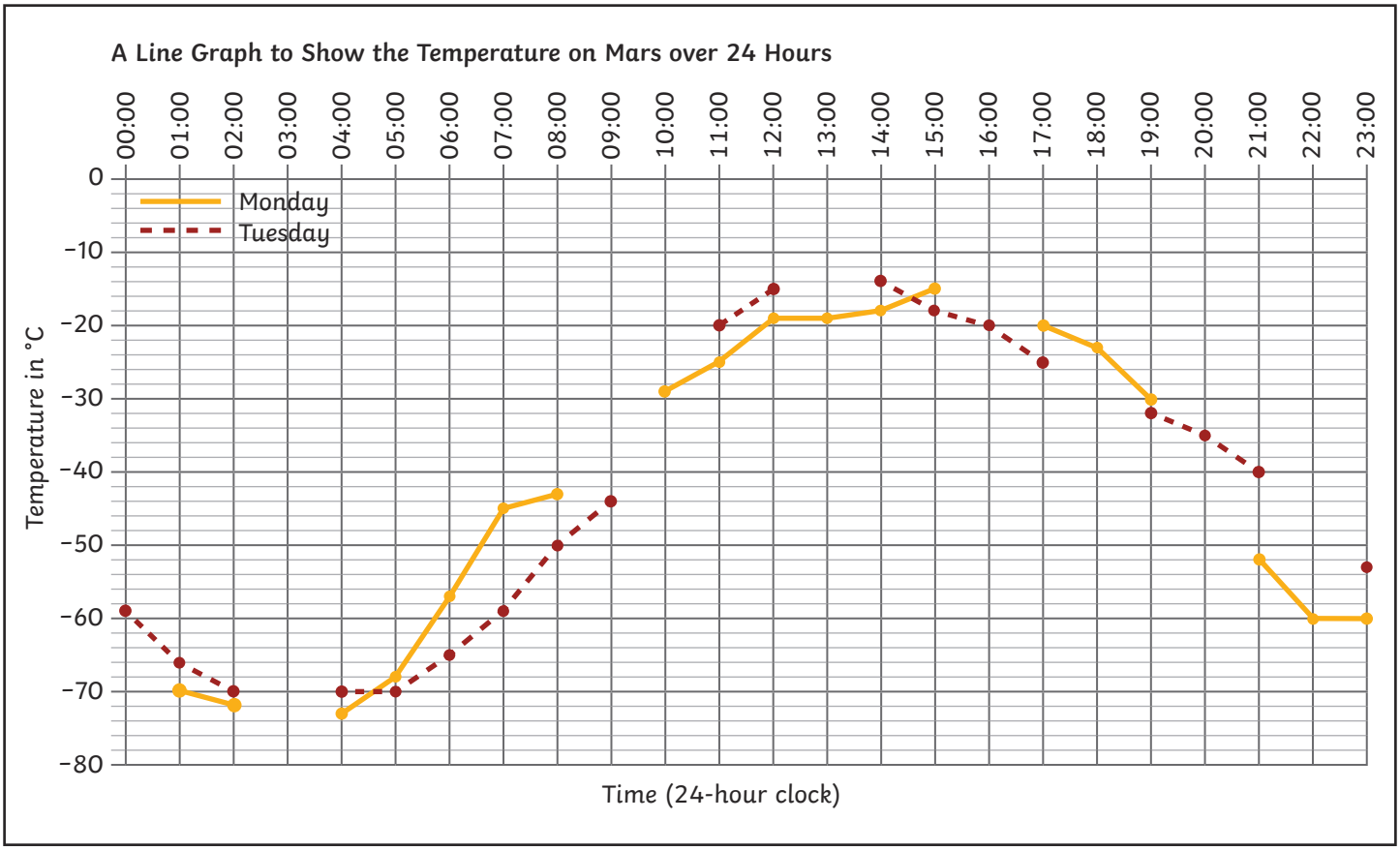
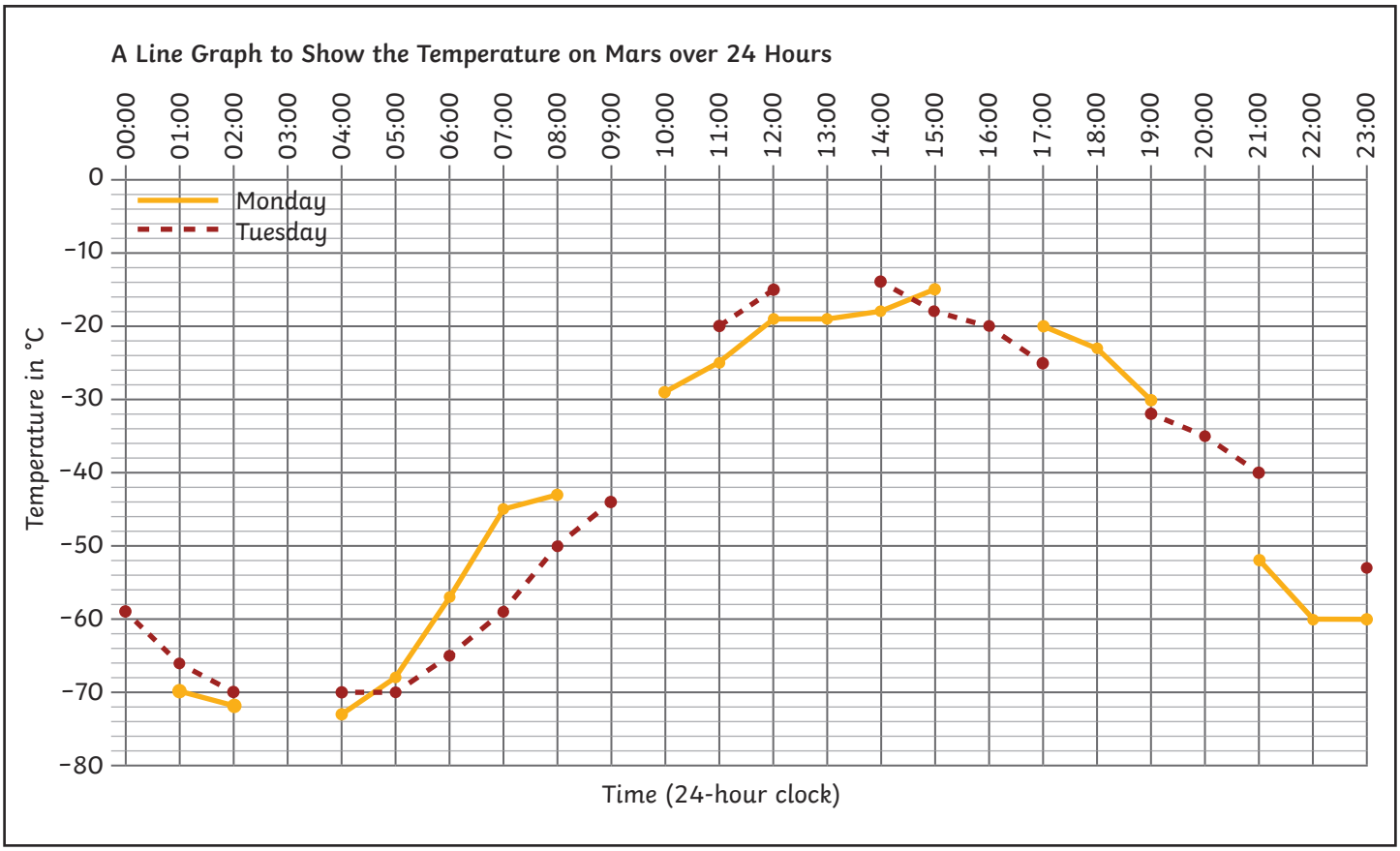

