The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA I (Common Core)

Thursday, June 16, 2016 — 9:15 a.m. to 12:15 p.m.

MODEL RESPONSE SET

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Given that \( f(x) = 2x + 1 \), find \( g(x) \) if \( g(x) = 2[f(x)]^2 - 1 \).

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

**Score 2:** The student gave a complete and correct response.
25 Given that \( f(x) = 2x + 1 \), find \( g(x) \) if \( g(x) = 2[f(x)]^2 - 1 \).

\[
2[2x+1]^2 - 1
\]

Score 2: The student gave a complete and correct response.
Given that \( f(x) = 2x + 1 \), find \( g(x) \) if \( g(x) = 2[f(x)]^2 - 1 \).

\[
\begin{align*}
g(x) &= 2(f(x))^2 - 1 \\
g(x) &= 2(2x+1)^2 - 1 \\
g(x) &= 2(4x^2 + 4x + 1) - 1 \\
g(x) &= 8x^2 + 8x + 2 - 1 \\
g(x) &= 8x^2 + 8x + 1 \\
\end{align*}
\]

**Score 1:** The student made an error when squaring the binomial.
Given that \( f(x) = 2x + 1 \), find \( g(x) \) if \( g(x) = 2[f(x)]^2 - 1 \).

**Score 0:** The student gave a completely incorrect response.
26 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

\[ 144 \] RATIONAL

\[ \rightarrow \] 144 CAN BE WRITTEN AS A FRACTION

Score 2: The student gave a complete and correct response.
Question 26

26 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

I multiplied it on my calculator and got 144 which is rational because it's an integer.

Score 2: The student gave a complete and correct response.
26 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

\[ 24 \cdot \sqrt{36} \]

\[ 24 \cdot 6 \]  

\[ \text{both are rational} \]

**Score 1:** The student wrote an incomplete explanation.
Question 26

26 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

\[
(4.242640687)(33.9411255) = 144
\]

\[\text{Rational}\]

Score 1: The student did not write an explanation.
26 Determine if the product of $3\sqrt{2}$ and $8\sqrt{18}$ is rational or irrational. Explain your answer.

I believe that it is irrational because it cannot be written as a fraction. Both answers come out as decimals.

Score 0: The student gave an irrelevant response.
27 On the set of axes below, draw the graph of \( y = x^2 - 4x - 1 \).

State the equation of the axis of symmetry.

\[ x = 2 \]

**Score 2:** The student gave a complete and correct response.
Question 27

27 On the set of axes below, draw the graph of $y = x^2 - 4x - 1$.

State the equation of the axis of symmetry.

$$x = \frac{-b}{2a} = \frac{4}{2}$$

Score 2: The student gave a complete and correct response.
Question 27

27 On the set of axes below, draw the graph of \( y = x^2 - 4x - 1 \).

State the equation of the axis of symmetry.

\[
\begin{align*}
\text{Axis of Symmetry: } & \quad x = \frac{-b}{2a} \\
& \quad x = 2 \\
\text{Vertex: } & \quad (2, -5) \\
\text{y-intercept: } & \quad y = -5
\end{align*}
\]

Score 1: The student did not indicate which boxed-in response was the equation of the axis of symmetry.
27 On the set of axes below, draw the graph of \( y = x^2 - 4x - 1 \).

State the equation of the axis of symmetry.

**Score 1:** The student used a scale other than one on the \( y \)-axis, but did not label it on the graph.
27 On the set of axes below, draw the graph of \( y = x^2 - 4x - 1 \).

State the equation of the axis of symmetry.

\[
\frac{-b}{2a} = \frac{4}{2} = \frac{4}{2} = 2
\]

**Score 1:** The student did not write the axis of symmetry as \( x = 2 \).
27 On the set of axes below, draw the graph of \( y = x^2 - 4x - 1 \).

State the equation of the axis of symmetry.

