The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Tuesday, June 20, 2023 — 9:15 a.m. to 12:15 p.m., only

MODEL RESPONSE SET

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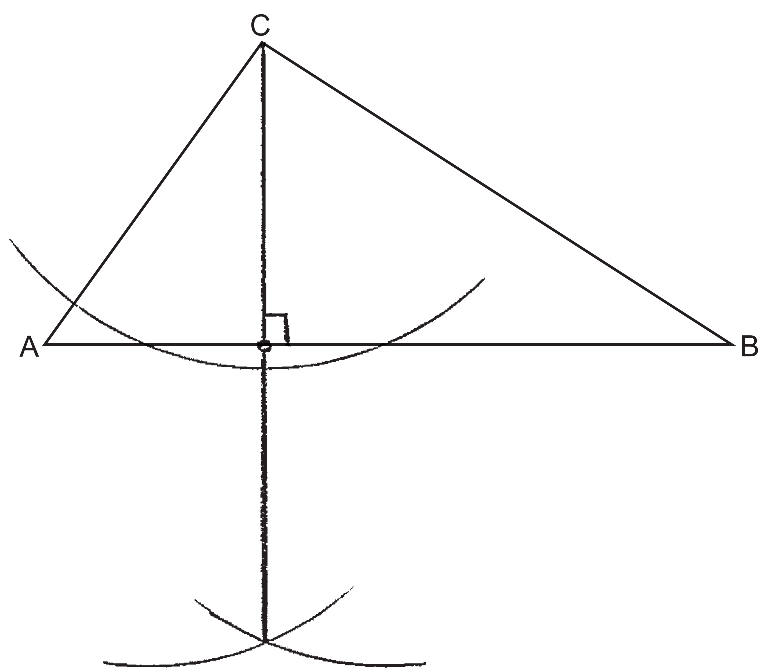
Question 25

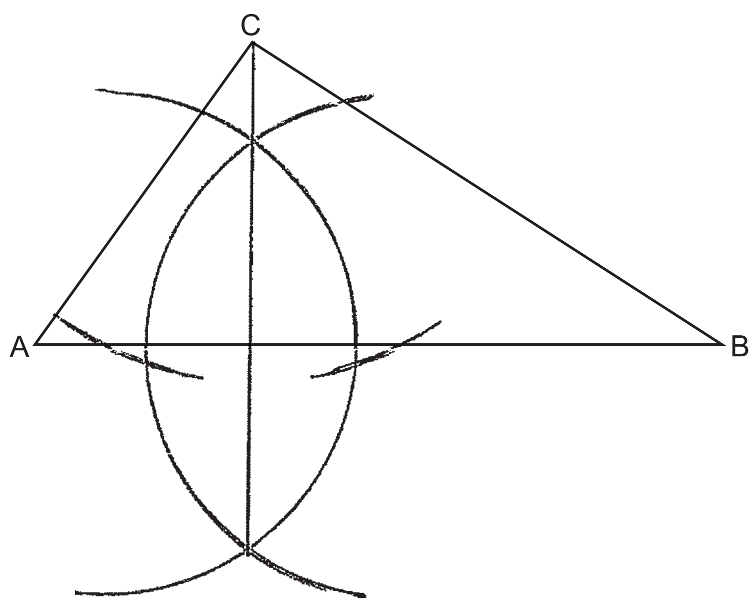
25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from C to $\overline{AB}$. [Leave all construction marks.]



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

Question 25

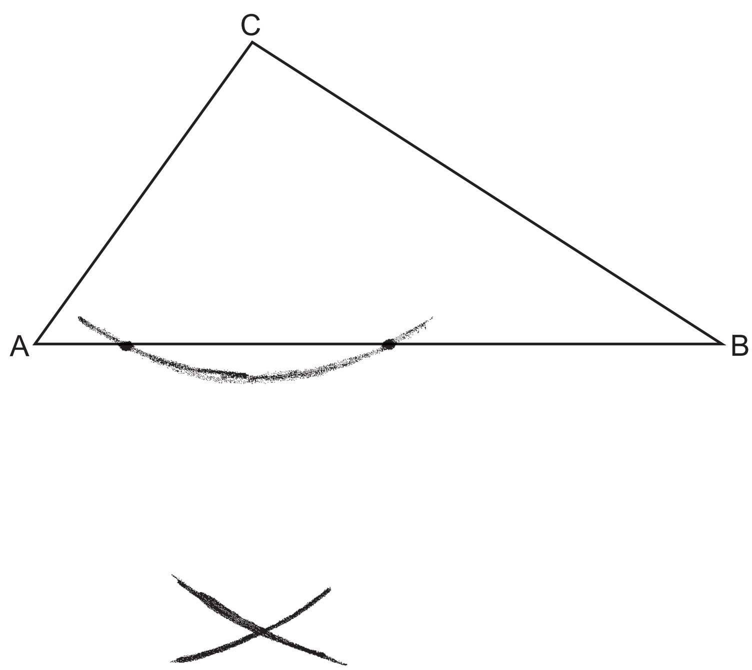
25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from C to $\overline{AB}$. [Leave all construction marks.]



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

Question 25

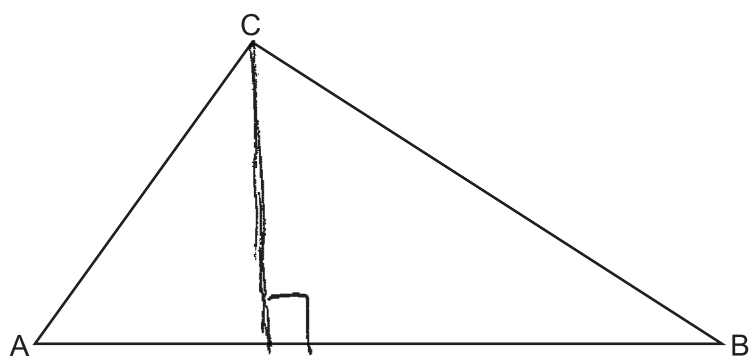
25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from C to $\overline{AB}$. [Leave all construction marks.]



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

Question 25

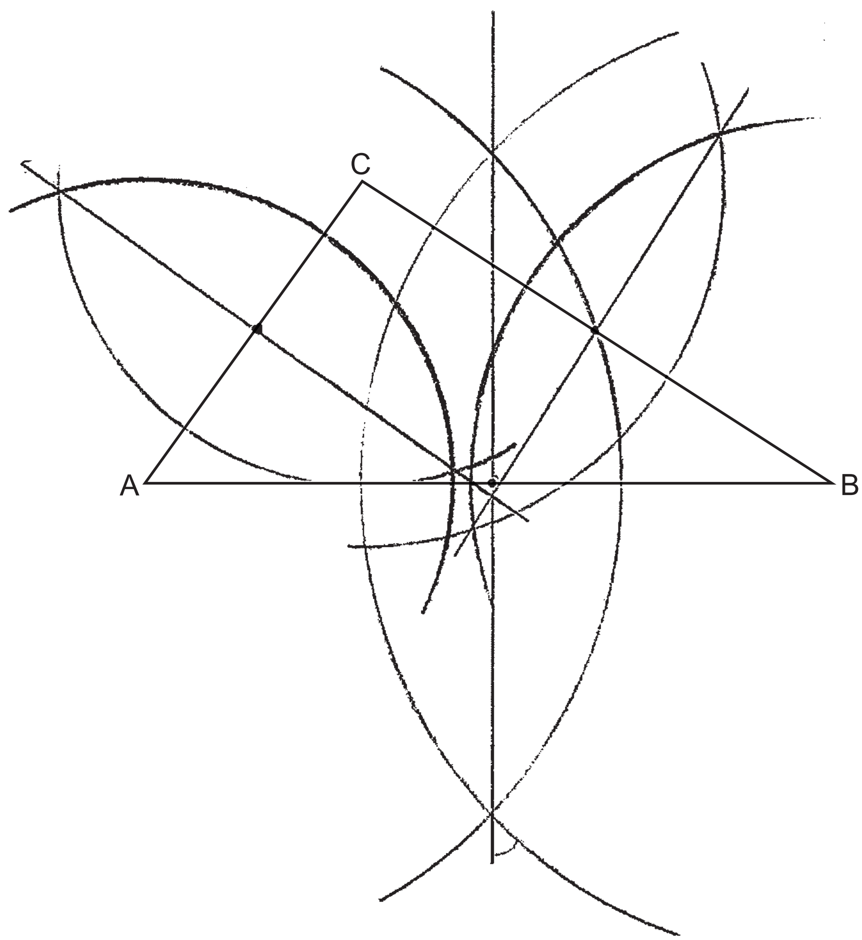
25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from C to $\overline{AB}$. [Leave all construction marks.]



Score 0: The student made a drawing that was not an appropriate construction.

Question 25

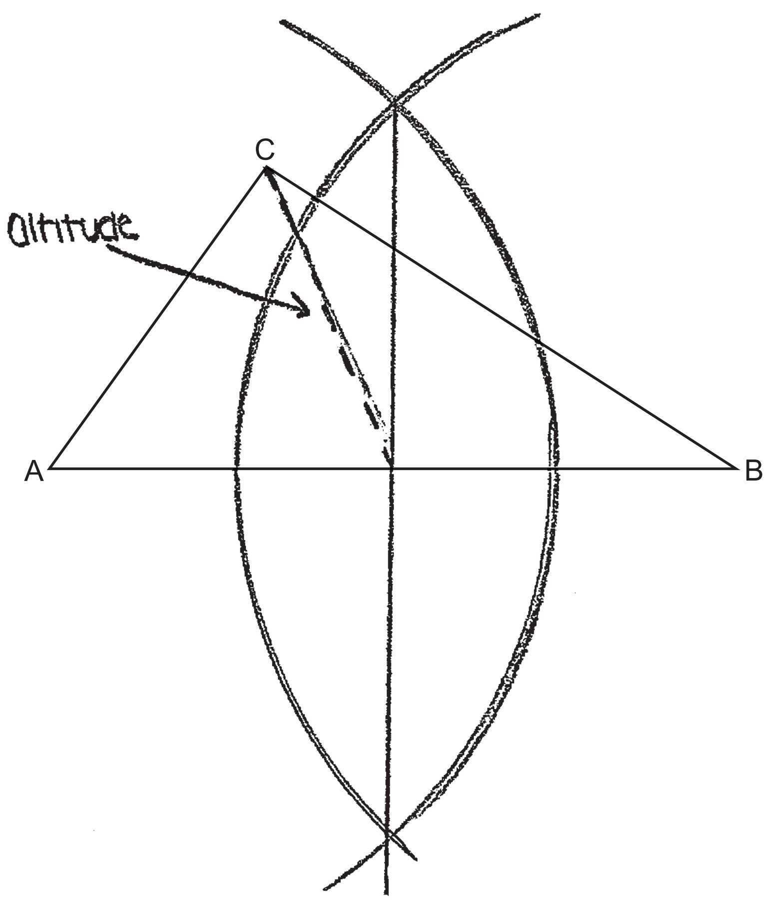
25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from C to $\overline{AB}$. [Leave all construction marks.]



Score 0: The student gave a completely incorrect response.

Question 25

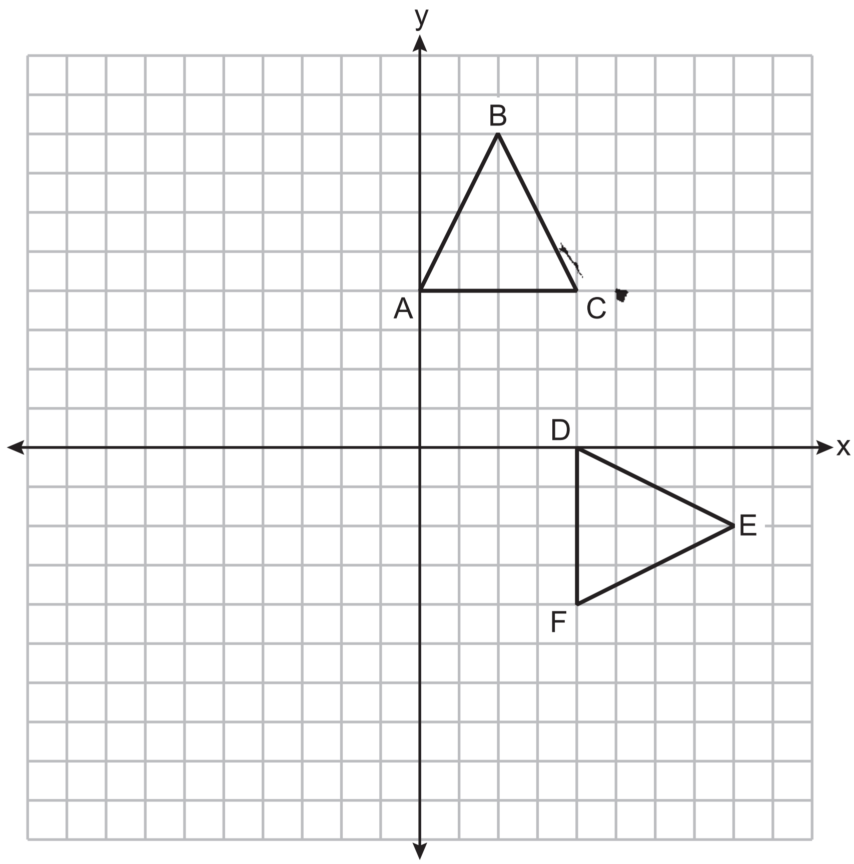
25 In $\triangle ABC$ below, use a compass and straightedge to construct the altitude from C to $\overline{AB}$. [Leave all construction marks.]



Score 0: The student gave a completely incorrect response.

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



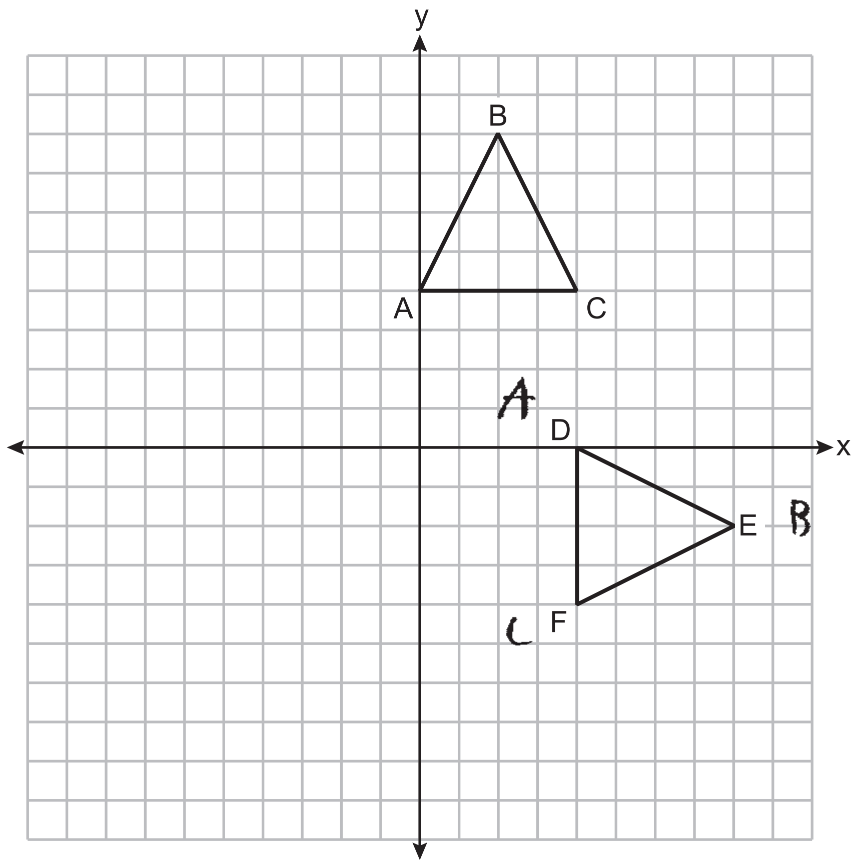
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

translate ΔABC down 8 units, then rotate ΔABC 90° clockwise around point F

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

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



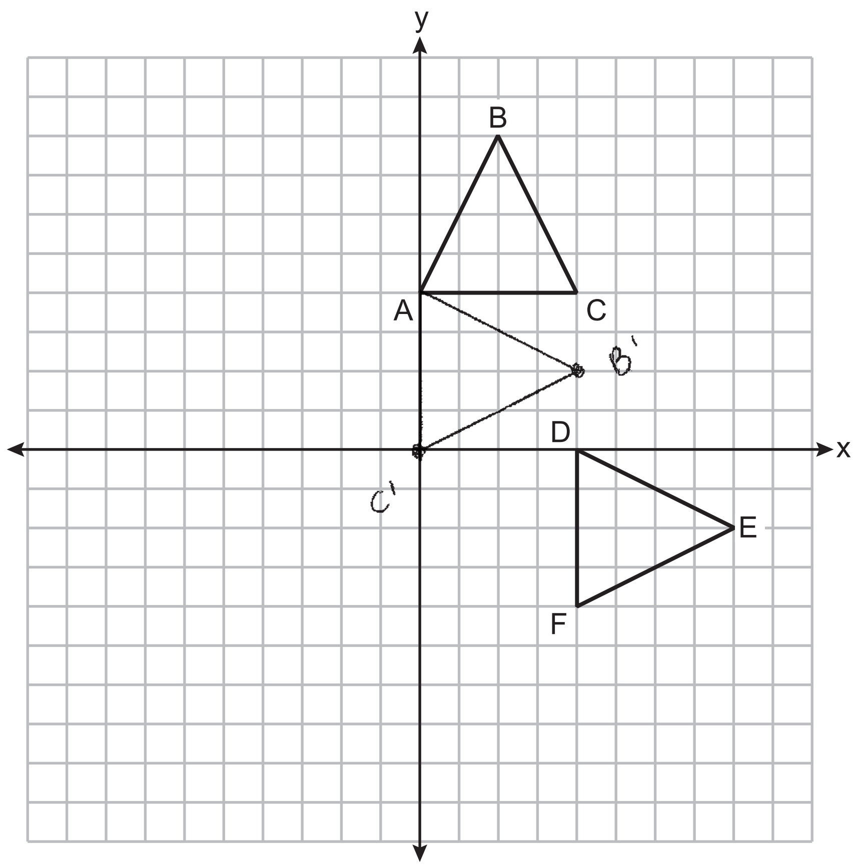
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

rotation 90° Clockwise around the origin

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

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



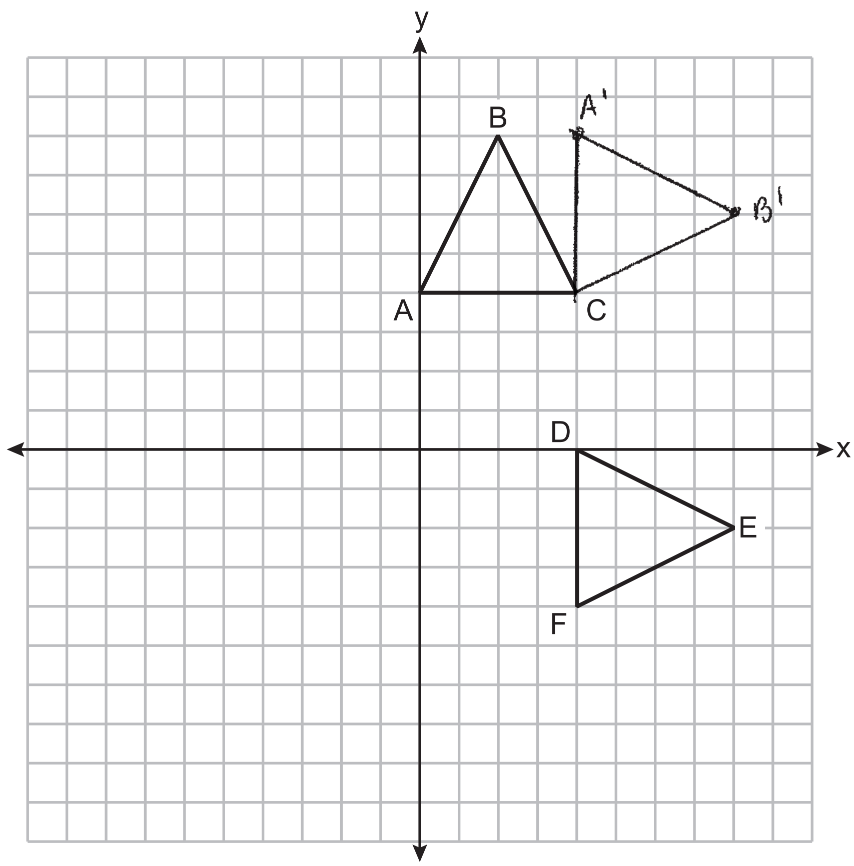
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

$T_{4,-4} \circ R_{A,-90^\circ}$

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

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



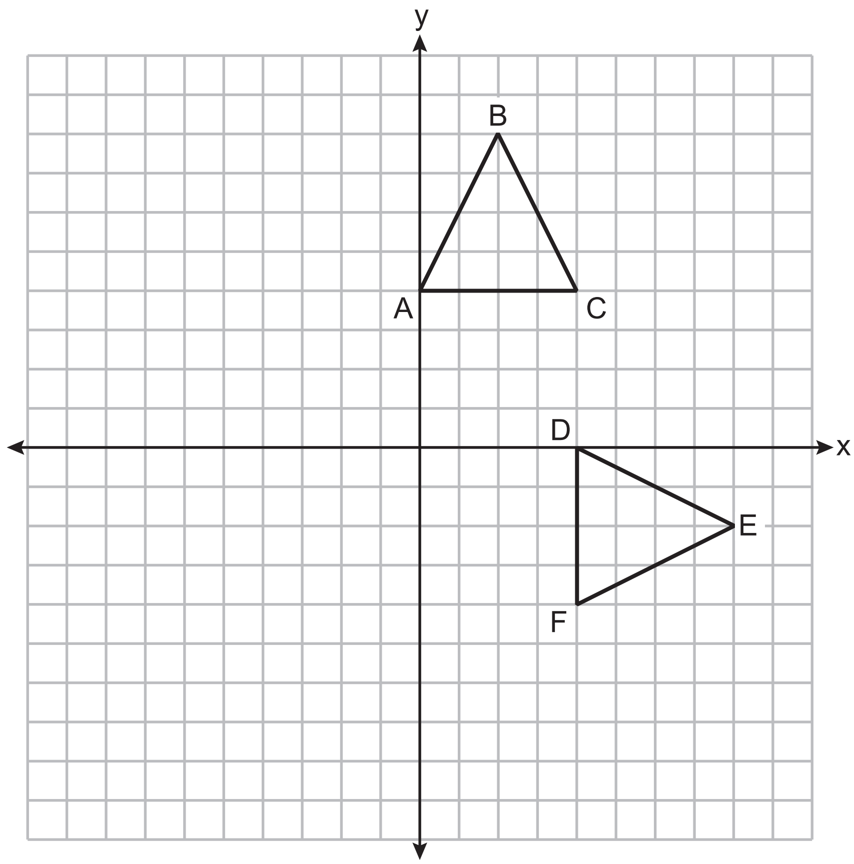
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Rotation about point C, 90° clockwise, followed by a translation down by 8.

