The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY (Common Core)

Tuesday, June 2, 2015 — 1:15 to 4:15 p.m.

MODEL RESPONSE SET

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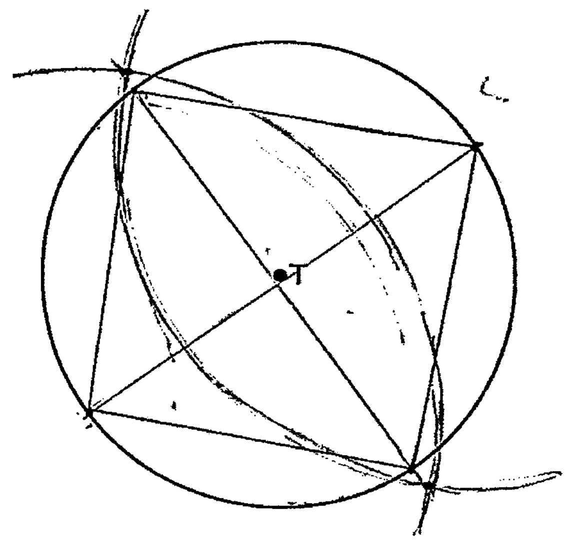
Question 25

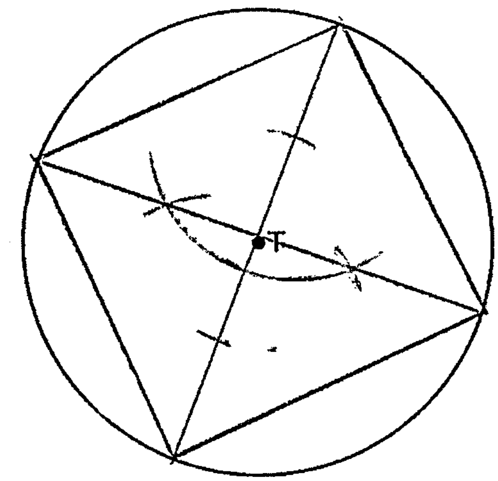
25 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]



Score 2: The student drew a correct construction showing all appropriate construction marks and the square was drawn.

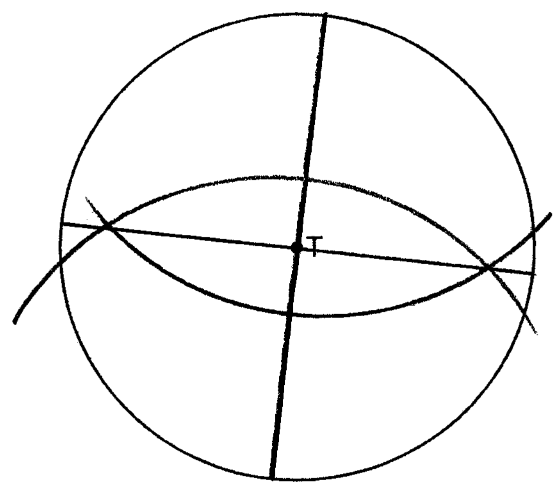
Question 25

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.

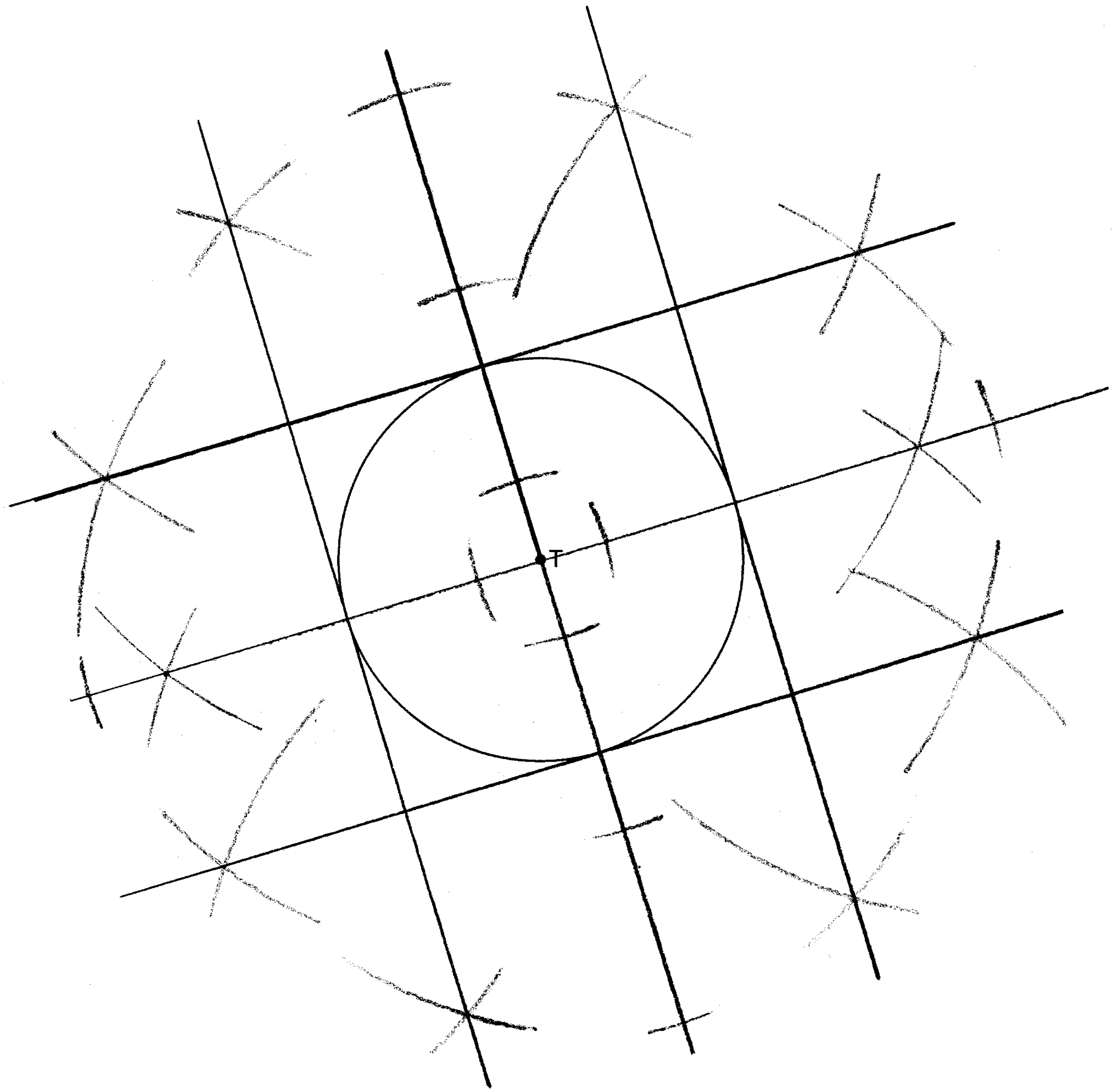
25 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]



Score 1: The student drew a correct construction showing all appropriate construction marks, but the square was not drawn.

Question 25

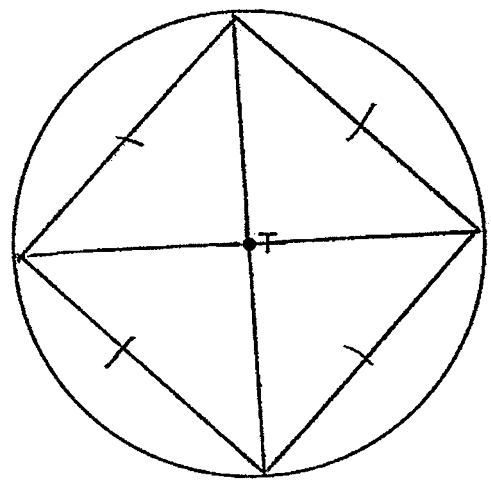
25 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]



Score 1: The student made an error by correctly constructing a circumscribed square around circle T.

Question 25

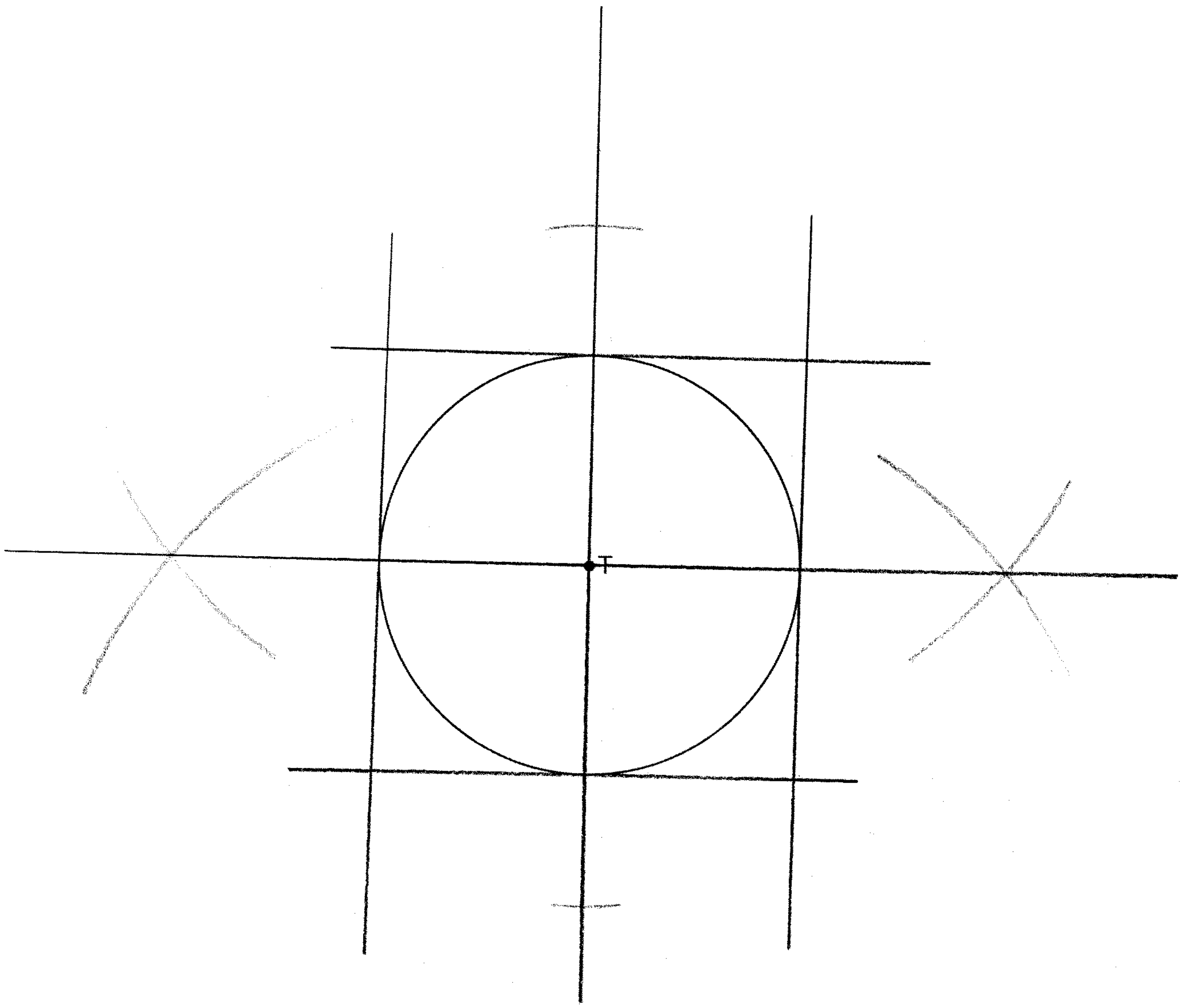
25 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]



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

Question 25

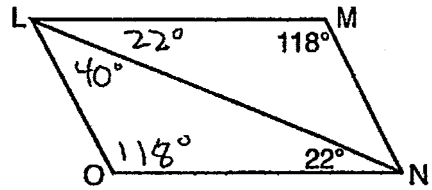
25 Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]



Score 0: The student incorrectly drew a circumscribed square around circle T.

Question 26

26 The diagram below shows parallelogram *LMNO* with diagonal $\overline{LN}$, m$\angle M$ = 118°, and m$\angle LNO$ = 22°.



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

$\angle$LON is 118° b/c opposite $\angle$'s of a ▱ are $\cong$.

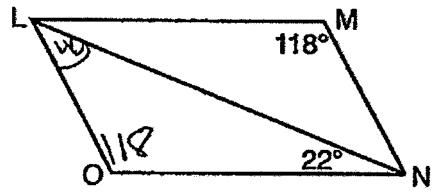
A $\triangle$'s $\angle$ measures add up to 180°.

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

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

Question 26

26 The diagram below shows parallelogram *LMNO* with diagonal $\overline{LN}$, m∠*M* = 118°, and m∠*LNO* = 22°.



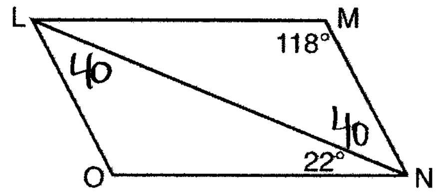
Explain why m∠*NLO* is 40 degrees.

They split the parallelogram in half so the two triangles are congruent to each so ∠LON is 118 too. If you add 118 and 22 you got 140 then subtract that by 180 you get 40 and that is the angle for ∠NLO.

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

Question 26

26 The diagram below shows parallelogram $LMNO$ with diagonal $\overline{LN}$, $m\angle M = 118°$, and $m\angle LNO = 22°$.



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

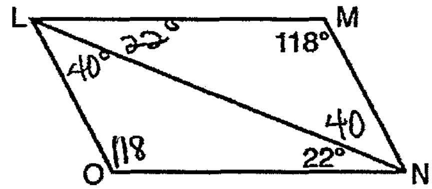
In a p-gram,
m∡MNO = 62° (consecutive ∡'s are supp)

62 − 22 = 40° for m∡LNM

m∡NLO = 40° because since $\overline{LO} \parallel \overline{MN}$,
alternate interior ∡'s are congruent.

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

26 The diagram below shows parallelogram $LMNO$ with diagonal $\overline{LN}$, m$\angle M$ = 118°, and m$\angle LNO$ = 22°.



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

$118° + 118° = 236°$

$360 - 236 = 124° / 2 = 62°$

$62° - 22° = 40$

$118 + 40 + x = 180$

$158 + x = 180$

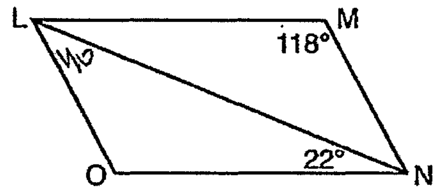
$x = 22°$

therefore, m$\angle$NLO$=40°$

Score 1: The student mathematically justified the angle measure, but did not provide an explanation in words.

Question 26

26 The diagram below shows parallelogram *LMNO* with diagonal $\overline{LN}$, m$\angle M$ = 118°, and m$\angle LNO$ = 22°.



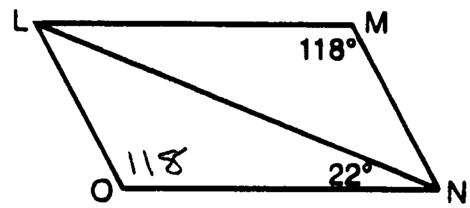
Explain why m$\angle NLO$ is 40 degrees.

becaus 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° and 22° was not established.

Question 26

26 The diagram below shows parallelogram $LMNO$ with diagonal $\overline{LN}$, m$\angle M$ = 118°, and m$\angle LNO$ = 22°.



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

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

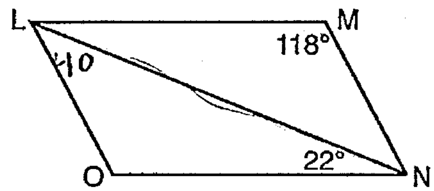
$$\begin{array}{r} 118 \\ +22 \\ \hline 130 \end{array} \qquad \begin{array}{r} 180 \\ -130 \\ \hline 50 \end{array}$$

So m∠NLO = 50° not 40°

Score 1: The student had one computational error with an appropriate explanation.

Question 26

26 The diagram below shows parallelogram *LMNO* with diagonal $\overline{LN}$, $m\angle M = 118°$, and $m\angle LNO = 22°$.



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

because ∡M & ∡N are complemantary angles
So when you add them up and equal it
to 180 you get 140 then subtract that from
180 and you get 40°

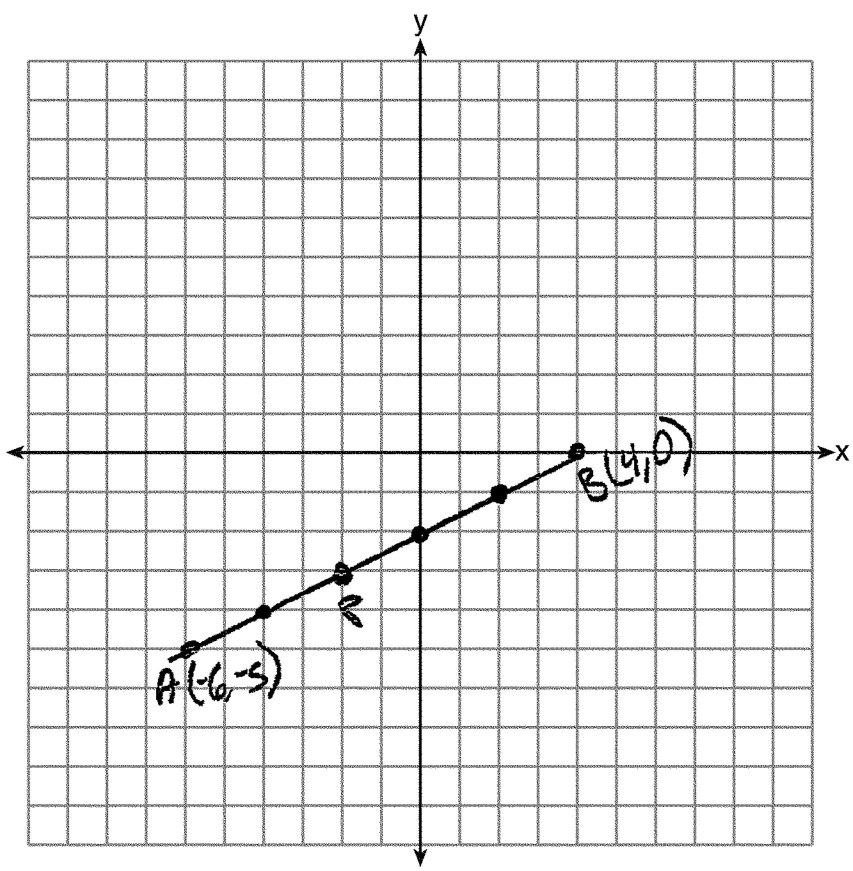
Score 0: The student gave a completely incorrect explanation.

