# Question ID 6d99b141

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Lines, angles, and triangles | ■■■ |
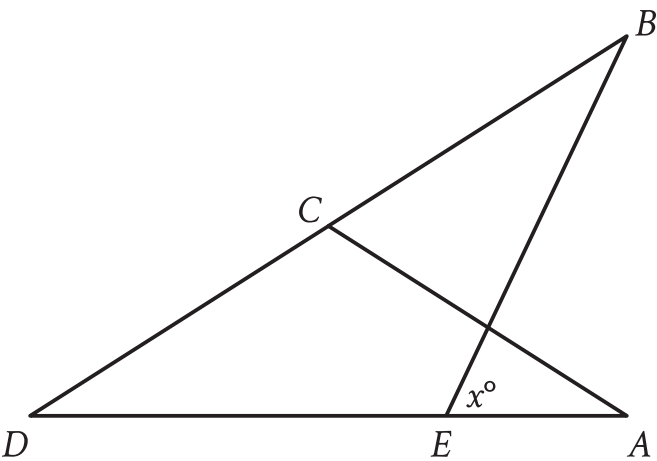
Note: Figure not drawn to scale.

In the figure, $AC = CD$. The measure of angle $EBC$ is $45°$, and the measure of angle $ACD$ is $104°$. What is the value of $x$?

**Correct Answer:** 83

**Rationale**

The correct answer is $83$. It's given that in the figure, $AC = CD$. Thus, triangle $ACD$ is an isosceles triangle and the measure of angle $CDA$ is equal to the measure of angle $CAD$. The sum of the measures of the interior angles of a triangle is $180°$. Thus, the sum of the measures of the interior angles of triangle $ACD$ is $180°$. It's given that the measure of angle $ACD$ is $104°$. It follows that the sum of the measures of angles $CDA$ and $CAD$ is $(180 - 104)°$, or $76°$. Since the measure of angle $CDA$ is equal to the measure of angle $CAD$, the measure of angle $CDA$ is half of $76°$, or $38°$. The sum of the measures of the interior angles of triangle $BDE$ is $180°$. It's given that the measure of angle $EBC$ is $45°$. Since the measure of angle $BDE$, which is the same angle as angle $CDA$, is $38°$, it follows that the measure of angle $DEB$ is $(180 - 45 - 38)°$, or $97°$. Since angle $DEB$ and angle $AEB$ form a straight line, the sum of the measures of these angles is $180°$. It's given in the figure that the measure of angle $AEB$ is $x°$. It follows that $97 + x = 180$. Subtracting $97$ from both sides of this equation yields $x = 83$.

**Question Difficulty:** Hard

# Question ID 9912e19f

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Lines, angles, and triangles | ■□□ |

## ID: 9912e19f

Triangles $EFG$ and $JKL$ are congruent, where $E$, $F$, and $G$ correspond to $J$, $K$, and $L$, respectively. The measure of angle $E$ is $45°$ and the measure of angle $F$ is $20°$. What is the measure of angle $J$?

A. $20°$

B. $45°$

C. $135°$

D. $160°$

## ID: 9912e19f Answer

**Correct Answer:** B

**Rationale**

Choice B is correct. It's given that triangles $EFG$ and $JKL$ are congruent such that angle $E$ corresponds to angle $J$. Corresponding angles of congruent triangles are congruent, so angle $E$ and angle $J$ must be congruent. Therefore, if the measure of angle $E$ is $45°$, then the measure of angle $J$ is also $45°$.

Choice A is incorrect. This is the measure of angle $K$, not angle $J$.

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:** Easy

# Question ID 4b7bb316

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Area and volume | ■■☐ |

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?

**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:** Medium

# Question ID e10d8313

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Lines, angles, and triangles | ■■■ |
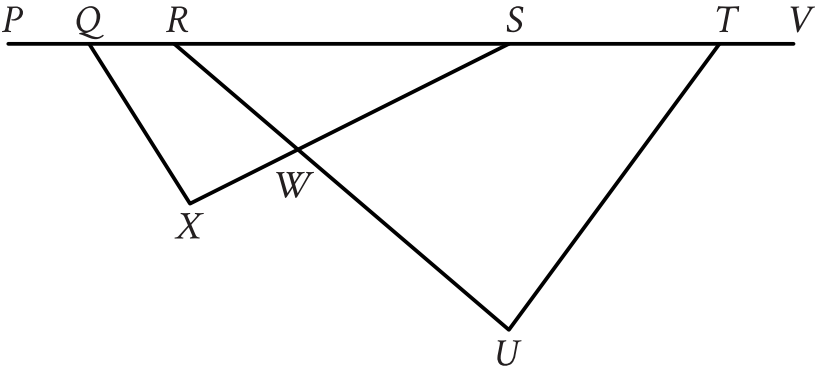
Note: Figure not drawn to scale.

In the figure shown, points $Q$, $R$, $S$, and $T$ lie on line segment $PV$, and line segment $RU$ intersects line segment $SX$ at point $W$. The measure of $\angle SQX$ is $48°$, the measure of $\angle SXQ$ is $86°$, the measure of $\angle SWU$ is $85°$, and the measure of $\angle VTU$ is $162°$. What is the measure, in degrees, of $\angle TUR$?

