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### Question No. | Item Type | Content Cluster | Content Standard | Answer Key | Points |
--- | --- | --- | --- | --- | --- |
1 | Multiple Choice | Define trigonometric ratios and solve problems involving right triangles. | Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. (G.SRT.6) | D | 1 point |
2 | Equation Item | Define trigonometric ratios and solve problems involving right triangles. | Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. (G.SRT.8) | --- | 1 point |
3 | Multiple Choice | Solve equations and inequalities in one variable. | Solve quadratic equations in one variable.  
b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$. (A.REI.4b) | D | 1 point |
4 | Multiple Choice | Analyze functions using different representations. | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.  
a. Graph linear and quadratic functions and show intercepts, maxima, and minima. (F.IF.7a) | C | 1 point |
Integrated Math II
Item Release

Question 1

Question and Scoring Guidelines
Question 1

A triangle with side lengths $a$ units, $b$ units, and $c$ units is shown. Which equation is true for the triangle?

- A $\tan(55^\circ) = \frac{c}{a}$
- B $\cos(55^\circ) = \frac{a}{b}$
- C $\cos(55^\circ) = \frac{c}{b}$
- D $\sin(55^\circ) = \frac{a}{c}$

Points Possible: 1

Content Cluster: Define trigonometric ratios and solve problems involving right triangles.

Content Standard: Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. (G.SRT.6)
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may have attempted to use the definitions of trigonometric ratios, but confused tan(55°), the ratio of the opposite side length to the adjacent side length, with the reciprocal of sin(55°), the length of the hypotenuse to the length of the opposite side.

Rationale for Option B: This is incorrect. The student may have attempted to use the definitions of trigonometric ratios, but confused cos(55°), the ratio of the adjacent side length to the length of hypotenuse, with tan(55°), the ratio of the opposite side length to the adjacent side length.

Rationale for Option C: This is incorrect. The student may have attempted to use the definitions of trigonometric ratios, but reversed the numbers in the cosine ratio, adjacent side length to the length of the hypotenuse, to become the ratio of the length of the hypotenuse to the length of the adjacent side.

Rationale for Option D: Key – The student correctly used the definitions of trigonometric ratios to identify that sin(55°) is the ratio of the length of the opposite side to the length of the hypotenuse, or \(\frac{a}{c}\).

Sample Response: 1 point

A triangle with side lengths \(a\) units, \(b\) units, and \(c\) units is shown.

Which equation is true for the triangle?

- \(A\) \(\tan(55^\circ) = \frac{c}{a}\)
- \(B\) \(\cos(55^\circ) = \frac{a}{b}\)
- \(C\) \(\cos(55^\circ) = \frac{c}{b}\)
- \(\bullet\) \(\sin(55^\circ) = \frac{a}{c}\)
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Question 2

Question and Scoring Guidelines
Question 2

A sign company is building a sign with the dimensions shown.

What is the area, in square feet, of the sign?

Points Possible: 1

Content Cluster: Define trigonometric ratios and solve problems involving right triangles.

Content Standard: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. (G.SRT.8)
Scoring Guidelines

Exemplar Response

• 60

Other Correct Responses

• Any equivalent value

For this item, a full-credit response includes:

• The correct area (1 point).
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Question 2

Sample Responses
Sample Response: 1 point

A sign company is building a sign with the dimensions shown.

10 ft

13 ft

What is the area, in square feet, of the sign?

60
Notes on Scoring

This response earns full credit (1 point) because it shows the correct area of the sign, 60 square feet.

The given sign is the shape of the triangle. The area, \( A \), of the sign can be found by using the formula \( A = \frac{1}{2}bh \), where \( b \) is the length of the base, 10 feet, and \( h \) is the unknown height (dashed line segment) of the triangle.

The height separates the original triangle into two congruent right triangles. In each right triangle, the length of the shorter leg is half of the length of the original base, \( \frac{10}{2} = 5 \) feet; the length of the hypotenuse is 13 feet; and the length of the longer leg is \( h \). The Pythagorean Theorem, which states that the sum of the squares of the length of each leg of a right triangle equals the square of the hypotenuse, can be used to calculate the length of the longer leg,

\[
5^2 + h^2 = 13^2 \\
h^2 = 13^2 - 5^2 \\
h^2 = 144 \\
h = 12
\]

The values of \( b = 10 \) and \( h = 12 \) can be substituted into the area formula to calculate the area of the sign, \( A = \left(\frac{1}{2}\right) \cdot 10 \cdot 12 = 60 \) square feet.
Sample Response: 0 points

A sign company is building a sign with the dimensions shown.

