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Question 39 . . . . . . . . . . . . . . . . . . 77
28 Factor $6x^3 + 33x^2 - 63x$ completely.

\[
3x (2x^2 + 11x - 21) \\
3x (2x - 3)(x + 7)
\]

**Score:** 2  The student gave a complete and correct response.
28 Factor $6x^3 + 33x^2 - 63x$ completely.

Score: 2 The student gave a complete and correct response.
28 Factor $6x^3 + 33x^2 - 63x$ completely.

Score: 1 The student made an error by treating the expression as an equation.
28 Factor $6x^3 + 33x^2 - 63x$ completely.

$3x (2x^2 + 11x - 21)$

$3x (2x + 7)(x - 3)$

Score: 1  The student made one factoring error.
28 Factor $6x^3 + 33x^2 - 63x$ completely.

\[ 3x(2x+11x -21) \]

**Score:** 1  The student did not factor completely.
28 Factor $6x^3 + 33x^2 - 63x$ completely.

\[
\begin{array}{c|c|c|c}
3x & 2x^2 + 11x - 21 & = 0 \\
\hline
3x & 2x^2 + 11x - 21 & = 0 \\
\hline
 & 2(x^2 - 7x + 7) & x + 7 = 0 \\
 & x = -7 & 15, 75 = 0 \\
 & x = -7 & \\
\end{array}
\]

Score: 0 The student factored incorrectly and treated the expression as an equation.
29 Five thousand dollars is invested at an interest rate of 3.5% compounded quarterly. No money is deposited or withdrawn from the account. Using the formula below, determine, to the nearest cent, how much this investment will be worth in 18 years.

\[ A = P\left(1 + \frac{r}{n}\right)^{nt} \]

- \( A \) = amount
- \( P \) = principal
- \( r \) = interest rate
- \( n \) = number of times the interest rate compounded annually
- \( t \) = time in years

\[ A = 5000\left(1 + \frac{0.035}{4}\right)^{4 \cdot 18} \]

\[ A = \$9362.36 \]

**Score: 2** The student gave a complete and correct response.
Five thousand dollars is invested at an interest rate of 3.5% compounded quarterly. No money is deposited or withdrawn from the account. Using the formula below, determine, to the nearest cent, how much this investment will be worth in 18 years.

\[ A = P\left[1 + \frac{r}{n}\right]^nt \]

- \( A \) = amount
- \( P \) = principal
- \( r \) = interest rate
- \( n \) = number of times the interest rate compounded annually
- \( t \) = time in years

Score: 1  The student did not divide 0.035 by 4 to get the quarterly rate.
29 Five thousand dollars is invested at an interest rate of 3.5% compounded quarterly. No money is deposited or withdrawn from the account. Using the formula below, determine, to the nearest cent, how much this investment will be worth in 18 years.

\[ A = P \left(1 + \frac{r}{n}\right)^{nt} \]

- \( A \) = amount
- \( P \) = principal
- \( r \) = interest rate
- \( n \) = number of times the interest rate compounded annually
- \( t \) = time in years

\[ A = 5000 \left(1 + \frac{0.035}{4}\right)^{4 \times 18} \]

\[ A = 5848.90 \]

\[ A = 5,848.90 \]

\[ A = \$5,848.90 \]

**Score: 1** The student did not multiply the number of years by 4.
Question 29

29 Five thousand dollars is invested at an interest rate of 3.5% compounded quarterly. No money is deposited or withdrawn from the account. Using the formula below, determine, to the nearest cent, how much this investment will be worth in 18 years.

\[ A = P\left[1 + \frac{r}{n}\right]^{nt} \]

- \( A \) = amount
- \( P \) = principal
- \( r \) = interest rate
- \( n \) = number of times the interest rate compounded annually
- \( t \) = time in years

\[ 5000\left[1 + \frac{3.5}{4}\right]^{18 \times 4} \]

\[ 5069, 883, 615.22 \]

Score: 0 The student gave a completely incorrect response.
30 A colony of bacteria grows exponentially. The table below shows the data collected daily.

<table>
<thead>
<tr>
<th>Day (x)</th>
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<tbody>
<tr>
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<td>5</td>
<td>1650</td>
</tr>
<tr>
<td>6</td>
<td>2600</td>
</tr>
</tbody>
</table>

State the exponential regression equation for the data, rounding all values to the nearest hundredth.

\[
\begin{align*}
a &= 239.21 \\
b &= 1.48 \\
y &= 239.21 (1.48)^x
\end{align*}
\]

**Score: 2**  The student gave a complete and correct response.
30 A colony of bacteria grows exponentially. The table below shows the data collected daily.

