

11-8 Volume of Pyramids

Name _____ Date _____

To find the volume of a pyramid, use the formula: $V = \frac{1}{3}Bh$.

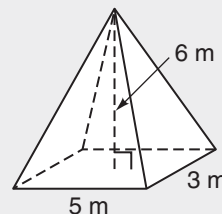
Find the volume of the rectangular pyramid.

$$V = \frac{1}{3}(\ell w)h \quad \leftarrow \text{Use the formula for volume of a pyramid.}$$

$$= \frac{1}{3}(5 \cdot 3)6 \quad \leftarrow \text{Substitute.}$$

$$V = 30 \text{ m}^3 \quad \leftarrow \text{Use cubic units.}$$

The volume is 30 cubic meters.



To find an unknown dimension of a pyramid when the volume is given, use the formula $V = \frac{1}{3}Bh$ and substitute the known values.

Triangular pyramid: $V = 40 \text{ ft}^3$

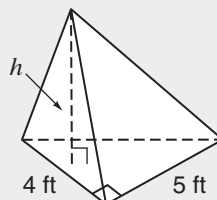
$$V = \frac{1}{3}Bh \rightarrow V = \frac{1}{3}\left(\frac{1}{2}bh_{\text{base}}\right)h_{\text{pyramid}}$$

$$40 = \frac{1}{3}\left(\frac{1}{2} \cdot 5 \cdot 4\right)h \quad \leftarrow \text{Substitute.}$$

$$40 = \frac{1}{3}(10)h \quad \leftarrow \text{Divide both sides by } \frac{10}{3}.$$

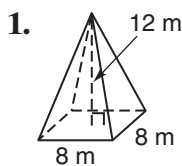
$$h = 12 \quad \leftarrow \text{Solve for } h.$$

The height is 12 feet.



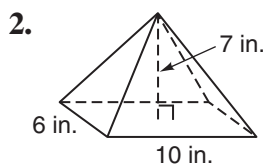
For $B = \frac{1}{2}bh$,
 h = height of the
 triangular base
 For $V = \frac{1}{3}Bh$,
 h = height of the
 pyramid

Find each volume. Round to the nearest tenth, if necessary.



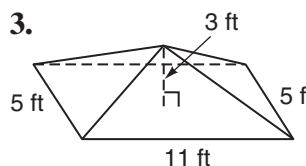
$$V = \frac{1}{3}Bh = \frac{1}{3}(\ell w)h$$

$$\frac{1}{3}(8 \cdot 8)12 = 64 \cdot 4 = 256 \text{ m}^3$$

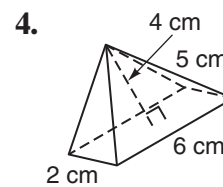


$$V = \frac{1}{3}(6 \cdot 10)7 = 20 \cdot 7$$

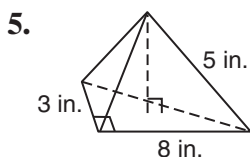
$$= 140 \text{ in.}^3$$



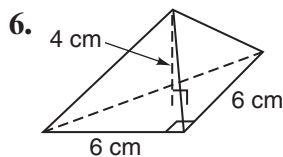
$$V = \frac{1}{3}(5 \cdot 11)3 = 55 \text{ ft}^3$$



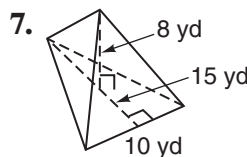
$$V = \frac{1}{3}(2 \cdot 6)4 = 16 \text{ cm}^3$$



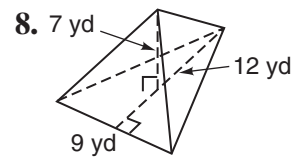
$$V = \frac{1}{3}\left(\frac{1}{2} \cdot 8 \cdot 3\right)5 = 20 \text{ in.}^3$$



$$V = \frac{1}{3}\left(\frac{1}{2} \cdot 6 \cdot 6\right)4 = 24 \text{ cm}^3$$



$$V = \frac{1}{3}\left(\frac{1}{2} \cdot 10 \cdot 15\right)8 = 200 \text{ yd}^3$$



$$V = \frac{1}{3}\left(\frac{1}{2} \cdot 9 \cdot 12\right)7 = 126 \text{ yd}^3$$

9. $\ell = 15 \text{ in.}$
 $w = 18.7 \text{ in.}$
 $h = 8 \text{ in.}$

$$V = \frac{1}{3}(15 \cdot 18.7)8 = 748 \text{ in.}^3$$

10. $\ell = 13.8 \text{ ft}$
 $w = 24 \text{ ft}$
 $h = 11 \text{ ft}$

$$V = \frac{1}{3}(13.8 \cdot 24)11 = 1214.4 \text{ ft}^3$$

11. $\ell = 21 \text{ cm}$
 $w = 5\frac{1}{2} \text{ cm}$
 $h = 15 \text{ cm}$

$$V = \frac{1}{3}\left(21 \cdot 5\frac{1}{2}\right)15 = 577\frac{1}{2} \text{ cm}^3$$

12. $\ell = 8\frac{1}{2} \text{ m}$
 $w = 30 \text{ m}$
 $h = 15 \text{ m}$

$$V = \frac{1}{3}\left(8\frac{1}{2} \cdot 30\right)15 = 1275 \text{ m}^3$$



Find the missing dimension of each pyramid.

