ALGEBRA I

Wednesday, January 24, 2024 — 1:15 to 4:15 p.m., only

MODEL RESPONSE SET

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25 Student scores on a recent test are shown in the table below.

<table>
<thead>
<tr>
<th>Score</th>
<th>85</th>
<th>96</th>
<th>92</th>
<th>82</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>90</td>
<td>88</td>
<td>95</td>
<td>86</td>
<td>88</td>
</tr>
<tr>
<td>Score</td>
<td>90</td>
<td>87</td>
<td>96</td>
<td>82</td>
<td>85</td>
</tr>
<tr>
<td>Score</td>
<td>92</td>
<td>96</td>
<td>86</td>
<td>92</td>
<td>87</td>
</tr>
</tbody>
</table>

On the number line below, create a dot plot to model the data.

State the median test score for the data set.

89

Score 2: The student gave a complete and correct response.
25 Student scores on a recent test are shown in the table below.

<table>
<thead>
<tr>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
<th>Score 4</th>
<th>Score 5</th>
<th>Score 6</th>
<th>Score 7</th>
<th>Score 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>96</td>
<td>92</td>
<td>82</td>
<td>90</td>
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<td></td>
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</tr>
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<td>90</td>
<td>88</td>
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<td>87</td>
<td>96</td>
<td>82</td>
<td>85</td>
<td></td>
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<tr>
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<td>92</td>
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</tr>
</tbody>
</table>

On the number line below, create a dot plot to model the data.

State the median test score for the data set.

The median test score for the data set is 89

Score 1: The student stated the median correctly.
25 Student scores on a recent test are shown in the table below.

<table>
<thead>
<tr>
<th>Score 1</th>
<th>82</th>
<th>85</th>
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<th>85</th>
<th>87</th>
<th>87</th>
<th>88</th>
<th>88</th>
<th>90</th>
<th>90</th>
<th>90</th>
<th>92</th>
<th>92</th>
<th>87</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score 2</td>
<td>80</td>
<td>85</td>
<td>90</td>
<td>90</td>
<td>92</td>
<td>96</td>
<td>85</td>
<td>82</td>
<td>87</td>
<td>88</td>
<td>88</td>
<td>85</td>
<td>90</td>
<td>92</td>
</tr>
</tbody>
</table>

On the number line below, create a dot plot to model the data.

State the median test score for the data set.

\[82, 82, 85, 85, 85, 87, 87, 88, 88, 90, 90, 90, 92, 92, 87, 85, 90, 92, 92, 92, 92, 95, 96, 96\]

\[88.5\]

Score 1: The student created a correct dot plot.
25 Student scores on a recent test are shown in the table below.

<table>
<thead>
<tr>
<th>Score</th>
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<td>90</td>
<td>87</td>
<td>96</td>
<td>82</td>
<td>85</td>
</tr>
</tbody>
</table>

On the number line below, create a dot plot to model the data.

![Number Line with Dot Plot](image)

State the median test score for the data set.

The median test scores is 85.

**Score 0:** The student did not show enough correct work to receive any credit.
26 State whether \(2\sqrt{3} + 6\) is rational or irrational. Explain your answer.

It is irrational because it equals to a non-repeating, non-terminating decimal that cannot be converted to a fraction. This is because \(\sqrt{3}\) is an imperfect square and it is multiplied by a rational number and added to a rational number, which results in an irrational number.

Score 2: The student gave a complete and correct response.
26 State whether $2\sqrt{3} + 6$ is rational or irrational. Explain your answer.

$$2\sqrt{3} + 6 = 9.464101615$$

$2\sqrt{3} + 6$ is irrational because its sum is not a number that terminates or repeats. The digits behind the decimal point do not repeat in a specific order with the same numbers therefore, it is irrational.

**Score 2:** The student gave a complete and correct response.
26 State whether $2\sqrt{3} + 6$ is rational or irrational. Explain your answer.

$2\sqrt{3} + 6 = 6$ which is rational because it's a whole number.

**Score 1:** The student made a computational error, but wrote an appropriate explanation.
26 State whether \( 2\sqrt{3} + 6 \) is rational or irrational. Explain your answer.

9.4641... is the answer, this is irrational because 3 is not a perfect square. So when solving, your answer will be a decimal.

Score 1: The student wrote an incomplete explanation.
26 State whether $2\sqrt{3} + 6$ is rational or irrational. Explain your answer.

$2\sqrt{3} + 6$

$2\sqrt{3} + 6$ is irrational it turns into a radical.

**Score 0:** The student wrote an incorrect explanation.
The table below shows data from a recent car trip for the Burke family.

<table>
<thead>
<tr>
<th>Hours After Leaving (x)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles from Home (y)</td>
<td>45</td>
<td>112</td>
<td>178</td>
<td>238</td>
<td>305</td>
</tr>
</tbody>
</table>

State the average rate of change for the distance traveled between hours 2 and 4. Include appropriate units.

