The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Wednesday, January 29, 2014 — 9:15 a.m. to 12:15 p.m., only

Student Name:_____

School Name: _____

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

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

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

This examination has four parts, with a total of 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.

Part I

Answer all 28 questions in this part. Each correct answer will receive 2 credits. 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 The midpoint of $\overline{AB}$ is $M(4,2)$. If the coordinates of A are $(6,-4)$, what are the coordinates of B?

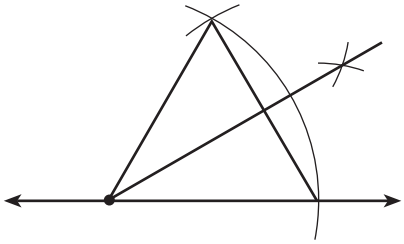
(1) $(1,-3)$

(2) $(2,8)$

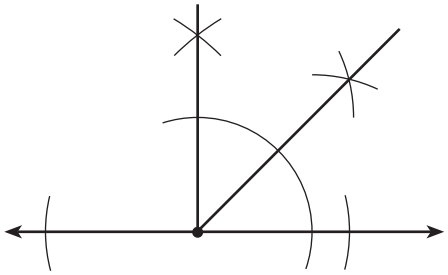
(3) $(5,-1)$

(4) $(14,0)$

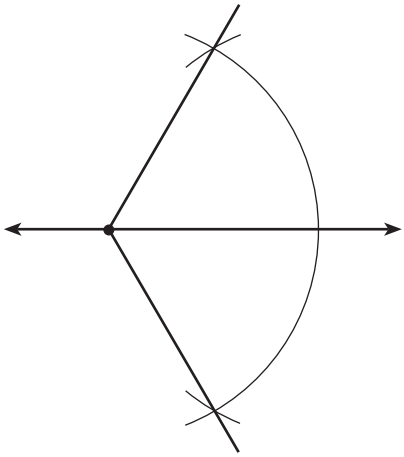
2 Which diagram shows the construction of a 45° angle?



(1)



(3)



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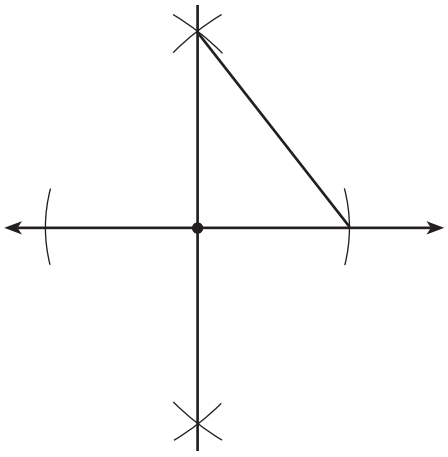


(4)

Use this space for computations.

3 What are the coordinates of the center and the length of the radius of the circle whose equation is $(x + 1)^2 + (y - 5)^2 = 16$?

(1) $(1,-5)$ and 16

(2) $(-1,5)$ and 16

(3) $(1,-5)$ and 4

(4) $(-1,5)$ and 4

4 If distinct planes $\mathcal{R}$ and $\mathcal{S}$ are both perpendicular to line ℓ, which statement must always be true?

(1) Plane $\mathcal{R}$ is parallel to plane $\mathcal{S}$.

(2) Plane $\mathcal{R}$ is perpendicular to plane $\mathcal{S}$.

(3) Planes $\mathcal{R}$ and $\mathcal{S}$ and line ℓ are all parallel.

(4) The intersection of planes $\mathcal{R}$ and $\mathcal{S}$ is perpendicular to line ℓ.

5 If $\triangle ABC$ and its image, $\triangle A'B'C'$, are graphed on a set of axes, $\triangle ABC \cong \triangle A'B'C'$ under each transformation *except*

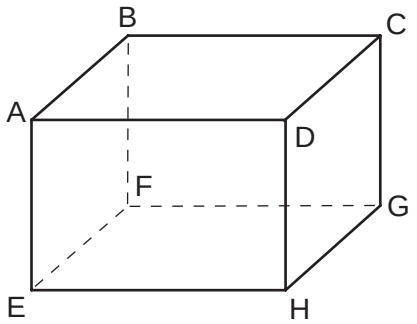
(1) D_2

(2) $R_{90°}$

(3) $r_{y=x}$

(4) $T_{(-2,3)}$

6 A right rectangular prism is shown in the diagram below.



Which pair of edges are *not* coplanar?

(1) $\overline{BF}$ and $\overline{CG}$

(2) $\overline{BF}$ and $\overline{DH}$

(3) $\overline{EF}$ and $\overline{CD}$

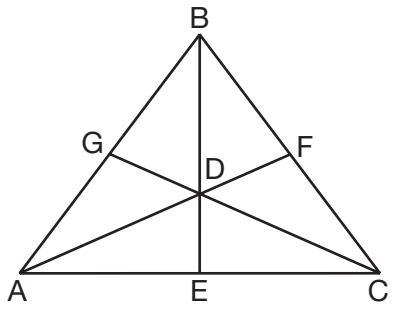
(4) $\overline{EF}$ and $\overline{BC}$

Use this space for computations.

7 How many points in the coordinate plane are 3 units from the origin and also equidistant from both the x-axis and the y-axis?

(1) 1
(2) 2
(3) 8
(4) 4

8 As shown below, the medians of $\triangle ABC$ intersect at D.



If the length of $\overline{BE}$ is 12, what is the length of $\overline{BD}$?

(1) 8
(2) 9
(3) 3
(4) 4

9 The solution of the system of equations $y = x^2 - 2$ and $y = x$ is

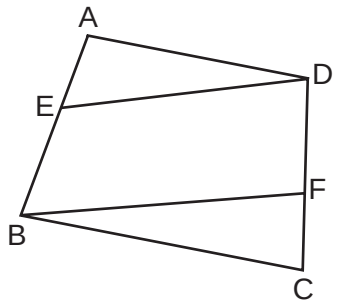
(1) (1,1) and $(-2,-2)$
(2) (2,2) and $(-1,-1)$
(3) (1,1) and (2,2)
(4) $(-2,-2)$ and $(-1,-1)$

10 Line ℓ passes through the point (5,3) and is parallel to line k whose equation is $5x + y = 6$. An equation of line ℓ is

(1) $y = \frac{1}{5}x + 2$
(2) $y = -5x + 28$
(3) $y = \frac{1}{5}x - 2$
(4) $y = -5x - 28$

Use this space for computations.

11 In the diagram below of quadrilateral $ABCD$, E and F are points on $\overline{AB}$ and $\overline{CD}$, respectively, $\overline{BE} \cong \overline{DF}$, and $\overline{AE} \cong \overline{CF}$.



Which conclusion can be proven?

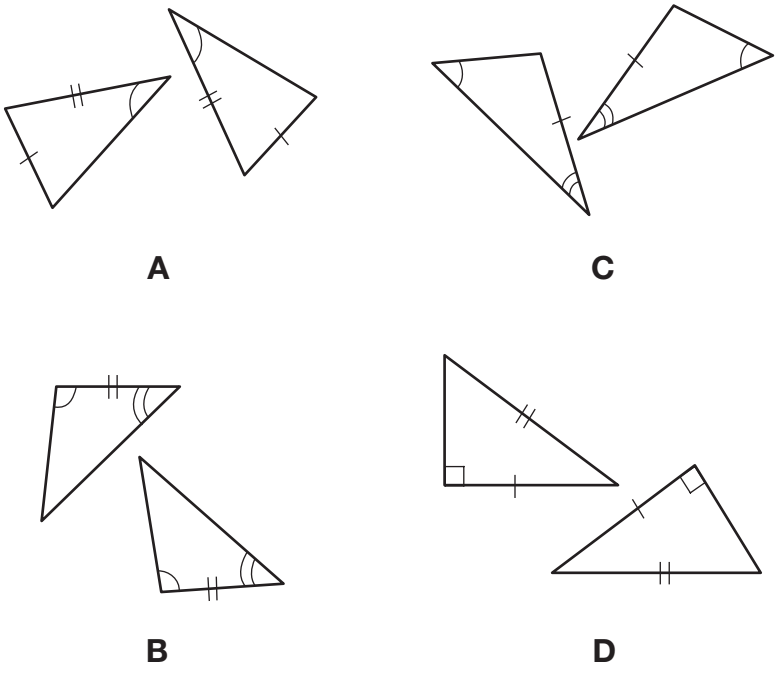
(1) $\overline{ED} \cong \overline{FB}$

(2) $\overline{AB} \cong \overline{CD}$

(3) $\angle A \cong \angle C$

(4) $\angle AED \cong \angle CFB$

12 In the diagram below, four pairs of triangles are shown. Congruent corresponding parts are labeled in each pair.



Using only the information given in the diagrams, which pair of triangles can *not* be proven congruent?

(1) A

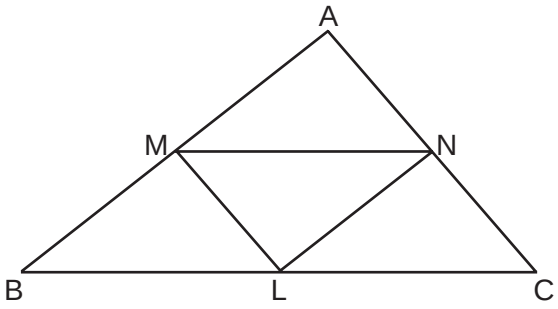
(2) B

(3) C

(4) D

Use this space for computations.

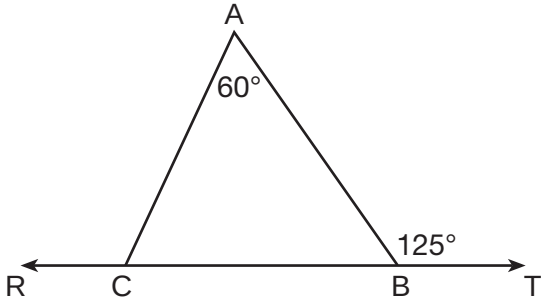
13 In $\triangle ABC$ shown below, L is the midpoint of $\overline{BC}$, M is the midpoint of $\overline{AB}$, and N is the midpoint of $\overline{AC}$.



If $MN = 8$, $ML = 5$, and $NL = 6$, the perimeter of trapezoid $BMNC$ is

(1) 35
(2) 31
(3) 28
(4) 26

14 In the diagram below, $\overleftrightarrow{RCBT}$ and $\triangle ABC$ are shown with $m\angle A = 60$ and $m\angle ABT = 125$.

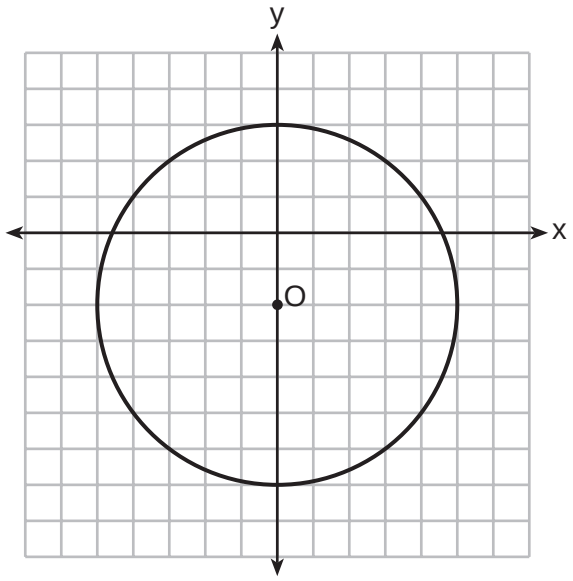


What is $m\angle ACR$?

(1) 125
(2) 115
(3) 65
(4) 55

Use this space for computations.

15 Which equation represents circle O shown in the graph below?



(1) $x^2 + (y - 2)^2 = 10$
(2) $x^2 + (y + 2)^2 = 10$
(3) $x^2 + (y - 2)^2 = 25$
(4) $x^2 + (y + 2)^2 = 25$

16 For which measures of the sides of $\triangle ABC$ is angle B the largest angle of the triangle?

(1) $AB = 2, BC = 6, AC = 7$
(2) $AB = 6, BC = 12, AC = 8$
(3) $AB = 16, BC = 9, AC = 10$
(4) $AB = 18, BC = 14, AC = 5$

17 What is the measure of the largest exterior angle that any regular polygon can have?

(1) 60°
(2) 90°
(3) 120°
(4) 360°

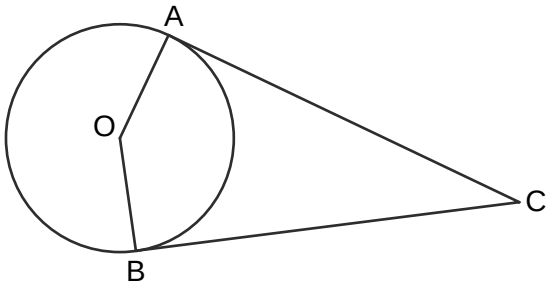
Use this space for computations.

18 As shown in the diagram below, a landscaper uses a cylindrical lawn roller on a lawn. The roller has a radius of 9 inches and a width of 42 inches.

To the *nearest square inch*, the area the roller covers in one complete rotation is

(1) 2,374
(2) 2,375
(3) 10,682
(4) 10,688

19 In the diagram below, $\overline{AC}$ and $\overline{BC}$ are tangent to circle O at A and B, respectively, from external point C.



If $m\angle ACB = 38$, what is $m\angle AOB$?

(1) 71
(2) 104
(3) 142
(4) 161

Use this space for computations.

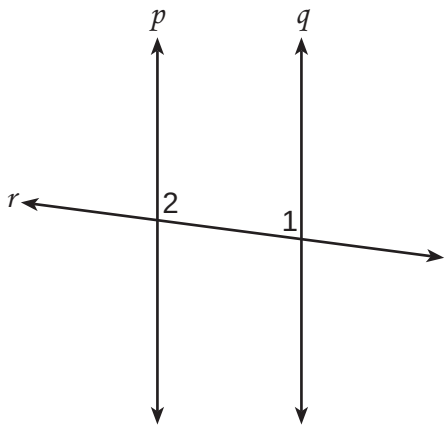
20 What is the perimeter of a square whose diagonal is $3\sqrt{2}$?

(1) 18
(2) 12
(3) 9
(4) 6

21 The coordinates of point P are (7,1). What are the coordinates of the image of P after $R_{90°}$ about the origin?

(1) (1,7)
(2) $(-7,-1)$
(3) $(1,-7)$
(4) $(-1,7)$

22 Lines p and q are intersected by line r, as shown below.



If $m\angle 1 = 7x - 36$ and $m\angle 2 = 5x + 12$, for which value of x would $p \parallel q$?