A Line Graph to Show the Temperature on Mars over 24 Hours
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0
-10
-20
-30
-40
-50
-60
-70
-80
Monday
Tuesday
Temperature in °C
Time (24-hour clock)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00:00
01:00
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04:00
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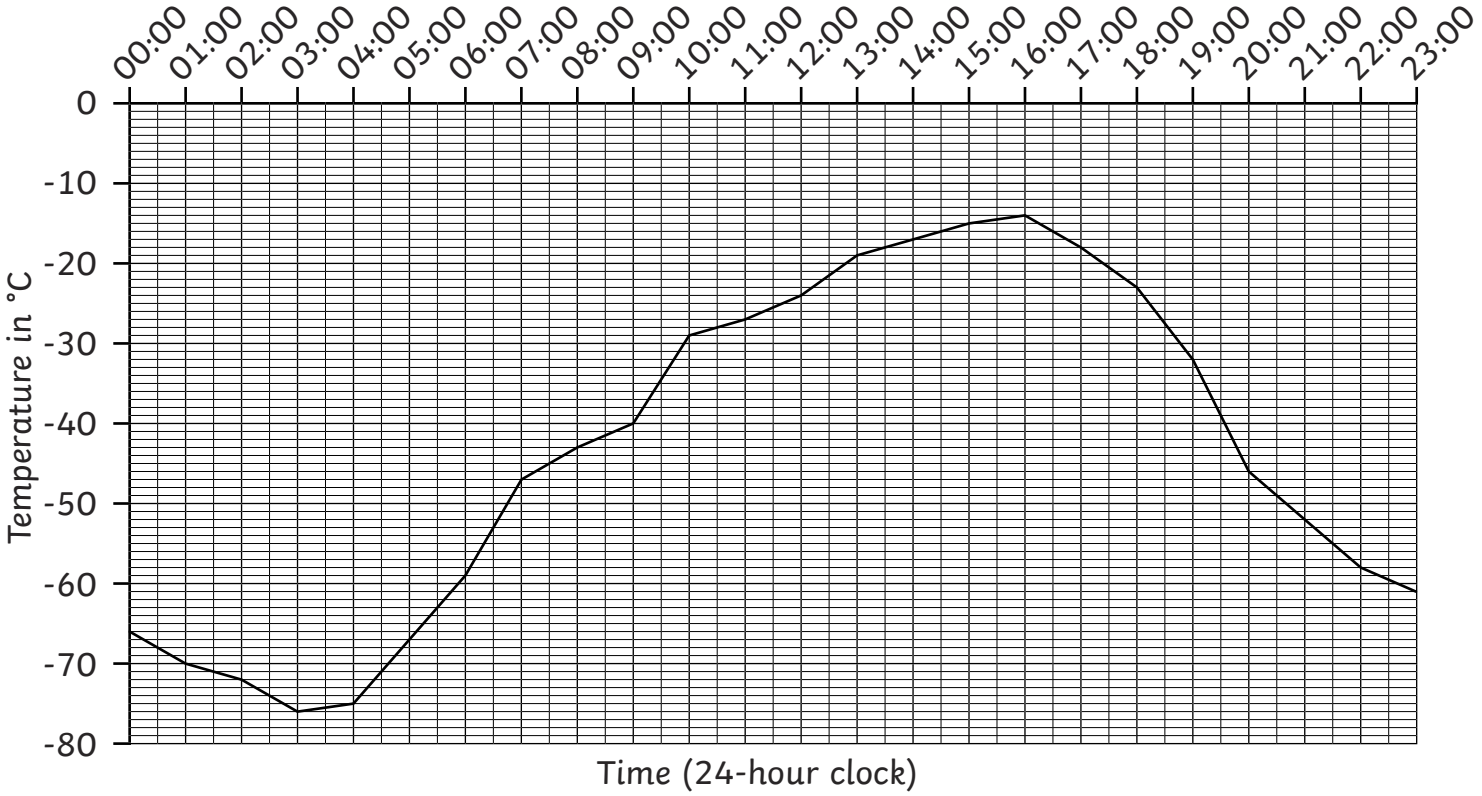
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0
-10
-20
-30
-40
-50
-60
-70
-80
Monday
Tuesday
Temperature in °C
Time (24-hour clock)