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{238 - 112}{4 - 2} = \frac{126}{2} = 63
\]

63 miles/hr

**Score 2:** The student gave a complete and correct response.
The table below shows data from a recent car trip for the Burke family.

<table>
<thead>
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<th>Hours After Leaving (x)</th>
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</table>

State the average rate of change for the distance traveled between hours 2 and 4. Include appropriate units.

\[
\frac{126}{2} = 63 \text{ miles per hour}
\]

**Score 2:** The student gave a complete and correct response.
The table below shows data from a recent car trip for the Burke family.

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</tbody>
</table>

State the average rate of change for the distance traveled between hours 2 and 4.
Include appropriate units.

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

\[ m = \frac{238 - 112}{4 - 2} \rightarrow \frac{126}{2} \rightarrow 63 \]

\[ m = 63 \]

**Score 1:** The student did not include the units.
27 The table below shows data from a recent car trip for the Burke family.

<table>
<thead>
<tr>
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</tbody>
</table>

State the average rate of change for the distance traveled between hours 2 and 4. Include appropriate units.

$$\text{ArOC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{238 - 112}{4 - 2} = \frac{126}{2} = 63$$

The average rate of change for distance traveled between hours 2 and 4 is 63 miles.

Score 1: The student gave incorrect units.
The table below shows data from a recent car trip for the Burke family.

<table>
<thead>
<tr>
<th>x</th>
<th>Hours After Leaving (x)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<td>y</td>
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<td>238</td>
<td>305</td>
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</tbody>
</table>

State the average rate of change for the distance traveled between hours 2 and 4. Include appropriate units.

\[
\text{Rate of change} = \frac{x_2 - x_1}{y_2 - y_1} = \frac{4 - 2}{238 - 112} = \frac{2}{126} \approx 0.0163
\]

**Score 0:** The student incorrectly determined the average rate of change and did not include units.
The table below shows data from a recent car trip for the Burke family.

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<thead>
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State the average rate of change for the distance traveled between hours 2 and 4. Include appropriate units.

\[
\frac{\Delta y}{\Delta x} = \frac{238 - 112}{4 - 2} = \frac{126}{2} = 63 \text{ miles/hour}
\]

**Score 0:** The student did not show enough correct work to receive any credit.
28 On the set of axes below, graph the equation $3y + 2x = 15$.

\[
\begin{align*}
\frac{3y}{3} &= \frac{2x + 15}{3} \\
y &= \frac{2}{3}x + 5
\end{align*}
\]

Explain why $(26,9)$ is a solution to the equation.

Score 2: The student gave a complete and correct response.
28 On the set of axes below, graph the equation $3y + 2x = 15$.

Explain why ($-6, 9$) is a solution to the equation.

Score 2: The student gave a complete and correct response.
28 On the set of axes below, graph the equation \(3y + 2x = 15\).

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

Explain why \((-6, 9)\) is a solution to the equation.

\[
\begin{align*}
3(-6) + 2(-6) &= 15 \\
-18 - 12 &= 15 \\
15 &= 15 \checkmark
\end{align*}
\]

**Score 1:** The student wrote a justification, not an explanation.
28 On the set of axes below, graph the equation $3y + 2x = 15$. 

\[
\begin{align*}
3y + 2x &= 15 \\
-2x &= -2x \\
3y &= 2x + 16 \\
3y &= -\frac{2}{3}x + 16
\end{align*}
\]

Explain why $(-6, 9)$ is a solution to the equation.

\[
\text{It is the top point}
\]

Score 1: The student graphed the equation correctly.
28 On the set of axes below, graph the equation \( \frac{3y}{3} + \frac{2x}{3} = 15 \).

\[
\begin{align*}
3y &= 2x + 45 \\
y &= \frac{2}{3}x + 15
\end{align*}
\]

Explain why \((-6, 9)\) is a solution to the equation.

Because it is near the line of the graph.

**Score 0:** The student did not show enough correct work to receive any credit.
29 Using the quadratic formula, solve \(3x^2 - 2x - 6 = 0\) for all values of \(x\).

Round your answers to the nearest hundredth.

\[
\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

\[
2 \pm \frac{\sqrt{(-2)^2 - 4(3)(-6)}}{2(3)}
\]

\[
2 \pm \frac{\sqrt{4 + 72}}{6}
\]

\[
2 \pm \frac{\sqrt{76}}{6}
\]

\[
\frac{2 \pm \sqrt{19}}{3}
\]

\[
\frac{2 \pm \sqrt{19}}{3}
\]

\[
\frac{1 + \sqrt{19}}{3} \quad \frac{1 - \sqrt{19}}{3}
\]

\[
1.12 \quad -1.12
\]

**Score 2:** The student gave a complete and correct response.
29 Using the quadratic formula, solve $3x^2 - 2x - 6 = 0$ for all values of $x$.
Round your answers to the nearest hundredth.

