How Much Do You Know: Geometry and Trigonometry

Directions

Try the questions that follow, using the Method for SAT Math Questions. When you're done, check your answers and read through the explanations in the "Check Your Work" section.

There will be an opportunity for timed practice at the end of the Geometry and Trigonometry unit.

1

The longer leg of a right triangle is three times the length of the shorter leg. Given that the length of each leg is a whole number, which of the following could be the length of the hypotenuse?
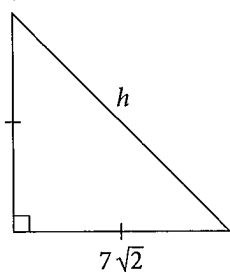
(A) $\sqrt{40}$

(B) $\sqrt{47}$

(C) $\sqrt{55}$

(D) $\sqrt{63}$

2

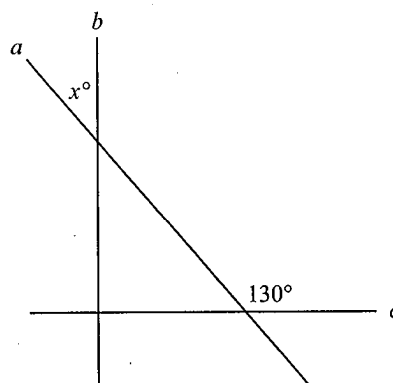What is the value of h in the figure shown?
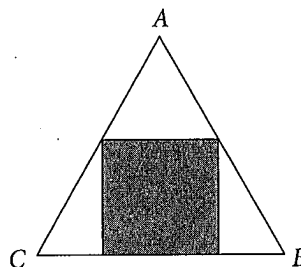
(A) 3.5

(B) 7

(C) 12.5

(D) 14

3

In the figure shown, line b is perpendicular to line c. What is the value of x?

4

In the figure, the shaded region is a square with an area of 12 square units, inscribed inside equilateral triangle ABC. What is the perimeter of triangle ABC?

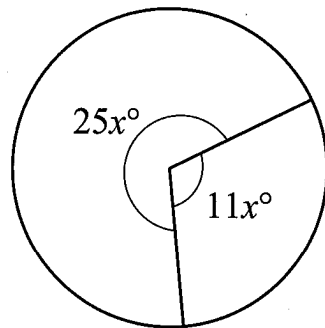(A) $18\sqrt{3}$

(B) $12 + 6\sqrt{3}$

(C) $4 + 6\sqrt{3}$

(D) $4 + \sqrt{3}$

5

Triangle *ABC* has side lengths of 8, 15, and 17. Which of the following could be the side lengths of a triangle that is similar to *ABC*?
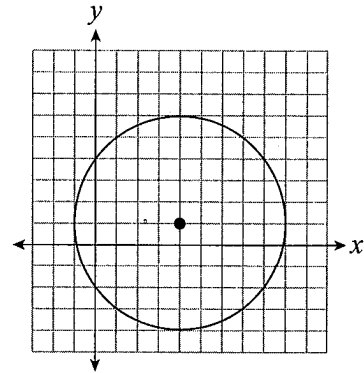
Ⓐ 3, 4, 5

Ⓑ 5, 12, 13

Ⓒ 10, 17, 19

Ⓓ 24, 45, 51

6

$25x°$

$11x°$

For the circle shown, what is the measure, in degrees, of the smallest angle?

