The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

# GEOMETRY

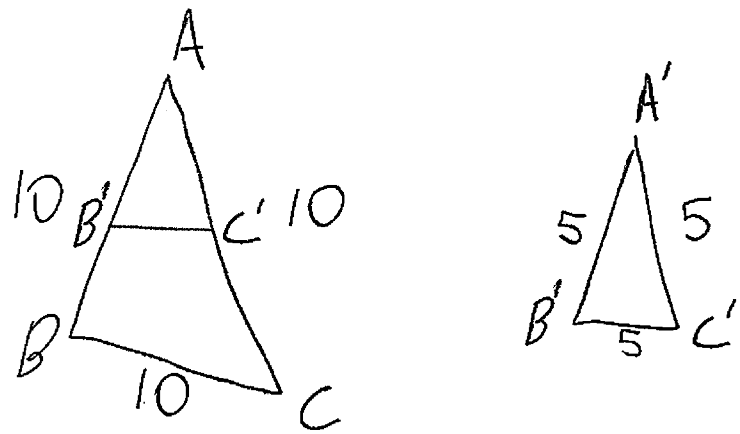
**Friday,** June 21, 2019 — 9:15 a.m. to 12:15 p.m.

## MODEL RESPONSE SET

### Table of Contents

## Question 25

**25** Triangle $A'B'C'$ is the image of triangle $ABC$ after a dilation with a scale factor of $\frac{1}{2}$ and centered at point $A$. Is triangle $ABC$ congruent to triangle $A'B'C'$? Explain your answer.




No $\Delta ABC$ isn't congruent to $\Delta A'B'C'$ becuse a dilation dosent preserve segment lengths

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

## Question 25

**25** Triangle $A'B'C'$ is the image of triangle $ABC$ after a dilation with a scale factor of $\frac{1}{2}$ and centered at point $A$. Is triangle $ABC$ congruent to triangle $A'B'C'$? Explain your answer.

no, they're not congruent b/c A'B'C' had a dilation of $\frac{1}{2}$ so the image will be a lot smaller than ABC. It will be the same shape but different size.

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

## Question 25

**25** Triangle $A'B'C'$ is the image of triangle $ABC$ after a dilation with a scale factor of $\frac{1}{2}$ and centered at point $A$. Is triangle $ABC$ congruent to triangle $A'B'C'$? Explain your answer.

No, dilations always produce similar triangles.

**Score 1:** The student wrote an incomplete explanation.

## Question 25

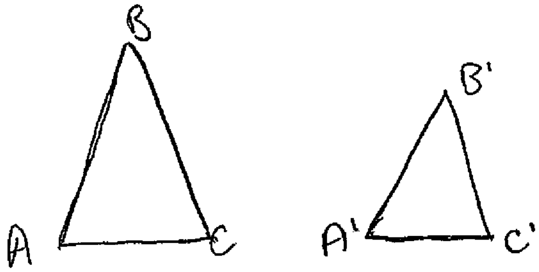
**25** Triangle $A'B'C'$ is the image of triangle $ABC$ after a dilation with a scale factor of $\frac{1}{2}$ and centered at point $A$. Is triangle $ABC$ congruent to triangle $A'B'C'$? Explain your answer.

No, a dilation is not a rigid motion.

**Score 1:** The student wrote an incomplete explanation.

## Question 25

**25** Triangle $A'B'C'$ is the image of triangle $ABC$ after a dilation with a scale factor of $\frac{1}{2}$ and centered at point $A$. Is triangle $ABC$ congruent to triangle $A'B'C'$? Explain your answer.




Yes $\triangle ABC$ is $\cong$ to $\triangle A'B'C'$ by $\cancel{A}$AA.

**Score 0:** The student gave a completely incorrect response.

## Question 26

**26** Determine and state the area of triangle *PQR*, whose vertices have coordinates $P(-2,-5)$, $Q(3,5)$, and $R(6,1)$.

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

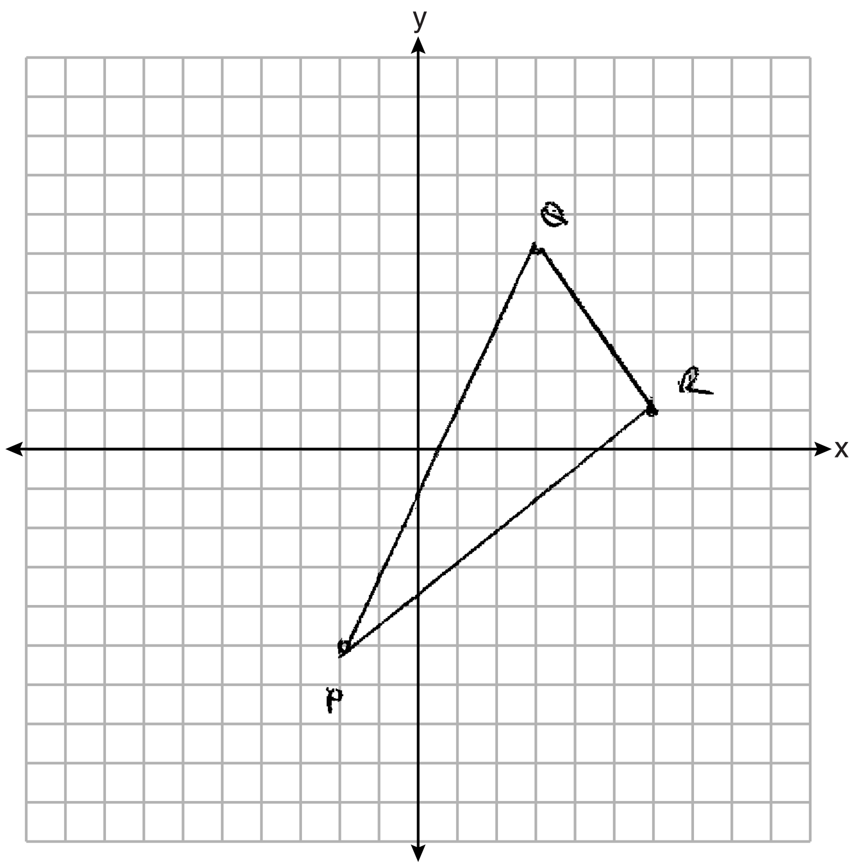
$m\overline{QR} = \frac{-4}{3}$

$m\overline{PR} = \frac{6}{8} = \frac{3}{4}$ $\perp$

$QR = \sqrt{3^2 + (-4)^2} = \sqrt{25} = 5$

$PR = \sqrt{8^2 + 6^2} = \sqrt{100} = 10$

$A = \frac{1}{2}(5)(10) = 25$




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

## Question 26

**26** Determine and state the area of triangle $PQR$, whose vertices have coordinates $P(-2,-5)$, $Q(3,5)$, and $R(6,1)$.

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

Total $= 10 \cdot 8 = 80$

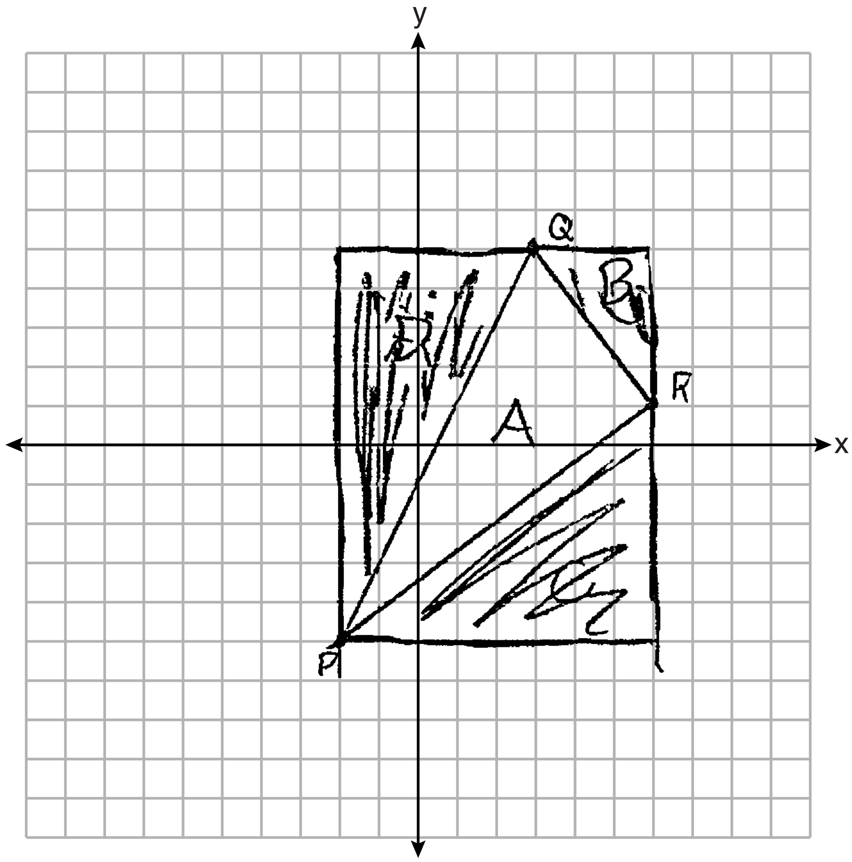
$B = \frac{1}{2}(3 \cdot 4)$
$= 6$

$C = \frac{1}{2}(6 \cdot 8)$
$= 24$

$D = \frac{1}{2}(5 \cdot 10)$
$= 25$

$A = 80 - 55$

$\triangle PQR = 25$

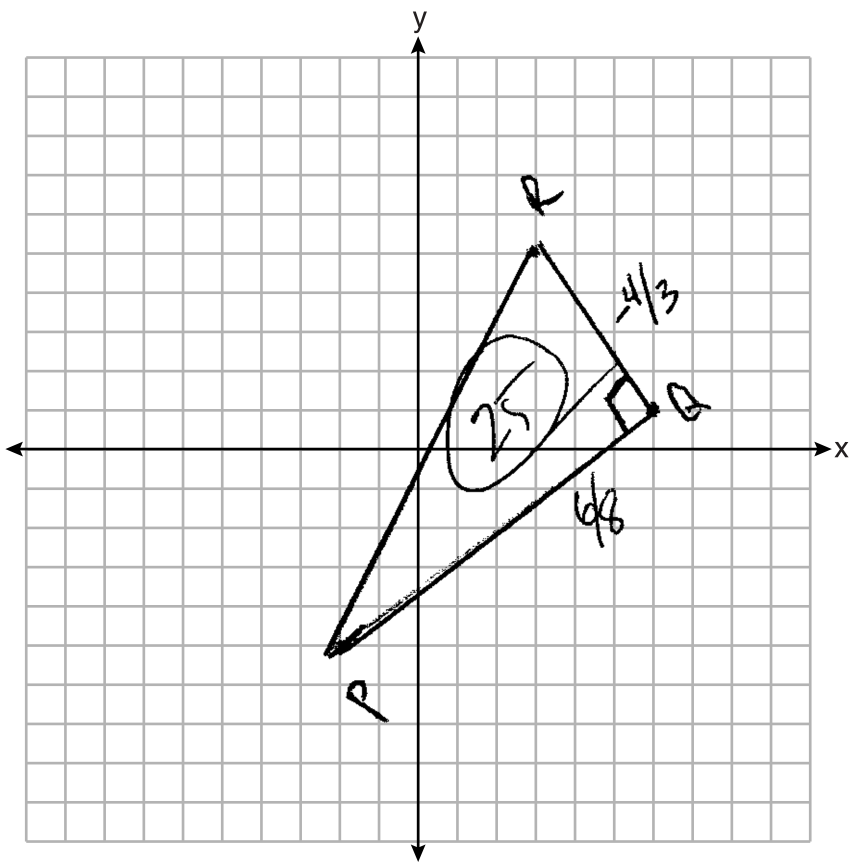



**Score 2:** The student gave a complete and correct response.

## Question 26

**26** Determine and state the area of triangle $PQR$, whose vertices have coordinates $P(-2,-5)$, $Q(3,5)$, and $R(6,1)$.

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




**Score 1:** The student did not show work to determine the lengths of $\overline{QR}$ and $\overline{PR}$.

## Question 26

**26** Determine and state the area of triangle $PQR$, whose vertices have coordinates $P(-2,-5)$, $Q(3,5)$, and $R(6,1)$.

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

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

PQ $\sqrt{(-2-3)^2+(5-5)^2} = 15$

Pr $\sqrt{(-2-6)^2+(5-1)^2} = 58$

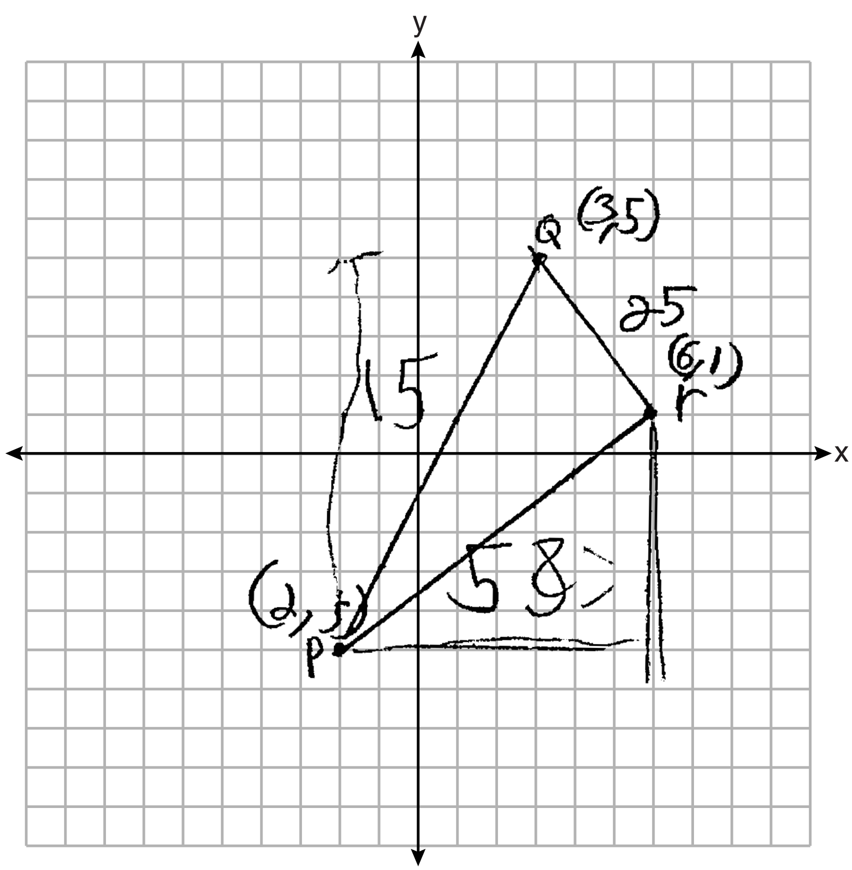
Qr $\sqrt{(3-6)^2+(5-1)^2} = 25$

$\boxed{a = 1450}$

5x10

1/2 bh

1/2 (25)(58)