(1) 17
(2) 24
(3) 83
(4) 97

Use this space for computations.

23 What is the equation of the circle with its center at $(-1,2)$ and that passes through the point $(1,2)$?

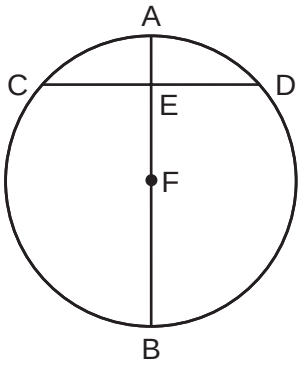
(1) $(x + 1)^2 + (y - 2)^2 = 4$

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

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

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

24 In the diagram below, diameter $\overline{AB}$ bisects chord $\overline{CD}$ at point E in circle F.



If $AE = 2$ and $FB = 17$, then the length of $\overline{CE}$ is

(1) 7

(2) 8

(3) 15

(4) 16

25 Which quadrilateral does *not* always have congruent diagonals?

(1) isosceles trapezoid

(2) rectangle

(3) rhombus

(4) square

26 A circle with the equation $(x + 6)^2 + (y - 7)^2 = 64$ does *not* include points in Quadrant

(1) I

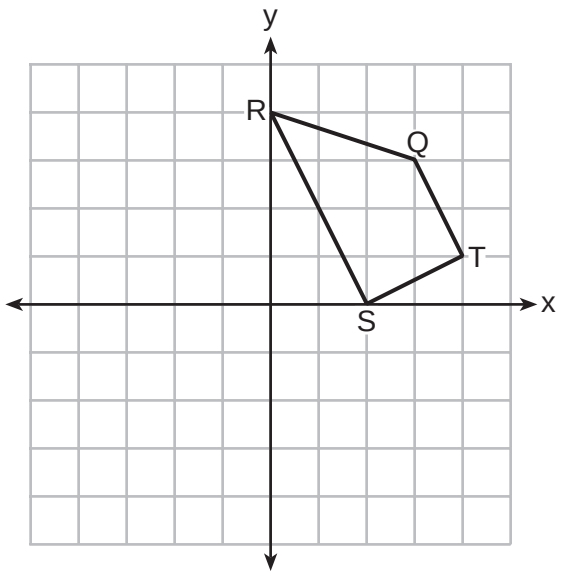
(2) II

(3) III

(4) IV

Use this space for computations.

27 Trapezoid *QRST* is graphed on the set of axes below.



Under which transformation will there be *no* invariant points?

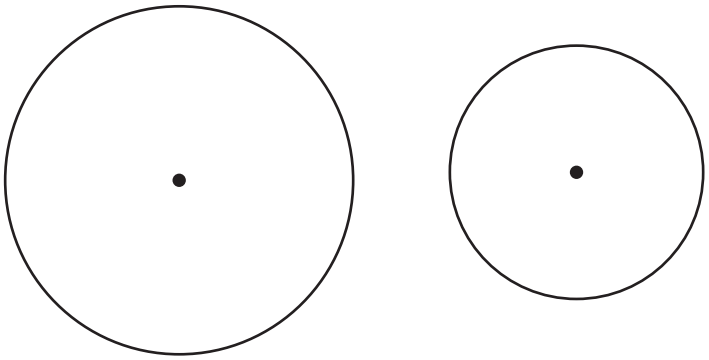
(1) $r_{y=0}$

(2) $r_{x=0}$

(3) $r_{(0,0)}$

(4) $r_{y=x}$

28 How many common tangent lines can be drawn to the circles shown below?



(1) 1

(2) 2

(3) 3

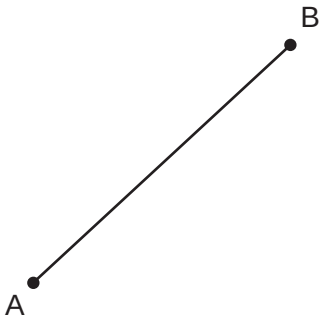
(4) 4

Part II

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 diameter of a sphere is 5 inches. Determine and state the surface area of the sphere, to the *nearest hundredth of a square inch*.

30 Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$.
[Leave all construction marks.]



31 The endpoints of $\overline{AB}$ are $A(3,-4)$ and $B(7,2)$. Determine and state the length of $\overline{AB}$ in simplest radical form.

32 A right prism has a square base with an area of 12 square meters. The volume of the prism is 84 cubic meters. Determine and state the height of the prism, in meters.

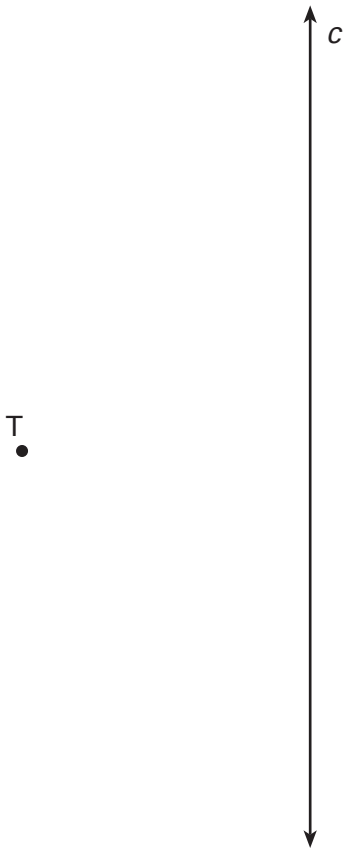
33 State whether the lines represented by the equations $y = \frac{1}{2}x - 1$ and $y + 4 = -\frac{1}{2}(x - 2)$ are parallel, perpendicular, or neither.

Explain your answer.

34 A tree, T, is 6 meters from a row of corn, c, as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree.

Sketch both loci.

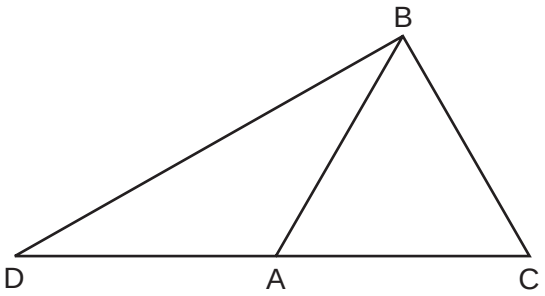
Indicate, with an **X**, all possible locations for the scarecrow.



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 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find $m\angle D$.

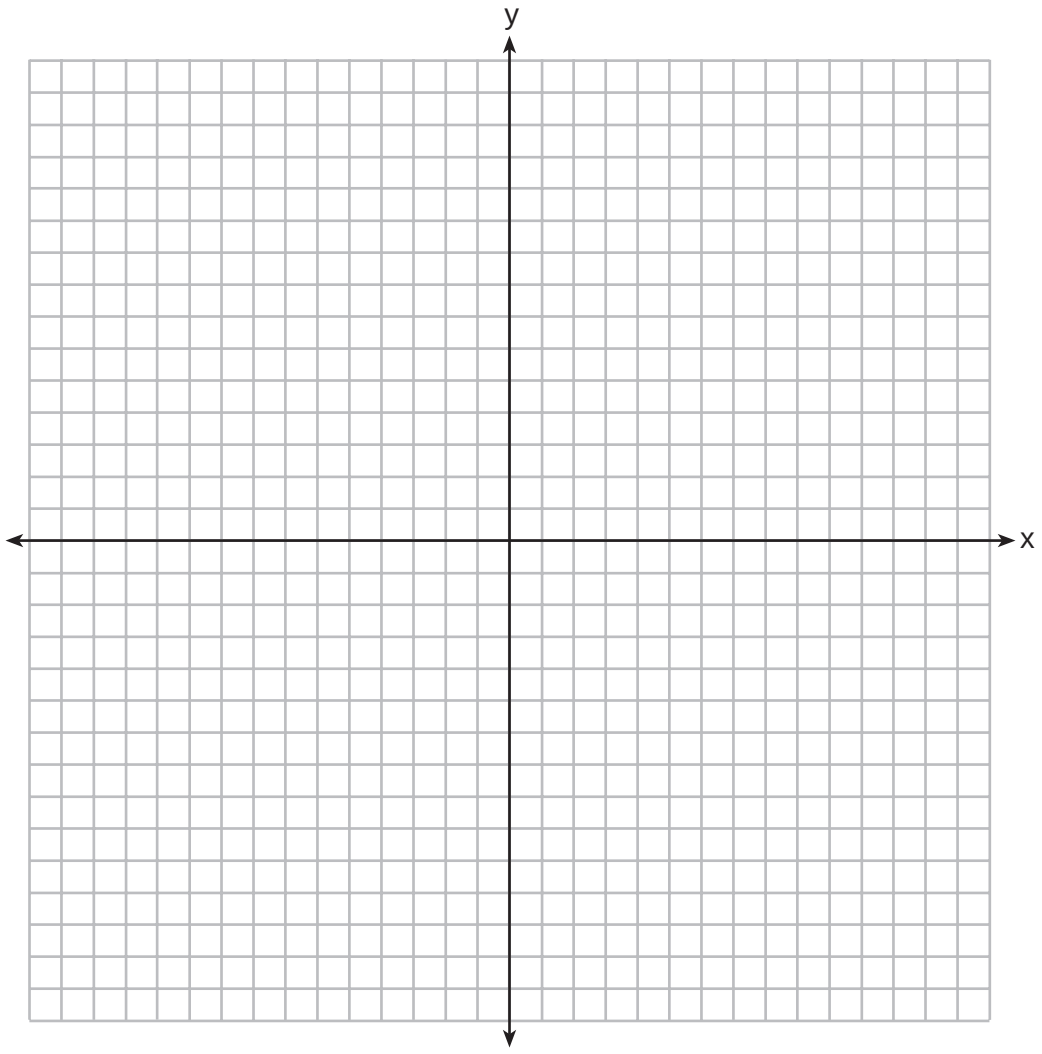
Find $m\angle BAC$.

Find the length of $\overline{BC}$.

Find the length of $\overline{DC}$.

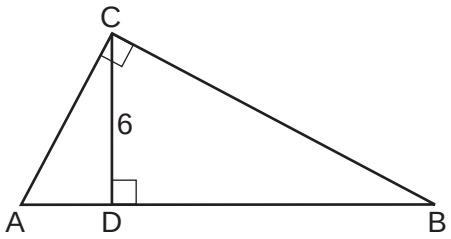
36 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5)$, $B(-4,8)$, and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{4,-5} \circ r_{y\text{-axis}}$.

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



37 In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$.

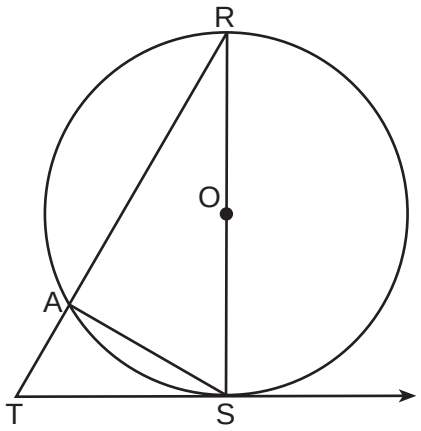
[Only an algebraic solution can receive full credit.]



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. 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 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.



Complete the following proof to show $(RS)^2 = RA \bullet RT$

Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overrightarrow{TS}$	2. _____
3. $\angle RST$ is a right angle	3. $\perp$ lines form right angles
4. $\angle RAS$ is a right angle	4. _____
5. $\angle RST \cong \angle RAS$	5. _____
6. $\angle R \cong \angle R$	6. Reflexive property
7. $\triangle RST \sim \triangle RAS$	7. _____
8. $\frac{RS}{RA} = \frac{RT}{RS}$	8. _____
9. $(RS)^2 = RA \bullet RT$	9. _____

Tear Here

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	$SA = 4\pi r^2$

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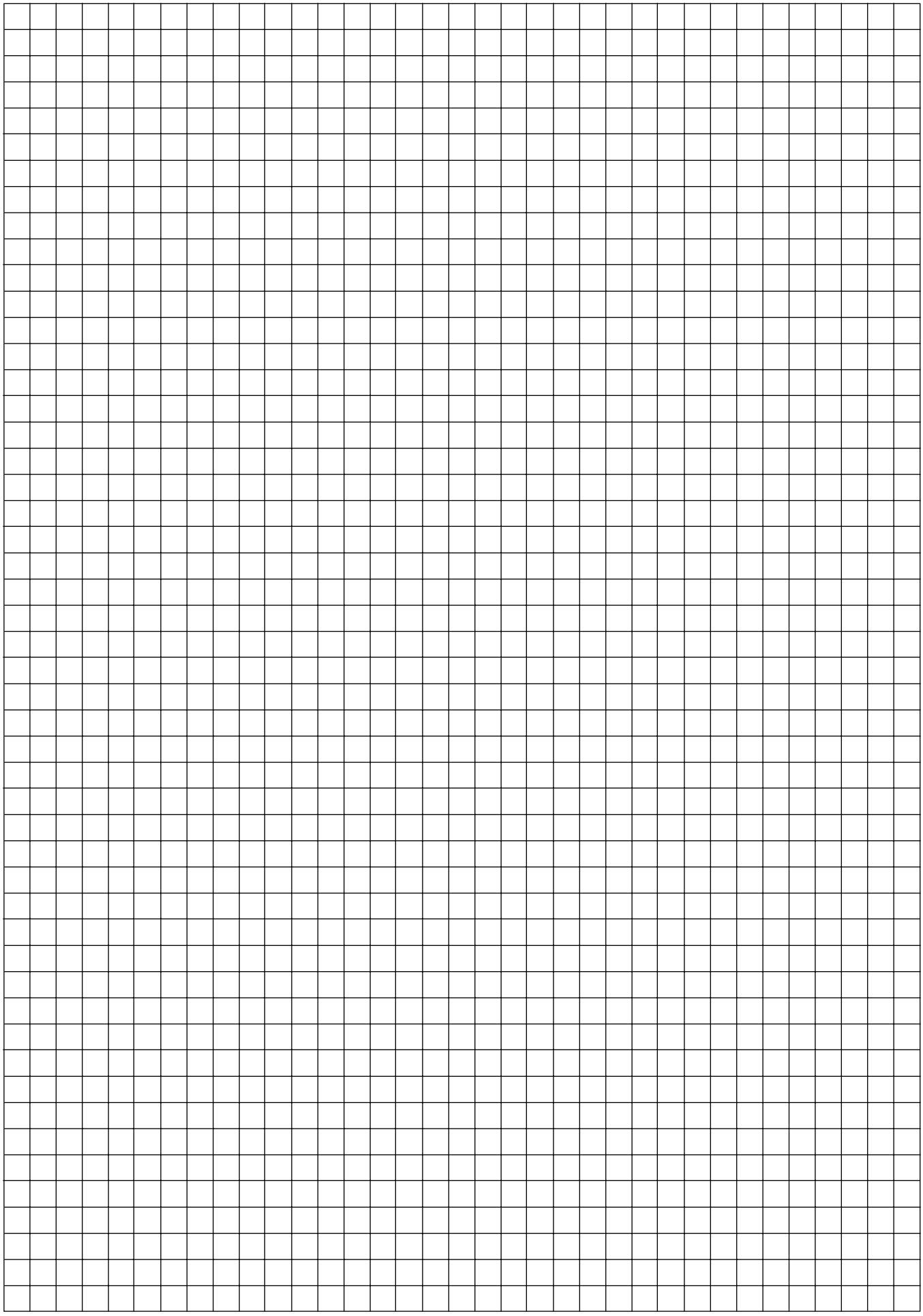
Scrap Graph Paper — This sheet will *not* be scored.