**Score 0:** The student did not indicate that the graph continues beyond \((-1,4)\) and \((5,4)\), and did not write the equation of the axis of symmetry.
28 Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and $-6$. Do you agree with Amy’s solutions? Explain why or why not.

She is correct because when the solutions are substituted for $x$, and the equation is solved, both sides equal 0.

Score 2: The student gave a complete and correct response.
28 Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and $-6$. Do you agree with Amy’s solutions? Explain why or why not.

$$\left(2x - 7\right)\left(x + 6\right)$$

Yes, because when you solve for the zeroes using the factoring method, the factors of the equation are $2x - 7$ and $x + 6$. If you set those equal to 0, then you would get $\frac{7}{2}$ and $-6$ as the zeroes.

**Score 2:** The student gave a complete and correct response.
Question 28

28 Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and $-6$. Do you agree with Amy's solutions? Explain why or why not.

Yes

When I graphed the equation on my calculator it crossed the x-axis at 3.5 and -6.

Score 2: The student gave a complete and correct response.
28 Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and $-6$. Do you agree with Amy’s solutions? Explain why or why not.

Yes the solutions are $\frac{7}{2}$ and $-6$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-5 \pm \sqrt{25 + 4(2)(42)}}{2(2)}$$

$$x = \frac{-5 \pm \sqrt{19}}{4}$$

$$x = \frac{-5 + 19}{4} = \frac{7}{2}$$

$$x = \frac{-5 - 19}{4} = -6$$

**Score 1:** The student justified that the solutions are $\frac{7}{2}$ and $-6$, but did not write an explanation.
Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and $-6$. Do you agree with Amy's solutions? Explain why or why not.

No, I do not agree with Amy's solutions because the right answers are $-3.5$ and $6$.

**Score 1:** The student made a factoring error, but wrote an appropriate explanation.
28 Amy solved the equation $2x^2 + 5x - 42 = 0$. She stated that the solutions to the equation were $\frac{7}{2}$ and $-6$. Do you agree with Amy’s solutions? Explain why or why not.

Score 0: The student wrote yes, but did not write an explanation.
Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points \((-3,4)\) and \((6,1)\). Sue wrote \(y - 4 = -\frac{1}{3}(x + 3)\) and Kathy wrote \(y = -\frac{1}{3}x + 3\). Justify why both students are correct.

Score 2: The student gave a complete and correct response.
Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points \((-3,4)\) and \((6,1)\). Sue wrote \(y - 4 = -\frac{1}{3}(x + 3)\) and Kathy wrote \(y = -\frac{1}{3}x + 3\). Justify why both students are correct.

They are both correct because as I plugged the equations in the calculator, and they both have the same points, \((-3,4)\) and \((6,1)\) on the table.

**Score 2:** The student gave a complete and correct response.
Question 29

29 Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points \((-3,4)\) and \((6,1)\). Sue wrote \(y - 4 = -\frac{1}{3}(x + 3)\) and Kathy wrote \(y = -\frac{1}{3}x + 3\). Justify why both students are correct.

The students are both correct because the graph show two lines declining but they both go through \((-3,4)\) \((6,1)\). The two lines are on one another so they went through the same points.

Score 2: The student gave a complete and correct response.
29 Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points (−3,4) and (6,1). Sue wrote \( y - 4 = -\frac{1}{3}(x + 3) \) and Kathy wrote \( y = -\frac{1}{3}x + 3 \). Justify why both students are correct.

Both students are correct because they are just doing different representations of the same equation. Kathy wrote it in the \( y = mx + b \) format while Sue wrote it in the point-slope format. They are both the same equations just in different forms.

