The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Tuesday, June 19, 2018 — 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 translation of 2 units to the right and 3 units up. Is triangle ABC congruent to triangle $A'B'C'$? Explain why.

$\triangle ABC$ must be congruent to $\triangle A'B'C'$ because a translation is a basic rigid motion which preserves angle measure and side length. Therefore the 2 $\triangle$'s have all corresponding parts congruent.

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 translation of 2 units to the right and 3 units up. Is triangle ABC congruent to triangle $A'B'C'$? Explain why.

Yes, the $\triangle$'s are $\cong$ because a translation is a rigid motion so it preserves side lengths. ~~and angle measures~~

Because corr. sides have the same lengths, the $\triangle$'s are $\cong$ by SSS.

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 translation of 2 units to the right and 3 units up. Is triangle ABC congruent to triangle $A'B'C'$? Explain why.

Yes, because a translation keeps the triangles the same sije.

Score 1: The student wrote an incomplete explanation.

Question 25

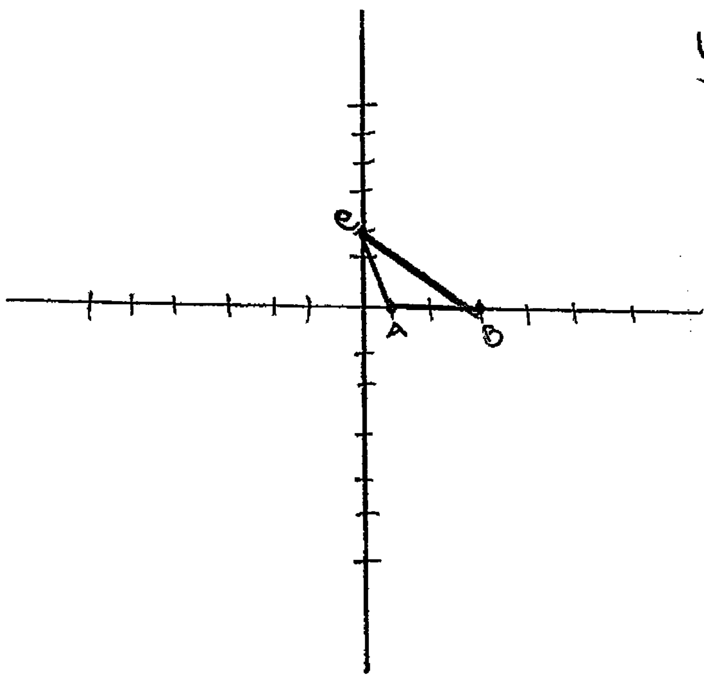
25 Triangle $A'B'C'$ is the image of triangle ABC after a translation of 2 units to the right and 3 units up. Is triangle ABC congruent to triangle $A'B'C'$? Explain why.

Yes because it was translated not dialated. Dilations change sizes of shapes causing them to not be congruent.

Score 1: The student wrote a partially correct explanation.

Question 25

25 Triangle $A'B'C'$ is the image of triangle ABC after a translation of 2 units to the right and 3 units up. Is triangle ABC congruent to triangle $A'B'C'$? Explain why.

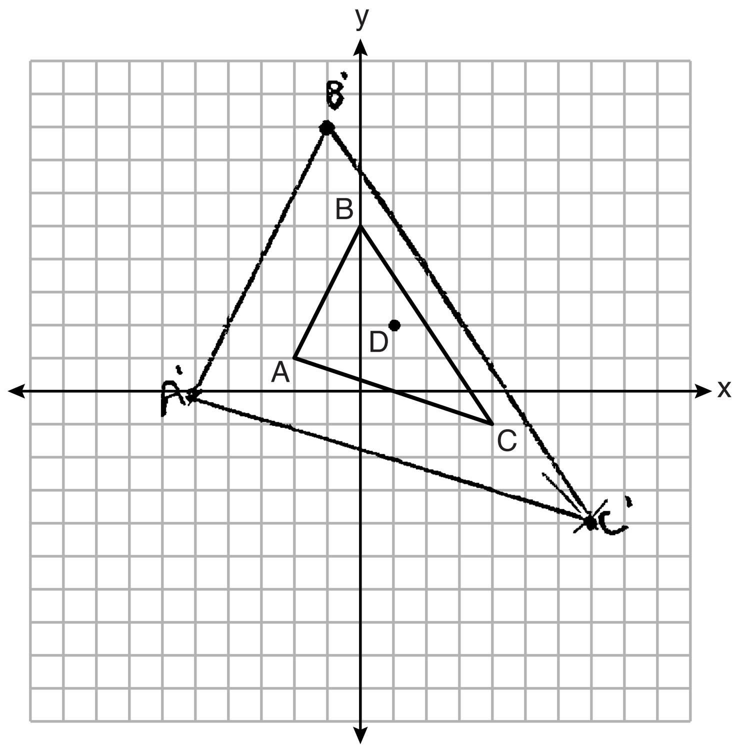


Yes it is still congruent because the angles haven't Changed and the triangle has become a different one.

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

Question 26

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.

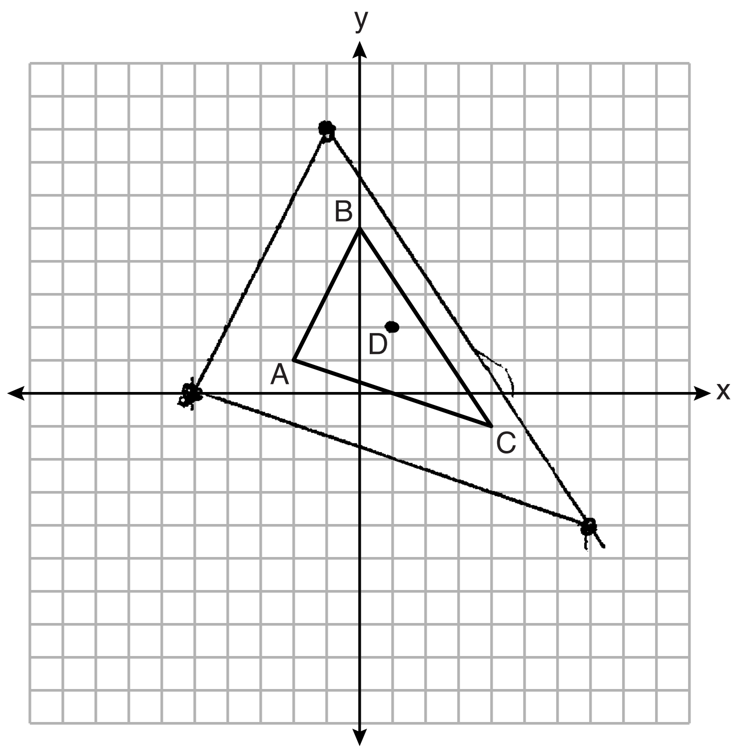


Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

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

Question 26

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.



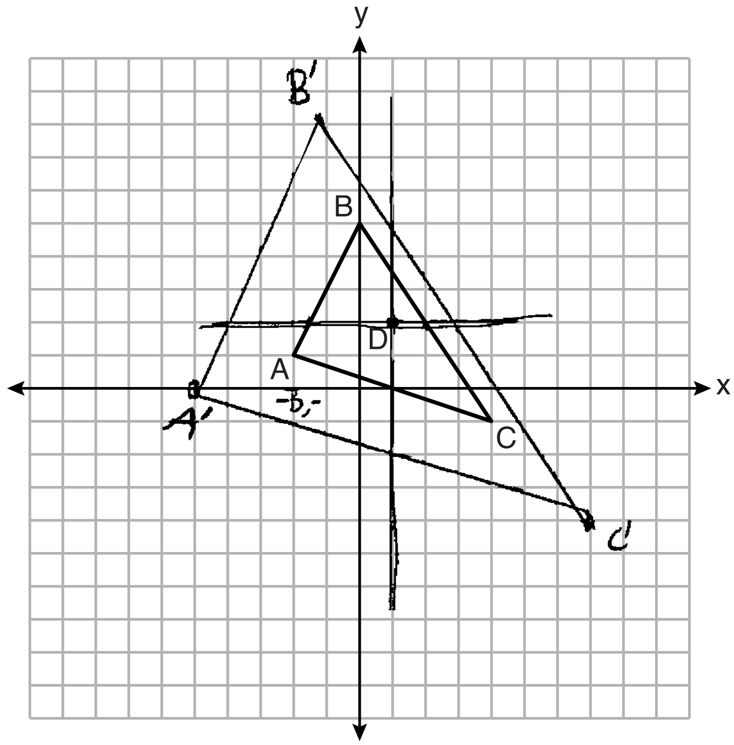
A' (-5, 0)
B' (-1, 8)
C' (7, -4)

Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

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

Question 26

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.



A:

(-3, -1)

A' (-6, -2)

B(-1, 3)

B' (-2, 6)

C (3, -3)

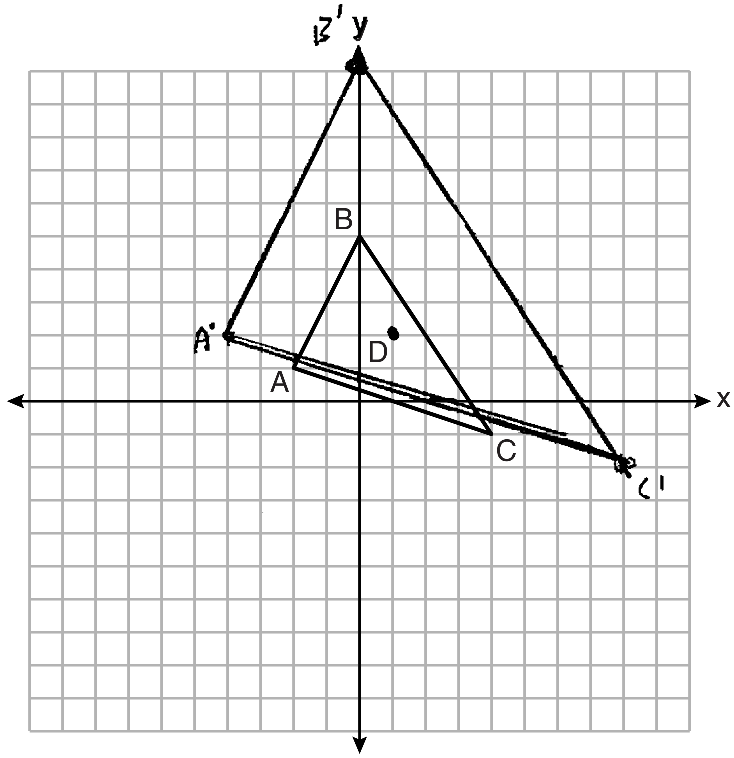
C' (6, -6)

Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

Score 2: The student gave a complete and correct response. The student drew a new set of axes whose origin is at point D. Then the student dilated and graphed $\triangle ABC$ by a scale factor of 2 centered at the origin, point D, with respect to the new axes. The result is a graph of $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation of 2 centered at point D (1,2), with respect to the original set of axes.

Question 26

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.



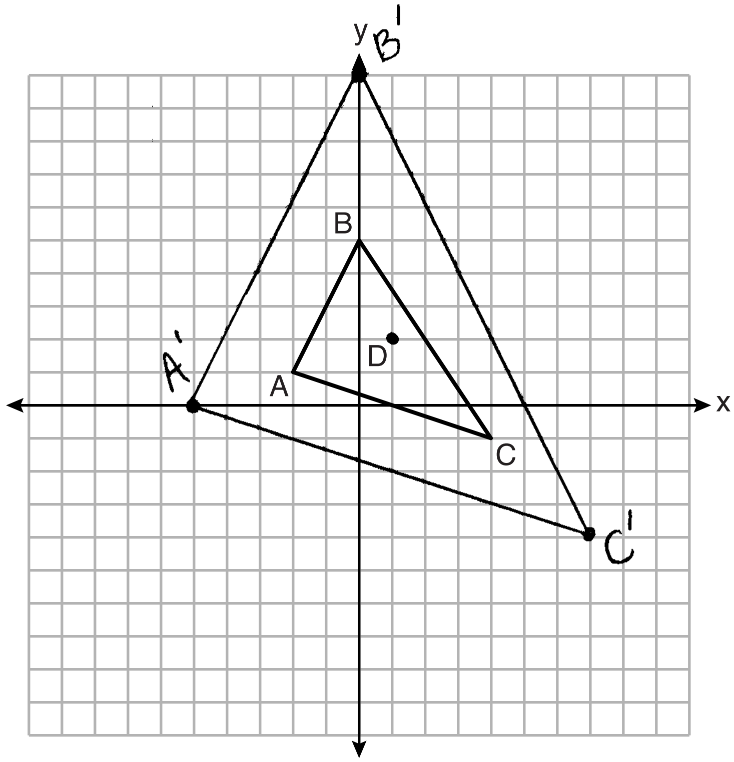
Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

A - (-2, 1) — A' (-4, 2)
B - (0, 5) - B' (0, 10)
C - (4, -1) - C' (8, -2)

Score 1: The student used the origin as the center of dilation.

Question 26

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.

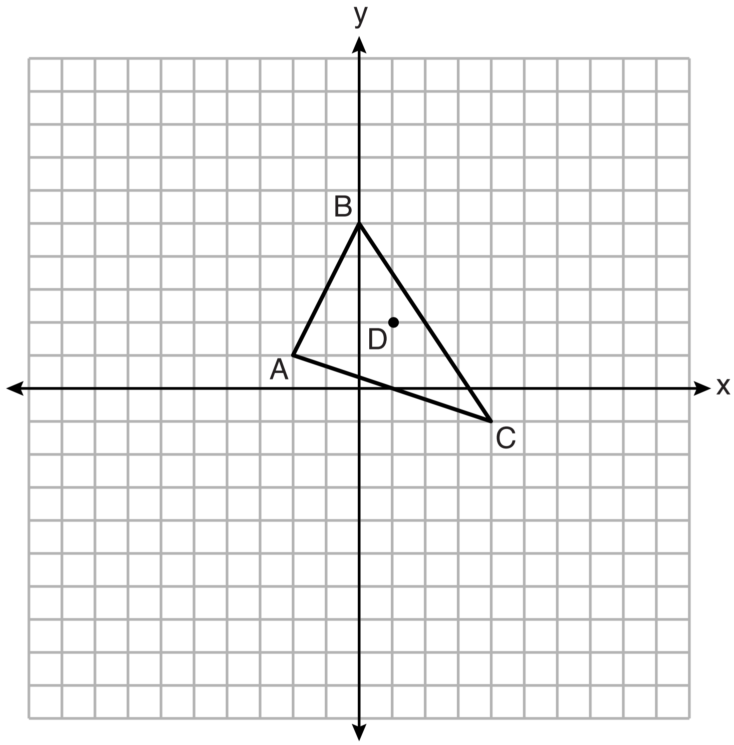


Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

Score 1: The student made one graphing error when graphing point B.

Question 26

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.



Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

$A'(-5,0)$

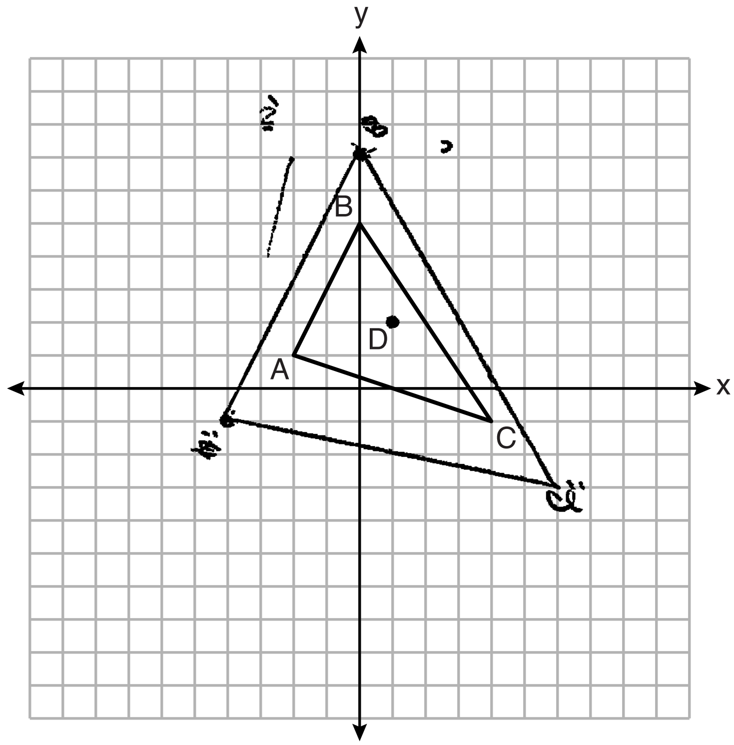
$B'(-1,8)$

$C'(7,-4)$

Score 1: The student stated the vertices of triangle $A'B'C'$, but did not draw the triangle.

Question 26

26 Triangle ABC and point $D(1,2)$ are graphed on the set of axes below.

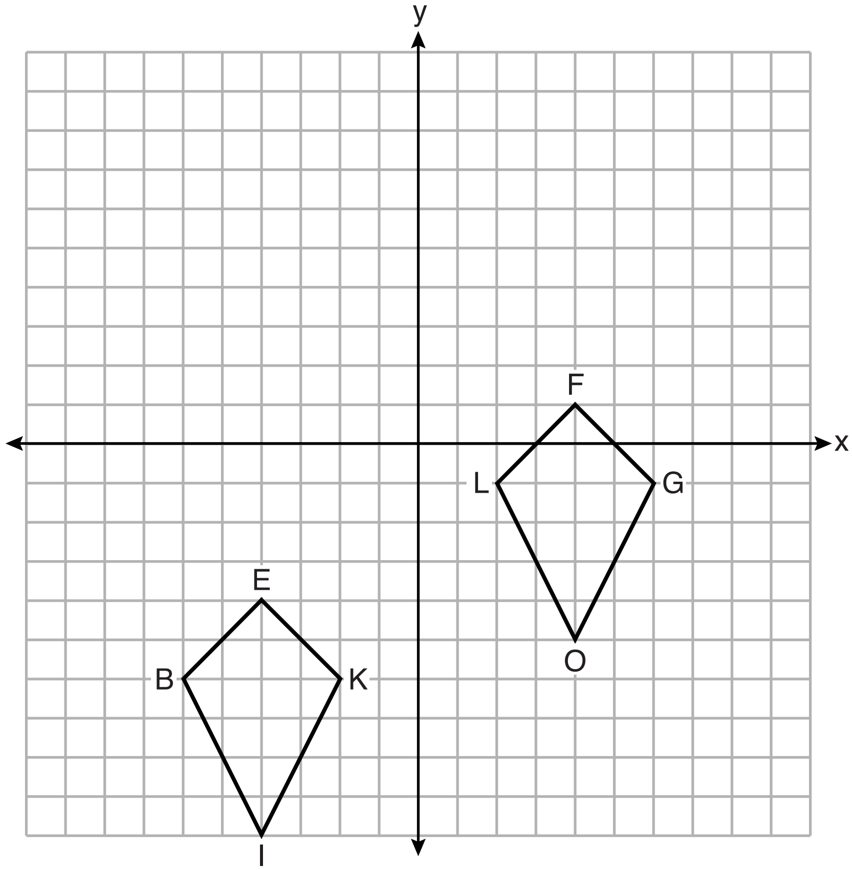


Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$, after a dilation of scale factor 2 centered at point D.

Score 0: The student gave a completely incorrect response.

Question 27

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.



Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

along $\overrightarrow{EF}$

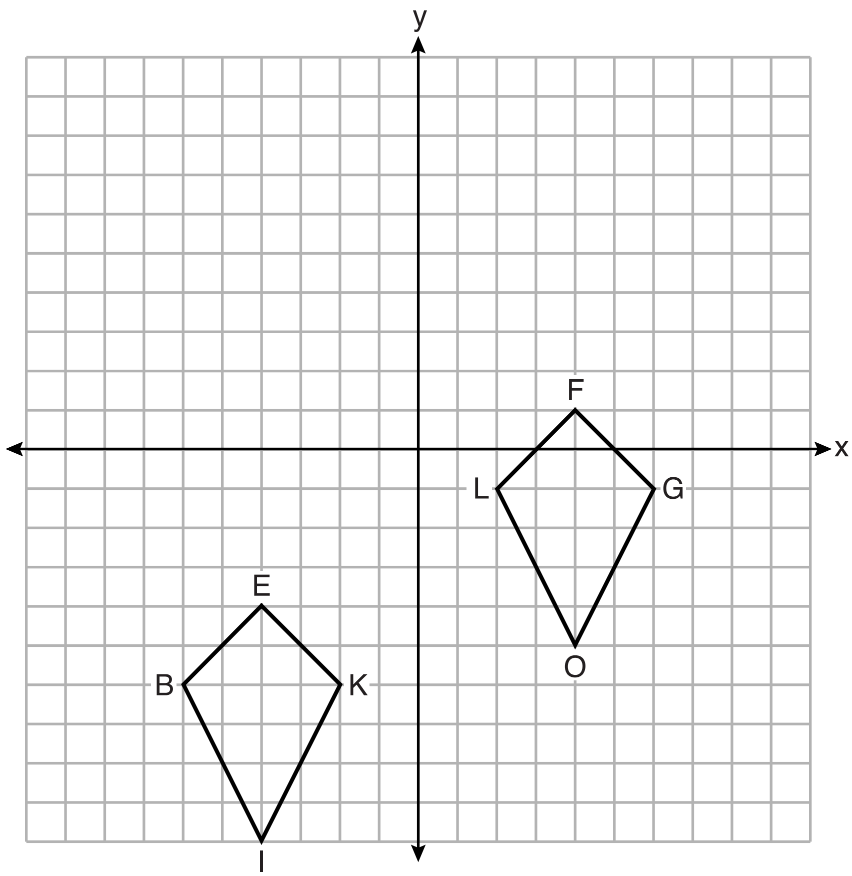
Translate point E to point F. Use the same transformation to move point B to point L, point K to point G and point I to point O.

Draw $\overline{FO}$
Reflect Quad BIKE over $\overline{FO}$ to have the figures map.

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

Question 27

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.



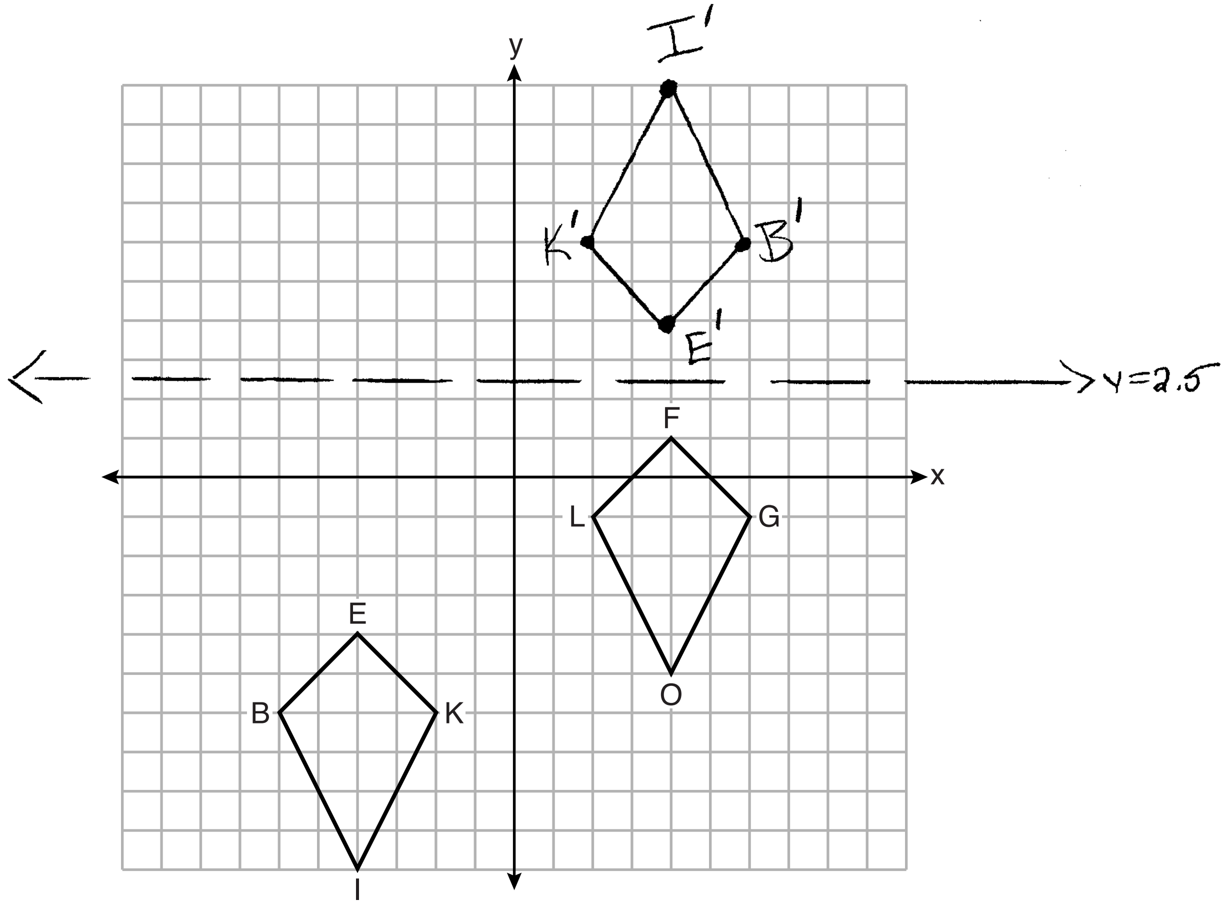
Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

Reflection across the y-axis, followed by
a translation 5 units up

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

Question 27

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.



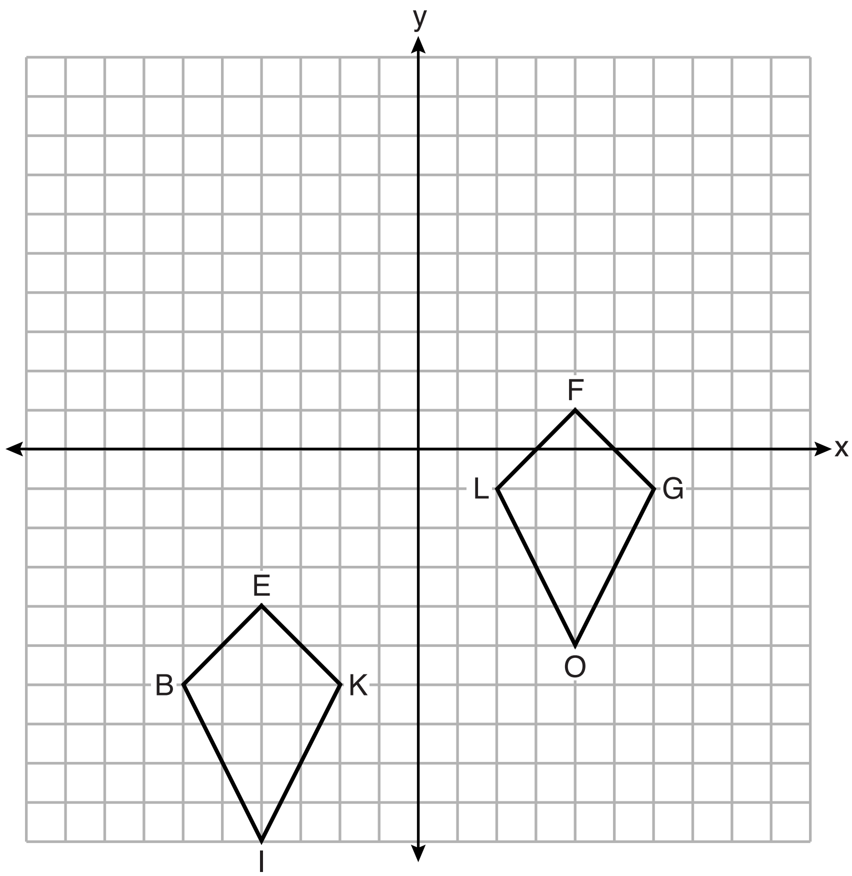
Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

Rotate Quad BIKE, 180° around the origin. Image is B'I'K'E'
Reflect B'I'K'E' ~~F~~ over the line y = 2.5
Then Quad BIKE will be onto Quad GOLF

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

Question 27

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.



Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

reflection over $X=-1$

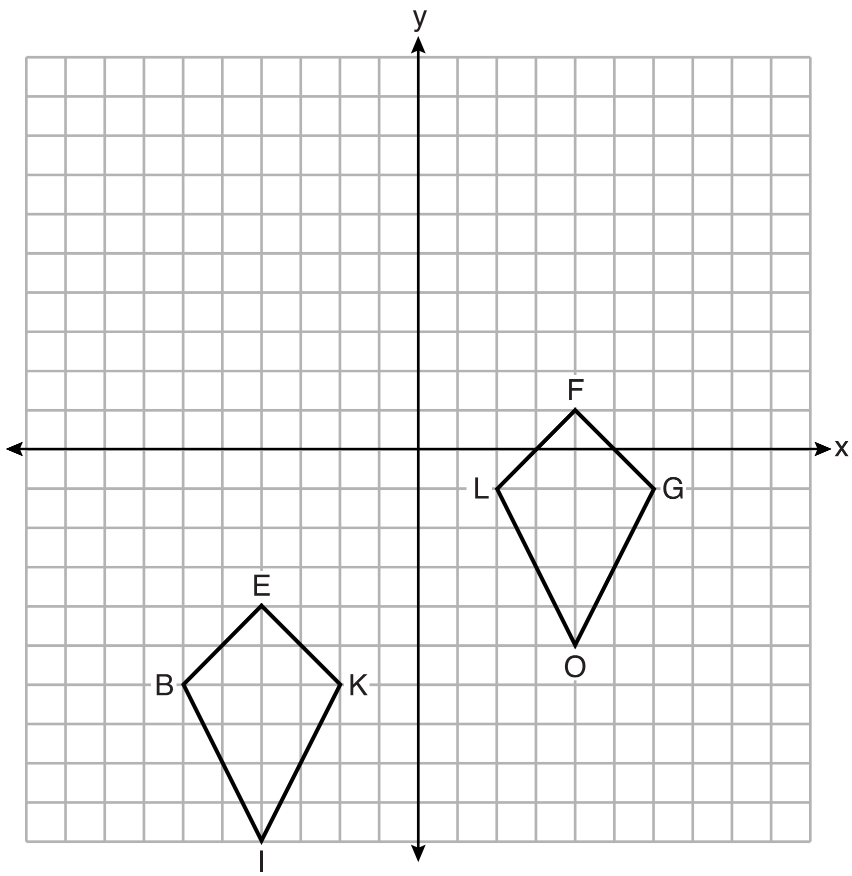
Followed by

translation up 5, right 2

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

Question 27

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.



