

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

GEOMETRY

Friday, June 19, 2015 — 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.

Part I

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.

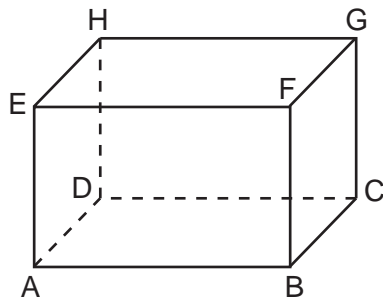
1 Quadrilateral $ABCD$ undergoes a transformation, producing quadrilateral $A'B'C'D'$. For which transformation would the area of $A'B'C'D'$ *not* be equal to the area of $ABCD$?

- (1) a rotation of 90° about the origin
- (2) a reflection over the y -axis
- (3) a dilation by a scale factor of 2
- (4) a translation defined by $(x,y) \rightarrow (x + 4, y - 1)$

2 The diameter of a sphere is 12 inches. What is the volume of the sphere to the *nearest cubic inch*?

- (1) 288
- (2) 452
- (3) 905
- (4) 7,238

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



Which line segments are coplanar?

- (1) \overline{EF} and \overline{BC}
- (2) \overline{HD} and \overline{FG}
- (3) \overline{GH} and \overline{FB}
- (4) \overline{EA} and \overline{GC}

Use this space for computations.

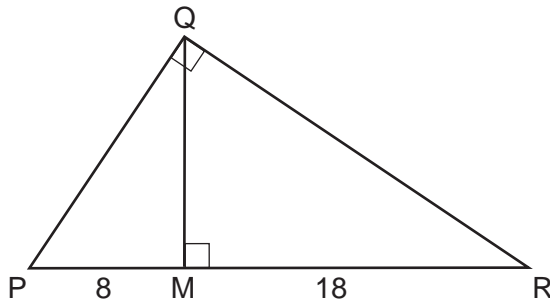
4 What are the coordinates of the image of point $A(2, -7)$ under the translation $(x, y) \rightarrow (x - 3, y + 5)$?

- (1) $(-1, -2)$ (3) $(5, -12)$
(2) $(-1, 2)$ (4) $(5, 12)$

5 Point M is the midpoint of \overline{AB} . If the coordinates of M are $(2, 8)$ and the coordinates of A are $(10, 12)$, what are the coordinates of B ?

- (1) $(6, 10)$ (3) $(-8, -4)$
(2) $(-6, 4)$ (4) $(18, 16)$

6 In the diagram below, \overline{QM} is an altitude of right triangle PQR , $PM = 8$, and $RM = 18$.



What is the length of \overline{QM} ?

- (1) 20 (3) 12
(2) 16 (4) 10

7 What is an equation of the line that passes through the point $(2, 4)$ and is perpendicular to the line whose equation is $3y = 6x + 3$?

- (1) $y = -\frac{1}{2}x + 5$ (3) $y = 2x - 6$
(2) $y = -\frac{1}{2}x + 4$ (4) $y = 2x$

Use this space for computations.

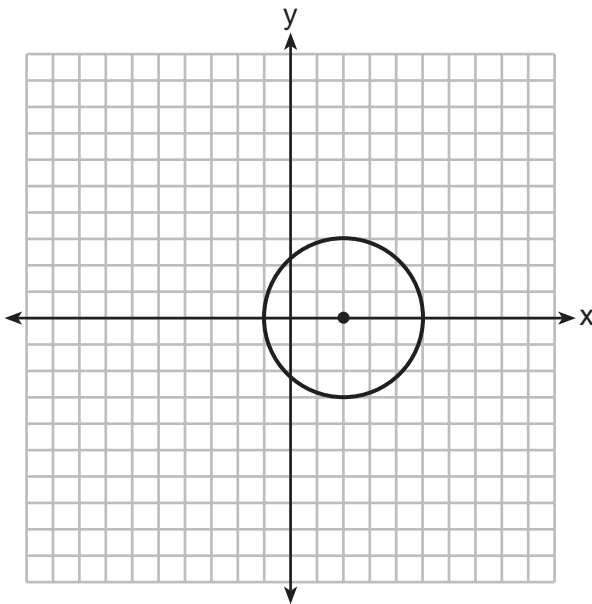
8 In all isosceles triangles, the exterior angle of a base angle must always be

- (1) a right angle
- (2) an acute angle
- (3) an obtuse angle
- (4) equal to the vertex angle

9 If $\triangle W'X'Y'$ is the image of $\triangle WXY$ after the transformation R_{90° , which statement is *false*?

- (1) $XY = X'Y'$
- (2) $\overline{WX} \parallel \overline{W'X'}$
- (3) $\triangle WXY \cong \triangle W'X'Y'$
- (4) $m\angle XWY = m\angle X'W'Y'$

10 Which equation represents the circle shown in the graph below?

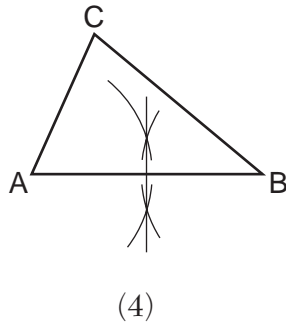
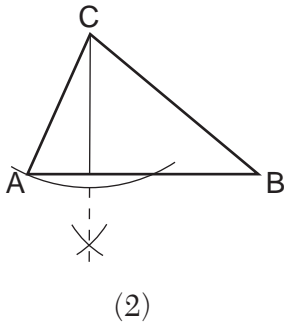
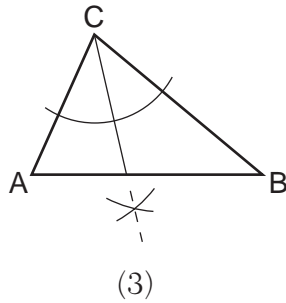
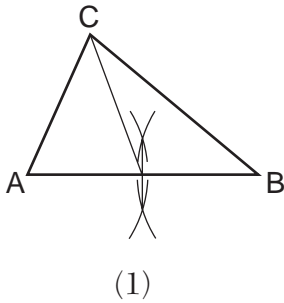


- (1) $(x - 2)^2 + y^2 = 9$
- (2) $(x + 2)^2 + y^2 = 9$
- (3) $(x - 2)^2 + y^2 = 3$
- (4) $(x + 2)^2 + y^2 = 3$

Use this space for
computations.

- 11 In quadrilateral $ABCD$, each diagonal bisects opposite angles.
If $m\angle DAB = 70$, then $ABCD$ must be a
- (1) rectangle (3) rhombus
(2) trapezoid (4) square

- 12 Which diagram illustrates a correct construction of an altitude of $\triangle ABC$?



- 13 From external point A , two tangents to circle O are drawn.
The points of tangency are B and C . Chord BC is drawn to form $\triangle ABC$. If $m\angle ABC = 66$, what is $m\angle A$?
- (1) 33 (3) 57
(2) 48 (4) 66

14 Point A lies on plane \mathcal{P} . How many distinct lines passing through point A are perpendicular to plane \mathcal{P} ?

- | | |
|-------|--------------|
| (1) 1 | (3) 0 |
| (2) 2 | (4) infinite |

15 Students made four statements about a circle.

A: The coordinates of its center are $(4, -3)$.

B: The coordinates of its center are $(-4, 3)$.

C: The length of its radius is $5\sqrt{2}$.

D: The length of its radius is 25.

If the equation of the circle is $(x + 4)^2 + (y - 3)^2 = 50$, which statements are correct?

- | | |
|-------------|-------------|
| (1) A and C | (3) B and C |
| (2) A and D | (4) B and D |

16 Points A , B , C , and D are located on circle O , forming trapezoid $ABCD$ with $\overline{AB} \parallel \overline{DC}$. Which statement must be true?

- | | |
|---|---------------------------------------|
| (1) $\overline{AB} \cong \overline{DC}$ | (3) $\angle A \cong \angle D$ |
| (2) $\widehat{AD} \cong \widehat{BC}$ | (4) $\widehat{AB} \cong \widehat{DC}$ |

17 If $\triangle ABC \sim \triangle LMN$, which statement is *not* always true?

- | | |
|-----------------------------|---|
| (1) $m\angle A = m\angle N$ | (3) $\frac{\text{area } \triangle ABC}{\text{area } \triangle LMN} = \frac{(AC)^2}{(LN)^2}$ |
| (2) $m\angle B = m\angle M$ | (4) $\frac{\text{perimeter } \triangle ABC}{\text{perimeter } \triangle LMN} = \frac{AB}{LM}$ |

Use this space for
computations.

18 The equations representing lines k , m , and n are given below.

$$k: 3y + 6 = 2x$$

$$m: 3y + 2x + 6 = 0$$

$$n: 2y = 3x + 6$$

Which statement is true?

(1) $k \parallel m$

(3) $m \perp k$

(2) $n \parallel m$

(4) $m \perp n$

19 A regular polygon with an exterior angle of 40° is a

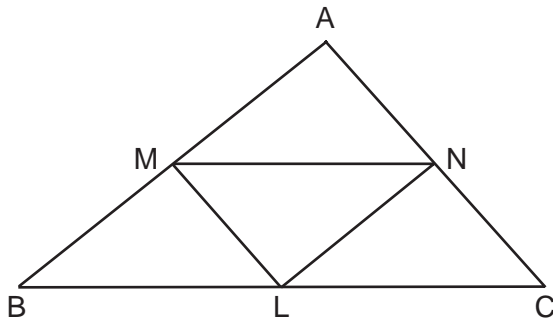
(1) pentagon

(3) nonagon

(2) hexagon

(4) decagon

20 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) 26

(3) 30

(2) 28

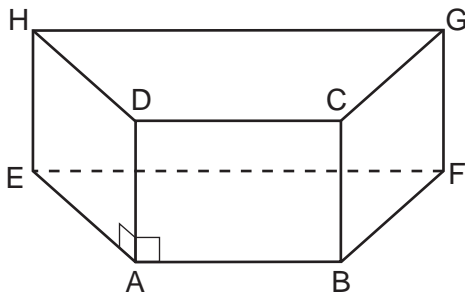
(4) 35

Use this space for computations.

21 The sum of the interior angles of a regular polygon is 720° . How many sides does the polygon have?

- (1) 8 (3) 5
(2) 6 (4) 4

22 In the prism shown below, $\overline{AD} \perp \overline{AE}$ and $\overline{AD} \perp \overline{AB}$.



Which plane is perpendicular to \overline{AD} ?

- (1) HEA (3) EAB
(2) BAD (4) EHG

23 In $\triangle ABC$, $m\angle A = 65$ and $m\angle B$ is greater than $m\angle A$. The lengths of the sides of $\triangle ABC$ in order from smallest to largest are

- (1) $\overline{AB}, \overline{BC}, \overline{AC}$ (3) $\overline{AC}, \overline{BC}, \overline{AB}$
(2) $\overline{BC}, \overline{AB}, \overline{AC}$ (4) $\overline{AB}, \overline{AC}, \overline{BC}$

24 Which equation represents a circle whose center is the origin and that passes through the point $(-4,0)$?

- (1) $x^2 + y^2 = 8$ (3) $(x + 4)^2 + y^2 = 8$
(2) $x^2 + y^2 = 16$ (4) $(x + 4)^2 + y^2 = 16$

Use this space for
computations.

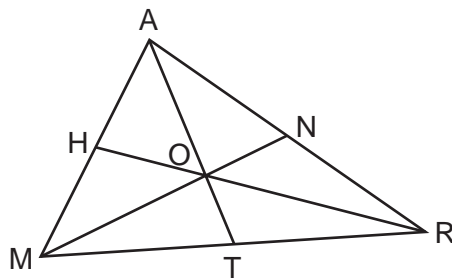
25 The lengths of two sides of a triangle are 7 and 11. Which inequality represents all possible values for x , the length of the third side of the triangle?

- (1) $4 \leq x \leq 18$ (3) $4 \leq x < 18$
(2) $4 < x \leq 18$ (4) $4 < x < 18$

26 Which statement is the inverse of “If $x + 3 = 7$, then $x = 4$ ”?

- (1) If $x = 4$, then $x + 3 = 7$.
(2) If $x \neq 4$, then $x + 3 \neq 7$.
(3) If $x + 3 \neq 7$, then $x \neq 4$.
(4) If $x + 3 = 7$, then $x \neq 4$.

27 In the diagram below of $\triangle MAR$, medians \overline{MN} , \overline{AT} , and \overline{RH} intersect at O .



If $TO = 10$, what is the length of \overline{TA} ?

- (1) 30 (3) 20
(2) 25 (4) 15

28 What is an equation of the line that passes through the point (4,5) and is parallel to the line whose equation is $y = \frac{2}{3}x - 4$?

- (1) $2y + 3x = 11$ (3) $3y - 2x = 2$
(2) $2y + 3x = 22$ (4) $3y - 2x = 7$

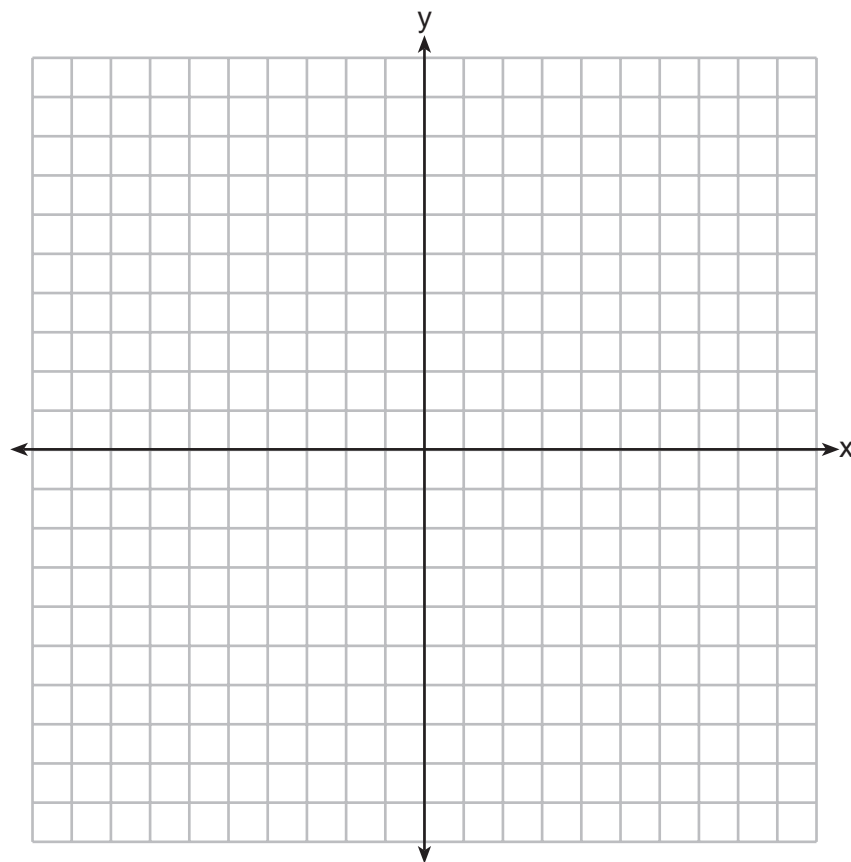
Part II

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]

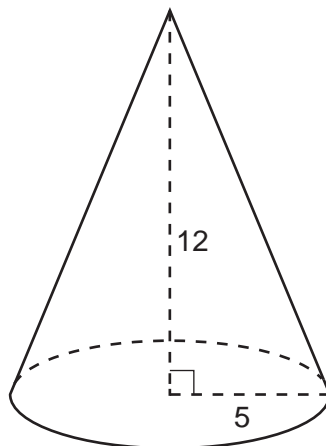
- 29 The measures of the angles of a triangle are in the ratio 5:6:7. Determine the measure, in degrees, of the *smallest* angle of the triangle.

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of $\triangle ABC$ after the transformation $r_{y=x}$ is $\triangle A'B'C'$. State and label the coordinates of $\triangle A'B'C'$.

