25 Using a compass and straightedge, construct the angle bisector of $\angle ABC$.
[Leave all construction marks.]
Question 25

25 Using a compass and straightedge, construct the angle bisector of \( \angle ABC \).
[Leave all construction marks.]

Score 2: The student gave a complete and correct response.
25 Using a compass and straightedge, construct the angle bisector of $\angle ABC$.
[Leave all construction marks.]

Score 1: The student constructed the bisector of angle $A$. 
Using a compass and straightedge, construct the angle bisector of $\angle ABC$. [Leave all construction marks.]

Score 0: The student gave a completely incorrect response.
26 On the set of axes below, \( \triangle ABC \) and \( \triangle DEF \) are graphed.

Describe a sequence of rigid motions that would map \( \triangle ABC \) onto \( \triangle DEF \).

- A rotation of \( 90^\circ \) clockwise about point \( B \) and then a translation down 4 and to the right by 3.

Score 2: The student gave a complete and correct response.
Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

First, rotate $90^\circ$ clockwise, then translate one unit right and four units down.

Score 1: The student described an appropriate sequence of rigid motions, but the center of rotation was not stated.
26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.

Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

- **Rotate $90^\circ$ clockwise.**
- **Translate down so that $A \rightarrow D$.**
- **$B \rightarrow E$, $E \rightarrow F$.**

**Score 1:** The student described an appropriate sequence of rigid motions, but the description was incomplete.
26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.

Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

- a rotation counterclockwise $270^\circ$ about point B
- a translation down 3 and right 4 units

**Score 1:** The student gave a correct description of the rotation, but gave an incorrect description of the translation.
26 On the set of axes below, \( \triangle ABC \) and \( \triangle DEF \) are graphed.

Describe a sequence of rigid motions that would map \( \triangle ABC \) onto \( \triangle DEF \).

A rotation followed by a translation

Score 1: The student described an appropriate sequence, but the description was incomplete.
26 On the set of axes below, \( \triangle ABC \) and \( \triangle DEF \) are graphed.

Describe a sequence of rigid motions that would map \( \triangle ABC \) onto \( \triangle DEF \).

A reflection over the line \( y=x \),
followed by a translation of right 1.

Score 0: The student gave a completely incorrect description.
As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.

Determine and state, to the nearest degree, the angle of elevation of the roof frame.

\[ \tan \theta = \frac{4}{12} \]

\[ \theta = \tan^{-1} \left( \frac{4}{12} \right) \]

\[ \theta = 18.4^\circ \]

Angle of elevation = 18°

Score 2: The student gave a complete and correct response.
27 As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.

Determine and state, to the nearest degree, the angle of elevation of the roof frame.

\[
\tan(x) = \frac{4}{24}
\]

\[
\tan^{-1}\left(\frac{4}{24}\right)
\]

\[x = 9.1^\circ\]

**Score 1:** The student wrote an incorrect trigonometric equation, but solved the equation correctly.
27 As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.

Determine and state, to the nearest degree, the angle of elevation of the roof frame.

\[
\tan \frac{A}{2} = \frac{4}{24}
\]

\[
\tan \frac{A}{2} = 0.1667 
\]

\[
\tan \frac{A}{2} = 14.0362 + 47 = 14^\circ
\]

**Score 1:** The student wrote a correct trigonometric equation, but no further correct work was shown.
As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.

Determine and state, to the nearest degree, the angle of elevation of the roof frame.

\[ 1^2 + 12^2 = x^2 \]
\[ 144 + 144 = x^2 \]
\[ \sqrt{288} = x \]
\[ x \approx 16.97 \, \text{ft} \]

\[ \angle = 13^\circ \]

Score 0: The student gave a completely incorrect response.
Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio 3:2.

\[ k = \frac{2}{5} \]

\[ P \left( x_1 + k(x_2 - x_1), y_1 + k(y_2 - y_1) \right) \]

\[ P \left( -2 + \frac{2}{5}(8+2), 5 + \frac{2}{5}(-1-5) \right) \]

\[ P(4, 1.4) \]

**Score 2:** The student gave a complete and correct response.
28 Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio $3:2$.

[The use of the set of axes below is optional.]

Find $x$: 
$$-2 + \frac{3}{5} (8 - (-2)) = 4$$

Find $y$: 
$$5 + \frac{2}{5} (-1 - 5) = 1.4$$

$P = (4, 1.4)$
Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio 3:2.

The use of the set of axes below is optional.

\[
\frac{2}{3} (10) = 6 \quad \frac{2}{5} (6) = 3.6
\]

\[
A \ (-2,5) \\
+ 6 - 3.6 \\
\hline
P \ (4, 1.4)
\]

Score 2: The student gave a complete and correct response.
Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio 3:2.

[The use of the set of axes below is optional.]

\[ P = (4, 1.4) \]

**Score 1:** The student gave a correct answer, but no work was shown.
28 Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio 3:2.

[The use of the set of axes below is optional.]

Score 1: The student determined point $P$, but did not state it as a coordinate.
28 Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio 3:2.

[The use of the set of axes below is optional.]

Score 1: The student showed correct work to determine the $x$-coordinate of $P$, but made an error in determining the $y$-coordinate.
Question 28

28 Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio 3:2.

[The use of the set of axes below is optional.]

Score 1: The student showed correct work to partition the line segment, but made an error in determining the $y$-coordinate.
Question 28

28 Directed line segment $AB$ has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of $P$, the point which divides the segment in the ratio 3:2.

[The use of the set of axes below is optional.]

