The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Friday, June 20, 2014 — 1:15 to 4:15 p.m., only

Student Name:_____

School Name: _____

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

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

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

This examination has four parts, with a total of 38 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.

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.

Answer all 28 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. 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. [56]

Use this space for computations.

1 Plane $\mathcal{P}$ is parallel to plane Q. If plane $\mathcal{P}$ is perpendicular to line ℓ, then plane Q

(1) contains line ℓ

(2) is parallel to line ℓ

(3) is perpendicular to line ℓ

(4) intersects, but is not perpendicular to line ℓ

2 In the diagram below, quadrilateral $ABCD$ has vertices $A(-5,1)$, $B(6,-1)$, $C(3,5)$, and $D(-2,7)$.
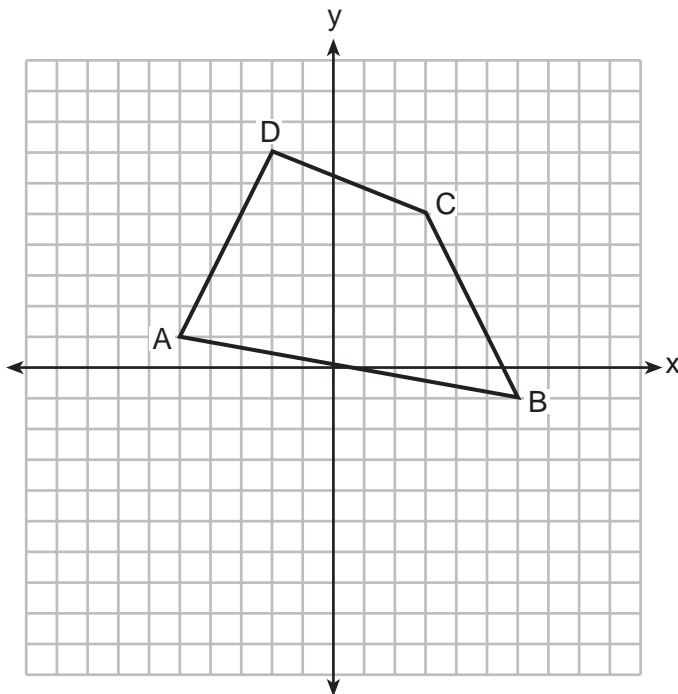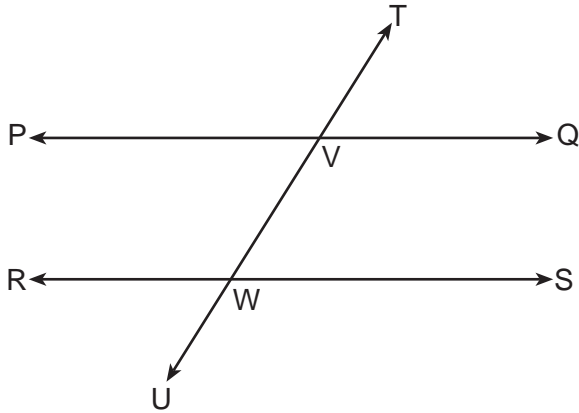

What are the coordinates of the midpoint of diagonal $\overline{AC}$?

(1) $(-1,3)$ (3) $(1,4)$

(2) $(1,3)$ (4) $(2,3)$

3 In the diagram below, transversal $\overleftrightarrow{TU}$ intersects $\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$ at V and W, respectively.

If $m\angle TVQ = 5x - 22$ and $m\angle VWS = 3x + 10$, for which value of x is $\overleftrightarrow{PQ} \parallel \overleftrightarrow{RS}$?

(1) 6   (3) 24

(2) 16   (4) 28

4 The measures of the angles of a triangle are in the ratio 2:3:4. In degrees, the measure of the *largest* angle of the triangle is

(1) 20   (3) 80

(2) 40   (4) 100

5 The diameter of the base of a right circular cylinder is 6 cm and its height is 15 cm. In square centimeters, the lateral area of the cylinder is

(1) 180π (3) 90π

(2) 135π (4) 45π

6 When the system of equations $y + 2x = x^2$ and $y = x$ is graphed on a set of axes, what is the total number of points of intersection?

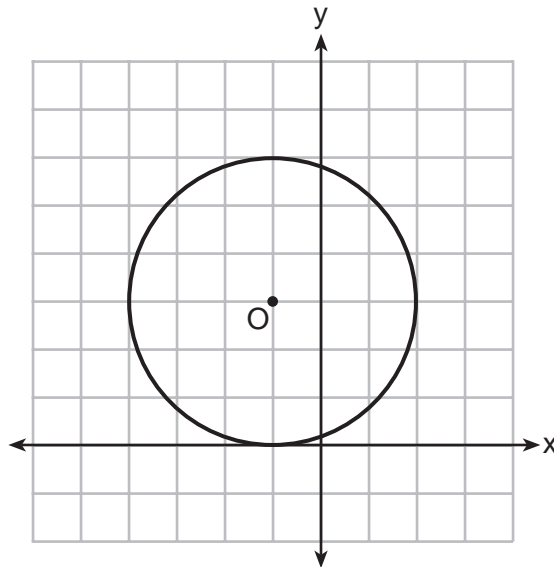(1) 1   (3) 3

(2) 2   (4) 0

7 The vertex angle of an isosceles triangle measures 15 degrees more than one of its base angles. How many degrees are there in a base angle of the triangle?

(1) 50   (3) 65

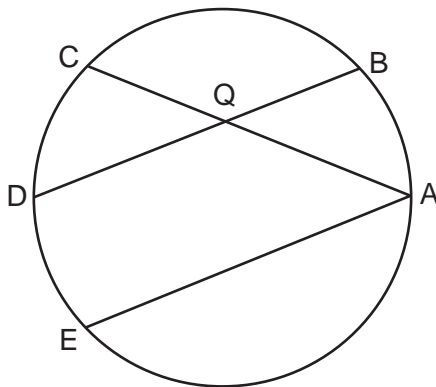(2) 55   (4) 70

8 Circle *O* is graphed on the set of axes below. Which equation represents circle *O*?

(1) $(x + 1)^2 + (y - 3)^2 = 9$

(2) $(x - 1)^2 + (y + 3)^2 = 9$

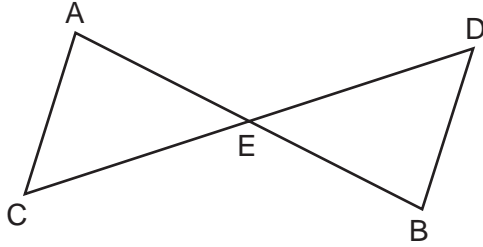(3) $(x + 1)^2 + (y - 3)^2 = 6$

(4) $(x - 1)^2 + (y + 3)^2 = 6$

9 In the diagram of the circle shown below, chords $\overline{AC}$ and $\overline{BD}$ intersect at *Q*, and chords $\overline{AE}$ and $\overline{BD}$ are parallel.

Which statement must always be true?

(1) $\overset{\frown}{AB} \cong \overset{\frown}{CD}$ (3) $\overset{\frown}{AB} \cong \overset{\frown}{DE}$

(2) $\overset{\frown}{DE} \cong \overset{\frown}{CD}$ (4) $\overset{\frown}{BD} \cong \overset{\frown}{AE}$

10 In the diagram below, $\triangle AEC \cong \triangle BED$.

Which statement is *not* always true?

(1) $\overline{AC} \cong \overline{BD}$ (3) $\angle EAC \cong \angle EBD$

(2) $\overline{CE} \cong \overline{DE}$ (4) $\angle ACE \cong \angle DBE$

11 What is the length of $\overline{RS}$ with $R(-2,3)$ and $S(4,5)$?

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

(2) 40 (4) $2\sqrt{17}$

**12** What are the truth values of the statement "Two is prime" and its negation?

(1) The statement is false and its negation is true.

(2) The statement is false and its negation is false.

(3) The statement is true and its negation is true.

(4) The statement is true and its negation is false.

13 A regular polygon has an exterior angle that measures 45°. How many sides does the polygon have?

(1) 10   (3) 6

(2) 8   (4) 4

14 In rhombus $ABCD$, with diagonals $\overline{AC}$ and $\overline{DB}$, $AD = 10$.
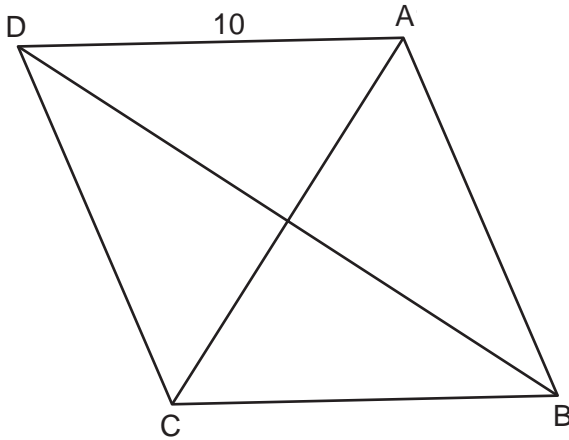
If the length of diagonal $\overline{AC}$ is 12, what is the length of $\overline{DB}$?

(1) 8

(3) $\sqrt{44}$

(2) 16

(4) $\sqrt{136}$

15 If the surface area of a sphere is 144π square centimeters, what is the length of the diameter of the sphere, in centimeters?

(1) 36

(3) 12

(2) 18

(4) 6

16 Which numbers could represent the lengths of the sides of a triangle?
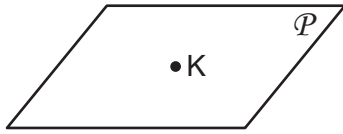
(1) 5, 9, 14

(3) 1, 2, 4

(2) 7, 7, 15

(4) 3, 6, 8

17 The equation of a line is $3y + 2x = 12$. What is the slope of the line perpendicular to the given line?

(1) $\frac{2}{3}$

(3) $-\frac{2}{3}$

(2) $\frac{3}{2}$

(4) $-\frac{3}{2}$
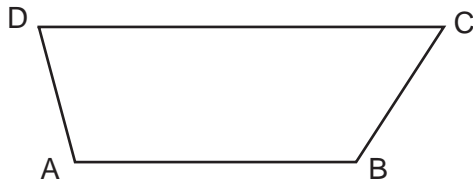
18 In the diagram below, point K is in plane $\mathcal{P}$.

How many lines can be drawn through K, perpendicular to plane $\mathcal{P}$?

(1) 1   (3) 0

(2) 2   (4) an infinite number

19 In the diagram below, $\overline{AB}$ and $\overline{CD}$ are bases of trapezoid $ABCD$.

(Not drawn to scale)

If $m\angle B = 123$ and $m\angle D = 75$, what is $m\angle C$?

(1) 57   (3) 105

(2) 75   (4) 123

20 What is the equation of a line passing through the point $(4, -1)$ and parallel to the line whose equation is $2y - x = 8$?

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

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

21 The image of rhombus *VWXY* preserves which properties under the transformation $T_{2,-3}$?

   (1) parallelism, only   (3) both parallelism and orientation

   (2) orientation, only   (4) neither parallelism nor orientation

22 The equation of a circle is $(x - 3)^2 + y^2 = 8$. The coordinates of its center and the length of its radius are

   (1) $(-3,0)$ and 4 (3) $(-3,0)$ and $2\sqrt{2}$

   (2) $(3,0)$ and 4 (4) $(3,0)$ and $2\sqrt{2}$

23 Which statement has the same truth value as the statement "If a quadrilateral is a square, then it is a rectangle"?

   (1) If a quadrilateral is a rectangle, then it is a square.

   (2) If a quadrilateral is a rectangle, then it is not a square.

   (3) If a quadrilateral is not a square, then it is not a rectangle.

   (4) If a quadrilateral is not a rectangle, then it is not a square.

24 The three medians of a triangle intersect at a point. Which measurements could represent the segments of one of the medians?

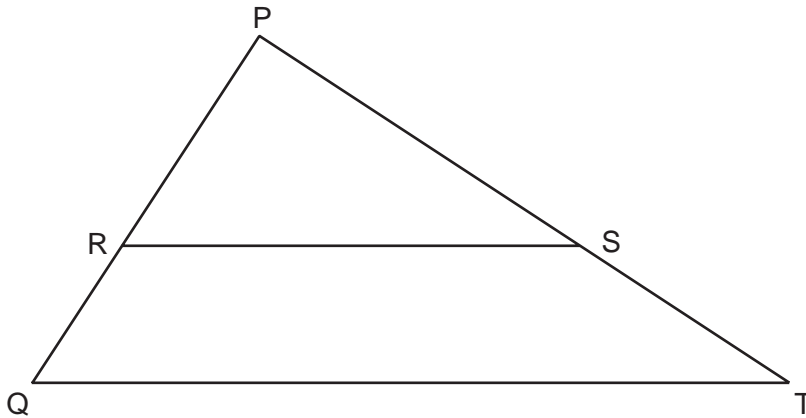   (1) 2 and 3   (3) 3 and 6

   (2) 3 and 4.5   (4) 3 and 9

25 In the diagram of $\triangle PQR$ shown below, $\overline{PR}$ is extended to S, $m\angle P = 110$, $m\angle Q = 4x$, and $m\angle QRS = x^2 + 5x$.

Q

(4x)°

110°   (x² + 5x)°

P   R   S

What is $m\angle Q$?

(1) 44   (3) 11
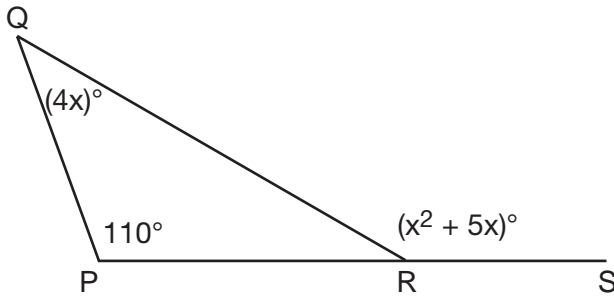
(2) 40   (4) 10

26 Triangle PQT with $\overline{RS} \parallel \overline{QT}$ is shown below.

P

R   S

Q   T

If $PR = 12$, $RQ = 8$, and $PS = 21$, what is the length of $\overline{PT}$?

(1) 14   (3) 35

(2) 17   (4) 38

27 In the diagram of $\overline{WXYZ}$ below, $\overline{WY} \cong \overline{XZ}$.

W   X   Y   Z

Which reasons can be used to prove $\overline{WX} \cong \overline{YZ}$?

(1) reflexive property and addition postulate

(2) reflexive property and subtraction postulate

(3) transitive property and addition postulate

(4) transitive property and subtraction postulate

28 The coordinates of the endpoints of the diameter of a circle are $(2,0)$ and $(2,-8)$. What is the equation of the circle?

(1) $(x - 2)^2 + (y + 4)^2 = 16$

(2) $(x + 2)^2 + (y - 4)^2 = 16$

(3) $(x - 2)^2 + (y + 4)^2 = 8$

(4) $(x + 2)^2 + (y - 4)^2 = 8$

Answer all 6 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. 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]
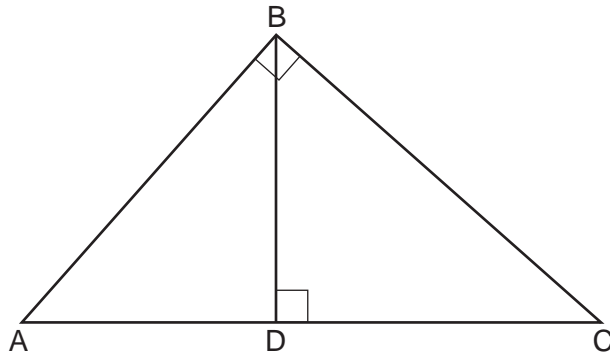
29 The coordinates of the endpoints of $\overline{BC}$ are $B(5,1)$ and $C(-3,-2)$. Under the transformation R_{90}, the image of $\overline{BC}$ is $\overline{B'C'}$. State the coordinates of points B' and C'.

30 As shown in the diagram below, $\overline{AS}$ is a diagonal of trapezoid $STAR$, $\overline{RA} \parallel \overline{ST}$, m∠$ATS$ = 48, m∠RSA = 47, and m∠ARS = 68.
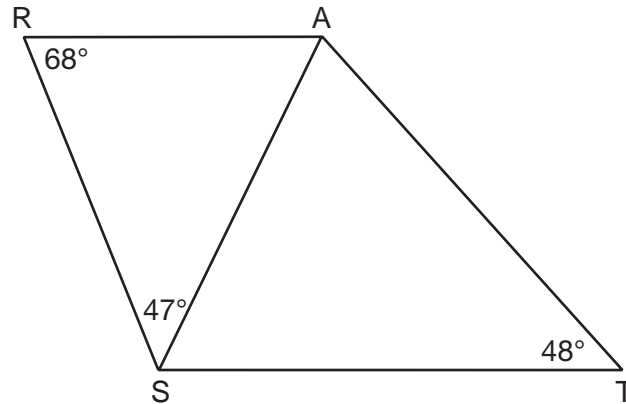
Determine and state the longest side of △SAT.

31 In right triangle ABC shown below, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.

If $AD = 8$ and $DC = 10$, determine and state the length of $\overline{AB}$.

[14]

32 Two prisms with equal altitudes have equal volumes. The base of one prism is a square with a side length of 5 inches. The base of the second prism is a rectangle with a side length of 10 inches. Determine and state, in inches, the measure of the width of the rectangle.

