

**GEOMETRY**

Wednesday, June 11, 2025 — 9:15 a.m. to 12:15 p.m., only

Student Name: \_\_\_\_\_

School Name: \_\_\_\_\_

**The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.**

Print your name and the name of your school on the lines above.

A separate answer sheet for **Part I** has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 35 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II, III, and IV** directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will *not* be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

**Notice ...**

**A graphing calculator, a straightedge (ruler), and a compass must be available for you to use while taking this examination.**

**DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.**

## Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for  
computations.

- 1 The perimeter of a triangle is 18. What is the perimeter of a similar triangle after a dilation with a scale factor of 3?

- (1) 6                                      (3) 54  
(2) 18                                      (4) 162

- 2 The Washington Monument, shown below, is in Washington, D.C. At a point on the ground 200 feet from the center of the base of the monument, the angle of elevation to the top of the monument is  $70.19^\circ$ .

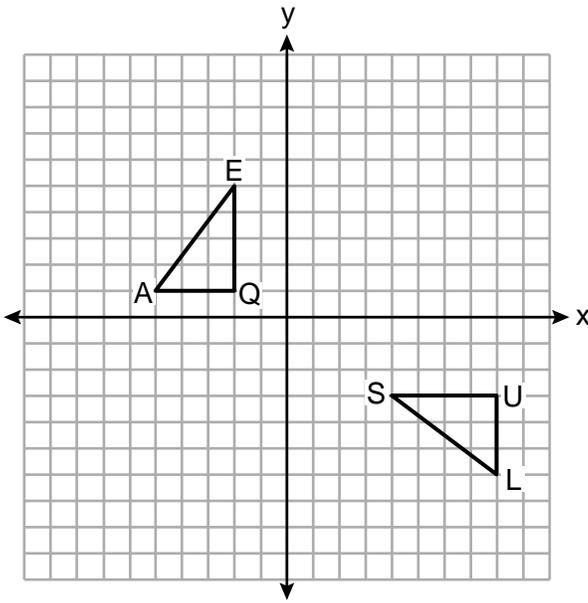


What is the height of the monument, to the *nearest foot*?

- (1) 188                                      (3) 555  
(2) 213                                      (4) 590

Use this space for  
computations.

3 On the set of axes below,  $\triangle EQA$  and  $\triangle SUL$  are graphed.



Which sequence of transformations shows that  $\triangle EQA \cong \triangle SUL$ ?

- (1) Rotate  $\triangle EQA$   $90^\circ$  counterclockwise about the origin and then translate 9 units right and 1 unit down.
- (2) Rotate  $\triangle EQA$   $90^\circ$  counterclockwise about the origin and then reflect over the line  $x = 4$ .
- (3) Reflect  $\triangle EQA$  over the  $x$ -axis and then rotate  $90^\circ$  clockwise about the origin.
- (4) Translate  $\triangle EQA$  10 units right and then reflect over the line  $x = -1$ .

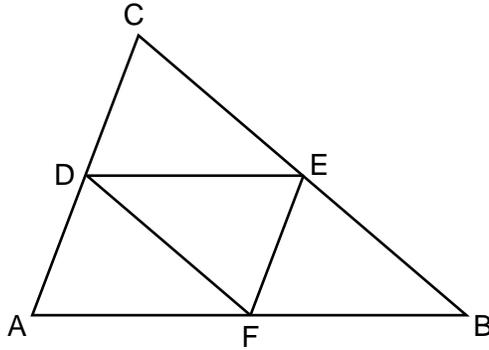
4 If two sides of a triangle have lengths of 2 and 8, the length of the third side could be

- |        |       |
|--------|-------|
| (1) 10 | (3) 6 |
| (2) 7  | (4) 4 |



8 In  $\triangle CAB$  below, midsegments  $\overline{DE}$ ,  $\overline{EF}$ , and  $\overline{FD}$  are drawn.

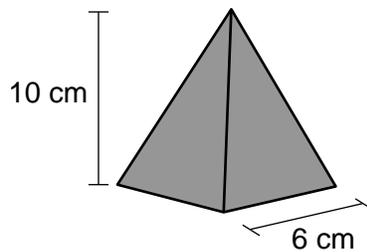
Use this space for computations.



If  $CA = 14$ ,  $CB = 20$ , and  $FB = 9$ , what is the perimeter of quadrilateral  $DEFA$ ?

- (1) 26
- (2) 32
- (3) 44
- (4) 52

9 A candle can be modeled by a pyramid with a square base, as shown below. The height of the candle is 10 cm, and each side of the base measures 6 cm.



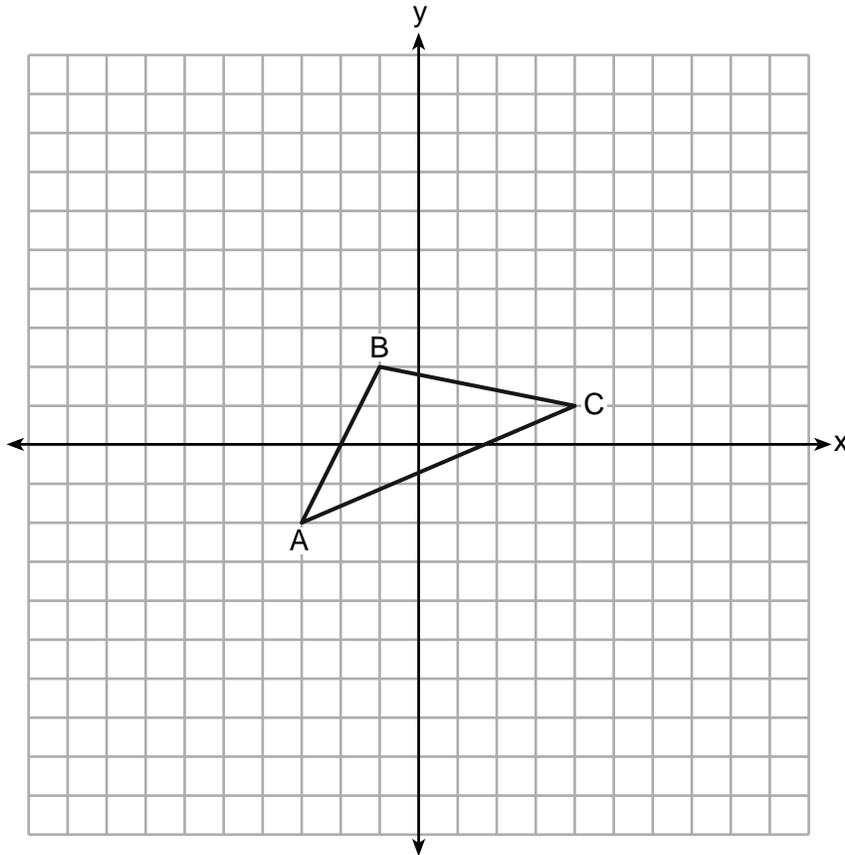
If the candle wax burns at a rate of 3.5 cubic centimeters per hour, what is the approximate number of hours this candle could burn?

- (1) 103
- (2) 51
- (3) 34
- (4) 11



Use this space for  
computations.

- 12 Triangle  $ABC$ , with vertices whose coordinates are  $A(-3,-2)$ ,  $B(-1,2)$ , and  $C(4,1)$ , is graphed on the set of axes below.



Triangle  $A'B'C'$ , whose vertices have coordinates  $A'(-6,-2)$ ,  $B'(-2,2)$ , and  $C'(8,1)$ , is the image of  $\triangle ABC$ . The transformation that maps  $\triangle ABC$  onto  $\triangle A'B'C'$  is a

- (1) dilation  
(2) translation  
(3) vertical stretch  
(4) horizontal stretch
- 13 Which equation represents a line parallel to the line represented by  $y = 4x + 6$  and passing through the point  $(-3,2)$ ?

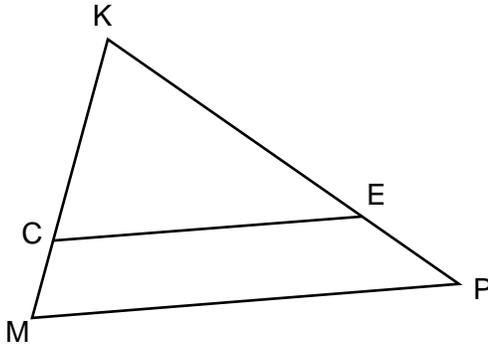
- (1)  $y - 2 = 4(x + 3)$   
(2)  $y + 3 = 4(x - 2)$   
(3)  $y - 2 = -\frac{1}{4}(x + 3)$   
(4)  $y + 3 = -\frac{1}{4}(x - 2)$

Use this space for  
computations.

14 Which two-dimensional figure is always formed when a plane intersects a right cylinder perpendicular to its base?

- (1) circle
- (2) triangle
- (3) rhombus
- (4) rectangle

15 In  $\triangle KMP$  below,  $\overline{CE}$  is drawn parallel to  $\overline{MP}$ .



If  $KC = 8$ ,  $CM = 3$ , and  $CE = 12$ , what is the length of  $\overline{MP}$ ?

- (1) 24
- (2) 16.5
- (3) 15
- (4) 4.5

16 A parallelogram must be a rectangle if its diagonals

- (1) are perpendicular
- (2) bisect each other
- (3) bisect its angles
- (4) are congruent



**20** Trapezoid  $ZOYD$  has parallel sides  $\overline{ZO}$  and  $\overline{DY}$ . If  $m\angle Z = 141^\circ$  and  $m\angle Y = 73^\circ$ , what is  $m\angle D$ ?

(1)  $39^\circ$

(3)  $107^\circ$

(2)  $73^\circ$

(4)  $141^\circ$

**Use this space for  
computations.**

**21** Triangle  $ABC$  is translated 5 units to the left and 2 units up to map onto  $\triangle PQR$ . Which statement is *not* always true?

(1)  $\triangle PQR \cong \triangle ABC$

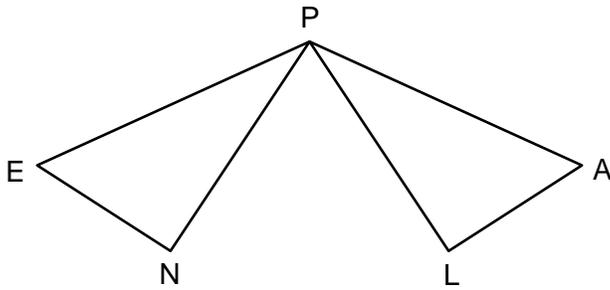
(3)  $BQ = \sqrt{29}$

(2)  $\angle A \cong \angle Q$

(4)  $RQ = CB$

Use this space for  
computations.

22 In the diagram below, congruent triangles  $PEN$  and  $PAL$  are drawn.



Which rigid motion maps  $\triangle PEN$  onto  $\triangle PAL$ ?

- (1) a point reflection of  $\triangle PEN$  through  $P$
  - (2) a reflection of  $\triangle PEN$  over the angle bisector of  $\angle EPA$
  - (3) a rotation of  $\triangle PEN$  about point  $P$ , mapping  $\overline{PE}$  onto  $\overline{PA}$
  - (4) a translation of  $\triangle PEN$  along  $\overline{EA}$ , mapping point  $E$  onto  $A$
- 23 A cone has a height of 8 inches and volume of 75.4 cubic inches.  
What is the diameter of the cone, to the *nearest inch*?
- (1) 9
  - (2) 2
  - (3) 3
  - (4) 6
- 24 The line represented by the equation  $5x - 2y = 10$  is transformed by a dilation centered at  $(2,0)$  with a scale factor of 2. The image of the line
- (1) is the original line
  - (2) passes through the point  $(4,0)$
  - (3) passes through the point  $(0,-10)$
  - (4) is perpendicular to the original line
-

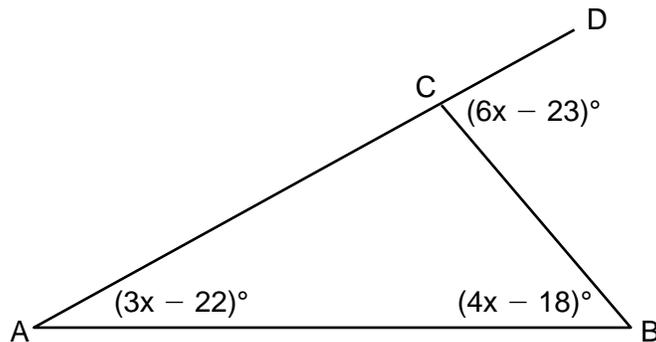
## Part II

Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [14]

**25** In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

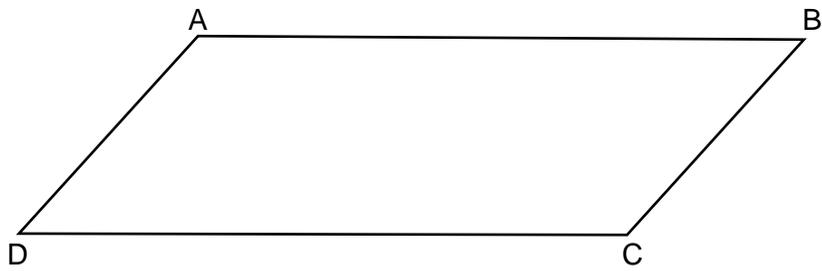
Which village had the larger population density in 2020? Justify your answer.

**26** In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .

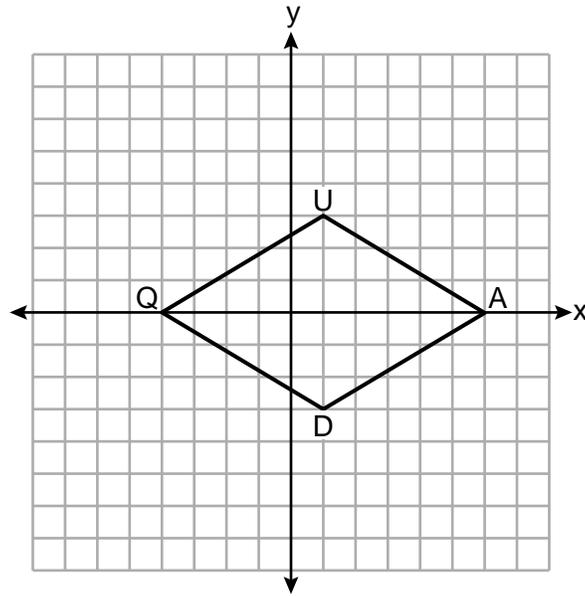


Determine and state  $m\angle ACB$ .

**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



28 Quadrilateral  $QUAD$  is graphed on the set of axes below.

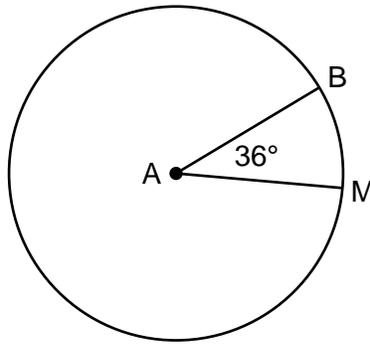


Determine and state the area of quadrilateral  $QUAD$ .

**29** In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

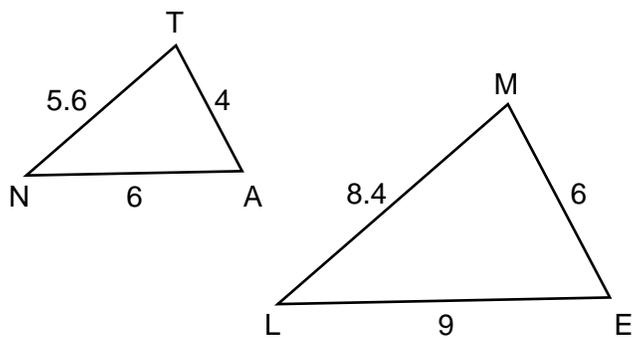
Determine and state the value of  $x$ .

30 In circle  $A$  below,  $m\angle BAM = 36^\circ$ .



If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

### Part III

Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

**32** A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

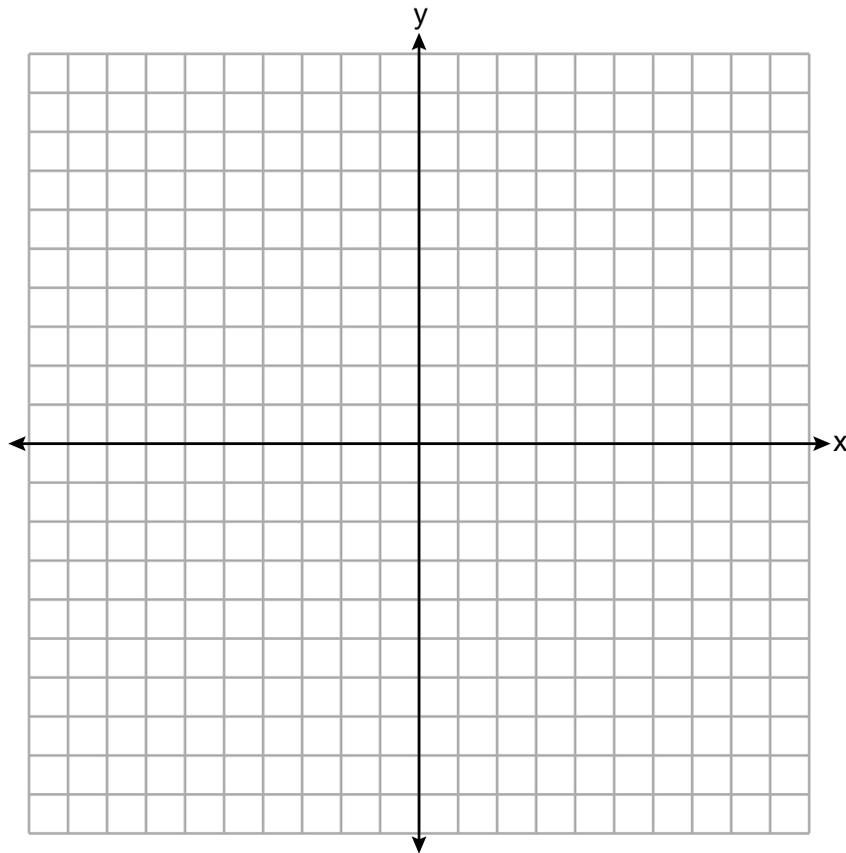
Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

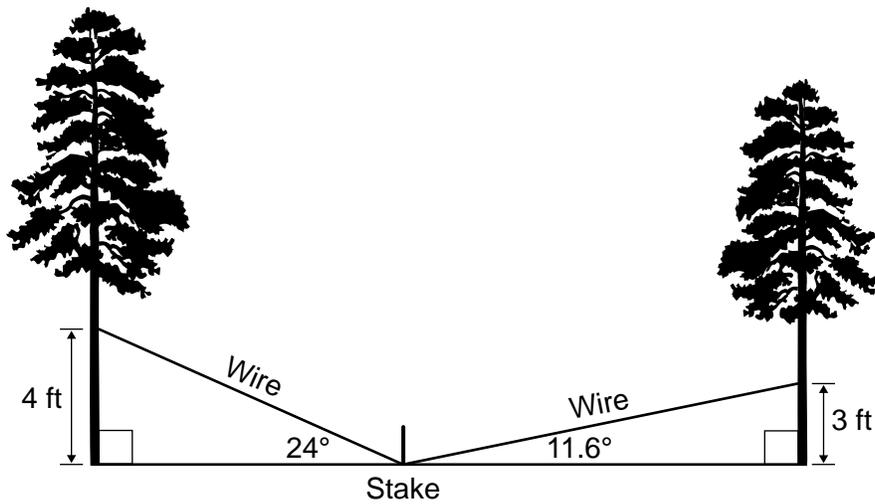
If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

**33** Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
[The use of the set of axes below is optional.]



- 34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.

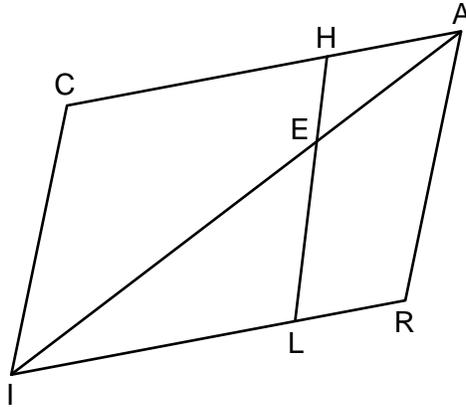


The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



Prove:  $HA \cdot EL = LI \cdot EH$

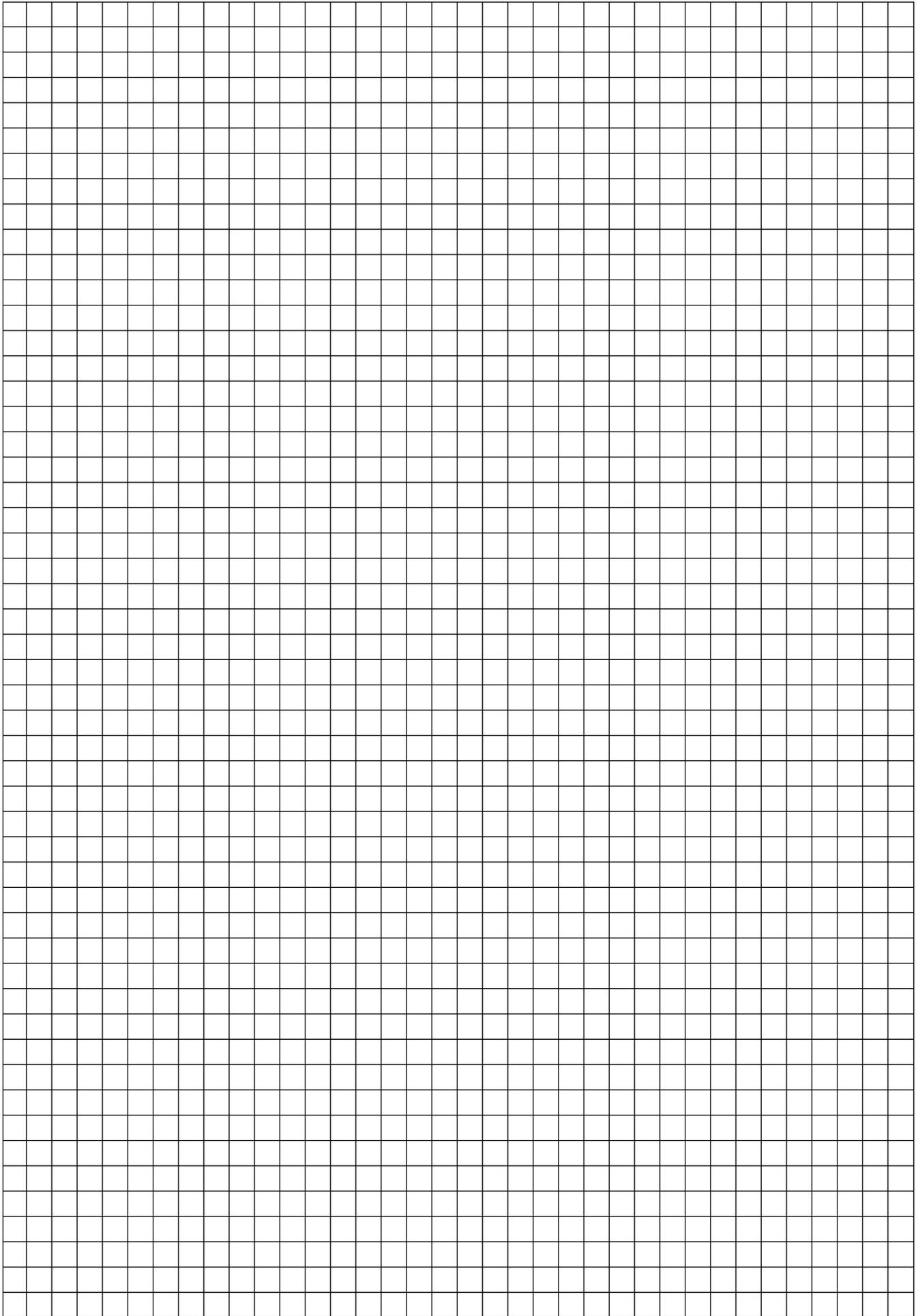




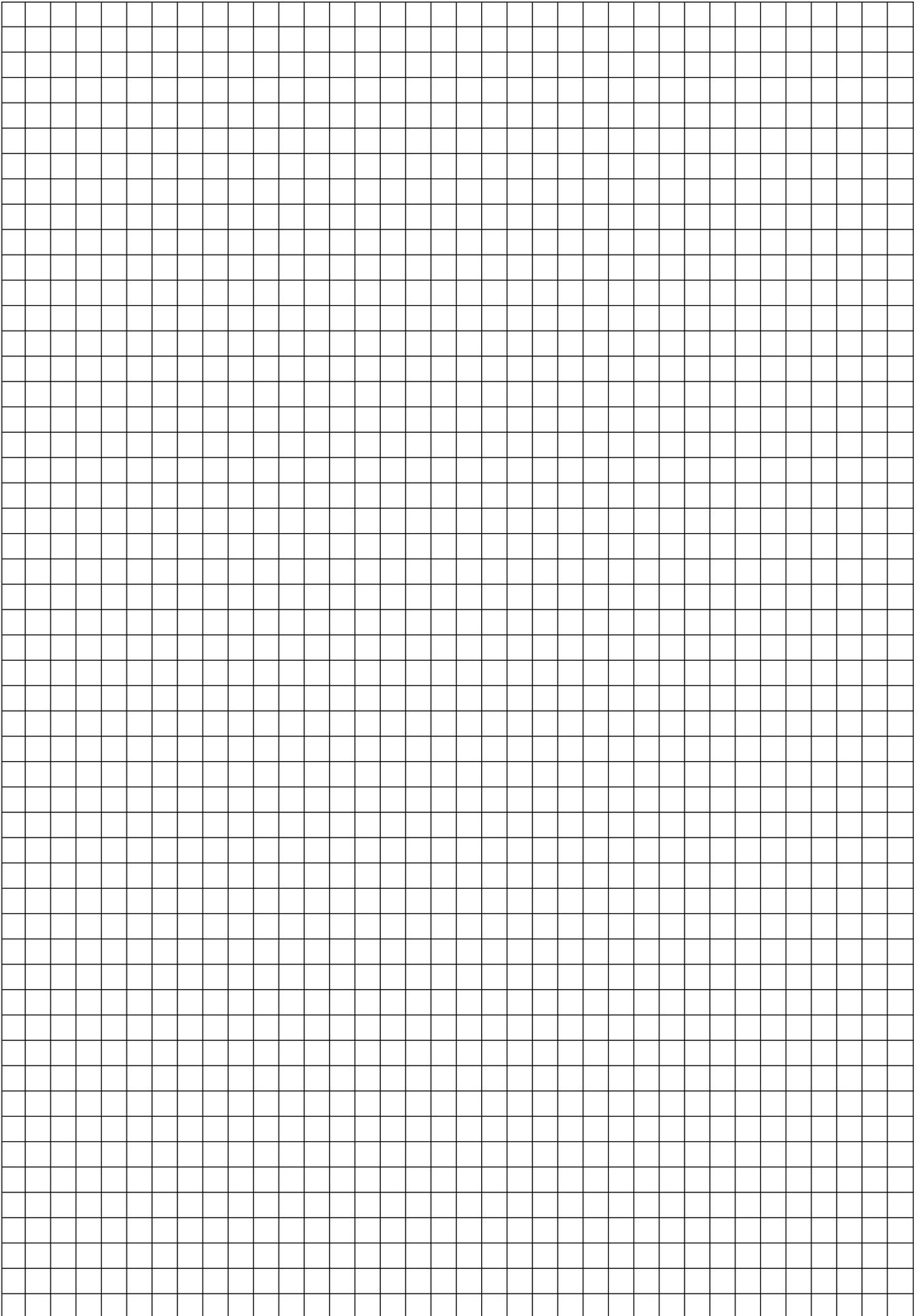
Scrap Graph Paper — this sheet will *not* be scored.