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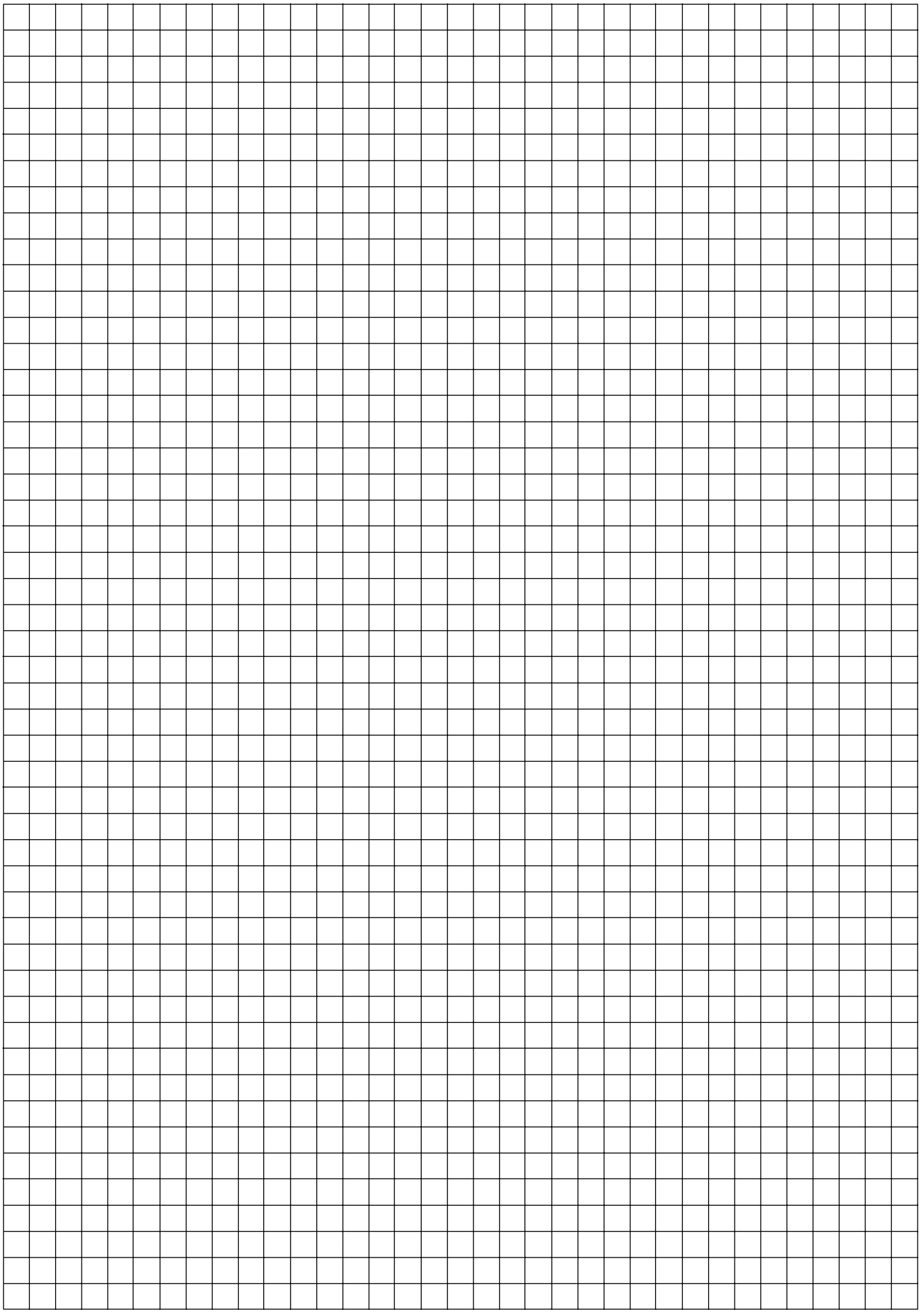

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GEOMETRY

FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Wednesday, January 29, 2014 — 9:15 a.m. to 12:15 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 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 Wednesday, January 29, 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) 2	(11) 2	(21) . . . . . 4 . . . . .
(2) 3	(12) 1	(22) . . . . . 1 . . . . .
(3) 4	(13) 1	(23) . . . . . 1 . . . . .
(4) 1	(14) 2	(24) . . . . . 2 . . . . .
(5) 1	(15) 4	(25) . . . . . 3 . . . . .
(6) 4	(16) 1	(26) . . . . . 4 . . . . .
(7) 4	(17) 3	(27) . . . . . 3 . . . . .
(8) 1	(18) 2	(28) . . . . . 4 . . . . .
(9) 2	(19) 3	
(10) 2	(20) 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.

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. A response with one conceptual error can receive no more than half credit.

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 two (or more) different major conceptual errors, it should be considered completely incorrect and receive no credit.

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]** 78.54, 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] 78.54, 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.

(30) **[2]** A correct construction is drawn showing all appropriate arcs, and the perpendicular bisector is correctly drawn.

[1] A correct construction is drawn showing all appropriate arcs, but the perpendicular bisector is not drawn.

[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.

(31) **[2]** $2\sqrt{13}$, and correct work is shown.

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

or

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

or

[1] Appropriate work is shown to find $\sqrt{52}$, but no further correct work is shown.

or

[1] Appropriate work is shown, but the answer is expressed as a decimal.

or

[1] $2\sqrt{13}$, 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]** 7, 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] 7, 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]** Neither, and a correct explanation is written for why the lines are not parallel and also why the lines are not perpendicular.

[1] One computational error is made, but an appropriate determination is made. An appropriate explanation is written.

or

[1] One conceptual error is made, but an appropriate determination is made. An appropriate explanation is written.

or

[1] Neither, but only a correct explanation for why the lines are not parallel or for why the lines are not perpendicular is written.

[0] Neither, but no explanation is written.

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) **[2]** Both loci are sketched correctly, and the two correct points are labeled with an **X**.

[1] Both loci are sketched, but one conceptual error is made, such as drawing only one line parallel to the row of corn. Appropriate points are labeled with an **X**.

or

[1] Both loci are sketched correctly, but the locations are not labeled with an **X**.

[0] One locus is sketched correctly, but no further correct 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.

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]** 30, 60, 10, and 20, and correct algebraic work is shown.

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

or

[3] Correct work is shown to find 30, 60, and 10, but no further correct work is shown.

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

or

[2] Correct work is shown to find $m\angle D = 30$ and $BC = 10$, but no further correct work is shown.

or

[2] Correct work is shown to find 30 and 60, but no further correct work is shown.

or

[2] 30, 60, 10, and 20, but a method other than algebraic is used to find x and y.

[1] $x + 5x - 30 + 3x - 60 = 180$ and $6y - 8 = 4y - 2$ or equivalent equations are written, but no further correct work is shown.

or

[1] Correct work is shown to find either $m\angle D = 30$ or $BC = 10$, but no further correct work is shown.

or

[1] 30, 60, 10, and 20, 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.

(36) **[4]** $A''(10,0)$, $B''(8,3)$, and $C''(3,1)$, and correct work is shown.

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

or

[3] $\triangle A''B''C''$ is graphed and labeled correctly, but the coordinates are not stated or are stated incorrectly.

or

[3] Correct work is shown to find (10,0), (8,3), and (3,1), but the points are not labeled or are labeled incorrectly.

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

or

[2] Appropriate work is shown, but one conceptual error is made, such as translating before reflecting.

or

[2] Correct work is shown to find $A'(6,5)$, $B'(4,8)$, and $C'(-1,6)$, but no further correct work is shown.

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

or

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

or

[1] The translation is performed on $\triangle ABC$, and $A'(-2,0)$, $B'(0,3)$, and $C'(5,1)$ are stated and labeled. No further correct work is shown.

or

[1] $A''(10,0)$, $B''(8,3)$, and $C''(3,1)$, but no work is shown.

[0] (10,0), (8,3), and (3,1) are stated, 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.

(37) **[4]** 12, and correct algebraic work is shown.

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

or

[3] Correct work is shown to find 3, the length of $\overline{AD}$, but no further correct work is shown.

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

or

[2] Appropriate work is shown, but one conceptional error is made.

or

[2] 12, but a method other than algebraic is used.

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

or

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

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 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]** All six reasons are correct.

[5] Only five reasons are correct.

[4] Only four reasons are correct.

[3] Only three reasons are correct.

[2] Only two reasons are correct.

[1] Only one reason is correct.

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

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

The *Chart for Determining the Final Examination Score for the January 2014 Regents Examination in Geometry* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Wednesday, January 29, 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

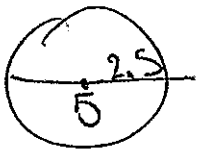
Wednesday, January 29, 2014 — 9:15 a.m.

SAMPLE RESPONSE SET

Table of Contents

Question 29

29 The diameter of a sphere is 5 inches. Determine and state the surface area of the sphere, to the *nearest hundredth of a square inch*.



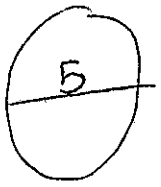
$SA = 4\pi r^2$
$= 4\pi(2.5)^2$
$= 4\pi(6.25)$
$= 25\pi$
$= 78.539816334$

$SA = 78.54 \text{ in}^2$

Score 2: The student has a complete and correct response. Note: Labeling "in^2" was not required.

Question 29

29 The diameter of a sphere is 5 inches. Determine and state the surface area of the sphere, to the *nearest hundredth of a square inch*.



$SA_{sphere} = 4\pi r^2$

$SA = 4\pi(2.5)^2$

$SA = 4\pi(6.25)$

$SA = 4(19.634954108)$

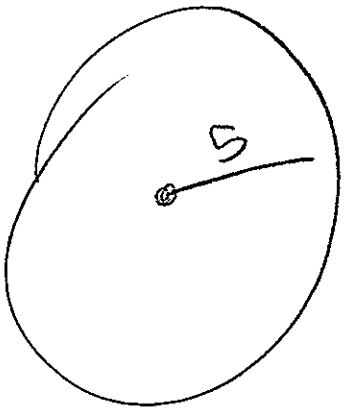
$SA = 78.539816\,34$

$SA \approx 79 \text{ inches}^2$

Score 1: The student made a rounding error.

Question 29

29 The diameter of a sphere is 5 inches. Determine and state the surface area of the sphere, to the *nearest hundredth of a square inch*.



$SA = 4\pi r^2$

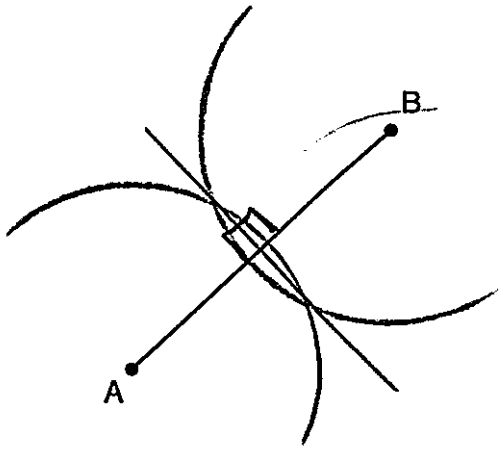
$4\pi(5)^2$

$314.15 in^2$

Score 0: The student made a conceptual error by using 5 as the radius and a rounding error.

Question 30

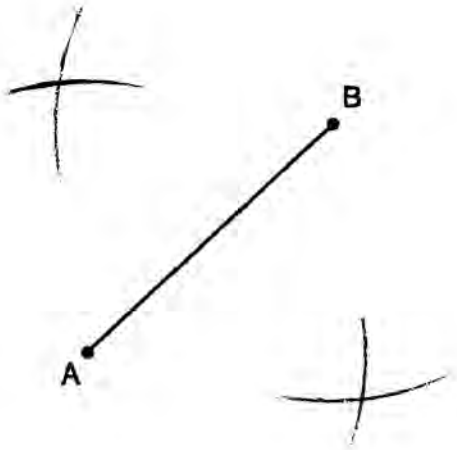
30 Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$.
[Leave all construction marks.]



Score 2: The student has a correct construction. Note: The right angle symbols were not required.

Question 30

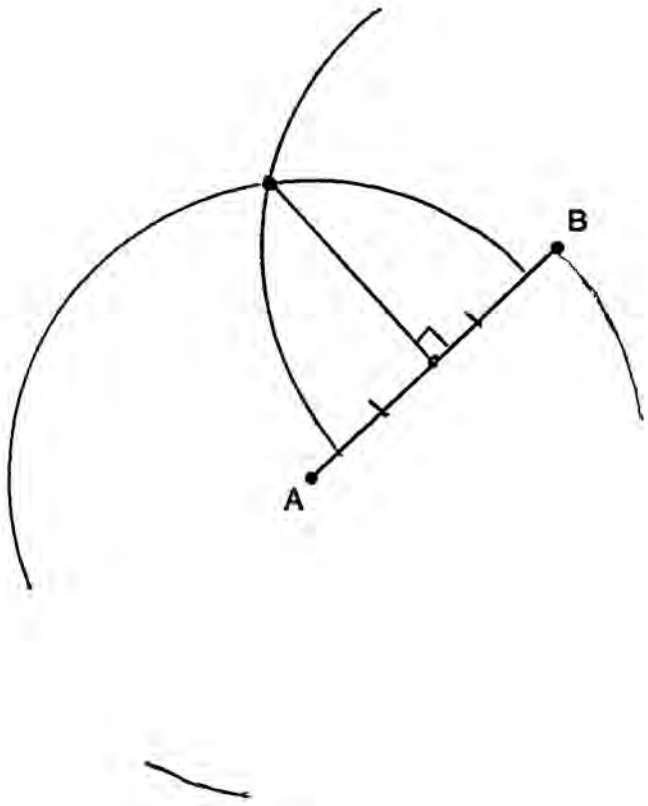
30 Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$.
[Leave all construction marks.]