Score 1: The student wrote an incomplete justification because no work was shown to demonstrate that the equations are the same.
Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points \((-3,4)\) and \((6,1)\). Sue wrote \(y - 4 = -\frac{1}{3}(x + 3)\) and Kathy wrote \(y = -\frac{1}{3}x + 3\). Justify why both students are correct.

\[
\frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 4}{6 - (-3)} = \frac{-3}{9} \rightarrow \frac{-1}{3}
\]

\[
\text{Sue} \rightarrow y - 4 = -\frac{1}{3}(x + 3) \rightarrow \frac{-1}{3}
\]

\[
y - 4 = -\frac{1}{3}x + \frac{-1}{3}
\]

\[
\text{Kathy} \rightarrow y = -\frac{1}{3}x + 3
\]

**Score 1:** The student wrote an incomplete justification.
Question 29

29 Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points (−3, 4) and (6, 1). Sue wrote $y - 4 = -\frac{1}{3}(x + 3)$ and Kathy wrote $y = -\frac{1}{3}x + 3$. Justify why both students are correct.

Both students are correct because they both used the same equation except Sue put $y = 4 = \frac{1}{3}(x + 3)$ and Kathy wrote $y = -\frac{1}{3}x + 3$. They just used different numbers in some places.

Score 0: The student rewrote the question, but did not provide a justification.
During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m.

If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?

\[ \frac{4 - 0}{3 - 0} = \frac{4}{3} \]

It represents the rate at which snow falls per hour. \((\frac{1}{2} \text{ in. every hour})\)

**Score 2:** The student gave a complete and correct response.
30 During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m.

If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?

Score 2: The student gave a complete and correct response.
30 During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m.

If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?

The amount of snow increases as time increases.

Score 1: The student wrote an explanation that did not include inches and hours.
30 During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m.

If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?

If she were to graph this data, then the slope of the line would represent that every half hour, the snow increased by half an inch.

Score 1: The student made an error in the explanation by writing “every half hour.”
30 During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m.

If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?

The slope of the line represents the amount of inches of snow on the ground at different times.

Score 0: The student gave a completely incorrect response.
During a recent snowstorm in Red Hook, NY, Jaime noted that there were 4 inches of snow on the ground at 3:00 p.m., and there were 6 inches of snow on the ground at 7:00 p.m.

If she were to graph these data, what does the slope of the line connecting these two points represent in the context of this problem?

The slope of the line represents an increase of the value of snow on the ground.

Score 0: The student gave a completely incorrect response.
The formula for the sum of the degree measures of the interior angles of a polygon is 
$S = 180(n - 2)$. Solve for $n$, the number of sides of the polygon, in terms of $S$.

$S = 180(n - 2)$

$S = 180n - 360 + 360 + 360$

$S + 360 = 180n$

$n = \frac{S + 360}{180}$

Score 2: The student gave a complete and correct response.
Question 31

31 The formula for the sum of the degree measures of the interior angles of a polygon is $S = 180(n - 2)$. Solve for $n$, the number of sides of the polygon, in terms of $S$.

\[ S = 180n - 360 \]

\[ \frac{180n - S + 360}{180} \]

\[ n = \frac{S}{180} + 2 \]

Score 2: The student gave a complete and correct response.
31 The formula for the sum of the degree measures of the interior angles of a polygon is $S = 180(n - 2)$. Solve for $n$, the number of sides of the polygon, in terms of $S$.

\[
\frac{S}{180} = n - \frac{360}{180} + \frac{360}{180}
\]

\[
\frac{S}{180} + \frac{360}{180} = n
\]

**Score 1:** The student did not divide 360 by 180.
31 The formula for the sum of the degree measures of the interior angles of a polygon is $S = 180(n - 2)$. Solve for $n$, the number of sides of the polygon, in terms of $S$.

\[
S = 180(n - 2) \\
S = 180n + \frac{2 \times 360}{n} \\
S = 180
\]

Score 0: The student gave a completely incorrect response.
32 In the diagram below, \( f(x) = x^3 + 2x^2 \) is graphed. Also graphed is \( g(x) \), the result of a translation of \( f(x) \).

Determine an equation of \( g(x) \). Explain your reasoning.

\[
g(x) = x^3 + 2x^2 - 4
\]

Translated down 4 units.

