

Question ID 35efc692

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 35efc692

In triangle ABC , angle B is a right angle. The length of side AB is $10\sqrt{37}$ and the length of side BC is $24\sqrt{37}$. What is the length of side AC ?

- A. $14\sqrt{37}$
- B. $26\sqrt{37}$
- C. $34\sqrt{37}$
- D. $\sqrt{34 \cdot 37}$

ID: 35efc692 Answer

Correct Answer: B

Rationale

Choice B is correct. The Pythagorean theorem states that for a right triangle, $c^2 = a^2 + b^2$, where c represents the length of the hypotenuse and a and b represent the lengths of the legs. It's given that in triangle ABC , angle B is a right angle. Therefore, triangle ABC is a right triangle, where the hypotenuse is side AC and the legs are sides AB and BC . It's given that the lengths of sides AB and BC are $10\sqrt{37}$ and $24\sqrt{37}$, respectively. Substituting these values for a and b in the formula $c^2 = a^2 + b^2$ yields $c^2 = 10\sqrt{37}^2 + 24\sqrt{37}^2$, which is equivalent to $c^2 = 10037 + 57637$, or $c^2 = 67637$. Taking the square root of both sides of this equation yields $c = \pm 26\sqrt{37}$. Since c represents the length of the hypotenuse, side AC , c must be positive. Therefore, the length of side AC is $26\sqrt{37}$.

Choice A is incorrect. This is the result of solving the equation $c = 24\sqrt{37} - 10\sqrt{37}$, not $c^2 = 10\sqrt{37}^2 + 24\sqrt{37}^2$.

Choice C is incorrect. This is the result of solving the equation $c = 10\sqrt{37} + 24\sqrt{37}$, not $c^2 = 10\sqrt{37}^2 + 24\sqrt{37}^2$.

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

Question Difficulty: Hard

Question ID 57616839

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 57616839

The length of a rectangle’s diagonal is $5\sqrt{17}$, and the length of the rectangle’s shorter side is 5. What is the length of the rectangle’s longer side?

- A. $\sqrt{17}$

B. 20

C. $15\sqrt{2}$

D. 400

ID: 57616839 Answer

Correct Answer: B

Rationale

Choice B is correct. A rectangle’s diagonal divides a rectangle into two congruent right triangles, where the diagonal is the hypotenuse of both triangles. It’s given that the length of the diagonal is $5\sqrt{17}$ and the length of the rectangle’s shorter side is 5. Therefore, each of the two right triangles formed by the rectangle’s diagonal has a hypotenuse with length $5\sqrt{17}$, and a shorter leg with length 5. To calculate the length of the longer leg of each right triangle, the Pythagorean theorem, $a^2 + b^2 = c^2$, can be used, where a and b are the lengths of the legs and c is the length of the hypotenuse of the triangle. Substituting 5 for a and $5\sqrt{17}$ for c in the equation $a^2 + b^2 = c^2$ yields $5^2 + b^2 = 5\sqrt{17}^2$, which is equivalent to $25 + b^2 = 2517$, or $25 + b^2 = 425$. Subtracting 25 from each side of this equation yields $b^2 = 400$. Taking the positive square root of each side of this equation yields $b = 20$. Therefore, the length of the longer leg of each right triangle formed by the diagonal of the rectangle is 20. It follows that the length of the rectangle’s longer side is 20.

Choice A is incorrect and may result from dividing the length of the rectangle’s diagonal by the length of the rectangle’s shorter side, rather than substituting these values into the Pythagorean theorem.

Choice C is incorrect and may result from using the length of the rectangle’s diagonal as the length of a leg of the right triangle, rather than the length of the hypotenuse.

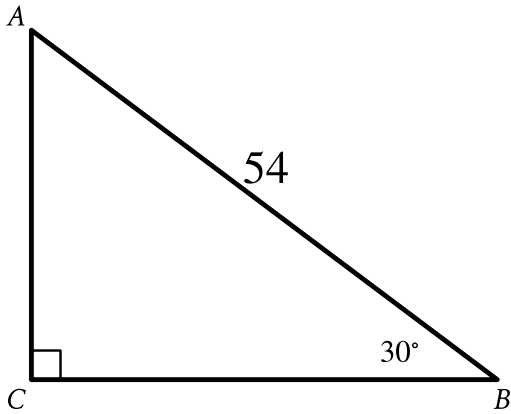
Choice D is incorrect. This is the square of the length of the rectangle’s longer side.