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State the exponential regression equation for the data, rounding all values to the nearest hundredth.

\[ y = a \times b^x \]

\[ a = 239.21 \quad b = 1.48 \]

Score: 2  The student gave a complete and correct response.
A colony of bacteria grows exponentially. The table below shows the data collected daily.

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State the exponential regression equation for the data, rounding all values to the nearest hundredth.

\[ y = a \cdot b^x \]

\[ y = 245.015 \cdot (1.47)^x \]

**Score:** 1  The student wrote an incorrect exponential regression equation. [The student may have not cleared the frequency on the exponential regression screen on the calculator after doing question number 25.]
30 A colony of bacteria grows exponentially. The table below shows the data collected daily.

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State the exponential regression equation for the data, rounding all values to the nearest hundredth.

\[ 239.21 \left(1.48\right)^x \]

Score: 1 The student wrote an expression instead of an equation.
A colony of bacteria grows exponentially. The table below shows the data collected daily.

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</table>

State the exponential regression equation for the data, rounding all values to the nearest hundredth.

\[ y = a \cdot b^x \]

\[ a = 239.2 \]
\[ b = 1.5 \]
\[ y = \left(239.2\right)^{1.5^x} \]

**Score: 0** The student rounded both values to the nearest tenth and made a conceptual error when writing the equation.
A colony of bacteria grows exponentially. The table below shows the data collected daily.

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</table>

State the exponential regression equation for the data, rounding all values to the nearest hundredth.

\[
\hat{y} = 239.211 \cdot 1.481^x
\]

**Score:** 0  The student rounded incorrectly and wrote an expression instead of an equation.
30 A colony of bacteria grows exponentially. The table below shows the data collected daily.

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</table>

State the exponential regression equation for the data, rounding all values to the nearest hundredth.

\[ y = ax + b \]
\[ a = 361.25 \]
\[ b = -43.75 \]

\[ y = 361.25x - 43.75 \]

**Score:** 0  The student made an error by finding a linear regression.
31 Express \( \frac{2 + \frac{6}{x - 3}}{x} \) in simplest form, when \( x \neq 0 \) and \( x \neq 3 \).

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

**Score: 2**  The student gave a complete and correct response.
Express \( \frac{2 + \frac{6}{x-3}}{\frac{x}{x-3}} \) in simplest form, when \( x \neq 0 \) and \( x \neq 3 \).

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

Express \( \frac{2 + \frac{6}{x-3}}{\frac{x}{x-3}} \) in simplest form, when \( x \neq 0 \) and \( x \neq 3 \).

**Score: 1** The student made an error by not multiplying both terms of the numerator by \((x - 3)\).
31 Express \( \frac{x}{x - 3} + \frac{6}{x - 3} \) in simplest form, when \( x \neq 0 \) and \( x \neq 3 \).

Score: 1  The student did not simplify completely.
Question 31

31 Express \( \frac{2 + \frac{6}{x-3}}{x} \) in simplest form, when \( x \neq 0 \) and \( x \neq 3 \).

Score: 0  The student made an error by not multiplying both terms of the numerator by \((x - 3)\) and stated the final answer as an equation.
A central angle whose measure is $\frac{2\pi}{3}$ radians intercepts an arc with a length of $4\pi$ feet.

Find the radius of the circle, in feet.

$$S = \Theta r$$

$$S = 4\pi$$

$$\Theta = \frac{2\pi}{3}$$

$$\frac{3}{4\pi} \cdot 4\pi = \left(\frac{2\pi}{3}\right) r \cdot \frac{3}{2\pi}$$

$$6 = r$$

Score: 2   The student gave a complete and correct response.
32 A central angle whose measure is $\frac{2\pi}{3}$ radians intercepts an arc with a length of $4\pi$ feet.

Find the radius of the circle, in feet.

\[
\frac{2\pi}{3} \cdot \lambda = 4\pi
\]

\[
\frac{\lambda}{3} = 2
\]

\[
\lambda = 6
\]

**Score: 2** The student gave a complete and correct response.
32 A central angle whose measure is \( \frac{2\pi}{3} \) radians intercepts an arc with a length of 4\( \pi \) feet.