Score 0: The student graphed $AB$ correctly, but no further correct work is shown.
29 In \( \triangle ABC \), \( AB = 5 \), \( AC = 12 \), and \( \angle A = 90° \). In \( \triangle DEF \), \( m\angle D = 90° \), \( DF = 12 \), and \( EF = 13 \). Brett claims \( \triangle ABC \cong \triangle DEF \) and \( \triangle ABC \sim \triangle DEF \).

Is Brett correct? Explain why.

**Score 2:** The student gave a complete and correct response.
29 In \( \triangle ABC \), \( AB = 5 \), \( AC = 12 \), and \( \angle A = 90^\circ \). In \( \triangle DEF \), \( \angle D = 90^\circ \), \( DF = 12 \), and \( EF = 13 \). Brett claims \( \triangle ABC \cong \triangle DEF \) and \( \triangle ABC \sim \triangle DEF \).

Is Brett correct? Explain why.

\[
\begin{align*}
5^2 + 12^2 &= c^2 \\
25 + 144 &= c^2 \\
\sqrt{169} &= c \\
13 &= c \\
AB &= \overline{DE} \\
13 &= \overline{BC} \\
AC &= \overline{EF} \\
\frac{5}{13} &= \frac{12}{13}
\end{align*}
\]

\( \overline{AB} \cong \overline{DE} \), \( \overline{BC} \cong \overline{EF} \), and \( \overline{AC} \cong \overline{DF} \) b/c they have the same lengths, \( \triangle ABC \cong \triangle DEF \) by \( \text{SSS} \cong \text{SSS} \).

\( \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} \) b/c they are proportionally =.

\( \triangle ABC \sim \triangle DEF \) by \( \text{SSS} \sim \).
29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90^\circ$. In $\triangle DEF$, $m\angle D = 90^\circ$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.

$\sqrt{5^2 + 12^2} = BC$

$169 = BC^2$

$13 = BC$

$(ED)^2 + 144 = 169$

$(ED)^2 = 25$

$ED = \sqrt{25}$

$ED = 5$

$\triangle ABC \cong \triangle DEF$ because $SSS \cong SSS$.

If the 2 $\triangle$s are $\cong$ it also means that they are similar $\sim$. All $\cong \triangle$s are $\sim$.

Score 2: The student gave a complete and correct response.
29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m \angle A = 90^\circ$. In $\triangle DEF$, $m \angle D = 90^\circ$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \equiv \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.

Yes. $\triangle ABC$ is a 5-12-13 Pythagorean Triple and $\triangle DEF$ is also a 5-12-13.

$\triangle ABC \equiv \triangle DEF$ by SSS.

Since the $\triangle$'s $\equiv$, they must be similar.

Score 2: The student gave a complete and correct response.
29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90^\circ$. In $\triangle DEF$, $m\angle D = 90^\circ$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.

Brett is correct because both triangles are right triangles and if we use the Pythagorean theorem, we find out that all the side lengths correspond to each other. (SSS)

Score 1: The student did not explain why the triangles are similar.
29 In \( \triangle ABC \), \( AB = 5 \), \( AC = 12 \), and \( \angle A = 90^\circ \). In \( \triangle DEF \), \( \angle D = 90^\circ \), \( DF = 12 \), and \( EF = 13 \). Brett claims \( \triangle ABC \equiv \triangle DEF \) and \( \triangle ABC \sim \triangle DEF \).

Is Brett correct? Explain why.

Score 0: The student did not show enough correct relevant work to receive any credit.
29 In \( \triangle ABC \), \( AB = 5 \), \( AC = 12 \), and \( \angle A = 90^\circ \). In \( \triangle DEF \), \( \angle D = 90^\circ \), 
\( DF = 12 \), and \( EF = 13 \). Brett claims \( \triangle ABC \cong \triangle DEF \) and \( \triangle ABC \sim \triangle DEF \).

Is Brett correct? Explain why.

I would say Brett is half-correct, both triangles are right triangles. That is where the similarities end though. The triangle cannot be congruent because the angle lengths differ.

Score 0: The student did not show enough correct relevant work to receive any credit.
The volume of a triangular prism is 70 in$^3$. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

\[ V = B \cdot h \]
\[ 70 = B \cdot 4 \]
\[ 70 = \frac{4B}{4} \]
\[ 17.5 = B \]

\[ A_\Delta = \frac{1}{2} l_1 \cdot l_2 \]
\[ 17.5 = \frac{1}{2} \cdot 5 \cdot l_2 \]
\[ 17.5 = \frac{2.5 \cdot l_2}{2} \]
\[ 7 = l_2 \]

**Score 2:** The student gave a complete and correct response.
30 The volume of a triangular prism is 70 in$^3$. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

\[ V = \frac{1}{2} \cdot l_1 \cdot l_2 \cdot h \]
\[ 70 = \left(\frac{1}{2} \times 5 \cdot x\right) \cdot 4 \]
\[ 70 = 10x \]
\[ x = 7 \]

Score 2: The student gave a complete and correct response.
The volume of a triangular prism is 70 in$^3$. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

\[ V = \frac{1}{2}bh \]

\[ 70 = 4B \]

\[ B = 17.5 \]

\[ 5x = 17.5 \]

\[ x = 3.5 \]

Score 1: The student found the correct area of the base of the triangular prism, but no further correct work was shown.
The volume of a triangular prism is 70 in$^3$. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

\[ V = \frac{1}{3} Bh \]
\[ 70 = \frac{1}{3} \left( \frac{1}{2} \times 5 \times x \right) \]
\[ 210 = \frac{1}{3} \times 5 \times x \]
\[ 21 = x \]

**Score 1:** The student made an error in drawing and using a pyramid instead of a prism.
30 The volume of a triangular prism is 70 in$^3$. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

Score 0: The student gave a completely incorrect response.
31 Triangle $ABC$ with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.

