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25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from $C$ to $\overline{AB}$.

[Leave all construction marks.]

**Score 2:** The student gave a complete and correct response.
25 In \( \triangle ABC \) below, use a compass and straightedge to construct the altitude from \( C \) to \( \overline{AB} \).

[Leave all construction marks.]

\[ \text{Score 2: The student gave a complete and correct response.} \]
25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from $C$ to $\overline{AB}$. [Leave all construction marks.]

Score 1: The student constructed all appropriate arcs, but the altitude was not drawn.
Question 25

25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from $C$ to $\overline{AB}$.

[Leave all construction marks.]

Score 0: The student made a drawing that was not an appropriate construction.
25 In \( \triangle ABC \) below, use a compass and straightedge to construct the altitude from \( C \) to \( \overline{AB} \).

[Leave all construction marks.]

Score 0: The student gave a completely incorrect response.
25 In \( \triangle ABC \) below, use a compass and straightedge to construct the altitude from \( C \) to \( \overline{AB} \).

[Leave all construction marks.]
26 Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Translate $\triangle ABC$ down 8 units, then rotate $\triangle ABC$ 90° clockwise around point $F$.

Score 2: The student gave a complete and correct response.
Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

**Rotation 90° clockwise around the origin**

**Score 2:** The student gave a complete and correct response.
Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Score 2: The student gave a complete and correct response.
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Rotation about point $C$, $90^\circ$ clockwise, followed by a translation down by 8.

**Score 2:** The student gave a complete and correct response.
Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

$90^\circ$ counterclockwise rotation about the origin

Score 1: The student wrote an incorrect direction for the rotation.
26 Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Rotation $270^\circ$ counterclockwise

Score 1: The student did not state the center of rotation.
26 Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

- Rotation $90^\circ$ clockwise about $C$
- Translate 4 units down
- Reflect over the $x$-axis

Score 1: The student gave a correct description of the rotation and translation, but no further correct work was shown.
Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Rotate $90^\circ$ clockwise

**Score 1:** The student did not state the center of rotation.
26 Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

$\text{Translation } <4, -4> \text{ rotation 90 degrees clockwise}$

Score 1: The student correctly stated the translation as a vector, but did not state the center of rotation.
26 Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Score 0: The student did not show enough correct relevant work to receive any credit.
26 Triangles \(ABC\) and \(DEF\) are graphed on the set of axes below.

Describe a sequence of transformations that maps \(\triangle ABC\) onto \(\triangle DEF\).

**Score 0:** The student gave an incomplete rotation and an incorrect reflection.
26 Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Score 0: The student gave a completely incorrect description.
Triangles $ABC$ and $DEF$ are graphed on the set of axes below.

Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

1. rotate $ABC$ $180^\circ$
2. translate $A'B'C'(-8,0)$
3. Done.

Score 0: The student gave a completely incorrect description.
Line segment \( PQ \) has endpoints \( P(-5,1) \) and \( Q(5,6) \), and point \( R \) is on \( PQ \). Determine and state the coordinates of \( R \), such that \( PR:RQ = 2:3 \).

\[
\begin{align*}
(x + \frac{2}{5} (10), &\quad y + \frac{2}{5} (5)) \\
-5 + \frac{2}{5} (10), &\quad 1 + \frac{2}{5} (5)
\end{align*}
\]

\[R = (-1, 3)\]

Score 2: The student gave a complete and correct response.
Line segment $PQ$ has endpoints $P(-5,1)$ and $Q(5,6)$, and point $R$ is on $\overline{PQ}$. Determine and state the coordinates of $R$, such that $PR:RQ = 2:3$.

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

\[
\begin{align*}
5 - (-5) &= 10 & 6 - 1 &= 5 \\
10 \cdot \frac{2}{3} &= 4 & 5 \cdot \frac{2}{3} &= 2 \\
-5 + 4 &= -1 & 1 + 2 &= 3
\end{align*}
\]

**Score 2:** The student gave a complete and correct response.
27 Line segment $PQ$ has endpoints $P(-5,1)$ and $Q(5,6)$, and point $R$ is on $PQ$. Determine and state the coordinates of $R$, such that $PR:RQ = 2:3$.

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

$$-5 + \frac{2}{5}(5+5)$$

$$(-1,3)$$

Score 2: The student gave a complete and correct response.
27 Line segment $PQ$ has endpoints $P(-5,1)$ and $Q(5,6)$, and point $R$ is on $PQ$. Determine and state the coordinates of $R$, such that $PR:RQ = 2:3$.

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

Score 2: The student gave a complete and correct response.
27 Line segment \( PQ \) has endpoints \( P(-5,1) \) and \( Q(5,6) \), and point \( R \) is on \( PQ \). Determine and state the coordinates of \( R \), such that \( PR:RQ = 2:3 \).

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

\[
\frac{2}{5}(-10)+5 = 1 \quad \frac{2}{5}(-5)+6 =
\]

\( R(1,4) \)

**Score 1:** The student determined the coordinates of \( R \) such that \( PR:RQ \) was in a 3:2 ratio.
Line segment \( PQ \) has endpoints \( P(-5,1) \) and \( Q(5,6) \), and point \( R \) is on \( \overline{PQ} \). Determine and state the coordinates of \( R \), such that \( PR:RQ = 2:3 \).

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

**Score 1:** The student determined the coordinates of \( R \), but did not show work.
Line segment $PQ$ has endpoints $P(-5,1)$ and $Q(5,6)$, and point $R$ is on $PQ$. Determine and state the coordinates of $R$, such that $PR:RQ = 2:3$.