Question 27

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.]

$$d_{\overline{AB}} = \sqrt{(x-x)^2+(y-y)^2}$$
$$= \sqrt{(-6-4)^2+(-5-0)^2}$$
$$= \sqrt{(-10)^2+(-5)^2}$$
$$= \sqrt{100+25}$$
$$= \sqrt{125}$$
$$= \sqrt{25}\cdot\sqrt{5}$$
$$= 5\sqrt{5}$$

$\boxed{P(-2,-3)}$



Score 2: The student has a complete and correct response. The student showed correct work that was not necessary.

Question 27

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.]

X-value

$-6+\frac{2}{5}(4--6)$

$-6+\frac{2}{5}(10)$

$-6+4$

-2

y-value

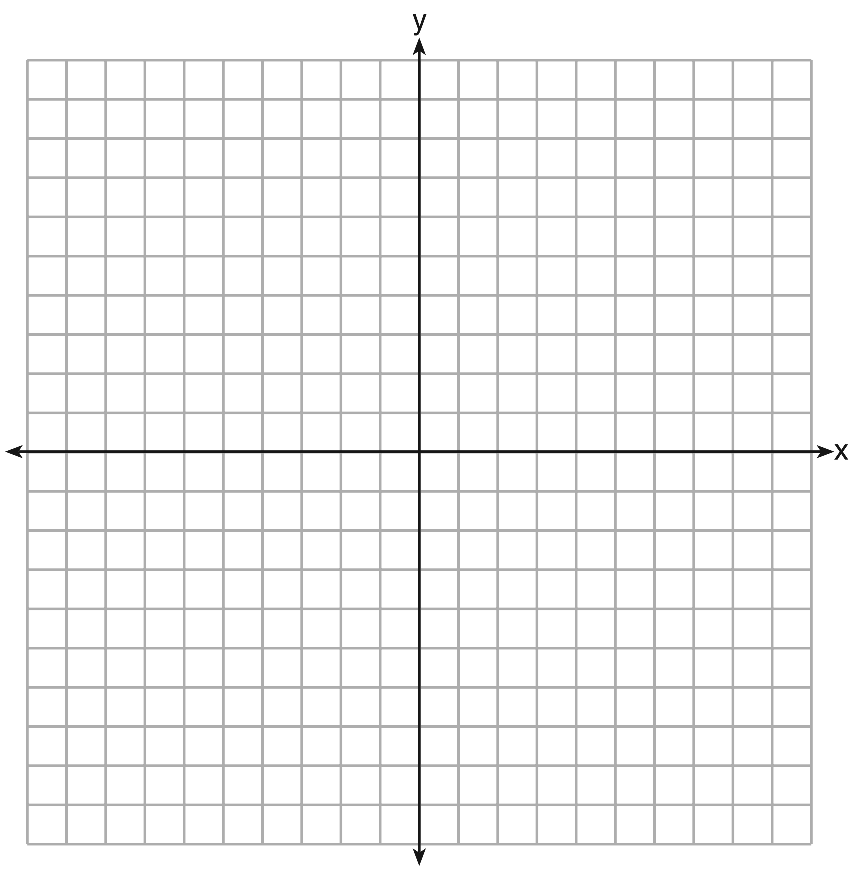
$-5+\frac{2}{5}(0--5)$

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

$-5+2$

-3

$(-2,-3)$

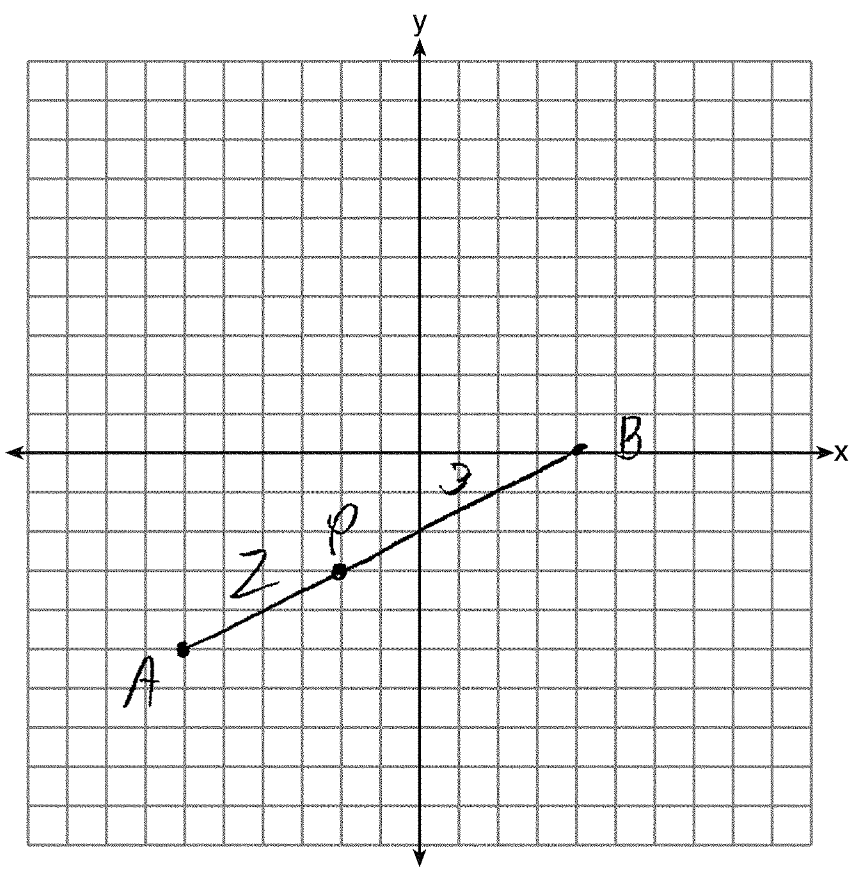


Score 2: The student has a complete and correct response.

Question 27

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.]

-2, -3



Score 1: The coordinates of P were not stated as a point.

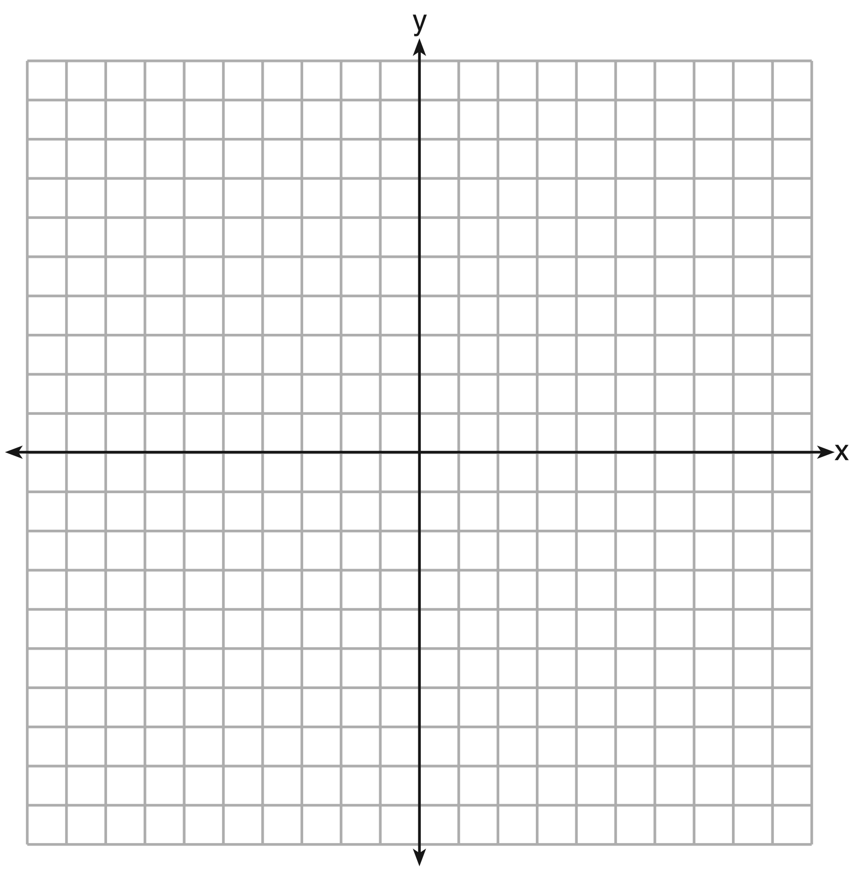
Question 27

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.]

$P_x = \frac{2}{5}(4-(-6)) - 6 = 4 - 6 = -2$

$P_y = \frac{2}{5}(0-(-5)) - 5 = -2 - 5 = -7$

$P(-2,-7)$

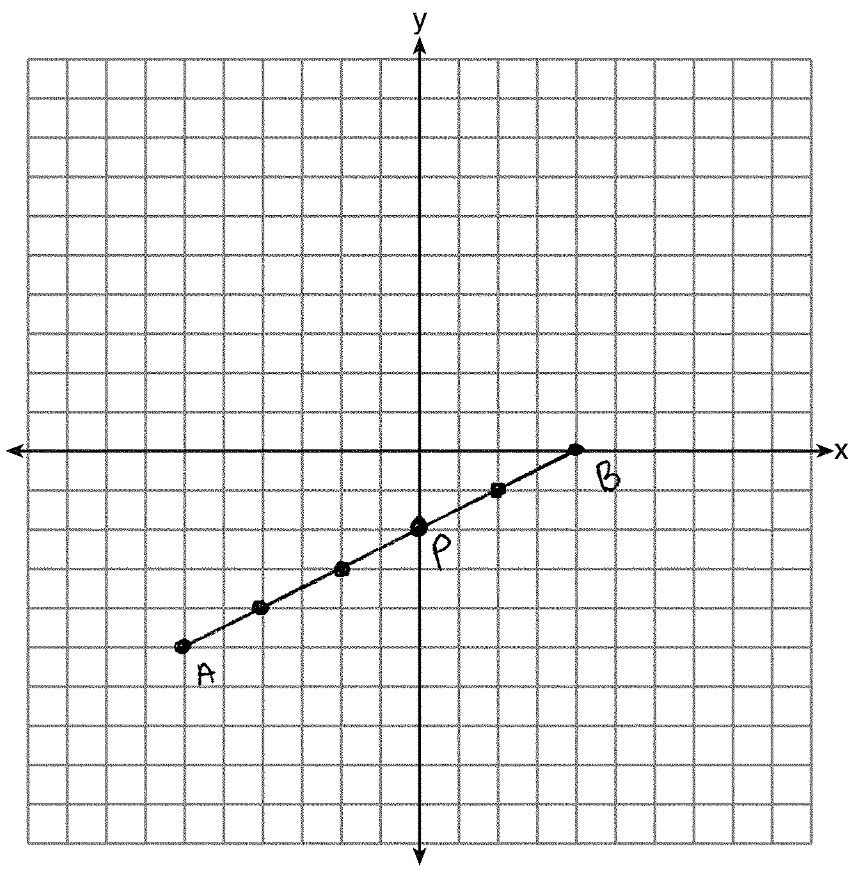


Score 1: The student made an error in determining the y-coordinate.

Question 27

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.

Question 27

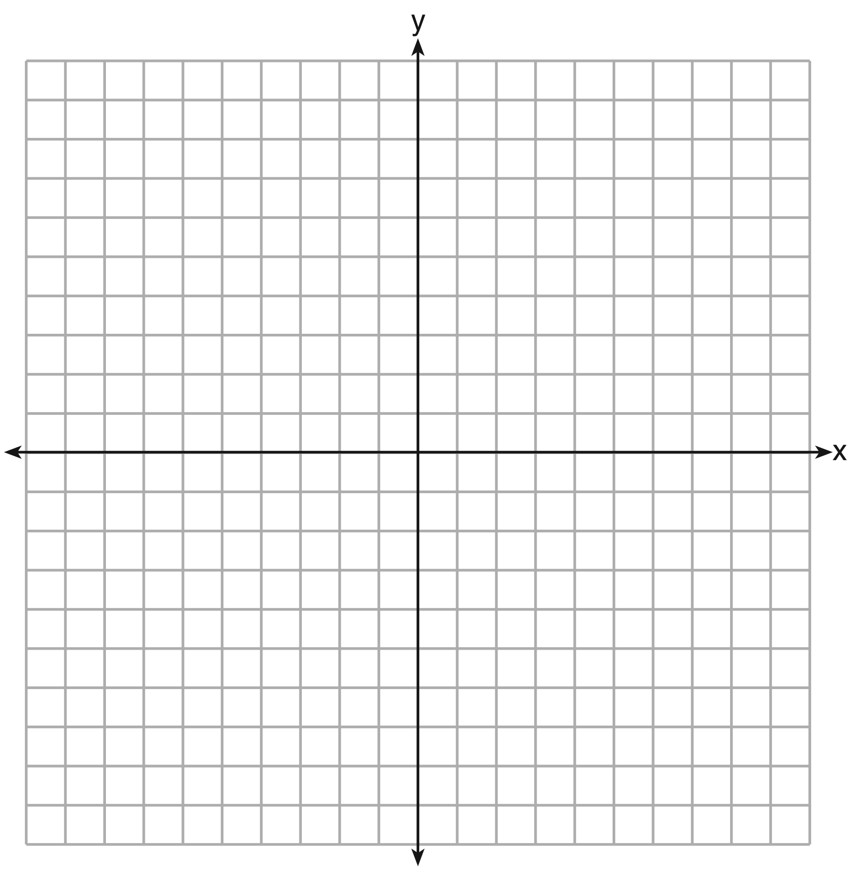
27 The coordinates of the endpoints of $\overline{AB}$ are $A(-6,-5)$ and $B(4,0)$. Point P is on $\overline{AB}$. Determine and state the coordinates of point P, such that $AP{:}PB$ is 2:3.
[The use of the set of axes below is optional.]

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

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

$P\left(-6+6\,{}^{2}/{}_{3}, -5+3\,{}^{1}/{}_{3}\right)$

$P\left({}^{2}/{}_{3}, -1\,{}^{2}/{}_{3}\right)$



Score 1: The student made an error by multiplying by $\frac{2}{3}$ instead of $\frac{2}{5}$.

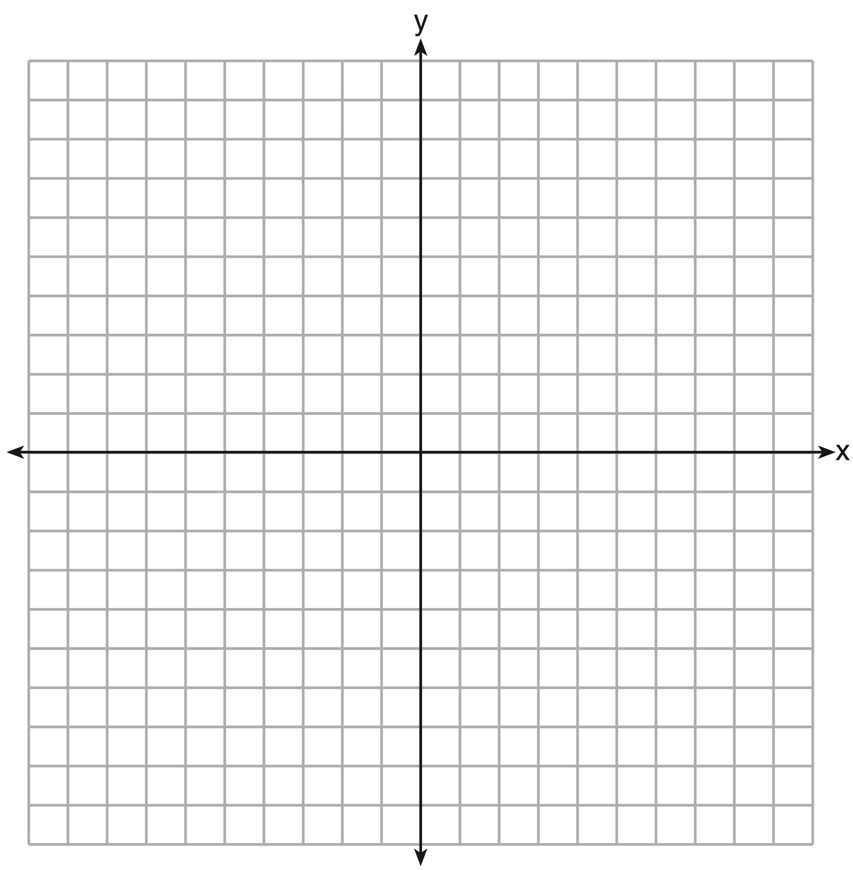
Question 27

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.]

$$\frac{-6+4}{2}, \frac{-5+0}{2}$$

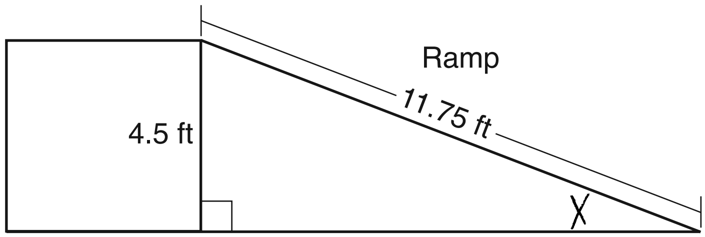
$$-\frac{2}{2}, -\frac{5}{2}$$

$$\left(-1, -\frac{5}{2}\right)$$



Score 0: The student's use of the midpoint formula was irrelevant to the question.

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.

