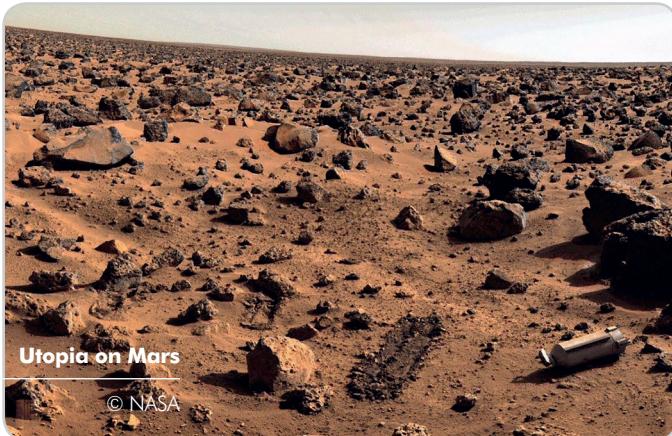


For 7 to 11 year olds

Context

ESA's ExoMars mission is sending a lander, and a rover called Rosalind Franklin, to Mars to search for evidence of life. Scientists believe that life might have existed when Mars was more like Earth, millions of years ago. Since living things on Earth need water and the right temperature to survive, good places to look for evidence of life on Mars might be where water once was. The landing site must allow a safe landing and enable the rover to travel easily across the area to drill for samples. The preferred site is in an area known as Oxia Planum. The area is relatively smooth for landing and has lots of clay, indicating that water was involved in its formation, so might have been habitable for microorganisms.

In this activity, the children watch a video clip of ExoMars and are introduced to some geographical features of Mars, including the proposed landing site. They identify the coordinates to match points marked on the map. They later look for points of interest and write coordinates for others to interpret.



National curriculum links

Maths - shape, space and measure:

- Identify coordinates in the first quadrant on a map, and then in two quadrants involving negative numbers
- Describe positions on the full coordinate grid (all four quadrants)
- Draw shapes using coordinates (extension)

Resources

- Activity sheets 1-1b with images of the Martian surface' key features, and images of delta on Earth
- Activity sheets 1c-1e with laminated landing site images
- Marker pens
- Paper or whiteboards

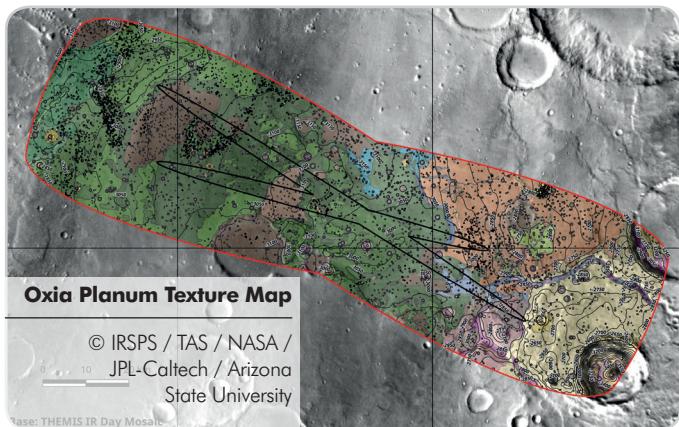
Lesson starter

Scientists are sending a rover called Rosalind on a long journey to Mars: exploration.esa.int/science-e/www/object/index.cfm?fobjectid=58091

Rosalind will collect samples of Mars soil and look for evidence of living things that may once have lived on Mars. The rover will need a parachute to help it land gently. This ESA video clip shows how it all happens: www.youtube.com/watch?v=9NpkbExlNiA

Rosalind has to land in a safe place avoiding obstacles such as mountains or rocks. Show the children a few images of key surface features of planet Mars from Activity sheets 1-1a or using this link:mars.nasa.gov/mro/multimedia/images/?ImageID=7731

The landing site needs to be sufficiently smooth so that Rosalind can move about on her wheels to places of interest. Since living things on Earth need water to live, scientists believe that the best places to look for life on Mars are where water once was: see some examples (show images from Activity sheet 1b of gullies on Mars and a river delta on Earth).



