The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

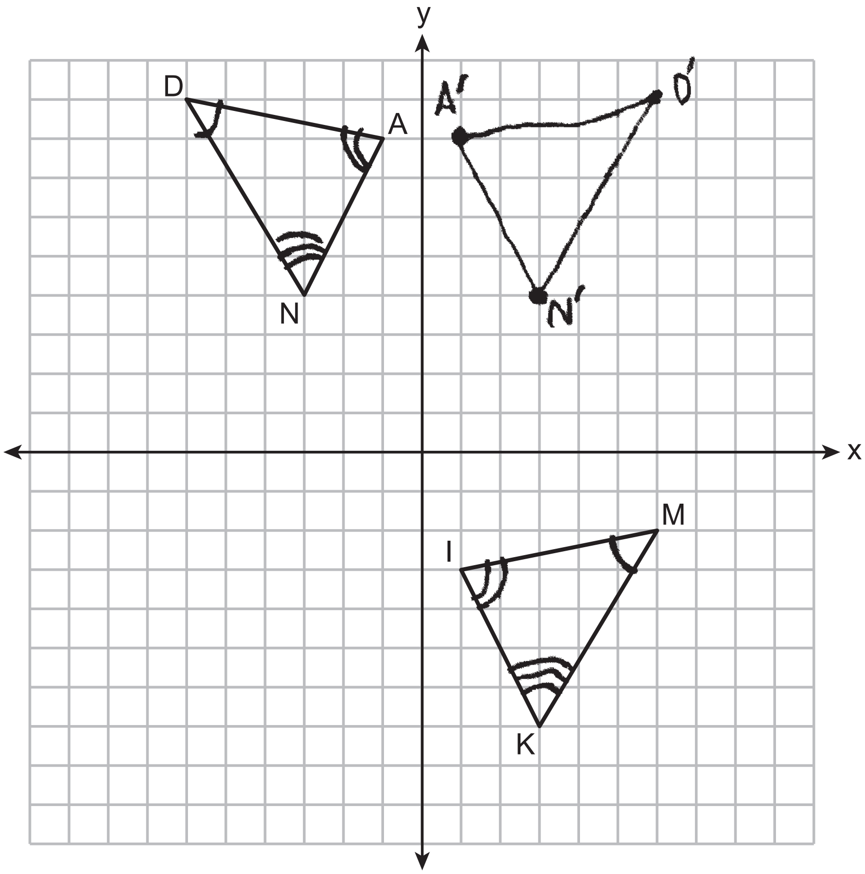
Tuesday, June 23, 2026 — 1:15 to 4:15 p.m., only

MODEL RESPONSE SET

Table of Contents

Question 25

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



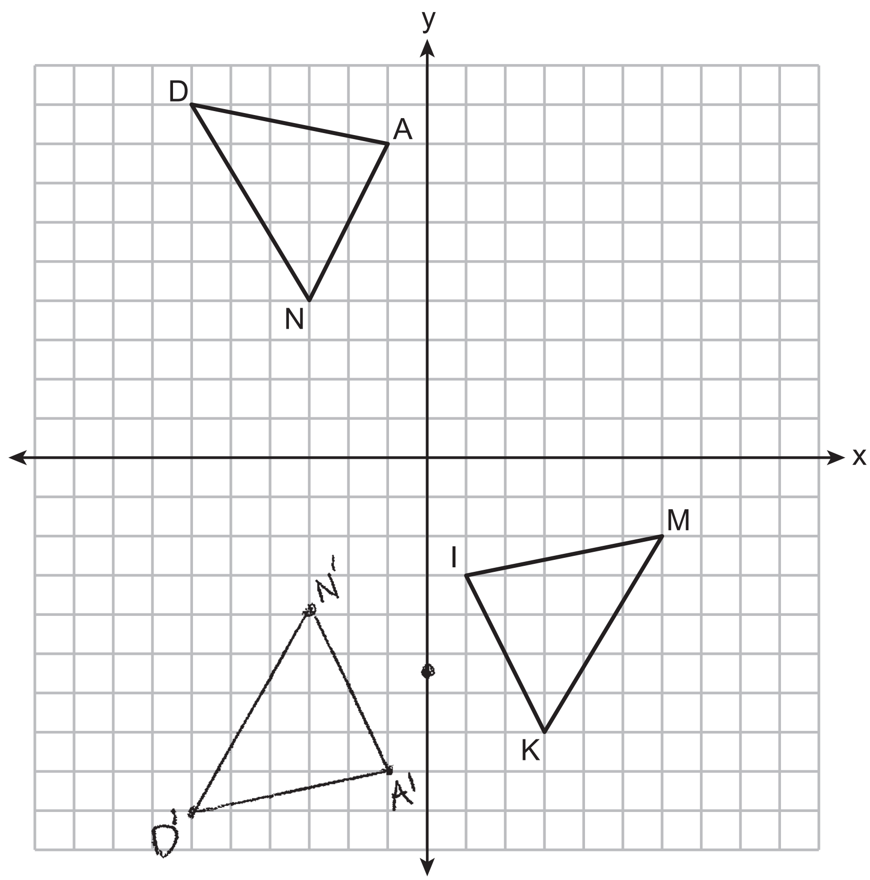
Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

1st: Reflect $\triangle DAN$ over the y-axis
2nd: Translate $\triangle D'A'N'$ down 11 units

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

Question 25

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.

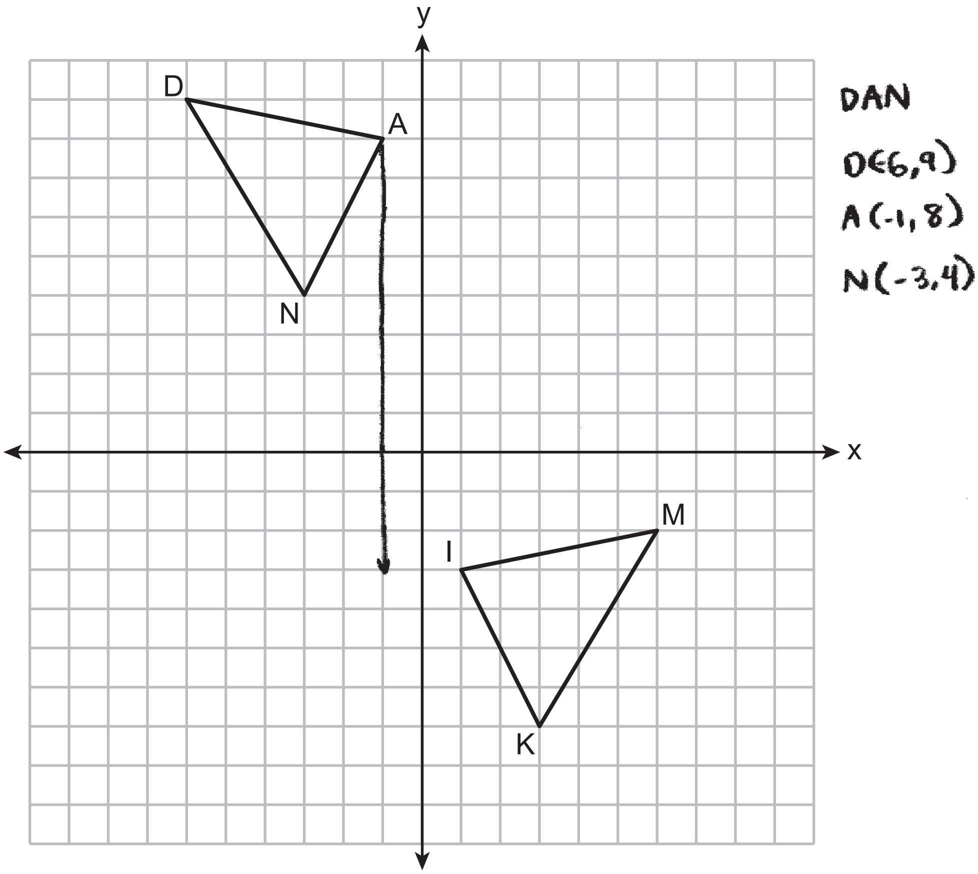


Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

Reflect $\triangle DAN$ over the x-axis
Then reflect it through the point (0, -5.5).

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

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

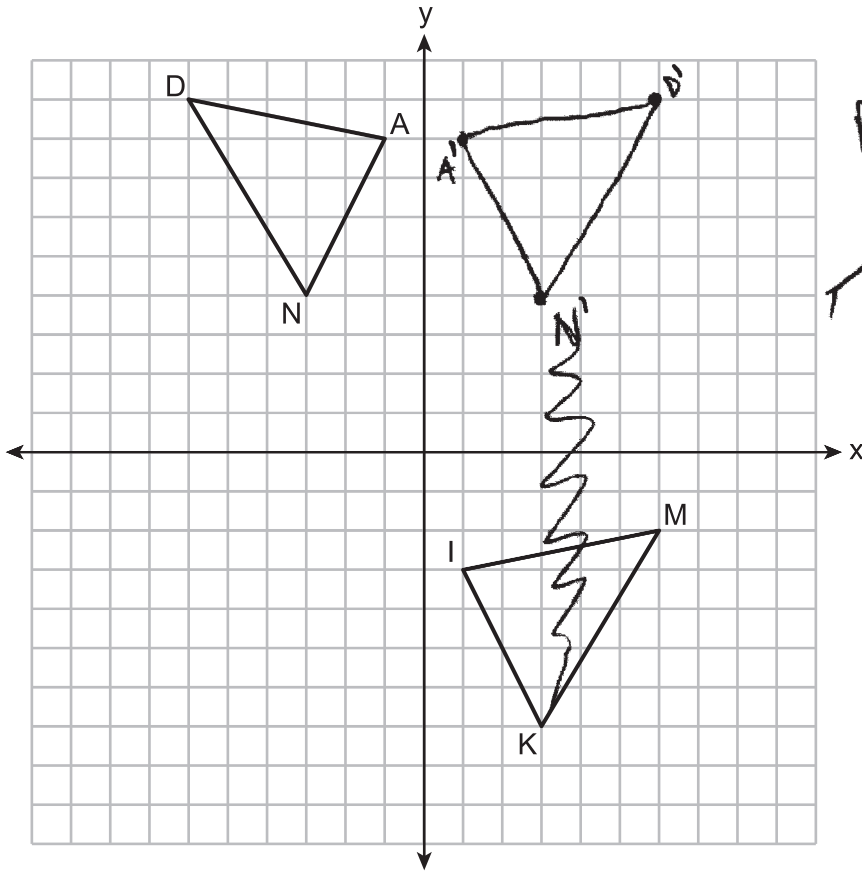
- a translation ~~#~~ 11 units down

- a reflection over the y-axis

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

Question 25

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



$r_{(y\text{-axis})}$

$T_{(0,-11)}$

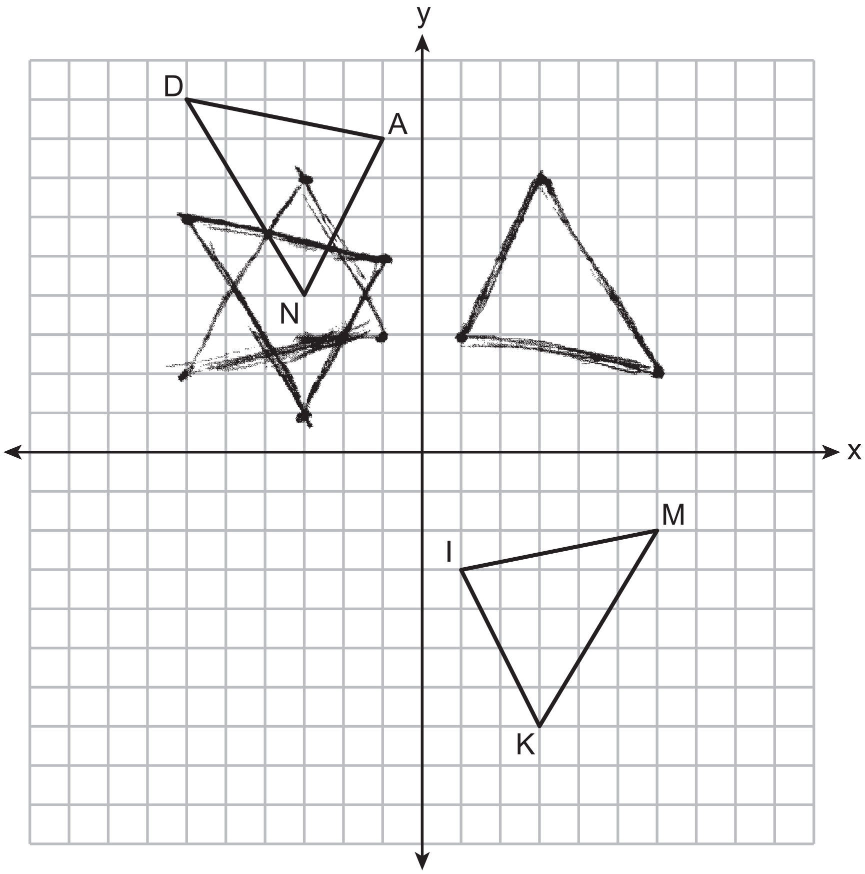
Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

$[T_{(0,-11)} \circ r_{(y\text{-axis})}]$

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

Question 25

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

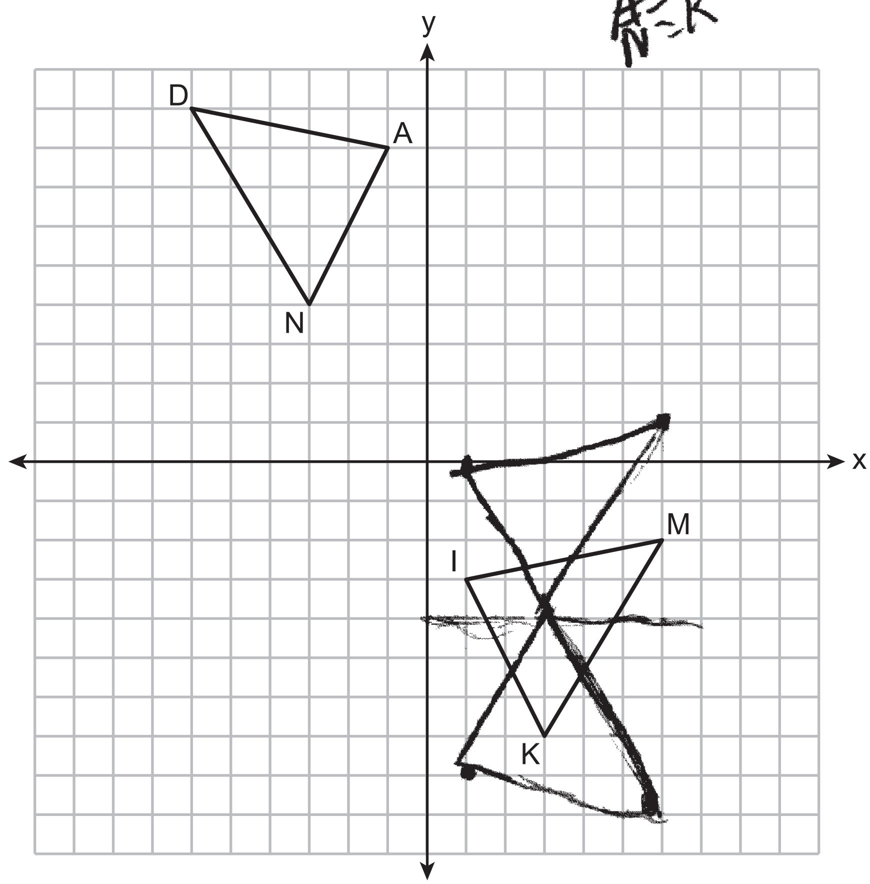
Reflection Across the X axis
Reflection Across the y axis
Refledion across y = 4
Translation up 3 units

Score 1: The student mapped $\triangle MIK$ onto $\triangle DAN$.

Question 25

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.

D=M
A=I
N=K



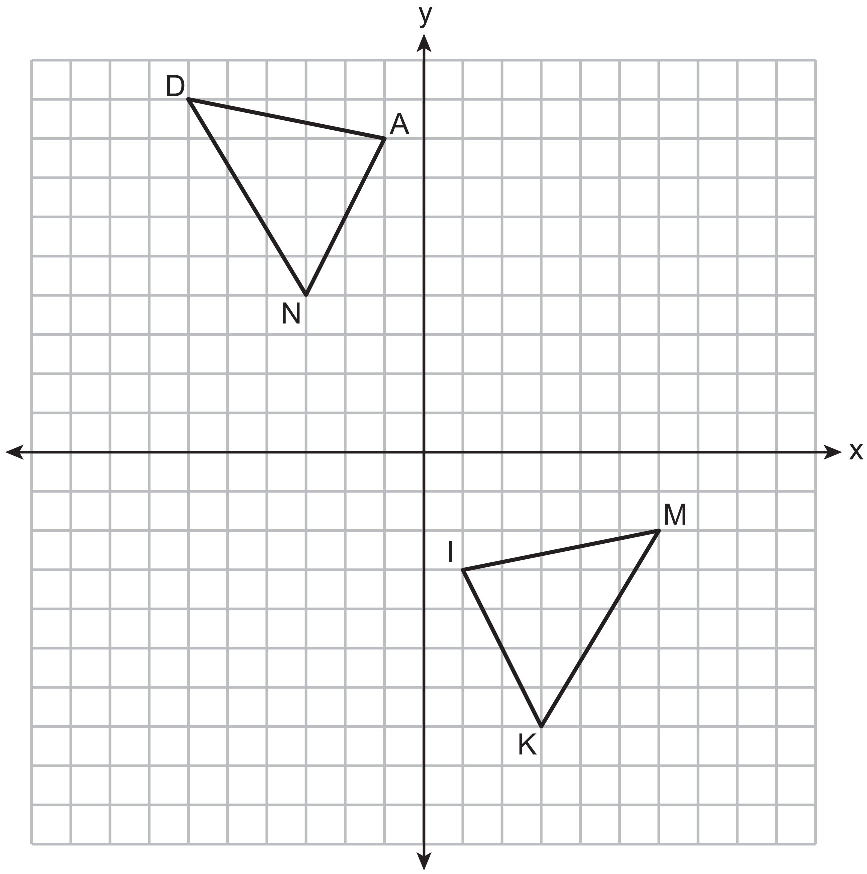
Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

- rotation 180°
- reflection over y = -4
- Translation <0, -3>

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

Question 25

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



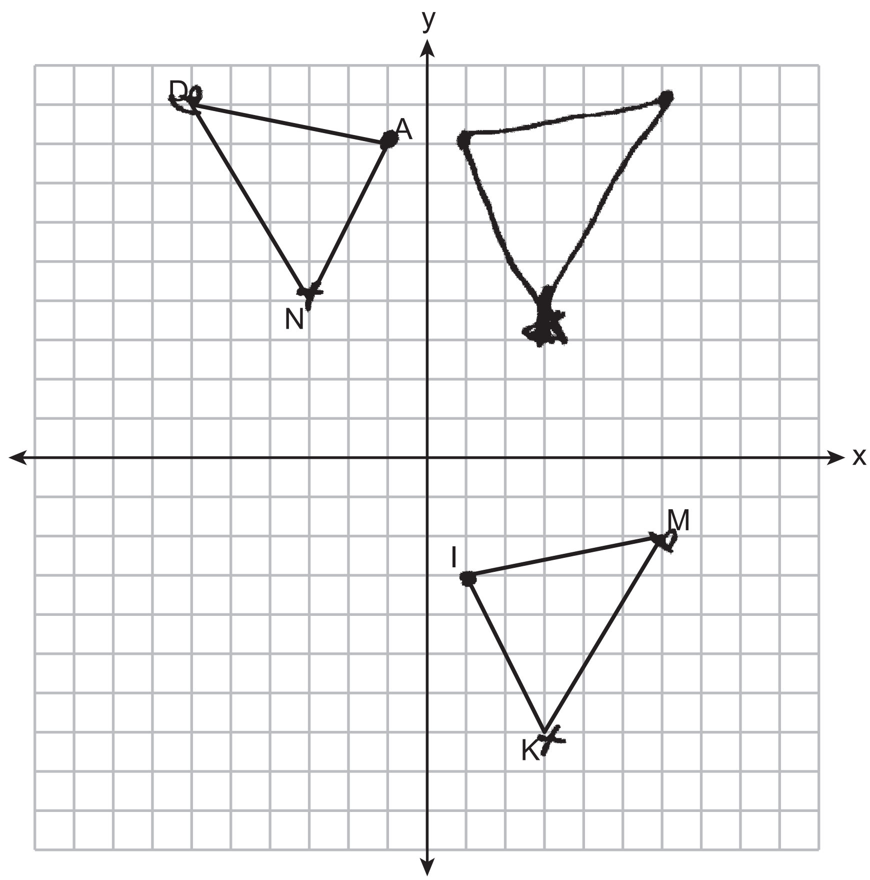
Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

A reflection over the y-axis to bring ΔDAN into quadrant I. A translation

Score 1: The student wrote an incomplete description of the translation.