Find the radius of the circle, in feet.

\[
\frac{2(180)}{3} = 120
\]

\[
\frac{120}{360} = \frac{2}{\pi r}
\]

\[
\frac{1}{3} = \frac{2}{r}
\]

\[
r = 6
\]

Score: 2  The student gave a complete and correct response.
A central angle whose measure is $\frac{2\pi}{3}$ radians intercepts an arc with a length of $4\pi$ feet. Find the radius of the circle, \textit{in feet}.

\begin{align*}
\frac{\frac{2\pi}{3}}{2\pi} &= \frac{4\pi}{2\pi r} \\
8\pi^2 &= 4\pi^2 \cdot \frac{2}{3} \\
24\pi^2 &= 4\pi^2 r \\
6 &= r
\end{align*}

\textbf{Score: 2} \quad \text{The student gave a complete and correct response.}
32 A central angle whose measure is \( \frac{2\pi}{3} \) radians intercepts an arc with a length of \( 4\pi \) feet.

Find the radius of the circle, in feet.

Score: 1  The student made an error by dividing \( \frac{2\pi}{3} \) by \( 4\pi \).
32 A central angle whose measure is $\frac{2\pi}{3}$ radians intercepts an arc with a length of $4\pi$ feet. Find the radius of the circle, in feet.

\[
\frac{4\pi}{\frac{2\pi}{3}} = \frac{\frac{2\pi}{3}}{\frac{2\pi}{3}}
\]

\[
\frac{2}{3} = r
\]

**Score:** 1 The student made an error when dividing by $\frac{2\pi}{3}$. 
32 A central angle whose measure is \( \frac{2\pi}{3} \) radians intercepts an arc with a length of \( 4\pi \) feet. Find the radius of the circle, in feet.

Score: 0 The student made an error by interchanging the arc length and angle measure, and then made an error when dividing by \( 4\pi \).
A sine function is graphed below.

Determine and state the amplitude and period of this function.

\[
\text{amplitude} = 2 \\
\text{period} = 2\pi
\]

Score: 2  The student gave a complete and correct response.
33 A sine function is graphed below.

Determine and state the amplitude and period of this function.

Score: 1  The student stated an incorrect period.
A sine function is graphed below.

Determine and state the amplitude and period of this function.

\[
\text{Amplitude} = 4
\]

\[
\text{Period} = 2\pi
\]

Score: 1 The student stated an incorrect amplitude.
33 A sine function is graphed below.

Determine and state the amplitude and period of this function.

Amplitude - 1.3
Period - \( \frac{1}{3}\pi \)

Score: 0  The student stated an incorrect amplitude and period.
On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2.

Determine how many students scored between 79.9 and 88.3.

\[
\begin{align*}
\text{Score: } & 2 \quad \text{The student gave a complete and correct response.}
\end{align*}
\]
On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2.

Determine how many students scored between 79.9 and 88.3.

\[ \frac{62.4}{100} = \frac{x}{210} \]

13,104 = 100x

131 = x

Score: 2  The student gave a complete and correct response.
34 On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2.

Determine how many students scored between 79.9 and 88.3.

\[
\text{normalcdf} (-79.9, 88.3, 82, 4.2) = 0.1311776002 \\
\approx 131
\]

Score: 2  The student gave a complete and correct response.
Question 34

34 On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2.

Determine how many students scored between 79.9 and 88.3.

Score: 1    The student did not determine the number of students.
34 On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2.

Determine how many students scored between 79.9 and 88.3.

Score: 1 The student made an error in finding the percentage.
34 On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2. Determine how many students scored between 79.9 and 88.3.

Score: 0 The student made an error in calculating the percentage and did not round appropriately.
35 Given \( \tan \theta = -\frac{5}{12} \) and \( \frac{\pi}{2} < \theta < \pi \), determine the exact value of the expression \( \sin \theta \cot \theta \).