Tear Here

Tear Here



Scrap Graph Paper — this sheet will *not* be scored.



Tear Here

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## Reference Sheet for Geometry

Volume	Cylinder	$V = Bh$ where $B$ is the area of the base
	General Prism	$V = Bh$ where $B$ is the area of the base
	Sphere	$V = \frac{4}{3}\pi r^3$
	Cone	$V = \frac{1}{3}Bh$ where $B$ is the area of the base
	Pyramid	$V = \frac{1}{3}Bh$ where $B$ is the area of the base

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# GEOMETRY

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GEOMETRY

**Regents Examination in Geometry – June 2025**

**Scoring Key: Part I (Multiple-Choice Questions)**

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Geometry	June '25	1	3	MC	2
Geometry	June '25	2	3	MC	2
Geometry	June '25	3	1	MC	2
Geometry	June '25	4	2	MC	2
Geometry	June '25	5	2	MC	2
Geometry	June '25	6	4	MC	2
Geometry	June '25	7	3	MC	2
Geometry	June '25	8	2	MC	2
Geometry	June '25	9	3	MC	2
Geometry	June '25	10	3	MC	2
Geometry	June '25	11	1	MC	2
Geometry	June '25	12	4	MC	2
Geometry	June '25	13	1	MC	2
Geometry	June '25	14	4	MC	2
Geometry	June '25	15	2	MC	2
Geometry	June '25	16	4	MC	2
Geometry	June '25	17	4	MC	2
Geometry	June '25	18	1	MC	2
Geometry	June '25	19	3	MC	2
Geometry	June '25	20	1	MC	2
Geometry	June '25	21	2	MC	2
Geometry	June '25	22	2	MC	2
Geometry	June '25	23	4	MC	2
Geometry	June '25	24	1	MC	2

**Regents Examination in Geometry – June 2025**

**Scoring Key: Parts II, III, and IV (Constructed-Response Questions)**

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Geometry	June '25	25	-	CR	2
Geometry	June '25	26	-	CR	2
Geometry	June '25	27	-	CR	2
Geometry	June '25	28	-	CR	2
Geometry	June '25	29	-	CR	2
Geometry	June '25	30	-	CR	2
Geometry	June '25	31	-	CR	2
Geometry	June '25	32	-	CR	4
Geometry	June '25	33	-	CR	4
Geometry	June '25	34	-	CR	4
Geometry	June '25	35	-	CR	6

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **June 2025 Regents Examination in Geometry** will be posted on the Department's web site at: <https://www.nysedregents.org/geometryre/> no later than June 26, 2025. Conversion charts provided for the previous administrations of the Regents Examination in Geometry must NOT be used to determine students' final scores for this administration.

# FOR TEACHERS ONLY

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

## GEOMETRY

Wednesday, June 11, 2025 — 9:15 a.m. to 12:15 p.m., only

### RATING GUIDE

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: <https://www.nysed.gov/state-assessment/high-school-regents-examinations> and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

The Department is providing supplemental scoring guidance, the "Model Response Set," for the Regents Examination in Geometry. This guidance is intended to be part of the scorer training. Schools should use the Model Response Set along with the rubrics in the Rating Guide to help guide scoring of student work. While not reflective of all scenarios, the Model Response Set illustrates how less common student responses to constructed response questions may be scored. The Model Response Set will be available on the Department's web site at: <https://www.nysedregents.org/geometryre/>.

## Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Geometry. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Geometry*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the constructed-response questions, use check marks to indicate student errors. Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. No one teacher is to score more than approximately one-third of the constructed-response questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

**Schools are not permitted to rescore any of the constructed-response questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.**

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: <https://www.nysed.gov/state-assessment/high-school-regents-examinations> no later than June 26, 2025. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

# General Rules for Applying Mathematics Rubrics

## I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Geometry are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examination in Geometry*, use their own professional judgment, confer with other mathematics teachers, and/or contact the State Education Department for guidance. During each Regents Examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

## II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase “such as”), it does not mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

## III. Appropriate Work

*Full-Credit Responses:* The directions in the examination booklet for all the constructed-response questions state: “Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.” The student has the responsibility of providing the correct answer **and** showing how that answer was obtained. The student must “construct” the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

*Responses With Errors:* Rubrics that state “Appropriate work is shown, but...” are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete; i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has **not** been shown. Other rubrics address incomplete responses.

## IV. Multiple Errors

*Computational Errors, Graphing Errors, and Rounding Errors:* Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

*Conceptual Errors:* A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

For 4- and 6-credit questions, if a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors. Refer to the rubric for specific scoring guidelines.

## Part II

For each question, use the specific criteria to award a maximum of 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(25) [2] Lancaster is indicated, and a correct justification is given.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] Correct work is shown to find the population density of either village, but no further correct work is shown.

[0] Lancaster, but no work is shown.

*or*

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(26) [2] 101, and correct work is shown.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] Correct work is shown to find  $x = 17$ , but no further correct work is shown.

*or*

[1] 101, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

- (27) [2] A correct construction is drawn showing all appropriate arcs.
- [1] An appropriate construction is drawn showing all appropriate arcs, but the altitude from point  $A$  to side  $\overline{DC}$  is not drawn.
- or*
- [1] A correct construction is drawn showing all appropriate arcs, but an altitude from  $B$  to  $\overline{DC}$ ,  $C$  to  $\overline{AB}$ , or  $D$  to  $\overline{AB}$  is drawn.
- [0] A drawing that is not an appropriate construction is shown.
- or*
- [0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.
- (28) [2] 30, and correct work is shown.
- [1] Appropriate work is shown, but one computational error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] 30, but no work is shown.
- [0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(29) [2] 24, and correct work is shown.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] A correct equation is written to determine the value of  $x$ , but no further correct work is shown.

*or*

[1] 24, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(30) [2]  $4\pi$ , and correct work is shown.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1]  $4\pi$ , but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(31) [2] A complete and correct explanation is written.

[1] An appropriate explanation is written, but one conceptual error is made.

*or*

[1] Correct proportions are written, but the explanation is incomplete or partially correct.

[0] Correct proportions are written, but the explanation is missing or incorrect.

*or*

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

---

### Part III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

- (32) [4] Container 3 is indicated, and correct work is shown.
- [3] Appropriate work is shown, but one computational error is made. An appropriate container is selected.
- or*
- [3] Correct work is shown to find the volumes of all three containers, but no further correct work is shown.
- [2] Appropriate work is shown, but two computational errors are made. An appropriate container is selected.
- or*
- [2] Correct work is shown to find the volumes of two containers, but no further correct work is shown.
- [1] Appropriate work is shown, but three or more computational errors are made. An appropriate container is selected.
- or*
- [1] Correct work is shown to find the volume of one container, but no further correct work is shown.
- [0] Container 3, but no work is shown.
- or*
- [0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

- (33) [4] Correct work is shown to prove *MIKE* is a parallelogram, and not a rhombus. Correct concluding statements are written.
- [3] Appropriate work is shown, but one computational or graphing error is made. Appropriate concluding statements are written.
- or***
- [3] Correct work is shown to prove *MIKE* is a parallelogram, and not a rhombus, but one concluding statement is missing or incorrect.
- [2] Appropriate work is shown, but two or more computational or graphing errors are made.
- or***
- [2] Correct work is shown to prove *MIKE* is a parallelogram and a correct concluding statement is written.
- or***
- [2] Correct work is shown to prove *MIKE* is not a rhombus and a correct concluding statement is written.
- [1] Correct work is shown to prove *MIKE* is a parallelogram, but the concluding statement is missing or incorrect.
- or***
- [1] Correct work is shown to prove *MIKE* is not a rhombus, but the concluding statement is missing or incorrect.
- [0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

- (34) [4] No is indicated, and a correct justification is shown.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or*
- [3] Correct work is shown to find the length of the wire from the stake to both trees, but no further correct work is shown.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.
- or*
- [2] Appropriate work is shown, but one conceptual error is made.
- or*
- [2] Correct work is shown to find the length of the wire from the stake to one tree, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
- or*
- [1] At least one correct relevant trigonometric equation is written correctly, but no further correct work is shown.
- [0] No, but no work is shown.
- or*
- [0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.
-

## Part IV

For this question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

- (35) [6] A complete and correct proof that includes a concluding statement is written.
- [5] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement and/or reason is missing or incorrect.
- [4] A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two statements and/or reasons are missing or incorrect.
- or*
- [4] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
- or*
- [4]  $\triangle IEL \sim \triangle AEH$  is proven, but no further correct work is shown.
- [3] A proof is written that demonstrates a method of proof, but three statements and/or reasons are missing or incorrect.
- or*
- [3] A proof is written that demonstrates a method of proof, but one conceptual error is made, and one statement and/or reason is missing or incorrect.
- [2] A proof is written that demonstrates a good understanding of the method of proof, but two conceptual errors are made.
- or*
- [2] Some correct relevant statements about the proof are made, but four statements and/or reasons are missing or incorrect.
- or*
- [2]  $\triangle ICA \cong \triangle ARI$  is proven, but no further correct work is shown.
- [1] Only one correct relevant statement and reason are written.
- [0] The “given” and/or the “prove” statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.
- or*
- [0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

**Map to the Learning Standards  
Geometry  
June 2025**

<b>Question</b>	<b>Type</b>	<b>Credits</b>	<b>Cluster</b>
1	Multiple Choice	2	G-SRT.A
2	Multiple Choice	2	G-SRT.C
3	Multiple Choice	2	G-CO.B
4	Multiple Choice	2	G-CO.C
5	Multiple Choice	2	G-CO.A
6	Multiple Choice	2	G-GPE.A
7	Multiple Choice	2	G-SRT.C
8	Multiple Choice	2	G-CO.C
9	Multiple Choice	2	G-MG.A
10	Multiple Choice	2	G-C.A
11	Multiple Choice	2	G-SRT.D
12	Multiple Choice	2	G-CO.A
13	Multiple Choice	2	G-GPE.B
14	Multiple Choice	2	G-GMD.B
15	Multiple Choice	2	G-SRT.B
16	Multiple Choice	2	G-CO.C
17	Multiple Choice	2	G-GPE.B
18	Multiple Choice	2	G-MG.A
19	Multiple Choice	2	G-SRT.B
20	Multiple Choice	2	G-CO.C
21	Multiple Choice	2	G-CO.B
22	Multiple Choice	2	G-CO.B
23	Multiple Choice	2	G-GMD.A
24	Multiple Choice	2	G-SRT.A
25	Constructed Response	2	G-MG.A
26	Constructed Response	2	G-CO.C
27	Constructed Response	2	G-CO.D
28	Constructed Response	2	G-GPE.B
29	Constructed Response	2	G-SRT.C
30	Constructed Response	2	G-C.B
31	Constructed Response	2	G-SRT.A
32	Constructed Response	4	G-MG.A
33	Constructed Response	4	G-GPE.B
34	Constructed Response	4	G-SRT.C
35	Constructed Response	6	G-SRT.B

**The *Chart for Determining the Final Examination Score for the June 2025 Regents Examination in Geometry* will be posted on the Department's web site at: <https://www.nysed.gov/state-assessment/high-school-regents-examinations> no later than June 26, 2025. Conversion charts provided for previous administrations of the Regents Examination in Geometry must NOT be used to determine students' final scores for this administration.**

### **Online Submission of Teacher Evaluations of the Test to the Department**

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to <https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments>.
2. Click Regents Examinations.
3. Complete the required demographic fields.
4. Select the test title from the Regents Examination dropdown list.
5. Complete each evaluation question and provide comments in the space provided.
6. Click the SUBMIT button at the bottom of the page to submit the completed form.

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

# GEOMETRY

Wednesday, June 11, 2025 — 9:15 a.m. to 12:15 p.m., only

## MODEL RESPONSE SET

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**Question 25**

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**25** In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

Which village had the larger population density in 2020? Justify your answer.

$$\begin{array}{l} 5.1 \text{ mi}^2 \quad 15,069 / 5.1 = 2954.705\dots \\ 2.7 \text{ mi}^2 \quad 10,087 / 2.7 = 3735.925\dots \end{array}$$

The village of Lancaster New York had the larger population density in 2020.

---

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

Question 25

25 In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

Which village had the larger population density in 2020? Justify your answer.

5.1 Sq miles  
Pop: 15,069

$$\frac{15,069}{5.1} = 2954.705882$$

Lancaster had a higher population density because they had 181.2200434 more people on average per Sq mile

2.7 Sq miles  
Pop: 10,087

$$\frac{10,087}{2.7} = 3735.925926$$
$$- 2954.705882$$
$$\hline 781.2200434$$

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

---

**Question 25**

---

**25** In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

Which village had the larger population density in 2020? Justify your answer.

The village of Lancaster because it had about 3736 every square mile while the village of Depew had about 2959 per square mile

**Score 1:** The student wrote a correct answer, but did not show work.

---

**Question 25**

---

**25** In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

Which village had the larger population density in 2020? Justify your answer.

$$15,069 / 5.1 = 2.95$$

$$10,087 / 2.7 = 3.73$$

Lancaster

**Score 1:** The student made the same computational error when determining the population densities, but stated an appropriate answer.

Question 25

25 In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

Which village had the larger population density in 2020? Justify your answer.

Depew New York	Lancaster, NY
$5.1 \cdot 15,069$ 76,851.9 ↓ 76,852 PEOPLE	$2.7 \cdot 10,087$ 27,234.9 ↓ 27,235 PEOPLE
Depew	

**Score 1:** The student made a conceptual error when determining the population densities, but found an appropriate answer.

---

**Question 25**

---

**25** In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

Which village had the larger population density in 2020? Justify your answer.

Village of Lancaster because it had 2.7 square miles and had 10,087 people, while Depew had almost twice the square miles and had only  $\wedge$  5,000 more people about

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

---

**Question 25**

---

**25** In the year 2020, the village of Depew, New York had an area of 5.1 square miles and a population of 15,069. In the same year, the village of Lancaster, New York had an area of 2.7 square miles and a population of 10,087.

Which village had the larger population density in 2020? Justify your answer.

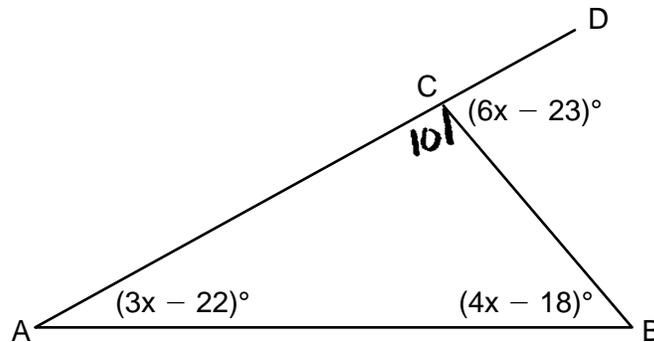
$$\text{Depew: } 5.1 / 15069 \approx \boxed{3.4}$$
$$\text{Lancaster: } 2.7 / 10087 \approx 2.7$$

Depew has a larger population Density than Lancaster.

**Score 0:** The student made the same conceptual error and the same computational error when determining the population densities.

Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



Determine and state  $m\angle ACB$ .

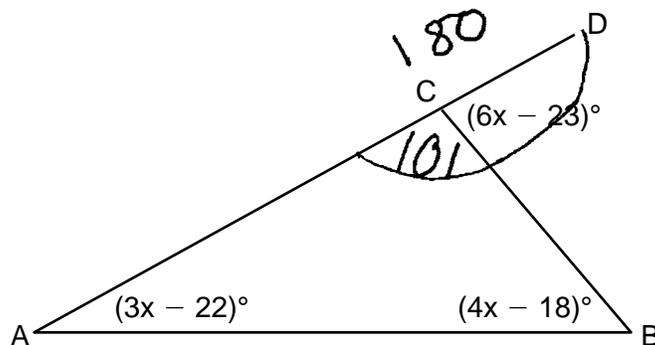
$$\begin{aligned} 3x - 22 + 4x - 18 &= 6x - 23 & \left( \begin{aligned} 6(17) - 23 &= 79 \\ 180 - 79 &= 101 \end{aligned} \right. \\ 7x - 40 &= 6x - 23 \\ -6x + 40 & \quad -6x + 40 \\ x &= 17 \end{aligned}$$

$$m\angle ACB = 101^\circ$$

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

Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



Determine and state  $m\angle ACB$ .

$$6x - 23 = 3x - 22 + 4x - 18$$

$$6x - 23 = 3x + 4x - 40$$

$$6x - 23 = 7x - 40$$

$$+23 \quad +23$$

$$6x = 7x - 17$$

$$-7x \quad -7x$$

$$\frac{-1x}{-1} = \frac{-17}{-1}$$

$$x = 17$$

$m\angle ACB$

$$6(17) - 23$$

$$102 - 23 = 79$$

$$79 + 101 = 180$$

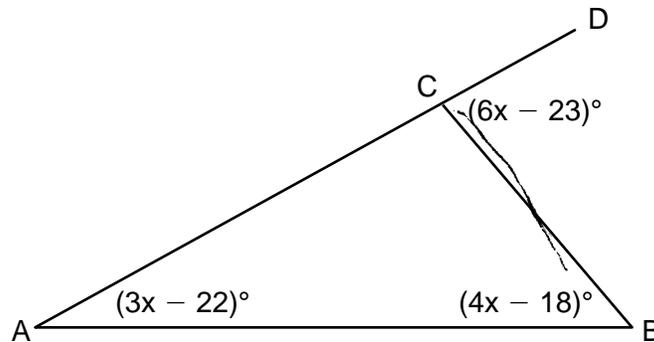
101

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



Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



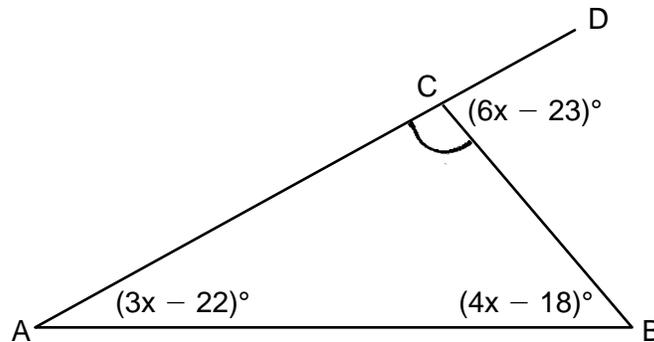
Determine and state  $m\angle ACB$ .

$$\begin{aligned}(3x - 22) + (4x - 18) &= 6x - 23 \\ 7x - 40 &= 6x - 23 \\ -6x & \quad -6x \\ x - 40 &= -23 \\ +40 & \quad +40 \\ \mathbf{x = 17}\end{aligned}$$

**Score 1:** The student correctly determined the value of  $x$ .

Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



Determine and state  $m\angle ACB$ .

$$\begin{aligned} 3x - 22 + 4x - 18 &= 6x - 23 \\ 7x - 40 &= 6x - 23 \\ 7x - 40 + 40 &= 6x - 23 + 40 \\ 7x &= 6x + 17 \\ 7x - 6x &= 6x + 17 - 6x \\ x &= 17 \end{aligned}$$

$3(17) - 22 = 29$

$4(17) - 18 = 50$

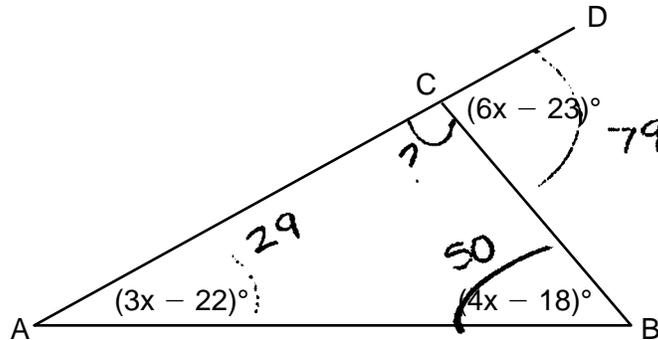
$6(17) - 23 = 79$

$m\angle ACB = 79$

**Score 1:** The student correctly determined the value of  $x$ .

Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



Determine and state  $m\angle ACB$ .

$$180 - 29 - 79 = 72^\circ$$

$$3x - 22 + 4x - 18 = 6x - 23$$

$$7x - 40 = 6x - 23$$

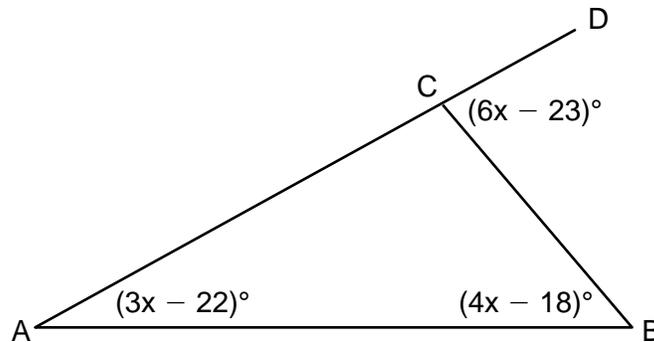
$$\begin{array}{r} 7x - 40 = 6x - 23 \\ \underline{-7x} \quad \underline{-7x} \\ -17 = -1x \\ \underline{-1} \quad \underline{-1} \\ x = 17 \end{array}$$

$m\angle ACB = 72^\circ$

**Score 1:** The student correctly determined the value of  $x$ .

Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



Determine and state  $m\angle ACB$ .

$$\begin{array}{r} 5x - 40 = 6x - 23 \\ + 23 \qquad + 23 \\ \hline \end{array}$$

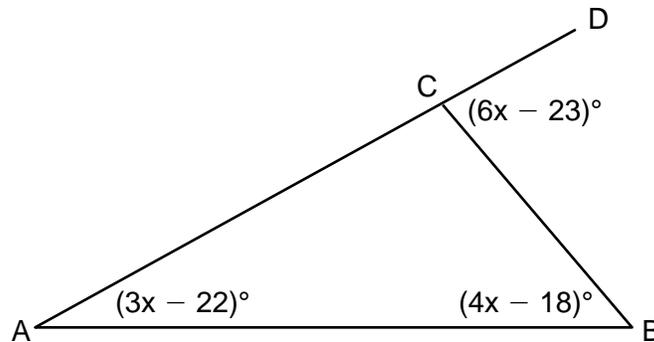
$$\begin{array}{r} 5x - 17 = 6x \\ - 5x \qquad - 5x \\ \hline \end{array}$$

$$-17 = x$$

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

Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



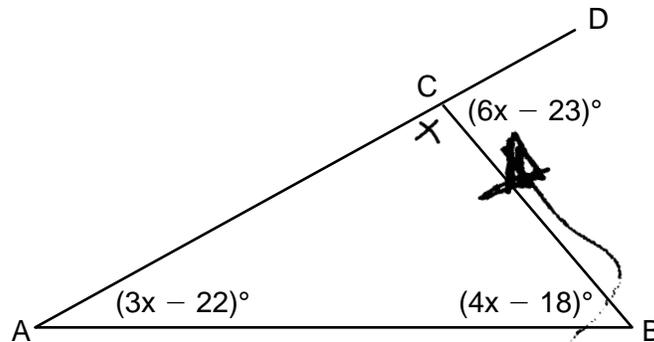
Determine and state  $m\angle ACB$ .

$$\begin{aligned} 3x - 22 &= 4x - 18 \\ 7x - 40 &= 6x - 23 \\ \underline{13x - 63} & \\ 13 & \quad 13 \\ m\angle ACB &= -4.846 \end{aligned}$$

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

Question 26

26 In  $\triangle ABC$  below,  $\overline{AC}$  is extended through  $C$  to  $D$ ,  $m\angle A = (3x - 22)^\circ$ ,  $m\angle B = (4x - 18)^\circ$ , and  $m\angle BCD = (6x - 23)^\circ$ .



