VIRGINIA STANDARDS OF LEARNING

TEST ITEM SET

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** $\frac{\sqrt{7x}}{8}$

Directions: Type your answer in the box.

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** $2w^4\sqrt[3]{3}$
- **B** $2w^4\sqrt[3]{6}$
- **C** $2w^{11}\sqrt[3]{3w^2}$
- **D** $2w^{11}\sqrt[3]{6w^2}$

The steps used to solve an equation are shown.

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

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

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?

$$\frac{\frac{11-w}{30w^2}}{\frac{w-11}{5w^6}}$$

- 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** $6x(3x - 1)(x + 1)$
- **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** $18x^3y^5$
- **D** $18x^{\frac{9}{2}}y^{\frac{25}{2}}$

What nonzero value of x is a solution to the following equation?

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

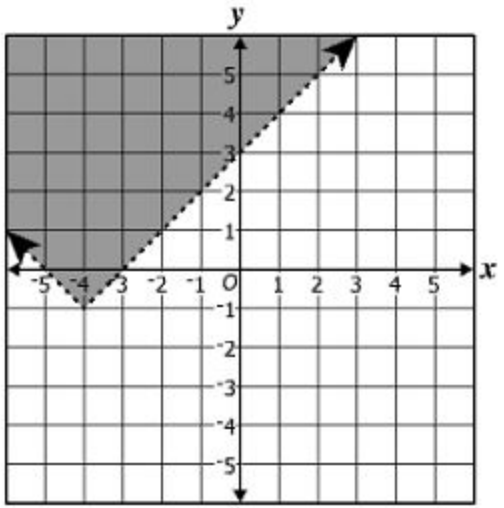
- A $x=\frac{27}{14}$
- B $x=\frac{17}{14}$
- C $x=\frac{13}{14}$
- D $x=\frac{5}{14}$

How many values of x will satisfy the equation $-2|3x-5|=0$?

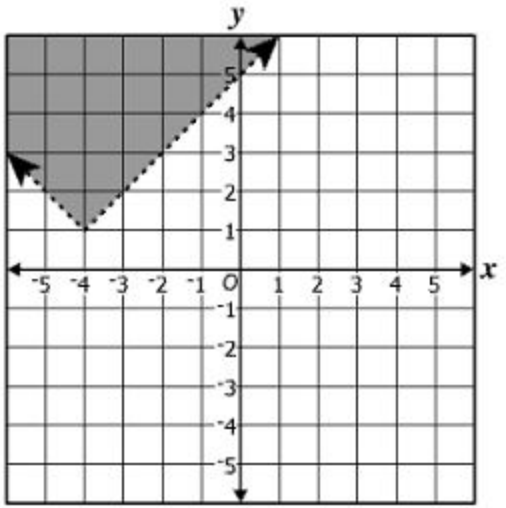
- **A** 0
- **B** 1
- **C** 2
- **D** 3

Which graph best represents the solutions for $y < |x + 4| - 1$?

