The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

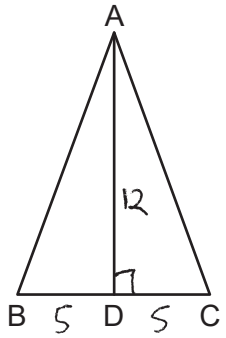
Wednesday, January 24, 2024 — 9:15 a.m. to 12:15 p.m., only

MODEL RESPONSE SET

Table of Contents

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude $\overline{AD}$ is drawn.



The length of $\overline{AD}$ is 12 cm and the length of $\overline{BC}$ is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about $\overline{AD}$.

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

$= \frac{1}{3}\pi(5^2)(12)$

$= \frac{1}{3}\pi(25)(12)$

$= \frac{1}{3}300\pi$

$= \frac{1}{3}(942.4777961)$

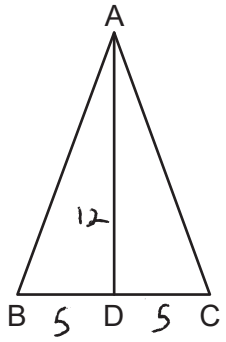
$= 314.159$

$= 314$

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

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude $\overline{AD}$ is drawn.



The length of $\overline{AD}$ is 12 cm and the length of $\overline{BC}$ is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about $\overline{AD}$.

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

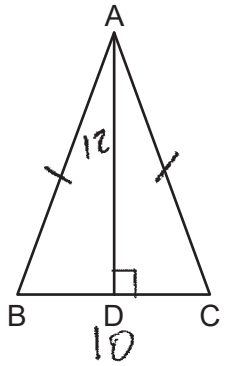
$V = \frac{1}{3}\pi 5^2 (12)$

$V = 314$

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

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude $\overline{AD}$ is drawn.



The length of $\overline{AD}$ is 12 cm and the length of $\overline{BC}$ is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about $\overline{AD}$.

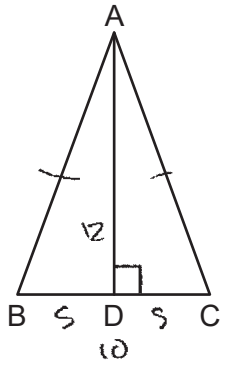
$V = \frac{1}{3}\pi r^2 h$

$V = 314\ cm^3$

Score 1: The student did not show work when determining the volume.

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude $\overline{AD}$ is drawn.



The length of $\overline{AD}$ is 12 cm and the length of $\overline{BC}$ is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about $\overline{AD}$. cone

$V = 1/3 \pi r^2 h$

$V = 1/3 \pi (5)^2 (12)$

$V = 1/3 \pi 25 (12)$

$V = \frac{\pi 25 (12)}{3}$

$V = \frac{78.539 (12)}{3}$

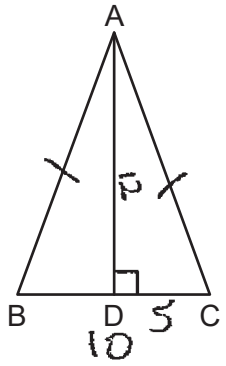
$V = \frac{942.47}{3}$

$V = 314.1592 cm^3$

Score 1: The student made one rounding error.

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude $\overline{AD}$ is drawn.



The length of $\overline{AD}$ is 12 cm and the length of $\overline{BC}$ is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about $\overline{AD}$.

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

$V = \frac{1}{3}\pi(5)^2 \cdot 12$

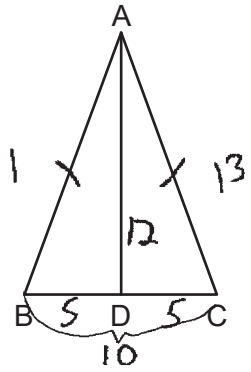
$V = 942.47$

$V = 942$

Score 1: The student made a computational error by not multiplying by $\frac{1}{3}$.

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude $\overline{AD}$ is drawn.



The length of $\overline{AD}$ is 12 cm and the length of $\overline{BC}$ is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about $\overline{AD}$.

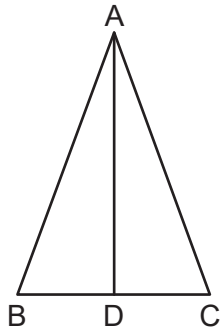
$V = Bh$
$V = (5)(12)$
$V = 300\ cm^3$

$C = 2\pi r$
$C = 2\pi(13)$
$C = 81.68$
$C = 82\ cm^3$

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude $\overline{AD}$ is drawn.



The length of $\overline{AD}$ is 12 cm and the length of $\overline{BC}$ is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about $\overline{AD}$.

$V = \frac{1}{3}Bh$

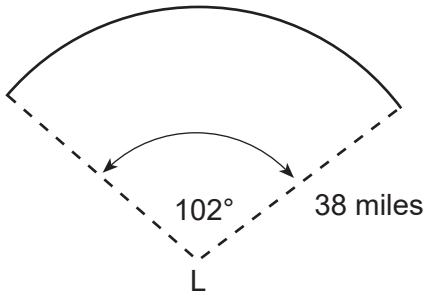
$V = \frac{1}{3}(10)(12)$

$V = 40$ cm

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 26

26 The diagram below models the projection of light from a lighthouse, *L*. The sector has a radius of 38 miles and spans 102°.



Determine and state the area of the sector, to the *nearest square mile*.

$\frac{\angle}{360} \times \pi r^2 = A \text{ of sector}$

$\frac{102}{360} \times \pi 38^2 = A \text{ of sector}$

$\frac{102}{360} \times \pi 1444 = A \text{ of sector}$

$\frac{102}{360} \times 4536.4598 = A \text{ of sector}$

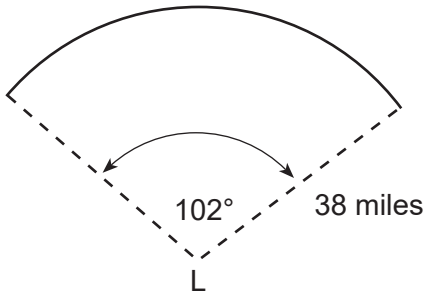
$1285.3303 = A \text{ of sector}$

$1285 \text{ mi}^2 = A \text{ of sector}$

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

Question 26

26 The diagram below models the projection of light from a lighthouse, *L*. The sector has a radius of 38 miles and spans 102°.



Determine and state the area of the sector, to the *nearest square mile*.

$A_{\text{circle}} = \pi r^2$

$= \pi (38)^2$

$= 1444\pi$

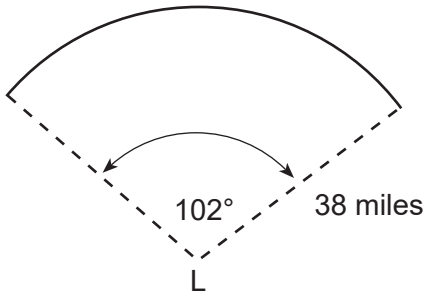
$1444\pi \cdot \frac{102}{360}$

The area of the sector is 1285 square miles

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

Question 26

26 The diagram below models the projection of light from a lighthouse, *L*. The sector has a radius of 38 miles and spans 102°.



Determine and state the area of the sector, to the *nearest square mile*.

$\frac{X}{360} = \frac{102}{4444\pi}$

$A = (38^2)\pi$

$A = 1444\pi$

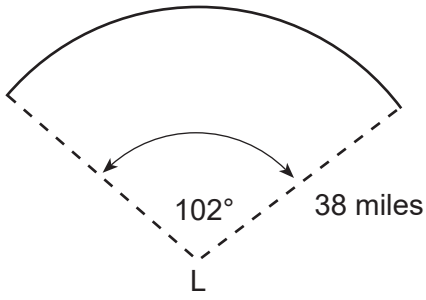
$\frac{462718.8988}{360} = \frac{360x}{360}$

Area of sector is 1285 miles^2

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

Question 26

26 The diagram below models the projection of light from a lighthouse, *L*. The sector has a radius of 38 miles and spans 102°.



Determine and state the area of the sector, to the *nearest square mile*.

$A = \left(\frac{\theta}{360}\right)\pi r^2$

$A = \left(\frac{102}{360}\right)\pi 38^2$

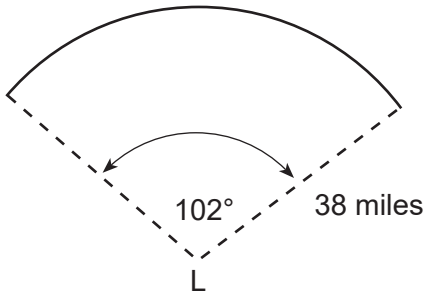
$A = 409.1\overline{3}$

the area of the sector is 409 miles^2

Score 1: The student made a computational error by leaving π out.

Question 26

26 The diagram below models the projection of light from a lighthouse, *L*. The sector has a radius of 38 miles and spans 102°.



Determine and state the area of the sector, to the *nearest square mile*.

$A = \pi r^2 \frac{x}{360}$

$A = \pi(38)^2 \left(\frac{102}{360}\right)$

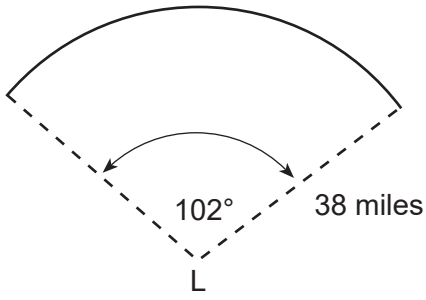
$A = 33.8244809$

$A = 34 \text{ mi}^2$

Score 1: The student made a computational error by not squaring 38.

Question 26

26 The diagram below models the projection of light from a lighthouse, *L*. The sector has a radius of 38 miles and spans 102°.



Determine and state the area of the sector, to the *nearest square mile*.

$\frac{102}{360} = \frac{x}{\pi 38}$

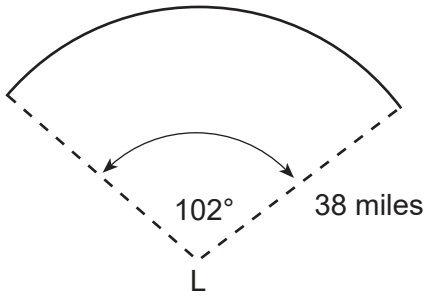
$x = 67.64898803$

68 miles^2

Score 1: The student determined the arc length of the sector.

Question 26

26 The diagram below models the projection of light from a lighthouse, *L*. The sector has a radius of 38 miles and spans 102°.



Determine and state the area of the sector, to the *nearest square mile*.

$A = \pi 38^2$

$= 4536.46$

$360 - 102 = 258$

$4536.46 \div 258$

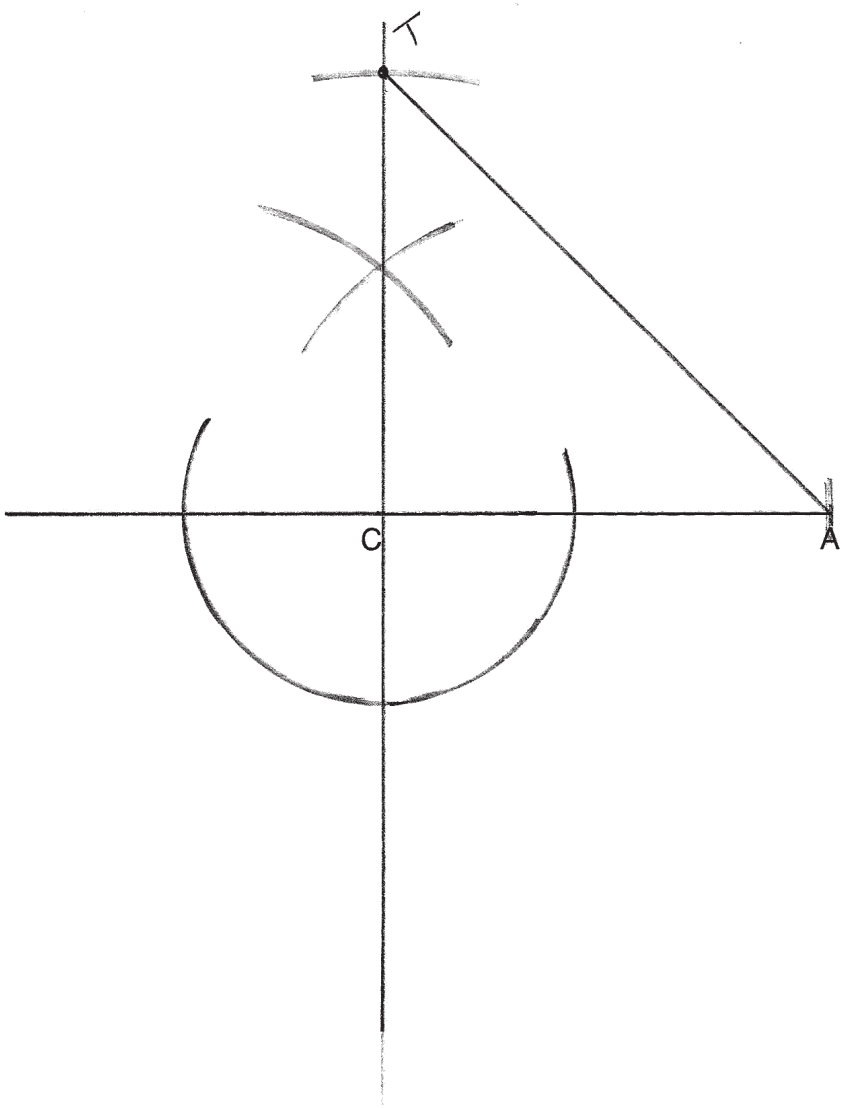
$A_{sect} = 17.6$

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

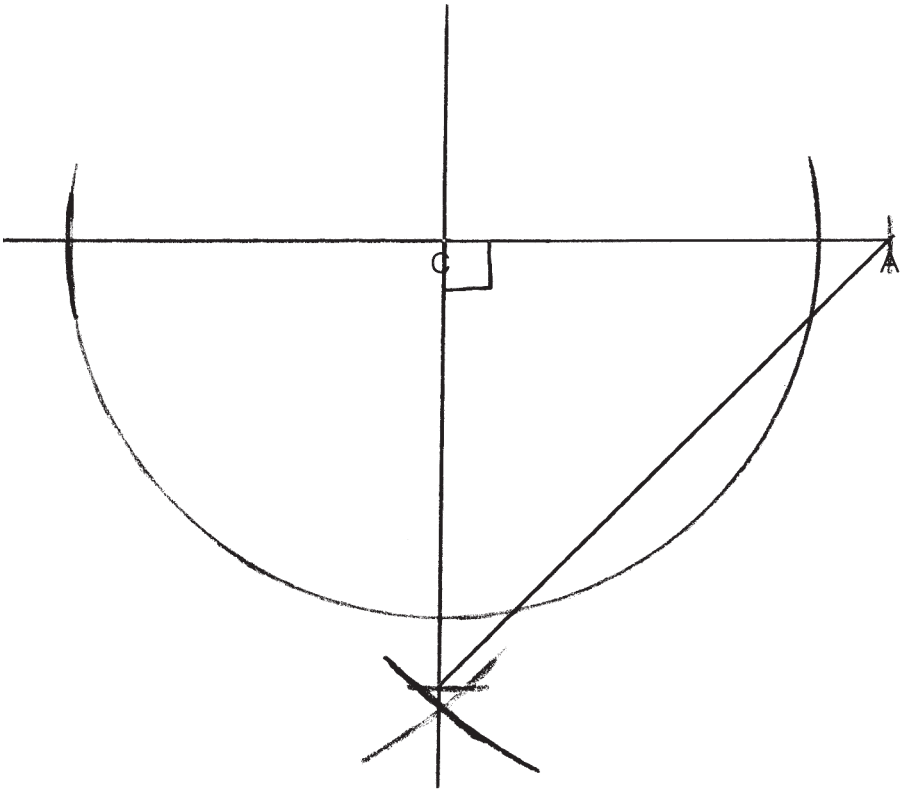


Score 2: The student gave a complete and correct response.

Question 27

27 Segment *CA* is drawn below. Using a compass and straightedge, construct isosceles right triangle *CAT* where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

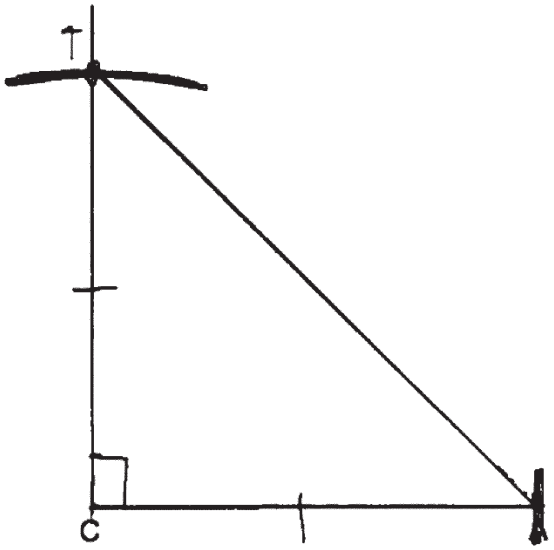


Score 2: The student gave a complete and correct response.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

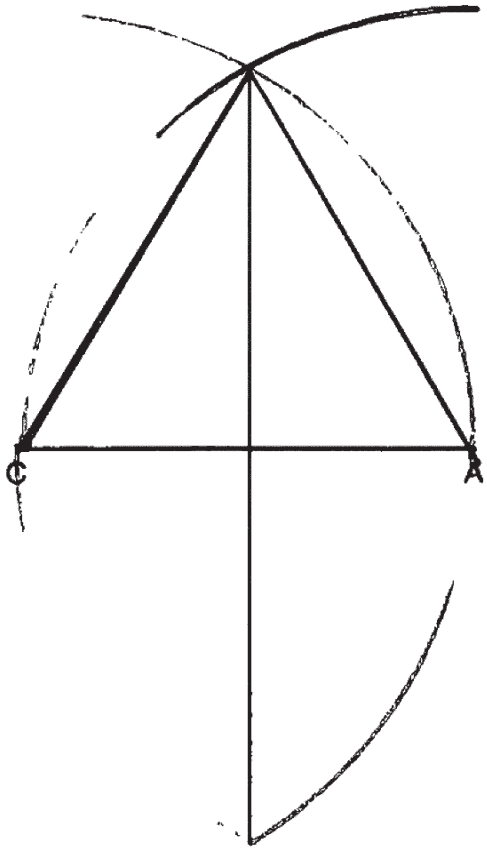


Score 1: The student constructed an isosceles triangle, but not a right triangle.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

