The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY (COMMON CORE)

Wednesday, August 17, 2016 — 8:30 to 11:30 a.m.

MODEL RESPONSE SET

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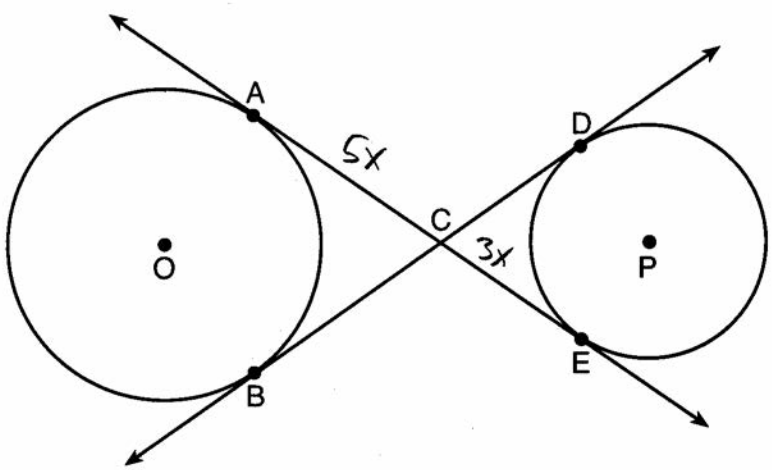
Question 25

25 Lines AE and BD are tangent to circles O and P at A, E, B, and D, as shown in the diagram below. If $AC:CE = 5:3$, and $BD = 56$, determine and state the length of $\overline{CD}$.



$5x + 3x = 56$

$\frac{8x}{8} = \frac{56}{8}$

$x = 7$

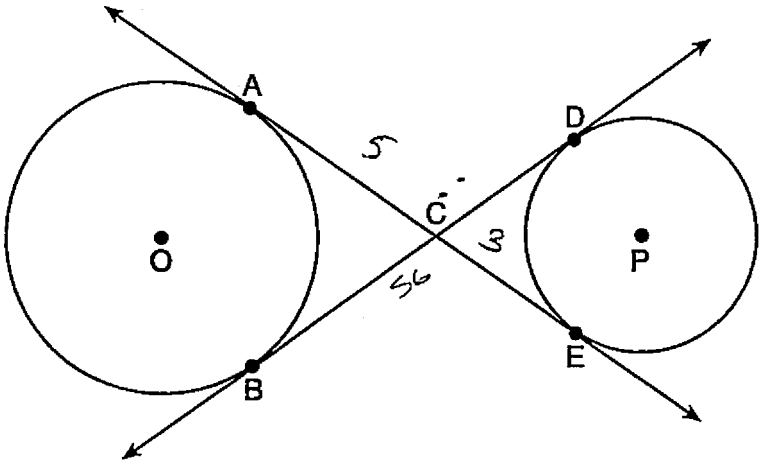
$CE = 3(7) = 21$

$CD = 21$

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

Question 25

25 Lines AE and BD are tangent to circles O and P at A, E, B, and D, as shown in the diagram below. If $AC:CE = 5:3$, and $BD = 56$, determine and state the length of $\overline{CD}$.



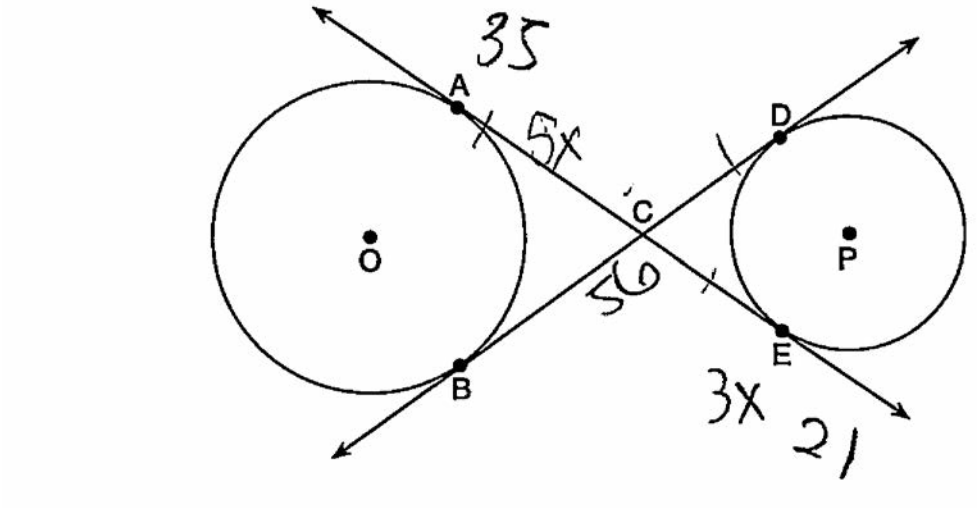
1 unit = $56 \div (5+3)$
$= 56 \div 8$
$= 7$

$\therefore CD = 7(3)$
$= 21$

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

Question 25

25 Lines AE and BD are tangent to circles O and P at A, E, B, and D, as shown in the diagram below. If $AC:CE = 5:3$, and $BD = 56$, determine and state the length of $\overline{CD}$.



$5x + 3x = 56$

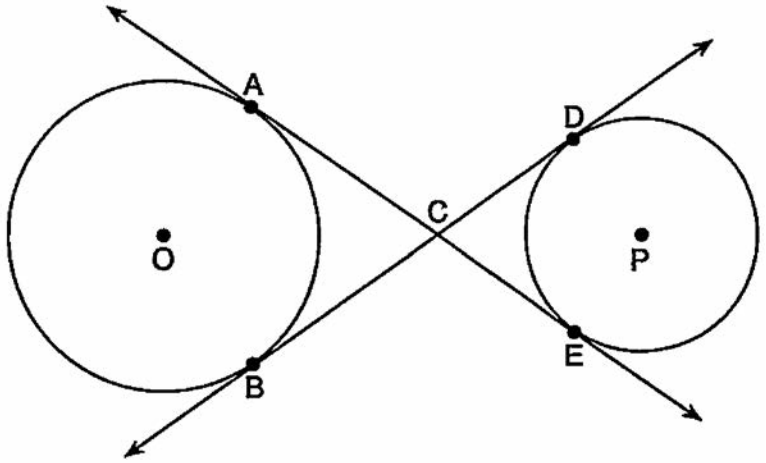
$\frac{8x}{8} = \frac{56}{8}$ $x = 7$

$CD = 35$

Score 1: The student substituted incorrectly and found the length of $\overline{CB}$.

Question 25

25 Lines AE and BD are tangent to circles O and P at A, E, B, and D, as shown in the diagram below. If $AC:CE = 5:3$, and $BD = 56$, determine and state the length of $\overline{CD}$.



$5x + 3x = 360$

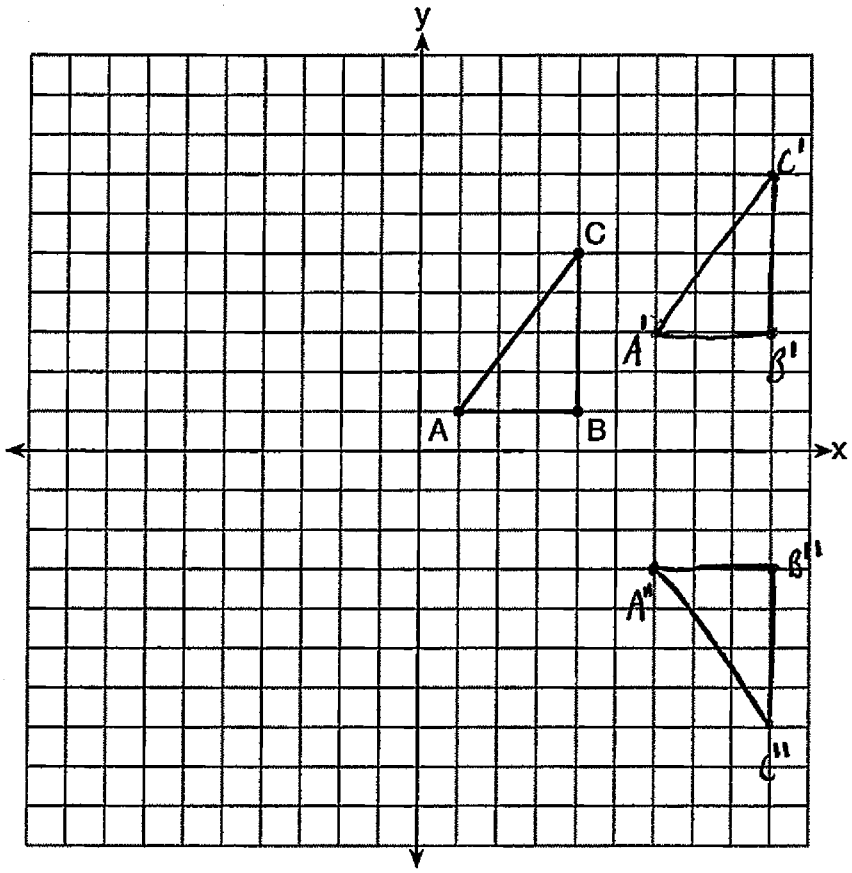
$\frac{8x}{8} = \frac{360}{8}$

$x = 45$

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

Question 26

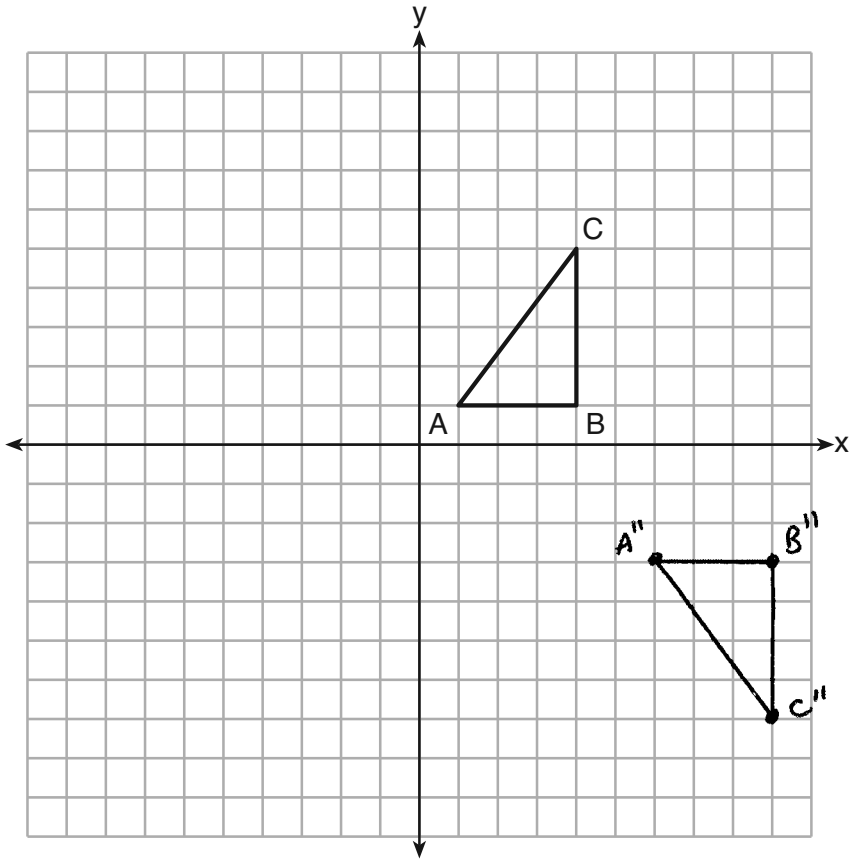
26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.



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

Question 26

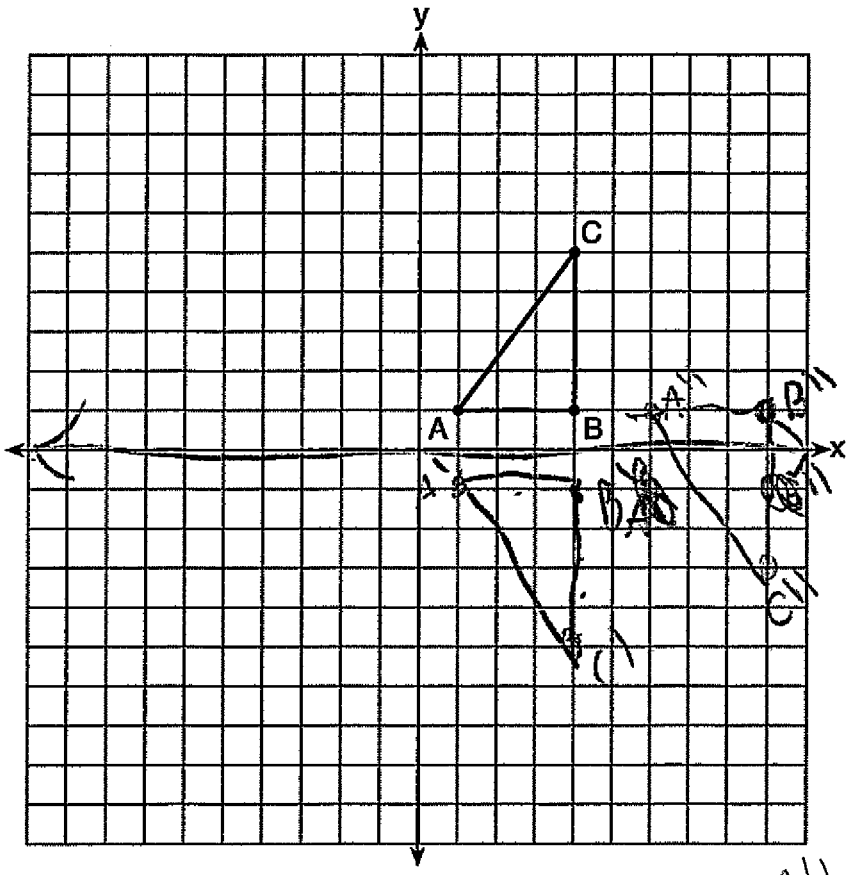
26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.