Question Difficulty: Hard

Question ID 7e881644

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 7e881644



Note: Figure not drawn to scale.



Right triangle ABC is shown. What is the value of $\tan A$?

- A. $\frac{\sqrt{3}}{54}$
- B. $\frac{1}{\sqrt{3}}$
- C. $\sqrt{3}$
- D. $27\sqrt{3}$

ID: 7e881644 Answer

Correct Answer: C

Rationale

Choice C is correct. In the triangle shown, the measure of angle B is 30° and angle C is a right angle, which means that it has a measure of 90° . Since the sum of the angles in a triangle is equal to 180° , the measure of angle A is equal to $180^\circ - 30^\circ - 90^\circ$, or 60° . In a right triangle whose acute angles have measures 30° and 60° , the lengths of the legs can be represented by the expressions x , $x\sqrt{3}$, and $2x$, where x is the length of the leg opposite the angle with measure 30° , $x\sqrt{3}$ is the length of the leg opposite the angle with measure 60° , and $2x$ is the length of the hypotenuse. In the triangle shown, the hypotenuse has a length of 54. It follows that $2x = 54$, or $x = 27$. Therefore, the length of the leg opposite angle B is 27 and the length of the leg opposite angle A is $27\sqrt{3}$. The tangent of an acute angle in a right triangle is defined as the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. The length of the leg opposite angle A is $27\sqrt{3}$ and the length of the leg adjacent to angle A is 27. Therefore, the value of $\tan A$ is $\frac{27\sqrt{3}}{27}$, or $\sqrt{3}$.

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

Choice B is incorrect. This is the value of $\frac{1}{\tan A}$, not the value of $\tan A$.

Choice D is incorrect. This is the length of the leg opposite angle A , not the value of $\tan A$.

Question Difficulty: Hard

Question ID 93f7842a

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 93f7842a

The perimeter of an equilateral triangle is **624** centimeters. The height of this triangle is $k\sqrt{3}$ centimeters, where k is a constant. What is the value of k ?

ID: 93f7842a Answer

Correct Answer: 104

Rationale

The correct answer is 104. An equilateral triangle is a triangle in which all three sides have the same length and all three angles have a measure of 60° . The height of the triangle, $k\sqrt{3}$, is the length of the altitude from one vertex. The altitude divides the equilateral triangle into two congruent 30-60-90 right triangles, where the altitude is the side across from the 60° angle in each 30-60-90 right triangle. Since the altitude has a length of $k\sqrt{3}$, it follows from the properties of 30-60-90 right triangles that the side across from each 30° angle has a length of k and each hypotenuse has a length of $2k$. In this case, the hypotenuse of each 30-60-90 right triangle is a side of the equilateral triangle; therefore, each side length of the equilateral triangle is $2k$. The perimeter of a triangle is the sum of the lengths of each side. It's given that the perimeter of the equilateral triangle is 624; therefore, $2k + 2k + 2k = 624$, or $6k = 624$. Dividing both sides of this equation by 6 yields $k = 104$.

Question Difficulty: Hard

Question ID a954e998

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: a954e998

The length of a rectangle’s diagonal is $3\sqrt{17}$, and the length of the rectangle’s shorter side is **3**. What is the length of the rectangle’s longer side?

ID: a954e998 Answer

Correct Answer: 12

Rationale

The correct answer is 12. The diagonal of a rectangle forms a right triangle, where the shorter side and the longer side of the rectangle are the legs of the triangle and the diagonal of the rectangle is the hypotenuse of the triangle. It's given that the length of the rectangle's diagonal is $3\sqrt{17}$ and the length of the rectangle's shorter side is 3. Thus, the length of the hypotenuse of the right triangle formed by the diagonal is $3\sqrt{17}$ and the length of one of the legs is 3. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b , then $a^2 + b^2 = c^2$. Substituting $3\sqrt{17}$ for c and 3 for b in this equation yields $a^2 + 3^2 = (3\sqrt{17})^2$, or $a^2 + 9 = 153$. Subtracting 9 from both sides of this equation yields $a^2 = 144$. Taking the square root of both sides of this equation yields $a = \pm \sqrt{144}$, or $a = \pm 12$. Since a represents a length, which must be positive, the value of a is 12. Thus, the length of the rectangle's longer side is 12.