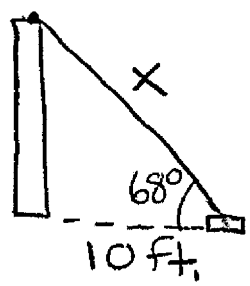



58x15
870
$\boxed{435}$

6x8

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

**27** A support wire reaches from the top of a pole to a clamp on the ground. The pole is perpendicular to the level ground and the clamp is 10 feet from the base of the pole. The support wire makes a 68° angle with the ground. Find the length of the support wire to the *nearest foot*.




$$\cos = \frac{A}{H}$$

$$\frac{\cos(68)}{1} = \frac{10}{x}$$

$$\frac{\cos(68)x}{\cos(68)} = \frac{10}{\cos(68)}$$

$$x = 26.69467163$$

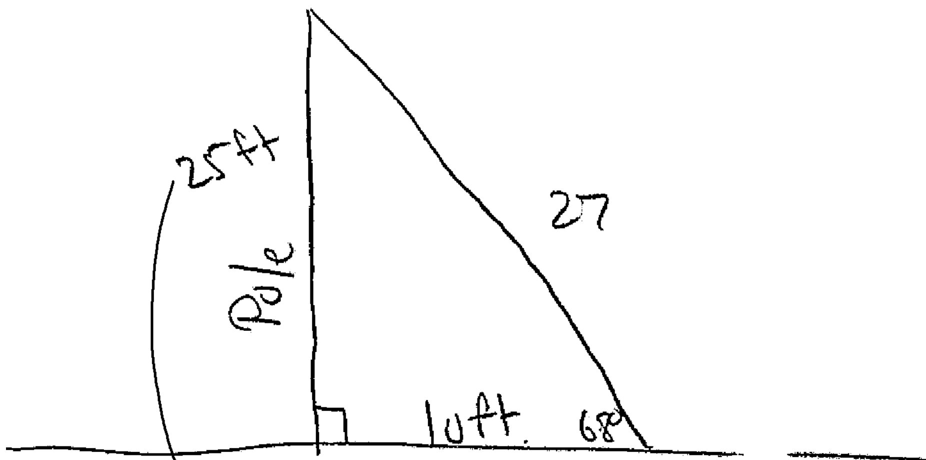
$$\boxed{\text{support wire} = 27 \text{ ft.}}$$

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

## Question 27

**27** A support wire reaches from the top of a pole to a clamp on the ground. The pole is perpendicular to the level ground and the clamp is 10 feet from the base of the pole. The support wire makes a 68° angle with the ground. Find the length of the support wire to the *nearest foot*.

$S\frac{o}{h}\ C\frac{a}{h}\ T\frac{o}{a}$




$$\frac{\tan 68°}{1} = \frac{x}{10}$$

$x = 24.75$

$10^2 + 24.75^2 = c^2$

$100 + 612.5625 = c^2$

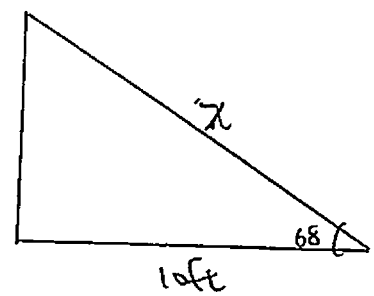
$712.5625 = c^2$

$c = 27$

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

## Question 27

**27** A support wire reaches from the top of a pole to a clamp on the ground. The pole is perpendicular to the level ground and the clamp is 10 feet from the base of the pole. The support wire makes a 68° angle with the ground. Find the length of the support wire to the *nearest foot*.




$\cos 68° = \frac{10}{x}$

$\cos 68 \cdot 10 = x$

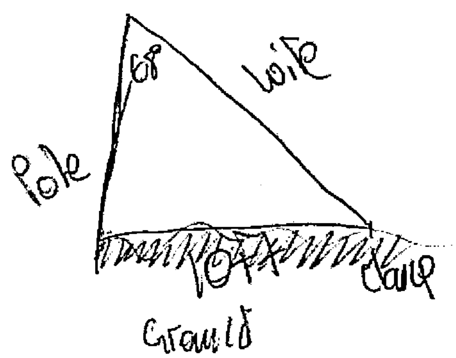
$4 \approx x$

4 feet

**Score 1:** The student wrote a correct trigonometric equation to find the length of the support wire, but no further correct work was shown.

## Question 27

**27** A support wire reaches from the top of a pole to a clamp on the ground. The pole is perpendicular to the level ground and the clamp is 10 feet from the base of the pole. The support wire makes a 68° angle with the ground. Find the length of the support wire to the *nearest foot*.




$$\frac{\sin(68)}{1} = \frac{10}{x}$$

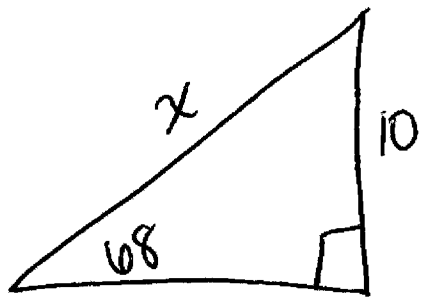
$$\frac{x\sin(68)}{\sin(68)} = \frac{10}{\sin(68)}$$

$$x \approx 11\text{ft}$$

the wire to the clamp is approximately 11ft.

**Score 1:** The student showed appropriate work based on an incorrect location of the angle of elevation.

**27** A support wire reaches from the top of a pole to a clamp on the ground. The pole is perpendicular to the level ground and the clamp is 10 feet from the base of the pole. The support wire makes a 68° angle with the ground. Find the length of the support wire to the *nearest foot*.




$$\sin 68 = \frac{10}{x}$$

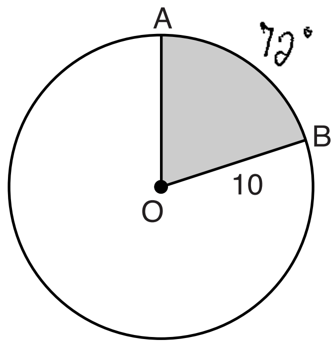
$$x = \frac{10}{\sin 68}$$

$x = 10.8$ feet

**Score 0:** The student labeled the diagram incorrectly and did not round the answer to the nearest foot.

## Question 28

**28** In the diagram below, circle $O$ has a radius of 10.




If m$\overset{\frown}{AB}$ = 72°, find the area of shaded sector $AOB$, in terms of $\pi$.

$$\frac{72}{360} = \frac{x}{100\pi}$$

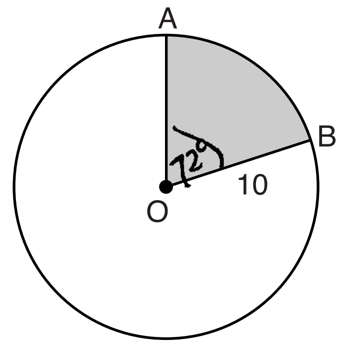
$$7200\pi = 360x$$

$$20\pi = x$$

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

## Question 28

**28** In the diagram below, circle $O$ has a radius of 10.




If m$\widehat{AB}$ = 72°, find the area of shaded sector $AOB$, in terms of $\pi$.

$$\frac{72}{360} = \frac{1}{5}$$

Area circle $= \pi r^2$

$= \pi 10^2$

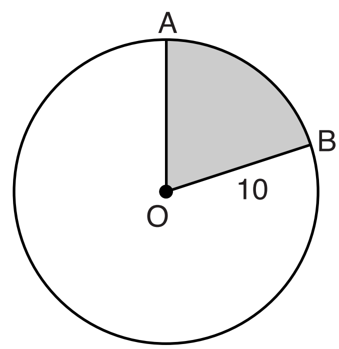
$A = 100\pi$

$$\frac{1}{5}(100\pi) = \boxed{20\pi}$$

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

## Question 28

**28** In the diagram below, circle $O$ has a radius of 10.




If m$\widehat{AB}$ = 72°, find the area of shaded sector $AOB$, in terms of π.

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

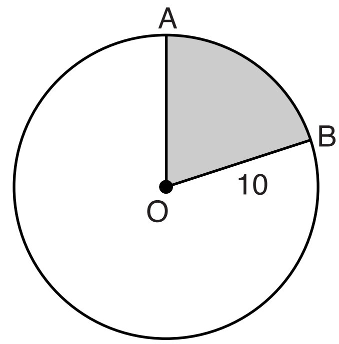
$$A_{sector} = \frac{72}{360}\pi 100$$

$$A_{sector} = 62.8$$

**Score 1:** The student wrote an appropriate answer, but not in terms of π.

## Question 28

**28** In the diagram below, circle $O$ has a radius of 10.




If $m\widehat{AB} = 72°$, find the area of shaded sector $AOB$, in terms of $\pi$.

$C = 2\pi r$

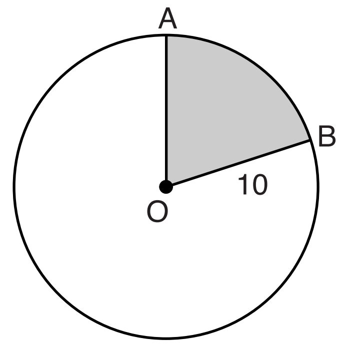
$C = 2\pi(10)$

$C = 20\pi$

**Score 0:** The student gave a correct response that was obtained by an incorrect procedure.

## Question 28

**28** In the diagram below, circle $O$ has a radius of 10.




If m$\overset{\frown}{AB}$ = 72°, find the area of shaded sector $AOB$, in terms of $\pi$.

$A = \pi r^2$

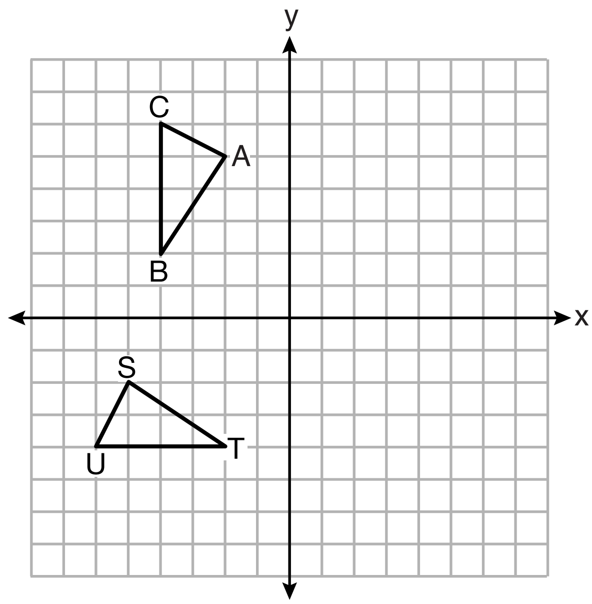
$A = \pi 10^2$

$A = \pi 100$

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

## Question 29

**29** On the set of axes below, $\triangle ABC \cong \triangle STU$.



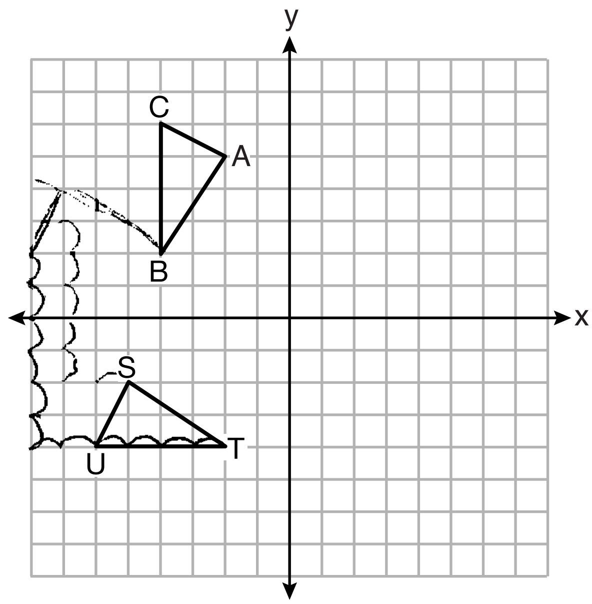

Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle STU$.

A rotation of 90° counter clockwise about The origin.

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

## Question 29

**29** On the set of axes below, $\triangle ABC \cong \triangle STU$.



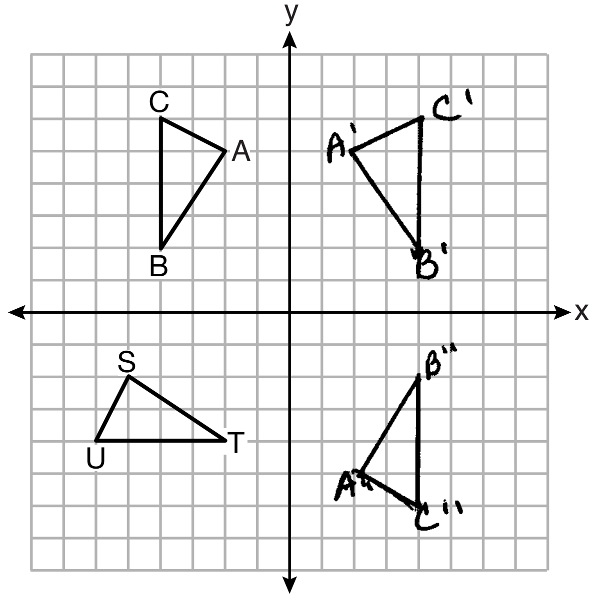

Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle STU$.

To map $\Delta ABC$ onto $\Delta STU$ first it needs to rotate 90° counterclockwise from (-4, 2), next translate 6 units down and then 2 units right.

