The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Tuesday, June 21, 2022 — 9:15 a.m. to 12:15 p.m.

MODEL RESPONSE SET

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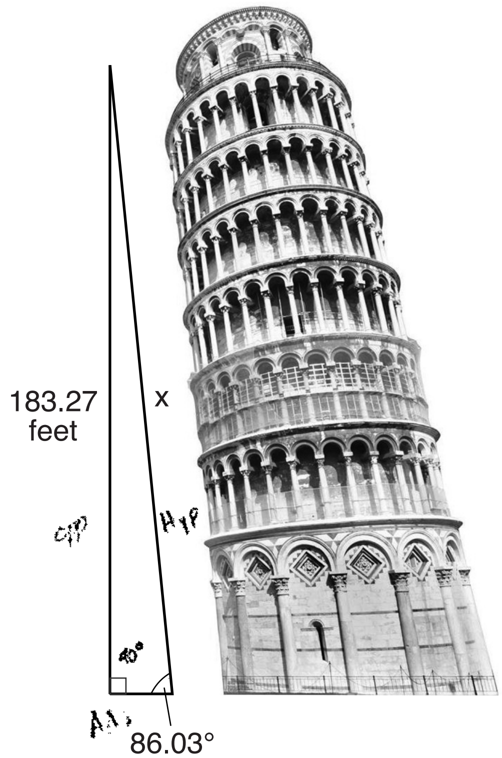
Question 25

25 The Leaning Tower of Pisa in Italy is known for its slant, which occurred after its construction began. The angle of the slant is 86.03° from the ground. The low side of the tower reaches a height of 183.27 feet from the ground.



Determine and state the slant height, x, of the low side of the tower, to the *nearest hundredth of a foot*.

$$\frac{\sin 86.03}{1} = \frac{183.27}{x}$$

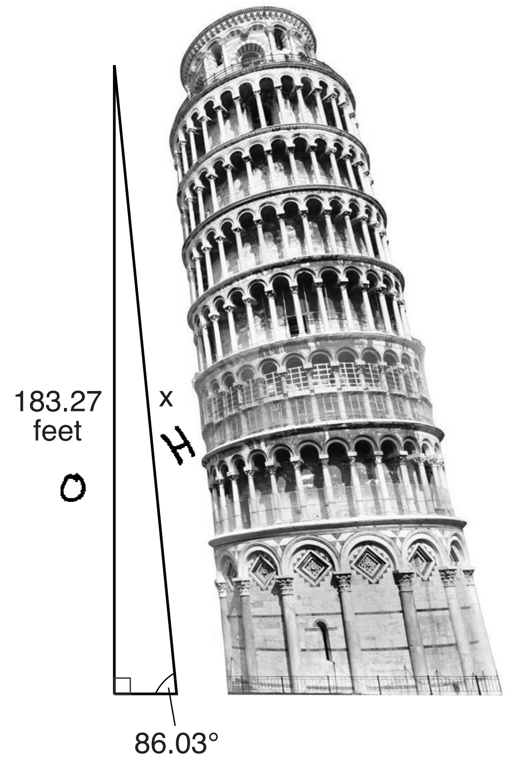
$$\frac{x \sin 86.03}{\sin 86.03} = \frac{183.27}{\sin 86.03}$$

$x = 183.71$ feet

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

Question 25

25 The Leaning Tower of Pisa in Italy is known for its slant, which occurred after its construction began. The angle of the slant is 86.03° from the ground. The low side of the tower reaches a height of 183.27 feet from the ground.



Determine and state the slant height, x, of the low side of the tower, to the *nearest hundredth of a foot*.

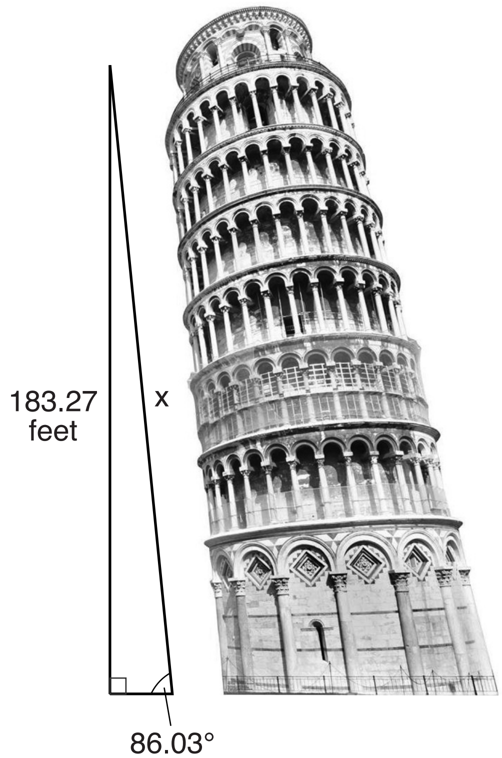
$\sin(86.03) = \frac{183.27}{x}$ O/H

$\frac{183.27}{\sin(86.03)}$

$x = 1837.711$ feet

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

25 The Leaning Tower of Pisa in Italy is known for its slant, which occurred after its construction began. The angle of the slant is 86.03° from the ground. The low side of the tower reaches a height of 183.27 feet from the ground.



Determine and state the slant height, x, of the low side of the tower, to the *nearest hundredth of a foot*.

$$\sin 86.03 = \frac{x}{183.27}$$

$$x = 183.27(\sin 86.03)$$

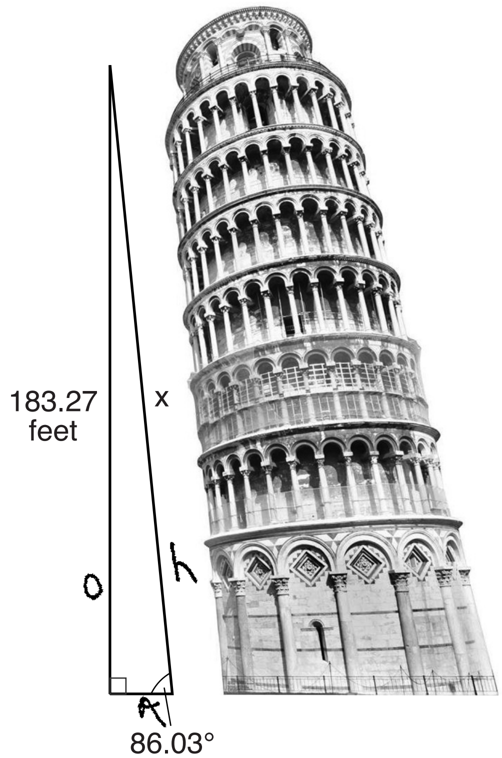
$$x = 182.83$$

Score 1: The student used an incorrect equation, but found an appropriate length.

Question 25

25 The Leaning Tower of Pisa in Italy is known for its slant, which occurred after its construction began. The angle of the slant is 86.03° from the ground. The low side of the tower reaches a height of 183.27 feet from the ground.

SOH
CAH
TOA



Determine and state the slant height, x, of the low side of the tower, to the *nearest hundredth of a foot*.

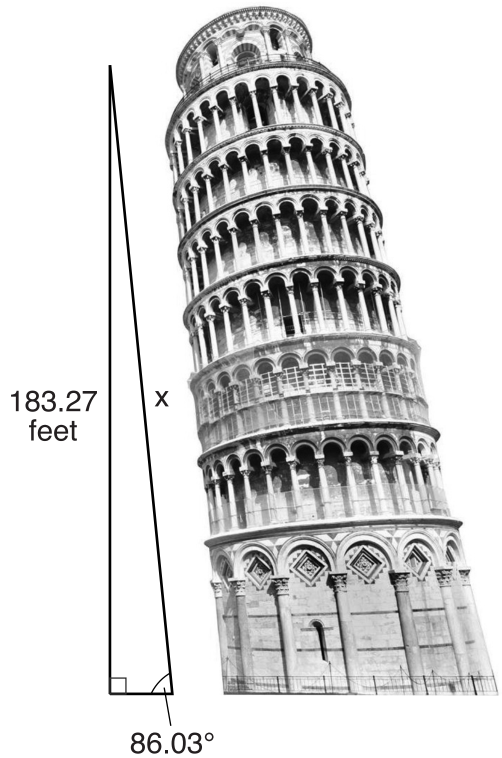
$$\frac{x \cdot \sin(86.03)}{\sin(86.03)} = \frac{183.27}{\sin(86.03}$$

$$x = 183.9$$

Score 1: The student made one rounding error.

Question 25

25 The Leaning Tower of Pisa in Italy is known for its slant, which occurred after its construction began. The angle of the slant is 86.03° from the ground. The low side of the tower reaches a height of 183.27 feet from the ground.



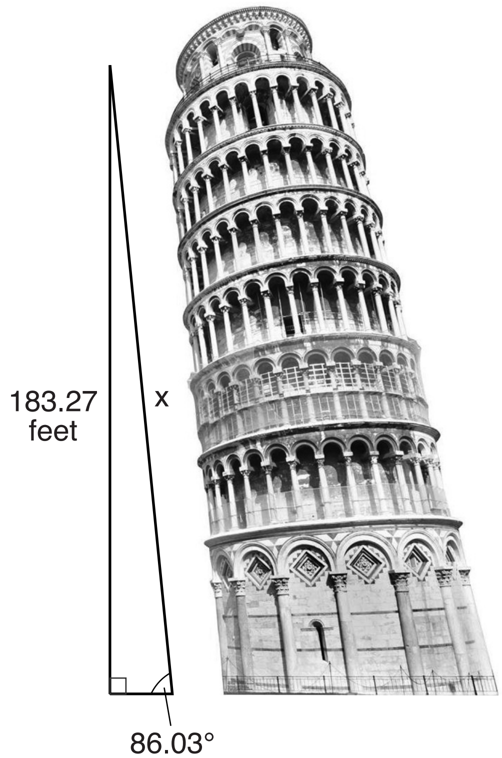
Determine and state the slant height, x, of the low side of the tower, to the *nearest hundredth of a foot*.

$\frac{183.27ct}{x} \rightarrow \frac{opp}{hyp} \rightarrow (\sin)$

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

Question 25

25 The Leaning Tower of Pisa in Italy is known for its slant, which occurred after its construction began. The angle of the slant is 86.03° from the ground. The low side of the tower reaches a height of 183.27 feet from the ground.



Determine and state the slant height, x, of the low side of the tower, to the *nearest hundredth of a foot*.

Tan = opp/adj

183.27 / 86.03

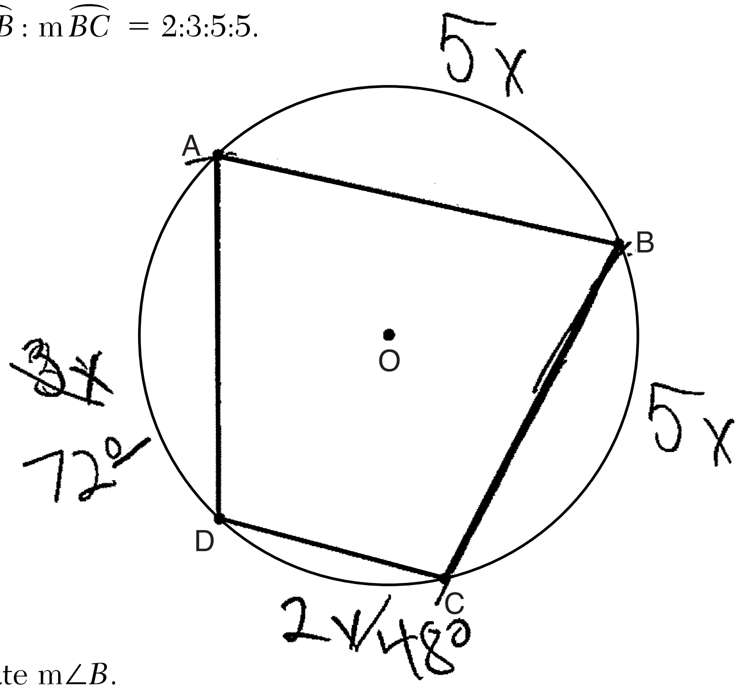
48.383

x = 48 feet

Score 0: The student gave a completely incorrect response.

Question 26

26 In the diagram below, quadrilateral *ABCD* is inscribed in circle *O*, and $m\widehat{CD} : m\widehat{DA} : m\widehat{AB} : m\widehat{BC} = 2:3:5:5$.



$15x = 360$

$\frac{15x}{15} = \frac{360}{15}$

$x = 24$

Determine and state m∠*B*.

$\widehat{AD}$ 72
$\widehat{DC}$ + 48
$\overline{120}$
$120 \div 2 = 60$

$m\angle B = \frac{1}{2}\widehat{AC}$

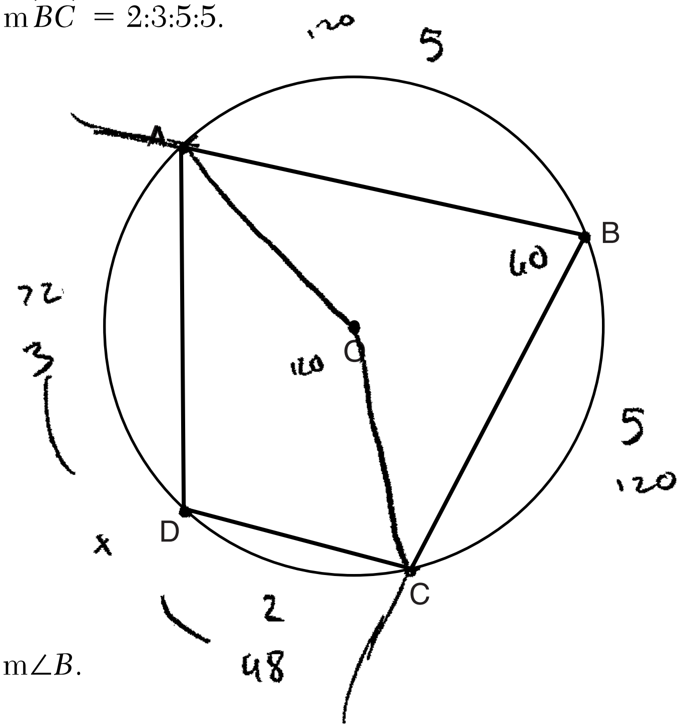
$m\angle B = 60°$

You need to find half the measure of $\widehat{AC}$ to find the measure of ∠B.

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

Question 26

26 In the diagram below, quadrilateral $ABCD$ is inscribed in circle O, and $m\widehat{CD} : m\widehat{DA} : m\widehat{AB} : m\widehat{BC} = 2{:}3{:}5{:}5$.



Determine and state m∠B.

$\angle B = 60°$

$120 \div 2 = 60$

$\frac{360}{15} = 24$

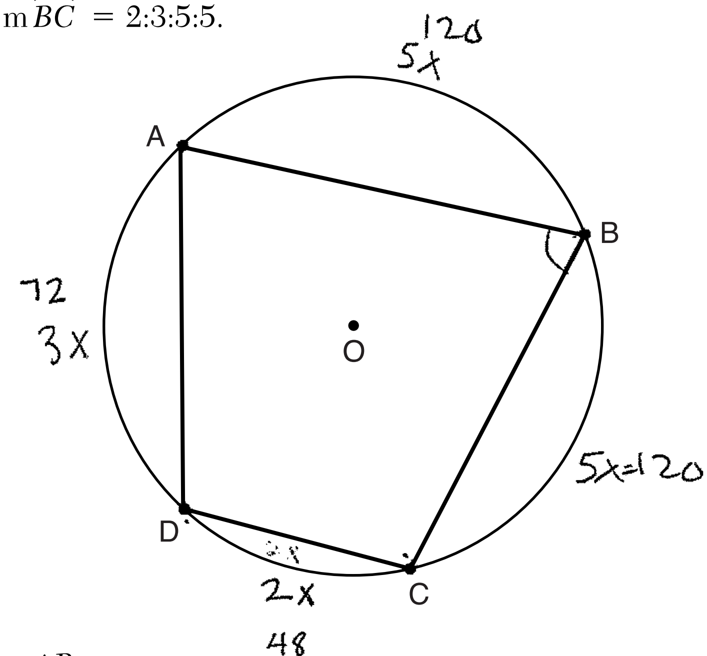
$2 : 3 : 5 : 5$

$48° : 72 : 120 : 120$

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

Question 26

26 In the diagram below, quadrilateral *ABCD* is inscribed in circle *O*, and $m\overparen{CD} : m\overparen{DA} : m\overparen{AB} : m\overparen{BC} = 2:3:5:5$.