Question Difficulty: Hard

Question ID 036097b4

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 036097b4

An isosceles right triangle has a perimeter of $94 + 94\sqrt{2}$ inches. What is the length, in inches, of one leg of this triangle?

- A. 47
- B. $47\sqrt{2}$
- C. 94
- D. $94\sqrt{2}$

ID: 036097b4 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the right triangle is isosceles. In an isosceles right triangle, the two legs have equal lengths, and the length of the hypotenuse is $\sqrt{2}$ times the length of one of the legs. Let l represent the length, in inches, of each leg of the isosceles right triangle. It follows that the length of the hypotenuse is $l\sqrt{2}$ inches. The perimeter of a figure is the sum of the lengths of the sides of the figure. Therefore, the perimeter of the isosceles right triangle is $l + l + l\sqrt{2}$ inches. It's given that the perimeter of the triangle is $94 + 94\sqrt{2}$ inches. It follows that $l + l + l\sqrt{2} = 94 + 94\sqrt{2}$. Factoring the left-hand side of this equation yields $1 + 1 + \sqrt{2}l = 94 + 94\sqrt{2}$, or $2 + \sqrt{2}l = 94 + 94\sqrt{2}$. Dividing both sides of this equation by $2 + \sqrt{2}$ yields $l = \frac{94 + 94\sqrt{2}}{2 + \sqrt{2}}$. Rationalizing the denominator of the right-hand side of this equation by multiplying the right-hand side of the equation by $\frac{2 - \sqrt{2}}{2 - \sqrt{2}}$ yields $l = \frac{94 + 94\sqrt{2} \cdot 2 - \sqrt{2}}{2 + \sqrt{2} \cdot 2 - \sqrt{2}}$. Applying the distributive property to the numerator and to the denominator of the right-hand side of this equation yields $l = \frac{188 - 94\sqrt{2} + 188\sqrt{2} - 94\sqrt{4}}{4 - 2\sqrt{2} + 2\sqrt{2} - \sqrt{4}}$. This is equivalent to $l = \frac{94\sqrt{2}}{2}$, or $l = 47\sqrt{2}$. Therefore, the length, in inches, of one leg of the isosceles right triangle is $47\sqrt{2}$.

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

Choice C is incorrect. This is the length, in inches, of the hypotenuse.

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

Question Difficulty: Hard

Question ID 40780ef3

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 40780ef3

A rectangle is inscribed in a circle, such that each vertex of the rectangle lies on the circumference of the circle. The diagonal of the rectangle is twice the length of the shortest side of the rectangle. The area of the rectangle is $1,089\sqrt{3}$ square units. What is the length, in units, of the diameter of the circle?

ID: 40780ef3 Answer

Correct Answer: 66

Rationale

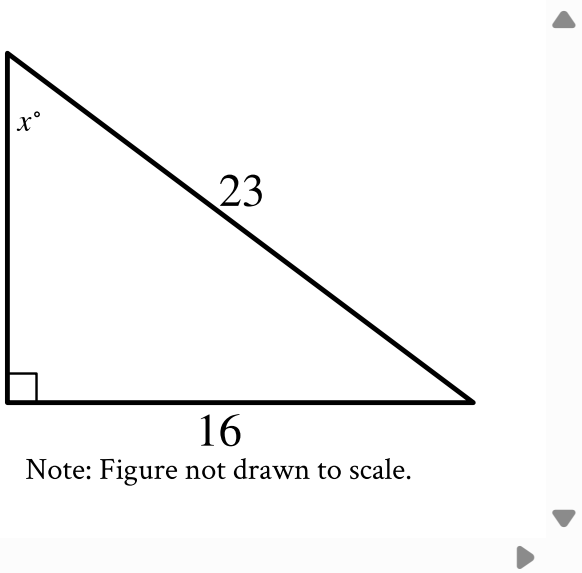
The correct answer is 66. It's given that each vertex of the rectangle lies on the circumference of the circle. Therefore, the length of the diameter of the circle is equal to the length of the diagonal of the rectangle. The diagonal of a rectangle forms a right triangle with the shortest and longest sides of the rectangle, where the shortest side and the longest side of the rectangle are the legs of the triangle and the diagonal of the rectangle is the hypotenuse of the triangle. Let s represent the length, in units, of the shortest side of the rectangle. Since it's given that the diagonal is twice the length of the shortest side, $2s$ represents the length, in units, of the diagonal of the rectangle. By the Pythagorean theorem, if a right triangle has a hypotenuse with length c and legs with lengths a and b , then $a^2 + b^2 = c^2$. Substituting s for a and $2s$ for c in this equation yields $s^2 + b^2 = 2s^2$, or $s^2 + b^2 = 4s^2$. Subtracting s^2 from both sides of this equation yields $b^2 = 3s^2$. Taking the positive square root of both sides of this equation yields $b = s\sqrt{3}$. Therefore, the length, in units, of the rectangle's longest side is $s\sqrt{3}$. The area of a rectangle is the product of the length of the shortest side and the length of the longest side. The lengths, in units, of the shortest and longest sides of the rectangle are represented by s and $s\sqrt{3}$, and it's given that the area of the rectangle is $1,089\sqrt{3}$ square units. It follows that $1,089\sqrt{3} = ss\sqrt{3}$, or $1,089\sqrt{3} = s^2\sqrt{3}$. Dividing both sides of this equation by $\sqrt{3}$ yields $1,089 = s^2$. Taking the positive square root of both sides of this equation yields $33 = s$. Since the length, in units, of the diagonal is represented by $2s$, it follows that the length, in units, of the diagonal is 233, or 66. Since the length of the diameter of the circle is equal to the length of the diagonal of the rectangle, the length, in units, of the diameter of the circle is 66.