$X = \sin^{-1}\left(\frac{4.5}{11.75}\right)$

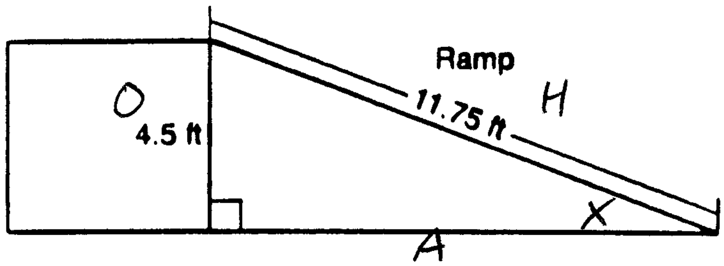
$X = 22.518$

$X = 23^\circ$

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

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.

SOH CAH TOA

$\sin X = \frac{4.5}{11.75}$

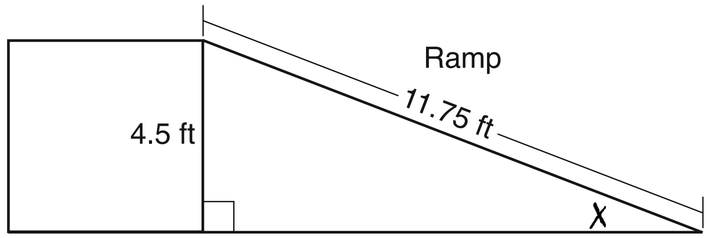
$\sin X = .3829787234$

38°

Score 1: The student wrote a correct equation, but the angle of elevation was found incorrectly.

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.

$$\tan x = \frac{4.5}{11.75}$$

$$x = \tan^{-1} \frac{4.5}{11.75}$$

$$x = 20.9557767306$$

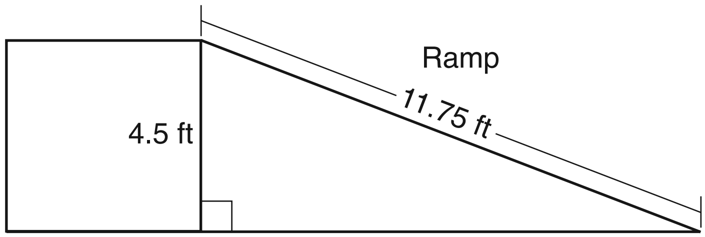
$$x = 21$$

$$21$$

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.

$\sin x = \frac{4.5}{11.75}$

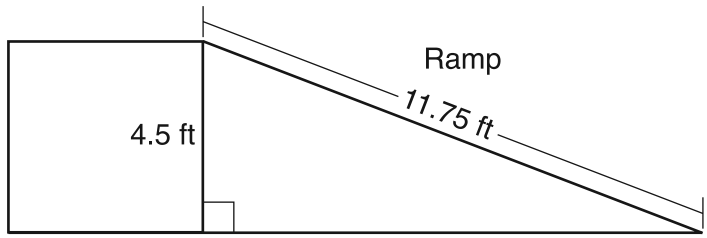
$.393$

$1°$

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.

$$a^2 + b^2 = c^2$$

$$(4.5)^2 + b^2 = (11.75)^2$$

$$20.25 + b^2 = 138.0625$$

$$-20.25 \qquad -20.25$$

$$\sqrt{b^2} = \sqrt{117.8125}$$

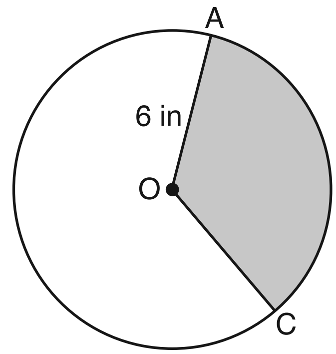
$$b = 10.854146673$$

$$\boxed{11^\circ}$$

Score 0: The student had a completely incorrect response.

Question 29

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



$A = \pi r^2$

$= 6^2 \cdot \pi$

$= 36\pi$

$\frac{12\pi}{36\pi} = \frac{1}{3}$

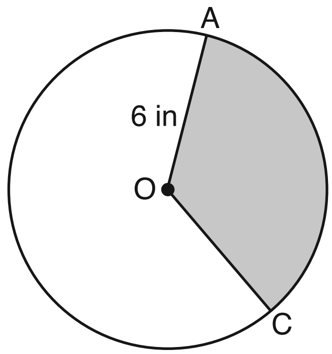
$\frac{1}{3} \cdot 360$

$120°$

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

Question 29

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



$A = \frac{rs}{2}$

$2 \quad 12\pi = \frac{6 \cdot s}{2} \cdot 2$

$\frac{24\pi}{6} = \frac{6s}{6}$

$s = 4\pi$

$s = r\theta$

$\frac{4\pi}{6} = \frac{6\theta}{6}$

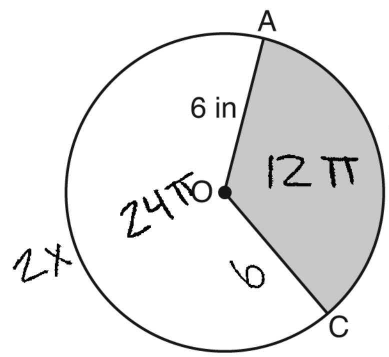
$\theta = \frac{4\pi}{6} = \frac{2\pi}{3}$

$m\angle AOC = \frac{2\pi}{3}$

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

Question 29

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



$1x = 120$

$\frac{24}{12} = 2$

$A = \pi r^2$

$A = \pi(6)^2$

$A = 36\pi$

$36\pi - 12\pi = 24\pi$

$\boxed{m\angle AOC = 120°}$

$2x + 1x = 360$

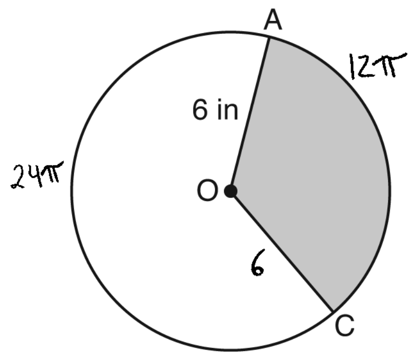
$3x = 360$

$x = 120$

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

Question 29

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



$A = \pi r^2$

$A = \pi 6^2$

$A = 36\pi$

$36\pi - 12\pi = 24\pi$

$\frac{24\pi}{36\pi} = \frac{x}{360}$

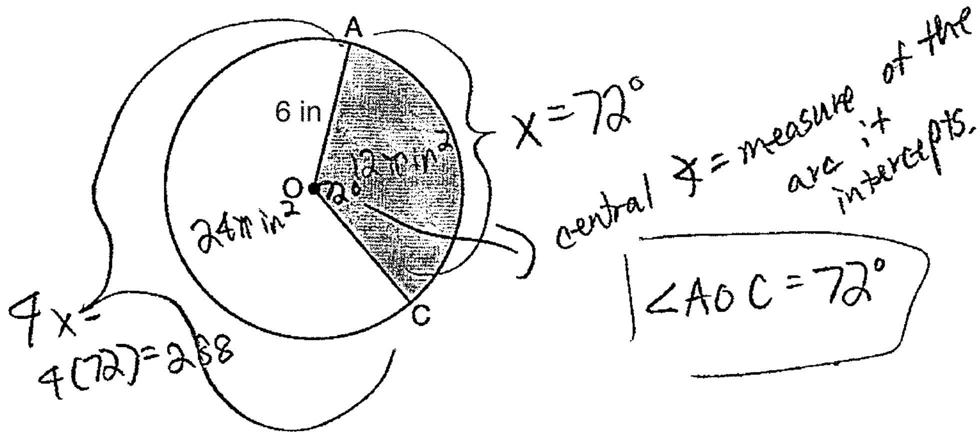
$8640 = 36x$

$240° = x$

Score 1: The student made an error by finding the central angle for the unshaded sector.

Question 29

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



$A = \pi r^2$

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

$$\begin{array}{r} 36\pi \text{ in}^2 \\ -\ 12\pi \text{ in}^2 \\ \hline 24\pi \text{ in}^2 \end{array}$$

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

$1x + 4x = 360$

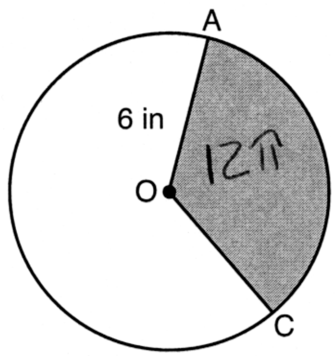
$\frac{5x}{5} = \frac{360}{5}$

$x = 72$

Score 1: The student made an error when reducing $\frac{12}{24}$.

Question 29

29 In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state m$\angle AOC$.



Sector $= \theta r$

$$\frac{12\pi}{6} = \frac{\theta(6)}{6}$$

$2\pi = \theta$

$m\angle AOC = 2\pi$

Score 0: The student had a completely incorrect response.

Question 30

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 ~~or~~ keep distances the same. So $\overline{AB} \cong \overline{A'B'}$ and $\overline{BC} \cong \overline{B'C'}$ and $\overline{AC} \cong \overline{A'C'}$, so $\triangle$'s $\cong$ SSS

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

Question 30

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.

Question 30

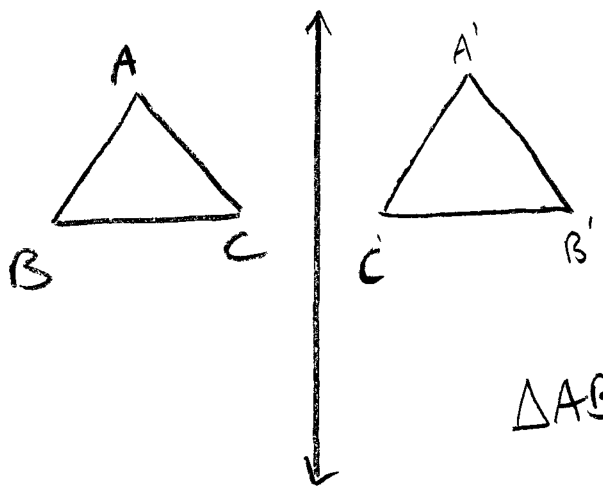
30 After a reflection over a line, $\triangle A'B'C'$ is the image of $\triangle ABC$. Explain why triangle ABC is congruent to triangle $A'B'C'$.

Because reflections are rigid motions.

Score 1: The student wrote an incomplete explanation.

Question 30

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 $A'B'C'$.

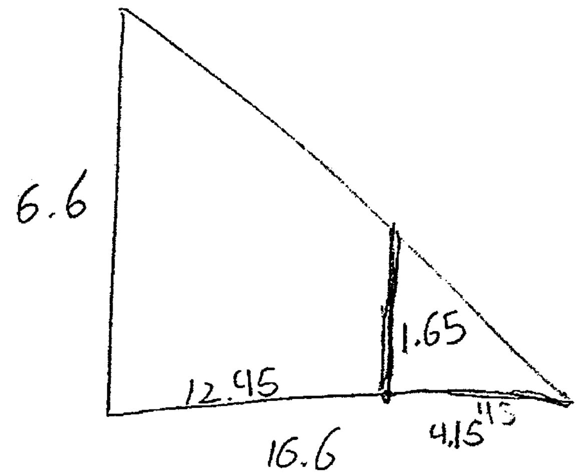


$\triangle ABC \cong \triangle A'B'C'$

Score 0: The student did not provide an explanation.

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.*



$$\frac{1.65}{4.15} = \frac{x}{16.6}$$

$4.15x = 27.39$

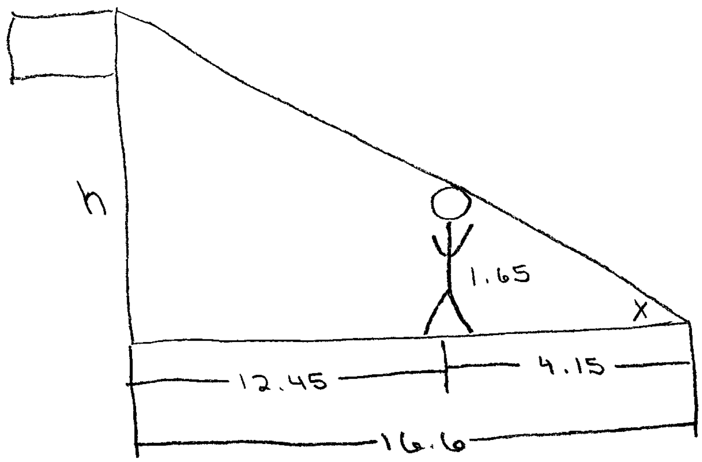
$x = 6.6$

6.6 m

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

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.*



$$\tan x = \frac{1.65}{4.15}$$

$$x = 21.7$$

$$\tan 21.7 = \frac{h}{16.6}$$

$$h = 6.6$$

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

Question 31

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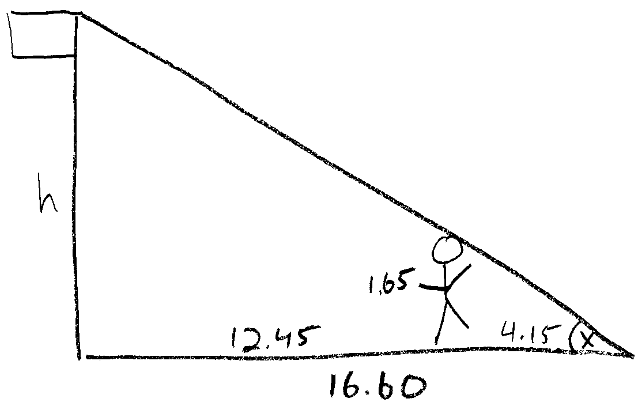


$$\begin{array}{r} 16.60 \\ -12.45 \\ \hline 4.15 \end{array}$$

$\text{Tan } x = \frac{1.65}{4.15}$

$x = \text{Tan}^{-1}\left(\frac{1.65}{4.15}\right)$

$x = .378427378$

$\text{Tan}(.378427378) = \frac{h}{16.60}$

$h = 16.60 \cdot \text{Tan}(.378427378)$

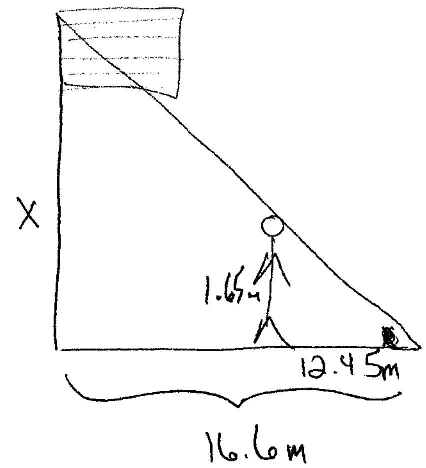
$h = 6.6$

6.6 meters

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

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.*



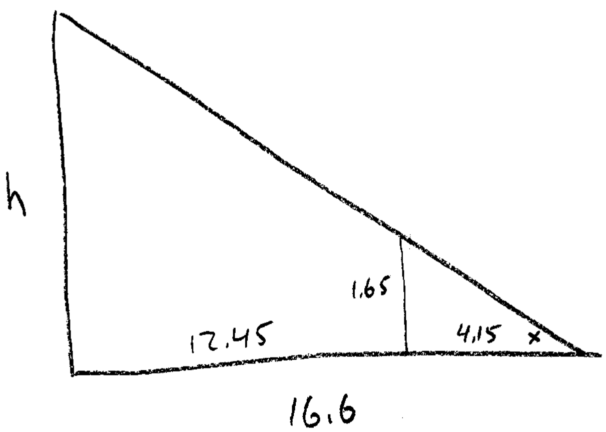
$$\frac{x}{16.60} = \frac{1.65}{12.45}$$

$$12.45x = 27.39$$

$$x = 2.2\text{m}$$

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

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.*



$$\sin x = \frac{1.65}{4.15}$$

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

$$x = 23.427626509$$

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

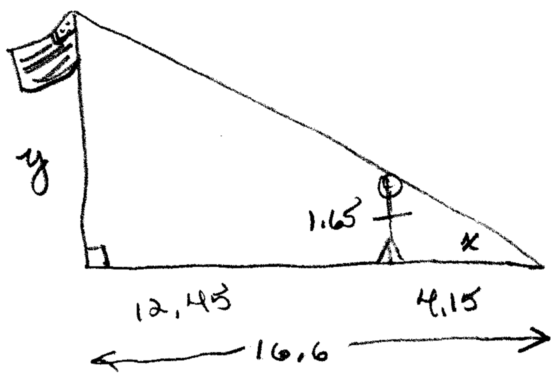
$$6.6 = h$$

$$\boxed{6.6 \text{ meters}}$$

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.

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.*



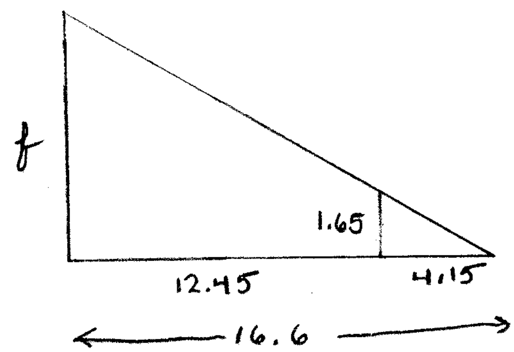
$$\tan x = \frac{1.65}{4.15} \qquad \tan x = \frac{y}{16.6}$$

?

Score 1: The student wrote a correct system of equations, but no further work was shown.

