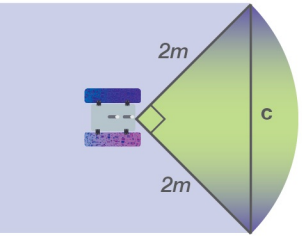
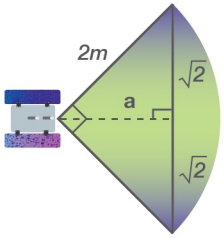
π IN THE SKY 11

ANSWER KEY



MOON MAPPERS

How far does each rover have to drive to survey its portion of the Moon's surface?



1. **Convert radians to degrees, then use the Pythagorean theorem to find the swath width.**

   $(\pi/2) \bullet (180°/\pi) = 90°$

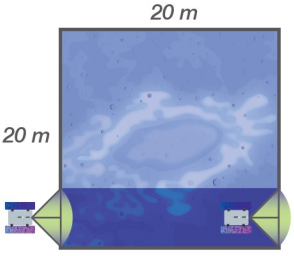
   $a^2 + b^2 = c^2 \Rightarrow (2\text{ m})^2 + (2\text{ m})^2 = c^2 \Rightarrow c = 2\sqrt{2}\text{ m}$

2. **Determine the number of swaths the rovers need to drive to map the entire square.**

   $20\text{ m} / 2\sqrt{2}\text{ m} = 5\sqrt{2} \approx 7.07$ swaths, round up to 8 swaths to ensure complete coverage

3. **Use the Pythagorean theorem to determine the sensor triangle's altitude length.**

   $a^2 + b^2 = c^2 \Rightarrow a^2 + (\sqrt{2}\text{ m})^2 = (2\text{ m})^2 \Rightarrow a = \sqrt{2}\text{ m}$

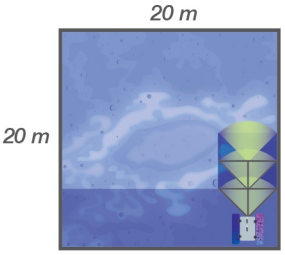


4. **Determine the horizontal drive distance for the first swath.**

   $\sqrt{2}\text{ m} + 20\text{ m} - \sqrt{2}\text{ m} = 20\text{ m}$

5. **Determine the vertical distance the rover must drive to position itself for the second swath. Note that the rover rotating in place does not add drive distance.**

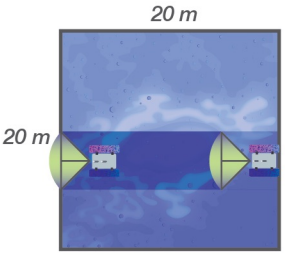
   $\sqrt{2}\text{ m} + \sqrt{2}\text{ m} = 2\sqrt{2}\text{ m}$



6. **Determine the horizontal drive distance for the second swath, then add it to the vertical distance. The result is the drive distance for each subsequent swath.**

   $20\text{ m} - 2\sqrt{2}\text{ m}$

   $20\text{ m} - 2\sqrt{2}\text{ m} + 2\sqrt{2}\text{ m} = 20\text{ m}$



7. **Compute the total distance to be driven by all three rovers, then divide by three.**

   $(20\text{ m})(8) = 160\text{ m}$

   $(160\text{ m}) / 3 \approx 53.3\text{ m}$, round up to **54 m**