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

GEOMETRY

Wednesday, January 25, 2023 — 9:15 a.m. to 12:15 p.m., only

MODEL RESPONSE SET

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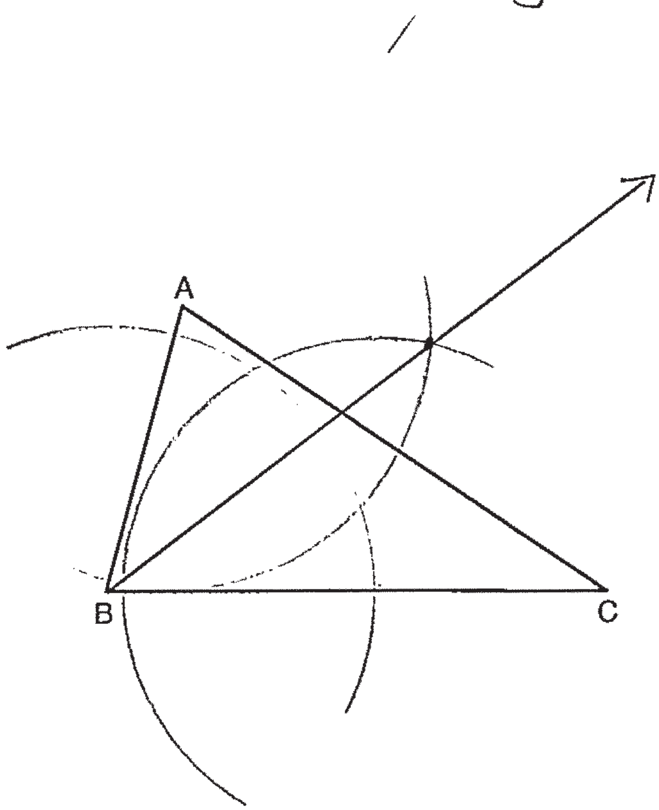
Question 25

25 Using a compass and straightedge, construct the angle bisector of $\angle ABC$.
[Leave all construction marks.]

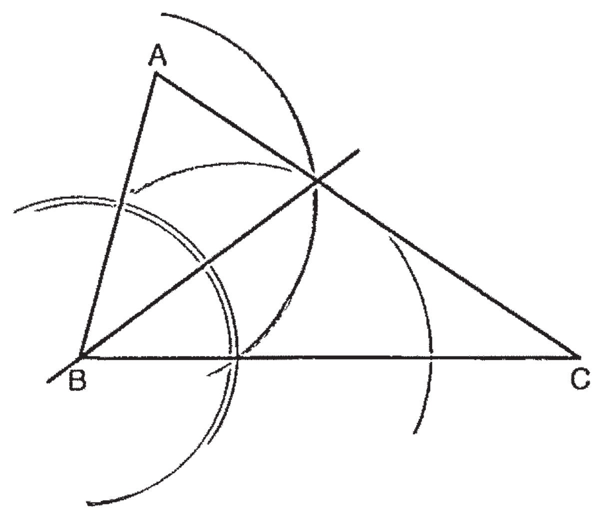
angle bisector of $\angle ABC$



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

Question 25

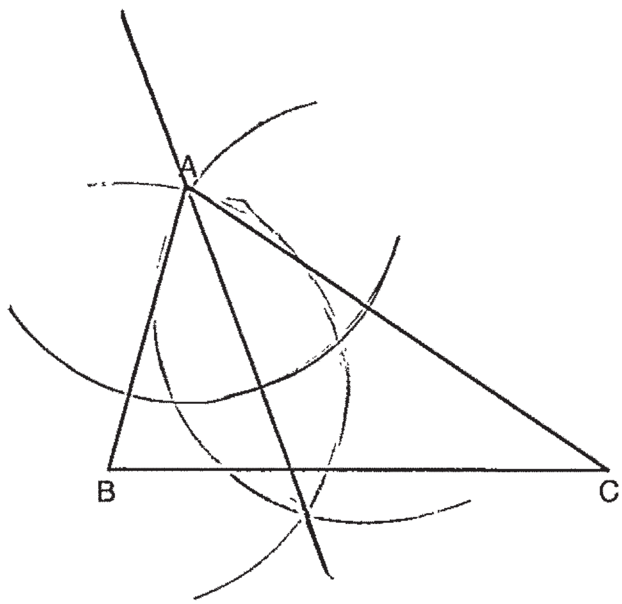
25 Using a compass and straightedge, construct the angle bisector of $\angle ABC$.
[Leave all construction marks.]



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

Question 25

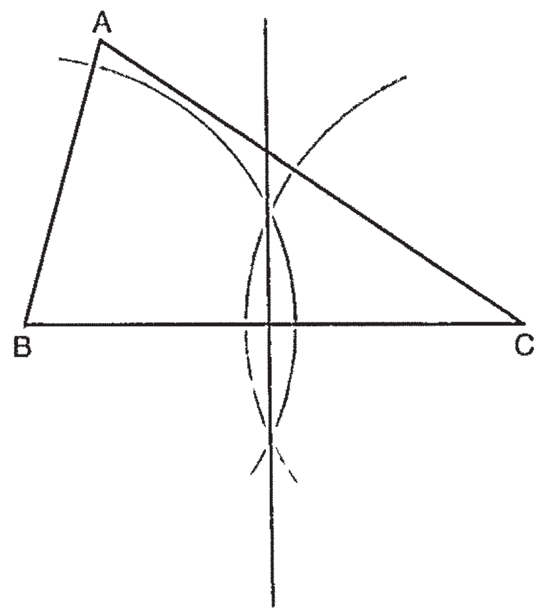
25 Using a compass and straightedge, construct the angle bisector of $\angle ABC$.
[Leave all construction marks.]



Score 1: The student constructed the bisector of angle A.

Question 25

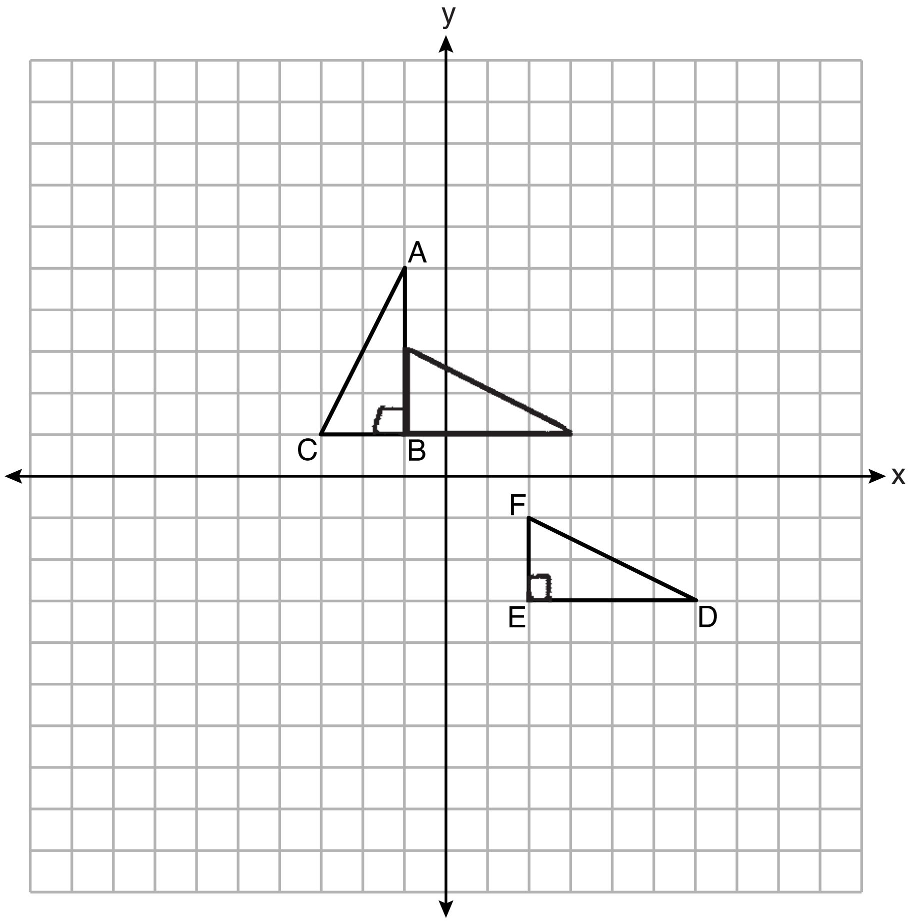
25 Using a compass and straightedge, construct the angle bisector of $\angle ABC$.
[Leave all construction marks.]



Score 0: The student gave a completely incorrect response.

Question 26

26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.



Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

a rotation of 90° clockwise about point B and then a translation down 4 and to the right by 3

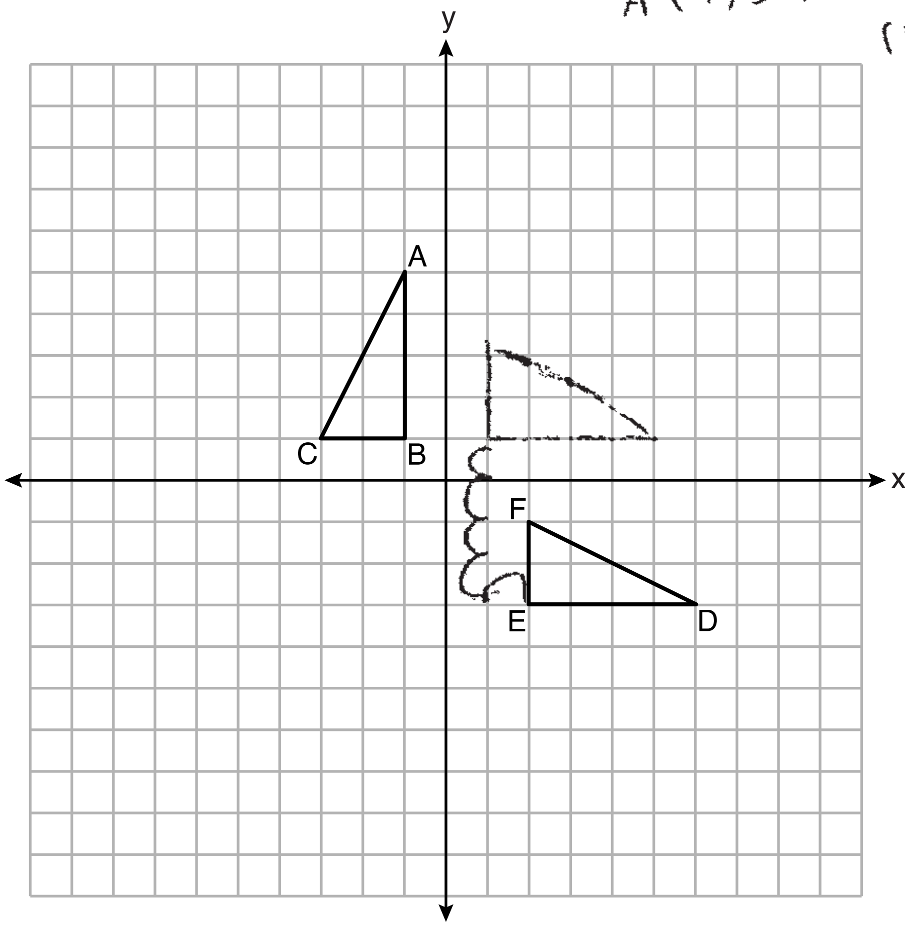
Score 2: The student gave a complete and correct response.

Question 26

26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.

A (1,5)

(5,1)



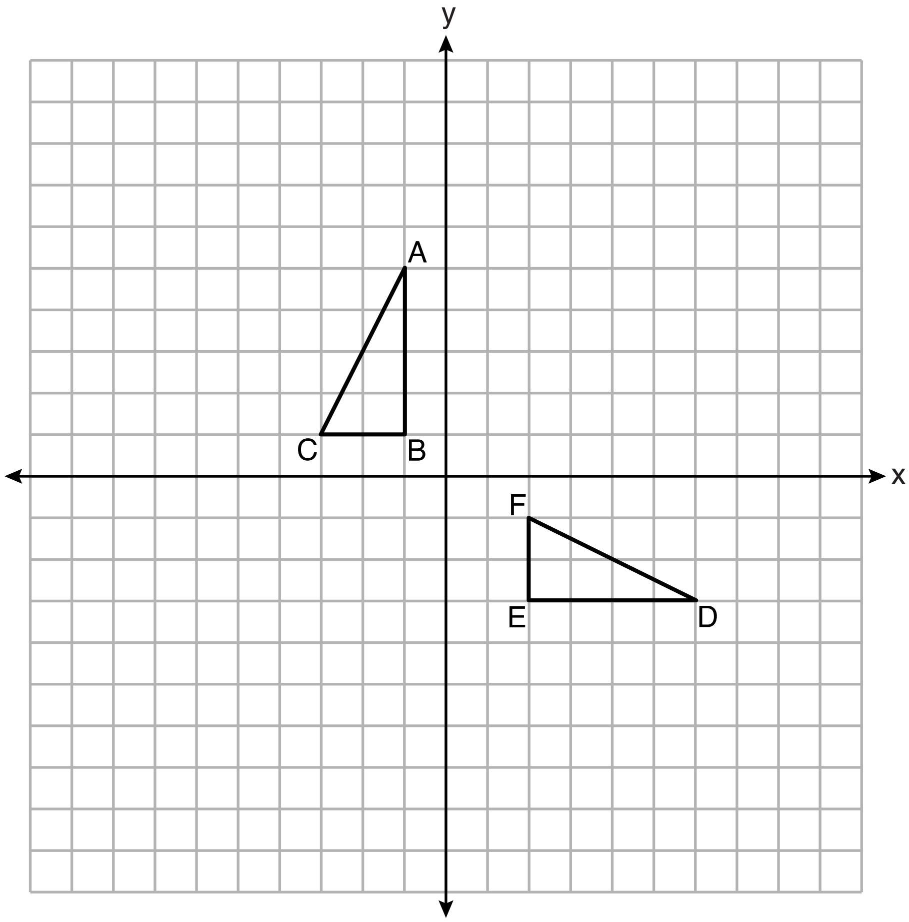
Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

First, rotate 90° clockwise, then translate one unit right and four units down.

Score 1: The student described an appropriate sequence of rigid motions, but the center of rotation was not stated.

Question 26

26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.



Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

Rotate 90° clockwise

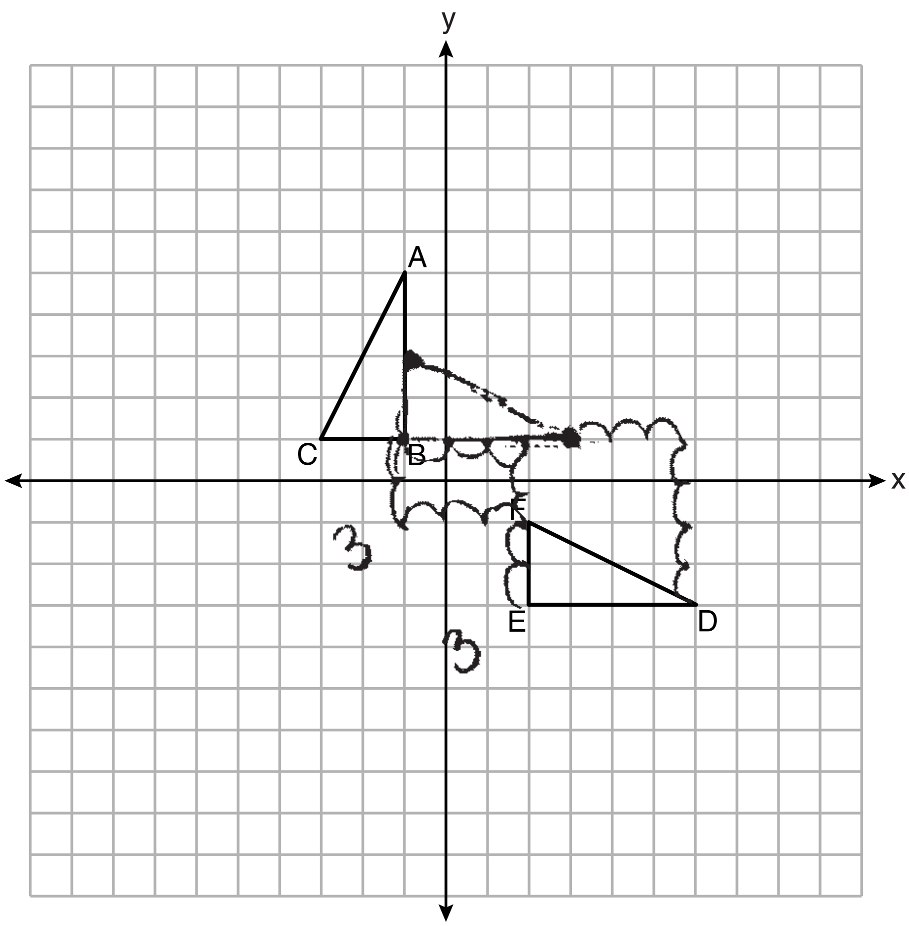
Translate down so that $A \to D$

$B \to E$ $C \to F$

Score 1: The student described an appropriate sequence of rigid motions, but the description was incomplete.

Question 26

26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.



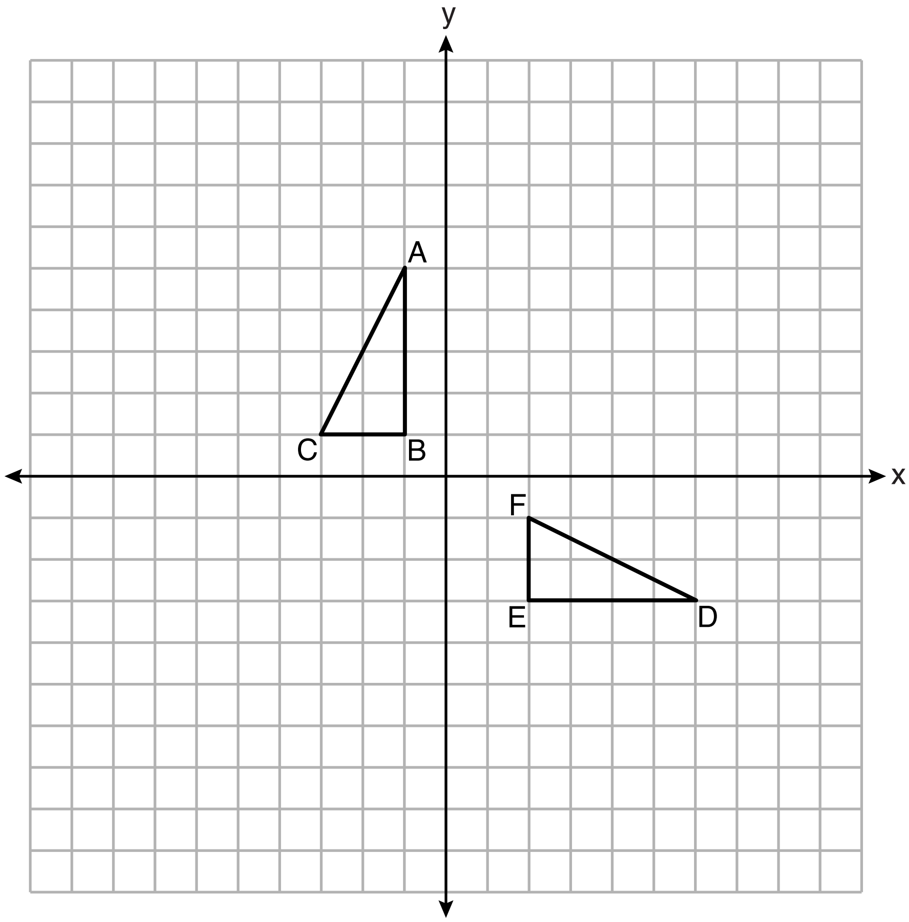
Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

a rotation counterclockwise 270° about point B
a translation down 3 and right 4 units

Score 1: The student gave a correct description of the rotation, but gave an incorrect description of the translation.