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

**Score 1:** The student determined the coordinates of $R$, but did not show work.
27 Line segment $PQ$ has endpoints $P(-5,1)$ and $Q(5,6)$, and point $R$ is on $PQ$.
Determine and state the coordinates of $R$, such that $PR:RQ = 2:3$.

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

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

$$d = \sqrt{(-5-5)^2 + (1-6)^2}$$

$$= \sqrt{25 + 25}$$

$$= 5$$

Score 0: The student did not show enough correct relevant work to receive any credit.
27 \quad \text{Line segment } \overline{PQ} \text{ has endpoints } P(-5,1) \text{ and } Q(5,6), \text{ and point } R \text{ is on } \overline{PQ}. \text{ Determine and state the coordinates of } R, \text{ such that } \frac{PR}{RQ} = \frac{2}{3}.

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

\[2x + 3x = 10\]
\[\frac{5x}{5} = \frac{10}{5}\]
\[x = 2\]

\((3, 1)\)

**Score 0:** The student did not show enough correct relevant work to receive any credit.
28 A circle has a radius of 6.4 inches. Determine and state, to the nearest square inch, the area of a sector whose arc measures 80°.

\[
\frac{80}{360} = \frac{x}{6.4^2 \pi}
\]

\[
360 \times \frac{x}{80} = \frac{1024.2708}{360}
\]

\[
x = 26.5659
\]

Score 2: The student gave a complete and correct response.
28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.

\[
A = \pi r^2.
\]

\[
A = \pi (6.4)^2
\]

\[
= 40.96\pi
\]

\[
\frac{80}{360} (40.96\pi)
\]

\[
= 28.59547
\]

**Score 2:** The student gave a complete and correct response.
28 A circle has a radius of 6.4 inches. Determine and state, to the nearest square inch, the area of a sector whose arc measures 80°.

Score 2: The student gave a complete and correct response.
A circle has a radius of 6.4 inches. Determine and state, to the nearest square inch, the area of a sector whose arc measures 80°.

\[
\pi (6.4)^2 = 128.6796351
\]
\[
\frac{80}{360} = \frac{x}{128.6796351}
\]
\[
360x = 10294.37681
\]
\[
x = 29.1
\]

\textbf{Score 1:} The student determined the area of the sector in inches, not square inches.
28 A circle has a radius of 6.4 inches. Determine and state, to the nearest square inch, the area of a sector whose arc measures $80^\circ$.

\[
\frac{80}{360} \cdot 2\pi(6.4) = 8.436 \ldots
\]

\[
\approx 9 \text{ in.}^2
\]

**Score 1:** The student made an error in using a formula for arc length, but found an appropriate answer.
28 A circle has a radius of 6.4 inches. Determine and state, to the nearest square inch, the area of a sector whose arc measures 80°.

\[ \frac{\theta}{360} \cdot \pi \cdot r^2 = A. \]

\[ \frac{80}{360} \cdot \pi \cdot 6.4^2 = \frac{64\pi}{45} \text{ or } 4.468 \]

**Score 1:** The student made an error in not squaring the radius, but found an appropriate answer.
28 A circle has a radius of 6.4 inches. Determine and state, to the nearest square inch, the area of a sector whose arc measures 80°.

\[
\begin{align*}
\frac{80^\circ}{360^\circ} &= \frac{2\pi}{3}\left(\frac{6.4}{2}\right) \\
&= \frac{2\pi}{3} \\
&= \frac{12.8}{3} \\
\text{Area} &= 8 \text{ inches}^2
\end{align*}
\]

**Score 0:** The student used an incorrect formula and made one rounding error.
A circle has a radius of 6.4 inches. Determine and state, to the nearest square inch, the area of a sector whose arc measures 80°.

\[
A = \pi r^2 \\
A = \pi (6.4)^2 \\
A = 128.6 \\
A = 129
\]

**Score 0:** The student did not show enough correct relevant course-level work to receive any credit.
A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of $\pi$.]

$V = \frac{4}{3} \pi r^3$

$V = \frac{4}{3} \pi 1^3$

$V = \frac{4}{3} \pi 2^3$

$V = \frac{4}{3} \pi 3^3$

$V = \frac{4}{3} \pi r^3$

$1.3\pi$

$10.6\pi$

$3\pi$

$\frac{48\pi}{3}$

**Score 2:** The student gave a complete and correct response.
A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of $\pi$.]

\[
V = \frac{4}{3} \pi (1)^3 + \frac{4}{3} \pi (2)^3 + \frac{4}{3} \pi (3)^3 \\
= \frac{4}{3} \pi + \frac{32}{3} \pi + 36 \pi \\
= 12 \pi + 36 \pi \\
= 48 \pi
\]

**Score 2:** The student gave a complete and correct response.
29 A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of \( \pi \).]

\[
V = \frac{4}{3} \pi r^3
\]

1. \( V = \frac{4}{3} \pi 1^3 = 1.33 \pi \)

2. \( V = \frac{4}{3} \pi 2^3 = 16.67 \pi \)

3. \( V = \frac{4}{3} \pi 3^3 = 36 \pi \)

\( V = 47.9 \pi \)

Score 1: The student made a rounding error.
Question 29

A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of \( \pi \).]

Score 1: The student made an error by squaring the radius when using the volume formula, but found an appropriate answer.
A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of $\pi$.]

Score 1: The student determined the volume of the snowman, but not in terms of $\pi$. 
A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of \( \pi \).]
A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of \( \pi \).]

\[
\begin{align*}
\text{Volume} &= \pi r^2 \\
\pi \cdot 1^2 + \pi \cdot 2^2 + \pi \cdot 3^2 \\
&= \pi + 4\pi + 9\pi \\
&= 14\pi \text{ cubic ft}
\end{align*}
\]

**Score 0:** The student did not show enough correct relevant course-level work to receive any credit.
In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$, $AD = 2$ and $AC = 6$.