What is the area, in square feet, of the sign?

130

Notes on Scoring

This response earns no credit (0 points) because it shows an incorrect area of the sign, 130 square feet. The student may have incorrectly used the formula $A = \frac{1}{2} bh$ for the area of the triangle by confusing the height with the side length, 13 feet, and did not multiply the product of the two side lengths by $\frac{1}{2}$. 
Sample Response: 0 points

A sign company is building a sign with the dimensions shown.

What is the area, in square feet, of the sign?

65

Notes on Scoring

This response earns no credit (0 points) because it shows an incorrect area of the sign, 65 square feet. The student may have incorrectly used the formula \( A = \frac{1}{2}bh \) for the area of the triangle by confusing the height with the side length, 13 feet.
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Question 3

Question and Scoring Guidelines
Question 3

Solve the equation $x^2 + 6x = -\frac{11}{4}$.

A. $x = -3$ and $x = 2$
B. $x = -2$ and $x = 3$
C. $x = \frac{1}{2}$ and $x = -\frac{11}{2}$
D. $x = -\frac{1}{2}$ and $x = -\frac{11}{2}$

Points Possible: 1

Content Cluster: Solve equations and inequalities in one variable.

Content Standard: Solve quadratic equations in one variable.
b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$. (A.REI.4b)
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may have incorrectly applied a factoring technique by using factors 3 and 2 of the coefficient 6, and then used the negative sign in front of $\frac{11}{4}$ to decide that 3 and 2 should have opposite signs.

Rationale for Option B: This is incorrect. The student may have incorrectly applied a factoring technique by using factors 3 and 2 of the coefficient 6, and then used the negative sign in front of $\frac{11}{4}$ to decide that 3 and 2 should have opposite signs.

Rationale for Option C: This is incorrect. The student may have attempted to solve the quadratic equation by factoring. First, he or she may have multiplied both sides by 4 and put the equation in the standard form $4x^2 + 24x + 11 = 0$. Then, he or she may have made a mistake when writing the equation in the factored form $(2x - 1)(2x + 11) = 0$. Lastly, the student may have set each factor equal to zero (i.e., $2x - 1 = 0$ and $2x + 11 = 0$) and then solved both linear equations for $x$ to get $x = \frac{1}{2}$ or $x = -\frac{11}{2}$.

Rationale for Option D: Key – The student may have correctly solved the quadratic equation by factoring. First, he or she may have multiplied both sides by 4 and put the equation in the standard form $4x^2 + 24x + 11 = 0$. Then, he or she may have written the equation in the factored form $(2x + 1)(2x + 11) = 0$. Lastly, the student may have set each factor equal to zero (i.e., $2x + 1 = 0$ and $2x + 11 = 0$) and then solved both linear equations for $x$ to get $x = -\frac{1}{2}$ or $x = -\frac{11}{2}$. 
Sample Response: 1 point

Solve the equation \( x^2 + 6x = -\frac{11}{4} \).

(A) \( x = -3 \) and \( x = 2 \)

(B) \( x = -2 \) and \( x = 3 \)

(C) \( x = \frac{1}{2} \) and \( x = -\frac{11}{2} \)

\( x = -\frac{1}{2} \) and \( x = -\frac{11}{2} \)
Integrated Math II
Item Release

Question 4

Question and Scoring Guidelines
A function is shown.

\[ f(x) = x^2 + 2x - 1 \]

Which graph represents the function?

Options:
A.  
B.  
C.  
D.  

Points Possible: 1

Content Cluster: Analyze functions using different representations.

Content Standard: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
a. Graph linear and quadratic functions and show intercepts, maxima, and minima. (F.IF.7a)
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may not have realized that even though the graph opens upward, it does not have a y-intercept at \((0, -1)\).

Rationale for Option B: This is incorrect. The student may have misinterpreted the positive leading coefficient of \(x^2\) and thought that the graph should open downward.

Rationale for Option C: Key – The student correctly identified that since the leading coefficient of the quadratic equation \(f(x) = x^2 + 2x - 1\) is \(a = 1\), and the value of \(f(0)\) is \(-1\), the graph is a parabola that opens upward and has a y-intercept at \((0, -1)\).

Rationale for Option D: This is incorrect. The student may have misinterpreted the constant term \(-1\) as the x-intercept \((-1, 0)\) instead of the y-intercept \((0, -1)\).
A function is shown.

\[ f(x) = x^2 + 2x - 1 \]

Which graph represents the function?
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