Question 25

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



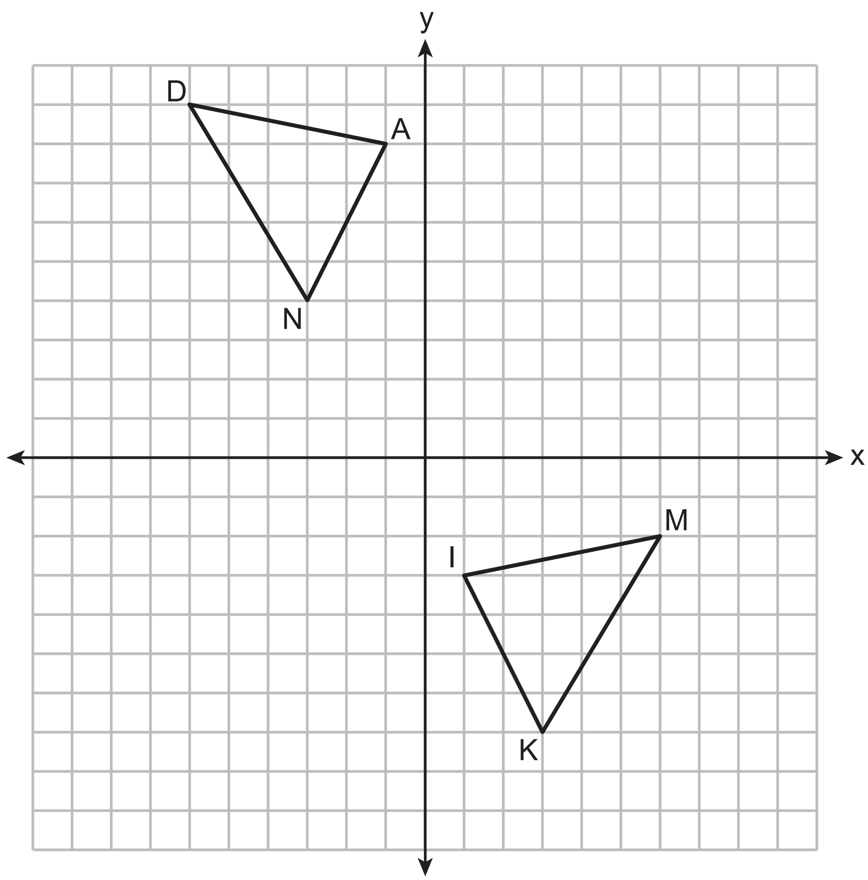
Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

Reflect over x

Down 10 units

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

25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



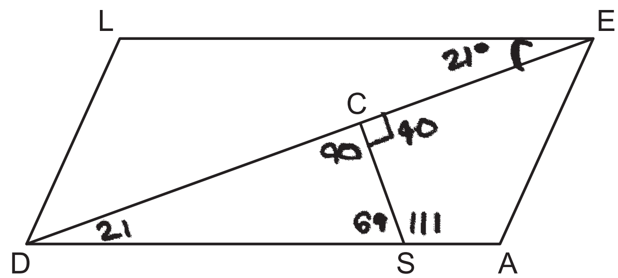
Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

rotation by $180°$ around the origin

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

Question 26

26 In parallelogram *LEAD* below, *C* is on $\overline{DE}$ and *S* is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



If $m\angle LED = 21°$, determine and state the measure of $\angle CSA$.

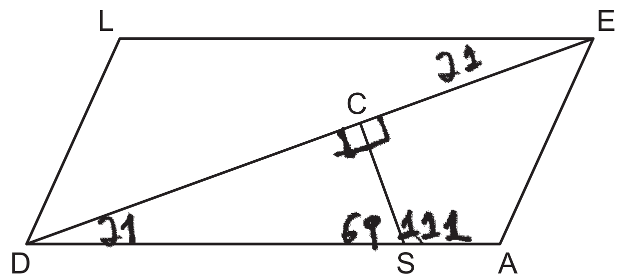
$\boxed{111°}$

$$\begin{array}{r} 21 \\ +90 \\ \hline 111 \end{array} \qquad \begin{array}{r} 180 \\ -111 \\ \hline 69 \end{array} \qquad \begin{array}{r} 180 \\ -\ 69 \\ \hline 111 \end{array}$$

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

Question 26

26 In parallelogram *LEAD* below, *C* is on $\overline{DE}$ and *S* is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



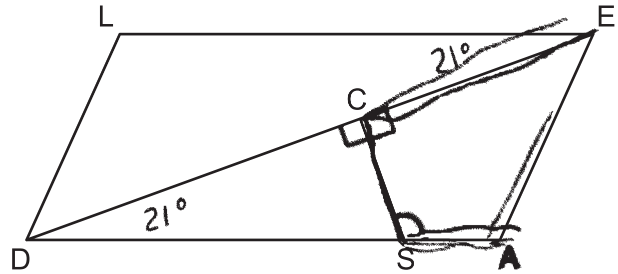
If m$\angle LED = 21°$, determine and state the measure of $\angle CSA$.

m∠CSA = 111°

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

Question 26

26 In parallelogram *LEAD* below, *C* is on $\overline{DE}$ and *S* is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



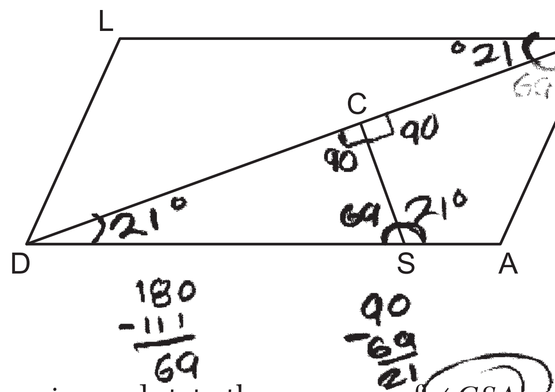
If m$\angle LED = 21°$, determine and state the measure of $\angle CSA$.

90 + 21 = 111

$\boxed{m\angle CSA = 111°}$

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

26 In parallelogram *LEAD* below, *C* is on $\overline{DE}$ and *S* is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



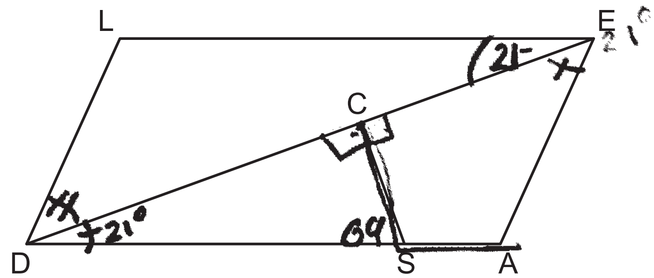
If m∠*LED* = 21°, determine and state the measure of ∠*CSA*.

∠CSA = 21°

Score 1: The student made an error when determining m∠*CSA*.

Question 26

26 In parallelogram $LEAD$ below, C is on $\overline{DE}$ and S is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



If $m\angle LED = 21°$, determine and state the measure of $\angle CSA$.

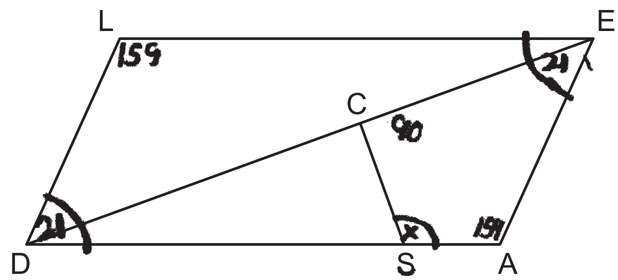
$180 - 90 - 21 = 69°$ $\angle DSC = 69°$

$\angle CDS = 21°$ b/c of alternate interior angles are $\cong$ in a parallelogram.

Score 1: The student showed correct work to determine $m\angle CSD$, but did not determine $m\angle CSA$.

Question 26

26 In parallelogram *LEAD* below, *C* is on $\overline{DE}$ and *S* is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



If m$\angle LED$ = 21°, determine and state the measure of $\angle CSA$.

$360 = 159 + 90 + x + 10.5$

$360 = 259.5 + x$

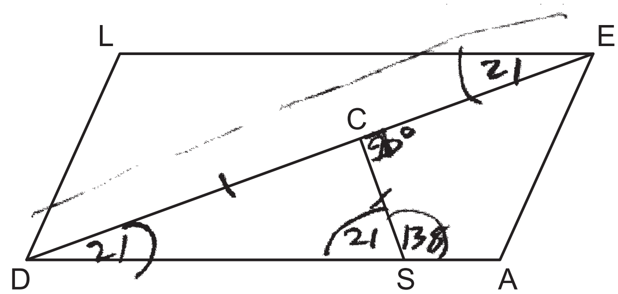
$-259.5 \quad -259.5$

$100.5 = x$

$m\angle CSA = 100.5°$

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

26 In parallelogram *LEAD* below, *C* is on $\overline{DE}$ and *S* is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



If m$\angle LED = 21°$, determine and state the measure of $\angle CSA$.

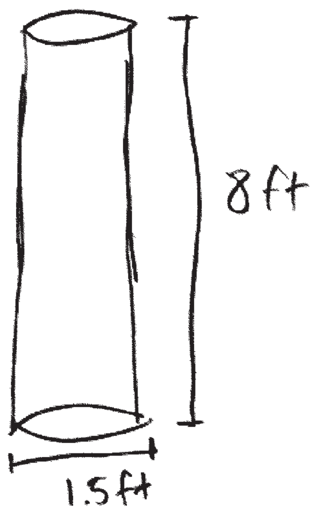
$\boxed{\angle CSA = 138°}$

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

Question 27

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.



$d = 2r$

$r = \frac{d}{2}$

$r = \frac{1.5 \text{ ft}}{2}$

$r = 0.75 \text{ ft}$

$V_{cylinder} = \pi r^2 h$

$V_{cylinder} = \pi (0.75)^2 (8)$

$\text{Weight} = \frac{25 \text{ lbs}}{1 \cancel{\text{ft}^3}} \left(\pi (0.75)^2 (8)\right) \cancel{\text{ft}^3}$

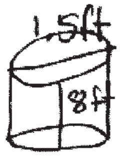
$\boxed{\text{Weight} = 353 \text{ lbs}}$

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

Question 27

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.



$A = \pi r^2$
$= \pi .75^2$
$= 1.7671...$

$V = Bh$
$= 1.76... \times 8$
$= 14.137...$

$$\frac{25 \text{ lbs}}{1 \text{ ft}^3} = \frac{x}{14.137 \text{ ft}^3}$$

$x = 353.4...$

353 lbs

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

Question 27

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.

$V = \pi r^2 h$

$V = \pi(0.75^2)8$

$V = 4.5\pi$

$\frac{4.5\pi}{1} * \frac{25}{1} = \boxed{353 \text{ lbs}}$

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

Question 27

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.

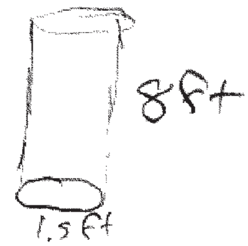
$V = Bh$

$V = \pi r^2(8)$

$V = \pi 2.25(8)$

$V = \frac{56.549\text{ ft}^3}{1} \times \frac{25\text{ lbs}}{1\text{ ft}^3} = 1413.7167\text{ lbs}$

$\boxed{1414\text{ lbs}}$

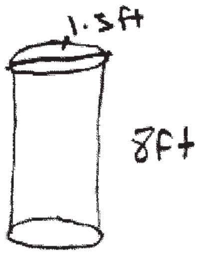


Score 1: The student made an error using a radius of 1.5 when determining the volume.

Question 27

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.



$V = B \times h$

$V = (\pi r^2)\ 8$

$(\pi .5625)\ 8$

$V = 14$

$$\begin{array}{r} 14 \\ \times\ 25 \\ \hline 350 \end{array}$$

the weight of this section is 350 pounds.

Score 1: The student made a rounding error when determining the volume of the section of white pine.

Question 27

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

0.75

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.

M D

$D = \frac{1.5}{2}$

$r = 0.75$

$h = 8$

$D = \frac{M}{V}$ $M = D \cdot V$

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

$V = \pi(0.75)^2 \cdot 8$

$V = \pi 0.5625 \cdot 8$

$V = 4.5\pi$

$D = \frac{25}{4.5\pi} =$

$D = 5.555555556\pi$

$D = 17.45329252$

$\boxed{D = 17 \text{ pounds}}$

Score 1: The student correctly determined the volume.

Question 27

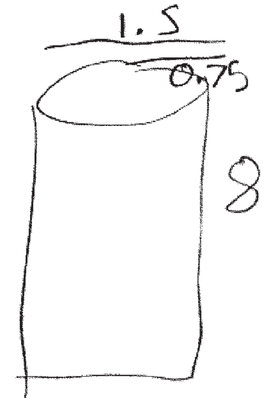
27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.

$(0.75^2\pi) \cdot 8 = 5.964117303$

$5.96... \cdot 25 = 149.1029$

149 pounds



Score 1: The student made an error when determining the volume, but found an appropriate weight.

Question 27

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.

$V = 7.068$

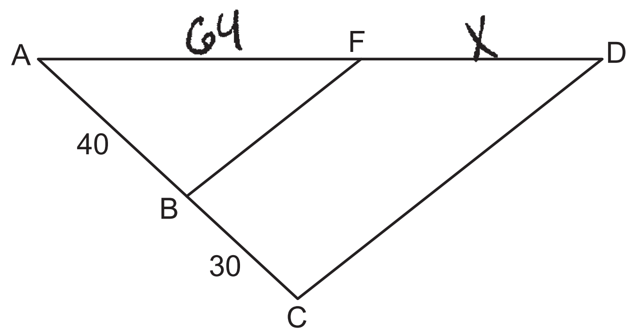
$$\begin{array}{r} 25 \\ \times\ 7.068 \\ \hline \end{array}$$

$W = 176.7$ lbs

Score 0: The student made an error when determining the volume of the section of tree trunk and made a rounding error.

Question 28

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

$$\frac{64}{40} = \frac{x}{30}$$

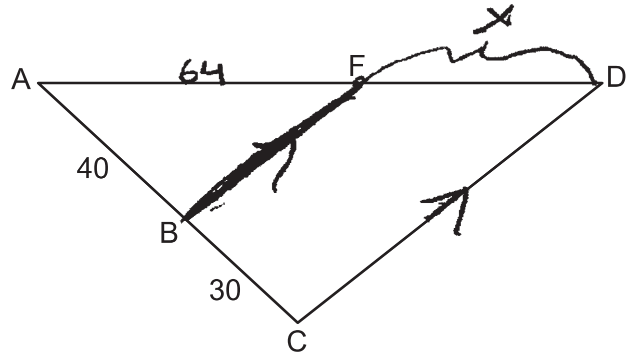
$$\frac{40x}{40} = \frac{1920}{40}$$

$$x = 48$$

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

Question 28

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

$$\frac{64}{x} = \frac{40}{30}$$

$$\frac{40x}{40} = \frac{1920}{40}$$

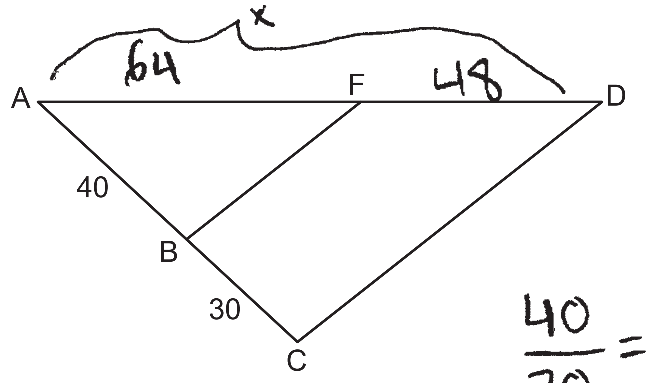
$x = 48$

$\boxed{FD = 48}$

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

Question 28

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



$$\frac{40}{70} = 57.14285\%$$

If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

$$\frac{57.14285}{100} = \frac{64}{x}$$

$$6400 = 57.14285x$$

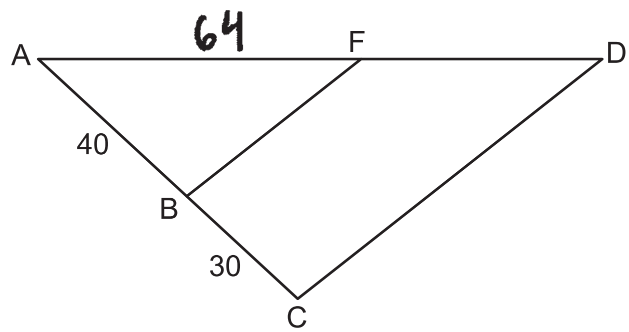
$$112 = x$$

$$112 - 64 =$$

$$48$$

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

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

$\frac{40}{70} = \frac{64}{x}$

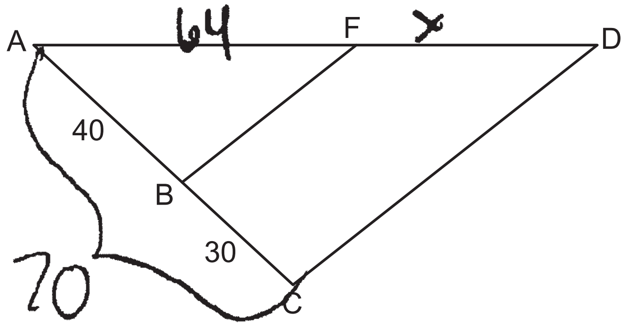
$\frac{\cancel{40}x}{\cancel{40}} = \frac{4480}{40}$

$x = 112$

$\boxed{112}$

Score 1: The student correctly determined the length of $\overline{AD}$.

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

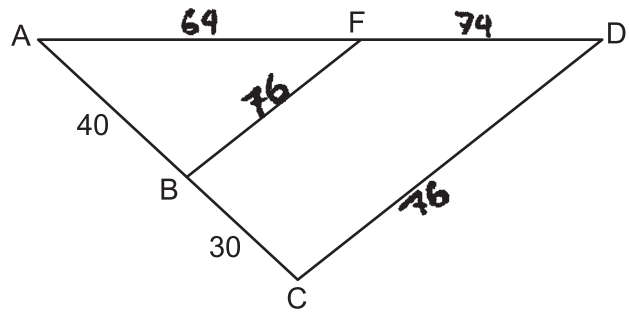
$$\frac{64}{40} = \frac{64+x}{70}$$

$$\frac{2560x}{2560} = \frac{4480}{2560}$$

$$x = 1.75$$

Score 1: The student wrote a correct proportion, but made an error when cross-multiplying.

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

AB + AF $(40 + 64) - 180 = 76$

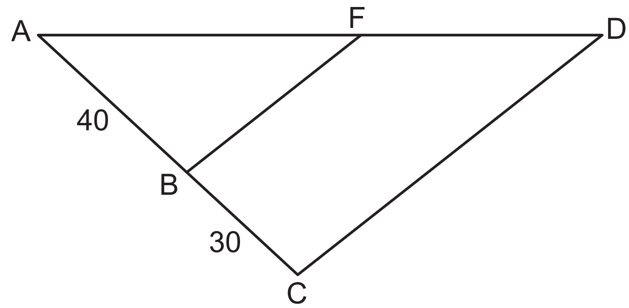
BC + CD $(30 + 76) - 180 = 74$

$\boxed{\overline{BF} \parallel \overline{CD}}$

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

Question 28

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

$40+30=70$

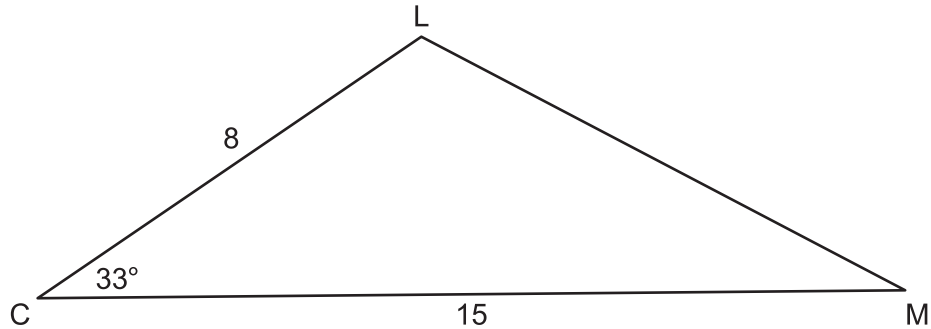
$+64$

$\boxed{114}$

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

Question 29

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.