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

## Question 29

**29** On the set of axes below, $\triangle ABC \cong \triangle STU$.



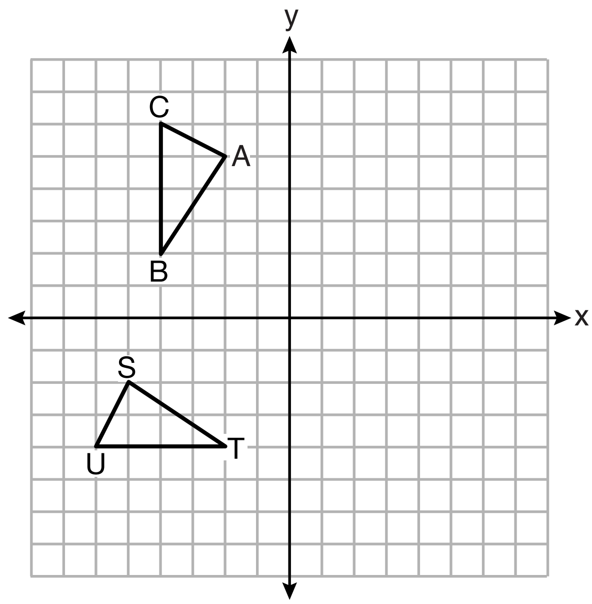

Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle STU$.

Reflect $\triangle ABC$ over the y-axis, then reflect the image over the x-axis, then rotate around the origin 90° clockwise onto $\triangle STU$.

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

## Question 29

**29** On the set of axes below, $\triangle ABC \cong \triangle STU$.



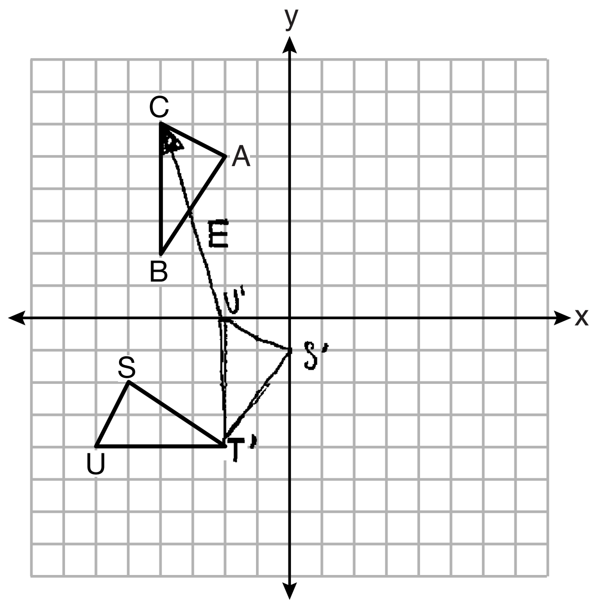

Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle STU$.

A counter-clockwise rotation $90°$

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

## Question 29

**29** On the set of axes below, $\triangle ABC \cong \triangle STU$.



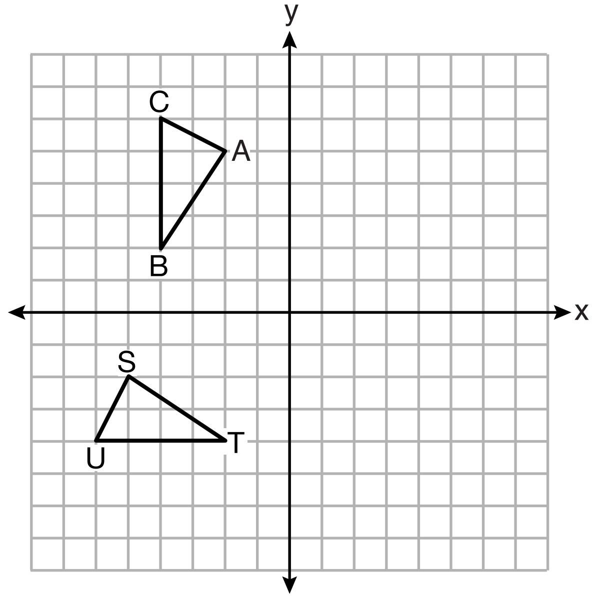

Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle STU$.

1.) Rotate $\Delta STU$ 90° clockwise around point T
2.) Translate $\Delta S'T'U'$ along vector $\overrightarrow{U'C}$ until it maps on to $\Delta ABC$

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

## Question 29

**29** On the set of axes below, $\triangle ABC \cong \triangle STU$.



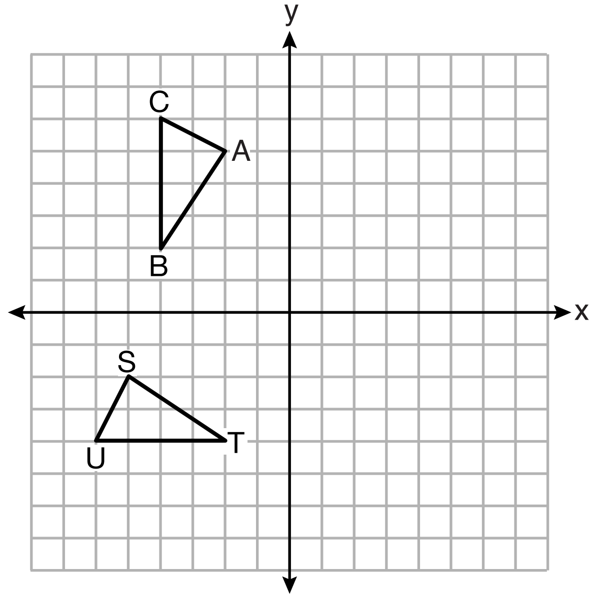

Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle STU$.

COUNTER CLOCKWISE ROTATION

**Score 0:** The student did not state the number of degrees in the rotation and did not state the center of rotation.

## Question 29

**29** On the set of axes below, $\triangle ABC \cong \triangle STU$.



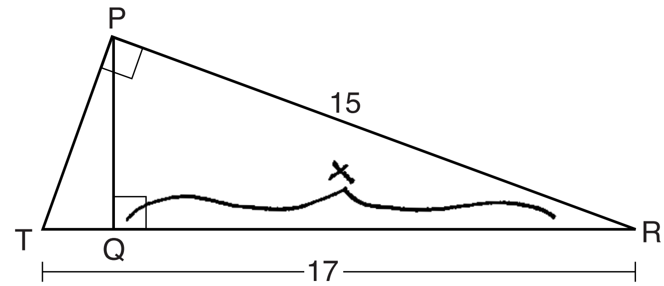

Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle STU$.

$\triangle$ABC rotated clockwise on point c and did a translation of (2, -6).

**Score 0:** The student did not state the number of degrees in the rotation and wrote an incorrect translation from point $C$.

## Question 30

**30** In right triangle $PRT$, $m\angle P = 90°$, altitude $\overline{PQ}$ is drawn to hypotenuse $\overline{RT}$, $RT = 17$, and $PR = 15$.




Determine and state, to the *nearest tenth*, the length of $\overline{RQ}$.

$$\frac{h}{LL} = \frac{h}{LL}$$

$$\overline{RQ} = 13.2$$

$$\frac{17}{15} = \frac{15}{x}$$

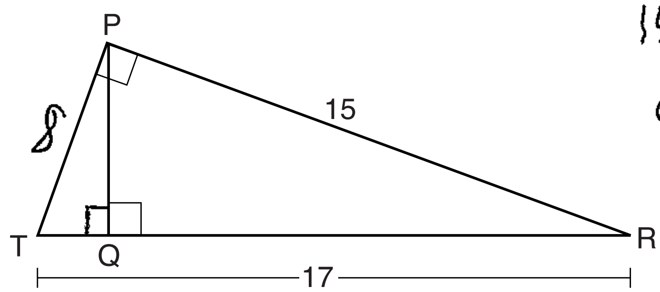
$$\frac{17x = 225}{17}$$

$$x = 13.235 \approx 13.2$$

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

## Question 30

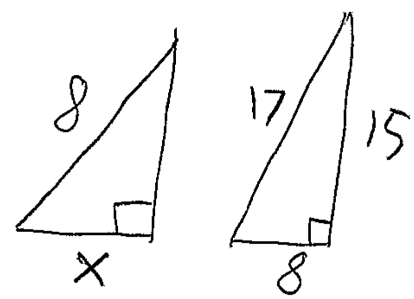
**30** In right triangle $PRT$, $m\angle P = 90°$, altitude $\overline{PQ}$ is drawn to hypotenuse $\overline{RT}$, $RT = 17$, and $PR = 15$.




$15^2 + x^2 = 17^2$

$64$

Determine and state, to the *nearest tenth*, the length of $\overline{RQ}$.




$\frac{8}{17} = \frac{x}{8}$

$\frac{17x}{17} = \frac{64}{17}$

$x = 3.76471$

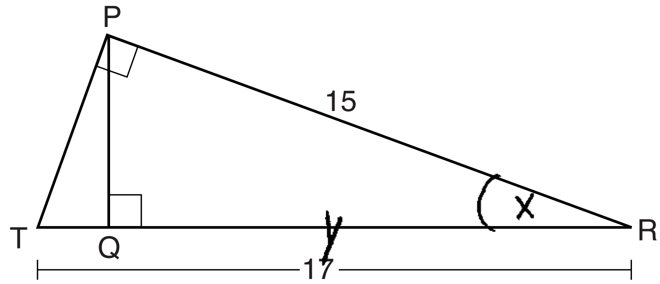
$17 - 3.76471$

$\overline{RQ} = 13.2$ units

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

## Question 30

**30** In right triangle $PRT$, m$\angle P = 90°$, altitude $\overline{PQ}$ is drawn to hypotenuse $\overline{RT}$, $RT = 17$, and $PR = 15$.




Determine and state, to the *nearest tenth*, the length of $\overline{RQ}$.

$\cos X = \frac{15}{17}$

$X = \cos^{-1}\left(\frac{15}{17}\right)$

$x = 28.07248694$

$\cos(28.07248694) = \frac{y}{15}$

$y = 15 \cdot \cos(28.07248694)$

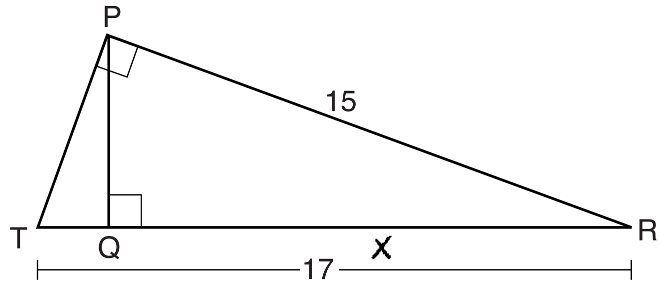
$y = 13.23529412$

13.2

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

## Question 30

**30** In right triangle $PRT$, $m\angle P = 90°$, altitude $\overline{PQ}$ is drawn to hypotenuse $\overline{RT}$, $RT = 17$, and $PR = 15$.




Determine and state, to the *nearest tenth*, the length of $\overline{RQ}$.

$$\frac{17}{15} = \frac{15}{x}$$

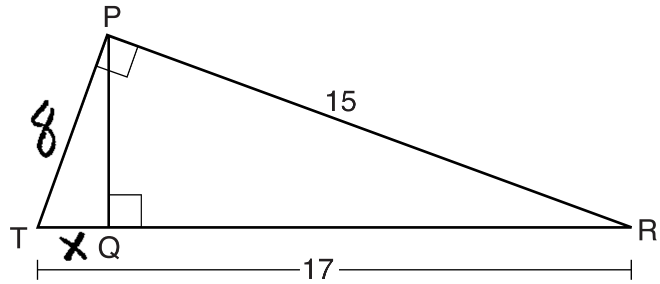
$$\frac{15x}{15} = \frac{255}{15}$$

$$x = 17$$

**Score 1:** The student wrote a correct proportion to solve for $RQ$, but no further correct work was shown.

## Question 30

**30** In right triangle $PRT$, $m\angle P = 90°$, altitude $\overline{PQ}$ is drawn to hypotenuse $\overline{RT}$, $RT = 17$, and $PR = 15$.




Determine and state, to the *nearest tenth*, the length of $\overline{RQ}$.

$\{8, 15, 17\}$ triple

HLLS

$$\frac{17}{8} = \frac{15}{x}$$

$$\frac{\cancel{17}x}{\cancel{17}} = \frac{129}{17}$$

$17 - 7.0588$

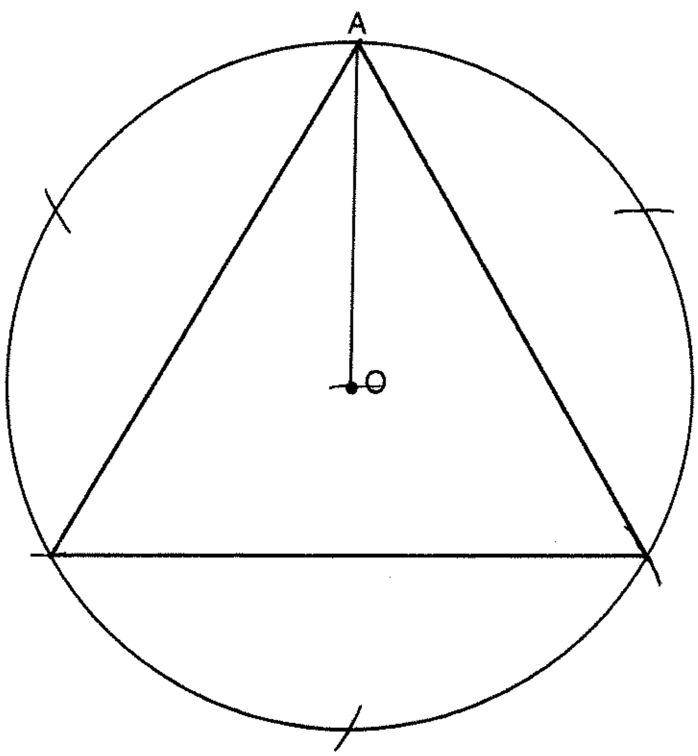
$x = 7.0588$

$$\boxed{9.9412 = QR}$$

**Score 0:** The student wrote an incorrect proportion to solve for $TQ$, then made a rounding error.

## Question 31

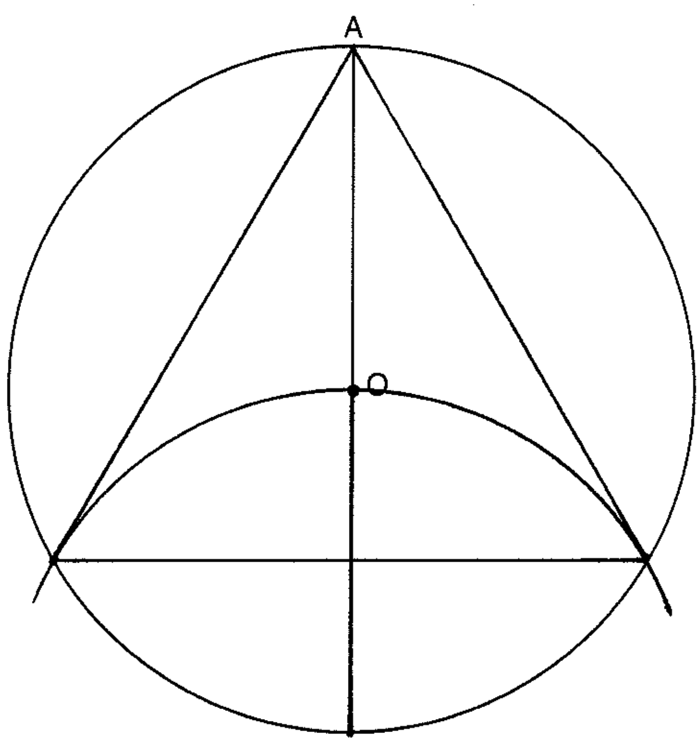
**31** Given circle $O$ with radius $\overline{OA}$, use a compass and straightedge to construct an equilateral triangle inscribed in circle $O$. [Leave all construction marks.]