Mars Line Graphs

I can answer questions about data presented in a line graph.

A Line Graph to Show the Temperature on Mars over 24 Hours



1) What was the temperature on Mars at 20:00?

2) What was the temperature on Mars at 08:00?

3) At what time was the temperature on Mars -19°C?

4) At what time was the temperature on Mars -32°C?

5) By how many degrees did the temperature on Mars change from 18:00 to 20:00?

6) By how many degrees did the temperature on Mars change from 21:00 to 22:00?

7) From what time did the temperature on Mars drop from -14°C to -46°C?

8) From what time did the temperature on Mars increase from -75°C to -47°C?

9) By how many degrees did the temperature on Mars change over 24 hours?

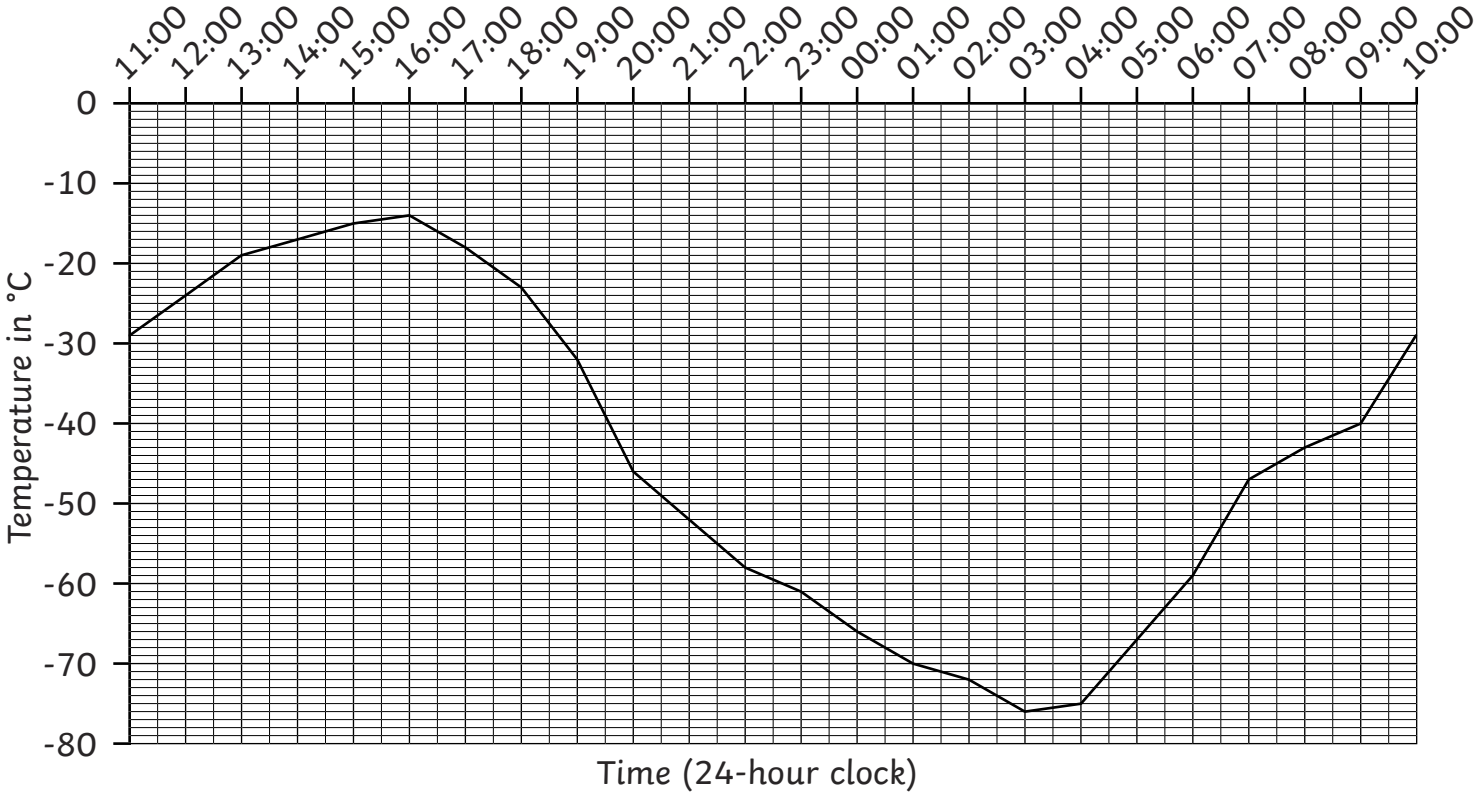
Mars Line Graphs **Answers**

Question	Answer
1.	What was the temperature on Mars at 20:00?
	-46°C
2.	What was the temperature on Mars at 08:00?
	-43°C
3.	At what time was the temperature on Mars -19°C?
	13:00 or 17:15
4.	At what time was the temperature on Mars -32°C?
	19:00 or 09:40
5.	By how many degrees did the temperature on Mars change from 18:00 to 20:00?
	23°C
6.	By how many degrees did the temperature on Mars change from 21:00 to 22:00?
	6°C
7.	From what time did the temperature on Mars drop from -14°C to -46°C?
	16:00 to 20:00
8.	From what time did the temperature on Mars increase from -75°C to -47°C?
	04:00 to 07:00
9.	By how many degrees did the temperature on Mars change over 24 hours?
	62°C

Mars Line Graphs

I can answer questions about data presented in a line graph.

A Line Graph to Show the Temperature on Mars over 24 Hours



1) What was the temperature on Mars at 22:00?

2) What was the temperature on Mars at 05:30?

3) At what time was the temperature on Mars -40°C?

4) At what time was the temperature on Mars -58°C?

5) By how many degrees did the temperature on Mars change from 16:00 to 20:00?

6) By how many degrees did the temperature on Mars change from 00:30 to 03:00?

7) From what time did the temperature on Mars increase from -21°C to -14°C?

8) By how many degrees did the temperature on Mars change over 24 hours?