Question Difficulty: Hard

Question ID f0333710

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: f0333710



In the triangle shown, what is the value of $\sin x^\circ$?

ID: f0333710 Answer

Correct Answer: .6956, .6957, 16/23

Rationale

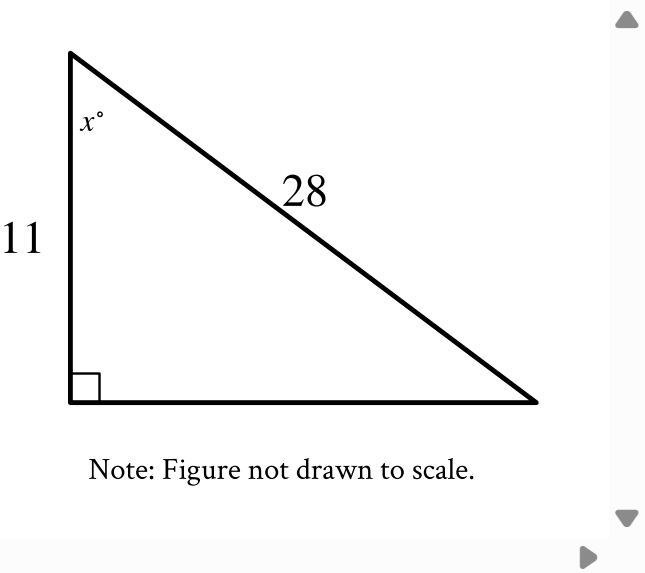
The correct answer is $\frac{16}{23}$. In a right triangle, the sine of an acute angle is defined as the ratio of the length of the side opposite the angle to the length of the hypotenuse. In the triangle shown, the length of the side opposite the angle with measure x° is 16 units and the length of the hypotenuse is 23 units. Therefore, the value of $\sin x^\circ$ is $\frac{16}{23}$. Note that 16/23, .6956, .6957, 0.695, and 0.696 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 3f6e0eb2

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 3f6e0eb2



Note: Figure not drawn to scale.



In the triangle shown, what is the value of $\cos x^\circ$?

ID: 3f6e0eb2 Answer

Correct Answer: .3928, .3929, 11/28

Rationale

The correct answer is $\frac{11}{28}$. The cosine of an acute angle in a right triangle is defined as the ratio of the length of the leg adjacent to the angle to the length of the hypotenuse. In the triangle shown, the length of the leg adjacent to the angle with measure x° is 11 units and the length of the hypotenuse is 28 units. Therefore, the value of $\cos x^\circ$ is $\frac{11}{28}$. Note that 11/28, .3928, .3929, 0.392, and 0.393 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 00181f03

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 00181f03

An isosceles right triangle has a hypotenuse of length 58 inches. What is the perimeter, in inches, of this triangle?