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

Question 26

26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.

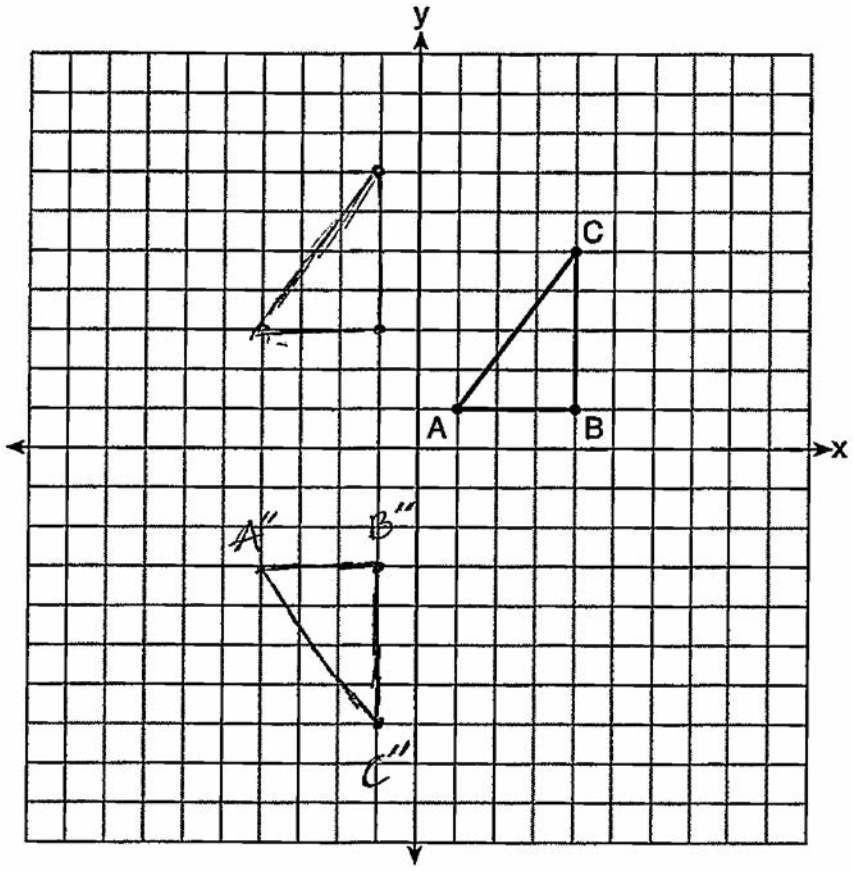


A''(6,1)
B''(9,1)
C''(9,-3)

Score 1: The student made an error by graphing the reflection and then the translation.

Question 26

26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.

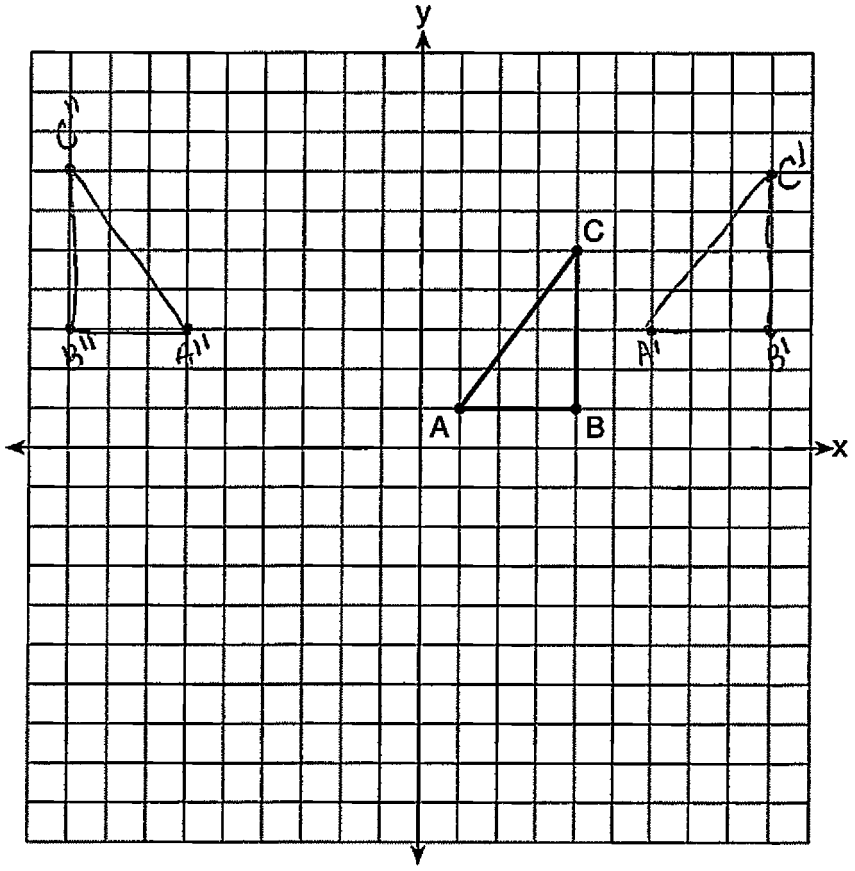


Score 1: The student made an error by translating five units to the left.

Question 26

26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.

x+5 y+2

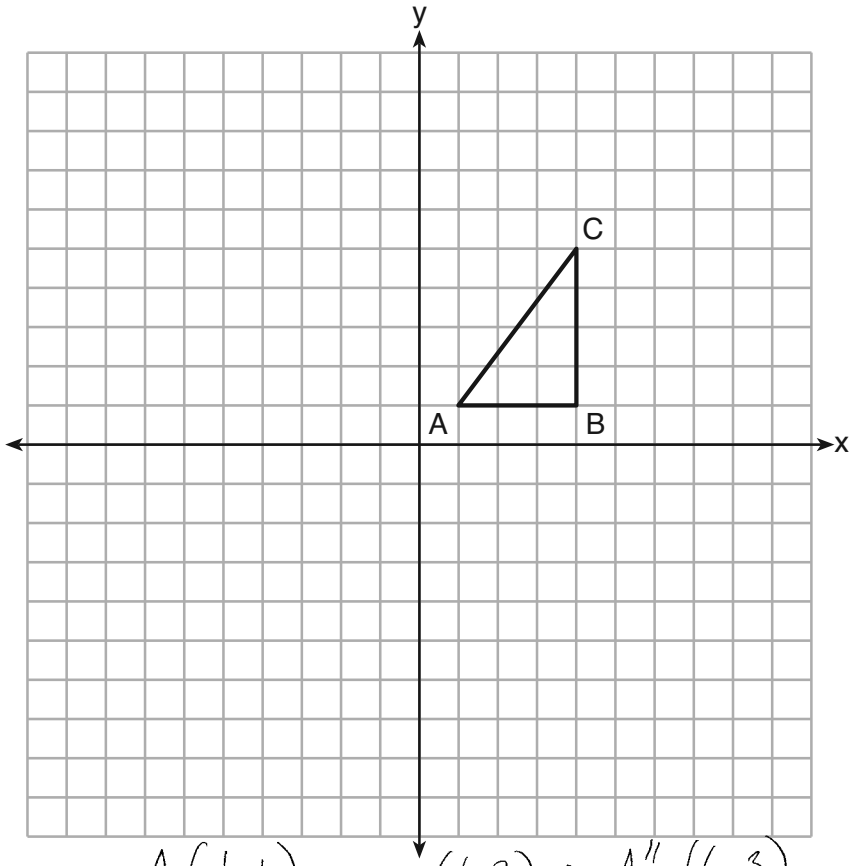


A(1,1) → A'(6,3) → A''(-6,3)
B(4,1) → B'(9,3) → B''(-9,3)
C(4,5) → C'(9,7) → C''(-9,7)

Score 1: The student made an error by reflecting over the y-axis.

Question 26

26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.

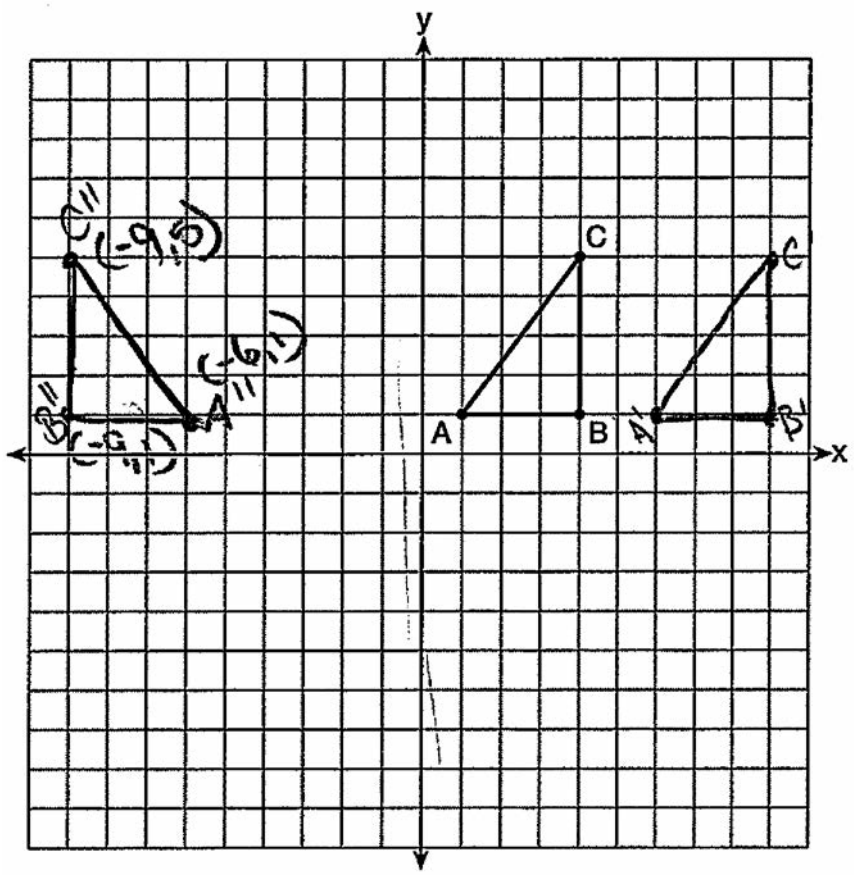


A(1,1) → (6,3) → A'' (6,-3)
B(4,1) → (9,3) → B'' (9,-3)
C(4,5) → (9,7) → C'' (9,-7)

Score 1: The student performed the sequence of transformations algebraically.

Question 26

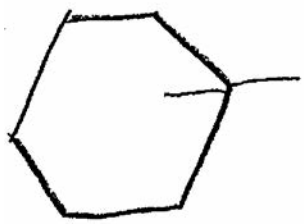
26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up



Score 0: The student graphed the sequence of transformations incorrectly.

Question 27

27 A regular hexagon is rotated in a counterclockwise direction about its center. Determine and state the minimum number of degrees in the rotation such that the hexagon will coincide with itself.



$\frac{180(n-2)}{n} = \frac{180(6-2)}{6}$

$\frac{720}{6} = 120$ $\quad 180 - 120$

60°

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

Question 27

27 A regular hexagon is rotated in a counterclockwise direction about its center. Determine and state the minimum number of degrees in the rotation such that the hexagon will coincide with itself.

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

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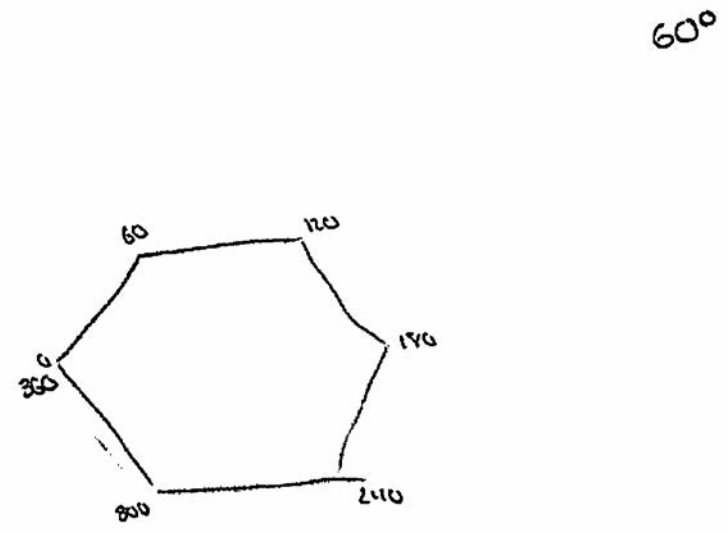

Score 2: The student had a complete and correct response.

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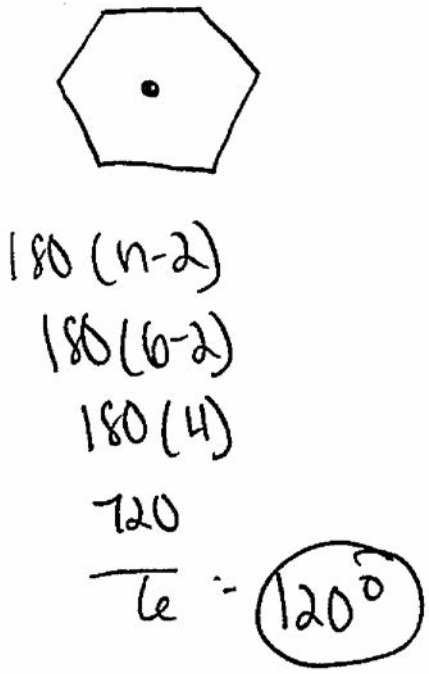
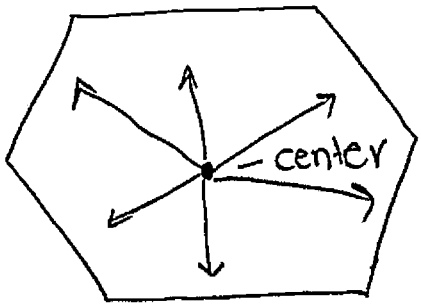


Score 1: The student found the measure of one interior angle of the hexagon.