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

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



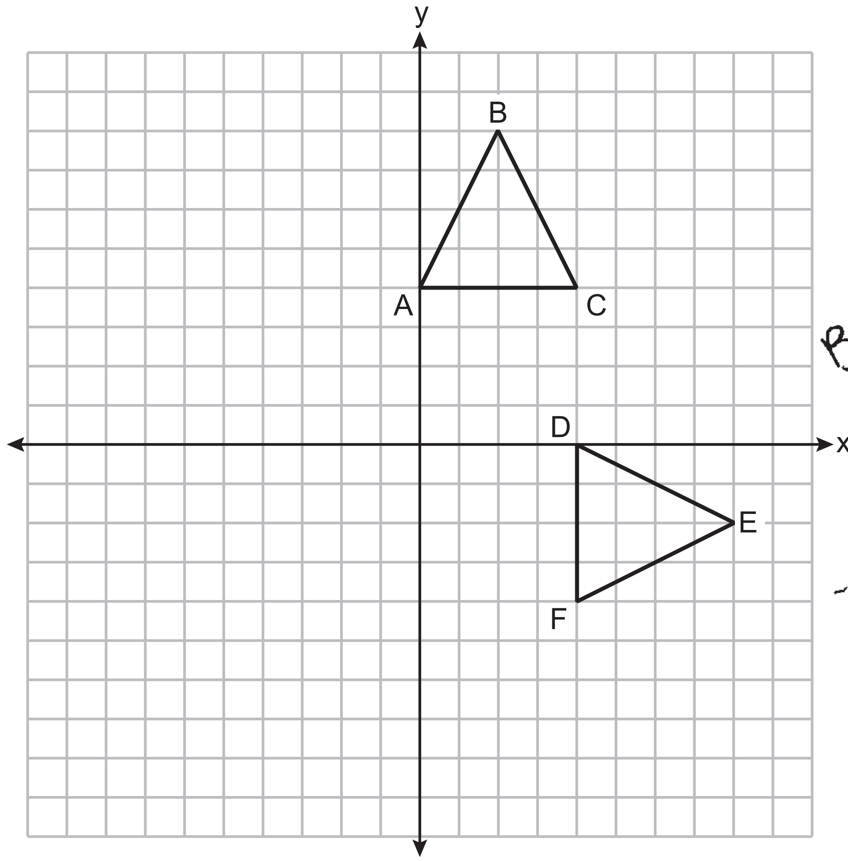
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

90° counterclockwise rotation about the origin

Score 1: The student wrote an incorrect direction for the rotation.

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



A = 0,4

B = 2,8

C = 4,4

-y, x

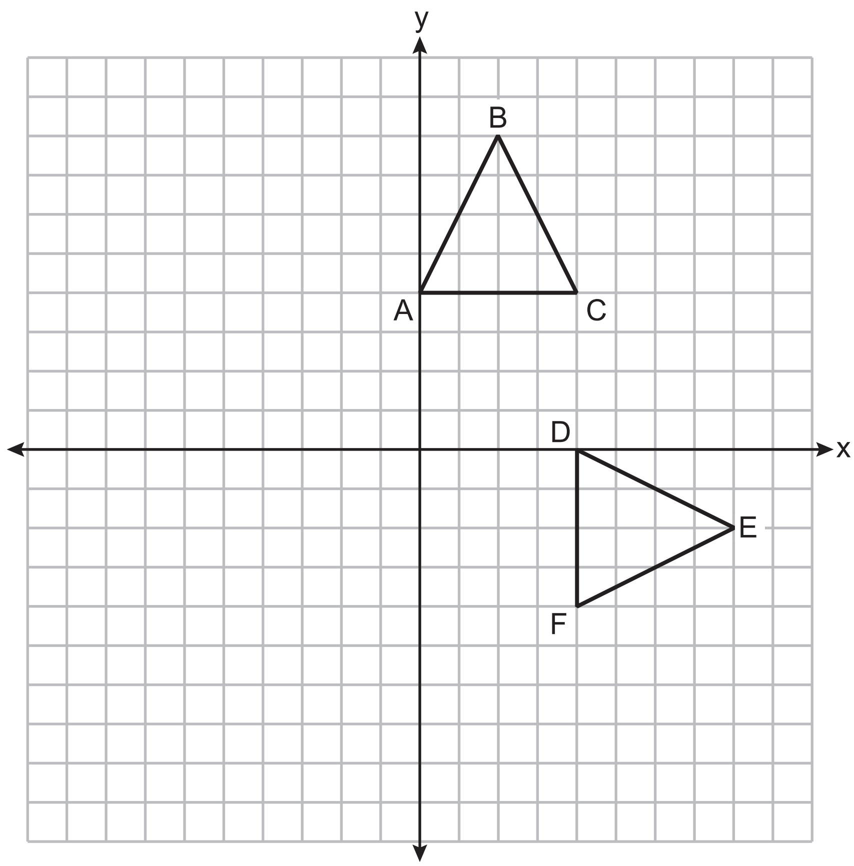
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Rotation 270 counterclockwise

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

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



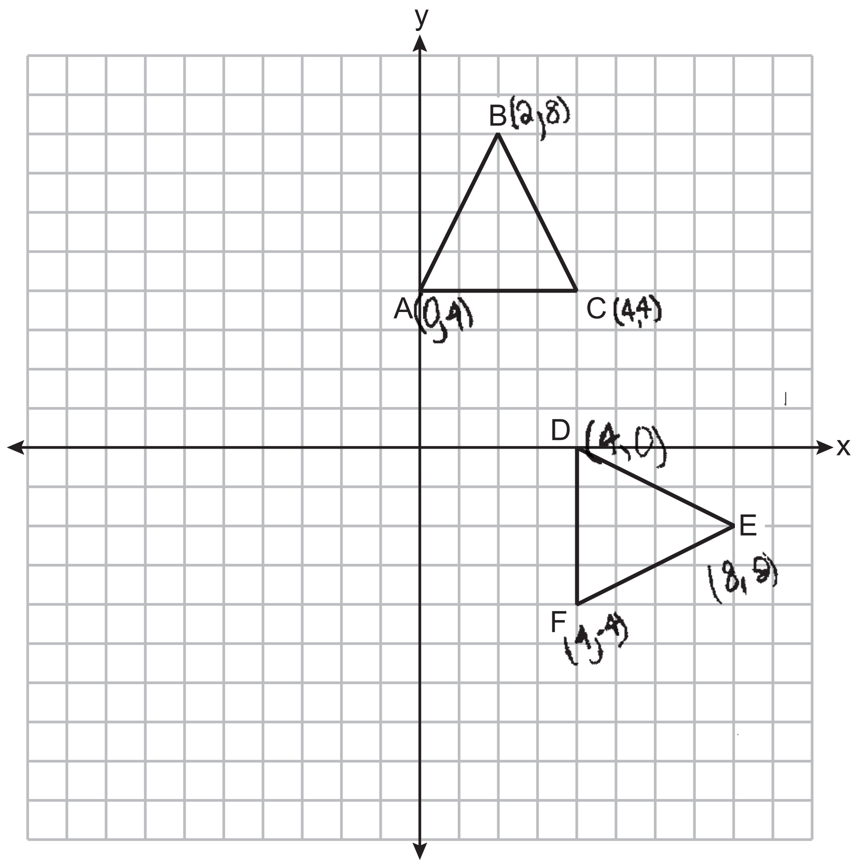
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

rotation 90° clockwise about C
translate 4 units down
reflect over the x-axis

Score 1: The student gave a correct description of the rotation and translation, but no further correct work was shown.

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



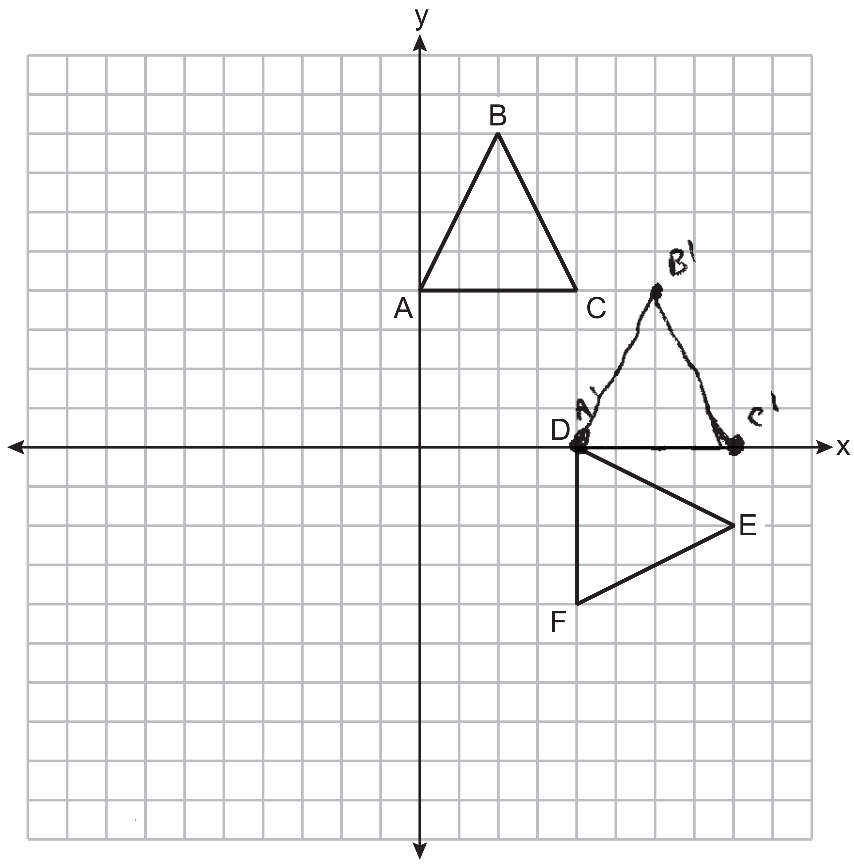
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Rotate 90° clockwise

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

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



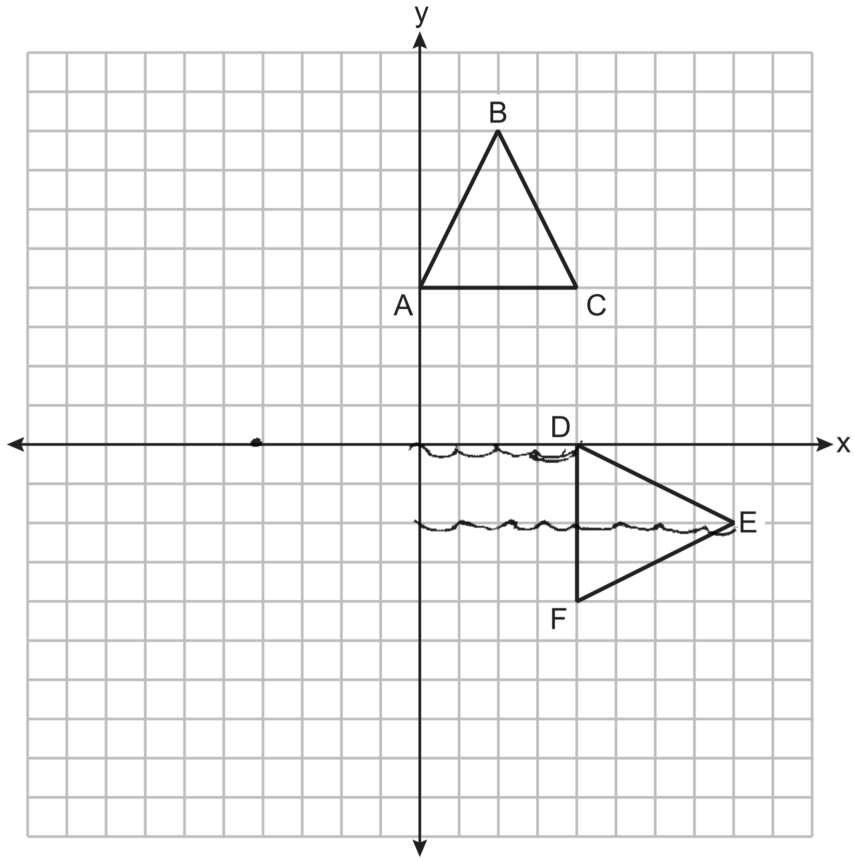
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Translation ⟨4,-4⟩ rotation 90 clockwise

Score 1: The student correctly stated the translation as a vector, but did not state the center of rotation.

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



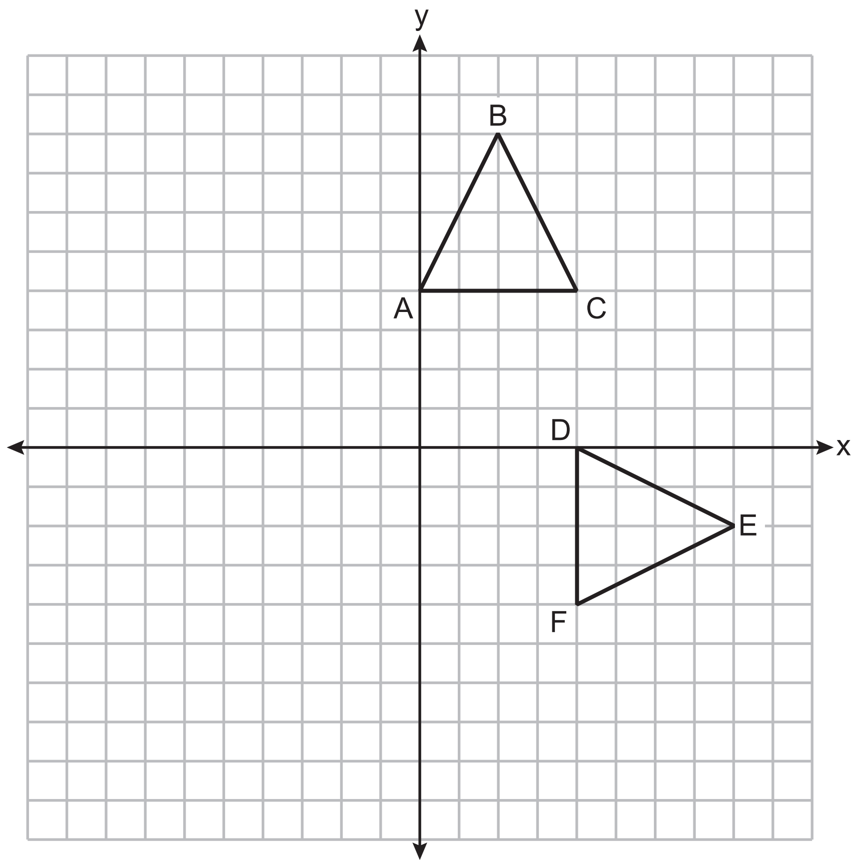
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Bac took a counter clockwise rotation
90° 2 times

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

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.

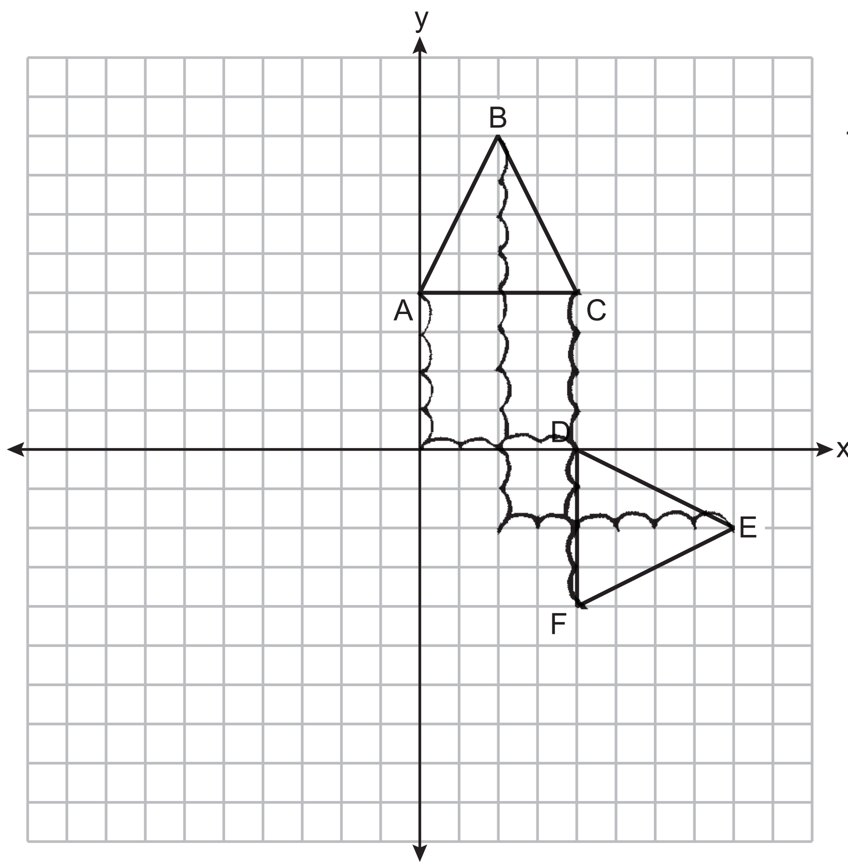


Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

Rotation and Reflection

Score 0: The student gave an incomplete rotation and an incorrect reflection.

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



$\triangle ABC$

$\triangle DEF$

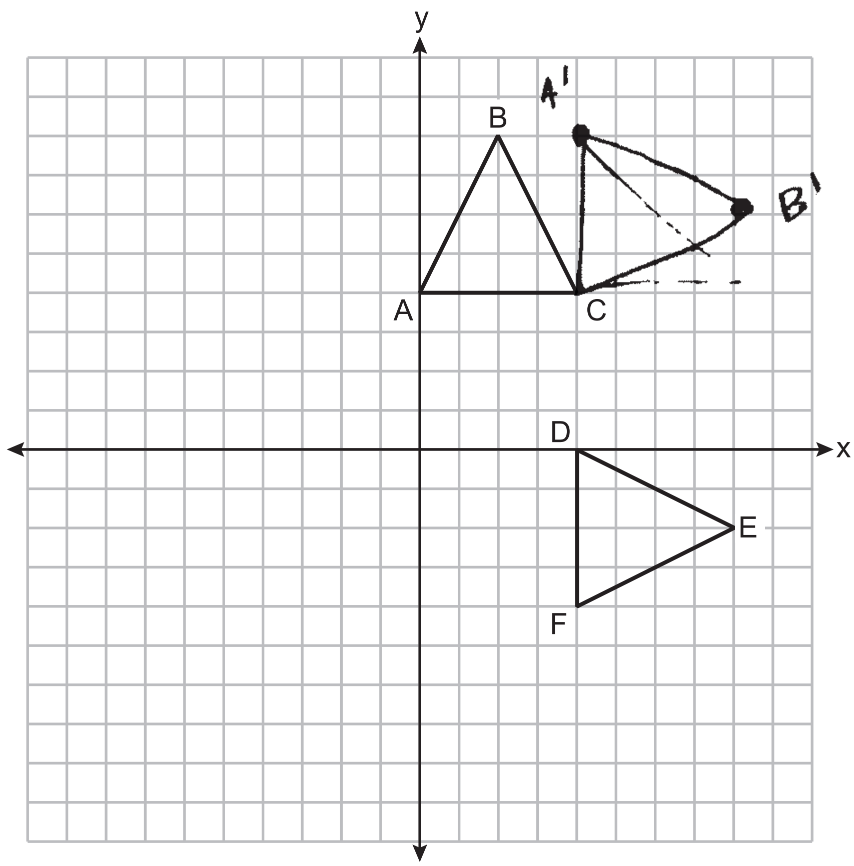
Describe a sequence of transformations that maps $\triangle ABC$ onto $\triangle DEF$.

A to D is 4 down and 4 to the right
B to E is 10 down and 6 to the Right
C to F is 8 down and stops

Score 0: The student gave a completely incorrect description.