33 As shown in the diagram below, $\overline{BO}$ and tangents $\overline{BA}$ and $\overline{BC}$ are drawn from external point B to circle O. Radii $\overline{OA}$ and $\overline{OC}$ are drawn.
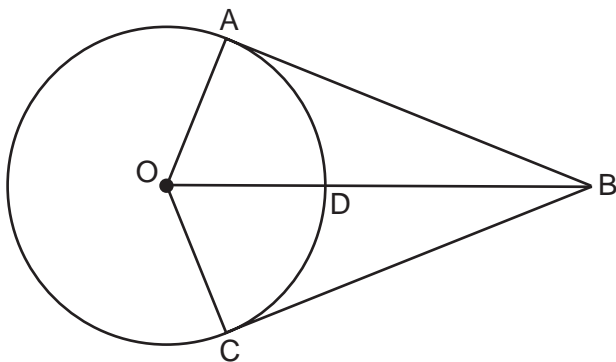
If $OA = 7$ and $DB = 18$, determine and state the length of $\overline{AB}$.

34 Triangle *RST* is similar to $\triangle XYZ$ with $RS = 3$ inches and $XY = 2$ inches. If the area of $\triangle RST$ is 27 square inches, determine and state the area of $\triangle XYZ$, in square inches.
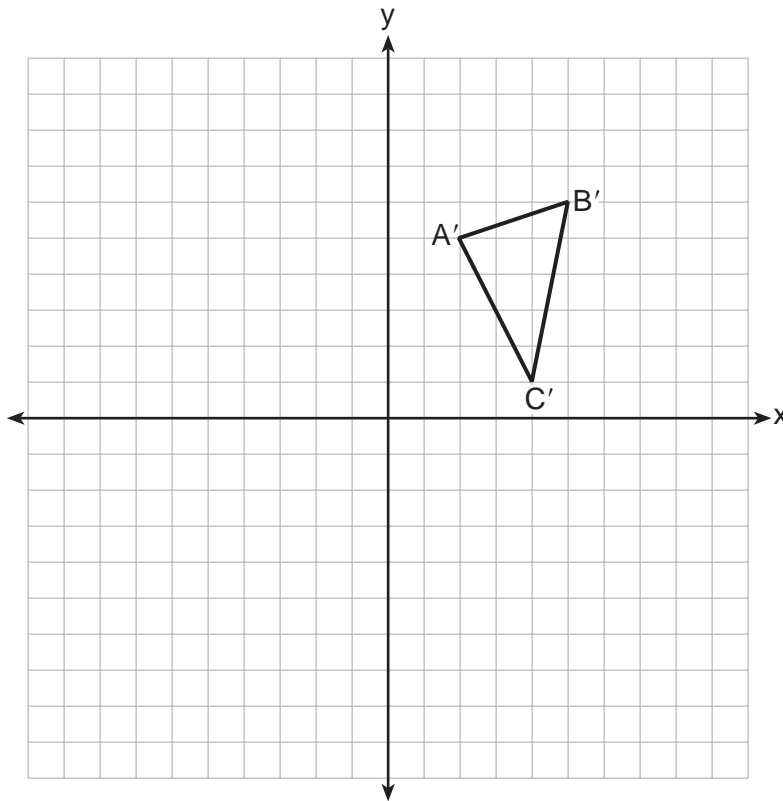
Part III

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. 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]

35 The graph below shows $\triangle A'B'C'$, the image of $\triangle ABC$ after it was reflected over the y-axis.

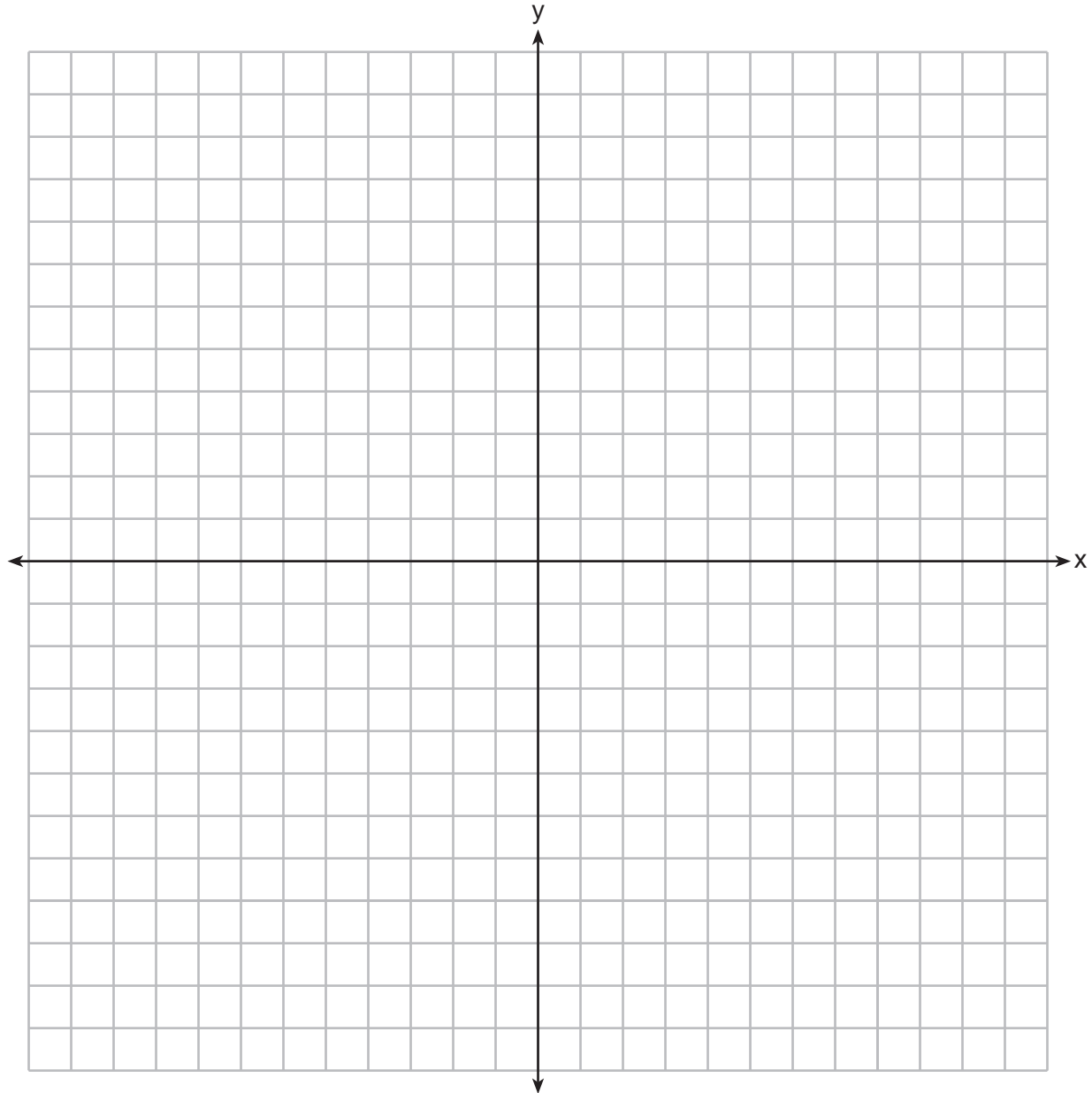Graph and label $\triangle ABC$, the pre-image of $\triangle A'B'C'$.

Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after it is reflected through the origin.

State a single transformation that will map $\triangle ABC$ onto $\triangle A''B''C''$.

36 On the set of axes below, sketch the locus of points 2 units from the *x*-axis and sketch the locus of points 6 units from the point (0,4).

Label with an **X** all points that satisfy both conditions.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at A.
[Leave all construction marks.]

A ————————————————————— B

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. A correct numerical answer with no work shown will receive only 1 credit. The answer should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

38 The vertices of quadrilateral $JKLM$ have coordinates $J(-3,1)$, $K(1,-5)$, $L(7,-2)$, and $M(3,4)$.

Prove that $JKLM$ is a parallelogram.

Prove that $JKLM$ is *not* a rhombus.

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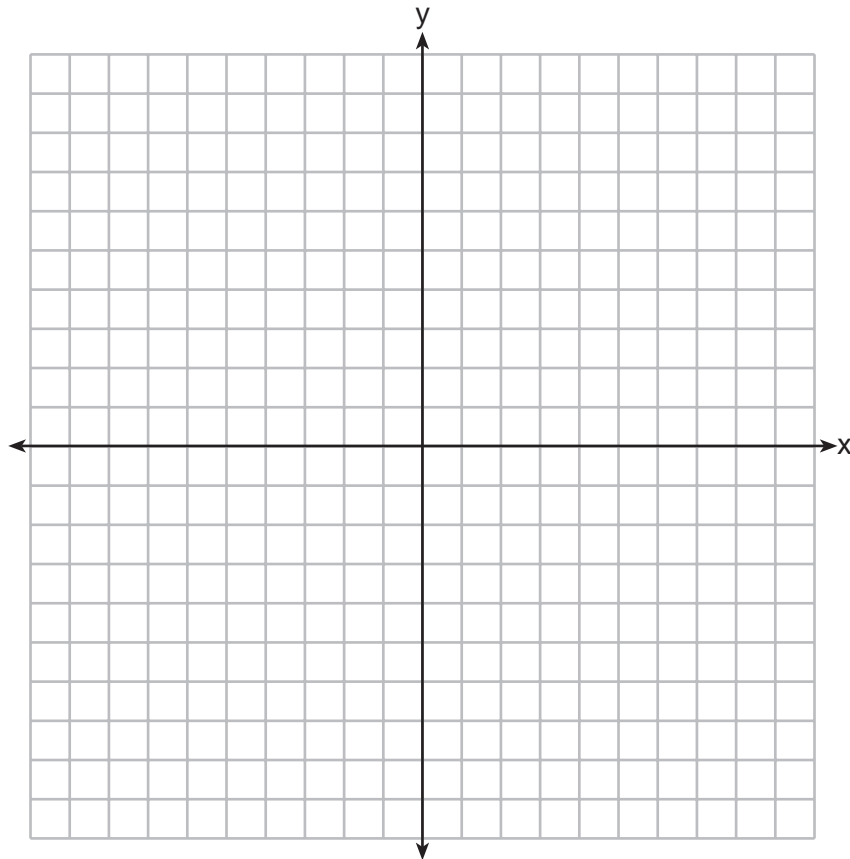
Reference Sheet

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

Lateral Area (L)	Right Circular Cylinder	$L = 2\pi rh$
	Right Circular Cone	$L = \pi rl$ where l is the slant height

Surface Area	Sphere	$SA = 4\pi r^2$

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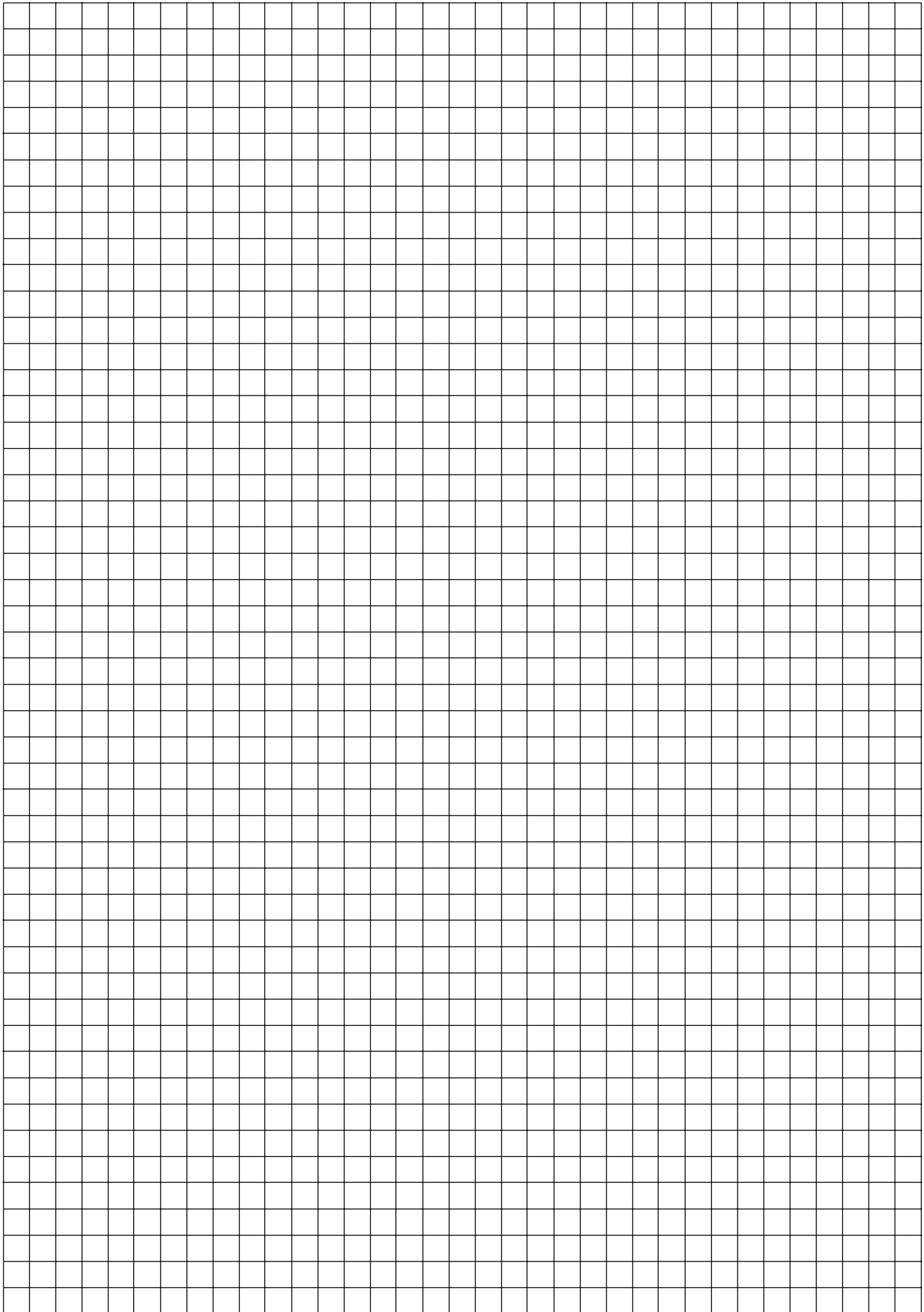
FOR TEACHERS ONLY

GEOMETRY

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 Examinations in Mathematics*.

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, June 20, 2014. 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 56 credits, 2 credits for each of the following.

(1) 3	(11) 3	(21) . . . . . 3 . . . . .
(2) 1	(12) 4	(22) . . . . . 4 . . . . .
(3) 2	(13) 2	(23) . . . . . 4 . . . . .
(4) 3	(14) 2	(24) . . . . . 3 . . . . .
(5) 3	(15) 3	(25) . . . . . 2 . . . . .
(6) 2	(16) 4	(26) . . . . . 3 . . . . .
(7) 2	(17) 2	(27) . . . . . 2 . . . . .
(8) 1	(18) 1	(28) . . . . . 1 . . . . .
(9) 3	(19) 1	
(10) 4	(20) 1	

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.

Beginning in June 2013, the Department is providing supplemental scoring guidance, the "Sample Response Set," for the Regents Examination in Geometry. This guidance is not required as part of the scorer training. It is at the school's discretion to incorporate it into the scorer training or to use it as supplemental information during scoring. While not reflective of all scenarios, the sample student responses selected for the Sample Response Set illustrate how less common student responses to open-ended questions may be scored. The Sample Response Set will be available on the Department's web site at: http://www.nysedregents.org/Geometry/.

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 Examinations in Mathematics*, 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 any response. 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.

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; i.e., awarding half credit for the conceptual error and deducting 1 credit for each mechanical error (maximum of two deductions for mechanical errors).

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.

(29)   **[2]** $(-1,5)$ and $(2,-3)$ are stated.

       [1] One conceptual error is made, such as rotating 90° clockwise and stating $(1,-5)$ and $(-2,3)$.

<div align="center">or</div>

       [1] $(-1,5)$ or $(2,-3)$ is stated.

       [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]** $\overline{ST}$, and correct work is shown.

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

<div align="center">or</div>

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

<div align="center">or</div>

       [1] m$\angle TSA = 65$ and m$\angle SAT = 67$ are found, but no further correct work is shown.

       [0] $\overline{ST}$, but no work is shown.

<div align="center">or</div>

       [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]** 12, and correct work is shown.

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

<p align="center">***or***</p>

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

<p align="center">***or***</p>

　　　　[1] $\frac{8}{x} = \frac{x}{18}$ or an equivalent equation, but no further correct work is shown.

<p align="center">***or***</p>

　　　　[1] Appropriate work is shown to find $\sqrt{80}$ or $\sqrt{180}$, but no further correct work is shown.

<p align="center">***or***</p>

　　　　[1] 12, 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.

(32)   **[2]** 2.5, and correct work is shown.

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

<p align="center">***or***</p>

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

<p align="center">***or***</p>

　　　　[1] 2.5, 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.

(33)   **[2]** 24, and correct work is shown.

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

or

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

or

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

or

       [1] 24, 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.

(34)   **[2]** 12, and correct work is shown.

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

or

       [1] Appropriate work is shown, but one conceptual error is made, such as not squaring the sides.

or

       [1] 12, 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.

(35)   **[4]** $\triangle ABC$ and $\triangle A''B''C''$ are graphed and labeled correctly, and a reflection over the *x*-axis is stated.