Question 27

27 A regular hexagon is rotated in a counterclockwise direction about its center. Determine and state the minimum number of degrees in the rotation such that the hexagon will coincide with itself.



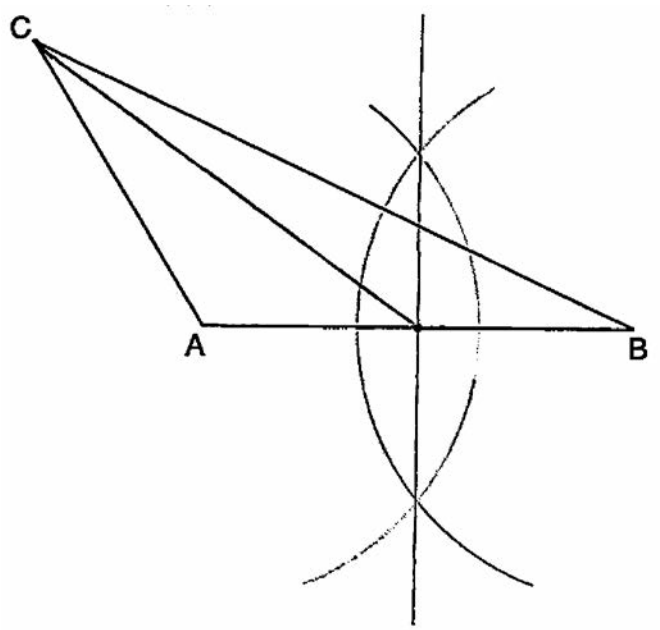
$n+6=180$
$n+6=180$
$6+6=180$
$12=180$
$x=15$

Minimun number of degrees in a rotation is 150

Score 0: The student had a completely incorrect response.

Question 28

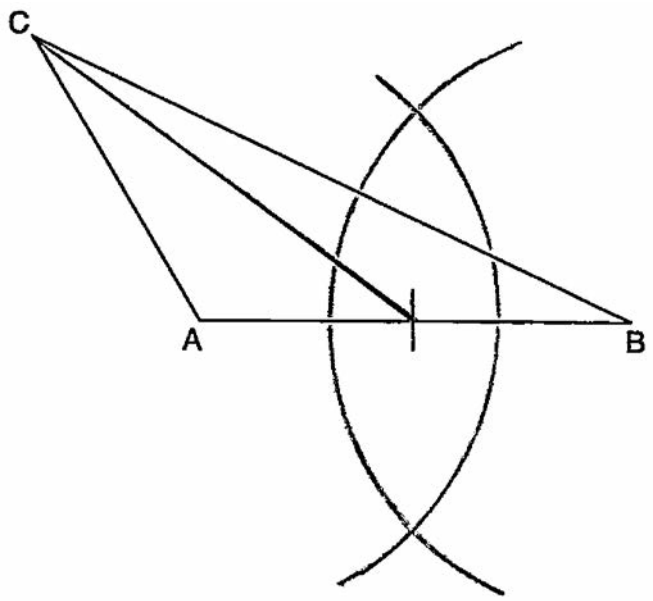
28 In the diagram of $\triangle ABC$ shown below, use a compass and straightedge to construct the median to $\overline{AB}$. [Leave all construction marks.]



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

Question 28

28 In the diagram of $\triangle ABC$ shown below, use a compass and straightedge to construct the median to $\overline{AB}$. [Leave all construction marks.]



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

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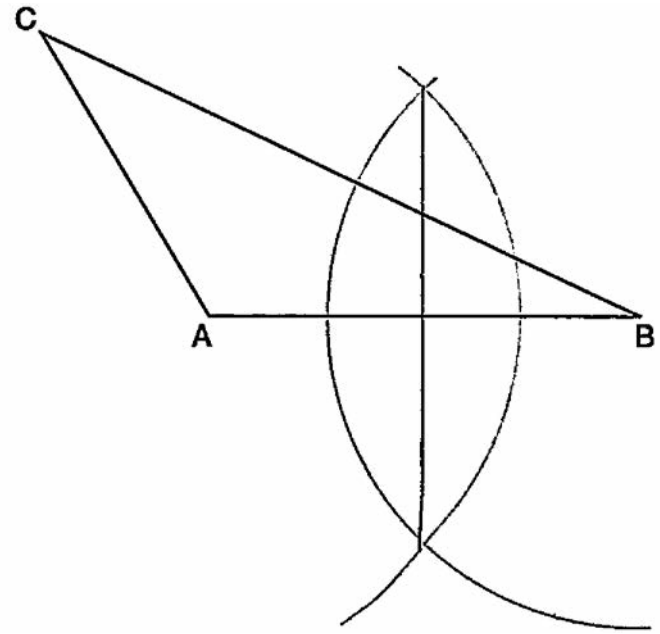

Score 1: The student had a correct construction of a perpendicular bisector, but did not draw the median.

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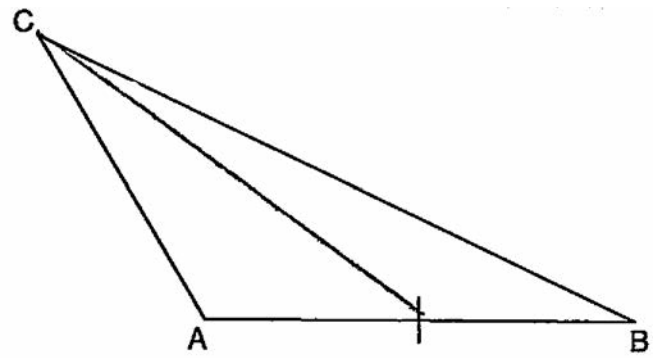
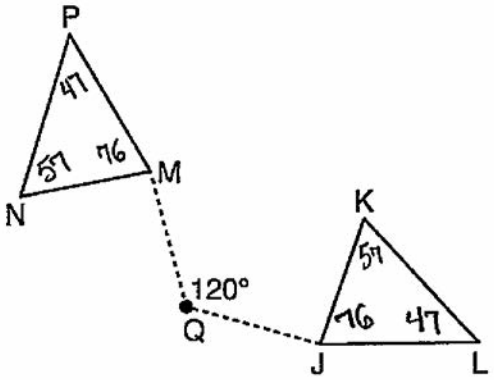


Score 0: The student made a drawing that was not a construction.

Question 29

29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.



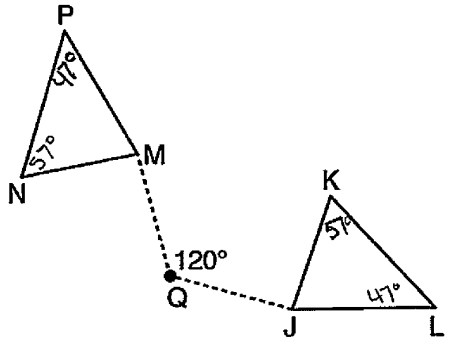
180
−57
−47
76

m∠M is 76°, because angle K is angle N after the rotation, and angle L becomes angle P and angle J becomes angle M. Rotation is a rigid motion, so their measures will be the same.
On △MNP m∠P=47° and m∠N=57°. A triangle is 180° so 180°−57°−47°=76°, the measure of ∠M.

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

Question 29

29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.



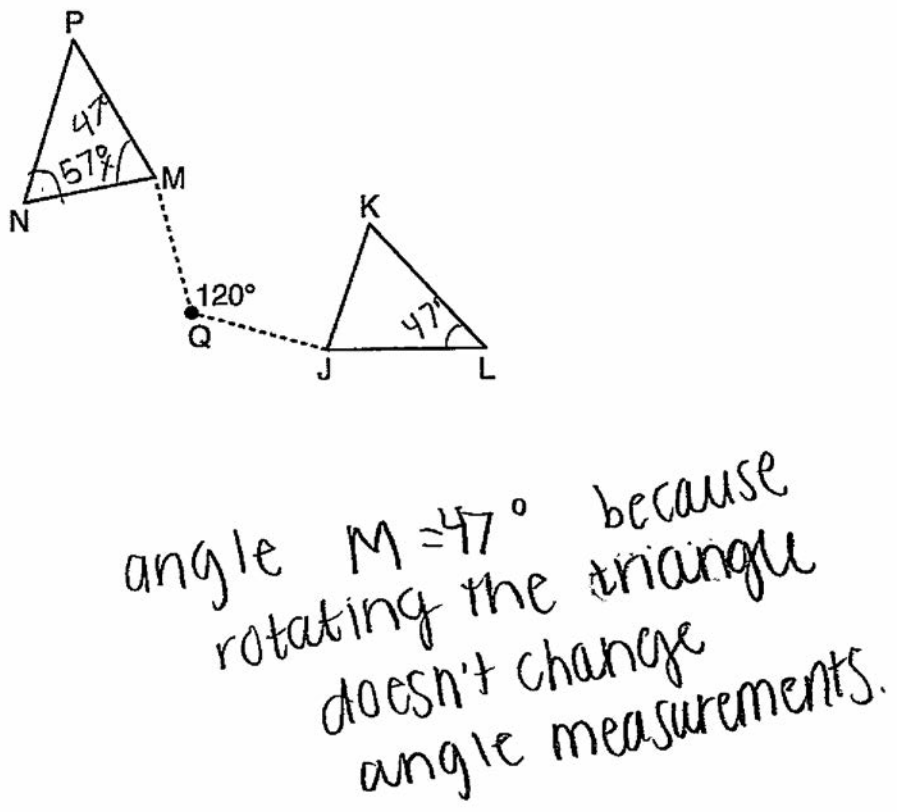
180
- 47
- 57
76°

A rotation is an isometry so the triangles must be congruent and have corresp. congruent angles. So that means $\angle P \cong \angle L$ and $\angle P = 47°$ by substitution. Then 47° and 57° can be subtracted from 180° to find $\angle M = 76°$

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

Question 29

29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.

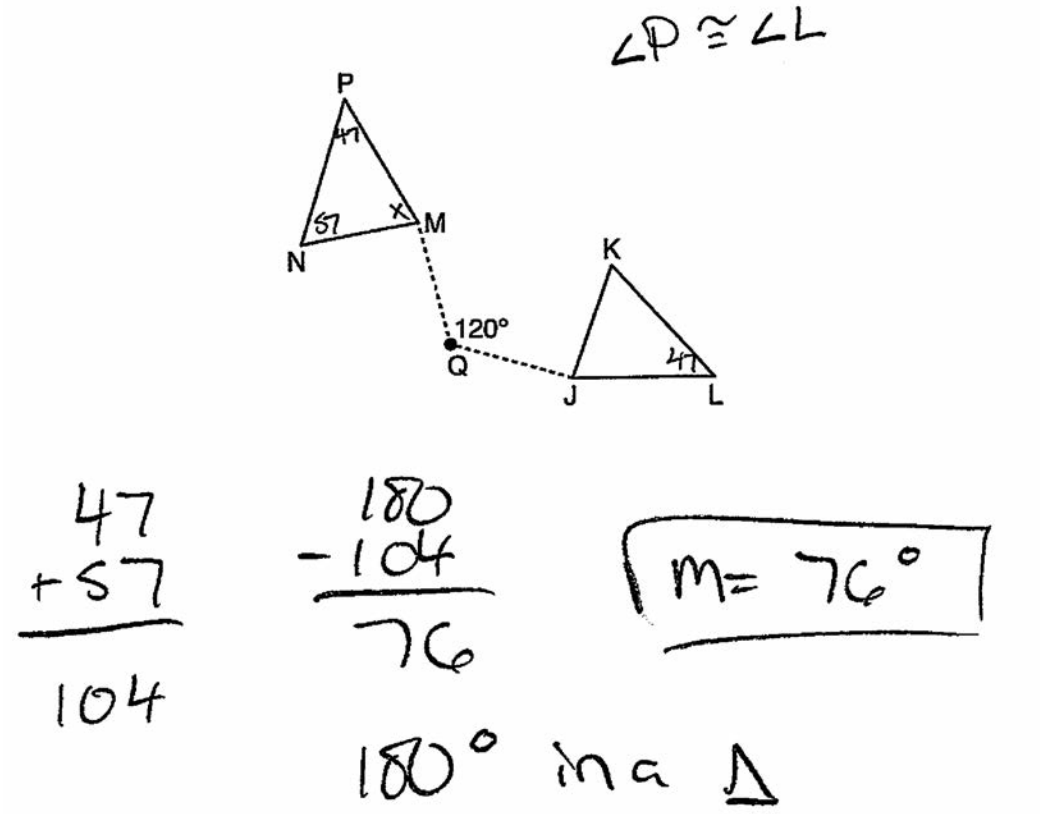


angle M = 47° because rotating the triangle doesn't change angle measurements.

Score 1: The student wrote a correct explanation, but the angle measure was incorrect.

Question 29

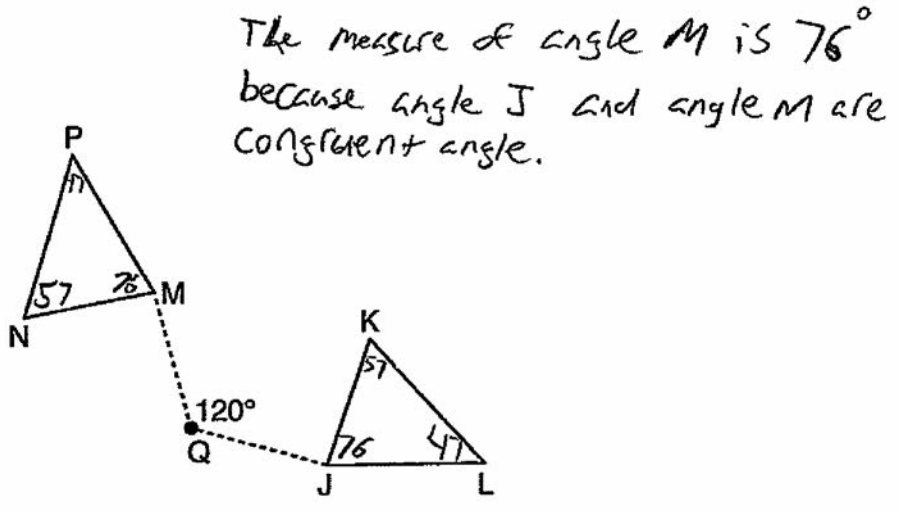
29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.