Score 1: The student made a substitution error.
29 Using the quadratic formula, solve \(3x^2 - 2x - 6 = 0\) for all values of \(x\).
Round your answers to the nearest hundredth.

\[
\begin{align*}
x &= \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-6)}}{2(3)} \\
x &= \frac{2 \pm \sqrt{76}}{6} \\
x &= \frac{2 + \sqrt{76}}{6} \quad \text{or} \quad \frac{2 - \sqrt{76}}{6} \\
x &= \left[1.70\right] \quad \text{or} \quad \left[-1.11\right]
\end{align*}
\]

**Score 1:** The student made one rounding error.
Question 29

29 Using the quadratic formula, solve $3x^2 - 2x - 6 = 0$ for all values of $x$. Round your answers to the nearest hundredth.

\[ a = 3, \quad b = -2, \quad c = -6 \]

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

\[ x = \frac{2 \pm \sqrt{(-2)^2 - 4(3)(-6)}}{2(3)} \]

\[ x = \frac{2 \pm \sqrt{4 + 72}}{6} \]

\[ x = \frac{2 \pm \sqrt{76}}{6} \]

\[ x = \frac{2 \pm 8.72}{6} \]

\[ x = \frac{2 + 8.72}{6} \]

\[ x = \frac{2 - 8.72}{6} \]

\[ x = 1.12 \]

\[ x = 0.47 \]

Score 0: The student made more than one computational error.
The piecewise function $f(x)$ is given below.

$$f(x) = \begin{cases} 
2x - 3, & x > 3 \\
-x^2 + 15, & x \leq 3 
\end{cases}$$

State the value of $f(3)$.

Justify your answer.

$$-(3)^2 + 15 = 6$$

**Score 2:** The student gave a complete and correct response.
The piecewise function $f(x)$ is given below.

$$f(x) = \begin{cases} 
2x - 3, & x > 3 \\
-x^2 + 15, & x \leq 3 
\end{cases}$$

State the value of $f(3)$.

Justify your answer.

\[
\begin{align*}
2(3) - 3 \\
6 - 3 = 3
\end{align*}
\]

Score 1: The student evaluated $2x - 3$ for $f(3)$ instead of evaluating $-x^2 + 15$. 
30 The piecewise function $f(x)$ is given below.

$$f(x) = \begin{cases} 
2x - 3, & x > 3 \\
-x^2 + 15, & x \leq 3
\end{cases}$$

State the value of $f(3)$.

Justify your answer.

\[ f(3) = \begin{cases} 
2(3) - 3, & 3 > 3 \\
-3^2 + 15, & 3 \leq 3
\end{cases} \]

\[ f(3) = \begin{cases} 
3, & \text{not applicable} \\
6, & 3 \leq 3
\end{cases} \]

Score 0: The student did not show enough correct work to receive any credit.
31 Express the equation \( x^2 - 8x = -41 \) in the form \((x - p)^2 = q\). 

\[
\begin{align*}
\frac{x^2 - 8x + 16}{10} &= -41 + 16 \\
(x - 4)^2 &= -25
\end{align*}
\]

**Score 2:** The student gave a complete and correct response.
31 Express the equation \(x^2 - 8x = -41\) in the form \((x - p)^2 = q\).

\[
x^2 - 8x + 41 = 0
\]

\[
(x^2 - 8x + 16) + 41 - 16 = 0
\]

\[
(x - 4)^2 + 25 = 0
\]

\[
(x - 4)^2 = -25
\]

**Score 2:** The student gave a complete and correct response.
31 Express the equation $x^2 - 8x = -41$ in the form $(x - p)^2 = q$.

\[
\begin{align*}
(x - 4)^2 & = 41 \\
(x - 8) + 16 & = -41 \\
(x - 4)^2 & = 41
\end{align*}
\]

**Score 1:** The student only added 16 to one side of the equation.
Express the equation $x^2 - 8x = -41$ in the form $(x - p)^2 = q$.

\[
x^2 - 8x = -41
\]

\[
x^2 - 8x + 16 = -41 + 16
\]

\[
(x - 4)^2 = -25
\]

\[
\sqrt{(x - 4)^2} = \sqrt{-25}
\]

\[
x = -4\pm 5i
\]

**Score 1:** The student showed correct work to find $(x - 4)^2 = -25$, but continued with incorrect work.
31. Express the equation $x^2 - 8x = -41$ in the form $(x - p)^2 = q$.

\[
(x - 8)^2 = -41
\]

\[
\begin{align*}
(x^2 - 16x + 64) &= -41 \\
x^2 - 16x + 64 &= -41 + 41 \\
x^2 - 16x + 105 &
\end{align*}
\]

Score 0: The student did not show enough correct work to receive any credit.
32 Factor $36 - 4x^2$ completely.