**Score: 2**  The student gave a complete and correct response.
35 Given \( \tan \theta = -\frac{5}{12} \) and \( \frac{\pi}{2} < \theta < \pi \), determine the exact value of the expression \( \sin \theta \cot \theta \).

\[
\tan \theta = -\frac{5}{12} \\
\theta = \tan^{-1}(-\frac{5}{12}) \\
\theta = 157.3801351
\]

\[
\sin \theta \cot \theta = -0.9230769251 \\
\sin \theta \cot \theta = -0.923076
\]

**Score: 2** The student gave a complete and correct response.
35 Given \( \tan \theta = -\frac{5}{12} \) and \( \frac{\pi}{2} < \theta < \pi \), determine the exact value of the expression \( \sin \theta \cot \theta \).

\[
\sin \theta \cot \theta = \left( -\frac{5}{12} \right) \left( -\frac{12}{5} \right) = \frac{60}{60} = 1
\]

\[
tan \theta = -\frac{5}{12} \text{ and } \frac{\pi}{2} < \theta < \pi
\]

\[
\begin{array}{c}
T \\
A \\
C
\end{array}
\]

Score: 1  The student made an error by placing the angle in Quadrant III.
Given \( \tan \theta = -\frac{5}{12} \) and \( \frac{\pi}{2} < \theta < \pi \), determine the exact value of the expression \( \sin \theta \cot \theta \).

Score: 1  The student made an error by not finding the product.
35 Given $\tan \theta = -\frac{5}{12}$ and $\frac{\pi}{2} < \theta < \pi$, determine the exact value of the expression $\sin \theta \cot \theta$.
Question 35

35 Given $\tan \theta = -\frac{5}{12}$ and $\frac{\pi}{2} < \theta < \pi$, determine the exact value of the expression $\sin \theta \cot \theta$.

Score: 0  The student made a transcription error when expressing $\cot \theta$ and did not express the exact value as the final answer.
35 Given \( \tan \theta = -\frac{5}{12} \) and \( \frac{\pi}{2} < \theta < \pi \), determine the exact value of the expression \( \sin \theta \cot \theta \).

\[
\theta = \tan^{-1}(-\frac{5}{12}) = -22.61986495
\]

\[
(\sin(-22.619...)) \left( \frac{\pi}{\sin(-22.619...)} \right) = 1
\]

**Score: 0**  The student gave a completely incorrect response.
The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

Score: 4  The student gave a complete and correct response.
The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

\[
x = \cos^{-1}\left(\frac{b^2 + c^2 - a^2}{2bc}\right)
\]

\[x = 115.3769335\]

\[x \approx 115.4\]

**Score: 4** The student gave a complete and correct response.
The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

Score: 3 The student made an error by dividing by 84 instead of \(-84\).
36 The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

Score: 2  The student made an error by finding the measure of angle A in radians.
36 The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

\[ 11^2 = 6^2 + 7^2 - 2(6)(7) \sin A \]
\[ 121 = 36 + 49 - 84 \sin A \]
\[ 36 = -84 \sin A \]
\[ \sin A = \frac{36}{-84} \]

\[ A = -25.4 \]  

**Score: 2** The student made a transcription error by using sine instead of cosine, and did not recognize that $-25.4$ is not a viable solution.
The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

Score: 2  The student stated \( \cos \theta = 115.3 \) and did not round properly.
36 The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

\[ a^2 = b^2 + c^2 - 2bc \cos A \]
\[ 11^2 = 7^2 + 6^2 - 2(7)(6) \cos X \]
\[ 121 = 49 + 36 - 84 \cos X \]
\[ 121 = 85 + 84 \cos X \]
\[ 36 = 84 \cos X \]
\[ -4.3 = \cos X \]

Score: 2 The student rounded prematurely and did not solve for \( x \).
The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

Score: 1  The student made a correct substitution into the Law of Cosines.
36 The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

\[ 6^2 = 7^2 + 11^2 - 2(7)(11) \cos x \]
\[ 36 = 49 + 121 - 154 \cos x \]
\[ 36 = 170 - 154 \cos x \]
\[ -134 = -154 \cos x \]
\[ \cos x = 0.8701298701 \]
\[ \angle x = 29.53^\circ \]

Score: 1 The student made an error by finding the smallest angle and rounding incorrectly.
The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the nearest tenth of a degree, the measure of the largest angle of the triangle.

\[ \frac{6}{\sin 7} = \frac{11}{\sin x} \]
\[ \frac{6 \sin x = 11 \cdot \sin 7}{6} \]
\[ \sin x = 0.2234 \ldots \]
\[ \sin^{-1}(0.2234 \ldots) = 12.9 \]