Determine and state m∠*B*.

$3x + 5x + 5x + 2x = 360$

$15x = 360$

$\frac{15x}{15} = \frac{360}{15}$

$x = 24$

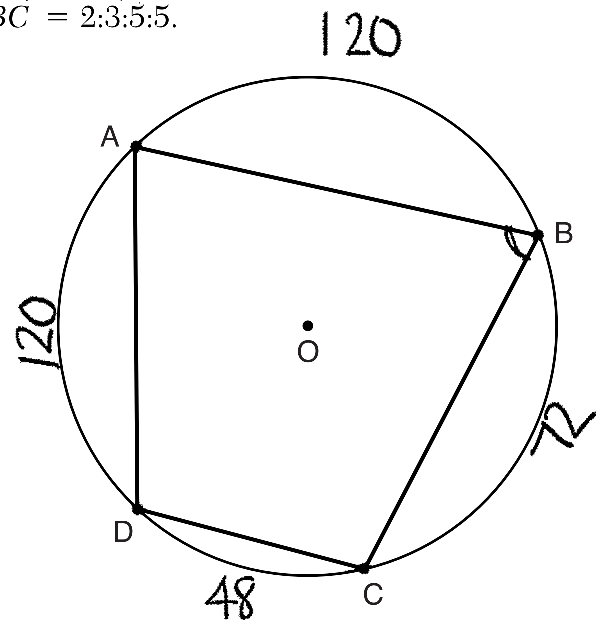
$72 - 48 = 24$

$\angle B = 24$

Score 1: The student correctly found the measure of $\overparen{DC}$ and $\overparen{AD}$.

Question 26

26 In the diagram below, quadrilateral *ABCD* is inscribed in circle *O*, and $m\overset{\frown}{CD} : m\overset{\frown}{DA} : m\overset{\frown}{AB} : m\overset{\frown}{BC} = 2:3:5:5$.



Determine and state m∠*B*.

$2x + 3x + 5x + 5x = 360$

$15x = 360$

$x = 24$

$\angle B = 84°$

$\overset{\frown}{CD}: 48$

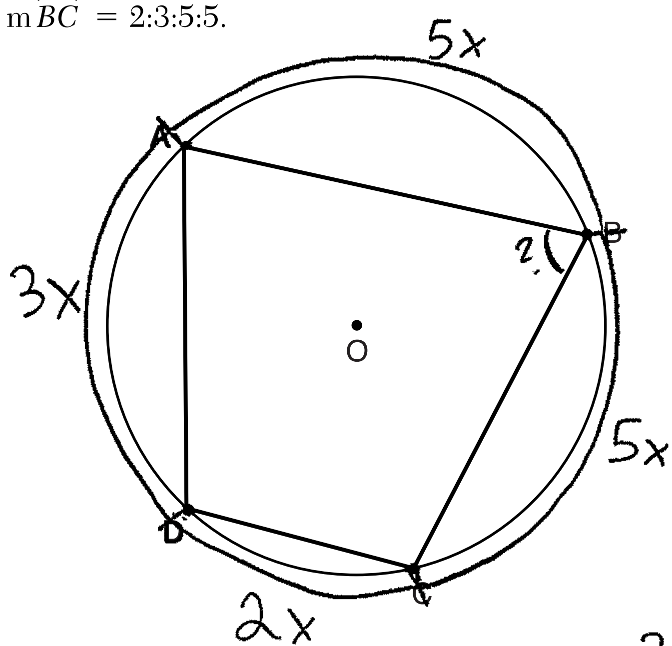
$\overset{\frown}{DA}: 72$

$\overset{\frown}{AB}: 120$

$\overline{BC}: 120$

Score 1: The student mislabeled $\overset{\frown}{AD}$ and $\overset{\frown}{BC}$ in the diagram, but found an appropriate measure for angle *B*.

26 In the diagram below, quadrilateral *ABCD* is inscribed in circle *O*, and $m\widehat{CD} : m\widehat{DA} : m\widehat{AB} : m\widehat{BC} = 2:3:5:5$.



Determine and state m∠*B*.

3

$3x+2x+5x+5x$

$15x$

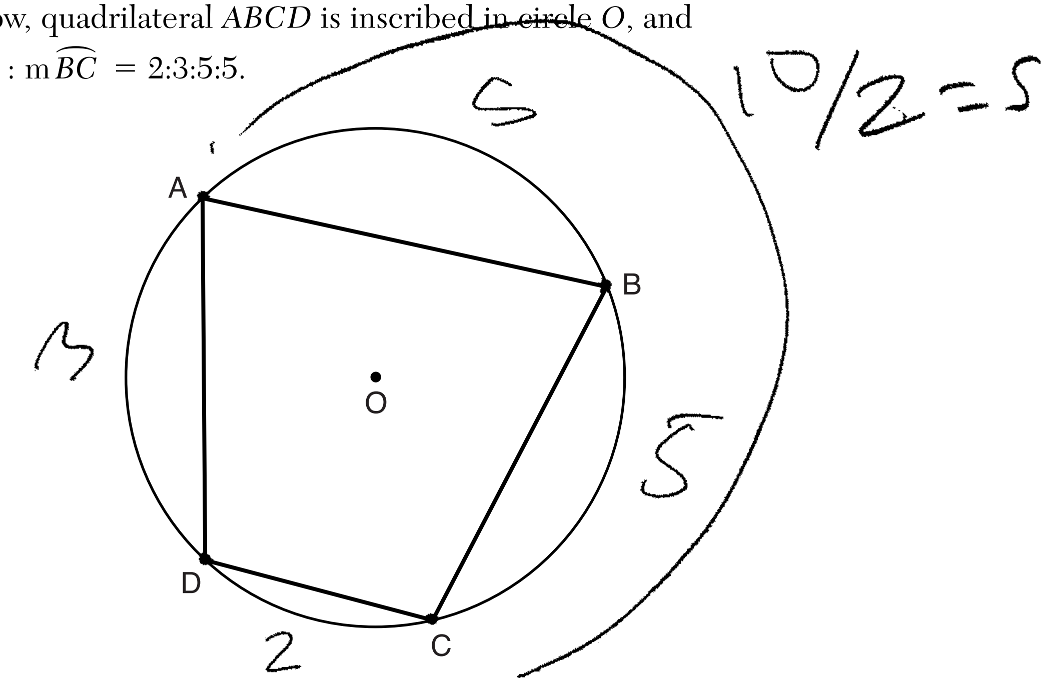
$\frac{360}{15} = \frac{15x}{15} =$

$24 = x$

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

Question 26

26 In the diagram below, quadrilateral *ABCD* is inscribed in circle *O*, and $m\widehat{CD} : m\widehat{DA} : m\widehat{AB} : m\widehat{BC} = 2{:}3{:}5{:}5$.



Determine and state m∠*B*.

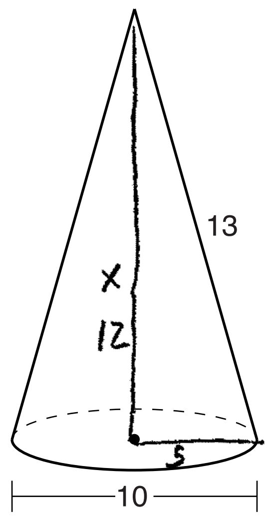
5+5 = 10/2 = 5

m∠B = 5

Score 0: The student gave a completely incorrect response.

Question 27

27 In the diagram below, a right circular cone has a diameter of 10 and a slant height of 13.



Determine and state the volume of the cone, in terms of π.

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

$V = \frac{1}{3}\pi (5)^2 (12)$

$\boxed{V = 100\pi}$

$x^2 + 5^2 = 13^2$

$-5^2 \quad -5^2$

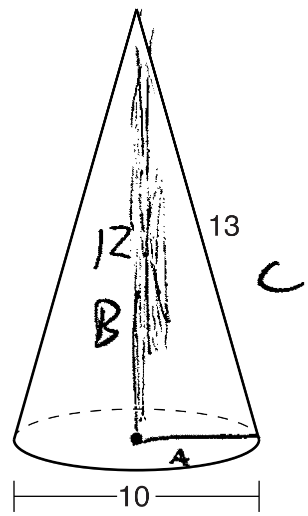
$\sqrt{x^2} = \sqrt{144}$

$x = 12$

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

Question 27

27 In the diagram below, a right circular cone has a diameter of 10 and a slant height of 13.



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

$5^2+b^2=13^2$

$25+b^2=169$

$\sqrt{144}=12$

Determine and state the volume of the cone, in terms of π.

$169-25=144$

$\sqrt{144}=$

$R=5$

$B=12$

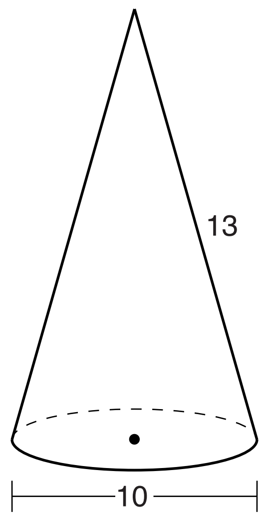
$V=\frac{1}{3}\pi r^2h$

$V=\frac{1}{3}\pi 5^2(12)$

Score 1: The student showed correct work to find the height of the cone.

Question 27

27 In the diagram below, a right circular cone has a diameter of 10 and a slant height of 13.



Determine and state the volume of the cone, in terms of π.

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

$\frac{10}{2} = 5$

$V = \frac{1}{3}\pi 5^2(13)$

$V = \frac{1}{3}\pi 25(13)$

$V = \frac{1}{3}\pi(325)$

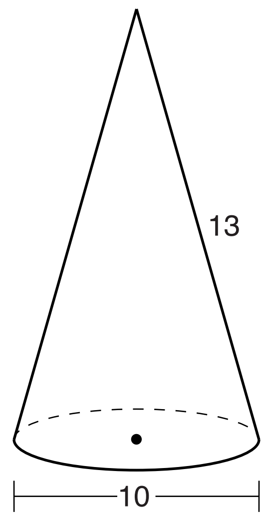
$V = 108.\overline{3}\pi$

Volume: $108.\overline{3}\pi$

Score 1: The student used the slant height, but found an appropriate volume.

Question 27

27 In the diagram below, a right circular cone has a diameter of 10 and a slant height of 13.



Determine and state the volume of the cone, in terms of π.

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

$V = \frac{1}{3}\pi(5)^2(13)$

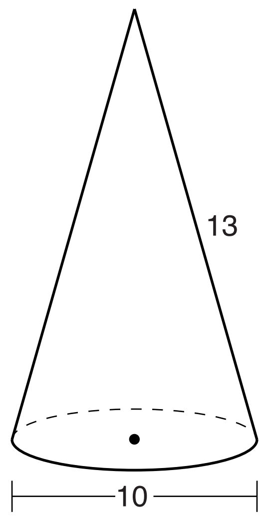
$V = \frac{1}{3}\pi\, 325$

$V = 975\pi$

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

Question 27

27 In the diagram below, a right circular cone has a diameter of 10 and a slant height of 13.



Determine and state the volume of the cone, in terms of π.

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

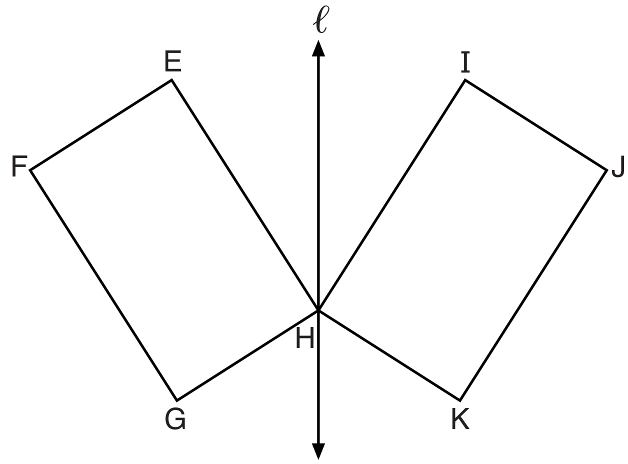
$V = \frac{1}{2}(10)\cdot(13)$

$= \boxed{65}$

Score 0: The student gave a completely incorrect response.

Question 28

28 In the diagram below, parallelogram *EFGH* is mapped onto parallelogram *IJKH* after a reflection over line ℓ.



Use the properties of rigid motions to explain why parallelogram *EFGH* is congruent to parallelogram *IJKH*.

Under a line reflection, distance is preserved and angle measure is preserved.

$\overline{EF} \cong \overline{IJ}$ $\quad \angle E \cong \angle I$

$\overline{FG} \cong \overline{JK}$ $\quad \angle F \cong \angle J$

$\overline{GH} \cong \overline{KH}$ $\quad \angle G \cong \angle K$

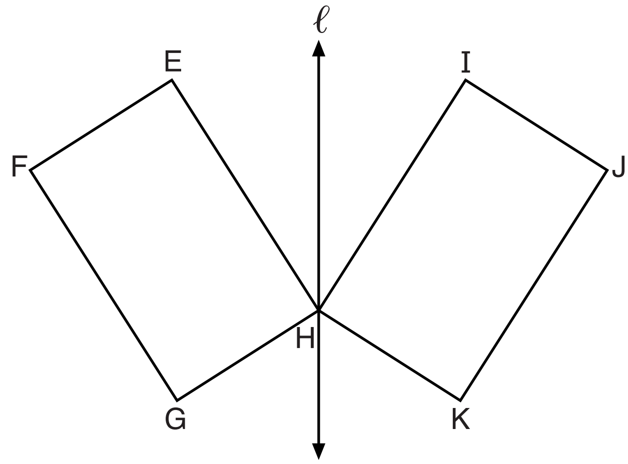
$\overline{HE} \cong \overline{HI}$ $\quad \angle H \cong \angle H$

Since all the corresponding sides and angles are $\cong$, $\square EFGH \cong \square IJKH$

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

Question 28

28 In the diagram below, parallelogram *EFGH* is mapped onto parallelogram *IJKH* after a reflection over line ℓ.



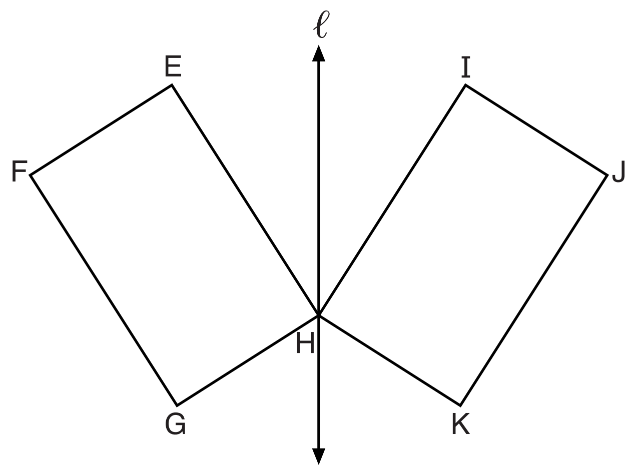
Use the properties of rigid motions to explain why parallelogram *EFGH* is congruent to parallelogram *IJKH*.

A reflection is a rigid motion and all rigid motions preserve distance and angle measure which also preserves congruence. So parallelogram EFGH is congruent to parallelogram IJKH after a line reflection.