Determine and state the length of $AB$.

\[
\frac{2}{6} = \frac{6}{x} \quad \Rightarrow \quad AB = 18
\]

\[
2x = 36
\]

\[
x = 18
\]

**Score 2**: The student gave a complete and correct response.
30 In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$, $AD = 2$ and $AC = 6$.

Determine and state the length of $AB$.

\[
\frac{x+2}{2} = \frac{6}{2} \quad \frac{3x}{2} = 2x + 41
\]

\[
\frac{32}{2} = 2x \\
16 = x
\]

\[AB = 18\]

**Score 2:** The student gave a complete and correct response.
30 In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$, $AD = 2$ and $AC = 6$.

Determine and state the length of $AB$.

$$ \text{Find } CD$$

$$ 2^2 + (CD)^2 = 6^2$$

$$ (CD)^2 = 36 - 4$$

$$ CD = \sqrt{32} $$

$$ \triangle ADC \sim \triangle CDB $$

$$ \frac{CD}{AD} = \frac{BD}{CD} $$

$$ \frac{\sqrt{32}}{2} = \frac{x}{\sqrt{32}} $$

$$ 2x = 32 $$

$$ BD = x = 16 $$

$$ AB = 16 + 2 $$

$$ AB = 18 $$

**Score 2:** The student gave a complete and correct response.
30 In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$, $AD = 2$ and $AC = 6$.

Determine and state the length of $AB$.

\[
\frac{\text{Leg}}{\text{Sh}} = \frac{\text{hyp}}{\text{Leg}}
\]

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

$12 = 2x$

$x = 6$

**Score 1:** The student made a computational error.
In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$, $AD = 2$ and $AC = 6$.

Determine and state the length of $AB$.

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

\[
4 + 2x = 36
\]

\[
2x = 32
\]

\[
x = 16
\]

**Score 1:** The student correctly determined the length of $DB$, but did not find the length of $AB$. 

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[49]
30 In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$, $AD = 2$ and $AC = 6$.

Determine and state the length of $AB$.

\[
\begin{align*}
2^2 + x^2 &= 6^2 \\
4 + x^2 &= 36 \\
x^2 &= 32 \\
x &= \sqrt{32} \\
x &= 4
\end{align*}
\]

$AB = 6$

Score 0: The student made a conceptual error and a computational error in determining the length of $DB$. 
30 In the diagram below of right triangle $ACB$, altitude $CD$ is drawn to hypotenuse $AB$, $AD = 2$ and $AC = 6$.

Determine and state the length of $AB$.

$$\begin{align*}
\sqrt{x^2 + y^2} &= \sqrt{x^2 + 36} \\
6x + y &= 100 \\
36 + 6y &= 100
\end{align*}$$

$\sqrt{36 + x^2} = 10$

$x = 5.7$

$\overline{AB} = 10$

Score 0: The student did not show enough correct relevant work to receive any credit.
Triangle $RST$ has vertices with coordinates $R(-3, -2)$, $S(3, 2)$ and $T(4, -4)$. Determine and state an equation of the line parallel to $\overline{RT}$ that passes through point $S$.

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

\[
\frac{y - y_1}{x - x_1} = \frac{-4 + 2}{4 + 3} = \frac{-2}{7}
\]

For a line segment to be parallel, it must have the same slope, and pass through the point $(3, 2)$.

\[
y - 2 = \frac{-2}{7}(x - 3) \quad \Rightarrow \quad y = \left(-\frac{2}{7}\right)x + \frac{20}{7}
\]

Score 2: The student gave a complete and correct response.
31 Triangle $RST$ has vertices with coordinates $R(-3, -2)$, $S(3, 2)$ and $T(4, -4)$. Determine and state an equation of the line parallel to $\overline{RT}$ that passes through point $S$.

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

\[
\begin{align*}
\text{Slope of } \overline{RT} &= \frac{-4 + 2}{4 + 3} = \frac{-2}{7} \\
\text{y - 2} &= \frac{-2}{7}(x - 3) \\
\text{y - 2} &= \frac{-2}{7}x + \frac{6}{7} \\
y &= \frac{-2}{7}x + \frac{10}{7}
\end{align*}
\]

Score 2: The student gave a complete and correct response.
31 Triangle $RST$ has vertices with coordinates $R(-3,-2)$, $S(3,2)$ and $T(4,-4)$. Determine and state an equation of the line parallel to $RT$ that passes through point $S$.

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

\[
y = -0.3x + 2.9
\]

Score 1: The student made an error when determining the slope of $RT$. 
31 Triangle $RST$ has vertices with coordinates $R(-3,-2)$, $S(3,2)$ and $T(4,-4)$. Determine and state an equation of the line parallel to $RT$ that passes through point $S$.

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

$$m_{RT} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 + 2}{4 + 3} = \frac{-2}{7}$$

The slope of the line perpendicular to $RT$ is the negative reciprocal of $\frac{-2}{7}$.

$$m_{\perp} = \frac{7}{2}$$

Using point $S(3,2)$:

$$y = \frac{7}{2}x + b$$

$$2 = \frac{7}{2}(3) + b$$

$$b = 2 - \frac{21}{2} = -\frac{17}{2}$$

$$y = \frac{7}{2}x - 8.5$$

This equation is the correct one because the slope is a negative reciprocal and it intersects the point $S$.

Score 1: The student wrote an equation of the line perpendicular to $RT$ through point $S$. 
Triangle $RST$ has vertices with coordinates $R(-3,-2)$, $S(3,2)$ and $T(4,-4)$. Determine and state an equation of the line parallel to $\overline{RT}$ that passes through point $S$.