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

## Question 31

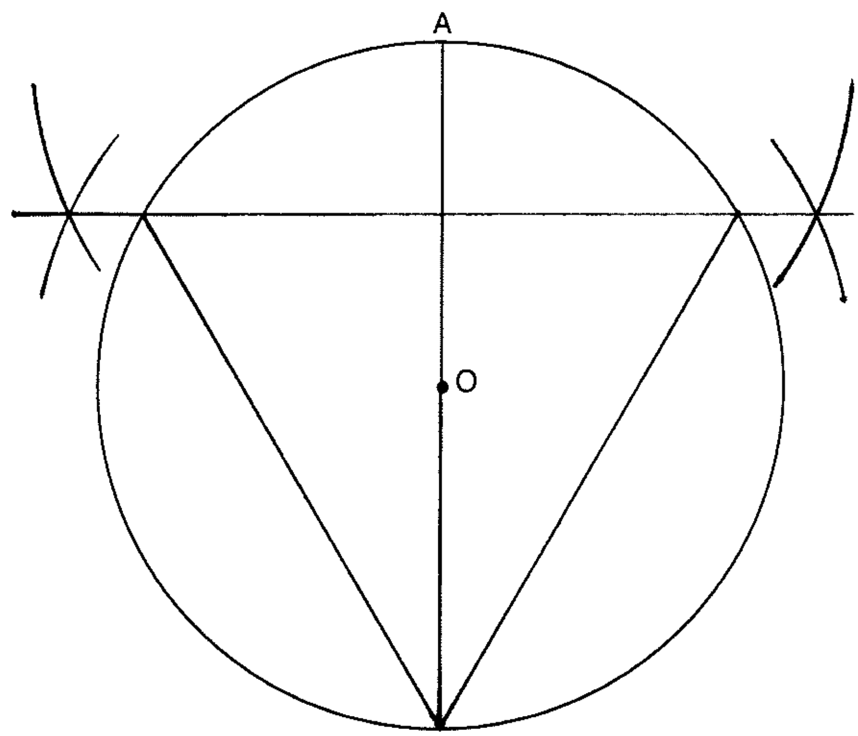
**31** Given circle $O$ with radius $\overline{OA}$, use a compass and straightedge to construct an equilateral triangle inscribed in circle $O$. [Leave all construction marks.]




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

## Question 31

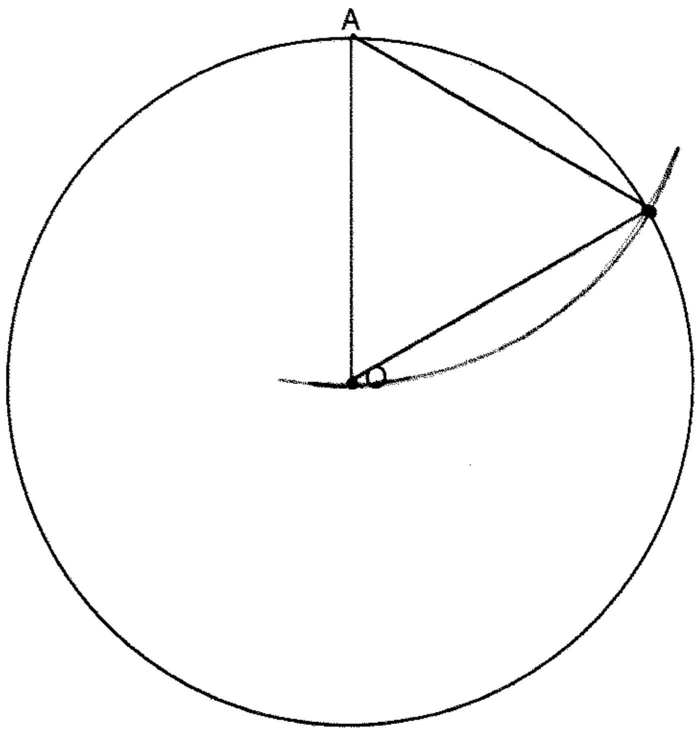
**31** Given circle $O$ with radius $\overline{OA}$, use a compass and straightedge to construct an equilateral triangle inscribed in circle $O$. [Leave all construction marks.]




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

## Question 31

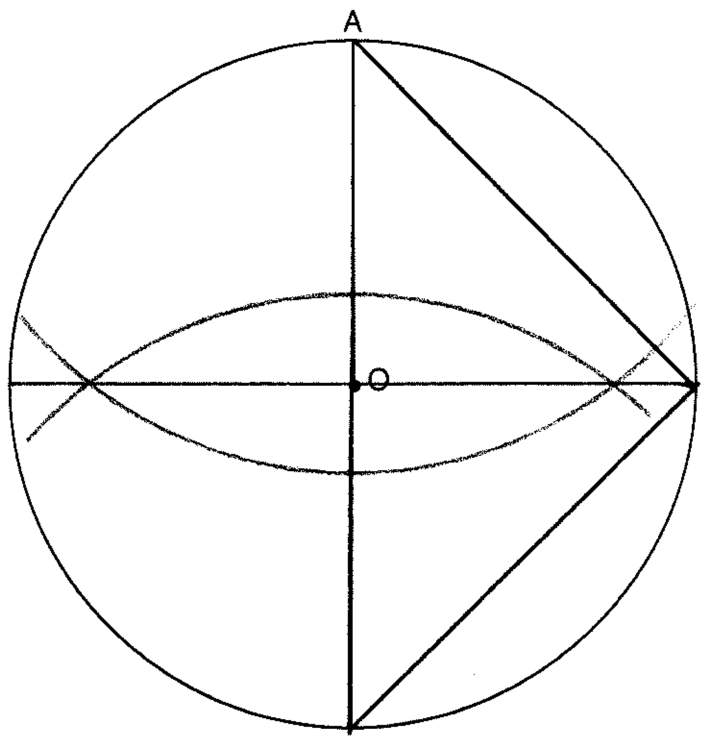
**31** Given circle $O$ with radius $\overline{OA}$, use a compass and straightedge to construct an equilateral triangle inscribed in circle $O$. [Leave all construction marks.]




**Score 1:** The student constructed an equilateral triangle, but it was not inscribed in circle $O$.

## Question 31

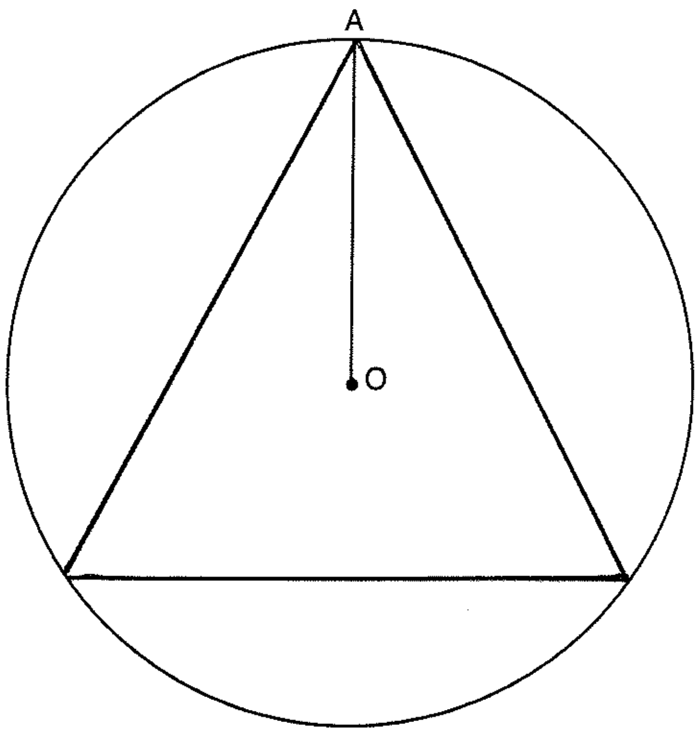
**31** Given circle $O$ with radius $\overline{OA}$, use a compass and straightedge to construct an equilateral triangle inscribed in circle $O$. [Leave all construction marks.]




**Score 1:** The student constructed an inscribed isosceles right triangle.

## Question 31

**31** Given circle $O$ with radius $\overline{OA}$, use a compass and straightedge to construct an equilateral triangle inscribed in circle $O$. [Leave all construction marks.]




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

## Question 32

**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral.
Prove that Riley's quadrilateral $ABCD$ is a trapezoid.
[The use of the set of axes on the next page is optional.]

$$m_{AD} = \frac{0-6}{1--1} = \frac{-6}{2} = \frac{-3}{1}$$

$$m_{BC} = \frac{-1-8}{6-3} = \frac{-9}{3} = \frac{-3}{1}$$

$$\overline{AD} \parallel \overline{BC}$$

Riley's quadrilateral ABCD is a trapezoid because it has a pair of parallel sides.

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

Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that $ABCD$ is *not* an isosceles trapezoid.

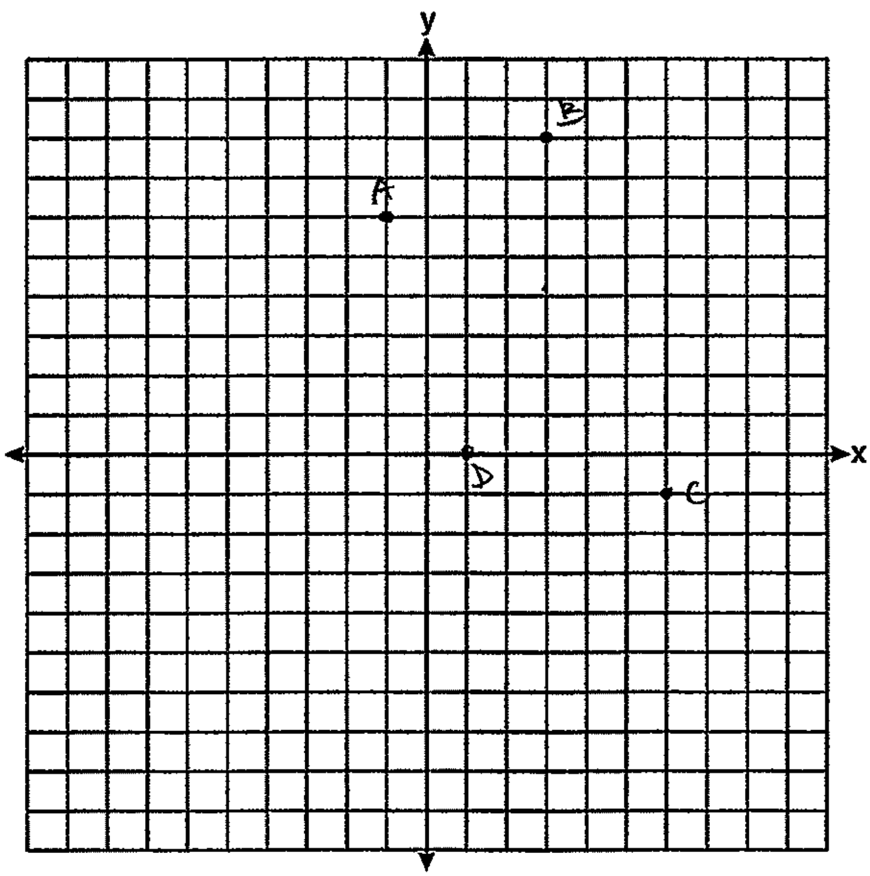
$-1, 6$
$3, 8$

$6, -1$
$1, 0$

$AC = \sqrt{(-1-6)^2 + (6--1)^2} \approx 9.899$

$BD = \sqrt{(8-0)^2 + (3-1)^2} \approx 8.246$

ABCD is not an isosceles trapezoid because its diagonals aren't congruent.
$9.899 \neq 8.246$



## Question 32

**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral. Prove that Riley's quadrilateral $ABCD$ is a trapezoid.

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

$m\overline{AB} = \frac{2}{4}$

$m\overline{BC} = \frac{9}{-3} = \frac{-3}{1}$

$m\overline{CD} = \frac{-1}{5}$

$m\overline{AD} = \frac{-6}{2} = \frac{-3}{1}$

Not same slope $\therefore$ Not // sides

Same slope $\therefore$ // sides

Since there is only 1 pair of opp sides //, Quad ABCD is a trapezoid.

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

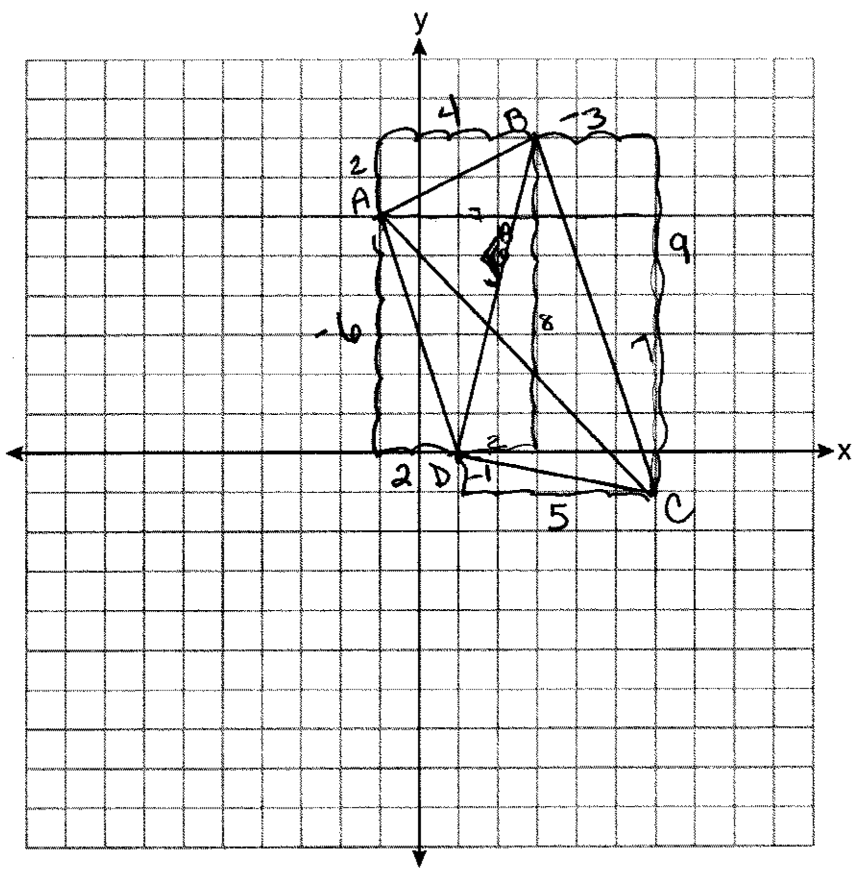
Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that *ABCD* is *not* an isosceles trapezoid.