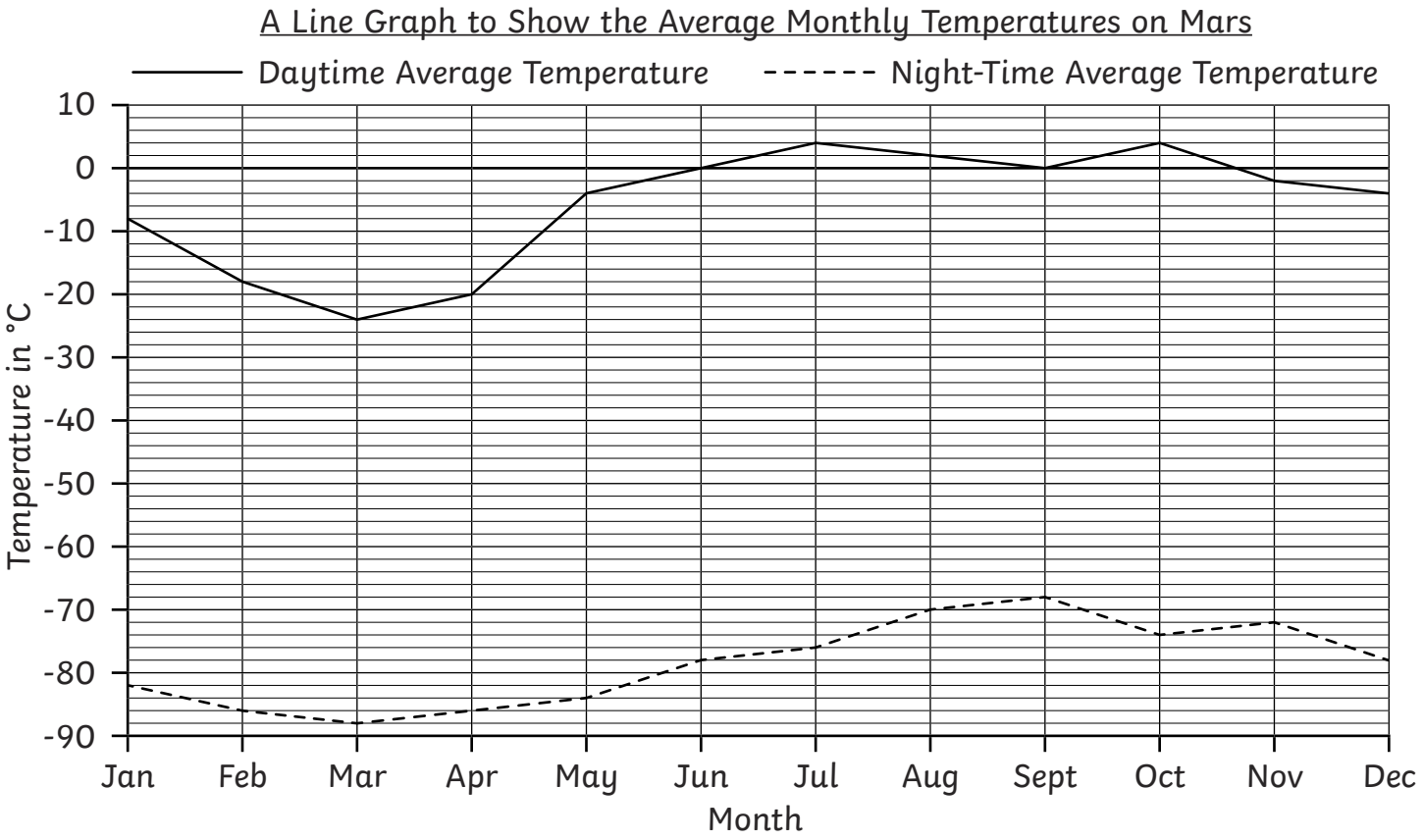
9) Between which times was the temperature on Mars between -60°C to -80°C?

Mars Line Graphs **Answers**

Question	Answer
1.	What was the temperature on Mars at 22:00?
	-58°c
2.	What was the temperature on Mars at 05:30?
	-63°c
3.	At what time was the temperature on Mars -40°C?
	09:00 or 19:30
4.	At what time was the temperature on Mars -58°C?
	22:00 or 06:00
5.	By how many degrees did the temperature on Mars change from 16:00 to 20:00?
	32°c
6.	By how many degrees did the temperature on Mars change from 00:30 to 03:00?
	8°c
7.	From what time did the temperature on Mars increase from -21°C to -14°C?
	12:30 to 16:00
8.	By how many degrees did the temperature on Mars change over 24 hours?
	62°c
9.	Between which times was the temperature on Mars between -60°C to -80°C?
	22:30 to 06:00

Mars Line Graphs

I can answer questions about data presented in a line graph.



1) What is the average daytime temperature on Mars in May?

2) What is the average night-time temperature on Mars in September?

3) In which months is the average night-time temperature on Mars -78°C?

4) By how many degrees does the average daytime temperature on Mars change from January to March?

5) By how many degrees does the average night-time temperature on Mars change from July to September?

6) By how many degrees does the average daytime temperature on Mars change over a year?

7) By how many degrees does the average night-time temperature on Mars change over a year?