Score 1: The student has correct construction arcs, but did not draw the perpendicular bisector.

Question 30

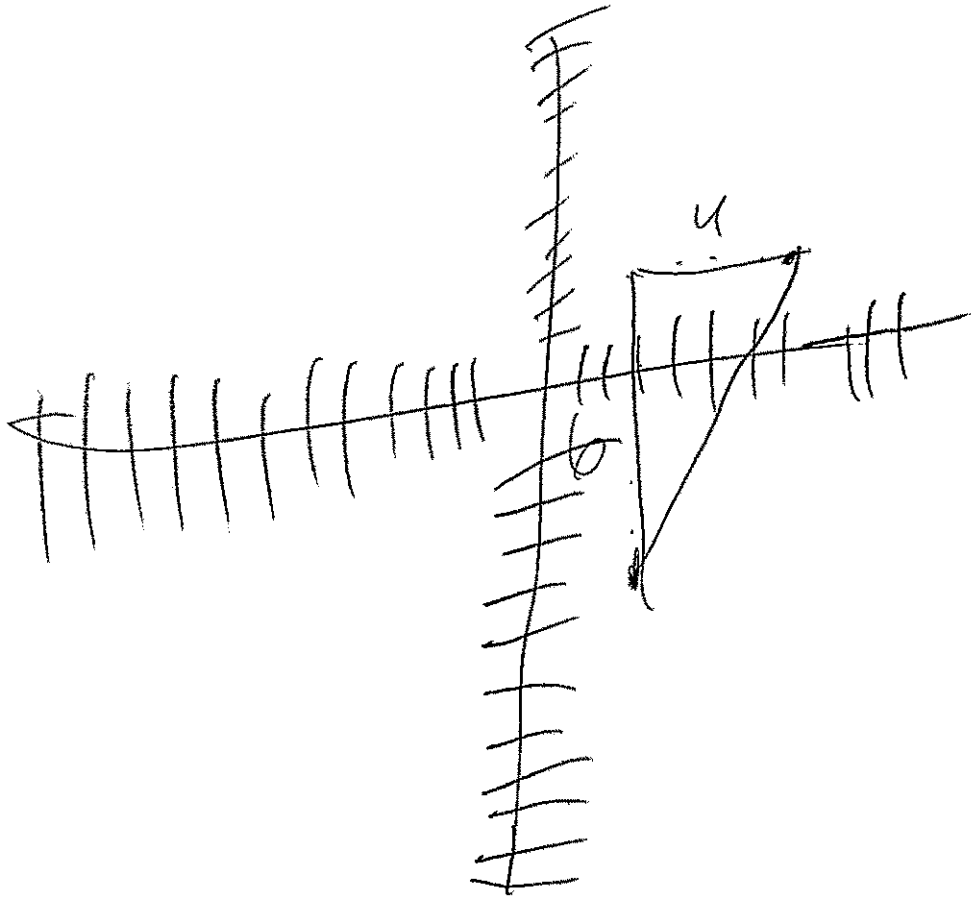
30 Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$.
[Leave all construction marks.]



Score 0: The student did not construct two pairs of intersecting arcs.

Question 31

31 The endpoints of $\overline{AB}$ are $A(3,-4)$ and $B(7,2)$. Determine and state the length of $\overline{AB}$ in simplest radical form.



$52 = x^2$

$\sqrt{52}$

$2\sqrt{13}$

Score 2: The student has a complete and correct response. The student graphed $\overline{AB}$, drew a right triangle, and applied the Pythagorean Theorem.

Question 31

31 The endpoints of $\overline{AB}$ are $A(3,-4)$ and $B(7,2)$. Determine and state the length of $\overline{AB}$ in simplest radical form.

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

$d = \sqrt{(7-3)^2 + (2+4)^2}$

$d = \sqrt{4^2 + 6^2}$

$d = \sqrt{16 + 36}$

$d = \sqrt{52}$

$d = 7\sqrt{3}$

$\boxed{d = 2\sqrt{6}}$

Score 1: The student showed correct work to find $\sqrt{52}$, but no further correct work is shown.

Question 31

31 The endpoints of $\overline{AB}$ are $A(3,-4)$ and $B(7,2)$. Determine and state the length of $\overline{AB}$ in simplest radical form.

$\sqrt{(3+7)^2+(-4+2)^2} = AB^2$

$\sqrt{100+4} = AB^2$

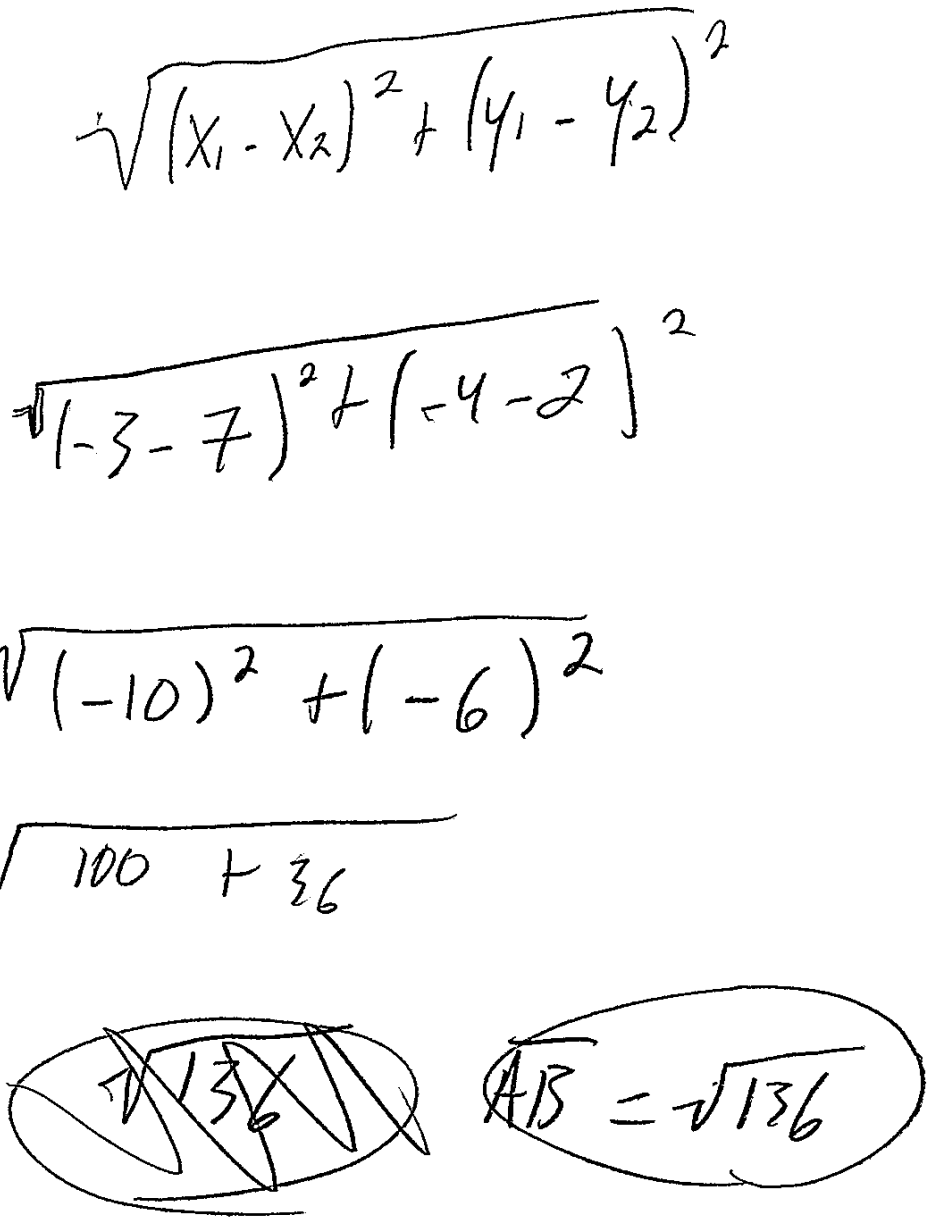
$\sqrt{104} = AB^2$

$2\sqrt{26} = AB$

Score 1: The student made a conceptual error in using the formula for length of a segment. The student's answer was simplified correctly.

Question 31

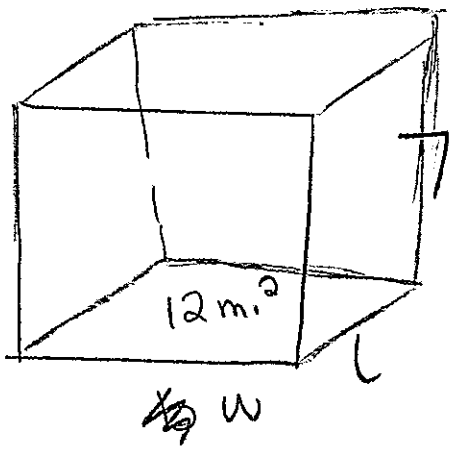
31 The endpoints of $\overline{AB}$ are $A(3,-4)$ and $B(7,2)$. Determine and state the length of $\overline{AB}$ in simplest radical form.



Score 0: The student made an error in substituting into the distance formula and did not simplify the answer.

Question 32

32 A right prism has a square base with an area of 12 square meters. The volume of the prism is 84 cubic meters. Determine and state the height of the prism, in meters.



7 meters

84/12=7

12·1
2·6
3·4

Score 2: The student has a complete and correct response. Note: Labeling "meters" was not required.

Question 32

32 A right prism has a square base with an area of 12 square meters. The volume of the prism is 84 cubic meters. Determine and state the height of the prism, in meters.

$V = Bh$

$\frac{84}{12} = \frac{12h}{12}$

$7 = h$

height = 7 m.²

Score 1: The student showed correct work, but labeled the answer with incorrect units.

Question 32

32 A right prism has a square base with an area of 12 square meters. The volume of the prism is 84 cubic meters. Determine and state the height of the prism, in meters.

$12m^2 + 84m^3 = 96m^5$

Score 0: The student work is completely incorrect.

Question 33

33 State whether the lines represented by the equations $y = \frac{1}{2}x - 1$ and $y + 4 = -\frac{1}{2}(x - 2)$ are parallel, perpendicular, or neither.

Explain your answer.

$y = \frac{1}{2}x - 1$

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

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

$-4 \quad -4$

$y = -\frac{1}{2}x - 3$

They are neither because they do not have the same slope which would make them parallel, and they do not have negative reciprocle slopes which would make them perpendicular.

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

Question 33

33 State whether the lines represented by the equations $y = \frac{1}{2}x - 1$ and $y + 4 = -\frac{1}{2}(x - 2)$ are parallel, perpendicular, or neither.

Explain your answer.

$y = \frac{1}{2}x - 1$

$m = \frac{1}{2}$

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

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

$-4 \quad -4 \quad -4$

$y = -4.5x - 3$

$m = -4.5$

Neither because their slopes aren't the same or negative reciprocals of each other.

Score 1: The student made a conceptual error in solving the second equation for y. An appropriate determination and justification were written.

Question 33

33 State whether the lines represented by the equations $y = \frac{1}{2}x - 1$ and $y + 4 = -\frac{1}{2}(x - 2)$ are parallel, perpendicular, or neither.
Explain your answer.

$Y+4=-\frac{1}{2}(X-2)$
$-4 \qquad\qquad -4$

$Y=\frac{1}{2}(X-6$

$Y=\frac{1}{2}x-6 \neq Y=\frac{1}{2}x-1$

nether because they have different Y- intercepts

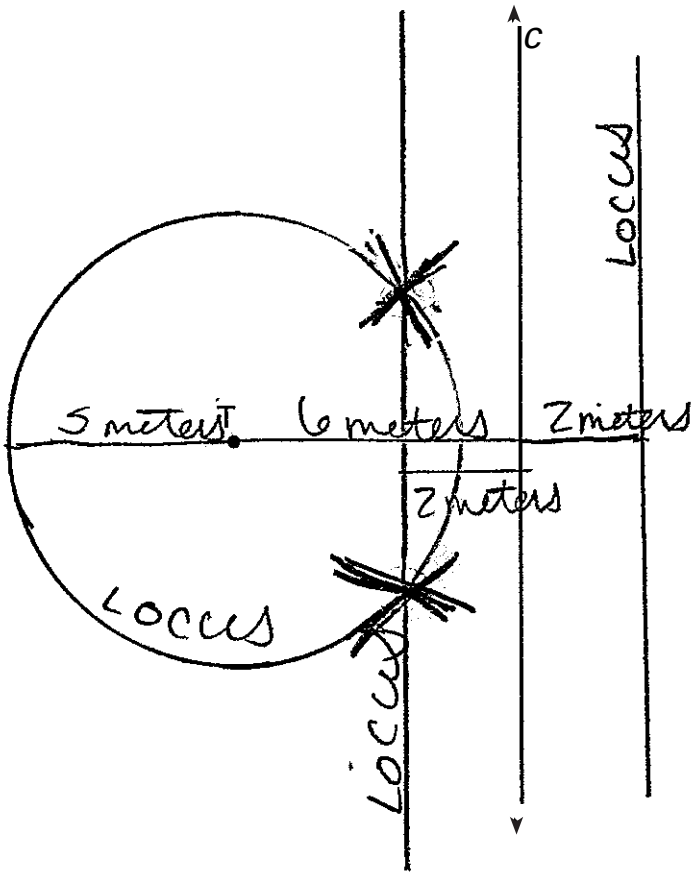
Score 0: The student wrote "neither," but the work and justification are completely incorrect.

Question 34

34 A tree, T, is 6 meters from a row of corn, c, as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree.

Sketch both loci.

Indicate, with an **X**, all possible locations for the scarecrow.



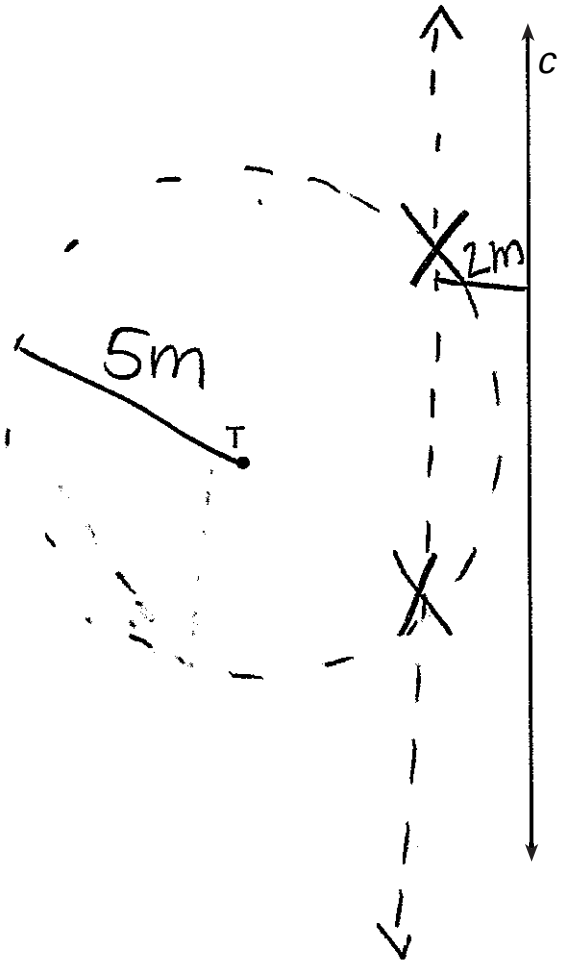
Score 2: The student sketched both loci correctly and labeled both locations with an X.