- A. $29\sqrt{2}$
- B. $58\sqrt{2}$
- C. $58 + 58\sqrt{2}$
- D. $58 + 116\sqrt{2}$

ID: 00181f03 Answer

Correct Answer: C

Rationale

Choice C is correct. Since the triangle is an isosceles right triangle, the two sides that form the right angle must be the same length. Let x be the length, in inches, of each of those sides. The Pythagorean theorem states that in a right triangle, $a^2 + b^2 = c^2$, where c is the length of the hypotenuse and a and b are the lengths of the other two sides. Substituting x for a , x for b , and 58 for c in this equation yields $x^2 + x^2 = 58^2$, or $2x^2 = 58^2$. Dividing each side of this equation by 2 yields $x^2 = \frac{58^2}{2}$, or $x^2 = \frac{2 \cdot 58^2}{4}$. Taking the square root of each side of this equation yields two solutions: $x = \frac{58\sqrt{2}}{2}$ and $x = -\frac{58\sqrt{2}}{2}$. The value of x must be positive because it represents a side length. Therefore, $x = \frac{58\sqrt{2}}{2}$, or $x = 29\sqrt{2}$. The perimeter, in inches, of the triangle is $58 + x + x$, or $58 + 2x$. Substituting $29\sqrt{2}$ for x in this expression gives a perimeter, in inches, of $58 + 2(29\sqrt{2})$, or $58 + 58\sqrt{2}$.

Choice A is incorrect. This is the length, in inches, of each of the congruent sides of the triangle, not the perimeter, in inches, of the triangle.

Choice B is incorrect. This is the sum of the lengths, in inches, of the congruent sides of the triangle, not the perimeter, in inches, of the triangle.

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

Question Difficulty: Hard

Question ID 2095ae72

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 2095ae72

- A square is inscribed in a circle. The radius of the circle is $\frac{20\sqrt{2}}{2}$ inches. What is the side length, in inches, of the square?
- A. 20
 - B. $\frac{20\sqrt{2}}{2}$
 - C. $20\sqrt{2}$
 - D. 40

ID: 2095ae72 Answer

Correct Answer: A

Rationale

Choice A is correct. When a square is inscribed in a circle, a diagonal of the square is a diameter of the circle. It's given that a square is inscribed in a circle and the length of a radius of the circle is $\frac{20\sqrt{2}}{2}$ inches. Therefore, the length of a diameter of the circle is $2\frac{20\sqrt{2}}{2}$ inches, or $20\sqrt{2}$ inches. It follows that the length of a diagonal of the square is $20\sqrt{2}$ inches. A diagonal of a square separates the square into two right triangles in which the legs are the sides of the square and the hypotenuse is a diagonal. Since a square has 4 congruent sides, each of these two right triangles has congruent legs and a hypotenuse of length $20\sqrt{2}$ inches. Since each of these two right triangles has congruent legs, they are both 45-45-90 triangles. In a 45-45-90 triangle, the length of the hypotenuse is $\sqrt{2}$ times the length of a leg. Let s represent the length of a leg of one of these 45-45-90 triangles. It follows that $20\sqrt{2} = \sqrt{2}s$. Dividing both sides of this equation by $\sqrt{2}$ yields $20 = s$. Therefore, the length of a leg of one of these 45-45-90 triangles is 20 inches. Since the legs of these two 45-45-90 triangles are the sides of the square, it follows that the side length of the square is 20 inches.

Choice B is incorrect. This is the length of a radius, in inches, of the circle.

Choice C is incorrect. This is the length of a diameter, in inches, of the circle.

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

Question Difficulty: Hard

Question ID 49570665

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Geometry and Trigonometry	Right triangles and trigonometry	<div><div></div><div></div><div></div></div>

ID: 49570665

A right triangle has legs with lengths of **24** centimeters and **21** centimeters. If the length of this triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$, where d is an integer, what is the value of d ?

ID: 49570665 Answer

Correct Answer: 113

Rationale

The correct answer is 113. It's given that the legs of a right triangle have lengths 24 centimeters and 21 centimeters. In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the two legs. It follows that if h represents the length, in centimeters, of the hypotenuse of the right triangle, $h^2 = 24^2 + 21^2$. This equation is equivalent to $h^2 = 1,017$. Taking the square root of each side of this equation yields $h = \sqrt{1,017}$. This equation can be rewritten as $h = \sqrt{9 \cdot 113}$, or $h = \sqrt{9} \cdot \sqrt{113}$. This equation is equivalent to $h = 3\sqrt{113}$. It's given that the length of the triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$. It follows that the value of d is 113.

Question Difficulty: Hard