Question ID 752cef17

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 752cef17

A circle has a radius of 43 meters. What is the area, in square meters, of the circle?

A. $\frac{43\pi}{2}$

B. 43π

C. 86π

D. $1{,}849\pi$

ID: 752cef17 Answer

Correct Answer: D

Rationale

Choice D is correct. The area, A, of a circle is given by the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the circle has a radius of 43 meters. Substituting 43 for r in the formula $A = \pi r^2$ yields $A = \pi(43)^2$, or $A = 1{,}849\pi$. Therefore, the area, in square meters, of the circle is $1{,}849\pi$.

Choice A is incorrect. This is the area, in square meters, of a circle with a radius of $\sqrt{\frac{43}{2}}$ meters.

Choice B is incorrect. This is the area, in square meters, of a circle with a radius of $\sqrt{43}$ meters.

Choice C is incorrect. This is the circumference, in meters, of the circle.

Question Difficulty: Hard

Question ID c86d574d

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: c86d574d

A right circular cone has a volume of $71{,}148\pi$ cubic centimeters and the area of its base is $5{,}929\pi$ square centimeters. What is the slant height, in centimeters, of this cone?

A. 12

B. 36

C. 77

D. 85

ID: c86d574d Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a right circular cone is given by the formula $V = \frac{1}{3}\pi r^2 h$, where πr^2 is the area of the circular base of the cone and h is the height. It's given that this right circular cone has a volume of $71{,}148\pi$ cubic centimeters and the area of its base is $5{,}929\pi$ square centimeters. Substituting $71{,}148\pi$ for V and $5{,}929\pi$ for πr^2 in the formula $V = \frac{1}{3}\pi r^2 h$ yields $71{,}148\pi = \left(\frac{1}{3}\right)(5{,}929\pi)(h)$. Dividing each side of this equation by $5{,}929\pi$ yields $12 = \frac{h}{3}$. Multiplying each side of this equation by 3 yields $36 = h$. Let s represent the slant height, in centimeters, of this cone. A right triangle is formed by the radius, r, height, h, and slant height, s, of this cone, where r and h are the legs of the triangle and s is the hypotenuse. Using the Pythagorean theorem, the equation $r^2 + h^2 = s^2$ represents this relationship. Because $5{,}929\pi$ is the area of the base and the area of the base is πr^2, it follows that $5{,}929\pi = \pi r^2$. Dividing both sides of this equation by π yields $5{,}929 = r^2$. Substituting $5{,}929$ for r^2 and 36 for h in the equation $r^2 + h^2 = s^2$ yields $5{,}929 + 36^2 = s^2$, which is equivalent to $5{,}929 + 1{,}296 = s^2$, or $7{,}225 = s^2$. Taking the positive square root of both sides of this equation yields $85 = s$. Therefore, the slant height of the cone is 85 centimeters.

Choice A is incorrect. This is one-third of the height, in centimeters, not the slant height, in centimeters, of this cone.

Choice B is incorrect. This is the height, in centimeters, not the slant height, in centimeters, of this cone.

Choice C is incorrect. This is the radius, in centimeters, of the base, not the slant height, in centimeters, of this cone.

Question Difficulty: Hard

Question ID 707f7a8a

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 707f7a8a

A triangle has a base length of 56 centimeters and a height of 112 centimeters. What is the area, in square centimeters, of the triangle?

A. 168

B. $1{,}568$

C. $3{,}136$

D. $6{,}272$

ID: 707f7a8a Answer

Correct Answer: C

Rationale

Choice C is correct. The area, A, of a triangle is given by the formula $A = \frac{1}{2}bh$, where b is the base length and h is the height of the triangle. It's given that a triangle has a base length of 56 centimeters and a height of 112 centimeters. Substituting 56 for b and 112 for h in the formula $A = \frac{1}{2}bh$ yields $A = \left(\frac{1}{2}\right)(56)(112)$, or $A = 3{,}136$. Therefore, the area, in square centimeters, of the triangle is $3{,}136$.

Choice A is incorrect. This is the value of $56 + 112$, not $\left(\frac{1}{2}\right)(56)(112)$.

Choice B is incorrect. This is the value of $\left(\frac{1}{4}\right)(56)(112)$, not $\left(\frac{1}{2}\right)(56)(112)$.

Choice D is incorrect. This is the value of $(56)(112)$, not $\left(\frac{1}{2}\right)(56)(112)$.

Question Difficulty: Hard

Question ID bd731427

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: bd731427

A right circular cylinder has a volume of 432 cubic centimeters. The area of the base of the cylinder is 24 square centimeters. What is the height, in centimeters, of the cylinder?

A. 18

B. 24

C. 216

D. $10{,}368$

ID: bd731427 Answer

Correct Answer: A

Rationale

Choice A is correct. The volume, V, of a right circular cylinder is given by the formula $V = \pi r^2 h$, where πr^2 is the area of the base of the cylinder and h is the height. It's given that a right circular cylinder has a volume of 432 cubic centimeters and the area of the base is 24 square centimeters. Substituting 432 for V and 24 for πr^2 in the formula $V = \pi r^2 h$ yields $432 = 24h$. Dividing both sides of this equation by 24 yields $18 = h$. Therefore, the height of the cylinder, in centimeters, is 18.

Choice B is incorrect. This is the area of the base, in square centimeters, not the height, in centimeters, of the cylinder.

Choice C is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is 2, not 24, cubic centimeters.

Choice D is incorrect. This is the height, in centimeters, of a cylinder if its volume is 432 cubic centimeters and the area of its base is $\frac{1}{24}$, not 24, cubic centimeters.

Question Difficulty: Hard

Question ID ebcbcf82

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: ebcbcf82

Circle A has a radius of $3n$ and circle B has a radius of $129n$, where n is a positive constant. The area of circle B is how many times the area of circle A?

A. 43

B. 86

C. 129

D. $1{,}849$

ID: ebcbcf82 Answer

Correct Answer: D

Rationale

Choice D is correct. The area of a circle can be found by using the formula $A = \pi r^2$, where A is the area and r is the radius of the circle. It's given that the radius of circle *A* is $3n$. Substituting this value for r into the formula $A = \pi r^2$ gives $A = \pi(3n)^2$, or $9\pi n^2$. It's also given that the radius of circle *B* is $129n$. Substituting this value for r into the formula $A = \pi r^2$ gives $A = \pi(129n)^2$, or $16{,}641\pi n^2$. Dividing the area of circle *B* by the area of circle *A* gives $\frac{16{,}641\pi n^2}{9\pi n^2}$, which simplifies to $1{,}849$. Therefore, the area of circle *B* is $1{,}849$ times the area of circle *A*.

Choice A is incorrect. This is how many times greater the radius of circle *B* is than the radius of circle *A*.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the coefficient on the term that describes the radius of circle *B*.

Question Difficulty: Hard

Question ID cf63d338

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: cf63d338

A rectangular poster has an area of 360 square inches. A copy of the poster is made in which the length and width of the original poster are each increased by 20%. What is the area of the copy, in square inches?

