

2.2 Surface Area

Example 1 Calculate the Surface Area of a Right Cone

A right cone has a circular base with diameter 27 cm and slant height 40 cm. Calculate the surface area of the cone, to the nearest tenth of a square centimetre.

$$SA = \pi r^2 + \pi r s$$

$$= \pi (13.5)^2 + \pi (13.5)(40)$$

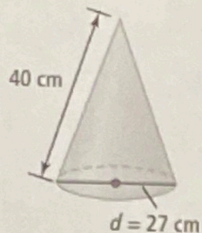
$$= 2269.015$$

$$\approx 2269.0 \text{ cm}^2$$

$$r = d \div 2$$

$$= 27 \div 2$$

$$= 13.5$$



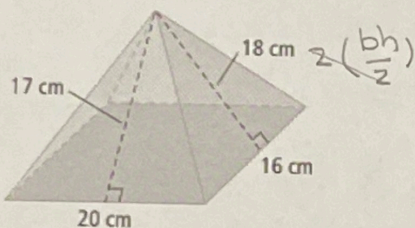
Example 2 Calculate the Surface Area of a Right Pyramid

A right rectangular pyramid has a rectangular base measuring 16 cm by 20 cm. The slant height of the triangular face with the shorter base is 18 cm, while the slant height of the triangular face with the longer base is 17 cm. What is the surface area of the pyramid?

$$SA = \text{Base} + \text{triangle sides}$$

$$= (20 \times 16) + (17 \times 20) + (16 \times 18)$$

$$= 948 \text{ cm}^2$$



Example 3 Calculate the Surface Area of a Sphere

A satellite is wrapped with polyester film to protect it during transportation. How much film is required to cover the Echo Satellite that has a circumference of 95.8 m? Express your answer to the nearest tenth of a square metre.

$$SA = 4\pi r^2$$

$$= 4\pi (15.2)^2$$

$$= 2921.3$$

$$\approx 2921.3 \text{ m}^2$$

$$C = 2\pi r$$

$$95.8 = 2\pi r$$

$$\frac{95.8}{2\pi} = \frac{2\pi r}{2\pi}$$

$$15.2 = r$$

Example 4 Determine a Dimension When the Surface Area is Known

The surface area of an official 5-pin bowling ball varies from approximately 459.96 cm² to 506.71 cm². What is the variation in the diameter of the bowling ball?

$$SA = 4\pi r^2$$

$$459.96 = 4\pi r^2$$

$$\frac{459.96}{4\pi} = \frac{4\pi r^2}{4\pi}$$

$$\sqrt{36.6} = \sqrt{r^2}$$

$$6.04 \text{ cm} = r$$

$$d = 12.1 \text{ cm}$$

$$SA = 4\pi r^2$$

$$506.71 = 4\pi r^2$$

$$\frac{506.71}{4\pi} = \frac{4\pi r^2}{4\pi}$$

$$\sqrt{40.3} = \sqrt{r^2}$$

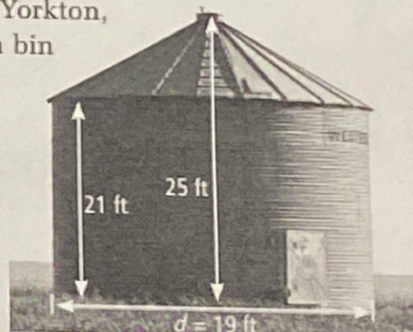
$$r = 6.35$$

$$d = 12.7$$

The variation of diameters is between 12.1 cm and 12.7 cm.

Example 5 Visualize and Find Surface Areas of Composite Objects

A farm equipment manufacturer in Yorkton, SK, has decided to construct a grain bin using galvanized steel. How much steel is required to construct the grain bin as shown? Express your answer to the nearest hundredth of a square foot. Do not include overlap of the steel sheets where they are fastened together.



Cylinder

$$SA = \pi dh$$

$$= \pi (19)(21)$$

$$= 1253.5 \text{ ft}^2$$

Cone

$$SA = \pi r s$$

$$= \pi (9.5)(10.3)$$

$$= 307.6 \text{ ft}^2$$

Total surface area of 1561.13 ft²

$$25 - 21 = 4 \text{ ft}$$

$$\frac{19}{2} = 9.5$$

Slant $\Rightarrow a^2 + b^2 = c^2$

$$9.5^2 + 4^2 = c^2$$

$$\sqrt{106.25} = c$$

$$c = 10.3$$

Slant = 10.3 ft.

