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Algebra I
Item Release

Question 1

Question and Scoring Guidelines
Question 1

To start her collection of comic books, Joylin’s uncle gives Joylin a box of comic books and several monthly subscriptions to comic books. The number of comic books in her collection, \( y \), after \( x \) months is modeled by the equation shown.

\[ y = 40 - 6x \]

What does the number 40 represent in this equation?

\( \text{A} \) the price of a comic book subscription
\( \text{B} \) the number of months of Joylin’s subscriptions
\( \text{C} \) the number of comic books in the box she received
\( \text{D} \) the number of title subscriptions Joylin received each month

Points Possible: 1

Content Cluster: Interpret expressions for functions in terms of the situation they model.

Content Standard: Interpret the parameters in a linear or exponential function in terms of a context. (F.LE.5)
Scoring Guidelines

Rationale for Option A: This is incorrect. The student may not have realized that the equation models the total number of books that Joylin received from her uncle and from the subscription, not the price of the book subscription.

Rationale for Option B: This is incorrect. The student may have believed that the constant term, 40, represents the length of the subscription, in months.

Rationale for Option C: Key – The student correctly recognized that the constant term, 40, represents the number of comic books in the box that Joylin initially received from her uncle and that the variable term is $6x$, which represents the number of subscription comic books that Joylin received during $x$ months.

Rationale for Option D: This is incorrect. The student may have confused the meaning of the constant term, 40, which represents the number of books in the box, with the coefficient 6, which represents the number of comic books (title subscriptions) that Joylin receives each month.

Sample Response: 1 point

To start her collection of comic books, Joylin’s uncle gives Joylin a box of comic books and several monthly subscriptions to comic books. The number of comic books in her collection, $y$, after $x$ months is modeled by the equation shown.

$y = 40 + 6x$

What does the number 40 represent in this equation?

A. the price of a comic book subscription
B. the number of months of Joylin’s subscriptions
C. the number of comic books in the box she received
D. the number of title subscriptions Joylin received each month
Algebra I
Item Release
Question 2

Question and Scoring Guidelines
Question 2

A system of linear equations is shown.

\[-3x + y = K\]
\[2x + 3y = L\]

Which system has the same solution as the system shown?

(A) \[-9x + 3y = -3K\]
\[2x + 3y = L\]

(B) \[6x - 2y = -2K\]
\[2x + 3y = L\]

(C) \[-3x + y = K\]
\[3x + 4.5y = L\]

(D) \[-3x + y = K\]
\[-8x - 12y = L\]

Points Possible: 1

Content Cluster: Solve systems of equations.

Content Standard: Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. (A.REI.5)
**Scoring Guidelines**

**Rationale for Option A:** This is incorrect. The student may not have realized that the left side of the first equation in the original system was multiplied by 3, and that the right side was multiplied by \((-3)\), which produced a pair of non-equivalent equations and thus a system with different solutions than the original system.

**Rationale for Option B:** Key – The student correctly recognized that a system of two equations in two variables will have the same solutions if one (or both) equation(s) is replaced by an equivalent equation (e.g., a product of the original equation and any real number). According to the Multiplication Property of Equality, the first equations in both systems are equivalent because $6x - 2y = -2K$ is a product of $-3x + y = K$ and $(-2)$.

**Rationale for Option C:** This is incorrect. The student may not have realized that the left side of the second equation in the original system was multiplied by $1.5$, and that the right side was multiplied by $1$, which produced a pair of non-equivalent equations and thus a system with different solutions than the original system.

**Rationale for Option D:** This is incorrect. The student may not have realized that the left side of the second equation in the original system was multiplied by $(-4)$, and that the right side was multiplied by $1$, which produced a pair of non-equivalent equations and thus a system with different solutions than the original system.
A system of linear equations is shown.

\[-3x + y = K\]
\[2x + 3y = L\]

Which system has the same solution as the system shown?

(A) \[-9x + 3y = -3K\]
\[2x + 3y = L\]

(B) \[6x - 2y = -2K\]
\[2x + 3y = L\]

(C) \[-3x + y = K\]
\[3x + 4.5y = L\]

(D) \[-3x + y = K\]
\[-8x - 12y = L\]
Algebra I
Item Release

Question 3

Question and Scoring Guidelines
A function is shown.

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

Which graph represents the function?

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.

\[ f(x) = x^3 + 2x - 1 \]

Which graph represents the function?
Algebra I
Item Release

Question 4

Question and Scoring Guidelines
Question 4

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 $x = -\frac{11}{2}$