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25 Use a compass and straightedge to construct an inscribed square in circle $T$ shown below. [Leave all construction marks.]

**Score 2:** The student drew a correct construction showing all appropriate construction marks and the square was drawn.
25 Use a compass and straightedge to construct an inscribed square in circle $T$ shown below. [Leave all construction marks.]

Score 2: The student drew a correct construction showing all appropriate construction marks and the square was drawn.
25 Use a compass and straightedge to construct an inscribed square in circle $T$ shown below.
[Leave all construction marks.]

Score 1: The student drew a correct construction showing all appropriate construction marks, but the square was not drawn.
Use a compass and straightedge to construct an inscribed square in circle $T$ shown below. [Leave all construction marks.]

Score 1: The student made an error by correctly constructing a circumscribed square around circle $T$. 
25 Use a compass and straightedge to construct an inscribed square in circle $T$ shown below. [Leave all construction marks.]

Score 0: The student made a drawing that is not a construction.
Question 25

25 Use a compass and straightedge to construct an inscribed square in circle $T$ shown below. [Leave all construction marks.]

Score 0: The student incorrectly drew a circumscribed square around circle $T$. 
26 The diagram below shows parallelogram $LMNO$ with diagonal $\overline{LN}$, $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.

Explain why $m\angle NLO$ is $40$ degrees.

$\angle LO\ N$ is $118^\circ$ b/c opposite $\angle$’s of a $\Box$ are $\cong$.

A $\triangle$’s $\angle$ measures add up to $180^\circ$.

$118 + 22 = 140$ so $\angle NLO$ must be $40^\circ$.

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

26 The diagram below shows parallelogram $LMNO$ with diagonal $LN$, $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.

Explain why $m\angle NLO$ is 40 degrees.

Score 2: The student has a complete and correct response.
26 The diagram below shows parallelogram $LMNO$ with diagonal $LN$, $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.

In a parallelogram, $m\angle MNO = 62^\circ$ (consecutive $\angle$s are supp)

$62 - 22 = 40^\circ$ for $m\angle LNM$

$m\angle NLO = 40^\circ$ because since $\parallel LN \parallel MN$, alternate interior $\angle$s are congruent.

**Score 2:** The student has a complete and correct response.
The diagram below shows parallelogram $LMNO$ with diagonal $LN$, $\angle M = 118^\circ$, and $\angle LNO = 22^\circ$.

Explain why $\angle NLO$ is 40 degrees.

\[
\begin{align*}
118^\circ + 118^\circ &= 236^\circ \\
360^\circ - 236^\circ &= 124^\circ / 2 = 62^\circ \\
62^\circ - 22^\circ &= 40 \\
118^\circ + 40 + \angle \beta &= 180 \\
158 + \angle \beta &= 180 \\
\angle \beta &= 22^\circ \\
\therefore \, \angle NLO &= 40^\circ
\end{align*}
\]

**Score 1:** The student mathematically justified the angle measure, but did not provide an explanation in words.
26 The diagram below shows parallelogram $LMNO$ with diagonal $LN$, $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.

Explain why $m\angle NLO$ is 40 degrees.

Because if you add 118 and 22, you get 140 and every triangle equals 180, so you subtract 140 from 180 to get 40.

Score 1: The student gave an incomplete explanation, because a geometric relationship between $118^\circ$ and $22^\circ$ was not established.
Question 26

26 The diagram below shows parallelogram $LMNO$ with diagonal $LN$, $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.

Explain why $m\angle NLO$ is 40 degrees.

Opposite angles of parallelogram are congruent.
The angles of a triangle add to 180.

\[
\begin{array}{ccc}
118 & 180 \\
+ 22 & - 130 \\
130 & 50 \\
\end{array}
\]

So $m\angle NLO = 50^\circ$ not $40^\circ$

Score 1: The student had one computational error with an appropriate explanation.
26 The diagram below shows parallelogram $LMNO$ with diagonal $LN$, $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.

Explain why $m\angle NLO$ is 40 degrees.

because $\angle M$ and $\angle N$ are complementary angles. So when you add them up and equal it to 180 you get 140 when subtract that from 180 and you get $40^\circ$.

Score 0: The student gave a completely incorrect explanation.
27 The coordinates of the endpoints of $AB$ are $A(-6,-5)$ and $B(4,0)$. Point $P$ is on $AB$. Determine and state the coordinates of point $P$, such that $AP:PB$ is $2:3$.

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

\[
d = \sqrt{(x-x)^2 + (y-y)^2} = \sqrt{(-6-4)^2 + (0-0)^2} = \sqrt{(-10)^2 + (0)^2} = \sqrt{100 + 0} = \sqrt{100} = 10.
\]

Score 2: The student has a complete and correct response. The student showed correct work that was not necessary.
The coordinates of the endpoints of $AB$ are $A(-6, -5)$ and $B(4, 0)$. Point $P$ is on $AB$. Determine and state the coordinates of point $P$, such that $AP:PB$ is 2:3. [The use of the set of axes below is optional.]

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

27 The coordinates of the endpoints of $AB$ are $A(-6,-5)$ and $B(4,0)$. Point $P$ is on $AB$. Determine and state the coordinates of point $P$, such that $AP:PB$ is 2:3. [The use of the set of axes below is optional.]

Score 1: The coordinates of $P$ were not stated as a point.
27 The coordinates of the endpoints of $AB$ are $A(-6,-5)$ and $B(4,0)$. Point $P$ is on $AB$. Determine and state the coordinates of point $P$, such that $AP:PB$ is $2:3$.

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

\[
\begin{align*}
    x &= \frac{2}{5} \cdot (4 - (-6)) = \frac{2}{5} \cdot 10 = 4 - 6 = -2 \\
    y &= \frac{2}{5} \cdot (0 - (-5)) = \frac{2}{5} \cdot 5 = -2 - 5 = -7
\end{align*}
\]

$P(-2, -7)$

**Score 1:** The student made an error in determining the $y$-coordinate.
27 The coordinates of the endpoints of \( \overline{AB} \) are \( A(-6,-5) \) and \( B(4,0) \). Point \( P \) is on \( \overline{AB} \). Determine and state the coordinates of point \( P \), such that \( AP:PB \) is 2:3.

