The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Thursday, August 17, 2023 — 12:30 to 3:30 p.m., only

MODEL RESPONSE SET

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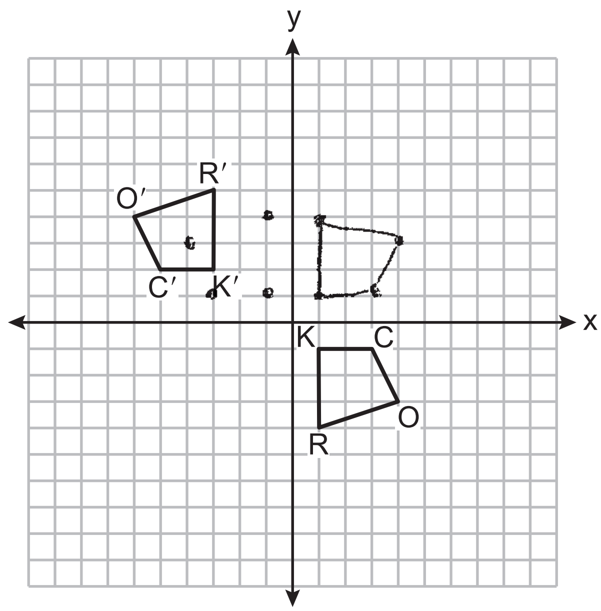
Question 25

25 On the set of axes below, congruent quadrilaterals *ROCK* and $R'O'C'K'$ are graphed.



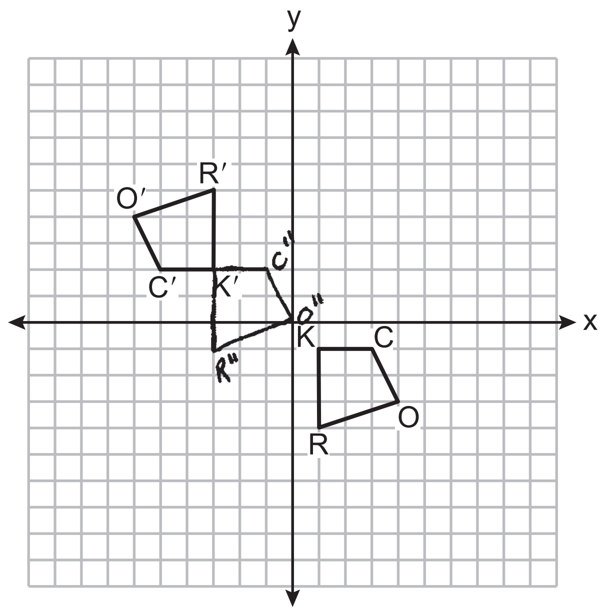
Describe a sequence of transformations that would map quadrilateral *ROCK* onto quadrilateral $R'O'C'K'$.

reflection over x axis, reflection over y axis
and translation up 1, left 2

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

Question 25

25 On the set of axes below, congruent quadrilaterals $ROCK$ and $R'O'C'K'$ are graphed.



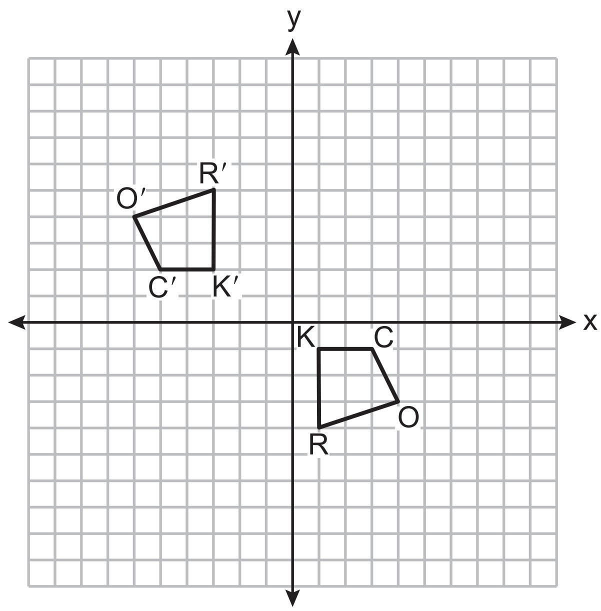
Describe a sequence of transformations that would map quadrilateral $ROCK$ onto quadrilateral $R'O'C'K'$.

-translate up 3 left 4 pt K onto pt K'
- Rotate R"O"C"K' about pt. K' 180° mapping R"→R'
O"→O' and C"→C'

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

Question 25

25 On the set of axes below, congruent quadrilaterals *ROCK* and $R'O'C'K'$ are graphed.



Describe a sequence of transformations that would map quadrilateral *ROCK* onto quadrilateral $R'O'C'K'$.

1 a reflection across the y axis.

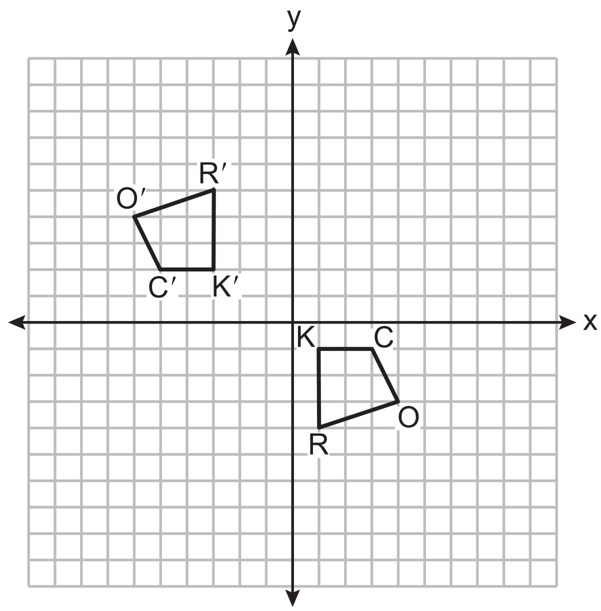
2 a translation up 1 unit. and left 2 units

3 a reflection across line y = 1

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

Question 25

25 On the set of axes below, congruent quadrilaterals *ROCK* and *R′O′C′K′* are graphed.



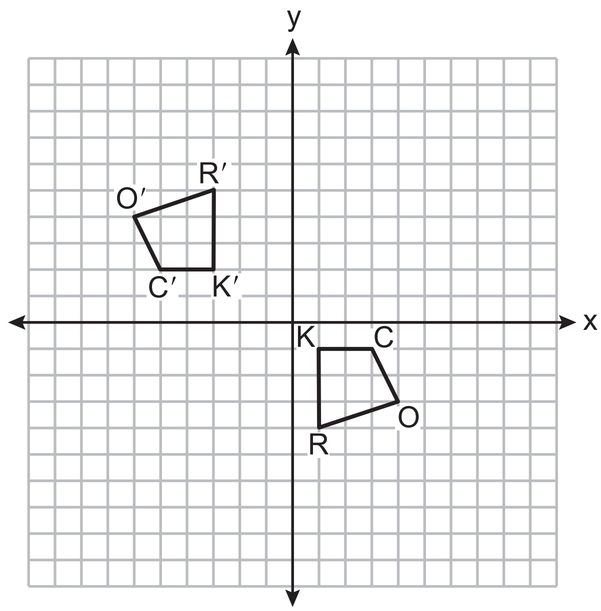
Describe a sequence of transformations that would map quadrilateral *ROCK* onto quadrilateral *R′O′C′K′*.

Rotate 180° about point $(-1, \frac{1}{2})$

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

Question 25

25 On the set of axes below, congruent quadrilaterals *ROCK* and $R'O'C'K'$ are graphed.



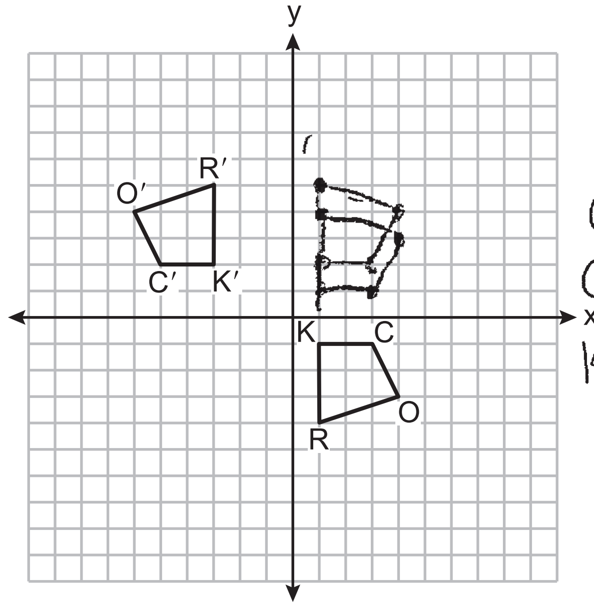
Describe a sequence of transformations that would map quadrilateral *ROCK* onto quadrilateral $R'O'C'K'$.

Rotation of 180° counterclockwise about origin.

Score 1: The student stated an incorrect coordinate as the center of rotation.

Question 25

25 On the set of axes below, congruent quadrilaterals $ROCK$ and $R'O'C'K'$ are graphed.



$R(1,-4) \rightarrow R'(1,4)$
$O(4,-3) \rightarrow O'(4,3)$
$C(3,-1) \rightarrow C'(3,1)$
$K(1,-1) \rightarrow K'(1,1)$

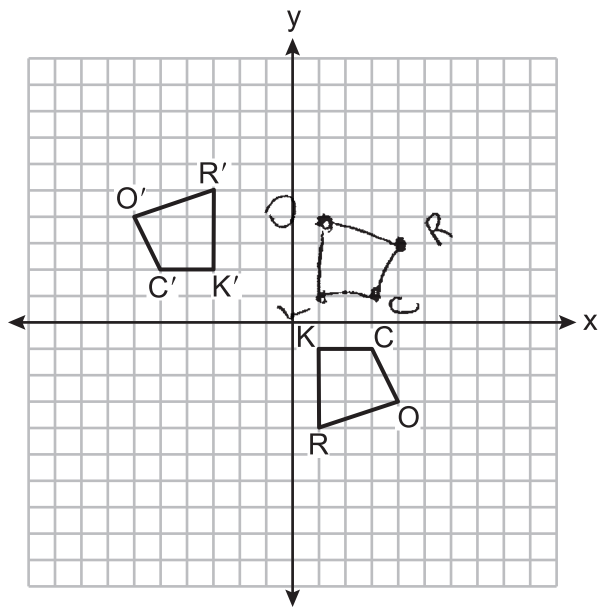
Describe a sequence of transformations that would map quadrilateral $ROCK$ onto quadrilateral $R'O'C'K'$.

A reflection over the x axis, a translation of $T_{1,0}$, A translation of $T_{0,-2}$, a reflection over $x=-2$.

Score 1: The student determined the sequence of transformations correctly, but stated the translations incorrectly as $T_{1,0}$ and $T_{0,-2}$, rather than $T_{0,1}$ and $T_{-2,0}$.

Question 25

25 On the set of axes below, congruent quadrilaterals *ROCK* and $R'O'C'K'$ are graphed.



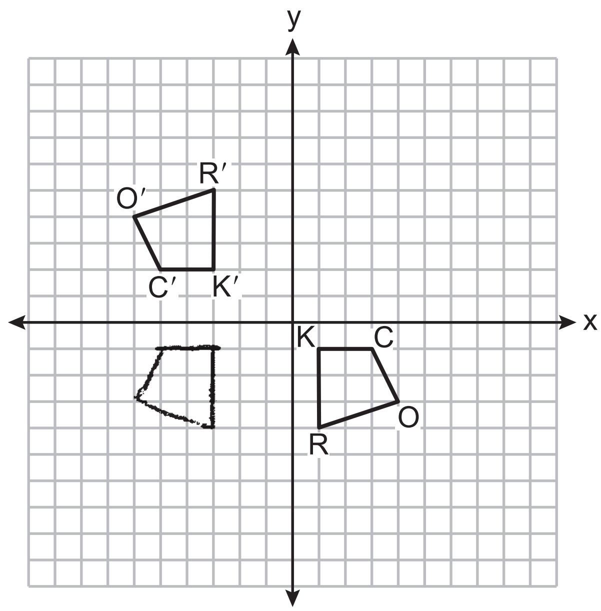
Describe a sequence of transformations that would map quadrilateral *ROCK* onto quadrilateral $R'O'C'K'$.

A reflection over the x-axis ~~by~~ ~~a~~ ~~rotate~~ and translation of (−4, 0) till it maps on to R' O' C' K'

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

Question 25

25 On the set of axes below, congruent quadrilaterals *ROCK* and *R′O′C′K′* are graphed.



Describe a sequence of transformations that would map quadrilateral *ROCK* onto quadrilateral *R′O′C′K′*.

T
A
P
S

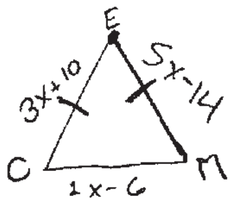
Translate over to the left four units followed by a reflection on the x-axis. from pt K.
ROCK maps onto R′O′C′K′ because Translations and reflections are rigid motions. Side lengths and angle measures are preserved.

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

Question 26

26 In triangle CEM, $CE = 3x + 10$, $ME = 5x - 14$, and $CM = 2x - 6$.

Determine and state the value of x that would make $\triangle CEM$ an isosceles triangle with the vertex angle at E.



2 sides congruent, vertex at E

$$3x+10 = 5x-14$$
$$-3x \quad -3x$$
$$10 = 2x-14$$
$$+14 \quad +14$$
$$24 = 2x$$
$$\frac{24}{2} = \frac{2x}{2}$$
$$12 = x$$

$$x = 12$$

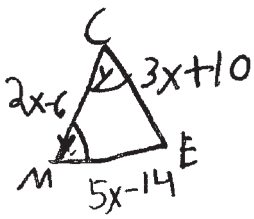
Score 2: The student gave a complete and correct response.

Question 26

26 In triangle CEM, $CE = 3x + 10$, $ME = 5x - 14$, and $CM = 2x - 6$.

Determine and state the value of x that would make $\triangle CEM$ an isosceles triangle with the vertex angle at E.

$\boxed{x = 12}$



$3x + 10 = 5x - 14$

$24 = 2x$

$x = 12$

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

Question 26

26 In triangle CEM, $CE = 3x + 10$, $ME = 5x - 14$, and $CM = 2x - 6$.

Determine and state the value of x that would make $\triangle CEM$ an isosceles triangle with the vertex angle at E.

$$5x - 14 = 2x - 6$$
$$-2x \qquad -2x$$
$$3x - 14 = -6$$
$$+14 \quad +14$$
$$\frac{3x}{3} = \frac{8}{3}$$
$$x = \frac{8}{3}$$

Score 1: The student wrote an incorrect equation, but found an appropriate value of x.

Question 26

26 In triangle CEM, $CE = 3x + 10$, $ME = 5x - 14$, and $CM = 2x - 6$.

Determine and state the value of x that would make $\triangle CEM$ an isosceles triangle with the vertex angle at E.

$3x+10+5x-14+2x-6=180$

$10x+10-14-6=180$

$10x \quad -10=180$

$\quad +10 \quad +10$

$\frac{10x}{10}=\frac{190}{10}$

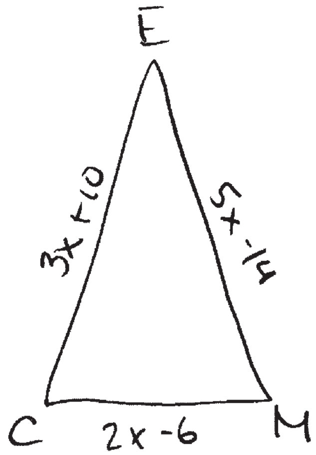
$x=19$

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

Question 26

26 In triangle CEM, $CE = 3x + 10$, $ME = 5x - 14$, and $CM = 2x - 6$.

Determine and state the value of x that would make $\triangle CEM$ an isosceles triangle with the vertex angle at E.



combine like terms

$(3x + 10) = (2x - 6) = (5x - 4)$

$+4 \qquad +4$

$3x + 10 = 2x - 2 = 5x$

$-2x \qquad -2x$

$1x + 10 = -2 = 5x$

$-1 \qquad -1$

$10 = -2 = 4x$

$+2 \qquad +2$

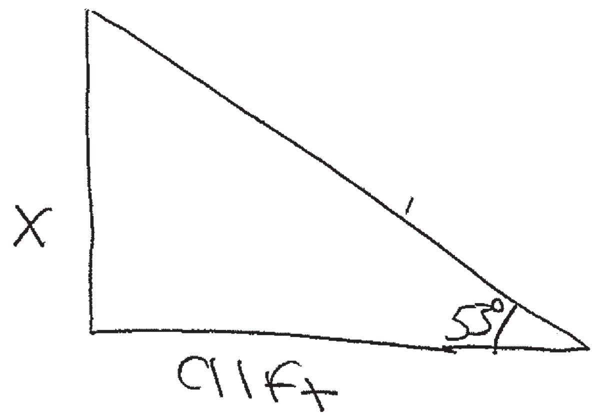
$\frac{12}{4} = \frac{4x}{4}$

$\boxed{x = 3}$

Score 0: The student gave a completely incorrect response.

27 A flagpole casts a shadow on the ground 91 feet long, with a 53° angle of elevation from the end of the shadow to the top of the flagpole.

