The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY (COMMON CORE)

Thursday, January 28, 2016 — 9:15 a.m. to 12:15 p.m.

MODEL RESPONSE SET

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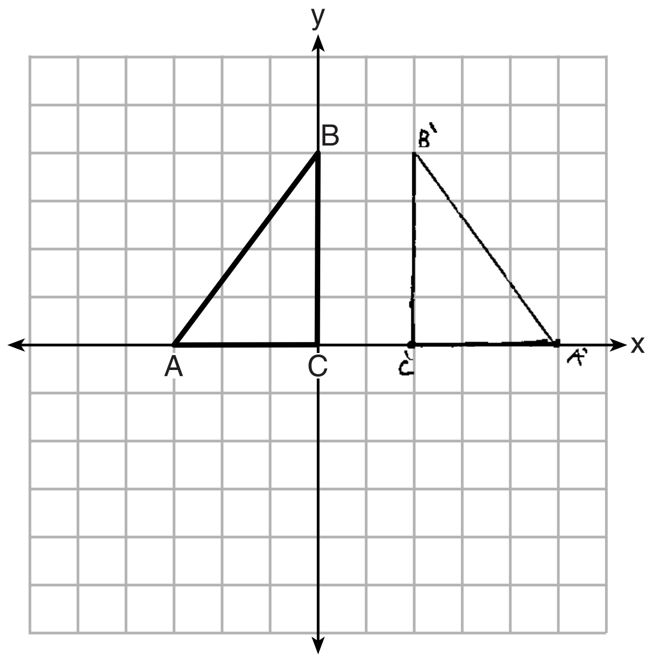
Question 25

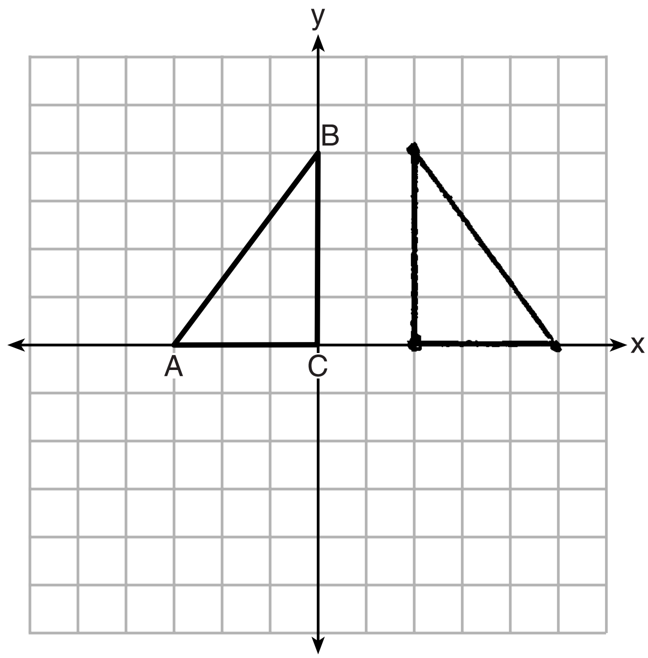
25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.



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

Question 25

25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.



A′ (5, 0)

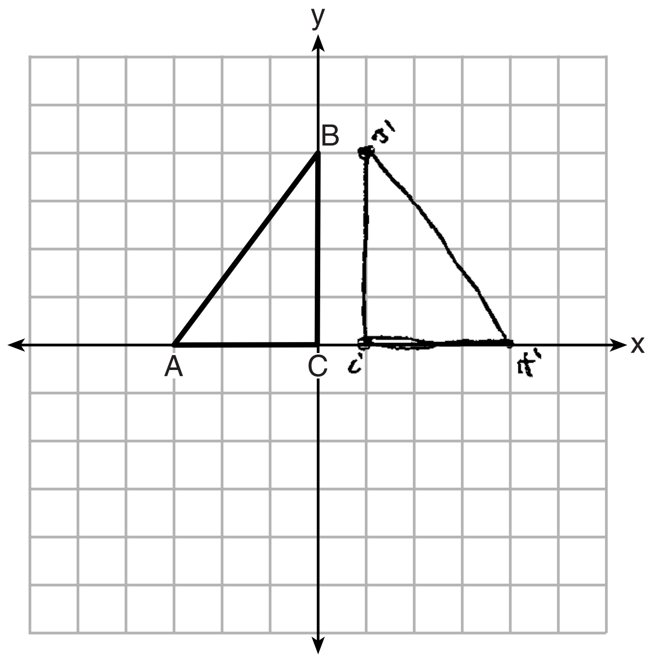
B′ (2, 4)

C′ (2, 0)

Score 2: The student graphed the image of $\triangle ABC$ correctly, then stated and labeled its coordinates.

Question 25

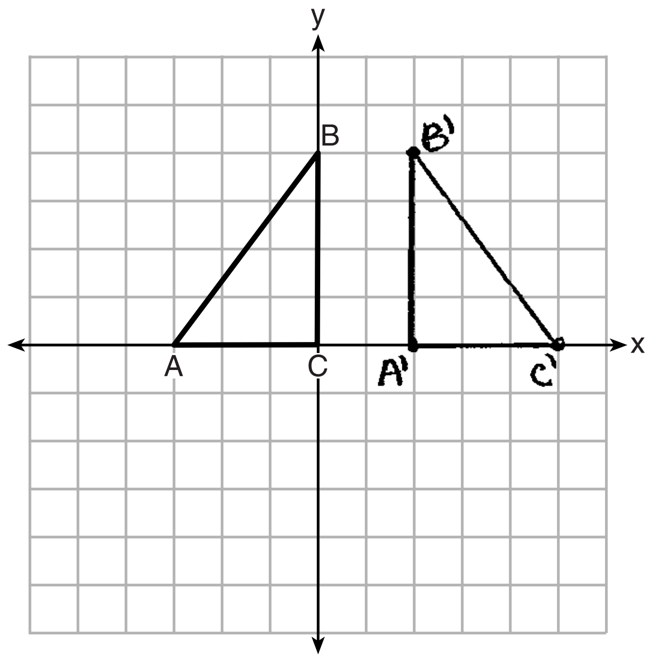
25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.



Score 1: The student did a reflection over the line $x = \frac{1}{2}$.

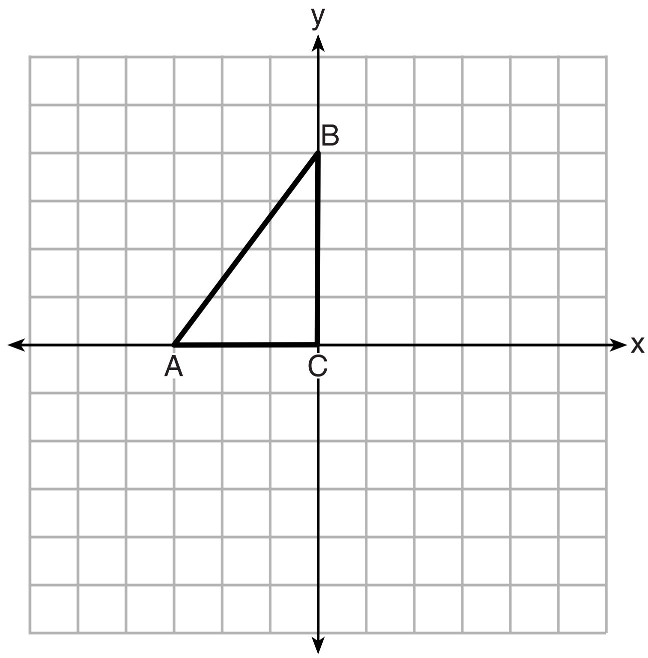
Question 25

25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.



Score 1: The student labeled $\triangle A'B'C'$ incorrectly.

25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.

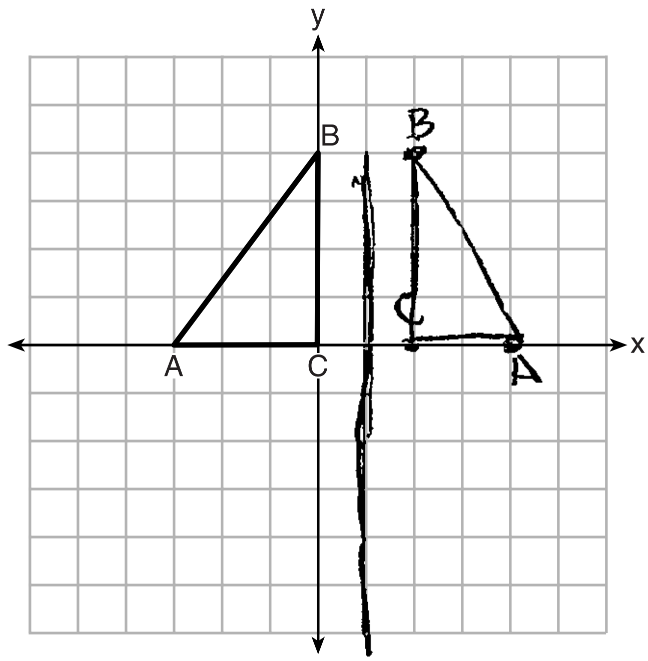


A'(5,0)
B'(2,4)
C'(2,0)

Score 1: The student stated and labeled the correct coordinates for A', B', and C'.

Question 25

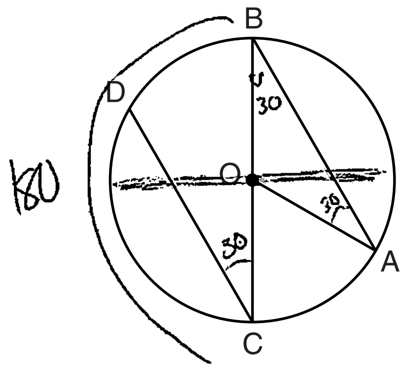
25 Triangle ABC is graphed on the set of axes below. Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $x = 1$.



Score 0: The student graphed the image of A incorrectly, and labeled the triangle incorrectly.

Question 26

26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.



If m$\angle BCD$ = 30°, determine and state m$\angle AOB$.

$\boxed{m\angle AOB = 120}$

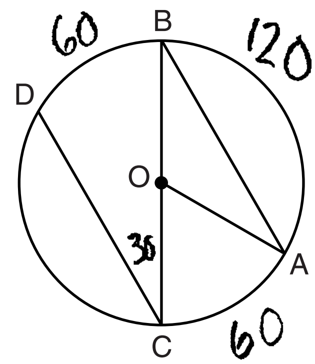
$$\begin{array}{r} 30 \\ +\ 30 \\ \hline 60 \end{array}$$

$$\begin{array}{r} 180 \\ -\ 60 \\ \hline 120 \end{array}$$

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

Question 26

26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.



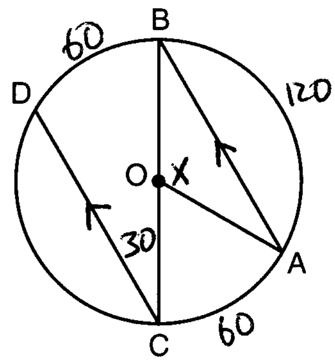
If m$\angle BCD = 30°$, determine and state m$\angle AOB$.

m<AOB=120

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

Question 26

26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.



If m$\angle BCD$ = 30°, determine and state m$\angle AOB$. $360^\circ = 2\pi$ radians

$$\frac{120}{360} = \frac{x}{2\pi}$$

$$\frac{240\pi}{360} = \frac{360x}{360}$$

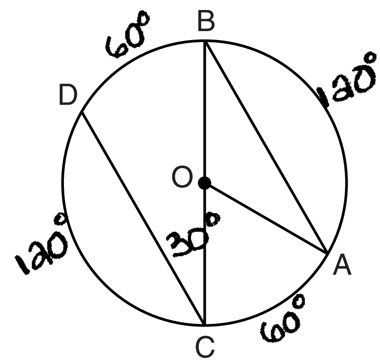
$$\frac{240\pi}{360} = x$$

$$x = \frac{2\pi}{3}$$

$$\angle AOB = \frac{2\pi}{3} \text{ radians}$$

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

26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.

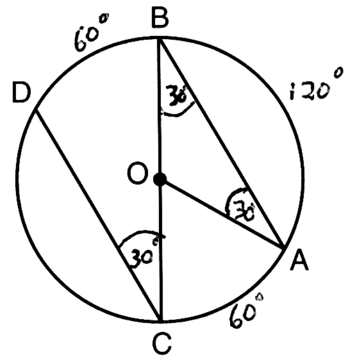


If m$\angle BCD = 30°$, determine and state m$\angle AOB$.

Score 1: The student labeled the arcs correctly, but did not find the angle.

Question 26

26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.

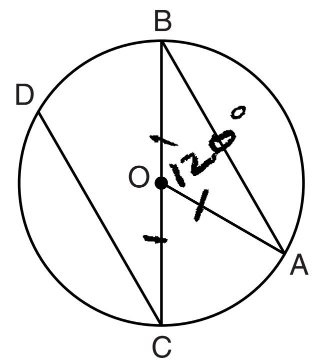


If m$\angle BCD = 30°$, determine and state m$\angle AOB$.

Score 1: The student labeled the angles and arcs correctly, but did not find m$\angle AOB$.

Question 26

26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.

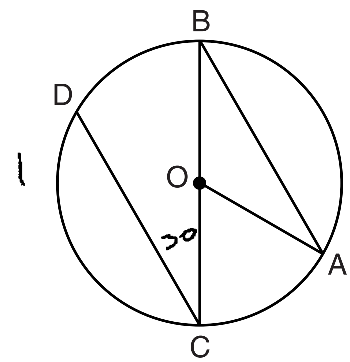


If m$\angle BCD = 30°$, determine and state m$\angle AOB$.

Score 1: The student marked off equal radii, but showed no work to find the angle.

Question 26

26 In the diagram below of circle O with diameter $\overline{BC}$ and radius $\overline{OA}$, chord $\overline{DC}$ is parallel to chord $\overline{BA}$.



If m$\angle BCD = 30°$, determine and state m$\angle AOB$.

