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

GEOMETRY

Friday, August 17, 2018 — 12:30 to 3:30 p.m., only

Student Name: _____

School Name: _____

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

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

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

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

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

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

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

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

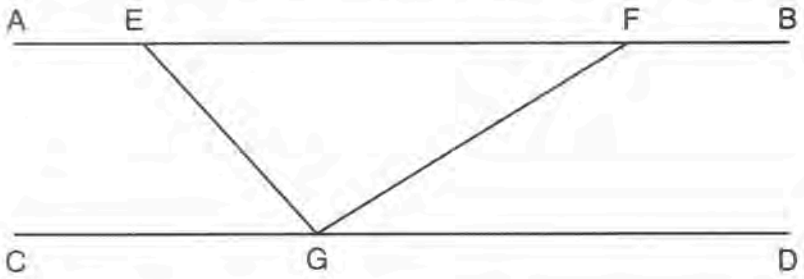
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

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

Use this space for computations.

1 In the diagram below, $\overline{AEFB} \parallel \overline{CGD}$, and $\overline{GE}$ and $\overline{GF}$ are drawn.



If $m\angle EFG = 32°$ and $m\angle AEG = 137°$, what is $m\angle EGF$?

(1) 11°
(2) 43°
(3) 75°
(4) 105°

2 If $\triangle ABC$ is mapped onto $\triangle DEF$ after a line reflection and $\triangle DEF$ is mapped onto $\triangle XYZ$ after a translation, the relationship between $\triangle ABC$ and $\triangle XYZ$ is that they are always

(1) congruent and similar
(2) congruent but not similar
(3) similar but not congruent
(4) neither similar nor congruent

Use this space for computations.

3 An isosceles right triangle whose legs measure 6 is continuously rotated about one of its legs to form a three-dimensional object. The three-dimensional object is a

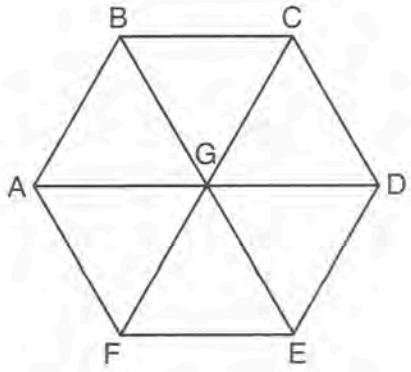
(1) cylinder with a diameter of 6

(2) cylinder with a diameter of 12

(3) cone with a diameter of 6

(4) cone with a diameter of 12

4 In regular hexagon $ABCDEF$ shown below, $\overline{AD}$, $\overline{BE}$, and $\overline{CF}$ all intersect at G.



When $\triangle ABG$ is reflected over $\overline{BG}$ and then rotated 180° about point G, $\triangle ABG$ is mapped onto

(1) $\triangle FEG$

(2) $\triangle AFG$

(3) $\triangle CBG$

(4) $\triangle DEG$

5 A right cylinder is cut perpendicular to its base. The shape of the cross section is a

(1) circle

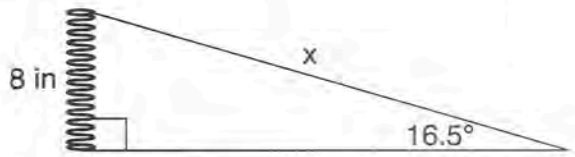
(2) cylinder

(3) rectangle

(4) triangular prism

Use this space for computations.

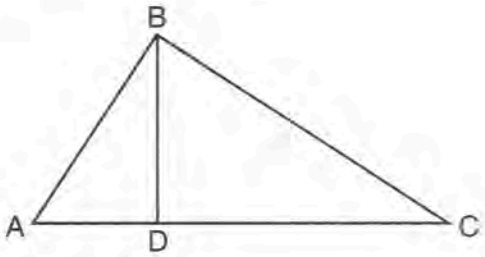
6 Yolanda is making a springboard to use for gymnastics. She has 8-inch-tall springs and wants to form a 16.5° angle with the base, as modeled in the diagram below.



To the *nearest tenth of an inch*, what will be the length of the springboard, x?

(1) 2.3
(2) 8.3
(3) 27.0
(4) 28.2

7 In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.



If $BD = 4$, $AD = x - 6$, and $CD = x$, what is the length of $\overline{CD}$?

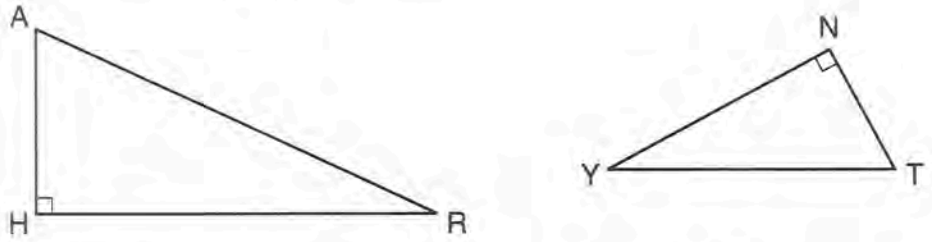
(1) 5
(2) 2
(3) 8
(4) 11

8 Rhombus $STAR$ has vertices $S(-1,2)$, $T(2,3)$, $A(3,0)$, and $R(0,-1)$. What is the perimeter of rhombus $STAR$?

(1) $\sqrt{34}$
(2) $4\sqrt{34}$
(3) $\sqrt{10}$
(4) $4\sqrt{10}$

Use this space for computations.

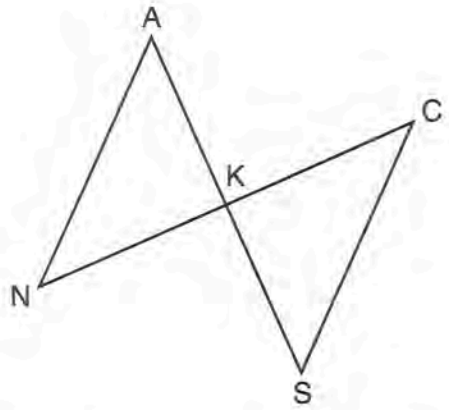
9 In the diagram below of $\triangle HAR$ and $\triangle NTY$, angles H and N are right angles, and $\triangle HAR \sim \triangle NTY$.



If $AR = 13$ and $HR = 12$, what is the measure of angle Y, to the *nearest degree*?

(1) 23°
(2) 25°
(3) 65°
(4) 67°

10 In the diagram below, $\overline{AKS}$, $\overline{NKC}$, $\overline{AN}$, and $\overline{SC}$ are drawn such that $\overline{AN} \cong \overline{SC}$.



Which additional statement is sufficient to prove $\triangle KAN \cong \triangle KSC$ by AAS?

(1) $\overline{AS}$ and $\overline{NC}$ bisect each other.
(2) K is the midpoint of $\overline{NC}$.
(3) $\overline{AS} \perp \overline{CN}$
(4) $\overline{AN} \parallel \overline{SC}$

Use this space for computations.

11 Which equation represents a line that is perpendicular to the line represented by $y = \frac{2}{3}x + 1$?

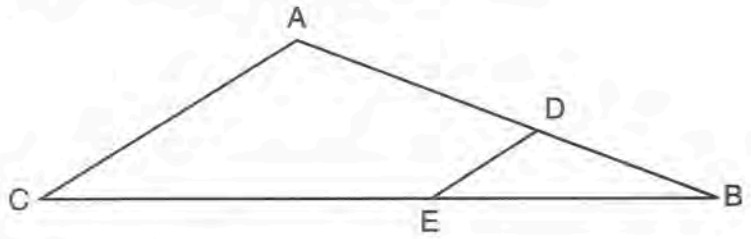
(1) $3x + 2y = 12$

(2) $3x - 2y = 12$

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

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

12 In the diagram of $\triangle ABC$ below, points D and E are on sides $\overline{AB}$ and $\overline{CB}$ respectively, such that $\overline{DE} \parallel \overline{AC}$.



If EB is 3 more than DB, $AB = 14$, and $CB = 21$, what is the length of $\overline{AD}$?

(1) 6

(2) 8

(3) 9

(4) 12

13 Quadrilateral $MATH$ has both pairs of opposite sides congruent and parallel. Which statement about quadrilateral $MATH$ is always true?

(1) $\overline{MT} \cong \overline{AH}$

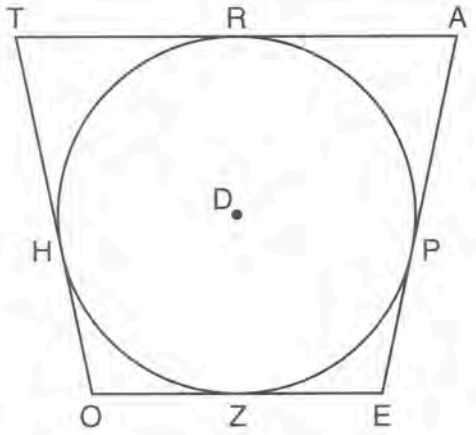
(2) $\overline{MT} \perp \overline{AH}$

(3) $\angle MHT \cong \angle ATH$

(4) $\angle MAT \cong \angle MHT$

Use this space for computations.

14 In the figure shown below, quadrilateral $TAEO$ is circumscribed around circle D. The midpoint of $\overline{TA}$ is R, and $\overline{HO} \cong \overline{PE}$.



If $AP = 10$ and $EO = 12$, what is the perimeter of quadrilateral $TAEO$?

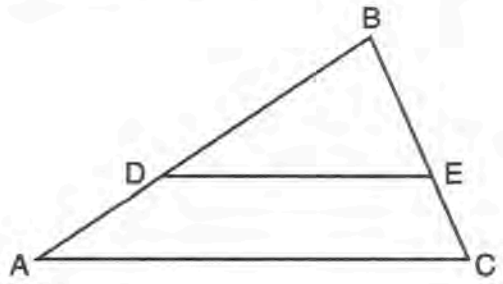
(1) 56
(2) 64
(3) 72
(4) 76

15 The coordinates of the endpoints of directed line segment ABC are $A(-8,7)$ and $C(7,-13)$. If $AB:BC = 3:2$, the coordinates of B are

(1) $(1,-5)$
(2) $(-2,-1)$
(3) $(-3,0)$
(4) $(3,-6)$

Use this space for computations.

16 In triangle ABC, points D and E are on sides $\overline{AB}$ and $\overline{BC}$, respectively, such that $\overline{DE} \parallel \overline{AC}$, and $AD:DB = 3:5$.

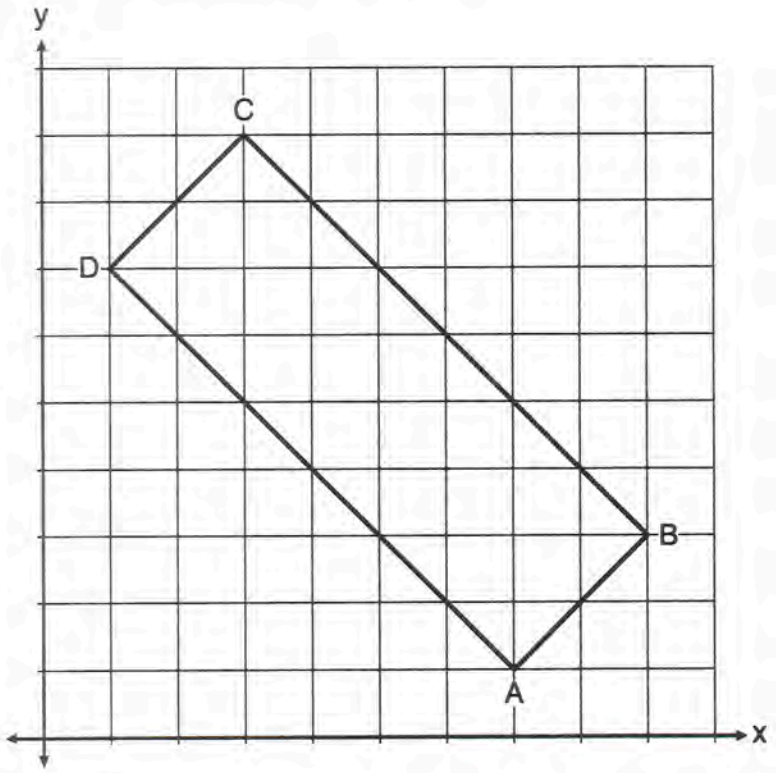


If $DB = 6.3$ and $AC = 9.4$, what is the length of $\overline{DE}$, to the *nearest tenth*?

(1) 3.8
(2) 5.6
(3) 5.9
(4) 15.7

Use this space for computations.

17 In the diagram below, rectangle $ABCD$ has vertices whose coordinates are $A(7,1)$, $B(9,3)$, $C(3,9)$, and $D(1,7)$.



Which transformation will *not* carry the rectangle onto itself?

(1) a reflection over the line $y = x$

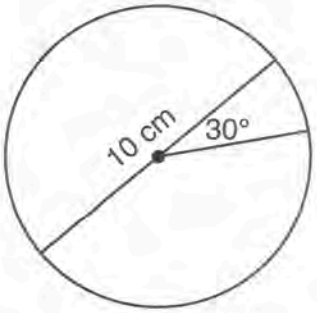
(2) a reflection over the line $y = -x + 10$

(3) a rotation of 180° about the point (6,6)

(4) a rotation of 180° about the point (5,5)

Use this space for computations.

18 A circle with a diameter of 10 cm and a central angle of 30° is drawn below.



What is the area, to the *nearest tenth of a square centimeter*, of the sector formed by the 30° angle?

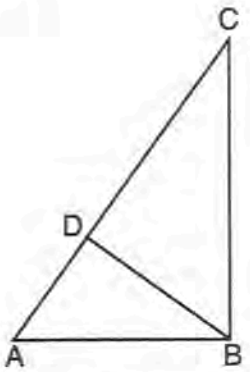
(1) 5.2
(2) 6.5
(3) 13.1
(4) 26.2

19 A child's tent can be modeled as a pyramid with a square base whose sides measure 60 inches and whose height measures 84 inches. What is the volume of the tent, to the *nearest cubic foot*?

(1) 35
(2) 58
(3) 82
(4) 175

Use this space for computations.

20 In the accompanying diagram of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.



Which statement must always be true?

(1) $\frac{AD}{AB} = \frac{BC}{AC}$

(2) $\frac{AD}{AB} = \frac{AB}{AC}$

(3) $\frac{BD}{BC} = \frac{AB}{AD}$

(4) $\frac{AB}{BC} = \frac{BD}{AC}$

21 An equation of circle O is $x^2 + y^2 + 4x - 8y = -16$. The statement that best describes circle O is the

(1) center is $(2,-4)$ and is tangent to the x-axis

(2) center is $(2,-4)$ and is tangent to the y-axis

(3) center is $(-2,4)$ and is tangent to the x-axis

(4) center is $(-2,4)$ and is tangent to the y-axis

22 In $\triangle ABC$, $\overline{BD}$ is the perpendicular bisector of $\overline{ADC}$. Based upon this information, which statements below can be proven?

I. $\overline{BD}$ is a median.

II. $\overline{BD}$ bisects $\angle ABC$.

III. $\triangle ABC$ is isosceles.

(1) I and II, only

(2) I and III, only

(3) II and III, only

(4) I, II, and III

Use this space for computations.

23 Triangle RJM has an area of 6 and a perimeter of 12. If the triangle is dilated by a scale factor of 3 centered at the origin, what are the area and perimeter of its image, triangle $R'J'M'$?

(1) area of 9 and perimeter of 15

(2) area of 18 and perimeter of 36

(3) area of 54 and perimeter of 36

(4) area of 54 and perimeter of 108

24 If $\sin(2x + 7)^\circ = \cos(4x - 7)^\circ$, what is the value of x?

(1) 7

(2) 15

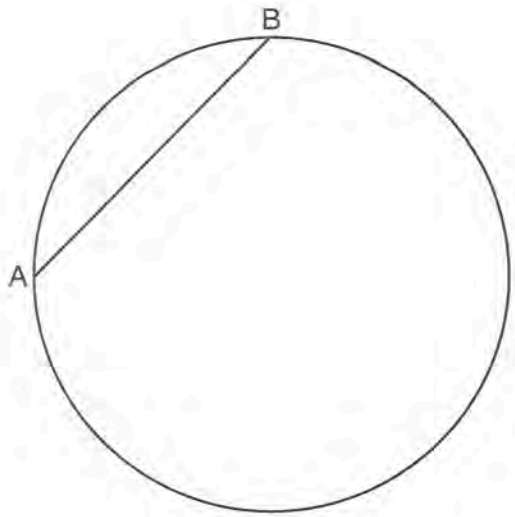
(3) 21

(4) 30

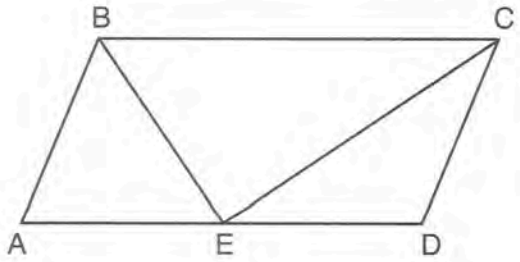
Part II

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

25 In the circle below, $\overline{AB}$ is a chord. Using a compass and straightedge, construct a diameter of the circle. [Leave all construction marks.]

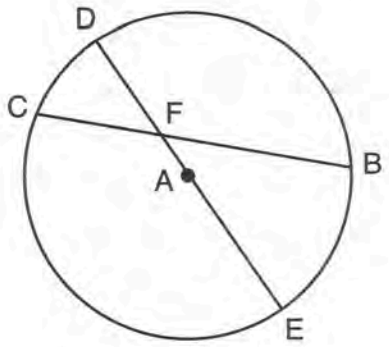


26 In parallelogram $ABCD$ shown below, the bisectors of $\angle ABC$ and $\angle DCB$ meet at E, a point on $\overline{AD}$.



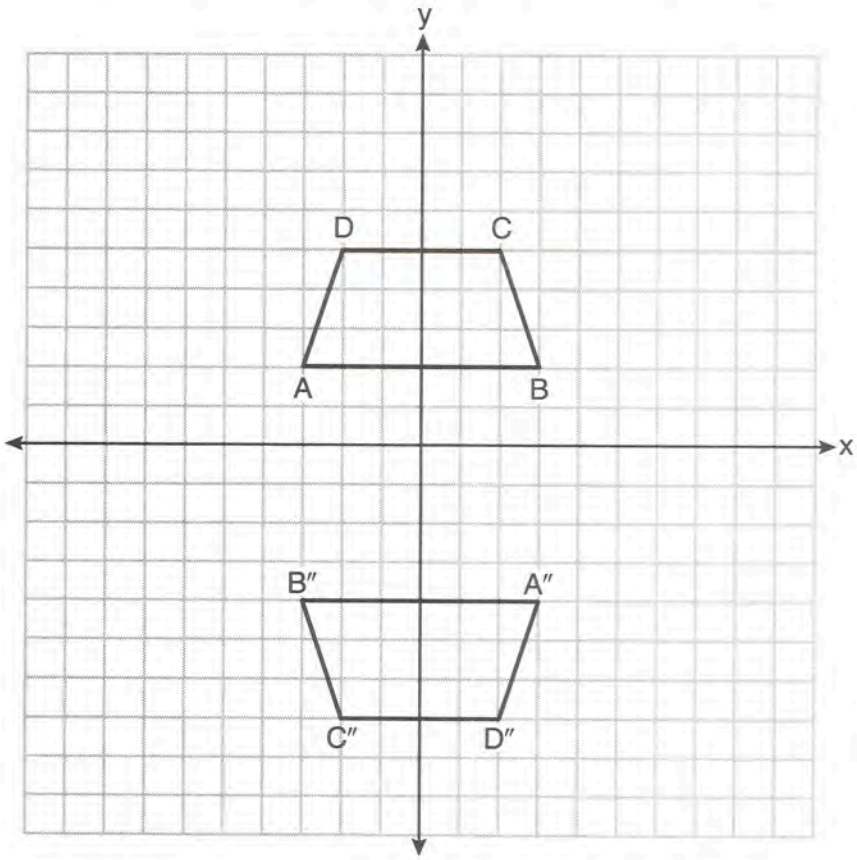
If $m\angle A = 68°$, determine and state $m\angle BEC$.

27 In circle A below, chord $\overline{BC}$ and diameter $\overline{DAE}$ intersect at F.



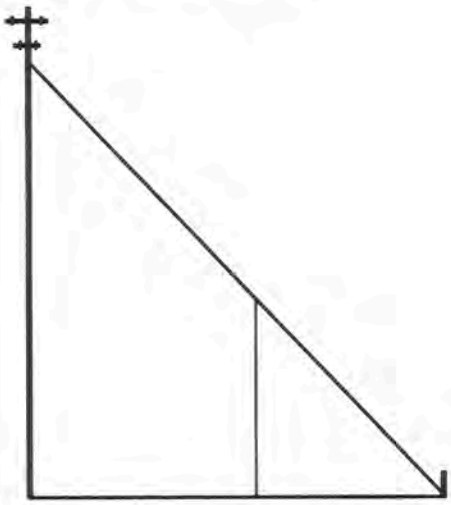
If $m\widehat{CD} = 46°$ and $m\widehat{DB} = 102°$, what is $m\angle CFE$?

28 Trapezoids $ABCD$ and $A''B''C''D''$ are graphed on the set of axes below.



Describe a sequence of transformations that maps trapezoid $ABCD$ onto trapezoid $A''B''C''D''$.

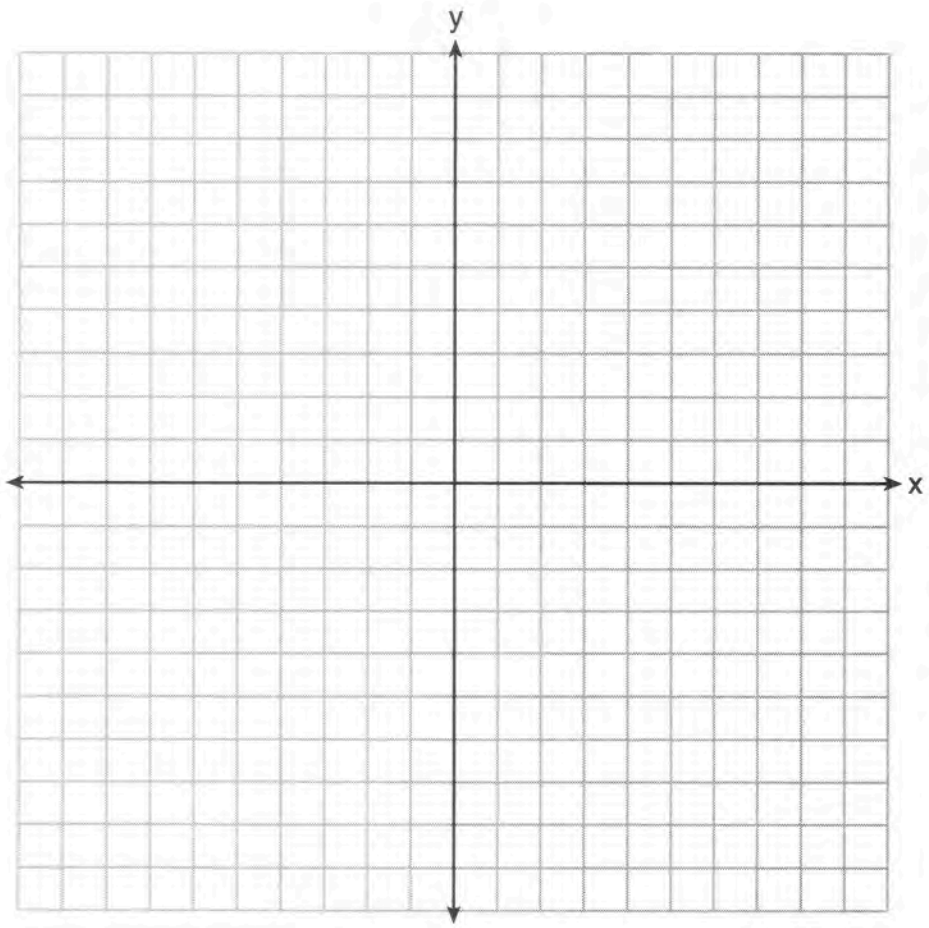
29 In the model below, a support wire for a telephone pole is attached to the pole and anchored to a stake in the ground 15 feet from the base of the telephone pole. Jamal places a 6-foot wooden pole under the support wire parallel to the telephone pole, such that one end of the pole is on the ground and the top of the pole is touching the support wire. He measures the distance between the bottom of the pole and the stake in the ground.