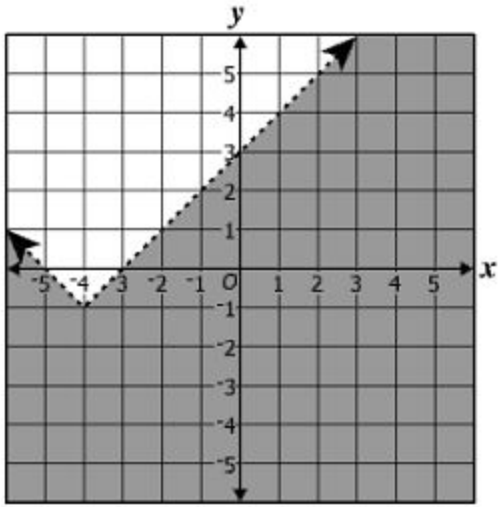
A



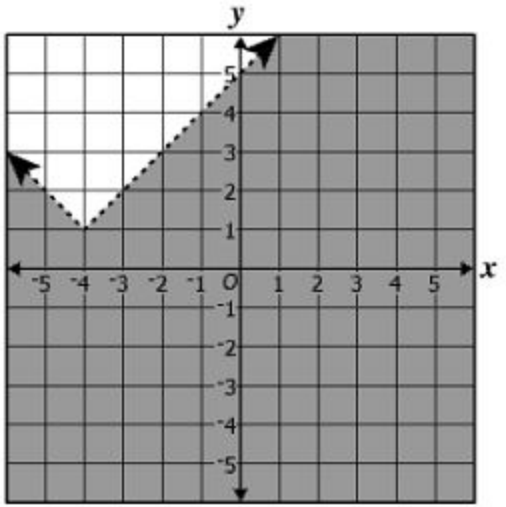
C



B



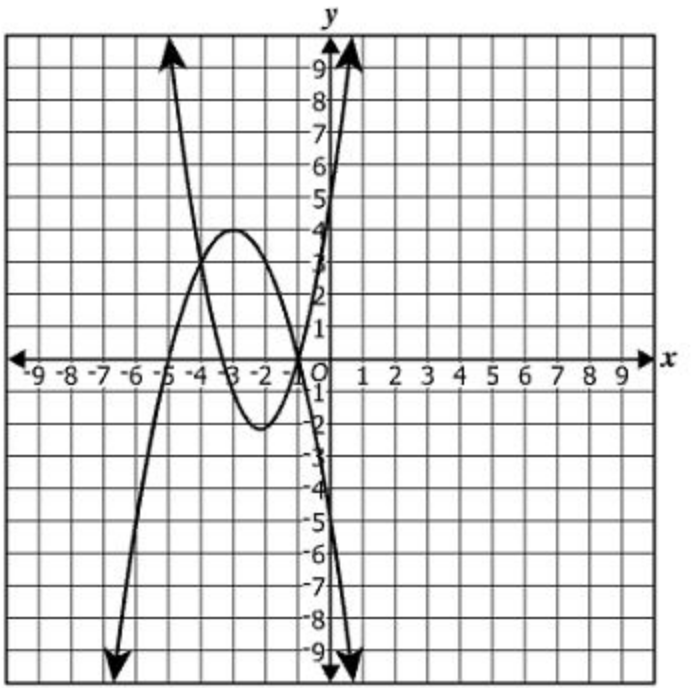
D



What is a solution of $\sqrt{7-2x}+5=8$?

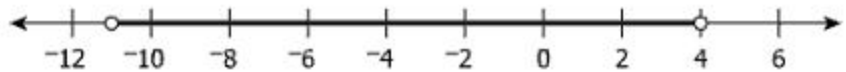
- **A** $x=-26$
- **B** $x=\frac{-19}{2}$
- **C** $x=\frac{-13}{2}$
- **D** $x=-1$

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** $\left\{(-5, 0), \left(-3\frac{1}{3}, 0\right), (-1, 0)\right\}$

This graph best represents the solution to which inequality?



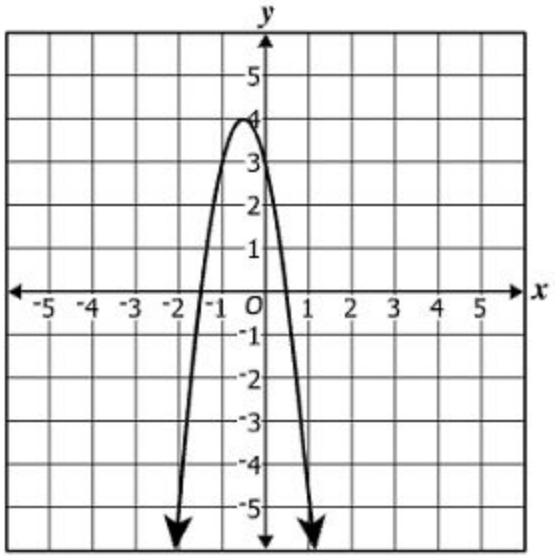
- **A** $|x-11|>4$
- **B** $|x-11|<4$
- **C** $|2x+7|>15$
- **D** $|2x+7|<15$

Directions: Type your answer in the box.

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 $\left\{\frac{-1}{2}, 4\right\}$
- C $\left\{\frac{-3}{2}, \frac{1}{2}\right\}$
- 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?

$$\begin{cases} y = 4x + 2 \\ y = x^2 + x - 8 \end{cases}$$

- **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.

