The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY
(Common Core)

Friday, June 16, 2017 — 9:15 a.m. to 12:15 p.m.

MODEL RESPONSE SET

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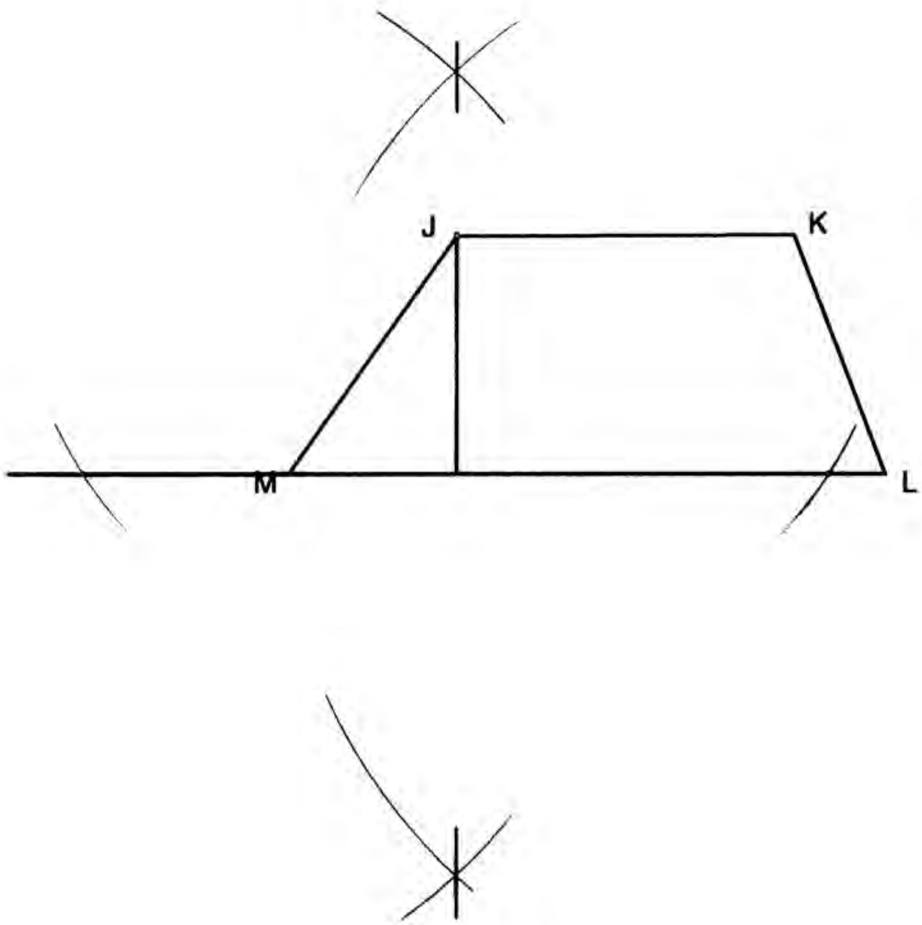
Question 25

25 Given: Trapezoid $JKLM$ with $\overline{JK} \parallel \overline{ML}$

Using a compass and straightedge, construct the altitude from vertex J to $\overline{ML}$.
[Leave all construction marks.]

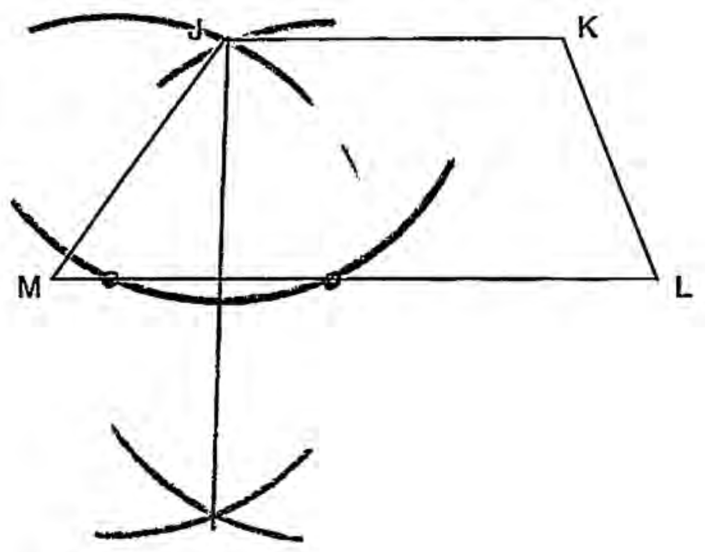


Score 2: The student gave a complete and correct response.

Question 25

25 Given: Trapezoid $JKLM$ with $\overline{JK} \parallel \overline{ML}$

Using a compass and straightedge, construct the altitude from vertex J to $\overline{ML}$.
[Leave all construction marks.]

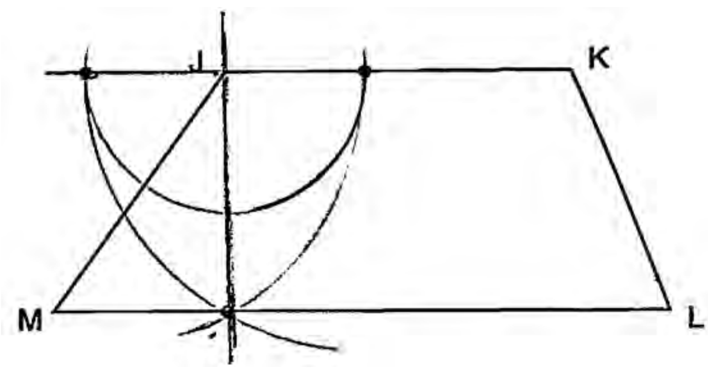


Score 2: The student gave a complete and correct response.

Question 25

25 Given: Trapezoid $JKLM$ with $\overline{JK} \parallel \overline{ML}$

Using a compass and straightedge, construct the altitude from vertex J to $\overline{ML}$. [Leave all construction marks.]

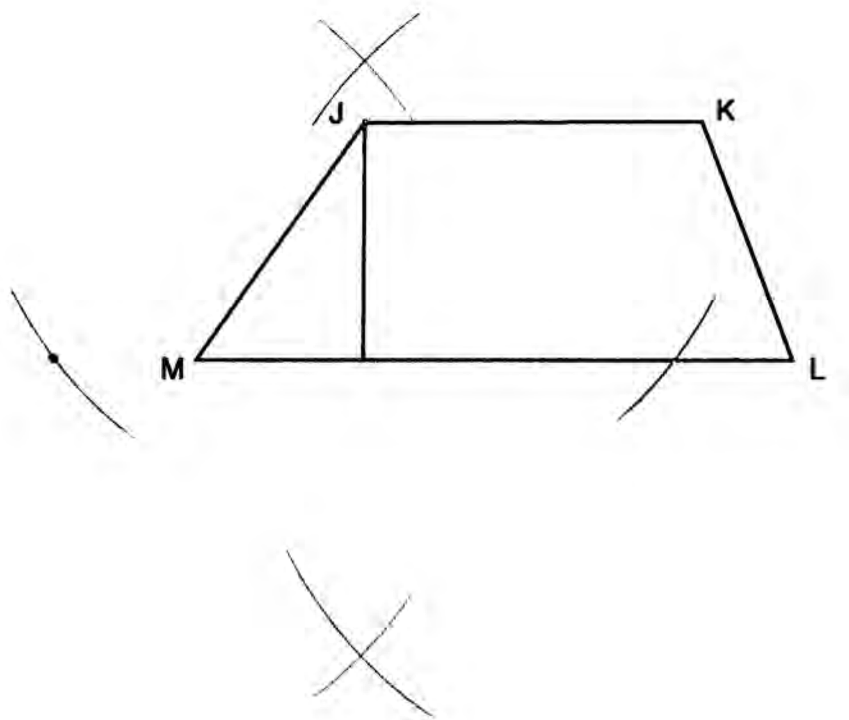


Score 2: The student gave a complete and correct response.

Question 25

25 Given: Trapezoid $JKLM$ with $\overline{JK} \parallel \overline{ML}$

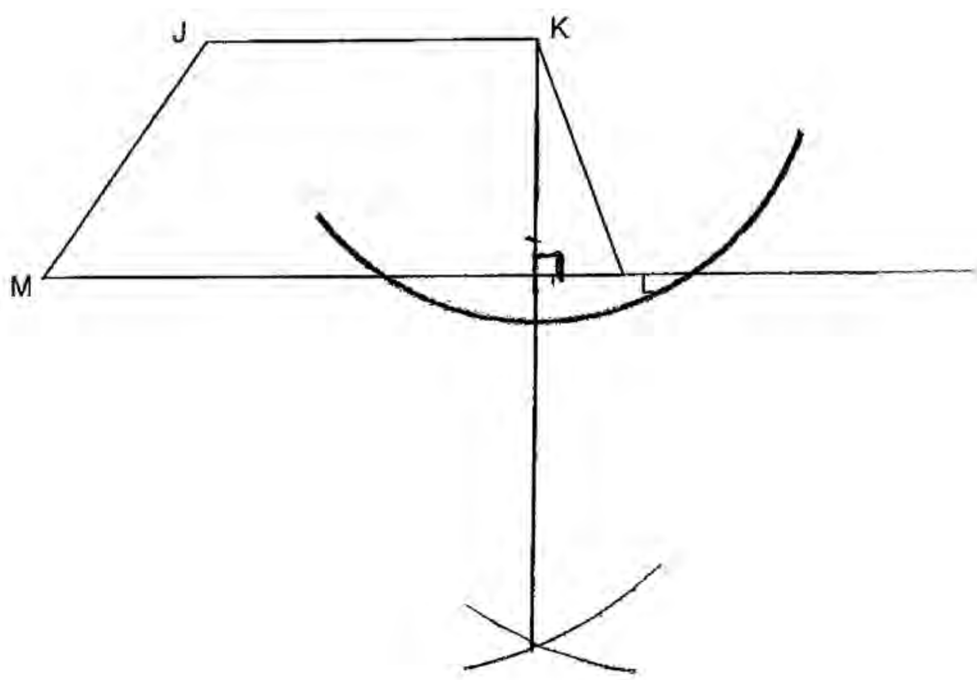
Using a compass and straightedge, construct the altitude from vertex J to $\overline{ML}$.
[Leave all construction marks.]



Score 1: The student did not extend side $\overline{ML}$ through vertex M to locate the intersection of the extension of $\overline{ML}$ and the arc drawn from vertex J.

25 Given: Trapezoid *JKLM* with $\overline{JK} \parallel \overline{ML}$

Using a compass and straightedge, construct the altitude from vertex *J* to $\overline{ML}$.
[Leave all construction marks.]

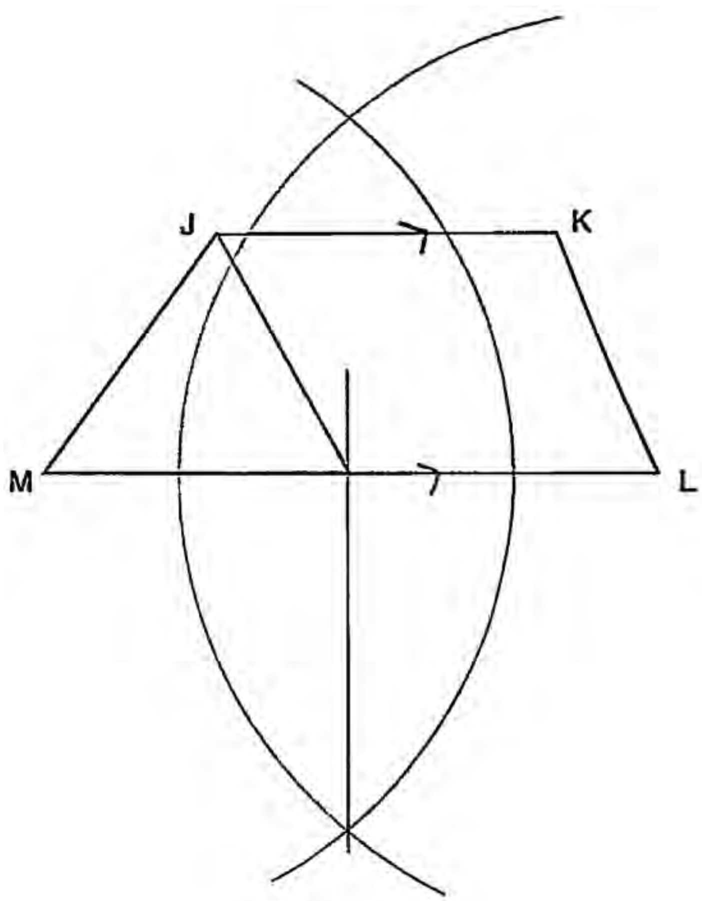


Score 1: The student constructed an altitude correctly, but constructed the altitude from vertex *K*.

Question 25

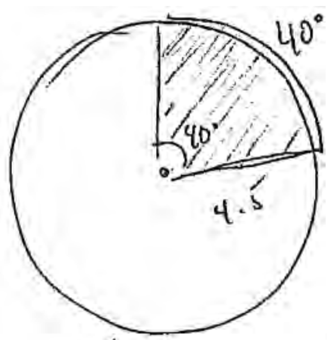
25 Given: Trapezoid $JKLM$ with $\overline{JK} \parallel \overline{ML}$

Using a compass and straightedge, construct the altitude from vertex J to $\overline{ML}$. [Leave all construction marks.]



Score 0: The student had a completely incorrect response.

26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.



$\cancel{40}^{2} \times \frac{\pi}{\cancel{180}_{9}} \qquad \frac{2\pi}{9}$

$20\frac{1}{4}$

$A = \frac{1}{2}\theta r^2$

$A = \frac{1}{2}\left(\frac{2\pi}{9}\right)\left(\frac{81}{4}\right)$

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

$A = \frac{9\pi}{4}$

$\boxed{\frac{9\pi}{4}}$

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

Question 26

26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

$A = \pi r^2$

$A = 4.5^2 \cdot \pi$

$A = 20.25\pi$

$\frac{\text{Angle}}{\text{area}} \quad \frac{40°}{x} = \frac{360}{20.25\pi}$

$\frac{360x}{360} = \frac{810\pi}{360}$

$\boxed{x = \frac{9\pi}{4}}$

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

Question 26

26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

$$\frac{x°}{360} \cdot \pi r^2$$

$$\frac{40}{360} \cdot \pi \cdot (4.5)^2$$

$$\frac{1}{9} \cdot \frac{2025}{1} \pi$$

$$2.25\pi$$

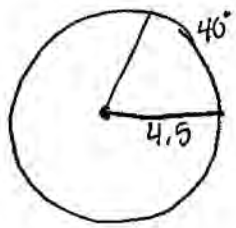
or

$$\frac{9}{4}\pi$$

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

Question 26

26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.



$\cancel{40} \cdot \frac{\pi}{\cancel{180}}$

4.5

$A = \frac{1}{2}\theta \cdot r^2$

$A = \frac{1}{2}\left(\frac{\pi}{4.5}\right)(4.5)^2$

$A = \frac{1}{2}\left(\frac{\pi}{4.5}\right)(20.25)$

$A = \left(\frac{\pi}{2.25}\right)(20.25)$

$A = \frac{20.25\pi}{2.25}$

$\boxed{A = 9\pi}$

Score 1: The student made one computational error when multiplying $\left(\frac{1}{2}\right)\left(\frac{\pi}{4.5}\right)$.

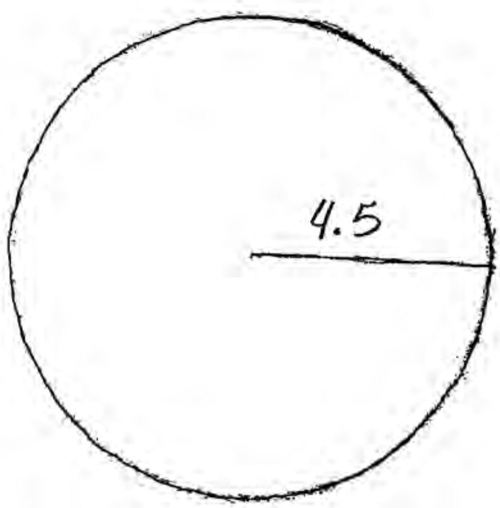
Question 26

26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

$a = \pi r^2$

$a = \pi \cdot 4.5^2$

20.25π



$\frac{40}{360} = \frac{.11}{1}$

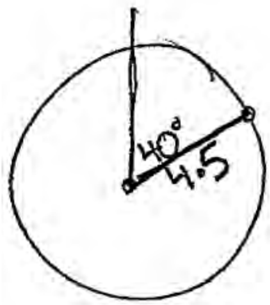
$.11 \cdot 20.25$

2.2275π

Score 1: The student made one rounding error.

Question 26

26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.



$\frac{40}{360}(2\pi r)$

$\frac{40}{360}(2\pi 4.5)$

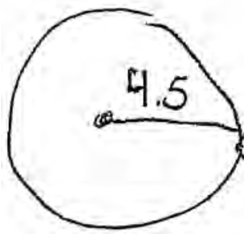
9π

$\frac{9}{4}\pi$

Score 0: The student had a correct answer with incorrect work.

Question 26

26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.