$d\,\overline{DB} = \sqrt{68}$

$d\,\overline{AC} = \sqrt{98}$

diagonals have different dist.
$\therefore$ They are not $\cong$.

Trap ABCD is Not Isosceles



**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral.

Prove that Riley's quadrilateral $ABCD$ is a trapezoid.

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

Plan: Show that ABCD is a trapezoid by proving that it's bases are //

Slope of $\overline{AD} = \frac{6-0}{-1-1} = \frac{6}{-2} = -3$

Slope of $\overline{BC} = \frac{8--1}{3-6} = \frac{9}{-3} = -3$

$-3 = -3$

$\therefore \overline{AD} \parallel \overline{BC}$ b/c equal slopes yeild // lines and ABCD is a trapezoid b/c it is a quadrilateral w/ at least one pair of opp. sides $\parallel$.

**Score 3:** The student made a computational error in determining the length of diagonal $\overline{BD}$.

Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that *ABCD* is *not* an isosceles trapezoid.

Plan: Prove that ABCD is not an isosceles trapezoid by showing that the diagonals are not =

$AC = \sqrt{(-1-6)^2+(6--1)^2}$

$AC = \sqrt{49+49}$

$AC = \sqrt{98}$

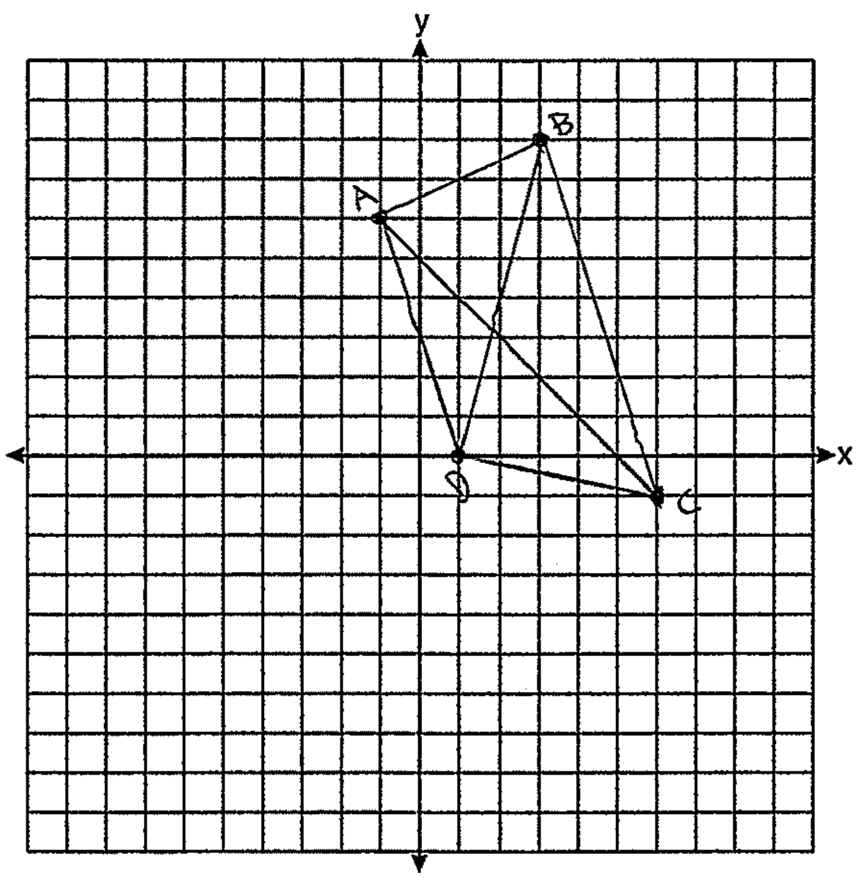
$BD = \sqrt{(3-1)^2+(8-0)^2}$

$= \sqrt{4+64}$

$= \sqrt{70}$

$\sqrt{98} \neq \sqrt{70}$

∴ ABCD is not isosceles b/c it's diagonals are not ≅



## Question 32

**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral.

Prove that Riley's quadrilateral $ABCD$ is a trapezoid.

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

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

$m\overline{BC} = \frac{-1-8}{6-3} = \frac{-9}{3} = \boxed{-3}$

$m\overline{AD} = \frac{0-6}{1-(-1)} = \frac{-6}{2} = \boxed{-3}$

$m\overline{BC} = m\overline{AD}$

$\therefore \boxed{\overline{BC} \parallel \overline{AD}}$

ABCD is a trapezoid because it has one pair of parallel sides.

**Score 2:** The student correctly proved quadrilateral *ABCD* is a trapezoid, but no further correct work is shown.

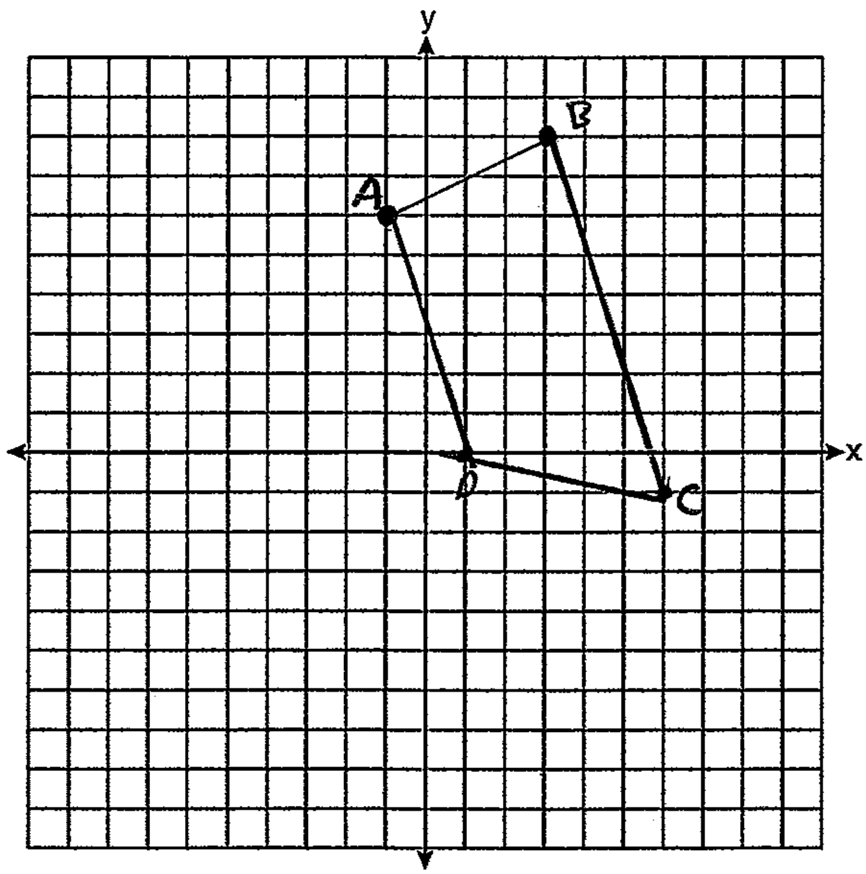
Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that *ABCD* is *not* an isosceles trapezoid.

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

$D_{\overline{AB}} = \sqrt{(3-(-1))^2 + (8-6)^2}$

$D_{\overline{AD}} = \sqrt{4^2 + 2^2} = \sqrt{16+4} = \boxed{\sqrt{20}}$

$D_{\overline{CD}} = \sqrt{\phantom{x}}$



## Question 32

**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral.

Prove that Riley's quadrilateral $ABCD$ is a trapezoid.

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

$\overline{AD} \cong \overline{BC} \rightarrow$ if lines are $\parallel$, then sides are $\cong$

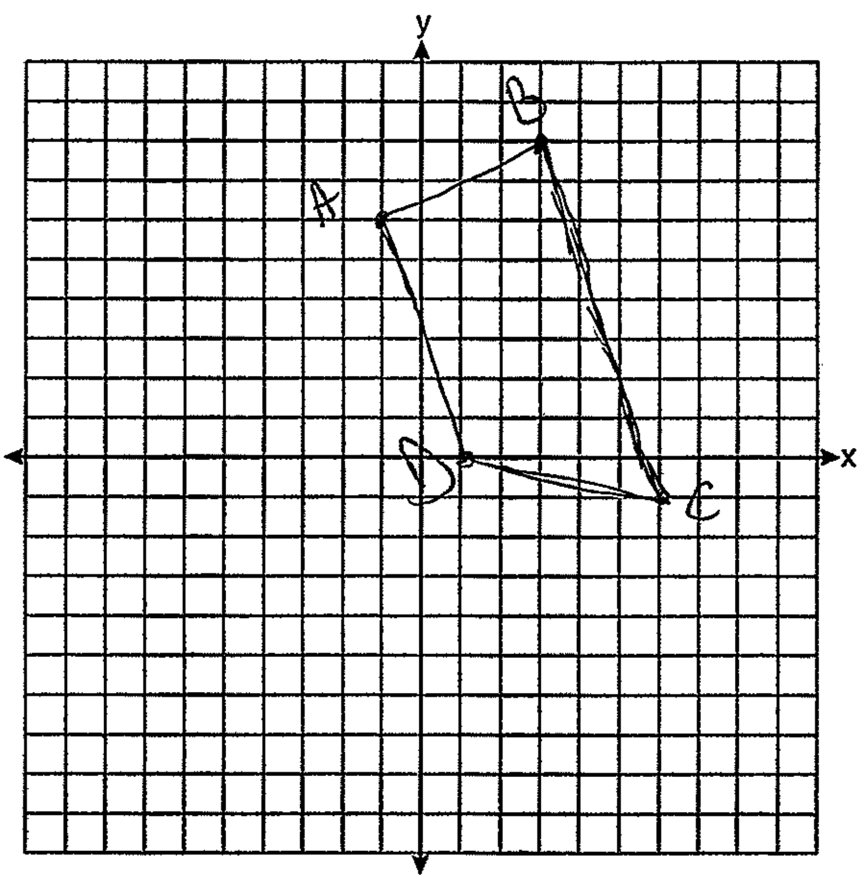
**Score 2:** The student correctly proved the diagonals are not congruent, so quadrilateral *ABCD* is not an isosceles trapezoid.

Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that *ABCD* is *not* an isosceles trapezoid.

$AC = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$= \sqrt{(6+1)^2+(-1-6)^2}$
$= \sqrt{49+49}$
$= \sqrt{98} = 9.8994\ldots$

$BD = \sqrt{(3-1)^2+(8-0)^2}$
$= \sqrt{4+64}$
$= \sqrt{68} = 8.2462\ldots$

Not isosceles due to distances not being equal



## Question 32

**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral. Prove that Riley's quadrilateral $ABCD$ is a trapezoid.

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

$m = \frac{\text{rise}}{\text{run}}$

$m_{\overline{AD}} = \frac{-6}{2} = -\frac{3}{1}$

$m_{\overline{AD}} = m_{\overline{BC}}$

$m_{\overline{BC}} = -\frac{9}{3} = -\frac{3}{1}$

**Score 2:** Appropriate work is shown, but both concluding statements are missing.

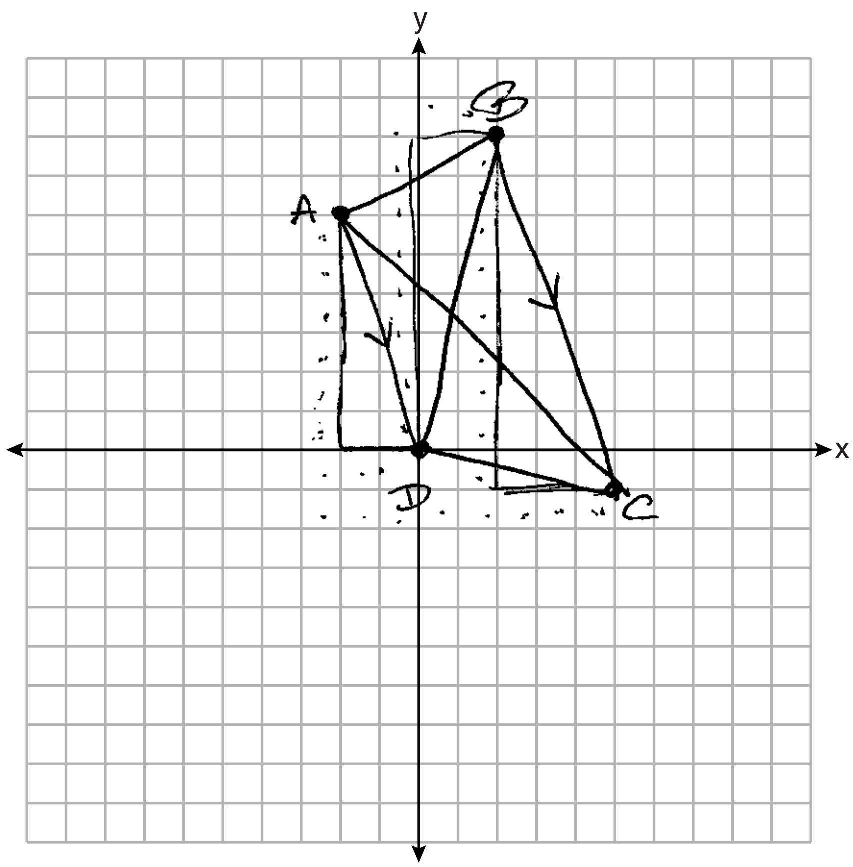
## Question 32 continued

Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that *ABCD* is *not* an isosceles trapezoid.

