K-12

CCHS-Geometry

Common Core High School: Geometry (Common Core State Standards Initiative)

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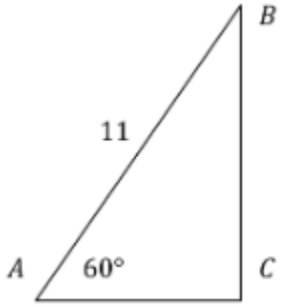
Question: 1

In right triangle ABC below, what is the length of AC?



A. $\frac{11}{3}$

B. 5.5

C. $\frac{11\sqrt{3}}{2}$

D. $\frac{121\sqrt{3}}{8}$

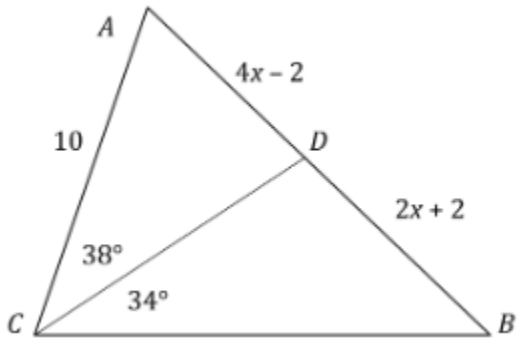
Answer: B

Explanation:

Since we are told that this is a right triangle, we know that angle C is 90°. Thus, angle B must be 30°, so this is a 30-60-90 triangle. This is a special triangle: the ratio of the shortest leg to the hypotenuse is always $\frac{1}{2}$. So, AC is half of AB: $\frac{11}{2} = 5.5$. Choice A divides the hypotenuse by 3 instead of 2. Choice C gives side BC. Choice D gives the area of the triangle.

Question: 2

In triangle ABC below, segment CD is a median. What is the length of AB?



A. 2
B. 6
C. 12
D. 15

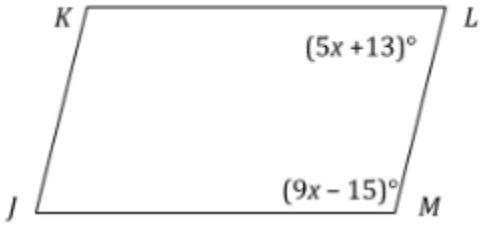
Answer: D

Explanation:

In a triangle, a median bisects a side of the triangle, even though it may not be an angle bisector. So, we know that AD and BD are the same length and can set them equal to each other: $4x - 2 = 2x + 2$. We subtract $2x$ from each side and add 2 to each side: $2x = 4$. Dividing each side by 2 yields $x = 2$. Then we can solve for either segment: $AD = 4(2) - 2 = 6$. Since BD is also 6, AB is $6 + 6 = 12$. Answer A is the value of x. Answer B is the value of AD or BD.

Question: 3

In the figure shown below, $JKLM$ is a parallelogram. What is the measure of $\angle JKL$?



A. 13˚
B. 44.1˚
C. 78˚
D. 102˚

Answer: D

Explanation:

One of the theorems about parallelograms states that the adjacent angles in a parallelogram are supplementary. Therefore, according to the figure, $\angle KLM + \angle LMJ = 180$, so $5x + 13 + 9x - 15 = 180$. We combine like terms to find that $14x = 182$. Dividing both sides by 14 yields $x = 13$. Another theorem about parallelograms states that the opposite angles in a parallelogram are equal. Thus, $\angle JKL = \angle LMJ$. To find the measure of $\angle LMJ$, we first substitute the value for x into the expression for $\angle LMJ$: $9(13) - 15 = 117 - 15 = 102°$. Answer A is the value of x. Answer B is the measure of $\angle JKL$ if the angles were incorrectly thought to be complementary instead of supplementary. Answer C is the value of $\angle KLM$.

Question: 4

Segment AB goes through points A (I, —4) and B (—3, 2). Segment CD goes through points C (-3, -1) and D (6, 5). Segment AB is _____ to Segment CD.

