Question ID f4680374

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: f4680374

In $\triangle ABC$, $\angle B$ is a right angle and the length of $\overline{BC}$ is 136 millimeters. If $\cos A = \frac{3}{5}$, what is the length, in millimeters, of $\overline{AB}$?

A. 34

B. 102

C. 136

D. 170

ID: f4680374 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that in $\triangle ABC$, $\angle B$ is a right angle. Therefore, $\triangle ABC$ is a right triangle, and $\overline{AC}$ is the hypotenuse of the triangle. It's also given that $\cos A = \frac{3}{5}$. Since the cosine of an acute angle in a right triangle is defined as the ratio of the length of the side adjacent to the angle to the length of the hypotenuse, the ratio of the length of $\overline{AB}$ to the length of $\overline{AC}$ is 3 to 5. It follows that the length of $\overline{AB}$ can be represented as $3a$ and the length of $\overline{AC}$ can be represented as $5a$, where a is a constant. The Pythagorean theorem states that the sum of the squares of the length of the legs of a right triangle is equal to the square of the length of its hypotenuse, so it follows that $AB^2 + BC^2 = AC^2$. Substituting $3a$ for AB and $5a$ for AC in this equation yields $(3a)^2 + BC^2 = (5a)^2$, or $9a^2 + BC^2 = 25a^2$. Subtracting $9a^2$ from both sides of this equation yields $BC^2 = 16a^2$, or $BC = 4a$. It follows that the ratio of the length of $\overline{AB}$ to the length of $\overline{BC}$ is 3 to 4. Let x represent the length, in millimeters, of $\overline{AB}$. It's given that the length of $\overline{BC}$ is 136 millimeters. Since the ratio of the length of $\overline{AB}$ to the length of $\overline{BC}$ is 3 to 4, $\frac{x}{136} = \frac{3}{4}$. Multiplying both sides of this equation by 136 yields $x = \frac{3(136)}{4}$, or $x = 102$. Therefore, the length of $\overline{AB}$ is 102 millimeters.

Choice A is incorrect. This is the scale factor by which the 3 to 4 to 5 ratio is multiplied that results in the side lengths of $\triangle ABC$.

Choice C is incorrect. This is the length of $\overline{BC}$, not the length of $\overline{AB}$.

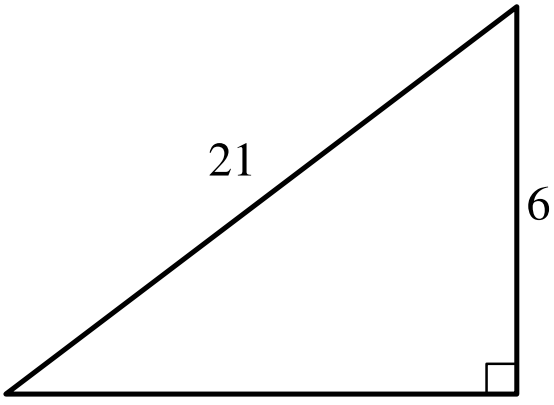
Choice D is incorrect. This is the length of $\overline{AC}$, not the length of $\overline{AB}$.

Question Difficulty: Medium

Question ID de6d51e1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: de6d51e1



Note: Figure not drawn to scale.

For the triangle shown, which expression represents the value of a?

A. $\sqrt{21^2 - 6^2}$

B. $21^2 - 6^2$

C. $\sqrt{21 - 6}$

D. $21 - 6$

ID: de6d51e1 Answer

Correct Answer: A

Rationale

Choice A is correct. For the right triangle shown, the lengths of the legs are a units and 6 units, and the length of the hypotenuse is 21 units. The Pythagorean theorem states that in a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse. Therefore, $a^2 + 6^2 = 21^2$. Subtracting 6^2 from both sides of this equation yields $a^2 = 21^2 - 6^2$. Taking the square root of both sides of this equation yields $a = \pm\sqrt{21^2 - 6^2}$. Since a is a length, a must be positive. Therefore, $a = \sqrt{21^2 - 6^2}$. Thus, for the triangle shown, $\sqrt{21^2 - 6^2}$ represents the value of a.

Choice B is incorrect. For the triangle shown, this expression represents the value of a^2, not a.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID 06e0b4a8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: 06e0b4a8

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: 06e0b4a8 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 $5^2 + b^2 = \left(5\sqrt{17}\right)^2$, which is equivalent to $25 + b^2 = 25(17)$, 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: Medium

Question ID 79588172

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: 79588172

A right triangle has legs with lengths of 28 centimeters and 20 centimeters. What is the length of this triangle's hypotenuse, in centimeters?