Determine and state the area of $\triangle ABC$.

\[ A = \frac{1}{2}bh \]
\[ A = \frac{1}{2}(12)(3) \]
\[ A = 18 \]

\[ A = \frac{1}{2}bh \]
\[ A = \frac{1}{2}(6)(3) \]
\[ A = 9 \]

\[ A = \frac{1}{2}bh \]
\[ A = \frac{1}{2}(6)(6) \]
\[ A = 18 \]

\[ A = lw \]
\[ A = (12)(6) \]
\[ A = 72 \]

\[ 18 + 18 + 9 = 45 \]

\[ 72 - 45 = 27 \]

**Score 2:** The student gave a complete and correct response.
31 Triangle \( ABC \) with coordinates \( A(-2,5), B(4,2), \) and \( C(-8,-1) \) is graphed on the set of axes below.

Determine and state the area of \( \triangle ABC \).

\[
\text{Area} = \frac{bh}{2} - \frac{bh}{2} - \frac{bh}{2}
\]

\[
= 72 - \frac{6(3)}{2} - \frac{6(6)}{2} - \frac{12(3)}{2}
\]

\[
= 72 - 9 - 18 - 18
\]

\[
= 72 - 45
\]

\[
\text{Area} = 27
\]

\textbf{Score 2:} The student gave a complete and correct response.
31 Triangle $ABC$ with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.

Determine and state the area of $\triangle ABC$.

Score 2: The student gave a complete and correct response.
31 Triangle $ABC$ with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.

Determine and state the area of $\triangle ABC$.

\[
\begin{align*}
A &= \frac{1}{2} \times \text{base} \times \text{height} \\
A &= \frac{1}{2} \left( \sqrt{153} \times \sqrt{2025} \right) \\
A &= \frac{1}{2} \left( \sqrt{153} \times 15 \right) \\
A &= \frac{1}{2} \times 22.20736 \\
A &= 27.8309629729
\end{align*}
\]

\[
\begin{align*}
\text{Distance of } BC &= \sqrt{(4+8)^2 + (2+1)^2} \\
&= \sqrt{(12)^2 + (3)^2} \\
&= \sqrt{153}
\end{align*}
\]

\[
\begin{align*}
\text{Distance of } AM &= \sqrt{(-2-2)^2 + (5+1)^2} \\
&= \sqrt{(-4)^2 + (6)^2} \\
&= \sqrt{52}
\end{align*}
\]

**Score 1:** The student made an error using the median instead of the altitude in determining the area.
31 Triangle $ABC$ with coordinates $A(-2,5), B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.

Determine and state the area of $\triangle ABC$.

\[
\begin{align*}
A_{\triangle} &= A_{\square} - A_{\triangle I} - A_{\triangle II} - A_{\triangle III} \\
&= 12.6 - \frac{12(3)}{2} - \frac{6(3)}{2} - \frac{6(6)}{2} \\
&= 72 - 18 + 9 + 18 \\
&= 81 \\
\end{align*}
\]

Score 1: The student made a computational error in determining the area of the triangle.
31 Triangle $ABC$ with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.

Determine and state the area of $\triangle ABC$.

\[
A = \frac{1}{2}bh \\
A = \frac{1}{2}(8)(6) \\
A = 36
\]

**Score 0:** The student did not show enough relevant course-level work to receive any credit.
Who was served more ice cream, Sally or Mary? Justify your answer.

\[ V_{\text{Sally}} = \pi \left( \frac{d}{2} \right)^2 h = \pi \left( \frac{4}{2} \right)^2 \cdot 8 = 100.53 \text{ cm}^3 \]

\[ V_{\text{Mary}} = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \left( \frac{7}{2} \right)^2 \cdot 12.5 = 60.35 \text{ cm}^3 \]

Mary has more ice cream

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.

\[ 60.35 - 100.53 = 60 \text{ cm}^3 \]
Sally and Mary both get ice cream from an ice cream truck. Sally’s ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary’s ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally’s cylinder and Mary’s cone.

Who was served more ice cream, Sally or Mary? Justify your answer.

Mary, because the volume of her container filled is \(51.0416\pi\) while Sally’s is only \(32\pi\)

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.

\[
51.0416\pi - 32\pi = 59.82116011
\]

\(60\) cubic cm

Score 4: The student gave a complete and correct response.
Sally and Mary both get ice cream from an ice cream truck. Sally’s ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary’s ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally’s cylinder and Mary’s cone.

Who was served more ice cream, Sally or Mary? Justify your answer.

Mary’s ice cream because it has more volume for the cone than the cylinder.

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.

<table>
<thead>
<tr>
<th>Cylinder</th>
<th>Cone</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V = 101 \text{ cm}^3 )</td>
<td>( V = 160 \text{ cm}^3 )</td>
</tr>
</tbody>
</table>

Score 3: The student correctly determined Mary had more ice cream, but no further correct work was shown.
Sally and Mary both get ice cream from an ice cream truck. Sally’s ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary’s ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally’s cylinder and Mary’s cone.

Who was served more ice cream, Sally or Mary? Justify your answer.

Mary, because her volume is $51.04\pi$ and Sally’s is $32\pi$.