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



$$\frac{\tan(53)}{1} = \frac{x}{91}$$

$$x = 91(\tan 53)$$

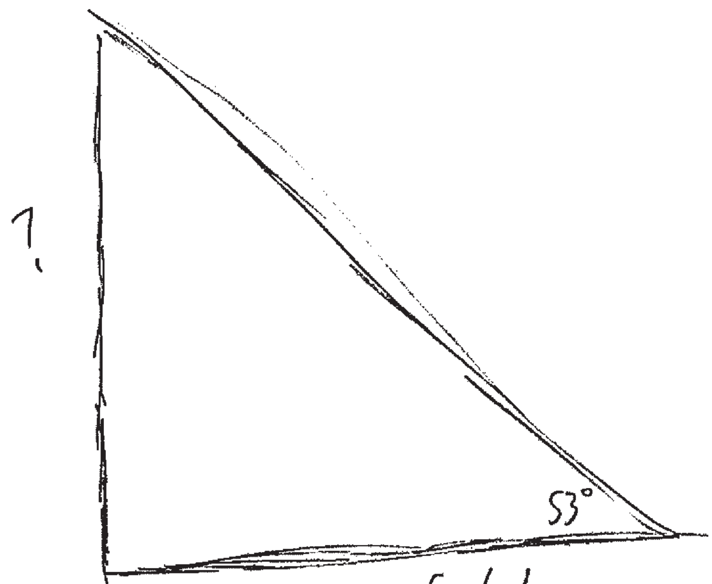
$$x = 120.8 \text{ ft}$$

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

Question 27

27 A flagpole casts a shadow on the ground 91 feet long, with a 53° angle of elevation from the end of the shadow to the top of the flagpole.

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



91 feet long

$\tan 53 = \frac{?}{91}$

$91 \tan(53)$

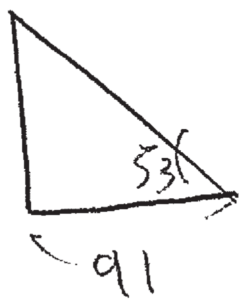
$= \boxed{120.8 \text{ ft}}$

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

Question 27

27 A flagpole casts a shadow on the ground 91 feet long, with a 53° angle of elevation from the end of the shadow to the top of the flagpole.

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



TOA

C SOHCAH TOA $\frac{O}{A}$

$\tan 53 = \frac{x}{91}$

TOA

$\boxed{121}$

Score 1: The student made a rounding error.

Question 27

27 A flagpole casts a shadow on the ground 91 feet long, with a 53° angle of elevation from the end of the shadow to the top of the flagpole.

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

$S\frac{O}{H}\;C\frac{A}{H}\;T\frac{O}{A}$

$\tan 53 = \frac{x}{91}$

$\tan 53x = 91$

$\frac{1.33x}{1.33} = \frac{91}{1.33}$

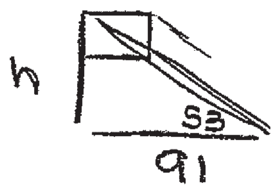
$x = 68.4$

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

Question 27

27 A flagpole casts a shadow on the ground 91 feet long, with a 53° angle of elevation from the end of the shadow to the top of the flagpole.

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



$\cos 53 = \frac{h}{91}$

$h = \cos 53(91)$

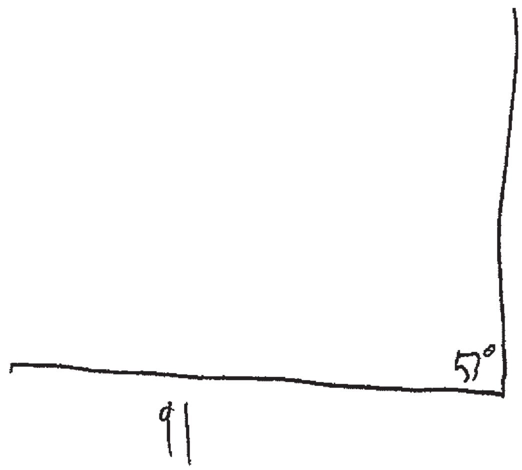
$\boxed{h = 54.8 \text{ ft}}$

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

Question 27

27 A flagpole casts a shadow on the ground 91 feet long, with a 53° angle of elevation from the end of the shadow to the top of the flagpole.

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



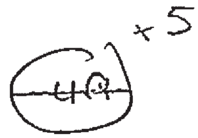
$\boxed{88.91}$

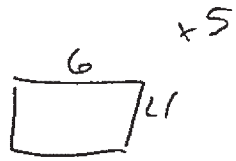
$\tan^{-1}(53 = 88.91$

Score 0: The student gave a completely incorrect response.

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?





$A = \pi r^2$

$A = \pi 2^2$

$A = \pi 4$

$A = 12.56$

$A = 12.56 \cdot 5$

$A = 62.83$ sq ft

$A = 6 \cdot 4$

$A = 24$

$A = 24 \cdot 5$

$A = 120$ sq ft

$$\begin{array}{r} 120.00 \\ +\ 62.83 \\ \hline 182.83 \end{array}$$

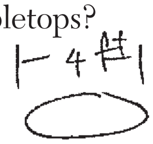
$\frac{182.83}{25} = 7.3132$

8 spray cans

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

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?



$Ar = \pi r^2 \qquad 5 \times \pi 4 = 20\pi \text{ ft}^2$

$= \pi 4 \text{ ft}^2$

$A \text{ rectangle} = l \times w$

$= 6 \times 4 \qquad 5 \times 24 = 120 \text{ ft}^2$

$= 24 \text{ ft}^2$

$(20\pi + 120) \div 25 \boxed{\approx 8 \text{ cans}}$

Ans: 8 cans of spray paint must be purchased to paint all of the tabletops.

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

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?

$5 \cdot 2^2\pi \approx 63 ft^2$

$5 \cdot 4 \cdot 6 = 120 ft^2$

$+$

$183 ft^2$

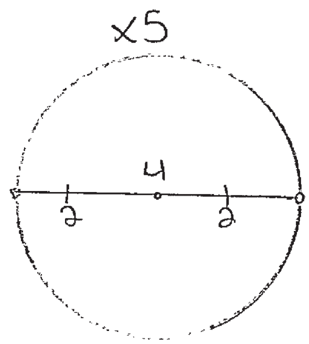
$25 \overline{)183}$ 7.32

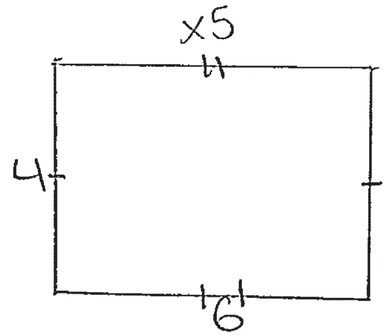
8 cans of spray paint

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

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?





$= 25\text{ ft}^2$

$$\begin{array}{r} 100 \\ +\ 62.83 \\ \hline 162.83 \end{array}$$

$25\overline{)162.83}$ = 6.5

$\downarrow \approx$

7

$A = \pi r^2$
$= \pi(2)^2$
$= 12.566$

$12.566 \times 5 = 62.83\text{ ft}^2$

$A = bh$
$= (6)(4)$
$= 20$

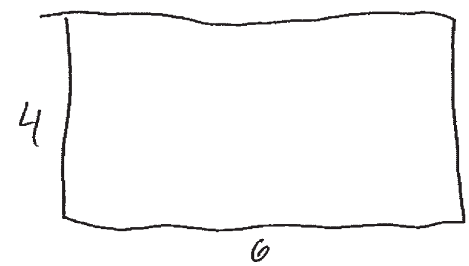
$20 \times 5 = 100\text{ ft}^2$

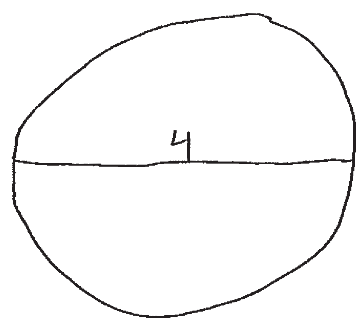
7 cans of spray paint are needed to paint all of the tabletops

Score 1: The student made a computational error.

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?





183 cans

rectangle

$A = bh$

$A = 4 \cdot 6$

$A = 24$

$24 \cdot 5 = 120$

$A = \pi r^2$

$A = \pi 2^2$

$A = 4\pi$

$A = 12.5663$

$12.5663 \cdot 5 = 62.5318$

$120 + 62.8318 = 182.8$

Score 1: The student determined the total area of the ten tables, but no further correct work was shown.

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?

Five round top tables

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

one $\rightarrow (2^2)\pi \rightarrow 4\pi$ ft^2

Five round $\rightarrow 4\pi \times 5 = 20\pi$ ft^2

Five rectangle top tables

one $\rightarrow 4 \times 6 = 24$ ft^2

Five rectangle $\rightarrow 24 \times 5 = 120$ ft^2

Total $\rightarrow 4\pi + 120$

$\frac{4\pi + 120}{25} \approx 5.3026 \uparrow$

≈ 6

Answer:

It will need 6 cans of spray paint must be purchased to paint all of the tabletops.

Score 1: The student made a transposition error when determining the total area of the ten tables.

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?

$A=\pi r^2$

$A=\pi 2^2$

$A=\pi 4$

~~A~~

$5(4\pi)$

$62.8318530 7$

$A=hl$

$A=4\cdot 6$

$A=24\text{ ft}$

$$\begin{array}{r} 240.00000000 \\ +\ \ 62.83185307 \\ \hline 302.83185307 \end{array}$$

$$\frac{302.83185307}{25}=12.11327412$$

13 cans

Score 1: The student made a computational error in determining the area of the five rectangular tables.

Question 28

28 A man is spray-painting the tops of 10 patio tables. Five tables have round tops, with diameters of 4 feet, and five tables have rectangular tops, with dimensions of 4 feet by 6 feet. A can of spray paint covers 25 square feet. How many cans of spray paint must be purchased to paint all of the tabletops?

$\pi 4^2 = 16\pi$

$5(16\pi) = 251.327412287 18$

$6(4) = 24$

$5(24) = 120$

$251.32741228718 + 120 =$

$\frac{371.32741228718}{25} = 12.69$

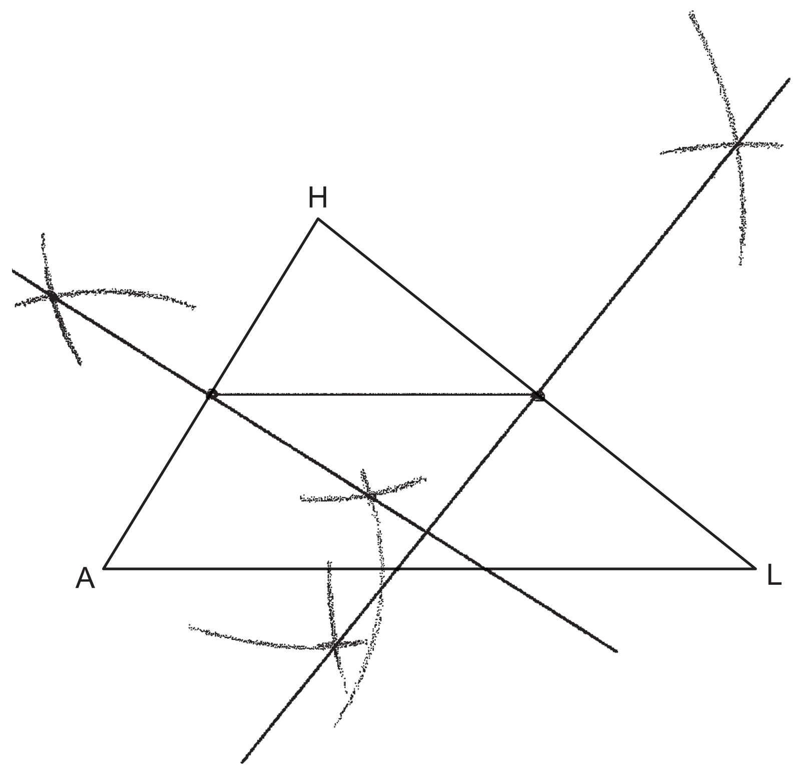
$\boxed{13 \text{ cans}}$

Score 0: The student used an incorrect radius when determining the area of the five round tables. The student made a computational error when determining the number of cans.

Question 29

29 Using a compass and straightedge, construct a midsegment of $\triangle AHL$ below.

[Leave all construction marks.]

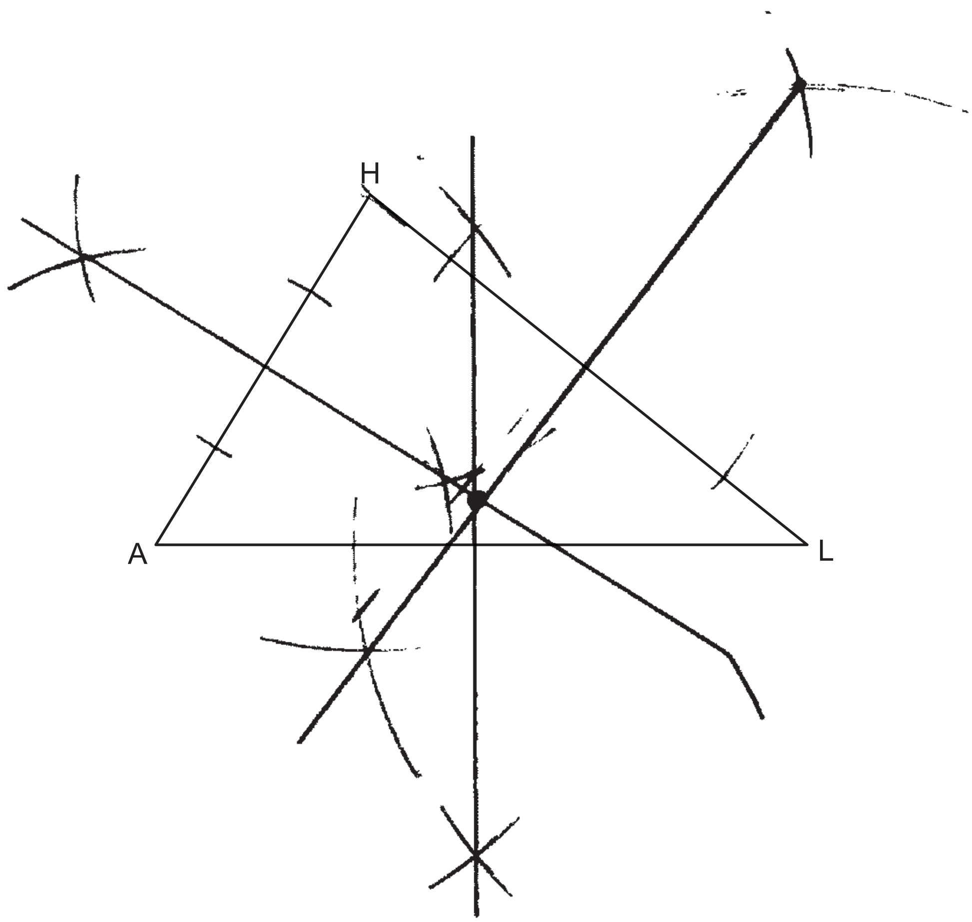


Score 2: The student gave a complete and correct response.

Question 29

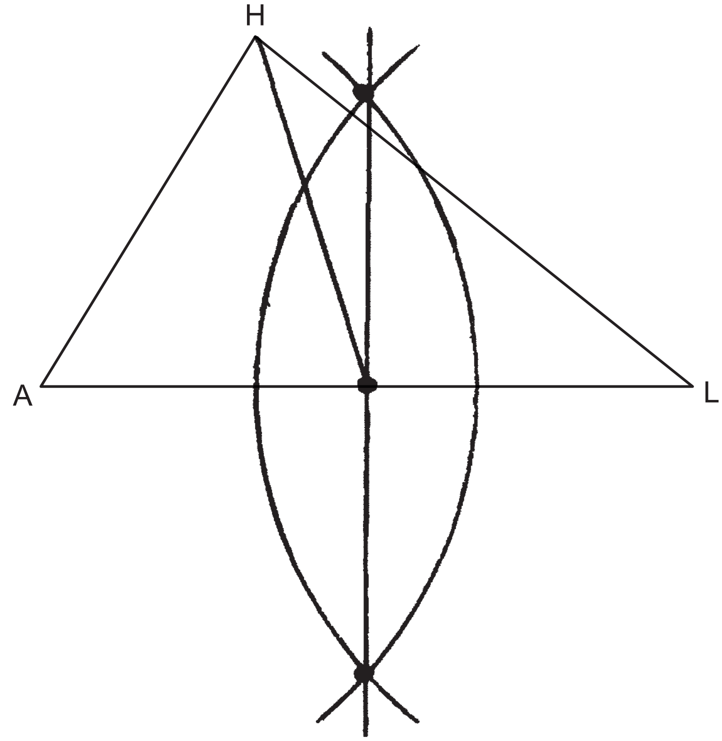
29 Using a compass and straightedge, construct a midsegment of $\triangle AHL$ below.

[Leave all construction marks.]



Score 1: The student constructed the perpendicular bisectors of the sides of $\triangle AHL$, but did not draw the midsegment.