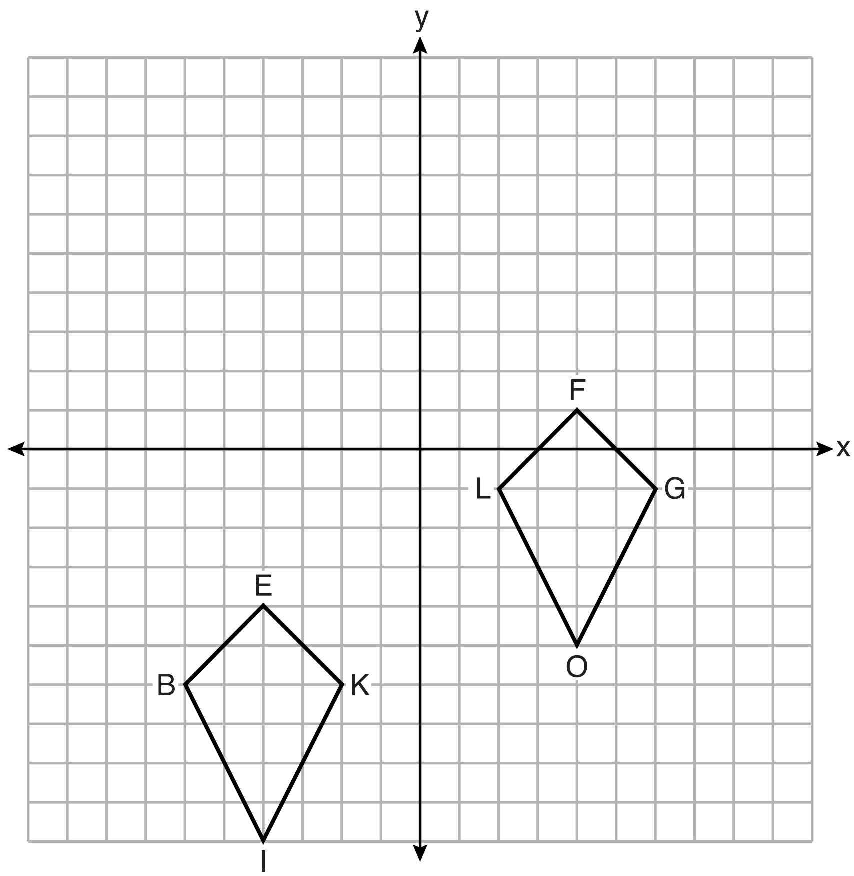
Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

tralation of (x+0, y+5) and a reflection

Score 1: The student gave an incomplete response. The student did not describe the reflection.

Question 27

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.



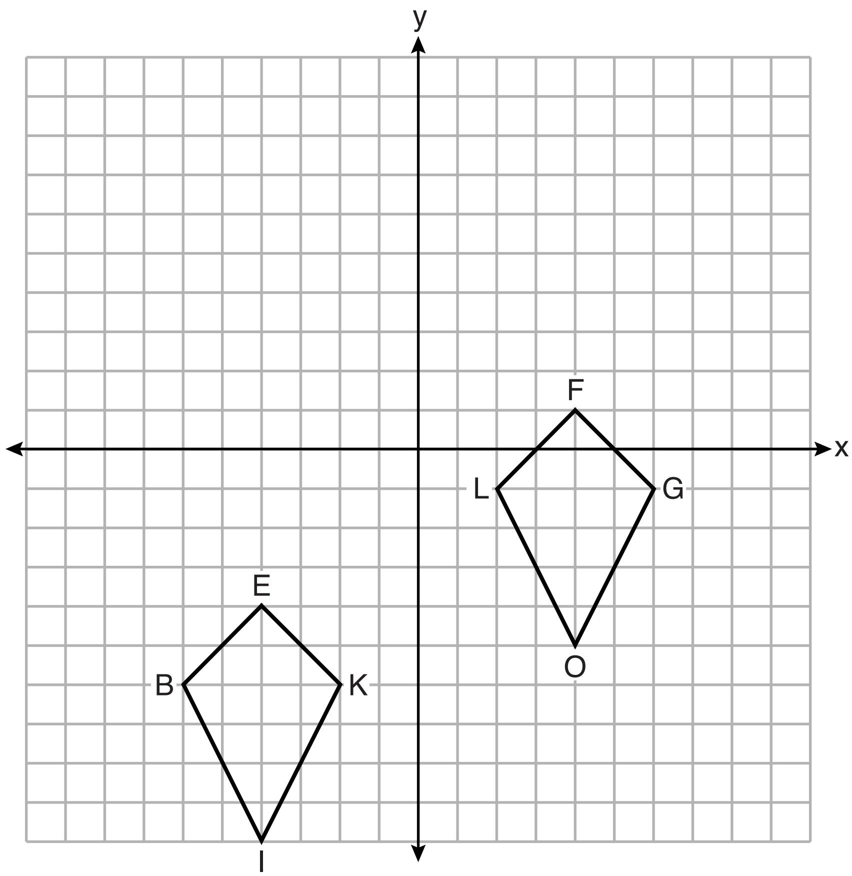
Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

A translation of $\langle 8,5 \rangle$.

Score 1: The student correctly described a translation that carries quadrilateral *BIKE* onto quadrialateral *LOGF*, not accounting for the orientation of the quadrilateral.

Question 27

27 Quadrilaterals *BIKE* and *GOLF* are graphed on the set of axes below.



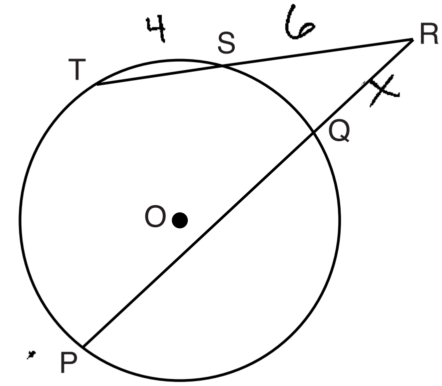
Describe a sequence of transformations that maps quadrilateral *BIKE* onto quadrilateral *GOLF*.

$T_{(5,8)}$

Score 0: The student gave a completely incorrect response.

Question 28

28 In the diagram below, secants $\overline{RST}$ and $\overline{RQP}$, drawn from point R, intersect circle O at S, T, Q, and P.



$15x = 10 \cdot 6$

$15x = 60$

If $RS = 6$, $ST = 4$, and $RP = 15$, what is the length of $\overline{RQ}$?

$15x = 10 \cdot 6$

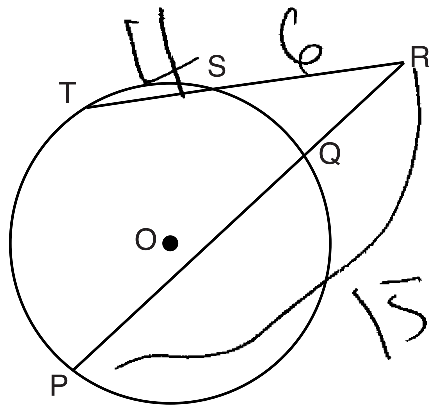
$\frac{15x}{15} = \frac{60}{15}$

$\boxed{x = 4}$

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

Question 28

28 In the diagram below, secants $\overline{RST}$ and $\overline{RQP}$, drawn from point R, intersect circle O at S, T, Q, and P.



If $RS = 6$, $ST = 4$, and $RP = 15$, what is the length of $\overline{RQ}$?

$6+4=10$

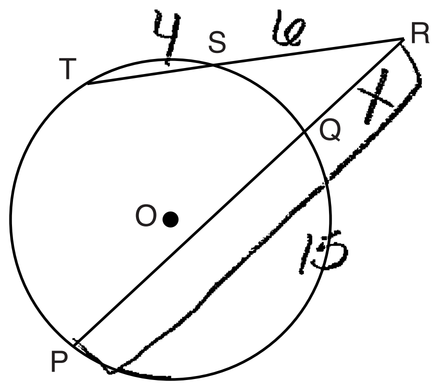
$6 \cdot 10 = 60$

$\frac{60}{15} = 4$

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

Question 28

28 In the diagram below, secants $\overline{RST}$ and $\overline{RQP}$, drawn from point R, intersect circle O at S, T, Q, and P.



If $RS = 6$, $ST = 4$, and $RP = 15$, what is the length of $\overline{RQ}$?

$$4 \cdot 6 = 15x$$

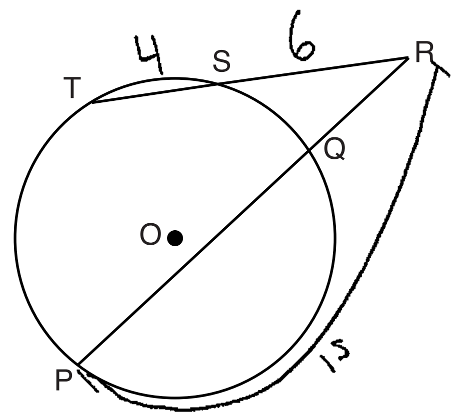
$$\frac{24}{15} = \frac{\cancel{15}x}{\cancel{15}}$$

$$x = 1.6$$

Score 1: The student wrote an incorrect equation, but solved it correctly for the length of $\overline{RQ}$.

Question 28

28 In the diagram below, secants $\overline{RST}$ and $\overline{RQP}$, drawn from point R, intersect circle O at S, T, Q, and P.



If $RS = 6$, $ST = 4$, and $RP = 15$, what is the length of $\overline{RQ}$?

$60 = x(x+15)$

$60 = x^2 + 15x$

$$\frac{x^2 + 15x - 60 = 0}{15x}$$

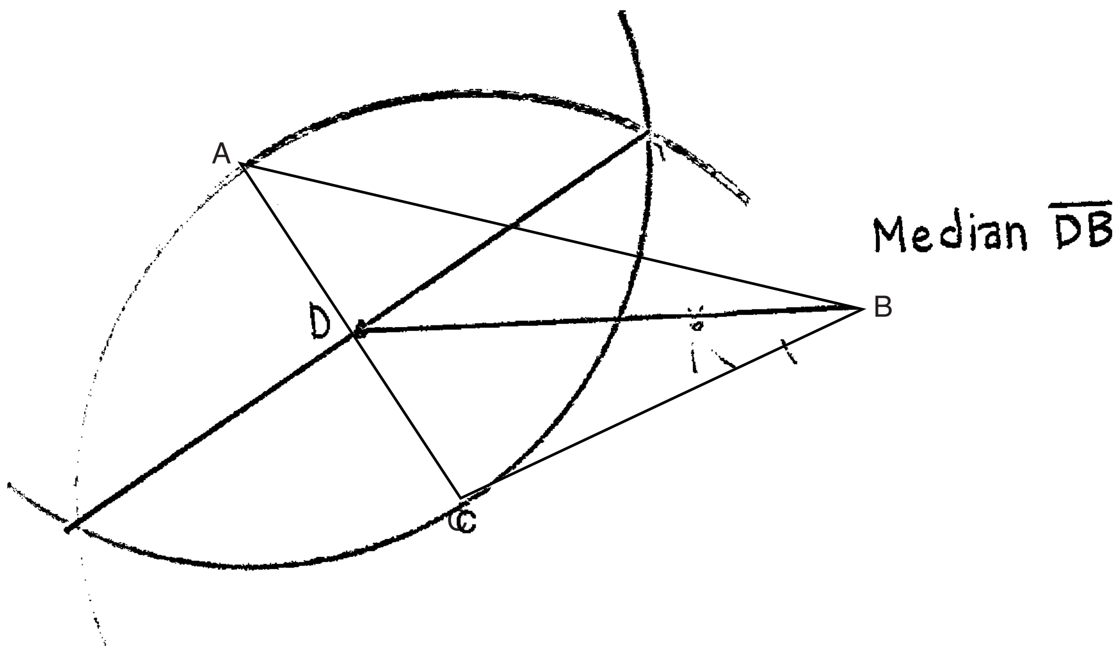
$\sqrt{x^2} = \sqrt{4}$

$x = 2$

Score 0: The student gave a completely incorrect response.

Question 29

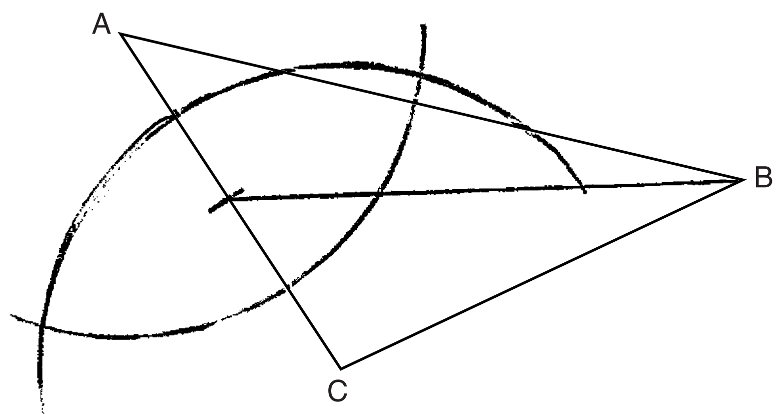
29 Using a compass and straightedge, construct the median to side $\overline{AC}$ in $\triangle ABC$ below. [Leave all construction marks.]



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

Question 29

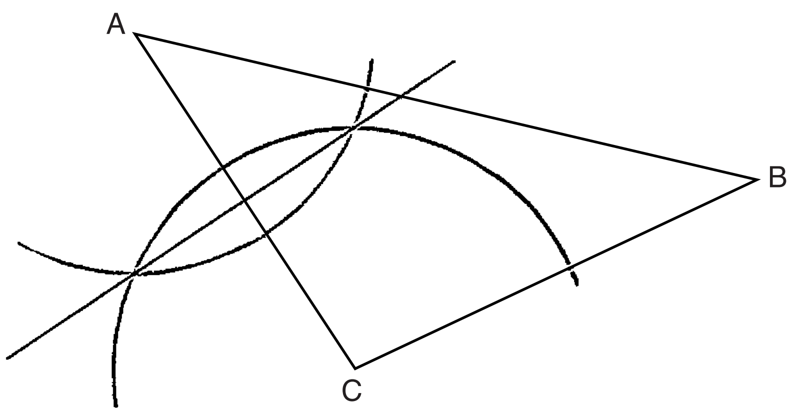
29 Using a compass and straightedge, construct the median to side $\overline{AC}$ in $\triangle ABC$ below. [Leave all construction marks.]



