FSA Algebra 2 End-of-Course Review Packet

Algebra and Modeling

Functions and Modeling

Statistics, Probability, and the Number System

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Algebra and Modeling

MAFS.912.A-APR.1.1
Also assesses MAFS.912.A-APR.3.4

1. What is the expanded form of $3x(x+2)^2$?

   A. $3x^3 + 27x$
   B. $3x^3 + 18x$
   C. $3x^3 + 18x^2 + 18x$
   D. $3x^3 + 18x^2 + 27x$

2. Algebraically prove that the difference of the squares of any two consecutive integers is an odd integer.

3. Dennis used a method for squaring two-digit numbers that end in 5. The method states to find the values that end in 0 before and after this number, multiply them and combine the result with the square of 5. If x represents the two-digit number to be squared, which of the following polynomial identities can be used to justify this method?

   A. $x^2 = (x-5)^2 + 5^2$
   B. $x^2 = (x-5)^2 - 5^2$
   C. $x^2 = (x-5)(x+5) + 5^2$
   D. $x^2 = (x-5)(x+5) - 5^2$

4. Suppose $xy = 9$ and $(x+y)^2 = 21$. What is $x^2 + y^2$?

   A. 3
   B. 12
   C. 36
   D. 81

5. Determine if the set of polynomials is closed under division. Explain why or why not.

   A. The set of polynomials is closed under division.
   Just as multiplication is repeated addition, division is repeated subtraction. Since polynomials are closed under subtraction, they are also closed under division.
   B. The set of polynomials is not closed under division.
   Let $f(x)$ and $g(x)$ be polynomial expressions where $g(x)$ is not equal to zero.
   Then $\frac{f(x)}{g(x)}$ is undefined if $g(x) = 0$. In this case, $\frac{f(x)}{g(x)}$ is not a rational expression, so the set of polynomials is not closed under division.
   C. The set of polynomials is closed under division.
   Since the set of polynomials is closed under multiplication, and division is the inverse operation for multiplication, the set of polynomials is also closed under division.
   D. The set of polynomials is not closed under division.
   Let $f(x)$ and $g(x)$ be polynomial expressions where $g(x)$ is not equal to zero.
   By the definition of polynomial expressions, $\frac{f(x)}{g(x)}$ is not a polynomial expression, so the set of polynomials is not closed under division. (The quotient of two polynomial expressions is a rational expression.)

MAFS.912.A-APR.4.6
Also assesses *MAFS.912.A-APR.2.2*

1. Which expression shows $\frac{x^3-x^2-x+10}{x+2}$ in simplest form?

   A. $x^2 + 5$
   B. $x^2 - 3x + 5$
   C. $x^2 + x + 1 + \frac{12}{x+2}$
   D. $x^2 - 3x + 7 + \frac{4}{x+2}$

2. The expression $\frac{6x^3+17x^2+10x+2}{2x+3}$ equals

   A. $3x^2 + 4x - 1 + \frac{5}{2x+3}$
   B. $6x^2 + 8x - 2 + \frac{5}{2x+3}$
   C. $6x^2 - x + 13 - \frac{37}{2x+3}$
   D. $3x^2 + 13x + \frac{49}{2} + \frac{151}{2x+3}$

3. If k is a constant, what is the value of k such that the polynomial $k^2x^3 - 6kx + 9$ is divisible by $x - 1$? Enter your answer in the box.

4. If dividing the polynomial $f(x)$ by $(x + 4)$ yields a remainder of -11, which of the following is true?

   A. $f(-11) = -4$
   B. $f(-11) = 4$
   C. $f(-4) = -11$
   D. $f(4) = -11$

5. Use an appropriate procedure to show that $(x - 4)$ is a factor of the function $f(x) = 2x^3 - 5x^2 - 11x - 4$. Explain your answer.

MAFS.912.A-CED.1.1
Also assesses *MAFS.912.A-REI.1.2,* and *MAFS.912.A-CED.1.4*

1. John is buying a car for $8,000. The value of the car will decrease by 5% each year. Which equation can he use to predict the value of the car after 3 years?

   A. $y = 8{,}000(0.05)^3$
   B. $y = 8{,}000(1 - 0.5)^3$
   C. $y = 8{,}000(1 - 0.05)^3$
   D. $y = 8{,}000(1 + 0.05)^3$

2. After sitting out of the refrigerator for a while, a turkey at room temperature (68°F) is placed into an oven at 8 a.m., when the oven temperature is 325°F. Newton's Law of Heating explains that the temperature of the turkey will increase proportionally to the difference between the temperature of the turkey and the temperature of the oven, as given by the formula below:

   $$T = T_s + (T_0 + T_s)e^{-kt}$$

   T_s: the temperature surrounding the object.
   T_0: the initial temperature of the object.
   t: the time in hours
   T: the temperature of the object after t hours
   k: decay constant.

   The turkey reaches the temperature of approximately 100° F after 2 hours. Find the value of k, to the *nearest thousandth*, and write an equation to determine the temperature of the turkey after t hours. Determine the Fahrenheit temperature of the turkey, to the *nearest degree*, at 3 p.m.

3. The period for a pendulum to complete one swing is t, the time in seconds. The period can be approximated by the formula $t = 2\pi\sqrt{\frac{l}{9.81}}$, where l is the length of the pendulum in meters. If the period of a pendulum is 2.5 seconds, which is closest to the length of the pendulum?

   A. 1.55 meters
   B. 3.17 meters
   C. 3.90 meters
   D. 9.76 meters

4. What is the solution to $\sqrt{5x + 6} + 3 = 7$?

   A. $x = \frac{4}{5}$
   B. $x = 2$
   C. $x = \frac{34}{5}$
   D. $x = 8$

5. 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. $x=\frac{5}{14}$

6. Solve algebraically for all values of x: $\sqrt{x+5}+x=7$

7. What extraneous solution arises when the equation $\sqrt{x+3}=2x$ is solved for x by first squaring both sides of the equation?
Enter your answer in the box.

8. Determine the solution(s) of the equation.

$$\frac{2m^2+3m-5}{m^2+4m-5}=4$$

Select **ALL** that apply.

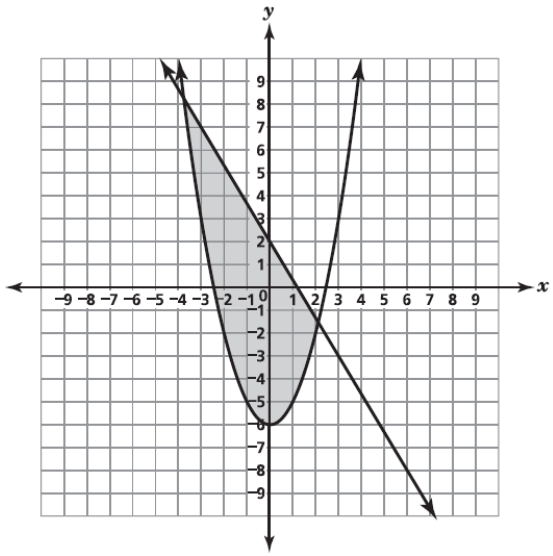
- ☐ -5
- ☐ $-\frac{15}{2}$
- ☐ $-\frac{5}{2}$
- ☐ 0
- ☐ 1

MAFS.912.A-CED.1.2
Also assesses *MAFS.912.A-CED.1.3*, *MAFS.912.A-REI.3.6*, and *MAFS.912.A-REI.3.7*

1. Barry is planning to raise some money for his senior dues. He will sell sports drinks, a, for \$1.65 each and granola bars, b, for \$0.85 each. Which equation models how much money, t, Barry will raise from his sales?

   A. $t = \frac{1.65a}{0.85b}$
   B. $t = 1.65a + 0.85b$
   C. $t = 1.65a - 0.85b$
   D. $t = (1.65a)(0.85b)$

2. Which system of inequalities is best represented by the shaded region of this graph?



   A. $\begin{cases} 3x + 5y \leq 10 \\ x^2 - y \leq 6 \end{cases}$
   B. $\begin{cases} 5x + 3y \leq 6 \\ x^2 - y \leq 6 \end{cases}$
   C. $\begin{cases} 3x + 5y \leq 10 \\ x^2 - y \geq 6 \end{cases}$
   D. $\begin{cases} 5x + 3y \leq 6 \\ x^2 - y \geq 6 \end{cases}$

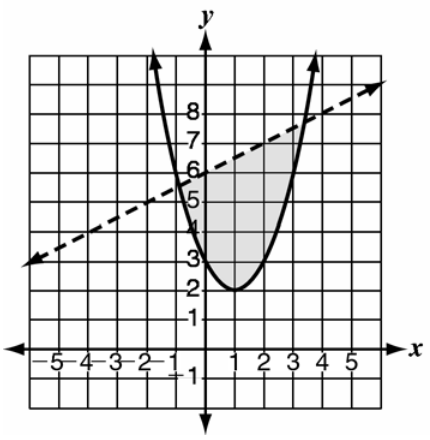
3. Which ordered pair is a solution to this system of equations?

$$\begin{cases} x^2 - 6x + 11 \\ y = -3x + 9 \end{cases}$$

   A. $(6, 1)$
   B. $(4, 0)$
   C. $(2, 3)$
   D. $(1, 0)$

4. Which graph represents the solution set to the system $y \leq (x-1)^2 + 2$ and $y < -\frac{1}{2}x + 6$?

A.



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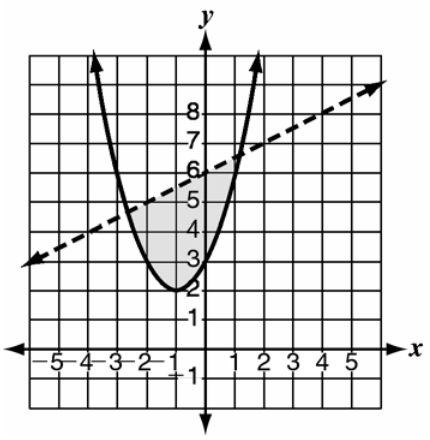

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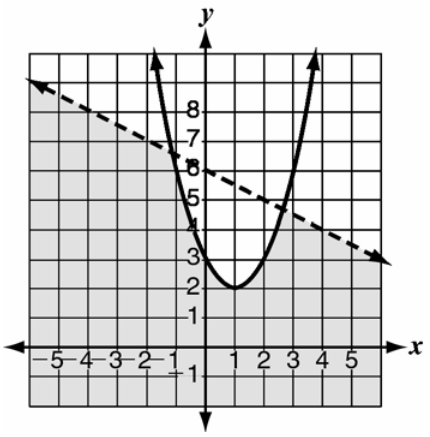
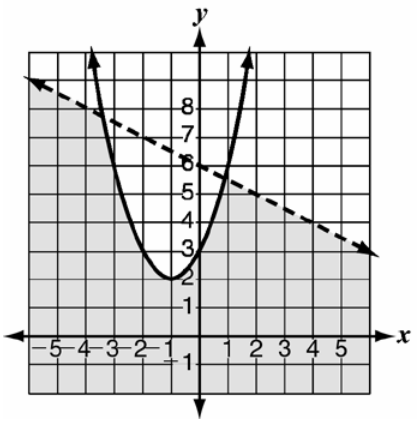


D.