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

Question 28

28 In the diagram below, parallelogram *EFGH* is mapped onto parallelogram *IJKH* after a reflection over line ℓ.



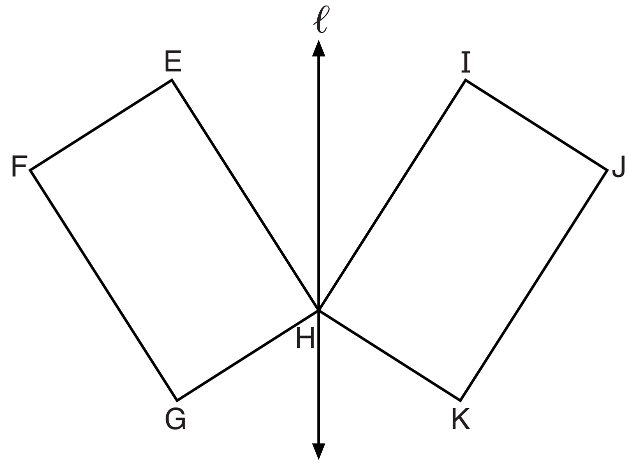
Use the properties of rigid motions to explain why parallelogram *EFGH* is congruent to parallelogram *IJKH*.

as you can see above a reflection has occured, a reflection is a rigid moton, meaning that distance is preserved, so EFGH has to be congruent to IJKH.

Score 1: The student wrote an incomplete explanation by not stating that rigid motions preserve angle measure.

Question 28

28 In the diagram below, parallelogram *EFGH* is mapped onto parallelogram *IJKH* after a reflection over line ℓ.



Use the properties of rigid motions to explain why parallelogram *EFGH* is congruent to parallelogram *IJKH*.

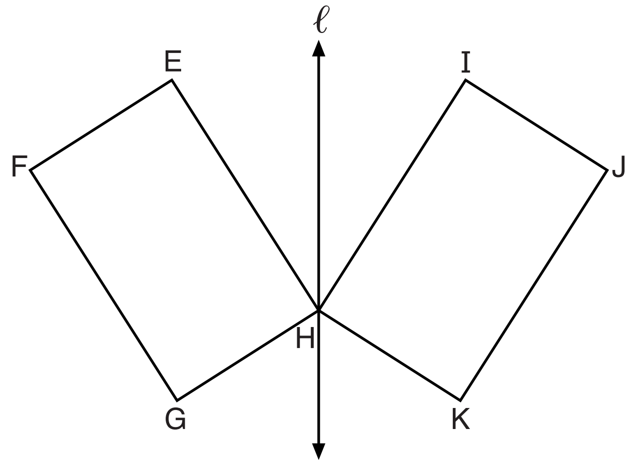
Since a rigid motion is being used here the size or numbers dont change.

The size only changes when a dilation is being used. But since this is a reflection its just mirrored to the other axis and the dimensions dont change

Score 1: The student wrote an incomplete explanation.

Question 28

28 In the diagram below, parallelogram *EFGH* is mapped onto parallelogram *IJKH* after a reflection over line ℓ.



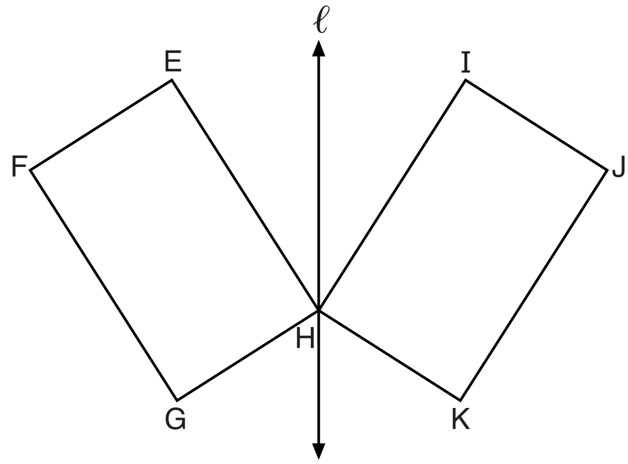
Use the properties of rigid motions to explain why parallelogram *EFGH* is congruent to parallelogram *IJKH*.

Since EFGH was reflected over line ℓ, and this didn't cause any dilations, parallelogram EFGH is congruent to parallelogram IJKH.

Score 0: The student wrote an incorrect explanation.

Question 28

28 In the diagram below, parallelogram *EFGH* is mapped onto parallelogram *IJKH* after a reflection over line ℓ.



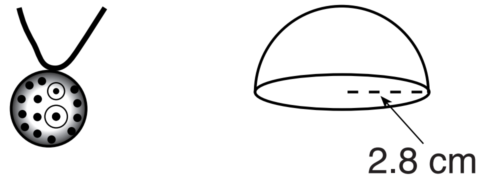
Use the properties of rigid motions to explain why parallelogram *EFGH* is congruent to parallelogram *IJKH*.

The reflective Property was used, and each of the points are the same, only opposite eachother.

Score 0: The student gave a completely incorrect response.

Question 29

29 Izzy is making homemade clay pendants in the shape of a solid hemisphere, as modeled below. Each pendant has a radius of 2.8 cm.



How much clay, to the *nearest cubic centimeter*, does Izzy need to make 100 pendants?

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

$V = \frac{2}{3}\pi (2.8)^3$

$V = \frac{2}{3}\pi (21.952)$

$V = \frac{2}{3}(68.9642)$

$V = 45.9761$

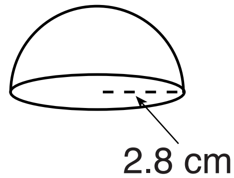
$(45.9761)100 = 4597.61$

4598 cm^3

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

Question 29

29 Izzy is making homemade clay pendants in the shape of a solid hemisphere, as modeled below. Each pendant has a radius of 2.8 cm.



How much clay, to the *nearest cubic centimeter*, does Izzy need to make 100 pendants?

$V = \frac{1}{2}\left(\frac{4}{3}\right)\pi r^3$

$V = \frac{1}{2}\left(\frac{4}{3}\right)\pi (2.8)^3 = 45.97616129\,(100)$

4598 cm^3

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

Question 29

29 Izzy is making homemade clay pendants in the shape of a solid hemisphere, as modeled below. Each pendant has a radius of 2.8 cm.

How much clay, to the *nearest cubic centimeter*, does Izzy need to make 100 pendants?

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

$V = 4/3\,\pi\,(2.8)^3/2$

$V = 91.95232/2$

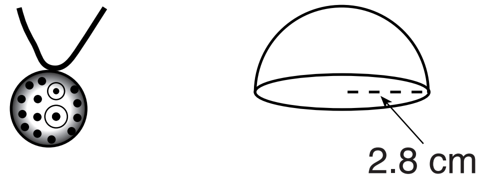
$V = 45.97616$ for 1

She needs 4,597 Cubic Centimeters of Clay to make 100 pendants.

Score 1: The student made one rounding error.

Question 29

29 Izzy is making homemade clay pendants in the shape of a solid hemisphere, as modeled below. Each pendant has a radius of 2.8 cm.



How much clay, to the *nearest cubic centimeter*, does Izzy need to make 100 pendants?

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

$V = \frac{4}{3}\pi 2.8^3$

$V = 92/2$

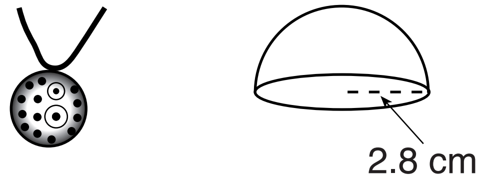
$V = 46\text{ cm}^3$

$46 \cdot 100 = 4600\text{ cm}^3$

Score 1: The student made one rounding error.

Question 29

29 Izzy is making homemade clay pendants in the shape of a solid hemisphere, as modeled below. Each pendant has a radius of 2.8 cm.



How much clay, to the *nearest cubic centimeter*, does Izzy need to make 100 pendants?

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

$V = \frac{4}{3}\pi 2.8^2$

$32.8401 \div 2 = 16.4200$

$17 * 100 = \boxed{1700}$

Score 0: The student used an incorrect volume formula (squared the radius) and made a rounding error.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle whose equation is $x^2 + y^2 + 6x = 6y + 63$.

$x^2 + 6x + \underline{9} + y^2 - 6y + \underline{9} = 63 + 9 + 9$

$(x+3)^2 + (y-3)^2 = 81$

Center = (−3,3)
Radius = 9

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle whose equation is $x^2 + y^2 + 6x = 6y + 63$.

$-6 \quad -6y$

$x^2 + y^2 + 6x - 6y = 63$

$x^2 + 6x + 9 = 63 + 9 - 3$

	x	3
x	x^2	$3x$
3	$3x$	9

	y	-3
y	y^2	$-3y$
-3	$-3y$	9

$(x+3)^2 + (y-3)^2 = 69$

$(-3, 3) =$ center

radius $= 8.3$

Score 1: The student made one error when writing minus 3 instead of plus 9 to get 69.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle whose equation is $x^2 + y^2 + 6x = 6y + 63$.

$x^2 + 6x + y^2 - 6y = 63$

$\left(\frac{b}{2}\right)^2$

$x^2 + 6x + 9 \quad y^2 - 6y + 9$

$(x+3)^2 + (y-3)^2 = 63$

coordinate of the center = $(-3, 3)$

radius = $\sqrt{63}$

Score 1: The student made an error by not adding 18 to both sides of the equation.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle whose equation is $x^2 + y^2 + 6x = 6y + 63$.

$-6y \quad -6y$

$x^2 + 6x + y^2 - 6y = 63$

$x^2 + 6x + \underline{9} + y^2 - 6y + \underline{9} = 63 + \underline{9} + \underline{9}$

$x^2 + 6x + 9 + y^2 - 6y + 9 = 81$

$(x+3)^2 + (y-3)^2 = 9$

$r = 81$

$c = (-3, 3)$

Score 1: The student made an error when determining the length of the radius.

30 Determine and state the coordinates of the center and the length of the radius of the circle whose equation is $x^2 + y^2 + 6x = 6y + 63$.

$x^2+6x+\underline{9}+y^2+6y+\underline{9}=63+\underline{9}+\underline{9}$

$x^2+6x+18+y^2+6y=81$

$-18 \qquad -18$

$x^2+6x+y^2+6y=63$

$(x+3x)(x+3x)+(y+3)(y+3)=63$

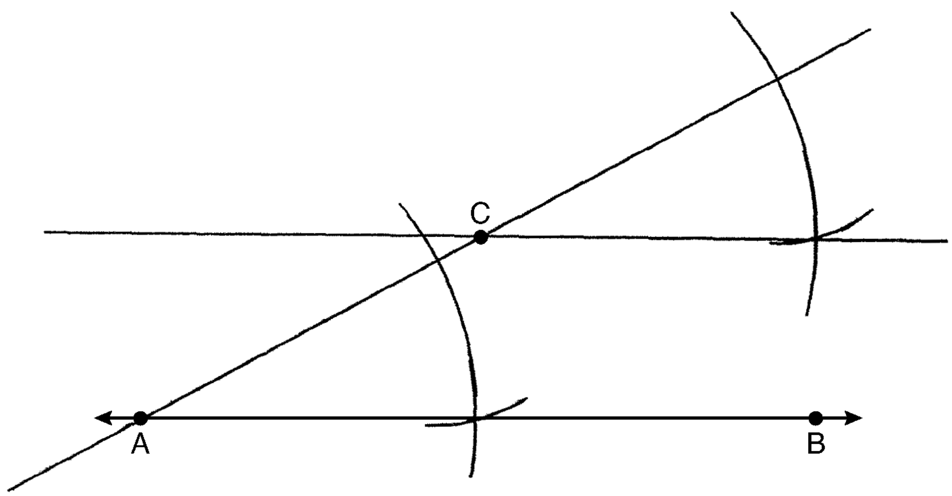
center - 3,3

radius =

Score 0: The student made multiple computational and factoring errors.

Question 31

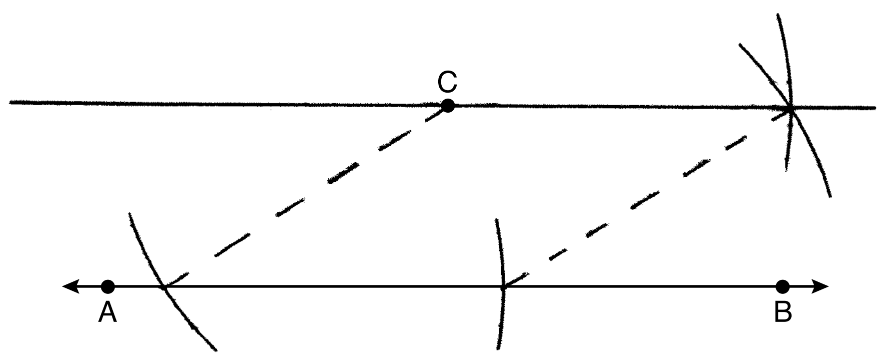
31 Use a compass and straightedge to construct a line parallel to $\overleftrightarrow{AB}$ through point C, shown below. [Leave all construction marks.]



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

Question 31

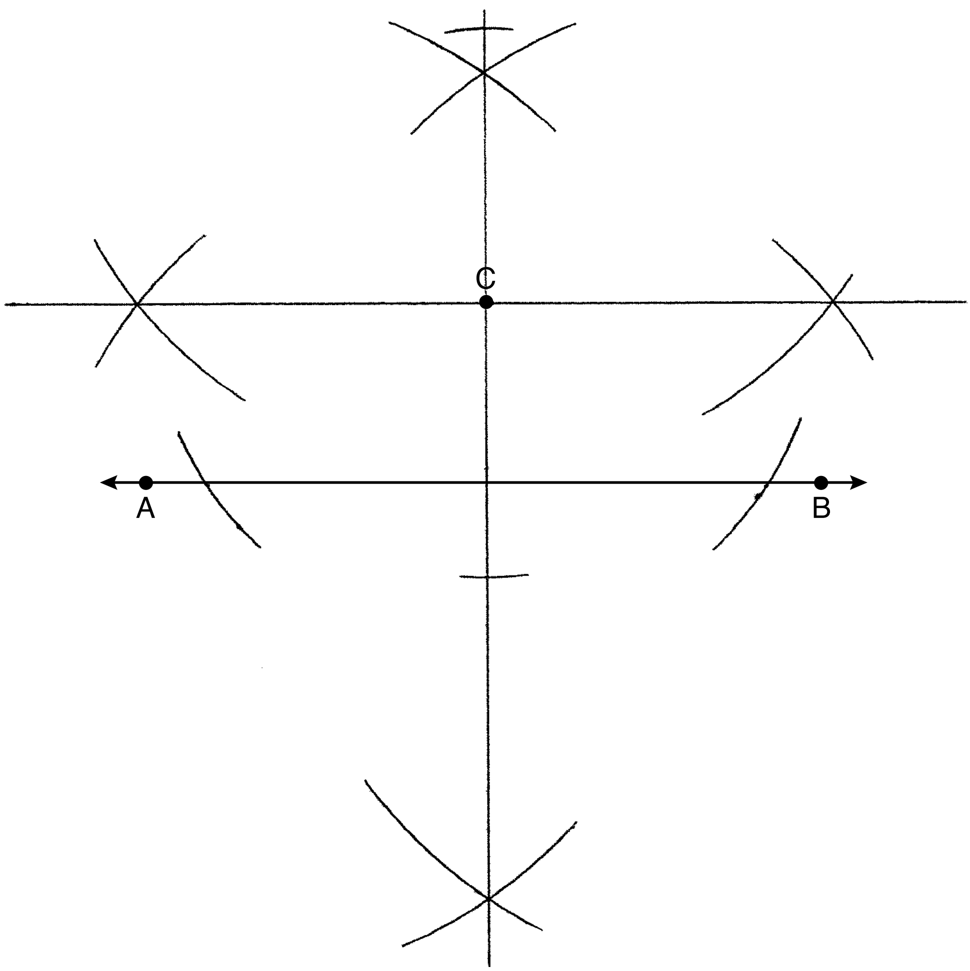
31 Use a compass and straightedge to construct a line parallel to $\overleftrightarrow{AB}$ through point C, shown below. [Leave all construction marks.]



Score 2: The student gave a complete and correct response.
(The student constructed a rhombus to construct the parallel line through C.)