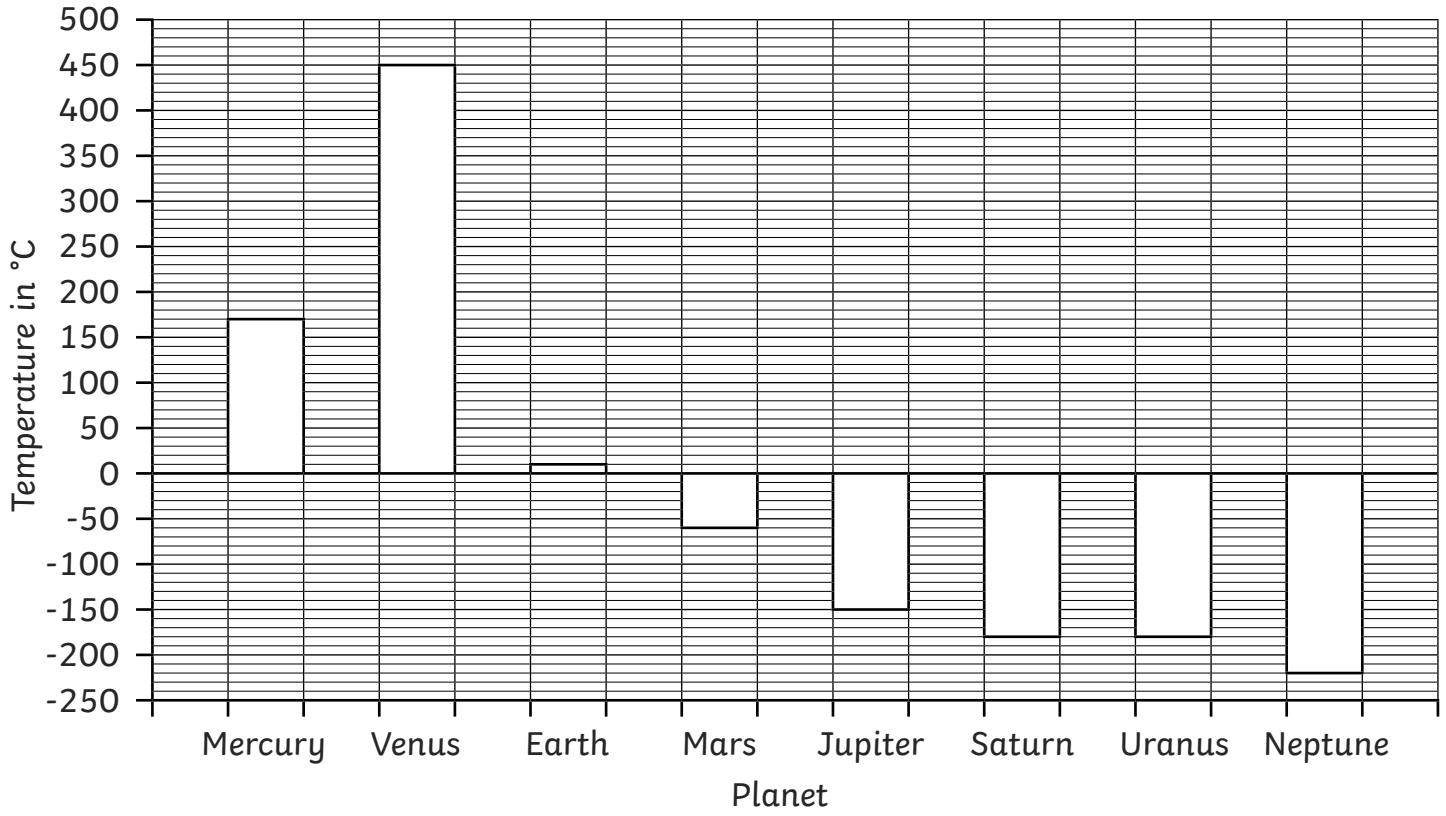
8) What is the difference between daytime and night-time temperatures on Mars in April?

9) What is the difference between daytime and night-time temperatures on Mars in October?

