

GEOMETRY

Wednesday, January 24, 2024 — 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 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.

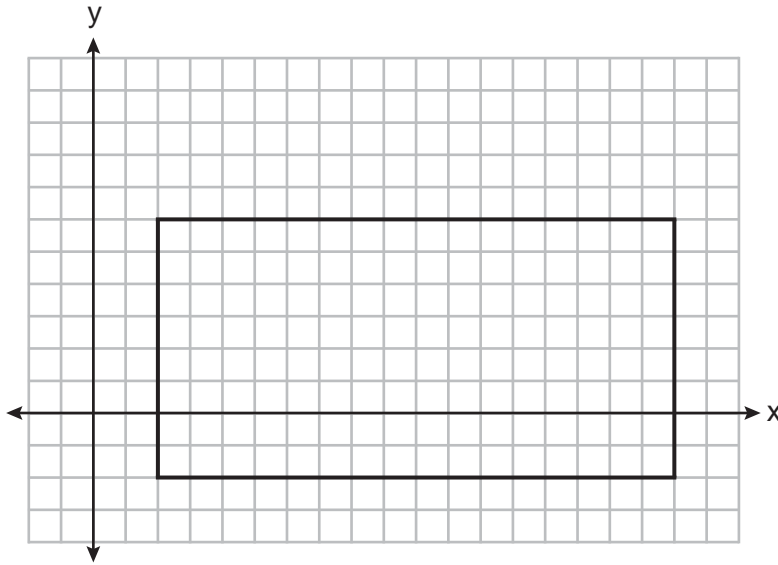
Notice ...

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.

Use this space for computations.

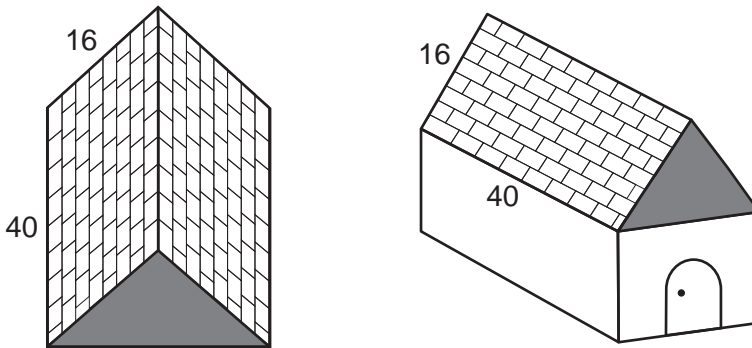
3 A rectangle is graphed on the set of axes below.



A reflection over which line would carry the rectangle onto itself?

- (1) $y = 2$
- (2) $y = 10$
- (3) $y = \frac{1}{2}x - 3$
- (4) $y = -\frac{1}{2}x + 7$

4 The surface of the roof of a house is modeled by two congruent rectangles with dimensions 40 feet by 16 feet, as shown below.



Roofing shingles are sold in bundles. Each bundle covers $33\frac{1}{3}$ square feet. What is the minimum number of bundles that must be purchased to completely cover both rectangular sides of the roof?

- (1) 20
- (2) 2
- (3) 39
- (4) 4

Use this space for computations.

5 Which equation represents a line that is perpendicular to the line whose equation is $y - 3x = 4$?

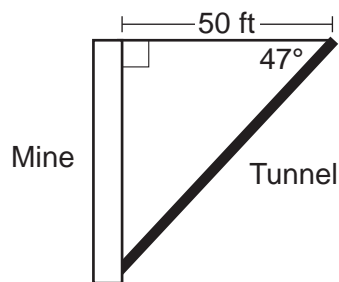
(1) $y = -\frac{1}{3}x - 4$

(3) $y = -3x + 4$

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

(4) $y = 3x - 4$

6 A vertical mine shaft is modeled in the diagram below. At a point on the ground 50 feet from the top of the mine, a ventilation tunnel is dug at an angle of 47° .



What is the length of the tunnel, to the *nearest foot*?

(1) 47

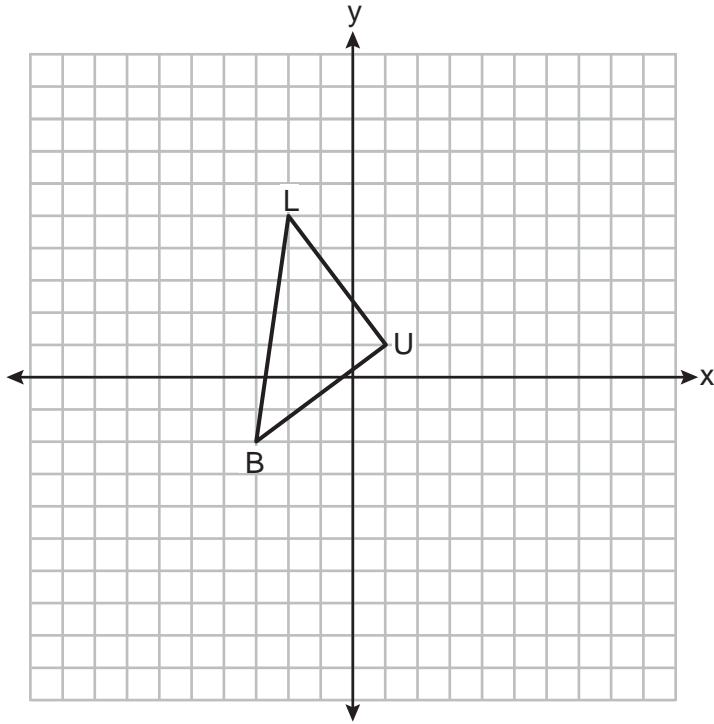
(3) 68

(2) 54

(4) 73

Use this space for
computations.

- 7 On the set of axes below, $\triangle BLU$ has vertices with coordinates $B(-3,-2)$, $L(-2,5)$, and $U(1,1)$.

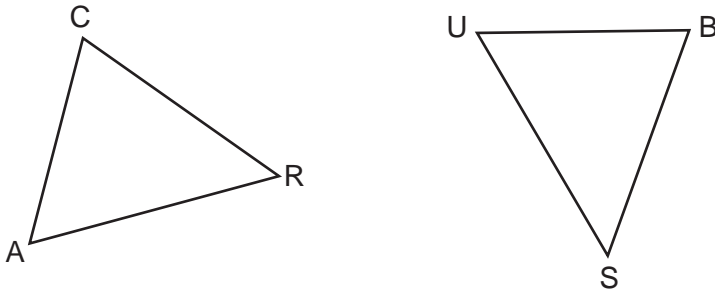


What is the area of $\triangle BLU$?

- (1) 11 (3) 14
(2) 12.5 (4) 17.1

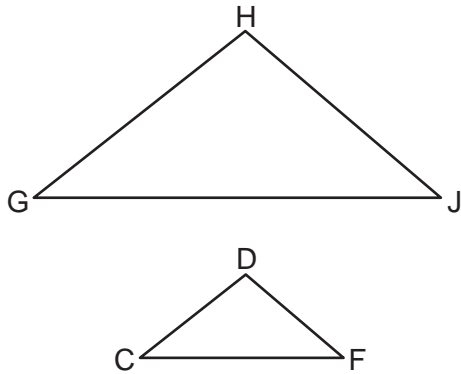
Use this space for computations.

- 8 In the diagram below, $\triangle CAR$ is mapped onto $\triangle BUS$ after a sequence of rigid motions.



If $AR = 3x + 4$, $RC = 5x - 10$, $CA = 2x + 6$, and $SB = 4x - 4$, what is the length of \overline{SB} ?

- (1) 6
(2) 16
(3) 20
(4) 28
- 9 In the diagram below, $\triangle GHJ$ is dilated by a scale factor of $\frac{1}{2}$ centered at point B to map onto $\triangle CDF$.



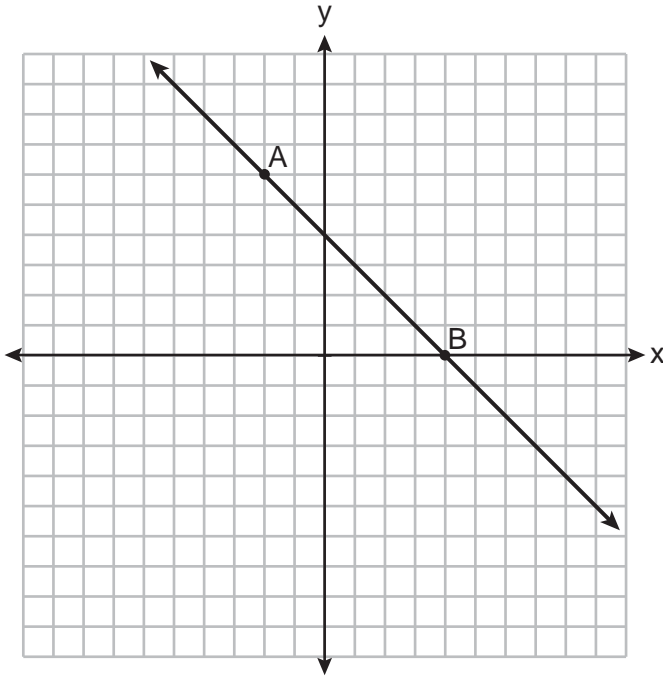
B•

If $m\angle DFC = 40^\circ$, what is $m\angle HJG$?

- (1) 20°
(2) 40°
(3) 60°
(4) 80°

Use this space for
computations.

- 16 On the set of axes below, \overline{AB} is drawn and passes through $A(-2,6)$ and $B(4,0)$.



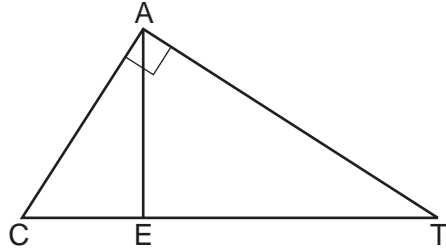
If \overline{CD} is the image of \overline{AB} after a dilation with a scale factor of $\frac{1}{2}$ centered at the origin, which equation represents \overline{CD} ?

- (1) $y = -x + 4$ (3) $y = -\frac{1}{2}x + 4$
(2) $y = -x + 2$ (4) $y = -\frac{1}{2}x + 2$
- 17 In parallelogram $ABCD$ with $\overline{AC} \perp \overline{BD}$, $AC = 12$ and $BD = 16$.
What is the perimeter of $ABCD$?

- (1) 10 (3) 40
(2) 24 (4) 56

Use this space for
computations.

- 18 In the diagram of $\triangle CAT$ below, $m\angle A = 90^\circ$ and altitude \overline{AE} is drawn from vertex A .



Which statement is always true?

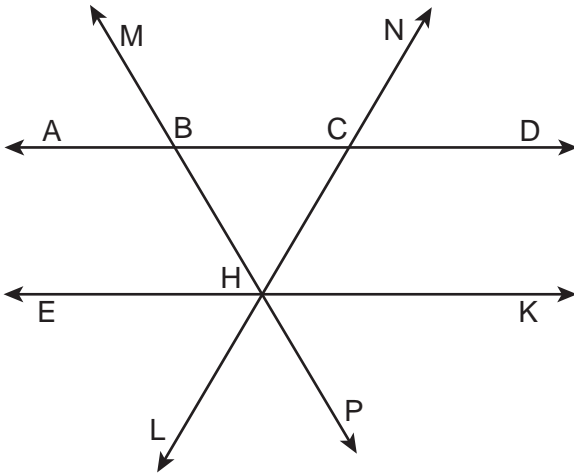
- (1) $\frac{CE}{AE} = \frac{AE}{ET}$ (3) $\frac{AC}{CE} = \frac{AT}{ET}$
(2) $\frac{AE}{CE} = \frac{AE}{ET}$ (4) $\frac{CE}{AC} = \frac{AC}{ET}$
- 19 A sandbox in the shape of a rectangular prism has a length of 43 inches and a width of 30 inches. Jack uses bags of sand to fill the sandbox to a depth of 9 inches. Each bag of sand has a volume of 0.5 cubic foot. What is the minimum number of bags of sand that must be purchased to fill the sandbox?
- (1) 14 (3) 7
(2) 13 (4) 4

Use this space for computations.

20 Parallelogram $EATK$ has diagonals \overline{ET} and \overline{AK} . Which information is always sufficient to prove $EATK$ is a rhombus?

- (1) $\overline{EA} \perp \overline{AT}$ (3) $\overline{ET} \cong \overline{AK}$
 (2) $\overline{EA} \cong \overline{AT}$ (4) $\overline{ET} \cong \overline{AT}$

21 In the diagram below, $\overline{ABCD} \parallel \overline{EHK}$, and \overline{MBHP} and \overline{NCHL} are drawn such that $\overline{BC} \cong \overline{BH}$.



If $m\angle NCD = 62^\circ$, what is $m\angle PHK$?

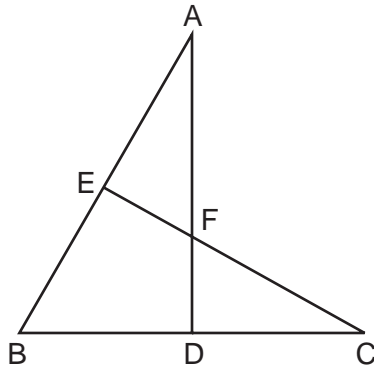
- (1) 118° (3) 62°
 (2) 68° (4) 56°

22 Triangles YEG and POM are two distinct non-right triangles such that $\angle G \cong \angle M$. Which statement is sufficient to prove $\triangle YEG$ is always congruent to $\triangle POM$?

- (1) $\angle E \cong \angle O$ and $\angle Y \cong \angle P$
 (2) $\overline{YG} \cong \overline{PM}$ and $\overline{YE} \cong \overline{PO}$
 (3) There is a sequence of rigid motions that maps $\angle E$ onto $\angle O$ and \overline{YE} onto \overline{PO} .
 (4) There is a sequence of rigid motions that maps point Y onto point P and \overline{YG} onto \overline{PM} .

Use this space for
computations.

- 23 In the diagram of triangles ABD and CBE below, sides \overline{AD} and \overline{CE} intersect at F , and $\angle ADB \cong \angle CEB$.



Which statement can *not* be proven?

- (1) $\triangle ADB \cong \triangle CEB$ (3) $\triangle ADB \sim \triangle CEB$
(2) $\angle EAF \cong \angle DCF$ (4) $\triangle EAF \sim \triangle DCF$
- 24 A small town is installing a water storage tank in the shape of a cylinder. The tank must be able to hold at least 100,000 gallons of water. The tank must have a height of exactly 30 feet.
[1 cubic foot holds 7.48 gallons of water]

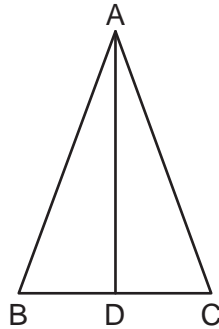
What should the minimum diameter of the tank be, to the *nearest foot*?

- (1) 12 (3) 65
(2) 24 (4) 75
-

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]

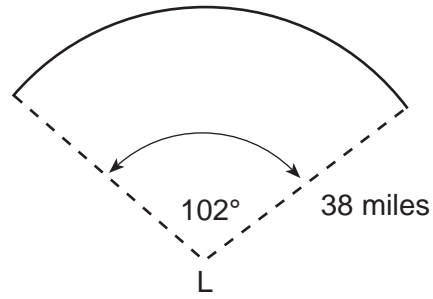
25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} .

26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



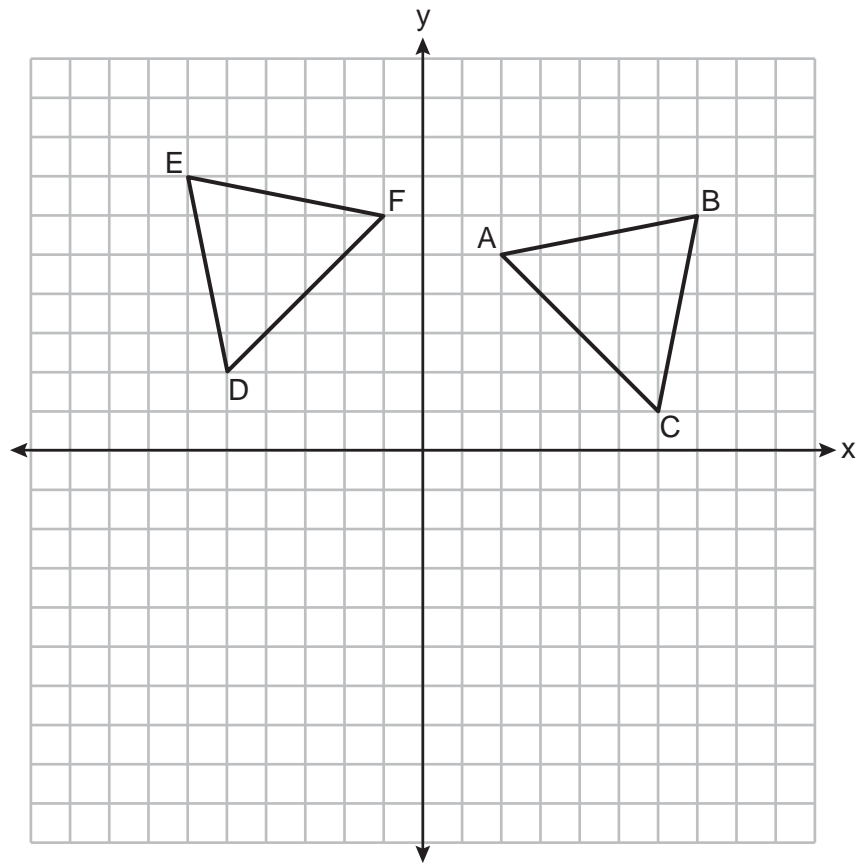
Determine and state the area of the sector, to the *nearest square mile*.

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

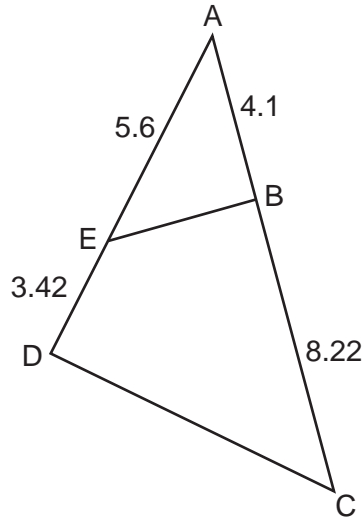


28 On the set of axes below, congruent triangles ABC and DEF are graphed.



Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

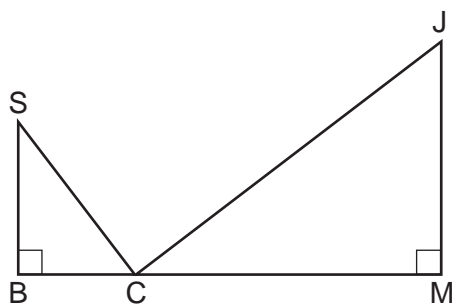
29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.

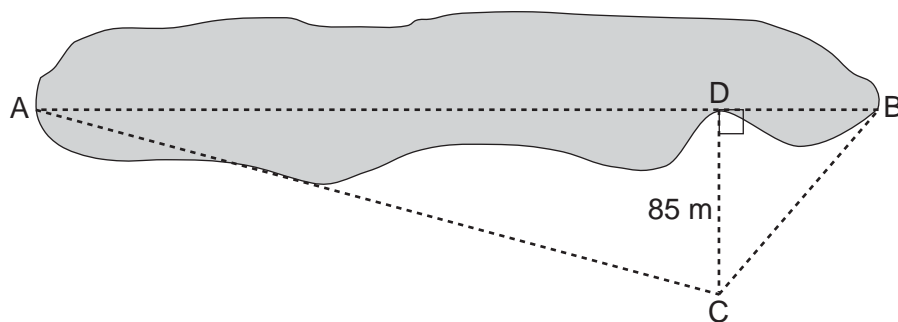


Determine and state $m\angle S$, to the *nearest degree*.

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]

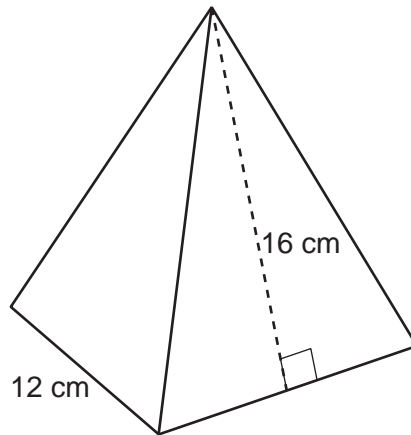
- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

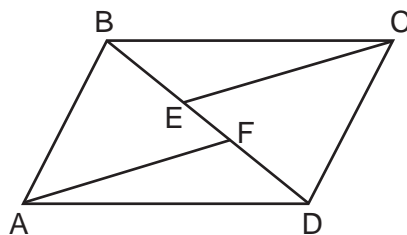
- 33** A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

- 34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



Prove: $\overline{CE} \cong \overline{AF}$

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 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

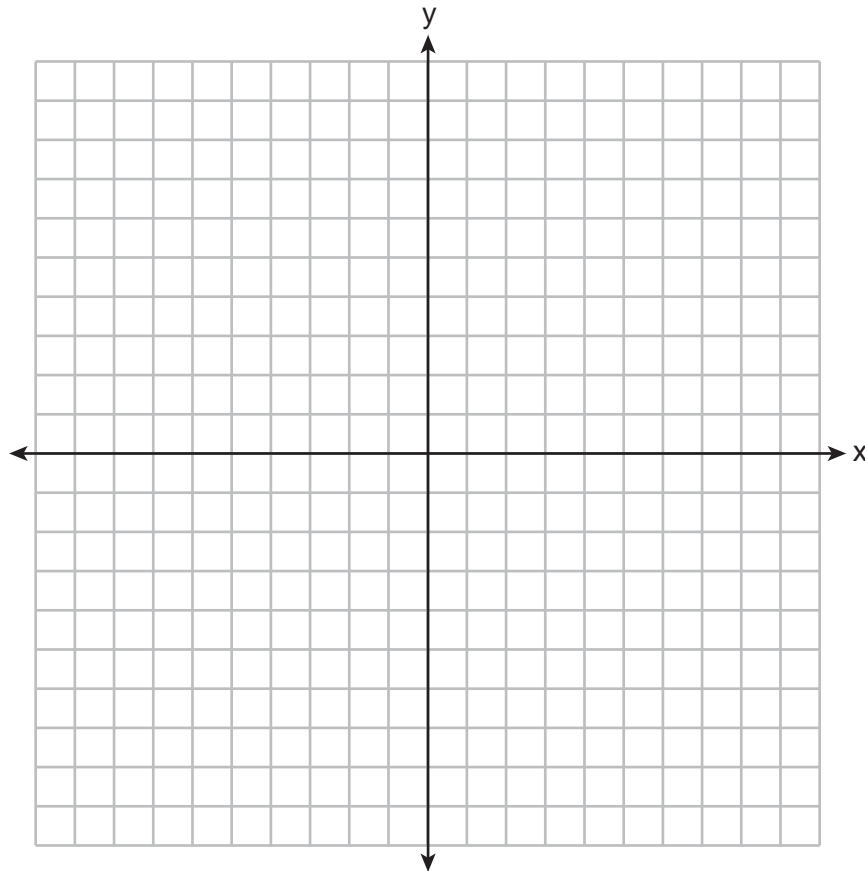
[The use of the set of axes on the next page is optional.]

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

Question 35 is continued on the next page.

Question 35 continued

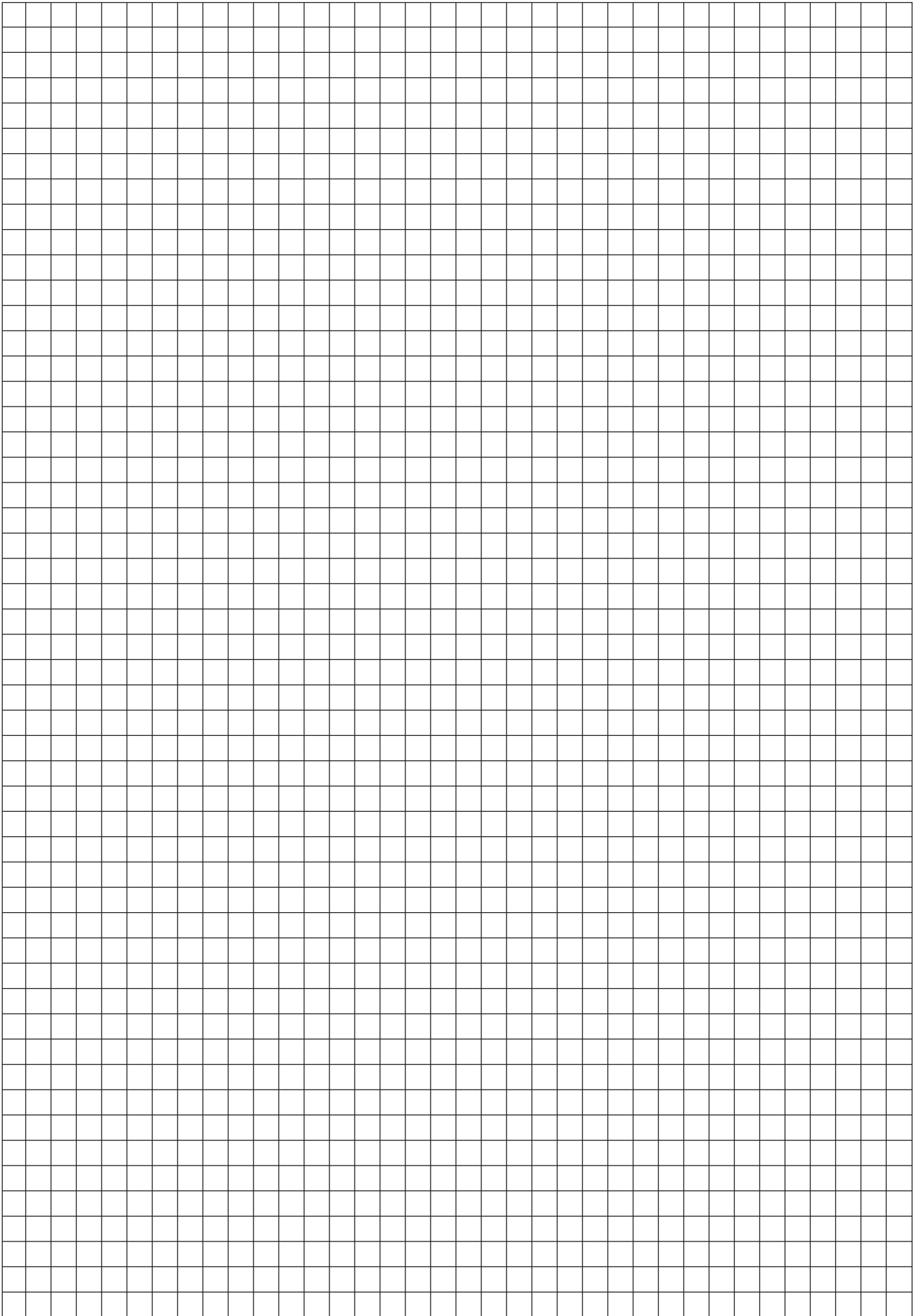
Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]



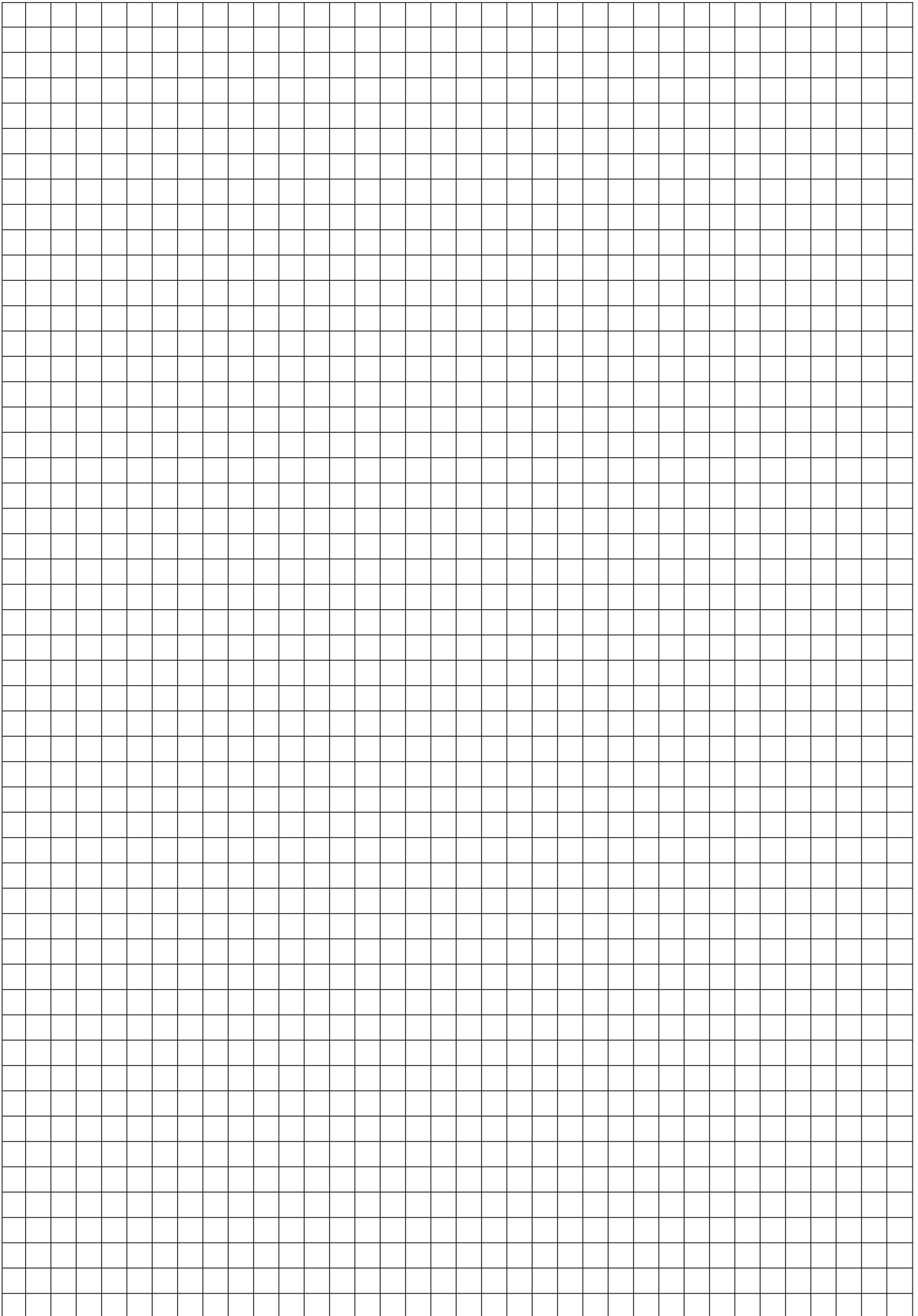
Scrap Graph Paper — this sheet will *not* be scored.

Tear Here

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



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Tear Here

High School Math Reference Sheet

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilogram	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n - 1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian = $\frac{180}{\pi}$ degrees
Degrees	1 degree = $\frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

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GEOMETRY

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GEOMETRY

Regents Examination in Geometry – January 2024**Scoring Key: Part I (Multiple-Choice Questions)**

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

Regents Examination in Geometry – January 2024**Scoring Key: Parts II, III, and IV (Constructed-Response Questions)**

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Geometry	January '24	25	-	CR	2
Geometry	January '24	26	-	CR	2
Geometry	January '24	27	-	CR	2
Geometry	January '24	28	-	CR	2
Geometry	January '24	29	-	CR	2
Geometry	January '24	30	-	CR	2
Geometry	January '24	31	-	CR	2
Geometry	January '24	32	-	CR	4
Geometry	January '24	33	-	CR	4
Geometry	January '24	34	-	CR	4
Geometry	January '24	35	-	CR	6

Key

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

The chart for determining students' final examination scores for the **January 2024 Regents Examination in Geometry** will be posted on the Department's web site at: <https://www.nysedregents.org/geometryre/> on the day of the examination. 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, January 24, 2024 — 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 Scoring Key and 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> by Wednesday, January 24, 2024. 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] 314, and correct work is shown.
- [1] Appropriate work is shown, but one computational or rounding error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] 314, 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.
- (26) [2] 1285, and correct work is shown.
- [1] Appropriate work is shown, but one computational or rounding error is made.
- or*
- [1] Appropriate work is shown, but one conceptual error is made.
- or*
- [1] 1285, 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] Appropriate work is shown, but one construction error is made.
- or*
- [1] Appropriate work is shown, but the right angle is not constructed at vertex C .
- [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] A correct sequence of rigid motions is written.
- [1] An appropriate sequence of rigid motions is written, but one conceptual error is made.
- or*
- [1] An appropriate sequence of rigid motions is written, but it is incomplete or partially correct.
- [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] Yes is indicated, and a complete and correct explanation is written.
- [1] An appropriate explanation is written, but one computational error is made.
- or*
- [1] An appropriate explanation is written, but one conceptual error is made.
- or*
- [1] Yes, and an incomplete or partially correct explanation is written.
- or*
- [1] Appropriate work is shown, but the explanation is missing or incorrect.
- [0] Yes, and 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.

- (30) [2] $(-8, -6)$ and 12, 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 $(x + 8)^2 + (y + 6)^2 = 144$.
- or**
- [1] Correct work is shown to find $(-8, -6)$ or 12.
- or**
- [1] $(-8, -6)$ and 12, but no work is shown.
- [0] $(-8, -6)$ or 12, 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.
- (31) [2] 37, and correct work is shown.
- [1] Appropriate work is shown, but one computational or rounding error is made.
- or**
- [1] Appropriate work is shown, but one conceptual error is made.
- or**
- [1] A correct relevant trigonometric equation is written, but no further correct work is shown.
- or**
- [1] 37, 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.
-

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] 377, and correct work is shown.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or*
- [3] Correct work is shown to find the lengths of \overline{AD} and \overline{DB} , 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 \overline{AD} or \overline{DB} , 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, but no further correct work is shown.
- or*
- [1] 377, 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.

- (33) [4] 712 and 23, and correct work is shown.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or*
- [3] Correct work is shown to find the volume of the candle, 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 when determining the volume of the candle.
- [1] Appropriate work is shown, but one conceptual error is made when determining the volume of the candle and one computational or rounding error are made.
- or*
- [1] Correct work is shown to find the height of the candle, but no further correct work is shown.
- or*
- [1] 712 and 23, 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.

- (34) [4] A complete and correct proof that includes a concluding statement is written.
- [3] 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.
- or**
- [3] $\triangle ABF \cong \triangle CDE$ or $\triangle CBE \cong \triangle ADF$ is proven, but no further correct relevant work is shown.
- [2] 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**
- [2] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
- [1] Some correct relevant statements about the proof are made, but one conceptual error and one statement and/or reason are missing or incorrect.
- or**
- [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.
-

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] Correct work is shown to prove $MATH$ is a trapezoid. Point $Y(7,3)$ is stated, and correct work is shown to prove $MYTH$ is a rectangle. Correct concluding statements are written.
- [5] Appropriate work is shown, but one computational or graphing error is made.
- or**
- [5] Appropriate work is shown, but one concluding statement is missing or incorrect.
- or**
- [5] Correct proofs are written, but $Y(7,3)$ is not stated. Correct concluding statements are written.
- [4] Appropriate work is shown, but two computational or graphing errors are made.
- or**
- [4] Appropriate work is shown, but one conceptual error is made in proving $MYTH$ is a rectangle.
- or**
- [4] Appropriate work is shown, but both concluding statements are missing or incorrect.
- or**
- [4] Point $Y(7,3)$ is stated, and correct work is shown to prove $MYTH$ is a rectangle and a correct concluding statement is written. No further correct work is shown.
- [3] Appropriate work is shown, but three or more computational or graphing errors are made.
- or**
- [3] Appropriate work is shown, but one conceptual error is made in proving $MYTH$ is a rectangle and one computational or graphing error is made.
- or**
- [3] Correct work is shown to prove $MATH$ is a trapezoid and a correct concluding statement is written. Point $Y(7,3)$ is stated. No further correct work is shown.
- or**
- [3] Correct work is shown to prove $MYTH$ is a rectangle and a correct concluding statement is written. No further correct work is shown.

[2] Correct work is shown to prove *MATH* is a trapezoid and a correct concluding statement is written. No further correct work is shown.

[1] Correct work is shown to prove *MATH* is a trapezoid, but the concluding statement is missing or incorrect. No further correct work is shown.

or

[1] Point $Y(7,3)$ is stated, but no further correct 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.

**Map to the Learning Standards
Geometry
January 2024**

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

Regents Examination in Geometry
January 2024
Chart for Converting Total Test Raw Scores to
Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the January 2024 Regents Examination in Geometry* will be posted on the Department's web site at: <https://www.nysed.gov/state-assessment/high-school-regents-examinations> on Wednesday, January 24, 2024. 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. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. 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, January 24, 2024 — 9:15 a.m. to 12:15 p.m., only

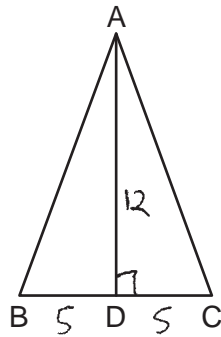
MODEL RESPONSE SET

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Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

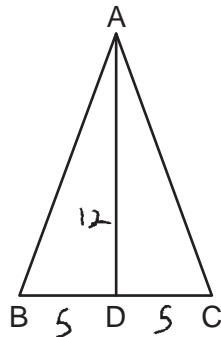
Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} .

$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (5^2)(12) \\ &= \frac{1}{3} \pi (25)(12) \\ &= \frac{1}{3} \cancel{300} \pi \\ &= \frac{1}{3} (942.4777961) \\ &= 314.159 \\ &= \boxed{314} \end{aligned}$$

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

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} .

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

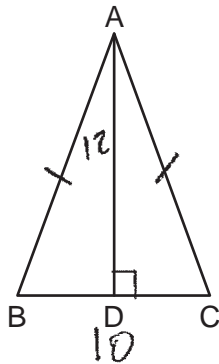
$$V = \frac{1}{3} \pi 5^2 (12)$$

$$V = 314$$

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

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

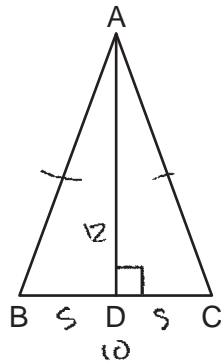
Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} .

$$V = \frac{1}{3} \pi r^2 h$$
$$V = 314 \text{ cm}^3$$

Score 1: The student did not show work when determining the volume.

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} . *cone*

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

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

$$V = \frac{1}{3} \pi 25(12)$$

$$V = \frac{\pi 25(12)}{3}$$

$$V = \frac{78.539(12)}{3}$$

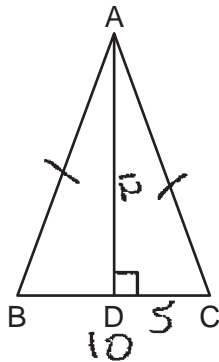
$$V = \frac{942.47}{3}$$

$$V = 314.1592 \text{ cm}^3$$

Score 1: The student made one rounding error.

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

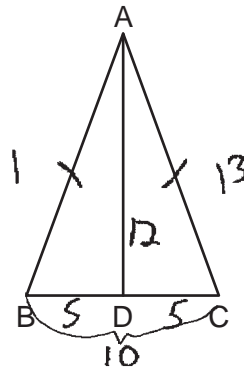
Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} .

$$V = \frac{1}{3} \pi r^2 h$$
$$V = \frac{1}{3} \pi (5)^2 \cdot 12$$
$$V = 942.47$$
$$V = 942$$

Score 1: The student made a computational error by not multiplying by $\frac{1}{3}$.

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} .

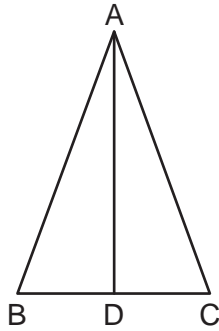
$$\begin{aligned} V &= Bh \\ V &= (5 \cdot 5)(12) \\ V &= 300 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} C &= 2\pi r \\ C &= 2\pi(13) \\ C &= 81.681 \\ C &= 82 \text{ cm}^3 \end{aligned}$$

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

Question 25

25 In isosceles triangle ABC shown below, $\overline{AB} \cong \overline{AC}$, and altitude \overline{AD} is drawn.



The length of \overline{AD} is 12 cm and the length of \overline{BC} is 10 cm.

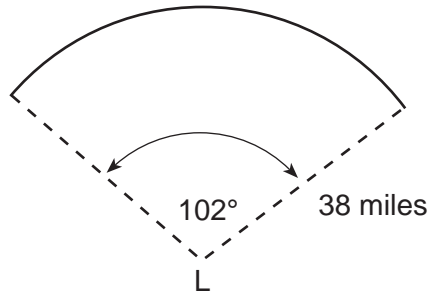
Determine and state, to the *nearest cubic centimeter*, the volume of the solid formed by continuously rotating $\triangle ABC$ about \overline{AD} .

$$V = \frac{1}{3} Bh$$
$$V = \frac{1}{3} (10)(12)$$
$$V = 40 \text{ cm}$$

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

Question 26

- 26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



Determine and state the area of the sector, to the *nearest square mile*.

$$\frac{\cancel{4}}{360} \times \pi r^2 = A \text{ of sector}$$

$$\frac{102}{360} \times \pi 38^2 = A \text{ of sector}$$

$$\frac{102}{360} \times \pi 1444 = A \text{ of sector}$$

$$\frac{102}{360} \times 4536.4598 = A \text{ of sector}$$

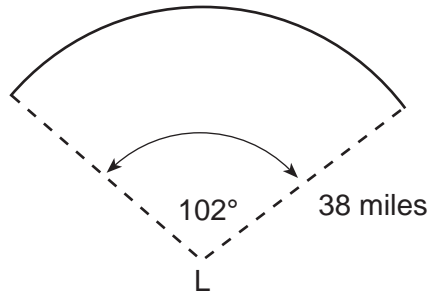
$$1285.3303 = A \text{ of sector}$$

$$1285 \text{ mi}^2 = A \text{ of sector}$$

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

Question 26

- 26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



Determine and state the area of the sector, to the *nearest square mile*.

$$\begin{aligned} A_{\text{sector}} &= \pi r^2 \\ &= \pi (38)^2 \\ &= 1444\pi \end{aligned}$$

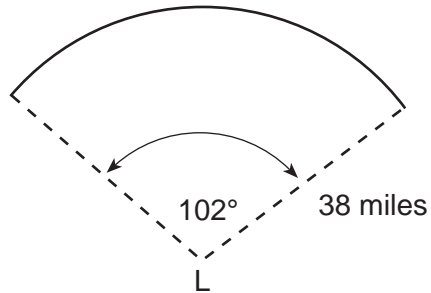
$$1444\pi \cdot \frac{102}{360}$$

The area of the sector is 1285 square miles

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

Question 26

- 26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



Determine and state the area of the sector, to the *nearest square mile*.

~~$$\frac{x}{360} = \frac{102}{360}$$~~

~~$$1444\pi$$~~

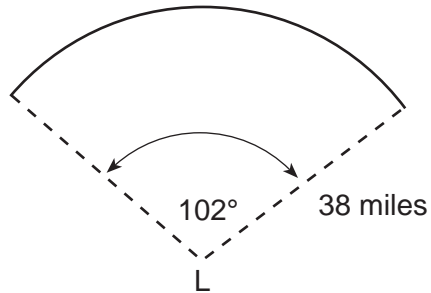
$$A = (38^2)\pi$$
$$A = 1444\pi$$
$$\frac{462718.8988}{360} = \frac{360x}{360}$$

Area of sector is 1285 miles²

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

Question 26

- 26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



Determine and state the area of the sector, to the *nearest square mile*.

$$A = \left(\frac{\theta}{360}\right) \pi r^2$$

$$A = \left(\frac{102}{360}\right) \pi 38^2$$

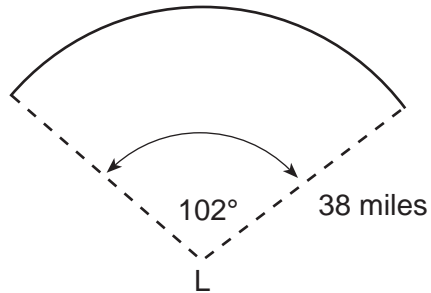
$$A = 409.13$$

the area of the
sector is 409 miles²

Score 1: The student made a computational error by leaving π out.

Question 26

- 26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



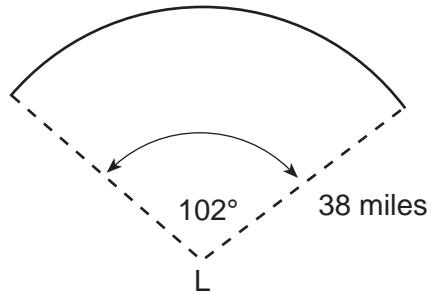
Determine and state the area of the sector, to the nearest square mile.

$$A = \pi r^2 \frac{x}{360}$$
$$A = \pi (38)^2 \left(\frac{102}{360} \right)$$
$$A = 33,824,480.9$$
$$A = 34 \text{ mi}^2$$

Score 1: The student made a computational error by not squaring 38.

Question 26

- 26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



Determine and state the area of the sector, to the *nearest square mile*.

$$\frac{102}{360} = \frac{x}{25638}$$

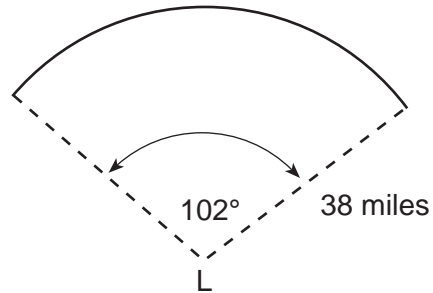
$$x = 67.648918073$$

68 miles²

Score 1: The student determined the arc length of the sector.

Question 26

- 26 The diagram below models the projection of light from a lighthouse, L . The sector has a radius of 38 miles and spans 102° .



Determine and state the area of the sector, to the *nearest square mile*.

$$A = \pi 38^2$$
$$= 4536.46$$

$$360 - 102 = 258$$

$$4536.46 \div 258$$

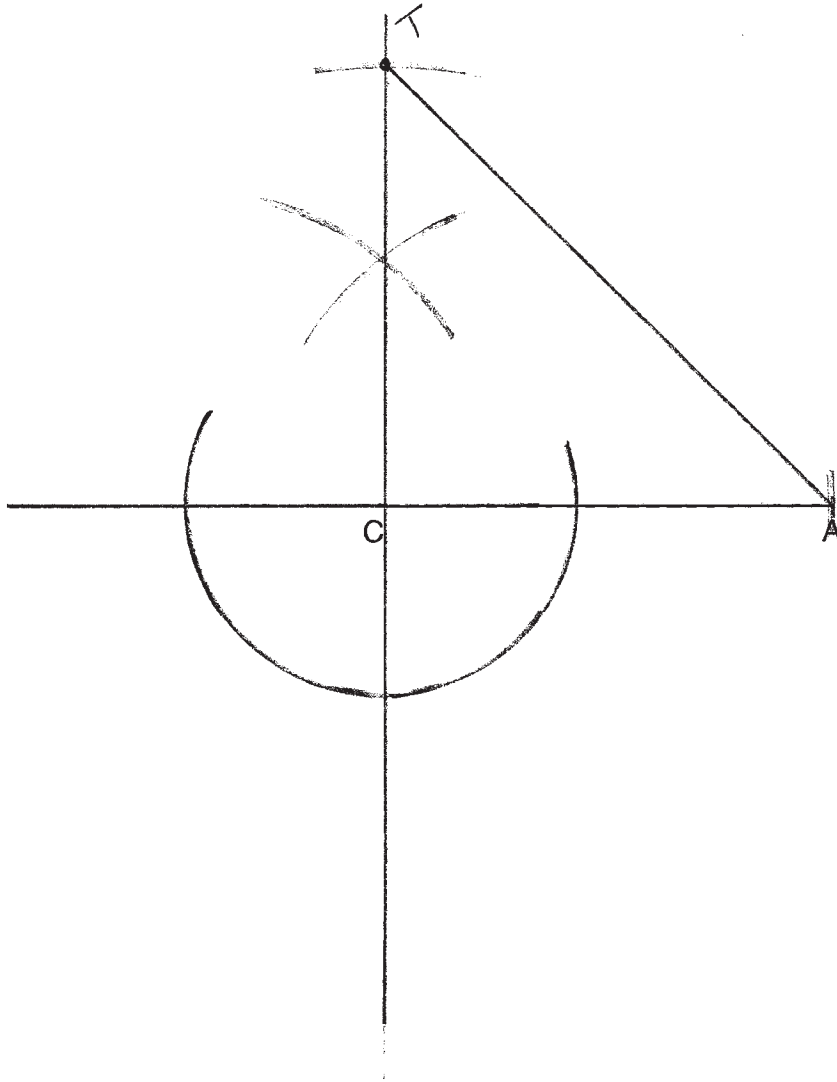
$$A_{\text{sect}} = 17.6$$

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

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

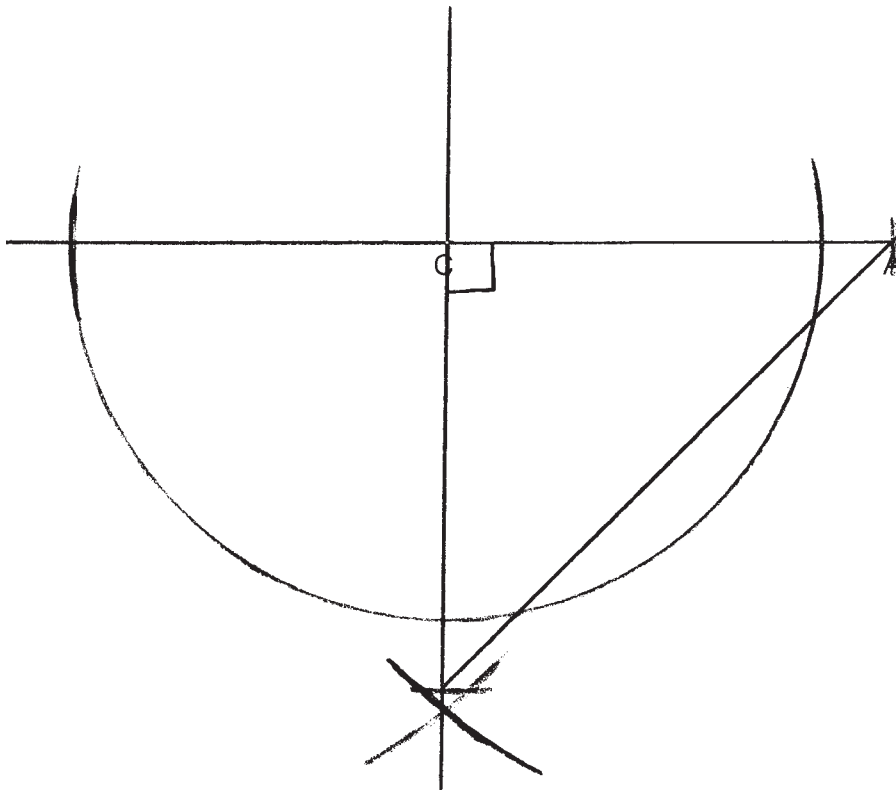


Score 2: The student gave a complete and correct response.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

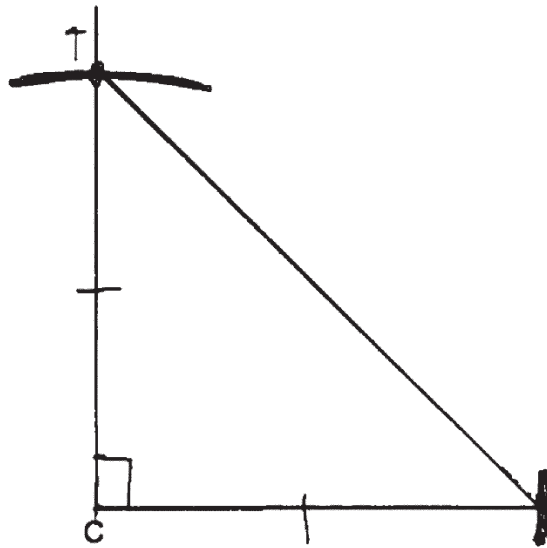


Score 2: The student gave a complete and correct response.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

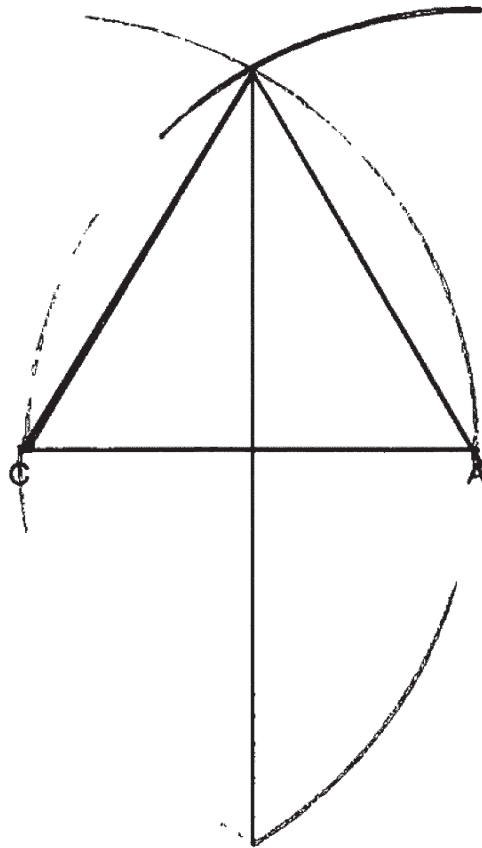


Score 1: The student constructed an isosceles triangle, but not a right triangle.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

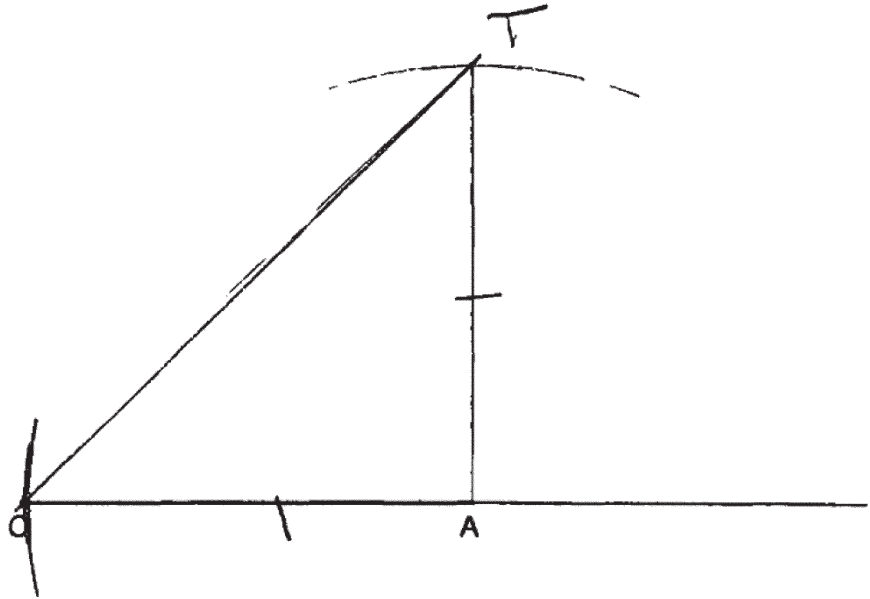


Score 1: The student constructed an isosceles triangle, but did not construct a right angle at C .

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

[Leave all construction marks.]

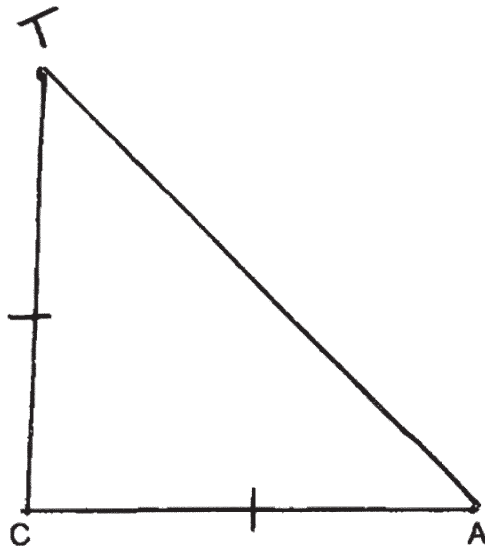


Score 0: The student did not construct $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

Question 27

27 Segment CA is drawn below. Using a compass and straightedge, construct isosceles right triangle CAT where $\overline{CA} \perp \overline{CT}$ and $\overline{CA} \cong \overline{CT}$.

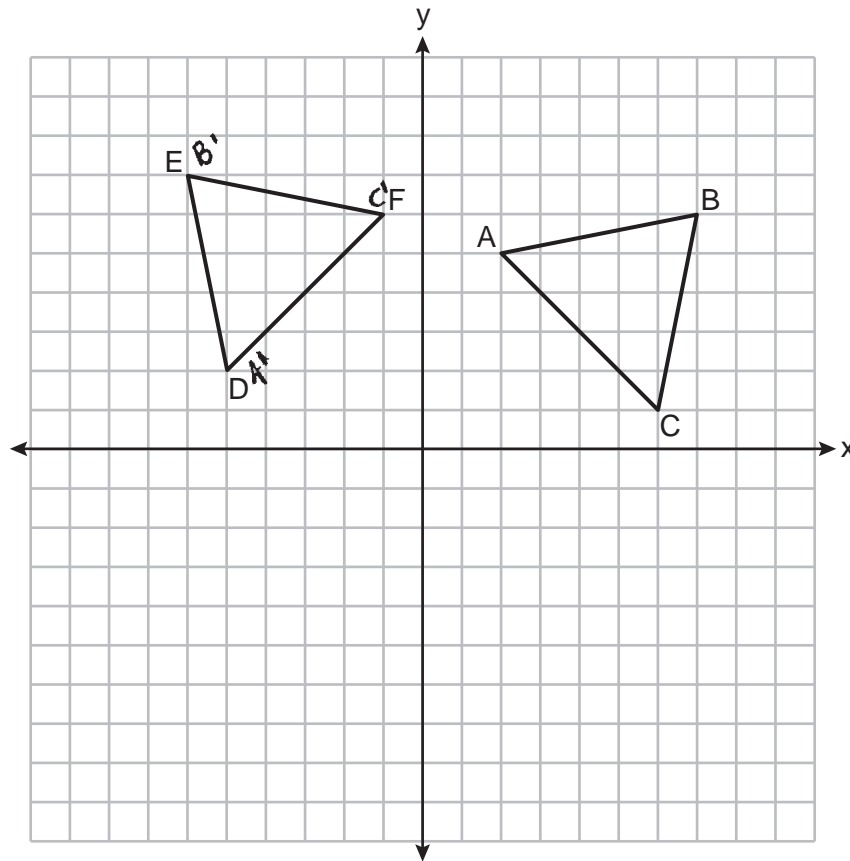
[Leave all construction marks.]



Score 0: A drawing that is not an appropriate construction is shown.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



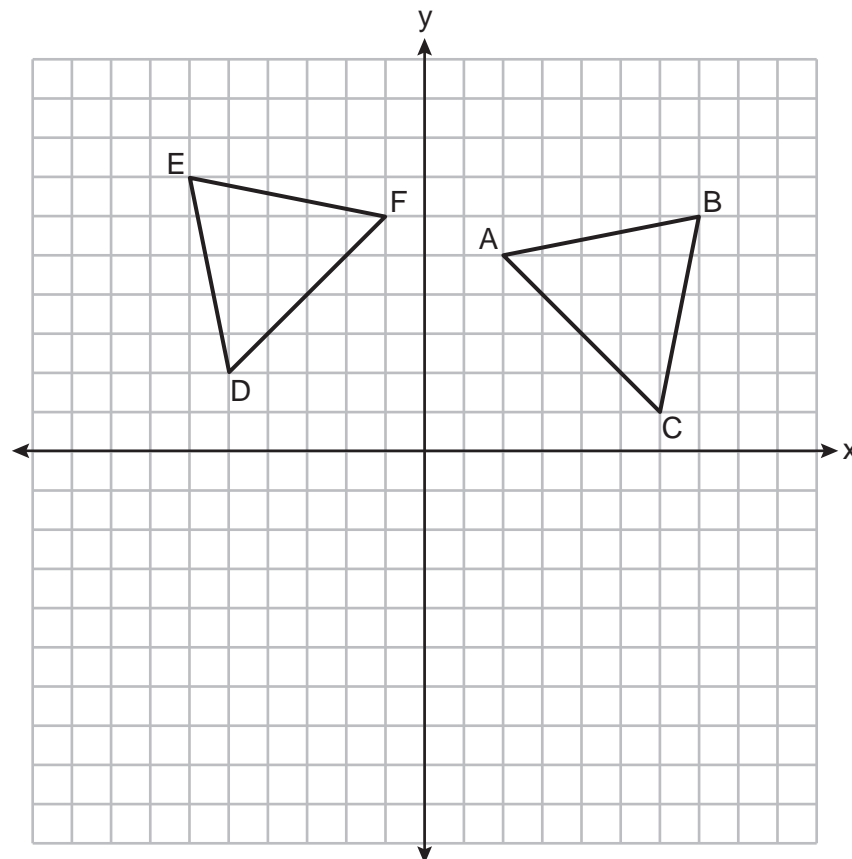
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

Rotate $\triangle ABC$ 90° counter clockwise about the origin

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

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



$A \rightarrow D$ $B \rightarrow E$ $C \rightarrow F$

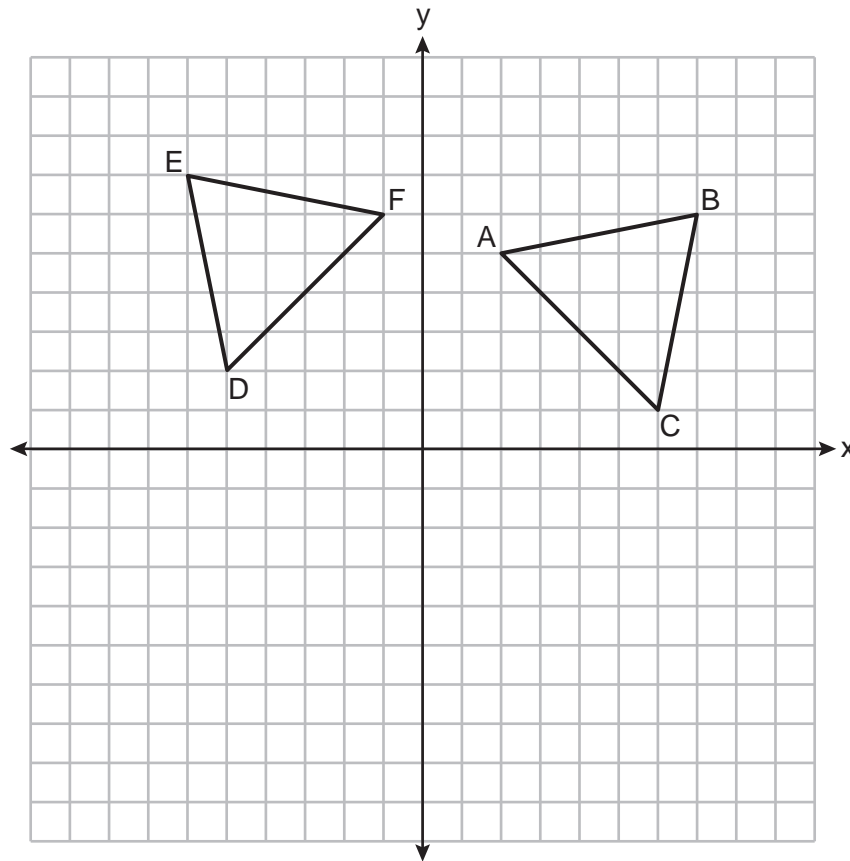
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

first, a translation of $-7, -3$ mapping $A \rightarrow D$
then a counterclockwise rotation of 90° about point D,

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

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



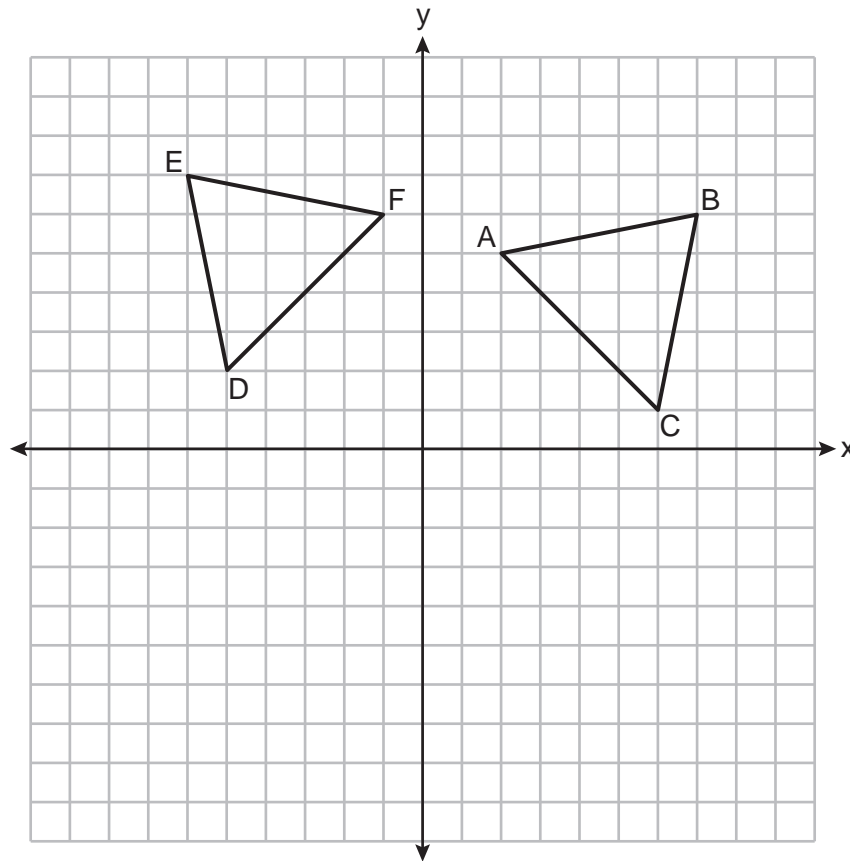
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

$\triangle ABC$ reflects over y -axis then translate one unit up and one unit right

Score 1: The student mapped $\triangle ABC$ onto $\triangle FED$.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



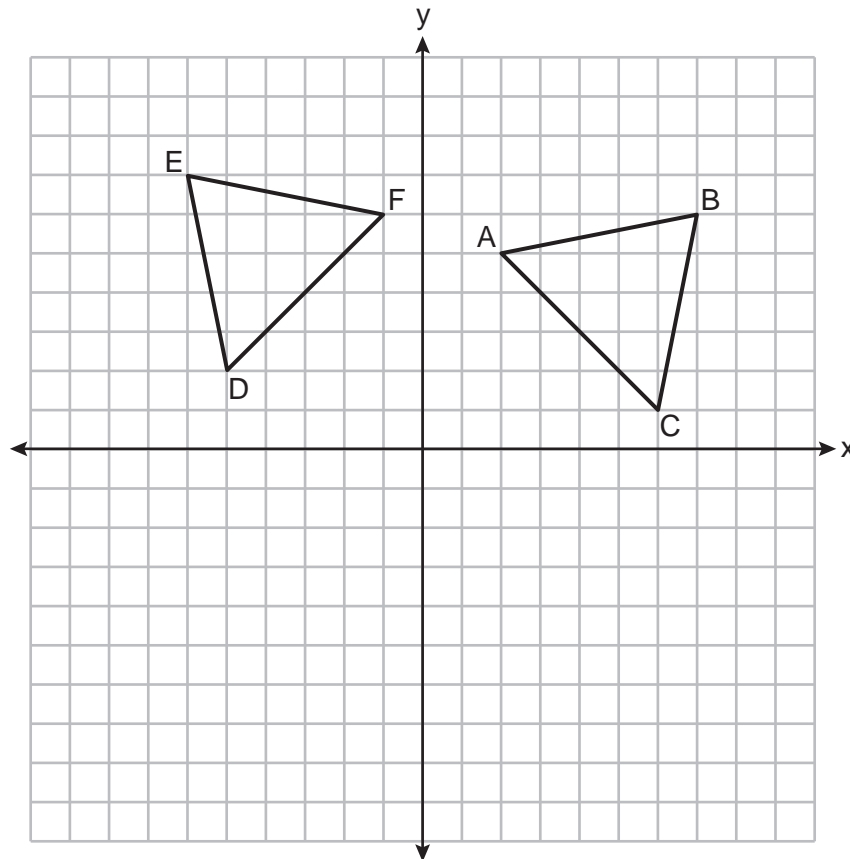
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

Translation 7 right and 3 up so that D lies on A.
Rotation around point A of 90° clockwise.

Score 1: The student mapped $\triangle DEF$ onto $\triangle ABC$.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



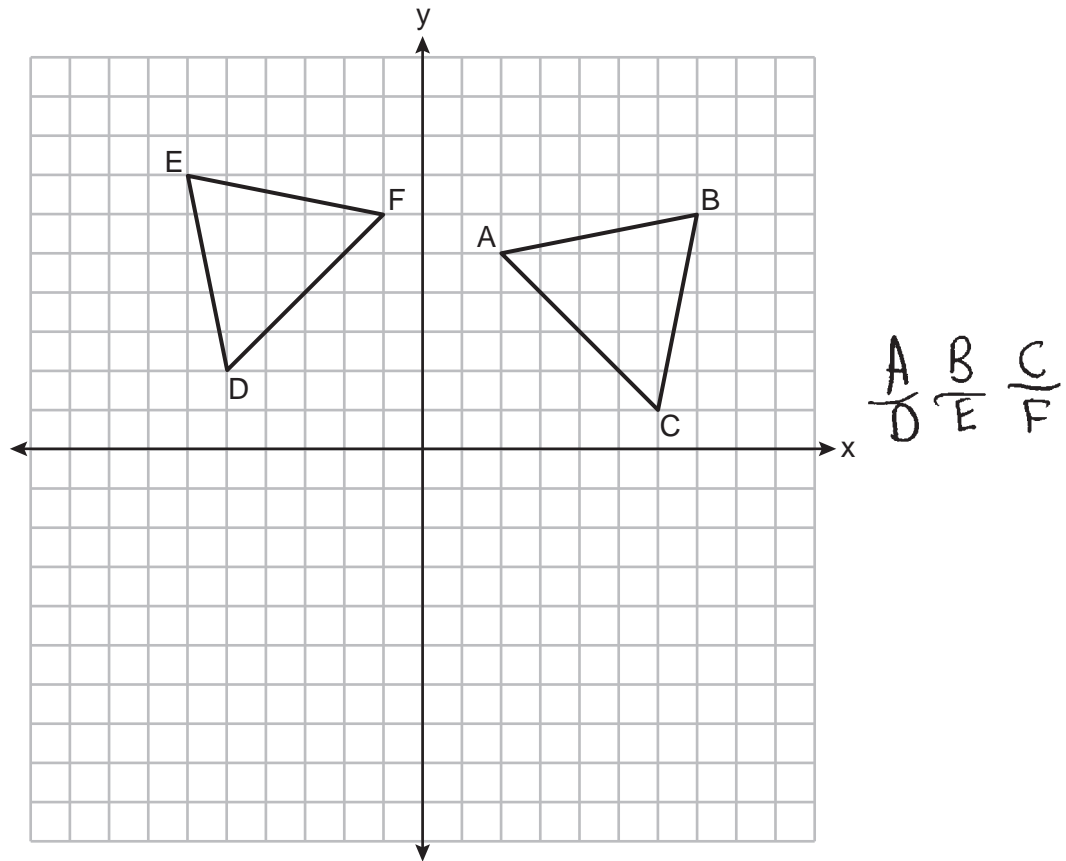
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

1. Translate up 1 unit
2. Translate left 2 unit
3. Reflection over the y-axis

Score 1: The student mapped $\triangle ABC$ onto $\triangle FED$.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



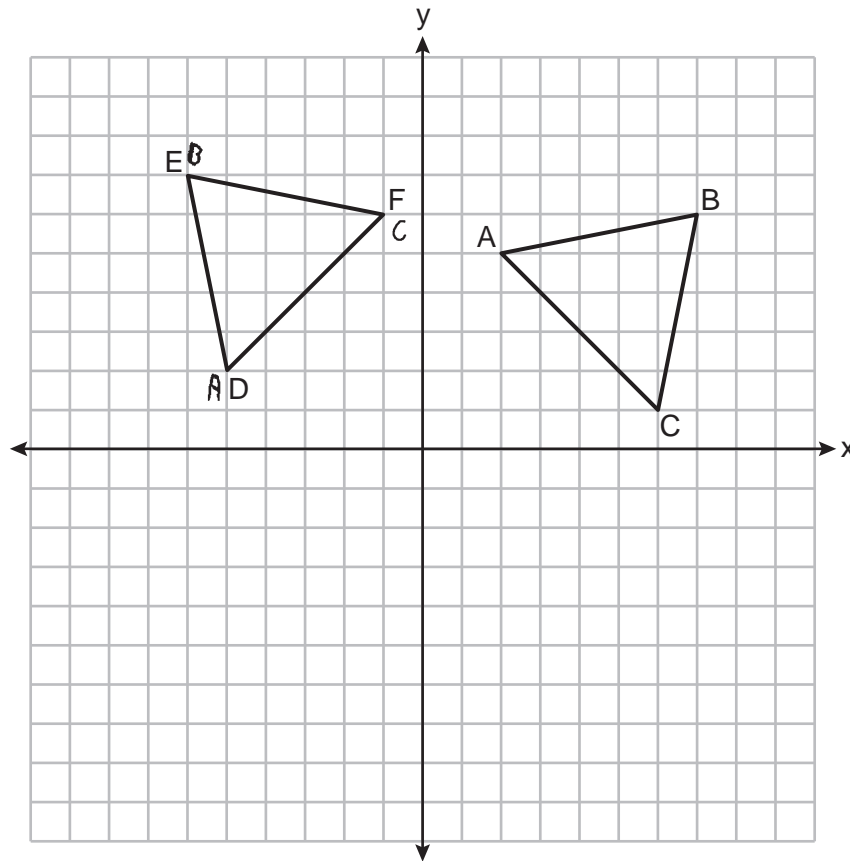
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

rotation 90° counter clockwise

Score 1: The student did not state the center of rotation.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



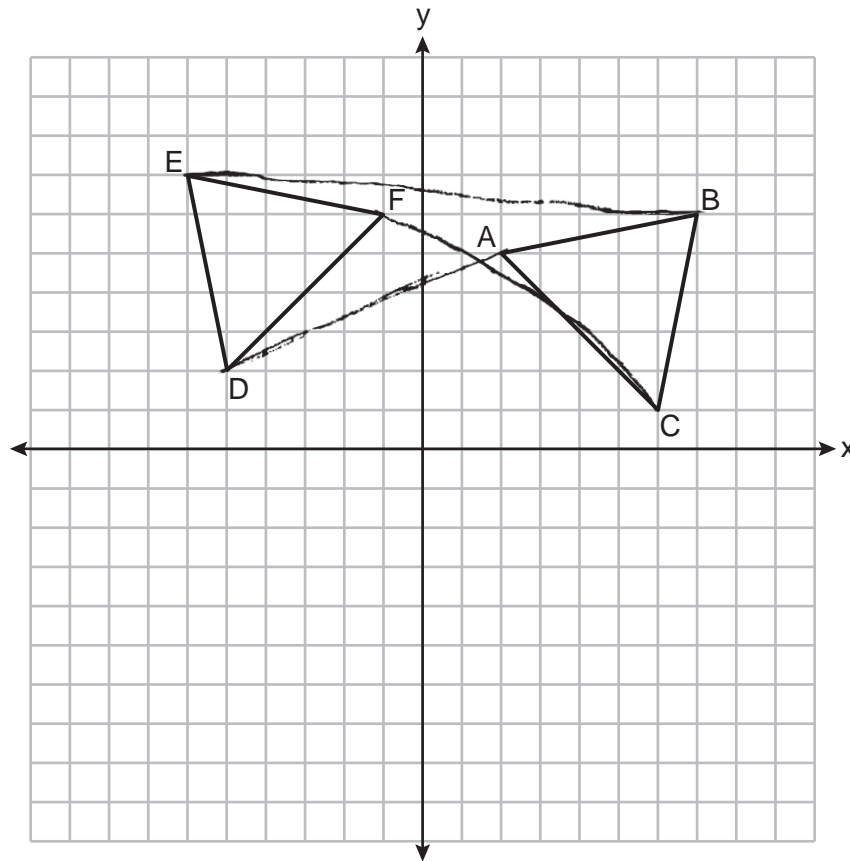
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

a 90° rotation counter clockwise
A = -5,5
B -6,6
-1,6

Score 1: The student did not state the center of rotation.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



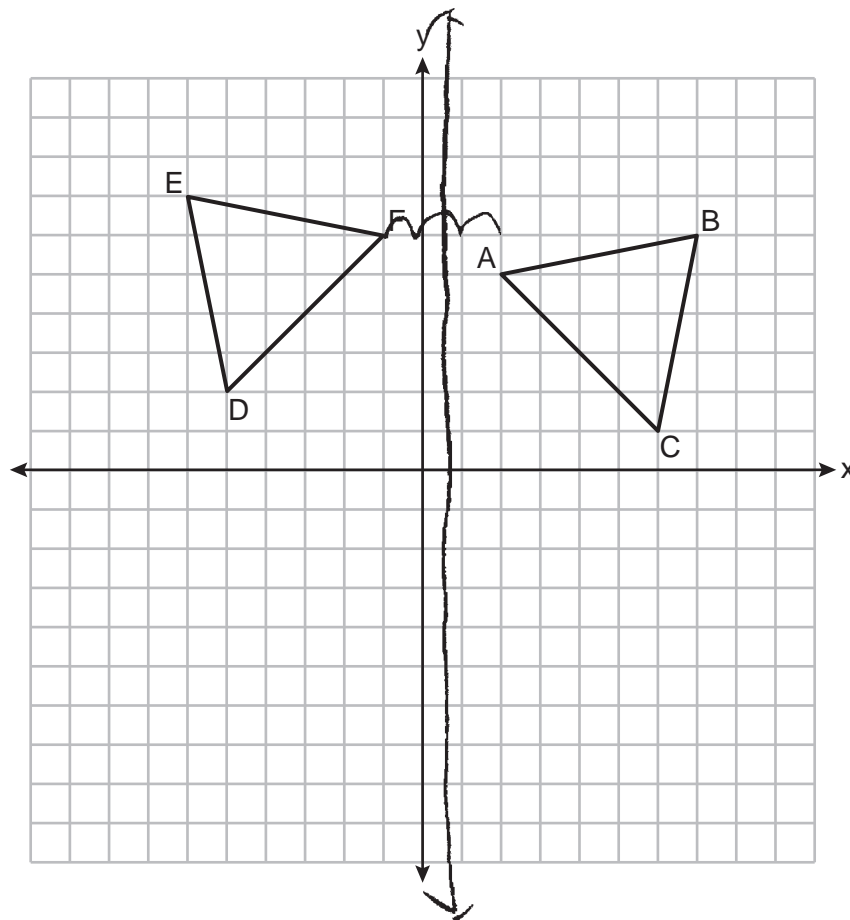
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

rotation around $(0,0)$, 90°

Score 1: The student did not state the direction of the rotation.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

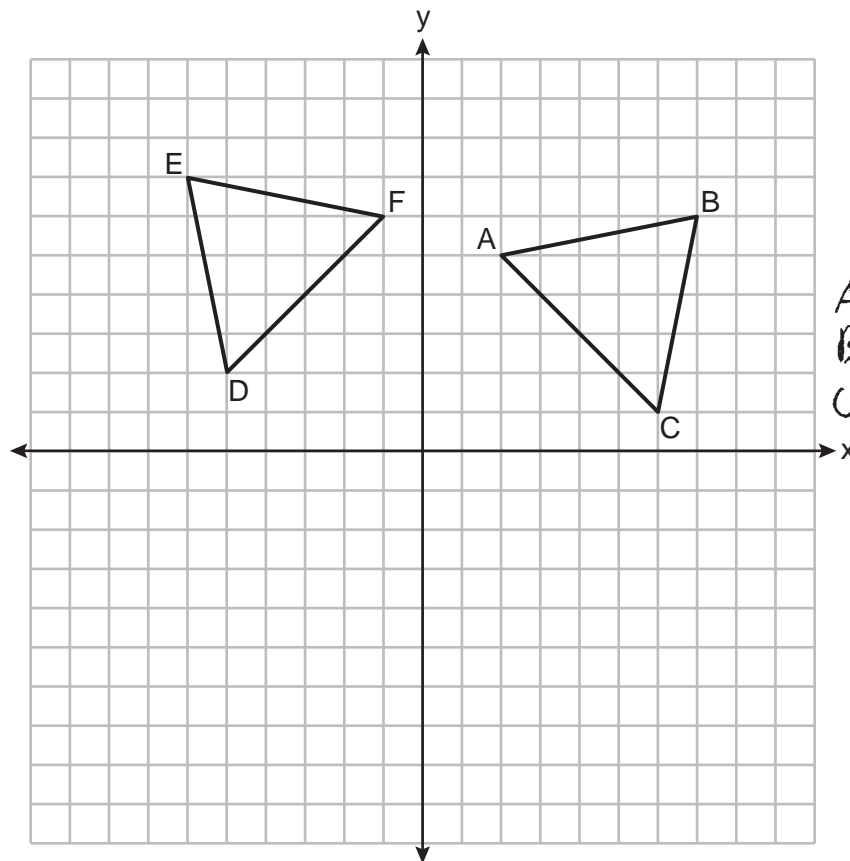
Reflect $\triangle ABC$ across line $x = \frac{1}{2}$

Translate up 1

Score 1: The student mapped $\triangle ABC$ onto $\triangle FED$.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



$A(2, 5) - D(-5, 2)$
 $B(7, 6) - E(-6, 7)$
 $C(6, 1) - F(-1, 6)$

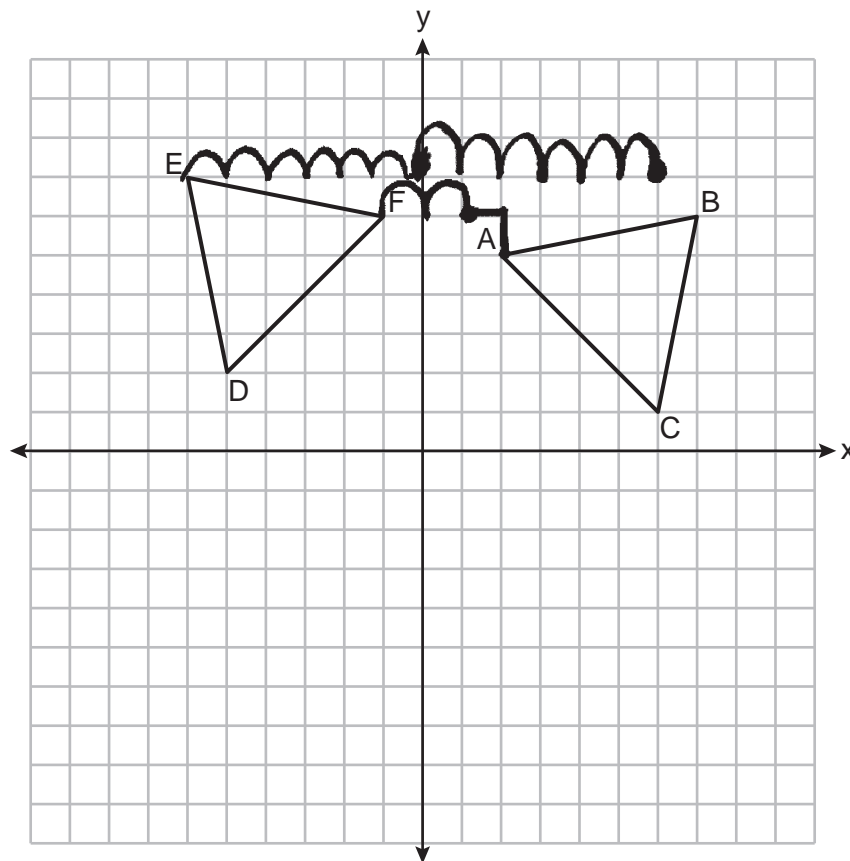
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

Rotation of 270° counterclockwise

Score 0: The student did not state the center of rotation and stated an incorrect direction of the rotation.

Question 28

28 On the set of axes below, congruent triangles ABC and DEF are graphed.



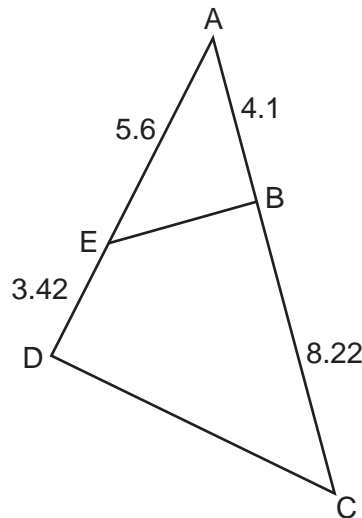
Describe a sequence of rigid motions that maps $\triangle ABC$ onto $\triangle DEF$.

y-axis reflection and then a line translation of $(x+1, y-1)$.

Score 0: The student gave a completely incorrect response.

Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



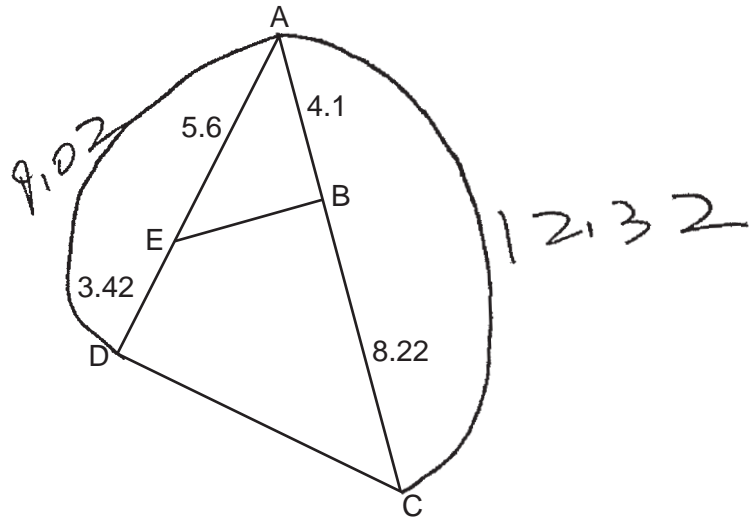
Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

$\frac{AD}{AB} = \frac{AC}{AE}$ and $\angle A \cong \angle A$
 they are similar by SAS~

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

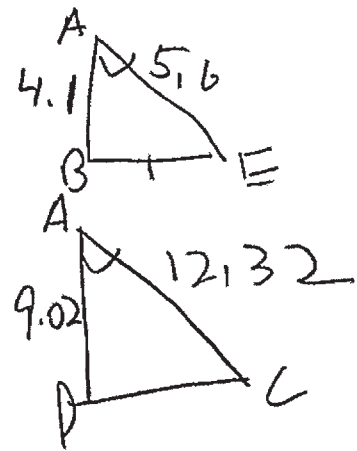
Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

They are similar because they have two pairs of corresponding sides in proportion and have angle A in common due to same angle, $\angle A \cong \angle A$



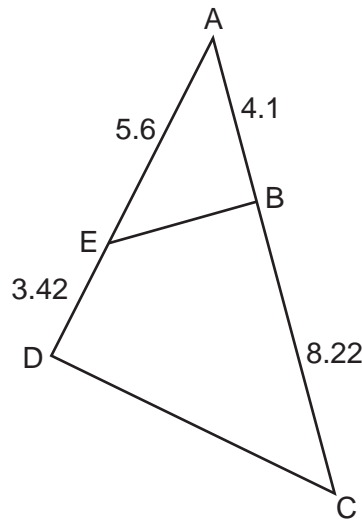
$$\frac{4.1}{9.02} = \frac{5.6}{12.32}$$

$$\frac{5}{11} = \frac{5}{11}$$

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

Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

$$\frac{9.02}{4.1} = \frac{12.32}{5.6}$$

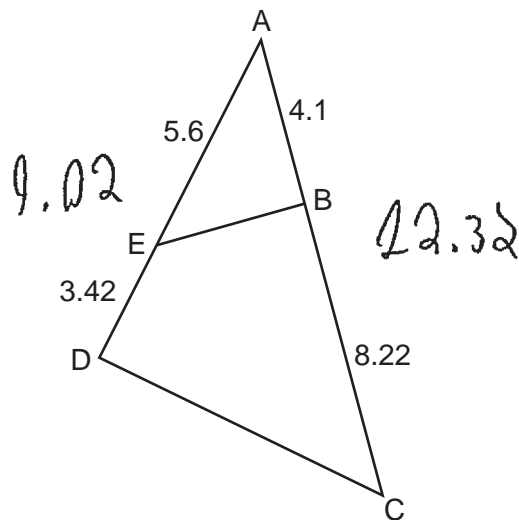
$$50.512 = 50.512 \checkmark$$

$\triangle ABE$ is \sim to $\triangle ADC$ because side lengths are proportional by scale factor $k=2.2$

Score 1: The student wrote an incomplete explanation.

Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

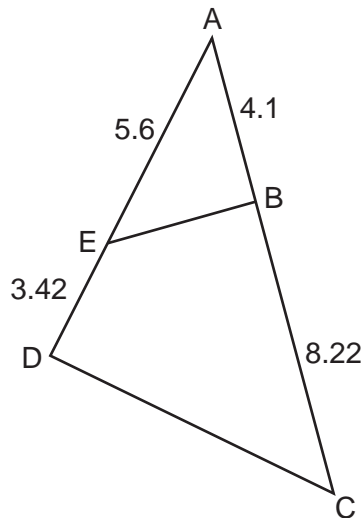
$$2.2 = \frac{12.32}{5.6} = \frac{9.02}{4.1} = 2.2$$

Yes because ~~they~~
Their sides AD & AB
and AC & AE have the same
ratio.

Score 1: The student wrote an incomplete explanation.

Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

Side splitter

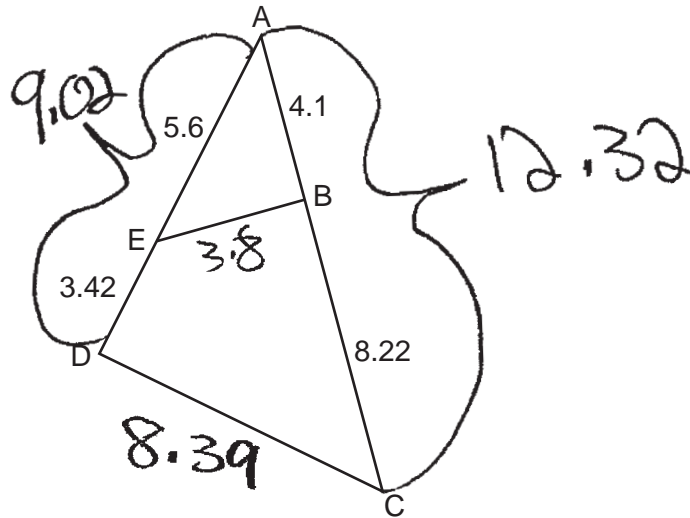
$$\frac{5.6}{4.1} = \frac{3.42}{8.22}$$
$$14.022 \neq 46.032$$

no, $\triangle ABE$ is not similar to $\triangle ADC$ b/c it does not check with the side splitter method.

Score 1: The student made an error when determining the proportional segments.

Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

$$\begin{array}{r}
 4.1^2 + b^2 = 5.6^2 \\
 16.81 + b^2 = 31.36 \\
 \underline{-16.81} \qquad \underline{-16.81} \\
 \sqrt{b^2} = 14.55 \\
 b = 3.8
 \end{array}$$

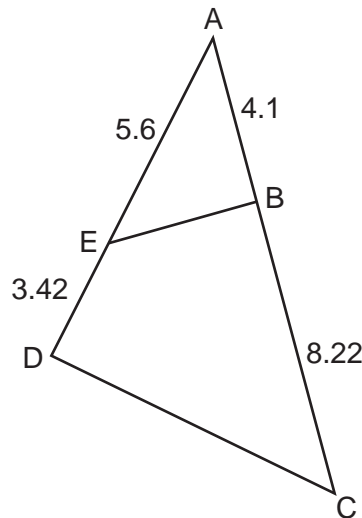
Both \triangle are right triangles and $\triangle AEB$ is dilated by a scale factor of 2.

$$\begin{array}{r}
 9.02^2 + b^2 = 12.32^2 \\
 81.36 + b^2 = 151.78 \\
 \underline{-81.36} \qquad \underline{-81.36} \\
 \sqrt{b^2} = 70.42 \\
 b = 8.39
 \end{array}$$

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

Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

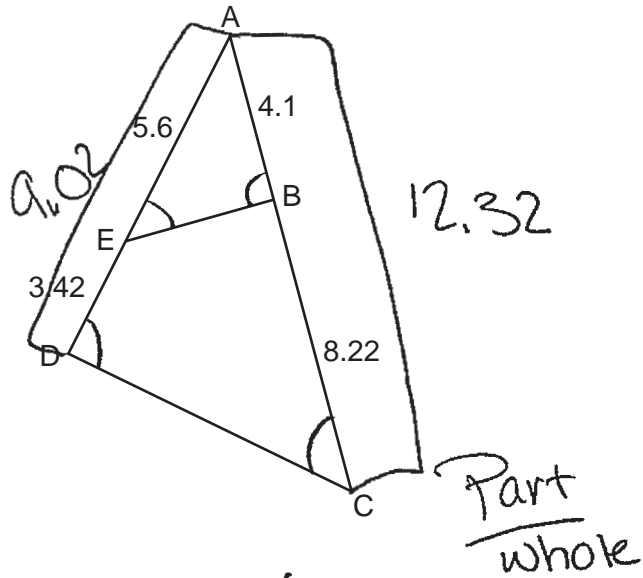
$$\frac{5.6}{3.42} = \frac{4.1}{8.22}$$

$\triangle ABE$ is similar to $\triangle ADC$ because the sides are proportional.

Score 0: The student gave a completely incorrect response.

Question 29

29 In $\triangle ADC$ below, \overline{EB} is drawn such that $AB = 4.1$, $AE = 5.6$, $BC = 8.22$, and $ED = 3.42$.



Is $\triangle ABE$ similar to $\triangle ADC$? Explain why.

$\triangle ABE$ is similar to $\triangle ADC$
because consecutive angles
are \cong .

Part
whole

$$\frac{5.6}{9.02} \neq \frac{4.1}{12.32}$$

$$\frac{68,992}{36,982} =$$

$$1.865556217$$

Score 0: The student gave a completely incorrect response.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$$x^2 + 16x + y^2 + 12y - 44 = 0$$

$$x^2 + 16x + y^2 + 12y = 44$$

$$\frac{16}{2} = (8)^2 = 64$$

$$x^2 + 16x + 64 + y^2 + 12y + 36 = 44 + 64 + 36$$

$$\frac{12}{2} = (6)^2 = 36 \quad (x^2 + 16x + 64) + (y^2 + 12y + 36) = 144$$

$$(x + 8)(x + 8) + (y + 6)(y + 6) = 144$$

$$(x + 8)^2 + (y + 6)^2 = 144$$

$$\text{Center} = (-8, -6)$$

$$\text{Radius} = 12$$

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$$x^2 + 16x + \boxed{64} + y^2 + 12y + \boxed{36} = 44 + \boxed{64} + \boxed{36}$$

$$(x + 8)^2 + (y + 6)^2 = 144$$

Center: $(-8, -6)$

radius: 12

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$$x^2 + 16x + \underline{64} + y^2 + 12y - 44 = 0$$

$$x^2 + 16x + y^2 + 12y = 20$$

$$(x+8)^2 + (y+6)^2 = 20$$

Center = $(-8, -6)$

Radius = 4.47

Score 1: The student determined the coordinates of the center of the circle.

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$$x^2 + 16x + 64 + y^2 + 12y + 36 = -44 + 36 + 64$$

$$(x + 8)^2 + (y + 6)^2 = 56$$

$$\text{Center: } (-8, -6)$$

$$\text{Radius} = \sqrt{56}$$

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$$x^2 + 16x + \underline{64} + y^2 + 12y + \underline{36} = 44 + 36 + 64$$

$$(x+8)^2 + (y+6)^2 = 144$$

$$\frac{1}{2} 144 = 72$$

Center $(-8, -6)$

radius = 72

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$$\left(\frac{1}{2}\right)16 \\ B^2 = 64$$

$$x^2 + 16x + 64 = 0 \\ (x + 4)(x + 4) = 0$$

$$x + 4 = 0 \\ \underline{-4 \quad -4} \\ x = -4$$

$$\left(\frac{1}{2}\right)12 \\ 6^2 = 36$$

$$y^2 + 12y + 36 = 0 \\ (y + 6)(y + 6) = 0$$

$$y + 6 = 0 \quad y + 6 = 0 \\ y = -6 \quad y = -6$$

$$(-4, -6) \rightarrow (-4, 6)$$

$$(-4, -6) \rightarrow (-4, 6)$$

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

Question 30

30 Determine and state the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + 16x + y^2 + 12y - 44 = 0$.

$$x^2 + 16x\left(\frac{16}{2}\right) + y^2 + 12y\left(\frac{12}{2}\right) = -44$$
$$x^2 + 16x + 64 + y^2 + 12y + 36 = -44$$
$$-8$$

$$x^2 + 16x + y^2 + 12y = 56$$

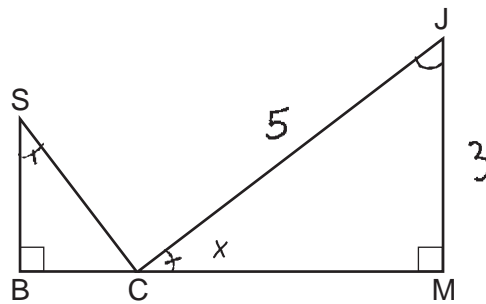
$$(x+8) + (y+6) = 56$$

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

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.

SOH CAH TOA



Determine and state $m\angle S$, to the nearest degree.

$$\sin x = \frac{3}{5} \quad \sin^{-1}\left(\frac{3}{5}\right)$$

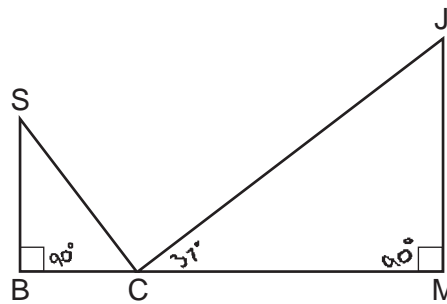
$$36.869897$$

$$m\angle S \approx \boxed{37^\circ}$$

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

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



$\cos J = 0.6$
 $\cos^{-1}(0.6)$
 $= 53.1^\circ$
 $= 53$

SOH
 CAH
 TOA

$\frac{A}{11}$
 $\frac{33}{+90}$
 $\frac{123}{}$

Determine and state $m\angle S$, to the nearest degree.

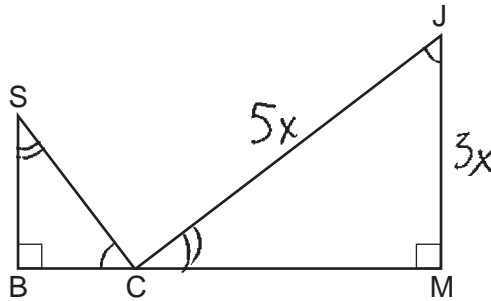
$180 - 143 = 37^\circ$

$m\angle S = 37^\circ$ because $\angle S \cong \angle JLM$ and $\angle JCM$ is
 37° because $53 + 90 = 143$ and $180 - 143 = 37^\circ$.

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

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the nearest degree.

$$\cos J = \frac{3}{5} \quad (\cos^{-1}) \quad 90 - 53.130102 = 36.869$$

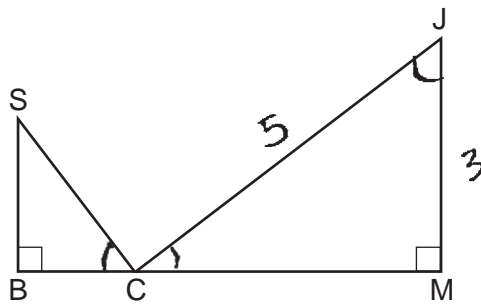
$$m\angle J = 53.130102$$

$$m\angle S = 37^\circ$$

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

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



AA

Determine and state $m\angle S$, to the nearest degree.

$$\cos J = 3/5$$

$$\cos^{-1}(3/5)$$

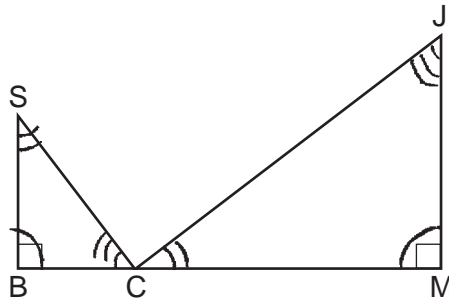
since $\triangle SBC \sim \triangle CMJ$

$$m\angle S = 53^\circ$$

Score 1: The student made an error in determining the measure of $\angle S$.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



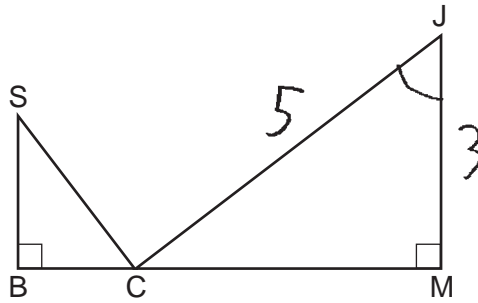
Determine and state $m\angle S$, to the nearest degree.

$m\angle S = 37^\circ$ bc triangles
equal 180° and $180 - 143 = 37^\circ$

Score 1: The student determined the measure of $\angle S$, but did not show work to determine 143° .

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the *nearest degree*.

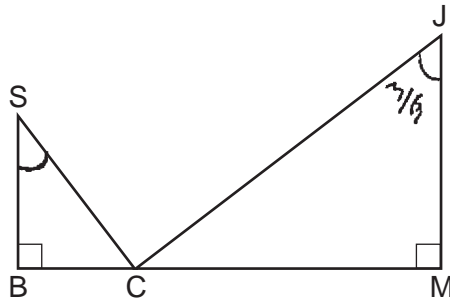
$$\frac{3}{5}$$

$$m\angle S = \frac{1}{2} \text{ of } \frac{3}{5} = \frac{3}{10}$$

Score 0: The student gave a completely incorrect response.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



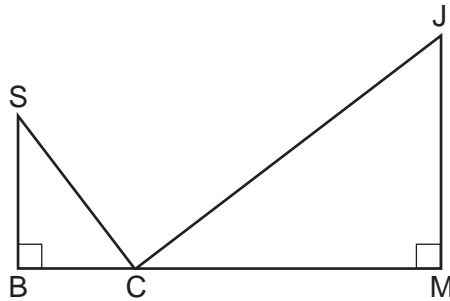
Determine and state $m\angle S$, to the nearest degree.

$m\angle S$ is $\frac{3}{5}$ because
the angles J and S are
similar.

Score 0: The student gave a completely incorrect response.

Question 31

31 In the diagram below, $\triangle SBC \sim \triangle CMJ$ and $\cos J = \frac{3}{5}$.



Determine and state $m\angle S$, to the nearest degree.

$$180 - 90 = 90$$
$$\frac{90}{5} = 18$$

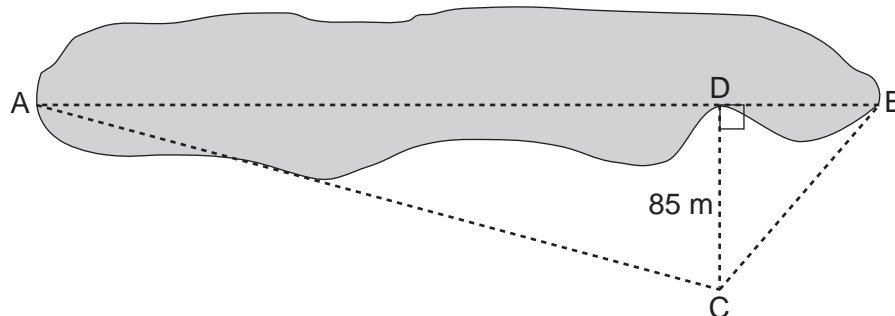
$$18 \times 3 = 54$$

$\angle S$ is 54 degrees because
cos B is congruent to
sin A.

Score 0: The student gave a completely incorrect response.

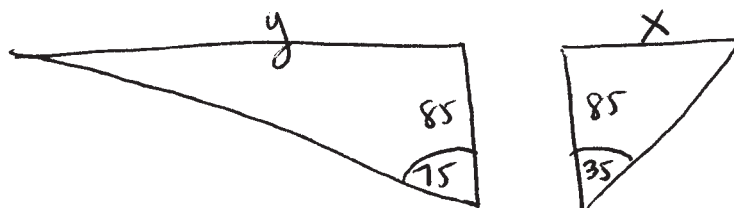
Question 32

- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.



$$\tan 75 = \frac{y}{85}$$

$$= 317.224$$

$$\tan 35 = \frac{x}{85}$$

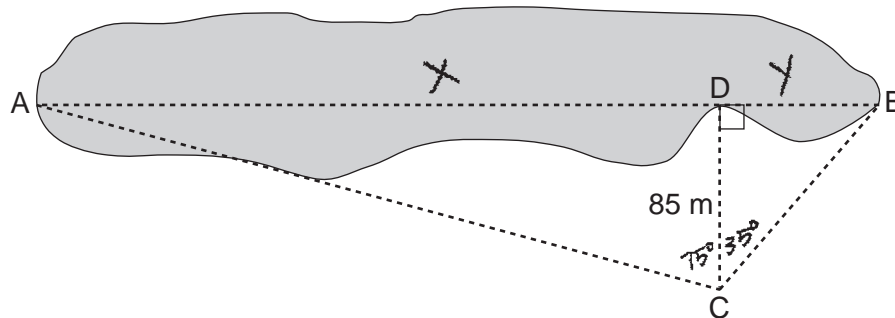
$$= 59.517$$

$$\begin{array}{r} 317.224 \\ + 59.517 \\ \hline 376.741 \approx 377 \end{array}$$

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

Question 32

- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

$$AB = 377 \text{ meters}$$

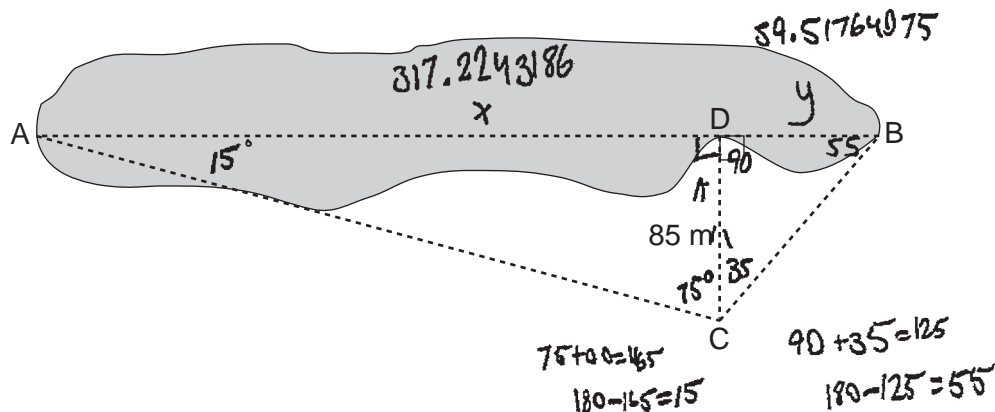
$$\begin{aligned}\tan 35^\circ &= \frac{y}{85} \\ y &= \tan 35^\circ (85) \\ y &= 59.5\end{aligned}$$

$$\begin{aligned}\tan 75^\circ &= \frac{x}{85} \\ x &= \tan 75^\circ (85) \\ x &= 317.2 \\ 317.2 + 59.5 &= 376.7\end{aligned}$$

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

Question 32

- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

$$\boxed{AB = 376.7414594}$$

$$85 \cdot \tan 75 = \frac{x}{85} \cdot 85$$

$$317.2243186 = x$$

$$85 \cdot \tan 35 = \frac{y}{85} \cdot 85$$

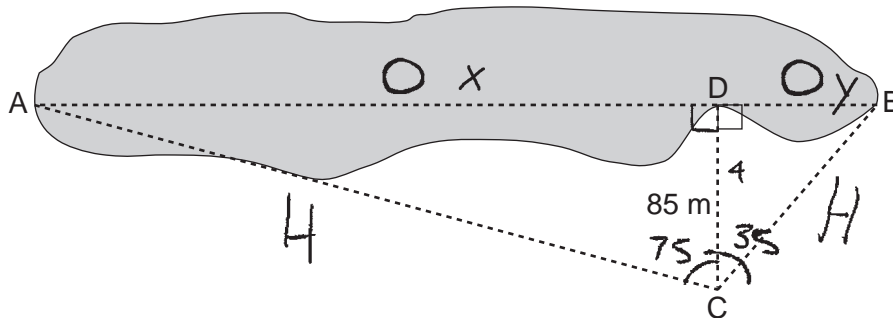
$$59.51764075$$

$$x + y = 376.7414594$$

Score 3: The student made one rounding error.

Question 32

- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the *nearest meter*.

Soh|Coh|Toa

$$\frac{\tan 75}{1} = \frac{x}{85}$$

$$3.732 \times 85 = 317.22$$

$$\frac{\tan 35}{1} = \frac{y}{85}$$

$$.7002 \times 85 = 59.517$$

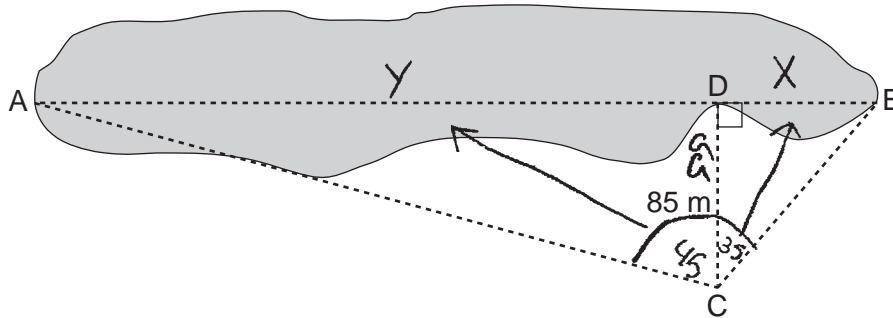
$$\begin{array}{r} 317.22 \\ +59.51 \\ \hline \end{array}$$

AB = 376.73

Score 3: The student made one rounding error.

Question 32

- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

SOH CAH TOA

$$\frac{\tan 35}{1} \times \frac{x}{85}$$

$$x = 59.91764075$$

$$\frac{\tan 45}{1} \times \frac{y}{85}$$

$$y = 85$$

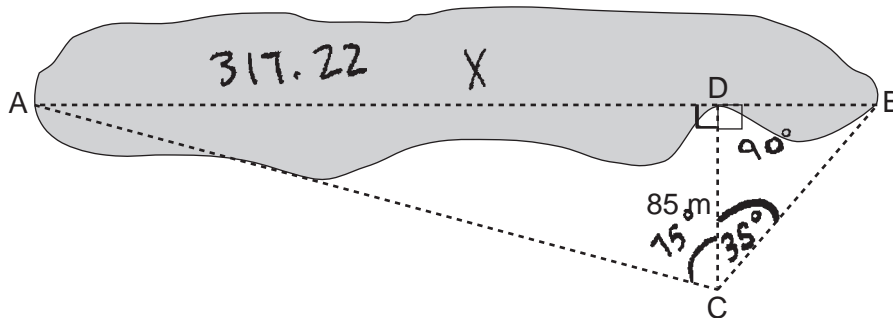
$$59.91764075 + 85 = 144.5$$

145 meters

Score 3: The student made a transposition error in labeling the measure of $\angle ACD$ as 45° .

Question 32

- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

$$\tan 75 = \frac{X}{85}$$

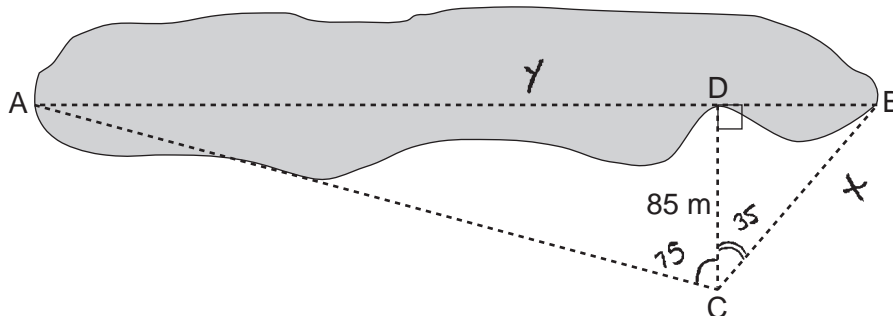
$$\tan 75(85) = X$$

$$X = 317.22$$

Score 2: The student determined the length of \overline{AD} .

Question 32

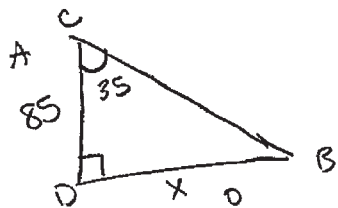
32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

AM

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.



OA

$$\frac{\tan(75)}{1} = \frac{y}{85}$$

$$85 \tan(75) = y$$

$$y = 317.2243186 + 103.76584 = 420.9901586$$

$$\frac{\cos(35)}{1} = \frac{85}{x}$$

$$\frac{\cos(35)x = 85}{\cos(35)}$$

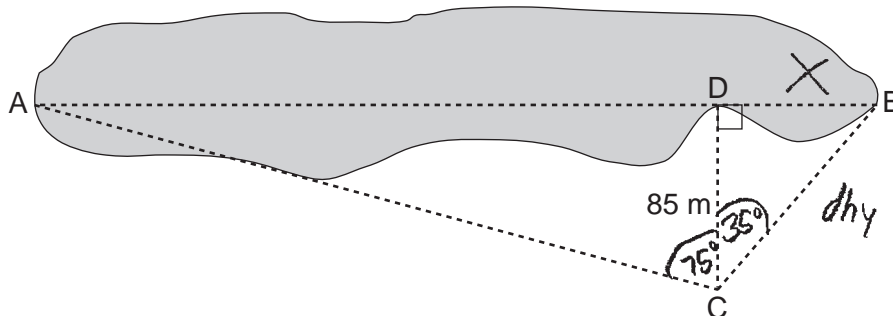
$$= 103.76584$$

421 meters

Score 2: The student made a conceptual error when determining the length of \overline{DB} .

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

SOH CAH TOA

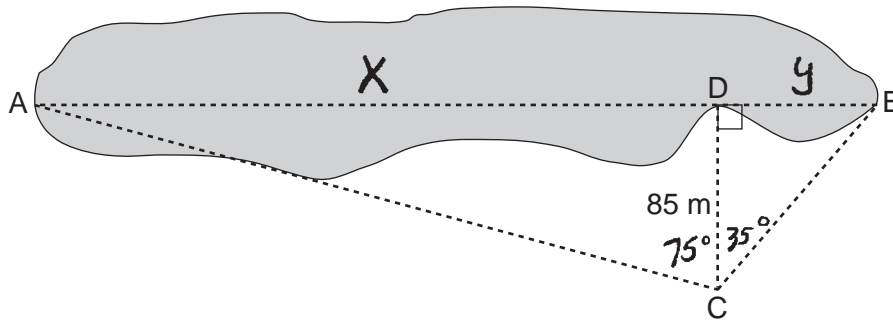
$\tan 35 = \frac{x}{85}$
 $\frac{7002}{1} \times \frac{x}{85}$
 $\frac{7002}{85}$
 $x = 59.51$

The student's work includes a small right-angled triangle with a 35-degree angle at the top. The hypotenuse is labeled '85' and the opposite side is labeled 'x'. The text 'SOH CAH TOA' is written above the calculation. The calculation shows the equation $\tan 35 = \frac{x}{85}$, followed by $\frac{7002}{1} \times \frac{x}{85}$, then $\frac{7002}{85}$, and finally the result $x = 59.51$ enclosed in a hand-drawn box.

Score 2: The student determined the length of \overline{DB} .

Question 32

- 32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

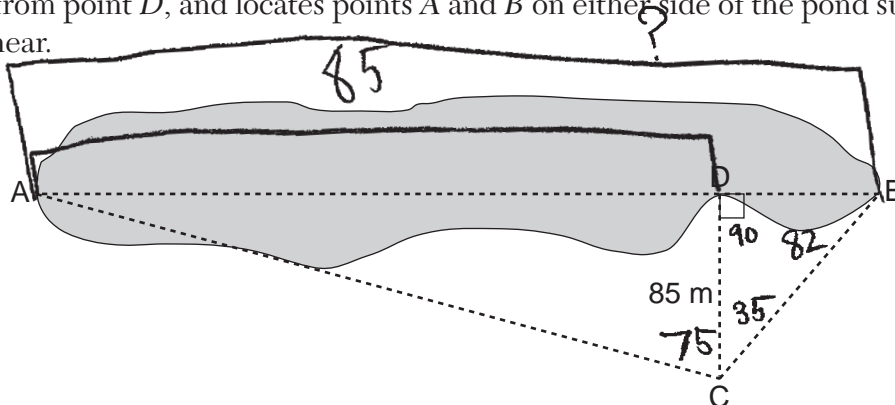
$$\tan 75^\circ = \frac{x}{85}$$

$$\tan 35^\circ = \frac{y}{85}$$

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

Question 32

32 Trish is a surveyor who was asked to estimate the distance across a pond. She stands at point C , 85 meters from point D , and locates points A and B on either side of the pond such that A , D , and B are collinear.



Trish approximates the measure of angle DCB to be 35° and the measure of angle ACD to be 75° .

Determine and state the distance across the pond, \overline{AB} , to the nearest meter.

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

$$90^2 = 35^2 + b^2$$

$$8100 = 1225 + b^2$$

$$\begin{array}{r} 8100 \\ -1225 \\ \hline 6875 \end{array}$$

$$\sqrt{b^2} = \sqrt{6875}$$

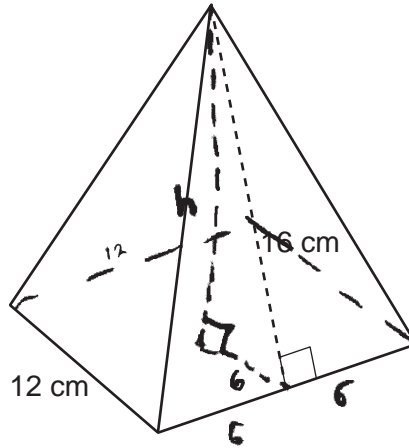
$$b = 82.9$$

$$AB = 180^\circ$$

Score 0: The student gave a completely incorrect response.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the nearest cubic centimeter.

$$12 \div 2 = 6$$

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

$$x^2 + 6^2 = 16^2$$

$$x^2 + 36 = 256$$

$$\begin{array}{r} x^2 + 36 = 256 \\ -36 \quad -36 \\ \hline x^2 = 220 \end{array}$$

$$\sqrt{x^2} = \sqrt{220}$$

$$x = 14.83239697$$

$$V = \frac{1}{3} B h$$

$$V = \frac{1}{3} (12)(12)(h)$$

$$V = \frac{1}{3} (12 \times 12) (14.83239697)$$

$$V = \frac{1}{3} (144) (14.83239697)$$

$$V = \frac{1}{3} (2,135.865169)$$

$$V = 711.9550546$$

$$V \approx 712 \text{ cm}^3$$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the nearest ounce.

$$D = \frac{W}{V}$$

$$\frac{0.032 \text{ oz}}{1 \text{ cm}^3} = \frac{W}{712 \text{ cm}^3}$$

$$W = 0.032 \cdot 712$$

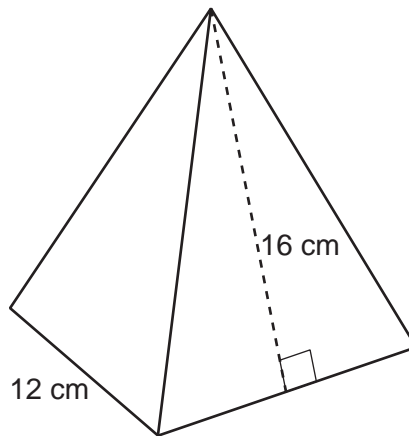
$$W = 22.184$$

$$W \approx 23$$

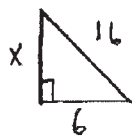
Score 4: The student gave a complete and correct response.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

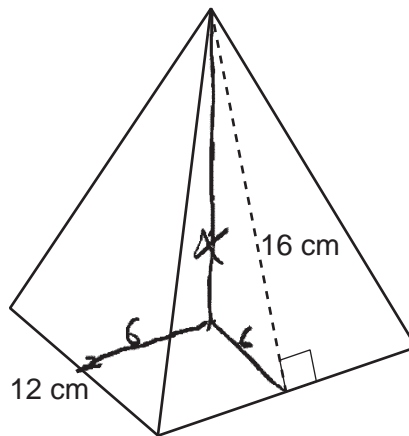
$$\begin{aligned} V &= \frac{1}{3} B h \\ v &= \frac{1}{3} (12)(12)(14.832) \\ &= 712 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} 6^2 + x^2 &= 16^2 \\ 36 + x^2 &= 256 \\ -36 & \quad -36 \\ \hline x^2 &= \sqrt{220} \\ x &= 14.83 \end{aligned}$$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

Score 3: The student found the volume of the candle, but did not find the weight of the candle.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$$16^2 - 6^2 = x^2$$

$$256 - 36 = x^2$$

$$x^2 = 220 \quad x = 14.832$$

pyramid $V = \frac{1}{3} Bh$

$$V = \frac{1}{3} (12^2) \cdot 14.832 = 711.936$$

$$V = 712$$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

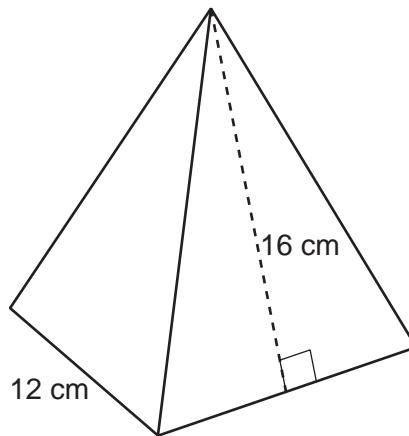


$$0.032 \cdot 712 = 22.7 \approx \textcircled{23 \text{ lbs}}$$

Score 3: The student labeled the wrong unit of weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$$\begin{aligned}V &= \frac{1}{3} Bh \\V &= \frac{1}{3} (144)(16) \\V &= \frac{1}{3} (2304) \\V &= 768 \text{ cm}^3\end{aligned}$$

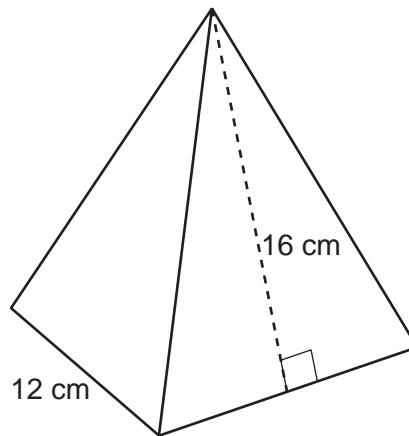
The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$$\begin{aligned}0.032 (768) \\24.576 \text{ ounces} \\25 \text{ ounces}\end{aligned}$$

Score 2: The student made a conceptual error using 16 as the height.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



$$\begin{aligned}x^2 + 6^2 &= 16^2 \\x^2 + 36 &= 256 \\-36 &\quad -36 \\ \hline x^2 &= 220 \\x &= 14.8323 \\ \textcircled{x = 15}\end{aligned}$$

Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$$\begin{aligned}V &= \frac{1}{3} B \cdot h \\ &= \frac{1}{3} (12)(12)(15) \\ \textcircled{V = 720}\end{aligned}$$

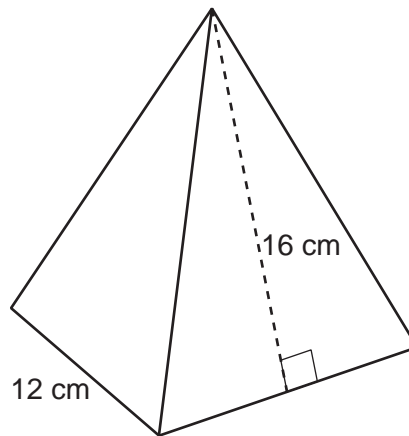
The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$$\frac{720}{0.032} = \textcircled{22,500}$$

Score 2: The student rounded the height which led to an incorrect volume. The student made an error in determining the weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



$$6^2 + 16^2 = c^2$$
$$292 = c^2$$
$$\sqrt{292} = c$$

Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$$V = \frac{1}{3} Bh$$

$$V = \frac{1}{3} \cdot 144 \cdot \sqrt{292}$$

$$V = 820.22$$

$$V = 820$$

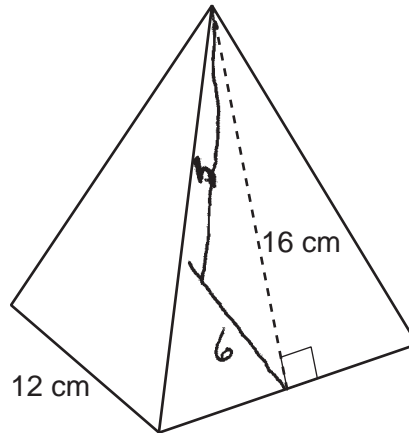
The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$$(.032)(820) = 26.2$$

Score 2: The student made an error when determining the height and made a rounding error when determining the weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$$\begin{aligned}6^2 + h^2 &= 16^2 \\36 + h^2 &= 256 \\h^2 &= 220 \\h &= \sqrt{220}\end{aligned}$$

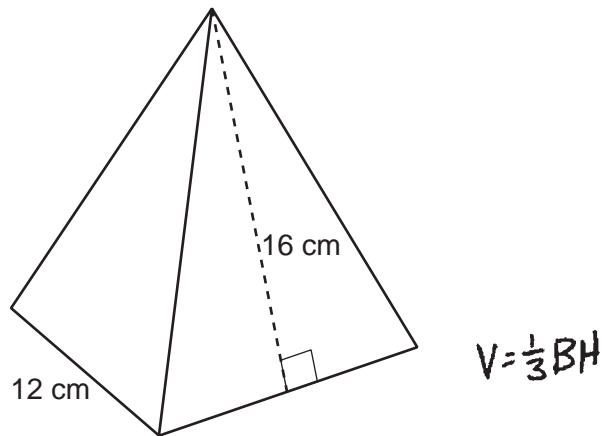
$$\begin{aligned}V &= Bh \\V &= (12 \cdot 12)(\sqrt{220}) \\V &= 144(\sqrt{220}) \\V &= 2135.865 \\V &= 2136\end{aligned}$$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

Score 2: The student found the height of the pyramid correctly, but used an incorrect formula when determining the volume. No further correct work is shown.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

$$\begin{aligned}
 V &= \frac{1}{3}BH \\
 V &= \frac{1}{3}(12 \times 16) \\
 V &= \frac{1}{3}(192) \\
 V &= \frac{1}{3} \times \frac{192}{1} = 64
 \end{aligned}$$

$V = 64 \text{ cm}^3$

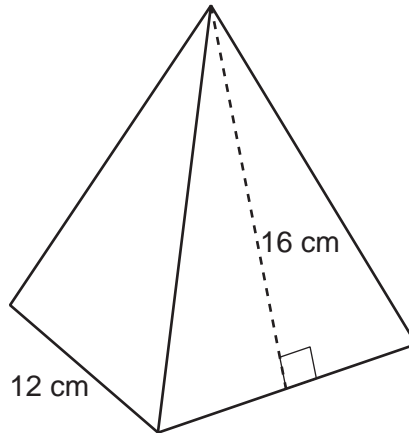
The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

$$\begin{aligned}
 \frac{0.032 \text{ ounce}}{x} &= \frac{1 \text{ cm}^3}{64 \text{ cm}^3} \\
 x &= 2.048 \text{ ounces} \\
 x &= \text{2 ounce}
 \end{aligned}$$

Score 1: The student found an incorrect volume, but found an appropriate weight.

Question 33

33 A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

The volume of the candle is 11.5 cm.

$$12 \times \cos 16$$
$$11.53514035$$
$$11.5$$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

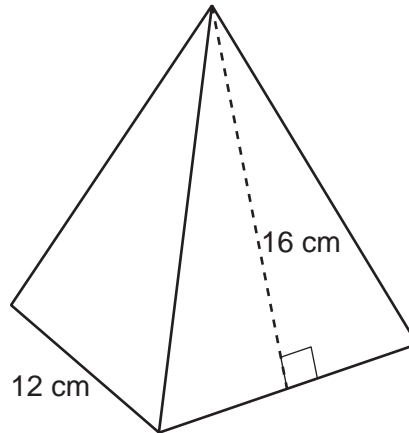
$$11.5 \times 0.032 = 0.368$$

The candle weighs 0.368 pounds.

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

Question 33

- 33** A candle in the shape of a right pyramid is modeled below. Each side of the square base measures 12 centimeters. The slant height of the pyramid measures 16 centimeters.



Determine and state the volume of the candle, to the *nearest cubic centimeter*.

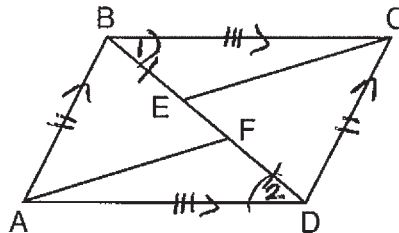
$$\begin{aligned} V &= \frac{1}{3}bh \\ V &= \frac{1}{3}(12)(16) \\ V &= 64 \text{ cm}^3 \end{aligned}$$

The wax used to make the candle weighs 0.032 ounce per cubic centimeter. Determine and state the weight of the candle, to the *nearest ounce*.

Score 0: The student gave a completely incorrect response.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



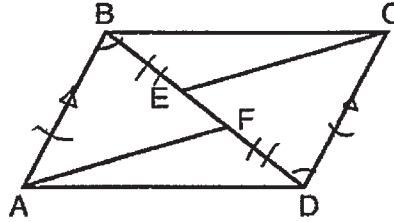
Prove: $\overline{CE} \cong \overline{AF}$

Statements	Reasons
① Quad $ABCD$, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$	① given
② $\overline{BE} \cong \overline{DF}$	
③ $ABCD$ is a p-gram	② if a quad has one pair of opp sides \parallel and \cong , it is a p-gram
④ $\overline{BC} \parallel \overline{AD}$	③ opp sides of a p-gram are \parallel
⑤ $\overline{BC} \cong \overline{AD}$	④ opp sides of a p-gram are \cong
⑥ $\angle 1 \cong \angle 2$	⑤ if lines are \parallel and cut by a transv., alt. int. \angle 's are \cong
⑦ $\triangle BCE \cong \triangle DAF$	⑥ SAS \cong SAS
⑧ $\overline{CE} \cong \overline{AF}$	⑦ CPCTC

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



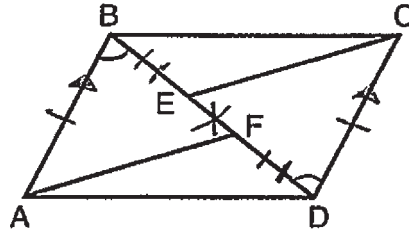
Prove: $\overline{CE} \cong \overline{AF}$

Statement	Reason
1) $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, $\overline{BE} \cong \overline{DF}$	1) Given
2) $\overline{BE} + \overline{EF} = \overline{BF}$ $\overline{DF} + \overline{EF} = \overline{DE}$	2) A segment is equal to the sum of its parts
2.5) $\overline{EF} \cong \overline{EF}$	2.5) Reflexive
3) $\overline{BE} + \overline{EF} \cong \overline{DF} + \overline{EF}$	3) Addition
4) $\overline{BF} \cong \overline{DE}$	4) Substitution Property of Equality
5) $\angle ABE \cong \angle CDE$	5) when 2 lines are cut by a transversal alt. int. \angle 's are \cong .
6) $\triangle ABF \cong \triangle CDE$	6) SAS Congruence Theorem
7) $\overline{CE} \cong \overline{AF}$	7) corres. parts of \cong \triangle 's are \cong .

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



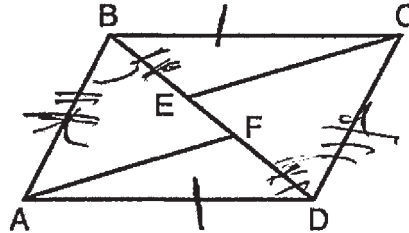
Prove: $\overline{CE} \cong \overline{AF}$

Statements	Reasons
① Quad $ABCD$, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$, \overline{BD} is a diagonal, $\overline{BE} \cong \overline{DF}$.	① givens
② $\angle ABF \cong \angle CDE$	② when parallel lines are cut by a transversal, they form two congruent alternate interior angles
③ $\overline{EF} \cong \overline{FE}$	③ reflexive property
④ $\overline{BE} + \overline{EF} \cong \overline{DF} + \overline{FE}$ or $\overline{BF} \cong \overline{DE}$	④ addition
⑤ $\triangle AFB \cong \triangle CED$	⑤ SAS \cong SAS
⑥ $\overline{AF} \cong \overline{CE}$	⑥ CPCTC

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



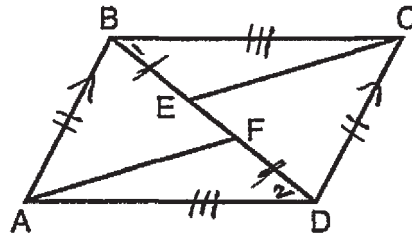
Prove: $\overline{CE} \cong \overline{AF}$

Statement	Reason
1) $ABCD$ is a quadrilateral \overline{AB} is \cong and \parallel to \overline{CD} ; \overline{CE} and \overline{AF} are drawn to diagonal \overline{BD} so that $\overline{BE} \cong \overline{DF}$	1) Given
2) $ABCD$ is a parallelogram	2) When one pair of opposite sides of a quadrilateral are parallel and congruent the quad is a parallelogram
3) $\overline{AD} \cong \overline{BC}$	3) opposite sides of a parallelogram are congruent
4) $\angle CDB \cong \angle ABD$	4) Alt. Int. angles
5) $\angle CDA \cong \angle CBA$	5) opposite angles of parallelogram are congruent
6) $\angle CDA - \angle CDB \cong \angle CBA -$ $\angle ABD$ or $\angle BDA \cong \angle CBD$	6) When 2 congruent quantities are subtracted from 2 congruent quantities the results are congruent.
7) $\triangle FDA \cong \triangle EBC$	7) SAS
8) $\overline{CE} \cong \overline{AF}$	8) CPCTC

Score 3: The student had an incomplete reason in step 4.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
 Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



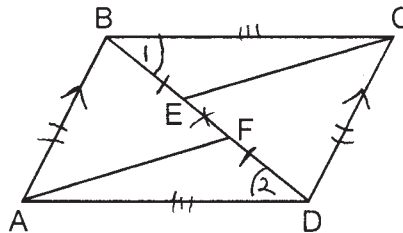
Prove: $\overline{CE} \cong \overline{AF}$

S	R
1) Quad $ABCD$, \overline{AB} is \cong and \parallel to \overline{CD} . Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$ 2) Quad $ABCD$ is a p.gram 3) \overline{BC} and $\overline{AD} \cong$ 4) $\angle 1 \cong \angle 2$ 5) $\triangle BCE \cong \triangle DAF$ 6) $\overline{CE} \cong \overline{AF}$	1) Given 2) opp. sides \cong and $\parallel \rightarrow$ p.gram 3) opp. sides \cong in p.gram 4) If \parallel lines \rightarrow alt. int. \angle 's \cong 5) SAS 6) CPCTC

Score 3: The student had one missing statement and reason to prove step 4.

Question 34

- 34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



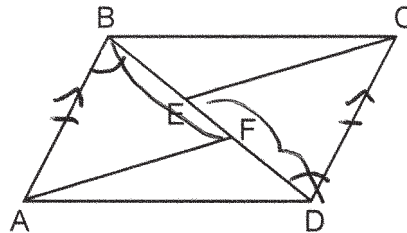
Prove: $\overline{CE} \cong \overline{AF}$

- | | |
|--|---|
| <p>1. Quad $ABCD$, $\overline{AB} \cong \overline{CD}$, $\overline{AB} \parallel \overline{CD}$,
\overline{CE} + \overline{AF} are drawn to diagonal \overline{BD}
$\overline{BE} \cong \overline{DF}$</p> <p>2. $ABCD$ is a parallelogram</p> <p>3. $\angle 1 \cong \angle 2$</p> <p>4. $\overline{BC} \cong \overline{AD}$</p> <p>5. $\triangle ADF \cong \triangle CBE$</p> <p>6. $\overline{CE} \cong \overline{AF}$</p> | <p>1. Given</p> <p>2. If one pair of opposite sides of a quad are \cong and \parallel, it is a parallelogram.</p> <p>3. Alternate interior angles are \cong.</p> <p>4. opposite sides of a \square are \cong.</p> <p>5. SAS \cong SAS</p> <p>6. CPCTC</p> |
|--|---|

Score 2: The student had one missing statement and reason to prove step 3 and an incomplete reason in step 3.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



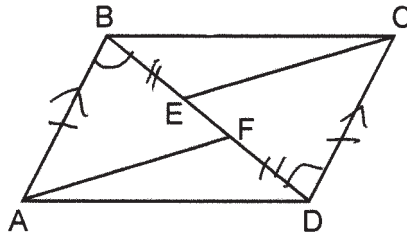
Prove: $\overline{CE} \cong \overline{AF}$

Statement	Reason
① Quad $ABCD$, $\overline{AB} \cong \overline{CD}$ $\overline{AB} \parallel \overline{CD}$ \overline{CE} + \overline{AF} drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$	① Given
② $\overline{BE} + \overline{EF} \cong \overline{DF} + \overline{EF}$ $\overline{BF} \cong \overline{DE}$	② Addition Property
③ $\angle ABF \cong \angle CDE$	③ IF 2 lines \parallel , then Alternate Interior \angle 's \cong
④ $\triangle BAF \cong \triangle DCE$	④ SAS
⑤ $\overline{CE} \cong \overline{AF}$	⑤ Sides of $\cong \triangle$'s

Score 2: The student had a missing statement and reason to prove step 2 and had an incorrect reason in step 5.

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$.
 Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



Prove: $\overline{CE} \cong \overline{AF}$

1. Quad $ABCD$
 $\overline{AB} \cong \overline{CD}$ (S≅S)
 $\overline{AB} \parallel \overline{CD}$
 $\overline{BE} \cong \overline{DF}$ (S≅S)
2. $\triangle ABF \cong \triangle CDE$ (a≅a)
3. $\triangle ABF \cong \triangle CDE$
4. $\overline{CE} \cong \overline{AF}$

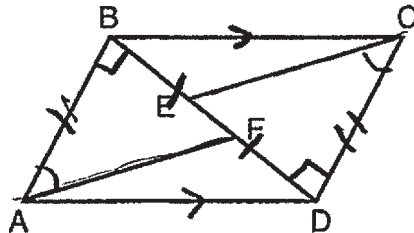
Given

2. Parallel lines form \cong alternate interior angles
3. ~~SSA~~ \cong SSA
4. Segments are \cong .

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

Question 34

34 In the diagram of quadrilateral $ABCD$ below, $\overline{AB} \cong \overline{CD}$, and $\overline{AB} \parallel \overline{CD}$. Segments CE and AF are drawn to diagonal \overline{BD} such that $\overline{BE} \cong \overline{DF}$.



Prove: $\overline{CE} \cong \overline{AF}$

statements	reasons
1.) \overline{AB} is congruent and parallel to \overline{CD} . $\overline{BE} \cong \overline{DF}$	1.) Given
2.) $\angle A \cong \angle C$	2.) alternate interior angles congruent
3.) $\angle B$; $\angle D$ are right angles	3.) def of perpendicular lines
4.) $\angle B \cong \angle D$	4.) all right angles congruent
5.) $\overline{CE} \cong \overline{AF}$	5.) opposite sides are both parallel and congruent

Score 0: The student gave a completely incorrect response.

Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$m = \frac{-4}{8} = -\frac{1}{2}$$

Slope of line $\overline{MA} = -\frac{1}{2}$
Slope of line $\overline{HT} = -\frac{1}{2}$
So: $\overline{MA} \parallel \overline{HT}$

Since the slopes of \overline{MA}
and \overline{HT} are equal, \overline{MA}
and \overline{HT} are parallel.

Quadrilateral $MATH$ is a trapezoid because
it has a pair of parallel sides.

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$$Y(7,3)$$

Question 35 is continued on the next page.

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

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

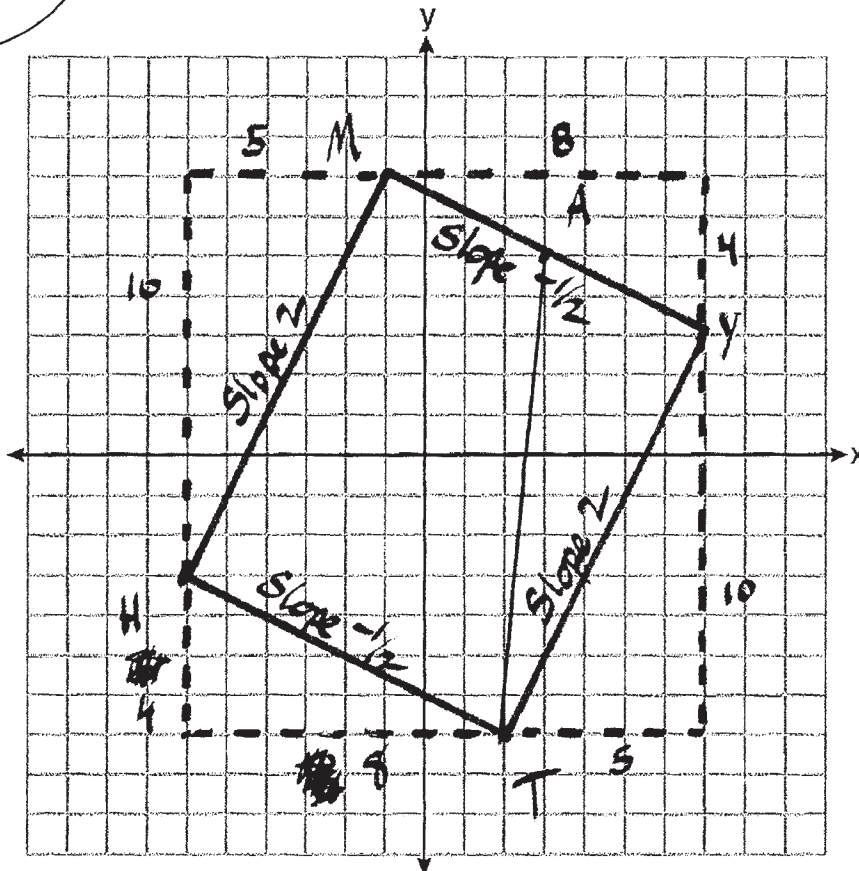
Slope of $\overline{MY} = -\frac{1}{2}$
 Slope of $\overline{HT} = -\frac{1}{2}$
 Slope of $\overline{HM} = 2$
 Slope of $\overline{TY} = 2$

Since the slopes of \overline{MY} and \overline{HT} are equal,
 \overline{MY} and \overline{HT} are parallel.
 Since the slopes of \overline{HM} and \overline{TY} are equal,
 \overline{HM} and \overline{TY} are parallel.
 $\therefore MYTH$ is a parallelogram.

Since the slopes of \overline{MY} and \overline{HM} are negative reciprocals, $\overline{MY} \perp \overline{HM}$, so angle M is a right angle.

Then $MYTH$ is a rectangle because it is a parallelogram with a right angle.

$m = \frac{-4}{8} = -\frac{1}{2}$
 $m = \frac{10}{5} = 2$



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$m \overline{MA} = \frac{7-5}{-1-3} = \frac{2}{-4} = \left(-\frac{1}{2}\right)$$

$$m \overline{HT} = \frac{-7--3}{2--6} = \frac{-4}{8} = \left(-\frac{1}{2}\right)$$

Same Slope
Parallel Lines

$$m \overline{AT} = \frac{5--7}{3-2} = \frac{12}{1} = (12)$$

$$m \overline{MH} = \frac{7--3}{-1--6} = \frac{10}{5} = (2)$$

$MATH$ is a trapezoid
because it has 1 Pair
of Parallel sides.

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$$Y(7, 3)$$

Question 35 is continued on the next page.

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

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

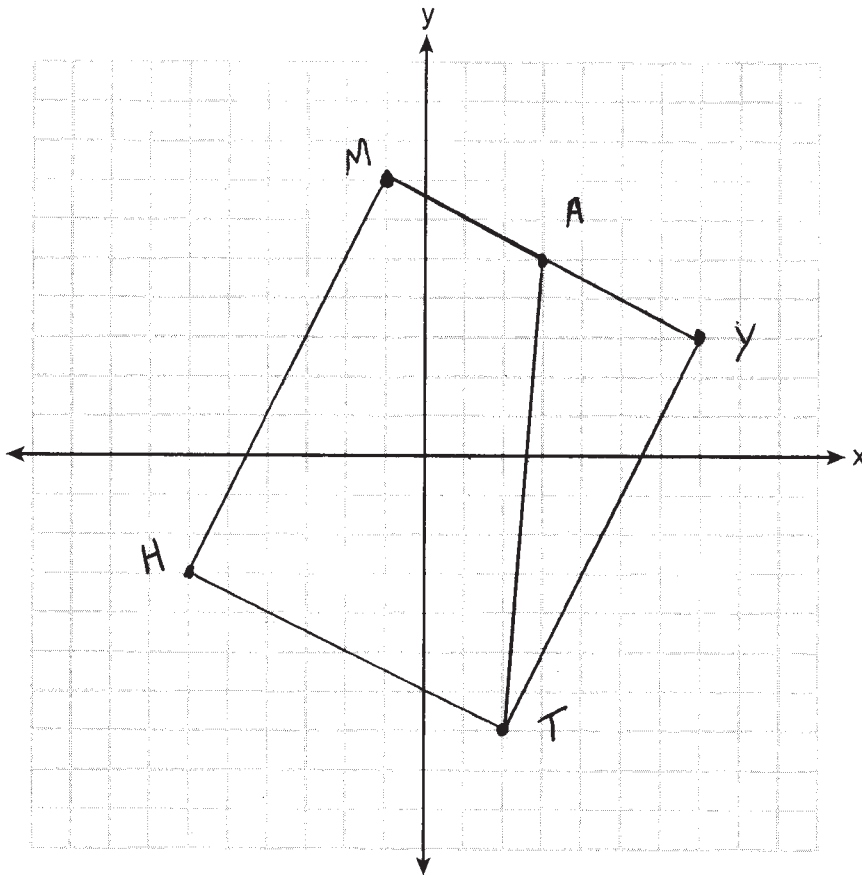
$$\begin{aligned}
 d \overline{MY} &= \sqrt{(7-1)^2 + (3-7)^2} = \sqrt{64+16} = \sqrt{80} \\
 d \overline{HT} &= \sqrt{(2-6)^2 + (-7-3)^2} = \sqrt{64+16} = \sqrt{80} \\
 d \overline{MH} &= \sqrt{(-1-6)^2 + (7-3)^2} = \sqrt{25+16} = \sqrt{41} \\
 d \overline{YT} &= \sqrt{(7-2)^2 + (3-7)^2} = \sqrt{25+16} = \sqrt{41}
 \end{aligned}$$

} Same length

$MYTH$ is a parallelogram b/c it has 2 Pairs of \cong opposite sides.

$\overline{MA} \perp \overline{MH}$ b/c negative reciprocal slopes, $\therefore \angle M$ is a right angle.

$MYTH$ is a rectangle b/c it is a parallelogram with a right angle.



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$\begin{array}{l} \text{Slope of line } \overline{MA} = \frac{-2}{4} = -\frac{1}{2} \\ \text{Slope of line } \overline{HT} = \frac{-4}{8} = -\frac{1}{2} \end{array} > \overline{MA} \parallel \overline{HT}$$

$MATH$ is a trapezoid because it has one pair of parallel sides \overline{MA} and \overline{HT} .

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$$Y, (7,3)$$

Question 35 is continued on the next page.

Score 5: The student wrote a partially correct concluding statement when proving the rectangle.

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

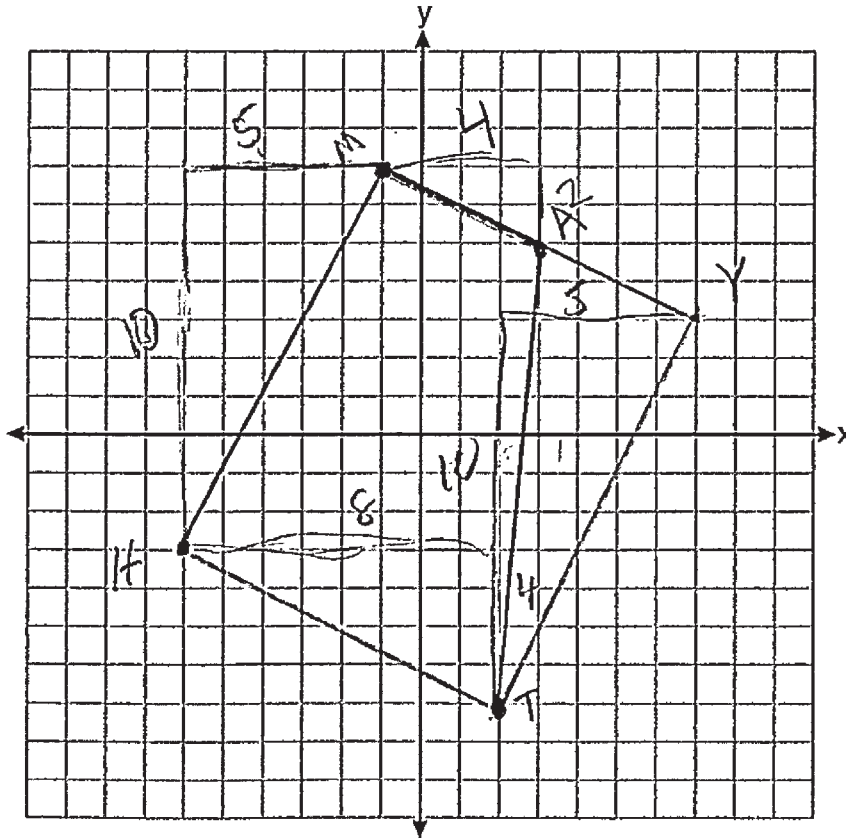
$$\text{Slope of } \overline{MY} = -\frac{4}{8} = -\frac{1}{2}$$

$$\text{Slope of } \overline{HT} = -\frac{1}{2}$$

$$\text{Slope of } \overline{HM} = \frac{10}{5} = 2$$

$$\text{Slope of } \overline{TY} = \frac{10}{5} = 2$$

All the sides are perpendicular to each other because they have opposite reciprocal slopes. Meaning all the angles are right angles. $MYTH$ has 2 pairs of parallel lines $\overline{MY} \parallel \overline{HT}$ and $\overline{HM} \parallel \overline{TY}$. A rectangle has all right angles and 2 pairs of parallel lines so $MYTH$ is a rectangle.



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

Quadrilateral *MATH* is a trapezoid if it has a pair of // sides,

$$\overline{MA} \quad \frac{7-5}{-1-3} = -\frac{2}{4} \quad \overline{HT} \quad \frac{-3+7}{-6-2} = -\frac{4}{8} = -\frac{2}{4}$$

same slopes \rightarrow parallel

Quadrilateral *MATH* is a trapezoid because
it has one pair of // sides

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$$\overline{MA} \quad \frac{7-5}{-1-3} = -\frac{2}{4}$$
$$Y(-7,3)$$

Question 35 is continued on the next page.

Score 5: The student wrote a partially correct concluding statement when proving the rectangle.

Question 35 continued.

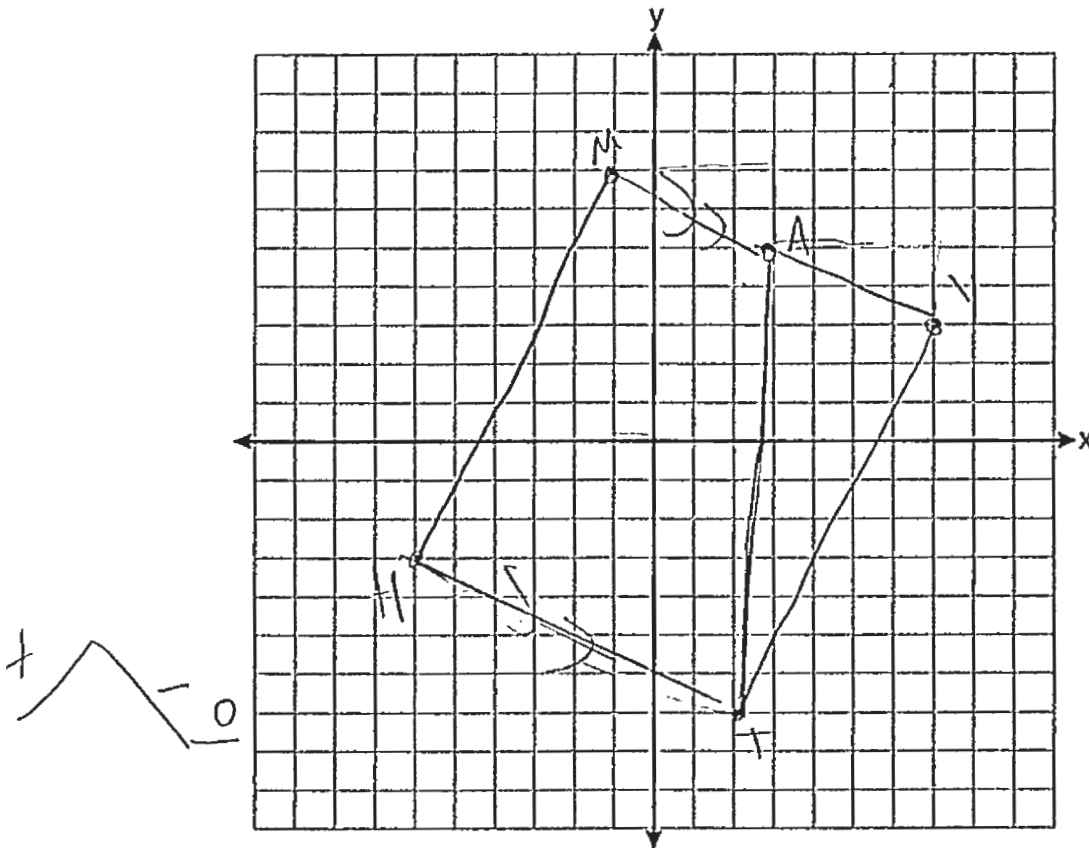
Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

Quadrilateral $MYTH$ is a rectangle if all 4 angles are 90°

$$\overline{HT} = \frac{-3+7}{-6-2} = \frac{4}{-8} = -\frac{1}{2} \quad \overline{MY} = \frac{3-7}{7+1} = \frac{-4}{8} = -\frac{1}{2}$$

$$\overline{YT} = \frac{3+7}{7-1} = \frac{10}{6} = \frac{5}{3} \quad \overline{MH} = \frac{7+3}{-1+6} = \frac{10}{5} = 2$$

Quadrilateral $MYTH$ is a rectangle because all 4 sides are neg reciprocals bcs \overline{HT} and \overline{MY} are $-\frac{1}{2}$ and \overline{YT} and \overline{MH} are $\frac{5}{3}$ therefore neg rec. Create \perp lines and \perp lines form 90° so Quadrilateral $MYTH$ is a rectangle.



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$\left. \begin{array}{l} m\overline{MA} = -\frac{1}{2} \\ m\overline{HT} = \frac{1}{2} \end{array} \right\} \text{same } \overline{MA} \parallel \overline{HT}$$

Since quad $MATH$ has only one set of parallel sides, it is a trapezoid.

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$(7, 3)$

Question 35 is continued on the next page.

Score 4: The student made a conceptual error when proving the rectangle.

Question 35 continued.

Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]

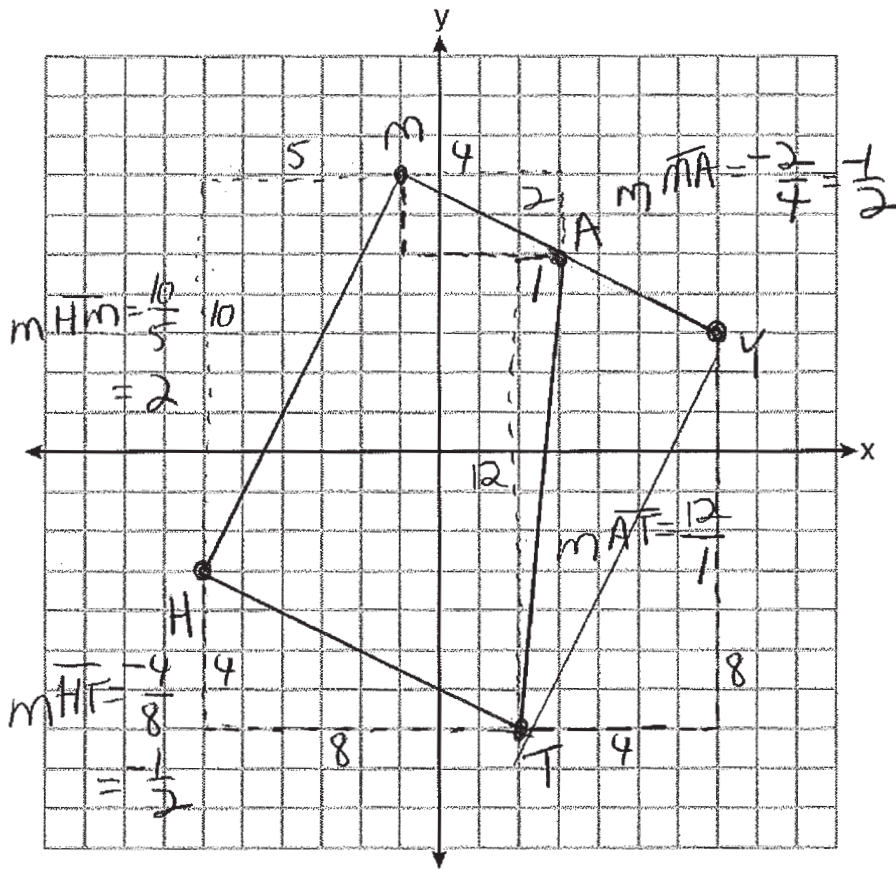
$$d\overline{MY} = \sqrt{(7 - -1)^2 + (3 - 7)^2} = \sqrt{80}$$

$$d\overline{HM} = \sqrt{(-1 - -6)^2 + (7 - 3)^2} = \sqrt{125}$$

$$d\overline{HT} = \sqrt{(2 - -6)^2 + (-7 - 3)^2} = \sqrt{80}$$

$$d\overline{TY} = \sqrt{(7 - 2)^2 + (3 - -7)^2} = \sqrt{125}$$

It is a rectangle
because the opposite
sides are equal.



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$\begin{aligned} \text{Slope } \overline{MA} &= \frac{5-7}{3-(-1)} & \text{Slope } \overline{TH} &= \frac{-3-(-7)}{-6-2} \\ &= \frac{-2}{4} & &= \frac{4}{-8} \\ &= -\frac{1}{2} & &= -\frac{1}{2} \end{aligned}$$

Since \overline{MA} and \overline{TH} have the same slope, $\overline{MA} \parallel \overline{TH}$

Since quadrilateral $MATH$ has one pair of opposite sides parallel, it is a trapezoid.

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$$Y(7,3)$$

Question 35 is continued on the next page.

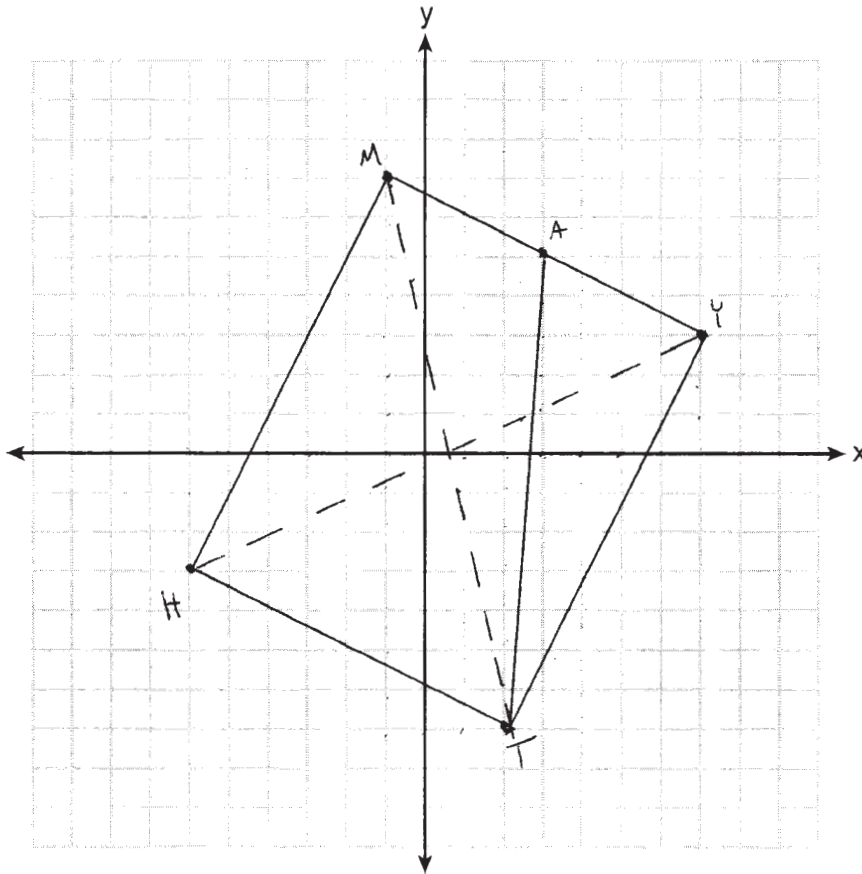
Score 4: The student made a conceptual error when proving the rectangle.

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

$$\begin{aligned} MT &= \sqrt{(-1-2)^2 + (7-(-7))^2} & HY &= \sqrt{(-1-(-6))^2 + (3-(-3))^2} \\ &= \sqrt{(-3)^2 + (14)^2} & &= \sqrt{13^2 + 6^2} \\ &= \sqrt{9 + 196} & &= \sqrt{169 + 36} \\ &= \sqrt{205} & &= \sqrt{205} \end{aligned}$$

Since the diagonals of quad $MYTH$ are \cong , it is a rectangle.



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$\begin{aligned} \text{Slope } \overline{MA} &= \frac{5-7}{3+1} = \frac{-2}{4} = -\frac{1}{2} \\ \text{Slope } \overline{TH} &= \frac{-3+7}{-6-2} = \frac{4}{-8} = -\frac{1}{2} \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{Slope } \overline{MA} \\ \text{Slope } \overline{TH} \end{aligned}} \right\} \text{parallel}$$

\therefore Quad $MATH$ is a trapezoid because it has one pair of \parallel sides.

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$$\text{point } Y = (7, 3)$$

Question 35 is continued on the next page.

Score 4: The student made a conceptual error when proving the rectangle.

Question 35 continued.

Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]

$$m \text{ Slope of } \overline{MA} = -\frac{1}{2}$$

$$\text{Slope of } \overline{TH} = -\frac{1}{2}$$

$$\text{Slope of } \overline{MT} : \frac{-3-7}{-6+1} = \frac{10}{5} = 2$$

$$\text{Slope of } \overline{YT} : \frac{-7-3}{2-7} = \frac{10}{5} = 2$$

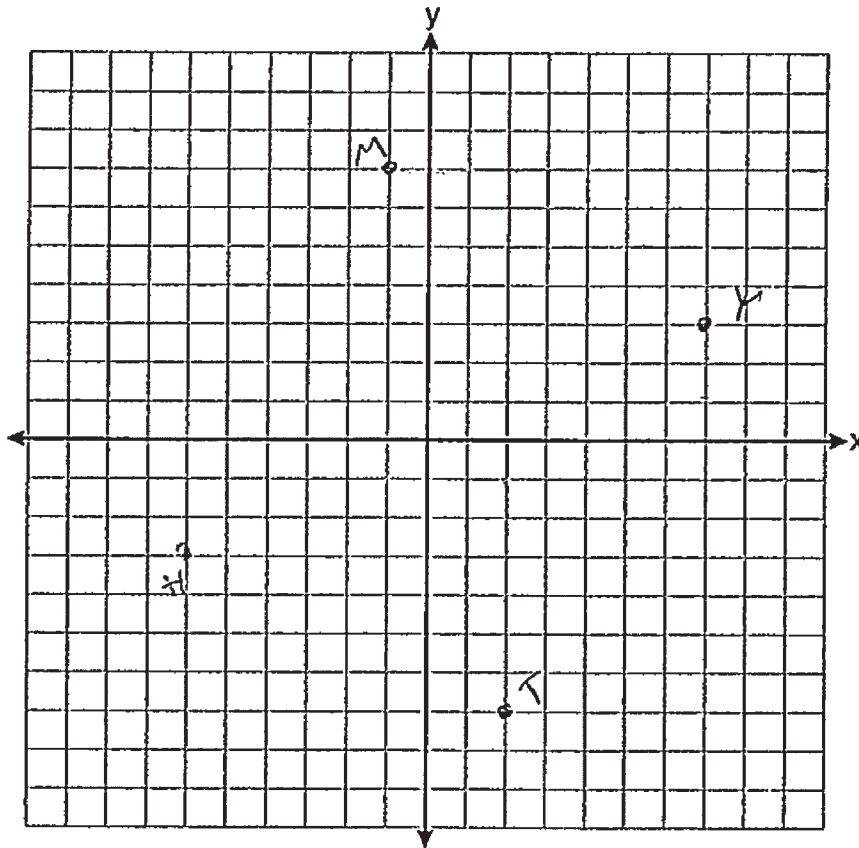
$$\text{Slope of } \overline{MH} = \frac{-7-7}{2+1} = \frac{-14}{3}$$

$$\text{Slope of } \overline{YH} = \frac{-3-3}{-6-7} = \frac{6}{13}$$

$$m(-1,7) \quad t(2,-7)$$

$$y(7,3) \quad h(-6,-3)$$

Quad *MYTH*
is a rectangle
because it has
⊥ diagonals and
2 pairs of || sides



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

slope $\overline{MA} = \frac{2}{4}$
 $\overline{HT} = \frac{-4}{8} = -\frac{2}{4}$ $\left. \begin{array}{l} \\ \end{array} \right\}$ parallel

Trapezoids are a quadrilateral with one set of parallel lines,
 \overline{MA} and \overline{HT} are parallel.

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$$(7, 3)$$

Question 35 is continued on the next page.

Score 3: The student made one conceptual and one computational error when proving the rectangle.

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

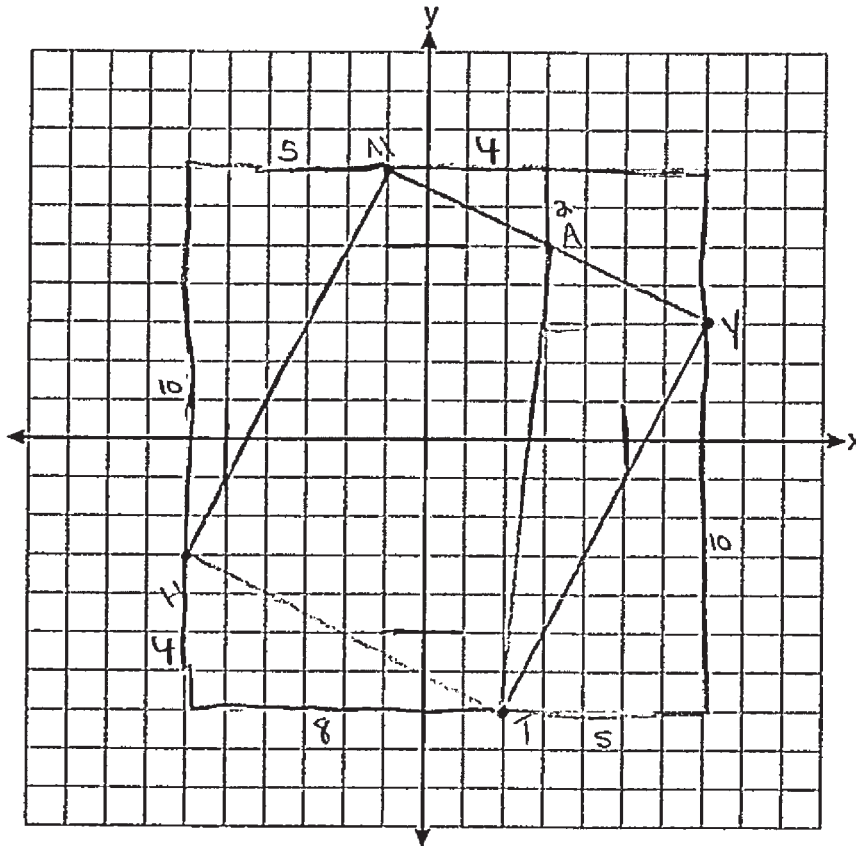
$$\text{slope } \overline{MY} = \frac{-4}{8} = -\frac{1}{2}$$

$$\overline{HT} = \frac{-4}{8} = -\frac{1}{2}$$

$$\text{slope } \overline{MH} = \frac{10}{5} = \frac{1}{2}$$

$$\overline{TY} = \frac{10}{5} = \frac{1}{2}$$

Rectangles are quadrilaterals with two sets of parallel lines, $\overline{MY} \parallel \overline{HT}$ and $\overline{MH} \parallel \overline{TY}$. They also require four 90° angles, since the slopes are negative reciprocals, $(-\frac{1}{2}$ and $\frac{1}{2})$ then they create a 90° angle.



