Lesson 6: Surface Area and Volume Problem Solving

Are You Ready? Possible Answers

1. a. Surface area measures the amount of space, in square units, that covers a surface of a 3-D object.

   b. Volume measures the amount of space, in cubic units, occupied by a 3-D object.

2. a. The following are the correct surface area calculations.

   i.
   $$SA_{cyl} = 2\pi r^2 + 2\pi rh$$
   $$= 2\pi(2.3 \text{ m})^2 + 2\pi (2.3 \text{ m})(4.6 \text{ m})$$
   $$= 33.24 \text{ m}^2 + 66.48 \text{ m}^2 \quad \leftarrow \text{ These values have been rounded to the nearest hundredth.}$$
   $$= 99.71 \text{ m}^2 \quad \text{Note that exact values were used to obtain the final answer.}$$

   ii. $SA_{sph} = 4\pi r^2$
   $$= 4\pi (13.2 \text{ cm})^2$$
   $$2189.56 \text{ cm}^2$$

   iii. $SA_{pyr} = A_{base} + A_{faces}$
   $$= 24 \text{ ft}^2 + 4(0.5 \times 24 \text{ ft} \times 37 \text{ ft})$$
   $$= 576 \text{ ft}^2 + 1776 \text{ ft}^2$$
   $$= 2352 \text{ ft}^2$$

   iv. $SA_{con} = \pi r^2 + 2\pi rs$
   $$= \pi (5 \text{ cm})^2 + 2\pi(5 \text{ cm})(13 \text{ cm})$$
   $$= 78.54 \text{ cm}^2 + 408.41 \text{ cm}^2$$
   $$= 486.95 \text{ cm}^2$$

   b. The following are the correct volume calculations.

   i. $V_{cyl} = \pi r^2 h$
   $$V_{cyl} = \pi (2.3 \text{ m})^2 (4.6 \text{ m})$$
   $$V_{cyl} = 76.4 \text{ m}^3$$

   ii. $V_{sph} = \frac{4}{3}\pi r^3$
   $$V_{sph} = \frac{4}{3}\pi (13.2 \text{ cm})^3$$
   $$V_{sph} = 9634.1 \text{ cm}^3$$

iii.

$V_{pyr} = \frac{1}{3}$ area of base $\times$ height

$V_{pyr} = \frac{1}{3}$ (24 ft $\times$ 24 ft x 35 ft)

$V_{pyr} = 6720 \text{ ft}^3$

iv. $V_{con} = \frac{1}{3}\pi r^2 h$

$V_{con} = \frac{1}{3}\pi$ (5 cm)^2 (12 cm)

$V_{con} = 314.2 \text{ cm}^3$