29 Using a compass and straightedge, construct a midsegment of $\triangle AHL$ below.
[Leave all construction marks.]

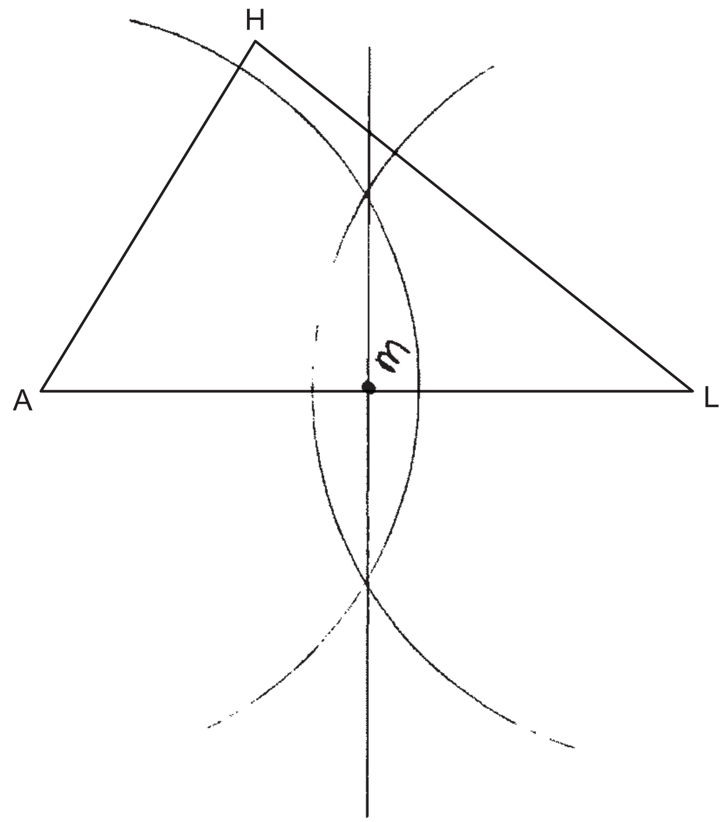


Score 0: The student did not show enough correct work to receive any credit.

Question 29

29 Using a compass and straightedge, construct a midsegment of $\triangle AHL$ below.

[Leave all construction marks.]



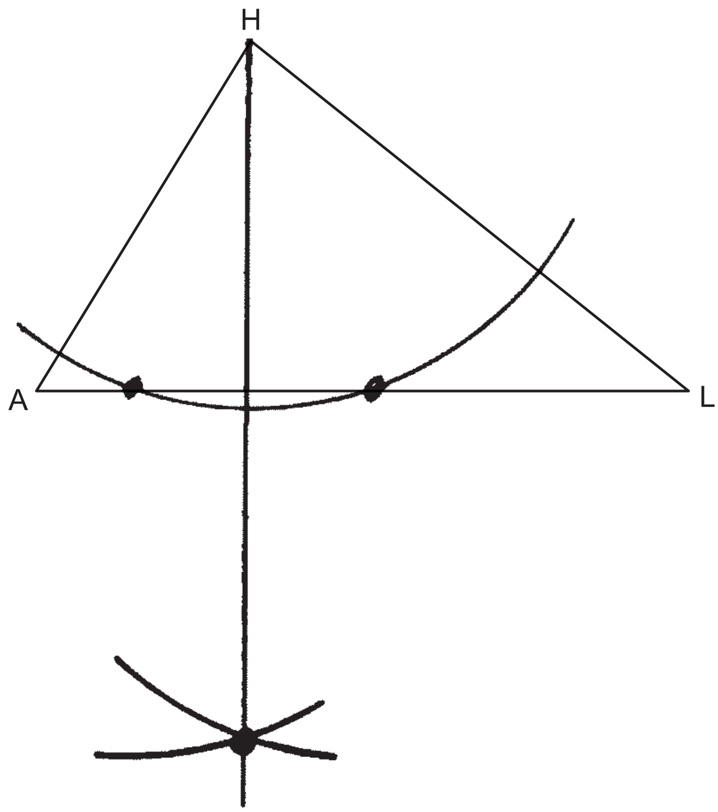
Score 0: The student did not show enough correct work to receive any credit.

Question 29

29 Using a compass and straightedge, construct a midsegment of $\triangle AHL$ below.

[Leave all construction marks.]

Bottom 9

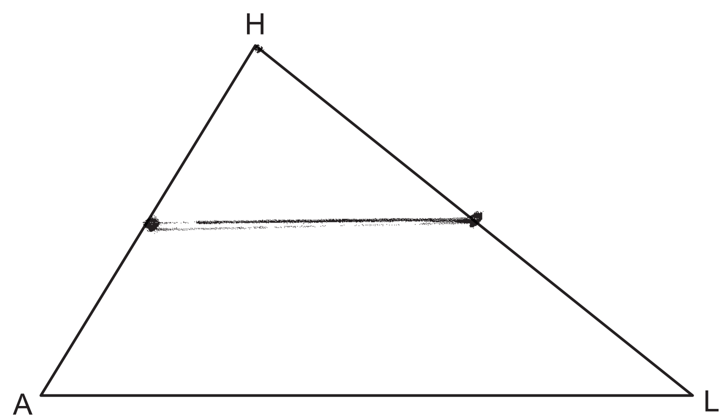


Score 0: The student gave a completely incorrect response.

Question 29

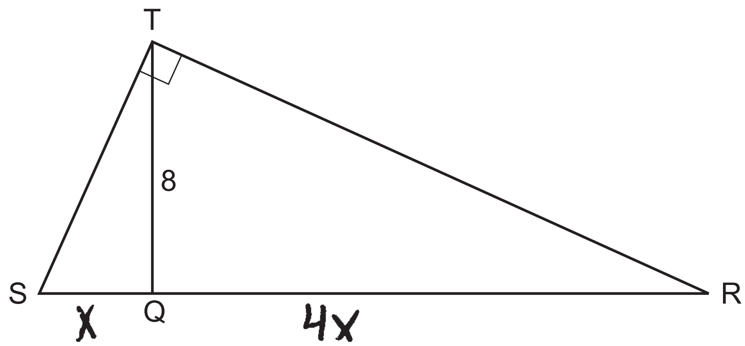
29 Using a compass and straightedge, construct a midsegment of $\triangle AHL$ below.

[Leave all construction marks.]



Score 0: The student gave a completely incorrect response.

30 Right triangle STR is shown below, with m$\angle T = 90°$. Altitude $\overline{TQ}$ is drawn to $\overline{SQR}$, and $TQ = 8$.



If the ratio SQ:QR is 1:4, determine and state the length of $\overline{SR}$.

$$\frac{x}{8} = \frac{8}{4x}$$

$$4x \cdot x = 8 \cdot 8$$

$$4x^2 = 64$$

$$x^2 = 16$$

$$x = 4$$

$SQ = 4$

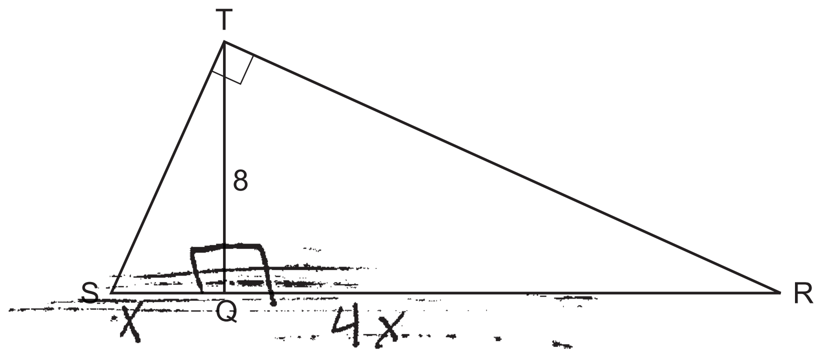
$QR = 16$

$SR = 20$

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

Question 30

30 Right triangle STR is shown below, with $m\angle T = 90°$. Altitude $\overline{TQ}$ is drawn to $\overline{SQR}$, and $TQ = 8$.



If the ratio $SQ:QR$ is 1:4, determine and state the length of $\overline{SR}$.

$8^2 = (x)(4x)$

$\cancel{8^2} = 4x^2$

$\frac{64}{4} = \frac{4x^2}{4}$

$\sqrt{16} = \sqrt{x^2}$

$\boxed{x = 4}$

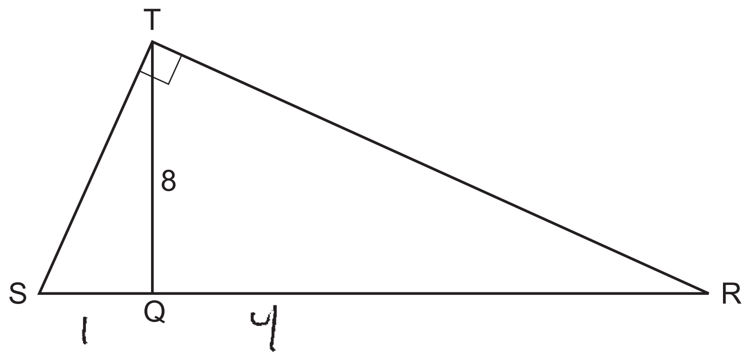
length of $\overline{SR}$ = 20 units

$4 + 4(4) = 20$

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

Question 30

30 Right triangle STR is shown below, with $m\angle T = 90°$. Altitude $\overline{TQ}$ is drawn to $\overline{SQR}$, and $TQ = 8$.



If the ratio $SQ{:}QR$ is 1:4, determine and state the length of $\overline{SR}$.

$$\frac{x}{8} = \frac{8}{4x}$$

$$\sqrt{64} = \sqrt{4x^2}$$

$$\frac{8}{4} = \frac{4x}{4}$$

$$2 = x$$

$$5x = \overline{SR}$$

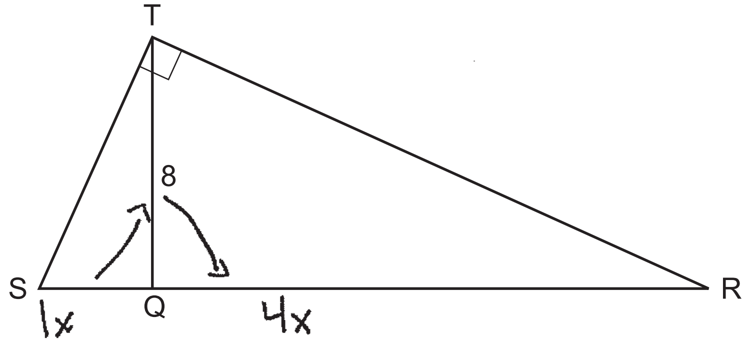
$$5(2) = 10$$

$$\boxed{\overline{SR} = 10}$$

Score 1: The student made a computational error.

Question 30

30 Right triangle STR is shown below, with $m\angle T = 90°$. Altitude $\overline{TQ}$ is drawn to $\overline{SQR}$, and $TQ = 8$.



If the ratio $SQ{:}QR$ is 1:4, determine and state the length of $\overline{SR}$.

$$\frac{1x}{8} = \frac{8}{4x}$$

$$\frac{4x}{4} = \frac{64}{4}$$

$$x = 16$$

$$16 + 4(16)$$

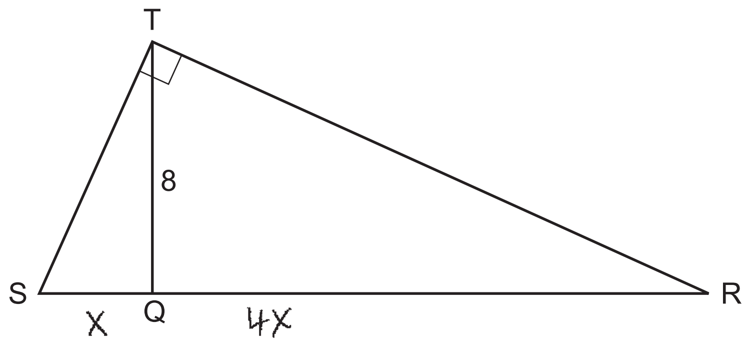
$$16 + 64$$

$$80$$

$$\overline{SR} = 80$$

Score 1: The student made a computational error.

30 Right triangle STR is shown below, with $m\angle T = 90°$. Altitude $\overline{TQ}$ is drawn to $\overline{SQR}$, and $TQ = 8$.



If the ratio SQ:QR is 1:4, determine and state the length of $\overline{SR}$.

$$\frac{x}{8} = \frac{8}{4x}$$

$$\frac{4x^2}{4} = \frac{64}{4}$$

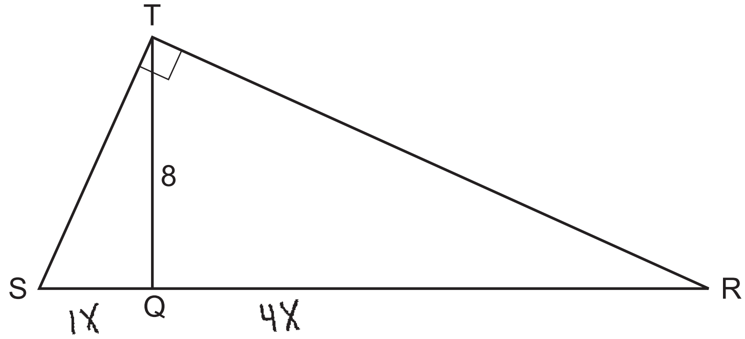
$$x^2 = 16$$

$$\boxed{x = 4}$$

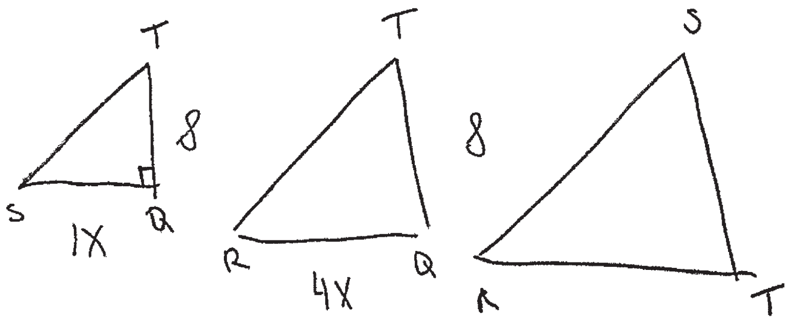
Score 1: The student correctly determined the length of $\overline{SQ}$, but no further correct work was shown.

Question 30

30 Right triangle STR is shown below, with $m\angle T = 90°$. Altitude $\overline{TQ}$ is drawn to $\overline{SQR}$, and $TQ = 8$.



If the ratio SQ:QR is 1:4, determine and state the length of $\overline{SR}$.



$$\frac{8}{1X} = \frac{8}{4X}$$

$$\frac{32x}{8} = \frac{8x}{8}$$

$$\frac{4x}{x} = \frac{x}{x}$$

$$4 = x$$

$4(1) + 4(4)$

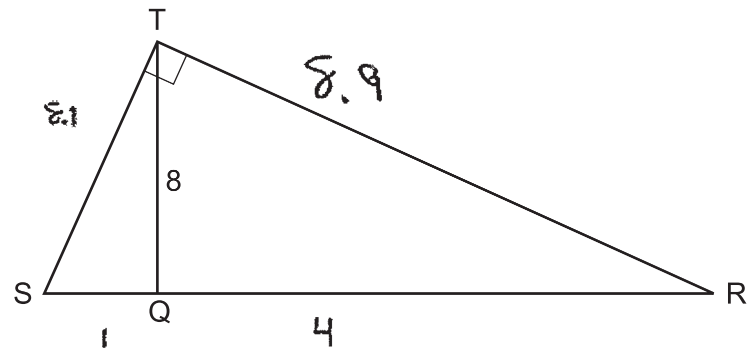
$4 + \cancel{8}16$

$\overline{SR} = 20$

Score 0: The student wrote an incorrect proportion and solved the proportion incorrectly, thus obtaining a correct answer by an incorrect procedure.

Question 30

30 Right triangle STR is shown below, with $m\angle T = 90°$. Altitude $\overline{TQ}$ is drawn to $\overline{SQR}$, and $TQ = 8$.



If the ratio SQ:QR is 1:4, determine and state the length of $\overline{SR}$.

$8^2 + 1^2 = x^2$

$64 + 1 = x^2$

$\sqrt{65} = \sqrt{x^2}$

8.1

$8^2 + 4^2 = x^2$

$64 + 16 = x^2$

$80 = x^2$

8.9

$8.1^2 + 8.9^2 = x^2$

$65.61 + 79.21 = x^2$

$\sqrt{144.82} = \sqrt{x^2}$

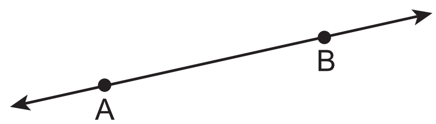
6.7

$SR = 6.7$

Score 0: The student gave a completely incorrect response.

Question 31

31 Line AB is dilated by a scale factor of 2 centered at point A.



Evan thinks that the dilation of $\overleftrightarrow{AB}$ will result in a line parallel to $\overleftrightarrow{AB}$, not passing through points A or B.

Nathan thinks that the dilation of $\overleftrightarrow{AB}$ will result in the same line, $\overleftrightarrow{AB}$.

Who is correct?

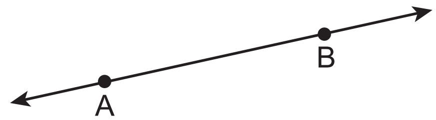
Explain why.

Nathan is right because a line dialated through a point on the line won't change it at all. The dilation wouldn't move the line because the center of dilation is on the line.

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

Question 31

31 Line AB is dilated by a scale factor of 2 centered at point A.



Evan thinks that the dilation of $\overleftrightarrow{AB}$ will result in a line parallel to $\overleftrightarrow{AB}$, not passing through points A or B.

Nathan thinks that the dilation of $\overleftrightarrow{AB}$ will result in the same line, $\overleftrightarrow{AB}$.

Who is correct?

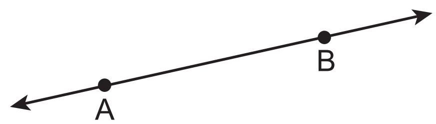
Explain why.