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

\( (0, -2) \)

Score 1: The student determined the coordinates of \( P \) such that \( AP:PB \) is in a 3:2 ratio.
27 The coordinates of the endpoints of $AB$ are $A(-6,-5)$ and $B(4,0)$. Point $P$ is on $AB$. Determine and state the coordinates of point $P$, such that $AP:PB$ is 2:3. 

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

$$P \left(-6 + \frac{2}{3} \cdot 10, -5 + \frac{2}{3} \cdot 5\right)$$

$$P \left(-6 + \frac{2}{3} \cdot 10, -5 + \frac{10}{3}\right)$$

$$P \left(-6 + \frac{20}{3}, -5 + \frac{10}{3}\right)$$

$$P \left(\frac{2}{3}, -1\frac{2}{3}\right)$$

**Score 1:** The student made an error by multiplying by $\frac{2}{3}$ instead of $\frac{2}{5}$. 
The coordinates of the endpoints of $AB$ are $A(-6,-5)$ and $B(4,0)$. Point $P$ is on $AB$. Determine and state the coordinates of point $P$, such that $AP:PB$ is 2:3.

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

![Graph showing the line segment AB with points and coordinate calculations]

Score 0: The student's use of the midpoint formula was irrelevant to the question.
The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.

Determine and state, to the nearest degree, the angle of elevation formed by the ramp and the ground.

\[
\theta = \sin^{-1}\left(\frac{4.5}{11.75}\right)
\]

\[
\theta = 22.518^\circ
\]

\[
\theta = 23^\circ
\]

**Score 2:** The student has a complete and correct response.
The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.

Determine and state, to the nearest degree, the angle of elevation formed by the ramp and the ground.

\[
\sin X = \frac{4.5}{11.75}
\]

\[
\sin X = 0.3829787234
\]

38°

**Score 1:** The student wrote a correct equation, but the angle of elevation was found incorrectly.
The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.

Determine and state, to the nearest degree, the angle of elevation formed by the ramp and the ground.

\[ \tan \theta = \frac{4.5}{11.75} \]

\[ \theta = \tan^{-1} \frac{4.5}{11.75} \]

\[ \theta = 21 \]

Score 1: The student made an error by using the wrong trigonometric function, but found an appropriate angle of elevation.
Question 28

28 The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.

Determine and state, to the nearest degree, the angle of elevation formed by the ramp and the ground.

\[
\sin x = \frac{4.5}{11.75}
\]

\[
.393
\]

\[
1^\circ
\]

Score 1: The student wrote a correct equation, but no further correct work was shown.
Question 28

28 The diagram below shows a ramp connecting the ground to a loading platform 4.5 feet above the ground. The ramp measures 11.75 feet from the ground to the top of the loading platform.

Determine and state, to the nearest degree, the angle of elevation formed by the ramp and the ground.

\[ a^2 + b^2 = c^2 \]

\[ (4.5)^2 + b^2 = (11.75)^2 \]

\[ 20.25 + b^2 = 138.0625 \]

\[ 20.25 - 20.25 \]

\[ \sqrt{b^2} = \sqrt{117.8125} \]

\[ b = 10.854146673 \]

\[ 110 \]

Score 0: The student had a completely incorrect response.
In the diagram below of circle \( O \), the area of the shaded sector \( AOC \) is \( 12\pi \) in\(^2\) and the length of \( OA \) is 6 inches. Determine and state \( m\angle AOC \).

\[
A = \pi r^2 = 6^2 \cdot \pi = 36\pi
\]

\[
\frac{12\pi}{36\pi} = \frac{1}{3}
\]

\[\frac{1}{3} \cdot 360 = 120^\circ\]

**Score 2:** The student has a complete and correct response.
29 In the diagram below of circle $O$, the area of the shaded sector $AOC$ is $12\pi$ in$^2$ and the length of $OA$ is 6 inches. Determine and state $m\angle AOC$.

\[ A = \frac{rs}{2} \]

\[ 2 \cdot 12\pi = \frac{6 \cdot 5}{2} \cdot 2 \]

\[ \frac{24\pi}{6} = \frac{6s}{6} \]

\[ s = 4\pi \]

\[ \frac{4\pi}{6} = \frac{5\theta}{6} \]

\[ \theta = \frac{4\pi}{6} = \frac{2\pi}{3} \]

\[ m\angle AOC = \frac{2\pi}{3} \]

**Score 2:** The student has a complete and correct response.
29 In the diagram below of circle $O$, the area of the shaded sector $AOC$ is $12\pi$ in$^2$ and the length of $OA$ is 6 inches. Determine and state $m\angle AOC$.

\[ A = \pi r^2 \]
\[ A = \pi (6)^2 \]
\[ A = 36\pi \]

\[ 36\pi - 12\pi = 24\pi \]

\[ m\angle AOC = 120^\circ \]

\[ 2x + 1x = 360 \]
\[ 3x = 360 \]
\[ x = 120 \]

**Score 2:** The student has a complete and correct response.
29 In the diagram below of circle $O$, the area of the shaded sector $AOC$ is $12\pi$ in$^2$ and the length of $OA$ is 6 inches. Determine and state $m\angle AOC$.

\[ A = \pi r^2 \]
\[ A = \pi \cdot 6^2 \]
\[ A = 36\pi \]

\[ 36\pi - 12\pi = 24\pi \]

\[ \frac{24\pi}{36\pi} = \frac{X}{360} \]

\[ 8\cdot 40 = 3\cdot x \]

\[ 240 = x \]

**Score 1:** The student made an error by finding the central angle for the unshaded sector.
In the diagram below of circle $O$, the area of the shaded sector $AOC$ is $12\pi \text{ in}^2$ and the length of $OA$ is 6 inches. Determine and state $\angle AOC$.

$$A = \pi r^2$$
$$A = (6)^2 \pi = 36\pi \text{ in}^2$$

$$\frac{\frac{12}{24}}{24} = \frac{1}{4}$$

$$1x + 4x = 360$$
$$5x = 360$$
$$x = 72$$

Score 1: The student made an error when reducing $\frac{12}{24}$.
29 In the diagram below of circle $O$, the area of the shaded sector $AOC$ is $12\pi$ in$^2$ and the length of $OA$ is 6 inches. Determine and state $m\angle AOC$.