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.*



$$\frac{f}{16.6} = \frac{1.65}{4.15}$$

$$\frac{f}{16.6} = \frac{1.7}{4.2}$$

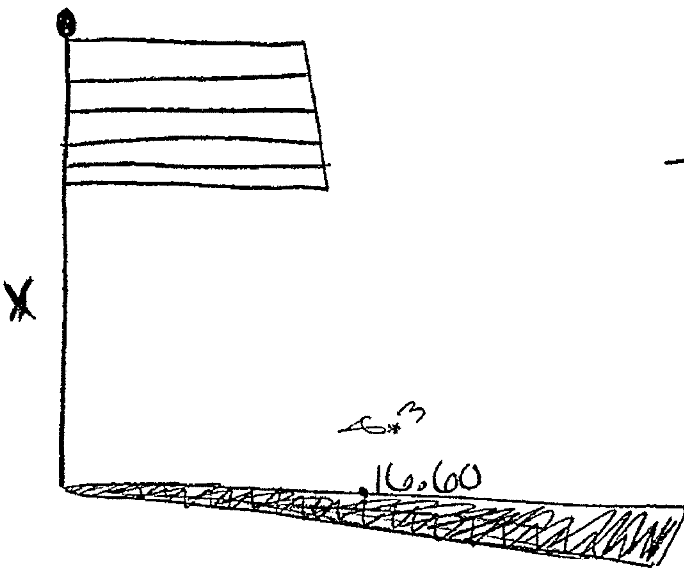
$$f = 6.719047619$$

$$f = 6.7$$

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

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.*



$$\frac{x}{1.65} = \frac{12.45}{16.60}$$

$$\frac{20.5425}{16.60} = \frac{\cancel{16.60}x}{\cancel{16.60}}$$

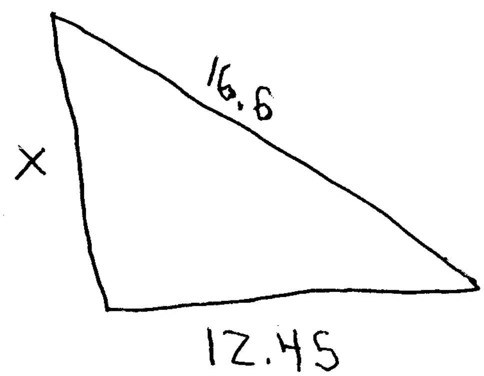
$$1.2375 = x$$

height of Flagpole = 1.2 meters long

Score 0: The student did not subtract 12.45 from 16.60. The student also wrote an incorrect proportion.

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.*



$$x^2 + 12.45^2 = 16.6$$

$$x^2 + 155.0025 = 275.56$$

$$x^2 = 120.5575$$

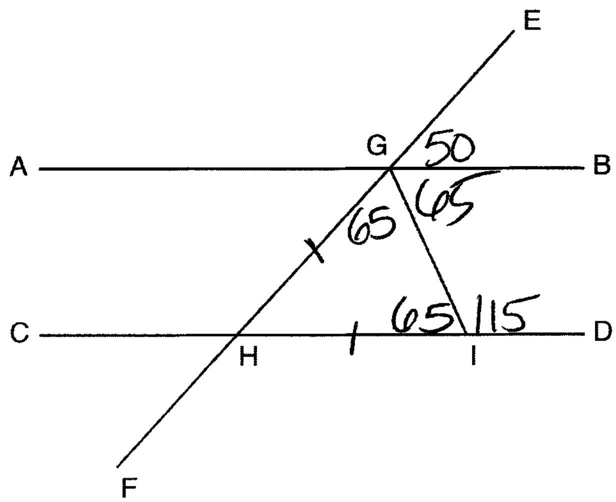
$$x \approx 10.979$$

11

Score 0: The student had a completely incorrect response.

Question 32

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



If m$\angle EGB$ = 50° and m$\angle DIG$ = 115°, explain why $\overline{AB} \parallel \overline{CD}$.

m∡GIH = 65 linear pairs are supplementary

m∡HGI = 65 - Base angles of an isosceles triangle are equal

m∡EGB + m∡BGI + m∡HGI = 180

50 + m∡BGI + 65 = 180

115 + m∡BGI = 180

−115 −115

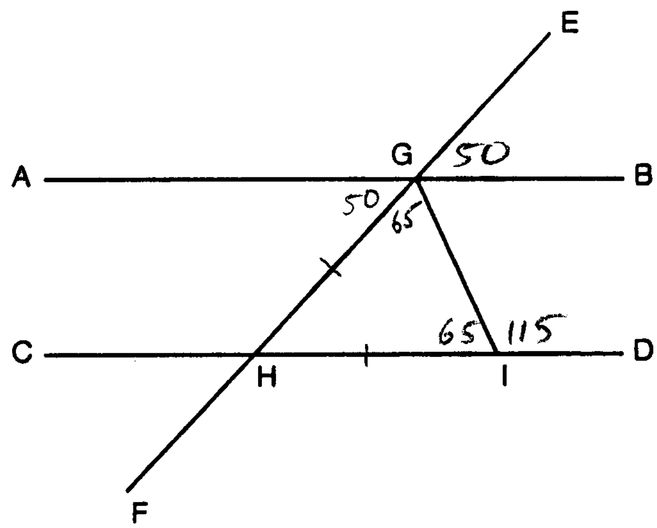
m∡BGI = 65

∡BGI and ∡DIG are same-side interior ∡'s, and since they are supplementary, $\overline{AB} \parallel \overline{CD}$.

Score 4: The student has a complete and correct response.

Question 32

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



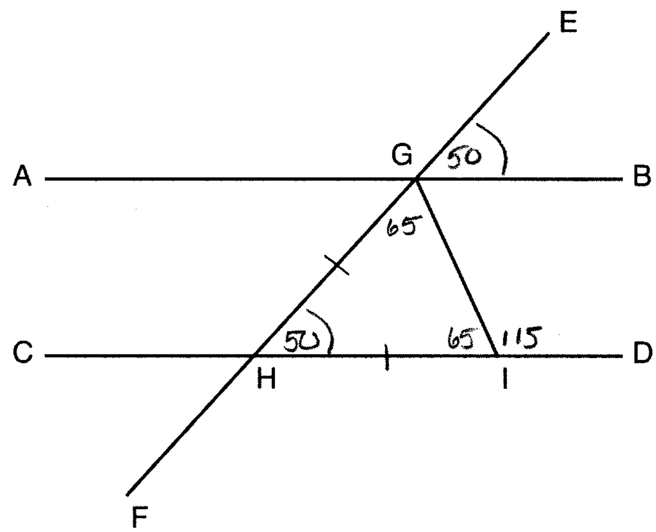
If $m\angle EGB = 50°$ and $m\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

∡AGH = 50, and ∡GIH = 65. ΔGHI is isosceles so ∡GIH ≅ ∡IGH. This makes ∡AGI = 115, and since alternate interior angles ∡AGI and ∡DIG are corgruent, $\overline{AB} \parallel \overline{CD}$.

Score 3: The student stated correct angle measures, but did not have an explanation for $m\angle AGH$ and $m\angle GIH$.

Question 32

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



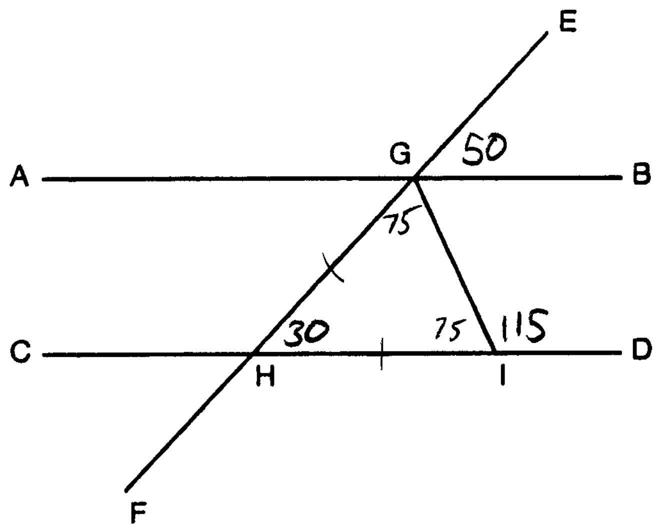
If m$\angle EGB = 50°$ and m$\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

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

Score 3: The student stated correct angle measures with explanations, but did not explain why $\overline{AB} \parallel \overline{CD}$.

Question 32

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



180
-115
75

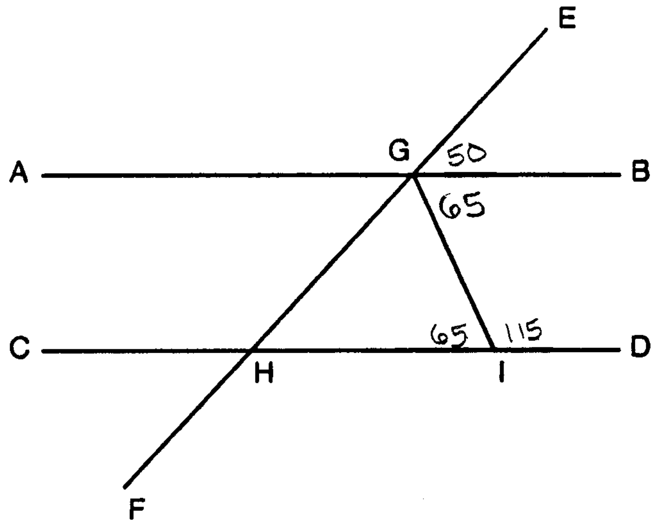
If m$\angle EGB$ = 50° and m$\angle DIG$ = 115°, explain why $\overline{AB} \parallel \overline{CD}$.

$\measuredangle$ HIG is supplementary to $\measuredangle$ DIG, so $\measuredangle$ HIG = 75.
$\triangle$GHI is isosceles, so $\measuredangle$ HGI = 75 too. The angles of a triangle add to 180, so $\measuredangle$GHI = 30.
Since alternate interior angles $\measuredangle$EGB and $\measuredangle$GHI are not equal, $\overline{AB}$ is not parallel to $\overline{CD}$.

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.

Question 32

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



If $m\angle EGB = 50°$ and $m\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

m∠DIG + m∠HIG = 180 supplementary

m∠HIG ≅ m∠BGI alternate interior

m∠BGI + mDIG = 180 same side interior

65 + 115 = 180

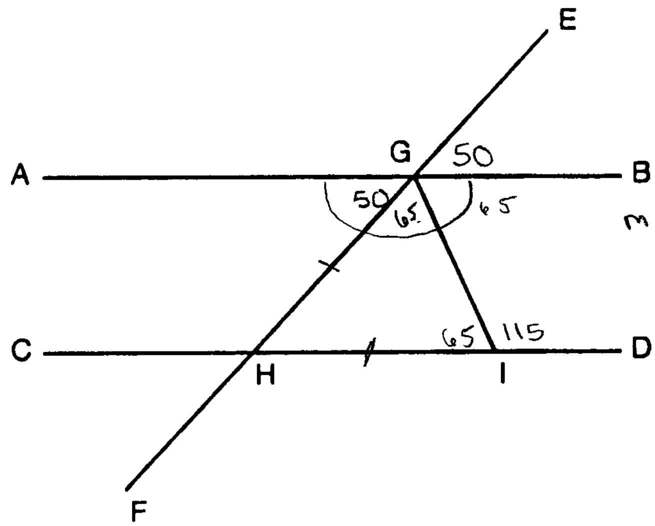
180 = 180

lines parallel when same side interior angles add up to 180.

Score 2: The student made one conceptual error using alternate interior angles of parallel lines to prove the same lines parallel.

Question 32

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



$m\angle BGI = 180 - (65+50)$
$= 65$

115
$+65$
180

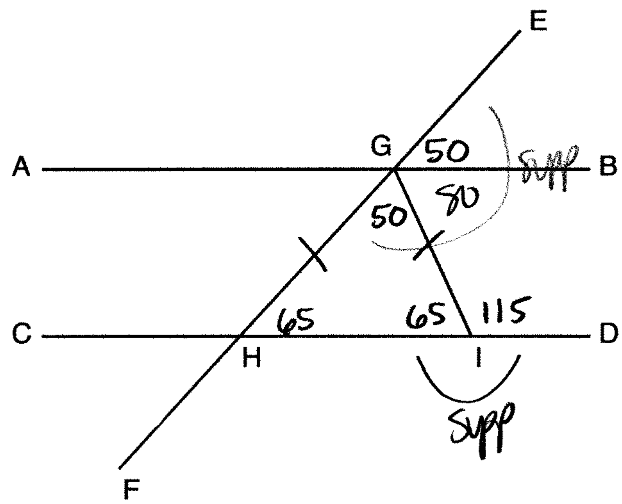
If $m\angle EGB = 50°$ and $m\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

$m\angle BGI + m\angle DIG = 180$
$65 + 115 = 180$
$180 = 180$ → only when lines are //.

Score 2: The student had appropriate angle measures stated correctly, but was missing the explanation.

Question 32

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

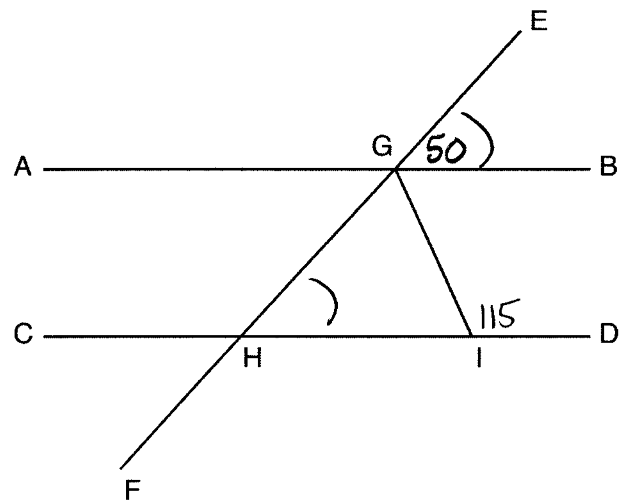


If m$\angle EGB$ = 50° and m$\angle DIG$ = 115°, explain why $\overline{AB} \parallel \overline{CD}$.

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, $\overline{EF}$ intersects $\overline{AB}$ and $\overline{CD}$ at G and H, respectively, and $\overline{GI}$ is drawn such that $\overline{GH} \cong \overline{IH}$.



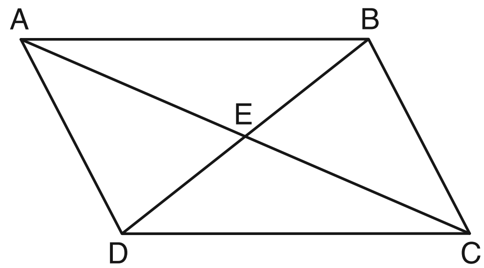
If $m\angle EGB = 50°$ and $m\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.

Corresponding ∠s are ≅,
so AB ∥ $\overline{CD}$.

Score 0: The student did not show enough work on which to base the explanation.

Question 33

33 Given: Quadrilateral *ABCD* is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at *E*



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

ABCD is parallelogram — Given

diagonals $\overline{AC}$ + $\overline{DB}$ intersect at E — Given

$\overline{AE} \cong \overline{CE}$, $\overline{BE} \cong \overline{DE}$ — Diagonals of parallelogram bisect each other

$\angle AED \cong \angle CEB$ — vertical angles $\cong$

$\triangle AED \cong \triangle CEB$ — SAS

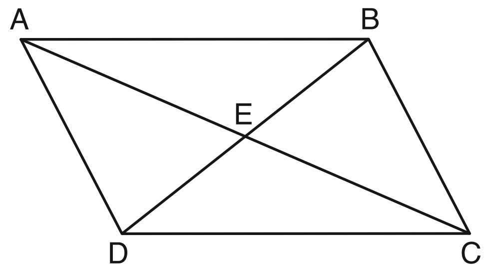
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

rotation of 180° 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 $\overline{AC}$ and $\overline{BD}$ intersecting at E



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

Statment	Reason
1. Quad ABCD is a parallelogn	1. given
2. $\overline{AD} \cong \overline{CB}$	2. opposite sides of parallelogram are congruent
3. $\overline{AC}$ and $\overline{DB}$ intersect at E	3. given
4. $\angle AED \cong \angle CEB$	4. vertical angles are congruent
5. $\overline{BC} \parallel \overline{DA}$	5 def. of ▱
6. $\angle DBC \cong \angle BDA$	6. alt. interior angles are $\cong$
7. $\triangle AED \cong \triangle CEB$	7. AAS $\cong$ AAS

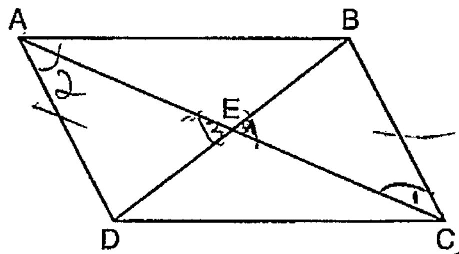
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

Rotation of $\triangle AED$ around point E of $180°$

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 $\overline{AC}$ and $\overline{BD}$ intersecting at E



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

AAS

Statements	Reasons
1. Quadrilateral ABCD is a ▱ with diagonals $\overline{AC}$ & $\overline{DB}$ intersecting at E	1. GN
2. AD ≅ BC	2. All opposite sides of a ▱ are ≅
3. AD ∥ BC	3. Opposite sides of a ▱ are ∥
4. ∠1 ≅ ∠2	4. If 2 ∥ lines are cut by a transversal, the alternate interior ∠'s are ≅.
5. ∠3 ≅ ∠4	5. Vertical ∠'s are ≅
6. △AED ≅ △BEC	6. AAS ≅ AAS

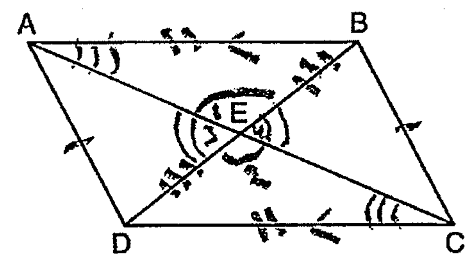
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

Reflection

Score 3: The student wrote an incomplete description of the rigid motion.