Nathan because when a line is dilated it still has the same slope as before and it continues on the same line starting at the center point on line AB.

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

Question 31

31 Line AB is dilated by a scale factor of 2 centered at point A.



Evan thinks that the dilation of $\overleftrightarrow{AB}$ will result in a line parallel to $\overleftrightarrow{AB}$, not passing through points A or B.

Nathan thinks that the dilation of $\overleftrightarrow{AB}$ will result in the same line, $\overleftrightarrow{AB}$.

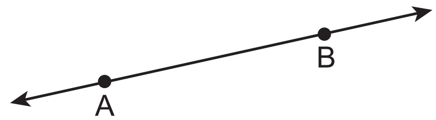
Who is correct?

Explain why. Nathan is correct because if line $\overleftrightarrow{AB}$ is dialated when it is centered at point A, it will just be another form of $\overleftrightarrow{AB}$ since its image will be on that line. Basically, the dialated line will just be the same as line $\overleftrightarrow{AB}$ since it has the same slope and is centered at A.

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

Question 31

31 Line AB is dilated by a scale factor of 2 centered at point A.



Evan thinks that the dilation of $\overleftrightarrow{AB}$ will result in a line parallel to $\overleftrightarrow{AB}$, not passing through points A or B.

Nathan thinks that the dilation of $\overleftrightarrow{AB}$ will result in the same line, $\overleftrightarrow{AB}$.

Who is correct?

Explain why.

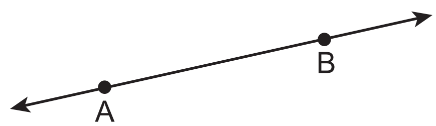
Nathan.

The slopes are the same.

Score 1: The student wrote a partially correct explanation.

Question 31

31 Line AB is dilated by a scale factor of 2 centered at point A.



Evan thinks that the dilation of $\overleftrightarrow{AB}$ will result in a line parallel to $\overleftrightarrow{AB}$, not passing through points A or B.

Nathan thinks that the dilation of $\overleftrightarrow{AB}$ will result in the same line, $\overleftrightarrow{AB}$.

Who is correct?

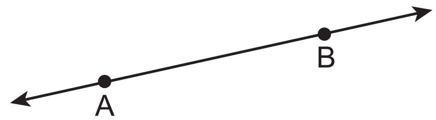
Explain why.

Evan because when a line is dilated the slopes are equal, but the ~~y-intercepts~~ y-intercept is multiplied by the scale factor. So the lines will be parallel with different y-intercepts.

Score 1: The student wrote a partially correct explanation.

Question 31

31 Line AB is dilated by a scale factor of 2 centered at point A.



Evan thinks that the dilation of $\overleftrightarrow{AB}$ will result in a line parallel to $\overleftrightarrow{AB}$, not passing through points A or B.

Nathan thinks that the dilation of $\overleftrightarrow{AB}$ will result in the same line, $\overleftrightarrow{AB}$.

Who is correct?

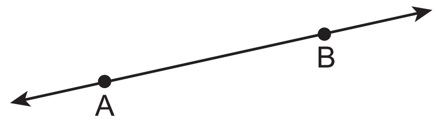
Explain why.

Nathan, if you dialate the segment, you are just making it longer.

Score 0: The student wrote an incorrect explanation.

Question 31

31 Line *AB* is dilated by a scale factor of 2 centered at point *A*.



Evan thinks that the dilation of $\overleftrightarrow{AB}$ will result in a line parallel to $\overleftrightarrow{AB}$, not passing through points *A* or *B*.

Nathan thinks that the dilation of $\overleftrightarrow{AB}$ will result in the same line, $\overleftrightarrow{AB}$.

Who is correct?

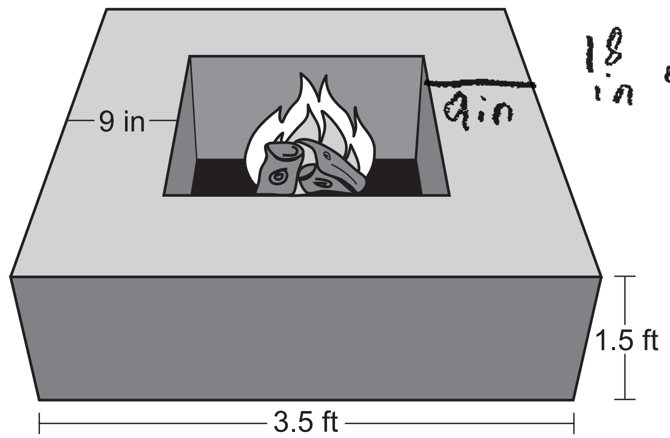
Explain why.

Evan is correct because the line created would not be drawn on the same line.

Score 0: The student wrote an incorrect explanation.

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



9in

18 in or 1.5 ft.

If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

Volume of whole fire

$V = B \cdot h$

$V = 3.5^2 \cdot 1.5$

$V = 18.375 \text{ ft}^3$

$$\begin{array}{r} 3.5 \\ -1.5 \\ \hline 2.0 \end{array}$$

Volume of inner fire

$V = Bh$

$V = 2^2 \cdot 1.5$

$V = 6 \text{ ft}^3$

$$\begin{array}{r} 18.375 \\ -\ 6.000 \\ \hline 12.375 \text{ ft}^3 \end{array}$$

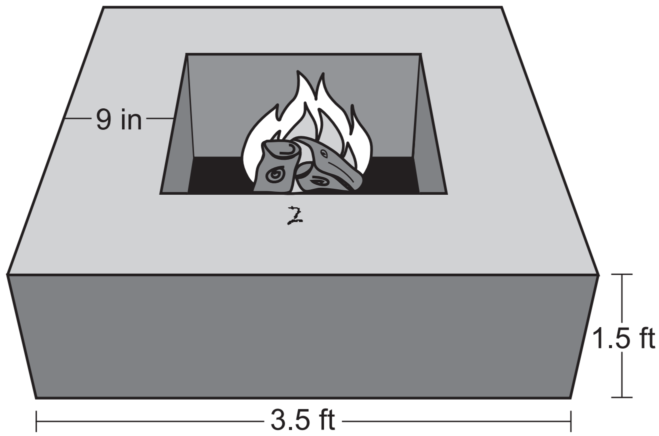
$\dfrac{12.375}{0.6} = 21$ bags

$\boxed{\text{Josh will need a minimum of 21 bags.}}$

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

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$9 \div 12 = 0.75$ ft

$3.5 - 0.75 - 0.75 = 2$ ft.

$3.5^2 \cdot 1.5 = 18.375$ ft^3

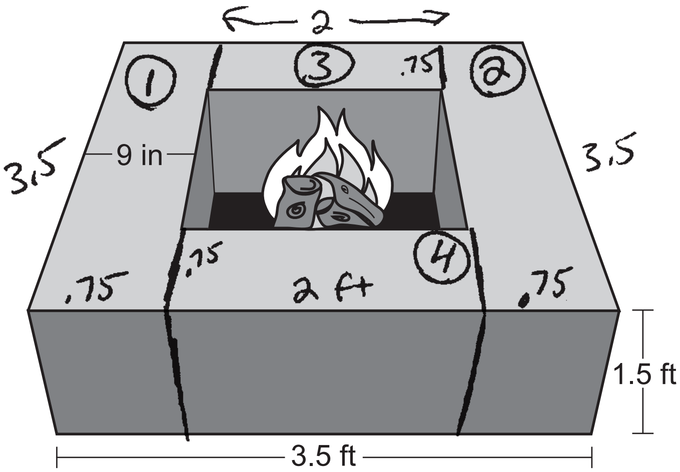
$2^2 \cdot 1.5 = 6$ ft^3

$18.375 - 6 = 12.375$ ft^3

$12.375 \div 0.6 \approx 21$ bags

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

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

1 $V = 3.5 \cdot 1.5 \cdot .75 = 3.9375 \text{ ft}^3$

2 $V = 3.5 \cdot 1.5 \cdot .75 = 3.9375 \text{ ft}^3$

3 $V = 2 \cdot 1.5 \cdot .75 = 2.25 \text{ ft}^3$

4 $V = 2 \cdot 1.5 \cdot .75 = 2.25 \text{ ft}^3$

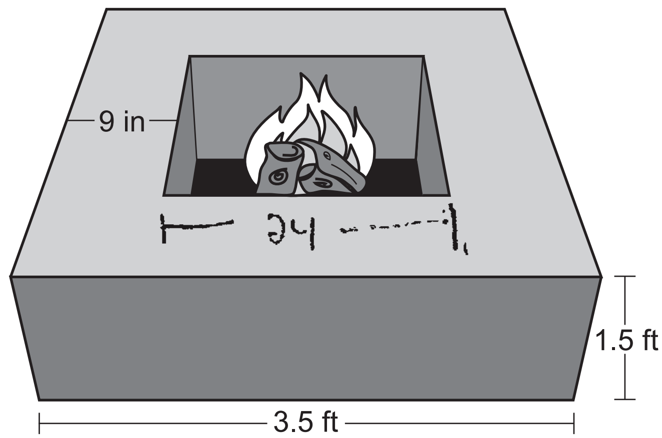
Volme of fire pit = 12.375 ft^3

$\frac{12.375}{0.6} = 20.625 \longrightarrow 21$ bags

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

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$3.5 \cdot 12 = 42$ $\quad 42 - 9 = 33 - 9 = 24$

$24 \cdot 24 \cdot 1.5 = \cancel{864}$

$2 \cdot 2 \cdot 0.125 = .5$

$3.5 \cdot 3.5 \cdot 1.5 = 18.375 ft$

$18.375 - .5$

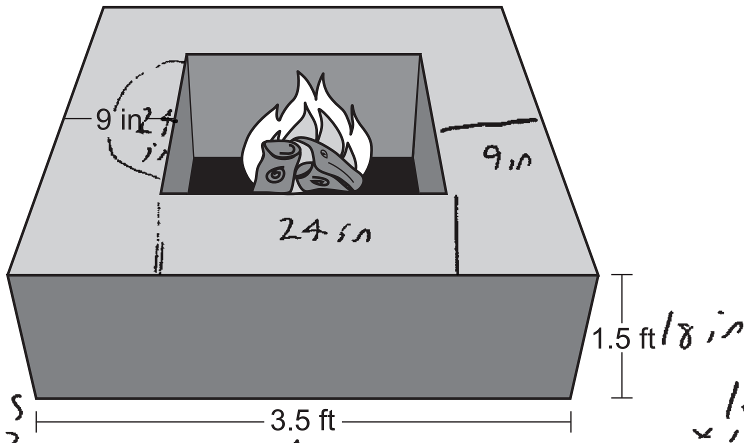
$\frac{17.875}{.6} = 29.79$

30 bags

Score 3: The student made a computational error in determining the volume of the inner region of the fire pit.

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



$42 - 18 = 24$

$3.5 \times 12 = 42$

$1.5 \times 12 = 18$

If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$42\text{ in} \times 42\text{ in} \times 18\text{ in} = 31{,}752\text{ in}^3$

$24\text{ in} \times 24\text{ in} \times 1.5\text{ in} = 864\text{ in}$

$31{,}752 - 864 = 30{,}888\text{ in}^3$

$1\text{ ft}^3 = 1728\text{ in}^3$

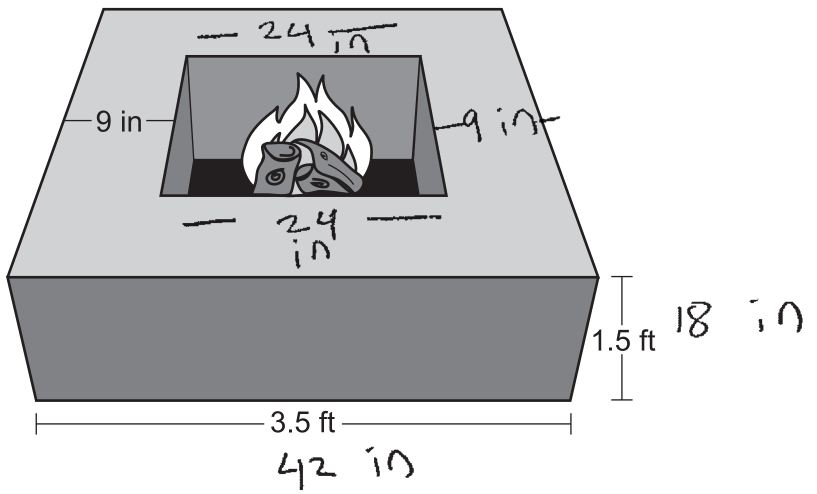
$0.6\text{ ft}^3 = 1036.8\text{ in}^3$

$$\frac{30{,}888\text{ in}^3}{1036.8\text{ in}^3} = 29.79 \approx 30\text{ bags}$$

Score 3: The student used an incorrect height when determining the volume of the inner region of the fire pit.

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$V = lwh$

$V = 42 \times 42 \times 18$

$V = 31752 \text{ in}^3$

$V = 24 \times 24 \times 18$

$V = 10368 \text{ in}^3$

$31752 - 10368 = 21384$

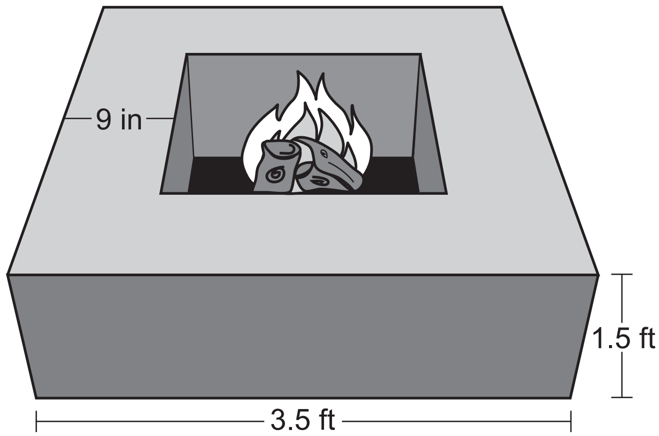
$\frac{21384}{0.6} = 35640$

35640 bags

Score 3: The student did not convert the volume of concrete to cubic feet.

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$$\text{Volume} = (3.5)(1.5) - (2)(1.5)$$

$$= 2.25$$

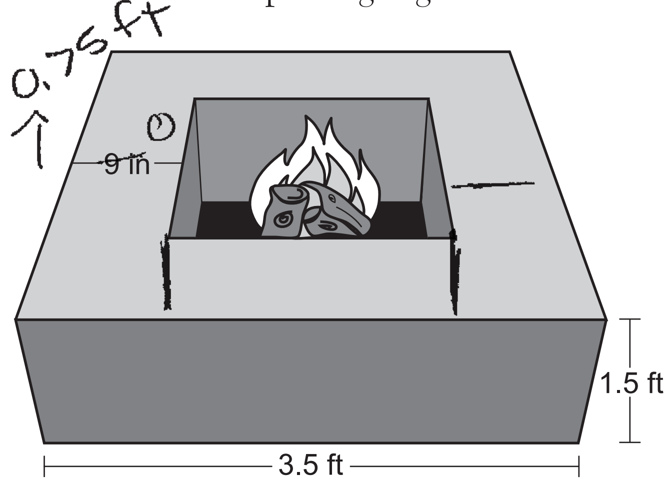
$$\#\text{bags} = 2.25/0.6 = 3.75$$

$$\boxed{\#\text{ bags} = 4 \text{ bags}}$$

Score 2: The student made a conceptual error when determining the volume of both the outside rectangular prism and the inner region of the fire pit.

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

vol. large − vol. small

$(3.5)(1.5)(1.5) - (1.5)(1.5)(1.5)$

$7.875 - 3.375 = \boxed{4.5 ft^3}$

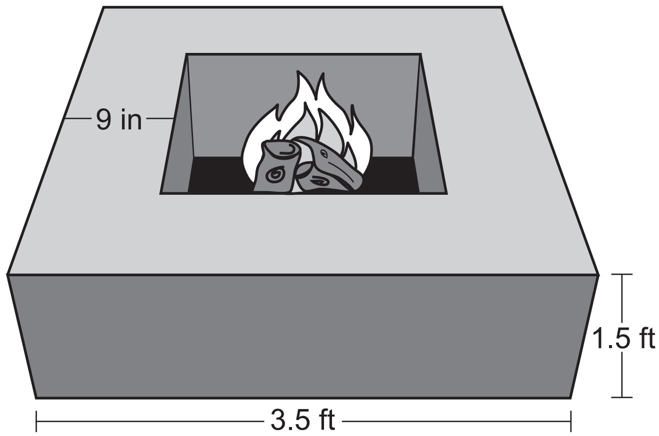
$4.5 \div .6 = 7.5$

minimum # of bags: 7 bags

Score 1: The student made a conceptual error in determining the volume of both the outside rectangular prism and inner region of the fire pit. The student made a rounding error in determining the number of bags of concrete.

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$V = l \cdot w \cdot h$

$= 3.5 \times 3.5 \times 1.5$

$\boxed{V = 18.375}$

$V = 2.75 \times 2.75 \times 1.5$

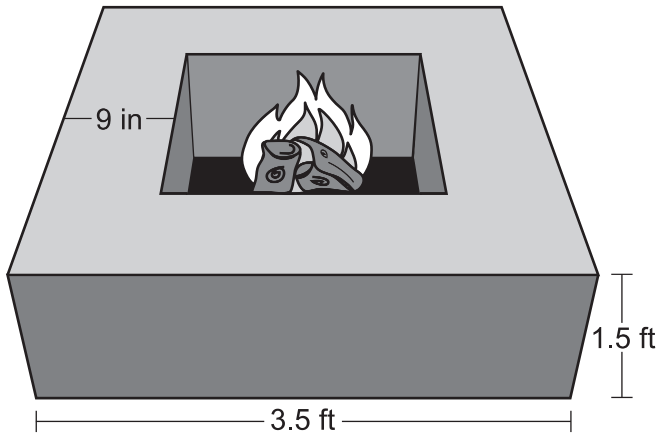
$\boxed{V = 11.34375}$

$\frac{18.375}{11.34375} = \boxed{1.619 \text{ bags}}$

Score 1: The student determined the volume of the outside rectangular prism, but no further correct work was shown.