[3] Appropriate work is shown, but one graphing or labeling error is made, but an appropriate single transformation is stated.

or

[3] $\triangle ABC$ and $\triangle A''B''C''$ are graphed and labeled correctly, but a single transformation is not stated or is stated incorrectly.

[2] Appropriate work is shown, but two or more graphing or labeling errors are made, but an appropriate single transformation is stated.

or

[2] Appropriate work is shown, but one conceptual error is made in graphing either $\triangle ABC$ or $\triangle A''B''C''$, but an appropriate single transformation is stated.

or

[2] $\triangle ABC$ and $\triangle A''B''C''$ are graphed, but are not labeled or are labeled incorrectly and no further correct work is shown.

or

[2] $\triangle A''B''C''$ is graphed and labeled correctly, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error in graphing either $\triangle ABC$ or $\triangle A''B''C''$, and one graphing or labeling error are made, but an appropriate single transformation is stated.

or

[1] $\triangle ABC$ is graphed and labeled correctly, but no further correct work is shown.

or

[1] $\triangle ABC$ or $\triangle A''B''C''$ is graphed, but it is not labeled or is labeled incorrectly. No further correct work is shown.

or

[1] Appropriate work is shown to find $A(-2,5)$, $B(-5,6)$, and $C(-4,1)$, and $A''(-2,-5)$, $B''(-5,-6)$, and $C''(-4,-1)$, but no further correct work is shown.

[0] $r_{x\text{-axis}}$, but 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.

(36) **[4]** Both loci are drawn correctly, and the three correct points of intersection are labeled with an **X**.

[3] Both loci are drawn correctly, but only one or two points of intersection are labeled with an **X**.

or

[3] Both loci are drawn, but one graphing error is made. Appropriate points of intersection are labeled with an **X**.

[2] Both loci are drawn, but two or more graphing errors are made. Appropriate points of intersection are labeled with an **X**.

or

[2] Both loci are drawn, but one conceptual error is made. Appropriate points of intersection are labeled with an **X**.

or

[2] Both loci are drawn correctly, the points of intersection are not labeled.

[1] One locus is drawn correctly, but 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.

(37)   **[4]** A correct construction of an equilateral triangle is drawn showing all appropriate arcs. A correct construction of a 30° angle at *A* is drawn showing all appropriate arcs.

[3] A correct construction is drawn showing all appropriate arcs for an equilateral triangle. One construction error is made in drawing the angle bisector or a perpendicular line.

or

[3] A correct construction is drawn showing all appropriate arcs, and an equilateral triangle is drawn. The 30° angle is constructed at a different vertex.

[2] A correct construction is drawn showing all appropriate arcs, and the equilateral triangle is drawn. No further correct work is shown.

or

[2] A correct construction is drawn for a 30° angle at vertex *A*.

[1] All construction arcs are drawn for an equilateral triangle, but the sides are not drawn. No further correct work is shown.

or

[1] All construction arcs are drawn for an equilateral triangle, but a length other than *AB* is used.

[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.

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.

(38) **[6]** Correct work is shown to prove *JKLM* is a parallelogram and not a rhombus, and appropriate concluding statements are made.

[5] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but one computational or graphing error is made. Appropriate concluding statements are made.

or

[5] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but one concluding statement is missing or is incorrect.

[4] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but two or more computational or graphing errors are made. Appropriate concluding statements are made.

or

[4] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but one conceptual error is made. Appropriate concluding statements are made.

or

[4] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but both concluding statements are missing or are incorrect.

[3] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but one conceptual error and one computational or graphing error are made. Appropriate concluding statements are made.

or

[3] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but two or more computational or graphing errors are made, and one concluding statement is missing or is incorrect.

or

[3] Appropriate work is shown to prove *JKLM* is a parallelogram, and an appropriate concluding statement is written, but no further correct work is shown.

or

[3] Appropriate work is shown to prove *JKLM* is not a rhombus, and an appropriate concluding statement is written, but no further correct work is shown.

[2] Appropriate work is shown to prove *JKLM* is a parallelogram and not a rhombus, but two conceptual errors are made. Appropriate concluding statements are written.

or

[2] Appropriate work is shown to prove $\overline{JK} \parallel \overline{LM}$ and $\overline{JM} \parallel \overline{KL}$, but no further correct work is shown.

or

[2] Appropriate work is shown to prove that $\overline{JL}$ and $\overline{KM}$ bisect each other, but no further correct work is shown.

or

[2] Appropriate work is shown to prove that $\overline{JL}$ is not perpendicular to $\overline{KM}$, but no further correct work is shown.

or

[2] Appropriate work is shown to find the lengths of all four sides, but no further correct work is shown.

or

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

[1] Appropriate work is shown to find the midpoints of $\overline{JL}$ and $\overline{KM}$, but no further correct work is shown.

or

[1] Appropriate work is shown to find the slopes of $\overline{JL}$ and $\overline{KM}$, but no further correct work is shown.

or

[1] Appropriate work is shown to find the slopes of all four sides, but 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 Core Curriculum

Content Band	Item Numbers
Geometric Relationships	1, 5, 15, 18, 32
Constructions	37
Locus	36
Informal and Formal Proofs	3, 4, 7, 9, 10, 12, 13, 14, 16, 19, 23, 24, 25, 26, 27, 30, 31, 33, 34
Transformational Geometry	21, 29, 35
Coordinate Geometry	2, 6, 8, 11, 17, 20, 22, 28, 38

Regents Examination in Geometry
June 2014
Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the June 2014 Regents Examination in Geometry* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Friday, June 20, 2014. 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, June 20, 2014 — 1:15 p.m.

SAMPLE RESPONSE SET

Table of Contents

29 The coordinates of the endpoints of $\overline{BC}$ are $B(5,1)$ and $C(-3,-2)$. Under the transformation R_{90}, the image of $\overline{BC}$ is $\overline{B'C'}$. State the coordinates of points B' and C'.

$$(-1,5)$$
$$(2,-3)$$

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

29 The coordinates of the endpoints of $\overline{BC}$ are $B(5,1)$ and $C(-3,-2)$. Under the transformation R_{90}, the image of $\overline{BC}$ is $\overline{B'C'}$. State the coordinates of points B' and C'.
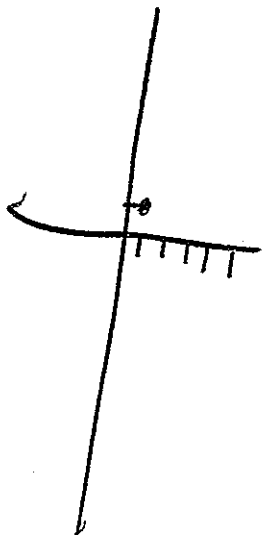
$B' = -1,5$

$C' = 2, -3$

Score 1: The student did not express the coordinates as an ordered pair.

29 The coordinates of the endpoints of $\overline{BC}$ are $B(5,1)$ and $C(-3,-2)$. Under the transformation R_{90}, the image of $\overline{BC}$ is $\overline{B'C'}$. State the coordinates of points B' and C'.

$$(1,-5)$$
$$(2,-3)$$

Score 1: The student only stated $(2,-3)$ correctly.

29 The coordinates of the endpoints of $\overline{BC}$ are $B(5,1)$ and $C(-3,-2)$. Under the transformation R_{90}, the image of $\overline{BC}$ is $\overline{B'C'}$. State the coordinates of points B' and C'.

$B(5,1)$ $C(-3,-2)$

$B'(-1,-5)$ $(-1,-5)$ $(2,3)$

$C'(2,3)$

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

Score 0:   The student's work is completely incorrect.

30 As shown in the diagram below, $\overline{AS}$ is a diagonal of trapezoid *STAR*, $\overline{RA} \parallel \overline{ST}$, m∠*ATS* = 48, m∠*RSA* = 47, and m∠*ARS* = 68.

Determine and state the longest side of △*SAT*.

R   A

68°   65°

67°

47°

65°

S   48°   T

47
+ 68
̄ ̄ ̄ ̄ ̄
115°⁻

65
+ 48
̄ ̄ ̄ ̄ ̄
113°
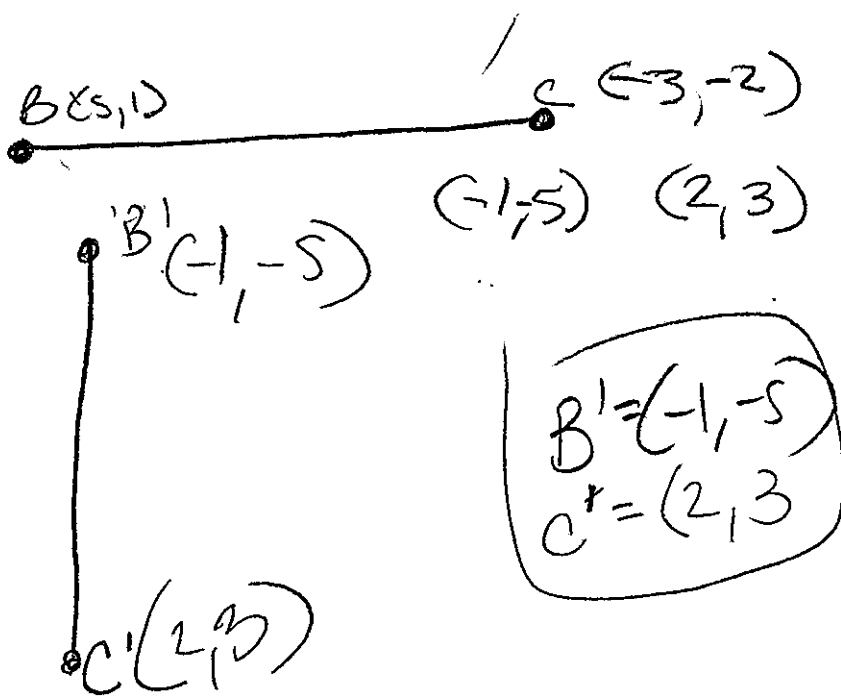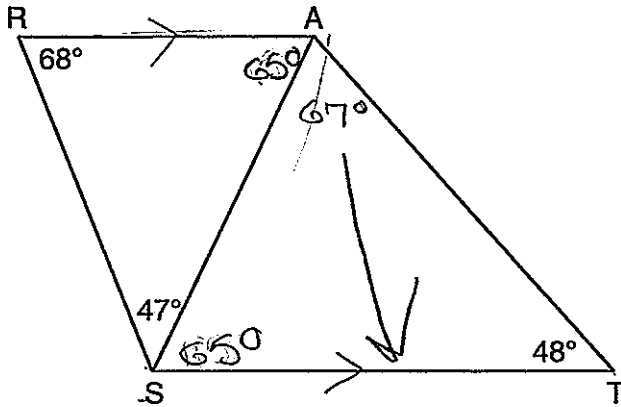
$\overline{ST}$ is the longest side

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

30 As shown in the diagram below, $\overline{AS}$ is a diagonal of trapezoid *STAR*, $\overline{RA} \parallel \overline{ST}$, m∠*ATS* = 48, m∠*RSA* = 47, and m∠*ARS* = 68.

Determine and state the longest side of △*SAT*.

R ——— A
68°
67
47°
65
48°
S   T

ST

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

30 As shown in the diagram below, $\overline{AS}$ is a diagonal of trapezoid *STAR*, $\overline{RA} \parallel \overline{ST}$, m∠*ATS* = 48, m∠*RSA* = 47, and m∠*ARS* = 68.

Determine and state the longest side of △*SAT*.

R ⟶ A

68°

47°

48
+47
95

47°
85°
48°

S ⟶ T

$\overline{AT}$ is longest

180
-95
85
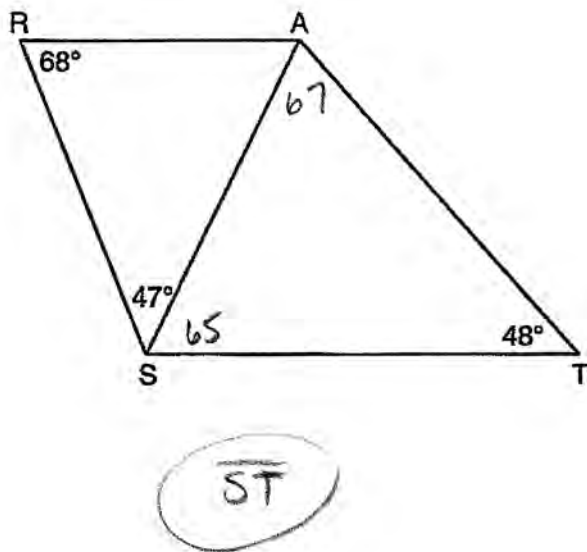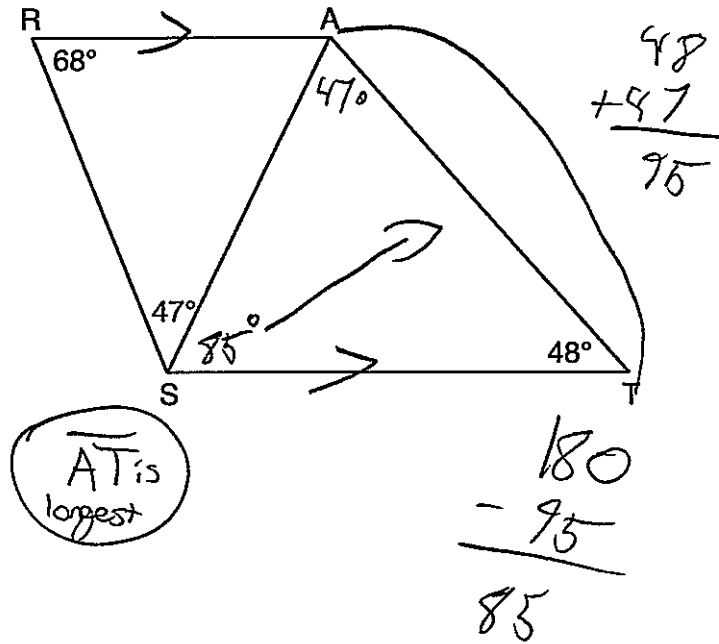
Score 1: The student made one conceptual error in finding m∠*SAT* = 47, but found an appropriate m∠*AST* and determined $\overline{AT}$ as the longest side.

30 As shown in the diagram below, $\overline{AS}$ is a diagonal of trapezoid *STAR*, $\overline{RA} \parallel \overline{ST}$, m∠*ATS* = 48, m∠*RSA* = 47, and m∠*ARS* = 68.

Determine and state the longest side of △*SAT*.
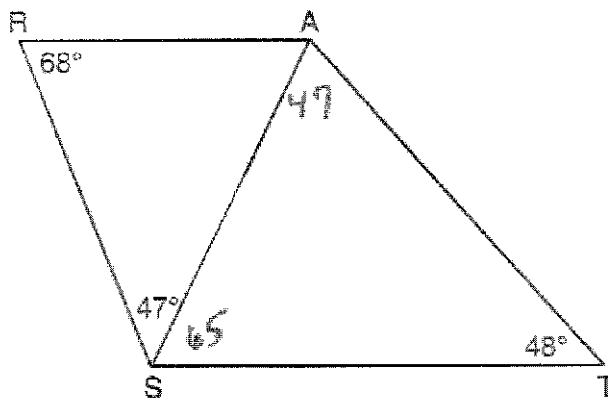
Score 0: The student made one conceptual error in finding m∠*SAT*. A longest side was not stated.

31 In right triangle ABC shown below, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.
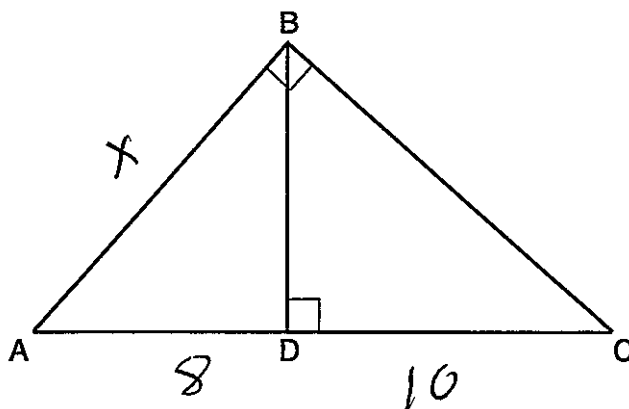
If $AD = 8$ and $DC = 10$, determine and state the length of $\overline{AB}$.

$$\text{law } \frac{\text{leg}}{\text{hyp}} \quad \frac{8}{x} = \frac{x}{18}$$

$$x^2 = 144$$

$$x = 12$$

length of $\overline{AB} = 12$

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

31 In right triangle *ABC* shown below, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.

B

X

A   8   D   10   C

If *AD* = 8 and *DC* = 10, determine and state the length of $\overline{AB}$.

$$\frac{8}{x} = \frac{x}{10}$$

1 4 9 12 16 25 36
49

$$x^2 = \sqrt{80}$$

$\sqrt{16}$ $\sqrt{5}$

$4\sqrt{5}$
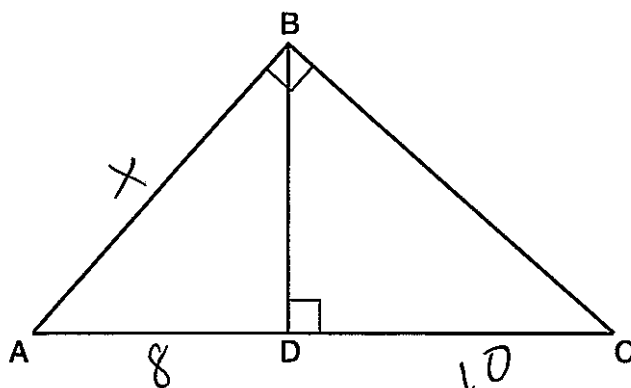
Score 1: The student made a conceptual error when writing the proportion, but wrote an appropriate solution.