Supplementary

$\angle BCD = 30$

$180 - 30 = 150$

$\angle AOB = 150°$

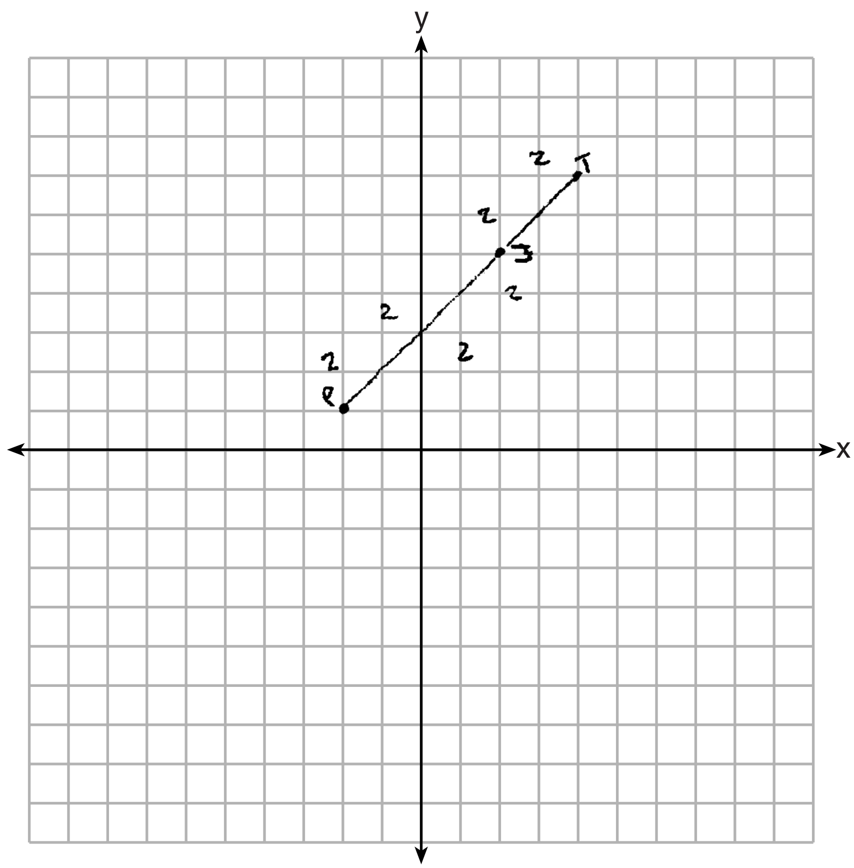
Score 0: The student had a completely incorrect response.

Question 27

27 Directed line segment *PT* has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point *J* that divides the segment in the ratio 2 to 1.

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

J(2,5)



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

Question 27

27 Directed line segment *PT* has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point *J* that divides the segment in the ratio 2 to 1.

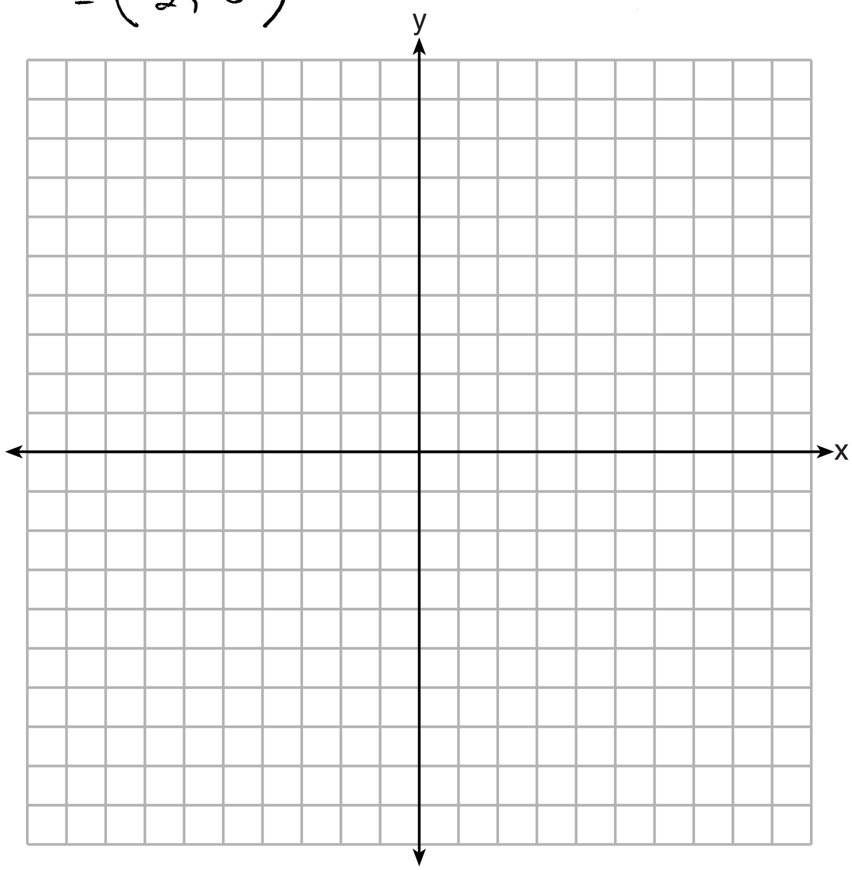
[The use of the set of axes below is optional.]

$$J = \left(\frac{2}{3}(4-(-2))-2,\ \frac{2}{3}(7-1)+1\right)$$

$$= \left(\frac{2}{3}(6)-2,\ \frac{2}{3}(6)+1\right)$$

$$= (4-2,\ 4+1)$$

$$= (2,\ 5)$$



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

Question 27

27 Directed line segment *PT* has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point *J* that divides the segment in the ratio 2 to 1.

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

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

$D = \sqrt{(-2-4)^2 + (1-7)^2}$

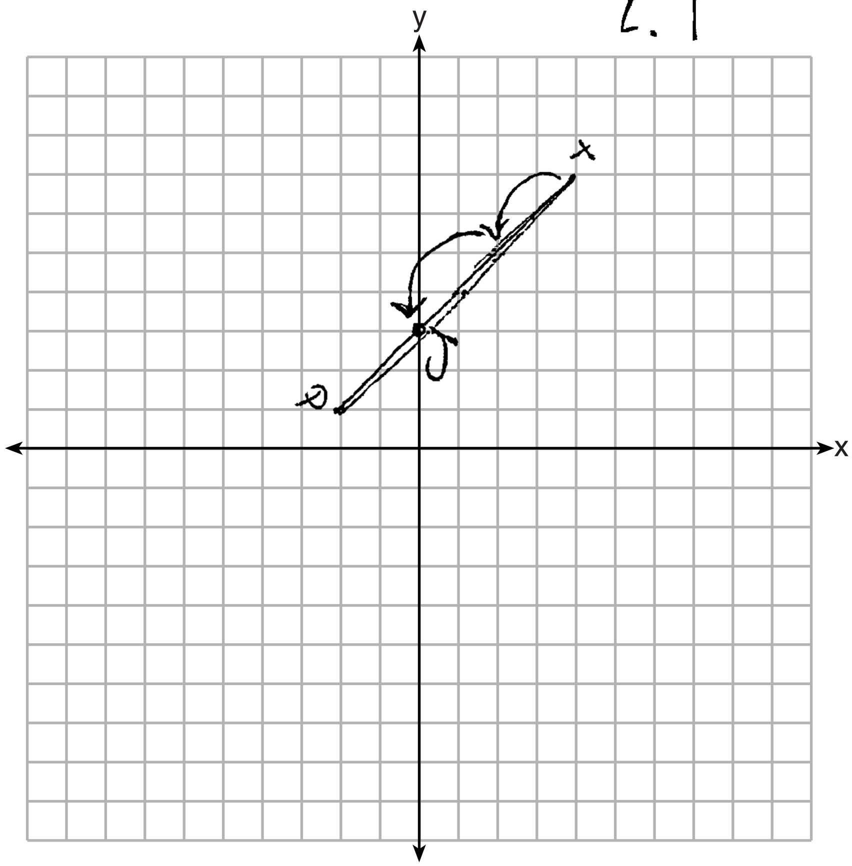
$D = \sqrt{(-6)^2 + (-6)^2}$

$D = \sqrt{36 + 36}$

$D = \sqrt{72}$

(0,3)

2:1

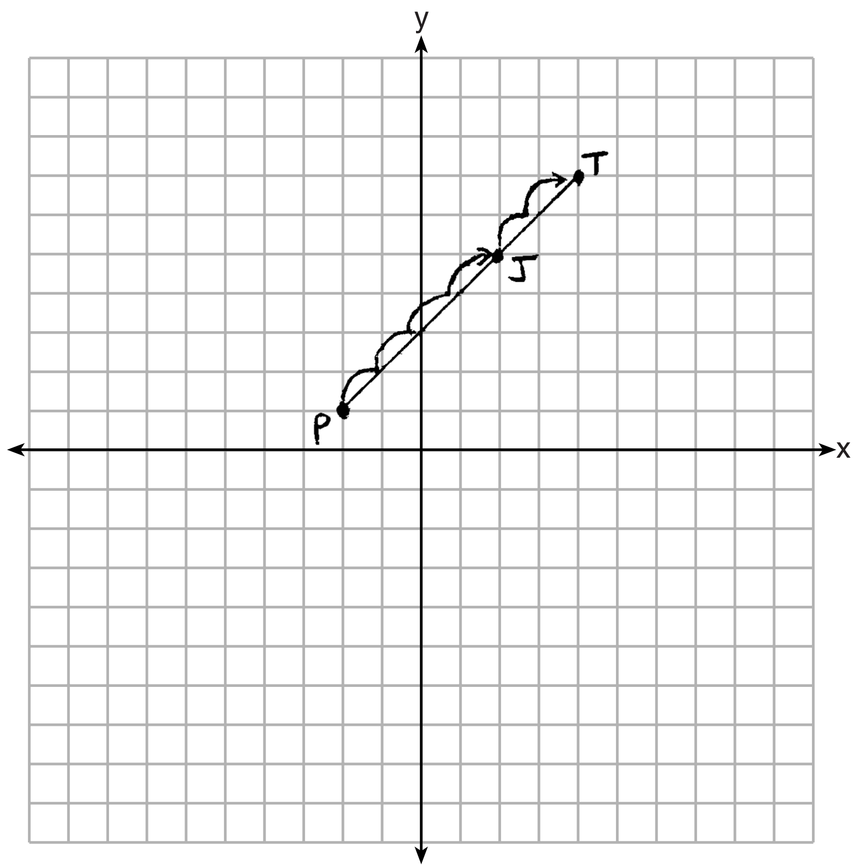


Score 1: The student graphed $PJ{:}JT = 1{:}2$ instead of $PJ{:}JT = 2{:}1$. Unnecessary correct work was shown.

Question 27

27 Directed line segment PT has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point J that divides the segment in the ratio 2 to 1.

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



$\frac{4}{2} = \frac{2}{1}$

Score 1: The student located point J graphically, but did not state its coordinates.

Question 27

27 Directed line segment PT has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point J that divides the segment in the ratio 2 to 1.

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

$\frac{PJ}{PT} = \frac{2}{3}$

$-2-4 \qquad 1-7$

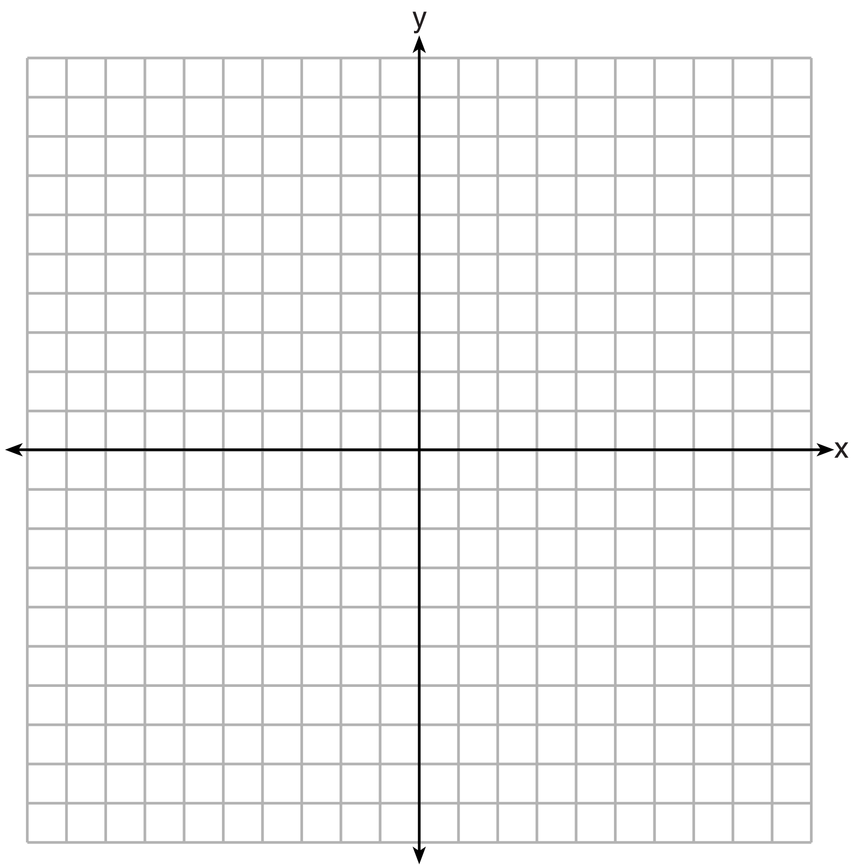
$\frac{2}{3} \cdot -6 \qquad \frac{2}{3} \cdot -6$

$-4 \qquad -4$

$P(-2,1) \qquad -2 - -4 \qquad 1 - -4$

$-2+4 \qquad 1+4$

$J \qquad 2 \qquad 5$

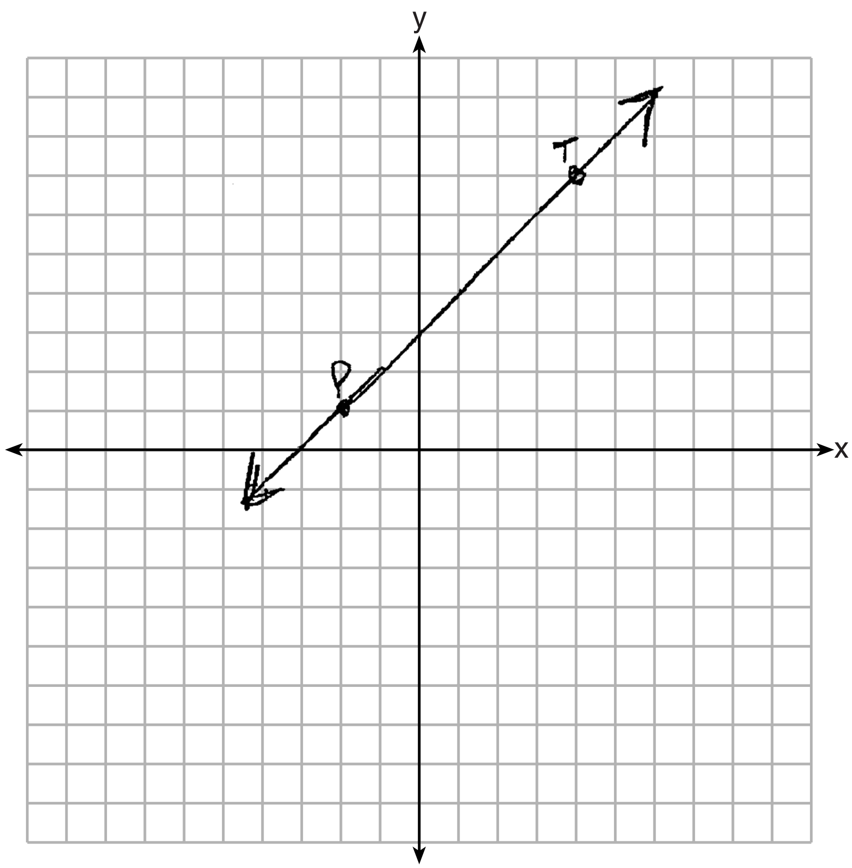


Score 1: The student did not write the solution as coordinates.