Question 32

32 Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick.



If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$B = b \cdot h$

$B = 3.5 \cdot 1.5$

$B = 5.25$

$V = Bh$

$V = 5.25(9)$

$V = 47.25 \text{ in}^3$

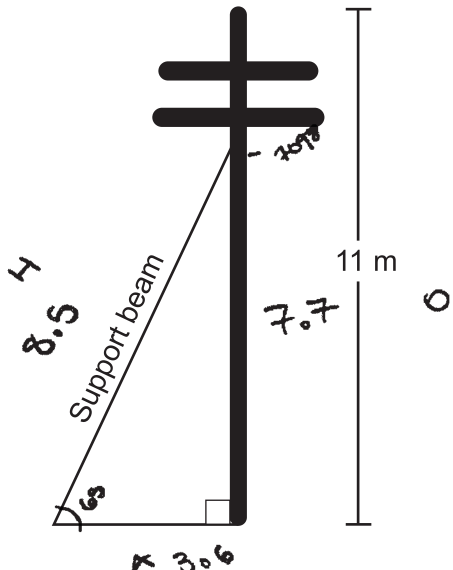
$0.6 \times 47.25 = 28.35$

The minimum number of bags needed to build the fire pit is 28 bag of Concrete.

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

Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

$.70(11) = 7.7$

$S = \frac{O}{H} \rightarrow \frac{7.7}{H} = \sin 65$

$\frac{\sin 65 H}{\sin 65} = \frac{7.7}{\sin 65}$

$H = 8.5$ meters

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

$\tan 65 = \frac{7.7}{x}$

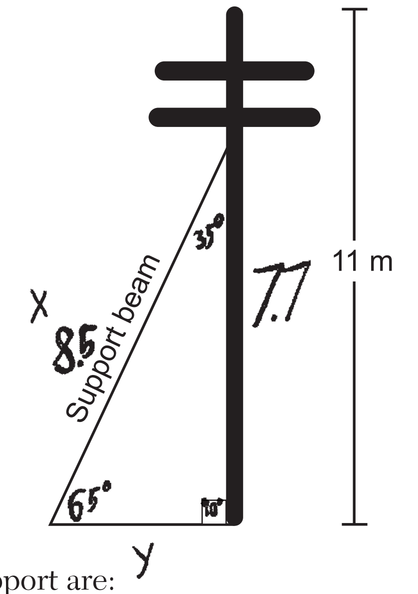
$\frac{\tan 65 x}{\tan 65} = \frac{7.7}{\tan 65}$

$x = 3.6$ meters

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

Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

$\frac{x}{11} \times \frac{70}{100}$ $\frac{770}{100} = 7.7\ m$

$\sin(65°) = \frac{7.7}{x}$

$\frac{0.906}{1} \times \frac{7.7}{x}$ $\frac{7.7}{0.906} =$ 8.5 meters

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

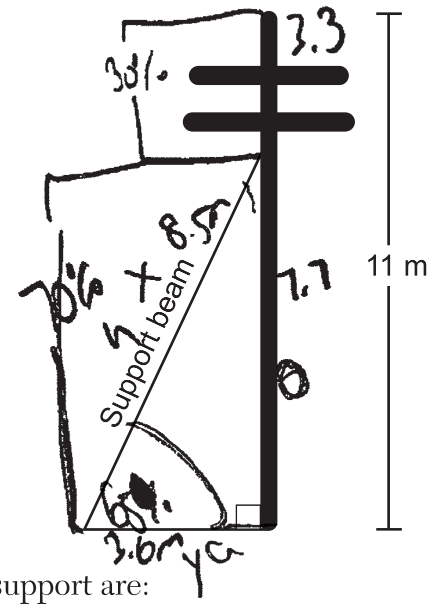
$\cos(65°) = \frac{y}{8.5}$

$\frac{0.423}{1} \times \frac{y}{8.5} =$ 3.6 meters

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

Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

the length is 8.5m

$\frac{\sin 65}{1} = \frac{o}{h}$

$11 \cdot 0.7 = 7.7$

$\frac{\sin 65}{1} = \frac{7.7}{x}$

$\frac{0.9063}{1} = \frac{7.7}{x}$

$x = 8.5$

$\frac{0.9063x}{0.9063} = \frac{7.7}{0.9063}$

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

$\frac{\tan 65}{1} = \frac{o}{a}$

It must be plac 3.6m away

$\frac{\tan 65}{1} = \frac{7.7}{y}$

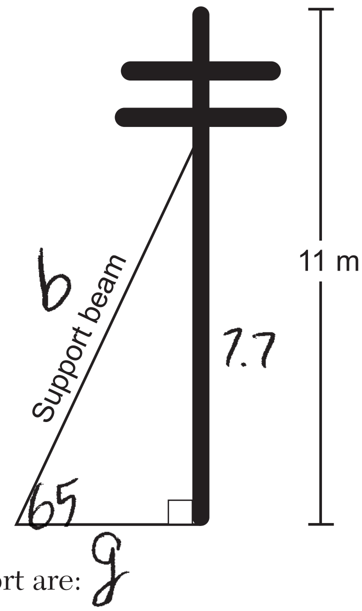
$\frac{2.1445y}{2.1445} = \frac{7.7}{2.1445}$

$y = 3.59658$

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

Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



$11(.7) = 7.7$

Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

$\sin 65 = \frac{7.7}{b}$ $\quad b = \frac{7.7}{\sin 65}$

$\boxed{b = 8.5}$

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

$7.7^2 + g^2 = 8.5^2$

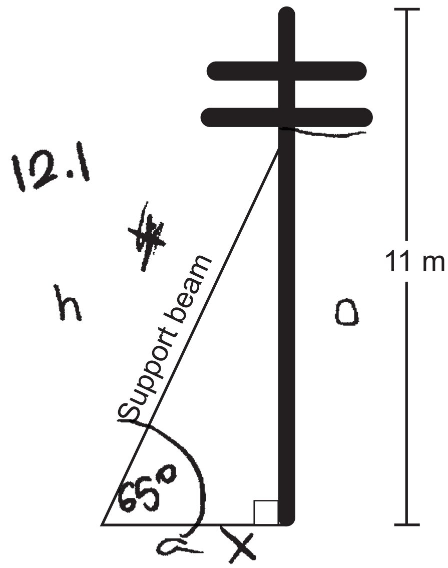
$g^2 = 12.96$

$\boxed{g = 3.6}$

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

Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

$S\frac{o}{h}\, C\frac{a}{h}\, T\frac{o}{a}$

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

$\sin 65 = \frac{11}{h}$

$\boxed{12.1\text{m}}$

$\frac{h \cdot \cancel{\sin(65)}}{\cancel{\sin 65}} = \frac{11}{\sin 65}$

$h = 12.137...$

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

$\frac{\cos 65}{1} = \frac{x}{12.1}$

$x = 5.1136$

$\boxed{5.1}$

The support beam must be placed 5.1m from the base of the pole

Score 3: The student used an incorrect height when determining the length of the support beam.

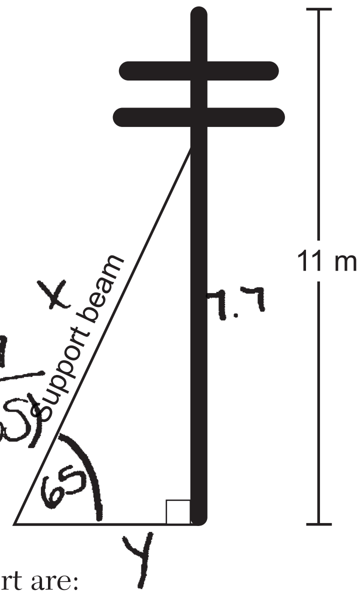
Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.

$$\frac{\sin(65)}{1} = \frac{7.7}{x}$$

$$\frac{\sin(65)x}{\sin(65)} = \frac{7.7}{\sin(65)}$$

$x =$



Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

$\boxed{8.5\text{m}}$

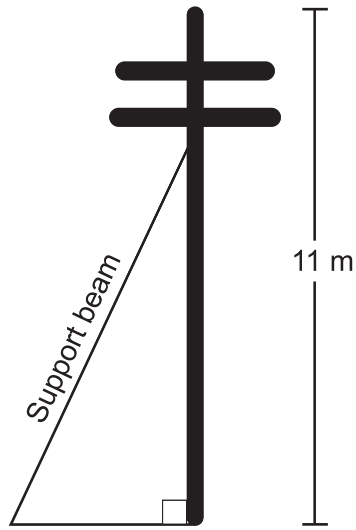
Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

$$\frac{\cos(65)}{1} = \frac{y}{7.7} \qquad \boxed{3\text{m}}$$

Score 2: The student determined the length of the support beam, but no further correct work was shown.

Question 33

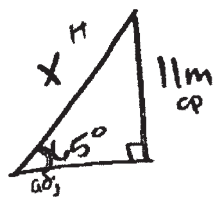
33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.



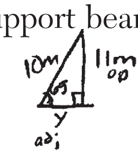
$\sin 65 = \frac{11}{x}$

$= 9.469385657$

$= 10m$

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

10m



$\cos 65 = \frac{y}{10}$

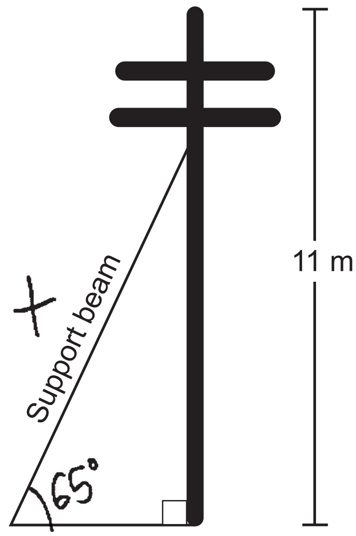
$= 4.2261826m$

$= 4.2m$

Score 2: The student used an incorrect height and made a computational error when determining the length of the support beam. The student found an appropriate distance from the bottom of the support beam to the base of the pole.

Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

$\frac{\sin 65°}{1} = \frac{11}{x}$

$\frac{11}{\sin 65°} = \frac{x(\cancel{\sin 65°})}{\cancel{\sin 65°}}$

$x = 12.1$

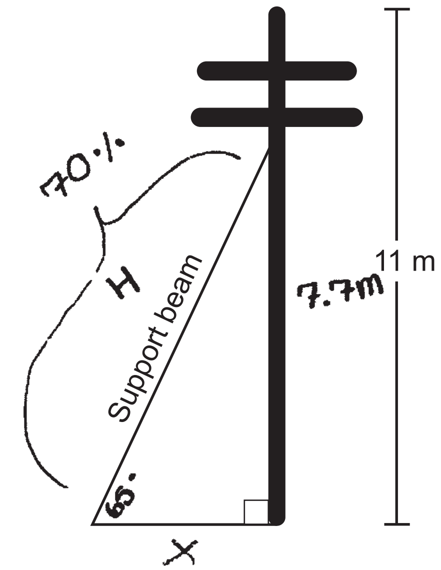
12.1 meters

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

$12.1 - 11 = 1.1$ meters

Score 1: The student used an incorrect height when determining the length of the support beam. No further correct work was shown.

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



SOH CAH TOA
sin cos Tan

Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

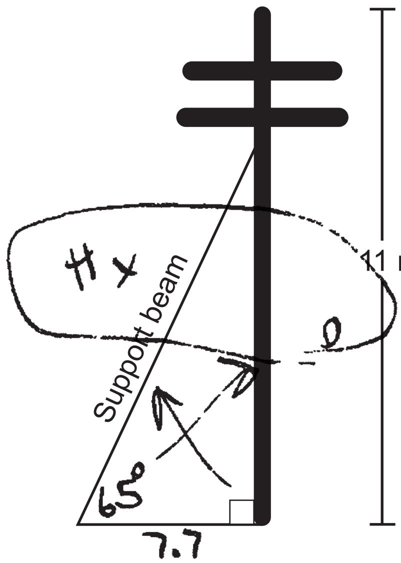
$\sin 65 = \frac{7.7}{H}$

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

Score 1: The student wrote one correct relevant trigonometric equation.

Question 33

33 A telephone pole 11 meters tall needs to be stabilized with a support beam, as modeled below.



$11 \times 0.70 = 7.7$ m

Two conditions for proper support are:

- The beam reaches the telephone pole at 70% of the telephone pole's height above the ground.
- The beam forms a 65° angle with the ground.

Determine and state, to the *nearest tenth of a meter*, the length of the support beam that meets these conditions for this telephone pole.

$x = 11 \sin 65$

10m

Determine and state, to the *nearest tenth of a meter*, how far the support beam must be placed from the base of the pole to meet the conditions.

70% of 11m

0.7

$11 \times 0.7 = 7.7$m

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

34 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,4), *B*(3,8), *C*(8,3), and *D*(5,−1).

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

$d_{AB}\sqrt{(0-3)^2+(4-8)^2} = \sqrt{(9)+(16)} = \sqrt{25} = 5$

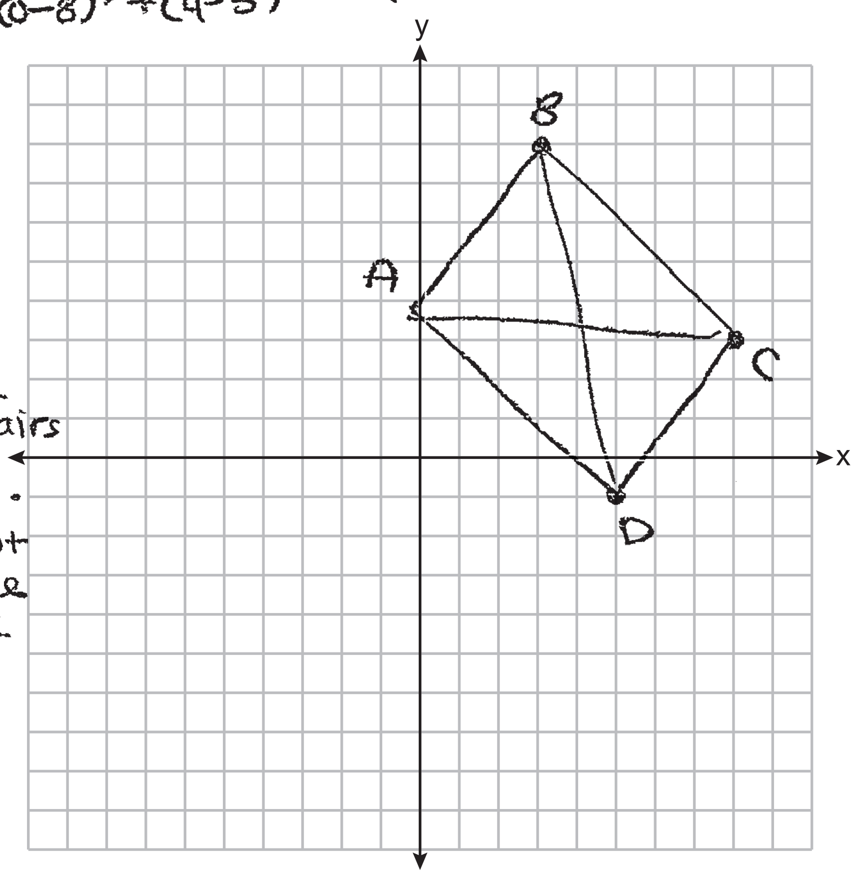
$d_{CD}\sqrt{(8-5)^2+(3+1)^2} = \sqrt{9+16} = \sqrt{25} = 5$

$d_{BC}\sqrt{(3-8)^2+(8-3)^2} = \sqrt{(25)+(25)} = \sqrt{50}$

$d_{AD} = \sqrt{(0-5)^2+(4+1)^2} = \sqrt{25+25} = \sqrt{50}$

$d_{BD} = \sqrt{(3-5)^2+(8+1)^2} = \sqrt{(4)+(81)} = \sqrt{85}$

$d_{AC} = \sqrt{(0-8)^2+(4-3)^2} = \sqrt{(64)+(1)} = \sqrt{65}$



- ABCD is a $\boxed{P}$ bc both pairs opp sides ≅.
- ABCD is not a rectangle bc diagonal are not ≅.

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

Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are $A(0,4)$, $B(3,8)$, $C(8,3)$, and $D(5,-1)$.

