DATE: NAME: CLASS:

CHAPTER 11

Astronomical Distance Units

BLM 4-36

Goal • Practise using different units of measurement for astronomical distances.

Think About It

Would it be sensible to measure distance to the Moon in millimetres? How about the distance to the Sun or farther? Scientists use a variety of units to make astronomical measurements in space practical and useful.

What to Do

Read the examples below and fill in the blanks for each question.

Planets

For distances on Earth, metres and kilometres are suitable units.

Example: Radius of Earth = 6400 km = 6 400 000 m = 6.4×10^6 m

1. Circumference of Earth = about 40 000 km = _____ m = _____ $\times 10^7$ m
2. Distance to the Moon = _____ km = _____ m = 3.8×10^8 m

Inside the Solar System

For distances to other places in the solar system, astronomical units (AU) are convenient and practical units.

Example: Distance from Earth to the Sun = 1 AU = 1.5×10^{11} m

3. Mars is about one and a half times as far from the Sun as the Earth. Distance from the Sun to Mars is 1.5 AU = _____ m
4. Distance from Jupiter to the Sun is 7.8×10^{11} m = _____ AU

Interstellar Distances

Distances to stars are so great that light-years—the distance light travels in a year—are used.

Example: The nearest star is 4.3 light-years away. The distance to the star Betelgeuse in Orion is 1400 light-years.

5. The distance to the brightest star in the sky, Sirius, is 9 light-years. Suppose we could travel at half the speed of light and we took off in a rocket for Sirius today. If we started back immediately after our arrival, in what year would we expect to return to Earth?

ANSWER KEY

BLM 4-36, Astronomical Distance Units

1. $40\,000\,\text{km} = 40\,000\,000\,\text{m} = 4 \times 10^7\,\text{m}$
2. $380\,000\,\text{km} = 380\,000\,000\,\text{m} = 3.8 \times 10^8\,\text{m}$
3. $2.25 \times 10^{11}\,\text{m}$
4. $7.8 \times 10^{11}\,\text{m} = \dfrac{7.8 \times 10^{11}\,m}{1.5 \times 10^{11}\,m}\, 7.8 \times 10^{11}\,\text{m} / 1.5 \times 10^{11}\,\text{m per Au} = 5.2\,\text{AU}$
5. Time for round trip: 18 light-years divided by 0.5 speed of light = 36 years
   Return date = today + 36 years