Question 27

27 Directed line segment PT has endpoints whose coordinates are $P(-2,1)$ and $T(4,7)$. Determine the coordinates of point J that divides the segment in the ratio 2 to 1.

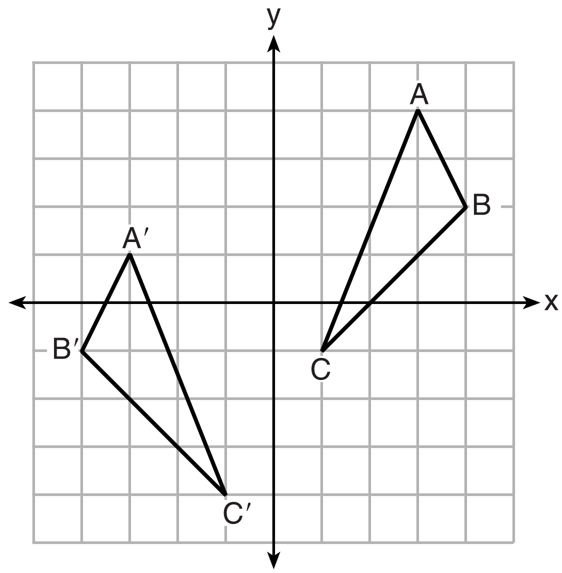
[The use of the set of axes below is optional.]



Score 0: The student only graphed $\overleftrightarrow{PT}$.

Question 28

28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.



Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

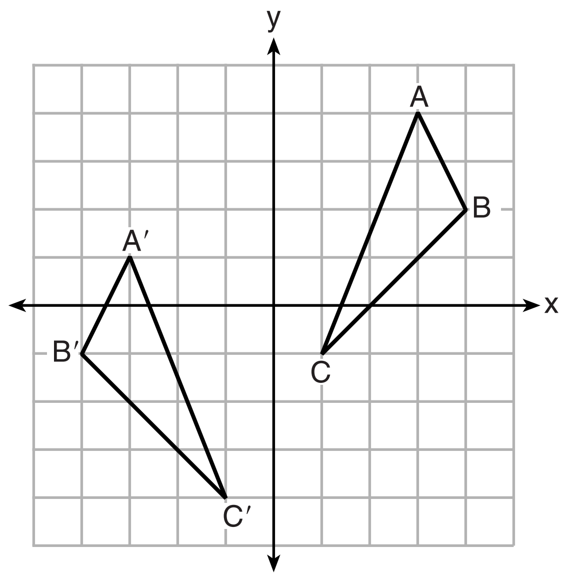
Yes.

$\triangle$ ABC is reflected over the y-axis and then translated down 3. These are rigid motions and in rigid motions distance stays the same.

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

Question 28

28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.



$\triangle ABC$
↓
Reflection over y axis
↓
Translate (0, −3)

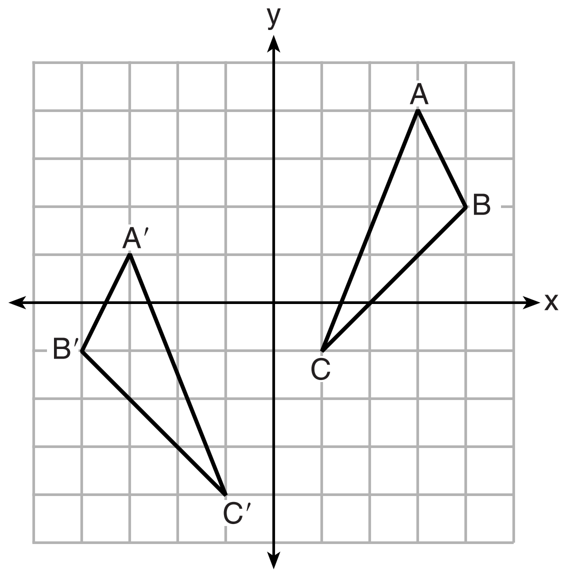
Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

$\triangle A'B'C'$ is congruent to $\triangle ABC$ because $\triangle ABC$ reflected across the y-axis then translates by (0, −3). This is considered to by an Isometry because the size stays the same.

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

Question 28

28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.



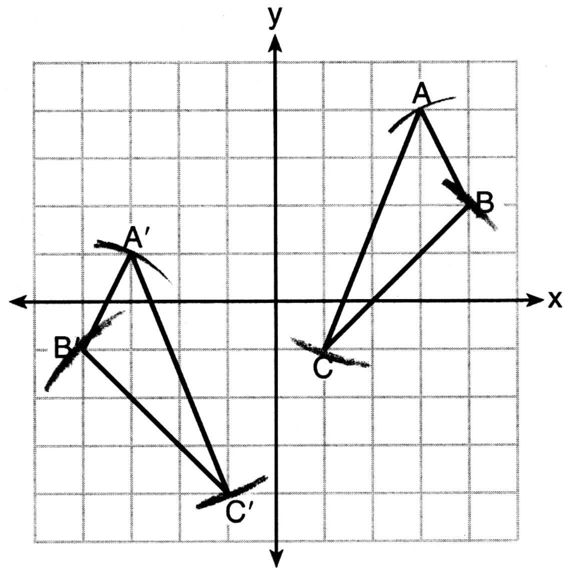
Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

yes because no dilation or change was done to the shape. it was reflected over the y-axis and then translated (0,-3)

Score 1: The student correctly described the transformation, but the explanation was not complete for congruence.

Question 28

28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.



Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

Yes

$AB = A'B'$

$BC = B'C'$

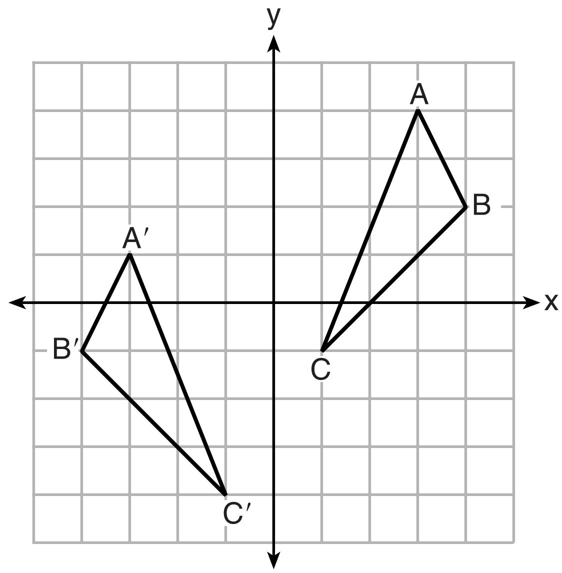
$AC = A'C'$

$\cong$ By SSS

Score 1: The student wrote an appropriate explanation about congruency, but not based on rigid motions.

Question 28

28 As graphed on the set of axes below, $\triangle A'B'C'$ is the image of $\triangle ABC$ after a sequence of transformations.



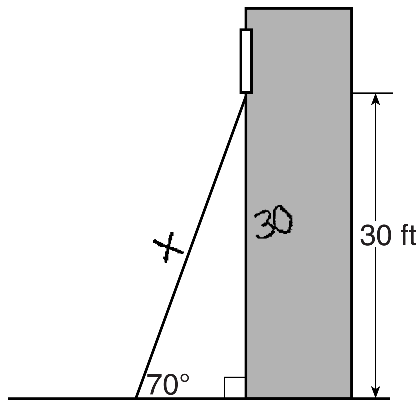
Is $\triangle A'B'C'$ congruent to $\triangle ABC$? Use the properties of rigid motion to explain your answer.

Yes, because triangles are congruent.

Score 0: The student had no correct explanation.

Question 29

29 A carpenter leans an extension ladder against a house to reach the bottom of a window 30 feet above the ground. As shown in the diagram below, the ladder makes a 70° angle with the ground. To the *nearest foot*, determine and state the length of the ladder.



$$x \cdot \sin 70 = \frac{30}{x} \cdot x$$

$$\frac{x \sin 70}{\sin 70} = \frac{30}{\sin 70}$$

$$x = \frac{30}{\sin 70}$$

$$x = 32 \text{ ft}$$

$\boxed{\text{The length of the ladder is 32 feet.}}$

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

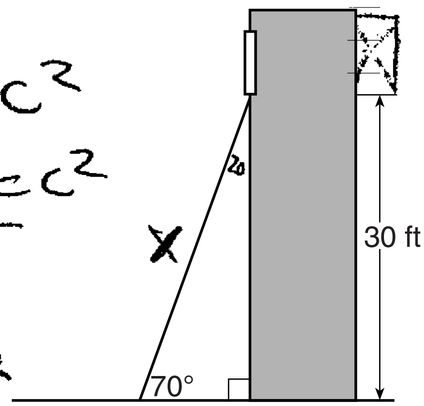
29 A carpenter leans an extension ladder against a house to reach the bottom of a window 30 feet above the ground. As shown in the diagram below, the ladder makes a 70° angle with the ground. To the *nearest foot*, determine and state the length of the ladder.

$30^2 + 10.91^2 = c^2$

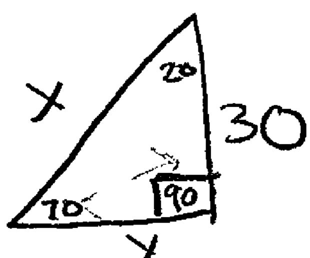
$900 + 119.0281 = c^2$

$\sqrt{1019.0281} = \sqrt{c^2}$

$c = 31.922$



Length of the ladder = 32 ft



10.91

$\frac{\tan 70}{1} = \frac{30}{y}$

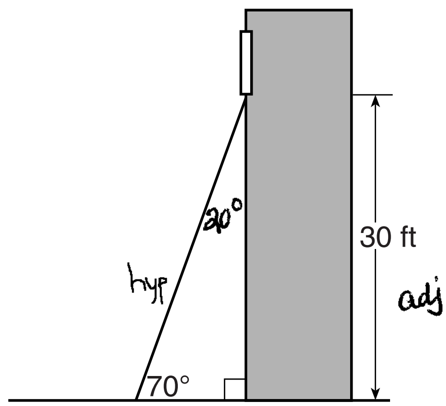
$\frac{30}{2.75} = \frac{2.75y}{2.75}$

$y = 10.91$

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

Question 29

29 A carpenter leans an extension ladder against a house to reach the bottom of a window 30 feet above the ground. As shown in the diagram below, the ladder makes a 70° angle with the ground. To the *nearest foot*, determine and state the length of the ladder.



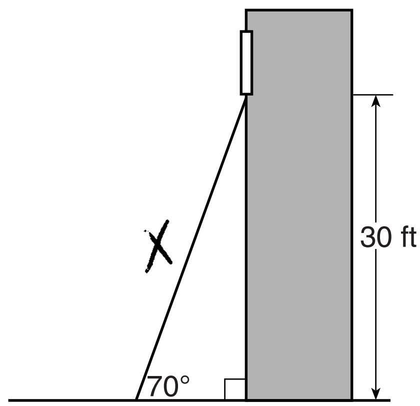
$$\frac{\cos 20}{1} = \frac{30}{x}$$

$$x \cos 20 = 30$$

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

Question 29

29 A carpenter leans an extension ladder against a house to reach the bottom of a window 30 feet above the ground. As shown in the diagram below, the ladder makes a 70° angle with the ground. To the *nearest foot*, determine and state the length of the ladder.



$$\sin 70 = \frac{x}{30}$$

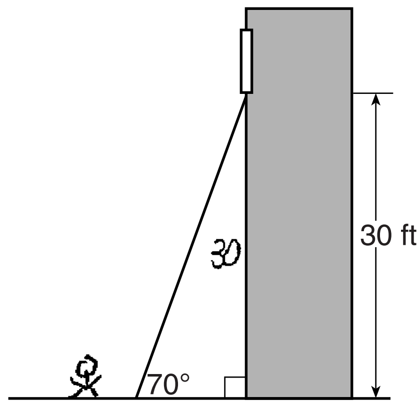
$$30 \sin 70 = x$$

$$28.19\ldots = x$$

$$\boxed{28 \text{ feet}}$$

Score 1: The student wrote an incorrect trigonometric equation.

29 A carpenter leans an extension ladder against a house to reach the bottom of a window 30 feet above the ground. As shown in the diagram below, the ladder makes a 70° angle with the ground. To the *nearest foot*, determine and state the length of the ladder.



SOH
CAH
TOA

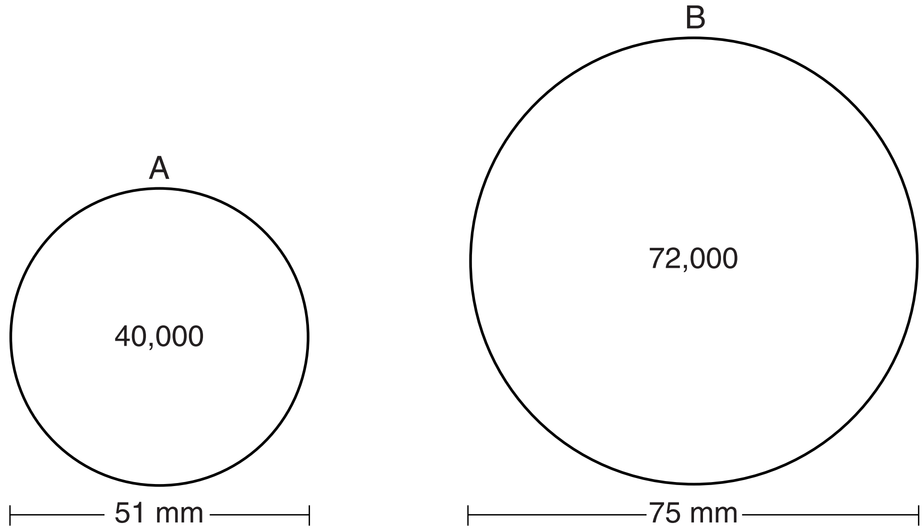
$\tan 70 = \frac{30}{x}$

$x = \tan(70) * 30 = 36.6$ or $\boxed{37 \text{ feet}}$

Score 0: The student's work was completely incorrect.