$4(9 - x^2) \quad 4(3 - x)(3 + x)$

**Score 2:** The student gave a complete and correct response.
32 Factor $36 - 4x^2$ completely.

\[
\begin{array}{c|cccc}
2 & 36 & -4x^2 \\
    & 18 & -2x^2 \\
    &    & 4(9 - x^2) \\
    &    & 4(3+x)(3-x) \\
\end{array}
\]

**Score 2:** The student gave a complete and correct response.
32. Factor $36 - 4x^2$ completely.

$$36 - 4x^2 = 0$$

$$4(9 - x^2) = 0$$

$$4(3 + x)(3 - x) = 0$$

$$x = -3$$

$$x = 3$$

**Score 1:** The student made an error by solving for $x$. 
32 Factor $36 - 4x^2$ completely.

\[
-4x^2 + 36
\]

\[
-4(x^2 - 9)
\]

\[
(x - 3)(x + 3)
\]

**Score 1:** The student made a factoring error by leaving out the GCF.
32 Factor \(36 - 4x^2\) completely.

\[
\begin{align*}
36 - 4x^2 &= 0 \\
-4x^2 &= -36 \\
\sqrt{-x^2} &= \sqrt{9} \\
X &= 3
\end{align*}
\]

**Score 0:** The student did not show enough correct work to receive any credit.
Question 33

33 While playing golf, Laura hit her ball from the ground. The height, in feet, of her golf ball can be modeled by $h(t) = -16t^2 + 48t$, where $t$ is the time in seconds.

Graph $h(t)$ on the set of axes below.

What is the maximum height, in feet, that the golf ball reaches on this hit? 36 ft

How many seconds does it take the golf ball to hit the ground? 3 seconds

Score 4: The student gave a complete and correct response.
33 While playing golf, Laura hit her ball from the ground. The height, in feet, of her golf ball can be modeled by \( h(t) = -16t^2 + 48t \), where \( t \) is the time in seconds.

Graph \( h(t) \) on the set of axes below.

What is the maximum height, in feet, that the golf ball reaches on this hit?

The maximum height is 36 feet

How many seconds does it take the golf ball to hit the ground?

It takes the ball 1.5 seconds to hit the ground.

Score 3: The student drew a correct graph and gave a correct maximum height.
33 While playing golf, Laura hit her ball from the ground. The height, in feet, of her golf ball can be modeled by \( h(t) = -16t^2 + 48t \), where \( t \) is the time in seconds.

Graph \( h(t) \) on the set of axes below.

What is the maximum height, in feet, that the golf ball reaches on this hit?

\[ 32 \text{ ft} \]

How many seconds does it take the golf ball to hit the ground?

3 seconds

**Score 2:** The student made one graphing error by not including the point (1.5,36) and gave an incorrect maximum height.
33 While playing golf, Laura hit her ball from the ground. The height, in feet, of her golf ball can be modeled by \( h(t) = -16t^2 + 48t \), where \( t \) is the time in seconds.

Graph \( h(t) \) on the set of axes below.

What is the maximum height, in feet, that the golf ball reaches on this hit?

\[ \text{32 feet} \]

How many seconds does it take the golf ball to hit the ground?

\[ \text{3 seconds} \]

Score 1: The student made two graphing errors by not including the point \((1.5,36)\) and included arrows beyond the \(x\)-axis and gave an incorrect maximum height.
33 While playing golf, Laura hit her ball from the ground. The height, in feet, of her golf ball can be modeled by $h(t) = -16t^2 + 48t$, where $t$ is the time in seconds.

Graph $h(t)$ on the set of axes below.

What is the maximum height, in feet, that the golf ball reaches on this hit?

$32$ feet

How many seconds does it take the golf ball to hit the ground?

$3$ seconds

Score 1: The student stated 3, the number of seconds the golf ball took to hit the ground.
Question 33

33 While playing golf, Laura hit her ball from the ground. The height, in feet, of her golf ball can be modeled by \( h(t) = -16t^2 + 48t \), where \( t \) is the time in seconds.

Graph \( h(t) \) on the set of axes below.

What is the maximum height, in feet, that the golf ball reaches on this hit?

\[ 40 \text{ ft} \]

How many seconds does it take the golf ball to hit the ground?

\[ 2 \text{ sec} \]

Score 0: The student did not show enough correct work to receive any credit.
The table below shows the number of SAT prep classes five students attended and the scores they received on the test.

<table>
<thead>
<tr>
<th>Number of Prep Classes Attended (x)</th>
<th>3</th>
<th>1</th>
<th>6</th>
<th>7</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math SAT Score (y)</td>
<td>500</td>
<td>410</td>
<td>620</td>
<td>720</td>
<td>500</td>
</tr>
</tbody>
</table>

State the linear regression equation for this data set, rounding all values to the nearest hundredth.

\[ y = 40.48x + 363.81 \]

State the correlation coefficient, rounded to the nearest hundredth.