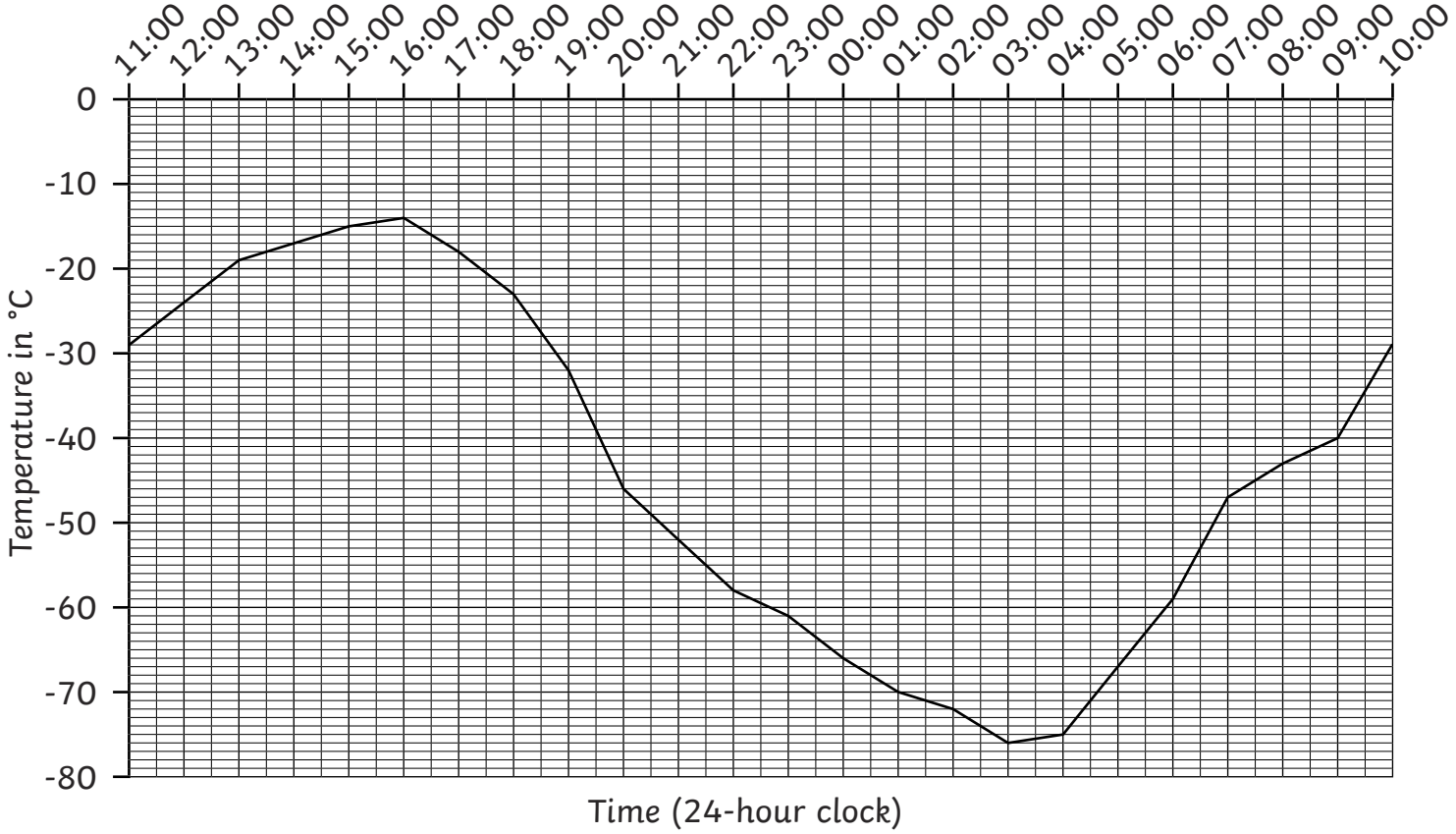
Mars Line Graphs **Answers**

Question	Answer
1.	What is the average daytime temperature on Mars in May?
	-4°C
2.	What is the average night-time temperature on Mars in September?
	-68°C
3.	In which months is the average night-time temperature on Mars -78°C?
	June and December
4.	By how many degrees does the average daytime temperature on Mars change from January to March?
	16°C
5.	By how many degrees does the average night-time temperature on Mars change from July to September?