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

\[
m = \frac{-2}{7}
\]

\[
y = \frac{-2}{7}x + 3
\]

**Score 1:** The student correctly determined the slope of the line parallel to $\overline{RT}$, but no further correct work was shown.
Triangle $RST$ has vertices with coordinates $R(-3, -2)$, $S(3, 2)$ and $T(4, -4)$. Determine and state an equation of the line parallel to $\overline{RT}$ that passes through point $S$.

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

\[
\begin{align*}
3, 2 & : y = mx + b \\
2 & = m(3) + b \\
2 & = 1/6(3) + b \\
\therefore \: & : 5 + b \\
\therefore \: & : 1.5 = b
\end{align*}
\]

Score 0: The student did not show enough correct relevant work to receive any credit.
32 Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area A, 3280 feet away from launch pad B. After launch, the rocket was sighted at C with an angle of elevation of 15°. The rocket was later sighted at D with an angle of elevation of 31°.

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, C and D.

\[
\frac{\tan 15°}{1} = \frac{x}{3280} \quad \frac{\tan 31°}{1} = \frac{y}{3280}
\]

\[
x = \tan 15°(3280) \quad y = \tan 31°(3280)
\]

\[
B-C \quad x = 878.873 \quad B-D \quad y = 1970.822
\]

\[
\frac{1970.822}{-878.873} = 1041.949 \text{ ft}
\]

Distance traveled between: 1042 ft

Score 4: The student gave a complete and correct response.
Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area A, 3280 feet away from launch pad B. After launch, the rocket was sighted at C with an angle of elevation of 15°. The rocket was later sighted at D with an angle of elevation of 31°.

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, C and D.

\[
\tan 15° = \frac{x}{3280} \quad \tan 31° = \frac{y}{3280}
\]

\[
x = 3280 \tan 15° \quad y = 3280 \tan 31°
\]

\[
z = y - x
\]

\[
z = 3280 \tan 31° - 3280 \tan 15° = 3280 (\tan 31° - \tan 15°)
\]

\[
\approx 3280 (0.5875824266)
\]

\[
\approx 1919.447
\]

\[
\approx 1920
\]

**Score 4:** The student gave a complete and correct response.
32 Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area A, 3280 feet away from launch pad B. After launch, the rocket was sighted at C with an angle of elevation of 15°. The rocket was later sighted at D with an angle of elevation of 31°.

![Diagram of the rocket launch scenario with points A, B, C, and D labeled and angle measurements indicated.]

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, C and D.

\[
\begin{align*}
\text{Find } AD & \quad \cos 31^\circ = \frac{3280}{AD} \\
3280 \div \cos 31^\circ & = AD \\
AD & = 3826.56
\end{align*}
\]

\[
\begin{align*}
\text{Find } CB & \quad \tan 15^\circ = \frac{CB}{3280} \\
CB & = 878.87
\end{align*}
\]

\[
\begin{align*}
\text{Find } BD & \quad \frac{BD}{BD} - \frac{CB}{BD} = (3280 + CB)^2 \\
BD & - CB = 878.87 + 1970.9 \\
BD & = 1092.03
\end{align*}
\]

Score 4: The student gave a complete and correct response.
32 Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area A, 3280 feet away from launch pad B. After launch, the rocket was sighted at C with an angle of elevation of 15°. The rocket was later sighted at D with an angle of elevation of 31°.

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, C and D.

\[
\tan \theta = \frac{\text{opp}}{\text{adj}}
\]

\[
\tan(31°) = \frac{x}{3280}
\]

\[
x = (3280) \cdot (\tan(31°))
\]

\[
x = 1970.82283
\]

\[
\tan(15°) = \frac{y}{3280}
\]

\[
y = (3280) \cdot (\tan(15°))
\]

\[
y = 978.873512
\]

\[
x - y = z
\]

\[
z = 1091.9494795612
\]

Score 3: The student made a rounding error when determining the length of DC.
Question 32

32 Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area $A$, 3280 feet away from launch pad $B$. After launch, the rocket was sighted at $C$ with an angle of elevation of $15^\circ$. The rocket was later sighted at $D$ with an angle of elevation of $31^\circ$.

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, $C$ and $D$.

\[
\tan 31^\circ = \frac{x}{3280} = 1971 \text{ ft} = DB
\]

The distance the rocket traveled was 1971 ft.

Score 2: The student correctly determined the length of $DB$. 
Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area $A$, 3280 feet away from launch pad $B$. After launch, the rocket was sighted at $C$ with an angle of elevation of $15^\circ$. The rocket was later sighted at $D$ with an angle of elevation of $31^\circ$.

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, $C$ and $D$.

\[
\cos 15^\circ = \frac{3280}{x}
\]

\[
x \cos 15^\circ = 3280
\]

\[
\frac{x}{\cos 15^\circ} = \frac{3280}{\cos 15^\circ}
\]

\[
x = 3395.705872
\]

Score 2: The student made a conceptual error in using the tangent function in a non-right triangle.
32 Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area $A$, 3280 feet away from launch pad $B$. After launch, the rocket was sighted at $C$ with an angle of elevation of $15^\circ$. The rocket was later sighted at $D$ with an angle of elevation of $31^\circ$.

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, $C$ and $D$.

Score 1: The student wrote two correct relevant trigonometric equations, but no further correct work was shown.
32 Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area A, 3280 feet away from launch pad B. After launch, the rocket was sighted at C with an angle of elevation of 15°. The rocket was later sighted at D with an angle of elevation of 31°.

Determine and state, to the nearest foot, the distance the rocket traveled between the two sightings, C and D.