0.84

State what this correlation coefficient indicates about the linear fit of the data.

The number of prep classes attended and the math SAT score have a strong positive correlation. The more prep classes attended the higher the SAT score.

Score 4: The student gave a complete and correct response.
34 The table below shows the number of SAT prep classes five students attended and the scores they received on the test.

<table>
<thead>
<tr>
<th>Number of Prep Classes Attended (x)</th>
<th>3</th>
<th>1</th>
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</table>

State the linear regression equation for this data set, rounding all values to the nearest hundredth.

\[ y = 40.48x + 363.81 \]

State the correlation coefficient, rounded to the nearest hundredth.

\[ r = 0.84 \]

State what this correlation coefficient indicates about the linear fit of the data.

It is strong.

Score 4: The student gave a complete and correct response.
The table below shows the number of SAT prep classes five students attended and the scores they received on the test.

<table>
<thead>
<tr>
<th>Number of Prep Classes Attended (x)</th>
<th>3</th>
<th>1</th>
<th>6</th>
<th>7</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math SAT Score (y)</td>
<td>500</td>
<td>410</td>
<td>620</td>
<td>720</td>
<td>500</td>
</tr>
</tbody>
</table>

State the linear regression equation for this data set, rounding all values to the nearest hundredth.

\[ y = ax + b \]

\[ y = 70.48x + 432.8 \]

State the correlation coefficient, rounded to the nearest hundredth.

\[ r = 0.94 \]

State what this correlation coefficient indicates about the linear fit of the data.

There is a strong positive correlation.

Score 3: The student made one rounding error.
The table below shows the number of SAT prep classes five students attended and the scores they received on the test.

<table>
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<tr>
<th>Number of Prep Classes Attended (x)</th>
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<tr>
<td>Math SAT Score (y)</td>
<td>500</td>
<td>410</td>
<td>620</td>
<td>720</td>
<td>500</td>
</tr>
</tbody>
</table>

State the linear regression equation for this data set, rounding all values to the nearest hundredth.

\[ y = a \times + b \]
\[ y = 40.5 \times + 363.8 \]

\[ r = .84 \]

State what this correlation coefficient indicates about the linear fit of the data.

Score 2: The student made one rounding error by rounding to the nearest tenth, but stated the correlation coefficient correctly.
34 The table below shows the number of SAT prep classes five students attended and the scores they received on the test.

<table>
<thead>
<tr>
<th>Number of Prep Classes Attended (x)</th>
<th>3</th>
<th>1</th>
<th>6</th>
<th>7</th>
<th>6</th>
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<td>500</td>
<td>410</td>
<td>620</td>
<td>720</td>
<td>500</td>
</tr>
</tbody>
</table>

State the linear regression equation for this data set, rounding all values to the nearest hundredth.

\[ y = 40.48x + 363.80 \]

State the correlation coefficient, rounded to the nearest hundredth.

363.80

State what this correlation coefficient indicates about the linear fit of the data.

It shows the minimum score you get without prep classes.

Score 1: The student made one rounding error, and no further correct work is shown.
The table below shows the number of SAT prep classes five students attended and the scores they received on the test.

<table>
<thead>
<tr>
<th>Number of Prep Classes Attended (x)</th>
<th>3</th>
<th>1</th>
<th>6</th>
<th>7</th>
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<td>500</td>
<td>410</td>
<td>620</td>
<td>720</td>
<td>500</td>
</tr>
</tbody>
</table>

State the linear regression equation for this data set, rounding all values to the nearest hundredth.

\[40.48x + 363.81\]

State the correlation coefficient, rounded to the nearest hundredth.

\[r = 0.89\]

State what this correlation coefficient indicates about the linear fit of the data.

It shows the amount of score the first attendee had.

**Score 1:** The student wrote an expression instead of an equation, and no further correct work was shown.
The table below shows the number of SAT prep classes five students attended and the scores they received on the test.

<table>
<thead>
<tr>
<th>Number of Prep Classes Attended (x)</th>
<th>3</th>
<th>1</th>
<th>6</th>
<th>7</th>
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<td>Math SAT Score (y)</td>
<td>500</td>
<td>410</td>
<td>620</td>
<td>720</td>
<td>500</td>
</tr>
</tbody>
</table>

State the linear regression equation for this data set, rounding all values to the nearest hundredth.

\[ y = a \cdot b^x \]
\[ y = a \cdot (1-r)^x \]

State the correlation coefficient, rounded to the nearest hundredth.

State what this correlation coefficient indicates about the linear fit of the data.