Question 33

33 Given: Quadrilateral *ABCD* is a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at *E*



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

1. AC and DB intersect at E, ABCD is a ▱	1. Given
2. $\overline{AB} \cong \overline{DC}$, $\overline{AD} \cong \overline{BC}$	2. opp. sides of a ▱ are ≅
3. ∡1 ≅ ∡2, ∡3 ≅ ∡4	3. vertical ∡'s are ≅
4. AB ∥ DC	4. opp. sides of a ▱ are ∥
5. ∡DCA ≅ ∡BAC	5. If 2 lines are ∥ their alt. int. ∡'s are ≅
6. △DCE ≅ △BAE	6. AAS
7. $\overline{ED} \cong \overline{EB}$	7. corresp sides of ≅ △'s are ≅
8. △AED ≅ △CEB	8 SAS

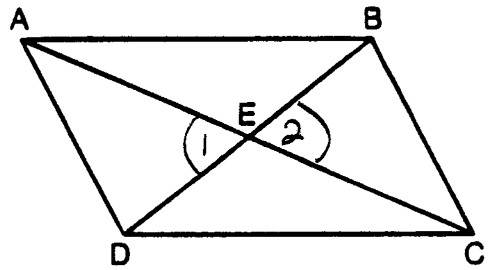
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

reflection through E

Score 3: The student had an incorrect reason for the last step, but a correct rigid motion was stated.

Question 33

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



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

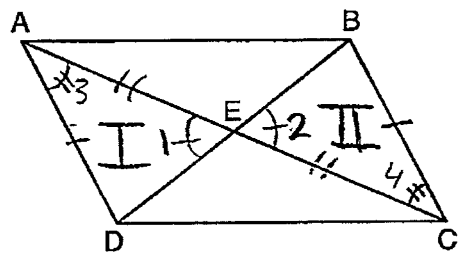
In a parallelogram, the diagonals bisect each other, so $\overline{AE} \cong \overline{CE}$ and $\overline{BE} \cong \overline{DE}$. $\angle 1 \cong \angle 2$. So $\triangle AED \cong \triangle CEB$ by SAS.

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

$180°$ 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 $\overline{AC}$ and $\overline{BD}$ intersecting at *E*



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

Statement	Reason
1. ABCD is a Parallelogram $\overline{AC}$ + $\overline{BD}$ intersect at E	1. Given
2. $\angle 2 \cong \angle 1$	2. verticle $\angle$s are $\cong$
3. $\angle 3 \cong \angle 4$	3. Opposite inverse are $\cong$
4. $\overline{AE} \cong \overline{EC}$	4. Diagonals of a parallelogram are $\cong$
5. $\triangle I \cong \triangle II$	5. ASA

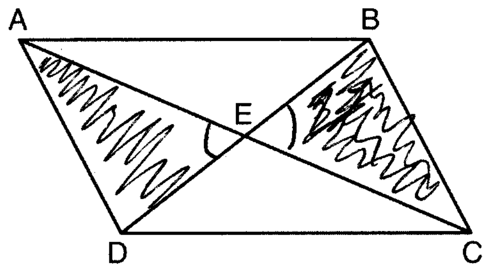
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

Rotation 180°

Score 1: The student had some correct statements about the proof. The description of the rigid motion was incomplete.

Question 33

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



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

1) parallelogram ABCD diagonals $\overline{AC}$ and $\overline{BC}$ intersecting at E

1) given

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

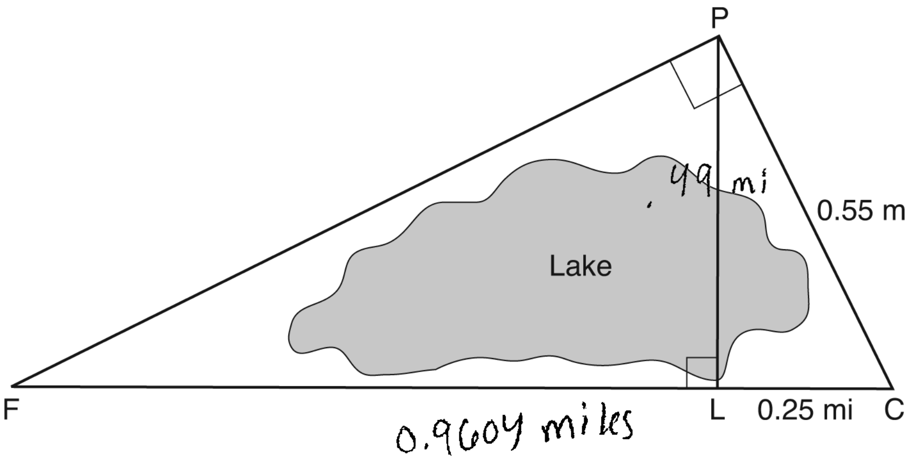
Describe a single rigid motion that maps $\triangle AED$ onto $\triangle CEB$.

Rotate 180°

Score 0: The student wrote only the "given" information, and an incomplete description of the rigid motion.

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.

$a^2+b^2=c^2$

$a^2+0.0625=0.3025$

$a^2=0.24$

$a=.489897...$

the distance is 0.49 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.

Altitude = $\frac{\cancel{x}}{h}=\frac{h}{y}$

$\frac{0.25}{0.49}=\frac{0.49}{y}$

$0.25y=0.2401$

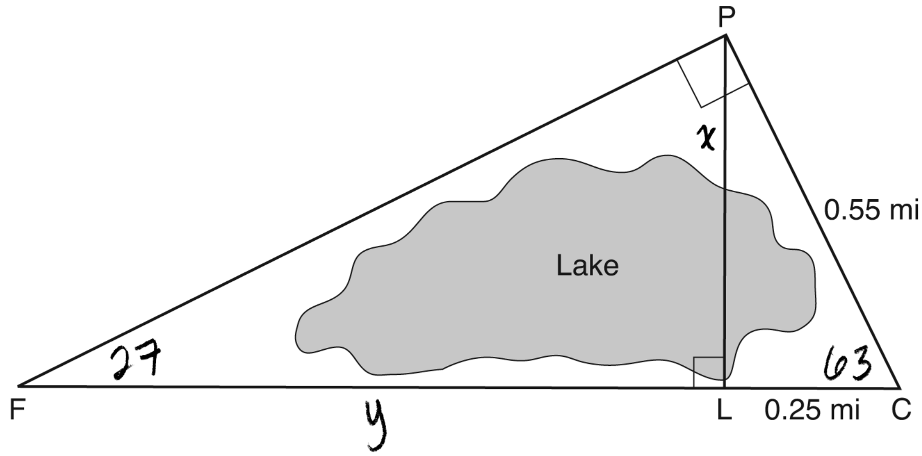
$y=0.9604$

NO, the distance from F to L is 0.9604 miles; when added to the distance from L to C, it's only around 1.2 miles, not 1.5 miles.

Score 4: The student has a complete and correct response.

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.

$\cos C = \frac{.25}{.55}$ $\quad$ $\tan 63 = \frac{x}{.25}$

$\angle C = 63^\circ$ $\quad$ $x = .4906$

$x = .49$

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

$180 - 90 - 63 = 27$ $\quad$ $y = .96$

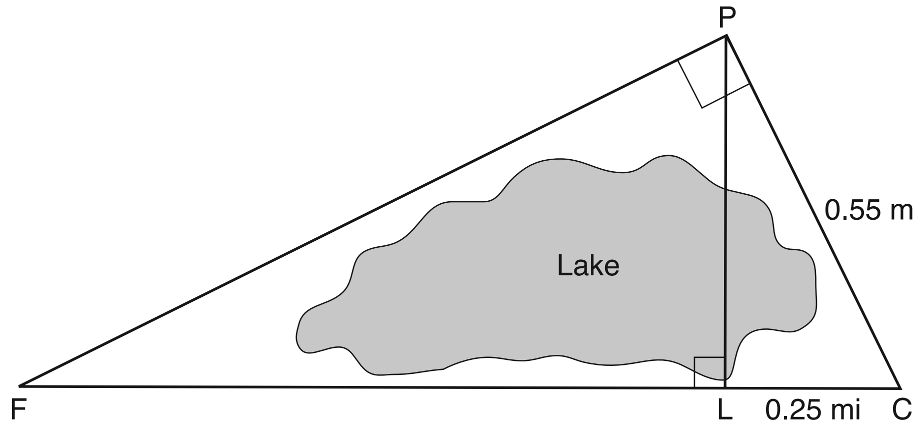
$\tan 27 = \frac{.49}{y}$ $\quad$ $+ .25$

1.21

Score 3: The student did not state if Gerald is correct.

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.

$\frac{0.55}{FC} = \frac{0.25}{0.55}$

$0.25\ FC = 0.3025$

$FC = 1.21$

$\frac{x}{0.96} = \frac{0.25}{x}$

$x^2 = 0.24$

$x = 0.55$

Distance between P and L = 0.5 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.

let x be FC

No because it is 1.21 miles. $\frac{0.55}{x} = \frac{0.25}{0.55}$

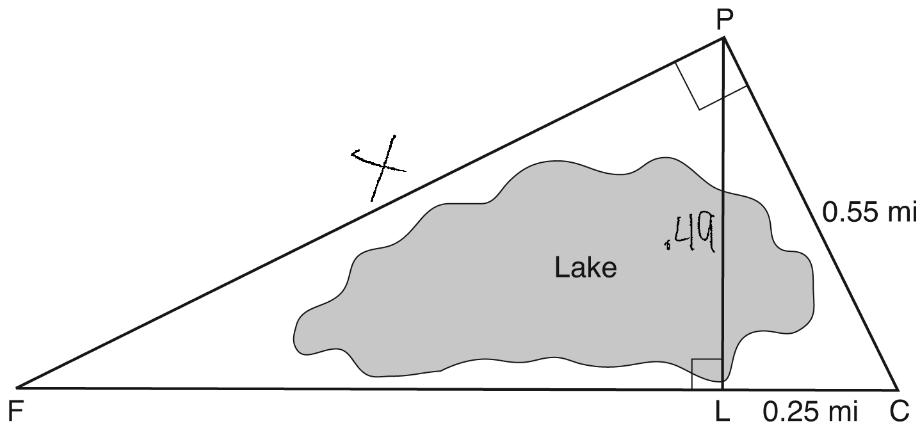
$0.25\ FC = 0.3025$

$FC = 1.21$

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.

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.

$a^2+b^2=c^2$

$0.25^2+b^2=0.55^2$

$.0625+b^2=.3025$

$-.0625 \quad -.0625$

$\sqrt{b^2}=\sqrt{.24} \quad b=.49$

$\boxed{.49 \text{ miles}}$

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

$0.25^2+x+.49^2=c^2$

$0.625+x+.2401=c^2$

$.3026+x=c^2$

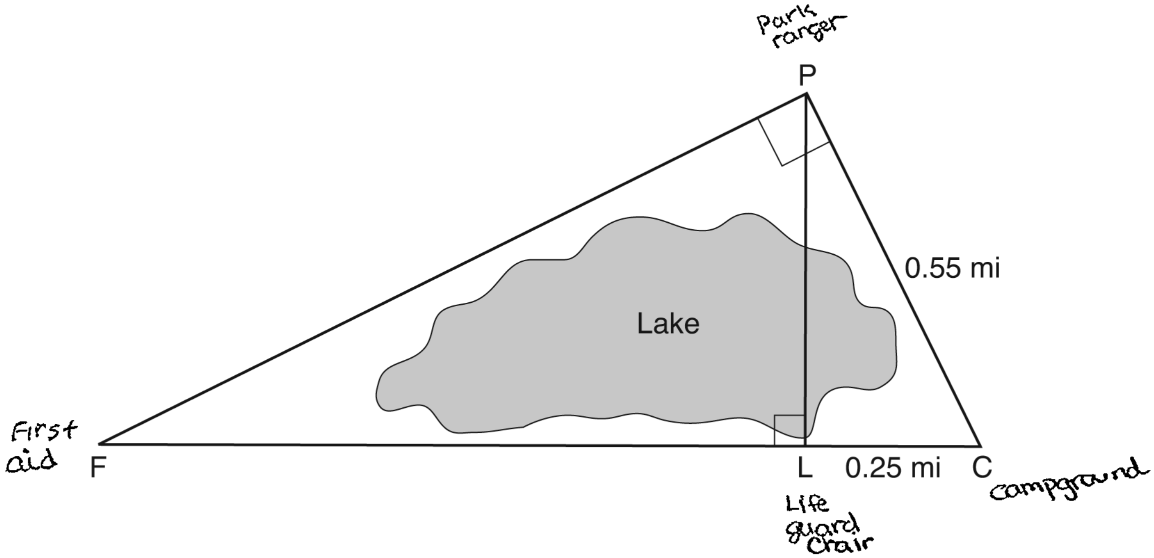
$\boxed{x=.55}$

$.55+0.25=.8$

No, Gerald is not correct it is about .8 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.

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.

$(0.25)^2 + b^2 = (0.55)^2$

$0.0625 + b^2 = .3025$

$-.0625 \qquad -.0625$

$b^2 = \sqrt{0.24}$

$b = 0.48989794\,86$

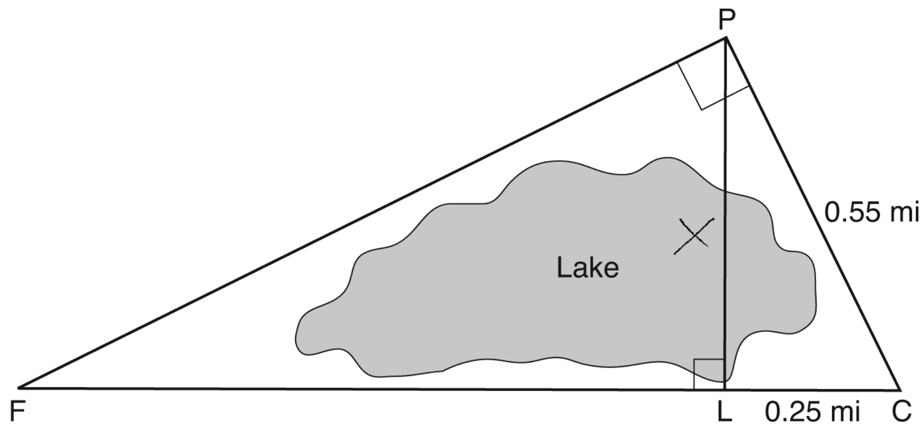
$\boxed{\text{Distance} \approx 0.5 \text{ miles}}$

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.

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.

$$.25^2 + .55^2 = x^2$$

$$.0625 + .3025 = x^2$$

$$.365 = x^2$$

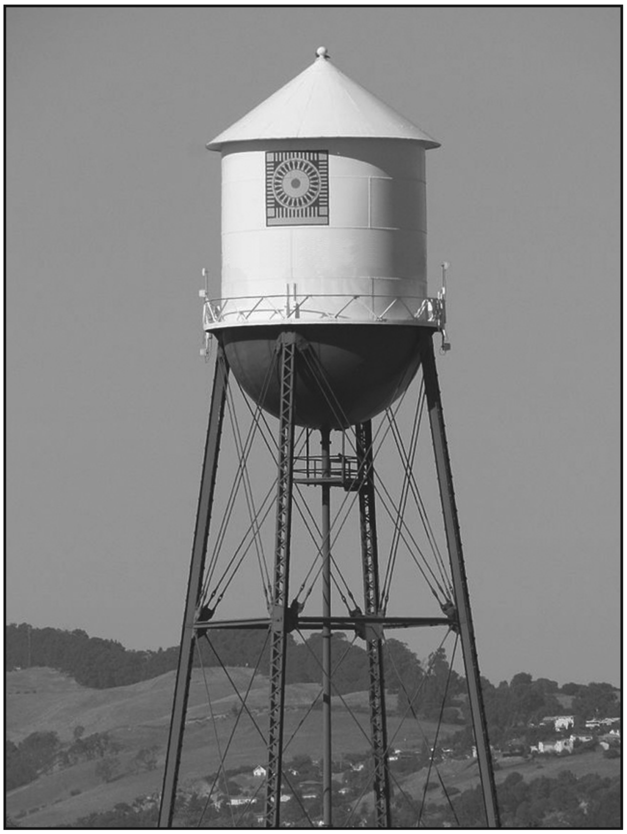
$$\boxed{.6 = x}$$

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

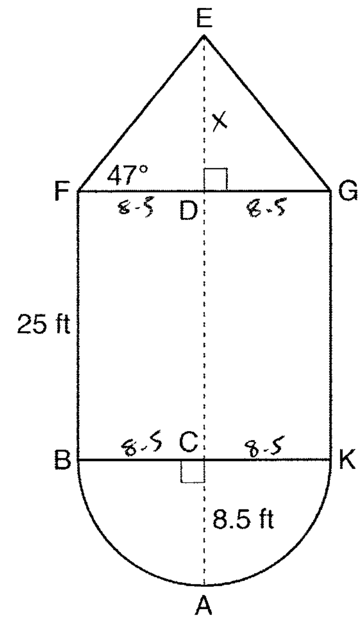
Yes – its far away.

Score 0: The student had a completely incorrect response.

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.

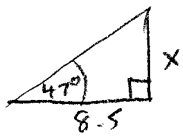


Source: http://en.wikipedia.org



Question 35 is continued on the next page.

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



$\tan 47° = \frac{x}{8.5}$

$x = 8.5 \tan 47°$

$x = 9.11513$

Volume cone

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

$= \frac{1}{3}\pi (8.5)^2 (9.11513)$

$V = 689.65125$

Volume cylinder

$V = \pi r^2 h$

$V = \pi (8.5)^2 (25)$

$V = 5674.50173$

Volume Hemisphere

$V = \frac{1}{2}\left(\frac{4}{3}\pi r^3\right)$

$= \frac{2}{3}\pi (8.5)^3$

$= 1286.22039$

$V = 689.65125 + 5674.50173 + 1286.22039 = 7650.37337$

$= \boxed{7650 \text{ ft}^3}$

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.