Question 26

26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.



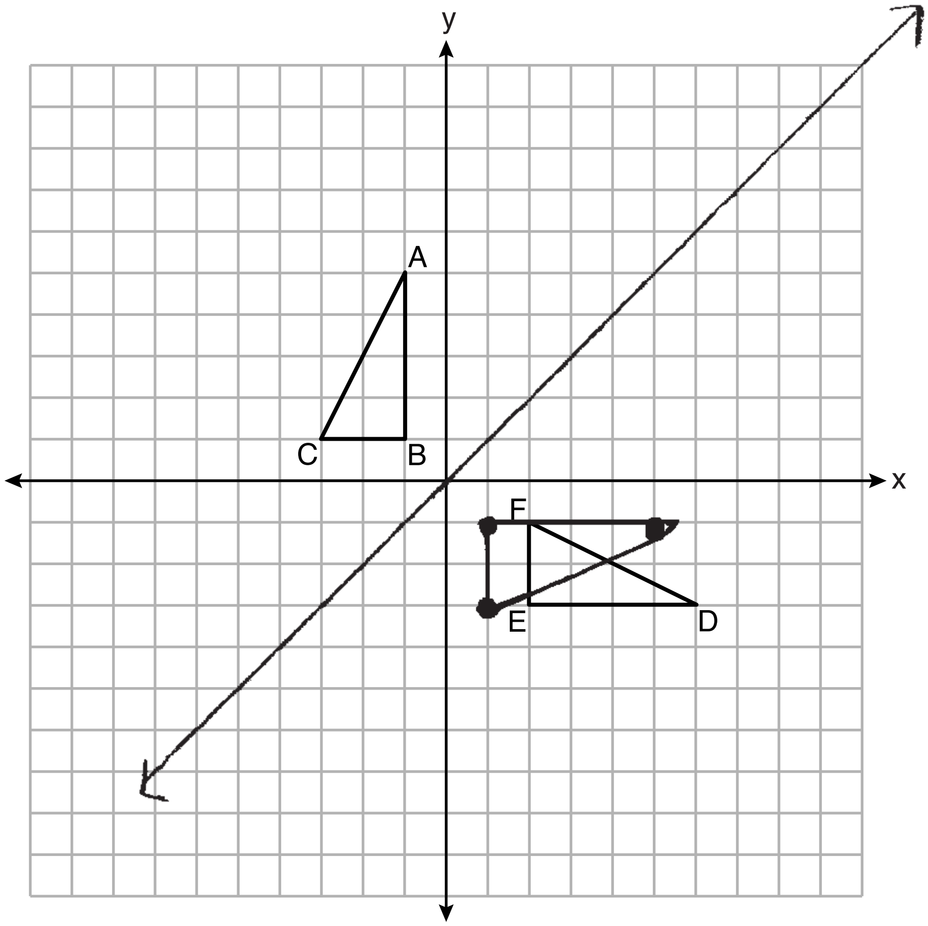
Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

A rotation followed by a translation

Score 1: The student described an appropriate sequence, but the description was incomplete.

Question 26

26 On the set of axes below, $\triangle ABC$ and $\triangle DEF$ are graphed.



Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle DEF$.

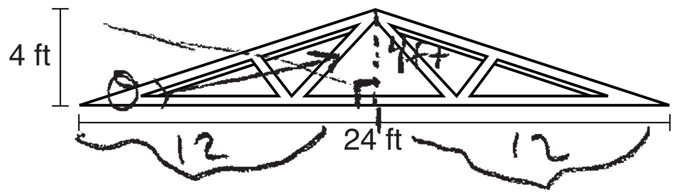
A reflection over the line $y=x$,

followed by a translation of right 1.

Score 0: The student gave a completely incorrect description.

Question 27

27 As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.



Determine and state, to the *nearest degree*, the angle of elevation of the roof frame.

$\tan\theta = \frac{4}{12}$

$\theta = \tan^{-1}\left(\frac{4}{12}\right)$

$\theta = 18.4$

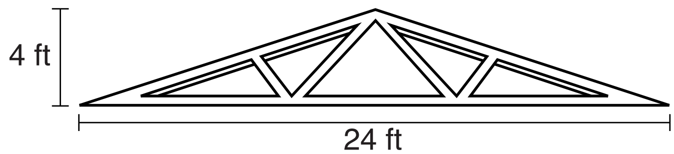
$\theta = 18^\circ$

Angle of elevation $= 18^\circ$

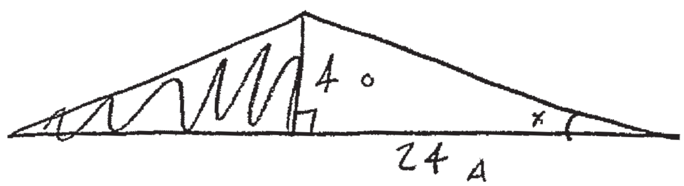
Score 2: The student gave a complete and correct response.

Question 27

27 As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.



Determine and state, to the *nearest degree*, the angle of elevation of the roof frame.



$$\tan(x) = \frac{4}{24}$$

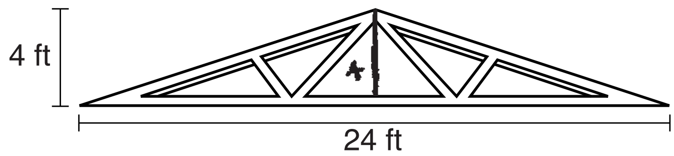
$$\tan^{-1}\left(\frac{4}{24}\right)$$

$$\boxed{x = 9^\circ}$$

Score 1: The student wrote an incorrect trigonometric equation, but solved the equation correctly.

Question 27

27 As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.



Determine and state, to the *nearest degree*, the angle of elevation of the roof frame.

$24/2 = 12$

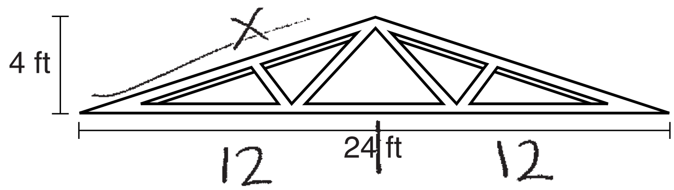
$\text{Tan.} = \frac{\text{opp.}}{\text{adj.}}$

$\text{Tan}^{-1} \frac{4}{12} = 14.03624347 \approx 14°$

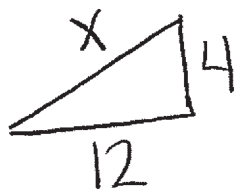
Score 1: The student wrote a correct trigonometric equation, but no further correct work was shown.

Question 27

27 As shown in the diagram below, a symmetrical roof frame rises 4 feet above a house and has a width of 24 feet.



Determine and state, to the nearest degree, the angle of elevation of the roof frame.



$4^2+12^2=x^2$

$16+144=x^2$

$\sqrt{160}=\sqrt{x^2}$

$12.64911064=x^2$

$13° = x$

Score 0: The student gave a completely incorrect response.

28 Directed line segment *AB* has endpoints whose coordinates are *A*(−2,5) and *B*(8,−1). Determine and state the coordinates of *P*, the point which divides the segment in the ratio 3:2.

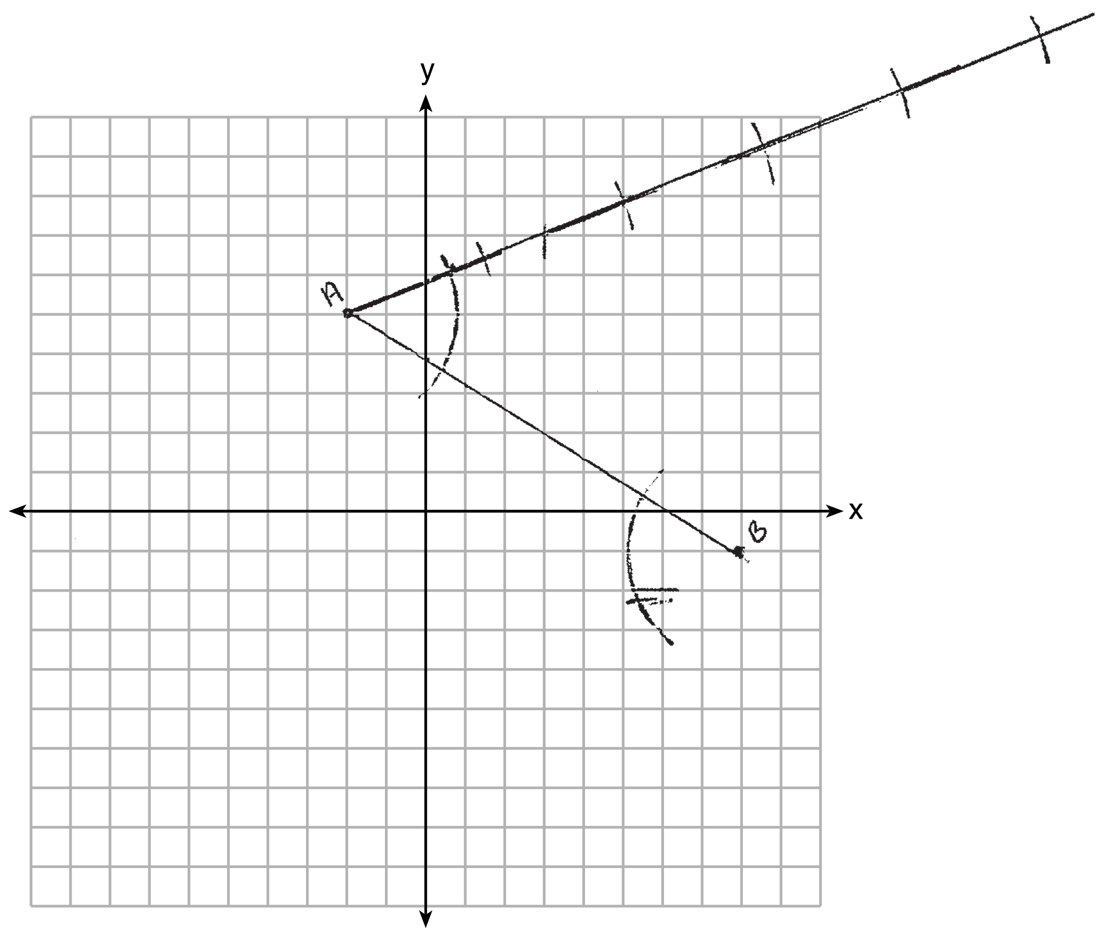
[The use of the set of axes below is optional.]

$K = \frac{3}{5}$

$P(x_1 + K(x_2 - x_1),\ y_1 + K(x_2 - x_1))$

$P(-2 + \frac{3}{5}(8+2),\ 5 + \frac{3}{5}(-1-5))$

$\boxed{P(4, 1.4)}$



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

Question 28

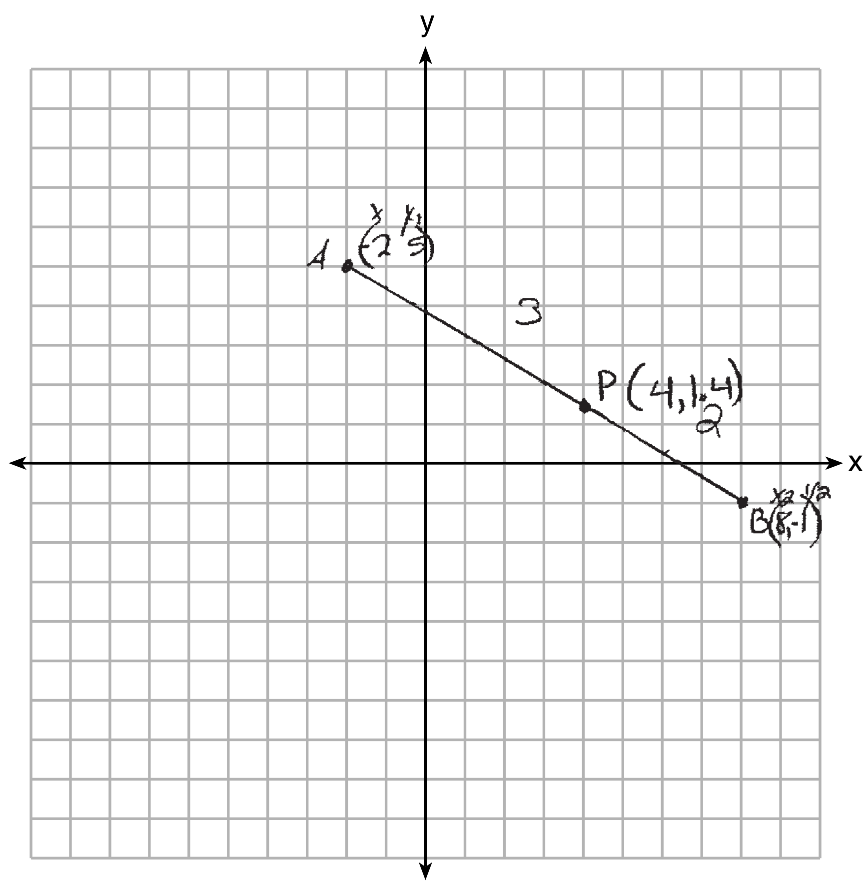
28 Directed line segment *AB* has endpoints whose coordinates are *A*(−2,5) and *B*(8,−1). Determine and state the coordinates of *P*, the point which divides the segment in the ratio 3:2.

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

Find x: $-2 + \frac{3}{5}(8-(-2)) = 4$

Find y: $5 + \frac{3}{5}(-1-5) = 1.4$

$\boxed{P = (4, 1.4)}$



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

Question 28

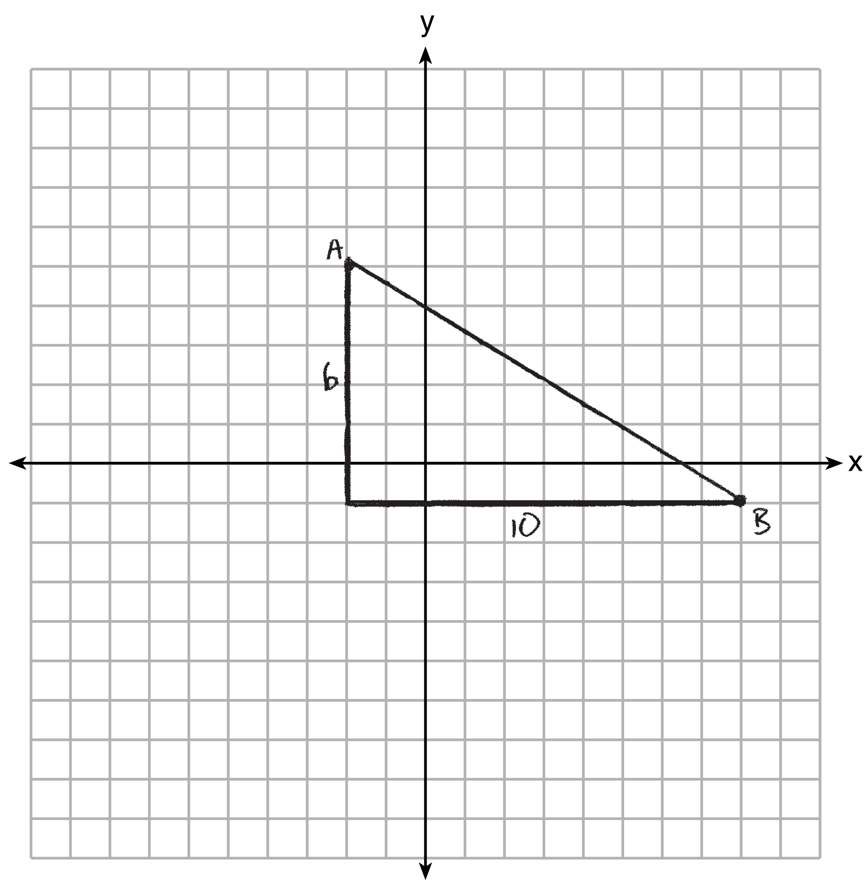
28 Directed line segment *AB* has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of *P*, the point which divides the segment in the ratio 3:2.

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

$\frac{3}{5}(10)=6 \quad | \quad \frac{3}{5}(6)=3.6$

A (-2,5)
+6 -3.6

P (4, 1.4)



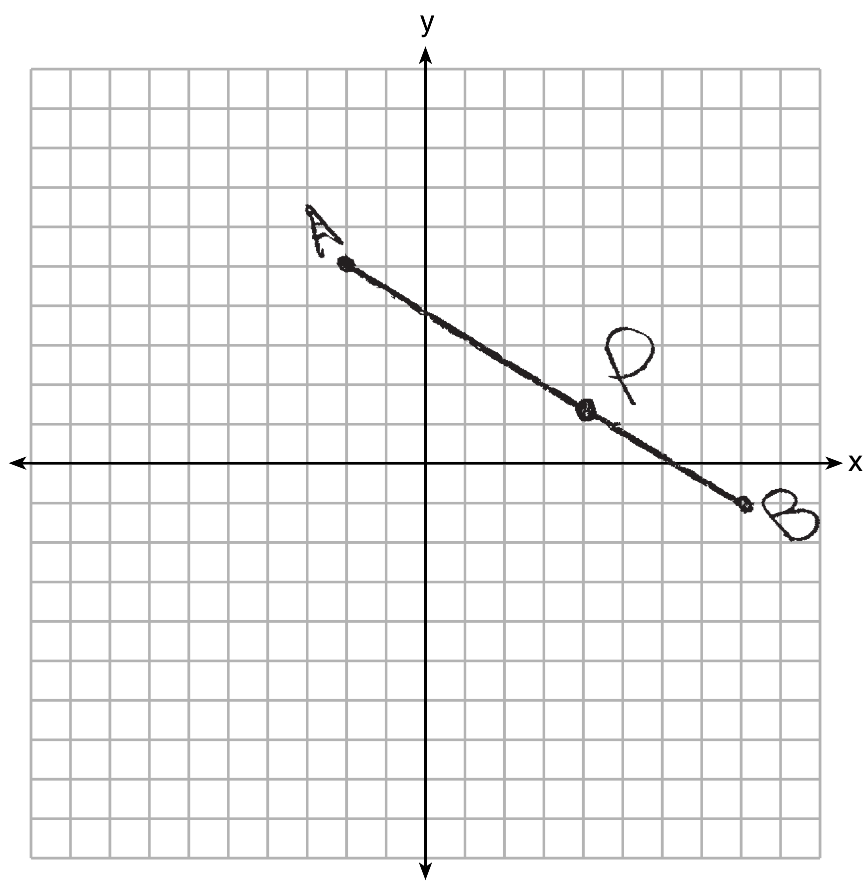
Score 2: The student gave a complete and correct response.

Question 28

28 Directed line segment AB has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of P, the point which divides the segment in the ratio 3:2.

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

$P = (4, 1.4)$



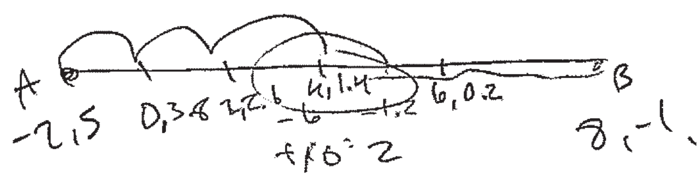
Score 1: The student gave a correct answer, but no work was shown.