Ⓐ 10

Ⓑ 55

Ⓒ 110

Ⓓ 250

7
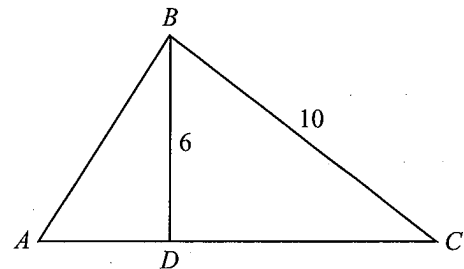

If each grid line of the *xy*-plane shown is 3 units, what is the equation of the circle?
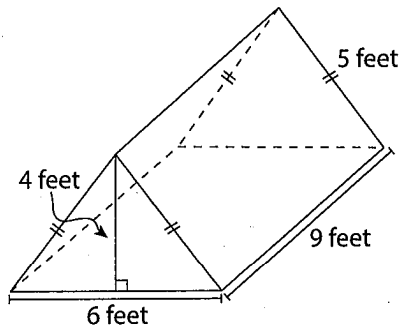
Ⓐ $(x - 4)^2 + (y - 1)^2 = 25$

Ⓑ $(x + 4)^2 + (y + 1)^2 = 25$

Ⓒ $(x - 12)^2 + (y - 3)^2 = 225$

Ⓓ $(x + 12)^2 + (y + 3)^2 = 225$

8

In the figure shown, $\overline{AC} \perp \overline{BD}$ and $\overline{AB} \perp \overline{BC}$. What is the length of *AB*?

9

The figure shown represents a camping tent that will be sprayed with a waterproofing agent. If it takes 1 ounce of the agent to cover 3 square feet, how many ounces will it take to spray the entire outside of the tent, excluding the tent bottom?
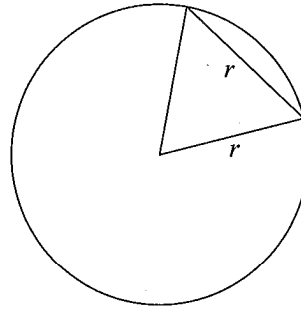
Ⓐ 38

Ⓑ 72

Ⓒ 114

Ⓓ 216

10

Note: Figure not drawn to scale.

What is the sine of the central angle of the circle shown?

Ⓐ $\dfrac{1}{2}$
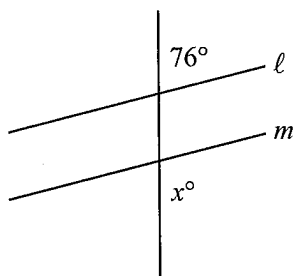
Ⓑ $\dfrac{1}{\sqrt{3}}$

Ⓒ $\dfrac{\sqrt{2}}{\sqrt{3}}$

Ⓓ $\dfrac{\sqrt{3}}{2}$

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.
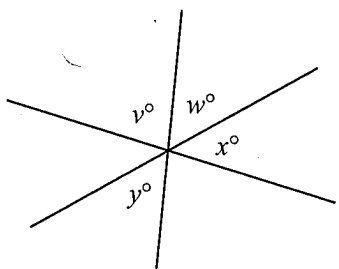
1

In the figure shown, l and m are parallel. Which of the following is the value of x?
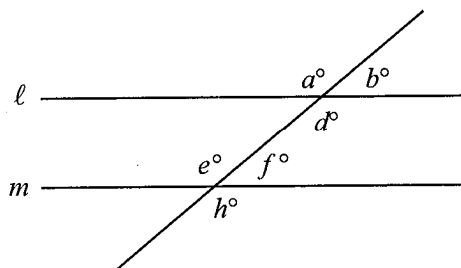
Ⓐ 76

Ⓑ 96

Ⓒ 104

Ⓓ 124

2

The figure shows three lines that meet at a point. Given that $x = 45$ and $v = 65$, what is the value of y?

3

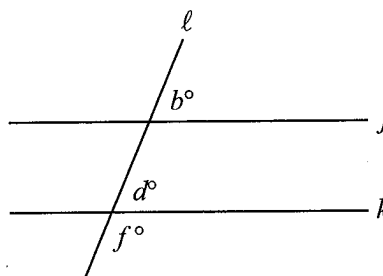HINT: In a pair of supplementary angles, 180° minus one angle will always equal the other angle. How can you use this fact in Q3?

In the figure shown, if line l is parallel to line m, which of the following is NOT necessarily equal to a?