5. What is the value of z in the solution of the system of linear equations?

$$\begin{cases} x - 9y + 4z = 1 \\ -2x + 9y - 4z = -3 \\ 2x + y - 4z = -3 \end{cases}$$

Enter your answer in the box.

6. Solve the system:

$$\begin{cases} 3x - 4y = 100 \\ \frac{x}{3} + \frac{4y}{3} = 100 \end{cases}$$

A. $(0, -25)$
B. $(50, 12.5)$
C. $(50, 100)$
D. $(100, 50)$

7. How many points of intersection does the given system of equations have?

$$\begin{cases} y = 1 - x^2 \\ y = 2 = x \end{cases}$$

A. none
B. one
C. two
D. infinitely many

8. 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. $\{(-1, -2), (6, 26)\}$
D. $\{(-2, -6), (5, 22)\}$

FSA Algebra 2 EOC Review

MAFS.912.A-REI.1.1

1. What process was used to obtain the equation shown in Step 2?

   Step 1: $\frac{x}{5} - \frac{1}{6} = 2$

   Step 2: $6x - 5 = 60$

   A. Added $\frac{1}{6}$ to both sides of the equation.
   B. Added 58 to both sides of the equation.
   C. Multiplied both sides of the equation by 30.
   D. Divide both sides of the equation by 30.

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

MAFS.912.A-REI.4.11

1. Given the functions $h(x) = |x - 4| + 1$ and $k(x) = x^2 + 3$, which intervals contain a value of x for which $h(x) = k(x)$?
   Select **ALL** that apply.

   ☐ $-4.5 < x < -3$
   ☐ $-4.5 < x < -3$
   ☐ $-1.5 < x < 1.5$
   ☐ $1.5 < x < 3$
   ☐ $3 < x < 4.5$

2. Let $f(x) = 14x^3 + 28x^3 - 46x$ and g(x) = 2x + 7. Which is the solution set to the equation $\frac{1}{12} f(x) = g(x)$?

   A. $\{-3, 0, 1\}$
   B. $\{-3, -1, 2\}$
   C. $\{-2, 1, 3\}$
   D. $\{1, 5, 11\}$

3. What is the point of intersection for $f(x) = 2^x$ and $g(x) = \left(\frac{1}{2}\right)^x$?

   A. $(0, 1)$
   B. $(1, 0)$
   C. $\left(1, \frac{1}{2}\right)$
   D. $(2, 4)$

MAFS.912.A-SSE.2.3
Also assesses *MAFS.912.A-SSE.1.1* and *MAFS.912.A-SSE.1.2*

1. A scientist places 7.35 grams of a radioactive element in a dish. The half-life of the element is 2 days. After d days, the number of grams of the element remaining in the dish is given by the function $R(d) = 7.35(\frac{1}{2})^{\frac{d}{2}}$. Which statement is true about the equation when it is rewritten without a fractional exponent?
   Select **ALL** that apply.

- ☐ An approximately equivalent equation is $R(d) = 7.35(0.250)^d$.
- ☐ An approximately equivalent equation is $R(d) = 7.35(0.707)^d$.
- ☐ The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.250 grams per day.
- ☐ The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.707 grams per day.
- ☐ The base of the exponent in this form of the equation can be interpreted to mean that about 25°/o of the element remains from one day to the next day.
- ☐ The base of the exponent in this form of the equation can be interpreted to mean that about 70.7°/o of the element remains from one day to the next day.

2. Which equation is equivalent to the equation shown? Select the correct answer.

   A. $2^{x^2} = 2$
   B. $2^{x^2-x} = 2$
   C. $2^{2x} = 2$
   D. $2^{2x^2-x} = 2$

3. The expression $x^2(x - y)^3 - y^2(x - y)^3$ can be written in the form $(x - y)^a(x + y)$, where a is a constant. What is the value of a?
   Enter your answer in the box.

   ☐

4. What is the completely factored form of $k^4 - 4k^2 + 8k^3 - 32k + 12k^2 - 48$?

   A. $(k-2)(k-2)(k+3)(k+4)$
   B. $(k-2)(k-2)(k+6)(k+2)$
   C. $(k+2)(k-2)(k+3)(k+4)$
   D. $(k+2)(k-2)(k+6)(k+2)$

MAFS.912.N-CN.3.7
Also assesses *MAFS.912.A-REI.2.4*

1. What are the complex solutions to the following equation:

$$0.5x^2 - 0.2x + 0.2 = 0$$

A. $2 \pm 6i$
B. $6 \pm 2i\sqrt{2}$
C. $2 \pm 6i\sqrt{2}$
D. $0.2 \pm 0.6i$

2. What values of x make this equation true?

$$-(2x + 6)^2 + 14 = 30$$

A. $-1, -5$
B. $1, 5$
C. $-3 - 2i, -3 + 2i$
D. $3 + 2i, 3 - 2i$

3. The equation $2x^2 - 5x = -12$ is rewritten in the form of $2(x - p)^2 + q = 0$. What is the value of q?

A. $\frac{167}{16}$
B. $\frac{71}{8}$
C. $\frac{25}{8}$
D. $\frac{25}{16}$

4. The solutions to the equation $-\frac{1}{2}x^2 = -6x + 20$ are

A. $-6 \pm 2i$
B. $-6 \pm 2\sqrt{19}$
C. $6 \pm 2i$
D. $6 \pm 2\sqrt{19}$

5. Solve $x^2 + 25 = 0$ over the set of complex numbers.

A. ± 5
B. $\pm 5i$
C. ± 25
D. $\pm 25i$

MAFS.912.G-GPE.1.2

1. Which equation represents all points, (x, y), that are equidistant from $(-3, 4)$ and the line containing $(1, -5)$ and $(1, 5)$?

   A. $-16(y-4) = (x+3)^2$
   B. $-16(x+3) = (y-4)^2$
   C. $-8(x+1) = (y-4)^2$
   D. $-8(y-4) = (x+1)^2$

2. Which equation represents a parabola with a focus of $(0, 4)$ and a directrix of $y = 2$?

   A. $y = x^2 + 3$
   B. $y = -x^2 + 1$
   C. $y = \frac{x^2}{2} + 3$
   D. $y = \frac{x^2}{4} + 3$

3. A parabola has focus at $(0, 3)$ and vertex at the origin. Which could be the equation of the directrix?

   A. $y = -12$
   B. $y = -3$
   C. $y = 0$
   D. $y = 3$

Functions and Modeling

MAFS.912.F-BF.1.2
Also assesses *MAFS.912.F-BF.1.1* and *MAFS.912.A-SSE.2.4*

1. Which equation can be used to find the nth term for the sequence below?

2, 5, 10, 17, ...

t= term
n = term number

A. $t = n + 3$
B. $t = n^2 + 1$
C. $t = 2n + 1$
D. $t = 3n - 1$

2. Paul started to train for a marathon. The table shows the number of miles Paul ran during each of the first three weeks after he began training.

Week	1	2	3
Distance (miles)	10	12	14.4

If this pattern continues, which of the listed statements could model the number of miles Paul runs a_n, in terms of the number of weeks, n, after he began training? Select **ALL** that apply.

☐ $a_n = 10 + 2(n - 1)$
☐ $a_n = 10n^2$
☐ $a_n = 10(1.2)^{n-1}$
☐ $a_1 = 10, \quad a_n = 1.2a_{n-1}$
☐ $a_1 = 10, \quad a_n = 2 + a_{n-1}$

3. Every day commuting to and from work, Jay drives his car a total of 45 miles. His car already has 2,700 miles on it. Which function shows the total number of miles Jay's car will have been driven after n more days?

A. $d(n) = 60$
B. $d(n) = 60n$
C. $d(n) = 45 + 2{,}700n$
D. $d(n) = 2{,}700 + 45n$

4. The functions f and g are defined by $f(x) = x^2$ and $g(x) = 2x$, respectively. Which equation is equivalent to $h(x) = \frac{f(2x)g(-2x)}{2}$?

A. $h(x) = -2x^3$
B. $h(x) = -8x^3$
C. $h(x) = x^2 - 2x$
D. $h(x) = 2x^2 + 2x$

5. A board is made up of 9 squares. A certain number of pennies is placed in each square, following a geometric sequence. The first square has 1 penny, the second has 2 pennies, the third has 4 pennies, etc. When every square is filled, how many pennies will be used in total?

   A. 512
   B. 511
   C. 256
   D. 81

6. DeShawn is in his fifth year of employment as a patrol officer for the Metro Police. His salary for his first year of employment was $47,000. Each year after the first, his salary increased by 4% of his salary the previous year.

   Part A
   What is the sum of DeShawn's salaries for his first five years of service?

   A. $101,983
   B. $188,000
   C. $219,932
   D. $254,567

   Part B
   If DeShawn continues his employment at the same rate of increase in yearly salary, for which year will the sum of his salaries first exceed $1,000,000? Give your answer to the nearest integer.
   Enter your answer in the box.

7. Monthly mortgage payments can be found using the formula below:

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment
P = amount borrowed
r = annual interest rate
n = number of monthly payments

   The Banks family would like to borrow $120,000 to purchase a home. They qualified for an annual interest rate of 4.8%. Algebraically determine the *fewest* number of whole years the Banks family would need to include in the mortgage agreement in order to have a monthly payment of no more than $720.