31 In right triangle *ABC* shown below, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.
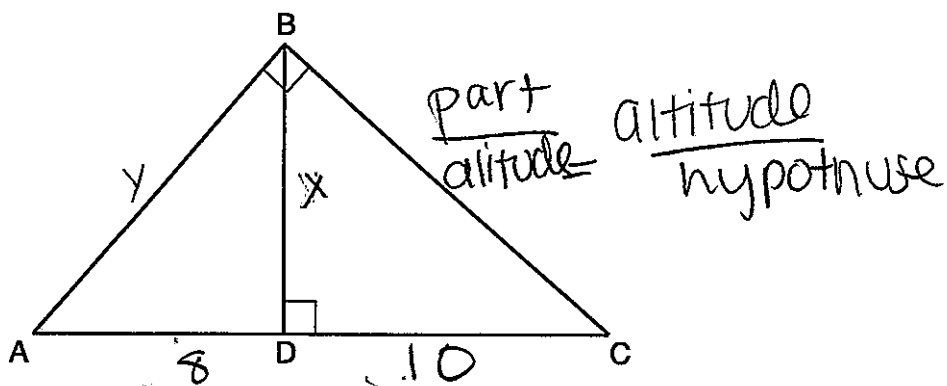
If *AD* = 8 and *DC* = 10, determine and state the length of $\overline{AB}$.

$$\frac{8}{x} = \frac{x}{10}$$

$$80 = x^2$$

$$x = 8.9$$

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

$$8.9^2 + 8^2 = y^2$$

$$79.21 + 64 = 143.21$$

$$y = 11.96$$

Score 1: The student found an approximate length of $\overline{BD}$, and used it to find the length of $\overline{AB}$.

31 In right triangle *ABC* shown below, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.

If *AD* = 8 and *DC* = 10, determine and state the length of $\overline{AB}$.

$\dfrac{Hyp}{x}$

$\dfrac{x}{\cancel{reflect}}$

$\dfrac{x}{8} \quad \dfrac{8}{10}$

$\dfrac{64}{10} = 6.4$

Score 0: The student's work is completely incorrect.

32 Two prisms with equal altitudes have equal volumes. The base of one prism is a square with a side length of 5 inches. The base of the second prism is a rectangle with a side length of 10 inches. Determine and state, in inches, the measure of the width of the rectangle.

2.5

5

5

5

5

$A = bh$

$A = 25$

X

10
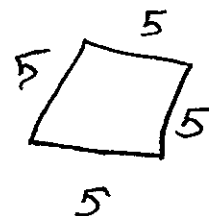
$A = bh$

$A = 10x$

$25 = 10x$

$2.5 = x$

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

32 Two prisms with equal altitudes have equal volumes. The base of one prism is a square with a side length of 5 inches. The base of the second prism is a rectangle with a side length of 10 inches. Determine and state, in inches, the measure of the width of the rectangle.

$$\cancel{V} = l \, w \cancel{h} \qquad\qquad \cancel{V} = l \, w \cancel{h}$$

$$V = V$$

$$5^2 = 10w$$

$$\frac{10}{10} = \frac{10w}{10}$$

$$1 = w$$

Score 1: The student made a conceptual error in squaring 5.

32 Two prisms with equal altitudes have equal volumes. The base of one prism is a square with a side length of 5 inches. The base of the second prism is a rectangle with a side length of 10 inches. Determine and state, in inches, the measure of the width of the rectangle.
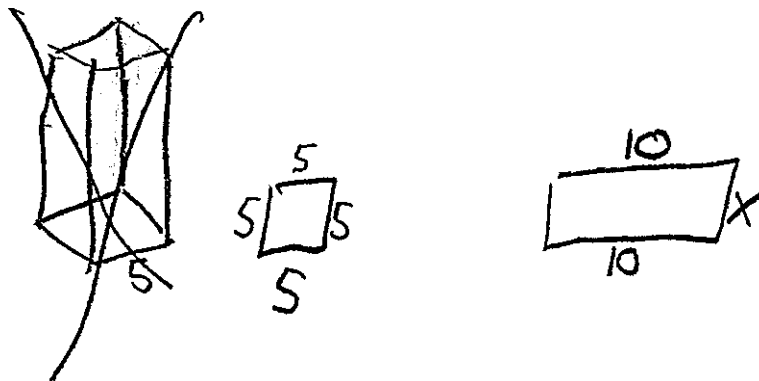
Score 0: The student did not write an equation or state an answer.

33 As shown in the diagram below, $\overline{BO}$ and tangents $\overline{BA}$ and $\overline{BC}$ are drawn from external point B to circle O. Radii $\overline{OA}$ and $\overline{OC}$ are drawn.
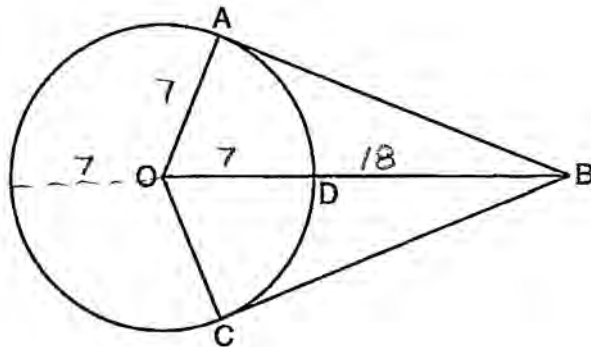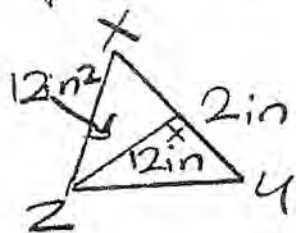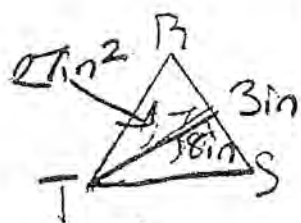

If $OA = 7$ and $DB = 18$, determine and state the length of $\overline{AB}$.

$$18 \cdot 32 = AB^2$$

$$\sqrt{576} = \sqrt{AB^2}$$

$$24 = AB$$

Score 2: The student has a complete and correct response using the theorem of a tangent and secant drawn to a circle. $AB = 24$ is stated.

33 As shown in the diagram below, $\overline{BO}$ and tangents $\overline{BA}$ and $\overline{BC}$ are drawn from external point B to circle O. Radii $\overline{OA}$ and $\overline{OC}$ are drawn.
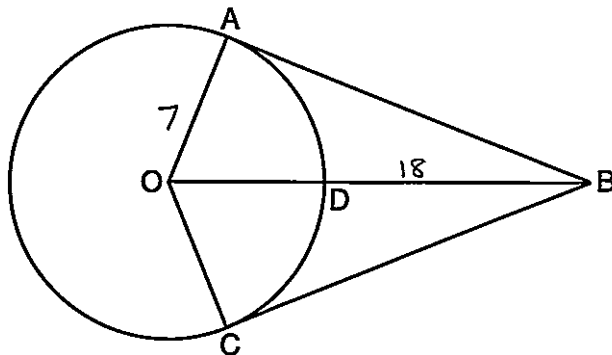
If $OA = 7$ and $DB = 18$, determine and state the length of $\overline{AB}$.

$$25^2 - 7^2 = 576$$

$$\sqrt{576} = 24$$

$$\boxed{AB = 24}$$

Score 2: The student has a correct response. The student used the Pythagorean Theorem to find $AB = 24$.

33 As shown in the diagram below, $\overline{BO}$ and tangents $\overline{BA}$ and $\overline{BC}$ are drawn from external point B to circle O. Radii $\overline{OA}$ and $\overline{OC}$ are drawn.

If $OA = 7$ and $DB = 18$, determine and state the length of $\overline{AB}$.

$$7^2 + b^2 = 25^2$$
$$49 + b^2 = 225$$
$$\underline{-49 \qquad -49}$$
$$\sqrt{b^2} = \sqrt{176}$$
$$b \approx 13.3$$

Score 1: The student made a computational error in calculating 25^2.

33 As shown in the diagram below, $\overline{BO}$ and tangents $\overline{BA}$ and $\overline{BC}$ are drawn from external point B to circle O. Radii $\overline{OA}$ and $\overline{OC}$ are drawn.
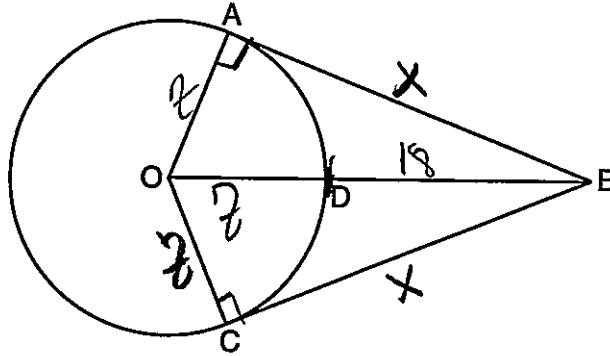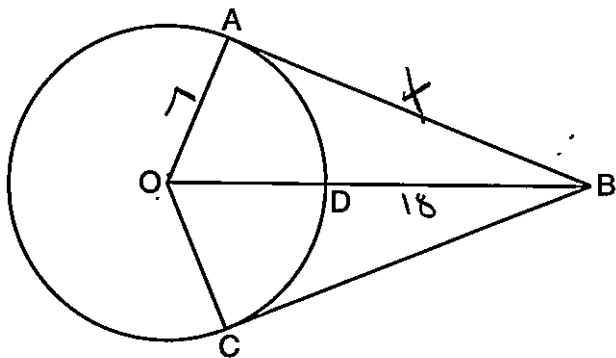
If $OA = 7$ and $DB = 18$, determine and state the length of $\overline{AB}$.

$$a^2 + b^2 = c^2$$
$$7^2 + b^2 = 18^2$$
$$49 + b^2 = 324$$
$$\underline{-49 \qquad\qquad -49}$$
$$\sqrt{b^2} = \sqrt{275}$$
$$b = \sqrt{25}\,\sqrt{11}$$
$$b = 5\sqrt{11}.$$

Score 1: The student made a conceptual error by using 18 as the length of the hypotenuse.

33 As shown in the diagram below, $\overline{BO}$ and tangents $\overline{BA}$ and $\overline{BC}$ are drawn from external point B to circle O. Radii $\overline{OA}$ and $\overline{OC}$ are drawn.
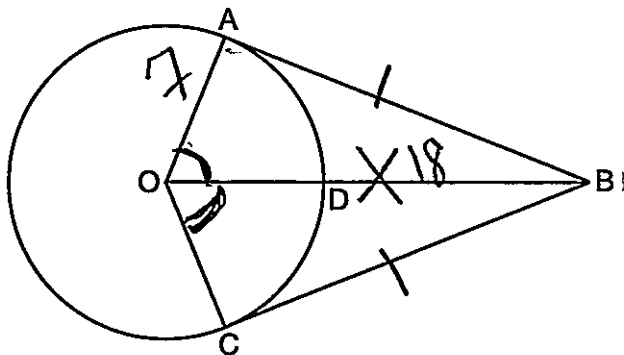
If $OA = 7$ and $DB = 18$, determine and state the length of $\overline{AB}$.

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

$$7^2 \cdot 18^2 = c^2$$

$$\sqrt{373} = \sqrt{c^2}$$

$$19.3 = c$$

Score 0: The student made two conceptual errors.

34 Triangle *RST* is similar to △*XYZ* with *RS* = 3 inches and *XY* = 2 inches. If the area of △*RST* is 27 square inches, determine and state the area of △*XYZ*, in square inches.

$$A = \frac{bh}{2}$$

$$27 = \frac{3 \cdot h}{2}$$

$$h = 18$$

$$\frac{18}{X} = \frac{3}{2}$$

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

$$X = 12$$

$$A = \frac{bh}{2}$$

$$A = \frac{2 \cdot 12}{2}$$

$$\boxed{A = 12 \, in^2}$$

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

34 Triangle *RST* is similar to △*XYZ* with *RS* = 3 inches and *XY* = 2 inches. If the area of △*RST* is 27 square inches, determine and state the area of △*XYZ*, in square inches.

$$\frac{27}{A} = \frac{3^2}{2^2}$$

$$\frac{27}{A} = \frac{9}{4}$$

$$9A = 108$$

$$A = 12$$

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

34 Triangle *RST* is similar to $\triangle XYZ$ with $RS = 3$ inches and $XY = 2$ inches. If the area of $\triangle RST$ is 27 square inches, determine and state the area of $\triangle XYZ$, in square inches.
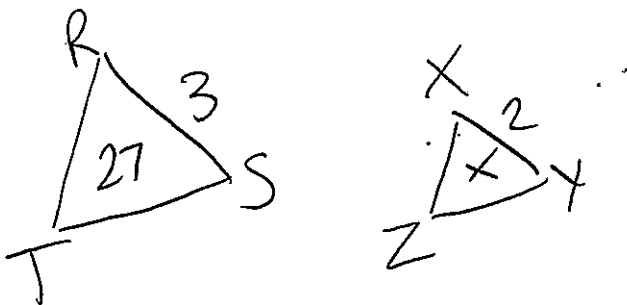
The area of $\triangle XYZ$ is $18 in^2$

$$\frac{3}{27} = \frac{2}{x}$$

$$3x = 2(27)$$

$$\frac{3x}{3} = \frac{54}{3}$$

$$x = 18$$

Score 1: The student made one conceptual error by not squaring the sides in the ratio.

34 Triangle *RST* is similar to △*XYZ* with *RS* = 3 inches and *XY* = 2 inches. If the area of △*RST* is 27 square inches, determine and state the area of △*XYZ*, in square inches.

R

3

27

S   T

X

2

Y   Z
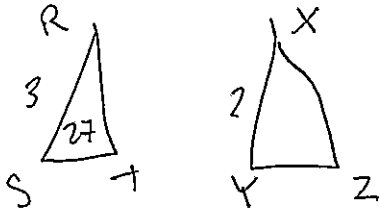
$$\frac{1}{2}Bh = 27$$

$$\frac{1}{2}3h = 27$$

$$\frac{1.5h}{1.5} = \frac{27}{1.5}$$

$$h = 18$$

$$\frac{3}{2} = \frac{18}{X}$$

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

$$X = 12$$

$$\frac{1}{2}(2)(12)$$

$$\frac{1}{2} \ 24$$

$$24 = area \ of \ △XYZ$$

Score 1: The student correctly calculated the height of △*XYZ*, but made an error in calculating the area of the triangle.

34 Triangle *RST* is similar to $\triangle XYZ$ with $RS = 3$ inches and $XY = 2$ inches. If the area of $\triangle RST$ is 27 square inches, determine and state the area of $\triangle XYZ$, in square inches.
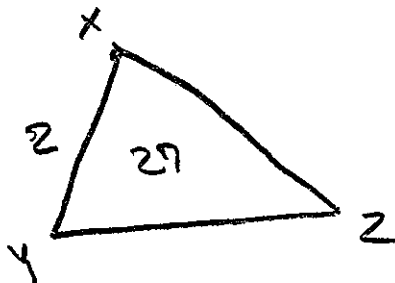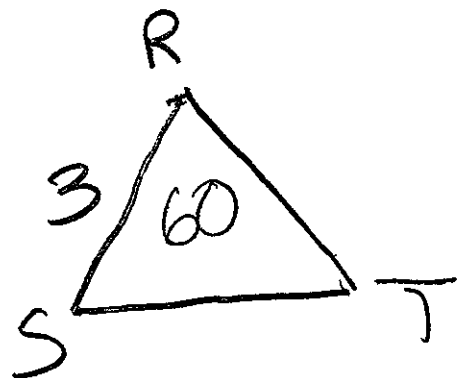
$$\frac{2^2}{3^2} = \frac{4}{9}$$

$$\left(\frac{9}{4}\right)\frac{4}{9}x = 27\left(\frac{9}{4}\right)$$

$$x = 60$$

Score 0: The student made an error by labeling the area of $\triangle XYZ$ as 27. The student made a rounding error in finding $x = 60$.
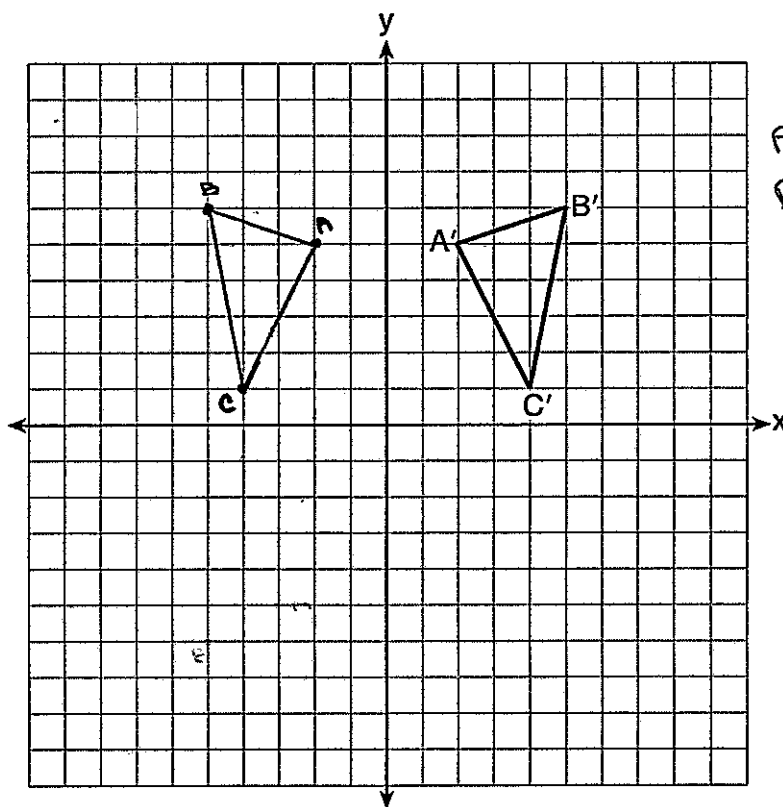
35 The graph below shows $\triangle A'B'C'$, the image of $\triangle ABC$ after it was reflected over the y-axis.