$A = \pi r^2$

$A = \pi \cdot 4.5^2$

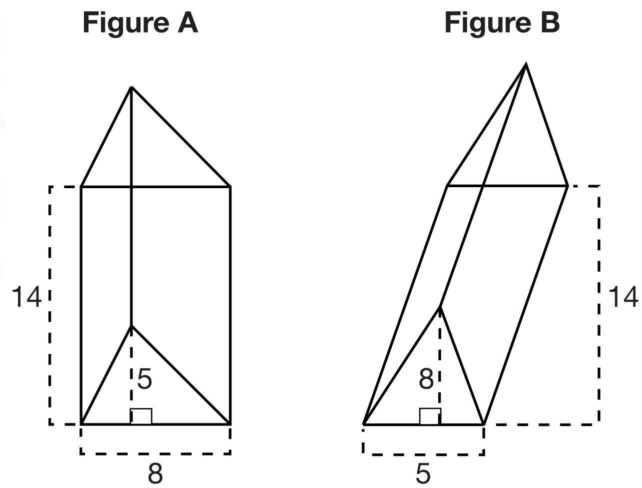
$A = 20.25\pi$

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

Question 27

27 The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

$A = \frac{1}{2}bh$
$\frac{1}{2}(8)(5)$
$4(5)$
20



Use Cavalieri's Principle to explain why the volumes of these two triangular prisms are equal.

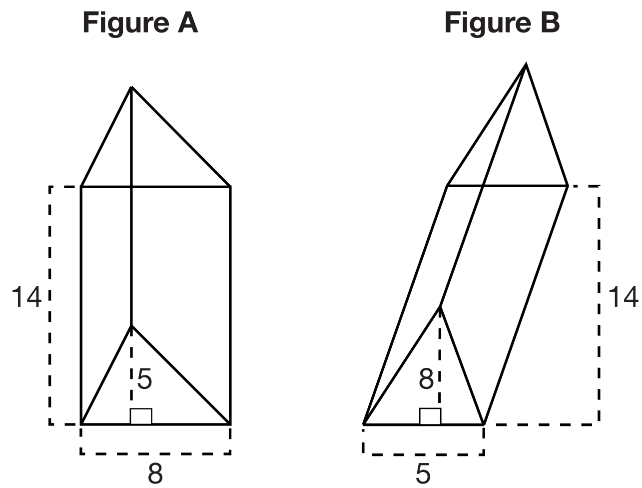
The volumes of these 2 triangular prisms are equal because of Cavalieri's principle which states that if the base area is the same in the 2 figures, in this case 20 units², the height is the same in the 2 figures, in this case 14, and the cross sections remain the same area as the base area, the volumes are the same

20(14) 14(20)
280 280

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

Question 27

27 The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.



Use Cavalieri's Principle to explain why the volumes of these two triangular prisms are equal.

V of Figure A $14\left(\frac{5 \times 8}{2}\right) = 280$

V of Figure B $14\left(\frac{8 \times 5}{2}\right) = 280$

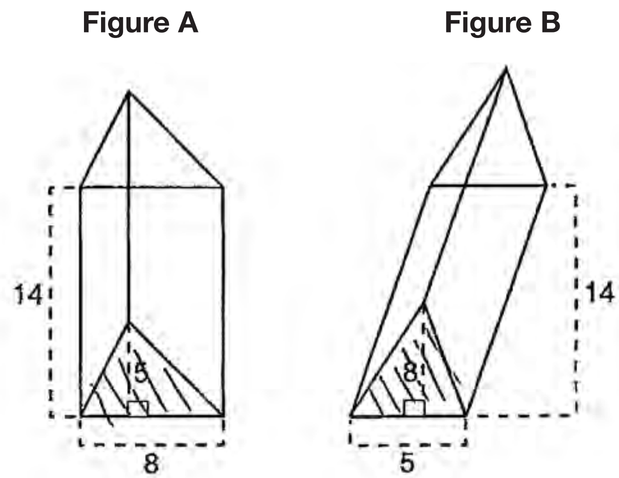
A and B have the same base area and height

So, their Volumes are equal.

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

Question 27

27 The diagram below shows two figures. Figure *A* is a right triangular prism and figure *B* is an oblique triangular prism. The base of figure *A* has a height of 5 and a length of 8 and the height of prism *A* is 14. The base of figure *B* has a height of 8 and a length of 5 and the height of prism *B* is 14.



Use Cavalieri's Principle to explain why the volumes of these two triangular prisms are equal.

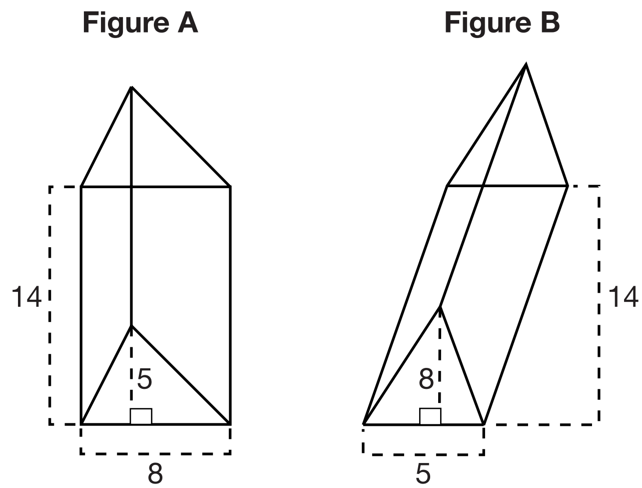
Figure A: $B = \frac{1}{2}(5)(8)$
$= 20$

Figure B: $B = \frac{1}{2}(8)(5)$
$= 20$

The base areas of the two figures are the same so the volumes of the prisms are equal.

Score 1: The student wrote an incomplete explanation.

27 The diagram below shows two figures. Figure *A* is a right triangular prism and figure *B* is an oblique triangular prism. The base of figure *A* has a height of 5 and a length of 8 and the height of prism *A* is 14. The base of figure *B* has a height of 8 and a length of 5 and the height of prism *B* is 14.



Use Cavalieri's Principle to explain why the volumes of these two triangular prisms are equal.

$V = \frac{1}{2} \cdot 8 \cdot 5 \cdot 14$ $\quad$ $V = \frac{1}{2} \cdot 5 \cdot 8 \cdot 14$

$V = \frac{1}{2} \cdot 40 \cdot 14$ $\quad$ $V = \frac{1}{2} \cdot 40 \cdot 14$

$V = 280$ $\quad$ $V = 280$

Score 1: The student showed algebraically that both prisms have equal volumes, but did not write an explanation using Cavalieri's Principle.

Question 27

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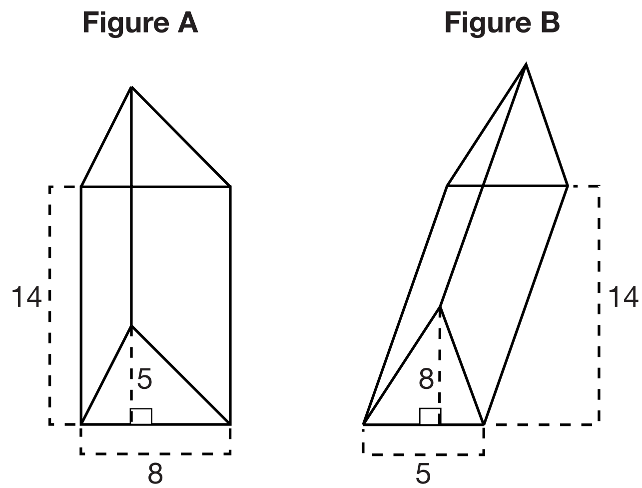


Use Cavalieri's Principle to explain why the volumes of these two triangular prisms are equal.

V of $\Delta = \frac{1}{2}bh$
$V = \frac{1}{2}(5)\cdot(8)$
$V = 20$

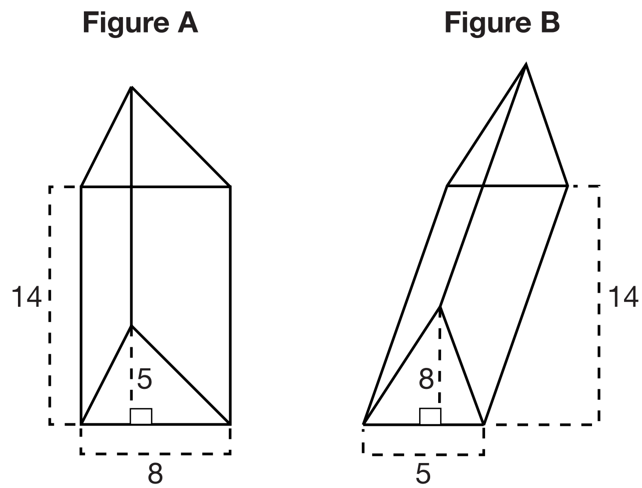
V of $\Delta = \frac{1}{2}bh$
V of $\Delta = \frac{1}{2}(8)(5)$
$V = 20$

The volume of the Δ will be the the same making the prisms equal because the base and height can be used interchangebly in the volume of a Δ formula. It is shown in the work above.

Score 0: The student wrote an incorrect explanation.

Question 27

27 The diagram below shows two figures. Figure *A* is a right triangular prism and figure *B* is an oblique triangular prism. The base of figure *A* has a height of 5 and a length of 8 and the height of prism *A* is 14. The base of figure *B* has a height of 8 and a length of 5 and the height of prism *B* is 14.



Use Cavalieri's Principle to explain why the volumes of these two triangular prisms are equal.

$V = \frac{1}{2}(8 \times 5)(14)$

$V = \frac{1}{2}(40)(14)$

$V = 1/2(40)(14)$

$V = 280$

Slant height

$V = \frac{1}{3}(5 \times 8)(14)$

$V = \frac{1}{3}(40)(14)$

$V = \frac{1}{3}(40)(14)$

$V = 187$

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

28 When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in^3. After being fully inflated, its volume is approximately 294 in^3. To the *nearest tenth of an inch*, how much does the radius increase when the volleyball is fully inflated?

$$\frac{180}{\frac{4}{3}} = \frac{\cancel{\frac{4}{3}}\pi r^3}{\cancel{\frac{4}{3}}}$$

$$\frac{135}{\pi} = \frac{\cancel{\pi} r^3}{\cancel{\pi}}$$

$$\sqrt[3]{42.97183463} = \sqrt[3]{r^3}$$

$$r = 3.502632975$$

$$\frac{294}{\frac{4}{3}} = \frac{\cancel{\frac{4}{3}}\pi r^3}{\cancel{\frac{4}{3}}}$$

$$\frac{220.5}{\pi} = \frac{\cancel{\pi} r^3}{\cancel{\pi}}$$

$$\sqrt{70.1873299} = \sqrt[3]{r^3}$$

$$r = 4.124958408$$

the radius incrreased 0.6 of an inch

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

Question 28

28 When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in^3. After being fully inflated, its volume is approximately 294 in^3. To the *nearest tenth of an inch*, how much does the radius increase when the volleyball is fully inflated?

$3 \cdot 180 = \frac{4\pi r^3}{3} \cdot 3$

$\frac{540}{4\pi} = \frac{4\pi r^3}{4\pi}$

$\sqrt[3]{424.115} = \sqrt[3]{r^3}$

$r \approx 7.5$

$3 \cdot 294 = \frac{4\pi r^3}{3} \cdot 3$

$\frac{882}{4\pi} = \frac{4\pi r^3}{4\pi}$

$\sqrt[3]{692.721} = \sqrt[3]{r^3}$

$r \approx 8.8$

$8.8 - 7.5 = 1.3$

r increased 1.3 in when the volleyball is fully inflated

Score 1: The student made a computational error when dividing by 4π.

Question 28

28 When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in^3. After being fully inflated, its volume is approximately 294 in^3. To the *nearest tenth of an inch*, how much does the radius increase when the volleyball is fully inflated?

Partially Inflated

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

$\frac{3}{4}\left(180 = \frac{4}{3}\pi r^2\right)$

$135 = \pi r^2$

$r^2 = \frac{135}{\pi}$

$r_1 = 6.555290584$

Fully Inflated

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

$\frac{3}{4}\left(294 = \frac{4}{3}\pi r^2\right)$

$220.5 = \pi r^2$

$r^2 = \frac{220.5}{\pi}$

$r_2 = 8.377787888$

$r_2 - r_1 = 1.822497304$

1.8

Score 1: The student calculated the square root in both equations rather than the cube root.

Question 28

28 When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in^3. After being fully inflated, its volume is approximately 294 in^3. To the *nearest tenth of an inch*, how much does the radius increase when the volleyball is fully inflated?

$V = 180$

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

$180 = \frac{4\pi (r^3)}{3}$

$176 \cdot \pi$

$58.67 \cdot \pi = r^3$

$55.5... = r^3$

$r \approx 3.8$

$294 = \frac{4\pi r^3}{3}$

$98 = 4\pi r^3$

$94 = \pi r^3$

$-\pi \quad \pi$

$\sqrt[3]{90.8...} = r^3$

≈ 4.5

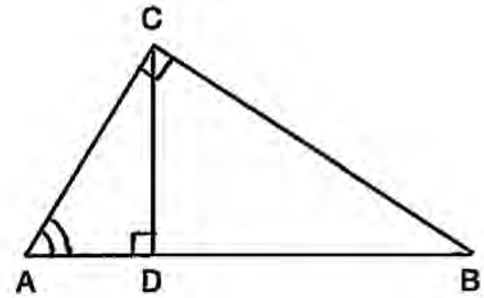
radous

The volleyball increased .7 inches

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

Question 29

29 In right triangle *ABC* shown below, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. Explain why $\triangle ABC \sim \triangle ACD$.

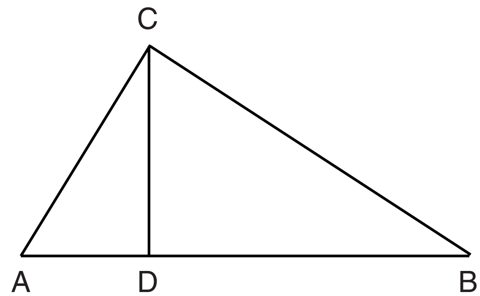


since $\triangle ABC$ is a right triangle, $\angle ACB$ is a right angle because right triangles contain right angles. This also means that $\angle CDA$ is a right angle because altitude $\overline{CD}$ leaves a vertex and is perpendicular to the opposite side and perpendicular lines intersect to form right angles. All right angles are congruent so $\angle ACB \cong \angle CDA$. $\angle A$ is a reflexive angle so $\angle A \cong \angle A$. So $\triangle ABC \sim \triangle ACD$ by AA

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

Question 29

29 In right triangle ABC shown below, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. Explain why $\triangle ABC \sim \triangle ACD$.

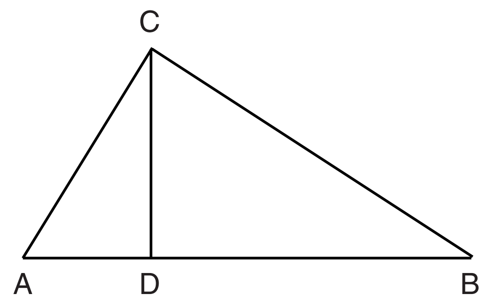


If an altitude is drawn to the hypotenuse of a right triangle, it divides the Δ into 2 right Δs each similar to each other and to the original right Δ.

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

Question 29

29 In right triangle ABC shown below, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. Explain why $\triangle ABC \sim \triangle ACD$.

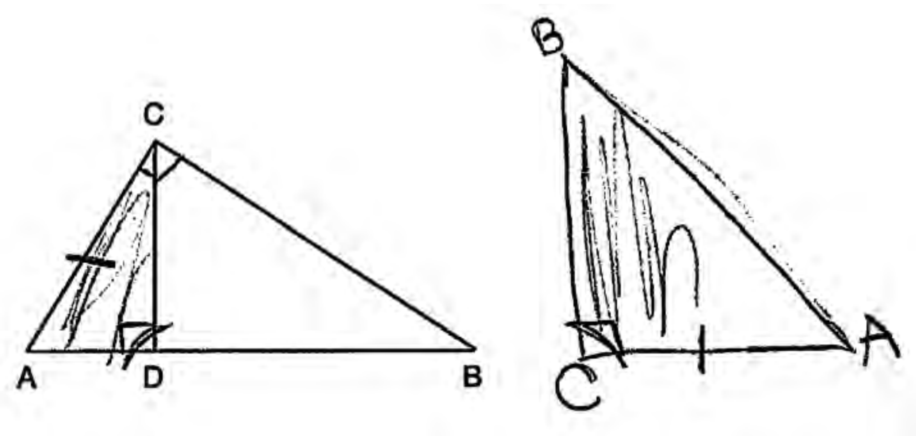


Both triangles share angle A and there are 2 rigut angles at D (altitude) and a rigut angle at C. So the triangles are similar by AA.

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

Question 29

29 In right triangle ABC shown below, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. Explain why $\triangle ABC \sim \triangle ACD$.

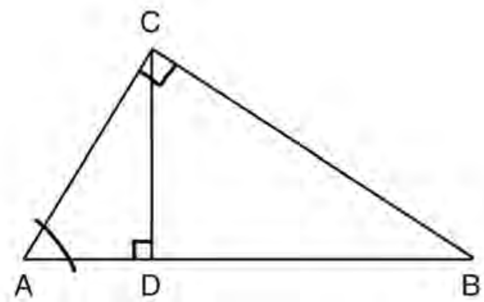


$\triangle ABC \sim \triangle ACD$ because they both share the side $\overline{CA}$, so its congruent. In triangle ABC, angle C is a right angle, in $\triangle ACD$, $\angle D$ is a right angle because $\overline{CD}$ is an altitude to $\overline{AB}$ so $\angle D$ is congruent to $\angle C$.

Score 1: The student explained correctly why one pair of angles is congruent.

Question 29

29 In right triangle ABC shown below, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. Explain why $\triangle ABC \sim \triangle ACD$.

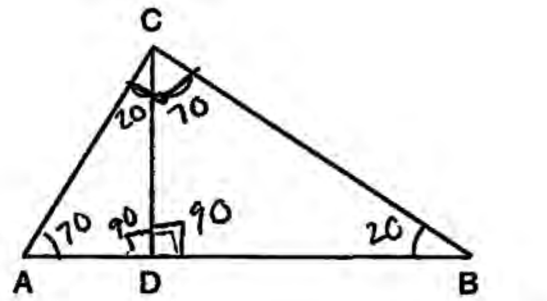


The triangles are similar, by AA because they have 2 pairs of $\cong \angle$'s.