Ⓐ $b + f$

Ⓑ d

Ⓒ $180 - b$

Ⓓ $\dfrac{e + h}{2}$

4

Lines j and k are parallel in the figure shown. If $f = 9b$, what is the value of $2d$?

Ⓐ 18

Ⓑ 36

Ⓒ 162

Ⓓ 324

5

HINT: For Q5, keep in mind that supplementary angles need not be adjacent.
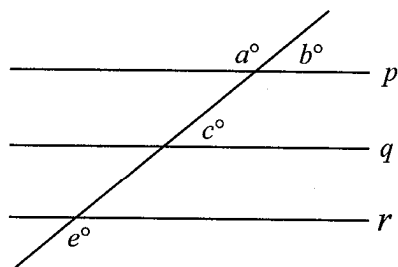
Note: Figure not drawn to scale.

In the figure shown, lines p, q, and r are all parallel. If $b = 30$, what is the value of $a + c + e$?

6

In the figure shown, lines l and m are parallel. What is the value of z?

Ⓐ 50

Ⓑ 70

Ⓒ 110

Ⓓ 120

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

7

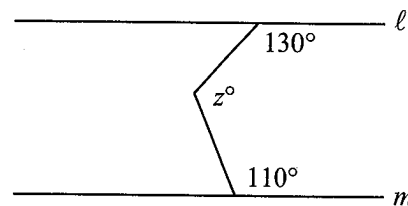What is the positive difference in area between a parallelogram with a height of 9 and a base length of 8 and a triangle with a height of 7 and a base length of 6?

Ⓐ   72

Ⓑ   51

Ⓒ   30

Ⓓ   5

8

The rectangular top of a balance beam is w centimeters wide. If the length of the beam is 50 times its width, what is the perimeter of the top surface of the beam, in centimeters, in terms of w?

Ⓐ $51w$

Ⓑ $50w^2$

Ⓒ $102w$

Ⓓ $102w^2$

9

The height of a billboard is 34 feet less than its width. If the area of the billboard is 672 square feet, what is the height of the billboard, in feet?

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┌─────────────────────┐
│                     │
│   _____   │
└─────────────────────┘
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10

The area of a triangle is x square inches. If both the base and height of the triangle are doubled, what is the area of the new triangle in terms of x?

Ⓐ $2x$

Ⓑ $4x$

Ⓒ $2x^2$

Ⓓ $4x^2$

11

HINT: The area of a square is s^2, and the perimeter is $4s$. How can you use this fact in Q11?

The area of Square A is 4 times the area of Square B. How many times greater is the perimeter of Square A than the perimeter of Square B?

Ⓐ   2

Ⓑ   4

Ⓒ   8

Ⓓ   16

12

HINT: For Q12, a decrease by x percent can be written as $1 - \dfrac{x}{100}$.

The height of a triangle is increased by 50 percent, and its base is decreased by x percent. If the area of the triangle increased by 20 percent, what is the value of x?
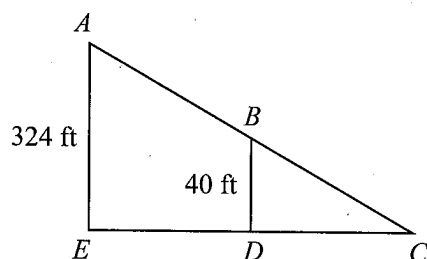
Ⓐ   20

Ⓑ   30

Ⓒ   70

Ⓓ   80

Try on Your Own

Directions

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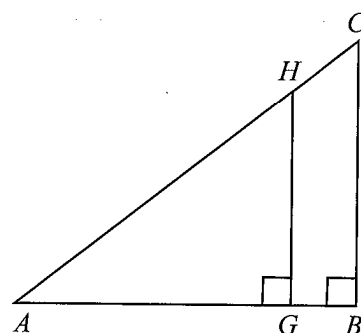
13

The diagram shows similar triangles *ACE* and *BCD*. If segment *DC* is 50 percent longer than segment *BD*, how long, in feet, is segment *DE*?