Question 34

34 A tree, T, is 6 meters from a row of corn, c, as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree.

Sketch both loci.

Indicate, with an **X**, all possible locations for the scarecrow.



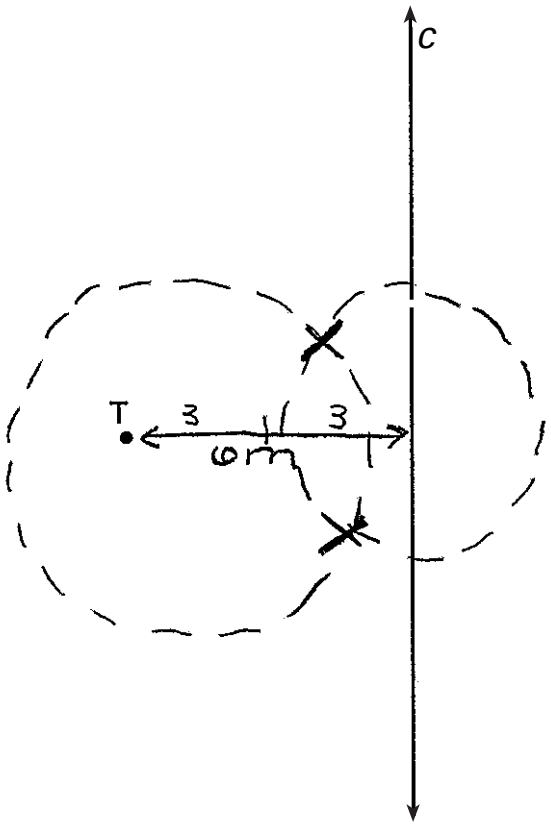
Score 1: The student made a conceptual error and drew only one line parallel to the row of corn, but labeled appropriate points with an X.

Question 34

34 A tree, T, is 6 meters from a row of corn, c, as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree.

Sketch both loci.

Indicate, with an **X**, all possible locations for the scarecrow.



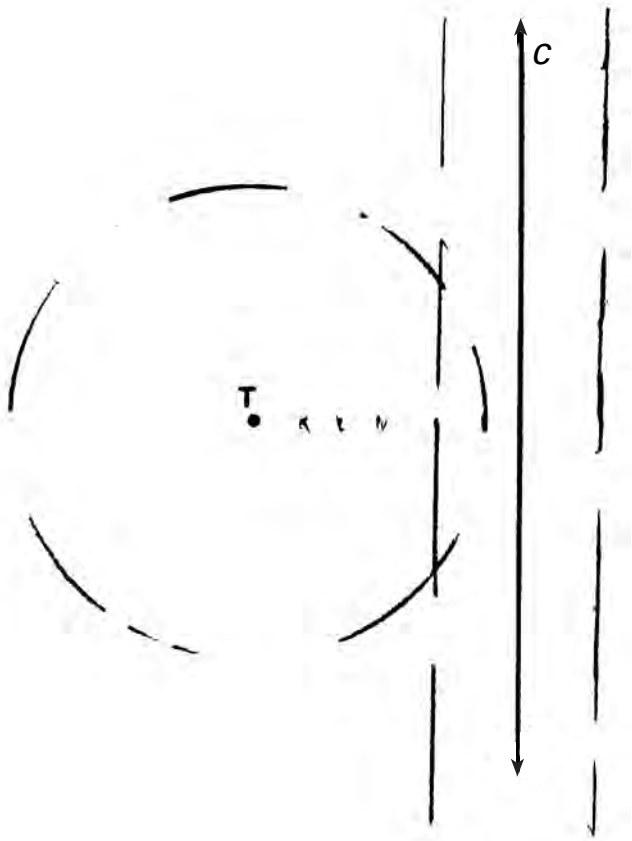
Score 1: The student made a conceptual error in drawing one locus, but labeled appropriate points X.

Question 34

34 A tree, T, is 6 meters from a row of corn, c, as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree.

Sketch both loci.

Indicate, with an **X**, all possible locations for the scarecrow.



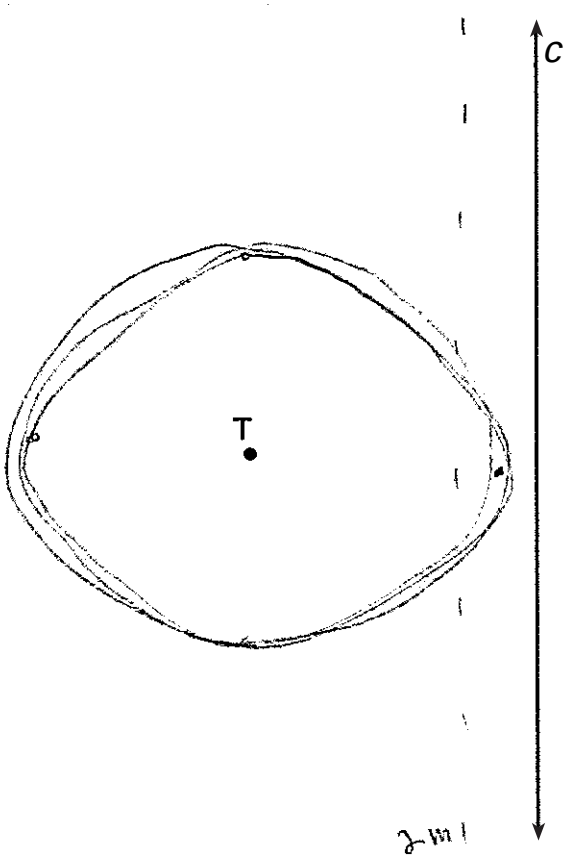
Score 1: The student sketched both loci correctly, but the locations are not labeled with an X.

Question 34

34 A tree, *T*, is 6 meters from a row of corn, *c*, as represented in the diagram below. A farmer wants to place a scarecrow 2 meters from the row of corn and also 5 meters from the tree.

Sketch both loci.

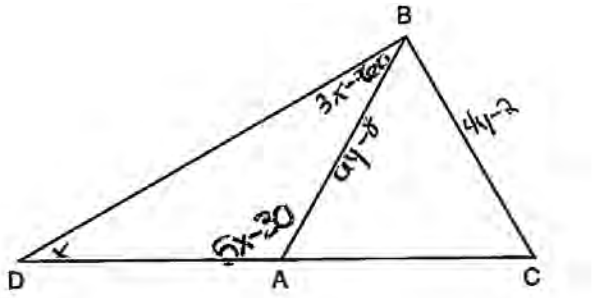
Indicate, with an **X**, all possible locations for the scarecrow.



Score 0: The student sketched only one locus correctly and made a conceptual error in sketching the second locus. Appropriate points are not labeled with an X.

Question 35

35 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find $m\angle D$.

$x + 3x - 60 + 5x - 30 = 180$

$9x - 90 = 180$

$+90 \quad +90$

$\frac{9x}{9} = \frac{270}{9}$

$x = 30°$

Find $m\angle BAC$.

$5x - 30 = \angle BAD$

$5(30) - 30 = \angle BAD$

$150 - 30$

$180 - 120 = 60°$

Find the length of $\overline{BC}$.

$6y - 8 = 4y - 2$

$+8 \quad +8$

$6y = 4y + 6$

$-4y \quad -4y$

$\frac{2y}{2} = \frac{6}{2} \quad y = 3$

$\overline{BC} = 4y - 2$

$BC = 4(3) - 2$

$\overline{BC} = 12 - 2$

$\overline{BC} = 10$

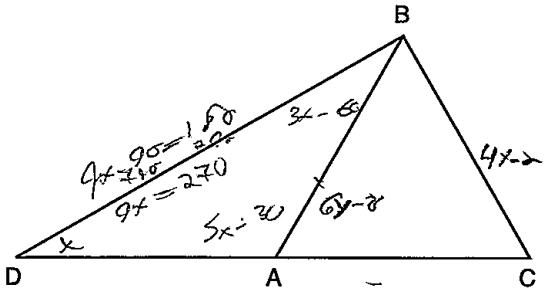
Find the length of $\overline{DC}$.

20

Score 4: The student has a complete and correct response. The student wrote and solved correct equations to find $x = 30$ and $y = 3$. The four correct answers are stated.

Question 35

35 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



$6x - 8 = 4x - 2$
$+4x \quad +8 \quad -4x \quad +8$
$\frac{2x}{2} = \frac{6}{2}$
$x = 3$

In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find $m\angle D$.

$m\angle D = 30$

Find $m\angle BAC$.

$m\angle BAC = 60$

Find the length of $\overline{BC}$.

16

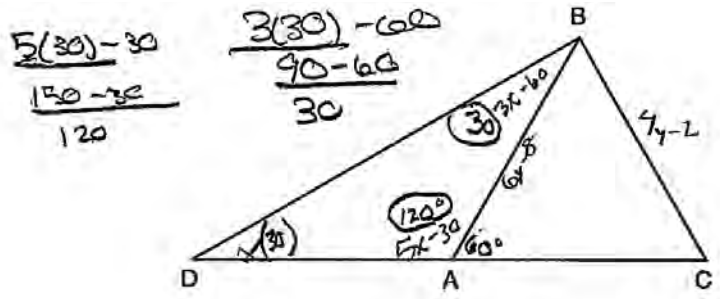
Find the length of $\overline{DC}$.

30

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

Question 35

35 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find $m\angle D$.

30°

$x + 5x - 30 + 3x - 60 = 180$

$9x - 90 = 180$

$+90 \quad +90$

$9x = 270$

$x = 30$

Find $m\angle BAC$.

60°

Find the length of $\overline{BC}$.

10

$6y - 8 = 4y - 2$

$-4y \quad -4y$

$2y - 8 = -2$

$+8 \quad +8$

$2y = 6$

$y = 3$

$4(3) - 2$

$12 - 2$

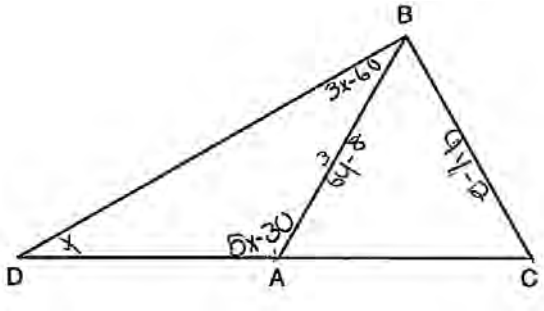
10

Find the length of $\overline{DC}$.

Score 3: The student showed correct work to find 30, 60, and 10. The length of $\overline{DC}$ is not stated.

Question 35

35 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find $m\angle D$.

$x + 5x - 30 + 3x - 60 = 180$

$9x - 90 = 180$

$+90 \quad +90$

$\frac{9x}{9} = \frac{270}{9}$ → $x = 30$

$m\angle D = 30$

Find $m\angle BAC$.

$5x - 30 + x = 180$

$6x - 30 = 180$

$+30 \quad +30$

$\frac{6x}{6} = \frac{210}{6}$

$x = 35$

$m\angle BAC = 35$

Find the length of $\overline{BC}$.

$6y - 8 = 4y - 2$

$-4y \quad -4y$

$2y - 8 = -2$

$+8 \quad +8$

$2y = 6$

$\frac{2y}{2} = \frac{6}{2}$

$y = 3$

$BC = 4(3) - 2$

$= 12 - 2$

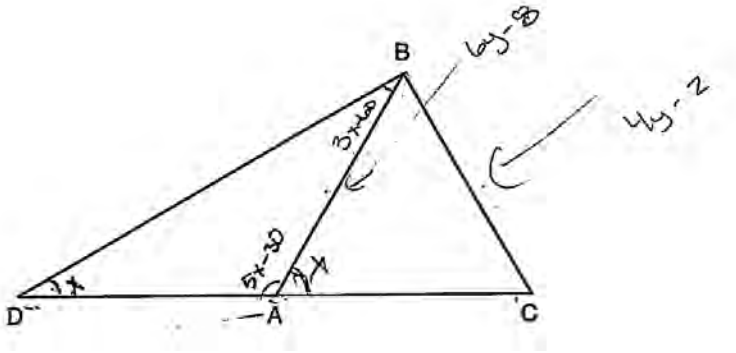
$BC = 10$

Find the length of $\overline{DC}$.

Score 2: The student showed correct work to find 30 and 10. No further correct work is shown.

Question 35

35 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find $m\angle D$.

$x+5x+30+3x+60=180$
$9x+90=180$
$-90 \quad -90$
$9x = 90$
$x=10$

$m\angle D = 10$

Find $m\angle BAC$.

$5x-30+x=180$
$6x-30=180$
$+30 \quad +30$
$6x=150$

$\frac{6x}{6}=\frac{150}{6}$
$x=25$

$BAC = 25$

Find the length of $\overline{BC}$.

$6y-8=4y-2$
$-4y \quad -4y$
$2y-8=-2$
$+8 \quad +8$
$2y=6$

$\frac{2y}{2}=\frac{6}{2}$
$y=3$

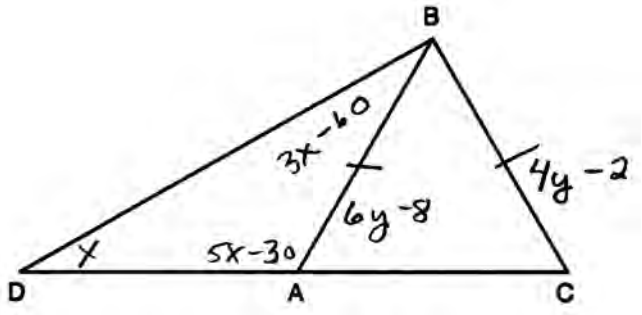
$BC = 4y-2$
$= 4(3)-2$
$12-2$
10

Find the length of $\overline{DC}$.

Score 1: The student showed correct work to find 10, the length of $\overline{BC}$. No further correct work is shown.