	8°C
6.	By how many degrees does the average daytime temperature on Mars change over a year?
	28°C
7.	By how many degrees does the average night-time temperature on Mars change over a year?
	20°C
8.	What is the difference between daytime and night-time temperatures on Mars in April?
	66°C
9.	What is the difference between daytime and night-time temperatures on Mars in October?
	78°C

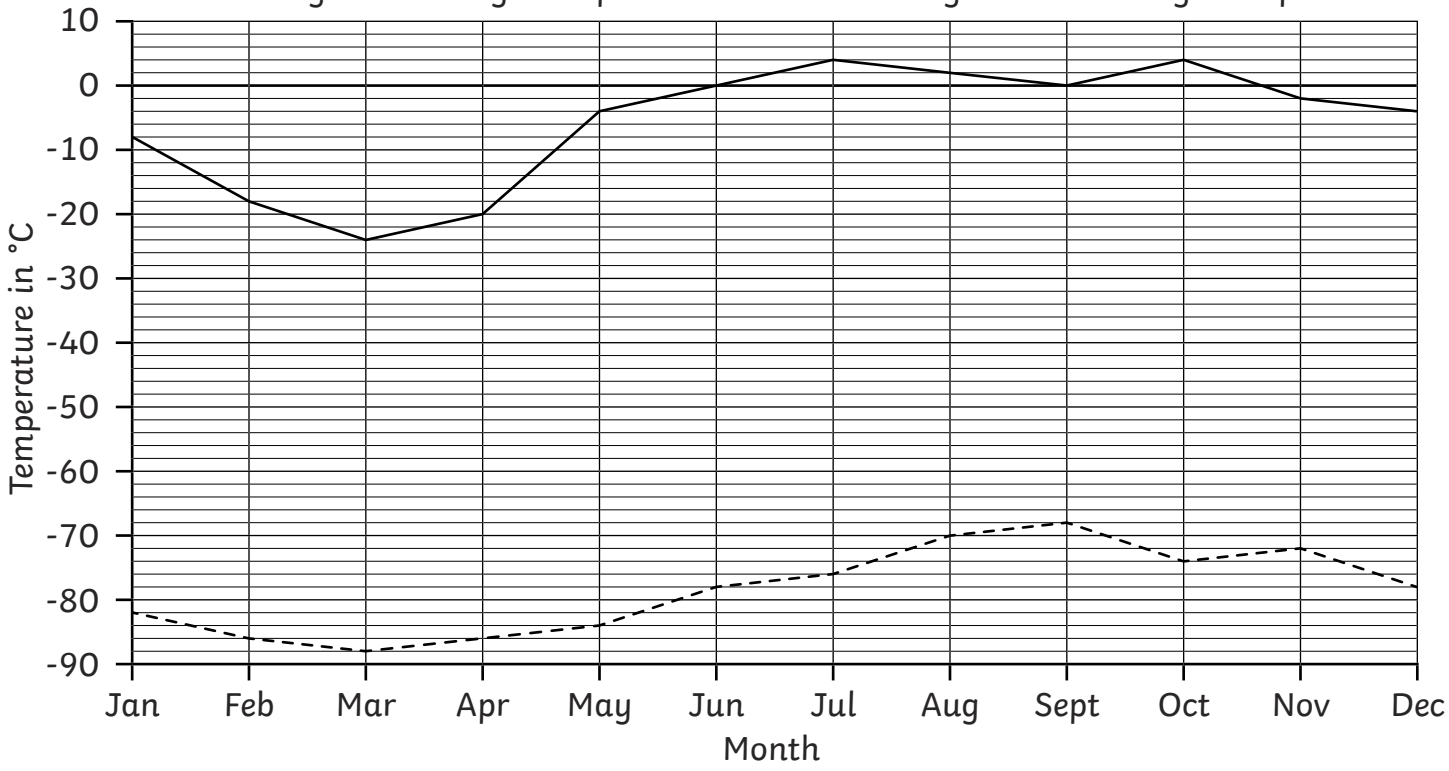
A Bar Chart to Show the Average Temperatures of the Planets in our Solar System