Score 0: The student had a completely incorrect response.
30 After a reflection over a line, $\triangle A'B'C'$ is the image of $\triangle ABC$. Explain why triangle $ABC$ is congruent to triangle $A'B'C'$.

Reflections are rigid motions and rigid motions keep distances the same. So $AB = A'B'$ and $BC = B'C'$ and $AC = A'C'$, so $\triangle ABC \cong \triangle A'B'C'$.

Score 2: The student has a complete and correct response.
30 After a reflection over a line, $\triangle A'B'C'$ is the image of $\triangle ABC$. Explain why triangle $ABC$ is congruent to triangle $A'B'C'$.

Two triangles are congruent if rigid motions can map one onto another. A reflection is a rigid motion.

So $\triangle ABC \cong \triangle A'B'C'$ after a reflection.

Score 2: The student has a complete and correct response.
30 After a reflection over a line, \( \triangle A'B'C' \) is the image of \( \triangle ABC \). Explain why triangle \( ABC \) is congruent to triangle \( A'B'C' \).

Because reflections are rigid motions.

Score 1: The student wrote an incomplete explanation.
After a reflection over a line, \( \triangle A'B'C' \) is the image of \( \triangle ABC \). Explain why triangle \( ABC \) is congruent to triangle \( A'B'C' \).

**Score 0:** The student did not provide an explanation.
31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[
\frac{1.65}{4.15} = \frac{x}{16.6}
\]

\[4.15x = 27.39\]

\[x = 6.6\]

\[6.6 \text{ m}\]

Score 2: The student has a complete and correct response.
A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[
\tan x = \frac{1.65}{4.15}
\]

\[
x = 21.7
\]

\[
\tan 21.7 = \frac{h}{16.6}
\]

\[
h = 6.6
\]

Score 2: The student has a complete and correct response.
A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[
\tan X = \frac{1.65}{4.15} \quad \tan(37.8427378) = \frac{h}{16.60} \\
X = \tan^{-1}\left(\frac{1.65}{4.15}\right) \quad h = 16.60 \cdot \tan(37.8427378) \\
X = 37.8427378 \quad h = 6.6 \\
\]

6.6 meters

Score 2: The student has a complete and correct response.
31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[
\frac{x}{16.60} = \frac{1.65}{12.45} \\
12.45x = 27.39 \\
x = 2.2m
\]

Score 1: The student wrote an incorrect equation based on an incorrectly labeled diagram, but solved it appropriately.
Question 31

31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[ \sin x = \frac{1.65}{4.15} \]

\[ x = \sin^{-1}\left(\frac{1.65}{4.15}\right) \]

\[ x = 23.427626509 \]

\[ 16.6 \cdot \sin(23.427626509) = \frac{h}{16.6} \cdot 16.6 \]

\[ 6.6 = h \]

6.6 meters

Score 1: The student made an error using the incorrect trigonometric function, and found an incorrect angle measure for \( x \). The student made the same error in finding the height.
31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[
tan \theta = \frac{1.65}{4.15} \quad \quad \quad \quad \quad \quad \quad \quad tan \theta = \frac{y}{16.6}
\]

**Score 1:** The student wrote a correct system of equations, but no further work was shown.
31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[
\frac{f}{16.6} = \frac{1.65}{4.15} \\
\frac{f}{16.6} = \frac{1.7}{4.2} \\
\frac{f}{16.6} = 0.719047619 \\
f = 6.7
\]

**Score 1:** The student wrote a correct proportion, but no further correct work was shown.
31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[
\frac{x}{1.65} = \frac{12.45}{16.60}
\]

\[
\frac{20.5495}{16.60} = \frac{16.60x}{16.60}
\]

\[
x = 123.75
\]

**Height of Flagpole = 12.4 meters long**

**Score 0:** The student did not subtract 12.45 from 16.60. The student also wrote an incorrect proportion.
31 A flagpole casts a shadow 16.60 meters long. Tim stands at a distance of 12.45 meters from the base of the flagpole, such that the end of Tim’s shadow meets the end of the flagpole’s shadow. If Tim is 1.65 meters tall, determine and state the height of the flagpole to the nearest tenth of a meter.

\[ x^2 + 12.45^2 = 16.6 \]
\[ x^2 + 155.0025 = 275.56 \]
\[ x^2 = 120.5575 \]
\[ x = 10.979 \]

Score 0: The student had a completely incorrect response.
Question 32

32 In the diagram below, $EF$ intersects $AB$ and $CD$ at $G$ and $H$, respectively, and $GI$ is drawn such that $GH \cong IH$.

If $m\angle EGB = 50^\circ$ and $m\angle DIG = 115^\circ$, explain why $AB \parallel CD$.

$m\angle GHI = 65$ (linear pairs are supplementary)

$m\angle HGI = 65$ - Base angles of an isosceles triangle are equal

$m\angle EGB + m\angle BGI + m\angle HGI = 180$

$50 + m\angle BGI + 65 = 180$

$115 + m\angle BGI = 180$

$m\angle BGI = 65$

$\angle BGI$ and $\angle DIG$ are same-side interior $\angle s$, and since they are supplementary, $AB \parallel CD$.

Score 4: The student has a complete and correct response.
32 In the diagram below, \( EF \) intersects \( AB \) and \( CD \) at \( G \) and \( H \), respectively, and \( GI \) is drawn such that \( GH = IH \).

If \( m\angle EGB = 50^\circ \) and \( m\angle DIG = 115^\circ \), explain why \( AB \parallel CD \).

\[ \begin{align*}
\angle AGH &= 50^\circ, \text{ and } \\
\angle GIH &= 65^\circ. \text{ \( \triangle GH \) is isosceles} \\
50^\circ &\neq 65^\circ \neq 115^\circ.
\end{align*} \]

This makes \( \angle AGI = 115^\circ \), and since alternate interior angles \( \angle AGI \) and \( \angle DIG \) are congruent, \( AB \parallel CD \).