MAFS.912.F-BF.2.3

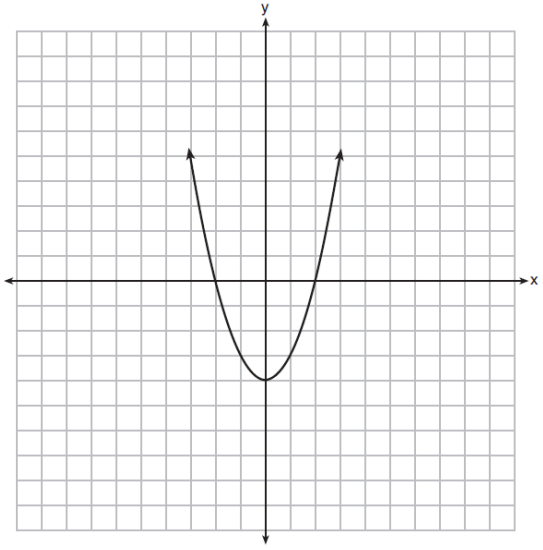
1. How does the graph of the function $g(x) = x^3 + 1$ compare to the parent function $f(x) = x^3$?

   A. shifted up 1 unit
   B. shifted down 1 unit
   C. shifted left 1 unit
   D. shifted right 1 unit

2. Which best describes how the graph will be affected when the quadratic equation $y = 3x^2 + 5$ is changed to $y = 3x^2 - 2$?

   A. The graph moves up 7.
   B. The graph moves down 2.
   C. The graph moves down 7.
   D. The graph moves up 5.

3. The function $f(x)$ is graphed on the set of axes below. On the same set of axes, graph $f(x + 1) + 2$.



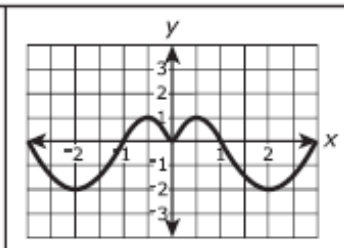
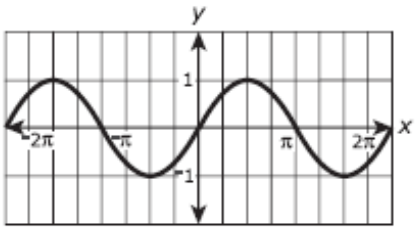
4. Consider the function $g(x) = a(3)^x$, where $a > 0$. What happens to $g(x)$ as the value of a increases?

   A. $g(x)$ will increase at a faster rate.
   B. $g(x)$ will increase at a slower rate.
   C. $g(x)$ will decrease at a faster rate.
   D. $g(x)$ will decrease at a slower rate.

5. Which of the following most accurately describes the translation of the graph $y = -2(x-6)^2 - 1$ to the graph $y = -2(x-4)^2$?

   A. up 1 and 2 to the right
   B. up 1 and 2 to the left
   C. down 1 and 2 to the right
   D. down 1 and 2 to the left

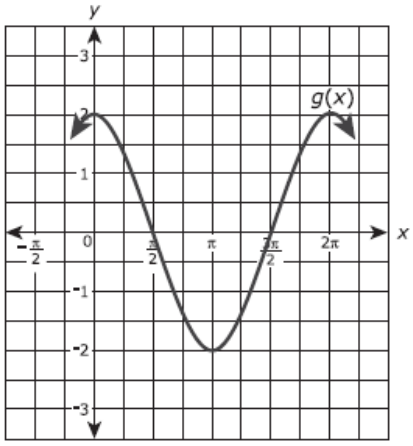
6. Consider the functions $f(x)$ and $g(x)$ described by the equations and the functions $h(x)$ and $k(x)$ shown by graphs.

$f(x) = 3x^2$	$g(x) = -x^3 + 5$	 **h (x)**	 **k (x)**

Which of the statements are true? Select all that apply.

- ☐ f is an odd function.
- ☐ f is neither an even nor odd function.
- ☐ g is an even function.
- ☐ g is neither an even nor odd function.
- ☐ h is an even function.
- ☐ h is an odd function.
- ☐ k is an odd function.

7. **Part A**
   The function $f(x) = cos(x)$. Function $g(x)$ results from a transformation on the function $f(x) = cos(x)$. A portion of the graph of $g(x)$ is shown.

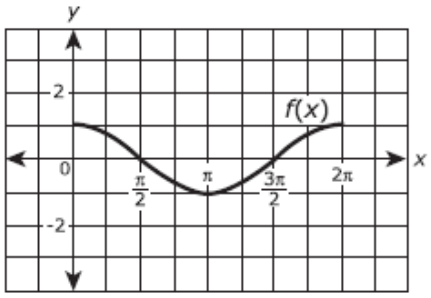


   What is the equation of $g(x)$?

   A. $g(x) = cos\,(x) - 2$
   B. $g(x) = cos(x) + 2$
   C. $g(x) = cos(2x) + 0$
   D. $g(x) = 2cos(x) + 0$

Part B

The graph shows $f(x) = cos(x)$ on the interval $0 \leq x \leq 2\pi$.



Function h is a transformation of such that $h(x) = -f(x)$. Which of the following statements is true? Select **EACH** correct statement.

- ☐ Function f is an even function.
- ☐ Function f is an odd function.
- ☐ Function f is neither an even nor odd function.
- ☐ Function h is an even function.
- ☐ Function h is an odd function.
- ☐ Function h is neither an even nor odd function.

MAFS.912.F-BF.2.4

1. Which function is the inverse of $f(x) = x^3 - 6$?

   A. $f^{-1}(x) = x^3 + 6$
   B. $f^{-1}(x) = \sqrt[3]{x} + 6$
   C. $f^{-1}(x) = \sqrt[3]{x} - 6$
   D. $f^{-1}(x) = \sqrt[3]{x + 6}$

2. Which function is the inverse of $f(x) = \frac{1}{2}x - 4$?

   A. $f^{-1}(x) = \frac{1}{2}x + 2$
   B. $f^{-1}(x) = \frac{1}{2}x + 4$
   C. $f^{-1}(x) = 2x + 4$
   D. $f^{-1}(x) = 2x + 8$

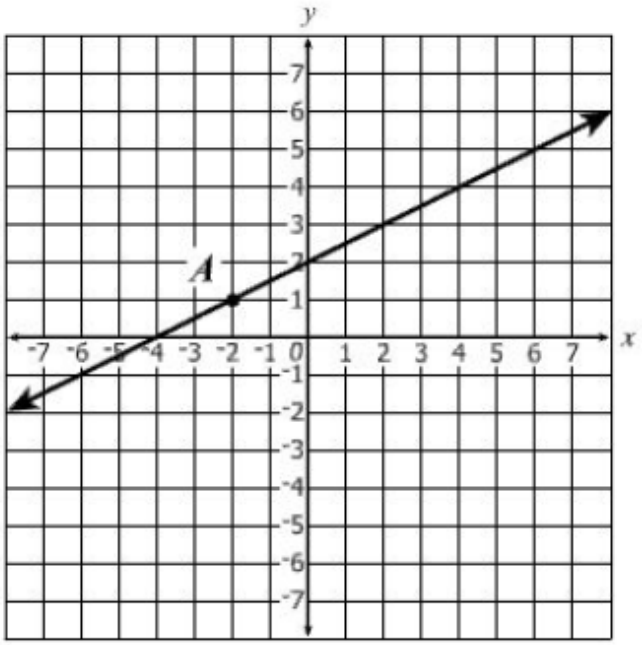
3. What is the inverse of $g(x) = \sqrt{(5x - 2)} + 1$, for all $x \geq \frac{2}{5}$?

   A. $g^{-1}(x) = \frac{(x-1)^2+2}{5}$
   B. $g^{-1}(x) = \frac{(x-1)^2}{5} + 2$
   C. $g^{-1}(x) = \frac{(x+1)^2-2}{5}$
   D. $g^{-1}(x) = \frac{(x+1)^2}{5} - 2$

4. If $f(x) = x^2 + 3x$ and $g(x) = 2x^2$, what is $g(f(-1))$?

   A. -4
   B. 0
   C. 8
   D. 10

5. 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 $f^{-1}(x)$.



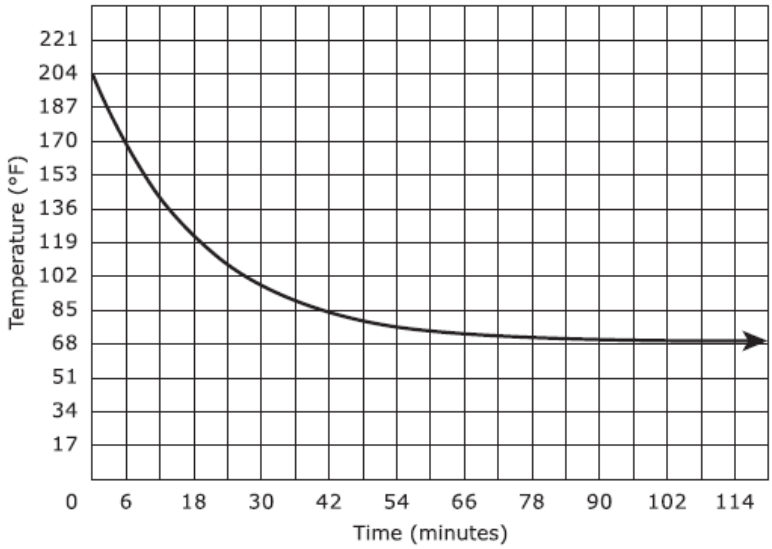
MAFS.912.F-IF.2.4

Also assesses MAFS.912.F-IF.3.9, MAFS.912.F-IF.2.5, and MAFS.912.F-LE.2.5

1. Which function has an x −intercept of 7?

   A. $y = 7 + x^2$
   B. $y = 7 - x^2$
   C. $y = \sqrt{7} - \sqrt{x}$
   D. $y = \sqrt{7} + \sqrt{x}$

2. The graph represents the temperature, in degrees Fahrenheit $(°F)$, of tea for the first 120 minutes after it was poured into a cup.



Part A

Based on the graph, what was the temperature of the tea when it was first poured into the cup?

A. 68°
B. 114°
C. 136°
D. 204°

Part B

Based on the graph, as the number of minutes increased, what temperature did the tea approach?

A. 68°
B. 114°
C. 136°
D. 204°

3. Which function has a minimum value of 0?

   A. $y = -x^3$
   B. $y = x^3$
   C. $y = -x^4$
   D. $y = x^4$

4. Which function has a y-intercept of -3?

   A. $y = (x-3)^5$
   B. $y = x^5 - 3$
   C. $y = (-3x)^5$
   D. $y = -3x^5$

5. 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. $-\infty < x < \infty$

6. Which table(s) represent a function with the same y-intercept as $f(x) = 2^x$?

Table 1

x	y
1	4
2	8
3	16
4	32
5	64

Table 2

x	y
1	4
2	16
3	64
4	256
5	1,024

Table 3

x	y
1	1
2	2
3	4
4	8
5	16

   A. table 2 only
   B. table 3 only
   C. tables 1 and 2
   D. tables 1 and 3

7. A box with an open top will be constructed from a rectangular piece of cardboard.
   - The piece of cardboard is 8 inches wide and 12 inches long.
   - The box will be constructed by cutting out equal squares of side x at each corner and then folding up the sides.