Graph and label $\triangle ABC$, the pre-image of $\triangle A'B'C'$.

Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after it is reflected through the origin.

State a single transformation that will map $\triangle ABC$ onto $\triangle A''B''C''$.
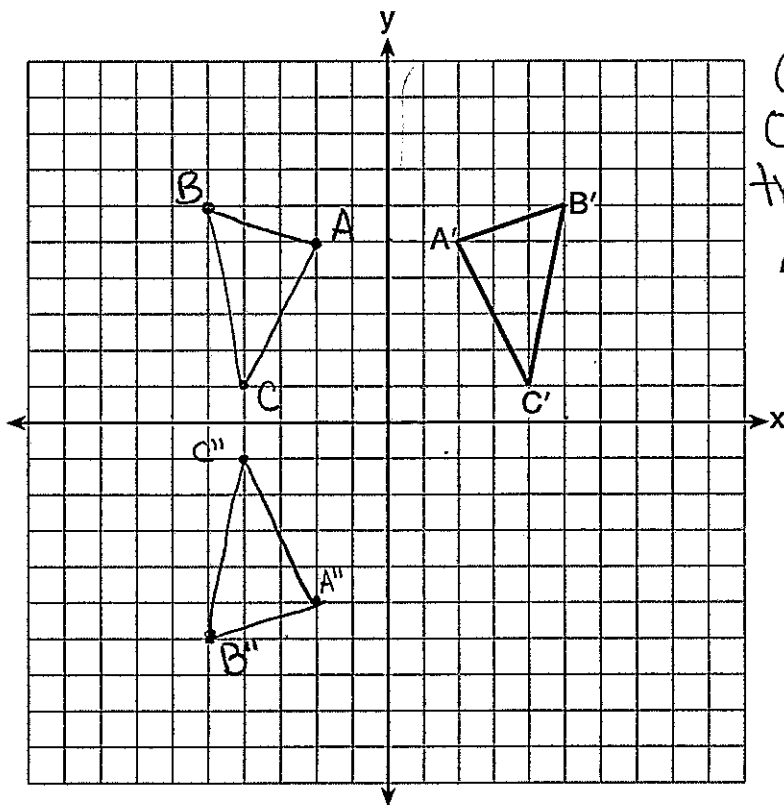
Reflection over the x-axis of $\triangle ABC$ will transform into $\triangle A''B''C''$.

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

35 The graph below shows $\triangle A'B'C'$, the image of $\triangle ABC$ after it was reflected over the y-axis.

Graph and label $\triangle ABC$, the pre-image of $\triangle A'B'C'$.

Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after it is reflected through the origin.

State a single transformation that will map $\triangle ABC$ onto $\triangle A''B''C''$. A rotation over the x-axis
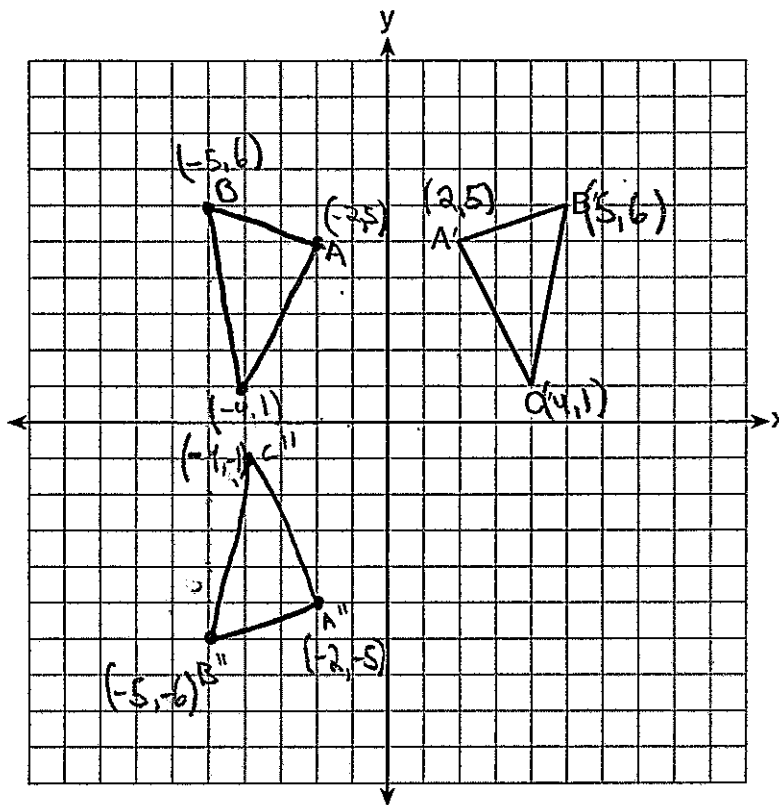
Score 3: The student graphed and labeled $\triangle ABC$ and $\triangle A''B''C''$ correctly, but stated an incorrect transformation.

35 The graph below shows $\triangle A'B'C'$, the image of $\triangle ABC$ after it was reflected over the y-axis.

Graph and label $\triangle ABC$, the pre-image of $\triangle A'B'C'$.

Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after it is reflected through the origin.

State a single transformation that will map $\triangle ABC$ onto $\triangle A''B''C''$.
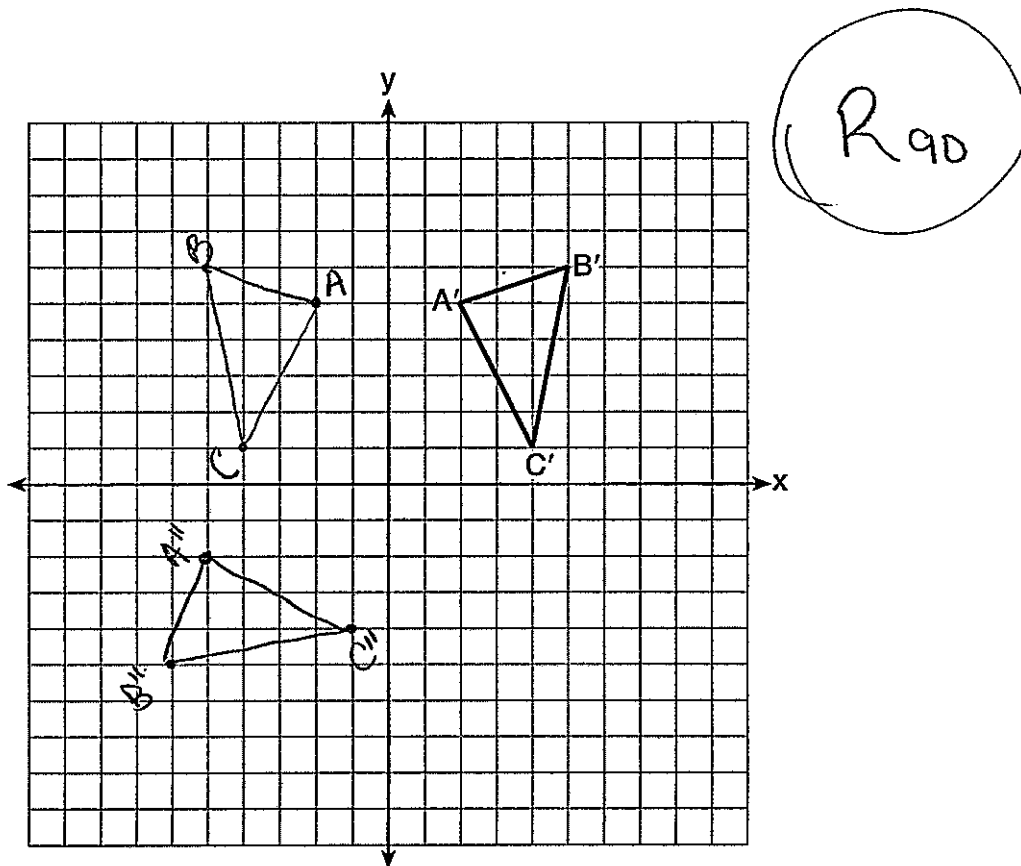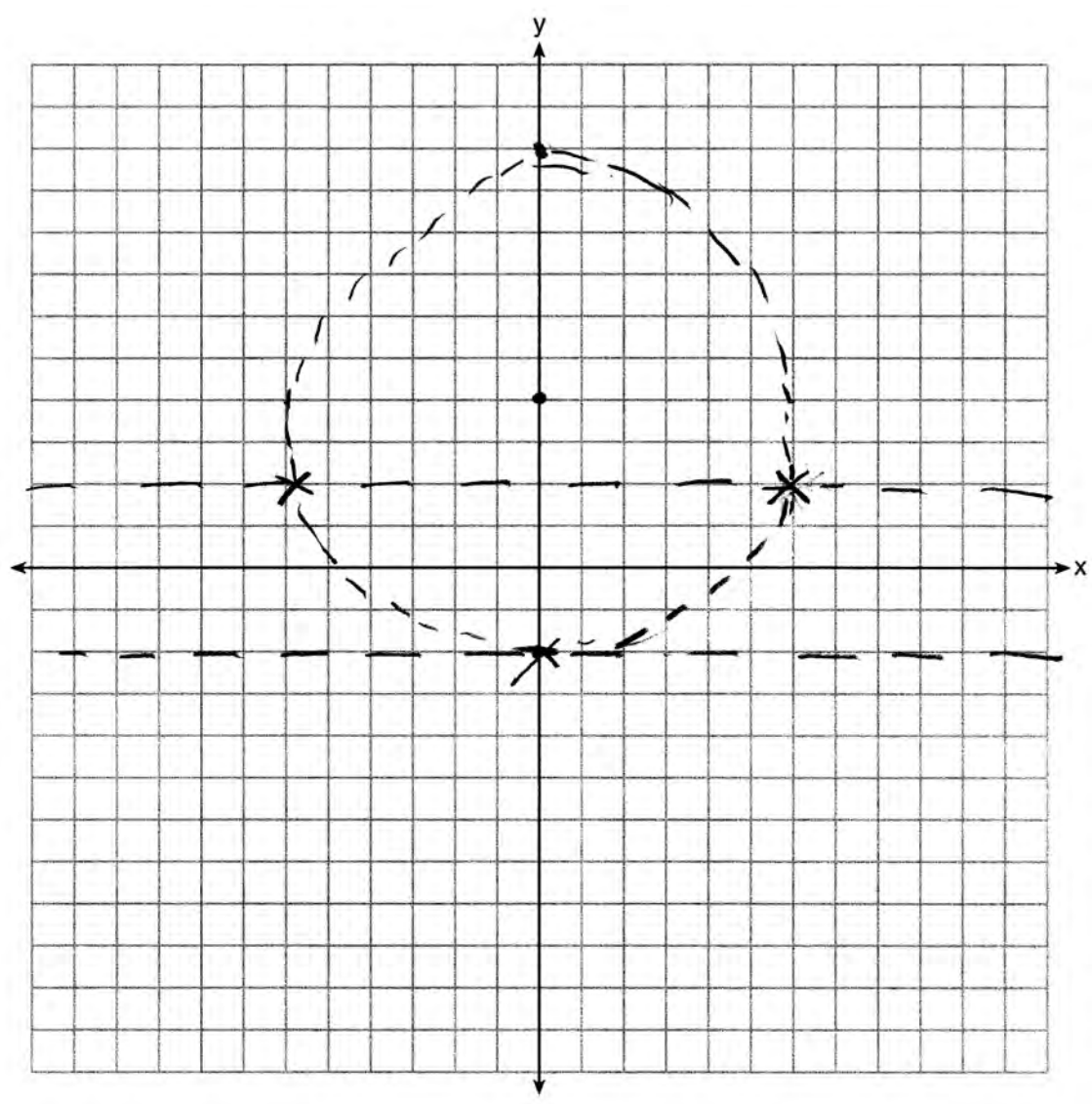

Score 2: The student graphed and labeled $\triangle ABC$ correctly, but made one conceptual error in graphing $\triangle A''B''C''$. An appropriate transformation was stated.

35 The graph below shows $\triangle A'B'C'$, the image of $\triangle ABC$ after it was reflected over the y-axis.

Graph and label $\triangle ABC$, the pre-image of $\triangle A'B'C'$.

Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after it is reflected through the origin.

State a single transformation that will map $\triangle ABC$ onto $\triangle A''B''C''$.

A(-2, 5)
B(-5, 6)
C(-4, 1)

A'(2, 5)
B'(5, 6)
C'(4, 1)

A''(,)
B''(,)
C''(,)

Score 1: The student graphed and labeled $\triangle ABC$ correctly. No further correct work is shown.

35 The graph below shows $\triangle A'B'C'$, the image of $\triangle ABC$ after it was reflected over the y-axis.

Graph and label $\triangle ABC$, the pre-image of $\triangle A'B'C'$.

Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after it is reflected through the origin.

State a single transformation that will map $\triangle ABC$ onto $\triangle A''B''C''$.
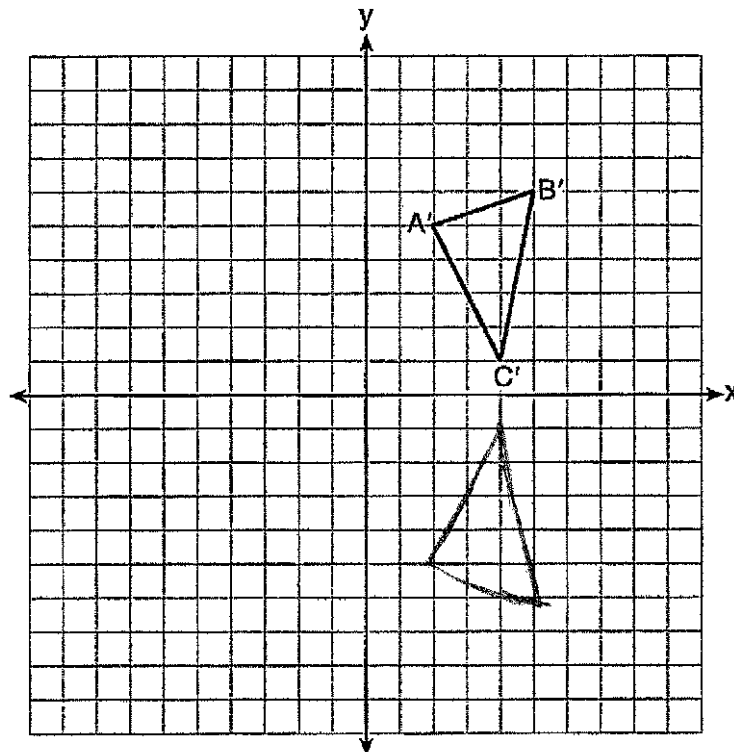
Score 0: The student has no correct work.

36 On the set of axes below, sketch the locus of points 2 units from the *x*-axis and sketch the locus of points 6 units from the point (0,4).

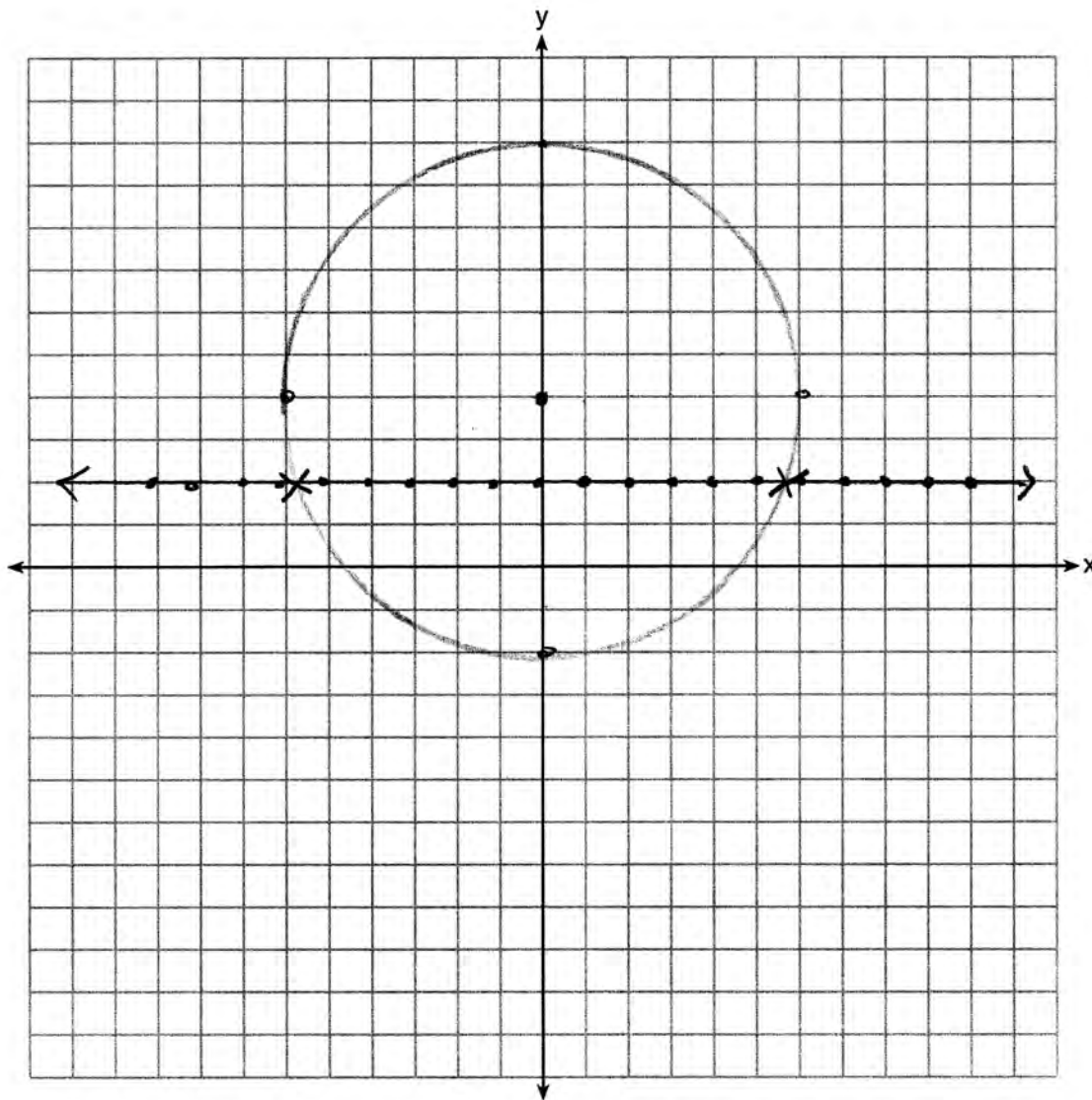Label with an **X** all points that satisfy both conditions.