**Score 3:** The student stated correct angle measures, but did not have an explanation for \( m\angle AGH \) and \( m\angle GIH \).
32 In the diagram below, $EF$ intersects $AB$ and $CD$ at $G$ and $H$, respectively, and $GI$ is drawn such that $GH = IH$.

If $m \angle EGB = 50^\circ$ and $m \angle DIG = 115^\circ$, explain why $AB \parallel CD$.

$\angle DIG$ is supplementary to $\angle HIG$, so $m \angle HIG = 65^\circ$.
$\angle HIG = \angle HGI$ because angles opposite equal sides are equal.
The sum of angles of a triangle is $180^\circ$ so $\angle GHI$ is $50^\circ$.
So, $AB \parallel CD$.

**Score 3:** The student stated correct angle measures with explanations, but did not explain why $AB \parallel CD$. 
32 In the diagram below, $EF$ intersects $AB$ and $CD$ at $G$ and $H$, respectively, and $GI$ is drawn such that $GH = IH$.

If $m\angle EGB = 50^\circ$ and $m\angle DIG = 115^\circ$, explain why $AB \parallel CD$.

$\angle HIG$ is supplementary to $\angle DIG$, so $\angle HIG = 75^\circ$.

$\triangle GHI$ is isosceles, so $\angle HGI = 75^\circ$ too. The angles of a triangle add to $180^\circ$, so $\angle GHI = 30^\circ$.

Since alternate interior angles $\angle EGB$ and $\angle GHI$ are not equal, $AB$ is not parallel to $CD$.

**Score 2:** The student made one computational error in finding $m\angle HIG$. The student made an error in the explanation by identifying $\angle EGB$ and $\angle GHI$ as alternate interior angles.
In the diagram below, \( EF \) intersects \( AB \) and \( CD \) at \( G \) and \( H \), respectively, and \( GI \) is drawn such that \( GH \equiv IH \).

If \( m \angle EGB = 50^\circ \) and \( m \angle DIG = 115^\circ \), explain why \( AB \parallel CD \).

\[
\begin{align*}
\text{m} \angle \text{DIG} + \text{m} \angle \text{HIG} &= 180 \\
\text{m} \angle \text{HIG} &\leq \text{m} \angle \text{BCI} \\
\text{m} \angle \text{BCI} + \text{m} \angle \text{DIG} &= 180 \\
65 + 115 &= 180 \\
180 &= 180
\end{align*}
\]

**Score 2:** The student made one conceptual error using alternate interior angles of parallel lines to prove the same lines parallel.
32 In the diagram below, $EF$ intersects $AB$ and $CD$ at $G$ and $H$, respectively, and $GI$ is drawn such that $GH \cong IH$.

If $m\angle EGB = 50^\circ$ and $m\angle DIG = 115^\circ$, explain why $AB \parallel CD$.

\[
m\angle BGI + m\angle DIG = 180^\circ
\]
\[
65 + 115 = 180
\]
\[
180 = 180 \rightarrow \text{only when lines are } \parallel.
\]

Score 2: The student had appropriate angle measures stated correctly, but was missing the explanation.
If \( m\angle EGB = 50^\circ \) and \( m\angle DIG = 115^\circ \), explain why \( AB \parallel CD \).

**Score 1:** The student found appropriate angle measures based on a mislabeled diagram, and the explanation was missing.
Question 32

32 In the diagram below, \( EF \) intersects \( AB \) and \( CD \) at \( G \) and \( H \), respectively, and \( GI \) is drawn such that \( GH = IH \).

\[
\begin{align*}
\text{\( \angle EGB \)} & \quad = \quad 50^\circ \\
\text{\( \angle DIG \)} & \quad = \quad 115^\circ
\end{align*}
\]

If \( \angle EGB = 50^\circ \) and \( \angle DIG = 115^\circ \), explain why \( AB \parallel CD \).

**Score 0:** The student did not show enough work on which to base the explanation.
33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at $E$

Prove: $\triangle AED \cong \triangle CEB$

Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

*rotation of $180^\circ$ at point $E$.*

**Score 4:** The student has a complete and correct proof, and a correct rigid motion is stated.
Question 33

33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $AC$ and $BD$ intersecting at $E$

Prove: $\triangle AED \cong \triangle CEB$

<table>
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<tr>
<th>Statement</th>
<th>Reason</th>
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<tr>
<td>1. Quad $ABCD$ is a parallelogram</td>
<td>1. given</td>
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<tr>
<td>2. $\overline{AD} \cong \overline{BC}$</td>
<td>2. opposite sides of parallelogram are congruent</td>
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<tr>
<td>3. $\overline{AC}$ and $\overline{DB}$ intersect at $E$</td>
<td>3. given</td>
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<td>4. $\angle AED \cong \angle CEB$</td>
<td>4. vertical angles are congruent</td>
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<td>5. $\overline{BE} \parallel \overline{DA}$</td>
<td>5. def. of $\parallel$</td>
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<td>6. $\angle DBC \cong \angle BDA$</td>
<td>6. alt. interior angles are $\cong$</td>
</tr>
<tr>
<td>7. $\triangle AED \cong \triangle CEB$</td>
<td>7. $AAS \cong AAS$</td>
</tr>
</tbody>
</table>

Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

 Rotation of $\triangle AED$ around point $E$ of $180^\circ$.

Score 4: The student has a complete and correct proof, and a correct rigid motion is described.
Question 33

33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $AC$ and $BD$ intersecting at $E$

Prove: $\triangle AED \cong \triangle CEB$

Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

Score 3: The student wrote an incomplete description of the rigid motion.
33 Given: Quadrilateral \(ABCD\) is a parallelogram with diagonals \(AC\) and \(BD\) intersecting at \(E\)

Prove: \(\triangle AED \cong \triangle CEB\)

1. \(AC\) and \(BD\) intersect at \(E\), \(ABCD\) is a \(\square\)
2. \(AB \cong BC\), \(AD \cong DC\)
3. \(\angle 1 \cong \angle 2\), \(\angle 3 \cong \angle 4\)
4. \(AB \parallel DC\)
5. \(\angle DCA \cong \angle BAC\)
6. \(\angle DCE \cong \angle BAE\)
7. \(ED \cong EB\)
8. \(\triangle AED \cong \triangle CEB\)

Describe a single rigid motion that maps \(\triangle AED\) onto \(\triangle CEB\).

\[\text{reflection through } E\]

Score 3: The student had an incorrect reason for the last step, but a correct rigid motion was stated.
33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at $E$

Prove: $\triangle AED \cong \triangle CEB$

In a parallelogram, the diagonals bisect each other, so $AE = CE$ and $BE = DE$. $\angle 1 \cong \angle 2$. So $\triangle AED \cong \triangle CEB$ by SAS.

Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

$180^\circ$ rotation

Score 2: The student was missing the reason $\angle 1 \cong \angle 2$ and wrote an incomplete description of the rigid motion.
33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $AC$ and $BD$ intersecting at $E$

Prove: $\triangle AED \cong \triangle CEB$

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $ABCD$ is a Parallelogram with $AC$ and $BD$ intersecting at $E$</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. $\angle 2 \cong \angle 1$</td>
<td>2. Verticle $\angle$s are $\cong$</td>
</tr>
<tr>
<td>3. $\angle 3 \cong \angle 4$</td>
<td>3. Opposite $\angle$s $\cong$</td>
</tr>
<tr>
<td>4. $AE \cong EC$</td>
<td>4. Diagonals of a Parallelogram are $\cong$</td>
</tr>
<tr>
<td>5. $\triangle I \cong \triangle II$</td>
<td>5. ASA</td>
</tr>
</tbody>
</table>

Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

Rotation $180^\circ$

**Score 1:** The student had some correct statements about the proof. The description of the rigid motion was incomplete.
33 Given: Quadrilateral $ABCD$ is a parallelogram with diagonals $AC$ and $BD$ intersecting at $E$

Prove: $\triangle AED \cong \triangle CEB$

1) parallelogram $ABCD$  
   
   1) given

Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

$\text{Rotate } 180^\circ$

**Score 0:** The student wrote only the “given” information, and an incomplete description of the rigid motion.
34 In the diagram below, the line of sight from the park ranger station, \( P \), to the lifeguard chair, \( L \), on the beach of a lake is perpendicular to the path joining the campground, \( C \), and the first aid station, \( F \). The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.

If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the nearest hundredth of a mile, the distance between the park ranger station and the lifeguard chair.

\[
\begin{align*}
\text{Distance} &= \sqrt{a^2 + b^2} \\
&= \sqrt{0.25^2 + 0.55^2} \\
&= \sqrt{0.0625 + 0.3025} \\
&= \sqrt{0.365} \\
&= 0.604 \\
&= 0.60 	ext{ miles (rounded)}
\end{align*}
\]

Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

\[
\frac{h}{y} = 0.75 \\
0.75y = 0.2401 \\
y = 0.32 \\
F \text{ to } L \text{ is } 0.9004 \text{ miles.}
\]

\[
\text{When added to the distance from } L \text{ to } C, \text{ it's only about } 1.2 \text{ miles, not } 1.5 \text{ miles.}
\]

Score 4: The student has a complete and correct response.
34 In the diagram below, the line of sight from the park ranger station, \( P \), to the lifeguard chair, \( L \), on the beach of a lake is perpendicular to the path joining the campground, \( C \), and the first aid station, \( F \). The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.

If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the nearest hundredth of a mile, the distance between the park ranger station and the lifeguard chair.

\[
\cos C = \frac{0.25}{0.55}
\]

\[
\tan \angle 3 = \frac{x}{0.25}
\]

\[
\angle C = 63^\circ
\]

\[
x = 0.4906
\]

\[
x = 0.49
\]

Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

\[
180 - 90 - \angle 3 = 27
\]

\[
\tan 27 = \frac{0.49}{y}
\]

\[
y = 0.96
\]

\[
y + 0.25 = 1.21
\]

**Score 3:** The student did not state if Gerald is correct.
34 In the diagram below, the line of sight from the park ranger station, \( P \), to the lifeguard chair, \( L \), on the beach of a lake is perpendicular to the path joining the campground, \( C \), and the first aid station, \( F \). The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.

If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the nearest hundredth of a mile, the distance between the park ranger station and the lifeguard chair.

\[
\frac{0.55}{x} = \frac{0.25}{0.55} \\
0.25 \div 0.55 = 0.3025 \\
C_{FC} = 1.21
\]

Distance between \( P \) and \( L \) = 0.55 mi.

Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

No because \( \text{it is } 1.21 \text{ miles} \).

\[
\frac{0.55}{x} = \frac{0.25}{0.55} \\
0.25 \div 0.55 = 0.3025 \\
C_{FC} = 1.21
\]

Score 2: The student made one computational error and one rounding error in finding the distance between the park ranger station and the lifeguard chair.
34 In the diagram below, the line of sight from the park ranger station, $P$, to the lifeguard chair, $L$, on the beach of a lake is perpendicular to the path joining the campground, $C$, and the first aid station, $F$. The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.

If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the nearest hundredth of a mile, the distance between the park ranger station and the lifeguard chair.

\[
\begin{align*}
0.25^2 + 1.0^2 &= C^2 \\
0.25^2 + 0.55^2 &= 0.625 + 0.3025 = 0.9275 \\
\sqrt{0.9275} &= 0.9625 \\
\end{align*}
\]

Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

\[
\begin{align*}
0.25^2 + x^2 &= 1.5^2 \\
0.25^2 + 0.25^2 &= 1.5^2 \\
0.625 + 0.625 &= 2.25 \\
1.25 &= 2.25
\end{align*}
\]

Gerald is not correct. It is about 1.5 miles from the first aid station to the campground.

**Score 2:** The student showed correct work to find 0.49, but no further correct work was shown.
Question 34

34 In the diagram below, the line of sight from the park ranger station, \( P \), to the lifeguard chair, \( L \), on the beach of a lake is perpendicular to the path joining the campground, \( C \), and the first aid station, \( F \). The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.