Question 30

30 During an experiment, the same type of bacteria is grown in two petri dishes. Petri dish *A* has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour. Petri dish *B* has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.



Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.

$A^{\circ A} = \pi r^2$

$A = \pi 25.5^2$

$A = 2042.820623$

$2042.820623 \overline{)40000}$ = 19.58076962

$A =^{\circ B} \pi r^2$

$A = \pi 37.5^2$

$A = 4417.864669$

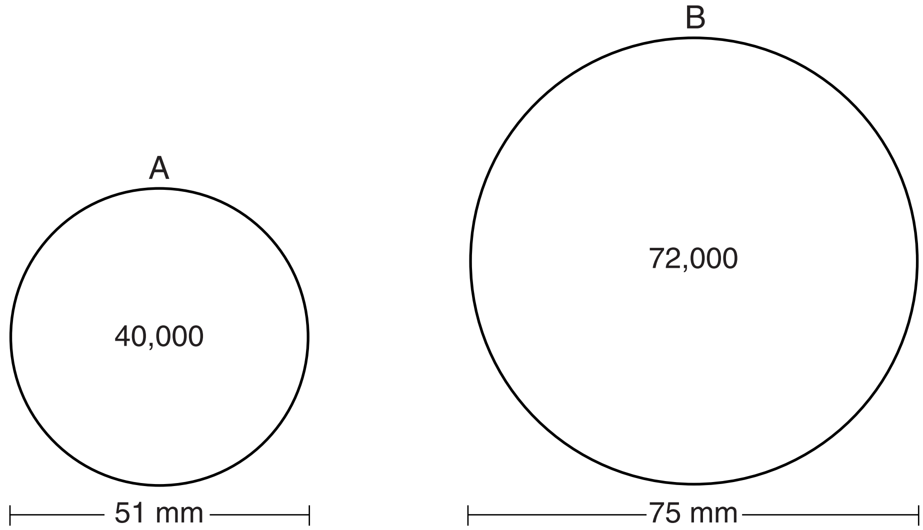
$4417.864669 \overline{)72000}$ = 16.29746617

Petri dish A

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

Question 30

30 During an experiment, the same type of bacteria is grown in two petri dishes. Petri dish A has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour. Petri dish B has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.



Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.

$\frac{d}{\text{bacter.}} = \frac{1}{x}$

$\frac{51}{40{,}000} = \frac{1}{x}$

$\frac{51x}{51} = \frac{40{,}000}{51}$

$x = 784.31$

$\frac{75}{72{,}000} = \frac{1}{x}$

$\frac{75x}{75} = \frac{72000}{75}$

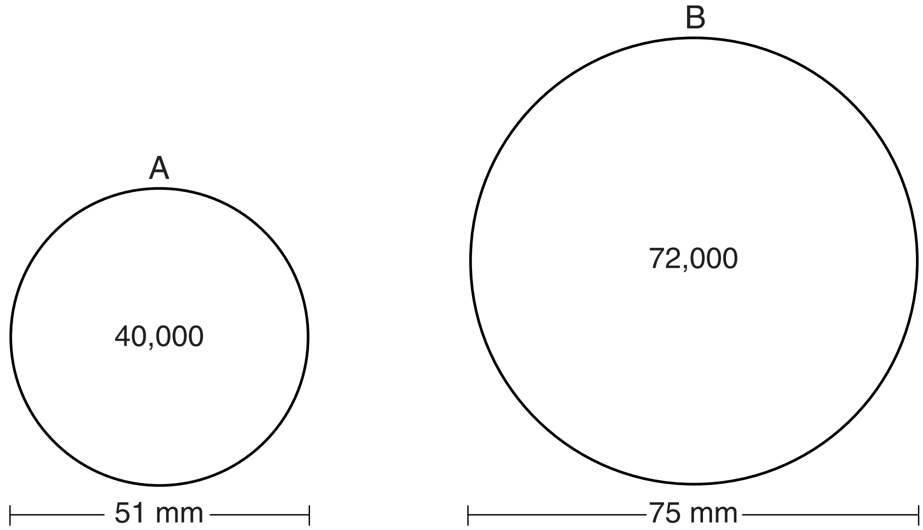
$x = 960$

Petri dish B had the greater Population density at the end of the first hour.

Score 1: The student calculated density based on the diameter of the petri dish and chose an appropriate dish.

Question 30

30 During an experiment, the same type of bacteria is grown in two petri dishes. Petri dish *A* has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour. Petri dish *B* has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.



Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.

A

$A=\pi r^2$

$A=\pi\, 25.5^2$

$A=650.25\pi$

B

$A=\pi r^2$

$A=\pi\, 37.5^2$

$A=1406.25\pi$

Petri dish B has a greater population Density.

Score 0: The student found the area of both petri dishes, but did not calculate a density to compare them.

Question 31

31 Line ℓ is mapped onto line m by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line m.

$$3x - y = 4$$

$$-3x \qquad -3x$$

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

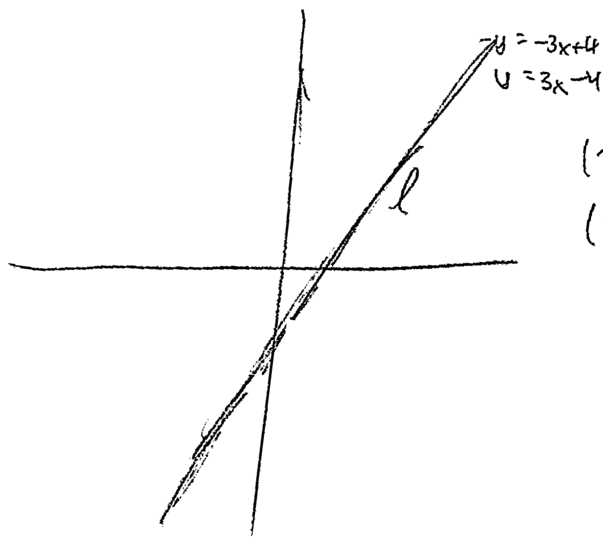
$$y = 3x - 4$$

$$y = 3x - 8$$

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

Question 31

31 Line ℓ is mapped onto line m by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line m.



$(2,2) \xrightarrow{D_2} (4,4)$

$(3,5) \xrightarrow{D_2} (6,10)$

$m = \frac{10-4}{6-4} = \frac{6}{2} = 3$

$y = 3x+b$

$10 = 3(6)+b$

$10 = 18+b$

$-18 \quad -18$

$-8 = b$

$\boxed{y = 3x-8}$

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

31 Line ℓ is mapped onto line m by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line m.

$$3x - y = 4$$

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

$$\boxed{y = 3x - 4}$$

$$\boxed{y = 6x - 8}$$

line m

Score 1: The student multiplied both the slope and y-intercept by a scale factor of 2.

Question 31

31 Line ℓ is mapped onto line m by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line m.

$$3x - y = 4$$
$$-3x \quad = -3x$$
$$\frac{-y}{-1} = \frac{-3x}{-1} \frac{+4}{-1}$$
$$y = \frac{3}{1}x - 4$$

$$\boxed{y = -\frac{1}{3}x - 4}$$

Score 0: The student found an equation for $m \perp \ell$, which is not relevant to the problem.

Question 31

31 Line ℓ is mapped onto line m by a dilation centered at the origin with a scale factor of 2. The equation of line ℓ is $3x - y = 4$. Determine and state an equation for line m.

$$3x - y = 4$$
$$-3x \quad -3x$$
$$\frac{-y}{-1} = \frac{-3x}{-1} \frac{+4}{-1}$$
$$y = 3x - 4$$

Score 0: The student solved the given equation for y, but made no attempt to do a dilation.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.

$$\frac{16}{9} = \frac{x}{20.6}$$

$$\frac{9x}{9} = \frac{329.6}{9}$$

$$x = 36.6$$

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

$$36.6^2 + 20.6^2 = c^2$$

$$1339.56 + 424.36 = c^2$$

$$1339.56 + 424.36 = 1763.92$$

42

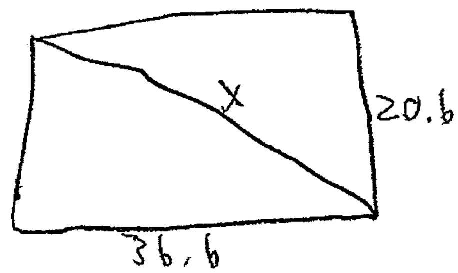
42 inch

Score 4: The student has complete and correct work.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.

$20.6^2 + 36.6^2 = c^2$

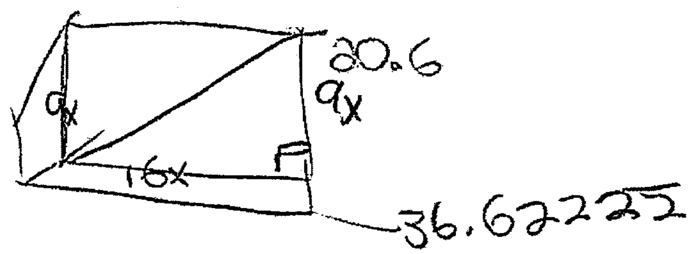


$x = 42$

Score 3: The student showed no work to find the width, but used the Pythagorean Theorem to find the screen size.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.



$$\frac{9x}{9}=\frac{20.6}{9}$$

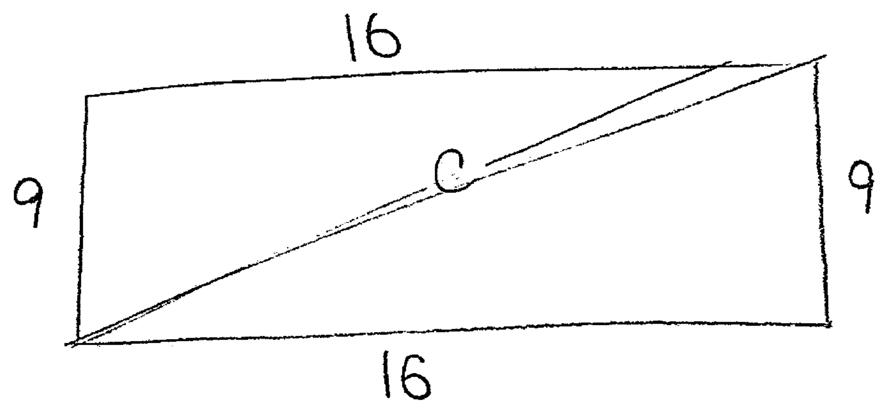
$$x \approx 2.3$$

$$\boxed{\approx 42 \text{ inches}}$$

Score 3: The student showed correct work to find the width, but no work to find 42.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.

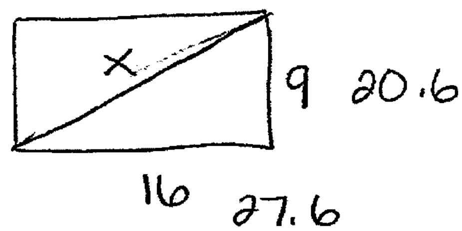


$$a^2+b^2=c^2$$
$$16^2+9^2=c^2$$
$$256+81=c^2$$
$$337=c^2$$
$$18.4=c$$

Score 2: The student used the aspect ratio to find the diagonal, but did not find the screen size.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.



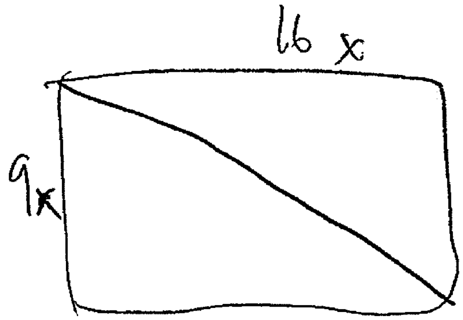
$$27.6^2 + 20.6^2 = x^2$$
$$761.76 + 424.36 = x^2$$
$$\sqrt{1186.12} = \sqrt{x^2}$$
$$x = 34 \text{ in}$$

screen size is 34in

Score 2: The student made a conceptual error in finding the width, but found an appropriate screen size.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.



$9x = 20.6$ $\quad$ $16x$

$x = 2.2\overline{8}$ $\quad$ $16 \cdot 2.2\overline{8} = 36.6\overline{2}$

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

$20.6^2 + 36.6\overline{2} = 49.5990123$

$\sqrt{49.5990123} \approx 20.726$

$20.726 \approx 21$

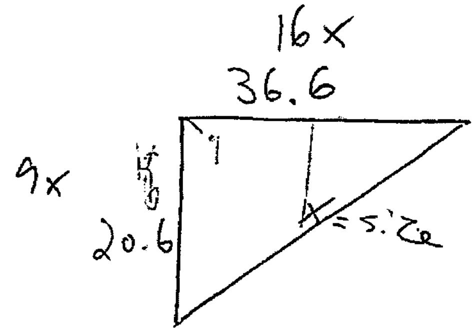
$\boxed{\text{diagonal} \approx 21 \text{ in}}$

Score 2: The student showed correct work to find the width, but no further correct work was shown.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.

16:9

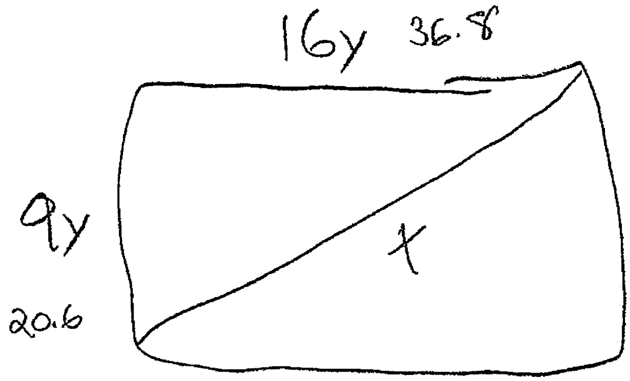


X = 42 inchs

Score 2: The student stated a correct width and screen size, but did not show work.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.