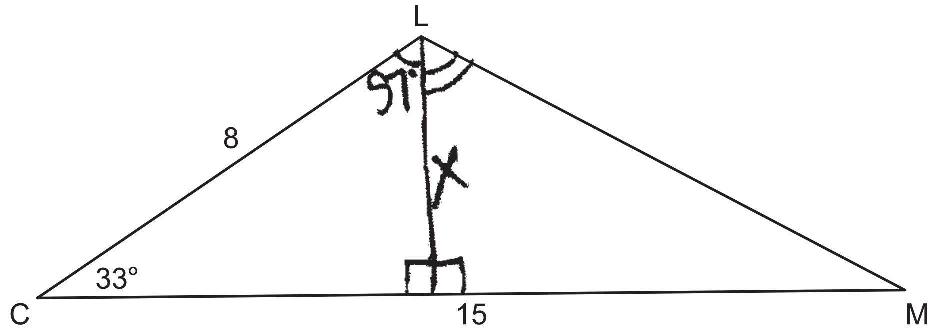
Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$\frac{1}{2}(8)(15)\sin 33$

$A = 32.7$

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

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.



Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$\frac{\cos(57)}{1} = \frac{x}{8}$ $\quad x \approx 4.357$

$\frac{15 \cdot 4.357}{2} \approx 32.7$

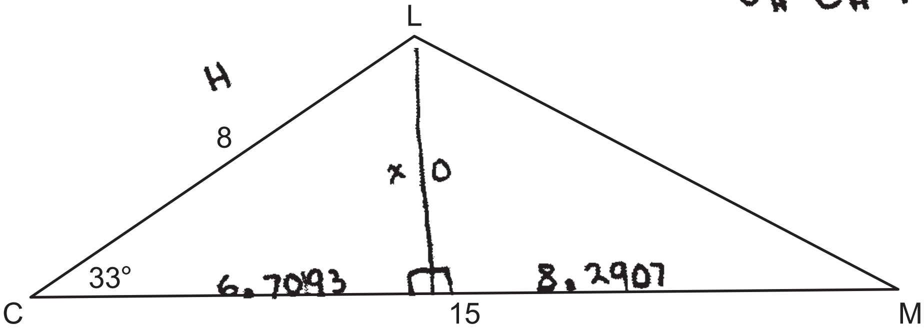
$\boxed{\text{area of } \triangle CLM \approx 32.7}$

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

Question 29

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.

S $\frac{O}{H}$ C $\frac{A}{H}$ T $\frac{O}{A}$



Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$15 - 6.7093 = 8.2907$

$\frac{\sin 33}{1} = \frac{x}{8}$

$x = \sin 33 (8)$

$x = 4.3571$

$(4.3571)^2 + b^2 = (8)^2$

$18.9843 + b^2 = 64$

$-18.9843 \qquad -18.9843$

$\sqrt{b^2} = \sqrt{45.0157}$

$b = 6.7093$

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(6.7093)(4.3571)$

$A = 14.6165$

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(8.2907)(4.3571)$

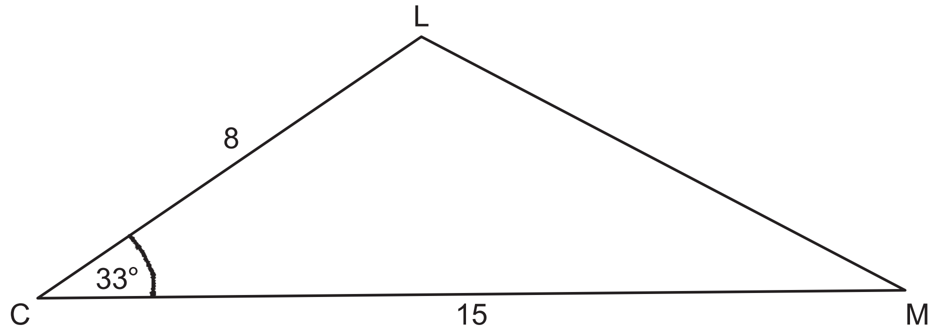
$A = 18.0617$

$18.0617 + 14.6165 = 32.7 \text{ units}^2$

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

Question 29

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.



Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$A_{\Delta} = ab\sin C$

$A_{\Delta} = 8 \cdot 15 \cdot \sin 33$

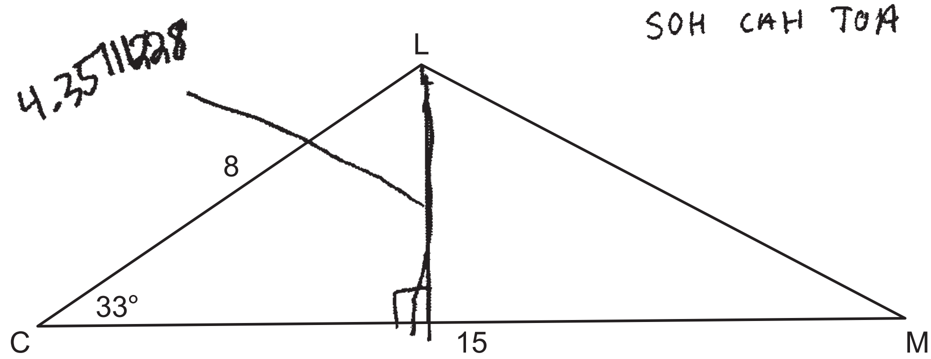
$A_{\Delta} \approx 65.4$

Score 1: The student made an error by not using $\frac{1}{2}$ in the formula, but found an appropriate answer.

Question 29

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.

SOH CAH TOA



Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$A = \frac{1}{2}(b)(h)$

$\sin(33) = \frac{x}{8}$

$x = 4.35711228$

$A = \frac{1}{2}(15)(4.35711228)$

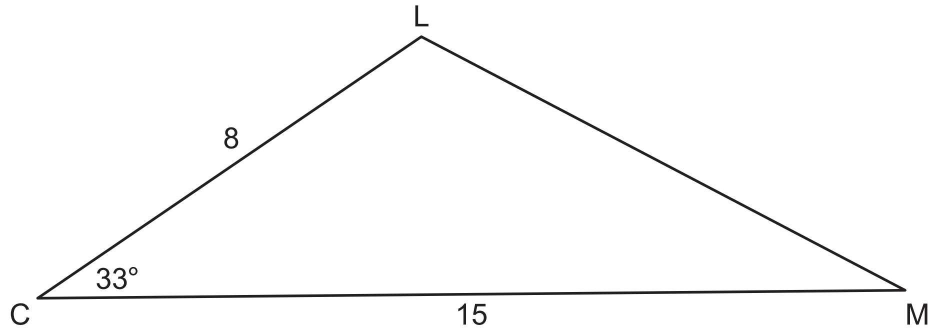
$A =$

$\boxed{A \approx 32.68 \text{ units}^2}$

Score 1: The student made a rounding error.

Question 29

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.



Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$A = \frac{1}{2} b \cdot h$

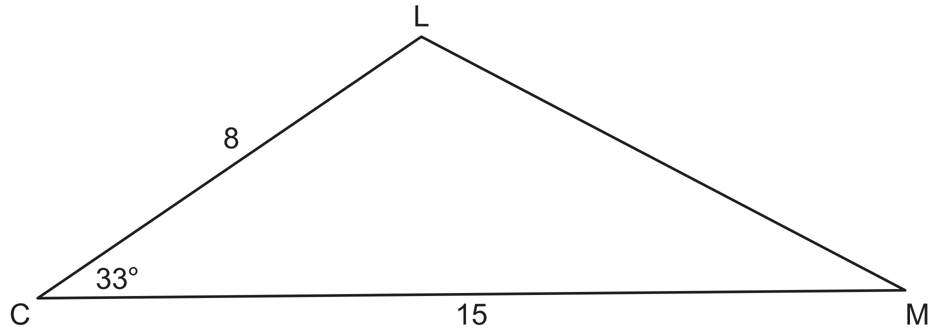
$A = (\frac{1}{2})(15)(8)$

$A = 60.0$

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

Question 29

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.



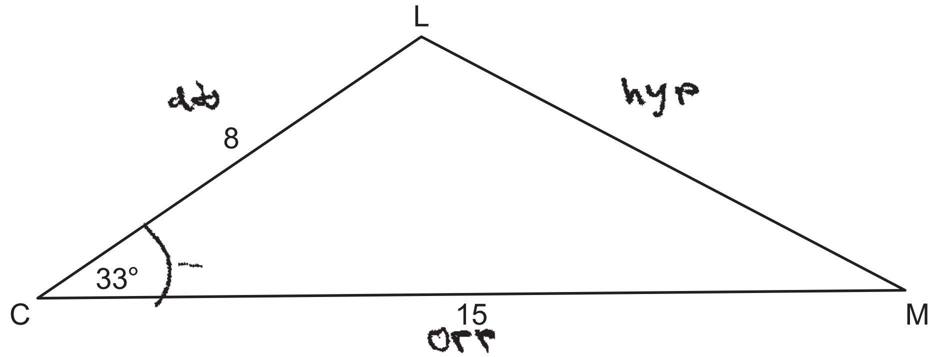
Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$A = \frac{1}{2}(15)(33)(\tan 12) = 8.6$

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

Question 29

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.



Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

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

$8^2 + 15^2 = c^2$

$\frac{289}{33} = c$

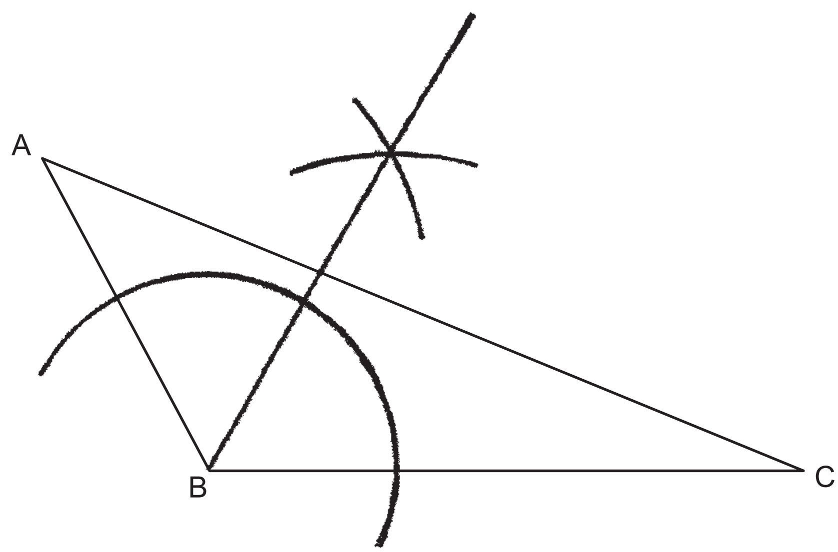
$c = \underline{8.8}$ or $\sqrt{289} = \underline{17}$

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

Question 30

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]

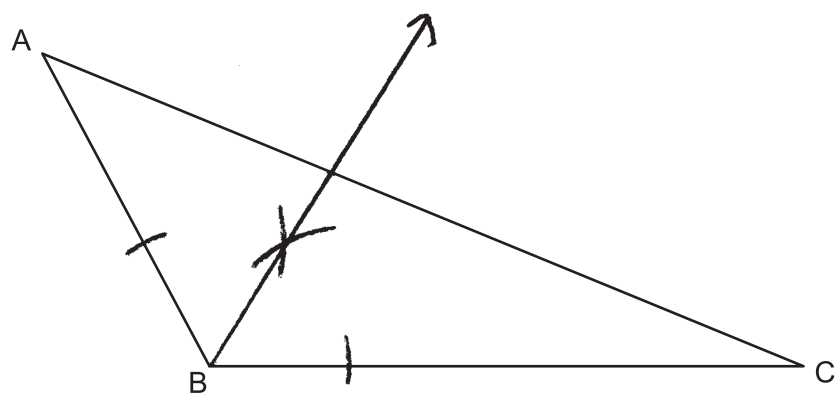


Score 2: The student gave a complete and correct response.

Question 30

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]

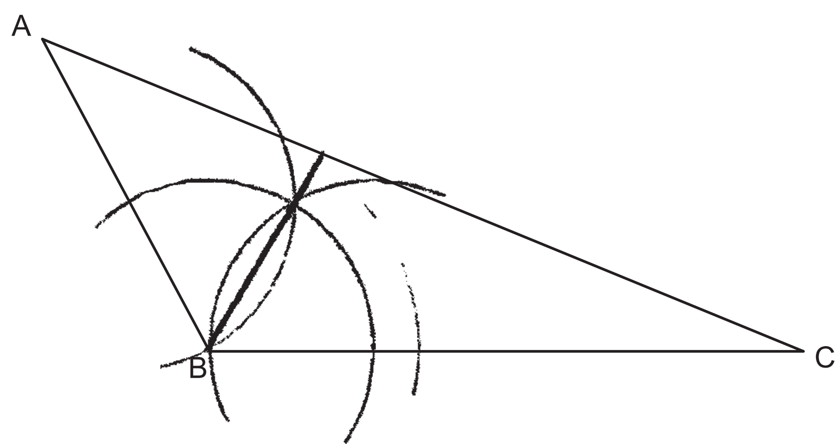


Score 2: The student gave a complete and correct response.

Question 30

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]

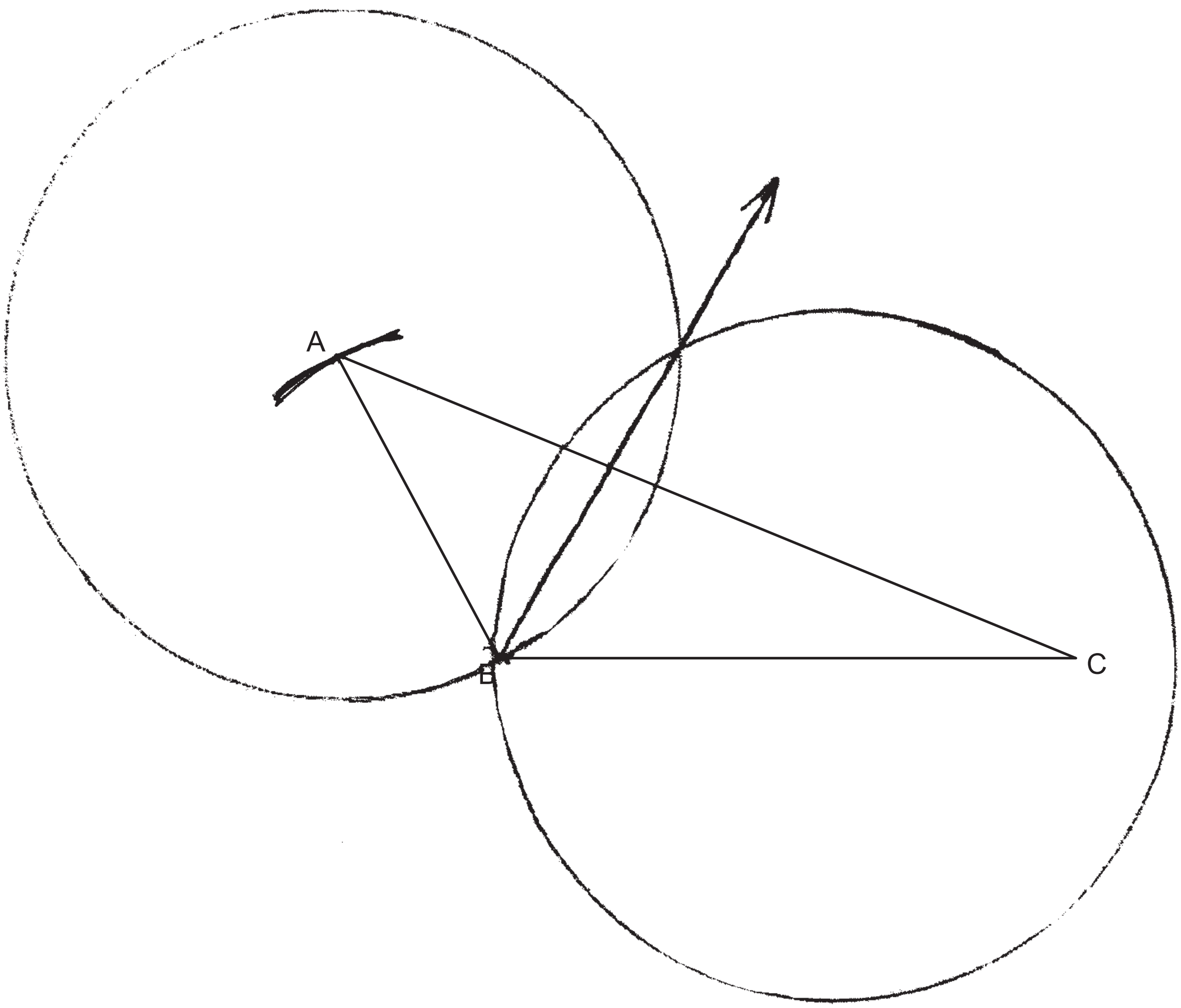


Score 2: The student gave a complete and correct response.

Question 30

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

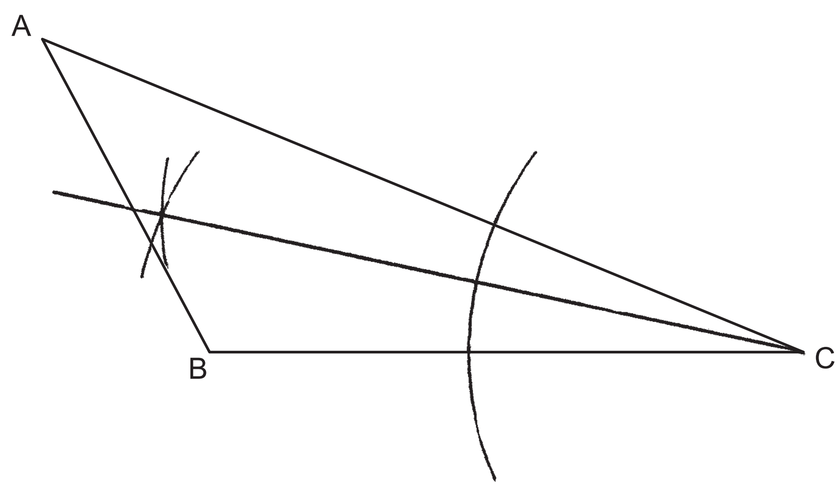
[Leave all construction marks.]



Score 1: The student did not construct the arc on $\overline{BC}$ that is the center of the second circle.

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]

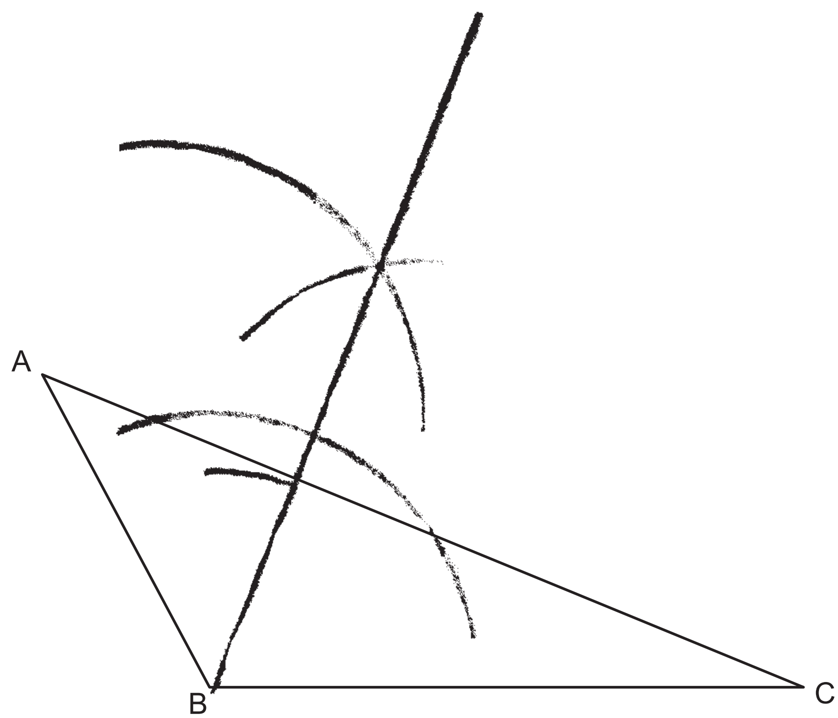


Score 1: The student constructed the bisector of $\angle C$.

Question 30

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]

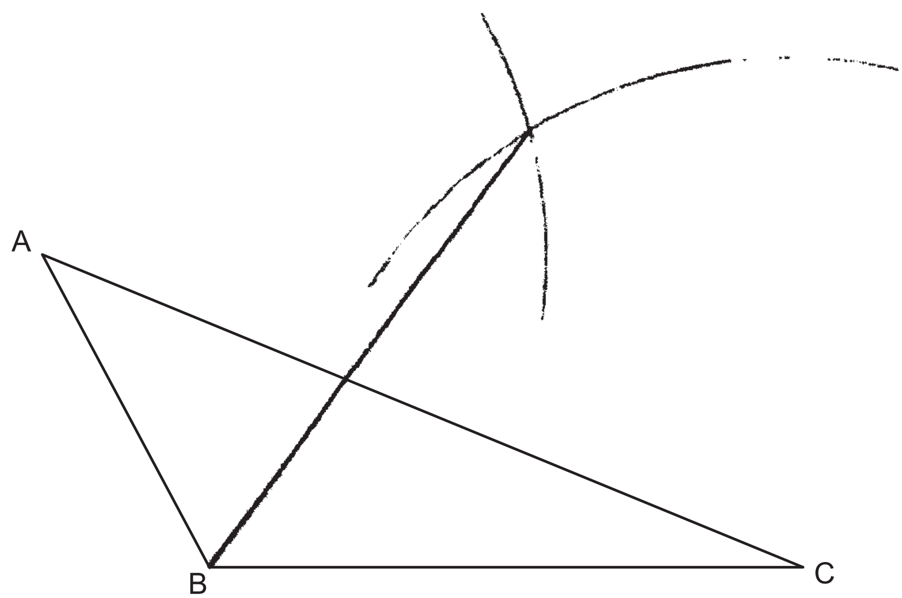


Score 0: The student constructed an altitude from vertex B.