If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the nearest hundredth of a mile, the distance between the park ranger station and the lifeguard chair.

\[
(0.25)^2 + b^2 = (0.55)^2
\]

\[
0.0625 + b^2 = 0.3025
\]

\[
b^2 = 0.24
\]

\[
b = 0.489879486
\]

Distance \( \approx 0.5 \) miles

Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

Score 1: The student made one rounding error, and no further correct work was shown.
34 In the diagram below, the line of sight from the park ranger station, \( P \), to the lifeguard chair, \( L \), on the beach of a lake is perpendicular to the path joining the campground, \( C \), and the first aid station, \( F \). The campground is 0.25 mile from the lifeguard chair. The straight paths from both the campground and first aid station to the park ranger station are perpendicular.

If the path from the park ranger station to the campground is 0.55 mile, determine and state, to the nearest hundredth of a mile, the distance between the park ranger station and the lifeguard chair.

\[
.25^2 + .55^2 = x^2
\]
\[
.0625 + .3025 = x^2
\]
\[
.365 = x^2
\]
\[
.6 = x
\]

Gerald believes the distance from the first aid station to the campground is at least 1.5 miles. Is Gerald correct? Justify your answer.

**Yes - it's far away.**

**Score 0:** The student had a completely incorrect response.
The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

Source: http://en.wikipedia.org

Question 35 is continued on the next page.
If \( AC = 8.5 \) feet, \( BF = 25 \) feet, and \( m\angle EFD = 47^\circ \), determine and state, to the nearest cubic foot, the volume of the water tower.

\[
\begin{align*}
\tan 47^\circ &= \frac{x}{8.5} \\
x &= 8.5 \tan 47^\circ \\
x &\approx 9.11513
\end{align*}
\]

\[
V = \frac{1}{3} \pi (8.5)^2 (9.11513) = 689.65125
\]

\[
V = \pi (8.5)^2 (25) = 5674.50173
\]

\[
V = \frac{1}{2} \left( \frac{4}{3} \pi (8.5)^3 \right) = 1286.22099
\]

\[
V = 689.65125 + 5674.50173 + 1286.22099 = 7650.37377
\]

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and not exceed the weight limit? Justify your answer.

\[
7650 \times 62.4 = 477,360 \text{ lbs}
\]

\[
.85 \times 477,360 = 405,175 \text{ lbs}
\]

No - the weight would exceed 400,000 lbs

**Score 6:** The student had a complete and correct response.
The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

Source: http://en.wikipedia.org

Question 35 is continued on the next page.
If \( AC = 8.5 \) feet, \( BF = 25 \) feet, and \( m \angle EFD = 47^\circ \), determine and state, to the nearest cubic foot, the volume of the water tower.

\[
\tan 47 = \frac{x}{8.5} \\
x = 9.115
\]

\[
V = \frac{1}{3} \pi r^2 h + \pi r^2 h + \frac{1}{2} \cdot \pi \left( \frac{4}{3} \pi r^3 \right)
\]

\[
V = \frac{1}{3} (3.14)(8.5)^2(9.115) + 3.14(8.5)^2(25) + \frac{1}{2} \cdot \pi \left( \frac{4}{3} \pi (8.5)^3 \right)
\]

\[
= 1689.2914917 + 5471.625 + 1285.568333
\]

\[
= 7640.884825
\]

\[
V = 7640
\]

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85\% of its volume and not exceed the weight limit? Justify your answer.

\[
7640 \times 0.624 = 477110.4 \text{ pounds}
\]

\[
477110.4 \times 0.85 = 405343.84 \text{ pounds}
\]

No because it would exceed 400,000 pounds.

**Score 5:** The student used 3.14 instead of \( \pi \) to calculate the volume.
35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

$$\tan 47^\circ = \frac{x}{8.5}$$

$$x = 8.5 \tan 47^\circ$$

$$x = 9.11513$$
If $AC = 8.5$ feet, $BF = 25$ feet, and $m \angle EFD = 47^\circ$, determine and state, to the nearest cubic foot, the volume of the water tower.

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and not exceed the weight limit? Justify your answer.

No

**Score 4:** The student found the correct volume, but did not justify the answer ‘No.’
35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

Source: http://en.wikipedia.org

Question 35 is continued on the next page.
If $AC = 8.5 \text{ feet}$, $BF = 25 \text{ feet}$, and $m\angle EFD = 47^\circ$, determine and state, to the nearest cubic foot, the volume of the water tower.

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and not exceed the weight limit? Justify your answer.

**Score 4:** The student rounded early with $x = 9.1$, and did not state if the water tower can be filled to 85%.
35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

Source: http://en.wikipedia.org

Question 35 is continued on the next page.
If $AC = 8.5$ feet, $BF = 25$ feet, and $m \angle EFD = 47^\circ$, determine and state, to the nearest cubic foot, the volume of the water tower.

$$\tan 47^\circ = \frac{h}{8.5} = 9.12$$

$$\frac{1}{2} \pi (8.5)^2 (9.12) + \frac{\pi (8.5)^2 (25)}{2} + 30.125 \pi = 2062.01 \pi$$

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and not exceed the weight limit? Justify your answer.

$$(0.85)(6478) = 5506.3$$

$$(5506.3)(62.4) = 343,593.12$$

Yes because less than 400,000

**Score 3:** The student made one conceptual error by finding the area of half of a circle instead of the volume of a hemisphere. The height of the cone was rounded incorrectly. The student used the answer from the first part to answer the second part appropriately.
35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

Source: http://en.wikipedia.org

Question 35 is continued on the next page.
If $AC = 8.5$ feet, $BF = 25$ feet, and $m \angle EFD = 47^\circ$, determine and state, to the nearest cubic foot, the volume of the water tower.

\[
\text{Cone:} \quad V = \frac{1}{3} \pi r^2 h \\
\frac{1}{3} \pi (8.5)^2 \times 8.5 \\
= 643.11
\]

\[
\text{Hem.:} \quad V = \frac{2}{3} \pi \cdot (8.5)^3 \\
= \frac{2}{3} \pi \cdot 8.5^3 \\
= 1286.22
\]

\[
V = \pi \cdot 8.5^2 \times 25 \\
= 643.11 \\
5674.50 \\
\underline{+} \\
7605.83 = \sqrt[4]{7604}
\]

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and not exceed the weight limit? Justify your answer.

\[
7604 \times 62.4 = 474,489.6 \text{ lbs}
\]

\[
474,489.6 \times .85 = 403,316.16 \text{ lbs}
\]