A. $8\sqrt{6}$

B. $4\sqrt{74}$

C. 48

D. $1{,}184$

ID: 79588172 Answer

Correct Answer: B

Rationale

Choice B is correct. The Pythagorean theorem states that in a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse. It's given that the right triangle has legs with lengths of 28 centimeters and 20 centimeters. Let c represent the length of this triangle's hypotenuse, in centimeters. Therefore, by the Pythagorean theorem, $28^2 + 20^2 = c^2$, or $1{,}184 = c^2$. Taking the positive square root of both sides of this equation yields $\sqrt{1{,}184} = c$, or $4\sqrt{74} = c$. Therefore, the length of this triangle's hypotenuse, in centimeters, is $4\sqrt{74}$.

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

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

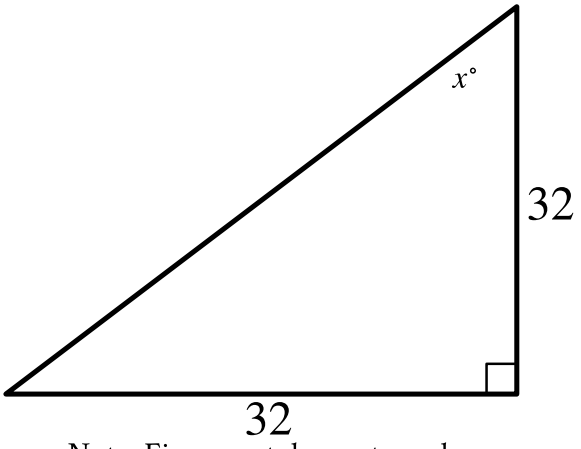
Choice D is incorrect. This is the square of the length of the triangle's hypotenuse.

Question Difficulty: Medium

Question ID 2c02a042

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: 2c02a042



Note: Figure not drawn to scale.

In the triangle shown, what is the value of x?

ID: 2c02a042 Answer

Correct Answer: 45

Rationale

The correct answer is 45. An isosceles right triangle has a right angle and two legs of equal length. In the triangle shown, one angle is a right angle and the two legs each have a length of 32. Thus, the given triangle is an isosceles right triangle. In an isosceles right triangle, the measures of the two non-right angles are 45°. It follows that the value of x is 45.

Question Difficulty: Medium

Question ID 2f3f970c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: 2f3f970c

One leg of a right triangle has a length of 43.2 millimeters. The hypotenuse of the triangle has a length of 196.8 millimeters. What is the length of the other leg of the triangle, in millimeters?

A. 43.2

B. 120

C. 192

D. 201.5

ID: 2f3f970c Answer

Correct Answer: C

Rationale

Choice C is correct. The Pythagorean theorem states that for a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse. It's given that one leg of a right triangle has a length of 43.2 millimeters. It's also given that the hypotenuse of the triangle has a length of 196.8 millimeters. Let b represent the length of the other leg of the triangle, in millimeters. Therefore, by the Pythagorean theorem, $43.2^2 + b^2 = 196.8^2$, or $1{,}866.24 + b^2 = 38{,}730.24$. Subtracting $1{,}866.24$ from both sides of this equation yields $b^2 = 36{,}864$. Taking the positive square root of both sides of this equation yields $b = 192$. Therefore, the length of the other leg of the triangle, in millimeters, is 192.

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: Medium

Question ID 51355d23

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: 51355d23

Triangle FGH is similar to triangle JKL, where angle F corresponds to angle J and angles G and K are right angles. If $\sin(F) = \frac{308}{317}$, what is the value of $\sin(J)$?

A. $\frac{75}{317}$

B. $\frac{308}{317}$

C. $\frac{317}{308}$

D. $\frac{317}{75}$

ID: 51355d23 Answer

Correct Answer: B

Rationale

Choice B is correct. If two triangles are similar, then their corresponding angles are congruent. It's given that right triangle FGH is similar to right triangle JKL and angle F corresponds to angle J. It follows that angle F is congruent to angle J and, therefore, the measure of angle F is equal to the measure of angle J. The sine ratios of angles of equal measure are equal. Since the measure of angle F is equal to the measure of angle J, $\sin(F) = \sin(J)$. It's given that $\sin(F) = \frac{308}{317}$. Therefore, $\sin(J)$ is $\frac{308}{317}$.

Choice A is incorrect. This is the value of $\cos(J)$, not the value of $\sin(J)$.

Choice C is incorrect. This is the reciprocal of the value of $\sin(J)$, not the value of $\sin(J)$.