Question 30

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]

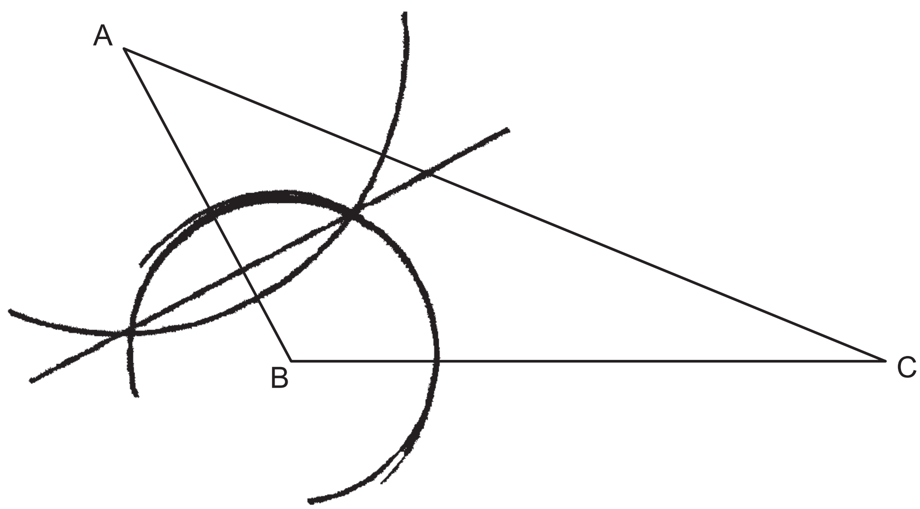


Score 0: The student did not show enough correct relevant course-level work to receive any credit.

Question 30

30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]

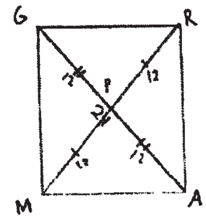


Score 0: The student did not show enough correct relevant course-level work to receive any credit.

Question 31

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.



GRAM is ▱, RP=12, GA=24

$\overline{MP} \cong \overline{PR}$ and $\overline{GP} \cong \overline{PA}$ becouse diagonals bisect each other in parallelograms.

GP=12, PA=12 since segment bisectors divide a segment into two equal halves.
24/2=12

Since $\overline{MP} \cong \overline{PR}$, MP=12

GP+PA=MP+PR, so diagonols $\overline{GA} \cong \overline{MR}$.
12+12=12+12

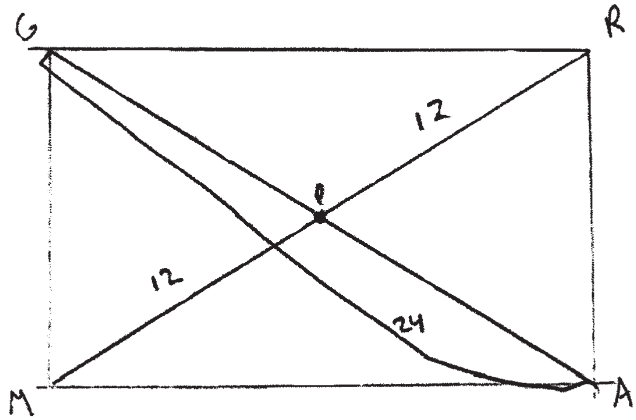
GRAM is a rectongle since rectongles are parallelograms with ≅ diagonals.

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

Question 31

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.



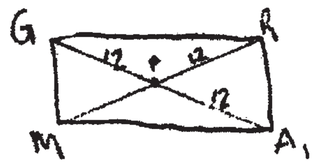
Statement	Reason
1) GRAM is a parallelogram RP=12 GA=24	1) Given
2) $\overline{RP} \cong \overline{MP}$	2) Parallelograms diagonals bisect eachother, bisector cuts segment into 2 $\cong$ parts.
3) $\overline{RM} \cong \overline{GA}$	3) 24=24
4) GRAM is a rectangle	4) PGRAM w/ $\cong$ diagonals is a rectangle

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

Question 31

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.



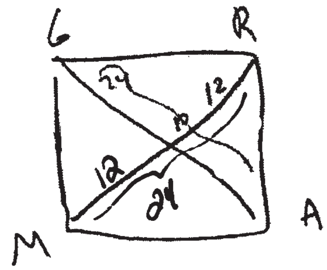
12+12=24

We know that GRAM is a rectangle because the diagonals of a parallelogram bisect each other, so if diagonal GA = 24 and the diagonals intersect at P GP = 12 PA = 12 sinse 24÷2=12. And sinse PR = 12 we know RM = 24 for the same reason diagonals of a parallelogram bisect each other so if half the diagonal is 12 the whole diagonal is 24. Now that I've proven RM = 24 and GA = 24 $\overline{RM} \cong \overline{GA}$ therefore parallelogram GRAM is a rectangle since the diagonals are congruent.

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

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.



$\overline{RM} \cong \overline{GA}$, $24 = 24$ Parallelogram

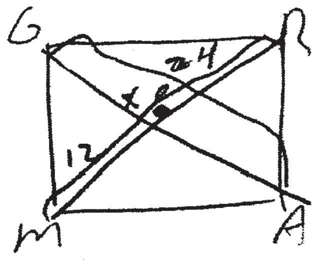
GRAM is a rectangle

because diagonals are $\cong$

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

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.



$$\begin{array}{r} 24 \\ -12 \\ \hline \boxed{12} \end{array} \qquad \begin{array}{r} 12 \\ +12 \\ \hline 24\checkmark \end{array}$$

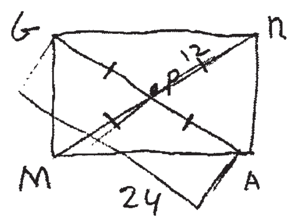
$\therefore \overline{GA} \cong \overline{RM}$

Score 1: The student wrote a partially correct explanation.

Question 31

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.



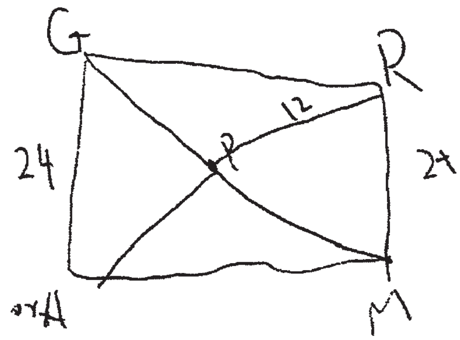
for parallelogram GRAM to be a rectangle the diagonals of the shape have to intersect at the midpoints which they do at point p. also bc all of the diagonals are ≅ this means the opposite sides are ≅ making GRAM a rectangle

Score 1: The student wrote a partially correct explanation.

Question 31

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.

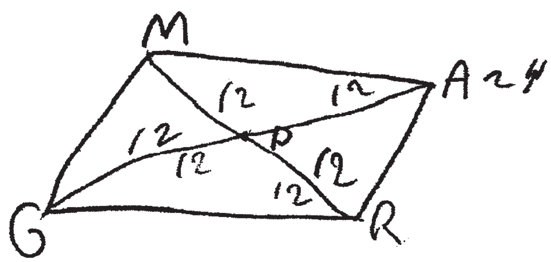


GRAM is A rectangle because GA and RM will have the same side length and they all have intersect at P

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

31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.

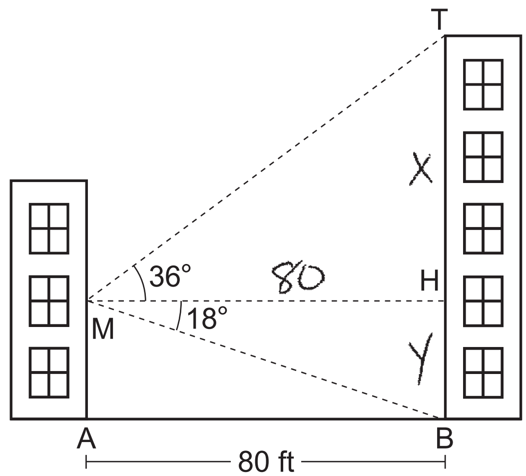


GRAM is a rectangle because it has equal sides like a square does, but it doesn't have 4 90° angles so instead of a square its a Rectangle

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

Question 32

32 As modeled below, Maria wants to determine the height of the building across the street from her position, *M*. The angle of elevation from *M* to the top of the building, *T*, is 36°. From *M*, the angle of depression to the base of the building, *B*, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, *TB*, across the street from Maria.

$\tan 36 = \frac{x}{80}$

$x = 80(\tan 36)$

$x = 58.12340224$

$\tan 18 = \frac{y}{80}$

$y = 80(\tan 18)$

$y = 25.99357757$

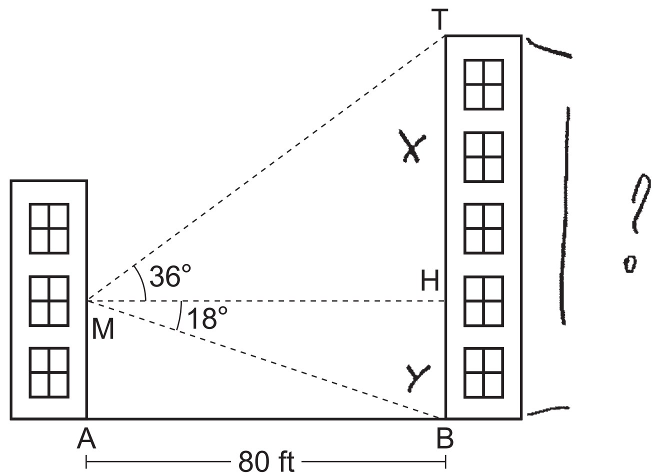
$x + y = 84.11697794$

84

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

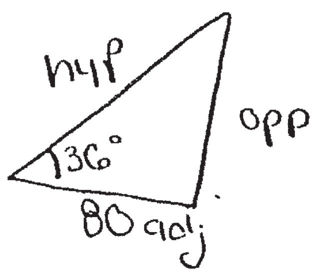
Question 32

32 As modeled below, Maria wants to determine the height of the building across the street from her position, M. The angle of elevation from M to the top of the building, T, is 36°. From M, the angle of depression to the base of the building, B, is 18°. The buildings are 80 feet apart.

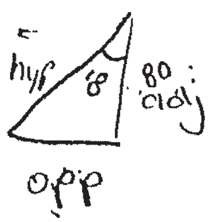


Determine and state, to the *nearest foot*, the height of the building, TB, across the street from Maria.

sohcah toa



tan 36: $\frac{.7265}{1} = \frac{X}{80}$ → 58



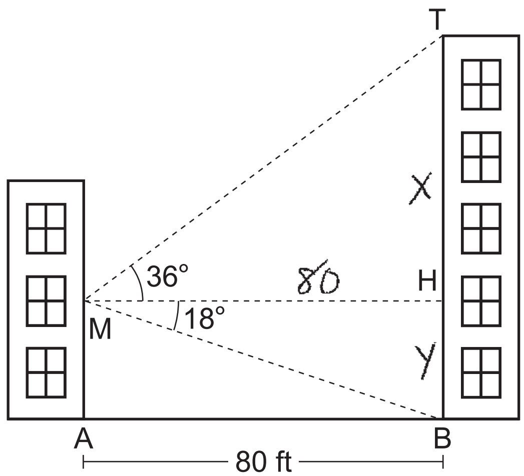
tan 18 : $\frac{.3249}{1} = \frac{Y}{80}$ → 26

$$\begin{array}{r} 58 \\ +\ 26 \\ \hline \end{array}$$

84 is the height of the building

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

32 As modeled below, Maria wants to determine the height of the building across the street from her position, *M*. The angle of elevation from *M* to the top of the building, *T*, is 36°. From *M*, the angle of depression to the base of the building, *B*, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, *TB*, across the street from Maria.

$\tan 36 = \frac{x}{80}$

$\sin 18 = \frac{y}{80}$

$x = (\tan 36)(80)$

$x = 58.12340224$

$y = (\sin 18)(80)$

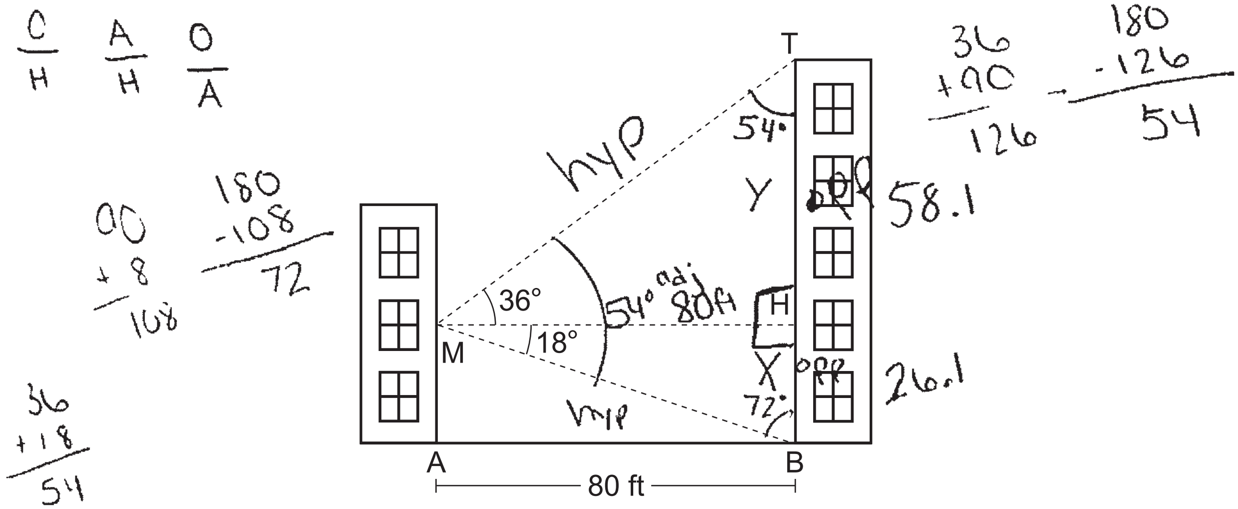
$y = 24.72135955$

$x + y = 82.84476179$

83

Score 3: The student made an error when determining the length of $\overline{HB}$, but found an appropriate length for $\overline{TB}$.

32 As modeled below, Maria wants to determine the height of the building across the street from her position, *M*. The angle of elevation from *M* to the top of the building, *T*, is 36°. From *M*, the angle of depression to the base of the building, *B*, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, *TB*, across the street from Maria.

$\frac{\tan 18°}{1} = \frac{X}{80}$ $\frac{\tan 36°}{1} = \frac{Y}{80}$

$X = 80\tan 18°$ $Y = 80\tan 36°$

$X = 26.1$ $Y = 58.1$

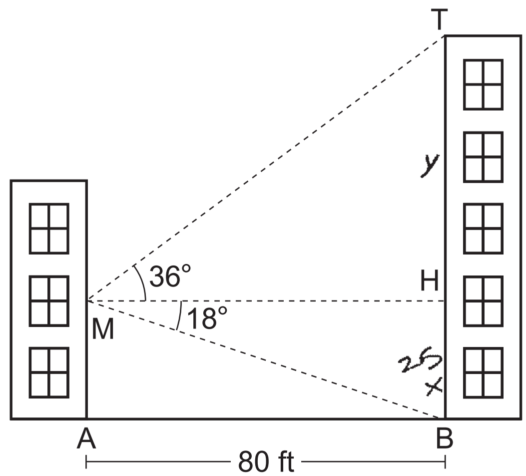
$$\begin{array}{r} 58.1 \\ +\ 26.1 \\ \hline 84.2 \end{array}$$

height of building TB = 84 ft

Score 3: The student made a computational error when determining the length of $\overline{HB}$.

Question 32

32 As modeled below, Maria wants to determine the height of the building across the street from her position, *M*. The angle of elevation from *M* to the top of the building, *T*, is 36°. From *M*, the angle of depression to the base of the building, *B*, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, *TB*, across the street from Maria.

SOH ~~CAH~~ CAH TOA

$\frac{\sin 18}{1} = \frac{x}{80}$

$80 \sin 18 = x$

$\boxed{x \approx 25}$

$\frac{\tan 36}{1} = \frac{y}{80}$

$80 \tan 36 = y$

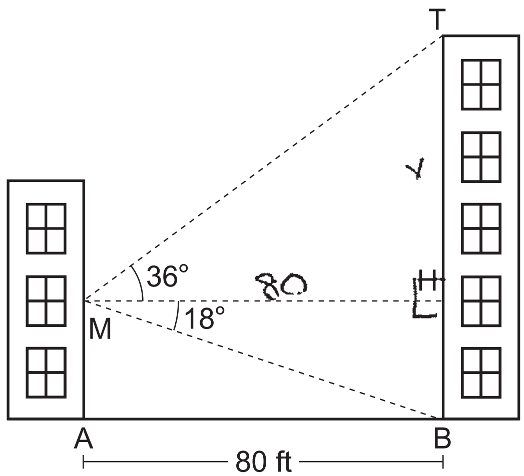
$y \approx 58$ ft

Bulding $\overline{TB}$ is apvox 8.4 ft

Score 2: The student made errors when determining the lengths of $\overline{HB}$ and $\overline{TB}$.

Question 32

32 As modeled below, Maria wants to determine the height of the building across the street from her position, M. The angle of elevation from M to the top of the building, T, is 36°. From M, the angle of depression to the base of the building, B, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, TB, across the street from Maria.

$\tan(36) = \frac{x}{80}$

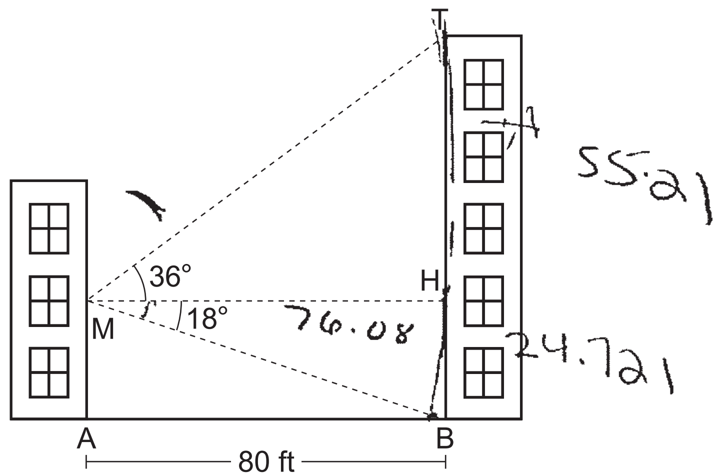
$\tan(36) \cdot 80 = x$

$58.123 = x$

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

Question 32

32 As modeled below, Maria wants to determine the height of the building across the street from her position, M. The angle of elevation from M to the top of the building, T, is 36°. From M, the angle of depression to the base of the building, B, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, TB, across the street from Maria.

$$\frac{\sin(18)}{1} = \frac{HB}{80} \qquad \frac{\cos(18)}{1} = \frac{MH}{80}$$

$$HB = \sin(18)(80) \qquad MH = \cos(18)(80)$$

$$HB = 24.721 \qquad MH = 76.08$$

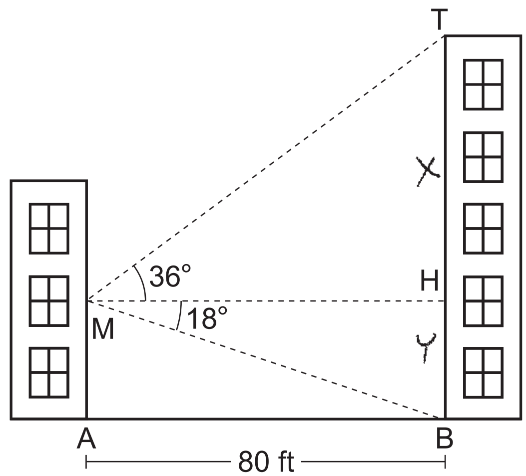
$$\frac{\tan(36)}{1} = \frac{TH}{76}$$

$$TH = \tan(36)(76)$$

$$TB = 79.938$$

Score 1: The student made errors when determining the lengths of $\overline{HB}$ and $\overline{MH}$ and made a rounding error when determining the length of $\overline{TB}$.

32 As modeled below, Maria wants to determine the height of the building across the street from her position, M. The angle of elevation from M to the top of the building, T, is 36°. From M, the angle of depression to the base of the building, B, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, TB, across the street from Maria.