Question 35

35 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find $m\angle D$.

30

Find $m\angle BAC$.

60

Find the length of $\overline{BC}$.

10

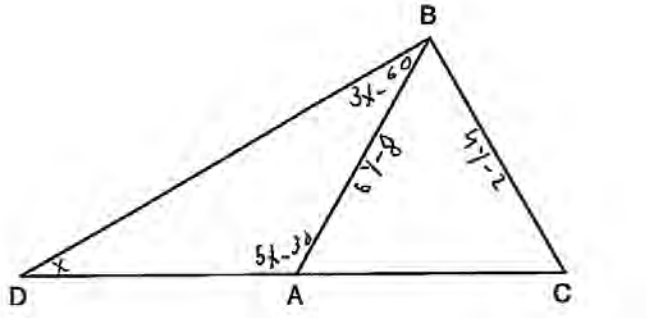
Find the length of $\overline{DC}$.

20

Score 1: The student showed no work, but stated four correct answers.

Question 35

35 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.



In $\triangle DAB$, m$\angle D = x$, m$\angle DAB = 5x - 30$, and m$\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.]

Find m$\angle D$.

$8x - 60 = 180$
$+60 \quad +60$
$\frac{8x}{8} = \frac{240}{8}$
$x = 30$

$x = 30$

Find m$\angle BAC$.

$10y - 6 = 180$
$+6 \quad +6$
$\frac{10y}{10} = \frac{186}{10}$
$y = 18.6$

$6x = 18.6$

Find the length of $\overline{BC}$.

$4y - 2 = 180$
$+2 \quad +2$
$\frac{4y}{4} = \frac{182}{4}$
$y = 45.5$

$y = 46.5$

Find the length of $\overline{DC}$.

$6x - 30 = 180$
$+30 \quad +30$
$\frac{6x}{6} = \frac{210}{6}$
$x = 35$

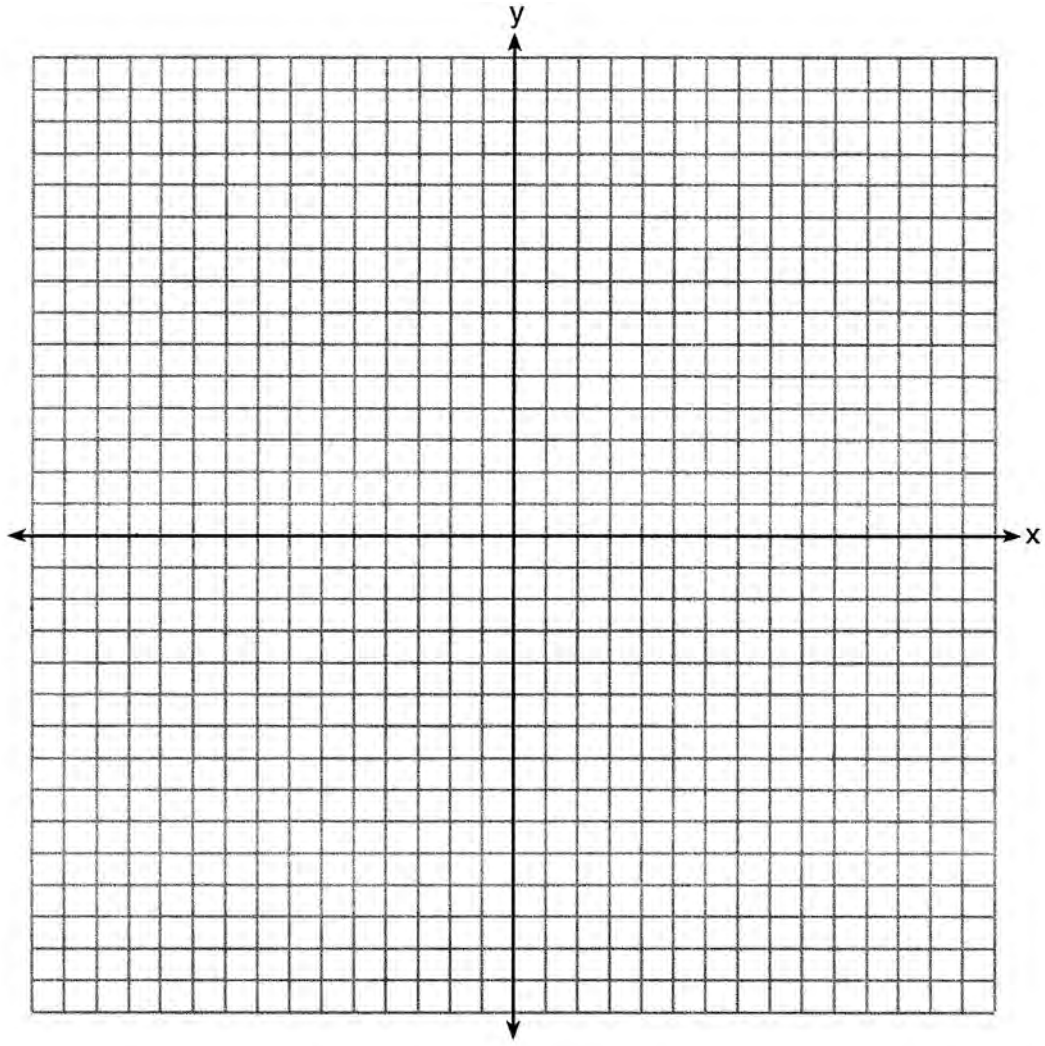
$x = 35$

Score 0: The student showed no correct work.

Question 36

36 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5)$, $B(-4,8)$, and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{4,-5} \circ r_{y\text{-axis}}$.

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



A(-6,5)
A'(6,5)
A''(10,0)

B(-4,8)
B'(4,8)
B''(8,3)

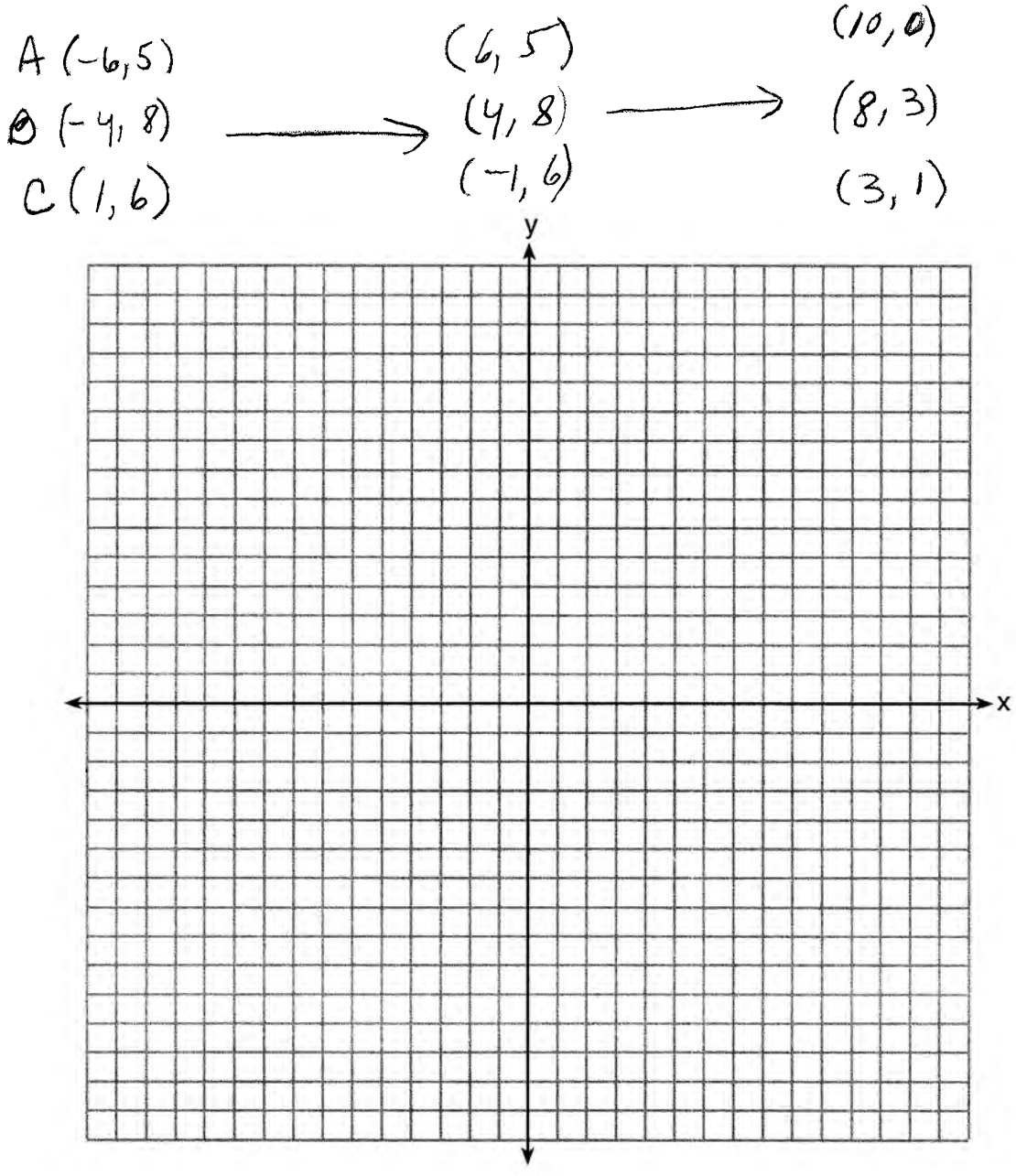
C(1,6)
C'(-1,6)
C''(3,1)

Score 4: The student has a complete and correct response. The student showed correct work to find the coordinates of A'', B'', and C''.

Question 36

36 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5)$, $B(-4,8)$, and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{4,-5} \circ r_{y\text{-axis}}$.

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



Score 4: The student has a complete and correct response. The student showed correct work to find the coordinates of the images of A, B, and C after $T_{4,-5} \circ r_{y\text{-axis}}$. The arrows indicate the mapping of $A(-6,5)$ onto $(6,5)$ onto $(10,0)$.

Question 36

36 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5)$, $B(-4,8)$, and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{4,-5} \circ r_{y\text{-axis}}$.

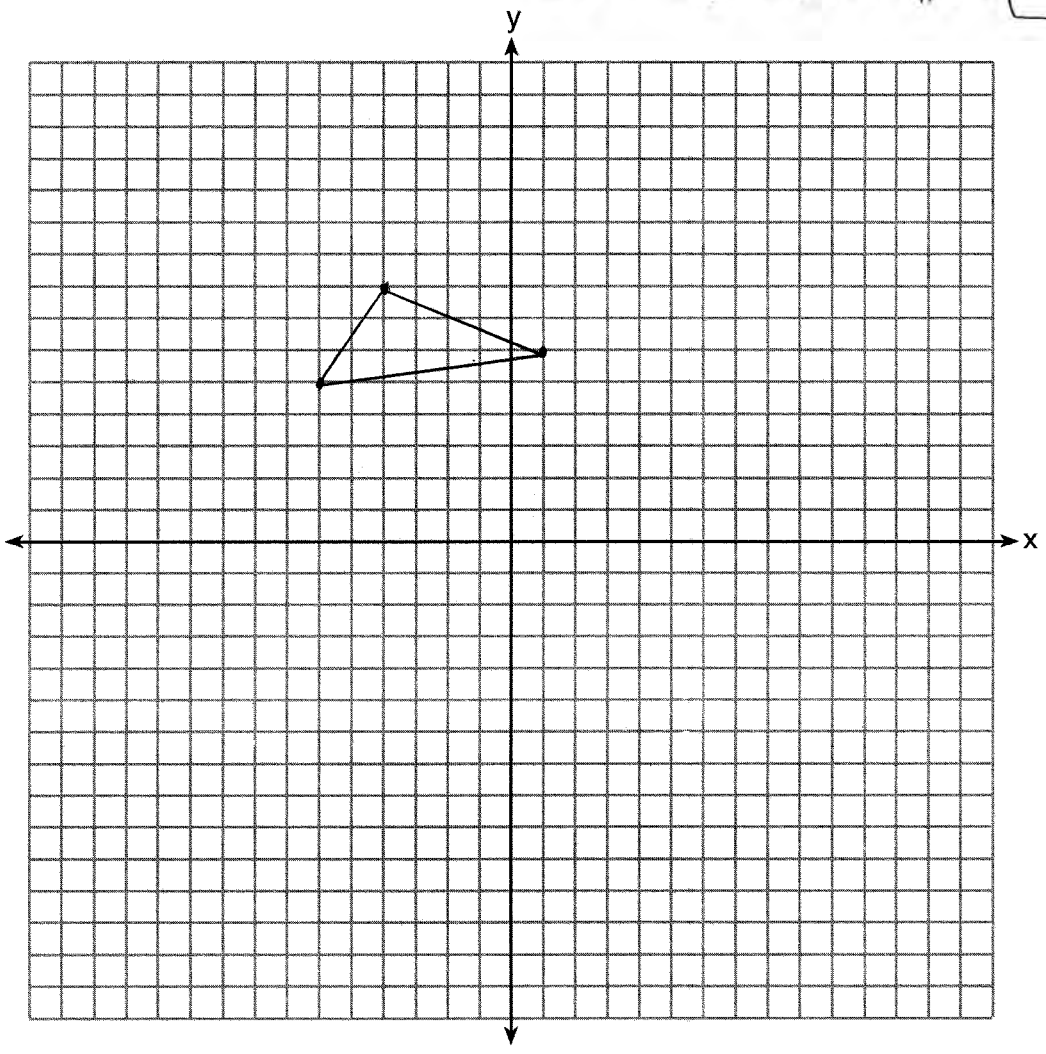
[The use of the set of axes below is optional.]

$T_{4,-5} \cdot r_{y\text{-axis}}$

$A(-6,5) \xrightarrow{r_{y\text{-axis}}} A'(6,5) \xrightarrow{T_{4,-5}} A''(10,0)$

$B(-4,8) \xrightarrow{r_{y\text{-axis}}} B'(4,8) \xrightarrow{T_{4,-5}} B''(8,3)$

$C(1,6) \xrightarrow{r_{y\text{-axis}}} C'(1,6) \xrightarrow{T_{4,-5}} C''(5,1)$



Score 3: The student made an error reflecting one point (C) over the y-axis, but did the transformation correctly.