Score 2: The student gave a complete and correct response.
32 In the diagram below, \( f(x) = x^3 + 2x^2 \) is graphed. Also graphed is \( g(x) \), the result of a translation of \( f(x) \).

Determine an equation of \( g(x) \). Explain your reasoning.

\[
g(x) = \frac{1}{4}x^3 + \frac{1}{4}x^2
\]

\( \text{// it is a translation y down} \)

Score 1: The student wrote a correct explanation, but the equation is incorrect.
32 In the diagram below, \( f(x) = x^3 + 2x^2 \) is graphed. Also graphed is \( g(x) \), the result of a translation of \( f(x) \).

Determine an equation of \( g(x) \). Explain your reasoning.

Score 0: The student gave a completely incorrect response.
33 The height, \( H \), in feet, of an object dropped from the top of a building after \( t \) seconds is given by 
\[ H(t) = -16t^2 + 144. \]

How many feet did the object fall between one and two seconds after it was dropped?

After the first second, the object was 128 feet from the ground and after 2 seconds, the object was 80 feet from the ground. That means that it fell 48 feet between 1 and 2 seconds.

Determine, algebraically, how many seconds it will take for the object to reach the ground.

\[
\begin{align*}
0 &= -16t^2 + 144 \\
-144 &= -16t^2 + 144 \\
-16 &= -16t^2 \\
1 &= t^2 \\
\sqrt{1} &= t \\
1 &= t \\
3 &= t
\end{align*}
\]

It will take 3 seconds for the object to reach the ground.

Score 4: The student gave a complete and correct response.
33 The height, \( H \), in feet, of an object dropped from the top of a building after \( t \) seconds is given by \( H(t) = -16t^2 + 144 \).

How many feet did the object fall between one and two seconds after it was dropped?

\[
\begin{align*}
H(1) &= 128 \\
H(2) &= 80 \\
128 - 80 &= 48
\end{align*}
\]

Determine, algebraically, how many seconds it will take for the object to reach the ground.

\[
\begin{align*}
6t^2 - 144 &= 0 \\
4(4t^2 - 36) &= 0 \\
4(2t + 6)(2t - 6) &= 0 \\
2t &= -6, 2t &= 6 \\
t &= -3, t &= 3
\end{align*}
\]

**Score 4:** The student gave a complete and correct response.
The height, $H$, in feet, of an object dropped from the top of a building after $t$ seconds is given by $H(t) = -16t^2 + 144$.

How many feet did the object fall between one and two seconds after it was dropped?

\[
\begin{align*}
H(1) &= -16(1)^2 + 144 = 128 \\
H(2) &= -16(2)^2 + 144 = 80
\end{align*}
\]

The object fell 48 feet.

Determine, algebraically, how many seconds it will take for the object to reach the ground.

\[
H(t) = -16t^2 + 144 = 0
\]

3 seconds

Score 3: The student did not determine 3 algebraically.
33 The height, $H$, in feet, of an object dropped from the top of a building after $t$ seconds is given by $H(t) = -16t^2 + 144$.

How many feet did the object fall between one and two seconds after it was dropped?

\[32\]

Determine, algebraically, how many seconds it will take for the object to reach the ground.

\[0 = -16t^2 + 144\]
\[t^2 - 9 = 0\]
\[t = 3\]

**Score 2:** The student showed appropriate algebraic work to determine 3.
33 The height, $H$, in feet, of an object dropped from the top of a building after $t$ seconds is given by $H(t) = -16t^2 + 144$.