   What is the entire domain for the function $V(x)$ that gives the volume of the box as a function of x?

   A. $0 < x < 4$
   B. $0 < x < 6$
   C. $0 < x < 8$
   D. $0 < x < 12$

8. The number of maps remaining at an information booth can be modeled by the function $f(x) = 274 - 32x$, where x is the number of hours that have elapsed since the booth opened. Which statement is true?

   A. Every hour, 274 maps are given away.
   B. Every hour, 242 maps are given away.
   C. There were 32 maps at the booth before it opened.
   D. There were 274 maps at the booth before it opened.

MAFS.912.F-IF.3.8

Also assesses MAFS.912.A-APR.2.3, MAFS.912.F-IF.2.6, and MAFS.912.F-IF.3.7a, b, c, d, and e.

1. What are the real zeros of the function $(x) = x^3 + 6x^2 - 13x - 42$?

   A. $-7, -3, -2$
   B. $-7, 3, -2$
   C. $-7, 3, 2$
   D. $7, 3, -2$

2. The graph of a polynomial function has the following x-intercepts: -3, 1, and 4. Which of these expressions represents such a function?

   A. $(x - 1)(x + 3)(x - 4)$
   B. $(x + 1)(x - 3)(x + 4)$
   C. $(x + 1)(-3x + 1)(4x + 1)$
   D. $(x - 1)(-3x - 1)(4x - 1)$

3. Identify ALL the points where the graph of $h(x) = (x + 1)(x^2 + 8\text{x} + 16)$ intersects the x-axis.

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

1. Which function has x −intercepts of 2 and -5?

   A. $f(x) = x^2 + 2x - 5$
   B. $f(x) = x^2 - 3x - 10$
   C. $f(x) = x^2 + 3x - 10$
   D. $f(x) = x^2 + 7x + 10$

2. If $z > 0$ and $z^x z^y = 81$, what is the value of z?

   ☐

3. Which statement is incorrect for the graph of the function $y = -3cos\left[\frac{\pi}{3}(x - 4)\right] + 7$?

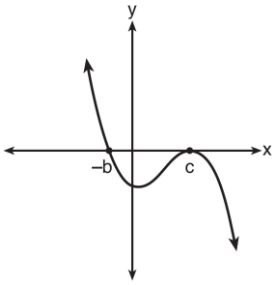
   A. The period is 6.
   B. The amplitude is 3.
   C. The range is [4,10].
   D. The midline is $y = -4$.

4. As x approaches negative infinity, which of the following describes the end behavior of $f(x) = -x^7 + bx^3 + c$?

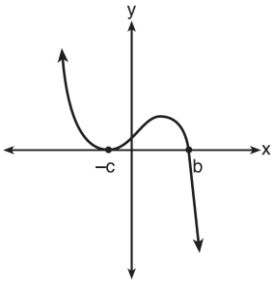
   A. $f(x)$ approaches c.
   B. $f(x)$ approaches 0.
   C. $f(x)$ approaches positive infinity.
   D. $f(x)$ approaches negative infinity.

5. If a, b, and c are all positive real numbers, which graph could represent the sketch of the graph of $p(x) = -a(x + b)(x^2 - 2cx + c^2)$

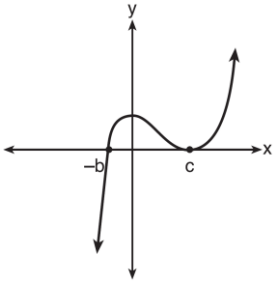
A.



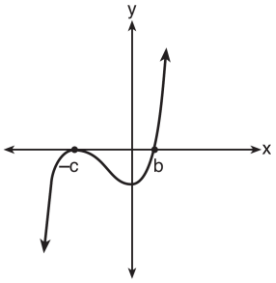
B.



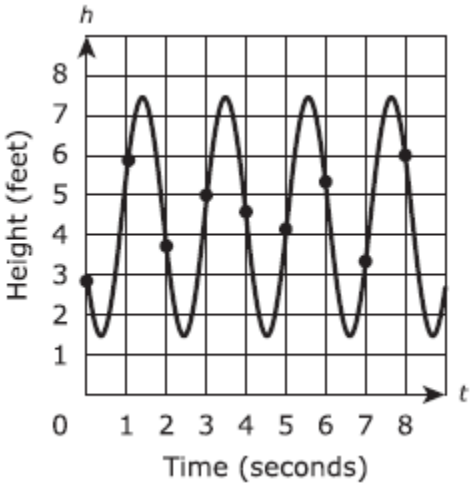
C.



D.



6. The graph models the height h above the ground, in feet, at time t, in seconds, of a person swinging on a swing. Each point indicated on the graph represents the height of the person above the ground at the end of each one-second interval.



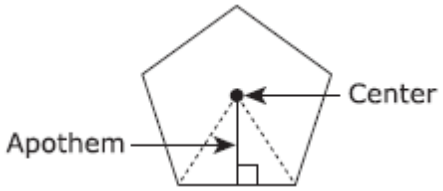
Select **two** time intervals for which the average rate of change in the height of the person is approximately $-\frac{1}{2}$ feet per second.

- ☐ from 0 seconds to 1second
- ☐ from 1second to 2 seconds
- ☐ from 2 seconds to 3 seconds
- ☐ from 3 seconds to 4 seconds
- ☐ from 4 seconds to 5 seconds
- ☐ from 5 seconds to 6 seconds
- ☐ from 6 seconds to 7 seconds

Select **each** statement that is true about the graph of $f(x) = sin(x + 3) - 2$.

- ☐ Amplitude: 1
- ☐ Amplitude: 2
- ☐ Midline: $y = 2$
- ☐ y −intercept: (0, -2)
- ☐ x −intercept: (0, 0)

7. The apothem of a regular polygon is the distance from the center to any side.



If the length of the apothem remains constant at 10 inches, the formula for the perimeter of a regular polygon as a function of the number of sides n is $P(n) = 10(tan\frac{360°}{2n})(2n)$.
As the regular polygon changes from a pentagon (5 sides) to an octagon (8 sides), what is the approximate average rate of change in the perimeter?

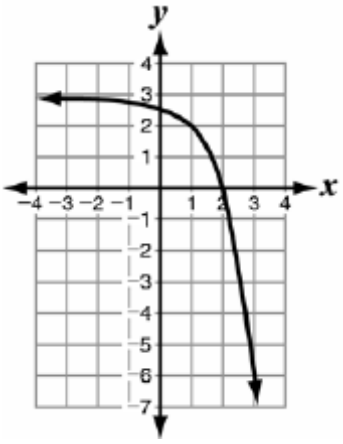
A. decrease of 0.80 inches for each additional side
B. decrease of 2.13 inches for each additional side
C. decrease of 4.56 inches for each additional side
D. decrease of 6.38 inches for each additional side

8. At the beginning of an experiment, the number of bacteria in a colony was counted at time $t = 0$ The number of bacteria in the colony minutes after the initial count is modeled by the function $b(t) = 4(2)^t$ Which value and unit represent the average rate of change in the number of bacteria for the first 5 minutes of the experiment?

Select ALL that apply.

- ☐ 24.0
- ☐ 24.8
- ☐ 25.4
- ☐ 25.6
- ☐ Bacteria
- ☐ Minutes
- ☐ Bacteria per minute
- ☐ Minutes per bacteria

9. Which function is represented by the graph?

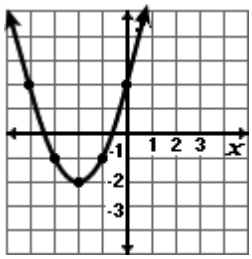


A. $y = -3^x + 3$
B. $y = -\left(\frac{1}{3}\right)^x + 3$
C. $y = -3^{x-1} + 3$
D. $y = -\left(\frac{1}{3}\right)^{x-1} + 3$

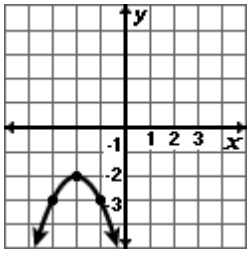
10. Which is the graph of the following function?

$$y = (x-2)^2 - 2$$

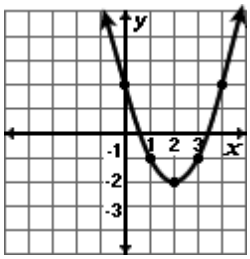
A.



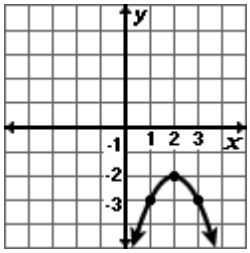
B.



C.



D.

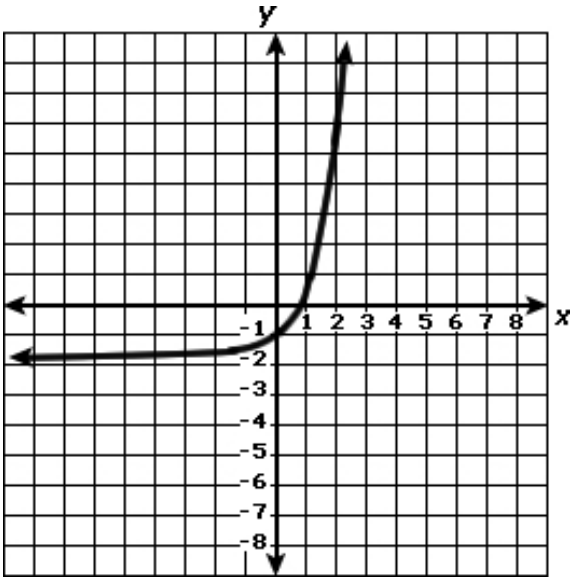


11. What is the equation of the horizontal asymptote of the graph of the following equation?

$$f(x) = 4^{(x+1)} - 10$$

A. $y = 4$
B. $y = 0$
C. $y = -1$
D. $y = -10$

12. Which function is represented by the graph below?



A. $y = e^x - 2$
B. $y = e^x + 2$
C. $y = 2 - e^x$
D. $y = -2 - e^x$

MAFS.912.F-LE.1.4

Also assesses MAFS.912.F-BF.2.a

1. Carol invests her money in an account that is compounded continuously at a rate of 1.5%. Which expression represents the number of years it will take for her investment to triple?