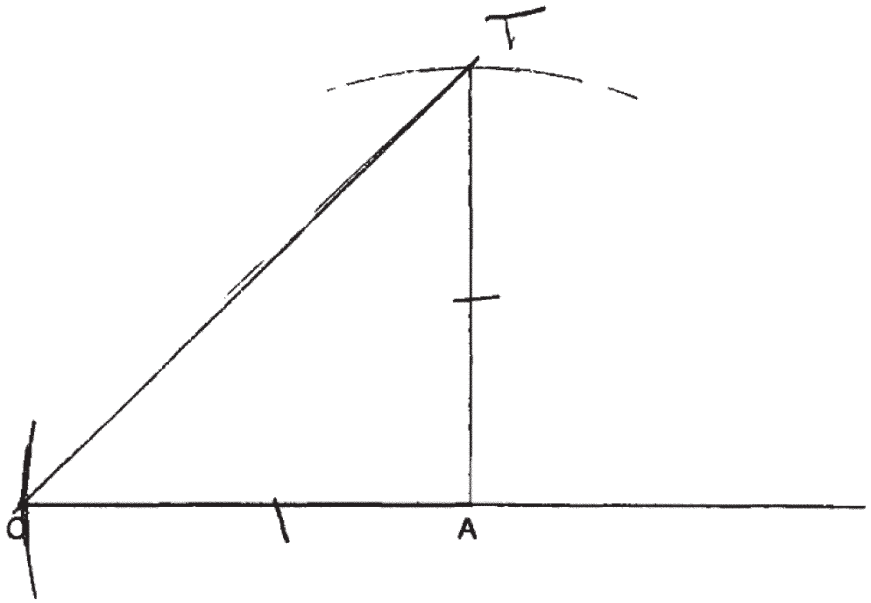


Score 1: The student constructed an isosceles triangle, but did not construct a right angle at C.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

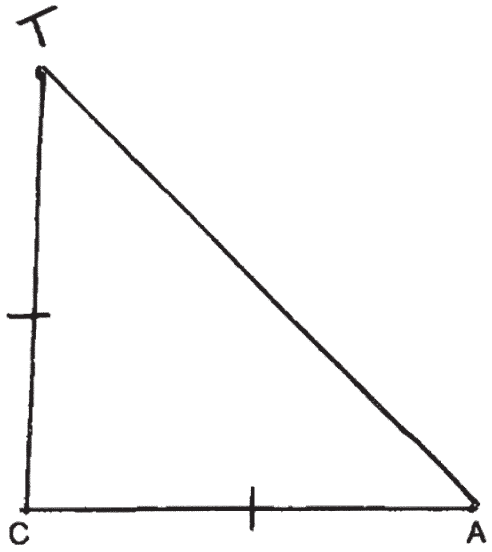


Score 0: The student did not construct $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

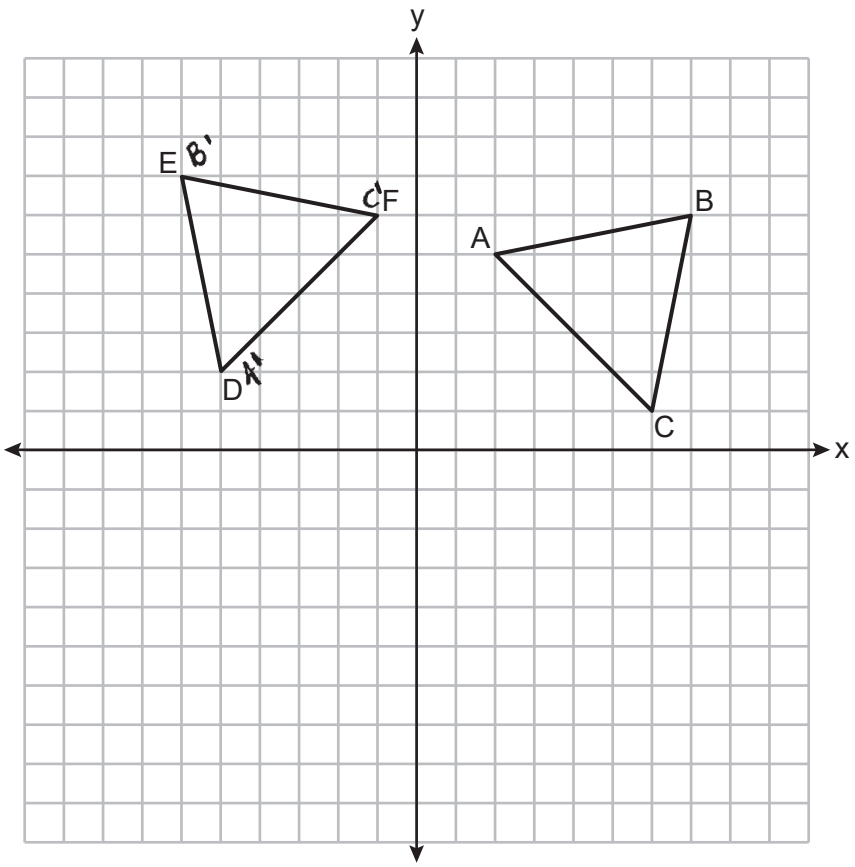
[Leave all construction marks.]



Score 0: A drawing that is not an appropriate construction is shown.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



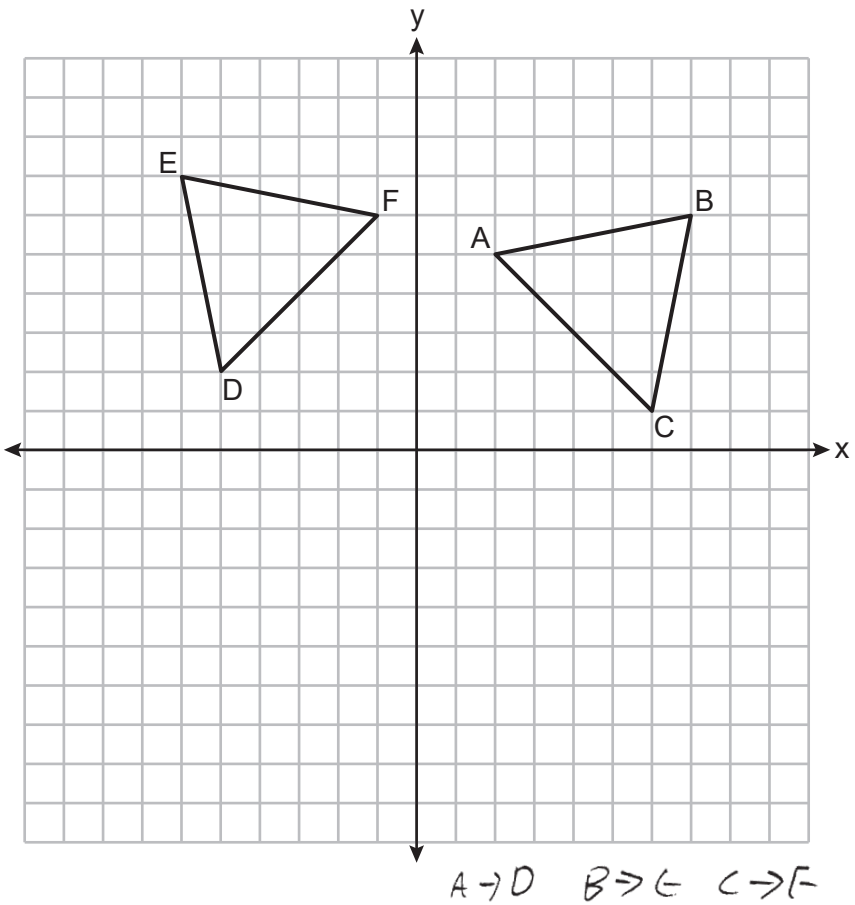
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

Rotate △ABC 90° counterclockwise about the orgin

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

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



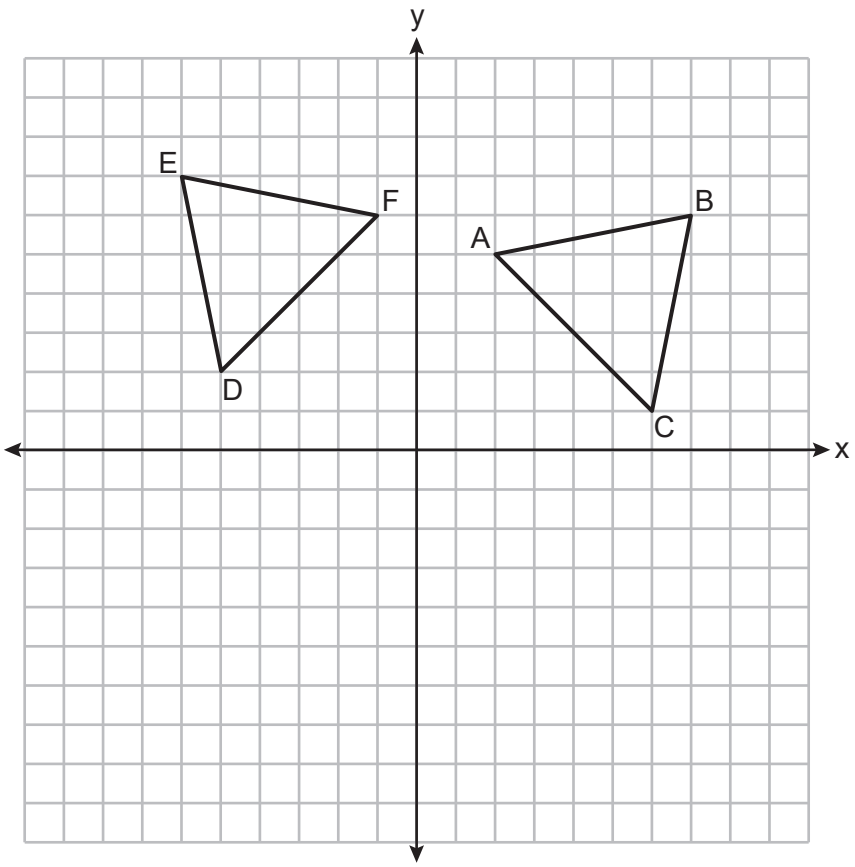
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

first, A translation of −7, −3 mapping A→D
then a counterclockwise rotation of 90° about point D,

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

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



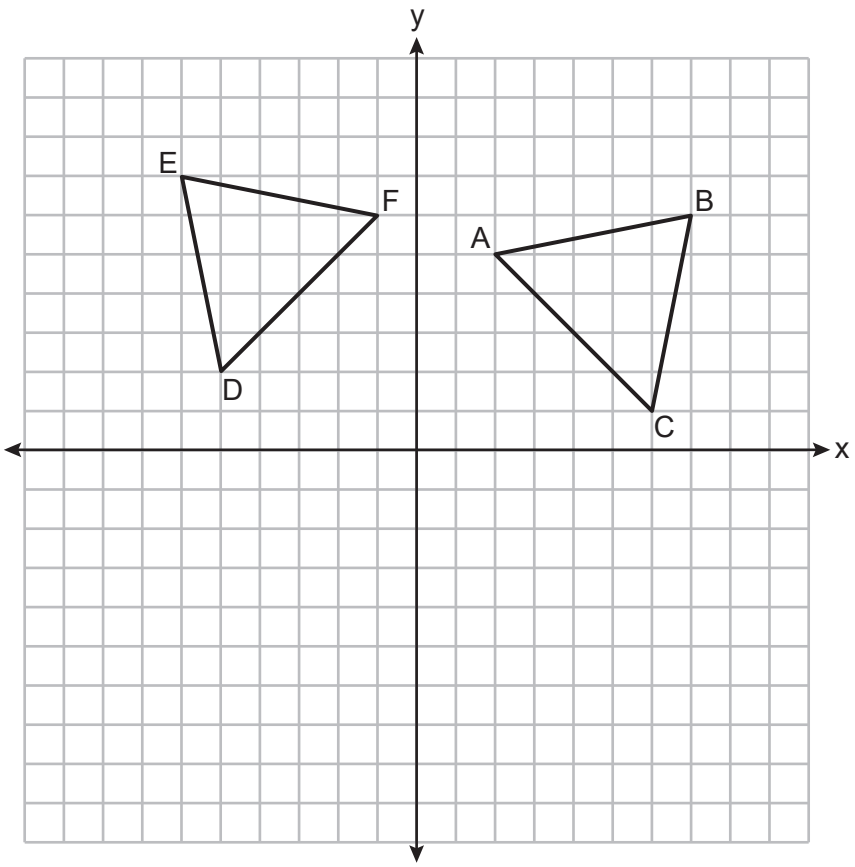
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

△ABC reflects over y-axis then translate one unit up and one unit right

Score 1: The student mapped $\triangle ABC$ onto $\triangle FED$.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



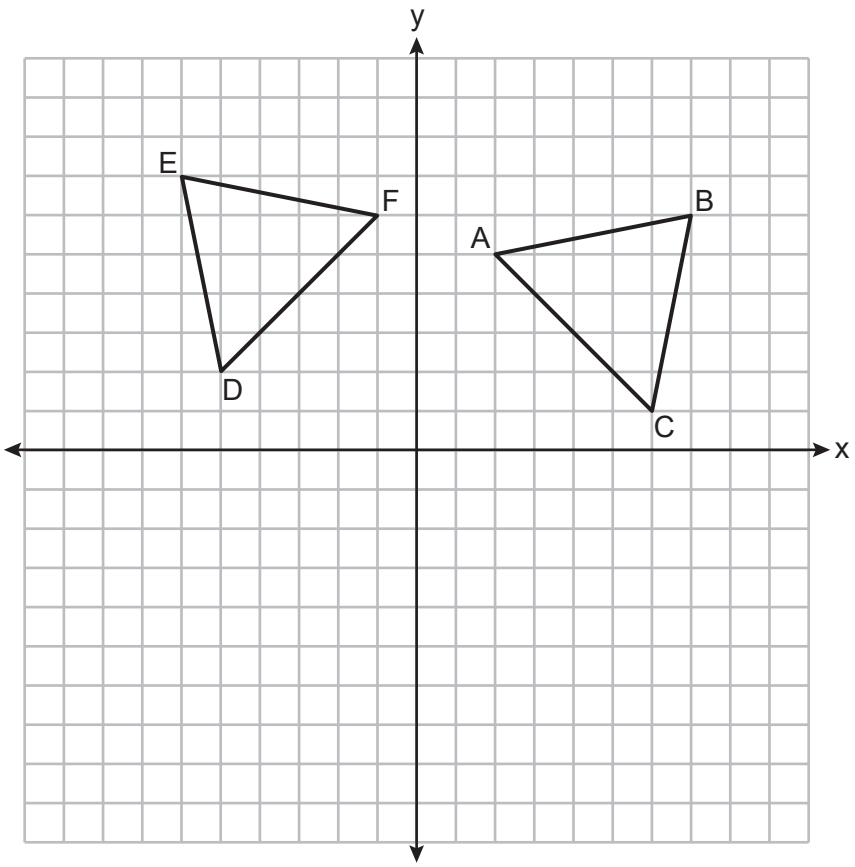
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

Translation 7 right and 3 up so that D lies on A.
Rotation around point A of 90° clockwise.

Score 1: The student mapped $\triangle DEF$ onto $\triangle ABC$.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



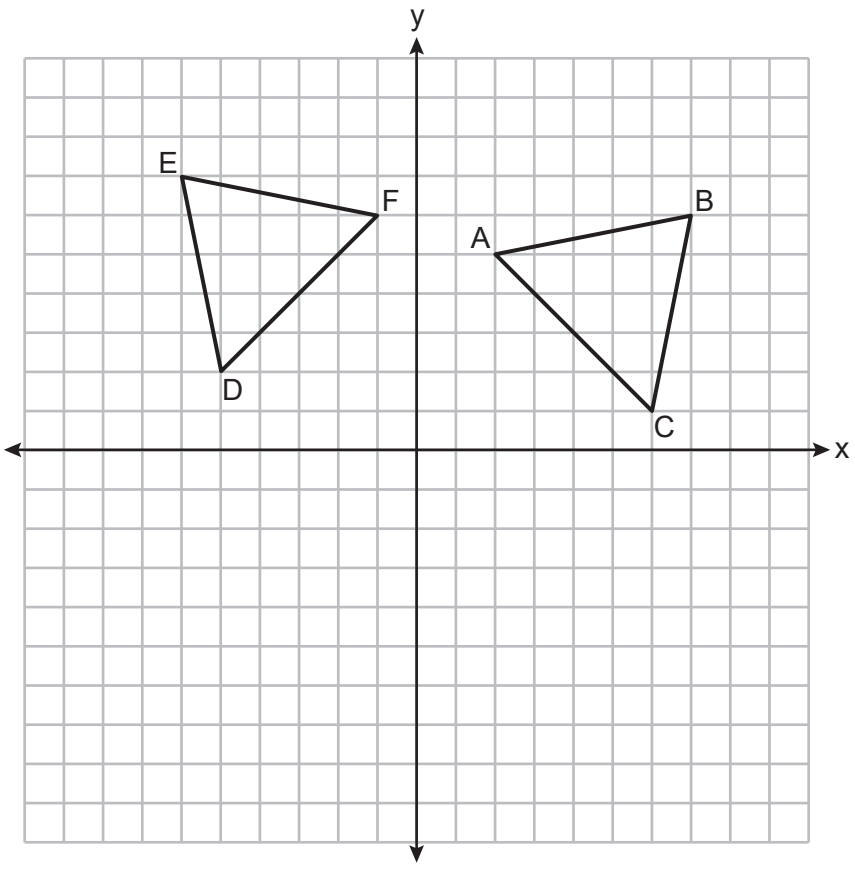
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

1. Translate up 1 unit
2. Translate left 1 unit
3. Reflection over the y-Axis

Score 1: The student mapped $\triangle ABC$ onto $\triangle FED$.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



A/D B/E C/F

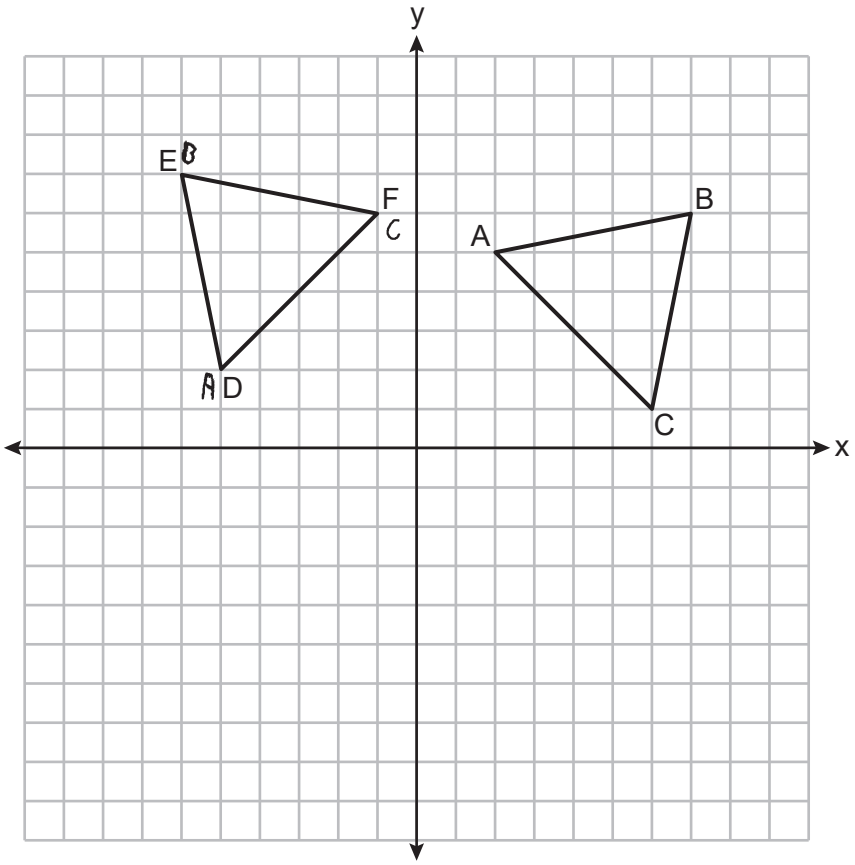
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

rotation 90° counter clockwise.