**Correct Answer:** 123

**Rationale**

The correct answer is **123**. The triangle angle sum theorem states that the sum of the measures of the interior angles of a triangle is **180** degrees. It's given that the measure of $\angle SQX$ is $48°$ and the measure of $\angle SXQ$ is $86°$. Since points $S$, $Q$, and $X$ form a triangle, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle QSX$ is $180 - 48 - 86$, or $46$. It's also given that the measure of $\angle SWU$ is $85°$. Since $\angle SWU$ and $\angle SWR$ are supplementary angles, the sum of their measures is $180$ degrees. It follows that the measure, in degrees, of $\angle SWR$ is $180 - 85$, or $95$. Since points $R$, $S$, and $W$ form a triangle, and $\angle RSW$ is the same angle as $\angle QSX$, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle WRS$ is $180 - 46 - 95$, or $39$. It's given that the measure of $\angle VTU$ is $162°$. Since $\angle VTU$ and $\angle STU$ are supplementary angles, the sum of their measures is $180$ degrees. It follows that the measure, in degrees, of $\angle STU$ is $180 - 162$, or $18$. Since points $R$, $T$, and $U$ form a triangle, and $\angle URT$ is the same angle as $\angle WRS$, it follows from the triangle angle sum theorem that the measure, in degrees, of $\angle TUR$ is $180 - 39 - 18$, or $123$.

**Question Difficulty:** Hard

# Question ID bcb66188

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Right triangles and trigonometry | ■■□ |

## ID: bcb66188

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: bcb66188 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 $\sin(J)$.

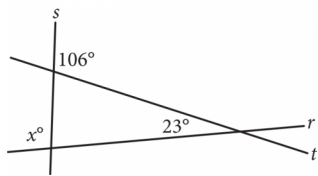Choice D is incorrect. This is the reciprocal of the value of $\cos(J)$, not the value of $\sin(J)$.

**Question Difficulty:** Medium

# Question ID f88f27e5

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Lines, angles, and triangles | ■■■ |

### ID: f88f27e5

Intersecting lines $r$, $s$, and $t$ are shown below.



What is the value of $x$ ?

### ID: f88f27e5 Answer

**Rationale**

The correct answer is 97. The intersecting lines form a triangle, and the angle with measure of $x°$ is an exterior angle of this triangle. The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles of the triangle. One of these angles has measure of $23°$ and the other, which is supplementary to the angle with measure $106°$, has measure of $180° - 106° = 74°$. Therefore, the value of x is $23 + 74 = 97$.

**Question Difficulty:** Hard

# Question ID 5207e508

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Lines, angles, and triangles | ■☐☐ |

**ID: 5207e508**
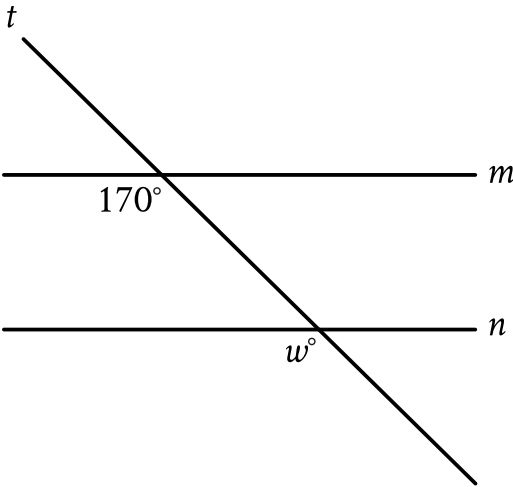


Note: Figure not drawn to scale.

In the figure, line $m$ is parallel to line $n$. What is the value of $w$?

A. 17

B. 30

C. 70

D. 170

**ID: 5207e508 Answer**

**Correct Answer:** D

**Rationale**

Choice D is correct. It's given that lines $m$ and $n$ are parallel. Since line $t$ intersects both lines $m$ and $n$, it's a transversal. The angles in the figure marked as $170°$ and $w°$ are on the same side of the transversal, where one is an interior angle with line $m$ as a side, and the other is an exterior angle with line $n$ as a side. Thus, the marked angles are corresponding angles. When two parallel lines are intersected by a transversal, corresponding angles are congruent and, therefore, have equal measure. It follows that $w° = 170°$. Therefore, the value of $w$ is $170$.

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 ID f67e4efc

| Assessment | Test | Domain | Skill | Difficulty |
|------------|------|--------|-------|------------|
| SAT | Math | Geometry and Trigonometry | Area and volume | ■■□ |

A right circular cylinder has a volume of $45\pi$. If the height of the cylinder is 5, what is the radius of the cylinder?

A. 3

B. 4.5

C. 9

D. 40

**Correct Answer:** A

**Rationale**

Choice A is correct. The volume of a right circular cylinder with a radius of r is the product of the area of the base, $\pi r^2$, and the height, h. The volume of the right circular cylinder described is $45\pi$ and its height is 5. If the radius is r, it follows that $45\pi = \pi(r)^2(5)$. Dividing both sides of this equation by $5\pi$ yields $9 = r^2$. Taking the square root of both sides yields $r = 3$ or $r = -3$. Since r represents the radius, the value must be positive. Therefore, the radius is 3.

Choice B is incorrect and may result from finding that the square of the radius is 9, but then from dividing 9 by 2, rather than taking the square root of 9. Choice C is incorrect. This represents the square of the radius. Choice D is incorrect and may result from solving the equation $45\pi = \pi(r)^2(5)$ for $r^2$, not r, by dividing by $\pi$ on both sides and then by subtracting, not dividing, 5 from both sides.

**Question Difficulty:** Medium

# Question ID e5c57163

| Assessment | Test | Domain | Skill | Difficulty |
|---|---|---|---|---|
| SAT | Math | Geometry and Trigonometry | Area and volume | ■■■ |

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 $k$?

**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