Score 0: The student did not show enough correct relevant work to receive any credit.
A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

\[
\begin{align*}
\pi \left(\frac{7}{2}\right)^2 \cdot 9 &= \pi \cdot 12.25 \cdot 9 \\
&= 109.725 \\
&\approx 110.25 \\
346.360 \\
&\approx 346 \text{ cm}^3
\end{align*}
\]

\[
\begin{align*}
\pi \left(\frac{9}{2}\right)^2 \cdot 13 &= \pi \cdot 11.25 \cdot 13 \\
&= 459.13 \\
&\approx 459.13 \\
&\approx 263.25 \\
&\approx 827.024 \\
&\approx 827 \text{ cm}^3
\end{align*}
\]

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

3 cans, \(827 \div 346 = 2.39\) but you need 3 cans to fill the larger container.

**Score 4:** The student gave a complete and correct response.
33 A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

\[ \frac{8.27}{3.46} = 2.4 \]

About 2.4 small cans are needed to fill the large container.

Score 3: The student made an error in determining the number of small cans needed.
33 A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

\[ V = \pi r^2 h \]

Small = \pi 3.5^2 9

Small = 110 \text{ cm}^3

Large = \pi 4.5^2 13

Large = 827 \text{ cm}^3

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

\[ \frac{827.0242}{110.25} = 7.5 \]

About 8

Score 3: The student made an error in determining the volume of the small can.
A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

Score 2: The student determined the volume of the small can and large container, but no further correct work was shown.
Question 33

33 A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

\[ V_{\text{Small}} = \pi (7)^2 \cdot 9 \]
\[ = 441\pi \]
\[ \approx 1385 \]

\[ V_{\text{Large}} = \pi (9)^2 \cdot 13 \]
\[ = 1053\pi \]
\[ \approx 3308 \]

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

\[ \frac{V_{\text{Large}}}{V_{\text{Small}}} = \frac{3308}{1385} \approx 2.388 \]

Score 2: The student made an error by using diameter for the volume of both cylinders and made an error in determining the number of small cans needed.
A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

\[ V = \pi r^2 h \]
\[ V = \pi \left(\frac{7}{2}\right)^2 (9) \]
\[ V = 63\pi \]
\[ V = 197.920 \]
\[ V = 198 \]

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

**Score 1:** The student determined the correct volume of the large container, but no further correct work was shown.
A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

\[
V = \pi r^2 h \\
= \pi \left(\frac{d}{2}\right)^2 \cdot h \\
= \pi \left(\frac{7}{2}\right)^2 \cdot 9 \\
= \pi \cdot 12.25 \cdot 9 \\
= 346.67 \\
\]

\[
V = \pi r^2 h \\
= \pi \left(\frac{d}{2}\right)^2 \cdot h \\
= \pi \left(\frac{9}{2}\right)^2 \cdot 13 \\
= \pi \cdot 20.25 \cdot 13 \\
= 827.00 \\
\]

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

Score 1: The student found the volumes of the small can and large container, but rounded to the nearest tenth of a cubic centimeter. No further correct work was shown.
33 A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

Score 0: The student made errors in determining the volumes of both cylinders and did not show enough correct relevant work to receive additional credit.
33 A small can of soup is a right circular cylinder with a base diameter of 7 cm and a height of 9 cm. A large container is also a right circular cylinder with a base diameter of 9 cm and a height of 13 cm.

Determine and state the volume of the small can and the volume of the large container to the nearest cubic centimeter.

What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

58 small cans of soup are needed to fill the container because if you do $7^2 \cdot 3.14$ that gave you 153.86. 90 multiply that by 9 you got 1384.74 then you add that up by 49 to get 1433.74 then you do 49. added by your height to get 58.

Score 0: The student did not show enough correct relevant work to receive any credit.
34 Parallelogram $MATH$ has vertices $M(-7,-2), A(0,4), T(9,2),$ and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

\[
\begin{align*}
MA &= \sqrt{(-7)^2 + (-2)^2} = \sqrt{53} \\
AT &= \sqrt{9^2 + 2^2} = \sqrt{85} \\
HT &= \sqrt{9^2 + 16^2} = \sqrt{289} \\
MH &= \sqrt{2^2 + 2^2} = \sqrt{8}
\end{align*}
\]

$MATH$ is a rhombus because all side lengths are equal, therefore all sides are $\cong$ to each other.

Determine and state the area of $MATH$.

\[
\begin{align*}
A &= 16(\frac{8}{2}) = 128 \\
A &= \frac{1}{2} (6)(7) = 21 \\
A &= \frac{1}{2} (2)(9) = 9
\end{align*}
\]

\[128 - 2(9+21) = 18\]

Score 4: The student gave a complete and correct response.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

All four sides are $\overline{MA} \cong \overline{AT} \cong \overline{TH} \cong \overline{HM}$

therefore, $MATH$ is a rhombus

Determine and state the area of $MATH$.

Score 4: The student gave a complete and correct response.
Parallelogram $MATH$ has vertices $M(-7, -2), A(0, 4), T(9, 2),$ and $H(2, -4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

\[
\begin{align*}
MA &= \sqrt{(0 - (-7))^2 + (4 - (-2))^2} \\
&= \sqrt{7^2 + 6^2} \\
&= \sqrt{49 + 36} \\
&= \sqrt{85}
\end{align*}
\]

\[
\begin{align*}
AT &= \sqrt{(9 - 0)^2 + (2 - 4)^2} \\
&= \sqrt{9^2 + (-2)^2} \\
&= \sqrt{81 + 4} \\
&= \sqrt{85}
\end{align*}
\]

\[
\begin{align*}
TH &= \sqrt{(2 - 9)^2 + (2 - (-2))^2} \\
&= \sqrt{(-7)^2 + (4 - (-2))^2} \\
&= \sqrt{49 + 36} \\
&= \sqrt{85}
\end{align*}
\]

\[
\begin{align*}
MH &= \sqrt{(2 - (-7))^2 + (2 - (-2))^2} \\
&= \sqrt{9^2 + (-2)^2} \\
&= \sqrt{81 + 4} \\
&= \sqrt{85}
\end{align*}
\]

$MATH$ is a rhombus since the opposite sides are equal.