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

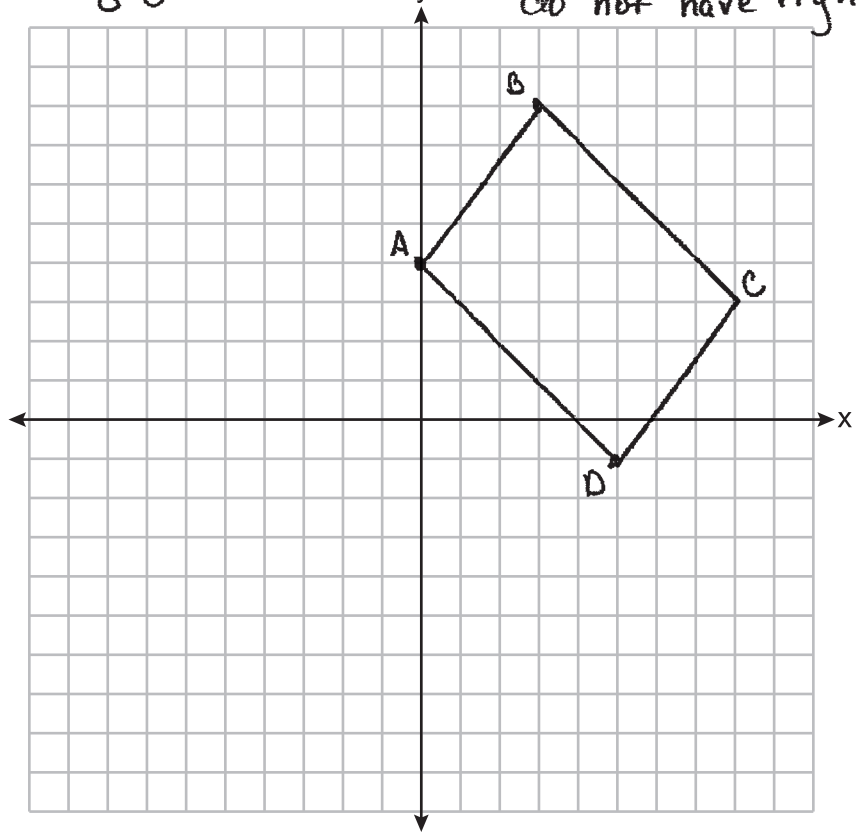
slope $\overline{AB} = \frac{8-4}{3-0} = \frac{4}{3}$

slope $\overline{CD} = \frac{-1-3}{5-8} = \frac{-4}{-3} = \frac{4}{3}$ $\Big\} \parallel$

slope $\overline{BC} = \frac{3-8}{8-3} = -1$

slope $\overline{AD} = \frac{-1-4}{5-0} = -1$ $\Big\} \parallel$

ABCD is a parallelogram but not a rectangle because both pairs of opposite sides are parallel but consecutive sides do not have opposite reciprocal slopes so they ~~slopes~~ are not perpendicular and therefore do not have right angles



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

Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,4), *B*(3,8), *C*(8,3), and *D*(5,−1).

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

$\overline{AB}$

$d=\sqrt{(0-3)^2+(4-8)^2}$

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

$d=\sqrt{9+16}$

$d=\sqrt{25}=5$

$\overline{BC}$

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

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

$d=\sqrt{25+25}$

$d=\sqrt{50}$

since both pairs of opposite sides are congruent, ABCD is a parallelogram

$\overline{CD}$

$d=\sqrt{(8-5)^2+(3--1)^2}$

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

$d=\sqrt{9+16}$

$d=\sqrt{25}=5$

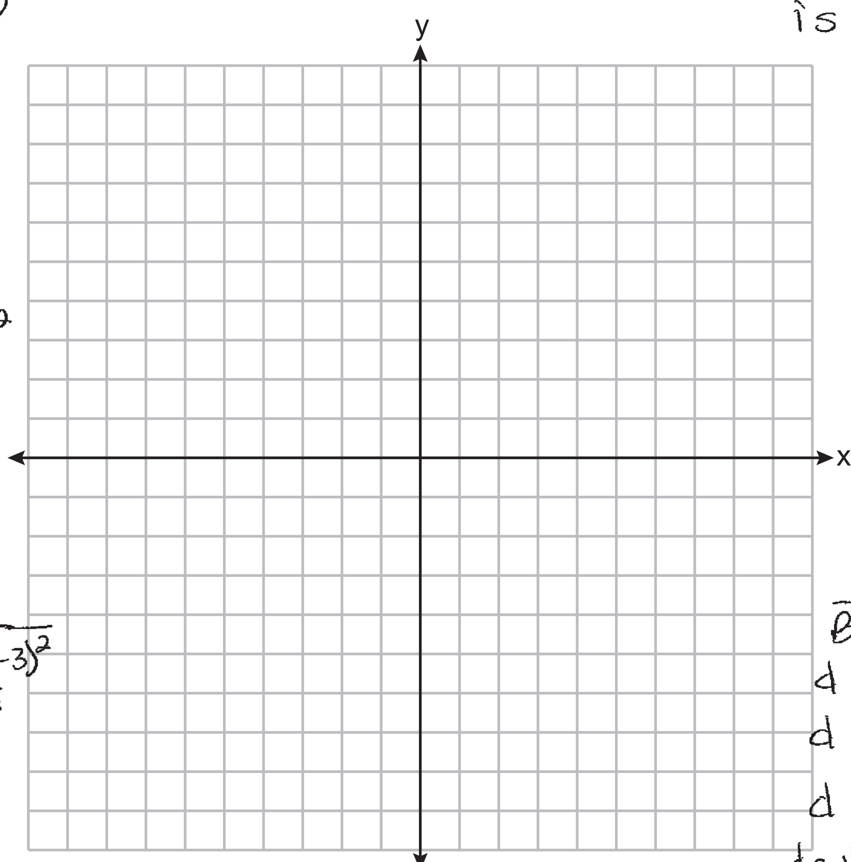
$\overline{AD}$

$d=\sqrt{(0-5)^2+(4-1)^2}$

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

$d=\sqrt{25+25}$

$d=\sqrt{50}$



$\overline{AC}$

$d=\sqrt{(0-8)^2+(4-3)^2}$

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

$d=\sqrt{64+1}$

$d=\sqrt{65}$

$\overline{BD}$

$d=\sqrt{(3-5)^2+(8--1)^2}$

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

$d=\sqrt{4+81}$

$d=\sqrt{85}$

Score 3: The student did not write a concluding statement when proving *ABCD* is not a rectangle.

Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,4), *B*(3,8), *C*(8,3), and *D*(5,−1).

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

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

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

$\sqrt{25 + 25}$

$5 \sqrt{50}$

$\sqrt{25}\sqrt{2}$

$BC = 5\sqrt{2}$

$AD = \sqrt{(5-0)^2 + (-1-4)^2}$

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

$\sqrt{25 + 25}$

$5 \sqrt{50}$

$\sqrt{25}\sqrt{2}$

$AD = 5\sqrt{2}$

∴ opposite sides are congruent

$BD = \sqrt{(5-3)^2 + (-1-8)^2}$

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

$\sqrt{4 + 81}$

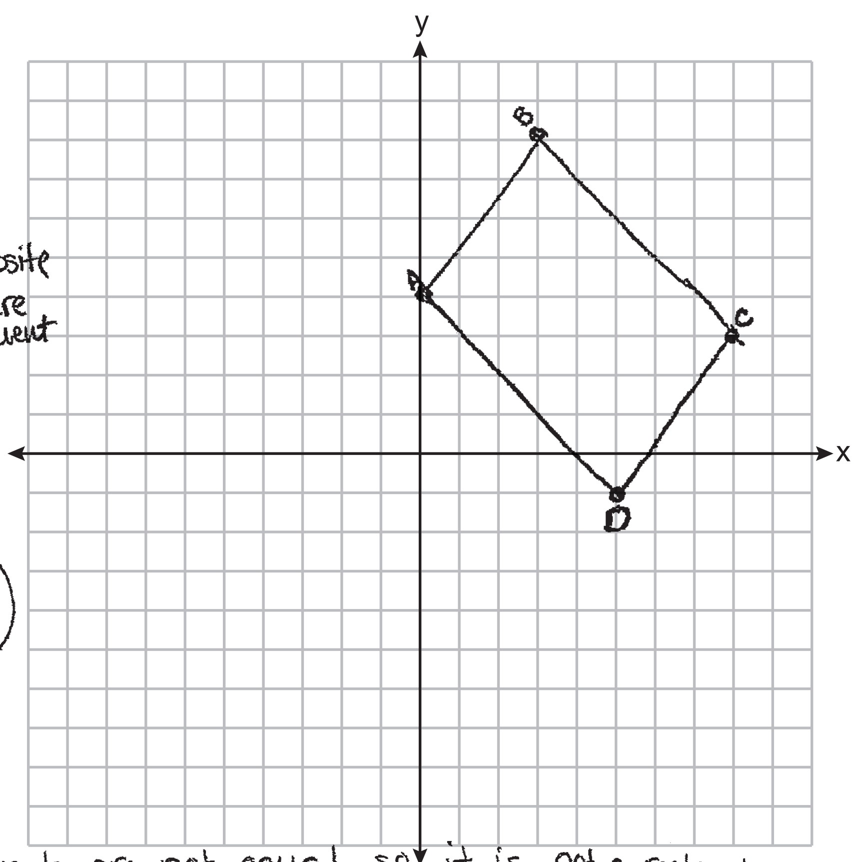
$BD = \sqrt{85}$

$AC = \sqrt{(8-0)^2 + (3-4)^2}$

$\sqrt{8^2 + -1^2}$

$\sqrt{64 + 1}$

$AC = \sqrt{65}$



∴ The diagonals are not equal so it is not a rectangle

Score 2: The student proved *ABCD* was not a rectangle, but did not prove *ABCD* was a parallelogram.

Question 34

34 The coordinates of the vertices of quadrilateral $ABCD$ are $A(0,4)$, $B(3,8)$, $C(8,3)$, and $D(5,-1)$.

Prove that $ABCD$ is a parallelogram, but *not* a rectangle.

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

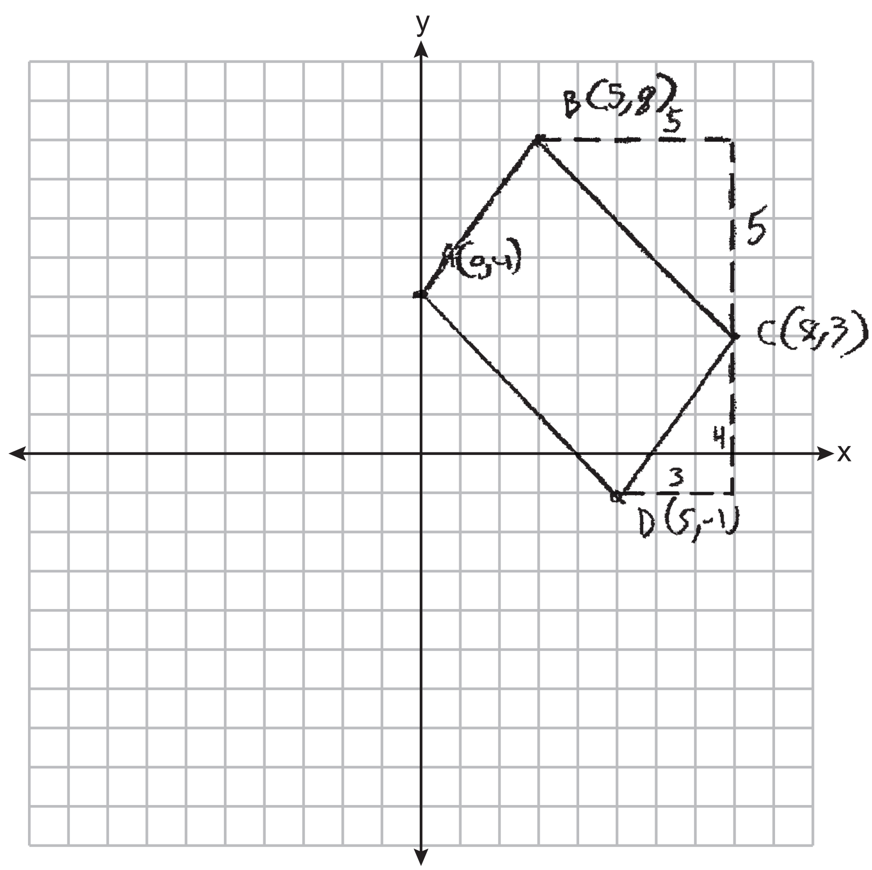
slope $\overline{BC} = \frac{\text{Rise}}{\text{Run}}$

slope $\overline{BC} = \frac{5}{-5} = \frac{1}{-1} = -1$

slope $\overline{DC} = \frac{\text{rise}}{\text{Run}}$

slope $\overline{DC} = \frac{4}{3}$

-1 and $\frac{4}{3}$ are not opsite reciprocals lines are not perpendicular, in rectangle all ajacent lines are perpendicular
▱ABCD is not a Rectangle



Score 2: The student proved $ABCD$ was not a rectangle, but did not prove $ABCD$ was a parallelogram.

Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,4), *B*(3,8), *C*(8,3), and *D*(5,−1).

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

$AB\sqrt{(0-3)^2+(4-8)^2}$

$\sqrt{9+16}$

$\sqrt{25}$

$AB=5$

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

$\sqrt{25+25}$

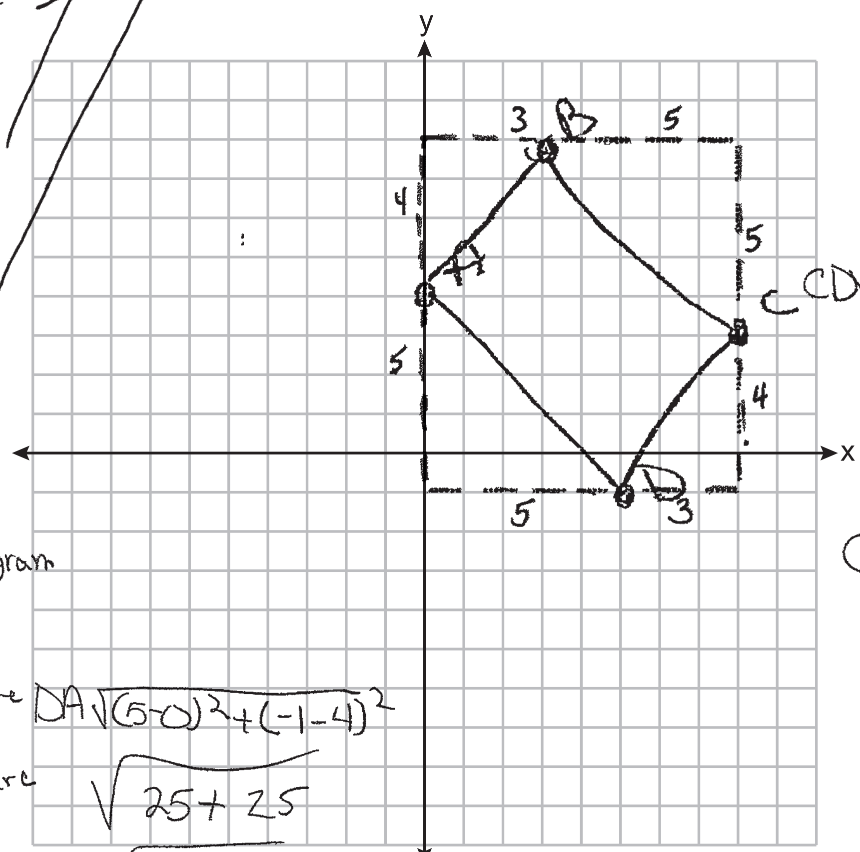
$\sqrt{50}$

$\overline{AB}\ \frac{Rise}{Run} = \frac{4}{3}$ ∥

$\overline{BC}\ \frac{Rise}{Run} = -\frac{5}{5}$ ∥

$\overline{CD}\ \frac{Rise}{Run} = \frac{4}{3}$

$\overline{AD}\ \frac{Rise}{Run} = \frac{-5}{5}$



$CD\sqrt{(8-5)^2+(3-1)^2}$

$\sqrt{9+16}$

$\sqrt{25}$

$CD=5$

yes its a parallelogram because $\overline{AB}$ and $\overline{CD}$ are parallel and $\overline{BC}$ and $\overline{DA}$ are parallel

$DA\sqrt{(5-0)^2+(-1-4)^2}$

$\sqrt{25+25}$

$\sqrt{50}$

Score 2: The student proved *ABCD* was a parallelogram, but did not prove *ABCD* was not a rectangle.

Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,4), *B*(3,8), *C*(8,3), and *D*(5,−1).

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

AB
(0,4)
(3,8)

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

$\sqrt{(3-0)^2+(8-4)^2}$

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

$\sqrt{9+16}$

$\sqrt{25}$

$\boxed{5}$

BC (3,8)
(8,3)

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

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

$\sqrt{25+25}$

$\sqrt{50}$

$\boxed{7.07}$

CD (8,3)
(5,-1)

$\sqrt{(5-8)^2+(-1-3)^2}$

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

$\sqrt{9+16}$

$\sqrt{25}$

$\boxed{5}$

AD (0,4)
(5,-1)

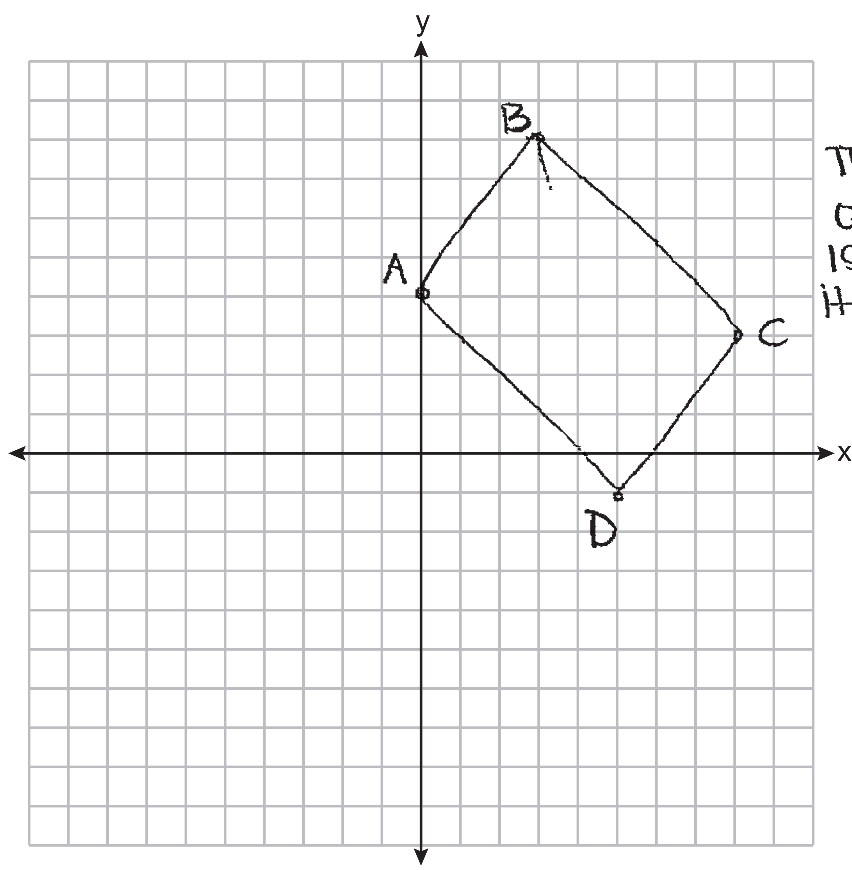
$\sqrt{(5-0)^2+(-1-4)^2}$

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

$\sqrt{25+25}$

$\sqrt{50}$

$\boxed{7.07}$



The distance of the bisector is different ∴ it is a parallelog

Score 1: The student found the length of all four sides, but no further correct work was shown.

Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,4), *B*(3,8), *C*(8,3), and *D*(5,−1).

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

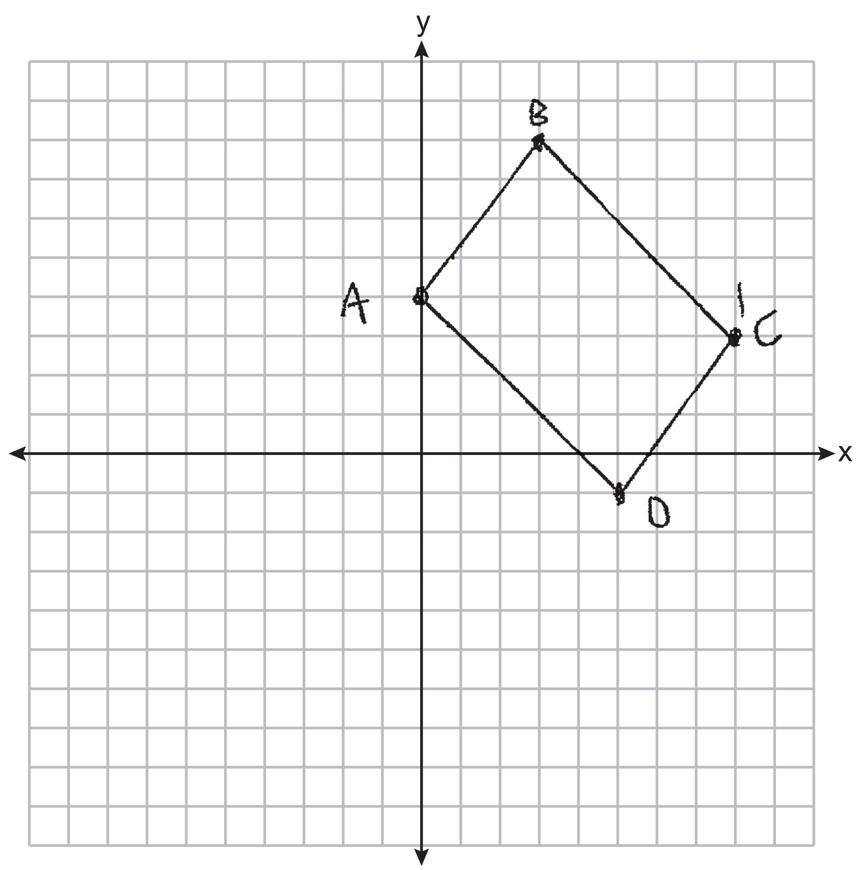
$M_{\overline{AB}} = \frac{8-4}{3-0} = \frac{4}{3}$

$M_{\overline{BC}} = \frac{8-3}{3-8} = \frac{5}{-5} = -1$

$M_{\overline{CD}} = \frac{3-1}{8-5} = \frac{4}{3}$

$M_{\overline{DA}} = \frac{4+1}{0-5} = \frac{5}{-5} = -1$

$\overline{AB}$ is not perpindicular to $\overline{BC}$.



Score 1: The student found the slopes of all four sides, but wrote an incomplete concluding statement when proving *ABCD* was not a rectangle.

Question 34

34 The coordinates of the vertices of quadrilateral $ABCD$ are $A(0,4)$, $B(3,8)$, $C(8,3)$, and $D(5,-1)$.

Prove that $ABCD$ is a parallelogram, but *not* a rectangle.

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

A (0,4)

C (8,3)

$Mpx = \frac{x_1+x_2}{2}$

$= \frac{0+8}{2}$ $= \frac{8}{2}$

$= 4$ (4, 3.5)

$\frac{4+3}{2}$

$= \frac{7}{2}$

$= 3.5$

B(3,8)

D(5,−1)

$Mpy = \frac{y_1+y_2}{2}$

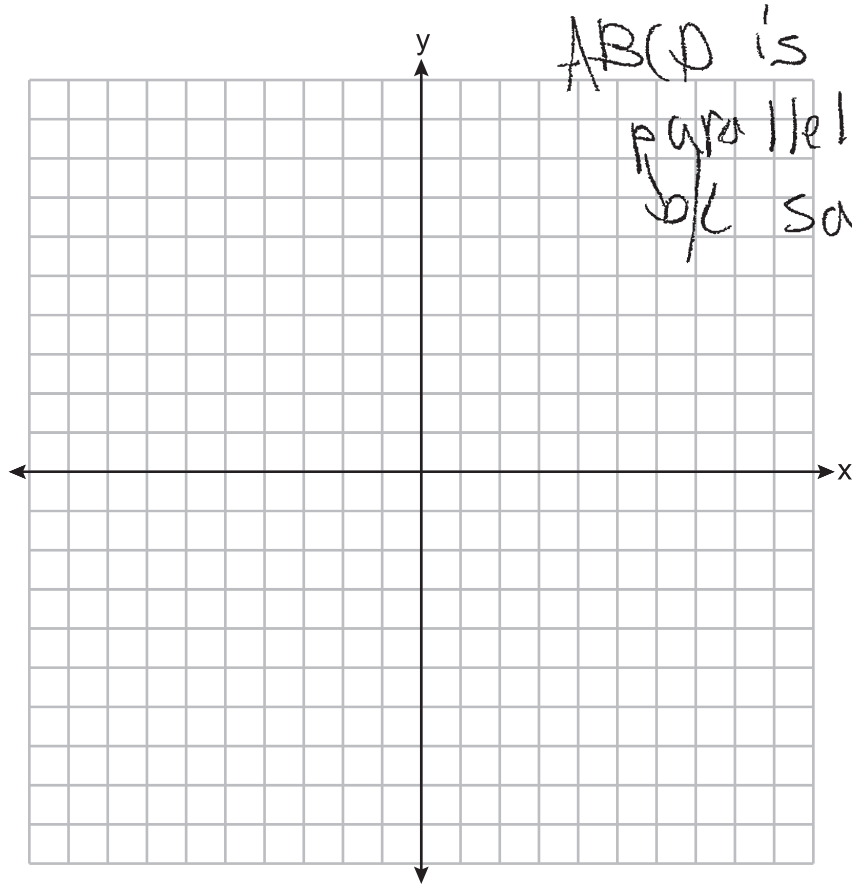
$\frac{3+5}{2}$ $\frac{8-1}{2}$

$= \frac{8}{2}$ $= \frac{7}{2}$

$= 4$ $= 3.5$

(4, 3.5)

ABCD is a parallelogram b/c same midpt



Score 1: The student found the midpoints of both diagonals, but wrote an incomplete concluding statement when proving $ABCD$ was a parallelogram. No further correct work was shown.

Question 34

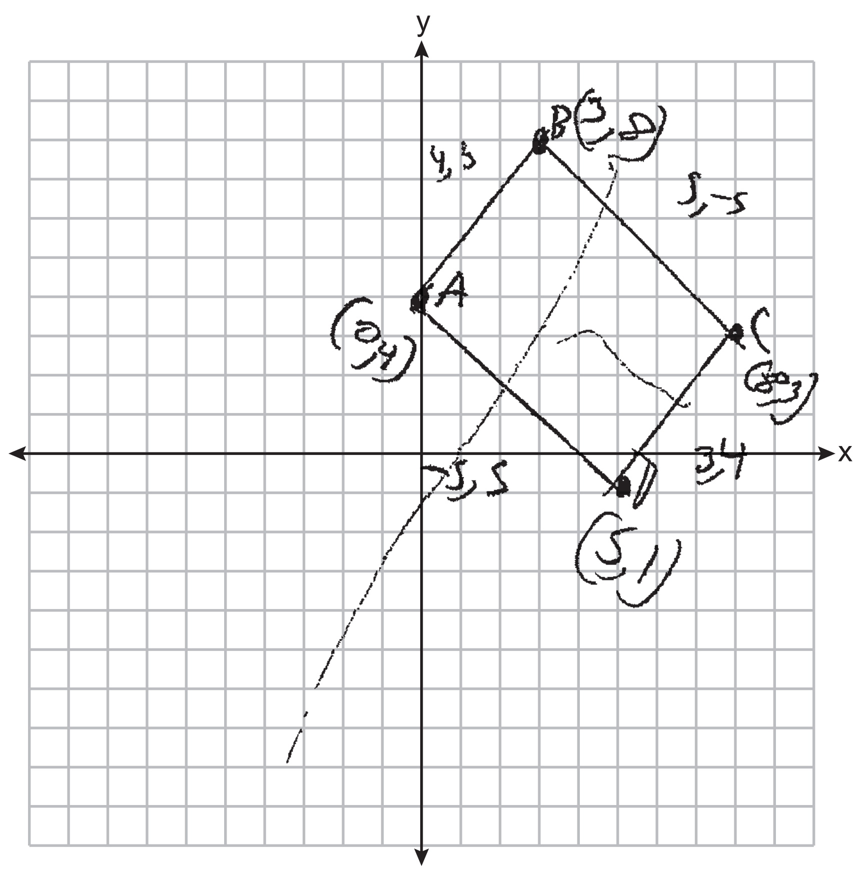
34 The coordinates of the vertices of quadrilateral *ABCD* are $A(0,4)$, $B(3,8)$, $C(8,3)$, and $D(5,-1)$.

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

4,3   3,4

-5,5   5,-5



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

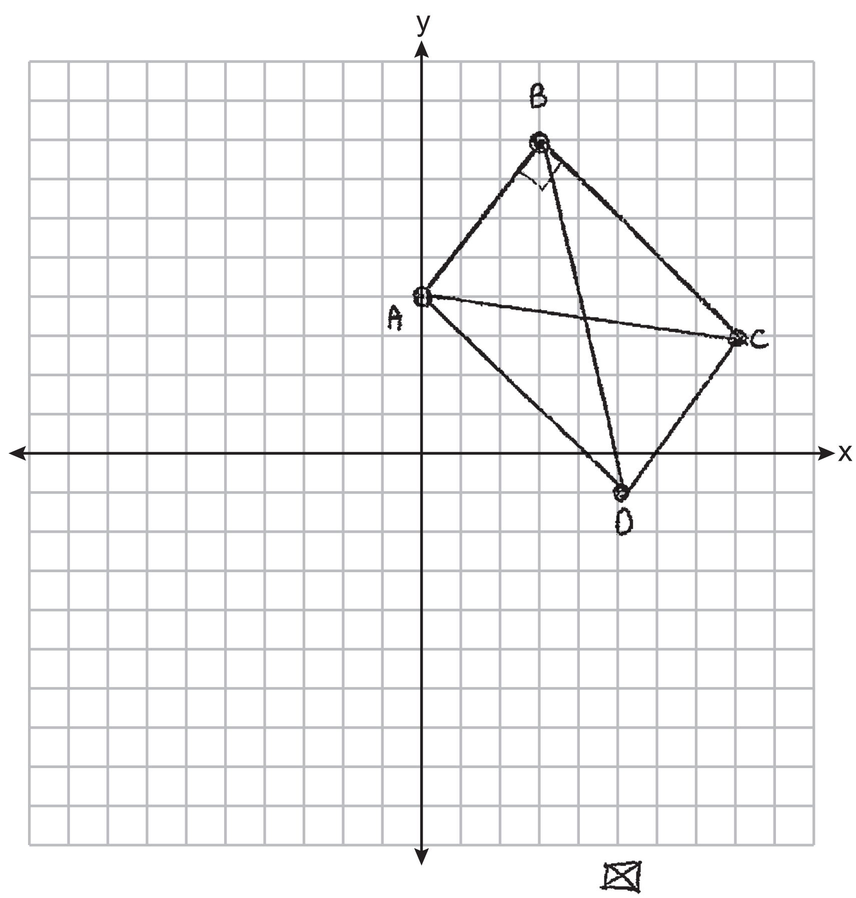
Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are $A(0,4)$, $B(3,8)$, $C(8,3)$, and $D(5,-1)$.

Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

ABCD is a parrallelogram because 2 sets of parrallel sides are equal in proportion to each other. It is not a rectangle because the diagnols are not ⊥. In a porallelagram diagnols bisect each other like the diagram below.



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

Question 34

34 The coordinates of the vertices of quadrilateral *ABCD* are *A*(0,4), *B*(3,8), *C*(8,3), and *D*(5,−1).

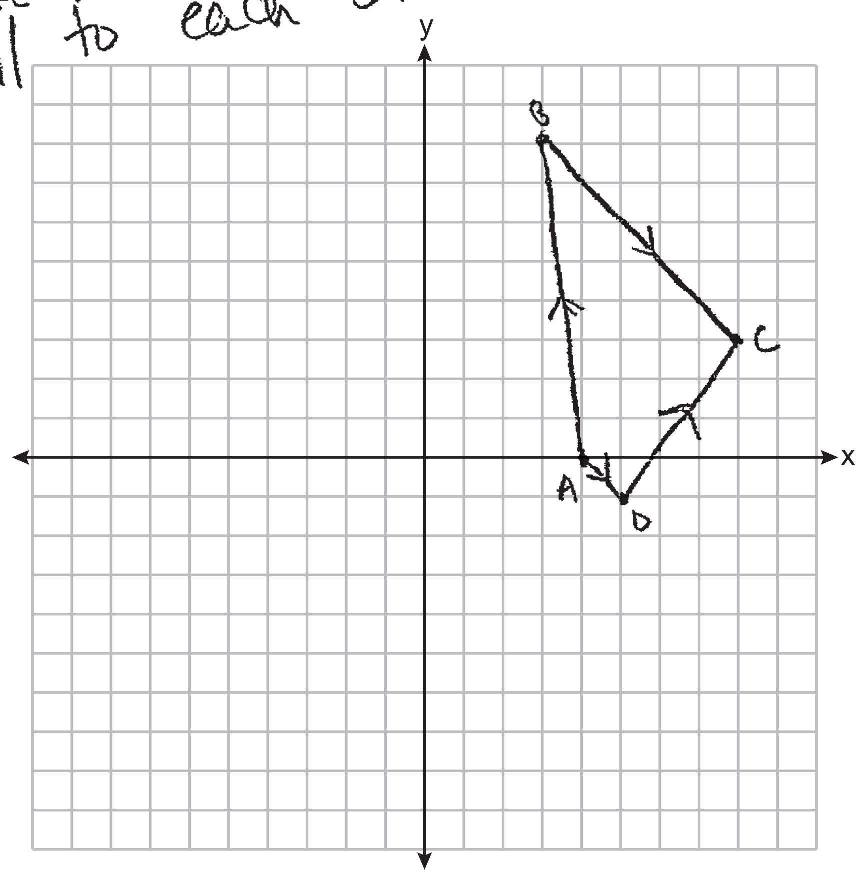
Prove that *ABCD* is a parallelogram, but *not* a rectangle.

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

ABCD is a ▱ $\frac{3}{4}$ $\frac{3}{4}$ $D=\sqrt{\Delta x+\Delta y}$ $\frac{3}{4}$ $\frac{3}{4}$
and not a rectangle
because the opposite sides
are ∥ to each other.

$S=\frac{\Delta y}{\Delta x}$ $\frac{\Delta y}{\Delta x}$ 5/5 5/5

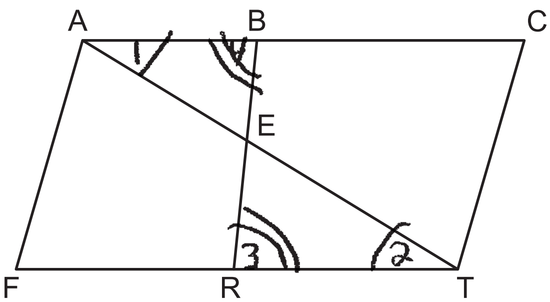
(1, 1)



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

Question 35

35 In the diagram below of quadrilateral *FACT*, $\overline{BR}$ intersects diagonal $\overline{AT}$ at *E*, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

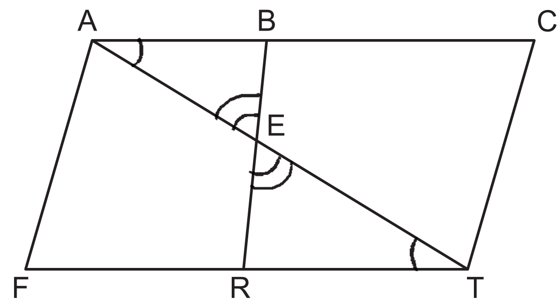
Statements	Reasons
1. Quad FACT, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} // \overline{CT}$, $\overline{AF} \cong \overline{CT}$	1. Given
2. ACTF is a parallelogram	2. A quad w/ one set of opp sides // and $\cong$ $\rightarrow$ parallelogram
3. $\overline{AC} // \overline{FT}$	3. parallelogram $\rightarrow$ opp. sides //
4. $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$	4. parallel lines cut by a transversal $\rightarrow$ alt. int. $\angle$'s $\cong$
5. $\triangle ABE \sim \triangle TRE$	5. AA Similarity
6. $\frac{AB}{AE} = \frac{TR}{TE}$	6. $\sim \triangle$'s $\rightarrow$ corr. sides proportional
7. $AB \cdot TE = AE \cdot TR$	7. product of means = product of extremes

Work space for question 35 is continued on the next page.