Question 26

26 Triangles *ABC* and *DEF* are graphed on the set of axes below.



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

1. rotate ABC 180°
2. translate A'B'C (-8,0)
3. Done.

Score 0: The student gave a completely incorrect description.

Question 27

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

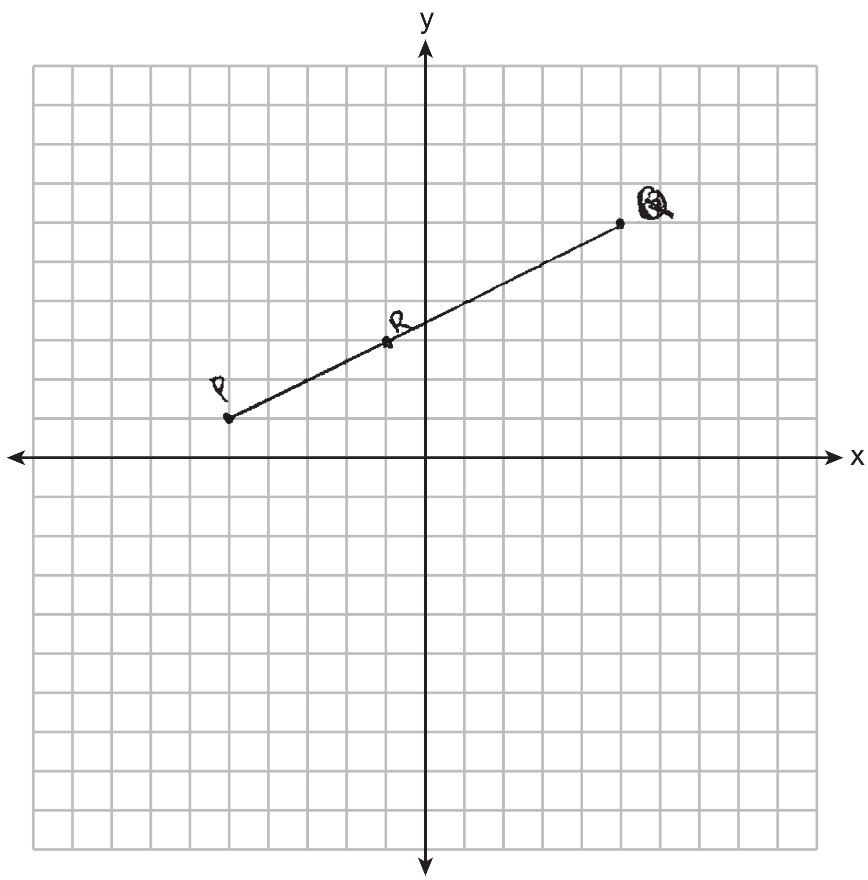
[The use of the set of axes below is optional.]

$\Delta x = 10$
$\Delta y = 5$

$\left(x + \frac{2}{5}(\Delta x) ; y + \frac{2}{5}(\Delta y)\right)$

$-5 + \frac{2}{5}(10) \quad 1 + \frac{2}{5}(5)$

$R = (-1, 3)$

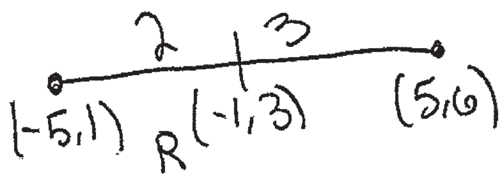


Score 2: The student gave a complete and correct response.

Question 27

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

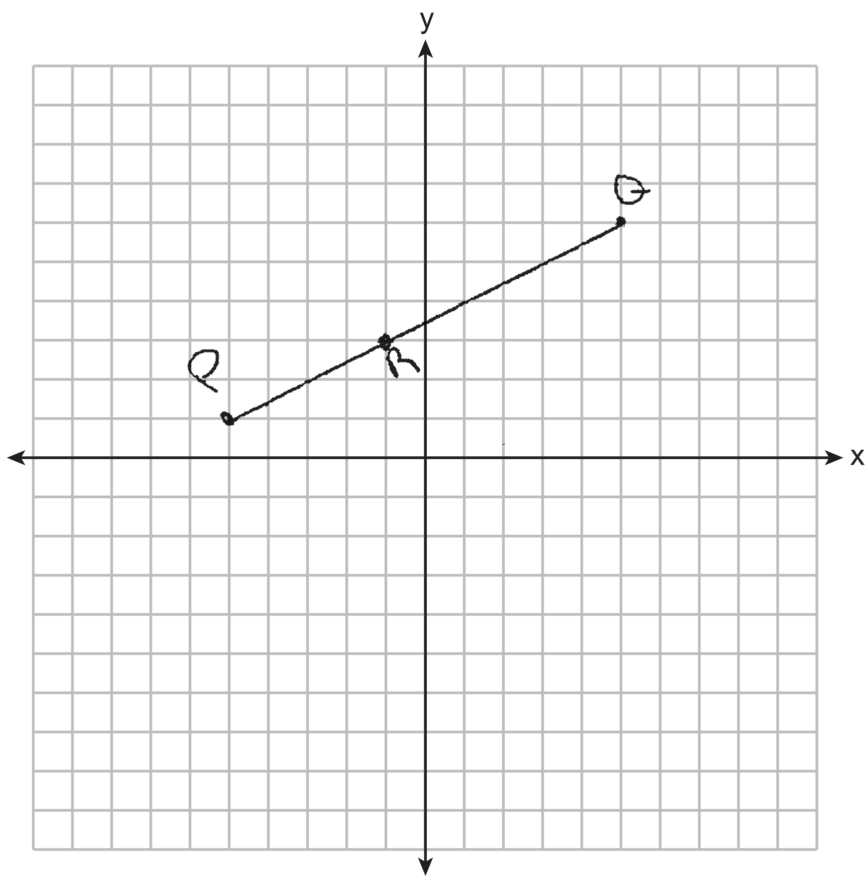
[The use of the set of axes below is optional.]



$5 - -5 = 10$ $\quad$ $6-1=5$

$10 \cdot \frac{2}{5} = 4$ $\quad$ $5 \cdot \frac{2}{5} = 2$

$-5+4=-1$ $\quad$ $1+2=3$



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

Question 27

27 Line segment *PQ* has endpoints *P*(–5,1) and *Q*(5,6), and point *R* is on $\overline{PQ}$. Determine and state the coordinates of *R*, such that *PR*:*RQ* = 2:3.

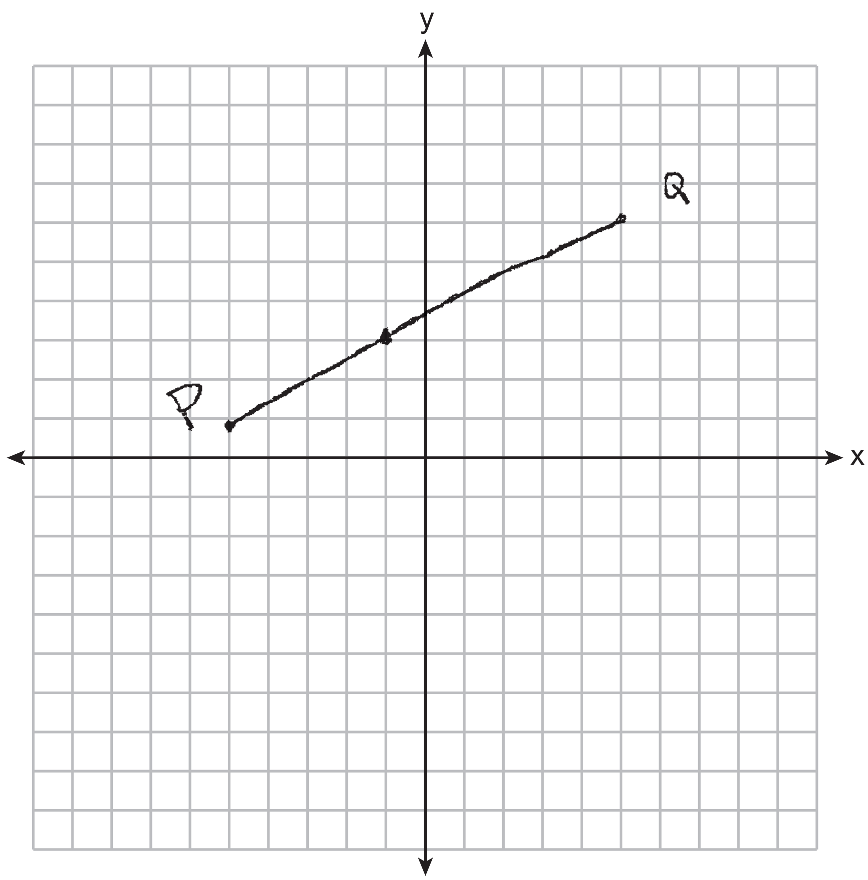
[The use of the set of axes below is optional.]

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

$(-1,3)$

$1 + \frac{2}{5}(6-1)$

$R(-1,3)$



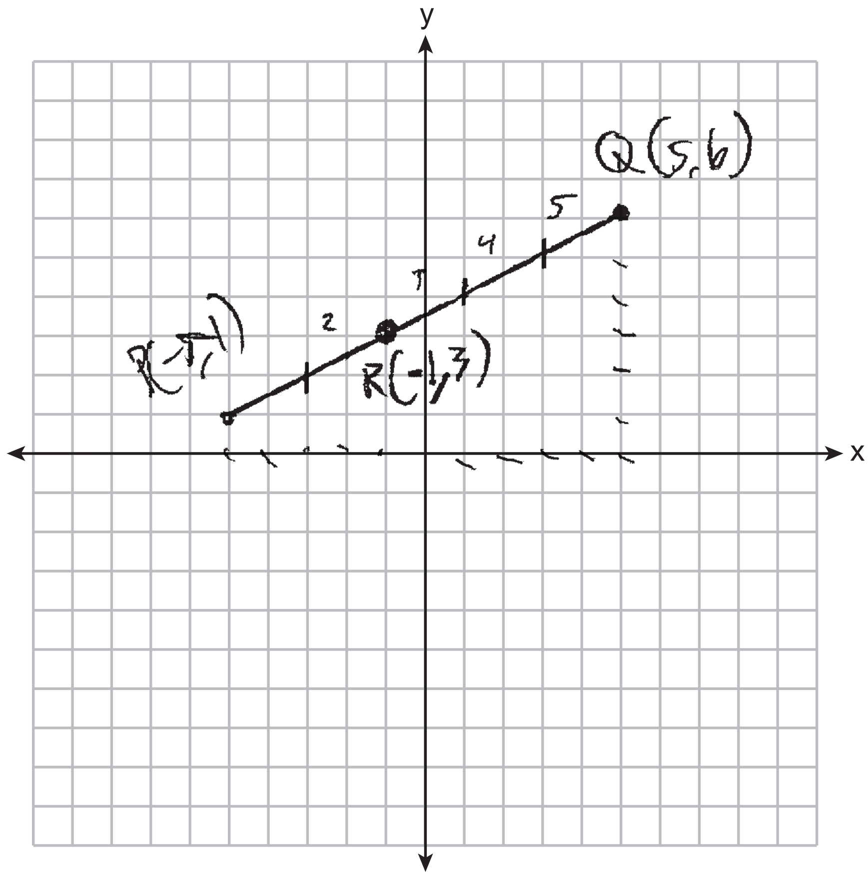
Score 2: The student gave a complete and correct response.

Question 27

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

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

R(-1,3), for that is the proper location to place it if the line segment PQ is evenly divided into 5 segments to give that PR has two segments within it and that RQ has three.



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

Question 27

-10

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

-5

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

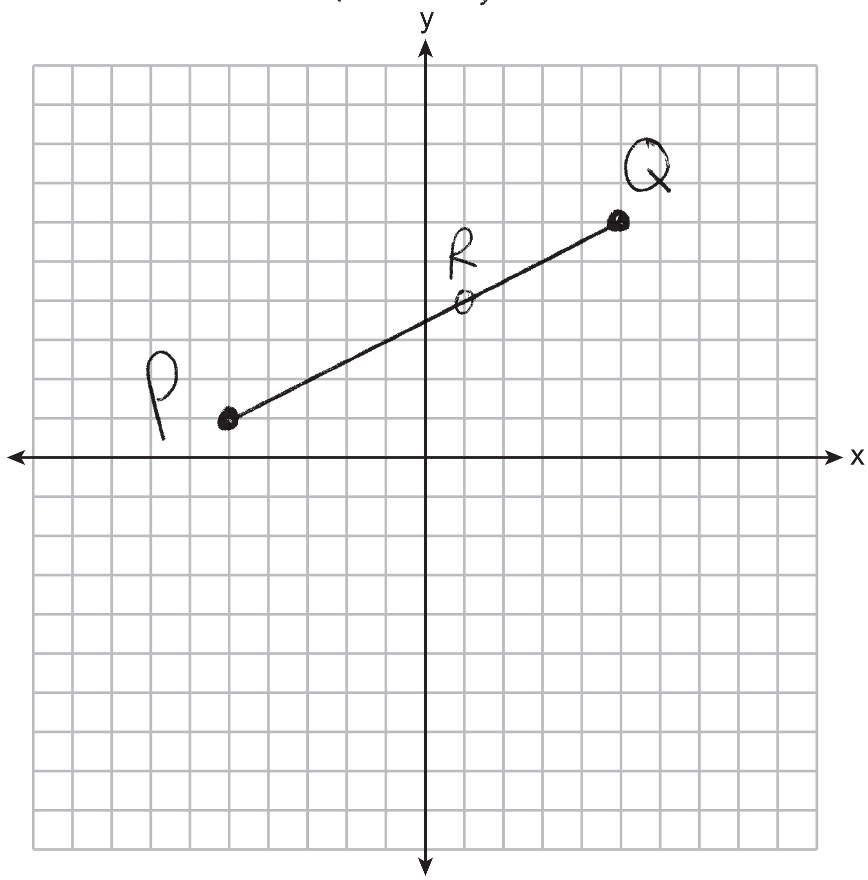
x

$\frac{2}{5}(-10)+5 = 1$

y

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

R(1,4)



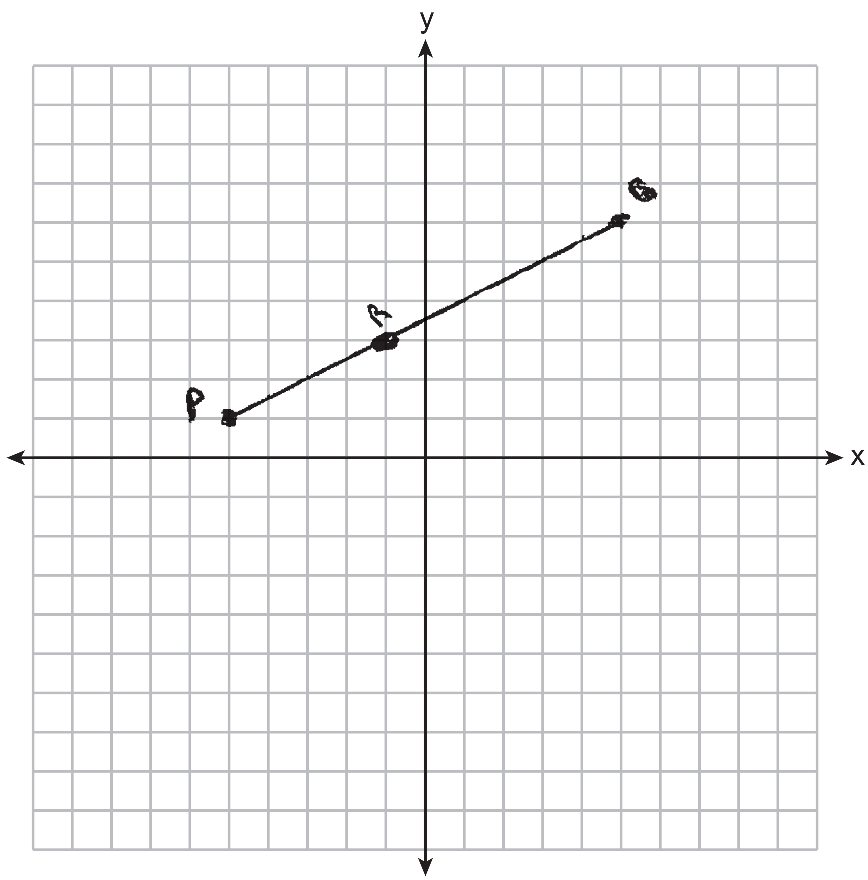
Score 1: The student determined the coordinates of R such that $PR:RQ$ was in a 3:2 ratio.

Question 27

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

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

R(-1,3)



Score 1: The student determined the coordinates of R, but did not show work.

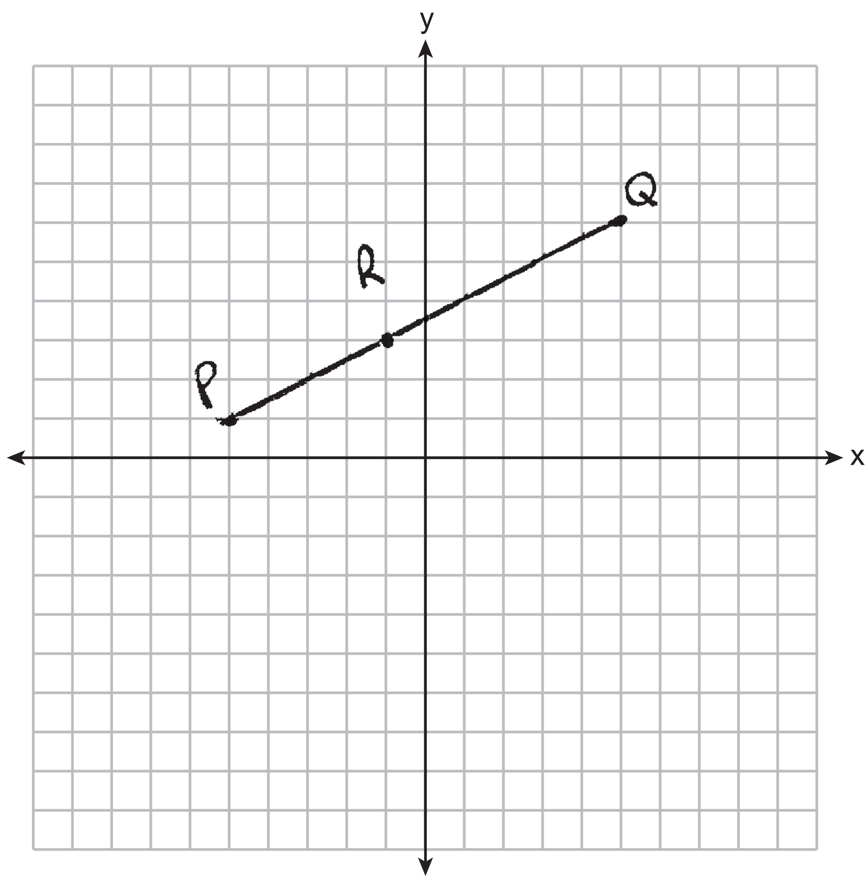
Question 27

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

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

The distance of $\overline{PR}$ to the distance of $\overline{RQ}$ when simplified results in the ratio of 2:3

$\boxed{\therefore R(-1,3)}$



Score 1: The student determined the coordinates of R, but did not show work.