$\tan 36° = \frac{x}{80}$ | $\sin 18° = \frac{y}{80}$

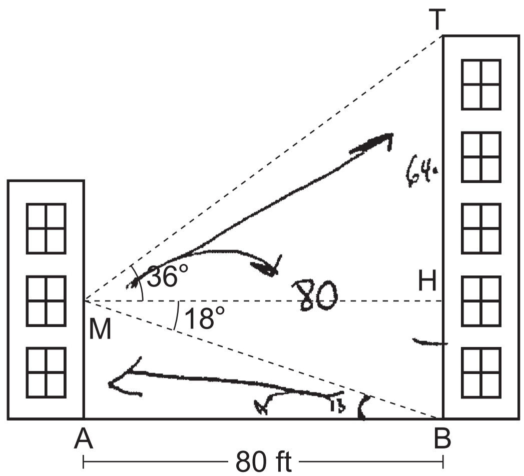
$X = .36 \times 80$ | $Y = .18 \times 80$

$x = 28.8$ | $Y = 14.4$

$X + Y =$ 28.8 + 14.4 = 43.2

Score 1: The student wrote one correct relevant trigonometric equation.

32 As modeled below, Maria wants to determine the height of the building across the street from her position, *M*. The angle of elevation from *M* to the top of the building, *T*, is 36°. From *M*, the angle of depression to the base of the building, *B*, is 18°. The buildings are 80 feet apart.



SOH - CAH TOA

OH

$\cos 36 = x/80$

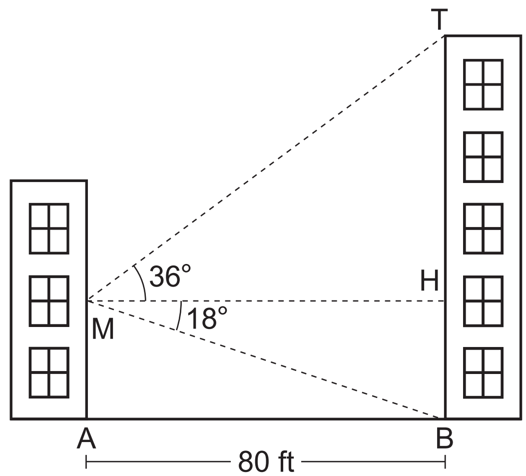
76.0345

Determine and state, to the *nearest foot*, the height of the building, *TB*, across the street from Maria.

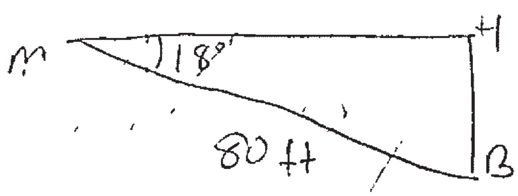
58.1234042 . . .

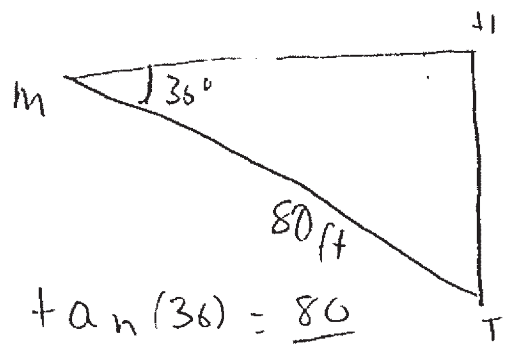
Score 0: The student did not show enough correct relevant course-level work to receive any credit.

32 As modeled below, Maria wants to determine the height of the building across the street from her position, M. The angle of elevation from M to the top of the building, T, is 36°. From M, the angle of depression to the base of the building, B, is 18°. The buildings are 80 feet apart.



Determine and state, to the *nearest foot*, the height of the building, TB, across the street from Maria.





$\tan(18) = \frac{80}{X}$

$80\tan(18) = X$

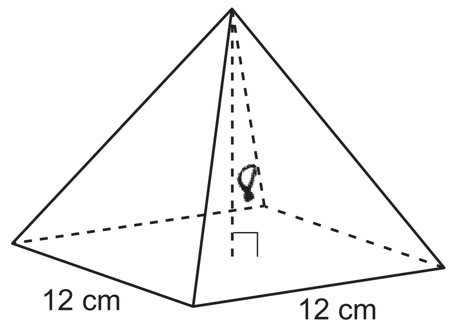
$\tan(36) = \frac{80}{Y}$

$80\tan(36) = Y$

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

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$12 \cdot 12 = 144$ $m = d \cdot V$

$\frac{1}{3} \cdot 144 \cdot 8 = 384$

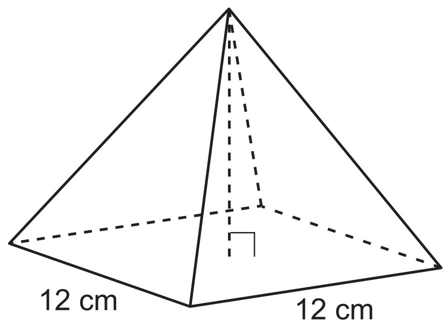
$384 \cdot 1.25 = 480g$ $0.48\ kg$

$\frac{15}{0.48} = 31.25 \approx \boxed{31 \text{ Pyramids}}$

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

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$\frac{1}{3}12^2(8) = 384$

$\frac{1.25}{1} = \frac{m}{384\text{cm}^3}$

$m = 480$ grams

$\frac{480g}{1000} = .48$ kilograms

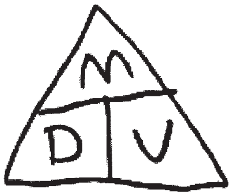
$\frac{15}{.48} = 31.25$

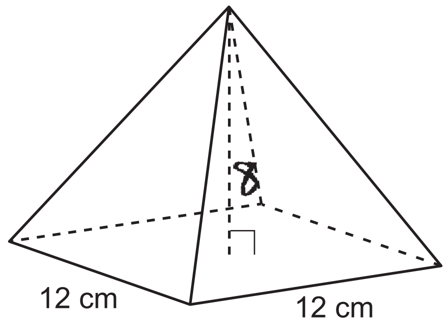
31 pyramids

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

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.





The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

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

$V = \frac{1}{3}(12 \cdot 12)(8)$

$V = \frac{1}{3}(144)(8)$

$V = \frac{1}{3}(1152)$

$V = 384$

15000g

$D \cdot V$

$(1.25)(384)$

480

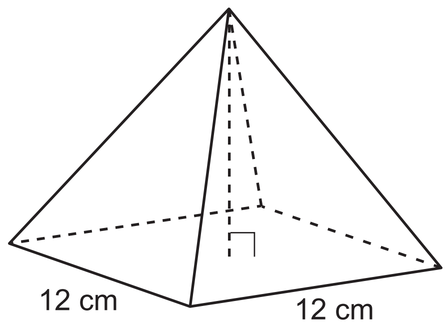
$\frac{15000}{480} = 31.25$

max 31 pyramids can be made

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

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$15 \text{ Kg} = 15{,}000 \text{ g}$

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

$1.25 = \frac{15{,}000}{x}$

$\frac{1.25x}{1.25} = \frac{15{,}000}{1.25}$

$x = 12{,}000 \text{ cm}^3$

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

$= \frac{1}{3}(12 \cdot 12)(8)$

$= \frac{1}{3}(1152)$

$V = 384 \text{ cm}^3$

$\frac{12{,}000}{384}$

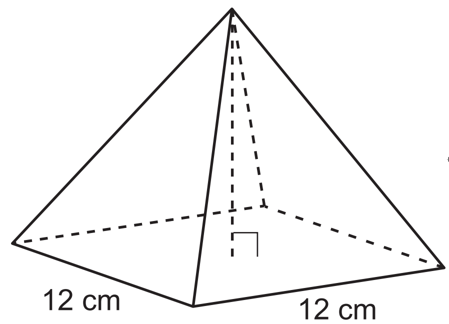
$= 31.25$

$\boxed{31}$

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

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



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

The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$\frac{1}{3}(12 \times 8) = 32$

$32 \times 1.25 = 40g$

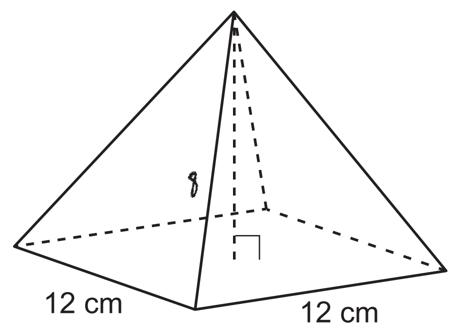
$\frac{15000}{40} = 375$

375 pyramids could be made

Score 3: The student made an error when determining the volume of one pyramid.

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

V of Pyramid $= (8 \cdot 12 \cdot 12)\frac{1}{3}$

$V = 384\text{cm}^3$

$1.25 \times 384 = g$

$480 = g$

$480/100 = kg$

$4.8 = kg$

$15/4.8 =$ max # of pyra

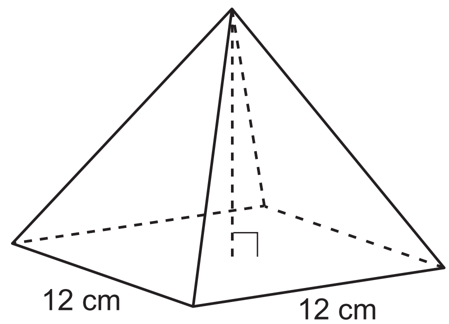
3.125

$\boxed{3 \text{ pyramids}}$

Score 3: The student made an error converting grams to kilograms.

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

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

$V = \frac{1}{3}(12 \cdot 12)(8)$

$V = \frac{1}{3}(144)(8)$

$V = 384 \text{cm}^3$

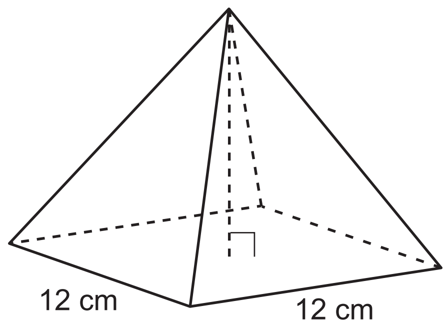
$M = 384(1.25)$

$M = 480$

Score 2: The student correctly determined the mass of one pyramid.

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

pyramid

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

$v = \frac{1}{3}(12 \cdot 12)8$

$v = 384 \text{ cm}^3$

$384 \cdot 1.25 = 480$

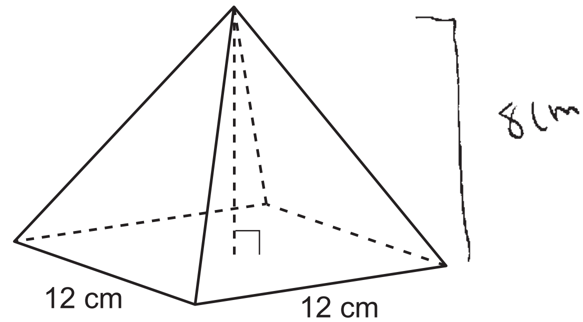
$480/15 = 32$

32 pyramids

Score 2: The student correctly determined the mass of one pyramid.

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

A of base $= 12 \cdot 12 = 144$

$V = \frac{1}{3}(144)(8)$

$V = 384$

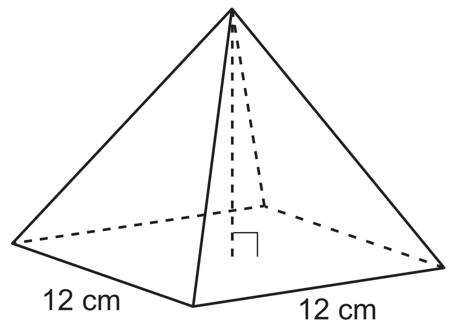
$\frac{384}{15} = 25.6$

artist can make 25 pyramids

Score 1: The student correctly determined the volume of one pyramid.

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



h = 8

The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$A_{base} = 12(12)$

$= 144$

$V = \frac{1}{3}(144)(8)$

$V = 384$

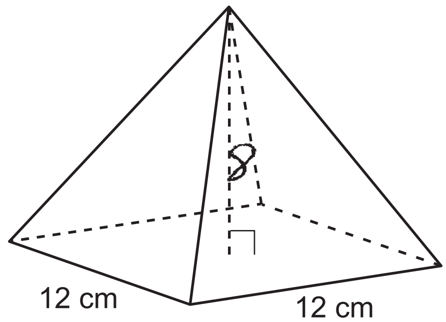
$384/1.25$

$= 307.2$

Score 1: The student correctly determined the volume of one pyramid.

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$\frac{1}{3}Bh$

$d = \frac{m}{V}$ $\quad$ $1.25 = \frac{m}{256}$ $\quad$ $\frac{1}{3}(12)(12)(8)$

256

$320 = m$

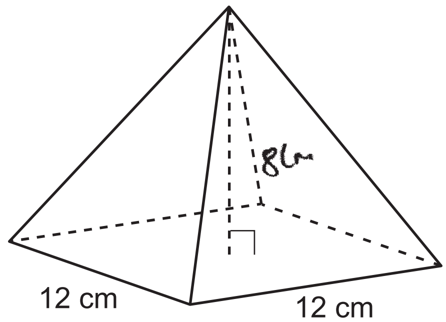
$320/15 = 21.333333$

21 pyramids

Score 1: The student made a computational error when determining the volume of one pyramid, but found an appropriate mass.

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$12 \times 12 = 144$

$12 \times 8 = 96$

$\times 4$

384

$384 + 144 = 528$

44

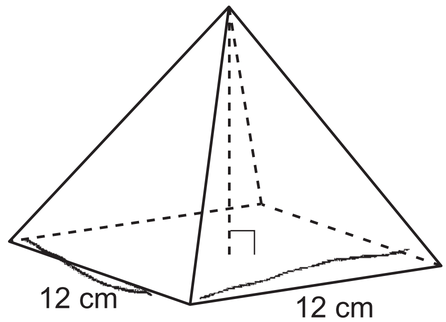
$44 = \frac{660}{15} = \frac{15}{15}$

$\cancel{\frac{15}{528} = \frac{1.25}{1}}$

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

Question 33

33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$12 \cdot 12 \cdot 8 = 1152$

$1152 / 1.25\, g/cm^3$

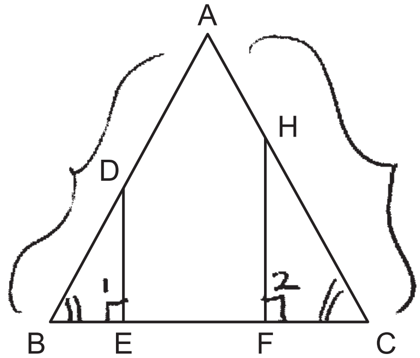
$= 921.6^3 / 15$

$= 61.44$

≈ 61 pyramids.

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

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



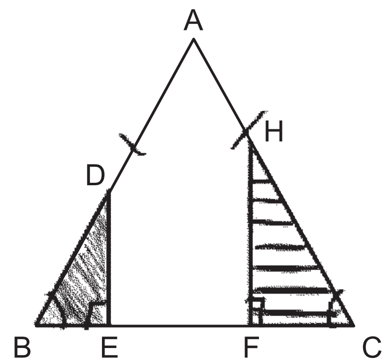
Prove: $\dfrac{DE}{BE} = \dfrac{HF}{CF}$

$\triangle ABC$ Statements	Reasons
1 $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$	1 Given
2 $\triangle ABC$ is isos.	2 2 $\cong$ legs $\rightarrow$ isos. $\triangle$
3 $\angle B \cong \angle C$	3 Isos $\triangle \rightarrow 2 \cong$ base $\angle$'s
4 $\angle 1, \angle 2$ are right	4 $\perp$ lines $\rightarrow$ right $\angle$'s
5 $\angle 1 \cong \angle 2$	5 Right $\angle$'s $\rightarrow \cong \angle$'s
6 $\triangle DBE \sim \triangle HCF$	6 AA $\sim$
7 $\dfrac{DE}{BE} = \dfrac{HF}{CF}$	7 $\sim \triangle$s $\rightarrow$ proportional corr. sides

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

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



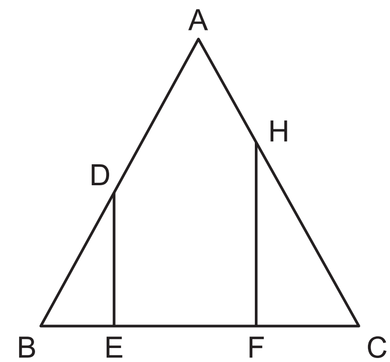
Prove: $\frac{DE}{BE} = \frac{HF}{CF}$

Statements	Reasons
(1) $\triangle ABC$, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$	(1) Given
(2) $\angle B \cong \angle C$	(2) In a $\triangle$, angles opposite $\cong$ sides are $\cong$
(3) $\angle DEB \cong \angle HFC$	(3) $\perp$ lines form $\cong$ right $\angle$s
(4) $\triangle DEB \sim \triangle \cancel{HEF}$ HFC	(4) AA$\sim$
(5) $\frac{DE}{BE} = \frac{HF}{CF}$	(5) Corresponding sides of $\sim$ $\triangle$s are in proportion

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

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



Prove: $\frac{DE}{BE} = \frac{HF}{CF}$

$\triangle ABC$, $\overline{AB} \cong \overline{AC}$
Given

$\overline{DE} \perp \overline{BC}$
$\overline{HF} \perp \overline{BC}$
Given

$\triangle ABC$ is isosceles
If a $\triangle$ has 2 $\cong$ sides it is isosceles

$\angle DEB \cong \angle HFC$
$\perp$ lines form $\cong$ right $\angle$'s

$\angle B \cong \angle C$
Isosceles $\triangle$'s have 2 $\cong$ base $\angle$'s

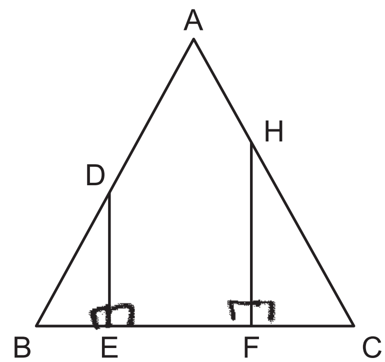
$\triangle DEB \sim \triangle HFC$
AA~

$\frac{DE}{BE} = \frac{HF}{CF}$
Similar $\triangle$'s corresponding sides are in proportion

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

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$

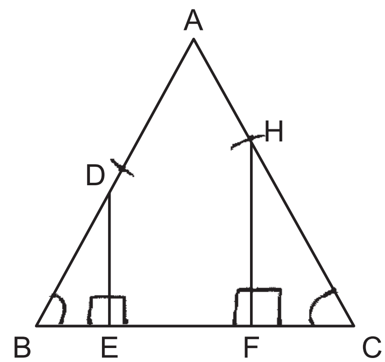


Prove: $\dfrac{DE}{BE} = \dfrac{HF}{CF}$

Statement	Reason
1. $\triangle ABC$, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$	1. Given
2. $\angle DEB$ and $\angle HFC$ are right $\angle$'s	2. $\perp$ segments form right $\angle$'s
3. $\angle DEB \cong \angle HFC$	3. All right $\angle$'s are $\cong$
4. $\triangle ABC$ is isoscelec	4. A $\triangle$ with 2 $\cong$ sides is issoscles
5. $\angle B \cong \angle C$	5. Base $\angle$'s of a $\cong$ $\triangle$ are $\cong$
6. $\triangle DBE \sim \triangle HCF$	6. $AA \cong AA$
7. $\frac{DE}{BE} = \frac{HF}{CF}$	7. Corr. sidec of similar $\triangle$'s are in proportion

Score 3: The student wrote an incorrect reason in step 5.

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



Prove: $\frac{DE}{BE} = \frac{HF}{CF}$

product of mean equals product of extremes

corasponding parts of corasponding triangles are congruent

(1) $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$, $\triangle ABC$ — (1) Given

(2) $\angle ABC \cong \angle ACB$ — (2) if 2 sides of a triangle are $\cong$ then the $\angle$'s opposite those sides are $\cong$

(3) $\angle DEB$ and $\angle HFC$ are right angles — (3) $\perp$ lines form right angles

(4) $\angle DEB \cong \angle HFC$ — (3) All right angles are congruent

(5) $\triangle DBE \sim \triangle HCF$ — (5) AA~

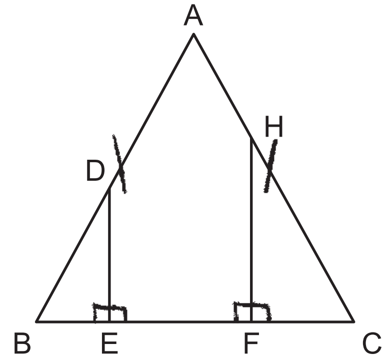
(6) $\overline{DE} \cong \overline{CF}$ $\overline{HF} \cong \overline{BE}$ — (6) corasponding parts of corasponding triangles are congruent

(7) $\frac{DE}{BE} = \frac{HE}{CF}$ — (7) Products of means is equal to the product of the extrems

Score 3: The student correctly proved $\triangle DBE \sim \triangle HCF$.