$d_{\overline{AC}} = \sqrt{7^2 + 7^2} = \sqrt{98}$

$d_{\overline{AC}} \neq d_{\overline{BD}}$

$d_{\overline{BD}} = \sqrt{8^2 + 2^2} = \sqrt{68}$



## Question 32

**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral.

Prove that Riley's quadrilateral $ABCD$ is a trapezoid.

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

$AD = \frac{0-6}{1+1} = \frac{-6}{2} = -3$

Slope of AD is −3

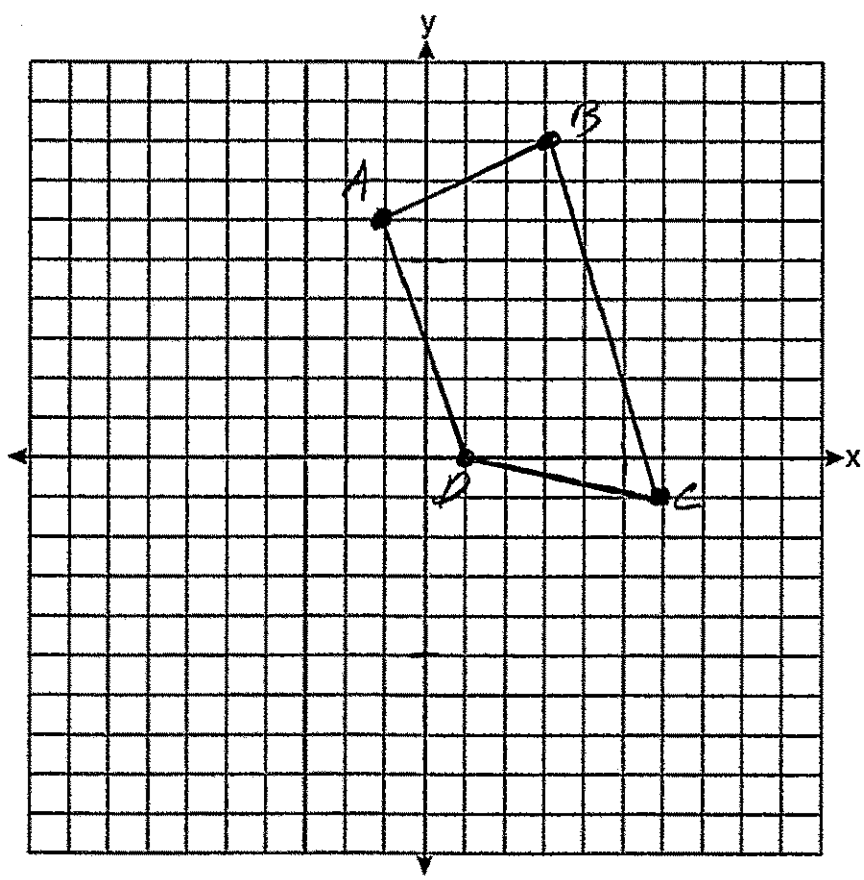
Slope of BC is also −3

$BC = \frac{-1-8}{6-3} = \frac{-9}{3} = -3$

has one set of parallel lines

**Score 1:** The student found the slopes of bases $\overline{AD}$ and $\overline{BC}$, but the concluding statement is incomplete. No further correct work is shown.

Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that *ABCD* is *not* an isosceles trapezoid.



## Question 32

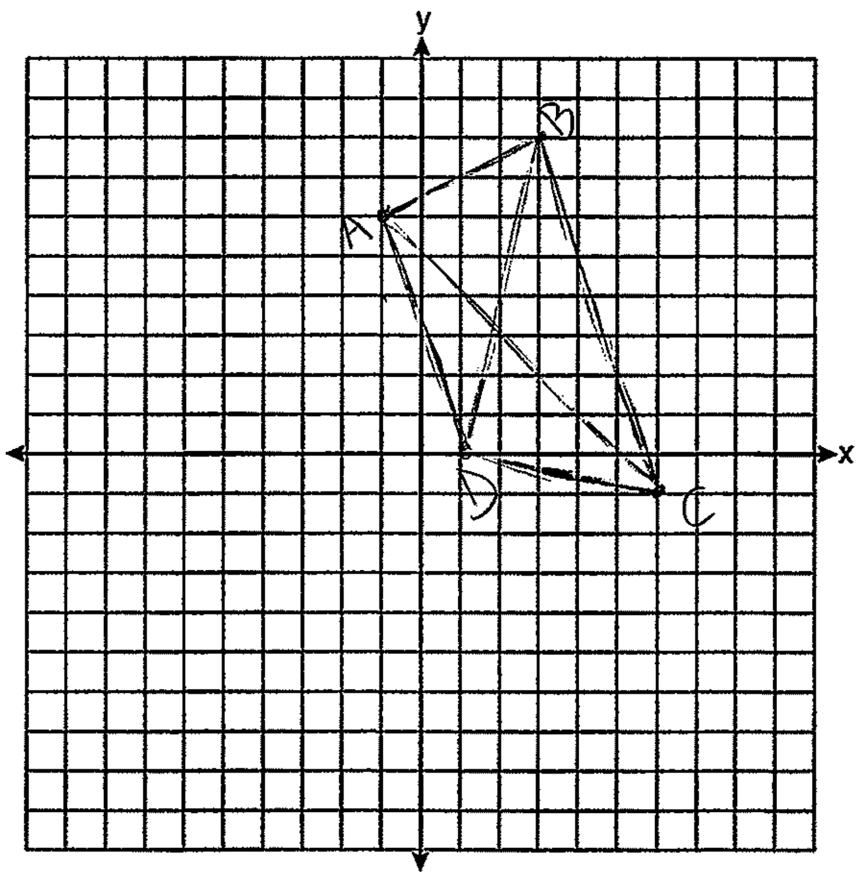
**32** Riley plotted $A(-1,6)$, $B(3,8)$, $C(6,-1)$, and $D(1,0)$ to form a quadrilateral.
Prove that Riley's quadrilateral $ABCD$ is a trapezoid.
[The use of the set of axes on the next page is optional.]

Quadrilateral ABCD is a trapezoid

4 sides
One set of parallel lines

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

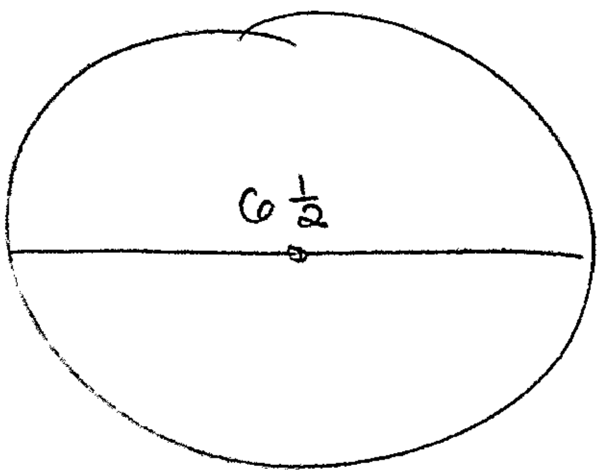
Riley defines an isosceles trapezoid as a trapezoid with congruent diagonals. Use Riley's definition to prove that *ABCD* is *not* an isosceles trapezoid.




Both diagonals have different slopes so they are not congruent, therefore it cannot be an isosceles trapezoid.

## Question 33

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.




$V = \pi\, 3.25^2 \times \frac{2}{3}$

Volume of water $= 22.12$

$\approx 22$

height : 12"

depth : $\frac{2}{3}$ of a foot

One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

$7.48 \times 22.12$

$= 165.45$

$\approx 165$ gallons

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

## Question 33

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.

$V = Bh$

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

$V = 33.18\ ft^3 \times \frac{2}{3} = 22\ ft^3$

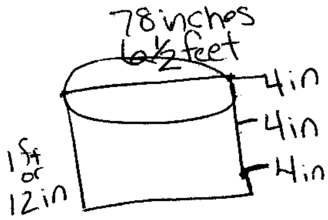
One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

$22 \cdot 7.48 = 165\ gl$

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

## Question 33

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.




$V = \pi r^2 h$

$V = \pi 39^2 \cdot 12$

$V = \pi 1521 \cdot 12$

$V = 18252\pi$

$V = \frac{57340.34911}{3}$

$19113.4497 \cdot 2 =$

$38226.89941 \text{ in}^3$

$\frac{38226.89941}{12} =$

$3185.57495$

$3186 \text{ ft}^3$

One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

$3186 * 7.48 = 23831.28$

23,831 gallons

**Score 3:** The student made an error in converting cubic inches into cubic feet.

## Question 33

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.

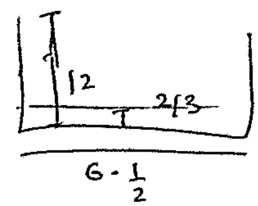
Volume of cylinder $= \pi r^2 h$

$\frac{\text{diameter}}{2} = \text{radius}$

$\frac{6.5}{2} = 3.25$

Volume $= \pi (3.5)^2 \cdot \left(\frac{2}{3}\right)$

$= 26 \cdot \text{feet}^3$




The volume of water is 26 feet$^3$

One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

$1 = 7.48$

$x =$

$\frac{7.48}{1} = \frac{x}{26}$

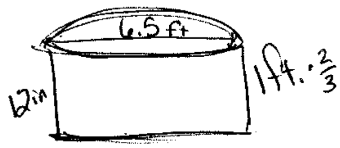
$x = 194.48$ gallons

The number of gallons of water in this pools is 194 gallons.

**Score 3:** The student made a transcription error by using a radius of 3.5 instead of 3.25.

## Question 33

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.




$d = 6.5$

$r = 3.25$

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

$V_{cyl} = Bh$

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

$V_{cyl} = (3.25)^2 \pi \cdot \frac{2}{3}$

$V = 22.12204827$

$V = 22.1 \text{ ft}^3$

One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

$$\frac{1 \text{ ft}^3}{7.48 \text{gal}} = \frac{22.1 \text{ft}^3}{x}$$

$x \cancel{\text{ft}^3} = 165.308 \cancel{\text{ft}^3} \text{gal}$

$x = 165.3 \text{ gallons}$

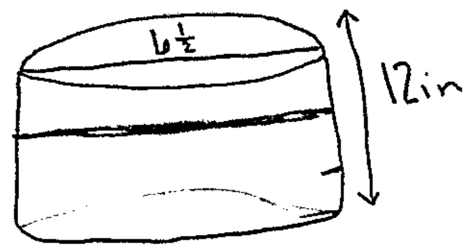
**Score 3:** The student made the same rounding error for both answers.

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.

$\pi r^2(h)$

$\pi 3.25^2\left(\frac{2}{3}\right)$

$7.04167\pi$




22.12

One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

22.12/7.48

2.957219251

so approx. 3 gallons

**Score 2:** The student made a rounding error in determining the volume and a computational error in determining the number of gallons.

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.

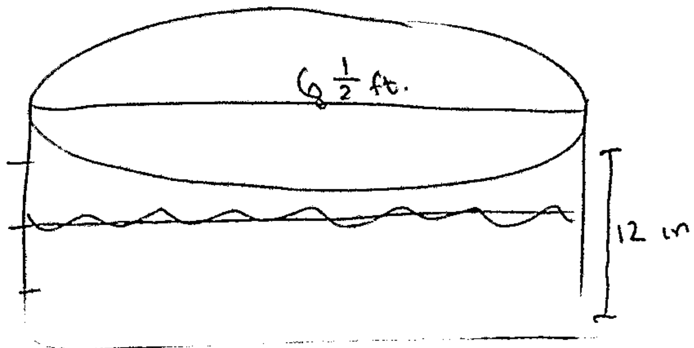
$V = \pi r^2 h$

$V = \pi 3^2 (12)$

$V = \pi\ 9(12)$

$V = \pi\ 108$

$\boxed{V = 339 \text{ ft}^3}$




One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

$1 \text{ ft}^3 = 7.48$

$339 \times 7.48 = 2535.72$

$\boxed{2535.72 \text{ gallons of water}}$

**Score 1:** The student found the volume incorrectly and made a rounding error.

## Question 33

**33** A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*.

$$V = (6\tfrac{1}{2})(12)(\tfrac{2}{3})\pi$$
$$= 52\pi \text{ ft}^3$$

One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

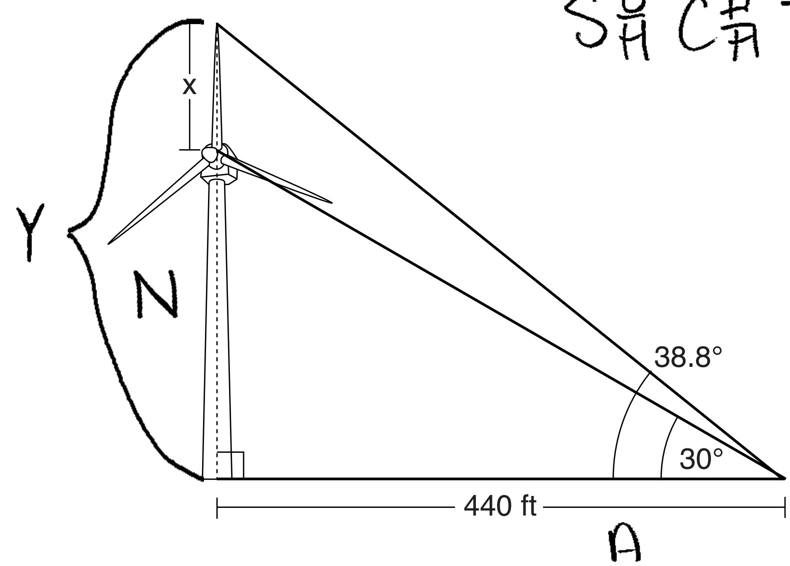
$$\frac{52\pi}{7.48} = 21.84 \text{ gallons}$$

**Score 0:** The student gave a completely incorrect response.

## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.

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




Determine and state a blade's length, *x*, to the <u>*nearest foot*</u>.