ID: cf63d338 Answer

Correct Answer: 2592/5, 518.4

Rationale

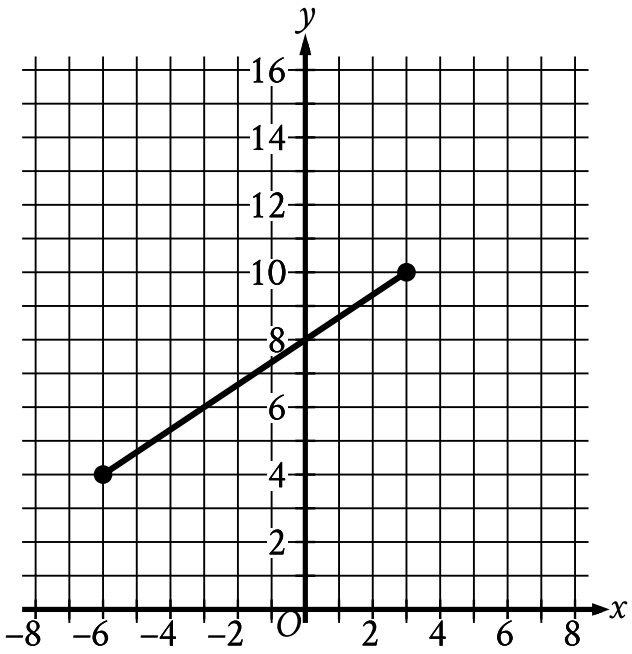
The correct answer is 518.4. It's given that the area of the original poster is 360 square inches. Let ℓ represent the length, in inches, of the original poster, and let w represent the width, in inches, of the original poster. Since the area of a rectangle is equal to its length times its width, it follows that $360 = \ell w$. It's also given that a copy of the poster is made in which the length and width of the original poster are each increased by 20%. It follows that the length of the copy is the length of the original poster plus 20% of the length of the original poster, which is equivalent to $\ell + \frac{20}{100}\ell$ inches. This length can be rewritten as $\ell + 0.2\ell$ inches, or 1.2ℓ inches. Similarly, the width of the copy is the width of the original poster plus 20% of the width of the original poster, which is equivalent to $w + \frac{20}{100}w$ inches. This width can be rewritten as $w + 0.2w$ inches, or $1.2w$ inches. Since the area of a rectangle is equal to its length times its width, it follows that the area, in square inches, of the copy is equal to $(1.2\ell)(1.2w)$, which can be rewritten as $(1.2)(1.2)(\ell w)$. Since $360 = \ell w$, the area, in square inches, of the copy can be found by substituting 360 for ℓw in the expression $(1.2)(1.2)(\ell w)$, which yields $(1.2)(1.2)(360)$, or 518.4. Therefore, the area of the copy, in square inches, is 518.4.

Question Difficulty: Hard

Question ID beae147d

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: beae147d



The line segment shown in the *xy*-plane represents one of the legs of a right triangle. The area of this triangle is $36\sqrt{13}$ square units. What is the length, in units, of the other leg of this triangle?

A. 12

B. 24

C. $3\sqrt{13}$

D. $18\sqrt{13}$

ID: beae147d Answer

Correct Answer: B

Rationale

Choice B is correct. The length of a segment in the *xy*-plane can be found using the distance formula, $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$, where (x_1, y_1) and (x_2, y_2) are the endpoints of the segment. The segment shown has endpoints at $(-6, 4)$ and $(3, 10)$. Substituting $(-6, 4)$ and $(3, 10)$ for (x_1, y_1) and (x_2, y_2), respectively, in the distance formula yields $\sqrt{(3-(-6))^2+(10-4)^2}$, or $\sqrt{9^2+6^2}$, which is equivalent to $\sqrt{81+36}$, or $\sqrt{117}$. Let x represent the length, in units, of the other leg of this triangle. The area, A, of a right triangle can be calculated using the formula $A=\frac{1}{2}bh$, where b and h are the lengths of the legs of the triangle. It's given that the area of the triangle is $36\sqrt{13}$ square units. Substituting $36\sqrt{13}$ for A, $\sqrt{117}$ for b, and x for h in the formula $A=\frac{1}{2}bh$ yields $36\sqrt{13}=\frac{1}{2}\left(\sqrt{117}\right)(x)$. Multiplying both sides of this equation by 2 yields $72\sqrt{13}=x\sqrt{117}$. Dividing both sides of

this equation by $\sqrt{117}$ yields $\frac{72\sqrt{13}}{\sqrt{117}} = x$. Multiplying the numerator and denominator on the left-hand side of this equation by $\sqrt{117}$ yields $\frac{72\sqrt{1,521}}{117} = x$, or $\frac{72(39)}{117} = x$, which is equivalent to $\frac{2,808}{117} = x$, or $24 = x$. Therefore, the length, in units, of the other leg of this triangle is 24.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. $3\sqrt{13}$ is equivalent to $\sqrt{117}$, which is the length, in units, of the line segment shown in the *xy*-plane, not the length, in units, of the other leg of the triangle.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 33ddd1e0

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 33ddd1e0

The length of each edge of a box is 29 inches. Each side of the box is in the shape of a square. The box does not have a lid. What is the exterior surface area, in square inches, of this box without a lid?

ID: 33ddd1e0 Answer

Correct Answer: 4205

Rationale

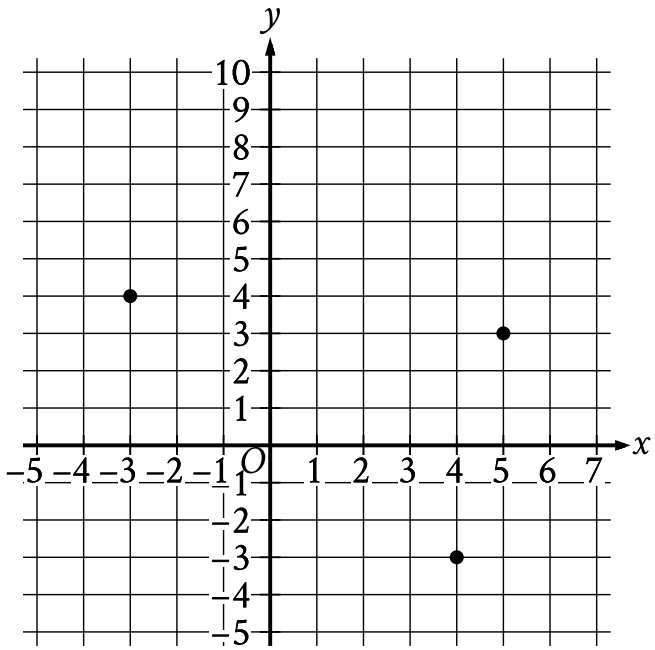
The correct answer is $4{,}205$. The exterior surface area of a figure is the sum of the areas of all its faces. It's given that the box does not have a lid and that each side of the box is in the shape of a square. Therefore, the box consists of 5 congruent square faces. It's also given that the length of each edge is 29 inches. Let s represent the length of an edge of a square. It follows that the area of a square is equal to s^2. Therefore, the area of each of the 5 square faces is equal to 29^2, or 841, square inches. Since the box consists of 5 congruent square faces, it follows that the sum of the areas of all its faces, or the exterior surface area of this box without a lid, is $5(841)$, or $4{,}205$, square inches.

Question Difficulty: Hard

Question ID 9b9a8aef

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 9b9a8aef



What is the area, in square units, of the triangle formed by connecting the three points shown?

ID: 9b9a8aef Answer

Correct Answer: 24.5, 49/2

Rationale

The correct answer is 24.5. It's given that a triangle is formed by connecting the three points shown, which are $(-3, 4)$, $(5, 3)$, and $(4, -3)$. Let this triangle be triangle A. The area of triangle A can be found by calculating the area of the rectangle that circumscribes it and subtracting the areas of the three triangles that are inside the rectangle but outside triangle A. The rectangle formed by the points $(-3, 4)$, $(5, 4)$, $(5, -3)$, and $(-3, -3)$ circumscribes triangle A. The width, in units, of this rectangle can be found by calculating the distance between the points $(5, 4)$ and $(5, -3)$. This distance is $4 - (-3)$, or 7. The length, in units, of this rectangle can be found by calculating the distance between the points $(5, 4)$ and $(-3, 4)$. This distance is $5 - (-3)$, or 8. It follows that the area, in square units, of the rectangle is $(7)(8)$, or 56. One of the triangles that lies inside the rectangle but outside triangle A is formed by the points $(-3, 4)$, $(5, 4)$, and $(5, 3)$. The length, in units, of a base of this triangle can be found by calculating the distance between the points $(5, 4)$ and $(5, 3)$. This distance is $4 - 3$, or 1. The corresponding height, in units, of this triangle can be found by calculating the distance between the points $(5, 4)$ and $(-3, 4)$. This distance is $5 - (-3)$, or 8. It follows that the area, in square units, of this triangle is $\frac{1}{2}(8)(1)$, or 4. A second triangle that lies inside the rectangle but outside triangle A is formed by the points $(4, -3)$, $(5, 3)$, and $(5, -3)$. The length, in units, of a base of this triangle can be found by calculating the distance between the points $(5, 3)$ and $(5, -3)$. This distance is $3 - (-3)$, or 6. The corresponding height, in units, of this triangle can be found by calculating the distance between the points $(5, -3)$ and $(4, -3)$. This distance is $5 - 4$, or 1. It follows that the area, in square units, of this triangle is $\frac{1}{2}(1)(6)$, or 3. The third triangle that lies inside the rectangle but outside triangle A is formed by the points $(-3, 4)$, $(-3, -3)$, and $(4, -3)$. The length, in units,