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.

\[ \frac{160.35 - 106.53}{59.82} \]

Score 3: The student made a rounding error in determining the difference in the volumes of the ice creams.
32 Sally and Mary both get ice cream from an ice cream truck. Sally’s ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary’s ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally’s cylinder and Mary’s cone.

Who was served more ice cream, Sally or Mary? Justify your answer.

\[
\begin{align*}
\text{Sally} & : \ V = \pi r^2 h \\
& : \ V = \pi (2)^2 8 \\
& : \ V = 100.5 \\
\text{Mary} & : \ V = \frac{1}{3} \pi r^2 h \\
& : \ V = \frac{1}{3} \pi (3.5)^2 (12.5) \\
& : \ V = 160.35
\end{align*}
\]

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.

Score 2: The student correctly determined the volume of the cylinder and cone, but no further correct work was shown.
32 Sally and Mary both get ice cream from an ice cream truck. Sally’s ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary’s ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally’s cylinder and Mary’s cone.

Who was served more ice cream, Sally or Mary? Justify your answer.

mary cause it's bigger

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.

Score 1: The student indicated Mary and 60, but appropriate work was not shown.
Who was served more ice cream, Sally or Mary? Justify your answer.

\[
\text{Sally's ice cream: } V = \pi r^2 h = \pi \left( \frac{4}{2} \right)^2 \times 8 = 100.53 \text{ cm}^3
\]

\[
\text{Mary's ice cream: } V = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \left( \frac{7}{2} \right)^2 \times 12.5 = 48.1 \text{ cm}^3
\]

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.

**Score 1:** The student correctly determined the volume of the cylinder, but no further correct work was shown.
Sally and Mary both get ice cream from an ice cream truck. Sally’s ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary’s ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally’s cylinder and Mary’s cone.

Who was served more ice cream, Sally or Mary? Justify your answer.

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the nearest cubic centimeter.
**Question 33**

Given: \( \triangle AEB \) and \( \triangle DFC \), \( ABCD \parallel DF, EB \parallel FC, AC = DB \)

Prove: \( \triangle EAB \cong \triangle FDC \)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( \triangle AEB \parallel DF ) ( \triangle DFC ) ( \overline{ABCD} \parallel \overline{EF} ) ( \overline{AE} \parallel \overline{DF} ) ( \overline{EB} \parallel \overline{FC} ) ( \overline{AC} = \overline{DB} )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( \angle A \cong \angle D ) (( \overline{AB} \parallel \overline{DF} )) ( \angle EBC \cong \angle FCB )</td>
<td>2. If two parallel lines are cut by a transversal, then the alternate interior angles are congruent (1)</td>
</tr>
<tr>
<td>3. ( \angle ABE ) and ( \angle EBC ) ( \angle DCF ) and ( \angle FCB ) are supplementary</td>
<td>3. A linear pair form supplementary angles (2)</td>
</tr>
<tr>
<td>4. ( \angle ABE \cong \angle DCF ) (3) ( \angle EBC \cong \angle FCB ) ( \angle ABE \cong \angle DCF ) ( \angle EBC \cong \angle FCB )</td>
<td>4. Supplements of congruent angles are congruent (3)</td>
</tr>
<tr>
<td>5. ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} ) ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} ) ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} )</td>
<td>5. Given</td>
</tr>
<tr>
<td>6. ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} ) ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} ) ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} )</td>
<td>6. Reflexive property</td>
</tr>
<tr>
<td>7. ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} ) ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} ) ( \overline{AC} = \overline{DB} ) ( \overline{EB} \parallel \overline{FC} )</td>
<td>7. Subtraction property (5, 6)</td>
</tr>
<tr>
<td>8. ( \triangle EAB \cong \triangle FDC )</td>
<td>8. ASA postulate (2) (4) (7)</td>
</tr>
</tbody>
</table>

**Score 4:** The student gave a complete and correct response.
Question 33

Given: $\triangle AEB$ and $\triangle DFC$, $ABCD \parallel DF$, $AE \parallel DF$, $EB \parallel FC$, $AC \cong DB$

Prove: $\angle EAB > \angle FDC$

Proof:

1. $\triangle AEB \cong \triangle DFC$, $ABCD \parallel DF$, $AE \parallel DF$, $EB \parallel FC$, $AC \cong DB$  \(\circ\) given

2. $\angle A \cong \angle D$  \(\circ\) alternate interior angles are congruent when parallel lines

3. $BC \cong BC$  \(\circ\) reflexive

4. $AB \cong CD$  \(\circ\) subtraction postulate

5. $\angle EBA \cong \angle FCD$  \(\circ\) alternate exterior angles are congruent when parallel lines

6. $\triangle EAB \cong \triangle FDC$  \(\circ\) ASA Postulate

Score 4: The student gave a complete and correct response.
33 Given: $\triangle AEB$ and $\triangle DFC$, $ABCD$, $AE \parallel DF$, $EB \parallel FC$, $AC \cong DB$

Prove: $\triangle EAB \cong \triangle FDC$

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) $\triangle AEB$, $\triangle DFC$, $ABCD$, $AE \parallel DF$</td>
<td>1) given</td>
</tr>
<tr>
<td>2) $EB \parallel FC$, $AC \cong DB$</td>
<td>2) reflexive property</td>
</tr>
<tr>
<td>3) $AC \cong DB$</td>
<td>3) equals minus equals the result are equal</td>
</tr>
<tr>
<td>4) $AB \cong CD$</td>
<td>4) $\parallel$ lines form alternate interior angles that are congruent</td>
</tr>
<tr>
<td>5) $\angle EAB \cong \angle FDC$</td>
<td>5) $\textit{ASA}$ postulate</td>
</tr>
</tbody>
</table>