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

36 On the set of axes below, sketch the locus of points 2 units from the *x*-axis and sketch the locus of points 6 units from the point (0,4).

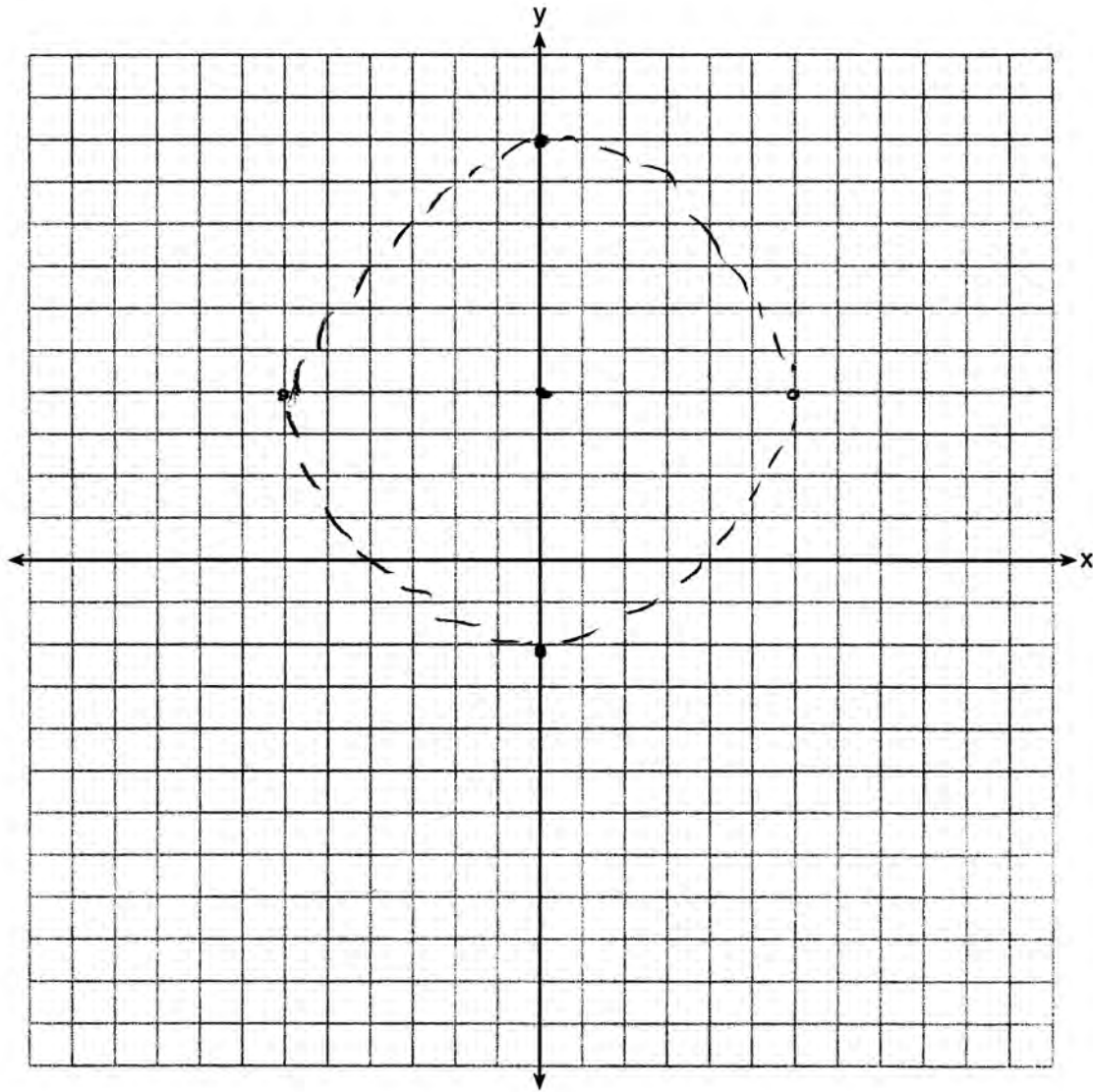Label with an **X** all points that satisfy both conditions.

Score 3: The student sketched both loci correctly, but labeled only one point of intersection with an **X**.

36 On the set of axes below, sketch the locus of points 2 units from the *x*-axis and sketch the locus of points 6 units from the point (0,4).

Label with an **X** all points that satisfy both conditions.

Score 2: The student made a conceptual error by sketching the locus of points 2 units from the *y*-axis. Appropriate points are labeled with an **X**.

Question 36

36 On the set of axes below, sketch the locus of points 2 units from the *x*-axis and sketch the locus of points 6 units from the point (0,4).

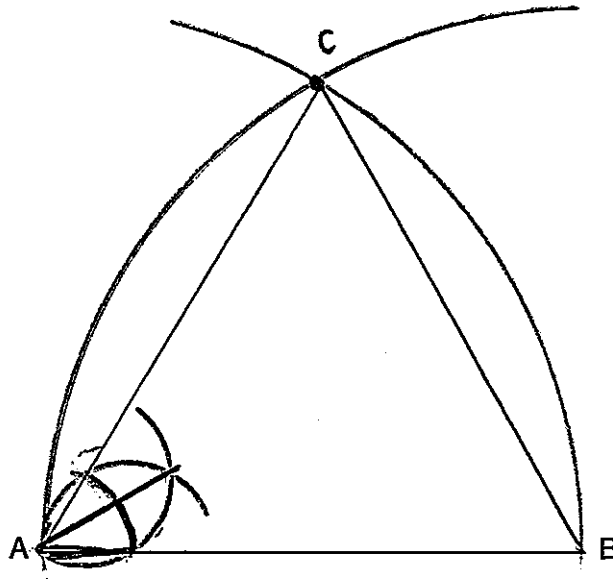Label with an **X** all points that satisfy both conditions.

Score 2: The student made a conceptual error by not graphing $y = -2$. Appropriate points are labeled with an **X**.

36 On the set of axes below, sketch the locus of points 2 units from the *x*-axis and sketch the locus of points 6 units from the point (0,4).

Label with an **X** all points that satisfy both conditions.

Score 1: The student sketched one locus correctly.

36 On the set of axes below, sketch the locus of points 2 units from the *x*-axis and sketch the locus of points 6 units from the point (0,4).

Label with an **X** all points that satisfy both conditions.
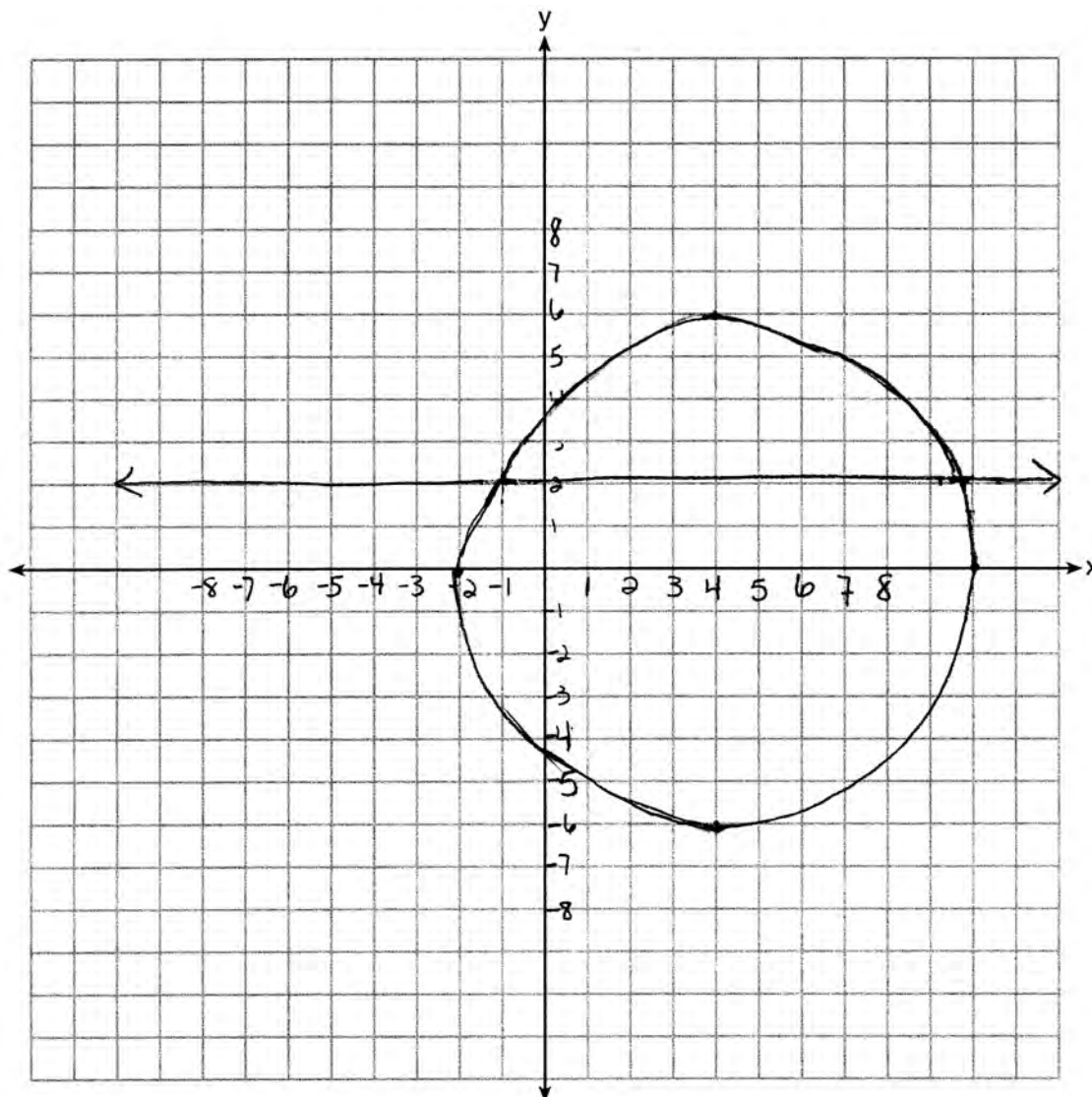
Score 0: The student did not graph $y = -2$ and sketched the locus of points 6 units from (4,0) instead of (0,4). Points of intersection are not labeled.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at A.
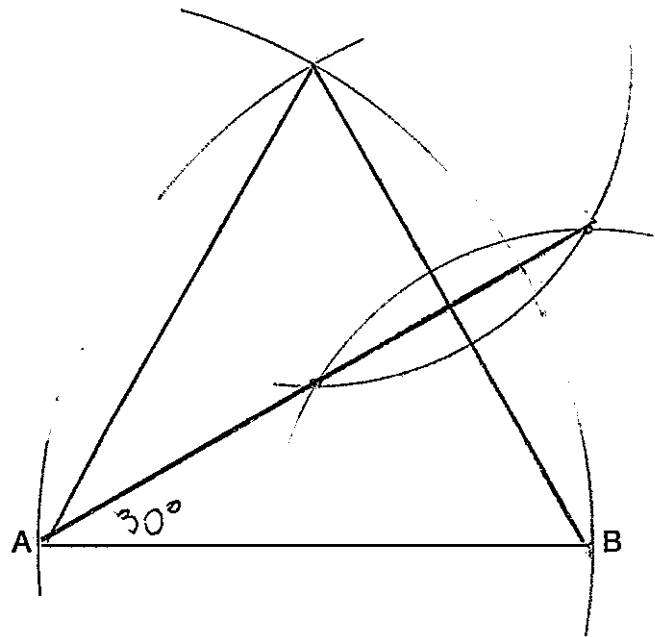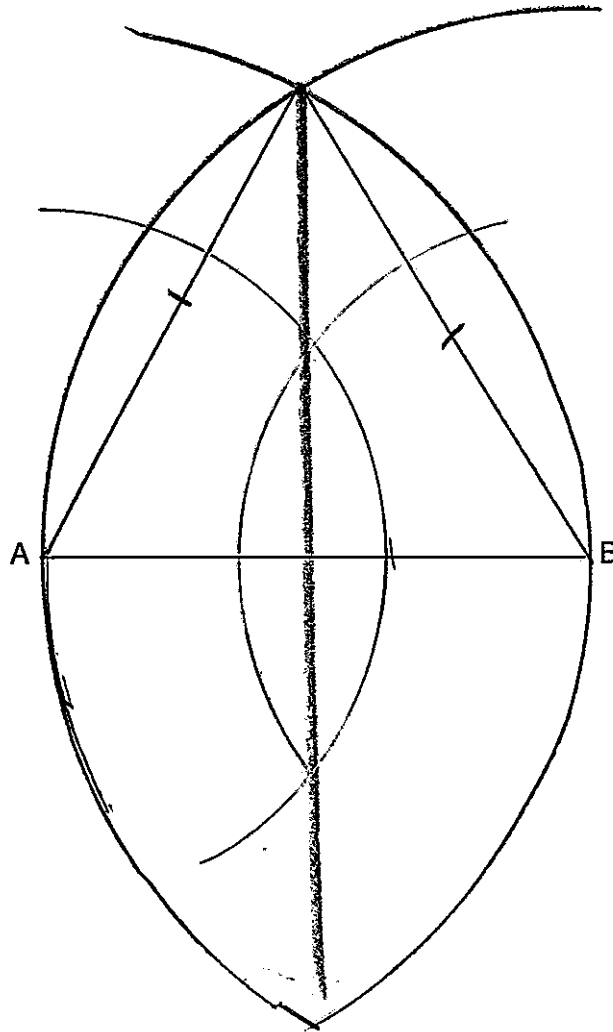[Leave all construction marks.]

Score 4: The student has a complete and correct construction.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at A.
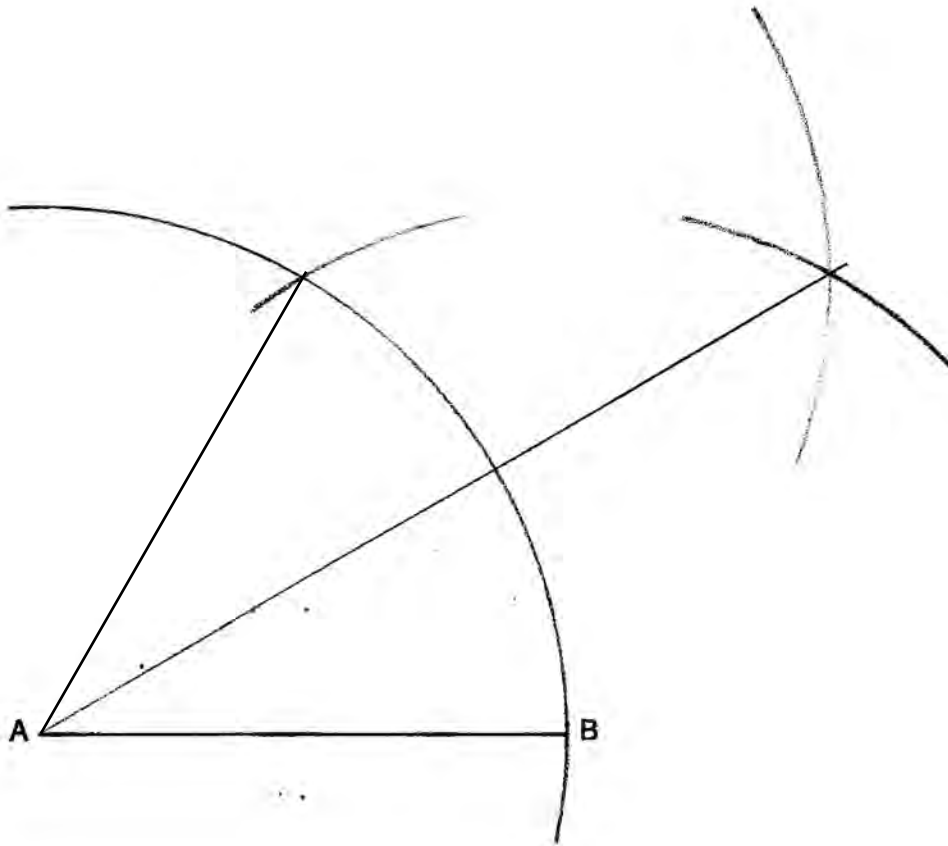[Leave all construction marks.]

Score 4: The student has a complete and correct construction.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at *A*.
[Leave all construction marks.]

Score 3 The student has a correct construction of an equilateral triangle, but constructed a 30° angle at a vertex other than *A*.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at A.
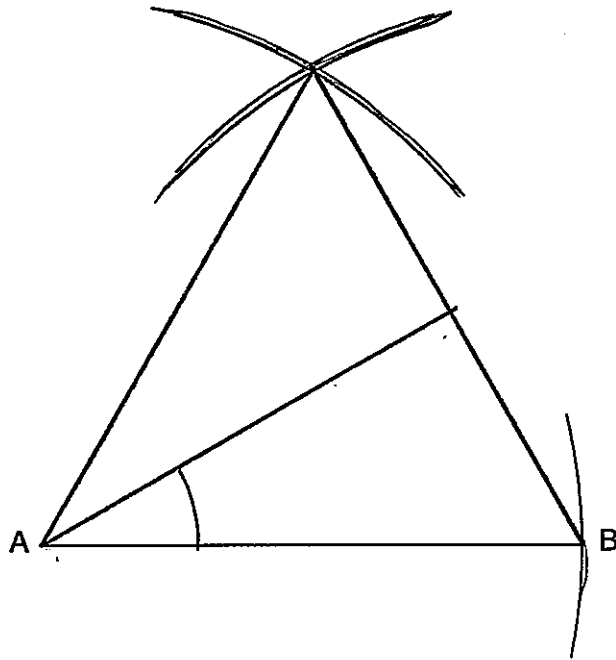[Leave all construction marks.]

Score 3: The student showed all appropriate arcs for constructing an equilateral triangle, but did not draw both sides. The student made a correct construction of a 30° angle at vertex A.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at A.
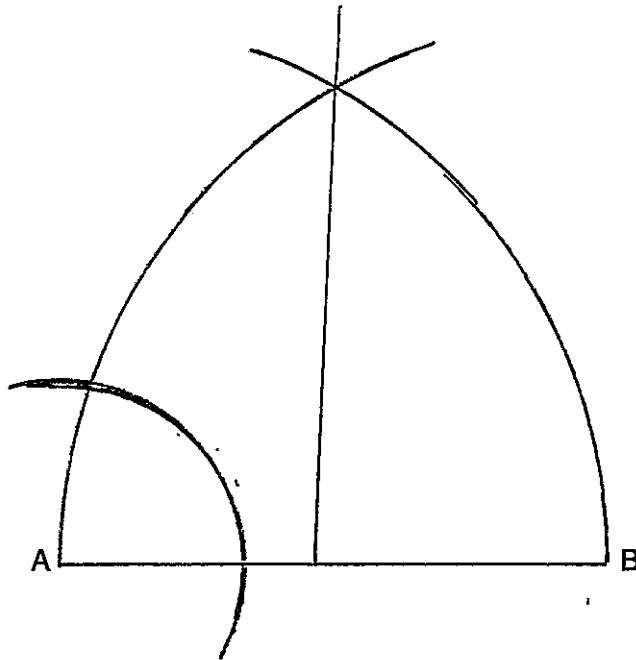[Leave all construction marks.]

Score 2: The student showed a correct construction of an equilateral triangle. No further correct work is shown.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at A.
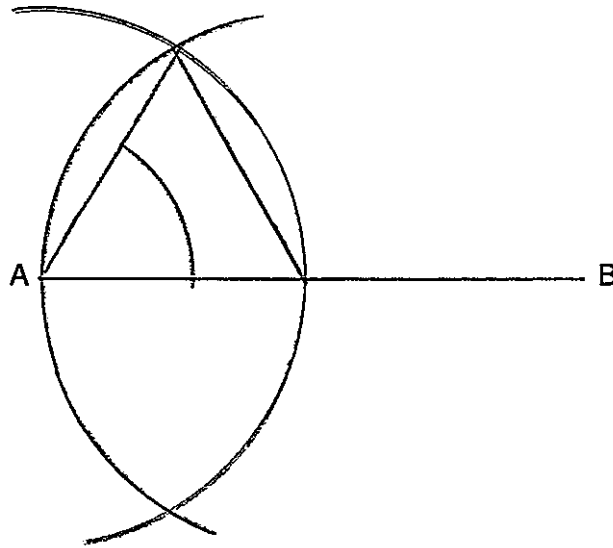[Leave all construction marks.]

Score 1: The student showed all appropriate arcs for constructing an equilateral triangle, but did not draw the sides. No further correct work is shown.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at A.
[Leave all construction marks.]

Score 1: The student showed an appropriate construction of an equilateral triangle, but used a length other than AB.

37 Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side.

Using this triangle, construct a 30° angle with its vertex at *A*.
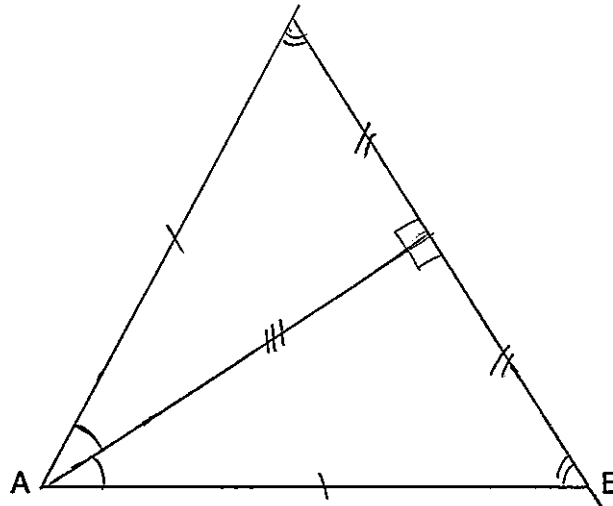[Leave all construction marks.]

Score 0: The student made a drawing that is not an appropriate construction.

38 The vertices of quadrilateral *JKLM* have coordinates *J*(−3,1), *K*(1,–5), *L*(7,−2), and *M*(3,4).

Prove that *JKLM* is a parallelogram.

Prove that *JKLM* is *not* a rhombus.

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

$$m_{\overline{JM}} = \frac{4-1}{3+3} = \frac{3}{6} = \frac{1}{2}$$

$$m_{\overline{KL}} = \frac{-2+5}{7-1} = \frac{-3}{6} = \frac{1}{2}$$

$\overline{JM} \neq \overline{KL}$ are //
b/c the have the
same slope.

$$m_{\overline{JK}} = \frac{-5-1}{1+3} = \frac{-6}{4} = -\frac{3}{2}$$

$$m_{\overline{ML}} = \frac{4+2}{3-7} = \frac{6}{-4} = -\frac{3}{2}$$

$$d_{\overline{JM}} = \sqrt{(-3-3)^2 + (1-4)^2}$$

$$= \sqrt{36+9}$$

$\sqrt{52} \neq \sqrt{45}$ $d = \sqrt{45}$

$$d_{\overline{JK}} = \sqrt{(-3-1)^2 + (1+5)^2}$$

$$= \sqrt{16+36}$$

$$d = \sqrt{52}$$

JKLM is not a rhombus b/c not all of the sides are equal.

$\overline{JK} \neq \overline{ML}$ are //
b/c the have
the same slope
JKLM is a ▱
b/c 2 pairs of
opposite sides are
parallel.
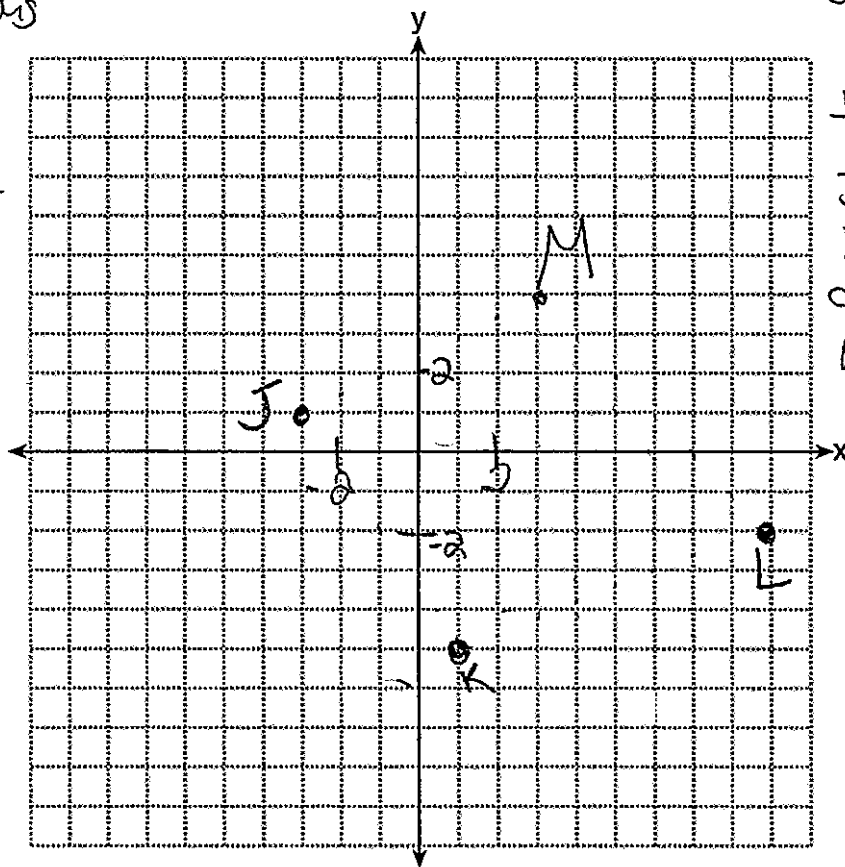
Score 6:   The student has a complete and correct response.

38 The vertices of quadrilateral *JKLM* have coordinates *J*(−3,1), *K*(1,−5), *L*(7,−2), and *M*(3,4).

Prove that *JKLM* is a parallelogram.
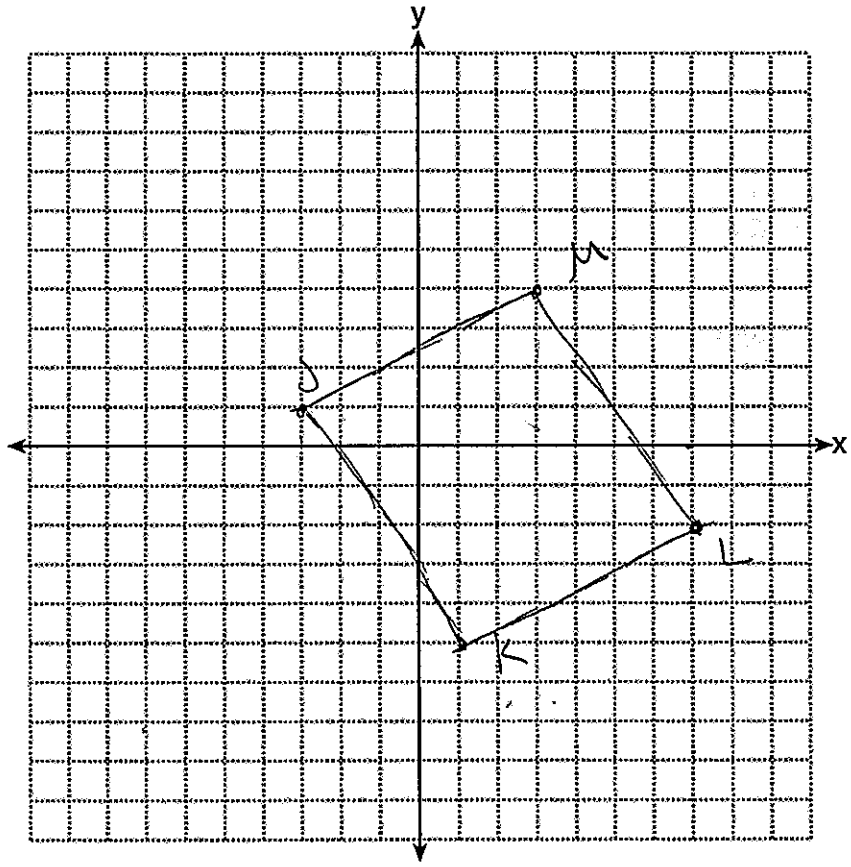
Prove that *JKLM* is *not* a rhombus.

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

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

If opposite sides are ≅, then it's a Parallelogram

It's not a rhombus because not all sides are ≅.

JK
$\sqrt{(-5-1)^2 + (1+3)^2}$
$\sqrt{6^2 + 16}$
$\sqrt{52}$

ML
$\sqrt{(-4+2)^2 + (3-7)^2}$
$\sqrt{6^2 + 64^2}$
$\sqrt{36 + 16}$
$\sqrt{52}$

JM
$\sqrt{(1-4)^2 + (-3-3)^2}$
$\sqrt{3^2 + (6)^2}$
$\sqrt{9 + 36}$
$\sqrt{45}$

KL
$\sqrt{(-2+5)^2 + (7-1)^2}$
$\sqrt{3^2 + 6^2}$
$9 + 36$
45

Score 5: The student did not write the radical symbol when finding the length of $\overline{KL}$.

38 The vertices of quadrilateral *JKLM* have coordinates *J*(−3,1), *K*(1,–5), *L*(7,−2), and *M*(3,4).

Prove that *JKLM* is a parallelogram.

Prove that *JKLM* is *not* a rhombus.

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

$m = \dfrac{y-y}{x-x}$

$\overline{KM} = \dfrac{-5-4}{1-3} = \dfrac{-9}{-2}$

$\overline{JL} = \dfrac{1+2}{-3-7} = \dfrac{3}{-10}$

$JM = \dfrac{1-4}{-3-3} = \dfrac{-3}{-6} = \dfrac{3}{6}$

$KL = \dfrac{-5+2}{1-7} = \dfrac{-3}{-6} = \dfrac{3}{6}$

$ML = \dfrac{4+2}{3-7} = \dfrac{6}{4} = \dfrac{3}{2}$

$JK = \dfrac{-5-1}{-3-1} = \dfrac{-6}{-4} = \dfrac{6}{4} = \dfrac{3}{2}$

The diagonals in a rhombus form a right angle. Since the slopes of the diagonals are not negative reciprocals it is not a rhombus because the diagonals are not perpendicular and do not form a right angle.

JKLM is a parallelogram.

A parallelogram contains 2 sets of parallel sides. Parallel sides are created when 2 segments share the same slope.
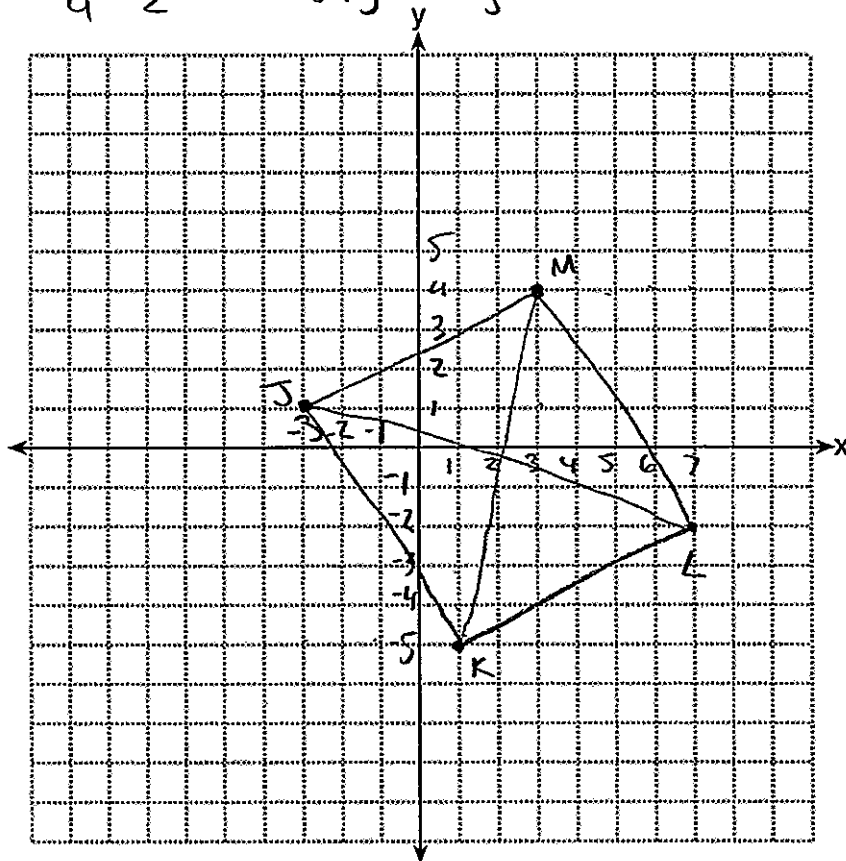
38 The vertices of quadrilateral *JKLM* have coordinates *J*(−3,1), *K*(1,–5), *L*(7,−2), and *M*(3,4).

Prove that *JKLM* is a parallelogram.

Prove that *JKLM* is *not* a rhombus.

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

This is not a rhombus because not all sides are congruent.