A. Parallel
B. Perpendicular
C. Tangent
D. Congruent

Answer: B

Explanation:

We check the slopes and the lengths of the segments to see how they compare. We find the slope of Segment AB by dividing the difference in y-values by the difference in x-values: $m = \frac{2--4}{-3-1} = \frac{6}{-4} = -\frac{3}{2}$. We then find the slope of Segment CD: $m = \frac{5--1}{6--3} = \frac{6}{9} = \frac{2}{3}$. Next we find the length of each by using the distance formula from one point to another: $AB = \sqrt{(1--3)^2 + (-4-2)^2} = \sqrt{4^2 + (-6)^2} = \sqrt{16+36} = \sqrt{52}$, and $CD = \sqrt{(-3-6)^2 + (-1-5)^2} = \sqrt{(-9)^2 + (-6)^2} = \sqrt{81+36} = \sqrt{117}$. We can see from the slopes that they are opposite reciprocals, so the segments are perpendicular. Parallel segments (Answer A) would have had identical slopes. Congruent segments (Answer D) would have been the same length. A tangent segment or line (Answer C) is one that just touches a curve without passing through it.

Question: 5

Given the line $y = -\frac{5}{2}x + 2$, find the equation of a line parallel to that line that passes through the point (2, 3).

A. $5x + 2y = 16$
B. $-2x + 5y = 11$
C. $-5x + 2y = -4$
D. $2x + 5y = 19$

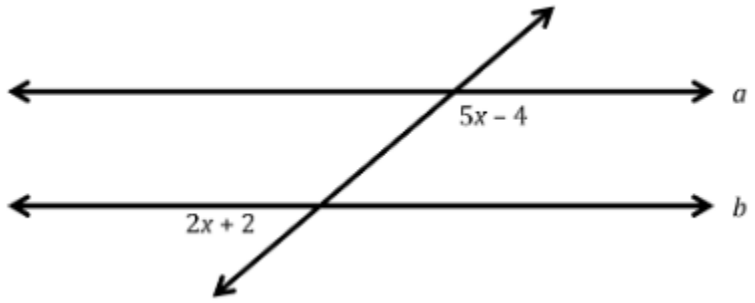
Answer: A

Explanation:

The slope of the original line is $m = -\frac{5}{2}$. Since the new line needs to be parallel, the new slope needs to be the same as the original slope. The given point is (2, 3), which is equivalent to (x_1, y_1) in the point-slope equation of $y - y_1 = m(x - x_1)$. Substituting in the new slope and given point, the point-slope equation becomes $y - 3 = -\frac{5}{2}(x - 2)$. Distributing on the right side of the equation results in $y - 3 = -\frac{5}{2}x + 5$. Add 3 to both sides of the equation to get the parallel line of $y = -\frac{5}{2}x + 8$. Multiplying through by 2 and moving the x-value to the left yields: $5x + 2y = 16$. Answer B found the perpendicular line. Answer C used the opposite slope. Answer D took the reciprocal slope.

Question: 6

In the figure below, lines a and b are parallel. Find the value of x.



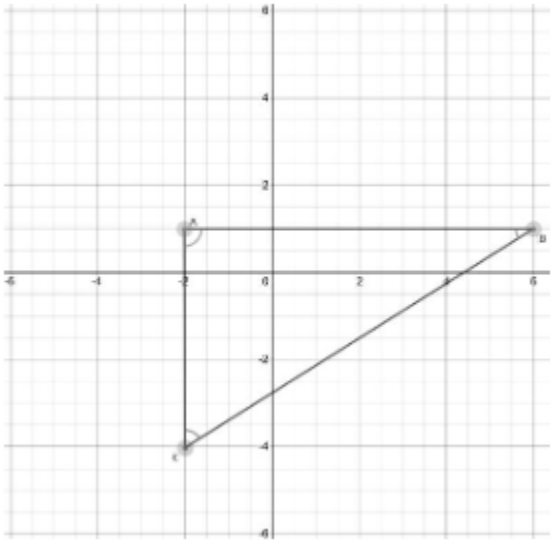
A. x = 2
B. $x = \frac{92}{7}$
C. x = 26
D. x = 54

Answer: C

Explanation:
The listed angles are supplementary angles. When a transversal cuts across parallel lines, the alternate interior angles are congruent, but an interior angle and its alternate exterior angle are supplementary. Since lines a and b are parallel, it means that 5x — 4 + 2x + 2 = 180. Combining like terms and moving constants to the right yields 7x = 182, or x = 26. In Answer A, the angles were incorrectly treated as equal. In Answer B, the angles were incorrectly treated as complementary, Answer D is the measure of the lower left angle rather than the value of x.

