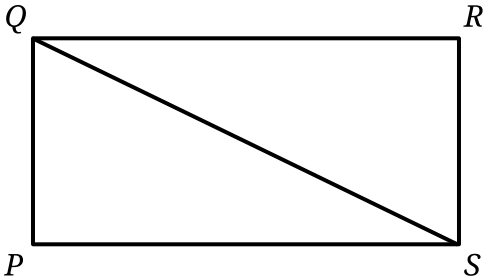


Question ID: 2c3aefc9

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

Question



Note: Figure not drawn to scale.

In rectangle $PQRS$, the length of line segment QS is $\sqrt{2,344}$ and the length of side PS is 8 more than the length of side RS . What is the length of side QR ?

Correct Answer: 38

Rationale

The correct answer is 38. It's given that in rectangle $PQRS$, the length of side PS is 8 more than the length of side RS . In a rectangle, opposite sides are congruent. Since side QR is opposite side PS , it follows that side QR is congruent to side PS . Thus, the length of side QR is 8 more than the length of side RS . Let x represent the length of side RS . It follows that the length of side QR is represented by the expression $x + 8$. Since all angles in a rectangle are right angles, angle R is a right angle. It follows that side QR , side RS , and line segment QS form a right triangle, where line segment QS is the hypotenuse and sides QR and RS are the legs. It's given that the length of line segment QS is $\sqrt{2,344}$. 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 x for a , $x + 8$ for b , and $\sqrt{2,344}$ for c in this equation yields $x^2 + (x + 8)^2 = (\sqrt{2,344})^2$, or $x^2 + (x + 8)^2 = 2,344$. Expanding the left-hand side of this equation yields $x^2 + x^2 + 16x + 64 = 2,344$, or $2x^2 + 16x + 64 = 2,344$. Dividing both sides of this equation by 2 yields $x^2 + 8x + 32 = 1,172$. To complete the square, subtracting 16 from both sides of this equation yields $x^2 + 8x + 16 = 1,156$. Since the left-hand side of this equation is a perfect square trinomial, it follows that $x^2 + 8x + 16 = 1,156$ is equivalent to $(x + 4)^2 = 1,156$. Taking the positive square root of both sides of this equation yields $x + 4 = 34$. Subtracting 4 from both sides of this equation yields $x = 30$. Since the length of side QR is represented by the expression $x + 8$, it follows that the length of side QR is $30 + 8$, or 38.

Question ID: e89f63bf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Medium

Question

The sum of the measures of two angles in a triangle is **64°**. What is the measure of the third angle?

Answer

- A. **26°**
- B. **52°**
- C. **116°**
- D. **128°**

Correct Answer: C

Rationale

Choice C is correct. It’s given that the sum of the measures of two angles in a triangle is **64°**. The sum of the measures of all three angles in a triangle is **180°**. It follows that the measure of the third angle is the difference between **180°** and **64°**, or **180 – 64**, which is **116°**. Therefore, the measure of the third angle is **116°**.

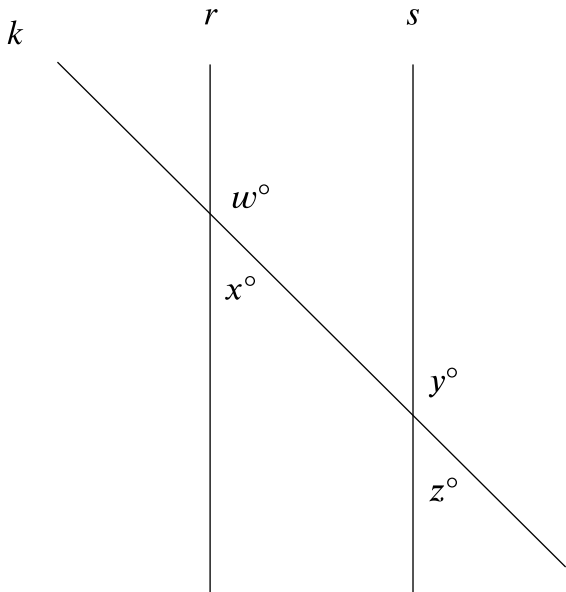
Choice A is incorrect and may result from conceptual or calculation errors.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Medium

Question



Note: Figure not drawn to scale.

In the figure shown, line k intersects lines r and s . If $w = 147$, which additional piece of information is sufficient to prove that lines r and s are parallel?

Answer

- A. $x = 33$
- B. $y = 147$
- C. $w + y = 180$
- D. $y + z = 180$

Correct Answer: B

Rationale

Choice B is correct. The figure shows transversal k intersecting lines r and s , where the angles labeled w° and y° are two corresponding angles and the angles labeled x° and z° are two corresponding angles. When a transversal intersects two lines, the lines are parallel if and only if two corresponding angles are congruent. It's given that $w = 147$. If $y = 147$, then the two corresponding angles labeled w° and y° are congruent, which is sufficient to prove that lines r and s are parallel.

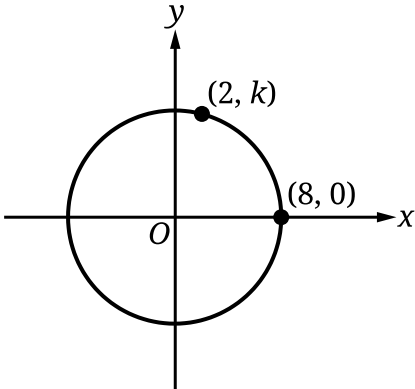
Choice A is incorrect. The angle labeled x° forms a linear pair with the angle labeled w° , so $x = 180 - 147$, or $x = 33$, regardless of whether lines r and s are parallel.

Choice C is incorrect. Substituting 147 for w in this equation yields $147 + y = 180$, or $y = 33$. Since the angle labeled w° and the angle labeled y° are corresponding angles, if w and y aren't equal, then lines r and s can't be parallel.

Choice D is incorrect. The relationship $y + z = 180$ describes a linear pair at line s , which is true regardless of whether lines r and s are parallel.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question



Note: Figure not drawn to scale.

The circle shown has its center at $(0, 0)$. What is the value of k ?

Answer

- A. 6
- B. 7
- C. 8
- D. $\sqrt{60}$

Correct Answer: D

Rationale

Choice D is correct. It's given that the circle shown has its center at $(0, 0)$. The equation of a circle in the xy -plane with its center at $(0, 0)$ can be expressed as $x^2 + y^2 = r^2$, where r is the radius of the circle. It's shown that $(8, 0)$ lies on the circle. Since the circle has its center at $(0, 0)$ and $(8, 0)$ lies on the circle, it follows that the radius of the circle is 8. Substituting 8 for r in the equation $x^2 + y^2 = r^2$ yields $x^2 + y^2 = 64$. It's also shown that $(2, k)$ lies on the circle. Substituting 2 for x and k for y in this equation yields $2^2 + k^2 = 64$, or $4 + k^2 = 64$. Subtracting 4 from both sides of this equation yields $k^2 = 60$. Taking the square root of both sides of this equation yields $k = \pm\sqrt{60}$. Since $(2, k)$ lies above the x -axis, k must be positive. Therefore $k = \sqrt{60}$.

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 x -coordinate of one of the circle's x -intercepts, not the value of k .

Question ID: 1fe41c6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question

The table gives the areas and perimeters of two similar rectangles, where n is a constant.

	Area (square inches)	Perimeter (inches)
Rectangle A	630	210
Rectangle B	2,520	n

What is the value of n ?

Answer

- A. 2,100
- B. 1,680
- C. 840
- D. 420

Correct Answer: D

Rationale

Choice D is correct. It’s given that rectangle A and rectangle B are similar. Therefore, there is a positive constant k such that the length of each side of rectangle B is k times the length of the corresponding side of rectangle A and the area of rectangle B is k^2 times the area of rectangle A. It’s also given that the area of rectangle A is 630 square inches and that the area of rectangle B is 2,520 square inches. It follows that $2,520 = 630k^2$. Dividing both sides of this equation by 630 yields $4 = k^2$, or $k^2 = 4$. Taking the positive square root of each side of this equation yields $k = 2$. Therefore, the length of each side of rectangle B is 2 times the length of the corresponding side of rectangle A. It follows that the perimeter of rectangle B is 2 times the perimeter of rectangle A. Since the perimeter of rectangle A is 210 inches, the perimeter of rectangle B is $2(210)$, or 420, inches. Therefore, $n = 420$.

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 using the area scale factor instead of the side length scale factor.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Hard

Question

In triangle ABC , the measure of angle A is 52° and $AC = 30$. In triangle PQR , the measure of angle P is 52° and $PR = 120$. Which additional piece of information is sufficient to prove that triangle ABC is similar to triangle PQR ?

Answer

- A. $AB = 50$ and $PQ = 50$.
- B. $AB = 50$ and $QR = 200$.
- C. The measures of angle B and angle R are 32° and 96° , respectively.
- D. The measures of angle B and angle Q are 52° and 32° , respectively.

Correct Answer: C

Rationale

Choice C is correct. It's given that the measure of angle A is 52° and the measure of angle P is 52° . Therefore, angle A is congruent to angle P . Choice C states that the measures of angle B and angle R are 32° and 96° , respectively. The triangle sum theorem states that the measures of the angles in a triangle sum to 180° . In triangle ABC , if the measure of angle B is 32° , it follows that the measure of angle C is $(180 - (52 + 32))^\circ$, or 96° . In triangle PQR , if the measure of angle R is 96° , it follows that the measure of angle Q is $(180 - (52 + 96))^\circ$, or 32° . Therefore, in triangles ABC and PQR , angle B is congruent to angle Q , and angle C is congruent to angle R . If two triangles have three pairs of congruent angles, then the triangles are similar. Therefore, the additional piece of information that is sufficient to prove that triangle ABC is similar to triangle PQR is that the measures of angle B and angle R are 32° and 96° , respectively.

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. If the measure of angle B is 52° , it follows that the measure of angle C is $(180 - (52 + 52))^\circ$, or 76° . If the measure of angle Q is 32° , which isn't equal to any angle measure in triangle ABC , the triangles can't be similar.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Medium

Question

$(x - 3)^2 + (y + 16)^2 = 289$

The graph of the given equation is a circle in the xy -plane. The point (q, s) lies on the circle. Which of the following is NOT a possible value of q ?

Answer

- A. -17
- B. -3
- C. 3
- D. 17

Correct Answer: A

Rationale

Choice A is correct. It's given that the graph of the equation $(x - 3)^2 + (y + 16)^2 = 289$ is a circle in the xy -plane. For a circle in the form $(x - h)^2 + (y - k)^2 = r^2$, its center is (h, k) and its radius is r . It follows that $r^2 = 289$. Taking the positive square root of both sides of this equation yields $r = 17$. Therefore, the center of this circle is $(3, -16)$ and the radius is 17 . It follows that the x -coordinates of the points that lie on the circle must be within 17 units of the x -coordinate of the center of the circle. Therefore, the least possible x -coordinate of a point that lies on the circle is $3 - 17$, or -14 , and the greatest possible x -coordinate of a point that lies on the circle is $3 + 17$, or 20 . So for any point (q, s) to lie on the circle, it must be true that $-14 \leq q \leq 20$. Since -17 does not satisfy this inequality, it is NOT a possible value of q .

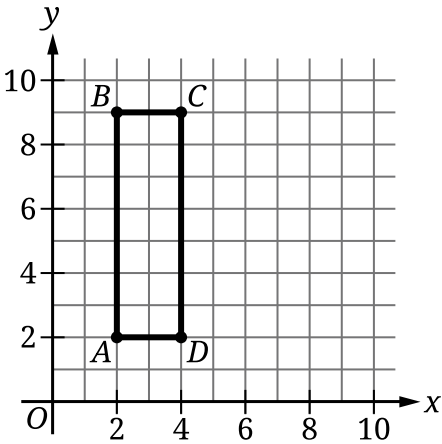
Choice B is incorrect. Since -3 satisfies the inequality $-14 \leq q \leq 20$, it is a possible value of q .

Choice C is incorrect. Since 3 satisfies the inequality $-14 \leq q \leq 20$, it is a possible value of q .

Choice D is incorrect. Since 17 satisfies the inequality $-14 \leq q \leq 20$, it is a possible value of q .

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Easy

Question



Rectangle $ABCD$ shown has a length of **7** units and a width of **2** units. What is the area, in square units, of rectangle $ABCD$?

Answer

- A. **5**
- B. **9**
- C. **14**
- D. **28**

Correct Answer: C

Rationale

Choice C is correct. The area, A , of a rectangle is given by the formula $A = \ell w$, where ℓ is the length and w is the width of the rectangle. It's given that rectangle $ABCD$ shown has a length of **7** units and a width of **2** units. Substituting **7** for ℓ and **2** for w in the formula $A = \ell w$ yields $A = (7)(2)$, or $A = 14$. Therefore, the area, in square units, of rectangle $ABCD$ is **14**.

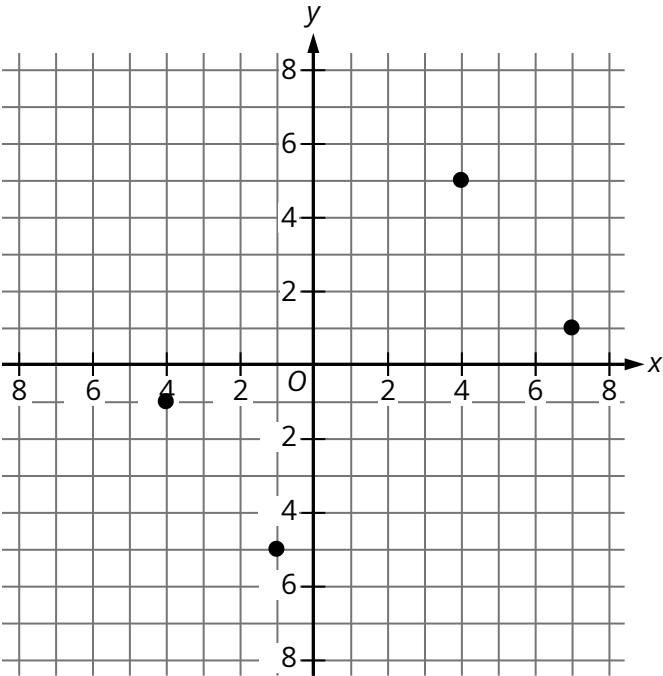
Choice A is incorrect and may result from conceptual or calculation errors.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question



A rectangle is formed by the four points shown. What is the area, in square units, of the rectangle?

Correct Answer: 50

Rationale

The correct answer is 50. The area of a rectangle is **Math output error**, where **Math output error** and w are the lengths of two adjacent sides of the rectangle. It's given that the points $(-4, -1)$, $(4, 5)$, $(7, 1)$, and $(-1, -5)$ form a rectangle. The points $(-4, -1)$ and $(4, 5)$ form a side of the rectangle that is adjacent to the side of the rectangle formed by the points $(4, 5)$ and $(7, 1)$. In the xy -plane, the distance between two points, (x_1, y_1) and (x_2, y_2) , can be found as $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Thus, the length, in units, of the side formed by the points $(-4, -1)$ and $(4, 5)$ can be found as $\sqrt{(4 - (-4))^2 + (5 - (-1))^2}$, which can be simplified to $\sqrt{100}$, or 10. The length, in units, of the side formed by the points $(4, 5)$ and $(7, 1)$ can be found as $\sqrt{(7 - 4)^2 + (1 - 5)^2}$, which can be simplified to $\sqrt{25}$, or 5. Therefore, the area, in square units, of the rectangle formed by the four points shown is $(10)(5)$, or 50.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question

$$x^2 + x\sqrt{t} + y^2 - y - 65 = 0$$

The given equation, where t is a constant, defines a circle in the xy -plane. The radius of this circle is $\sqrt{83}$. What is the value of t ?

Answer

- A. 73
- B. 71
- C. 37
- D. 35

Correct Answer: B

Rationale

Choice B is correct. It's given that the equation $x^2 + x\sqrt{t} + y^2 - y - 65 = 0$, where t is a constant, defines a circle in the xy -plane. The equation of a circle in the xy -plane can be written in the form $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center and r is the radius of the circle. Adding 65 to both sides of the given equation yields $x^2 + x\sqrt{t} + y^2 - y = 65$. By completing the square, this equation can be rewritten as $\left(x^2 + x\sqrt{t} + \left(\frac{\sqrt{t}}{2}\right)^2\right) + \left(y^2 - y + \left(-\frac{1}{2}\right)^2\right) = 65 + \left(\frac{\sqrt{t}}{2}\right)^2 + \left(-\frac{1}{2}\right)^2$. This equation can be rewritten as $\left(x^2 + x\sqrt{t} + \frac{t}{4}\right) + \left(y^2 - y + \frac{1}{4}\right) = 65 + \frac{t}{4} + \frac{1}{4}$, or $\left(x + \frac{\sqrt{t}}{2}\right)^2 + \left(y - \frac{1}{2}\right)^2 = \frac{261}{4} + \frac{t}{4}$. Therefore, $r^2 = \frac{261}{4} + \frac{t}{4}$. It's given that the radius of this circle is $\sqrt{83}$; therefore, $r = \sqrt{83}$. Squaring both sides of this equation yields $r^2 = 83$. Since $r^2 = \frac{261}{4} + \frac{t}{4}$ and $r^2 = 83$, it follows that $\frac{261}{4} + \frac{t}{4} = 83$. Multiplying both sides of this equation by 4 yields $261 + t = 332$. Subtracting 261 from both sides of this equation yields $t = 71$. Therefore, the value of t is 71.

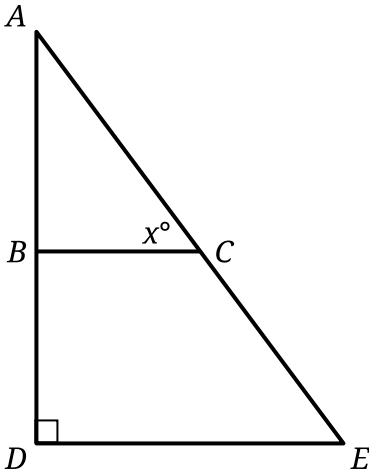
Choice A is incorrect and may result from conceptual or calculation errors.

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

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

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

Question



Note: Figure not drawn to scale.

In the figure, $\overline{BC}$ is parallel to $\overline{DE}$. If the length of $\overline{DE}$ is 147 and the length of $\overline{AE}$ is 245, what is the value of $\tan x^\circ$?

Answer

- A. $\frac{147}{196}$
- B. $\frac{147}{245}$
- C. $\frac{196}{147}$
- D. $\frac{245}{147}$

Correct Answer: C

Rationale

Choice C is correct. It's given that the length of $\overline{DE}$ is 147, and the length of $\overline{AE}$ is 245. Since angle D is a right angle, triangle ADE is a right triangle with hypotenuse $\overline{AE}$ and legs $\overline{AD}$ and $\overline{DE}$. 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 AD for a , 147 for b , and 245 for c in the equation $a^2 + b^2 = c^2$ yields $AD^2 + 147^2 = 245^2$. Subtracting 147^2 from both sides of this equation yields $AD^2 = 245^2 - 147^2$. Evaluating this difference yields $AD^2 = 60,025 - 21,609$, or $AD^2 = 38,416$. Taking the positive square root of both sides of this equation yields $AD = 196$. It's given that $\overline{BC}$ is parallel to $\overline{DE}$, and $\overline{AE}$ intersects $\overline{BC}$ and $\overline{DE}$. It follows that angle ACB is congruent to angle AED . Since angle A is common to triangles ABC and ADE , it follows that triangle ABC is similar to triangle ADE . In triangle ABC , $\tan x^\circ$ is the ratio of the leg opposite angle ACB to the leg adjacent to angle ACB , so $\tan x^\circ = \frac{AB}{BC}$. Since triangle ABC is similar to triangle ADE and similar triangles have proportional side lengths, it follows that $\frac{AB}{BC} = \frac{AD}{DE}$. Therefore, $\tan x^\circ = \frac{AD}{DE}$. Substituting 196 for AD and 147 for DE in this equation yields $\tan x^\circ = \frac{196}{147}$. Therefore, the value of $\tan x^\circ$ is $\frac{196}{147}$.

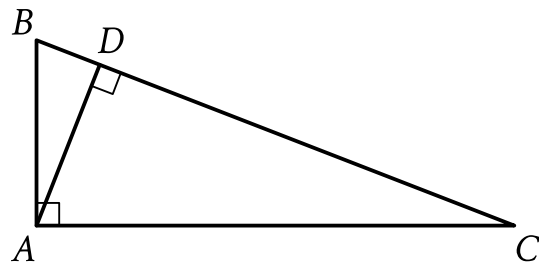
Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect. This is the value of $\cos x^\circ$, not $\tan x^\circ$.

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

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

Question



Note: Figure not drawn to scale.

In the figure, $\overline{AD}$ and $\overline{BC}$ intersect at point D . If the length of $\overline{BD}$ is 5 and the tangent of angle CAD is 1.3, what is the length of $\overline{AD}$?

Correct Answer: 6.5, 13/2

Rationale

The correct answer is 6.5. The figure shows that $\triangle BAC$ is a right triangle. In the figure, $\overline{AD}$ is perpendicular to $\overline{BC}$, which forms two additional right triangles: $\triangle BDA$ and $\triangle ADC$. If two pairs of corresponding angles in two triangles are congruent, then the triangles are similar. $\triangle BDA$ shares angle B with $\triangle BAC$ and $\triangle ADC$ shares angle C with $\triangle BAC$. Therefore, the figure contains three similar right triangles: $\triangle BAC$, $\triangle BDA$, and $\triangle ADC$. In similar triangles, the tangents of corresponding angles are equivalent. It's given that the tangent of angle CAD is 1.3. Since angle CAD in $\triangle ADC$ corresponds to angle ABD in $\triangle BDA$, it follows that the tangent of angle ABD is also 1.3. The tangent of an acute angle in a right triangle is equal to the length of the leg opposite the angle divided by the length of the leg adjacent to the angle. Therefore, $\tan ABD = \frac{AD}{BD}$. It's given that the length of $\overline{BD}$ is 5. Substituting 5 for BD and 1.3 for $\tan ABD$ in the equation $\tan ABD = \frac{AD}{BD}$ yields $1.3 = \frac{AD}{5}$. Multiplying both sides of this equation by 5 yields $6.5 = AD$. Therefore, the length of $\overline{AD}$ is 6.5. Note that 6.5 and 13/2 are examples of ways to enter a correct answer.

Question ID: f389569d

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

Question

What is the perimeter of an equilateral triangle with a height of $39\sqrt{3}$?

Answer

- A. 117
- B. $117\sqrt{3}$
- C. 234
- D. $1,521\sqrt{3}$

Correct Answer: C

Rationale

Choice C is correct. It’s given that the equilateral triangle has a height of $39\sqrt{3}$. In equilateral triangles, all three angles have a measure of 60° and the height is equal to the length of an altitude from one vertex to the midpoint of the side across from the vertex. Thus, an altitude in this equilateral triangle has a length of $39\sqrt{3}$. 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 $39\sqrt{3}$, it follows from the properties of 30-60-90 right triangles that the side across from each 30° angle has a length of 39 and each hypotenuse has a length of $2(39)$, or 78. Therefore, each side of the equilateral triangle has a length of 78. In equilateral triangles, all three sides have equal length. Therefore, the perimeter of this equilateral triangle is $78 + 78 + 78$, or 234.

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.

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

Question

Acute angle P has a measure of p radians, and acute angle T has a measure of t radians. The function g is defined by $g(x) = p(8)^x + 6t$. If $\sin p = \cos t$, which of the following represents the value $g(0)$ in terms of t ?