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

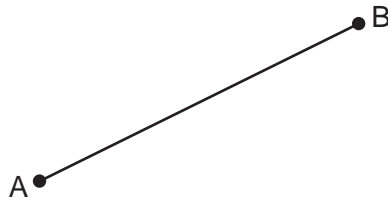


31 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.



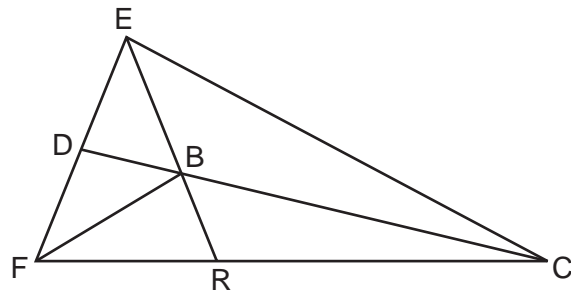
Determine, in terms of π , the lateral area of the right circular cone.

32 Using a compass and straightedge, locate the midpoint of \overline{AB} by construction.
[Leave all construction marks.]



33 The coordinates of the endpoints of \overline{CD} are $C(3,8)$ and $D(6,-1)$. Express the length of \overline{CD} in simplest radical form.

34 In the diagram below, point B is the incenter of $\triangle FEC$, and \overline{EBR} , \overline{CBD} , and \overline{FB} are drawn.



If $m\angle FEC = 84$ and $m\angle ECF = 28$, determine and state $m\angle BRC$.

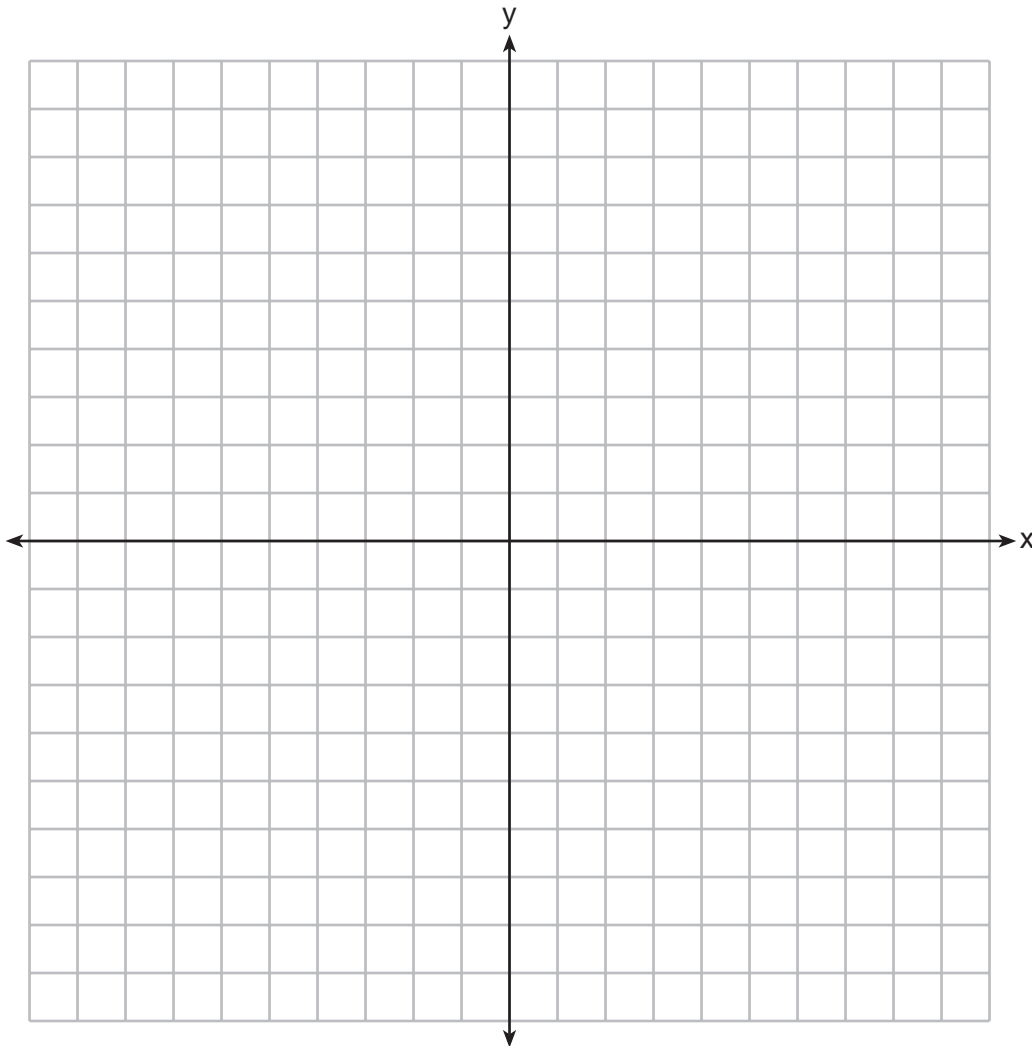
Part III

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 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$y + 4x = x^2 + 5$$

$$x + y = 5$$



36 In parallelogram $ABCD$, with diagonal \overline{AC} drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.

37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.

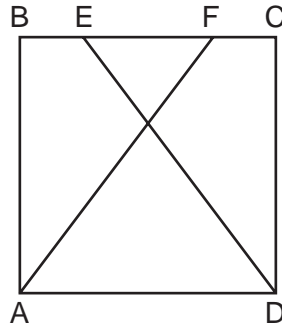


Part IV

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 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



Reference Sheet

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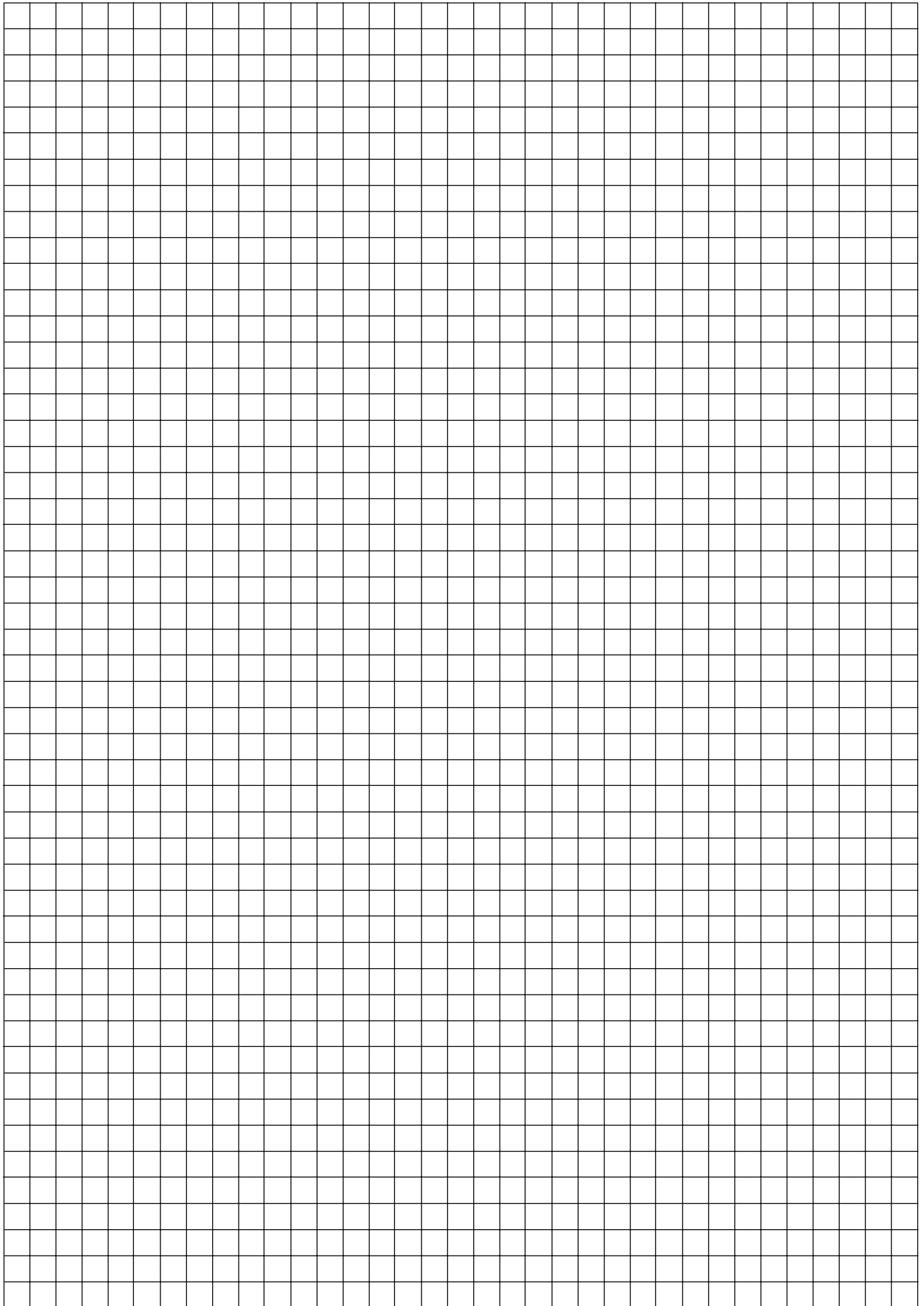
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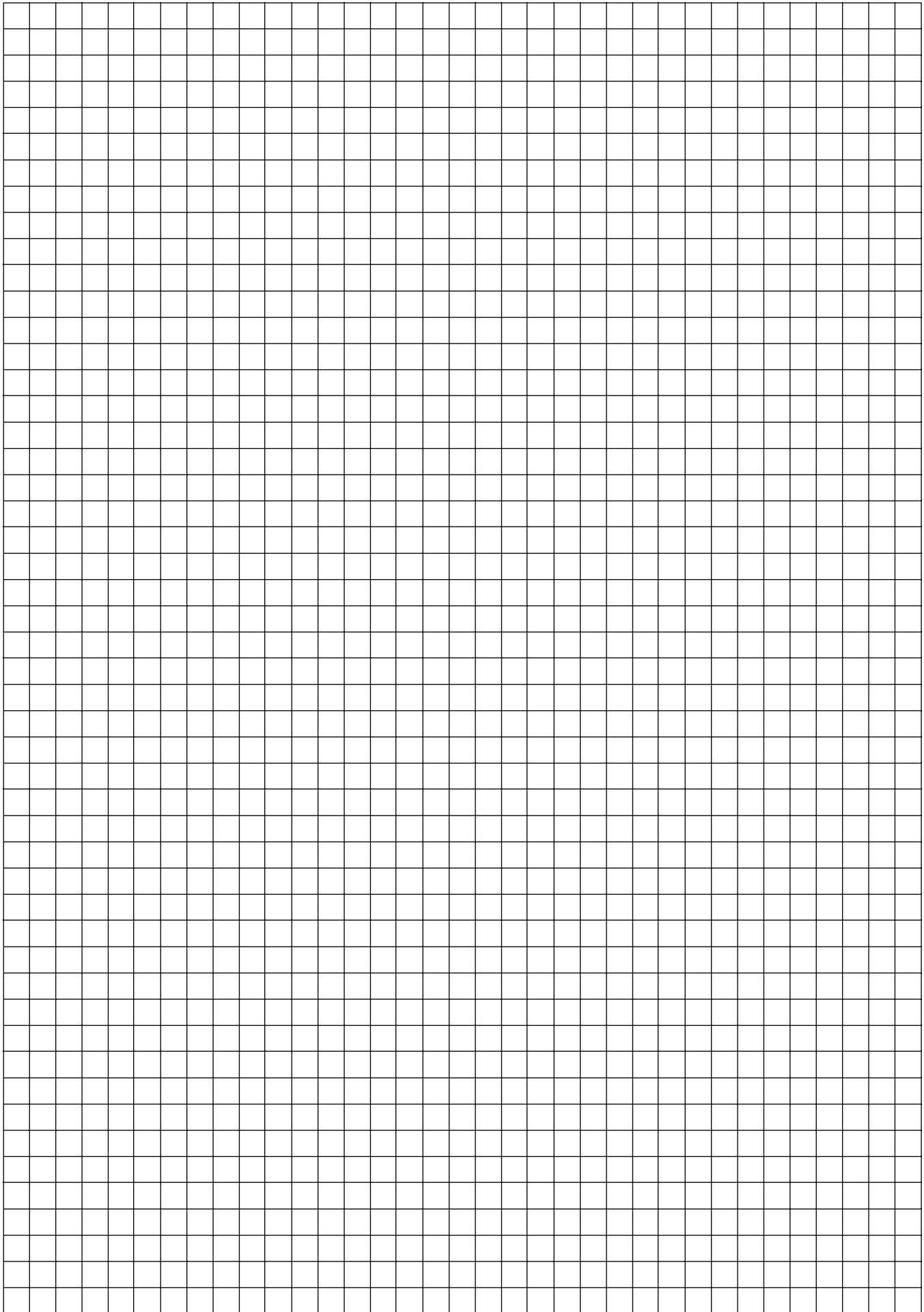
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Scrap Graph Paper — This sheet will *not* be scored.

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FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Friday, June 19, 2015 — 1:15 to 4:15 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 Friday, June 19, 2015. 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) 2
(2) 3	(12) 2	(22) 3
(3) 4	(13) 2	(23) 1
(4) 1	(14) 1	(24) 2
(5) 2	(15) 3	(25) 4
(6) 3	(16) 2	(26) 3
(7) 1	(17) 1	(27) 1
(8) 3	(18) 4	(28) 4
(9) 2	(19) 3	
(10) 1	(20) 4	

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.

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

Part II

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

(29) [2] 50, 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] Appropriate work is shown to find 10, but no further correct work is shown.

or

[1] 50, but no work is shown.

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

(30) [2] $A'(1, -1)$, $B'(3,1)$, and $C'(1,4)$ are stated.

[1] One graphing or labeling error is made.

or

[1] One conceptual error is made.

or

[1] The coordinates of two points are stated and labeled correctly.

or

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

or

[1] $(1, -1)$, $(3,1)$, and $(1,4)$ are stated, but the points are not labeled or are labeled incorrectly.

[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] 65π , 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 using 12 as the slant height.
- or*
- [1] Appropriate work is shown, but the answer is expressed as a decimal.
- or*
- [1] 65π , 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] A correct construction is drawn showing all appropriate arcs, and the midpoint is located on \overline{AB} .
- [1] Appropriate work is shown, but one construction error is made, such as not locating the midpoint.
- [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.
- (33) [2] $3\sqrt{10}$, 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] $3\sqrt{10}$, 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] 110, and correct work is shown, such as a completely labeled diagram.

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

or

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

or

[1] 110, 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] Correct graphs are drawn, and (0,5) and (3,2) are stated.
- [3] Appropriate work is shown, but one computational or graphing error is made.
- or*
- [3] Correct graphs are drawn, but only the coordinates of one point are stated correctly.
- [2] Appropriate work is shown, but one conceptual error is made.
- or*
- [2] Appropriate work is shown, but two or more computational or graphing errors are made.
- or*
- [2] Both equations are graphed correctly, but no further correct work is shown.
- or*
- [2] (0,5) and (3,2), but a method other than graphing is used.
- [1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
- or*
- [1] One equation is graphed correctly, but no further correct work is shown.
- or*
- [1] (0,5) and (3,2), 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] 128, and correct work is shown.
- [3] Appropriate work is shown, but one computational error is made.
- or**
- [3] Appropriate work is shown to find 18 ($m\angle BCA$ or $m\angle DAC$) and 34 ($m\angle BAC$ or $m\angle DCA$). No further correct work is shown.
- or**
- [3] Appropriate work is shown to find $m\angle BAD = 52$ or $m\angle BCD = 52$, 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 conceptual error is made.
- or**
- [2] Appropriate work is shown to find $x = 4$ and $y = 7$, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational error are made.
- or**
- [1] Appropriate work is shown to find $x = 4$ or $y = 7$, but no further correct work is shown.
- or**
- [1] $6x - 6 = 4x + 2$ and $5y - 1 = 7y - 15$ or equivalent equations are written, but no further correct work is shown.
- or**
- [1] 128, 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.