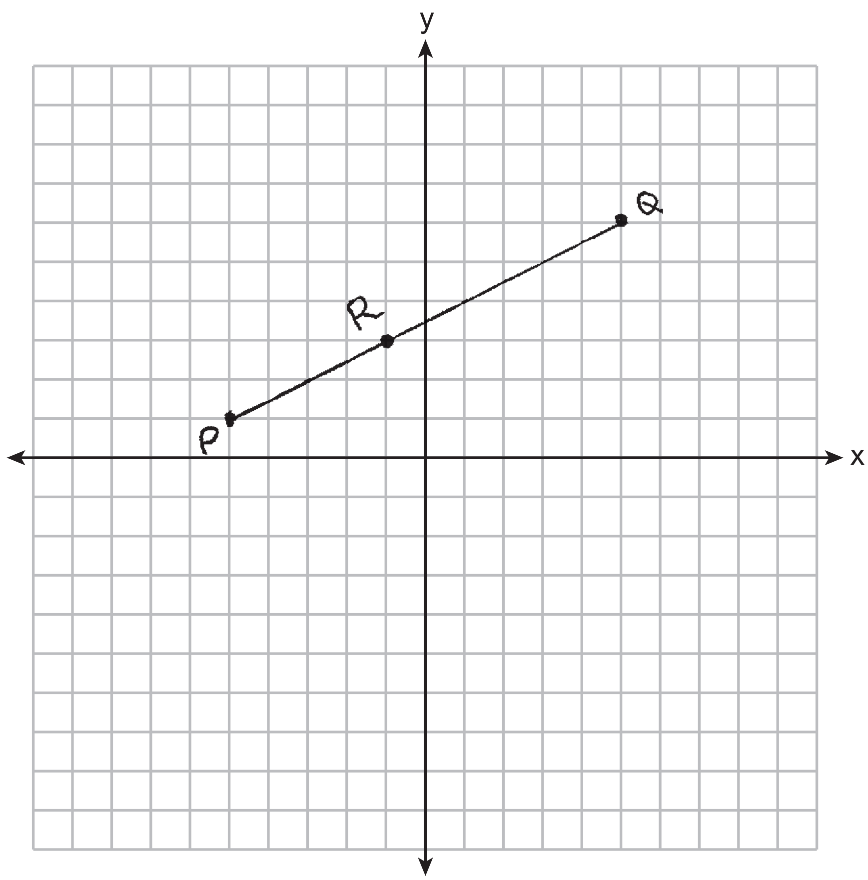
Question 27

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

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

$$2 = \sqrt{(-5-x)^2 + (1-x)^2}$$
$$2 = \sqrt{(-25 + x^2) + 1 + x^2}$$
$$2^2 = \sqrt{(26 + 2x^2)}^2$$
$$4 = 26 + 2x^2$$

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$
$$d = \sqrt{(-5-5)^2 + (1-6)^2}$$
$$= \sqrt{(0)^2 + (-5)^2}$$
$$= \sqrt{25}$$
$$= .5$$



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

Question 27

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

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

$\overline{PQ} = 10$ units

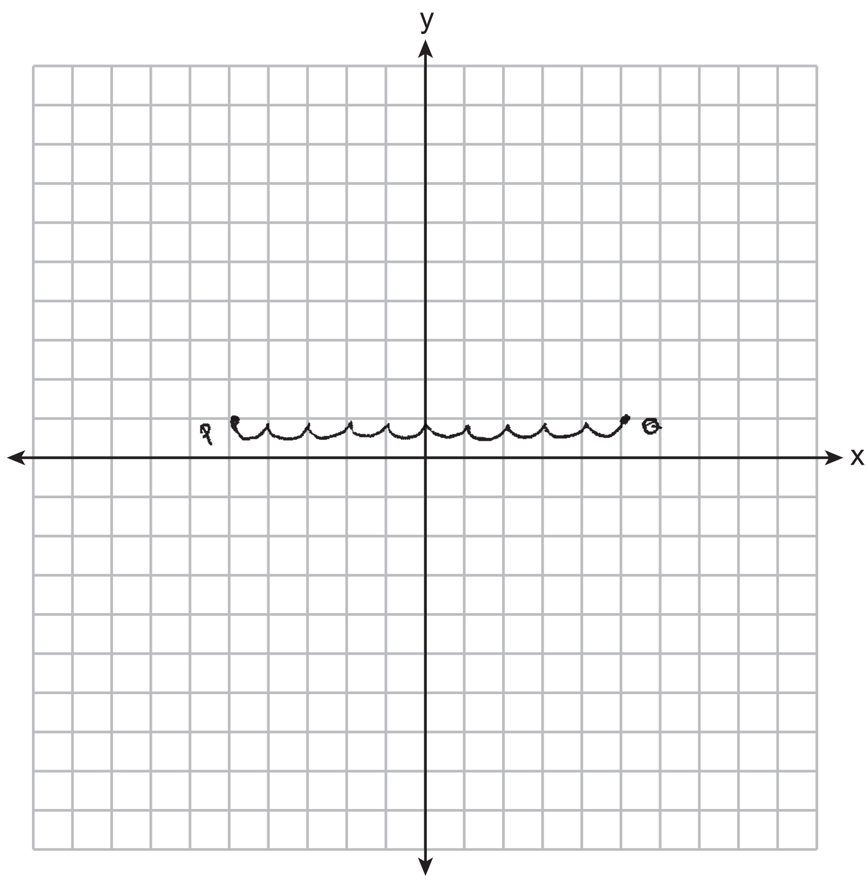
let $x = R$

$2x + 3x = 10$

$\frac{\cancel{5}x}{\cancel{5}} = \frac{10}{5}$

$x = 2$

$(-3,1)$



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

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.

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

$$\frac{360x}{360} = \frac{10294.3708}{360}$$

$$x = 28.5954$$

$$29$$

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

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.

$A = \pi r^2$

$A = \pi(6.4)^2$

$A = 40.96\pi$

$\frac{80}{360}(40.96\pi)$

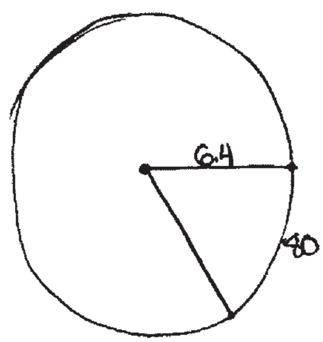
$= 28.59547$

$\boxed{29}$

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

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.



$A = \pi(6.4)^2$

$A = 128.6796351$

$\frac{80}{360} = \frac{x}{128.6796351}$

$\frac{360x = 10294.37081}{360}$

$x = 28.59547447$

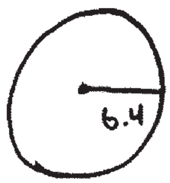
≈ 29

$\boxed{\approx 29 in^2}$

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

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.



$\pi 6.4^2 = 128.6796351$

$\frac{80}{360} = \frac{x}{128.6796357}$

$360x = 10294.37681$

$x = 29 \text{ in}$

Score 1: The student determined the area of the sector in inches, not square inches.

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.

$$\downarrow$$

$$\frac{\theta}{360}$$

$$\frac{80}{360} \cdot 2\pi(6.4) = 8.936\ldots$$

$$\approx 9 \text{ in.}^2$$

Score 1: The student made an error in using a formula for arc length, but found an appropriate answer.

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.

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

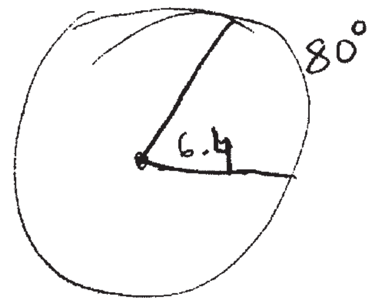
$$\frac{80}{360} \cdot \pi \cdot 6.4^2 = \frac{64\pi}{45} \text{ or } 4.468$$

4

Score 1: The student made an error in not squaring the radius, but found an appropriate answer.

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.



$\frac{\cancel{80°}^{2}}{\cancel{360}}$ $2\pi\, 6.4$

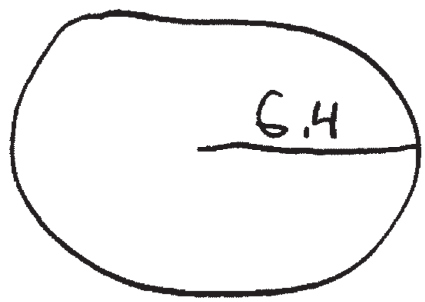
$\frac{2}{9}\pi\, 12.8$

$\boxed{\text{Area} = 8 \text{ inces}}$

Score 0: The student used an incorrect formula and made one rounding error.

Question 28

28 A circle has a radius of 6.4 inches. Determine and state, to the *nearest square inch*, the area of a sector whose arc measures 80°.



$A = \pi r^2$

$A = \pi 6.4^2$

$A = 128.6$

$\boxed{A = 129}$

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

Question 29

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

[Leave your answer in terms of π.]

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

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

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

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

$1.\overline{3}\pi$

$10.\overline{6}\pi$

$+\ 36\pi$

$48\pi ft^3$

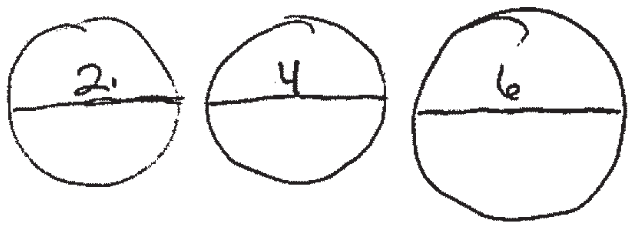
$48\pi ft^3$

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

Question 29

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

[Leave your answer in terms of π.]



$$V = \tfrac{4}{3}\pi r^3 + \tfrac{4}{3}\pi r^3 + \tfrac{4}{3}\pi r^3$$

$$V = \tfrac{4}{3}\pi (1)^3 + \tfrac{4}{3}\pi (2)^3 + \tfrac{4}{3}\pi (3)^3$$

$$= \tfrac{4}{3}\pi (1) + \tfrac{4}{3}\pi (8) + \tfrac{4}{3}\pi (27)$$

$$= \tfrac{4}{3}\pi + \tfrac{32}{3}\pi + 36\pi$$

$$= 12\pi + 36\pi$$

$$V = 48\pi$$

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

Question 29

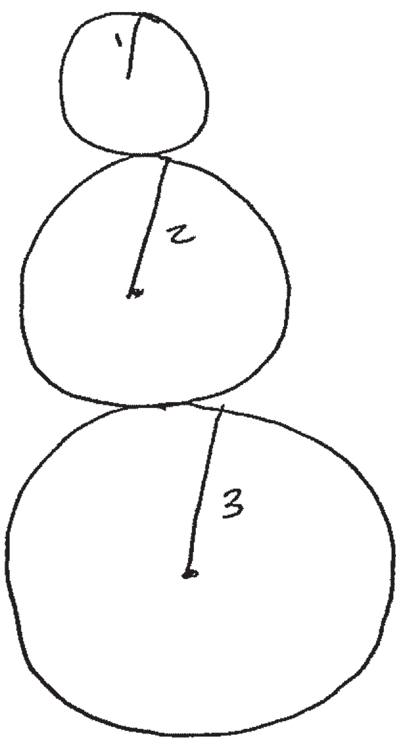
29 A large snowman is made of three spherical snowballs with radii of 1 foot, 2 feet, and 3 feet, respectively. Determine and state the amount of snow, in cubic feet, that is used to make the snowman.

[Leave your answer in terms of π.]

$V = \frac{4}{3}\pi 1^3 \quad 1.3\pi$

$V = \frac{4}{3}\pi 2^3 = 10.6\pi$

$V = \frac{4}{3}\pi 3^3 = 36\pi$



$\boxed{V = 47.9\pi}$

Score 1: The student made a rounding error.

Question 29

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

[Leave your answer in terms of π.]

$v = \frac{4}{3}\pi r^2$

$v = \frac{4}{3}\pi 1^2$

$v = \frac{4}{3}\pi 1$

$v = 1.\overline{3}\pi \text{ ft}^3$

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

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

$V = \frac{4}{3}\pi 9$

$V = 12\pi \text{ ft}^3$

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

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

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

$V = 5.\overline{3}\pi \text{ ft}^3$

12.0
$5.\overline{3}$
1.3

r

$\boxed{18.\overline{6}\pi \text{ ft}^3}$

Score 1: The student made an error by squaring the radius when using the volume formula, but found an appropriate answer.

Question 29

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

[Leave your answer in terms of π.]

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

$\frac{4}{3}\pi 1^3$ 4.19 cubic feet

$\frac{4}{3}\pi 2^3$ 33.51 cubic feet

$\frac{4}{3}\pi 3^3$ 113.10 cubic feet

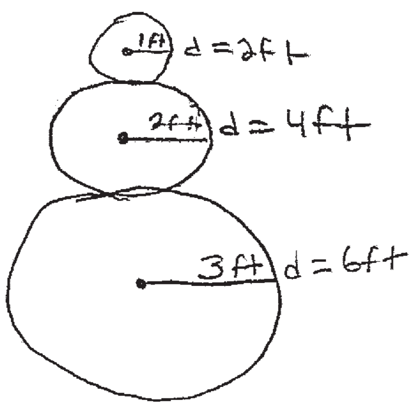
$V = 150.8$

Score 1: The student determined the volume of the snowman, but not in terms of π.

Question 29

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

[Leave your answer in terms of π.]



$C = \pi d$

$C = 12\pi$

$\underline{12\pi}$

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

Question 29

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

[Leave your answer in terms of π.]

$V = \pi r^2$

$\pi 1^2 + \pi 2^2 + \pi 3^2$

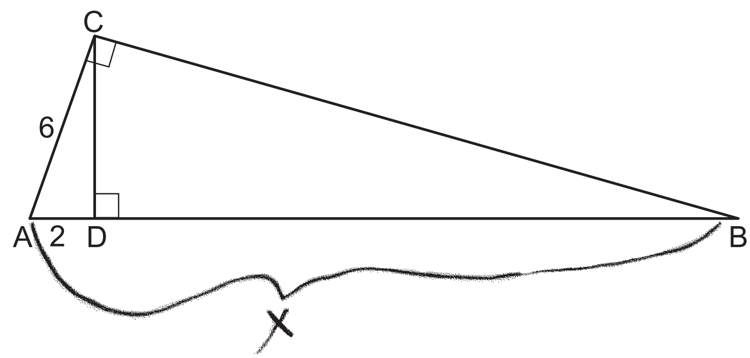
$1\pi + 4\pi + 9\pi$

$\boxed{14\pi \text{ cubic ft}}$

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

Question 30

30 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 2$ and $AC = 6$.



Determine and state the length of $\overline{AB}$.

$$\frac{2}{6} = \frac{6}{x}$$

$$2x = 36$$

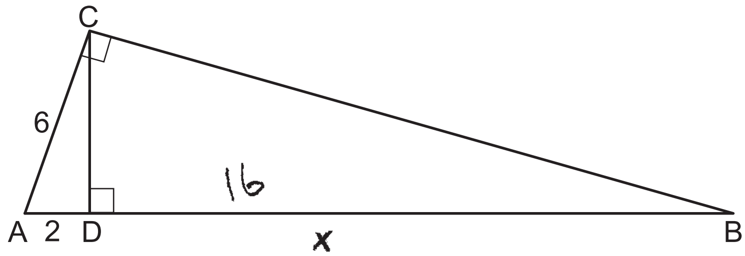
$$x = 18$$

$AB = 18$

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

Question 30

30 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 2$ and $AC = 6$.



Determine and state the length of $\overline{AB}$.

$$\frac{x+2}{6} = \frac{6}{2}$$

$$36 = 2x + 4$$
$$-4 \qquad -4$$

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

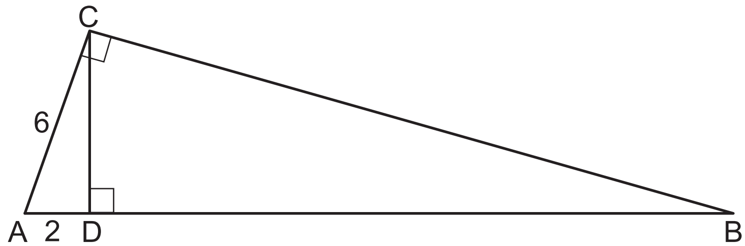
$$16 = x$$

$$\boxed{AB = 18}$$

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

Question 30

30 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 2$ and $AC = 6$.



Determine and state the length of $\overline{AB}$.

Find CD

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

$(CD)^2 = 36 - 4$

$CD = \sqrt{32}$

$\triangle ADC \sim \triangle CDB$

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

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

$2x = 32$

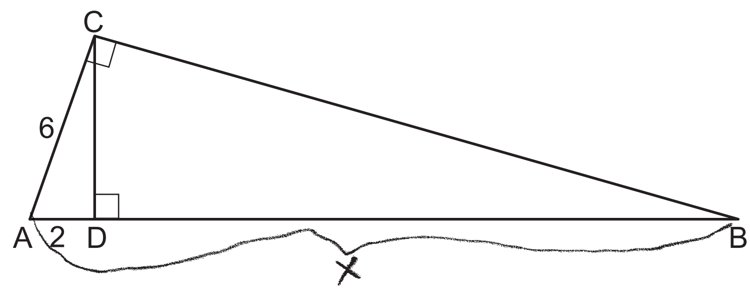
$BD = x = 16$

$AB = 16 + 2$

$AB = 18$

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

30 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 2$ and $AC = 6$.



Determine and state the length of $\overline{AB}$.

$$\frac{\text{Leg1}}{\text{sh1}} = \frac{\text{hyp}}{\text{Leg1}}$$

$$\frac{6}{2} = \frac{x}{6}$$

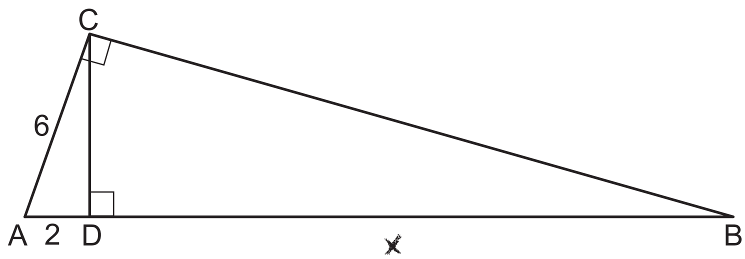
$$12 = 2x$$

$$x = 6$$

Score 1: The student made a computational error.

Question 30

30 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 2$ and $AC = 6$.



Determine and state the length of $\overline{AB}$.

$$\frac{2}{6} = \frac{6}{2+x}$$

$$4 + 2x = 36$$

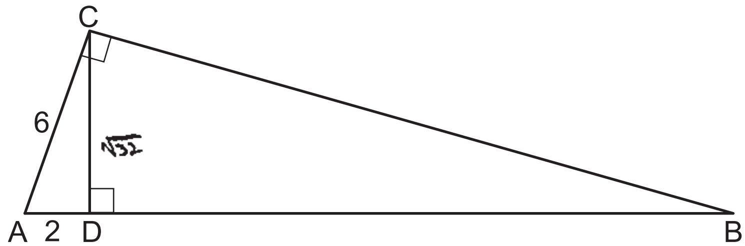
$$2x = 32$$

$$x = 16$$

Score 1: The student correctly determined the length of $\overline{DB}$, but did not find the length of $\overline{AB}$.

Question 30

30 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 2$ and $AC = 6$.



Determine and state the length of $\overline{AB}$.

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

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

$4+x^2=36$

$-4 \qquad -4$

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

$x=\sqrt{32}$

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

$x^2+x^2=\sqrt{32}$

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

$x^2=\sqrt{16}$

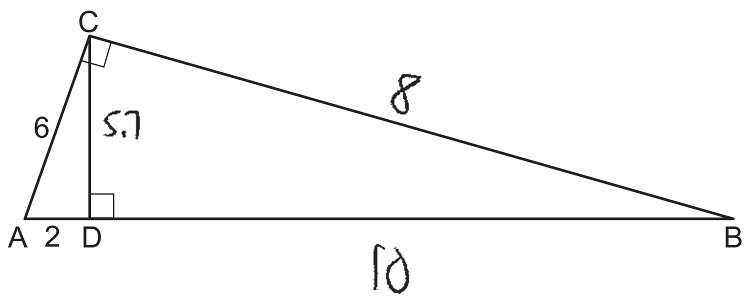
$x=4$

$AB=6$

Score 0: The student made a conceptual error and a computational error in determining the length of $\overline{DB}$.

Question 30

30 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 2$ and $AC = 6$.



Determine and state the length of $\overline{AB}$.