13. Rectangular pyramid

$$\ell = 6 \text{ ft}, w = 2\frac{1}{2} \text{ ft}, V = 35 \text{ ft}^3, h = ?$$

$$V = \frac{1}{3}Bh = \frac{1}{3}(\ell w)h$$

$$35 = \frac{1}{3}(6 \cdot 2\frac{1}{2})h$$

$$35 = 5h$$

$$h = \underline{\quad 7 \text{ ft} \quad}$$

15. Triangular Pyramid

$$h \text{ (base)} = 14 \text{ in.}, b \text{ (base)} = 18 \text{ in.},$$

$$h \text{ (pyramid)} = ?, V = 84 \text{ in.}^3$$

$$84 = \frac{1}{3}(\frac{1}{2} \cdot 18 \cdot 14)h = 42h; 84 = 42h$$

$$h = \underline{\quad 2 \text{ in.} \quad}$$

14. Tetrahedron

$$\text{base of triangular base} = b$$

$$\text{base height} = 62 \text{ cm}$$

$$\text{pyramid height} = 21 \text{ cm}$$

$$V = 70\,308 \text{ cm}^3$$

$$70\,308 = \frac{1}{3}(\frac{1}{2} \cdot b \cdot 62)21; 70\,308 = 217b$$

$$b = \underline{\quad 324 \text{ cm} \quad}$$

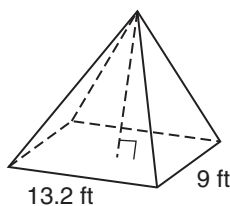
16. Rectangular Pyramid

$$\ell = 12 \text{ m}, w = ? \text{ m}, V = 432 \text{ m}^3, h = 6 \text{ m}$$

$$432 = \frac{1}{3}(12 \cdot w)6 = 24w; 432 = 24w$$

$$w = \underline{\quad 18 \text{ m} \quad}$$

17.

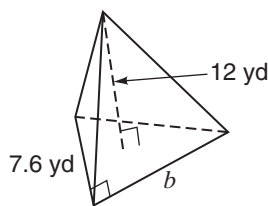


$$V = 554.4 \text{ ft}^3$$

$$554.4 = \frac{1}{3}(13.2 \cdot 9)h$$

$$h = \underline{\quad 14 \text{ ft} \quad}$$

18.



$$V = 197.6 \text{ yd}^3$$

$$197.6 = \frac{1}{3}(\frac{1}{2} \cdot b \cdot 7.6)12$$

$$b = \underline{\quad 13 \text{ yd} \quad}$$

Problem Solving

19. The attic of a house has the shape of a square pyramid. If the base measures 33 yd long by 33 yd wide, and the pyramid is 21.5 yd tall, how much cubic room does it have?

$$V = \frac{1}{3}(33 \cdot 33)21.5 = 7804.5$$

The attic has 7804.5 cubic yards of room

20. A town is planning to build a water storage tank in the shape of an upside down rectangular pyramid. The base needs to be 15 m by 12 m. If the tank needs to hold 1320 m³ of water, how tall should they build the pyramid?

$$1320 = \frac{1}{3}(15 \cdot 12)h; h = 22$$

They should build the pyramid 22 m high.

SPIRAL REVIEW

Use the formulas $S = 2\pi r^2 + 2\pi rh$ and $S = \pi r^2 + \pi r\ell$ to find the surface area. Use $\pi \approx 3.14$.

21. Cylinder

$$r = 8 \text{ cm}$$

$$h = 11 \text{ cm}$$

$$S = 2\pi(8^2) + 2\pi \cdot 8 \cdot 11$$

$$\approx 954.56 \text{ cm}^2$$

22. Cylinder

$$d = 6 \text{ in.}$$

$$h = 9 \text{ in.}$$

$$S = 2\pi(3^2) + 2\pi \cdot 3 \cdot 9$$

$$\approx 226.08 \text{ in.}^2$$

23. Cone

$$d = 18 \text{ m}$$

$$\ell = 7 \text{ m}$$

$$S = \pi(9^2) + \pi \cdot 9 \cdot 7$$

$$\approx 452.16 \text{ m}^2$$

24. Cone

$$r = 11 \text{ ft}$$

$$\ell = 5 \text{ ft}$$

$$S = \pi(11^2) + \pi \cdot 11 \cdot 5$$

$$\approx 552.64 \text{ ft}^2$$