- (37) [4] Both loci are sketched correctly, and the three correct points of intersection are labeled with an **X**.
- [3] Both loci are sketched correctly, but only one or two points of intersection are labeled with an **X**.
- or*
- [3] Both loci are sketched, but one sketching error is made. Appropriate points of intersection are labeled with an **X**.
- or*
- [3] Both loci are sketched correctly, and the three correct points of intersection are labeled with an **X**, but additional points are also labeled with an **X**.
- [2] Both loci are sketched correctly, but two or more sketching errors are made. Appropriate points of intersection are labeled with an **X**.
- or*
- [2] Both loci are sketched, but one conceptual error is made. Appropriate points of intersection are labeled with an **X**.
- or*
- [2] Both loci are sketched correctly, but the points of intersection are not labeled or are labeled incorrectly.
- [1] One locus is sketched 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.
-

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] A complete and correct proof that includes a conclusion is written.
- [5] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement and/or reason is missing or is incorrect, or the concluding statement is missing.
- or*
- [5] A proof is written that shows $\triangle ABF \cong \triangle DCE$, but no further correct work is shown.
- [4] A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two statements and/or reasons are missing or are incorrect.
- [3] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
- [2] Some correct relevant statements about the proof are made, but three or four statements and/or reasons are missing or are incorrect.
- or*
- [2] $\overline{BF} \cong \overline{EC}$ is proven, but no further correct work is shown.
- or*
- [2] $\angle B \cong \angle C$ and $\overline{AB} \cong \overline{DC}$ are proven, but no further correct work is shown.
- [1] $\angle B \cong \angle C$ or $\overline{AB} \cong \overline{DC}$ is proven, but no further correct work is shown.
- [0] The “given” and/or the “prove” statements are written, but no further correct relevant statements are 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.
-

Map to Core Curriculum

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

Regents Examination in Geometry

June 2015

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

The *Chart for Determining the Final Examination Score for the June 2015 Regents Examination in Geometry* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Friday, June 19, 2015. 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 19, 2015 — 1:15 p.m.

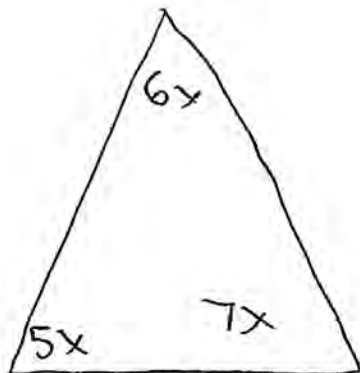
SAMPLE RESPONSE SET

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Question 29	2
Question 30	7
Question 31	13
Question 32	18
Question 33	22
Question 34	25
Question 35	29
Question 36	37
Question 37	42
Question 38	49

Question 29

29 The measures of the angles of a triangle are in the ratio 5:6:7. Determine the measure, in degrees, of the smallest angle of the triangle.



$$5x + 6x + 7x = 180$$

$$\begin{array}{r} 18x = 180 \\ \hline 18 \quad \quad \quad \hline 18 \end{array}$$

$$x = 10$$

smallest angle: 50°

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

Question 29

29 The measures of the angles of a triangle are in the ratio 5:6:7. Determine the measure, in degrees, of the *smallest* angle of the triangle.



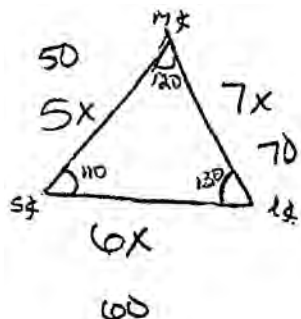
$$\begin{aligned} 180 &\div 18 = 10 \\ 6 \times 10 &= 60 \\ 7 \times 10 &= 70 \\ 5 \times 10 &= 50 \\ \hline &180 \end{aligned}$$

50

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

Question 29

29 The measures of the angles of a triangle are in the ratio 5:6:7. Determine the measure, in degrees, of the smallest angle of the triangle.



$$\begin{array}{r} 130 \\ 120 \\ + 110 \\ \hline 360 \end{array}$$

$$5x + 6x + 7x = 180$$

$$\frac{18x}{18} = \frac{180}{18}$$

$$x = 10$$

$$5(10) = 50$$

$$6(10) = 60$$

$$7(10) = 70$$

$$180 - 50 = 130$$

$$180 - 60 = 120$$

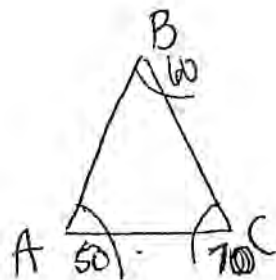
$$180 - 70 = 110$$

the smallest angle = 110°

Score 1: The student made a conceptual error.

Question 29

29 The measures of the angles of a triangle are in the ratio 5:6:7. Determine the measure, in degrees, of the *smallest* angle of the triangle.

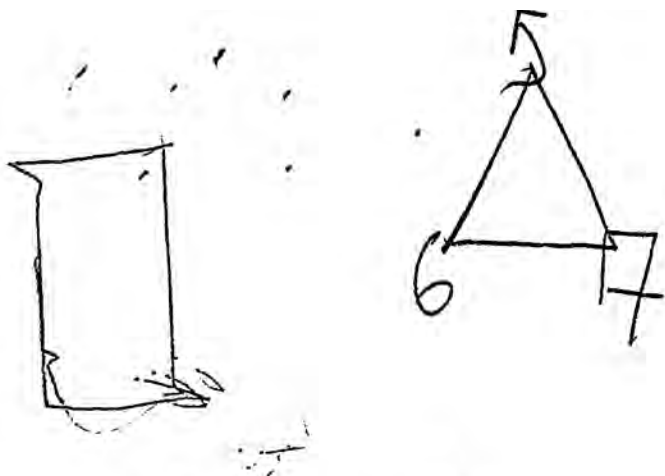


$\angle 50^\circ$

Score 1: The student showed no work.

Question 29

29 The measures of the angles of a triangle are in the ratio 5:6:7. Determine the measure, in degrees, of the *smallest* angle of the triangle.



$$\frac{18x}{18} = \frac{360}{18}$$

$$x = 20$$

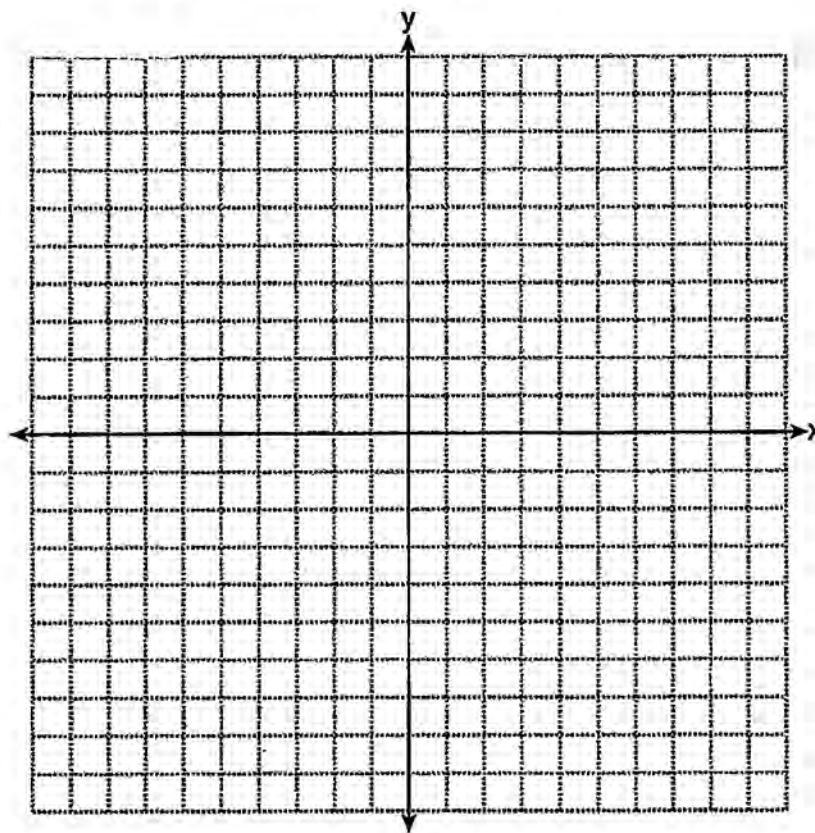
Score 0: The student made a conceptual error and did not find the measure of the smallest angle.

Question 30

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of $\triangle ABC$ after the transformation $r_{y=x}$ is $\triangle A'B'C'$. State and label the coordinates of $\triangle A'B'C'$.

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

$$\begin{aligned} A(-1,1) &\xrightarrow{r_{y=x}} A'(1,-1) \\ B(1,3) &\xrightarrow{r_{y=x}} B'(3,1) \\ C(4,1) &\xrightarrow{r_{y=x}} C'(1,4) \end{aligned}$$



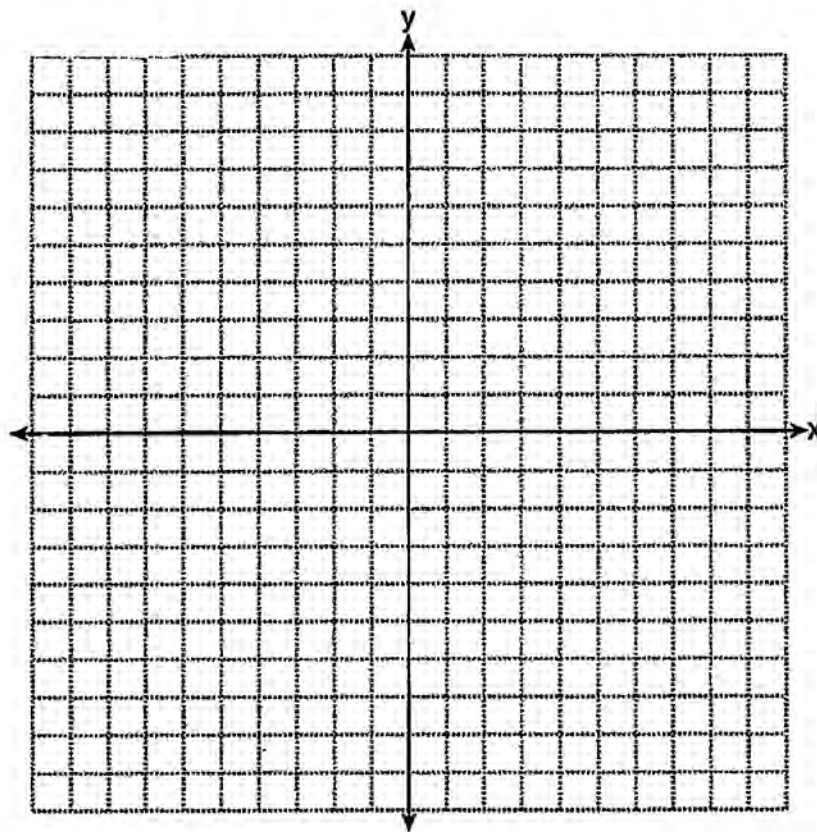
Score 2: The student had a complete and correct response.

Question 30

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of $\triangle ABC$ after the transformation $r_{y=x}$ is $\triangle A'B'C'$. State and label the coordinates of $\triangle A'B'C'$.

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

$$\begin{array}{ccc} A(-1, 1) & \xrightarrow{r_{y=x}} & (1, -1) \\ B(1, 3) & \xrightarrow{r_{y=x}} & (3, 1) \\ C(4, 1) & \xrightarrow{r_{y=x}} & (1, 4) \end{array}$$



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

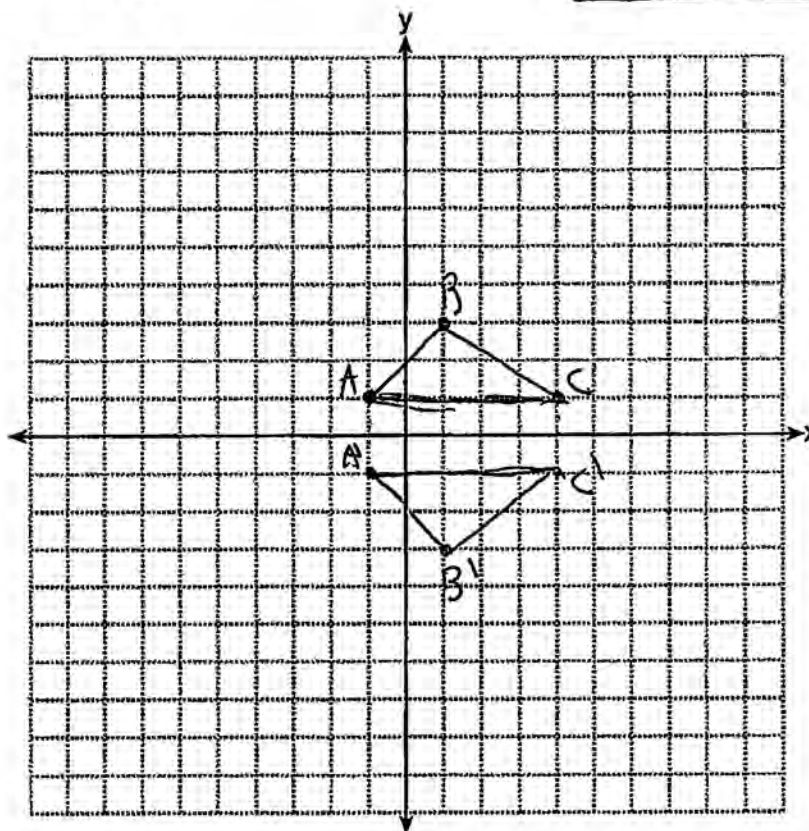
Question 30

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of $\triangle ABC$ after the transformation $r_{y=x}$ is $\triangle A'B'C'$. State and label the coordinates of $\triangle A'B'C'$.

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

NEGATE Y COORDINATES
WHEN REFLECTING THROUGH
THE X-AXIS.

$A' = (-1, -1)$
 $B' = (1, -3)$
 $C' = (4, -1)$



Score 1: The student made one conceptual error by reflecting over the x -axis, but appropriate points were stated and labeled.

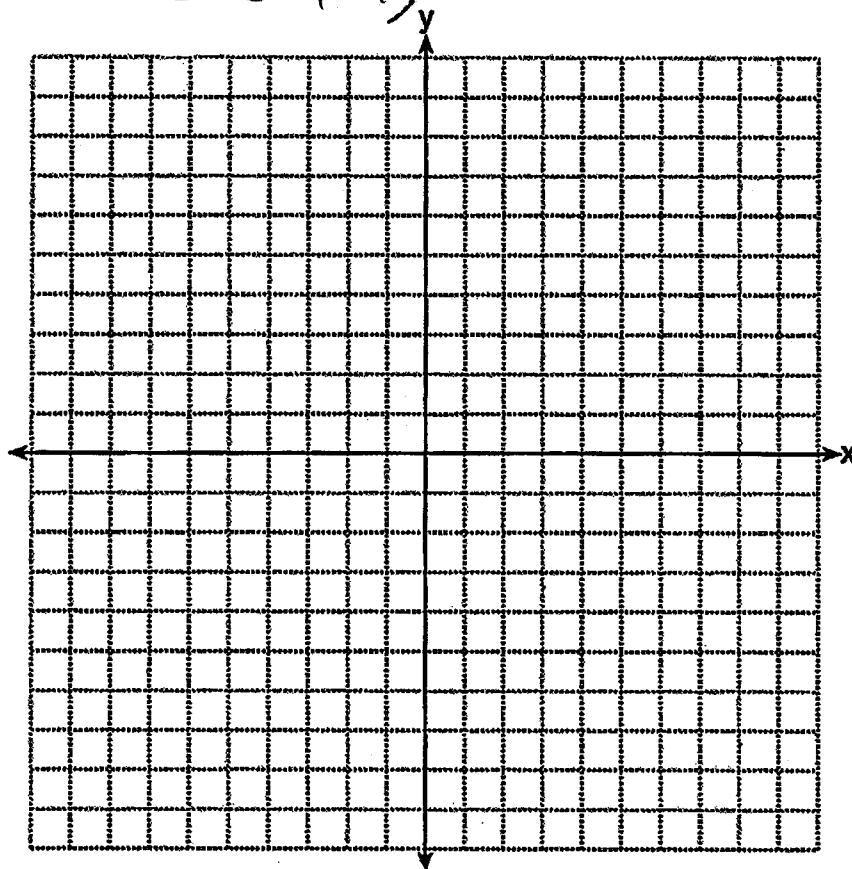
Question 30

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of $\triangle ABC$ after the transformation $r_{y=x}$ is $\triangle A'B'C'$. State and label the coordinates of $\triangle A'B'C'$.