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

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

$4+x^2=36$

$-4 \qquad -4$

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

$x=5.7$

$\sqrt{38+x^2}=\sqrt{y^2}$

$\sqrt{38+x}=y$

$6^2+x^2=y^2-2$

$36+x^2=y^2-2$

$6^2+8^2=10^2$

$36+64=100$

$\overline{AB}=10$

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

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

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

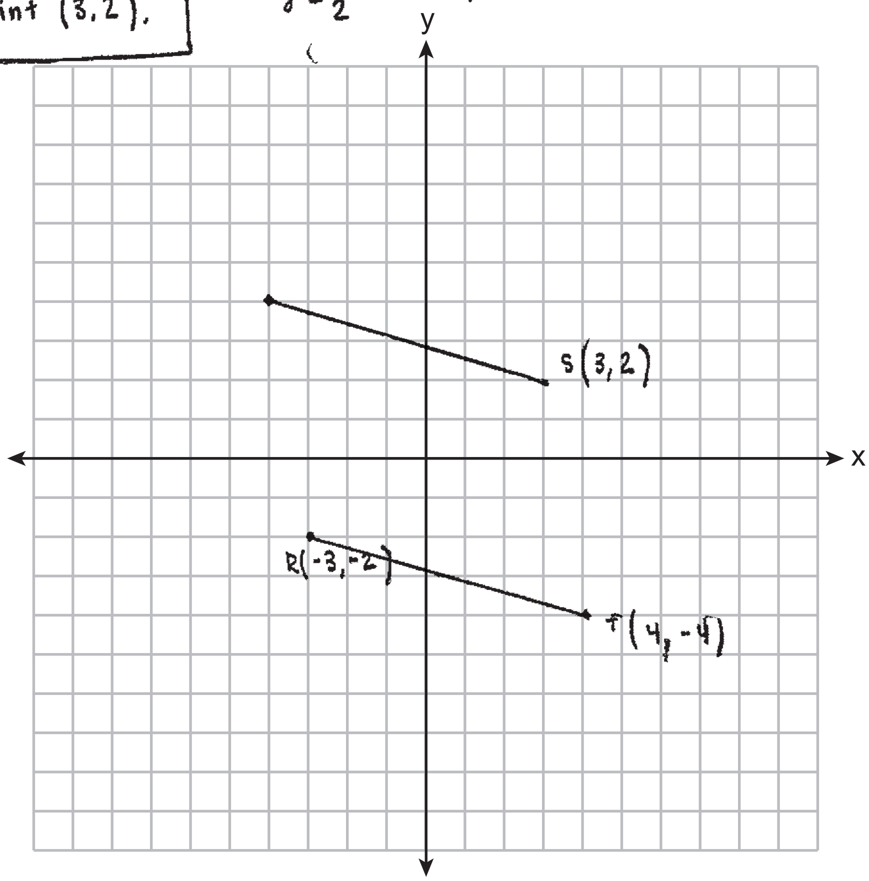
$\frac{y_2-y_1}{x_2-x_1}$ $\quad$ $\frac{-4+2}{4+3} = -\frac{2}{7}$

$\boxed{y-2 = -\frac{2}{7}(x-3)}$

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

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

$y - 2 = \left(-\frac{2}{7}\right)x + \frac{6}{7}$



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

Question 31

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

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

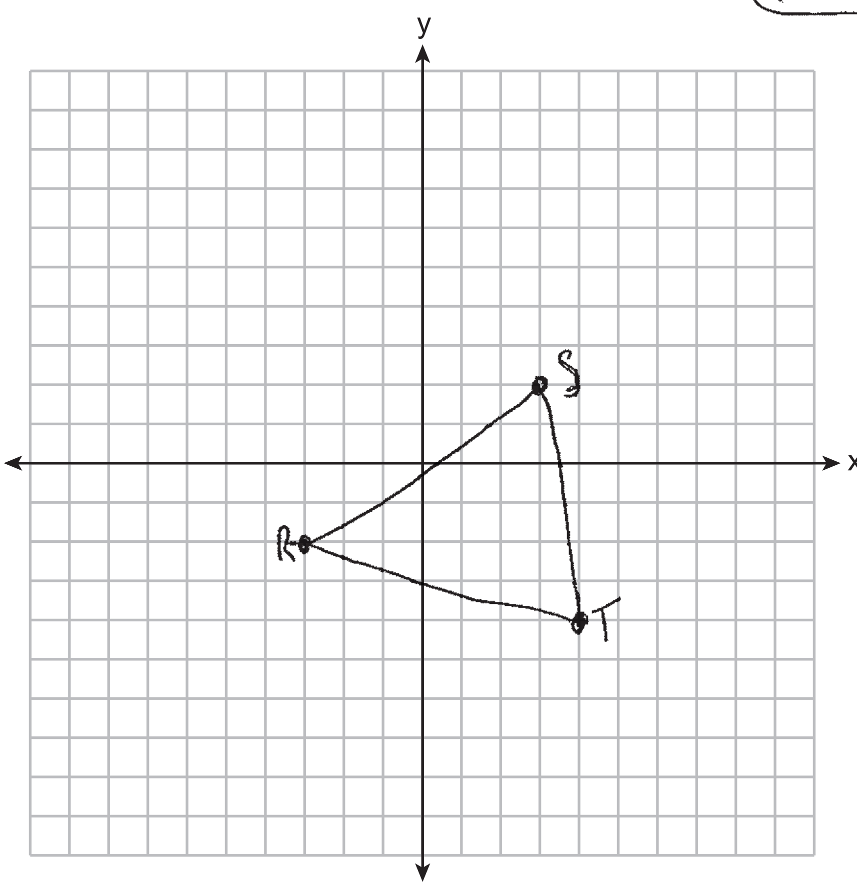
Slope of $\overline{RT} = \frac{-4+2}{4+3} = \frac{-2}{7}$

$y-2=\frac{-2}{7}(x-3)$

$y-2=\frac{-2}{7}x+\frac{6}{7}$

$+2 \qquad +2$

$y=\frac{-2}{7}x+\frac{20}{7}$



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

Question 31

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

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

$y = -0.3x + b$

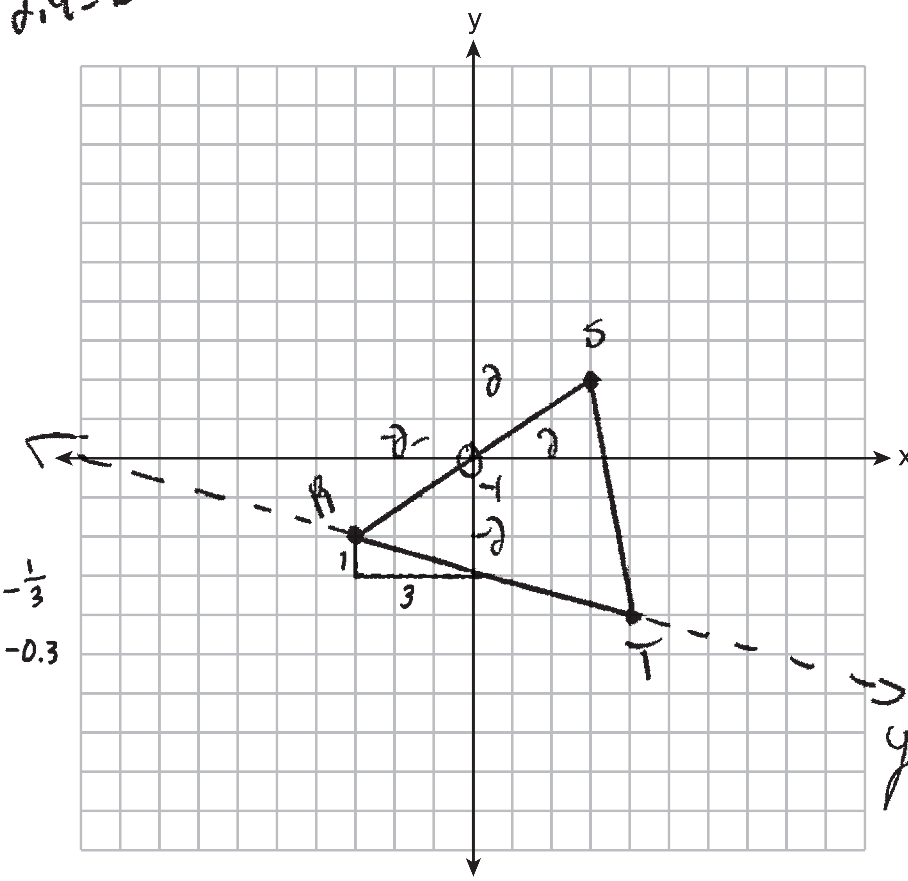
$2 = -0.3(3) + b$

$2 = -0.9 + b$

$+0.9 \quad +0.9$

$2.9 = b$

$y = -0.3x + 2.9$



$M = -\frac{1}{3}$

$M = -0.3$

$y = -0.3x + -2.9$

Score 1: The student made an error when determining the slope of $\overline{RT}$.

Question 31

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

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

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

↓ negative reciprocal

$$\frac{7}{2}$$

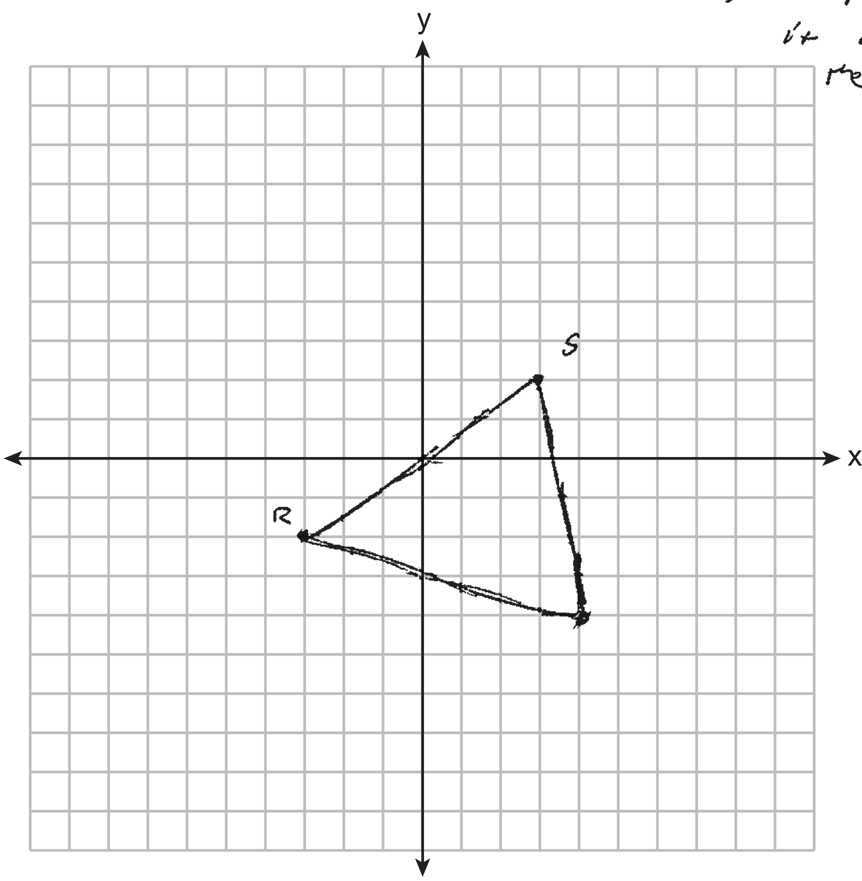
$y = \frac{7}{2}x + b$

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

$2 = 10.5 + b$

$-8.5 = b$

$y = \frac{7}{2}x - 8.5$ is the equation because the slope is a negative reciprocal and it intersects the point S.



Score 1: The student wrote an equation of the line perpendicular to $\overline{RT}$ through point S.

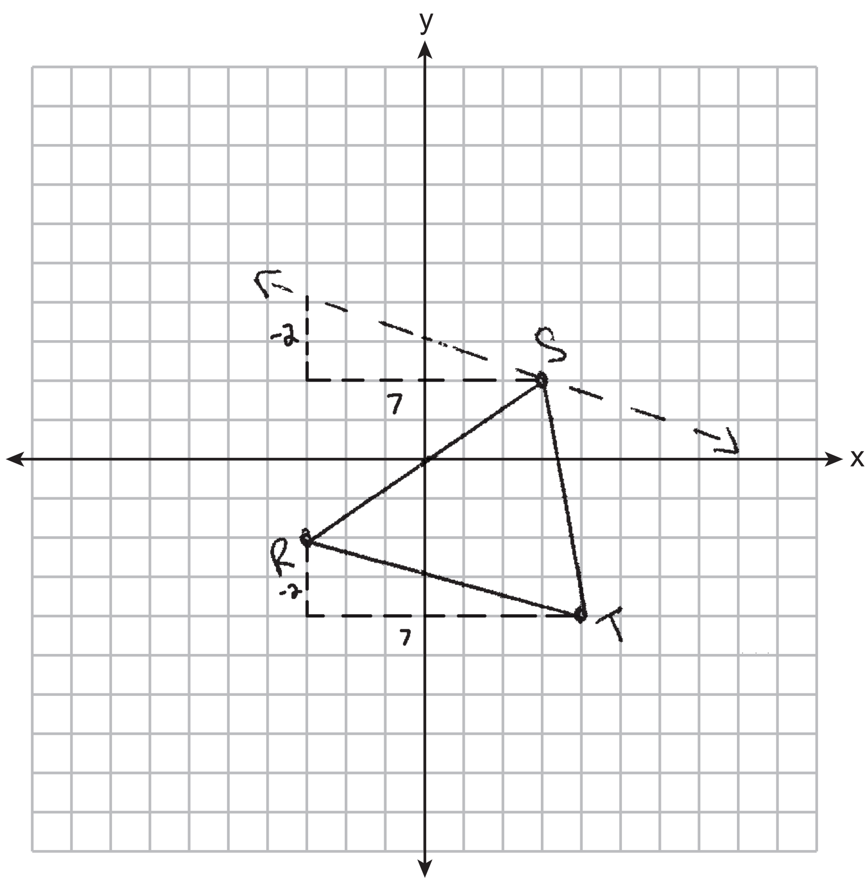
Question 31

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

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

$m = \frac{-2}{7}$

$\boxed{y = \frac{-2}{7}x + 3}$



Score 1: The student correctly determined the slope of the line parallel to $\overline{RT}$, but no further correct work was shown.

Question 31

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

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

(3,2)

$y=mx+b$

$2=m(3)+b$

$2=\frac{1}{6}(3)+b$

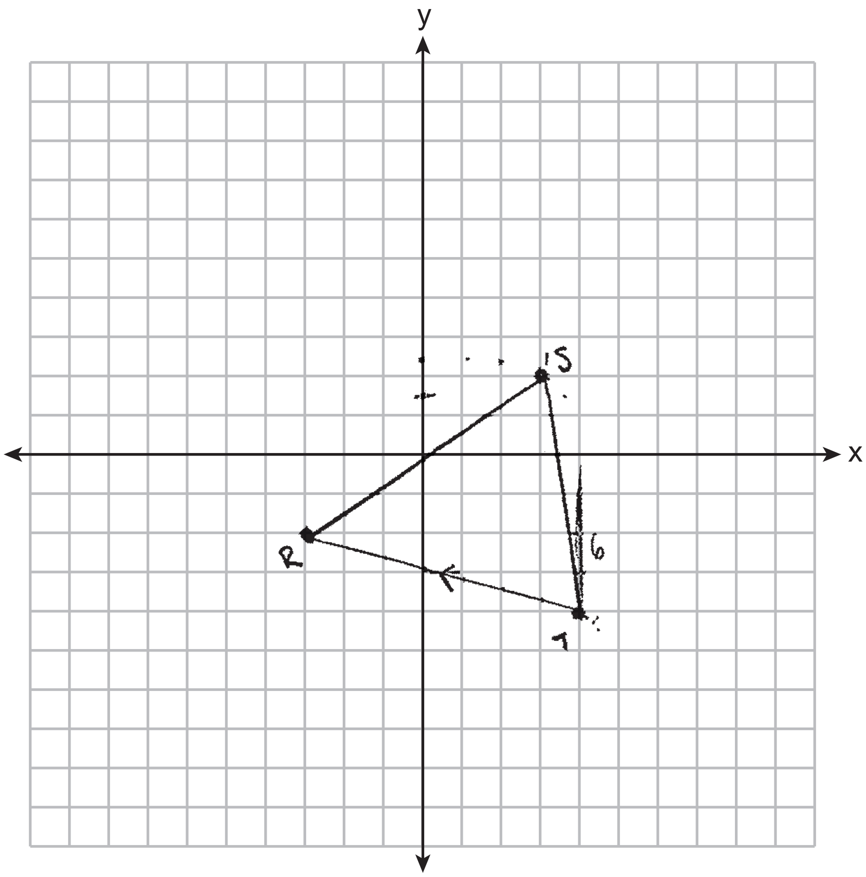
$2=.5+b$

$-.5 \quad -.5$

$1.5=b$

$y=5x+1.5$

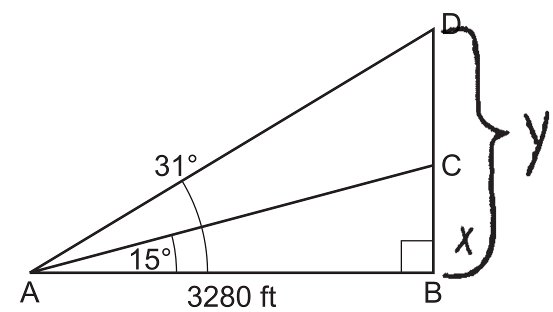
passes through point S and is ∥ to $\overline{RT}$.



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

Question 32

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



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

$\frac{\text{Tan } 15}{1} = \frac{x}{3280}$ $\frac{\text{Tan } 31}{1} = \frac{y}{3280}$

$x = \text{Tan } 15(3280$ $y = \text{Tan } 31(3280)$

B-C $x = 878.873$ B-D $y = 1970.822$

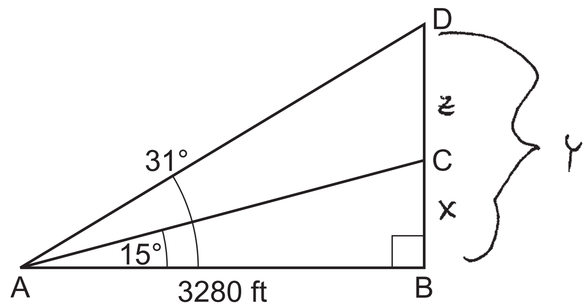
$$\begin{array}{r} 1970.822 \\ -\,878.873 \\ \hline 1091.949 \text{ ft} \end{array}$$

Distance traveled between: 1092 ft

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

Question 32

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



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

$\tan 15° = \frac{x}{3280}$ | $\tan 31° = \frac{Y}{3280}$

$x = 3280 \tan 15°$ | $Y = 3280 \tan 31°$

$z = Y - x$

$z = 3280 \tan 31° - 3280 \tan 15°$

$= 3280 (\tan 31° - \tan 15°)$

$= 3280 (.3329114266)$

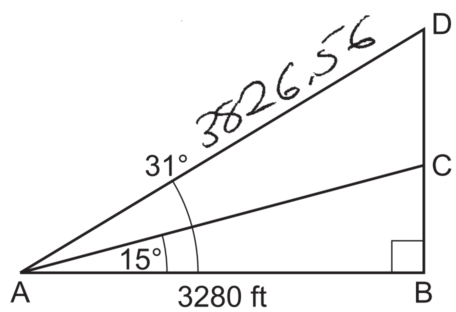
$= 1091.949479$

$= \boxed{1092}$

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

Question 32

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



Find AD

$\cos 31 = \frac{3280}{(AD)}$

$3280 \div (\cos 31) = AD$

$AD = 3826.56$

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

Find CB

$\tan 15 = \frac{CB}{3280}$

$CB = 878.87$

Find BD

$3280^2 + (BD)^2 = (3826.6)^2$

1970.91

$BD - CB =$

$-878.87 + 1970.9$

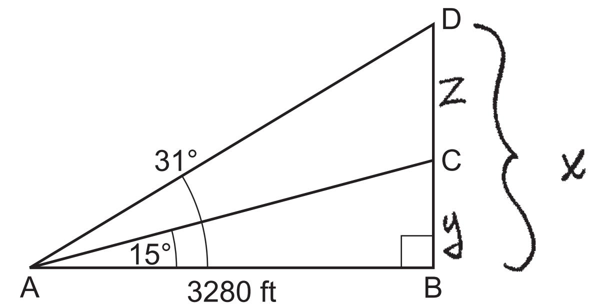
1092.03

1092 ft. Ans

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

Question 32

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



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

$\tan\theta = \frac{opp}{adj}$

$\tan(31°) = \frac{x}{3280}$

$x = (3280)(\tan(31°))$

$x = 1970.82283$

$\tan(15°) = \frac{y}{3280}$

$y = (3280)(\tan 15)$

$y = 878.8733512$

$x - y = z$

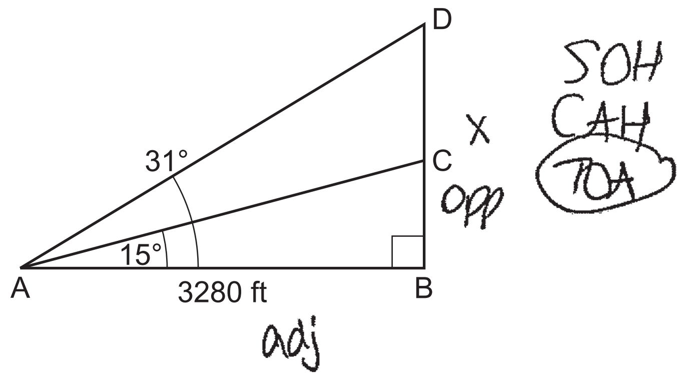
$1970.82283 - 878.8733512 =$

$\boxed{1091.949479 \text{ ft}}$

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

Question 32

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



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

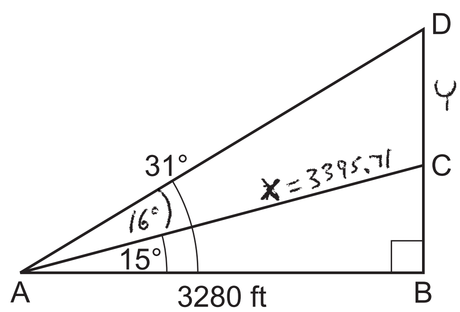
$$\text{Tan } 31 = \frac{x}{3280} = $$

1971 ft = DB

distance rocket traveled was 1971 ft.

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

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



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

$\cos 15° = \frac{3280}{x}$

$\frac{x \cos 15}{\cos 15} = \frac{3280}{\cos 15}$

$x = 3395.705872$

$\tan 16° = \frac{y}{3395.71}$

$y = 973.70417$

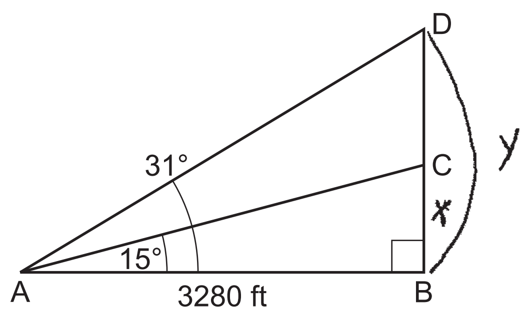
$\boxed{y = 974 \text{ ft}}$

Score 2: The student made a conceptual error in using the tangent function in a non-right triangle.