   A. $\frac{ln3}{1.5}$

   B. $\frac{ln3}{0.015}$

   C. $\frac{ln1.5}{3}$

   D. $\frac{ln0.015}{3}$

2. Which values are solutions to the equation? Select **ALL** that apply.

   ☐ -2

   ☐ -1

   ☐ $-\frac{1}{2}$

   ☐ $\frac{1}{2}$

   ☐ 1

   ☐ 2

3. Which equation has the same solution as $\log_4(x+7) = 5$?

   A. $4^{x+7} = 5$

   B. $5^{x+7} = 5$

   C. $5^4 = x + 7$

   D. $5^4 = x + 7$

4. Aaron invested $4000 in an account that paid an interest rate r compounded continuously. After 10 years he has $5809.81. The compound interest formula is $A = Pe^{rt}$, where P is the principal (the initial investment), A is the total amount of money (principal plus interest), r is the annual interest rate, and t is the time in years.

   Part A

   Divide both sides of the formula by P and then use logarithms to rewrite the formula without an exponent. Show your work.

   Part B

   Using your answer for Part A as a starting point, solve the compound interest formula for the interest rate r.

   Part C

   Use your equation from Part A to determine the interest rate.

MAFS.912.F-TF.1.2

Also assesses MAFS.912.F-TF.1.1 and MAFS.912.F-TF.3.8

1. The diameter of a circle is 8 centimeters. A central angle of the circle intercepts an arc of 12 centimeters. What is the radian measure of the angle?

   A. $\frac{3}{2}$
   B. 3
   C. 4
   D. 8π

2. Angle $\emptyset$ is in Quadrant II, and $sin\emptyset = \frac{4}{5}$. What is the value of $cos\emptyset$?

   A. $\frac{4}{5}$
   B. $\frac{3}{5}$
   C. $-\frac{3}{5}$
   D. $-\frac{4}{5}$

3. If the terminal side of angle θ, in standard position, passes through point $(-4, 3)$, what is the numerical value of $\sin\theta$?

   A. $\frac{3}{5}$
   B. $\frac{4}{5}$
   C. $-\frac{3}{5}$
   D. $-\frac{4}{5}$

4. Angle ∂ is in Quadrant IV, with $\cos\partial = \frac{4}{5}$. What is $\sin\partial$?

   A. $-\frac{3}{4}$
   B. $-\frac{3}{5}$
   C. $\frac{9}{25}$
   D. $\frac{3}{5}$

5. Which degree measure is equivalent to $\frac{11\pi}{18}$?

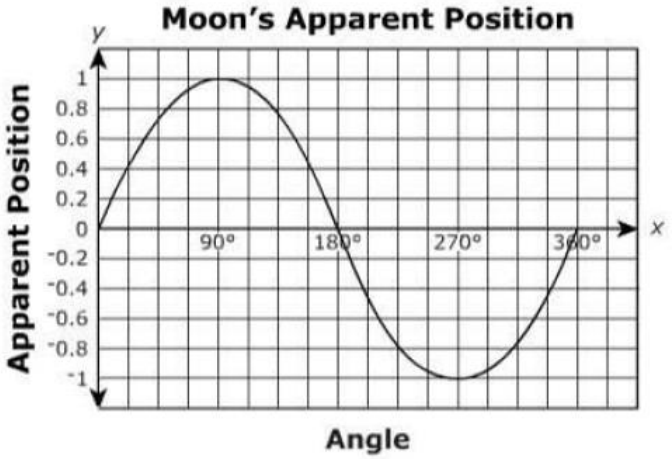
   A. $220°$
   B. $110°$
   C. $55°$
   D. $10°$

MAFS.912.F-TF.2.5

1. A wave on an oscilloscope has an amplitude of 2 millimeters and a frequency of 550 cycles per second. The wave can be modeled by a cosine function. Which equation best represents h, the height in millimeters from the equilibrium position, as a function of t, the time in seconds?

   A. $h = \cos(550\pi t)$
   B. $h = \cos(1100\pi t)$
   C. $h = 2\cos(550\pi t)$
   D. $h = 2\cos(1100\pi t)$

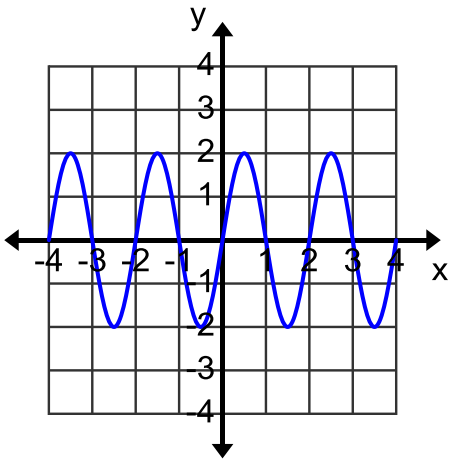
2. The apparent position of a moon varies sinusoidally with the changing angle from a line of sight as it orbits Jupiter. The moon's apparent position is shown in the graph below.



   Which are the closest amplitude and period of the moon's orbit?

   A. Amplitude = 0.5 and Period = 180°
   B. Amplitude = 0.5 and Period = 360°
   C. Amplitude = 1 and Period = 180°
   D. Amplitude = 1 and Period = 360°

3. Which is the equation of the graph shown below?



   A. $f(x) = 2\sin \pi x$
   B. $f(x) = 2\sin 2\pi x$
   C. $f(x) = \frac{1}{2}\sin \pi x$
   D. $f(x) = \frac{1}{2}\sin \frac{\pi}{2} x$

4. The graph of which function has a period of π and an amplitude of π?

   A. $y = \frac{1}{\pi}\sin 2x$

   B. $y = \pi \sin 2x$

   C. $y = \frac{1}{\pi}\sin\frac{1}{2}x$

   D. $y = \pi \sin\frac{1}{2}x$

Statistics, Probability, and the Number System

MAFS.912.N-CN.1.2
Also assesses *MAFS.912.N-CN.1.1*

1. For the products listed, i represents the imaginary unit. Which of the products are real numbers? Select **ALL** that apply.

   ☐ $(8 - 2i)(8 + 2i)$
   ☐ $(8 - 2i)(5i)$
   ☐ $(3)(5i)$
   ☐ $(3)(-4)$
   ☐ $(i)(8 + 2i)$
   ☐ $(i)(5i)$

2. What is the complex conjugate of $\sqrt{-400} + 17$?

   A. $20 - 17i$
   B. $20 + 17i$
   C. $17 - 20i$
   D. $17 + 20i$

3. Which is equivalent to $(2 - 5i)(-2 + 5i)$?

   A. 21
   B. -29
   C. $21 + 20i$
   D. $-29 - 20i$

4. Write $(5 + 2yi)(4 - 3i) - (5 - 2yi)(4 - 3i)$ in $a + bi$ form, where y is a real number.

   ☐

5. What component of a complex number does the term 6i represent in the following expression?

$$8 + 6i$$

   A. irrational number
   B. fractional number
   C. real number
   D. imaginary number

MAFS.912.N-RN.1.2
Also assesses MAFS.912.N-RN.1.1

1. If $\sqrt{\sqrt[3]{(x+1)^5}} = (x+1)^a$, for $x \geq -1$, and a is a constant, what is the value of a?

   A. $\frac{3}{10}$
   B. $\frac{5}{6}$
   C. $\frac{5}{3}$
   D. $\frac{10}{3}$

2. Given that $x > 0$, which expression is equivalent to $5\sqrt{xy} + 25\sqrt{x}$?

   A. $5(xy)^{-1} + 25x^{-1}$
   B. $25x^{\frac{1}{2}}(\sqrt{y} + 5)$
   C. $\sqrt{x}(25y^{\frac{1}{2}} + 5)$
   D. $5x^{\frac{1}{2}}(y^{\frac{1}{2}} + 5)$

3. Use the properties of rational exponents to determine the value of y for the equation:

$$\frac{\sqrt[3]{x^8}}{(x^4)^{\frac{1}{3}}} = x^y, x > 1$$

FSA Algebra 2 EOC Review

MAFS.912.S-CP.1.1

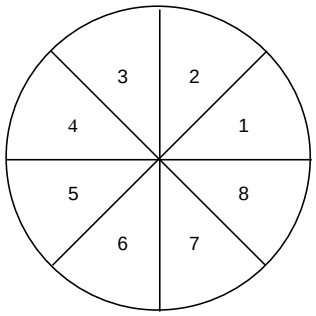
1. The set of all outcomes of a rolled die is {1, 2, 3, 4, 5, 6}. What is the complement of the subset {1, 2}?

   A. {3, 4, 5, 6}
   B. {1, 2}
   C. {5, 6}
   D. There is not enough information to determine.

2. Let U be the set of all integers from 1 to 10. Let A = {1, 3, 6, 7} and B = {2, 3}.
   Which choice describes the set {4, 5, 8, 9, 10}?

   A. $\overline{A \cap B}$
   B. $A \cap B$
   C. $\overline{A \cup B}$
   D. $A \cup B$

3. You spin the numbered spinner shown below. Event A is landing on a prime number. Event B is landing on an odd number. What is the intersection of A and B?



   A. ∅
   B. $\{3, 5, 7\}$
   C. $\{1, 2, 3, 5, 7\}$
   D. $\{1, 2, 3, 4, 5, 6, 7, 8\}$

MAFS.912.S-CP.1.5

Also assesses *MAFS.912.S-CP.1.4, MAFS.912.S-CP.1.2, MAFS.912.S-CP.1.3,* and *MAFS.912.S-CP.2.6*

1. Whenever Sara rents a movie, the probability that it is a horror movie is 0.57. Of the next five movies she rents, determine the probability, to the nearest hundredth, that no more than two of these rentals are horror movies. Enter your answer in the box.

2. The two-way table shows the classification of students in a mathematics class by gender and dominant hand. A student who is ambidextrous uses both hands equally well.

	Right-handed	Left-handed	Ambidextrous	Total
Male	11	4	1	16
Female	12	2	0	14
Total	23	6	1	30

Part A

What is the probability that a randomly selected student in the class is female given that the student is right-handed?

A. $\frac{1}{12}$

B. $\frac{12}{30}$

C. $\frac{12}{23}$

D. $\frac{23}{30}$

Part B

One student will be selected at random from the class.

Consider the events:

- X the selected student is female
- Y the selected student is right-handed

Which statement about events X and Y is true?