**Score: 0** The student made an error by using the Law of Sines and treated the 7 as an angle.
Question 37

37 Solve algebraically for $c$:

\[
\left| \frac{3}{2}c - 10 \right| - 9 \leq -1
\]

\[
\frac{3}{2}c - 10 + 9 \geq 0
\]

\[
\frac{3}{2}c \geq 1
\]

\[
c \geq \frac{2}{3}
\]

\[
\frac{3}{2}c - 10 - 9 \leq 0
\]

\[
\frac{3}{2}c - 10 - 9 \geq 0
\]

\[
\frac{3}{2}c \leq 19
\]

\[
c \leq \frac{38}{3}
\]

\[
\frac{3}{2}c \leq 19
\]

\[
\frac{3}{2}c - 10 - 9 \leq 0
\]

\[
\frac{3}{2}c - 10 - 9 \geq 0
\]

\[
\frac{3}{2}c \leq 19
\]

\[
c \leq \frac{38}{3}
\]

\[
\text{Score: 4} \quad \text{The student gave a complete and a correct response.}
\]
37 Solve algebraically for $c$:

\[
\left| \frac{3}{2}c - 10 \right| - 9 \leq -1
\]

Score: 4  The student gave a complete and correct response.
37 Solve algebraically for $c$:

$$\left| \frac{3}{2}c - 10 \right| - 9 \leq -1$$

\[
\begin{align*}
\frac{3}{2}c - 10 & \leq 8 \\
+10 & \quad +10 \\
\frac{2}{3}c & \leq 18 \cdot \frac{2}{3} \\
(12) & \geq c \\
\end{align*}
\]

\[
\begin{align*}
\frac{3}{2}c - 10 & \geq -8 \\
+10 & \quad +10 \\
\frac{2}{3}c & \geq 2 \cdot \frac{2}{3} \\
(1.3) & \leq c
\end{align*}
\]

**Score:** 3  The student made an error by expressing \(\frac{4}{3}\) as 1.3 instead of 1.\(\overline{3}\).
37 Solve algebraically for $c$:

$$\left| \frac{3}{2}c - 10 \right| - 9 \leq -1$$

\[\begin{align*}
\frac{3}{2}c - 10 - 9 & \leq -1 \\
\frac{3}{2}c - 19 & \leq -1 \\
\frac{3}{2}c & \leq 18 \\
c & \leq 12
\end{align*}\]

\[\begin{align*}
-\frac{3}{2}c + 10 - 9 & \leq -1 \\
-\frac{3}{2}c + 1 & \leq -1 \\
-\frac{3}{2}c & \leq -2 \\
\frac{3}{2}c & \geq 2 \\
c & \geq \frac{4}{3}
\end{align*}\]

\(\{ \frac{4}{3}, 12 \}\)

**Score: 3** The student made an error by not stating the solution as a conjunction.
37 Solve algebraically for $c$:

$$\left| \frac{3}{2}c - 10 \right| - 9 \leq -1$$

$$\quad \quad + 9 + 9$$

$$\left| \frac{3}{2}c - 10 \right| \leq 8$$

$$\frac{3}{2}c - 10 \leq 8$$

$$\quad + 10 + 10$$

$$\frac{3}{2}c \leq 18$$

$$\quad \frac{3}{2} \quad \frac{3}{2}$$

$$c \leq 12$$

$$\frac{3}{2}c + 10 \geq 9$$

$$\quad -10 -10$$

$$\frac{3}{2}c \geq -2$$

$$\quad - \frac{3}{2}c - \frac{3}{2}$$

$$c \geq 1.66$$

**Score: 2** The student made an error when writing the inequality symbol and did not write the solution as a conjunction.
Question 37

37 Solve algebraically for $c$:

$$\left| \frac{3}{2}c - 10 \right| - 9 \leq -1$$

\[
\begin{align*}
\left( \frac{3}{2}c - 10 \right) - 9 & \leq -1 \\
\frac{3}{2}c - 10 & \leq -20 \\
\frac{3}{2}c & \leq 10 \\
c & \leq \frac{20}{3}
\end{align*}
\]

\[
\begin{align*}
\left( \frac{3}{2}c + 10 \right) + 9 & \geq 1 \\
\frac{3}{2}c + 10 & \geq -10 \\
\frac{3}{2}c & \geq -20 \\
c & \geq \frac{4}{3}
\end{align*}
\]

\[c \leq 12\]