$7650 \times 62.4 = 477,360$ lbs

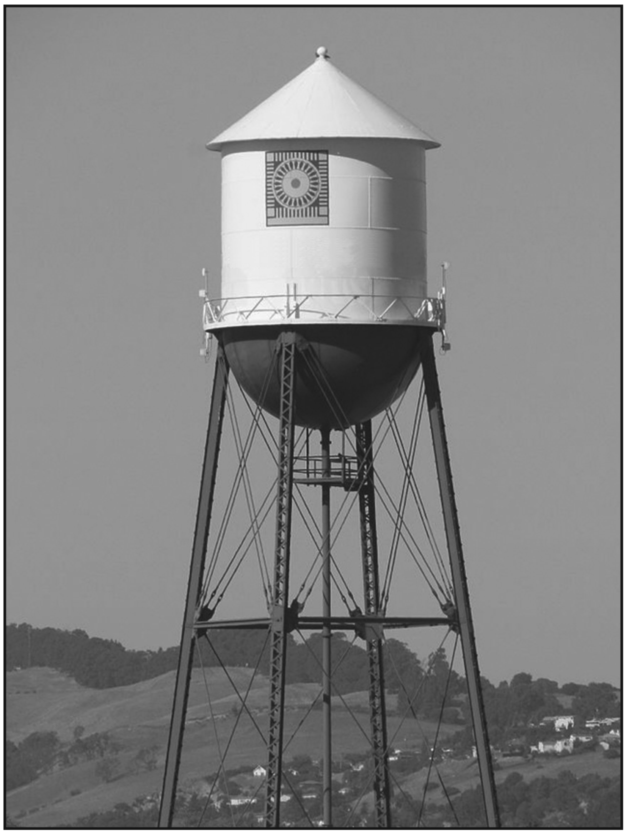
$.85 \times 477,360 = \boxed{405,756 \text{ lbs}}$

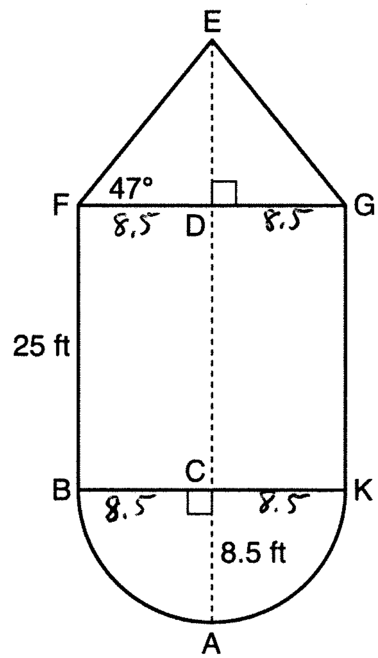
No – the weight would exceed 400,000 lbs

Score 6: The student had a complete and correct response.

Question 35

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.

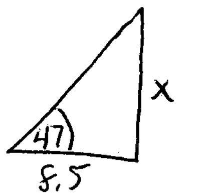

Source: http://en.wikipedia.org



Question 35 is continued on the next page.

Question 35 continued

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



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

$x = 9.115$

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

$V = \frac{1}{3}(3.14)(8.5)^2(9.115) + 3.14(8.5)^2(25) + \frac{1}{2}\cdot\frac{4}{3}(3.14)(8.5)^3$

$= 689.2914917 + 5671.625 + 1285.568333$

$= 7646.484825$

$V = 7646$

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.

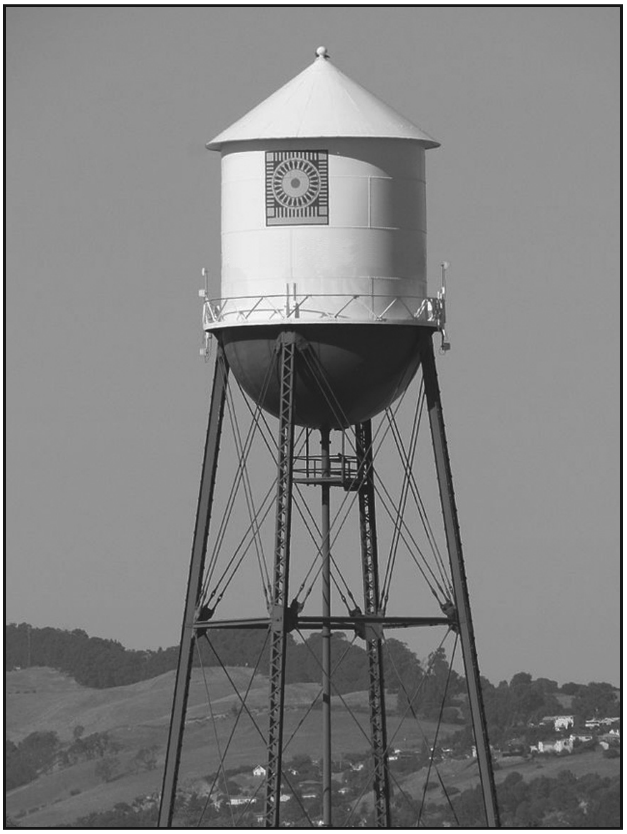
$7646(62.4) = 477,110.4$ pounds

$477,110.4(.85) = 405,543.84$ pounds

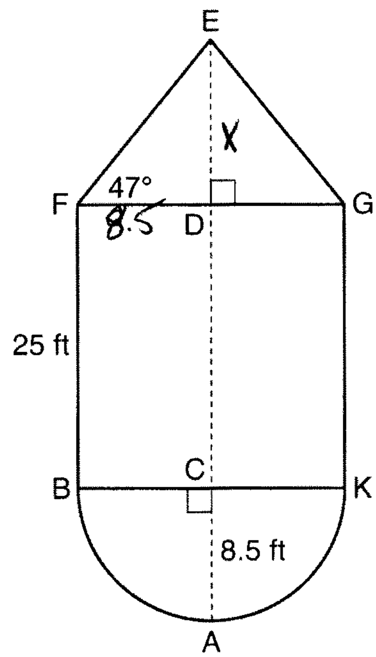
No because it would exceed 400,000 pounds

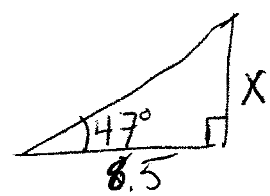
Score 5: The student used 3.14 instead of π to calculate the volume.

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.



Source: http://en.wikipedia.org





$\tan 47° = \frac{x}{8.5}$

$x = 8.5 \tan 47°$

$x = 9.11513$

Question 35 is continued on the next page.

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

Cone

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

$V = \frac{1}{3}\pi(8.5)^2(9.11513)$

$V = 689.65125$

Cylinder

$V = \pi r^2 h$

$V = \pi(8.5)^2(25)$

$V = 5674.50173$

Hemisphere

$V = \frac{1}{2}\left(\frac{4}{3}\pi r^3\right)$

$V = \frac{4}{6}\pi(8.5)^3$

$V = 1286.22039$

$V = 689.65125 + 1286.22039 + 5674.50173$

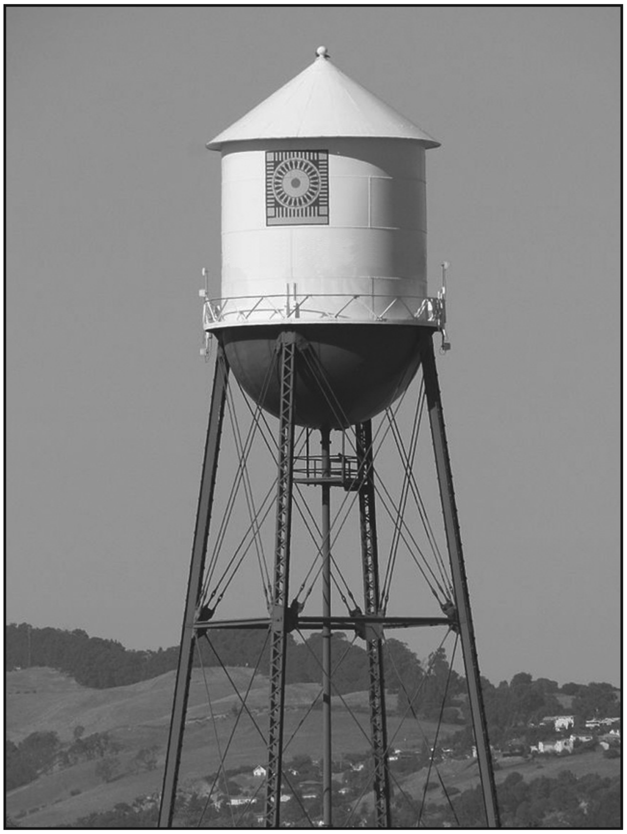
$V = 7650 \text{ ft}^3$

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.

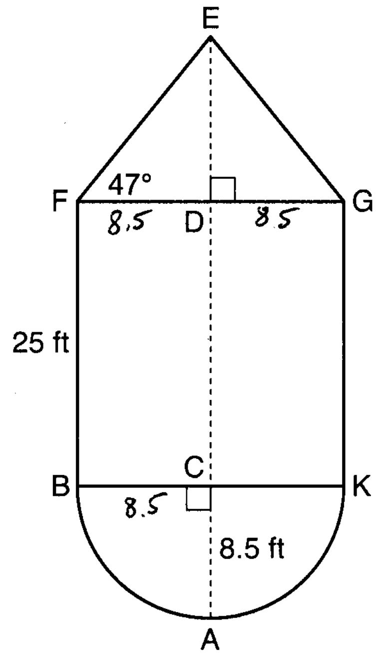
No

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.

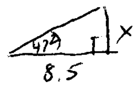


Source: http://en.wikipedia.org



Question 35 is continued on the next page.

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



$\tan 47 = x/8.5$

$x = 8.5 \tan 47$

$x = 9.1151$

$\boxed{x = 9.1}$

Volume Hemisphere

$V = \frac{1}{2}\left(\frac{4}{3}\pi r^3\right)$

$= \frac{2}{3}\pi(8.5)^3$

$V = 1286.22039$

Volume Cylinder

$V = \pi r^2 h$

$V = \pi(8.5^2)(25)$

$V = 5674.5017$

Volume Cone

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

$V = \frac{1}{3}\pi(8.5)^2(9.1)$

$V = 688.5062$

$V = 1286.2704 + 5674.5017 + 688.5062$

$= 7649.2183$

$V = \boxed{7649 \text{ ft}^3}$

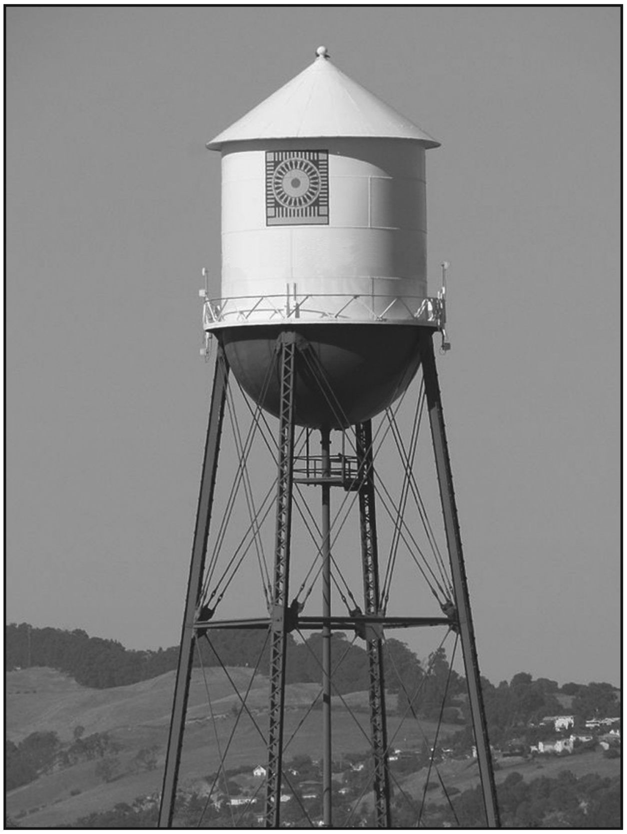
The water tower was constructed to hold a maximum of 400,000 pounds of water. If water weighs 62.4 pounds per cubic foot, can the water tower be filled to 85% of its volume and *not* exceed the weight limit? Justify your answer.

$7649 \times 62.4 = 477{,}297.6$ lbs.

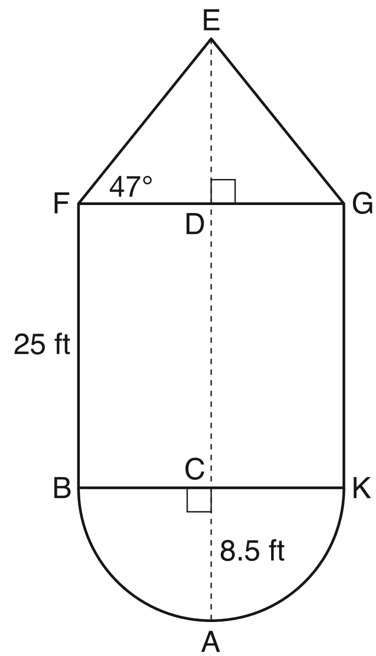
$477{,}297.6 \times .85 = \boxed{405{,}702.96}$ lbs.

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.

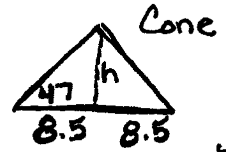


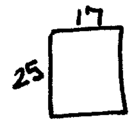
Source: http://en.wikipedia.org



Question 35 is continued on the next page.

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





cylinder

½ Circle

$\tan 47° = \frac{h}{8.5} = 9.12$

$\frac{1}{3}\pi(8.5)^2(9.12)$ $\quad$ $\pi(8.5)^2(25)$ $\quad$ $\frac{1}{2}\left[\pi(8.5)^2\right]$

$219.64\pi + 1806.25\pi + 36.125\pi$

2062.015π

6478.01

6478

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.

$(.85)(6478) = 5506.3$

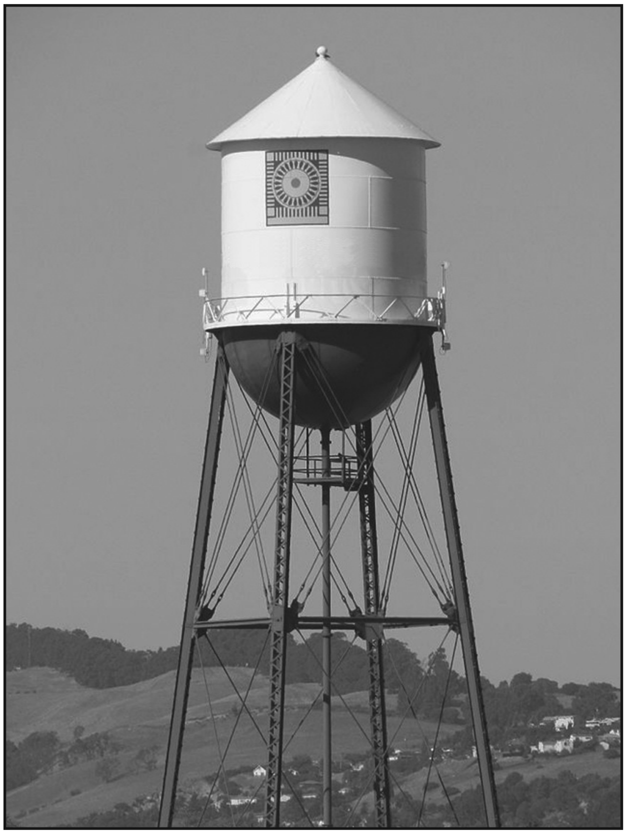
$(5506.3)(62.4) = 343{,}593.12$

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.

Question 35

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.



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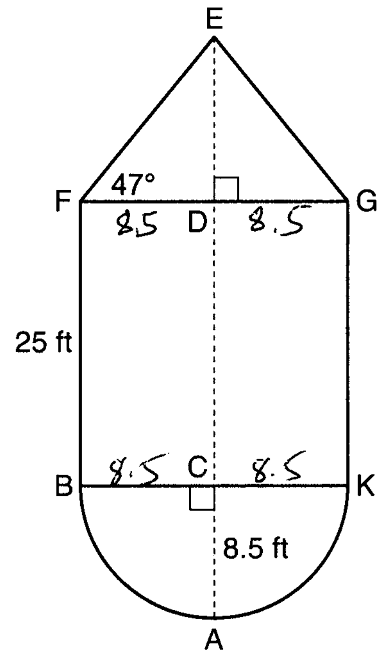


Question 35 is continued on the next page.

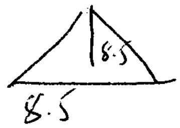
If $AC = 8.5$ feet, $BF = 25$ feet, and $m\angle EFD = 47°$, determine and state, to the *nearest cubic foot*, the volume of the water tower.

Cone

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

$\frac{1}{3}\pi\, 8.5^2 \times 8.5$

$= 643.11$



Hem:

$V = \frac{1}{2}\left(\frac{4}{3}\pi \cdot 8.5^3\right)$

$= \frac{2}{3}\pi \cdot 8.5^3$

$= 1286.22$

Cyl

$V = \pi \cdot 8.5^2 \times 25$

$= 5674.50$

643.11
5674.50
+ 1286.22

$7603.83 = V$ ft^3

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.

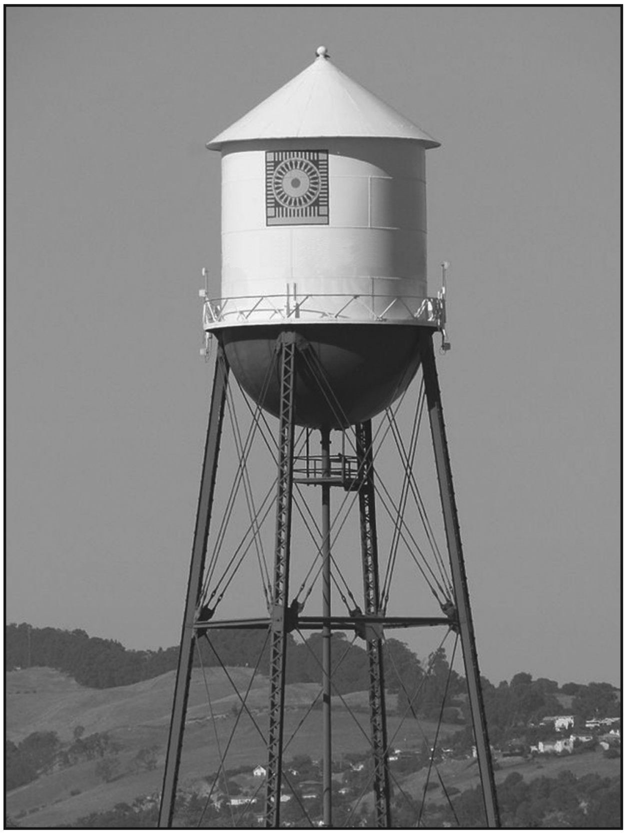
$7604 \times 62.4 = 474{,}489.6$ lbs

$474{,}489.6 \times .85 =$

403,316.16 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%.