Score 3: The student wrote an incorrect reason in step 4 for $\angle EBA \cong \angle FCD$. 
Question 33

33 Given: \( \triangle AEB \) and \( \triangle DFC \), \( ABCD \parallel DF \), \( AE \parallel DF \), \( EB \parallel FC \), \( AC \equiv DB \)

Prove: \( \triangle EAB \equiv \triangle FDC \)

\[
\begin{align*}
\text{S} &
\begin{align*}
(1) & \text{AE} \parallel \text{DF}, \text{EB} \parallel \text{FC} \\
& \text{AC} \equiv \text{DB}, \text{ABCD} \\
(2) & \text{BC} \equiv \text{BC} \\
(3) & \text{AC} - \text{BC} \equiv \text{BD} - \text{BC} \\
& \text{AB} \equiv \text{DC} \\
(4) & \angle E \equiv \angle F \\
& \angle A \equiv \angle D \\
(5) & \triangle EAB \equiv \triangle FDC
\end{align*}
\end{align*}
\]

\[
\begin{align*}
\text{P} &
\begin{align*}
(1) & \text{Given} \\
(2) & \text{reflexive} \\
(3) & \text{Subtraction postulate} \\
(4) & \text{When parallel lines are cut by a transversal alt int \( \angle \)'s are \( \equiv \) } \\
(5) & \text{AAS}
\end{align*}
\end{align*}
\]

Score 3: The student wrote an incorrect statement and reason in step 4 for \( \angle E \equiv \angle F \).
33 Given: \( \triangle AEB \) and \( \triangle DFC \), \( ABCD \parallel DF, EB \parallel FC \), \( AC \equiv DB \)

Prove: \( \triangle EAB \equiv \triangle FDC \)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( \triangle AEB, \triangle DFC, ABCD, AE \parallel DF, EB \parallel FC ), ( AC \equiv DB )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( \angle A \equiv \angle D )</td>
<td>2. When 2 ( \parallel ) lines are cut by a transversal, alternate exterior angles are congruent</td>
</tr>
<tr>
<td>3. ( \angle EBA \equiv \angle FCD )</td>
<td>3. When 2 ( \parallel ) lines are cut by a transversal, alternate interior angles are congruent</td>
</tr>
<tr>
<td>4. ( AC \equiv DB )</td>
<td>4. Given</td>
</tr>
<tr>
<td>5. ( \overline{CB} \equiv \overline{CB} )</td>
<td>5. Reflexive Postulate</td>
</tr>
<tr>
<td>6. ( \overline{AB} \equiv \overline{CD} )</td>
<td>6. Subtraction Postulate</td>
</tr>
<tr>
<td>7. ( \triangle EAB \equiv \triangle FDC )</td>
<td>7. ASA ( \equiv )</td>
</tr>
</tbody>
</table>

Score 2: The student wrote incorrect reasons in steps 2 and 3.
33 Given: \( \triangle AEB \) and \( \triangle DFC \), \( ABCD \parallel DF \), \( AE \parallel DF \), \( EB \parallel FC \), \( AC \cong DB \)

Prove: \( \triangle EAB \cong \triangle FDC \)

1) \( AE \parallel DF \) \( \Rightarrow \) \( EB \parallel FC \) 
   1) Given

2) \( \angle 1 \cong \angle 2 \) 
   2) Alt. interior \( \angle s \cong \)

3) \( \angle 3 \cong \angle 4 \) 
   3) Alt. interior \( \angle s \cong \)

4) \( AC \cong DB \) 
   4) Given

5) \( CB \cong CB \) 
   5) Reflexive property

6) \( \frac{AC - BC}{DB - CB} = \frac{AC}{DB} \) 
   6) Subtraction property

or

\[ \frac{AB}{CD} = \]

7) \( \triangle EAB \cong \triangle FDC \) \( \Rightarrow \) \( ASA \)

Score 2: The student wrote an incomplete reason in step 2 and an incorrect reason in step 3.
33 Given: \( \triangle AEB \) and \( \triangle DFC \), \( ABCD \ || \ DF, \ EB \ || FC \), \( AC = DB \)

Prove: \( \triangle EAB \cong \triangle FDC \)

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Given</td>
</tr>
<tr>
<td>2.</td>
<td>Reflexive</td>
</tr>
<tr>
<td>3.</td>
<td>Substitution</td>
</tr>
<tr>
<td>4.</td>
<td>Parallel lines create ( \cong ) segments</td>
</tr>
<tr>
<td>5.</td>
<td>Corresponding exterior ( \cong ) segments</td>
</tr>
<tr>
<td>6.</td>
<td>SAS</td>
</tr>
</tbody>
</table>

Score 1: The student had only one correct statement and reason in step 2.
Question 33

33 Given: \( \triangle AEB \) and \( \triangle DFC \), \( ABCD \parallel DF, \text{ } EB \parallel FC, \text{ } AC \cong DB \)

Prove: \( \triangle EAB \cong \triangle FDC \)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( \triangle AEB, \triangle DFC ), ( ABCD ) ( \parallel ) ( DF, \text{ } EB \parallel FC ) ( AC \cong DB )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( \angle A \cong \angle D )</td>
<td>2. Parallel lines cut by a transversal form ( \cong ) alternate interior angles</td>
</tr>
<tr>
<td>3. ( \angle EBA \cong \angle FCD )</td>
<td>3. Parallel lines cut by a transversal form ( \cong ) alternate interior angles</td>
</tr>
<tr>
<td>4. ( \triangle EAB \cong \triangle FDC )</td>
<td>4. ( \text{AAS} \cong \text{AAS} )</td>
</tr>
</tbody>
</table>