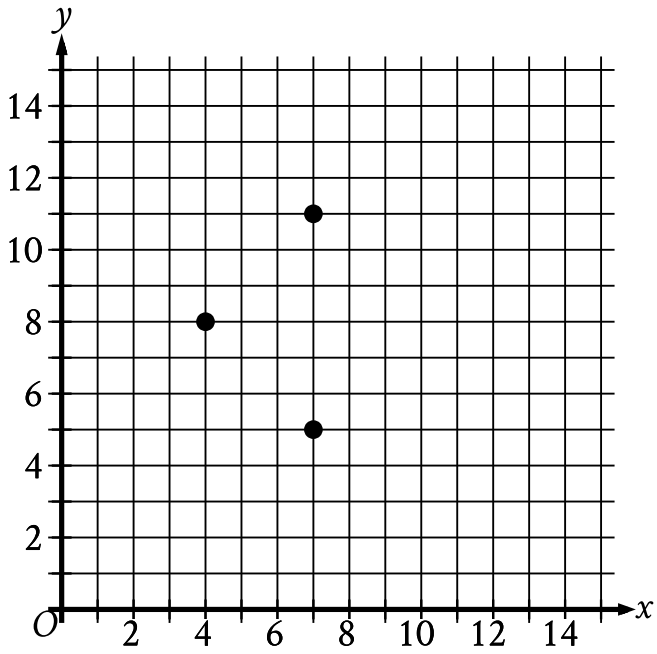
of a base of this triangle can be found by calculating the distance between the points $(4, -3)$ and $(-3, -3)$. This distance is $4 - (-3)$, or 7. The corresponding height, in units, of this triangle can be found by calculating the distance between the points $(-3, 4)$ and $(-3, -3)$. This distance is $4 - (-3)$, or 7. It follows that the area, in square units, of this triangle is $\frac{1}{2}(7)(7)$, or 24.5. Thus, the area, in square units, of the triangle formed by connecting the three points shown is $56 - 4 - 3 - 24.5$, or 24.5. Note that 24.5 and 49/2 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 226ba345

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 226ba345



The three points shown define a circle. The circumference of this circle is $k\pi$, where k is a constant. What is the value of k?

A. 3

B. 6

C. 7

D. 9

ID: 226ba345 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the three points shown define a circle, so the center of that circle is an equal distance from each of the three points. The point $(7, 8)$ is halfway between the points $(7, 5)$ and $(7, 11)$ and is a distance of 3 units from each of those two points. The point $(7, 8)$ is also a distance of 3 units from $(4, 8)$. Because the point $(7, 8)$ is the same distance from all three given points, it must be the center of the circle. The radius of a circle is the distance from the center to any point on the circle. Since that distance is 3, it follows that the radius of the circle is 3. The circumference of a circle with radius r is equal to $2\pi r$. It follows that the circumference of the circle is $2(\pi)(3)$, or 6π. It's given that the circumference of the circle is $k\pi$. Therefore, the value of k is 6.

Choice A is incorrect. This is the radius of the circle, not the value of k in the expression $k\pi$.

Choice C is incorrect. This is the *x*-coordinate of the center of the circle, not the value of k in the expression $k\pi$.

Choice D is incorrect. This is the value of k for which $k\pi$ represents the area of the circle, in square units, not the circumference of the circle, in units.

Question Difficulty: Hard

Question ID f682f810

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: f682f810

The floor of a ballroom has an area of 600 square meters. An architect creates a scale model of the floor of the ballroom, where the length of each side of the model is $\frac{1}{10}$ times the length of the corresponding side of the actual floor of the ballroom. What is the area, in square meters, of the scale model?

A. 6

B. 10

C. 60

D. 150

ID: f682f810 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the length of each side of a scale model is $\frac{1}{10}$ times the length of the corresponding side of the actual floor of a ballroom. Therefore, the area of the scale model is $\left(\frac{1}{10}\right)^2$, or $\frac{1}{100}$, times the area of the actual floor of the ballroom. It's given that the area of the floor of the ballroom is 600 square meters. Therefore, the area, in square meters, of the scale model is $\left(\frac{1}{100}\right)(600)$, or 6.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 2eb9177a

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 2eb9177a

A triangle has a base length of 10 centimeters and a corresponding height of 70 centimeters. What is the area, in square centimeters, of the triangle?

A. 700

B. 350

C. 175

D. 80

ID: 2eb9177a Answer

Correct Answer: B

Rationale

Choice B is correct. The area, A, of a triangle is given by $A = \left(\frac{1}{2}\right)bh$, where b is the length of a base of the triangle and h is the corresponding height of the triangle. It's given that a triangle has a base length of 10 centimeters and a corresponding height of 70 centimeters. Substituting 10 for b and 70 for h in the formula $A = \left(\frac{1}{2}\right)bh$ yields $A = \left(\frac{1}{2}\right)(10)(70)$, or $A = 350$. Therefore, the area, in square centimeters, of the triangle is 350.

Choice A is incorrect. This is the product of the given base and height of the triangle, not its area.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the sum of the given base and height of the triangle, not its area.

Question Difficulty: Hard

Question ID ee0f7ad7

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: ee0f7ad7

A cylinder has a diameter of 8 inches and a height of 12 inches. What is the volume, in cubic inches, of the cylinder?

A. 16π

B. 96π

C. 192π

D. 768π

ID: ee0f7ad7 Answer

Correct Answer: C

Rationale

Choice C is correct. The base of a cylinder is a circle with a diameter equal to the diameter of the cylinder. The volume, V, of a cylinder can be found by multiplying the area of the circular base, A, by the height of the cylinder, h, or $V = Ah$. The area of a circle can be found using the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the diameter of the cylinder is 8 inches. Thus, the radius of this circle is 4 inches. Therefore, the area of the circular base of the cylinder is $A = \pi(4)^2$, or 16π square inches. It's given that the height h of the cylinder is 12 inches. Substituting 16π for A and 12 for h in the formula $V = Ah$ gives $V = 16\pi(12)$, or 192π cubic inches.

Choice A is incorrect. This is the area of the circular base of the cylinder.

Choice B is incorrect and may result from using 8, instead of 16, as the value of r^2 in the formula for the area of a circle.

Choice D is incorrect and may result from using 8, instead of 4, for the radius of the circular base.

Question Difficulty: Hard

Question ID b23cbeba

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: b23cbeba

A right circular cylinder has a base diameter of 22 centimeters and a height of 6 centimeters. What is the volume, in cubic centimeters, of the cylinder?

A. 132π

B. 264π

C. 726π

D. $2{,}904\pi$

ID: b23cbeba Answer

Correct Answer: C

Rationale

Choice C is correct. The volume, V, of a right circular cylinder is given by the formula $V = \pi r^2 h$, where r is the radius of the base of the cylinder and h is the height of the cylinder. It's given that a right circular cylinder has a height of 6 centimeters. Therefore, $h = 6$. It's also given that the cylinder has a base diameter of 22 centimeters. The radius of a circle is half the diameter of the circle. Since the base of a right circular cylinder is a circle, it follows that the radius of the base of the right circular cylinder is $\frac{22}{2}$, or 11, centimeters. Therefore, $r = 11$. Substituting 11 for r and 6 for h in the formula $V = \pi r^2 h$ yields $V = \pi(11)^2(6)$, which is equivalent to $V = \pi(121)(6)$, or $V = 726\pi$. Therefore, the volume, in cubic centimeters, of the cylinder is 726π.

Choice A is incorrect. This is the volume of a right circular cylinder that has a base diameter of $2\sqrt{22}$, not 22, centimeters and a height of 6 centimeters.

Choice B is incorrect. This is the volume of a right circular cylinder that has a base diameter of $4\sqrt{11}$, not 22, centimeters and a height of 6 centimeters.

Choice D is incorrect. This is the volume of a right circular cylinder that has a base diameter of 44, not 22, centimeters and a height of 6 centimeters.

Question Difficulty: Hard

Question ID aa5a26a3

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: aa5a26a3

Two identical rectangular prisms each have a height of 90 centimeters (cm). The base of each prism is a square, and the surface area of each prism is $K\ \text{cm}^2$. If the prisms are glued together along a square base, the resulting prism has a surface area of $\frac{92}{47}K\ \text{cm}^2$. What is the side length, in cm, of each square base?