**Score 0:** The student did not show enough correct work to receive any credit.
35 Julia is 4 years older than twice Kelly’s age, \(x\). The product of their ages is 96. Write an equation that models this situation.

\[(2x + 4)(x) = 96\]

Determine Kelly’s age algebraically.

\[
\begin{align*}
2x^2 + 4x &= 96 \\
2x^2 + 4x - 96 &= 0 \\
-4 \pm \sqrt{16 + 4(96)} &= 2(7) \\
-4 \pm 1784 &= x = 6 \\
-4 \pm 4 &= x = 8
\end{align*}
\]

State the difference between Julia’s and Kelly’s ages, in years.

\[
2(6) + 4 = 16
\]

\[
16 - 6 = 10
\]

Score 4: The student gave a complete and correct response.
35 Julia is 4 years older than twice Kelly’s age, $x$. The product of their ages is 96.

Write an equation that models this situation.

\[ J = 2x + 4 \]
\[ 1x = 96 \]
\[ (2x + 4)(x) = 96 \]

Determine Kelly’s age algebraically.

\[ 2x^2 + 4x - 96 = 0 \]
\[ x^2 + 2x - 48 = 0 \]
\[ (x + 8)(x - 6) = 0 \]
\[ x = 6 \]
Kelly cannot have a negative age

State the difference between Julia’s and Kelly’s ages, in years.

\[ J = 2(6) + 4 = 16 \]
\[ 16 - 6 = 10 \]
Julia is 10 yrs older than Kelly

**Score 4:** The student gave a complete and correct response.
35 Julia is 4 years older than twice Kelly’s age, $x$. The product of their ages is 96.
Write an equation that models this situation.

Determine Kelly’s age algebraically.

\[ \text{Let Kelly's age} = x \]
\[ \text{let Julia} = 2x + 4 \]
\[ (3x + 4)(x) = 96 \]
\[ (2(x + 4))(x) = 96 \]
\[ (16)(6) = 96 \]

State the difference between Julia’s and Kelly’s ages, in years.

\[ 16 - 6 = 10 \]

Score 3: The student wrote a correct equation, but found 6 by a method other than algebraic.
35 Julia is 4 years older than twice Kelly’s age, \( x \). The product of their ages is 96.

Write an equation that models this situation.

\[
2x + 4 = 96
\]

Determine Kelly’s age algebraically.

\[
\begin{align*}
2x + 4 &= 96 \\
-4 &\quad -4 \\
2x &= 92 \\
\frac{2x}{2} &= \frac{92}{2} \\
 x &= 46
\end{align*}
\]

State the difference between Julia’s and Kelly’s ages, in years.

\[4 \text{ years}\]

Score 2: The student wrote a linear equation instead of a quadratic, but solved and used it appropriately to find the difference in ages.
35 Julia is 4 years older than twice Kelly’s age, \(x\). The product of their ages is 96.
Write an equation that models this situation.

\[2x + 4 = 96\]

Determine Kelly’s age algebraically.

\[
\begin{align*}
2x + 4 &= 96 \\
2x &= 92 \\
x &= \frac{92}{2} \\
x &= 46 \text{ years old}
\end{align*}
\]

State the difference between Julia’s and Kelly’s ages, in years.

\[
\begin{align*}
4(x) &= 8 \\
46 + 8 &= 54 \\
54 - 46 &= 8 \\
8 \text{ years}
\end{align*}
\]

**Score 1:** The student wrote a linear equation instead of a quadratic, but solved it appropriately.
Julia is 4 years older than twice Kelly’s age, $x$. The product of their ages is 96.

Write an equation that models this situation.

\[
\begin{align*}
\text{Julia:} & \quad 2x + 4 \\
\text{Kelly:} & \quad x
\end{align*}
\]

\[x(2x + 4) = 96\]

Determine Kelly’s age algebraically.

\[
\begin{align*}
\text{Kelly:} & \quad x \\
\text{Julia:} & \quad 2x + 4
\end{align*}
\]

\[x(2x + 4) = 96\]

\[2x^2 + 4x = 96\]

State the difference between Julia’s and Kelly’s ages, in years.

**Score 1:** The student wrote a correct equation.
35 Julia is 4 years older than twice Kelly’s age, \( x \). The product of their ages is 96.

Write an equation that models this situation.

\[ 2x + (x+4) = 96 \]

Determine Kelly’s age algebraically.

\[
\begin{align*}
\frac{96-48}{2} &= 24 \\
48-4 &= 44 \\
\frac{2x+(4x)+4}{2} &= 96-4 \\
3x &= 92 \\
x &= 24
\end{align*}
\]

State the difference between Julia’s and Kelly’s ages, in years.

Score 0: The student did not show enough correct work to receive any credit.
36 On the set of axes below, graph the following system of inequalities:

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

Label the solution set \( S \).

Is \((4, 2)\) a solution to this system? Justify your answer.

\[
\begin{align*}
(2) &> \frac{1}{3}(4) + 2 \\
2 &> \frac{2}{3} \\
(2) &< 2(4) - 4 \\
2 &< 4
\end{align*}
\]

Score 4: The student gave a complete and correct response.
36 On the set of axes below, graph the following system of inequalities:

\[
\begin{align*}
2x - y &> 4 \\
x + 3y &< 6
\end{align*}
\]

Label the solution set \( S \).