Score 1: The student did not write an explanation.

Question 29

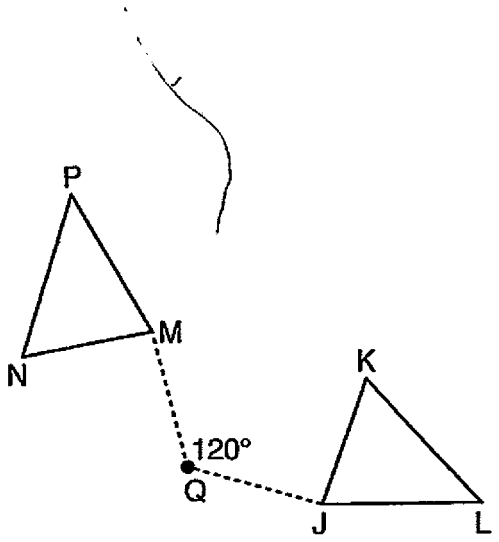
29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.



Score 1: The student had an incomplete explanation.

Question 29

29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.



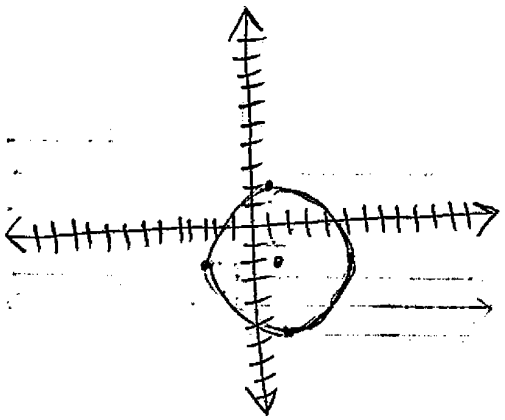
120 + 47 + 57 = 224

224 - 180 = 44°

Score 0: The student had a completely incorrect response.

Question 30

30 A circle has a center at (1,–2) and radius of 4. Does the point (3.4,1.2) lie on the circle? Justify your answer.



$(x-1)^2+(x+2)^2=4^2$

$(3.4-1)^2+(1.2+2)^2=16$

$5.76+10.24=16$

$16=16$ ✓

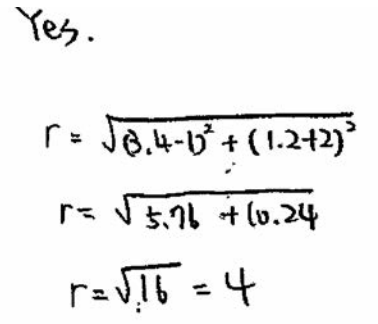
yes →

The point (3.4, 1.2) lie on the circle. By using the equation of the circle, $(x-1)^2+(x+2)^2=4^2$, you plug in the x and the y. First you get $(3.4-1)^2+(1.2+2)^2=16$. When you solve + simplify everything, you get $16=16$.

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

Question 30

30 A circle has a center at (1,–2) and radius of 4. Does the point (3.4,1.2) lie on the circle? Justify your answer.



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

Question 30

30 A circle has a center at (1,–2) and radius of 4. Does the point (3.4,1.2) lie on the circle? Justify your answer.

$(x+1)^2+(y-2)^2=16$

$(3.4+1)^2+(1.2-2)^2=16$

$19.36+0.64 \stackrel{?}{=} 16$

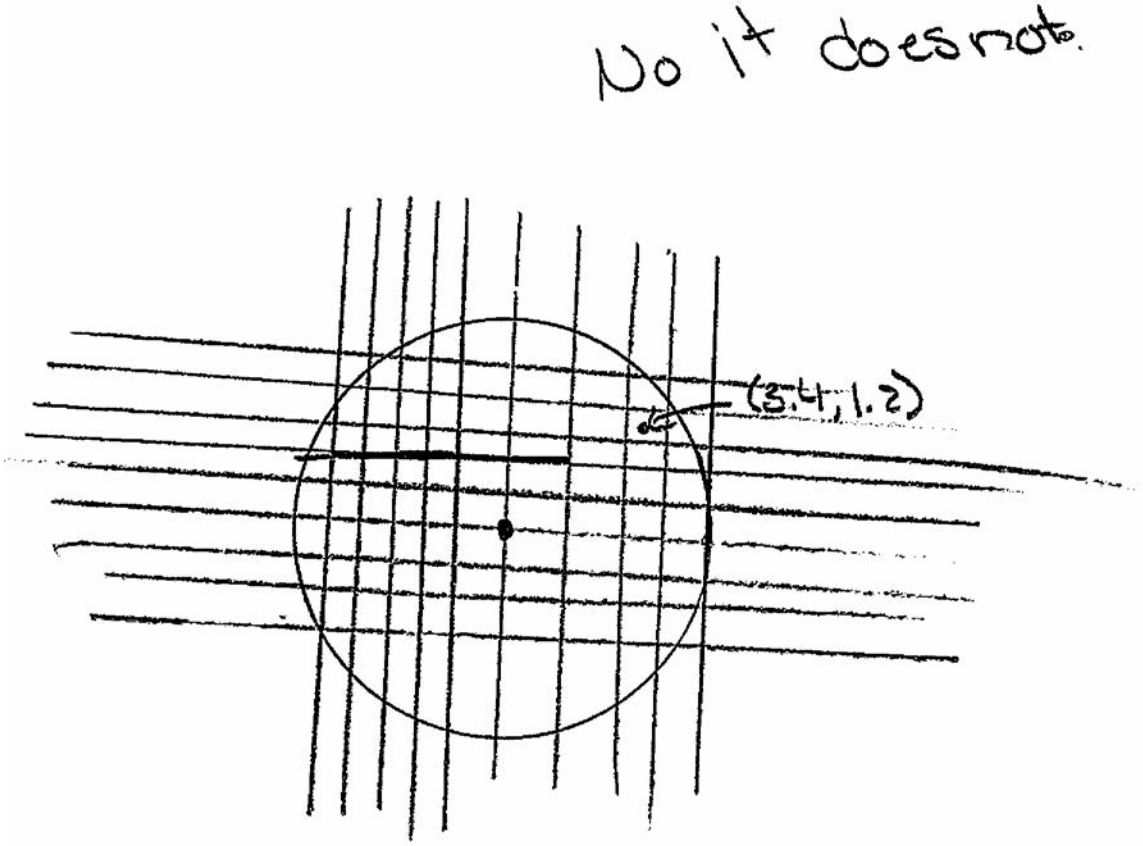
$20 \neq 16$

no

Score 1: The student made a substitution error, but wrote an appropriate conclusion.

Question 30

30 A circle has a center at (1,–2) and radius of 4. Does the point (3.4,1.2) lie on the circle? Justify your answer.



Score 0: The student had a completely incorrect response.

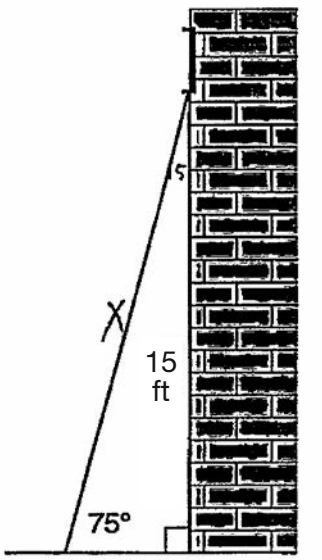
Question 31

31 In the diagram below, a window of a house is 15 feet above the ground. A ladder is placed against the house with its base at an angle of 75° with the ground. Determine and state the length of the ladder to the *nearest tenth of a foot*.

$\frac{\text{Sine}(75)}{1} = \frac{15}{X}$

$X = \frac{15}{\text{Sine}(75)}$

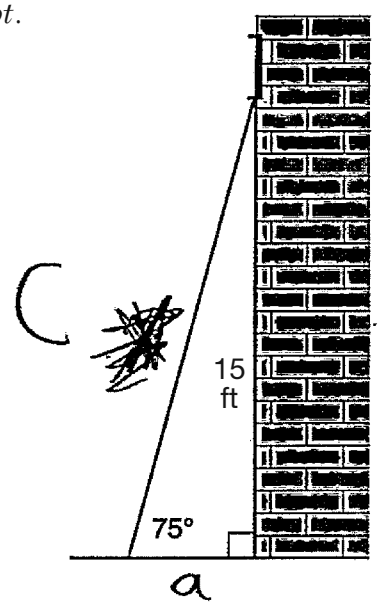
$X = 15.5$



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

Question 31

31 In the diagram below, a window of a house is 15 feet above the ground. A ladder is placed against the house with its base at an angle of 75° with the ground. Determine and state the length of the ladder to the *nearest tenth of a foot*.



$a \cdot \tan(75) = \frac{15}{a} \cdot a$

$a = \frac{15}{\tan(75)}$

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

$\sqrt{\left(\frac{15}{\tan(75)}\right)^2 + 225} = c$

$15.5 = c$

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

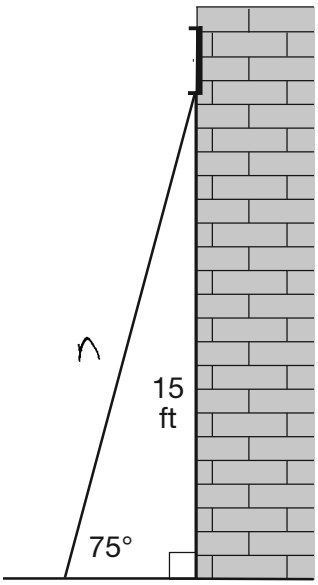
Question 31

31 In the diagram below, a window of a house is 15 feet above the ground. A ladder is placed against the house with its base at an angle of 75° with the ground. Determine and state the length of the ladder to the *nearest tenth of a foot*.

$\sin(75) = \frac{15}{n}$

$n = 15 \cdot \sin(75)$

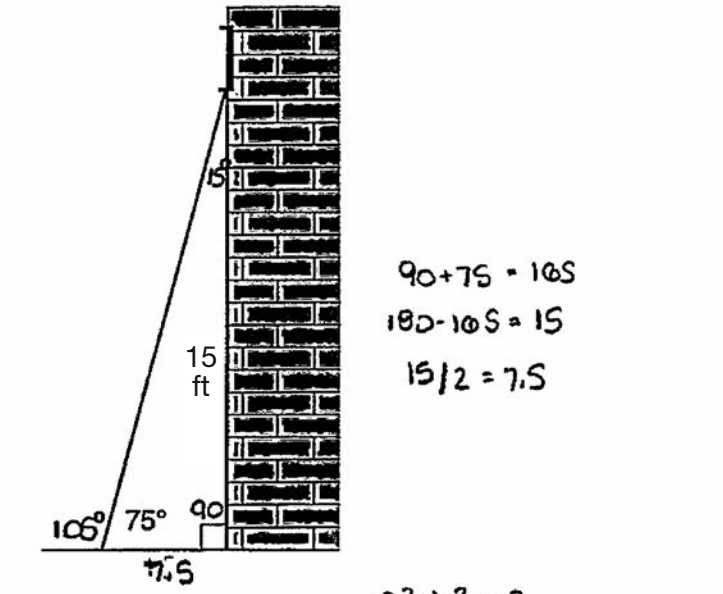
$n = 14.5$



Score 1: The student had a correct equation, but solved it incorrectly.

Question 31

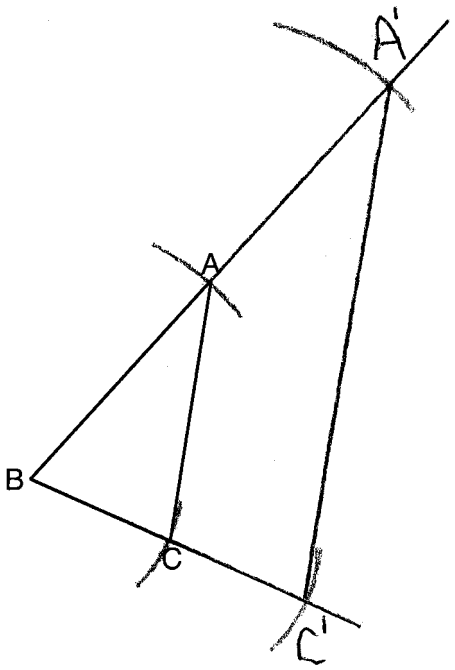
31 In the diagram below, a window of a house is 15 feet above the ground. A ladder is placed against the house with its base at an angle of 75° with the ground. Determine and state the length of the ladder to the *nearest tenth of a foot*.