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

Question 29

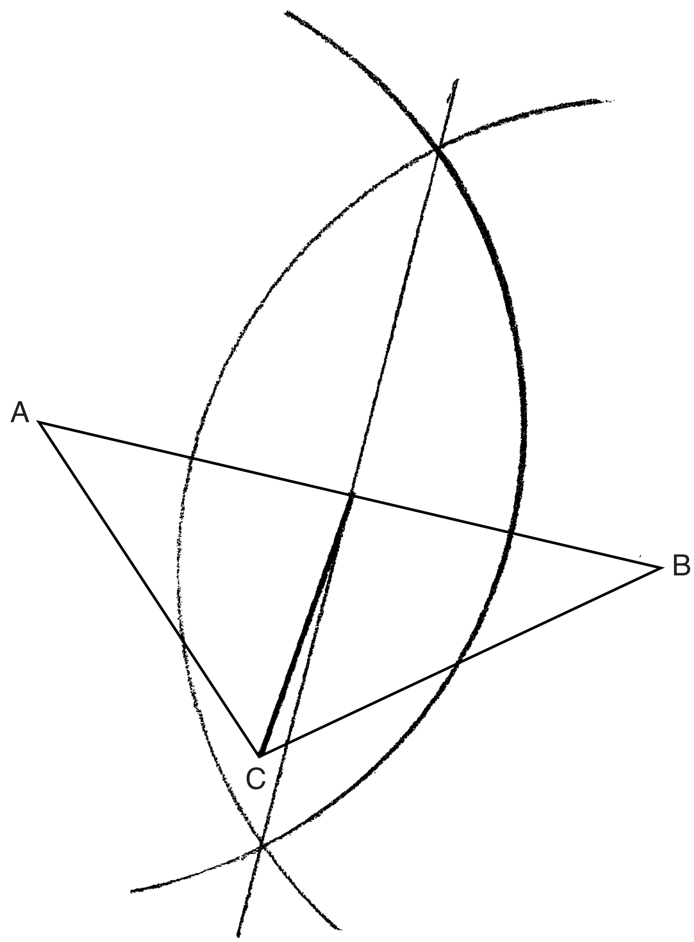
29 Using a compass and straightedge, construct the median to side $\overline{AC}$ in $\triangle ABC$ below. [Leave all construction marks.]



Score 1: The student correctly constructed the perpendicular bisector of side $\overline{AC}$, but did not draw the median to side $\overline{AC}$.

Question 29

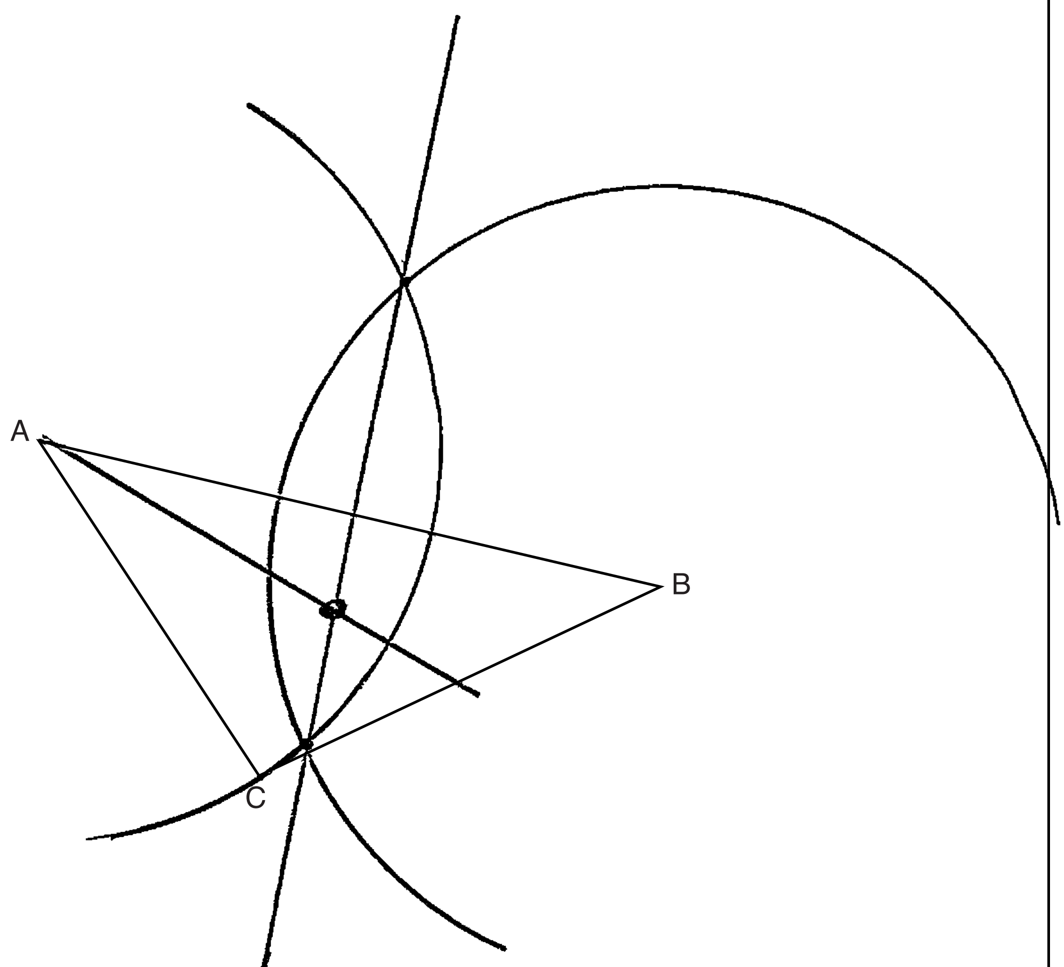
29 Using a compass and straightedge, construct the median to side $\overline{AC}$ in $\triangle ABC$ below. [Leave all construction marks.]



Score 1: The student had an appropriate construction of a median, but constructed it to the wrong side.

Question 29

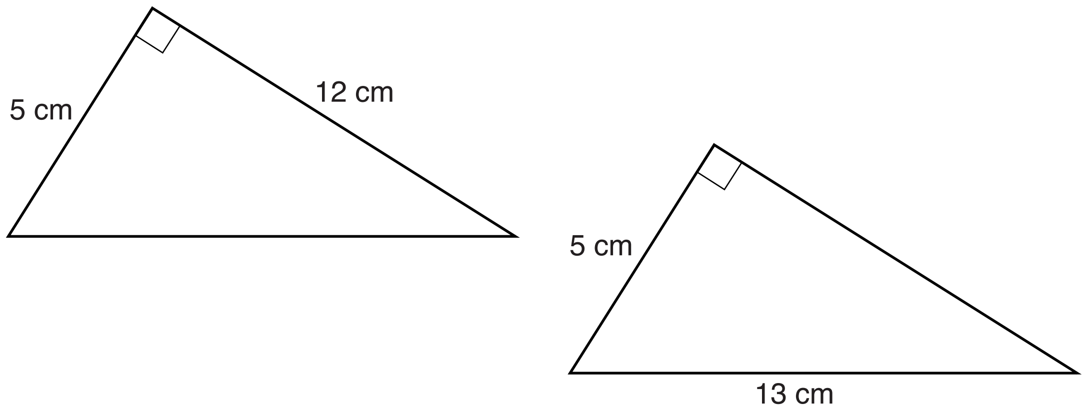
29 Using a compass and straightedge, construct the median to side $\overline{AC}$ in $\triangle ABC$ below. [Leave all construction marks.]



Score 0: The student gave a completely incorrect response.

Question 30

30 Skye says that the two triangles below are congruent. Margaret says that the two triangles are similar.



Are Skye and Margaret both correct? Explain why.

Yes they are both correct

using pyth Thm, both Δ's are 5-12-13 triples.

So, Δ's are $\cong$ by SSS

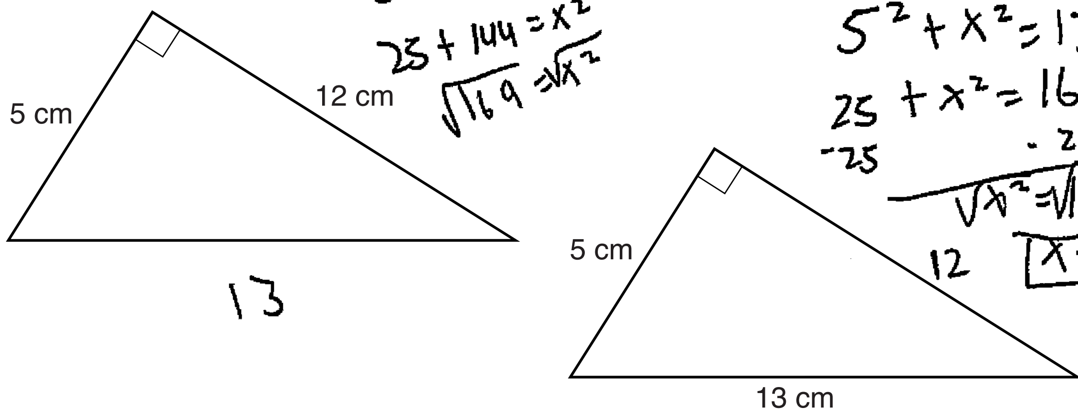
All $\cong \Delta$'s are also similar.

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

Question 30

30 Skye says that the two triangles below are congruent. Margaret says that the two triangles are similar.

$5^2+12^2=x^2$
$25+144=x^2$
$\sqrt{169}=\sqrt{x^2}$



$5^2+x^2=13^2$
$25+x^2=169$
$-25 \quad -25$
$\sqrt{x^2}=\sqrt{144}$
$\boxed{x=12}$

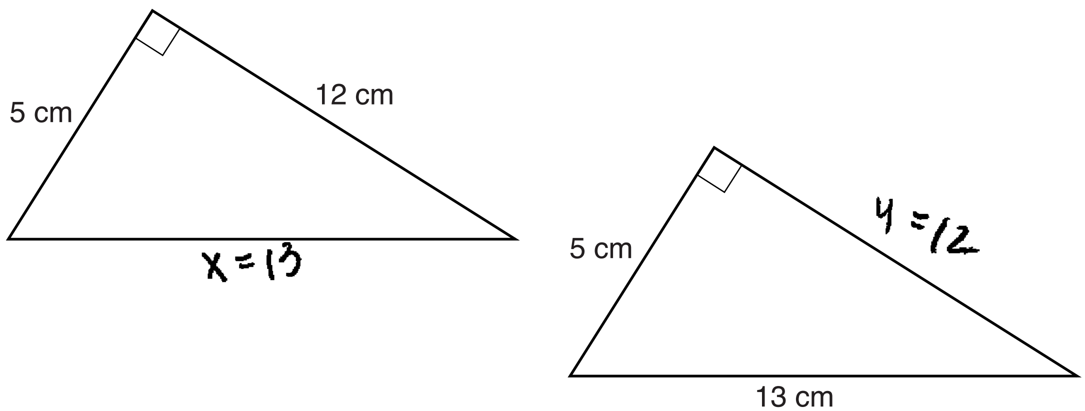
Are Skye and Margaret both correct? Explain why.

They are both coreet due to all sides in the triangle, along with their right angles being congrent and similar. After doing pythagoran theorm you find how all the sides are the same.

Score 1: The student wrote an incomplete explanation. The student did not explain why the triangles were also similar.

Question 30

30 Skye says that the two triangles below are congruent. Margaret says that the two triangles are similar.



Are Skye and Margaret both correct? Explain why.

$5^2 + 12^2 = x^2$
$25 + 144 = x^2$
$\sqrt{169} = \sqrt{x^2}$
$13 = x$

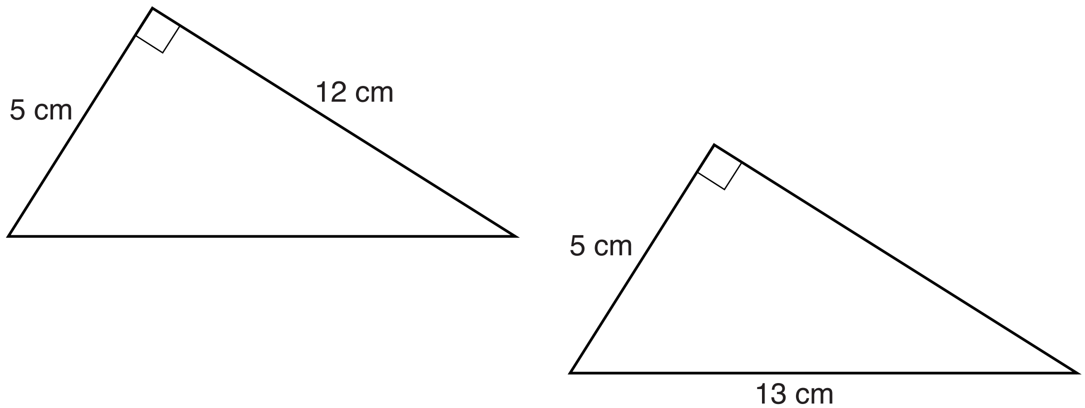
$5^2 + y^2 = 13^2$
$25 + y^2 = 169$
$\sqrt{y^2} = \sqrt{144}$
$y = 12$

No, only Skye is correct. The triangles have the same measurements. Margaret is wrong because one triangle is not bigger or smaller than the other one.

Score 1: The student wrote a partially correct explanation. The student incorrectly concluded that similar triangles must be different sizes.

Question 30

30 Skye says that the two triangles below are congruent. Margaret says that the two triangles are similar.



Are Skye and Margaret both correct? Explain why.

They are both correct becaue the trianglesare right triangles. All right triangles are similar and congruent.

Score 0: The student wrote a completely incorrect explanation as to why the triangles were congruent and similar.

Question 31

31 Randy's basketball is in the shape of a sphere with a maximum circumference of 29.5 inches. Determine and state the volume of the basketball, to the *nearest cubic inch*.

$$C = 2\pi r$$

$$\frac{29.5\text{in}}{2\pi} = \frac{2\pi r}{2\pi}$$

$$4.69507082\text{1in} = r$$

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

$$V = \frac{4}{3}\pi(4.695070821\text{in})^3$$

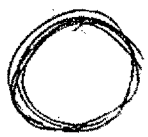
$$V = 433.525903\text{6in}^3$$

$$\boxed{V = 434\text{in}^3}$$

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

Question 31

31 Randy's basketball is in the shape of a sphere with a maximum circumference of 29.5 inches. Determine and state the volume of the basketball, to the *nearest cubic inch*.



29.5

$c = \pi d$

$\frac{29.5}{\pi} = \frac{\pi d}{\pi}$

$\frac{9.39014164 2}{2} = d$

$4.7 \approx \text{radius}$

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

$V = \frac{4}{3}\pi 4.7^3$

$V \approx 435 \text{ in}^3$

Score 1: The student rounded the radius, leading to an incorrect volume of the sphere.

Question 31

31 Randy's basketball is in the shape of a sphere with a maximum circumference of 29.5 inches. Determine and state the volume of the basketball, to the *nearest cubic inch*.