A. 4

B. 8

C. 9

D. 16

ID: aa5a26a3 Answer

Correct Answer: B

Rationale

Choice B is correct. Let x represent the side length, in cm, of each square base. If the two prisms are glued together along a square base, the resulting prism has a surface area equal to twice the surface area of one of the prisms, minus the area of the two square bases that are being glued together, which yields $2K - 2x^2\ \text{cm}^2$. It's given that this resulting surface area is equal to $\frac{92}{47}K\ \text{cm}^2$, so $2K - 2x^2 = \frac{92}{47}K$. Subtracting $\frac{92}{47}K$ from both sides of this equation yields $2K - \frac{92}{47}K - 2x^2 = 0$. This equation can be rewritten by multiplying $2K$ on the left-hand side by $\frac{47}{47}$, which yields $\frac{94}{47}K - \frac{92}{47}K - 2x^2 = 0$, or $\frac{2}{47}K - 2x^2 = 0$. Adding $2x^2$ to both sides of this equation yields $\frac{2}{47}K = 2x^2$. Multiplying both sides of this equation by $\frac{47}{2}$ yields $K = 47x^2$. The surface area K, in cm^2, of each rectangular prism is equivalent to the sum of the areas of the two square bases and the areas of the four lateral faces. Since the height of each rectangular prism is $90\ \text{cm}$ and the side length of each square base is $x\ \text{cm}$, it follows that the area of each square base is $x^2\ \text{cm}^2$ and the area of each lateral face is $90x\ \text{cm}^2$. Therefore, the surface area of each rectangular prism can be represented by the expression $2x^2 + 4(90x)$, or $2x^2 + 360x$. Substituting this expression for K in the equation $K = 47x^2$ yields $2x^2 + 360x = 47x^2$. Subtracting $2x^2$ and $360x$ from both sides of this equation yields $0 = 45x^2 - 360x$. Factoring x from the right-hand side of this equation yields $0 = x(45x - 360)$. Applying the zero product property, it follows that $x = 0$ and $45x - 360 = 0$. Adding 360 to both sides of the equation $45x - 360 = 0$ yields $45x = 360$. Dividing both sides of this equation by 45 yields $x = 8$. Since a side length of a rectangular prism can't be 0, the length of each square base is $8\ \text{cm}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID e8a76dc3

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: e8a76dc3

Circle K has a radius of 4 $\textbf{millimeters (mm)}$. Circle L has an area of 100π $\textbf{mm}^2$. What is the total area, $\textbf{in mm}^2$, of circles K and L?

A. 14π

B. 28π

C. 56π

D. 116π

ID: e8a76dc3 Answer

Correct Answer: D

Rationale

Choice D is correct. The area, A, of a circle is given by the formula $A = \pi r^2$, where r represents the radius of the circle. It's given that circle K has a radius of 4 $\textbf{millimeters (mm)}$. Substituting 4 for r in the formula $A = \pi r^2$ yields $A = \pi(4)^2$, or $A = 16\pi$. Therefore, the area of circle K is 16π $\textbf{mm}^2$. It's given that circle L has an area of 100π $\textbf{mm}^2$. Therefore, the total area, $\textbf{in mm}^2$, of circles K and L is $16\pi + 100\pi$, or 116π.

Choice A is incorrect. This is the sum of the radii, $\textbf{in mm}$, of circles K and L multiplied by π, not the total area, $\textbf{in mm}^2$, of the circles.

Choice B is incorrect. This is the sum of the diameters, $\textbf{in mm}$, of circles K and L multiplied by π, not the total area, $\textbf{in mm}^2$, of the circles.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 6c5aefc0

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 6c5aefc0

A right circular cylinder has a volume of 377 cubic centimeters. The area of the base of the cylinder is 13 square centimeters. What is the height, in centimeters, of the cylinder?

ID: 6c5aefc0 Answer

Correct Answer: 29

Rationale

The correct answer is 29. The volume, V, of a right circular cylinder is given by the formula $V = \pi r^2 h$, where r is the radius of the base of the cylinder and h is the height of the cylinder. Since the base of the cylinder is a circle with radius r, the area of the base of the cylinder is πr^2. It's given that a right circular cylinder has a volume of 377 cubic centimeters; therefore, $V = 377$. It's also given that the area of the base of the cylinder is 13 square centimeters; therefore, $\pi r^2 = 13$. Substituting 377 for V and 13 for πr^2 in the formula $V = \pi r^2 h$ yields $377 = 13h$. Dividing both sides of this equation by 13 yields $29 = h$. Therefore, the height of the cylinder, in centimeters, is 29.

Question Difficulty: Hard

Question ID 5f20344a

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 5f20344a

A right circular cylinder has a height of 8 meters (m) and a base with a radius of 12 m. What is the volume, $\text{in } \text{m}^3$, of the cylinder?

A. 8π

B. 20π

C. 768π

D. $1{,}152\pi$

ID: 5f20344a Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a right circular cylinder is given by $V = \pi r^2 h$, where r is the radius of the circular base and h is the height of the cylinder. It's given that the cylinder has a height of 8 meters and a base with a radius of 12 meters. Substituting 12 for r and 8 for h in $V = \pi r^2 h$ yields $V = \pi(12)^2(8)$, or $V = 1{,}152\pi$. Therefore, the volume, in m^3, of the cylinder is $1{,}152\pi$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect. This is the volume, in m^3, of a cylinder with a radius of 8 meters and a height of 12 meters.

Question Difficulty: Hard

Question ID 96e751b0

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 96e751b0

A sphere has a radius of $\frac{17}{5}$ feet. What is the volume, in cubic feet, of the sphere?

A. $\frac{5\pi}{17}$

B. $\frac{68\pi}{15}$

C. $\frac{32\pi}{5}$

D. $\frac{19{,}652\pi}{375}$

ID: 96e751b0 Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a sphere can be found using the formula $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. It's given that the sphere has a radius of $\frac{17}{5}$ feet. Substituting $\frac{17}{5}$ for r in the formula $V = \frac{4}{3}\pi r^3$ yields $V = \frac{4}{3}\pi\left(\frac{17}{5}\right)^3$, which is equivalent to $V = \frac{4}{3}\pi\left(\frac{4{,}913}{125}\right)$, or $V = \frac{19{,}652\pi}{375}$. Therefore, the volume, in cubic feet, of the sphere is $\frac{19{,}652\pi}{375}$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the volume, in cubic feet, of a sphere with a radius of $\sqrt[3]{\frac{17}{5}}$ feet.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 6245a010

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 6245a010

The circumference of the base of a right circular cylinder is 20π meters, and the height of the cylinder is 6 meters. What is the volume, in cubic meters, of the cylinder?

A. 60π

B. 120π

C. 600π

D. $2{,}400\pi$

ID: 6245a010 Answer

Correct Answer: C

Rationale

Choice C is correct. The volume, V, of a right circular cylinder is given by the formula $V = \pi r^2 h$, where r is the radius of the base of the cylinder and h is the height of the cylinder. It's given that a right circular cylinder has a height of 6 meters. Therefore, $h = 6$. It's also given that the right circular cylinder has a base with a circumference of 20π meters. The circumference, C, of a circle is given by $C = 2\pi r$, where r is the radius of the circle. Substituting 20π for C in the formula $C = 2\pi r$ yields $20\pi = 2\pi r$. Dividing each side of this equation by 2π yields $10 = r$. Substituting 10 for r and 6 for h in the formula $V = \pi r^2 h$ yields $V = \pi(10)^2(6)$, or $V = 600\pi$. Therefore, the volume, in cubic meters, of the cylinder is 600π.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the lateral surface area, not the volume, of the cylinder.

Choice D is incorrect. This is the result of using the diameter, not the radius, for the value of r in the formula $V = \pi r^2 h$.

Question Difficulty: Hard

Question ID 0d36e672

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 0d36e672

Rectangles $ABCD$ and $EFGH$ are similar. The length of each side of $EFGH$ is 6 times the length of the corresponding side of $ABCD$. The area of $ABCD$ is 54 square units. What is the area, in square units, of $EFGH$?