Score: 2  The student did not reverse the inequality sign and did not write the solution as a conjunction.
37 Solve algebraically for $c$:

$$\left| \frac{3}{2}c - 10 \right| - 9 \leq -1$$

$$\frac{3}{2}c - 10 \leq 8$$

$$\frac{3}{2}c \leq 18$$

$$c \leq 12$$

$$\frac{3}{2}c - 10 \geq 8$$

$$\frac{3}{2}c \geq 18$$

$$c \geq 12$$

Score: 1 The student made a conceptual error by multiplying by $\frac{3}{2}$ and then did not state the solution as a conjunction.
37 Solve algebraically for $c$:

\[
\left| \frac{3}{2}c - 10 \right| - 9 \leq -1
\]

\[
\left| \frac{3}{2}c - 10 \right| \leq 8
\]

\[
\frac{3}{2}c - 10 \leq 8
\]

\[
\frac{3}{2}c \leq 18
\]

\[
\frac{3}{2}c \leq 18 \div \frac{3}{2}
\]

\[
c \leq 12
\]

Score: 1  The student made an error by only solving for $c \leq 12$. 
Question 37

37 Solve algebraically for $c$:

$$\left| \frac{3}{2}c - 10 \right| - 9 \leq -1$$

\[
\begin{align*}
\frac{3}{2}c + 10 - 9 & \leq -1 \\
\frac{3}{2}c - 1 & \leq -1 \\
\frac{3}{2}c & \leq -2 \\
\frac{3}{2}c & \leq -4 \\
\frac{3}{2}c & \leq -1.3 \\
\frac{3}{2}c & \leq -1.2
\end{align*}
\]

\[
\begin{align*}
\frac{3}{2}c - 10 - 9 & \leq -1 \\
\frac{3}{2}c - 19 & \leq -1 \\
\frac{3}{2}c & \leq 18 \\
\frac{3}{2}c & \geq 12
\end{align*}
\]

Score: 0  The student gave a completely incorrect response.
37 Solve algebraically for c:

\[ \left| \frac{3}{2}c - 10 \right| - 9 \leq -1 \]

Score: 0  The student attempted to solve only one inequality and made a transcription error.
38 Solve $2\cos^3 \theta = \cos \theta$ for all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$.

Score: 4  The student gave a complete and correct response.
38 Solve $2\cos^2 \theta = \cos \theta$ for all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$.

Let $u = \cos \theta$

\[2u^2 + u - u = 0\]
\[2u^2 - u = 0\]
\[u(2u-1) = 0\]

\[u = 0\] or \[2u-1 = 0\]

\[u = \frac{1}{2}\]

\[\cos \theta = 0\] or \[\cos \theta = \frac{1}{2}\]

\[\theta = 90^\circ, 270^\circ\] or \[\theta = 60^\circ, 300^\circ\]

**Score:** 4  The student gave a complete and correct response.
38 Solve $2\cos^2 \theta = \cos \theta$ for all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$.

Score: 3  The student made an error by stating $180^\circ$ instead of $270^\circ$. 
Question 38

38 Solve $2\cos^2 \theta = \cos \theta$ for all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$.

Score: 3  The student made a graphing error by graphing $\cos^2 \theta$ instead of $2\cos^2 \theta$. 
Question 38

38 Solve \(2\cos^2 \theta = \cos \theta\) for all values of \(\theta\) in the interval \(0^\circ \leq \theta < 360^\circ\).

\[
\frac{2 \cos^2 \theta}{\cos \theta} = \frac{\cos \theta}{\cos \theta}
\]

\[
\frac{2 \cos \theta}{2} = \frac{1}{2}
\]

\[
\cos \theta = \frac{1}{2}
\]

\[
\theta = 60^\circ \text{ and } 300^\circ
\]

Score: 2  The student made a conceptual error by dividing both sides by \(\cos \theta\).
38 Solve $2\cos^2 \theta = \cos \theta$ for all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$.

Score: 2  The student did not use $a = 0$. 
38 Solve \(2\cos^3 \theta = \cos \theta\) for all values of \(\theta\) in the interval \(0^\circ \leq \theta < 360^\circ\).

\[
\begin{align*}
2\cos^2 \theta - \cos \theta &= 0 \\
\cos \theta (2\cos \theta - 1) &= 0 \\
\cos \theta &= 0 \quad 2\cos \theta - 1 = 0 \\
\cos \theta &= 0 \quad \cos \theta = \frac{1}{2} \\
\theta &= 60^\circ \quad \theta = 90^\circ
\end{align*}
\]

**Score:** 2   The student only found the two angles.
38 Solve $2\cos^2 \theta = \cos \theta$ for all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$.