Is \((4, 2)\) a solution to this system? Justify your answer.

It would be a solution because it is in the shaded area of both inequalities.

Score 4: The student gave a complete and correct response.
36 On the set of axes below, graph the following system of inequalities:

\[
\begin{align*}
2x - y &> 4 \\
-x + 3y &> 6 \\
y &< 2x - 4
\end{align*}
\]

Label the solution set \( S \).

Is \((4,2)\) a solution to this system? Justify your answer.

Yes, \((4,2)\) is a solution to this set because it is placed in the solution area.

Score 3: The student made one graphing error by not using dashed lines.
36 On the set of axes below, graph the following system of inequalities:

\[
\begin{align*}
2x - y &> 4 \\
-2x + y &> 4 \\
x + 3y &> 6 \\
y \leq 2x - 4
\end{align*}
\]

Label the solution set \( S \).

Is (4,2) a solution to this system? Justify your answer.

Yes because (4,2) is a solution to both inequalities. It is in the solution set \( S \) on the graph.

Score 3: The student made one graphing error by not labeling at least one of the lines.
36 On the set of axes below, graph the following system of inequalities:

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

Label the solution set \( S \).

Is \((4,2)\) a solution to this system? Justify your answer.

\[ \text{No, because it's only in one of the inequalities.} \]

Score 3: The student made one computational error by writing \( y > 2x - 4 \) instead of \( y < 2x - 4 \), but used their inequality appropriately.
On the set of axes below, graph the following system of inequalities:

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

Label the solution set \( S \).

Is (4,2) a solution to this system? Justify your answer.

**Yes. It is in the solution set.**

**Score 2:** The student made two graphing errors by not labeling at least one of the lines and by not using dashed lines.
**Question 36**

36 On the set of axes below, graph the following system of inequalities:

\[-\frac{2x}{3} - y > \frac{4}{3} \]
\[x + 3y > 6 \]
\[y > \frac{2x - 9}{3} \]

Label the solution set \( S \).

Is \((4,2)\) a solution to this system? Justify your answer.

**Yes. It is a solution.**

**Score 1:** The student made two or more graphing errors and wrote an incomplete justification, but labeled the solution set appropriately.
36 On the set of axes below, graph the following system of inequalities:

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

Label the solution set \( S \).

Is \((4,2)\) a solution to this system? Justify your answer.

Yes, it is a solution because when plugged in, we get \(6 > 4\) and \(10 > 6\), making it true.

**Score 1:** The student wrote a correct justification.
36 On the set of axes below, graph the following system of inequalities:

\[ 2x - y > 4 \]
\[ x + 3y > 6 \]

Label the solution set \( S \).

Is \((4,2)\) a solution to this system? Justify your answer.

\[ \text{No, } (4,2) \notin S \text{ as it is not a solution set.} \]

**Score 0:** The student did not show enough correct work to receive any credit.
Jim had a bag of coins. The number of nickels, \( n \), and the number of quarters, \( q \), totaled 28 coins. The combined value of the coins was $4.

Write a system of equations that models this situation.

\[
\begin{align*}
0.05n + 0.25q &= 4 \\
n + q &= 28
\end{align*}
\]

Use your system of equations to algebraically determine both the number of quarters, \( q \), and the number of nickels, \( n \), that Jim had in the bag.

\[
\begin{align*}
q &= 28 - n \\
0.05n + 0.25(28 - n) &= 4 \\
0.05n + 7 - 0.25n &= 4 \\
0.05n - 0.25n &= -3 \\
-0.20n &= -3 \\
n &= 15 \\
n &= 28 - q \\
0.05(28 - q) + 0.25q &= 4 \\
1.4 - 0.05q + 0.25q &= 4 \\
0.20q &= 2.6 \\
q &= 13
\end{align*}
\]

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

\[
\begin{align*}
q &= n \\
0.25q + 0.05n &= 3 \\
0.25n + 0.05n &= 3 \\
0.3n &= 3 \\
n &= 10
\end{align*}
\] 

\[
\begin{align*}
q &= 10 \\
0.05q + 0.25n &= 3 \\
0.25n &= 3 \\
3n &= 30 \\
n &= 10
\end{align*}
\]

Score 6: The student gave a complete and correct response.
37 Jim had a bag of coins. The number of nickels, $n$, and the number of quarters, $q$, totaled 28 coins. The combined value of the coins was $4. Write a system of equations that models this situation.

\[
\begin{align*}
q + n &= 28 \\
0.05n + 0.25q &= 4
\end{align*}
\]

Use your system of equations to algebraically determine both the number of quarters, $q$, and the number of nickels, $n$, that Jim had in the bag.

\[
\begin{align*}
q + n &= 28 \\
0.25q + 0.05n &= 4 - 4 \\
0.2n &= -16 \\
\frac{0.2n}{0.2} &= \frac{-16}{0.2} \\
q &= 13 \\
n &= 15
\end{align*}
\]

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

10 of each.

\[
0.25(10) + 0.05(10) = 3
\]

I did this on the calculator through trial and error.