Question: 7

In triangle ABC, shown below, point A is at (—2, 1), point B is at (6, 1), and point C is at (-2, -4). If the triangle is reflected across the x-axis, what are the new coordinates of point C?



A. $(-2, 4)$
B. $(-2, -1)$
C. $(6, -1)$
D. $(2, -4)$

Answer: A

Explanation:
Reflecting a point across the x-axis involves leaving the x-coordinate as it is and switching the sign of the y-coordinate. Answer B is the reflection of point A. Answer C is the reflection of point B. Answer D is the reflection of point C across they-axis.

Question: 8

Which of the following sets of points creates a triangle that is congruent to the one from the previous problem?

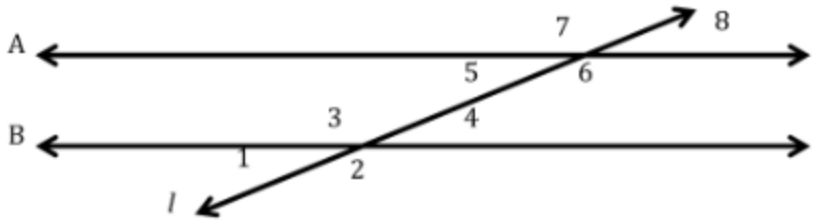
A. $(-2, 0), (-10,0), (-2,6)$
B. $(-4, 0), (-4,8), (1,0)$
C. $(3, -1), (10, -1), (3,4)$
D. $(2, 2), (11,2), (2,8)$

Answer: B

Explanation:
In order for two figures to be congruent, they must have the same size and shape. The triangle from the previous problem is a right triangle with legs of 8 and 5, so we test the points in the answer choices to see which one matches by finding the difference in x- and y-values in the coordinates. Answer A has legs of 8 and 6. Answer C has legs of 7 and S. Answer D has legs of 9 and 6. Only Answer B has a triangle with legs of 8 and 5, congruent to the one from the previous problem.

Question: 9

In the figure below, line I is a transversal, intersecting parallel lines A and B. Complete line 6 in the proof that alternate exterior angles 1 and 8 are congruent.



1.	Lines A and B are parallel	1.	Given
2.	Lines A and B cut by transversal l	2.	Given
3.	$\angle 1$ and $\angle 8$ are alternate exterior angles	3.	Definition of alternate exterior angles
4.	$\angle 1 \cong \angle 5, \angle 4 \cong \angle 8$	4.	Corresponding Angles Postulate
5.	$\angle 5 \cong \angle 8$	5.	Vertical Angles
6.	$\angle 1 \cong \angle 8$	6.	

A. Reflexive Property.
B. Symmetric Property.
C. Transitive Property.
D. CPCTC.

Answer: C

Explanation:
The property that a value can be substituted for another value that has already been determined to be congruent is termed the transitive property. The reflexive property (Answer A) states that a segment or angle is congruent to itself. The symmetric property (Answer B) states that if a = b, then b = a. CPCTC (Answer D) stands for "Corresponding Parts of Congruent Triangles are Congruent, which does not apply to this proof since it does not involve triangles.

Question: 10

Rectangle $ABCD$ is defined by the points A (–3, 0), B (–3, 10), C (2, 10), and D (2, 0). If it is dilated by a scale factor of $\frac{3}{5}$ to create its image $A'B'C'D'$, what is the length of $A'B'$?

A. 3
B. 6
C. 10
D. $\frac{50}{3}$

Answer: B

Explanation:

We first find the length of side AB in the original rectangle. From point $(-3, 0)$ to $(-3, 10)$ is a distance of 10. So, the dilated length can be found by multiplying the scale factor: $10 \cdot \frac{3}{5} = 6$. Answer A is the length of $B'C'$ or $D'A'$. Answer C is the length of AB without dilation. Answer D divided by $\frac{3}{5}$ instead of multiplying.

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