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.



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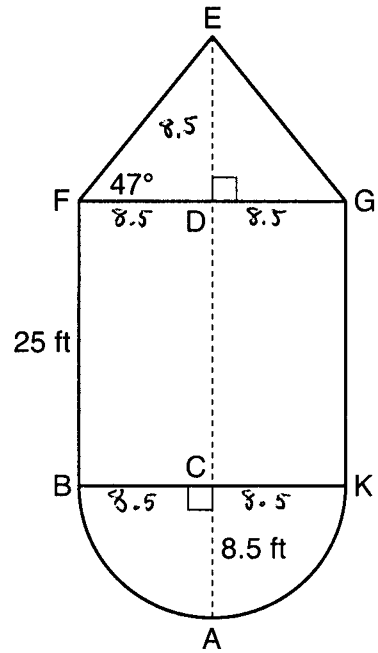


Question 35 is continued on the next page.

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

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

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

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

$$V = 643.1101961 + 5674.501731 + 302.6\cancel{3}^{4}00923$$

$$V = 6620.252019$$

6620

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.

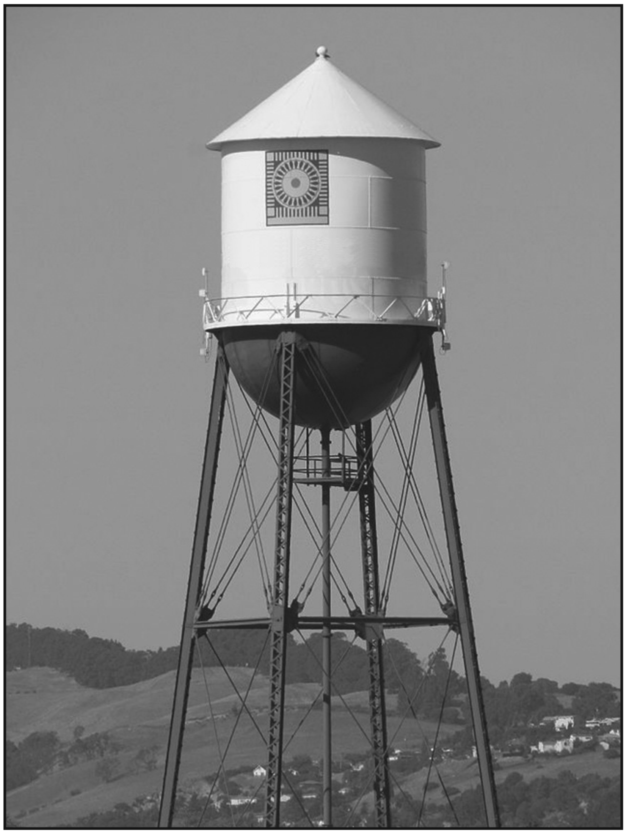
$$6620(.85) = 5627$$

$$5627(62.4) = 351,124.8$$

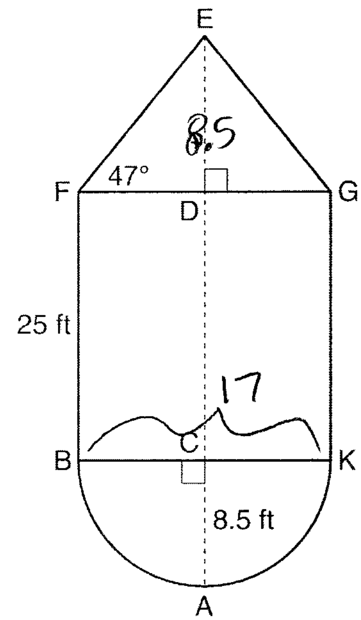
Score 2: The student made one conceptual error by using 8.5 for the height of the cone, and made an error by not dividing the volume of the sphere by 2. The student did not state if the water tower can be filled to 85%.

Question 35

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 $m\angle EFD = 47°$, determine and state, to the *nearest cubic foot*, the volume of the water tower.

Cone

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

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

$V = 643.1$

Cylinder

$\pi r^2 h$

$\pi (8.5)^2 (33.5)$

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.

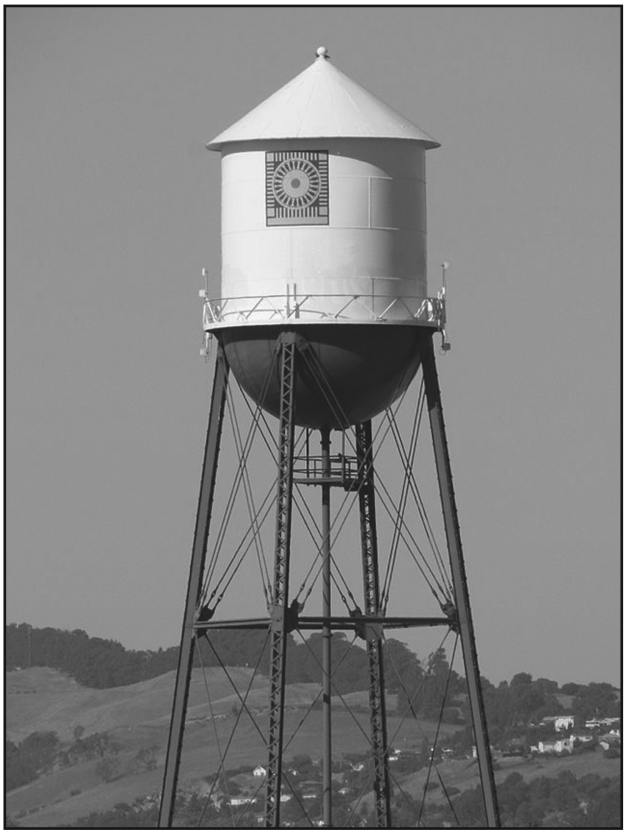
$8247 \times 62.4 = 514{,}612.8$ lbs

NO

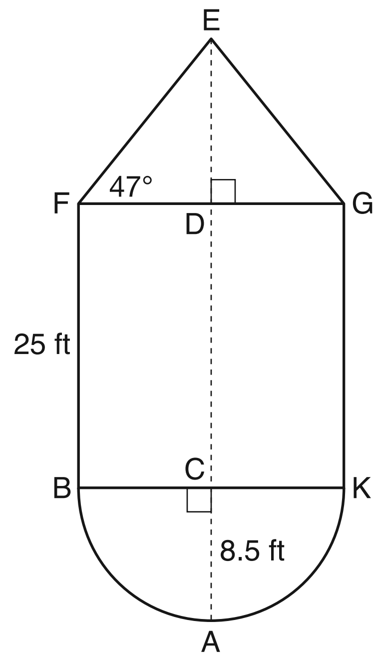
Score 1: The student made two conceptual errors in finding the volume of the water tower and one computational error by not multiplying by 85%.

Question 35

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°, determine and state, to the *nearest cubic foot*, the volume of the water tower.

17π

8.5

25

8.5

$(42)(17)^2\pi$

$12138\pi = 38132.65$

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.

$(400000)(.85) = 340000$

Score 0: The student had a completely incorrect response.

Question 36

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.]

$m_{\overline{RS}} = \frac{3}{5}$

$m_{\overline{ST}} = \frac{-10}{6} = \frac{-5}{3}$

Therefore the slopes of $\overline{RS}$ and $\overline{ST}$ are negative reciprocals and so $\overline{RS} \perp \overline{ST}$. Since the segments are $\perp$, $\measuredangle S$ is a rt $\measuredangle$.

$\therefore$ ΔRST is a rt Δ because it has 1 rt $\measuredangle$.

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

(0,9)

Question 36 is continued on the next page.

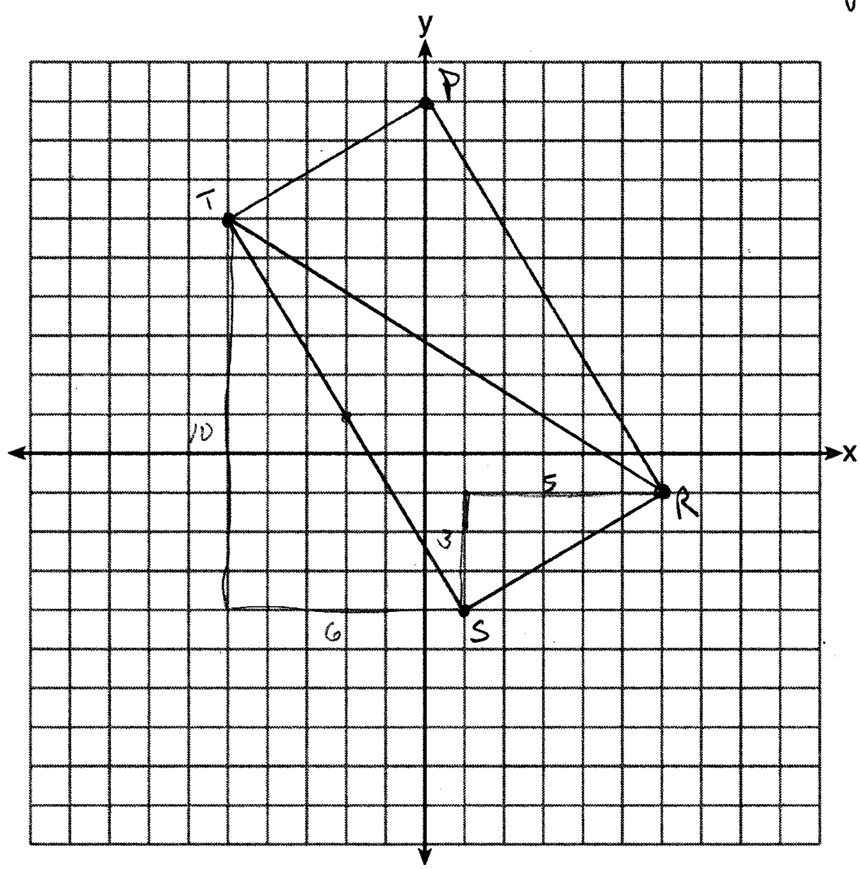
Question 36 continued

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

$$\left.\begin{aligned} m_{\overline{RS}} &= \frac{3}{5} \\ m_{\overline{PT}} &= \frac{3}{5} \end{aligned}\right\} \therefore \overline{RS} \parallel \overline{PT}$$

$$\left.\begin{aligned} m_{\overline{ST}} &= \frac{-10}{6} = \frac{-5}{3} \\ m_{\overline{RP}} &= \frac{-10}{6} = \frac{-5}{3} \end{aligned}\right\} \therefore \overline{ST} \parallel \overline{RP}$$

Since RSTP is a quadrilateral with both pairs of opposite sides $\parallel$ and one rt $\angle$ 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.]

$RS = \sqrt{3^2+5^2} = \sqrt{34}$

$ST = \sqrt{6^2+10^2} = \sqrt{136}$

$RT = \sqrt{7^2+11^2} = \sqrt{170}$

$RS^2 + ST^2 = RT^2$

$\sqrt{34}^2 + \sqrt{136}^2 = \sqrt{170}^2$

$34 + 136 = 170 \checkmark$

ΔRST is a rt Δ b/c it's side lengths satisfy the pyth. theorem

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

$P(0,9)$

Question 36 is continued on the next page.

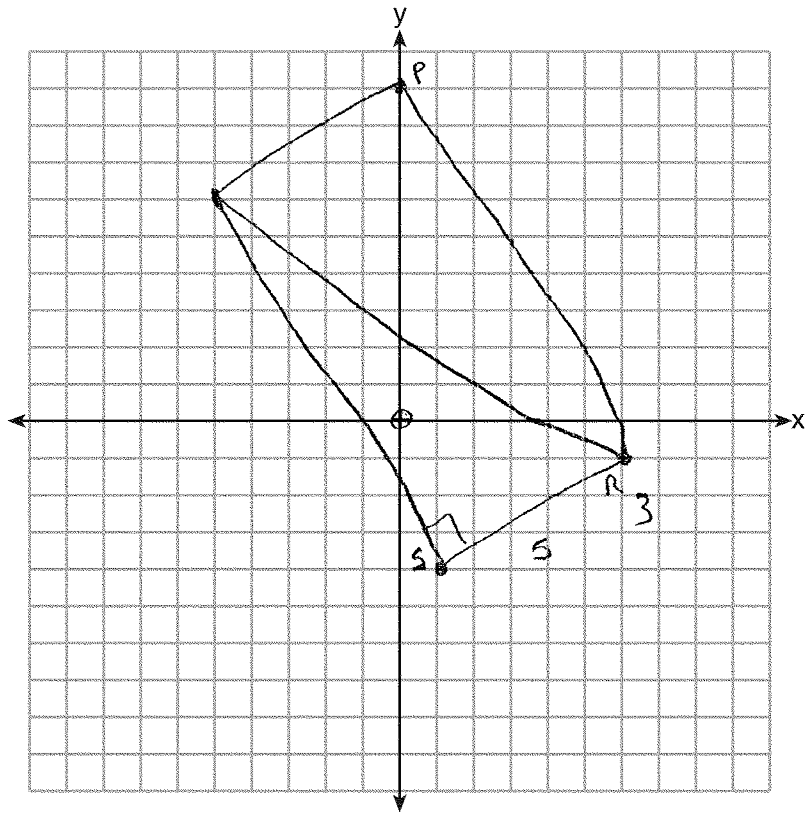
Prove that your quadrilateral *RSTP* is a rectangle.
[The use of the set of axes below is optional.]

$m\,\overline{PT} = 3/5$
$m\,\overline{RS} = 3/5$] ∥

$m\,\overline{ST} = \frac{-10}{6}$
$m\,\overline{RP} = \frac{-10}{6}$] ∥

RSTP is a ▱ b/c both sets of opposite sides are ∥.

A ▱ w/ 1 Rt ∡, ∡S, is a rectangle ∴ RSTP is a rectangle



Score 6: The student has a complete and correct response.

Question 36

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.]

Slopes

$\overline{TS} = -\frac{10}{6} = \frac{-5}{3}$

$\overline{SR} = 3/5$

$\overline{TS} \perp \overline{SR}$ because their slopes are negative reciprocals of each other. $\measuredangle S$ is a right $\measuredangle$ because $\perp$ lines form rt. $\measuredangle$'s. ΔRST is a right Δ because it has 1 right $\measuredangle$.

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

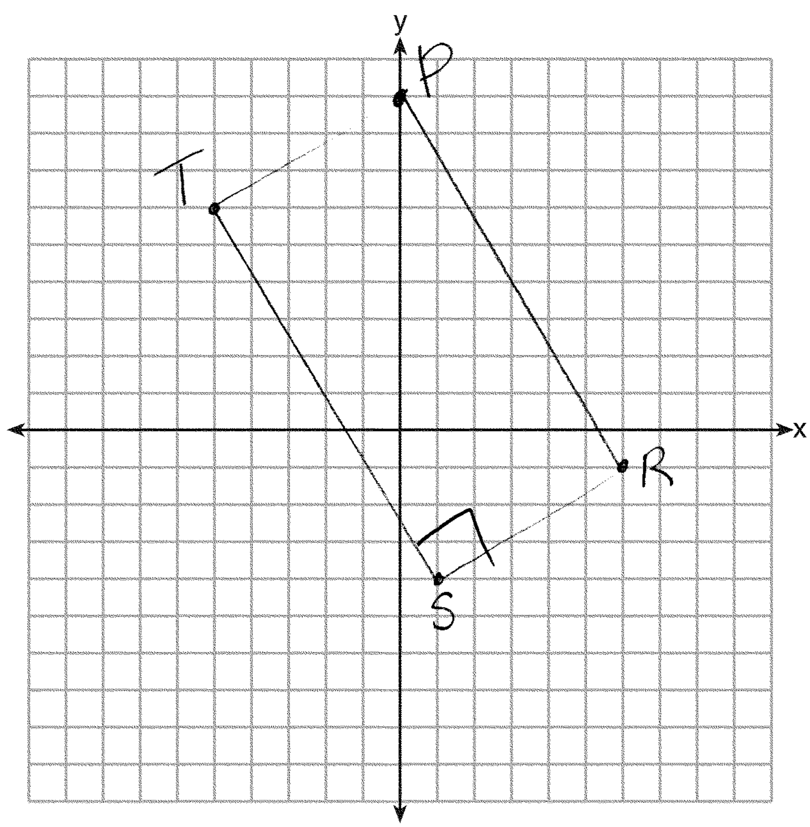
$P(0,9)$

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.]

$m_{TP} = 3/5$
$m_{\overline{SR}} = 3/5$
$m_{TS} = -5/3$
$m_{PR} = -5/3$

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.

Question 36

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.]

Slope $\overline{RS} = \frac{3}{5}$ Slope $\overline{TS} = \frac{-10}{6} = \frac{-5}{3}$

$\overline{RS} \perp \overline{TS}$ since they have negative reciprocal slopes

There fore $\angle S$ is a right $\angle$

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.

