ALGEBRA II

2009 Mathematics Standards of Learning

Released Spring 2015

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SAMPLE A

Which expression is equivalent to $\sqrt{\frac{7x}{16}}$?

- A $\frac{7x}{4}$
- B $\frac{7x}{8}$
- C $\frac{\sqrt{7x}}{4}$
- D $\frac{\sqrt{7x}}{8}$
SAMPLE B

What value of $x$ makes $\sqrt{x} - 3 = 6$ true?
Which expression is equivalent to $\sqrt{20x^{16}y^{25}}$ for positive $x$ and $y$ values?

- A $2x^4y^5\sqrt{5}$
- B $5x^4y^5\sqrt{2}$
- C $2x^8y^{12}\sqrt{5y}$
- D $5x^8y^{12}\sqrt{2y}$
Which expression is equivalent to $\sqrt[3]{6w^7} \cdot \sqrt[3]{4w^5}$?

- A. $2w^4 \frac{3}{\sqrt{3}}$
- B. $2w^4 \frac{3}{\sqrt{6}}$
- C. $2w^{11} \frac{3}{\sqrt{3}w^2}$
- D. $2w^{11} \frac{3}{\sqrt{6}w^2}$
The steps used to solve an equation are shown.

Step 1: \( \frac{2}{3} r = 14i \)

Step 2: \( \left( \frac{3}{2} \right)^2 r = 14i \left( \frac{3}{2} \right) \)

Step 3: \( \left( \frac{3}{2} \cdot \frac{2}{3} \right) r = 14i \left( \frac{3}{2} \right) \)

Step 4: \( 1 \cdot r = 21i \)

Step 5: \( r = 21i \)

What property justifies the work between Step 4 and Step 5?

- **A** Identity property of multiplication
- **B** Inverse property of multiplication
- **C** Commutative property of multiplication
- **D** Associative property of multiplication
Which expression is equivalent to the following expression if no denominators equal zero?

\[ \frac{11 - w}{30w^2} \cdot \frac{w - 11}{5w^6} \]

- A \( \frac{-w^4}{6} \)
- B \( \frac{-6}{w^3} \)
- C \( \frac{w^3}{6} \)
- D \( \frac{6}{w^4} \)
What is the complete factorization of \((18x^4 + 12x^3 - 6x)\)?

- A  \(6x^3(3x + 2)\)
- B  \(6x(3x^3 + 2x^2)\)
- C  \(6x(x - 1)(x + 1)\)
- D  \(6x(3x^3 + 2x^2 - 1)\)
Which of these is equivalent to $i^{75}$?

- A $i$
- B $-i$
- C 1
- D $-1$
For which value of \( b \) is \( x^2 + bx - 60 \) factorable over the set of integers?

- A 61
- B 23
- C -7
- D -16
If no denominator equals zero, which expression is equivalent to \( \frac{25 - 4x^2}{6x^2 + 9x - 15} \cdot \frac{6x^2 - 2x - 4}{2x^2 - x - 10} \)?

- A. \(-2\)
- B. \(2\)
- C. \(\frac{-2(3x + 2)}{3(x + 2)}\)
- D. \(\frac{2(3x + 2)}{3(x + 2)}\)
Assuming the denominators do NOT equal zero, which expression is equivalent to \( \frac{12}{x + 1} + \frac{1}{x - 4} \)?

- A \( \frac{13x - 47}{(x + 1)(x - 4)} \)
- B \( \frac{13}{(x + 1)(x - 4)} \)
- C \( \frac{13x - 47}{2x - 3} \)
- D \( \frac{13}{2x - 3} \)
Which expression is equivalent to $\sqrt{36x^9y^{25}}$, where $x > 0$ and $y > 0$?

- A $6x^3y^5$
- B $6x^{\frac{9}{2}}y^{\frac{25}{2}}$
- C $18x^{3}y^{5}$
- D $18x^{\frac{9}{2}}y^{\frac{25}{2}}$
What nonzero value of \( x \) is a solution to the following equation?

\[
\frac{x + 2}{x} + \frac{x - 6}{3x} = \frac{2x + 9}{5x}
\]

\( \begin{align*}
\text{A} & \quad x = \frac{27}{14} \\
\text{B} & \quad x = \frac{17}{14} \\
\text{C} & \quad x = \frac{13}{14} \\
\text{D} & \quad x = \frac{5}{14}
\end{align*} \)
How many values of $x$ will satisfy the equation $-2|3x - 5| = 0$?

- A 0
- B 1
- C 2
- D 3
Which graph best represents the solutions for \( y < |x + 4| - 1 \)?
What is a solution of $\sqrt{7 - 2x} + 5 = 8$?