Score: 1  The student made a conceptual error by dividing both sides by $\cos \theta$, and then only found the one angle.
Question 38

38 Solve $2\cos^2 \theta = \cos \theta$ for all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$.

Score: 0  The student made a conceptual error by dividing by $\cos \theta$ and then stated $\cos \theta = 60$, and did not find 300.
Solve for $p$ algebraically: $\log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) = \frac{3}{4}$
39 Solve for $p$ algebraically: $\log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) - \log_{16} (2p + 11) = \frac{3}{4}$

\[
\log_{16} \frac{p^2 - p + 4}{2p + 11} = \frac{3}{4}
\]

\[
\frac{p^2 - p + 4}{2p + 11} = 16^{\frac{3}{4}}
\]

\[
8 = p^2 - p + 4
\]

\[
p^2 - 17p - 84 = 0
\]

\[
p = 17 \pm \sqrt{17^2 - 4(-84)}
\]

\[
p = 17 \pm \sqrt{49\cdot 5}
\]

\[
p = 21 \quad p = -4
\]

Score: 6  The student gave a complete and correct response.
Question 39

39 Solve for $p$ algebraically: \[ \log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) = \frac{3}{4} \]

\[ \frac{p^2 - p + 4}{2p + 11} = 16^{\frac{3}{4}} \]
\[ \frac{p^2 - p + 4}{2p + 11} = 4 \]
\[ 4(2p + 11) = p^2 - p + 4 \]
\[ 8p + 44 = p^2 - p + 4 \]
\[ 0 = p^2 - 9p - 40 \]
\[ (p - 21)(p + 4) = 0 \]
\[ p = 21 \text{ or } p = -4 \]

Score: 5  The student made an error by rejecting $p = 21$. 
Question 39

39 Solve for $p$ algebraically: $\log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) = \frac{3}{4}$

\[ \log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) = \frac{3}{4} \]

\[ 16^{\frac{3}{4}} = \frac{p^2 - p + 4}{2p + 11} \]

\[ 8 = \frac{p^2 - p + 4}{2p + 11} \]

\[ 8(2p + 11) = p^2 - p + 4 \]

\[ 16p + 88 = p^2 - p + 4 \]

\[ -p^2 - p + 16p + 88 - 4 = 0 \]

\[ -p^2 + 15p + 84 = 0 \]

\[ p^2 - 15p - 84 = 0 \]

\[ p = \frac{15 \pm \sqrt{225 + 336}}{2} \]

\[ p = \frac{15 \pm \sqrt{561}}{2} \]

Score: 5  The student made a sign error when moving $p$ to the other side of the equation.
39 Solve for $p$ algebraically: \[ \log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) - \log_{16} (2p + 11) = \frac{3}{4} \]

\[
\frac{3}{4} = \frac{p^2 - p + 4}{2p + 11}
\]

\[
(2p + 11) \left( \frac{3}{4} \right) = \frac{p^2 - p + 4}{2p + 11} (2p + 11)
\]

\[
2p + 88 = p^2 - p + 4
\]

\[
0 = p^2 - 3p - 84
\]

\[
x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-84)}}{2(1)}
\]

\[
x = \frac{3 \pm \sqrt{9 + 334}}{2}
\]

\[
x = \frac{3 \pm \sqrt{345}}{2}
\]

Score: 4  The student made an error using the distributive property and did not reject

\[
\frac{3}{2} \neq \frac{\sqrt{345}}{2}.
\]
Question 39

39 Solve for \( p \) algebraically: \( \log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) - \log_{16} (2p + 11) = \frac{3}{4} \)

\[
\log_{16} \frac{p^2 - p + 4}{2p + 11} = \frac{3}{4}
\]

\[
\frac{p^2 - p + 4}{2p + 11} = 16^{\frac{3}{4}} = \left(\sqrt[4]{16}\right)^3 = 2^3 = 8
\]

\[
p^2 - p + 4 = 16p + 88
\]

\[
p^2 - 17p - 84 = 0
\]

\[
p = \frac{17 \pm \sqrt{289 - (-336)}}{2}
\]