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



$DE \cdot CF = BE \cdot HF$

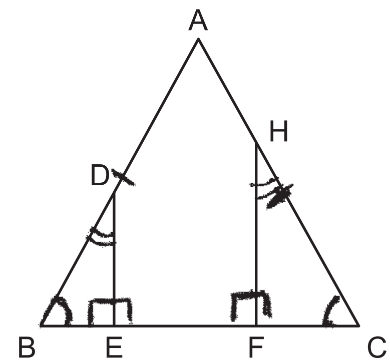
Prove: $\dfrac{DE}{BE} = \dfrac{HF}{CF}$

Statement	Reason
1 $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$, ABC is a triangle	1 given
2 $\angle ABE \cong \angle ACF$	2 all base ∠'s of a isocles △ are ≅
3 $\angle DEB$, $\angle HFC$ are right ∠'s	3 perpendicular lins form right ∠s
4 $\angle DEB \cong \angle HFC$	4 all right ∠s are ≅
5 $\triangle BDE \sim \triangle CHF$	5 AA~
6 $\frac{DE}{BE} = \frac{HF}{CF}$	6 product of the meas equals the product of the extremes

Score 2: The student was missing a statement and reason to prove step 2. The student wrote an incorrect reason in step 6.

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



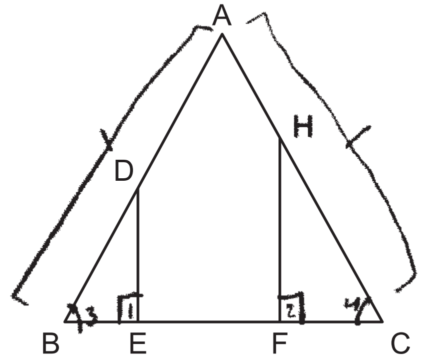
Prove: $\dfrac{DE}{BE} = \dfrac{HF}{CF}$

1. $\triangle ABC$, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$	1. Given
2. $\angle ABE \cong \angle ACF$	2. Definition of icoscelese
3. $\angle DEB$ and $\angle HFC$ are $\cong$ right $\angle$s	3. Perpendicular lines form $\cong$ right angles
4. $\triangle DBE \sim \triangle HCF$	4. AA~
5. $\dfrac{DE}{BE} = \dfrac{HF}{CF}$	5. Due to similarity since the angles are the same they are similar which prove it

Score 2: The student wrote correct relevant statements and reasons in steps 3 and 4.

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$

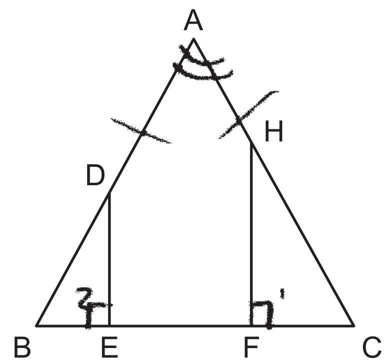


Prove: $\dfrac{DE}{BE} = \dfrac{HF}{CF}$

S	R
1. $\triangle ABC$ $\overline{AB} \cong \overline{AC}$ $\overline{DE} \perp \overline{BC}$ $\overline{HF} \perp \overline{BC}$	1. Given
2. $\angle 1 \cong \angle 2$	2. $\perp$ lines form $\cong$ rt $\angle$'s
3. $\angle 3 \cong \angle 4$	3. Congruent sides form $\cong$ opposite $\angle$'s
4. $\triangle DEB \sim \triangle HFC$	4. AA~
5. $\frac{DE}{BC} = \frac{HF}{CF}$	5. CPSTS

Score 2: The student wrote an incomplete reason in step 3 and an incorrect reason in step 5.

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



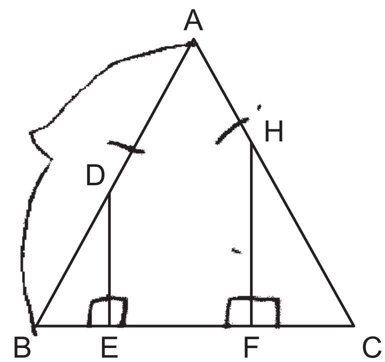
Prove: $\dfrac{DE}{BE} = \dfrac{HF}{CF}$

Statments	Reason
① $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$	① Given
② ∠1 and ∠2 are right ∠'s	② All ⊥ lines form right ∠'s
③ ∠2 ≅ ∠1	③ All right ∠'s are ≅
④ ∠A ≅ ∠A	④ Reflexive property
⑤ △DBE ~ △HCF	⑤ AA~
⑥ $\frac{DE}{BE} = \frac{HF}{CF}$	⑥ 2 △'s similar, ≅ ∠'s are ~~crossed~~ multiplied

Score 1: The student correctly proved ∠2 ≅ ∠1.

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



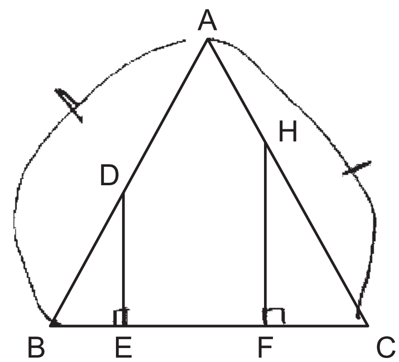
Prove: $\frac{DE}{BE} = \frac{HF}{CF}$

we are given $\overline{AB} \cong \overline{AC}$ $\overline{DE} \perp \overline{BC}$ and $\overline{HF} \perp \overline{BC}$.
$\triangle ABC$ is isocoles b/c it has
2 congruent sides $\overline{AB}$, $\overline{AC}$, so $\angle B \cong \angle C$.

Score 1: The student wrote one correct relevant statement and reason.

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



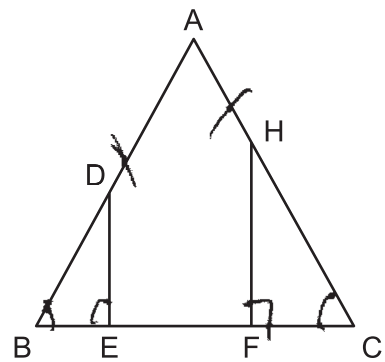
Prove: $\frac{DE}{BE} = \frac{HF}{CF}$

I know	b/c
1. $\overline{AB} \cong \overline{AC}$	1. given
2. $\overline{DE} \perp \overline{BC}$	2. given
3. $\angle DEB$ is a rt $\angle$	3. $\perp$ lines form rt $\angle$
4. $\overline{HF} \perp \overline{BC}$	4. given
5. $\angle HFC$ is a rt $\angle$	5. $\perp$ lines form rt $\angle$
6. $\angle DEB \cong \angle HFC$	6. All rt $\angle$s are $\cong$
7. $\triangle DEB \sim \triangle HFC$	7 AA
8.	

Score 1: The student correctly proved $\angle DEB \cong \angle HFC$.

Question 34

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



Prove: $\frac{DE}{BE} = \frac{HF}{CF}$

1.) ∡B ≅ ∡C

2.) ∡E ≅ ∡F

3.) $\frac{DE}{BE} = \frac{HF}{CF}$

1) base ∡s are ≅

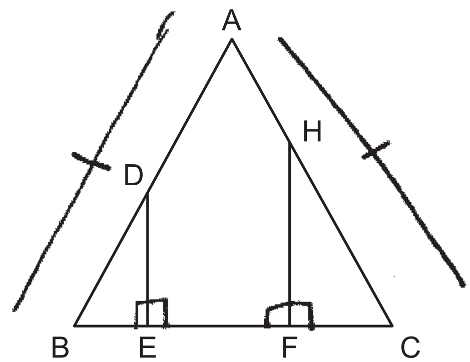
2.) ⊥ ∡s are ≅

2.)

3.) AA

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

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



Prove: $\dfrac{DE}{BE} = \dfrac{HF}{CF}$

Statement	Reasons
1. $\triangle ABC$, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$ and $\overline{HF} \perp \overline{BC}$	1. Given
2.	
) $\triangle DEB \sim \triangle HFC$	) AA similarity
) $\dfrac{DE}{BE} = \dfrac{HF}{CF}$	) Prod of means = prod of extremes.

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

Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$D(1,5)$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$m_{\overline{AB}} = -\frac{3}{2}$ $m_{\overline{BC}} = \frac{6}{4}$ ∴ ABCD is a parallelogram because both sets of opposite sides are parallel

$m_{\overline{CD}} = \frac{-3}{2}$ $m_{\overline{AD}} = \frac{6}{4}$

same slope $\overline{AB} \parallel \overline{CD}$ same slope $\overline{BC} \parallel \overline{AD}$

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$E(-3,5)$

Question 35 is continued on the next page.

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

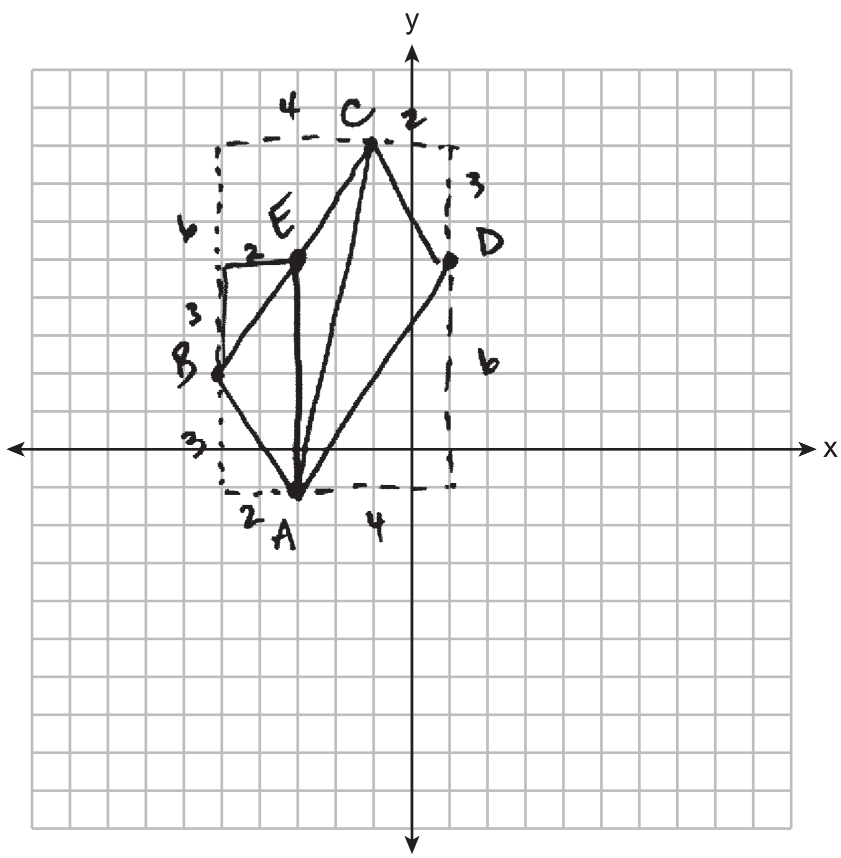
Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$$d_{BE} = \sqrt{3^2 + 2^2} = \sqrt{13}$$

$$d_{AB} = \sqrt{(-3)^2 + (2)^2} = \sqrt{13}$$

$\overline{BE} \cong \overline{AB}$

$\therefore \triangle ABE$ is an isosceles triangle because 2 sides are congruent.



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$D(1,5)$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

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

$d_{AB}=\sqrt{(-3+5)^2+(-1-2)^2}=\sqrt{4+9}=\sqrt{13}$

$d_{CD}=\sqrt{(1+1)^2+(5-8)^2}=\sqrt{4+9}=\sqrt{13}$

$d_{BC}=\sqrt{(-5+1)^2+(2-8)^2}=\sqrt{16+36}=\sqrt{52}$

$d_{AD}=\sqrt{(1+3)^2+(5+1)^2}=\sqrt{16+36}=\sqrt{52}$

ABCD is a p-gram b/c both pairs of opposite sides are congruent.

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$E(-3,5)$

Question 35 is continued on the next page.

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

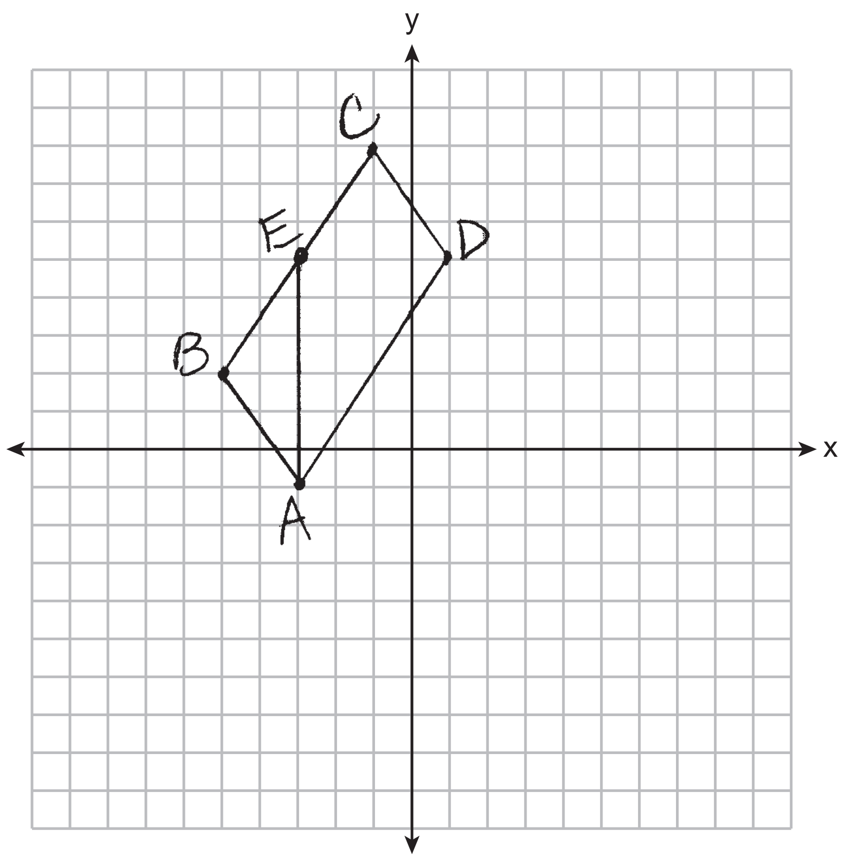
Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$AB = \sqrt{13}$ $\quad$ $d_{BE} = \sqrt{(-5++3)^2 + (2-5)^2}$

$= \sqrt{4+9}$

$= \sqrt{13}$

$\triangle ABE$ is isosceles because it has 2 $\cong$ sides.
$(\overline{AB} \cong \overline{BE})$.



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

D $\overset{3}{\downarrow}$, $\overset{2}{\rightarrow}$ D(1,5)

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

Midpoint $\overline{AC} = \left(\frac{-3+(-1)}{2}, \frac{-1+8}{2}\right)$
$= \left(\frac{-4}{2}, \frac{7}{2}\right)$
$= (-2, 3.5)$

Midpoint $\overline{BD} = \left(\frac{-5+1}{2}, \frac{2+5}{2}\right)$
$= \left(\frac{-4}{2}, \frac{7}{2}\right)$
$= (-2, 3.5)$

Since diagonals $\overline{AC}$ and $\overline{BD}$ have the same midpoint, they bisect eachother.
Since the diagonals bisect eachother, ABCD is a parallelogram.

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

Midpoint of $\overline{BC} = \left(\frac{-5+(-1)}{2}, \frac{2+8}{2}\right)$
$= \left(\frac{-6}{2}, \frac{10}{2}\right)$
E $(-3, 5)$

Question 35 is continued on the next page.

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

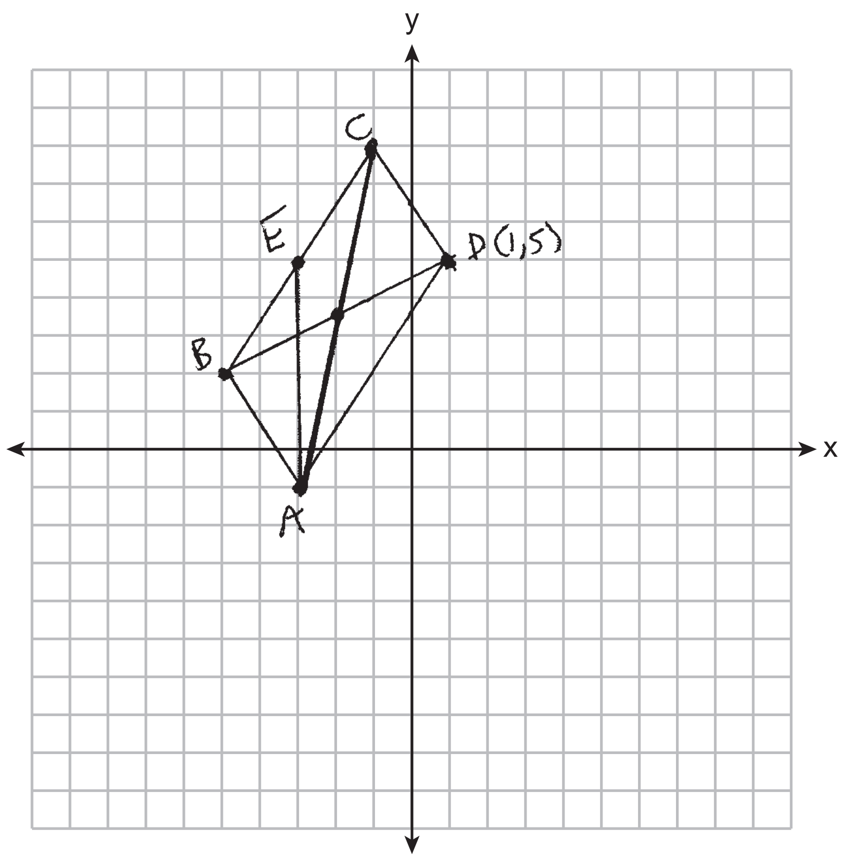
Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$$AB = \sqrt{(-5-(-3))^2+(2-(-1))^2}$$
$$= \sqrt{(-2)^2+3^2}$$
$$= \sqrt{4+9}$$
$$AB = \sqrt{13}$$

$$BE = \sqrt{(-3-(-5))^2+(5-2)^2}$$
$$= \sqrt{2^2+3^2}$$
$$= \sqrt{4+9}$$
$$BE = \sqrt{13}$$

$$\overline{AB} \cong \overline{BE}$$

Since 2 sides of $\triangle ABE$ are $\cong$, it is isosceles.



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

D(1,5)

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

OPP Sides parallel

$m\overline{BA} = \frac{-1-2}{-3+5} = \frac{-3}{2}$

$m\overline{CD} = \frac{5-8}{1+1} = \frac{-3}{2}$

$\overline{BA} \parallel \overline{CD}$

$m\overline{CB} = \frac{2-8}{-5+1} = \frac{-6}{-4} = \frac{3}{2}$

$m\overline{DA} = \frac{-1+-5}{-3-1} = \frac{-6}{-4} = \frac{3}{2}$

$\overline{CB} \parallel \overline{DA}$

Since both pairs of OPP Sides $\parallel$, ABCD is a parallelogram

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$\frac{-5+-1}{2} = -3$

$\frac{8+2}{2} = 5$

(-3,5)

Question 35 is continued on the next page.

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

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$A(-3,-1)$ $B(-5,2)$ $E(-3,5)$

$d_{\overline{AB}} = \sqrt{(2+1)^2+(-5+3)^2}$

$\sqrt{9 + 4}$

$\sqrt{13}$

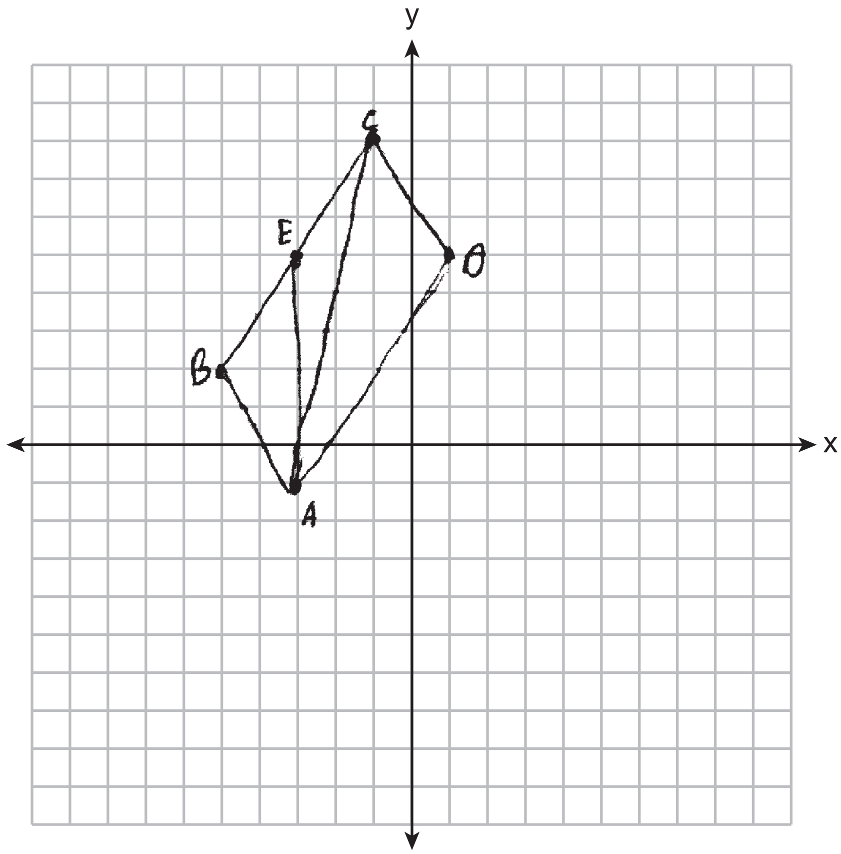
$d_{\overline{BE}} = \sqrt{(5-2)^2+(-3+5)^2}$

$\sqrt{9 + 4}$

$\sqrt{13}$

$\overline{AB} \cong \overline{BE}$

Since 2 Sides $\cong$, $\triangle ABE$ is an isosceles triangle



35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

D: (1,5)

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

Slope: $\overline{AD}: \frac{3}{2}$ $\overline{BC}: \frac{3}{2}$ $\overline{CD}: \frac{-3}{2}$ $\overline{AB}: \frac{-3}{2}$

same so //

if 2 sets opposite parallel lines

then it is a parallelogram.