Question 32

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

S tan



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

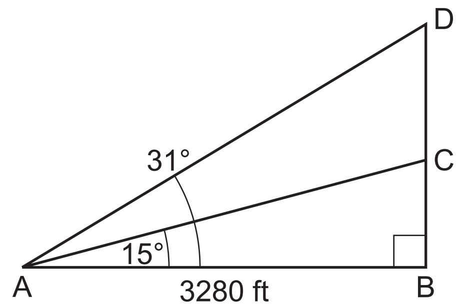
$\tan 15° = \frac{x}{3280}$

$\tan 31° = \frac{y}{3280}$

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

Question 32

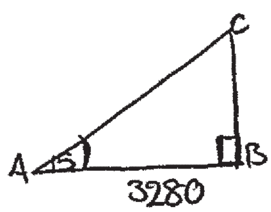
32 Cape Canaveral, Florida is where NASA launches rockets into space. As modeled in the diagram below, a person views the launch of a rocket from observation area *A*, 3280 feet away from launch pad *B*. After launch, the rocket was sighted at *C* with an angle of elevation of 15°. The rocket was later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

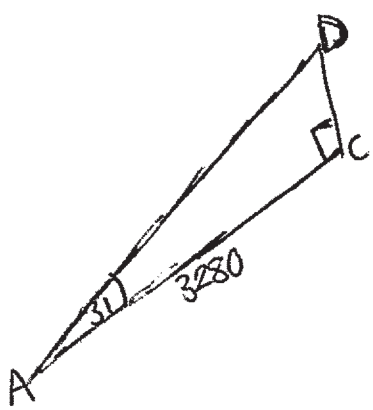


Determine and state, to the *nearest foot*, the distance the rocket traveled between the two sightings, *C* and *D*.

sohcahtoa

$x \cdot \cos 15^\circ = \frac{3280}{\cancel{x}} \cdot \cancel{x}$





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

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

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

$\pi r^2 h$

$\pi (3.5)^2 9$

$\pi\ 110.25$

346.360

$\approx 346\text{cm}^3$

$\pi r^2 h$

$\pi (4.5)^2 13$

$\pi\ 263.25$

827.024

$\approx 827\text{cm}^3$

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

3 cans. $827 \div 346 = 2.39$ but. You need 3 cans to fill the larger container

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

Question 33

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

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

$r=3.5$

small	large
$V=\pi r^2 h$	$V=\pi r^2 h$
$V=\pi \cdot (3.5)^2(9)$	$V=\pi(4.5)^2(13)$
$V=110.25\pi$	$V=263.25\pi$
$\boxed{V=346\text{cm}^3}$	$\boxed{V=827\text{cm}^3}$

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

$\frac{827}{346} = \cancel{2.4}\ 2$

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

Score 3: The student made an error in determining the number of small cans needed.

Question 33

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

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

$V = \pi r^2 h$

Small $= \pi\, 3.5^2 9$ Large $= \pi\, 4.5^2 13$

Small $= 110\text{ cm}^3$ Large $= 827\text{ cm}^3$

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

About 8

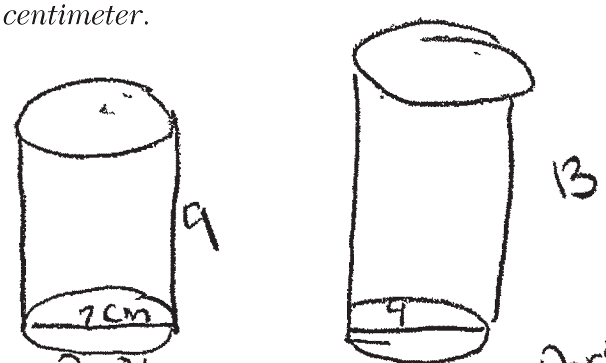
$\frac{827.0242}{110.25} = 7.5$

Score 3: The student made an error in determining the volume of the small can.

Question 33

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

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



$V = \pi r^2 h$
$V = \pi \cdot 3.5^2 \cdot 9$
$V = \pi \cdot 12.25 \cdot 9$
$V = 110.25\pi$
$V = 346 \text{ cm}^3$

$V = \pi r^2 h$
$V = \pi 4.5^2 \cdot 13$
$V = \pi \cdot 20.25 \cdot 13$
$V = 263.25\pi$
$V = 827 \text{ cm}^3$

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

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

Question 33

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

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

$V_{small} = \pi(7)^2 9$

$= 441\pi$

≈ 1385

$V_{Large} = \pi(9)^2 13$

$= 1053\pi$

≈ 3308

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

$\frac{V_{Large}}{V_{small}} = \frac{3308}{1385} \approx 2.388$

2

Score 2: The student made an error by using diameter for the volume of both cylinders and made an error in determining the number of small cans needed.

Question 33

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

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

$V = \pi r^2 h$

$V = \pi\, 3.5^2 (9)$

$V = \pi (7)(9)$

$V = 63\pi$

$V = 197.920$

$V = 198$

$V = \pi r^2 h$

$V = \pi (4.5)^2 (13)$

$V = \pi (20.25)(13)$

$V = 263.25\pi$

$V = 827.024$

$V = 827$

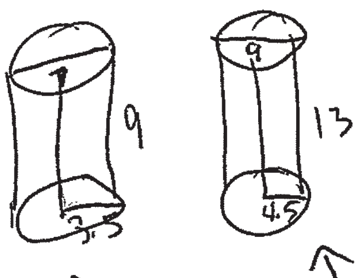
What is the minimum number of small cans that must be opened to fill the large container? Justify your answer.

Score 1: The student determined the correct volume of the large container, but no further correct work was shown.

Question 33

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

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



$V = \pi r^2 h$

$= \pi 3.5^2(9)$

$12.25(9)$

$= 110.25\pi$

$= 346.4$

$V = \pi r^2 h$

$V = \pi 4.5^2(13)$

$= \pi\, 20.25(13)$

$= 263.25\pi$

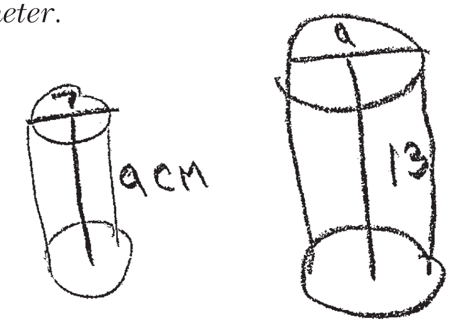
$= 827.0$

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

Score 1: The student found the volumes of the small can and large container, but rounded to the nearest tenth of a cubic centimeter. No further correct work was shown.

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

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



$V = \pi r^2 h$

$V = \pi (3.5)^2(9)$

$V = \pi 12(9)$

$V = 108\pi$ cm^3

$V = 327$ cm^3

$V = \pi (4.5)^2(13)$

$V = \pi\, 21.5(13)$

$V = 282\pi$

$V = 876$

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

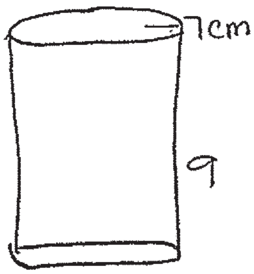
2

Score 0: The student made errors in determining the volumes of both cylinders and did not show enough correct relevant work to receive additional credit.

Question 33

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

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



$7^2 \cdot 3.14$

$153.86 \cdot 9$

$\boxed{1384.74}$ LA

$1384.74 + 49$

$\boxed{1433.74}$ S.A

$49 + 9 =$

$\boxed{58} = V$

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

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

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

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

$MA = \sqrt{7^2+6^2} = \sqrt{85}$

$AT = \sqrt{9^2+2^2} = \sqrt{85}$

$TH = \sqrt{7^2+6^2} = \sqrt{85}$

$\overline{MH} = \sqrt{9^2+2^2} = \sqrt{85}$

▱MATH is a rhombus because all side lengths are equal, therefore all sides are ≅ to each other

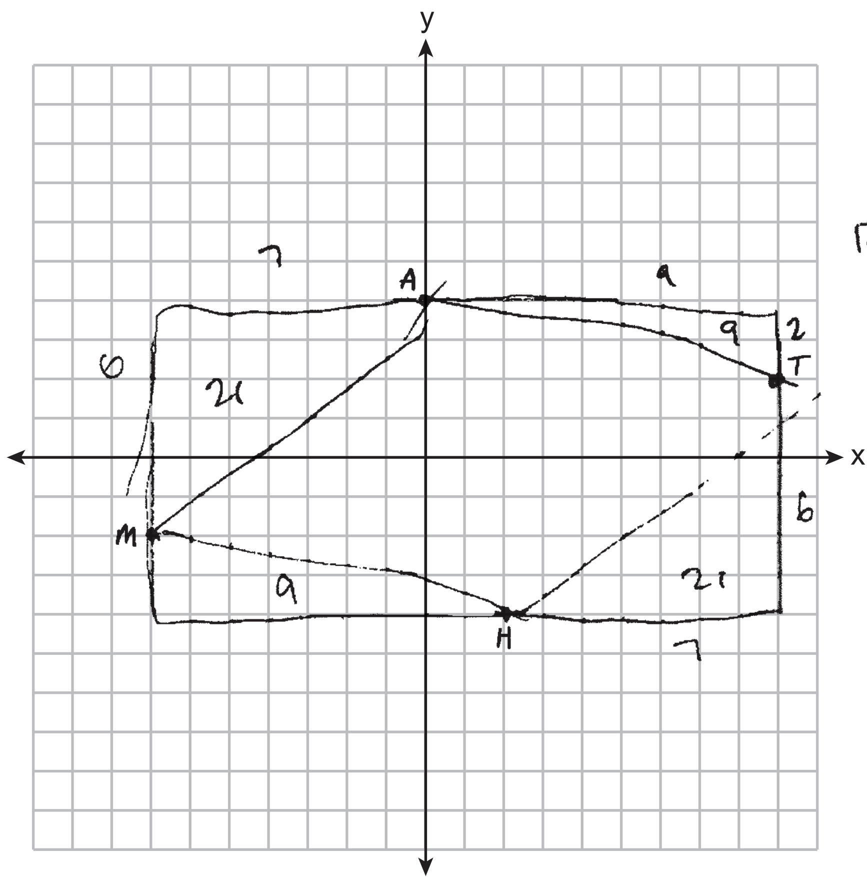
Determine and state the area of *MATH*.

$A = 16(8) = 128$

$A = \frac{1}{2}(6)(7) = 21$

$A = \frac{1}{2}(2)(9) = 9$

$128 - 2(9+21) = \boxed{68}$



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

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

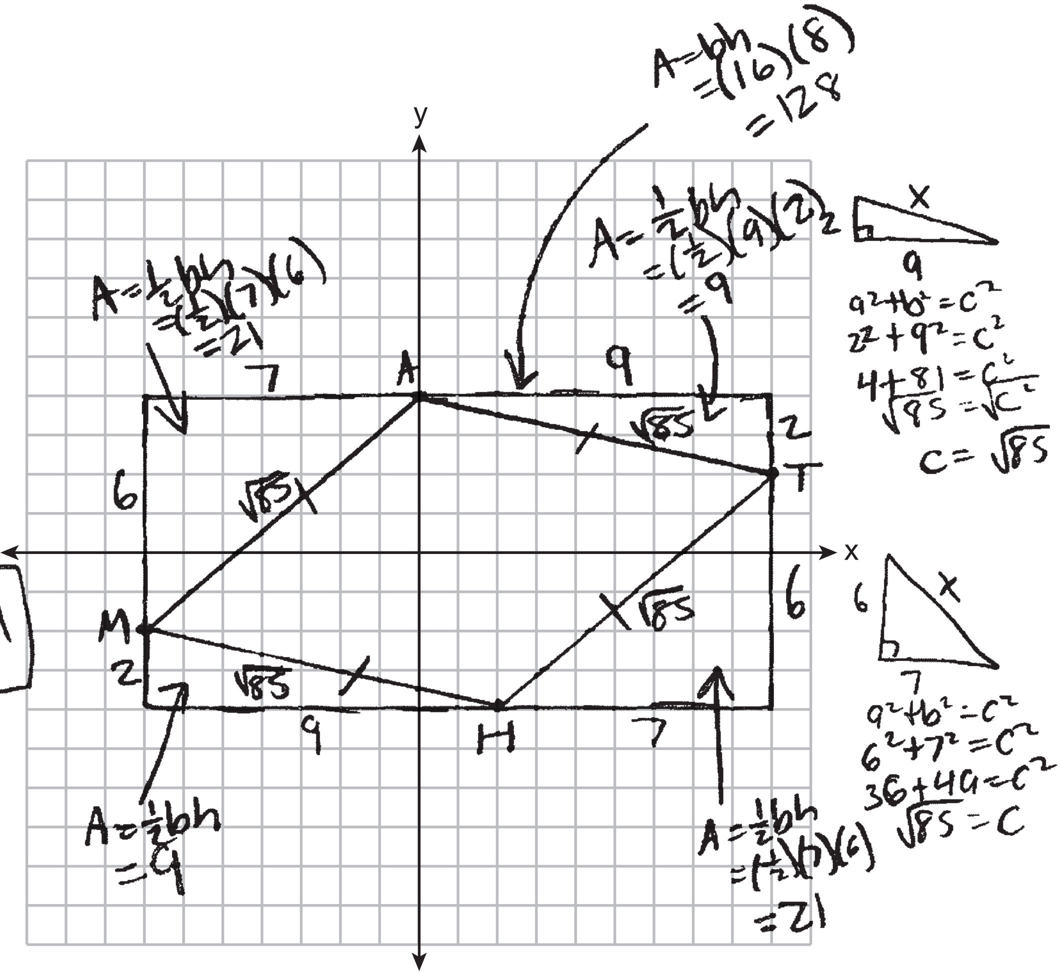
[The use of the set of axes below is optional.]

All four sides are $\cong$ ($\overline{MA} \cong \overline{AT} \cong \overline{TH} \cong \overline{HM}$)
therefore, MATH is a rhombus

Determine and state the area of *MATH*.

$$\begin{array}{r} 128 \\ -21 \\ \hline 107 \\ -21 \\ \hline 86 \\ -9 \\ \hline 77 \\ -9 \\ \hline 68 \end{array}$$

Area of MATH is 68



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

34 Parallelogram $MATH$ has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram $MATH$ is a rhombus.

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

$MA = \sqrt{(0-(-7))^2+(4-(-2))^2}$
$= \sqrt{7^2+6^2}$
$= \sqrt{49+36}$
$= \sqrt{85}$

$AT = \sqrt{(9-0)^2+(2-4)^2}$
$= \sqrt{9^2+(-2)^2}$
$= \sqrt{81+4}$
$= \sqrt{85}$

$TH = \sqrt{(2-9)^2+(-4-2)^2}$
$= \sqrt{(-7)^2+(-6)^2}$
$= \sqrt{49+36}$
$= \sqrt{85}$

$MH = \sqrt{(2-(-7))^2+(-4-(-2))^2}$
$= \sqrt{9^2+(-2)^2}$
$= \sqrt{81+4}$
$= \sqrt{85}$

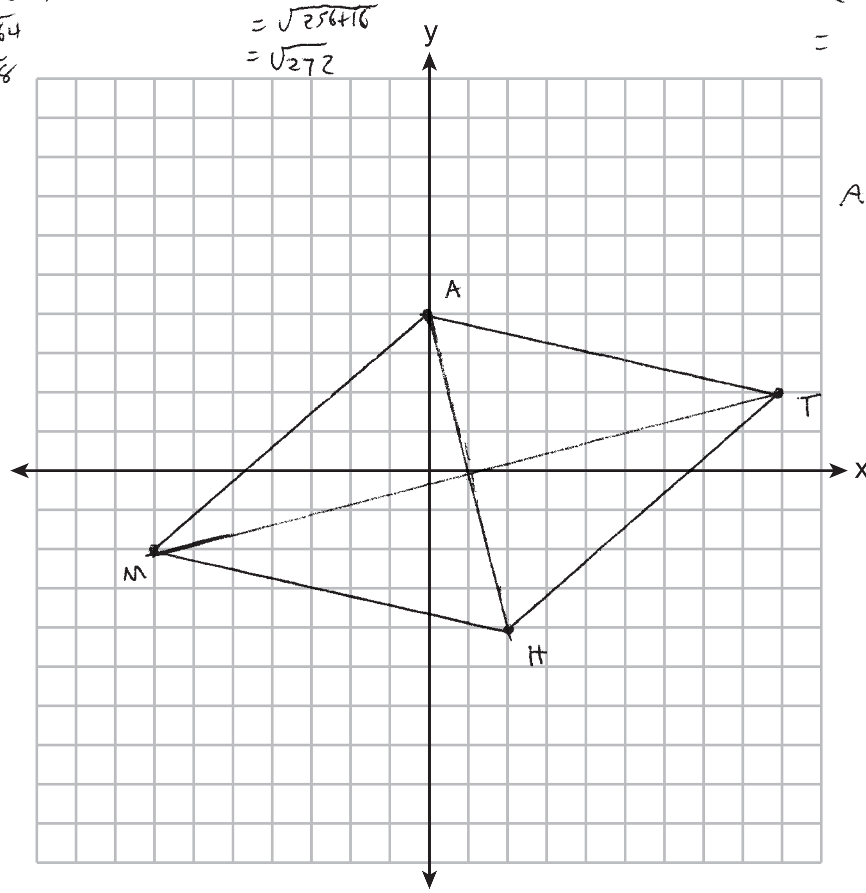
MATH is a rhombus since the opposite sides are $\cong$

Determine and state the area of $MATH$.

$AH = \sqrt{(2-0)^2+(-4-4)^2}$
$= \sqrt{2^2+(-8)^2}$
$= \sqrt{4+64}$
$= \sqrt{68}$

$MT = \sqrt{(9-(-7))^2+(2-(-2))^2}$
$= \sqrt{16^2+4^2}$
$= \sqrt{256+16}$
$= \sqrt{272}$

$A = \frac{1}{2} d_1 \cdot d_2$
$= \frac{1}{2}(\sqrt{68} \cdot \sqrt{272})$
$= \frac{1}{2}\sqrt{18496}$
$= \frac{1}{2}\, 136$
$A = \boxed{68}$



Score 3: The student wrote an incorrect concluding statement when proving the rhombus.

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

$d(M,A) = \sqrt{7^2+6^2} = \sqrt{85}$

$d(A,T) = \sqrt{9^2+2^2} = \sqrt{85}$

$d(T,H) = \sqrt{7^2+6^2} = \sqrt{85}$

$d(H,M) = \sqrt{9^2+2^2} = \sqrt{85}$

$d(A,H) = \sqrt{8^2+2^2} = \sqrt{68}$

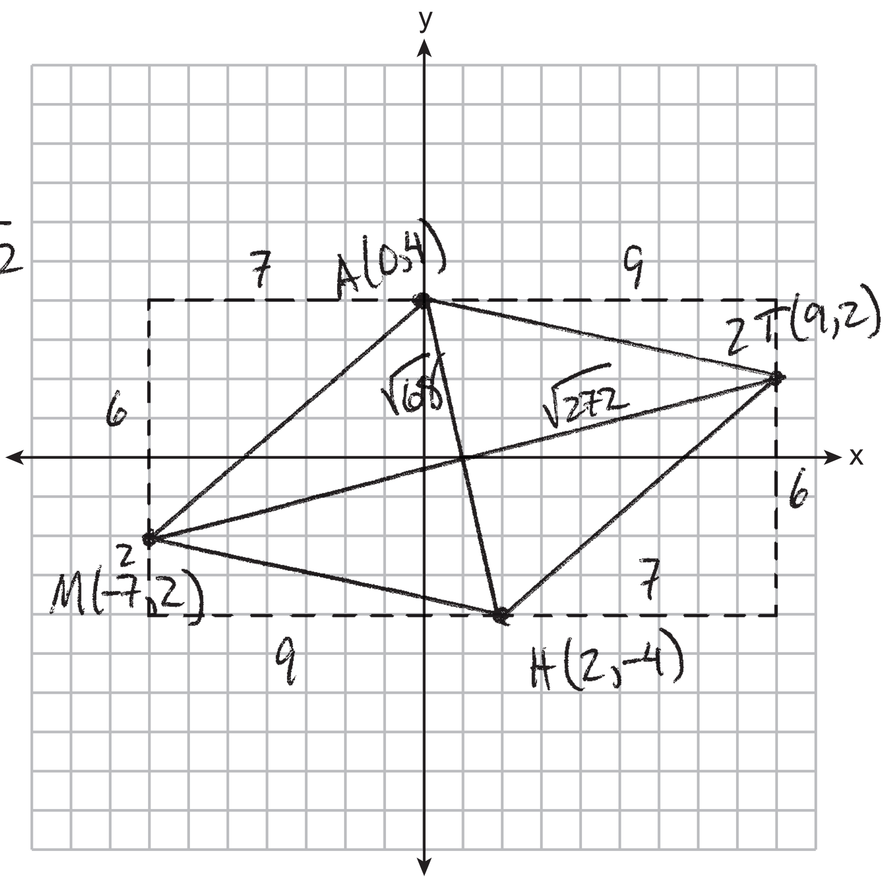
$d(M,T) = \sqrt{16^2+4^2} = \sqrt{272}$

Determine and state the area of *MATH*.

$A = \frac{1}{2}\sqrt{68} \cdot \sqrt{272}$

$= \frac{1}{2}\sqrt{18496}$

$= 68$



Score 3: The student did not write a concluding statement when proving the rhombus.

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

A parallelogram with a pair of consecutive sides equal is a rhombus.

So ▱Math is a rhombus

$(d_{AM})^2 = 6^2 + 7^2$

$d^2 = 36 + 49$

$d = \sqrt{85}$

$(d_{AT})^2 = 9^2 + 2^2$

$d^2 = 81 + 4$

$d = \sqrt{85}$

Determine and state the area of *MATH*.