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

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



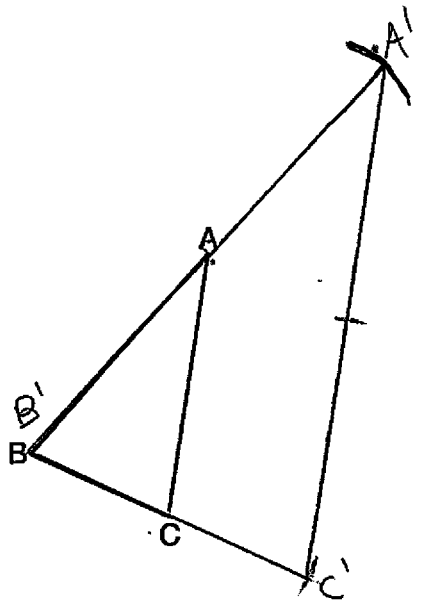
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

the length of $\overline{A'C'}$ is twice the length of $\overline{AC}$

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

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



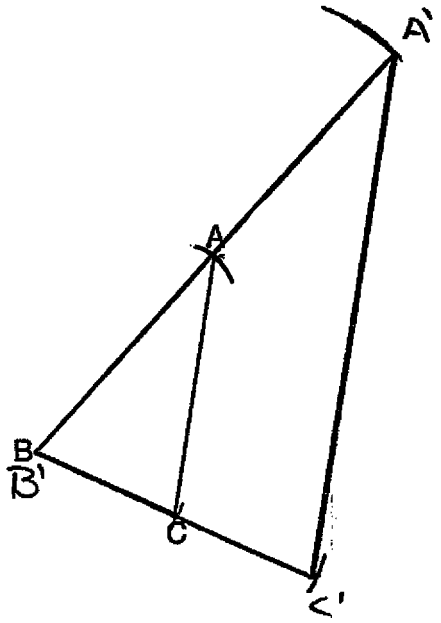
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

The ratio of the lengths of $\overline{A'C'}$ to $\overline{AC}$ is 2:1

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

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



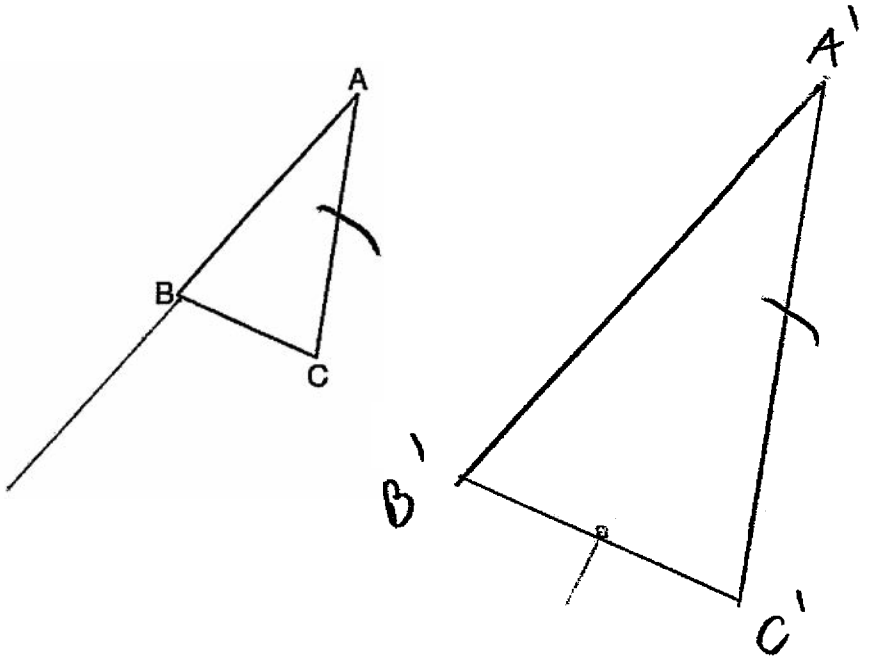
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

$\overline{AC}$ and $\overline{A'C'}$ are both parallel to each other.

Score 3: The student had a correct construction, but the description was of a correct relationship other than length.

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



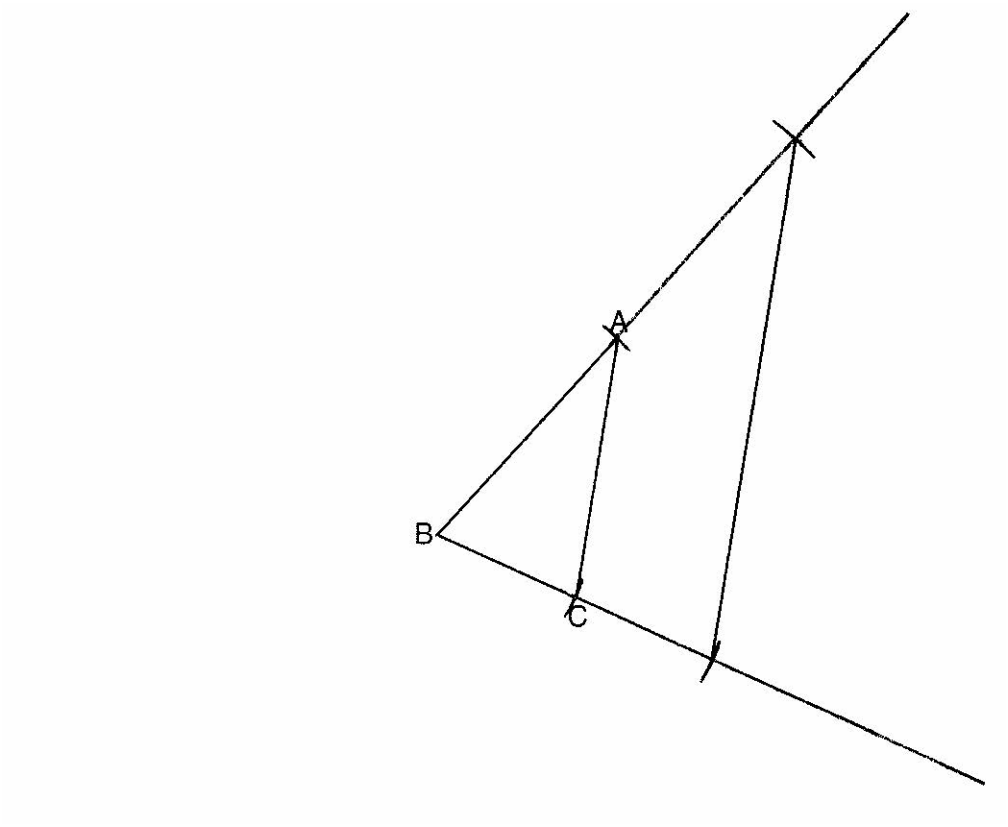
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

AC is half A'C'

Score 2: The student had a correct description, but no further correct work was shown.

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



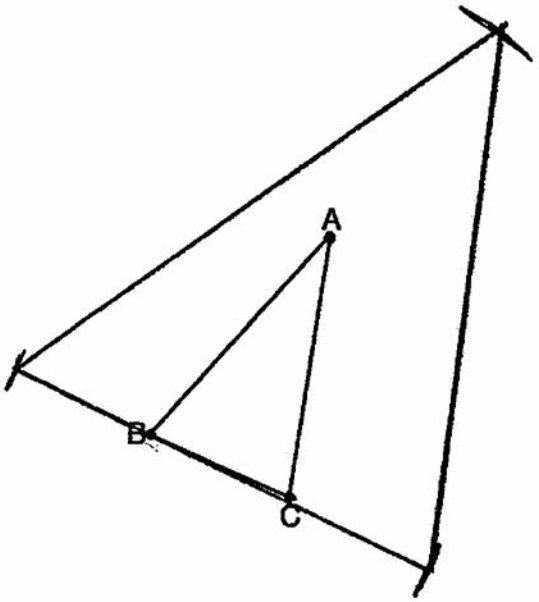
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

They are in a ratio of 2:1

Score 2: The student did not label A' and C' on the construction. The description was incomplete.

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



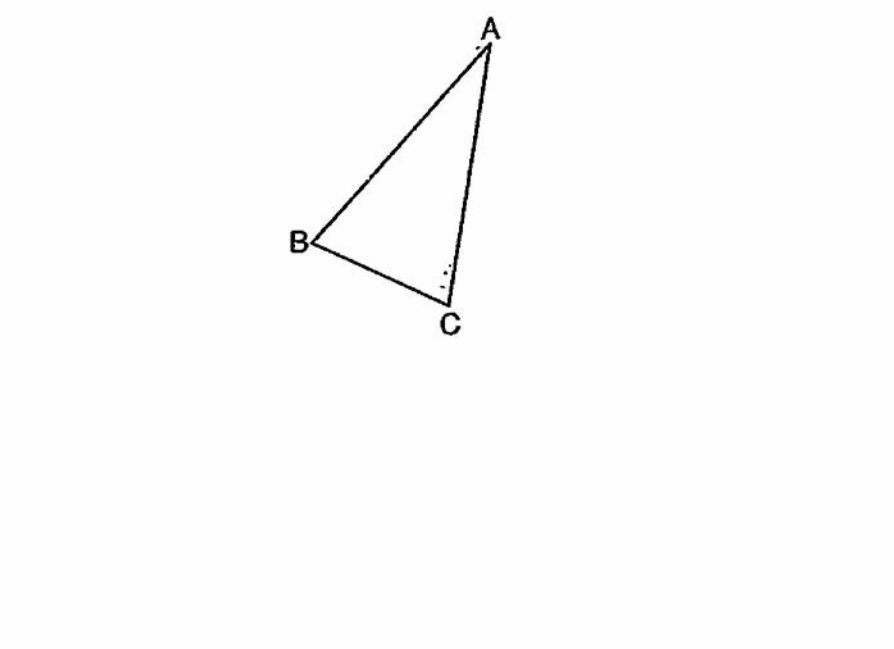
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

it is doubled

Score 1: The student made an incorrect construction. The description was incomplete.

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



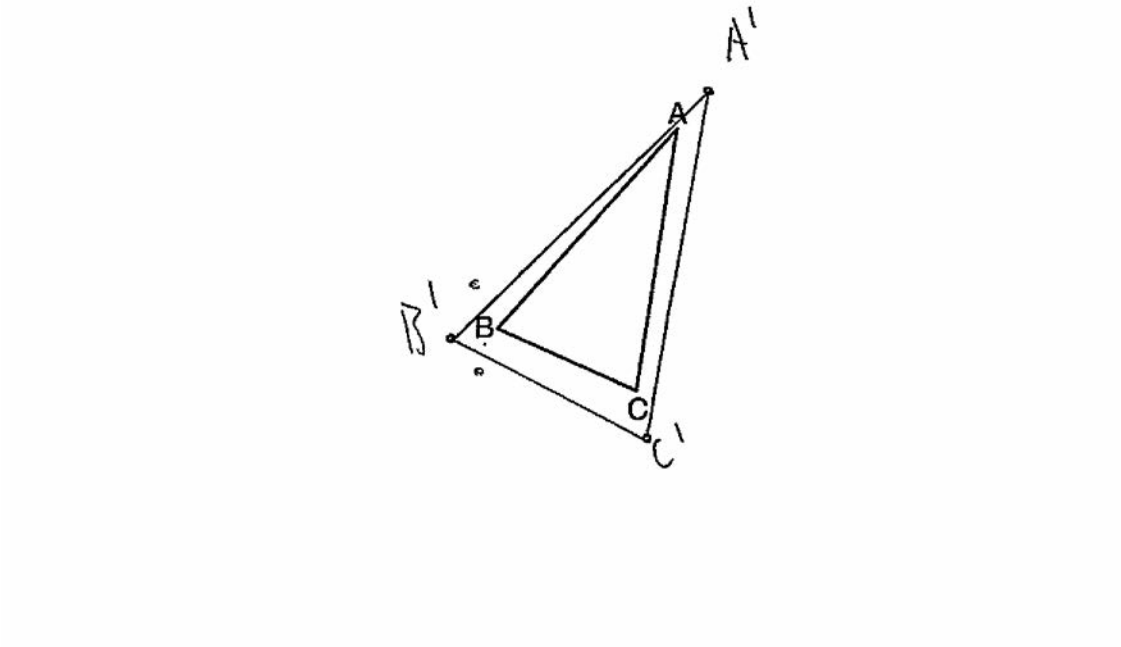
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

is 2x bigger.

Score 1: The student wrote an incomplete description and the construction was missing.

Question 32

32 Using a compass and straightedge, construct and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a dilation with a scale factor of 2 and centered at B. [Leave all construction marks.]



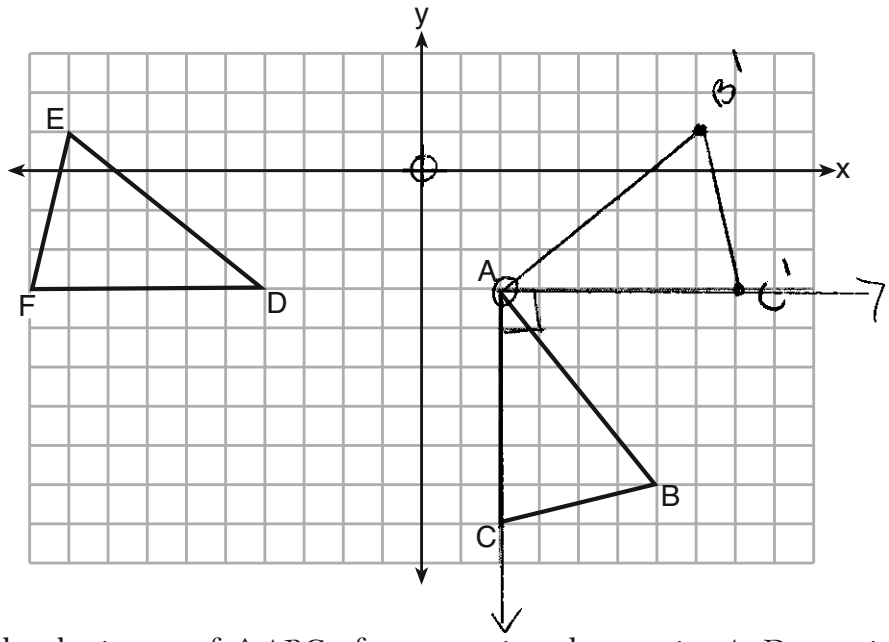
Describe the relationship between the lengths of $\overline{AC}$ and $\overline{A'C'}$.

A'C' is a dialated line Segment of AC

Score 0: The construction and description were completely incorrect.

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



$m = -\frac{5}{4}$

$\perp m = \frac{4}{5}$

Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

B'(7,1) The angle of Rotation that took C to C' was 90° counterclockwise, so take B to B' by finding the point using the same rotation about point A.