$440 \cdot \text{Ton}(30) = \frac{N}{\cancel{440}} \cdot \cancel{440}$ $N = 254.0341184$

$\text{Ton}(38.8) = \frac{Y}{440} \cdot Y = 353.7690827$

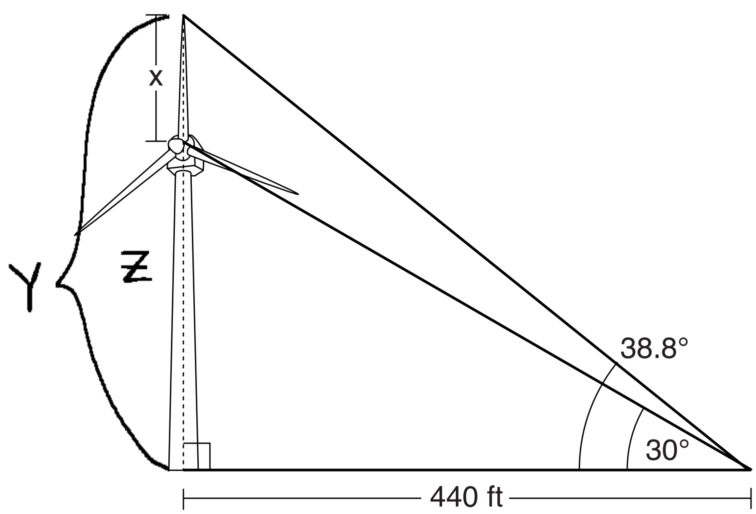
$$\begin{array}{r} 353.7690827 \\ -\ 254.0341184 \\ \hline 99.7349643 \end{array}$$

One blade's length is 100 ft

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

## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.




Determine and state a blade's length, $x$, to the *nearest foot*.

~~138.8~~ 100 ft.

$\tan 30 = \frac{z}{440}$ $\quad 440 \tan 30 = z$ $\quad z \approx 254$

$\tan 38.8 = \frac{y}{440}$

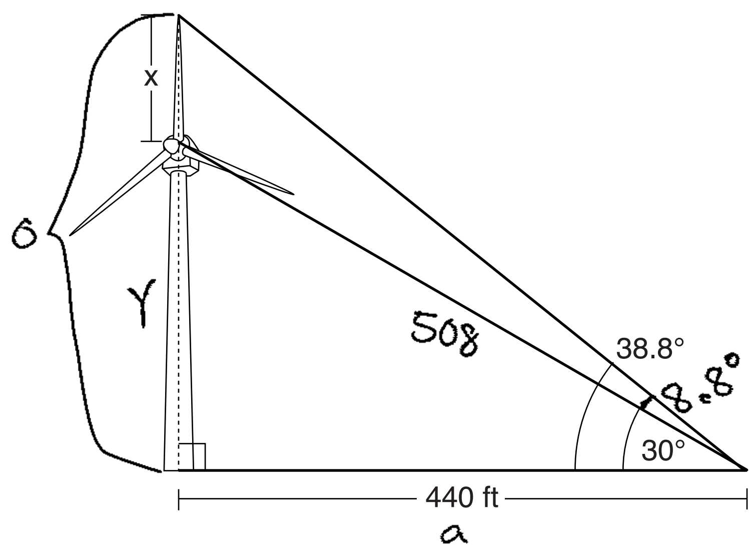
$440 \tan 38.8 = y$ $\quad y \approx 353.8$

$353.8 - 254.0 = 99.8$ $\quad 100$

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

## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.




Determine and state a blade's length, $x$, to the *nearest foot*.

$\frac{\tan(30)}{1} = \frac{Y}{440}$

$Y = 254$

~~$\frac{\cos(30)}{1} = \frac{440}{x}$~~

~~$\frac{440}{\cos(30)} = \frac{x \cdot \cos(30)}{\cos(30)}$~~

~~508~~

$\frac{\tan(38.8)}{1} = \frac{O}{440}$

$O = 440 \cdot \tan(38)$

$= 343.7$

$= 344$

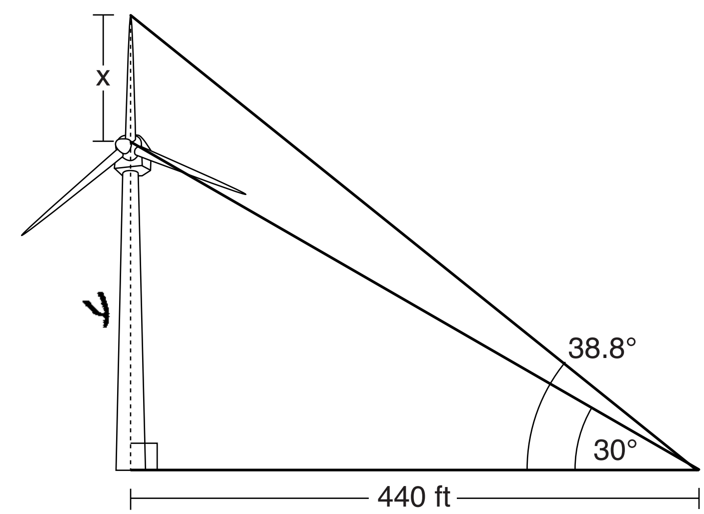
$\begin{array}{r} 344 \\ -254 \\ \hline 90 \end{array}$

90 ft

**Score 3:** The student made a transcription error by using 38° instead of 38.8°.

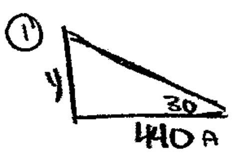
## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.




Determine and state a blade's length, $x$, to the *nearest foot*.

(1)

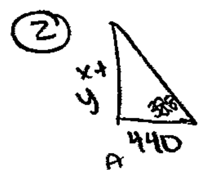



$\tan \frac{30}{1} = \frac{y}{440}$

$y = \tan 30(440)$

$y = -2818.3457$

(2)




$\tan 38.8 = \frac{x+y}{440}$

$\tan \frac{38.8}{1} = \frac{x + -2818.3457}{440}$

$x + -2818.3457 = \tan 38.8(440)$

$x + -2818.3457 = 8660.3969$

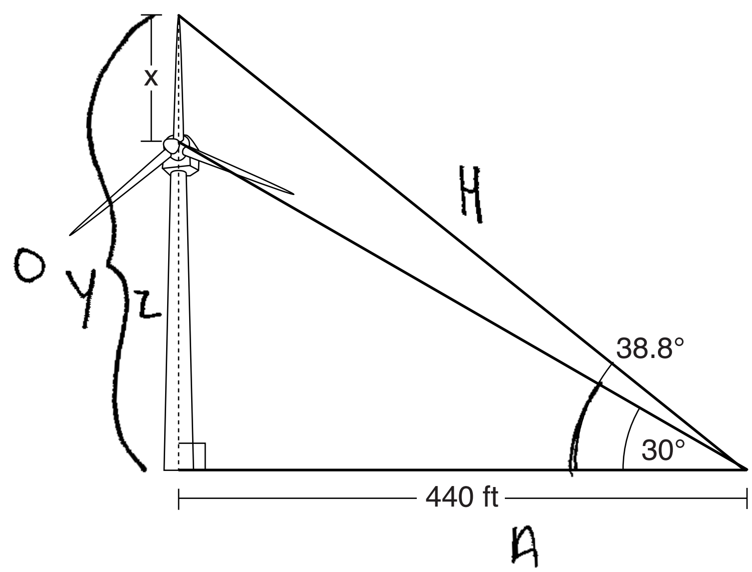
$+2818.3457 \quad + 2818.3457$

$\boxed{x = 3685 \text{ ft}}$

**Score 3:** The student made an error using radian measure.

## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.




Determine and state a blade's length, *x*, to the *nearest foot*.

$\tan \angle = O/A$

$\tan(38.8) = y/440$

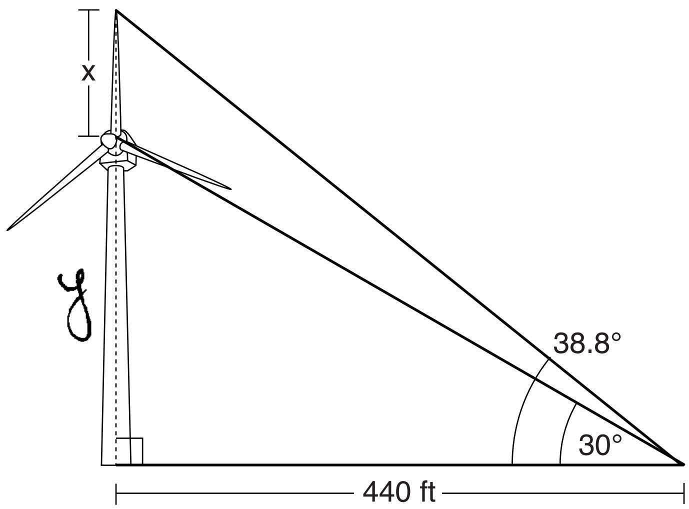
$y = 353.769$

$y = 354$

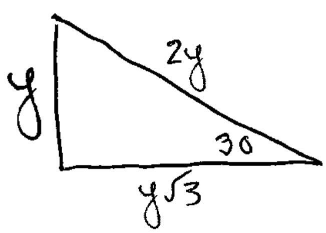
**Score 2:** The student correctly found the height to the top of the top blade.

## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.




Determine and state a blade's length, $x$, to the *nearest foot*.




$$\frac{440}{\sqrt{3}} = \frac{y\sqrt{3}}{\sqrt{3}}$$

$$\frac{440}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right) = y\left(\frac{\sqrt{3}}{\sqrt{3}}\right)$$

$$\frac{440\sqrt{3}}{3} = y$$

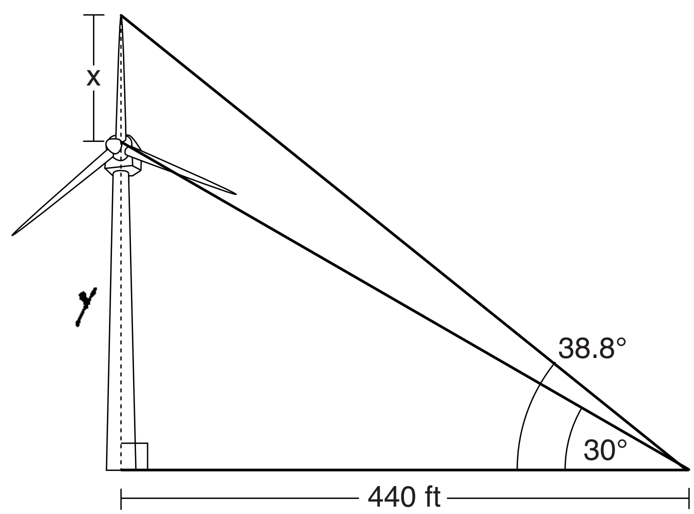
$$254.0341 = y$$

$$y = 254$$

**Score 2:** The student correctly found the height to the bottom of the top blade.

## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.




Determine and state a blade's length, *x*, to the *nearest foot*.

$$\tan 30^\circ = \frac{y}{440}$$

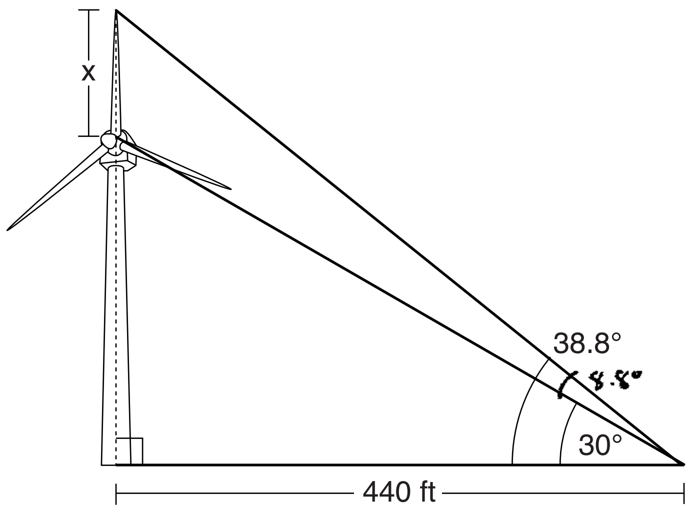
$$y = -2818.3457 \text{ ft}$$

???

**Score 1:** The student wrote a correct trigonometric equation.

## Question 34

**34** Nick wanted to determine the length of one blade of the windmill pictured below. He stood at a point on the ground 440 feet from the windmill's base. Using surveyor's tools, Nick measured the angle between the ground and the highest point reached by the top blade and found it was 38.8°. He also measured the angle between the ground and the lowest point of the top blade, and found it was 30°.




Determine and state a blade's length, *x*, to the *nearest foot*.

$\tan(8.8) = \frac{x}{440} =$

$x = (\tan(8.8))440$

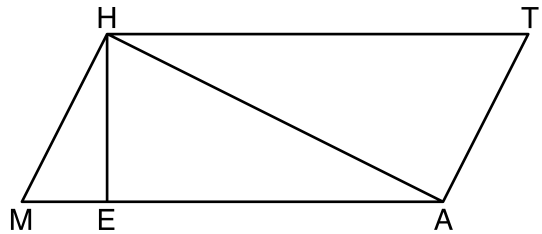
$x = 68.115$

the blade is 70 ft long

**Score 0:** The student gave a completely incorrect response.

## Question 35

**35** Given: Quadrilateral $MATH$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



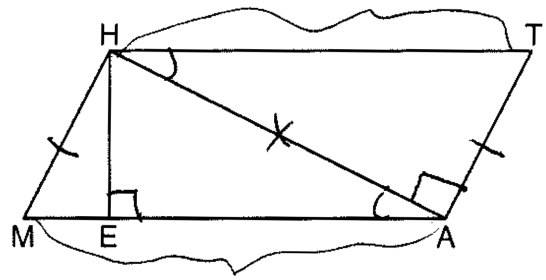

Prove: $TA \bullet HA = HE \bullet TH$

| Statements | Reasons |
| --- | --- |
| 1. Quad MATH, $\overline{HE} \perp \overline{MEA}$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HA} \perp \overline{AT}$ | 1. Given |
| 2. $\angle HEA$, $\angle TAH$ are rt $\angle$s | 2. $\perp$ lines form right $\angle$s. |
| 3. $\angle HEA \cong \angle TAH$ | 3. All right $\angle$s are $\cong$. |
| 4. MATH is a $\boxed{P}$ | 4. If a quadrilateral has 2 pairs of $\cong$ opp sides, the quad is a $\boxed{P}$. |
| 5. $\overline{MA} \parallel \overline{TH}$ | 5. Opposite sides of a $\boxed{P}$ are $\parallel$. |
| 6. $\angle THA \cong \angle EAH$ | 6. Alt int $\angle$s of $\parallel$ lines and a transversal are $\cong$. |
| 7. $\triangle HEA \sim \triangle TAH$ | 7. AA |
| 8. $\frac{HA}{TH} = \frac{HE}{TA}$ | 8. Corresponding sides of similar $\triangle$s are in proportion. |
| 9. $TA \cdot HA = HE \cdot TH$ | 9. In a proportion, the product of the means equals the product of the extremes |