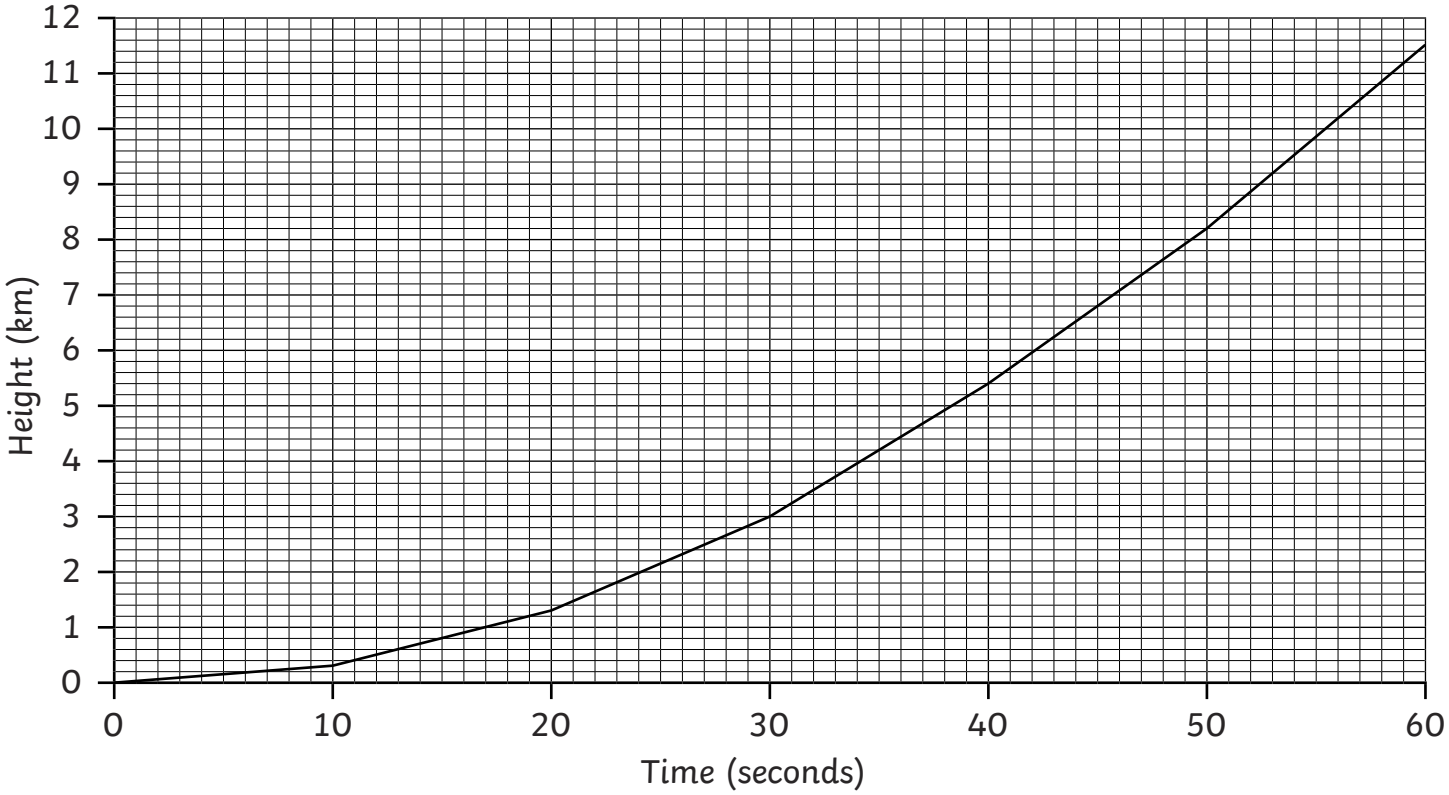
A Line Graph to Show the Temperature on Mars over 24 Hours



A Line Graph to Show the Average Monthly Temperatures on Mars



A Line Graph to Show the Altitude of a Space Rocket



Statistics | Mars Line Graphs

I can answer questions about data presented in a line graph.		
I can interpret data in bar charts and line graphs.		
I can identify the features of a line graph.		
I can answer comparison, sum and difference questions about data presented in a line graph.		

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