Score 1: The student had only one correct statement and reason in step 2.
33 Given: $\triangle AEB$ and $\triangle DFC$, $ABCD$, $AE \parallel DF$, $EB \parallel FC$, $AC \cong DB$

Prove: $\triangle EAB \cong \triangle FDC$

<table>
<thead>
<tr>
<th>S</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $AE \parallel DF$, $EB \parallel FC$</td>
<td>1. given</td>
</tr>
<tr>
<td>2. $AC \cong DB$</td>
<td>2. given</td>
</tr>
<tr>
<td>3. $\angle AEB \cong \angle DFC$</td>
<td>3. parallel lines form</td>
</tr>
<tr>
<td>4. $AE \cong DF$</td>
<td>4. parallel lines form</td>
</tr>
<tr>
<td>5. $EB \cong FC$</td>
<td>5. parallel lines form</td>
</tr>
<tr>
<td>6. $\triangle AEB \cong \triangle DFC$</td>
<td>6. SAS</td>
</tr>
</tbody>
</table>

Score 0: The student had a completely incorrect response.
Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point $A$ on the ground to the top of the tree, $H$, is 40°. The angle of elevation from point $B$ on the ground to the top of the tree, $H$, is 80°. The distance between points $A$ and $B$ is 85 feet.

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

Determine and state, to the nearest foot, the height of the tree.

Score 4: The student gave a complete and correct response.
Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point $A$ on the ground to the top of the tree, $H$, is $40^\circ$. The angle of elevation from point $B$ on the ground to the top of the tree, $H$, is $80^\circ$. The distance between points $A$ and $B$ is $85$ feet.

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

$\angle CBH$ is $80^\circ$ and is a supplementary angle to $\angle ABH$ making $\angle ABH = 100^\circ$. $\angle BAH$ is already given as $40^\circ$ and since another angle is $100^\circ$, the last angle would be $40^\circ$. This creates an isosceles $\triangle$ with 2 equivalent angle measures.

Determine and state, to the nearest foot, the height of the tree.

\[
\cos 80^\circ = \frac{y}{85} \quad \tan 40^\circ = \frac{x}{100}
\]

\[
y = 14.7 \\
y = 15
\]

Score 4: The student gave a complete and correct response.
Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point $A$ on the ground to the top of the tree, $H$, is $40^\circ$. The angle of elevation from point $B$ on the ground to the top of the tree, $H$, is $80^\circ$. The distance between points $A$ and $B$ is 85 feet.

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

$\triangle ABH$ is isosceles because $\angle ABH$ is $100^\circ$ and $\angle A$ is given $40^\circ$. That means $\angle AHB$ must be $40^\circ$, and isosceles triangles have 2 equal angles.

Determine and state, to the nearest foot, the height of the tree.

$$\sin 80^\circ = \frac{x}{85}$$

$$x = 14.76$$

$x \approx 15$

**Score 3:** The student wrote a correct explanation and a correct trigonometric equation, but no further correct work was shown.
34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point $A$ on the ground to the top of the tree, $H$, is $40^\circ$. The angle of elevation from point $B$ on the ground to the top of the tree, $H$, is $80^\circ$. The distance between points $A$ and $B$ is 85 feet.

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

Barry is correct because $\angle AHB$ is $100^\circ$.

$\angle A = 40^\circ$ and $\angle AHB$ is $40^\circ$ too because $100^\circ + 40^\circ = 140^\circ$ and a triangle is $180^\circ$.

$180^\circ - 140^\circ = 40^\circ$.

Determine and state, to the nearest foot, the height of the tree.

$$\tan 40^\circ \frac{z}{85}$$
$$x = 71.3$$
$$\cos 40^\circ \frac{y}{85}$$
$$y = 12.4$$

Score 2: The student wrote an incomplete explanation and made an error in using tangent in a non-right triangle.
Barry wants to find the height of a tree that is modeled in the diagram below, where \( \angle C \) is a right angle. The angle of elevation from point A on the ground to the top of the tree, \( H \), is 40°. The angle of elevation from point B on the ground to the top of the tree, \( H \), is 80°. The distance between points A and B is 85 feet.

Barry claims that \( \triangle ABH \) is isosceles. Explain why Barry is correct.

He is correct because \( \angle AHB \) is 40° and an isosceles \( \triangle \) needs to have 2 \( \angle \)s to be isosceles.

Determine and state, to the nearest foot, the height of the tree.

85 ft.

Score 2: The student wrote a complete and correct explanation, but no further correct work was shown.
Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point $A$ on the ground to the top of the tree, $H$, is $40^\circ$. The angle of elevation from point $B$ on the ground to the top of the tree, $H$, is $80^\circ$. The distance between points $A$ and $B$ is 85 feet.

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

\[
\begin{align*}
\frac{180}{100} - \frac{80}{100} &= \frac{80}{80} \\
\text{m} \triangle ABH &= 80^\circ / 2 = 40^\circ = \text{m} \angle ABH \\
\text{Barry is correct - refer to justified work above as explanation.}
\end{align*}
\]

Determine and state, to the nearest foot, the height of the tree.

\[
\tan (410) = \frac{x}{85} \\
x = \tan (410) \cdot 85 \\
x = 71.3235
\]

Score 1: The student wrote an incomplete explanation. No further correct relevant work was shown.
Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point $A$ on the ground to the top of the tree, $H$, is $40^\circ$. The angle of elevation from point $B$ on the ground to the top of the tree, $H$, is $80^\circ$. The distance between points $A$ and $B$ is 85 feet.