Answer

- A. $6t + \pi$
- B. $6t$
- C. $5t + \pi$
- D. $5t + \frac{\pi}{2}$

Correct Answer: D

Rationale

Choice D is correct. It's given that acute angle P has a measure of p radians and that acute angle T has a measure of t radians. If $\sin p = \cos t$, it follows that $p + t = \frac{\pi}{2}$, or $p = \frac{\pi}{2} - t$. It's also given that function g is defined by $g(x) = p(8)^x + 6t$. To determine the value of $g(0)$ in terms of t , substituting 0 for x and $\frac{\pi}{2} - t$ for p in the equation $g(x) = p(8)^x + 6t$ yields $g(0) = (\frac{\pi}{2} - t)(8)^0 + 6t$, or $g(0) = (\frac{\pi}{2} - t)(1) + 6t$. This is equivalent to $g(0) = \frac{\pi}{2} - t + 6t$, or $g(0) = 5t + \frac{\pi}{2}$. Therefore, $5t + \frac{\pi}{2}$ represents the value of $g(0)$ in terms of t .

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Medium

Question

A circle in the xy -plane has the equation $(x - 19)^2 + (y - 17)^2 = 64k^2$, where k is a positive constant. Which of the following gives the center of the circle and its radius?

Answer

- A. The center is at $(19, 17)$, and the radius is 8 .
- B. The center is at $(19, 17)$, and the radius is $8k$.
- C. The center is at $(19, 17)$, and the radius is 64 .
- D. The center is at $(19, 17)$, and the radius is $64k$.

Correct Answer: B

Rationale

Choice B is correct. The equation of a circle in the xy -plane can be written as $(x - h)^2 + (y - p)^2 = r^2$, where the center of the circle is (h, p) and the radius of the circle is r . It's given that the circle in the xy -plane has the equation $(x - 19)^2 + (y - 17)^2 = 64k^2$, where k is a positive constant. It follows that $h = 19$, $p = 17$, and $r^2 = 64k^2$. Taking the positive square root of each side of $r^2 = 64k^2$ yields $r = 8k$. Therefore, the center of the circle is at $(19, 17)$ and the radius is $8k$.

Choice A is incorrect. This circle has the equation $(x - 19)^2 + (y - 17)^2 = 64$, not $(x - 19)^2 + (y - 17)^2 = 64k^2$.

Choice C is incorrect. This circle has the equation $(x - 19)^2 + (y - 17)^2 = 4,096$, not $(x - 19)^2 + (y - 17)^2 = 64k^2$.

Choice D is incorrect. This circle has the equation $(x - 19)^2 + (y - 17)^2 = 4,096k^2$, not $(x - 19)^2 + (y - 17)^2 = 64k^2$.

Question ID: 179edb12

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question

A right circular cone has a height of **22 centimeters (cm)** and a base with a diameter of **18 cm**. The volume of this cone is $n\pi \text{ cm}^3$. What is the value of n ?

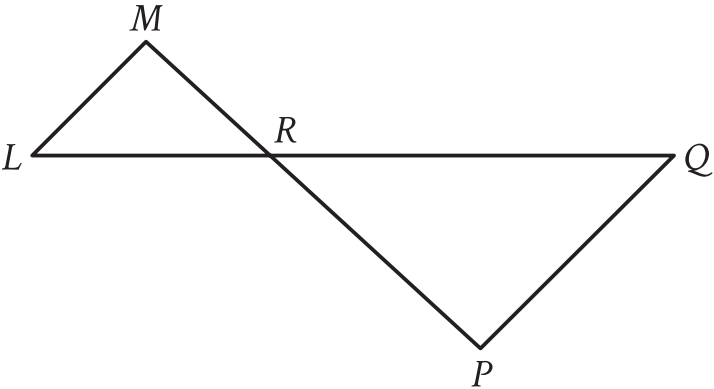
Correct Answer: 594

Rationale

The correct answer is **594**. It's given that the right circular cone has a height of **22 cm** and a base with a diameter of **18 cm**. Since the diameter of the base of the cone is **18 cm**, the radius of the base is **9 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**, of the cone and r is the radius, in **cm**, of the base of the cone. Substituting **22** for h and **9** for r in this formula yields $V = \frac{1}{3}\pi(9)^2(22)$, or $V = 594\pi$. Therefore, the volume of the cone is **$594\pi \text{ cm}^3$** . It's given that the volume of the cone is $n\pi \text{ cm}^3$. Therefore, the value of n is **594**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Hard

Question



Note: Figure not drawn to scale.

In the figure, $\overline{LQ}$ intersects $\overline{MP}$ at point R , and $\overline{LM}$ is parallel to $\overline{PQ}$. The lengths of $\overline{MR}$ and $\overline{RP}$ are 8 and 14 units, respectively. The area of $\triangle LMR$ is 36 square units. What is the area of $\triangle PQR$, in square units?

Answer

- A. $\frac{576}{49}$
- B. $\frac{144}{7}$
- C. 63
- D. $\frac{441}{4}$

Correct Answer: D

Rationale

Choice D is correct. The figure shows that $\angle MRL$ and $\angle PRQ$ are vertical angles. Since vertical angles are congruent, $\angle MRL$ and $\angle PRQ$ are congruent. It's given that $\overline{LM}$ is parallel to $\overline{PQ}$. The figure also shows that $\overline{LQ}$ intersects $\overline{LM}$ and $\overline{PQ}$. If two parallel segments are intersected by a third segment, alternate interior angles are congruent. Thus, $\angle MLR$ and $\angle PQR$ are congruent. Since $\triangle LMR$ and $\triangle PQR$ have two pairs of congruent angles, the triangles are similar, where $\overline{MR}$ in $\triangle LMR$ corresponds to $\overline{PR}$ in $\triangle PQR$. Since the areas of similar triangles are proportional to the squares of the lengths of corresponding sides, it follows that $\frac{\text{area of } \triangle PQR}{\text{area of } \triangle LMR} = \left(\frac{RP}{MR}\right)^2$. It's given that the lengths of $\overline{MR}$ and $\overline{RP}$ are 8 and 14 units, respectively, and the area of $\triangle LMR$ is 36 square units. Substituting 14 for RP , 8 for MR , and 36 for $\text{area of } \triangle LMR$ in the equation $\frac{\text{area of } \triangle PQR}{\text{area of } \triangle LMR} = \left(\frac{RP}{MR}\right)^2$ yields $\frac{\text{area of } \triangle PQR}{36} = \left(\frac{14}{8}\right)^2$, which is equivalent to $\frac{\text{area of } \triangle PQR}{36} = \left(\frac{7}{4}\right)^2$, or $\frac{\text{area of } \triangle PQR}{36} = \frac{49}{16}$. Multiplying each side of this equation by 36 yields $\text{area of } \triangle PQR = 36\left(\frac{49}{16}\right)$, or $\text{area of } \triangle PQR = \frac{441}{4}$. Therefore, the area of $\triangle PQR$ is $\frac{441}{4}$ square units.

Choice A is incorrect. This is the result of multiplying 36 by $\left(\frac{8}{14}\right)^2$ instead of by $\left(\frac{14}{8}\right)^2$.

Choice B is incorrect. This is the result of multiplying 36 by $\frac{8}{14}$ instead of by $\left(\frac{14}{8}\right)^2$.

Choice C is incorrect. This is the result of multiplying **36** by $\frac{14}{8}$ instead of by $\left(\frac{14}{8}\right)^2$.

Question ID: c8ab85ad

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Easy

Question

Which expression represents the area, in square inches, of a square with a side length of **35** inches?

Answer

- A. $\sqrt{35}$
- B. $35 + 35$
- C. $(4)(35)$
- D. 35^2

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 **35** inches. Substituting **35** for s in the expression s^2 yields 35^2 . Therefore, the expression that represents the area, in square inches, of the square is 35^2 .

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 represents the perimeter, in inches, of the square rather than the area, in square inches.

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

Question

In right triangle XYZ , angles X and Z are acute angles. Point R lies on $\overline{XZ}$ such that $\overline{YR}$ is perpendicular to $\overline{XZ}$. The measure of $\angle XZY$ is a° , the measure of $\angle XYR$ is b° , and the length of $\overline{XY}$ is 19. If $\sin a^\circ = \frac{12}{13}$, what is the value of $\tan b^\circ$?

Correct Answer: 2.4, 12/5

Rationale

The correct answer is $\frac{12}{5}$. It's given that in right triangle XYZ , $\angle X$ and $\angle Z$ are acute angles. It follows that $\angle Y$ is a right angle. It's given that point R lies on $\overline{XZ}$ such that $\overline{YR}$ is perpendicular to $\overline{XZ}$. Since $\angle Y$ is a right angle and is comprised of $\angle XYR$ and $\angle ZYR$, it follows that the sum of the measures of $\angle XYR$ and $\angle ZYR$ is 90° . It's given that the measure of $\angle XYR$ is b° . It follows that the measure of $\angle ZYR$ is $(90 - b)^\circ$. Since $\overline{YR}$ is perpendicular to $\overline{XZ}$, it follows that $\angle XRY$ and $\angle ZRY$ are right angles. It follows that $\triangle XRY$ and $\triangle ZRY$ are right triangles. It's given that the measure of $\angle XZY$ is a° . Because the sum of the measures of the interior angles of a triangle is 180° , it follows that the measures of $\angle ZRY$, $\angle XZY$, and $\angle ZYR$ have a sum of 180° . Since the measure of $\angle ZRY$ is 90° , the measure of $\angle YZR$ is a° , and the measure of $\angle ZYR$ is $(90 - b)^\circ$, it follows that $90 + a + 90 - b = 180$, or $a - b + 180 = 180$. Subtracting 180 from both sides of this equation yields $a - b = 0$. Adding b to both sides of this equation yields $a = b$. It's given that $\sin a^\circ = \frac{12}{13}$. Since $a = b$, it follows that $\sin b^\circ = \frac{12}{13}$. In a right triangle, the sine of an acute angle is the ratio of the length of the leg opposite the angle to the length of the hypotenuse. It follows that, for a positive constant k , $12k$ represents the length of the leg opposite $\angle XYR$ and $13k$ represents the length of the hypotenuse of $\triangle XRY$. The Pythagorean theorem states that 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 other two sides. Let nk represent the length of the leg adjacent to $\angle XYR$. It follows that $(13k)^2 = (12k)^2 + (nk)^2$, or $169k^2 = 144k^2 + n^2k^2$. Subtracting $144k^2$ from both sides of this equation yields $25k^2 = n^2k^2$. Taking the positive square root of both sides of this equation yields $5k = nk$. Therefore, the length of the leg adjacent to $\angle XYR$ is $5k$. In a right triangle, the tangent of an acute angle is the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. It follows that $\tan b^\circ = \frac{12k}{5k}$, or $\tan b^\circ = \frac{12}{5}$. Note that 12/5 and 2.4 are examples of ways to enter a correct answer.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question

The edge length, in inches, of cube Y is $\frac{3}{88}$ the edge length, in inches, of cube X. The surface area, in square inches, of cube Y is n times the surface area, in square inches, of cube X. What is the value of n ?

Answer

- A. $\frac{9}{7,744}$
- B. $\frac{27}{3,872}$
- C. $\frac{3}{88}$
- D. $\frac{9}{44}$

Correct Answer: A

Rationale

Choice A is correct. Since all cubes are similar to each other, cube X and cube Y are similar figures. In similar figures, if lengths differ by a scale factor of k , then areas differ by a scale factor of k^2 . It's given that the edge length, in inches, of cube Y is $\frac{3}{88}$ the edge length, in inches, of cube X. It follows that the surface area, in square inches, of cube Y is $\left(\frac{3}{88}\right)^2$, or $\frac{9}{7,744}$, times the surface area, in square inches, of cube X. Therefore, the value of n is $\frac{9}{7,744}$.

Alternate approach: The surface area of a cube is $6s^2$, where s is the edge length. Let x represent the edge length, in inches, of cube X. Substituting x for s in $6s^2$ yields $6x^2$. Therefore, the surface area, in square inches, of cube X can be expressed as $6x^2$. It's given that the edge length, in inches, of cube Y is $\frac{3}{88}$ the edge length, in inches, of cube X. Therefore, the edge length, in inches, of cube Y can be expressed as $\left(\frac{3}{88}\right)x$, or $\frac{3x}{88}$. Substituting $\frac{3x}{88}$ for s in $6s^2$ yields $6\left(\frac{3x}{88}\right)^2$, which is equivalent to $6\left(\frac{9x^2}{7,744}\right)$, or $\frac{27x^2}{3,872}$. Therefore, the surface area, in square inches, of cube Y can be expressed as $\frac{27x^2}{3,872}$. It's given that the surface area, in square inches, of cube Y is n times the surface area, in square inches, of cube X. It follows that $\frac{27x^2}{3,872} = n(6x^2)$. Dividing both sides of this equation by $6x^2$ yields $\frac{27x^2}{3,872(6x^2)} = n$, which is equivalent to $\frac{27x^2}{23,232x^2} = n$, or $\frac{9}{7,744} = n$. Therefore, the value of n is $\frac{9}{7,744}$.

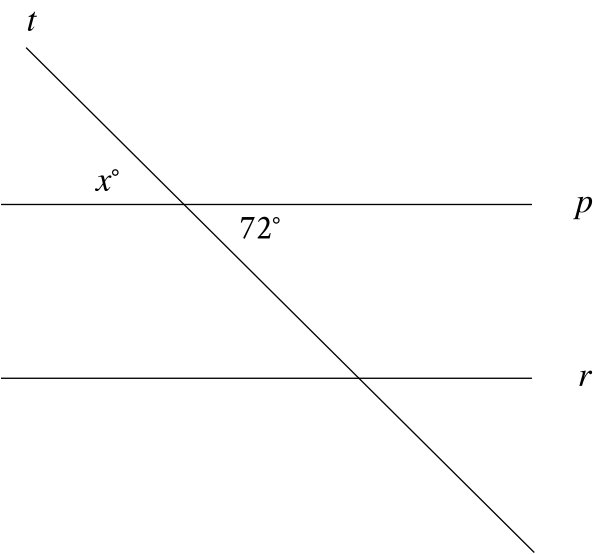
Choice B is incorrect and may result from conceptual or calculation errors.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Easy

Question



Note: Figure not drawn to scale.

In the figure, line *p* is parallel to line *r*, and line *t* intersects both lines. What is the value of *x*?

Answer

- A. 36
- B. 72
- C. 180
- D. 252

Correct Answer: B

Rationale

Choice B is correct. In the figure shown, the angles with measures *x*° and 72° are vertical angles. Vertical angles have equal measure, so the two marked angles have equal measure. Therefore, the value of *x* is 72.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Hard

Question

For triangles ABC and FGH , angles B and G each measure 51° , the length of $\overline{AB}$ is 6 , and the length of $\overline{FG}$ is 18 . Which additional piece(s) of information is(are) sufficient to prove that triangle ABC is similar to triangle FGH ?

- I. The measure of angle A is equal to the measure of angle F .
- II. The measure of angle C is equal to the measure of angle H .
- III. The length of $\overline{FH}$ is 3 times the length of $\overline{AC}$.

Answer

- A. I is sufficient, II is sufficient, and III is sufficient.
- B. I is sufficient and II is sufficient, but III is not.
- C. II is sufficient and III is sufficient, but I is not.
- D. III is sufficient, but I is not and II is not.

Correct Answer: B

Rationale

Choice B is correct. It's given that in triangles ABC and FGH , angles B and G each measure 51° , the length of $\overline{AB}$ is 6 , and the length of $\overline{FG}$ is 18 . For statement I, if the measure of angle A is equal to the measure of angle F , then triangles ABC and FGH have two pairs of congruent angles, angles A and F and angles B and G . When 2 pairs of angles in 2 triangles are congruent, the triangles are similar, so statement I is sufficient. For statement II, if the measure of angle C is equal to the measure of angle H , then triangles ABC and FGH have 2 pairs of congruent angles, angles C and H and angles B and G . When 2 pairs of angles in 2 triangles are congruent, the triangles are similar, so statement II is sufficient. For statement III, if the length of $\overline{FH}$ is 3 times the length of $\overline{AC}$, then the ratio of the length of $\overline{FH}$ to the length of $\overline{AC}$ is 3 . It's given that the length of $\overline{FG}$ is 18 and the length of $\overline{AB}$ is 6 . Therefore, the ratio of the length of $\overline{FG}$ to the length of $\overline{AB}$ is also 3 , so there are two pairs of sides in proportion. However, angle B isn't between sides AB and AC , and angle G isn't between sides FG and FH . Since the given angle measures aren't between the proportional sides, this information isn't sufficient to prove that the triangles are similar. Therefore, statements I and II are each sufficient, but statement III isn't sufficient.

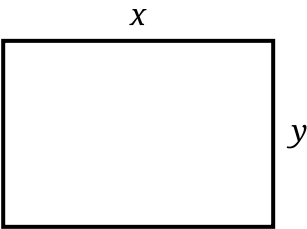
Choice A is incorrect and may result from conceptual or calculation errors.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Easy

Question



Note: Figure not drawn to scale.

In the rectangle shown, $x = 7$ centimeters and $y = 5$ centimeters. What is the area, in square centimeters, of the rectangle?

Answer

- A. 7
- B. 12
- C. 35
- D. 40

Correct Answer: C

Rationale

Choice C is correct. It's given that $x = 7$ centimeters and $y = 5$ centimeters for the rectangle. The area, A , of a rectangle can be found using the formula **Math output error**, where **Math output error** represents the length and w represents the width. In this rectangle, x represents the length and y represents the width. Substituting 7 for **Math output error** and 5 for w in the equation yields $A = (7)(5)$, or $A = 35$. Therefore, the area of the rectangle is 35 square centimeters.

Choice A is incorrect. This is the length, not the area, of the rectangle.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question

In the xy -plane, circle M is the graph of the equation $(x - 4)^2 + (y - 5)^2 = 9$. Circle P has the same center as circle M but has a radius that is twice the radius of circle M . Which equation represents circle P ?

Answer

- A. $(x - 4)^2 + (y - 5)^2 = 18$
- B. $(x - 4)^2 + (y - 5)^2 = 36$
- C. $(x - 8)^2 + (y - 10)^2 = 9$
- D. $(x - 8)^2 + (y - 10)^2 = 18$

Correct Answer: B

Rationale

Choice B is correct. An equation of a circle in the xy -plane can be written as $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center and r is the radius. It's given that in the xy -plane, circle M is the graph of the equation $(x - 4)^2 + (y - 5)^2 = 9$, which is equivalent to $(x - 4)^2 + (y - 5)^2 = 3^2$. Therefore, the center of circle M is $(4, 5)$ and the radius of circle M is 3 . It's given that circle P has the same center as circle M but has a radius that is twice the radius of circle M . Therefore, the center of circle P is $(4, 5)$ and the radius of circle P is $2(3)$, or 6 . Substituting 4 for h , 5 for k , and 6 for r in the equation $(x - h)^2 + (y - k)^2 = r^2$ yields $(x - 4)^2 + (y - 5)^2 = 6^2$, which can be rewritten as $(x - 4)^2 + (y - 5)^2 = 36$.

Choice A is incorrect. The graph of this equation has a radius of $\sqrt{2}(3)$, not $2(3)$.

Choice C is incorrect. The graph of this equation has center $(8, 10)$, not $(4, 5)$, and a radius of 3 , not $2(3)$.

Choice D is incorrect. The graph of this equation has center $(8, 10)$, not $(4, 5)$, and a radius of $\sqrt{2}(3)$, not $2(3)$.

Question ID: 186fdbca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Easy

Question

A circle has a diameter of **12.6** centimeters. What is the radius of the circle, in centimeters?

Correct Answer: 6.3, 63/10

Rationale

The correct answer is **6.3**. The diameter of a circle is equal to **2 r** , where **r** represents the radius of the circle. It's given that a circle has a diameter of **12.6** centimeters. Therefore, **12.6 = 2 r** . Dividing both sides of this equation by **2** yields **6.3 = r** . It follows that the radius of the circle, in centimeters, is **6.3**. Note that 6.3 and 63/10 are examples of ways to enter a correct answer.

Question ID: 73e1b793

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question

Right rectangular prism P is similar to right rectangular prism Q. The volume of prism P is **972 cubic centimeters (cm³)**, and the volume of prism Q is **36 cm³**. One edge of prism P has a length of **12 cm**. What is the length, in **cm**, of the corresponding edge of prism Q?

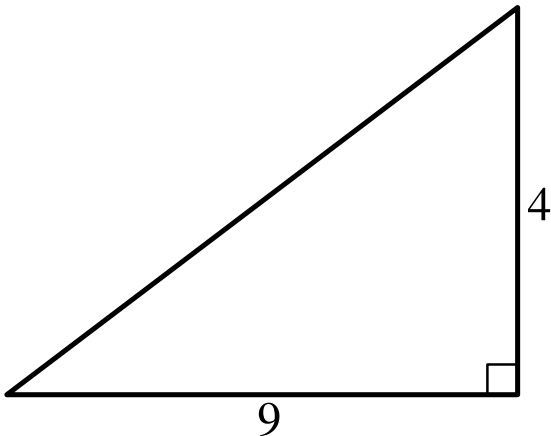
Correct Answer: 4

Rationale

The correct answer is **4**. It's given that right rectangular prism P is similar to right rectangular prism Q. Therefore, there is a positive constant ***k*** such that the length of each edge of prism P is ***k*** times the length of the corresponding edge of prism Q and the volume of prism P is ***k*³** times the volume of prism Q. It's given that the volume of prism P is **972 cm³** and the volume of prism Q is **36 cm³**. It follows that **972 = 36*k*³**. Dividing both sides of this equation by **36** yields **$\frac{972}{36} = k^3$** , or ***k*³ = 27**. Taking the cube root of both sides of this equation yields ***k* = 3**. It follows that the length of each edge of prism P is **3** times the length of the corresponding edge of prism Q. It's given that one edge of prism P has a length of **12 cm**. It follows that **12 cm** is **3** times the length of the corresponding edge of prism Q. Thus, the length, in **cm**, of the edge of prism Q corresponding to the edge of prism P with a length of **12 cm** is **$\frac{12}{3}$** , or **4**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Easy

Question



Note: Figure not drawn to scale.

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

Answer

- A. 18
- B. 13
- C. 9
- D. 4

Correct Answer: A

Rationale

Choice A is correct. 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 9 units, and its height is 4 units. Substituting 9 for b and 4 for h in the formula $A = \frac{1}{2}bh$ yields $A = \frac{1}{2}(9)(4)$, or $A = 18$. Therefore, the area of the triangle, in square units, is 18.

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

Choice C is incorrect. This is the length of the base of the triangle, in units, not the area of the triangle, in square units.

Choice D is incorrect. This is the height of the triangle, in units, not the area of the triangle, in square units.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question

A right square pyramid has a total surface area of **70,560** square inches, and the combined surface area of the four lateral faces of this pyramid is **38,160** square inches. What is the height, in inches, of this pyramid?