Determine and state the area of $MATH$.

\[
A = \frac{1}{2} \left| \begin{array}{cc}
y_1 & x_2 \\
y_2 & x_1 \\
y_3 & x_4 \\
y_4 & x_3
\end{array} \right| = \frac{1}{2} \left| \begin{array}{cc}
4 & -7 \\
-2 & 0 \\
4 & 9 \\
2 & -2
\end{array} \right| = \frac{1}{2} \left| 16 - 42 + 18 + 8 \right| = \frac{1}{2} 136 = 68
\]

**Score 3:** The student wrote an incorrect concluding statement when proving the rhombus.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

\[
\begin{align*}
\overline{M}A &= \sqrt{7^2 + 6^2} = \sqrt{85} \\
\overline{A}T &= \sqrt{9^2 + 2^2} = \sqrt{85} \\
\overline{T}H &= \sqrt{7^2 + 6^2} = \sqrt{85} \\
\overline{H}M &= \sqrt{9^2 + 2^2} = \sqrt{85}
\end{align*}
\]

Determine and state the area of $MATH$.

Score 3: The student did not write a concluding statement when proving the rhombus.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

Determine and state the area of $MATH$.

Score 3: The student made an error in computing the area of triangle IV.
34 Parallelogram MATH has vertices M(−7,−2), A(0,4), T(9,2), and H(2,−4).

Prove that parallelogram MATH is a rhombus.

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

\[
\begin{align*}
\overline{MA} &= \sqrt{(-7-0)^2 + (-2-4)^2} = \sqrt{85} \\
\overline{AT} &= \sqrt{(9-0)^2 + (2-4)^2} = \sqrt{85} \\
\overline{WH} &= \sqrt{(9-2)^2 + (2-4)^2} = \sqrt{85} \\
\overline{MH} &= \sqrt{(-7-2)^2 + (-2-4)^2} = \sqrt{85}
\end{align*}
\]

\[\square \text{MATH is a rhombus because all the sides are congruent.}\]

Determine and state the area of MATH.

Score 2: The student proved parallelogram MATH is a rhombus, but no further correct work was shown.
34 Parallelogram \( MATH \) has vertices \( M(-7, -2), A(0,4), T(9,2), \) and \( H(2,-4). \)

Prove that parallelogram \( MATH \) is a rhombus.

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

\[
\overline{MATH} \text{ is a rhombus due to } \overline{MA} \parallel \overline{HT}.
\]

Determine and state the area of \( MATH. \)

\[
\frac{16 \cdot 8}{2} = 128
\]

\[
\Delta_1 \frac{1}{2} \cdot 4 \cdot 6 = 12
\]

\[
\Delta_2 \frac{1}{2} \cdot 9 \cdot 2 = 9
\]

\[
\Delta_3 \frac{1}{2} \cdot 7 \cdot 6 = 21
\]

\[
\Delta_4 \frac{1}{2} \cdot 9 \cdot 2 = 9
\]

\[
\therefore \text{area} = 60
\]

Score 2: The student determined the area of \( MATH \), but no further correct work was shown.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

\[
\text{Parallelogram } MATH \text{ is a rhombus because its diagonals are perpendicular to each other.}
\]

Determine and state the area of $MATH$.

Score 2: The student proved parallelogram $MATH$ is a rhombus, but no further correct work was shown.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

Determine and state the area of $MATH$.

\[ A = 85 (85) \]

\[ A = 7225 \]

**Score 1:** The student found the lengths of the sides of $MATH$, but the concluding statement was incorrect. No further correct work was shown.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

Parallelogram $MATH$ is not a rhombus because the diagonals do not have negative reciprocal slopes.

Determine and state the area of $MATH$.

\[
\begin{align*}
MA &= \sqrt{(-7-2)^2 + (4+2)^2} = \sqrt{85} \\
AT &= \sqrt{(9-0)^2 + (2-4)^2} = \sqrt{85} \\
TH &= \sqrt{(2-9)^2 + (-4+2)^2} = \sqrt{85} \\
MH &= \sqrt{(2+7)^2 + (-4+2)^2} = \sqrt{85}
\end{align*}
\]

\[
\text{Area } MATH = \sqrt{85}
\]

Score 1: The student found the length of at least two consecutive sides of $MATH$. No further correct relevant work was shown.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

$$AH = \sqrt{(8)^2 + (2)^2} = \sqrt{68}$$

$$MH = \sqrt{(10)^2 + (4)^2} = \sqrt{272}$$

Determine and state the area of $MATH$.

$$\text{Area} = \text{diagonal} \times \text{diagonal}$$

$$\sqrt{68} \times \sqrt{272} = 136$$

Score 1: The student made an error in determining the area of $MATH$. No further correct relevant work was shown.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

Determine and state the area of $MATH$.

Score 0: The student did not show enough correct relevant work to receive any credit.
34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

Determine and state the area of $MATH$.

Score 0: The student did not show enough correct relevant work to receive any credit.
34 Parallelogram \( MATH \) has vertices \( M(-7,-2), A(0,4), T(9,2), \) and \( H(2,-4) \).

Prove that parallelogram \( MATH \) is a rhombus.

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

Parallelogram \( MATH \) is a rhombus because all sides are congruent.