Determine and state  $m\angle ACB$ .

112°

$$\begin{aligned} 6x - 23 + x &= 180 \\ 7x - 23 &\quad - 23 \\ \hline 7x &= 157 \\ &27.4 \end{aligned}$$

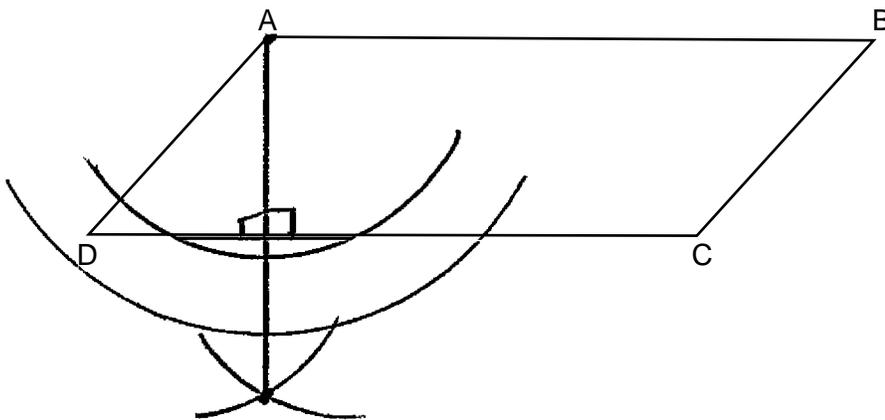
**Score 0:** The student did not show enough correct work to receive any credit.

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**Question 27**

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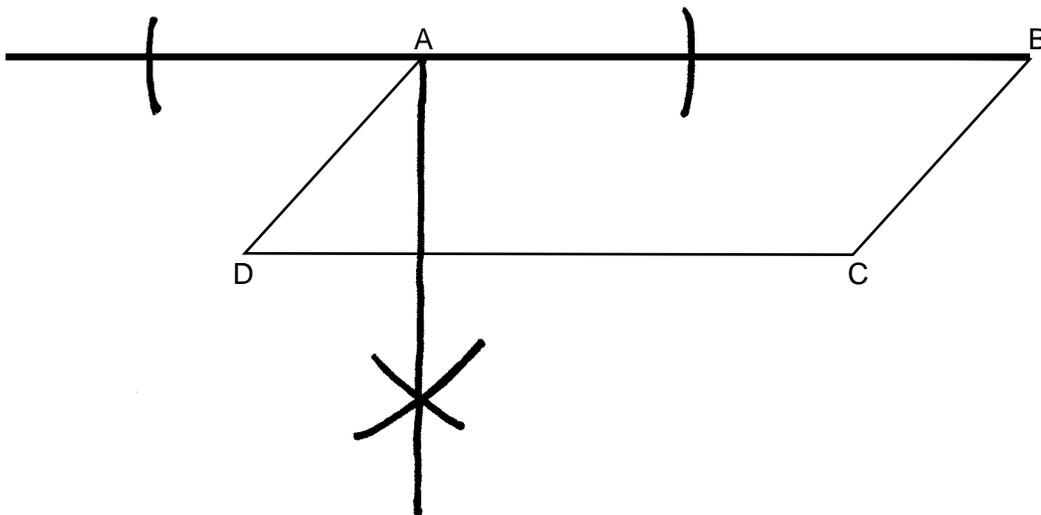
**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $DC$ . [Leave all construction marks.]



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

**Question 27**

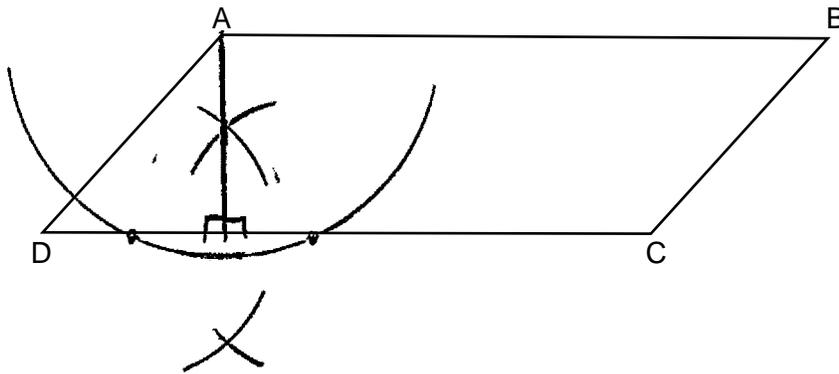
**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



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

**Question 27**

**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



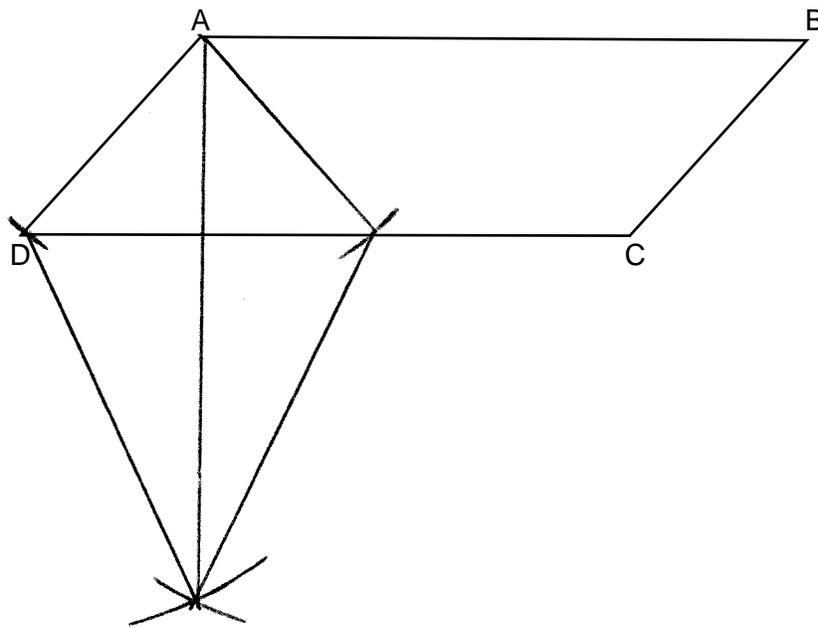
**Score 2:** The student gave a complete and correct response.

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**Question 27**

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**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]

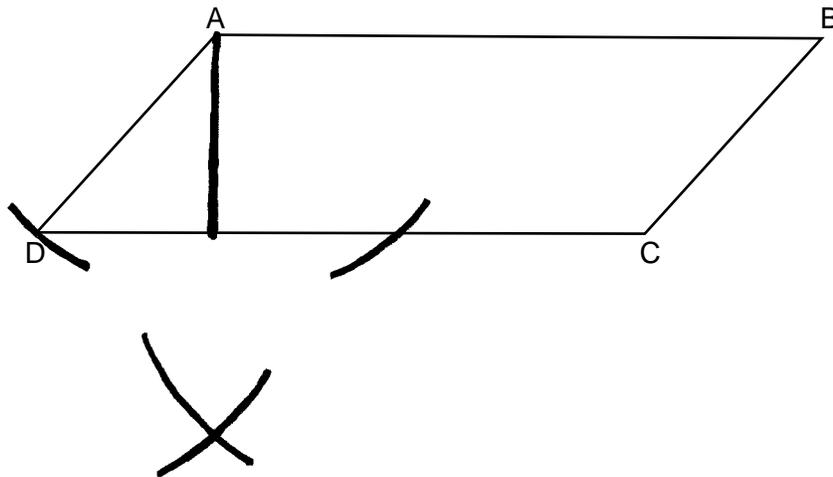


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**Score 2:** The student gave a complete and correct response.

**Question 27**

**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



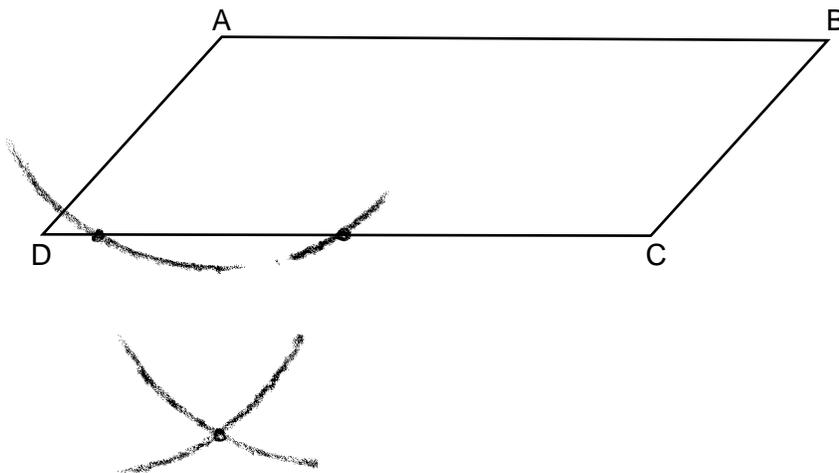
**Score 2:** The student gave a complete and correct response.

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**Question 27**

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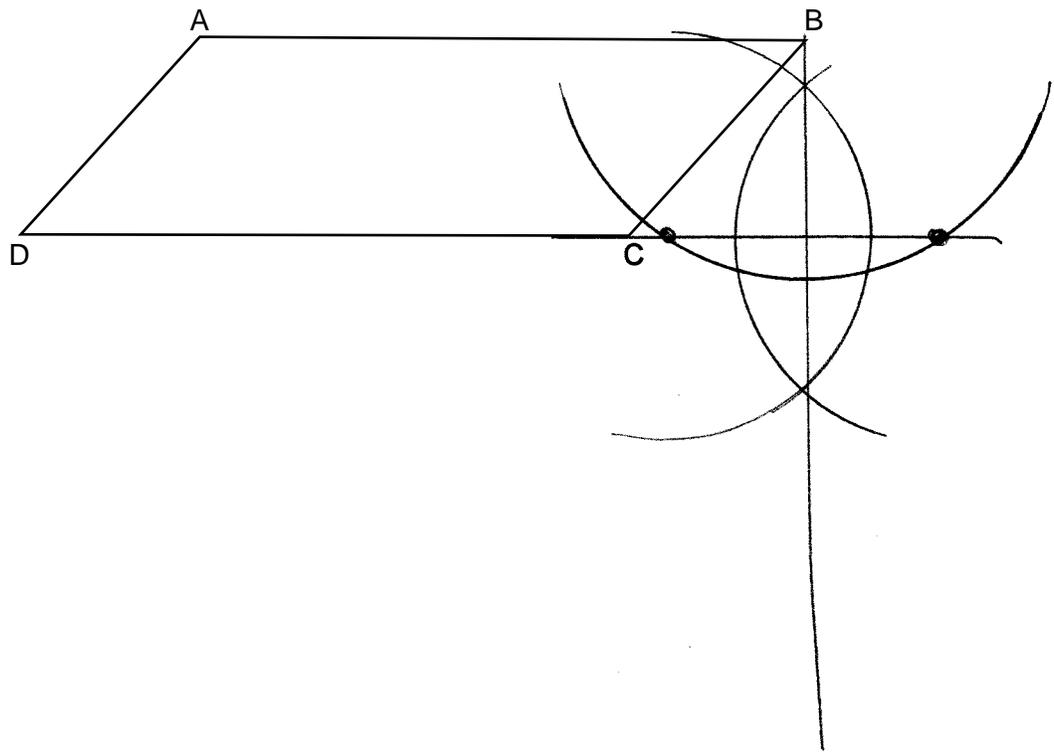
**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



**Score 1:** The student constructed all appropriate arcs, but did not draw the altitude.

**Question 27**

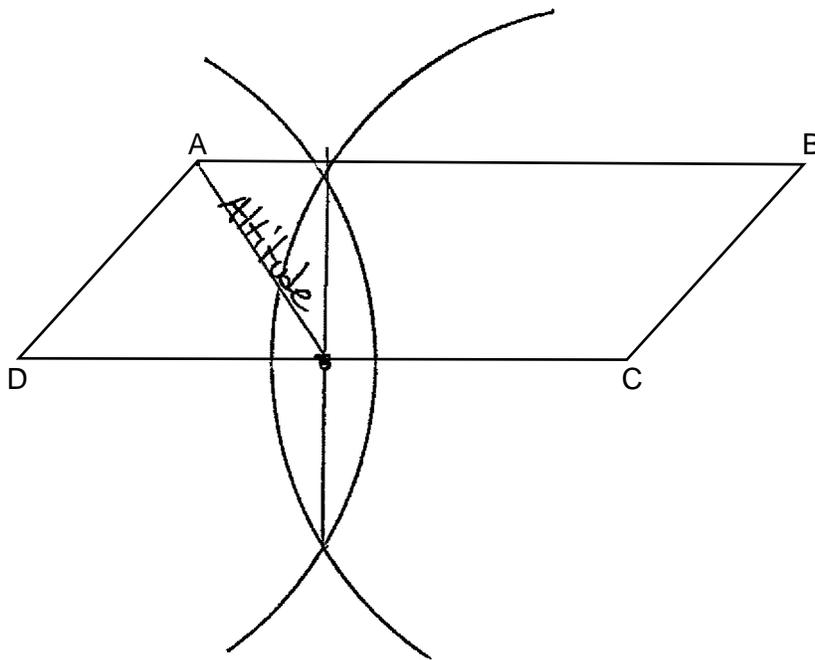
**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



**Score 1:** The student constructed the altitude from point  $B$ .

**Question 27**

**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



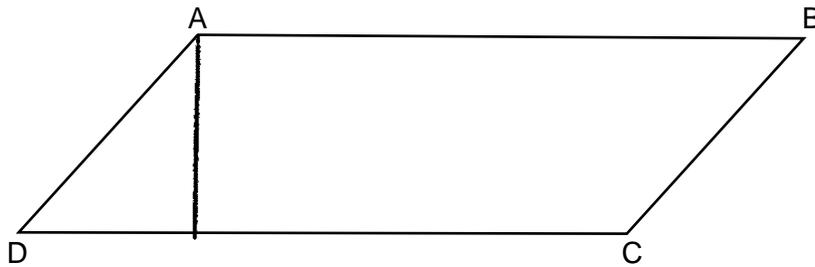
**Score 0:** The student did not show enough correct relevant work to receive any credit.

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**Question 27**

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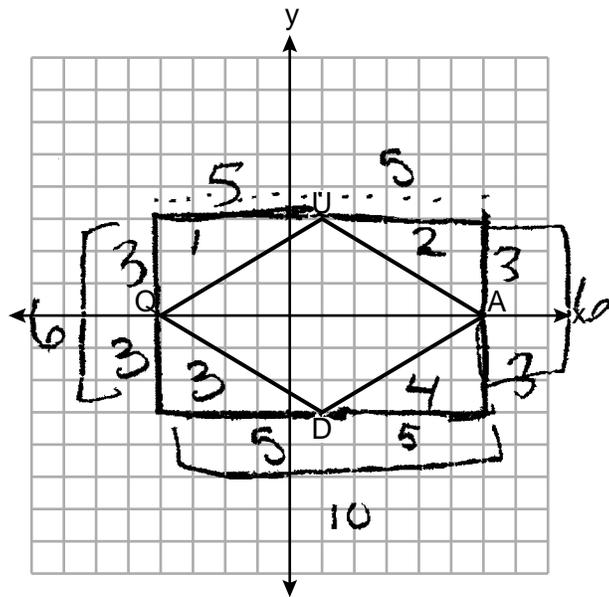
**27** Parallelogram  $ABCD$  is shown below. Using a compass and straightedge, construct the altitude from point  $A$  to side  $\overline{DC}$ . [Leave all construction marks.]



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

Question 28

28 Quadrilateral *QUAD* is graphed on the set of axes below.



Determine and state the area of quadrilateral *QUAD*.

$$AR = 10(6) = 60$$

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

$A_1$	$A_2$	$A_3$	$A_4$
$A = \frac{bh}{2}$	$A = \frac{bh}{2}$	$A = \frac{bh}{2}$	$A = \frac{bh}{2}$
$A = \frac{3(5)}{2}$	$A = \frac{5(3)}{2}$	$A = \frac{3(5)}{2}$	$A = \frac{5(3)}{2}$
$A = 7.5$	$A = 7.5$	$A = 7.5$	$A = 7.5$

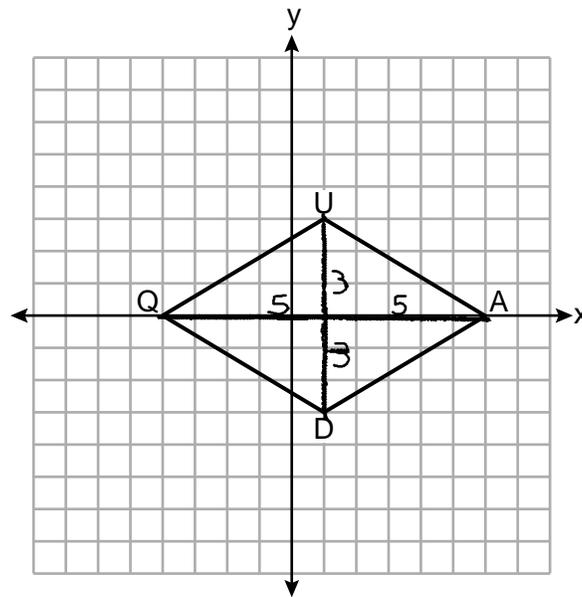
30

$A = 30 \text{ units}^2$

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

Question 28

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.



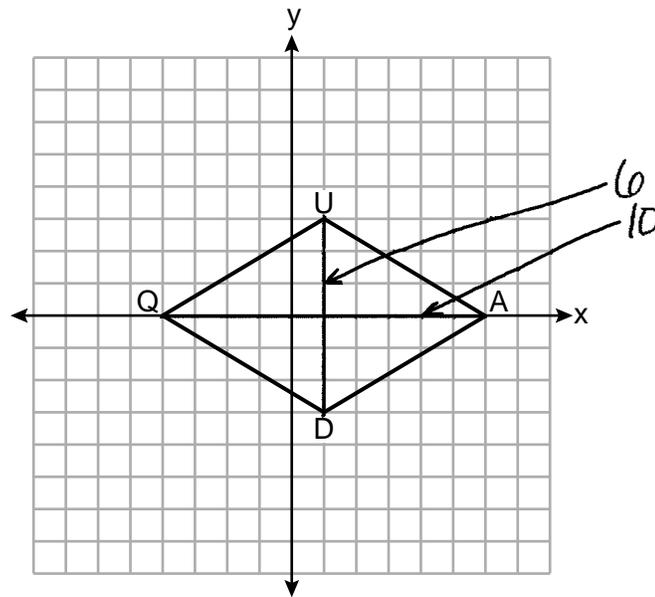
Determine and state the area of quadrilateral  $QUAD$ .

$$\begin{aligned} A &= \frac{1}{2}bh \\ &= \frac{1}{2}(5)(6) \\ &= \frac{1}{2}15 \\ &= 7.5 \\ A_{quad's} &= 7.5(4) = \boxed{30} \end{aligned}$$

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

Question 28

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.



Determine and state the area of quadrilateral  $QUAD$ .

$$A = \frac{1}{2} d_1 \cdot d_2$$

$$A = \frac{1}{2} (6)(10)$$

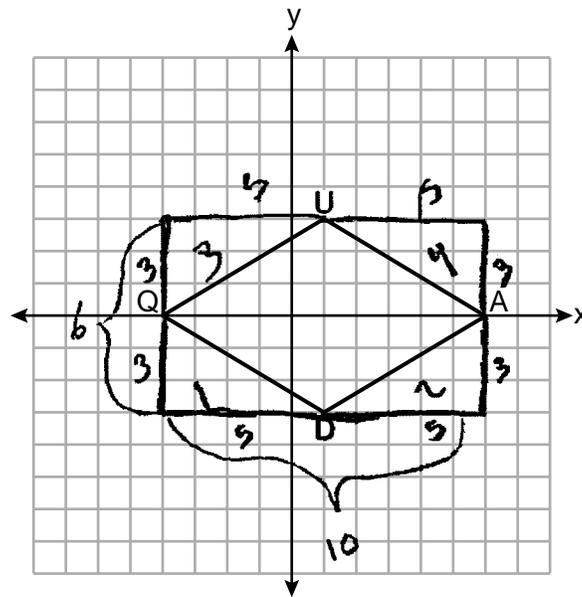
$$A = 30$$

30

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

Question 28

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.



Determine and state the area of quadrilateral  $QUAD$ .

$$A_{DU} = \frac{1}{2} \cdot 5 \cdot 3 = 7.5$$

$$A_U = 7.5$$

$$A_S = 7.5$$

$$A_T = 7.5$$

$$A_D = 6 \cdot 10$$

$$A_D = 60$$

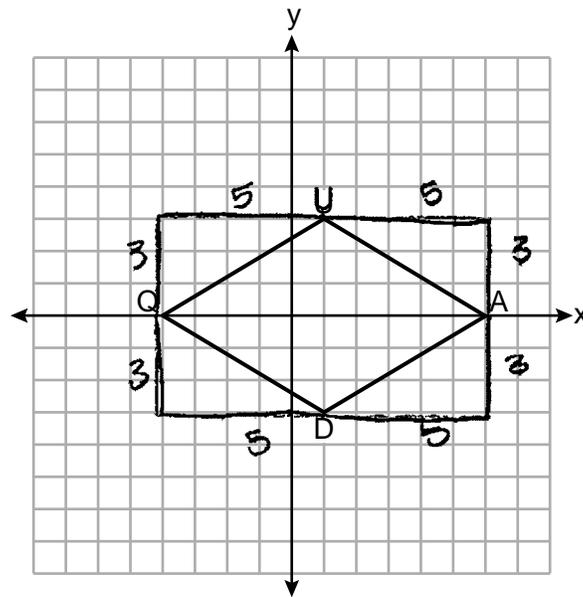
7.5	
7.5	60
<u>7.5</u>	<u>-30</u>
+ 7.5	30
<u>30</u>	

$$A = 30$$

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

Question 28

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.



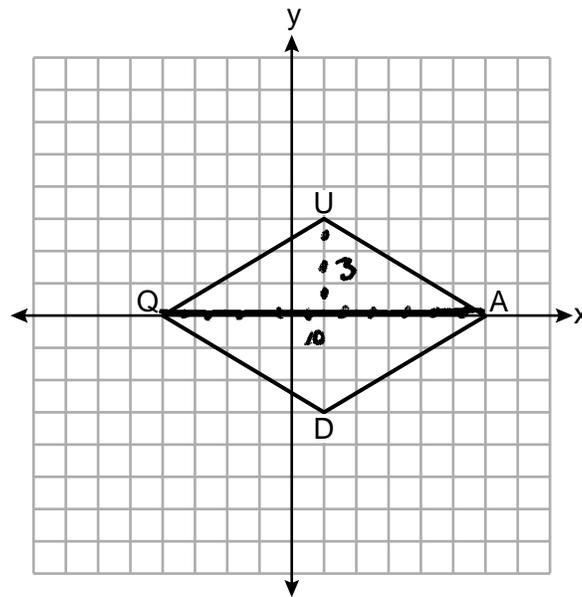
Determine and state the area of quadrilateral  $QUAD$ .

$$\begin{aligned} 10(6) &= 60 & A_{\Delta} &= \frac{1}{2} \cdot 5 \cdot 3 = 7.5 \\ A_{\square} &= 60 & A_{\text{4}\Delta} &= 30 \\ A_{\text{4}\Delta} &= 30 & A_{\square} - A_{\text{4}\Delta} &= A_{\square} \\ 60 - 30 &= 30 \\ \boxed{30} \end{aligned}$$

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

Question 28

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.



Determine and state the area of quadrilateral  $QUAD$ .