How many feet did the object fall between one and two seconds after it was dropped?

$$H(1) = -16(1)^2 + 144$$

$$H(2) = -16(2)^2 + 144$$

$$H(1) = 80 \text{ ft}$$

Determine, algebraically, how many seconds it will take for the object to reach the ground.

$$H(t) = -16(3)^2 + 144$$

$$H(3) = 0$$

3 seconds

Score 2: The student did not find the difference between the two heights and did not determine $3$ algebraically.
Question 33

33 The height, \( H \), in feet, of an object dropped from the top of a building after \( t \) seconds is given by 
\[ H(t) = -16t^2 + 144. \]

How many feet did the object fall between one and two seconds after it was dropped?

\[
\begin{align*}
-16(1)^2 + 144 &= 128 \text{ ft} \\
-16(2)^2 + 144 &= 80 \text{ ft} \\
\frac{128}{208} &= \frac{80}{208} \text{ ft after 1t}
\end{align*}
\]

Determine, algebraically, how many seconds it will take for the object to reach the ground.

\[
\begin{align*}
-16t^2 + 144 &= 128 \\
-16t^2 + 144 &= 80 \\
\frac{0 + 2}{0 + 2} &= \frac{48}{0 + 2} \\
\frac{208}{32} &= 48 \text{ more seconds}
\end{align*}
\]

Score 1: The student showed appropriate work to find 128 and 80.
33 The height, $H$, in feet, of an object dropped from the top of a building after $t$ seconds is given by $H(t) = -16t^2 + 144$.

How many feet did the object fall between one and two seconds after it was dropped?

$$t = 128 \text{ feet}$$

Determine, algebraically, how many seconds it will take for the object to reach the ground.

The second will take the object 28. to reach the ground

Score 0: The student gave a completely incorrect response.
The sum of two numbers, $x$ and $y$, is more than 8. When you double $x$ and add it to $y$, the sum is less than 14.

Graph the inequalities that represent this scenario on the set of axes below.

Kai says that the point (6,2) is a solution to this system. Determine if he is correct and explain your reasoning.

It is not because it lands where the 2 dotted lines meet and it has to be in the shaded area of both lines.

**Score 4:** The student gave a complete and correct response.
Question 34

34 The sum of two numbers, $x$ and $y$, is more than 8. When you double $x$ and add it to $y$, the sum is less than 14.

Graph the inequalities that represent this scenario on the set of axes below.

Kai says that the point (6,2) is a solution to this system. Determine if he is correct and explain your reasoning.

He is correct because it’s where the two graphs intersect.

Score 3: The student made one graphing error by drawing solid lines, but wrote an appropriate explanation based on the graph.
The sum of two numbers, $x$ and $y$, is more than 8. When you double $x$ and add it to $y$, the sum is less than 14.

Graph the inequalities that represent this scenario on the set of axes below.

Kai says that the point (6,2) is a solution to this system. Determine if he is correct and explain your reasoning.

He is correct because that is the point they intersected.

**Score 2:** The student treated the inequalities as equations, but wrote an appropriate explanation based on the graph.
Question 34

The sum of two numbers, $x$ and $y$, is more than 8. When you double $x$ and add it to $y$, the sum is less than 14.

Graph the inequalities that represent this scenario on the set of axes below.

Kai says that the point (6,2) is a solution to this system. Determine if he is correct and explain your reasoning.

Score 1: The student stated both inequalities correctly. The student made multiple errors graphing the inequality and wrote an incorrect explanation based on the graph.
The sum of two numbers, $x$ and $y$, is more than 8. When you double $x$ and add it to $y$, the sum is less than 14.

Graph the inequalities that represent this scenario on the set of axes below.

Kai says that the point (6,2) is a solution to this system. Determine if he is correct and explain your reasoning.

Score 0: The student wrote only one correct inequality.
An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles.

Determine the speed of the plane, at cruising altitude, in miles per minute.

Write an equation to represent the number of miles the plane has flown, \( y \), during \( x \) minutes at cruising altitude, only.

Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.

\[
y = 9.5(88) = 836
\]

\[
836 + 192 = 1028
\]

Score 4: The student gave a complete and correct response.
35 An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles.