A. The events are independent because the number of right-handed students in the class is larger than the number of female students.

B. The events are independent because the number of categories for dominant hand is different from the number of categories for gender.

C. The events are not independent because for one of the dominant hand categories the number of female students is 0.

D. The events are not independent because the probability of X is not equal to the probability of X given Y.

3. Olivia selects marbles from a bag containing 5 red and 7 blue marbles. Which of the following events are independent?

   A. selecting two red marbles in one pick
   B. selecting a red and blue marble in one pick
   C. selecting one red and one blue in two picks with replacement
   D. selecting one red and one blue in two picks without replacement

4. If events A and B are independent, which statement must be true about the conditional probability of A given B?

   A. The probability of event A > the conditional probability of event B given A.
   B. The probability of event A = the conditional probability of event B given A.
   C. The probability of event A > the conditional probability of event A given B.
   D. The probability of event A = the conditional probability of event A given B.

5. The results of a poll of 200 students are shown in the table below:

	Preferred Music Style		
	Techno	**Rap**	**Country**
Female	54	25	27
Male	36	40	18

   For this group of students, do these data suggest that gender and preferred music styles are independent of each other? Justify your answer.

6. At Lincoln Heights Junior High, students have the option to participate in two electives, Art and Band. Seventy-five percent of the students participate in Art and 55% participate in Band. What is the probability that a student is enrolled in Band given that the same student is enrolled in Art?

   A. 40%
   B. 55%
   C. 65%
   D. 73%

MAFS.912.S-CP.2.7

1. The probability that Flight 9876 will be late is 0.27. The probability that Flight 123 will be late is 0.11. The probability that both flights will be late is 0.09. What is the probability that Flight 9876 or Flight 123 will be late?

   A. 0.47
   B. 0.38
   C. 0.29
   D. 0.07

2. A geneticist is studying a population of fruit flies. Of the 1278 flies, 467 are wingless and 446 have red eyes. There are 210 flies that are wingless whose eyes are not red. What is the approximate probability that a fly is wingless or has red eyes?

   A. 0.49
   B. 0.51
   C. 0.71
   D. 0.88

3. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

   A. 80%
   B. 20%
   C. 85.7%
   D. 14.3%

4. The sections on a spinner are numbered from 1 through 8. If the probability of landing on a given section is the same for all the sections, what is the probability of spinning a number less than 4 or greater than 7 in a single spin?

   A. $\frac{1}{2}$
   B. $\frac{1}{8}$
   C. $\frac{3}{8}$
   D. $\frac{5}{8}$

FSA Algebra 2 EOC Review

MAFS.912.S-IC.1.1

1. A reporter wants to know the percentage of voters in the state who support building a new highway. What is the reporter's population?

   A. the number of people who live in the state
   B. the people who were interviewed in the state
   C. all voters over 25 years old in the state
   D. all eligible voters in the state

2. The General Social Survey (GSS) finds that 28% of the 1500 people interviewed do not approve of capital punishment. The number 28% is

   A. A confidence level
   B. A random digit
   C. A parameter
   D. A statistic

3. At Rosa's summer job with a research company, she must get a representative sample of people from her town to answer a question about health habits. Which of the following methods could be used to get a representative sample?

   A. Selecting people who are in the hospital
   B. Gathering responses from women who own businesses in town.
   C. Selecting people randomly from a computer list
   D. Selecting every 10^{th} person as they enter a fast-food restaurant.

4. Jean polled a random sample from a population and calculated a sample statistic. Jean can use this statistic to draw an inference about what?

   A. the corresponding sample parameter
   B. the population size
   C. the corresponding population statistic
   D. the corresponding population parameter

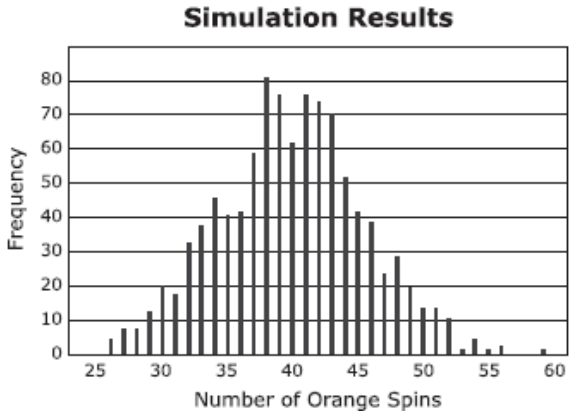
MAFS.912.S-IC.2.3

Also assesses *MAFS.912.S-IC.1.2, MAFS.912.S-IC.2.4, MAFS.912.S-IC.2.5,* and *MAFS.912.S-IC.2.6*

1. Which survey is least likely to contain bias?

   A. surveying a sample of people leaving a movie theater to determine which flavor of ice cream is the most popular
   B. surveying the members of a football team to determine the most watched TV sport
   C. surveying a sample of people leaving a library to determine the average number of books a person reads in a year
   D. surveying a sample of people leaving a gym to determine the average number of hours a person exercises per week

2. A circular spinner is divided into five sectors of different colors. A student spun the arrow on the spinner 200 times and recorded that the arrow stopped on the orange sector 38 times out of the 200 spins. To test whether the spinner was fair, the student used a computer to simulate the number of times the arrow stops on orange in 200 spins of a fair spinner equally divided into five sectors of different colors. The results of 1,000 trials of the simulation are shown.



   Based on the results of the simulation, is there statistical evidence that the spinner is not fair?

   A. Yes, because 38 was the most frequent outcome.
   B. Yes, because about 8°/o of the outcomes were 38.
   C. No, because the distribution is approximately normal.
   D. No, because an outcome of 38 or less is not unusual.

3. A study is done to determine which steroid cream is more effective for bug bites. If the only bug bites treated in this study were mosquito bites, which of the following is true?

   A. The steroid cream that is found to be the best will work for all bug bites.
   B. The steroid cream that is found to be the best will work only for mosquito bites.
   C. The study will only be able to produce results concerning the effect of the steroid creams on mosquito bites.
   D. The observational study is inherently biased.

4. A recent claim has been made that people who have an iPad spend more time on the iPad than people who spend time on their Tablets. After all calculations are performed, the study noted the t statistic to be 2.8, with 24 degrees of freedom, a two-tail test, and a significance level of 0.01. Is there truly a significant difference between the two data sets?

   A. Yes, because $p > \alpha$
   B. Yes, because $p < \alpha$
   C. No, because $p < \alpha$
   D. No, because $p > \alpha$

5. A company specializing in building robots that clean your house has found that the average amount of time kids spend cleaning their houses is about 2 hours per week. If their sample size was 1000 randomly chosen kids and the standard deviation was 0.3 hours, what is the margin of error for a confidence interval of 95%?

   A. 0.392
   B. 0.018
   C. 0.039
   D. 0.185

6. A researcher is studying the effects of aspirin on the sleep patterns of patients. Which scenario describes an observational study?

   A. Find 100 patients who regularly suffer from headaches, 50 of whom regularly use aspirin, and SO of whom use an alternative medication. Over a 2-month period, collect data on the sleep patterns of the 100 patients, analyze the data, and draw conclusions.
   B. Find 100 patients who regularly suffer from headaches. Randomly assign SO of the patients to an aspirin treatment, and assign the others to an alternative treatment. Over a 2-month period, collect data on the sleep patterns of the 100 patients, analyze the data, and draw conclusions.
   C. Find 100 patients who suffer from sleep disorders. Assign 50 of the patients to an aspirin treatment, and assign the others to an alternative treatment. Over a 2-month period, collect data on the sleep patterns of the 100 patients, analyze the data, and draw conclusions.
   D. Find 100 patients who regularly take aspirin. Randomly select SO of the patients to stop their aspirin treatments and to take an alternative medicine instead. Over a 2-month period, collect data on the sleep patterns of the 100 patients, analyze the data, and draw conclusions.

7. A grocery store manager wants to determine how many servings of fresh fruit her adult customers eat per day. She randomly surveys adult customers in the produce aisle of her store about their eating habits. Which statement best explains why her survey could be biased?

   A. The sample does not include children.
   B. The produce aisle contains more than just fresh fruit.
   C. Adults who do not eat fresh fruit are less likely to shop in a local grocery store.
   D. Adults who do not eat fresh fruit are less likely to be found in the produce aisle.

8. In order to assess the opinion of students at the University of Michigan on campus snow removal, a reporter for the student newspaper interviews the first 12 students he meets who are willing to express their opinion. In this case, the sample is

   A. All those students favoring prompt snow removal
   B. All students at universities receiving substantial snow
   C. The 12 students interviewed
   D. All students at the University of Michigan

9. The manager of food services at a local high school is interested in assessing student opinion about a new lunch menu in the school cafeteria. The manager is planning to conduct a sample survey of the student population.

   Part A
   Which of the listed methods of sample selection would be the most effective at reducing bias?

   A. Randomly select one day of the week and then select the first 30 students who enter the cafeteria on that day.
   B. Post the survey on the school Web site and use the first 30 surveys that are submitted.
   C. Randomly select 30 students from a list of all the students in the school.
   D. Randomly select one classroom in the school and then select the first 30 students who enter that classroom.

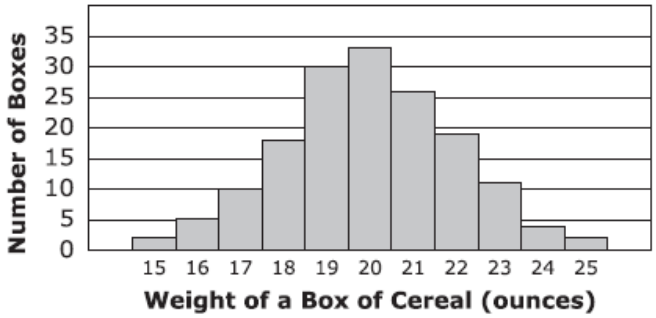
   Part B
   The manager wants to know if a student's gender is related to the student's opinion about the menu. Which statement **best** describes the study?

   A. This is an observational study and therefore the manager will be able to establish a cause-and-effect relationship between gender and opinion.
   B. This is an observational study and therefore the manager will not be able to establish a cause-and-effect relationship between gender and opinion.
   C. This is an experimental study and therefore the manager will be able to establish a cause-and-effect relationship between gender and opinion.
   D. This is an experimental study and therefore the manager will not be able to establish a cause-and-effect relationship between gender and opinion.