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

$$(a,b) \rightarrow (b,a)$$

$$\begin{aligned} A' & (1, -1) \\ B' & (3, 1) \\ C' & (-1, 4) \end{aligned}$$

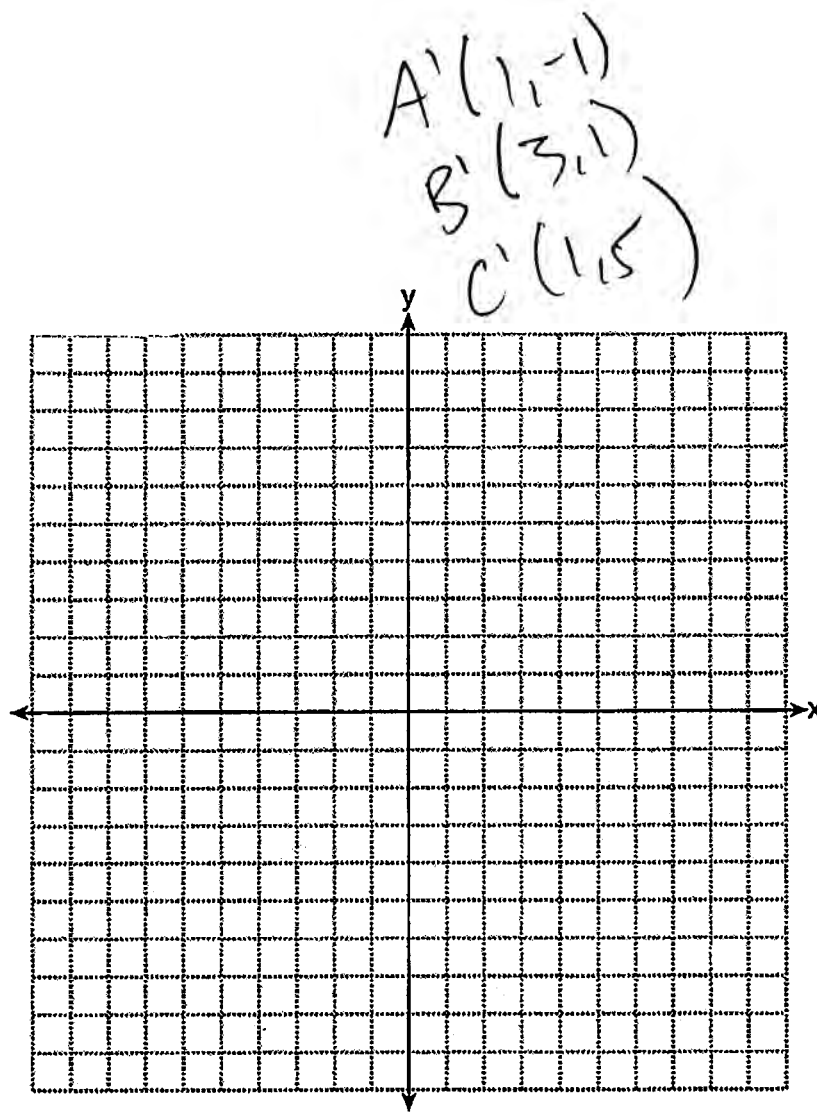


Score 1: The student made an error in finding C' .

Question 30

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of $\triangle ABC$ after the transformation $r_{y=x}$ is $\triangle A'B'C'$. State and label the coordinates of $\triangle A'B'C'$.

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



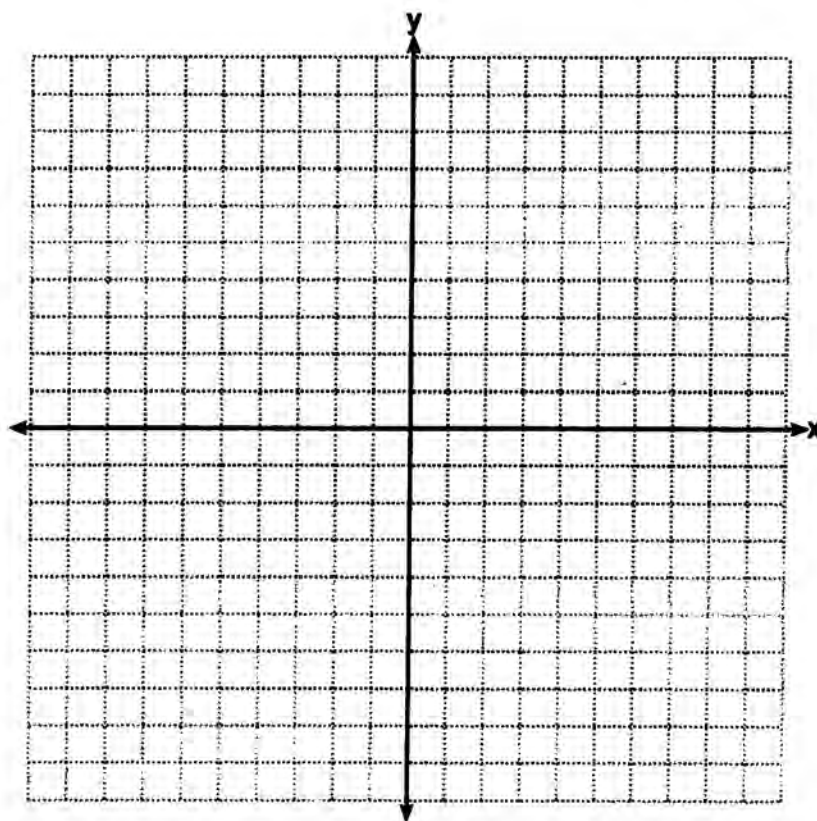
Score 1: The student stated and labeled two points correctly.

Question 30

30 Triangle ABC has vertices $A(-1,1)$, $B(1,3)$, and $C(4,1)$. The image of $\triangle ABC$ after the transformation $r_{y=x}$ is $\triangle A'B'C'$. State and label the coordinates of $\triangle A'B'C'$.

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

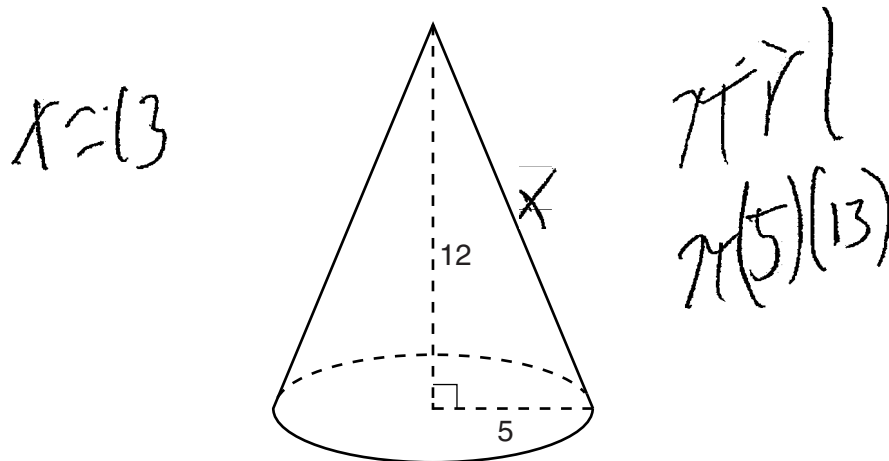
$(-1, -1)$
 $(1, -3)$
 $(4, -1)$



Score 0: The student made a conceptual error by reflecting across the x -axis and did not label the coordinates.

Question 31

31 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.



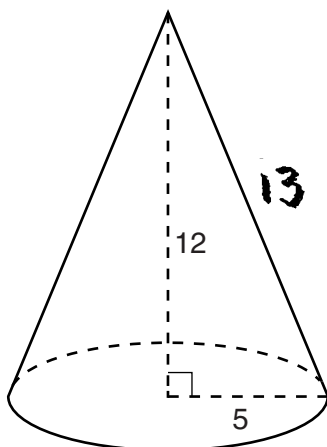
Determine, in terms of π , the lateral area of the right circular cone.



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

Question 31

31 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.



$$12^2 + 5^2 = c^2$$
$$144 + 25 = c^2$$
$$\sqrt{169} = \sqrt{c^2}$$
$$c = 13$$

Determine, in terms of π , the lateral area of the right circular cone.

$$L = \pi r l$$

$$L = \pi 5 (13)$$

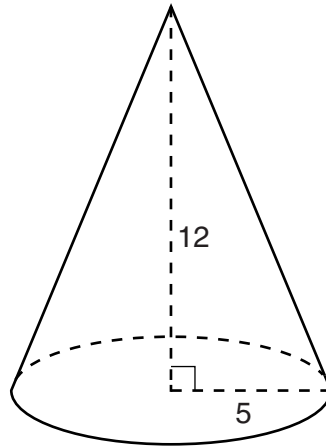
$$L = \pi 65$$

$$L = 204.2035225$$

Score 1: The student found 65π , but indicated a decimal as the final answer.

Question 31

31 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.



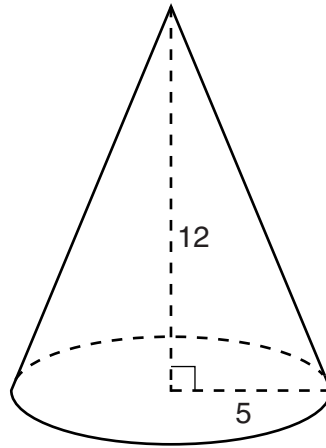
Determine, in terms of π , the lateral area of the right circular cone.

$$L = \pi r l$$
$$L = \pi(5)(12)$$
$$L = 60\pi$$

Score 1: The student made a conceptual error in finding a lateral area of 60π .

Question 31

31 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.



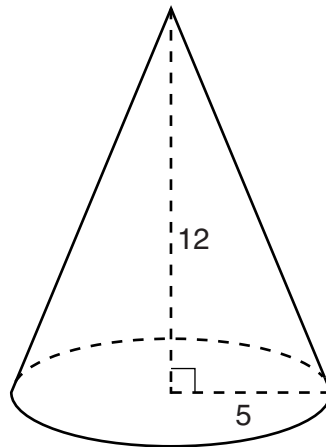
Determine, in terms of π , the lateral area of the right circular cone.

$$\begin{aligned}5^2 + 12^2 &= l^2 \\25 + 144 &= l^2 \\169 &= l^2 \\l &= 13\end{aligned}$$

Score 1: The student showed work to find the slant height, but no further work was shown.

Question 31

31 As shown in the diagram below, a right circular cone has a height of 12 and a radius of 5.



Determine, in terms of π , the lateral area of the right circular cone.

$$L = \pi r l$$

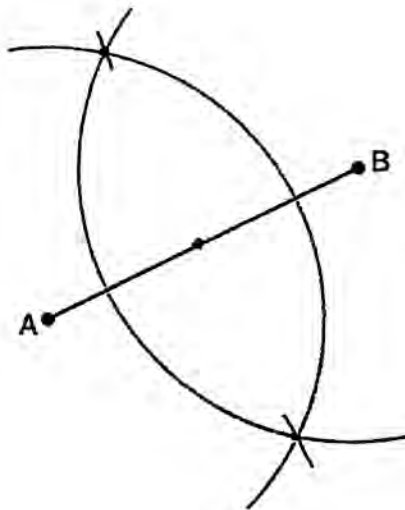
$$L = \pi \cdot 5 \cdot 12$$

$$L = 188.5$$

Score 0: The student made a conceptual error, did not simplify the lateral area in terms of π , and expressed the answer as a rounded decimal.

Question 32

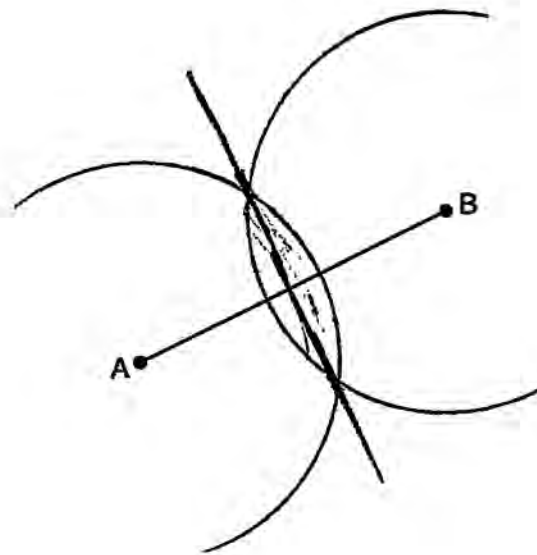
32 Using a compass and straightedge, locate the midpoint of \overline{AB} by construction.
[Leave all construction marks.]



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

Question 32

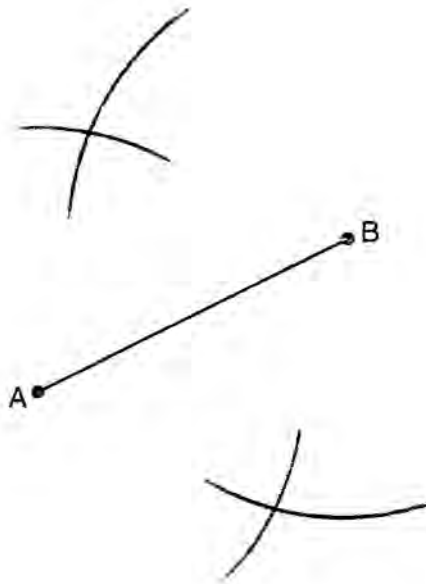
32 Using a compass and straightedge, locate the midpoint of \overline{AB} by construction.
[Leave all construction marks.]



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

Question 32

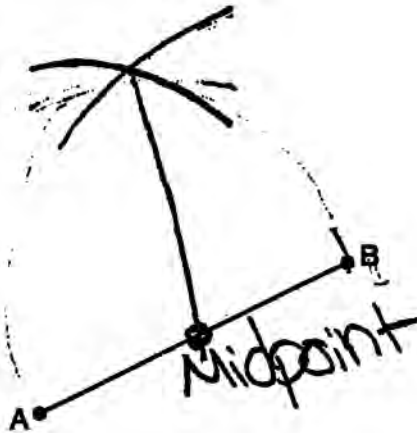
32 Using a compass and straightedge, locate the midpoint of \overline{AB} by construction.
[Leave all construction marks.]



Score 1: The student showed all appropriate arcs, but the midpoint was not located.

Question 32

32 Using a compass and straightedge, locate the midpoint of \overline{AB} by construction.
[Leave all construction marks.]



Score 0: The student had a completely incorrect response.

Question 33

33 The coordinates of the endpoints of \overline{CD} are $C(3,8)$ and $D(6,-1)$. Express the length of \overline{CD} in simplest radical form.

$$\begin{aligned} a \quad \overline{CD} &= \sqrt{(6-3)^2 + (-1-8)^2} \\ &= \sqrt{(3)^2 + (-9)^2} \\ &= \sqrt{9 + 81} \\ &= \sqrt{90} \\ &= \sqrt{9 \cdot 10} \\ &= 3\sqrt{10} \end{aligned}$$

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

Question 33

33 The coordinates of the endpoints of \overline{CD} are $C(3,8)$ and $D(6,-1)$. Express the length of \overline{CD} in simplest radical form.