Score 1: The student did not state the center of rotation.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



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

a 90° rotation counter clockwise

A = -5, 5

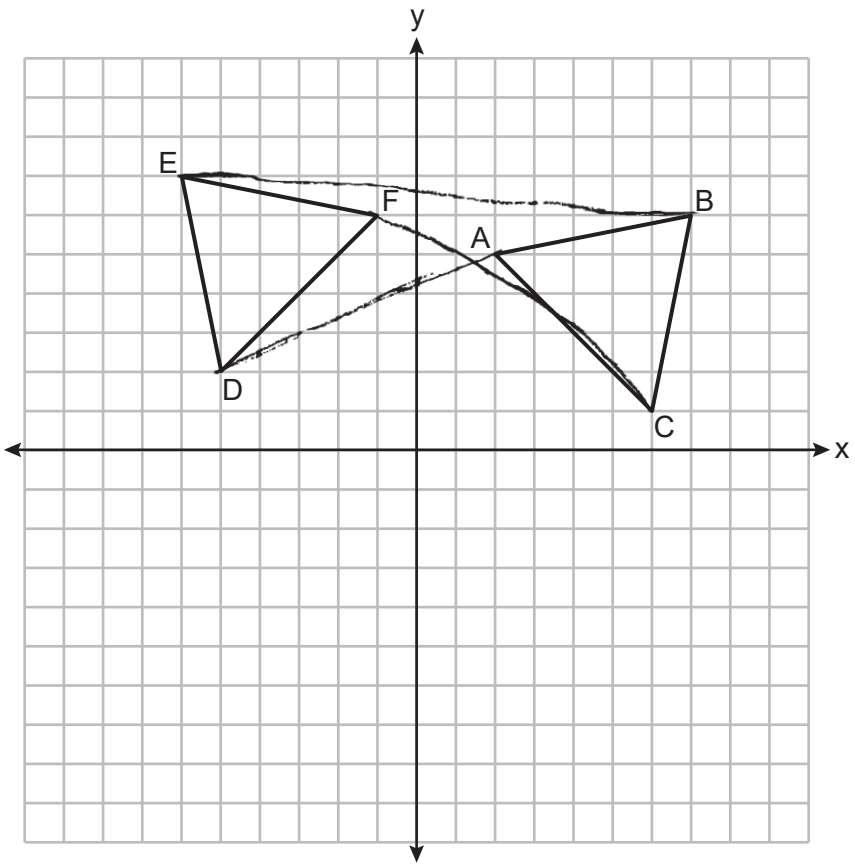
B -6, 6

-1, 6

Score 1: The student did not state the center of rotation.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



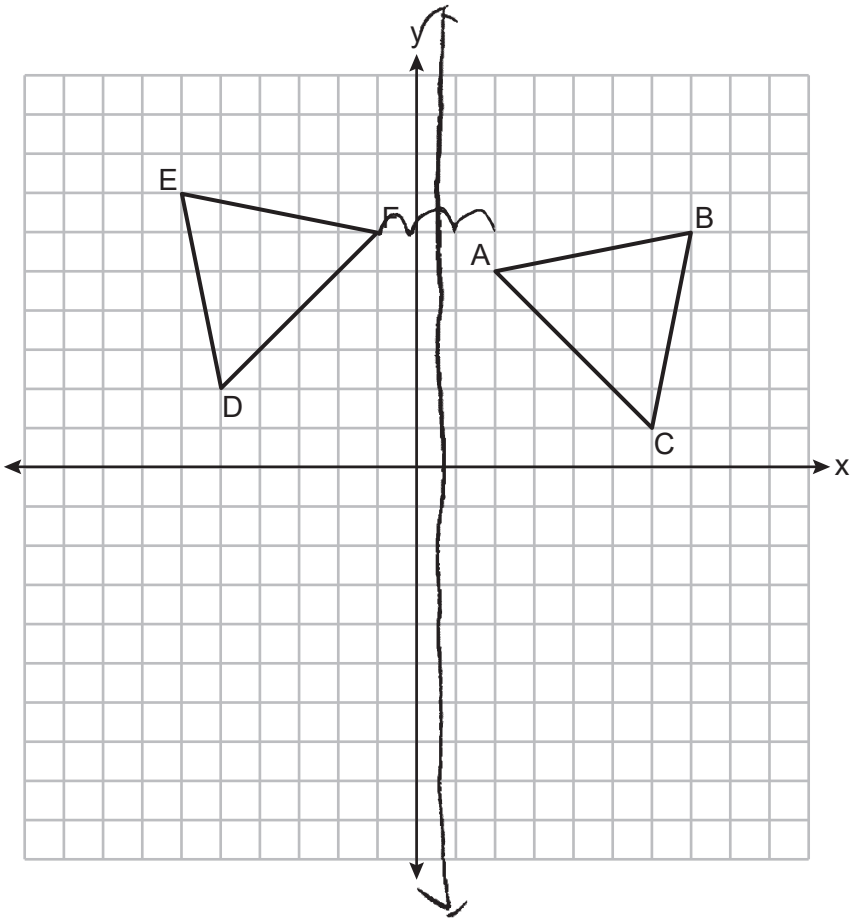
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

rotation around (0,0), 90°

Score 1: The student did not state the direction of the rotation.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



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

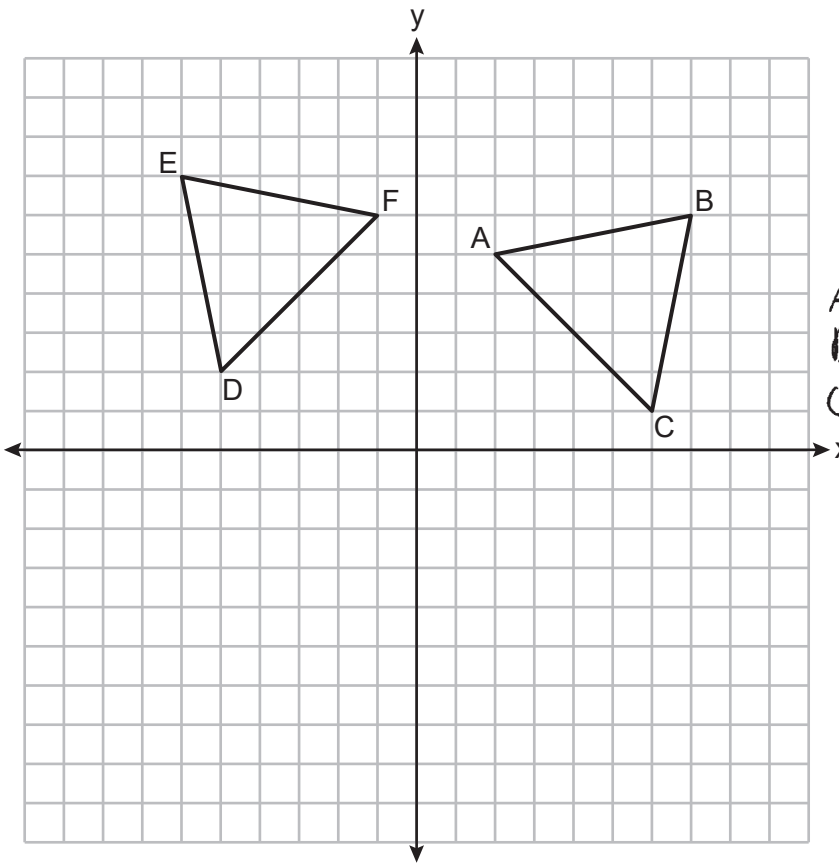
Reflect $\triangle ABC$ across line $x = \frac{1}{2}$

Translate up 1

Score 1: The student mapped $\triangle ABC$ onto $\triangle FED$.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



A(2,5) - D(-5,2)
B(7,6) - E(-6,7)
C(6,1) - F(-1,6)

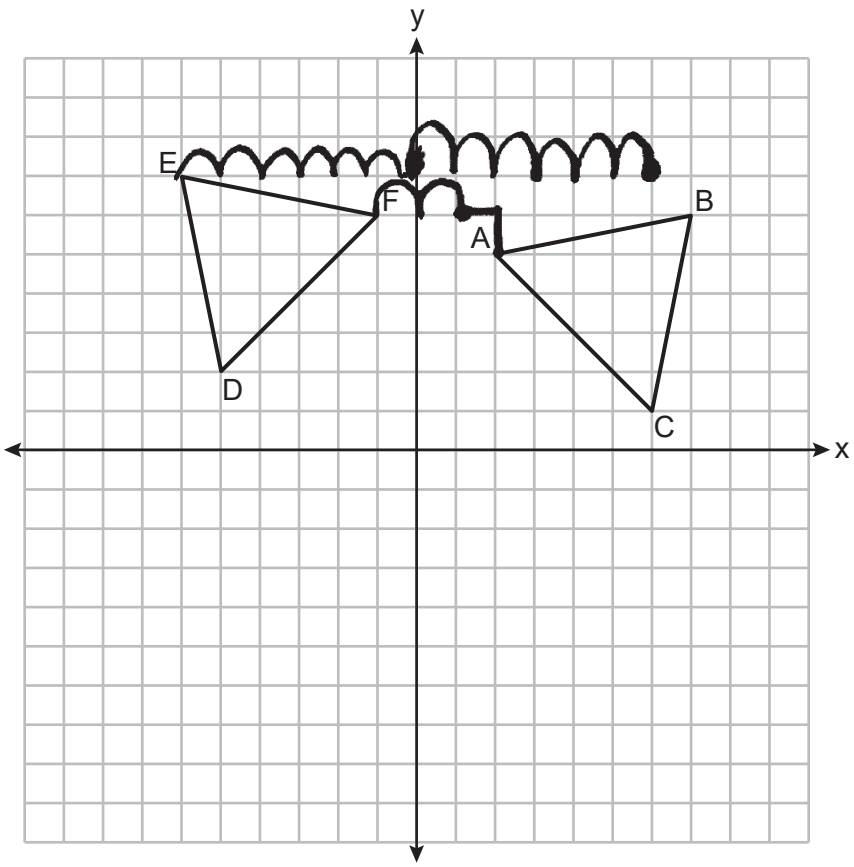
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

Rotation of 270° counterclockwise

Score 0: The student did not state the center of rotation and stated an incorrect direction of the rotation.

Question 28

28 On the set of axes below, congruent triangles *ABC* and *DEF* are graphed.



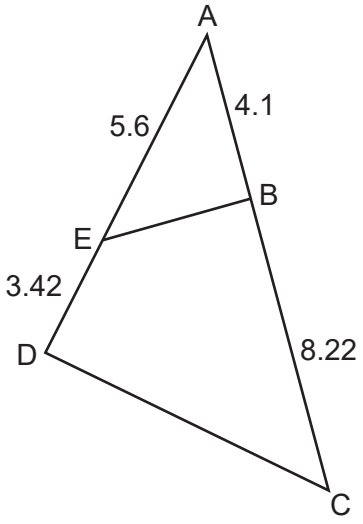
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

y-axis reflection and then a line translation of (x+1, y-1).

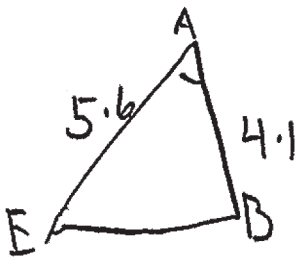
Score 0: The student gave a completely incorrect response.

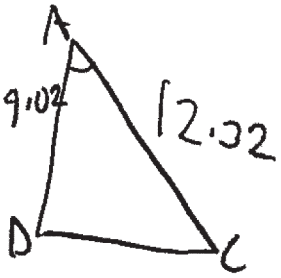
Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.





$\frac{12.32}{5.6} = 2.2$

$\frac{9.02}{4.1} = 2.2$

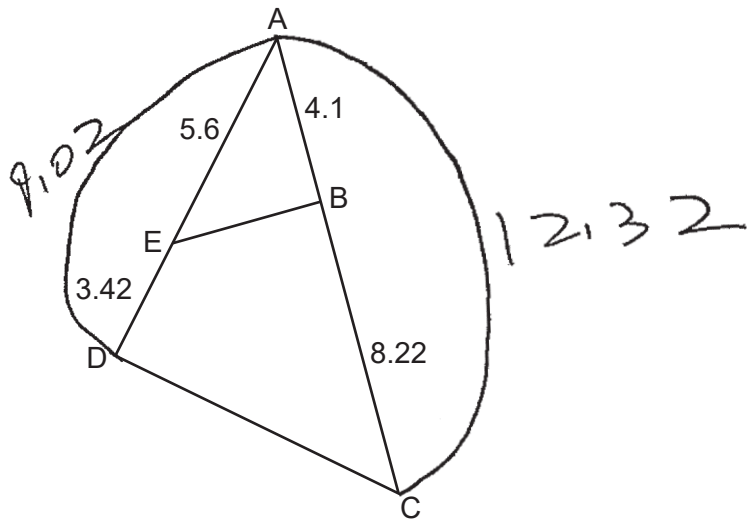
$\frac{AD}{AB} = \frac{AC}{AE}$ and $\angle A \cong \angle A$

they are similar by SAS~

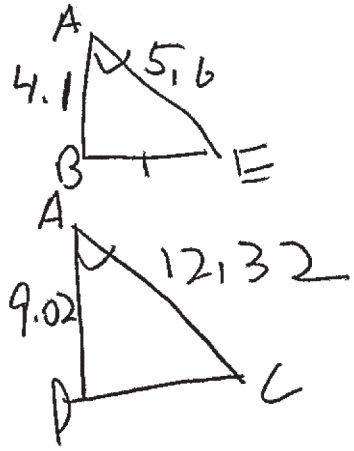
Score 2: The student gave a complete and correct response.

Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.



They are similar because they have two pairs of corresponding sides in proportion and have angle $\angle A$ in common due to same angle, $\angle A \cong \angle A$

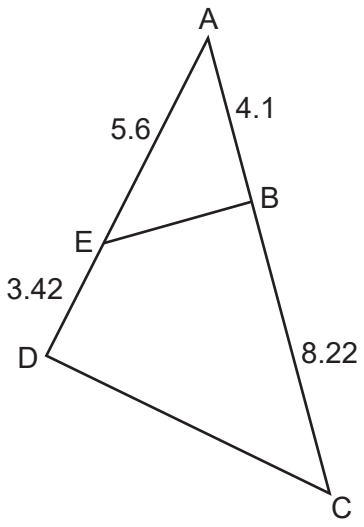
$\frac{4.1}{9.02} = \frac{5.6}{12.32}$

$\frac{5}{11} = \frac{5}{11}$

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

Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

$\frac{9.02}{4.1} = \frac{12.32}{5.6}$

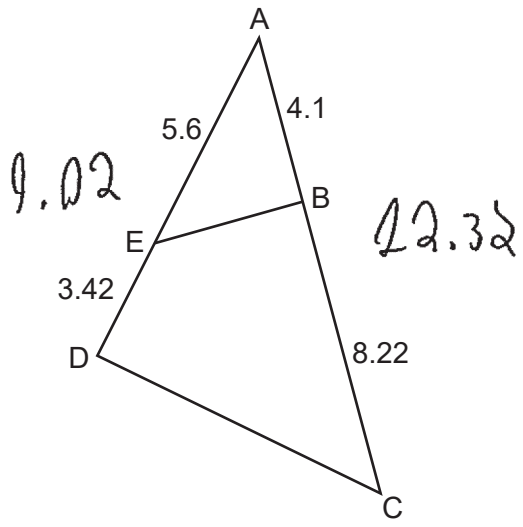
$50.512 = 50.512$ ✓

$\triangle ABE$ is ~ to $\triangle ADC$ because side lengths are proportional by scale factor $k = 2.2$

Score 1: The student wrote an incomplete explanation.

Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

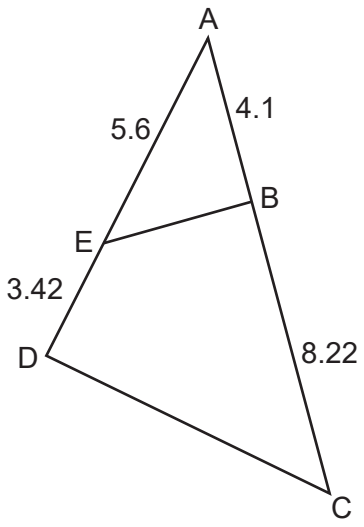
$2.2 = \frac{12.32}{5.6} = \frac{9.02}{4.1} = 2.2$

Yes because ~~Hey~~ Their sides AD & AB and AC & AE have the same ratio.

Score 1: The student wrote an incomplete explanation.

Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

Side Splitter

$\frac{5.6}{4.1} = \frac{3.42}{8.22}$

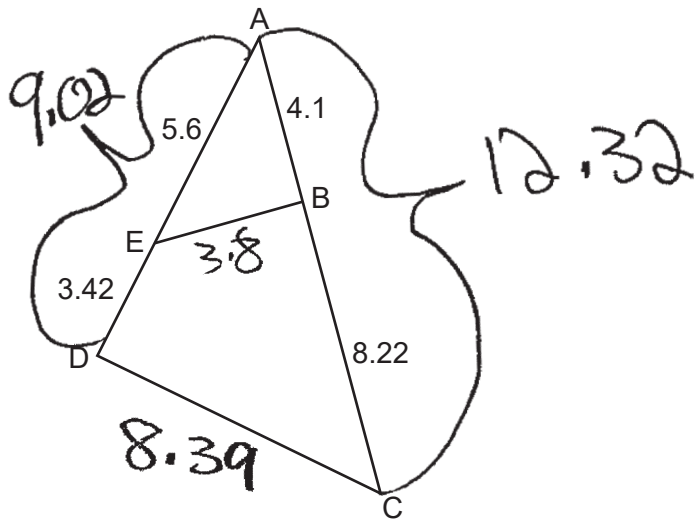
$14.022 \neq 46.032$

no, $\triangle ABE$ is ~~not~~ similar to $\triangle ADC$ b/c it does not check with the side splitter method.

Score 1: The student made an error when determining the proportional segments.

Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

$4.12^2+b^2=5.6^2$

$16.81+b^2=31.36$

$-16.81 \quad -16.81$

$\sqrt{b^2}=\sqrt{14.55}$

$b=3.8$

Both $\triangle$ are right triangles and $\triangle AEB$ is dialated by a scale factor of 2.