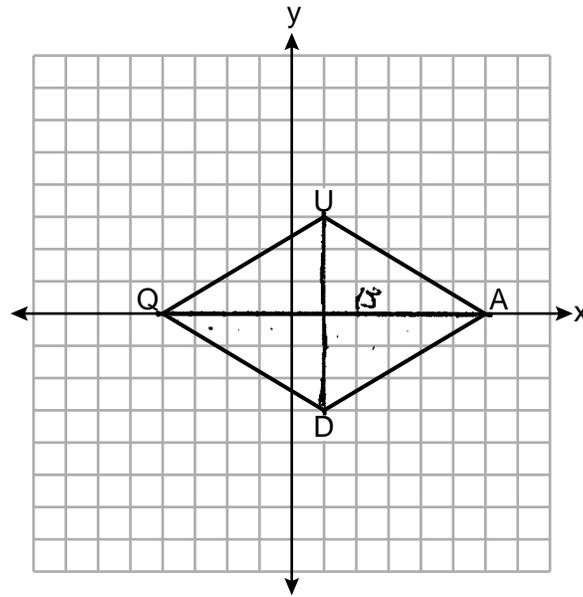
$\triangle QUA \cong \triangle QDA$   
Find one and then  
double

$$A = \frac{1}{2} (10)(3) = 15$$

**Score 1:** The student made a computational error in not doubling the area of  $\triangle QUA$ .

**Question 28**

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.



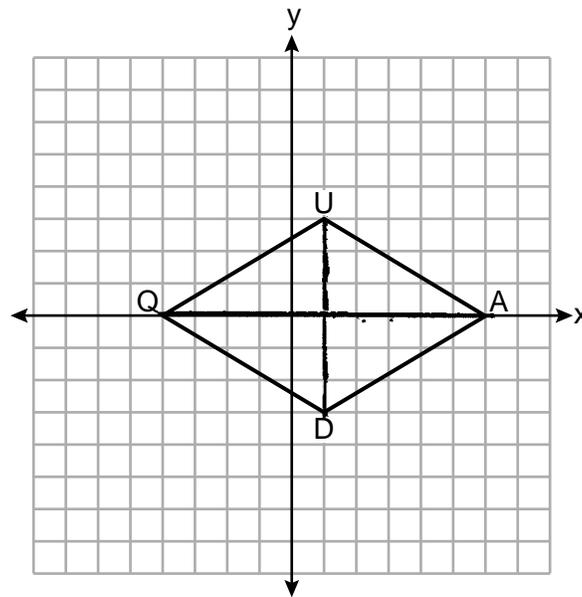
Determine and state the area of quadrilateral  $QUAD$ .

30

**Score 1:** The student wrote a correct answer, but did not show work.

Question 28

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.



$$A \begin{pmatrix} x_2 & y_2 \\ 6 & 0 \end{pmatrix}$$
$$D \begin{pmatrix} x_1 & y_1 \\ 1 & -3 \end{pmatrix}$$

Determine and state the area of quadrilateral  $QUAD$ .

$$A = bh$$
$$A = 6(5.8)$$

$$A = 34.8 \text{ units}^2$$

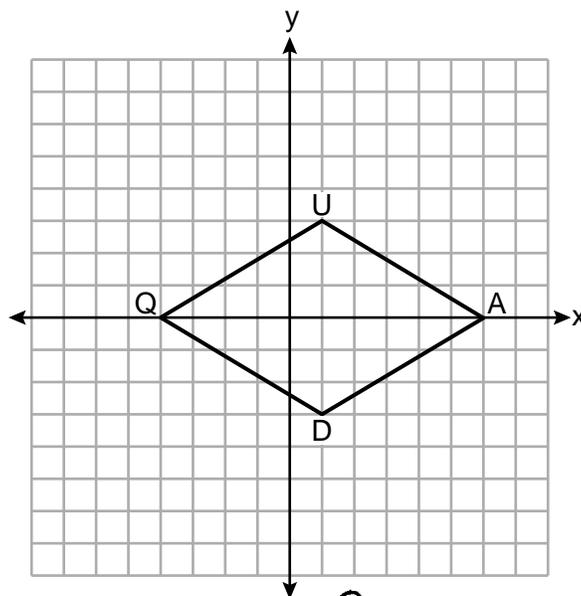
$$D_{DA} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(6 - 1)^2 + (0 - (-3))^2}$$
$$= \sqrt{25 + 9}$$
$$= \sqrt{34} \approx 5.8 \dots$$

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

Question 28

28 Quadrilateral  $QUAD$  is graphed on the set of axes below.

$\surd U(1, 3)$   
 $A(6, 0)$   
 $\surd D(1, -3)$   
 $\surd Q(-4, 0)$



$A = b \cdot h$

Determine and state the area of quadrilateral  $QUAD$ .

$$\begin{aligned} &\underline{UQ} \\ &\sqrt{(-4-1)^2 + (0-3)^2} \\ &\sqrt{5^2 + 3^2} \end{aligned}$$

$$\begin{aligned} &\underline{QD} \\ &\sqrt{(-4-1)^2 + (0-3)^2} \\ &\sqrt{5^2 + 3^2} \\ &\sqrt{34} \end{aligned}$$

$$\sqrt{34}$$

$$\underline{\underline{PA}}$$

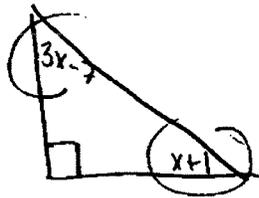
$$A = \sqrt{34} \text{ units}^2$$

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

Question 29

29 In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

Determine and state the value of  $x$ .



$$90 + 3x - 7 + x + 1 = 180$$

83    4x    84

$$4x + 84 = 180$$

-84    -84

$$\frac{4x}{4} = \frac{96}{4}$$

$$x = 24$$

$$90 + 3(24) - 7 + (24) + 1 = 180$$

180 = 180 ✓

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

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**Question 29**

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**29** In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

Determine and state the value of  $x$ .

$$3x - 7 + x + 1 = 90$$

$$4x - 6 = 90$$

$$4x = 96$$

$$x = 24$$

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

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**Question 29**

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**29** In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

Determine and state the value of  $x$ .

$$\begin{aligned}3x - 7 + x + 1 &= 90 \\4x - 6 &= 90 \\4x &= 96 \\x &= 24\end{aligned}$$

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

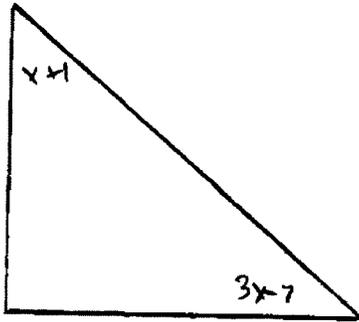
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**Question 29**

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29 In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

Determine and state the value of  $x$ .



$$\begin{array}{r} 3x - 7 = x + 1 \\ \underline{+7} \quad \underline{+7} \end{array}$$

$$\begin{array}{r} 3x = x + 8 \\ \underline{-x} \quad \underline{-x} \end{array}$$

$$\begin{array}{r} 2x = 8 \\ \underline{2} \quad \underline{2} \end{array}$$

$$\boxed{x = 4}$$

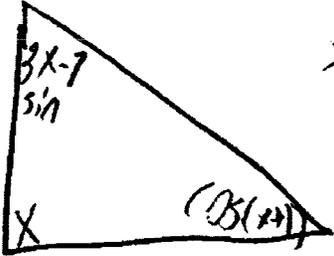
**Score 1:** The student made a conceptual error using an incorrect equation, but found an appropriate answer.



Question 29

29 In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

Determine and state the value of  $x$ .



$$x + \sin(3x - 7) + \cos(x + 1) = 180$$

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

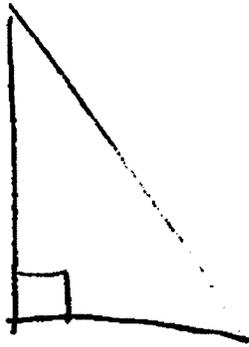
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**Question 29**

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29 In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

Determine and state the value of  $x$ .



$$\sin(3x - 7)^\circ : \cos(x + 1)^\circ$$

$$\sin(3x - 7)^\circ + \cos(x + 1)^\circ = 90^\circ$$

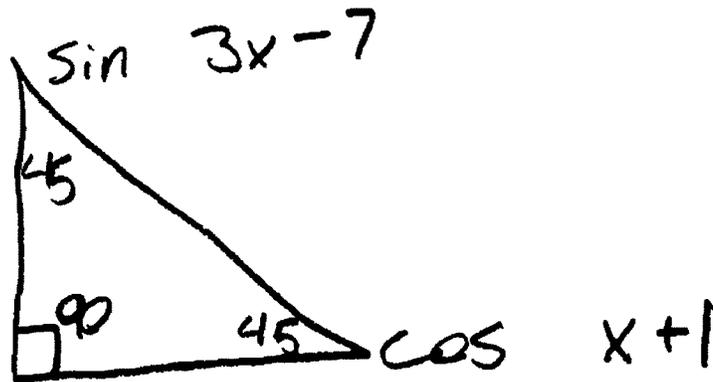
$$180 - 90 = 90$$

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

Question 29

29 In a right triangle, the acute angles have the relationship  $\sin(3x - 7)^\circ = \cos(x + 1)^\circ$ .

Determine and state the value of  $x$ .



$$\sin 3x - 7 = 45$$
$$\cos x + 1 = 45$$

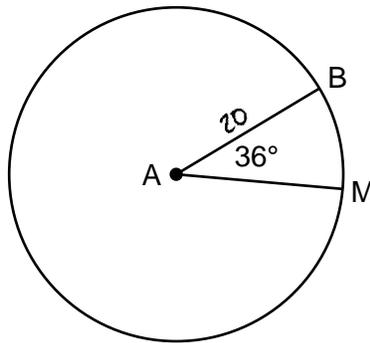
$$.78$$
$$3x = 52$$
$$x = 44$$
$$.72$$

$$3x - 7 = x + 1 = 45$$

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

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$$\widehat{MB} = 4\pi$$

$$AL = \frac{n}{360} \cdot \pi r$$

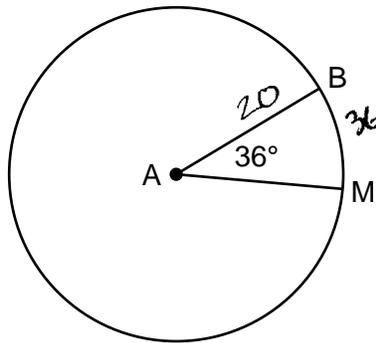
$$AL = \frac{36}{360} \cdot \pi (40)$$

$$AL = 4\pi$$

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

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .

[Leave your answer in terms of  $\pi$ .]

$$C = \pi(40) \\ 40\pi$$

$$\frac{36}{360} = \frac{x}{40\pi}$$

$$36(40\pi) = 360x$$

$$\frac{1440\pi}{360} = \frac{360x}{360}$$

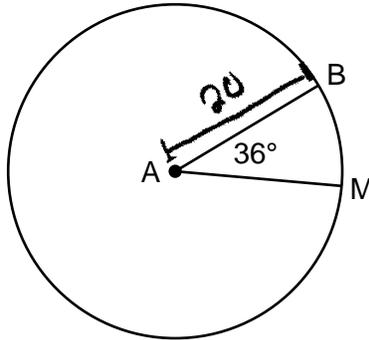
$$x = 4\pi$$

$$\widehat{MB} = 4\pi$$

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

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



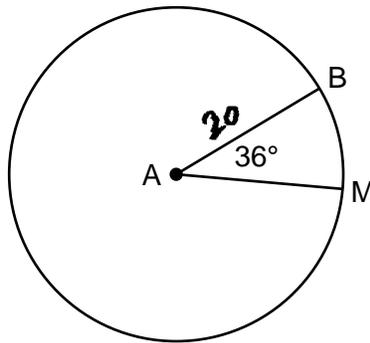
If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$$\begin{aligned}l &= \left(\frac{36}{360}\right) 2\pi 20 \\ &= \left(\frac{36}{360}\right) 40\pi \\ &= \frac{1440\pi}{360} \\ &= 4\pi\end{aligned}$$

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

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



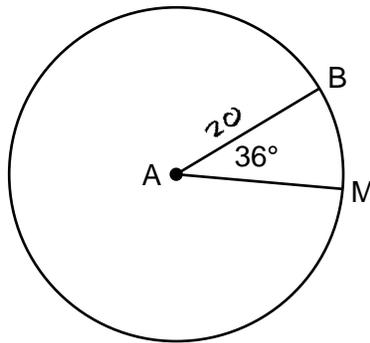
If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$$\begin{aligned} C &= 2\pi r & \frac{36}{360} &= \frac{40\pi}{1} \\ C &= 2\pi(20) & \frac{1440\pi}{360} & \\ C &= 40\pi & & \\ & & \text{4}\pi & \end{aligned}$$

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

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

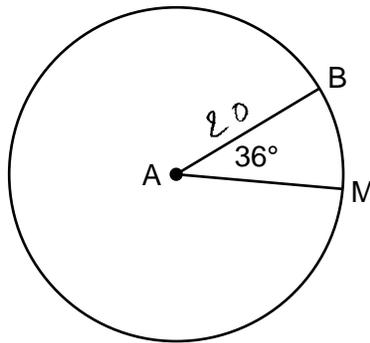
$$\frac{36}{360} \cdot \pi (20)^2$$

$$40\pi$$

**Score 1:** The student made a conceptual error in using the area formula.

**Question 30**

**30** In circle  $A$  below,  $m\angle BAM = 36^\circ$ .



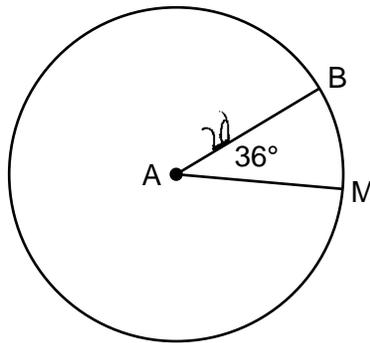
If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$4\pi$

**Score 1:** The student wrote a correct answer, but did not show work.

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$$A = \pi r^2$$
$$A = (20)^2 \pi$$
$$400\pi$$

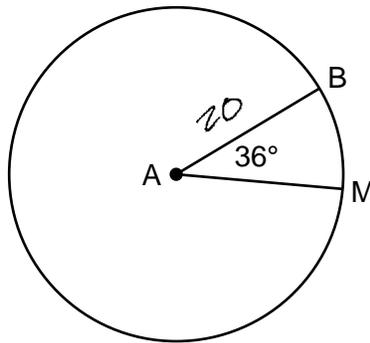
$$\frac{36}{360} \quad \frac{400\pi}{1}$$

$$\frac{440\pi}{360} \quad (4\pi)$$

**Score 0:** The student made a conceptual error using the area formula and made a computational error when squaring 20.

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



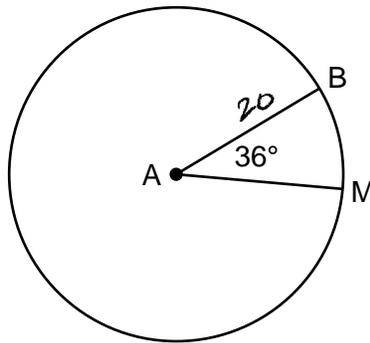
If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$$\frac{36}{360} = 2\pi 20$$
$$\frac{36}{360} = 40\pi$$
$$\cdot 1 = 40\pi$$
$$\underline{39.9\pi}$$

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

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$$C = 2\pi r$$

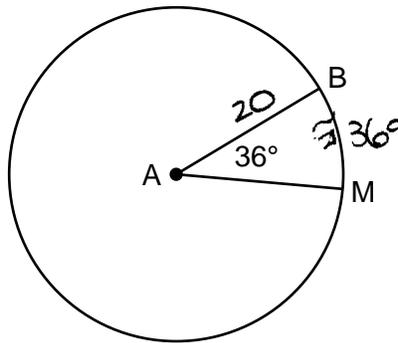
$$C = 2\pi 20$$

$$C = 40\pi$$

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

Question 30

30 In circle A below,  $m\angle BAM = 36^\circ$ .



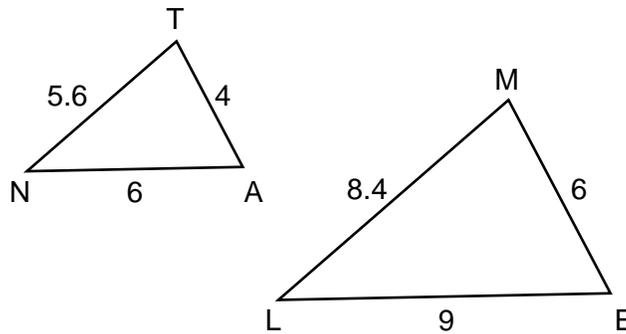
If  $AB = 20$ , determine and state the length of  $\widehat{MB}$ .  
[Leave your answer in terms of  $\pi$ .]

$\widehat{MB} = 36^\circ$

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

Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{NA}{LE} = \frac{6}{9} = \frac{2}{3}$$

$$\frac{TN}{ML} = \frac{5.6}{8.4} = \frac{2}{3}$$

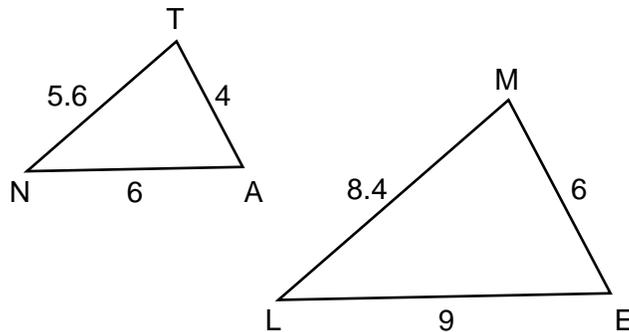
$$\frac{TA}{ME} = \frac{4}{6} = \frac{2}{3}$$

If the ratios of the 3 pairs of corresponding sides of the 2 triangles are all in the same proportion, the 2 triangles are similar by SSS similarity  $\triangle ANT \sim \triangle ELM$

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

Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{9}{6} = \frac{6}{4} = \frac{8.4}{5.6}$$

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

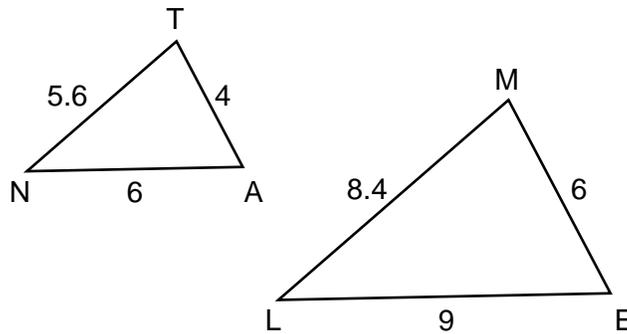
$$\frac{LE}{NA} = \frac{ME}{TA} = \frac{ML}{TN}$$

Since all 3 pairs of corresponding sides are in proportion,  $\triangle ANT \sim \triangle ELM$  by SSS  $\sim$

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

Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{6}{9} = \overline{.6} \quad \frac{4}{6} = \overline{.6} \quad \frac{5.6}{8.4} = \overline{.6}$$

The ratio of all pairs of corresponding sides of  $\triangle ANT$  and  $\triangle ELM$  equals  $\overline{.6}$

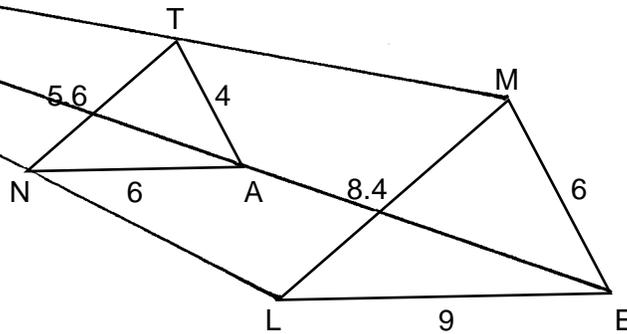
so corresponding sides are in proportion.

By SSS for similarity,  $\triangle ANT \sim \triangle ELM$ .

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

Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{8.4}{5.6} = \frac{6}{4} = \frac{9}{6}$$
$$1.5 = 1.5 = 1.5$$

I dilated  $\triangle ANT$  by a scale factor of 1.5 centered at  $C$  to map  $\triangle ANT$  onto  $\triangle ELM$

Dilations preserve angle measure so

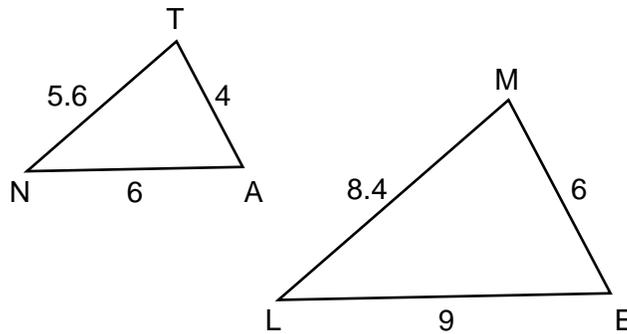
$$\angle A \cong \angle E \text{ and } \angle T \cong \angle M$$

$$\triangle ANT \sim \triangle ELM \text{ by AA} \sim$$

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

Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{TA}{ME} = \frac{4}{6} = \frac{2}{3}$$

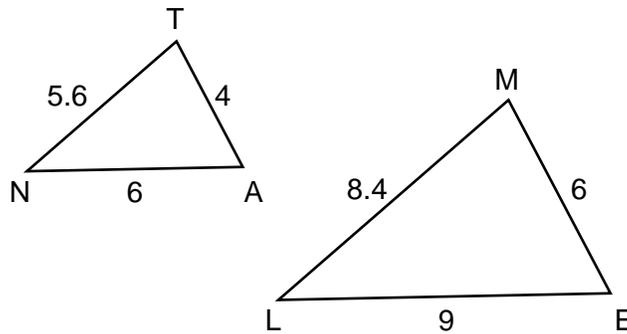
$$\frac{AN}{EL} = \frac{6}{9} = \frac{2}{3}$$

$\triangle ANT \sim \triangle ELM$  because 2 pairs of corresponding sides are in the same proportion.  
so they are similar by ~~SS~~ SS similarity.

**Score 1:** The student wrote a partially correct explanation by only comparing the ratios of two pairs of corresponding sides.

Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{TA}{ME} = \frac{NA}{LE}$$

$$\frac{4}{6} = \frac{6}{9}$$

$$36 = 36$$

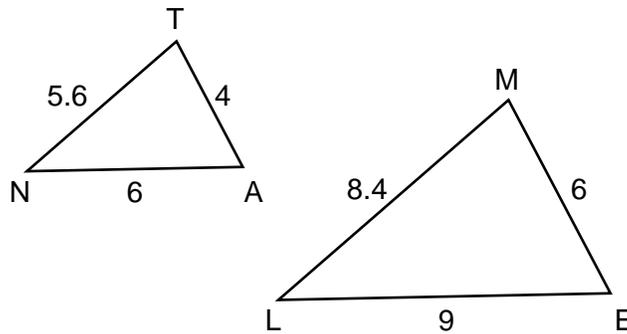
$$\angle A \cong \angle E$$

The triangles have corresponding side lengths with = cross products and the included angles are congruent. By SAS for similarity the triangles

**Score 1:** The student incorrectly assumed  $\angle A \cong \angle E$ , but wrote an appropriate explanation.

### Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

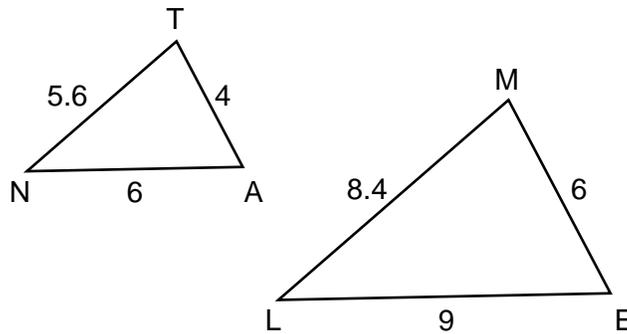
$$\frac{6}{9} = \bar{0.6} \quad \frac{4}{8.4} = 0.4762 \quad \frac{5.6}{6} = 0.9\bar{3}$$

Since the corresponding side lengths do not have the same ratio, they are not in proportion. The triangles are not similar.

**Score 1:** The student made an error in not using corresponding sides for two ratios, but wrote an appropriate explanation.

Question 31

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{9}{6} = \frac{6}{4} = \frac{8.4}{5.6} = \frac{3}{2}$$

Translate  $\triangle NAT$  so  $\angle A$  maps onto  $\angle E$ , then dilate its image by a scale factor of  $\frac{3}{2}$  centered at  $E$ .

Dilations preserve angle measure, so  $\angle T \cong \angle M$  and  $\angle N \cong \angle L$ .

By AA similarity,  $\triangle ANT \sim \triangle ELM$ .

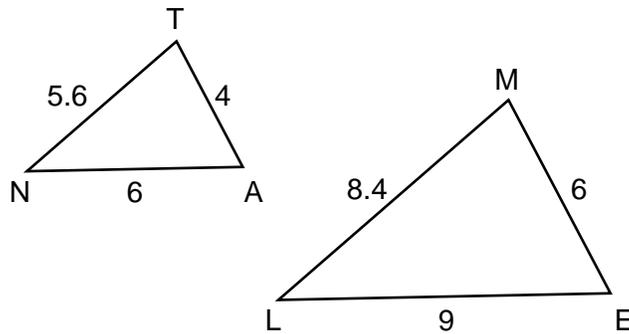
**Score 1:** The student incorrectly assumed  $\angle A \cong \angle E$ , but wrote an appropriate explanation.