Answer

- A. 56
- B. 90
- C. 106
- D. 180

Correct Answer: A

Rationale

Choice A is correct. The total surface area of a right square pyramid is the sum of the combined surface area of its four lateral faces and the area of its square base. It's given that the right square pyramid has a total surface area of **70,560** square inches, and the combined surface area of the four lateral faces of this pyramid is **38,160** square inches. It follows that the area of the square base is the difference between the total surface area and the combined surface area of the four lateral faces, or **(70,560 – 38,160)** square inches, which is equal to **32,400** square inches. The area, ***B***, of the base of a square pyramid is given by the equation **$B = s^2$** , where ***s*** is the side length of the base. Substituting **32,400** for ***B*** in this equation yields **$32,400 = s^2$** . Taking the positive square root of both sides of this equation yields **$180 = s$** . The four lateral faces of a square pyramid are congruent triangles. It follows that the area of each lateral face is **$\frac{38,160}{4}$** , or **9,540**, square inches. The area, ***A***, of each lateral face of a square pyramid is given by the equation **Math output error**, where ***s*** is the side length of the pyramid's base and **Math output error** is the pyramid's slant height. Substituting **9,540** for ***A*** and **180** for ***s*** in this equation yields **Math output error**, or **Math output error**. Dividing both sides of this equation by **90** yields **Math output error**. In the right square pyramid, a right triangle can be drawn, where the lengths of the legs correspond to the pyramid's height, ***h***, and half the side length of its base, **$\frac{1}{2}s$** , and the length of the hypotenuse corresponds to the pyramid's slant height, **Math output error**. It follows that the relationship between ***h***, ***s***, and **Math output error** is given by the equation **Math output error**. Substituting **180** for ***s*** and **106** for **Math output error** in this equation yields **$h^2 + ((\frac{1}{2})(180))^2 = (106)^2$** , or **$h^2 + 8,100 = 11,236$** . Subtracting **8,100** from both sides of this equation yields **$h^2 = 3,136$** . Taking the positive square root of both sides of the equation yields ***h* = 56**. Therefore, the height, in inches, of this pyramid is **56**.

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

Choice C is incorrect. This is the pyramid's slant height, not its height, in inches.

Choice D is incorrect. This is the side length of the pyramid's base, not its height, in inches.

Question ID: f6ca90cc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question

A right prism has a square base with side lengths of **10** inches. The height of the prism is **58** inches. What is the volume, in cubic inches, of the prism?

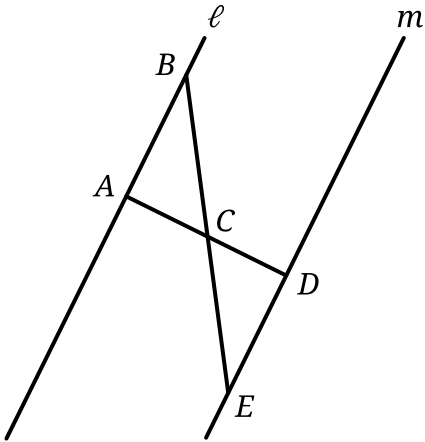
Correct Answer: 5800

Rationale

The correct answer is **5,800**. The volume, V , of a right prism with a square base is given by the formula $V = s^2h$, where s is the side length of the square base and h is the height of the prism. It's given that a right prism has a square base with side lengths of **10** inches. It's also given that the height of the prism is **58** inches. Substituting **10** for s and **58** for h in the formula $V = s^2h$ yields $V = (10)^2(58)$, or $V = 5,800$. Therefore, the volume, in cubic inches, of the prism is **5,800**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Hard

Question



Note: Figure not drawn to scale.

In the figure, segment AD and segment BE intersect at point C . Segment AD is perpendicular to line ℓ at point A . Which of the following additional pieces of information is(are) sufficient to determine that triangle ABC is congruent to triangle DEC ?

- I. Segment AD is perpendicular to line m at point D .
- II. $AC = 13$ and $DC = 13$

Answer

- A. I is sufficient by itself, but II is not.
- B. II is sufficient by itself, but I is not.
- C. I is sufficient by itself, and II is sufficient by itself.
- D. Neither I nor II is sufficient by itself.

Correct Answer: D

Rationale

Choice D is correct. In the figure, it's given that segment AD is perpendicular to line ℓ at point A . Statement I is that segment AD is perpendicular to line m at point D . It follows that angles BAC and EDC are right angles. Therefore, triangles ABC and DEC are right triangles. At least one pair of congruent corresponding sides is needed to determine triangle congruence by the side-angle-side (SAS) condition or the angle-side-angle (ASA) condition, so statement I is not sufficient to determine that triangle ABC is congruent to triangle DEC . Statement II is that $AC = 13$ and $DC = 13$. It follows that triangles ABC and DEC share one pair of congruent corresponding sides. Two additional pairs of congruent corresponding parts are needed to determine triangle congruence by SAS condition, ASA condition, or side-side-side (SSS) condition, so statement II is not sufficient to determine that triangle ABC is congruent to triangle DEC . Therefore, neither I nor II is sufficient by itself to determine that triangle ABC is congruent to triangle DEC .

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 ID: 25cc5327

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Medium

Question

The base of a right rectangular pyramid has a length of **27** centimeters and a width of **2** centimeters. The height of this pyramid is **7** centimeters. What is the volume, in cubic centimeters, of this pyramid?

Correct Answer: 126

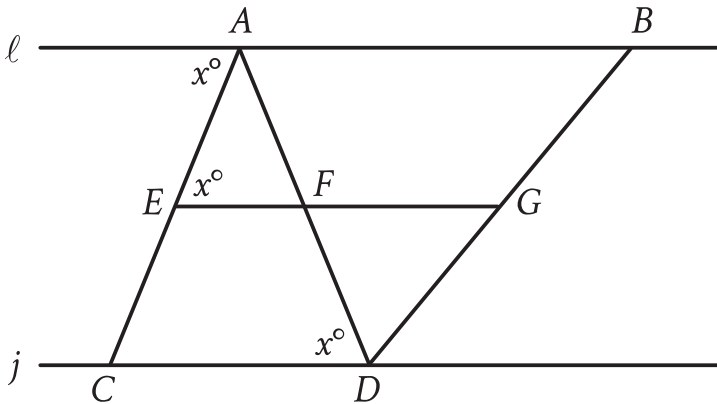
Rationale

The correct answer is **126**. It's given that the base of the right rectangular pyramid has a length of **27** centimeters and a width of **2** centimeters and that the height of the pyramid is **7** centimeters. The volume, V , of a right rectangular pyramid is given by the formula $V = \frac{1}{3}\ell wh$, where ℓ and w are the length and width, respectively, of the pyramid's base and h is the height of the pyramid. Substituting **27** for ℓ , **2** for w , and **7** for h in this formula yields $V = \frac{1}{3}(27)(2)(7)$, or $V = 126$. Therefore, the volume, in cubic centimeters, of the pyramid is **126**.



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Hard

Question



Note: Figure not drawn to scale.

In the figure, $\overline{EG}$ and $\overline{AD}$ intersect at point F , and line ℓ is parallel to line j . If $EF = 0.5CD$ and $FG = 2.25CD$, which of the following must be true?

- I. $AB = 2.25EF$
- II. $FG = 0.5AB$
- III. $\frac{EF}{FG} = \frac{AF}{FD}$

Answer

- A. I only
- B. II only
- C. I and II
- D. II and III

Correct Answer: B

Rationale

Choice B is correct. In the figure, $\overline{AE}$ intersects line ℓ and $\overline{EG}$, and alternate interior angles are both marked x° . It follows that $\overline{EG}$ is parallel to line ℓ . It's given that line ℓ is parallel to line j , so $\overline{EG}$ is also parallel to line j . Thus, the following angles also have measure x° : $\angle EFA$, $\angle ACD$, $\angle BAD$, and $\angle GFD$. Triangles AEF and ACD each have two angles with measure x° , so triangles AEF and ACD are similar. It's also given that $EF = 0.5CD$, so $AF = 0.5AD$. It follows that $AF = FD$. Triangles DFG and DAB each have one angle with measure x° and share $\angle FDG$, so triangles DFG and DAB are similar. Since $AF = FD$, it follows that $AD = 2FD$, so $AB = 2FG$. Substituting $2FG$ for AB in statement I yields $2FG = 2.25EF$. It's given that $FG = 2.25CD$. Substituting $2.25CD$ for FG and $0.5CD$ for EF in the equation $2FG = 2.25EF$ yields $2(2.25CD) = 2.25(0.5CD)$, or $4.5CD = 1.125CD$. Thus, statement I is not true. Since $AB = 2FG$, it follows that $0.5AB = FG$, or $FG = 0.5AB$. Therefore, statement II must be true. Substituting $0.5CD$ for EF , $2.25CD$ for FG , and FD for AF in statement III yields $\frac{0.5CD}{2.25CD} = \frac{FD}{FD}$, or $\frac{2}{9} = 1$. Thus, statement III is not true. Therefore, statement II only must be true.

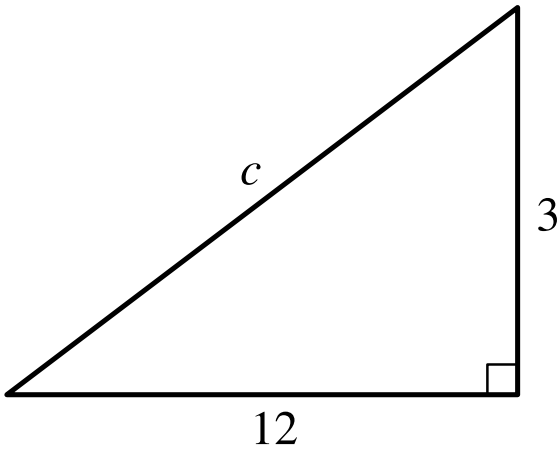
Choice A is incorrect and may result from conceptual or calculation errors.

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

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

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

Question



Note: Figure not drawn to scale.

Which equation shows the relationship between the side lengths of the triangle shown?

- Answer**
- A. $12 \cdot 3 = c$
 - B. $12 + 3 = c$
 - C. $12^2 + 3^2 = c^2$
 - D. $12^2 - 3^2 = c^2$

Correct Answer: C

Rationale

Choice C is correct. The Pythagorean theorem states that for a right triangle, $a^2 + b^2 = c^2$, where a and b represent the lengths of the legs and c represents the length of the hypotenuse. It's given that the right triangle shown has legs with lengths **12** and **3** and a hypotenuse with length c . Substituting **12** for a and **3** for b in the formula $a^2 + b^2 = c^2$ yields $12^2 + 3^2 = c^2$.

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 ID: 4fb972f2

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

Question

In right triangle QRS , the length of hypotenuse SQ is $4\sqrt{82}$ and the length of side QR is 4 . What is the length of side RS ?

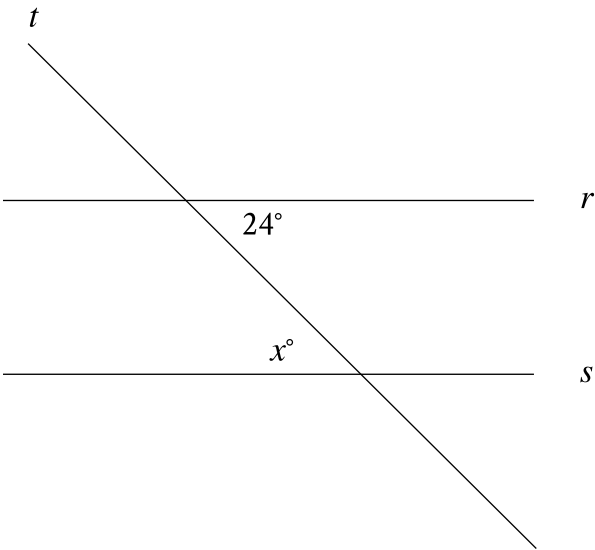
Correct Answer: 36

Rationale

The correct answer is **36**. It's given that side SQ is the hypotenuse of right triangle QRS . It's also given that the length of side SQ is $4\sqrt{82}$ and the length of side QR is 4 . It follows that sides QR and RS are the legs of triangle QRS . 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. Let b represent the length of side RS . By the Pythagorean theorem, $4^2 + b^2 = \left(4\sqrt{82}\right)^2$, or $16 + b^2 = 1,312$. Subtracting **16** from both sides of this equation yields $b^2 = 1,296$. Taking the positive square root of both sides of this equation yields $b = 36$. Therefore, the length of side RS is **36**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Easy

Question



Note: Figure not drawn to scale.

In the figure, line t intersects lines r and s . Which additional piece of information is sufficient to prove that lines r and s are parallel?

Answer

- A. $x < 24$
- B. $x = 24$
- C. $x > 24$
- D. $x - 24 = 360$

Correct Answer: B

Rationale

Choice B is correct. In the figure shown, transversal t intersects lines r and s . Two lines intersected by a transversal are parallel if and only if a pair of alternate interior angles have equal measure. The angle marked 24° and the angle marked x° form a pair of alternate interior angles. Therefore, $x = 24$ is sufficient to prove that lines r and s are parallel.

Choice A is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Question ID: 149021da

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question

A circle has center P , and points A and B lie on the circle. The measure of arc AB is 45° and the length of arc AB is 4π units. What is the length, in units, of the radius of the circle?

Correct Answer: 16

Rationale

The correct answer is **16**. It's given that the measure of arc AB is 45° and the length of arc AB is 4π units. In a circle, the circumference corresponds to an arc measure of 360° . Therefore, the ratio of the measure of arc AB to 360° is equal to the ratio of the length of arc AB to the circumference. Since the circumference of a circle is $2\pi r$, it follows that $\frac{45}{360} = \frac{4\pi}{2\pi r}$. This equation can be rewritten as $\frac{1}{8} = \frac{2}{r}$. Multiplying both sides of this equation by $8r$ yields $1(r) = 2(8)$, or $r = 16$. Therefore, the length, in units, of the radius of the circle is **16**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Medium

Question

The difference between the measure of angle A and the measure of angle B is $-\frac{5}{6}\pi$ radians. Which expression shows the difference between the measure of angle A and the measure of angle B , in degrees?

Answer

- A. $-\frac{5}{6}\pi \cdot \frac{360^\circ}{\pi}$
- B. $-\frac{5}{6}\pi \cdot \frac{180^\circ}{\pi}$
- C. $-\frac{5}{6}\pi \cdot \frac{\pi}{180^\circ}$
- D. $-\frac{5}{6} \cdot \frac{180^\circ}{\pi}$

Correct Answer: B

Rationale

Choice B is correct. Since π radians = 180° , the measure of an angle, in degrees, can be found by multiplying its measure, in radians, by $\frac{180^\circ}{\pi}$. It's given that the difference between the measure of angle A and the measure of angle B is $-\frac{5}{6}\pi$ radians. It follows that the expression $-\frac{5}{6}\pi \cdot \frac{180^\circ}{\pi}$ shows the difference between the measure of angle A and the measure of angle B , in degrees.

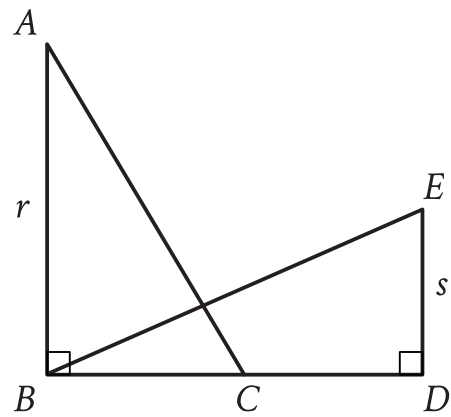
Choice A is incorrect and may result from conceptual or calculation errors.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Medium

Question



Note: Figure not drawn to scale.

In the figure shown, $\triangle ABC$ is congruent to $\triangle BDE$. If $r = 54$ and $s = 26$, what is the length of $\overline{CD}$?

Answer

- A. 26
- B. 27
- C. 28
- D. 54

Correct Answer: C

Rationale

Choice C is correct. It's given that $\triangle ABC$ is congruent to $\triangle BDE$. Corresponding sides of congruent triangles are equal in length. It's given that r , which represents the length of $\overline{AB}$, is equal to 54 and s , which represents the length of $\overline{DE}$, is equal to 26. Since $\overline{AB}$ and $\overline{DE}$ aren't equal in length, it follows that $\overline{AB}$ corresponds to $\overline{BD}$ and $\overline{BC}$ corresponds to $\overline{DE}$. Therefore, the length of $\overline{BD}$ is 54 and the length of $\overline{BC}$ is 26. The points B , C , and D lie on a straight line, so the length of $\overline{BD}$ can be expressed as the sum of the lengths of $\overline{BC}$ and $\overline{CD}$. This relationship can be written as $BD = BC + CD$. Substituting 54 for BD and 26 for BC in this equation yields $54 = 26 + CD$. Subtracting 26 from both sides of this equation yields $CD = 28$. Therefore, the length of $\overline{CD}$ is 28.

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

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

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

Question ID: 4757123b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Hard

Question

Trapezoid A and trapezoid B are similar. The length of each side of trapezoid A is **41** times the length of the corresponding side of trapezoid B. The area of trapezoid A is how many times as large as the area of trapezoid B?

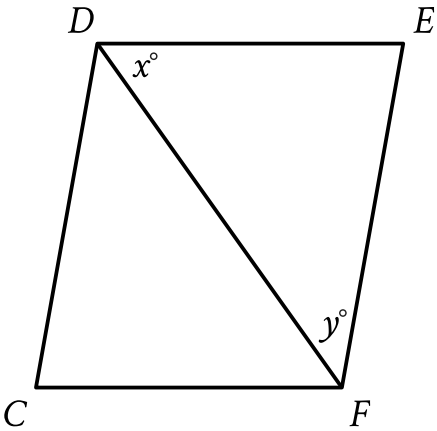
Correct Answer: 1681

Rationale

The correct answer is **1,681**. It's given that trapezoid A and trapezoid B are similar. When two trapezoids are similar, the scale factor between their corresponding side lengths is ***k***, and the scale factor between their areas is ***k*²**. It's given that the length of each side of trapezoid A is **41** times the length of the corresponding side of trapezoid B, so the scale factor between their corresponding side lengths is **41**. It follows that the scale factor between the areas is **41²**, or **1,681**. Therefore, the area of trapezoid A is **1,681** times as large as the area of trapezoid B.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Medium

Question



Note: Figure not drawn to scale.

In the figure shown, $CD = EF$ and $FC = DE$. If $x = 65$ and $y = 30$, what is the measure of $\angle CDE$?

Answer

- A. 30°
- B. 65°
- C. 95°
- D. 130°

Correct Answer: C

Rationale

Choice C is correct. It's given that $CD = EF$ and $FC = DE$, and the figure shows that $\overline{DF}$ is a side of both $\triangle CDF$ and $\triangle EFD$. Since $\triangle CDF$ and $\triangle EFD$ have three pairs of congruent sides, the triangles are congruent, where $\angle CFD$ corresponds to $\angle EDF$ and $\angle CDF$ corresponds to $\angle EFD$. It's given that the measure of $\angle EDF$ is 65° and the measure of $\angle EFD$ is 30° . Since corresponding angles of congruent triangles are congruent, $\angle CFD$ is congruent to $\angle EDF$ and $\angle CDF$ is congruent to $\angle EFD$. Therefore, the measure of $\angle CFD$ is 65° and the measure of $\angle CDF$ is 30° . Since $\angle CDE$ is made up of $\angle CDF$ and $\angle EDF$, it follows that the measure of $\angle CDE$ is equal to the sum of the measures of $\angle CDF$ and $\angle EDF$. Therefore, the measure of $\angle CDE$ is equal to $(30 + 65)^\circ$, or 95° .

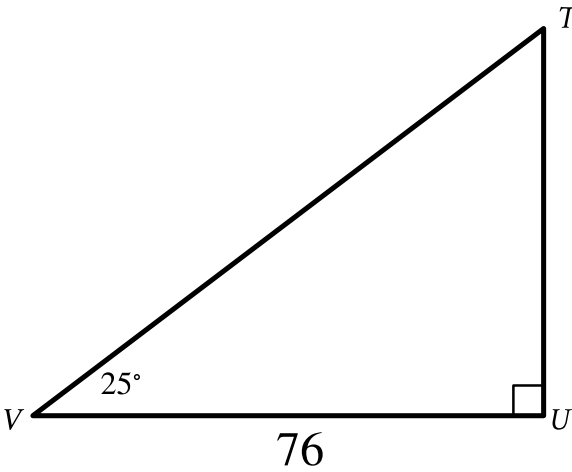
Choice A is incorrect. This is the measure of $\angle CDF$, not the measure of $\angle CDE$.

Choice B is incorrect. This is the measure of $\angle CFD$, not the measure of $\angle CDE$.

Choice D is incorrect. This is the sum of the measures of $\angle CFD$ and $\angle EDF$, not $\angle CDF$ and $\angle EDF$.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Medium

Question



Note: Figure not drawn to scale.

Triangle TUV is dilated by a scale factor of $\frac{1}{2}$ to obtain triangle $T'U'V'$ (not shown), where T corresponds to T' and U corresponds to U' . What is the measure, in degrees, of angle V' ?

Answer

- A. 25
- B. 38
- C. 50
- D. 76

Correct Answer: A

Rationale

Choice A is correct. It's given that triangle TUV is dilated by a scale factor of $\frac{1}{2}$ to obtain triangle $T'U'V'$, where T corresponds to T' and U corresponds to U' . A dilation is a transformation that multiplies all side lengths by the same scale factor while preserving angle measures. Therefore, corresponding angles in triangles TUV and $T'U'V'$ are equal. Since V corresponds to V' , the measure of angle V' is equal to the measure of angle V . The figure shows that the measure of angle V is 25° , so it follows that the measure of angle V' is also 25° .

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. This is the length of $\overline{UV}$, not the measure, in degrees, of angle V' .

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Easy

Question

The length of a side of square X is **9** centimeters. The area of rectangle Y is **32** square centimeters. What is the total area, in square centimeters, of square X and rectangle Y?

Answer

- A. **145**
- B. **113**
- C. **82**
- D. **81**

Correct Answer: B

Rationale

Choice B is correct. The area of a square is s^2 , where s is the side length of the square. It's given that the length of a side of square X is **9** centimeters. It follows that the area of square X is **9²**, or **81** square centimeters. It's also given that the area of rectangle Y is **32** square centimeters. Therefore, the total area, in square centimeters, of square X and rectangle Y is **81 + 32**, or **113**.

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 area of square X, not the total area of square X and rectangle Y, in square centimeters.

Question ID: 42155bac

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Medium

Question

The area of one of the bases of a right circular cylinder is **81** square centimeters, and the volume of the cylinder is **2,187** cubic centimeters. What is the height, in centimeters, of the cylinder?

Answer

- A. **27**
- B. **2,025**
- C. **2,106**
- D. **177,147**

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 one of the bases of the cylinder and h is the height. It's given that the area of one of the bases of the cylinder is **81** square centimeters and that the volume of the cylinder is **2,187** cubic centimeters. Substituting **2,187** for V and **81** for πr^2 in the formula $V = \pi r^2 h$ yields $2,187 = 81h$. Dividing both sides of this equation by **81** yields $27 = h$. Therefore, the height, in centimeters, of the cylinder is **27**.

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 ID: 1b687ae3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Area and volume	Medium

Question

The area of a triangle is **36** square units. If the height of this triangle is **2** units, what is the length, in units, of the base of this triangle?

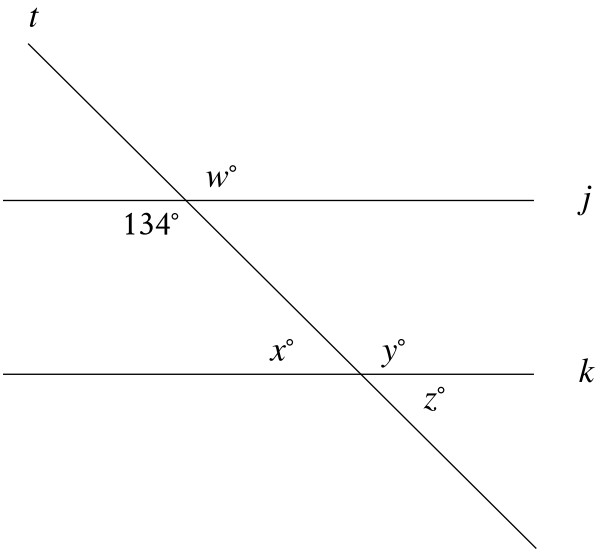
Correct Answer: 36

Rationale

The correct answer is **36**. The area, ***A***, of a triangle is given by the formula **$A = \frac{1}{2}bh$** , where ***b*** represents the length of the base of the triangle and ***h*** represents its height. It's given that the triangle has an area of **36** square units and a height of **2** units. Substituting **36** for ***A*** and **2** for ***h*** in the formula **$A = \frac{1}{2}bh$** yields **$36 = \frac{1}{2}b(2)$** , or **$36 = b$** . Thus, the length, in units, of the base of this triangle is **36**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Medium

Question



Note: Figure not drawn to scale.