14

HINT: Triangles with a shared angle and parallel sides are similar. How can you use this fact in Q14?

Triangle *ABC* shown has an area of 150 square units. If lengths *AB* = *AH* = 20, then what is the length of *HG*?
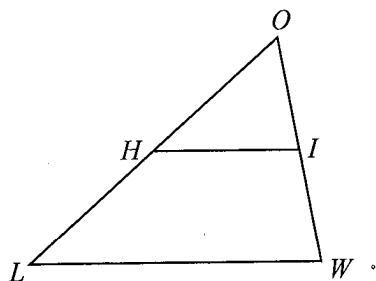
(A) 5

(B) 12

(C) 16

(D) 20

Math

15

Triangle *LOW* is shown in the figure above, where segment *HI* is the bisector of both segments *LO* and *OW*. Given that $LW = 30$ and $HI = 4x - 1$, what is the value of *x*?

Ⓐ 3.5

Ⓑ 4

Ⓒ 7.75

Ⓓ 8

16

Right triangle *DEF* is similar to right triangle *ABC*, and both are plotted on a coordinate plane (not shown). The vertices of triangle *DEF* are $D(3, 2)$, $E(3, -1)$, and $F(-1, -1)$. The vertices that form triangle *ABC*'s longer leg are $(-8, -3)$ and $(8, -3)$. If vertex *A* is in the same quadrant of the coordinate plane as vertex *D*, what is the *y*-coordinate of vertex *A*?

17

HINT: For Q17, translate carefully from English into math and fill in the lengths on the figure.
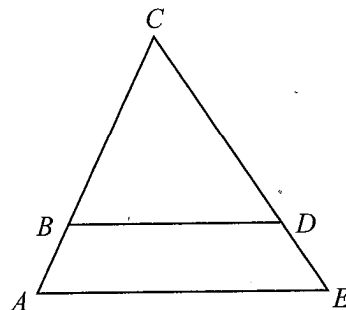
In the figure above, $\overline{BD} \parallel \overline{AE}$ and $AB = 5$. If *BC* is three times *AB*, and if *CD* is 2 more than half *AC*, then what is the length of segment *DE*?
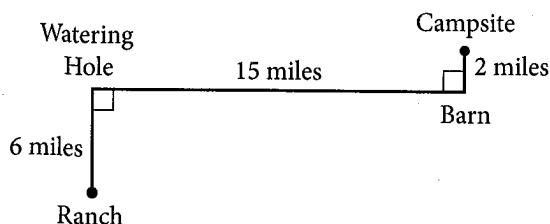
Ⓐ 3

Ⓑ 4

Ⓒ 5

Ⓓ 6

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

18

HINT: For Q18, draw the direct path and use it as the hypotenuse of a right triangle.

Watering Hole — 15 miles — Campsite

2 miles — Barn

6 miles — Ranch

A tourist ranch built the horse-riding trail shown in the figure. The trail takes a rider from the ranch to a watering hole, then to a barn, and finally to a campsite. If a rider took a horse on a direct path from the ranch to the campsite instead, how long, in miles, would the trip be?

(A) 6

(B) 17

(C) 23

(D) 40

19

Ted wants to visit his friend. If he bikes, he can cut through the yards of neighbors to travel in a straight line. If he drives, however, he must follow the streets. He travels 6 miles east, 6 miles south, and 2 more miles east by car. How much shorter, in miles, is Ted's bike route than his car route?

20

Sage takes a trail to a campsite that travels 5 miles south, 6 miles east, 7 miles south, and 2 miles west to a campsite. Annette uses a cross-country route that starts at the same point as Sage's trail but goes in a straight line from there to the campsite. About how many miles total will the two travel?