42.2 inches

$20.6^2 + 36.8^2 = x^2$

$\sqrt{1778.6} = \sqrt{x^2}$

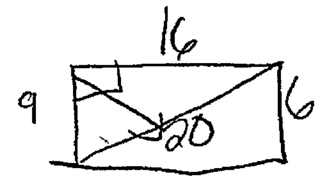
42.2

$y = 2.3$

Score 1: The student showed no work to find an incorrect width, but used it appropriately to find the screen size. The screen size was not stated to the nearest inch.

Question 32

32 The aspect ratio (the ratio of screen width to height) of a rectangular flat-screen television is 16:9. The length of the diagonal of the screen is the television's screen size. Determine and state, to the *nearest inch*, the screen size (diagonal) of this flat-screen television with a screen height of 20.6 inches.



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

$9^2 + 16^2 = 20^2$

$81 + 256 = 400$

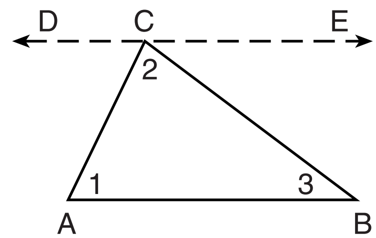
$337 = 400$
$-337 \quad -337$

$\boxed{63}$

Score 0: The student had no correct work.

Question 33

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.



Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

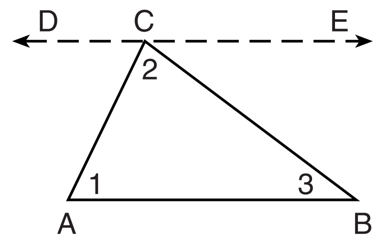
Fill in the missing reasons below.

Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) To a given line there is only one parallel line that can be drawn through a given point not on the line.
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) when two ll lines are cut by a transversal alternate interior ∡'s are ≅.
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) The sum of the angles on one side of a line is equal to 180°.
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) substitution

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

Question 33

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.



Given: $\triangle ABC$

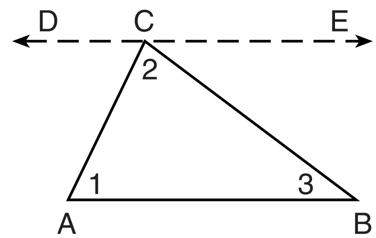
Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

Fill in the missing reasons below.

Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) Euclid's Parallel Postulate
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) If // lines, then alternate interior ∡s ≅ (2).
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) If 3∡s form a line, then they are supplementary.
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) Substitution Property (3,4)

Score 3: The student had three correct reasons.

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.



Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

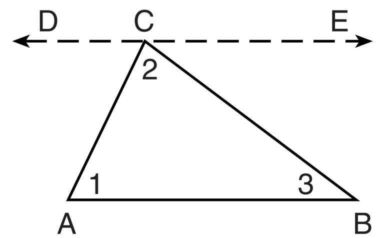
Fill in the missing reasons below.

Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) an auxiliary line can be drawn
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) if lines are parallel, alternate interior angles are congruent
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) if angles form a straight line it equals 180°
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) sum of angles in a triangle equals 180

Score 3: The student had three correct reasons.

Question 33

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.



Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

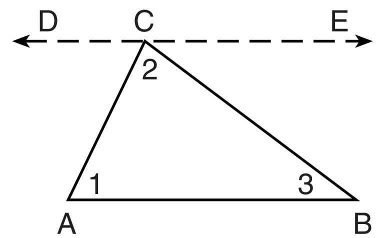
Fill in the missing reasons below.

Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) Draw parallel lines
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) Opposite interior ∠s are congruent.
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) $\overleftrightarrow{DCE}$; so straigh ∠ therefore = to 180°
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) Substitutation property

Score 2: The student had two correct reasons.

Question 33

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.



Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

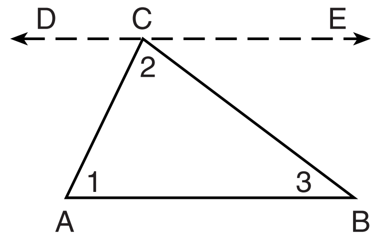
Fill in the missing reasons below.

Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) A line can be drawn ∥ to a given line through a point not on the line
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) IF lines ∥ ⇒ Alternate interior ∡s are ≅
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) Addition Property
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) Transitive Property

Score 2: The student had two correct reasons.

Question 33

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.



Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

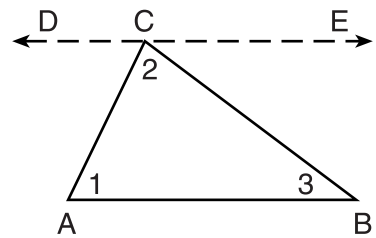
Fill in the missing reasons below.

Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) 2 parallel lines intersected by a transversal
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) alt. int. angles theorem
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) sum of the parts = the whole
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) substitution

Score 1: The student had one correct reason.

Question 33

33 Given the theorem, "The sum of the measures of the interior angles of a triangle is 180°," complete the proof for this theorem.



Given: $\triangle ABC$

Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$

Fill in the missing reasons below.

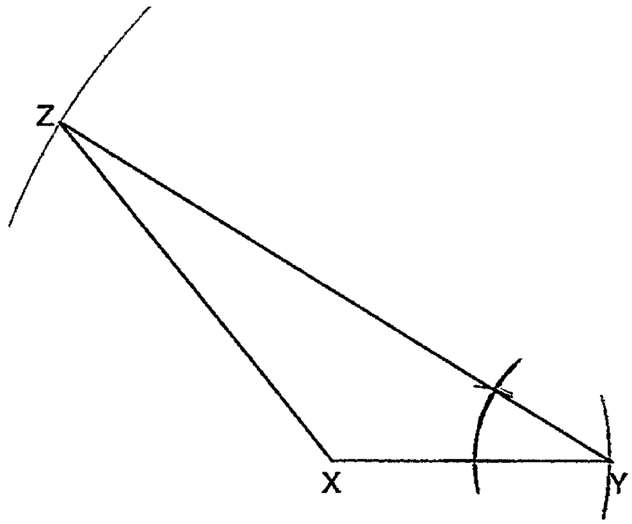
Statements	Reasons
(1) $\triangle ABC$	(1) Given
(2) Through point C, draw $\overleftrightarrow{DCE}$ parallel to $\overline{AB}$.	(2) A 2 line that are transversal ~~and~~ ~~are~~ parallel
(3) $m\angle 1 = m\angle ACD$, $m\angle 3 = m\angle BCE$	(3) Interior angle (2 parrall line cut by transversal are congruent)
(4) $m\angle ACD + m\angle 2 + m\angle BCE = 180°$	(4) Addition postulate
(5) $m\angle 1 + m\angle 2 + m\angle 3 = 180°$	(5) 2 parallel line cut by 2 transversal that make triangle are 180°

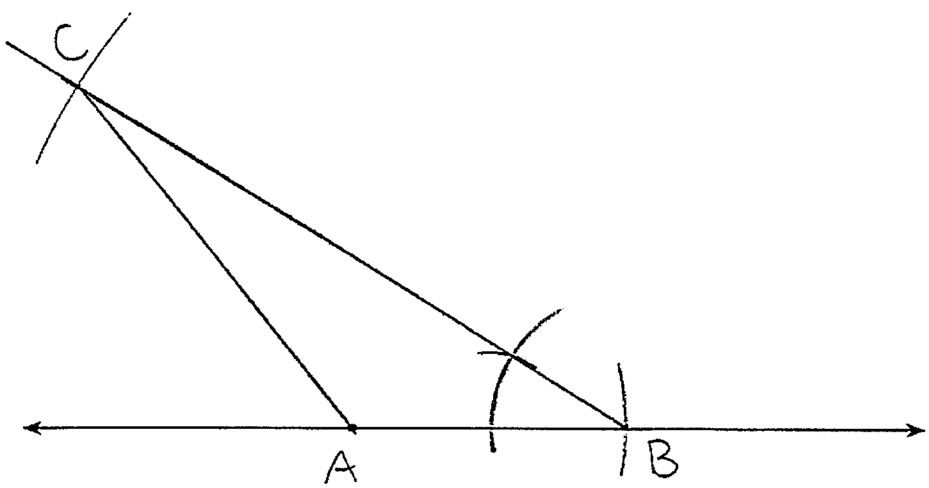
Score 0: The student had no correct reasons.

Question 34

34 Triangle *XYZ* is shown below. Using a compass and straightedge, on the line below, construct and label $\triangle ABC$, such that $\triangle ABC \cong \triangle XYZ$. [Leave all construction marks.]

Based on your construction, state the theorem that justifies why $\triangle ABC$ is congruent to $\triangle XYZ$.





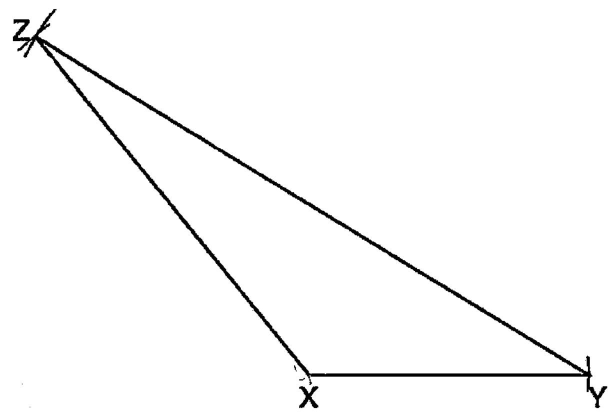
SAS theorem of congruent triangles.

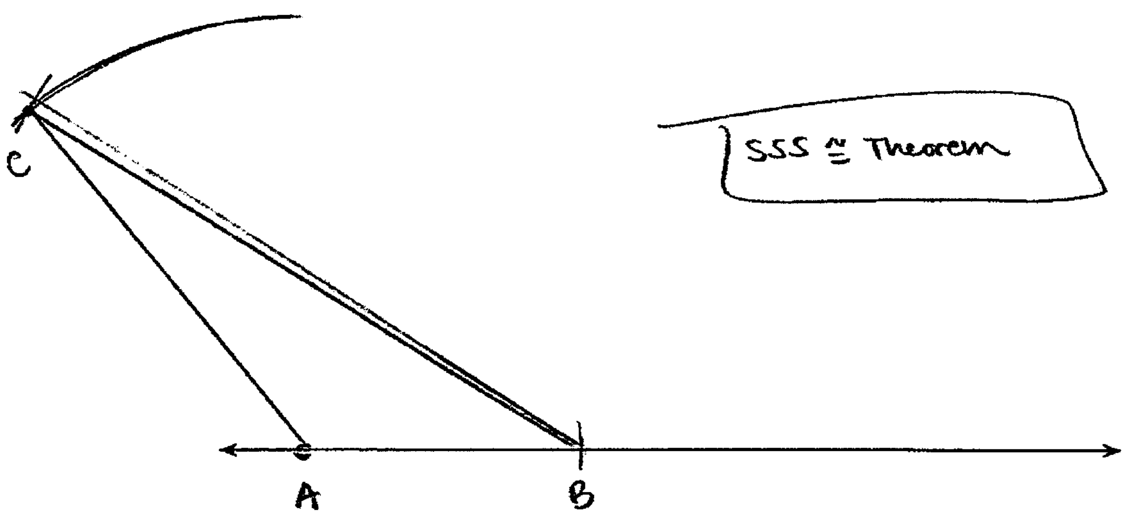
Score 4: The student has a complete and correct response.

Question 34

34 Triangle XYZ is shown below. Using a compass and straightedge, on the line below, construct and label $\triangle ABC$, such that $\triangle ABC \cong \triangle XYZ$. [Leave all construction marks.]

Based on your construction, state the theorem that justifies why $\triangle ABC$ is congruent to $\triangle XYZ$.

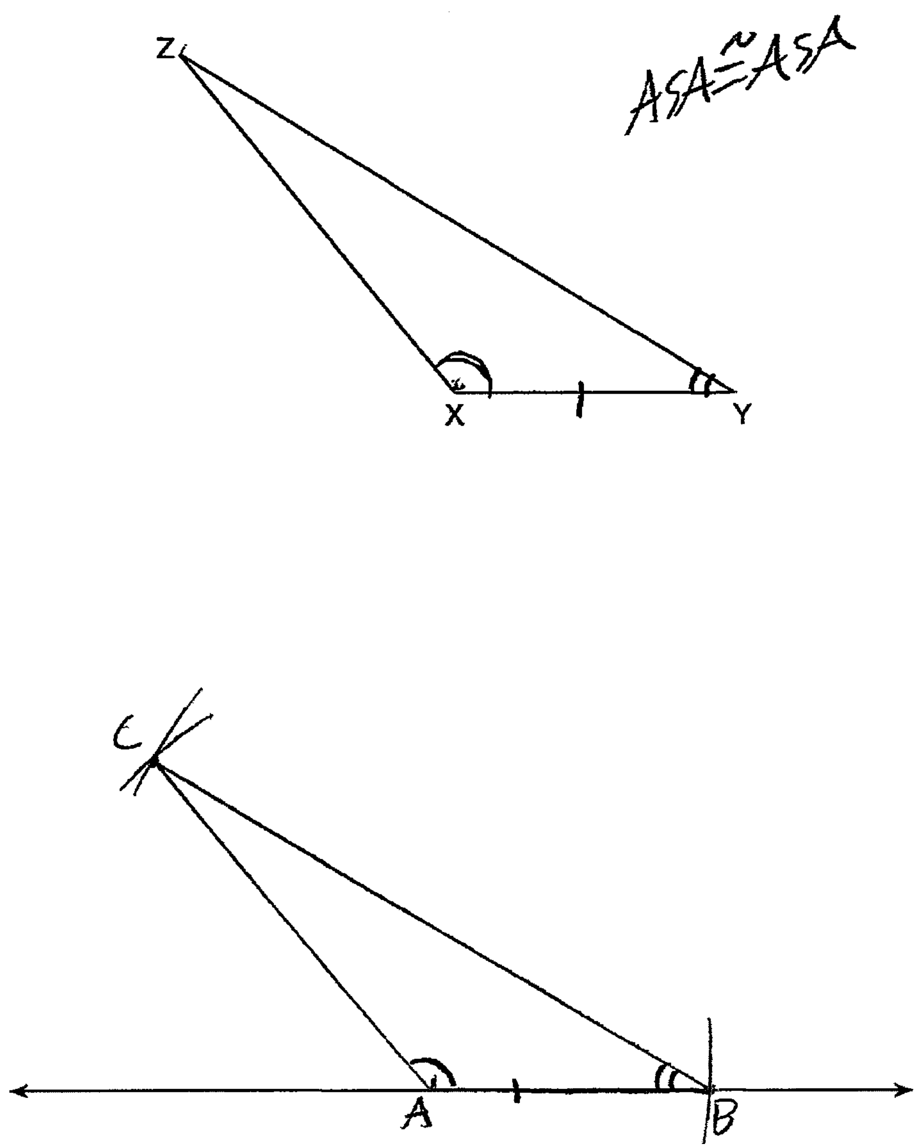




Score 4: The student has a complete and correct response.