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

$$\text{Distance of } \overline{CD} = \sqrt{(6-3)^2 + (-1-8)^2}$$

$$\text{Distance of } \overline{CD} = \sqrt{3^2 + (-9)^2}$$

$$\text{Distance of } \overline{CD} = \sqrt{9 + 81}$$

$$\text{Distance of } \overline{CD} = \sqrt{90}$$

$$\text{Distance of } \overline{CD} = \sqrt{9} \sqrt{10}$$

$$\text{Distance of } \overline{CD} = 3\sqrt{5}\sqrt{2}$$

$$\text{Distance of } \overline{CD} = 3 \cdot 2\sqrt{5}$$

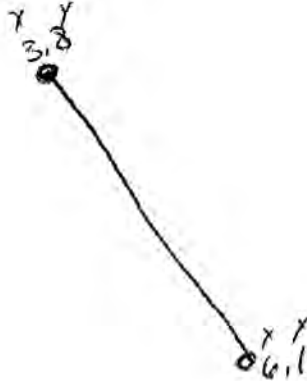
$$\text{Distance of } \overline{CD} = 6\sqrt{5}$$

Score 1: The student made an error when simplifying $\sqrt{90}$.

Question 33

33 The coordinates of the endpoints of \overline{CD} are $C(3,8)$ and $D(6,-1)$. Express the length of \overline{CD} in simplest radical form.

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



$$= (3 - 6)^2 + (8 - (-1))^2$$

$$= -3^2 + 7^2$$

$$= 9 + 49$$

$$= \sqrt{58}$$

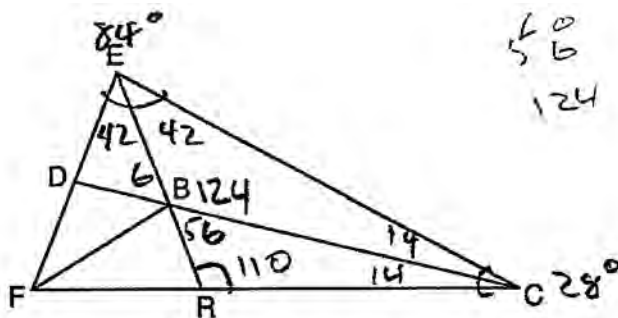
$$= \sqrt{4} \sqrt{14}$$

$$= 2\sqrt{14} = \text{length of } \overline{CD}$$

Score 0: The student made a transcription error when plotting point D and a computational error in calculating the length of \overline{CD} .

Question 34

34 In the diagram below, point B is the incenter of $\triangle FEC$, and \overline{EBR} , \overline{CBD} , and \overline{FB} are drawn.



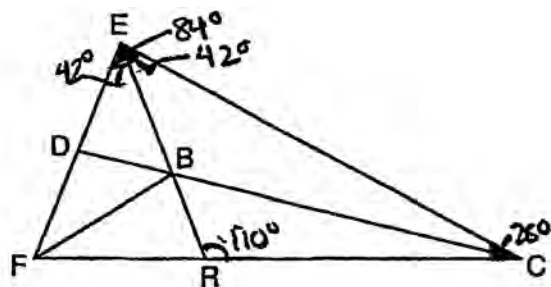
If $m\angle FEC = 84$ and $m\angle ECF = 28$, determine and state $m\angle BRC$.

110

Score 2: The student had a complete and correct response. Angle measures for both $\triangle BCE$ and $\triangle BCR$ were labeled on the diagram.

Question 34

34 In the diagram below, point B is the incenter of $\triangle FEC$, and \overline{EBR} , \overline{CBD} , and \overline{FB} are drawn.



If $m\angle FEC = 84$ and $m\angle ECF = 28$, determine and state $m\angle BRC$.

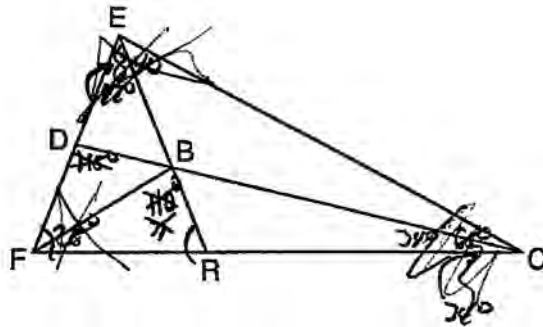
$$\begin{array}{r} 42 \\ + 28 \\ \hline 180 - 70 = 110^\circ \end{array}$$

$$m\angle BRC = 110^\circ$$

Score 2: The student had a complete and correct response. Angle measures for $\triangle CER$ were labeled on the diagram.

Question 34

34 In the diagram below, point B is the incenter of $\triangle FEC$, and \overline{EBR} , \overline{CBD} , and \overline{FB} are drawn.



If $m\angle FEC = 84$ and $m\angle ECF = 28$, determine and state $m\angle BRC$.

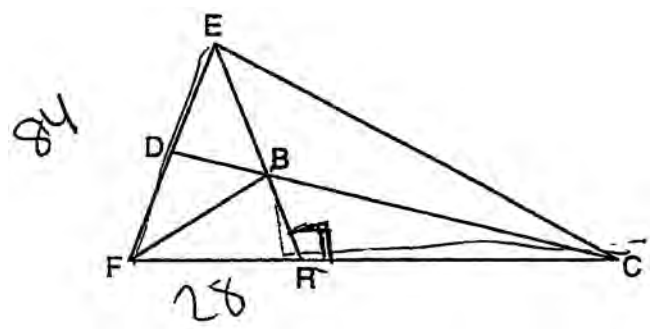
~~$28 + x = 180$~~
 ~~-28~~
 ~~$x = 152$~~
 ~~$m\angle BRC = 152$~~

$m\angle BRC = 110^\circ$

Score 1: The student crossed out attempts to show work, but wrote the correct answer.

Question 34

34 In the diagram below, point B is the incenter of $\triangle FEC$, and \overline{EBR} , \overline{CBD} , and \overline{FB} are drawn.



If $m\angle FEC = 84$ and $m\angle ECF = 28$, determine and state $m\angle BRC$.

$$\begin{array}{r} 84 + 28 = 180 \\ - 112 \\ \hline \boxed{68} \end{array}$$

Score 0: The student had a completely incorrect response.

Question 35

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$y + 4x = x^2 + 5$$

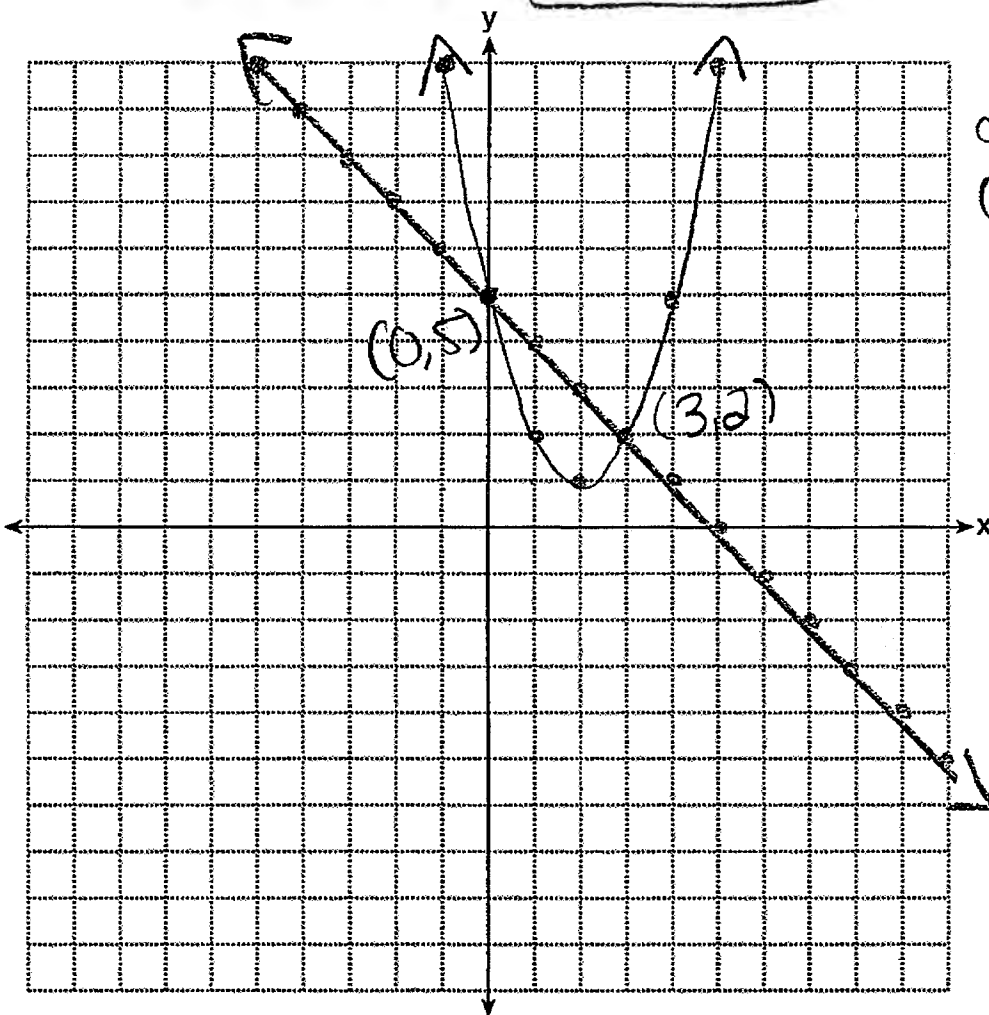
$$x + y = 5$$

$$\begin{array}{r} y + 4x = x^2 + 5 \\ -4x \quad -4x \\ \hline \end{array}$$

$$y = x^2 - 4x + 5$$

$$\begin{array}{r} x + y = 5 \\ -x \quad -x \\ \hline \end{array}$$

$$y = -x + 5$$



coordinates
(0, 5) and
(3, 2).

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

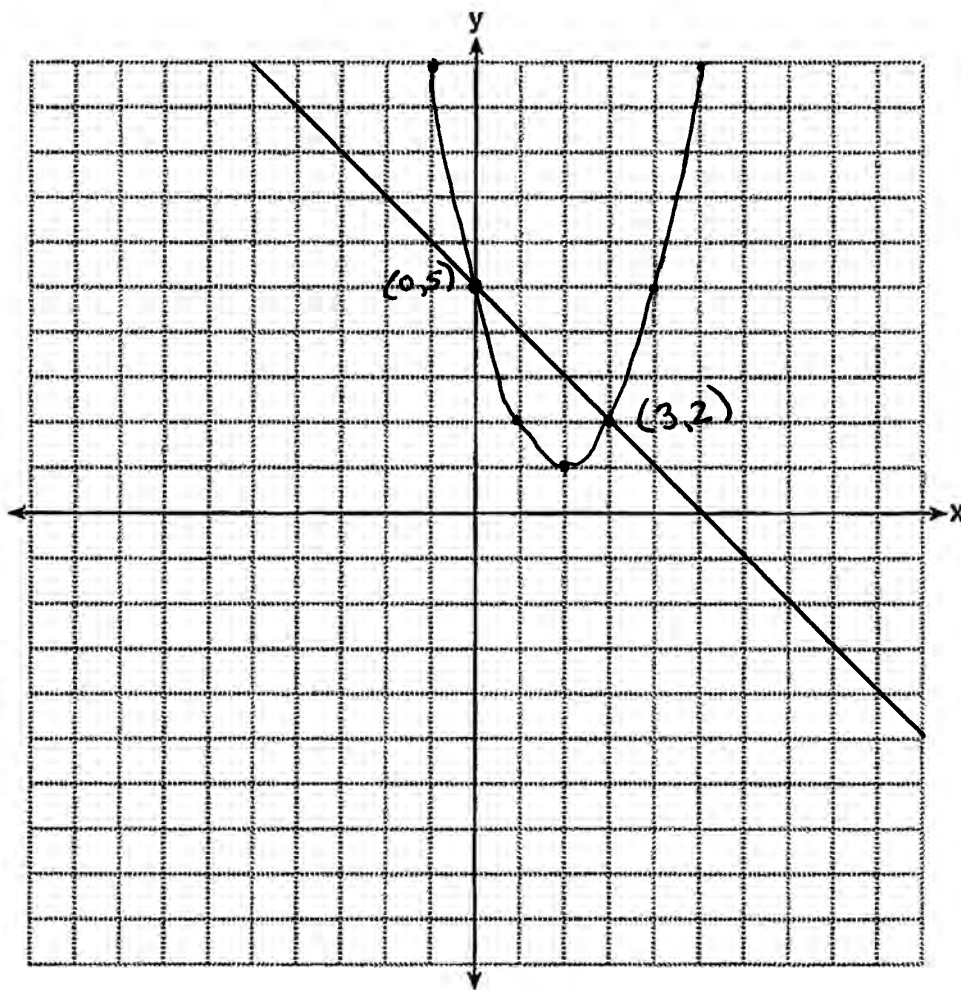
Question 35

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$y + 4x = x^2 + 5$$
$$x + y = 5$$

$$y = x^2 - 4x + 5$$

$$y = -x + 5$$



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

Question 35

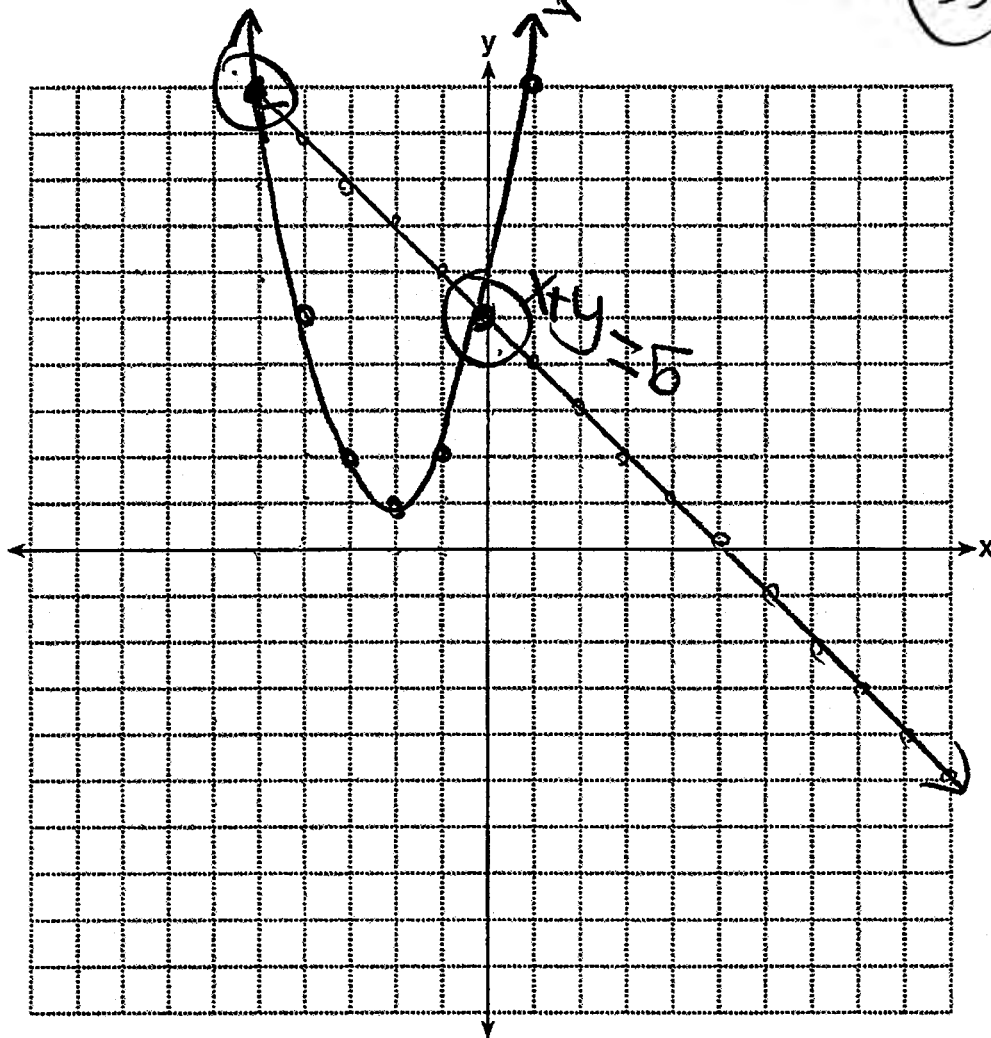
35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$\begin{array}{r}
 x \\
 -5 \\
 -3 \\
 -2 \\
 -1 \\
 0 \\
 - \\
 \hline
 10
 \end{array}$$

$$\begin{array}{l}
 y + 4x = x^2 + 5 \\
 \cancel{+4x} \quad \quad \quad \cancel{+4x} \\
 x + y = 5 \\
 \cancel{-x} \quad \quad \quad \cancel{-x} \\
 y = -x + 5 \\
 \frac{1}{-1} \quad (0, 5)
 \end{array}$$

$$y = x^2 + 4x + 5$$

solution = (0, 5) and (-5, 10)



Score 3: The student made a computational error when solving the quadratic equation for y . An appropriate parabola was graphed and appropriate solutions were stated.