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**Question 31**

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31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$$\frac{6}{9} = \frac{4}{6} = \frac{5.6}{8.4}$$

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

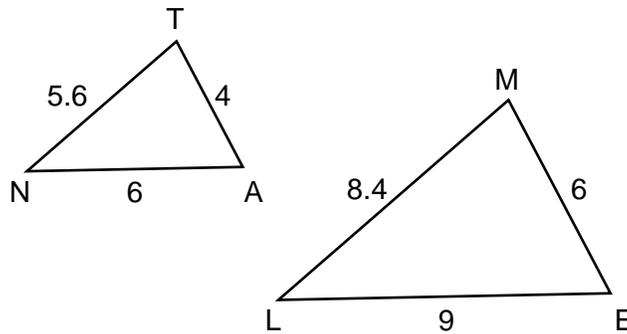
**Score 0:** The student wrote correct proportions, but the explanation is missing.

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**Question 31**

---

31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

$\triangle ANT \sim \triangle ELM$  because they are the same shape but different sizes.

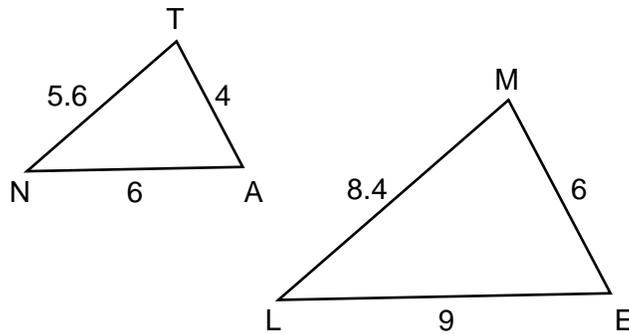
**Score 0:** The student did not show enough correct relevant course-level work to receive any credit.

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**Question 31**

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31 In triangles  $ANT$  and  $ELM$  below,  $AN = 6$ ,  $NT = 5.6$ ,  $TA = 4$ ,  $EL = 9$ ,  $LM = 8.4$ , and  $ME = 6$ .



Explain why  $\triangle ANT \sim \triangle ELM$ .

Because the side lengths  
are proportional.

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

Question 32

32 A store sells colored craft sand in the three different containers below.

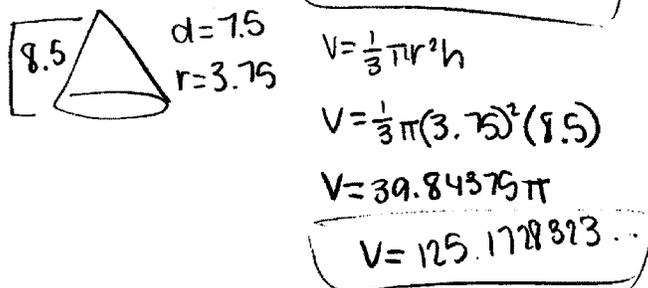
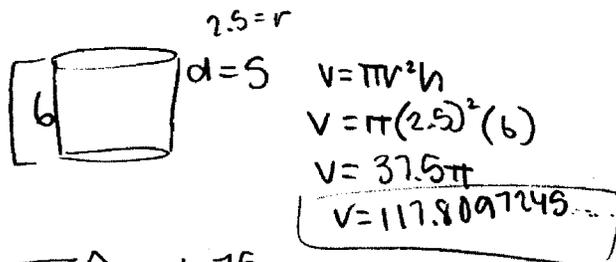
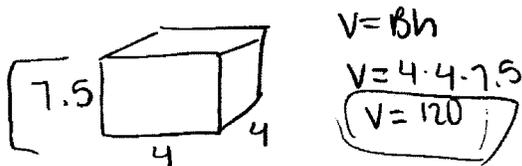
Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?

Justify your answer. **VOLUME**



the cone

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

Question 32

32 A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

1	2	3
$V = Bh$	$V = \pi r^2 h$	$V = \frac{1}{3} \pi r^2 h$
$V = (4)^2 (7.5)$	$V = \pi (2.5)^2 (6)$	$V = \frac{1}{3} \pi (3.75)^2 (8.5)$
$V = 120$	$V = 117.8097245$	$V = 125.778323$
	$V = 118$	$V = 125$

The cone will hold the most sand because its volume is greatest. (Container 3).

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

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**Question 32**

---

**32** A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

Container 1:		Container 2:	Container 3:
$V = Bh$	$s^2$	$V = \pi r^2 h$	$V = \frac{1}{3} \pi r^2 h$
$V = 6(7.5)$	$4^2$	$V = \pi(2.5)^2(6)$	$V = \frac{1}{3} \pi(3.75)^2(8.5)$
$V = 120$	$\downarrow$	$V = 37.5$	$V = 39.84375$
	6		

Container 1 will fill the most sand because container 1 can hold 120 sand.

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**Score 3:** The student made the same computational error by not multiplying by  $\pi$  when determining the volumes of the cylinder and the cone, but found an appropriate container.

Question 32

32 A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

$$\begin{aligned} \text{prism} &= Bh \\ \text{cylinder} &= \pi r^2 h \\ \text{cone} &= \frac{1}{3} \pi r^2 h \end{aligned}$$

$$\begin{aligned} \cancel{S_{qp}} \quad S_{qp} &= 4(7.5) 7.5 \\ S_{qp} &= 30(7.5) \\ \underline{S_{qp} = 225} \end{aligned}$$

$$\begin{aligned} C &= \pi (2.5)^2 6 \\ C &= \pi (6.25) 6 \\ C &= \pi 37.5 \\ \underline{C = 117.8097} \end{aligned}$$

$$\begin{aligned} \text{Cone} &= \frac{1}{3} \pi (3.75)^2 (8.5) \\ \text{cone} &= \frac{1}{3} \pi (14.0625) (8.5) \\ \text{cone} &= \frac{1}{3} \pi (119.53125) \\ \text{cone} &= \pi 39.8437 \\ \underline{\text{cone} = 125.1727} \end{aligned}$$

The square prism will hold ~~more~~ the most sand.

**Score 3:** The student made an error when determining the volume of the square prism, but found an appropriate container.

Question 32

32 A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

$$V_{\text{square prism}} = 2.5 \cdot 7.5 \\ = 187.5$$

$$V_{\text{cylinder}} = \pi 2.5^2 \cdot 6 \\ = 117.81$$

$$V_{\text{cone}} = \frac{1}{3} \pi 3.75^2 \cdot 8.5 \\ = 125.17$$

**Score 3:** The student made an error when determining the volume of the square prism, but found an appropriate container.

Question 32

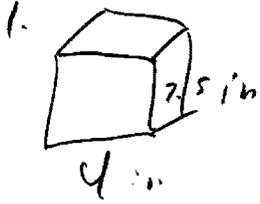
32 A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

1.   $4 \text{ in}$   $7.5 \text{ in}$

$6(4^2)(7.5)$   
 $V = 2720$

2.   $6 \text{ in}$

$V = \pi r^2 h$   
 $\pi (2.5)^2 (6)$   
 $= 37.5\pi$

3.   $8.5 \text{ in}$   $7.5 \text{ in}$

$V = \frac{1}{3} \pi r^2 h$   
 $= 39.84375\pi$

Container 1 will fill to the top for the most

**Score 3:** The student made an error when determining the volume of the square prism, but found an appropriate container.

Question 32

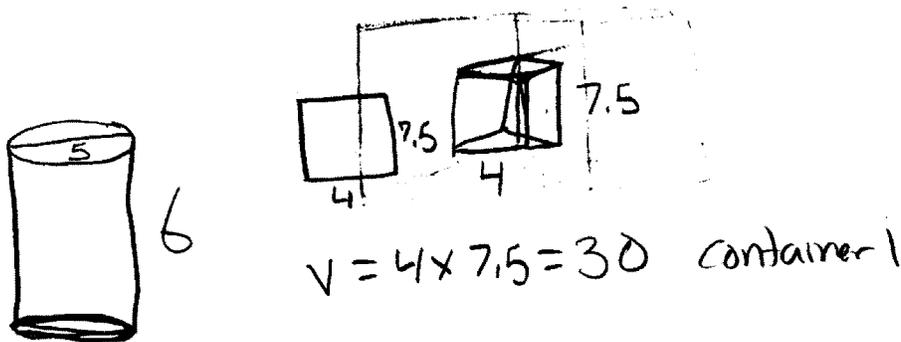
32 A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

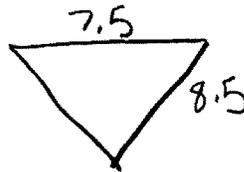
Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.



$$V = \pi r^2 h$$
$$\pi 2.5^2 \times 6$$
$$117.8097245$$

Container 2 would hold the most because it has the greatest volume.



$$V = \frac{1}{3} \pi 3.76^2 \times 8.5$$
$$125.1728323$$

**Score 2:** The student correctly determined the volume of the cylinder and cone.

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**Question 32**

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**32** A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

$$\text{Cont 1:}$$
$$V = Bh$$

$$V = 4(7.5)$$

$$V = 30$$

$$\text{Cont 2:}$$

$$V = \pi r^2 h$$

$$V = \pi(2.5)^2(6)$$

$$V = 166.9$$

$$\text{Cont 3:}$$

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

$$V = \frac{1}{3}\pi(3.75)^2(8.5)$$

$$V = 125.2$$

Container 2 will hold the most sand

---

**Score 2:** The student made errors when determining the volumes of the square prism and cylinder, but found an appropriate container.

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**Question 32**

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**32** A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

$$\text{con 1: } 4 \times 7.5 = 30$$

$$\text{con 2: } V = \pi r^2 h = \pi (2.5)^2 (6) = 30$$

$$\text{con 3: } \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi (3.75)^2 (8.5) = 66.759843889$$

Container 3 would be able to hold the most b/c its volume is greater than container 1 and 2.

---

**Score 1:** The student made errors when determining the volumes of the three containers, but found an appropriate container.

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**Question 32**

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**32** A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

*container 3 because its larger*

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

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**Question 32**

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**32** A store sells colored craft sand in the three different containers below.

Container 1: A square prism with a base length of 4 inches and a height of 7.5 inches.

Container 2: A cylinder with a diameter of 5 inches and a height of 6 inches.

Container 3: A cone with a diameter of 7.5 inches and a height of 8.5 inches.

If the containers are filled to the top, which container will hold the most sand?  
Justify your answer.

$$\begin{array}{l} 1. 4 \times 7.5 = 30 \\ 2. 5 \times 6 = 30 \\ 3. 7.5 \times 8.5 = 63.75 \end{array}$$

Container 3  
because it's the  
largest

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

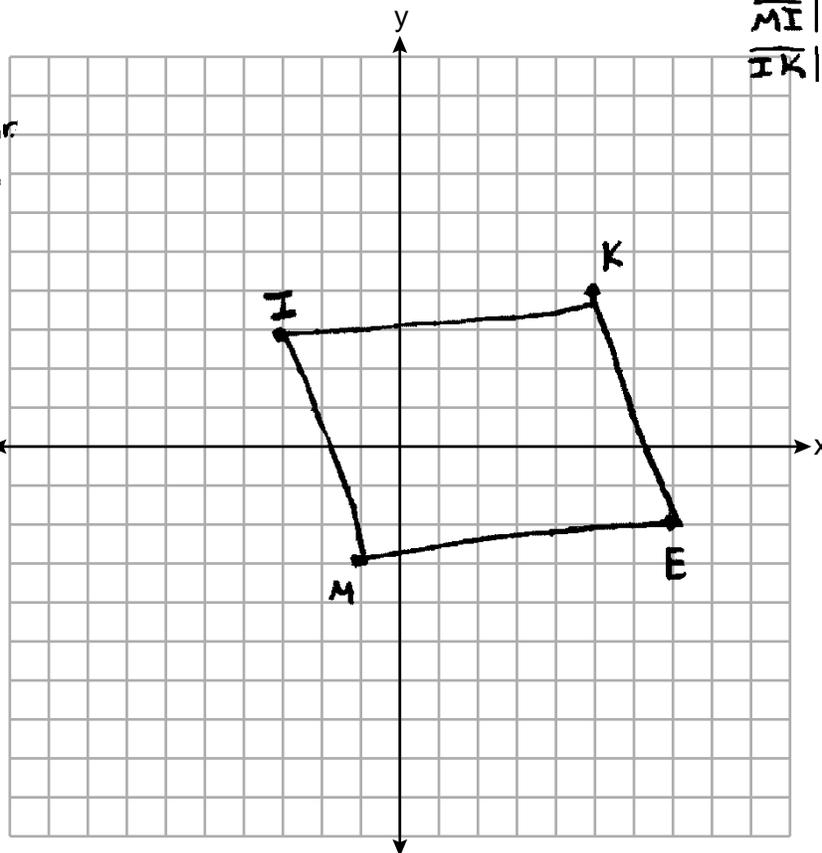
Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
 [The use of the set of axes below is optional.]

$$\begin{aligned}
 MI &= \sqrt{(-1+3)^2 + (-3-3)^2} = \sqrt{40} \\
 IK &= \sqrt{(-3-5)^2 + (3-4)^2} = \sqrt{65} \\
 KE &= \sqrt{(5-7)^2 + (4+2)^2} = \sqrt{40} \\
 EM &= \sqrt{(-1-7)^2 + (-3+2)^2} = \sqrt{65} \\
 m_{\overline{MI}} &= \frac{-3-3}{-1+3} = \frac{-6}{2} = -3 & m_{\overline{KE}} &= \frac{-2-4}{7-5} = \frac{-6}{2} = -3 \\
 m_{\overline{IK}} &= \frac{4-3}{5+3} = 1/8 & m_{\overline{EM}} &= \frac{-3+3}{7+1} = 1/8
 \end{aligned}$$

Quadrilateral *MIKE* is a parallelogram because both pairs of opposite sides are parallel (equal slopes) but isn't a rhombus because all 4 sides aren't congruent.



$\overline{MI} \parallel \overline{KE}$  same slope  
 $\overline{IK} \parallel \overline{EM}$  same slope

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

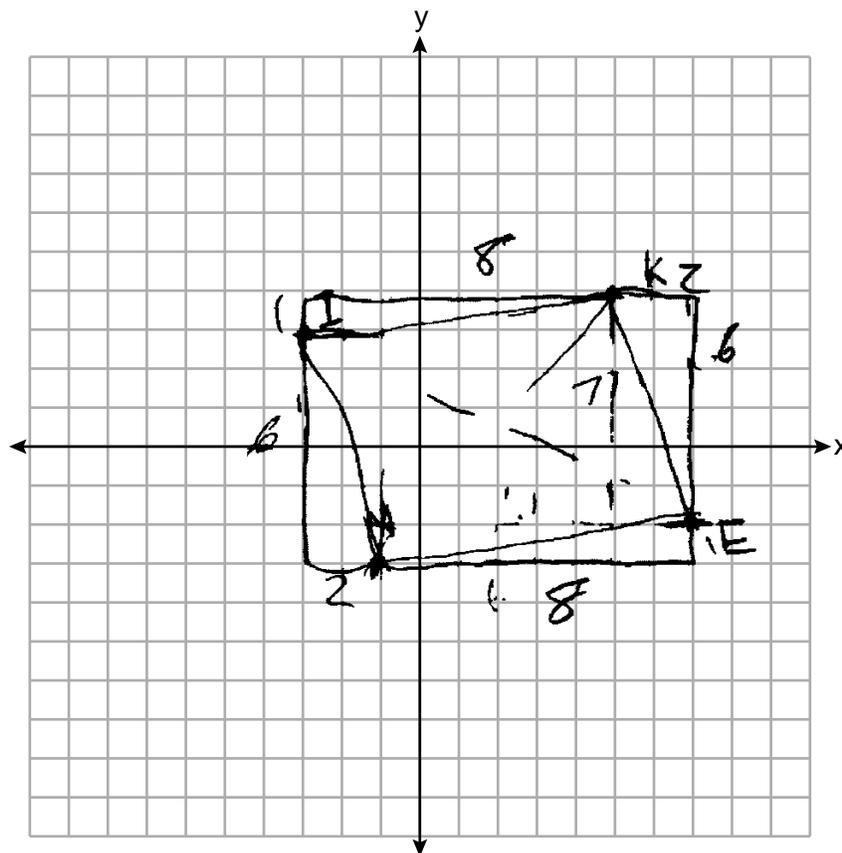
Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
 [The use of the set of axes below is optional.]

$d \text{ IM} : \sqrt{6^2 + 2^2} = \sqrt{36 + 4} = \sqrt{40}$   
 $d \text{ KE} : \sqrt{6^2 + 2^2} = \sqrt{36 + 4} = \sqrt{40}$   
 $d \text{ KI} : \sqrt{8^2 + 1^2} = \sqrt{64 + 1} = \sqrt{65}$   
 $d \text{ ME} : \sqrt{8^2 + 1^2} = \sqrt{64 + 1} = \sqrt{65}$

*MIKE* is a parallelogram  
 Because it has both pr. opposite sides  
 that are congruent and *MIKE* is  
 Not a Rhombus Because Not  
 All of its sides are congruent  
 therefore *MIKE* is a Parallelogram  
 But not a Rhombus.



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

Question 33

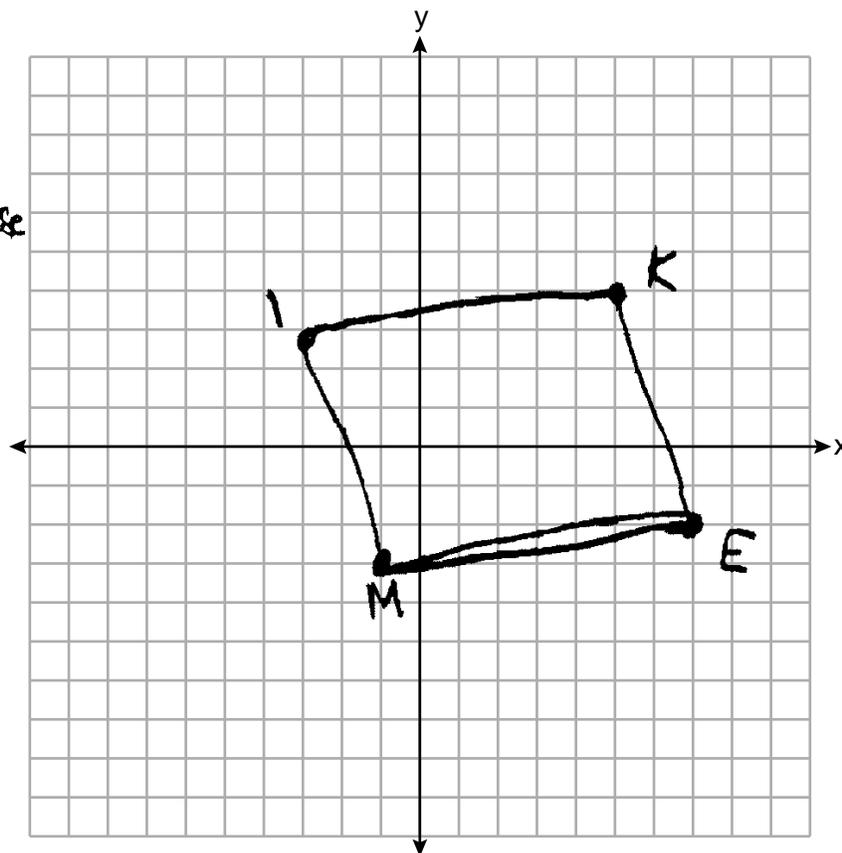
33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
[The use of the set of axes below is optional.]

$$IK = \sqrt{(5 - (-3))^2 + (4 - 3)^2} = \sqrt{65}$$
$$ME = \sqrt{(7 - (-1))^2 + (-2 - (-3))^2} = \sqrt{65}$$
$$IM = \sqrt{(-1 - (-3))^2 + (-3 - 3)^2} = \sqrt{40}$$
$$KE = \sqrt{(7 - 5)^2 + (-2 - 4)^2} = \sqrt{40}$$

MIKE is a para-gram  
because both  
pairs of opp-  
sides are  $\cong$

MIKE is not  
a rhombus because  
not all sides  
are congruent



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

**Question 33**

**33** Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is not a rhombus.

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

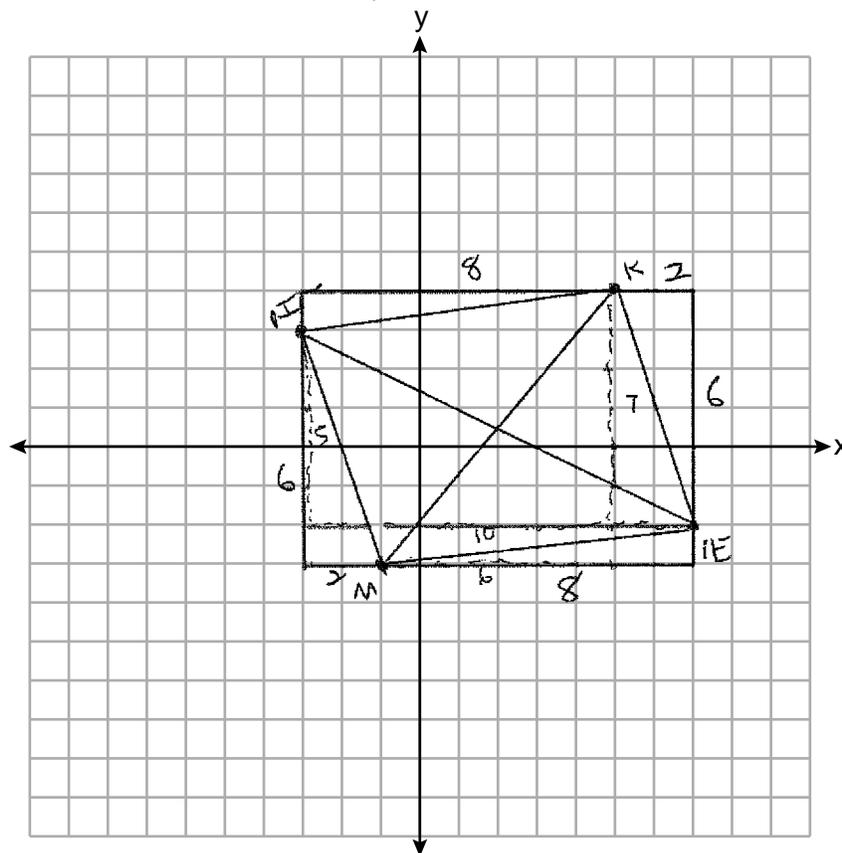
$m_{\overline{MI}} = \frac{-6}{2} = -3$   
 $m_{\overline{KE}} = \frac{-6}{2} = -3$   
 $m_{\overline{IK}} = \frac{1}{8}$   
 $m_{\overline{ME}} = \frac{1}{8}$

Same slopes  $\rightarrow$  parallel  
 Same slopes  $\rightarrow$  parallel

Since both pairs of opposite sides are parallel, *MIKE* is a parallelogram.

$m_{\overline{KM}} = \frac{7}{6}$   
 $m_{\overline{IE}} = \frac{-5}{10} = -\frac{1}{2}$

Since the slopes of diagonals  $\overline{KM}$  and  $\overline{IE}$  are not negative reciprocals, they are not perpendicular. Since  $\overline{KM}$  is not perpendicular to  $\overline{IE}$ , *MIKE* is not a rhombus.