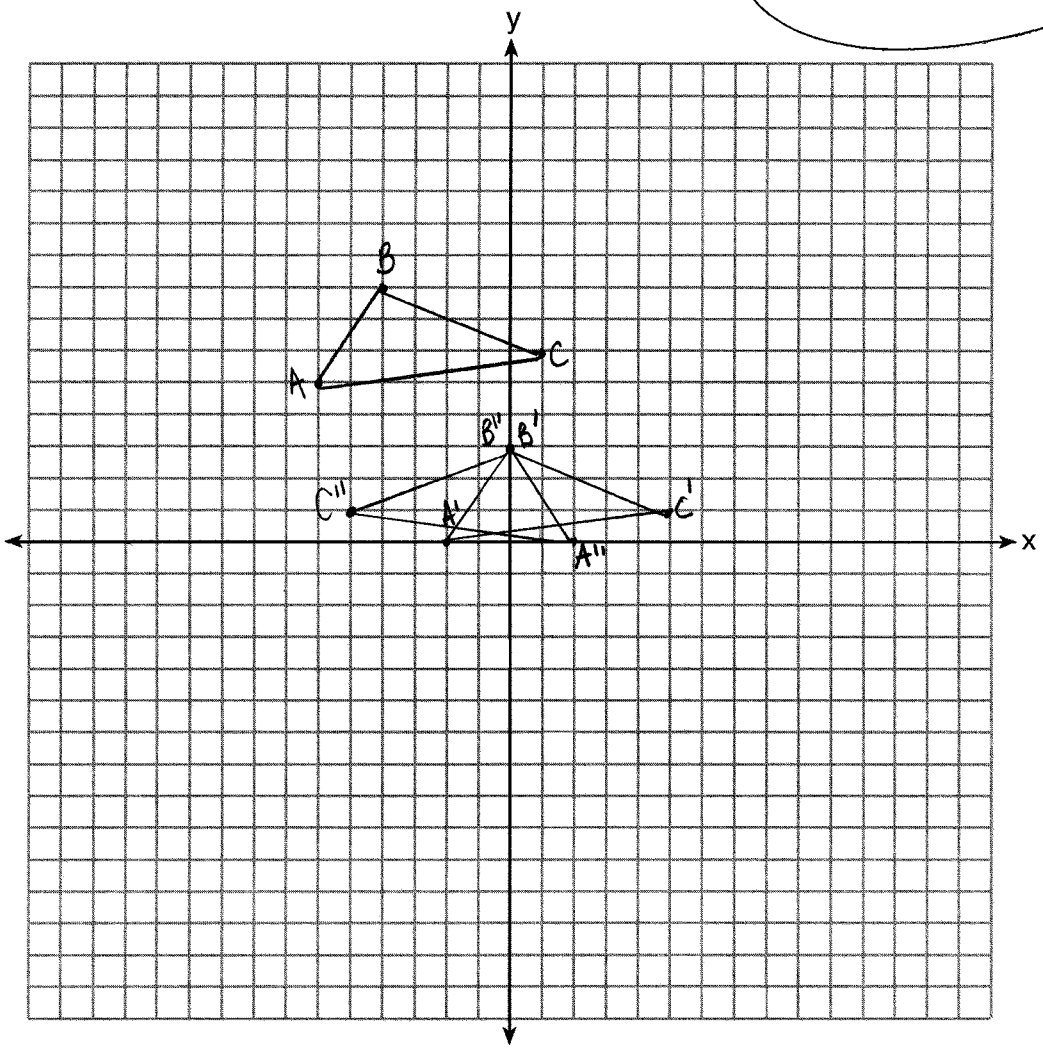
Question 36

36 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5)$, $B(-4,8)$, and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{4,-5} \circ r_{y\text{-axis}}$.

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

$A' = (-2,0)$
$B' = (-3,3)$
$C' = (5,1)$

$A'' = (2,0)$
$B'' = (3,3)$
$C'' = (-5,1)$



Score 2: The student made a conceptual error by doing the composition in the wrong order.

Question 36

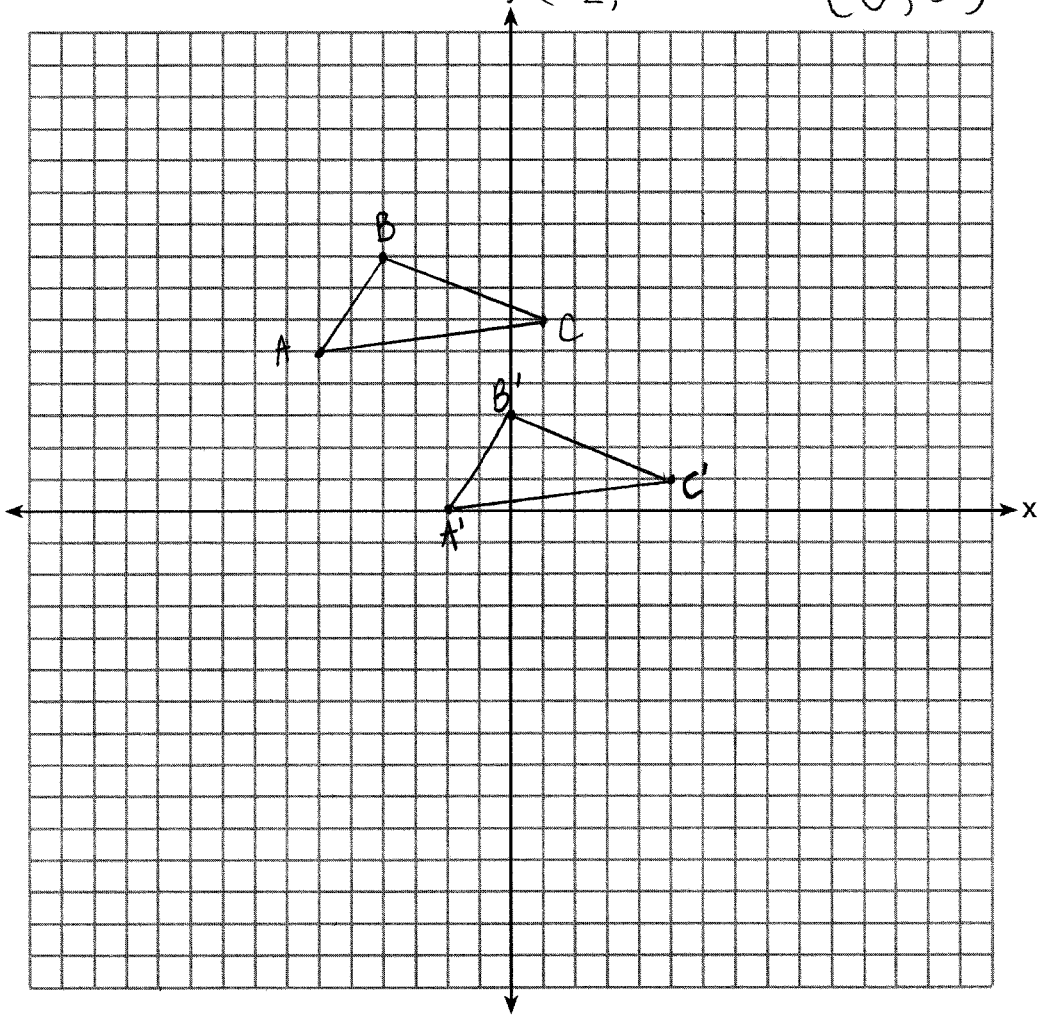
36 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5)$, $B(-4,8)$, and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{4,-5} \circ r_{y\text{-axis}}$.

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

A' (-6,5) +4 -5 (-2, 0)

B' (-4, 8) +4 -5 (0, 3)

C' (1, 6) +4 -5 (5, 1)

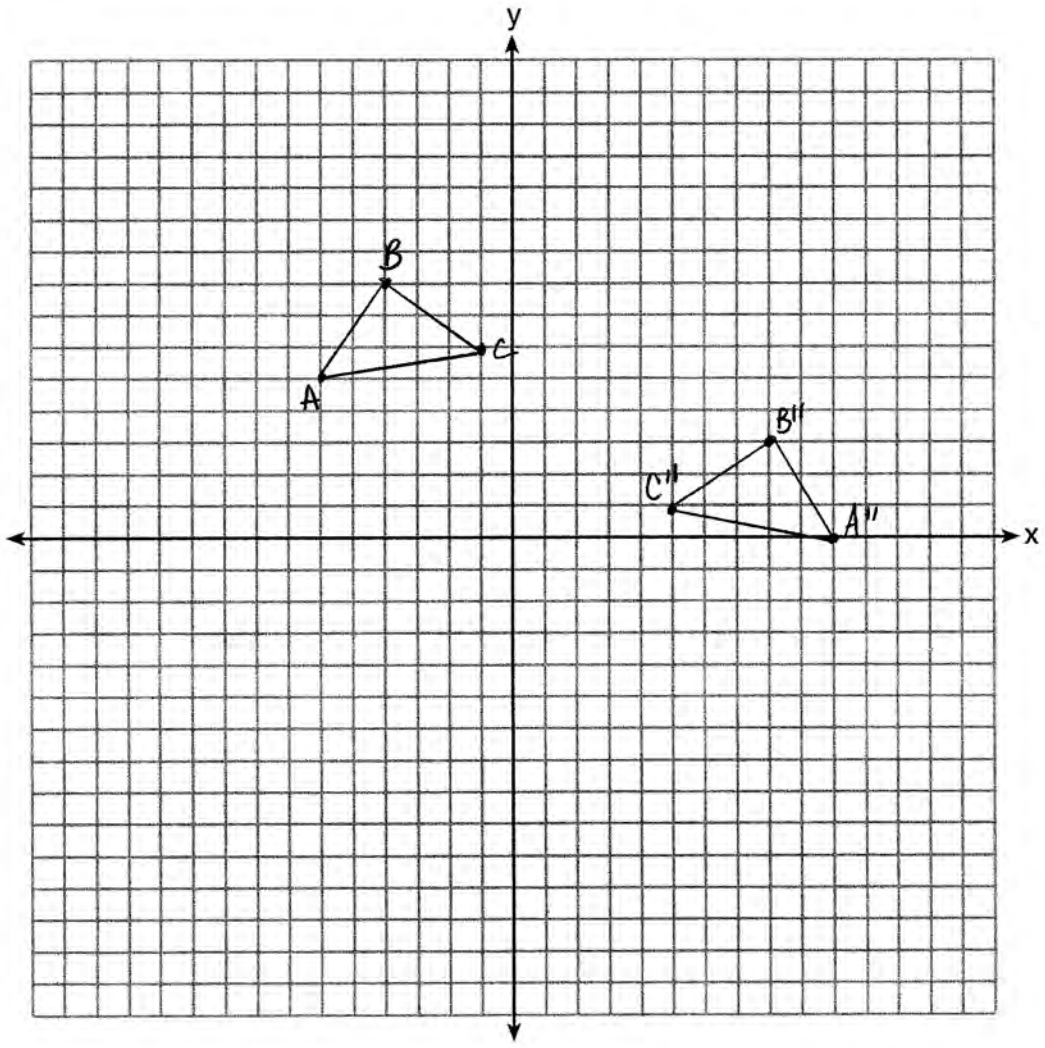


Score 1: The student did the translation on the vertices of $\triangle ABC$ correctly.

Question 36

36 The coordinates of the vertices of $\triangle ABC$ are $A(-6,5)$, $B(-4,8)$, and $C(1,6)$. State and label the coordinates of the vertices of $\triangle A''B''C''$, the image of $\triangle ABC$ after the composition of transformations $T_{4,-5} \circ r_{y\text{-axis}}$.

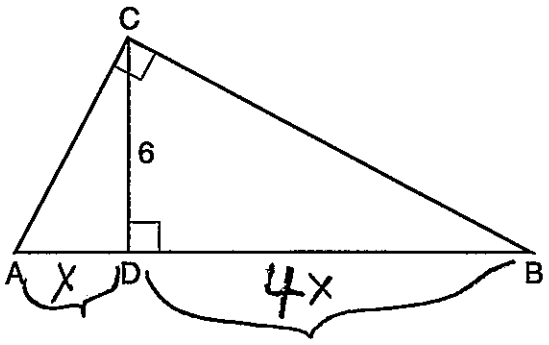
[The use of the set of axes below is optional.]



Score 0: The student did no correct work.

Question 37

37 In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$.
[Only an algebraic solution can receive full credit.]



4(3)=12

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

$4x^2 = 36$

$\frac{4}{4} \quad \frac{4}{4}$

$\sqrt{x^2} = \sqrt{9}$

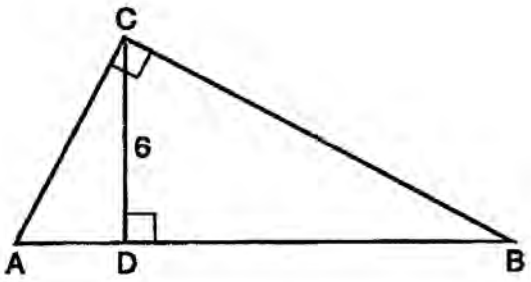
$x = 3$

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

Question 37

37 In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$.

[Only an algebraic solution can receive full credit.]



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

$4x^2 = 36$

$x^2 = 9$

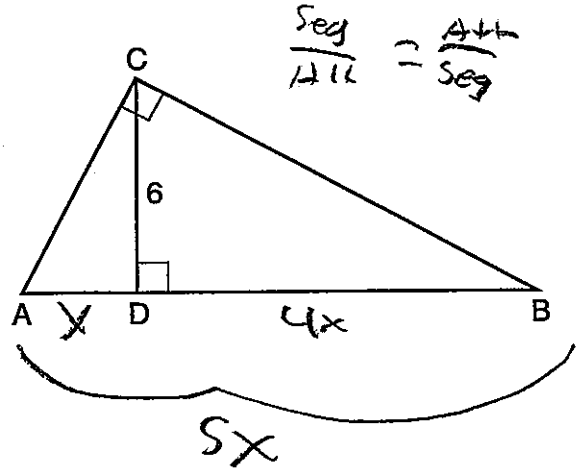
$x = 3$

Score 3: The student correctly solved the proportion for x, the length of $\overline{AD}$, but did not find the length of $\overline{BD}$.

Question 37

37 In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$.

[Only an algebraic solution can receive full credit.]



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

$5x = 36$

$\frac{5x}{5} = \frac{36}{5}$

$x = 7.2$

$\overline{BD} = 4x$

$\overline{BD} = 4(7.2)$

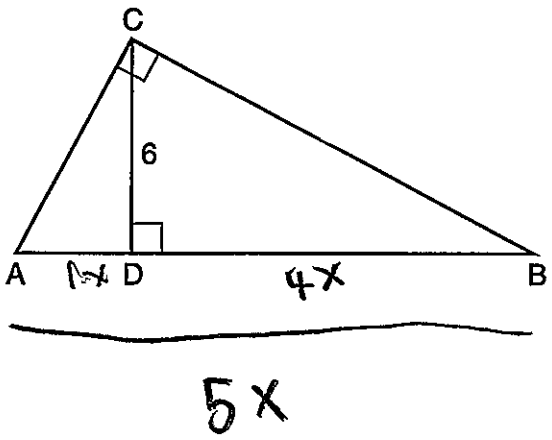
$\overline{BD} = 28.8$

Score 2: The student made a conceptual error in multiplying ($x \cdot 4x = 5x$), but found an appropriate length of $\overline{BD}$.