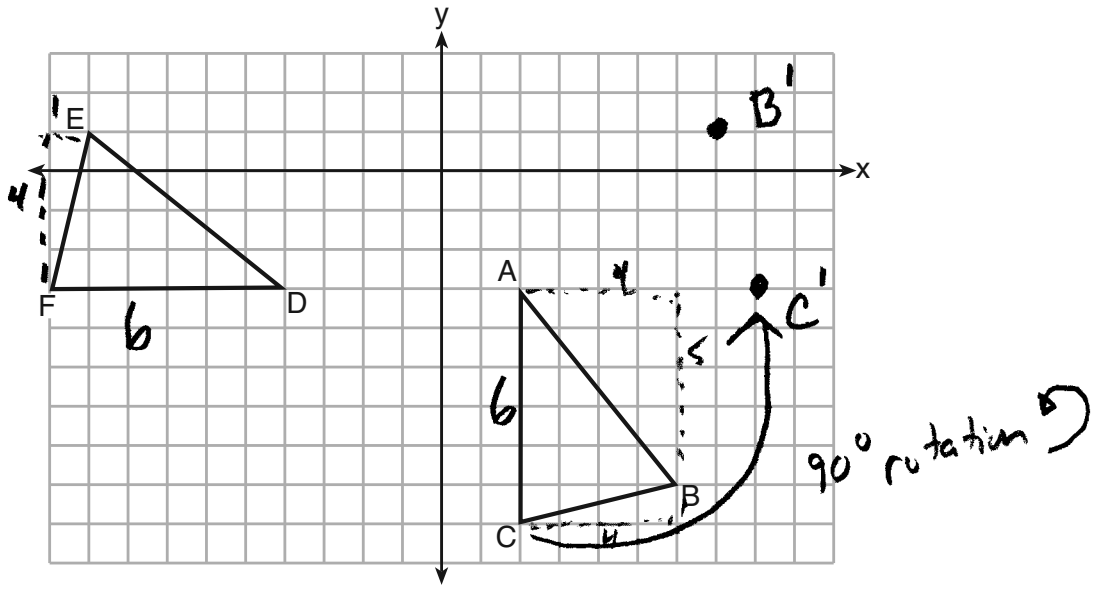
Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

Yes, when $\triangle A'B'C'$ is reflected over the line $x = -1$, it will map to $\triangle DEF$. Since a reflection is a rigid motion that preserves distance, $\triangle DEF \cong \triangle A'B'C'$

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

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

Rotate B counterclockwise 90° about A(2,-3)

$B(6,-8) \xrightarrow{\text{Subtract } (2,-3)} (4,-5) \xrightarrow{\text{Rotate}} (5,4) \xrightarrow{\text{Add } (2,-3)} B'(7,1)$

B'(7,1), was found by applying the rotation algorithm from a non-origin point.

Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer. YES

AC = 6 DF = 6 Counted

$BC = \sqrt{4^2+1^2} = \sqrt{17}$, $EF = \sqrt{4^2+1^2} = \sqrt{17}$

$AB = \sqrt{5^2+4^2} = \sqrt{41}$, $DE = \sqrt{5^2+4^2} = \sqrt{41}$

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

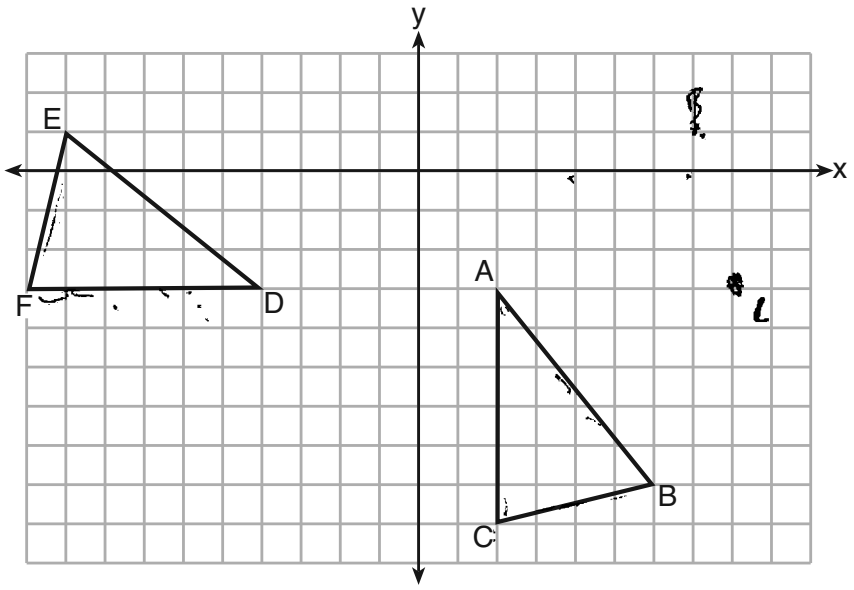
Since a rotation preserves distance, $\triangle ABC \cong \triangle A'B'C'$

So by substitution $\triangle DEF \cong \triangle A'B'C'$

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

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

It rotated 90° counterclockwise around A so Point B' would be (7,1)

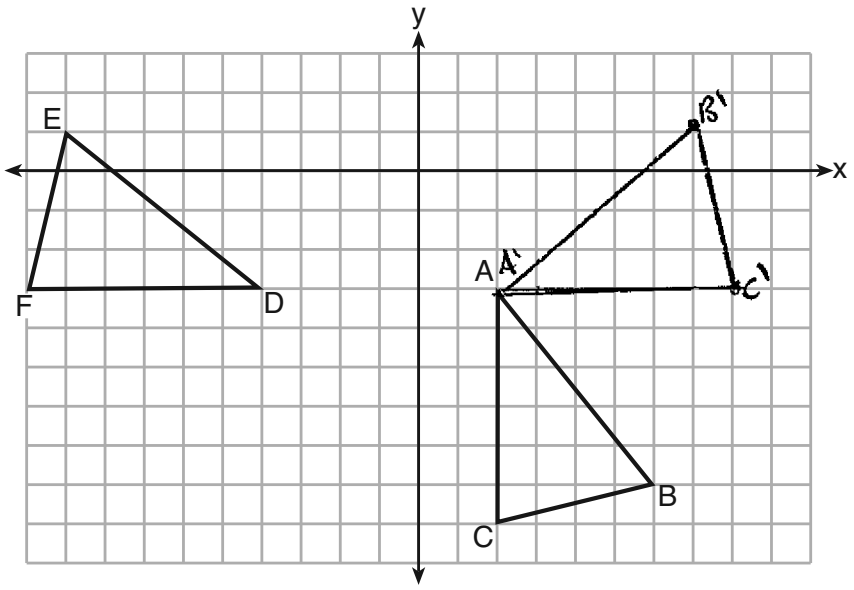
Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

△DEF and △ABC are congruent by SSS so △DEF is congruent to △A'B'C' by SSS.

Score 3: The student wrote an incomplete explanation for why $\triangle DEF$ is congruent to $\triangle A'B'C'$.

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

B`(7,1) C rotated 90°, so I rotated B 90°

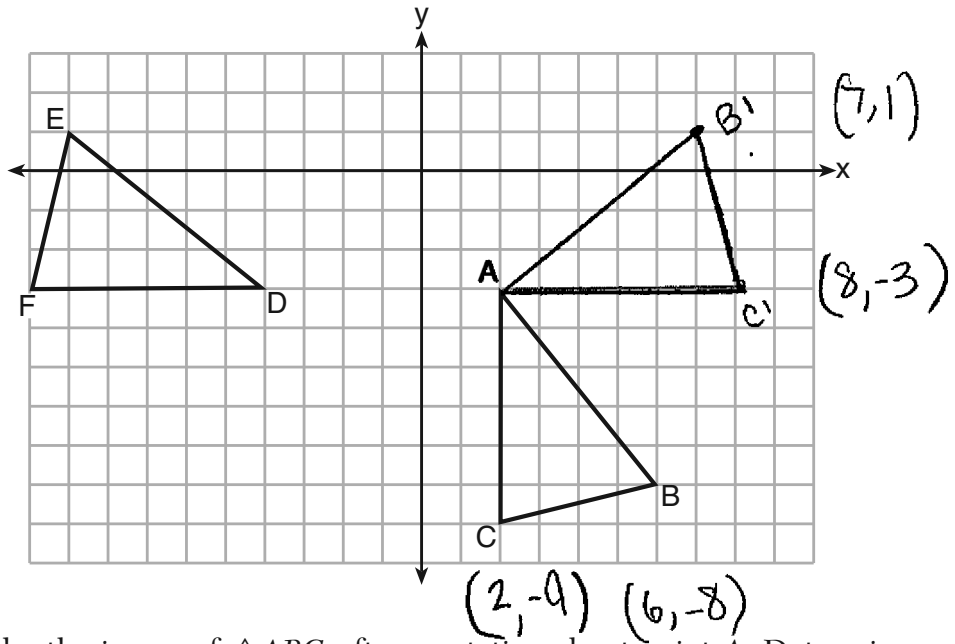
Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

Yes, if you reflect $\triangle A`B`C`$ over $x=-1$, it matches up perfectly, so $\triangle DEF$ is $\cong$ to $\triangle A`B`C`$

Score 3: The student wrote an incomplete explanation for why $\triangle DEF$ is congruent to $\triangle A'B'C'$.

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

(7,1) B' had to be the same distance away from C', as B and C were from eachother.

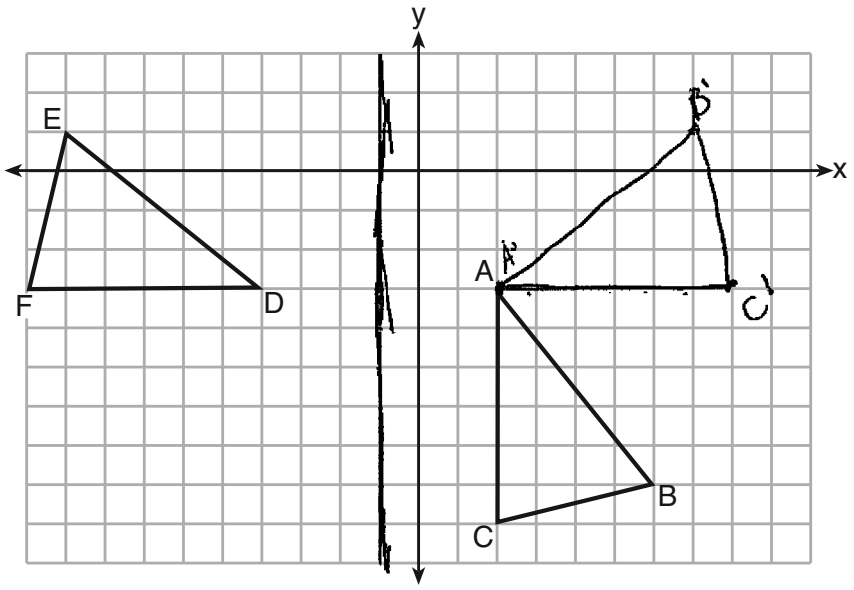
Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

Yes, each point is the same distance apart from one-another.

Score 2: The student wrote two incomplete explanations.

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

Counted the slopes and plotted points based on C's location

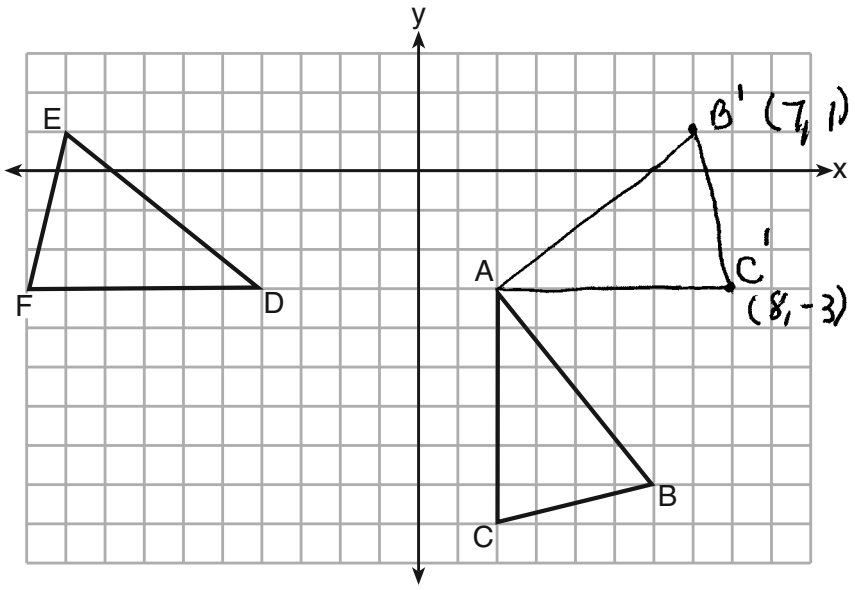
Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

Yes all the slopes are the same they just reflected over x = -1

Score 1: The student wrote yes, but the explanation was incorrect. No further correct work was shown.

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

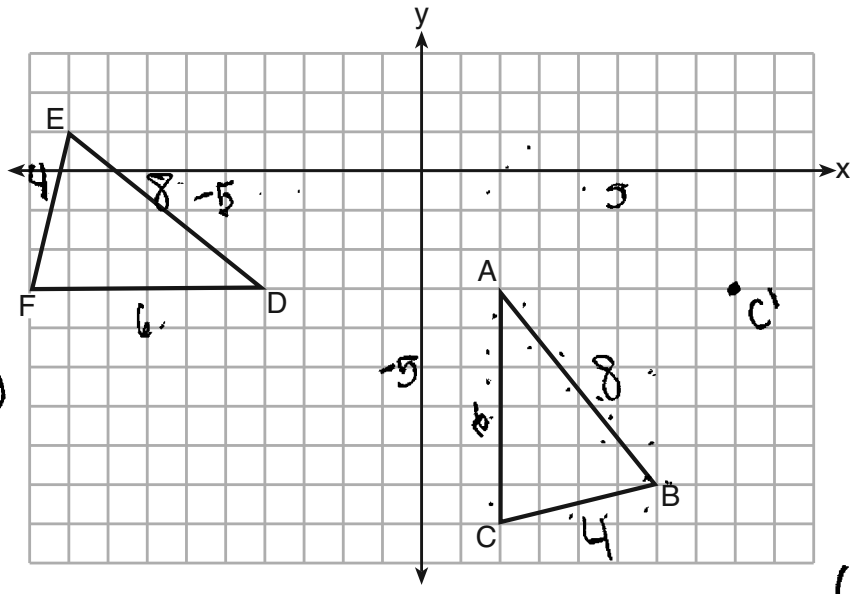
Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

Yes

Score 1: The student showed work to find (7,1), and wrote yes, but did not write any explanations.