- A $x = -26$
- B $x = \frac{-19}{2}$
- C $x = \frac{-13}{2}$
- D $x = -1$
Which is the apparent solution set of the system of equations graphed on the following grid?

- A \( \{(0, -5), (0, 5)\} \)
- B \( \{(-3, 4), (-2, -2)\} \)
- C \( \{(-4, 3), (-1, 0)\} \)
- D \( \{(-5, 0), (-3\frac{1}{3}, 0), (-1, 0)\} \)
This graph best represents the solution to which inequality?

○ A $|x - 11| > 4$

○ B $|x - 11| < 4$

○ C $|2x + 7| > 15$

○ D $|2x + 7| < 15$
What value of $x$ makes $\sqrt[3]{2x - 5} = 3$ true?

$x =$
What are the apparent roots of the equation graphed on the coordinate grid?

A \{ 0, 3 \}

B \{ -\frac{1}{2}, 4 \}

C \{ -\frac{3}{2}, \frac{1}{2} \}

D \{ -2, 1 \}
If no denominator is equal to zero, what is the solution set for the following equation?

\[
\frac{3x - 4}{x^2} = \frac{3}{2x}
\]

- A \[\left\{\frac{8}{3}\right\}\]
- B \[\left\{\frac{8}{9}\right\}\]
- C \[\left\{-\frac{2}{3}, 2\right\}\]
- D \[\left\{-\frac{2}{3}, \frac{2}{3}\right\}\]
What is the solution set for the following system of equations?

\[
\begin{align*}
  y &= 4x + 2 \\
  y &= x^2 + x - 8
\end{align*}
\]

- A \{ (-5, -18), (2, 10) \}
- B \{ (-1, -2), (6, 26) \}
- C \{ (-6, -22), (1, 6) \}
- D \{ (-2, -6), (5, 22) \}
Directions: Click on all the correct answers.

Identify all the points where the graph of $h(x) = (x + 1)(x^2 + 8x + 16)$ intersects the $x$-axis.

<table>
<thead>
<tr>
<th>(-4,0)</th>
<th>(1, 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-2,0)</td>
<td>(4, 0)</td>
</tr>
<tr>
<td>(-1,0)</td>
<td>(16, 0)</td>
</tr>
</tbody>
</table>
The function \( f(x) = (1 - x)^2 - 4 \) is decreasing throughout the interval —

- A \( -4 < x < \infty \)
- B \( -\infty < x < 1 \)
- C \( -1 < x < 3 \)
- D \( -\infty < x < \infty \)
Given: \( f(x) = 4x^4 - 15 \) and \( g(x) = 2x + 11 \)

What is the value of \( g(f(x)) \)?

- A \( 8x^5 + 44x^4 - 30x - 165 \)
- B \( 8x^5 - 165 \)
- C \( 8x^4 - 4 \)
- D \( 8x^4 - 19 \)
A normally distributed data set has a mean of 0 and a standard deviation of 0.5. Which is closest to the percent of values between \(-1\) and \(1\)?

- A 34%
- B 50%
- C 68%
- D 95%
Directions: Click on the grid to plot the correct point.

Point $A$ lies on the graph of $f(x) = \frac{1}{2}x + 2$. Locate the image of Point $A$ that lies on the graph of $f^{-1}(x)$. 
Which equation best represents this graph?

- **A** $f(x) = 3 \left( \frac{1}{5} \right)^x$
- **B** $f(x) = 3\sqrt{5x}$
- **C** $f(x) = \frac{1}{3} \log(5x)$
- **D** $f(x) = \frac{1}{3}(5)^x$
If \( f(x) = x^2 + 3x \) and \( g(x) = 2x^2 \), what is \( g(f(-1)) \)?

- **A**  -4
- **B**  0
- **C**  8
- **D**  10
The volume of a cone \( V \) varies jointly with its height \( h \) and the square of its radius \( r \). If \( k \) is the constant of proportionality, which of the following equations represents the correct relationship between volume, radius, and height?

- **A** \( V = k(rh)^2 \)
- **B** \( V = \frac{kr^2}{h} \)
- **C** \( V = \frac{k}{r^2h} \)
- **D** \( V = kr^2h \)
What is the equation of the horizontal asymptote of the graph of the following equation?

\[ f(x) = 4^{(x+1)} - 10 \]

- A  \( y = 4 \)
- B  \( y = 0 \)
- C  \( y = -1 \)
- D  \( y = -10 \)
As $x$ approaches negative infinity, which of the following describes the end behavior of $f(x) = -x^7 + bx^3 + c$?

- A $f(x)$ approaches $c$
- B $f(x)$ approaches 0
- C $f(x)$ approaches positive infinity
- D $f(x)$ approaches negative infinity
Jessica paid $23,000 for her car and kept a record of its value.

