Quiz: Volume and Surface Area of Pyramids

Section:Pyramids, Cones, and Sphere

Sub-section: Surface Area of Pyramids and Volume of Pyramids

Choose the correct answer.

1. Find the total surface area of a square pyramid with the slant height 18 centimeters and base length 16 centimeters.
   (understand, MA 2.1 G.9/1)

   A. $400\ cm^2$

   B. $576\ cm^2$

   C. $752\ cm^2$

   D. $832\ cm^2$

   Solution $832\ cm^2$

   $832\ cm^2$ because the total surface area $=$ area of base + all lateral triangular areas

   $= (16 \times 16) + 4(\frac{1}{2} \times 16 \times 18)$

   $= 256 + 4(144) = 256 + 576 = 832\ cm^2$

2. Find the total surface area of a square pyramid with the slant height 26 centimeters and base length 20 centimeters.
   (understand, MA 2.1 G.9/1)

   A. $660\ cm^2$

   B. $920\ cm^2$

   C. $1,040\ cm^2$

   D. $1,440\ cm^2$

   Solution $1,440\ cm^2$

   $1{,}440\ cm^2$, because the total surface area $=$ area of base + all lateral triangular areas

   $= (20 \times 20) + 4(\frac{1}{2} \times 20 \times 26)$

   $= 400 + 4(260)$

   $= 400 + 1,040$

   $= 1{,}440\ cm^2$

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3. Find the volume of a square pyramid with base sides 12 centimeters and altitude 15 centimeters.
   (understand, MA 2.1 G.9/2)

   A. $360\ cm^3$

   B. $540\ cm^3$

   C. $720\ cm^3$

   D. $900\ cm^3$

   Solution $720\ cm^3$

   $720\ cm^3$ because the volume $= \frac{1}{3} \times area\ of\ base \times height$

   $= \frac{1}{3} \times (12 \times 12) \times 15$

   $= 720\ cm^3$

4. Find the volume of a square pyramid with base sides 15 centimeters and altitude 20 centimeters.
   (understand, MA 2.1 G.9/2)

   A. $900\ cm^3$

   B. $1,500\ cm^3$

   C. $3,000\ cm^3$

   D. $4,500\ cm^3$

   Solution $1,500\ cm^3$

   $1{,}500\ cm^3$ because the volume $= \frac{1}{3} \times area\ of\ base \times height$

   $= \frac{1}{3} \times (15 \times 15) \times 20$

   $= 1{,}500\ cm^3$

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5. A rectangular pyramid has a height of 24 centimeters. Its base is a rectangle of side 20 centimeters by 14 centimeters. Find the volume of the rectangular pyramid. (understand, MA 2.1 G.9/2)

   A. $2,240\ cm^3$

   B. $3,360\ cm^3$

   C. $5,600\ cm^3$

   D. $6,720\ cm^3$

   Solution $2,240\ cm^3$

   $2{,}240\ cm^3$ because the volume $= \frac{1}{3} \times area\ of\ base \times height$

   $= \frac{1}{3} \times (20 \times 14) \times 24$

   $= 2{,}240\ cm^3$

6. A rectangular pyramid has a height of 20 centimeters. Its base is a rectangle of side 42 centimeters by 30 centimeters. Find the volume of the rectangular pyramid. (understand, MA 2.1 G.9/2)

   A. $2,800\ cm^3$

   B. $5,600\ cm^3$

   C. $8,400\ cm^3$

   D. $11,200\ cm^3$

   Solution $8,400\ cm^3$

   $8{,}400\ cm^3$ because the volume $= \frac{1}{3} \times area\ of\ base \times height$

   $= \frac{1}{3} \times (42 \times 30) \times 20$

   $= 8{,}400\ cm^3$

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---

7. A rectangular pyramid has a volume 1,080 cubic centimeters. Its base is a rectangle of side 15 centimeters by 12 centimeters. Find the height of the rectangular pyramid. (apply, MA 2.1 G.9/2)

   A. 6 cm

   B. 12 cm

   C. 18 cm

   D. 24 cm

   Solution 18 cm

   18 cm because the volume $= \frac{1}{3} \times area\ of\ base \times height$

   $$1{,}080 = \frac{1}{3} \times (15 \times 12) \times h$$

   $$1{,}080 = 60h$$

   $$h = 18\ cm$$

8. A rectangular pyramid has a volume 2,160 cubic centimeters. Its base is a rectangle of side 18 centimeters by 15 centimeters. Find the height of the rectangular pyramid. (apply, MA 2.1 G.9/2)

   A. 6 cm

   B. 12 cm

   C. 18 cm

   D. 24 cm

   Solution 24 cm

   24 cm because the volume $= \frac{1}{3} \times area\ of\ base \times height$

   $$2{,}160 = \frac{1}{3} \times (18 \times 15) \times h$$

   $$2{,}160 = 90h$$

   $$h = 24\ cm$$

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9. A square pyramid has a base of side 10 centimeters. The volume of the pyramid is 400 cubic centimeters. Find the total surface area of a square pyramid. (apply, MA 2.1 G.9/1)

   A. $300\ cm^2$

   B. $320\ cm^2$

   C. $340\ cm^2$

   D. $360\ cm^2$

   Solution $360\ cm^2$

   Find the height

   Let h = the height of a square pyramid.

$$\text{Volume} = \frac{1}{3} \times Area\ of\ base \times Height$$

$$400 = \frac{1}{3} \times (10 \times 10) \times h$$

$$400 = \frac{100}{3} h$$

$$h = 12$$

   Find the slant height

   Let x = the slant height of a square pyramid.

$$x^2 = 5^2 + 12^2$$

$$x^2 = 169$$

$$x = 13$$

   Find the total surface area

$$\text{total surface area} = \text{area of base} + \text{all lateral triangular areas}$$

$$= (10 \times 10) + 4(\frac{1}{2} \times 10 \times 13)$$

$$= 100 + 4(65)$$

$$= 100 + 260$$

$$= 360\ cm^2$$

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10. A square pyramid has a base of side 18 centimeters. The volume of the pyramid is 1,296 cubic centimeters. Find the total surface area of a square pyramid. (apply, MA 2.1 G.9/1)

    A. $648\ cm^2$

    B. $756\ cm^2$

    C. $864\ cm^2$

    D. $972\ cm^2$

    Solution $864\ cm^2$

    Find the height

    Let h = the height of a square pyramid.

$$\text{volume} = \frac{1}{3} \times \text{area of base} \times \text{height}$$

$$1{,}296 = \frac{1}{3} \times (18 \times 18) \times h$$

$$1{,}296 = 108h$$

$$h = 12$$

    Find the slant height

    Let x = the slant height of a square pyramid.

$$x^2 = 9^2 + 12^2$$

$$x^2 = 225$$

$$x = 15$$

    Find the total surface area

$$\text{total surface area} = \text{area of base} + \text{all lateral triangular areas}$$

$$= (18 \times 18) + 4\left(\frac{1}{2} \times 18 \times 15\right)$$

$$= 324 + 4(135)$$

$$= 324 + 540$$

$$= 864\ cm^2$$