(A) 32.65

(B) 33.42

(C) 34.00

(D) 34.42

21

The lengths of the legs of a right triangle are $3x$ and $x + 1$. The hypotenuse is $3x + 1$. What is the value of x?

22

HINT: In Q22, an isosceles right triangle has two equal sides.

If an isosceles right triangle has a hypotenuse of 4 inches, what is the perimeter, in inches, of the triangle?

(A) $4\sqrt{2}$

(B) $4 + 4\sqrt{2}$
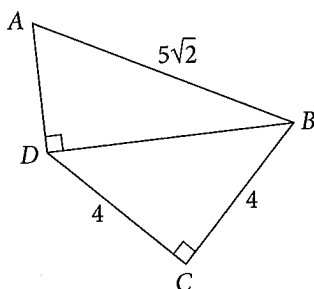
(C) $4 + 8\sqrt{2}$

(D) 8

Try on Your Own

Directions

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23

HINT: For Q23, don't rush to use the Pythagorean theorem. What kind of special triangle is triangle *ABD*?
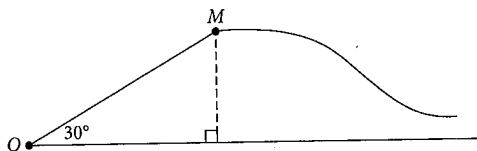

What is the area of triangle *ABD*?

(A) $3\sqrt{2}$

(B) 8

(C) 12

(D) $20\sqrt{2}$

24

The distance from point *O* to point *M* of an amusement ride course shown in the figure is $200\sqrt{3}$ feet. If the angle of ascent is 30°, what is the height, in feet, of the amusement ride at point *M*?
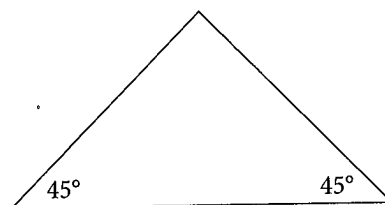
(A) $\dfrac{20}{3}\sqrt{3}$

(B) $100\sqrt{3}$

(C) 200

(D) 300

25

The triangle shown in the figure has a hypotenuse length of 16 inches. What is the area of the triangle, in square inches?

(A) 32

(B) 64

(C) $64\sqrt{2}$

(D) 128

26

HINT: Q26: Whenever a right triangle question involves $\sqrt{3}$, suspect a 30-60-90 special right triangle.

A rectangle has a 12-inch diagonal. If the length of the rectangle is $\sqrt{3}$ times longer than the width, what is the area, in square inches, of the rectangle?
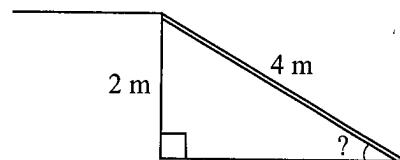
Ⓐ 12

Ⓑ $18\sqrt{3}$

Ⓒ 36

Ⓓ $36\sqrt{3}$

27

A theater is building a portable ramp to allow equipment and people easy access to the stage, which is 2 meters high. If the ramp is 4 meters long, what is the angle of the incline, in degrees?
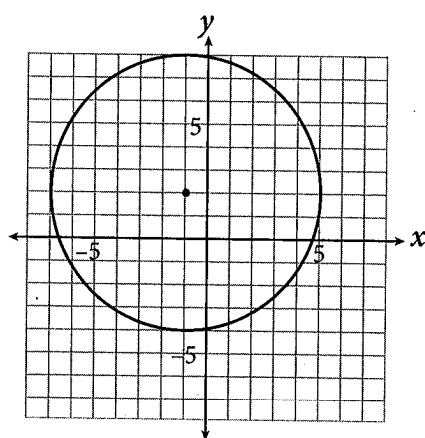
Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

28

HINT: For Q28, which part of the circle's equation would be the easiest to use to eliminate answer choices? The coordinates of the circle's center? The radius?

Which of the following represents the equation of the circle shown?