Main activity

Show the children the proposed landing site on Mars:
www.jpl.nasa.gov/spaceimages/details.php?id=PIA19851

It is called Oxia Planum. It is just north of the equator on Mars. Why do you think scientists chose this site? Can you recognise any interesting key features on the image? (See support notes for more information.) Can you spot any places where water may once have been? What clues are there?

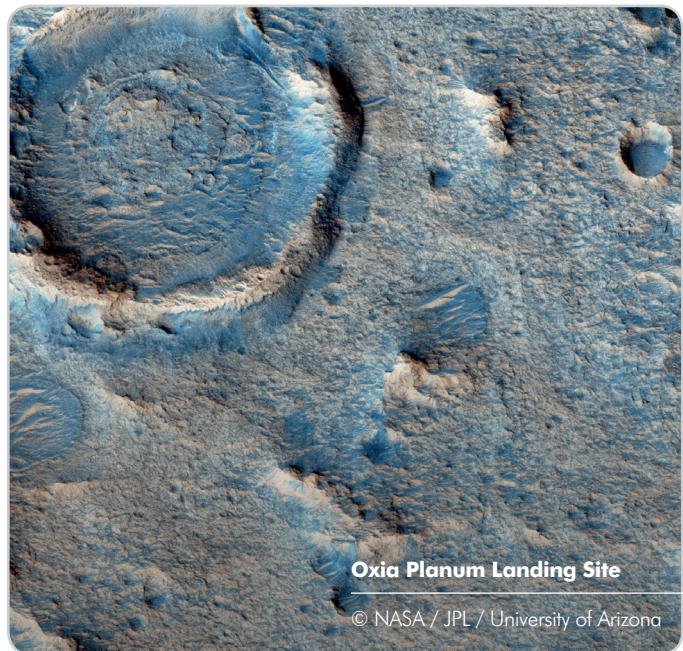
Today we are going to use coordinates to identify points on the map and places where Rosalind might take samples. On Activity sheet 1c are two maps of Oxia Planum; one has axes x and y and points marked on it in yellow. Can you write down the coordinates for each point marked on the image? The other image just has the axes and some coordinates are given under the map. Can you mark the coordinates onto the blank image?

Next, on Activity sheet 1d, the second map has a grid with axes and two quadrants. There are some negative numbers this time on the x axis. Can you write the coordinates for all the points shown? Can you mark the coordinates on the blank map? Map 3 has more coordinate challenges!

Plenary

Show maps 1 and 2 on the whiteboard and together identify and write down the coordinates for the points marked. Ask for volunteers to mark on the maps the coordinates given. Challenge them to give the coordinates for a larger area on the map, a whole square or several squares. Point out the large crater on the image of Oxia Planum. Rosalind is going to land on a smooth area but do the children think that a rover could ever land in a crater? It is possible, provided that the crater is sufficiently wide, and deep enough for the parachute to have time to slow the lander before it reaches the landing surface. In 2012 NASA's Curiosity rover landed in Gale crater on Mars. Show the animation of the landing.