$9.02^2+b^2=12.32^2$

$81.36+b^2=151.78$

$-81.36 \quad -81.36$

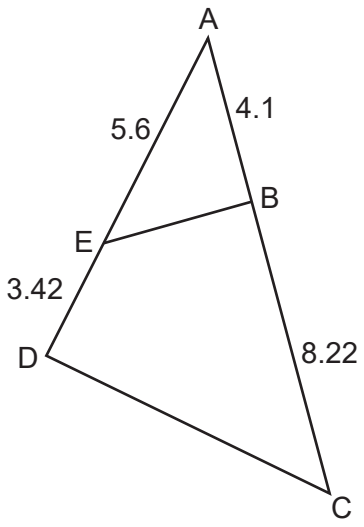
$\sqrt{b^2}=\sqrt{70.42}$

$b=8.39$

Score 0: The student did not show enough correct relevant work to receive any credit.

Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

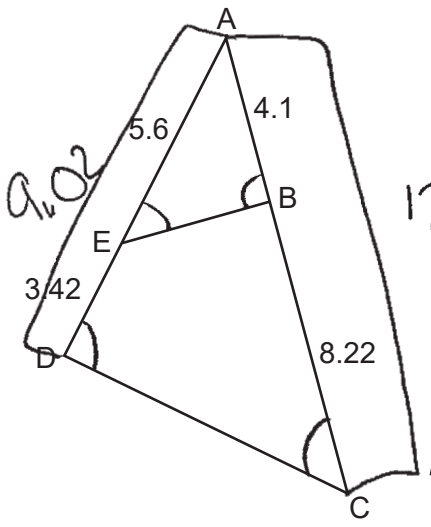
$\frac{5.6}{3.42} = \frac{4.1}{8.22}$

$\triangle ABE$ is similar to $\triangle ADC$ because the sides are proportional.

Score 0: The student gave a completely incorrect response.

Question 29

29 In $\triangle ADC$ below, $\overline{EB}$ is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Part / whole

Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

$\triangle ABE$ is similar to $\triangle ADC$ because Consecutive angles are $\cong$.

$\frac{5.6}{9.02} = \frac{4.1}{12.32}$

$68.992 = 36.982$

1.866555217

Score 0: The student gave a completely incorrect response.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$x^2 + 16x + y^2 + 12y - 44 = 0$

$+44 \quad +44$

$x^2 + 16x + y^2 + 12y = 44$

$\frac{16}{2} = (8)^2 = 64$

$\frac{12}{2} = (6)^2 = 36$

$x^2 + 16x + 64 + y^2 + 12y + 36 = 44 + 64 + 36$

$(x^2 + 16x + 64) + (y^2 + 12y + 36) = 144$

$(x + 8)(x + 8) + (y + 6)(y + 6) = 144$

$(x + 8)^2 + (y + 6)^2 = 144$

Center = $(-8, -6)$

Radius = 12

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$x^2+16x+\boxed{64}+y^2+12y+\boxed{36} = 44+\boxed{64}+\boxed{36}$

$(x+8)^2+(y+6)^2 = 144$

center: $(-8, -6)$

radius: 12

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$x^2 + 16x + 64 + y^2 + 12y - 44 = 0$

$x^2 + 16x + y^2 + 12y = 20$

$(x+8)^2 + (y+6)^2 = 20$

Center = $(-8, -6)$

Radius = 4.47

Score 1: The student determined the coordinates of the center of the circle.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$X^2 + 16x + 64 + y^2 + 12y + 36 = -44 + 36 + 64$

$(x + 8)^2 + (y + 6)^2 = 56$

Center: $(-8, -6)$

Radius = $\sqrt{56}$

Score 1: The student made an error when determining the length of the radius of the circle.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

+44

$x^2 + 16x + 64 + y^2 + 12y + 36 = 44 + 36 + 64$

$(x+8)^2 + (y+6)^2 = 144$

$\frac{1}{2}\ 144 = 72$

Center $(-8, -6)$

radius $= 72$

Score 1: The student made an error when determining the length of the radius of the circle.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$(\frac{1}{2})16$
$8^2 = 64$

$(\frac{1}{2})12$
$6^2 = 36$

$x^2+16x+64=0$
$(x+4)(x+4)=0$

$x+4=0$
$-4\ -4$
$x=-4$

$y^2+12y+36=0$
$(y+6)(y+2)=0$

$y+6=0$ $\quad y+2=0$
$y=-6$ $\quad y=-2$

$(-4,-2) \rightarrow (-4,2)$
$(-4,-6 \rightarrow (-4,6)$

Score 0: The student did not show enough correct relevant work to receive any credit.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$x^2+16x\left(\frac{16}{2}\right)^2+y^2+12y+\left(\frac{12}{2}\right)^2=-44$

$x^2+16x+64+y^2+12y+36=-44$

-8

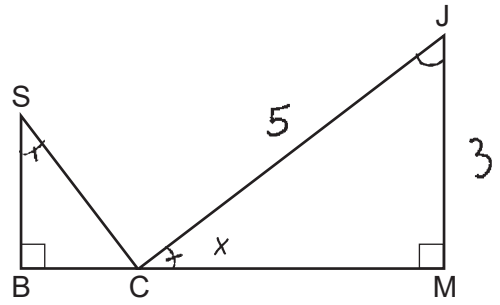
$x^2+16x+y^2+12y=56$

$(x+8)+(y+6)=56$

Score 0: The student did not show enough correct relevant work to receive any credit.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$. SOH CAH TOA



Determine and state m$\angle S$, to the *nearest degree*.

$\sin x = \frac{3}{5}$ $\sin^{-1}\left(\frac{3}{5}\right)$

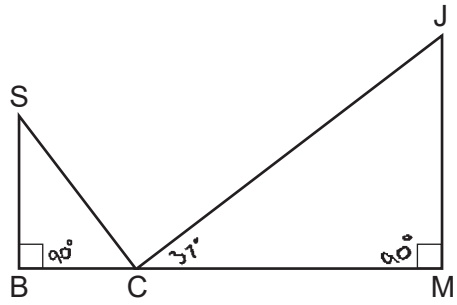
36.869897

m$\angle S \approx$ 37°

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

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the *nearest degree*.

SOH CAH TOA

Cos J = 0.6

$\cos^{-1}(0.6)$

= 53.1

= 53

53 + 90 = 143

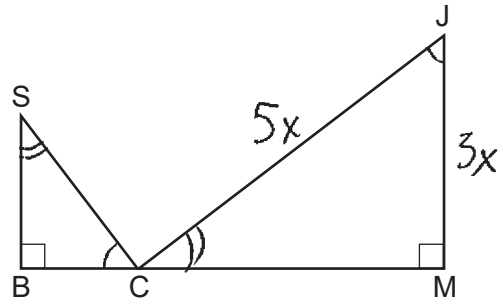
180 − 143 = 37°

m∠S = 37° because ∠S ≅ ∠JCM and ∠JCM is 37° because 53 + 90 = 143 and 180 − 143 = 37°.

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

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the *nearest degree*.

$\cos J = \frac{3}{5}$ ($\cos^{-1}$) ($\cos^{-1}$)

$90 - 53.130102 = 36.869$

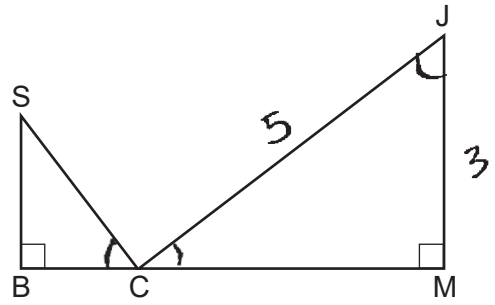
$m\angle J = 53.130102$

$m\angle S = 37°$

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

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the *nearest degree*.

$\cos J = 3/5$

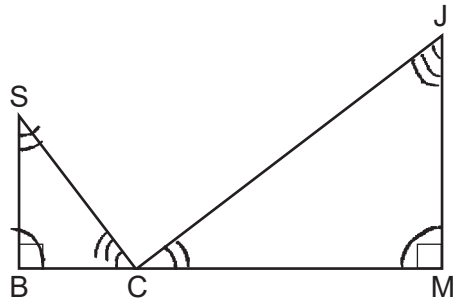
$\cos^{-1}(3/5)$ since $\triangle SBC \sim \triangle CMJ$

$m\angle S = 53.^{\circ}$

Score 1: The student made an error in determining the measure of $\angle S$.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



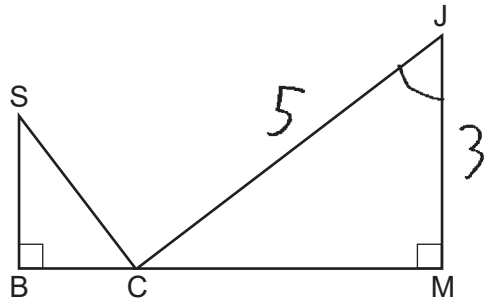
Determine and state $m\angle S$, to the *nearest degree*.

m∠S = 37° bc triangles
equal 180° and 180-143=37°

Score 1: The student determined the measure of $\angle S$, but did not show work to determine 143°.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the *nearest degree*.

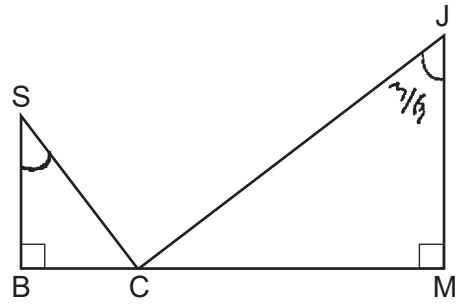
$\frac{3}{5}$

$m\angle S = \frac{1}{2}$ of $\frac{3}{5} = \frac{3}{10}$

Score 0: The student gave a completely incorrect response.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



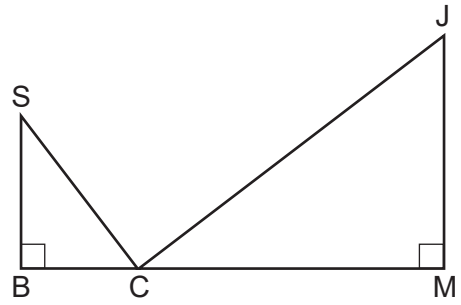
Determine and state m$\angle S$, to the *nearest degree*.

m<S is $\frac{3}{5}$ because the angles J an S are Similar.

Score 0: The student gave a completely incorrect response.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the *nearest degree*.

180 - 90 = 90

90/5 = 18

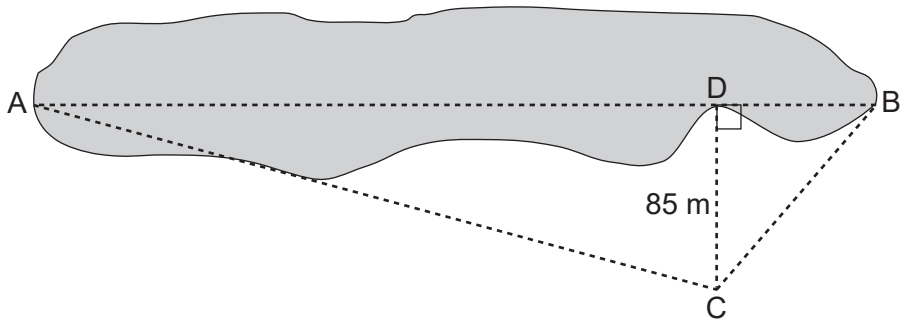
18 x 3 = 54

∠S is 54 degrees because cos B is congruent to sin A.

Score 0: The student gave a completely incorrect response.

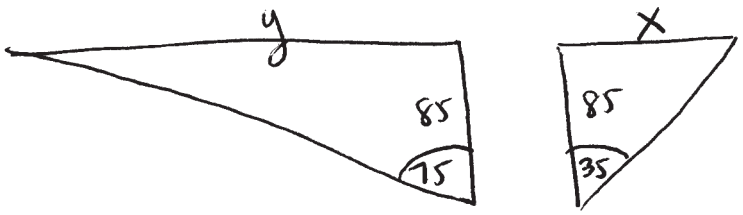
Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.



$\tan 75 = \frac{y}{85}$

$= 317.224$

$\tan 35 = \frac{x}{85}$

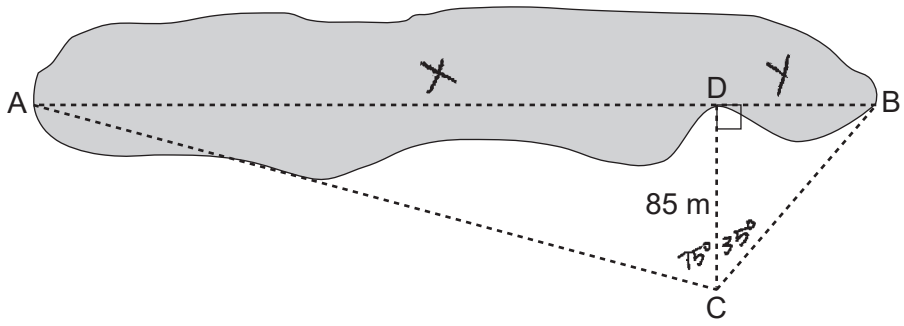
$= 59.517$

$317.224 + 59.517 = 376.741 \approx 377$

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

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.

AB=377 meters

$\tan 35° = \frac{Y}{85}$

$Y = \tan 35° (85)$

$Y = 59.5$

$\tan 75° = \frac{X}{85}$

$X = \tan 75 (85)$

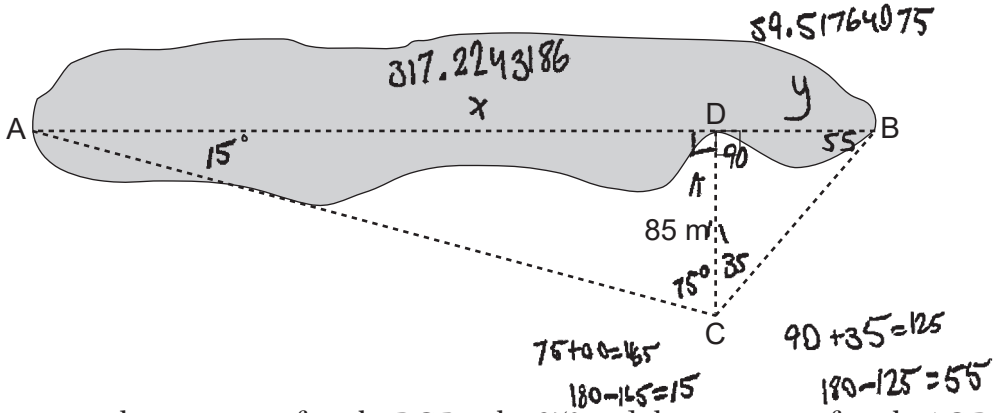
$X = 317.2$

$317.2 + 59.5 = 376.7$

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

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.

AB= 376.7419594

$85 \cdot \tan 75 = \frac{x}{85} \cdot 85$

$317.243186 = x$

$85 \cdot \tan 35 = \frac{y}{85} \cdot 85$

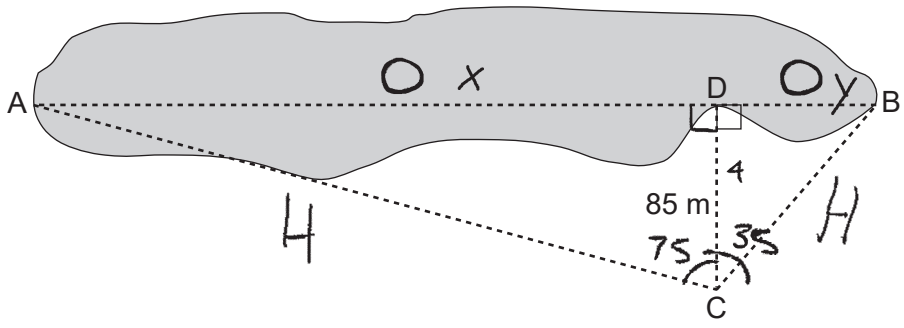
59.51764075

$x+y = 376.7419594$

Score 3: The student made one rounding error.

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.

SohCahToa

AB = 376.73

$\frac{\tan 75}{1} = \frac{x}{85}$

$3.732 \times 85 = 317.22$

$+59.51$

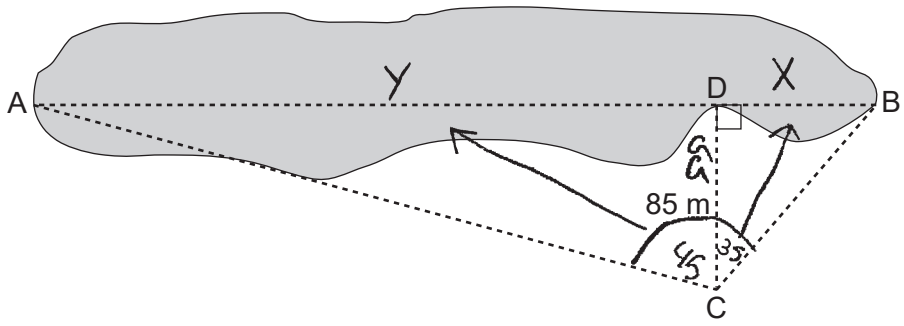
$\frac{\tan 35}{1} = \frac{y}{85}$

$.7002 \times 85 = 59.51$

Score 3: The student made one rounding error.

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.

SOH CAH TOA

$\frac{\tan 35}{1} \times \frac{X}{85}$

$X = 59.917640\overline{75}$

$\frac{\tan 45}{1} \times \frac{Y}{85}$

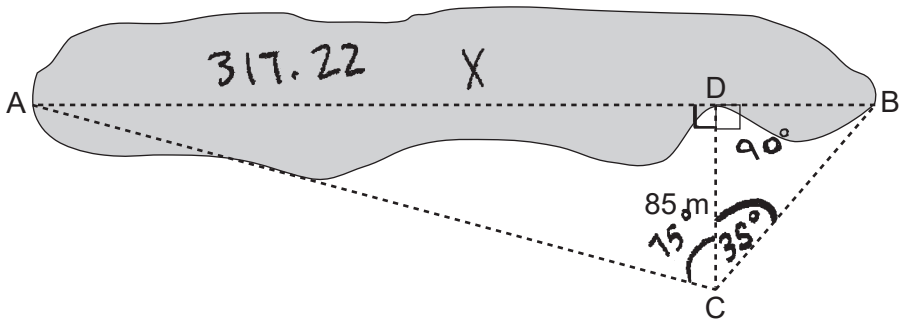
$Y = 85$

$59.917640\overline{75} + 85 = 144.5$ 145 meters

Score 3: The student made a transposition error in labeling the measure of $\angle ACD$ as 45°.

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.

$\tan 75 = \frac{X}{85}$

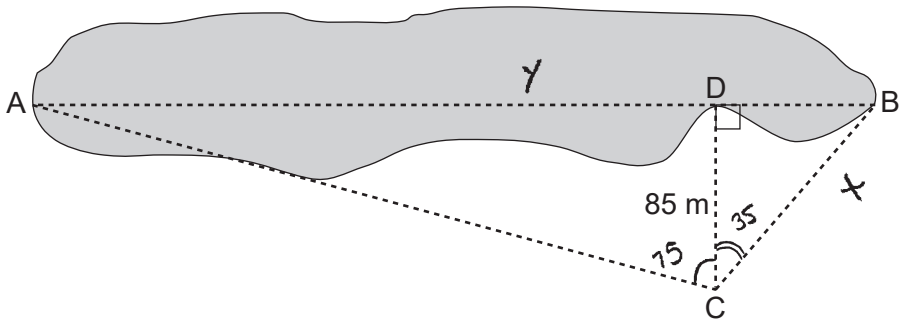
$\tan 75(85) = X$

$X = 317.22$

Score 2: The student determined the length of $\overline{AD}$.