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

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



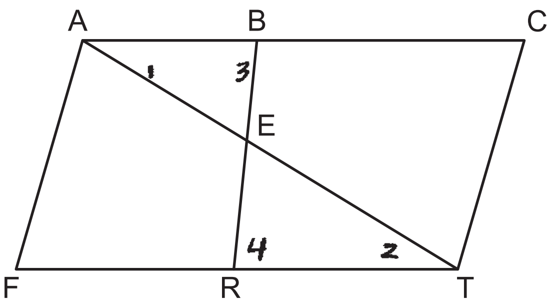
Prove: $(AB)(TE) = (AE)(TR)$

$\angle BEA \cong \angle RET$ b/c intersecting lines form $\cong$ verticle angles.
$\overline{AF} \parallel \overline{CT}$ and $\overline{AF} \cong \overline{CT}$ so quad FACT is a parallelogram, b/c one pair of opp sides are $\cong$ and $\parallel$.
$\overline{AC} \parallel \overline{FT}$ b/c parallelogram have opposite $\parallel$ sides. $\angle EAB \cong \angle ETR$ b/c $\parallel$ lines cut by transversal have $\cong$ alternate interior angles
$\triangle BEA \sim \triangle RET$ b/c AA. $\frac{AB}{TR} = \frac{AE}{TE}$ b/c similar $\triangle$s have proportional corresponding sides. $(AB)(TE) = (AE)(TR)$ b/c product of means = product of extremes.

Work space for question 35 is continued on the next page.

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

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

$\boxed{\overline{AF} \parallel \overline{CT}}$ Given

$\boxed{\overline{AF} \cong \overline{CT}}$ Given

$\boxed{\text{Quad } FACT}$ Given

$\boxed{FACT \text{ is a parallelogram}}$

Quad w/ 1 pair opp sides ≅ & ∥ → ▱

$\boxed{\overline{AC} \parallel \overline{FT}}$

▱ → opp sides ∥

$\boxed{\angle 1 \cong \angle 2}$ $\boxed{\angle 3 \cong \angle 4}$

∥ → alt. int. ∠'s ≅

$\boxed{\triangle ABE \sim \triangle TRE}$ AA~

$\boxed{\frac{AB}{AE} = \frac{TR}{TE}}$

corr sides of ~Δs proport

$\boxed{(AB)(TE) = (AE)(TR)}$

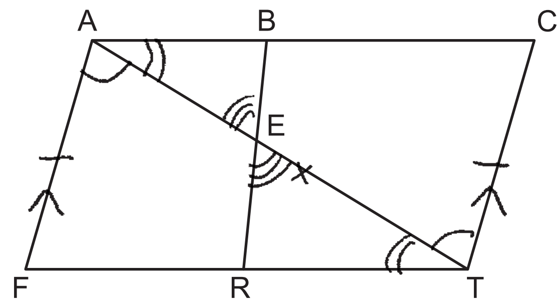
product of means = product of extremes

Work space for question 35 is continued on the next page.

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

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

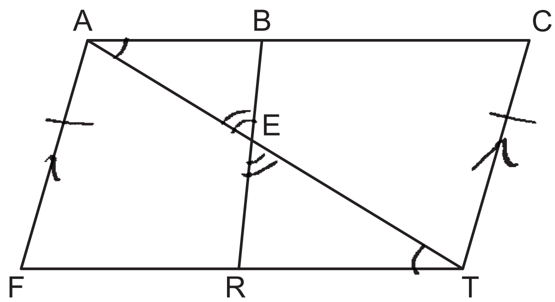
1. Quadrilateral FACT, $\overline{BR}$ + $\overline{AT}$ intersect at E, $\overline{AF} \parallel \overline{CT}$, $\overline{AF} \cong \overline{CT}$	1. Given
2. $\angle FAT \cong \angle CTA$	2. If 2 parallel lines are cut by a transversal, the alternate interior angles are $\cong$.
3. $\overline{AT} \cong \overline{AT}$	3. Reflexive
4. $\triangle AFT \cong \triangle TCA$	4. SAS $\cong$ SAS
5. $\angle FTA \cong \angle CAT$	5. CPCTC
6. $\angle BEA \cong \angle RET$	6. Vertical angles are $\cong$.
7. $\triangle AEB \sim \triangle TER$	7. AA $\cong$ AA
8. $\frac{AE}{AB} = \frac{TE}{TR}$	8. Corresponding sides of similar triangles are in proportion
9. $AB \cdot TE = AE \cdot TR$	9. Cross multiply.

Work space for question 35 is continued on the next page.

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

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

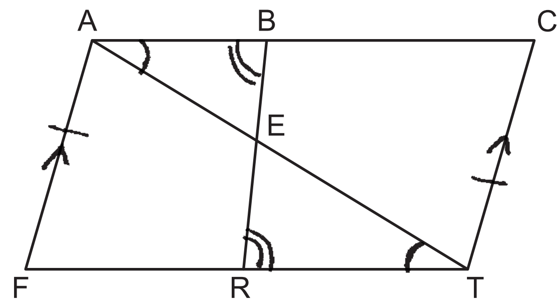
Statements	Reasons
1) Quad FACT $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, $\overline{AF} \cong \overline{CT}$	1) Given
1.5) $\overline{AC} \parallel \overline{FT}$	1.5) opposite sides of a parallelogram are parallel.(1)
A, 2) $\angle CAT \cong \angle RTA$	2) If parallel lines are cut by a transversal, then alternate interior angles are congruent (1.5).
A, 3) $\angle AEB \cong \angle TER$	3) Intersecting lines meet to form vertical angles that are congruent (PIC)
4) $\triangle ABE \sim \triangle TRE$	4) AA≅AA (2,3).
5) $\frac{AB}{AE} = \frac{TR}{TE}$	5) If triangles are similar, then corresponding sides are proportional (4)
6) $(AB)(TE) = (AE)(TR)$	6) In a proportion, the product of the means is equal to the product of the extremes (5).

Work space for question 35 is continued on the next page.

Score 4: The student made one conceptual error by not proving *FACT* was a parallelogram.

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



$\triangle ABE \sim \triangle TRE$

Prove: $(AB)(TE) = (AE)(TR)$

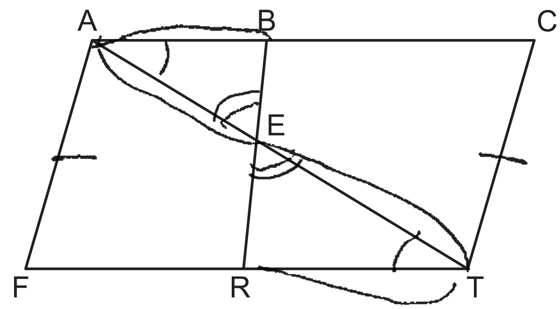
Statements	Reasons
Quad FACT	
1) $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, $\overline{AF} \cong \overline{CT}$	1) Given
2) quadrilateral FACT is a ▱	2) a quad with one pair of opp sides // and ≅ is a ▱
3) $\overline{AC} \parallel \overline{FT}$	3) ▱ → opp sides are //
4) $\angle CAT \cong \angle ATF$, $\angle BRT \cong \angle RBA$	4) when lines are //, alt int <s are ≅
5) $\triangle ABE \sim \triangle TRE$	5) AA~
6) $\frac{AB}{AE} = \frac{TR}{TE}$	6) def ~
7) $(AB)(TE) = (AE)(TR)$	7) cross product

Work space for question 35 is continued on the next page.

Score 4: The student had incorrect reasons for steps 6 and 7.

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

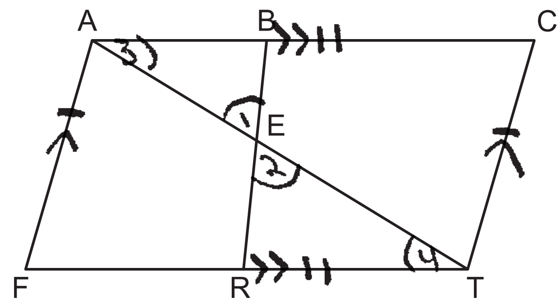
S	R
1) Quad FACT $\overline{AF} \parallel \overline{CT}$ $\overline{AF} \cong \overline{CT}$	1) given
2) Quadrilateral FACT is a parallelogram	2) definition of Parallelogram
3) $\overline{AC} \parallel \overline{FT}$	3) in a parallelogram opposite sides are parallel
4) $\angle BAE \cong \angle ETR$ (A)	4) Alternate interior angles are congruent
5) $\angle BEA \cong \angle TER$ (A)	5) vertical angles congruent
6) $\triangle BAE \sim \triangle RTE$	6) A.A postulate for similar triangle
7) $\frac{AB}{AE} = \frac{TR}{TE}$	7) in similar triangles the corresponding sides are in proportion
8) $(AB)(TE) = (AE)(TR)$	8) In a proportion the Product of means equals the product of extremes,

Work space for question 35 is continued on the next page.

Score 4: The student had an incorrect reason in step 2 and an incomplete reason in step 4.

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

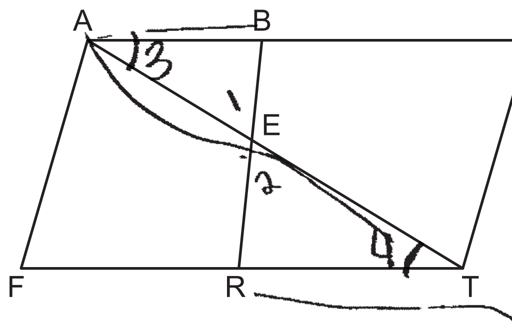
Statements	Reasons
1) quad FACT, $\overline{BR}$ intersects diag $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, $\overline{AF} \cong \overline{CT}$	1) given
2) $\angle 1 \cong \angle 2$	2) vertical $\angle$'s $\cong$
3) quad FACT is a parallelogram	3) one pair of opposite sides are $\parallel$ and $\cong$ then a quad is a parallelogram
4) $\overline{AC} \parallel \overline{FT}$	4) def of parallelogram
5) $\angle 3 \cong \angle 4$	5) two $\parallel$ lines cut by a transve result in 2 $\cong$ alt int $\angle$'s
6) $\triangle ABE \cong \triangle TRE$	6) AA
7) $\overline{AB} \cong \overline{AE}$, $\overline{TE} \cong \overline{TR}$	7) CPCTC
8) $(AB)(TE) = (AE)(TR)$	8) cross multiply

Work space for question 35 is continued on the next page.

Score 3: The student had three incorrect statements and/or reasons after step 5.

Question 35

35 In the diagram below of quadrilateral *FACT*, $\overline{BR}$ intersects diagonal $\overline{AT}$ at *E*, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

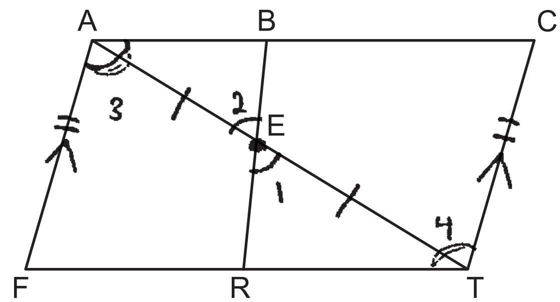
1. $\overline{AF} \parallel \overline{CT}$ $\overline{AF} \cong \overline{CT}$	1. Given
2. FACT is a //ogram	2. //ogram if opp sides // + $\cong$
3. $\angle 1$ & $\angle 2$ $\cong$	3. Vertical $\angle$s $\cong$ thrm
4 $\angle 3$ & $\angle 4$ $\cong$	4. Def bisected angle
5 $\triangle ABE \sim \triangle RET$	5 AAS
6. $(AB)(TE) = (AE)(TR)$	6. CPCTC

Work space for question 35 is continued on the next page.

Score 2: The student had two correct relevant statements and reasons in steps 2 and 3.

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

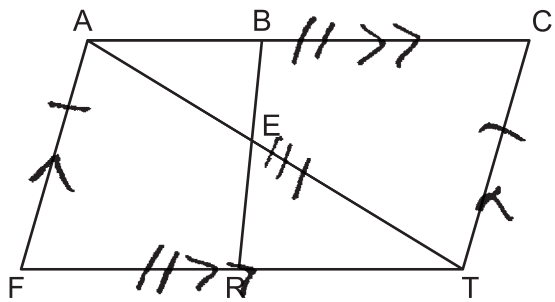
Statements	Reasons
1) $\overline{BR}$ intersects diagonal $\overline{AT}$	1) Given
2) $\overline{AE} \cong \overline{ET}$	2) Def of segment bisector
3) $\overline{AF} \parallel \overline{CT}$	3) Given
4) $\overline{AF} \cong \overline{CT}$	4) Given
5) $\angle 1 \cong \angle 2$	5) Verticle angles Congruent
6) $\angle 3 \cong \angle 4$	6) Because $\overline{BR}$ bisects the diagonal $\overline{AT}$ the opp angles are bisected and also equal to eachother
7) FACT is a parallelogram	7) Because diagonals $\cong$ & $\parallel$ line segments
8) $(AB)(TE) = (AE)(TR)$	8) Equals multiplied with equals results in equals

Work space for question 35 is continued on the next page.

Score 1: The student had only one correct relevant statement and reason in step 5.

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

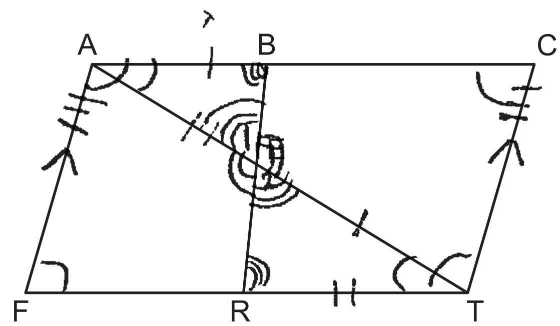
Statement	reason
1. Br intersects diag $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, $\overline{AF} \cong \overline{CT}$	1 Given
2. FACT is a prlanelogram	2. A quad is a paralleligram iff are pair of opposite Sides are peralle and congruent
3. $\overline{FT} \cong \overline{AC}$	3. parallelograms have opposite Sides ≅
4. $\overline{AT} \cong \overline{AT}$	4. Reflexive
5 $\triangle AFT \cong \triangle ACT$	5. SSS △≅
6.	6.

Work space for question 35 is continued on the next page.

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

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

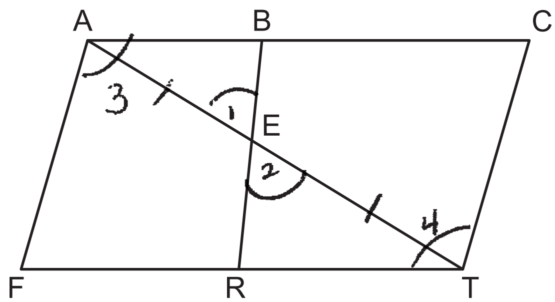
S	R
1) $\overline{BR}$ intersects diagonal $\overline{AT}$ at E; $\overline{AF} \parallel \overline{CT}$; $\overline{AF} \cong \overline{CT}$	1) Given
2) $\angle 1 \cong \angle 2$	2) vertical ∡'s are ≅
3) $\angle A \cong \angle T$	3) Alternate interior ∡'s are ≅ if lines are ∥
4) $\angle C \cong \angle F$; $\angle A \cong \angle F$	4) Defin i on of a parallelogram
5) $\triangle AFT \cong \triangle TCA$	5) ASA
6) $(AB)(TE) = (AE)(TR)$	6) CPCTC

Work space for question 35 is continued on the next page.

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

Question 35

35 In the diagram below of quadrilateral $FACT$, $\overline{BR}$ intersects diagonal $\overline{AT}$ at E, $\overline{AF} \parallel \overline{CT}$, and $\overline{AF} \cong \overline{CT}$.



Prove: $(AB)(TE) = (AE)(TR)$

Statements	Reasons
① $\overline{BR}$ intersects diag. $\overline{AT}$	① Given
② $\overline{AE} \cong \overline{ET}$	② Def. of seg. bisector
③ $\overline{AF} \parallel \overline{CT}$, $\overline{AF} \cong \overline{CT}$	③ Given
④ $\angle 1 \cong \angle 2$	④ Verticle angles
⑤ $\angle 3 \cong \angle 4$	⑤ Because $\overline{BR}$ bisects diag. $\overline{AT}$ the opp. $\angle$'s are bisected and equal to each other
⑥ FACT is a parallelogram	⑥ Because diagonals $\cong$ & $\parallel$ line segments
⑦ $(AB)(TE) = (AE)(TR)$	⑦ Equals multiplied with equals results in equals.

Work space for question 35 is continued on the next page.

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