34 Triangle *XYZ* is shown below. Using a compass and straightedge, on the line below, construct and label $\triangle ABC$, such that $\triangle ABC \cong \triangle XYZ$. [Leave all construction marks.]

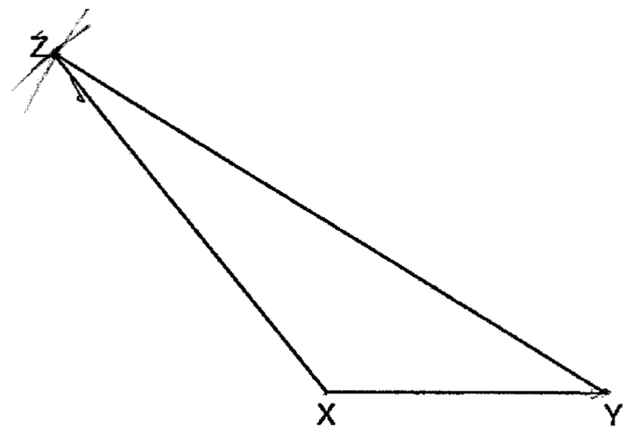
Based on your construction, state the theorem that justifies why $\triangle ABC$ is congruent to $\triangle XYZ$.

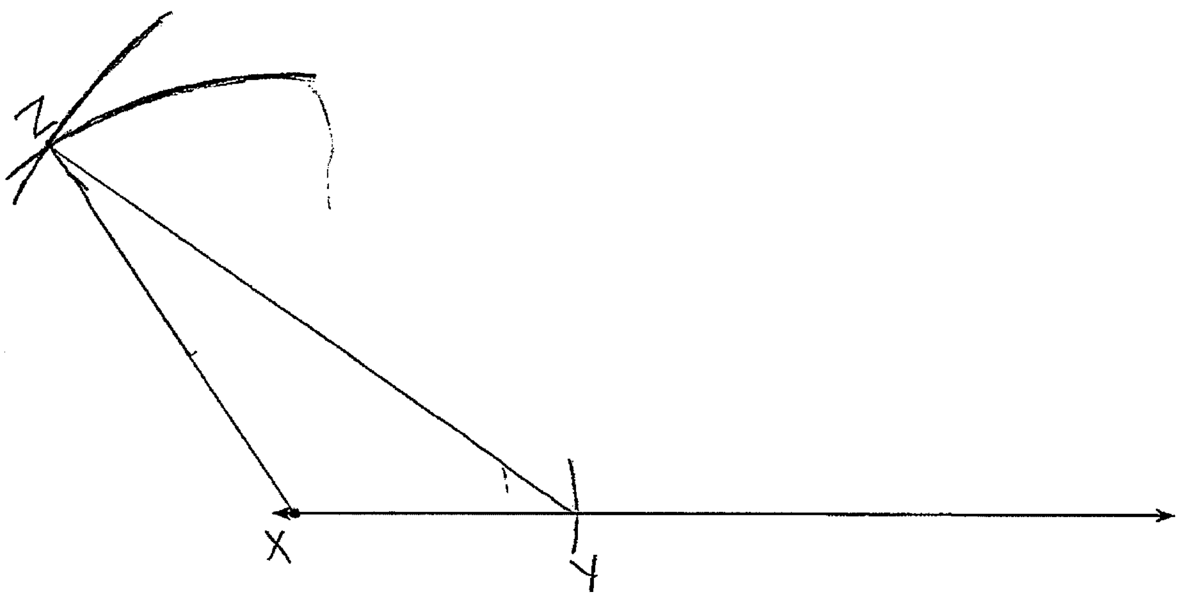


Score 3: The student showed a correct construction, but stated an incorrect theorem.

34 Triangle XYZ is shown below. Using a compass and straightedge, on the line below, construct and label $\triangle ABC$, such that $\triangle ABC \cong \triangle XYZ$. [Leave all construction marks.]

Based on your construction, state the theorem that justifies why $\triangle ABC$ is congruent to $\triangle XYZ$.



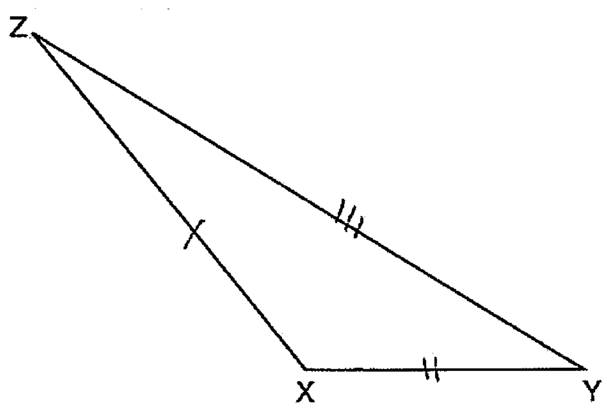


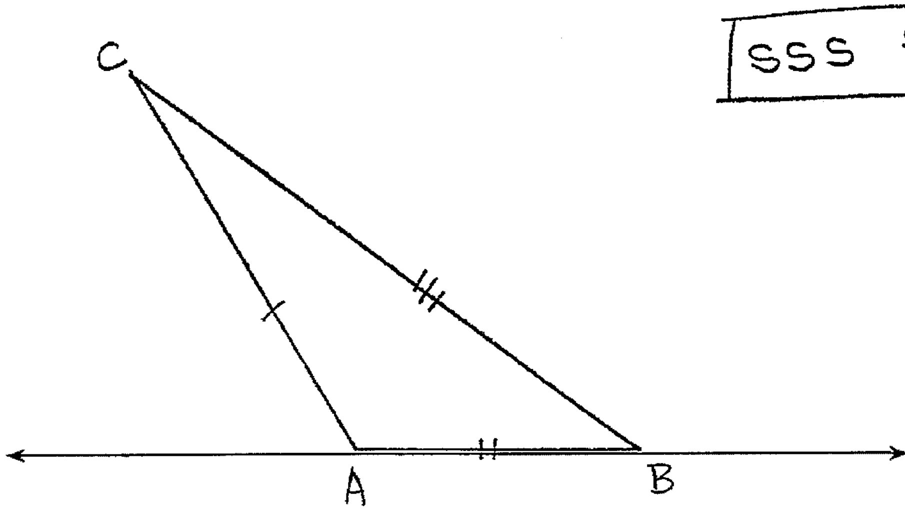
Score 2: The student had an appropriate construction of a congruent triangle, but the triangle was not labeled correctly and no theorem was stated.

Question 34

34 Triangle XYZ is shown below. Using a compass and straightedge, on the line below, construct and label $\triangle ABC$, such that $\triangle ABC \cong \triangle XYZ$. [Leave all construction marks.]

Based on your construction, state the theorem that justifies why $\triangle ABC$ is congruent to $\triangle XYZ$.





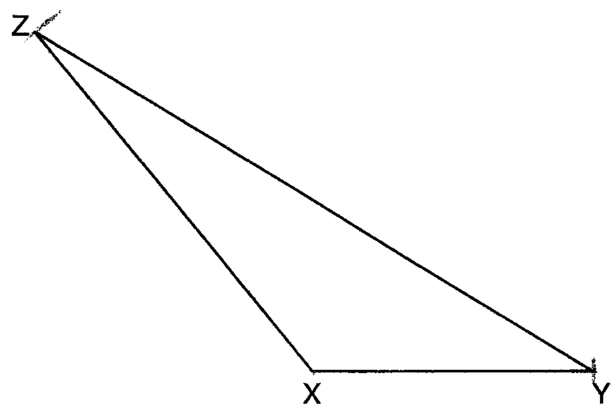
$\boxed{SSS \cong SSS}$

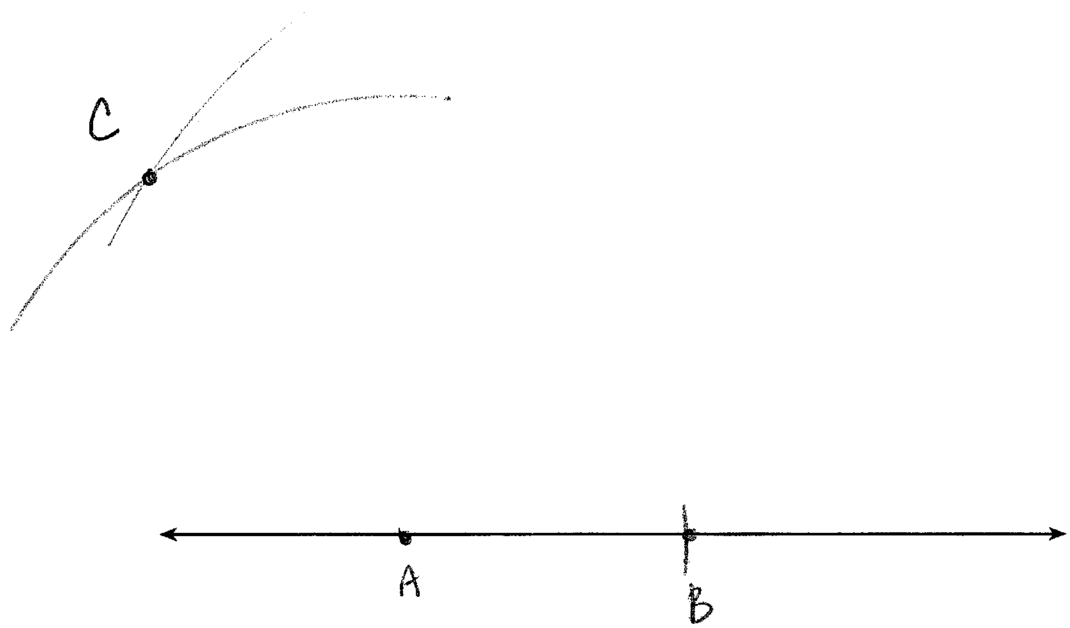
Score 1: The student made a drawing that was not a construction, but stated an appropriate theorem.

Question 34

34 Triangle XYZ is shown below. Using a compass and straightedge, on the line below, construct and label $\triangle ABC$, such that $\triangle ABC \cong \triangle XYZ$. [Leave all construction marks.]

Based on your construction, state the theorem that justifies why $\triangle ABC$ is congruent to $\triangle XYZ$.



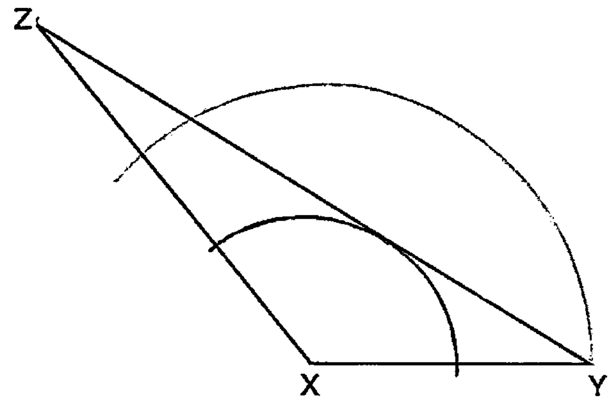


Score 1: The student made correct construction marks, but showed no further work.

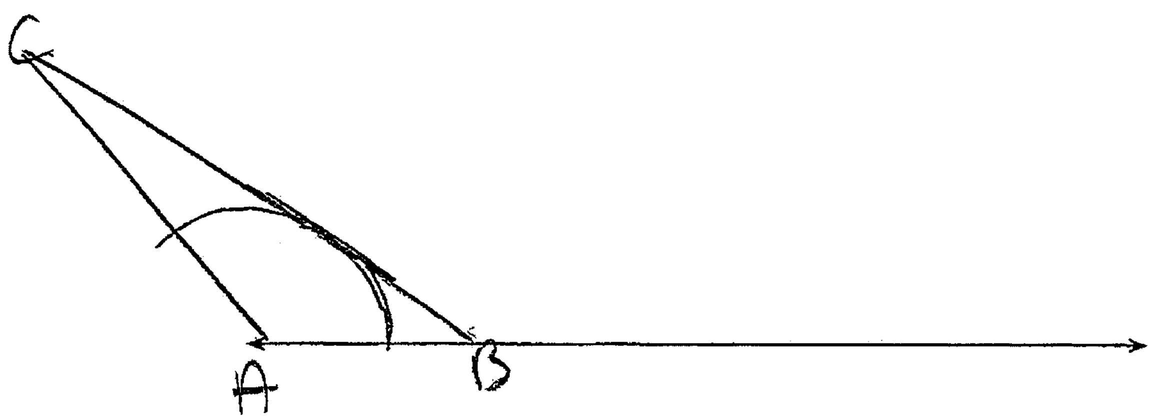
Question 34

34 Triangle XYZ is shown below. Using a compass and straightedge, on the line below, construct and label $\triangle ABC$, such that $\triangle ABC \cong \triangle XYZ$. [Leave all construction marks.]

Based on your construction, state the theorem that justifies why $\triangle ABC$ is congruent to $\triangle XYZ$.

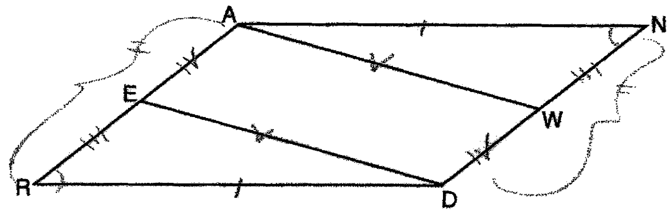


$\triangle ABC \cong \triangle XYZ$ because they have the same exact arc.



Score 0: The student's work was completely incorrect.