Score 1: The student wrote an incomplete explanation.

Question 29

29 In right triangle ABC shown below, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. Explain why $\triangle ABC \sim \triangle ACD$.

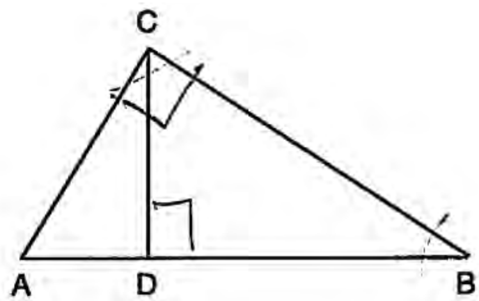


ΔABC is ~ to ΔACD because all of their corresponding angles have the same measurement.

Score 1: The student used a specific example to make a general conclusion of triangle similarity.

Question 29

29 In right triangle ABC shown below, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. Explain why $\triangle ABC \sim \triangle ACD$.

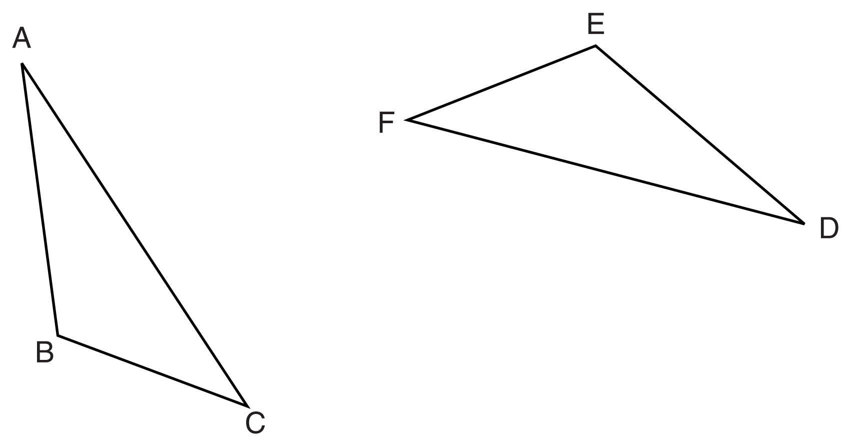


The altitude creates a perpendicular line. This makes right angles. Right angles means right triangles. Right triangles are similar.

Score 0: The student wrote an incorrect explanation.

Question 30

30 Triangle *ABC* and triangle *DEF* are drawn below.



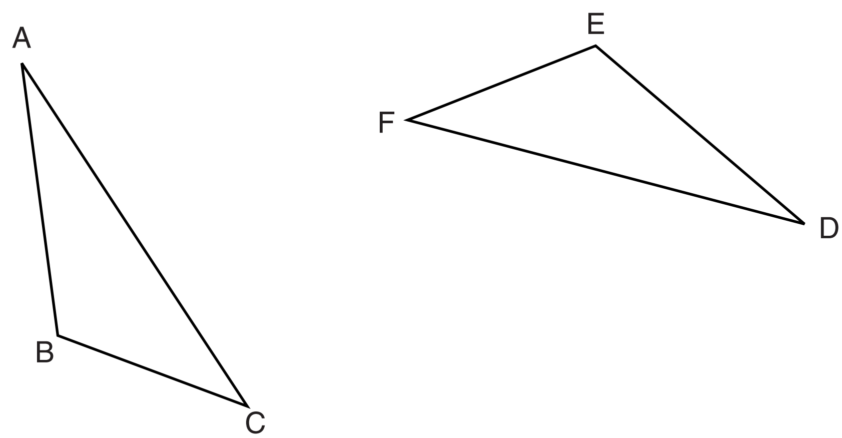
If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle *ABC* onto triangle *DEF*.

A translation along Vector $\overrightarrow{CF}$ so C maps onto F, followed by a Rotation about F that maps $\angle A$ to $\angle D$, $\overline{AB}$ to $\overline{DE}$, and $\overline{AC}$ to $\overline{DF}$.

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

Question 30

30 Triangle *ABC* and triangle *DEF* are drawn below.



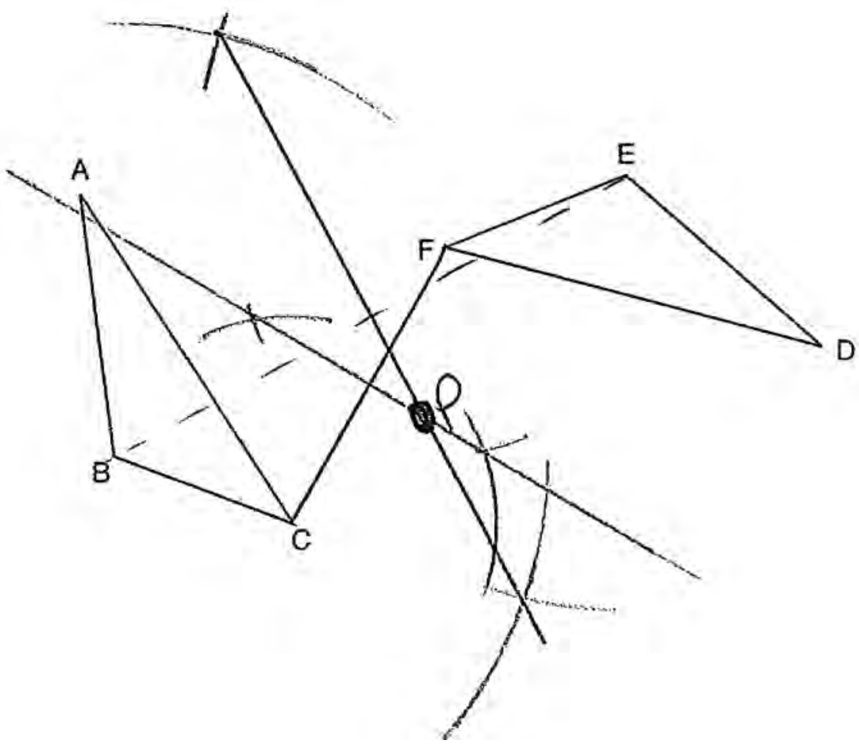
If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle *ABC* onto triangle *DEF*.

Rotate $\triangle ABC$ clockwise about point C until $\overline{DF} \parallel \overline{AC}$, then translate $\triangle ABC$ along $\overrightarrow{CF}$ so that $C \rightarrow F$, $B \rightarrow E$, and $A \rightarrow D$

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

Question 30

30 Triangle *ABC* and triangle *DEF* are drawn below.



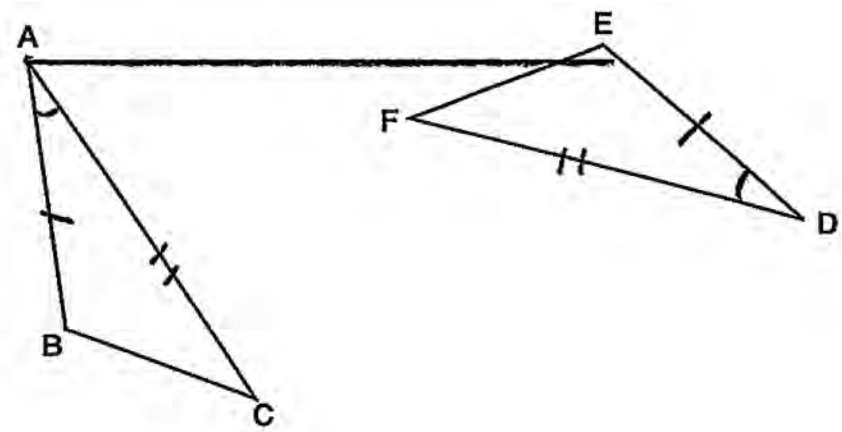
If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle *ABC* onto triangle *DEF*.

Rotation about point P until ∠A maps onto ∡D

Score 2: The student wrote a correct transformation based upon a correct construction to find the point of rotation, which is the point of intersection of the perpendicular bisectors of the segments whose endpoints are the corresponding vertices of the triangles.

Question 30

30 Triangle *ABC* and triangle *DEF* are drawn below.



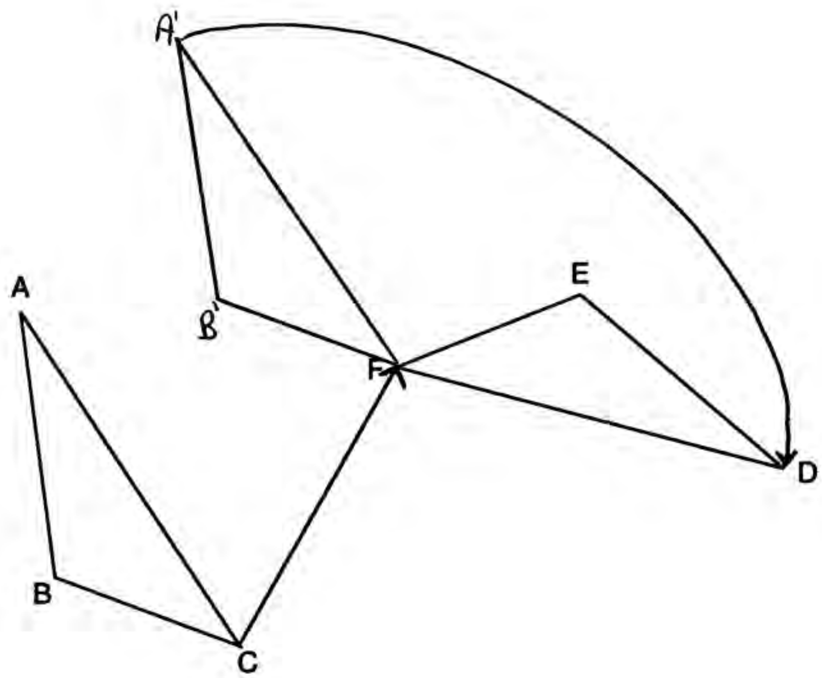
If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle *ABC* onto triangle *DEF*.

First you would translate triangle ABC to the right. Next you would then translate triangle ABC up. Last you would rotate triangle ABC clockwise until ∡A matched up with ∡D.

Score 1: The student wrote an incomplete sequence of transformations.

Question 30

30 Triangle *ABC* and triangle *DEF* are drawn below.



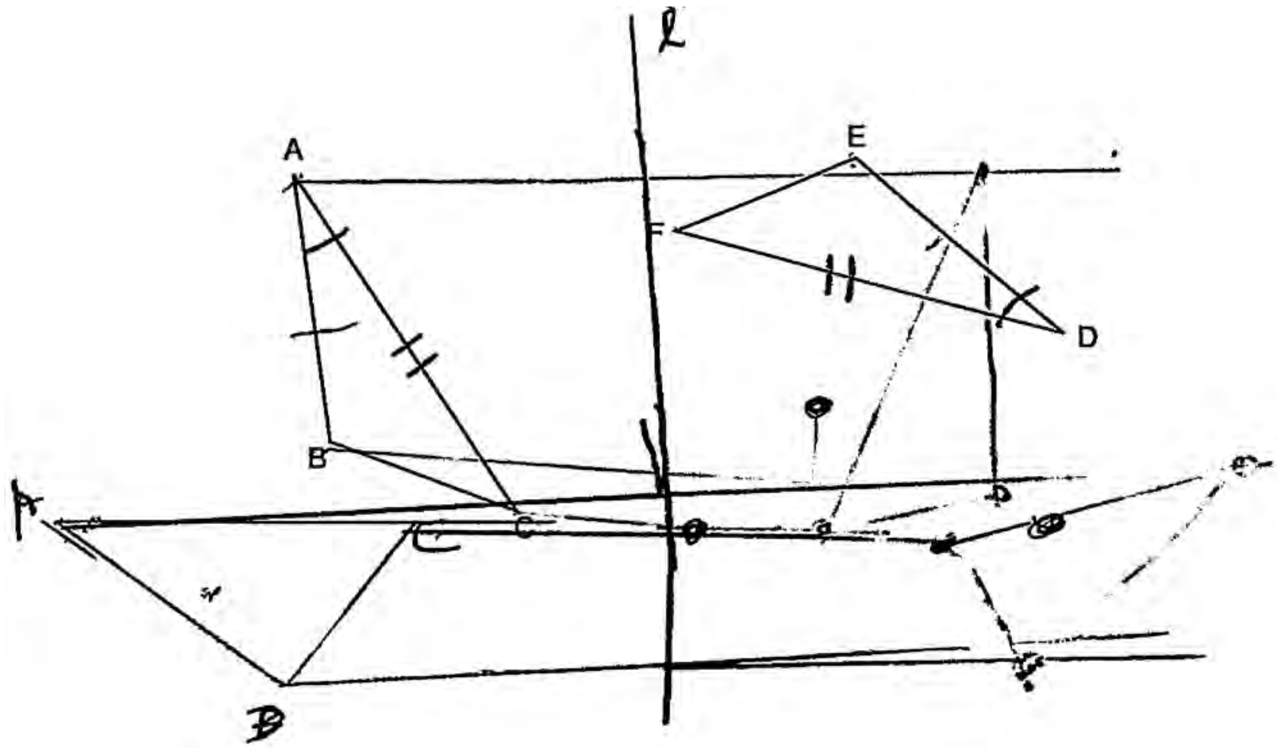
If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle *ABC* onto triangle *DEF*.

Translate and Rotate

Score 1: The student demonstrated knowledge of the transformation, but the written sequence was incomplete.

Question 30

30 Triangle *ABC* and triangle *DEF* are drawn below.



If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle *ABC* onto triangle *DEF*.

rotated - by
reflected - over line l
translated - by 3

Score 0: The student wrote an incorrect sequence of transformations.

Question 31

31 Line n is represented by the equation $3x + 4y = 20$. Determine and state the equation of line p, the image of line n, after a dilation of scale factor $\frac{1}{3}$ centered at the point (4,2). [The use of the set of axes below is optional.]

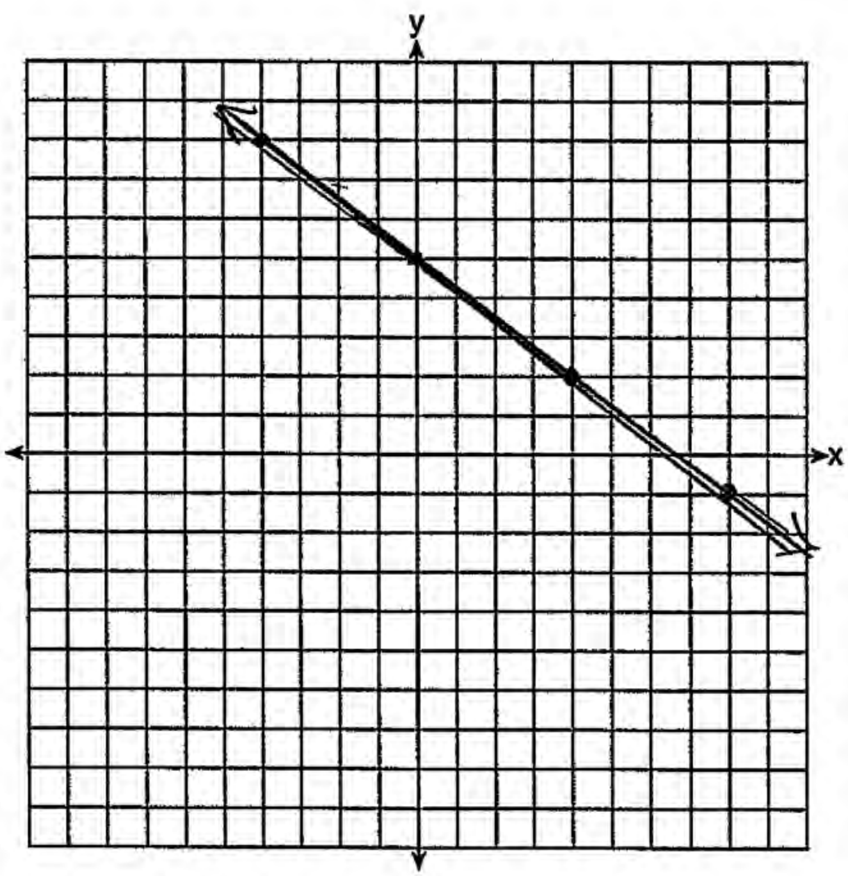
Explain your answer.

Line p

$3x+4y=20$

The line was on the center of dilation, Therefore the line remains invariant

$$3x+4y=20$$
$$-3x \qquad -3x$$
$$\frac{4y}{4}=\frac{-3x}{4}+\frac{20}{4}$$
$$y=\frac{-3}{4}x+5$$



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

Question 31

31 Line n is represented by the equation $3x + 4y = 20$. Determine and state the equation of line p, the image of line n, after a dilation of scale factor $\frac{1}{3}$ centered at the point (4,2). [The use of the set of axes below is optional.]