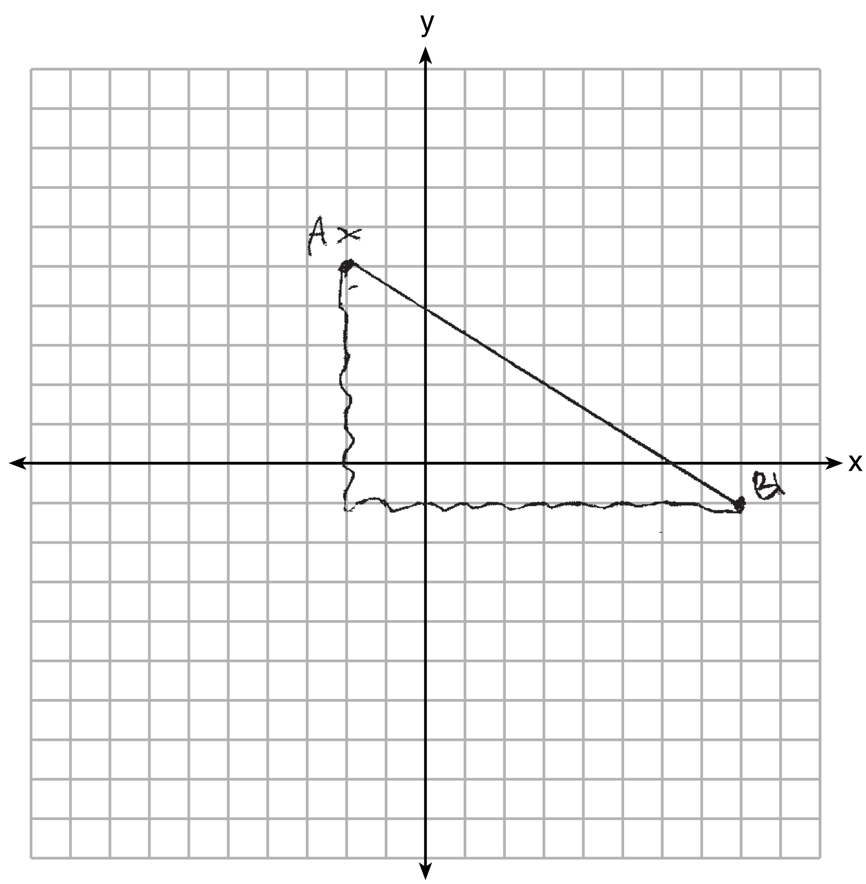
Question 28

28 Directed line segment AB has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of P, the point which divides the segment in the ratio 3:2.

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

5 $\boxed{P = 4,1.4}$





Score 1: The student determined point P, but did not state it as a coordinate.

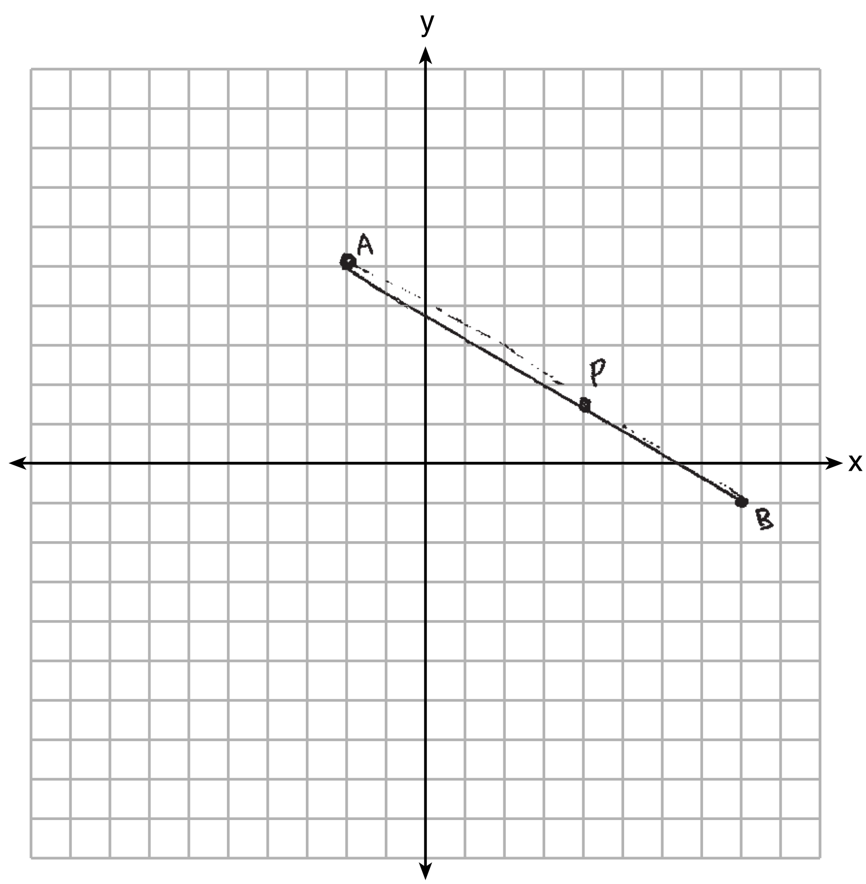
Question 28

28 Directed line segment AB has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of P, the point which divides the segment in the ratio 3:2.

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

x	y
8 - -2	5 - -1
10(3/5)	6(3/5)
6	3.6

$\boxed{P(4, 1.5)}$

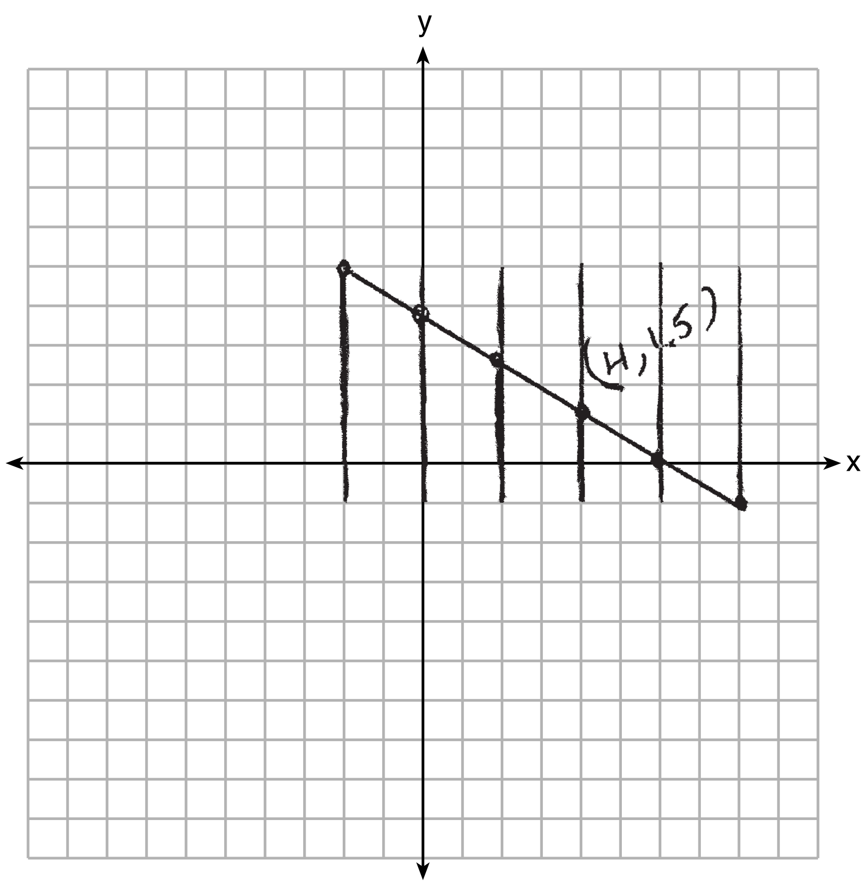


Score 1: The student showed correct work to determine the x-coordinate of P, but made an error in determining the y-coordinate.

Question 28

28 Directed line segment AB has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of P, the point which divides the segment in the ratio 3:2.

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

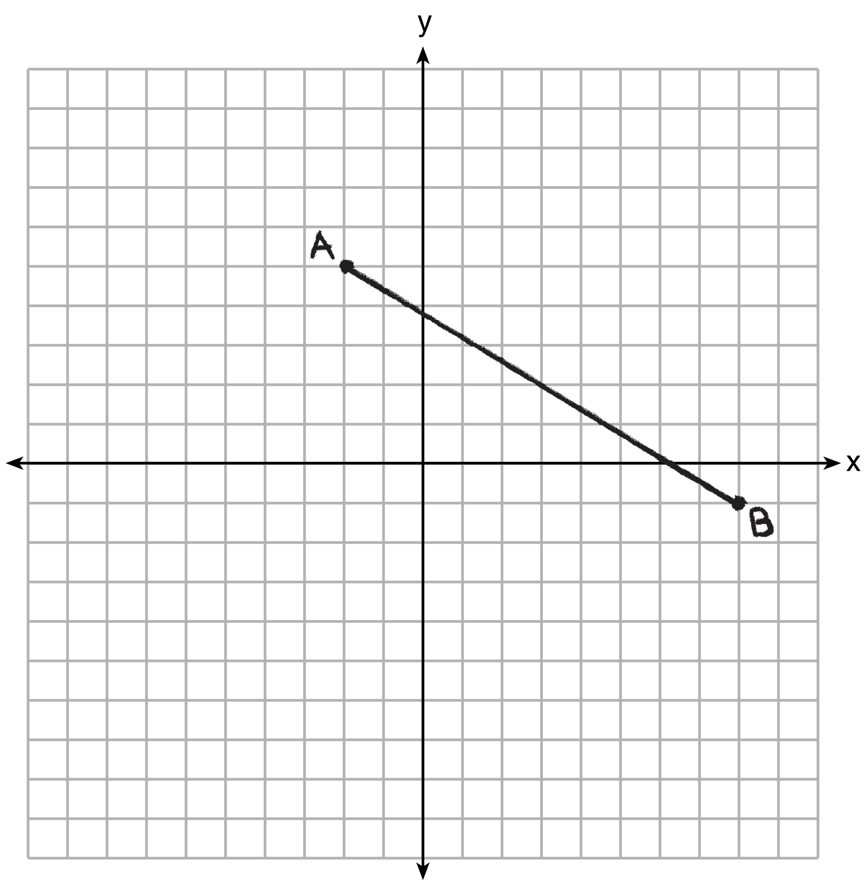


Score 1: The student showed correct work to partition the line segment, but made an error in determining the y-coordinate.

Question 28

28 Directed line segment AB has endpoints whose coordinates are $A(-2,5)$ and $B(8,-1)$. Determine and state the coordinates of P, the point which divides the segment in the ratio 3:2.

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

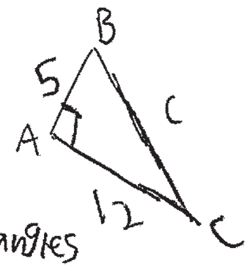


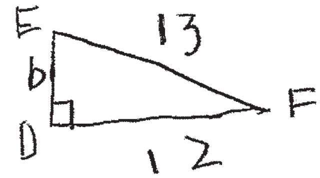
Score 0: The student graphed $\overline{AB}$ correctly, but no further correct work is shown.

Question 29

29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.





Yes, through the pythagorean theorem I proved that the triangles have $\cong$ sides making them $\cong$ and $\sim$ through SAS.

$5^2 + 12^2 = c^2$

$25 + 144 = c^2$

$\sqrt{169} = \sqrt{c^2}$

$c = 13$

$12^2 + b^2 = 13^2$

$144 + b^2 = 169$

$b^2 = 25$

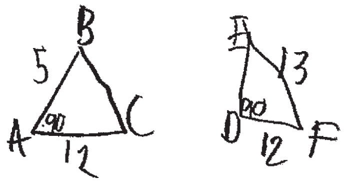
$b = 5$

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

Question 29

29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.



$\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, and $\overline{AC} \cong \overline{DF}$ b/c they have they have the same lengths.

$\triangle ABC \cong \triangle DEF$ by SSS $\cong$ SSS.

$\frac{\overline{AB}}{\overline{DE}} \cong \frac{\overline{BC}}{\overline{EF}} \cong \frac{\overline{AC}}{\overline{DF}}$ b/c they are proportionally =.

$\triangle ABC \sim \triangle DEF$ by SSS~

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

$5^2+12^2=c^2$

$25+144=c^2$

$\sqrt{169}=\sqrt{c^2}$

$13=c=\overline{BC}$

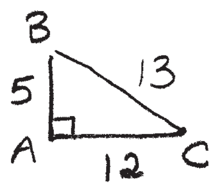
$5=a=\overline{DE}$

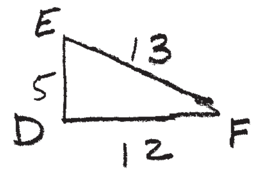
$\frac{5}{5}=\frac{13}{13}=\frac{12}{12}=1$

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

29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.





$(ED)^2 + 144 = 169$

$(ED)^2 = 25$

$ED = \sqrt{25}$

$ED = 5$

$5^2 + 12^2 = (BC)^2$

$25 + 144 = (BC)^2$

$169 = BC^2$

$\sqrt{169} = BC$

$13 = BC$

$\triangle ABC \cong \triangle DEF$ because of SSS $\cong$ SSS.

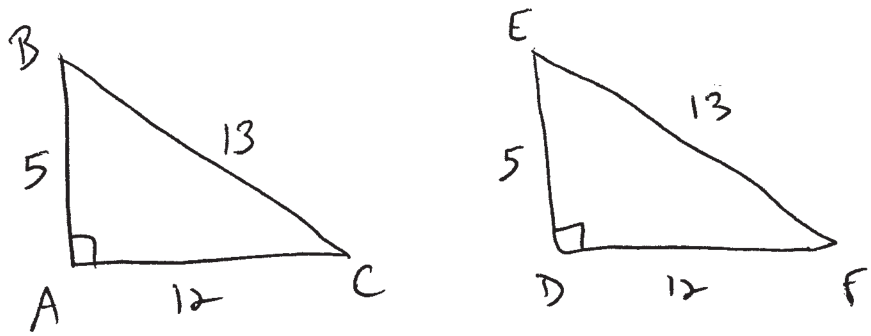
IF the 2 $\triangle$s are $\cong$ it also Means that they are similar ~. All $\cong$ $\triangle$s are ~.

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

Question 29

29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.



Pythagorean Triples 5-12-13

Yes. $\triangle ABC$ is 5, 12, 13 Pythagorean Triple

and $\triangle DEF$ is also 5, 12, 13.

$\triangle ABC \cong \triangle DEF$ by SSS.

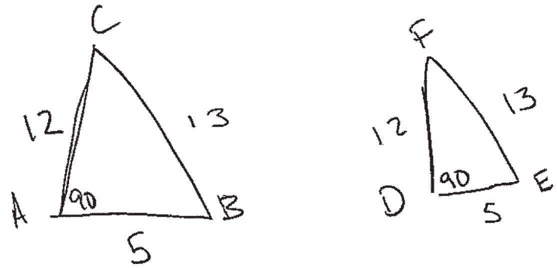
Since the $\triangle$'s $\cong$, they must be similar.

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

Question 29

29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.



$5^2 + 12^2 = x^2$

$25 + 144 = \sqrt{169}$

13

$12^2 + x^2 = 13^2$

$\sqrt{25}$

5

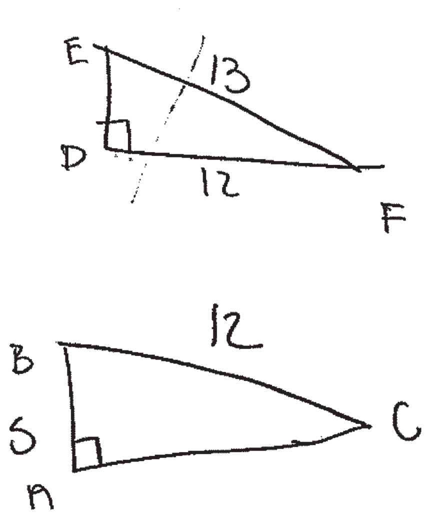
Brett is correct because both triangles are right triangles and if we use the pythagorean theorem, we find out that all the side lengths correspond/are equal to each other. (SSS)

Score 1: The student did not explain why the triangles are similar.

Question 29

29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

Is Brett correct? Explain why.



yes because they both have right $\measuredangle$'s and one side $\cong$.

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

Question 29

29 In $\triangle ABC$, $AB = 5$, $AC = 12$, and $m\angle A = 90°$. In $\triangle DEF$, $m\angle D = 90°$, $DF = 12$, and $EF = 13$. Brett claims $\triangle ABC \cong \triangle DEF$ and $\triangle ABC \sim \triangle DEF$.

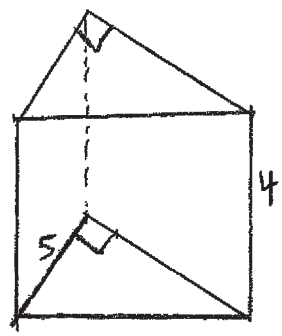
Is Brett correct? Explain why.

I would say Brett is half-correct, both triangles are 90°. That is where the similarities end though. The triangle cannot be congruent because the angle lengths differ.

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

Question 30

30 The volume of a triangular prism is 70 in^3. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.



$V = B \cdot h$

$70 = B \cdot 4$

$\frac{70}{4} = \frac{4B}{4}$

$17.5 = B$

$A_\triangle = \frac{1}{2} l_1 \cdot l_2$

$17.5 = \frac{1}{2} 5 \cdot l_2$

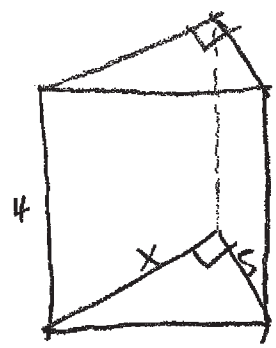
$\frac{17.5}{2.5} = \frac{2.5\, l_2}{2.5}$

$\boxed{7 = l_2}$

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

Question 30

30 The volume of a triangular prism is 70 in^3. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.



$V = Bh$

$V = \left(\frac{1}{2} l_1 \cdot l_2\right) h$

$70 = \left(\frac{1}{2} x \cdot 5\right) 4$

$\frac{70}{10} = \frac{10x}{10}$

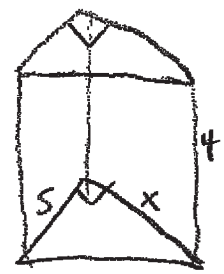
$\boxed{7 = x}$

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

Question 30

30 The volume of a triangular prism is 70 in^3. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

$V = 70$



$V = B \cdot h$

$70 = 4B$

$\boxed{17.5 = B}$

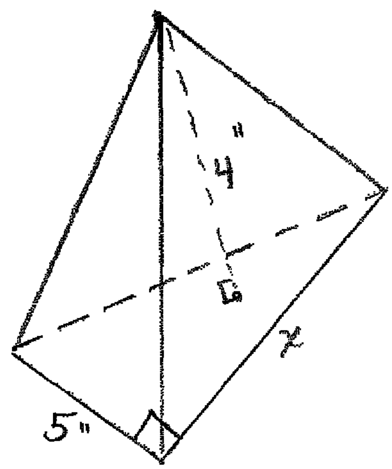
$5x = 17.5$

$\boxed{x = 3.5}$

Score 1: The student found the correct area of the base of the triangular prism, but no further correct work was shown.