Question 32

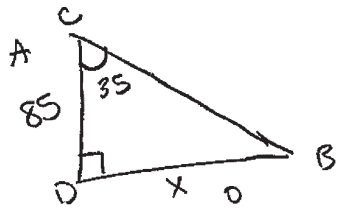
32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

AH

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.



$\frac{\cos(35)}{1} = \frac{85}{x}$

$\frac{\cos(35)x}{\cos(35)} = \frac{85}{\cos(35)}$

$= 103.76584$

OA

$\frac{\tan(75)}{1} = \frac{y}{85}$

$85\tan(75) = y$

$y = 317.2243186$

$+ 103.76584$

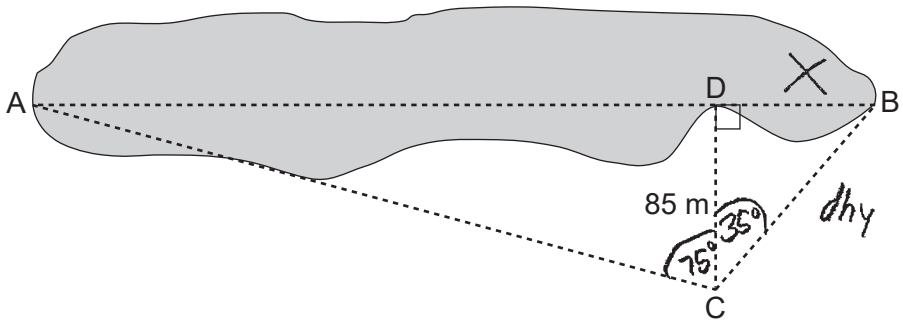
$= 420.9901586$

421 meters

Score 2: The student made a conceptual error when determining the length of $\overline{DB}$.

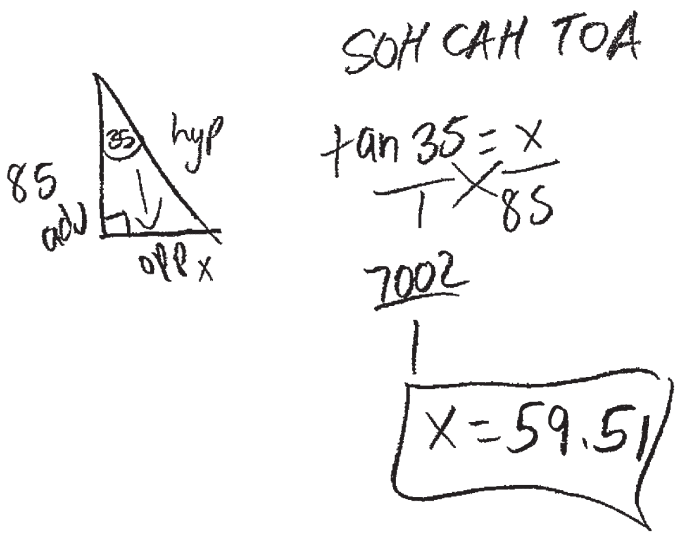
Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

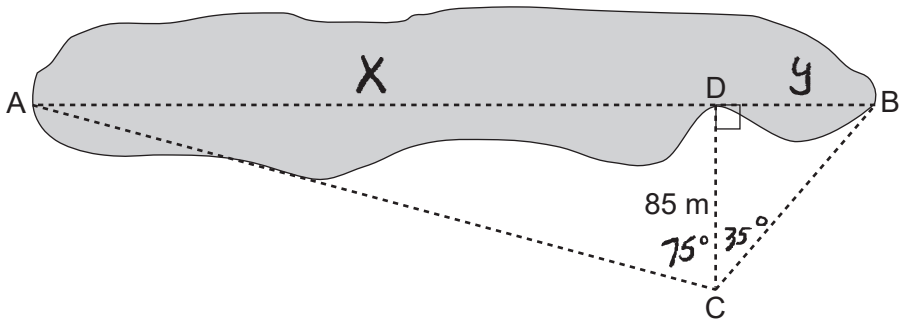
Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.



Score 2: The student determined the length of $\overline{DB}$.

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.

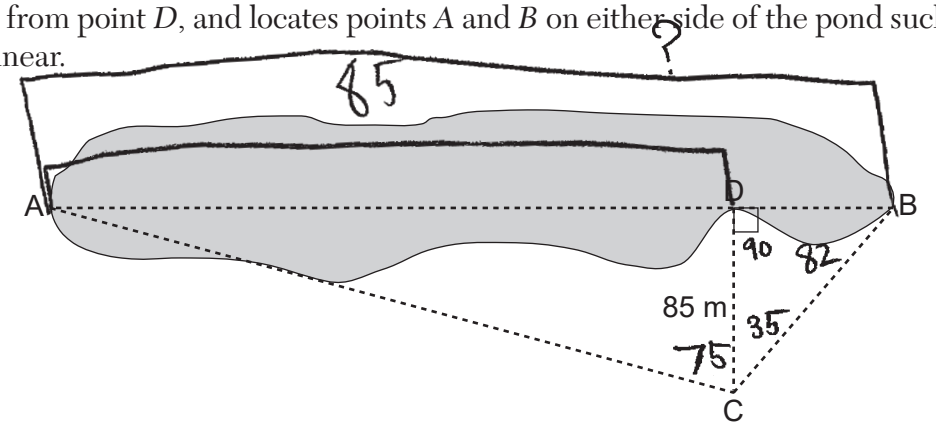
$\tan 75^\circ = \frac{x}{85}$

$\tan 35^\circ = \frac{y}{85}$

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

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C, 85 meters from point D, and locates points A and B on either side of the pond such that A, D, and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75°.

Determine and state the distance across the pond, $\overline{AB}$, to the *nearest meter*.

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

$90^2 = 35^2 + b^2$

$8100 = 1225 + b^2$

$-1225 \quad -1225$

$\sqrt{6875} = \sqrt{b^2}$

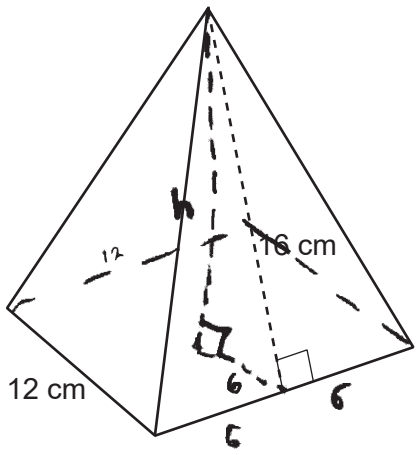
$b = 82.9$

$AB = 180^0$

Score 0: The student gave a completely incorrect response.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$12 \div 2 = 6$

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

$x^2 + 6^2 = 16^2$

$x^2 + 36 = 256$

$-36 \quad -36$

$\sqrt{x^2} = \sqrt{220}$

$x = 14.83239697$

$V = \frac{1}{3}Bh$

$V = \frac{1}{3}(l \cdot w)(h)$

$V = \frac{1}{3}(12 \times 12)(14.83239697)$

$V = \frac{1}{3}(144)(14.83239697)$

$V = \frac{1}{3}(2{,}135.865164)$

$V = 711.9550548$

$V \approx 712 cm^3$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$D = \frac{W}{V}$

$\frac{0.032 oz}{1 cm^3} = \frac{W}{712 cm^3}$

$W = 0.032 \cdot 712$

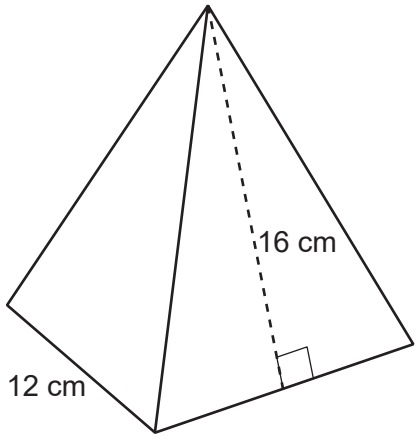
$W = 22.784$

$W \approx 23$

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

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.

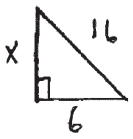


Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$V = \frac{1}{3}Bh$

$V = \frac{1}{3}(12)(12)(14.832)$

$712\ cm^3$



$6^2 + x^2 = 16^2$

$36 + x^2 = 256$

$-36 \quad -36$

$\sqrt{x^2} = \sqrt{220}$

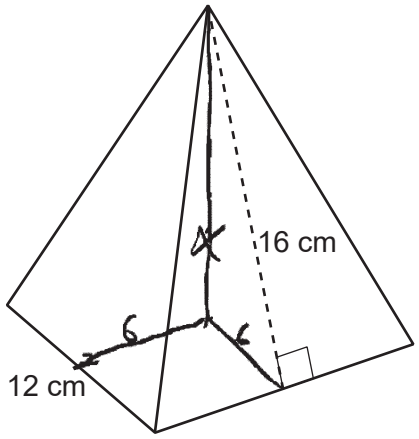
$x = 14.83$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

Score 3: The student found the volume of the candle, but did not find the weight of the candle.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$16^2 - 6^2 = x^2$

$256 - 36 = x^2$

$x^2 = 220$ $x = 14.832$

pyramid $V = \frac{1}{3}Bh$

$V = \frac{1}{3}(12^2) \cdot 14.832 = 711.936$

$V = 712$

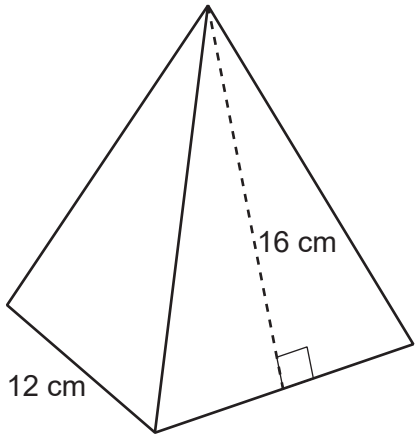
The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$0.032 \cdot 712 = 22.7 \approx 23$ lbs

Score 3: The student labeled the wrong unit of weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$V = \frac{1}{3}Bh$

$V = \frac{1}{3}(144)(16)$

$V = \frac{1}{3}(2304)$

$V = 768\ cm^3$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$0.032(768)$

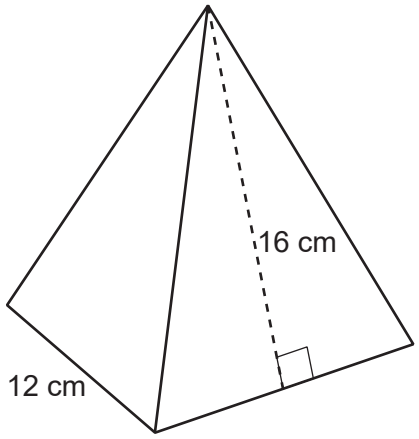
24.576 ounces

25 ounces

Score 2: The student made a conceptual error using 16 as the height.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



$x^2+6^2=16^2$

$x^2+36=256$

$-36 \quad -36$

$x^2=220$

$x=14.8323$

$x=15$

Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$V=\frac{1}{3}B\cdot h$

$=\frac{1}{3}(12)(12)(15)$

$V=720$

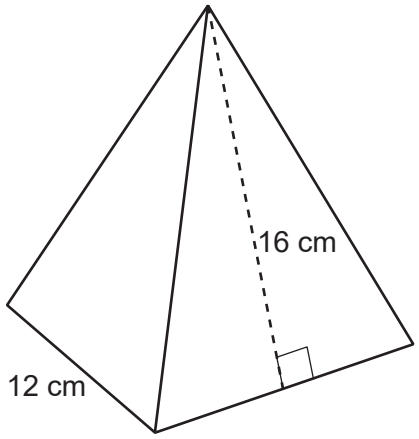
The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$\frac{720}{.032}=22{,}500$

Score 2: The student rounded the height which led to an incorrect volume. The student made an error in determining the weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



$6^2 + 16^2 = c^2$

$292 = c^2$

$\sqrt{292} = c$

Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$V = \frac{1}{3}Bh$

$V = \frac{1}{3} \cdot 144 \cdot \sqrt{292}$

$V = 820.22$

$V = 820$

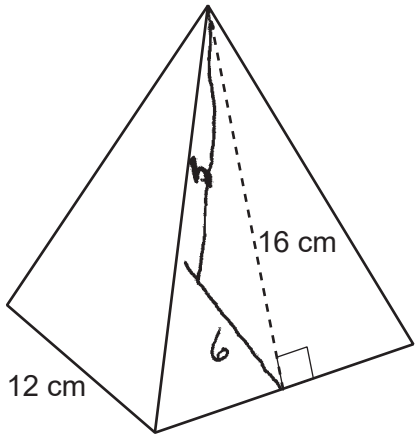
The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$(.032)(820) = 26.2$

Score 2: The student made an error when determining the height and made a rounding error when determining the weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$6^2 + h^2 = 16^2$

$36 + h^2 = 256$

$h^2 = 220$

$h = \sqrt{220}$

$V = Bh$

$V = (12 \cdot 12)(\sqrt{220})$

$V = 144(\sqrt{220})$

$V = 2135.865$

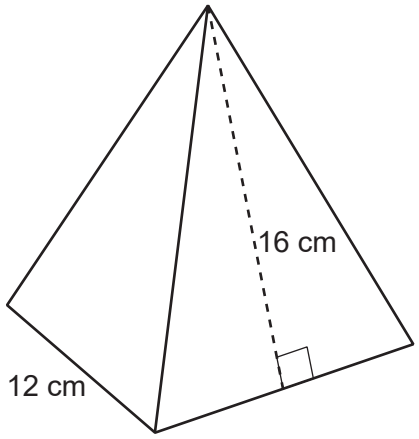
$V = 2136$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

Score 2: The student found the height of the pyramid correctly, but used an incorrect formula when determining the volume. No further correct work is shown.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



$V = \frac{1}{3}BH$

Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$V = \frac{1}{3}BH$

$V = \frac{1}{3}(12 \times 16)$

$V = \frac{1}{3}(192)$

$V = \frac{1}{1} \times \frac{192}{1} = 64$

$V = 64\ cm^3$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$$\frac{0.032\ \text{ounce}}{x} = \frac{1\ cm^3}{64\ cm^3}$$

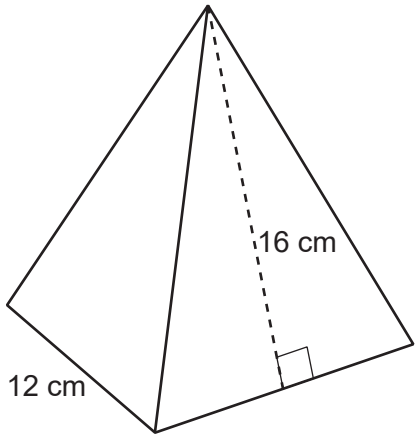
$x = 2.048$ ounces

$x = 2$ ounce

Score 1: The student found an incorrect volume, but found an appropriate weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

The volume of the candle is 11.5 cm.

12×cos16
11.53514035
11.5

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

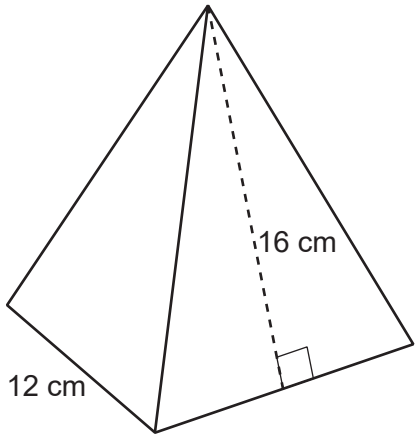
11.5×0.032=0.368

The candle weighs 0.368 pands.

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$V = \frac{1}{3}bh$

$V = \frac{1}{3}(12)(16)$

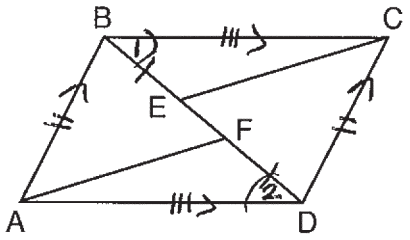
$V = 64\,cm^3$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

Score 0: The student gave a completely incorrect response.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



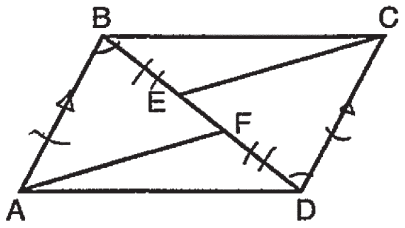
Prove: $\overline{CE} \cong \overline{AF}$

Statements	Reasons
① Quad ABCD, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$	① given
⑤ $\overline{BE} \cong \overline{DF}$	
② ABCD is a p-gram	② if a quad has one pair of opp sides $\parallel$ and $\cong$, it is a p-gram
③ $\overline{BC} \parallel \overline{AD}$	③ opp sides of a p-gram are $\parallel$
⑤ ④ $\overline{BC} \cong \overline{AD}$	④ opp sides of a p-gram are $\cong$
A ⑤ $\angle 1 \cong \angle 2$	⑤ if lines are $\parallel$ and cut by a transv., alt. int. $\angle$'s are $\cong$
⑥ $\triangle BCE \cong \triangle DAF$	⑥ SAS $\cong$ SAS
⑦ $\overline{CE} \cong \overline{AF}$	⑦ CPCTC

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



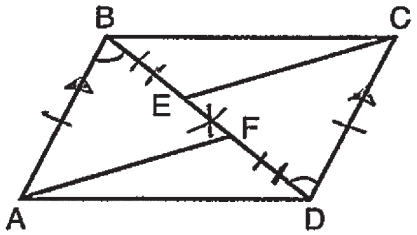
Prove: $\overline{CE} \cong \overline{AF}$

Statement	Reason
1). $\overline{AB} \cong \overline{CD}$ $\overline{AB} \parallel \overline{CD}$. $\overline{BE} \cong \overline{DF}$	1). Given
2). $\overline{BE} + \overline{EF} = \overline{BF}$ $\overline{DF} + \overline{EF} = \overline{DE}$	2). A segment is equal to the sum of its parts
2.5). $\overline{EF} \cong \overline{EF}$	2.5). Reflexive
3). $\overline{BE} + \overline{EF} \cong \overline{DF} + \overline{EF}$	3). Addition
4). $\overline{BF} \cong \overline{DE}$	4). Substitution Property of Equality
5). $\angle ABE \cong \angle CDF$	5). when $\parallel$ lines are cut by a transversal alt. int. $\angle$'s are $\cong$.
6). $\triangle ABF \cong \triangle CDE$	6). SAS Congruence theorem
7). $\overline{CE} \cong \overline{AF}$	7). corres. parts of $\cong$ $\triangle$'s are $\cong$.