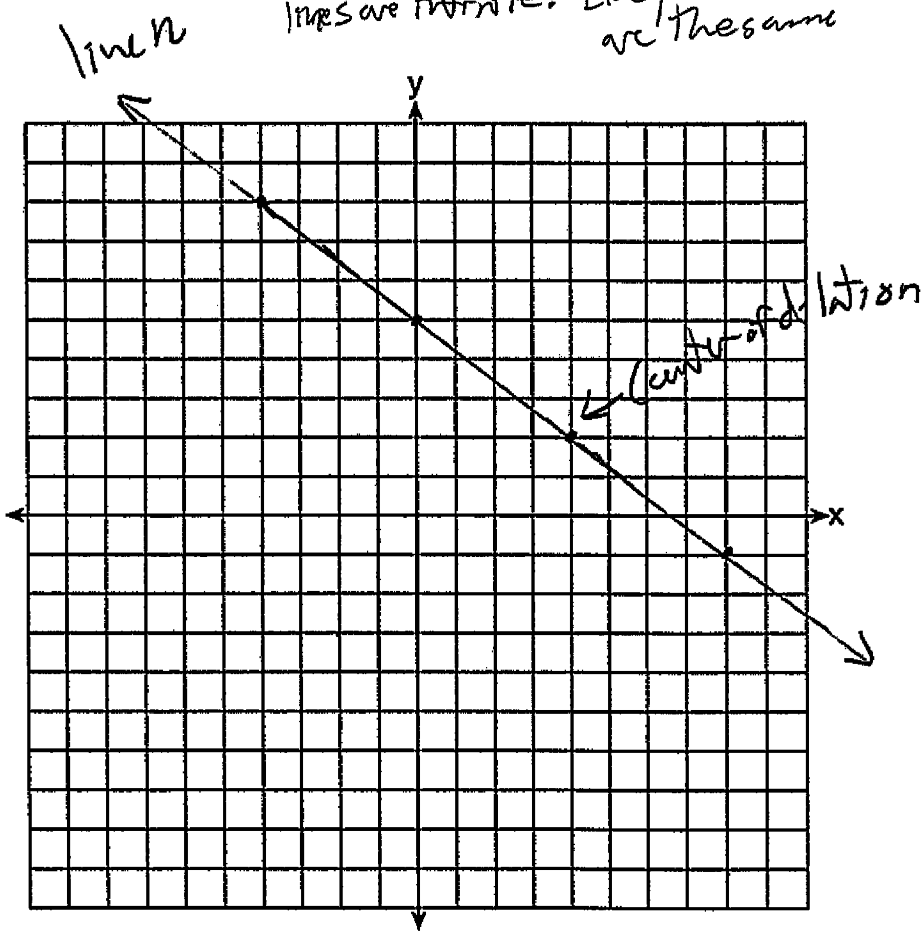
Explain your answer.

$$(4y=-3x+20)\frac{1}{4}$$

$$y=-\frac{3}{4}x+5$$

$$\boxed{\text{line } p = y=-\frac{3}{4}x+5}$$

The point the dilation is centered at is on the line, so the location of the line would not change. The size of the line would not change either because lines are infinite. Line p and line n are the same



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

Question 31

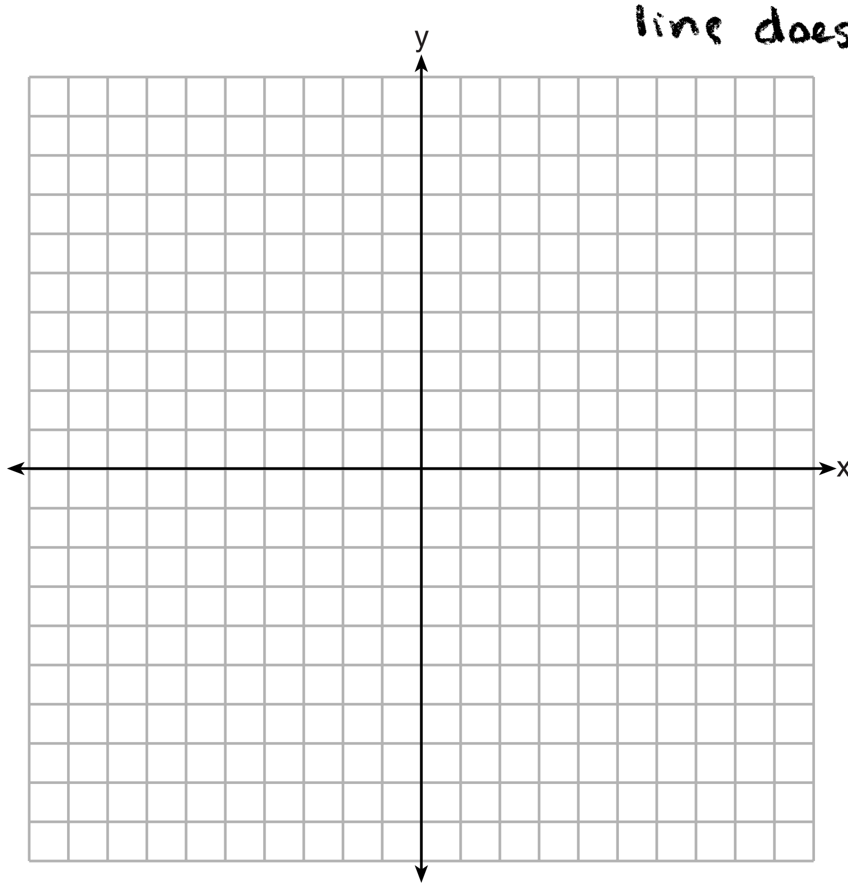
31 Line n is represented by the equation $3x + 4y = 20$. Determine and state the equation of line p, the image of line n, after a dilation of scale factor $\frac{1}{3}$ centered at the point (4,2). [The use of the set of axes below is optional.]

Explain your answer.

$3(4) + 4(2) = 20$

$20 = 20$

The line is on the center of dilation so the line doesn't change.



Score 1: The student wrote a correct explanation, but did not write the equation of line p.

Question 31

31 Line n is represented by the equation $3x + 4y = 20$. Determine and state the equation of line p, the image of line n, after a dilation of scale factor $\frac{1}{3}$ centered at the point (4,2).
[The use of the set of axes below is optional.]

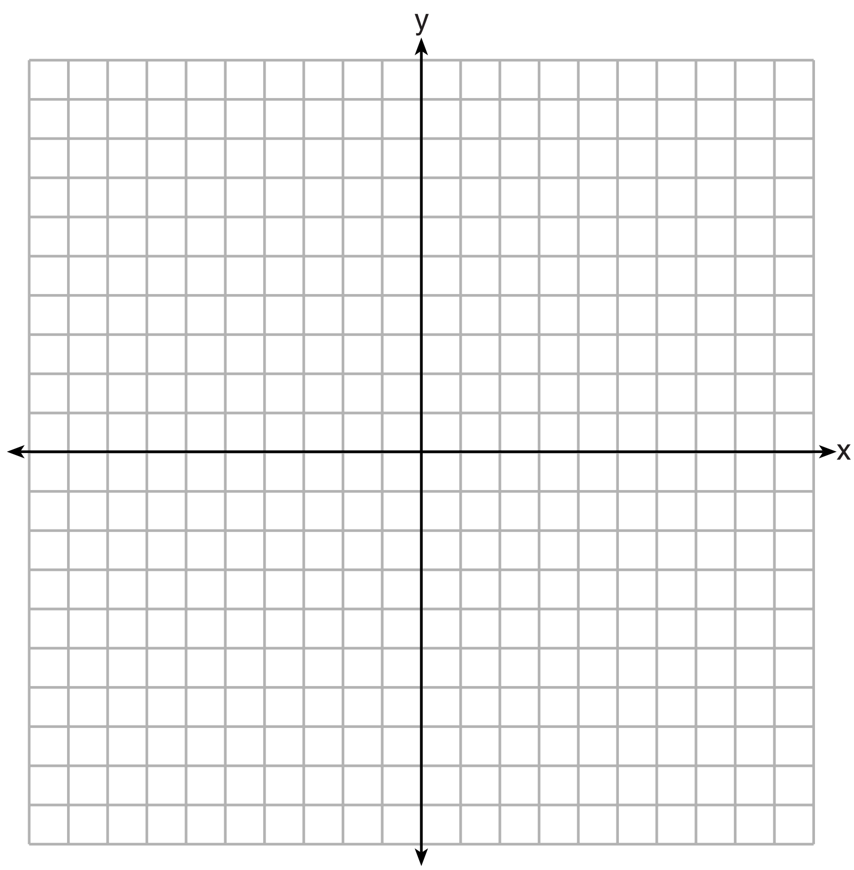
Explain your answer.

$$3x+4y=20$$
$$-3x \quad -3x$$
$$\frac{4y}{4}=\frac{20}{4}\frac{-3x}{4}$$
$$y=5-\frac{3}{4}x$$

$$5 \times \frac{1}{3}=\frac{5}{3}$$

$$y=\frac{5}{3}-\frac{3}{4}x$$

The y intercept is dilated but the slope stays the same



Score 1: The student did not account for the center of dilation being on line n.

Question 31

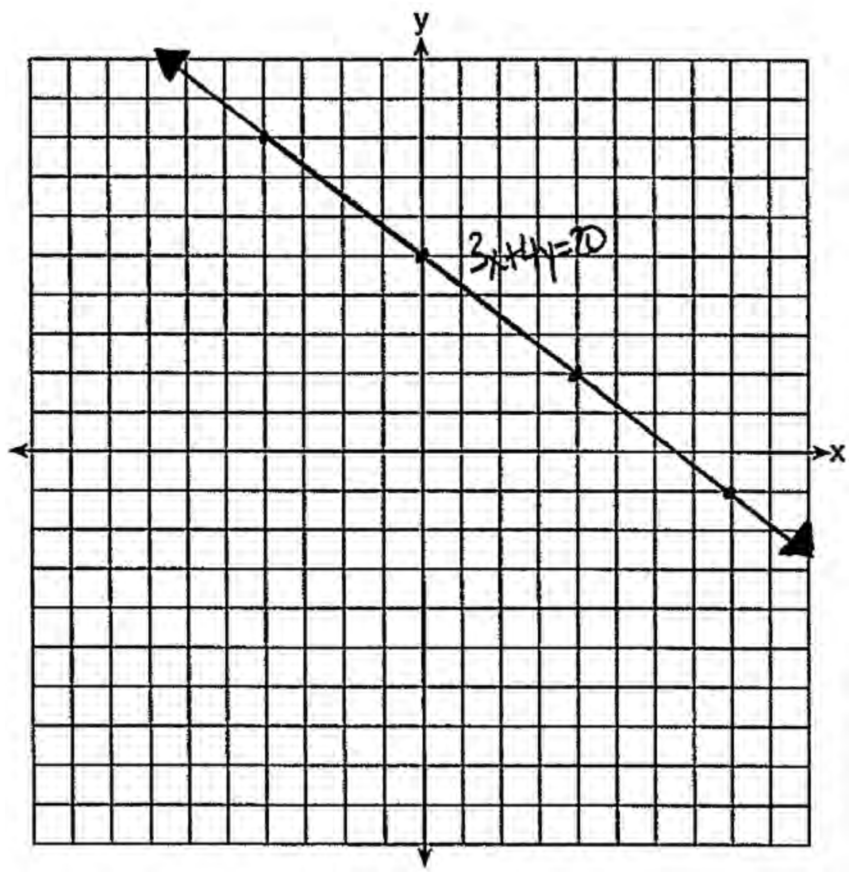
31 Line n is represented by the equation $3x + 4y = 20$. Determine and state the equation of line p, the image of line n, after a dilation of scale factor $\frac{1}{3}$ centered at the point (4,2).
[The use of the set of axes below is optional.]

Explain your answer.

$$3x+4y=20$$
$$-3x \qquad -3x$$
$$\frac{4y}{4}=\frac{-3x+20}{4}$$
$$y=\frac{-3}{4}x+5$$

$$2=4(x)+\frac{5}{3}$$
$$-\frac{5}{3} \qquad -\frac{5}{3}$$
$$\frac{1/3}{4}=\frac{4x}{4}$$
$$1/12=x$$

$$y=1/12x+\frac{5}{3}$$



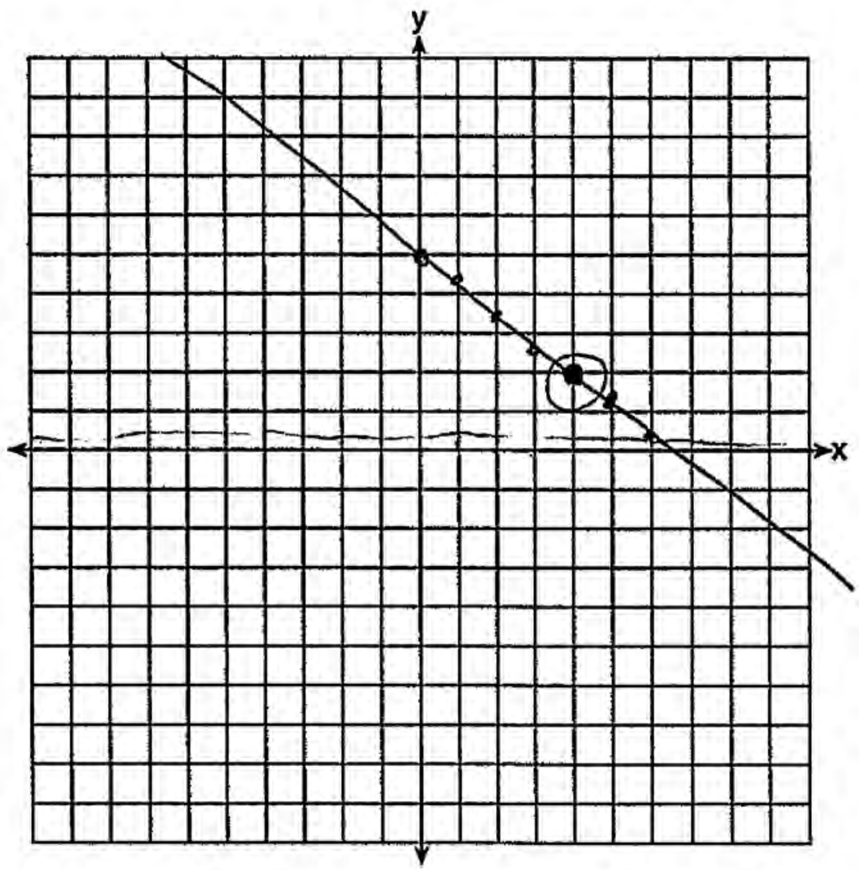
Score 0: The student wrote an incorrect equation and did not write an explanation.

31 Line n is represented by the equation $3x + 4y = 20$. Determine and state the equation of line p, the image of line n, after a dilation of scale factor $\frac{1}{3}$ centered at the point (4,2).
[The use of the set of axes below is optional.]

Explain your answer.

$$3x + 4y = 20$$
$$-3x \qquad -3x$$
$$\frac{4y}{4} = \frac{20}{4} - \frac{3x}{4}$$
$$y = 5 - \tfrac{3}{4}x$$

X	Y
0	5
1	4.25
2	3.5
3	2.75
4	2



Score 0: The student rewrote the given equation to graph the line, but did not write an explanation.

Question 32

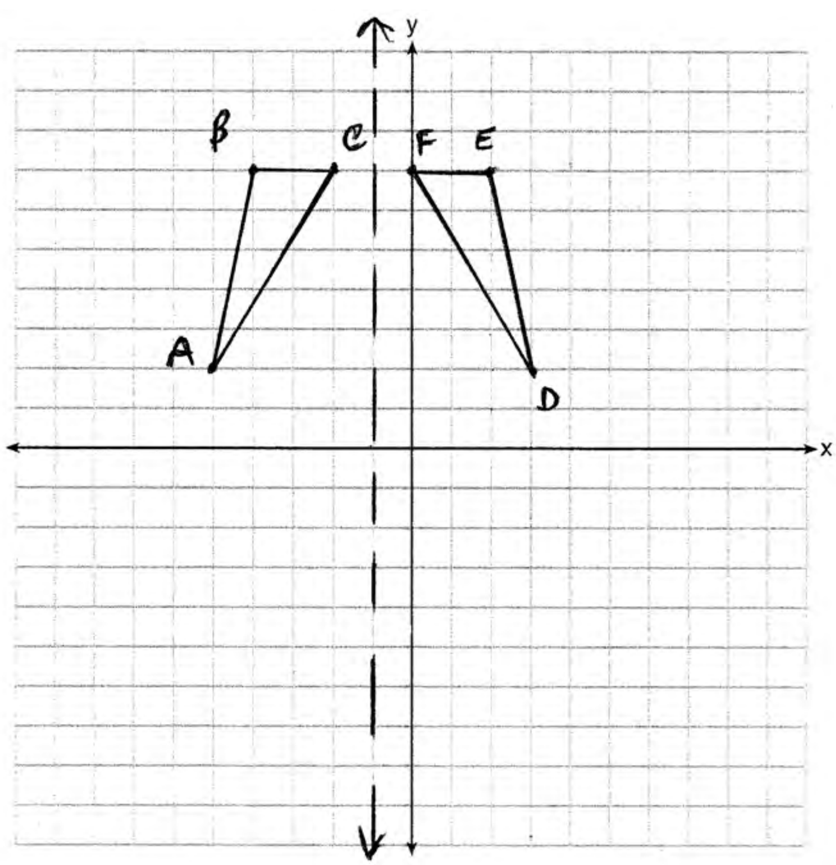
32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Reflect $\triangle ABC$ over the line $x = -1$

Reflections are rigid motions that preserve angle measures and side lengths, so $\triangle ABC \cong \triangle DEF$.