Question 30

30 The volume of a triangular prism is 70 in^3. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.



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

$70 = \frac{1}{3}\left(\frac{1}{2}bh\right)4$

$70 = \frac{1}{3}\left(\cancel{\frac{1}{2}}(5)(x)\right)\cancel{4}^{2}$

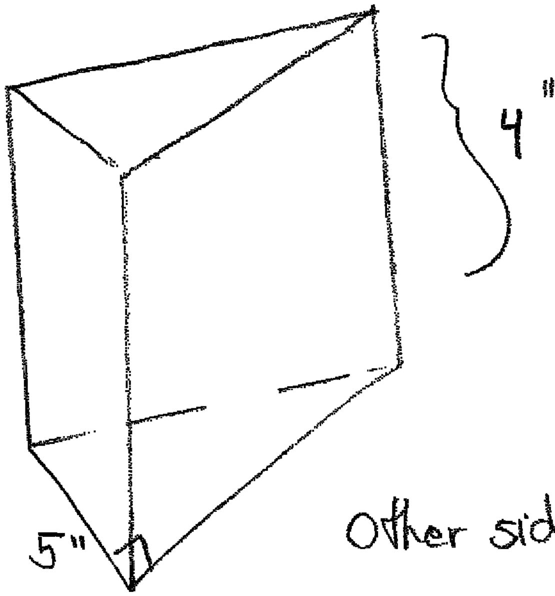
$210 = 10x$

$21 = x$

Score 1: The student made an error in drawing and using a pyramid instead of a prism.

Question 30

30 The volume of a triangular prism is 70 in^3. The base of the prism is a right triangle with one leg whose measure is 5 inches. If the height of the prism is 4 inches, determine and state the length, in inches, of the other leg of the triangle.

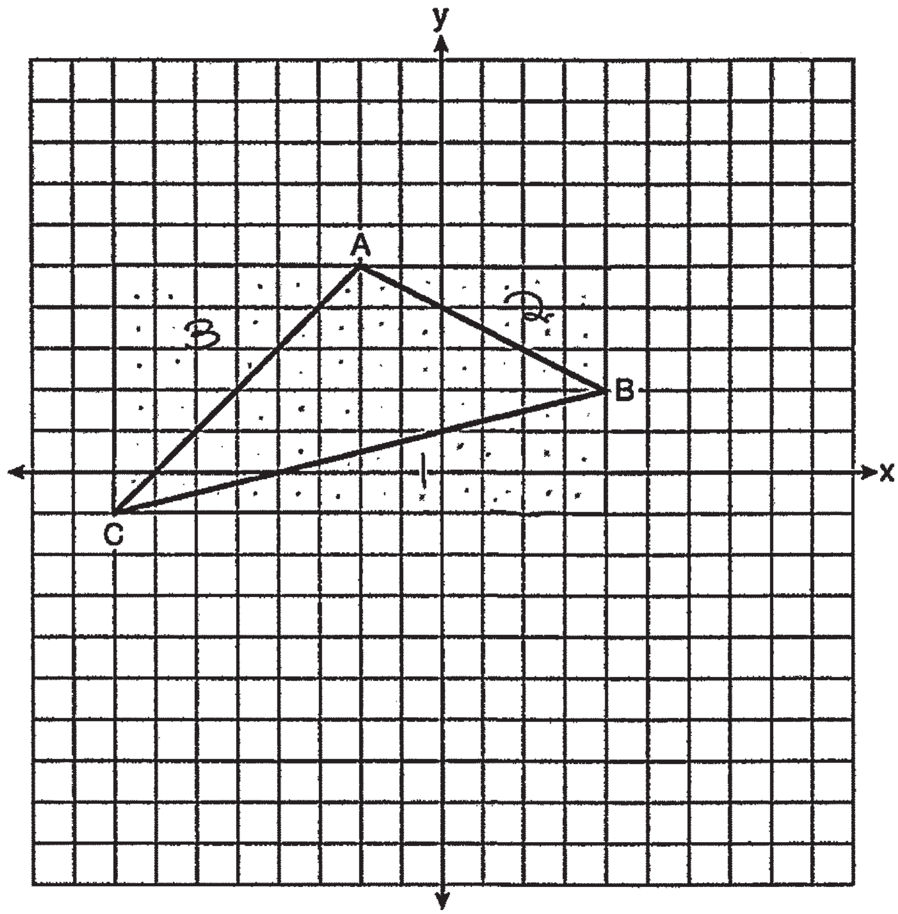


Other side ~~must~~ be 12, due to the Pythagorean theorem triple of 5, 12, 13.

Score 0: The student gave a completely incorrect response.

Question 31

31 Triangle ABC with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.



Determine and state the area of $\triangle ABC$.

1

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

$A = \frac{1}{2}(12)(3)$

$A = 18$

2

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

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

$A = 9$

3

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

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

$A = 18$

$A = l \cdot w$

$A = (12)(6)$

$A = 72$

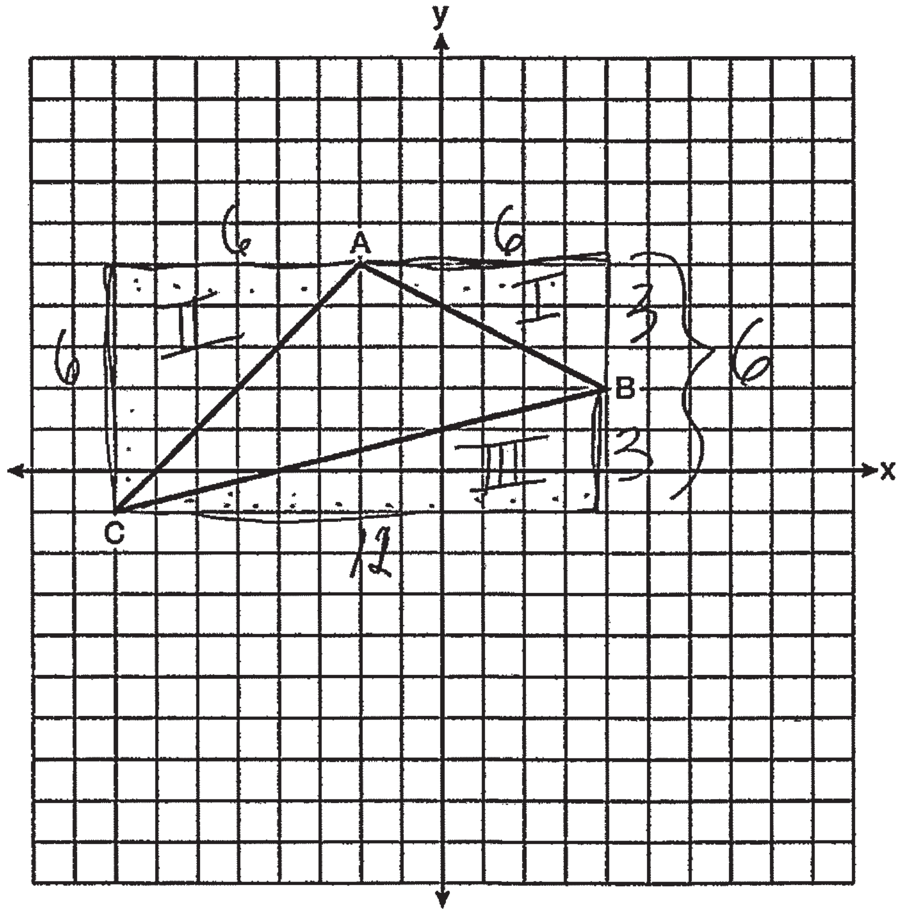
$18 + 18 + 9 = 45$

$72 - 45 = 27$

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

Question 31

31 Triangle ABC with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.



Determine and state the area of $\triangle ABC$.

A of $\square$ − A of $\Delta I - \Delta II - \Delta III$

$12 \cdot 6 - \frac{bh}{2} - \frac{bh}{2} - \frac{bh}{2}$

$= 72 - \frac{6(3)}{2} - \frac{6(6)}{2} - \frac{12(3)}{2}$

$= 72 - (9 + 18 + 18)$

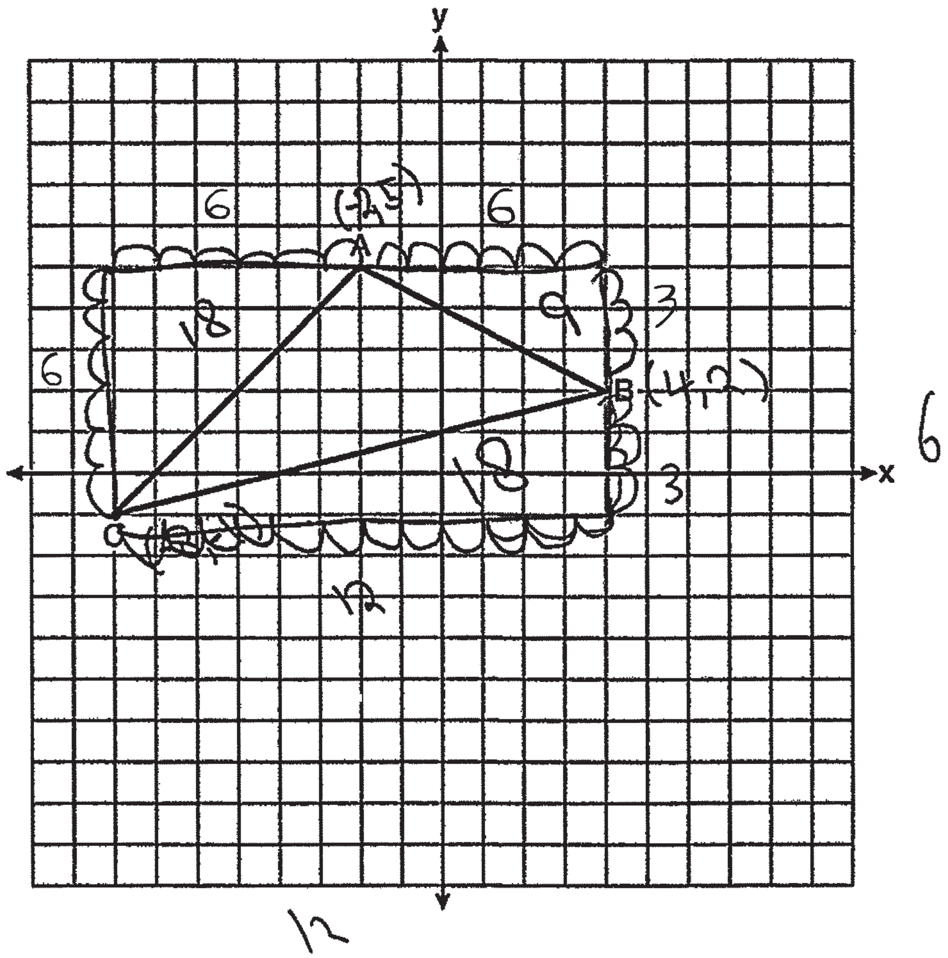
$= 72 - 45$

Area = 27

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

Question 31

31 Triangle ABC with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.



Determine and state the area of $\triangle ABC$.

72 − 45

$\boxed{ABC = 27}$

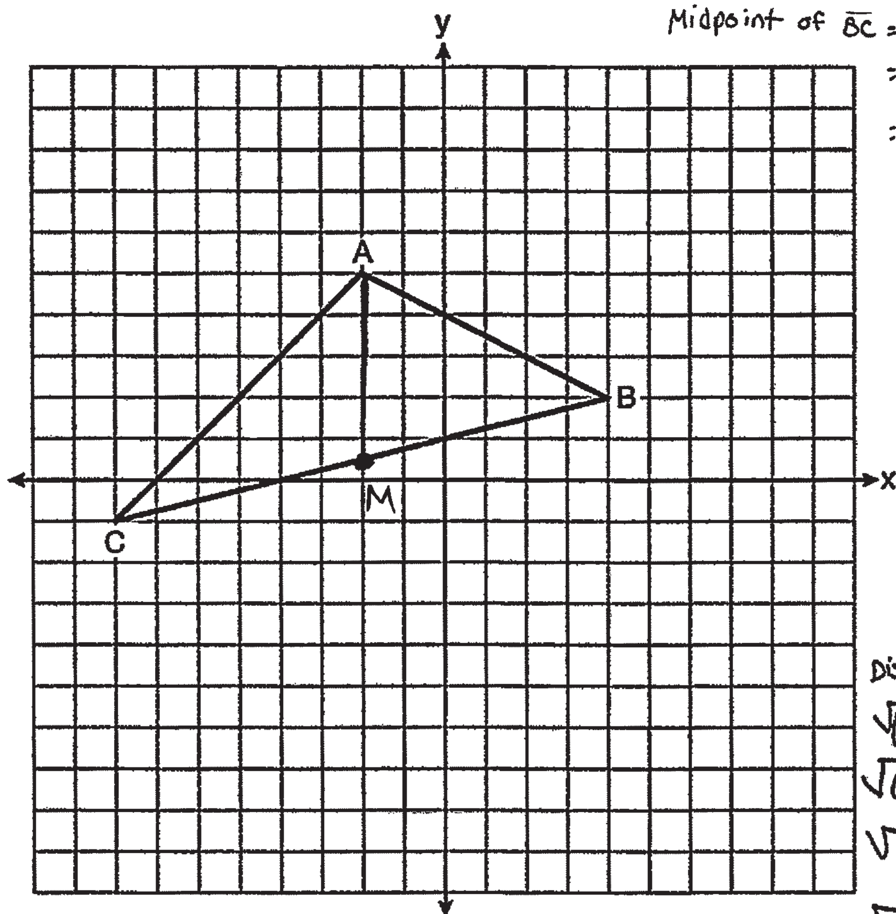
Score 2: The student gave a complete and correct response.

Question 31

31 Triangle ABC with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.

x y

Midpoint of $\overline{BC} = \left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2}\right)$
$= \left(\frac{4-8}{2}, \frac{2-1}{2}\right)$
$= \left(\frac{-4}{2}, \frac{1}{2}\right)$
$= (-2, 0.5)$



Distance of AM =
$\sqrt{(x_2-x_1)^2 (y_2-y_1)^2}$
$\sqrt{(-2+2)^2 + (5-.5)^2}$
$\sqrt{(0)^2 + (4.5)^2}$
$\sqrt{20.25}$

Determine and state the area of $\triangle ABC$.

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

$A = \frac{1}{2}(\sqrt{153} \cdot \sqrt{20.25})$

$A = \frac{1}{2}(55.66192559458)$

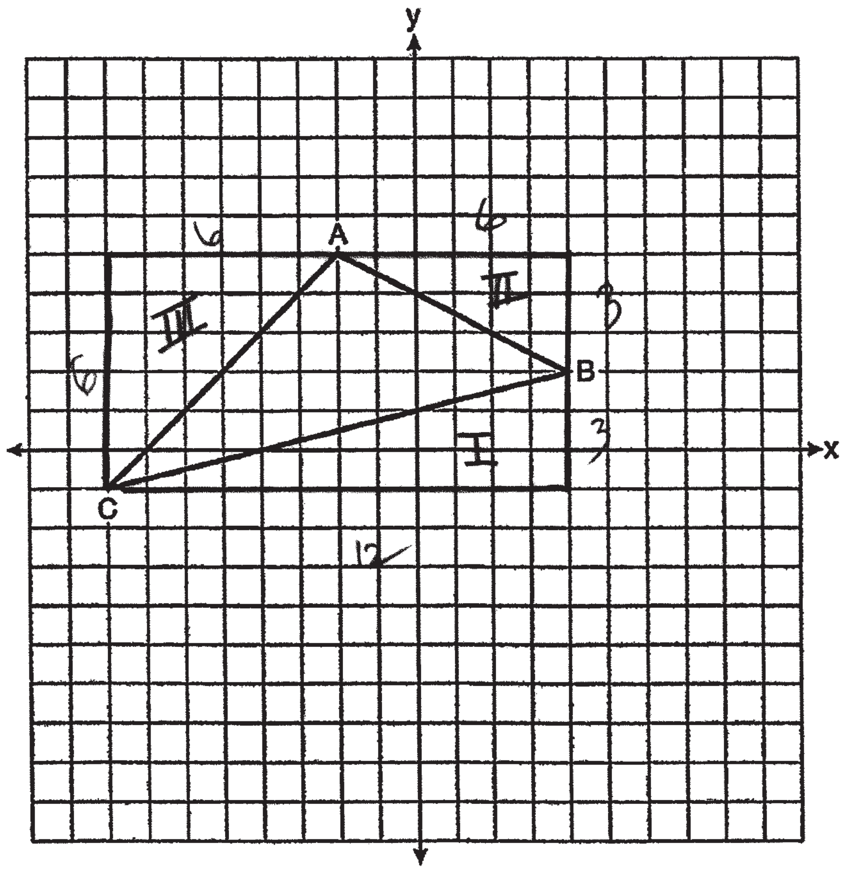
$A = 27.8309629729$

Distance of BC $= \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$
$= \sqrt{(4+8)^2 + (2+1)^2}$
$= \sqrt{(12)^2 + (3)^2}$
$= \sqrt{144+9}$
$= \sqrt{153}$

Score 1: The student made an error using the median instead of the altitude in determining the area.

Question 31

31 Triangle *ABC* with coordinates *A*(−2,5), *B*(4,2), and *C*(−8,−1) is graphed on the set of axes below.



Determine and state the area of $\triangle ABC$.

A of □ − A△I − A△II − A△III

$12 \cdot 6 - \frac{12(3)}{2} \quad \frac{6(3)}{2} \quad \frac{6(6)}{2}$

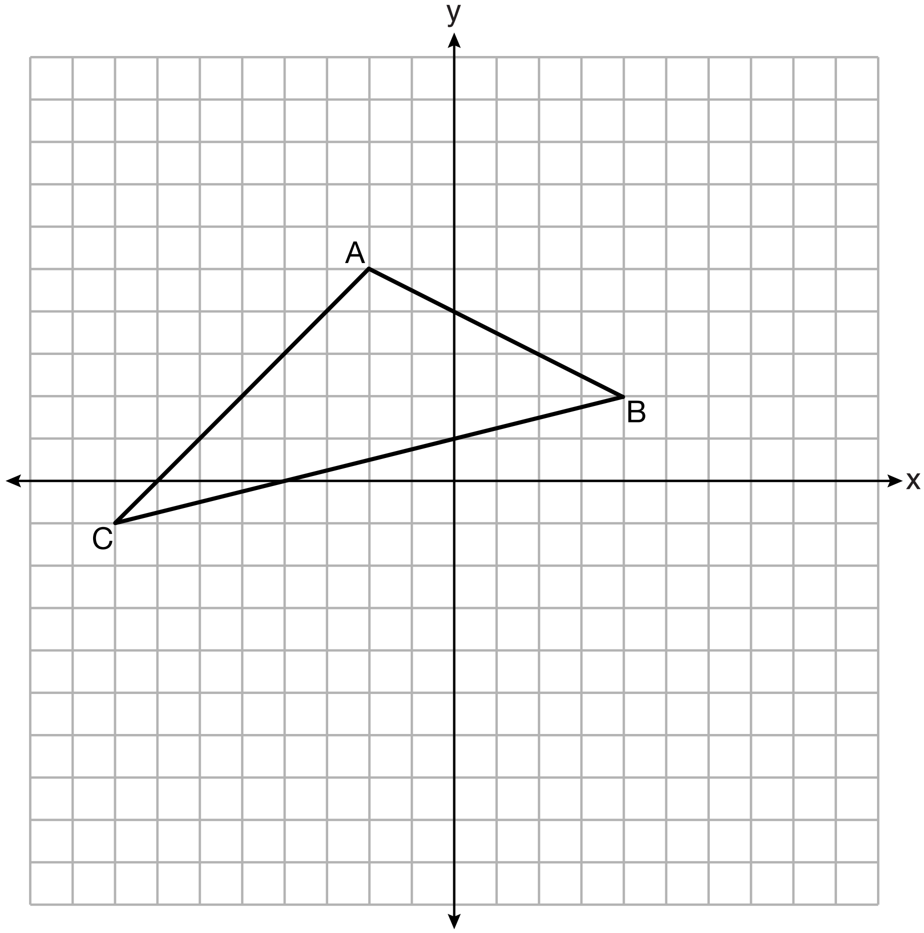
$72 - 18 + 9 + 18$

$A_{ABC} = 81$

Score 1: The student made a computational error in determining the area of the triangle.