$C = \pi d$

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

$\frac{29.5}{\pi} =$

$R = 9.4$

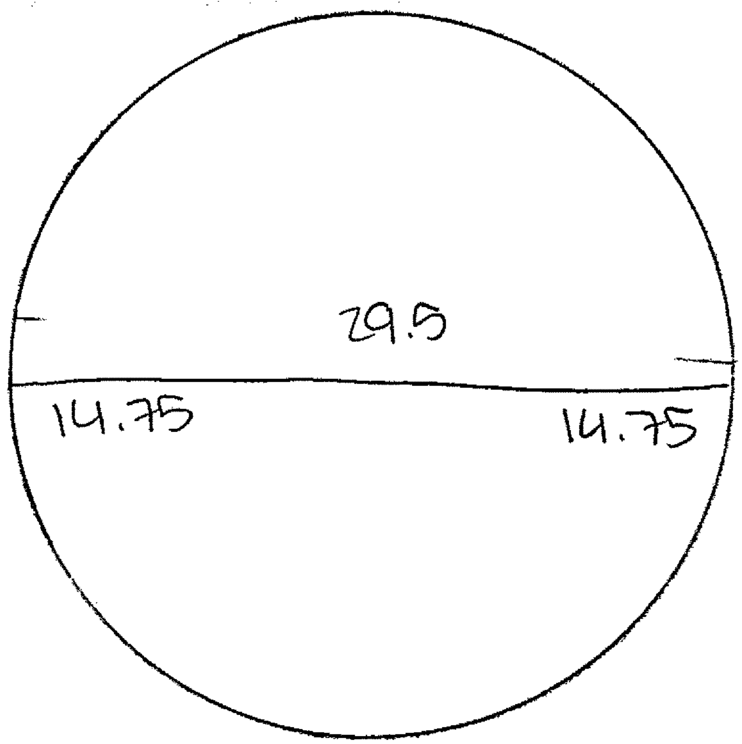
$V = \frac{4}{3}\pi(9.4)^3$

$\boxed{V = 3479 \text{ in}^3}$

Score 1: The student made an error in finding the length of the radius to find the volume of the sphere.

Question 31

31 Randy's basketball is in the shape of a sphere with a maximum circumference of 29.5 inches. Determine and state the volume of the basketball, to the *nearest cubic inch*.



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

$V = 1/3(\pi)(14.75)^2$

$V = 227.8309172$

$V = 228$

Score 0: The student gave a completely incorrect response.

Question 32

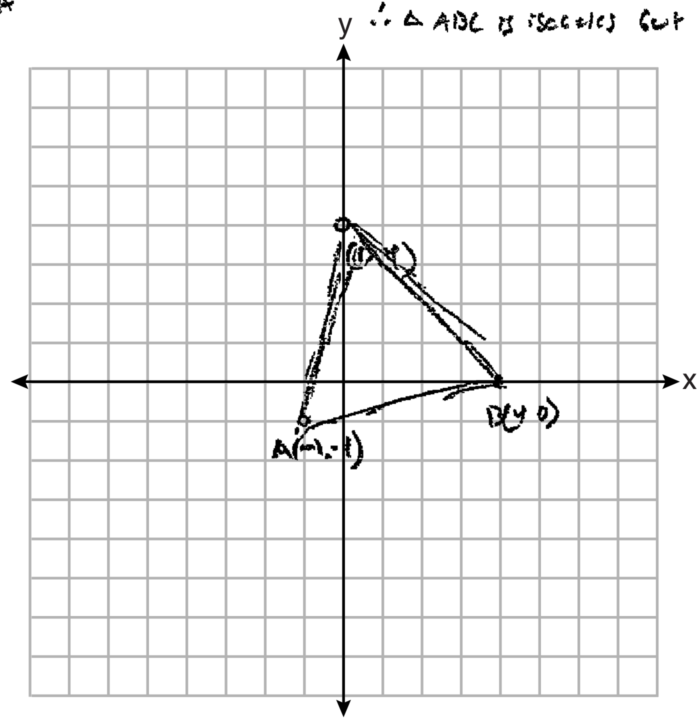
32 Triangle ABC has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

Distance AB $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$= \sqrt{(4-(-1))^2+(0-(-1))^2}$
$= \sqrt{(5)^2+(1)^2}$
$= \sqrt{25+1}$
Distance AB $= \sqrt{26}$

Distance BC $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$= \sqrt{(0-4)^2+(4-0)^2}$
$= \sqrt{(-4)^2+(4)^2}$
$= \sqrt{16+16}$
$= \sqrt{32}$
$= \sqrt{16}\sqrt{2}$
Distance BC $= 4\sqrt{2}$

Distance CA $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$= \sqrt{(-1-0)^2+(4-(-1))^2}$
$= \sqrt{(-1)^2+(5)^2}$
$= \sqrt{1+25}$
Distance CA $= \sqrt{26}$

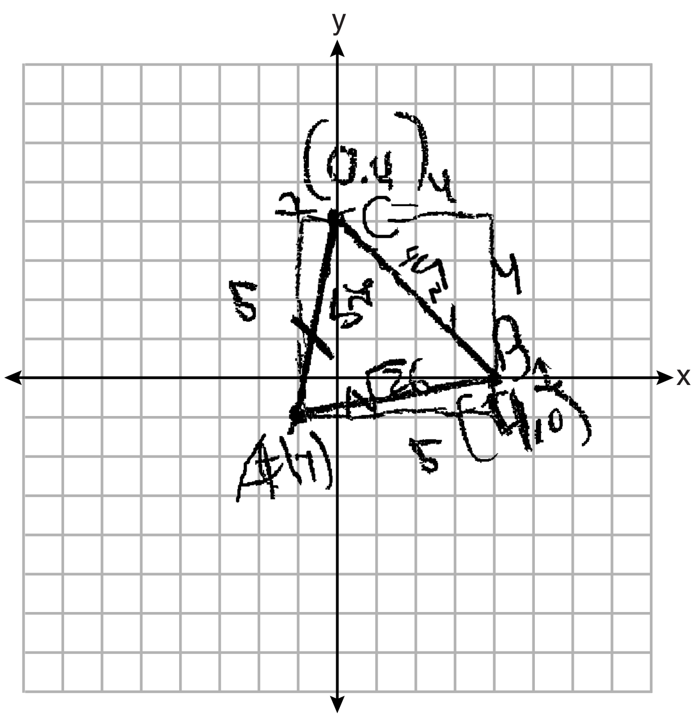
* using the distance formula
Distance CA = Distance AB
∴ △ABC has two equal sides and one side that is not equal.
∴ △ABC is isosceles but not equilateral



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

32 Triangle ABC has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

1. $\overline{AB}$ and $\overline{AC}$ are sides on equal length because of the Pythagorean theorm
2. Two sides of triangle ABC are congruent, therefore $\triangle ABC$ is an isosceles triangle
3. Side $\overline{BC}$ is not congruent to the other sides
4. 3 equal sides are necessary for an equilateral triangle, which is not present in the figure below
5. Therefore $\triangle ABC$ is isosceles but not equilateral



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

Question 32

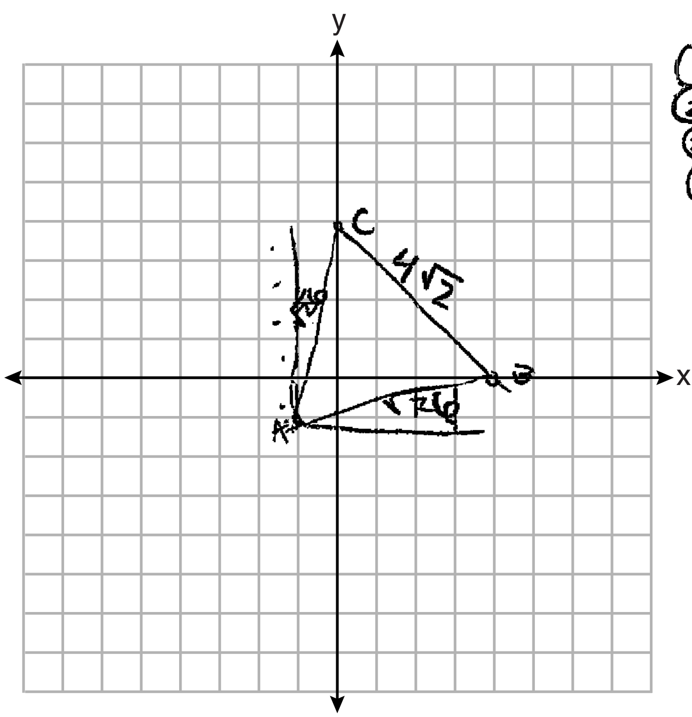
32 Triangle ABC has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

AC:
$1^2 + 5^2 = c^2$
$1 + 25 = c^2$
$26 = c^2$
$\sqrt{26} = c$

BC:
$4^2 + 4^2 = c^2$
$16 + 16 = c^2$
$32 = c^2$
$\sqrt{16}\sqrt{2} = c$
$4\sqrt{2} = c$

AB:
$1^2 + 5^2 = c^2$
$1 + 25 = c^2$
$26 = c^2$
$\sqrt{26} = c$

Two sides are congruent, and the third one is not, creating an isosceles triangle.



① $AC \cong AB$
② $CB \ncong AB$
③ $CB \ncong AC$
④ $\triangle ABC$ is isosceles

Score 3: The student proved $\triangle ABC$ is an isosceles triangle, but did not write a concluding statement that $\triangle ABC$ is not an equilateral triangle.

Question 32

32 Triangle ABC has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

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

$AC = \sqrt{(-1)^2+(3)^2} = \sqrt{10}$

$AB = \sqrt{(3)^2+(-1)^2} = \sqrt{10}$

$AC = AB$

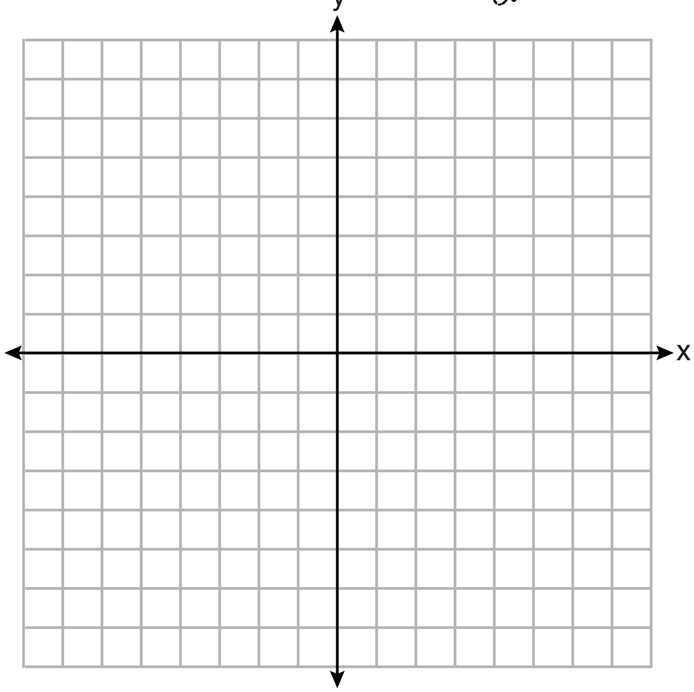
$\therefore \overline{AC} \cong \overline{AB}$

$\triangle ABC$ is isosceles because it has 2 $\cong$ sides

$BC = \sqrt{4^2+4^2} = \sqrt{32}$

$AC = AB \neq BC \therefore \overline{AB} \cong \overline{AC} \ncong \overline{BC}$

$\triangle ABC$ is not equilateral because all 3 sides aren't $\cong$.



Score 3: The student made a computational error in finding the lengths of $\overline{AB}$ and $\overline{AC}$ by stating that $-1 -4 = 3$.

Question 32

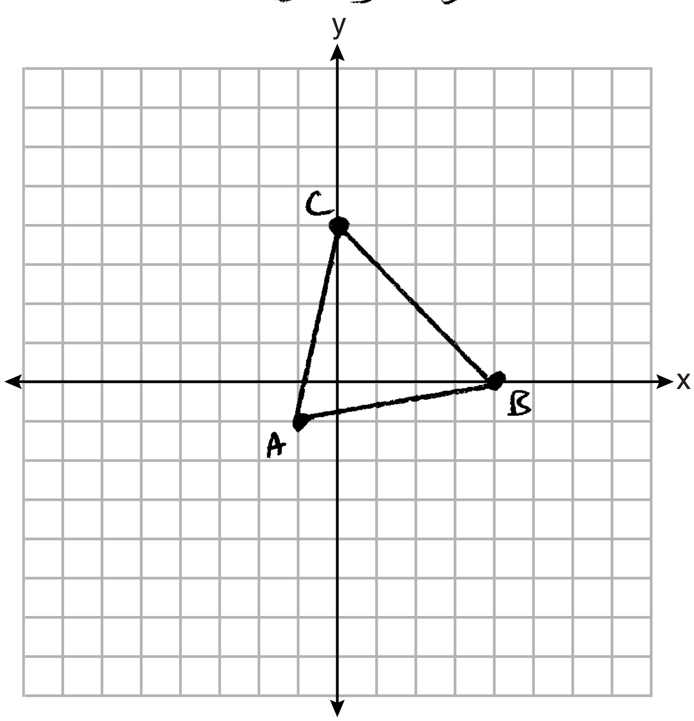
32 Triangle *ABC* has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

$AB: \sqrt{(-1-4)^2+(-1-0)^2} = \sqrt{26}$

$BC: \sqrt{(4-0)^2+(0-4)^2} = \sqrt{32}$

$AC: \sqrt{(-1-0)^2+(-1-4)^2} = \sqrt{26}$

$\triangle ABC$ is isosceles but not equilateral.



Score 2: The student wrote an incomplete concluding statement by not stating why the lengths of the sides of $\triangle ABC$ led to the triangle being isosceles but not equilateral.

Question 32

32 Triangle ABC has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

x_1 y_1 x_2 y_2 x_2

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

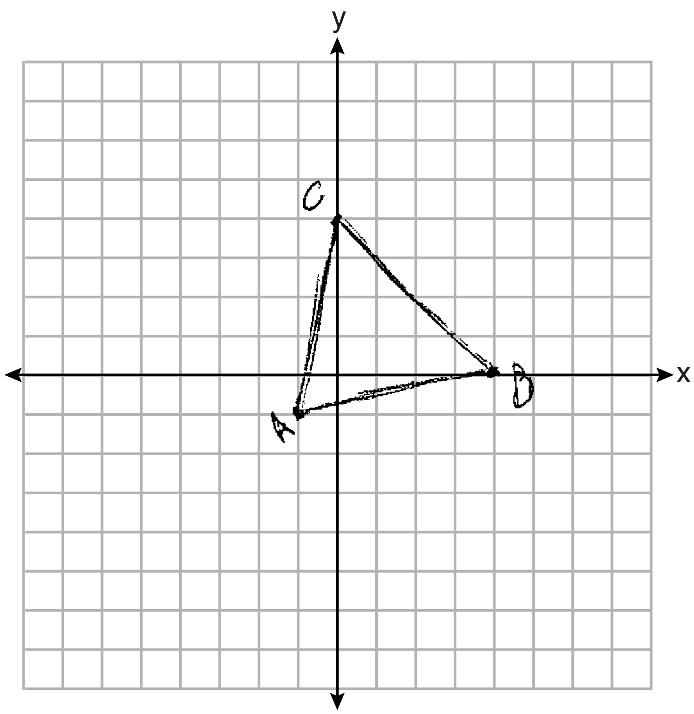
$=\sqrt{(0+1)^2+(4+1)^2}$

$=\sqrt{1+25}$

$=\sqrt{26}$

$d=\sqrt{(4+1)^2+(0+1)^2}$ $\overline{AB}$

$=\sqrt{26}$



Score 1: The student correctly found the lengths of $\overline{AB}$ and $\overline{AC}$, but no further correct work was shown.