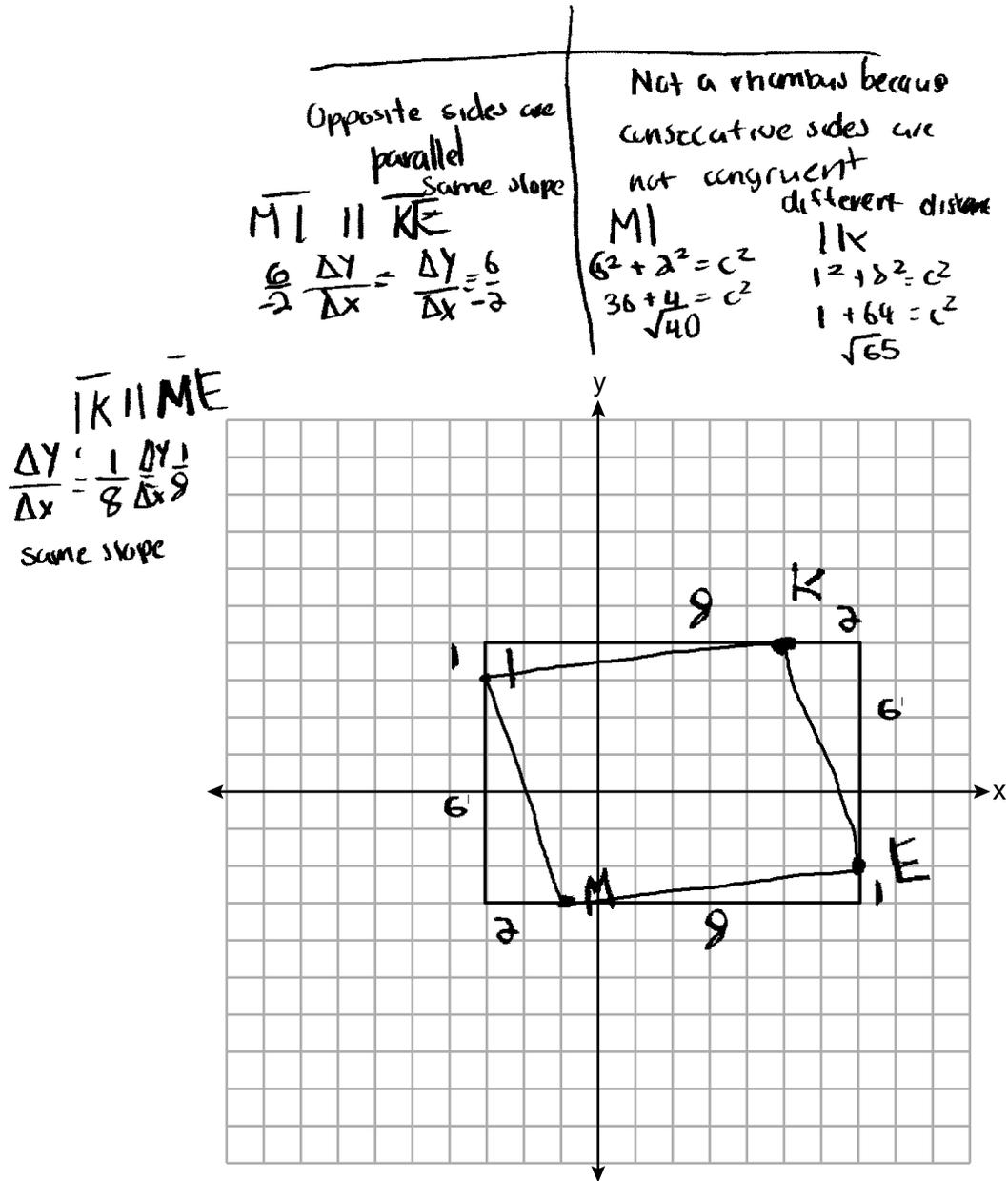


**Score 4:** The student gave a complete and correct response.

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
 [The use of the set of axes below is optional.]



**Score 3:** The student wrote an incomplete concluding statement when proving the parallelogram.

Question 33

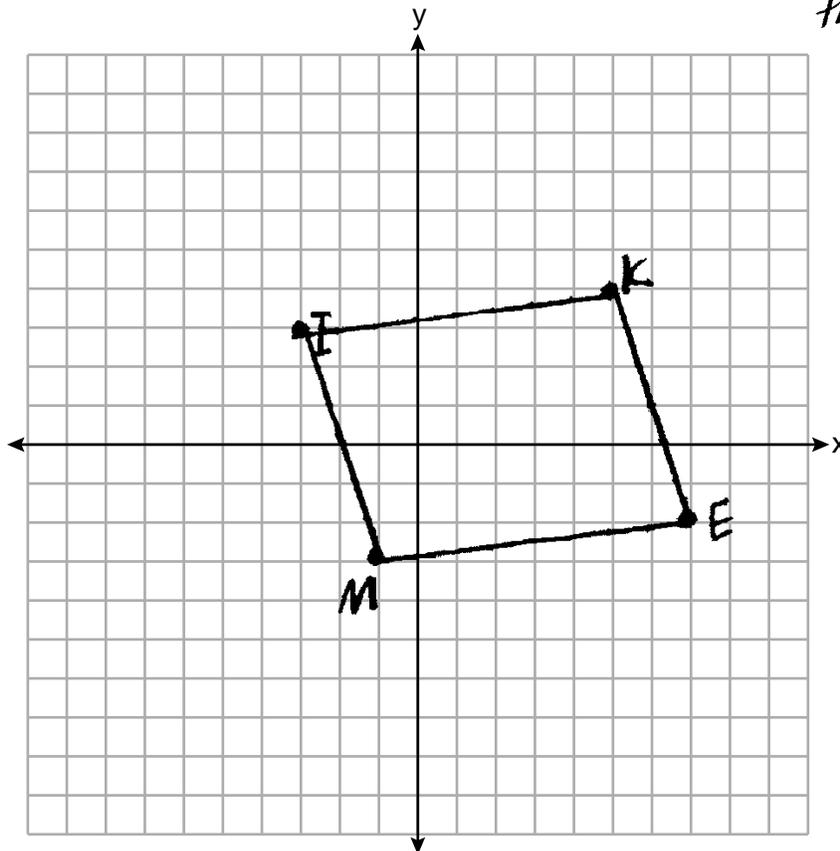
33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
 [The use of the set of axes below is optional.]

$\text{slope } \overline{MI} = \frac{3-3}{-3-1} = \frac{6}{-2} = -3$   
 $\text{slope } \overline{KE} = \frac{-2-4}{7-5} = \frac{-6}{2} = -3$   
 $D \overline{MI} \sqrt{(3+3)^2 + (-3+1)^2}$   
 $DV 36+4$   
 $DV 40$

$\text{slope } \overline{IK} = \frac{4-3}{5+3} = \frac{1}{8}$   
 $\text{slope } \overline{ME} = \frac{-2+3}{7+1} = \frac{1}{8}$   
 $D \overline{ME} \sqrt{(-2+3)^2 + (7+1)^2}$   
 $DV 1+64$   
 $DV 65$

*MIKE is a parallelogram because both pairs of opposite sides are parallel.*  
*MIKE is not a rhombus because not all sides are the same length.*



**Score 3:** The student wrote an incomplete conclusion when proving the opposite sides of *MIKE* parallel.

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.

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

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

$$IK = \sqrt{(5 - (-3))^2 + (4 - 3)^2}$$

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

$$IK = \sqrt{65}$$

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

$$IM = \sqrt{2^2 + 0^2}$$

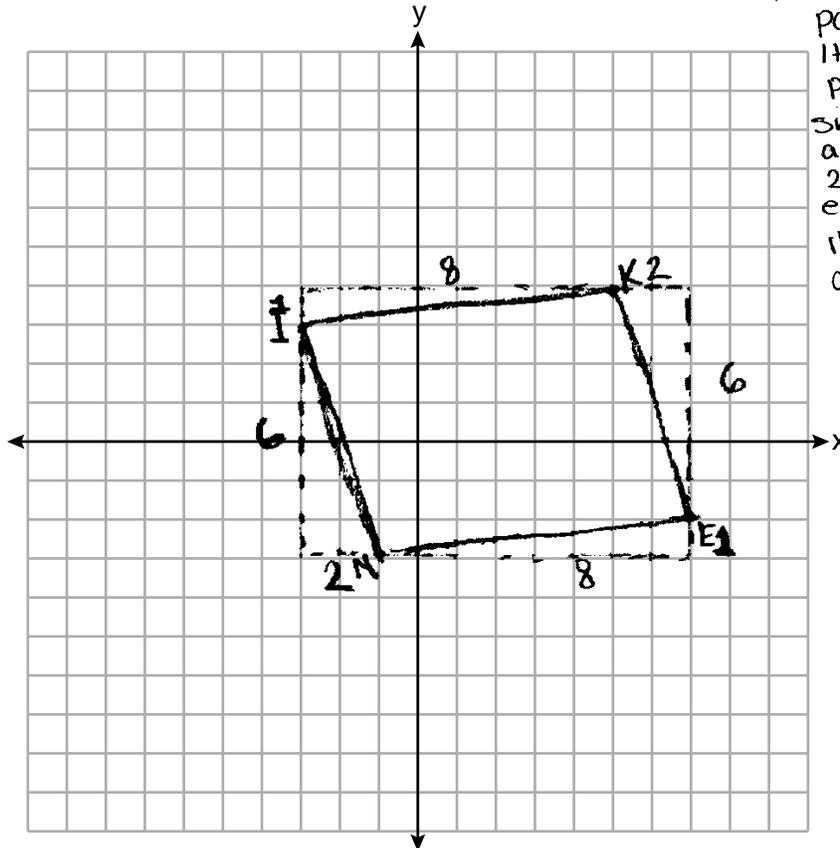
$$IM = \sqrt{4}$$

$$IM = 2$$

$$\left. \begin{array}{l} \text{Slope } \overline{IK} \quad \frac{1}{8} \\ \text{Slope } \overline{ME} \quad \frac{1}{8} \end{array} \right\} \text{same slope} \parallel$$

$$\left. \begin{array}{l} \text{Slope } \overline{IM} \quad \frac{-6}{2} \\ \text{Slope } \overline{KE} \quad \frac{-6}{2} \end{array} \right\} \text{same slope} \parallel$$

Quadrilateral *MIKE* is a parallelogram b/c it has two pairs of parallel opp. sides. It is not a rhombus b/c 2 sides are not equal, and a rhombus has all equal sides.



**Score 3:** The student made a computational error when determining the length of  $\overline{IM}$ .

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is not a rhombus.  
 [The use of the set of axes below is optional.]

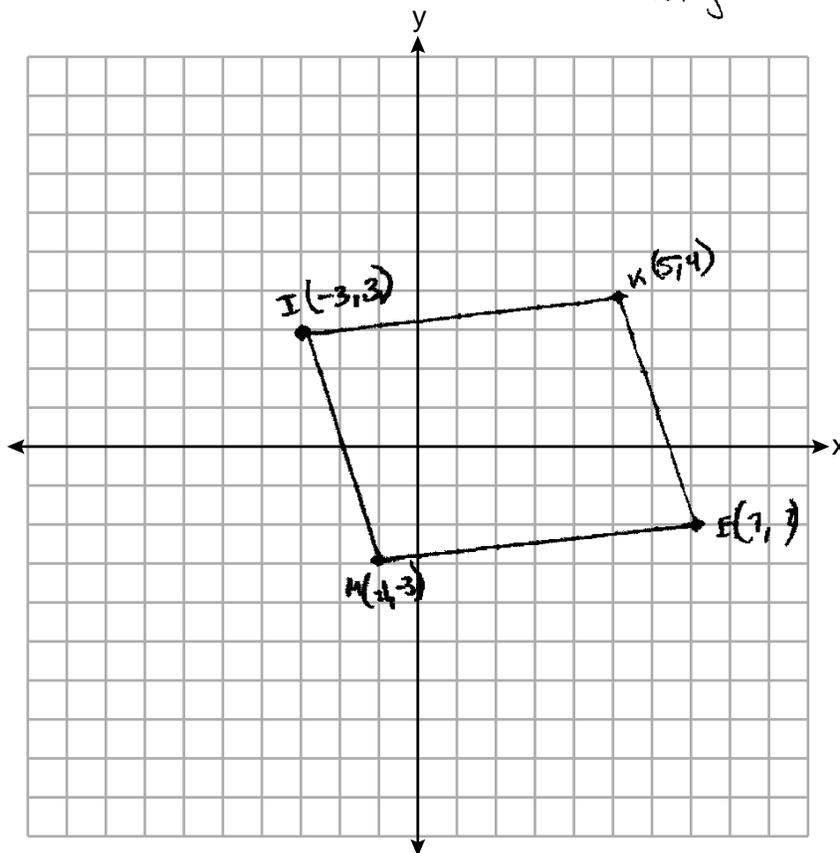
$$m\overline{IK} = \frac{4-3}{5-(-3)} = \frac{1}{8} \quad \left| \quad m\overline{ME} = \frac{-2-(-3)}{7-(-1)} = \frac{1}{8}$$

Opposite sides are parallel

$$IM = \sqrt{(-1-(-3))^2 + (-3-3)^2} = \sqrt{40}$$

$$IK = \sqrt{(5-(-3))^2 + (4-3)^2} = \sqrt{64+1} = \sqrt{65}$$

It's not a rhombus because all sides aren't congruent.



**Score 2:** The student proved *MIKE* is not a rhombus.

**Question 33**

**33** Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
 [The use of the set of axes below is optional.]

Rhombus = all sides same length  
 slope =  $\frac{y_2 - y_1}{x_2 - x_1}$

$\overline{MI}$  slope:  $-3$   
 $\overline{IK}$  slope:  $\frac{1}{8}$   
 $\overline{KE}$  slope:  $-3$   
 $\overline{ME}$  slope:  $\frac{1}{8}$

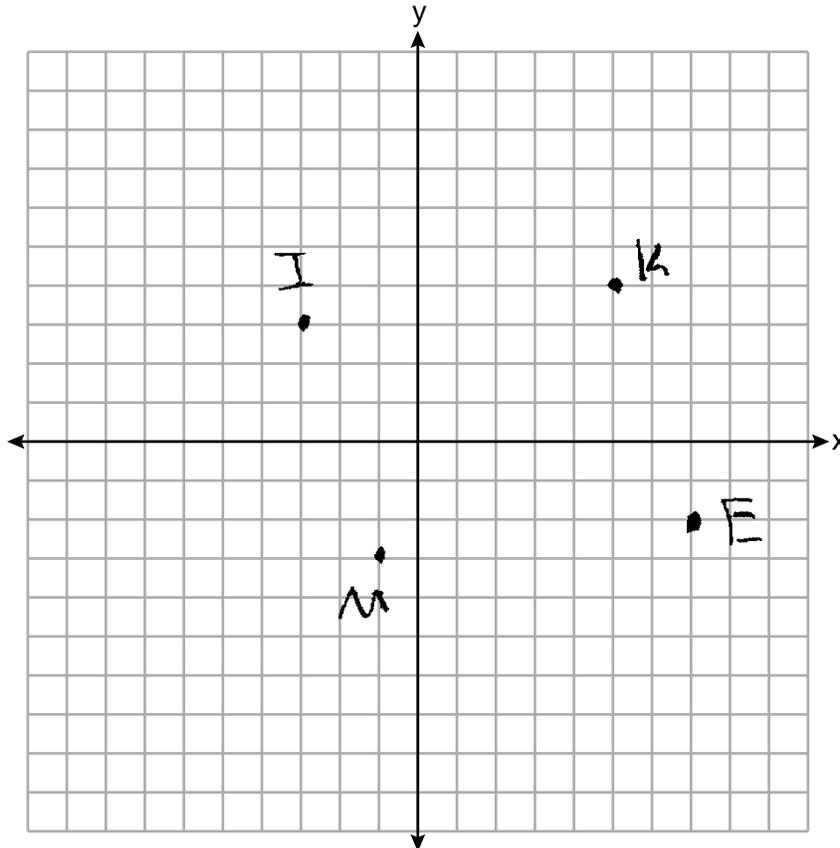
$$\overline{MI} \quad \frac{3+3}{-3+1} = \frac{6}{-2} = -3$$

$$\overline{IK} \quad \frac{4-3}{5+3} = \frac{1}{8}$$

$$\overline{KE} \quad \frac{-2-4}{7-5} = \frac{-6}{2} = -3$$

$$\overline{ME} \quad \frac{-2+3}{7+1} = \frac{1}{8}$$

*MIKE* is a parallelogram because it has two pairs of parallel sides ( $\overline{MI} \parallel \overline{KE}$   $\overline{IK} \parallel \overline{ME}$ ) but not a rhombus because not all sides are the same length.



**Score 2:** The student proved *MIKE* was a parallelogram, but no further correct work was shown.

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.

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

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

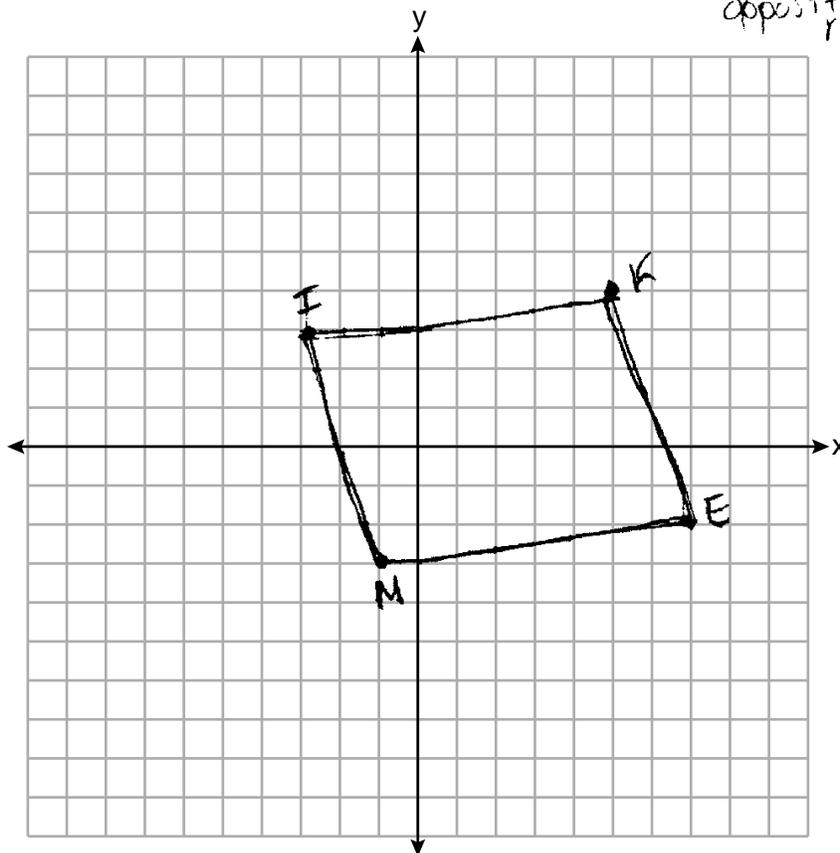
$$\overline{IK} \begin{matrix} (-3, 3) \\ (5, 4) \end{matrix} m = \frac{4 - 3}{5 - (-3)} = \frac{1}{8}$$

$$\overline{KE} \begin{matrix} (5, 4) \\ (7, -2) \end{matrix} m = \frac{-2 - 4}{7 - 5} = \frac{-6}{2}$$

$$\overline{IM} \begin{matrix} (-3, 3) \\ (-1, -3) \end{matrix} m = \frac{-3 - 3}{-1 - 3} = \frac{-6}{-4} = \frac{3}{2}$$

$$\overline{ME} \begin{matrix} (-1, -3) \\ (7, -2) \end{matrix} m = \frac{-2 - (-3)}{7 - (-1)} = \frac{1}{8}$$

\*MIKE is a parallelogram because opposite lines are parallel, it's not a rhombus because the opposite lines are not opposite reciprocal.



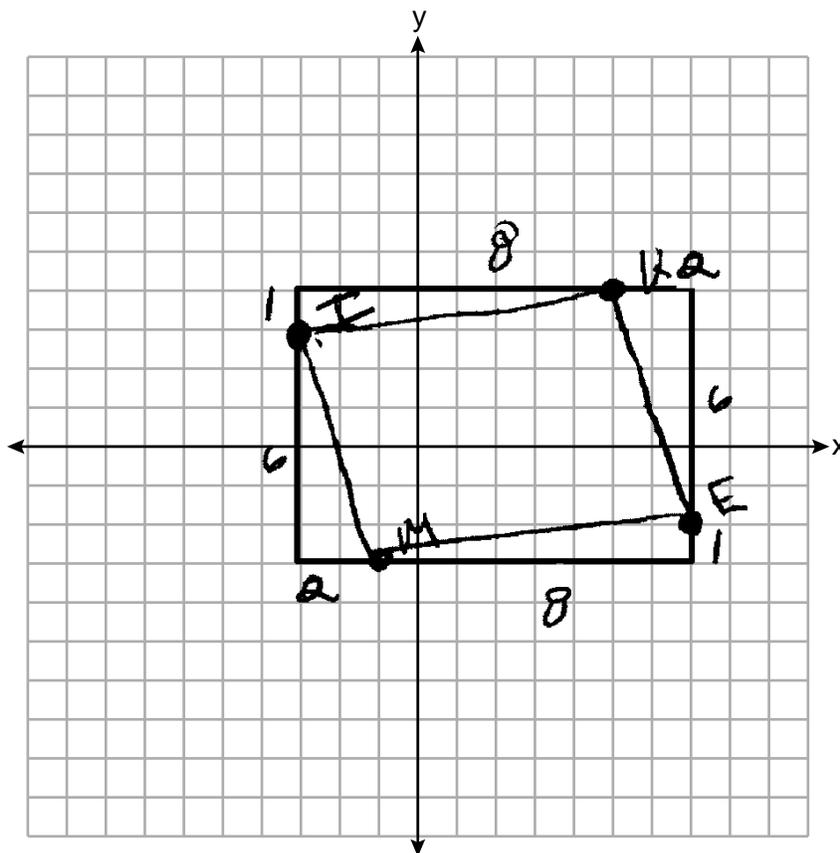
**Score 1:** The student correctly determined the slopes of all four sides of *MIKE*. No further correct work was shown.

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
 [The use of the set of axes below is optional.]

Slope	Distance
$\overline{MI}: -\frac{6}{2}$	$\sqrt{6^2+2^2} = \sqrt{40}$
$\overline{IK}: \frac{8}{8}$	$\sqrt{12^2+8^2} = \sqrt{65}$
$\overline{KE}: -\frac{8}{2}$	$\sqrt{6^2+2^2} = \sqrt{40}$
$\overline{EM}: -\frac{8}{1}$	$\sqrt{8^2+1^2} = \sqrt{65}$



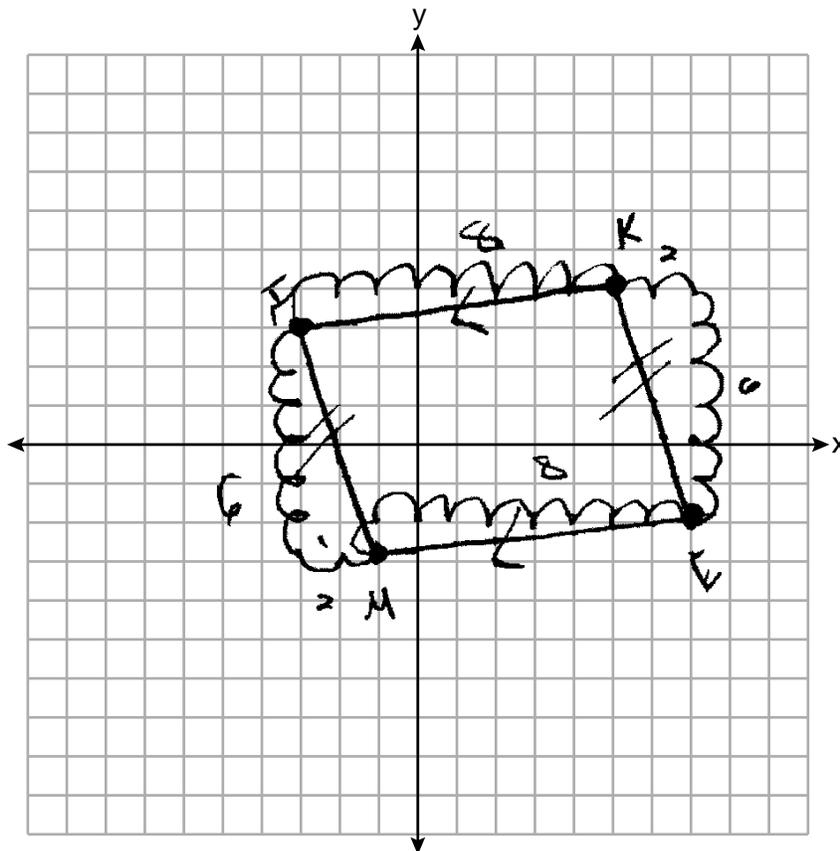
**Score 1:** The student made an error when determining the slope of  $\overline{EM}$ . The student did not write concluding statements.

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
[The use of the set of axes below is optional.]

$$\begin{aligned} m_{IK} &= \frac{1}{8} \\ m_{ME} &= \frac{1}{8} \\ m_{MI} &= -\frac{8}{2} = -3 \\ m_{KE} &= -\frac{8}{2} = -3 \end{aligned}$$



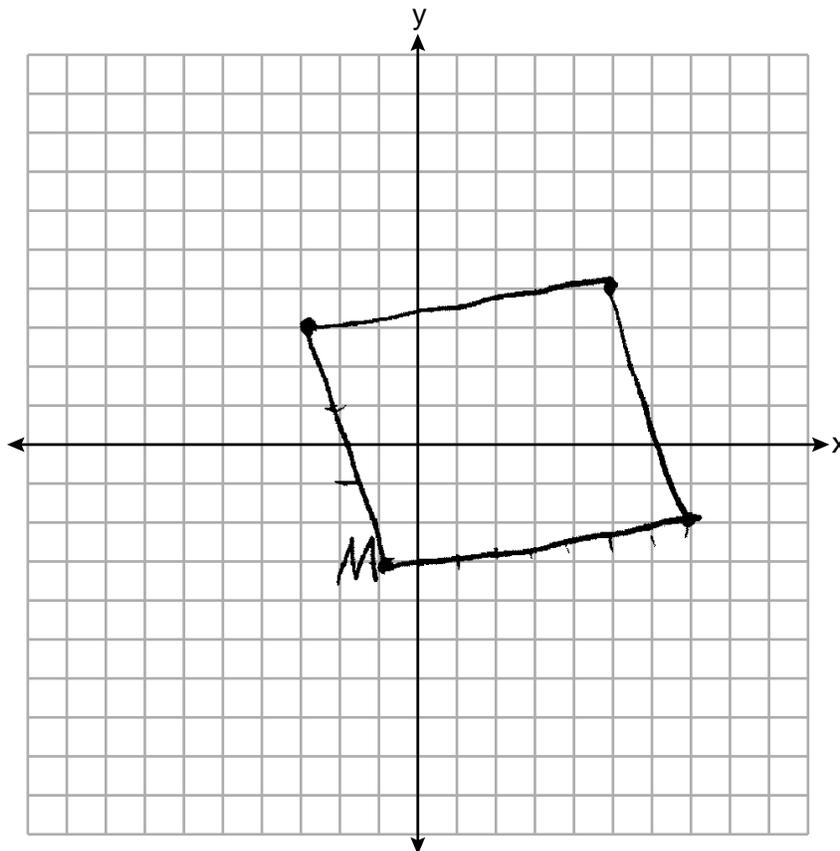
**Score 1:** The student correctly determined the slopes of the four sides of *MIKE*.