Question 31

31 Triangle ABC with coordinates $A(-2,5)$, $B(4,2)$, and $C(-8,-1)$ is graphed on the set of axes below.



Determine and state the area of $\triangle ABC$.

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

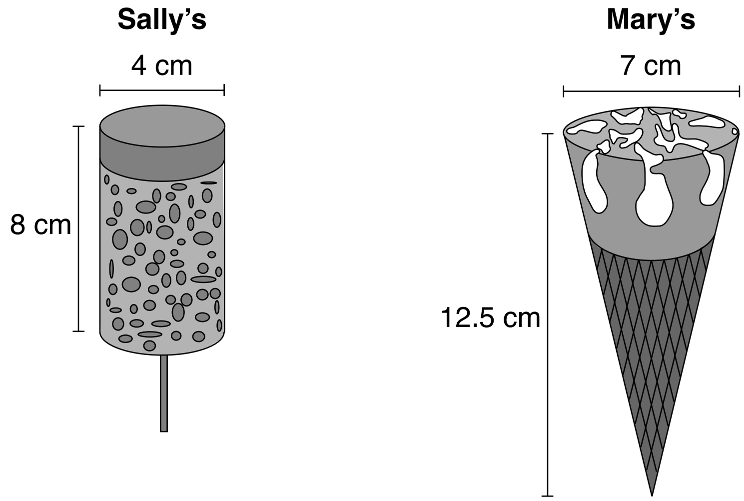
$A = \frac{1}{2}(12)(6)$

$A = 36$

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

Question 32

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.



Who was served more ice cream, Sally or Mary? Justify your answer.

$Sally = \pi(2)^2 \cdot 8$ $\qquad V = \frac{1}{3}(\pi)(3.5)^2 \cdot (12.5)$

$Sally = 100.53 cm^3$ $\qquad V = 160.35 cm^3$

Mary has more icecream

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

$160.35 - 100.53 = 60 cm^3$

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

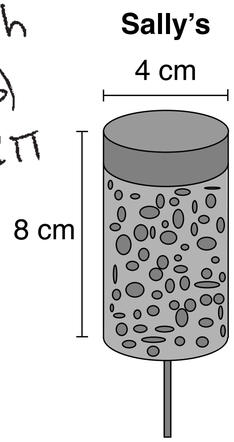
Question 32

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.

$\pi r^2 h$

$\pi(4)(8)$

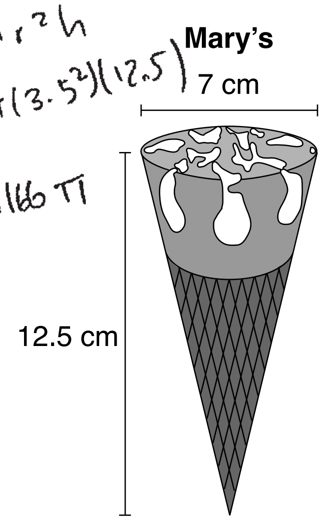
32π



$\frac{1}{3}\pi r^2 h$

$\frac{1}{3}\pi(3.5^2)(12.5)$

51.04166π



Who was served more ice cream, Sally or Mary? Justify your answer.

Mary, because the volume of her container filled is $51.041\bar{6}\pi$ while Sally's is only 32π

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

$51.041\bar{6}\pi - 32\pi = 59.8211601$

60 cubic cm

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

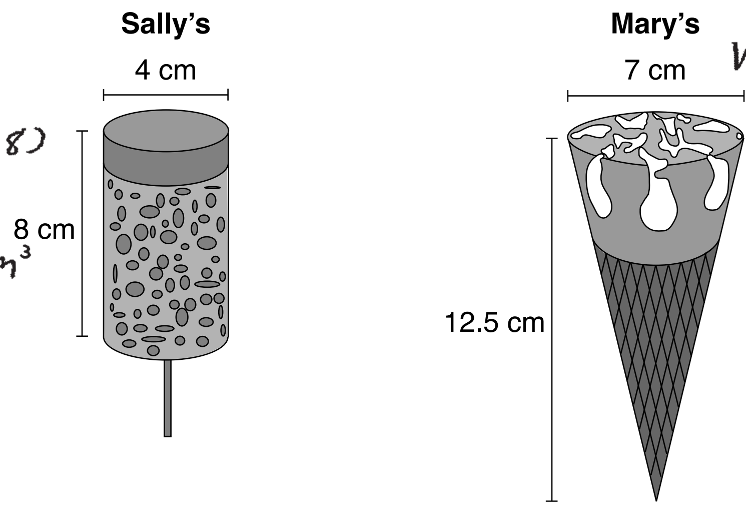
32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.

$V = \frac{1}{3}\pi r^2 h$

$V = \pi r^2 h$

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

$V = 101\text{cm}^3$



$V = \frac{1}{3}\pi(3.5)^2(12.5)$

$V = 160\text{cm}^3$

Who was served more ice cream, Sally or Mary? Justify your answer.

Mary's ice cream because it has more volume for the cone than the cylinder.

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

cylinder $V = 101\text{cm}^3$ cone $V = 160\text{cm}^3$

Score 3: The student correctly determined Mary had more ice cream, but no further correct work was shown.

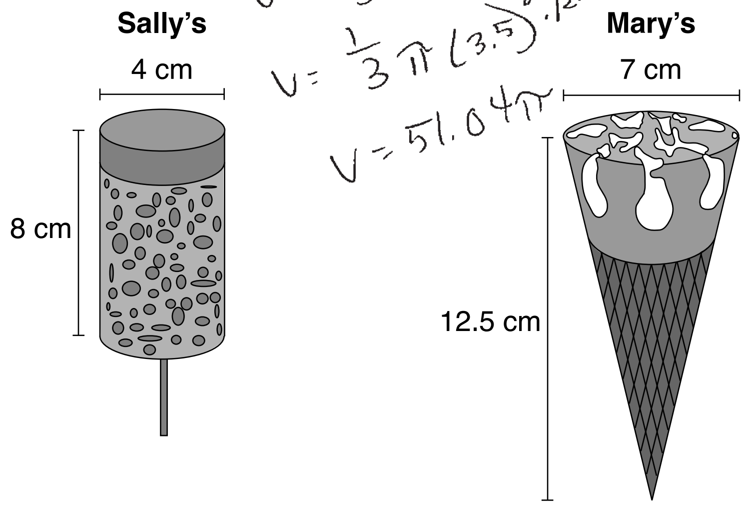
Question 32

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.

$V = \frac{1}{3}\pi r^2 \cdot h$

$V = \frac{1}{3}\pi (3.5)^2 \cdot 12.5$

$V = 51.04\pi$



Who was served more ice cream, Sally or Mary? Justify your answer.

Mary, because her volume is 51.04π and Sally's is 32π.

$V = \pi r^2 h$

$V = \pi (2)^2 h$

$V = \pi\, 4 \cdot 8$

$V = 32\pi$

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

$\cancel{V = \pi (3.5)^2\, 12.5}$

$\cancel{V = 153.125\pi}$

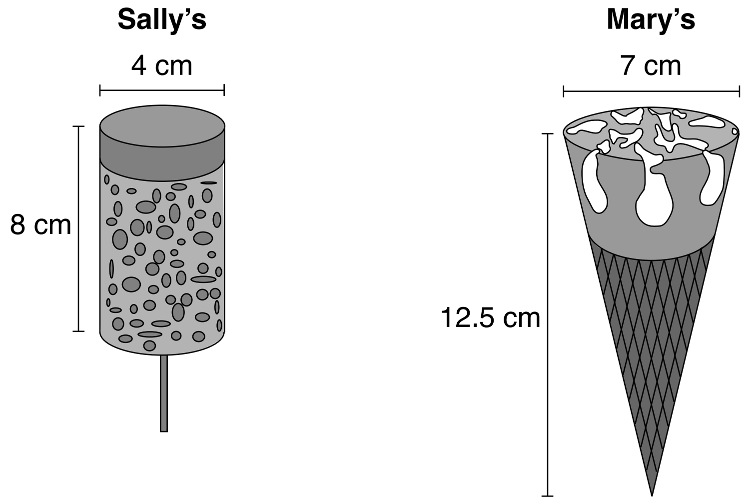
Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

$$\begin{array}{r} 160.35 \\ -\,100.53 \\ \hline 59.82 \end{array}$$

Score 3: The student made a rounding error in determining the difference in the volumes of the ice creams.

Question 32

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.



Who was served more ice cream, Sally or Mary? Justify your answer.

Sally
$V = \pi r^2 h$
$V = \pi(2)^2 8$
$V = 100.5$

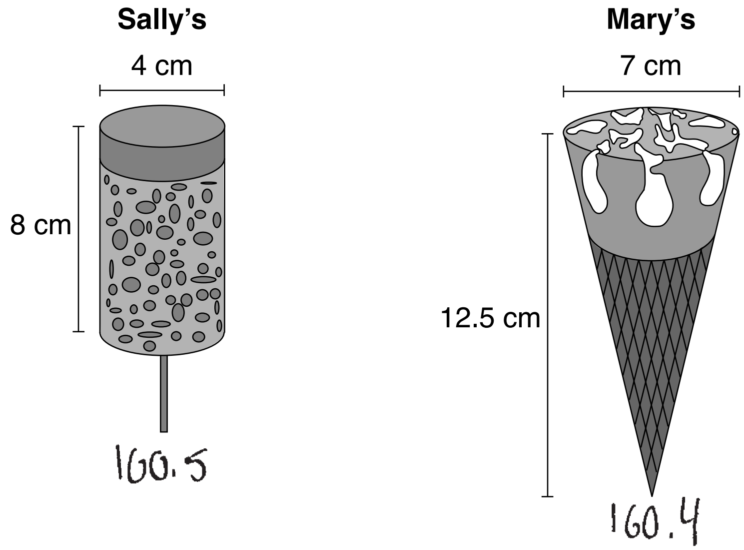
Mary
$V = \frac{1}{3}\pi r^2 h$
$V = \frac{1}{3}\pi(3.5)^2(12.5)$
$V = 160.35$

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

Score 2: The student correctly determined the volume of the cylinder and cone, but no further correct work was shown.

Question 32

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.



Who was served more ice cream, Sally or Mary? Justify your answer.

mary cause it's bigger

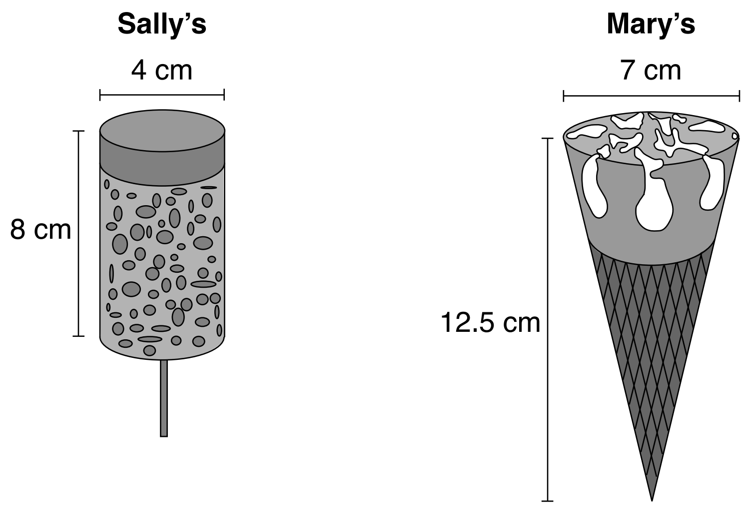
Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

60

Score 1: The student indicated Mary and 60, but appropriate work was not shown.

Question 32

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.



Who was served more ice cream, Sally or Mary? Justify your answer.

$V = Bh$
$V = \pi r^2 h$
$V = (4\pi)(8)$
$V = 100.5309649$

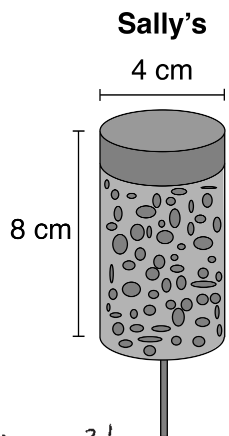
$V = Bh$
$V = \pi r^2 h$
$V = (12.25\pi)(12.5)$
$V = 481.0563751$

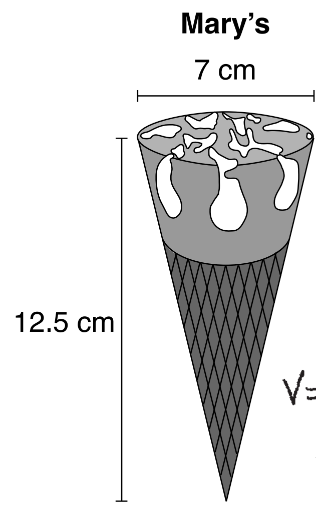
Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

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

Question 32

32 Sally and Mary both get ice cream from an ice cream truck. Sally's ice cream is served as a cylinder with a diameter of 4 cm and a total height of 8 cm. Mary's ice cream is served as a cone with a diameter of 7 cm and a total height of 12.5 cm. Assume that ice cream fills Sally's cylinder and Mary's cone.





$V = \pi r^2 h$
$= \pi (4)^2 \cdot 8$
$= 128\pi$

$V = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3}\pi (7)^2 \cdot 12.5$
$= \frac{1}{3}(612.5)$

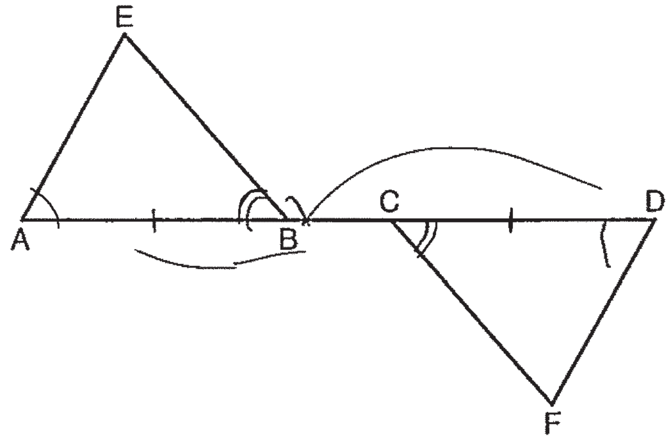
Who was served more ice cream, Sally or Mary? Justify your answer.

Determine and state how much more is served in the larger ice cream than the smaller ice cream, to the *nearest cubic centimeter*.

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

Question 33

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



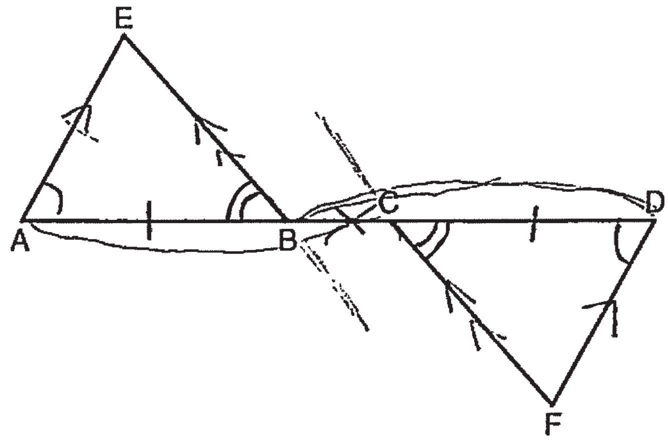
Prove: $\triangle EAB \cong \triangle FDC$

Statements	Reasons
1. $\triangle AEB$ $\triangle DFC$ $\overline{AE} \parallel \overline{DF}$ $\overline{ABCD}$ $\overline{EB} \parallel \overline{FC}$	1. Given
2. $\angle A \cong \angle D$ (A≅A) $\angle EBC \cong \angle FCB$	2. If two parallel lines are cut by a transversal, then the alternate interior angles are congruent (1)
3. $\angle ABE$ and $\angle EBC$, $\angle DCF$ and $\angle FCB$ are supplimentary	3. A linear pair form supplymentary angles (2)
4. ~~Supplementary of congru~~ $\angle ABE \cong \angle DCF$ (A≅A)	4. Supplements of congruent angles are congruent (3)(2) (3)
5. $\overline{AC} \cong \overline{DB}$	5. Given
6. $\overline{BC} \cong \overline{BC}$	6. Reflexive property
~~7. $\overline{AC} - \overline{BC}$~~	
7. $\overline{AC} - \overline{BC} \cong \overline{DB} - \overline{BC}$ or $\overline{AB} \cong \overline{CD}$ (S≅S)	7. Substraction ~~post~~ property (5, 6)
8. $\triangle$ ~~AEB~~ $\triangle EAB \cong \triangle FDC$	8. ASA postulate (2)(4)(7)

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

Question 33

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



Prove: $\triangle EAB \cong \triangle FDC$

① $\triangle AEB$, $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$ ① given

② $\angle A \cong \angle D$ ② alternate interior angles are congruent in parallel lines

③ $\overline{BC} \cong \overline{BC}$ ③ reflexive

④ $\overline{AB} \cong \overline{CD}$ ④ subtraction postulate

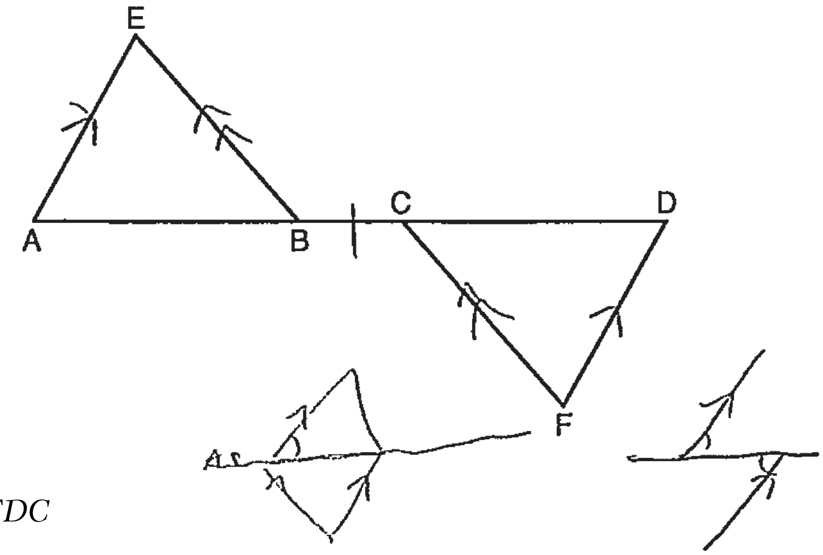
⑤ $\angle EBA \cong \angle FCD$ ⑤ alternate exterior angles are congruent in parallel lines

⑥ $\triangle EAB \cong \triangle FDC$ ⑥ ASA Postulate

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

Question 33

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



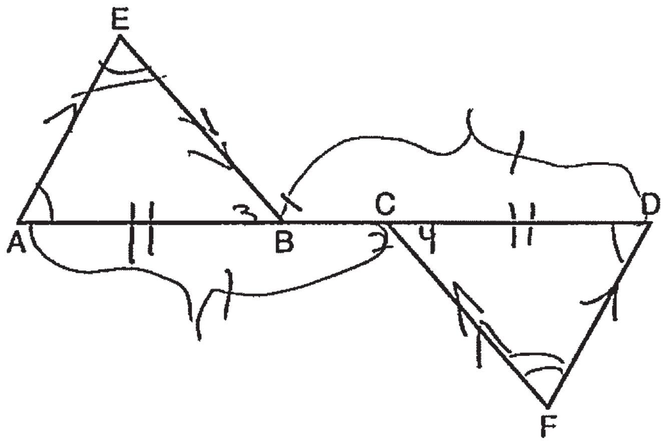
Prove: $\triangle EAB \cong \triangle FDC$

Statement	Reason
1) $\triangle AEB, \triangle DFC, \overline{ABCD}, \overline{AE} \parallel \overline{DF}$ $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$	1) given
2) $\overline{BC} \cong \overline{BC}$	2) reflexive property
3) $\overline{AC} - \overline{BC} \cong \overline{DB} - \overline{BC}$	3) equals minus equals the result are equal
S $\overline{AB} \cong \overline{CD}$	
4) $\angle EAB \cong \angle CDF$ A $\angle EBA \cong \angle FCD$ A	4) ∥ lines form alternate interior angles that are congruent.
5) $\triangle EAB \cong \triangle FDC$	5) ASA postulate.