Question 31

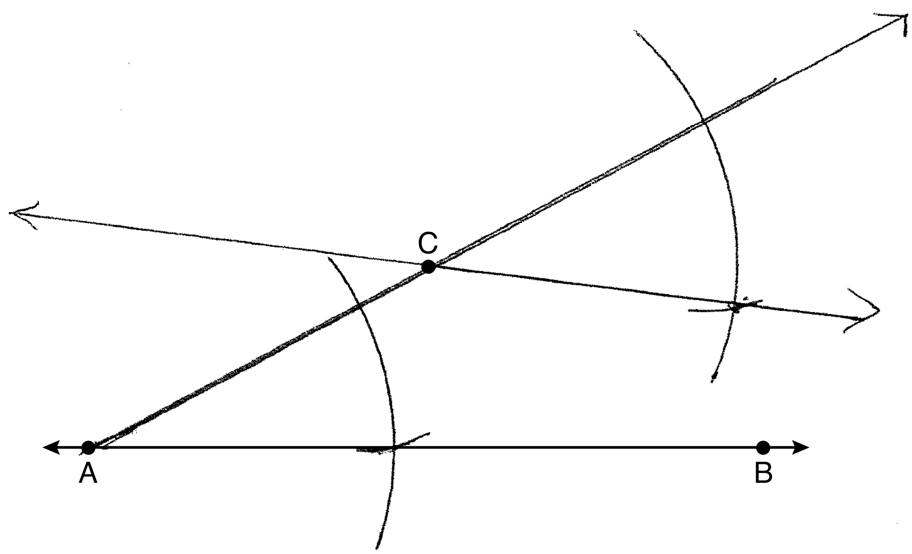
31 Use a compass and straightedge to construct a line parallel to $\overleftrightarrow{AB}$ through point C, shown below. [Leave all construction marks.]



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

Question 31

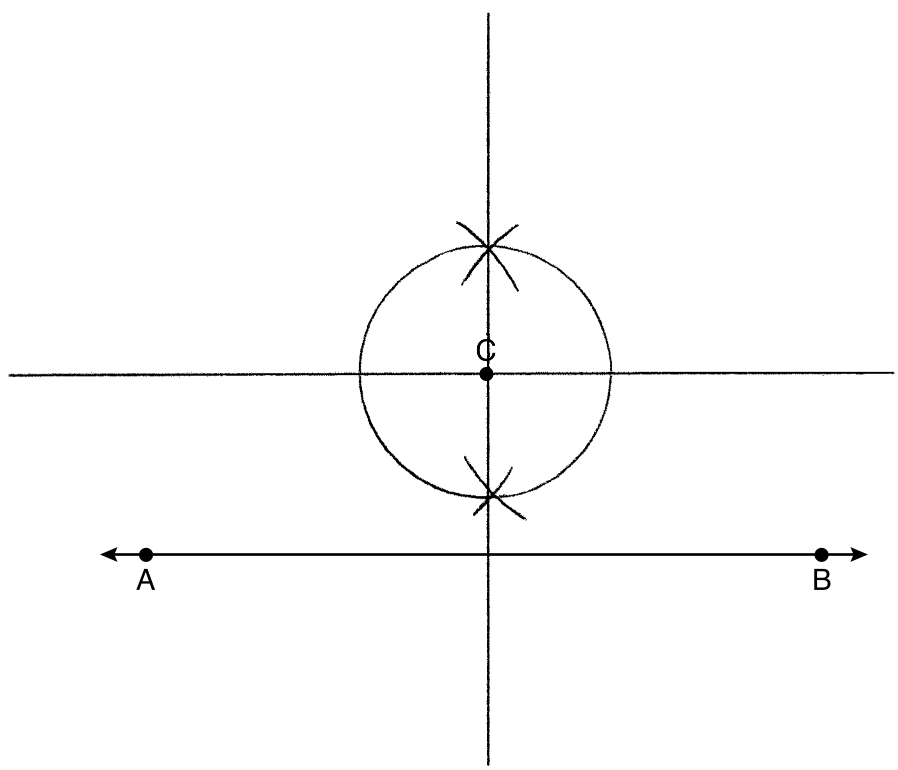
31 Use a compass and straightedge to construct a line parallel to $\overleftrightarrow{AB}$ through point C, shown below. [Leave all construction marks.]



Score 1: The student constructed corresponding angles, but they are not congruent.

Question 31

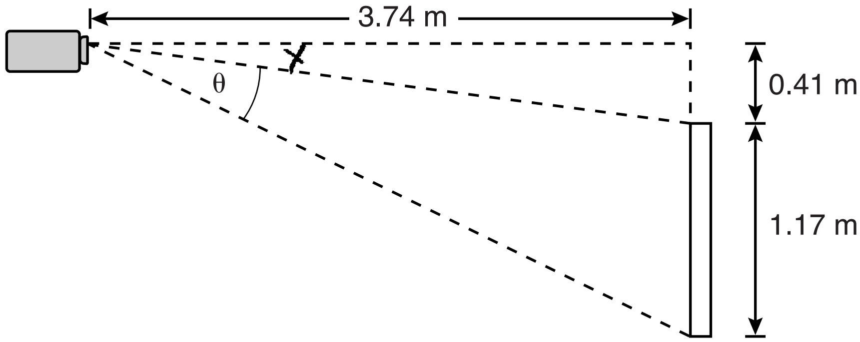
31 Use a compass and straightedge to construct a line parallel to $\overleftrightarrow{AB}$ through point C, shown below. [Leave all construction marks.]



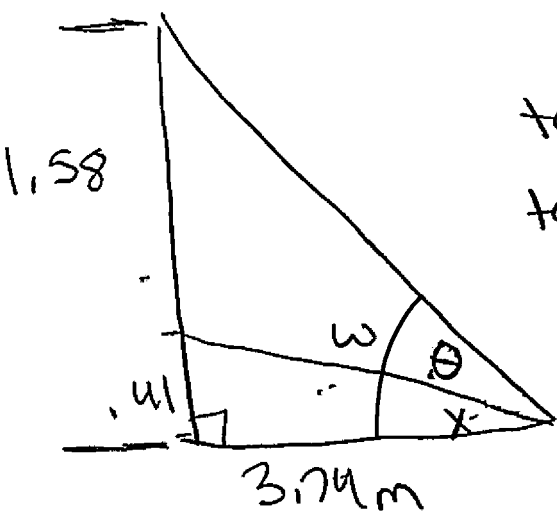
Score 0: The student gave a completely incorrect response.

Question 32

32 As modeled below, a projector mounted on a ceiling is 3.74 m from a wall, where a whiteboard is displayed. The vertical distance from the ceiling to the top of the whiteboard is 0.41 m, and the height of the whiteboard is 1.17 m.



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



$\tan(w) = \frac{1.38}{3.74}$ $w = 22.902107$

$\tan(x) = \frac{.41}{3.74}$ $x = 6.2561064$

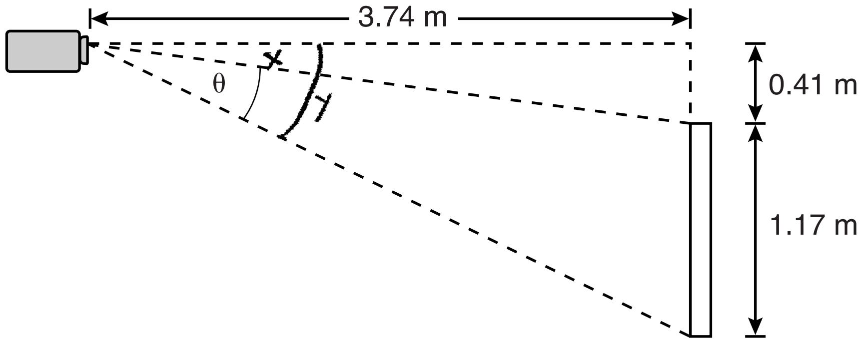
$\theta = 16.64600146$

θ $\boxed{16.6^\circ}$

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

Question 32

32 As modeled below, a projector mounted on a ceiling is 3.74 m from a wall, where a whiteboard is displayed. The vertical distance from the ceiling to the top of the whiteboard is 0.41 m, and the height of the whiteboard is 1.17 m.



$.41 + 1.17 = 1.58$

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

$\tan(x) = \frac{0.41}{3.74}$

$\tan^{-1}(.41/3.74) = 6.256106424$

$\tan(y) = \frac{1.58}{3.74}$

$\tan^{-1}(1.58/3.74) = 22.90210788$

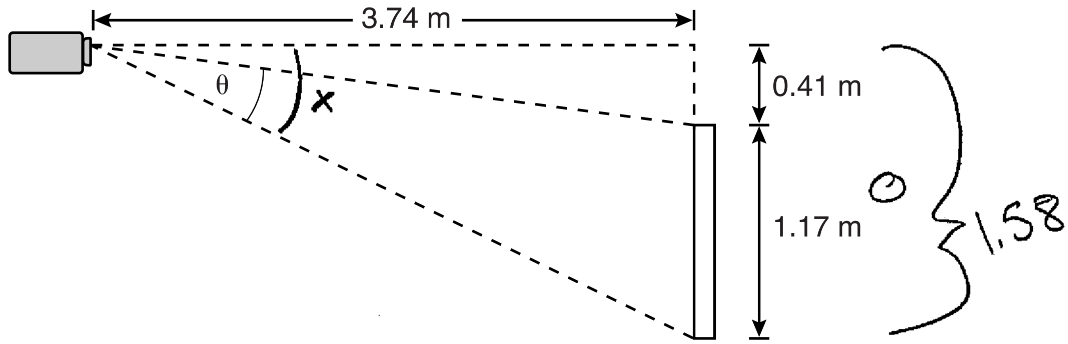
$22.90210788 - 6.256106424$

$17°$

Score 3: The student made one rounding error.

Question 32

32 As modeled below, a projector mounted on a ceiling is 3.74 m from a wall, where a whiteboard is displayed. The vertical distance from the ceiling to the top of the whiteboard is 0.41 m, and the height of the whiteboard is 1.17 m.



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

$\tan x = \frac{1.58}{3.74}$

$\tan^{-1}\left(\frac{1.58}{3.74}\right) = x$

$22.9° = x$

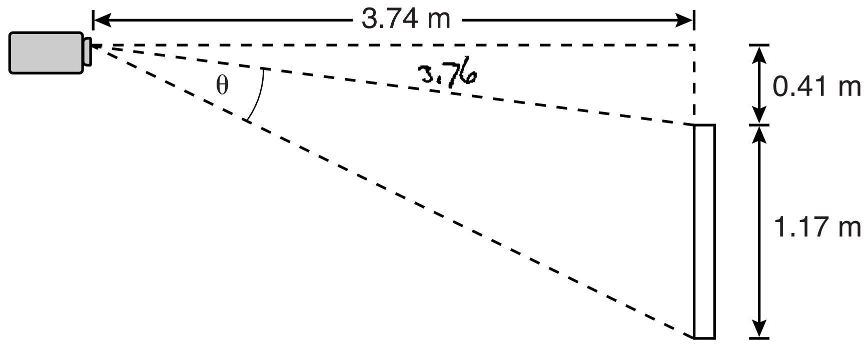
$22.9 - 0.41 = 22.49$

$\theta = 22.5°$

Score 2: The student found the larger angle of depression correctly, but no further correct work was shown.

Question 32

32 As modeled below, a projector mounted on a ceiling is 3.74 m from a wall, where a whiteboard is displayed. The vertical distance from the ceiling to the top of the whiteboard is 0.41 m, and the height of the whiteboard is 1.17 m.



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

$3.74^2 + 0.41^2 = c^2$

$\sqrt{4.1557} = \sqrt{c^2}$

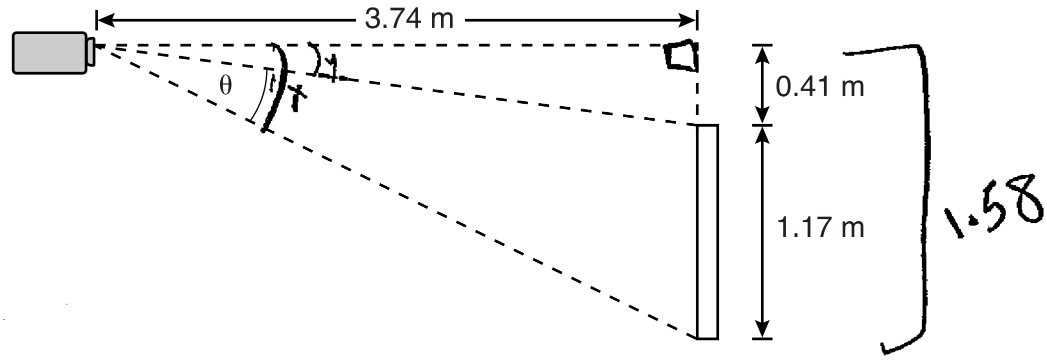
$c = 3.76$

$\tan^{-1}(1.17/3.76) = 17.3^\circ$

Score 2: The student made a conceptual error by using tangent in a non-right triangle.

Question 32

32 As modeled below, a projector mounted on a ceiling is 3.74 m from a wall, where a whiteboard is displayed. The vertical distance from the ceiling to the top of the whiteboard is 0.41 m, and the height of the whiteboard is 1.17 m.



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

$\frac{\tan x}{1} = \frac{1.58}{3.74}$

$\frac{\tan y}{1} = \frac{.41}{3.74}$

$\frac{1.58 = 75x}{75}$

$y = .002$

$x = .021$

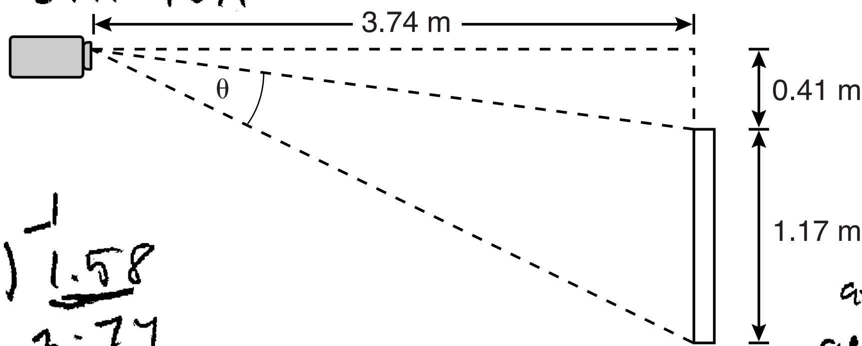
$\theta = .019$

Score 1: The student wrote two correct relevant trigonometric equations, but no further correct work was shown.

Question 32

32 As modeled below, a projector mounted on a ceiling is 3.74 m from a wall, where a whiteboard is displayed. The vertical distance from the ceiling to the top of the whiteboard is 0.41 m, and the height of the whiteboard is 1.17 m.

SOH CAH TOA adj



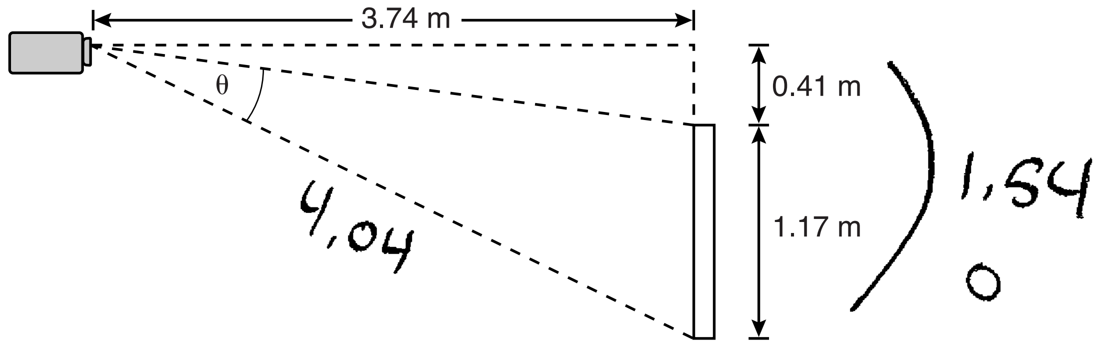
$\tan(x)^{-1} \frac{1.58}{3.74}$

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

The answer is 23°.

Score 1: The student wrote a correct relevant trigonometric equation, but made a rounding error when finding the larger angle of depression.

32 As modeled below, a projector mounted on a ceiling is 3.74 m from a wall, where a whiteboard is displayed. The vertical distance from the ceiling to the top of the whiteboard is 0.41 m, and the height of the whiteboard is 1.17 m.