In the figure, line t intersects lines j and k . Which additional piece of information is sufficient to prove that lines j and k are parallel?

- Answer**
- A. $x = 46$
 - B. $y = 46$
 - C. $w = 134$
 - D. $z = 134$

Correct Answer: A

Rationale

Choice A is correct. In the figure shown, line t , which is a transversal, intersects lines j and k . If two lines are intersected by a transversal and the measures of a pair of same-side interior angles sum to 180° , then the lines are parallel. In the figure, the angle measuring 134° and the angle measuring x° are a pair of same-side interior angles. If $x = 46$, $(134 + x)^\circ = (134 + 46)^\circ$, or $(134 + x)^\circ = 180^\circ$. Therefore, $x = 46$ is sufficient to prove that lines j and k are parallel.

Choice B is incorrect. The angle measuring y° and the angle measuring 134° are alternate interior angles. If $y = 46$ rather than $y = 134$, then lines j and k would not be parallel.

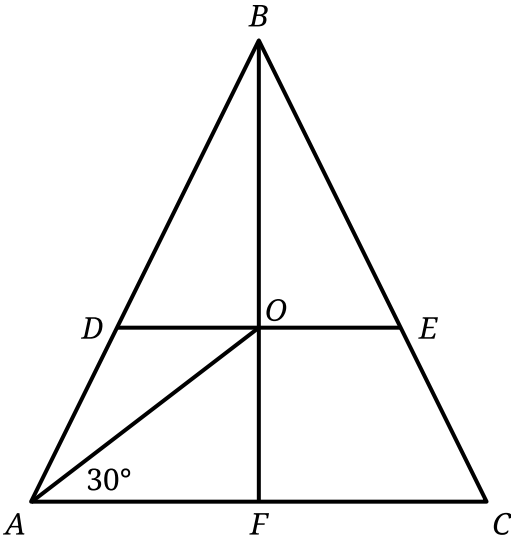
Choice C is incorrect. The angle measuring w° and the angle measuring 134° are vertical angles. Thus, $w = 134$ whether lines j and k are parallel or not.

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

Question ID: 1dacfb94

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Lines, angles, and triangles	Hard

Question



Note: Figure not drawn to scale.

In triangle ABC , $AB = BC$. Points D and E lie on line segments AB and BC , respectively, such that line segments DE and AC are parallel. Point O is the midpoint of line segment DE , and the measure of $\angle OAC$ is 30° . Point F lies on line segment AC , and line segment BF passes through point O . If $AB = 81$ and $AO = BO$, what is the length of line segment BE ?

Correct Answer: 54

Rationale

The correct answer is 54. It's given that $AB = BC$, so triangle ABC is isosceles. It's also given that line segments DE and AC are parallel. Since line segments DE and AC are parallel, triangle BDE is similar to triangle BAC , which means triangle BDE is also isosceles. It's given that point O is the midpoint of line segment DE . Since triangle BDE is isosceles, line segment BO splits triangle BDE into two congruent triangles, where $\angle BOD$ is a right angle. Therefore, $\angle BFA$ is also a right angle. The figure shows that the measure of $\angle OAF$ is 30° . It follows that triangle AOF is a 30-60-90 triangle, where the measure of $\angle AOF$ is 60° . In a 30-60-90 triangle, the side opposite the 30° angle is half the length of the side opposite the 90° angle. Let x represent the length of line segment OF and let $2x$ represent the length of line segment AO . It's given that $AO = BO$. Since $AO = BO$, the length of line segment BO is also $2x$. It follows that the length of line segment BF is $BO + OF$, which is $2x + x$, or $3x$. Since triangle BDE is similar to triangle BAC , the ratio of corresponding side lengths is equal to the ratio of the heights of the triangles. This means that $\frac{BE}{BC} = \frac{BO}{BF}$. Substituting $2x$ for BO and $3x$ for BF in this equation yields $\frac{BE}{BC} = \frac{2x}{3x}$, or $\frac{BE}{BC} = \frac{2}{3}$. It's given that $AB = 81$ and $AB = BC$, so $BC = 81$. Substituting 81 for BC in the equation $\frac{BE}{BC} = \frac{2}{3}$ yields $\frac{BE}{81} = \frac{2}{3}$. Multiplying both sides of this equation by 81 yields $BE = \frac{2}{3}(81)$, or $BE = 54$.

Question ID: 10e059a6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question

The measure of angle A is $\frac{\pi}{216}$ radians. The measure of angle B is **36** times the measure of angle A . What is the value of **cos** B ?

Answer

- A. 0
- B. $\frac{1}{2}$
- C. $\frac{\sqrt{2}}{2}$
- D. $\frac{\sqrt{3}}{2}$

Correct Answer: D

Rationale

Choice D is correct. It’s given that the measure of angle A is $\frac{\pi}{216}$ radians and the measure of angle B is **36** times the measure of angle A . Therefore, the measure of angle B is **36** $\left(\frac{\pi}{216}\right)$ radians, or $\frac{\pi}{6}$ radians. A trigonometric ratio can be found using the unit circle, or a circle with radius **1** unit. For a unit circle centered at the origin in the xy -plane, the cosine of $\frac{\pi}{6}$ radians is the x -coordinate of the point resulting from traveling a distance of $\frac{\pi}{6}$ counterclockwise from the point $(1, 0)$. This results in the point $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$. Therefore, the value of **cos** B is $\frac{\sqrt{3}}{2}$.

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

Choice B is incorrect. This is the value of **sin** B , not **cos** B .

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

Question ID: 9f9112ab

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question

The measure of angle L is **60** degrees. If the measure of angle L is $\frac{\pi}{n}$ radians, where n is a constant, what is the value of n ?

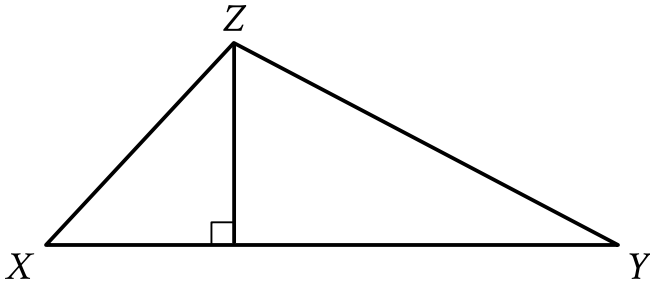
Correct Answer: 3

Rationale

The correct answer is **3**. The measure of an angle in radians is equal to the measure of the angle in degrees multiplied by $\frac{\pi}{180}$. It's given that the measure of angle L is **60** degrees. Multiplying **60** by $\frac{\pi}{180}$ yields $\frac{60\pi}{180}$, or $\frac{\pi}{3}$. It's also given that the measure of angle L is $\frac{\pi}{n}$ radians, so $\frac{\pi}{n} = \frac{\pi}{3}$. Dividing both sides of this equation by π yields $\frac{1}{n} = \frac{1}{3}$. Taking the reciprocal of both sides of this equation yields $\frac{n}{1} = \frac{3}{1}$, or $n = 3$. Therefore, the value of n is **3**.

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

Question



Note: Figure not drawn to scale.

In the figure shown, the measure of angle X is 54° . The length of $\overline{XY}$ is 26 units and the length of $\overline{XZ}$ is 19 units. What is the area, in square units, of triangle XYZ ?

- Answer
- A. 247
 - B. 494
 - C. $247 \sin 54^\circ$
 - D. $494 \sin 54^\circ$

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 length of a base of the triangle and h is its corresponding height. It's given that the length of $\overline{XY}$ is 26 units. This length represents a base of the triangle, so $b = 26$. Let h represent its corresponding height. It's given that the measure of angle X is 54° and the length of $\overline{XZ}$ is 19 units. It follows that $\sin 54^\circ = \frac{h}{19}$. Multiplying both sides of this equation by 19 yields $19 \sin 54^\circ = h$. Substituting 26 for b and $19 \sin 54^\circ$ for h in the formula $A = \frac{1}{2}bh$ yields $A = \frac{1}{2}(26)(19 \sin 54^\circ)$, or $A = 247 \sin 54^\circ$. Therefore, the area, in square units, of triangle XYZ is $247 \sin 54^\circ$.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question

In the xy -plane, circle F is defined by the equation $(x + 8)^2 + (y + 8)^2 = 25$. Circle G has the same center as circle F , and the radius of circle G is 2 units greater than the radius of circle F . Circle G is defined by the equation $(x + 8)^2 + (y + 8)^2 = p$, where p is a constant. What is the value of p ?

Correct Answer: 49

Rationale

The correct answer is 49. An equation of a circle in the xy -plane can be written as $(x - h)^2 + (y - k)^2 = r^2$, where the center of the circle is (h, k) and the radius of the circle is r . It's given that in the xy -plane, circle F is defined by the equation $(x + 8)^2 + (y + 8)^2 = 25$, which can be rewritten as $(x - (-8))^2 + (y - (-8))^2 = 5^2$. It follows that $h = -8$, $k = -8$, and $r = 5$. Therefore, the center of circle F is $(-8, -8)$ and the radius of circle F is 5. It's given that circle G has the same center as circle F , and the radius of circle G is 2 units greater than the radius of circle F . Therefore, the center of circle G is $(-8, -8)$ and the radius of circle G is $5 + 2$, or 7. Substituting -8 for h , -8 for k , and 7 for r into the equation $(x - h)^2 + (y - k)^2 = r^2$ yields $(x + 8)^2 + (y + 8)^2 = 7^2$, which is equivalent to $(x + 8)^2 + (y + 8)^2 = 49$. It follows that circle G is defined by the equation $(x + 8)^2 + (y + 8)^2 = 49$; therefore, the value of p is 49.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Geometry and Trigonometry	Circles	Hard

Question

$$x^2 + y^2 - 10x - 8y - 14n = 0$$

The given equation represents circle A in the xy -plane, where n is a constant. Point $(11, 8)$ lies on circle B, which has the same center but twice the diameter as circle A. What is the value of n ?

Correct Answer: -2

Rationale

The correct answer is -2 . It's given that $x^2 + y^2 - 10x - 8y - 14n = 0$ represents circle A in the xy -plane, where n is a constant. The equation of a circle in the xy -plane can be written in the form $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center of the circle and r is its radius. By completing the square, the equation $x^2 + y^2 - 10x - 8y - 14n = 0$ can be rewritten as $\left(x^2 - 10x + \left(\frac{-10}{2}\right)^2\right) + \left(y^2 - 8y + \left(\frac{-8}{2}\right)^2\right) = 14n + \left(\frac{-10}{2}\right)^2 + \left(\frac{-8}{2}\right)^2$. This is equivalent to $(x^2 - 10x + 25) + (y^2 - 8y + 16) = 14n + 25 + 16$, which can be written as $(x - 5)^2 + (y - 4)^2 = 14n + 41$. It follows that $(5, 4)$ is the center of circle A and $\sqrt{14n + 41}$ is its radius. It's given that circle B has the same center as circle A. Therefore, the center of circle B is $(5, 4)$. It's also given that circle B has twice the diameter as circle A. Therefore, circle B has twice the radius as circle A. Since the radius of circle A is $\sqrt{14n + 41}$, it follows that the radius of circle B is $2\sqrt{14n + 41}$. Substituting 5 for h , 4 for k , and $2\sqrt{14n + 41}$ for r in the equation $(x - h)^2 + (y - k)^2 = r^2$ yields $(x - 5)^2 + (y - 4)^2 = \left(2\sqrt{14n + 41}\right)^2$, or $(x - 5)^2 + (y - 4)^2 = 4(14n + 41)$, which represents an equation for circle B. It's given that the point $(11, 8)$ lies on circle B. Substituting 11 for x and 8 for y in the equation $(x - 5)^2 + (y - 4)^2 = 4(14n + 41)$ yields $(11 - 5)^2 + (8 - 4)^2 = 4(14n + 41)$, which gives $6^2 + 4^2 = 4(14n + 41)$, or $52 = 4(14n + 41)$. Dividing both sides of this equation by 4 yields $13 = 14n + 41$. Subtracting 41 from both sides of this equation yields $-28 = 14n$. Dividing both sides of this equation by 14 yields $-2 = n$. Therefore, the value of n is -2 .

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	Hard

Question

A square scale drawing has a side length of **55** inches, and **1** inch on the drawing represents an actual distance of **19** miles. A larger version of the same drawing is printed as a square with the side length **65%** longer than the side length of the previous drawing. On the larger drawing, which of the following is closest to the actual distance, in miles, represented by **1** inch?

Answer

- A. **6.65**
- B. **11.52**
- C. **31.35**
- D. **35.75**

Correct Answer: B

Rationale

Choice B is correct. It's given that **1** inch on the drawing represents an actual distance of **19** miles and that the larger drawing has a side length that is **65%** longer than the side length of the previous drawing. It follows that **(1.65)(1 inch)**, or **1.65** inches, on the larger drawing also represents an actual distance of **19** miles. Therefore, the scale of the larger drawing can be represented as $\frac{19 \text{ miles}}{1.65 \text{ inches}}$, which is approximately **11.52** miles per inch. Therefore, **11.52** is closest to the actual distance, in miles, represented by **1** inch on the larger drawing.

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 ID: 3e1bd4e2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	Medium

Question

Researchers studied a sample of a species of fish from a certain location. The researchers found that the mean length of fish in the sample was **16.59** millimeters. Based on the sample mean and margin of error, the researchers estimated that the mean length of all fish of this species from this location was between **15.86** and **17.32** millimeters. What is the margin of error, in millimeters?

Answer

- A. **0.73**
- B. **2.19**
- C. **15.86**
- D. **16.59**

Correct Answer: A

Rationale

Choice A is correct. It’s given that the mean length of fish in the sample was **16.59** millimeters. It’s also given that based on the sample mean and margin of error, the researchers estimated that the mean length of all fish of this species from this location was between **15.86** and **17.32** millimeters. These values are calculated by subtracting the margin of error from **16.59** millimeters to get the lower bound, **15.86** millimeters, and by adding the margin of error to **16.59** millimeters to get the upper bound, **17.32** millimeters. It follows that the margin of error, in millimeters, can be calculated as the difference between **16.59** and **15.86** or between **17.32** and **16.59**. The difference between **16.59** and **15.86** is **16.59 — 15.86**, or **0.73**. Therefore, the margin of error, in millimeters, is **0.73**.

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

Choice C is incorrect. This is the lower bound of the researchers' estimate of the mean length of all fish of this species from this location, not the margin of error.

Choice D is incorrect. This is the mean length of fish in the sample, not the margin of error.

Question ID: f6c18a66

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	Hard

Question

For data set A, the table summarizes the distribution of the number of deliveries received by an office each day during a period of **11** days.

Deliveries	Days
0	2
3	2
4	2
5	2
6	1
7	1
13	1

The data value **13** was recorded in error and is removed from data set A to create data set B, which consists of the remaining **10** data values. Which statement best compares the median of data set A and the median of data set B?

Answer

- A. The median of data set B is less than the median of data set A.
- B. The median of data set B is greater than the median of data set A.
- C. The median of data set B is equal to the median of data set A.
- D. There is not enough information to compare the medians of the two data sets.

Correct Answer: C

Rationale

Choice C is correct. It’s given that for data set A, the table summarizes the number of deliveries received by an office each day over a period of **11** days. If a data set contains an odd number of data values, the median is represented by the middle data value in the list when the data values are listed in ascending or descending order. Since data set A contains **11** data values in ascending order, the median of data set A is the **6th** value. Based on the number of days for each value shown in the table, the **6th** value is **4**, so the median of data set A is **4**. It’s also given that the data value **13** was recorded in error and is removed from data set A to create data set B. It follows that data set B contains **10** data values in ascending order. If a data set contains an even number of data values, the median is between the two middle data values when the values are listed in ascending or descending order. It follows that the median of data set B is between the **5th** and **6th** values. Based on the number of days for each value shown in the table, the **5th** and **6th** values are both **4**, so the median of data set B is **4**. Therefore, the median of data set B is equal to the median of data set A.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	Medium

Question

Which of the following lists represents a data set with the smallest standard deviation?

Answer

- A. 51, 52, 54, 56, 57
- B. 52, 52, 54, 56, 56
- C. 52, 53, 54, 55, 56
- D. 53, 54, 54, 54, 55

Correct Answer: D

Rationale

Choice D is correct. Standard deviation is a measure of the spread of the values in a data set from the mean of the data set, and the smaller the spread, the smaller the standard deviation. Each of the four choices represents a data set that is symmetric with respect to the value **54**. Therefore, **54** is the mean of each of these data sets. All the values in the data set in choice D differ from **54** by either **0** or **1**. In each of the other three data sets, the values in the data set, other than the value of **54**, differ from **54** by at least **1**. Therefore, the data set in choice D has the smallest spread and thus the smallest standard deviation.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	Hard

Question

For 100 buttons, the table summarizes the distribution by group and diameter.

Group	Diameter (millimeters)		
	Less than 20	20 to 30	Greater than 30
Group 1	12	8	3
Group 2	0	17	18
Group 3	10	32	0

One of these buttons will be selected at random. What is the probability of selecting a button with a diameter that is less than or equal to 30 millimeters, given that it is **not** in group 2? (Express your answer as a decimal or fraction, not as a percent.)

Correct Answer: .9538, 62/65

Rationale

The correct answer is $\frac{62}{65}$. It's given that one button will be selected at random out of a total of 100 buttons and that the table shows the distribution of buttons by group and diameter. The probability of selecting a button with a diameter less than or equal to 30 millimeters, given that it is not in group 2, is the number of buttons with a diameter less than or equal to 30 millimeters that are not in group 2 divided by the total number of buttons not in group 2. Based on the table, the buttons not in group 2 are those in group 1 and group 3. In group 1, there are 12 buttons with a diameter less than 20 millimeters and 8 buttons with a diameter from 20 to 30 millimeters, which yields 12 + 8, or 20, buttons with a diameter less than or equal to 30 millimeters. In group 3, there are 10 buttons with a diameter less than 20 millimeters and 32 buttons with a diameter from 20 to 30 millimeters, which yields 10 + 32, or 42, buttons with a diameter less than or equal to 30 millimeters. Therefore, the total number of buttons with a diameter less than or equal to 30 millimeters that are not in group 2 is 20 + 42, or 62. The total number of buttons that are not in group 2 is the sum of all buttons in group 1 and group 3. There are 12 + 8 + 3, or 23, buttons in group 1 and 10 + 32 + 0, or 42, buttons in group 3. Therefore, the total number of buttons in groups 1 and 3 is 23 + 42, or 65. It follows that the probability of selecting a button with a diameter less than or equal to 30 millimeters, given that it is not in group 2, is $\frac{62}{65}$. Note that 62/65 or .9538 are examples of ways to enter a correct answer.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	Hard

Question

The speeds of objects A, B, and C are a meters per second, b meters per second, and c meters per second, respectively. If the speed of object A is 5,900% of the speed of object C and the speed of object C is 0.008% of the speed of object B, which expression represents the value of $a + b$ in terms of c ?

Answer

- A. 1,840 c
- B. 5,908 c
- C. 6,025 c
- D. 12,559 c

Correct Answer: D

Rationale

Choice D is correct. It’s given that the speeds of objects A, B, and C are a meters per second, b meters per second, and c meters per second, respectively. If the speed of object A is 5,900% of the speed of object C, this means that $a = \frac{5,900}{100}c$, or $a = 59c$. If the speed of object C is 0.008% of the speed of object B, this means that $c = \frac{0.008}{100}b$, or $c = 0.00008b$. Dividing both sides of this equation by 0.00008 yields $\frac{1}{0.00008}c = b$, or $12,500c = b$. Since $a = 59c$ and $b = 12,500c$, it follows that $a + b = 59c + 12,500c$, or $a + b = 12,559c$. Therefore, the expression 12,559 c represents the value of $a + b$ in terms of c .

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

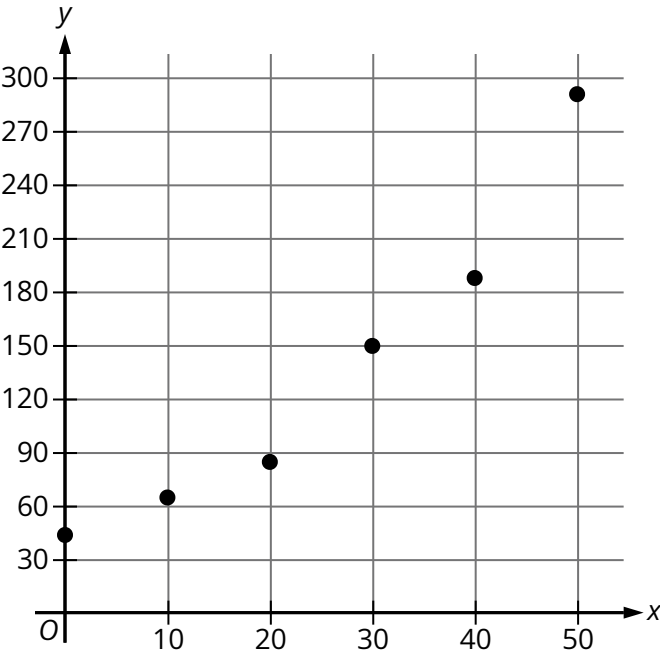
Choice B is incorrect and may result from conceptual or calculation errors.

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	Easy

Question

The scatterplot shows the relationship between the number of swans, y , in a certain population and the number of years since 1970, x , where $0 \leq x \leq 50$.



Which of the following equations is the most appropriate exponential model for the data shown in the scatterplot?

- Answer**
- A. $y = 43(1.04)^{-x}$
 - B. $y = 43(1.04)^x$
 - C. $y = 288(1.04)^{-x}$
 - D. $y = 288(1.04)^x$

Correct Answer: B

Rationale

Choice B is correct. It's given that the scatterplot shows the relationship between the number of swans, y , and the number of years since 1970, x , where $0 \leq x \leq 50$. According to the scatterplot, the number of swans increases as the number of years since 1970 increases, and the data shows an exponential growth pattern rather than a linear pattern. When $a > 0$ and $b > 1$, an exponential model of the form $y = a(b)^x$ represents exponential growth and a model of the form $y = a(b)^{-x}$ represents exponential decay. The models in all four choices show $a > 0$ and $b > 1$. Choices B and D show models of the form $y = a(b)^x$ and thus represent exponential growth. The initial value a should approximate the y -value when $x = 0$, which is a little more than 40, so $a = 43$ is reasonable and consistent with the graph. Therefore, the equation $y = 43(1.04)^x$ is the most appropriate exponential model for the data.

Choice A is incorrect. The model $y = 43(1.04)^{-x}$ represents exponential decay, rather than exponential growth, which doesn't match the pattern in the scatterplot.