$(-4,0)$	$(1, 0)$
$(-2,0)$	$(4, 0)$
$(-1,0)$	$(16, 0)$

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 $g(f(x))$ **?**

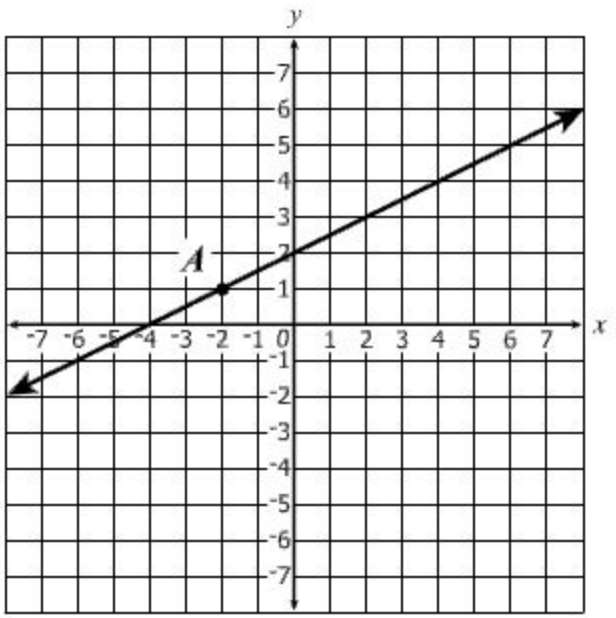
- **A** $8x^5 + 44x^4 - 30x - 165$
- **B** $8x^5 - 165$
- **C** $8x^4 - 4$
- **D** $8x^4 - 19$

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 ?

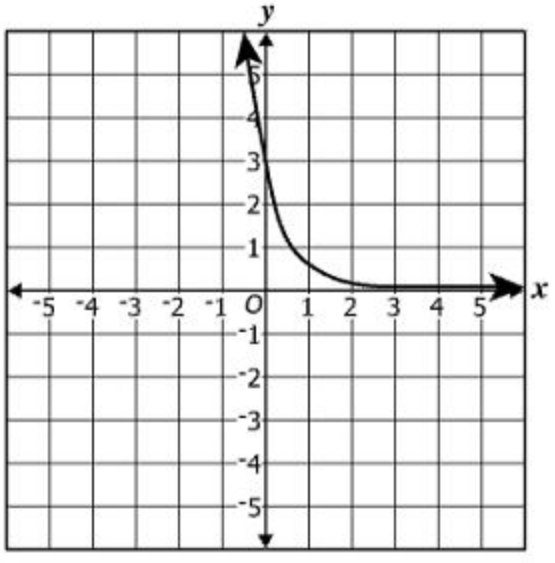
- **A** 34%
- **B** 50%
- **C** 68%
- **D** 95%

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.

Number of Years (x)	Value (in dollars) (y)
0	23,000
1	20,000
2	16,000
3	14,000
4	12,000
5	10,000

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** $g^{-1}(x) = \sqrt[3]{x - 11}$
- **B** $g^{-1}(x) = \sqrt[3]{x + 11}$
- **C** $g^{-1}(x) = x - \sqrt[3]{11}$
- **D** $g^{-1}(x) = x + \sqrt[3]{11}$

What is the domain of $g(x) = \log(x - 1)$?

- **A** $\{x | x > 10\}$
- **B** $\{x | x > 9\}$
- **C** $\{x | x > 1\}$
- **D** $\{x | x > 0\}$

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.

Radioactive Decay of Barium-122

Time (minutes)	Mass of Remaining Barium-122 (grams)
0	80.0
1	56.6
2	40.0
3	28.3
4	20.0

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?