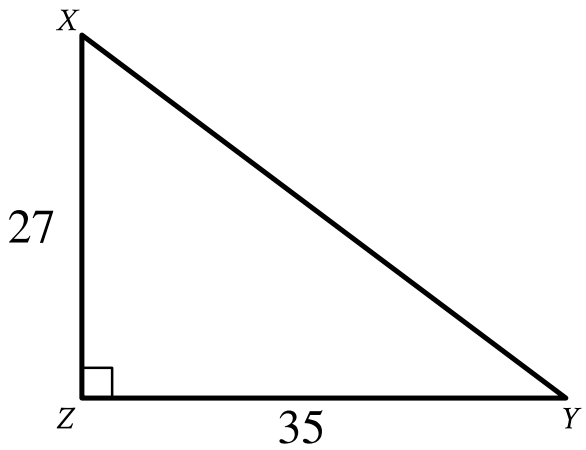
Choice D is incorrect. This is the reciprocal of the value of $\cos(J)$, not the value of $\sin(J)$.

Question Difficulty: Medium

Question ID dbe723cd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: dbe723cd



Note: Figure not drawn to scale.

Triangle XYZ shown is a right triangle. Which of the following has the same value as $\sin X$?

A. $\tan X$

B. $\tan Y$

C. $\cos X$

D. $\cos Y$

ID: dbe723cd Answer

Correct Answer: D

Rationale

Choice D is correct. The sine of an angle is equal to the cosine of its complementary angle. In the triangle shown, angle Z is a right angle; thus, angles X and Y are complementary angles. Therefore, $\cos Y$ has the same value as $\sin X$.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Question Difficulty: Medium

Question ID db81edbb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: db81edbb

In right triangle RST, the sum of the measures of angle R and angle S is 90 degrees. The value of $\sin(R)$ is $\frac{\sqrt{15}}{4}$. What is the value of $\cos(S)$?

A. $\frac{\sqrt{15}}{15}$

B. $\frac{\sqrt{15}}{4}$

C. $\frac{4\sqrt{15}}{15}$

D. $\sqrt{15}$

ID: db81edbb Answer

Correct Answer: B

Rationale

Choice B is correct. The sine of any acute angle is equal to the cosine of its complement. It's given that in right triangle RST, the sum of the measures of angle R and angle S is 90 degrees. Therefore, angle R and angle S are complementary, and the value of $\sin R$ is equal to the value of $\cos S$. It's given that the value of $\sin R$ is $\frac{\sqrt{15}}{4}$, so the value of $\cos S$ is also $\frac{\sqrt{15}}{4}$.

Choice A is incorrect. This is the value of $\tan S$.

Choice C is incorrect. This is the value of $\frac{1}{\cos S}$.

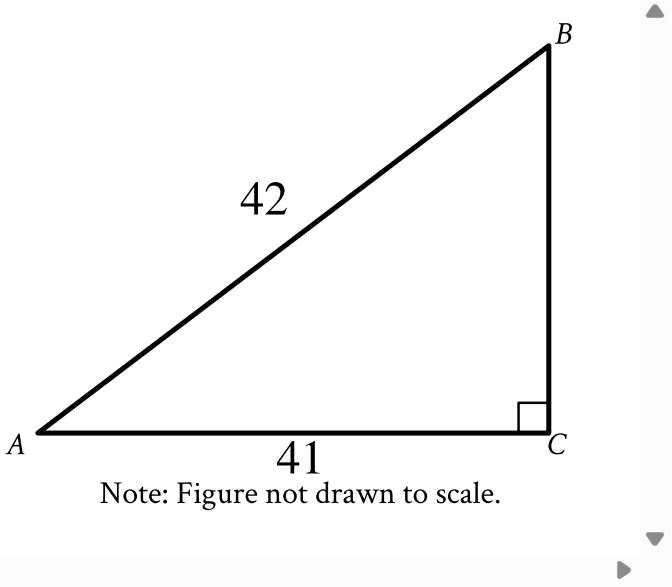
Choice D is incorrect. This is the value of $\frac{1}{\tan S}$.

Question Difficulty: Medium

Question ID c19b1626

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Right triangles and trigonometry	Medium

ID: c19b1626



Note: Figure not drawn to scale.

What is the value of $\cos A$ in the triangle shown?

A. $\frac{42}{41}$

B. $\frac{41}{42}$

C. $\frac{1}{42}$

D. $\frac{1}{41}$

ID: c19b1626 Answer

Correct Answer: B

Rationale

Choice B is correct. 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 angle A is 41, and the length of the hypotenuse is 42. Therefore, $\cos A = \frac{41}{42}$.

Choice A is incorrect. This is the value of $\frac{1}{\cos A}$.

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: Medium