Determine the speed of the plane, at cruising altitude, in miles per minute.

\[
\frac{762}{80 \text{ min}} = 9.5 \text{ miles per min}
\]

Write an equation to represent the number of miles the plane has flown, \( y \), during \( x \) minutes at cruising altitude, only.

\[ y = 9.5x \]

Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.

\[
\frac{2 \text{ hr} = 120 \text{ mins}}{80 \text{ mins} \text{ cruising altitude}} \implies \frac{y = 9.5(88)}{8 \approx 832}
\]

Score 3: The student did not add 192 miles to the 836 miles.
An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles.

Determine the speed of the plane, at cruising altitude, in miles per minute.

Let $y =$ number of miles

\[ x = \text{min at cruising speed} \]

\[
\frac{9.5}{60} = \frac{570}{9.5}
\]

Write an equation to represent the number of miles the plane has flown, $y$, during $x$ minutes at cruising altitude, only.

\[ y = x \]

\[ 762 = \]

Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.

\[
\text{2 hours} = 1140
\]

\[
8360 + 192 = 1028 \text{ miles}
\]

\[ \uparrow \quad \uparrow \]

\[ \text{cruise} \quad 32 \text{ min} \]

**Score 2:** The student showed correct work to determine 9.5, but did not write a correct equation or show sufficient work to find 1028.
An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles.

Determine the speed of the plane, at cruising altitude, in miles per minute.

Write an equation to represent the number of miles the plane has flown, $y$, during $x$ minutes at cruising altitude, only.

Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.

Score 1: The student showed correct work to find 9.5.
An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles.

Determine the speed of the plane, at cruising altitude, in miles per minute.

Write an equation to represent the number of miles the plane has flown, \( y \), during \( x \) minutes at cruising altitude, only.

\[
y = mx + b \\
y = 9.5x + 0
\]

Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.

1,140 miles

Score 0: The student wrote a correct equation, but did not show any work.
Question 36

36 On the set of axes below, graph

\[
g(x) = \frac{1}{2}x + 1
\]

and

\[
f(x) = \begin{cases} 
2x + 1, & x \leq -1 \\
2 - x^2, & x > -1
\end{cases}
\]

How many values of \(x\) satisfy the equation \(f(x) = g(x)\)? Explain your answer, using evidence from your graphs.

\textcolor{red}{1}\text{ value because the functions intersect on the graph one time}

Score 4: The student gave a complete and correct response.
Question 36

36 On the set of axes below, graph

\[ g(x) = \frac{1}{2}x + 1 \]

and

\[ f(x) = \begin{cases} 2x + 1, & x \leq -1 \\ 2 - x^2, & x > -1 \end{cases} \]

How many values of \( x \) satisfy the equation \( f(x) = g(x) \)? Explain your answer, using evidence from your graphs.

Only one value of \( x \) satisfies the equation \( f(x) = g(x) \) because there is only one place where the lines intercept.

Score 3:  The student made a graphing error by putting a solid dot at \((-1,1)\).
On the set of axes below, graph

\[ g(x) = \frac{1}{2}x + 1 \]

and

\[ f(x) = \begin{cases} 
2x + 1, & x \leq -1 \\
2 - x^2, & x > -1
\end{cases} \]

How many values of \( x \) satisfy the equation \( f(x) = g(x) \)? Explain your answer, using evidence from your graphs.

\[ \text{One only at } (0, 781, 137) \]

**Score 2:** The student graphed two linear equations correctly and stated 1, but did not write an explanation.
36 On the set of axes below, graph

\[ g(x) = \frac{1}{2}x + 1 \]

and

\[ f(x) = \begin{cases} 
2x + 1, & x \leq -1 \\
2 - x^2, & x > -1 
\end{cases} \]

How many values of \( x \) satisfy the equation \( f(x) = g(x) \)? Explain your answer, using evidence from your graphs.