Ⓐ $(x - 1)^2 + (y + 2)^2 = 6$

Ⓑ $(x + 1)^2 + (y - 2)^2 = 6$

Ⓒ $(x - 1)^2 + (y + 2)^2 = 36$

Ⓓ $(x + 1)^2 + (y - 2)^2 = 36$

29

A circle in the standard (x,y) coordinate plane is tangent to the x-axis at 4 and tangent to the y-axis at 4. Which of the following is the equation of the circle?

Ⓐ $x^2 + y^2 = 4$

Ⓑ $x^2 + y^2 = 16$

Ⓒ $(x - 4)^2 + (y - 4)^2 = 4$

Ⓓ $(x - 4)^2 + (y - 4)^2 = 16$

30

HINT: For Q30, complete the square for the x and y terms.

$$x^2 + y^2 + 8x - 20y = 28$$

What is the diameter of the circle given by the equation above?

Ⓐ 12

Ⓑ 24

Ⓒ 28

Ⓓ 56

31

A circle in the xy-plane is defined by the equation $(x - 4)^2 + (y + 2)^2 = 100$. Which of the following points is located on the circumference of the circle?
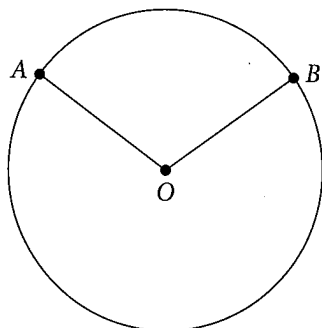
Ⓐ $(-3, 5)$

Ⓑ $(0, 9)$

Ⓒ $(4, -2)$

Ⓓ $(4, 8)$

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

32

HINT: For Q32, what do you need to calculate before using the circle ratios?

Note: Figure not drawn to scale.

In the figure, circle O has a radius of 120 centimeters. If the length of minor arc AB is 200 centimeters, what is the measure of central angle AOB, to the nearest tenth of a degree?
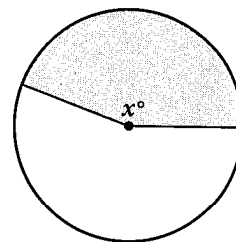
Ⓐ 95.5

Ⓑ 98.2

Ⓒ 102.1

Ⓓ 105.4

33

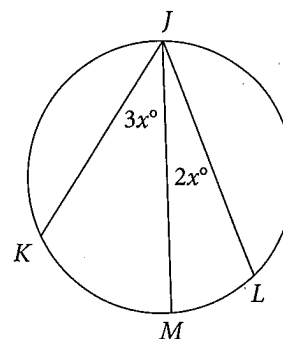In the figure, the ratio of the shaded area to the non-shaded area is 4 to 5. What is the value of x, in degrees?

Ⓐ 135

Ⓑ 145

Ⓒ 160

Ⓓ 288

34

In the figure, points J, K, L, and M lie on the circle. If minor arc KL has a measure of 150°, what is the value of x?

Ⓐ 12
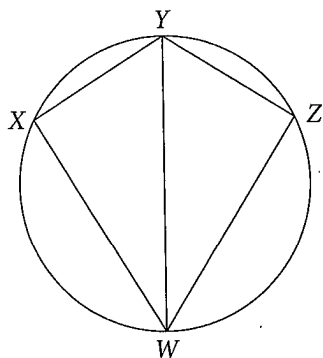
Ⓑ 15

Ⓒ 30

Ⓓ 60

35

In the figure, points W, X, Y, and Z lie on the circle. Semicircle YW has a measure of 180°, and minor arcs XY and YZ each have a measure of 60°. If the length of chord YZ is 3, then what is the length of chord WX?
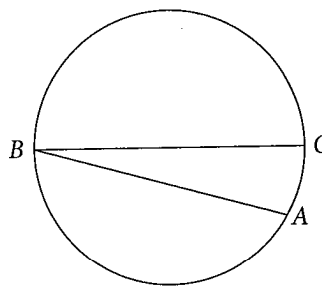
Ⓐ $\sqrt{3}$

Ⓑ 3

Ⓒ $3\sqrt{3}$

Ⓓ 6

36

In the figure, BC is the diameter of the circle. If the measure of minor arc AC is 30°, then what is the measure of minor arc BA, in radians?

