Topic: Nets/Volume/Surface area of cones

Question: A round guard tower has a cone-shaped roof with a radius of 12 ft and a height (not a slant height) of 16 ft. Approximately how many square feet of roof cover the tower?

Answer choices:

A 240 ft^2

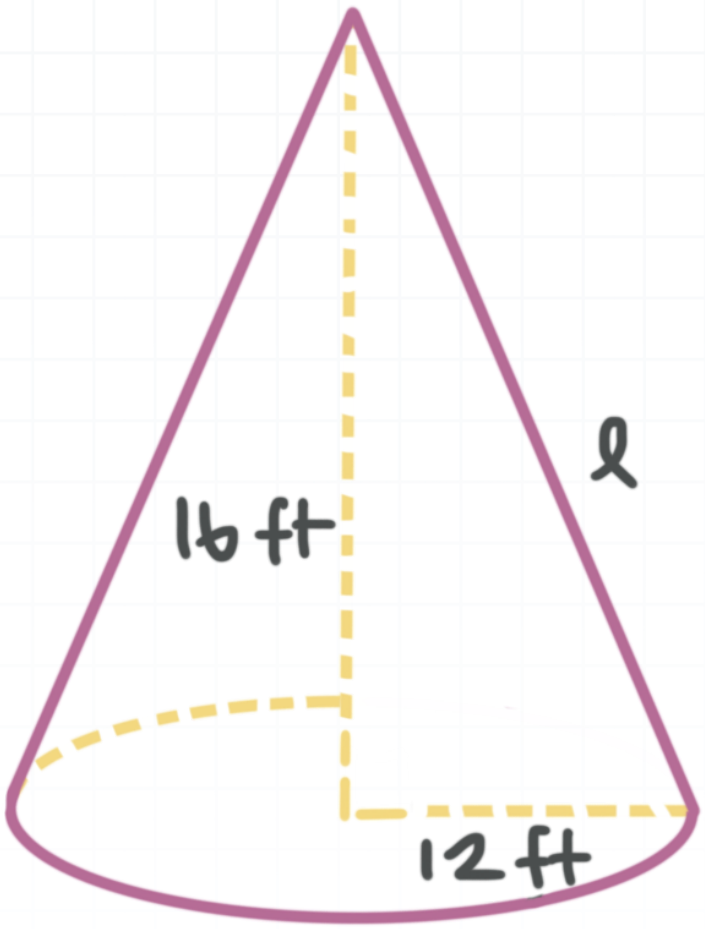
B 406 ft^2

C 639 ft^2

D 754 ft^2

Solution: D

The area of the roof is the lateral area of a cone.



To find it, we need to first get the slant height using $r^2 + h^2 = l^2$.

$$(12 \text{ ft})^2 + (16 \text{ ft})^2 = l^2$$

$$144 \text{ ft}^2 + 256 \text{ ft}^2 = l^2$$

$$400 \text{ ft}^2 = l^2$$

$$l = 20 \text{ ft}$$

Then the lateral surface area of the cone, and therefore the surface area of the roof, is given by

$$L = \pi r l$$

$$L \approx 3.14(12 \text{ ft})(20 \text{ ft})$$

$$L \approx 753.60 \text{ ft}^2$$

$$L \approx 754 \text{ ft}^2$$

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Question: An ice cream cone has a diameter of 3 in and a height of 6 in. When it's filled level with the top, what volume of ice cream will it hold?

Answer choices:

A 4.5π in^3

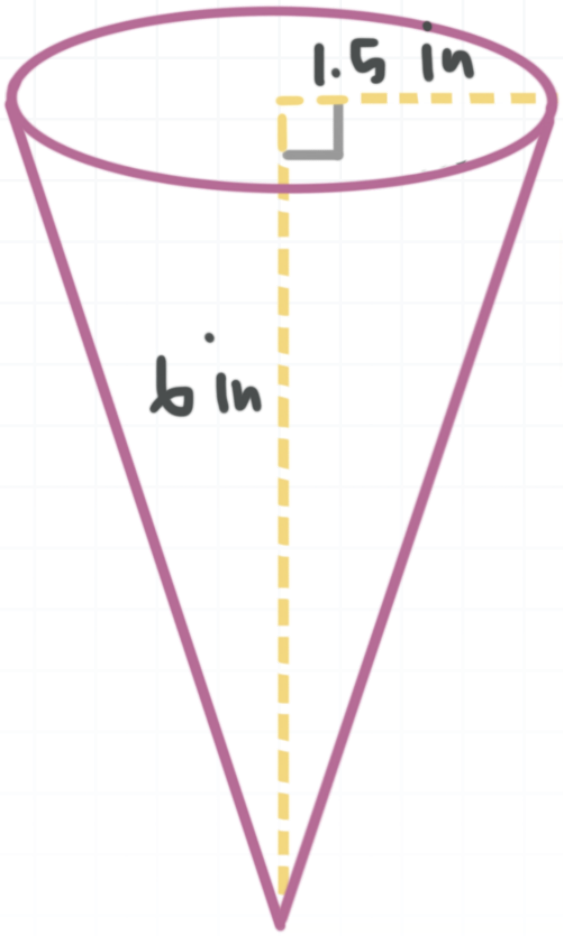
B 9.25π in^3

C 13.5π in^3

D 37.5π in^3

Solution: A

A sketch of the figure is



Plugging what we know into the formula for volume of a cone gives

$$V = \frac{1}{3}\pi r^2 h$$

$$V = \frac{1}{3}\pi(1.5 \text{ in})^2(6 \text{ in})$$

$$V = 4.5\pi \text{ in}^3$$

Topic: Nets/Volume/Surface area of cones

Question: Two identical cones are glued together base-to-base to make a single double-cone solid. The diameter of the base of one cone is 10, and the length of the solid (the distance from the apex of one cone to the apex of the other cone) is 24. What is the surface area to volume ratio of the solid?

Answer choices:

A $\frac{7}{10}$

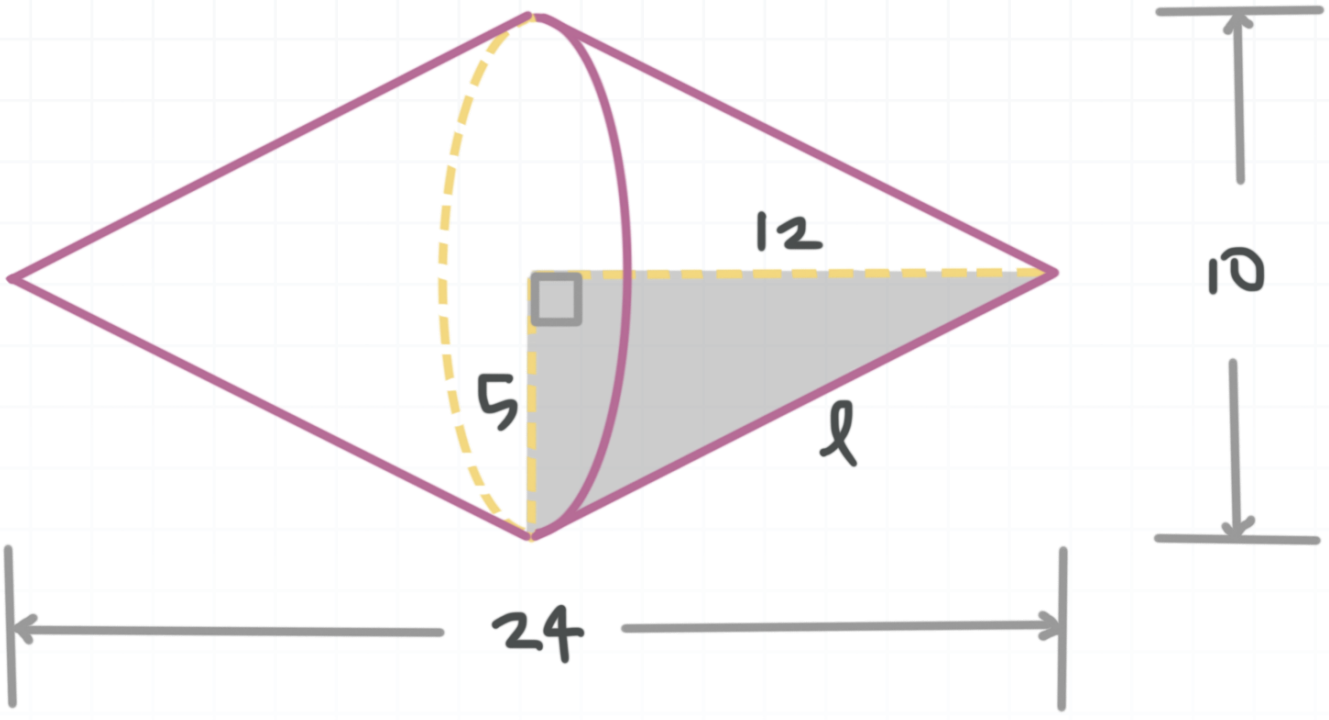
B $\frac{5}{6}$

C $\frac{5}{12}$

D $\frac{13}{20}$

Solution: D

The surface area of the solid is twice the lateral area of one cone, and the volume of the solid is twice the volume of one cone.



First, use $r^2 + h^2 = l^2$ to find l. Notice that h is half the length of the solid, so $h = 24/2 = 12$. Also, r is half the diameter of one cone, so $r = 10/2 = 5$.

$$5^2 + 12^2 = l^2$$

$$169 = l^2$$

$$13 = l$$

Second, find the lateral area of one cone.

$$L = \pi rl = \pi(5)(13) = 65\pi$$

Twice the lateral area of one cone is $2 \cdot 65\pi = 130\pi$.

Third, find the volume of one cone.

$$V = \frac{1}{3}\pi r^2 h$$

$$V = \frac{1}{3}\pi(5^2)(12)$$

$$V = 100\pi$$

Twice the volume of one cone is $2 \cdot 100\pi = 200\pi$.

Therefore, the surface area to volume ratio is

$$\frac{S}{V} = \frac{130\pi}{200\pi} = \frac{13}{20}$$