$$\frac{1}{3}, \frac{2}{3}, 1, \frac{4}{3}, \frac{5}{3}, \ldots$$

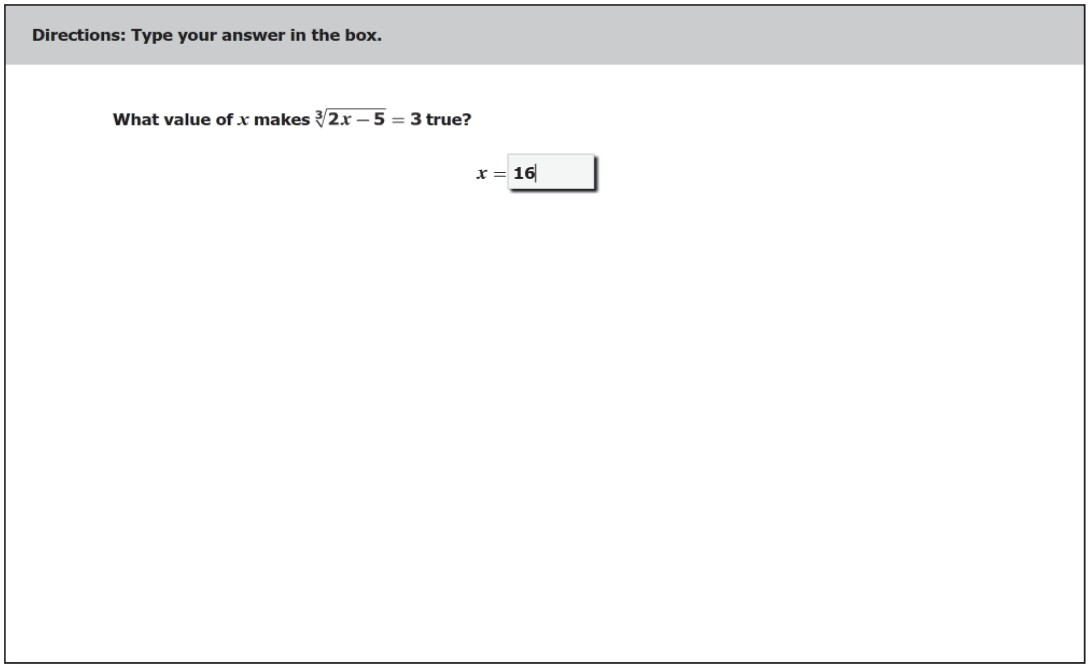
- **A** 5
- **B** 20
- **C** 70
- **D** 140

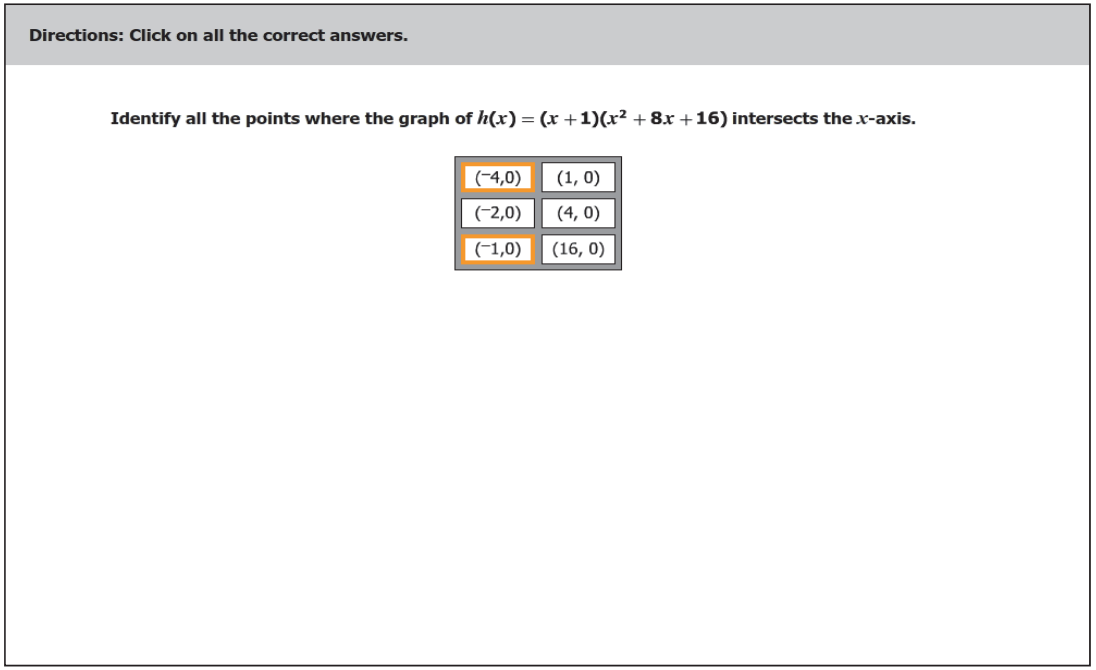
Directions: Type your answer in the box.

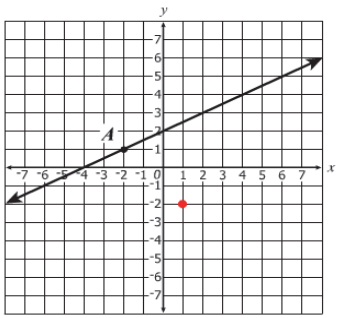
What is the number of possible permutations of 8 objects taken 3 at a time?