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$\boxed{(-3,5)}$

B
-5,2

C
-1,8

$$\left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2}\right)$$

$$\left(\frac{-5+-1}{2}, \frac{2+8}{2}\right)$$

(-3, 5)

Question 35 is continued on the next page.

Score 5: The student did not show work when finding the slopes of $\overline{CD}$ and $\overline{DA}$.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

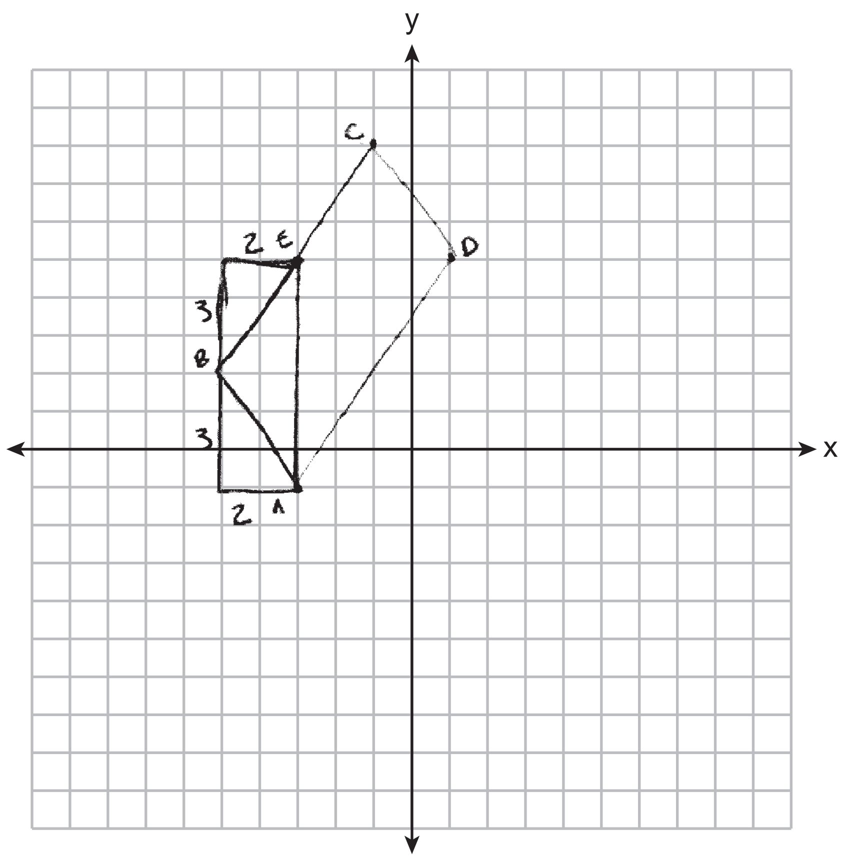
$2^2 + 3^2 = c^2$

$\sqrt{4+9} = C$

$\sqrt{13}$

distance : $\underbrace{AB : \sqrt{13} \quad BE : \sqrt{13}}_{\text{Same so } \cong}$

$\triangle ABE$ is an isosceles triangle because it has 2 congruent sides.



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$D(1,5)$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$D_{\overline{BC}} = \sqrt{4^2+6^2} = \sqrt{16+36} = \sqrt{52}$

$D_{\overline{CD}} = \sqrt{(-3)^2+2^2} = \sqrt{9+4} = \sqrt{13}$

$D_{\overline{DA}} = \sqrt{(-4)^2+6^2} = \sqrt{16+36} = \sqrt{52}$

$D_{\overline{AB}} = \sqrt{(2)^2+(-3)^2} = \sqrt{4+9} = \sqrt{13}$

distances are =
So sides are $\cong$

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{-5-1}{2}, \frac{2+8}{2}\right)$

$(-3,5)$

Question 35 is continued on the next page.

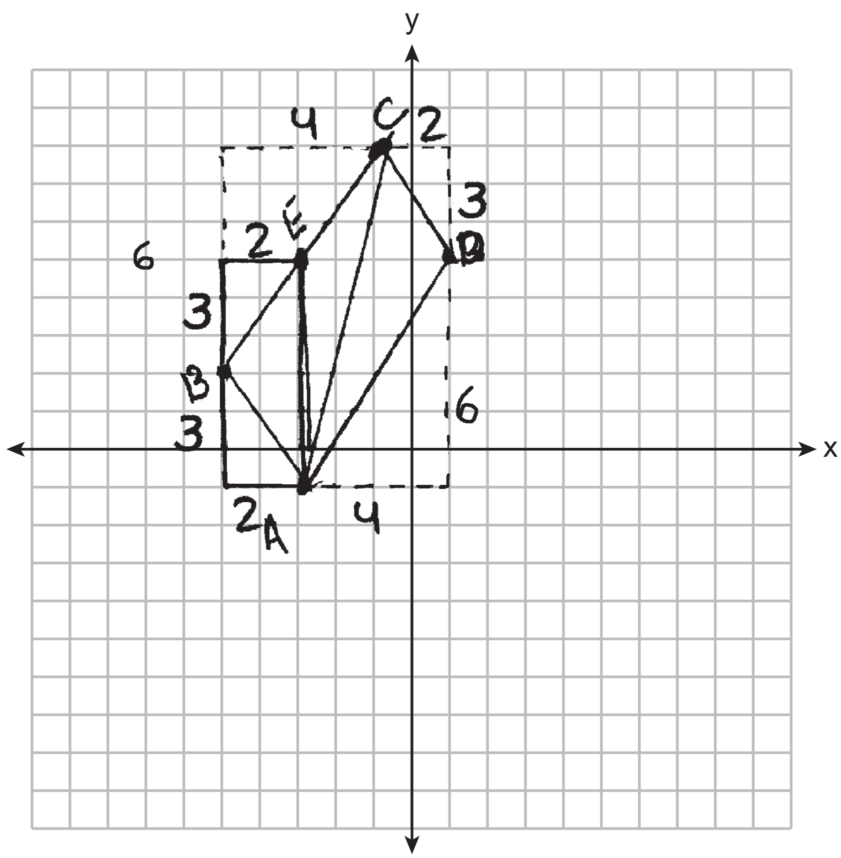
Score 5: The student wrote an incomplete conclusion when proving $ABCD$ is a parallelogram.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$D_{\overline{BE}} = \sqrt{3^2 + 2^2} = \sqrt{9+4} = \sqrt{13}$

$D_{\overline{BA}} = \sqrt{(-3)^2 + 2^2} = \sqrt{9+4} = \sqrt{13}$

Two sides are $\cong$ so the Δ is isosceles



35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$m_{\overline{AB}} = \frac{2--1}{-5--3} = \frac{3}{-2}$

$D = (1, 5)$

$m_{\overline{CD}} = \frac{8-y}{-1-x} = \frac{3}{-2}$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$m_{\overline{AB}} = \frac{3}{-2}$

$m_{\overline{CD}} = \frac{8-5}{-1-1} = \frac{3}{-2}$

same slope so $\overline{AB} \parallel \overline{CD}$

$d_{\overline{AB}} = 3.6055\ldots$
$\text{distance}_{\overline{CD}} = 3.6055\ldots$

same distance so $\overline{AB} \cong \overline{CD}$

One pair of opp sides are $\parallel$ + $\cong$ so it's a parallelogram

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$E(-3, 5)$

Question 35 is continued on the next page.

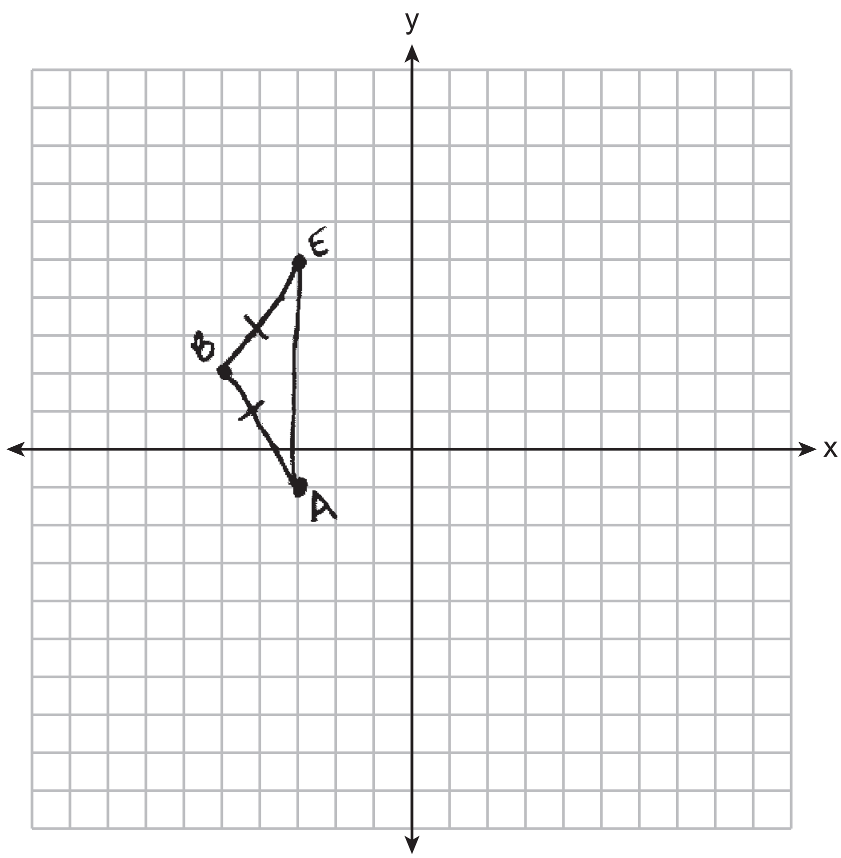
Score 5: The student did not show work when determining the lengths of $\overline{AB}$, $\overline{CD}$, and $\overline{EB}$.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$d_{\overline{AB}} = 3.6055\ldots$ same distance
So $\overline{AB} \cong \overline{BE}$

$d_{\overline{BE}} = 3.6055\ldots$

$\triangle ABE$ is an isos triangle because 2 sides are $\cong$



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$m = \frac{\Delta y}{\Delta x}$ $\frac{6}{4} = \frac{3}{2}$

$D = (1,5)$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$c = \sqrt{a^2+b^2}$

$AB = \sqrt{2^2+3^2} = \sqrt{13}$

$BC = \sqrt{4^2+6^2} = \sqrt{52}$

$CD = \sqrt{2^2+3^2} = \sqrt{13}$

$DA = \sqrt{4^2+6^2} = \sqrt{52}$

$\overline{AB} \cong \overline{CD}$

$\overline{BC} \cong \overline{DA}$

(2 pairs of opp sides $\cong$)

$\therefore \square ABCD$

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$E = (-3,5)$

Question 35 is continued on the next page.

Score 4: The student showed no correct work when proving $\triangle ABE$ is isosceles.

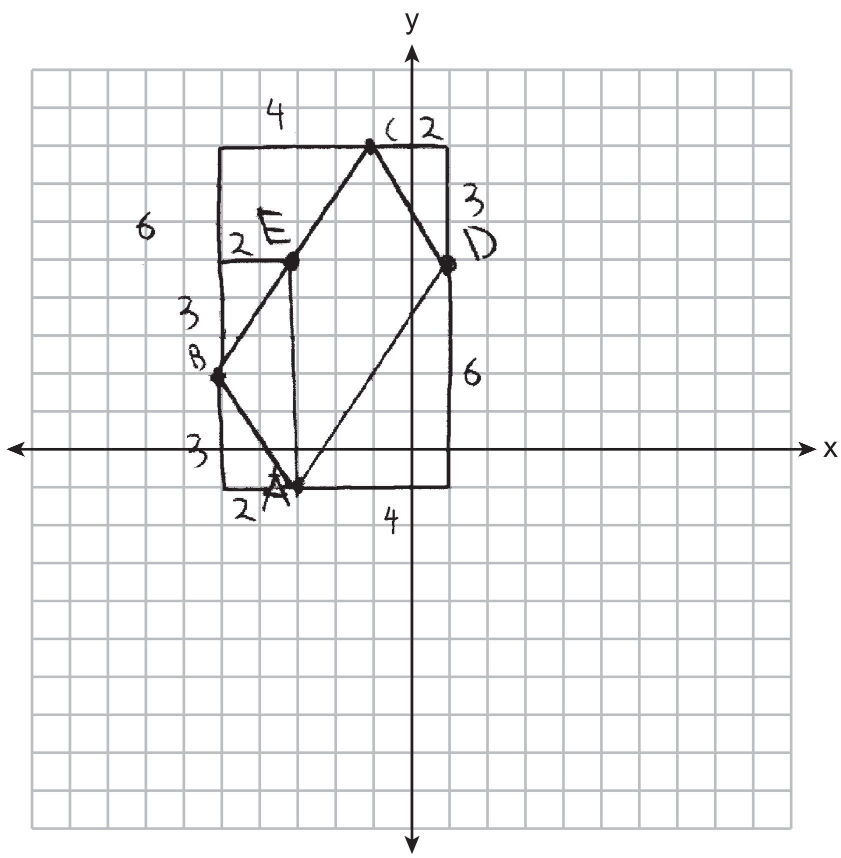
Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$M = \frac{\Delta y}{\Delta x}$

ΔABE is isocles(A isosceles Δ has 2 $\cong$ sides)

$EB = \frac{3}{2}$

$AB = \frac{-3}{2}$



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

Slope $\overline{AB}$: $\frac{2+1}{-5+3} = -\frac{3}{2}$ ↑ →

$D(1, 5)$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

Slope $\overline{BC}$: $\frac{2-8}{-5+1} = \frac{-6}{-4} = \frac{3}{2}$

Slope $\overline{AD}$: $\frac{-1-5}{-3-1} = \frac{-6}{-4} = \frac{3}{2}$

parallel line

Slope $\overline{BA}$: $\frac{-1-2}{-3+5} = \frac{-3}{2}$

Slope $\overline{CD}$: $\frac{5-8}{1+1} = \frac{-3}{2}$

parallel line

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

Slope $\overline{BC}$: $\frac{8-2}{-1+5} = \frac{6}{4} = \frac{3}{2}$ ↑ →

$E(-3, 5)$

Question 35 is continued on the next page.

Score 4: The student wrote an incomplete conclusion when proving $ABCD$ is a parallelogram. The student wrote a partially correct concluding statement when proving $\triangle ABE$ is isosceles.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$D_{\overline{AE}}: \sqrt{(-3+3)^2+(-1-5)^2}$
$: \sqrt{36} \quad D_{\overline{AE}} = 6$

$D_{\overline{EB}}: \sqrt{(-3+5)^2+(5-2)^2}$
$: \sqrt{13} \quad D_{\overline{EB}} = \sqrt{13}$

$D_{\overline{AB}}: \sqrt{(-3+5)^2+(-1-2)^2}$
$: \sqrt{13} \quad D_{\overline{AB}} = \sqrt{13}$

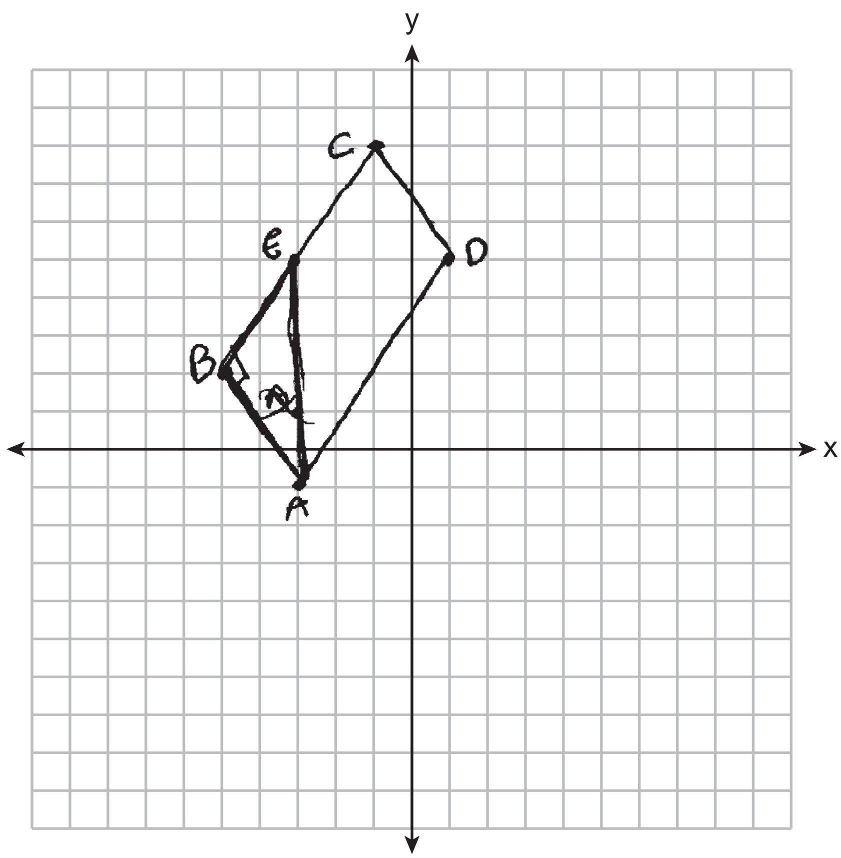
Equal

$\text{Slope}_{\overline{BE}}: \frac{5-2}{-3+5} = \frac{3}{2}$

$\text{Slope}_{\overline{BA}}: \frac{-1-2}{-3+5} = \frac{-3}{2}$

~~perp~~ $\perp$

$\therefore$ ΔABE is an isososceles triangle b/c it has 2 equal sides and 90° ∠. ⊥ lines form rt. ∠'s.



35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$m\overline{BA} = \frac{2+1}{-5+3} = \boxed{\frac{3}{-2}}$

$\boxed{D(x,y) = (1,5)}$

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$E(x,y) = (-3,5)$

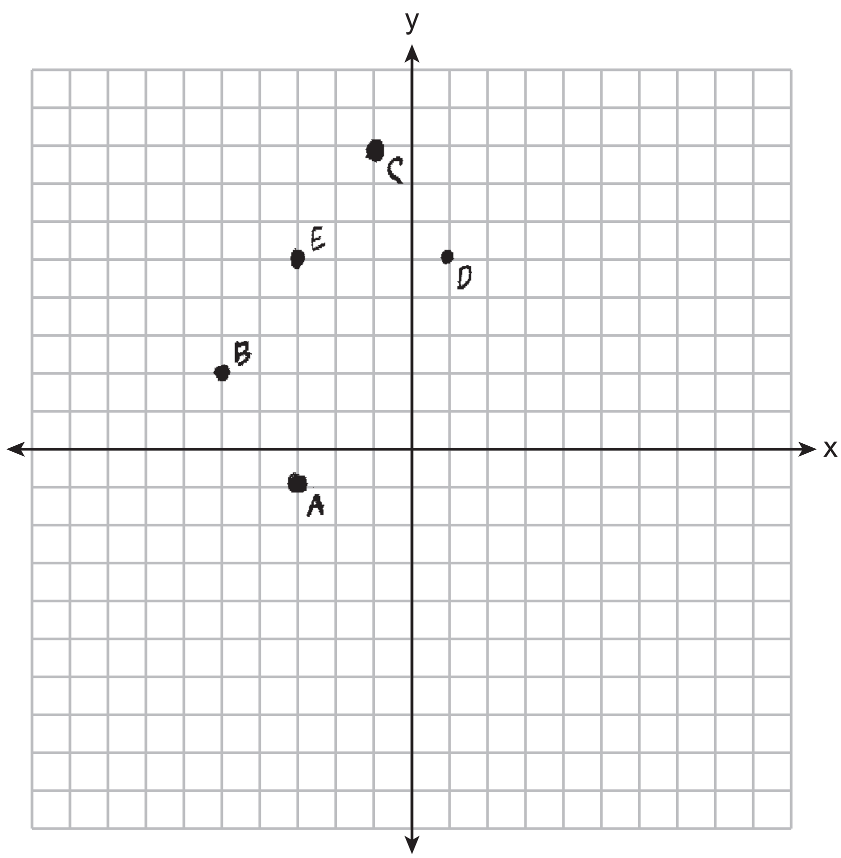
Question 35 is continued on the next page.