www.youtube.com/watch?v=Ki_Af_o9Q9s



Further activities

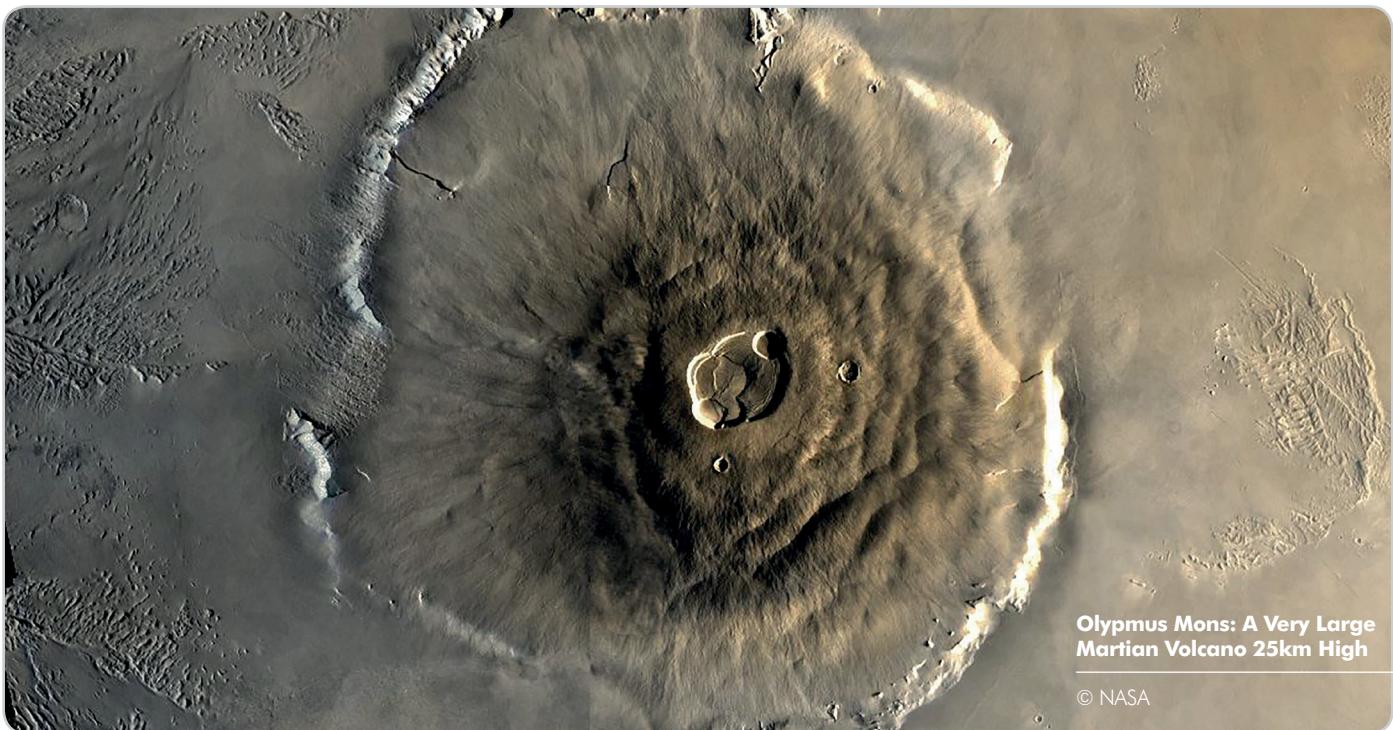
- Choose more points on Map 3 and give the coordinates in all four quadrants. Can you write coordinates for a whole square or even several squares on the map?
- Research Mars and draw a map showing features of your choice. Try making some craters by dropping a marble from different heights into sand in a tray. What do you notice about the craters produced? Try different sizes of marbles from the same height. What did you discover?
- Half fill a tray with sand. Raise one end of the tray and slowly pour water onto the sand. Observe the channels formed. Are they similar to channels in the Mars images?

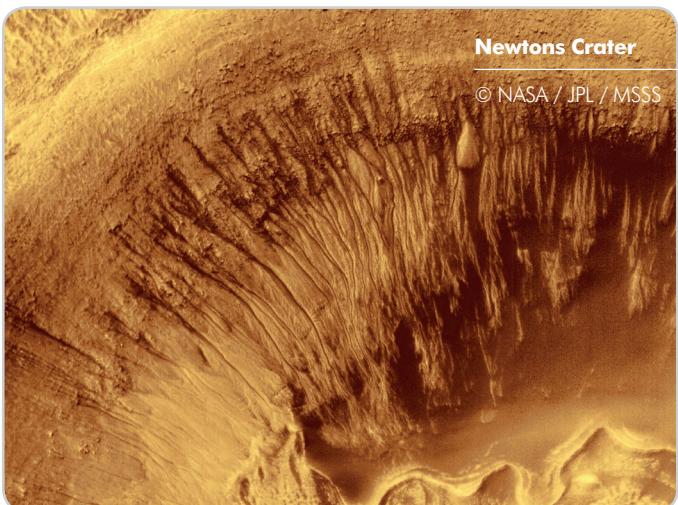
STEM Vocabulary

Crater	Volcano	X and Y axes
Channel	Coordinate	Forward, Along,
Delta	Position	Up, Down