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

## Question 35

**35** Given: Quadrilateral $MATH$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



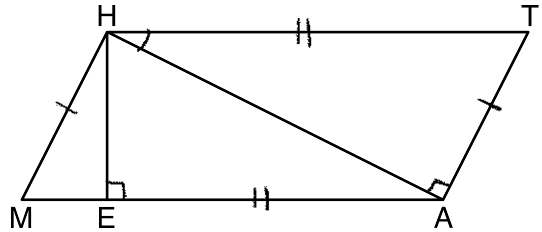

Prove: $TA \bullet HA = HE \bullet TH$

| | |
|---|---|
| 1. Quad $MATH$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, $\overline{HA} \perp \overline{AT}$ | 1. Given |
| 2. $\overline{HA} \cong \overline{HA}$ | 2. Reflexive |
| 3. $\triangle HAM \cong \triangle AHT$ | 3. SSS $\cong$ SSS |
| 4. $\angle THA \cong \angle MAH$ | 4. CPCTC |
| 5. $\angle HEA$ & $\angle TAH$ are right $\angle$s | 5. Perpendicular lines form right $\angle$s |
| 6. $\angle HEA \cong \angle TAH$ | 6. All right $\angle$s are $\cong$. |
| 7. $\triangle HEA \sim \triangle TAH$ | 7. AA $\cong$ AA |
| 8. $\frac{HE}{TA} = \frac{HA}{TH}$ | 8. Corresponding sides of similar triangles are in proportion. |
| 9. $TA \bullet HA = HE \bullet TH$ | 9. The product of the means equals the product of the extremes. |

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

## Question 35

**35** Given: Quadrilateral *MATH*, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



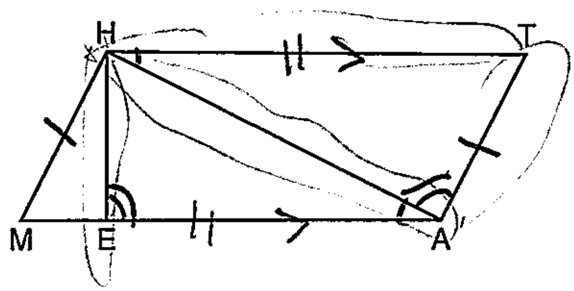

Prove: $TA \bullet HA = HE \bullet TH$

Since $\overline{HE} \perp \overline{MEA}$ + $\overline{HA} \perp \overline{AT}$, $\angle HEA$ and $\angle TAH$ are right angles. $\angle HEA$ + $\angle TAH$ are $\cong$ because all right angles are $\cong$. The opposite sides of quad. MATH are $\cong$ therefore MATH is a ▱ so by definition $\overline{HT} \parallel \overline{MEA}$. These parallel lines are cut by a transversal, $\overline{HA}$, which forms $\cong$ alternate interior angles $\angle THA \cong \angle HAE$. $\triangle THA \sim \triangle HAE$ by $AA \cong AA$. In similar $\triangle$'s the corresponding sides are in proportion so $\frac{TA}{HE} = \frac{TH}{HA}$. In a proportion the cross products are equal therefore $TA \cdot HA = HE \cdot TH$.

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

## Question 35

**35** Given: Quadrilateral *MATH*, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



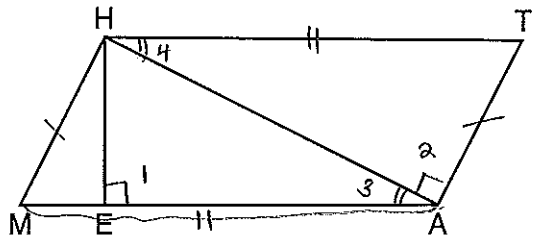

Prove: $TA \bullet HA = HE \bullet TH$

| | |
|---|---|
| 1) quad MATH, $\overline{MA} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, $\overline{HA} \perp \overline{AT}$ | 1) Given |
| 2) quad HMAT is a ▱ | 2) it has 2 sets of $\cong$ oppos. sides |
| 3) $\overline{HT} \parallel \overline{MA}$ | 3) ▱ have 2 sets of $\parallel$ sides |
| 4) $\measuredangle THA \cong \measuredangle HAE$ | 4) alt. int. $\measuredangle$S are $\cong$ if 2 sides are $\parallel$ |
| 5) $\measuredangle HEA$ and $\measuredangle TAH = 90°$ | 5) $\perp$ lines form 90° $\measuredangle$s |
| 6) $\measuredangle HEA \cong \measuredangle TAH$ | 6) 90° $\measuredangle$'s are all $\cong$ |
| 7) $\triangle HEA \sim \triangle TAH$ | 7) AA$\sim$ |
| 8) $\frac{TH}{TA} = \frac{HA}{HE}$ | 8) $\sim\triangle$ are proportional |
| 9) $TH \cdot EH = TA \cdot HA$ | 9) In a proportion product of the means = the product of the extremes |

**Score 5:** The student had an incomplete reason in step 8.

## Question 35

**35** Given: Quadrilateral *MATH*, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



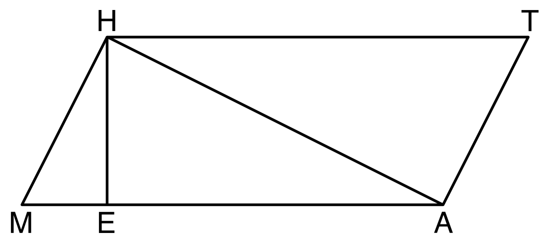

Prove: $TA \cdot HA = HE \cdot TH$

| Statements | Reasons |
|---|---|
| ① $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, $\overline{HA} \perp \overline{AT}$ | ① Given |
| ② $\angle 1 \cong \angle 2$ | ② All right angles are congruent. |
| ③ HMAT is a parallelogram | ③ A parallelogram is a quad with both pairs opposite sides $\cong$ |
| ④ $\angle 3 \cong \angle 4$ | ④ Alternate interior angles formed by parallel lines $\cong$ |
| ⑤ $\triangle HEA \sim \triangle TAH$ | ⑤ AA$\sim$ |
| ⑥ $\frac{TA}{HE} = \frac{TH}{HA}$ | ⑥ Corresponding sides of similar triangles are in proportion |
| ⑦ $TA \cdot HA = HE \cdot TH$ | ⑦ In a proportion, the product of the means is equal to the product of the extremes |

**Score 4:** The student had two missing statements and reasons: stating angles 1 and 2 are right angles and stating $\overline{HT} \parallel \overline{MA}$.

## Question 35

**35** Given: Quadrilateral *MATH*, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$




Prove: $TA \bullet HA = HE \bullet TH$

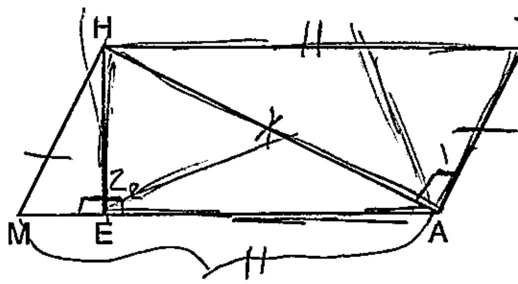
We were given the opposite sides of quadrilateral MATH are congruent, therefore MATH is a P'gram. By definition the opposite sides $\overline{HT}$ & $\overline{AM}$ are parallel as well, with $\overline{HA}$ as a transversal the alternate interior angles $\angle THA$ & $\angle HAE$ are congruent ($a \cong a$). Given $\overline{HE} \perp \overline{MEA}$ & $\overline{HA} \perp \overline{AT}$, $\cong$ right angles are formed, $\angle HEA \cong \angle TAH$ ($a \cong a$). By the reflexive property $\overline{HA} \cong \overline{HA}$. ($s \cong s$). So by $AAS \cong AAS$ $\triangle HEA \cong \triangle TAH$, therefore $\triangle HEA \sim \triangle TAH$.

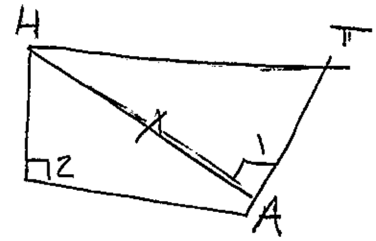
Since the corresponding sides of similar triangles are proportional the proportion $\frac{TA}{HE} = \frac{TH}{HA}$ can be derived, therefore $(TA)(HA) = (HE)(TH)$.

**Score 3:** The student incorrectly proved $\triangle HEA$ and $\triangle TAH$ congruent (AAS ≅ ASA) and had a missing reason for $(TA)(HA) = (HE)(TH)$.

## Question 35

**35** Given: Quadrilateral *MATH*, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



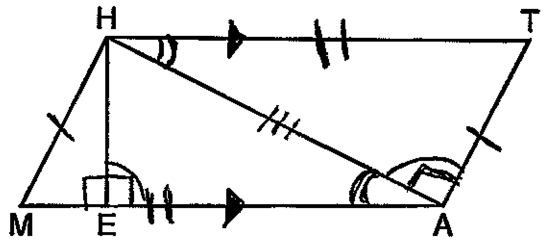

Prove: $TA \bullet HA = HE \bullet TH$

| Statements | Reasons |
|---|---|
| 1.) $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$ and $\overline{HA} \perp \overline{AT}$ | 1.) Given |
| 2.) $\measuredangle 1$ & $\measuredangle 2$ are rt $\measuredangle$'s | 2.) $\perp$ lines form rt $\measuredangle$'s |
| 3.) $\measuredangle 1 \cong \measuredangle 2$ | 3.) all rt $\measuredangle$'s are $\cong$ |
| 4.) $\overline{HA} \cong \overline{HA}$ | 4.) reflexive property |

**Score 2:** The student correctly proved $\angle HEA \cong \angle TAH$, but step 4 is not relevant in proving $\triangle HEA \sim \triangle TAH$.

## Question 35

**35** Given: Quadrilateral $MATH$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



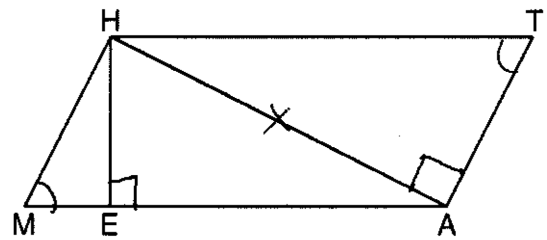

Prove: $TA \bullet HA = HE \bullet TH$

| S | R |
|---|---|
| ① $\overline{AM} \cong \overline{At}$, $\overline{HT} \cong \overline{AM}$, $\overline{He} \perp \overline{MEA}$, $\overline{HA} \perp \overline{AT}$ | ① Given |
| ② ∡HEA, ∡HAT, ∡MEH are 90° | ② Perpindicular → form - 90° |
| ③ ∡HEA ≅ ∡HAT ≅ ∡MEH | ③ are cangruent |
| ④ $\overline{HA} \cong \overline{HA}$ | ④ reflexive propert |
| ④.⑤ shape HTAM is a parallelogram | ④.⑤ definition of a parallelogram |
| ⑤ ∡THA ≅ ∡EAH | ⑤ If 2 ∥ lines are cut by a transversal than alt interior lines are ≅ |
| ⑥ ΔHMA ≅ ΔTAH | ⑥ SAS congruence |
| ⑦ TA · HA = HE · TH | ⑦ CPCTC |

**Score 2:** The student wrote some correct relevant statements and reasons (steps 2 and 4).

## Question 35

**35** Given: Quadrilateral $MATH$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



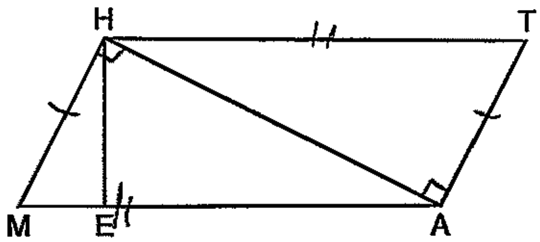

Prove: $TA \bullet HA = HE \bullet TH$

| | |
|---|---|
| 1. $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$<br>$\overline{HE} \perp \overline{MEA}$, $\overline{HA} \perp \overline{AT}$ | 1. Given |
| 2. $\angle HEA$ + $\angle HAT$ are right $\angle$s | 2. Perpendicular lines form right $\angle$s |
| 3. $\angle M \cong \angle T$ | 3. opposite angles $\cong$. |
| 4. $\triangle HEA \cong \triangle HAT$ | 4. AAS |
| 5. $\dfrac{TA}{HE} = \dfrac{TH}{HA}$ | 5. CPCTC |
| 6. $TA \bullet HA = HE \bullet TH$ | 6. Cross multiply |

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

## Question 35

**35** Given: Quadrilateral $MATH$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$



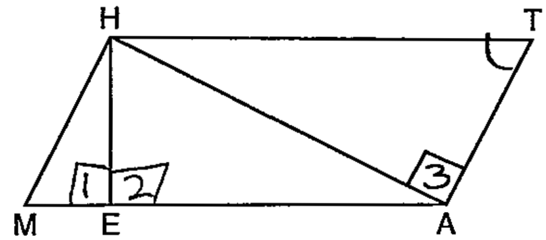

Prove: $TA \bullet HA = HE \bullet TH$

| | |
|---|---|
| 1) $\overline{HT} \cong \overline{Am}$; $\overline{HM} \cong \overline{AT}$ | 2) Given |
| 3) $\triangle mHA \cong \triangle TAH$ | 4) SSS |

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

## Question 35

**35** Given: Quadrilateral $MATH$, $\overline{HM} \cong \overline{AT}$, $\overline{HT} \cong \overline{AM}$, $\overline{HE} \perp \overline{MEA}$, and $\overline{HA} \perp \overline{AT}$




Prove: $TA \bullet HA = HE \bullet TH$

| | |
|---|---|
| 1.) $\overline{HM} \cong AT$ | 1.) Given |
| 2.) $\overline{HT} \cong \overline{AM}$ | 2.) Given |
| 3.) $\overline{HE} \perp \overline{MEA}$ | 3.) Given |
| 4.) $\overline{HA} \perp AT$ | 4.) Given |
| 5.) $\angle 1$, $\angle 2$, and $\angle 3$ are right $\angle$'s | 5.) def. right $\angle$'s |
| 6.) $\angle 1 \cong \angle 2$ | 6.) All right $\angle$'s are $\cong$ |
| 7.) T is a reflexive $\angle$ | 7.) Reflexive Property |
| 8.) $\triangle THA \sim \triangle HEA$ | 8.) AA~ |
| 9.) $TA \cdot HA = HE \cdot TH$ | 9.) CPCTC |

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