35 Given: Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E*, respectively



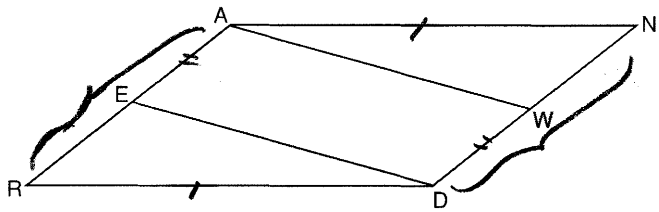
Prove that $\triangle ANW \cong \triangle DRE$.

Prove that quadrilateral *AWDE* is a parallelogram.

Statements	Reasons
① Parallelogram ANDR with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points W and E respectively.	① Given
② $\overline{AE} \cong \overline{RE}$, $\overline{DW} \cong \overline{NW}$	② A segment bisector cuts a segment into two $\cong$ parts
③ $\overline{RA} \cong \overline{DN}$, $\overline{RD} \cong \overline{NA}$	③ In a parallelogram opposite sides are $\cong$
④ $\overline{RE} \cong \overline{NW}$	④ Halves of $\cong$ segments are $\cong$
⑤ $\angle R \cong \angle N$	⑤ In a parallelogram, opposite angles are $\cong$.
⑥ $\triangle DRE \cong \triangle ANW$	⑥ SAS $\cong$ SAS
⑦ $\overline{ED} \cong \overline{WA}$	⑦ CPCTC
⑧ $\overline{AE} \cong \overline{DW}$	⑧ Halves of $\cong$ Segments are $\cong$
⑨ Quad. AWDE is a parallelogram	⑨ If both pairs of opposite sides are $\cong$, the quad is a parallelogram.

Score 6: The student has a complete and correct proof.

35 Given: Parallelogram $ANDR$ with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points W and E, respectively



Prove that $\triangle ANW \cong \triangle DRE$.

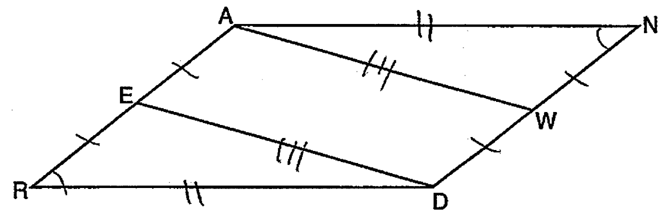
Prove that quadrilateral $AWDE$ is a parallelogram.

Statements	Reasons
1. ▱ $ANDR$, $\overline{AW}$ bisects $\overline{NWD}$, $\overline{DE}$ bisects $\overline{REA}$	1. given
2. $\overline{AN} \cong \overline{RD}$, $\overline{AER} \cong \overline{DWN}$	2. opp. sides of a ▱ are $\cong$
3. $AE = \frac{1}{2}AR$, $WD = \frac{1}{2}DN$ $\therefore \overline{AE} \cong \overline{WD}$	3. def. of bisect + div. prop. of =
4. $\overline{REA} \parallel \overline{DWN}$	4. opp. sides of a ▱ are $\parallel$
5. $AWDE$ is a ▱	5. if one pair of sides of a quad. are $\parallel$ and $\cong$, it is a ▱
6. $RE = \frac{1}{2}AR$, $NW = \frac{1}{2}DN$ $\therefore \overline{RE} \cong \overline{NW}$	6. reason 3
7. $\overline{ED} \cong \overline{AW}$	7. reason 2
8. $\triangle ANW \cong \triangle DRE$	8. SSS

Score 6: The student has a complete and correct proof.

Question 35

35 Given: Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E*, respectively



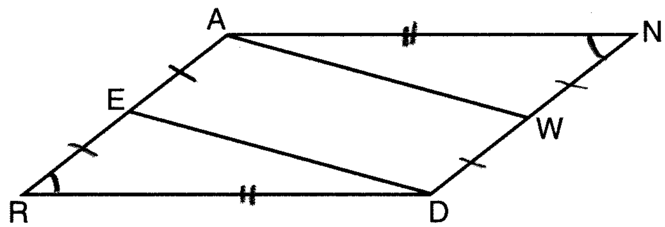
Prove that $\triangle ANW \cong \triangle DRE$.

Prove that quadrilateral *AWDE* is a parallelogram.

Statements	Reasons
1) ANDR is a ▱, $\overline{AW}$ & $\overline{DE}$ bisect $\overline{NWD}$ and $\overline{REA}$ at W & E	1) given
2) $\overline{REA} \cong \overline{NWD}$	2) opp sides of a ▱ are $\cong$
3) $\overline{NW}_{(S)} \cong \overline{WD} \cong \overline{EA} \cong \overline{ER}_{(S)}$	3) To bisect is to ÷ into 2 $\cong$ parts
4) $\overline{RD} \cong \overline{AN}$	4) opp. sides of a ▱ are $\cong$
5) ∡ERD $\cong$ ∡NAW	5) opp. ∡s of a ▱ are $\cong$
6) $\triangle ANW \cong \triangle DRE$	6) SAS
7) $\overline{AW} \cong \overline{ED}$	7) corresp. parts of $\cong$ △s are $\cong$
8) quad AWDE is a ▱	8) if a quad has both pairs of opp. sides $\cong$, its a ▱

Score 5: The student had one incomplete reason.

35 Given: Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E*, respectively



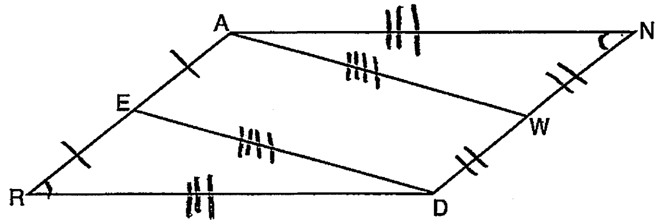
Prove that $\triangle ANW \cong \triangle DRE$.

Prove that quadrilateral *AWDE* is a parallelogram.

Statement	Reason
① ▱ANDR, $\overline{AW}$ and $\overline{DE}$ bisect $\overline{NWD}$ and $\overline{REA}$ at points W and E, respectively	① Given
② $\overline{AR} \cong \overline{ND}$ $\overline{RD} \cong \overline{NA}$ $\angle R \cong \angle N$	② ▱ properties
③ E is the midpoint of $\overline{RA}$ W is the midpoint of $\overline{ND}$	③ Definition of segment bisector
④ $\overline{AE} \cong \overline{RE}$ $\overline{DW} \cong \overline{NW}$	④ Definition of midpoint
⑤ $\triangle ANW \cong \triangle DRE$	⑤ SAS
⑥ $\overline{DE} \cong \overline{AW}$	⑥ CPCTC
⑦ AWDE is a ▱	⑦ In a parallelogram, both pairs of opposite sides are ≅

Score 5: The student had one missing statement and reason.

35 Given: Parallelogram $ANDR$ with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points W and E, respectively



Prove that $\triangle ANW \cong \triangle DRE$.

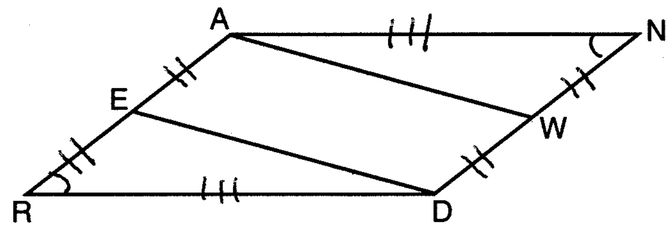
Prove that quadrilateral $AWDE$ is a parallelogram.

S	R
1.) ANDR is a parallelogram, $\overline{AW}$ + $\overline{DE}$ bisect $\overline{NWD}$ and $\overline{REA}$ at points W and E	1.) Given
2.) E and W are midpoints	2.) Def of a bisector
3.) $\overline{RE} \cong \overline{AE}$ $\overline{DW} \cong \overline{WN}$	3.) Def of a midpoint
4.) $\overline{AN} \cong \overline{RD}$, $\overline{AR} \cong \overline{ND}$	4.) Opposite sides of a parallelogram are $\cong$
5.) $\angle AND \cong \angle ARD$	5.) Opposite ∡'s of a parallelogram are $\cong$
6.) $\triangle ANW \cong \triangle DRE$	6.) SAS $\cong$ SAS
7.) $\overline{ED} \cong \overline{AW}$	7.) CPCTC
8.) AEDW is a parallelogram	8.) Opposite sides are $\cong$

Score 4: The student had a missing statement and reason and also an incomplete reason.

Question 35

35 Given: Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E*, respectively



Prove that $\triangle ANW \cong \triangle DRE$.

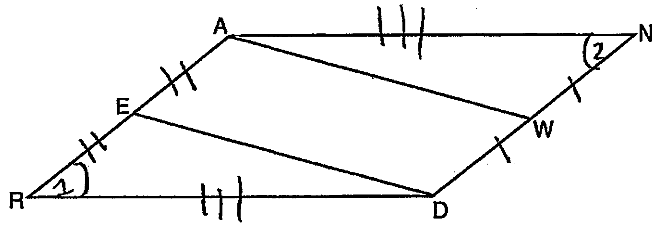
Prove that quadrilateral *AWDE* is a parallelogram.

1. ▱ABCD, $\overline{AW}$ + $\overline{DE}$ bisect $\overline{NWD}$ + $\overline{REA}$ at points W and E respectively	1. Given
2. $\overline{AN} \cong \overline{RD}$, $\overline{AR} \cong \overline{ND}$ (S≅S)	2. opposite sides of a ▱ are ≅.
3. $\overline{AE} \cong \overline{ER}$ or $ER = \frac{1}{2} AR$ $\overline{NW} \cong \overline{WD}$ or $NW = \frac{1}{2} ND$	3. A bisector divides a line segment into 2 ≅ segments.
4. $\overline{ER} \cong \overline{NW}$ (S≅S)	4. Halves of ≅ quantities are ≅.
5. ∡R ≅ ∡N (∡≅∡)	5. opposite angles of a ▱ are ≅.
6. △ANW ≅ △DRE	6. SAS ≅ SAS

Score 3: The student proved $\triangle ANW \cong \triangle DRE$, but did no further work.

Question 35

35 Given: Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E*, respectively



Prove that $\triangle ANW \cong \triangle DRE$.

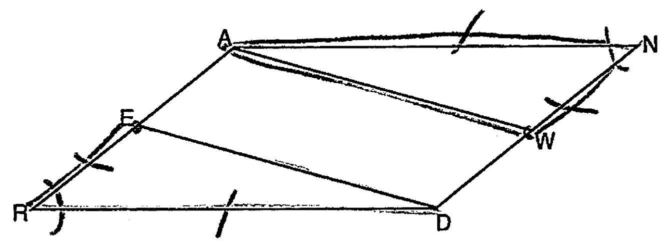
Prove that quadrilateral *AWDE* is a parallelogram.

Statement	Reason
1. $\square ANDR$	1. given
2. $\measuredangle 1 \cong \measuredangle 2$	2. opposite $\measuredangle$s of a $\square$ are $\cong$
3. $\overline{AE} \cong \overline{ER}$, $\overline{NW} \cong \overline{WD}$	3. def bisector is to $\div$ into 2 $\cong$ parts
4. $\overline{AR} \cong \overline{ND}$, $\overline{RD} \cong \overline{AN}$	4. opp. sides of a $\square$ are $\cong$
5. $\overline{ER} \cong \overline{NW}$	5. halves of $\cong$ line segs are $\cong$
6. $\triangle ANW \cong \triangle DRE$	6. SAS

Score 2: The student proved $\triangle ANW \cong \triangle DRE$, but the given was incomplete and no further work was shown.

Question 35

35 Given: Parallelogram *ANDR* with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points *W* and *E*, respectively



Prove that $\triangle ANW \cong \triangle DRE$.

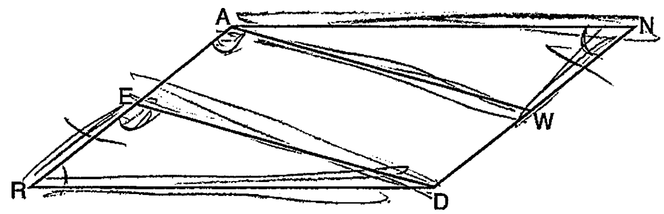
Prove that quadrilateral *AWDE* is a parallelogram.

Statements	reasons
1 $\boxed{P}$ ANDR w/ $\overline{AW}$ & DE bisecting $\overline{NWD}$ & REA @ pts W&E	1 Given
2 $\overline{RD} \cong \overline{AN}$	2 opposite side of a $\boxed{P}$ $\cong$
3 AR $\cong$ ND	3 opposite sides of a $\boxed{P}$ $\cong$
4 $\overline{NW} \cong \overline{WD} \cong \overline{RE} \cong \overline{AE}$	4 subtraction
5 $\angle N \cong \angle R$	5 opp. $\angle$'s of a $\boxed{P}$ are $\cong$
6 $\triangle ANW \cong \triangle DRE$	6 SAS

Score 2: The student had four statements and/or reasons missing or incorrect.

Question 35

35 Given: Parallelogram $ANDR$ with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points W and E, respectively



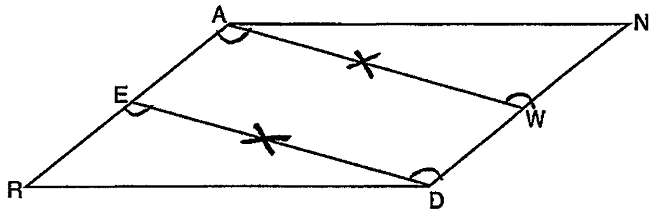
Prove that $\triangle ANW \cong \triangle DRE$.

Prove that quadrilateral $AWDE$ is a parallelogram.

Statement	Reason
1 ▱ ANDR	1 given
2 $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points W and E respectively	2 given
3 $\angle R \cong \angle N$	3 In a ▱ oppisate angles are $\cong$
4 $\angle E \cong \angle A$	4 In a ▱ corresponding angles are $\cong$
5 $\overline{RE} \cong \overline{WN}$	5 In a ▱ oppisate sides are $\cong$
6 $\triangle ANW \cong \triangle DRE$	6 ASA $\cong$ ASA

Score 1: The student had one correct statement and reason.