Score 3: The student wrote an incorrect reason in step 4 for $\angle EBA \cong \angle FCD$.

Question 33

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$

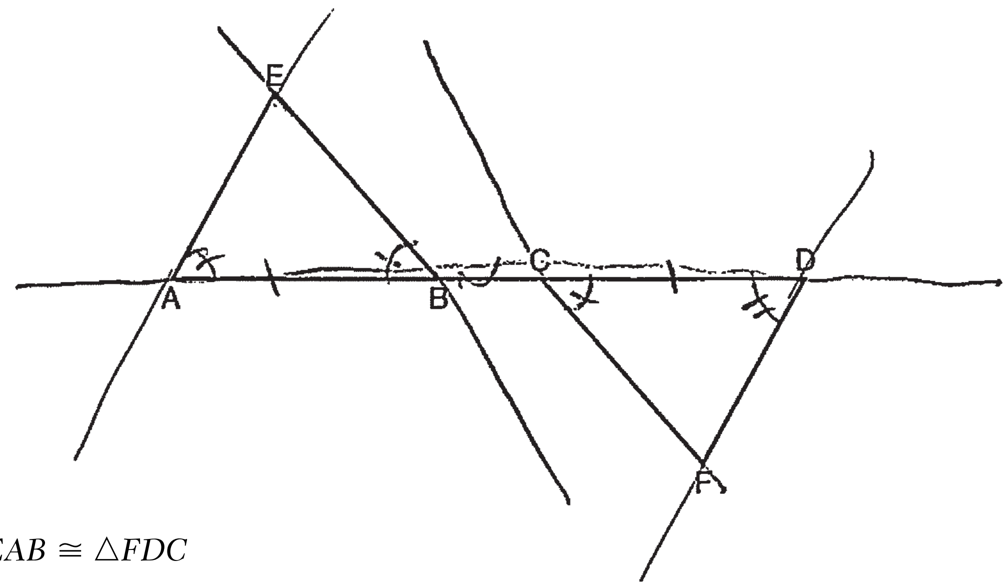


Prove: $\triangle EAB \cong \triangle FDC$

S	R
① $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$, $\overline{ABCD}$	① Given
② $\overline{BC} \cong \overline{BC}$	② reflexive
③ $\overline{AC} - \overline{BC} \cong \overline{BD} - \overline{BC}$, $\overline{AB} \cong \overline{DC}$	③ Subtraction postulate
④ $\angle E \cong \angle F$, $\angle A \cong \angle D$	④ When $\parallel$ lines are cut by a transversal alt int $\angle$'s are $\cong$
⑤ $\triangle EAB \cong \triangle FDC$	⑤ AAS

Score 3: The student wrote an incorrect statement and reason in step 4 for $\angle E \cong \angle F$.

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$

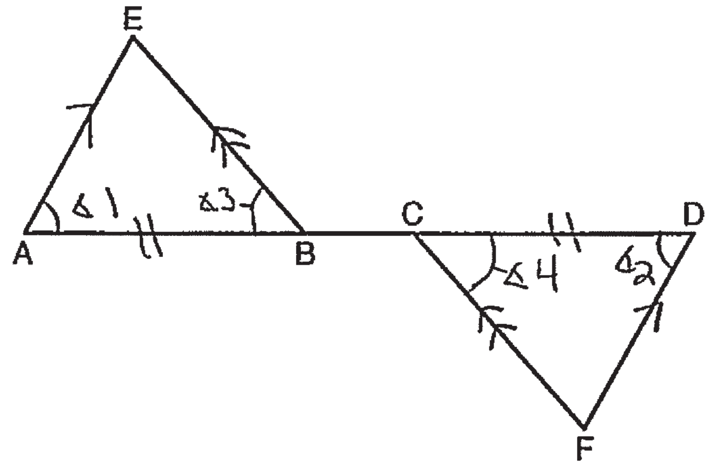


Prove: $\triangle EAB \cong \triangle FDC$

Statements	Reasons
1. $\triangle AEB$, $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$	1. Given
2. $\angle A \cong \angle D$	2. When 2 ∥ lines are cut by a transversal, alternate exterior angles are congruent
3. $\angle EBA \cong \angle FCD$	3. When 2 ∥ lines are cut by a transversal, alternate interior angles are congruent
4. $\overline{AC} \cong \overline{DB}$	4. Given
5. $\overline{CB} \cong \overline{CB}$	5. Reflexive Postulate
6. $\overline{AB} \cong \overline{CD}$	6. Subtraction Postulate
7. $\triangle EAB \cong \triangle FDC$	7. ASA $\cong$

Score 2: The student wrote incorrect reasons in steps 2 and 3.

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



Prove: $\triangle EAB \cong \triangle FDC$

1) $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$ — 1) Given

2) $\angle 1 \cong \angle 2$ — 2) Alt. interior ∡s ≅

3) $\angle 3 \cong \angle 4$ — 3) Alt. interior ∡s ≅

4) $\overline{AC} \cong \overline{DB}$ — 4) Given

5) $\overline{CB} \cong \overline{CB}$ — 5) reflexive property

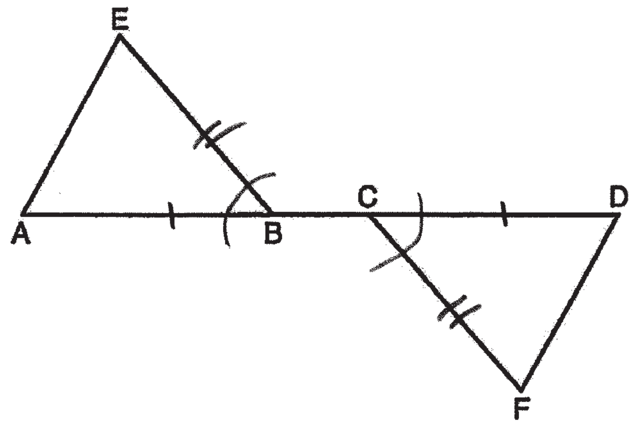
6) $\overline{AC} - \overline{BC} \cong \overline{DB} - \overline{CB}$ or $\overline{AB} \cong \overline{CD}$ — 6) subtraction property

7) $\triangle EAB \cong \triangle FDC$ — 7) ASA

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

Question 33

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



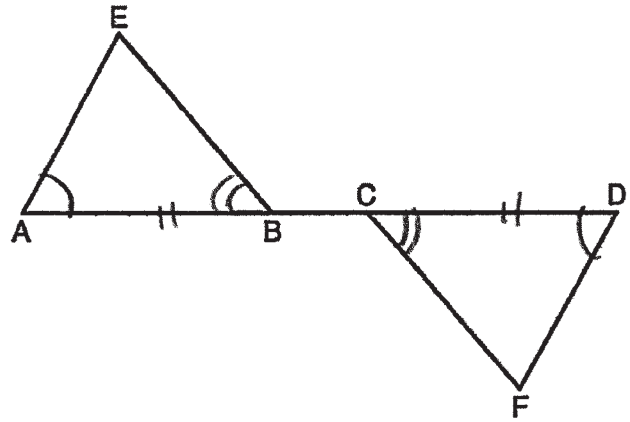
Prove: $\triangle EAB \cong \triangle FDC$

	Statements	Reasons
	1. $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$	1. given
	2. $\overline{BC} \cong \overline{BC}$	2. Reflexive
S	3. $\overline{AB} \cong \overline{CD}$	3. substitution
S	4. $\overline{EB} \cong \overline{FC}$	4. Parallel lines create $\cong$ segments
A	5. $\angle EBA \cong \angle DCF$	5. $\cong$ Corresponding exterior $\angle$s
	6. $\triangle EAB \cong \triangle FDC$	6. SAS

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

Question 33

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



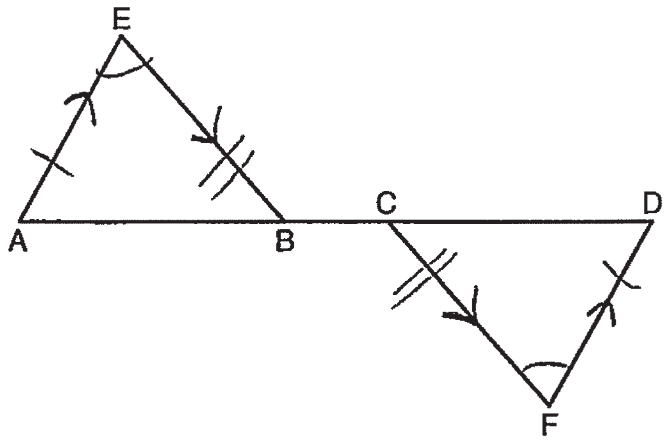
Prove: $\triangle EAB \cong \triangle FDC$

1 $\triangle AEB$, $\triangle DFC$, $\overline{ABCD}$ $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$ $\overline{AC} \cong \overline{DB}$ (G≅s)	1. Given
2. $\angle A \cong \angle D$ (G≅a)	2. Parallel lines cut by a transversal form ≅ alternate interior angles.
3. $\angle EBA \cong \angle FCD$ (G≅a)	3 Parallel lines cut by a transversal form ≅ alternate interior angles.
4. $\triangle EAB \cong \triangle FDC$	4. AAS ≅ AAS

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

Question 33

33 Given: $\triangle AEB$ and $\triangle DFC$, $\overline{ABCD}$, $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$, $\overline{AC} \cong \overline{DB}$



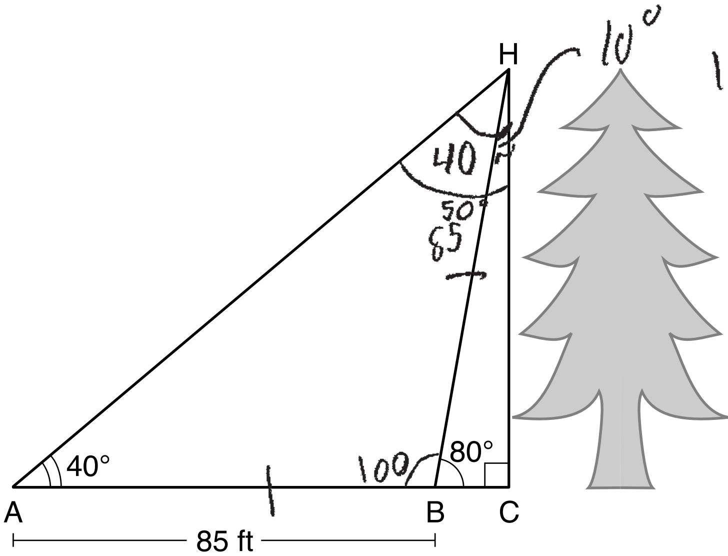
Prove: $\triangle EAB \cong \triangle FDC$

S	R
1. $\overline{AE} \parallel \overline{DF}$, $\overline{EB} \parallel \overline{FC}$	1. given
2. $\overline{AC} \cong \overline{DB}$	2 given
3. $\angle AEB \cong \angle DFC$	3. parallel lines form congruent alt ∡s
4. $\overline{AE} \cong \overline{DF}$	4. parallel lines form ≅ lines
5. $\overline{EB} \cong \overline{FC}$	5. parallel lines form ≅ lines
6. $\triangle AEB \cong \triangle DFC$	6. SAS

Score 0: The student had a completely incorrect response.

Question 34

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point A on the ground to the top of the tree, H, is 40° The angle of elevation from point B on the ground to the top of the tree, H, is 80°. The distance between points A and B is 85 feet.



$180-90-80=10$

$40+10=50$

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

∠ABC is 180° b/c it is a straight lin on the ground. This mans that ∠ABH and ∠CBH ar supplementary. Since ∠CBH is 80° we know ∠ABH is 100°. We already know that ∠A is 40°. We now know two m∠'s. Since a △'s ∠'s add to 180° we can do $100+40+x=180$ $\angle AHB=40$. Two m∠'s are ≅ meaning opposite sides $\overline{AB} \cong \overline{BH}$ Then it is isoseles.

Determine and state, to the *nearest foot*, the height of the tree.

SOH
CAH
TOA

$\frac{\sin 80}{1} = \frac{x}{85}$

$x = \sin 80 \cdot 85$

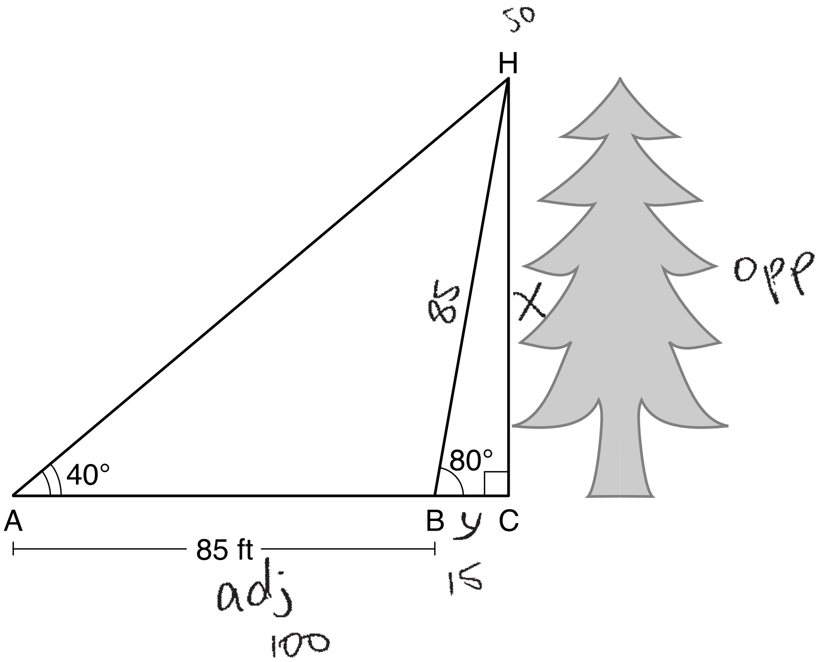
$x = 83.708$

84 ft

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

Question 34

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point A on the ground to the top of the tree, H, is 40° The angle of elevation from point B on the ground to the top of the tree, H, is 80°. The distance between points A and B is 85 feet.



Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

∠CBH is 80° and is a supplementary angle to ∠ABH making ∠ABH = 100°. ∠BAH is already given as 40° and since another angle is 100°, the last angle would be 40°. This creates an isosceles △ with 2 equivalent angle measures.

Determine and state, to the *nearest foot*, the height of the tree.

$\cos 80° = \frac{y}{85}$

$y = 14.7$

$y = 15$

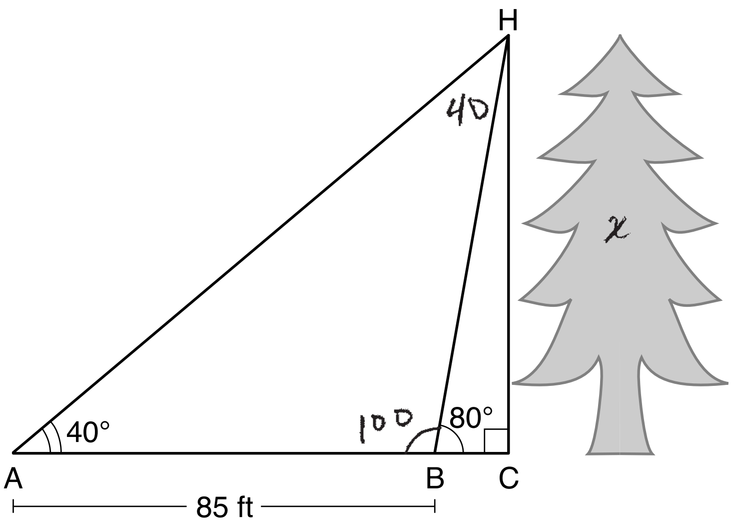
$\tan 40° = \frac{x}{100}$

$\boxed{84 \text{ feet}}$

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

Question 34

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point A on the ground to the top of the tree, H, is 40° The angle of elevation from point B on the ground to the top of the tree, H, is 80°. The distance between points A and B is 85 feet.



Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

ΔABH is isosceles because $\angle ABH$ is 100° and $\angle A$ is given 40°. That means $\angle AHB$ must be 40°, and isosceles triangles have 2 equal angles.

Determine and state, to the *nearest foot*, the height of the tree.

$\sin 80 = \frac{x}{85}$

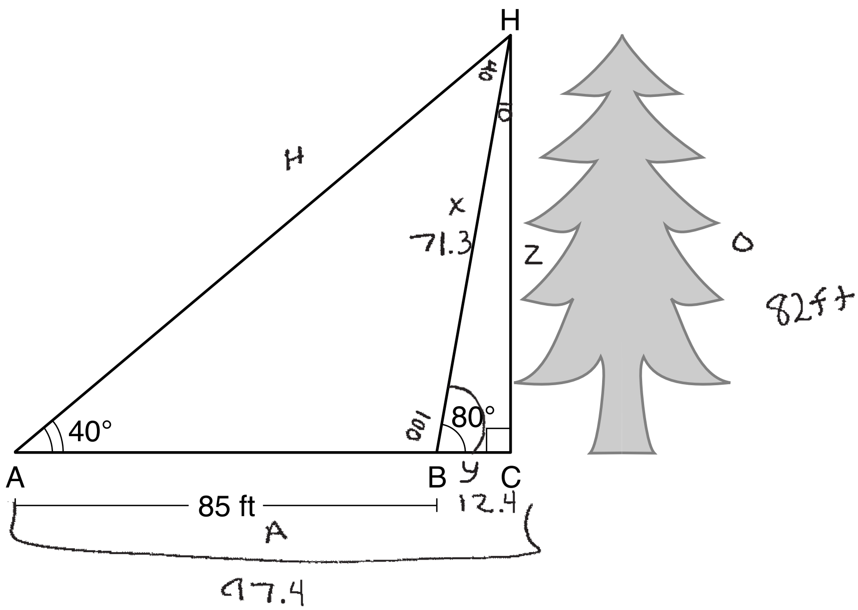
$x = 14.76$

$x = 15$

Score 3: The student wrote a correct explanation and a correct trigonometric equation, but no further correct work was shown.