Images of geographical features on Mars
mars.nasa.gov/mro/multimedia/images/?ImageID=7731

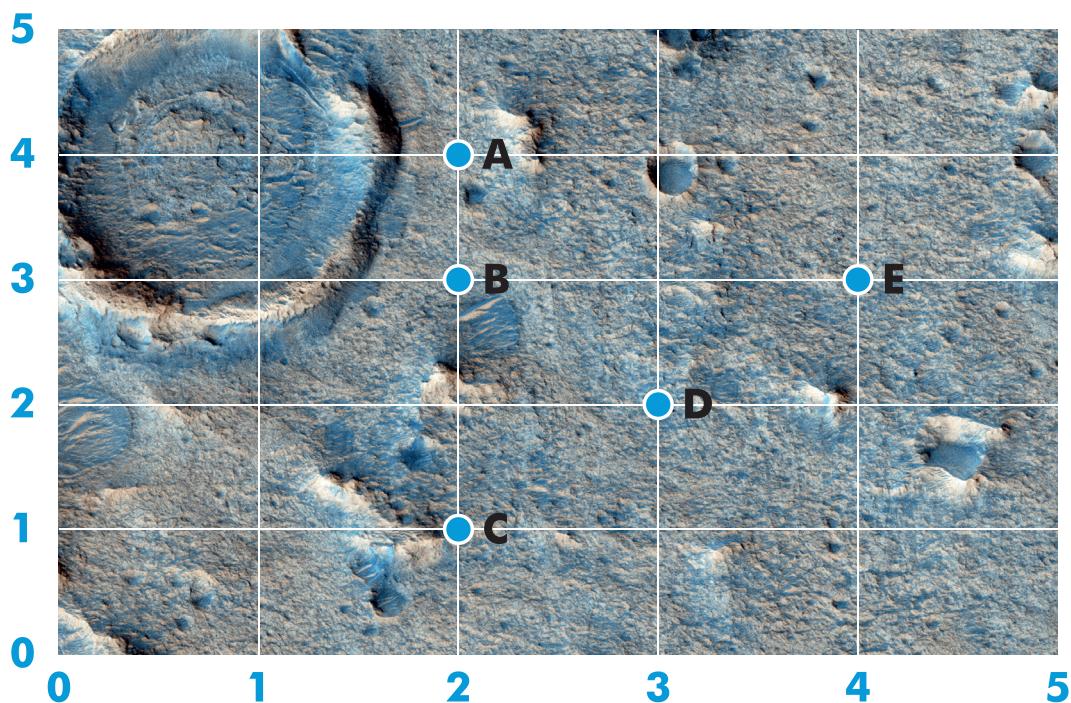






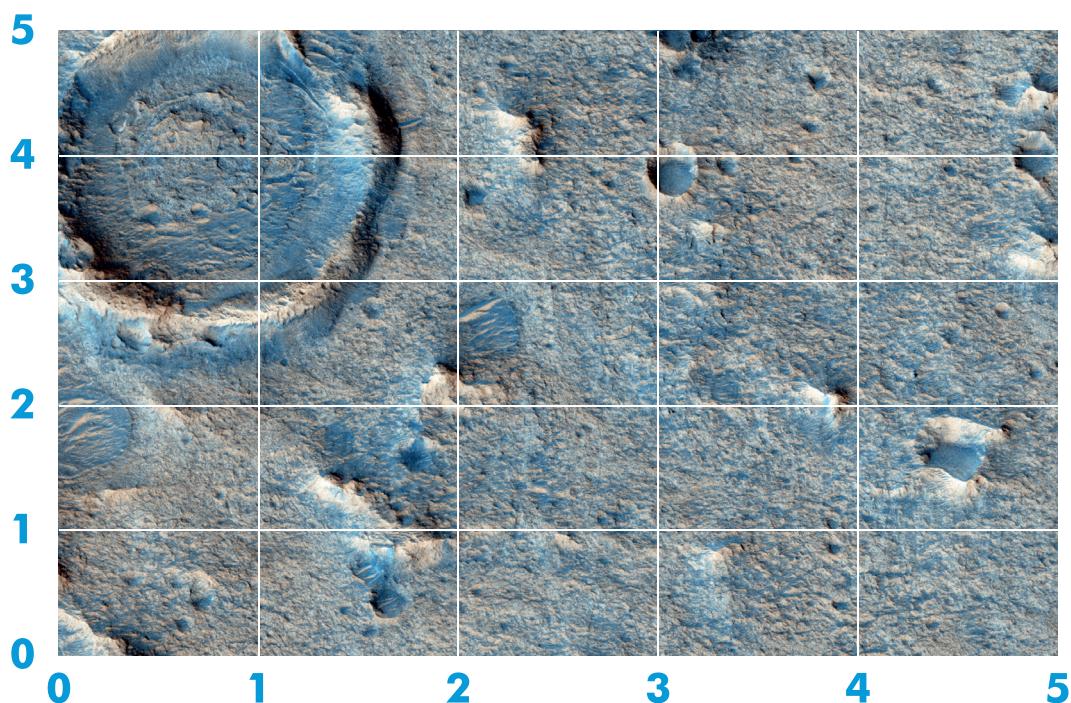
Scientists believe these channels on Mars were made by running water in the past