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



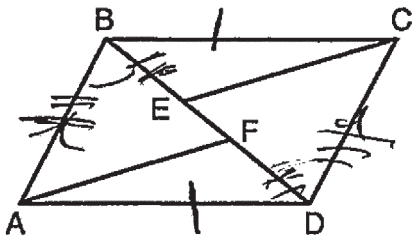
Prove: $\overline{CE} \cong \overline{AF}$

Statements	Reasons
① Quad ABCD, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, $\overline{BD}$ is a diagonal, $\overline{BE} \cong \overline{DF}$.	① givens
② $\angle ABF \cong \angle CDE$	② when parallel lines are cut by a transversal, they form two congruent alternate interior angles
③ $\overline{EF} \cong \overline{FE}$	③ reflexive property
④ $\overline{BE} + \overline{EF} \cong \overline{DF} + \overline{FE}$ or $\overline{BF} \cong \overline{DE}$	④ addition
⑤ $\triangle AFB \cong \triangle CED$	⑤ SAS $\cong$ SAS
⑥ $\overline{AF} \cong \overline{CE}$	⑥ CPCTC

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



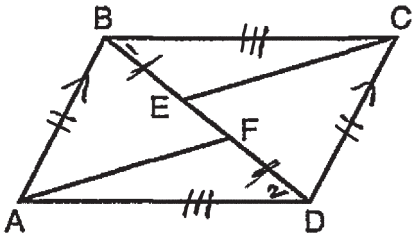
Prove: $\overline{CE} \cong \overline{AF}$

Statement	Reason
1) ABCD is a quadrilateral; $\overline{AB}$ is $\cong$ and $\parallel$ to $\overline{CD}$; $\overline{CE}$ and $\overline{AF}$ are drawn to diagonal $\overline{BD}$ so that $\overline{BE} \cong \overline{DF}$	1) Given
2) ABCD is a parallelogram	2) When one pair of opposite sides of a quadrilateral are parallel and congruent the quad is a parallelogram
3) $\overline{AD} \cong \overline{BC}$	3) opposite sides of a parallelogram are congruent
4) $\angle CDB \cong \angle ABD$	4) Alt. Int. angles
5) $\angle CDA \cong \angle CBA$	5) opposite angles of parallelogram are congruent
6) $\angle CDA - \angle CDB \cong \angle CBA - \angle ABD$ or $\angle BDA \cong \angle CBD$	6) When 2 congruent quantities are subtracted from 2 congruent quantities the results are congruent.
7) $\triangle FDA \cong \triangle EBC$	7) SAS
8) $\overline{CE} \cong \overline{AF}$	8) CPCTC

Score 3: The student had an incomplete reason in step 4.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



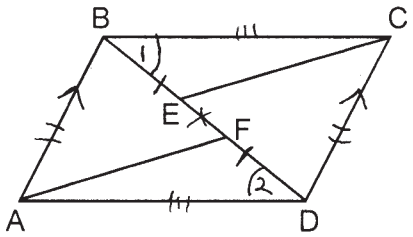
Prove: $\overline{CE} \cong \overline{AF}$

S	R
1) Quad ABCD, $\overline{AB}$ is $\cong$ and // to $\overline{CD}$. Segments CE and $\overline{AF}$ are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$	1) Given
2) Quad ABCD is a p.gram	2) opp. sides $\cong$ and // → p.gram
3) $\overline{BC}$ and $\overline{AD}$ $\cong$	3) opp. sides $\cong$ in p.gram
4) $\angle 1 \cong \angle 2$	4) If // lines → alt. int. $\angle$'s $\cong$
5) $\triangle BCE \cong \triangle DAF$	5) SAS
6) $\overline{CE} \cong \overline{AF}$	6) CPCTC

Score 3: The student had one missing statement and reason to prove step 4.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



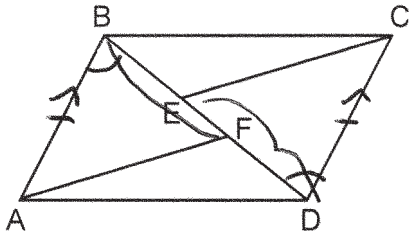
Prove: $\overline{CE} \cong \overline{AF}$

1. Quad ABCD, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, $\overline{CE}$ & $\overline{AF}$ are drawn to diagonal $\overline{BD}$ $\overline{BE} \cong \overline{DF}$	1. Given
2. ABCD is a parallelogram	2. If one pair of opposite sides of a quad are $\cong$ and $\parallel$, it is a parallelogram.
3. $\angle 1 \cong \angle 2$	3. Alternate interior angles are $\cong$.
4. $\overline{BC} \cong \overline{AD}$	4. opposite sides of a $\square$ are $\cong$.
5. $\triangle ADF \cong \triangle CBE$	5. SAS $\cong$ SAS
6. $\overline{CE} \cong \overline{AF}$	6. CPCTC

Score 2: The student had one missing statement and reason to prove step 3 and an incomplete reason in step 3.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



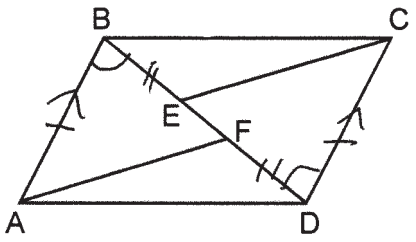
Prove: $\overline{CE} \cong \overline{AF}$

Statement	Reason
① Quad ABCD, $\overline{AB} \cong \overline{CD}$ $\overline{AB} \parallel \overline{CD}$ $\overline{CE}$ & $\overline{AF}$ drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$	① Given
② $\overline{BE} + \overline{EF} \cong \overline{DF} + \overline{EF}$ $\overline{BF} \cong \overline{DE}$	② Addition Property
③ $\angle ABF \cong \angle CDE$	③ If 2 lines $\parallel$, then Alternate Interior $\angle$'s $\cong$
④ $\triangle BAF \cong \triangle DCE$	④ SAS
⑤ $\overline{CE} \cong \overline{AF}$	⑤ Sides of $\cong$ $\triangle$'s

Score 2: The student had a missing statement and reason to prove step 2 and had an incorrect reason in step 5.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



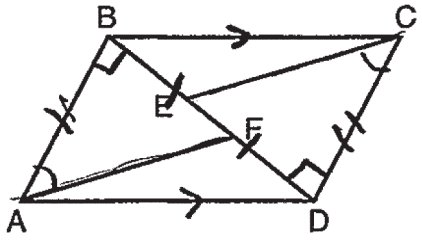
Prove: $\overline{CE} \cong \overline{AF}$

1. Quad ABCD $\overline{AB} \cong \overline{CD}$ (S≅S) $\overline{AB} \parallel \overline{CD}$ $\overline{BE} \cong \overline{DF}$ (S≅S)	1. Given
2. $\angle ABF \cong \angle CDE$ (a≅a)	2. Parallel lines form ≅ alternate interior angles
3. $\triangle ABF \cong \triangle CDE$	3. SSA ≅ SSA
4. $\overline{CE} \cong \overline{AF}$	4. Segments are ≅.

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal $\overline{BD}$ such that $\overline{BE} \cong \overline{DF}$.



Prove: $\overline{CE} \cong \overline{AF}$

Statements	reasons
1.) $\overline{AB}$ is congruent and parallel to $\overline{CD}$. $\overline{BE} \cong \overline{DF}$	1.) Given
2.) $\angle A \cong \angle C$	2.) alternate interior angles congruent
3.) $\angle B$; $\angle D$ are right angles	3.) def of perpendicular lines
4.) $\angle B \cong \angle D$	4.) all right angles congruent
5.) $\overline{CE} \cong \overline{AF}$	5.) opposite sides are both parallel and congruent

Score 0: The student gave a completely incorrect response.

Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$m = -4/8 = -1/2$

Slope of line $\overline{MA} = -1/2$

Slope of line $\overline{HT} = -1/2$

So: $\overline{MA} \parallel \overline{HT}$

Since the slopes of $\overline{MA}$ and $\overline{HT}$ are equal, $\overline{MA}$ and $\overline{HT}$ are parallel.

Quadrilateral MATH is a trapezoid because it has a pair of parallel sides.

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

$Y(7,3)$

Question 35 is continued on the next page.

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

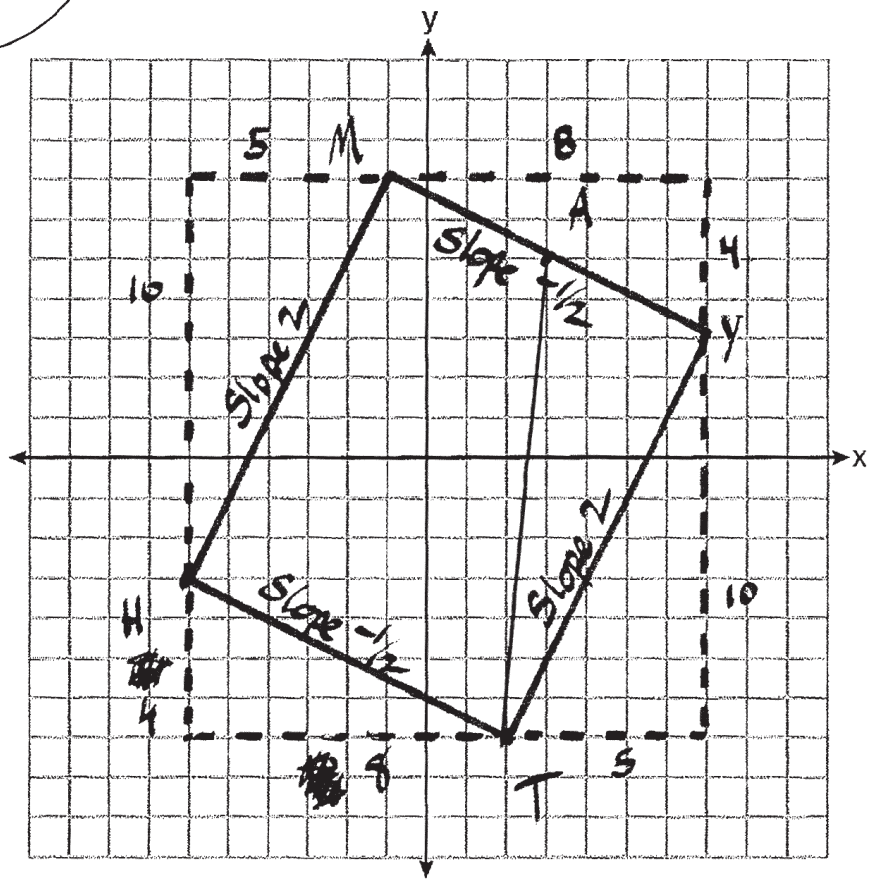
Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]

Slope of $\overline{MY} = -1/2$
Slope of $\overline{HT} = -1/2$
Slope of $\overline{HM} = 2$
Slope of $\overline{TY} = 2$

Since the slopes of $\overline{MY}$ and $\overline{HT}$ are equal, $\overline{MY}$ and $\overline{HT}$ are parallel.
Since the slopes of $\overline{HM}$ and $\overline{TY}$ are equal, $\overline{HM}$ and $\overline{TY}$ are parallel.
∴ MYTH is a parallelogram.
Since the slopes of $\overline{MY}$ and $\overline{HM}$ are negative reciprocals, $\overline{MY} \perp \overline{HM}$, so angle M is a right angle.
Then MYTH is a rectangle because it is a parallelogram with a right angle.

$M = \frac{-4}{8} = \frac{-1}{2}$

$M = \frac{10}{5} = \frac{2}{1}$



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$m\overline{MA} = \frac{7-5}{-1-3} = \frac{2}{-4} = \left(-\frac{1}{2}\right)$

$m\overline{HT} = \frac{-7--3}{2--6} = \frac{-4}{8} = \left(-\frac{1}{2}\right)$

Same Slope
Parallel Lines

$m\overline{AT} = \frac{5--7}{3-2} = \frac{12}{1} = (12)$

$m\overline{MH} = \frac{7--3}{-1--6} = \frac{10}{5} = (2)$

MATH is a trapezoid because it has 1 Pair of Parallel sides.

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

Y (7, 3)

Question 35 is continued on the next page.

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

Question 35 continued.

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

$d\overline{MY} = \sqrt{(7--1)^2 + (3-7)^2} = \sqrt{64+16} = \sqrt{80}$

$d\overline{HT} = \sqrt{(2--6)^2 + (-7--3)^2} = \sqrt{64+16} = \sqrt{80}$ } Same length

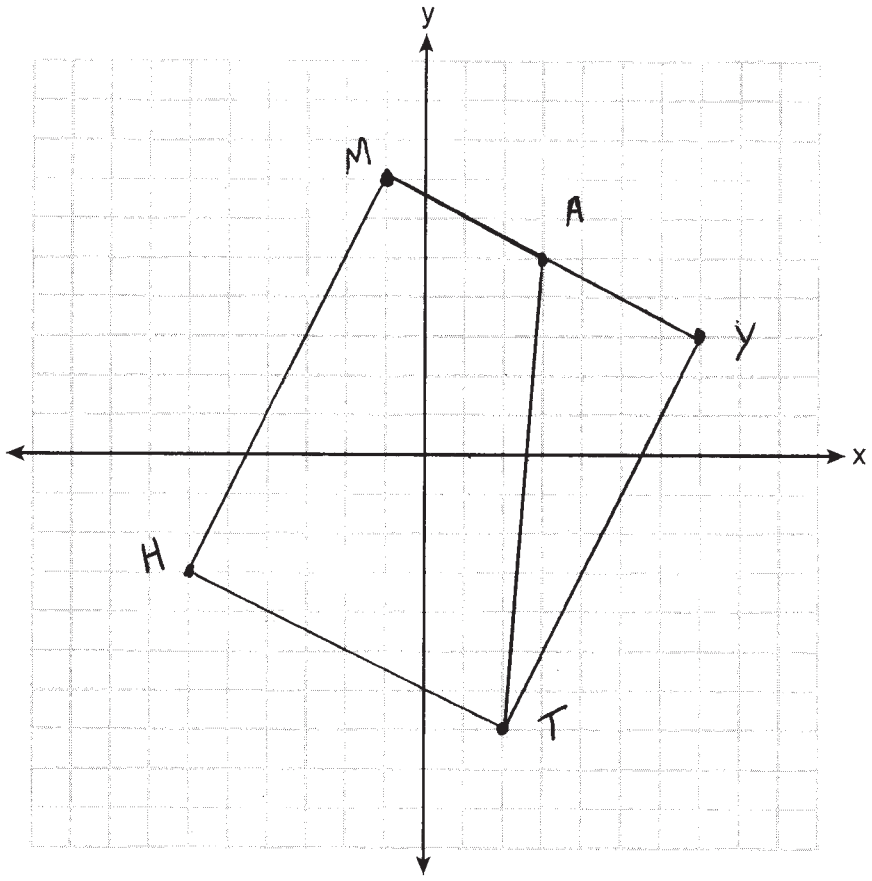
$d\overline{MH} = \sqrt{(-1--6)^2 + (7--3)^2} = \sqrt{25+100} = \sqrt{125}$

$d\overline{YT} = \sqrt{(7-2)^2 + (3--7)^2} = \sqrt{25+100} = \sqrt{125}$ } Same length

MYTH is a parallelogram b/c it has 2 pairs of $\cong$ opposite sides.

$\overline{MA} \perp \overline{MH}$ b/c negative reciprocals slopes, $\therefore \angle M$ is a right angle.

MYTH is a rectangle b/c it is a parallelogram with a right angle.



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

Slope of line $\overline{MA} = \frac{-2}{4} = -\frac{1}{2}$

Slope of line $\overline{HT} = \frac{-4}{8} = -\frac{1}{2}$ $>$ $\overline{MA} \parallel \overline{HT}$

MATH is a trapezoid because it has one pair of parallel sides $\overline{MA}$ and $\overline{HT}$.

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

Y. (7,3)

Question 35 is continued on the next page.

Score 5: The student wrote a partially correct concluding statement when proving the rectangle.

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

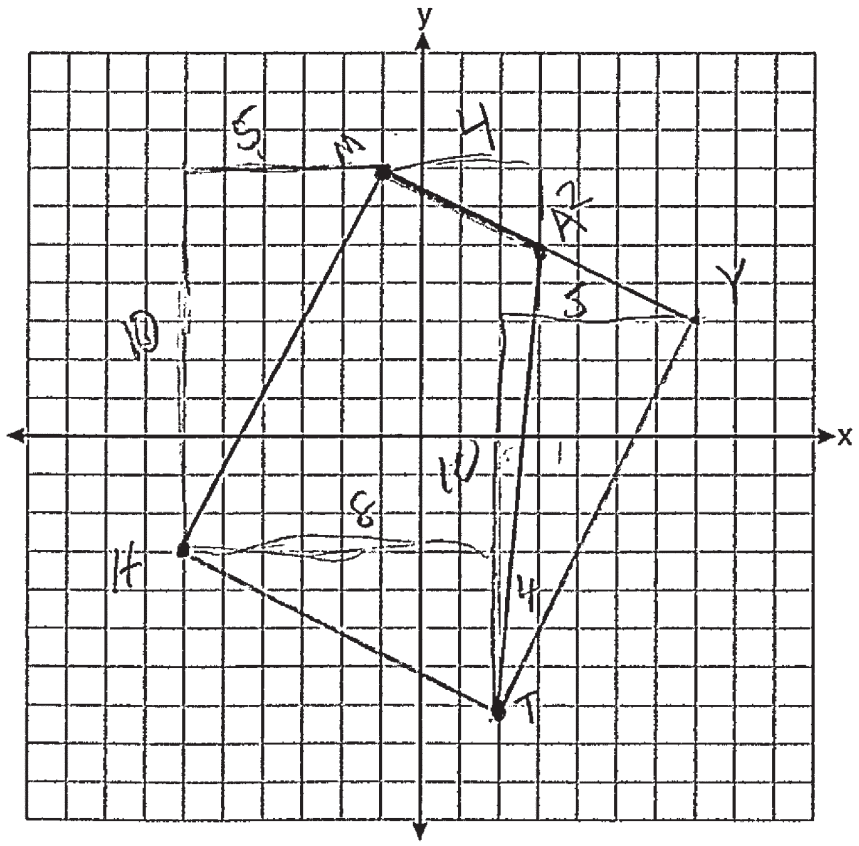
Slope of $\overline{MY} = -\frac{4}{8} = -\frac{1}{2}$

Slope of $\overline{HT} = -\frac{1}{2}$

Slope of $\overline{HM} = \frac{10}{5} = 2$

Slope of $\overline{TY} = \frac{10}{5} = 2$

All the sides are perpendicular to each other because they have opposite reciprocal slopes. Meaning all the angles are right angles. MYTH has 2 pairs of parallel lines $\overline{MY} \parallel \overline{HT}$ and $\overline{HM} \parallel \overline{TY}$. A rectangle has all right angles and 2 pairs of parallel lines so MYTH is a rectangle



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

Quadrilateral MATH is a trapezoid if it has a pair of ∥ sides,

$\overline{MA}$ $\frac{7-5}{-1-3} = \frac{2}{4}$ $\overline{HT}$ $\frac{-3+7}{-6-2} = \frac{4}{8} = \frac{-2}{4}$

same slopes → parallel

Quadrilateral MATH is a trapezoid bcs it has one pair of ∥ sides

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

$\overline{MA}$ $\frac{7-5}{-1-3} \quad \frac{2}{-4}$

Y(−7,3)

Question 35 is continued on the next page.