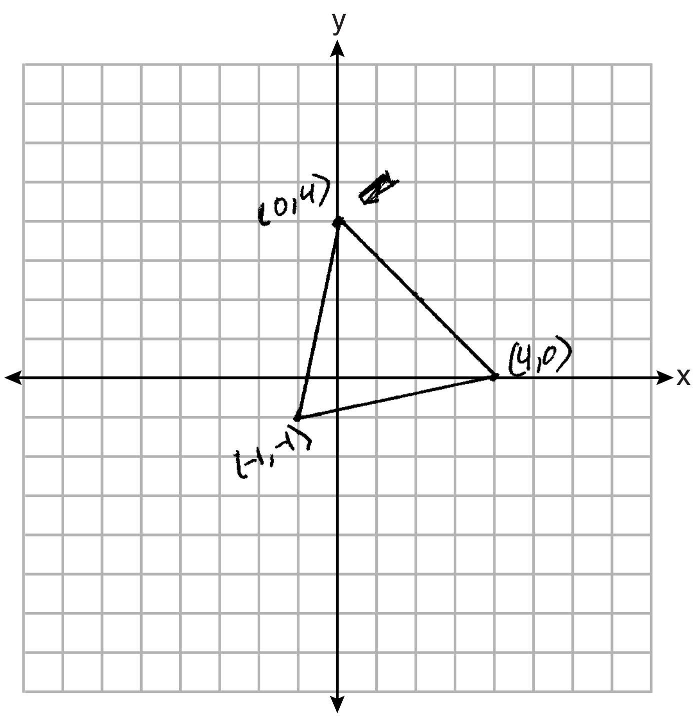
Question 32

32 Triangle *ABC* has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

$AB = \sqrt{(-1-4)^2 + (-1-0)^2} = \sqrt{26}$

$BC = \sqrt{(4-0)^2 + (0-4)^2} = \sqrt{32}$

$\triangle ABC$ is not equilateral



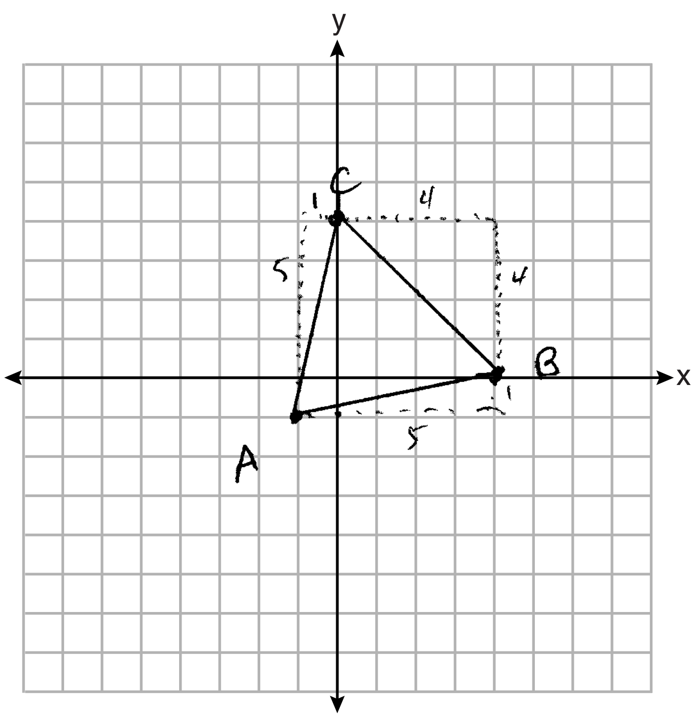
Score 1: The student found the lengths of two noncongruent sides, but the concluding statement was incomplete.

Question 32

32 Triangle ABC has vertices with coordinates $A(-1,-1)$, $B(4,0)$, and $C(0,4)$. Prove that $\triangle ABC$ is an isosceles triangle but *not* an equilateral triangle. [The use of the set of axes below is optional.]

AB 5+1 = 6
AC 5+1 = 6
BC 4+4 = 8

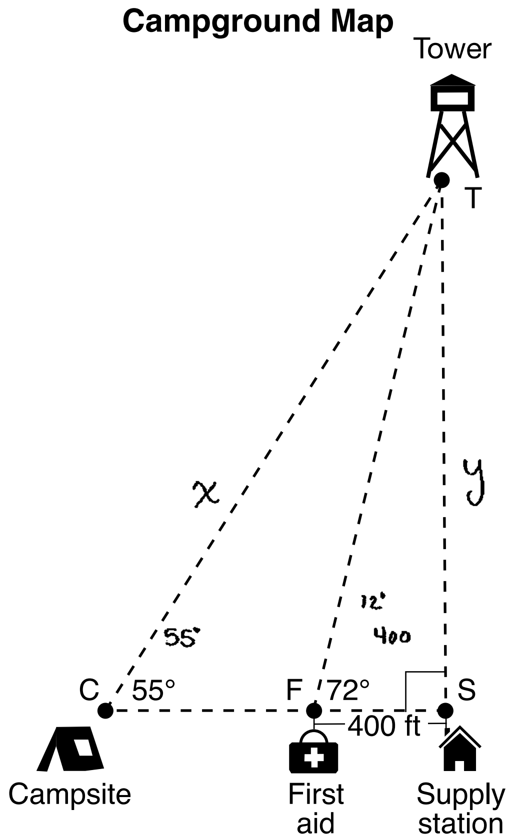
ABC is Isosceles



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

Question 33

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.



Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

$\tan 72 = \frac{y}{400}$

$400 \tan 72 = y$

$1231.0734 \approx y$

$\sin 55 = \frac{y}{x}$

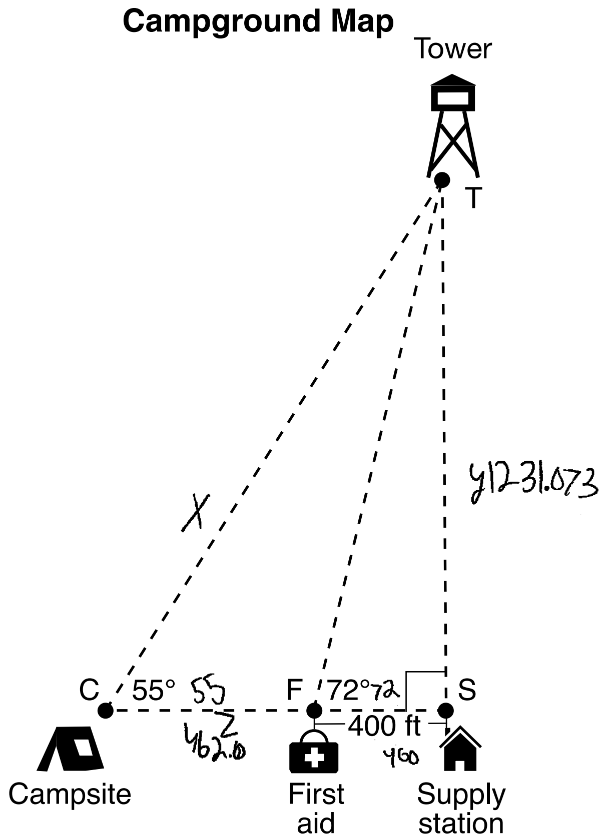
$\sin 55 = \frac{400 \tan 72}{x}$

$x = \frac{400 \tan 72}{\sin 55} \approx 1503 \text{ ft}$

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

Question 33

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.



Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

$862.006^2 + 1231.073^2 = x^2$

$x = 1502.863$

$x = \boxed{1503 \text{ ft}}$

$\tan 72 = \dfrac{y}{400}$

$y = 1231.073$

$\tan 55 = \dfrac{1231.073}{z+400}$

$1231.073 = 571.2 + z\tan 55$

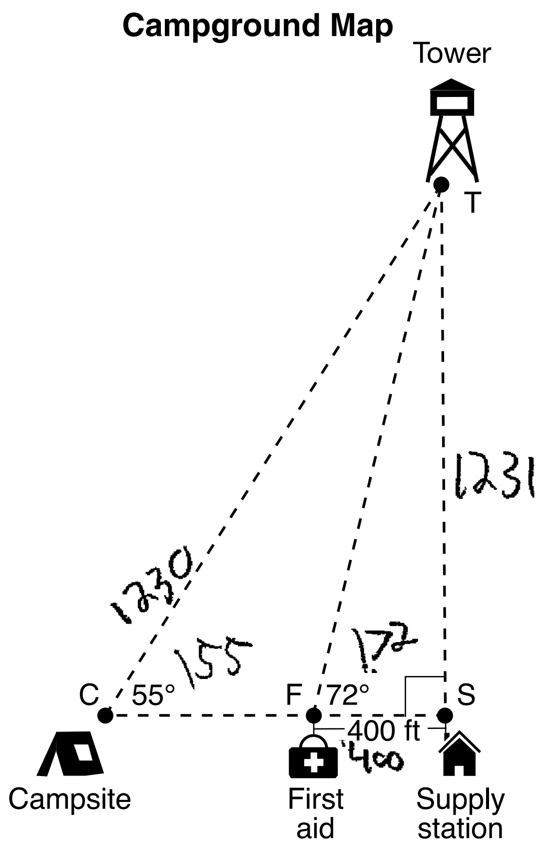
$659.8 = z\tan 55$

$z = 462.006$

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

Question 33

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.



Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

The distance from C to T is 1230 ft

$\frac{\tan 72}{1} = \frac{x}{400}$

$\frac{3.08}{1} = \frac{x}{400}$

$x = 1230$

$x = 1231$ ft

$\frac{.8192x = 1231}{.8192}$

$\frac{\sin 55}{1} = \frac{1231}{x}$

$\frac{.8192}{1} = \frac{1231}{x}$

Score 3: The student made one computational error in determining the length of $\overline{CT}$ by incorrectly dividing: $1231 \div 0.8192 \approx 1230$.

Question 33

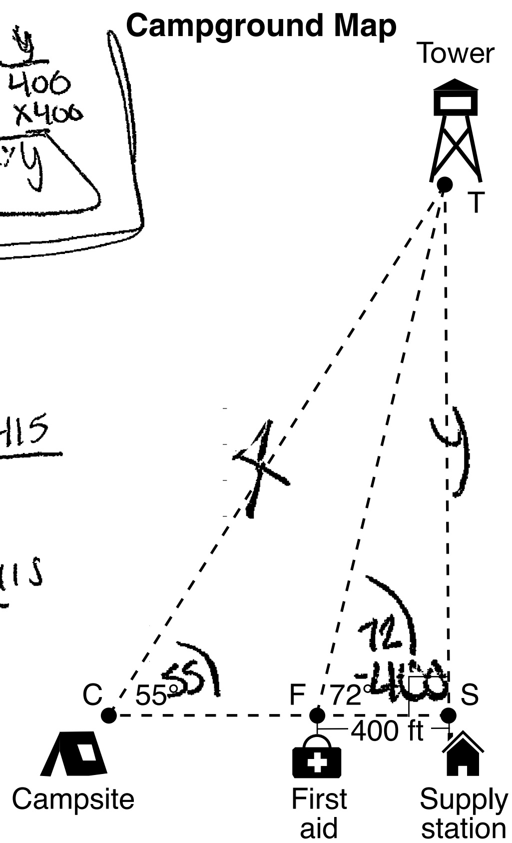
33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.

$\tan 72 = \frac{y}{400}$

$\times 400 \quad \times 400$

$\boxed{1231{,}073415 = y}$

SOH CAH TOA



CT=1485ft

$\sin 56 = \frac{1231.073415}{x}$

$(x) \quad (x)$

$\frac{\sin 56(x)}{\sin 56} = \frac{1231.073415}{\sin 56}$

x=1485ft

Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

Score 3: The student made a transcription error by writing sin 56 instead of sin 55.

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.

$\tan 72 = \frac{x}{400}$ $\quad x = \tan(72) \cdot 400 = 1{,}231.07$ feet

$1{,}231^2 + 400^2 = x^2 \quad 1675361 = x^2 \quad x = 1294.35 \quad x = 1294$ ft

$\frac{1{,}231}{1{,}294} \quad \frac{400}{x}$

$519{,}600 = 1{,}231x$

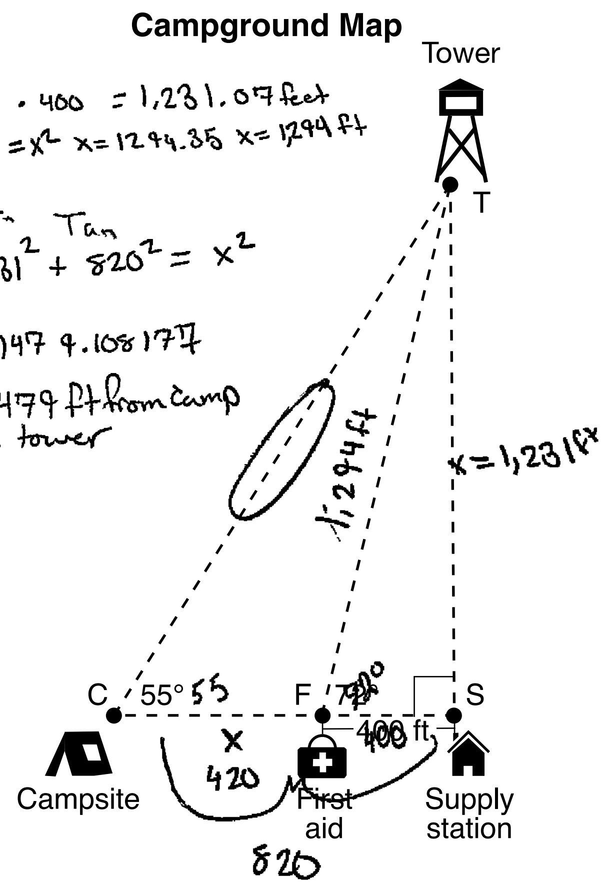
$x = 420.47$ 820

~~x~~ Tan

$1{,}231^2 + 820^2 = x^2$

$x = 1479.108177$

1479 ft from camp to tower

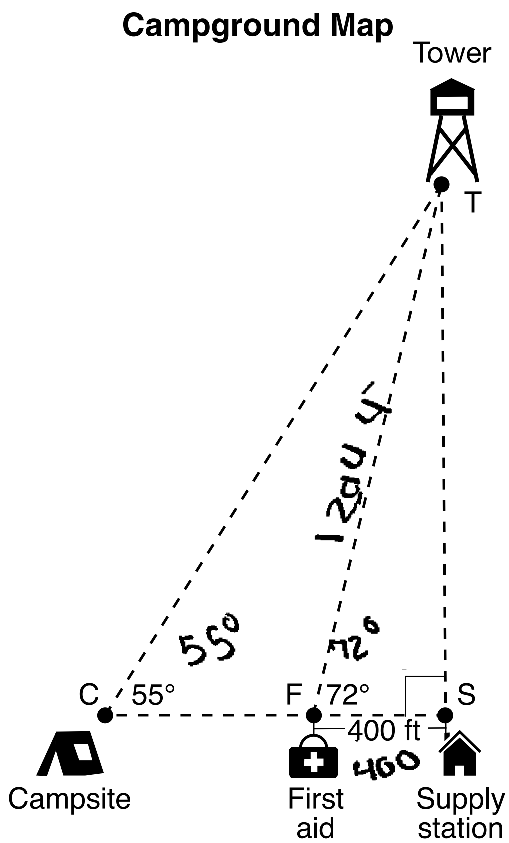


Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

Score 2: The student made one conceptual error by using a proportion in non-similar triangles to find CF.