Question 34

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point A on the ground to the top of the tree, H, is 40° The angle of elevation from point B on the ground to the top of the tree, H, is 80°. The distance between points A and B is 85 feet.



Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

Barry is correct bc $\angle ABH$ is 100° $\angle A$ is 40°; $\angle AHB$ is 40° too bc 100° + 40° = 140° and a triangle is 180° 180° − 140° = 40°.

Determine and state, to the *nearest foot*, the height of the tree.

$\frac{\tan 40}{1} = \frac{x}{85}$

$x = 71.3$

$\frac{\cos 80}{1} = \frac{y}{71}$

$y = 12.4$

$\frac{\tan 40}{1} = \frac{z}{97.4}$

$z = 81.7$

The tree is 82 ft tall

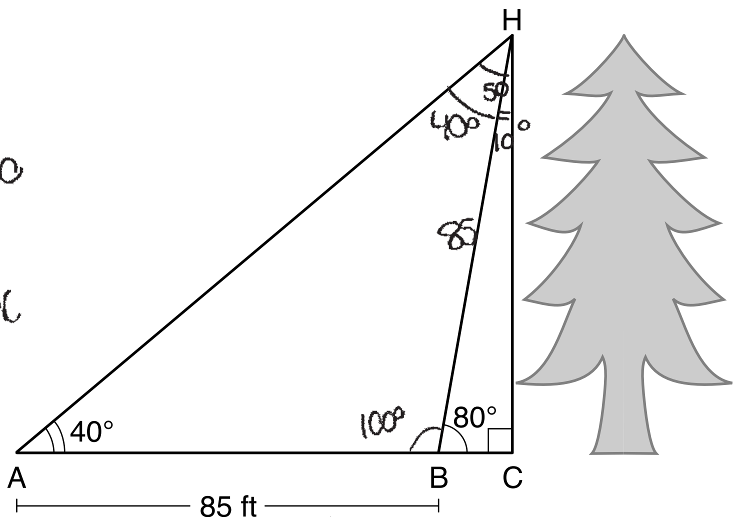
Score 2: The student wrote an incomplete explanation and made an error in using tangent in a non-right triangle.

Question 34

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point *A* on the ground to the top of the tree, *H*, is 40° The angle of elevation from point *B* on the ground to the top of the tree, *H*, is 80°. The distance between points *A* and *B* is 85 feet.

$40 + 90 = 130$
$180 - 130$
$50° = \angle AHC$

$80 + 90 = 170$
$180 - 170$
$10° = \angle BHC$



$50 - 10 = 40° = \angle AHB$

Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

He is correct b/c $\angle AHB$ is 40° and an isosceles $\triangle$ needs to have 2 $\cong$ base $\angle$'s to be isosceles.

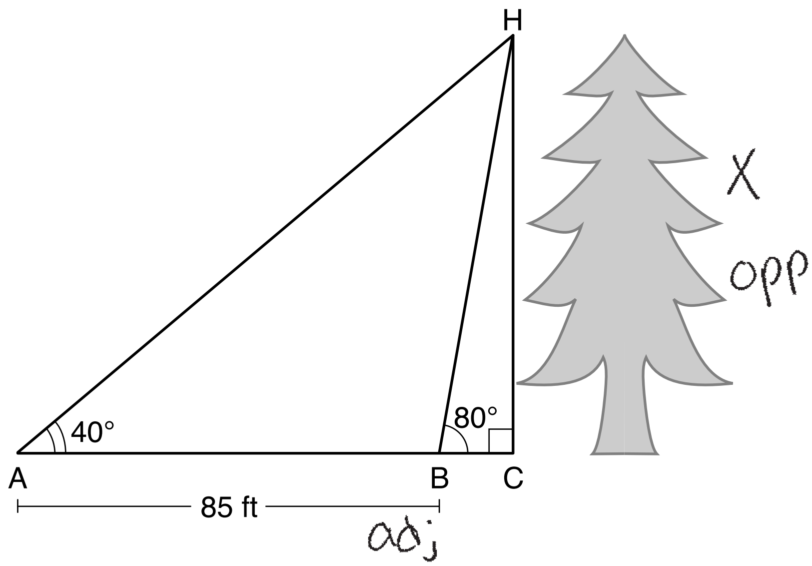
Determine and state, to the *nearest foot*, the height of the tree.

85 ft.

Score 2: The student wrote a complete and correct explanation, but no further correct work was shown.

Question 34

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point A on the ground to the top of the tree, H, is 40° The angle of elevation from point B on the ground to the top of the tree, H, is 80°. The distance between points A and B is 85 feet.



Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

$$\begin{array}{r} 180 \\ -\ 80 \\ \hline 100 \end{array}$$

$m\angle ABH$

$$\begin{array}{r} 180 \\ 100 \\ \hline 80 \end{array}$$

$80 \div 2 = 40 = m\angle AHB$

Barry is correct - refer to justified work above as explaination.

Determine and state, to the *nearest foot*, the height of the tree.

TOA

$\dfrac{\tan(40)}{1} = \dfrac{x}{85}$

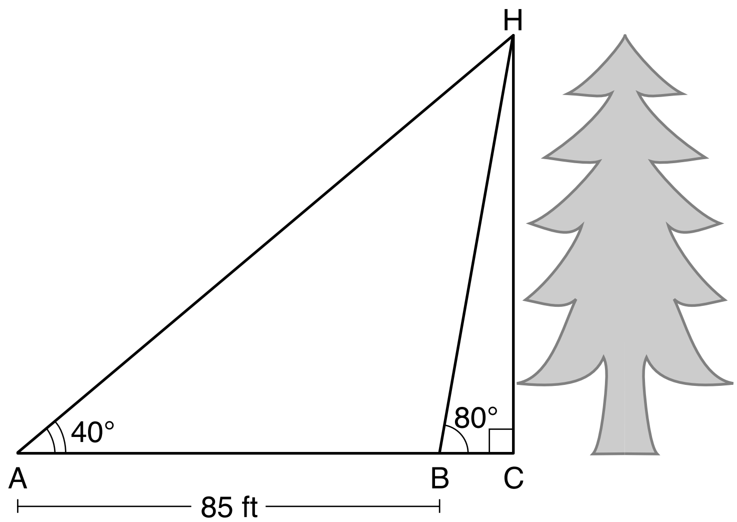
$x = \tan(40) \cdot 85$

$x = 71.3235$

Score 1: The student wrote an incomplete explanation. No further correct relevant work was shown.

Question 34

34 Barry wants to find the height of a tree that is modeled in the diagram below, where $\angle C$ is a right angle. The angle of elevation from point A on the ground to the top of the tree, H, is 40° The angle of elevation from point B on the ground to the top of the tree, H, is 80°. The distance between points A and B is 85 feet.



Barry claims that $\triangle ABH$ is isosceles. Explain why Barry is correct.

$\overline{AB}$ and $\overline{BH}$ are the same length.

Determine and state, to the *nearest foot*, the height of the tree.

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

Question 35

35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle
[The use of the set of axes on the next page is optional.]

$m_{\overline{DU}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-(-1)}{-1+3} = \frac{9}{2}$

$m_{\overline{UC}} = \frac{6-8}{8+1} = \frac{-2}{9}$

opp. reciprocal slopes
$\overline{DU} \perp \overline{UC}$

$\perp$ lines form right $\angle$'s.

$\triangle DUC$ is a right $\triangle$ because it has a right angle.

Question 35 is continued on the next page.

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

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

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

$\sqrt{(9)^2+(2)^2}$

$\sqrt{81+4}$

$\sqrt{85}$

$d\ \overline{UC} = \sqrt{(8-6)^2+(-1-8)^2}$

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

$\sqrt{4+81}$

$\sqrt{85}$

$d\ \overline{CU'} = \sqrt{(8-6)^2+(6+3)^2}$

$\sqrt{(2)^2+(9)^2}$

$\sqrt{4+81} = \sqrt{85}$

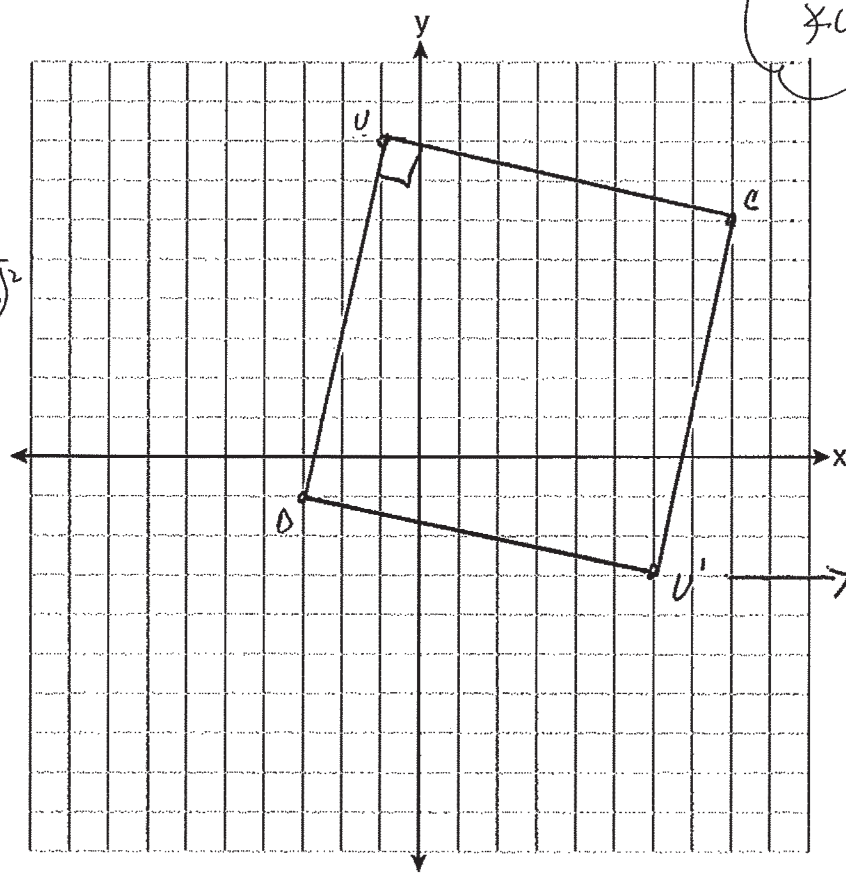
DUCU' is a square because it has 4 ≅ sides and a Right ∠, ∠U

$d\ \overline{U'D} = \sqrt{(-3-6)^2+(-1+3)^2}$

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

$\sqrt{81+4}$

$\sqrt{85}$



$\rightarrow U' = (6,-3)$

Question 35

35 Given: Triangle *DUC* with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle
[The use of the set of axes on the next page is optional.]

$DU = \sqrt{(-1-(-3))^2+(8-(-1))^2}$
$= \sqrt{2^2+9^2}$
$= \sqrt{4+81}$
$\boxed{DU = \sqrt{85}}$

$UC = \sqrt{(8-(-1))^2+(6-8)^2}$
$= \sqrt{9^2+(-2)^2}$
$= \sqrt{81+4}$
$\boxed{UC = \sqrt{85}}$

$CD = \sqrt{(8-(-3))^2+(6-(-1))^2}$
$= \sqrt{11^2+7^2}$
$= \sqrt{121+49}$
$\boxed{CD = \sqrt{170}}$

$\sqrt{85}^2 + \sqrt{85}^2 = \sqrt{170}^2$

$85 + 85 = 170$

$170 = 170$

Since the Pythagorean Theorem works, $\triangle DUC$ is a right $\triangle$.

Question 35 is continued on the next page.

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

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

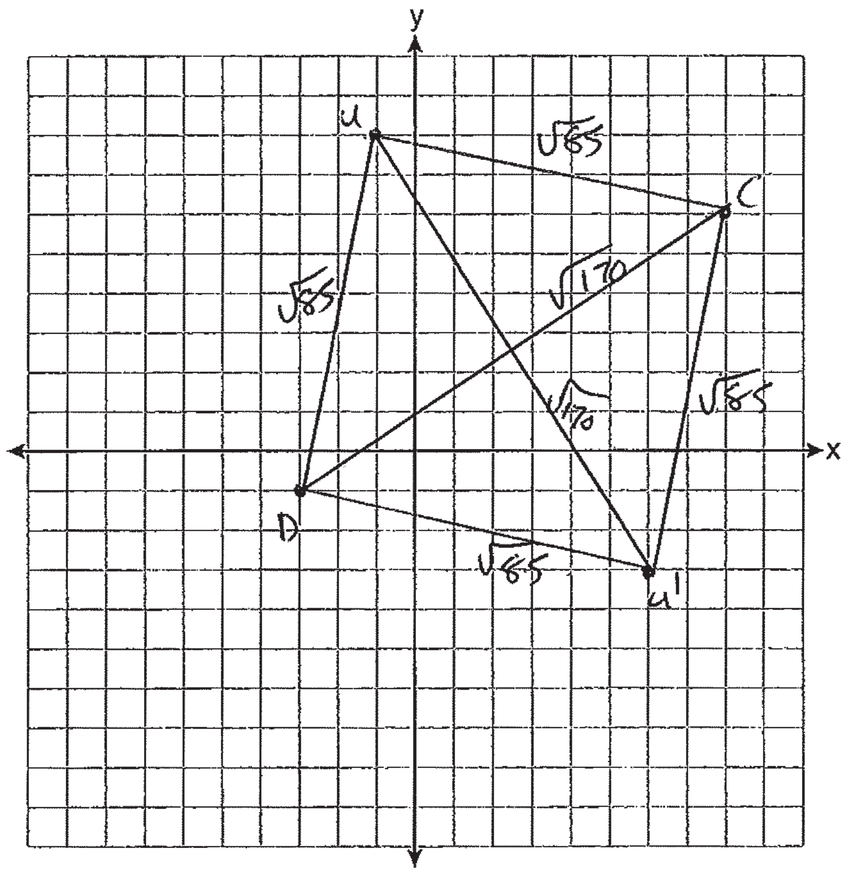
$u'(6,-3)$

$Du' = \sqrt{(6-(-3))^2+(-3-(-1))^2}$
$= \sqrt{9^2+(-2)^2}$
$= \sqrt{81+4}$
$\boxed{Du' = \sqrt{85}}$

$u'c = \sqrt{(8-6)^2+(6-(-3))^2}$
$= \sqrt{2^2+9^2}$
$= \sqrt{4+81}$
$\boxed{u'c = \sqrt{85}}$

$uu' = \sqrt{(6-(-1))^2+(-3-8)^2}$
$= \sqrt{7^2+(-11)^2}$
$= \sqrt{49+121}$
$\boxed{uu' = \sqrt{170}}$

Since all 4 sides of quadrilateral Ducu' are ≅, it is a rhombus $\overline{DC} \cong \overline{uu'}$. Since the diagonals of rhombus Ducu' are ≅, it is a square.

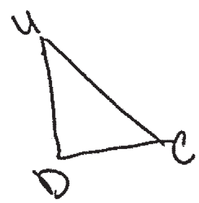


Question 35

35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle

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



$D(-3,-1)_1$
$U(-1,8)_2$

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

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

$= \frac{9}{2}$

$D(-3,-1)_1$
$C(8,6)_2$

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

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

$= \frac{7}{11}$

$U(-1,8)_1$
$C(8,6)_2$

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

$= \frac{6 - 8}{8 - -1}$

$= \frac{-2}{9}$

$\triangle$DUC is a Right triangle because lines $\overline{DU}$ and $\overline{UC}$'s slopes are negative Recipicals, meaning they are perpedicular. And perpendicular lines creat 90° angles making the triangle a Right triangle.

Question 35 is continued on the next page.

Score 5: The student wrote an incomplete concluding statement in proving the square.

Point U is reflected over $\overline{DC}$ to locate its image point, U', forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

$D(-3,-1)_1$
$U(-1,8)_2$
$D=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$=\sqrt{(-1--3)^2+(8--1)^2}$
$=\sqrt{85}$

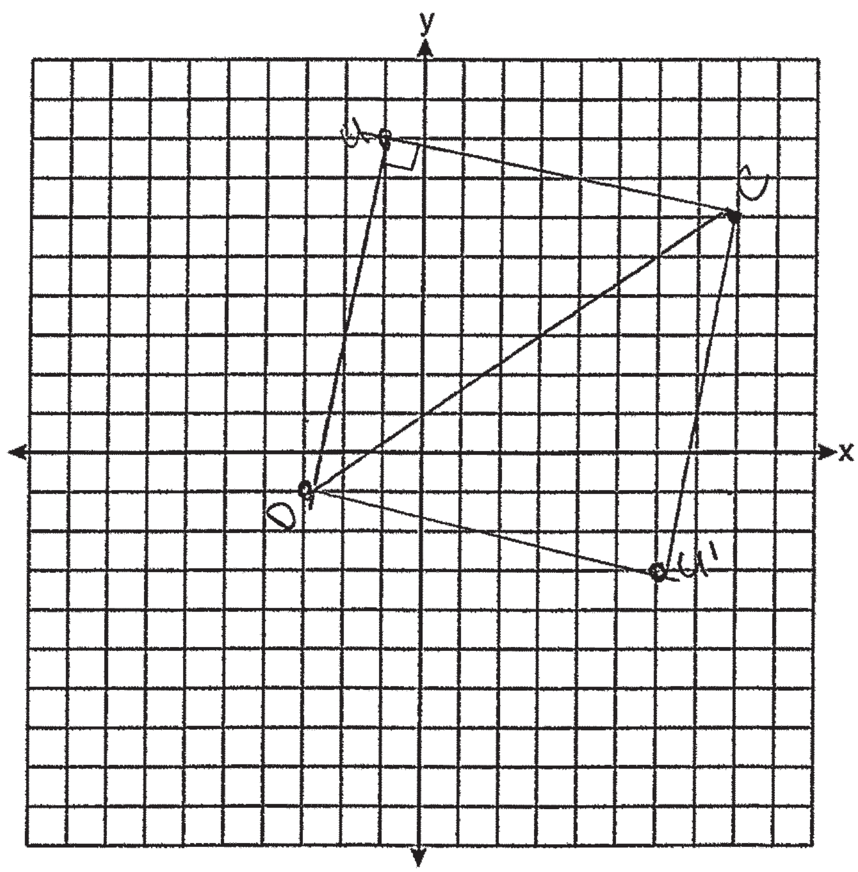
$U(-1,8)_1$
$C(8,6)_2$
$D=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$=\sqrt{(8--1)^2+(6-8)^2}$
$=\sqrt{85}$

$C(8,6)_1$
$U'(6,-3)_2$
$D=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$=\sqrt{(6-8)^2+(-3-6)^2}$
$=\sqrt{85}$

$U'(6,-3)_1$
$D(-3,-1)_2$
$D=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$=\sqrt{(-3-6)^2+(-1--3)^2}$
$=\sqrt{85}$

DUCU' is a rhombus because all the sides are equal.

DUCU' is a square because all the sides are equal.



35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle
[The use of the set of axes on the next page is optional.]

$m\overline{DU} = \frac{8+1}{-1+3} = \frac{9}{2}$

$m\overline{UC} = \frac{6-8}{8+1} = \frac{-2}{9}$

The slopes of $\overline{DU}$ and $\overline{UC}$ are negative reciprocals, $\therefore$ $\overline{DU}$ is $\perp$ to $\overline{UC}$, $\therefore$ perpendicular lines form right $\angle$s, $\therefore$ $\triangle DUC$ contains a rt. $\angle$, $\therefore$ $\triangle DUC$ is a rt. $\triangle$.