**Score: 4** The student made a correct substitution into the quadratic formula, but showed no further work.
39 Solve for \( p \) algebraically: \( \log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) - \log_{16} (2p + 11) = \frac{3}{4} \)

Score: 3  The student wrote a correct quadratic equation.
39 Solve for $p$ algebraically: $\log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) = \frac{3}{4}$

\[
\log_{16} p^2 - 3p - 7 = \frac{3}{4}
\]

\[
16 = p^2 - 3p - 7
\]

\[
8 = p^2 - 3p - 7
\]

\[
-8
\]

\[
p^2 - 3p - 15 = 0
\]

\[
p = \frac{3 \pm \sqrt{(-3)^2 - 4 \cdot 1 \cdot (-15)}}{2 \cdot 1}
\]

\[
p = \frac{3 \pm \sqrt{69}}{2}
\]

Score: 3  The student made a conceptual error by subtracting the polynomials instead of dividing them.
39 Solve for $p$ algebraically: $\log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) - \log_{16} (2p + 11) = \frac{3}{4}$

\[
\frac{\log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right)}{2p + 11} = \frac{3}{4}
\]
\[
16^{3/4} = \frac{p^2 - p + 4}{2p + 11}
\]

\[
y = 8 \rightarrow x = 21
\]

**Score:** 2  The student stated the equation in exponential form, but did not obtain 21 by an algebraic method.
39 Solve for $p$ algebraically: $\log_{16} \left( \frac{p^2 - p + 4}{2p + 11} \right) = \frac{3}{4}$

\[
\frac{3}{4} = \frac{p^2 - p + 4}{2p + 11}
\]

Score: 2  The student stated the equation correctly in exponential form.
39 Solve for \( p \) algebraically: \( \log_{16} (p^2 - p + 4) - \log_{16} (2p + 11) = \frac{3}{4} \)

Score: 1  The student rewrote the log equation correctly.
Question 39

39 Solve for $p$ algebraically: \( \log_{16} (p^2 - p + 4) - \log_{16} (2p + 11) = \frac{3}{4} \)

\[
\begin{align*}
\log_{16} \frac{2p+11}{p^2-p+4} &= \frac{3}{4} \\
\log_{16} \frac{3y}{16} &= \frac{2p+11}{p^2-p+4} \\
p^2-p+4 &= \left( \frac{2p+11}{p^2-p+4} \right) p^2-p+4 \\
8p^2-8p+32 &= 2p+11 \\
-2p - 11 &= -2p - 11 \\
8p^2-10p+21 &= 0 \\
m=168 \\
a=-10
\end{align*}
\]

**Score:** 1  The student made a conceptual error in rewriting the log equation, but did write an appropriate exponential equation.
39 Solve for $p$ algebraically: $\log_{16} \left( \frac{p^2 - p + 4}{(2p + 11)} \right) - \log_{16} (2p + 11) = \frac{3}{4}$

\[
\begin{align*}
\log_{16} \left( \frac{p^2 - p + 4}{(2p + 11)} \right) &= \frac{3}{4} \\
\frac{p^2 - p + 4}{(2p + 11)} &= 16^{\frac{3}{4}} \\
\frac{p^2 - p + 4}{(2p + 11)} &= 2^3 \\
p^2 - p + 4 &= 8(2p + 11) \\
p^2 - p + 4 &= 16p + 88 \\
p^2 - p - 83 &= 0 \\
-3 &\pm \sqrt{3^2 - 4(1)(-83)} = 0 \\
\end{align*}
\]

\[
\begin{align*}
p^2 &= (2p+3)(p-3) \\
(-3+p) + (2p+3)(p-3)(p+2) &= 0
\end{align*}
\]

Score: 0  The student wrote a completely incorrect response. No credit is given for finding 8.
39 Solve for \( p \) algebraically: \( \log_{16} \left( p^2 - p + 4 \right) - \log_{16} \left( 2p + 11 \right) = \frac{3}{4} \)

\[
\begin{align*}
12 &= \frac{p^2 - p + 4}{3p + 11} \\
34p + 132 &= p^2 - p + 4 \\
p^2 - 33p - 128 &= 0 \\
(p - 32)(p + 4) &= 0 \\
p &= 32 \text{ or } p = -4
\end{align*}
\]

**Score: 0**  The student made a conceptual error by evaluating \( 16 \left( \frac{3}{4} \right) \) followed by several computational errors, a factoring error, and did not reject \( p = -32 \).