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

Question 32

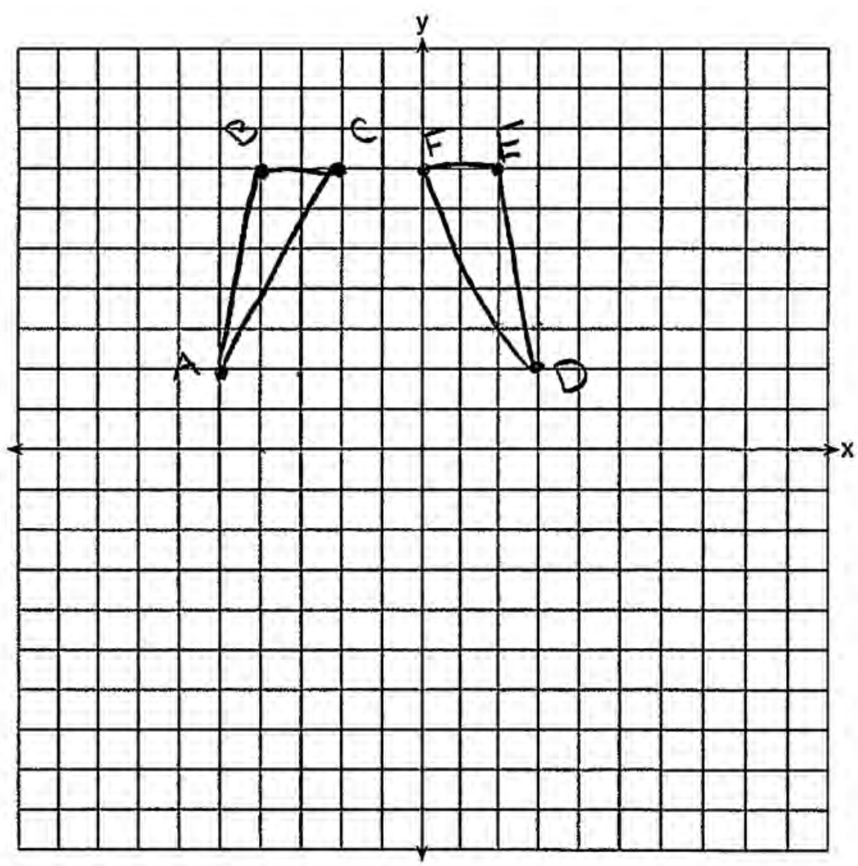
32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

- reflection over $x = -2$

- $\triangle ABC \cong \triangle DEF$ because reflections don't change side or angle measures



Score 3: The student miscounted when writing the equation of the line of reflection.

Question 32

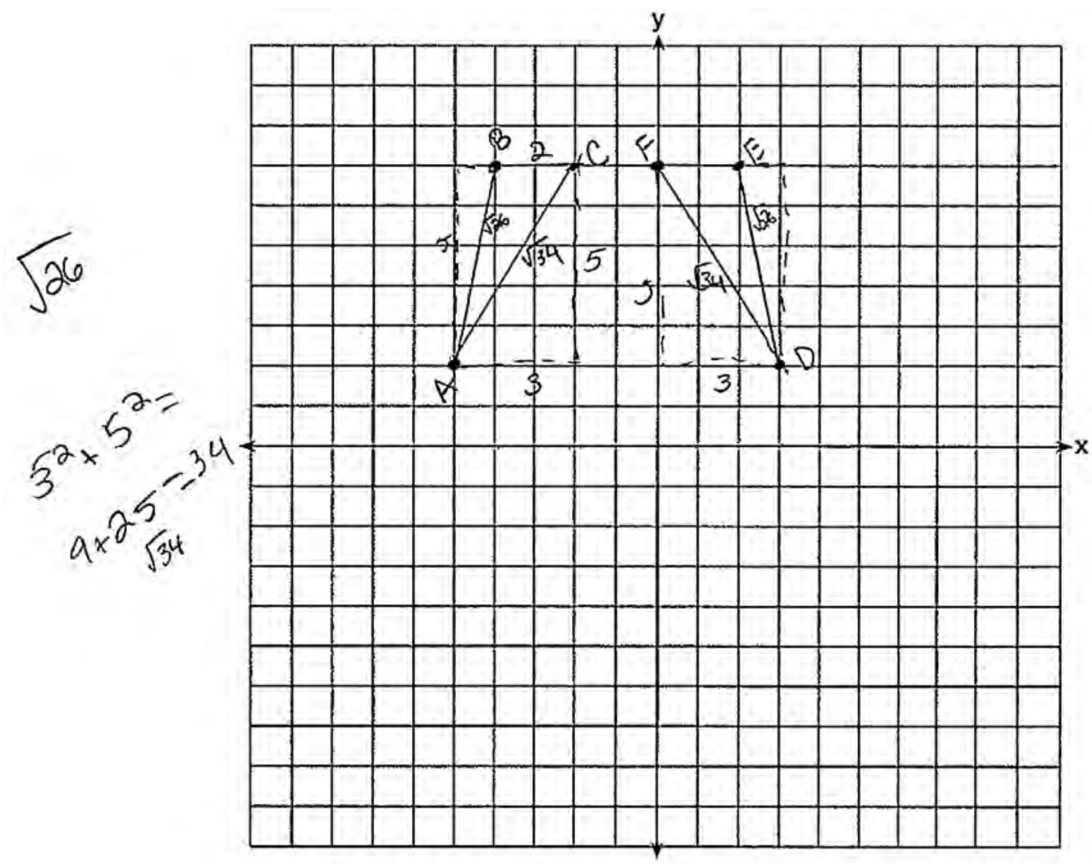
32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

△DEF was reflected over Line x = -1. I know because all the point are equidistant from that line that are the images.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

△ABC ≅ △DEF by SSS because all the sides are the same length because of pythagoreen theorem.



Score 3: The student gave an explanation for why the triangles are congruent, but did not use the transformation to explain why.

Question 32

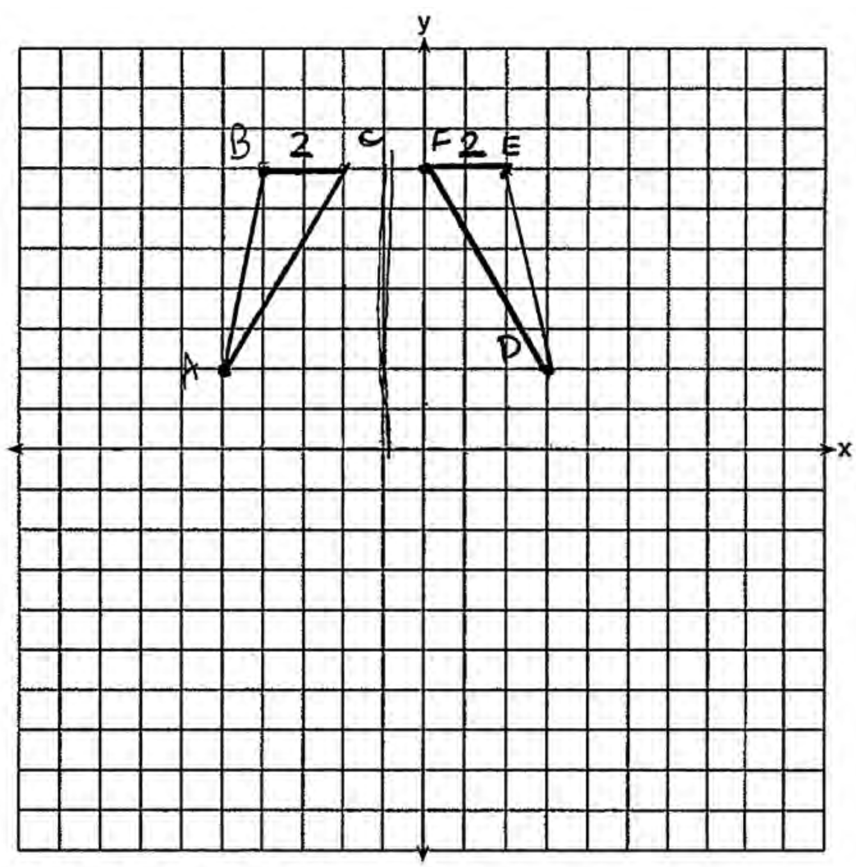
32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Reflection across X=-1

When reflected onto each other, the side lengths are the same as well as angle measures, therefore they are congruent through SSS similarity.



Score 3: The student wrote a partially correct explanation.

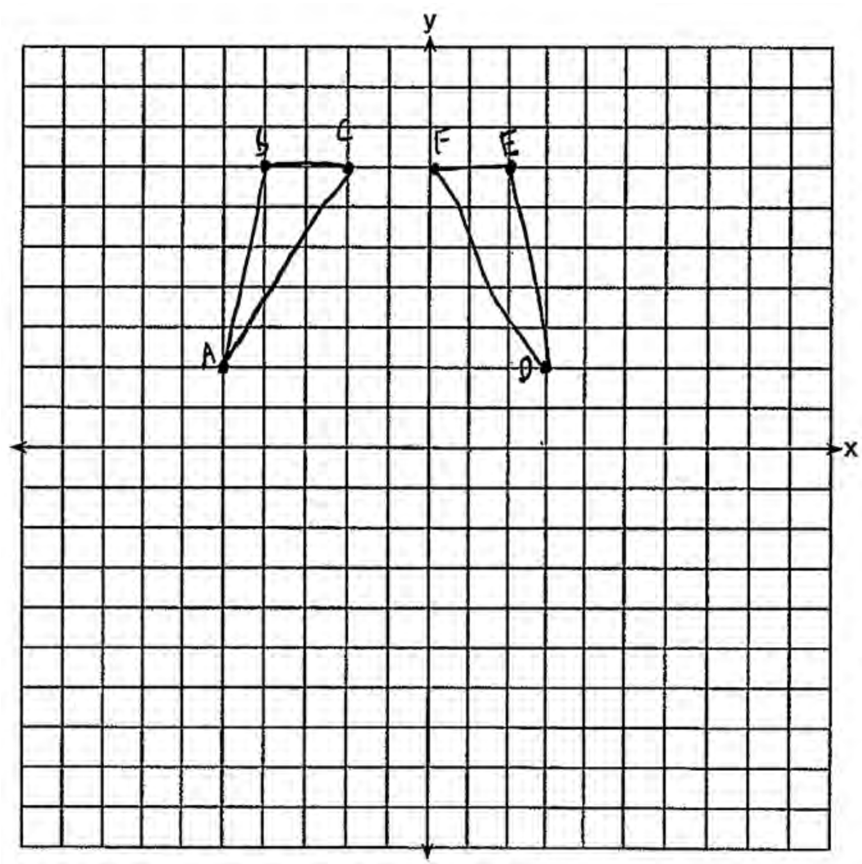
Question 32

32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Reflection over x=-1 the distance for each corresponding point is the same distance away from x=1



Score 2: The student graphed and labeled the triangles correctly and stated the correct line of reflection, but no further correct work was shown.

Question 32

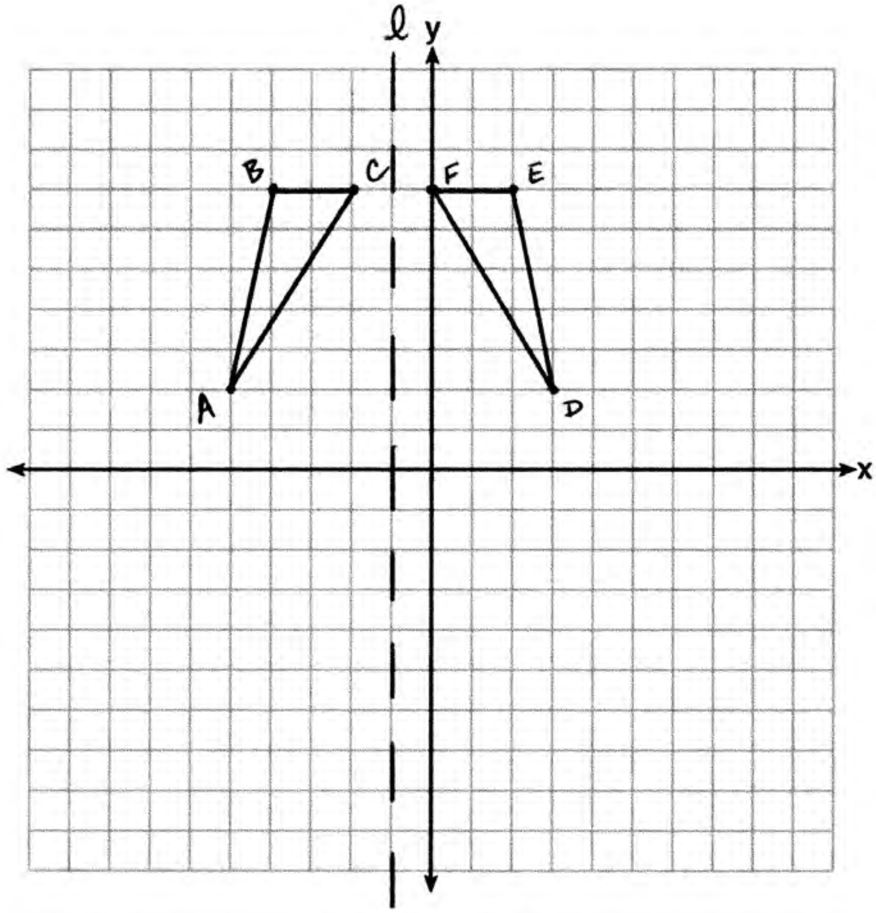
32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Reflect $\triangle ABC$ over line ℓ onto $\triangle DEF$.

They are congruent because they are the same size.



Score 2: The triangles were graphed and labeled correctly and a correct transformation was written, but no further correct work was shown.

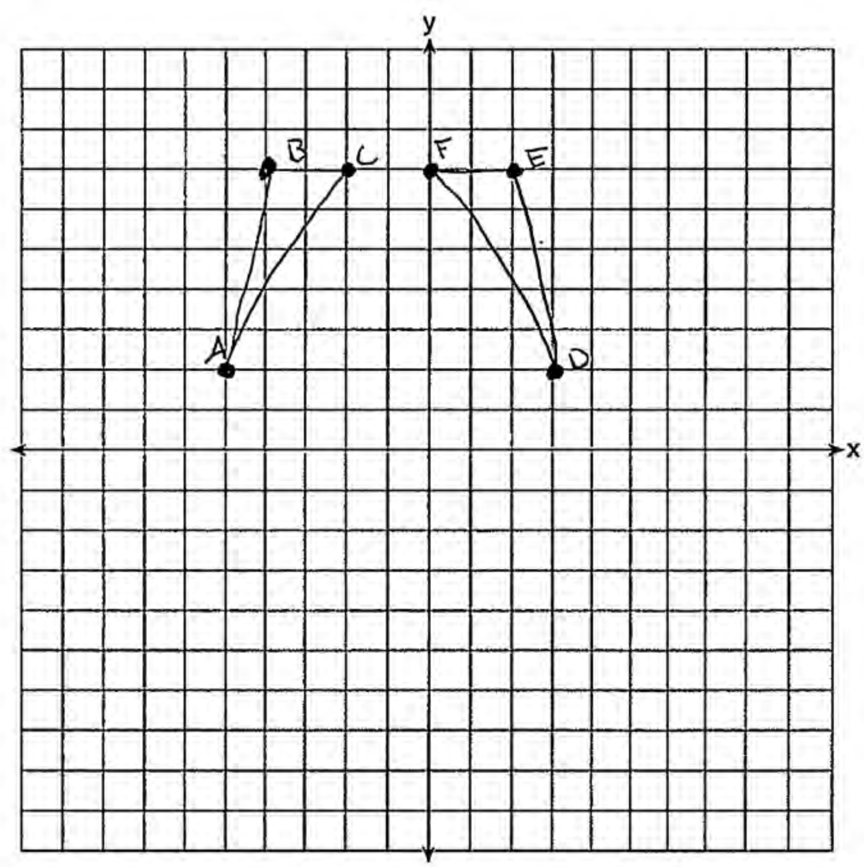
Question 32

32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Transformation: Rotation 270°



Score 1: The student graphed and labeled both triangles correctly, but no further correct work was shown.

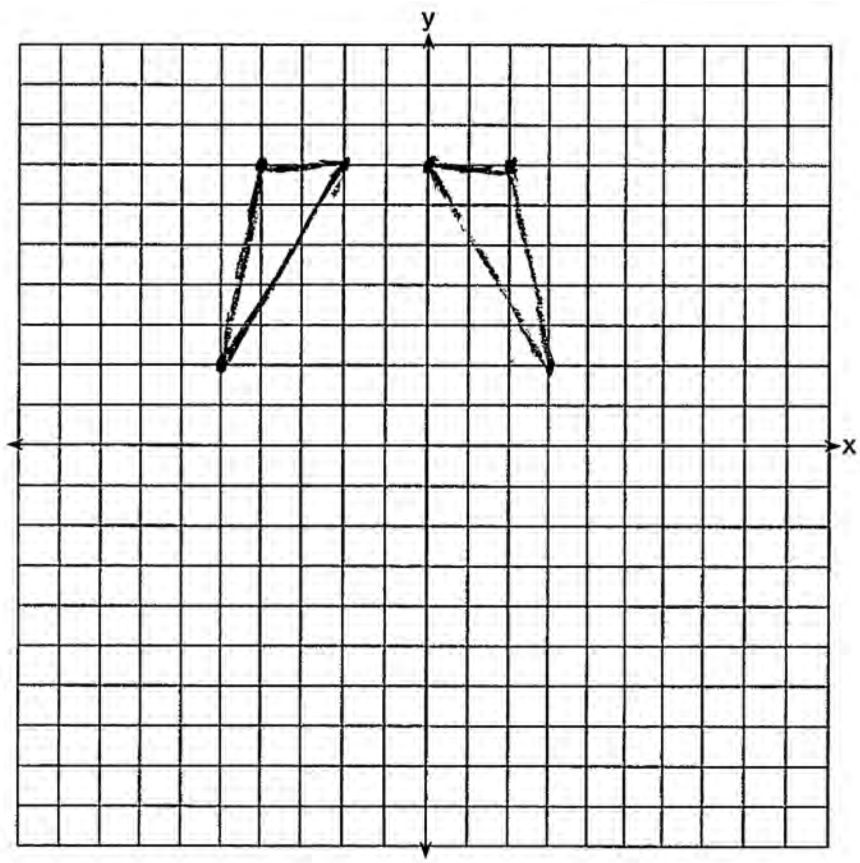
Question 32

32 Triangle ABC has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle DEF has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

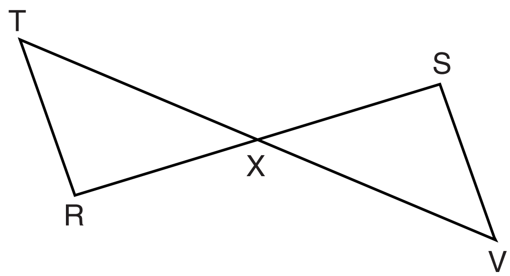
Reflection over the y-axis



Score 0: The student had a completely incorrect response.