A. 9

B. 36

C. 324

D. $1{,}944$

ID: 0d36e672 Answer

Correct Answer: D

Rationale

Choice D is correct. The area of a rectangle is given by bh, where b is the length of the base of the rectangle and h is its height. Let x represent the length, in units, of the base of rectangle $ABCD$, and let y represent its height, in units. Substituting x for b and y for h in the formula bh yields xy. Therefore, the area, in square units, of $ABCD$ can be represented by the expression xy. It's given that the length of each side of $EFGH$ is 6 times the length of the corresponding side of $ABCD$. Therefore, the length, in units, of the base of $EFGH$ can be represented by the expression $6x$, and its height, in units, can be represented by the expression $6y$. Substituting $6x$ for b and $6y$ for h in the formula bh yields $(6x)(6y)$, which is equivalent to $36xy$. Therefore, the area, in square units, of $EFGH$ can be represented by the expression $36xy$. It's given that the area of $ABCD$ is 54 square units. Since xy represents the area, in square units, of $ABCD$, substituting 54 for xy in the expression $36xy$ yields $36(54)$, or $1{,}944$. Therefore, the area, in square units, of $EFGH$ is $1{,}944$.

Choice A is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{1}{6}}$, not 6, times the length of the corresponding side of $ABCD$.

Choice B is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{\frac{2}{3}}$, not 6, times the length of the corresponding side of $ABCD$.

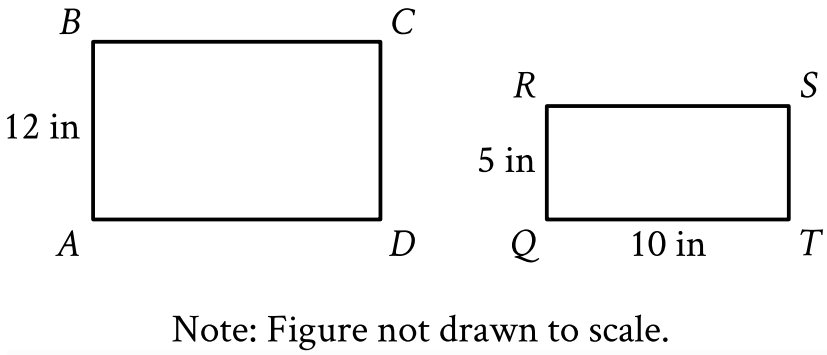
Choice C is incorrect. This is the area of a rectangle where the length of each side of the rectangle is $\sqrt{6}$, not 6, times the length of the corresponding side of $ABCD$.

Question Difficulty: Hard

Question ID 7bea77c0

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 7bea77c0



Note: Figure not drawn to scale.

Rectangles $ABCD$ and $QRST$ shown are similar, where A, B, C, and D correspond to Q, R, S, and T, respectively. What is the length, in inches (in), of $\overline{AD}$?

A. 60

B. 24

C. 17

D. 10

ID: 7bea77c0 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that rectangles $ABCD$ and $QRST$ are similar, where A, B, C, and D correspond to Q, R, S, and T, respectively. It follows that $\overline{AB}$ corresponds to $\overline{QR}$ and $\overline{AD}$ corresponds to $\overline{QT}$. If two rectangles are similar, then the lengths of their corresponding sides are proportional. It's given in the figure that the length of $\overline{AB}$ is 12 inches, the length of $\overline{QR}$ is 5 inches, and the length of $\overline{QT}$ is 10 inches. If x is the length, in inches, of $\overline{AD}$, then $\frac{12}{5}$ is equivalent to $\frac{x}{10}$. Therefore, the value of x can be found using the equation $\frac{12}{5} = \frac{x}{10}$. Multiplying each side of this equation by 10 yields $\frac{120}{5} = x$, or $24 = x$. Therefore, the length, in inches, of $\overline{AD}$ is 24.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect. This is the length, in inches, of $\overline{QT}$, not $\overline{AD}$.

Question Difficulty: Hard

Question ID 9af4eee3

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 9af4eee3

Rectangle $ABCD$ is similar to rectangle $EFGH$. The area of rectangle $ABCD$ is 648 square inches, and the area of rectangle $EFGH$ is 72 square inches. The length of the longest side of rectangle $ABCD$ is 36 inches. What is the length, in inches, of the longest side of rectangle $EFGH$?

A. 4

B. 9

C. 12

D. 36

ID: 9af4eee3 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that rectangle $ABCD$ is similar to rectangle $EFGH$. Therefore, if the length of each side of rectangle $ABCD$ is k times the length of the corresponding side of rectangle $EFGH$, then the area of rectangle $ABCD$ is k^2 times the area of rectangle $EFGH$. It's given that the area of rectangle $ABCD$ is 648 square inches and the area of rectangle $EFGH$ is 72 square inches. It follows that $k^2 = \frac{648}{72}$, or $k^2 = 9$. Taking the square root of each side of this equation yields $k = \sqrt{9}$, or $k = 3$. It follows that the length of each side of rectangle $ABCD$ is 3 times the length of the corresponding side of rectangle $EFGH$. It's given that the length of the longest side of rectangle $ABCD$ is 36 inches. Therefore, 36 inches is 3 times the length of the longest side of rectangle $EFGH$, and the longest side of rectangle $EFGH$ is equal to $\frac{36}{3}$, or 12, inches.

Choice A is incorrect. This is the length, in inches, of the longest side of a rectangle with side lengths that are $\frac{1}{9}$ the corresponding side lengths of rectangle $ABCD$, rather than a rectangle with an area that is $\frac{1}{9}$ the area of rectangle $ABCD$.

Choice B is incorrect. This is the factor by which the area of rectangle $ABCD$ is larger than the area of rectangle $EFGH$, not the length, in inches, of the longest side of rectangle $EFGH$.

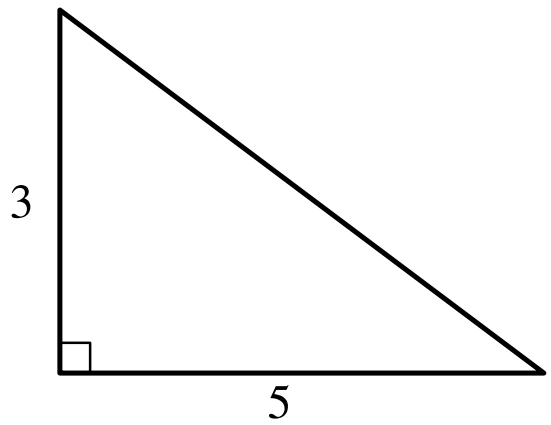
Choice D is incorrect. This is the length, in inches, of the longest side of rectangle $ABCD$, not rectangle $EFGH$.

Question Difficulty: Hard

Question ID 9ee4e592

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 9ee4e592



Note: Figure not drawn to scale.

The figure shows the lengths, in inches, of two sides of a right triangle. What is the area of the triangle, in square inches?

ID: 9ee4e592 Answer

Correct Answer: 7.5, 15/2

Rationale

The correct answer is $\frac{15}{2}$. The area, A, of a triangle is given by the formula $A = \frac{1}{2}bh$, where b is the length of the base of the triangle and h is the height of the triangle. In the right triangle shown, the length of the base of the triangle is 5 inches, and the height is 3 inches. It follows that $b = 5$ and $h = 3$. Substituting 5 for b and 3 for h in the formula $A = \frac{1}{2}bh$ yields $A = \frac{1}{2}(5)(3)$, which is equivalent to $A = \frac{1}{2}(15)$, or $A = \frac{15}{2}$. Therefore, the area of the triangle, in square inches, is $\frac{15}{2}$. Note that 15/2 and 7.5 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 02811722

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 02811722

A right rectangular prism has a length of 28 centimeters (cm), a width of 15 cm, and a height of 16 cm. What is the surface area, in cm^2, of the right rectangular prism?

ID: 02811722 Answer

Correct Answer: 2216

Rationale

The correct answer is $2{,}216$. The surface area of a prism is the sum of the areas of all its faces. A right rectangular prism consists of six rectangular faces, where opposite faces are congruent. It's given that this prism has a length of 28 cm, a width of 15 cm, and a height of 16 cm. Thus, for this prism, there are two faces with area $(28)(15)$ cm^2, two faces with area $(28)(16)$ cm^2, and two faces with area $(15)(16)$ cm^2. Therefore, the surface area, in cm^2, of the right rectangular prism is $2(28)(15) + 2(28)(16) + 2(15)(16)$, or $2{,}216$.