Question 37

37 In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$.

[Only an algebraic solution can receive full credit.]



$\frac{1x}{6}$ $\frac{6}{4x}$

$5x = 36$

$\frac{5x}{5} = \frac{36}{5}$

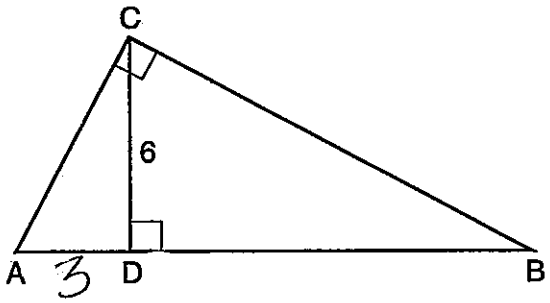
$x = 7.2$

Score 1: The student made a conceptual error in multiplying ($x \cdot 4x = 5x$), and did not find an appropriate length of $\overline{BD}$.

Question 37

37 In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$.

[Only an algebraic solution can receive full credit.]



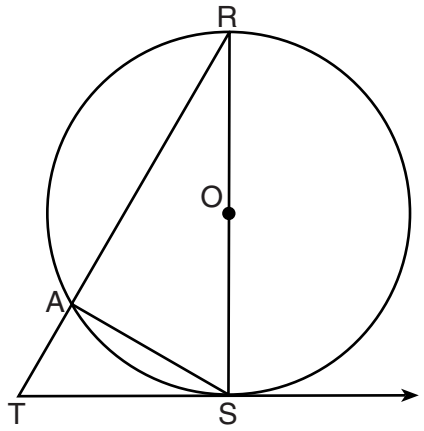
(34) = 12

DB = 12

Score 0: The student got the correct answer by a completely incorrect method.

Question 38

38 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.



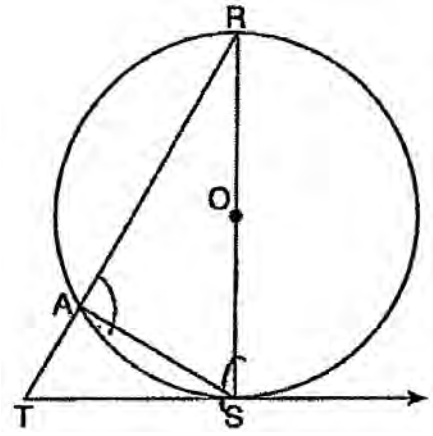
Complete the following proof to show $(RS)^2 = RA \bullet RT$

Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overrightarrow{TS}$	2. a tangent is ⊥ to the radius of the ⊙ at the point of tangency
3. $\angle RST$ is a right angle	3. ⊥ lines form right angles
4. $\angle RAS$ is a right angle	4. ∠s in a ⊙ that's inscribed in a semicircle are rt. angles
5. $\angle RST \cong \angle RAS$	5. all rt. ∠s are ≅.
6. $\angle R \cong \angle R$	6. Reflexive property
7. $\triangle RST \sim \triangle RAS$	7. $AA \cong AA$
8. $\frac{RS}{RA} = \frac{RT}{RS}$	8. corresponding sides of ~ △s are proportional to one another.
9. $(RS)^2 = RA \bullet RT$	9. the product of the means are = to the product of the extremes

Score 6: The student has a complete and correct response by writing six correct reasons.

Question 38

38 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.



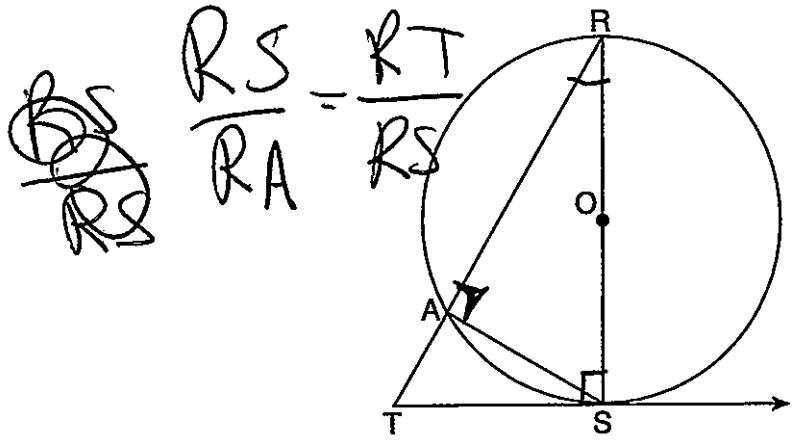
Complete the following proof to show $(RS)^2 = RA \bullet RT$

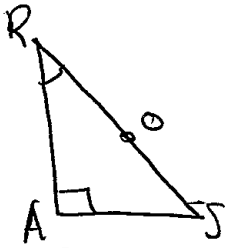
Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overrightarrow{TS}$	2. diameter drawn to point of tangency is ⊥ to tangent line
3. $\angle RST$ is a right angle	3. ⊥ lines form right angles
4. $\angle RAS$ is a right angle	4. ∡'s inscribed in semicircle are rt. ∡'s
5. $\angle RST \cong \angle RAS$	5. all rt. ∡s ≅
6. $\angle R \cong \angle R$	6. Reflexive property
7. $\triangle RST \sim \triangle RAS$	7. AA ~
8. $\frac{RS}{RA} = \frac{RT}{RS}$	8. corresponding sides are proportional in ~△'s
9. $(RS)^2 = RA \bullet RT$	9. multiplication

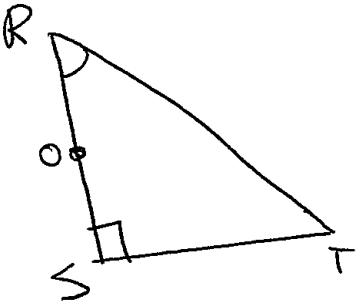
Score 5: The student wrote five correct reasons (2, 4, 5, 7, 8).

Question 38

38 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overleftrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.







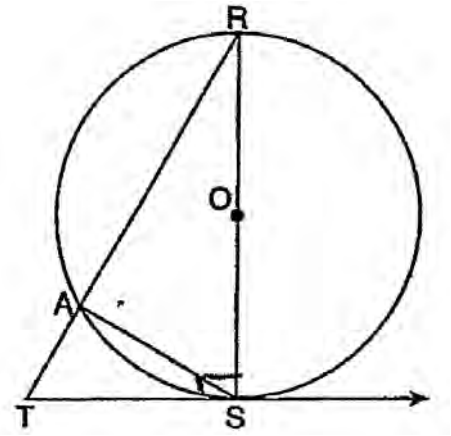
Complete the following proof to show $(RS)^2 = RA \bullet RT$

Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overleftrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overleftrightarrow{TS}$	2. Tangent $\overleftrightarrow{TS}$ and the diameter intersect half the circle making the perpendicular lines form right angles
3. $\angle RST$ is a right angle	3. $\perp$ lines form right angles
4. $\angle RAS$ is a right angle	4. half the circle, RS, is 180° so & RAS is half of the chord it intersects.
5. $\angle RST \cong \angle RAS$	5. All right &s are $\cong$.
6. $\angle R \cong \angle R$	6. Reflexive property
7. $\triangle RST \sim \triangle RAS$	7. ~~SAA~~ AA $\sim$ AA
8. $\frac{RS}{RA} = \frac{RT}{RS}$	8. Corresponding sides in ~ △s are in proportion.
9. $(RS)^2 = RA \bullet RT$	9. The product of the extremes is $\cong$ to the product of the means.

Score 4: The student wrote four correct reasons (5, 7, 8, 9).

Question 38

38 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.



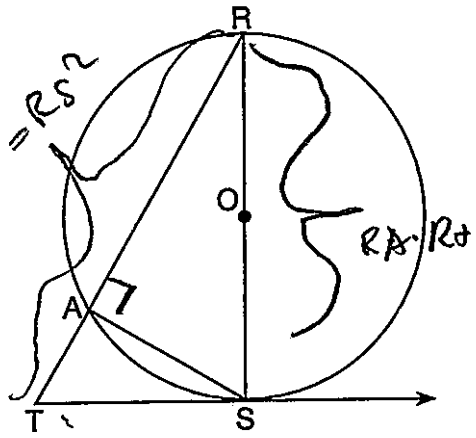
Complete the following proof to show $(RS)^2 = RA \bullet RT$

Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overrightarrow{TS}$	2. a diameter & tangent meet
3. $\angle RST$ is a right angle	3. $\perp$ lines form right angles
4. $\angle RAS$ is a right angle	4. if a chord & secant meet, right $\angle$s formed.
5. $\angle RST \cong \angle RAS$	5. all right $\angle$s are $\cong$
6. $\angle R \cong \angle R$	6. Reflexive property
7. $\triangle RST \sim \triangle RAS$	7. AA~
8. $\frac{RS}{RA} = \frac{RT}{RS}$	8. if 2 $\triangle$s ~, corresponding sides are in proportion
9. $(RS)^2 = RA \bullet RT$	9. if sides are in proportion, the extremes = the means

Score 3: The student wrote three correct reasons (5, 7, 8).

Question 38

38 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.



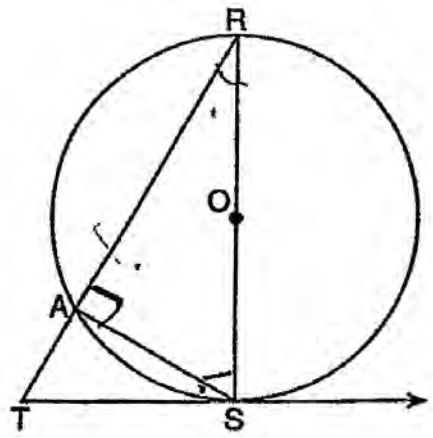
Complete the following proof to show $(RS)^2 = RA \bullet RT$

Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overrightarrow{TS}$	2. def of a tangent
	inter secting
	3. $\perp$ lines form right angles
3. $\angle RST$ is a right angle	4. $\angle$'s inscribed in a $\odot$ are right $\angle$'s
4. $\angle RAS$ is a right angle	5. $\cong$ arcs $\cong$ angles
5. $\angle RST \cong \angle RAS$	6. Reflexive property
	7. AA~
6. $\angle R \cong \angle R$	8. Similar $\triangle$'s similar proportions
7. $\triangle RST \sim \triangle RAS$	
8. $\frac{RS}{RA} = \frac{RT}{RS}$	9. product of the means = Products of the extremes
9. $(RS)^2 = RA \bullet RT$	

Score 2: The student wrote two correct reasons (7, 9).

Question 38

38 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.



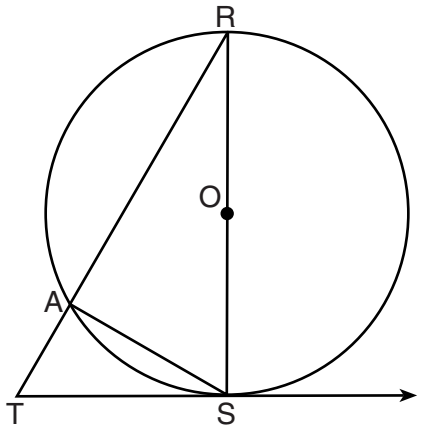
Complete the following proof to show $(RS)^2 = RA \bullet RT$

Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overrightarrow{TS}$	2. when a diameter & tangent meet
3. $\angle RST$ is a right angle	3. $\perp$ lines form right angles
4. $\angle RAS$ is a right angle	4. when 2 chords meet at 1 point they form 90°
5. $\angle RST \cong \angle RAS$	5. all right angles $\cong$
6. $\angle R \cong \angle R$	6. Reflexive property
7. $\triangle RST \sim \triangle RAS$	7. all angles the same
8. $\frac{RS}{RA} = \frac{RT}{RS}$	8. what?
9. $(RS)^2 = RA \bullet RT$	9. CPCTC

Score 1: The student wrote one correct reason (5).

Question 38

38 In the diagram of circle O below, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$ are drawn.



Complete the following proof to show $(RS)^2 = RA \bullet RT$

Statements	Reasons
1. circle O, diameter $\overline{RS}$, chord $\overline{AS}$, tangent $\overrightarrow{TS}$, and secant $\overline{TAR}$	1. Given
2. $\overline{RS} \perp \overrightarrow{TS}$	2. Two lines that form right angles are perpendicular.
3. $\angle RST$ is a right angle	3. $\perp$ lines form right angles
4. $\angle RAS$ is a right angle	4. _____
5. $\angle RST \cong \angle RAS$	5. _____
6. $\angle R \cong \angle R$	6. Reflexive property
7. $\triangle RST \sim \triangle RAS$	7. _____
8. $\frac{RS}{RA} = \frac{RT}{RS}$	8. _____
9. $(RS)^2 = RA \bullet RT$	9. _____

Score 0: The student has no correct reasons.

Regents Examination in Geometry – January 2014

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

Raw Score	Scale Score
86	**100**
85	**98**
84	**97**
83	**95**
82	**94**
81	**93**
80	**92**
79	**91**
78	**90**
77	**89**
76	**88**
75	**87**
74	**86**
73	**86**
72	**85**
71	**84**
70	**83**
69	**83**
68	**82**
67	**81**
66	**81**
65	**80**

Raw Score	Scale Score
64	**80**
63	**79**
62	**79**
61	**78**
60	**77**
59	**77**
58	**76**
57	**76**
56	**75**
55	**74**
54	**74**
53	**73**
52	**73**
51	**72**
50	**71**
49	**71**
48	**70**
47	**69**
46	**68**
45	**68**
44	**67**
43	**66**

Raw Score	Scale Score
42	**66**
41	**65**
40	**64**
39	**63**
38	**62**
37	**61**
36	**60**
35	**60**
34	**59**
33	**58**
32	**57**
31	**56**
30	**55**
29	**54**
28	**53**
27	**51**
26	**50**
25	**49**
24	**48**
23	**47**
22	**45**
21	**44**

Raw Score	Scale Score
20	**43**
19	**41**
18	**40**
17	**38**
16	**36**
15	**35**
14	**33**
13	**31**
12	**29**
11	**27**
10	**25**
9	**23**
8	**21**
7	**19**
6	**16**
5	**14**
4	**11**
3	**9**
2	**6**
1	**3**
0	**0**

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.