Question 35 is continued on the next page.

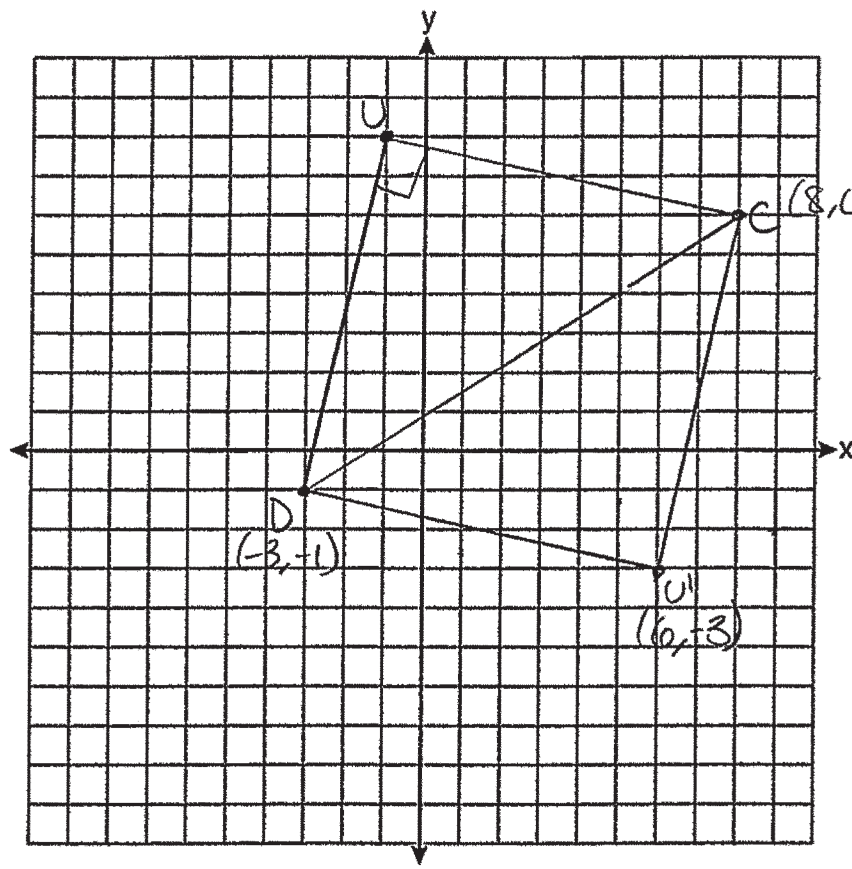
Score 4: The student made a conceptual error in proving the square.

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

$m\,\overline{CU'} = \frac{6+3}{8-6} = \frac{9}{2}$

$m\,\overline{DU'} = \frac{-1+3}{-3-6} = \frac{2}{-9}$

The slopes of $\overline{DU'}$ and $\overline{CU'}$ are negative reciprocals, ∴ $\overline{DU'}$ is ⊥ to $\overline{CU'}$, ∴ perpendicular lines form rt. <s, ∴ quad DUCU' contains 2 rt. <s, ∴ quad DUCU' is a square.



Question 35

35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle
[The use of the set of axes on the next page is optional.]

slope of $\overline{DU} = \frac{8-(-1)}{-1-(-3)} = \frac{9}{2}$

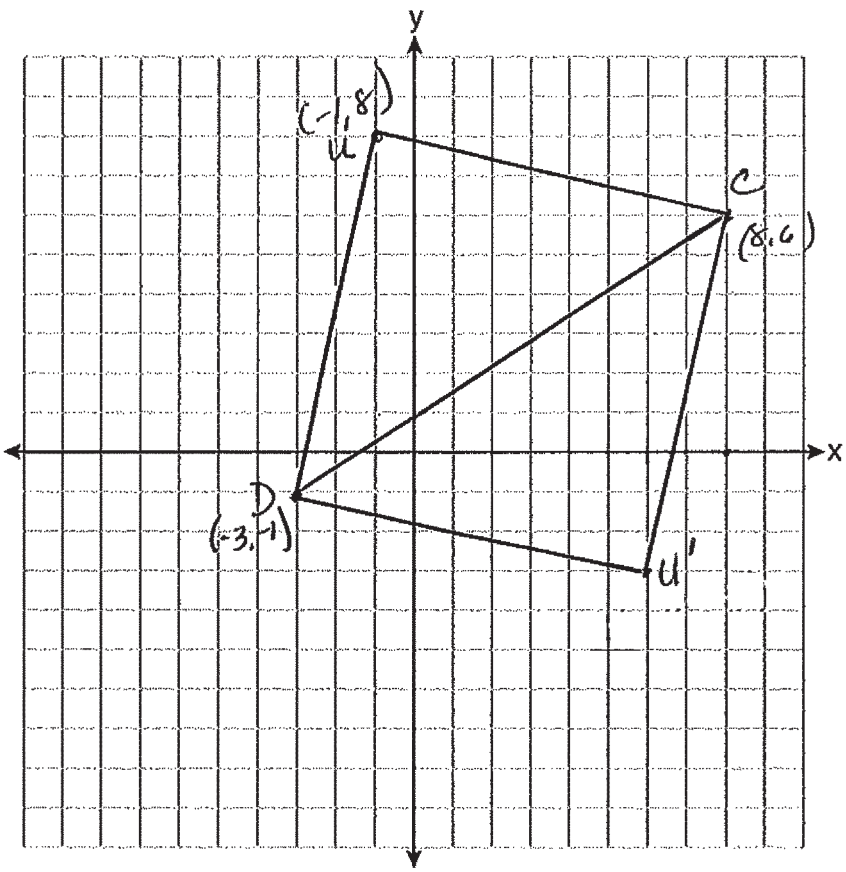
slope of $\overline{UC} = \frac{8-6}{-1-8} = -\frac{2}{9}$

Since the slopes are negative reciprocals the lines are perpendicular and perpendicular lines form right angles. Therefore $\triangle DUC$ is a right triangle.

Question 35 is continued on the next page.

Score 3: The student proved $\triangle DUC$ is a right triangle and located U'. No further correct work was shown.

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.



Question 35

35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle

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

$$m_{\overline{DU}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - -1}{-1 + 3} = \frac{9}{2}$$

$$m_{\overline{UC}} = \frac{6-8}{8+1} = \frac{-2}{9}$$

opposite reciprocal slopes

$\overline{DU} \perp \overline{UC}$

$\perp$ lines form rt $\angle$s.

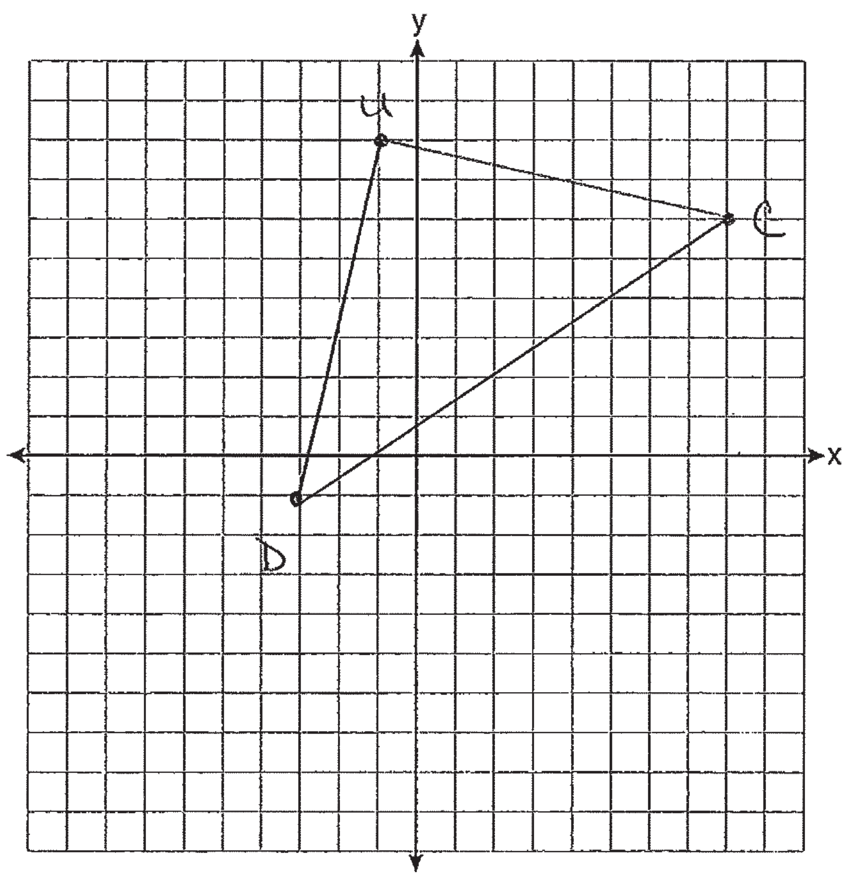
$\angle U$ is a rt. $\angle$.

$\triangle DUC$ is a rt $\triangle$ because it has a rt. $\angle$.

Question 35 is continued on the next page.

Score 2: The student proved $\triangle DUC$ is a right triangle. No further correct work was shown.

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.



Question 35

35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle
[The use of the set of axes on the next page is optional.]

$DU = \sqrt{(-3-(-1))^2+(-1-8)^2} = \sqrt{(-2)^2+(-9)^2} = \sqrt{85}$

$UC = \sqrt{(-1-8)^2+(8-6)^2} = \sqrt{(-9)^2+2^2} = \sqrt{85}$

$DC = \sqrt{(-3-8)^2+(-1-6)^2} = \sqrt{(-11)^2+(-7)^2} = \sqrt{170}$

$\Rightarrow (\sqrt{85})^2 + (\sqrt{85})^2 = (\sqrt{170})^2$

$\Rightarrow (\sqrt{85})^2 + (\sqrt{85})^2 = 170$, $(\sqrt{170})^2 = 170$

$\Rightarrow DU^2 + UC^2 = DC^2$

$\Rightarrow \triangle DUC$ is a right triangle (converse of Pithagore theorem)

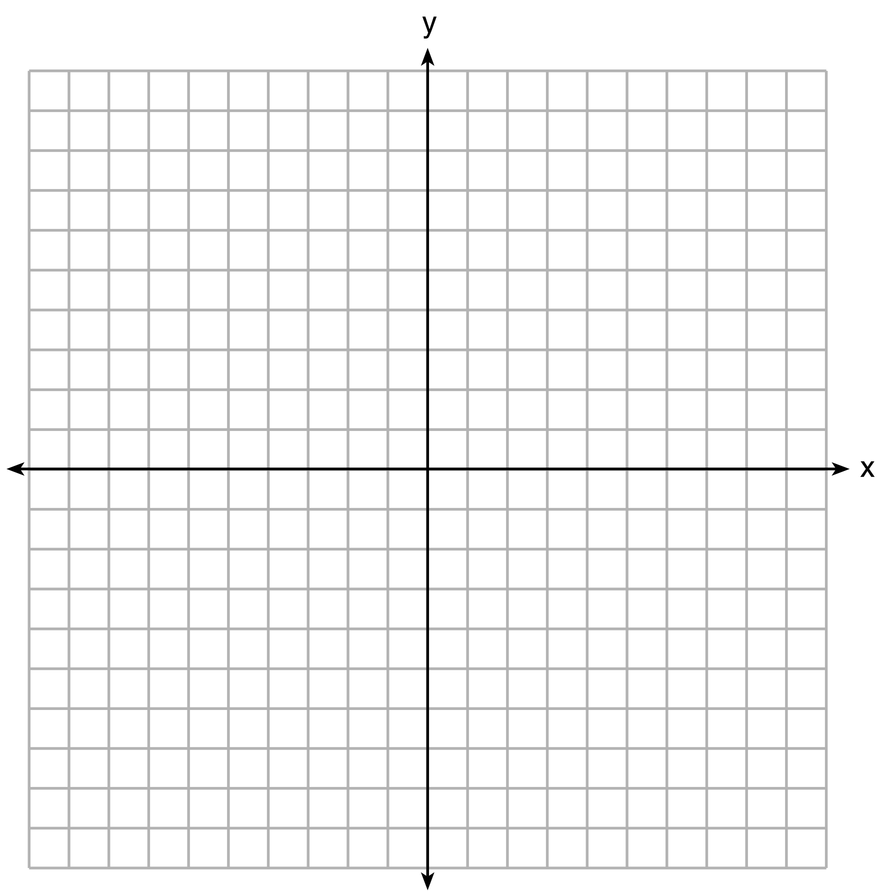
Question 35 is continued on the next page.

Score 2: The student proved $\triangle DUC$ is a right triangle. No further correct work was shown.

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.

U and U' are reflected over $\overline{DC}$

$$\Rightarrow \begin{cases} OU = OU' \\ OD = OC \\ UU' \perp DC \end{cases} \Rightarrow DUCU' \text{ is a rhombus}$$



Question 35

35 Given: Triangle DUC with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle
[The use of the set of axes on the next page is optional.]

Slope $\overline{DU} = \frac{8--1}{-1+3} = \frac{9}{2}$

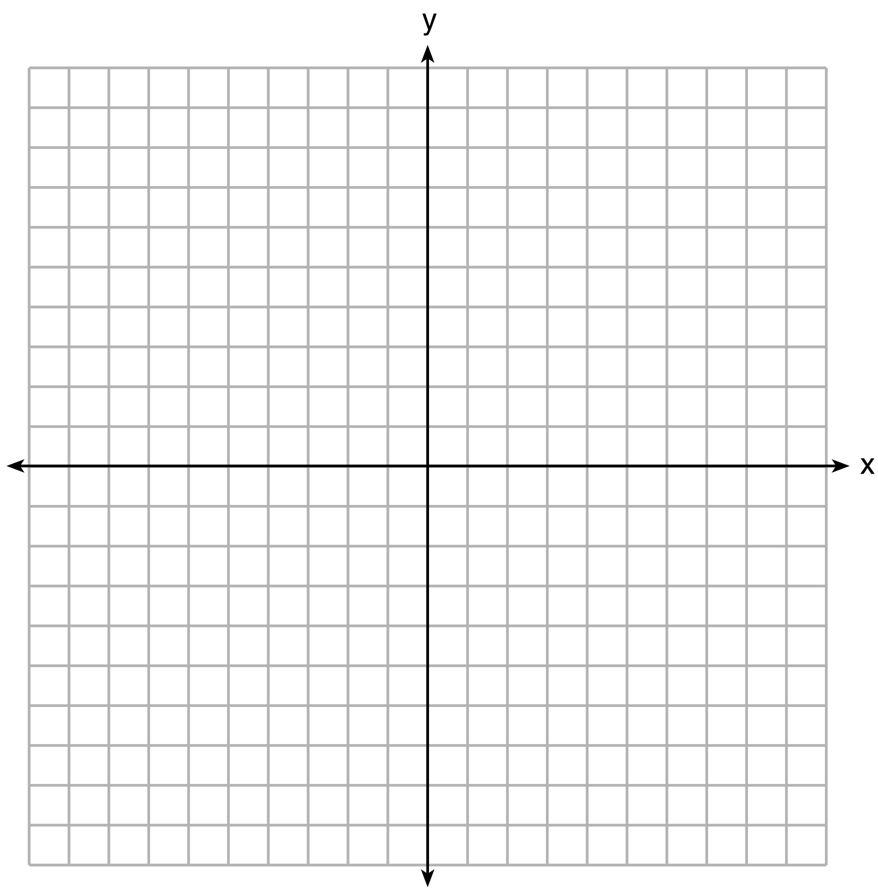
Slope $\overline{UC} = \frac{6-8}{8--1} = \frac{-2}{9}$

$\overline{DU} \perp \overline{UC}$ because they have opposite reciprocal slopes.

Question 35 is continued on the next page.

Score 1: The student wrote an incomplete conclusion in proving the right triangle. No further correct work was shown.

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.



35 Given: Triangle *DUC* with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle
[The use of the set of axes on the next page is optional.]

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

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

$\sqrt{85}$

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

$\sqrt{(8-{}^-1)^2+(6-8)^2}$

$\sqrt{85}$

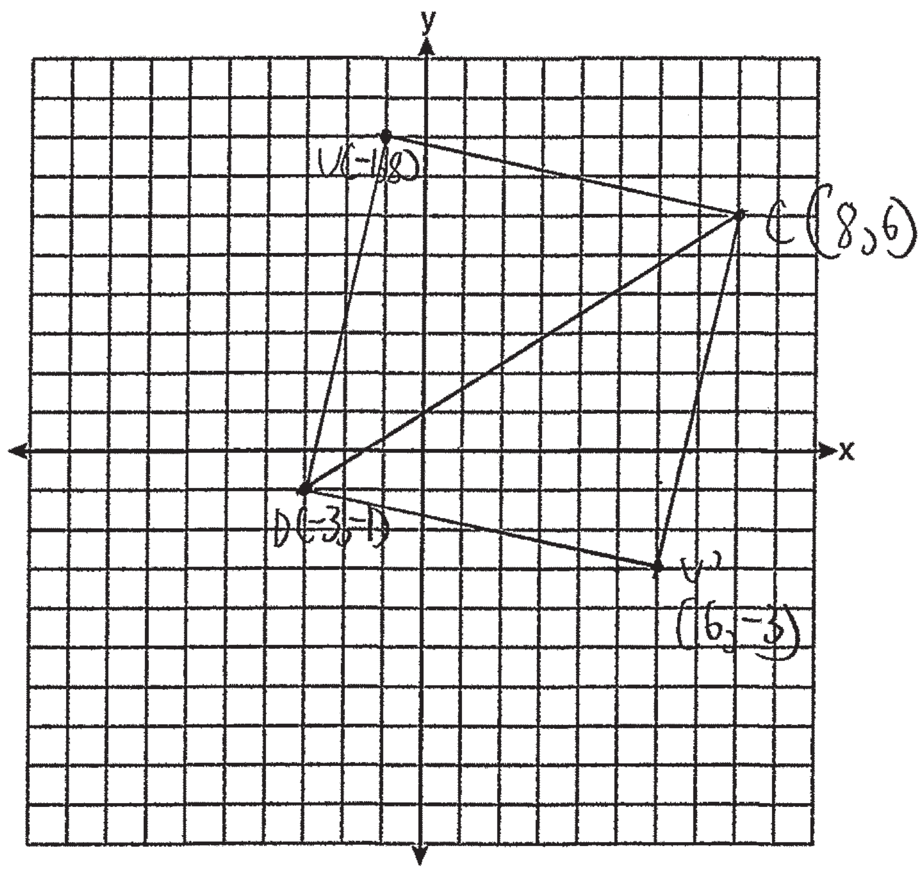
$\triangle$ DUC is a right triange

because it forms a right angle.

Question 35 is continued on the next page.

Score 1: The student located U′. The student did not show enough correct relevant work to receive any additional credit.

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.



Question 35

35 Given: Triangle *DUC* with coordinates $D(-3,-1)$, $U(-1,8)$, and $C(8,6)$

Prove: $\triangle DUC$ is a right triangle

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

$\overline{DU} = \sqrt{(-1 - -3)^2 + (8 - 7)^2}$

$(2)^2 + (9^2)$

$4 + 81$

$\overline{DU} = \sqrt{85}$

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

$(9^2) \quad (-2)^2$

$81 + 4$

$\overline{UC} = \sqrt{85}$

2 equal sides ~~because they are~~ in a triangle

Question 35 is continued on the next page.

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

Point U is reflected over $\overline{DC}$ to locate its image point, U′, forming quadrilateral $DUCU'$. Prove quadrilateral $DUCU'$ is a square.