$\triangle I = \frac{1}{2}(6)(7) = 21$

$\triangle II = \frac{1}{2}(2)(9) = 9$

$\triangle IV = \frac{1}{2}(2)(9) = 8$

$\triangle III = \frac{1}{2}(7)(6) = 21$

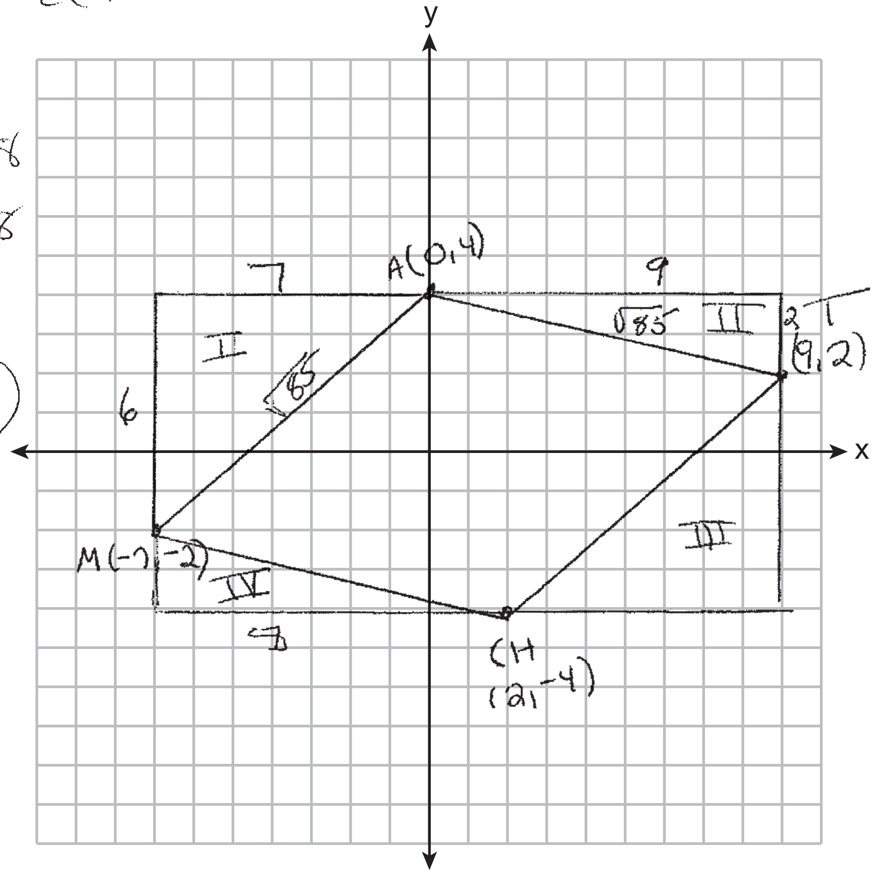
$\square = 16 \times 8$

$\square = 128$

$128 - (21 + 9 + 8 + 21)$

69

Area



Score 3: The student made an error in computing the area of triangle IV.

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

$\overline{MA}$ $\sqrt{(-7-0)^2+(-2-4)^2} = \sqrt{85}$

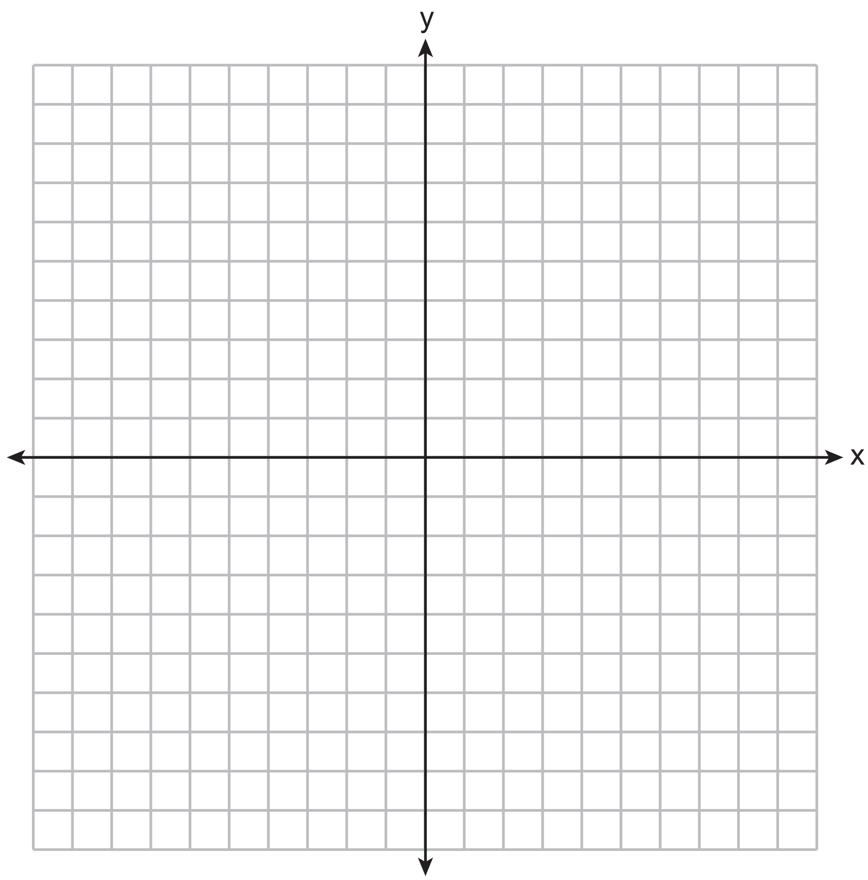
$\overline{AT}$. $\sqrt{(0-9)^2+(4-2)^2} = \sqrt{85}$

$\overline{TH}$ · $\sqrt{(9-2)^2+(2--4)^2} = \sqrt{85}$

$\overline{MH}$: $\sqrt{(-7-2)^2+(-2--4)^2} = \sqrt{85}$

☐ Math is a rhombus because all the sides are congruent

Determine and state the area of *MATH*.



Score 2: The student proved parallelogram *MATH* is a rhombus, but no further correct work was shown.

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

MATH is a rhombus due to $\overline{MA} \parallel \overline{HT}$ &
$\overline{AT} \parallel \overline{MH}$,

Determine and state the area of *MATH*.

$16 \cdot 8 = 128$

$\Delta_1 \ \frac{1}{2} \cdot 7 \cdot 6 = 21$

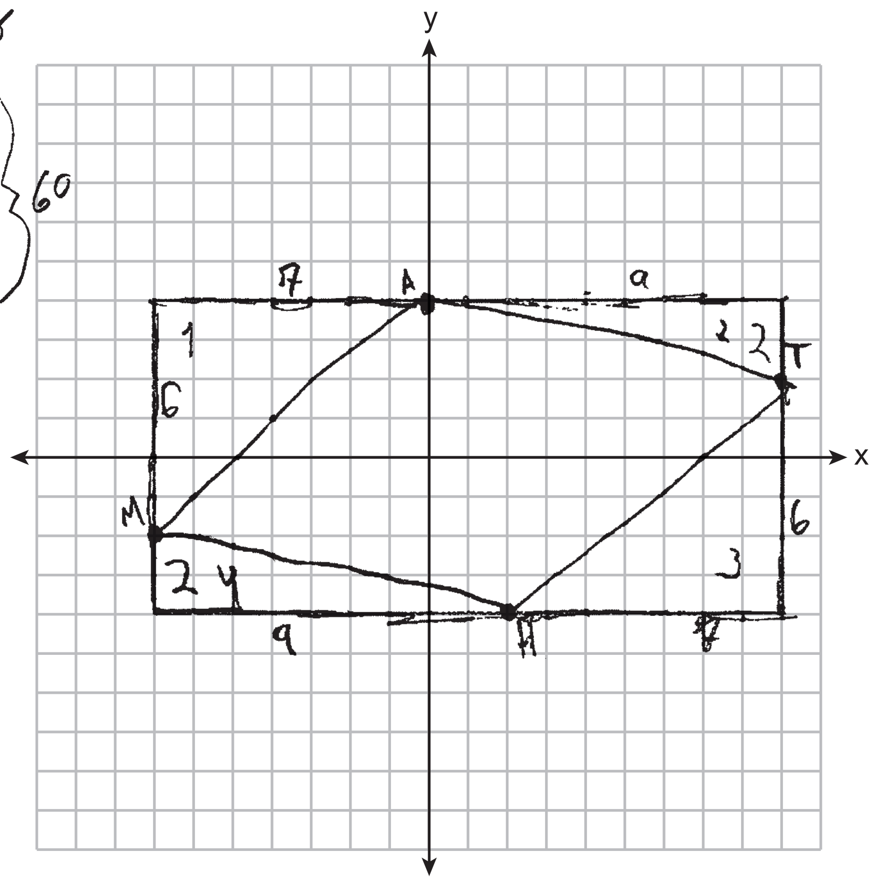
$\Delta_2 \ \frac{1}{2} \cdot 9 \cdot 2 = 9$

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

$\Delta_4 \ \frac{1}{2} \cdot 9 \cdot 2 = 9$

60

$128 - 60 = 68$



Score 2: The student determined the area of *MATH*, but no further correct work was shown.

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

slope of $\overline{AH} = \frac{8}{2} \rightarrow -\frac{4}{1}$

slope of $\overline{MT} = \frac{4}{16} \rightarrow \frac{1}{4}$

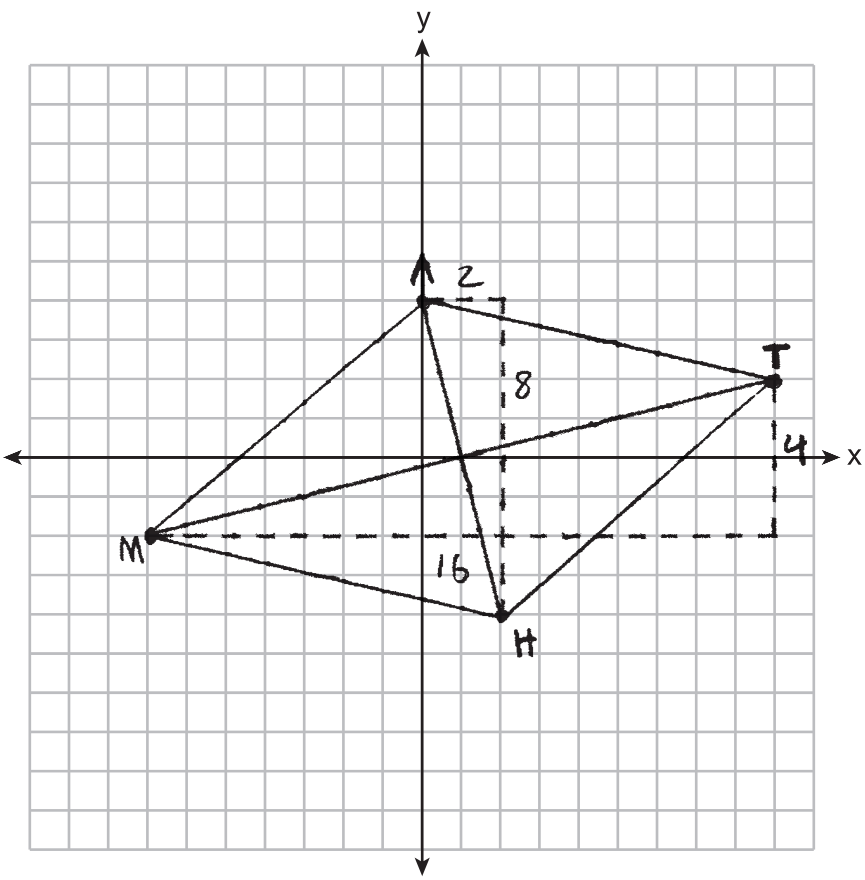
$\overline{AH}$ is perpendicular to $\overline{MT}$ (perpendicular lines have opposite reciprocal slopes)

Parallelogram MATH is a rhombus because its diagonals are perpendicular to each other.

Determine and state the area of *MATH*.

$\frac{8}{2}$

$\frac{4}{16}$ $\frac{1}{4}$



Score 2: The student proved parallelogram *MATH* is a rhombus, but no further correct work was shown.

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

statement	Reasoning
Parallelogram MATH has vertices M(-7,-2), A(0,4) T(9,2) and H(2,-4)	Given
$\overline{MA} \cong \overline{HT}$ and $\overline{AT} \cong \overline{MH}$	distance formula
MATH is a rhombus	both pairs of opposite sides are congruent

MA
$D = \sqrt{(0+7)^2 + (4+2)^2}$
$D = \sqrt{(7)^2 + (6)^2}$
$D = \sqrt{49 + 36}$
$D = \sqrt{85}$

HT
$D = \sqrt{(2-9)^2 + (-4-2)^2}$
$D = \sqrt{(-7)^2 + (-6)^2}$
$D = \sqrt{49 + 36}$
$D = \sqrt{85}$

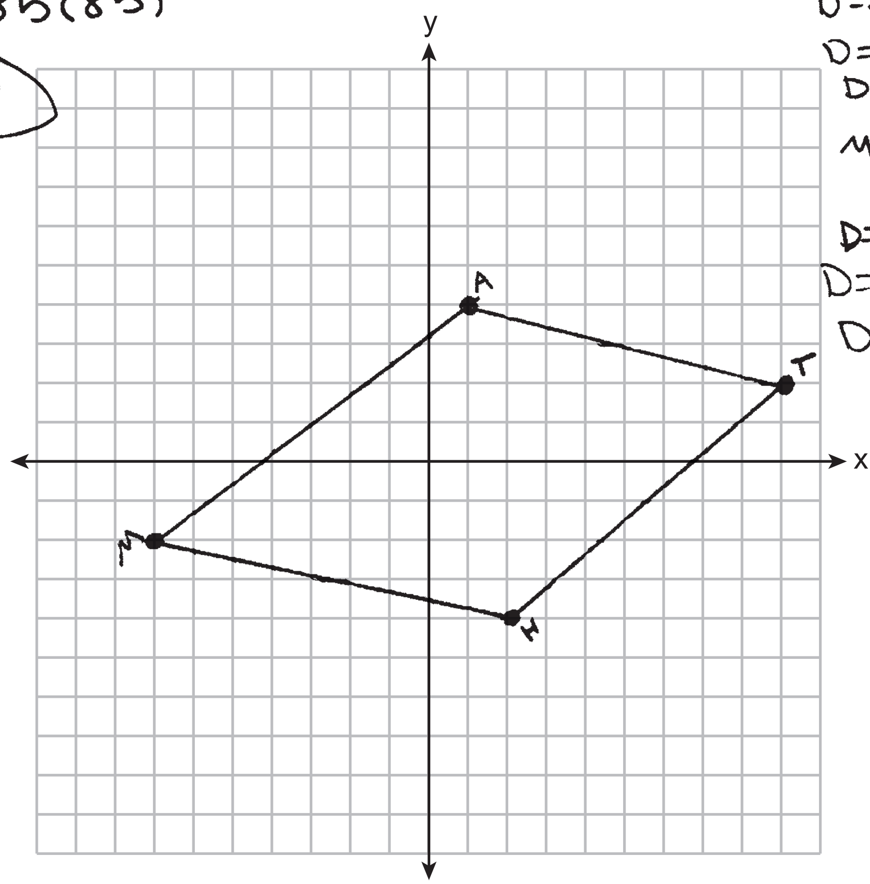
AT
$D = \sqrt{(9-0)^2 + (2-4)^2}$
$D = \sqrt{(9)^2 + (-2)^2}$
$D = \sqrt{(81) + (4)}$
$D = \sqrt{85}$

MH
$D = \sqrt{(2+7)^2 + (-4+2)^2}$
$D = \sqrt{(9)^2 + (-2)^2}$
$D = \sqrt{81 + 4}$
$D = \sqrt{85}$

Determine and state the area of *MATH*.

$A = 85(85)$

$A = 7225$



Score 1: The student found the lengths of the sides of *MATH*, but the concluding statement was incorrect. No further correct work was shown.

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

$MA = \left(\frac{4--2}{0--7}\right) = \frac{6}{7}$

$AT = \left(\frac{2-4}{9-0}\right) = \frac{-2}{9}$

$TH = \left(\frac{-4-2}{2-9}\right) = \frac{-6}{-7} = \frac{6}{7}$

$MH = \left(\frac{-4--2}{2--7}\right) = \frac{-2}{9}$

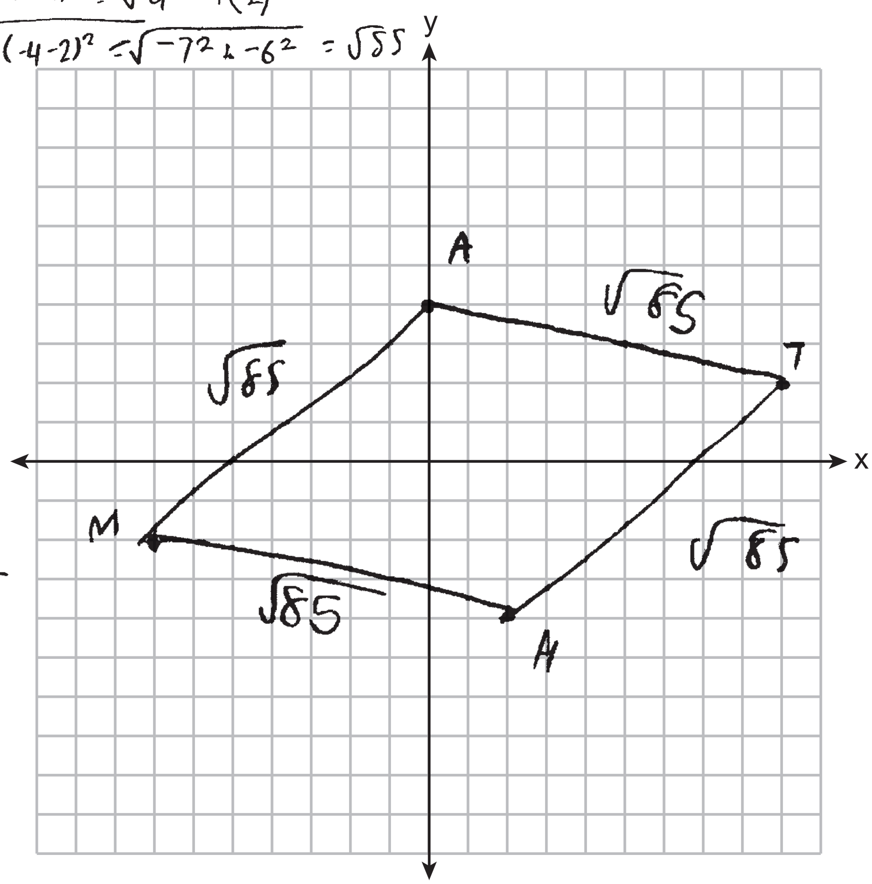
Parallelogram MATH is not a Rhombus because the diagonals do not have negative reciprocal slopes

Determine and state the area of *MATH*.

MA $d = \sqrt{(0--7)^2+(4--2)^2} = \sqrt{7^2+6^2} = \sqrt{85}$

AT $d = \sqrt{(9-0)^2+(2-4)^2} = \sqrt{9^2+(-2)^2} = \sqrt{85}$

TH $d = \sqrt{(2-9)^2+(-4-2)^2} = \sqrt{-7^2+-6^2} = \sqrt{85}$



$A = \boxed{85}$

Score 1: The student found the length of at least two consecutive sides of *MATH*. No further correct relevant work was shown.

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

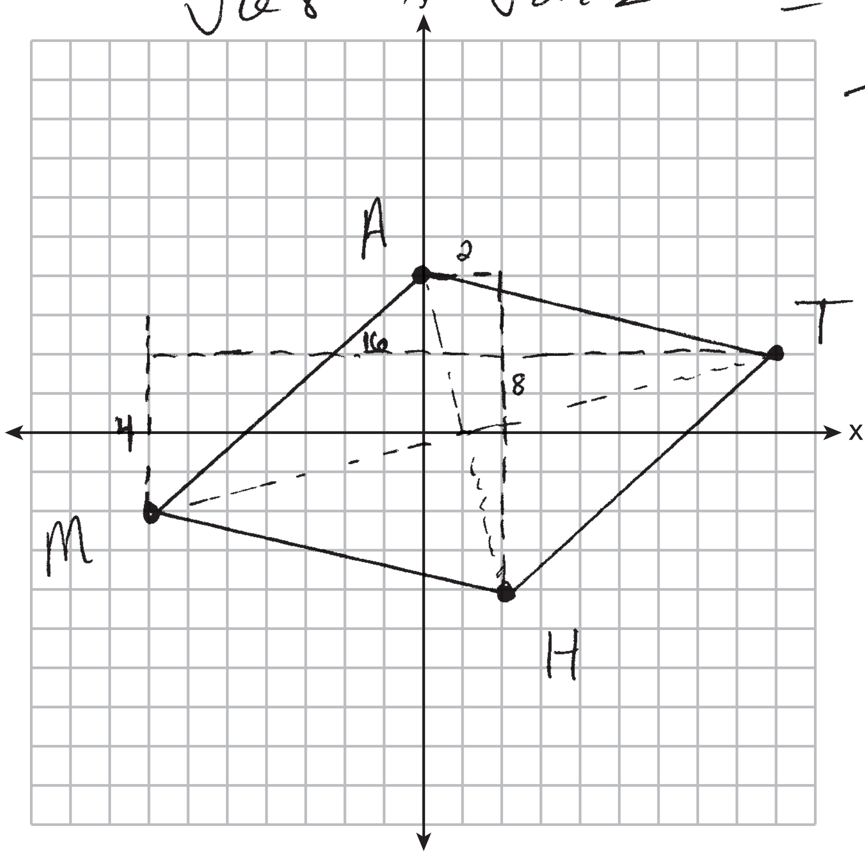
$AH = \sqrt{(8)^2 + (2)^2}$ $\quad$ $MT = \sqrt{(16)^2 + (4)^2}$

$\sqrt{68}$ $\quad$ $\sqrt{272}$

Determine and state the area of *MATH*.

Area = diagonal × diagonal

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



Score 1: The student made an error in determining the area of *MATH*. No further correct relevant work was shown.

Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

MA AT TH

$\frac{x_2-x_1}{y_2-y_1}$ $\frac{4-0}{2-4}$ $\frac{2-9}{-4-}$

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

Determine and state the area of *MATH*.

$\frac{0+7}{4+2}$ $\frac{9}{2}$ $\frac{-11}{-6}$

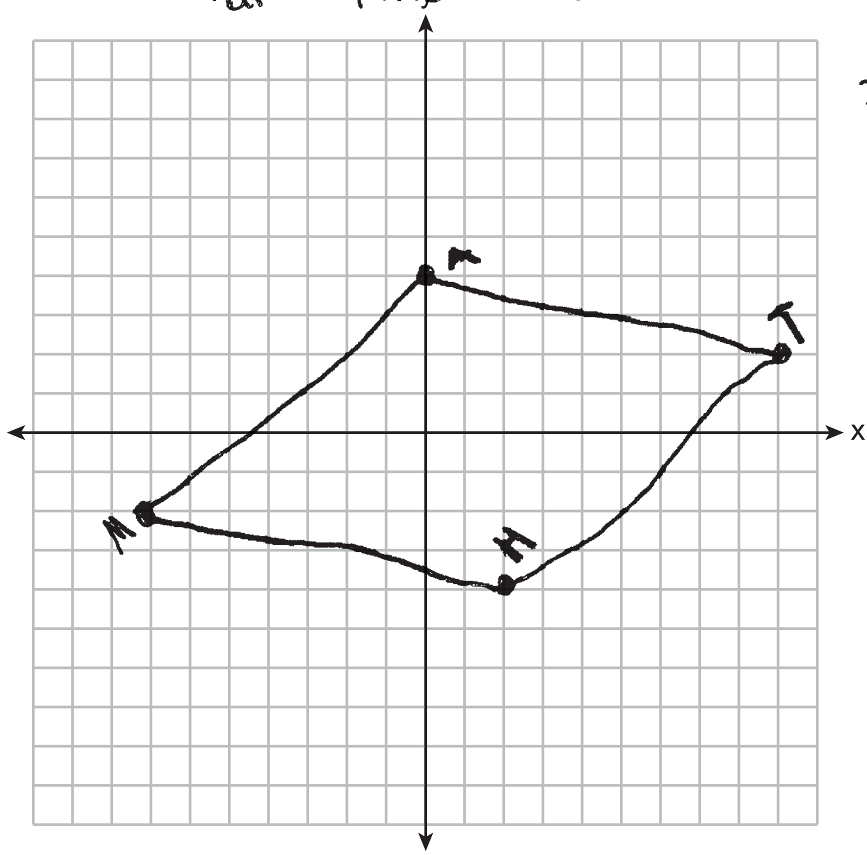
$\frac{7}{6}$

Since two angle measure are congruent I know that this is a rhombus

MH

$\frac{2+7}{-4-2}$

$\frac{7}{}$



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

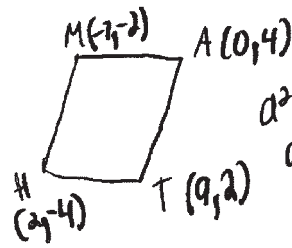
Question 34

34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

It has distances of $\sqrt{13}$ which is equal on all sides and rhombuses have equal sides.



$d^2 = \sqrt{(x^2 - x^1) + (y^2 -}$

$d^2 = \sqrt{(9-2) + (2+}$

$d^2 = \sqrt{(7) + (6}$

$\sqrt{d^2} = \sqrt{13}$

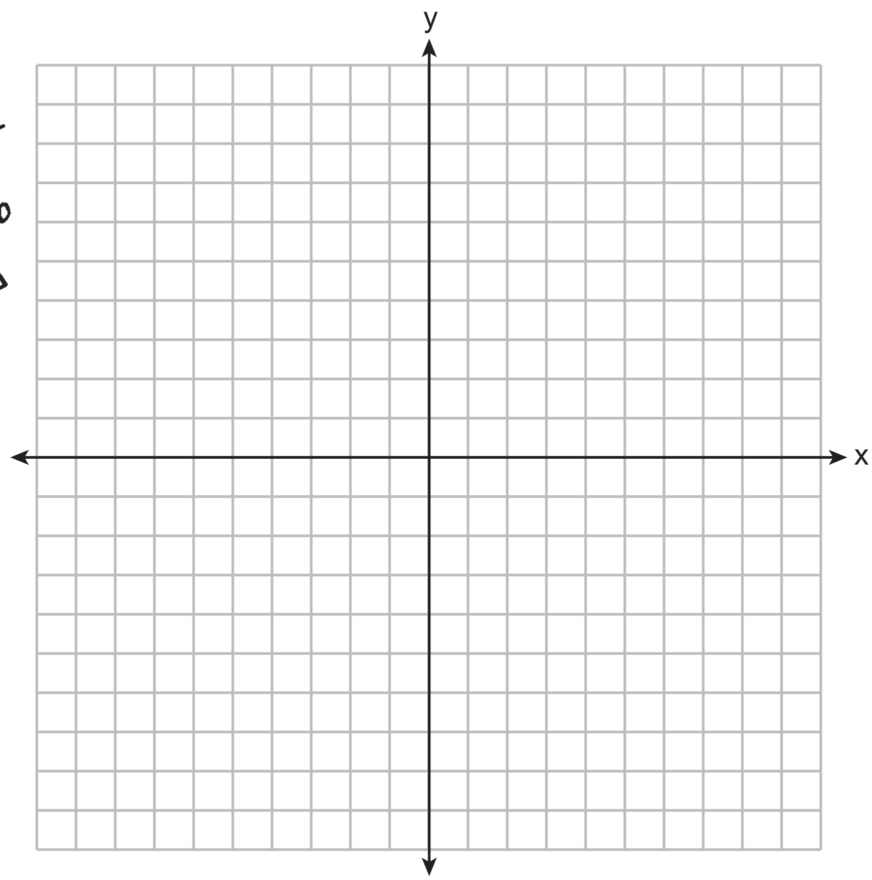
$d = \sqrt{13}$

Determine and state the area of *MATH*.

$\sqrt{13} + \sqrt{13}$

$3.6 + 3.6$

$\boxed{7.2}$



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

Question 34

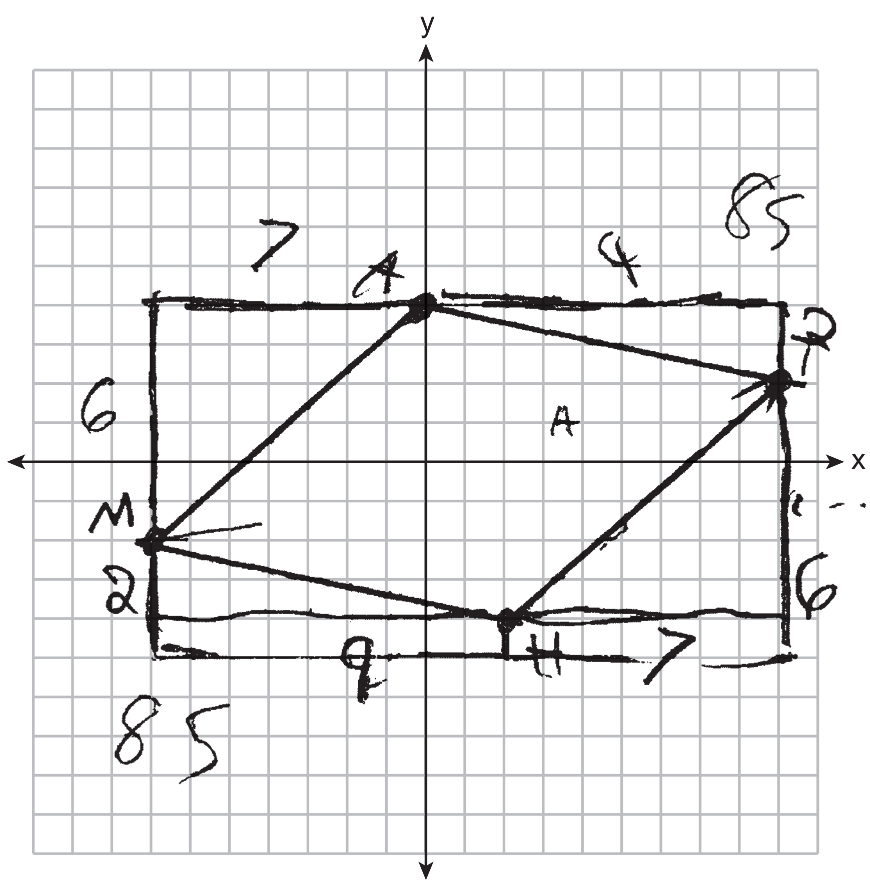
34 Parallelogram *MATH* has vertices $M(-7,-2)$, $A(0,4)$, $T(9,2)$, and $H(2,-4)$.

Prove that parallelogram *MATH* is a rhombus.

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

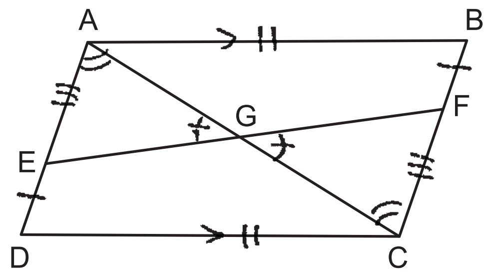
Parallelogram MATH is a rhombus because all Sides are Congruent.

Determine and state the area of *MATH*.



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

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



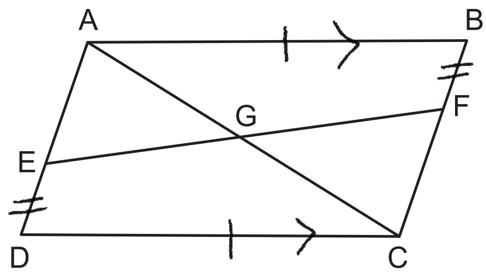
Prove: G is the midpoint of $\overline{EF}$

STATEMENT	REASONS
1. quadrilateral ABCD $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$	1. Given
2. ABCD is a parallelogram	2. If a quadrilateral has a pair of opposite sides that are parallel and congruent then it is a parallelogram
3. $\overline{DE} \cong \overline{BF}$	3. Given
4. $\overline{AD} \cong \overline{CB}$	4. Opposite sides of a parallelogram are congruent
5. $\overline{AE} \cong \overline{CF}$	5. Subtraction Postulate
6. $\overline{AD} \parallel \overline{CB}$	6. opposite sides of a parallelogram are parallel
7. $\angle EAG \cong \angle FCG$	7. If two parallel lines are cut by a transversal, then the alternate interior angles are congruent
8. $\angle AGE \cong \angle CGF$	8. If two lines intersect, they form vertical angles that are congruent
9. $\triangle AEG \cong \triangle CFG$	9. AAS Postulate
10. $\overline{EG} \cong \overline{FG}$	10. CPCTC
11. G is the midpoint of $\overline{EF}$	11. If a point divides a segment into two congruent segments then it is the midpoint of the segment

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

Question 35

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



Prove: G is the midpoint of $\overline{EF}$

Since quad. ABCD has one set of opposite sides $\cong$ and //, it is a parallelogram. Then $\overline{AD} \cong \overline{BC}$ and $\overline{AD} \parallel \overline{BC}$ b/c opposite sides of a p-gram are $\cong$ and //.

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

Since $\overline{AD} \parallel \overline{BC}$, transversals $\overline{AC}$ and $\overline{EF}$ will make $\cong$ alternate interior angles, so $\angle EAG \cong \angle FCG$ and $\angle AEG \cong \angle CFG$.

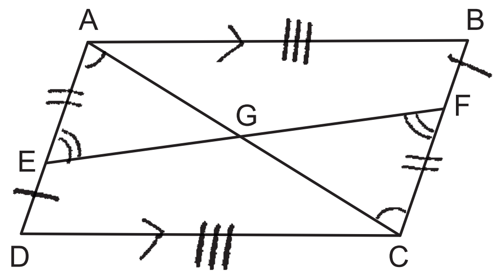
Therefore $\triangle AEG \cong \triangle CFG$ by ASA $\cong$.

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

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

Question 35

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



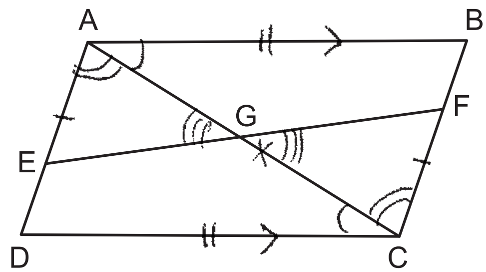
Prove: G is the midpoint of $\overline{EF}$

Statement	Reason
1. Quadrilateral ABCD, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, and $\overline{DE} \cong \overline{BF}$	1. Given
2. Quadrilateral ABCD is a parallelogram	2. If a set of opposite sides of a quadrilateral are ≅ and ∥ it is a parallelogram
3. $\overline{AD}$ is ∥ and ≅ to $\overline{CB}$	3. Opposite sides of a parallelogram are ≅ and ∥.
4. ∡EAG ≅ ∡FCG, ∡AEG ≅ ∡CFG	4. When lines are ∥ Alt. interior ∡'s are ≅
5. $\overline{AD}-\overline{ED} \cong \overline{CB}-\overline{FB}$ or $\overline{AE} \cong \overline{CF}$	5. Subtraction
6. △AEG ≅ △CFG	6. ASA ≅
7. $\overline{EG} \cong \overline{FG}$	7. CPCTC
8. G is the midpoint of $\overline{EF}$	8. If a point splits a segment into two ≅ segments, it is a midpoint.

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

Question 35

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



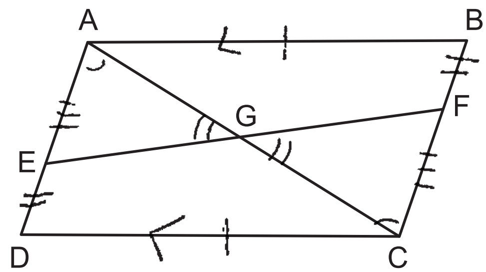
Prove: G is the midpoint of $\overline{EF}$

1. Quadrilateral $ABCD$, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$ $\overline{DE} \cong \overline{BF}$	1. Given
2. $\angle BAC \cong \angle DCA$	2. If 2 parallel lines are cut by a transversal, the alternate interior angles are $\cong$.
3. $\overline{AC} \cong \overline{AC}$	3. Reflexive
4. $\triangle ABC \cong \triangle CDA$	4. SAS $\cong$ SAS
5. $\angle EAG \cong \angle FCG$ $\overline{AD} \cong \overline{BC}$	5. CPCTC
6. $\overline{AD} - \overline{DE} \cong \overline{BC} - \overline{BF}$ or $\overline{AE} \cong \overline{FC}$	6. Subtraction
7. $\angle AGE \cong \angle CGF$	7. Vertical $\angle$'s are $\cong$.
8. $\triangle AGE \cong \triangle CGF$	8. AAS $\cong$ AAS
9. $\overline{EG} \cong \overline{FG}$	9. CPCTC

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

Question 35

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



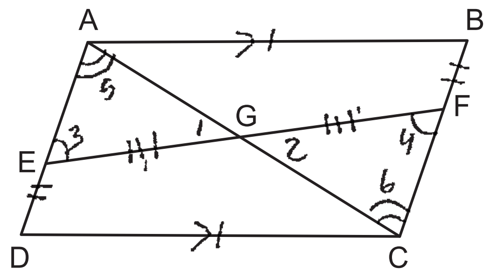
Prove: G is the midpoint of $\overline{EF}$

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

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

Question 35

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



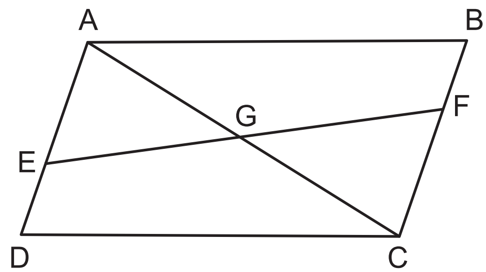
Prove: G is the midpoint of $\overline{EF}$

S	R
1) Quad ABCD, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, $\overline{DE} \cong \overline{BF}$	1) Given
2) $\angle 1$ & $\angle 2$ are $\cong$	2) Vert. ∠'s $\cong$
3) ABCD is a parallelogram	3) If opposite sides $\cong$ and $\parallel$, then the quad is a parallelogram.
4) $\overline{DA} \parallel \overline{CB}$	4) A parallelogram has opp sides parallel
5) $\angle 3 \cong \angle 4$, $\angle 5 \cong \angle 6$	5) when two $\parallel$ lines are cut by a transversal, alt. int. ∠'s $\cong$
6) $\triangle EAG \cong \triangle FCG$	6) AAA
7) $\overline{EG} \cong \overline{GF}$	7) CPCTC
8) G is midpoint of $\overline{EF}$	8) if G cuts $\overline{EF}$ into two equal parts it is a midpoint.

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

Question 35

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



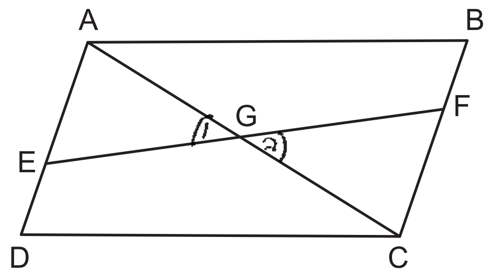
Prove: G is the midpoint of $\overline{EF}$

Statements	Reasons
1) Quad ABCD, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, $\overline{DE} \cong \overline{BF}$	1) Given
2) Quad ABCD is a ▱	2) when one pr of opp sides is // and ≅, a Quad is a ▱
3) $\overline{AD} - \overline{ED} \cong \overline{BC} - \overline{BF}$ $\overline{AE} \cong \overline{FC}$	3) Subtraction Post.
4) $\overline{AD} \parallel \overline{BC}$	4) A ▱ has opp sides //
5) $\angle EAG \cong \angle FCG$ $\angle AEG \cong \angle CFG$	5) alt int ∠'s are ≅
6) $\triangle AGE \cong \triangle CGF$	6) ASA
7) $\overline{EG} \cong \overline{FG}$	7) CPCTC

Score 3: The student had a missing statement and reason to prove step 3, an incomplete reason in step 5, and a missing concluding statement and reason after step 7.

Question 35

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



Prove: G is the midpoint of $\overline{EF}$

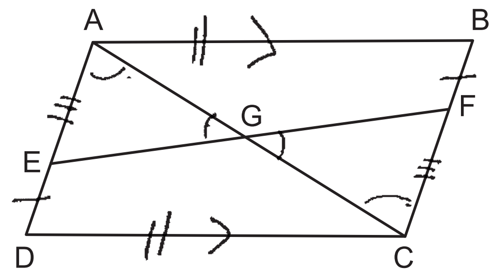
Quadrilateral ABCD

1. $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$ — 1. given
2. Quadrilateral ABCD is a parallogram — 2. A quad with one pair of opp sides ≅ + ∥ is a parallelogram
3. ∠1 and ∠2 are ≅ — 3. vert. ∠s ≅
4. ∠EAG ≅ ∠GCF, ∠AEG ≅ ∠CFG — 4. If 2 lines are parallel, then alt. int ∠s are ≅.
5. △AEG ≅ △CFG — 5. AAA ~
6. G is the midpoint of $\overline{EF}$ — 6. CPCTC

Score 2: The student made some correct relevant statements and reasons about the proof.

Question 35

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



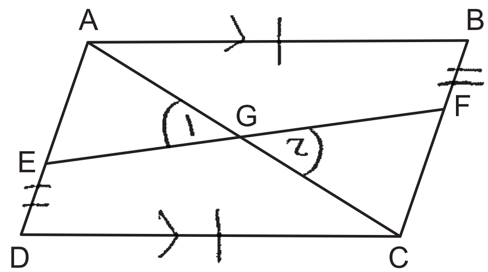
Prove: G is the midpoint of $\overline{EF}$

S	R
1 Quadrilateral ABCD $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$ $\overline{DE} \cong \overline{BF}$	1 Given
2 $\angle EAG \cong \angle FCG$	2 AIA
3 $\overline{AE} \cong \overline{CF}$	3 Subtraction Postulate
4 $\angle AGE \cong \angle CGF$	4 vertical $\angle$s are $\cong$
5 $\triangle AEG \cong \triangle CFG$	5 ASA
6 G is midpoint of $\overline{EF}$	6 CPCTC

Score 1: The student had only one correct relevant statement and reason in step 4.

Question 35

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



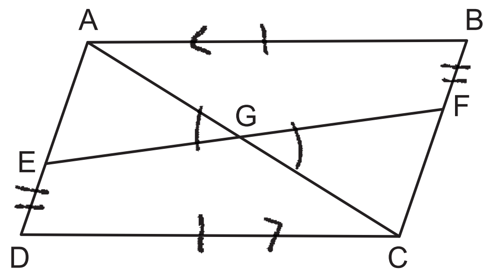
Prove: G is the midpoint of $\overline{EF}$

S	R
$\overline{AB} \cong \overline{CD}$ $\overline{AB} \parallel \overline{CD}$ $\overline{DE} \cong \overline{BF}$	Given
$\angle 1 \cong \angle 2$	vertical $\angle$'s are $\cong$

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

Question 35

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



Prove: G is the midpoint of $\overline{EF}$

Statements	Reasons
1) Quad ABCD, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, and $\overline{DE} \cong \overline{BF}$	1) Given
2) $\angle G \cong \angle G$	2) Reflexive prop
3)	3)

Score 0: The student had a completely incorrect response.