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

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

$(3.74)^2+(1.54)^2=c^2$

$13.9876+2.3716=c^2$

$16.3592=c^2$

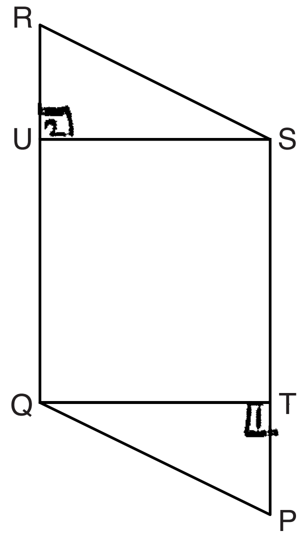
$c=4.04$

$\theta=12.11$

Score 0: The student gave a completely incorrect response.

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



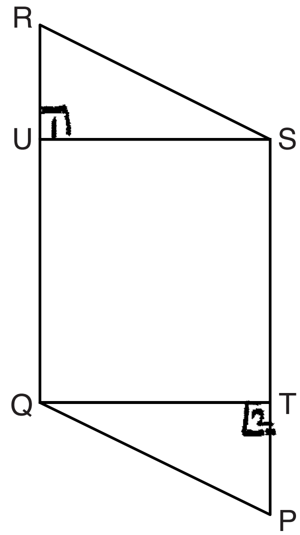
Prove: $\overline{PT} \cong \overline{RU}$

Statements	Reasons
1. Parallelogram PQRS, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$	1. Given
2. $\overline{RS} \cong \overline{QP}$	2. opposite sides of a parralelogram are ≅
3. ∠P ≅ ∠R	3. opposite ∠'s of a parralelogran are ≅
4. ∠1 and ∠2 are right ∠'s	4. def ⊥
5. ∠1 ≅ ∠2	5. all right ∠'s are ≅
6. △SUR ≅ △QTP	6. AAS ≅ AAS
7 $\overline{PT} \cong \overline{RU}$	7. CPCTC

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

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



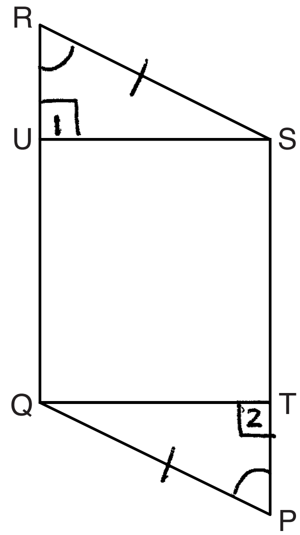
Prove: $\overline{PT} \cong \overline{RU}$

(A) $\angle R \cong \angle P$ and (S) $\overline{RS} \cong \overline{PQ}$ because parallelograms have both pairs of opposite angles and opposite sides congruent. (A) $\angle 1 \cong \angle 2$ because $\overline{QT} \perp \overline{PS}$ and $\overline{SU} \perp \overline{QR}$ and $\perp$ lines form right angles and all right angles are congruent. So, $\triangle RUS \cong \triangle PTQ$ by AAS, therefore $\overline{PT} \cong \overline{RU}$ by CPCTC.

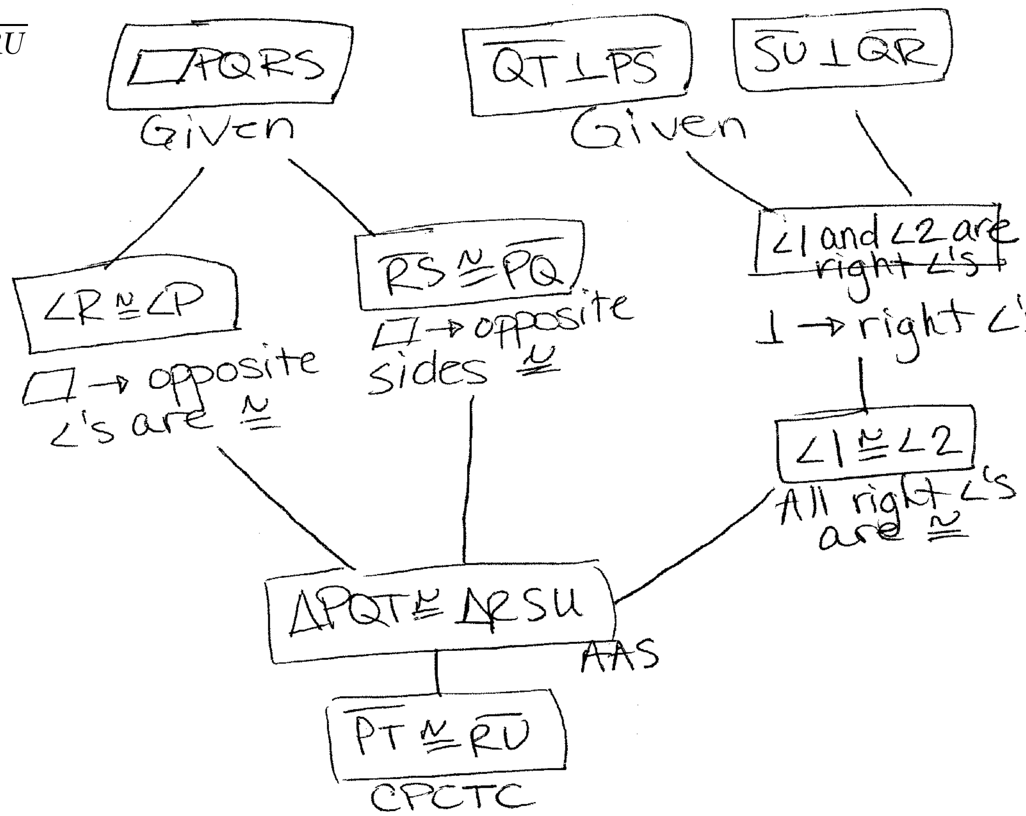
Score 4: The student gave a complete and correct response.

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



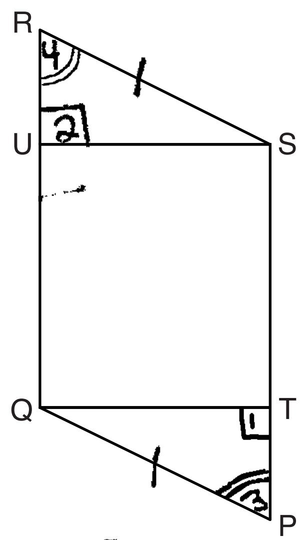
Prove: $\overline{PT} \cong \overline{RU}$



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

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



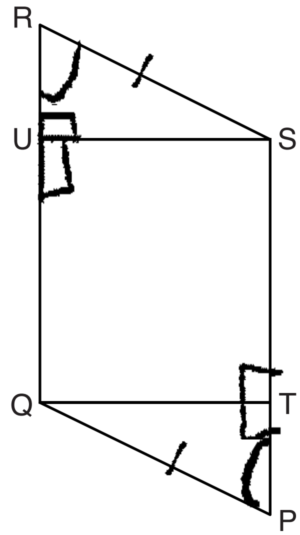
Prove: $\overline{PT} \cong \overline{RU}$

1) ▱ PQRS, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$	1) given
2) <1 and <2 are rt <s	2) def ⊥
3) <1 ≅ <2	3) all rt <s are ≅
4) <3 ≅ <4	4) ▱ has opp. <s ≅
5) $\overline{RS} \cong \overline{PQ}$	5) def ▱
6) △URS ≅ △TPQ	6) AAS
7) $\overline{PT} \cong \overline{RU}$	7) CPCTC

Score 3: The student wrote an incorrect reason in step 5.

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



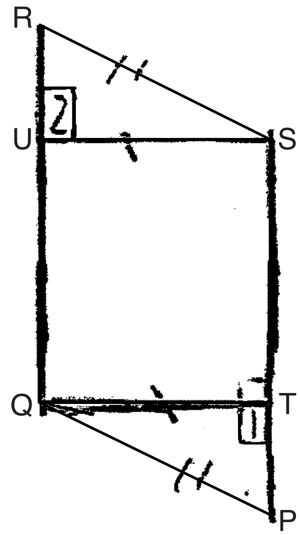
Prove: $\overline{PT} \cong \overline{RU}$

Statements	Reasons
1. Parallelogram PQRS $\overline{QT} \perp \overline{PS}$; $\overline{SU} \perp \overline{QR}$	1. Given
2. $\angle P \cong \angle R$; $\overline{RS} \cong \overline{QP}$	2. Def. of Parallelogram
3. $\angle QTP$ & $\angle SUR$ are right $\angle$'s	3. Def. of perpendicular
4. $\triangle QTP \cong \triangle SUR$	4. AAS
5. $\overline{PT} \cong \overline{RU}$	5. CPCTC

Score 2: The student wrote an incorrect reason in step 2 and did not state $\angle QTP \cong \angle SUR$.

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



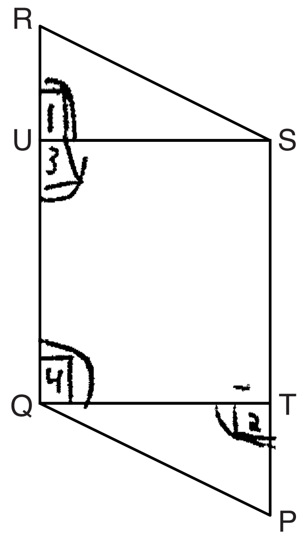
Prove: $\overline{PT} \cong \overline{RU}$

1. ▱PQRS, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$	1 Given
2. ∡1, ∡2 rt ∡'s.	2. Def ⊥
A 3. ∡1 ≅ ∡2	3. All rt ∡'s ≅
S 4. $\overline{US} \cong \overline{QT}$	4. Opp sides of a ▱ ≅
S 5. $\overline{RS} \cong \overline{PQ}$	5. Def ▱
6. △QPT ≅ △SRU	6. SAS
7. $\overline{PT} \cong \overline{RU}$	7. Parts are ≅

Score 1: The student only proved ∠1≅∠2.

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



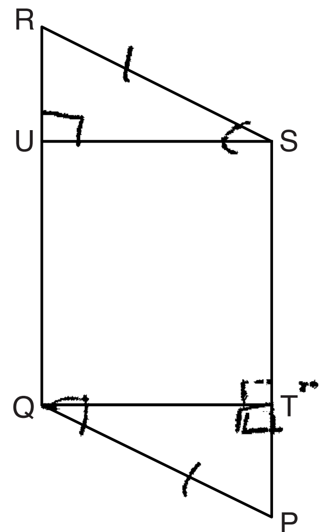
Prove: $\overline{PT} \cong \overline{RU}$

S	R
1. parallelogram PQRS $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$	1. given
2. ∠1, ∠2, ∠3, ∠4 are right angles	2. a right angle is formed when a line is drawn perpendicular to the other line
3. $\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle 4$	3. all right angles are congruent

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

Question 33

33 Given: Parallelogram $PQRS$, $\overline{QT} \perp \overline{PS}$, $\overline{SU} \perp \overline{QR}$



Prove: $\overline{PT} \cong \overline{RU}$

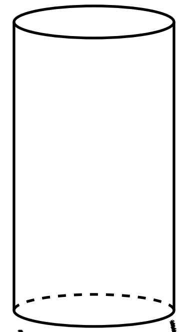
Statement	Reason
① ▱ PQRS, QT ⊥ PS, SU ⊥ QR	① Given
② ∠Q ≅ ∠S	② Corresponding ∠'s are ≅
③ $\overline{QP} \cong \overline{RS}$	③ In a ▱ all sides are congruent
④ △RUS ≅ QPT	④ ASA
⑤ $\overline{PT} \cong \overline{RU}$	⑤ CPCTC

Score 0: The student gave a completely incorrect response.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.

1 foot



4 ft

1 foot (12 inches) (6 inches) → 0.5 ft

If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi r^2 h$

$V = \pi(0.5)^2(4)$

$V = \pi$

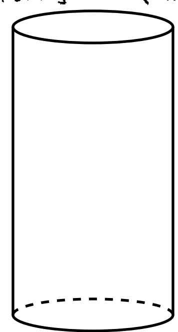
$\frac{10\pi}{(2/3)} \approx 48$

48 bags

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

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$\pi(.5)^2(4) = V$

$V \cdot 10 = 31.415$

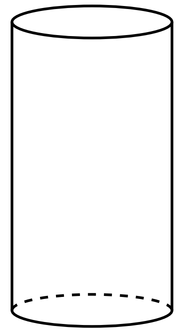
$\frac{2}{3}x = 31.415$

48

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

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi r^2 h$

$V = \pi(.5)^2(4)$

$V = \pi(.25)(4)$

$V = \pi(1)$

$V = 3.141592653 \times 10 =$

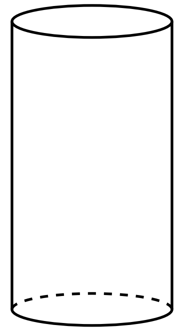
$31.41592653 \div \frac{2}{3}$

48 bags of concrete

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

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi(0.5)^2(4)$

$V = \pi(0.25)(4)$

$V = 1\pi$

$10(1\pi) = 31.41592$

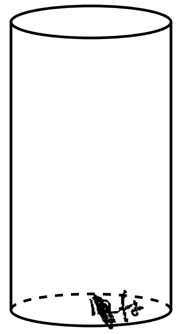
$\frac{31.41592}{2/3} = 47.12388$

47 bags

Score 3: The student incorrectly interpreted the number of bags.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi r^2 h$

$V = \pi (6)^2 (48)$

$V = \pi (36) 48$

$V = \frac{1728\pi}{12}$

$V = 144\pi$

$V = 452.3893421 \times 10$

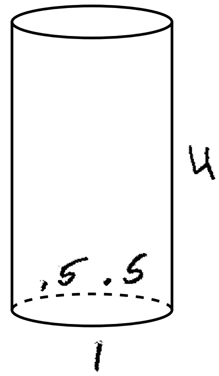
$= \frac{4523.893421}{.6}$

10 foots need = 6786 bags of concrete

Score 3: The student made a conversion error when converting from cubic inches to cubic feet.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi r^2 h$

$V = \pi .5^2 \cdot 4$

$V = 3.141592654$

$3.141592654 \times 10 = 31.41592654$

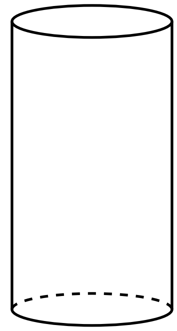
$31.41592654 \times \frac{2}{3}$

21 bags

Score 3: The student made an error by multiplying by $\frac{2}{3}$.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi(6)^2(4)$

$V = \pi(144)$

$V = 452.3893421$

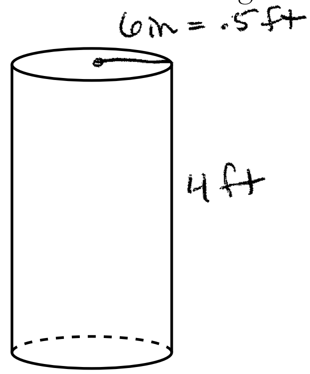
$\frac{452.3893421}{\frac{2}{3}} = 678.6$

679

Score 2: The student did not convert and did not find the volume of 10 footings.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi(.5)^2(4)$

$V = 1\pi$ 1 footing

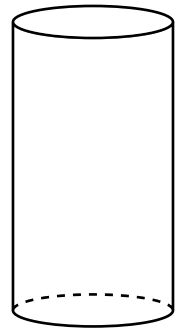
10 footing = 10π

$10\pi\left(\frac{2}{3}\right) = 20.94395102$

Score 2: The student found the volume of ten footings, but no further correct work was shown.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = Bh$

$V = \pi(12^2)48$

$V = \frac{21714.68842 \text{ in}^3}{1} = \frac{? \text{ ft}^3}{}$

$V = \pi r^2 h$

$V = \pi(6)^2(48)$

$= \frac{5428.672105 \text{ in}^3}{1728} = 3.14592654 \text{ ft}$

$3.14592654 \cdot \frac{2}{3} = (2.094395)10 =$

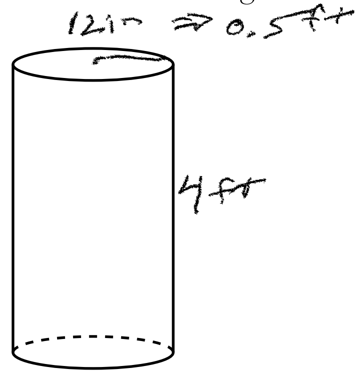
20.9439

$\approx$ **29 bags**

Score 2: The student made 2 errors in calculating the number of bags of concrete.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

footings will be $(0.5)^2 \times (4)\pi = 3.141592$

$\frac{2}{3} \times 3.141592$

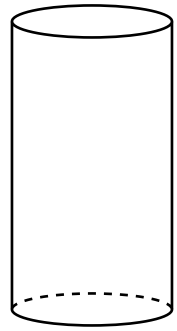
2.09439

2 bags

Score 1: The student found the volume of one footing, but no further correct work is shown.