Question 33

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.



Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

$\cos(72) = \frac{400}{x}$

$x = 400/\cos(72)$

$x = 1294.4$

$\sin(55) = \frac{1294.4}{x}$

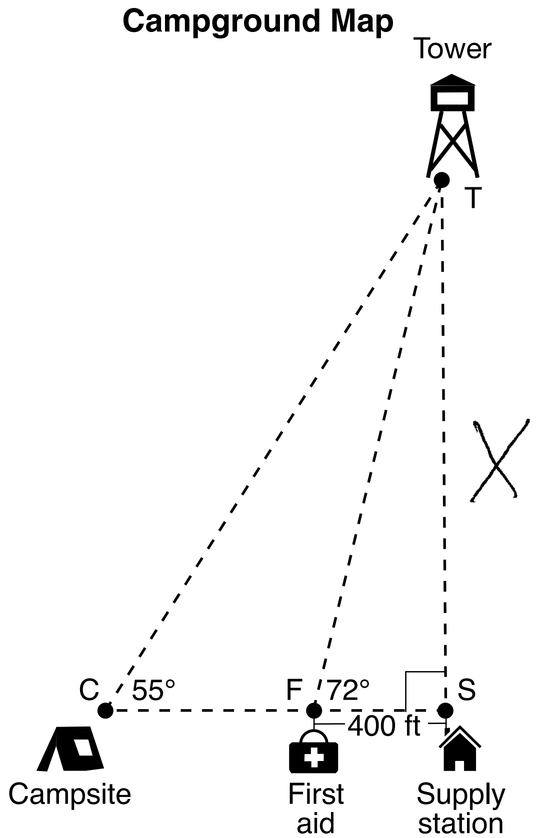
$x = 1294.4/\sin(55)$

$\boxed{1580 \text{ ft}}$

Score 2: The student made one conceptual error by incorrectly using the sine function in non-right triangle *CFT*.

Question 33

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.



Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

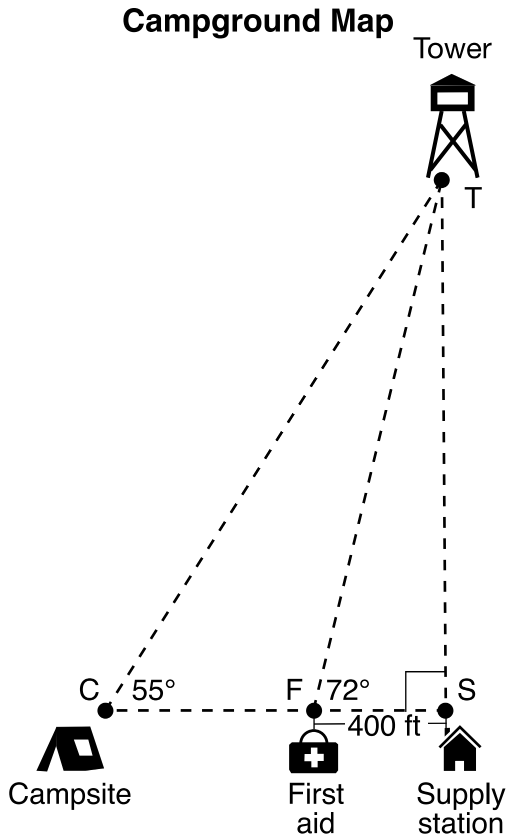
$\text{Tan } 72 = \frac{X}{400}$ $X = 129.9678785$ 130

$X = \frac{400}{\text{Tan } 72}$

Score 1: The student wrote one correct trigonometric equation to find the length of $\overline{TS}$, but no further correct work was shown.

Question 33

33 The map of a campground is shown below. Campsite C, first aid station F, and supply station S lie along a straight path. The path from the supply station to the tower, T, is perpendicular to the path from the supply station to the campsite. The length of path $\overline{FS}$ is 400 feet. The angle formed by path $\overline{TF}$ and path $\overline{FS}$ is 72°. The angle formed by path $\overline{TC}$ and path $\overline{CS}$ is 55°.



Determine and state, to the *nearest foot*, the distance from the campsite to the tower.

$72^2 + 52^2 = c^2$

$5184 + 2704 = c^2$

$7888 = c^2$

distance is 88.8 ft

Score 0: The student gave a completely incorrect response.

Question 34

34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.

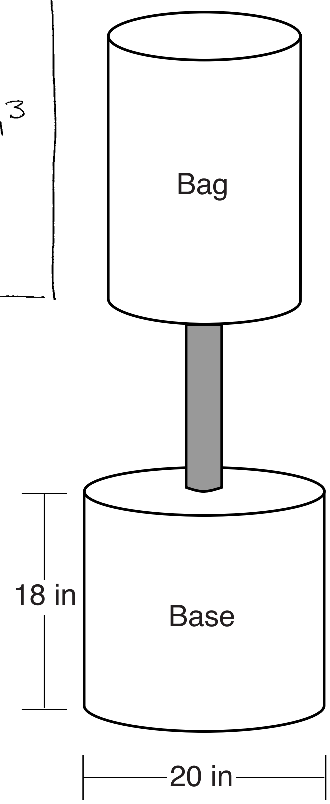
$V = \pi r^2 h$

$V = \pi \cdot 10^2 \cdot 18$

$V = 5654.866776 \text{ in}^3$

$V \times .85 =$

4806.63676



$4806.63676 \div 12^3$

2.781618495 ft^3

$\times 95.46 \text{ lbs/cuft}$

265.533 lbs

$+ 270 \text{ lb}$

$= 535.533$

536 lbs

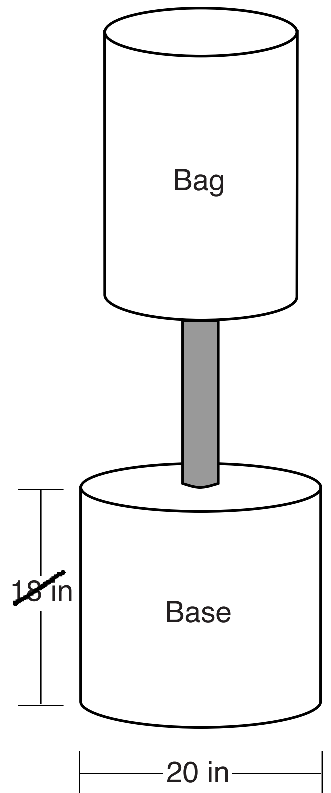
To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

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

Question 34

34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.

270 lbs.



r = 10 in.

$\frac{3}{2}$ $\frac{\cancel{9}}{\cancel{6}}$ $\frac{\cancel{18}}{\cancel{12}}$

$\frac{\cancel{10}}{\cancel{12}}$ $\frac{5}{6}$

$V_{base} = \pi\left(\frac{5}{6}\right)^2\left(\frac{3}{2}\right)$

$= \pi\left(\frac{5}{6}\right)\left(\frac{5}{\cancel{6}_{2}}\right)\left(\frac{\cancel{3}^{1}}{2}\right)$

$= \frac{25}{24}\pi$

$\approx 3.27249\ ft^3$

$$\begin{array}{r} 95.46 \text{ lbs} \\ \times \approx 3.27249 \\ \hline \approx 312.3921195 \\ \times \quad .85 \\ \hline \approx 265.533016 \\ \approx 266 \text{ lbs.} \end{array}$$

To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

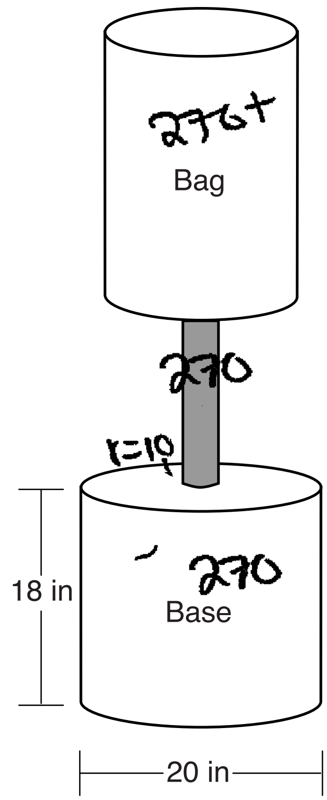
$$\begin{array}{r} 266 \\ +270 \\ \hline 536 \end{array}$$

$\boxed{\approx 536 \text{ pounds}}$

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

Question 34

34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.



$V = BH$
A of base =
$\pi 10^2 = 100\pi$
$H = 18$
$\boxed{V = 100\pi * 18 = 5654.866776}$
85% of V = 4806.63676

sand Inside = 95.46 llbs per cubic ft.

V. mass = 4806.6376 x 95.46 = 458841.5451

Bag weight = 458841.5451 + 270 = ≈459,112

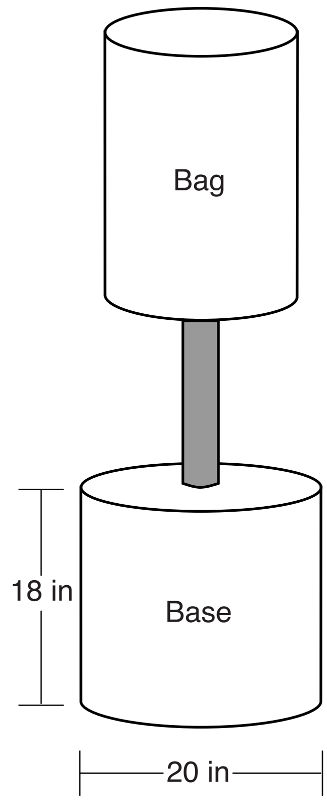
To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

The total weight of the freestanding training bag if the base is filled to 85% of its capacity is 459,112 pounds.

Score 3: The student did not convert cubic inches to cubic feet.

Question 34

34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.



To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

$V = \pi r^2 h$

$V = \pi \cdot (10^2)(18)$

$V = 1800\pi$

$V = 5654.86676$

change to ft^3

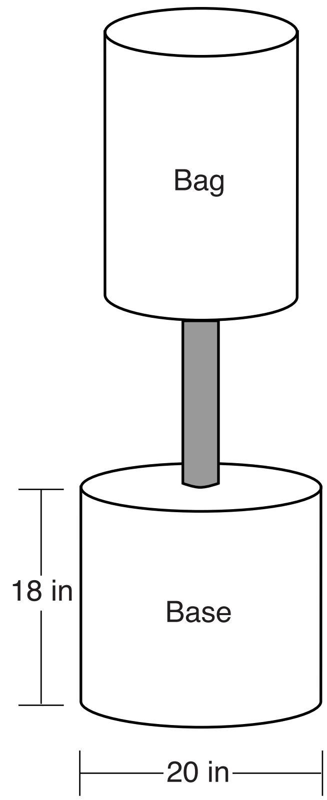
$\frac{5654.86676}{12^3}$

3.272492347 cubic feet

Score 2: The student found the volume of the base in cubic feet, but no further correct work was shown.

Question 34

34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.



To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

$V = \pi r^2 h$

$V = \pi (20)^2 (18)$

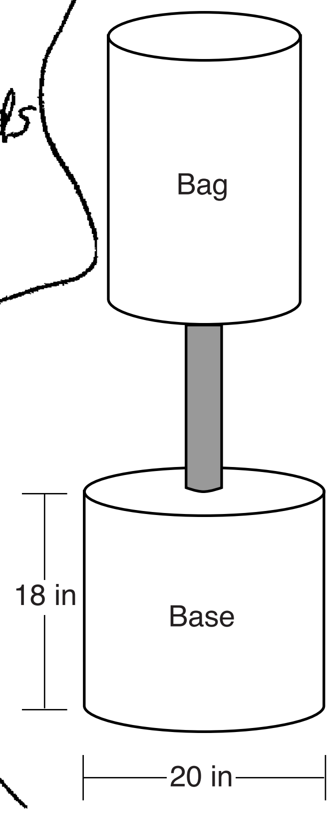
$V = \frac{22619.46711}{12^3} = 13.089 \; ft^3$

Score 1: The student made an error in finding the volume in cubic feet by using the diameter of the base in the volume formula.

Question 34

34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.

270 pounds



dry sand

95.46 lbs/cubic foot

To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

$V = \pi r^2 h$

$V = \pi 10^2 \cdot 18$

$V = 1800\pi$

$\frac{1800\pi}{112} = 50.489...$

$270 + 50 = 320$

$\boxed{320 \text{ lbs}}$

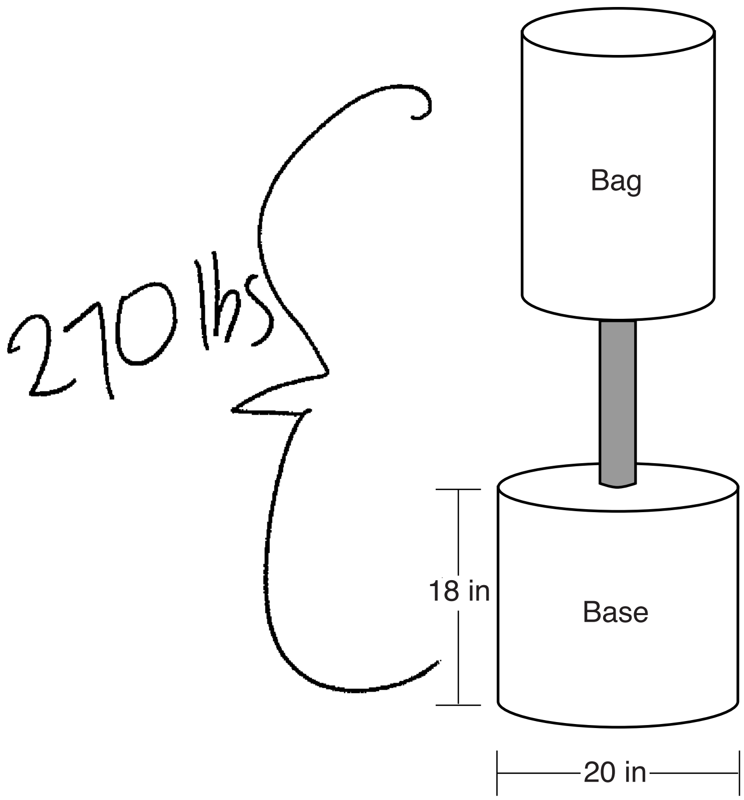
$\frac{95.46}{x} = \frac{85}{100}$

$\frac{9546}{85} = \frac{85x}{85}$

$112 = x$

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

34 Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.