Question Difficulty: Hard

Question ID 090d4df6

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 090d4df6

Square A has side lengths that are 166 times the side lengths of square B. The area of square A is k times the area of square B. What is the value of k?

ID: 090d4df6 Answer

Correct Answer: 27556

Rationale

The correct answer is $27{,}556$. The area of a square is s^2, where s is the side length of the square. Let x represent the length of each side of square B. Substituting x for s in s^2 yields x^2. It follows that the area of square B is x^2. It's given that square A has side lengths that are 166 times the side lengths of square B. Since x represents the length of each side of square B, the length of each side of square A can be represented by the expression $166x$. It follows that the area of square A is $(166x)^2$, or $27{,}556x^2$. It's given that the area of square A is k times the area of square B. Since the area of square A is equal to $27{,}556x^2$, and the area of square B is equal to x^2, an equation representing the given statement is $27{,}556x^2 = kx^2$. Since x represents the length of each side of square B, the value of x must be positive. Therefore, the value of x^2 is also positive, so it does not equal 0. Dividing by x^2 on both sides of the equation $27{,}556x^2 = kx^2$ yields $27{,}556 = k$. Therefore, the value of k is $27{,}556$.

Question Difficulty: Hard

Question ID b6a9bc22

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: b6a9bc22

Square A has side lengths that are 246 times the side lengths of square B. The area of square A is k times the area of square B. What is the value of k?

A. $60{,}516$

B. 492

C. 246

D. 123

ID: b6a9bc22 Answer

Correct Answer: A

Rationale

Choice A is correct. The area of a square is s^2, where s is the side length of the square. Therefore, the area of square B is b^2, where b is the side length of square B. It's given that square A has side lengths that are 246 times the side lengths of square B. Therefore, the side length of square A can be represented by the expression $246b$. It follows that the area of square A is $(246b)^2$, or $60{,}516b^2$. It's given that the area of square A is k times the area of square B, so $60{,}516b^2 = kb^2$. Therefore, the value of k is $60{,}516$.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID bfe225c0

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: bfe225c0

Parallelogram $ABCD$ is similar to parallelogram $PQRS$. The length of each side of parallelogram $PQRS$ is 2 times the length of its corresponding side of parallelogram $ABCD$. The area of parallelogram $ABCD$ is 5 square centimeters. What is the area, in square centimeters, of parallelogram $PQRS$?

A. 7

B. 10

C. 20

D. 25

ID: bfe225c0 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that parallelogram $ABCD$ is similar to parallelogram $PQRS$. When two parallelograms are similar, if the scale factor between their corresponding side lengths is k, the scale factor between their areas is k^2. It's given that the length of each side of parallelogram $PQRS$ is 2 times the length of its corresponding side of parallelogram $ABCD$, so the scale factor between their corresponding side lengths is 2. It follows that the scale factor between their areas is 2^2, or 4. It's given that the area, in square centimeters, of parallelogram $ABCD$ is 5. It follows that the area, in square centimeters, of parallelogram $PQRS$ is $5(4)$, or 20.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID c9fee8a2

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: c9fee8a2

A cube has a volume of $474{,}552$ cubic units. What is the surface area, in square units, of the cube?

ID: c9fee8a2 Answer

Correct Answer: 36504

Rationale

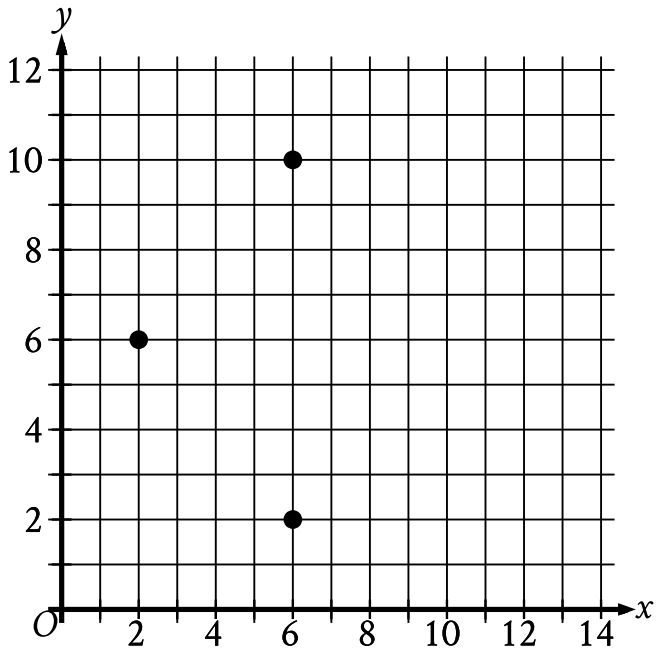
The correct answer is $36{,}504$. The volume of a cube can be found using the formula $V = s^3$, where s represents the edge length of a cube. It's given that this cube has a volume of $474{,}552$ cubic units. Substituting $474{,}552$ for V in $V = s^3$ yields $474{,}552 = s^3$. Taking the cube root of both sides of this equation yields $78 = s$. Thus, the edge length of the cube is 78 units. Since each face of a cube is a square, it follows that each face has an edge length of 78 units. The area of a square can be found using the formula $A = s^2$. Substituting 78 for s in this formula yields $A = 78^2$, or $A = 6{,}084$. Therefore, the area of one face of this cube is $6{,}084$ square units. Since a cube has 6 faces, the surface area, in square units, of this cube is $6(6{,}084)$, or $36{,}504$.

Question Difficulty: Hard

Question ID fac3be15

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: fac3be15



The three points shown define a circle. The circumference of this circle is $k\pi$, where k is a constant. What is the value of k?

ID: fac3be15 Answer

Correct Answer: 8

Rationale

The correct answer is 8. It's given that the three points shown define a circle, so the center of that circle is an equal distance from each of the three points. The point $(6, 6)$ is halfway between the points $(6, 2)$ and $(6, 10)$, and is a distance of 4 units from each of those two points. The point $(6, 6)$ is also a distance of 4 units from $(2, 6)$. Because the point $(6, 6)$ is the same distance from all three points shown, it must be the center of the circle. Since that distance is 4, it follows that the radius of the circle is 4. The circumference of a circle with radius r is equal to $2\pi r$. It follows that the circumference of the given circle is $2\pi(4)$, or 8π. It's given that the circumference of the circle is $k\pi$. Therefore, the value of k is 8.

Question Difficulty: Hard

Question ID 14be12ff

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 14be12ff

A hemisphere is half of a sphere. If a hemisphere has a radius of 27 inches, which of the following is closest to the volume, in cubic inches, of this hemisphere?

A. $1{,}500$

B. $6{,}100$

C. $30{,}900$

D. $41{,}200$

ID: 14be12ff Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a sphere is given by $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. Since a hemisphere is half of a sphere, it follows that the volume, V, of a hemisphere is given by $V = \left(\frac{1}{2}\right)\left(\frac{4}{3}\right)\pi r^3$, or $V = \frac{2}{3}\pi r^3$. Substituting 27 for r in this formula yields $V = \frac{2}{3}\pi(27)^3$, which gives $V = 13{,}122\pi$, or V is approximately equal to $41{,}223.98$. Therefore, the choice that is closest to the volume, in cubic inches, of this hemisphere is $41{,}200$.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 71ed94a7

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 71ed94a7

A circle has a radius of 2.1 inches. The area of the circle is $b\pi$ square inches, where b is a constant. What is the value of b?

ID: 71ed94a7 Answer

Correct Answer: 4.41, 441/100

Rationale

The correct answer is 4.41. The area, A, of a circle is given by the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the area of the circle is $b\pi$ square inches, where b is a constant, and the radius of the circle is 2.1 inches. Substituting $b\pi$ for A and 2.1 for r in the formula $A = \pi r^2$ yields $b\pi = \pi(2.1^2)$. Dividing both sides of this equation by π yields $b = 4.41$. Therefore, the value of b is 4.41.

Question Difficulty: Hard

Question ID 5d57a9d5

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 5d57a9d5

A right circular cone has a height of 22 centimeters (cm) and a base with a diameter of 6 cm. The volume of this cone is $n\pi$ cm^3. What is the value of n?