Question 34

34 A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings.



If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$V = \pi r^2 h$

$V = \pi (6)^2 (4)$

$V = \pi\ 36\ (4$

$V = \pi\ 144$

$V = 452.3893421 * .5 = 226.1946711$

$\frac{x}{10}$

Score 0: The student gave a completely incorrect response.

Question 35

35 The coordinates of the vertices of $\triangle ABC$ are $A(-2,4)$, $B(-7,-1)$, and $C(-3,-3)$.

Prove that $\triangle ABC$ is isosceles.

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

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

$AB = \sqrt{25+25}$

$AB = \sqrt{50}$

$AC = \sqrt{(-2--3)^2+(4--3)^2}$

$AC = \sqrt{1+49}$

$AC = \sqrt{50}$

Since $\triangle ABC$ has two equal side lengths then $\triangle ABC$ is isosceles.

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

+5 −5

$A(-2,4) \longrightarrow A'(3,-1)$

$B(-7,-1) \longrightarrow B'(-2,-6)$

$C(-3,-3) \longrightarrow C'(2,-8)$

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

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus. $A(-2,4)$, $A'(3,-1)$, $C'(2,-8)$, $C(-3,-3)$
[The use of the set of axes below is optional.]

$AC = \sqrt{50}$

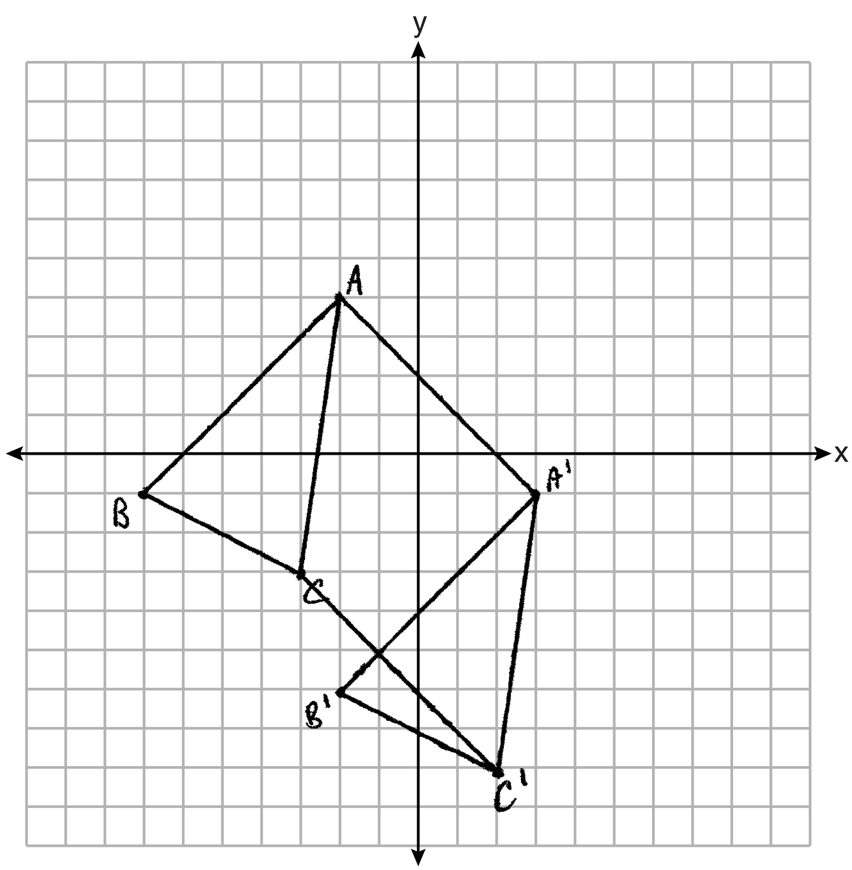
$A'C' = \sqrt{50}$ since rigid motions preserve side length

$AA' = \sqrt{(3-{}^-2)^2+(-1-4)^2}$ $CC' = \sqrt{(2-{}^-3)^2+({}^-8-{}^-3)^2}$

$AA' = \sqrt{25+25}$ $CC' = \sqrt{25+25}$

$AA' = \sqrt{50}$ $CC' = \sqrt{50}$

Since all 4 sides of Quad ~~the~~ $AA'C'C$ are equal then $AA'C'C$ is a rhombus



Question 35

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Prove that $\triangle ABC$ is isosceles.

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

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

$d_{\overline{AB}}$: $5^2+5^2=x^2$

$\sqrt{50}=\sqrt{x^2}$

$d_{\overline{AB}}=\sqrt{50}$

$d_{\overline{AC}}$: $7^2+1^2=x^2$

$\sqrt{50}=\sqrt{x^2}$

$d_{\overline{AC}}=\sqrt{50}$

$\triangle ABC$ is isosceles because it has 2 $\cong$ sides. $\overline{AB}\cong\overline{AC}$, $d=\sqrt{50}$

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

A' (3, -1)

B' (-2, -6)

C' (2, -8)

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

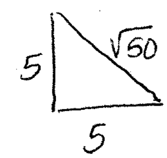
Question 35 continued

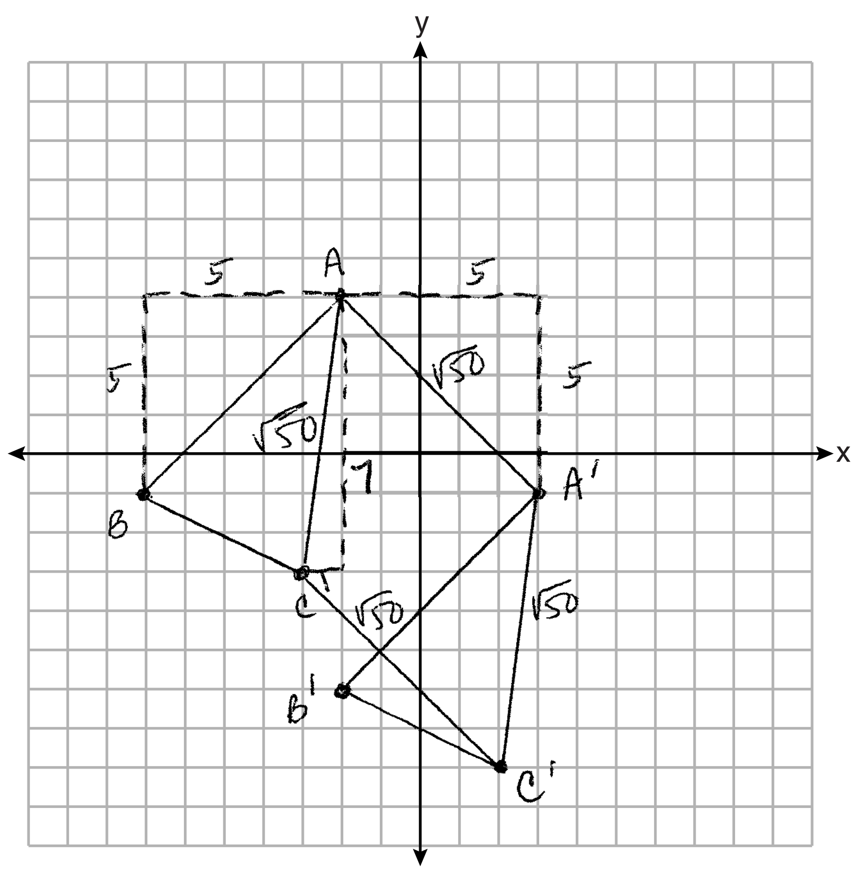
Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

- $AC = \sqrt{50}$, so its image $A'C' = \sqrt{50}$ because translations preserve distance.

- Point A is translated down 5 and right 5, so its distance from A to A' must be $\sqrt{50}$. Under the same translation, the same is true for C to $C' = \sqrt{50}$.

Therefore, all 4 sides $= \sqrt{50}$. AA'C'C is a rhombus





Question 35

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Prove that $\triangle ABC$ is isosceles.

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

$AB = \sqrt{(-7-(-2))^2+(-1-4)^2}$
$= \sqrt{(-5)^2+(-5)^2}$
$= \sqrt{25+25}$
$AB = \sqrt{50}$

$BC = \sqrt{(-3-(-7))^2+(-3-(-1))^2}$
$= \sqrt{4^2+(-2)^2}$
$= \sqrt{16+4}$
$BC = \sqrt{20}$

$AC = \sqrt{(-3-(-2))^2+(-3-4)^2}$
$= \sqrt{(-1)^2+(-7)^2}$
$= \sqrt{1+49}$
$AC = \sqrt{50}$

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

Since 2 sides of $\triangle ABC$ are $\cong$, it is isosceles

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

$T_{5,-5}$

$A(-2,4) \rightarrow A'(3,-1)$
$B(-7,-1) \rightarrow B'(-2,-6)$
$C(-3,-3) \rightarrow C'(2,-8)$

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

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

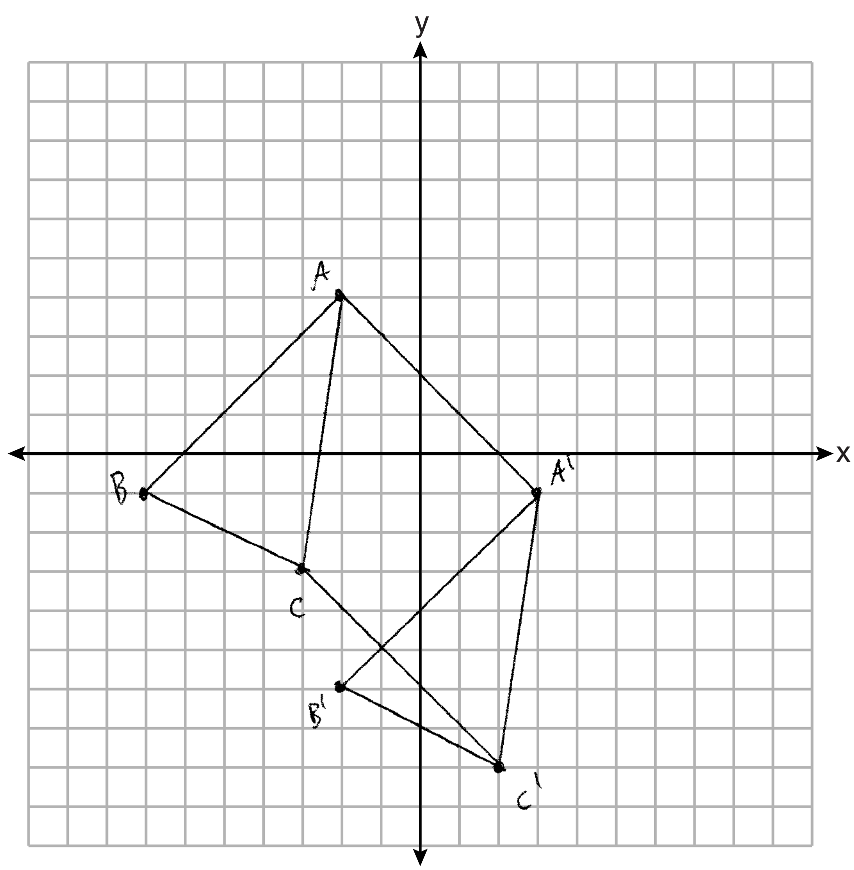
$AC = \sqrt{50}$

$AA' = \sqrt{(3-(-2))^2 + (-1-4)^2}$
$= \sqrt{5^2 + (-5)^2}$
$= \sqrt{25+25}$
$AA' = \sqrt{50}$

$A'C' = \sqrt{(3-2)^2 + (-1-(-8))^2}$
$= \sqrt{1^2 + 7^2}$
$= \sqrt{1+49}$
$A'C' = \sqrt{50}$

$CC' = \sqrt{(2-(-3))^2 + (-8-(-3))^2}$
$= \sqrt{5^2 + (-5)^2}$
$= \sqrt{25+25}$
$CC' = \sqrt{50}$

Since all 4 sides of quad AA'C'C are ≅, it is a rhombus



Question 35

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Prove that $\triangle ABC$ is isosceles.

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

$AB = \sqrt{(-7-(-2))^2 + (-1-4)^2}$
$= \sqrt{(-5)^2 + (-5)^2}$
$= \sqrt{25 + 25}$
$= \sqrt{50}$

$AC = \sqrt{(-3-(-2))^2 + (-3-4)^2}$
$= \sqrt{(-1)^2 + (-7)^2}$
$= \sqrt{1 + 49}$
$= \sqrt{50}$

$\overline{AB} \cong \overline{AC}$ since 2 sides of $\triangle ABC$ are $\cong$, it is isosceles.

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

$T_{5,-5}$

$A(-2,4) \longrightarrow A'(3,-1)$
$B(-7,-1) \longrightarrow B'(-2,-6)$
$C(-3,-3) \longrightarrow C'(2,-8)$

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

Question 35

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

Midpoint $\overline{AC'} = \left(\frac{-2+2}{2}, \frac{4+(-8)}{2}\right)$
$= \left(\frac{0}{2}, \frac{-4}{2}\right)$
$= (0,-2)$

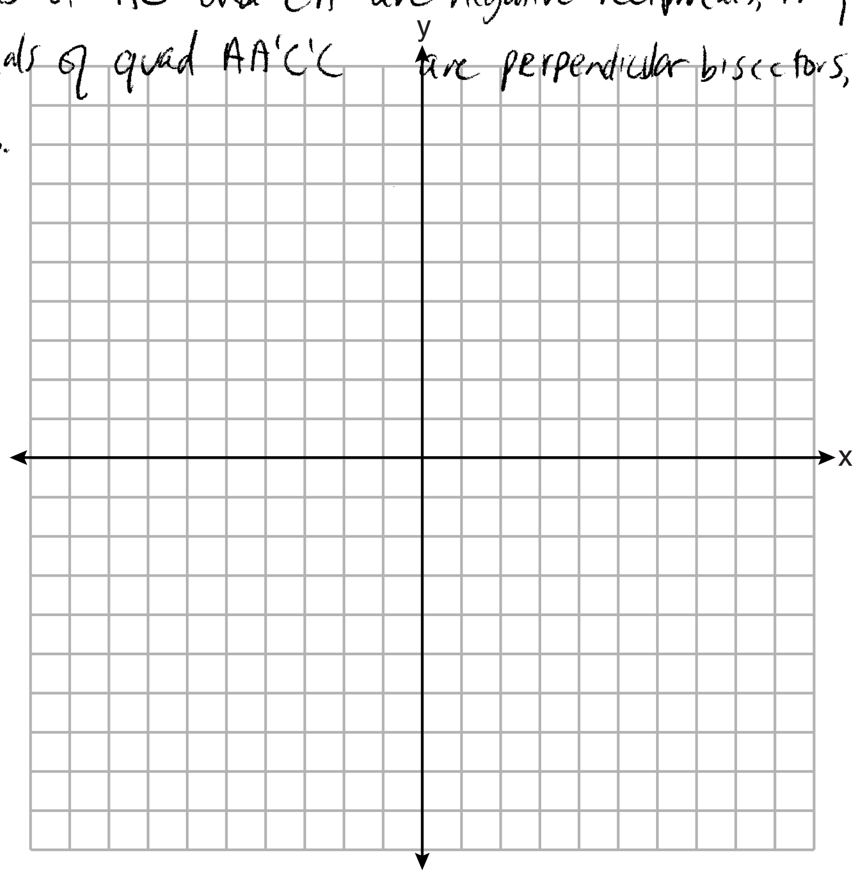
Midpoint $\overline{CA'} = \left(\frac{-3+3}{2}, \frac{-3+(-1)}{2}\right)$
$= \left(\frac{0}{2}, \frac{-4}{2}\right)$
$= (0,-2)$

Since diagonals $\overline{AC'}$ and $\overline{CA'}$ have the same midpoint, they bisect each other.