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.  
[The use of the set of axes below is optional.]

A parallelogram doesn't have all sides  $\cong$   
but a rhombus does.  
The image below does *not* have  
 $\cong$  sides



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

Question 33

33 Quadrilateral *MIKE* has vertices with coordinates  $M(-1,-3)$ ,  $I(-3,3)$ ,  $K(5,4)$ , and  $E(7,-2)$ .

Prove *MIKE* is a parallelogram, and prove *MIKE* is *not* a rhombus.

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

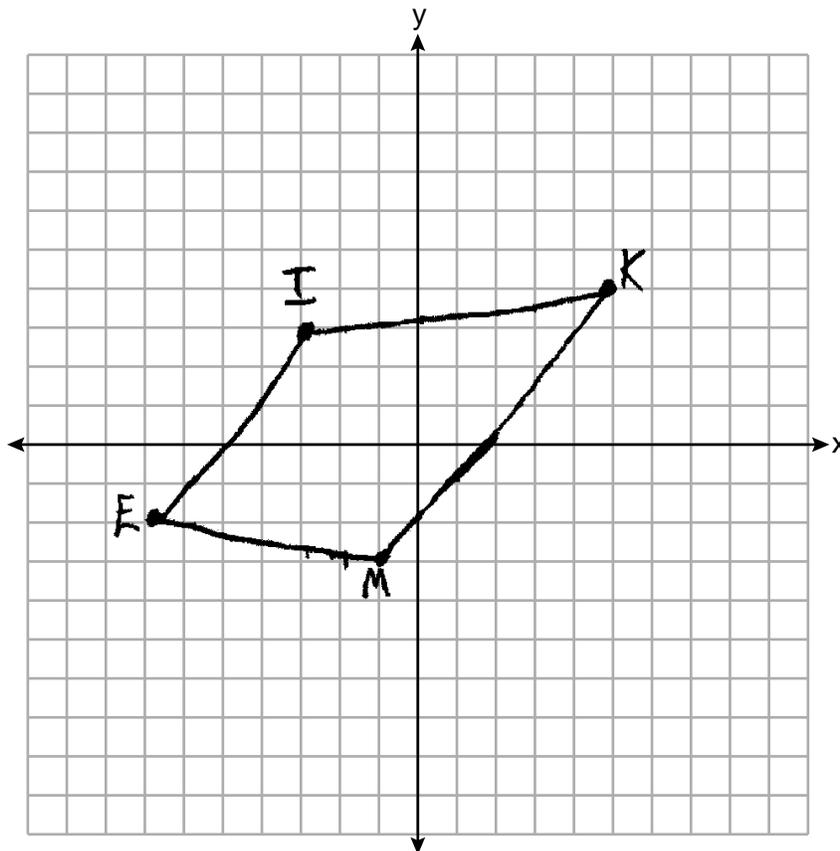
X1 X2 Y1 Y2 X1 X2 Y1 Y2

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

$$\left( \frac{5+4}{2}, \frac{-3+3}{2} \right)$$

$$(-2, 4.5)$$

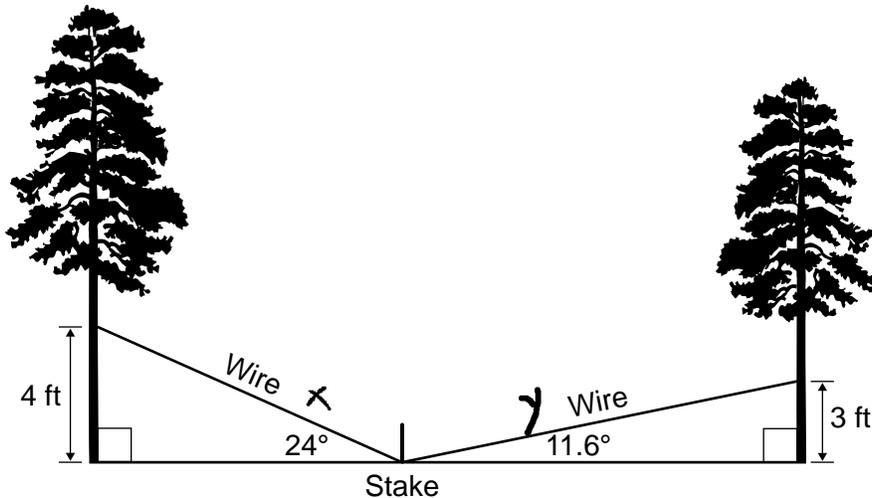
$$(4.5, 0)$$



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

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

$$\sin 24 = \frac{4}{x}$$

$$4 = \sin 24 (x)$$

$$x = 9.83 \text{ ft}$$

$$\sin 11.6 = \frac{3}{y}$$

$$3 = \sin 11.6 (y)$$

$$y = 14.92$$

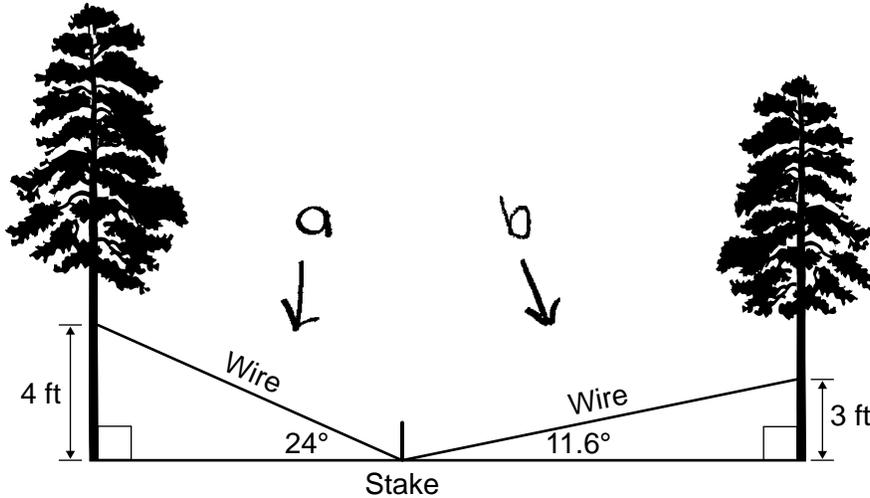
$$9.83 + 14.92 = 24.75$$

No he does not have enough wire for the trees.

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

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

$$\begin{array}{r} 9.8344 \\ +14.9196 \\ \hline 24.7540 \end{array}$$

$$a : \frac{\sin(24)}{1} = \frac{4}{a}$$

$$\frac{4}{\sin(24)} = \frac{a \cdot \sin(24)}{\sin(24)}$$

$$a = 9.8344$$

NO, The Park ranger will need about 5 more feet of wire

$$b : \frac{\sin(11.6)}{1} = \frac{3}{b}$$

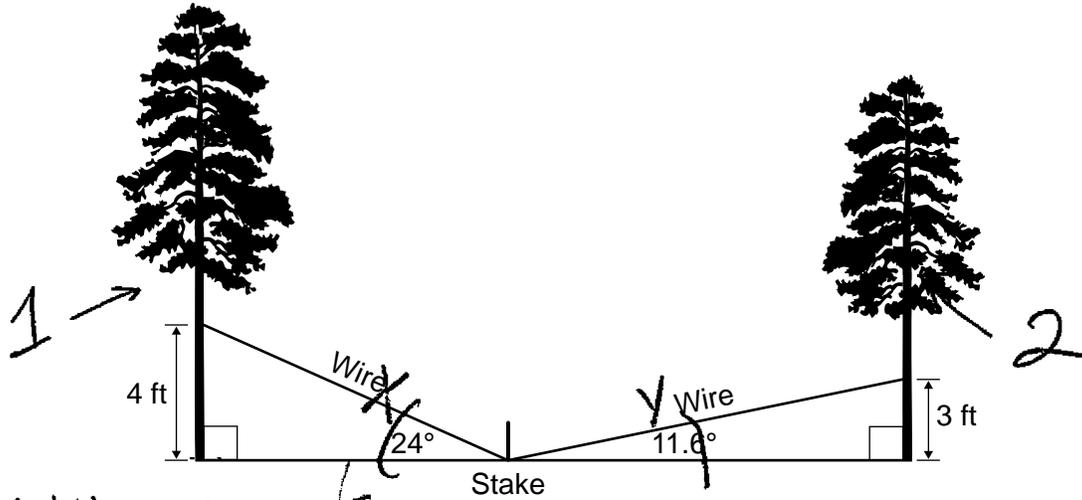
$$\frac{3}{\sin(11.6)} = \frac{b \cdot \sin(11.6)}{\sin(11.6)}$$

$$b = 14.9196$$

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

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



SOH CAH TOA

The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

$$1) \sin(24) = \frac{4}{x} \quad x = 9.8343 \dots$$

$$2) \sin(11.6) = \frac{3}{y} \quad y = 14.9196 \dots$$

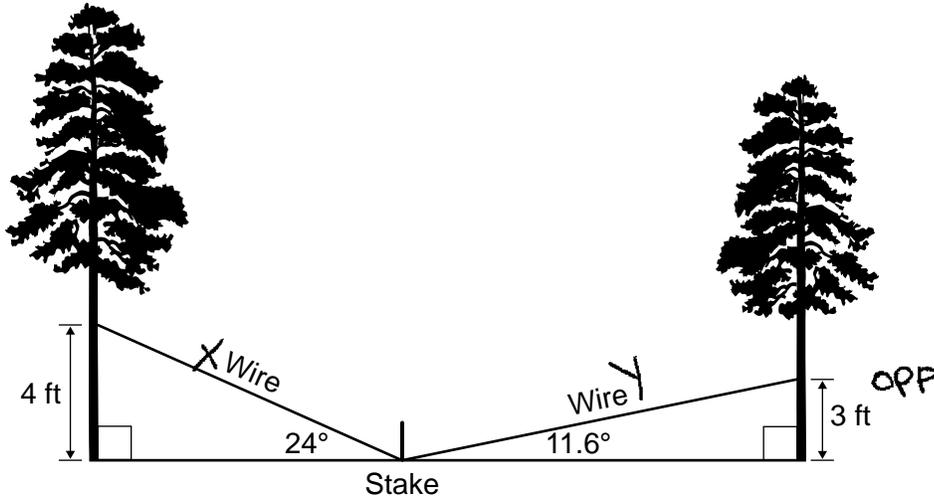
$$\begin{array}{r} + \\ \hline 24.75 \text{ ft} \end{array}$$

No he doesn't have enough wire because he only has 20 when he needs 24.75 ft

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

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

No, she would need about 7 more feet of wire because the length from the stakes is greater than the 20 ft of wire

$$\sin 24 = \frac{4}{x}$$

$$\frac{x \sin 24}{\sin 24} = \frac{4}{\sin 24}$$

$$x = \frac{4}{\sin 24}$$

$$x = 9.834373342$$

$$\sin 11.6 = \frac{3}{y}$$

$$\frac{y \sin 11.6}{\sin 11.6} = \frac{3}{\sin 11.6}$$

$$y = \frac{3}{\sin 11.6}$$

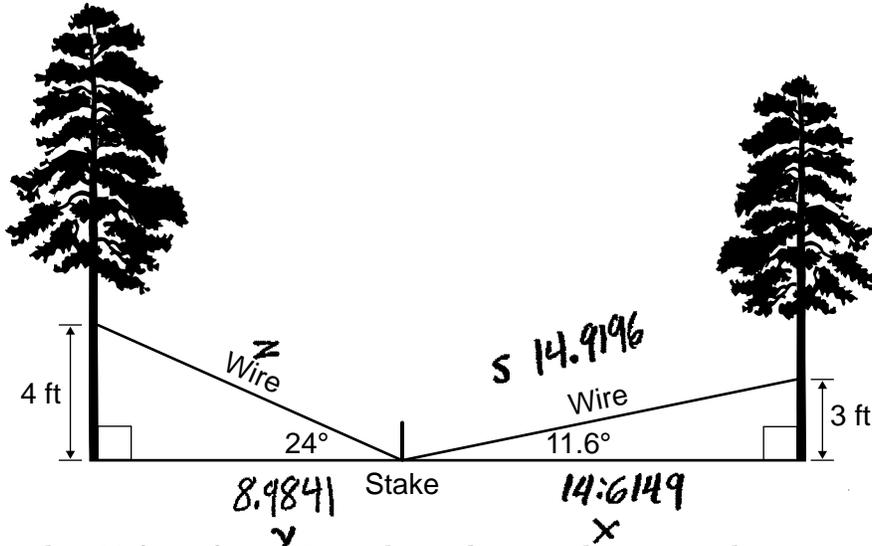
$$y = 16.30275681$$

$$\begin{array}{r} 16.30275681 \\ + 9.834373342 \\ \hline 26.13713015 \end{array}$$

Score 3: The student made a computational error in determining  $y$ .

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

$$\frac{\tan 24}{1} \times \frac{4}{y}$$

$$\frac{4 = \tan 24 y}{\tan 24}$$

$$8.9841 = y$$

$$4^2 + 8.9841^2 = z^2$$

$$\sqrt{96.7141} = z^2$$

$$9.8343 = z$$

$$\frac{\tan 11.6}{1} \times \frac{3}{x}$$

$$3 = \frac{\tan 11.6 x}{\tan 11.6}$$

$$14.6149 = x$$

$$3^2 + 14.6149^2 = s^2$$

$$\sqrt{222.5953} = s^2$$

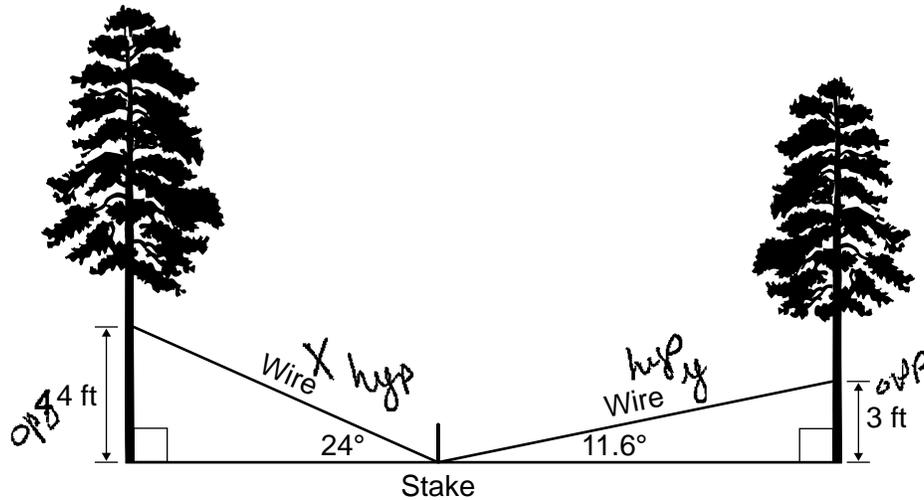
$$14.9196 = s$$

Score 3: The student correctly determined the length of both wires.

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.

5044



The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

$$\frac{\sin 24}{1} = \frac{4}{X}$$

$$\frac{4}{\sin 24} = \frac{X \cancel{\sin 24}}{\cancel{\sin 24}}$$

$$X = 9.834$$

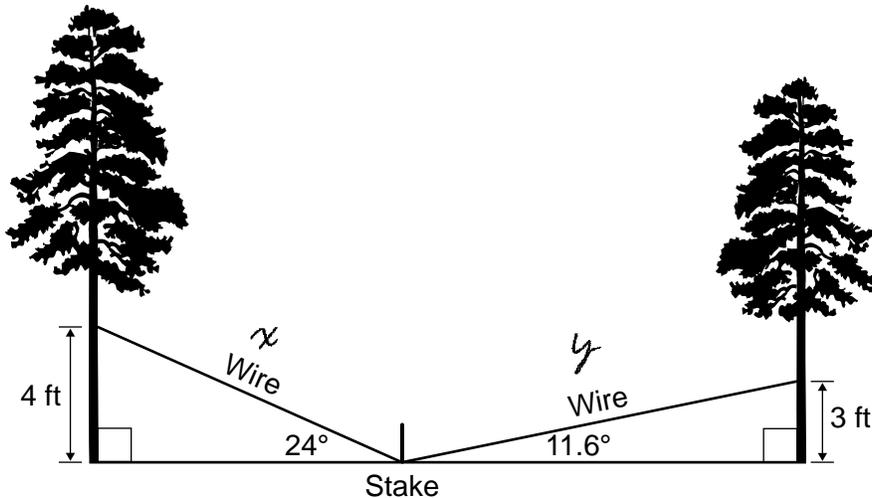
$$\frac{\sin 11.6}{1} = \frac{3}{y}$$

$$3 = y \sin 11.6$$

**Score 2:** The student correctly determined the length of one wire.

Question 34

- 34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

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

$$x = 4 \div \cos(24)$$

$$x = 4 \div 0.9135$$

$$x = 4.3788$$

$$\cos(11.6) = \frac{3}{y}$$

$$y = 3 \div \cos(11.6)$$

$$y = 3 \div 0.9796$$

$$y = 3.0625$$

$$4.3788 + 3.0625$$

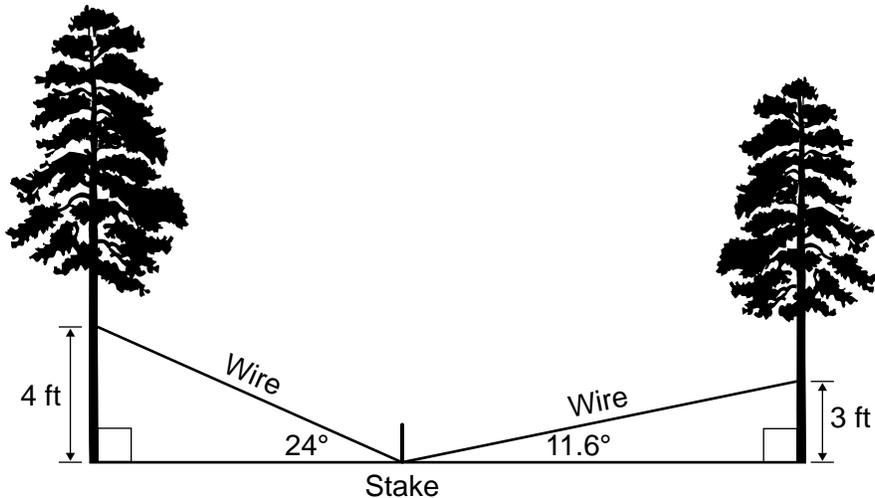
$$7.4413$$

Yes, the park ranger has more wire than 7.4413.

**Score 2:** The student made a conceptual error using cosine.

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

SOH - ~~CAH~~ - ~~TOA~~

$$\begin{aligned} \sin 24^\circ &= \frac{4}{x} \\ 4 \cdot 0.4067 &= \frac{4}{x} \cdot 4 \\ 0.1017 &= x \end{aligned}$$

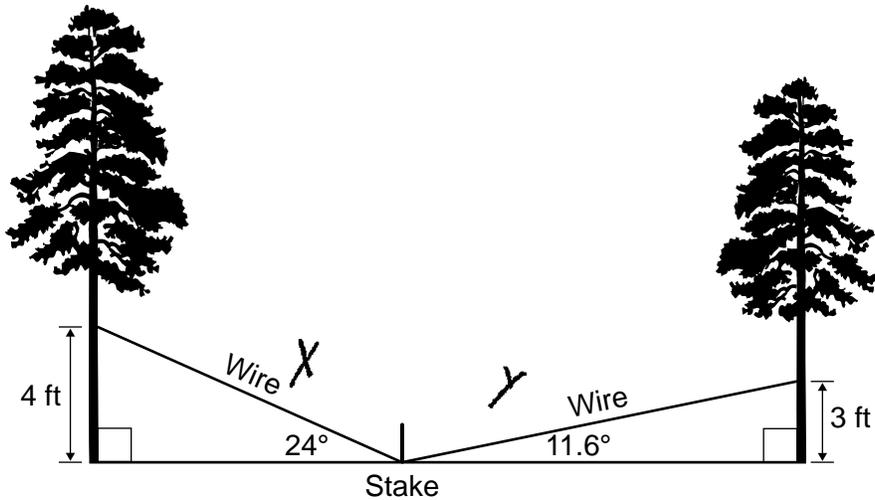
$$0.1787ft$$

$$\begin{aligned} \sin 11.6^\circ &= \frac{3}{x} \\ \frac{0.2011}{3} &= \frac{3}{x} \div 3 \\ 0.0670 &= x \end{aligned}$$

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

### Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



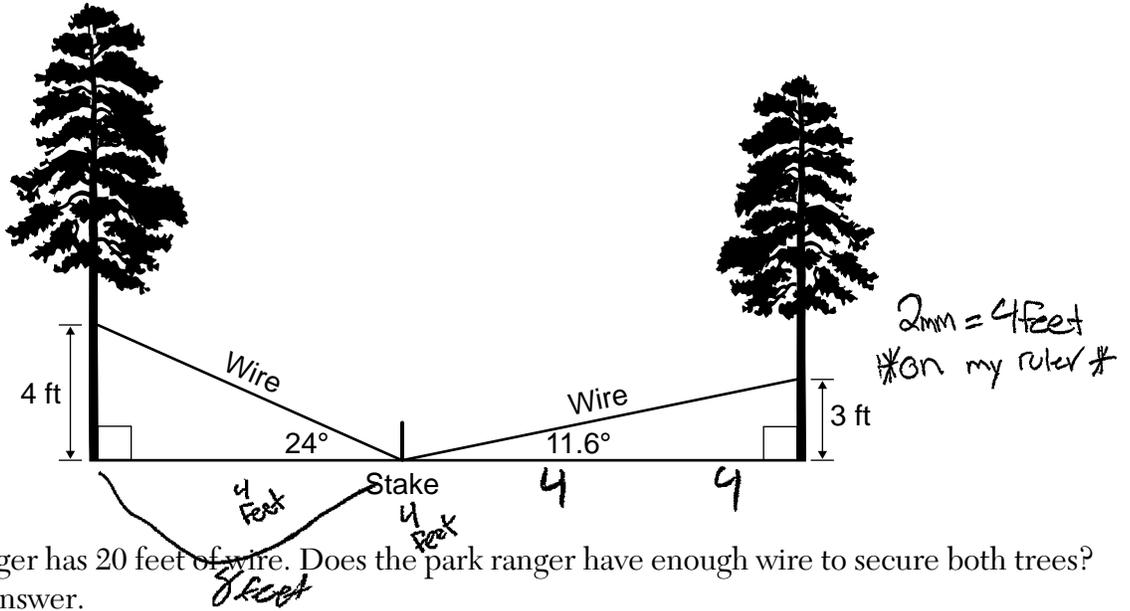
The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

$$\sin(24) = \frac{4}{X}$$
$$\sin(11.6) = \frac{3}{Y}$$

**Score 1:** The student wrote correct relevant trigonometric equations.

Question 34

34 A park ranger needs to secure two different trees with wire. A wire is to be attached from a stake in the ground to each tree. The wire is attached at two different heights and two different angles of elevation, as indicated in the model below.