35 Given: Parallelogram $ANDR$ with $\overline{AW}$ and $\overline{DE}$ bisecting $\overline{NWD}$ and $\overline{REA}$ at points W and E, respectively



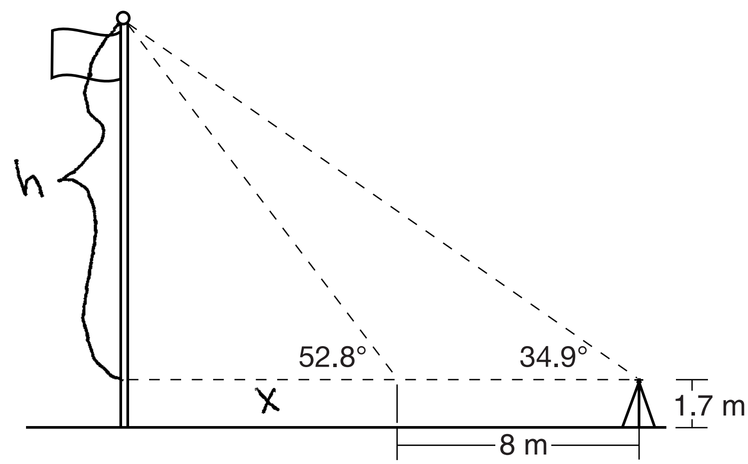
Prove that $\triangle ANW \cong \triangle DRE$.

Prove that quadrilateral $AWDE$ is a parallelogram.

Statement	Reason
1) $\overline{AW}$ and $\overline{DE}$ are ∠ bisectors	1) Given
2) $\overline{AW} \cong \overline{AW}$	2) reflexive property
3) $\overline{ED} \cong \overline{ED}$	3) reflexive postulate
4) $\angle D \cong \angle W$	4) Bisector's split angle's into Congruent ∠'s.
5) $\angle E \cong \angle A$	8) Same as statement 4
6) $\triangle ANW \cong \triangle DRE$	6) ASA ≅ ASA

Score 0: The student's proof was completely incorrect.

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$\tan 52.8 = \frac{h}{x}$

$x \tan 52.8 = h$

$\tan 34.9 = \frac{h}{x+8}$

$(x+8)\tan 34.9 = h$

$x \tan 52.8 = x \tan 34.9 + 8 \tan 34.9$

$- x \tan 34.9 \qquad - x \tan 34.9$

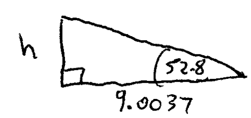
$x \tan 52.8 - x \tan 34.9 = 8 \tan 34.9$

$x(\tan 52.8 - \tan 34.9) = 8 \tan 34.9$

$\frac{\cancel{.6198416839}\, x}{\cancel{.6198416839}} = \frac{8 \tan 34.9}{.6198416839}$

$x = 9.003714087$

$\tan 52.8 = \frac{h}{9.003714087}$



$h = 9.003714087 \tan 52.8$

$h = 11.86195525$

$+ 1.7$

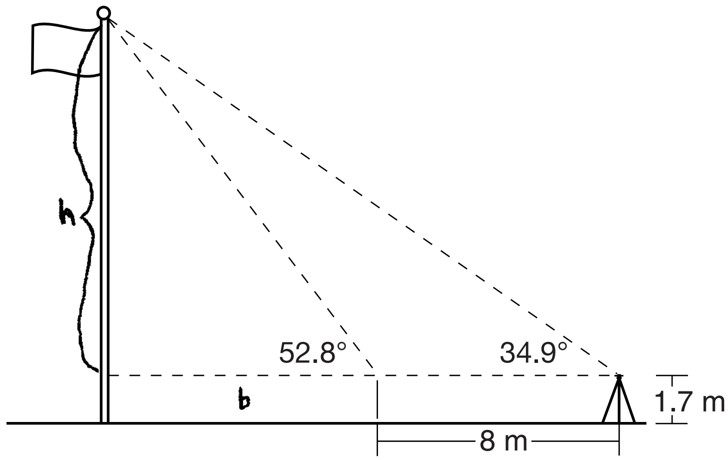
height $= 13.56195525$

$\boxed{\text{height} = 13.6 \text{ m}}$

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

Question 36

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$\tan 52.8 = \frac{h}{b}$

$\frac{b \cancel{\tan 52.8}}{\cancel{\tan 52.8}} = \frac{h}{\tan 52.8}$

$b = \frac{h}{\tan 52.8}$

$\tan 34.9 = \frac{h}{b+8}$

$(b+8)\tan 34.9 = h$

$b \tan 34.9 + 8 \tan 34.9 = h$

$-8\tan 34.9 \quad -8\tan 34.9$

$\frac{b \cancel{\tan 34.9}}{\cancel{\tan 34.9}} = \frac{h - 8\tan 34.9}{\tan 34.9}$

$b = \frac{h - 8\tan 34.9}{\tan 34.9}$

$\frac{h}{\tan 52.8} = \frac{h - 8\tan 34.9}{\tan 34.9}$

$h \tan 34.9 = h \tan 52.8 - 8 \tan 34.9 \tan 52.8$

$-h\tan 52.8 \quad -h\tan 52.8$

$h \tan 34.9 - h \tan 52.8 = {}^{-}8 \tan 34.9 \tan 52.8$

$\frac{h\cancel{(\tan 34.9 - \tan 52.8)}}{\cancel{(\tan 34.9 - \tan 52.8)}} = \frac{{}^{-}8 \tan 34.9 \tan 52.8}{(\tan 34.9 - \tan 52.8)}$

$h = \frac{{}^{-}8 \tan 34.9 \tan 52.8}{(\tan 34.9 - \tan 52.8)}$

$h = 11.8619525$

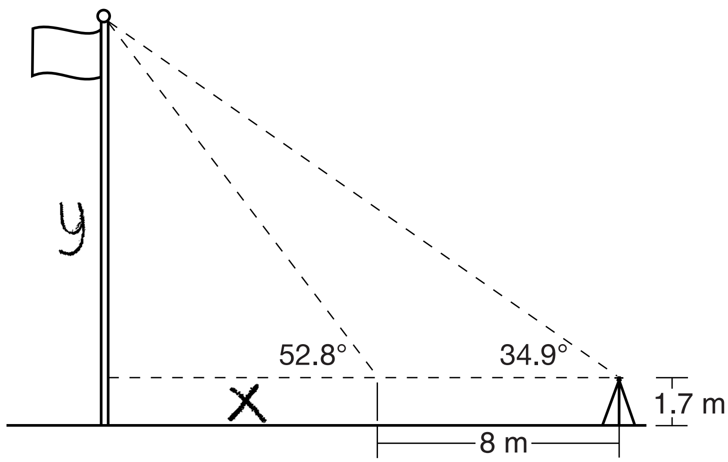
11.8619525
$+\ 1.7$
13.5619525

$\boxed{\text{height} = 13.6\text{ m}}$

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

Question 36

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$\tan 34.9 = \frac{y}{x+8}$ $\tan 52.8 = \frac{y}{x}$

$x\tan 34.9 + 8\tan 34.9 = x\tan 52.8$
$-x\tan 34.9 \qquad -x\tan 34.9$

$\frac{8\tan 34.9}{0.6198} = \frac{0.6198x}{0.6198}$

$x = 9.0037$

$9.0037(\tan 52.8) = y$

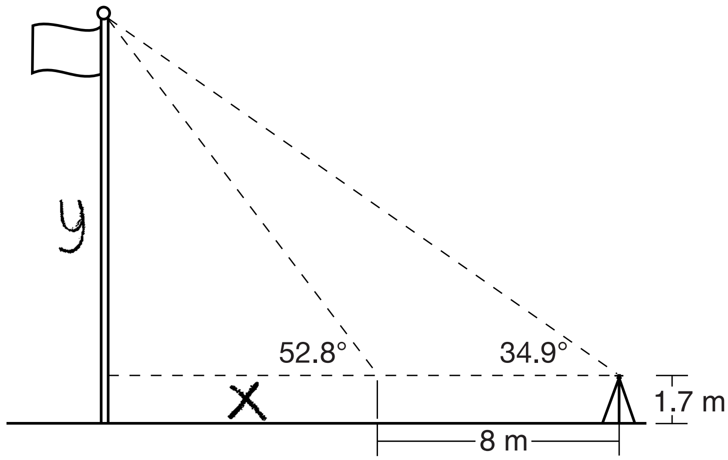
$y = 11.862$

11.9

Score 5: The student only found the vertical distance between the top of the flagpole to the top of the survey instrument.

Question 36

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$\tan 34.9 = \frac{y}{x+8}$ $\tan 52.8 = \frac{y}{x}$

$x\tan 34.9 + 8\tan 34.9 = x\tan 52.8$

$-x\tan 34.9 \qquad\qquad -x\tan 34.9$

$\frac{8\tan 34.9}{0.6198} = \frac{0.6198x}{0.6198}$

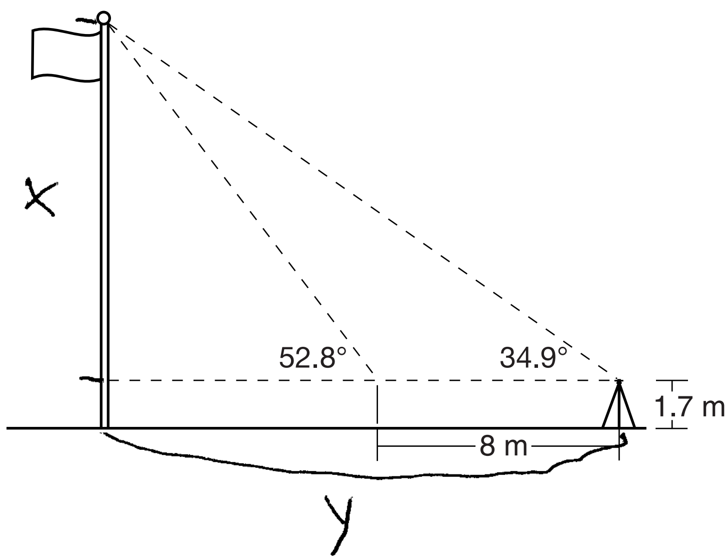
$x = 9.0037$

$\boxed{x = 9.0}$

Score 4: The student only found the distance between the second measurement and the flagpole.

Question 36

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$\tan 34.9 = \frac{x}{y}$

$\tan 52.8 = \frac{x}{y-8}$

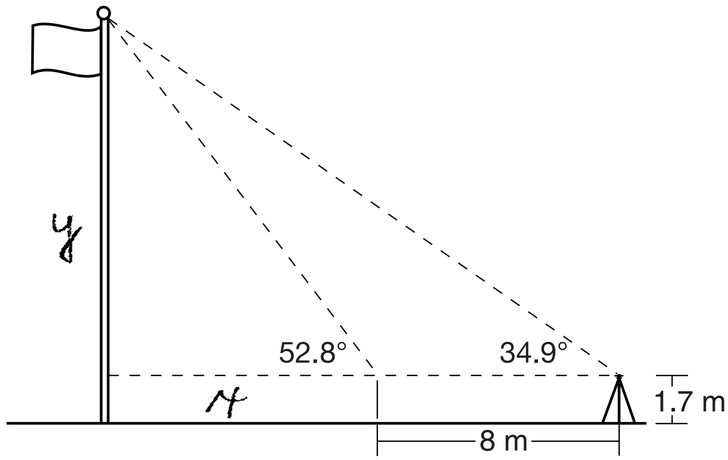
$y \tan 34.9 = x$

$\tan 52.8 = \frac{y \tan 34.9}{y-8}$

Score 3: The student wrote both trigonometric equations correctly and substituted correctly.

Question 36

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



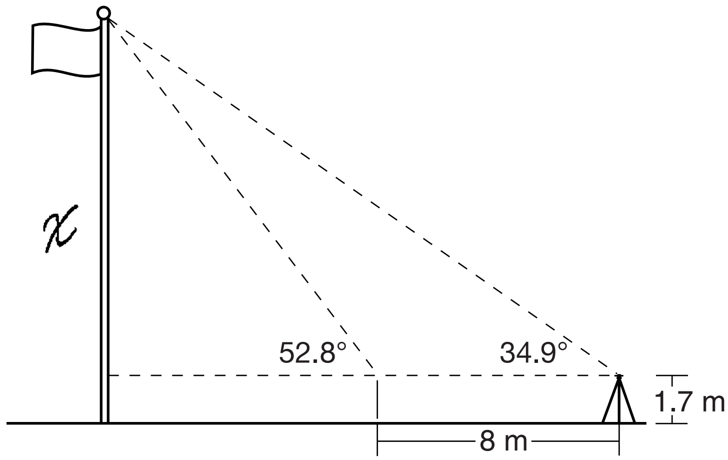
Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$\tan 52.8 = \frac{y}{x}$ $\tan 34.9 = \frac{y}{x+8}$

Score 2: The student wrote a correct system of trigonometric equations to find the height of the flagpole.

Question 36

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$\tan(34.9) = \frac{x}{16}$

$16(.69760) = \frac{x}{16} \cdot 16$

$11.1617546 = x + 1.7 = 12.8617546$

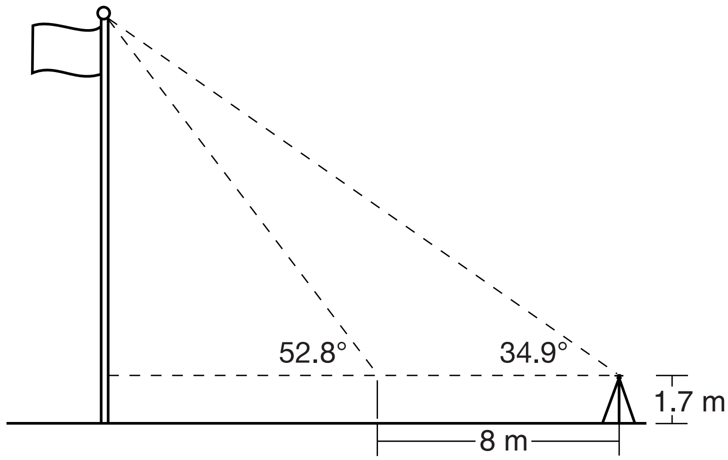
≈ 12.9

The height of the flagpole is approx. 12.9 m.

Score 1: The student made a critical error by assuming the distance between the survey instrument and the flagpole is 16 meters. This significantly reduced the level of difficulty of the question.

Question 36

36 Cathy wants to determine the height of the flagpole shown in the diagram below. She uses a survey instrument to measure the angle of elevation to the top of the flagpole, and determines it to be 34.9°. She walks 8 meters closer and determines the new measure of the angle of elevation to be 52.8°. At each measurement, the survey instrument is 1.7 meters above the ground.



Determine and state, to the *nearest tenth of a meter*, the height of the flagpole.

$8 \times 1.7 = \boxed{13.6}$

Score 0: The student found the correct answer by an obviously incorrect procedure.