Determine and state the area of \( MATH \).

Score 0: The student did not show enough correct relevant work to receive any credit.
Given: Quadrilateral $ABCD$, $AB \equiv CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \equiv BF$

Prove: $G$ is the midpoint of $EF$

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quadrilateral $ABCD$, $AB \equiv CD$, $AB \parallel CD$</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. $ABCD$ is a parallelogram</td>
<td>2. If a quadrilateral has a pair of opposite sides that are parallel and congruent then it is a parallelogram</td>
</tr>
<tr>
<td>3. $DE \equiv BF$</td>
<td>3. Given</td>
</tr>
<tr>
<td>4. $AD \equiv CB$</td>
<td>4. Opposite sides of a parallelogram are congruent</td>
</tr>
<tr>
<td>5. $AB \equiv CF$</td>
<td>5. Subtraction Postulate</td>
</tr>
<tr>
<td>6. $AD \parallel CB$</td>
<td>6. Opposite sides of a parallelogram are parallel</td>
</tr>
<tr>
<td>7. $\angle EAG \equiv \angle FCG$</td>
<td>7. If two parallel lines are cut by a transversal, then the alternate interior angles are congruent</td>
</tr>
<tr>
<td>8. $\angle ADE \equiv \angle CFE$</td>
<td>8. If two lines intersect, they form vertical angles that are congruent</td>
</tr>
<tr>
<td>9. $\triangle AEG \equiv \triangle CFG$</td>
<td>9. AAS Postulate</td>
</tr>
<tr>
<td>10. $EG \equiv FG$</td>
<td>10. CPCTC</td>
</tr>
<tr>
<td>11. $G$ is the midpoint of $EF$</td>
<td>11. If a point divides a segment into two congruent segments then it is the midpoint of the segment</td>
</tr>
</tbody>
</table>

Score 6: The student gave a complete and correct response.
35 Given: Quadrilateral $ABCD$, $AB \equiv CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \equiv BF$

prove: $G$ is the midpoint of $EF$

Since quad. $ABCD$ has one set of opposite sides $\cong$ and $\parallel$, it is a parallelogram. Then $AD \cong BC$ and $AD \parallel BC$ by opposite sides of a p-gram are $\cong$ and $\parallel$.

Since $AD \cong BC$ and $ED \cong BF$ (given), $AE \cong CF$ by the Subtraction property.

Since $AD \parallel BC$, transversals $AD$ and $EF$ will make $\cong$ alternate interior angles, so $\angle FCG \cong \angle FCG$ and $\angle AEG \cong \angle AFG$.

Therefore $\triangle AEG \cong \triangle CFG$ by $ASA \cong$.

Then $EG \cong FG$ by $CPCTC$. So, since $G$ is a point on $EF$ and is dividing it into 2 $\cong$ parts, $G$ must be a midpoint.

Score 6: The student gave a complete and correct response.
Given: Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \cong BF$

Prove: $G$ is the midpoint of $EF$

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, and $DE \cong BF$</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. Quadrilateral $ABCD$ is a parallelogram</td>
<td>2. If a set of opposite sides of a quadrilateral are $\cong$ and $\parallel$, it is a parallelogram</td>
</tr>
<tr>
<td>3. $AB$ is $\parallel$ and $\cong$ to $CD$</td>
<td>3. Opposite sides of a parallelogram are $\cong$ and $\parallel$.</td>
</tr>
<tr>
<td>4. $\angle EAG \cong \angle FCE$</td>
<td>4. When lines are $\parallel$, all interior $\angle$'s are $\cong$.</td>
</tr>
<tr>
<td>$\angle AEG \cong \angle CFG$</td>
<td>5. Subtraction</td>
</tr>
<tr>
<td>5. $\overrightarrow{AB} - \overrightarrow{ED} \cong \overrightarrow{CB} - \overrightarrow{FB}$ or $\overrightarrow{AE} \cong \overrightarrow{CF}$</td>
<td>6. AS A $\cong$</td>
</tr>
<tr>
<td>6. $\triangle AEG \cong \triangle CFG$</td>
<td>7. cprtc</td>
</tr>
<tr>
<td>7. $\overrightarrow{EA} \cong \overrightarrow{FG}$</td>
<td>8. If a point splits a segment into two $\cong$ segments, it is a midpoint.</td>
</tr>
<tr>
<td>8. $G$ is the midpoint of $EF$</td>
<td></td>
</tr>
</tbody>
</table>

Score 6: The student gave a complete and correct response.
Given: Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \cong BF$

Prove: $G$ is the midpoint of $EF$

\begin{align*}
1. & \text{ Given} \\
2. & \angle BAC \cong \angle DCA \\
3. & AD \cong BC \\
4. & \triangle ABC \cong \triangle CDA \\
5. & \angle EAG \cong \angle FCG \\
6. & \angle AD - DE \cong \angle BC - BF \\
7. & \angle AGE \cong \angle CFE \\
8. & \triangle AGE \cong \triangle CFE \\
9. & EG \cong FG \\
\end{align*}

Score 5: The student had a missing concluding statement and reason after step 9.
Question 35