Question 33

33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point X
$\overline{TR}$ and $\overline{SV}$ are drawn

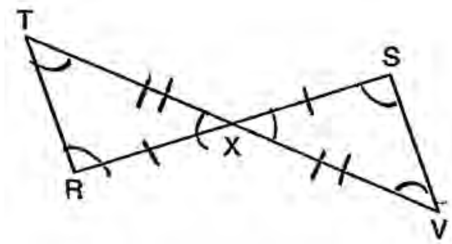


Prove: $\overline{TR} \parallel \overline{SV}$

Statement	Reason
1. $\overline{RS}$ and $\overline{TV}$ bisect each other at point X $\overline{TR}$ and $\overline{SV}$ are drawn	1. given
2. $\overline{TX} \cong \overline{VX}$ $\overline{RX} \cong \overline{SX}$	2. Segment bisectors meet at a midpoint and create 2 $\cong$ segments.
3. $\angle TXR \cong \angle VXS$	3. vertical angles are congruent
4. $\triangle TXR \cong \triangle VXS$	4. SAS
5. $\angle T \cong \angle V$	5. CPCTC
6. $\overline{TR} \parallel \overline{VS}$	6. If two lines are cut by a transversal so that alternate interior angles are congruent, the lines are parallel.

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

33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point X
$\overline{TR}$ and $\overline{SV}$ are drawn



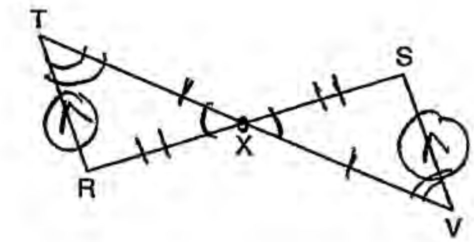
Prove: $\overline{TR} \parallel \overline{SV}$

Statements	Reasons
1. $\overline{RS}$ and $\overline{TV}$ bisect each other	1. Given
2. $\overline{TX} \cong \overline{VX}$; $\overline{SX} \cong \overline{RX}$	2. A segment bisector divides a segment into two $\cong$ parts.
3. $\angle TXR$ and $\angle SXV$ are vertical angles	3. ∥ Lines interect to create vertacal angle.
4. $\angle TXR \cong \angle SXV$	4 Vertical angles are $\cong$
5. $\triangle TRX \cong \triangle VSX$	5 . S.A.S $\cong$ S.A.S
6. $\angle T$ ~~asc~~ $\cong \angle V$, $\angle S \cong \angle R$	6. CPCTC
7. $\overline{TR} \parallel \overline{SV}$	7. Congruent alternate interior angles create parallel lines

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

Question 33

33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point X
$\overline{TR}$ and $\overline{SV}$ are drawn



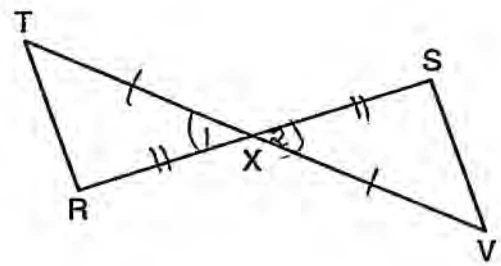
Prove: $\overline{TR} \parallel \overline{SV}$

S	R
1) $\overline{RS}$ and $\overline{TV}$ bisect eachother at point X	2) given
2) $\overline{TX} \cong \overline{XV}$, $\overline{RX} \cong \overline{XS}$	2) a bisector divides a segment into 2 ≅ parts
3) ∡TXR and ∡SXV are vertical ∡s	3) intersecting lines form vertical ∡s
4) ∡TXR ≅ ∡SXV	4) vertical ∡s are ≅
5) △TXR ≅ △VXS	5) SAS ≅ SAS
6) ∡RTX ≅ ∡SVX	6) CPCTC
7) ∡RTX and ∡SVX are alternate interior ∡s	7) ∡s on opposite side of transversal they are alternate interior
8) $\overline{TR} \parallel \overline{SV}$	8) they form alternate interior ∡s

Score 3: The student had an incorrect reason to prove statement 8.

Question 33

33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point X
$\overline{TR}$ and $\overline{SV}$ are drawn



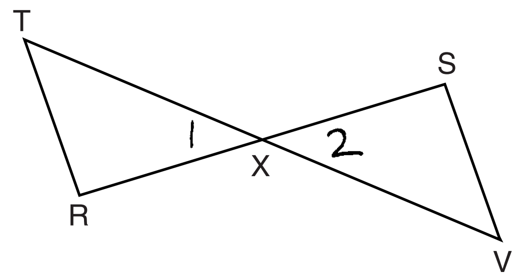
Prove: $\overline{TR} \parallel \overline{SV}$

Statements	Reasons
① $\overline{RS}$ & $\overline{TV}$ bisect eachother at X	① Given
② $\overline{TX} \cong \overline{XV}$, $\overline{RX} \cong \overline{XS}$	② Definition of bisector
③ $\angle 1 \cong \angle 2$	③ Vertical angles are $\cong$
④ $\triangle TXR \cong \triangle VXS$	④ SAS $\cong$ SAS
⑤ $\overline{TR} \parallel \overline{SV}$	⑤ CPOCTAC

Score 2: The triangles were proven congruent, but no further correct work was shown.

Question 33

33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point *X*
$\overline{TR}$ and $\overline{SV}$ are drawn



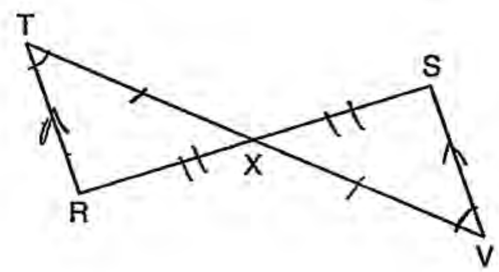
Prove: $\overline{TR} \parallel \overline{SV}$

Statement	Reason
1. $\overline{RS}$ and $\overline{TV}$ bisect each other, $\overline{TR}$ and $\overline{SV}$ are drawn.	1. Given
2. X is the midpoint of $\overline{RS}$ and $\overline{TV}$	2. Bisector definition
3. $\overline{XR} \cong \overline{XS}$, $\overline{XT} \cong \overline{XV}$	3. midpoint definition
4. $\angle 1 \cong \angle 2$	4. Vertical $\angle$'s are $\cong$
5. $\triangle TRX \cong \triangle VSX$	5. SAS
6. $\overline{TR} \parallel \overline{SV}$	6. CPCTC

Score 2: The triangles were proven congruent, but no further correct work was shown.

Question 33

33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point X
$\overline{TR}$ and $\overline{SV}$ are drawn



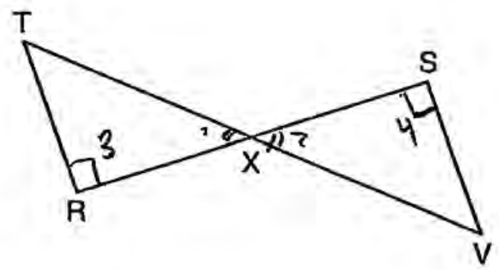
Prove: $\overline{TR} \parallel \overline{SV}$

① $\overline{RS}$ and $\overline{TV}$ bisect each other at point X $\overline{TR}$ and $\overline{SV}$ are drawn	① Given
② $\overline{X}$ X is the midpoint of $\overline{RXS}$ and $\overline{TXV}$	② def. of seg. bisector
③ $\overline{TX} \cong \overline{XV}$ and $\overline{RX} \cong \overline{XS}$	③ def. of midpoint
④ $\angle T \cong \angle V$	④ $\cong$ side have $\cong$ opp. angles
⑤ $\overline{TR} \parallel \overline{SV}$	⑤ aternate interior angles

Score 1: The student correctly proved $\overline{TX} \cong \overline{XV}$ and $\overline{RX} \cong \overline{XS}$, but no further correct work was shown.

Question 33

33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point X
$\overline{TR}$ and $\overline{SV}$ are drawn



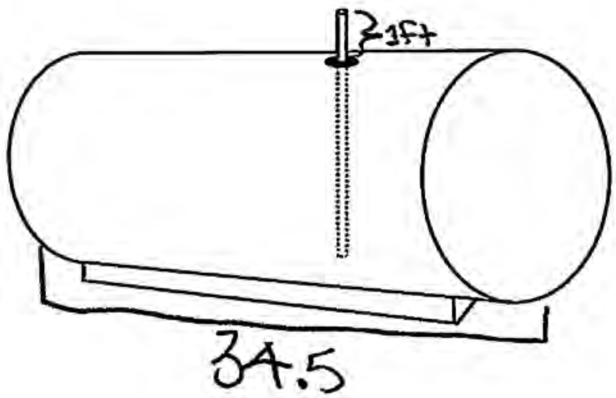
Prove: $\overline{TR} \parallel \overline{SV}$

① $\overline{RS}$ and $\overline{TV}$ bisect each other at point X $\overline{TR}$ and $\overline{SV}$ are drawn	① given
② ∠1 and ∠2 are vertical ∠'s	② All vertical ∠'s are ≅
③ ∠3 ≅ ∠4	③
④ $\overline{TR} \parallel \overline{SV}$	④ AA ?

Score 0: The student had a completely incorrect response.

Question 34

34 A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.



A metal pole is used to measure how much gas is in the tank. To the *nearest tenth of a foot*, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft^3 = 7.48 gallons]

$V = \pi r^2 h$

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

$r = \sqrt{\frac{V}{\pi h}}$

$r = \sqrt{\frac{2673.796}{\pi 34.5}}$

$r = 4.9668 \cdot 2 = d$

$d = 9.9$ ft.

$+1$ ft

10.9ft

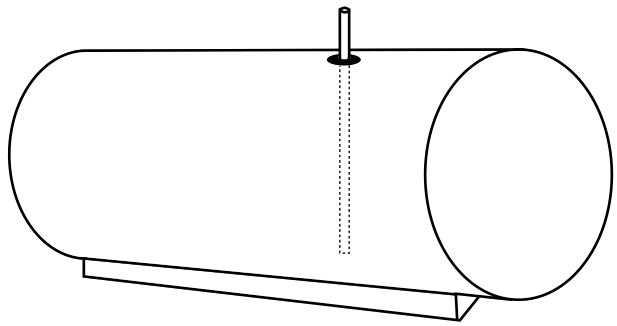
$\frac{20{,}000}{7.48} = 2673.796$

The pole must be 10.9ft to reach the bottom w/ one foot of metal still outside the tank

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

Question 34

34 A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.



A metal pole is used to measure how much gas is in the tank. To the *nearest tenth of a foot*, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft^3 = 7.48 gallons]

$V = 20000 \text{ gal}$

$= \frac{20000}{7.48} \approx 2673.8 \text{ ft}^3$

$V = \pi r^2 h$

$2673.8 = \pi r^2 (34.5)$

$r^2 = \frac{2673.8}{34.5}$

$r^2 = 77.5$

$r = 8.8035$

length of pole

$2r + 1$

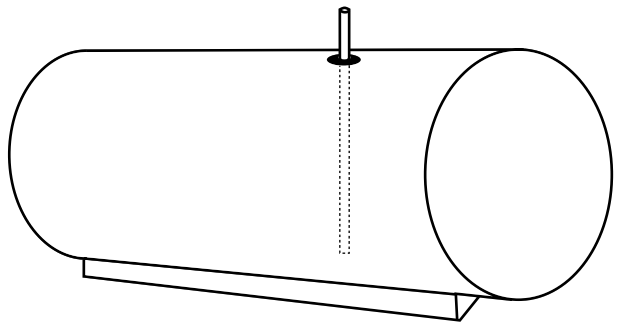
$2(8.8035) + 1$

$\boxed{l = 18.6}$

Score 3: The student did not divide by π when finding the radius.

Question 34

34 A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.



A metal pole is used to measure how much gas is in the tank. To the *nearest tenth of a foot*, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft^3 = 7.48 gallons]

$$\frac{20{,}000 \div 7.48}{}$$

$$\frac{2673.796791}{34.5} = \frac{\pi r^2 (34.5)}{34.5}$$

$$\frac{77.50135627}{\pi} = \frac{\pi r^2}{\pi}$$

$$\sqrt{24.66944789} = \sqrt{r^2}$$

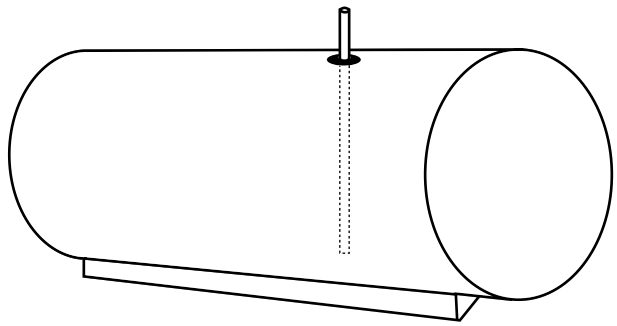
$$4.966834796 = r$$

$$\boxed{6 \text{ feet}}$$ because the tank is about 5 feet tall

Score 3: The student found the length of the radius, but no further correct work was shown.

Question 34

34 A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.



A metal pole is used to measure how much gas is in the tank. To the *nearest tenth of a foot*, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft^3 = 7.48 gallons]

$V = \pi r^2 h$

$20{,}000 = \pi r^2 (34.5)$

$\frac{20{,}000}{108.38} = \frac{108.38 r^2}{108.38}$

$\sqrt{184.54} = \sqrt{r^2}$

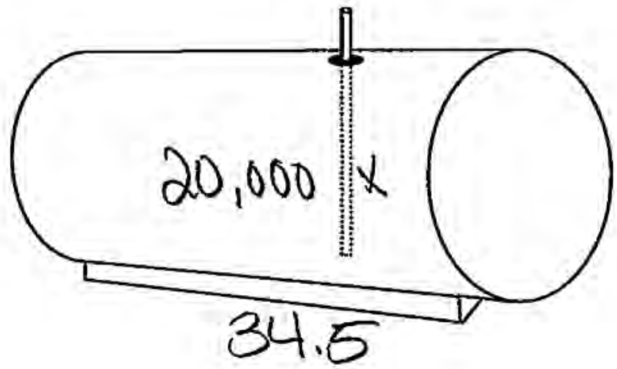
$13.58 = r$

$13.58 \times 2 + 1 = \boxed{28.2 \text{ Ft.}}$

Score 2: The student did not convert gallons to cubic feet.

Question 34

34 A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.



A metal pole is used to measure how much gas is in the tank. To the *nearest tenth of a foot*, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft^3 = 7.48 gallons]

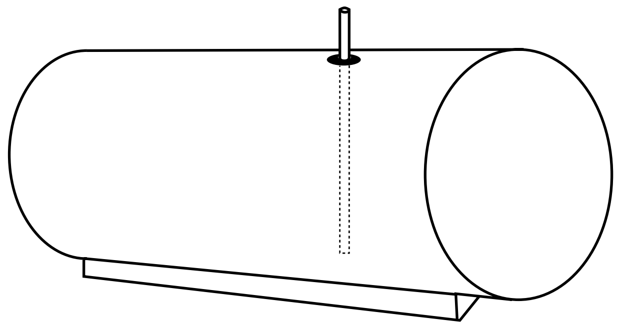
It will be 2,674 because when dividing the amount of gallons in the tank (20,000) by 7.48 you get 2,673.8. then adding another Foot outside the tank making it 2,674.

$$\begin{array}{r} 20{,}000 \\ \div\ 7.48 \\ \hline 2{,}673.8 \\ 2{,}674 \end{array}$$

Score 1: The student found the volume in cubic feet, but no further correct work was shown.

Question 34

34 A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.



A metal pole is used to measure how much gas is in the tank. To the *nearest tenth of a foot*, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft^3 = 7.48 gallons]

It need to be 155ft

$V = \pi r^2 \cdot h$

$V = 417.25$

$\frac{201000}{17.25} = \frac{417.25 \cdot h}{1.25}$

$\frac{1}{7.48} = \frac{x}{1154.42029}$

$\frac{7.48x}{7.48} = \frac{1154.42029}{7.48}$

$x = 455ft$

Score 0: The student had a completely incorrect response.

Question 35

35 Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.
[The use of the set of axes on the next page is optional.]

Prove Quad PQRS rhombus:

Distance Formula:

$PQ: \sqrt{(8-3)^2+(3+2)^2} = \sqrt{50} = 5\sqrt{2}$

$QR: \sqrt{(1-8)^2+(4-3)^2} = \sqrt{50} = 5\sqrt{2}$

$RS: \sqrt{(-4-1)^2+(-1-4)^2} = \sqrt{50} = 5\sqrt{2}$

$PS: \sqrt{(-4+3)^2+(-1+2)^2} = \sqrt{50} = 5\sqrt{2}$

$\overline{PQ} \cong \overline{QR} \cong \overline{RS} \cong \overline{PS}$

$\therefore$ Its a rhombus because all sides are equal

Question 35 is continued on the next page.