Score 6: The student gave a complete and correct response.
37 Jim had a bag of coins. The number of nickels, $n$, and the number of quarters, $q$, totaled 28 coins. The combined value of the coins was $4.

Write a system of equations that models this situation.

\[ n + q = 28 \]
\[ 5n + 25q = 400 \]

Use your system of equations to algebraically determine both the number of quarters, $q$, and the number of nickels, $n$, that Jim had in the bag.

\[ 5n + 25q = 400 \]

\[ \begin{align*}
15 \text{ nickels} \\
13 \text{ quarters}
\end{align*} \]

\[ \begin{align*}
15n + 13q &= 28 \\
n + q &= 28
\end{align*} \]

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

10 coins each. $25 \times 10 = 250$ and $5 \times 10 = 50$. Once added and divided by 100, we get 3.00.

**Score 5:** The student used a method other than algebraic to find $n = 15$ and $q = 13.$
37 Jim had a bag of coins. The number of nickels, $n$, and the number of quarters, $q$, totaled 28 coins. The combined value of the coins was $4.

Write a system of equations that models this situation.

\[ n + q = 28 \]

Use your system of equations to algebraically determine both the number of quarters, $q$, and the number of nickels, $n$, that Jim had in the bag.

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

\[ 25 \times 10 = 250 \]
\[ 5 \times 10 = 50 \]

\[ \text{300} \]

\[ \text{10 of each} \]

**Score 4:** The student wrote one correct equation, found $n = 15$ and $q = 13$ by a method other than algebraic, and wrote a correct justification.
Jim had a bag of coins. The number of nickels, \( n \), and the number of quarters, \( q \), totaled 28 coins. The combined value of the coins was $4.

Write a system of equations that models this situation.

\[
\begin{align*}
  n + q &= 28 \\
  5n + 25q &= 4.00
\end{align*}
\]

Use your system of equations to algebraically determine both the number of quarters, \( q \), and the number of nickels, \( n \), that Jim had in the bag.

\[
\begin{align*}
  n + q &= 28 \\
  5n + 25q &= 4.00 \\
  \underline{5n + 26q = 32} \\
  -1 \\
  26q &= 27 \\
  q &= 1
\end{align*}
\]

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

\[
\begin{align*}
  10 \text{ quarters} \\
  10 \text{ nickles} \\
  10 \times 25 = 250 \\
  10 \times 5 = 50 \\
  \downarrow \\
  3.00
\end{align*}
\]

**Score 3:** The student wrote only one equation correctly and gave a correct justification.
37 Jim had a bag of coins. The number of nickels, $n$, and the number of quarters, $q$, totaled 28 coins. The combined value of the coins was $4.

Write a system of equations that models this situation.

$$n + q = 28$$

$$0.05n + 0.25q = 4$$

Use your system of equations to algebraically determine both the number of quarters, $q$, and the number of nickels, $n$, that Jim had in the bag.

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

Score 2: The student wrote the correct system of equations.
37 Jim had a bag of coins. The number of nickels, \( n \), and the number of quarters, \( q \), totaled 28 coins. The combined value of the coins was $4.

Write a system of equations that models this situation.

\[
\begin{align*}
10n + 25q &= 4 \\
n + q &= 28
\end{align*}
\]

Use your system of equations to algebraically determine both the number of quarters, \( q \), and the number of nickels, \( n \), that Jim had in the bag.

\[
\begin{align*}
10n + 25q &= 4 \\
-25(n + q &= 28) \\
-25n - 25q &= -700 \\
\underline{\text{Subtract}} \\
-10n &= -696 \\
n &= 69.6 \\
\end{align*}
\]

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

Score 1: The student only wrote one correct equation.
37 Jim had a bag of coins. The number of nickels, \( n \), and the number of quarters, \( q \), totaled 28 coins. The combined value of the coins was $4.

Write a system of equations that models this situation.

\[
\begin{align*}
7n + 25q &= 4 \\
n + q &= 28
\end{align*}
\]

Use your system of equations to algebraically determine both the number of quarters, \( q \), and the number of nickels, \( n \), that Jim had in the bag.

\[
\begin{align*}
28 - q &= 7 \cdot 7 \\
n &= 7 \\
q &= 3
\end{align*}
\]

Jim was given an additional $3.00 that was made up of equal numbers of nickels and quarters. How many of each coin was he given? Justify your answer.

They were given 6 coins.

Score 0: The student did not show enough correct work to receive any credit.