MAFS.912.S-ID.1.4

1. In a certain school, the heights of the population of girls are normally distributed, with a mean of 63 inches and a standard deviation of 2 inches. If there are 450 girls in the school, determine how many of the girls are shorter than 60 inches. Round the answer to the nearest integer.
   Enter your answer in the box.

2. The distribution of weights (rounded to the nearest whole number) of all boxes of a certain cereal is approximately normal with mean 20 ounces and standard deviation 2 ounces.
   A sample of the cereal boxes was selected, and the weights of the selected boxes are summarized in the histogram shown.



Part A
If w is the weight of a box of cereal, which range of weights includes all of the weights of cereal boxes that are within 1.5 standard deviations of the mean?

A. $17 \leq w \leq 23$
B. $18.5 \leq w \leq 21.5$
C. $19 \leq w \leq 21$
D. $20 \leq w \leq 23$

Part B
Which of these values is the best estimate of the number of boxes in the sample with weights that are more than 1.5 standard deviations above the mean?

A. 2
B. 6
C. 17
D. 36

3. In a set of test scores that are normally distributed, a test score of 76 is 3 standard deviations below the mean. A score of 88 is 1 standard deviation above the mean. What is the mean of the data?

A. 79
B. 82
C. 84
D. 85

4. Automobile manufacturers have to design the driver's seat area so that both tall and short adults can sit comfortably, reach all the controls and pedals, and see through the windshield. Suppose a new car is designed so that these conditions are met for people from 58 inches to 76 inches tall.
The heights of adult men in the United States are approximately normally distributed with a mean of 70 inches and a standard deviation of 3 inches. Heights of adult women are approximately normally distributed with a mean of 64.5 inches and a standard deviation of 2.5 inches.

   What percentage of men in the United States is this car not designed to accommodate? Enter your answer in the box.

   What percentage of women in the United States is this car not designed to accommodate? Enter your answer in the box.

5. The mileages of the vehicles in a government fleet are normally distributed with a mean of 60,000 miles and a standard deviation of 8,000 miles. If a vehicle from the fleet is randomly selected, which is closest to the probability that the mileage is greater than 44,000 miles?

   A. 0.48
   B. 0.68
   C. 0.95
   D. 0.98

6. The mean of a normal distribution is 70 with a standard deviation of 5. If a value is randomly selected from this distribution, which is closest to the probability that the selected value is greater than or equal to 75?

   A. 0.16
   B. 0.34
   C. 0.66
   D. 0.84

7. 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%

APPENDIX

Achievement Level Descriptions

ALGEBRA AND MODELING				
Standard	**Level 2**	**Level 3**	**Level 4**	**Level 5**
MAFS.912.A- APR.1.1	adds two polynomials with integral coefficients, including adding when multiplying a constant to one or both polynomials using the distributive property is required	adds and subtracts polynomials, including adding or subtracting when one or both polynomials is multiplied by a monomial or binomial, with a degree no greater than 1	completes an informal argument on closure; applies multiple operations (excluding division) when simplifying polynomials	explains closure for polynomials
MAFS.912.A- CED.1.1	writes or chooses a one-variable linear equation or inequality in a real-world context	writes or chooses a simple exponential (no horizontal or vertical translation) or a simple quadratic equation	writes an exponential equation with a horizontal or vertical translation or a quadratic equation; identifies the meaning of the variables	employs the modeling cycle when writing an equation
MAFS.912.A- REI.2.3	solves linear equations (with variable on one side and simple benchmark fractions as the coefficient; may require the use of the distributive property and adding like terms) and inequalities (with a variable on one side and positive coefficient that may include a simple benchmark fraction as the coefficient) in one variable	solves linear equations and inequalities in one variable, where the variable is included on both sides of the equal sign or inequality, that require up to three steps to isolate the variable with rational coefficients	solves linear equations in one variable, including equations where one coefficient is represented by a letter and requires up to three steps to isolate the variable; solves compound inequalities in one variable	solves linear equations and inequalities in one variable, including equations with coefficients represented by letters that require up to four steps to isolate the variable
MAFS.912.A- CED.1.4	solves a literal linear equation in a real-world context for a variable whose coefficient is 1	solves a literal equation that requires two procedural steps	solves a literal equation that requires three procedural steps	solves a literal equation that requires four procedural steps
MAFS.912.A- CED.1.2	writes or chooses a two-variable linear equation for a real-world context with integral coefficients	writes or chooses a system of linear equations or writes a single equation that has at least three variables with integral coefficients	writes a system of linear equations or writes a single equation that has at least three variables; correctly identifies the meaning of the variables	employs the modeling cycle when writing equations that have two variables
MAFS.912.A- REI.3.5	identifies an equivalent system of two equations in two variables that has a multiple of one of the equations of the original system	identifies an equivalent system that has a sum of the original as one of the equations and a multiple of the other	identifies systems that have the same solutions	justifies why multiple equivalent systems would have the same solution

Standard	Level 2	Level 3	Level 4	Level 5
MAFS.912.A- REI.3.6	solves a system of linear equations approximately when given a graph of the system; solves a system of equations using elimination in the form of ax + by = c and dx + ey = f with integral coefficients, where only one equation requires multiplication; solves a simple system of equations that require substitution	explains whether a system of equations has one, infinitely many, or no solutions; solves a system of equations by graphing or substitution (manipulation of equations may be required) or elimination in the form of ax + by = c and dx + ey = f, where multiplication is required for both equations	solves a system of equations with rational coefficients by graphing, substitution, or elimination; interprets solutions in a real-world context	[intentionally left blank]
MAFS.912.A- REI.4.12	identifies a solution region when the graph of a linear inequality is given	graphs solutions of the system of two linear inequalities and identifies the solution set as a region of the coordinate plane that satisfies both inequalities; if the form is written in ax + by < c format, then a, b, and c should be integers	verifies ordered pairs as being a part of the solution set of a system of inequalities	justifies why an ordered pair is a part of a solution set
MAFS.912.A- CED.1.3	identifies constraints that are constant values or simple linear equations/inequalities in a real-world context	identifies variables; writes constraints as a system of linear inequalities or linear equations	models constraints using a combination of linear equations/inequalities; interprets solutions as viable or nonviable based on the context	employs the modeling cycle when writing constraints
MAFS.912.A- REI.1.1	chooses the correct justifications for the steps in a two-step equation, ax + b = c	chooses the correct justifications for the steps in an equation of the form a(bx +c) = d or ax + b = cx + d, where a, b, c, and d are integers	explains and justifies the steps in an equation of the form a(bx +c) = d or ax + b = cx + d, where a, b, c, and d are rational numbers	explains and justifies the steps in an equation of the form a(bx +c) = d(ex +f) , where a, b, c, d, e, and f are rational numbers
MAFS.912.A- REI.4.11	determines an integral solution for f(x) = g(x) given a graph or a table of a linear, quadratic, or exponential function, in a mathematical or real-world context	determines a solution to the nearest tenth for f(x) = g(x) given a graph or a table	completes an explanation on how to find an approximate solution to the nearest tenth for f(x) = g(x) given a graph or a table	explains how to find an approximate solution to the nearest tenth for f(x) = g(x) given a graph or a table and justifies why the intersection of two functions is a solution to f(x) = g(x)
MAFS.912.A- REI.4.10	distinguishes between coordinates that are solutions to linear equations in two variables and those that are not	distinguishes between coordinates that are solutions to equations in two variables (quadratic or exponential) and those that are not	recognizes that a graph is the set of all the solutions of a given equation	justifies that a graph is the set of all the solutions of an equation

Standard	Level 2	Level 3	Level 4	Level 5
MAFS.912. A- SSE.2.3a, b, and c	uses properties of exponents (one operation) and identifies the new base of an exponential function; explains the properties of the a in $y = ab^x$ in a real-world context	factors the difference of two squares with a degree of 2 and trinomials with a degree of 2 and explains the properties of the zeros; completes the square when the leading coefficient is 1 and explains the properties of the maximum or minimum; uses the properties of exponents and names the new rate	factors the difference of two squares with a common integral factor, trinomials with a common integral factor and a leading coefficient having more than four factors and explains the properties of the zeros; completes the square when the leading coefficient is greater than 1 and explains the properties of the maximum or minimum; transforms exponential functions that have more than one operation and explains the properties of expression	explains the differences between equivalent forms and why an equivalent form would provide the required property
MAFS.912. A- SSE.1.1	interprets coefficients or terms of exponential and quadratic expressions in a real-world context	interprets factors of exponential and quadratic expressions	interprets more than one part of an expression	given an interpretation, chooses the correct part of the expression
MAFS.912. A- SSE.1.2	works with expressions with only monomial factors and chooses the correct equivalent forms of a trinomial whose leading coefficient is 1	factors the difference of two squares with a degree of 2, trinomials with a degree of 2 whose leading coefficient has no more than 4 factors	factors the difference of two squares with a common integral factor, trinomials with a common integral factor and a leading coefficient with more than four factors	factors the difference of two squares with a degree of 4 with or without a common integral factor, and a polynomial with a degree of 3 and a leading coefficient of 1
FUNCTIONS AND MODELING				
Standard	**Level 2**	**Level 3**	**Level 4**	**Level 5**
MAFS.912. F- BF.2.3	identifies the graph, the equation, or ordered pairs of a linear, quadratic, or exponential function with a vertical or horizontal shift	identifies the graph of a linear or quadratic function with a vertical or horizontal stretch or shrink; determines the value of k given a graph and its transformation; completes a table of values for a function that has a vertical or horizontal shift; graphs a function with a vertical or horizontal shift	identifies the graph of an exponential function with a vertical or horizontal stretch or shrink; completes a table of values for a function with a horizontal or vertical stretch or shrink	determines the value of k when given a set of ordered pairs for two functions or a table of values for two functions; identifies differences and similarities between a function and its transformation