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]

Prove Quad PQRS is not a Square;

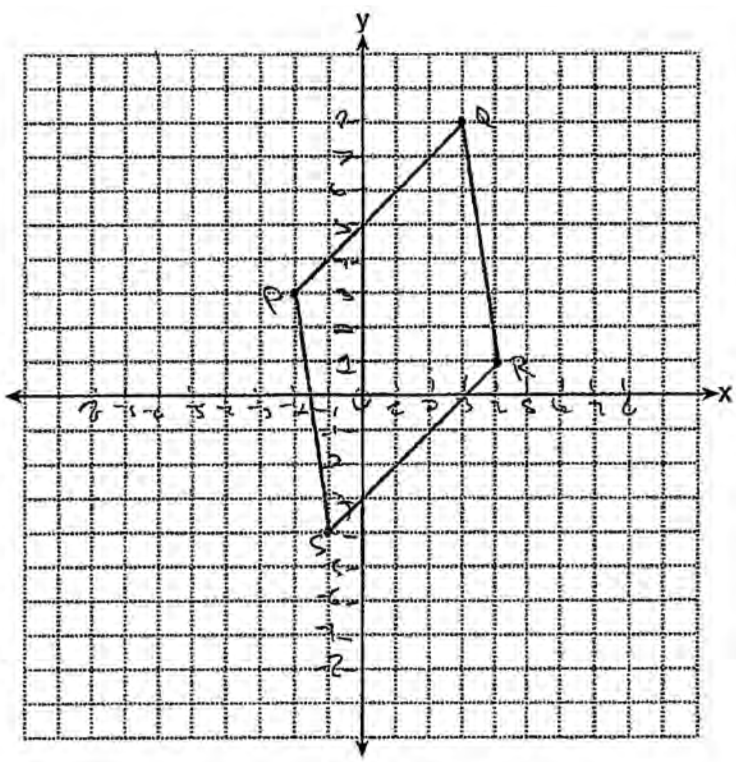
Slope:

$\overline{PQ}$: $\frac{8-3}{3+2} = \frac{5}{5} = 1$ $\quad 1 \cdot \frac{-7}{1} \neq -1$

$\overline{QR}$: $\frac{1-8}{4-3} = \frac{-7}{1}$

$\overline{PQ} \not\perp \overline{QR}$, $\angle Q$ is not a right angle.

∴ PQRS is not a square because it doesn't have right angles.



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

Question 35

35 Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.
[The use of the set of axes on the next page is optional.]

$PQ = \sqrt{(3-(-2))^2+(8-3)^2}$
$= \sqrt{5^2+5^2}$
$= \sqrt{25+25}$
$PQ = \sqrt{50}$

$QR = \sqrt{(4-3)^2+(1-8)^2}$
$= \sqrt{1^2+(-7)^2}$
$= \sqrt{1+49}$
$QR = \sqrt{50}$

$RS = \sqrt{(-1-4)^2+(-4-1)^2}$
$= \sqrt{(-5)^2+(-5)^2}$
$= \sqrt{25+25}$
$RS = \sqrt{50}$

$PS = \sqrt{(-1-(-2))^2+(-4-3)^2}$
$= \sqrt{1^2+(-7)^2}$
$= \sqrt{1+49}$
$= \sqrt{50}$

$\overline{PQ} \cong \overline{QR} \cong \overline{RS} \cong \overline{PS}$

Since all 4 sides of quadrilateral PQRS are $\cong$, PQRS is a rhombus.

Question 35 is continued on the next page.

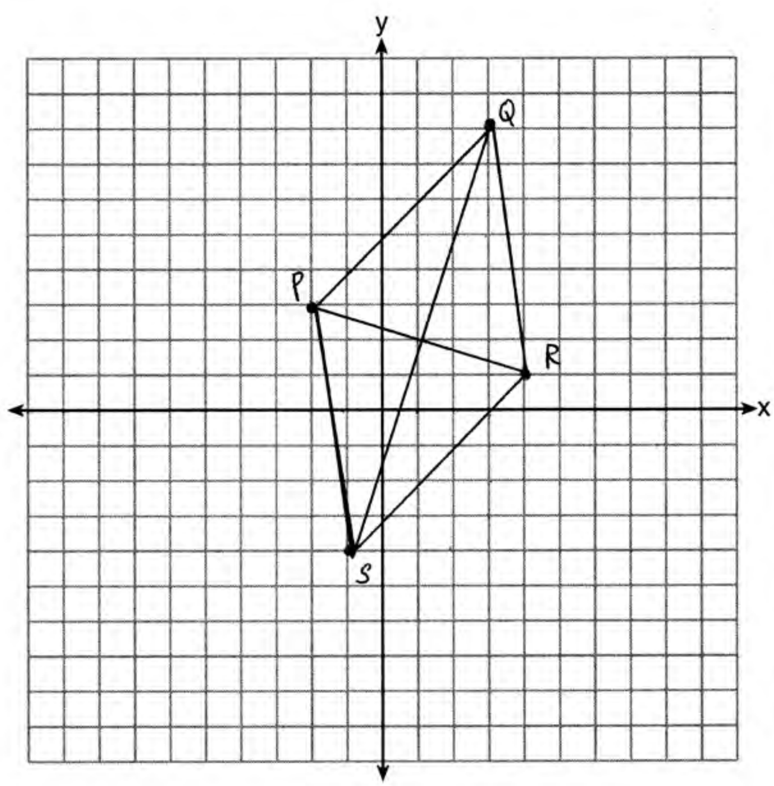
Question 35 continued

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]

$$PR = \sqrt{(4-(-2))^2 + (1-3)^2}$$
$$= \sqrt{(6)^2 + (-2)^2}$$
$$= \sqrt{36 + 4}$$
$$PR = \sqrt{40}$$

$$QS = \sqrt{(-1-3)^2 + (-4-8)^2}$$
$$= \sqrt{(-4)^2 + (-12)^2}$$
$$= \sqrt{16 + 144}$$
$$QS = \sqrt{160}$$

Since diagonals $\overline{PR}$ and $\overline{QS}$ are not congruent, rhombus PQRS is not a square.



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

35 Quadrilateral *PQRS* has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that *PQRS* is a rhombus.
[The use of the set of axes on the next page is optional.]

Statement	reasons
1) $\overline{PQ} \cong \overline{QR} \cong \overline{SR} \cong \overline{PS}$	distance are $\cong$
2) PQRS is a rhombus	a quadrilateral with all sides congruent is a rhombus

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

$\sqrt{(-2-3)^2+(3-8)^2}$

$\sqrt{(-5)^2+(-5)^2}$

$\sqrt{25+25}$

$\sqrt{50}$

$\sqrt{25}\ \sqrt{2}$

$5\sqrt{2}$

$d = \sqrt{(3-4)^2+(8-1)^2}$

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

$\sqrt{1+49}$

$\sqrt{50}$

$\sqrt{25}\ \sqrt{2}$

$5\sqrt{2}$

SR $d = \sqrt{(-1-4)^2+(-4-1)^2}$

$\sqrt{(-5)^2+(-5)^2}$

$\sqrt{25+25}$

$\sqrt{50}$

$\sqrt{25}\ \sqrt{2}$

$5\sqrt{2}$

PS $d = \sqrt{(-2-(-1))^2+(3-(-4))^2}$

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

$\sqrt{1+49}$

$\sqrt{50}$

$\sqrt{25}\ \sqrt{2}$

$5\sqrt{2}$

Question 35 is continued on the next page.

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]

PQRS is not a square because the slopes are not negative recipicals.

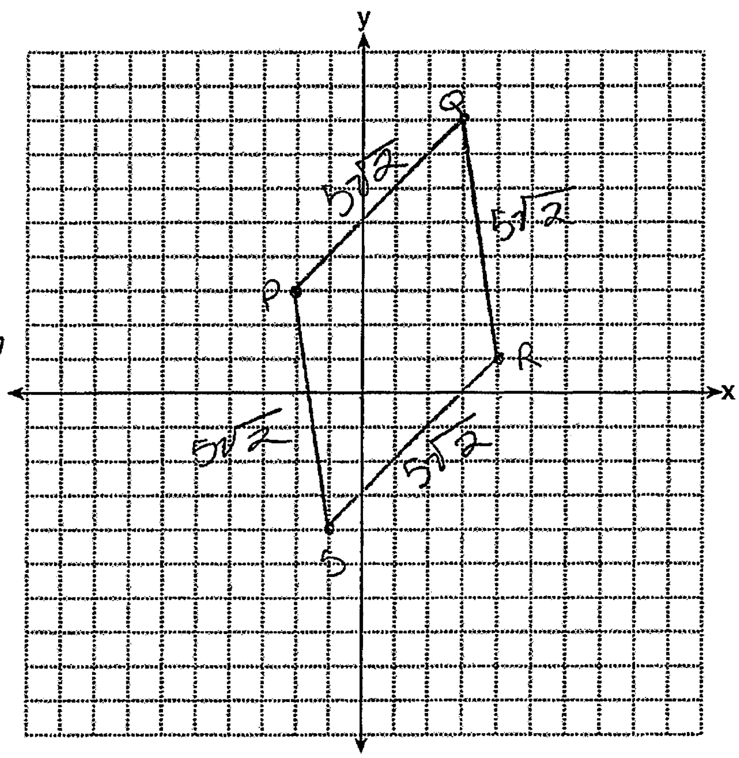
$m = \frac{y_1 - y_2}{x_1 - x_2}$

PQ $m = \frac{3-8}{-2-3}$

$m = \frac{-5}{-5} = \frac{5}{5}$

PS $m = \frac{3+(+4)}{-2+(+1)}$

$= \frac{7}{-1} = -7$



Score 5: The student wrote an incomplete concluding statement when proving *PQRS* is not a square.

Question 35

35 Quadrilateral *PQRS* has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that *PQRS* is a rhombus.
[The use of the set of axes on the next page is optional.]

$\overline{PQ} = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$= \sqrt{(3+2)^2+(8-3)^2}$
$= \sqrt{5^2+5^2}$
$= \sqrt{25+25}$
$= \sqrt{50}$

$\overline{QR} = \sqrt{(4-3)^2+(1-8)^2}$
$= \sqrt{-1^2+-7^2}$
$= \sqrt{1+49}$
$= \sqrt{50}$

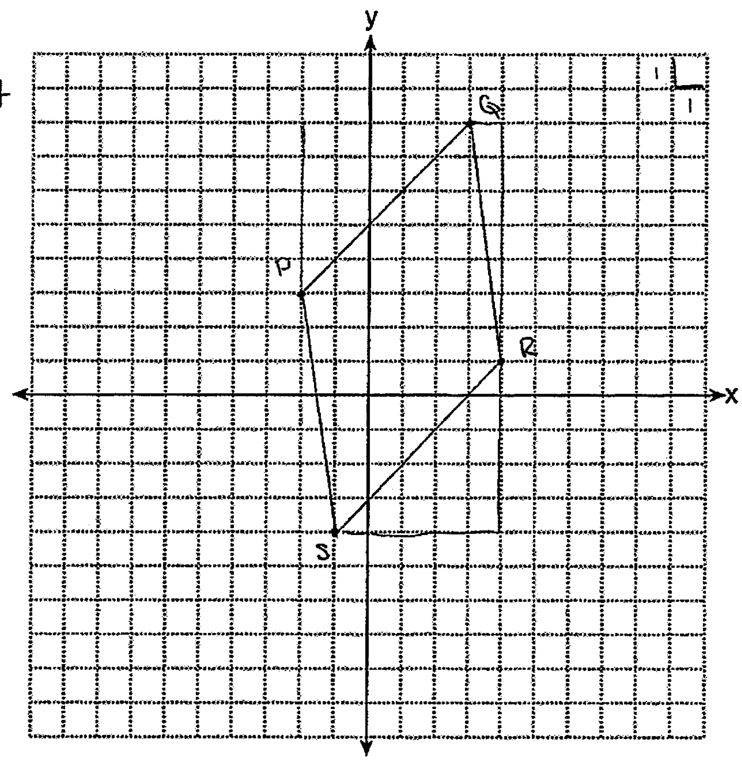
$\overline{RS} = \sqrt{(-1-4)^2+(-4-1)^2}$
$= \sqrt{-5^2+-5^2}$
$= \sqrt{25+25}$
$= \sqrt{50}$

$\overline{SP} = \sqrt{(-2+1)^2+(3+4)}$
$= \sqrt{-1^2+7^2}$
$= \sqrt{1+49}$
$= \sqrt{50}$

Question 35 is continued on the next page.

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]

PQRS is a rhombus
because all of its
sides are congruent



Score 4: *PQRS* is a rhombus was proven, but no further correct work was shown.

35 Quadrilateral *PQRS* has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that *PQRS* is a rhombus.
[The use of the set of axes on the next page is optional.]

PQRS is a ▱ b/c both sets of opposite sides of the quad are ∥.

$m\overline{PQ} = \frac{5}{5} = 1$

$m\overline{RS} = \frac{5}{5} = 1$

= slopes → ∥

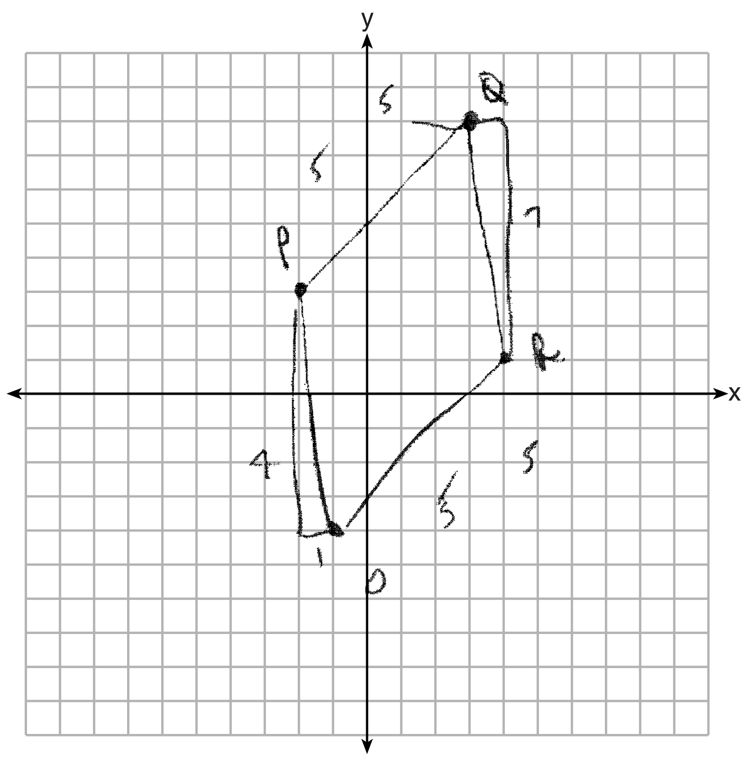
$m\overline{PS} = \frac{-7}{1} = -7$

$m\overline{QR} = \frac{-7}{1} = -7$

= slopes → ∥

Question 35 is continued on the next page.

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]



Score 3: *PQRS* is a parallelogram was proven, but no further correct work was shown.

Question 35

35 Quadrilateral *PQRS* has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that *PQRS* is a rhombus.
[The use of the set of axes on the next page is optional.]

(x, y)
$P(-2,3)$
$Q(3,8)$
$R(4,1)$
$S(-1,-4)$

PQ
$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$d=\sqrt{(3+2)^2+(8-3)^2}$
$d=\sqrt{(5)^2+(5)^2}$
$d=\sqrt{25+25}$
$d=\sqrt{50}$
$d=\sqrt{2}\sqrt{25}$
$d=5\sqrt{2}$

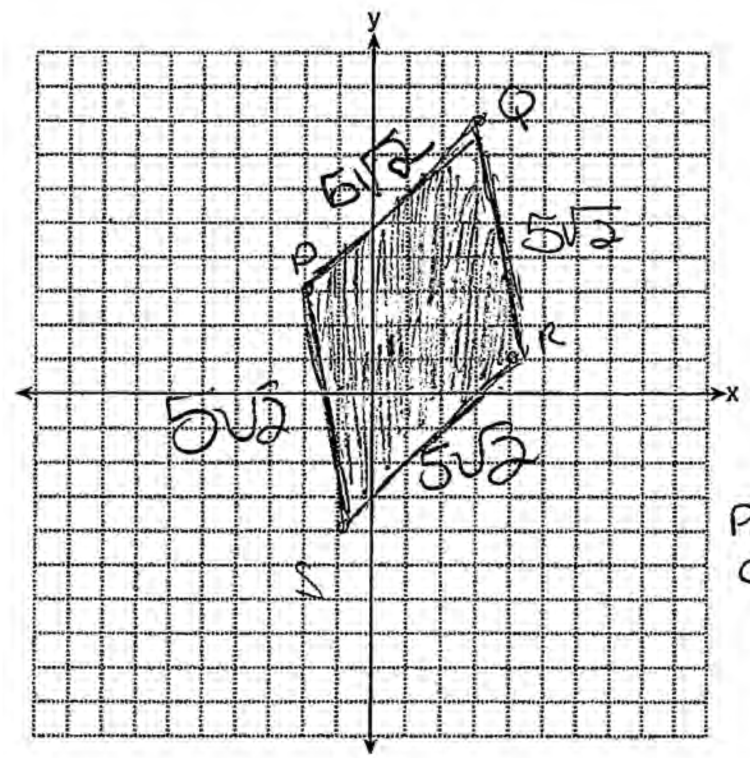
QR
$d=\sqrt{(4-3)^2+(1-8)^2}$
$d=\sqrt{(1)^2+(-7)^2}$
$d=\sqrt{1+49}$
$d=\sqrt{50}$
$d=\sqrt{2}\sqrt{25}$
$d=5\sqrt{2}$

PS
$\sqrt{(-1+2)^2+(-4-3)^2}$
$\sqrt{(1)^2+(-7)^2}$
$d=\sqrt{1+49}$
$d=\sqrt{50}$
$d=\sqrt{2}\sqrt{25}$
$d=5\sqrt{2}$

RS
$d=\sqrt{(-1-4)^2+(-4-1)^2}$
$d=\sqrt{(-5)^2+(-5)^2}$
$d=\sqrt{25+25}$
$d=\sqrt{50}$
$d=\sqrt{2}\sqrt{25}$
$d=5\sqrt{2}$

Question 35 is continued on the next page.