$\overline{JT}$

$4^2 + 6^2 = c^2$

$16 + 36 = 52$

$\sqrt{52} =$

7.2

$\overline{JM}$

$3^2 + 6^2 =$

$9 + 36 = 45$

$\sqrt{45} = 6.7$

$\overline{KL} = 6.7$

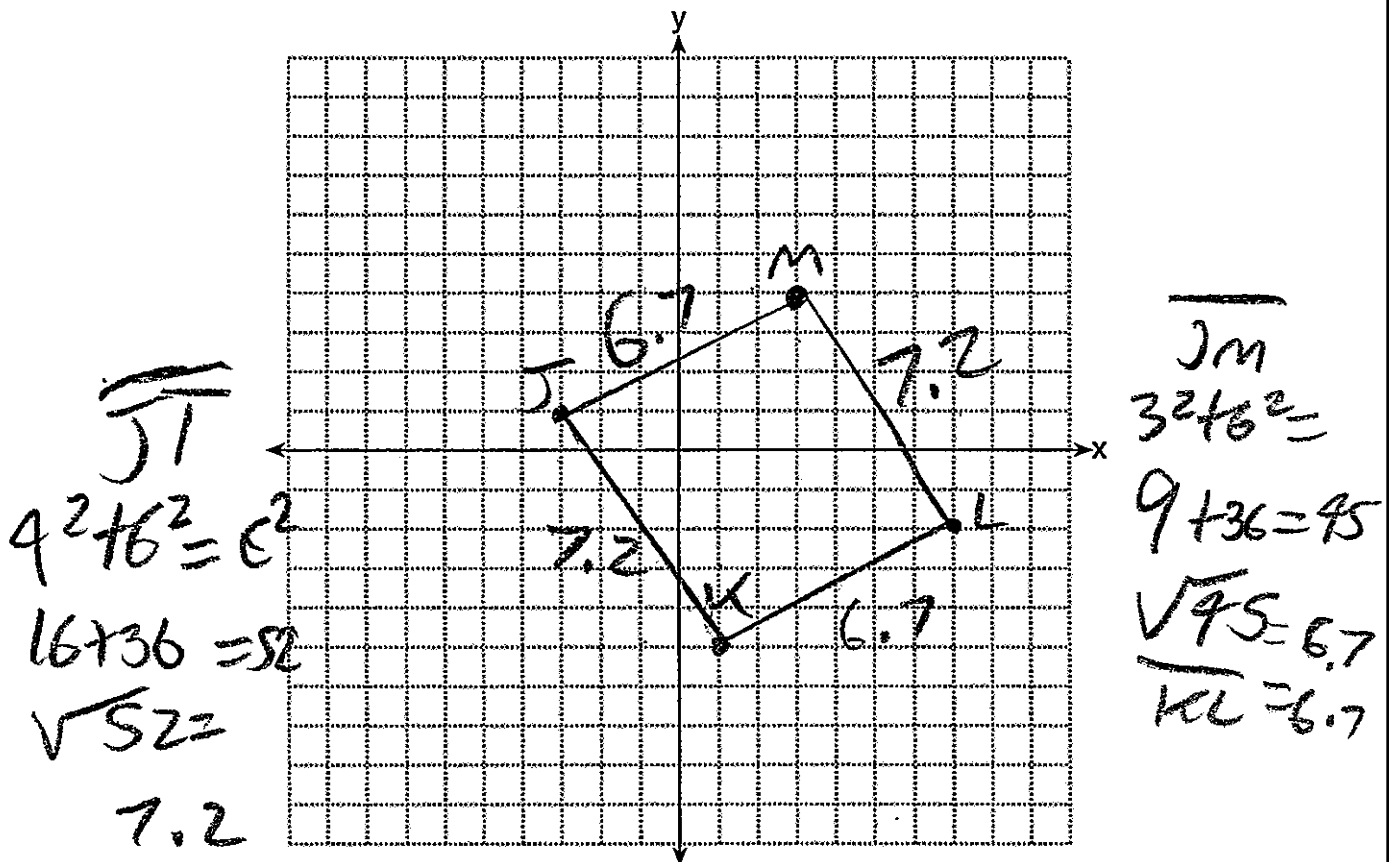**Score 3:** The student showed work to prove *JKLM* is not a rhombus.

38 The vertices of quadrilateral *JKLM* have coordinates *J*(−3,1), *K*(1,–5), *L*(7,−2), and *M*(3,4).

Prove that *JKLM* is a parallelogram.

Prove that *JKLM* is *not* a rhombus.

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

parallelogram have parallel sides.

This is a parallelogram because JM slope is ≅ to KL's slope. It is not a rhombus because JM ≇ KL and rhombi have opposite sides ≅.

distance of JM

slope JM
$$\frac{4-1}{3++3} = \frac{3}{6}$$

slope KL
$$\frac{-2++5}{7-1} = \frac{3}{6}$$

$$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$
$$d = \sqrt{(3++3)^2 + (4-1)^2}$$
$$d = \sqrt{36 + 9}$$
$$d = \sqrt{45}$$

≅ slopes

distance KL
$$d = \sqrt{(7-1)^2 + (-2++5)^2}$$
$$d = \sqrt{36 + 9}$$
$$d = \sqrt{45}$$

same distances
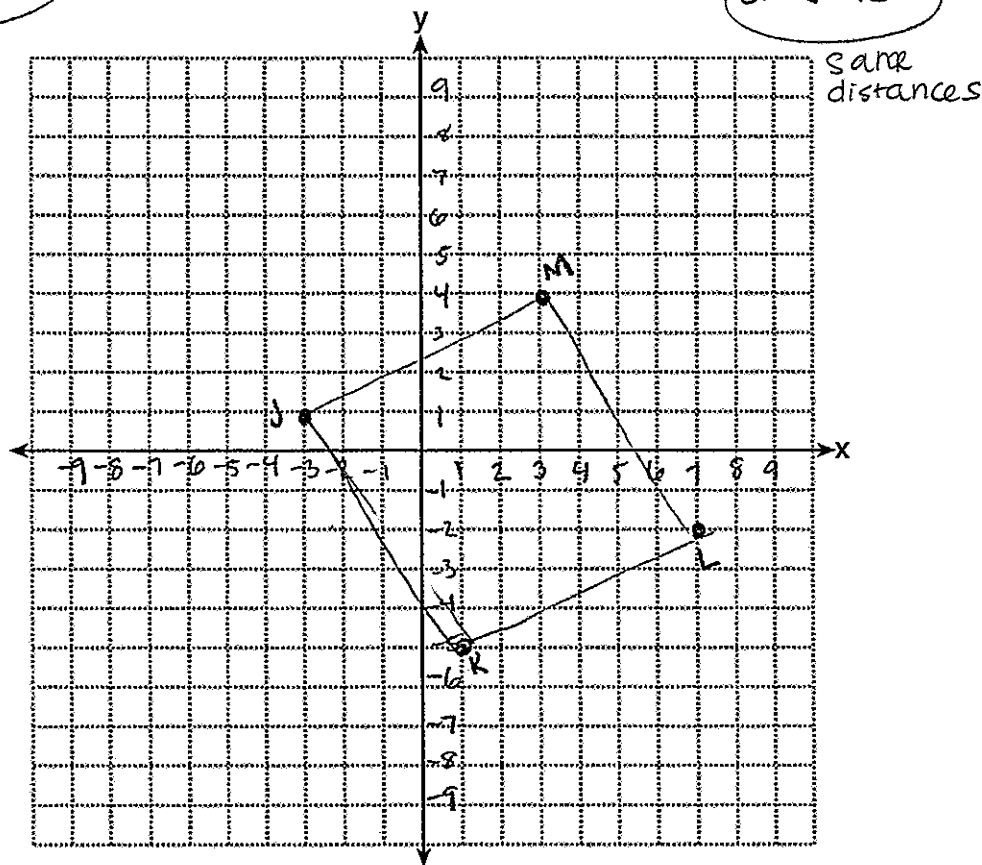
Score 2: The student did work to show that one pair of sides is congruent and parallel.

38 The vertices of quadrilateral *JKLM* have coordinates *J*(−3,1), *K*(1,–5), *L*(7,−2), and *M*(3,4).

Prove that *JKLM* is a parallelogram.

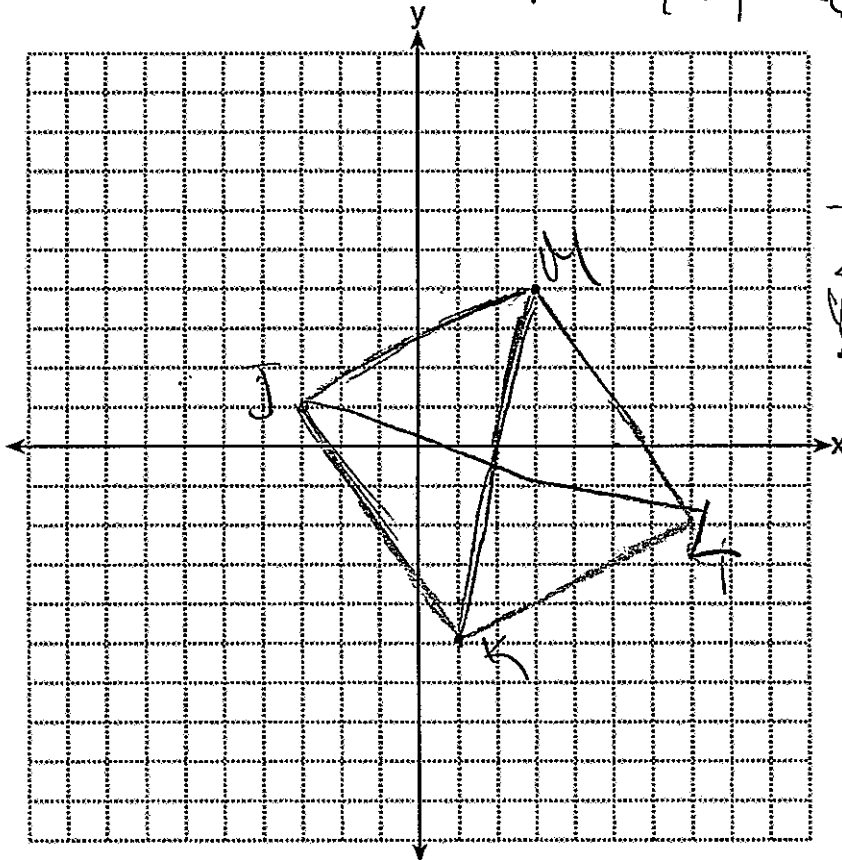Prove that *JKLM* is *not* a rhombus.

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

$$\text{slope} = \frac{\Delta y}{\Delta x}$$

$$JK = \frac{1-(-5)}{-3-1} = \frac{6}{-4} = \boxed{\frac{3}{-2}}$$ (Parallelogram

$$ML = \frac{4-(-2)}{3-7} = \frac{6}{-4} = \boxed{\frac{3}{-2}}$$

$$JM = \frac{1-4}{-3-3} = \frac{-3}{-6} \boxed{\frac{+}{2}}$$

$$KL = \frac{-5-(-2)}{1-7} = \frac{-3}{-6} \boxed{\frac{1}{2}}$$

JKLM is a Parallelogram because opposite slopes are equal.

Score 1: The student found the slopes of all four sides. The concluding statement is not complete.

38 The vertices of quadrilateral *JKLM* have coordinates *J*(−3,1), *K*(1,−5), *L*(7,−2), and *M*(3,4).

Prove that *JKLM* is a parallelogram.

Prove that *JKLM* is *not* a rhombus.

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

Prove not a rhombus

slope JL

JL x_1 y_1 $\left(\dfrac{y_2-y_1}{x_2-x_1}\right)$

J = (−3,1)

L = (7,−2) $\left(\dfrac{(-2)-1}{7-(-3)}\right)$

$\left(\dfrac{-3}{10}\right)$

KM x_1 y_1

K = (1,−5)

M = (3,4) $\left(\dfrac{y_2-y_1}{x_2-x_1}\right)$

$\left(\dfrac{4-(-5)}{3-1}\right)$

$\left(\dfrac{9}{2}\right)$

Prove parallelogram

distance

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

$(7-(-3))^2 + ((-2)-1)^2$

$(-3)^2 + (10)^2$

−9 + 100

KM

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

$(9)^2 + (2)^2$

81 + 4

$\sqrt{85}$

JKLM is a parallelogram

JKLM is not a rhombus because the slopes are not congruent to one another.
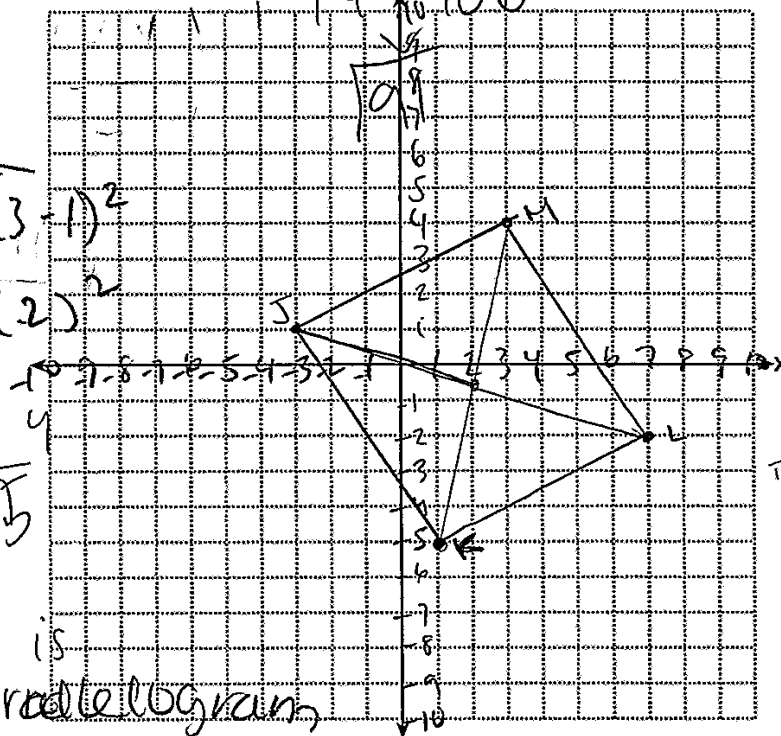
Score 1: The student found the slopes of both diagonals.

38 The vertices of quadrilateral *JKLM* have coordinates $J(-3,1)$, $K(1,-5)$, $L(7,-2)$, and $M(3,4)$.

Prove that *JKLM* is a parallelogram.

Prove that *JKLM* is *not* a rhombus.

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

JKLM

Yes it is parallel because when you set up the axes is gives you two parallel lines.

It is not a rhombus because when you set up the axes it does not form into a rhombus

Yes parallel
$J(-3,1)$
$K(1,-5)$
$L(7,-2)$
$M(3,4)$

No rhombus
$J(-3,1)$
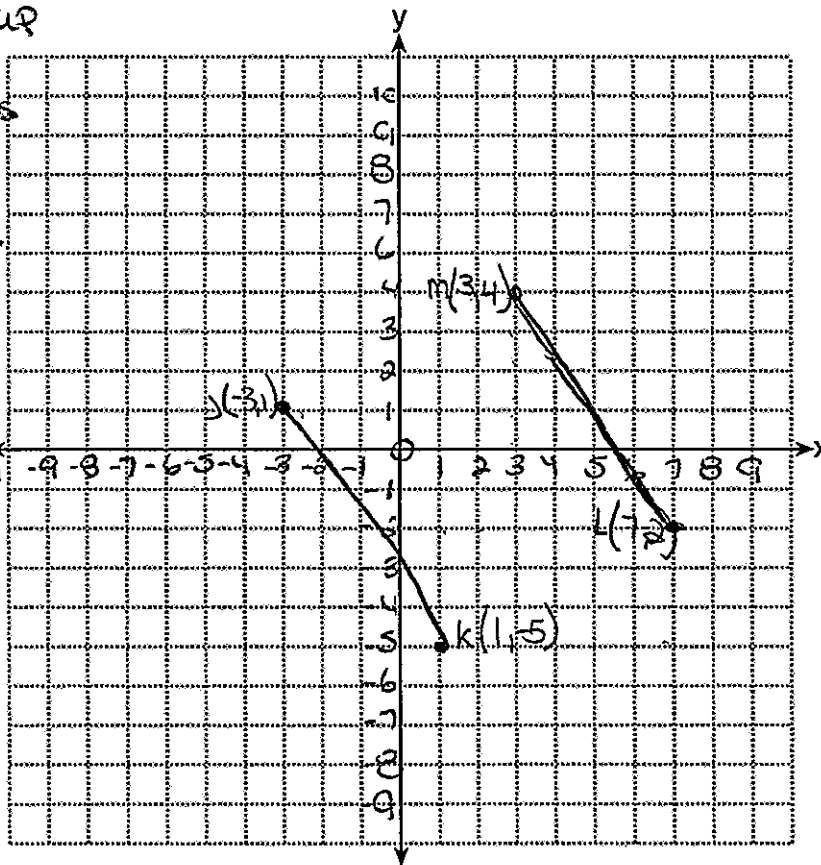$K(1,-5)$
$L(7,-2)$
$m(3,4)$

Statements	Reasons
$J(-3,1)$ $m(3,4)$	Given
Parallel	

7 moves to the left
3 moves down

$k(1,-5)$ Given
$L(7,-2)$

Parallel

7 moves to the left
4 moves Down

Score 0: The student has no relevant work.

Regents Examination in Geometry – June 2014

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

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

To determine the student's final examination 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.