Question 33

33 The grid below shows $\triangle ABC$ and $\triangle DEF$.



A = (2, -3)
B = (6, -8)
C = (2, -9)
D = (-4, -3)
E = (9, -1)
F = (10, -3)

(2, -9) (6, -8)

Let $\triangle A'B'C'$ be the image of $\triangle ABC$ after a rotation about point A. Determine and state the location of B' if the location of point C' is (8,–3). Explain your answer.

+6, -6

B' = (12, -14) because to get C to C' you had to +6 to the x and -6 from they.

Is $\triangle DEF$ congruent to $\triangle A'B'C'$? Explain your answer.

$\overline{AB} = \sqrt{(6-2)^2+(-8+3)^2} = \sqrt{16+25} = \sqrt{41}$

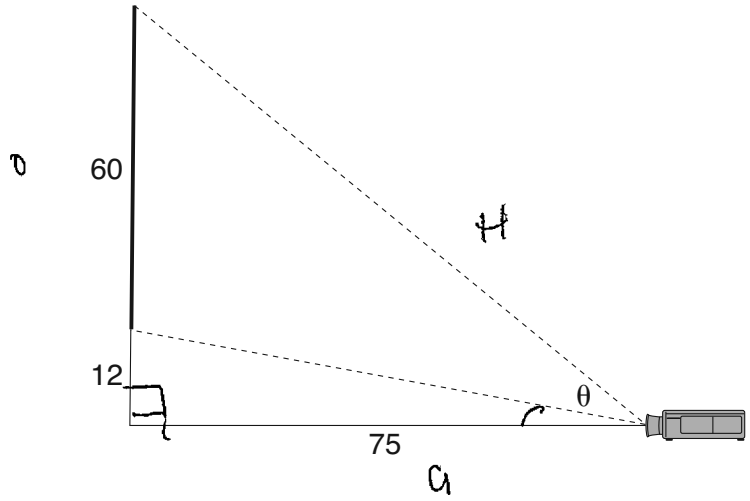
$\overline{ED} = \sqrt{(9+4)^2+(-1+3)^2} = \sqrt{169+4} = \sqrt{173}$

No, because not all of ~~the~~ sides are equal in measure.

Score 0: The student had a completely incorrect response.

Question 34

34 As modeled below, a movie is projected onto a large outdoor screen. The bottom of the 60-foot-tall screen is 12 feet off the ground. The projector sits on the ground at a horizontal distance of 75 feet from the screen.



Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

SOHCAHTOA

$\tan x = \frac{12}{75}$

$(\tan^{-1})\tan x = \frac{12}{75}(\tan^{-1})$

$x = 9.0903$

$\tan y = \frac{72}{75}$

$(\tan^{-1})\tan y = \frac{72}{75}(\tan^{-1})$

$y = 43.8308$

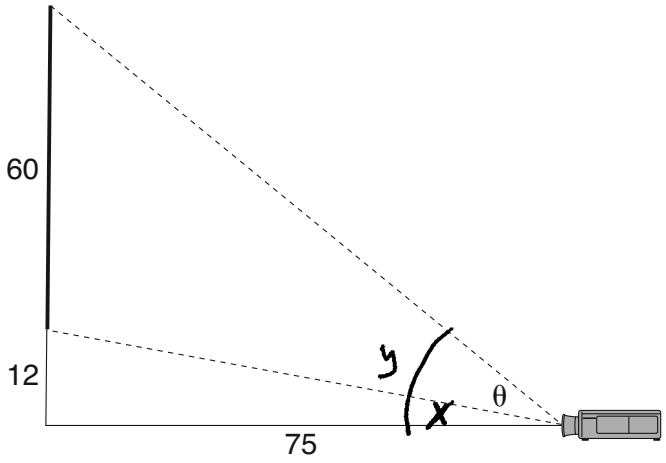
$43.8308 - 9.0903 = 34.7405$

The measure of θ is 34.7°

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

Question 34

34 As modeled below, a movie is projected onto a large outdoor screen. The bottom of the 60-foot-tall screen is 12 feet off the ground. The projector sits on the ground at a horizontal distance of 75 feet from the screen.



Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

$\theta = y - x$

$T = \frac{O}{A}$

2ND TAN $\frac{72}{75}$ 2ND TAN $\frac{12}{75}$

$\theta = 43.83 - 9.09$

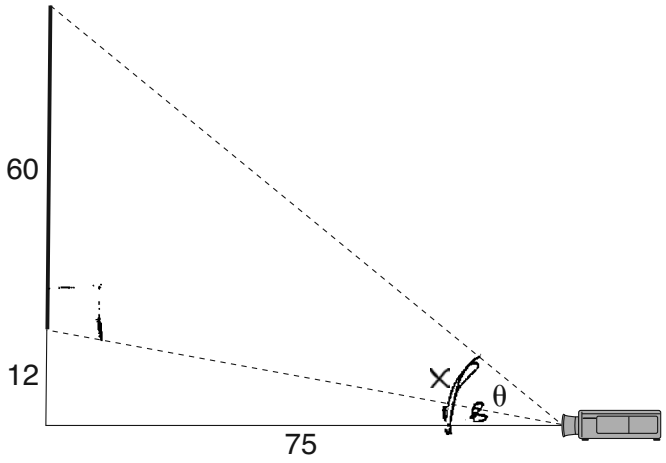
34.74

34.7

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

Question 34

34 As modeled below, a movie is projected onto a large outdoor screen. The bottom of the 60-foot-tall screen is 12 feet off the ground. The projector sits on the ground at a horizontal distance of 75 feet from the screen.



Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

$\tan B = \frac{12}{75}$

$\tan^{-1}\left(\frac{12}{17}\right) = 35.21759297$

$60 + 12 = 72$

$\tan x = \frac{72}{75}$

$\tan^{-1}\left(\frac{72}{75}\right) = 43.83086067$

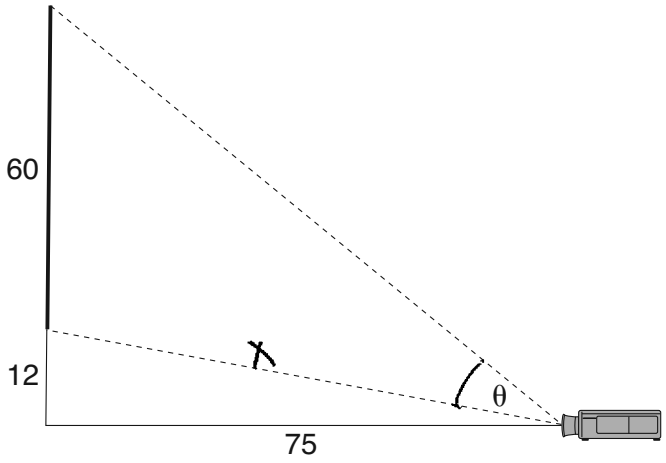
$43.83086067 - 35.21759297 = 8.6132677$

The measure of θ is 8.6

Score 3: The student made a transcription error.

Question 34

34 As modeled below, a movie is projected onto a large outdoor screen. The bottom of the 60-foot-tall screen is 12 feet off the ground. The projector sits on the ground at a horizontal distance of 75 feet from the screen.



Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

$75^2 + 12^2 = x^2$

$5625 + 144 = x^2$

$\sqrt{5769} = \sqrt{x^2}$

$75.953\ldots \approx x$

$\tan(\theta) = \frac{60}{\sqrt{5769}}$

$\tan^{-1}(\tan(\theta)) = \left(\frac{60}{\sqrt{5769}}\right)\tan^{-1}$

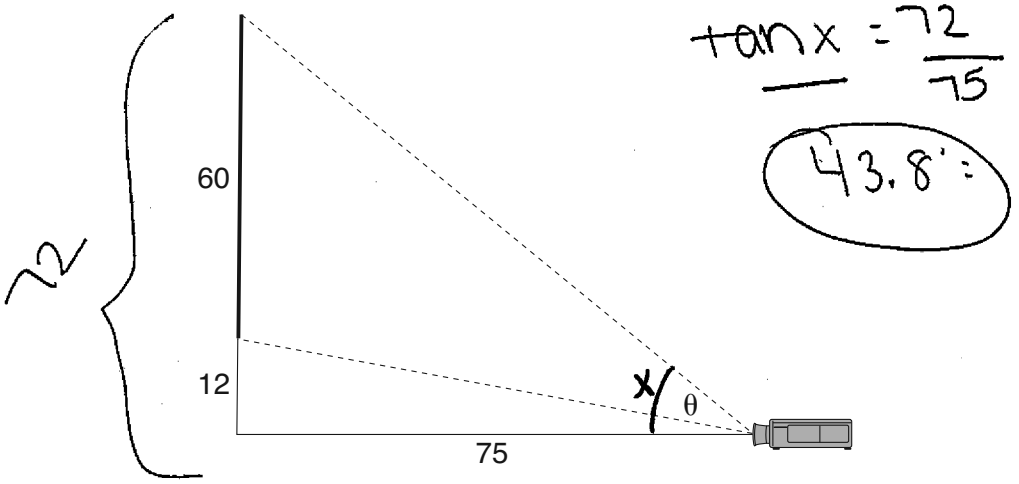
$\theta = 38.307\ldots$

$\theta \approx 38.3$

Score 2: The student made a conceptual error in using an obtuse triangle for right triangle trigonometry.

Question 34

34 As modeled below, a movie is projected onto a large outdoor screen. The bottom of the 60-foot-tall screen is 12 feet off the ground. The projector sits on the ground at a horizontal distance of 75 feet from the screen.



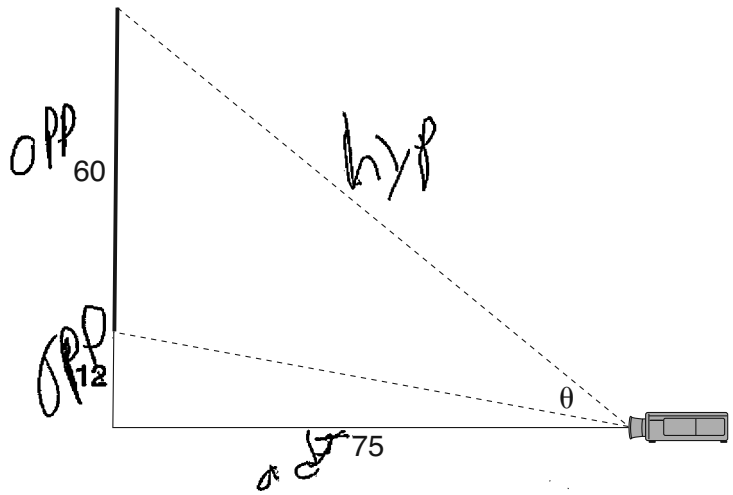
Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

43.8°

Score 1: The student determined only one angle of elevation.

Question 34

34 As modeled below, a movie is projected onto a large outdoor screen. The bottom of the 60-foot-tall screen is 12 feet off the ground. The projector sits on the ground at a horizontal distance of 75 feet from the screen.



Determine and state, to the *nearest tenth of a degree*, the measure of θ, the projection angle.

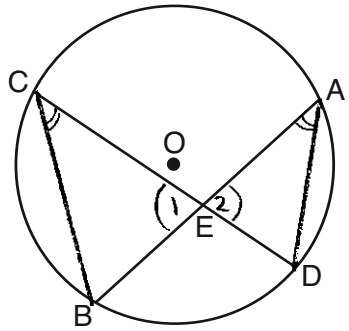
$\tan^{-1}(72/75)$

43.9

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

Question 35

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E



Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

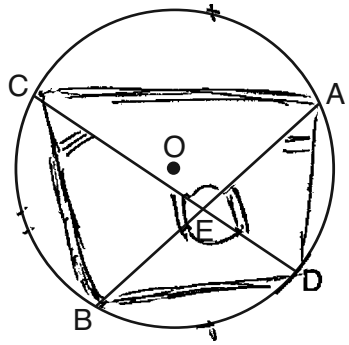
Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

Statement	Reason
① Circle O, chords $\overline{AB}$ + $\overline{CD}$	① Given
② $\overline{CB}$ and $\overline{AD}$ are drawn	② auxiliary lines can be drawn
③ $\angle 1 \cong \angle 2$	③ Vertical $\angle$'s are $\cong$
④ $\angle C \cong \angle A$	④ Inscribed $\angle$'s that intercept the same arc are $\cong$
⑤ $\triangle BCE \sim \triangle DAE$	⑤ AA
⑥ $\frac{AE}{CE} = \frac{ED}{EB}$	⑥ Corresponding sides of similar $\triangle$'s are proportional
⑦ $AE \cdot EB = CE \cdot ED$	⑦ In a proportion, the product of the means equals the product of the extremes

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

Question 35

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E



Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

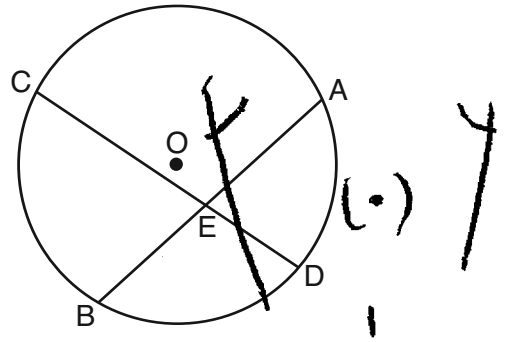
Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

Statements	Reasons
1. Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E	1. Given
2. $\angle CEA \cong \angle BED$, $\angle AED \cong \angle CEB$	2. vertical $\angle$'s $\cong$
3. $\angle BCE \cong \angle DAB$	3. Inscribed $\angle$'s that intercept the same arc are $\cong$
4. $\triangle ECB \sim \triangle EAD$	4. AA Sim Thm.
5 $\frac{AE}{CE} = \frac{ED}{EB}$	5. Corres. sides of $\sim \triangle$'s are in prop.
6. $AE \cdot EB = CE \cdot ED$	In a proporation, 6. The product of the means is equal to the product of the extremes

Score 5: The student did not include drawing chords $\overline{AC}$, $\overline{CB}$, $\overline{BD}$, and $\overline{AD}$ in the proof.