565.38(0.80) = 452.304

565.38/270 = 2.094

95.46 * 2.1 = 200.466

~~200.4(0.80)~~

200.4(0.85) = 170.34

$\pi r^2 = 10^2\pi = 31.4159$

31.41(18) = 565.38

V = 565.38

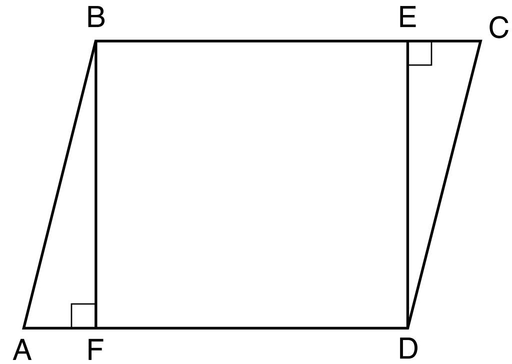
To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

The total weigh is 170. lbs.

Score 0: The student gave a completely incorrect response.

Question 35

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



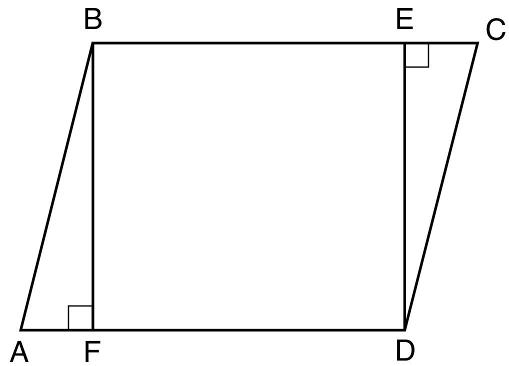
Prove: $BEDF$ is a rectangle

Statements	Reasons
① Parallelogram ABCD, $\overline{BF} \perp \overline{AD}$ and $\overline{DE} \perp \overline{BC}$	① Given
② $\angle BFA$, $\angle BFD$, $\angle DEC$, $\angle DEB$ are right $\angle$s	② $\perp$ lines form right angles
③ $\angle BFA \cong \angle BFD \cong \angle DEC \cong \angle DEB$	③ All right $\angle$s $\cong$
④ $\angle A \cong \angle C$	④ In a parallelogram, opp. $\angle$s $\cong$
⑤ $\overline{AB} \cong \overline{CD}$	⑤ In a parallelogram, opp. sides $\cong$
⑥ $\triangle AFB \cong \triangle CED$	⑥ AAS $\cong$ AAS
⑦ $\overline{BF} \cong \overline{DE}$	⑦ CPCTC
⑧ $\overline{BC} \parallel \overline{AD}$	⑧ In a parallelogram, opp. sides $\parallel$
⑨ $\overline{BF} \parallel \overline{ED}$	⑨ 2 lines $\perp$ to $\parallel$ lines are $\parallel$
⑩ BEDF is a parallelogram	⑩ one pair of opp. sides $\cong$ and $\parallel$ → parallelogram
⑪ BEDF is a rectangle	⑪ a parallelogram with a right $\angle$ is a rectangle

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

Question 35

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



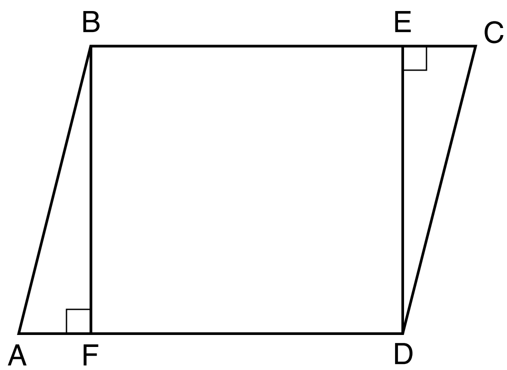
Prove: $BEDF$ is a rectangle

Statements	Reasons
1) ▱ABCD, $\overline{BF} \perp \overline{AFD}$, $\overline{DE} \perp \overline{BEC}$	1) Given
2) $\overline{BC} \parallel \overline{AD}$	2) opp. sides of a ▱ are //
3) $\overline{BE} \parallel \overline{FD}$	3) Parts of // lines are //
4) $\overline{BF} \parallel \overline{DE}$	4) 2 lines ⊥ to // lines are //
5) Quad BEDF is a ▱	5) A Quad w/ both prs of opp sides // is a ▱
6) ∠DEB is a rt ∠	6) ⊥ lines form rt ∠'s
7) ▱BEDF is a rectangle	7) A ▱ with one rt ∠ is a rectangle

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

Question 35

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



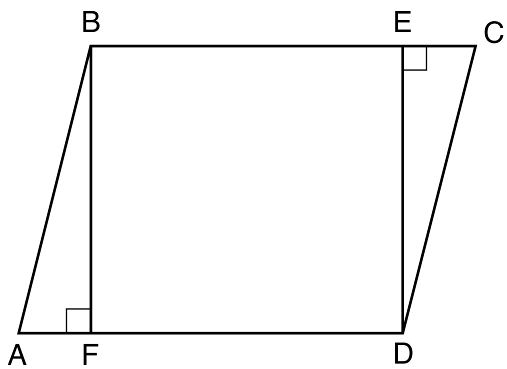
Prove: $BEDF$ is a rectangle

statement	reason
1) $ABCD$ is a parallelogram, $\overline{BF} \perp \overline{AD}$, $\overline{DE} \perp \overline{BC}$	1. given
2) $\angle A \cong \angle C$	2. opposit $\measuredangle$s of a parallelogram are $\cong$
3) $\overline{AB} \cong \overline{CD}$, $\overline{AD} \cong \overline{BC}$	3. opposite sidesof a parallelogram are $\cong$
4) $\angle BFD$, $\angle DEB$, are $\angle BFA$, $\angle DEC$ right $\angle$s	4. $\perp$ lines form right angles
4a) $\angle BFD \cong \angle DEB$, $\angle BFA \cong \angle DEC$	4a) all right $\angle$s are $\cong$
5) $\triangle ABF \cong \triangle CDE$	5) AAS $\cong$ AAS.
6) $\overline{BF} \cong \overline{ED}$, $\overline{AF} \cong \overline{EC}$	6) CPCTC
7) $\overline{BE} \cong \overline{FD}$	7) Equals subt from $=$s are $=$
8) BEDF is a parallelogram	8) Because both pairs of opposite sides are $\cong$
9) BEDF is a rectangle	9) Four $=$ sides and four $=$ angles (90°) so it is a quadrilateral from 8,6,4

Score 5: The student had an incorrect reason in step 9.

Question 35

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



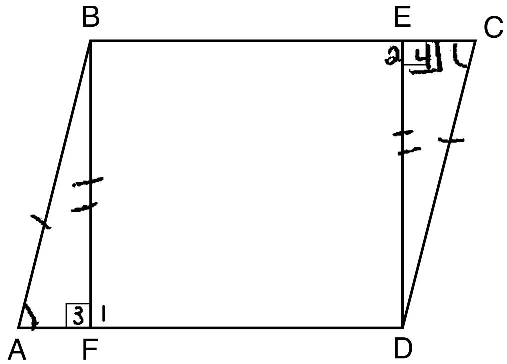
Prove: $BEDF$ is a rectangle

S	R
1. p-gram ABCD, $\overline{BF} \perp \overline{AFD}$, $\overline{DE} \perp \overline{BEC}$	1. Given
2. $\overline{AB} \cong \overline{CD}$	2. Opposite sides of a p-gram are $\cong$.
3. $\angle A \cong \angle C$	3. Opposite $\angle$s of a p-gram are $\cong$,
4. $\angle BFA$, $\angle BFD$, $\angle DEC$ are all right $\angle$s.	4. Perpendicular lines meet to form right angles.
5. $\angle BFA \cong \angle DEC$	5. All right $\angle$s are $\cong$,
6. $\triangle BFA \cong \triangle DEC$	6. AAS
7. $\overline{BF} \cong \overline{ED}$	7. CPCTC
8. $\overline{BF} \parallel \overline{ED}$	8. If 2 segments are each $\perp$ to // lines, then they are // to each other.
9. BEDF is a p-gram	9. A quad w/ one set of opposite sides $\cong$ and // is a p-gram.

Score 4: The student did not state that $\overline{AD} \parallel \overline{BC}$ in order to prove $\overline{BF} \parallel \overline{ED}$. The student did not prove $BEDF$ is a rectangle.

Question 35

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



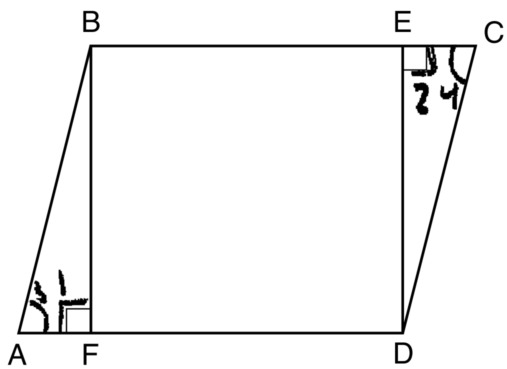
Prove: $BEDF$ is a rectangle

Statement	Reason
① ABCD ▱, $\overline{BF} \perp \overline{AD}$, $\overline{DE} \perp \overline{BC}$	① Given
② ∠1, ∠2, ∠3, ∠4 are Rt ∠'s	② Definition of Perpendicular
③ ∠3 ≅ ∠4	③ All Rt ∠'s ≅
④ ∠A ≅ ∠C	④ Opposite ∠'s ▱ ≅
⑤ $\overline{AB} \cong \overline{CD}$	⑤ Opposite sides ▱ ≅
⑥ △BAF ≅ △DCE	⑥ AAS
⑦ $\overline{BF} \cong \overline{ED}$	⑦ CPCTC
⑧ BEDF is a Rectangle	⑧ a Rectangle has Rt ∠'s and ≅ opposite sides

Score 4: The student made one conceptual error by concluding a rectangle is a quadrilateral with one pair of opposite sides congruent and two right angles (step 8).

Question 35

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$

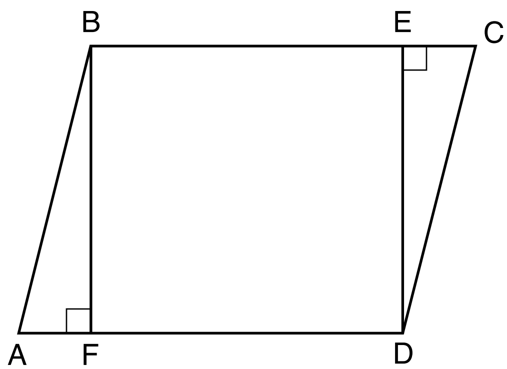


Prove: $BEDF$ is a rectangle

Statement	Reason
① ABCD is a ▱	① Given
② $\overline{AB} \cong \overline{CD}$	② in a ▱ opp sides are ≅
③ $\overline{BF} \perp \overline{AD}$, $\overline{DE} \perp \overline{BC}$	③ Given
④ ∠1, ∠2 = rt ∠'s	④ ⊥ lines make rt ∠'s
⑤ ∠1 ≅ ∠2	⑤ All rt ∠'s are ≅
⑥ ∠3 ≅ ∠4	⑥ In a ▱ opp ∠'s are ≅
⑦ △AFB ≅ △CED	⑦ AAS ≅ AAS
⑧	⑧

Score 3: The student proved $\triangle AFB \cong \triangle CED$.

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



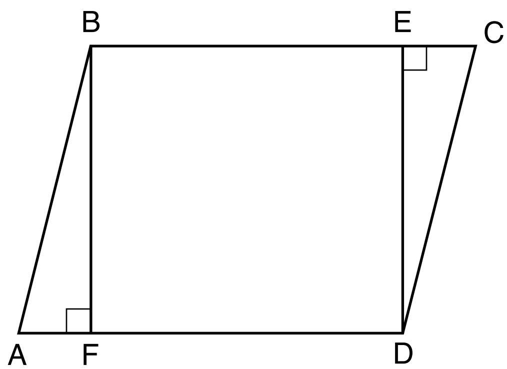
Prove: $BEDF$ is a rectangle

S	R
1 ▱ $ABCD$, $\overline{BF} \perp \overline{AD}$, $\overline{DE} \perp \overline{BC}$	1 Giv
2 $\angle A \cong \angle C$	2) opp ∠'s of ▱ are ≅
3) $\overline{AB} \cong \overline{DC}$	3) opp sides of ▱ are ≅
4) $\triangle AFB \cong \triangle CED$	4) HL
5) $\angle B$, $\angle E$, $\angle D$, $\angle F$ are all rt ∠'s	5) All rt ∠'s are =
6) BEDF is a rect.	6) A rect has all rt ∠'s

Score 2: The student made two correct relevant statements and reasons about parallelogram *ABCD* (steps 2 and 3).

Question 35

35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



Prove: $BEDF$ is a rectangle

S	R
1. parallogram ABCD, $\overline{BF} \perp \overline{AD}$, $\overline{DE} \perp \overline{BC}$	1. given
2. $\measuredangle BFA \cong \measuredangle CED$	2. $\perp$ lines make rt. $\measuredangle$s
3. $\overline{AF} \cong \overline{EC}$	3. Subtraction
4. $\measuredangle A \cong \measuredangle C$	4. Opposite $\measuredangle$s of a parallologram are $\cong$.
5. $\triangle ABF \cong \triangle CDE$	5. AAS
6. BEDF is a rectangle	6. CPCTC

Score 1: The student made a correct relevant statement and reason in step 4.

Question 35

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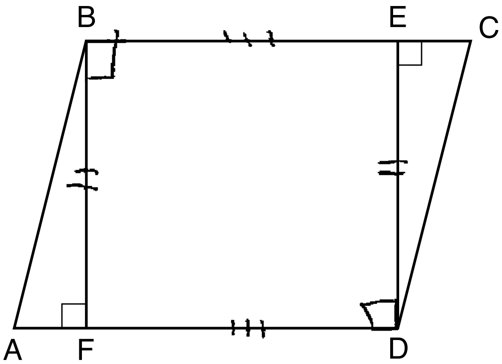
35 Given: Parallelogram $ABCD$, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$



Prove: $BEDF$ is a rectangle

Statements	Reasons
① $\overline{BF} \perp \overline{AD}$ & $\overline{DE} \perp \overline{BC}$	① given
② $\angle BFD \cong \angle DEB$	② Both right angles
③ $\overline{BE} \cong \overline{FD}$	③ parrallell lines
④ $\overline{BF} \cong \overline{ED}$	④ parralell lines
⑤ $\angle B \cong \angle D$	⑤ Both right angles
⑥ BEDF is a rectangle	⑥ all right angles but two pairs of matching sides

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