Standard	Level 2	Level 3	Level 4	Level 5
MAFS.912. F- IF.1.2	evaluates simple functions in their domains; evaluates functions for a simple quadratic, simple square root, and simple exponential	evaluates quadratic, polynomial of degree 3, absolute value, square root, and exponential functions for inputs in their domain; interprets statements that use function notation in terms of a real-world context for simple quadratic, simple square root, and simple exponential	uses function notation to evaluate functions for inputs in their domain and interprets statements that use function notation in terms of context	writes and evaluates functions when the function is described in a real-world context
MAFS.912. F- IF.1.1	uses the definition of a function to identify whether a relation represented by a graph, a table, mapping, diagrams, or sets of ordered pairs is a function	demonstrates understanding that a function's domain is assigned to exactly one element of the range in function notation	applies and extends knowledge of domain and range to real world situations and contexts; justifies that a relation is a function using the definition of a function	[intentionally left blank]
MAFS.912. F- IF.2.5	interprets and identifies domains of linear functions when presented with a graph in a real-world context	interprets and identifies domains of quadratic or exponential functions (with no translation) when presented with a graph; interprets and identifies the domain of a linear function from a context	relates the domains of linear, quadratic, or exponential functions to a graph when the function is described within the context	interprets and identifies domains of linear, quadratic, or exponential functions when presented a function described within the context
MAFS.912. F- IF.2.4	identifies the key features (as listed in the standard, excluding periodicity) when given a linear, quadratic, or exponential graph in a real-world context	interprets the key features (as listed in the standard, excluding periodicity) when given a table of a linear, quadratic, or exponential; interprets key features of a linear function given as a verbal description	interprets key features of a quadratic function given as a verbal description	interprets key features of an exponential function given as a verbal description
MAFS.912. F- IF.3.9	compares properties of two linear functions, each represented a different way in a real-world or mathematical context	compares the properties of two functions of the same type with different representations (such as a quadratic to a quadratic but using a table and an equation); differentiates between linear and quadratic functions that are represented using different representations (table, graph, or algebraic)	compares properties of two functions (linear, quadratic, or exponential), each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions); differentiates between exponential and quadratic functions that are represented using different representations (table, graph, or algebraic)	compares properties of two functions (linear, quadratic, or exponential) when at least one function is described verbally; differentiates between two functions (linear, quadratic, or exponential) when at least one is described verbally

Standard	Level 2	Level 3	Level 4	Level 5
MAFS.912.F- IF.2.6 S-ID.3.7	calculates the average rate of change of a function represented by a graph, table of values, or set of data in a real-world context (which may or may not be linear)	interprets the average rate of change of a function represented by a graph, table of values, or set of data or a linear regression equation; calculates the average rate of change when given a quadratic or exponential function presented algebraically; interprets the y-intercept of a linear regression equation	determines the units of a rate of change for a function presented algebraically; uses an interpretation to identify the graph	explains the interpretation, using units, of the rate of change and/or the y-intercept within the context
MAFS.912.F- IF.3.8a	finds zeros of quadratics of the form $ax^2 + b = c$, where a, b, and c are integers; interprets the zero contextually; real-world or mathematical contexts	factors the difference of two squares with a degree of 2, and trinomials with a degree of 2 whose leading coefficient has up to 4 factors and interprets the zeros; completes the square when the leading coefficient is 1; interprets the extreme values	factors quadratics with a common integral factor and a leading coefficient with more than four factors and interprets the zeros; completes the square when the leading coefficient is greater than 1 and b/(2a) is an integer; interprets the extreme values	interprets the axis of symmetry
MAFS.912.F- IF.3.8b	uses properties of exponents (one operation) and identifies the new base of an exponential function; interprets the a in $y = ab^x$	uses the properties of exponents and interprets the new base, in terms of a rate	transforms exponential functions that have more than one operation and explains the properties of the expressions within a real-world context	compares and contrasts different forms of exponential functions using a real-world context
MAFS.912.A- APR.2.3	identifies the zeros of a function from a graph	identifies the graph of a function given in factored form for a polynomial whose leading coefficient is a positive integer	creates a rough graph given a polynomial function in factored form whose leading coefficient is an integer in a real-world or mathematical context	uses the x-intercepts of a polynomial function and end behavior to graph the function in a real-world or mathematical context
MAFS.912.F-IF.3.7a and e	identifies the graph of a linear, simple quadratic, or simple exponential function given its equation	constructs the graph of a linear function, quadratic, or exponential given its equation; constructs a linear function using x- and y-intercepts	constructs the graph of a quadratic function given the x- and y-intercepts or vertex and end behavior; key features can be presented in both a mathematical and a real-world context	constructs the graph of an exponential function given the x- and y-intercepts and end behavior
MAFS.912.F- LE.1.1a, b, c	identifies relationships in tables and graphs that can be modeled with linear functions (constant rate of change) and with exponential functions (exponential rate of change)	proves that linear functions grow by equal differences over equal intervals; proves that exponential functions grow by equal factors over equal intervals; identifies the constant rate or rate of growth or decay; chooses an explanation as to why a context may be modeled by a linear or exponential function	identifies situations given as a written description in a real-world context in which one quantity changes at a constant rate per unit interval relative to another or grows by equal factors over equal intervals	[intentionally left blank]

Standard	Level 2	Level 3	Level 4	Level 5
MAFS.912.F- LE.2.5	identifies which values are constant from a given context	interprets the slope and x- and y-intercepts in a linear function; interprets the base value and vertical shifts in an exponential function of the form $f(x) = b^x + k$, where b is an integer and k can equal zero; in a real-world context	interprets the base value and initial value in an exponential function of the form $f(x) = ab^x$, where b is an integer and can be any positive integer	[intentionally left blank]
MAFS.912.F- LE.1.2	constructs linear functions of arithmetic sequences when given a graph in a real-world context	constructs linear functions, including arithmetic sequences, given a graph or input-output pairs; constructs exponential functions, including geometric sequences given a graph	constructs linear functions and exponential functions, including arithmetic sequences and geometric sequences, given input-output pairs, including those in a table	constructs linear and exponential functions, including arithmetic and geometric sequences, given the description of a relationship
MAFS.912.F- BF.1.1a	recognizes an explicit expression that is linear for arithmetic sequences whose common difference is an integer in a real-world context	writes an explicit function for arithmetic sequences and geometric sequences; writes a recursive formula for an arithmetic sequence; completes a table of calculations	writes a recursive formula for a geometric sequence	writes a recursive formula for a sequence that is not arithmetic or geometric
MAFS.912.F- BF.1.1b, c	combines standard function types using addition and subtraction when the functions are given within a real-world context	combines standard function types using addition, subtraction, and multiplication when the functions are given within the context; writes a composition of functions that involve two linear functions in a real-world context	writes a composition of functions that involve linear and quadratic functions	writes a new function that uses both a composition of functions and operations
MAFS.912.F- IF.1.3	identifies an arithmetic sequence as a linear function when the sequence is presented as a sequence	identifies an arithmetic sequence as a linear function when the sequence is presented as a graph or table; identifies that a geometric sequence is a function when the sequence is presented as a sequence, graph, or table; recognizes the domain of a sequence as a set of integers or a subset of integers	identifies non-arithmetic and non-geometric sequences as a function when given as a sequence	identifies non-arithmetic and non-geometric sequences as a function when given as a graph or table; explains why the domain of sequences are a set or a subset of integers

Standard	Level 2	Level 3	Level 4	Level 5
MAFS.912. F- LE.1.3	given graphs or a linear and exponential function on the same coordinate plane, describes how the graphs compare; identifies which function is a linear function, an exponential function, or a quadratic function given in a real-world context by interpreting the functions' graphs or tables	identifies that an exponential growth function will eventually increase faster than a linear function or a quadratic function given in a real-world context by interpreting the functions' tables	identifies that a quantity increasing exponentially eventually exceeds a quantity increasing linearly using graphs and tables; explains that an exponential growth function will eventually increase faster than a linear function or a quadratic function given in a real-world context by interpreting the functions' graphs or tables	describes and compares the changes of behavior between a linear and an exponential function including the approximate point(s) of intersection; justifies that an exponential function will eventually increase faster than a linear function or a quadratic function given in a real-world context by interpreting the functions' graphs or tables using rates
STATISTICS, PROBABILITY, AND THE NUMBER SYSTEM				
Standard	**Level 2**	**Level 3**	**Level 4**	**Level 5**
MAFS.912. N- RN.1.2	converts radical notation to rational exponent notation and vice versa	identifies equivalent forms of expressions involving rational exponents and radical expressions where there is one operation	identifies equivalent forms of expressions involving rational exponents and radical expressions where there are two operations	[intentionally left blank]
MAFS.912. N- RN.1.1	applies and explains properties of integer exponents	defines rational exponents by extending the properties of integer exponents	explains and uses the meaning of rational exponents in terms of properties of integer exponents, and uses notation for radicals in terms of rational exponents	proves the properties of rational exponents (which are an extension of the properties of integer exponents)
MAFS.912. N- RN.2.3	[intentionally left blank]	completes an informal proof to show that a sum or product of two rational numbers is rational, that the sum of a rational number and an irrational number is irrational, and that the product of a nonzero rational number and an irrational number is irrational	generalizes rules for sum and product properties of rational and irrational numbers	[intentionally left blank]
MAFS.912. S- ID.1.1	identifies dot plots, histograms, and box plots for a given set of data in a real-world context	uses real-world data (represented in a table or in another display) to create dot plots, histograms, or box plots applying correct labels for components and/or axes, applying appropriate scale in a graph	completes a dot plot, histogram, or box plot for data that requires some interpretation or inference	determines and justifies which type of data plot would be most appropriate for a set of data; identifies advantages and disadvantages of different types of data plots

Standard	Level 2	Level 3	Level 4	Level 5
MAFS.912.S- ID.1.2 & S- ID.1.3	determines the mean/median and interquartile range of a single set of data from a visual representation (e.g., table)	interprets the difference in mean, median, and interquartile range in the context of a data set and compares the similarities or differences in mean, median, and interquartile range between two sets of data; predicts the effect of an outlier on the shape and center of a data set; uses the empirical rule with data values that are one or more standard deviation about the mean	explains similarities and differences using specific measures of center and spread, given two sets of data; predicts the effect of an outlier on the spread of a data set; uses the empirical rule with two data values that have integers as standard deviations, up to 3, above or below the mean	plots data based on situations with multiple data sets, and then compares and discusses using measures of center and spread, normal distribution; justifies which measure(s) are most appropriate for comparison; identifies advantages and disadvantages of using each measure of center and spread
MAFS.912.A- REI.2.4a &b	solves quadratic equations of the form $x^2 + c = d$, where c and d are rational numbers by simple inspection or by taking square roots	solves quadratic equations of the form $x^2 + bx + c = d$, where b, c, and d are integers by completing the square, factoring, or using the quadratic formula; validates why taking the square root of both sides when solving a quadratic will yield two solutions	solves quadratic equations of the form $ax^2 + bx + c = d$, where a, b, c, and d are integers and b/a is an even integer; recognizes that a quadratic can yield nonreal solutions and that the quadratic formula is used to find complex solutions; completes steps in the derivation of the quadratic formula	determines if a quadratic will yield complex solutions; derives the quadratic formula