ID: 5d57a9d5 Answer

Correct Answer: 66

Rationale

The correct answer is 66. It's given that the right circular cone has a height of 22 centimeters (cm) and a base with a diameter of 6 cm. Since the diameter of the base of the cone is 6 cm, the radius of the base is 3 cm. The volume V, in cm^3, of a right circular cone can be found using the formula $V = \frac{1}{3}\pi r^2 h$, where h is the height, in cm, and r is the radius, in cm, of the base of the cone. Substituting 22 for h and 3 for r in this formula yields $V = \frac{1}{3}\pi(3)^2(22)$, or $V = 66\pi$. Therefore, the volume of the cone is 66π cm^3. It's given that the volume of the cone is $n\pi$ cm^3. Therefore, the value of n is 66.

Question Difficulty: Hard

Question ID 2476696b

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 2476696b

A triangular prism has a height of 8 centimeters (cm) and a volume of 216 cm^3. What is the area, in cm^2, of the base of the prism? (The volume of a triangular prism is equal to Bh, where B is the area of the base and h is the height of the prism.)

ID: 2476696b Answer

Correct Answer: 27

Rationale

The correct answer is 27. It's given that a triangular prism has a volume of 216 $\text{cubic centimeters (cm}^3\text{)}$ and the volume of a triangular prism is equal to Bh, where B is the area of the base and h is the height of the prism. Therefore, $216 = Bh$. It's also given that the triangular prism has a height of 8 cm. Therefore, $h = 8$. Substituting 8 for h in the equation $216 = Bh$ yields $216 = B(8)$. Dividing both sides of this equation by 8 yields $27 = B$. Therefore, the area, in cm^2, of the base of the prism is 27.

Question Difficulty: Hard

Question ID 8ea086cc

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 8ea086cc

A right square prism has a height of 14 units. The volume of the prism is $2{,}016$ cubic units. What is the length, in units, of an edge of the base?

ID: 8ea086cc Answer

Correct Answer: 12

Rationale

The correct answer is 12. The volume, V, of a right square prism can be calculated using the formula $V = s^2h$, where s represents the length of an edge of the base and h represents the height of the prism. It's given that the volume of the prism is $2{,}016$ cubic units and the height is 14 units. Substituting $2{,}016$ for V and 14 for h in the formula $V = s^2h$ yields $2{,}016 = (s^2)(14)$. Dividing both sides of this equation by 14 yields $144 = s^2$. Taking the square root of both sides of this equation yields two solutions: $-12 = s$ and $12 = s$. The length can't be negative, so $12 = s$. Therefore, the length, in units, of an edge of the base is 12.

Question Difficulty: Hard

Question ID 129bc31d

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 129bc31d

The length of each side of a square is 94 centimeters (cm). Which expression gives the area, in cm^2, of the square?

A. $2 \cdot 94$

B. $2 \cdot 94 \cdot 94$

C. $4 \cdot 94$

D. $94 \cdot 94$

ID: 129bc31d Answer

Correct Answer: D

Rationale

Choice D is correct. The area of a square is given by s^2, where s is the length of each side of the square. It's given that the length of each side of a square is 94 cm. It follows that the area, in cm^2, of the square is $(94)^2$, or $94 \cdot 94$. Therefore, the expression that gives the area, in cm^2, of the square is $94 \cdot 94$.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect. This expression gives the perimeter, in cm, of the square.

Question Difficulty: Hard

Question ID 6b1df07d

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 6b1df07d

The length of the edge of the base of a right square prism is 6 units. The volume of the prism is $2{,}880$ cubic units. What is the height, in units, of the prism?

A. $4\sqrt{30}$

B. 36

C. $24\sqrt{5}$

D. 80

ID: 6b1df07d Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a right square prism is given by the formula $V = s^2h$, where s represents the length of the edge of the base and h represents the height of the prism. It's given that the volume of a right square prism is $2{,}880$ cubic units and the length of the edge of the base is 6 units. Substituting $2{,}880$ for V and 6 for s in the formula $V = s^2h$ yields $2{,}880 = (6^2)h$, or $2{,}880 = 36h$. Dividing both sides of this equation by 36 yields $80 = h$. Therefore, the height, in units, of the prism is 80.

Choice A is incorrect. This is the height, in units, of a right square prism where the length of the edge of the base is 6 units and the volume of the prism is $144\sqrt{30}$, not $2{,}880$, units.

Choice B is incorrect. This is the area, in square units, of the base, not the height, in units, of the prism.

Choice C is incorrect. This is the height, in units, of a right square prism where the length of the edge of the base is 6 units and the volume of the prism is $864\sqrt{5}$, not $2{,}880$, units.

Question Difficulty: Hard

Question ID ddcae495

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: ddcae495

The table gives the perimeters of similar triangles TUV and XYZ, where $\overline{TU}$ corresponds to $\overline{XY}$. The length of $\overline{TU}$ is 18.

	Perimeter
Triangle TUV	37
Triangle XYZ	333

What is the length of $\overline{XY}$?

A. 2

B. 18

C. 55

D. 162

ID: ddcae495 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that triangle XYZ is similar to triangle TUV. Therefore, each side of triangle XYZ is k times its corresponding side of triangle TUV, where k is a constant. It follows that the perimeter of triangle XYZ is k times the perimeter of triangle TUV. It's also given that $\overline{TU}$ corresponds to $\overline{XY}$ and the length of $\overline{TU}$ is 18. Let x represent the length of $\overline{XY}$. It follows that $x = 18k$. The table shows that the perimeters of triangles TUV and XYZ are 37 and 333, respectively. It follows that $333 = 37k$, or $9 = k$. Substituting 9 for k in the equation $x = 18k$ yields $x = (18)(9)$, or $x = 162$. Therefore, the length of $\overline{XY}$ is 162.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the length of $\overline{TU}$, not the length of $\overline{XY}$.

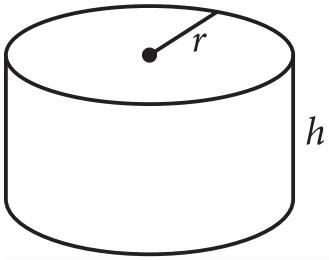
Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID 03945175

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 03945175



The figure shown is a right circular cylinder with a radius of r and height of h. A second right circular cylinder (not shown) has a volume that is 392 times as large as the volume of the cylinder shown. Which of the following could represent the radius R, in terms of r, and the height H, in terms of h, of the second cylinder?

A. $R = 8r$ and $H = 7h$

B. $R = 8r$ and $H = 49h$

C. $R = 7r$ and $H = 8h$

D. $R = 49r$ and $H = 8h$

ID: 03945175 Answer

Correct Answer: C

Rationale

Choice C is correct. The volume of a right circular cylinder is equal to $\pi a^2 b$, where a is the radius of a base of the cylinder and b is the height of the cylinder. It's given that the cylinder shown has a radius of r and a height of h. It follows that the volume of the cylinder shown is equal to $\pi r^2 h$. It's given that the second right circular cylinder has a radius of R and a height of H. It follows that the volume of the second cylinder is equal to $\pi R^2 H$. Choice C gives $R = 7r$ and $H = 8h$. Substituting $7r$ for R and $8h$ for H in the expression that represents the volume of the second cylinder yields $\pi(7r)^2(8h)$, or $\pi(49r^2)(8h)$, which is equivalent to $\pi(392r^2h)$, or $392(\pi r^2 h)$. This expression is equal to 392 times the volume of the cylinder shown, $\pi r^2 h$. Therefore, $R = 7r$ and $H = 8h$ could represent the radius R, in terms of r, and the height H, in terms of h, of the second cylinder.

Choice A is incorrect. Substituting $8r$ for R and $7h$ for H in the expression that represents the volume of the second cylinder yields $\pi(8r)^2(7h)$, or $\pi(64r^2)(7h)$, which is equivalent to $\pi(448r^2h)$, or $448(\pi r^2 h)$. This expression is equal to 448, not 392, times the volume of the cylinder shown.

Choice B is incorrect. Substituting $8r$ for R and $49h$ for H in the expression that represents the volume of the second cylinder yields $\pi(8r)^2(49h)$, or $\pi(64r^2)(49h)$, which is equivalent to $\pi(3{,}136r^2h)$, or $3{,}136(\pi r^2 h)$. This expression is equal to $3{,}136$, not 392, times the volume of the cylinder shown.