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

Plan
Show one set of opp. sides are \parallel .

$m_{\overline{MA}} = \frac{-2}{4} = -\frac{1}{2}$
 $m_{\overline{HT}} = \frac{-4}{8} = -\frac{1}{2}$
 $m_{\overline{MH}} = \frac{10}{5} = 2$
 $m_{\overline{AT}} = 12$

$\overline{MA} \parallel \overline{HT}$ because their slopes are $=$.
 $\overline{MH} \not\parallel \overline{AT}$ because their slopes aren't equal.

$MATH$ is a trapezoid because there is only one pair of opp. sides \parallel .

State the coordinates of point Y such that point A is the midpoint of \overline{MY} . $MA = \frac{-2}{4} = -\frac{1}{2}$

$(7, 3)$

Question 35 is continued on the next page.

Score 3: The student made a conceptual error in proving the rectangle and did not write a concluding statement.

Question 35 continued.

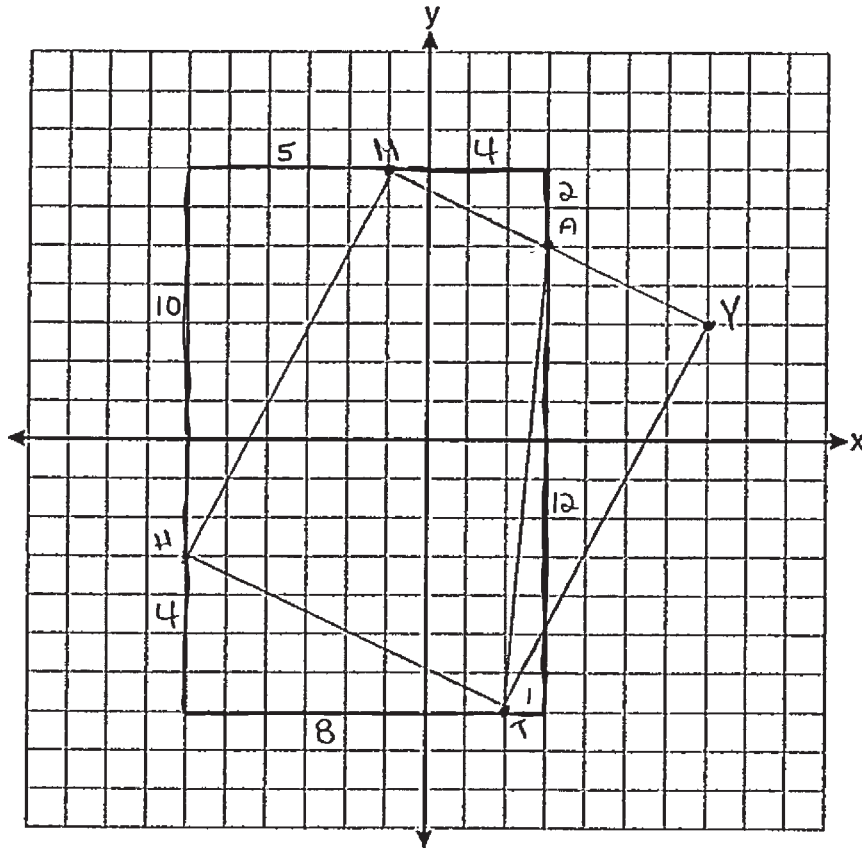
Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]

Plan

Show it's
p-gram
& diagonals
≈

$$\begin{aligned}d_{MY} &= \sqrt{(7+1)^2 + (3-7)^2} \\ &= \sqrt{(8)^2 + (-4)^2} \\ &= \sqrt{64+16} \\ &= \sqrt{80}\end{aligned}$$

$$\begin{aligned}d_{HT} &= \sqrt{(2+6)^2 + (-7+3)^2} \\ &= \sqrt{(8)^2 + (-4)^2} \\ &= \sqrt{64+16} \\ &= \sqrt{80}\end{aligned}$$



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$\overline{MA} = \text{Slope of } \frac{2}{4} = \frac{1}{2}$$
$$\overline{TH} = \text{Slope of } \frac{4}{8} = \frac{1}{2} \quad \parallel$$

Quadrilateral $MATH$ is a trapezoid, because in order to be a trapezoid you must have 1 pair of opposite sides that are \parallel . In $MATH$ both \overline{MA} and \overline{TH} are parallel. As well as opposite sides. Therefore quadrilateral $MATH$ is a trapezoid.

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

If A is the midpoint of \overline{MY} , then Y would be located at pt $(7, 3)$.

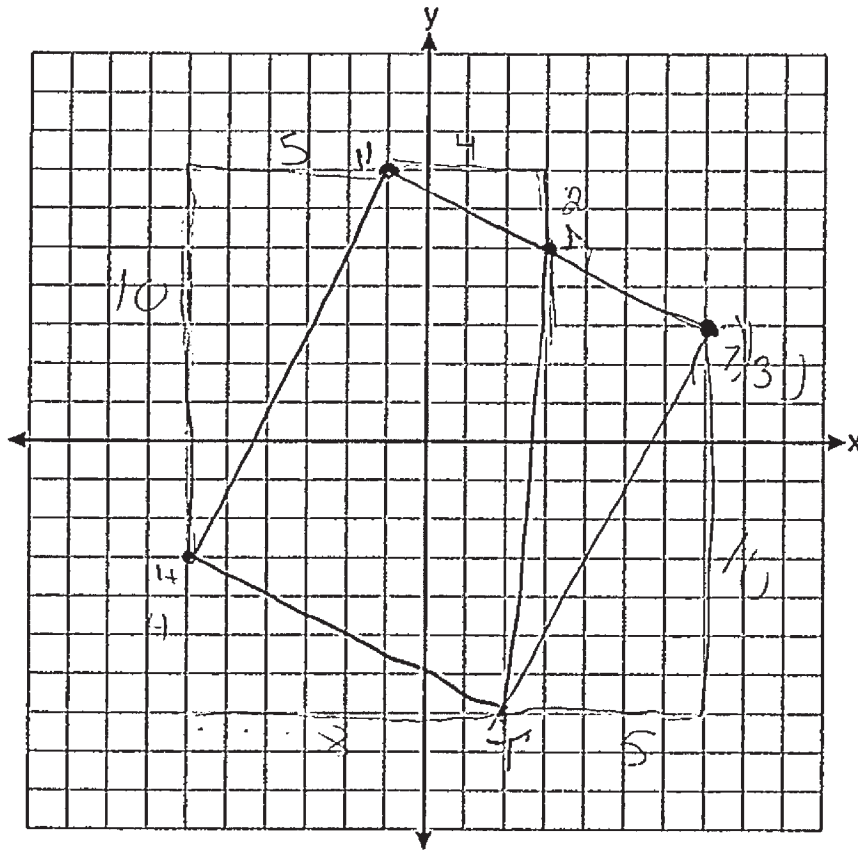
Question 35 is continued on the next page.

Score 2: The student made a computational error in determining the slopes of \overline{MA} and \overline{TH} . The student found the coordinates of Y . No further correct work was shown.

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

It is a rectangle b/c a rectangle has all 4 sides congruent. The opposite sides \overline{YT} and \overline{MH} are \parallel and opposite sides \overline{MY} and \overline{HT} are \parallel , \therefore there are 2 sets of opposite sides that are \parallel . Making $MYTH$ a rectangle.



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$(7,3)$

Question 35 is continued on the next page.

Score 2: The student found the coordinates of point Y and found the slopes of the sides, but did not prove the $MATH$ was a trapezoid and $MYTH$ was a rectangle.

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

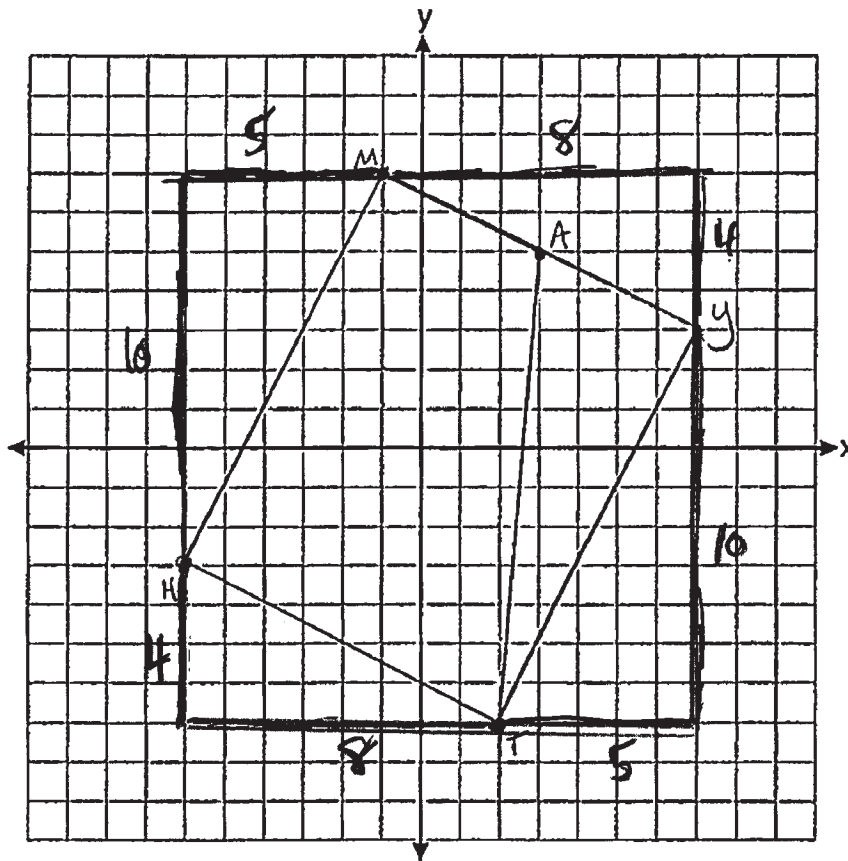
$$\text{slope}(\overline{MY}) = \frac{-4}{8} = -\frac{1}{2}$$

$$\text{slope}(\overline{HT}) = \frac{-4}{8} = -\frac{1}{2}$$

2 sets of congruent, parallel sides

$$\text{slope}(\overline{HM}) = \frac{10}{5} = 2$$

$$\text{slope}(\overline{TY}) = \frac{10}{5} = 2$$



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$\overline{HT} = \frac{-3 - (-7)}{-6 - (-2)} = \frac{4}{-8} = \left(\frac{2}{-4}\right)$$

$$\overline{MA} = \frac{5 - 7}{3 - (-1)} = \left(\frac{-2}{4}\right)$$

$$\overline{HM} = \frac{-3 - 7}{-6 - (-1)} = \frac{-10}{-5} = \left(\frac{2}{1}\right)$$

$$\overline{TA} = \frac{-7 - 5}{2 - 3} = \frac{-12}{-1} = \left(\frac{12}{1}\right)$$

The slope of \overline{HT} $\left(\frac{2}{-4}\right)$ is opposite reciprocal to \overline{MA} $\left(\frac{-2}{4}\right)$, therefore parallel.
The slopes of \overline{HM}

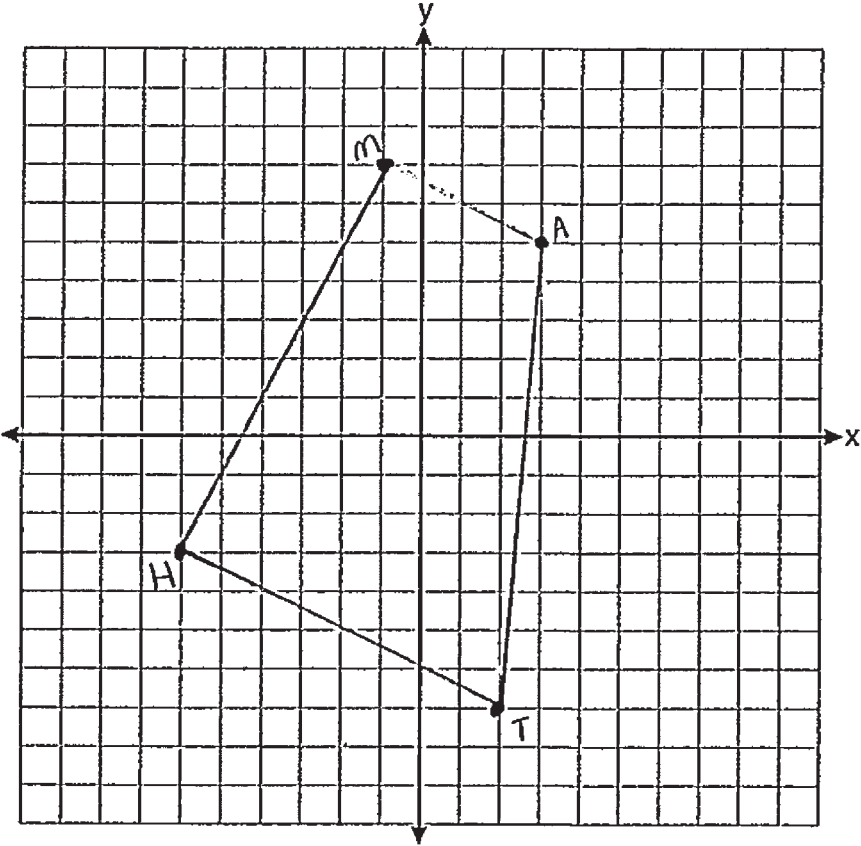
State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

Question 35 is continued on the next page.

Score 1: The student found the slopes of the sides of $MATH$. No further correct work was shown.

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

$$m_{\overline{HT}} = \frac{-7 - (-3)}{2 - (-6)} = \frac{-4}{8} = \left(-\frac{1}{2}\right)$$
$$m_{\overline{MA}} = \frac{5 - 7}{3 - (-1)} = \frac{-2}{4} = \left(-\frac{1}{2}\right)$$

Same slope

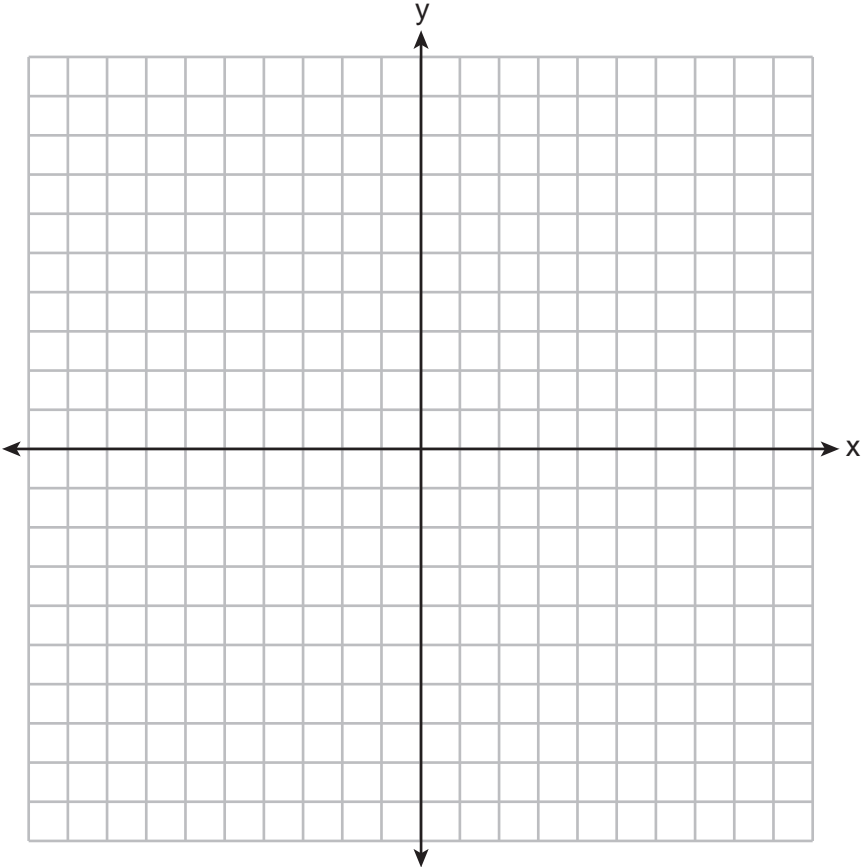
State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

Question 35 is continued on the next page.

Score 1: The student found the slopes of \overline{HT} and \overline{MA} . No further correct work was shown.

Question 35 continued.

Prove that quadrilateral *MYTH* is a rectangle. [The use of the set of axes below is optional.]



Question 35

35 Quadrilateral *MATH* has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral *MATH* is a trapezoid.

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

$$\frac{5-7}{3--1} = \frac{-2}{4}$$
$$\frac{-3+7}{-6-2} = \frac{4}{-8} = \frac{2}{-4}$$
$$\frac{-7-7}{2--1} = \frac{-14}{3}$$
$$\frac{-3-5}{-6-3} = \frac{-8}{9}$$

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

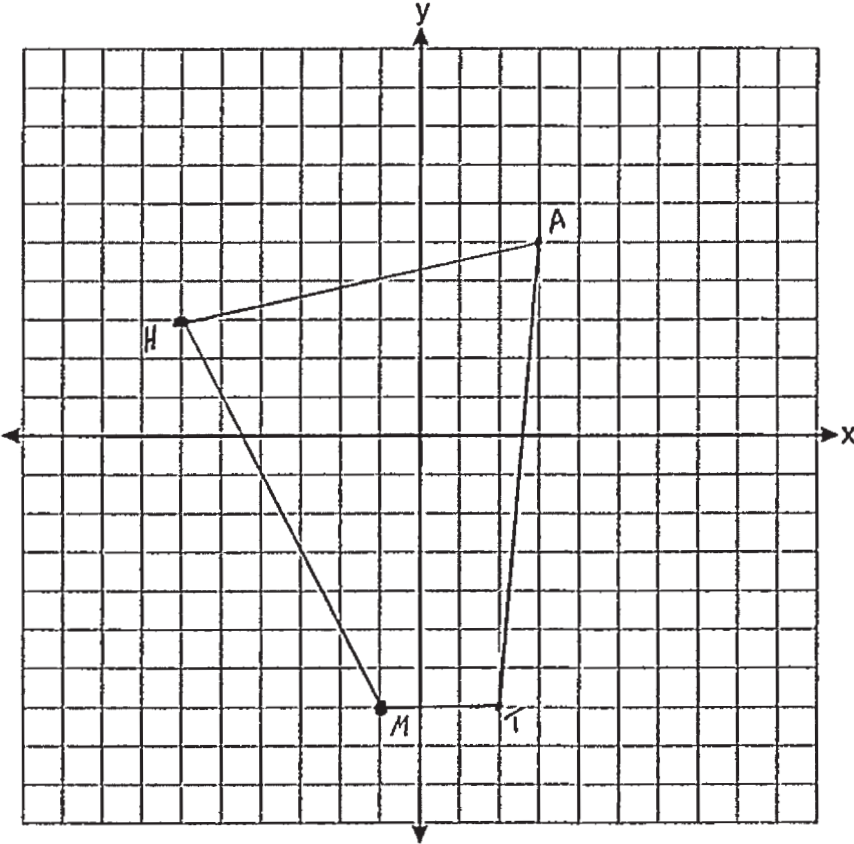
The points M and T show that it is a trapezoid since both are equal when plotted on a graph.

Question 35 is continued on the next page.

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

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]



Question 35

35 Quadrilateral $MATH$ has vertices with coordinates $M(-1,7)$, $A(3,5)$, $T(2,-7)$, and $H(-6,-3)$.

Prove that quadrilateral $MATH$ is a trapezoid.

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

Statements	Reasons
① Quad $MATH$ has vertices $M(-1,7)$, $A(3,5)$, $T(2,-7)$ and $H(-6,-3)$	① given
② $\overline{MA} \parallel \overline{HT}$ + $\overline{MH} \parallel \overline{AT}$	② In a quadrilateral opp. sides are \parallel
③ $\angle 1 \cong \angle 2$ + $\angle 3 \cong \angle 4$	③ If \parallel lines the \cong angles
④ quad $MATH$ is a trapezoid	④ SAS \cong SAS

State the coordinates of point Y such that point A is the midpoint of \overline{MY} .

$Y(6,3)$

Question 35 is continued on the next page.

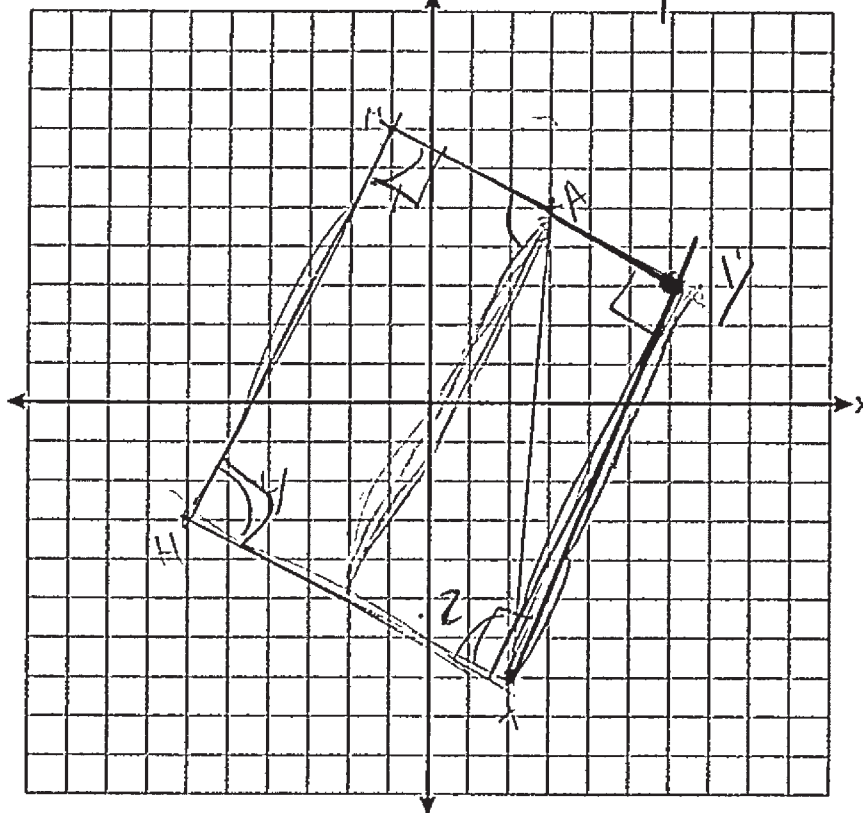
Score 0: The student had a completely incorrect response.

Question 35 continued.

Prove that quadrilateral $MYTH$ is a rectangle. [The use of the set of axes below is optional.]

Quadrilateral $MYTH$ is a rectangle because it has \cong sides and \perp s from the trapezoid.

Statements	Reasons
① $MYTH$ is a trapezoid	① Given
② $L_1, L_2, L_3 \perp L_4$ are right \perp s	② A mid point forms right \perp s
③ $L_1 \cong L_2 \cong L_3 \cong L_4$	③ All right \perp s are \cong
④ $MYTH$ is a rectangle	④ $AA \cong AA$



Regents Examination in Geometry – January 2024

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

(Use for the January 2024 exam only.)

Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level
80	100	5	53	79	3	26	61	2
79	98	5	52	78	3	25	60	2
78	97	5	51	78	3	24	59	2
77	96	5	50	77	3	23	57	2
76	95	5	49	77	3	22	56	2
75	94	5	48	76	3	21	55	2
74	93	5	47	76	3	20	53	1
73	92	5	46	75	3	19	51	1
72	91	5	45	75	3	18	50	1
71	90	5	44	74	3	17	48	1
70	90	5	43	74	3	16	46	1
69	89	5	42	73	3	15	44	1
68	88	5	41	73	3	14	42	1
67	87	5	40	72	3	13	40	1
66	87	5	39	72	3	12	38	1
65	86	5	38	71	3	11	36	1
64	86	5	37	70	3	10	33	1
63	85	5	36	70	3	9	31	1
62	84	4	35	69	3	8	28	1
61	83	4	34	68	3	7	25	1
60	83	4	33	67	3	6	22	1
59	82	4	32	67	3	5	19	1
58	82	4	31	66	3	4	16	1
57	81	4	30	65	3	3	12	1
56	80	4	29	64	2	2	9	1
55	80	4	28	63	2	1	4	1
54	79	3	27	62	2	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.