<table>
<thead>
<tr>
<th>Number of Years ($x$)</th>
<th>Value (in dollars) ($y$)</th>
</tr>
</thead>
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<tr>
<td>0</td>
<td>23,000</td>
</tr>
<tr>
<td>1</td>
<td>20,000</td>
</tr>
<tr>
<td>2</td>
<td>16,000</td>
</tr>
<tr>
<td>3</td>
<td>14,000</td>
</tr>
<tr>
<td>4</td>
<td>12,000</td>
</tr>
<tr>
<td>5</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Assuming the relationship is exponential, which equation best models the curve of best fit for the data?

- **A** \( y = 21,000(1.20)^x \)
- **B** \( y = 22,300(2.60)^x \)
- **C** \( y = 23,100(0.85)^x \)
- **D** \( y = 23,500(0.70)^x \)
What is the sum of the infinite geometric series $9 - 6 + 4 - \frac{8}{3} + \ldots$?

- A $\frac{29}{3}$
- B $\frac{25}{3}$
- C $\frac{27}{5}$
- D $\frac{18}{5}$
Which number is a zero of \( f(x) = 7x^2 + 16x - 48 \) ?

- A 12
- B 4
- C \( \frac{12}{7} \)
- D \( \frac{4}{7} \)
Which function is the inverse of \( g(x) = x^3 + 11 \)?

- **A** \( g^{-1}(x) = \frac{2}{3}x - 11 \)
- **B** \( g^{-1}(x) = \frac{2}{3}x + 11 \)
- **C** \( g^{-1}(x) = x - \frac{3}{11} \)
- **D** \( g^{-1}(x) = x + \frac{3}{11} \)
What is the domain of $g(x) = \log(x - 1)$?

- **A** $\{x \mid x > 10\}$
- **B** $\{x \mid x > 9\}$
- **C** $\{x \mid x > 1\}$
- **D** $\{x \mid x > 0\}$
A scientist obtained a sample that contained 80 grams of radioactive Barium-122 that decays exponentially over time. The amount of Barium-122 that remained in the sample at observed times is shown in the table.

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Mass of Remaining Barium-122 (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>80.0</td>
</tr>
<tr>
<td>1</td>
<td>56.6</td>
</tr>
<tr>
<td>2</td>
<td>40.0</td>
</tr>
<tr>
<td>3</td>
<td>28.3</td>
</tr>
<tr>
<td>4</td>
<td>20.0</td>
</tr>
</tbody>
</table>

If the radioactive decay continues at the same rate, which is closest to the amount of the sample of Barium-122 remaining at 5 minutes?

- A 8.3 grams
- B 10.0 grams
- C 11.7 grams
- D 14.1 grams
What is the sum of the first 20 terms of the arithmetic sequence shown?

\[ \frac{1}{3}, \frac{2}{3}, 1, \frac{4}{3}, \frac{5}{3}, \ldots \]

- A 5
- B 20
- C 70
- D 140
What is the number of possible permutations of 8 objects taken 3 at a time?
## Algebra II
### Released Test Item Set Spring 2015
#### Answer Key

<table>
<thead>
<tr>
<th>Sequence Number</th>
<th>Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)</th>
<th>Correct Answer</th>
<th>Reporting Category</th>
<th>Reporting Category Description</th>
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<td>TEI Typed response: 16 (and all equivalent answers)</td>
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<td>002</td>
<td>Equations and Inequalities</td>
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<tr>
<td></td>
<td>Directions: Type your answer in the box.</td>
<td></td>
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<tr>
<td></td>
<td>What value of $x$ makes $\frac{3}{2}x - 5 = 3$ true?</td>
<td>$x = 16$</td>
<td></td>
<td></td>
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<td>18</td>
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<tr>
<td>21</td>
<td>TEI (−4,0) (first row, left column) and (−1,0) (last row, left column) Both of these answers, and only these answers, must be selected.</td>
<td>003 Functions and Statistics</td>
<td></td>
<td></td>
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<td>25</td>
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<td>A point must be plotted on the coordinate plane at (1, -2). This point is the only correct answer.</td>
<td>003</td>
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<td>D</td>
<td>003</td>
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<td>D</td>
<td>003</td>
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<td>C</td>
<td>003</td>
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<td>32</td>
<td>MC</td>
<td>C</td>
<td>003</td>
<td>Functions and Statistics</td>
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</tbody>
</table>

**Diagram:**

Point A lies on the graph of \( f(x) = \frac{1}{2}x + 2 \). Locate the image of Point A that lies on the graph of \( f^{-1}(x) \).
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<td>Typed response: 336</td>
<td>003</td>
<td>Functions and Statistics</td>
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Directions: Type your answer in the box.

What is the number of possible permutations of 8 objects taken 3 at a time?

336