**Score 1:** The student graphed the two linear equations correctly.
On the set of axes below, graph

\[ g(x) = \frac{1}{2}x + 1 \]

and

\[ f(x) = \begin{cases} 
2x + 1, & x \leq -1 \\
2 - x^2, & x > -1
\end{cases} \]

How many values of \( x \) satisfy the equation \( f(x) = g(x) \)? Explain your answer, using evidence from your graphs.

\[ -1 \text{ because} \]

Score 0: The student graphed \( f(x) \) incorrectly.
37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let \( x \) equal the price of one package of cupcakes and \( y \) equal the price of one package of brownies.

Write a system of equations that describes the given situation.

\[
\begin{align*}
3x + 2y &= 19 \\
2x + 4y &= 24
\end{align*}
\]

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

3.50 cupcakes
4.25 brownies

\[
\begin{align*}
-\frac{1}{2}x + 6 &= \frac{3}{2}x + 9.5 \\
-6 &= -6
\end{align*}
\]

Set them equal to each other:

\[
\begin{align*}
-\frac{1}{2}x &= \frac{3}{2}x + 3.5 \\
+ \frac{3}{2}x &= + \frac{3}{2}x \\
\frac{1}{2}x &= 3.5
\end{align*}
\]

Score 6: The student gave a complete and correct response.
Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let \( x \) equal the price of one package of cupcakes and \( y \) equal the price of one package of brownies.

Write a system of equations that describes the given situation.

\[
\begin{align*}
3x + 2y &= 19 \\
2x + 4y &= 24
\end{align*}
\]

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

\[
\begin{align*}
y_1 &= 9.5 - 1.5x \\
y_2 &= 6 - 0.5x
\end{align*}
\]

2nd calc intersect \((3.5, 4.25)\)

**Score 6:** The student gave a complete and correct response.
37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

\[
\begin{align*}
 2y + 3x &= 19 \\
 3y &= 19 - 3x \\
 y &= 9.5 - \frac{3}{2}x \\

-2(3x + 2y &= 19) \\
-6x - 4y &= -38 \\
2x + 4y &= 24 \\
4x &= 14 \\
4 \quad x &= 3.50
\end{align*}
\]

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

\[
\begin{align*}
 2x + 4y &= 24 \\
 4y &= 24 - 2x \\
 y &= 6 - 1.5x \\

y &= 6 - \frac{3}{2}x \\

x &= 3.50 \\
y &= 4.25
\end{align*}
\]

\[
\begin{align*}
3(3.50) + 2(4.25) &= 19 \quad \sqrt{3} \\
2(3.50) + 4(4.25) &= 24 \quad \sqrt{2}
\end{align*}
\]

Score 5: The student did not draw the line through the plotted points for $y = 9 \frac{1}{2} - \frac{3}{2}x$. 

Algebra I (Common Core) – June ’16
37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

Let $x =$ cupcakes $= 3.5$
$y =$ brownies $= 4.25$

\[
\frac{2(3x+y)=19}{4x=14} \quad \frac{3(3.5)+2y=19}{10.5+2y=19} \quad \frac{2y=8.5}{y=4.25}
\]

\[
\begin{align*}
2x + 4y &= 24 \\
\text{Graph the lines for } 2x + 4y = 24.
\end{align*}
\]

Score 5: The student made an error when graphing $2x + 4y = 24$. 

Question 37

37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let \( x \) equal the price of one package of cupcakes and \( y \) equal the price of one package of brownies.

Write a system of equations that describes the given situation.

\[
\begin{align*}
3x + 2y &= 19 \\
3x + 4y &= 24
\end{align*}
\]

On the set of axes below, graph the system of equations.

Determin the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

\[
\begin{align*}
3x + 4(1.5) &= 24 \\
3x + 10 &= 24 \\
3x &= 14 \\
x &= 4.67
\end{align*}
\]

\[
\begin{align*}
2y &= 5 \\
y &= 2.5
\end{align*}
\]

Cupcakes costs $4.67
Brownies costs $2.50

Score 5: The student wrote one incorrect equation, but graphed and solved the system of equations appropriately.
37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let \( x \) equal the price of one package of cupcakes and \( y \) equal the price of one package of brownies.