Slope $\overline{AC'} = \frac{4-(-8)}{-2-2} = \frac{12}{-4} = \frac{-3}{1}$

Slope $\overline{CA'} = \frac{-1-(-3)}{3-(-3)} = \frac{2}{6} = \frac{1}{3}$

Since the slopes of $\overline{AC'}$ and $\overline{CA'}$ are negative reciprocals, they are perpendicular. Since the diagonals of quad AA'C'C are perpendicular bisectors, quad AA'C'C is a rhombus.



Question 35

35 The coordinates of the vertices of $\triangle ABC$ are $A(-2,4)$, $B(-7,-1)$, and $C(-3,-3)$.

Prove that $\triangle ABC$ is isosceles.

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

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

$\sqrt{(-5)^2 + (-5)^2}$

$\sqrt{25+25}$

$\sqrt{50}$

$\overline{BC} = \sqrt{(-3+2)^2 + (-3-4)^2}$

$\sqrt{1+49}$

$\sqrt{50}$

$\overline{AB}$ and $\overline{BC}$ are congruent, therefore making $\triangle ABC$ isosceles because a $\triangle$ with at least two congruent side is a isosceles triangle

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

$A'(3,-1)$

$B'(-2,-6)$

$C'(2,-8)$

Score 5: The student's concluding statement of "all sides congruent" doesn't match the work of showing that two consecutive sides are congruent.

Question 35

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

$A(-2,4)$ $C'(2,-8)$
$A'(3,-1)$ $C(-3,-3)$

$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$

$AA' = \frac{-1-4}{3+2} = \frac{-5}{5} = \frac{-1}{1}$

$CC' = \frac{-3+8}{-3-2} = \frac{5}{-5} = \frac{-1}{1}$

∥

$AC = \frac{-3-4}{-3+2} = \frac{-7}{-1} = \frac{7}{1}$

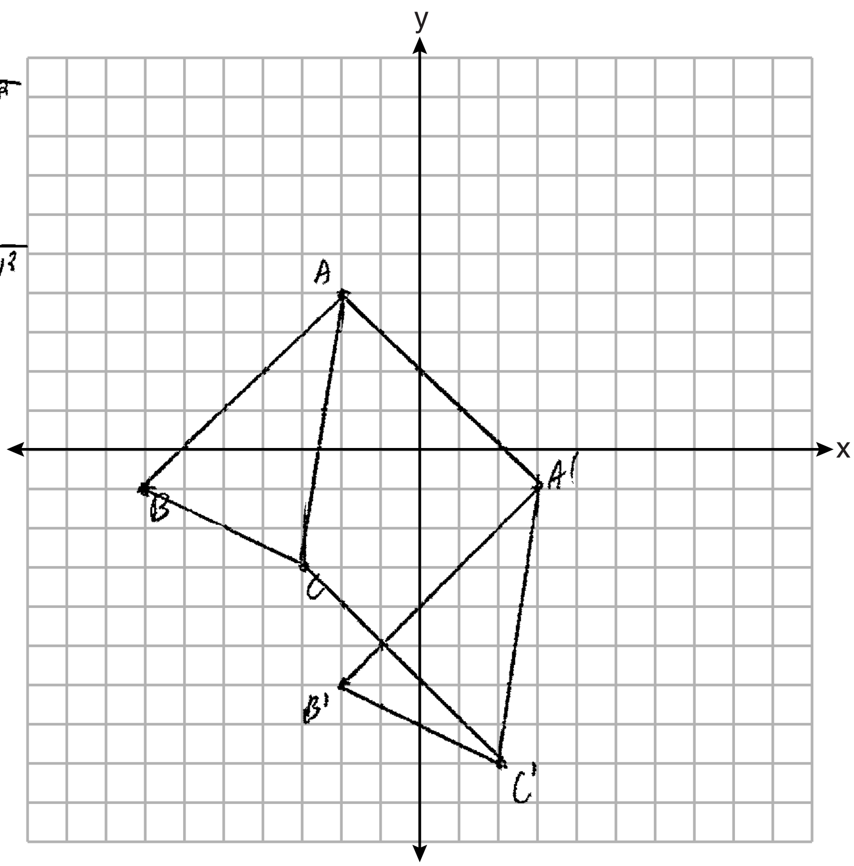
$A'C' = \frac{-8+1}{2-3} = \frac{-7}{-1} = \frac{7}{1}$

∥ → ▱

$AA'C'C$ is a rhombus because opposite sides are parallel to each other and all sides are congruent to each other.

$AA' \sqrt{(-1-4)^2+(3+2)^2}$
$\sqrt{50}$

$AC \sqrt{(-3-4)^2+(-3+2)^2}$
$\sqrt{50}$



Question 35

35 The coordinates of the vertices of $\triangle ABC$ are $A(-2,4)$, $B(-7,-1)$, and $C(-3,-3)$.

Prove that $\triangle ABC$ is isosceles.

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

$\triangle ABC$ is isosceles because sides $\overline{BA}$ and $\overline{AC}$ are $\cong$

$\overline{BA}$

$B(-7,-1)\ A(-2,4)$

$x_1\ y_1\ x_2\ y_2$

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

$d\sqrt{5^2+5^2}$

$d\sqrt{50}$

$d=\sqrt{25}\sqrt{2}$

$d=5\sqrt{2}$

$\overline{AC}$

$A(-2,4)\ C(-3,-3)$

$x_1\ y_1\ x_2\ y_2$

$d\sqrt{(-3+2)^2+(-3-4)^2}$

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

$d=\sqrt{50}$

$d=5\sqrt{2}$

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

$A'(3,-1)$

$B'(-2,-6)$

$C'(2,-8)$

Score 4: The student made a conceptual error by stating $AA'C'C$ is a rhombus. The work only proves it is a parallelogram.

Question 35

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

AA'

$A(-2,4)$ $A'(3,-1)$

$m = \frac{y_2 - y_1}{x_2 - x_1} = -5$

$m = \frac{-1-4}{3+2} = \frac{-5}{5}$

CC'

$C(-3,-3)$ $C'(2,-8)$

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

$m = \frac{-8+3}{2+3} \; \frac{-5}{5}$

One pair of opposite sides are ∥ since they share the same slope.

AA'

$A(-2,4)$ $A'(3,-1)$

$d\sqrt{(3+2)^2 + (-1-4)^2}$

$d = \sqrt{25+25}$

$d = 5\sqrt{2}$

CC'

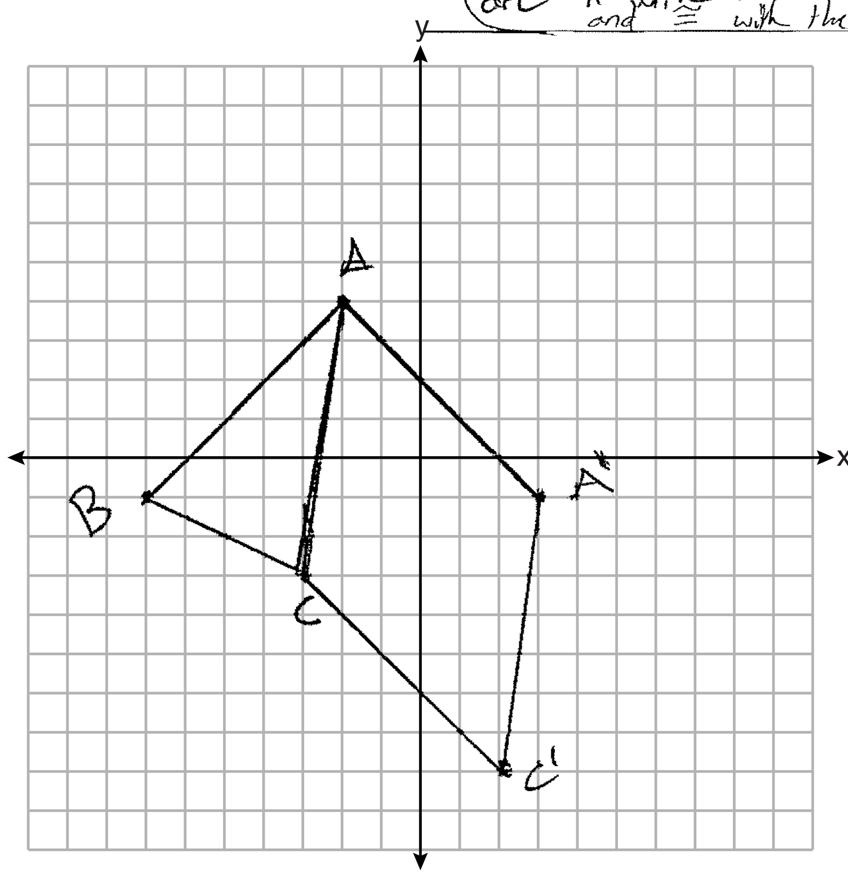
$C(-3,-3)$ $C'(2,-8)$

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

$d = \sqrt{25+25}$

$d = 5\sqrt{2}$

Is a rhombus because one pair of opposite sides are ∥ with the same slope and ≅ with the same distance



Question 35

35 The coordinates of the vertices of $\triangle ABC$ are $A(-2,4)$, $B(-7,-1)$, and $C(-3,-3)$.

Prove that $\triangle ABC$ is isosceles.

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

$d_{AB} = \sqrt{\Delta x^2 + \Delta y^2}$
$= \sqrt{(-5)^2 + (-5)^2}$
$= \sqrt{25+25}$
$d_{AB} = \sqrt{50}$

$d_{AC} = \sqrt{\Delta x^2 + \Delta y^2}$
$= \sqrt{(-1)^2 + (-7)^2}$
$= \sqrt{1+49}$
$d_{AC} = \sqrt{50}$

Isosceles △s have two ≅ sides and △ABC has two ≅ sides so △ABC is isosceles

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

$A' = (3,-1)$
$B' = (-2,-6)$
$C' = (2,-8)$

Score 4: The student made a conceptual error in proving the rhombus by proving the diagonals are perpendicular without including that the quadrilateral is a parallelogram.

Question 35

Question 35 continued

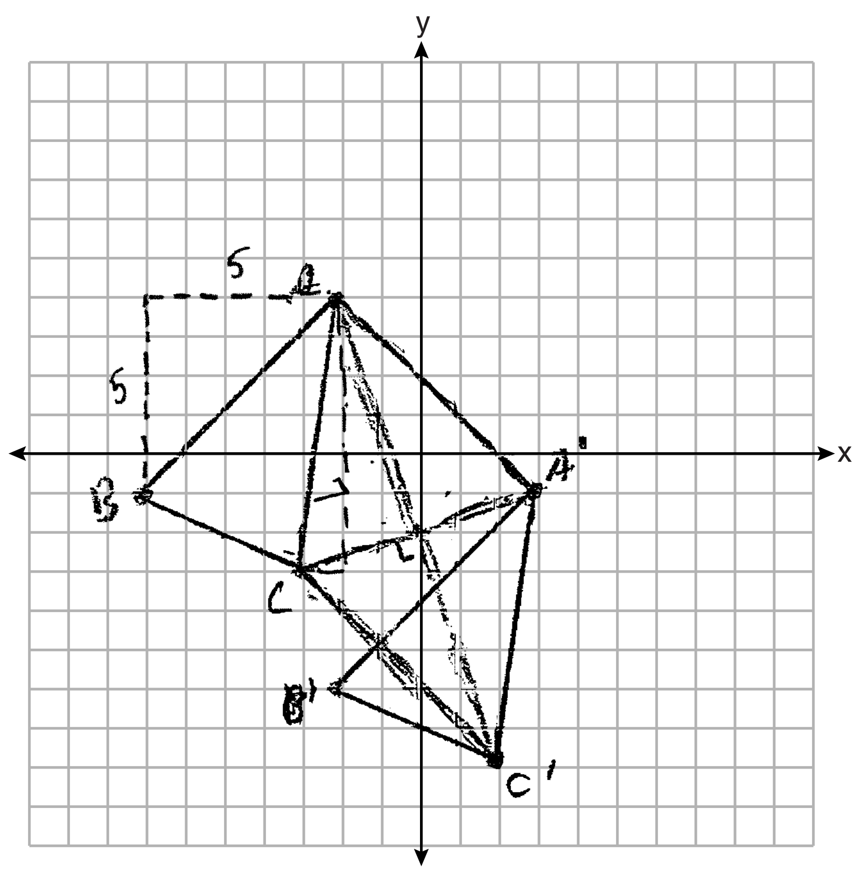
Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

slope $\overline{AC'} = \frac{\Delta y}{\Delta x} = \frac{-12}{4} = \frac{-3}{1}$

slope $\overline{CA'} = \frac{\Delta y}{\Delta x} = \frac{2}{6} = \frac{1}{3}$

negative reciprocals

AA'C'C is a rhombus because rhombus' have ⊥ diagonals and if two slopes lines have negative reciprocals they are ⊥, and shape AA'C'C has ⊥ diagonals.



Question 35

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Prove that $\triangle ABC$ is isosceles.

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

$d(AB) = \sqrt{(-7-(-2))^2+(-1-4)^2}$
$= \sqrt{(-5)^2+(-5)^2}$
$= \sqrt{50}$

$d(BC) = \sqrt{(-3-(-7))^2+(-3-(-1))^2}$
$= \sqrt{(4)^2+(-2)^2}$
$= \sqrt{20}$

$d(AC) = \sqrt{(-3-(-2))^2+(-3-4)^2}$
$= \sqrt{1+49}$
$= \sqrt{50}$

$\triangle ABC$ is isoceles because two sides are congrunt.

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

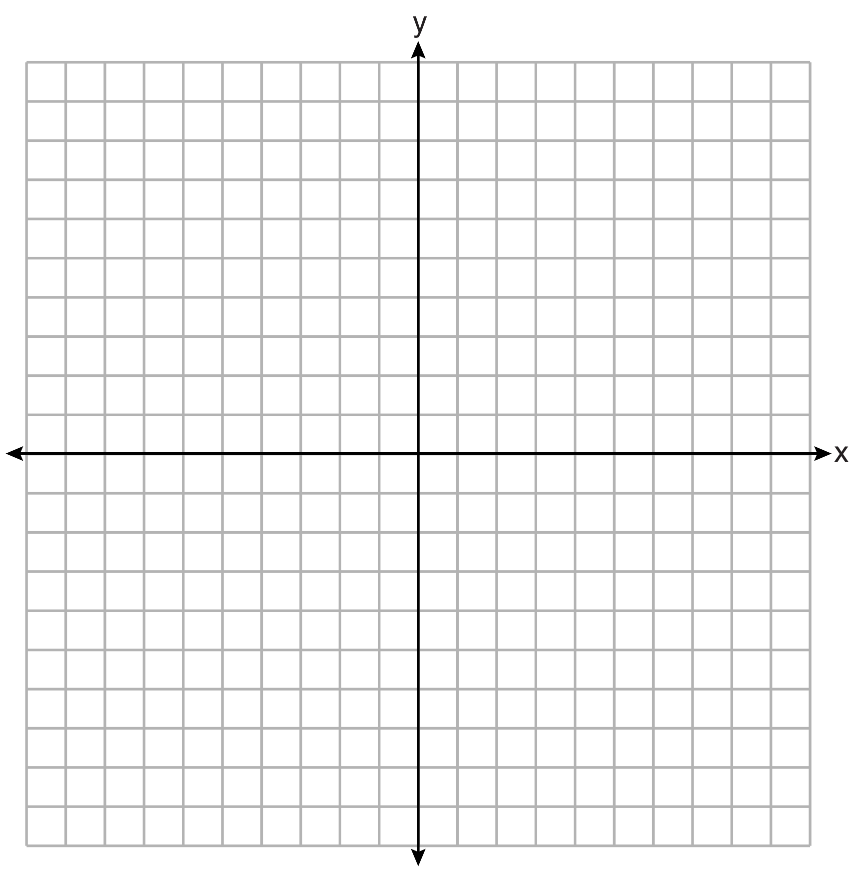
$A(-2,4) \rightarrow A'(3,-1)$
$B(-7,-1) \rightarrow B'(-2,-6)$
$C(-3,-3) \rightarrow C'(2,-8)$

Score 3: The student correctly proved triangle *ABC* is isosceles and stated the coordinates of the image of triangle *ABC*.