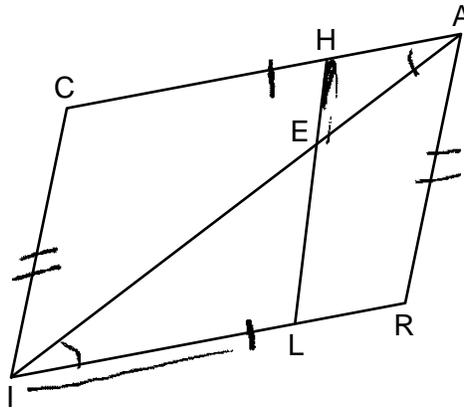
The park ranger has 20 feet of wire. Does the park ranger have enough wire to secure both trees? Justify your answer.

yes the ranger will have enough wire because both trees are 8 feet away from the stake

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

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



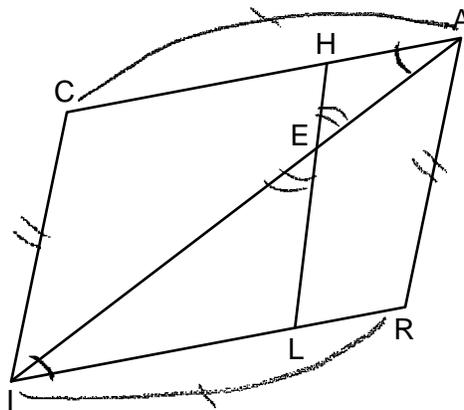
Prove:  $HA \cdot EL = LI \cdot EH$

- quad  $CARI$
- 1.)  $\overline{CA} \cong \overline{RI}$ ,  $\overline{CI} \cong \overline{RA}$ ,  $\overline{AEI}$ ,  $\overline{LEH}$
  - 2.)  $CARI$  is a parallelogram
  - 3.)  $\overline{CA} \parallel \overline{IR}$
  - 4.)  $\angle HAE \cong \angle LIE$
  - 5.)  $\angle HEA \cong \angle LEI$
  - 6.)  $\triangle HEA \sim \triangle LEI$
  - 7.)  $\frac{HA}{HE} = \frac{IL}{EL}$
  - 8.)  $HA \cdot EL = IL \cdot HE$
- 1) Given  
 2) a quadrilateral with 2 opposite sides congruent pairs of is a parallelogram  
 3) opposite sides of a parallelogram are  $\parallel$   
 4) If lines are  $\parallel$ , alternate interior  $\angle$ s are  $\cong$   
 5) vertical  $\angle$ s are  $\cong$   
 6) AA  $\sim$   
 7) corresponding sides of  $\sim$   $\Delta$ s are proportional  
 8) The product of the means = the product of the extremes

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

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



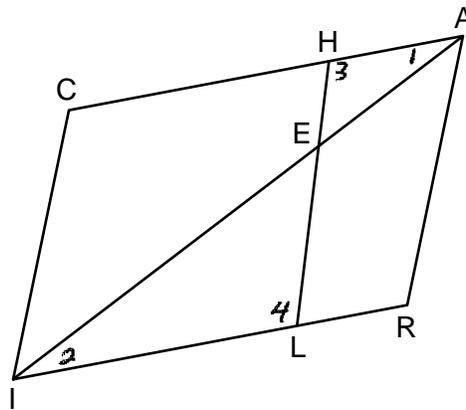
Prove:  $HA \cdot EL = LI \cdot EH$

STATEMENTS	REASONS
① Quadrilateral $CARI$ $\overline{CA} \cong \overline{RI}$ , $\overline{CI} \cong \overline{RA}$ $\overline{AEI}$ + $\overline{LEH}$ DRAWN	① GIVEN
② $\overline{AI} \cong \overline{AI}$	② REFLEXIVE
③ $\triangle ACI \cong \triangle IRA$	③ SSS CONGRUENCE
④ $\angle CAI \cong \angle RIA$	④ CPCTC
⑤ $\angle HEA \cong \angle LEI$	⑤ VERTICAL $\angle$ S ARE $\cong$
⑥ $\triangle AHE \sim \triangle LIE$	⑥ AA SIMILARITY
⑦ $\frac{HA}{LI} = \frac{EH}{EL}$	⑦ CORRESPONDING SIDES OF SIMILAR $\triangle$ S ARE IN PROPORTION
⑧ $HA \cdot EL = LI \cdot EH$	⑧ THE PRODUCT OF THE MEANS = THE PRODUCT OF THE EXTREMES

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

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



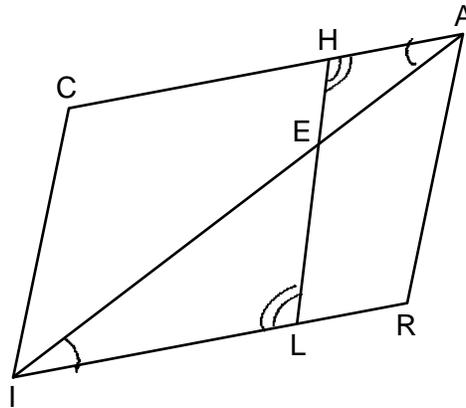
Prove:  $HA \cdot EL = LI \cdot EH$

We were given quad  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$  and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn, so  $CARI$  is a  $\square$  cause there are 2 pairs of opp. sides  $\cong$ . Since it's a  $\square$   $\overline{CA} \parallel \overline{RI}$  so alternate interior  $\angle$ s are therefore  $\cong$  ( $\angle 1 \cong \angle 2$  and  $\angle 3 \cong \angle 4$ ). With 2 pairs of corresponding  $\angle$ s  $\cong$ , the  $\Delta$ s  $HEA$  and  $LEI$  are similar. Corresponding sides of similar  $\Delta$ s are in proportion so working backward from the "Prove" statement,  $\frac{HA}{LI} = \frac{EH}{EL}$ . This proportion then gives us  $HA \cdot EL = LI \cdot EH$  because in a proportion the product of the means equals the product of the extremes.

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

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



Prove:  $HA \cdot EL = LI \cdot EH$

Quadrilateral  $CARI$   
 Given

$\overline{CA} \cong \overline{RI}$   
 $\overline{CI} \cong \overline{RA}$ 
  
 Given

$CARI$  is a  $\square$   
 Quad with both pairs of opp sides  $\cong$  is a  $\square$

$\overline{CA} \parallel \overline{IR}$   
 opposite sides of a  $\square$  are  $\parallel$

$\angle HAE \cong \angle LIE$   
 $\angle AHE \cong \angle ILE$   
 parallel lines cut by a transversal form  $\cong$  alternate interior angles

$\triangle HEA \sim \triangle LEI$   
 $AA \sim$

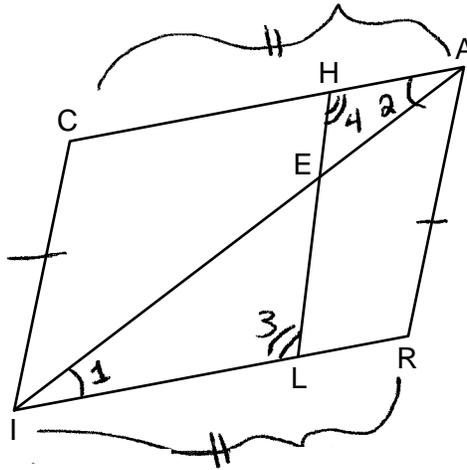
$\frac{LI}{HA} = \frac{EL}{EH}$   
 Corresponding sides of  $\sim \triangle$ s are in proportion

$HA \cdot EL = LI \cdot EH$   
 Cross products are equal

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

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



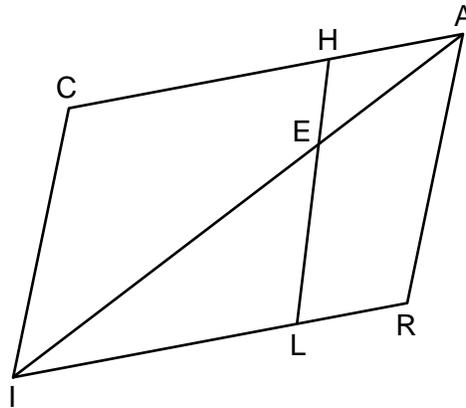
Prove:  $HA \cdot EL = LI \cdot EH$

<p>Quad <math>CARI</math></p> <p>1. <math>\overline{CA} \cong \overline{RI}</math> <math>\overline{CI} \cong \overline{RA}</math></p> <p>2. <math>CARI</math> is a p-gram</p> <p>3. <math>\overline{CA} \parallel \overline{IR}</math></p> <p>4. <math>\sphericalangle 1 \cong \sphericalangle 2</math>   <math>\sphericalangle 3 \cong \sphericalangle 4</math></p> <p>5. <math>\triangle IEL \sim \triangle AEH</math> similar</p> <p>6. <math>\frac{HA}{IL} = \frac{HE}{EL}</math></p> <p>7. <math>HA \cdot EL = IL \cdot HE</math></p>	<p>1. Given</p> <p>2. both ps. opp sides <math>\cong \rightarrow</math> p-gram</p> <p>3. p-gram <math>\rightarrow</math> opp sides <math>\parallel</math></p> <p>4. <math>\parallel</math> lines <math>\Rightarrow \cong</math> alt. int <math>\sphericalangle</math>s.</p> <p>5. <del>Vertical <math>\sphericalangle</math>s are <math>\cong</math>.</del> <math>AA \sim</math></p> <p>6. Similar <math>\triangle</math>s <math>\rightarrow</math> corresp. sides are proportional</p> <p>7. Cross multiply.</p>
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Score 5: The student had an incorrect reason in step 7.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



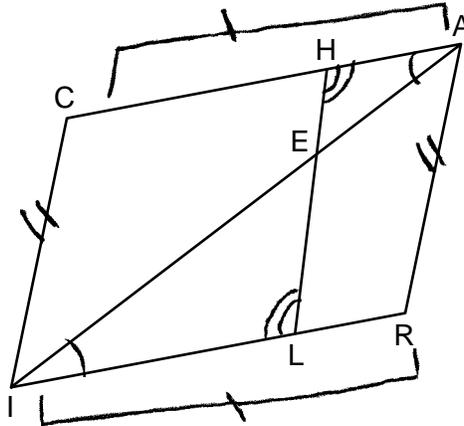
Prove:  $HA \cdot EL = LI \cdot EH$

Statements	Reasons
1. $\overline{CA} \cong \overline{RI}$ , $\overline{CI} \cong \overline{RA}$ , $\overline{AEI}$ , $\overline{LEH}$ quad $CARI$	1. Givens
2. $CARI$ is a $\square$	2. 2 pairs opp sides $\cong \rightarrow \square$
3. $\overline{CA} \parallel \overline{RI}$	3. $\square \rightarrow$ opp sides $\parallel$
4. $\angle HAE \cong \angle LIE$	4. Alternate interior $\angle$ s $\cong$
5. $\angle HEA \cong \angle LEI$	5. vertical $\angle$ s $\cong$
6. $\triangle AHE \sim \triangle LIE$	6. AA $\sim$
7. $\frac{HA}{LI} = \frac{EH}{EL}$	7. Corresponding sides of similar triangles are in proportion
8. $HA \cdot EL = LI \cdot EH$	8. The product of the means equals the product of the extremes.

Score 5: The student had an incomplete reason in step 4.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



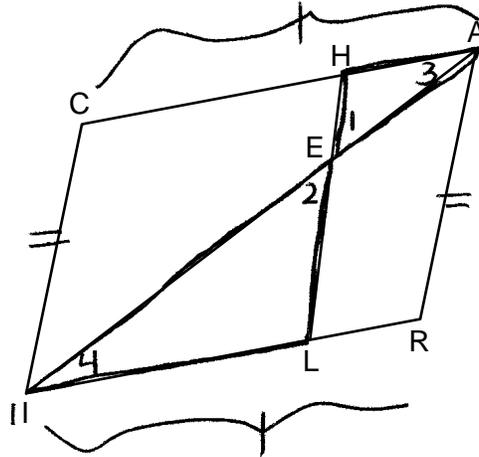
Prove:  $HA \cdot EL = LI \cdot EH$

S	R
<p>① Quadilateral <math>CARI</math> <math>\overline{CA} \cong \overline{RI}</math>, <math>\overline{CI} \cong \overline{RA}</math></p> <p>② <math>\overline{CA} \parallel \overline{RI}</math></p> <p>③ <math>\angle CAI \cong \angle RIA</math> <math>\angle AHE \cong \angle ILE</math></p> <p>④ <math>\triangle AHE \sim \triangle ILE</math></p> <p>⑤ <math>\frac{HA}{LI} = \frac{EH}{EL}</math></p> <p>⑥ <math>HA \cdot EL = LI \cdot EH</math></p>	<p>① Given</p> <p>② Opposite sides of PARAllelogram are PARAllel.</p> <p>③ Parallel lines form <math>\cong</math> alternate interior angles when cut by a transversal.</p> <p>④ AA similarity</p> <p>⑤ CORRESPONDING SIDES of Similar AS are IN proportion</p> <p>⑥ Product of means equal product of extremes</p>

Score 4: The student made a conceptual error in not proving  $CARI$  was a parallelogram.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



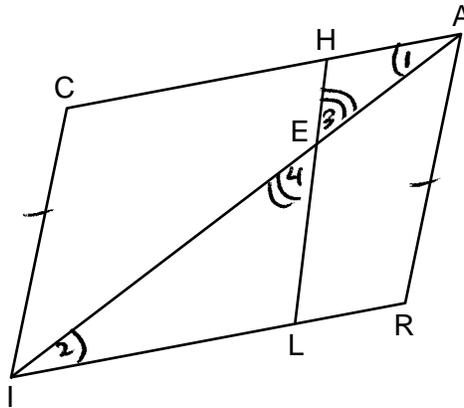
Prove:  $HA \cdot EL = LI \cdot EH$

Statements	Reasons
① Quad. $CARI$ , $\overline{CA} \cong \overline{RI}$ , $\overline{CI} \cong \overline{RA}$	① Given
② $CARI$ is a p-gram	② Both pairs of opp. sides $\cong \rightarrow$ p-gram
③ $\overline{CA} \parallel \overline{RI}$	③ Opp. sides p-gram are $\parallel$
④ $\angle 1 \cong \angle 2$	④ vertical $\angle$ 's are $\cong$
⑤ $\angle 3 \cong \angle 4$	⑤ $\parallel$ lines $\rightarrow$ alt. int. $\angle$ 's $\cong$
⑥ $\triangle IEL \sim \triangle AEH$	⑥ AA $\sim$
⑦ $HA \cdot EL = IL \cdot HE$	⑦ CPCTC

**Score 4:** The student proved  $\triangle IEL \sim \triangle AEH$ , but had no correct work after step 6.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



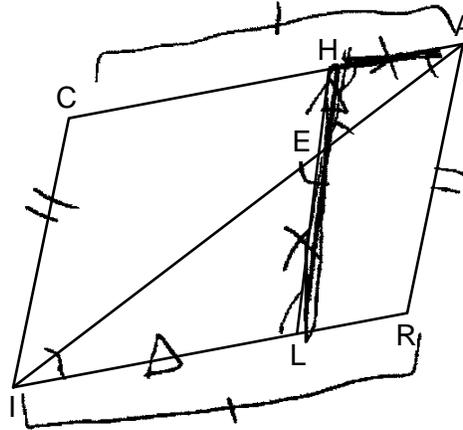
Prove:  $HA \cdot EL = LI \cdot EH$

Statements	Reasons
1. Quad. $CARI$ ; $\overline{CA} \cong \overline{RI}$ $\overline{CI} \cong \overline{RA}$	1. Given
2. $CARI$ is a $\square$	2. If both pr. of opp. sides of a Quad are $\cong$ , then it's a $\square$
3. $\angle 1 \cong \angle 2$	3. alt. interior $\angle$ s of $\parallel$ lines are $\cong$
4. $\angle 3 \cong \angle 4$	4. vertical $\angle$ 's are $\cong$
5. $\triangle AHE \sim \triangle ILE$	5. A.A. $\cong$ A.A.
6. $\frac{HE}{EL} = \frac{AE}{EI}$	6. CPCTC

**Score 3:** The student had a missing statement and reason to prove step 3. The student had no correct work after step 5.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



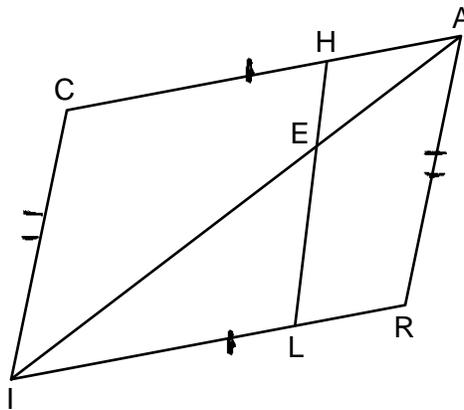
Prove:  $HA \cdot EL = LI \cdot EH$

- |  |   |
|--|---|
| <p>quad <math>CARI</math></p> <p>1) <math>\overline{CA} \cong \overline{RI}, \overline{CI} \cong \overline{RA}</math></p> <p>2) <math>CARI</math> is a parallelogram</p> <p>3) <math>\angle HAE \cong \angle EIL</math><br/><math>\angle AHE \cong \angle ILE</math></p> <p>4) <math>\angle HEA \cong \angle IEL</math></p> <p>5) <math>\triangle IEL \sim \triangle AEH</math></p> <p>6) <math>HA \cdot EL = LI \cdot HE</math></p> | <p>1) Given</p> <p>2) Both pairs of opposite sides are congruent, then it's a parallelogram</p> <p>3) parallel lines cut by a transversal create <math>\cong</math> alternate interior angles</p> <p>4) vertical angles are <math>\cong</math></p> <p>5) AAA <math>\sim</math></p> <p>6) Similar parts of similar triangles are similar</p> |
|--|---|

**Score 3:** The student had a missing statement and reason to prove step 3. The student had no correct work after step 5.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



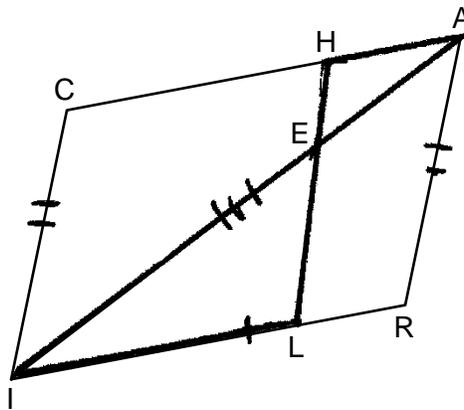
Prove:  $HA \cdot EL = LI \cdot EH$

1.  $\overline{CA} \cong \overline{RI}$ ,  $\overline{CI} \cong \overline{RA}$ , Quad  $CARI$  1. Given
2. Quadrilateral  $CARI$  is a parallelogram 2. Two pairs of opp. congruent sides form a parallelogram
3.  $\angle HAE \cong \angle EIL$ ,  $\angle AHE \cong \angle LIE$  3. parallel lines then Alt. int. angles are congruent
4.  $\triangle HEA \cong \triangle LEI$  4. AA
5.  $HA \cdot EL = IL \cdot HE$  5. CPCTC

**Score 2:** The student had a missing statement and reason to prove step 3. The student had an incorrect statement in step 4. The student had no correct work after step 4.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



$$\frac{HA}{IL} \neq \frac{HE}{EL}$$

Prove:  $HA \cdot EL = LI \cdot EH$

1)  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$  1) given

2)  $\overline{IA} \cong \overline{IA}$  2) reflexive prop

3)  $\triangle CAI \cong \triangle RIA$  3) SSS

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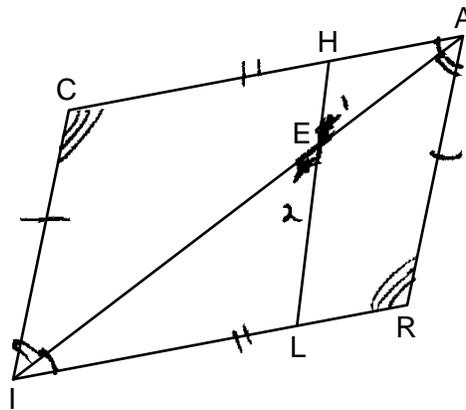
4)  $\frac{HA}{IL} \neq \frac{HE}{EL}$  4) CPCPC

5)  $HA \cdot EL = IL \cdot HE$  5) (cross-products)

**Score 2:** The student proved  $\triangle CAI \cong \triangle RIA$ , but had no further correct work after step 3.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



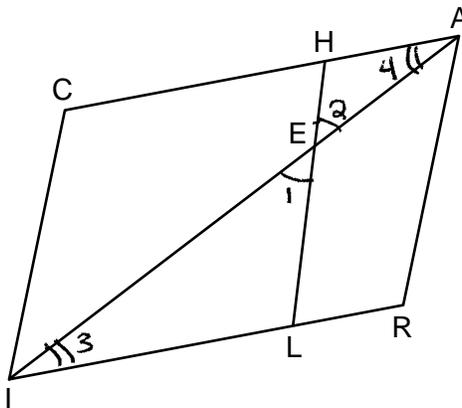
Prove:  $HA \cdot EL = LI \cdot EH$

- ①  $\overline{CA} \cong \overline{RI}$  &  $\overline{CI} \cong \overline{RA}$  (given)
- ②  $\angle 1 \cong \angle 2$     ② vertical angles are  $\cong$
- ③  $\angle EIL = \angle HAE$     ③ opp. int.  $\angle$ s are  $\cong$
- ④  $\triangle HAE \cong \triangle IEL$     ④ AA  $\cong$
- ⑤  $HA \cdot EL = IL \cdot HE$     ⑤ CPCTC

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

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



Prove:  $HA \cdot EL = LI \cdot EH$

$$1. \begin{array}{l} \overline{CA} \cong \overline{RI} \\ \overline{CI} \cong \overline{RA} \end{array}$$

$$2. \angle 1 \cong \angle 2$$

$$3. \angle 3 \cong \angle 4$$

$$4. \triangle IEL \cong \triangle AEH$$

$$5. HA \cdot EL = IL \cdot HE$$

1. Given

2. Vertical  $\angle$ s are  $\cong$

3. Alt. interior  $\angle$ s

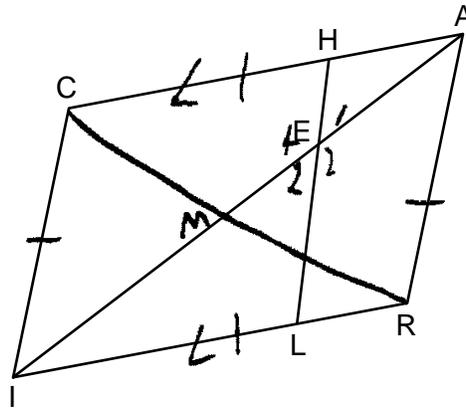
4. AA  $\sim$

5. Similar triangles

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

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



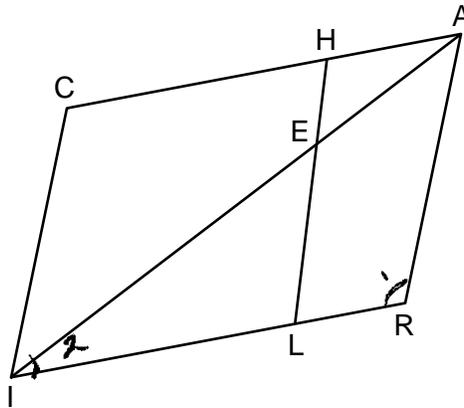
Prove:  $HA \cdot EL = LI \cdot EH$

<p>1 <math>CI \cong AR</math> <math>CA \cong IR</math></p> <p>2 <math>CARI</math> is a <math>\square</math></p> <p>3 angles <math>\cong</math></p> <p>4 <math>CMA</math> is isosceles</p> <p>5 <math>\triangle CMA \cong \triangle IMP</math></p> <p>6 <math>PO + MI = PO + PE</math></p>	<p>1 Given</p> <p>2 opposite congruent + sides slope <math>\cong</math></p> <p>3</p> <p>4 <math>\square</math></p> <p>5 <math>CPI \cong C</math></p> <p>6 <math>HA \cdot EL = IL \cdot HE</math></p>
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**Score 0:** The student did not show enough correct relevant work to receive any credit.

Question 35

35 Given: Quadrilateral  $CARI$  with  $\overline{CA} \cong \overline{RI}$  and  $\overline{CI} \cong \overline{RA}$ , and  $\overline{AEI}$  and  $\overline{LEH}$  are drawn



Prove:  $HA \cdot EL = LI \cdot EH$

Statements	Reasons
1. $\overline{CA} \cong \overline{RI}$ & $\overline{CI} \cong \overline{RA}$	1. Given
2. $\angle R \cong \angle I$	2. Perpendicular $\angle$ 's are $\sim$
3. $\frac{HA}{IL} = \frac{HE}{EL}$	3. AA
4. $HA \cdot EL = IL \cdot HE$	4. CPCTC

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

## Regents Examination in Geometry – June 2025

Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)

(Use for the June 2025 exam only.)

Raw Score	Scale Score	Performance Level
80	100	5
79	99	5
78	97	5
77	96	5
76	94	5
75	93	5
74	92	5
73	91	5
72	90	5
71	89	5
70	88	5
69	87	5
68	86	5
67	85	5
66	84	4
65	84	4
64	83	4
63	82	4
62	82	4
61	81	4
60	80	4
59	80	4
58	79	3
57	78	3
56	78	3
55	77	3
54	76	3

Raw Score	Scale Score	Performance Level
53	76	3
52	75	3
51	75	3
50	74	3
49	73	3
48	73	3
47	72	3
46	72	3
45	71	3
44	70	3
43	70	3
42	69	3
41	69	3
40	68	3
39	67	3
38	67	3
37	66	3
36	66	3
35	65	3
34	64	2
33	63	2
32	63	2
31	62	2
30	61	2
29	60	2
28	60	2
27	59	2

Raw Score	Scale Score	Performance Level
26	58	2
25	57	2
24	56	2
23	55	2
22	54	1
21	53	1
20	52	1
19	50	1
18	49	1
17	48	1
16	46	1
15	45	1
14	43	1
13	41	1
12	39	1
11	37	1
10	35	1
9	32	1
8	29	1
7	27	1
6	24	1
5	20	1
4	17	1
3	13	1
2	9	1
1	5	1
0	0	1

To determine the student’s final examination score (scale score), find the student’s total test raw score in the column labeled “Raw Score” and then locate the scale score that corresponds to that raw score. The scale score is the student’s final examination score. Enter this score in the space labeled “Scale Score” on the student’s answer sheet.

**Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.**

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student’s final score. The chart above is usable only for this administration of the Regents Examination in Geometry.