Ⓐ $\dfrac{\pi}{2}$

Ⓑ $\dfrac{2\pi}{3}$

Ⓒ $\dfrac{3\pi}{4}$

Ⓓ $\dfrac{5\pi}{6}$

Try on Your Own

Directions

Take as much time as you need on these questions. Work carefully and methodically. There will be an opportunity for timed practice later in the book.

37

HINT: For Q37, refer to the formulas given in the lesson. On test day, they are provided.

Two ornamental glass spheres have diameters of 6 centimeters and 12 centimeters, respectively. What is the positive difference, in cubic centimeters, in their volumes?

(A) 36π

(B) 252π

(C) 288π

(D) $2,016\pi$

38

HINT: For Q38, when the water is poured into a larger glass, what information about the water does not change?

Alma completely fills a small cylindrical glass with a height of 6 inches and a diameter of 3 inches with water. She then pours the water from the small glass into a larger cylindrical glass that is 8 inches tall and 4 inches in diameter. Assuming Alma doesn't spill any water, how many inches high will the water reach in the larger glass?

(A) 1.5

(B) 2.25

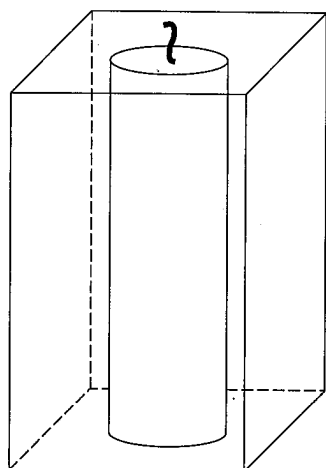(C) 3.375

(D) 6.0

39

16 inches
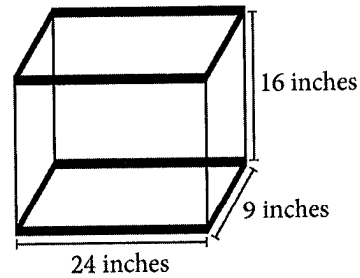
9 inches

24 inches

Staff at a pet store want to fill the bottom of 50 fish tanks (one shown) with two inches of sand. Sand comes in full-size 40-pound bags. If 1 cubic inch of sand weighs 0.125 pounds, how many bags of sand does the pet store need to buy?

40

In the figure, a cylindrical candle with a diameter of 2 inches and height of 8 inches sits within a rectangular glass box. The box is the same height as the candle and the area of the base of the box is 15 square inches. If Felipe wants to fill the space between the candle and the box with wax, how many cubic inches of wax does he need?
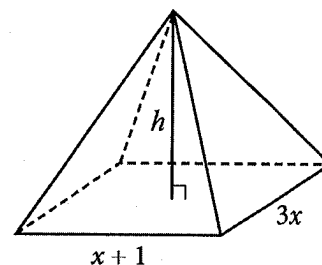
Ⓐ $120 - 8\pi$

Ⓑ $120 - 32\pi$

Ⓒ $225 - 8\pi$

Ⓓ $225 - 32\pi$

41

The perimeter of one face of a cube is $4x$. What is the surface area of the cube in terms of x?

Ⓐ $6x$

Ⓑ $24x$

Ⓒ $6x^2$

Ⓓ $16x^2$

42

If the volume of the pyramid shown in the figure can be represented by the function $V(x) = x^3 - x$, which of the following expressions represents the pyramid's height?

Ⓐ x

Ⓑ $2x$

Ⓒ $x - 1$

Ⓓ $x - 3$