Score 3: The student correctly determined the coordinates of points D and E and correctly determined the lengths of $\overline{AB}$ and $\overline{EB}$.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$d\overline{BA} = \sqrt{(-5+3)^2 + (2+1)^2} \rightarrow \sqrt{(-2)^2 + 3^2} \rightarrow \sqrt{4+9} = \boxed{\sqrt{13}}$

$d\overline{BE} = \sqrt{(-5+3)^2 + (2-5)^2} \rightarrow \sqrt{(-2)^2 + (-3)^2} \rightarrow \sqrt{4+9} = \boxed{\sqrt{13}}$



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

(1,5)

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$m\overline{BA} = \frac{-2}{3}$

$m\overline{CD} = \frac{-2}{3}$

$m\overline{CB} = \frac{4}{6}$

$m\overline{AD} = \frac{4}{6}$

ABCD is a parallelogram

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

(-3,5)

Question 35 is continued on the next page.

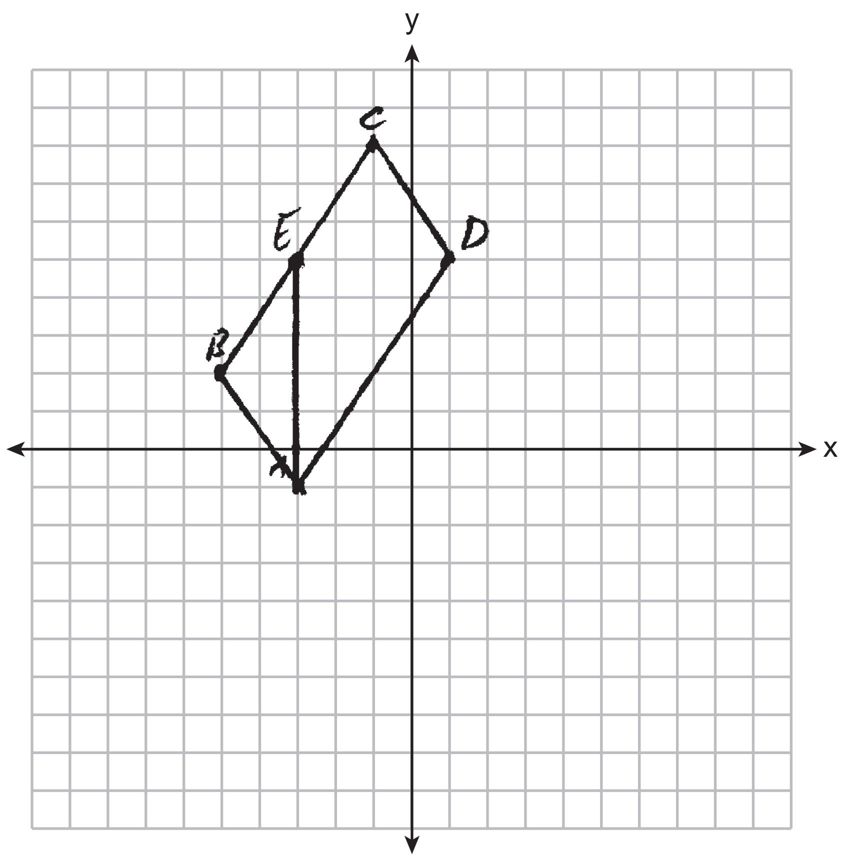
Score 3: The student made an error when determining the slopes of the four sides of $ABCD$. The student wrote an incomplete conclusion when proving $ABCD$ is a parallelogram. The student did not show enough work when determining the lengths of $\overline{AB}$ and $\overline{EB}$.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$BA = \sqrt{(2)^2 + (-3)^2} = \sqrt{13}$

$EB = \sqrt{(2)^2 + (3)^2} = \sqrt{13}$

$\triangle ABE$ is an isosceles triangle because it has 2 congruent sides



Question 35

35 Triangle *ABC* has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point *D* such that quadrilateral *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

D(1,5)

B → C   A → D

↑6 →4   ↑6 →4

Prove *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

BC + AD have the same slope 6/4

def of parallel lines

// lines make a parallelogram

State the coordinates of point *E*, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

B(-5,2)   C(-1,8)

$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ $\left(\frac{-6}{2}, \frac{10}{2}\right)$

$\left(\frac{-5+(-1)}{2}, \frac{2+8}{2}\right)$ E(-3,5)

Question 35 is continued on the next page.

Score 2: The student correctly determined the coordinates of points *D* and *E*.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

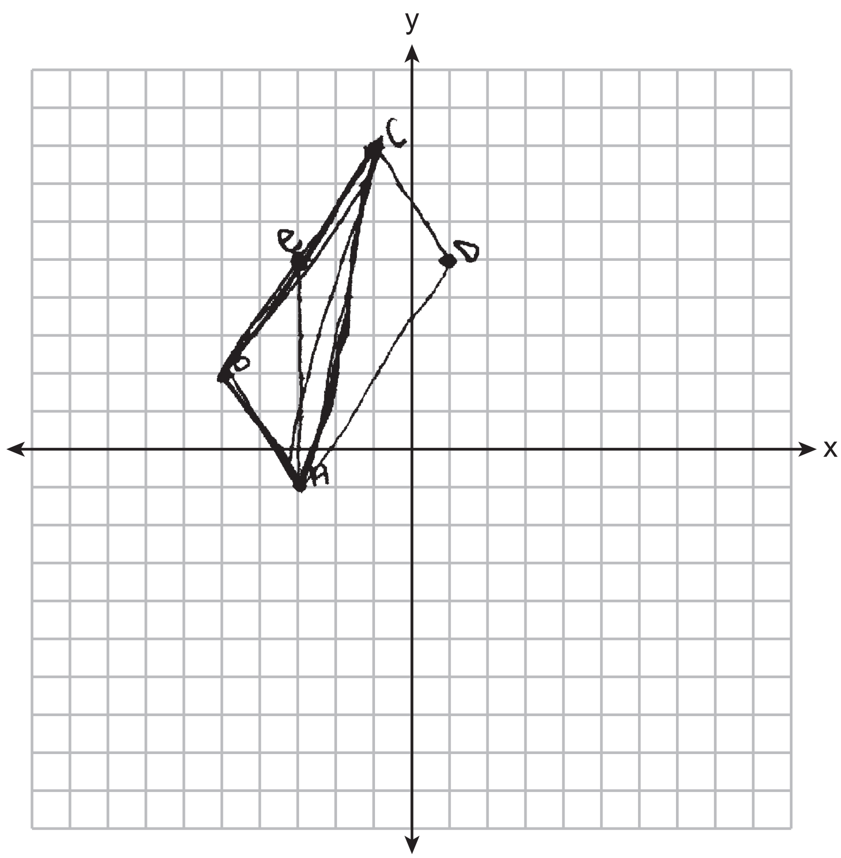
$\measuredangle$ eba is a right angle $90°$

making $\measuredangle$e + $\measuredangle$A $45°$

$90° + 45° + 45° = 180°$ ✓

$\measuredangle$e + $\measuredangle$a are $\cong$ def of isosceles Δ

6/4



Question 35

35 Triangle *ABC* has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point *D* such that quadrilateral *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

$(1,5)$

Prove *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

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

$\overline{BA}$
$3^2+2^2=c^2$
$9+4$
$\sqrt{13}=\sqrt{c^2}$
$\sqrt{13}=c$

$\overline{DA}$
$6^2+4^2=c^2$
$36+16$
$\sqrt{52}=\sqrt{c^2}$
$\sqrt{52}=c$

$\overline{CD}$
$3^2+2^2=c^2$
$9+4$
$\sqrt{13}=\sqrt{c^2}$
$\sqrt{13}=c$

$\overline{BC}$
$6^2+4^2=c^2$
$36+16=c^2$
$\sqrt{52}=\sqrt{c^2}$
$\sqrt{52}=c$

State the coordinates of point *E*, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$M=\left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2}\right)$

$\left(\frac{-1+5}{2}, \frac{\cancel{8}+2}{2}\right)$

$(-6, 5)$

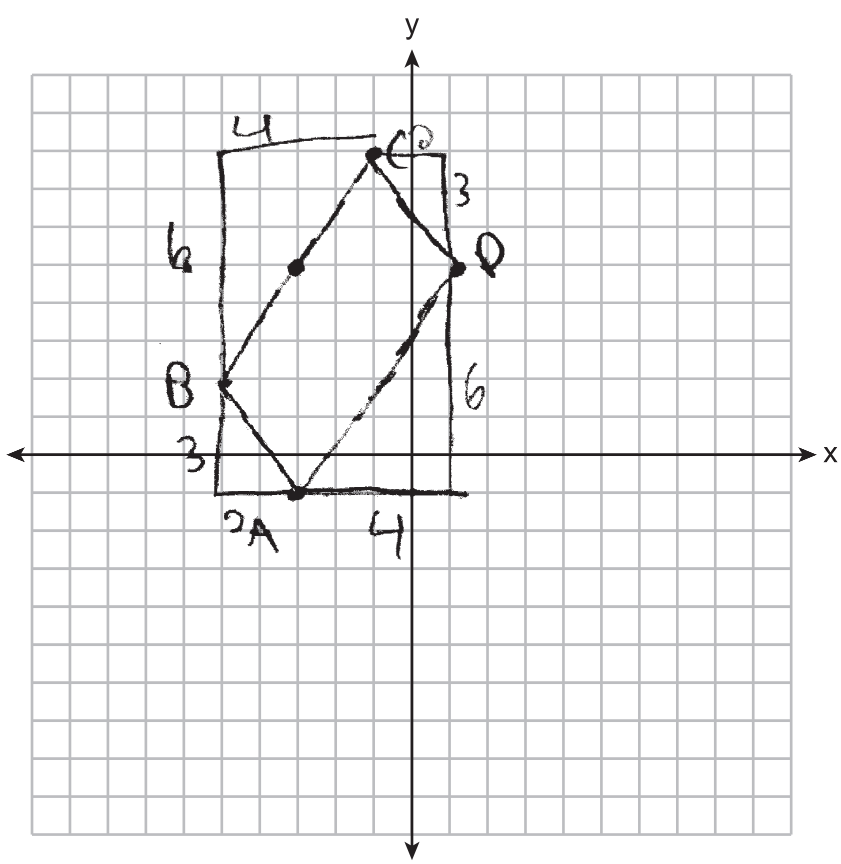
B $\overset{1}{(-5,2)}$ C $\overset{2}{(-1,8)}$
x y   x y

Question 35 is continued on the next page.

Score 2: The student correctly determined the coordinates of point *D* and correctly determined the lengths of the four sides of *ABCD*.

Question 35 continued.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

(1, 5)

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$D_{BC} = \sqrt{4^2+6^2} = \sqrt{16+36} = \sqrt{52}$

$\overline{BC} // \overline{AD}$

$D_{AD} = \sqrt{4^2+6^2} = \sqrt{16+36} = \sqrt{52}$

$\overline{BA} // \overline{CD}$

$D_{CD} = \sqrt{2^2+3^2} = \sqrt{4+9}\ \sqrt{13}$

$D_{BA} = \sqrt{2^2+3^2} = \sqrt{4+9}\ \sqrt{13}$

Allsidesae parallel so itsmakesa parallelogram

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$\dfrac{-5 + -1}{2}, \dfrac{2+8}{2}$

$-3, 5$

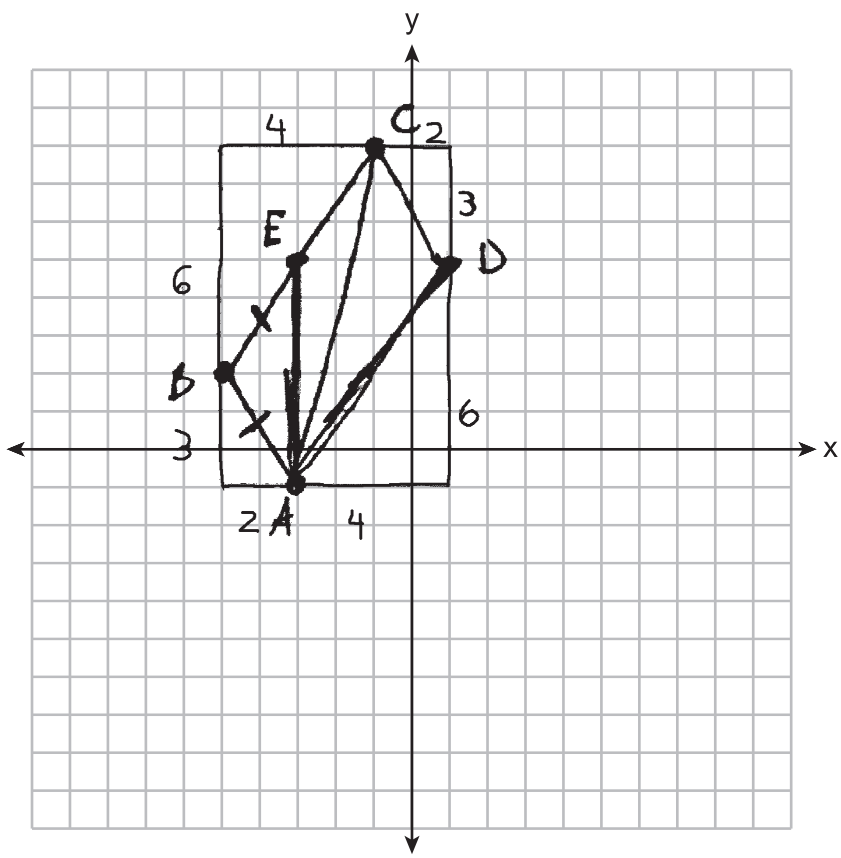
Question 35 is continued on the next page.

Score 2: The student wrote an incorrect concluding statement when proving $ABCD$ is a parallelogram. The student did not state point E as a coordinate. The student did not prove $\triangle ABE$ is isosceles.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$\overline{BE} \cong \overline{BA}$

The base sides are congruent
which makesthe triangle isosceles



35 Triangle *ABC* has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point *D* such that quadrilateral *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

(1, 5)

Prove *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

$\frac{2--1}{-5--3} = \boxed{-\frac{3}{2}}$ $\frac{8-2}{-1--5} = \boxed{-\frac{3}{2}}$

$\frac{5-8}{1--1} = \boxed{-\frac{3}{2}}$ $\frac{-1-5}{1--3} = \boxed{-\frac{3}{2}}$

Δ ABCD is a parrelogram because they all have the same slope.

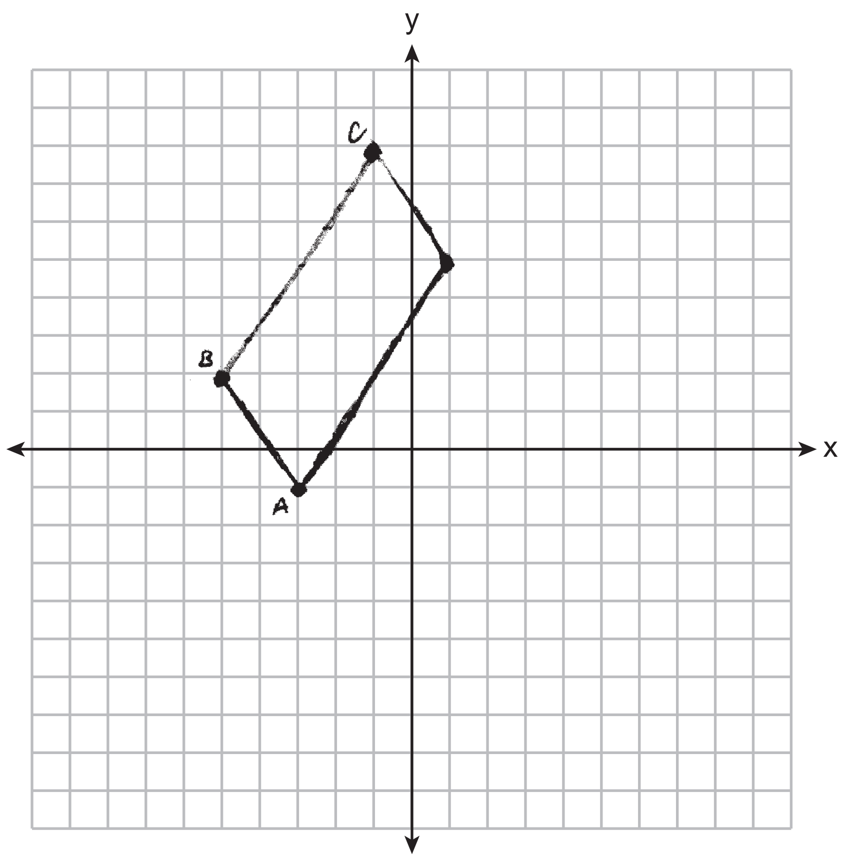
State the coordinates of point *E*, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

Question 35 is continued on the next page.

Score 1: The student correctly determined the coordinates of point *D*.

Question 35 continued.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]



Question 35

35 Triangle *ABC* has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point *D* such that quadrilateral *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

Prove *ABCD* is a parallelogram.
[The use of the set of axes on the next page is optional.]

State the coordinates of point *E*, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$$m = \frac{x^2 - y_2}{2} + \frac{y_1 - x_1}{2}$$

$$m = \frac{8-2}{2} + \frac{-1-5}{2}$$

$$m = (3, -3)$$

Question 35 is continued on the next page.

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

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

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

$2^2+2^2=c^2$

$4+4=c^2$

$\sqrt{8}=\sqrt{c^2}$

$\boxed{8}$

A(-3,-1)

B(-5,2)

E(3,-3)

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

$2^2+2^2=c^2$

$4+4=c^2$

$\sqrt{8}=\sqrt{c^2}$

$\boxed{8}$

All sides are equal.

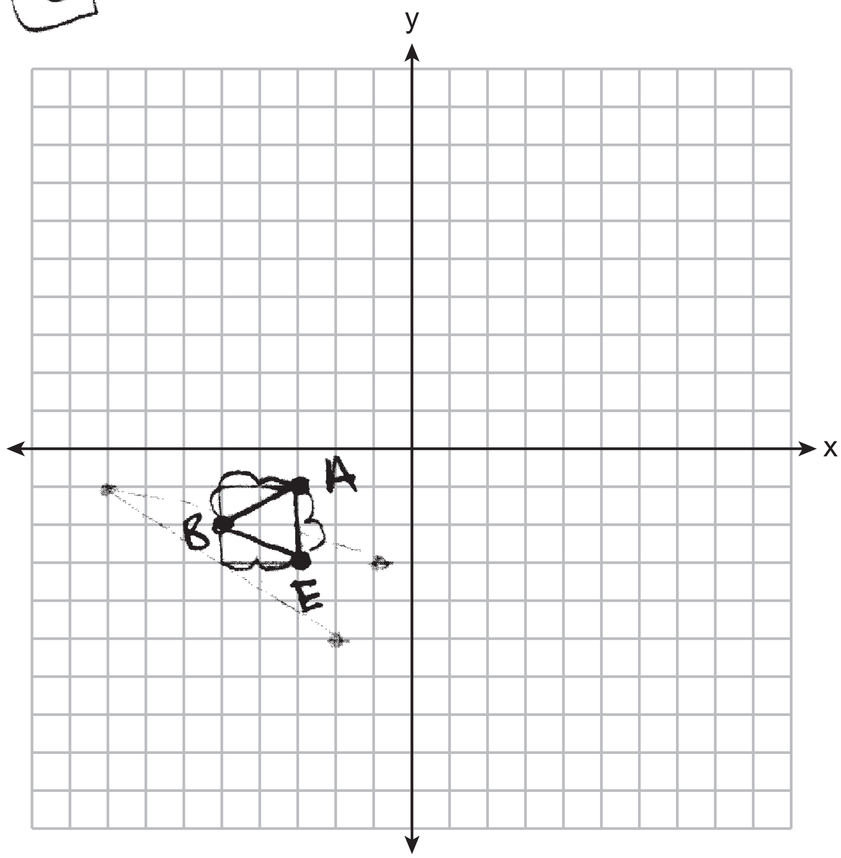
$a^2+b^2=c^2$

$2^2+2^2=c^2$

$4+4=c^2$

$\sqrt{8}=\sqrt{c^2}$

$\boxed{8}$



Question 35

35 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$D(-3, 5)$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$\overline{BC} \parallel \overline{AB}$

$\overline{DE} \perp \overline{BA}$

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$E(-4, 1)$

Question 35 is continued on the next page.

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

Question 35 continued.

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]