**Score 3:** The student made one conceptual error by using 8.5 for the height of the cone, and did not state if the water tower can be filled to 85%.
The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

Source: http://en.wikipedia.org

Question 35 is continued on the next page.
If $AC = 8.5$ feet, $BF = 25$ feet, and $m\angle EFD = 47^\circ$, determine and state, to the nearest cubic foot, the volume of the water tower.

$$V = \frac{1}{3} \pi r^2 h + \pi r^2 h + \frac{4}{3} \pi r^2$$

$$V = \frac{1}{3} \pi (8.5)^2 (8.5) + \pi (8.5)^2 (25) + \frac{4}{3} \pi (8.5)^2$$

$$V = \frac{1}{3} \pi (614.125) + \pi (1806.25) + \frac{4}{3} \pi (72.25)$$

$$V = 4043.1101961 + 5674.501731 + 302.600923$$

$$V = 6620.252019$$

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and not exceed the weight limit? Justify your answer.

$$6620 (0.85) = 5627$$

$$5627 (0.624) = 351,124.8$$

**Score 2:** The student made one conceptual error by using 8.5 for the height of the cone, and made an error by not dividing the volume of the sphere by 2. The student did not state if the water tower can be filled to 85%.
The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let $C$ be the center of the hemisphere and let $D$ be the center of the base of the cone.

Source: http://en.wikipedia.org

Question 35 is continued on the next page.
If $AC = 8.5$ feet, $BF = 25$ feet, and $m\angle EFD = 47^\circ$, determine and state, to the nearest cubic foot, the volume of the water tower.

\[
\text{Cone} \quad V = \frac{1}{3} \pi r^2 h \\
V = \frac{1}{3} \pi (8.5)^2 (8.5) \\
V = 643.1
\]

\[
\text{Cylinder} \quad V = \pi r^2 h \\
V = \pi (8.5)^2 (33.5) \\
V = 7603.8
\]

\[
V = 8247
\]

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and *not* exceed the weight limit? Justify your answer.

\[
8247 \times 62.4 = 514,501.28 \text{ lbs} \\
\text{NO}
\]

**Score 1:** The student made two conceptual errors in finding the volume of the water tower and one computational error by not multiplying by 85%.
35 The water tower in the picture below is modeled by the two-dimensional figure beside it. The water tower is composed of a hemisphere, a cylinder, and a cone. Let \( C \) be the center of the hemisphere and let \( D \) be the center of the base of the cone.

![Water tower image](http://en.wikipedia.org)

Source: http://en.wikipedia.org

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**Question 35 is continued on the next page.**
If \( AC = 8.5 \) feet, \( BF = 25 \) feet, and \( \angle EFD = 47^\circ \), determine and state, to the nearest cubic foot, the volume of the water tower.

\[
\frac{17\pi}{8.5} \left\{ \frac{(42)(17)^2\pi}{25} \cdot \frac{8.5}{8.5} \right\} = 38,321.65
\]

The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and not exceed the weight limit? Justify your answer.

\[
(400,000)(.85) = 340,000
\]

**Score 0:** The student had a completely incorrect response.
36  In the coordinate plane, the vertices of ΔRST are R(6,−1), S(1,−4), and T(−5,6).
Prove that ΔRST is a right triangle.
[The use of the set of axes on the next page is optional.]

\[
\begin{align*}
  m_{RS} &= \frac{3}{5} \\
  m_{ST} &= \frac{-10}{6} = \frac{-5}{3}
\end{align*}
\]

Therefore the slopes of RS and ST are negative reciprocals and so RS \perp ST. Since the segments are ⊥, KS is a rt. K.

\[
\therefore \angle RST \text{ is a rt } \angle \text{ because it has a rt } k.
\]

State the coordinates of point P such that quadrilateral RSTP is a rectangle.

\[\begin{pmatrix} 0 \\ 9 \end{pmatrix}\]

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.

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

\[
\begin{align*}
\text{m}_{RS} &= \frac{3}{5} \quad \therefore RS \parallel PT \\
\text{m}_{PT} &= \frac{3}{5} \\
\text{m}_{ST} &= \frac{-10}{6} = -\frac{5}{3} \quad \therefore ST \parallel RP \\
\text{m}_{RP} &= \frac{-10}{6} = -\frac{5}{3}
\end{align*}
\]

Since $RSTP$ is a quadrilateral with both pairs of opposite sides \(\parallel\) and one \(\perp\) at $S$, it must be a rectangle.

**Score 6:** The student has a complete and correct response.
36 In the coordinate plane, the vertices of $\triangle RST$ are $R(6, -1)$, $S(1, -4)$, and $T(-5, 6)$. Prove that $\triangle RST$ is a right triangle. 

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

State the coordinates of point $P$ such that quadrilateral $RSTP$ is a rectangle.

$$\begin{align*}
RS &= \sqrt{3^2 + 5^2} = \sqrt{34} \\
ST &= \sqrt{6^2 + 10^2} = \sqrt{116} \\
RT &= \sqrt{7^2 + 11^2} = \sqrt{170} \\
RS^2 + ST^2 &= RT^2 \\
34 + 116 &= 170 \checkmark \\
\triangle RST \text{ is a rt } \triangle \\
b/c \text{ is the side length that satisfies the pyth. theorem}
\end{align*}$$

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.

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

Score 6: The student has a complete and correct response.
In the coordinate plane, the vertices of \( \triangle RST \) are \( R(6, -1) \), \( S(1, -4) \), and \( T(-5, 6) \). Prove that \( \triangle RST \) is a right triangle.

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

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.

\[ P(0, 9) \]

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.

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

$$m_{TR} = \frac{3}{5}$$
$$m_{SR} = \frac{3}{5}$$
$$m_{TS} = -\frac{5}{3}$$
$$m_{PR} = -\frac{5}{3}$$

Opposite sides are parallel because they have the same slope. $RSTP$ is a parallelogram because opposite sides are parallel.