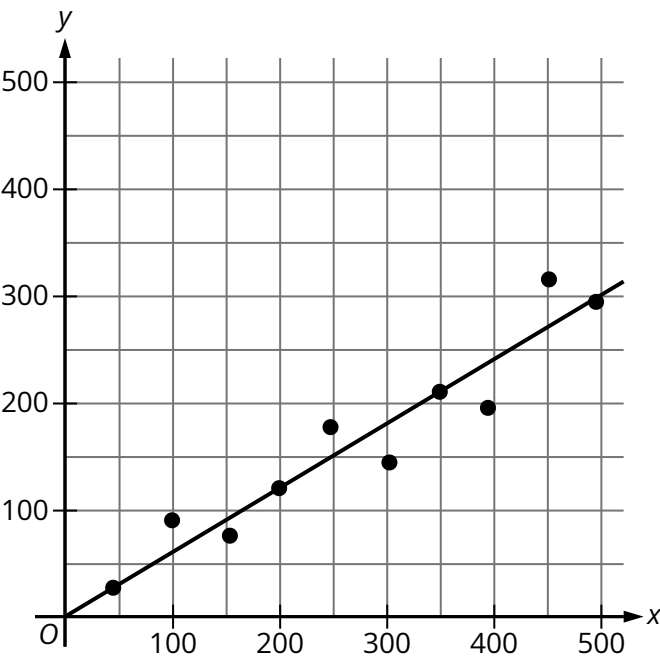
Choice C is incorrect. The model $y = 288(1.04)^{-x}$ represents exponential decay rather than exponential growth, which doesn't match the pattern in the scatterplot.

Choice D is incorrect. The model $y = 288(1.04)^x$ has an initial value of **288** when $x = 0$, so the initial value doesn't match the scatterplot.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	Medium

Question

A group of **10** botanists recorded data on the germination rates of a certain type of seed for one growing season. The scatterplot shows the relationship between the number of seeds planted, x , and the number of seeds that germinated, y , for each of the botanists. A line of best fit is also shown.



Which of the following is the best interpretation of the slope of the line of best fit in this context?

- Answer**
- A. The number of seeds planted is predicted to increase by **60** seeds every **100** days.
 - B. The number of seeds planted is predicted to increase by **300** seeds every **100** days.
 - C. The number of seeds that germinate is predicted to increase by **60** seeds for every additional **100** seeds that are planted.
 - D. The number of seeds that germinate is predicted to increase by **300** seeds for every additional **100** seeds that are planted.

Correct Answer: C

Rationale

Choice C is correct. It's given that the scatterplot shows the relationship between the number of seeds planted, x , and the number of seeds that germinated, y . The slope of a line of best fit represents the change in the y -value for a given change in the x -value. According to the graph, the y -value of the line of best fit increases by about **60** when the x -value increases by about **100**, which represents an increase of about **60** germinated seeds for every additional **100** seeds planted. Therefore, the best interpretation of the slope of the line of best fit is that the number of seeds that germinate is predicted to increase by **60** seeds for every additional **100** seeds that are planted.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	Hard

Question

On average, a certain plant grows **87** millimeters every ***m*** months. At this rate, which expression represents the number of millimeters, on average, the plant grows every ***k*** years?

Answer

- A. $\frac{29m}{4k}$
- B. $\frac{29k}{4m}$
- C. $\frac{1,044m}{k}$
- D. $\frac{1,044k}{m}$

Correct Answer: D

Rationale

Choice D is correct. It’s given that on average, a certain plant grows **87** millimeters every ***m*** months. This average rate can be written as $\frac{87}{m}$ millimeters per month. Since there are **12** months in **1** year, it follows that there are **12*k*** months in ***k*** years. Therefore, the number of millimeters, on average, the plant grows every ***k*** years can be calculated by multiplying the rate $\frac{87}{m}$ millimeters per month by **12*k*** months, which yields $(\frac{87}{m})(12k)$, or $\frac{1,044k}{m}$.

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: 1b96c116

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	Hard

Question

A rectangle has an area of **3,168** square inches. What is the area, in **square feet**, of this rectangle? (**1 foot = 12 inches**)

Answer

- A. **22**
- B. **56.3**
- C. **264**
- D. **675.4**

Correct Answer: A

Rationale

Choice A is correct. It’s given that **1 foot = 12 inches**. It follows that **1² square foot = 12² square inches**, or **1 square foot = 144 square inches**. Thus, **3,168** square inches is equivalent to **(3,168 square inches) ($\frac{1 \text{ square foot}}{144 \text{ square inches}}$)**, or **22** square feet.

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

Choice C is incorrect. This is the value of $\frac{3,168}{12}$, not $\frac{3,168}{144}$.

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

Question ID: 2bab1399

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	Medium

Question

A researcher is designing a study to investigate the average number of hours participants in a training course spend on a particular activity per day. The researcher will report an estimated average number of hours participants in the training course spend on this activity per day with an associated margin of error. The researcher is considering using a random sample of either **115** or **230** participants from the training course. Which of the following would be the most likely effect of using the larger random sample compared to the smaller random sample?

Answer

- A. The reported margin of error would be lower.
- B. The reported margin of error would be higher.
- C. The reported average number of hours would be lower.
- D. The reported average number of hours would be higher.

Correct Answer: A

Rationale

Choice A is correct. When using a random sample to report an estimated average, a larger sample size, such as **230** participants instead of **115** participants, generally leads to a smaller margin of error. Therefore, the most likely effect of using the larger random sample compared to the smaller random sample is that the reported margin of error would be lower.

Choice B is incorrect and may result from conceptual errors.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Probability and conditional probability	Hard

Question

The table shows the distribution of rooms in a certain facility by seating capacity.

Seating capacity	Proportion
Less than 18 seats	26%
18–40 seats	21%
41–65 seats	29%
Greater than 65 seats	24%

If a room in this facility is selected at random, which of the following is closest to the probability of selecting a room that has a seating capacity greater than 65 seats, given that the room has a seating capacity of at least 18 seats?

Answer

- A. 0.24
- B. 0.32
- C. 0.50
- D. 0.92

Correct Answer: B

Rationale

Choice B is correct. It’s given that the proportion of rooms with less than 18 seats is 26%, which is equivalent to 0.26. It’s also given that the proportion of rooms with 18–40 seats is 21%, or 0.21; that the proportion of rooms with 41–65 seats is 29%, or 0.29; and that the proportion of rooms with greater than 65 seats is 24%, or 0.24. The probability of selecting a room that has a seating capacity greater than 65 seats given that the room has a seating capacity of at least 18 seats is equal to the proportion of rooms that have a seating capacity of greater than 65 seats divided by the proportion of rooms that have a seating capacity of at least 18 seats. Rooms with a seating capacity of at least 18 seats include the categories 18–40 seats, 41–65 seats, and greater than 65 seats, so the total proportion for this condition can be written as 0.21 + 0.29 + 0.24, or 0.74. Therefore, the probability of selecting a room that has a seating capacity greater than 65 seats given that it has a seating capacity of at least 18 seats is $\frac{0.24}{0.74}$, or approximately 0.324. Of the given choices, 0.32 is closest to 0.324.

Choice A is incorrect. This is the probability of selecting a room that has a seating capacity greater than 65 seats from all rooms in the facility, not just rooms that meet the condition of having a seating capacity of at least 18 seats.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Inference from sample statistics and margin of error	Hard

Question

A researcher surveyed a random sample of **1,020** people from a certain city to estimate the percentage of people who support a recently announced proposal. From the survey, the researcher estimated that **86%** of people from the city support this proposal, with an associated margin of error of **2.13%**. The researcher repeated the survey with a random sample of people from the city that was double the original sample size. Assuming the margins of error were calculated in the same way, which of the following is true about the margin of error associated with the estimate from the larger sample?

Answer

- A. The margin of error is between **2.13%** and **3.13%**.
- B. The margin of error is between **4.13%** and **5.13%**.
- C. The margin of error is greater than **5.13%**.
- D. The margin of error is less than **2.13%**.

Correct Answer: D

Rationale

Choice D is correct. It's given that from the initial survey, the margin of error associated with the estimate was **2.13%**. A larger sample size generally leads to a smaller margin of error. Therefore, assuming the margins of error were calculated in the same way, the margin of error associated with the estimate from the larger sample is less than **2.13%**.

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 ID: 6feae9c3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	Hard

Question

At a recreation center, visitors used the exercise room for a total of t hours in July. At the same recreation center, visitors used the exercise room for $3.49t$ hours in August. What is the percent increase in the number of hours visitors used the exercise room from July to August?

Answer

- A. 2.49%
- B. 3.49%
- C. 249%
- D. 349%

Correct Answer: C

Rationale

Choice C is correct. It’s given that the total number of hours visitors used the exercise room increased from t hours in July to $3.49t$ hours in August. It follows that the number of hours increased by $3.49t - t$, or $2.49t$. Let $p\%$ represent the percent increase in the exercise room use from July to August, or the percentage that $2.49t$ is of t . The value of p can be found using the proportion $\frac{2.49t}{t} = \frac{p}{100}$, or $2.49 = \frac{p}{100}$. Multiplying both sides of this equation by 100 yields $p = 249$. Therefore, the percent increase in the number of hours visitors used the exercise room from July to August is 249% .

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

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

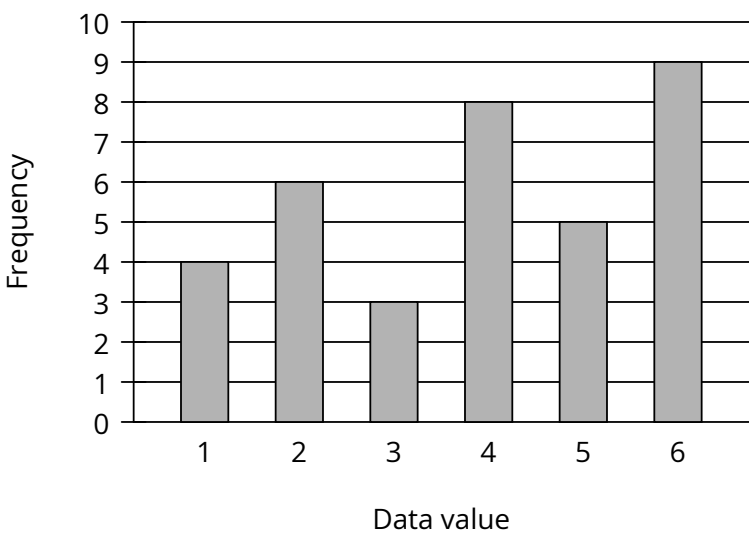
Choice D is incorrect. The exercise room use in August is 349% of the exercise room use in July, but this doesn't represent the percent increase from July to August.

Question ID: 559476f4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	Easy

Question

The bar graph shows the frequency of each data value in a data set.



What is the frequency of data value **2** in this data set?

Correct Answer: 6

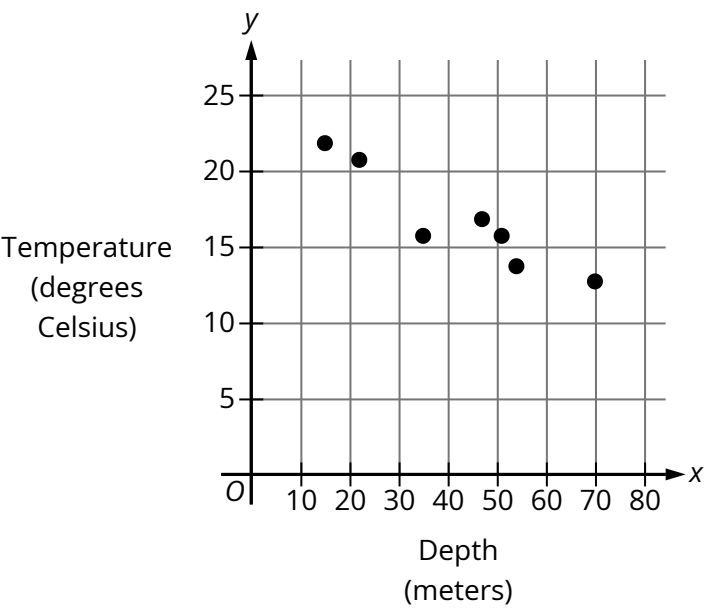
Rationale

The correct answer is **6**. It's given that the bar graph shows the frequency of each data value in a data set. The bar corresponding to the data value **2** has a height of **6**. Therefore, the frequency of the data value **2** in this data set is **6**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Two-variable data: Models and scatterplots	Medium

Question

As part of a study of lake conditions, the water temperature was recorded at different depths below the surface of a certain lake. The data shown in the scatterplot give the recorded temperature, in degrees Celsius, for 7 depths, in meters, below the surface of the lake.



Which of the following is closest to the slope of a line of best fit for the data shown?

- Answer**
- A. -0.17
 - B. -2.17
 - C. -6.02
 - D. -8.02

Correct Answer: A

Rationale

Choice A is correct. It's given that the data shown in the scatterplot give the recorded temperature, in degrees Celsius, for 7 depths, in meters, below the surface of a lake. The graph of an appropriate line of best fit for the data shown passes approximately through the points $(15, 21.8)$ and $(70, 12.7)$. The slope of a line in the xy -plane that passes through the points (x_1, y_1) and (x_2, y_2) can be calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(15, 21.8)$ and $(70, 12.7)$ for (x_1, y_1) and (x_2, y_2) , respectively, in the expression $\frac{y_2 - y_1}{x_2 - x_1}$ yields $\frac{12.7 - 21.8}{70 - 15}$, or $-\frac{9.1}{55}$, which is approximately -0.165 . Therefore, of the given choices, -0.17 is closest to the slope of a line of best fit for the data shown.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	One-variable data: Distributions and measures of center and spread	Hard

Question

$a, 26, 29, b, 31, 47, c$

For the given data set, the data values are listed in ascending order, where a , b , and c are constants. For this data set, the mean is **36**, the median is **29**, and the range is **72**. What is the value of c ?

Answer

- A. **54**
- B. **72**
- C. **81**
- D. **98**

Correct Answer: C

Rationale

Choice C is correct. It's given that the data set containing $a, 26, 29, b, 31, 47, c$ is listed in ascending order and has a mean of **36**, a median of **29**, and a range of **72**. Since there are **7** values in the given data set, it follows that the median is the value in the fourth position. It's given that b is in the fourth position in the given data set, so it follows that $b = 29$. Since the mean of the data set is **36**, it follows that $\frac{(a+26+29+29+31+47+c)}{7} = 36$. Multiplying both sides of this equation by **7** yields $a + 26 + 29 + 29 + 31 + 47 + c = 252$, which is equivalent to $a + c + 162 = 252$. Subtracting **162** from both sides of this equation yields $a + c = 90$. The range is the difference between the greatest and least values in a data set. Since c is the greatest value and a is the least value in the given data set, it follows that $c - a = 72$, or $-a + c = 72$. Adding the equations $a + c = 90$ and $-a + c = 72$ yields $2c = 162$. Dividing both sides of this equation by **2** yields $c = 81$.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	Easy

Question

A cluster fly is traveling at a velocity of **76** centimeters per second. What is this velocity, in **millimeters** per second? (**1 centimeter = 10 millimeters**)

Answer

- A. **7,600**
- B. **836**
- C. **760**
- D. **86**

Correct Answer: C

Rationale

Choice C is correct. It's given that **1 centimeter = 10 millimeters**. It follows that a velocity of **76** centimeters per second is equivalent to $\left(\frac{76 \text{ centimeters}}{1 \text{ second}}\right) \left(\frac{10 \text{ millimeters}}{1 \text{ centimeter}}\right)$, which is equivalent to **(76) (10)**, or **760**, millimeters per second.

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 ID: 98818acf

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Percentages	Hard

Question

The number of audiobooks in a library increased by **131%** from last year to this year. The number of audiobooks in the library last year was ***n***, and the number of audiobooks in the library this year is ***bn***, where ***b*** and ***n*** are constants. What is the value of ***b***?

Correct Answer: 2.31

Rationale

The correct answer is **2.31**. It's given that the number of audiobooks in the library increased by **131%** from last year to this year. Converting **131%** to a decimal yields **1.31**. It's also given that the number of audiobooks in the library last year was ***n***, where ***n*** is a constant. It follows that the number of audiobooks in the library this year can be represented by ***n*** plus **131%** of ***n***, or ***n* + 1.31*n***. Combining like terms in this expression yields **2.31*n***. Since the number of audiobooks in the library this year is represented as ***bn***, where ***b*** is a constant, it follows that the value of ***b*** is **2.31**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

Question

$$y = 9\left(\frac{a}{7}\right)^{x+c} - b$$

How many times does the graph of the given equation in the xy -plane cross the x -axis, where a , b , and c are positive constants such that $a > 7$ and $b > c$?

Answer

- A. Zero
- B. One
- C. Two
- D. Three

Correct Answer: B

Rationale

Choice B is correct. It’s given that $y = 9\left(\frac{a}{7}\right)^{x+c} - b$, where a , b , and c are positive constants such that $a > 7$ and $b > c$. The graph of any equation in the xy -plane crosses the x -axis when there is a point on the graph for which the value of y is equal to 0, and the value of y changes sign when the graph passes through that point. Since $a > 7$, the base $\frac{a}{7}$ is greater than 1, so the expression $9\left(\frac{a}{7}\right)^{x+c} - b$ increases as x increases. Since b is positive, there is a point on the graph of $y = 9\left(\frac{a}{7}\right)^{x+c} - b$ for which the value of y is equal to 0. When the graph passes through this point, the value of y changes sign from negative to positive. Therefore, the graph of the given equation crosses the x -axis exactly one time.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Medium

Question

$$y = 7,400(0.87)^x$$

The given equation estimates the value, in dollars, of a certain piece of equipment x years after it was purchased. According to the given equation, what was the estimated value, in dollars, of the piece of equipment at the time it was purchased?

Answer

- A. 740
- B. 6,438
- C. 7,400
- D. 8,700

Correct Answer: C

Rationale

Choice C is correct. It’s given that $y = 7,400(0.87)^x$ estimates the value, in dollars, of a certain piece of equipment x years after it was purchased. The estimated value of the piece of equipment at the time it was purchased corresponds to the value of y when $x = 0$. Substituting 0 for x in the equation $y = 7,400(0.87)^x$ yields $y = 7,400(0.87)^0$, which is equivalent to $y = 7,400(1)$, or $y = 7,400$. Therefore, the estimated value, in dollars, of the piece of equipment at the time it was purchased was 7,400.

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

Choice B is incorrect. This was the estimated value, in dollars, of the piece of equipment 1 year after it was purchased.

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Hard

Question

$r^2 + qr = 2r - 55$

In the given equation, q is an integer constant. The given equation has no real solutions. What is the largest possible value of q ?

Correct Answer: 16

Rationale

The correct answer is **16**. A quadratic equation of the form $ax^2 + bx + c = 0$, where a , b , and c are constants, has no real solution if and only if its discriminant, $b^2 - 4ac$, is negative. It's given that in the equation $r^2 + qr = 2r - 55$, q is an integer constant. Subtracting $2r$ and adding 55 to both sides of this equation yields $r^2 + qr - 2r + 55 = 0$, or $r^2 + (q - 2)r + 55 = 0$. In this equation, $a = 1$, $b = q - 2$, and $c = 55$. Substituting 1 for a , $q - 2$ for b , and 55 for c in the discriminant expression yields $(q - 2)^2 - 4(1)(55)$, or $(q - 2)^2 - 220$. Since the value of the discriminant must be negative, it follows that $(q - 2)^2 - 220 < 0$, or $(q - 2)^2 < 220$. This is equivalent to $|q - 2| < \sqrt{220}$, or $-\sqrt{220} < q - 2 < \sqrt{220}$. Adding 2 to each part of this inequality yields $2 - \sqrt{220} < q < 2 + \sqrt{220}$. Since $\sqrt{220}$ is approximately **14.83**, it follows that $-12.83 < q < 16.83$. Since q is an integer, the largest possible value of q is **16**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	Hard

Question

The expression $\frac{29x+102}{x(x+51)}$ is equivalent to $\frac{p}{x} + \frac{w}{x+51}$, where p and w are constants. What is the value of w ?

Correct Answer: 27

Rationale

The correct answer is **27**. The given expression $\frac{p}{x} + \frac{w}{x+51}$ can be rewritten with the common denominator $x(x+51)$. To add the two terms of this expression, $\frac{p}{x}$ can be rewritten as $\frac{p(x+51)}{x(x+51)}$ and $\frac{w}{(x+51)}$ can be rewritten as $\frac{wx}{x(x+51)}$. Therefore, the expression $\frac{p}{x} + \frac{w}{(x+51)}$ can be rewritten as $\frac{p(x+51)}{x(x+51)} + \frac{wx}{x(x+51)}$, which is equivalent to $\frac{px+51p+wx}{x(x+51)}$, or $\frac{(p+w)x+51p}{x(x+51)}$. Since $\frac{29x+102}{x(x+51)}$ is equivalent to $\frac{(p+w)x+51p}{x(x+51)}$ and these expressions have equivalent denominators, these expressions must also have equivalent numerators. It follows that $29x+102 = (p+w)x+51p$. In this equation, the x-coefficients must be equal and the constant terms must be equal. Therefore, $p+w = 29$ and $51p = 102$. Dividing both sides of $51p = 102$ by 51 yields $p = 2$. Substituting 2 for p in $p+w = 29$ yields $2+w = 29$. Subtracting 2 from both sides of this equation yields $w = 27$. Therefore, the value of w is **27**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Easy

Question

The number of cells of a certain bacteria doubles every **25** minutes during its growth period when placed in a medium of milk in a controlled laboratory environment. If a sample of **830** cells of this bacteria is placed in milk in a controlled laboratory environment, which function ***f*** best represents the number of cells of the bacteria ***x*** minutes after the growth period begins, where ***x*** is less than the number of minutes in the growth period?

Answer

- A. $f(x) = 830\left(\frac{1}{2}\right)^{\frac{x}{25}}$
- B. $f(x) = 830(2)^{\frac{x}{25}}$
- C. $f(x) = 830\left(\frac{1}{3}\right)^{\frac{x}{25}}$
- D. $f(x) = 830(3)^{\frac{x}{25}}$

Correct Answer: B

Rationale

Choice B is correct. For a bacteria with an initial population of ***P*** cells and a doubling time of ***m*** minutes, the number of cells, ***f*** (***x***), of the bacteria ***x*** minutes after the growth period begins can be given by the equation **$f(x) = P(2)^{\frac{x}{m}}$** . It's given that there are **830** cells of the bacteria when the growth period begins. Therefore, ***P* = 830**. It's also given that the number of cells of the bacteria doubles every **25** minutes during the growth period. Therefore, ***m* = 25**. Substituting **830** for ***P*** and **25** for ***m*** in the equation **$f(x) = P(2)^{\frac{x}{m}}$** yields **$f(x) = 830(2)^{\frac{x}{25}}$** .

Choice A is incorrect. This function represents a situation where the number of cells decreases by half, rather than doubles, every **25** minutes.

Choice C is incorrect. This function represents a situation where the number of cells decreases by two-thirds, rather than doubles, every **25** minutes.

Choice D is incorrect. This function represents a situation where the number of cells triples, rather than doubles, every **25** minutes.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Hard

Question

$$x^2 + y^2 = 36$$

$$y = mx + \frac{b}{4}$$

In the given system of equations, m and b are negative constants. In the xy -plane, the graphs of the equations in the given system intersect at the point $(-5, y)$, where $y < 0$. Which expression represents the value of b ?

Answer

- A. $-\frac{5m}{4} + \frac{\sqrt{11}}{4}$
- B. $\frac{5m}{4} - \frac{\sqrt{11}}{4}$
- C. $-20m + 4\sqrt{11}$
- D. $20m - 4\sqrt{11}$

Correct Answer: D

Rationale

Choice D is correct. It’s given that the graphs of $x^2 + y^2 = 36$ and $y = mx + \frac{b}{4}$, where m and b are negative constants, intersect at the point $(-5, y)$ in the xy -plane. It follows that this intersection point represents a solution to the given system of equations. Substituting -5 for x in the equation $x^2 + y^2 = 36$ yields $(-5)^2 + y^2 = 36$, or $25 + y^2 = 36$. Subtracting 25 from each side of this equation yields $y^2 = 11$. It’s also given that $y < 0$, so taking the negative square root of each side of this equation yields $y = -\sqrt{11}$. Substituting -5 for x and $-\sqrt{11}$ for y in the equation $y = mx + \frac{b}{4}$ yields $-\sqrt{11} = m(-5) + \frac{b}{4}$, or $-\sqrt{11} = -5m + \frac{b}{4}$. Adding $5m$ to each side of this equation yields $5m - \sqrt{11} = \frac{b}{4}$. Multiplying each side of this equation by 4 yields $4(5m - \sqrt{11}) = b$. Applying the distributive property to the left-hand side of this equation yields $20m - 4\sqrt{11} = b$. Therefore, the expression $20m - 4\sqrt{11}$ represents the value of b .