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]



PQRS is a square

Score 2: The student found the lengths of all four sides, but no further correct work was shown.

Question 35

35 Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.
[The use of the set of axes on the next page is optional.]

slope $= \dfrac{y_1 - y_2}{x_1 - x_2}$

$\overline{PQ}$ slope $\dfrac{3-8}{-2-3}$

$(-2,3)(3,8)$

$= \dfrac{-5}{-5}$

$= 1$

$QR = \dfrac{y_1 - y_2}{x_1 - x_2}$

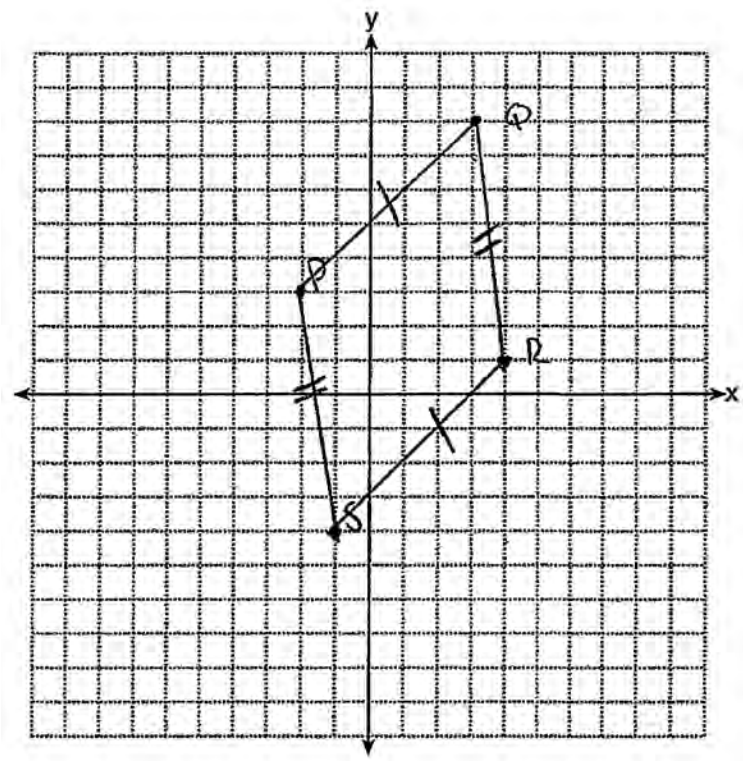
$(3,8)(4,1) = \dfrac{8-1}{3-4}$

$= \dfrac{7}{-1}$

① quad PQRS has vertices P(-2,3) Q(3,8) R(4,1) S(-1,-4)	① Given
② $PS \cong QR$, $PQ \cong SR$	② opposite sides are congruent in a quadrilateral
③ PQRS is a rhombus	③ all sides are congruent
④ PQRS is not a square	④ there are no rt ∡'s

Question 35 is continued on the next page.

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]



Score 1: The student found the slopes of two consecutive sides, but wrote an incomplete concluding statement about why *PQRS* is not a square.

Question 35

35 Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus. = opposite sides are parallel
[The use of the set of axes on the next page is optional.]

QR

$\frac{1-8}{4-3} = \frac{-7}{1} = -7$

PS

$\frac{-4-3}{-1+2} = -\frac{7}{1} = -7$

SR

$D = \sqrt{(4+1)^2 + (1+4)^2}$

$D = \sqrt{5^2 + 5^2}$

$D = \sqrt{25+25}$

$D = \sqrt{50}$

$\sqrt{25}\sqrt{2}$

$5\sqrt{2}$

PQ

$D = \sqrt{(-2-3)^2 + (-3-8)^2}$

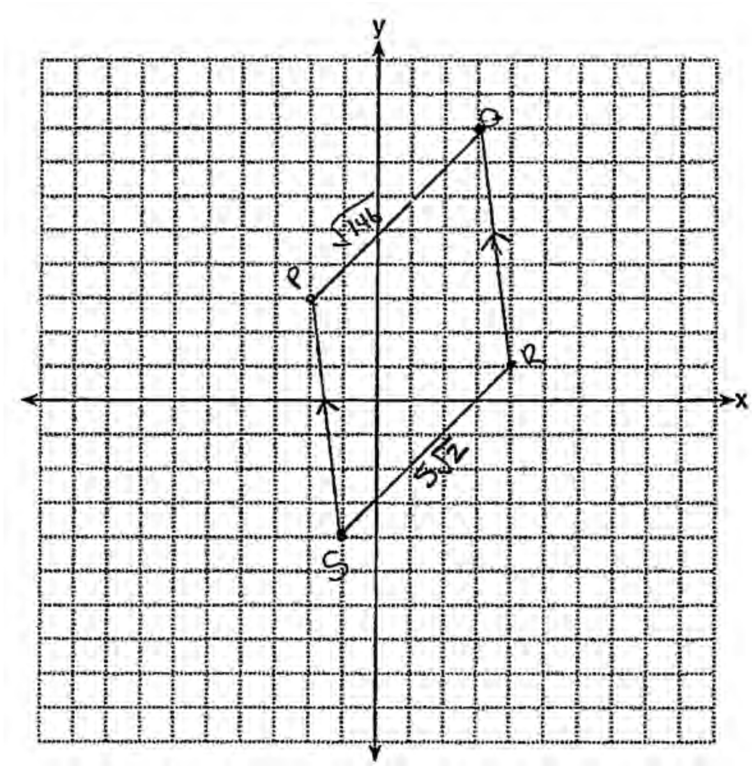
$D = \sqrt{(-5^2) + (-11)}$

$D = \sqrt{25 + 121}$

$D = \sqrt{146}$

Question 35 is continued on the next page.

Prove that *PQRS* is *not* a square.
[The use of the set of axes below is optional.]



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

Question 36

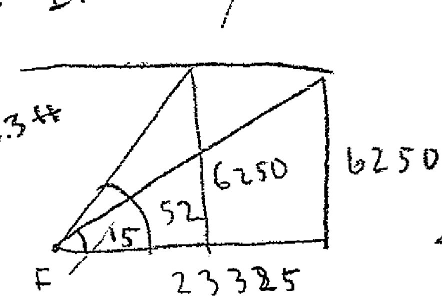
36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?

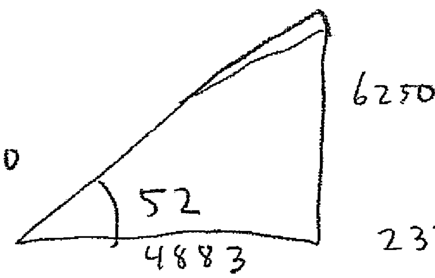
$\tan 15 = \frac{6250}{x}$

$\frac{6250}{\tan 15} = x$

$x \approx 23325.3$ ft

It has traveled 18,442 ft





$\tan 52 = \frac{6250}{x}$

$\frac{6250}{\tan 52} = x$

$x \approx 4883.0$

$23325.3 - 4883.0 =$
18442.3 ft
18442 ft

Determine and state the speed of the airplane, to the *nearest mile per hour*.

1 mile = 5280

$\frac{1 \text{ min}}{18442 \text{ ft}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \approx \frac{1 \text{ hr}}{1106520 \text{ ft}}$

$\cancel{\frac{1 \text{ hr}}{242980 \text{ ft}}} \approx$

$\frac{1106520 \text{ ft}}{1 \text{ hr}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} \approx 210 \text{ mph}$

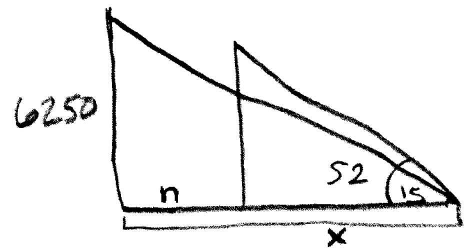
The airplane's speed is 210 mph

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

36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?

$$n = \frac{6250}{\tan 15} = 23,325.3'$$

$$x = \frac{6250}{\tan 52} = \frac{-4,883.0'}{18,442.3'}$$



$\boxed{18,442'}$ distance traveled in 1 min.

Determine and state the speed of the airplane, to the *nearest mile per hour.*

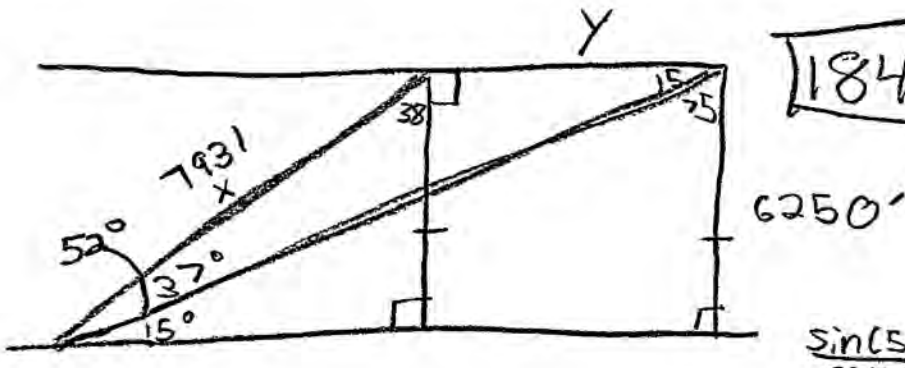
$r = \frac{d}{t}$ (mi/h)

$$\frac{18,442'}{1 \text{ min.}} \cdot \frac{60 \text{ min}}{1 \text{ hr.}} \cdot \frac{1 \text{ mi}}{5,280'} = \boxed{210 \text{ mi/h}}$$

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

Question 36

36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?



$\boxed{18442\text{ft}}$

$\frac{\sin(52)}{6250} = \frac{\sin(90)}{x}$

Determine and state the speed of the airplane, to the *nearest mile per hour*.

$\boxed{1106520 \text{ mil/hr}}$

$\frac{\sin(52)x}{\sin(52)} = \frac{\sin(90)6250}{\sin(52)}$

$x = 7931.4$

$\frac{\sin(15)}{7931.4} = \frac{\sin(37)}{y}$

$\frac{\sin(37)\cdot 7931.4}{\sin(15)} = \frac{\sin(15)y}{\sin(15)}$

$18442 = y$

$\begin{array}{r} 38 \\ +15 \\ \hline 53 \end{array}$ $\begin{array}{r} 90 \\ -53 \\ \hline 37 \end{array}$

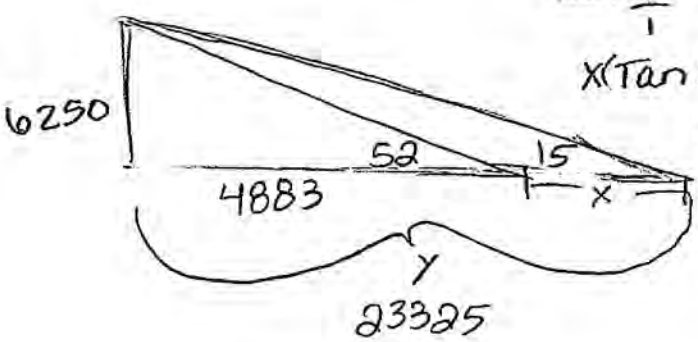
18442
x 60

Score 5: The student used an acceptable alternative method to find the correct distance traveled by the airplane, but found the speed of the airplane in feet per hour.

Question 36

36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?

Soh Can Toa



$\tan \frac{52}{1} = \frac{6250}{x}$

$x(\tan 52) = 6250$

$x = 4883$

$\tan 15 = \frac{6250}{y}$

$y(\tan 15) = 6250$

$y = 23325$

$23325 - 4883$

18442 ft

Determine and state the speed of the airplane, to the *nearest mile per hour*.

$\frac{18442}{60}$

307 m/h

Score 4: The student found the correct distance traveled by the airplane, but no further correct work was shown.

Question 36

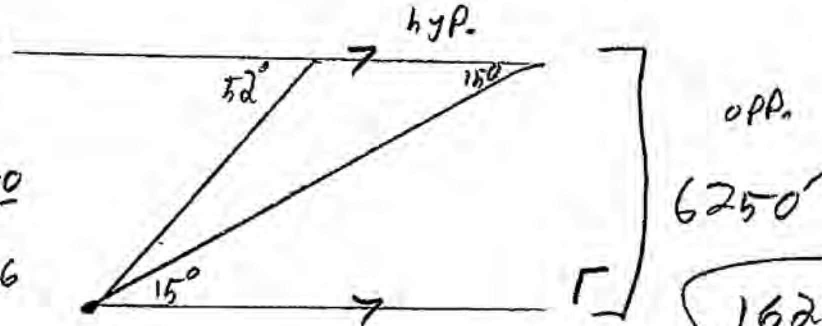
36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?

$\sin 15 = \frac{6250}{x}$

24148.1

$\sin 52 = \frac{6250}{x}$

7931.36



24148.1
7931.4
16216.7

16217 feet

Determine and state the speed of the airplane, to the *nearest mile per hour*.

1 mile = 5280 feet
1 hour = 60 minutes

16217 ft/min

$\frac{16217}{5280} = 3.0714$ ft/min

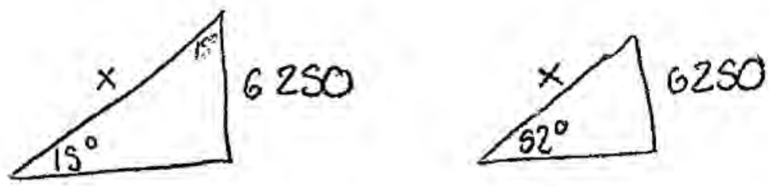
$3.0714 \cdot 60 = 184.824$

185 miles per hour

Score 3: The student made an error by using the sine function and made a transcription error.

Question 36

36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?



The airplane traveled 3,276 Ft

Determine and state the speed of the airplane, to the *nearest mile per hour*.

$\sin 15° = \frac{6250}{x}$

$\frac{6250}{\sin 15} = \frac{x \sin 15}{\sin 15}$

$\frac{6250}{\sin 15} = x$

$x = 9611$

$\sin 52° = \frac{6250}{x}$

$\frac{6250}{\sin 52} = \frac{x \sin 52}{\sin 52}$

$\frac{6250}{\sin 52} = x$

$x = 6335$

$\boxed{\text{The speed of the airplane is 196,560 per hour}}$

1 min = 60 sec
1 hour = 60 minutes

$3276 \times 60 = 196560$

Score 2: The student made one conceptual error by using the sine function and two other errors by using radian measure and not dividing by 5280.

Question 36

36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?

$\tan 15^\circ = \frac{6250}{6x}$

$0.27 = \frac{6250}{x}$

$\frac{x(0.27)}{0.27} = \frac{6250}{0.27}$

$x = 23148.15$

$\tan 52^\circ = \frac{x}{23148.15}$

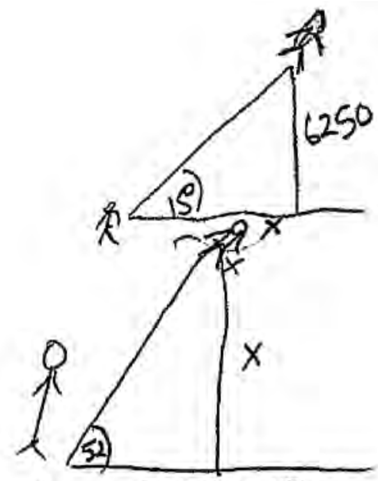
$1.28 = \frac{x}{23148.15}$

$29629.6 = x$

$ft = (29629.6 - 6250)$

$= 23379.6$

The airplane has traveled 23379.6 foot far.



Determine and state the speed of the airplane, to the *nearest mile per hour*.

minute = 29629.6 foot

60 " = (60 x 29629.6)

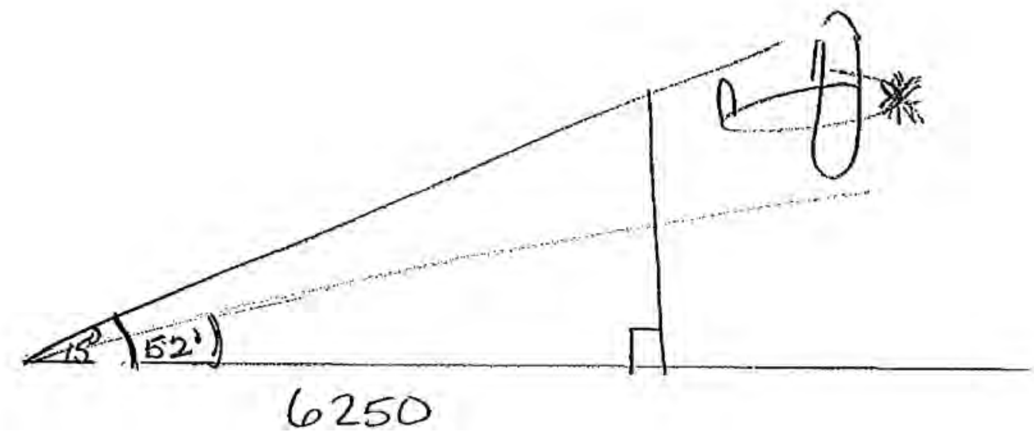
= 1777776

The nearest mile per hour is 1777776.

Score 1: The student wrote only one correct relevant trigonometric equation. No further correct work was shown.

Question 36

36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the *nearest foot*?



Determine and state the speed of the airplane, to the *nearest mile per hour*.

Score 0: The student had a completely incorrect response.