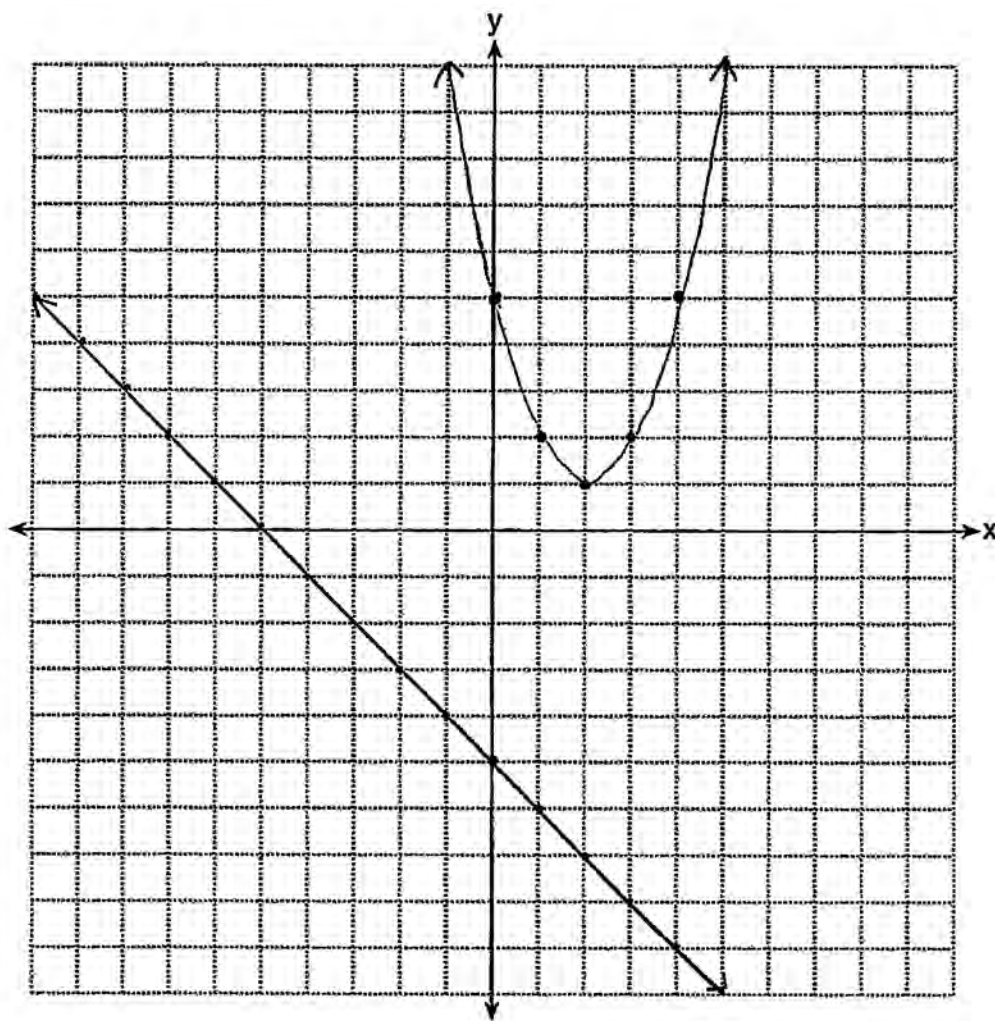
Question 35

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$y + 4x = x^2 + 5$$
$$x + y = 5$$

$$y + 4x = x^2 + 5$$
$$y = x^2 - 4x + 5$$
$$y = -x - 5$$

NO common solutions



Score 3: The student made a computational error when solving the linear equation for y . An appropriate line was graphed and an appropriate solution was stated.

Question 35

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

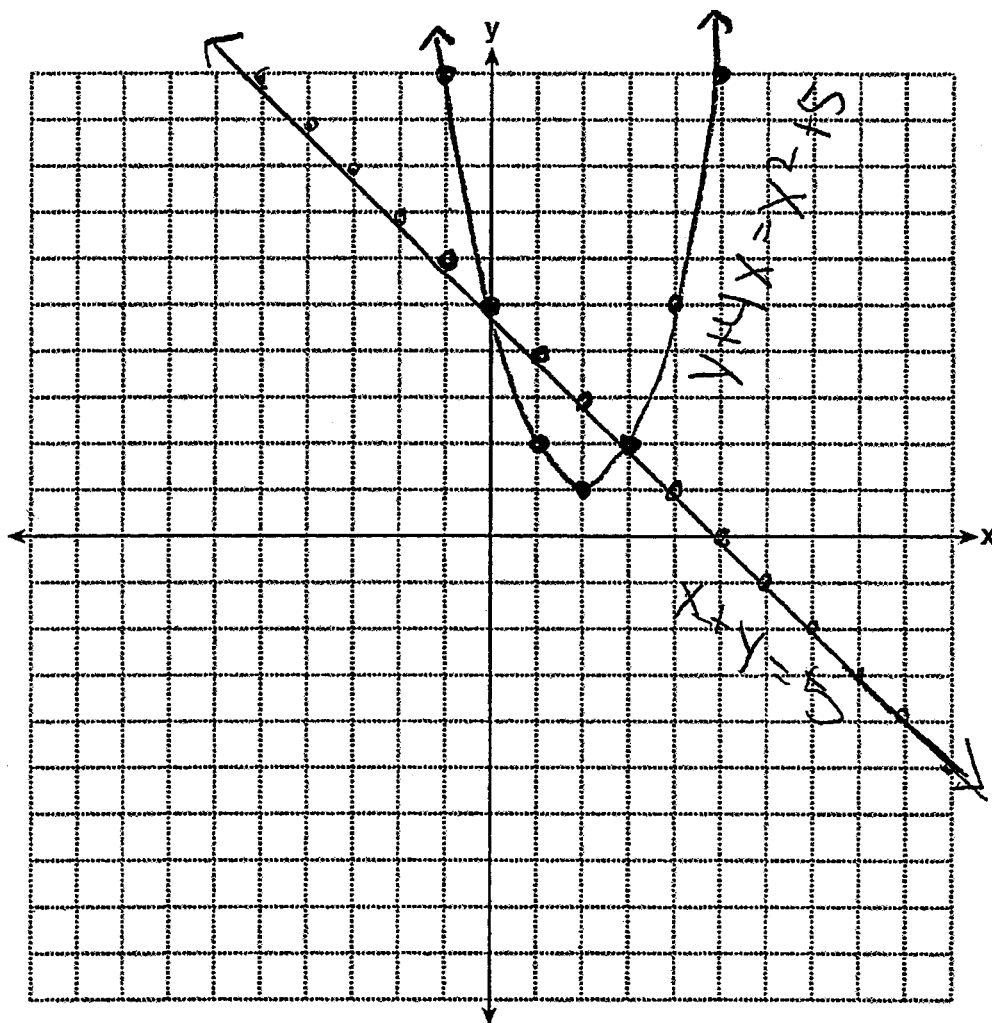
$$y + 4x = x^2 + 5$$

$$x + y = 5$$

$$\begin{array}{r} y + 4x = x^2 + 5 \\ -x - y = -5 \\ \hline y = x^2 - 4x + 5 \end{array}$$

x

$$y = -x + 5$$

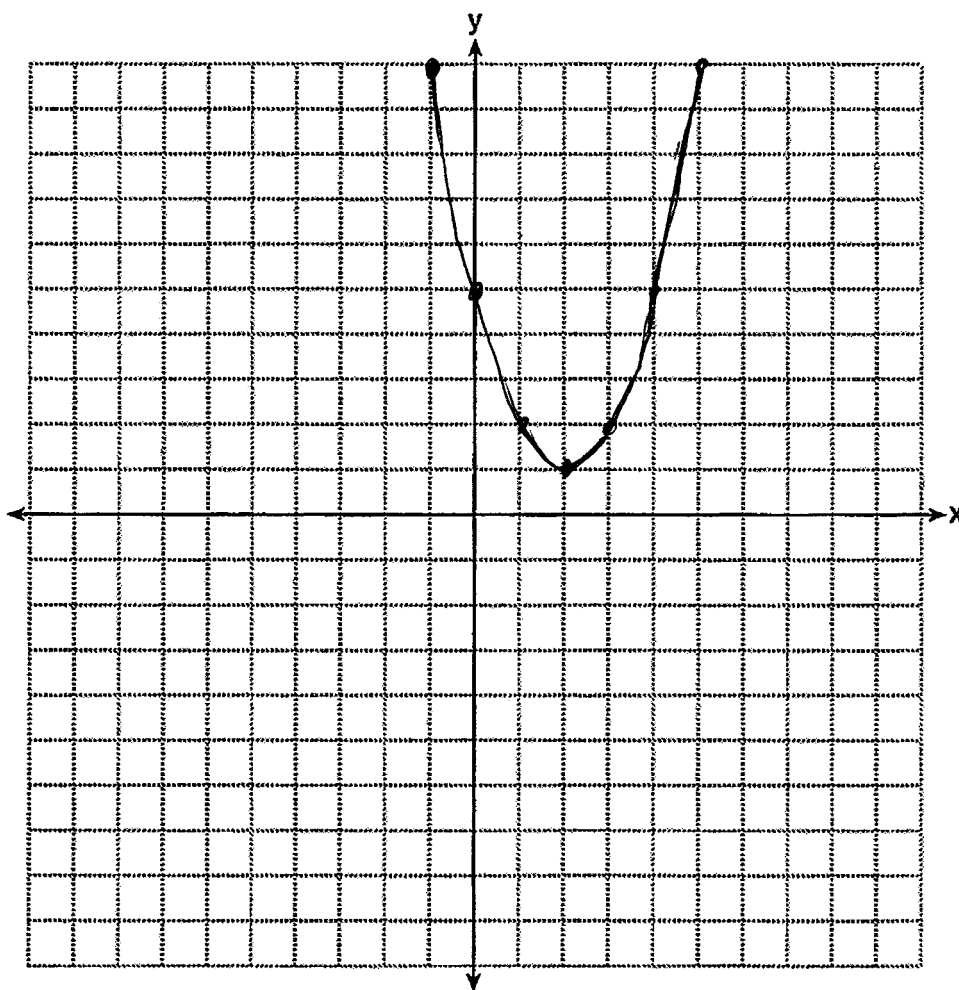


Score 2: The student graphed both equations correctly, but no coordinates were stated.

Question 35

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$\begin{aligned}y + 4x &= x^2 + 5 \\x + y &= 5\end{aligned}$$
$$y = x^2 - 4x + 5$$
$$x = \frac{4}{2}$$
$$x = 2$$
$$y = 1$$



Score 1: The student only graphed the parabola correctly.

Question 35

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

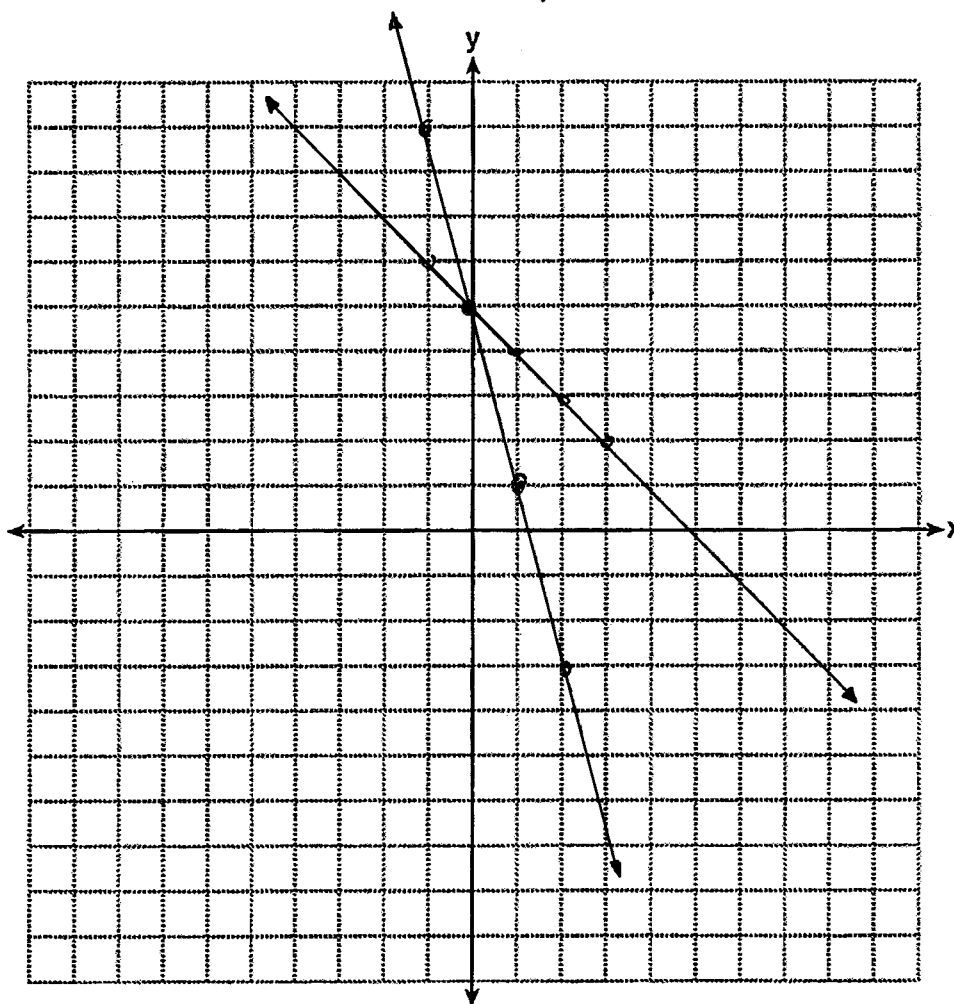
$$y + 4x = x^2 + 5$$

$$x + y = 5$$

$$\begin{array}{r} y + 4x = x^2 + 5 \\ -4x = -4x \\ \hline \end{array}$$

$$y = -4x + 5$$

$$y = -x + 5$$



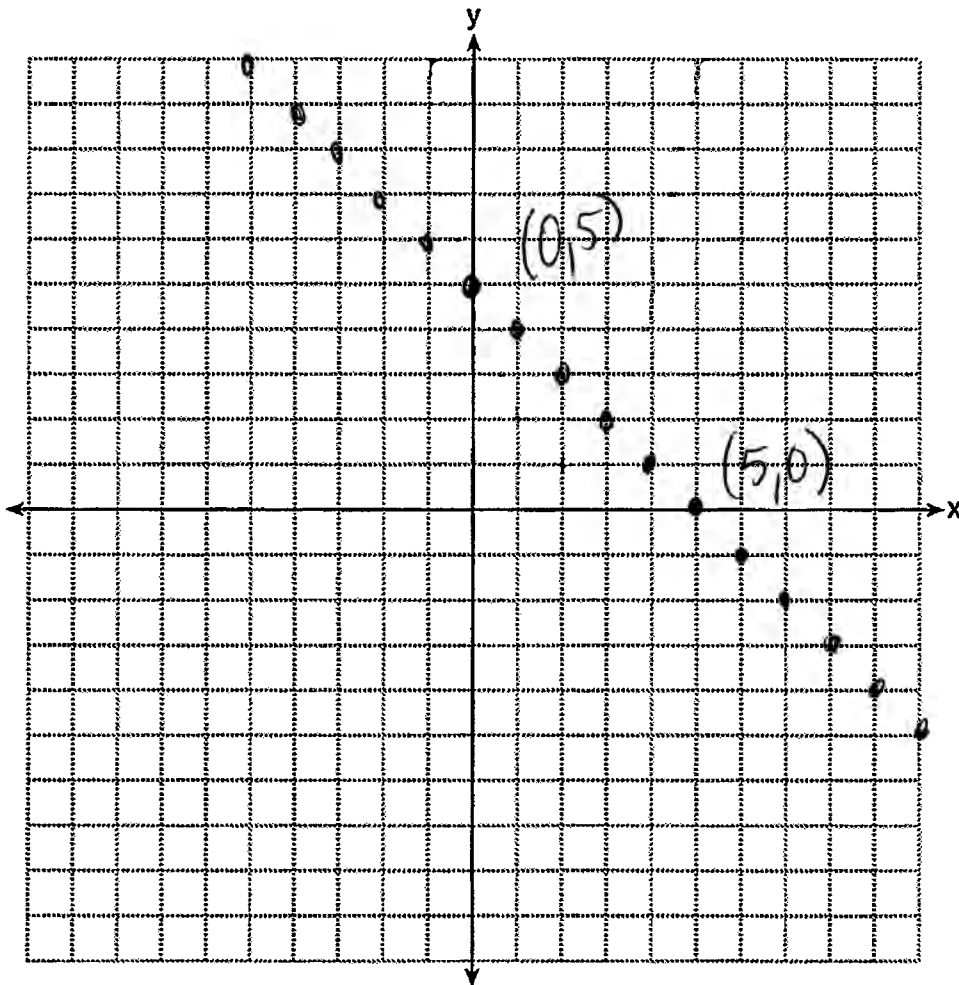
Score 1: The student made a conceptual error when solving the quadratic equation for y and did not state the solution of the system. The student graphed $x + y = 5$ correctly.

Question 35

35 Solve the following system of equations graphically. State the coordinates of all points in the solution.

$$y + 4x = x^2 + 5$$

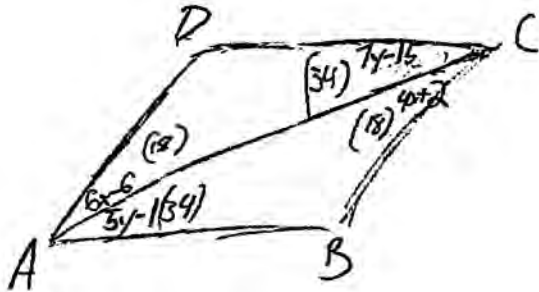
$$x + y = 5$$



Score 0: The student had a completely incorrect response.

Question 36

36 In parallelogram $ABCD$, with diagonal \overline{AC} drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.



$$6x - 6 = 4x + 2$$

$$2x = 8$$

$$x = 4$$

$$7y - 15 = 5y - 1$$

$$\frac{2y}{2} = \frac{14}{2}$$

$$y = 7$$

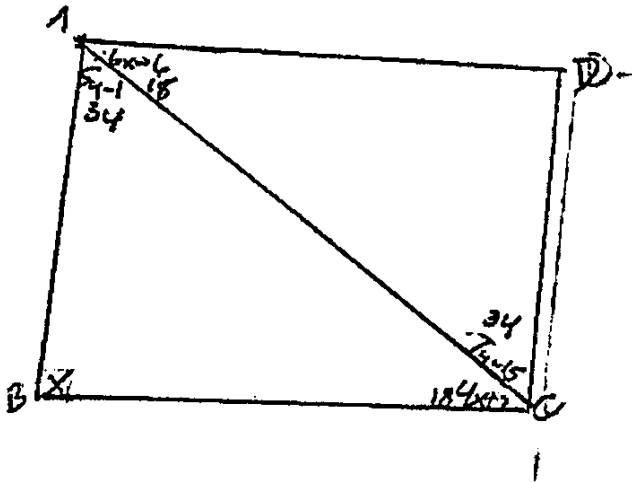
$$180 - 18 - 34 = 128$$

$$m\angle B = 128^\circ$$

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

Question 36

36 In parallelogram $ABCD$, with diagonal \overline{AC} drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.



$$\begin{aligned} 6x - 6 &= 4x + 2 \\ -4x &\quad -4x \\ 2x - 6 &= 2 \\ +6 &\quad +6 \\ \hline 2x &= 8 \\ \frac{2x}{2} &= \frac{8}{2} \\ x &= 4 \end{aligned}$$

$$\begin{aligned} 5y - 1 &= 7y - 15 \\ -5y &\quad -5y \\ -1 &= 2y - 15 \\ +15 &\quad +15 \\ \hline 14 &= 2y \\ \frac{14}{2} &= \frac{2y}{2} \\ 7 &= y \end{aligned}$$

$$\angle B = 90$$

Score 3: The student showed appropriate work to find $x = 4$ and $y = 7$. The student correctly labeled $m\angle ACB$ and $m\angle CAB$ on the diagram. The student did not find an appropriate measure for $\angle B$.

Question 36

36 In parallelogram $ABCD$, with diagonal \overline{AC} drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.

$$\begin{array}{r}
 4x + 2 = 6x - 6 \quad x = 4 \\
 \hline
 -2x \\
 \hline
 x + 2 = -6 \\
 x = -8 \\
 x = -8
 \end{array}$$

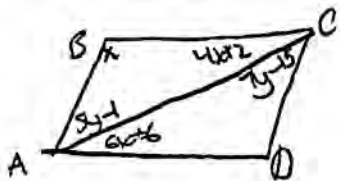
$$\begin{array}{r}
 5y - 1 = 7y - 15 \\
 \hline
 -2y \\
 \hline
 -2y - 1 = -15 \\
 -2y = -14 \\
 y = 7
 \end{array}$$

$$\boxed{m\angle B = 4}$$

Score 2: The student showed appropriate work to find $x = 4$ and $y = 7$, but no further correct work was shown.

Question 36

36 In parallelogram $ABCD$, with diagonal \overline{AC} drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.



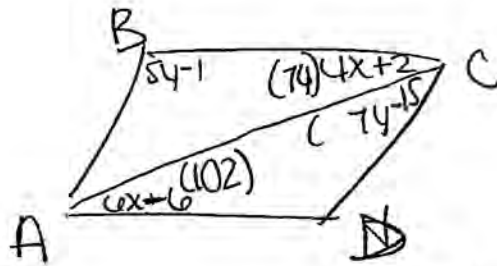
$$\begin{aligned} \text{Opp } \angle &\cong \\ 5y - 1 &= 7y - 15 \\ -5y &- 5y \\ -1 &= 2y - 15 \\ +15 & \quad +15 \\ \hline 14 &= 2y \\ \frac{14}{2} &= \frac{2y}{2} \\ y &= 7 \end{aligned}$$

$$\begin{aligned} 4x + 2 &= 6x - 6 \\ -4x &- 4x \\ \hline 25 &= 2x - 6 \end{aligned}$$

Score 1: The student showed appropriate work to find $y = 7$.

Question 36

36 In parallelogram $ABCD$, with diagonal \overline{AC} drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.



~~$$5y - 1 + 7y - 15 = 180$$

$$12y - 16 = 180$$

$$+16 \quad +16$$

$$12y = 196$$

$$\frac{12y}{12} = \frac{196}{12}$$

$$y$$~~

~~$$5y - 1 + 7y - 15 = 180$$

$$12y - 16 = 180$$

$$+16 \quad +16$$

$$12y = 196$$

$$\frac{12y}{12} = \frac{196}{12}$$~~

~~$$6(8) - 6$$

$$108 - 6$$

$$102$$

$$4(8) + 2$$

$$72 + 2$$

$$74$$~~

~~$$6x - 6 + 4x + 2 = 180$$

$$10x - 4 = 180$$

$$+4 \quad +4$$

$$10x = 184$$

$$\frac{10x}{10} = \frac{184}{10}$$

$$x = 18.4$$~~

~~$$7y - 15 + 5y - 1 = 180$$

$$12y - 16 = 180$$

$$+16 \quad +16$$

$$12y = 196$$

$$\frac{12y}{12} = \frac{196}{12}$$

$$y = 16.3$$~~

~~$$5(16.3) - 15$$

$$81.5 - 15$$

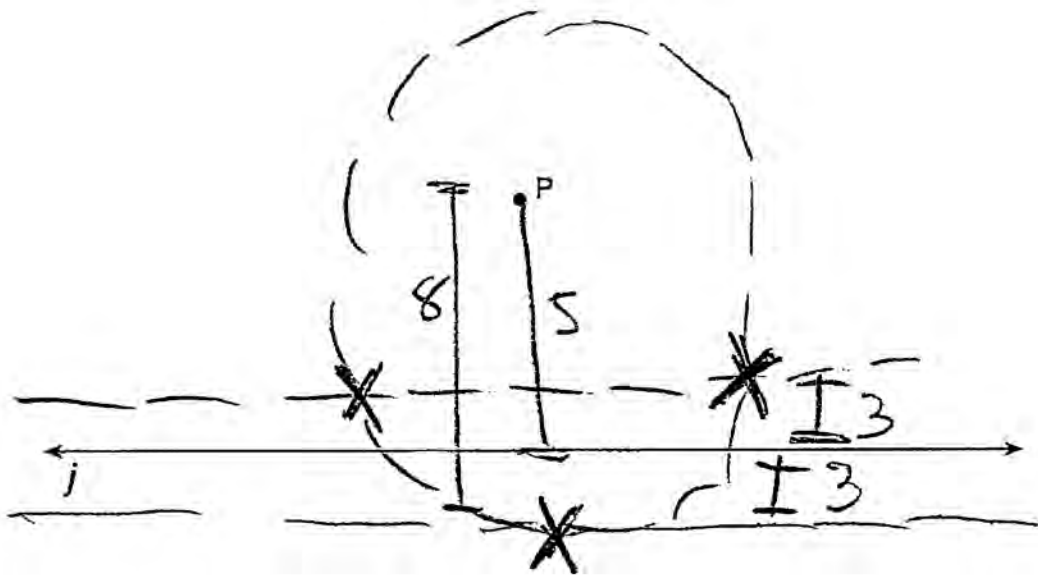
$$66.5$$~~

~~$$m\angle B = 66.5$$~~

Score 0: The student had a completely incorrect response.

Question 37

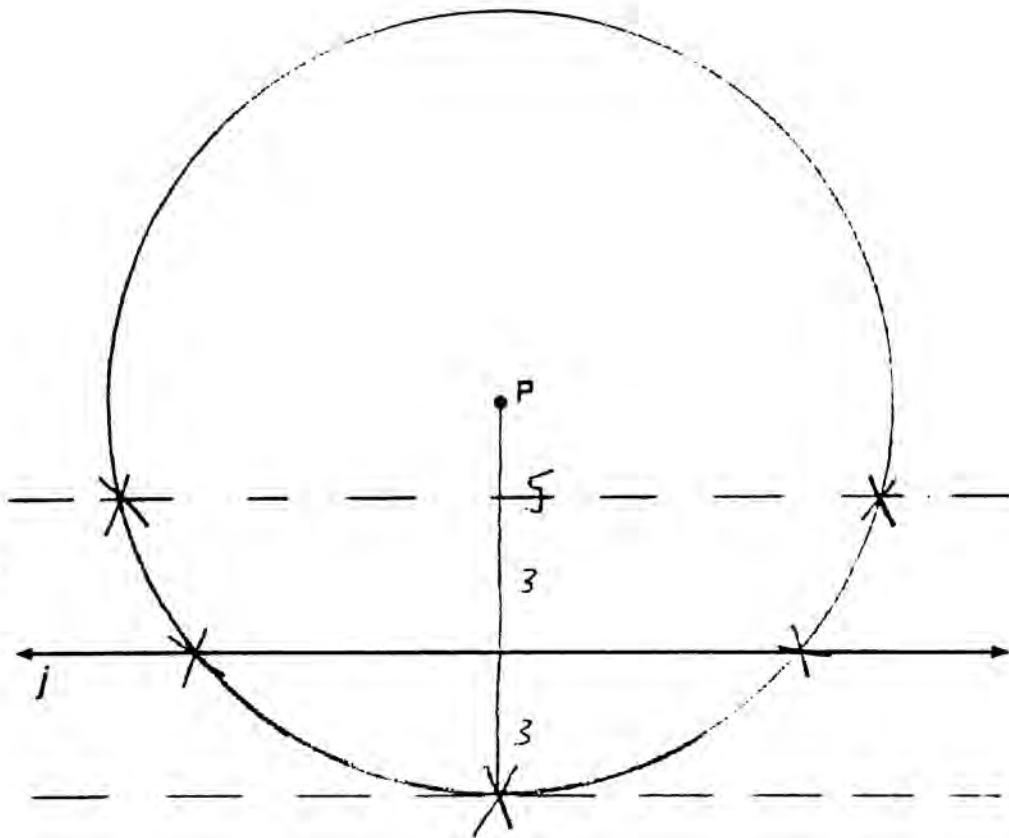
37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.



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

Question 37

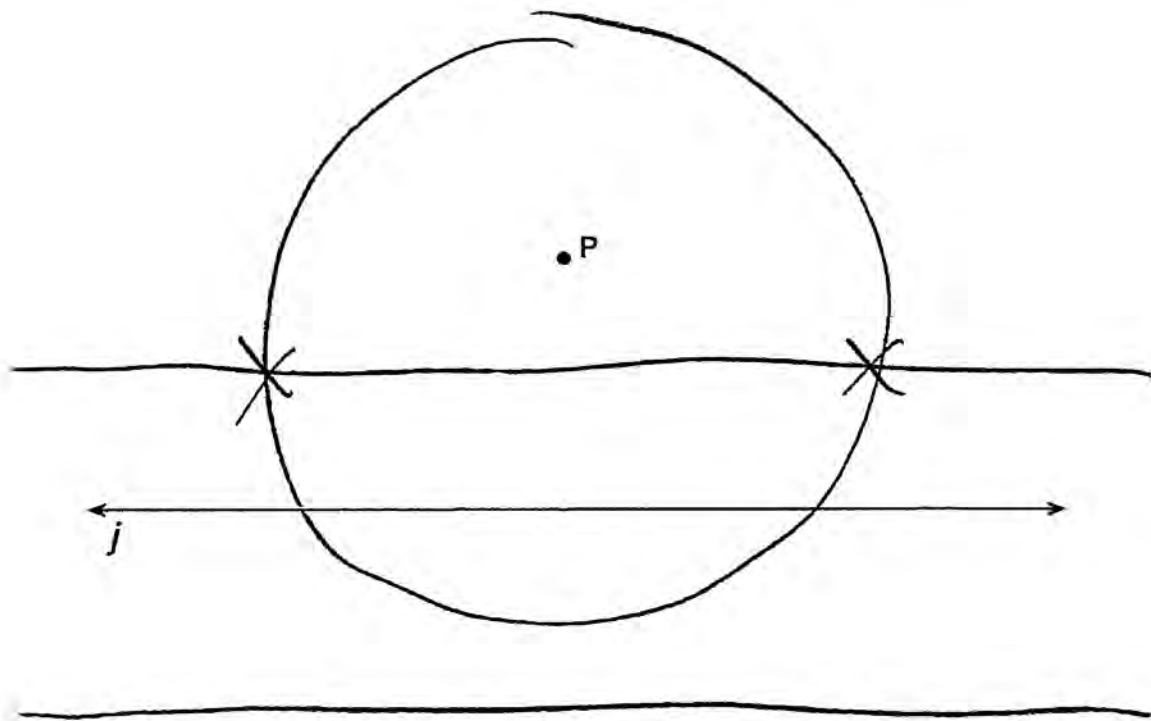
37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.