Score 5: The student wrote a partially correct concluding statement when proving the rectangle.

Question 35 continued.

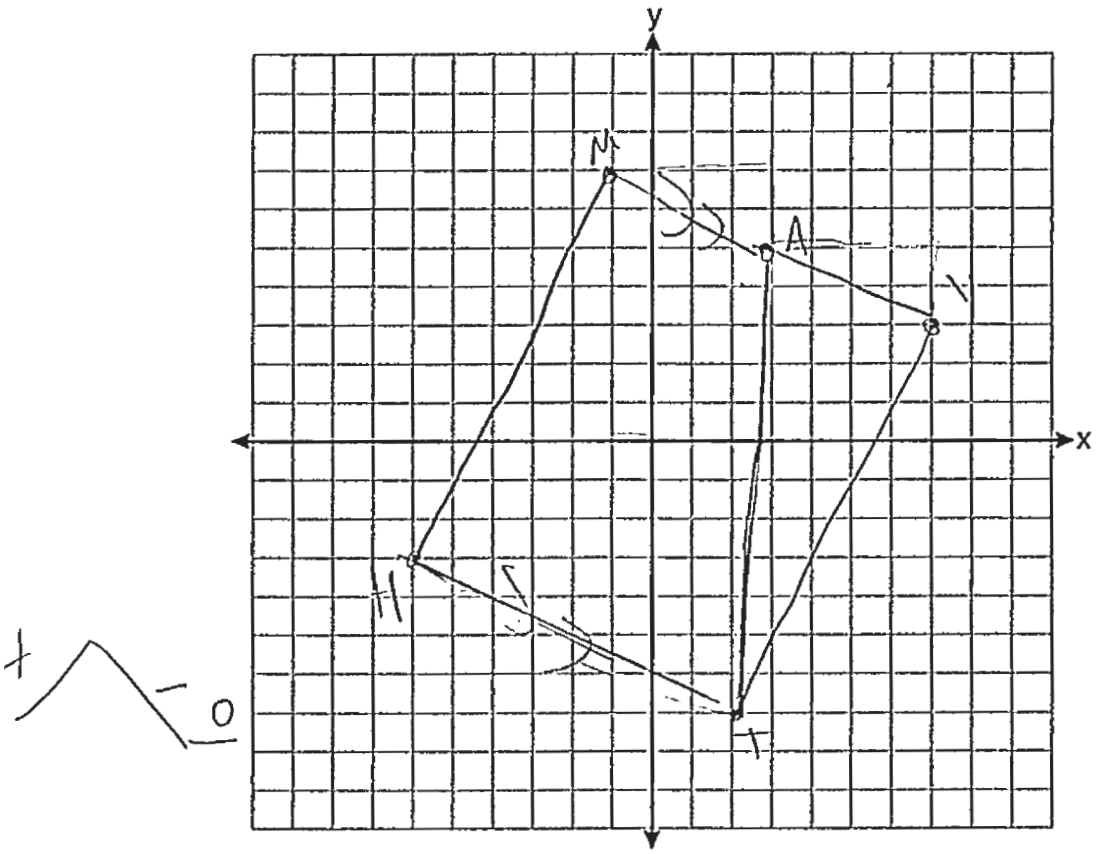
Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]

Quadrilateral MYTH is a rectangle if all 4 angles are rt ∠

$\overline{HT}$ $\frac{-3+7}{-6-2}$ $\frac{4}{-8}$ $-\frac{2}{4}$ $-\frac{1}{2}$ $\overline{MY}$ $\frac{3-7}{7+1}$ $-\frac{4}{8}$ $= -\frac{2}{4} = -\frac{1}{2}$

$\overline{YT}$ $\frac{3+7}{7-2}$ $\frac{10}{5} = \frac{2}{1}$ $\overline{MH} = \frac{7+3}{-1+6}$ $\frac{10}{5}$ $\frac{2}{1}$

Quadrilateral MYTH is a rectangle because all 4 sides are neg reciprocals bcs $\overline{HT}$ and $\overline{MY}$ are $-\frac{1}{2}$ and $\overline{YT}$ and $\overline{MH}$ are $\frac{2}{1}$ therefore neg rec. create ⊥ lines and ⊥ lines form rt ∠s ∴ Quadrilateral MYTH is a rectangle,



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$m\overline{MA} = -\frac{1}{2}$

$m\overline{HT} = -\frac{1}{2}$

} same $\overline{MA} \parallel \overline{HT}$

Since quad MATH has only one set of parallel sides, it is a trapezoid.

State the coordinates of point Y such that point A is the midpoint of $\overline{MY}$.

(7, 3)

Question 35 is continued on the next page.

Score 4: The student made a conceptual error when proving the rectangle.

Question 35 continued.

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

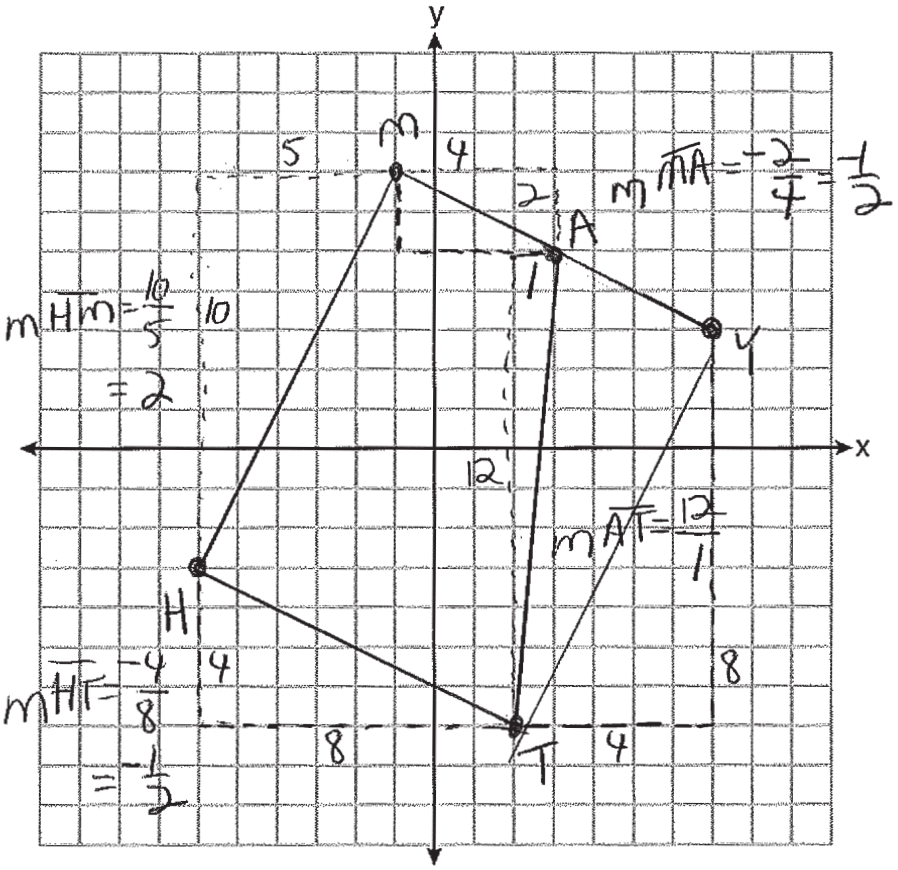
$d\overline{MY} = \sqrt{(7--1)^2+(3-7)^2} = \sqrt{80}$

$d\overline{HM} = \sqrt{(-1--6)^2+(7--3)^2} = \sqrt{125}$

$d\overline{HT} = \sqrt{(2-6)^2+(-7--3)^2} = \sqrt{80}$

$d\overline{TY} = \sqrt{(7-2)^2+(3--7)^2} = \sqrt{125}$

It is a rectangle because the opposite sides are equal.



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

Slope $\overline{MA} = \frac{5-7}{3-(-1)} = \frac{-2}{4} = -\frac{1}{2}$

Slope $\overline{TH} = \frac{-3-(-7)}{-6-2} = \frac{4}{-8} = -\frac{1}{2}$

Since $\overline{MA}$ and $\overline{TH}$ have the same slope, $\overline{MA} \parallel \overline{TH}$

Since quad MATH has one pair of opposite sides parallel, it is a trapezoid

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

Y (7,3)

Question 35 is continued on the next page.

Score 4: The student made a conceptual error when proving the rectangle.

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

$MT = \sqrt{(-1-2)^2+(7-(-7))^2}$

$= \sqrt{(-3)^2+(14)^2}$

$= \sqrt{9+196}$

$= \sqrt{205}$

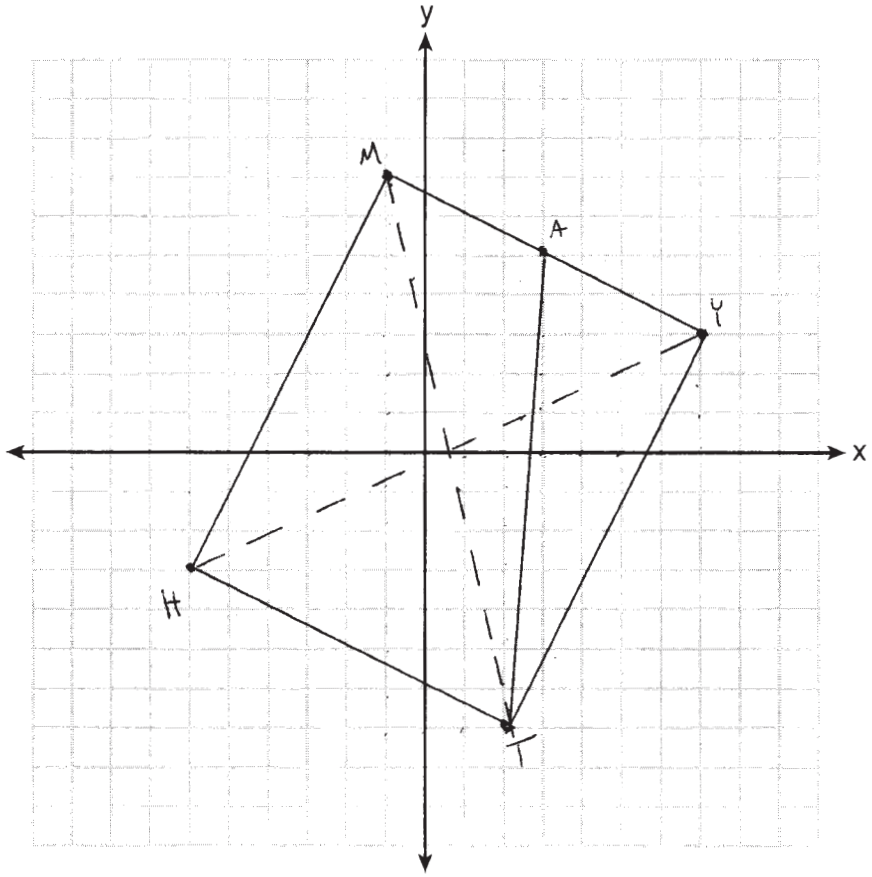
$HY = \sqrt{(7-(-6))^2+(3-(-3))^2}$

$= \sqrt{13^2+6^2}$

$= \sqrt{169+36}$

$\sqrt{205}$

Since the diagonals of quad MYTH are $\cong$, it is a rectangle.



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

Slope $\overline{MA}$ $\frac{5-7}{3+1} = \frac{2}{4} = -\frac{1}{2}$

Slope $\overline{TH}$ $\frac{-3+7}{-6-2} = \frac{4}{-8} = -\frac{1}{2}$ > parallel

∴ Quad MATH is a trapezoid because it has one pair of ll sides.

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

point Y = (7,3)

Question 35 is continued on the next page.

Score 4: The student made a conceptual error when proving the rectangle.

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

M Slope of $\overline{MA} = -\frac{1}{2}$

Slope of $\overline{TH} = -\frac{1}{2}$

Slope of $\overline{MH}$: $\frac{-3-7}{-6+1} = \frac{10}{5} = 2$

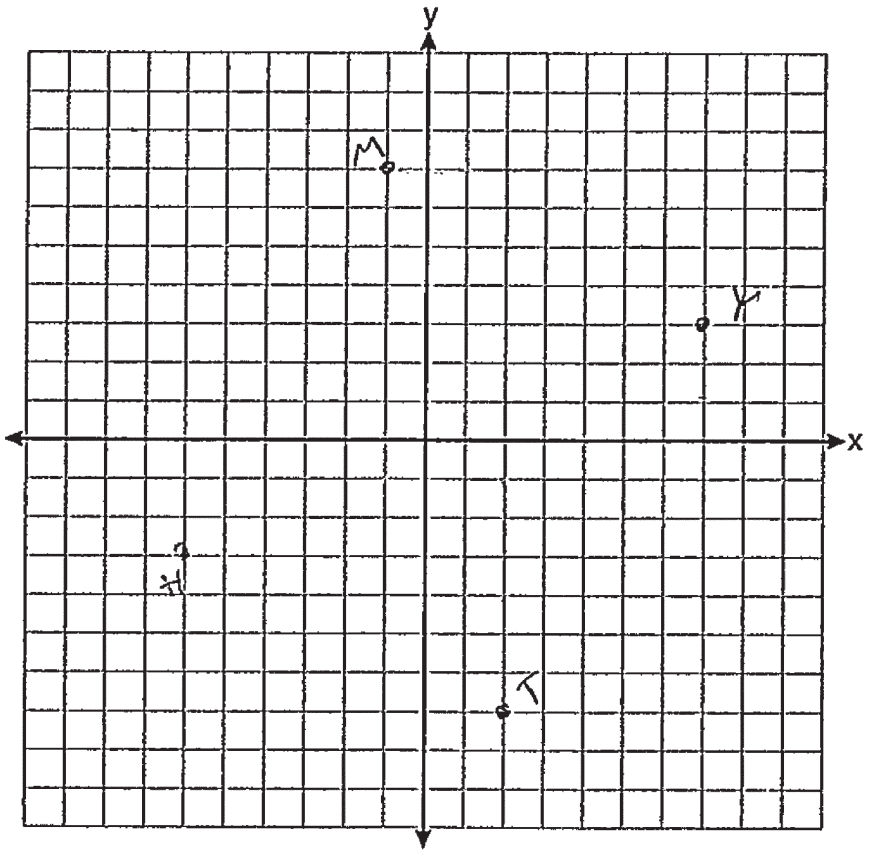
Slope of $\overline{YT}$: $\frac{-7-3}{2-7} = \frac{10}{5} = 2$

Slope $\overline{mt} = \frac{-7-7}{2+1} = \frac{-14}{3}$

Slope $\overline{yh} = \frac{-3-3}{-6-7} = \frac{6}{13}$

m(-1,7) t(2,-7)
y(7,3) h(-6,-3)

Quad MYTH is a rectangle because it has ⊥ diagonals and 2 pairs of ll sides



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

slope $\overline{MA} = -2/4$

$\overline{HT} = -4/8 = -2/4$ > parallel

Trapezoids are a quadrilateral with one set of parallel lines, $\overline{MA}$ and $\overline{HT}$ are parallel.

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

(7, 3)

Question 35 is continued on the next page.

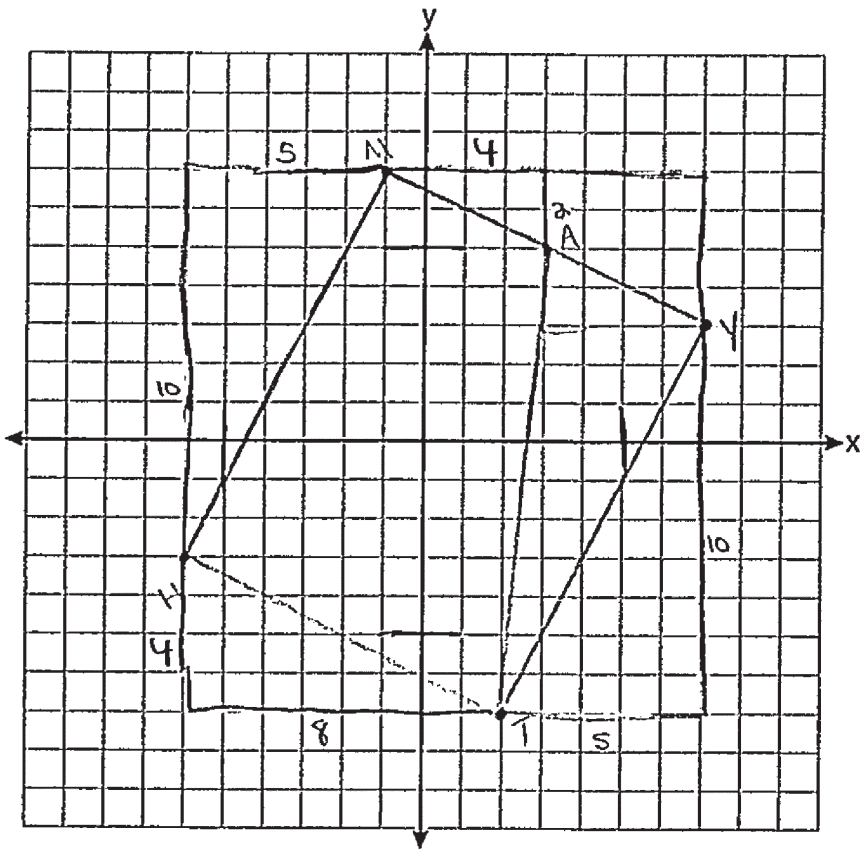
Score 3: The student made one conceptual and one computational error when proving the rectangle.

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

Slope $\overline{MY} = -4/8 = -1/2$
$\overline{HT} = -4/8$

Slope $\overline{MH} = \frac{10}{5} = 1/2$
$\overline{TY} = \frac{10}{5}$

Rectangles are quadrilaterals with two sets of parallel lines, MY ∥ HT and MH∥TY. They also require four 90° angles, since the slopes are negative reciprocals, (-1/2 and 1/2) then they create a 90° angle.



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

Plan

Show one set of opp. sides are ||.

$m\overline{HA} = \frac{-2}{4} = \frac{-1}{2}$

$m\overline{HT} = \frac{-4}{8} = \frac{-1}{2}$

$m\overline{MH} = \frac{10}{5} = 2$

$m\overline{AT} = 12$

$\overline{HA} \parallel \overline{HT}$ because their slopes are =.

$\overline{MH} \not\parallel \overline{AT}$ because their slopes aren't equal.

MATH is a trapezoid because there is only one pair of opp. sides ||.

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$. $MA: \frac{-2}{4} = \frac{-1}{2}$

(7, 3)

Question 35 is continued on the next page.

Score 3: The student made a conceptual error in proving the rectangle and did not write a concluding statement.

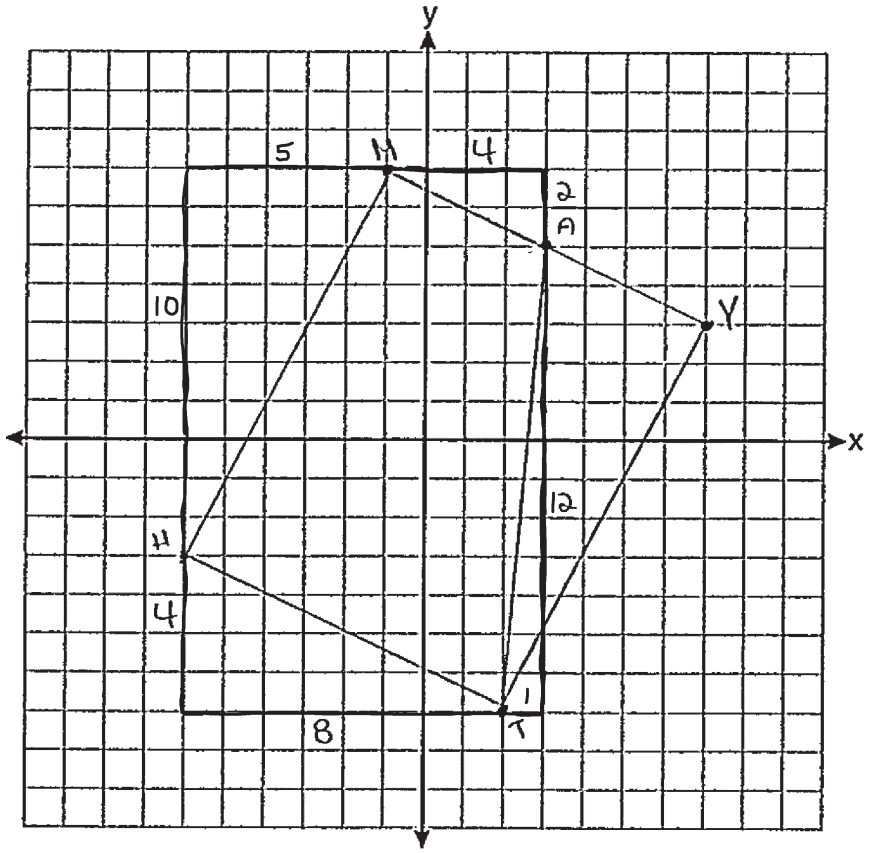
Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]

Plan

Show it's p-gram & diagonals ≅.

$d_{\overline{MY}} \sqrt{(7+1)^2+(3-7)^2}$
$= \sqrt{(8)^2+(-4)^2}$
$= \sqrt{64+16}$
$= \sqrt{80}$

$d_{\overline{HT}} \sqrt{(2+6)^2+(-7+3)^2}$
$= \sqrt{(8)^2+(-4)^2}$
$= \sqrt{64+16}$
$= \sqrt{80}$



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$\overline{MA}$ = Slope of $2/4 = 1/2$ $\parallel$
$\overline{TH}$ = Slope of $4/8 = 1/2$

Quadralateral MATH is a trapazoid, because in order to be a trapazoid you must have 1 pair of opposite sides that are $\parallel$. In MATH both $\overline{MA}$ and $\overline{TH}$ are parellel. As well as opposite sides. Therefore quadrilateral MATH is a trapizoid

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

If A is the midpoint of $\overline{MY}$, then Y would be located at pt(7, 3).

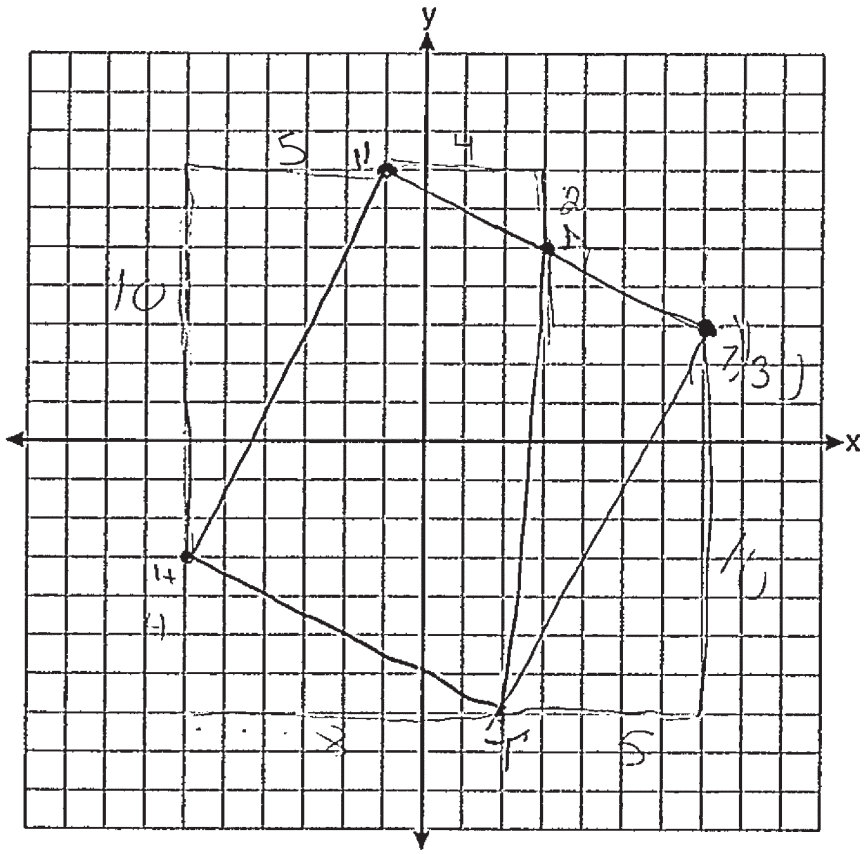
Question 35 is continued on the next page.

Score 2: The student made a computational error in determining the slopes of $\overline{MA}$ and $\overline{TH}$. The student found the coordinates of *Y*. No further correct work was shown.

Question 35 continued.

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

It is a rectangle b/c a rectangle has all 4 sides congruent. The opposite sides $\overline{YT}$ and $\overline{MH}$ are // and opposite sides $\overline{MY}$ and $\overline{HT}$ are //. ∴ there are 2 sets of opposite sides that are //. Making MYTH a rectangle.



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

(7,3)

Question 35 is continued on the next page.

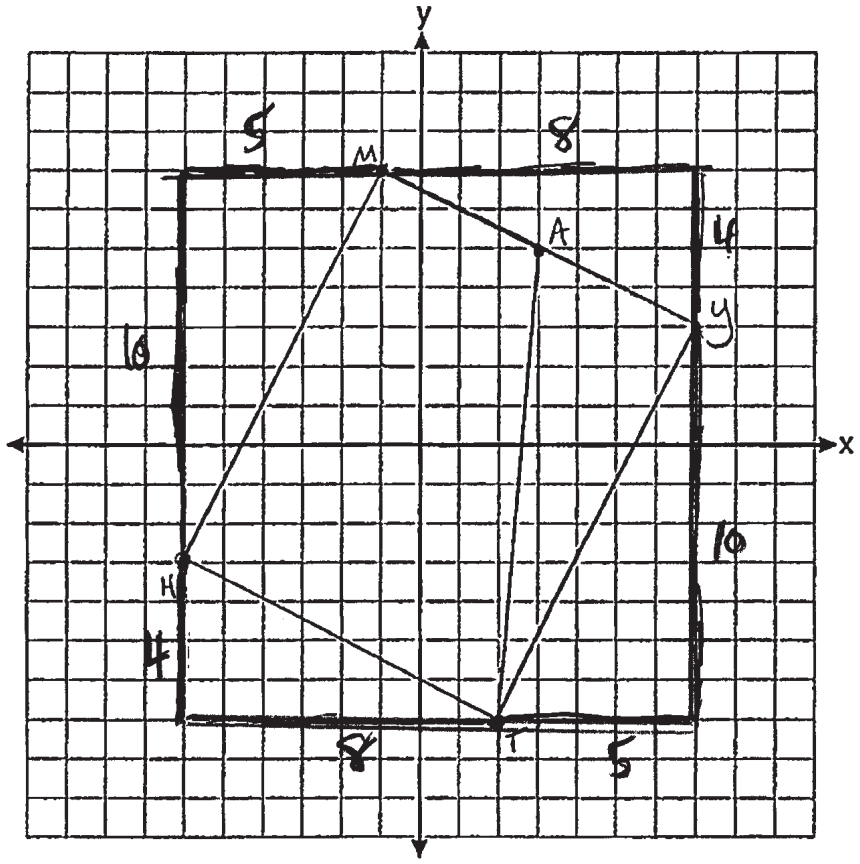
Score 2: The student found the coordinates of point *Y* and found the slopes of the sides, but did not prove the *MATH* was a trapezoid and *MYTH* was a rectangle.

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

Slope($\overline{MY}$) $= -4/8 = -1/2$
Slope($\overline{HT}$) $= -4/8 = -1/2$

2 sets of congruent, parallel sides

Slope($\overline{HM}$) $= 10/5 = 2$
slope($\overline{TY}$) $= 10/5 = 2$



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$\overline{HT}$ $\frac{-3+(+7)}{-6-2} = \frac{4}{-8} = \left(\frac{2}{-4}\right)$ $\overline{MA} = \frac{5-7}{3+(+1)} = \left(\frac{-2}{4}\right)$

$\overline{HM} = \frac{-3-7}{-6+(+1)} = \frac{-10}{-5} = \left(\frac{2}{1}\right)$ $\overline{TA} = \frac{-7-5}{2-3} = \frac{-12}{-1} = \left(\frac{12}{1}\right)$

The slope of $\overline{HT}\left(\frac{2}{-4}\right)$ is opposite reciple to $\overline{MA}\left(\frac{-2}{4}\right)$, therefore parallel.
The slopes of HTM

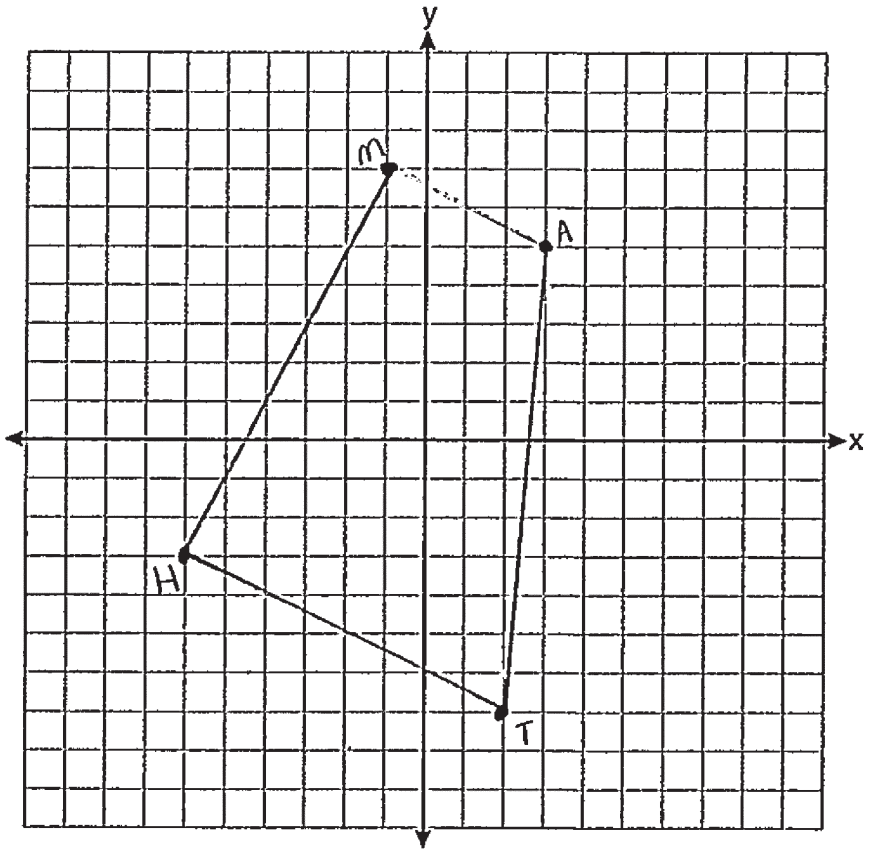
State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

Question 35 is continued on the next page.

Score 1: The student found the slopes of the sides of *MATH*. No further correct work was shown.

Question 35 continued.

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



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$m\overline{HT} = \frac{-7--3}{2--6} = \frac{-4}{8} = \left(\frac{-1}{2}\right)$

$m\overline{MA} = \frac{5-7}{3-1} = \frac{-2}{4} = \left(\frac{-1}{2}\right)$

Same Slope

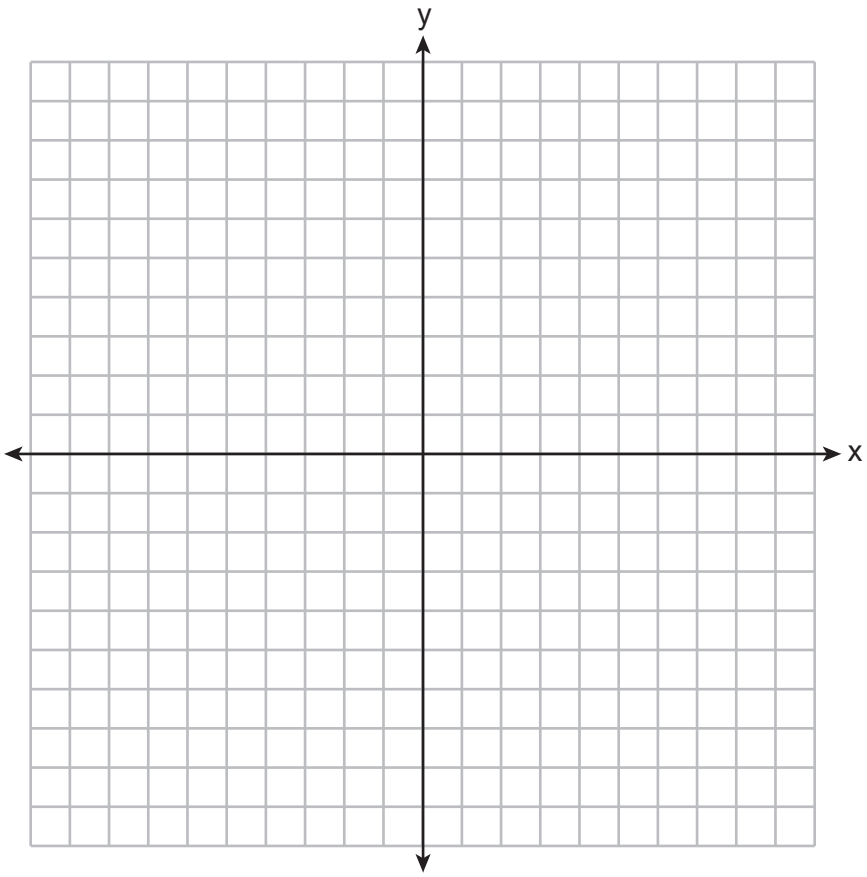
State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

Question 35 is continued on the next page.

Score 1: The student found the slopes of $\overline{HT}$ and $\overline{MA}$. No further correct work was shown.

Question 35 continued.

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



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$\frac{5-7}{3--1}$ $\frac{-2}{4}$

$\frac{-3+7}{-6-2}$ $\frac{4}{-8}$ $\frac{2}{}$

$\frac{-7-7=-14}{2--1}$ $\frac{}{3}$

$\frac{-3-5}{-6-3}$ $\frac{-8}{9}$

State the coordinates of point Y such that point A is the midpoint of $\overline{MY}$.

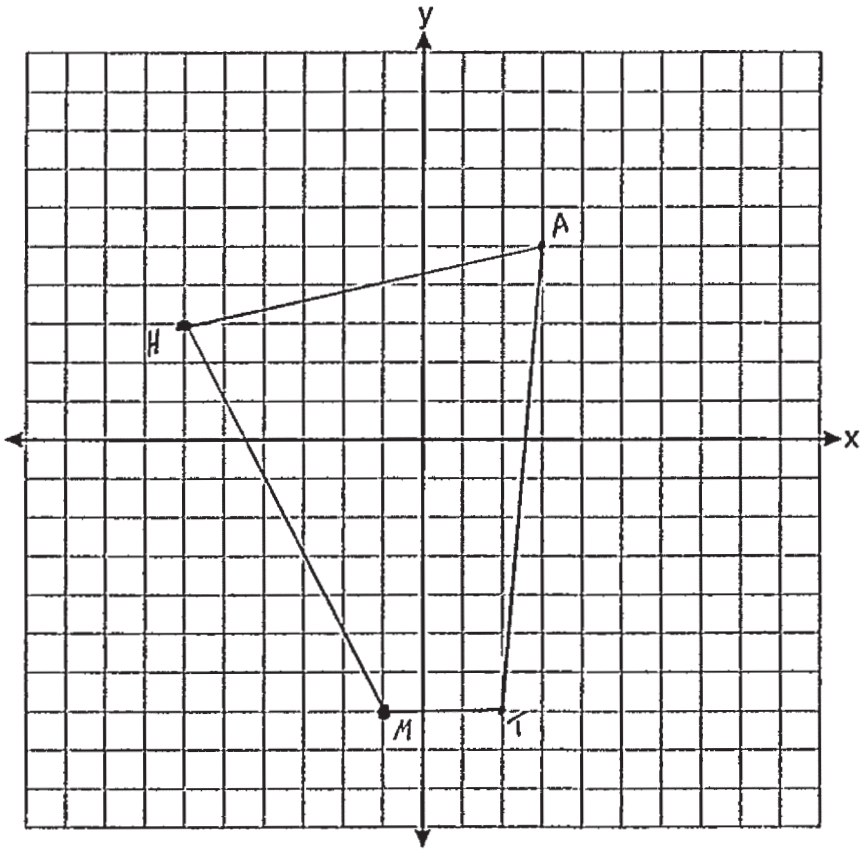
The points M and T show that it is a trapezoid since both are equal when plotted on a graph.

Question 35 is continued on the next page.

Score 0: The student did not show enough relevant course-level work to receive any credit.

Question 35 continued.

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



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

Statements	Reasons
(1) Quad MATH has vertices M(-1,7), A(3,5) T(2,-7) and H(-6,-3)	(1) given
(2) $\overline{MA} \parallel \overline{HT}$ & $\overline{MH} \parallel \overline{AT}$	(2) In a quadrilateral opp. sides are $\parallel$
(3) $\angle 1 \cong \angle 2$ & $\angle 3 \cong \angle 4$	(3) If $\parallel$ lines then $\cong$ $\angle$s.
(4) quad MATH is a trapezoid	(4) SAS $\cong$ SAS

State the coordinates of point *Y* such that point *A* is the midpoint of $\overline{MY}$.

Y (6,3)

Question 35 is continued on the next page.

Score 0: The student had a completely incorrect response.

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

Quadrilater MYTH is a rectangle because it has ≅ sides and ∡s from the trapezoid.

Statements	Reasons
① MATH is a trapezoid	① Given
② ∠1, ∠2, ∠3 & ∠4 are right ∠s	② A: mid point forms right ∠s
③ ∠1 ≅ ∠2 ≅ ∠3 ≅ ∠4	③ All right ∠s are ≅
④ MYTH is a rectangle	④ AA ≅ AA