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

Question

The function h is defined by $h(x) = a^x + b$, where a and b are positive constants. The graph of $y = h(x)$ in the xy -plane passes through the points $(0, 10)$ and $(2, 13)$. What is the value of ab ?

Answer

- A. 13
- B. 18
- C. 20
- D. 26

Correct Answer: B

Rationale

Choice B is correct. It's given that function h is defined by $h(x) = a^x + b$, where a and b are positive constants. It's also given that the graph of $y = h(x)$ in the xy -plane passes through the point $(0, 10)$. Substituting 0 for x and 10 for $h(x)$ in the equation $h(x) = a^x + b$ yields $10 = a^0 + b$. Since $a^0 = 1$, this equation can be rewritten as $10 = 1 + b$. Subtracting 1 from both sides of this equation yields $9 = b$. Substituting 9 for b in the equation $h(x) = a^x + b$ yields $h(x) = a^x + 9$. It's also given that the graph of $y = h(x)$ in the xy -plane passes through the point $(2, 13)$. Substituting 2 for x and 13 for $h(x)$ in the equation $h(x) = a^x + 9$ yields $13 = a^2 + 9$. Subtracting 9 from both sides of this equation yields $4 = a^2$. Taking the square root of both sides of this equation yields $2 = a$ and $-2 = a$. Since a is positive, it follows that $2 = a$. Since $9 = b$ and $2 = a$, it follows that the value of ab is $(2)(9)$, or 18 .

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

Question

A lab analyst observes a sample of a substance. An exponential model estimates that the mass, in grams, of the sample decreases by **24%** every **22.96** minutes. Which of the following equations could represent this model, where ***M*** is the estimated mass, in grams, of the sample ***t*** minutes after the lab analyst began observing the sample?

Answer

- A. $M = 100(0.24)^{t+22.96}$
- B. $M = 100(0.24)^{\frac{t}{22.96}}$
- C. $M = 100(0.76)^{t+22.96}$
- D. $M = 100(0.76)^{\frac{t}{22.96}}$

Correct Answer: D

Rationale

Choice D is correct. It’s given that the mass of a sample of a substance decreases by **24%** every **22.96** minutes. Therefore, after each **22.96**-minute interval the mass is multiplied by **1 – 0.24**, or **0.76**. It’s also given that ***t*** represents the number of minutes after the lab analyst began observing the sample; therefore, $\frac{t}{22.96}$ represents the number of **22.96**-minute intervals. The equation that could represent this model is ***M*** = **100(0.76) ^{$\frac{t}{22.96}$}** , where ***M*** is the estimated mass, in grams, of the sample ***t*** minutes after the lab analyst began observing it.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Hard

Question

$4x^2 - 5x - 5 = 0$

What is the greatest solution to the given equation?

Answer

- A. $\frac{5}{8} - \frac{\sqrt{105}}{8}$
- B. $\frac{5}{8} + \frac{\sqrt{105}}{8}$
- C. $\frac{5}{4} - \frac{\sqrt{105}}{4}$
- D. $\frac{5}{4} + \frac{\sqrt{105}}{4}$

Correct Answer: B

Rationale

Choice B is correct. The solutions to a quadratic equation of the form $ax^2 + bx + c = 0$, where a , b , and c are constants, can be calculated using the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. The given equation is of this form, where $a = 4$, $b = -5$, and $c = -5$. Substituting these values into the quadratic formula yields $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(4)(-5)}}{2(4)}$, or $x = \frac{5 \pm \sqrt{25 + 80}}{8}$. These solutions can be rewritten as $x = \frac{5 \pm \sqrt{105}}{8}$, or $x = \frac{5}{8} \pm \frac{\sqrt{105}}{8}$. Since $\frac{5}{8} + \frac{\sqrt{105}}{8}$ is greater than $\frac{5}{8} - \frac{\sqrt{105}}{8}$, it follows that the greatest solution to the given equation is $\frac{5}{8} + \frac{\sqrt{105}}{8}$.

Choice A is incorrect. This is the least, not the greatest, solution to the given equation.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

Question

The function f is a quadratic function. In the xy -plane, the graph of $y = f(x)$ has a vertex at $(1, 9)$ and passes through the points $(2, 33)$ and $(-1, 105)$. What is the value of $f(-2) - f(0)$?

Answer

- A. 81
- B. 129
- C. 192
- D. 225

Correct Answer: C

Rationale

Choice C is correct. It's given that function f is a quadratic function, and in the xy -plane, the graph of $y = f(x)$ has a vertex at $(1, 9)$. In the xy -plane, the graph of a quadratic function with a vertex at (h, k) has an equation of the form $y = a(x - h)^2 + k$, where a is a constant. Therefore, function f can be written as $f(x) = a(x - 1)^2 + 9$. It's also given that the graph of $y = f(x)$ passes through the point $(2, 33)$. Substituting 2 for x and 33 for $f(x)$ in the equation $f(x) = a(x - 1)^2 + 9$ yields $33 = a(2 - 1)^2 + 9$, or $33 = a + 9$. Subtracting 9 from both sides of this equation yields $24 = a$. Substituting 24 for a in the equation $f(x) = a(x - 1)^2 + 9$ yields $f(x) = 24(x - 1)^2 + 9$. The value of $f(-2)$ can be found by substituting -2 for x in function f . Therefore, $f(-2) = 24(-2 - 1)^2 + 9$, which yields $f(-2) = 24(9) + 9$, or $f(-2) = 225$. The value of $f(0)$ can be found by substituting 0 for x in function f . Therefore, $f(0) = 24(0 - 1)^2 + 9$, which yields $f(0) = 24 + 9$, or $f(0) = 33$. It follows that $f(-2) - f(0) = 225 - 33$, or $f(-2) - f(0) = 192$.

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. This is the value of $f(-2)$, not the value of $f(-2) - f(0)$.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	Hard

Question

The expression $6x^4 + 31x^2 + 35$ can be rewritten as $(3x^2 + a)(2x^2 + b)$, where a and b are positive integers, or as $(3x^2 + c)(2x^2 + d)$, where c and d are positive nonintegers. What is the value of $a + c$?

Correct Answer: 15.5, 31/2

Rationale

The correct answer is 15.5. It's given that $6x^4 + 31x^2 + 35$ can be rewritten as $(3x^2 + a)(2x^2 + b)$, where a and b are positive integers. The expression $(3x^2 + a)(2x^2 + b)$ can be rewritten as $6x^4 + 3bx^2 + 2ax^2 + ab$, or $6x^4 + (3b + 2a)x^2 + ab$. Therefore, the expression $6x^4 + (3b + 2a)x^2 + ab$ is equivalent to $6x^4 + 31x^2 + 35$. It follows that $3b + 2a = 31$ and $ab = 35$. Since a and b are positive integers and $ab = 35$, the possible values of a and b are 1 and 35, 5 and 7, 7 and 5, and 35 and 1, respectively. Of these options, the only pair that satisfies the equation $3b + 2a = 31$ is $a = 5$ and $b = 7$, since $3(7) + 2(5) = 31$. It's also given that $6x^4 + 31x^2 + 35$ can be rewritten as $(3x^2 + c)(2x^2 + d)$, where c and d are positive nonintegers. The expression $(3x^2 + c)(2x^2 + d)$ can be rewritten as $6x^4 + 3dx^2 + 2cx^2 + cd$, or $6x^4 + (3d + 2c)x^2 + cd$. Therefore, the expression $6x^4 + (3d + 2c)x^2 + cd$ is equivalent to $6x^4 + 31x^2 + 35$. It follows that $3d + 2c = 31$ and $cd = 35$. Since it's given that c and d are positive nonintegers, it follows that c and d are not zero. Thus, dividing both sides of the equation $cd = 35$ by c yields $d = \frac{35}{c}$. Substituting $\frac{35}{c}$ for d in the equation $3d + 2c = 31$ yields $3\left(\frac{35}{c}\right) + 2c = 31$, or $\frac{105}{c} + 2c = 31$. Multiplying both sides of this equation by c yields $c\left(\frac{105}{c} + 2c\right) = c(31)$, or $105 + 2c^2 = 31c$. Subtracting $31c$ from both sides of this equation yields $105 + 2c^2 - 31c = 0$, or $2c^2 - 31c + 105 = 0$. This equation can be rewritten as $2c^2 - 10c - 21c + 105 = 0$. Since the first two terms of the expression $2c^2 - 10c - 21c + 105$ have a common factor of $2c$ and the last two terms of the expression $2c^2 - 10c - 21c + 105$ have a common factor of 21 , the expression $2c^2 - 10c - 21c + 105$ can be rewritten as $2c(c - 5) - 21(c - 5)$. Since each term of this expression has a common factor of $(c - 5)$, the expression $2c(c - 5) - 21(c - 5)$ can be rewritten as $(c - 5)(2c - 21)$. Thus, the equation $2c^2 - 31c + 105 = 0$ can be rewritten as $(c - 5)(2c - 21) = 0$. It follows that $c = 5$ or $c = \frac{21}{2}$. Since c is a positive noninteger, it follows that $c = \frac{21}{2}$, or $c = 10.5$. Substituting 5 for a and 10.5 for c into the expression $a + c$ yields $5 + 10.5$, or 15.5. Therefore, the value of $a + c$ is 15.5. Note that 15.5 and 31/2 are examples of ways to enter a correct answer.

Alternate approach: The correct answer is 15.5. It's given that $6x^4 + 31x^2 + 35$ can be rewritten as $(3x^2 + a)(2x^2 + b)$, where a and b are positive integers. The expression $(3x^2 + a)(2x^2 + b)$ can be rewritten as $6x^4 + 3bx^2 + 2ax^2 + ab$, or $6x^4 + (3b + 2a)x^2 + ab$. Therefore, the expression $6x^4 + (3b + 2a)x^2 + ab$ is equivalent to $6x^4 + 31x^2 + 35$. It follows that $3b + 2a = 31$ and $ab = 35$. Since it's given that a and b are positive integers, it follows that a and b are not zero. Thus, dividing both sides of the equation $ab = 35$ by a yields $b = \frac{35}{a}$. Substituting $\frac{35}{a}$ for b in the equation $3b + 2a = 31$ yields $3\left(\frac{35}{a}\right) + 2a = 31$, or $\frac{105}{a} + 2a = 31$. Multiplying both sides of this equation by a yields $105 + 2a^2 = 31a$. Subtracting $31a$ from both sides of this equation yields $2a^2 - 31a + 105 = 0$. This equation can be rewritten as $2a^2 - 10a - 21a + 105 = 0$. Since the first two terms of the expression $2a^2 - 10a - 21a + 105$ have a common factor of $2a$ and the last two terms of the expression $2a^2 - 10a - 21a + 105$ have a common factor of 21 , the expression $2a^2 - 10a - 21a + 105$ can be rewritten as $2a(a - 5) - 21(a - 5)$. Since each term of this expression has a common factor of $(a - 5)$, the expression $2a(a - 5) - 21(a - 5)$ can be rewritten as $(a - 5)(2a - 21)$. Thus, the equation $2a^2 - 31a + 105 = 0$ can be rewritten as $(a - 5)(2a - 21) = 0$. It follows that $a = 5$ or $a = \frac{21}{2}$. Since a is a positive integer, it follows that $a = 5$. It's also given that $6x^4 + 31x^2 + 35$ can be rewritten as $(3x^2 + c)(2x^2 + d)$, where c and d are positive nonintegers. The expression $(3x^2 + c)(2x^2 + d)$ can be rewritten as $6x^4 + 3dx^2 + 2cx^2 + cd$, or $6x^4 + (3d + 2c)x^2 + cd$. Therefore, the expression $6x^4 + (3d + 2c)x^2 + cd$ is equivalent to $6x^4 + 31x^2 + 35$. It follows that $3d + 2c = 31$ and $cd = 35$. Since it's given that c and d are positive nonintegers, it follows that c and d are not zero. Thus, dividing both sides of the equation $cd = 35$ by c yields $d = \frac{35}{c}$. Substituting $\frac{35}{c}$ for d in the equation $3d + 2c = 31$ yields $3\left(\frac{35}{c}\right) + 2c = 31$, or $\frac{105}{c} + 2c = 31$. Multiplying both sides of this equation by c yields $105 + 2c^2 = 31c$. Subtracting $31c$ from both sides of this equation yields $2c^2 - 31c + 105 = 0$. Since the equations $2a^2 - 31a + 105 = 0$ and $2c^2 - 31c + 105 = 0$ represent the same equation, it follows that a is equal to c . Therefore, $c = 5$ or $c = \frac{21}{2}$. Since c is a positive noninteger, it follows that $c = \frac{21}{2}$, or $c = 10.5$. Substituting 5 for a and 10.5 for c in the expression $a + c$ yields $5 + 10.5$, or 15.5. Therefore, the value of $a + c$ is 15.5. Note that 15.5 and 31/2 are examples of ways to enter a correct answer.

Question ID: 6bd40794

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Medium

Question

$(x - 16)(x - 10)(x + 7)(x + 17) = 0$

What is a positive solution to the given equation?

Correct Answer: 10, 16

Rationale

The correct answer is either **10** or **16**. Applying the zero product property to the given equation yields four equations: $x - 16 = 0$, $x - 10 = 0$, $x + 7 = 0$, and $x + 17 = 0$. Adding **16** to both sides of the equation $x - 16 = 0$ yields $x = 16$. Adding **10** to both sides of the equation $x - 10 = 0$ yields $x = 10$. Subtracting **7** from both sides of the equation $x + 7 = 0$ yields $x = -7$. Subtracting **17** from both sides of the equation $x + 17 = 0$ yields $x = -17$. Therefore, the solutions to the given equation are **16**, **10**, **-7**, and **-17**. It follows that there are two positive solutions to the given equation: **10** and **16**. Note that 10 and 16 are examples of ways to enter a correct answer.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Hard

Question

$$\frac{1}{4xy} + xyz = \frac{1}{3yz}$$

In the given equation, x , y , and z are positive numbers. Which expression is equivalent to y ?

Answer

- A. $\frac{4x-3z}{12x^2z^2}$
- B. $\sqrt{\frac{4x-3z}{12x^2z^2}}$
- C. $\frac{1}{3xz^2-4x^2z}$
- D. $\sqrt{\frac{1}{3xz^2-4x^2z}}$

Correct Answer: B

Rationale

Choice B is correct. It's given that in the equation $\frac{1}{4xy} + xyz = \frac{1}{3yz}$, x , y , and z are positive numbers. Multiplying both sides of this equation by the least common denominator of $12xyz$ yields $12xyz\left(\frac{1}{4xy} + xyz\right) = 12xyz\left(\frac{1}{3yz}\right)$, which gives $\frac{12xyz}{4xy} + 12x^2y^2z^2 = \frac{12xyz}{3yz}$, or $3z + 12x^2y^2z^2 = 4x$. Subtracting $3z$ from both sides of this equation yields $12x^2y^2z^2 = 4x - 3z$. Dividing both sides of this equation by $12x^2z^2$ yields $y^2 = \frac{4x-3z}{12x^2z^2}$. Taking the square root of both sides of this equation yields $y = \pm\sqrt{\frac{4x-3z}{12x^2z^2}}$. Since y is a positive number, the expression $\sqrt{\frac{4x-3z}{12x^2z^2}}$ is equivalent to y .

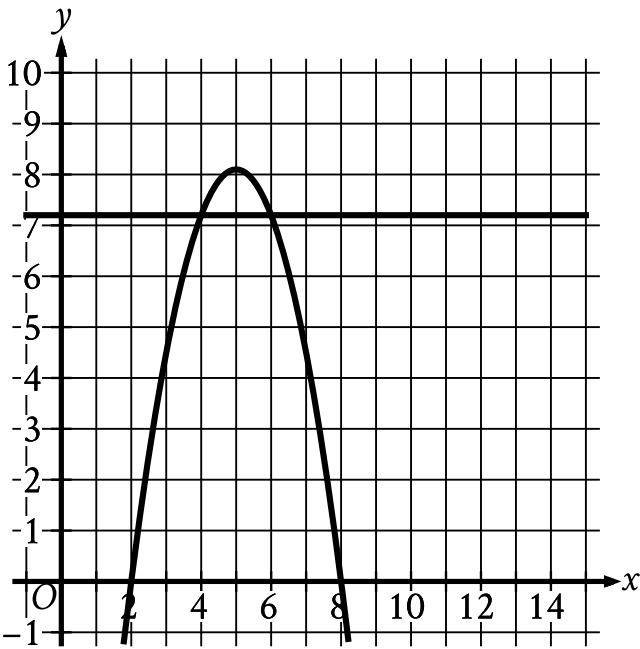
Choice A is incorrect and may result from conceptual or calculation errors.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Medium

Question



The graph of a system of a linear equation and a quadratic equation is shown. A solution to the system is (x, y) . What is a possible value of x ?

Answer

- A. 4
- B. 5
- C. 7.2
- D. 8

Correct Answer: A

Rationale

Choice A is correct. The solutions to the system correspond to the points where the graphs of the equations intersect. The graphs of the linear equation and the quadratic equation shown intersect at approximately $(4, 7.2)$ and $(6, 7.2)$. It follows that the possible values of x are 4 and 6. Of these two possible values, only 4 is given as a choice.

Choice B is incorrect. This is the x -value of the vertex of the graph of the quadratic equation, not the x -value of a solution to the system.

Choice C is incorrect. This is the approximate y -value, not the x -value, of a solution to the system.

Choice D is incorrect. This is the x -value of an x -intercept of the graph of the quadratic equation.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

Question

The function f is defined by $f(x) = 56(0.19)^x$. For any positive integer n , the value of $f(n)$ is $p\%$ less than the value of $f(n - 1)$. What is the value of p ?

- Answer**
- A. 19
 - B. 44
 - C. 56
 - D. 81

Correct Answer: D

Rationale

Choice D is correct. For a function of the form $f(x) = a(b)^x$, where a and b are constants and $b < 1$, the value of $f(x)$ decreases by $100(1 - b)\%$ for every increase of x by 1. In the given function, $a = 56$ and $b = 0.19$. Therefore, for the given function, the value of $f(x)$ decreases by $100(1 - 0.19)\%$, or 81% , for every increase of x by 1. It's given that the value of $f(n)$ is $p\%$ less than the value of $f(n - 1)$. The increase from $x = n - 1$ to $x = n$ can be expressed as $n - (n - 1)$, which is equivalent to $n - n + 1$, or 1. Since there is an increase by 1 from $n - 1$ to n , it follows that the value of $f(n)$ is 81% less than the value of $f(n - 1)$. Thus, the value of p is 81.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

Question

$$h(t) = -16t^2 + b$$

The function h estimates a ball's height, in feet, above a floor t seconds after the ball is released, where b is a constant. The function estimates that the ball is **19.36** feet above the floor when it is released at $t = 0$. How many seconds after being released does the function estimate the ball will reach the floor?

Correct Answer: 1.1, 11/10

Rationale

The correct answer is **1.1**. It's given that $h(t) = -16t^2 + b$ estimates a ball's height, in feet, above a floor t seconds after the ball is released, where b is a constant. It's also given that the function estimates that the ball is **19.36** feet above the floor when it is released at $t = 0$. Substituting **19.36** for $h(t)$ and **0** for t in the given function yields $19.36 = -16(0)^2 + b$, or $19.36 = b$. Substituting **19.36** for b in function h yields $h(t) = -16t^2 + 19.36$. When the ball reaches the floor, its height is **0** feet above the floor. Substituting **0** for $h(t)$ yields $0 = -16t^2 + 19.36$. Adding $16t^2$ to both sides of this equation yields $16t^2 = 19.36$. Dividing both sides of this equation by **16** yields $t^2 = 1.21$. Taking the positive square root of both sides of this equation yields $t = 1.1$. Therefore, the function estimates that the ball will reach the floor **1.1** seconds after being released. Note that 1.1 and 11/10 are examples of ways to enter a correct answer.

Question ID: 769b612d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Medium

Question

The function g is defined by $g(x) = 10^{5x-8}$. What is the value of x when $g(x)$ is equal to 10,000?

Answer

- A. $\frac{11}{5}$
- B. $\frac{12}{5}$
- C. 3
- D. 4

Correct Answer: B

Rationale

Choice B is correct. It’s given that $g(x) = 10^{5x-8}$. Since 10,000 can be written as 10^4 , substituting 10^4 for $g(x)$ in this equation yields $10^4 = 10^{5x-8}$. Because the bases on the left-hand side and right-hand side of this equation are equal, it follows that the exponents must be equal. Therefore, $4 = 5x - 8$. Adding 8 to both sides of this equation yields $12 = 5x$. Dividing both sides of this equation by 5 yields $\frac{12}{5} = x$. Therefore, the value of x when $g(x)$ is equal to 10,000 is $\frac{12}{5}$.

Choice A is incorrect. This is the value of x when $g(x)$ is equal to 1,000, not 10,000.

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

Choice D is incorrect. This is the value of $5x - 8$, not x , when $g(x)$ is equal to 10,000.

Question ID: 7bf77c19

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

Question

The functions p and r are defined by the equations shown, where a and b are integer constants such that $a < b$ and $b < 0$. If $y = p(x)$ and $y = r(x)$ are graphed in the xy -plane, which of the following equations displays, as a constant or coefficient, the y -coordinate of the y -intercept of the graph of the corresponding function?

- I. $p(x) = a(4.1)^x + b$
- II. $r(x) = a(4.1)^{x+b}$

Answer

- A. I only
- B. II only
- C. I and II
- D. Neither I nor II

Correct Answer: D

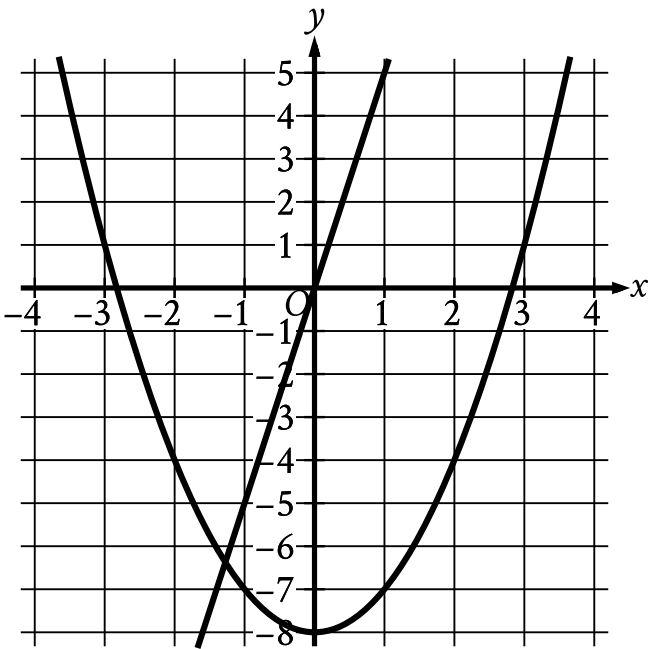
Rationale

Choice D is correct. It's given that a and b are integer constants such that $a < b$ and $b < 0$. The y -coordinate of the y -intercept of the graph of a function is the value of the function when $x = 0$. Equation I is $p(x) = a(4.1)^x + b$. Substituting 0 for x in this equation yields $p(0) = a(4.1)^0 + b$, which can be rewritten as $p(0) = a(1) + b$, or $p(0) = a + b$. Therefore, the y -coordinate of the y -intercept of the graph of $y = p(x)$ is $a + b$. Equation I has a coefficient of a and a constant b . Thus, the value of the y -coordinate of the y -intercept, $a + b$, is not displayed as a constant or coefficient in equation I. Equation II is $r(x) = a(4.1)^{x+b}$. Similarly, substituting 0 for x in this equation yields $r(0) = a(4.1)^{0+b}$, which can be rewritten as $r(0) = a(4.1)^b$. Since $b < 0$, the value of $(4.1)^b$ is not equal to 1. Thus, the value of $a(4.1)^b$ is not equal to a . The value of $a(4.1)^b$ is also not equal to b , since there is no pair of integers a and b such that $a(4.1)^b = b$. Thus, the value of the y -coordinate of the y -intercept for this equation is $a(4.1)^b$, which is not displayed in equation II as a constant or coefficient. The coefficient in equation II is a , and the only constant, b , appears in the exponent. Therefore, neither equation I nor equation II displays, as a constant or coefficient, the y -coordinate of the y -intercept of the graph of the corresponding function.