Question 35

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]



Question 35

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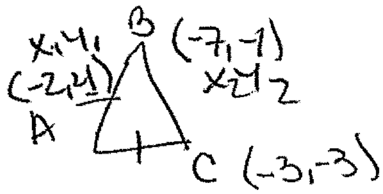
Prove that $\triangle ABC$ is isosceles.

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



$d_{AC} = \sqrt{(-3+2)^2 + (-3-4)^2}$

$d_{AC} = \sqrt{50}$

△ABC is isosceles b/c the distance of $\overline{AC}$ = distance of $\overline{AB}$

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

$= \sqrt{50}$

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

A' (3,-1)
B' (-2,-6)
C' (2,-8)

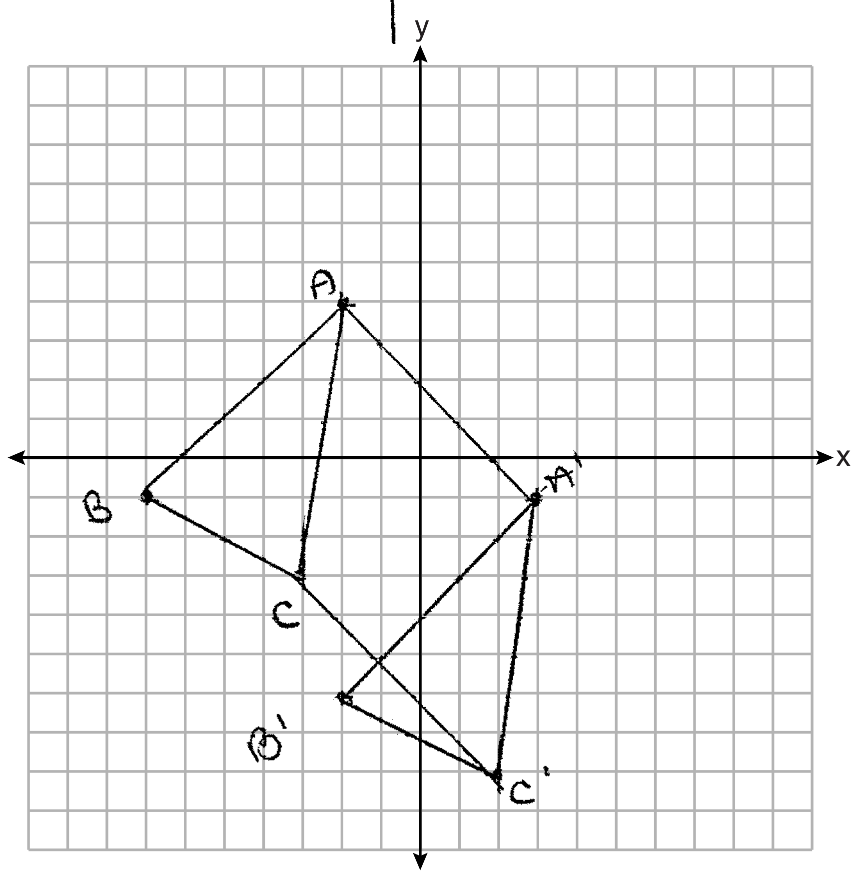
Score 3: The student correctly proved $\triangle ABC$ is isosceles. The student stated the coordinates of the image of triangle ABC correctly. Not enough correct work to prove the rhombus was shown to earn any additional credit.

Question 35

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

Statements	Reasons.
① Figure $AA'C'C$	① Given
② $\overline{AA'} \parallel \overline{C'C}$, $\overline{AC} \parallel \overline{A'C'}$	② Slopes that are the same make $\parallel$ lines.
③ $\overline{AA'} \cong \overline{C'C}$, $\overline{AC} \cong \overline{A'C'}$	③ distance was preserved b/c translation is a rigid motion.
④ $AA'C'C$ is a rhombus.	④ opp sides are $\parallel$ and $\cong$



Question 35

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Prove that $\triangle ABC$ is isosceles.

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

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

25 + 25

$\sqrt{50}$

$AC = \sqrt{(-2+3)^2 + (4+3)^2}$

1 + 49

$\sqrt{50}$

∴ $\triangle ABC$ is a isosceles triangle because two sides have equal lengths

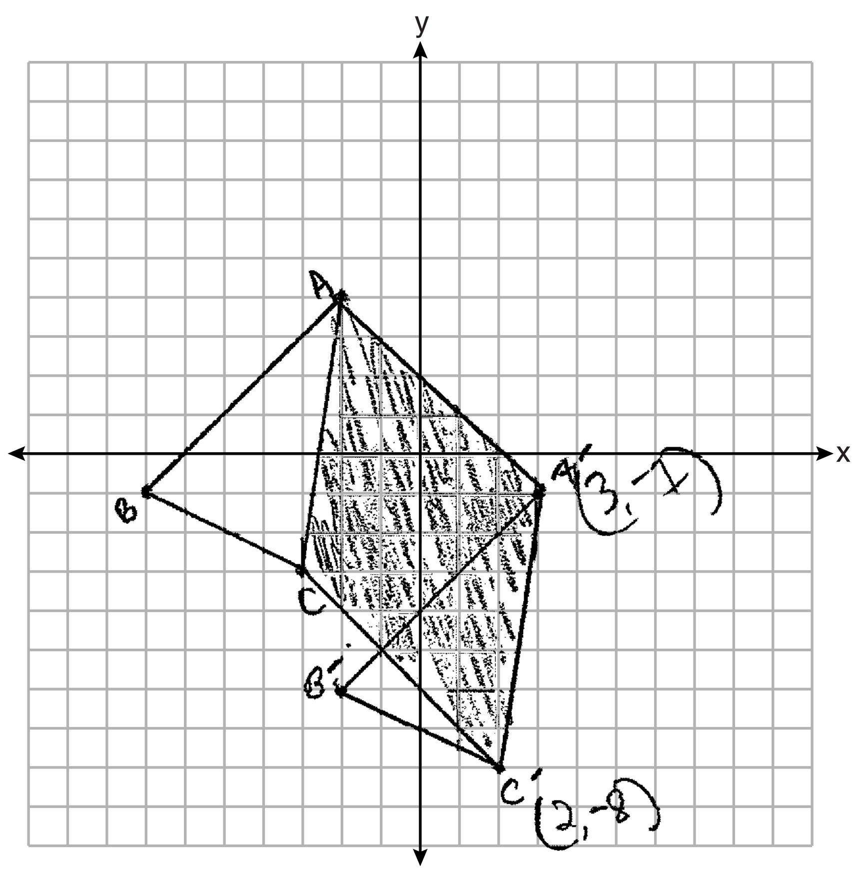
State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

(5,5)

Score 2: The student correctly proved triangle ABC is isosceles, but did not state the coordinates of B'. Rhombus $AA'C'C$ was not proven.

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]



35 The coordinates of the vertices of $\triangle ABC$ are $A(-2,4)$, $B(-7,-1)$, and $C(-3,-3)$.

Prove that $\triangle ABC$ is isosceles.

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

$\overline{AB} = \sqrt{(-2--7)^2 + (-2--1)^2}$
$5^2 + -1^2$
$25 + 1$
$\sqrt{26}$

$\overline{BC} = \sqrt{(-7--3)^2 + (-1--3)^2}$
$(-4)^2 + (2)^2$
$16 + 4$
$\sqrt{20}$

$\overline{CA} = \sqrt{(-2--3)^2 + (4--3)^2}$
$(1)^2 + (7)^2$
$\sqrt{50}$

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

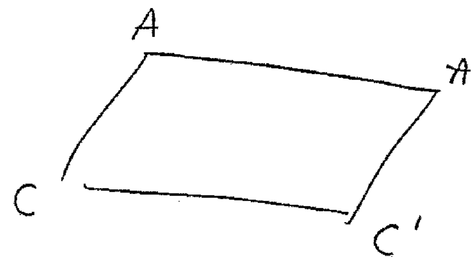
A' (3, −1)
B' (−2, −6)
C' (2, −8)

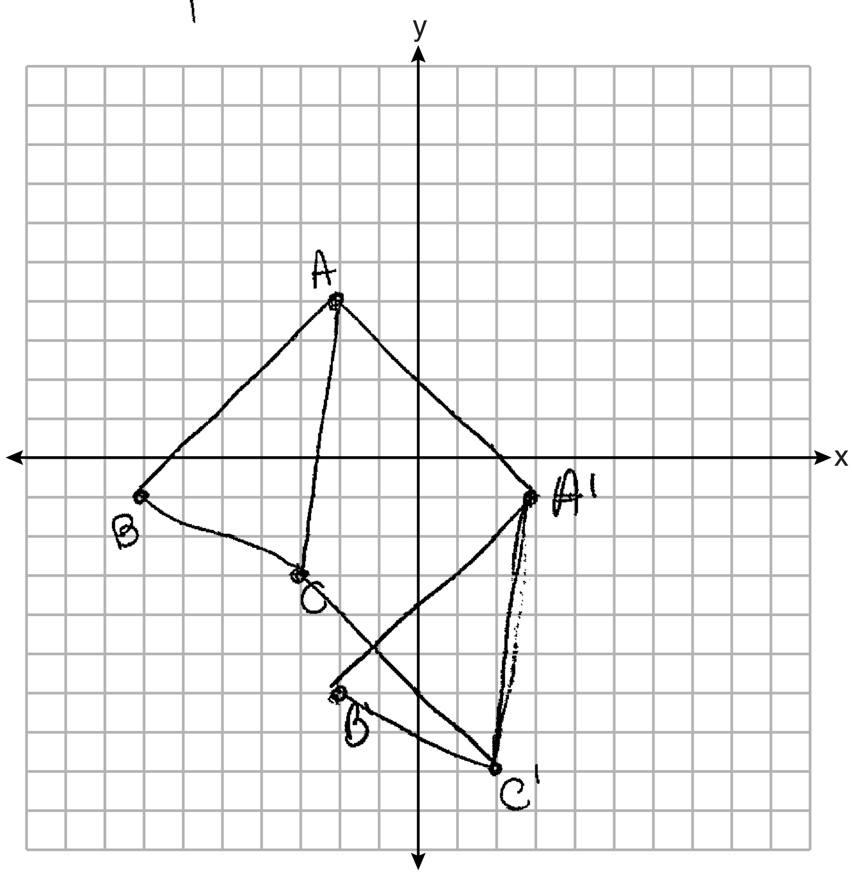
Score 1: The student stated the coordinates of the image of triangle *ABC*, but not enough correct relevant work was shown to receive more credit.

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

Statement | reason





Question 35

35 The coordinates of the vertices of $\triangle ABC$ are $A(-2,4)$, $B(-7,-1)$, and $C(-3,-3)$.

Prove that $\triangle ABC$ is isosceles.

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

$d=\sqrt{(\Delta x)^2+(\Delta y)^2}$

$\overline{AB}$ $d=\sqrt{(\Delta x)^2+(\Delta y)^2}$ $d=\sqrt{(-2+7)^2+(4+1)^2}$

$d=\sqrt{25+25}$

$d=\sqrt{50}$

$AC = d=\sqrt{(-2+3)^2+(4+3)^2}$

$d=\sqrt{1^2+49}$ $d=\sqrt{50}$

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

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

A - (-2,4)

A - (3,-1)

C - (-3,-3)

C' - (-2,8)

Score 1: The student showed correct work to find the lengths of AB and AC, but the coordinates of C' were stated incorrectly and B' was not stated. The student made a conceptual error in proving the rhombus and made computational errors.

Question 35

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

$m = \frac{\Delta y}{\Delta x}$

A $\quad d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$

$\overline{AA'}$ $\quad \frac{\Delta y}{\Delta x} \quad \frac{(4+1)}{(-2-3)} \quad \frac{5}{-5} = -1$

$\overline{A'C'}$ $\quad \frac{\Delta y}{\Delta x} = \frac{-1-8}{3+2} \quad \frac{-9}{5} =$

$\overline{AA'}$ is not perpendicular to $\overline{A'C'}$

$\overline{AA'}$ $\quad d = \sqrt{(5)^2 + (-5)^2}$ $\quad d = \sqrt{25+25}$ $\quad d = \sqrt{50}$

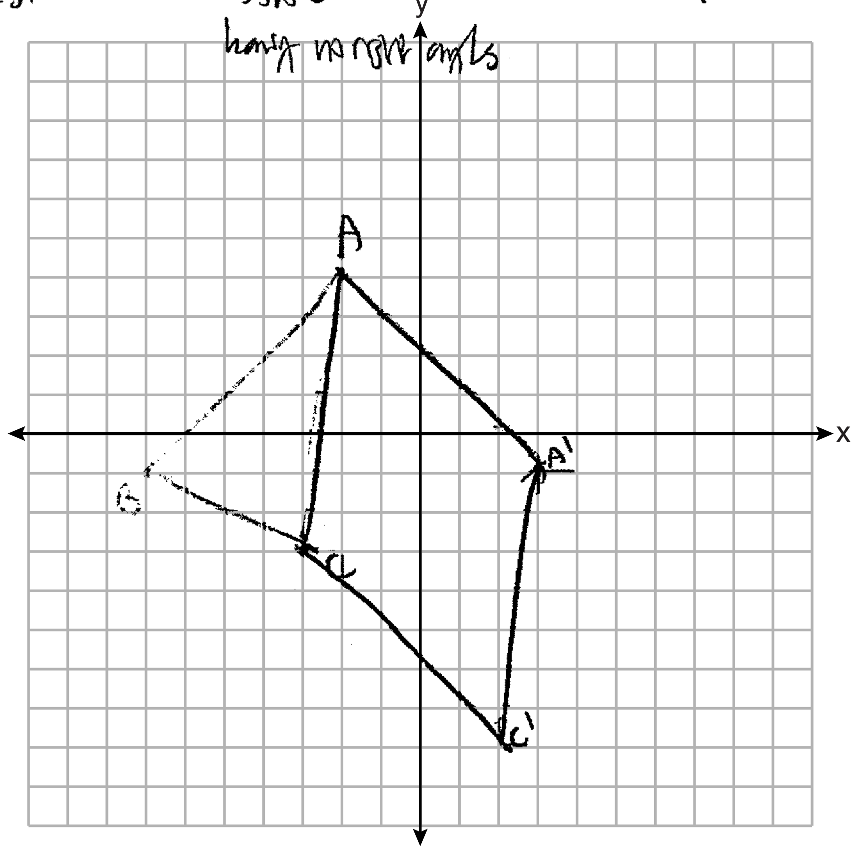
$\overline{AA'} \cong \overline{CC'}$

$\overline{CC'}$ $\quad d = \sqrt{(-5)^2 + 5^2}$ $\quad d = \sqrt{25+25}$ $\quad d = \sqrt{50}$

$\overline{CC'} \parallel \overline{AA'}$

$\overline{CC'}$ $\quad \frac{\Delta y}{\Delta x} = \frac{-3-8}{-3+2} = \frac{11}{1} = 11$

AA'C'C is a rhombus due to the opposite parallel congruent sides and having no right angles



Question 35

35 The coordinates of the vertices of $\triangle ABC$ are $A(-2,4)$, $B(-7,-1)$, and $C(-3,-3)$.

Prove that $\triangle ABC$ is isosceles.

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

$\triangle ABC$ is isosceles it has 2 ≅ sides, and 2 ≅ ∡s in the △.

State the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$, after a translation 5 units to the right and 5 units down.

$A' = (3,-1)$
$B' = (-2,-5)$
$C' = (2,-8)$

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

Question 35

Question 35 continued

Prove that quadrilateral $AA'C'C$ is a rhombus.
[The use of the set of axes below is optional.]

Statements	Reasons
1.)	1.) Given