Question 35

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E



Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

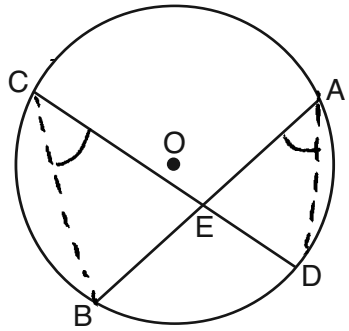
$\triangle CBE \sim \triangle AED$

S	R
① Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E	① given
② $\angle CEB$ and $\angle AED$ are vertical angles	② intersecting lines form vertical angles
③ $\angle CEB \cong \angle AED$	③ vertical angles are congruent
④ $\angle C \cong \angle A$	④ inscribed angles of the same are are congruent
⑤ $\triangle CBE \sim \triangle ADE$	⑤ two angles in the triangles are congruent
⑥ $\frac{EB}{ED} = \frac{CE}{AE}$	⑥ In two similar triangles, corresponding sides are in proportion
⑦ $AE \cdot EB = CE \cdot ED$	⑦ In a proportion, product of means equals product of extremes

Score 4: The student omitted one statement and reason, and another reason was incomplete.

Question 35

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E



Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

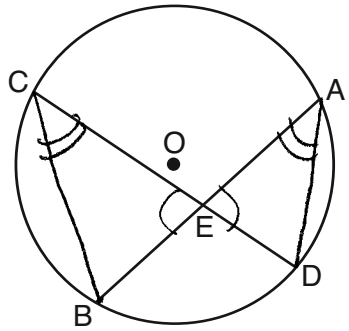
Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

1) $\overline{AB}$ and $\overline{CD}$ are chords in Circle O. Chords intersect at E	1) Given
2) Draw auxiliary lines $\overline{BC}$ and $\overline{AD}$	2) Between 2 pts there exists a line segment.
3) $\angle C \cong \angle A$ $\angle B \cong \angle D$	3) Angles inscribed in the same arc are $\cong$
4) $\triangle BCE \cong \triangle DAE$	4) AA ~ Thm
5) $AE \cdot EB = CE \cdot ED$	5) CPCTC

Score 3: The student had three missing or incomplete statements.

Question 35

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E



Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

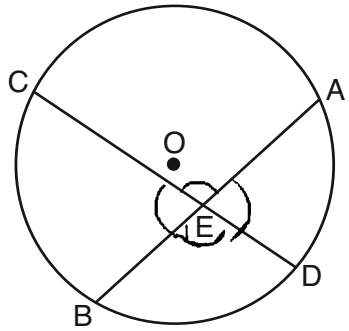
Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

Given circle O and chords $\overline{AB}$ and $\overline{CD}$ intersect at E. Since vertical angles are congruent, $\angle CEB \cong \angle AED$. $\angle C$ and $\angle A$ are inscribed in $\overset{\frown}{BD}$, so $\angle C \cong \angle A$. So $\triangle CEB \sim \triangle AED$. By the means extremes property, $AE \cdot EB = CE \cdot ED$.

Score 2: The student gave two correct relevant statements and reasons.

Question 35

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E



Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

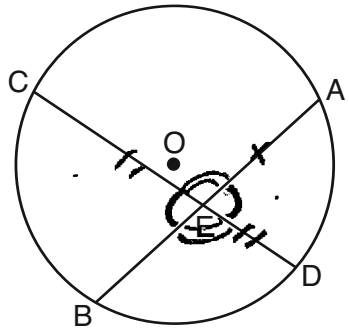
Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

Statements	Reason
chords $\overline{AB}$ and $\overline{CD}$ intersect at E	Given
$\angle CEA \cong \angle BED$	Vertical angles are congruent
$\angle CEB \cong \angle AED$	Vertical angles are congruent
$AE \cdot EB = CE \cdot ED$	If two cords intersect in a circle the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

Score 1: The student correctly stated the vertical angles were congruent.

Question 35

35 Given: Circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E



Theorem: If two chords intersect in a circle, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.

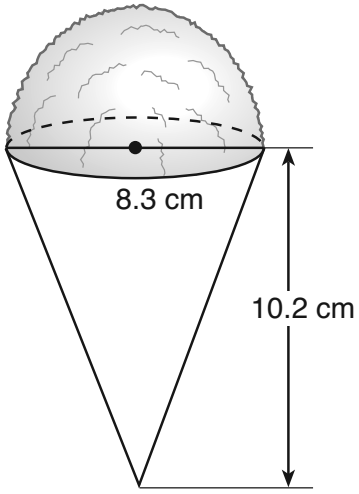
Prove this theorem by proving $AE \cdot EB = CE \cdot ED$.

Statement	Reason
1. $\overline{AB}$ and $\overline{CD}$ intersect at E	1. Given
2. $\angle CEB \cong \angle AED$	3. opposite exterior angles are congruent
3. $\angle CEA \cong \angle BED$	3. " "
4. $\overline{CD}$ bisect $\overline{AB}$	4. $\overline{AB}$ & $\overline{CD}$ intersect at E

Score 0: The student had a completely incorrect response.

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is $3.83. Determine and state the cost of the ice needed to make 50 snow cones.

$V_{Hemi} = \frac{\frac{4}{3}\pi(4.15)^3}{2}$

$V_{Hemi} = 149.69348666$

$V_{Cone} = \frac{1}{3}\pi(4.15)^2(10.2)$

$V_{Cone} = 183.96066702$

Total Volume = 333.65415568

$0.697 = \frac{m}{333.65415568}$

$m = 232.5569473$

$\frac{232.5569473}{1000} = 0.2325569473$

$0.2325569473\ (50)$

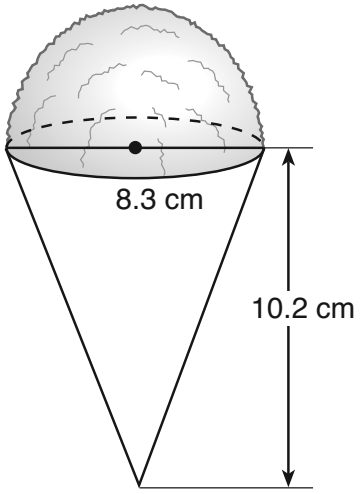
$11.62784737\ (3.83)$

$\$44.53$

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

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is $3.83. Determine and state the cost of the ice needed to make 50 snow cones.

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

$= \frac{1}{3}\pi (4.15)^2 (10.2)$

$= 58.5565\pi$

$V_{sphere} = \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi (4.15)^3$

$= 95.29783333\pi$

$V = 153.8543333\pi = 483.3476433 \text{ cm}^3$

$m = (483.3476433)(.697) = 336.8933074$ g for 1 snow cone

$m = 16.84466537$

$\times 3.83$

Cost = $64.52

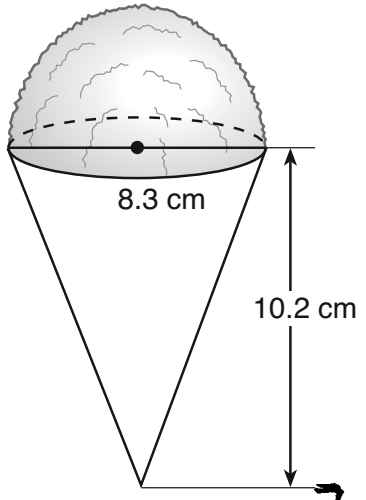
$\times 50$

16844.66537 g

Score 5: The student found the volume of a sphere and not a hemisphere.

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



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

$V = \frac{1}{3}\pi 4.15^2 \cdot 10.2$

$V = \frac{1}{3}\pi 17.2225 \cdot 10.2$

$V = 183.96$

or

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

$V = \frac{\frac{4}{3}\pi 71.473375}{2}$

$V = 149.69$

total Volume = $333\ cm^3$

The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is \$3.83. Determine and state the cost of the ice needed to make 50 snow cones.

232.5889 grams per cone

x 50

11629.445 grams

$\frac{11629.445 \text{ grams}}{1000} = 11.63$

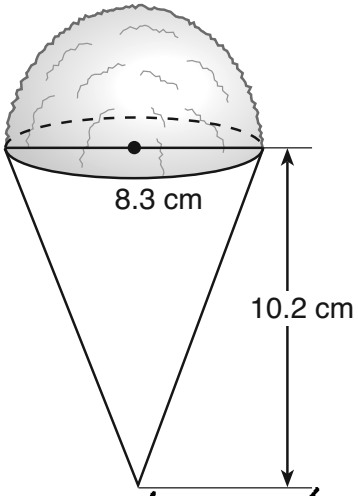
Kilogram = 1000 grams

\$44.54

Score 5: The student used an incorrectly rounded total volume of one snow cone when computing the mass.

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



8.3 = d 8.3/2 = 4.15 = r

The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is $3.83. Determine and state the cost of the ice needed to make 50 snow cones.

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

$V_{CONE} = \frac{1}{3}\pi * 4.15^2 * 10.2$

$V_{CONE} = \frac{1}{3} * \pi * 17.2225 * 10.2$

$V_{CONE} = 183.961 \text{ cm}^3$

$3.83 \Rightarrow 1{,}000 \text{ g}$

$0.00383 \rightarrow 1 \text{ g}$

$183.961 * 0.697 = 128.221 \text{ g/cm}^3 \rightarrow 1$ snow cone

$128.221 * 50 = 6411.05$

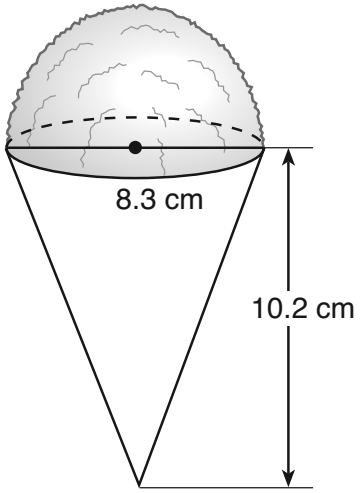
$6411.05 * 0.00383 = 24.55$

$24.55

Score 4: The student determined the cost of the cone without the hemisphere.

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is $3.83. Determine and state the cost of the ice needed to make 50 snow cones.

Vol = $\frac{1}{2} \cdot \frac{4}{3} \cdot \pi \cdot 4.15^3 = 149.693$

Vol = $\frac{1}{3} \cdot \pi \cdot 4.15^2 \cdot 10.2 = 183.961$

Total volume = 333.654

50 snow cones: vol = 16682.7 cm^3

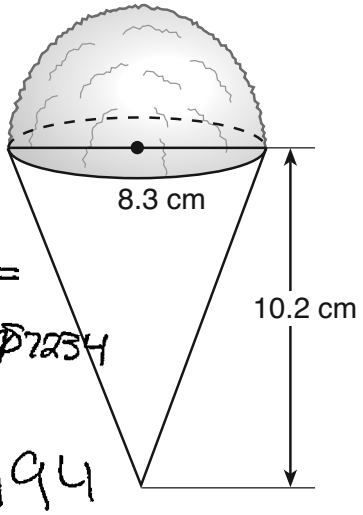
kg: $\frac{16682.7}{697} = 23.935$ kg

cost: $23.935 \times 3.83 = 91.67105$

Score 3: The student found the volume of fifty snow cones, but no further correct work was shown.

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



$r = 4.15$

hemisphere:

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

$\frac{2}{3}\pi \cdot 4.15^3$

$\frac{3}{3}\pi \cdot 71.473375$

149.69348606

$\frac{1}{3}\pi \cdot 4.15 \cdot 10.2 =$

414.32[illegible]7234

Cone:

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

194

The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is \$3.83. Determine and state the cost of the ice needed to make 50 snow cones.

$0.697 \cdot 194 = 135.218$

$135.218 \times 50 = 6760.9$

M DIV

$3.83 \times 50 = 191.5$

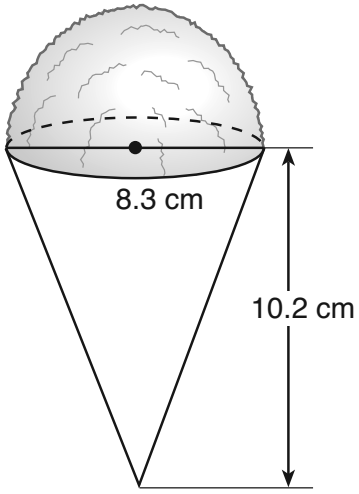
$6760.9 \div 191.5 = 35.30$

\$35.30

Score 2: The student made an error in determining the volume of the cone, but found an appropriate mass of fifty snow cones. No further correct work was shown.

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is \$3.83. Determine and state the cost of the ice needed to make 50 snow cones.

$D = \frac{m}{V}$ $0.697\ g/cm^3$ $V = \frac{1}{3}\pi r^2 h$

$50(3.83)$ $V = \frac{1}{3}\pi(4.15)^2 10.2$

191.5 $V = 183.9606702\ cm^3$

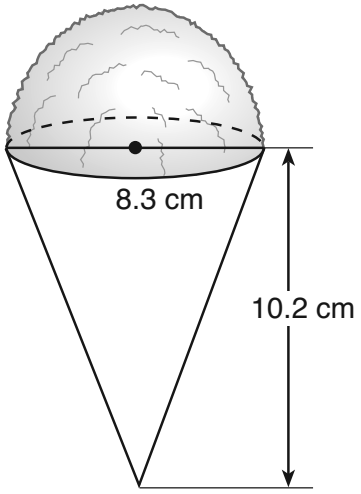
$50\ (183.9606702)$

\$9198.03 for 50 snow cones

Score 1: The student determined the volume of the cone.

Question 36

36 A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is $3.83. Determine and state the cost of the ice needed to make 50 snow cones.

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

$V = \frac{1}{3}\pi \cdot 4.15^2 \cdot 10.2$

$V = \frac{1}{3}\pi \cdot 17.22 \cdot 10.2$

$V = \frac{1}{3}\pi \cdot 175.644$

$V = 58.548$

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