- 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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Easy

Question



The graph of a system of a linear and a quadratic equation is shown. Which system of equations is represented by the graph?

Answer

- A. $y = -5x$
 $y = x^2 + 8$
- B. $y = -5x$
 $y = x^2 - 8$
- C. $y = 5x$
 $y = x^2 + 8$
- D. $y = 5x$
 $y = x^2 - 8$

Correct Answer: D

Rationale

Choice D is correct. It’s given that the graph shows a system consisting of a linear and a quadratic equation in the xy -plane. In each of the given choices, the linear equation is in the form $y = mx$, where m is a constant, and the quadratic equation is in the form $y = x^2 + c$, where c is a constant. The graph of a linear equation in the form $y = mx$ has a slope of m and a y -intercept at $(0, 0)$. Given two points on the line, (x_1, y_1)

and (x_2, y_2) , the slope can be calculated using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. The graph of the linear equation in this system has a y-intercept at $(0, 0)$ and passes through the point $(1, 5)$. Substituting the points $(0, 0)$ and $(1, 5)$ for (x_1, y_1) and (x_2, y_2) in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{5 - 0}{1 - 0}$, which is equivalent to $m = \frac{5}{1}$, or $m = 5$. It follows that the linear equation is $y = 5x$. The graph of a quadratic equation in the form $y = x^2 + c$ has a vertex at $(0, c)$. The graph of the quadratic equation in this system has a vertex at $(0, -8)$. It follows that the quadratic equation is $y = x^2 + (-8)$, or $y = x^2 - 8$. Thus, the system of equations represented by the graph is $y = 5x$ and $y = x^2 - 8$.

Choice A is incorrect. The graph of this system of equations has a line with a slope of -5 , not 5 , and a parabola with a vertex at $(0, 8)$, not $(0, -8)$.

Choice B is incorrect. The graph of this system of equations has a line with a slope of -5 , not 5 .

Choice C is incorrect. The graph of this system of equations has a parabola with a vertex at $(0, 8)$, not $(0, -8)$.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	Medium

Question

$f(x) = 2x + 3$

$g(x) = 7x - 2$

$h(x) = 5x + 6$

The functions f , g , and h are defined as shown. If $f(x) \cdot g(x) - h(x) = ax^2 + bx + c$, where a , b , and c are constants, what is the value of b ?

Answer

- A. -5
- B. 12
- C. 20
- D. 22

Correct Answer: B

Rationale

Choice B is correct. It's given that $f(x) = 2x + 3$, $g(x) = 7x - 2$, and $h(x) = 5x + 6$. It's also given that $f(x) \cdot g(x) - h(x) = ax^2 + bx + c$, where a , b , and c are constants. Substituting $2x + 3$ for $f(x)$, $7x - 2$ for $g(x)$, and $5x + 6$ for $h(x)$ in this equation yields $(2x + 3)(7x - 2) - (5x + 6) = ax^2 + bx + c$. Applying the distributive property to the left-hand side of this equation yields $(2x)(7x) + (2x)(-2) + (3)(7x) + (3)(-2) + (-1)(5x) + (-1)(6) = ax^2 + bx + c$, or $14x^2 - 4x + 21x - 6 - 5x - 6 = ax^2 + bx + c$. Combining like terms on the left-hand side of this equation yields $14x^2 + 12x - 12 = ax^2 + bx + c$. It follows that the value of b is 12 .

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 ID: 91aa9aa9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	Easy

Question

Which expression is equivalent to $(9x^2 + 6) - (8x^2)$?

Answer

- A. 7
- B. $17x^2 + 6$
- C. $x^2 - 6$
- D. $x^2 + 6$

Correct Answer: D

Rationale

Choice D is correct. The given expression is equivalent to $9x^2 + 6 - 8x^2$. The terms $9x^2$ and $-8x^2$ are like terms. Combining these like terms yields x^2 . It follows that the expression $(9x^2 + 6) - (8x^2)$ is equivalent to $x^2 + 6$.

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

Choice B is incorrect. This is equivalent to $(9x^2 + 6) + (8x^2)$, not the given expression.

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	Medium

Question

Which expression is equivalent to $2\left(x - \frac{9}{2}\right)(x + 8)$?

Answer

- A. $2x^2 - 72$
- B. $2x^2 + 7x - 72$
- C. $2x^2 - x - 36$
- D. $x^2 + 7x - 36$

Correct Answer: B

Rationale

Choice B is correct. In the given expression, $2\left(x - \frac{9}{2}\right)$ can be rewritten as $2x - 2\left(\frac{9}{2}\right)$, or $2x - 9$. Applying the distributive property to the expression $(2x - 9)(x + 8)$ yields $2x(x + 8) - 9(x + 8)$, or $2x^2 + 16x - 9x - 72$. Combining like terms in this expression yields $2x^2 + 7x - 72$. Thus, $2\left(x - \frac{9}{2}\right)(x + 8)$ is equivalent to $2x^2 + 7x - 72$.

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 ID: 9a1f1941

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Hard

Question

$|4x - 3| = -9$

How many solutions does the given equation have?

Answer

- A. Zero
- B. One
- C. Two
- D. Infinitely many

Correct Answer: A

Rationale

Choice A is correct. It's given that $|4x - 3| = -9$. By the definition of absolute value, the left-hand side of this equation, $|4x - 3|$, must be nonnegative. Since the right-hand side of this equation, -9 , is negative, it follows that no value of x can make this equation true; therefore, the given equation has zero solutions.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	Hard

Question

$\frac{1}{7}(x - k)(16 - x^2) = 0$

In the given equation, k is a positive constant. The sum of the solutions to the equation is **59**. What is the value of k ?

Correct Answer: 59

Rationale

The correct answer is **59**. It's given that in the equation $\frac{1}{7}(x - k)(16 - x^2) = 0$, k is a positive constant. Multiplying both sides of this equation by **7** yields $(x - k)(16 - x^2) = 0$. By the zero product property, it follows that $x - k = 0$ or $16 - x^2 = 0$. Adding k to both sides of the equation $x - k = 0$ yields $x = k$. Adding x^2 to both sides of the equation $16 - x^2 = 0$ yields $16 = x^2$. Taking the square root of both sides of this equation yields $4 = x$ and $-4 = x$. Therefore, the solutions to the given equation are k , **4**, and **-4**. It's given that the sum of the solutions to the equation is **59**. Thus, $k + 4 + (-4) = 59$, or $k = 59$.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Easy

Question

The function f is defined by $f(x) = 3x^5$. In the xy -plane, the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ up 4 units. Which equation defines the function g ?

- Answer**
- A. $g(x) = 3x^5 + 4$
 - B. $g(x) = 3x^5 - 4$
 - C. $g(x) = 3x^{20}$
 - D. $g(x) = 12x^5$

Correct Answer: A

Rationale

Choice A is correct. It's given that in the xy -plane, the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ up 4 units. It follows that $g(x) = f(x) + 4$. It's also given that function f is defined by $f(x) = 3x^5$. Substituting $3x^5$ for $f(x)$ into $g(x) = f(x) + 4$ yields $g(x) = 3x^5 + 4$. Therefore, the equation that defines function g is $g(x) = 3x^5 + 4$.

Choice B is incorrect. This equation defines a function g for which the graph of $y = g(x)$ is the result of shifting the graph of $y = f(x)$ down, not up, 4 units.

Choice C is incorrect and may result from conceptual errors.

Choice D is incorrect and may result from conceptual errors.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	Hard

Question

$$-14(5x - 2)^2 + 6(5x - 3)^2$$

The given expression can be rewritten as $\frac{a}{6}x^2 + \frac{b}{6}x + \frac{c}{6}$, where a , b , and c are constants. What is the value of $a + b + c$?

Answer

- A. **−612**
- B. −306
- C. −102
- D. −17

Correct Answer: A

Rationale

Choice A is correct. Expanding each squared binomial in the given expression yields $-14(25x^2 - 20x + 4) + 6(25x^2 - 30x + 9)$. Applying the distributive property to both terms of this expression yields $(-350x^2 + 280x - 56) + (150x^2 - 180x + 54)$. Combining like terms in this expression yields $-200x^2 + 100x - 2$. Since the given expression can be rewritten as $\frac{a}{6}x^2 + \frac{b}{6}x + \frac{c}{6}$, it follows that $\frac{a}{6} = -200$, $\frac{b}{6} = 100$, and $\frac{c}{6} = -2$. Multiplying both sides of each of these equations by 6 yields $a = -1,200$, $b = 600$, and $c = -12$, respectively. Substituting $-1,200$ for a , 600 for b , and -12 for c in the expression $a + b + c$ yields $-1,200 + 600 - 12$, or -612 .

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

Choice C is incorrect. This is the value of $\frac{a}{6} + \frac{b}{6} + \frac{c}{6}$, not $a + b + c$.

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	Hard

Question

$$\frac{\sqrt[3]{n^{17}p^5}}{5n^2(\sqrt[8]{p^8})}$$

For all positive values of n and p , the given expression is equivalent to which of the following?

I. $\frac{\left(n^{\frac{14}{3}}\right)\left(p^{\frac{5}{3}}\right)}{5np}$

II. $\frac{\sqrt[3]{n^{11}p^2}}{5}$

Answer

- A. I only
- B. II only
- C. I and II
- D. Neither I nor II

Correct Answer: C

Rationale

Choice C is correct. For positive values of a , $\sqrt[N]{a} = a^{\frac{1}{N}}$. Therefore, the given expression, $\frac{\sqrt[3]{n^{17}p^5}}{5n^2(\sqrt[8]{p^8})}$, can be rewritten as $\frac{(n^{17}p^5)^{\frac{1}{3}}}{5n^2(p^8)^{\frac{1}{8}}}$. Applying properties of exponents, this can be rewritten as $\frac{n^{\frac{17}{3}}p^{\frac{5}{3}}}{5n^2p^{\frac{1}{8}}}$, or $\frac{n^{\frac{17}{3}}p^{\frac{5}{3}}}{5n^2p}$. Dividing the numerator and the denominator of this expression by n yields $\frac{n^{\frac{14}{3}}p^{\frac{5}{3}}}{5np}$, which is statement I. Dividing the numerator and the denominator of this expression by np yields $\frac{n^{\frac{11}{3}}p^{\frac{2}{3}}}{5}$. This expression is equivalent to $\frac{(n^{11}p^2)^{\frac{1}{3}}}{5}$. It follows that this expression is equivalent to $\frac{\sqrt[3]{n^{11}p^2}}{5}$, which is statement II. Therefore, for all positive values of n and p , the given expression is equivalent to I and II.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Hard

Question

x	y
-34	t
-17	$t + 23$
0	$t + 46$

For a linear relationship between x and y , the table gives three values of x and their corresponding values of y , where t is a constant. Which equation represents this relationship?

Answer

- A. $y = -2x + t + 23$
- B. $y = 2x + t + 23$
- C. $y = -\frac{23}{17}x + t + 46$
- D. $y = \frac{23}{17}x + t + 46$

Correct Answer: D

Rationale

Choice D is correct. It's given that for a linear relationship between x and y , the table gives three values of x and their corresponding values of y . A linear equation can be written in the form $y = mx + b$, where m is the slope and $(0, b)$ is the y-intercept of the graph of the equation in the xy -plane. The slope of a line that passes through the points (x_1, y_1) and (x_2, y_2) can be calculated using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting $(-34, t)$ and $(-17, t + 23)$ for (x_1, y_1) and (x_2, y_2) , respectively, in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{(t + 23) - t}{(-17) - (-34)}$, which is equivalent to $m = \frac{t + 23 - t}{-17 + 34}$, or $m = \frac{23}{17}$. Based on the table, the graph of this relationship passes through the point $(0, t + 46)$. It follows that $b = t + 46$. Substituting $\frac{23}{17}$ for m and $t + 46$ for b in the equation $y = mx + b$ yields $y = \frac{23}{17}x + t + 46$. Therefore, the equation $y = \frac{23}{17}x + t + 46$ represents this relationship.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	Hard

Question

$$0.10x + 0.20y = 0.17(x + y)$$

The equation gives a volume x , in gallons, of a **10%** solution that could be mixed with a volume y , in gallons, of a **20%** solution to produce a **17%** solution. According to this equation, what volume, in gallons, of the **20%** solution could be mixed with **90.0** gallons of the **10%** solution to produce a **17%** solution? (Assume that the volume of the mixture is the sum of the volumes of the two solutions before they were mixed.)

Correct Answer: 210

Rationale

The correct answer is **210**. It's given that the equation $0.10x + 0.20y = 0.17(x + y)$ represents mixing a **10%** solution and a **20%** solution to obtain a **17%** solution. It's also given that x represents the volume, in gallons, of the **10%** solution. If **90.0** gallons of the **10%** solution is used, it follows that $x = 90.0$. Substituting **90.0** for x in the given equation yields $0.10(90.0) + 0.20y = 0.17(90.0 + y)$, or $9 + 0.20y = 15.3 + 0.17y$. Subtracting $0.17y$ from both sides of this equation yields $9 + 0.03y = 15.3$. Subtracting **9** from both sides of this equation yields $0.03y = 6.3$. Dividing both sides of this equation by **0.03** yields $y = 210$. Therefore, the volume of the **20%** solution that could be mixed with **90.0** gallons of the **10%** solution to produce a **17%** solution is **210** gallons.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	Hard

Question

$$x(r - 9) + 4 = 19x + 27$$

In the given equation, r is a positive integer. If the given equation has exactly one solution, what CANNOT be the value of r ?

Answer

- A. 4
- B. 9
- C. 23
- D. 28

Correct Answer: D

Rationale

Choice D is correct. In the given equation, $x(r - 9) + 4 = 19x + 27$, r is a positive integer. Distributing on the left-hand side of this equation yields $rx - 9x + 4 = 19x + 27$. Subtracting 4 from both sides of this equation yields $rx - 9x = 19x + 23$. Subtracting $19x$ from both sides of this equation yields $rx - 28x = 23$, which can be written as $(r - 28)x = 23$. For this equation to have exactly one solution, the coefficient of x , $(r - 28)$, cannot be equal to 0. Therefore, 28 CANNOT be the value of r .

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	Hard

Question

$38(x - n) = 38y + 38n$

One of the equations in a system of two linear equations is given, where n is a positive constant. The system has no solution. Which equation could be the second equation in this system?

Answer

- A. $4x - 4y = 8n$
- B. $4x + 4y = 4n$
- C. $4x + 4y = 8n$
- D. $4x - 4y = 4n$

Correct Answer: D

Rationale

Choice D is correct. A system of two linear equations in two variables, x and y , has no solution if the lines represented by the equations in the xy -plane are parallel and distinct. Lines represented by equations in standard form, $Ax + By = C$ and $Dx + Ey = F$, are parallel and distinct if the coefficients of x and y in one equation are proportional to the corresponding coefficients in the other equation, meaning $\frac{D}{A} = \frac{E}{B}$, and the constants are not proportional, meaning $\frac{F}{C}$ is not equal to $\frac{D}{A}$ nor $\frac{E}{B}$. It's given that one of the equations in a system of two linear equations is $38(x - n) = 38y + 38n$, where n is a positive constant. Distributing 38 on the left-hand side of this equation yields $38x - 38n = 38y + 38n$. Adding $38n$ to both sides of this equation yields $38x = 38y + 76n$. Subtracting $38y$ from both sides of this equation yields $38x - 38y = 76n$. Therefore, the given equation can be written in the form $Ax + By = C$, where $A = 38$, $B = -38$, and $C = 76n$. The equation in choice D, $4x - 4y = 4n$, is written in the form $Dx + Ey = F$, where $D = 4$, $E = -4$, and $F = 4n$. Using these values, it follows that the value of $\frac{D}{A}$ is $\frac{4}{38}$, or $\frac{2}{19}$; the value of $\frac{E}{B}$ is $\frac{-4}{-38}$, or $\frac{2}{19}$; and the value of $\frac{F}{C}$ is $\frac{4n}{76n}$, or $\frac{1}{19}$, since n is a positive constant. Since $\frac{D}{A} = \frac{E}{B}$ and since $\frac{F}{C}$ is not equal to $\frac{D}{A}$ nor $\frac{E}{B}$, it follows that the lines represented by these two equations are parallel and distinct. Therefore, the second equation in this system of equations with no solution could be $4x - 4y = 4n$.

- Choice A is incorrect. The system consisting of this equation and the given equation has infinitely many solutions rather than no solution.
- Choice B is incorrect. The system consisting of this equation and the given equation has one solution rather than no solution.
- Choice C is incorrect. The system consisting of this equation and the given equation has one solution rather than no solution.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	Medium

Question

If $2(5x) = 6$, what is the value of $5x$?

Answer

- A. $\frac{4}{5}$
- B. $\frac{5}{3}$
- C. **3**
- D. 4

Correct Answer: C

Rationale

Choice C is correct. Dividing both sides of the given equation by 2 yields $5x = 3$. Therefore, the value of $5x$ is 3.

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 ID: f8fa0cf0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	Medium

Question

$9r = 7(r + 7)$

What value of r is the solution to the given equation?

Correct Answer: 24.5, 49/2

Rationale

The correct answer is $\frac{49}{2}$. It's given that $9r = 7(r + 7)$. Applying the distributive property on the right-hand side of this equation yields $9r = 7r + 49$. Subtracting $7r$ from both sides of this equation yields $2r = 49$. Dividing both sides of this equation by 2 yields $r = \frac{49}{2}$. Therefore, the solution to the given equation is $\frac{49}{2}$. Note that 49/2 and 24.5 are examples of ways to enter a correct answer.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	Medium

Question

In the xy -plane, which of the following does NOT contain any points that are part of the solution set to $5x - 7y > 35$?

Answer

- A. The x -axis
- B. The region where $x > 0$ and $y > 0$
- C. The region where $x < 0$ and $y < 0$
- D. The region where $x < 0$ and $y > 0$

Correct Answer: D

Rationale

Choice D is correct. It's given that the solution set consists of points in the xy -plane where $5x - 7y > 35$, which can also be written as $5x + (-7y) > 35$. If (x, y) is a point in the region where $x < 0$ and $y > 0$, then x is a negative number and y is a positive number. If x is a negative number, then the value of $5x$ is a negative number. If y is a positive number, then the value of $-7y$ is a negative number. It follows that the expression $5x + (-7y)$ is the sum of two negative numbers and is therefore negative. If the value of $5x + (-7y)$ is negative, then the value of $5x + (-7y)$ cannot be greater than 35 . Thus, the region where $x < 0$ and $y > 0$ does not contain any points that are part of the solution set to $5x - 7y > 35$.

Choice A is incorrect. The x -axis contains the point $(10, 0)$, which is part of the solution set to $5x - 7y > 35$, since $5(10) - 7(0) > 35$, or $50 > 35$, is true.

Choice B is incorrect. The region where $x > 0$ and $y > 0$ contains the point $(10, 1)$, which is part of the solution set to $5x - 7y > 35$, since $5(10) - 7(1) > 35$, or $43 > 35$, is true.

Choice C is incorrect. The region where $x < 0$ and $y < 0$ contains the point $(-1, -10)$, which is part of the solution set to $5x - 7y > 35$, since $5(-1) - 7(-10) > 35$, or $65 > 35$, is true.

Question ID: 1a2a0f59

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Hard

Question

A yoga studio is offering a deal where the first session is free, the second session is half off the regular price, and the remaining sessions are at the regular price. If the regular price of a session is **\$25.40**, which function f gives the total cost, in dollars, of purchasing x sessions using this deal, where $x \geq 2$?

Answer

- A. $f(x) = 25.40(x - 1) + 12.70$
- B. $f(x) = 25.40(x - 2) + 12.70$
- C. $f(x) = 25.40(x - 1) + 12.70(x - 2)$
- D. $f(x) = 25.40(x - 2) + 12.70(x - 1)$

Correct Answer: B

Rationale

Choice B is correct. It's given that the regular price of a session at a yoga studio is **\$25.40**. It's also given that the yoga studio is offering a deal where the first session is free, or **\$0**; that the second session is half off the regular price, or **$25.40 - (\frac{1}{2})(25.40)$** , which is equal to **\$12.70**; and that the remaining sessions are at the regular price, **\$25.40**. Since x represents the total number of sessions and two sessions have already been accounted for, the number of remaining sessions can be represented by $x - 2$. The total cost, in dollars, of purchasing x sessions using this deal can be represented by the function $f(x) = 0 + 12.70 + 25.40(x - 2)$, or $f(x) = 25.40(x - 2) + 12.70$.

Choice A is incorrect. The function represents the total cost of purchasing x sessions when the first session is half off the regular price and the remaining sessions are at the regular price.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	Medium

Question

To complete a landscaping project, Adam charges a fee of **\$20.00** for his equipment and **\$9.50** per hour spent working on the project. To complete this same landscaping project, Caroline charges a fee of **\$17.00** for her equipment and **\$10.00** per hour spent working on the project. If x represents the number of hours spent working on the landscaping project, what are all the values of x for which Caroline's total charge is greater than Adam's total charge?

Answer

- A. $5 \leq x \leq 6$
- B. $6 \leq x \leq 7$
- C. $x < 5$
- D. $x > 6$

Correct Answer: D

Rationale

Choice D is correct. It's given that Adam charges a fee of **\$20.00** for his equipment and **\$9.50** per hour spent working on the project. For x hours spent working on the project, it follows that Adam's total charge, in dollars, is $20.00 + 9.50x$. It's also given that Caroline charges a fee of **\$17.00** for her equipment and **\$10.00** per hour spent working on the project. For x hours spent working on the project, it follows that Caroline's total charge, in dollars, is $17.00 + 10.00x$. Therefore, if x represents the number of hours spent working on the landscaping project, then Caroline's total charge is greater than Adam's total charge if $17.00 + 10.00x > 20.00 + 9.50x$, or $17 + 10x > 20 + 9.5x$. Subtracting $9.5x$ from both sides of this inequality yields $17 + 0.5x > 20$. Subtracting 17 from both sides of this inequality yields $0.5x > 3$. Dividing both sides of this inequality by 0.5 yields $x > 6$.

Choice A is incorrect. For example, if $x = 5$, then Caroline's total charge, in dollars, would be $17.00 + 10.00(5)$, or **67**, and Adam's total charge, in dollars, would be $20.00 + 9.50(5)$, or **67.50**. Since Caroline's total charge would be less than Adam's total charge, **5** can't be a possible value of x .