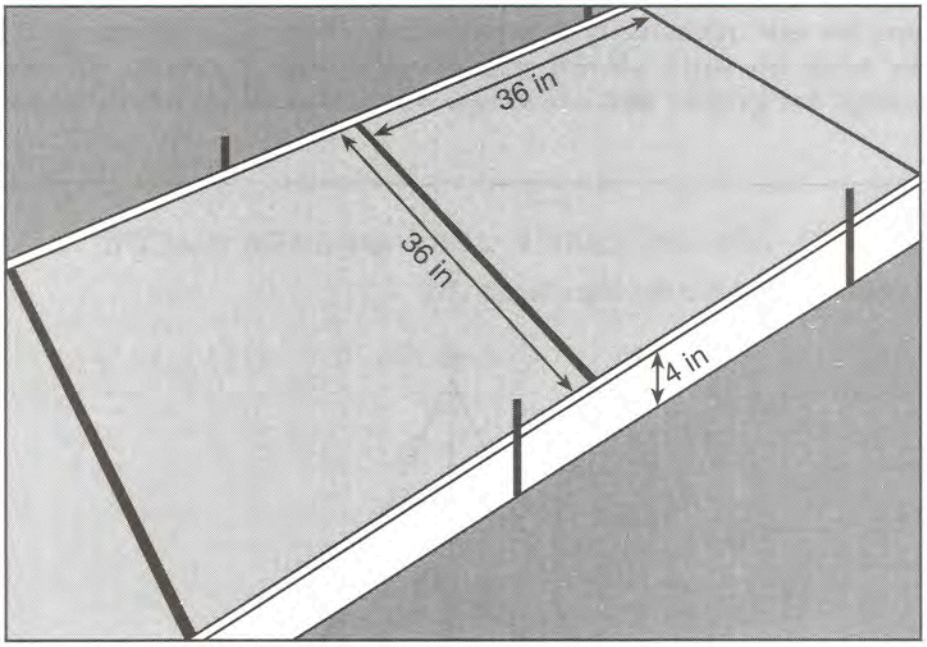
Jamal says he can approximate how high the support wire attaches to the telephone pole by using similar triangles. Explain why the triangles are similar.

30 Aliyah says that when the line $4x + 3y = 24$ is dilated by a scale factor of 2 centered at the point (3,4), the equation of the dilated line is $y = -\frac{4}{3}x + 16$. Is Aliyah correct? Explain why.

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



31 Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot.



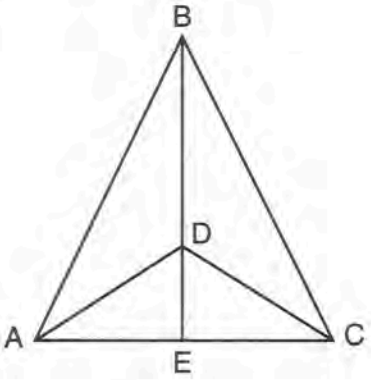
How much money will it cost Ian to replace the two concrete sections?

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 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$

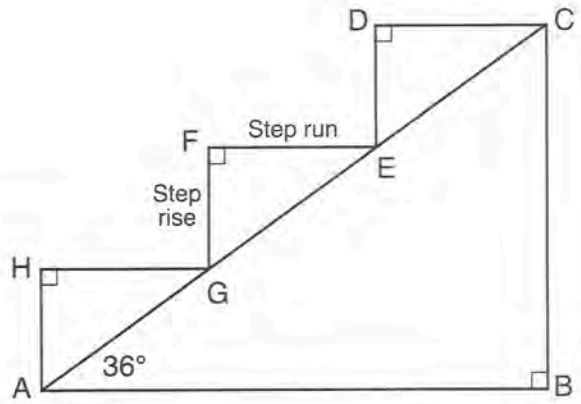
Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



Fill in the missing statement and reasons below.

Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) _____
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) _____	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6) _____
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) _____
	_____
	_____
	_____

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

34 A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.

The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3, determine and state, to the *nearest gram*, the total mass of the chocolate in the box.

GO RIGHT ON TO THE NEXT PAGE ➡

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 for the question to determine your answer. Note that diagrams are not necessarily drawn to scale. For the question 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. [6]

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

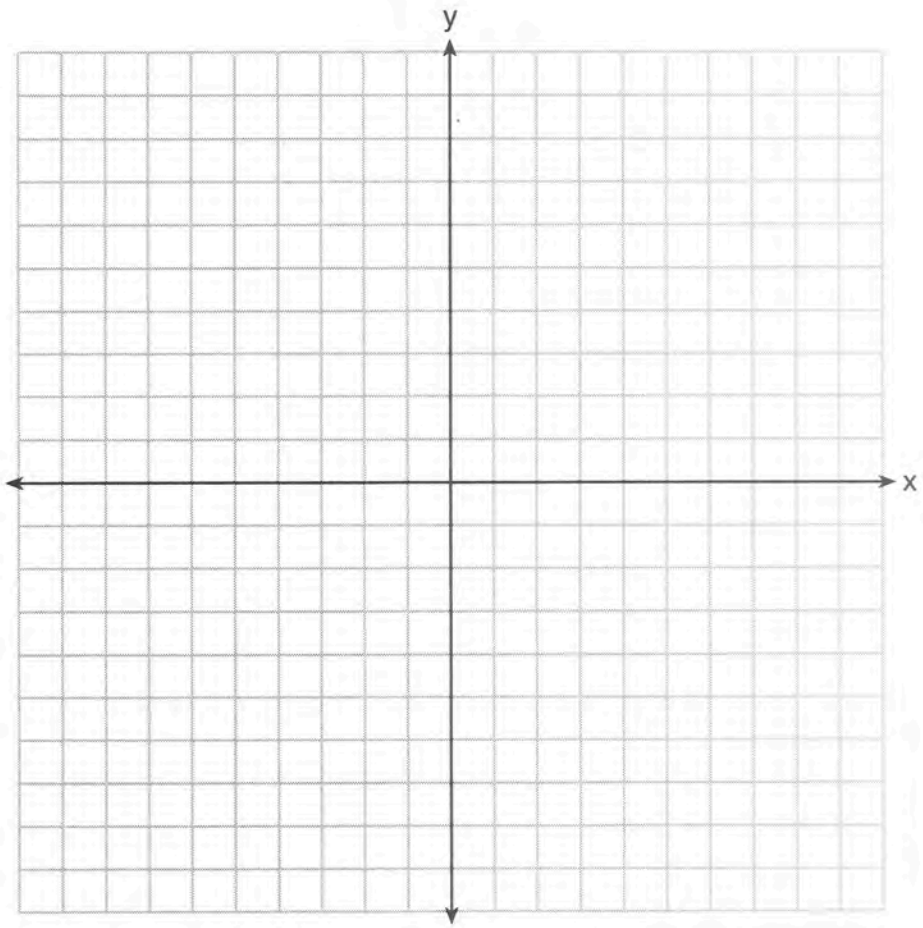
[The use of the set of axes on the next page is optional.]

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



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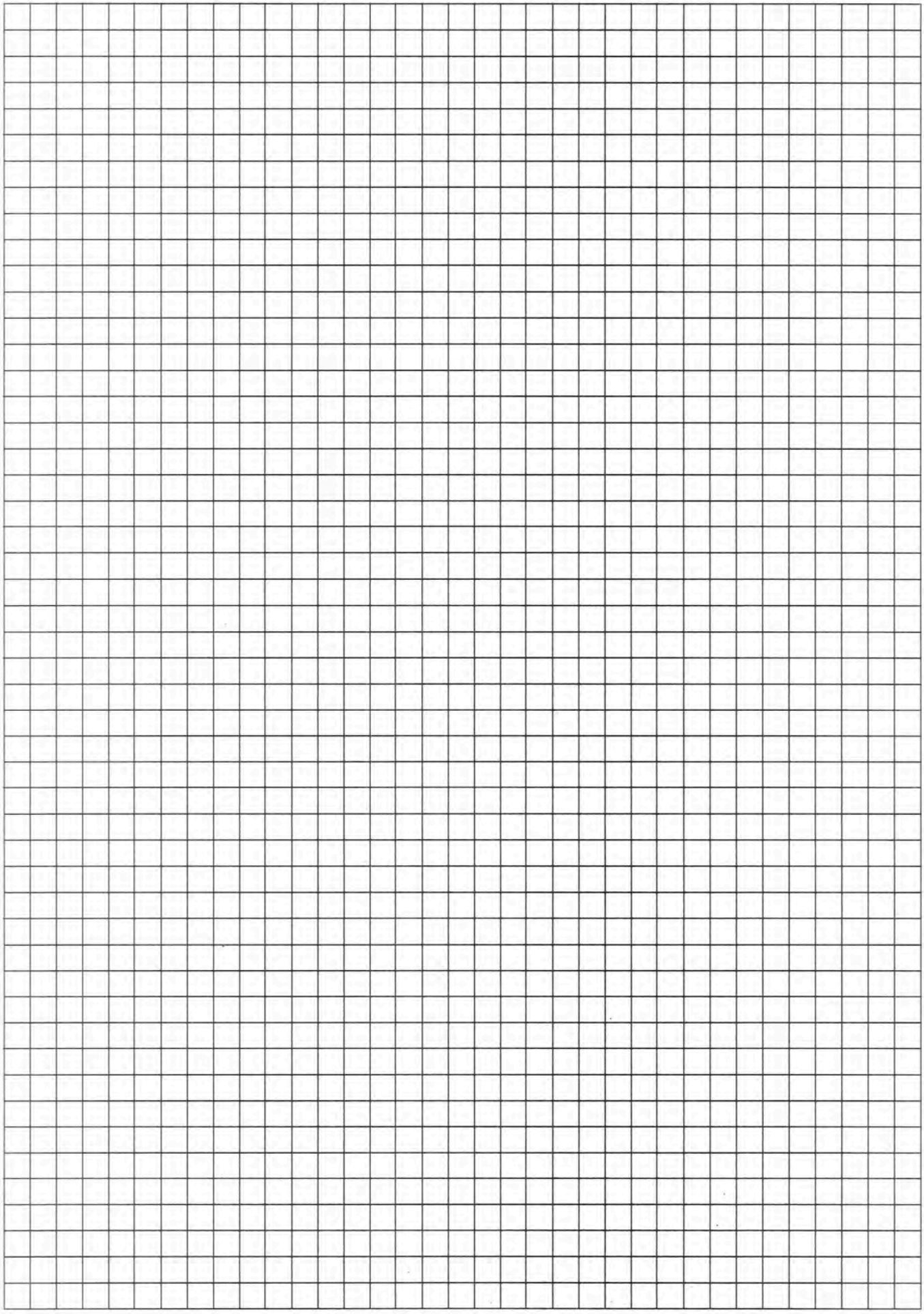
Scrap Graph Paper — This sheet will *not* be scored.



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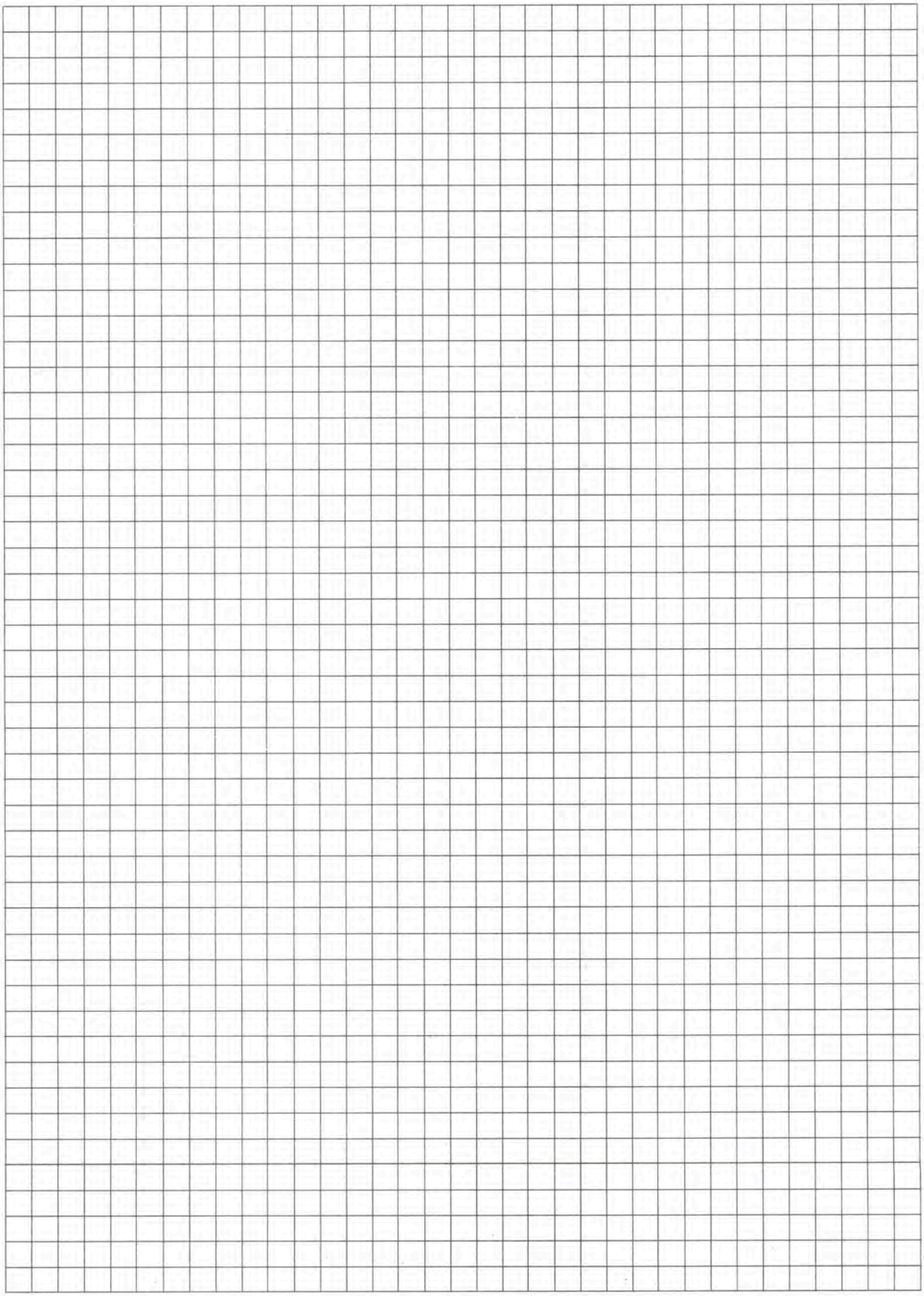

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High School Math Reference Sheet

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile = 1.609 kilometers

1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds
1 ton = 2000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
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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Tear Here

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GEOMETRY

FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Friday, August 17, 2018 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

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 open-ended 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 open-ended 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 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.

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: http://www.p12.nysed.gov/assessment/ on Friday, August 17, 2018. 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.

If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

Part I

Allow a total of 48 credits, 2 credits for each of the following. Allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 4	(9) 1	(17) . . . . . 3 . . . . .
(2) 1	(10) 4	(18) . . . . . 2 . . . . .
(3) 4	(11) 1	(19) . . . . . 2 . . . . .
(4) 1	(12) 2	(20) . . . . . 2 . . . . .
(5) 3	(13) 4	(21) . . . . . 4 . . . . .
(6) 4	(14) 2	(22) . . . . . 4 . . . . .
(7) 3	(15) 1	(23) . . . . . 3 . . . . .
(8) 4	(16) 3	(24) . . . . . 2 . . . . .

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: http://www.p12.nysed.gov/assessment/ 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: http://www.nysedregents.org/geometryre/.

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]** A correct construction is drawn showing all appropriate arcs.

[1] Appropriate arcs are drawn, but the diameter is not drawn.

or

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

[0] A drawing that is not an appropriate construction is shown.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(26) **[2]** 90, and correct work is shown, such as a labeled diagram.

[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] 90, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(27) **[2]** 118, 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] 118, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(28) **[2]** A correct sequence of transformations is described.

[1] An appropriate sequence of transformations is described, but one conceptual error is made.

or

[1] An appropriate sequence of transformations is written, but it is incomplete.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(29) **[2]** A complete and correct explanation is written.

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

or

[1] An incomplete or partially correct explanation is written.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(30) **[2]** No is indicated, and a complete and correct explanation is written.

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

or

[1] No, but an incomplete or partially correct explanation is written.

or

[1] Appropriate work is shown to determine (3,4) is on the line $4x + 3y = 24$, but the explanation is missing or incorrect.

[0] No, but the explanation is missing or incorrect.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(31) **[2]** 19.50, 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] Correct work is shown to find the volume of the two concrete sections, but no further correct work is shown.

or

[1] 19.50, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent 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]** Four statements or reasons are correct.

[3] Three statements or reasons are correct.

[2] Two statements or reasons are correct.

[1] One statement or reason is correct.

[0] No statement or reason is correct.

(33) **[4]** 7.3, 37, and correct work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Correct work is shown to find 7.3 or 37, but no further correct work is shown.

or

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or

[1] A correct trigonometric equation is written, but no further correct work is shown.

or

[1] 7.3 and 37, but no work is shown.

[0] 7.3 or 37, and no work is shown.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(34) **[4]** 19.4 and 203, and correct work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

or

[3] The volume and mass of one hollow chocolate sphere are found correctly, 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] The volume of one hollow chocolate sphere is found correctly, 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] The volume of a solid chocolate sphere is found correctly, but no further correct work is shown.

or

[1] 19.4 and 203, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part IV

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

(35) **[6]** A complete and correct proof that includes concluding statements that *MATH* is a parallelogram and *MATH* is a rectangle is written.

[5] Appropriate work is shown, but one computational or graphing error is made. Appropriate concluding statements are written.

or

[5] Appropriate work is shown to prove *MATH* is a parallelogram and a rectangle. One concluding statement is missing or incorrect.

[4] Appropriate work is shown, but two or more computational or graphing errors are made. Appropriate concluding statements are written.

or

[4] Appropriate work is shown, but one conceptual error is made. Appropriate concluding statements are written.

[3] Appropriate work is shown, but one conceptual error and one computational or graphing error are made. Appropriate concluding statements are written.

or

[3] Appropriate work is shown to prove *MATH* is a parallelogram, and a concluding statement is written. No further correct work is shown.

or

[3] Appropriate work is shown to prove *MATH* is a rectangle, and a concluding statement is written. No further correct work is shown.

[2] Appropriate work is shown, but two conceptual errors are made. Appropriate concluding statements are written.

or

[2] Appropriate work is shown, but one conceptual error and two or more computational or graphing errors are made. Appropriate concluding statements are written.

or

[2] Appropriate work is shown to prove two pairs of opposite sides are parallel. No further correct work is shown.

or

[2] Appropriate work is shown to prove two pairs of opposite sides are congruent to each other. No further correct work is shown.

or

[2] Appropriate work is shown to prove one pair of opposite sides are congruent and parallel. No further correct work is shown.

or

[2] Appropriate work is shown to prove the diagonals bisect each other, but no further correct work is shown.

[1] Appropriate work is shown, but two conceptual errors and one computational or graphing error are made. Appropriate concluding statements are written.

or

[1] Appropriate work is shown to find the slopes or lengths of all four sides. No further correct work is shown.

or

[1] Appropriate work is shown to find the slopes and lengths of one pair of opposite sides. No further correct work is shown.

or

[1] Appropriate work is shown to find the midpoints or lengths of both diagonals. No further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Map to the Core Learning Standards
Geometry
August 2018

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

Regents Examination in Geometry

August 2018

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

The *Chart for Determining the Final Examination Score for the August 2018 Regents Examination in Geometry* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Friday, August 17, 2018. 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 http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm.

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

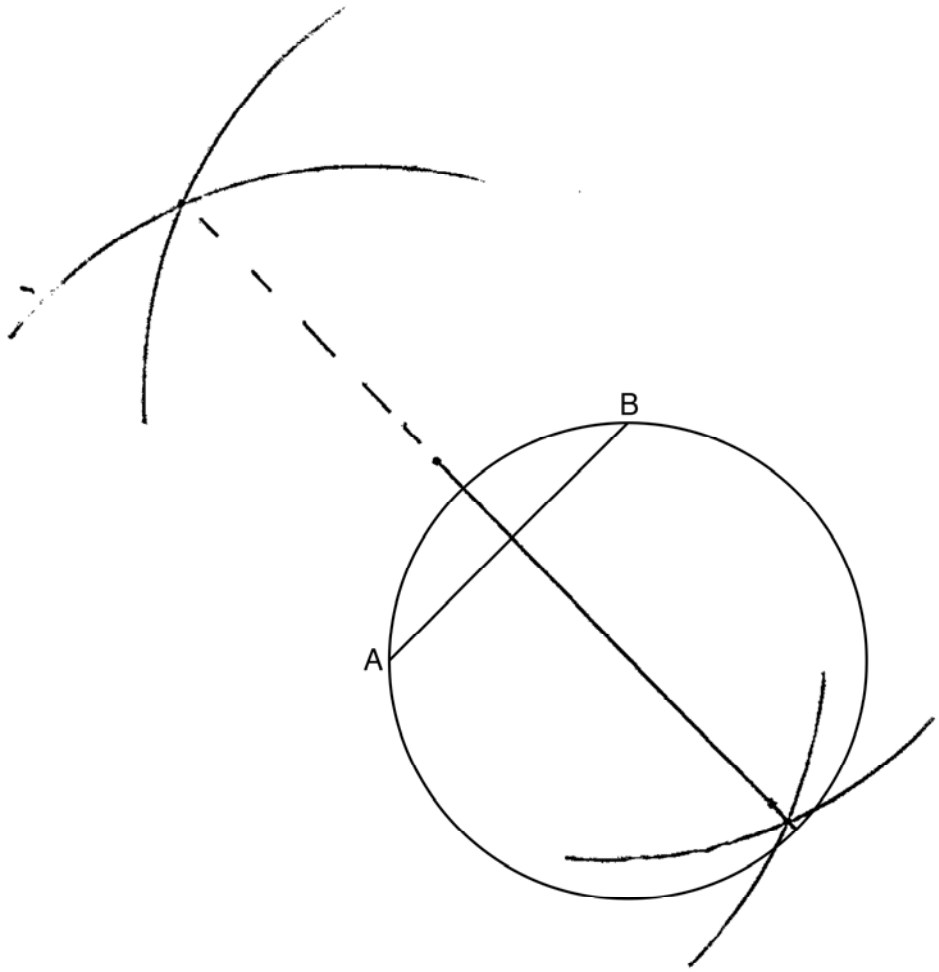
Friday, August 17, 2018 — 12:30 to 3:30 p.m.

MODEL RESPONSE SET

Table of Contents

Question 25

25 In the circle below, $\overline{AB}$ is a chord. Using a compass and straightedge, construct a diameter of the circle. [Leave all construction marks.]

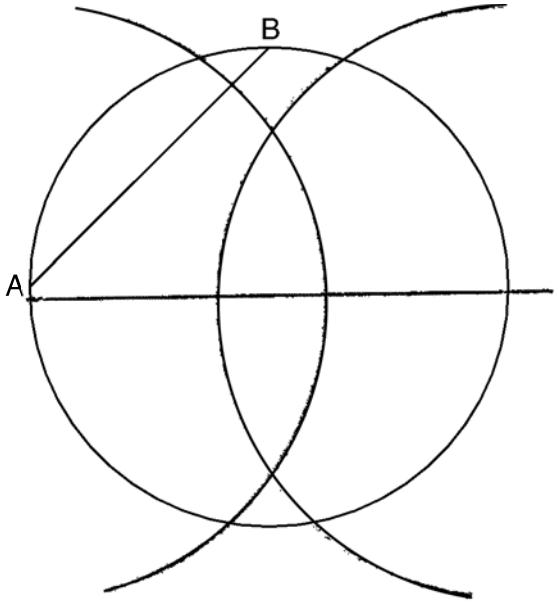


Score 2: The student gave a complete and correct response.

[2]

Question 25

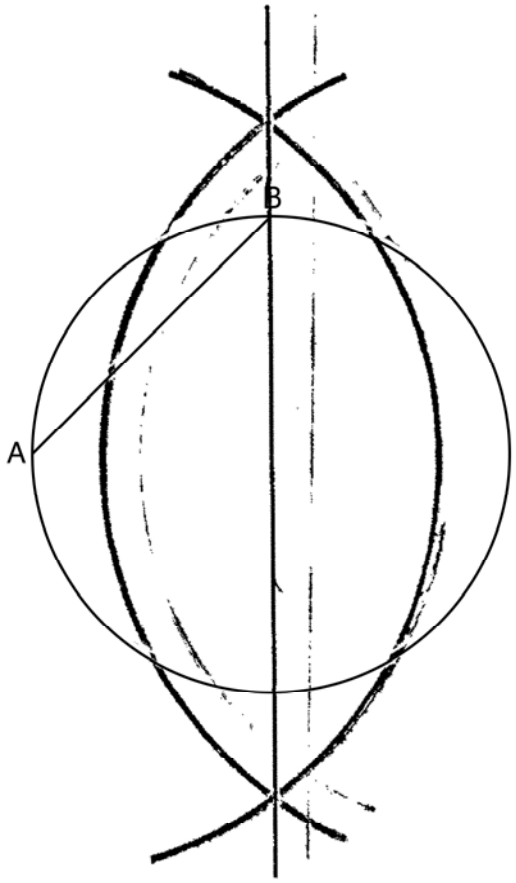
25 In the circle below, $\overline{AB}$ is a chord. Using a compass and straightedge, construct a diameter of the circle. [Leave all construction marks.]



Score 1: The student drew appropriate arcs for a chord other than $\overline{AB}$, but did not draw the diameter.

Question 25

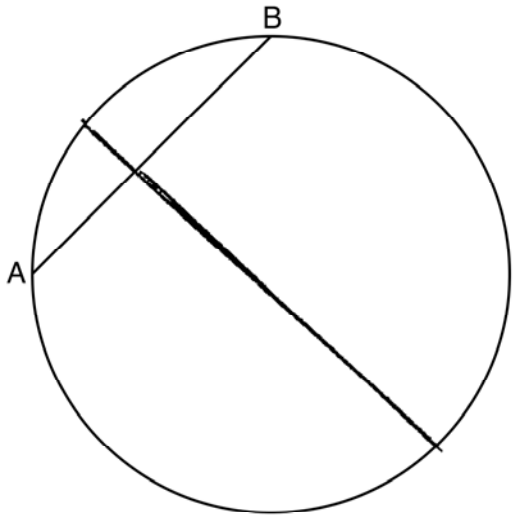
25 In the circle below, $\overline{AB}$ is a chord. Using a compass and straightedge, construct a diameter of the circle. [Leave all construction marks.]



Score 1: The student drew an appropriate construction, but the endpoint of the chord used is missing.

Question 25

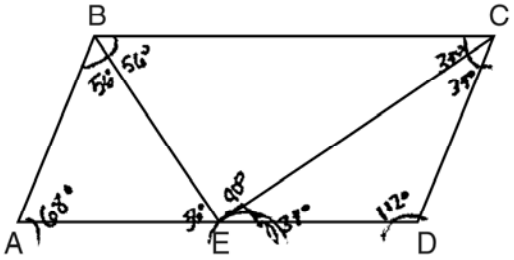
25 In the circle below, $\overline{AB}$ is a chord. Using a compass and straightedge, construct a diameter of the circle. [Leave all construction marks.]



Score 0: The student gave a completely incorrect response.

Question 26

26 In parallelogram $ABCD$ shown below, the bisectors of $\angle ABC$ and $\angle DCB$ meet at E, a point on $\overline{AD}$.



If m$\angle A = 68°$, determine and state m$\angle BEC$.

m∠BEC = 90°

* Numbered all of the steps

① Splits angle in half

② opposite angles are equal!!

180 − 68 = 112

112 ÷ 2 = 56

③ 56 + 34 = 90

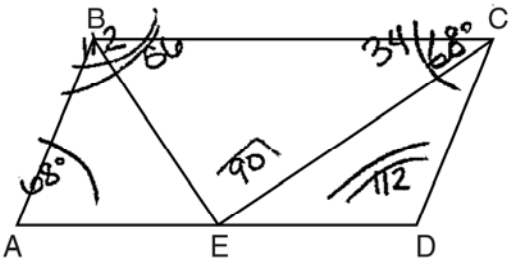
④ 180 − 90 = 90

Find out all the parts and subtract them from 180°. (Final step)

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

Question 26

26 In parallelogram $ABCD$ shown below, the bisectors of $\angle ABC$ and $\angle DCB$ meet at E, a point on $\overline{AD}$.



If m$\angle A = 68°$, determine and state m$\angle BEC$.

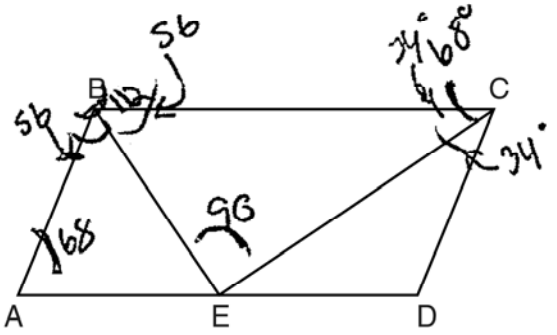
$360 - 68(2) = \frac{224}{2} = 112$

$m\angle BEC = 90°$

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

Question 26

26 In parallelogram $ABCD$ shown below, the bisectors of $\angle ABC$ and $\angle DCB$ meet at E, a point on $\overline{AD}$.



If $m\angle A = 68°$, determine and state $m\angle BEC$.

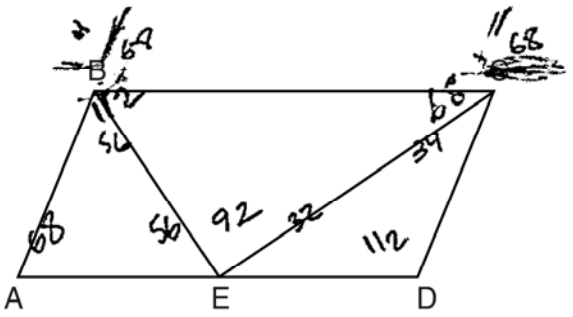
Statements | Reasons

1. $\overline{BE}$ & $\overline{CE}$ bisect $\angle ABC$ & $\angle DCB$ — 1. Given
   $\angle A = 68°$
   ABCD is a parallelogram
2. $\angle ABC = 112°$ — 2. adjacent $\angle$'s in a parallelogram are supp.
3. $\angle DCB = 68°$ — 3. opposite $\angle$'s in a parallelogram are $\cong$
4. $\angle EBC = 56°$, $\angle ECB = 34°$ — 4. Angle bisectors cut $\angle$'s in half
5. $\angle BEC = 90$ — 5. all angles in a triangle add to 180

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

Question 26

26 In parallelogram $ABCD$ shown below, the bisectors of $\angle ABC$ and $\angle DCB$ meet at E, a point on $\overline{AD}$.



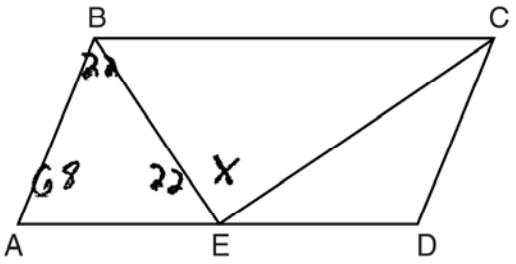
If $m\angle A = 68°$, determine and state $m\angle BEC$.

$m\angle BEC = 92°$

Score 1: The student made one computational error in determining $m\angle CED$.

Question 26

26 In parallelogram $ABCD$ shown below, the bisectors of $\angle ABC$ and $\angle DCB$ meet at E, a point on $\overline{AD}$.



If $m\angle A = 68°$, determine and state $m\angle BEC$.

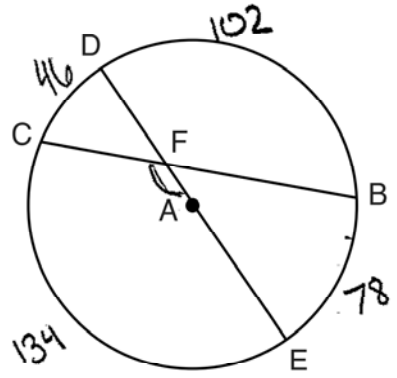
Consecutive angles are supplementary

180 - 68 = 112

Score 0: The student gave a completely incorrect response.

Question 27

27 In circle A below, chord $\overline{BC}$ and diameter $\overline{DAE}$ intersect at F.



If $m\widehat{CD} = 46°$ and $m\widehat{DB} = 102°$, what is $m\angle CFE$?

$$\frac{134 + 102}{2} = m\angle CFE$$

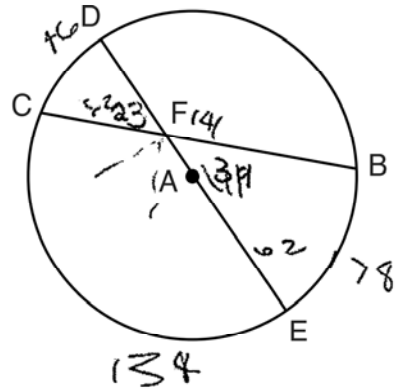
$$118 = m\angle CFE$$

Int. Vertical $\angle$s have a measure = $\frac{1}{2}$ sum intercepted arcs.

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

Question 27

27 In circle A below, chord $\overline{BC}$ and diameter $\overline{DAE}$ intersect at F.



If $m\overset{\frown}{CD} = 46°$ and $m\overset{\frown}{DB} = 102°$, what is $m\angle CFE$?

$(46 + 78)/2 = 62$

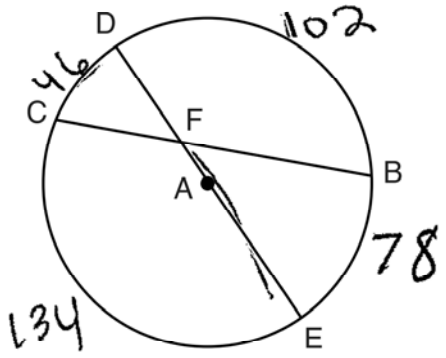
$180 - 62 = 118$

$118°$

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

Question 27

27 In circle A below, chord $\overline{BC}$ and diameter $\overline{DAE}$ intersect at F.



If $m\overset{\frown}{CD} = 46°$ and $m\overset{\frown}{DB} = 102°$, what is $m\angle CFE$?

180 - 102 = 78

180 - 46 = 134

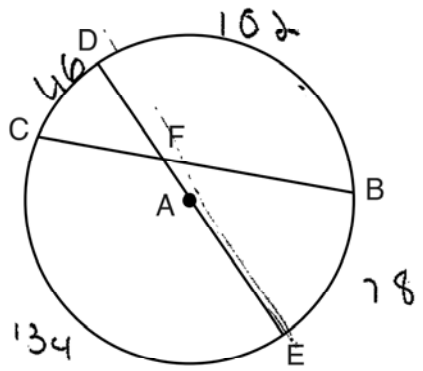
$\frac{134}{2} = 67$

m∠CFE = 67°

Score 1: The student made an error by taking half of $\overset{\frown}{CE}$ to find $m\angle CFE$.

Question 27

27 In circle A below, chord $\overline{BC}$ and diameter $\overline{DAE}$ intersect at F.



If $m\widehat{CD} = 46°$ and $m\widehat{DB} = 102°$, what is $m\angle CFE$?

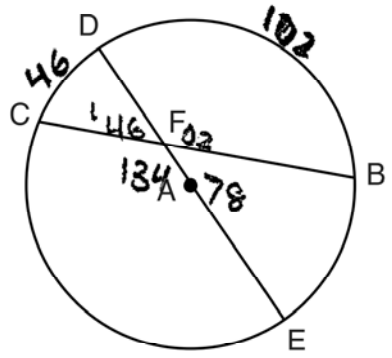
102
+132
234
2

117°

Score 1: The student made a transcription error on $\widehat{CE}$.

Question 27

27 In circle A below, chord $\overline{BC}$ and diameter $\overline{DAE}$ intersect at F.



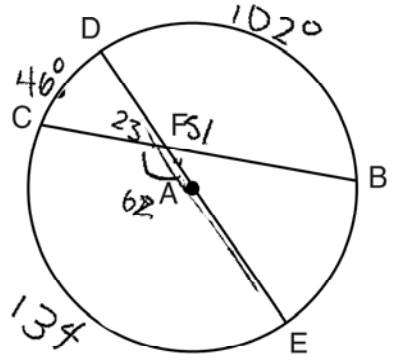
If $m\widehat{CD} = 46°$ and $m\widehat{DB} = 102°$, what is $m\angle CFE$?

$m\angle CFE = 134°$

Score 1: The student made an error in thinking $\angle CFE$ is a central angle.

Question 27

27 In circle A below, chord $\overline{BC}$ and diameter $\overline{DAE}$ intersect at F.



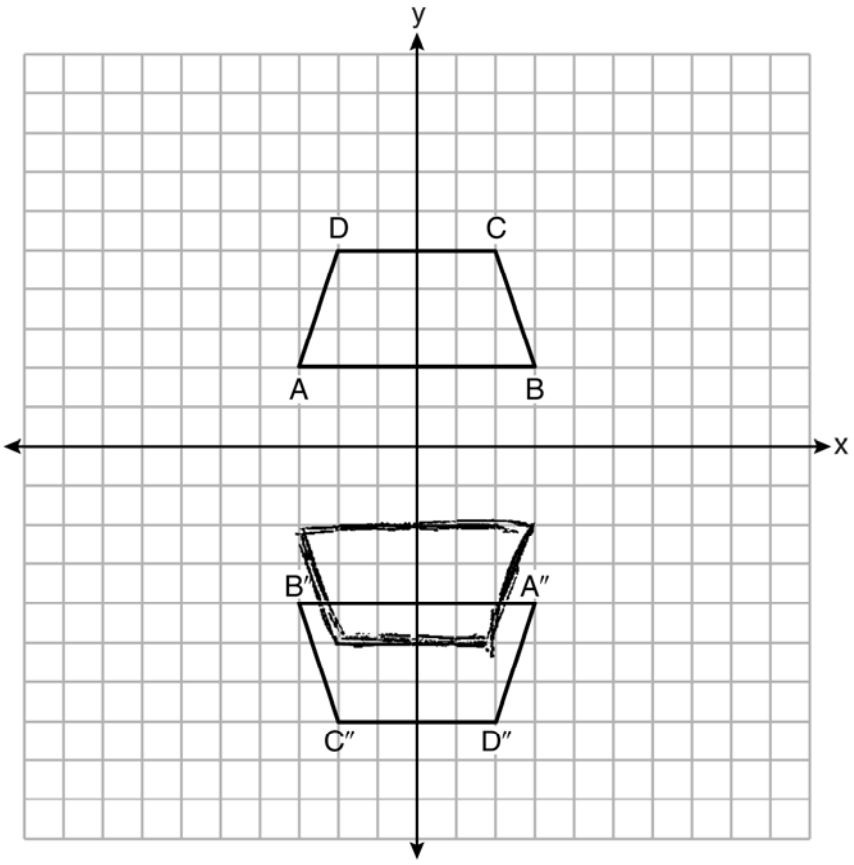
If $m\widehat{CD} = 46°$ and $m\widehat{DB} = 102°$, what is $m\angle CFE$?

m∠CFE is 62°

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

Question 28

28 Trapezoids *ABCD* and *A″B″C″D″* are graphed on the set of axes below.



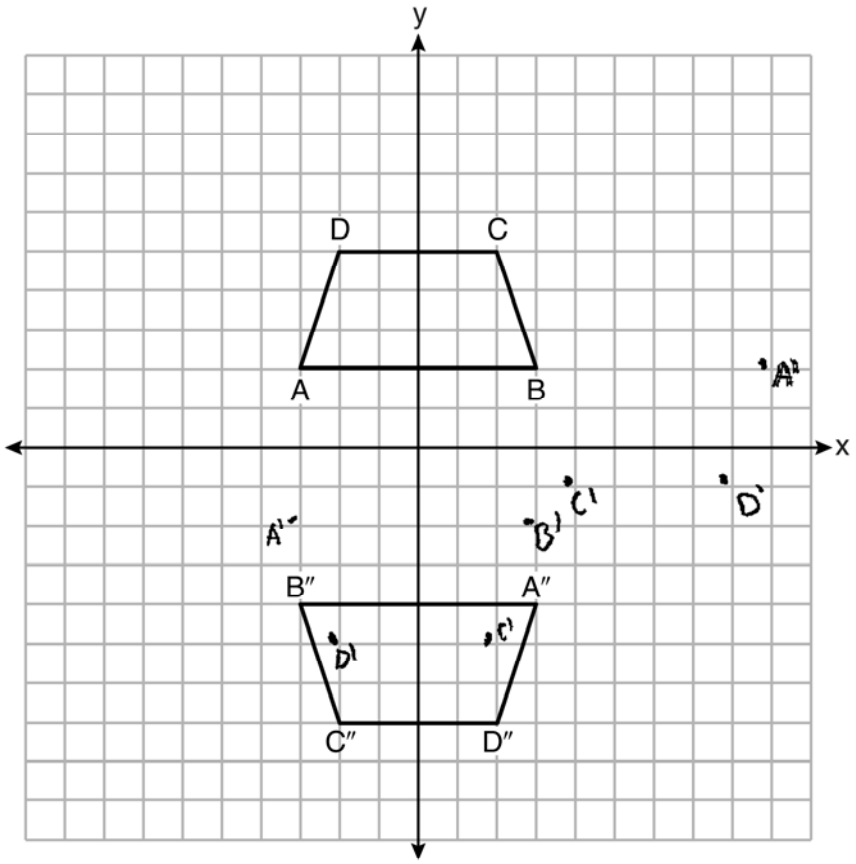
Describe a sequence of transformations that maps trapezoid *ABCD* onto trapezoid *A″B″C″D″*.

① A rotation of 180° on the origin
② A translation of two units down

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

Question 28

28 Trapezoids *ABCD* and *A″B″C″D″* are graphed on the set of axes below.



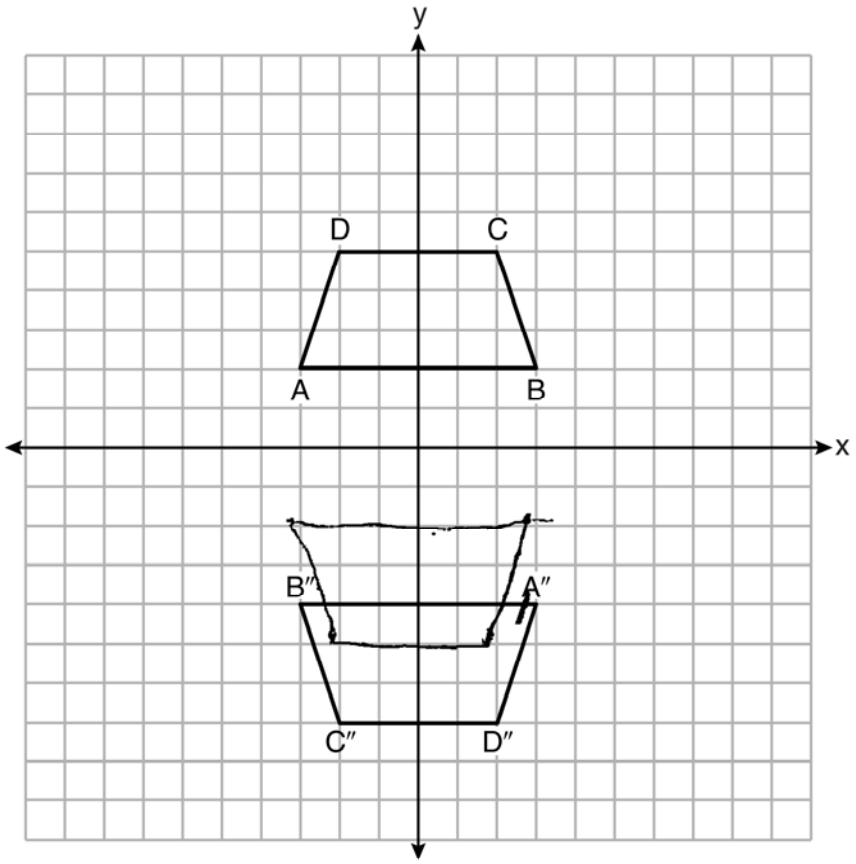
Describe a sequence of transformations that maps trapezoid *ABCD* onto trapezoid *A″B″C″D″*.

R 180° at point B
Translation of 6 units down & 6 units left

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

Question 28

28 Trapezoids *ABCD* and *A″B″C″D″* are graphed on the set of axes below.



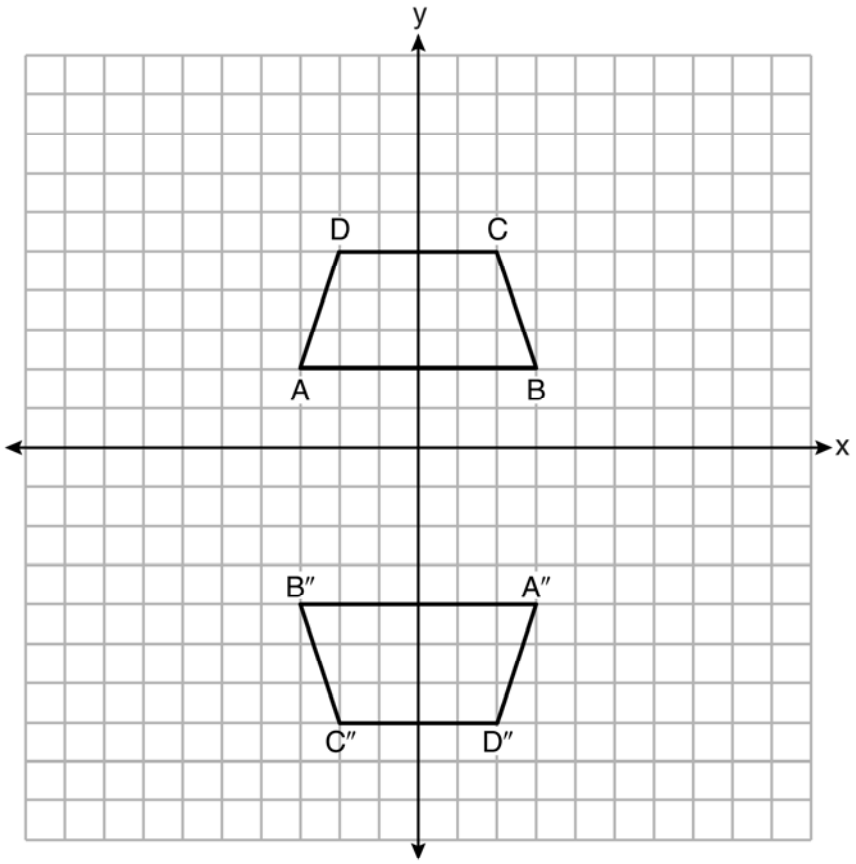
Describe a sequence of transformations that maps trapezoid *ABCD* onto trapezoid *A″B″C″D″*.

1. reflection over x-axis
2. translation down 2 units
3. reflection over y-axis

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

Question 28

28 Trapezoids *ABCD* and *A″B″C″D″* are graphed on the set of axes below.



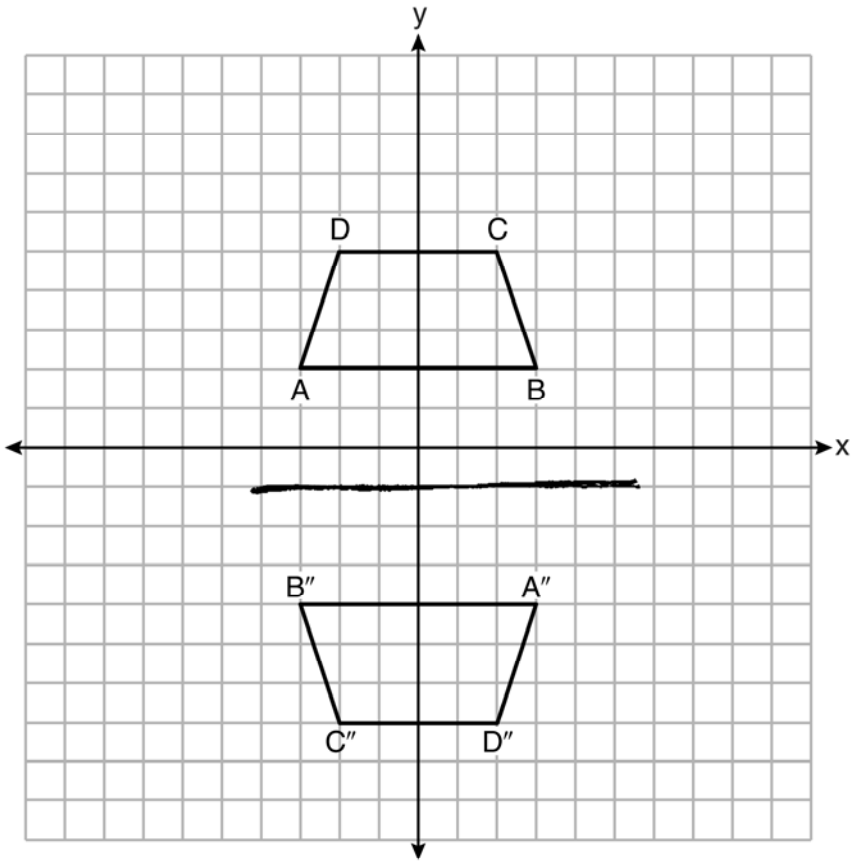
Describe a sequence of transformations that maps trapezoid *ABCD* onto trapezoid *A″B″C″D″*.

A reflection of ABCD over the y-axis.
Another refleetion over the x-axis.
Translation down 1 unit.

Score 1: The student made one error in stating the translation of down one instead of down two.

Question 28

28 Trapezoids $ABCD$ and $A''B''C''D''$ are graphed on the set of axes below.



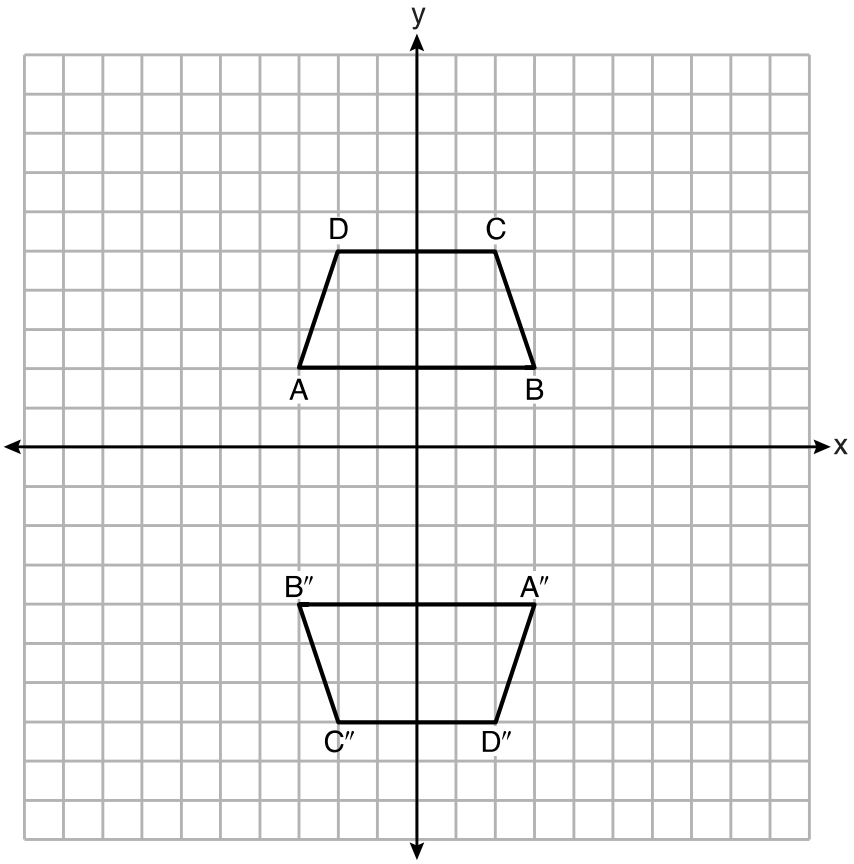
Describe a sequence of transformations that maps trapezoid $ABCD$ onto trapezoid $A''B''C''D''$.

A reflection over (y=-1) maps ABCD onto A''B''C''D', since its Rigid motion only orientation changes

Score 1: The student made an error by mapping trapezoid $ABCD$ onto trapezoid $B''A''D''C''$.

Question 28

28 Trapezoids *ABCD* and *A″B″C″D″* are graphed on the set of axes below.



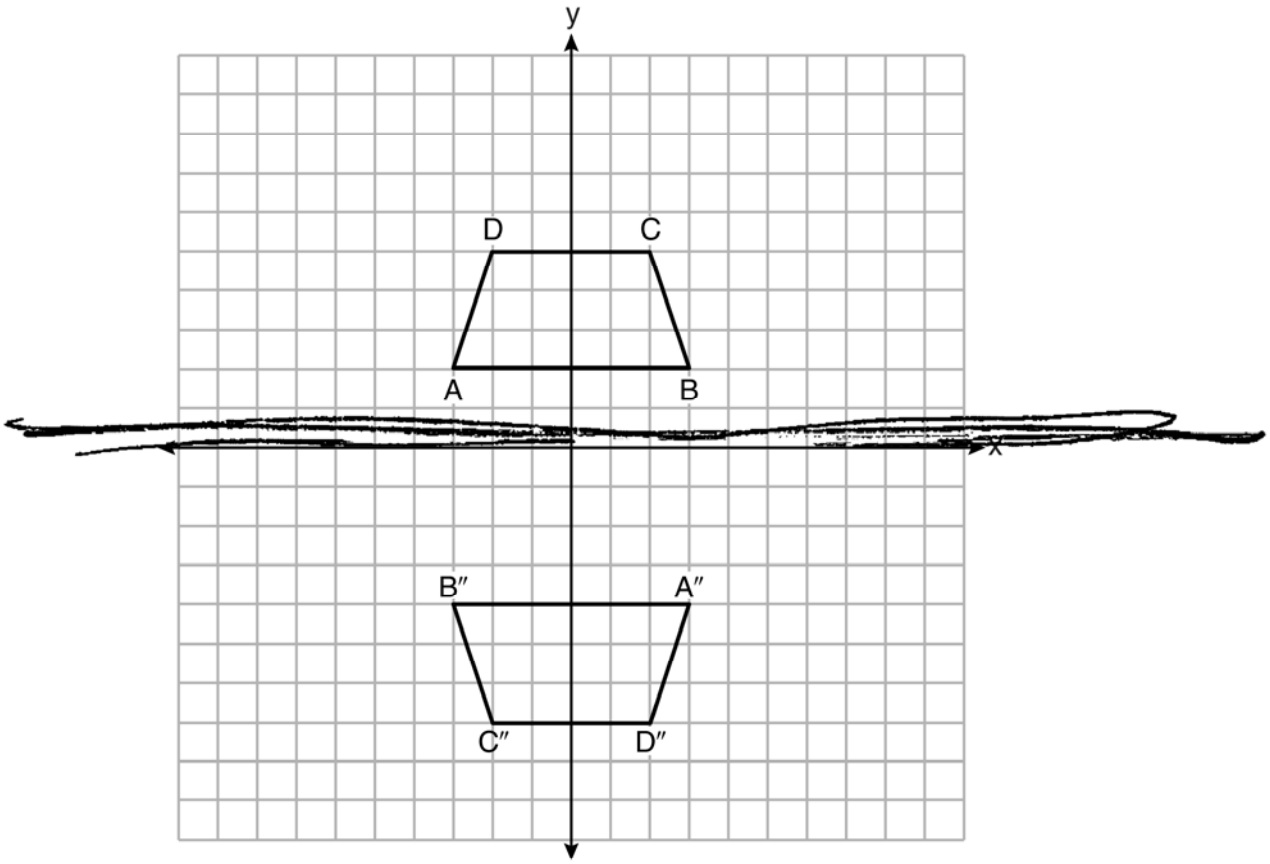
Describe a sequence of transformations that maps trapezoid *ABCD* onto trapezoid *A″B″C″D″*.

A reflection over the Y axis followed by a translation down 2.

Score 1: The student made an error by mapping trapezoid *ABCD* onto trapezoid *B″A″D″C″*.

Question 28

28 Trapezoids *ABCD* and *A″B″C″D″* are graphed on the set of axes below.



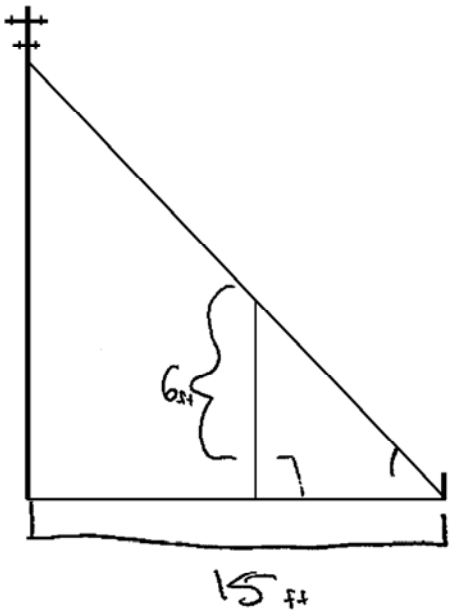
Describe a sequence of transformations that maps trapezoid *ABCD* onto trapezoid *A″B″C″D″*.

The sequence of transformation that maps the trapezoid is a Reflection over the x-axis.

Score 0: The student gave a completely incorrect response.

Question 29

29 In the model below, a support wire for a telephone pole is attached to the pole and anchored to a stake in the ground 15 feet from the base of the telephone pole. Jamal places a 6-foot wooden pole under the support wire parallel to the telephone pole, such that one end of the pole is on the ground and the top of the pole is touching the support wire. He measures the distance between the bottom of the pole and the stake in the ground.



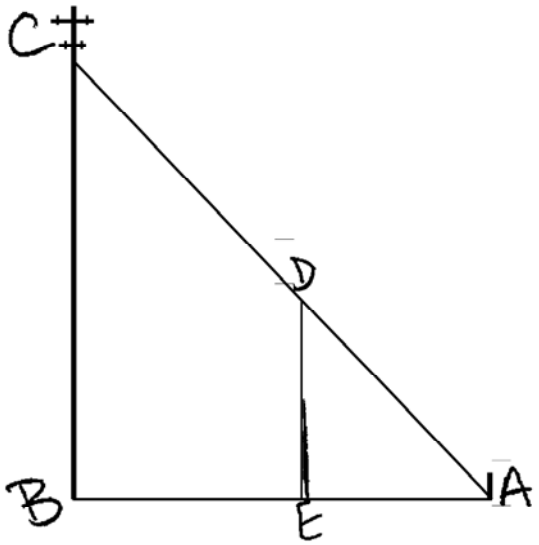
Jamal says he can approximate how high the support wire attaches to the telephone pole by using similar triangles. Explain why the triangles are similar.

The triangles are similar because they have the same angle measurements. They both share the angle that the stake makes with the ground and the ground and pole and ground and Jamal make right angles. Due to this they are similar by AA ≅ AA.

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

Question 29

29 In the model below, a support wire for a telephone pole is attached to the pole and anchored to a stake in the ground 15 feet from the base of the telephone pole. Jamal places a 6-foot wooden pole under the support wire parallel to the telephone pole, such that one end of the pole is on the ground and the top of the pole is touching the support wire. He measures the distance between the bottom of the pole and the stake in the ground.



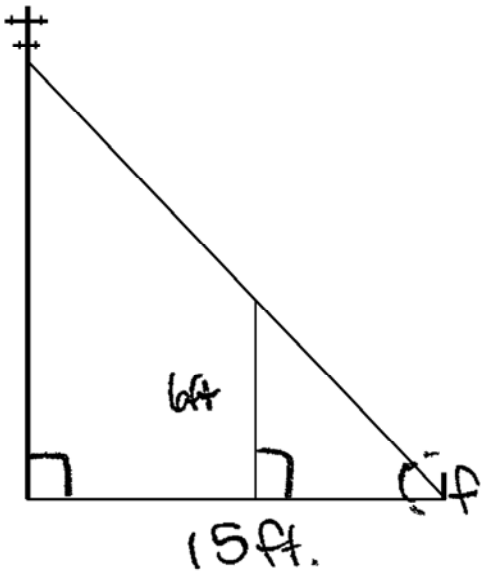
Jamal says he can approximate how high the support wire attaches to the telephone pole by using similar triangles. Explain why the triangles are similar.

These triangles are similar because of AA criteron. $\angle DAE \cong \angle CAB$ because they share that angle. $\angle DEA \cong \angle CBA$ because they are both right angles

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

Question 29

29 In the model below, a support wire for a telephone pole is attached to the pole and anchored to a stake in the ground 15 feet from the base of the telephone pole. Jamal places a 6-foot wooden pole under the support wire parallel to the telephone pole, such that one end of the pole is on the ground and the top of the pole is touching the support wire. He measures the distance between the bottom of the pole and the stake in the ground.



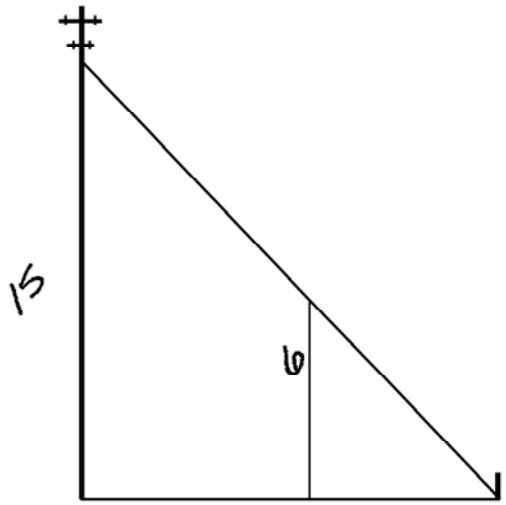
Jamal says he can approximate how high the support wire attaches to the telephone pole by using similar triangles. Explain why the triangles are similar.

They both share <f and both have right angles.

Score 1: The student wrote an incomplete explanation not connecting the angles to the similar triangles.

Question 29

29 In the model below, a support wire for a telephone pole is attached to the pole and anchored to a stake in the ground 15 feet from the base of the telephone pole. Jamal places a 6-foot wooden pole under the support wire parallel to the telephone pole, such that one end of the pole is on the ground and the top of the pole is touching the support wire. He measures the distance between the bottom of the pole and the stake in the ground.



Jamal says he can approximate how high the support wire attaches to the telephone pole by using similar triangles. Explain why the triangles are similar.

The triangles are Similar because they both have right angles which makes them right triangles, all right triangles are similar.

Score 0: The student gave a completely incorrect response.

Question 30

30 Aliyah says that when the line $4x + 3y = 24$ is dilated by a scale factor of 2 centered at the point (3,4), the equation of the dilated line is $y = -\frac{4}{3}x + 16$. Is Aliyah correct? Explain why.

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

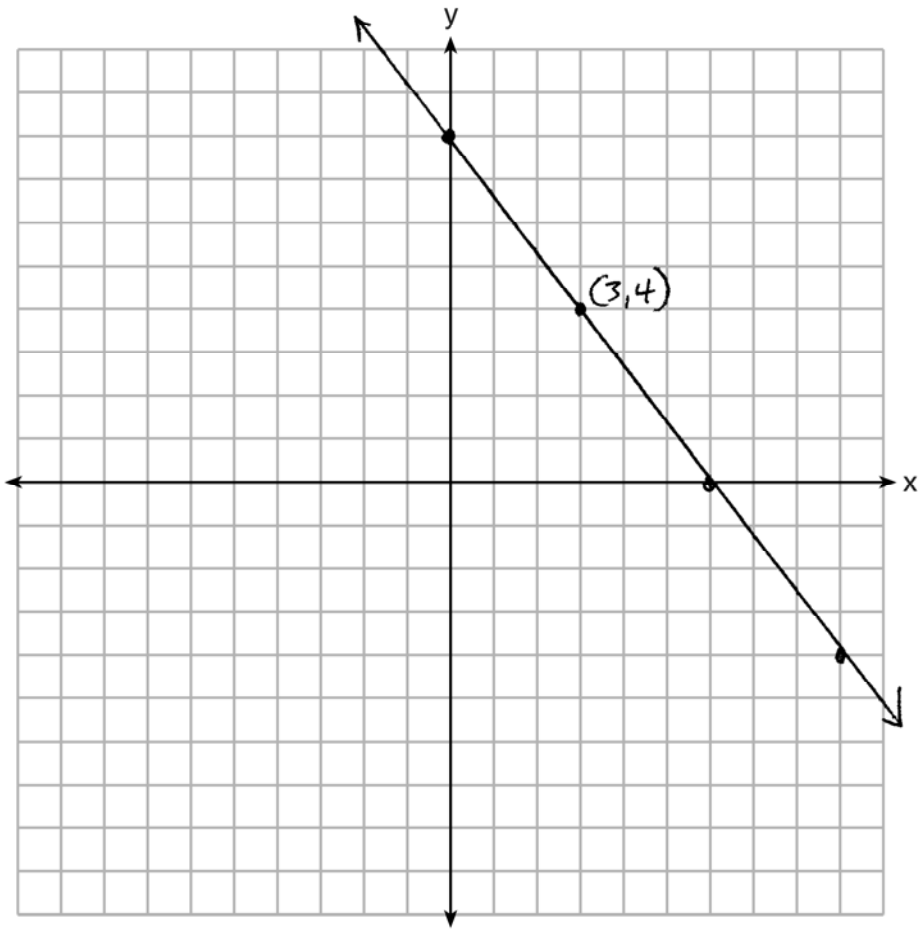
$4x + 3y = 24$

$-4x \quad -4x$

$\frac{3y}{3} = \frac{-4x+24}{3}$

$y = -\frac{4}{3}x + 8$

Aliyah is not correct. When the center of dilation is on the line, the equation remains the same. $y = -\frac{4}{3}x + 8$



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

Question 30

30 Aliyah says that when the line $4x + 3y = 24$ is dilated by a scale factor of 2 centered at the point (3,4), the equation of the dilated line is $y = -\frac{4}{3}x + 16$. Is Aliyah correct? Explain why.

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

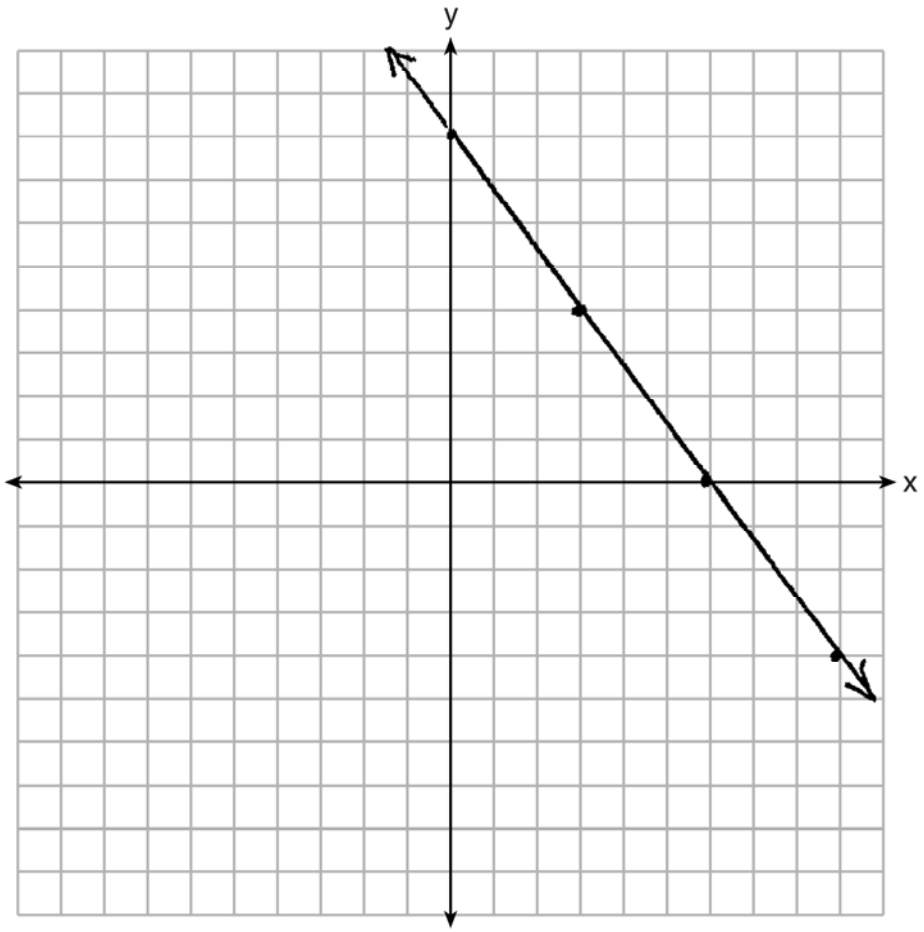
$4x + 3y = 24$

$3y - 4x = 24$

$y = \frac{4}{3}x + 8$

$y = -\frac{4}{3}x + 16$

Aliyah is not correct because the equation of the dilated line should be $y = -\frac{4}{3}x + 8$ to be correct.



Score 1: The student wrote an incomplete explanation.

Question 30

30 Aliyah says that when the line $4x + 3y = 24$ is dilated by a scale factor of 2 centered at the point (3,4), the equation of the dilated line is $y = -\frac{4}{3}x + 16$. Is Aliyah correct? Explain why.

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

$4 = -4/3(3) + 8$

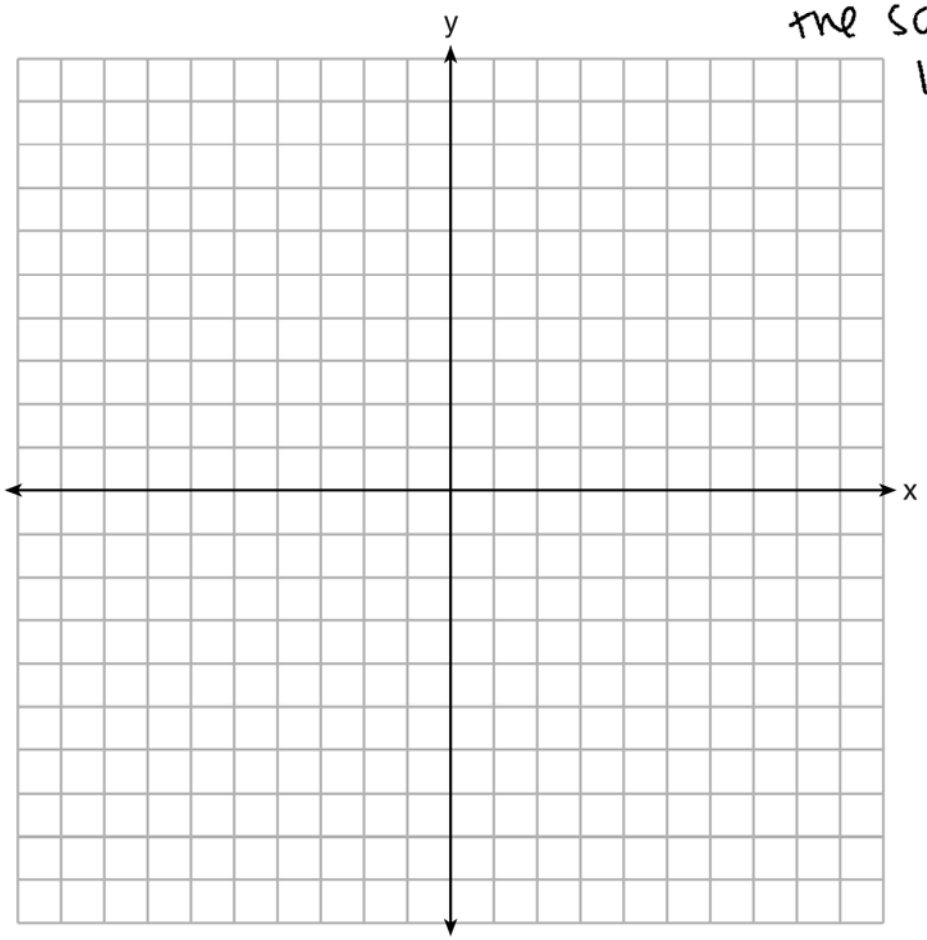
$4 = -4 + 8$

$4 = 4$

$\frac{3y = -4x = 24}{3}$

$y = -4/3x + 8$

No, because it should stay the same as the lines are connected, they lie on the same line



Score 1: The student wrote a partially correct explanation.

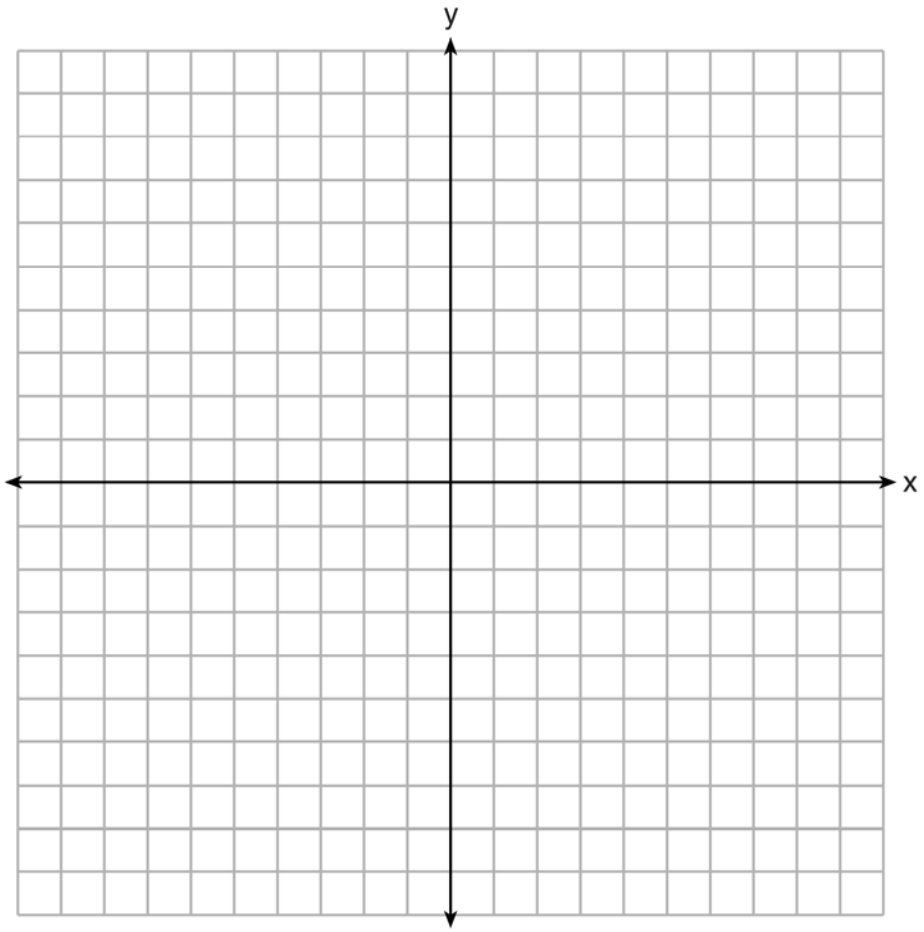
Question 30

30 Aliyah says that when the line $4x + 3y = 24$ is dilated by a scale factor of 2 centered at the point (3,4), the equation of the dilated line is $y = -\frac{4}{3}x + 16$. Is Aliyah correct? Explain why.

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

$4x+3y=24$
$-4x \quad -4x$
$\frac{3y}{3} = \frac{-4x}{3} + \frac{24}{3}$
$y = -\frac{4}{3}x + 8$
$\times 2$
$y = -\frac{4}{3}x + 16$

Yes, She's correct because (3,4) multiplied by 2, (6,4) lies on the new, dilated line, $y = -\frac{4}{3}x + 16$.



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

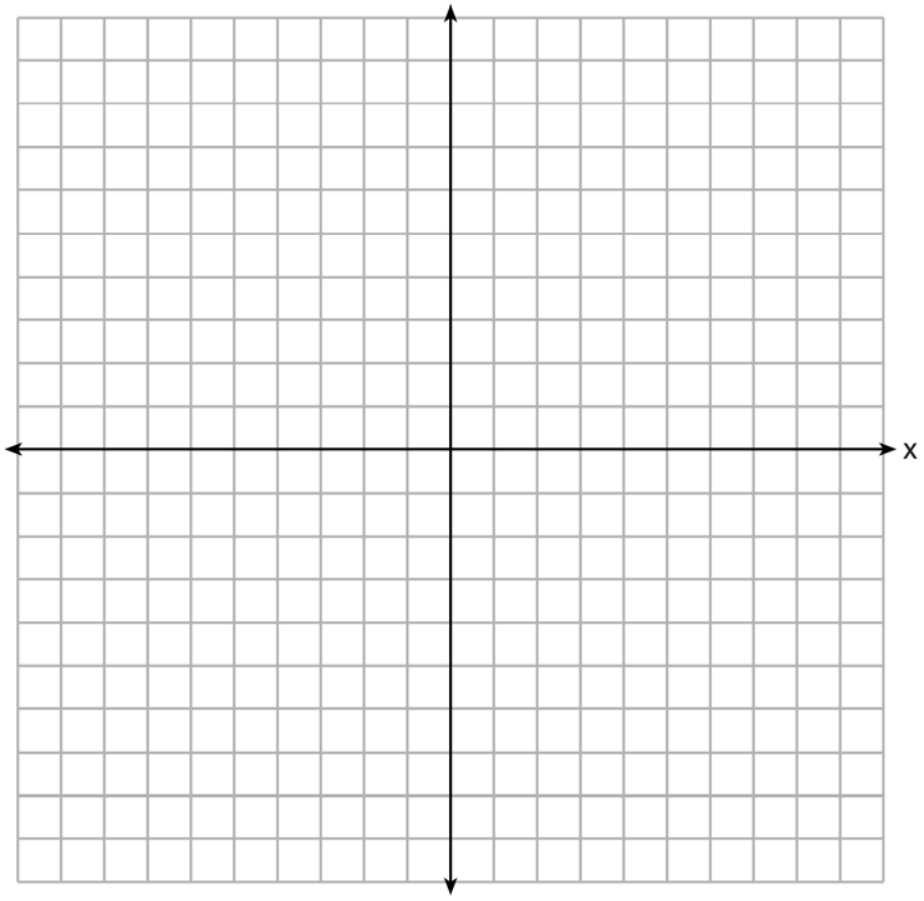
Question 30

30 Aliyah says that when the line $4x + 3y = 24$ is dilated by a scale factor of 2 centered at the point (3,4), the equation of the dilated line is $y = -\frac{4}{3}x + 16$. Is Aliyah correct? Explain why.

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

$4x+3y=24$
$-4x \quad -4x$
$3y=-4x+24$
$\frac{3y}{3}=\frac{-4x}{3}+\frac{24}{3}$
$y=-4/3x+8$

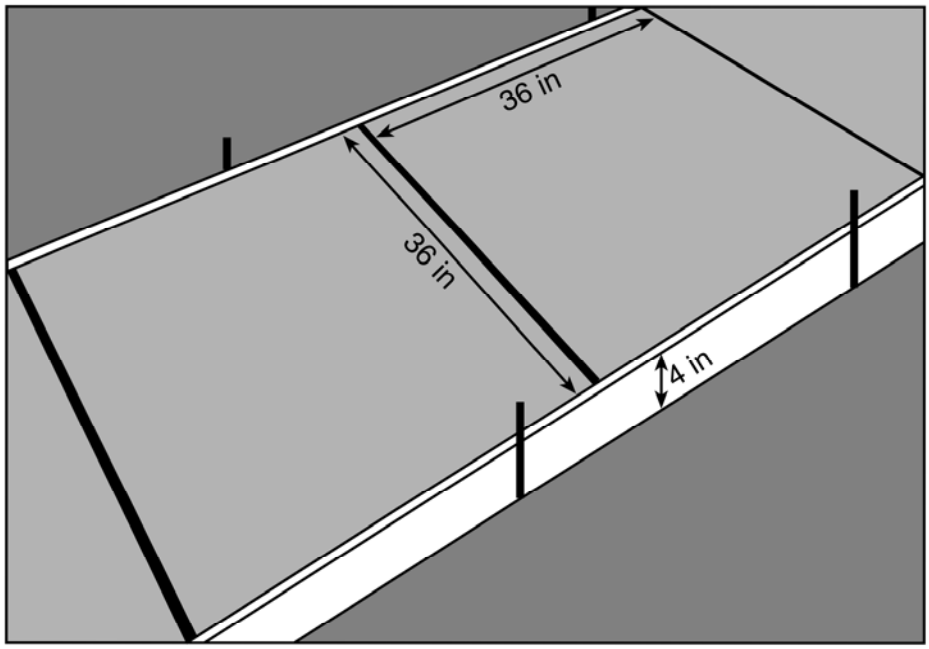
yes, b/c when dialating a line slope never changes only y-intercept



Score 0: The student gave a completely incorrect response.

Question 31

31 Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot.



How much money will it cost Ian to replace the two concrete sections?

$V = l \cdot w \cdot h$

$V = 36 \times 36 \times 4$

$V = 5184 \text{ in}^3$

$\times 2$

$V = 10{,}368 \text{ in}^3$

$\frac{10{,}368}{12^3} = 6$

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

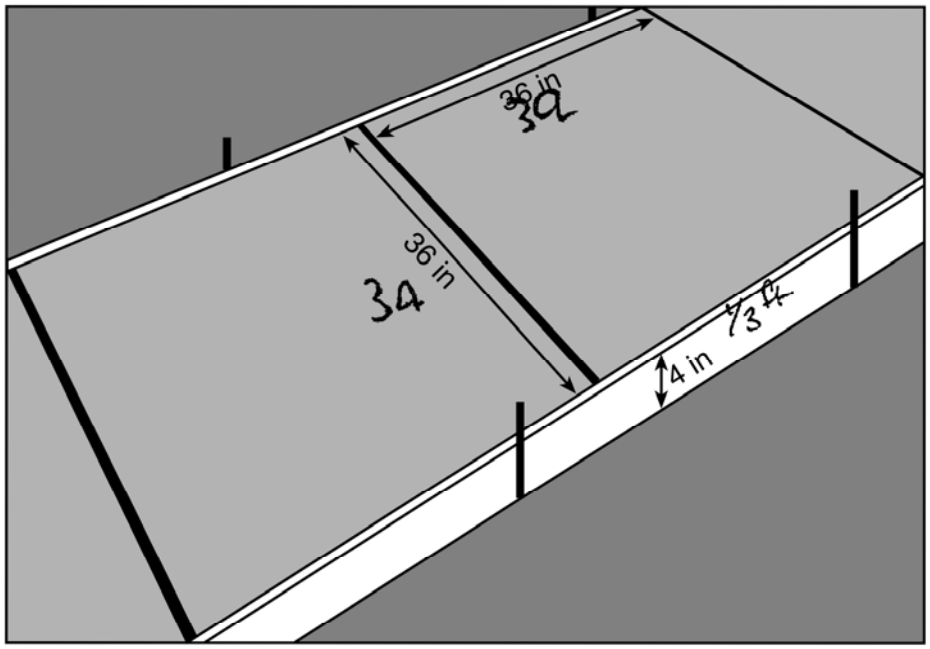
$\$3.25 \times 6$

Cost = $19.50

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

Question 31

31 Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot.



$\frac{36}{12} = 3$

$\frac{4}{12} = \frac{1}{3}$

How much money will it cost Ian to replace the two concrete sections?

$V = l \cdot w \cdot h$

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

$V = 3 ft^3$

$3 \times 3.25 = 9.75$

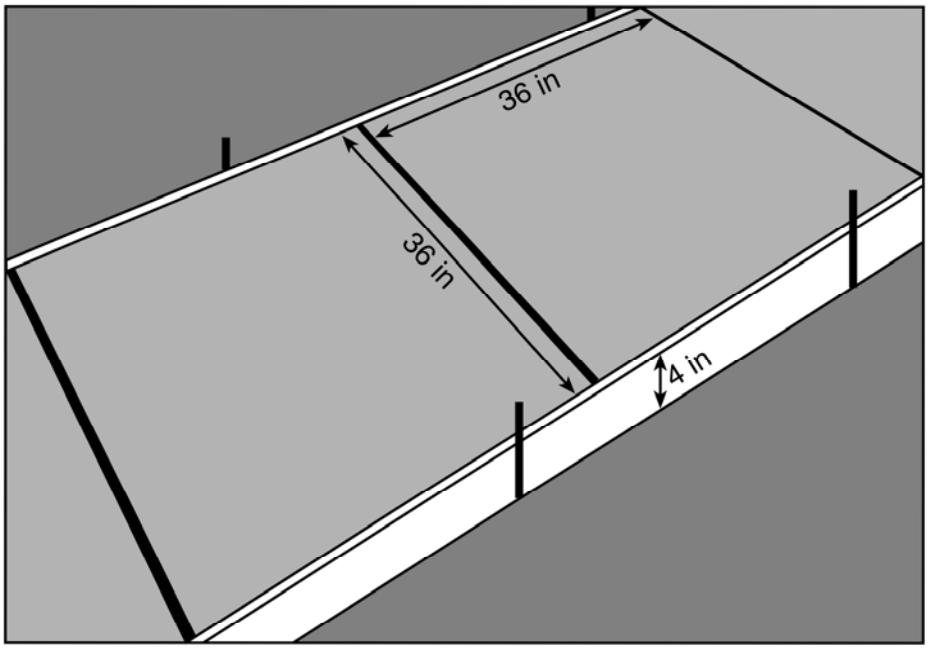
$9.75 \times 2 = 19.5$

It will cost $19.50 to replace the 2 concrete stations

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

Question 31

31 Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot.



How much money will it cost Ian to replace the two concrete sections?

$V = 36 \cdot 4 \cdot 36 = 5184$ $10,368(3.25) =$ 33,696.

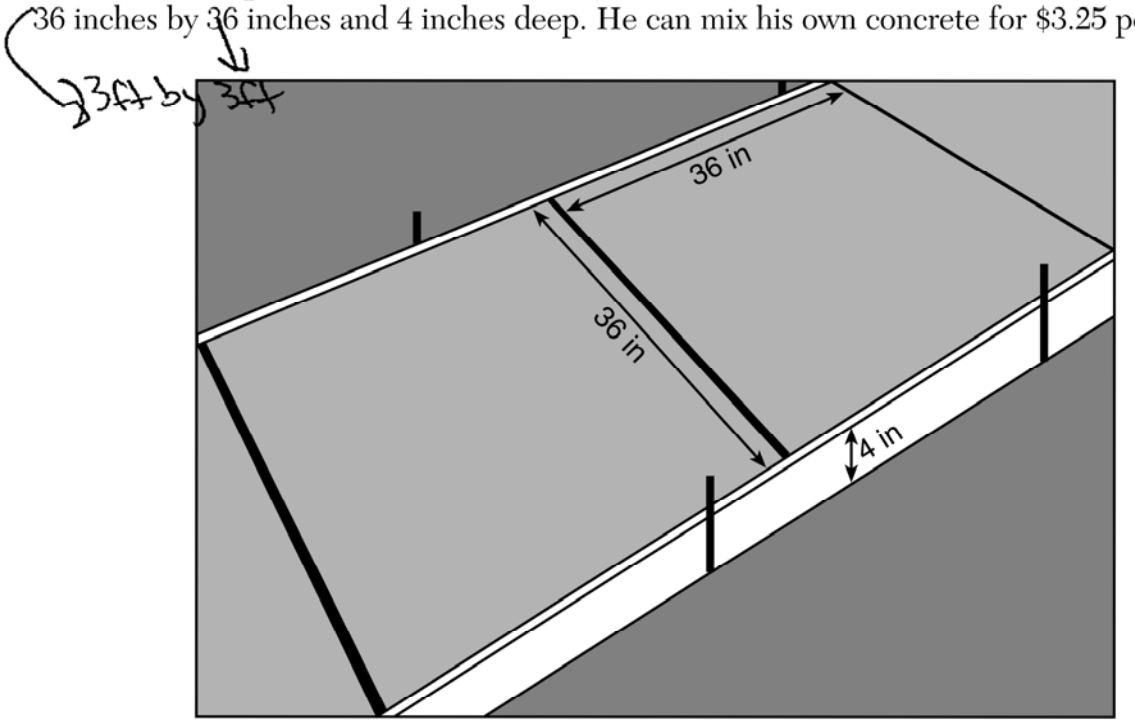
$2(5184) = 10,368$

It will cost $\$33,696.00$.

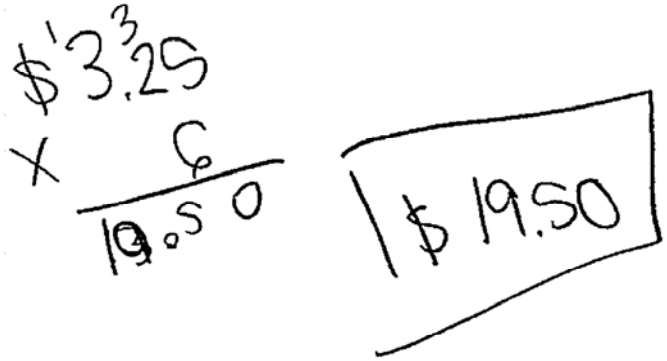
Score 1: The student did not convert from inches to feet.

Question 31

31 Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot.



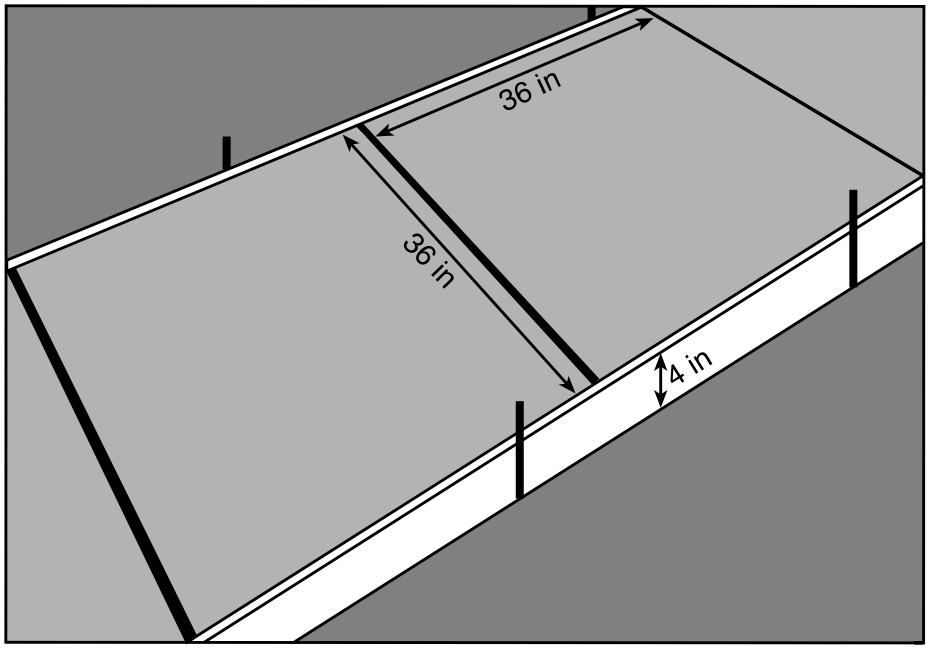
How much money will it cost Ian to replace the two concrete sections?



Score 1: The student did not show appropriate work when showing the volume of a concrete section.

Question 31

31 Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot.



How much money will it cost Ian to replace the two concrete sections?

$l \cdot w \cdot h$

$36 \cdot 36 \cdot 4 = 5184$ inches^3

$\frac{5184}{12} = 432$ feet^3

$432 \cdot 2 = 864$ feet^3

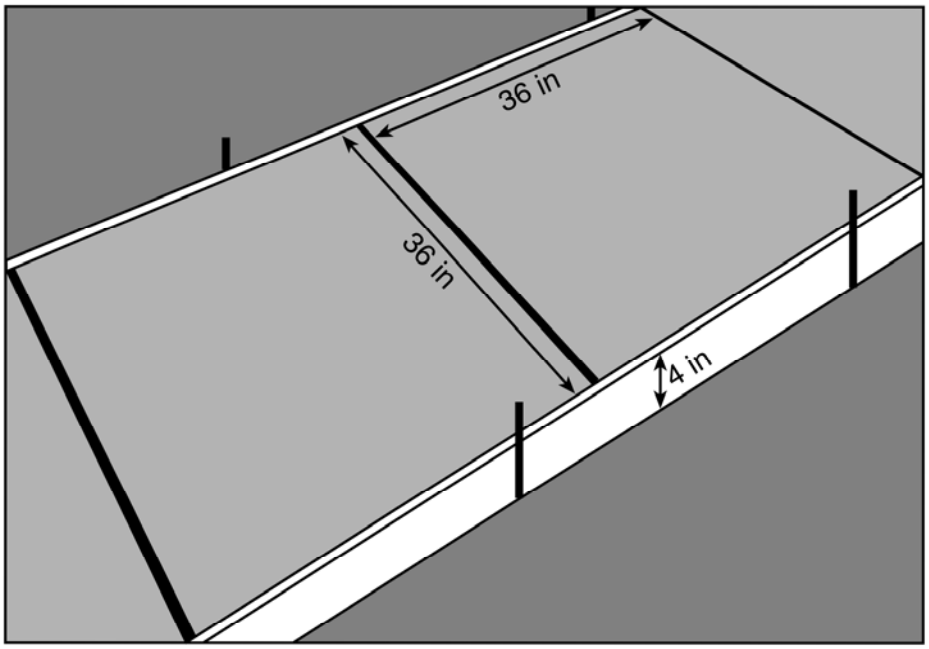
$864 \cdot 3.25$

$2808

Score 1: The student did not correctly convert from cubic inches to cubic feet.

Question 31

31 Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot.



36
x36
1296
x 4
5184

432
12 5184

432
x 3.25
1404

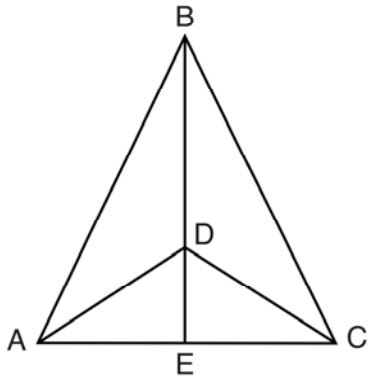
How much money will it cost Ian to replace the two concrete sections?

Score 0: The student gave a completely incorrect response.

Question 32

32 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$

Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



Fill in the missing statement and reasons below.

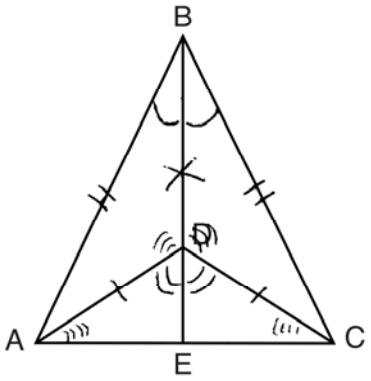
Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) Reflexive
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) $\angle BDA \cong \angle BDC$	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6) CPCTC
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) Since $\triangle ADC$ has 2 $\cong$ sides it is isosceles. Isosceles $\triangle$'s have $\cong$ base $\angle$'s so $\angle DAE \cong \angle DCA$. $\triangle ADE \cong \triangle CDE$ by ASA. By CPCTC, $\overline{AE} \cong \overline{CE}$ and $\angle DEA \cong \angle DEC$. If ~~a line~~ 2 intersecting lines form a linear pair of $\cong$ $\angle$'s then the lines are $\perp$ making $\overline{BDE}$ the $\perp$ bisector of $\overline{AC}$.

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

Question 32

32 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$

Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



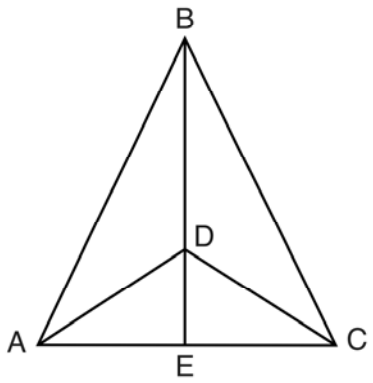
Fill in the missing statement and reasons below.

Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) Reflexive
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) $\angle ADB \cong \angle CDB$	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6) CPCTC
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) Since E is in the middle

Score 3 The student only wrote three correct reasons.

Question 32

32 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$
Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



Fill in the missing statement and reasons below.

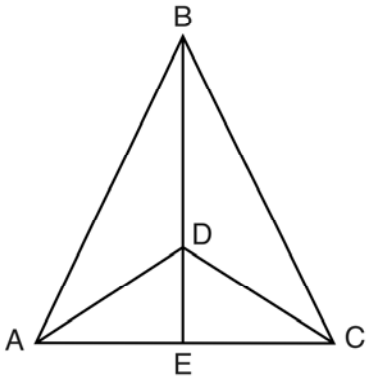
Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) Reflexive prop.
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) $\not\angle ADE \cong \not\angle CDE$	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6)
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) If points B and D are equidistant from the endpoints of $\overline{AC}$ then B and D are on the $\perp$ bisector of $\overline{AC}$.

Score 2: The student only wrote two correct reasons.

Question 32

32 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$

Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



Fill in the missing statement and reasons below.

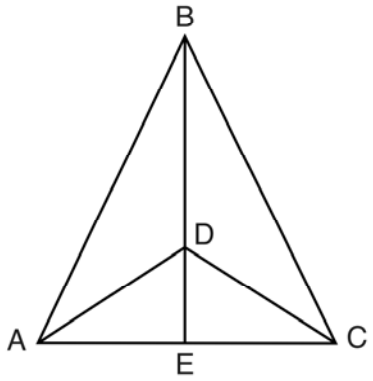
Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) Reflexive
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) $\angle D \cong \angle D$	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6) CPCTC
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) $\perp DK$

Score 2: The student only wrote two correct reasons.

Question 32

32 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$

Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



Fill in the missing statement and reasons below.

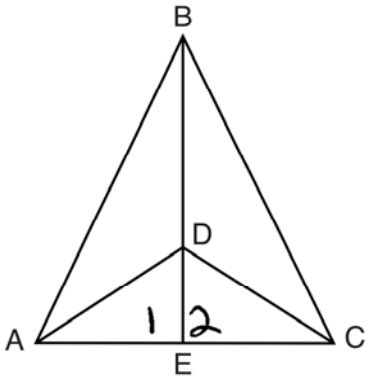
Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) Symmetric Property
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) $\measuredangle BDE \cong \measuredangle BDE$	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6) CPCTC
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) Yes it is!!

Score 1: The student only wrote one correct reason.

Question 32

32 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$

Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



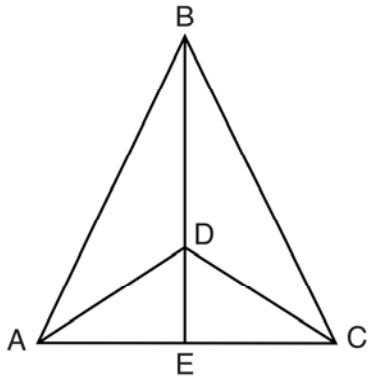
Fill in the missing statement and reasons below.

Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) Reflexive
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) $\angle 1 \cong \angle 2$	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6) CTPCT
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) Definition of perpendicular bisector

Score 1: The student only wrote one correct reason.

Question 32

32 Given: $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$, and $\angle ADE \cong \angle CDE$
Prove: $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$



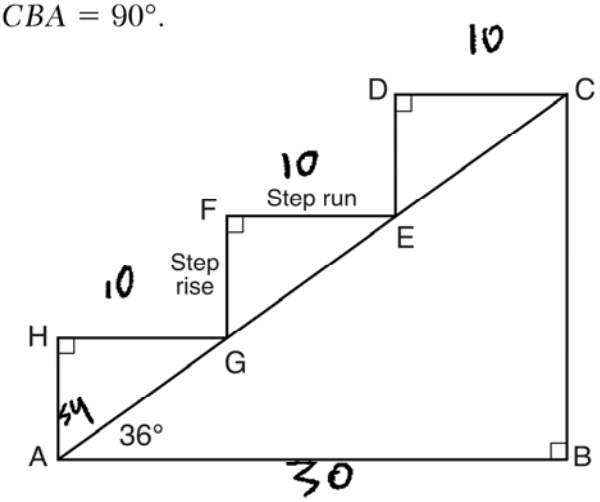
Fill in the missing statement and reasons below.

Statements	Reasons
(1) $\triangle ABC$, $\overline{AEC}$, $\overline{BDE}$ with $\angle ABE \cong \angle CBE$ and $\angle ADE \cong \angle CDE$	(1) Given
(2) $\overline{BD} \cong \overline{BD}$	(2) def of congruent
(3) $\angle BDA$ and $\angle ADE$ are supplementary. $\angle BDC$ and $\angle CDE$ are supplementary.	(3) Linear pairs of angles are supplementary.
(4) $\angle BDA + \angle ADE = 180^\circ$	(4) Supplements of congruent angles are congruent.
(5) $\triangle ABD \cong \triangle CBD$	(5) ASA
(6) $\overline{AD} \cong \overline{CD}$, $\overline{AB} \cong \overline{CB}$	(6) Transitive property
(7) $\overline{BDE}$ is the perpendicular bisector of $\overline{AC}$.	(7) because it is cut in half

Score 0: The student gave a completely incorrect response.

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

$\tan 54 = \frac{10}{x}$

$10/\tan 54 =$ 7.3 inches

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

$(10/\tan 54) \times 3 = CB$

$21.79627584 = CB$

$\uparrow^2 + 30^2 = AC^2$

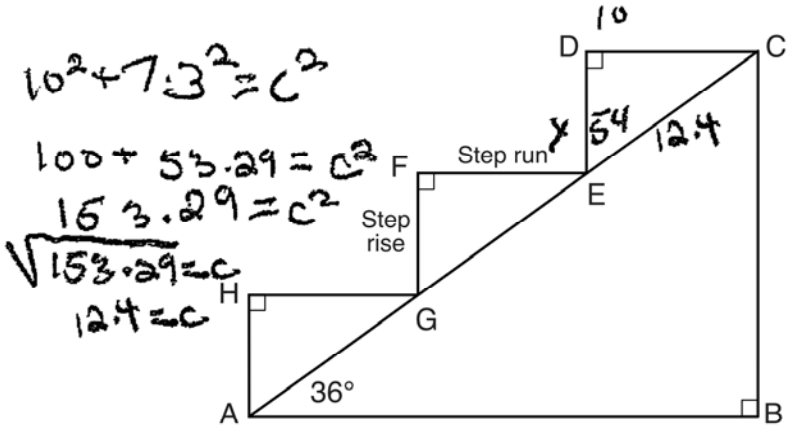
$\sqrt{1375.077641} = \sqrt{AC^2}$

$AC =$ 37 inches

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

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



$10^2 + 7.3^2 = c^2$

$100 + 53.29 = c^2$

$153.29 = c^2$

$\sqrt{153.29} = c$

$12.4 = c$

$\tan(54) = \frac{10}{x}$

$\frac{10}{\tan(54)x}$

-36

54

7.3 in

If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

7.3 in

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

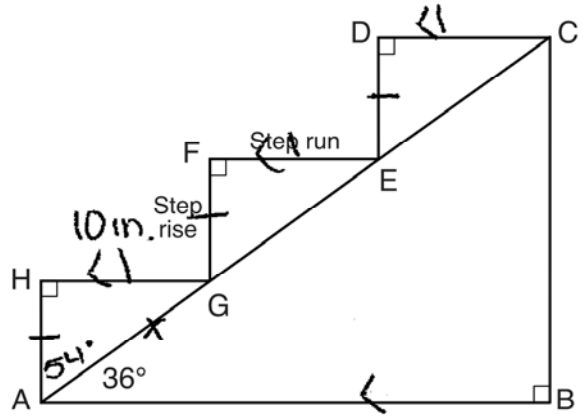
$(12.4)(3)$ $AC = 37.2$ in

$AC = 37$

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

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

SOH CAH TOA

$\tan 54 = \frac{10}{x}$

$\frac{x \tan 54}{\tan 54} = \frac{10}{\tan 54}$

$x = 14.8 \text{ in.}$

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

$10^2 + 14.8^2 = x^2$

$100 + 219.04 = x^2$

$319.04 = x^2$

$x = \sqrt{319.04}$

$x = 3$

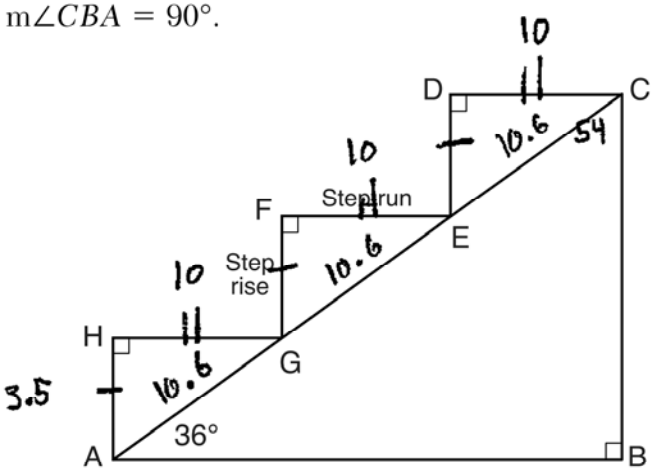
$\overline{AC} = 53.6 \text{ in.}$

$\overline{AC} = 54$

Score 3: The student made their calculations with the calculator in radian mode.

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

$2\sqrt{3} = 3.464101615$

∴ Each step rise is 3.5 inches

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

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

$10^2 + 3.5^2 = c^2$

$100 + 12.25 = \sqrt{112.25} = 10.6$ inches

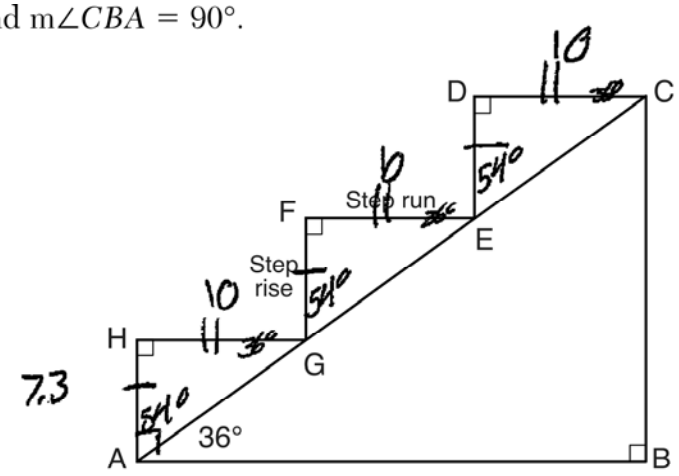
$10.6 \times 3 = 31.8$

∴ $\overline{AC}$ is 32 inches long

Score 2: The student found an appropriate length of *AC* based on a completely incorrect length of each step rise.

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

$\frac{\tan(36)}{1} = \frac{x}{10}$

$X = \tan(36)10$

$x \approx 7.26542528$

7.3 in.

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

$10^2 + 7.3^2 = x^2$

$100 + 57.78 = 157.7864045$

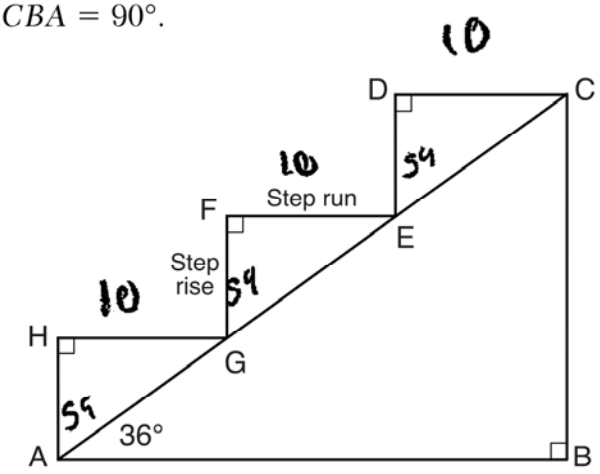
$x \approx 12.561305 84$

AC ≈ 13 in.

Score 2: The student made a computational error when squaring 7.3. The student did not multiply by 3 to find the length of $\overline{AC}$.

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

$\tan 54 = \frac{10}{x}$ = step rise

$x = 7.3$ in

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

$7^2 + 10^2 = c^2$

$49 + 100 = c^2$

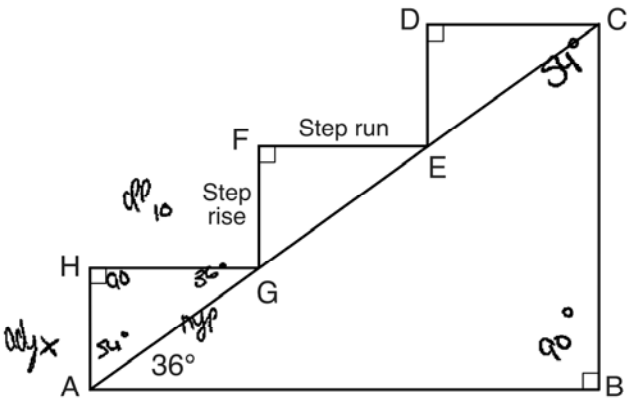
$149 = c^2$

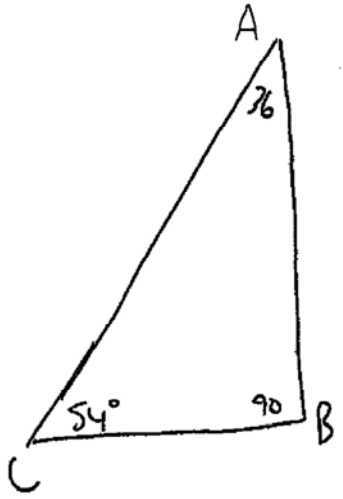
$c = \sqrt{149} = 12.2$ in

Score 2: The student made a rounding error in finding the length of each step rise. The student did not multiply by 3 to find the length of $\overline{AC}$.

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.





If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

$\tan(54) = \frac{10}{x}$ $x = \frac{\tan(54)}{10}$

$x = .14$

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

$\sin(54) \frac{10}{x}$

$x = \frac{\sin(54)}{10}$

$.08$

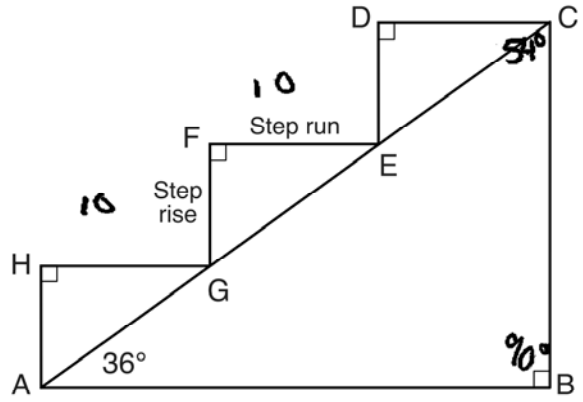
$AC = .24$

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

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.

10



90
+36
126
180
-126
54

If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

7.2

Determine and state the length of $\overline{AC}$, to the *nearest inch*.

$7.2^2 + 10^2 = x^2$

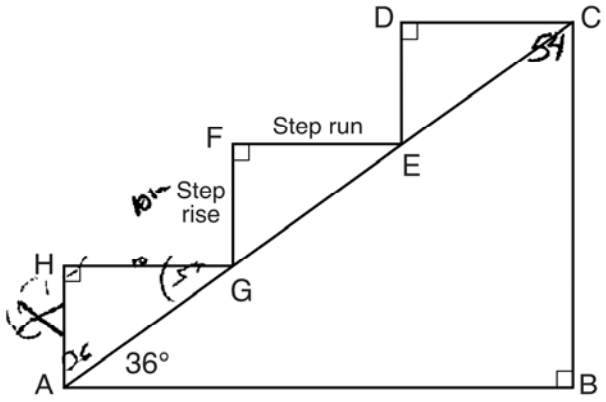
$51.84 + 100 = \sqrt{151.84^2}$

$\overline{AC} = 12.3$

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

Question 33

33 A homeowner is building three steps leading to a deck, as modeled by the diagram below. All three step rises, $\overline{HA}$, $\overline{FG}$, and $\overline{DE}$, are congruent, and all three step runs, $\overline{HG}$, $\overline{FE}$, and $\overline{DC}$, are congruent. Each step rise is perpendicular to the step run it joins. The measure of $\angle CAB = 36°$ and $m\angle CBA = 90°$.



If each step run is parallel to $\overline{AB}$ and has a length of 10 inches, determine and state the length of each step rise, to the *nearest tenth of an inch*.

$\frac{\tan 54}{10} = \frac{x}{180}$ $10x = (\tan 54)(180)$

$10x = 247$

$x = 24.8$

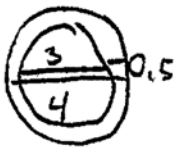
Determine and state the length of $\overline{AC}$, to the *nearest inch*.

30 inches.

Score 0: The student gave a completely incorrect response.

Question 34

34 A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.



$V = \frac{4}{3}\pi r^3$
$V = \frac{4}{3}\pi (2)^3$
$V = \frac{4}{3}\pi (8)$
$V = 10.\overline{666}\,\pi$
$V = 33.51032164$

$V = \frac{4}{3}\pi r^3$
$V = \frac{4}{3}\pi (1.5)^3$
$V = \frac{4}{3}\pi (3.375)$
$V = 14.13716694$

$33.51032164 - 14.13716694 = 19.37315469$

19.4 cm^3 of chocolate

The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3, determine and state, to the *nearest gram*, the total mass of the chocolate in the box.

$1.308 \cdot 19.4 = 25.3752$
$25.3752 \cdot 8 = 203.0016$

Total mass of chocolate in the box is 203 grams

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

Question 34

34 A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.

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

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

$V = 33.510321\,6383$

$V = 33.5\ cm^3$

The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3, determine and state, to the *nearest gram*, the total mass of the chocolate in the box.

$(33.5)(1.308) = 43.818$

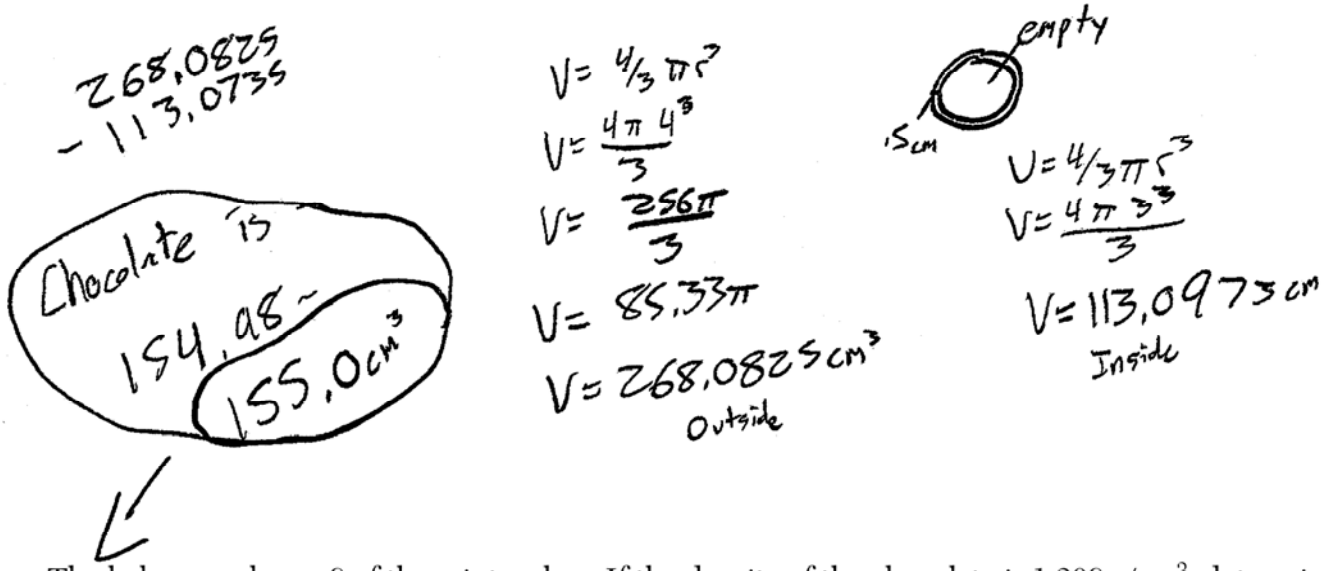
$(43.818)(8) = 350.544$

351 grams

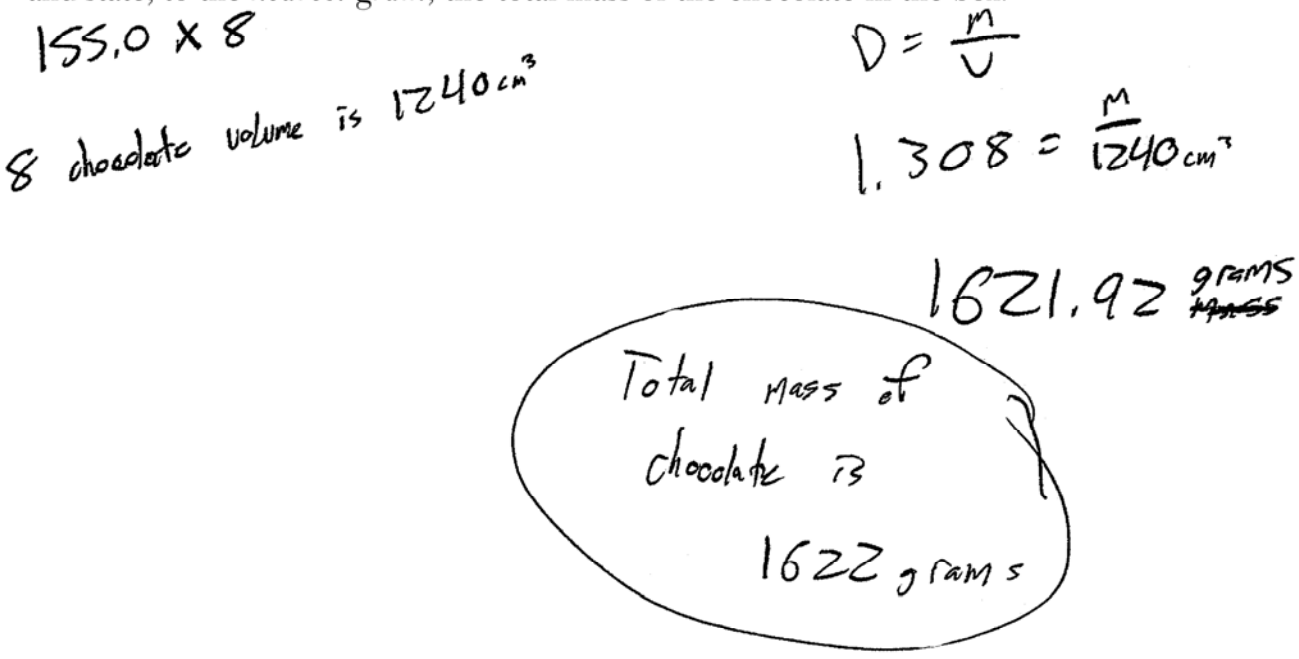
Score 3: The student found the volume and mass of 8 solid spheres, but no further correct work was shown.

Question 34

34 A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.



The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3, determine and state, to the *nearest gram*, the total mass of the chocolate in the box.



Score 3: The student used the diameters instead of the radii when calculating the volumes.

Question 34

34 A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.

$4 - .5 = 3.5$

$d = 3.5$

$\frac{3.5}{2} = 1.75 = r$

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

$= \frac{4}{3}\pi (2)^3$ — $\frac{4}{3}\pi (1.75)^3$

$= 33.51032164$ — 22.44929975

$V = 11.06102414$

$V = 11.1 \text{ cm}^3$

The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3, determine and state, to the *nearest gram*, the total mass of the chocolate in the box.

$11.1 \times 8 = 88.8$

$\times 1.380$

$122.544 =$ 123 grams

Score 2: The student used an incorrect radius of 1.75 in finding the volume and transcribed the density incorrectly.

Question 34

34 A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.

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

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

$V = \frac{4^1}{3}\pi \cdot \frac{8^2}{1}$

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

$V = 2.1$

Amount of chocolate in chocolate ball = $2.1\ cm^3$

The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3, determine and state, to the *nearest gram*, the total mass of the chocolate in the box.

$d = \frac{m}{V}$

$2.1 \cdot 1.308 = \frac{m}{2.1}$ ~~2.1~~ $2.7468 \cdot 8$

$m = 2.7468$

mass = 22 g

Score 1: The student made one computational error when finding the volume of one solid sphere. The student made a conceptual error by using the volume of a solid sphere to find the total mass.

Question 34

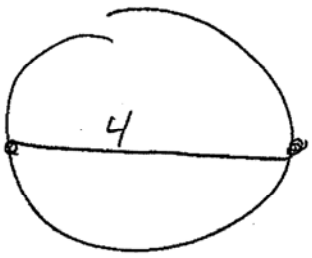
34 A bakery sells hollow chocolate spheres. The larger diameter of each sphere is 4 cm. The thickness of the chocolate of each sphere is 0.5 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.

A

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

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

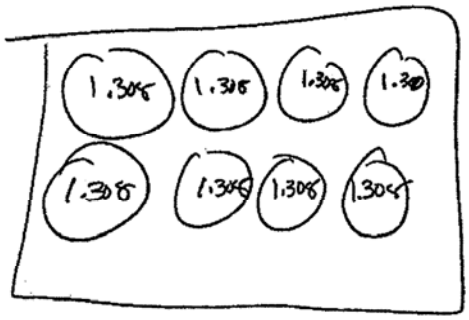
$V = \frac{4}{3}\pi 8$



$V = 10.7\pi$

$V = 33.6\ cm^3$

The bakery packages 8 of them into a box. If the density of the chocolate is 1.308 g/cm^3, determine and state, to the *nearest gram*, the total mass of the chocolate in the box.



33.