35 Given: Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \cong BF$

Prove: $G$ is the midpoint of $EF$

<table>
<thead>
<tr>
<th>Step</th>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, and $DE \cong BF$</td>
<td>Given</td>
</tr>
<tr>
<td>2.</td>
<td>Quadrilateral $ABCD$ is a parallelogram</td>
<td>When one pair of opposite sides is congruent and parallel, a quadrilateral is a parallelogram</td>
</tr>
<tr>
<td>3.</td>
<td>$\angle AGE \cong \angle FGC$</td>
<td>Vertical angles are congruent</td>
</tr>
<tr>
<td>4.</td>
<td>$\overline{AD} - \overline{ED} \cong \overline{BC} - \overline{BF}$ or $\overline{AE} \cong \overline{FC}$</td>
<td>Subtraction postulate</td>
</tr>
<tr>
<td>5.</td>
<td>$\angle EAG \cong \angle FCG$</td>
<td>When lines are parallel, alternate interior angles are congruent</td>
</tr>
<tr>
<td>6.</td>
<td>$\triangle AEG \cong \triangle CFG$</td>
<td>$AAS$</td>
</tr>
<tr>
<td>7.</td>
<td>$\overline{EG} \cong \overline{FG}$</td>
<td>CRCTC</td>
</tr>
<tr>
<td>8.</td>
<td>$G$ is the midpoint of $EF$</td>
<td>When two segments on a line segment are congruent, the point intersecting them is the midpoint</td>
</tr>
</tbody>
</table>

**Score 4:** The student had a missing statement and reason to prove step 4 and a missing statement and reason to prove step 5.
Question 35

35 Given: Quadrilateral $ABCD$, $AB \equiv CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \equiv BF$

Prove: $G$ is the midpoint of $EF$

Score 4: The student made a conceptual error in proving $\triangle EAG \cong \triangle FCG$. 

Geometry – June '23
Question 35

35 Given: Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \cong BF$

Prove: $G$ is the midpoint of $EF$

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) $ABCD$ is a $\square$</td>
<td>1) Given</td>
</tr>
<tr>
<td>$\frac{AB}{BC} = \frac{DE}{EF}$</td>
<td>when one $\parallel$, opp $\cong$</td>
</tr>
<tr>
<td>2) $AD - DE \cong BC - BF$</td>
<td>2) $\square$ and $\parallel$</td>
</tr>
<tr>
<td>$\frac{AD}{AE} = \frac{BC}{FC}$</td>
<td>3) Subtraction Post.</td>
</tr>
<tr>
<td>4) $AD \parallel BC$</td>
<td>4) A $\square$ has opp sides $\parallel$</td>
</tr>
<tr>
<td>5) $\angle AGF \cong \angle CFG$</td>
<td>5) ext int $\angle$'s are $\cong$</td>
</tr>
<tr>
<td>$\angle AEG \cong \angle CFG$</td>
<td>6) ASA</td>
</tr>
<tr>
<td>$\triangle AGE \cong \triangle CGF$</td>
<td>7) $\square$</td>
</tr>
<tr>
<td>$EG \cong FG$</td>
<td>$\square$</td>
</tr>
</tbody>
</table>

Score 3: The student had a missing statement and reason to prove step 3, an incomplete reason in step 5, and a missing concluding statement and reason after step 7.
35 Given: Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \cong BF$

Prove: $G$ is the midpoint of $EF$

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrilateral $ABCD$</td>
<td>1. given</td>
</tr>
<tr>
<td>$1. AB \cong CD$, $AB \parallel CD$</td>
<td>2. A quadrilateral with one pair of opposite sides $\cong$ is a parallelogram</td>
</tr>
<tr>
<td>Quadrilateral $ABCD$ is a parallelogram</td>
<td>3. Vert. $\angle s \cong$</td>
</tr>
<tr>
<td>$3. \angle 1$ and $\angle 2$ are $\cong$</td>
<td>4. If two lines are parallel, then alternate interior $\angle s \cong$</td>
</tr>
<tr>
<td>$\angle EAG \cong \angle GCF$</td>
<td>5. $\triangle AEG \cong \triangle CFG$ $\cong$, AAA</td>
</tr>
<tr>
<td>$\angle AEG \cong \angle CFG$</td>
<td>6. $G$ is the midpoint of $EF$, CPCTC</td>
</tr>
</tbody>
</table>

Score 2: The student made some correct relevant statements and reasons about the proof.
Given: Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \cong BF$.

Prove: $G$ is the midpoint of $EF$.

\begin{align*}
\text{\textbf{S}} & \quad \text{\textbf{R}} \\
1. \text{Quadrilateral } ABCD & \quad 1. \text{Given} \\
& \quad \text{AB} \cong \text{CD}, \text{AB} \parallel \text{CD} \\
2. \text{\angle LEAG} \cong \text{\angle FCG} & \quad 2. \text{AIA} \\
3. \text{AE} \cong \text{CF} & \quad 3. \text{Subtraction Postulate} \\
4. \text{\angle AGE} \cong \text{\angle CGF} & \quad 4. \text{Vertical \angle s are } \cong \\
5. \triangle \text{AEG} \cong \triangle \text{CFG} & \quad 5. \text{ASA} \\
6. \text{G is midpoint of } EF & \quad 6. \text{CPCTC} \\
\end{align*}

\textbf{Score 1}: The student had only one correct relevant statement and reason in step 4.
Given: Quadrilateral $ABCD$, $AB \equiv CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \equiv BF$

Prove: $G$ is the midpoint of $EF$

Score 1: The student had only one correct relevant statement and reason in step 2.
Question 35

Given: Quadrilateral $ABCD$, $AB \cong CD$, $AB \parallel CD$, diagonal $AC$ intersects $EF$ at $G$, and $DE \cong BF$

Prove: $G$ is the midpoint of $EF$

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Quad $ABCD$, $AB \cong CD$, $AB \parallel CD$, and $DE \cong BF$</td>
<td>1) Given</td>
</tr>
<tr>
<td>2) $\angle G \cong \angle G$</td>
<td>2) Reflexive prop</td>
</tr>
<tr>
<td>3)</td>
<td>3)</td>
</tr>
</tbody>
</table>

Score 0: The student had a completely incorrect response.