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

Determine and state, to the nearest foot, the height of the tree.

**Score 0:** The student did not show enough correct relevant work to receive any credit.
Given: Triangle $DUC$ with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle

[The use of the set of axes on the next page is optional.]

\[
\begin{align*}
    m_{DU} &= \frac{y_2-y_1}{x_2-x_1} = \frac{8-(-1)}{-1+3} = \frac{9}{2} \\
    m_{UC} &= \frac{6-8}{8+1} = -\frac{2}{9}
\end{align*}
\]

Opp. reciprocal slopes

$DU \perp UC$

$1$ lines form right $\Delta$’s.

$\triangle DUC$ is a right $\Delta$ because it has a right angle.

Score 6: The student gave a complete and correct response.
Point $U$ is reflected over $\overline{DC}$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

$$d\overline{DU} = \frac{\sqrt{(8-6)^2 + (-1-3)^2}}{\sqrt{(2)^2 + (2)^2}}$$
$$= \frac{\sqrt{31 + 4}}{\sqrt{85}}$$

$$d\overline{UC} = \frac{\sqrt{(8-6)^2 + (-1-8)^2}}{\sqrt{(2)^2 + (-9)^2}}$$
$$= \frac{\sqrt{4 + 81}}{\sqrt{85}}$$

$$d\overline{CU'} = \frac{\sqrt{(8-6)^2 + (6+3)^2}}{\sqrt{(2)^2 + (9)^2}}$$
$$= \frac{\sqrt{4 + 81}}{\sqrt{85}}$$

$DUCU'$ is a square because it has 4 equal sides and a right angle.
Given: Triangle $DUC$ with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle

[The use of the set of axes on the next page is optional.]

\[
\begin{align*}
DU &= \sqrt{(2-(-3))^2 + (8-(-1))^2} \\
&= \sqrt{25 + 81} \\
&= \sqrt{106} \\
\end{align*}
\]

\[
\begin{align*}
UC &= \sqrt{(8-(-1))^2 + (6-8))^2} \\
&= \sqrt{81 + 4} \\
&= \sqrt{85} \\
\end{align*}
\]

\[
\begin{align*}
CD &= \sqrt{(8-(-3))^2 + (6-(-1))^2} \\
&= \sqrt{121 + 49} \\
&= \sqrt{170} \\
\end{align*}
\]

\[
\sqrt{85}^2 + \sqrt{85}^2 = \sqrt{170}^2
\]

\[
85 + 85 = 170
\]

\[
170 = 170
\]

Since the Pythagorean Theorem works,

$\triangle DUC$ is a right $\triangle$.

Score 6: The student gave a complete and correct response.
Point $U$ is reflected over $DC$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

Since all 4 sides of quadrilateral $DUCU'$ are equal, it is a rhombus. Since the diagonals of a rhombus $DUCU'$ are equal, it is a square.
35 Given: Triangle DUC with coordinates D(−3,−1), U(−1,8), and C(8,6)

Prove: ΔDUC is a right triangle

[The use of the set of axes on the next page is optional.]

ΔDUC is a right triangle because lines DU and UC’s slopes are negative reciprocals, meaning they are perpendicular. And perpendicular lines create 90° angles making the triangle a right triangle.

Score 5: The student wrote an incomplete concluding statement in proving the square.
Point $U$ is reflected over $DC$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

$$D(-3,1)$$

$$U(-1,8)$$

$$C(8,6)$$

$$U'(-6,-3)$$

$$D'=(-3,-1)$$

$$U'=(-1,8')$$

$$C'(8,6')$$

$$U'(-6,-3)$$

$$D'(-3,-1)$$

$$D = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

$$= \sqrt{(-1-8)^2 + (8-1)^2}$$

$$= \sqrt{85}$$

$$D' = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

$$= \sqrt{(-1-8)^2 + (8-1)^2}$$

$$= \sqrt{85}$$

$DUCU'$ is a rhombus because all the sides are equal.

$DUCU'$ is a square because all the sides are equal.
35 Given: Triangle $DUC$ with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle

[The use of the set of axes on the next page is optional.]

$$m_{DU} = \frac{8+1}{-1+3} = \frac{9}{2}$$
$$m_{UC} = \frac{6-8}{8+1} = \frac{-2}{9}$$

The slopes of $DU$ and $UC$ are negative reciprocals, $\therefore$ $DU$ is $\perp$ to $UC$, $\therefore$ perpendicular lines form right $\angle$s, $\therefore$ $\triangle DUC$ contains a rt. $\angle$, $\therefore$ $\triangle DUC$ is a rt. $\triangle$.

Question 35 is continued on the next page.