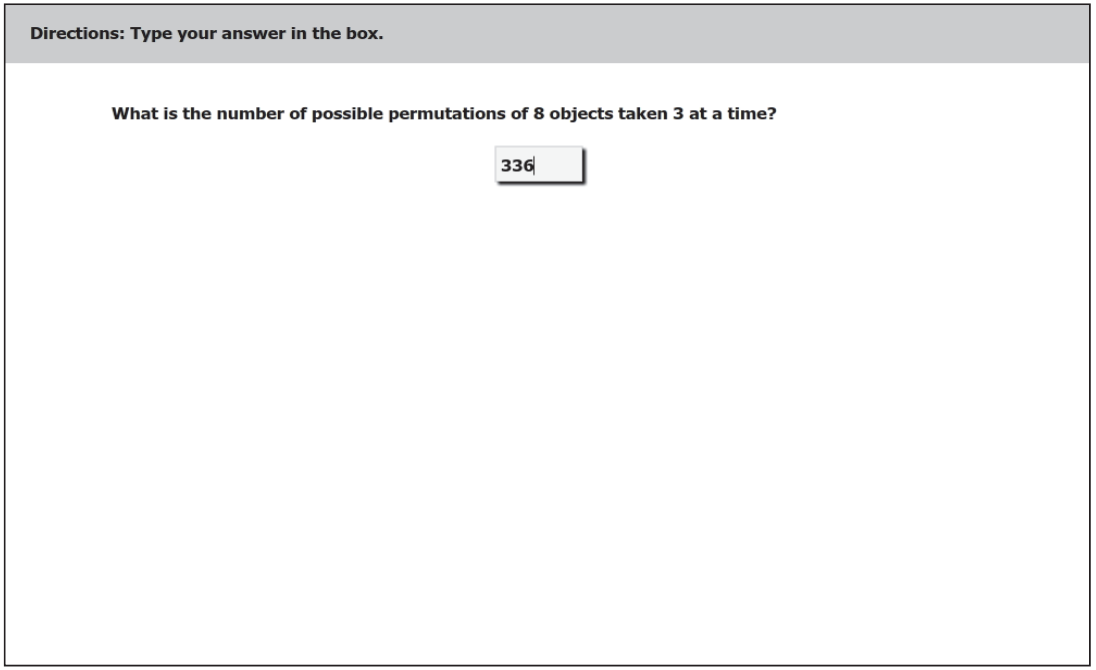
Algebra II
Released Test Item Set Spring 2015
Answer Key

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
1	MC	C	001	Expressions and Operations
2	MC	A	001	Expressions and Operations
3	MC	A	001	Expressions and Operations
4	MC	A	001	Expressions and Operations
5	MC	D	001	Expressions and Operations
6	MC	B	001	Expressions and Operations
7	MC	C	001	Expressions and Operations
8	MC	C	001	Expressions and Operations
9	MC	A	001	Expressions and Operations
10	MC	B	001	Expressions and Operations
11	MC	A	002	Equations and Inequalities
12	MC	B	002	Equations and Inequalities
13	MC	B	002	Equations and Inequalities
14	MC	D	002	Equations and Inequalities
15	MC	C	002	Equations and Inequalities
16	MC	D	002	Equations and Inequalities

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
17	TEI	Typed response: 16 (and all equivalent answers) 	002	Equations and Inequalities
18	MC	C	002	Equations and Inequalities
19	MC	A	002	Equations and Inequalities
20	MC	D	002	Equations and Inequalities

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
21	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. 	003	Functions and Statistics
22	MC	B	003	Functions and Statistics
23	MC	D	003	Functions and Statistics
24	MC	D	003	Functions and Statistics

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
25	TEI	A point must be plotted on the coordinate plane at (1,–2). This point is the only correct answer. **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 $f^{-1}(x)$.**  	003	Functions and Statistics
26	MC	A	003	Functions and Statistics
27	MC	C	003	Functions and Statistics
28	MC	D	003	Functions and Statistics
29	MC	D	003	Functions and Statistics
30	MC	C	003	Functions and Statistics
31	MC	C	003	Functions and Statistics
32	MC	C	003	Functions and Statistics

Sequence Number	Item Type: Multiple Choice (MC) or Technology-Enhanced Item (TEI)	Correct Answer	Reporting Category	Reporting Category Description
33	MC	C	003	Functions and Statistics
34	MC	A	003	Functions and Statistics
35	MC	C	003	Functions and Statistics
36	MC	D	003	Functions and Statistics
37	MC	C	003	Functions and Statistics
38	TEI	Typed response: 336 	003	Functions and Statistics

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