Choice B is incorrect. For example, if $x = 6$, then Caroline's total charge, in dollars, would be $17.00 + 10.00(6)$, or **77**, and Adam's total charge, in dollars, would be $20.00 + 9.50(6)$, or **77**. Since Caroline's total charge would be equal to Adam's total charge, **6** can't be a possible value of x .

Choice C is incorrect. For example, if $x = 4$, then Caroline's total charge, in dollars, would be $17.00 + 10.00(4)$, or **57**, and Adam's total charge, in dollars, would be $20.00 + 9.50(4)$, or **58**. Since Caroline's total charge would be less than Adam's total charge, **4** can't be a possible value of x .

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	Medium

Question

$$y = 4x$$
$$5x - 3y = -14$$

The solution to the given system of equations is (x, y) . What is the value of $x + y$?

Answer

- A. 4
- B. 6
- C. 8
- D. 10

Correct Answer: D

Rationale

Choice D is correct. The first equation in the given system is $y = 4x$. Substituting $4x$ for y in the second equation yields $5x - 3(4x) = -14$, which is equivalent to $5x - 12x = -14$, or $-7x = -14$. Dividing both sides of this equation by -7 yields $x = 2$. Substituting 2 for x in the equation $y = 4x$ yields $y = 4(2)$, or $y = 8$. Substituting 2 for x and 8 for y in the expression $x + y$ yields $2 + 8$, or 10 .

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

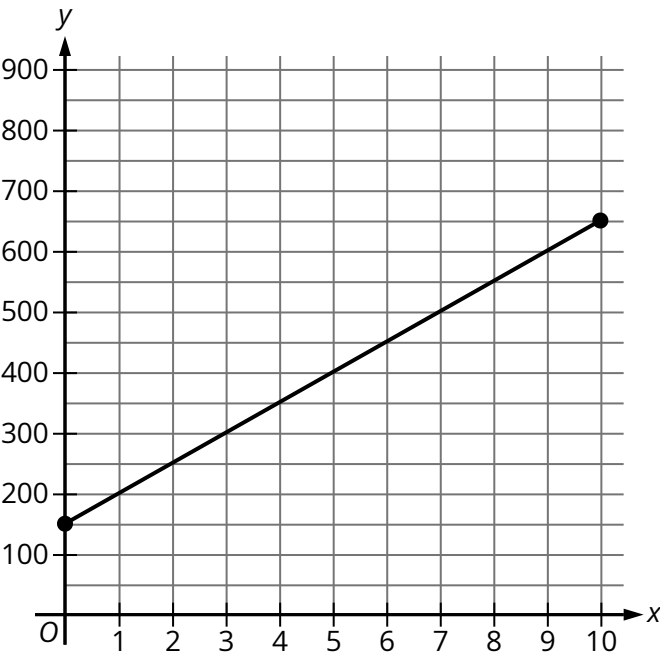
Choice B is incorrect. This is the value of $y - x$, not the value of $x + y$.

Choice C is incorrect. This is the value of y , not the value of $x + y$.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Hard

Question

While walking on a trail, Mary stopped to read a trail sign. The graph shows the total distance y , in meters, Mary had walked on the trail x minutes after leaving the trail sign.



What distance, in meters, did Mary walk on the trail in the **10** minutes after leaving the trail sign?

Correct Answer: 500

Rationale

The correct answer is **500**. It's given that the graph shows the total distance y , in meters, Mary had walked on the trail x minutes after leaving the trail sign. The graph represents a linear relationship between time and distance, so the distance walked in a given time interval corresponds to the change in the y -values over that interval. At $x = 0$, the graph shows a y -value of **150**, and at $x = 10$, the graph shows a y -value of **650**. The distance Mary walked in the **10** minutes after leaving the trail sign is the difference between these y -values, which can be written as **650 – 150**, or **500**. Therefore, the distance, in meters, Mary walked in the **10** minutes after leaving the trail sign is **500**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

Question

$$g(x) = 3(14x - 15)$$

What is the y-coordinate of the y-intercept of the graph of $y = g(x) - 2$ in the xy -plane?

Answer

- A. -47
- B. -45
- C. -17
- D. -15

Correct Answer: A

Rationale

Choice A is correct. It's given that $g(x) = 3(14x - 15)$. Substituting $3(14x - 15)$ for $g(x)$ in the equation $y = g(x) - 2$ yields $y = 3(14x - 15) - 2$. The y-intercept of the graph of a function in the xy -plane is the point where the function crosses the y-axis, which occurs when $x = 0$. Substituting 0 for x in the equation $y = 3(14x - 15) - 2$ yields $y = 3(14(0) - 15) - 2$. It follows that $y = -45 - 2$, or $y = -47$. Therefore, the y-intercept of the graph of $y = g(x) - 2$ in the xy -plane is $(0, -47)$, and the y-coordinate of the y-intercept of the graph is -47 .

Choice B is incorrect. This is the y-coordinate of the y-intercept of the graph of $y = g(x)$ in the xy -plane, not $y = g(x) - 2$.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	Hard

Question

$y = 7x + 18$

One of the equations in a system of two linear equations is given. The system has no solution. Which equation could be the second equation in the system?

Answer

- A. $-21x + y = 54$
- B. $-21x + y = 18$
- C. $-7x + y = 21$
- D. $-7x + y = 18$

Correct Answer: C

Rationale

Choice C is correct. A system of two linear equations in two variables, x and y , has no solution if the graphs of the equations in the xy -plane are two distinct and parallel lines, which don't intersect. Two lines in the xy -plane are distinct and parallel if their slopes are the same and the y -coordinates of their y -intercepts are different. A linear equation can be written in slope-intercept form, $y = mx + b$, where m is the slope of the line in the xy -plane and b is the y -coordinate of the y -intercept. Choice C can be written in slope-intercept form by adding $7x$ to both sides of the equation, which gives $y = 7x + 21$. In the equations $y = 7x + 18$ and $y = 7x + 21$, the values of m are each 7 , and the values of b are 18 and 21 , respectively. Since the slopes of these lines are the same and the y -coordinates of the y -intercepts are different, it follows that choice C could be the second equation in the system.

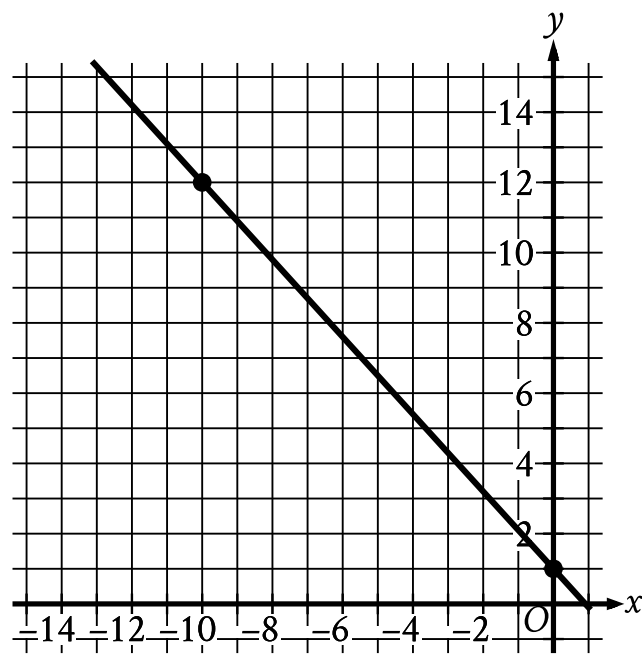
Choice A is incorrect. Adding $21x$ to both sides of this equation gives $y = 21x + 54$. In the equations $y = 7x + 18$ and $y = 21x + 54$, the values of m aren't equal, so the slopes of these lines are different. Therefore, these two lines intersect and the corresponding system of equations has one solution.

Choice B is incorrect. Adding $21x$ to both sides of this equation gives $y = 21x + 18$. In the equations $y = 7x + 18$ and $y = 21x + 18$, the values of m aren't equal, so the slopes of these lines are different. Therefore, these two lines intersect and the corresponding system of equations has one solution.

Choice D is incorrect. Adding $7x$ to both sides of this equation gives $y = 7x + 18$. Since this equation is the same as the given equation, these two lines are not distinct. Therefore, the corresponding system of equations has infinitely many solutions.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	Hard

Question



The graph of line g is shown in the xy -plane. Line k is defined by $165x + py = w$, where p and w are constants. If line k is graphed in this xy -plane, resulting in the graph of a system of two linear equations, the system of two linear equations will have infinitely many solutions. What is the value of $p + w$?

Correct Answer: 300

Rationale

The correct answer is **300**. It's given that the graph of line g is shown in the xy -plane and that line k is defined by $165x + py = w$, where p and w are constants. It's also given that if line k is graphed in this xy -plane, the resulting system of two linear equations will have infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. Therefore, line g and line k have the same slope and the same y -intercept. The slope of a line that passes through the points (x_1, y_1) and (x_2, y_2) can be calculated using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. The graph shows that line g passes through the points $(-10, 12)$ and $(0, 1)$. Substituting $(-10, 12)$ and $(0, 1)$ for (x_1, y_1) and (x_2, y_2) , respectively, in the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{1 - 12}{0 - (-10)}$, or $m = \frac{-11}{10}$. An equation representing a linear relationship can be written in the form $y = mx + b$, where m is the slope and $(0, b)$ is the y -intercept of the line in the xy -plane. Since line g passes through the point $(0, 1)$, it follows that $b = 1$. Thus, the equation of line g is $y = -\frac{11}{10}x + 1$. For line k , the equation $165x + py = w$ can be rewritten in $y = mx + b$ form by isolating y . Subtracting $165x$ from both sides of this equation yields $py = -165x + w$. Dividing both sides of this equation by p yields $y = \frac{-165}{p}x + \frac{w}{p}$. It follows that in the xy -plane, line k has a slope of $\frac{-165}{p}$ and $(0, \frac{w}{p})$ is the y -intercept. Since line g and line k have the same slope and the same y -intercept, it follows that $-\frac{165}{p} = -\frac{11}{10}$ and $\frac{w}{p} = 1$. Multiplying both sides of $-\frac{165}{p} = -\frac{11}{10}$ by $-10p$ yields $1,650 = 11p$. Dividing both sides of this equation by 11 yields $150 = p$. Substituting 150 for p in the equation $\frac{w}{p} = 1$ yields $\frac{w}{150} = 1$. Multiplying both sides of this equation by 150 yields $w = 150$. Substituting 150 for p and 150 for w in the expression $p + w$ yields $150 + 150$, which is equivalent to **300**. Therefore, the value of $p + w$ is **300**.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	Easy

Question

Students and chaperones from a middle school are going on a field trip to a museum. Admission to the museum will cost **\$8.50** for each student and **\$12** for each chaperone. It will cost a total of **\$730** for admission to the museum for all **83** people on the field trip. How many students are going on the field trip?

- Answer**
- A. **31**
 - B. **70**
 - C. **76**
 - D. **86**

Correct Answer: C

Rationale

Choice C is correct. It's given that admission to the museum will cost **\$8.50** for each student and **\$12** for each chaperone. It's also given that it will cost a total of **\$730** for admission to the museum for all **83** people on the field trip. Let ***x*** represent the number of students and ***y*** represent the number of chaperones going on the field trip. Since there are a total of **83** people going on the field trip, it follows that ***x + y = 83***. Since admission to the museum for each student costs **\$8.50** and each chaperone costs **\$12**, the total cost can be represented by the equation **$8.50x + 12y = 730$** . The equations ***x + y = 83*** and **$8.50x + 12y = 730$** form a system of equations. Subtracting ***x*** from both sides of the equation ***x + y = 83*** yields ***y = 83 - x***. Substituting **$83 - x$** for ***y*** in the equation **$8.50x + 12y = 730$** yields **$8.50x + 12(83 - x) = 730$** , or **$-3.50x + 996 = 730$** . Subtracting **996** from both sides of this equation yields **$-3.50x = -266$** . Dividing both sides of this equation by **-3.50** yields ***x = 76***. Therefore, **76** students are going on the field trip.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Medium

Question

$s(x) = 133 - 4x$

The function s shown gives the number of spoons, $s(x)$, remaining in a dispenser x minutes after the dispenser had been loaded with spoons. Which statement is the best interpretation of $s(3) = 121$?

Answer

- A. The number of spoons remaining in the dispenser decreased by a total of 3 spoons after 121 minutes.
- B. There were 3 spoons remaining in the dispenser 121 minutes after the dispenser had been loaded with spoons.
- C. There were 121 spoons remaining in the dispenser 3 minutes after the dispenser had been loaded with spoons.
- D. The number of spoons remaining in the dispenser decreased by a total of 121 spoons after 3 minutes.

Correct Answer: C

Rationale

Choice C is correct. It's given that $s(x)$ is the number of spoons remaining in a dispenser x minutes after the dispenser had been loaded with spoons. The expression $s(3)$ represents the value of $s(x)$ when $x = 3$. It follows that $s(3)$ represents the number of spoons remaining in the dispenser 3 minutes after it had been loaded with spoons. Therefore, the best interpretation of the equation $s(3) = 121$ is that there were 121 spoons remaining in the dispenser 3 minutes after it had been loaded with spoons.

Choice A is incorrect and may result from conceptual errors.

Choice B is incorrect. This would be the best interpretation of $s(121) = 3$, not $s(3) = 121$.

Choice D is incorrect and may result from conceptual errors.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	Medium

Question

Ellen bought two types of snack bags for a school event. Each box of chips Ellen bought contained **24** bags and cost **\$11**. Each box of crackers Ellen bought contained **16** bags and cost **\$9**. It cost Ellen **\$497** before tax to buy **968** bags. If x is the number of boxes of chips and y is the number of boxes of crackers that Ellen bought, which of the following systems of equations represents this situation?

Answer

A. $11x + 16y = 968$

$24x + 9y = 497$

B. $11x + 9y = 968$

$24x + 16y = 497$

C. $11x + 9y = 497$

$24x + 16y = 968$

D. $9x + 11y = 497$

$16x + 24y = 968$

Correct Answer: C

Rationale

Choice C is correct. It's given that Ellen bought two types of snack bags: chips and crackers. It's also given that each box of chips contains **24** bags. Thus, if Ellen bought x boxes of chips, the number of bags of chips is **24x**. Additionally, it's given that each box of chips costs **\$11**. Thus, if Ellen bought x boxes of chips, the cost for all the bags of chips is **11x**. It's also given that each box of crackers contains **16** bags. Thus, if Ellen bought y boxes of crackers, the number of bags of crackers is **16y**. Additionally, it's given that each box of crackers costs **\$9**. Thus, if Ellen bought y boxes of crackers, the cost for all the bags of crackers is **9y**. It's given that it cost Ellen **\$497** to buy **968** bags. Since Ellen bought **24x** bags of chips and **16y** bags of crackers, the total number of snack bags that Ellen bought can be represented by the equation **24x + 16y = 968**. Additionally, since the cost for all the bags of chips is **11x** and the cost for all the bags of crackers is **9y**, the total cost for all the snack bags that Ellen bought can be represented by the equation **11x + 9y = 497**. Therefore, the system consisting of the equations **11x + 9y = 497** and **24x + 16y = 968** represents this situation.

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

Choice B is incorrect. This system of equations represents a situation where the total cost is **\$968**, not **\$497**, and the total number of bags is **497**, not **968**.

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear inequalities in one or two variables	Medium

Question

Terry has a goal to collect at least **16** items per week for a donation drive. This week, Terry has collected **4** items. If x represents the additional number of items Terry needs to collect this week to meet the goal, which inequality represents this situation?

Answer

- A. $4 - x \leq 16$
- B. $4 + x \leq 16$
- C. $4 - x \geq 16$
- D. $4 + x \geq 16$

Correct Answer: D

Rationale

Choice D is correct. It’s given that this week, Terry has collected **4** items. It follows that the expression $4 + x$ represents the total number of items Terry will have collected after collecting x additional items. It’s also given that Terry’s goal is to collect at least **16** items per week. Therefore, the inequality $4 + x \geq 16$ represents this situation.

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

Choice B is incorrect. This inequality represents a situation where the goal is to collect at most, not at least, **16** items per week.

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

Question ID: 5eb4918d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	Easy

Question
If $9x + 4 = 67$, what is the value of $90x + 40$?

- Answer**
- A. 7
 - B. 70
 - C. 130
 - D. 670

Correct Answer: D

Rationale
Choice D is correct. Multiplying both sides of the given equation by 10 yields $10(9x + 4) = 10(67)$, or $90x + 40 = 670$. Therefore, the value of $90x + 40$ is 670.

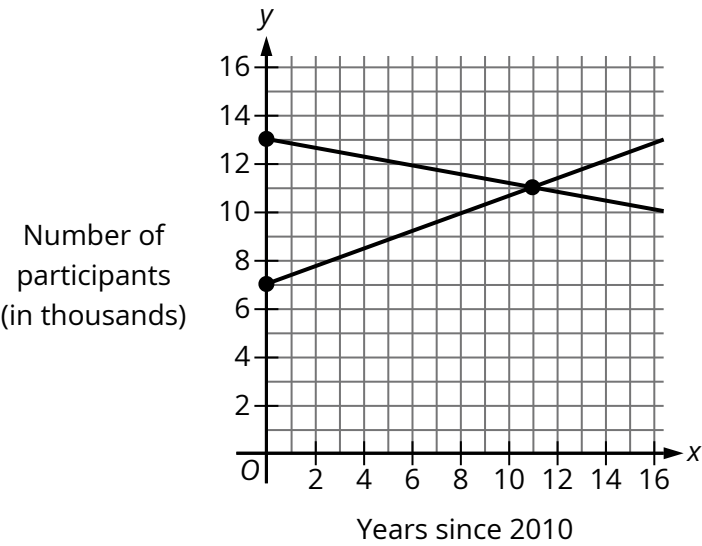
Choice A is incorrect. This is the value of x , not $90x + 40$.

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

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

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	Medium

Question



The functions f and g model the number of participants, in thousands, in two different programs x years since 2010. The graphs of $y = f(x)$ and $y = g(x)$ are shown. Which of the following could represent functions f and g ?

Answer

- A. $f(x) = -\frac{4}{11}x + 13$
 $g(x) = \frac{2}{11}x + 7$
- B. $f(x) = -\frac{4}{11}x + 7$
 $g(x) = \frac{2}{11}x + 13$
- C. $f(x) = -\frac{2}{11}x + 13$
 $g(x) = \frac{4}{11}x + 7$
- D. $f(x) = -\frac{2}{11}x + 7$
 $g(x) = \frac{4}{11}x + 13$

Correct Answer: C

Rationale

Choice C is correct. A line in the xy -plane that passes through the points (x_1, y_1) and (x_2, y_2) has slope m , where $m = \frac{y_2 - y_1}{x_2 - x_1}$. The equation of the line can be written in the form $y = mx + b$, where b is the y -intercept represented by $(0, b)$. One of the lines shown in the graph passes through the points $(0, 7)$ and $(11, 11)$. Substituting 0 for x_1 , 7 for y_1 , 11 for x_2 , and 11 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{11 - 7}{11 - 0}$, or $m = \frac{4}{11}$. Substituting $\frac{4}{11}$ for m and 7 for b in the equation $y = mx + b$ yields $y = \frac{4}{11}x + 7$. Therefore, an equation of this line is $y = \frac{4}{11}x + 7$. Similarly, the other line shown in the graph passes through the points $(0, 13)$ and $(11, 11)$. Substituting 0 for x_1 , 13 for y_1 , 11 for x_2 , and 11 for y_2 in the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ yields $m = \frac{11 - 13}{11 - 0}$, or $m = -\frac{2}{11}$. Substituting $-\frac{2}{11}$ for m and 13 for b in the equation $y = mx + b$ yields y

$= \frac{-2}{11}x + 13$. Therefore, an equation of this line is $y = \frac{-2}{11}x + 13$. So, the functions f and g could be represented by $f(x) = \frac{-2}{11}x + 13$ and $g(x) = \frac{4}{11}x + 7$.

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.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	Easy

Question

For a restaurant owner to purchase a pizza oven at a total price of **13,000** dollars, a onetime down payment is required, and then fixed monthly payments are made for the remaining amount owed for the pizza oven. The equation $13,000 = 2,800 + 200t$ represents this situation, where t is the number of fixed monthly payments that are made. Which of the following is the best interpretation of **200** in this context?

Answer

- A. The amount, in dollars, of the down payment
- B. The amount, in dollars, of each fixed monthly payment
- C. The total amount, in dollars, paid for the pizza oven after t fixed monthly payments
- D. The total number of fixed monthly payments

Correct Answer: B

Rationale

Choice B is correct. For a restaurant owner to purchase a pizza oven at a total price of **13,000** dollars, a onetime down payment is required, and then fixed monthly payments are made for the remaining amount owed for the pizza oven. It's given that the equation $13,000 = 2,800 + 200t$ represents this situation, where t is the number of fixed monthly payments that are made. In this equation, **2,800** is a constant term, which represents the onetime down payment, in dollars, and **200** is the coefficient of t . Multiplying **200** by t gives the total amount, in dollars, paid by the fixed monthly payments. Therefore, the best interpretation of **200** in this context is the amount, in dollars, of each fixed monthly payment.

Choice A is incorrect. This is the best interpretation of **2,800**, not **200**, in this context.

Choice C is incorrect. This is the best interpretation of **13,000**, not **200**, in this context.

Choice D is incorrect. This is the best interpretation of the variable t , not **200**, in this context.

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	Easy

Question

Sam has a flag with an area of **110 square inches (in²)**. Sam plans to enlarge the flag by sewing on pieces of colored nylon, where each piece would increase the flag's area by **64 in²**. Which equation gives the flag's total area ***y***, in square inches, after Sam sews on ***x*** pieces of nylon?

Answer

- A. ***y* = 64*x***
- B. ***y* = 64 + 110*x***
- C. ***y* = 110 + 64*x***
- D. ***y* = 174*x***

Correct Answer: C

Rationale

Choice C is correct. It's given that Sam has a flag with an area of **110 square inches (in²)** and that each piece of colored nylon Sam sews on increases the flag's area by **64 in²**. If Sam sews on ***x*** pieces of nylon and each piece increases the area by **64 in²**, it follows that the expression **64*x*** represents the total increase in area, in square inches, from sewing on ***x*** pieces of nylon. Adding this increase in area, **64*x* in²**, to the original area of the flag, **110 in²**, gives the total area of the flag. Therefore, the equation that gives the flag's total area ***y***, in square inches, after Sam sews on ***x*** pieces of nylon is ***y* = 110 + 64*x***.

Choice A is incorrect. This equation represents the total area, in square inches, of ***x*** pieces of colored nylon.

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

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

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Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	Medium

Question

Line p is defined by $2y + 8x = 11$. Line r is perpendicular to line p in the xy -plane. What is the slope of line r ?

Answer

- A. -4
- B. $-\frac{1}{4}$
- C. $\frac{1}{4}$
- D. 4

Correct Answer: C

Rationale

Choice C is correct. It's given that line p is defined by the equation $2y + 8x = 11$. The equation can be written in slope-intercept form $y = mx + b$, where m represents the slope of the line. Subtracting $8x$ from both sides of the equation $2y + 8x = 11$ yields $2y = -8x + 11$. Dividing both sides of this equation by 2 yields $y = -4x + \frac{11}{2}$. Therefore, the slope of line p in the xy -plane is -4 . It's also given that line p is perpendicular to line r . Perpendicular lines have slopes that are negative reciprocals of each other, so the slope of line r is $-\frac{1}{(-4)} = \frac{1}{4}$.

Choice A is incorrect. This is the slope of line p , not line r .

Choice B is incorrect. This is the reciprocal, not the negative reciprocal, of the slope of line p .

Choice D is incorrect. This is the negative, not the negative reciprocal, of the slope of line p .