

Chapter 1

1. **THINK** In this problem we're given the radius of Earth and asked to compute its circumference, surface area, and volume.

EXPRESS Assuming Earth to be a sphere of radius

$$R_E = (6.37 \times 10^6 \text{ m})(10^{-3} \text{ km/m}) = 6.37 \times 10^3 \text{ km},$$

we find that the corresponding circumference, surface area, and volume are

$$C = 2\pi R_E, \quad A = 4\pi R_E^2, \quad V = \frac{4\pi}{3} R_E^3.$$

These geometric formulas are given in Appendix E.

ANALYZE Using the formulas, we find (a) the circumference to be

$$C = 2\pi R_E = 2\pi(6.37 \times 10^3 \text{ km}) = 4.00 \times 10^4 \text{ km},$$

(b) the surface area to be

$$A = 4\pi R_E^2 = 4\pi(6.37 \times 10^3 \text{ km})^2 = 5.10 \times 10^8 \text{ km}^2,$$

and (c) the volume to be

$$V = \frac{4\pi}{3} R_E^3 = \frac{4\pi}{3} (6.37 \times 10^3 \text{ km})^3 = 1.08 \times 10^{12} \text{ km}^3.$$

LEARN From the formulas, we see that $C \sim R_E$, $A \sim R_E^2$, and $V \sim R_E^3$. The ratios of volume to surface area and surface area to circumference are $V/A = R_E/3$ and $A/C = 2R_E$.

2. The conversion factors are: 1 gry = 1/10 line, 1 line = 1/12 inch, and 1 point = 1/72 inch. The factors imply that

$$1 \text{ gry} = (1/10)(1/12)(72 \text{ points}) = 0.60 \text{ point}.$$

Thus, $1 \text{ gry}^2 = (0.60 \text{ point})^2 = 0.36 \text{ point}^2$, which means that $0.50 \text{ gry}^2 = 0.18 \text{ point}^2$.

3. The metric prefixes (micro, pico, nano, ...) are given in Table 1.1.2.

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