$0.5(8) =$ 4 grams

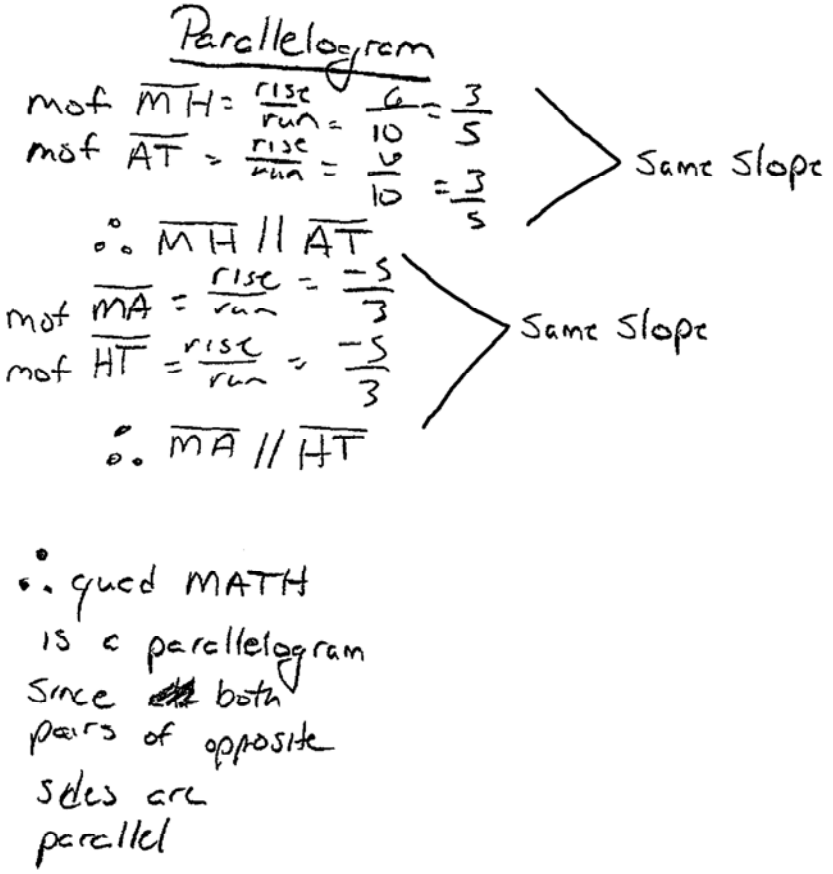
Score 0: The student did not show enough correct relevant work to receive any credit.

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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



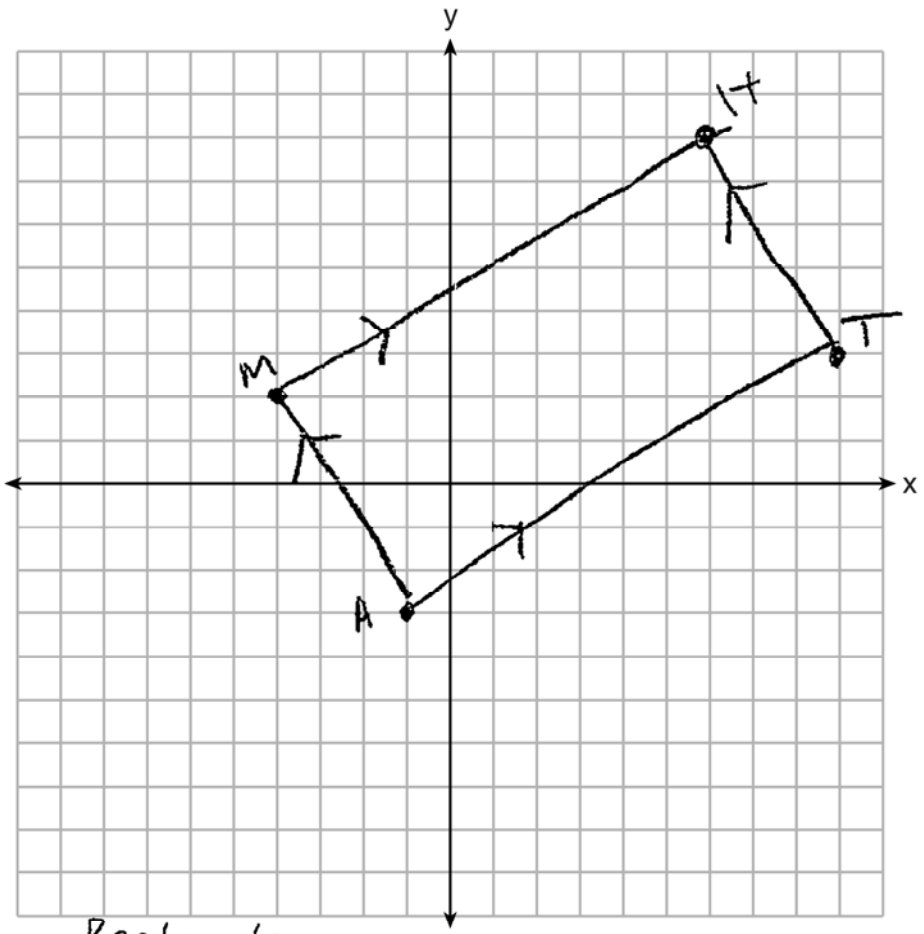
Score 6: The student gave a complete and correct response.

Question 35

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



Rectangle

$m\text{of } \overline{MA} = \frac{\text{rise}}{\text{run}} = \frac{-5}{3}$

$m\text{of } \overline{AT} = \frac{\text{rise}}{\text{run}} = \frac{6}{10} = \frac{3}{5}$

Negative reciprocals

$\therefore \overline{MA} \perp \overline{AT} \rightarrow \angle A$ is a right angle

∴ Parallelogram MATH is a rectangle since it has right angles.

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

Slope $\overline{MH} = \frac{6}{10}$
Slope $\overline{AT} = \frac{6}{10}$ > Same Slope ∴ // lines

need at least one pair of // sides to be a parallelogram MATH is a parallelogram

Slope $\overline{MA} = -\frac{5}{3}$
Slope $\overline{HT} = -\frac{5}{3}$ > Same Slope ∴ // lines

Score 5: The student made an incorrect conclusion of "at least one pair of parallel sides" to conclude *MATH* is a parallelogram.

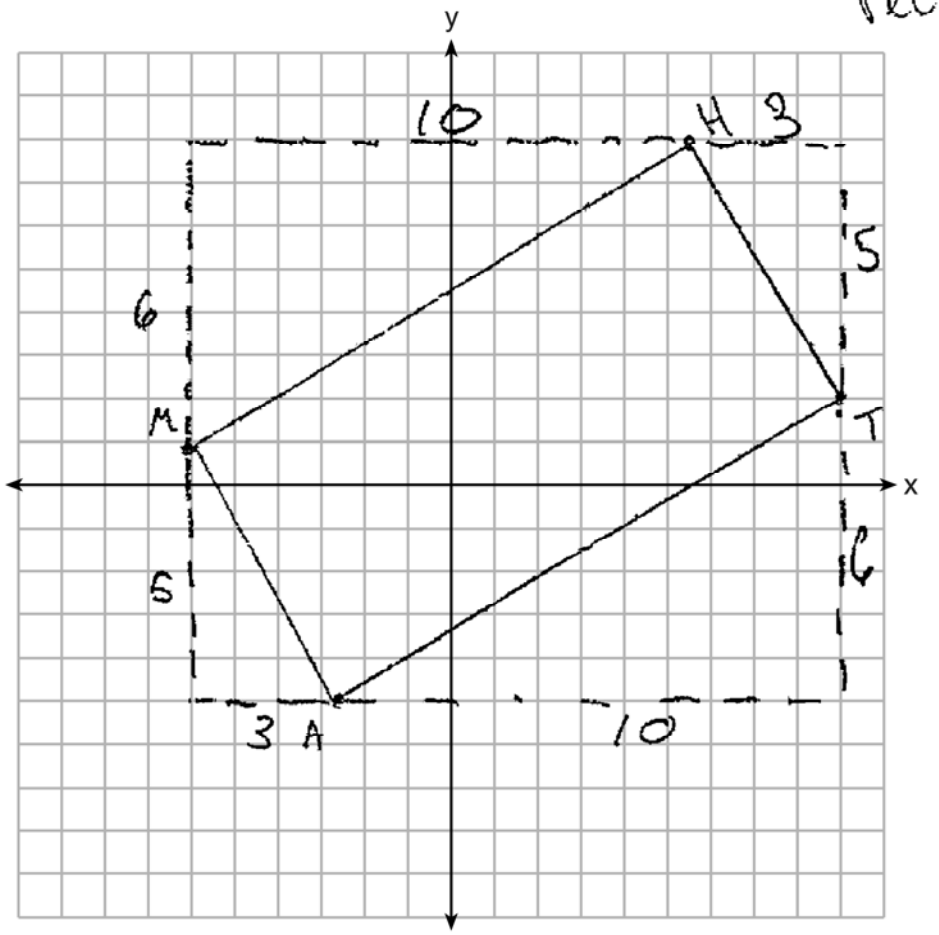
Question 35

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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

MATH is a rectangle



m of $\overline{HM}$

negative reciprocals make ⊥ lines

$\frac{6}{10} \Rightarrow \frac{3}{5}$

m of $\overline{MA}$

negative reciprocals

$-\frac{5}{3}$ and $\frac{3}{5}$

⊥ lines form right angles

∴ ∠HMA is a right angle.

need a right angle and 2 pairs of // sides to have a rectangle

Question 35

x_2 y_2 x_1 y_1

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

parallel
- $\overline{MH} = \frac{y_2-y_1}{x_2-x_1} \quad \frac{8-2}{6-(-4)} = \frac{6}{10} = \frac{3}{5}$ same slope
- $\overline{AT} = \frac{y_2-y_1}{x_2-x_1} = \frac{3-(-3)}{9-(-1)} = \frac{6}{10} = \frac{3}{5}$

parallel
- $\overline{MA} = \frac{y_2-y_1}{x_2-x_1} = \frac{-3-2}{-1-(-4)} = \frac{-5}{3}$ same slope
- $\overline{HT} = \frac{y_2-y_1}{x_2-x_1} = \frac{3-8}{9-6} = \frac{5}{3}$

opposite sides are parallel therefore quadrilateral MATH is a parallelogram

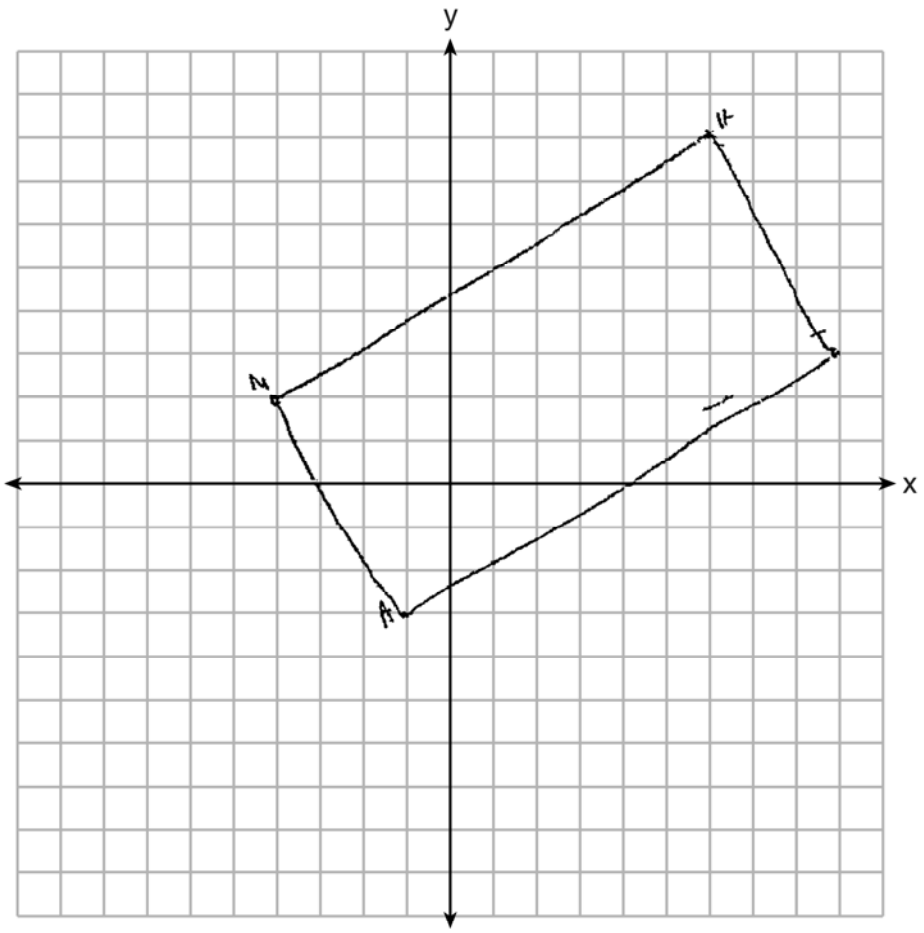
Score 5: The student had an incomplete reason when proving *MATH* is a rectangle.

Question 35

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



$MA = -\frac{5}{3}$ neg. rec.
$AT = \frac{3}{5}$ } perpendicular

$MH = \frac{3}{5}$ neg. rec.
$HT = -\frac{5}{3}$ } perpendicular

$\overline{MA}$ is $\perp$ $\overline{AT}$ and
$\overline{MH}$ is $\perp$ $\overline{HT}$ therefore
quadrilateral MATH is
a rectangle

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

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

$D_{MA} = \sqrt{(-4-1)^2 + (+2--3)^2}$

$D_{MA} = \sqrt{(-3)^2 + (5)^2}$

$D_{MA} = \sqrt{9+25}$

$D_{MA} = \sqrt{36}$

$D_{MA} = 6$

$D_{TH} = \sqrt{(9-6)^2 + (3-8)^2}$

$D_{TH} = \sqrt{(3)^2 + (-5)^2}$

$D_{TH} = \sqrt{9+25}$

$D_{TH} = \sqrt{36}$

$D_{TH} = 6$

Same length
∴ congruent

$D_{MH} = \sqrt{(6+4)^2 + (8+2)^2}$

$D_{MH} = \sqrt{(10)^2 + (6)^2}$

$D_{MH} = \sqrt{100+36}$

$D_{MH} = \sqrt{136}$

$D_{AT} = \sqrt{(9--1)^2 + (3--3)^2}$

$D_{AT} = \sqrt{100+36}$

$D_{AT} = \sqrt{136}$

Same length
∴ congruent

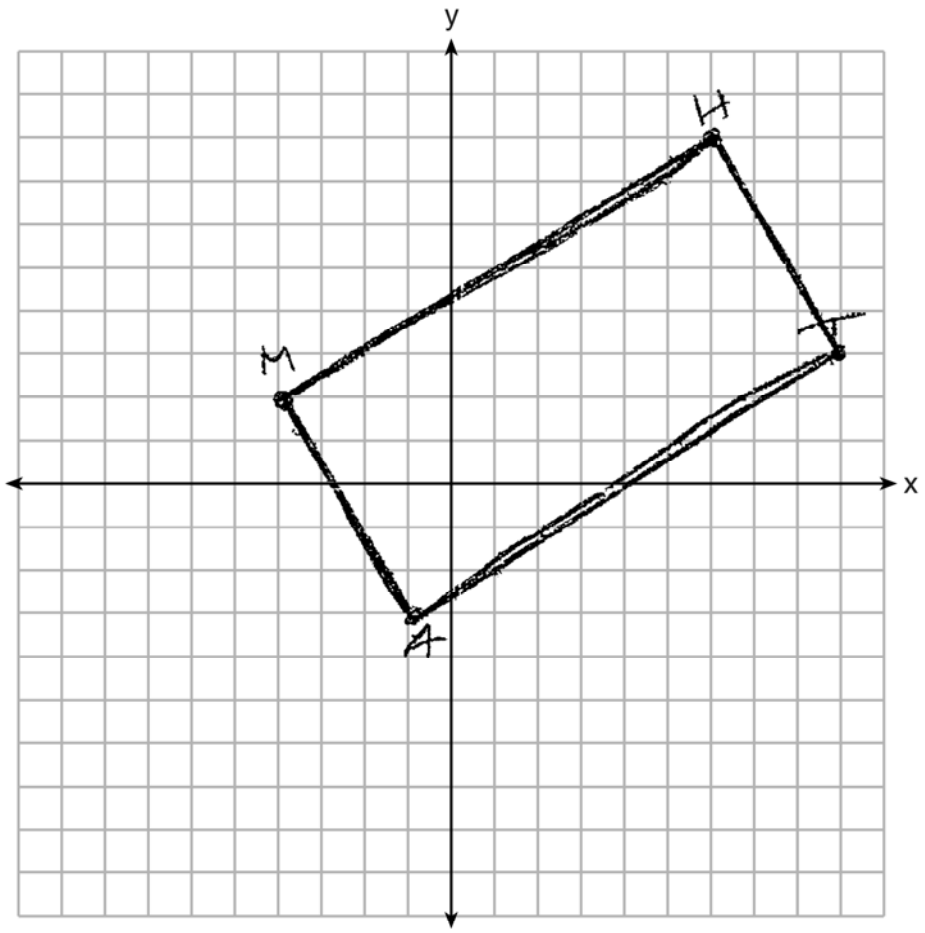
Conclusion:
It is a parallelogram because it has 2 pairs of congruent sides.

Score 5: The student made a computational error in finding the lengths of $\overline{MA}$ and $\overline{TH}$.

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



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

$M_{MA} = \frac{2-3}{-4-1}$

$M_{MA} = \frac{5}{-3}$

$M_{AT} = \frac{3-3}{9-1}$

$M_{AT} = \frac{6}{10} = \frac{3}{5}$

Negative reciprocal slopes

$\therefore \perp$

$\therefore$ rt. angle.

Conclusion:
This quadrilateral is a rectangle because it has 2 pairs of congruent sides and one rt. angle.

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

$m_{MH} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-2}{6+4} = \frac{6}{10} = \frac{3}{5}$

$m_{TH} = \frac{8-3}{6-9} = \frac{5}{-3}$

$m_{AT} = \frac{3+3}{9+1} = \frac{6}{10} = \frac{3}{5}$

$m_{AM} = \frac{2+3}{-4+1}$

$= \frac{5}{-3}$

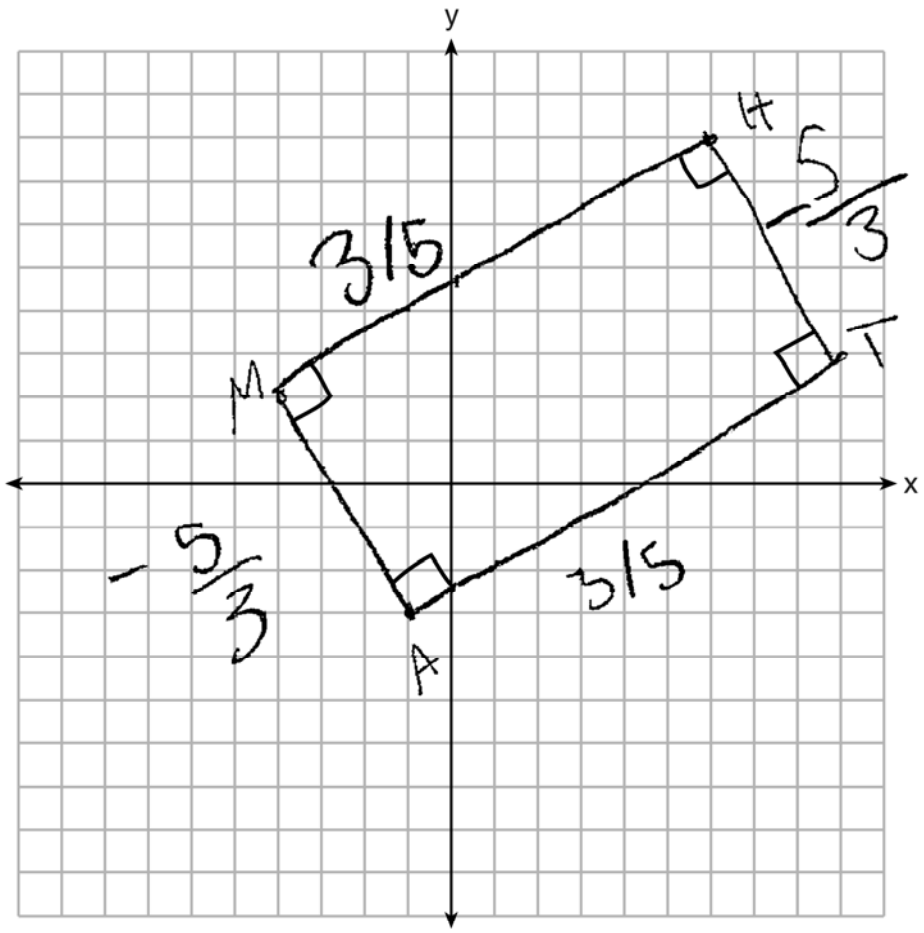
∴ It a P because opposite sides are //.

Score 4: The student made two incomplete concluding statements.

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



Q MATH is a rectangle because all the angles are right angles

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

$\overline{MH} \cong \overline{AT}$

$(-4,2)(6,8)$ $(-1,-3)(9,3)$

$\sqrt{(6-(-4))^2+(8-2)^2}$ $\sqrt{(9-(-1))^2+(3-(-3))^2}$

$\sqrt{10^2+6^2}$ $\sqrt{10^2+6^2}$

$\sqrt{100+36}$ $\sqrt{100+36}$

$\sqrt{136}$ $\sqrt{136}$

$\overline{MA} \cong \overline{HT}$

$(-4,2)(-1,-3)$ $(6,8)(9,3)$

$\sqrt{(-1-(-4))^2+(-3-2)^2}$ $\sqrt{(9-6)^2+(3-8)^2}$

$\sqrt{3^2+-5^2}$ $\sqrt{3^2+-5^2}$

$\sqrt{9+25}$ $\sqrt{9+25}$

$\sqrt{34}$ $\sqrt{34}$

MATH is a parallelogram because opposite sides are $\cong$

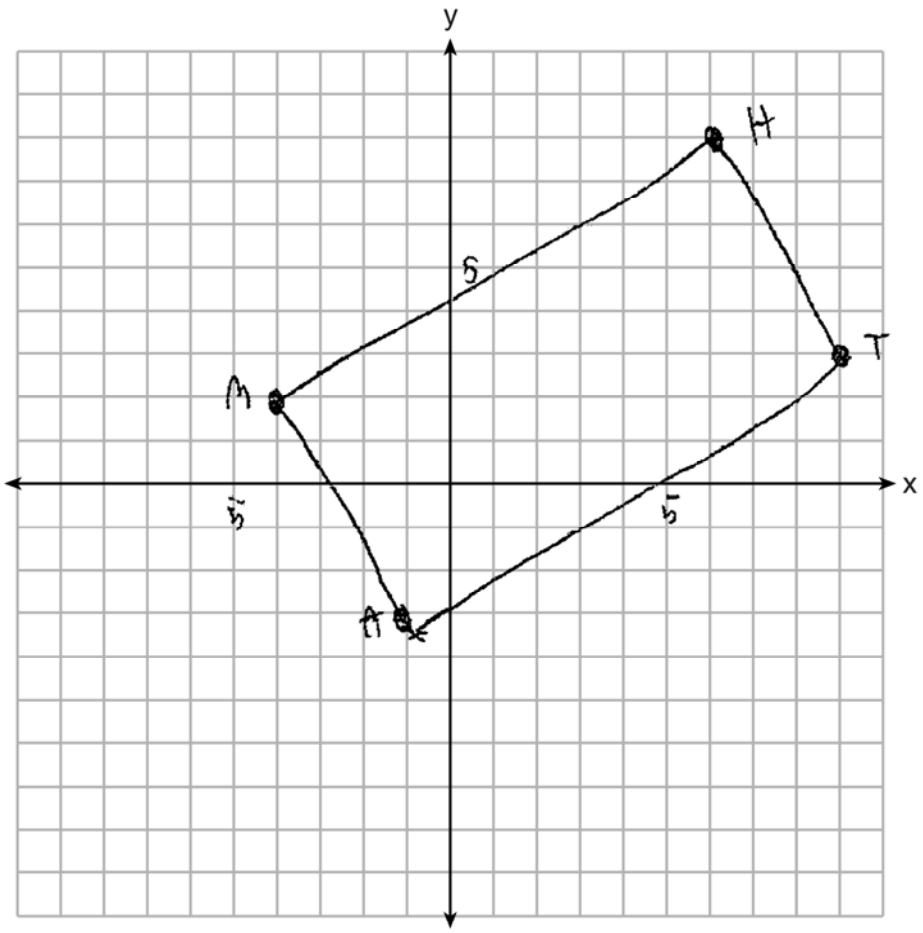
Score 3: The student proved *MATH* is a parallelogram, but no further correct work was shown.

Question 35

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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

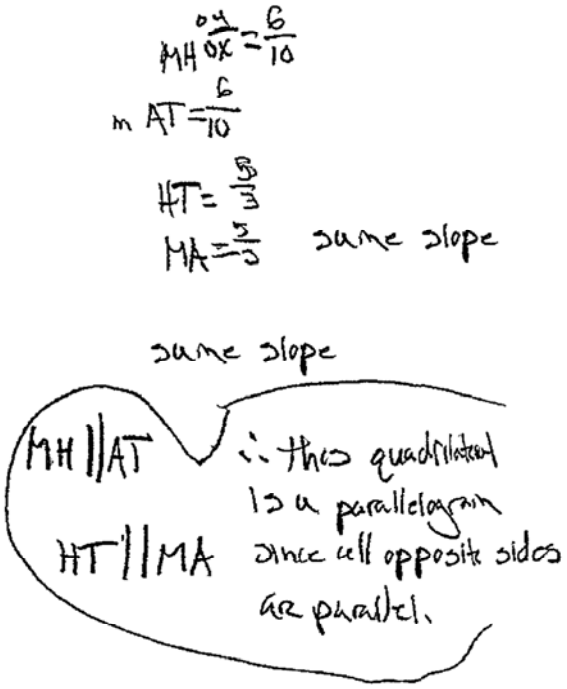


Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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



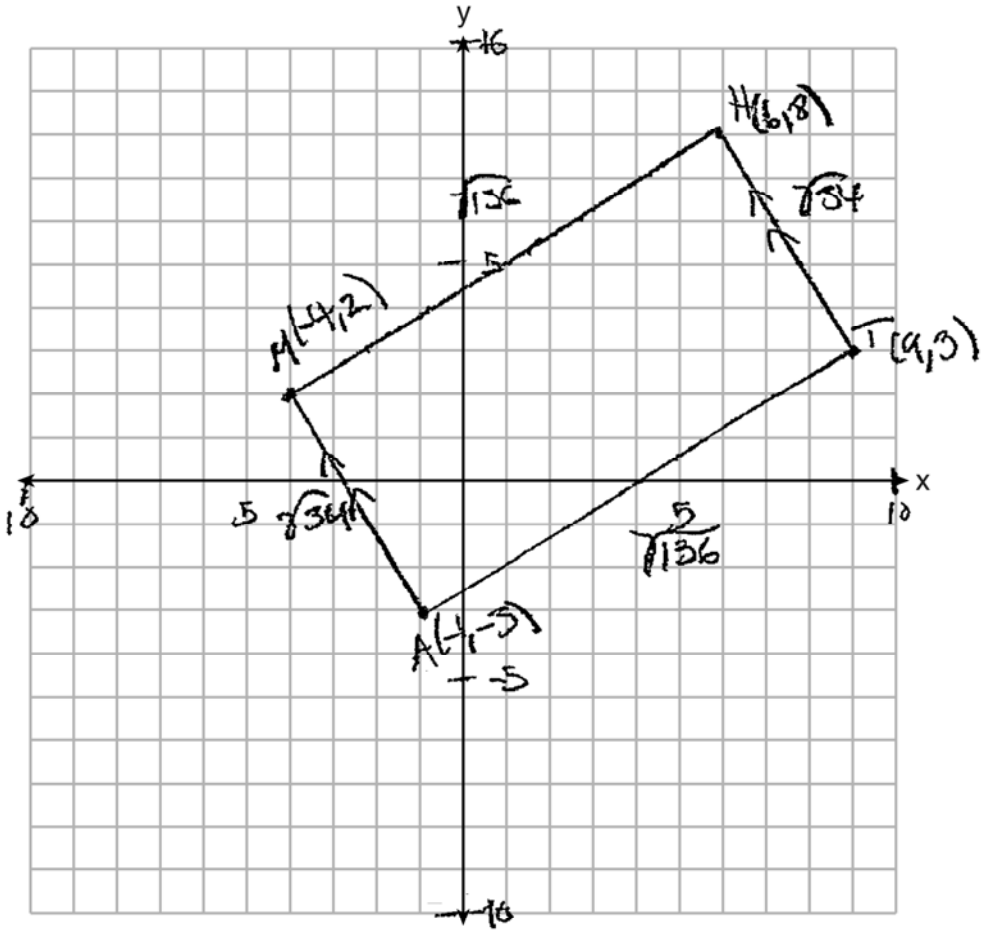
Score 3: The student found the slopes of $\overline{MA}$ and $\overline{HT}$ to be positive. The student had a conceptual error in proving *MATH* is a rectangle.

Question 35

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



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

MH $\sqrt{(6+4)^2+(8-2)^2}$ $\sqrt{100+36}$ $\sqrt{136}$

AT $\sqrt{(9+1)^2+(3+3)^2}$ $\sqrt{136}$

HT $\sqrt{(9-6)^2+(3-8)^2}$ $\sqrt{(3)^2+(-5)^2}$ $\sqrt{34}$

MA $\sqrt{(-1+4)^2+(-5-2)^2}$ $\sqrt{(-3)^2+(-7)^2}$ $\sqrt{34}$

quadrilateral MATH is a rectangle because it has two pairs of parallel sides and two pairs of congruent sides

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

$\overline{MH}$ $(-4,2)(6,8)$ x_1, y_1, x_2, y_2 $= \frac{y_2-y_1}{x_2-x_1} = \frac{8-2}{6--4} = \frac{6}{10} = \frac{3}{5}$

$\overline{AT}$ $(-1,-3)(9,3)$ x_1, y_1, x_2, y_2 $= \frac{y_2-y_1}{x_2-x_1} = \frac{3--3}{9--1} = \frac{6}{10} = \frac{3}{5}$

$\overline{MA}$ $(-4,2)(-1,-3)$ x_1, y_1, x_2, y_2 $= \frac{y_2-y_1}{x_2-x_1} = \frac{-3-2}{-1--4} = \frac{-5}{3}$

$\overline{HT}$ $(6,8)(9,3)$ x_1, y_1, x_2, y_2 $= \frac{y_2-y_1}{x_2-x_1} = \frac{3-8}{9-6} = \frac{-5}{3}$

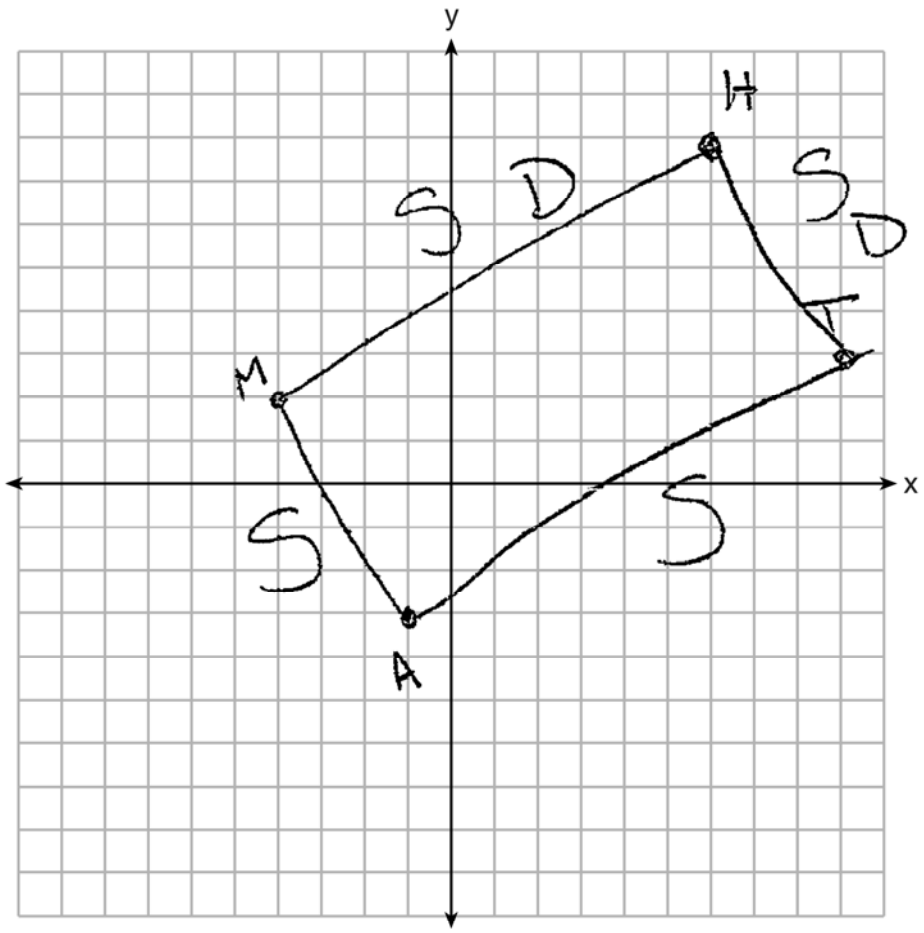
MATH is a ▱ because all opp. sides have the same slopes.

Score 2: The student did not connect the equal slopes to parallelism in proving *MATH* is a parallelogram. The student did not show enough relevant work to prove *MATH* is a rectangle.

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



$\overline{MH}$
(-4,2)(6,8) $d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
x_1y_1 x_2y_2 $d=\sqrt{(6--4)^2+(8-2)^2}$
$d=\sqrt{10^2+6^2}$
$d=\sqrt{100+36}$
$d=\sqrt{136}$

$\overline{HT}$
(6,8)(9,3)
x_1y_1 x_2y_2
$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
$d=\sqrt{(9-6)^2+(3-8)^2}$
$d=\sqrt{(3)^2+(-5)^2}$
$d=\sqrt{9+25}$
$d=\sqrt{34}$

MATH is a rectangle because the slopes form neg. reciprocals and the distances of joining sides are different.

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

Plan:
· Slope to show = slopes (parallel lines)

WORK:

MH $\frac{8-2}{6+4}$ $\frac{6}{10} = \frac{3}{5}$

AT $\frac{3+3}{9+1}$ $\frac{6}{10} = \frac{3}{5}$

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

HT $\frac{3-8}{9-6} = \frac{-5}{3}$

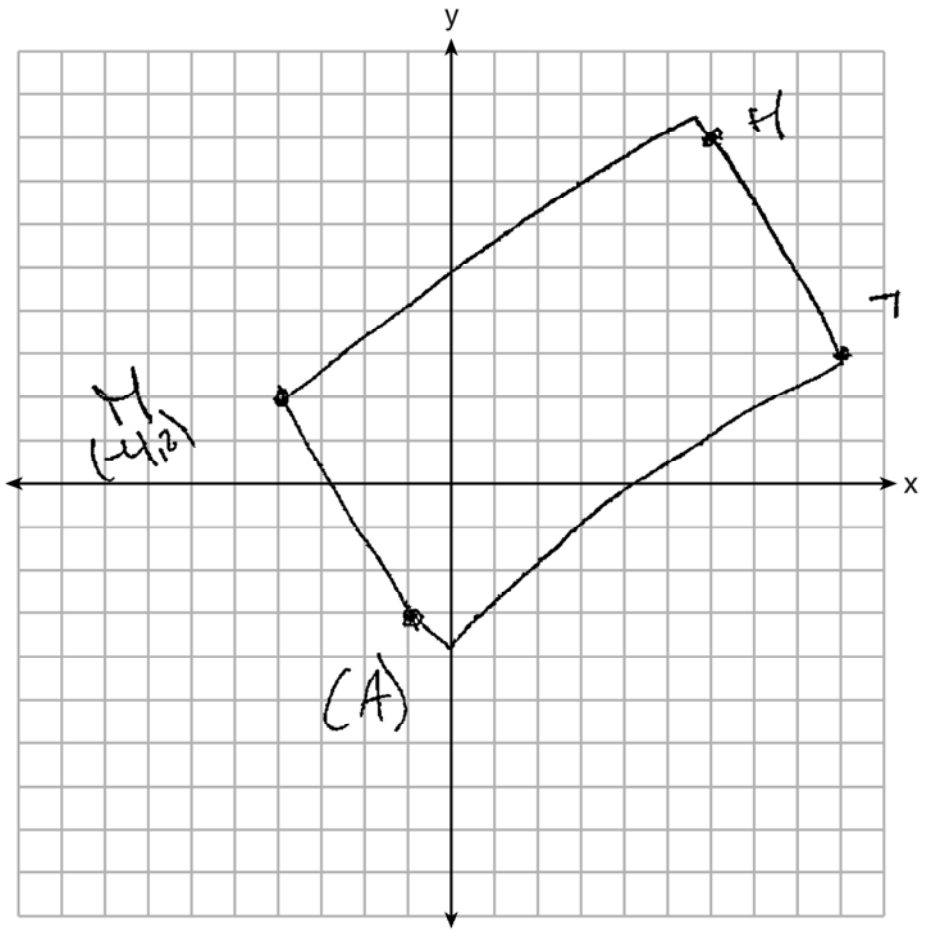
CONCLUSION
MATH is a parallelogram bc all 4 sides are parallel.

Score 2: The student made a computational error and wrote an incorrect conclusion in proving *MATH* is a parallelgram. The student made a conceptual error in proving *MATH* is a rectangle.

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



Plan:
· midpoint 2x to show diagonals bisect.

CONCLUSION

MATH is a rectangle bc their diagonals bisect eachother.

MAPT

AH $\left(\frac{-1+6}{2}, \frac{3+8}{2}\right)$ $(2.5, 2.5)$

MT $\left(\frac{-4+9}{2}, \frac{2+3}{2}\right)$ $(2.5, 2.5)$

Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

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

$\overline{AT} = \frac{-3-3}{-1-9} = \frac{-6}{-10} = \frac{3}{5}$

$\overline{TH} = \frac{3-8}{9-6} = -\frac{5}{3}$

$\overline{MH} = \frac{2-8}{-4-6} = \frac{-6}{-10} = \frac{3}{5}$

$\overline{MA} \parallel \overline{MH}$

$\overline{AT} \parallel \overline{TH}$

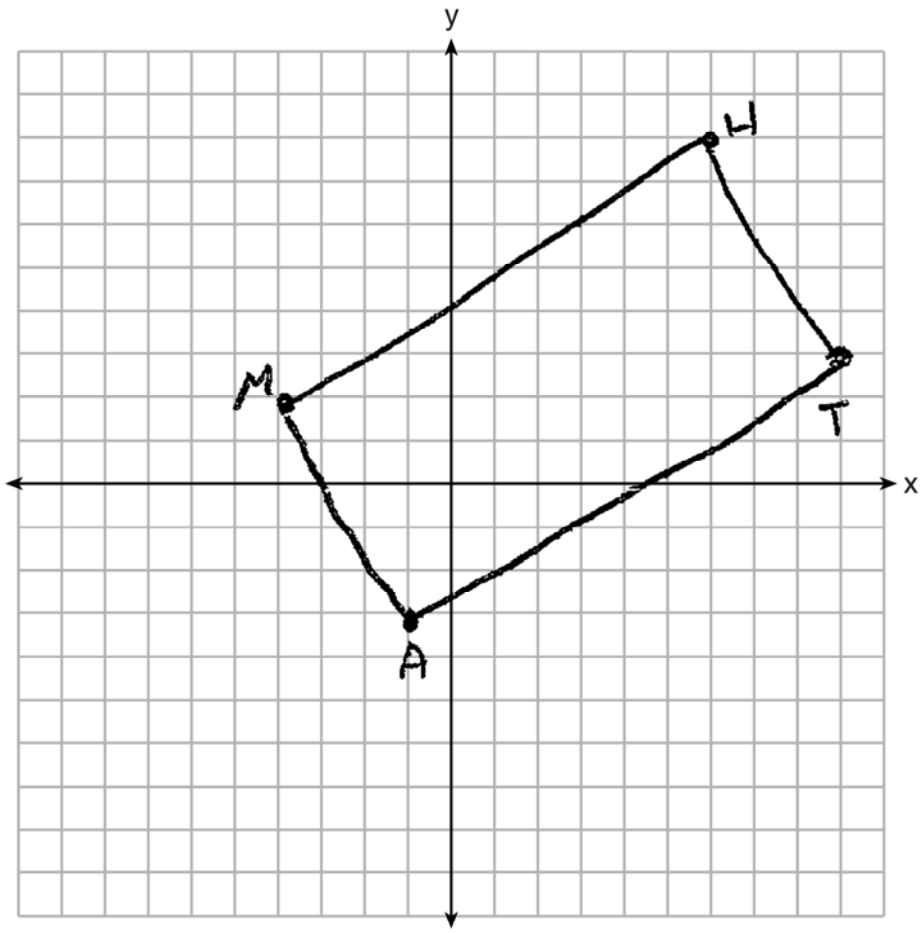
Opposite sides are parallel so quadrilateral MATH is a parallelogram and rectangle

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

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

Slope of $MH = \frac{8-2}{6-4} = \frac{6}{2}$

Slope of $AT = \frac{3+3}{9+1} = \frac{6}{10}$

$MH = \sqrt{(6-4)^2+(8-2)^2}$

$\sqrt{4+36}$

$\sqrt{40}$

$AT = \sqrt{(-1-9)^2+(-3-3)^2}$

$\sqrt{100+36}$

$\sqrt{136}$

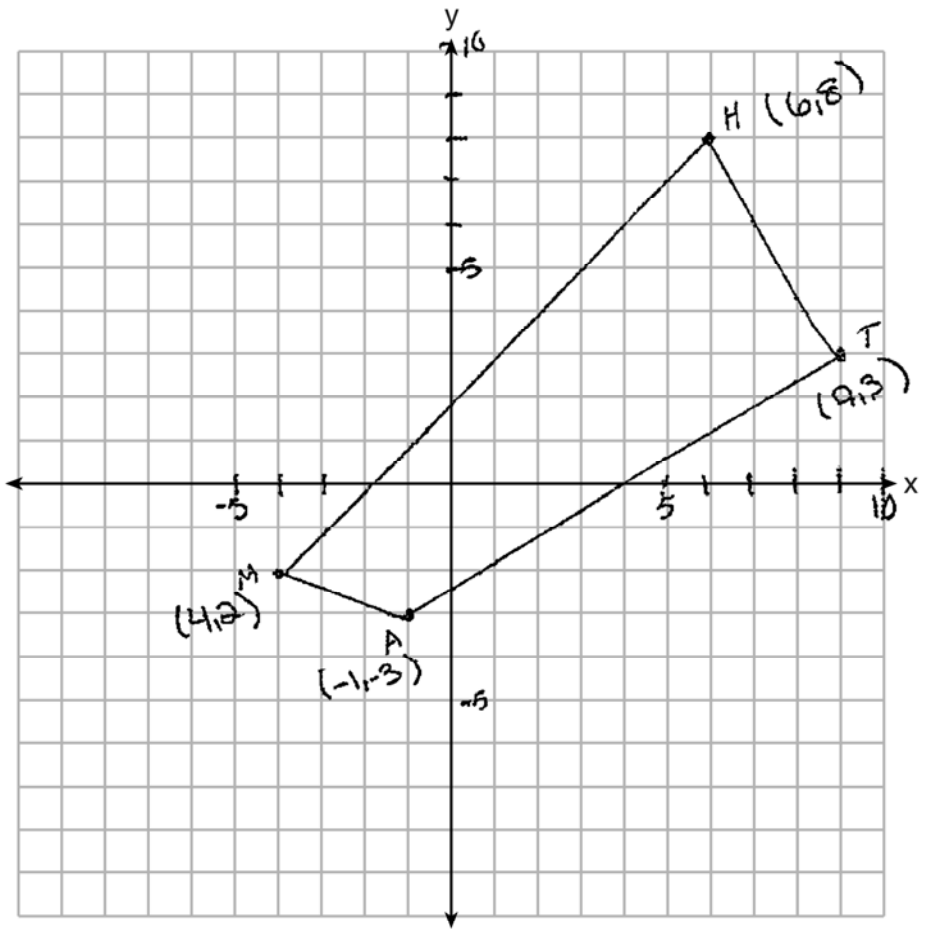
Score 0: The student did not show enough correct relevant work to receive any credit.

Question 35

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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



Question 35

35 The vertices of quadrilateral *MATH* have coordinates $M(-4,2)$, $A(-1,-3)$, $T(9,3)$, and $H(6,8)$.

Prove that quadrilateral *MATH* is a parallelogram.

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

distance: $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $\sqrt{(-1+4)^2+(-3,2)^2}$ $(3)^2+(-1)^2$ $9+1=\sqrt{10}$

$\sqrt{(6-9)^2+(8-3)^2}$ $(-3)^2+(5)^2$ $\sqrt{9+25}=\sqrt{34}$

MH $\sqrt{(6(+4)+(8,2)}$ $10+10=\sqrt{100}$ 10

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

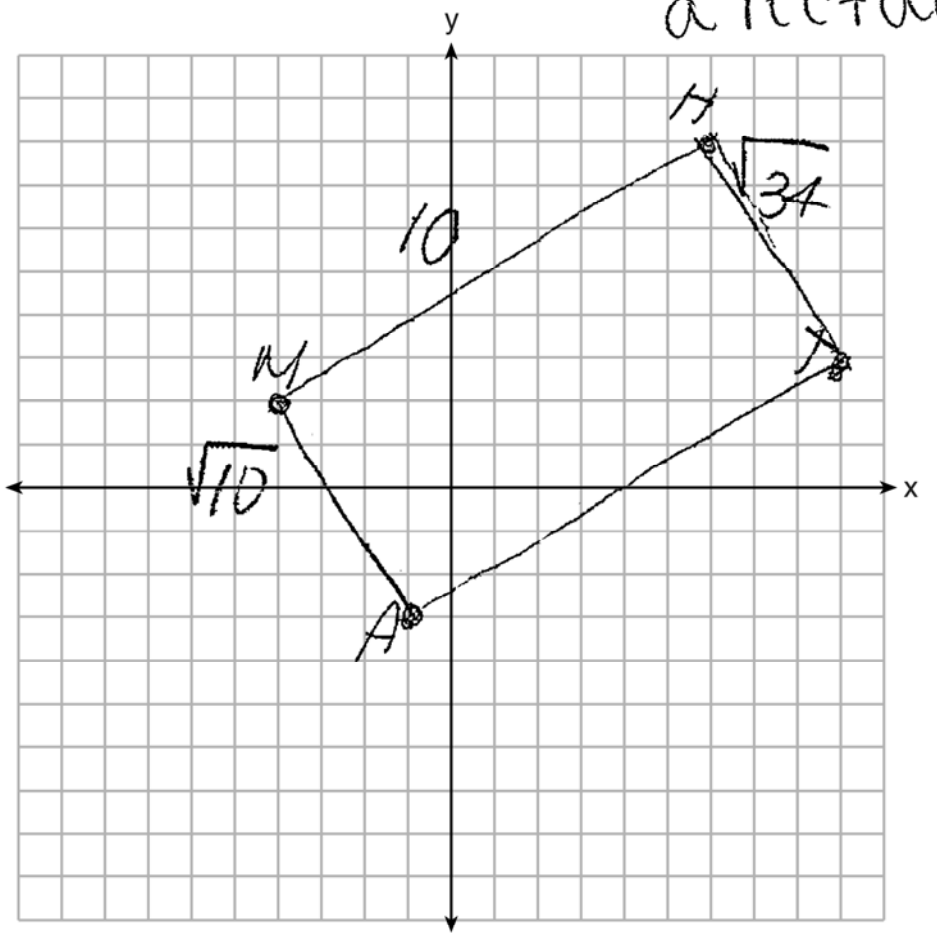
Question 35

Question 35 continued

Prove that quadrilateral *MATH* is a rectangle.

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

NO
~~pro~~ this
a parallelogram
but ~~not~~ is
a rectangle



The State Education Department / The University of the State of New York

Regents Examination in Geometry – August 2018

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

(Use for the August 2018 exam only.)

Raw Score	Scale Score	Performance Level
80	**100**	5
79	**99**	5
78	**98**	5
77	**97**	5
76	**96**	5
75	**95**	5
74	**95**	5
73	**94**	5
72	**93**	5
71	**92**	5
70	**91**	5
69	**91**	5
68	**90**	5
67	**89**	5
66	**88**	5
65	**88**	5
64	**87**	5
63	**86**	5
62	**86**	5
61	**85**	5
60	**84**	4
59	**84**	4
58	**83**	4
57	**83**	4
56	**82**	4
55	**81**	4
54	**81**	4
53	**80**	4
52	**80**	4
51	**79**	3
50	**79**	3
49	**78**	3
48	**78**	3
47	**77**	3
46	**77**	3
45	**76**	3
44	**76**	3
43	**75**	3
42	**74**	3
41	**74**	3
40	**73**	3
39	**73**	3
38	**72**	3
37	**71**	3
36	**70**	3
35	**70**	3
34	**69**	3
33	**68**	3
32	**67**	3
31	**66**	3
30	**65**	3
29	**64**	2
28	**63**	2
27	**62**	2
26	**61**	2
25	**60**	2
24	**58**	2
23	**57**	2
22	**56**	2
21	**55**	2
20	**53**	1
19	**51**	1
18	**50**	1
17	**48**	1
16	**46**	1
15	**44**	1
14	**42**	1
13	**40**	1
12	**38**	1
11	**36**	1
10	**33**	1
9	**31**	1
8	**28**	1
7	**26**	1
6	**23**	1
5	**19**	1
4	**16**	1
3	**13**	1
2	**9**	1
1	**5**	1
0	**0**	1

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

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

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