Oxia Planum Landing Site © NASA / JPL / University of Arizona



Write the coordinates for each of the letters A-E, marked on the map.

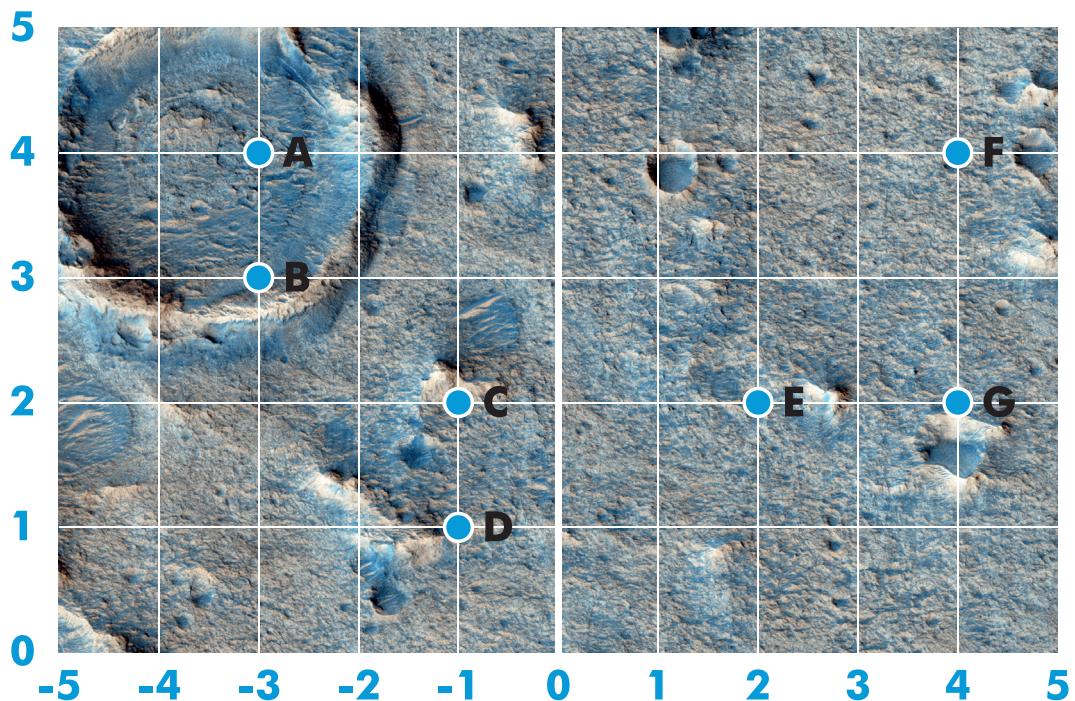
- A _____
B _____
C _____
D _____
E _____



Mark the points that match these coordinates on the map.

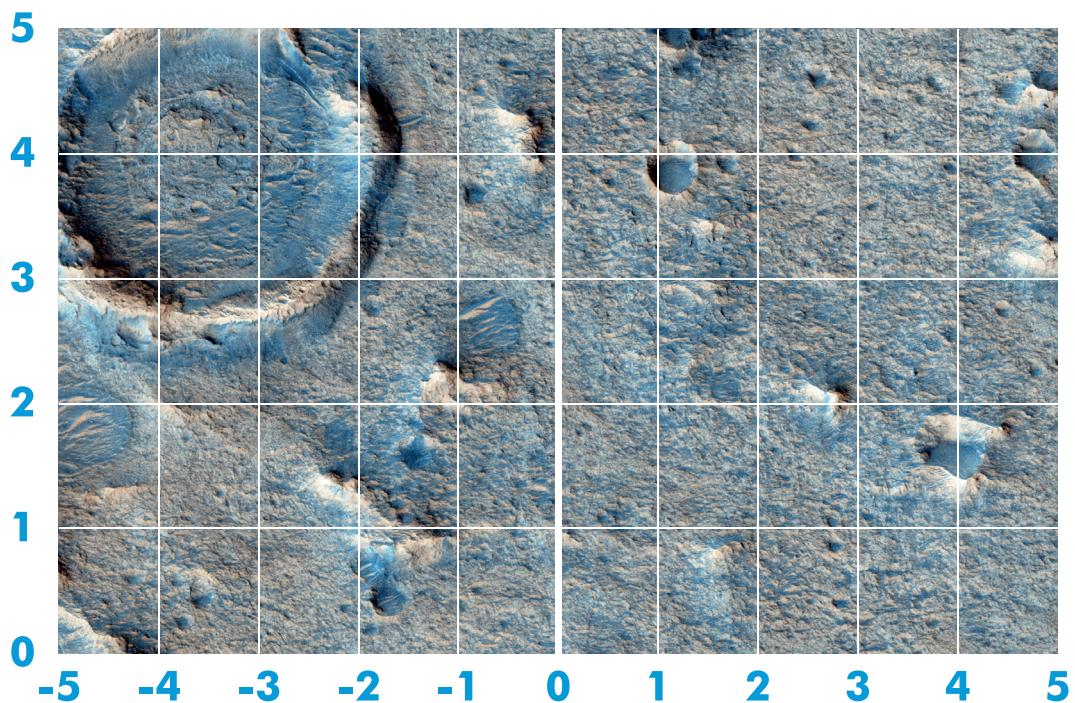
- A (2, 3)
B (4, 2)
C (3, 5)
D (5, 1)
E (1, 4)
F (2, 5)

Oxia Planum Landing Site © NASA / JPL / University of Arizona



Write the coordinates for each of the letters A-G marked on the map.

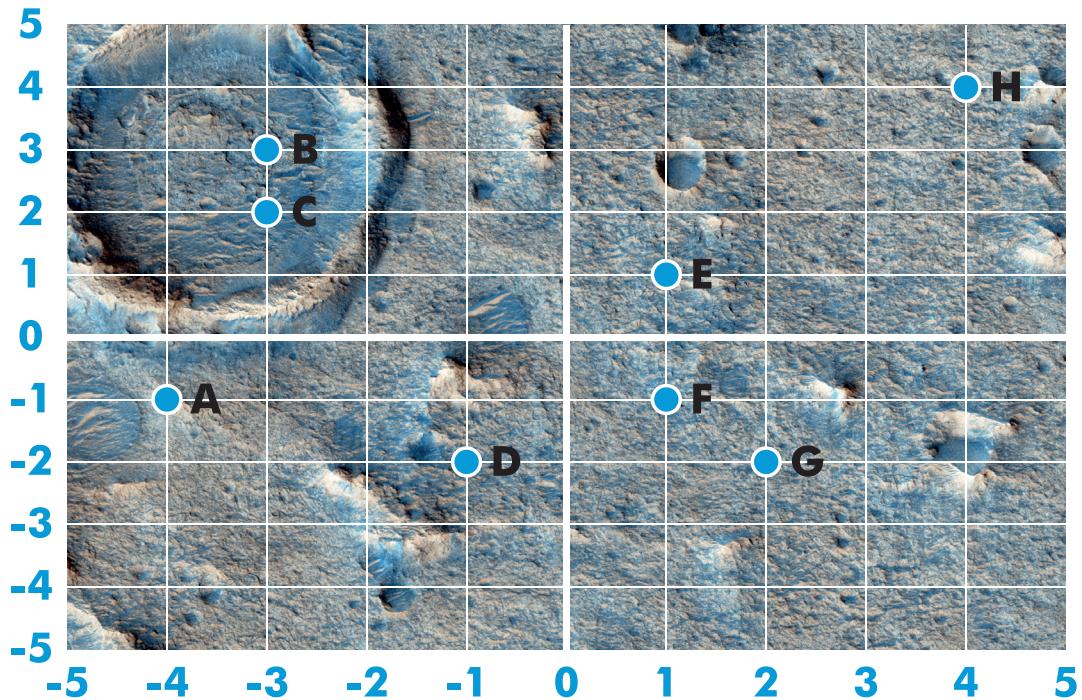
- A _____
B _____
C _____
D _____
E _____
F _____
G _____



Mark the points that match these coordinates on the map

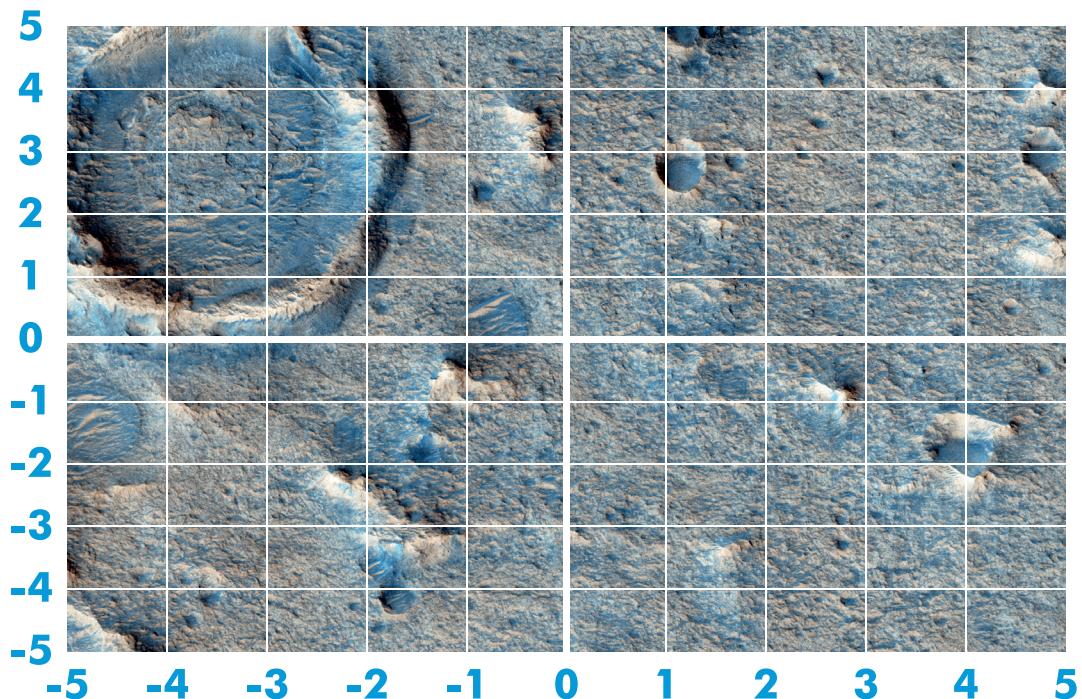
- A (-3, 2)
B (3, 5)
C (-2, 3)
D (5, 3)
E (4, 4)
F (-1, 4)

Oxia Planum Landing Site © NASA / JPL / University of Arizona



Write the coordinates for each of the letters A-H marked on the map.

- A _____
B _____
C _____
D _____
E _____
F _____
G _____
H _____



Mark the points that match these coordinates on the map

- A (-4, -2)
B (-3, 2)
C (5, 4)
D (-1, -4)
E (2, -4)
F (5, -3)