Write a system of equations that describes the given situation.

\[
\begin{align*}
3x + 2y &= 19 \\
2x + 4y &= 24
\end{align*}
\]

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

\[
\begin{align*}
y &= 9.5 - 3\frac{5}{2}x \\
2x + 4y &= 24
\end{align*}
\]

\[
\begin{align*}
2x + 4y &= 24 \\
4y &= 24 - 2x \\
y &= 6 - \frac{3}{4}x
\end{align*}
\]

Score 4: The student wrote and graphed a correct system of equations.
37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

\[
\begin{align*}
3x + 2y &= 19 \\
2x + 4y &= 24
\end{align*}
\]

On the set of axes below, graph the system of equations.

\[
\begin{align*}
2y &= -3x + 19 \\
y &= -\frac{3}{2}x + 9.5 \\
4y &= -2x + 24 \\
y &= -\frac{1}{2}x + 6
\end{align*}
\]

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

**Score 4:** The student wrote a correct system of equations. One equation was graphed correctly and one cost was determined.
Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

$$\begin{align*}
3x + 2y &= 19 \\
2x + 4y &= 24
\end{align*}$$

On the set of axes below, graph the system of equations.

[Graph of the system of equations]

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

\[
\begin{align*}
2(3x + 2y = 19) &\Rightarrow 6x + 4y = 38 \\
3(2x + 4y = 24) &\Rightarrow -6x - 12y = 72
\end{align*}
\]

\[
\begin{align*}
\frac{-8y}{-8} &= \frac{-34}{-8} \\
y &= 4.25
\end{align*}
\]

\[
\begin{align*}
3x + 2y &= 19 \\
3x + 2(4.25) &= 19 \\
3x + 8.50 &= 19 \\
-8.50 &= -8.50
\end{align*}
\]

\[
\begin{align*}
3c &= 10.5 \\
\frac{3c}{3} &= \frac{10.5}{3} \\
c &= \frac{10.5}{3} = 3.5
\end{align*}
\]

Score 3: The student wrote and solved an appropriate system of equations, but did not use $x$ and $y$. 
Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

$$\begin{align*}
3x + 2y &= 19 \\
2x + 4y &= 24
\end{align*}$$

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

$$\begin{align*}
2(3x + 2y &= 19) \\
2x + 4y &= 24
\end{align*}$$

$$\begin{align*}
-6x + 4y &= 38 \\
2x + 4y &= 24
\end{align*}$$

$$\begin{align*}
\Delta x &= \frac{14}{4} \\
&= 3.50 \\
\end{align*}$$

**Score 3:** The student wrote a correct system of equations and determined one cost correctly.
37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

Franco: $19 = 3x + 2y$

Caryl: $24 = 2x + 4y$

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

Score 2: The student wrote a correct system of equations.
Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

$$3x + 2y = 19$$

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

$$2x + 2y = 24$$

**Score 1:** The student wrote one correct equation.
37 Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let $x$ equal the price of one package of cupcakes and $y$ equal the price of one package of brownies.

Write a system of equations that describes the given situation.

$$5(c) + 6(b)$$

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

$$24 = 2(c) + 4(b)$$

Cupcakes = $3.50
Brownies = $4.93

Score 0: The student wrote one equation, but not in terms of $x$ and $y$, and did not show work to find the cost of the cupcakes.
Franco and Caryl went to a bakery to buy desserts. Franco bought 3 packages of cupcakes and 2 packages of brownies for $19. Caryl bought 2 packages of cupcakes and 4 packages of brownies for $24. Let \( x \) equal the price of one package of cupcakes and \( y \) equal the price of one package of brownies.

Write a system of equations that describes the given situation.

\[
3c + 2b = 19
\]

On the set of axes below, graph the system of equations.

Determine the exact cost of one package of cupcakes and the exact cost of one package of brownies in dollars and cents. Justify your solution.

**Score 0:** The student wrote one equation, but not in terms of \( x \) and \( y \).