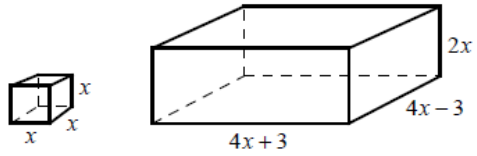
Practice Test

Volume and Surface Area

1



The figure above shows a cube and a rectangular prism. If the volume of the rectangular prism is 30 times the volume of the cube, what is the value of x?

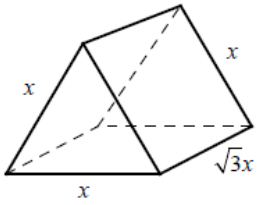
A) 1.5

B) 2

C) 2.5

D) 3

2



The figure above shows a triangular prism whose base is a equilateral triangle with side lengths x and height $\sqrt{3}x$. If the volume of the prism is $\frac{81}{4}$, what is the value of x?

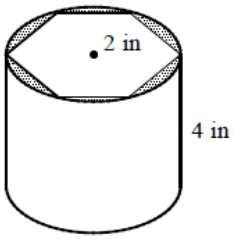
A) 3

B) 4

C) 5

D) 6

3



A regular hexagonal prism with edge lengths of 2 inches is created by cutting out a metal cylinder whose radius is 2 inches and height is 4 inches. What is the volume of the waste generated by creating the hexagonal prism from the cylinder, rounded to the nearest cubic inch?

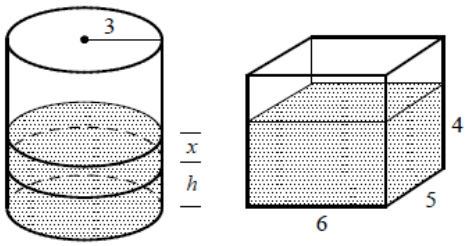
A) 7

B) 9

C) 11

D) 14

4



In the figure shown above, if all the water in the rectangular container is poured into the cylinder, the water level rises from h inches to $(h+x)$ inches. Which of the following is the best approximation of the value of x?

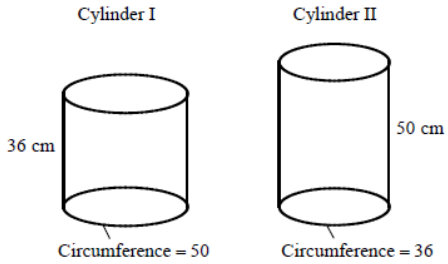
A) 3

B) 3.4

C) 3.8

D) 4.2

5



The figure above shows two cylinders that are rolled up from a poster 36 centimeter (cm) wide and 50 cm long without overlap. For cylinder I, the height is 36 cm and the circumference of the base is 50 cm. For cylinder II, the height is 50 cm and the circumference of the base is 36 cm. Which of the following is closest to the difference of volume between the two cylinders, in cubic centimeters?

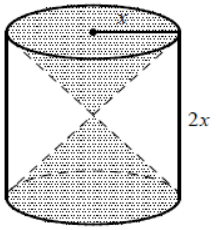
A) 1,600

B) 1,800

C) 2,000

D) 2,200

6



In the figure above, a double cone is inscribed in a cylinder whose radius is x and height is $2x$. What is the volume of the space inside the cylinder but outside the double cone, in terms of x?

A) $\frac{1}{2}\pi x^3$

B) $\frac{2}{3}\pi x^3$

C) $\frac{4}{3}\pi x^3$

D) $\frac{3}{2}\pi x^3$

7

The surface area of a cube is 54 square centimeters (cm^2). What is the volume of the cube in cubic centimeters?

8

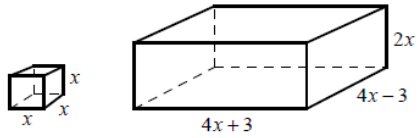
A cone with a height of 10 cm and radius of 3 cm is 90 percent filled with shaved ice. What is the volume of the shaved ice, to the nearest cubic centimeter?

9

A square pyramid and a cube have equal volumes. The cube has an edge length of 4 inches and the pyramid has a base side length of 6 inches. What is the height of the pyramid in inches?

Answers
Volume and Surface Area

1. D



Volume of the rectangular prism
$= (4x+3)(4x-3)(2x) = (16x^2-9)(2x)$

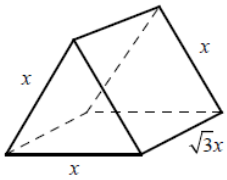
Volume of the cube $= x^3$

Since the volume of the rectangular prisms is 30 times the volume of the cube, the equation $(16x^2-9)(2x) = 30x^3$ can be used to find the value of x.

$(16x^2-9)(2x)-30x^3=0$	Make one side 0.
$2x\left[(16x^2-9)-15x^2\right]=0$	GCF is $2x$.
$2x(x^2-9)=0$	Simplify.
$2x(x+3)(x-3)=0$	Factor.
$x=0$, $x=-3$, and $x=3$	

Since the dimension has to be positive, $x=3$ is the correct answer.

2. A



Area of the equilateral triangle with side length of x is $\frac{\sqrt{3}}{4}x^2$.

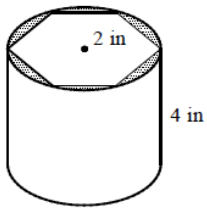
Volume of the triangular prism
$= B \cdot h = \frac{\sqrt{3}}{4}x^2 \cdot \sqrt{3}x = \frac{3}{4}x^3$

Since the volume of the prism is given as $\frac{81}{4}$, the equation $\frac{3}{4}x^3 = \frac{81}{4}$ can be used to find the value of x.

$\frac{3}{4}x^3 = \frac{81}{4} \Rightarrow 3x^3 = 81 \Rightarrow x^3 = 27$

$\Rightarrow x = \sqrt[3]{27} = 3$

3. B



Area of the equilateral triangle with side length of $2 = \frac{\sqrt{3}}{4}(2)^2 = \sqrt{3}$.

Area of the regular hexagon $= 6\sqrt{3}$.

Volume of the hexagonal prism $= 6\sqrt{3} \cdot 4 = 24\sqrt{3}$

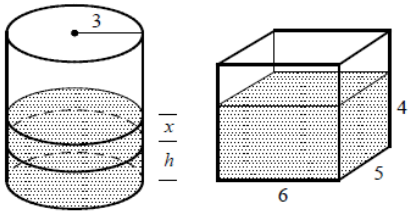
Volume of the cylinder $= \pi(2)^2 \cdot 4 = 16\pi$

The volume of the waste generated by creating the hexagonal prism from the cylinder can be found by subtracting the volume of the hexagonal prism from the volume of the cylinder.

$16\pi - 24\sqrt{3} \approx 8.69$

The volume of the waste is about 9 cubic inches.

4. D



The volume of the cylinder with a radius of 3 and a height of x is $\pi(3)^2 x$, or $9\pi x$.

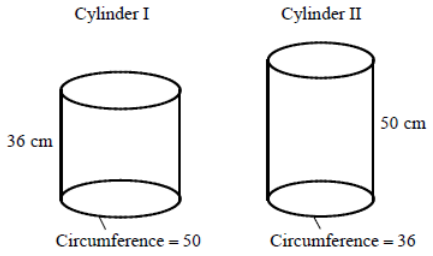
Volume of the water in the rectangular container is $6 \times 5 \times 4$, or 120.

To solve for x, let $9\pi x = 120$.

$x = \frac{120}{9\pi} \approx 4.24$

Answers
Volume and Surface Area

5. C



Let r_1 = the radius of cylinder I and
let r_2 = the radius of cylinder II.

$2\pi r_1 = 50 \Rightarrow r_1 = \frac{50}{2\pi} = \frac{25}{\pi}$

$2\pi r_2 = 36 \Rightarrow r_2 = \frac{36}{2\pi} = \frac{18}{\pi}$

Volume of cylinder I

$= \pi(r_1)^2 h = \pi(\frac{25}{\pi})^2(36) = \frac{22,500}{\pi}$

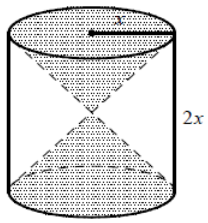
Volume of cylinder II

$= \pi(r_2)^2 h = \pi(\frac{18}{\pi})^2(50) = \frac{16,200}{\pi}$

The difference of volume between the two cylinders is $\frac{22,500}{\pi} - \frac{16,200}{\pi} \approx 2,005.3$.

Choice C is correct.

6. C



Volume of the space inside the cylinder but outside the double cone =
volume of the cylinder – volume of the two cones.

$\pi(x)^2(2x) - 2\left[\frac{1}{3}\pi(x)^2(x)\right]$

$= 2\pi x^3 - \frac{2}{3}\pi x^3 = \frac{4}{3}\pi x^3$

7. 27

Surface area of the cube = $6s^2$
Since the surface area of the cube is given as 54 cm^2, $6s^2 = 54$.

$6s^2 = 54$ is simplified to $s^2 = 9$. Solving for s gives $s = 3$.

Volume of the cube = $s^3 = (3)^3 = 27$

8. 85

Volume of the cone = $\frac{1}{3}\pi(3)^2(10) = 30\pi$

Since the cone is 90 percent filled with shaved ice, the volume of the shaved ice is $30\pi \times 0.9$, or 27π cubic centimeters.

27π cm$^3 \approx 84.8$ cm^3

Therefore, to the nearest cubic centimeter, the volume of the shaved is 85 cm^3.

9. $\frac{16}{3}$ or 5.33

Let h = the height of the square pyramid.
Volume of the square pyramid

$= \frac{1}{3}Bh = \frac{1}{3}(6)^2 h = 12h$

Volume of the cube = $s^3 = (4)^3 = 64$

Since the square pyramid and the cube have equal volumes, $12h = 64$.

Solving for h gives $h = \frac{64}{12} = \frac{16}{3}$, or 5.33.