Score 4:  The student made a conceptual error in proving the square.
Point $U$ is reflected over $\overline{DC}$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

$$m \overrightarrow{CU} = \frac{c+3}{8-c} = \frac{a}{2}$$

$$m \overrightarrow{DU} = \frac{-1+3}{-3-c} = \frac{2}{a}$$

The slopes of $\overrightarrow{CU'}$ and $\overrightarrow{CU}$ are negative reciprocals; $\overrightarrow{DU}$ is perpendicular to $\overrightarrow{CU'}$. $\therefore$ perpendicular lines form rt. $\angle s$, $\therefore$ quad $DUCU'$ contains 2 rt. $\angle s$, $\therefore$ quad $DUCU'$ is a square.
35 Given: Triangle DUC with coordinates \( D(-3,-1), U(-1,8), \) and \( C(8,6) \)

Prove: \( \triangle DUC \) is a right triangle

[The use of the set of axes on the next page is optional.]

\[
\text{slope of } \overline{Du} = \frac{8-(-1)}{-1-(-3)} = \frac{9}{2}
\]

\[
\text{slope of } \overline{uc} = \frac{8-6}{-1-8} = -\frac{2}{9}
\]

Since the slopes are negative reciprocals, the lines are perpendicular and perpendicular lines form right angles. Therefore \( \triangle DUC \) is a right triangle.

Question 35 is continued on the next page.

Score 3: The student proved \( \triangle DUC \) is a right triangle and located \( U' \). No further correct work was shown.
Point $U$ is reflected over $\overline{DC}$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.
Question 35

35 Given: Triangle DUC with coordinates D(-3,-1), U(-1,8), and C(8,6)

Prove: \( \triangle DUC \) is a right triangle

[The use of the set of axes on the next page is optional.]

\[
\begin{align*}
\frac{y_2 - y_1}{x_2 - x_1} &= \frac{8 - (-1)}{-1 - 3} = \frac{9}{-4} = -\frac{9}{4} \\
\frac{y_2 - y_1}{x_2 - x_1} &= \frac{8 - (-1)}{8 - 3} = \frac{9}{5}
\end{align*}
\]

\( \frac{y_2 - y_1}{x_2 - x_1} \) opposite reciprocal slopes

\( \overline{DU} \perp \overline{UC} \)

\( \perp \) lines form rt. \( \angle s \),

\( \angle U \) is \( \alpha \) rt. \( \angle \)

\( \triangle DUC \) is a rt. \( \triangle \) because it has a rt. \( \angle \).

Question 35 is continued on the next page.

Score 2: The student proved \( \triangle DUC \) is a right triangle. No further correct work was shown.
Point $U$ is reflected over $DC$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.
35 Given: Triangle $DUC$ with coordinates $D(-3, -1)$, $U(-1, 8)$, and $C(8, 6)$

Prove: $\triangle DUC$ is a right triangle

[The use of the set of axes on the next page is optional.]

\[
DU = \sqrt{(-3 - (-1))^2 + (-1 - 8)^2} = \sqrt{4^2 + 9^2} = \sqrt{85}
\]
\[
UC = \sqrt{(-1 - 8)^2 + (8 - 6)^2} = \sqrt{(-9)^2 + 2^2} = \sqrt{85}
\]
\[
DC = \sqrt{(-3 - 8)^2 + (-1 - 6)^2} = \sqrt{11^2 + 7^2} = \sqrt{170}
\]

\[
\Rightarrow \left(\sqrt{85}\right)^2 + \left(\sqrt{85}\right)^2 = \left(\sqrt{170}\right)^2
\]

\[
\Rightarrow \sqrt{85}^2 + \sqrt{85}^2 = 170, \quad \left(\sqrt{170}\right)^2 = 170
\]

\[
\Rightarrow DU^2 + UC^2 = DC^2
\]

\[
\Rightarrow \triangle DUC \text{ is a right triangle (converse of Pythagorean theorem)}
\]

Score 2: The student proved $\triangle DUC$ is a right triangle. No further correct work was shown.
Point $U$ is reflected over $\overline{DC}$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

$U$ and $U'$ are reflected over $\overline{DE}$

$\Rightarrow \begin{cases} \overline{OU} = \overline{OU'} \\ \overline{OD} = \overline{OE} \\ \overline{UU'} \perp \overline{DE} \end{cases} \Rightarrow DUCU'$ is a rhombus
Given: Triangle DUC with coordinates D(−3,−1), U(−1,8), and C(8,6)

Prove: ΔDUC is a right triangle

[The use of the set of axes on the next page is optional.]

\[
\text{Slope } \overline{DU} = \frac{8 - (-1)}{-1 + 3} = \frac{9}{2}
\]

\[
\text{Slope } \overline{UC} = \frac{6 - 8}{8 - (-1)} = \frac{-2}{9}
\]

\overline{DU} \perp \overline{UC} because they have opposite reciprocal slopes.

Score 1: The student wrote an incomplete conclusion in proving the right triangle. No further correct work was shown.
Point $U$ is reflected over $\overline{DC}$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.
Question 35

35 Given: Triangle DUC with coordinates D(−3,−1), U(−1,8), and C(8,6)

Prove: △DUC is a right triangle

[The use of the set of axes on the next page is optional.]

\[
\begin{align*}
D &= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} \\
&= \sqrt{(8-(-3))^2+(6-(-1))^2} \\
&= \sqrt{85}
\end{align*}
\]

\[
\begin{align*}
D &= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} \\
&= \sqrt{(8-(-1))^2+(6-8)^2} \\
&= \sqrt{85}
\end{align*}
\]

Δ DUC is a right triangle because it forms a right angle.

Score 1: The student located U’. The student did not show enough correct relevant work to receive any additional credit.
Point $U$ is reflected over $DC$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.
35 Given: Triangle $DUC$ with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle

[The use of the set of axes on the next page is optional.]

Question 35 is continued on the next page.

Score 0: The student did not show enough correct relevant work to receive any credit.
Point $U$ is reflected over $DC$ to locate its image point, $U'$, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.