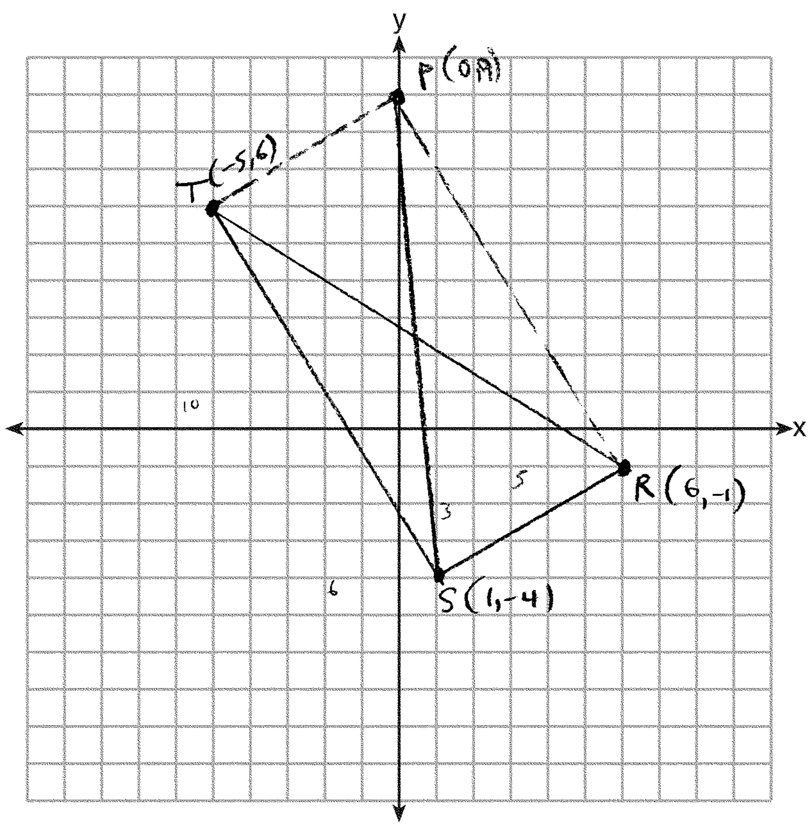
P (0,9)

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.]

Length $\overline{RT}$	Length $\overline{PS}$
$\sqrt{7^2+11^2}$	$\sqrt{13^2+1^2}$
$\sqrt{49+121}$	$\sqrt{169+1}$
$RT=\sqrt{170}$	$PS=\sqrt{170}$

Since the diagonals of RSTP are ≅, 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.

Question 36

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.

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.]

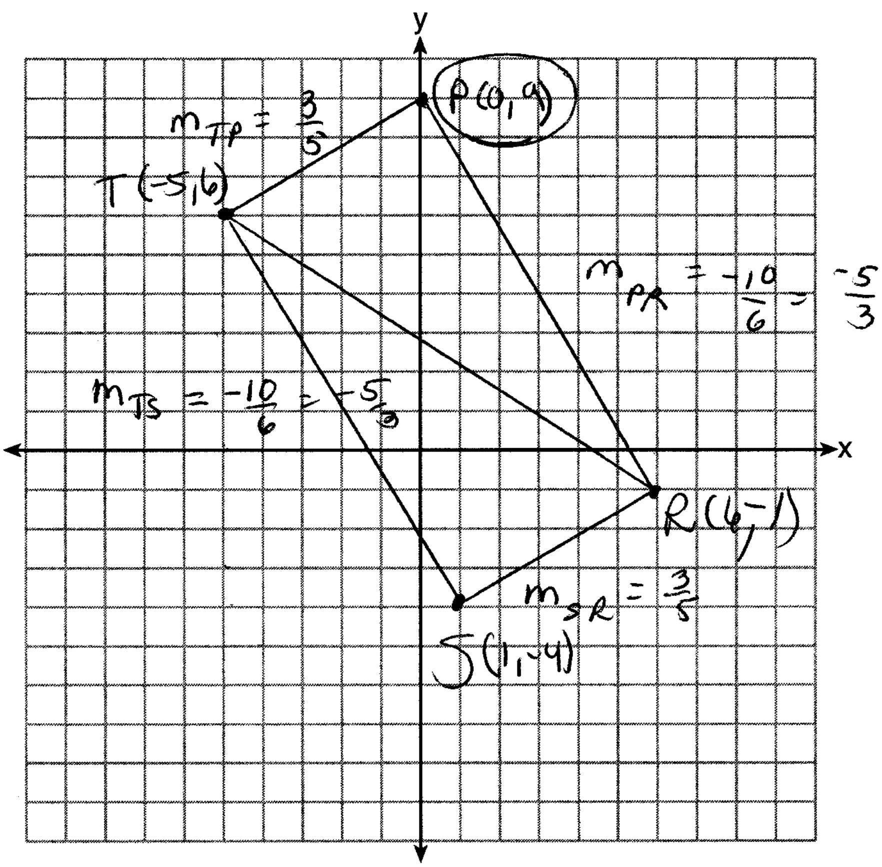
$m_{TP} = \frac{3}{5}$ $\overline{TP} \perp \overline{RP}$ b/c their slopes a neg. reciprocals

$m_{RP} = -\frac{5}{3}$ $\angle P$ is a rt $\angle$ b/c $\perp$ lines form right $\angle$s

$m_{SR} = \frac{3}{5}$ $\overline{TP} \parallel \overline{SR}$, $\overline{RP} \parallel \overline{TS}$ b/c their slopes are equal

$m_{TS} = \frac{-5}{3}$ RSTP is a ▱ b/c it ∝ pair of ∥ sides

RSTP is a ~~right~~ rectangle b/c a ▱ with a right $\angle$ is a rectangle



Score 4: The student did not prove $\triangle RST$ is a right triangle. The student found point *P* and stated its coordinates correctly. The student's proof for rectangle *RSTP* is correct.

Question 36

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.]

sides are $\perp$ because their slopes are negative reciprocals $\left\{ \begin{array}{l} m(TS) = \frac{10}{-6} = -\frac{5}{3} \\ m(SR) = \frac{3}{5} \end{array} \right.$

$\perp$ lines form right angles

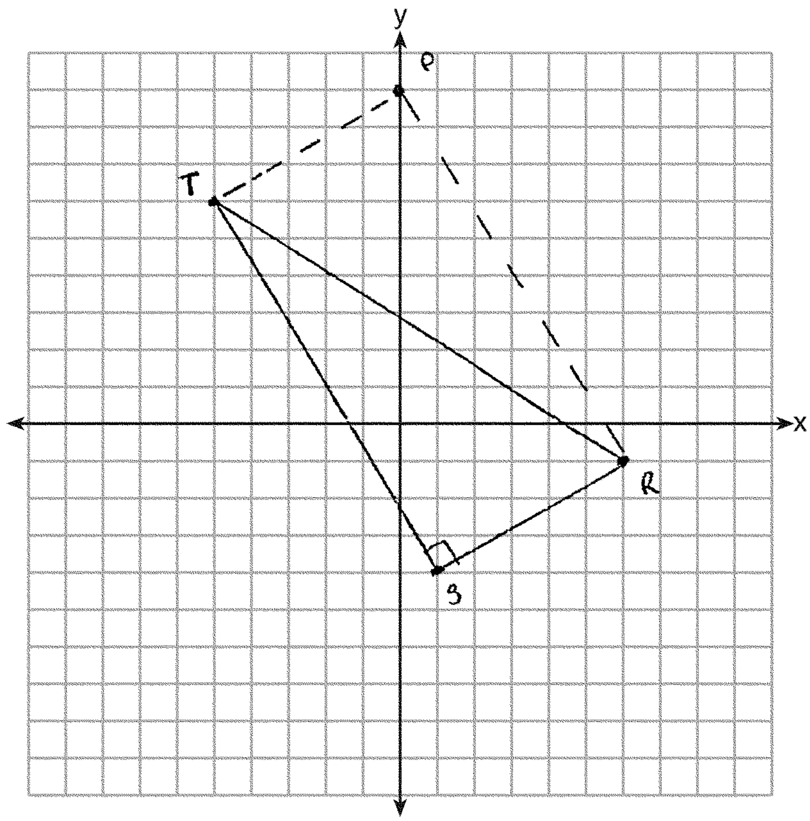
$\triangle$ RST is a right $\triangle$ because it has a right $\angle$.

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.]



Score 3: The student correctly proved the right triangle and stated the coordinates of P, but no further correct work was shown.

Question 36

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.]

R(6,−1)
S(1,−4)
T(−5,6)

$d_{RS} = \sqrt{(6-1)^2+(-1+4)^2} = \sqrt{25+9} = \sqrt{34}$

$d_{ST} = \sqrt{(1+5)^2+(-4-6)^2} = \sqrt{36+100} = \sqrt{136}$

$d_{RT} = \sqrt{(6+5)^2+(-1-6)^2} = \sqrt{121+49} = \sqrt{170}$

$(RS)^2+(ST)^2 \stackrel{?}{=} (RT)^2$

$(\sqrt{34})^2+(\sqrt{136})^2 \mid (\sqrt{170})^2$

$34+136$

$170=170$

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

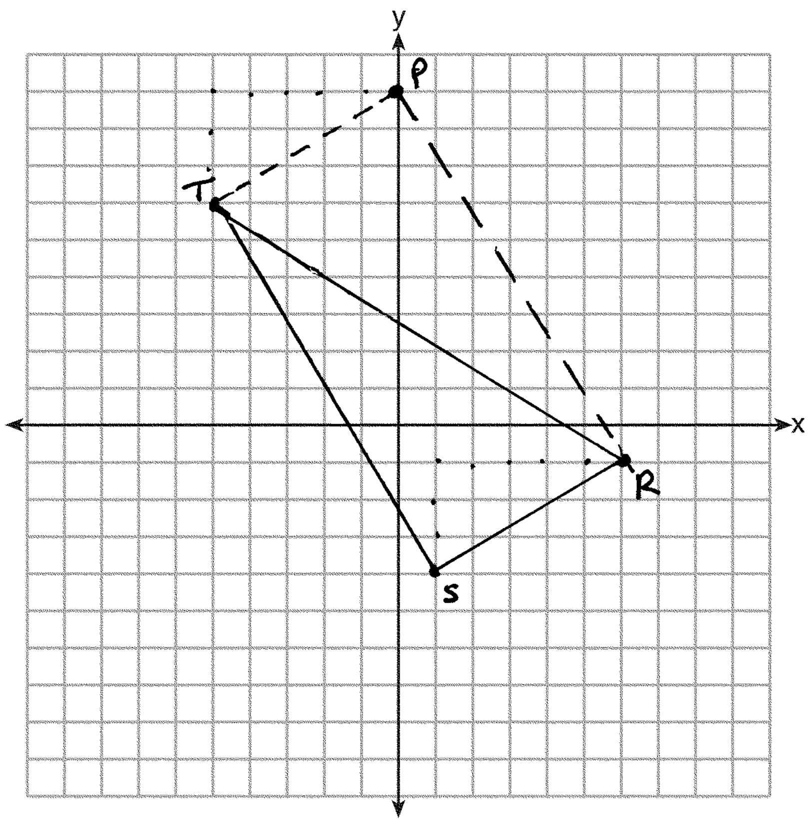
(0,9)

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.]

∡P is Rt ∡

RSTP is Rectangle because opposite ∡'s are Right ∡'s



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.]

$\triangle RST$ is a right triangle.

Slopes are negative reciprocals

$m_{SR} = 5/3$

$m_{ST} = -6/10 = -3/5$

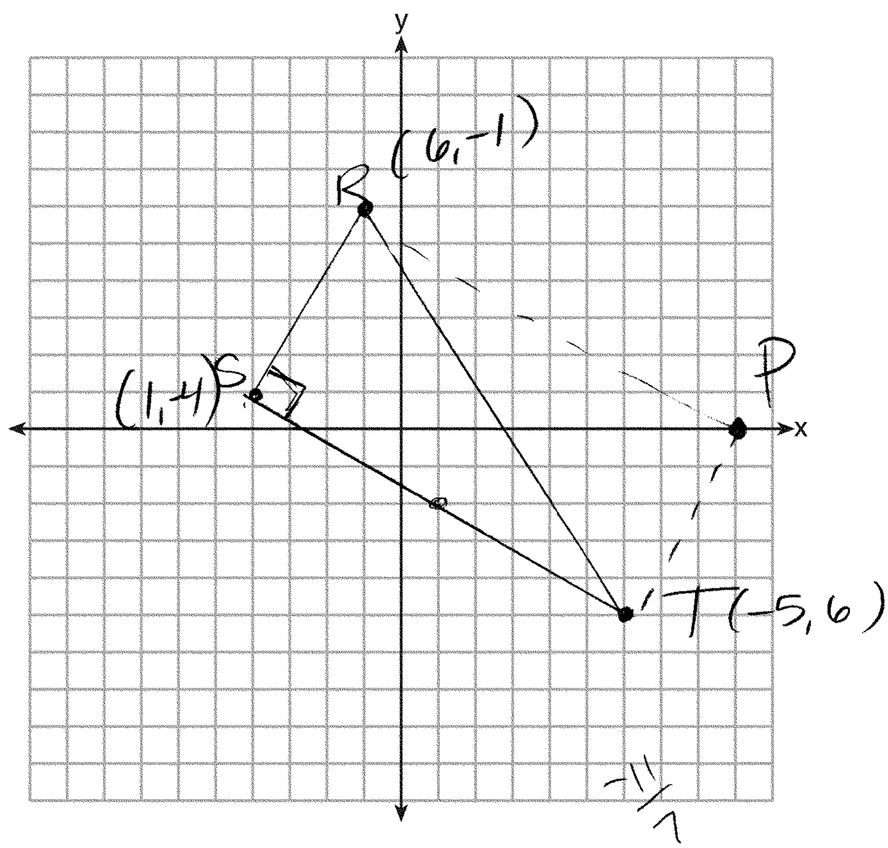
State the coordinates of point P such that quadrilateral $RSTP$ is a rectangle.

$P(0,9)$

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.]

RSTP is a rectangle.



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.

Question 36

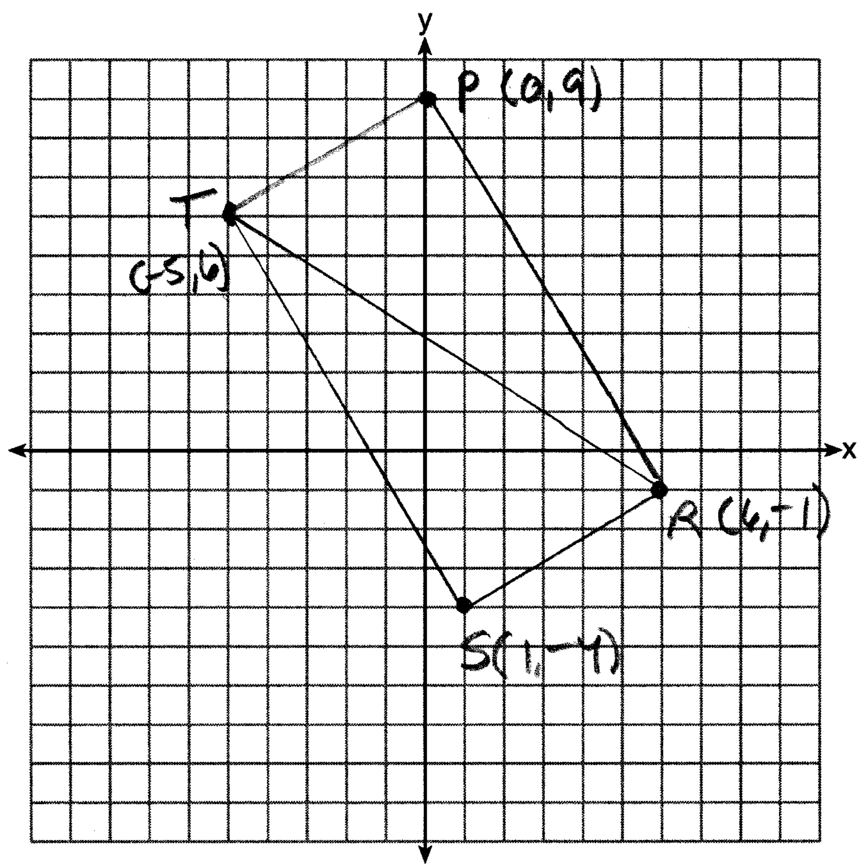
36 In the coordinate plane, the vertices of $\triangle RST$ are $R(6,-1)$, $S(1,-4)$, and $T(-5,6)$. Prove that $\triangle RST$ is a right triangle.
[The use of the set of axes on the next page is optional.]

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 $\measuredangle S$ is a right angle.

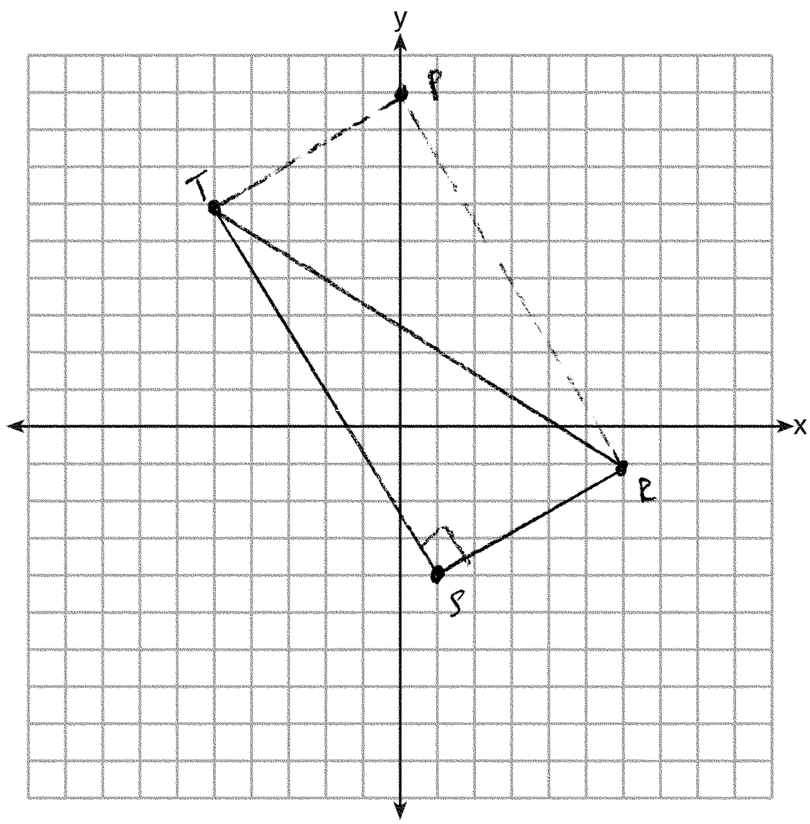
State the coordinates of point P such that quadrilateral $RSTP$ is a rectangle.

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.]

RSTP is a rectangle because it has a right ∠.



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