Choice D is incorrect. Substituting $49r$ for R and $8h$ for H in the expression that represents the volume of the second cylinder yields $\pi(49r)^2(8h)$, or $\pi(2{,}401r^2)(8h)$, which is equivalent to $\pi(19{,}208r^2h)$, or $19{,}208(\pi r^2 h)$. This expression is equal to $19{,}208$, not 392, times the volume of the cylinder shown.

Question Difficulty: Hard

Question ID 470c3f70

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 470c3f70

A cube has an edge length of 41 inches. What is the volume, in cubic inches, of the cube?

A. 164

B. $1{,}681$

C. $10{,}086$

D. $68{,}921$

ID: 470c3f70 Answer

Correct Answer: D

Rationale

Choice D is correct. The volume, V, of a cube can be found using the formula $V = s^3$, where s is the edge length of the cube. It's given that a cube has an edge length of 41 inches. Substituting 41 inches for s in this equation yields $V = 41^3$ cubic inches, or $V = 68{,}921$ cubic inches. Therefore, the volume of the cube is $68{,}921$ cubic inches.

Choice A is incorrect. This is the perimeter, in inches, of the cube.

Choice B is incorrect. This is the area, in square inches, of a face of the cube.

Choice C is incorrect. This is the surface area, in square inches, of the cube.

Question Difficulty: Hard

Question ID ec78b38e

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: ec78b38e

A cube has an edge length of 68 inches. A solid sphere with a radius of 34 inches is inside the cube, such that the sphere touches the center of each face of the cube. To the nearest cubic inch, what is the volume of the space in the cube not taken up by the sphere?

A. $149{,}796$

B. $164{,}500$

C. $190{,}955$

D. $310{,}800$

ID: ec78b38e Answer

Correct Answer: A

Rationale

Choice A is correct. The volume of a cube can be found by using the formula $V = s^3$, where V is the volume and s is the edge length of the cube. Therefore, the volume of the given cube is $V = 68^3$, or $314{,}432$ cubic inches. The volume of a sphere can be found by using the formula $V = \frac{4}{3}\pi r^3$, where V is the volume and r is the radius of the sphere. Therefore, the volume of the given sphere is $V = \frac{4}{3}\pi(34)^3$, or approximately $164{,}636$ cubic inches. The volume of the space in the cube not taken up by the sphere is the difference between the volume of the cube and volume of the sphere. Subtracting the approximate volume of the sphere from the volume of the cube gives $314{,}432 - 164{,}636 = 149{,}796$ cubic inches.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID d5620692

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: d5620692

Triangles ABC and DEF are similar. Each side length of triangle ABC is 4 times the corresponding side length of triangle DEF. The area of triangle ABC is 270 square inches. What is the area, in square inches, of triangle DEF?

ID: d5620692 Answer

Correct Answer: 135/8, 16.87, 16.88

Rationale

The correct answer is $\frac{135}{8}$. It's given that triangles ABC and DEF are similar and each side length of triangle ABC is 4 times the corresponding side length of triangle DEF. For two similar triangles, if each side length of the first triangle is k times the corresponding side length of the second triangle, then the area of the first triangle is k^2 times the area of the second triangle. Therefore, the area of triangle ABC is 4^2, or 16, times the area of triangle DEF. It's given that the area of triangle ABC is 270 square inches. Let a represent the area, in square inches, of triangle DEF. It follows that 270 is 16 times a, or $270 = 16a$. Dividing both sides of this equation by 16 yields $\frac{270}{16} = a$, which is equivalent to $\frac{135}{8} = a$. Thus, the area, in square inches, of triangle DEF is $\frac{135}{8}$. Note that 135/8, 16.87, and 16.88 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 80a8c7f7

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 80a8c7f7

Square X has a side length of 12 centimeters. The perimeter of square Y is 2 times the perimeter of square X. What is the length, in centimeters, of one side of square Y?

A. 6

B. 10

C. 14

D. 24

ID: 80a8c7f7 Answer

Correct Answer: D

Rationale

Choice D is correct. The perimeter, P, of a square can be found using the formula $P = 4s$, where s is the length of each side of the square. It's given that square X has a side length of 12 centimeters. Substituting 12 for s in the formula for the perimeter of a square yields $P = 4(12)$, or $P = 48$. Therefore, the perimeter of square X is 48 centimeters. It's also given that the perimeter of square Y is 2 times the perimeter of square X. Therefore, the perimeter of square Y is $2(48)$, or 96, centimeters. Substituting 96 for P in the formula $P = 4s$ gives $96 = 4s$. Dividing both sides of this equation by 4 gives $24 = s$. Therefore, the length of one side of square Y is 24 centimeters.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard

Question ID beaa3b50

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: beaa3b50

A circle has a circumference of 31π centimeters. What is the diameter, in centimeters, of the circle?

ID: beaa3b50 Answer

Correct Answer: 31

Rationale

The correct answer is 31. The circumference of a circle is equal to $2\pi r$ centimeters, where r represents the radius, in centimeters, of the circle, and the diameter of the circle is equal to $2r$ centimeters. It's given that a circle has a circumference of 31π centimeters. Therefore, $31\pi = 2\pi r$. Dividing both sides of this equation by π yields $31 = 2r$. Since the diameter of the circle is equal to $2r$ centimeters, it follows that the diameter, in centimeters, of the circle is 31.

Question Difficulty: Hard

Question ID 2d4c71c6

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 2d4c71c6

Right rectangular prism X is similar to right rectangular prism Y. The surface area of right rectangular prism X is 58 square centimeters (cm^2), and the surface area of right rectangular prism Y is $1{,}450\ \text{cm}^2$. The volume of right rectangular prism Y is $1{,}250$ cubic centimeters (cm^3). What is the sum of the volumes, in cm^3, of right rectangular prism X and right rectangular prism Y?

ID: 2d4c71c6 Answer

Correct Answer: 1260

Rationale

The correct answer is $1{,}260$. Since it's given that prisms X and Y are similar, all the linear measurements of prism Y are k times the respective linear measurements of prism X, where k is a positive constant. Therefore, the surface area of prism Y is k^2 times the surface area of prism X and the volume of prism Y is k^3 times the volume of prism X. It's given that the surface area of prism Y is $1{,}450\ \text{cm}^2$, and the surface area of prism X is $58\ \text{cm}^2$, which implies that $1{,}450 = 58k^2$. Dividing both sides of this equation by 58 yields $\frac{1{,}450}{58} = k^2$, or $k^2 = 25$. Since k is a positive constant, $k = 5$. It's given that the volume of prism Y is $1{,}250\ \text{cm}^3$. Therefore, the volume of prism X is equal to $\frac{1{,}250}{k^3}\ \text{cm}^3$, which is equivalent to $\frac{1{,}250}{5^3}\ \text{cm}^3$, or $10\ \text{cm}^3$. Thus, the sum of the volumes, in cm^3, of the two prisms is $1{,}250 + 10$, or $1{,}260$.

Question Difficulty: Hard

Question ID 799f5245

Assessment	Test	Domain	Skill	Difficulty
PSAT 8/9	Math	Geometry and Trigonometry	Area and volume	Hard

ID: 799f5245

A right triangle has sides of length $2\sqrt{2}$, $6\sqrt{2}$, and $\sqrt{80}$ units. What is the area of the triangle, in square units?

A. $8\sqrt{2}+\sqrt{80}$

B. 12

C. $24\sqrt{80}$

D. 24

ID: 799f5245 Answer

Correct Answer: B

Rationale

Choice B is correct. The area, A, of a triangle can be found using the formula $A=\frac{1}{2}bh$, where b is the length of the base of the triangle and h is the height of the triangle. It's given that the triangle is a right triangle. Therefore, its base and height can be represented by the two legs. It's also given that the triangle has sides of length $2\sqrt{2}$, $6\sqrt{2}$, and $\sqrt{80}$ units. Since $\sqrt{80}$ units is the greatest of these lengths, it's the length of the hypotenuse. Therefore, the two legs have lengths $2\sqrt{2}$ and $6\sqrt{2}$ units. Substituting these values for b and h in the formula $A=\frac{1}{2}bh$ gives $A=\frac{1}{2}\left(2\sqrt{2}\right)\left(6\sqrt{2}\right)$, which is equivalent to $A=6\sqrt{4}$ square units, or $A=12$ square units.

Choice A is incorrect. This expression represents the perimeter, rather than the area, of the triangle.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard