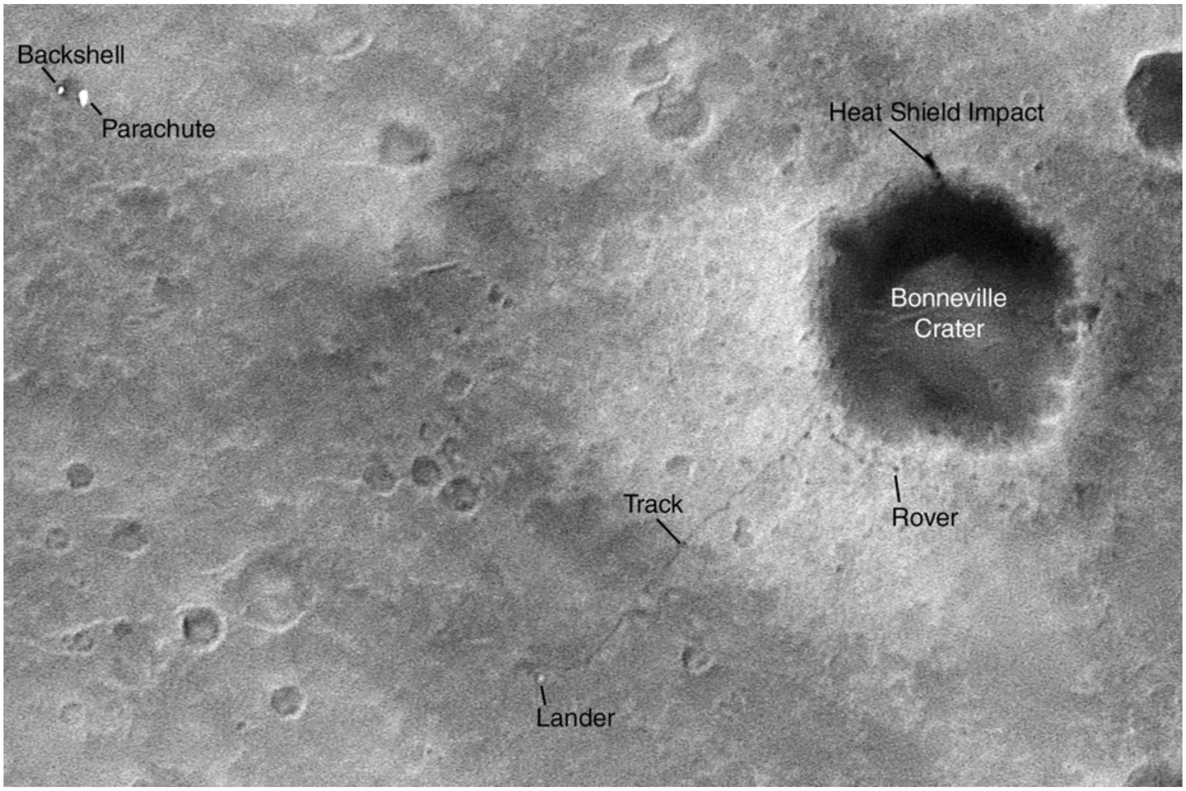
Mars Rover Landing Site



This NASA, Mars Orbiter image of the Mars Rover, Spirit, landing area near Bonneville Crater. The width of the image is exactly 895 meters. (Credit: NASA/JPL/MSSS). It shows the various debris left over from the landing, and the track of the Rover leaving the landing site.

The scale of an image is found by measuring with a ruler the distance between two points on the image whose separation in physical units you know. In this case, we are told the width of the image is 895 meters.

Step 1: Measure the width of the image with a metric ruler. How many millimeters wide is it?
Step 2: Use clues in the image description to determine a physical distance or length. Convert to meters.
Step 3: Divide your answer to Step 2 by your answer to Step 1 to get the image scale in meters per millimeter to two significant figures.

Once you know the image scale, you can measure the size of any feature in the image in units of millimeters. Then multiply it by the image scale from Step 3 to get the actual size of the feature in meters to two significant figures.

Problem 1: About what is the diameter of Bonneville Crater rounded to the nearest ten meters?

Problem 2: How wide, in meters, is the track of the Rover?

Problem 3: How big is the Rover?

Problem 4: How small is the smallest well-defined crater to the nearest meter in size?

Problem 5: A boulder is typically 5 meters across or larger. Are there any boulders in this picture?

Answer Key:

This NASA, Mars Orbiter image of the Mars Rover, Spirit, landing area near Bonneville Crater. The width of the crater is 200 meters. (Credit: NASA/JPL/MSSS). It shows the various debris left over from the landing, and the track of the Rover leaving the landing site.

The scale of an image is found by measuring with a ruler the distance between two points on the image whose separation in physical units you know. In this case, we are told the width of the image is 895 meters.

Step 1: Measure the width of the image with a metric ruler. How many millimeters wide is it?
Answer: 157 millimeters.

Step 2: Use clues in the image description to determine a physical distance or length. Convert to meters.
Answer: 895 meters.

Step 3: Divide your answer to Step 2 by your answer to Step 1 to get the image scale in meters per millimeter to two significant figures.
Answer: 895 m/157 mm = 5.7 meters / millimeter.

Once you know the image scale, you can measure the size of any feature in the image in units of millimeters. Then multiply it by the image scale from Step 3 to get the actual size of the feature in meters.

Problem 1: About what is the diameter of Bonneville Crater rounded to the nearest 10 meters?
Answer: Students answers for the diameter of the crater in millimeters may vary, but answers in the range from 30-40 mm are acceptable. Then this equals 30x5.7 = 170 meters to 40x5.7=230 meters. Students may average these two measurements to get (170+230)/2 = 200 meters.

Problem 2: How wide, in meters, is the track of the Rover?
Answer: 0.2 millimeters = 1 meter.

Problem 3: How big is the Rover?
Answer: 0.3 millimeters = 1.7 meters but since the measurement is only 1 significant figure, the answer should be 2 meters.

Problem 4: How small is the smallest well-defined crater in meters?
Answer: 2 millimeters x 5.7 = 11.4 meters, which to the nearest meter is 11 meters.

Problem 5: A boulder is typically 5 meters across or larger. Are there any boulders in this picture?
Answer: Students answers may vary and lead to interesting discussions about what features are real, and which ones are flaws in the printing of the picture. This is an important discussion because 'image artifacts' are very common in space-related photographs. 5 meters is about 1 millimeter, and there are no obvious rounded objects this large or larger in this image.