**Score 5:** The student proved $RSTP$ is a parallelogram, but did not have a concluding statement proving $RSTP$ is a rectangle.
36 In the coordinate plane, the vertices of \( \triangle RST \) are \( R(6,-1) \), \( S(1,-4) \), and \( T(-5,6) \).
Prove that \( \triangle RST \) is a right triangle.
[The use of the set of axes on the next page is optional.]

\begin{align*}
\text{Slope } \overline{RS} &= \frac{3}{5} \\
\text{Slope } \overline{TS} &= \frac{-10}{6} = -\frac{5}{3} \\
\overline{RS} \perp \overline{TS} \text{ since they have negative reciprocal slopes.}
\end{align*}

Therefore \( \triangle RST \) is a right \( \triangle \).

Since \( \triangle RST \) contains a right \( \angle \), it is a right \( \triangle \).

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.

\[ P(0,9) \]

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.
[The use of the set of axes below is optional.]

\[
\begin{align*}
\text{Length } RT &= \sqrt{7^2 + 11^2} = \sqrt{170} \\
\text{Length } PS &= \sqrt{13^2 + 12^2} = \sqrt{170}
\end{align*}
\]

Since the diagonals of $RSTP$ are equal, then it is a rectangle.

**Score 4:** The student made one conceptual error when proving the rectangle, because no work is shown to prove that $RSTP$ is a parallelogram.
In the coordinate plane, the vertices of \( \triangle RST \) are \( R(6,-1) \), \( S(1,-4) \), and \( T(-5,6) \). Prove that \( \triangle RST \) is a right triangle. 

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

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.
Prove that your quadrilateral \( RSTP \) is a rectangle.

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

\[
\begin{align*}
m_{TP} &= \frac{3}{5} & \text{TP} \perp RP \text{ be their slopes aneg. reciprocals} \\
m_{KP} &= -\frac{5}{3} & \text{CP is a right line} \\
m_{SR} &= \frac{3}{5} & \text{TP} \parallel RS \text{ be their slopes are equal} \\
m_{BS} &= \frac{3}{5} & \text{RSTP is a rectangle b/c it has a pair of \( \perp \) sides} \\
& & \text{RSTP is a rectangle b/c a \( \square \) with a right < is a rectangle}
\end{align*}
\]

\[
\begin{align*}
\text{Score 4:} & \quad \text{The student did not prove } \triangle RST \text{ is a right triangle. The student found point } P \text{ and} \\
& \quad \text{stated its coordinates correctly. The student’s proof for rectangle } RSTP \text{ is correct.}
\end{align*}
\]
36 In the coordinate plane, the vertices of \( \triangle RST \) are \( R(6, -1) \), \( S(1, -4) \), and \( T(-5, 6) \).

Prove that \( \triangle RST \) is a right triangle.

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

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.

\[ P(0, 4) \]

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.
[The use of the set of axes below is optional.]

**Score 3:** The student correctly proved the right triangle and stated the coordinates of $P$, but no further correct work was shown.
36 In the coordinate plane, the vertices of \( \triangle RST \) are \( R(6, -1) \), \( S(1, -4) \), and \( T(-5, 6) \). Prove that \( \triangle RST \) is a right triangle. [The use of the set of axes on the next page is optional.]

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.

\[
\begin{align*}
R(6, -1) \\
S(1, -4) \\
T(-5, 6)
\end{align*}
\]

\[
\begin{align*}
d_{RS} &= \sqrt{(6-1)^2 + (-1+4)^2} = \sqrt{25 + 9} = \sqrt{34} \\
d_{ST} &= \sqrt{(1+5)^2 + (-4-6)^2} = \sqrt{36 + 100} = \sqrt{136} \\
d_{RT} &= \sqrt{(6+5)^2 + (-1-6)^2} = \sqrt{121 + 49} = \sqrt{170}
\end{align*}
\]

\[
\begin{align*}
(RS)^2 + (ST)^2 &= (RT)^2 \\
(\sqrt{34})^2 + (\sqrt{136})^2 &= (\sqrt{170})^2 \\
34 + 136 &= 170
\end{align*}
\]

\[
170 = 170
\]

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.

\((0, 9)\)

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.
[The use of the set of axes below is optional.]

Score 2: The student was missing a concluding statement when proving the right triangle, and the coordinates of $P$ were correctly stated, but no further correct work is shown.
36 In the coordinate plane, the vertices of \( \triangle RST \) are \( R(6,-1) \), \( S(1,-4) \), and \( T(-5,6) \).
Prove that \( \triangle RST \) is a right triangle.
[The use of the set of axes on the next page is optional.]

\[
\begin{align*}
\text{\( \triangle RST \) is a right triangle,} \\
\text{Slopes are negative reciprocals} \\
M_{SR} &= \frac{5}{3} \\
M_{ST} &= -\frac{4}{10} = -\frac{2}{5}
\end{align*}
\]

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.

\( P(0,9) \)

Question 36 is continued on the next page.
Question 36 continued

Prove that your quadrilateral $RSTP$ is a rectangle.
[The use of the set of axes below is optional.]

Score 2: The student had an incomplete triangle proof. When graphing the triangle, the student mixed up the $x$- and $y$-coordinates, which is one graphing error. The student stated appropriate coordinates for $P$ based on this error. No further correct work was shown.
36 In the coordinate plane, the vertices of \( \triangle RST \) are \( R(6,-1) \), \( S(1,-4) \), and \( T(-5,6) \).
Prove that \( \triangle RST \) is a right triangle.
[The use of the set of axes on the next page is optional.]

State the coordinates of point \( P \) such that quadrilateral \( RSTP \) is a rectangle.

\[(0,9)\]

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.
[The use of the set of axes below is optional.]

**Score 1:** The student graphed point $P$ correctly and stated its coordinates. No further work was shown.
36 In the coordinate plane, the vertices of $\triangle RST$ are $R(6, -1)$, $S(1, -4)$, and $T(-5, 6)$. Prove that $\triangle RST$ is a right triangle.

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

$\triangle RST$ is a right $\triangle$ because $S$ is a right angle.

State the coordinates of point $P$ such that quadrilateral $RSTP$ is a rectangle.

$0, 9$

Question 36 is continued on the next page.
Prove that your quadrilateral $RSTP$ is a rectangle.

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

Score 0: The student had no work to justify the statements, and the parentheses are missing on the coordinates of $P$. 

RSTP is a rectangle because it has a right $\angle$. 