Score 3: The student sketched both loci correctly, but labeled additional **X**s on line j .

Question 37

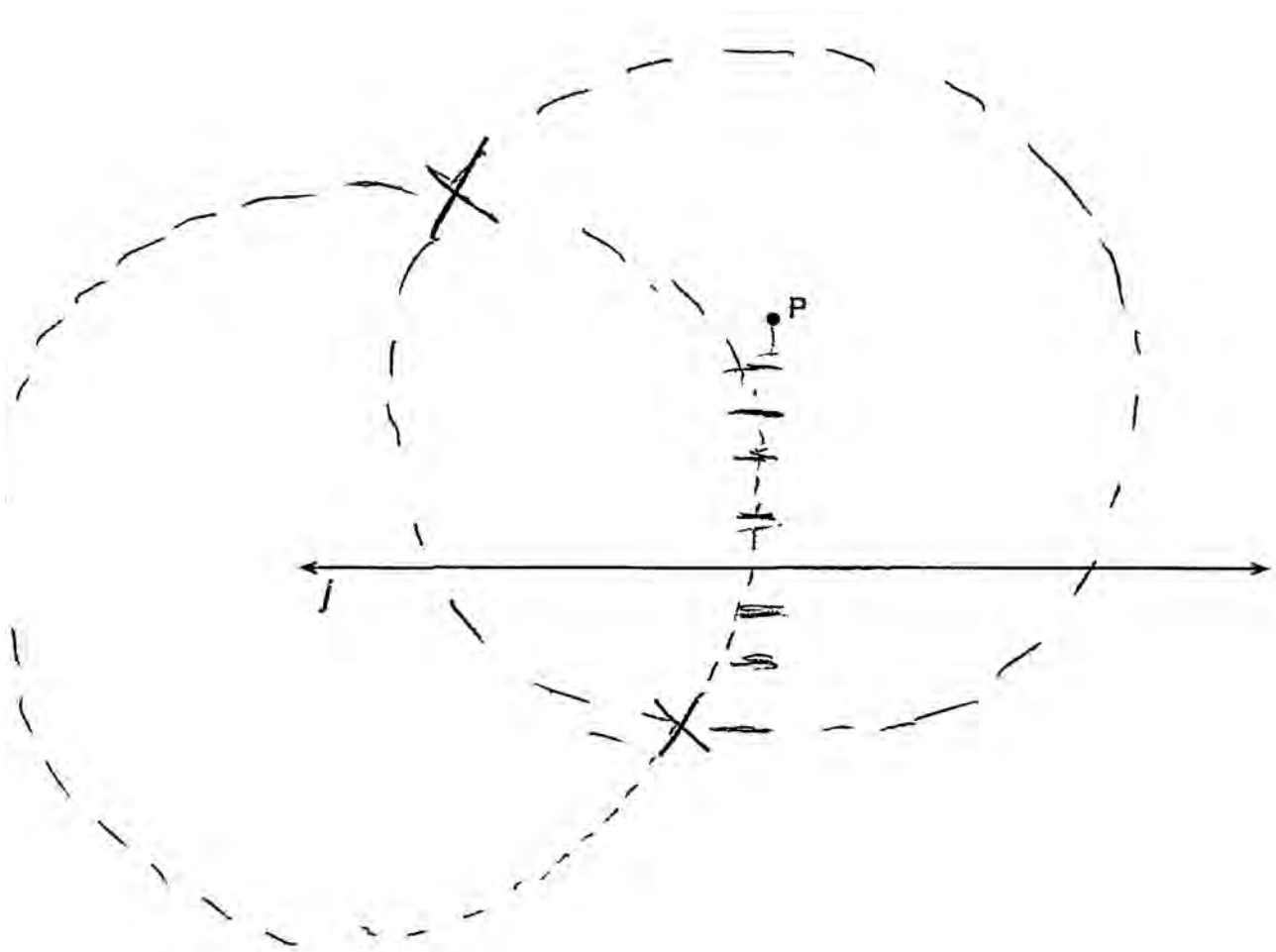
37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.



Score 3: The student made a sketching error on the second locus, but appropriate points were labeled with an **X**.

Question 37

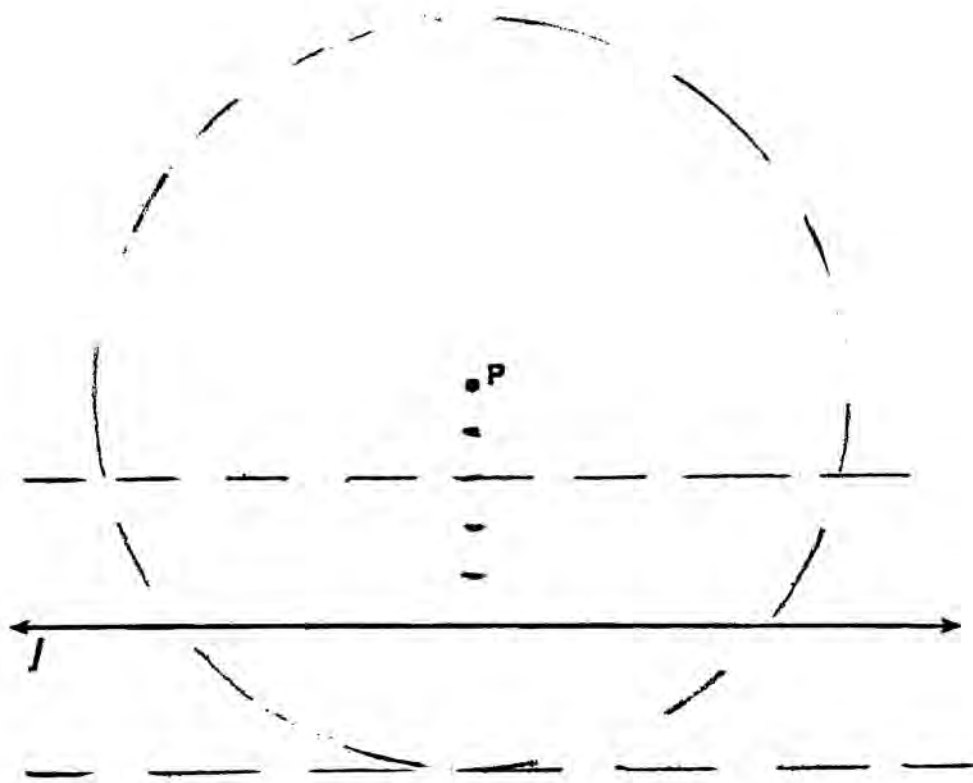
37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.



Score 2: The student sketched both loci, but made a conceptual error in sketching the first locus. Appropriate points of intersection were labeled with an **X**.

Question 37

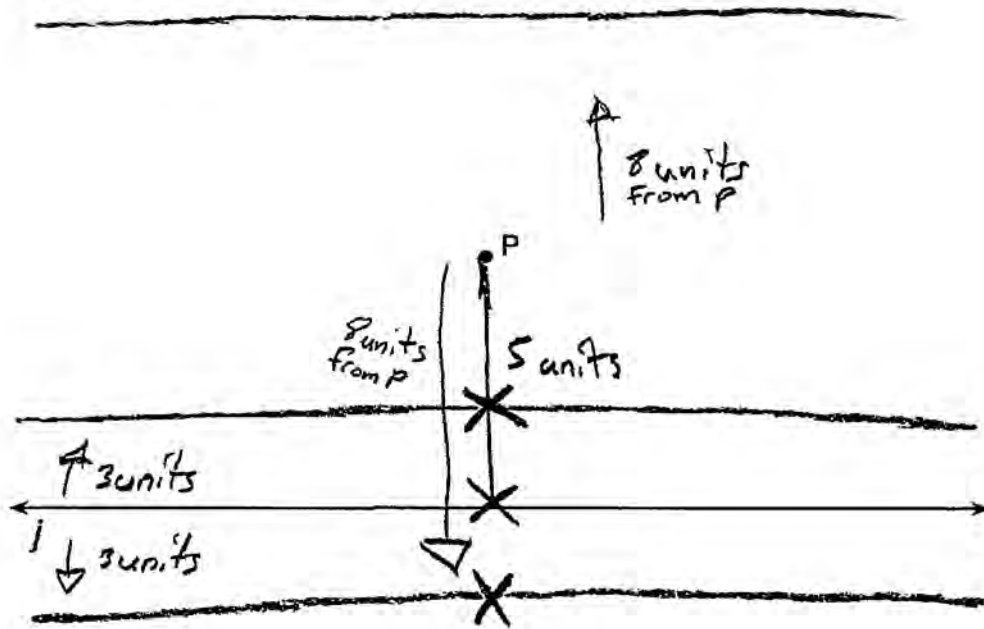
37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.



Score 2: The student sketched both loci correctly, but no points of intersection were labeled.

Question 37

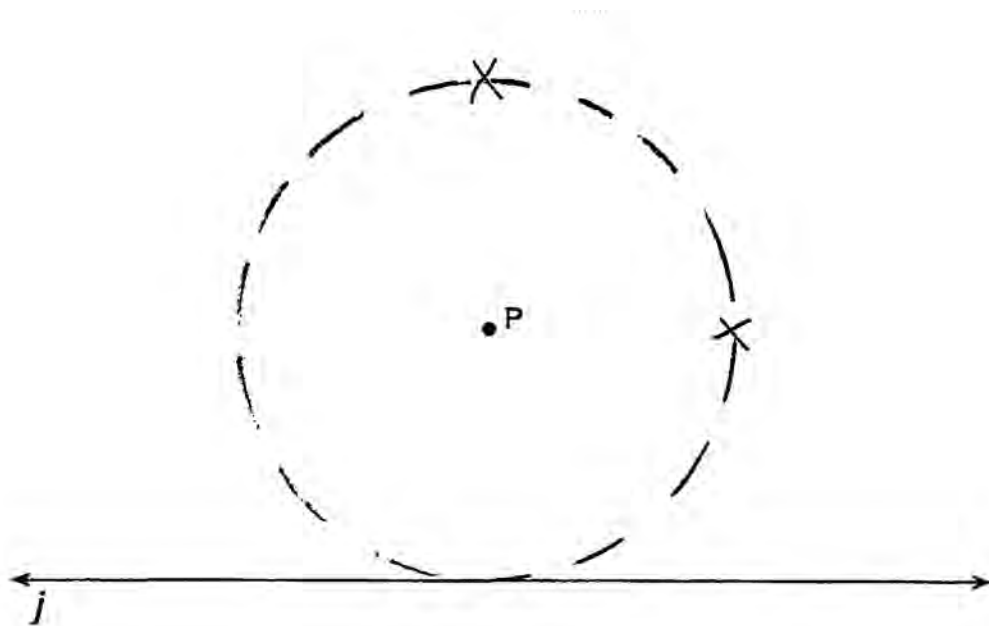
37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.



Score 1: The student sketched one locus correctly, but no further correct work was shown.

Question 37

37 Point P is 5 units from line j . Sketch the locus of points that are 3 units from line j and also sketch the locus of points that are 8 units from P . Label with an **X** all points that satisfy *both* conditions.

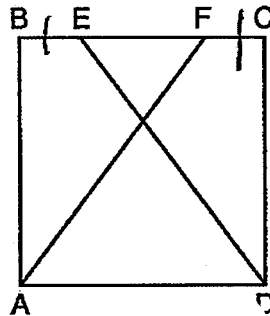


Score 0: The student had a completely incorrect response.

Question 38

38 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



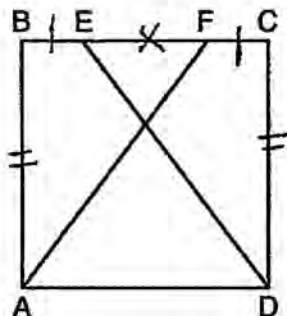
- given Pro
- | | |
|--|--|
| <p>① $ABCD$ is a square
and $\overline{BE} \cong \overline{FC}$</p> <p>② $\overline{EF} \cong \overline{EF}$</p> <p>③ $\overline{BF} = \overline{BE} + \overline{EF}$
$\overline{CE} = \overline{CF} + \overline{EF}$</p> <p>④ $\overline{BF} \cong \overline{CE}$</p> <p>⑤ $\overline{BA} \cong \overline{CD}$</p> <p>⑥ $\angle ABF \cong \angle DCE$</p> <p>⑦ $\triangle ABF \cong \triangle DCE$</p> <p>⑧ $\overline{AF} \cong \overline{DE}$</p> | <p>① given</p> <p>② reflexive</p> <p>③ partition</p> <p>④ equals plus equals are equal</p> <p>⑤ all sides in a square are congruent</p> <p>⑥ squares are equiangular</p> <p>⑦ SAS</p> <p>⑧ CPCTC</p> |
|--|--|

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

Question 38

38 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



- ① $\overline{BE} \cong \overline{FC}$
square $ABCD$
- ② $\overline{AB} \cong \overline{CD}$
- ③ $\overline{EF} \cong \overline{EF}$
- ④ $\overline{BE} + \overline{EF} \cong \overline{FC} + \overline{EF}$
- ⑤ $\angle ABF \cong \angle DCE$
- ⑥ $\triangle ABF \cong \triangle DCE$
- ⑦ $\overline{AF} \cong \overline{DE}$

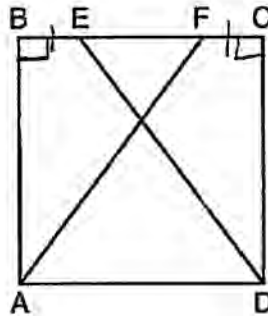
Given
 all sides of a square are \cong
 Reflexive Property
 addition postulate
 all \angle 's in square are rt. \angle 's, rt. \angle 's are \cong
 SAS \cong SAS
 CPCTC

Score 5: The student did not prove $\overline{BF} \cong \overline{CE}$.

Question 38

38 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



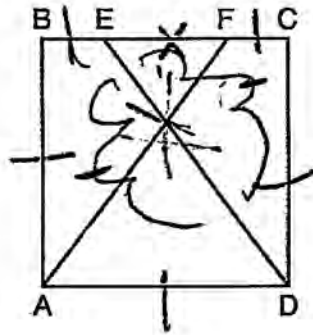
Statement	Reason
① $\overline{BE} \cong \overline{FC}$	① Given
② $\overline{EF} \cong \overline{EF}$	② Reflexive
③ $\overline{BF} \cong \overline{CE}$	③ Addition
④ $\overline{BA} \cong \overline{CD}$	④ All sides of a square are congruent
⑤ $\angle B$ & $\angle C$ are right angles	⑤ All angles of a square are right angles
⑥ $\angle B \cong \angle C$	⑥ All right angles are congruent
⑦ $\overline{AF} \cong \overline{DE}$	⑦ CPCTC

Score 4: The student did not write the complete given and missed one statement and its reason.

Question 38

38 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



- 1) $ABCD$ is a square, $\overline{BE} \cong \overline{FC}$
- 2) $\overline{EF} \cong \overline{EF}$
- 3) $\overline{BE} + \overline{EF} \cong \overline{EF} + \overline{FC}$
 $\therefore \overline{BF} \cong \overline{EC}$
- 4) $\overline{BA} \cong \overline{BC} \cong \overline{CD} \cong \overline{AD}$
- 5) $\triangle ABF \cong \triangle DCE$
- 6) $\overline{AF} \cong \overline{DE}$

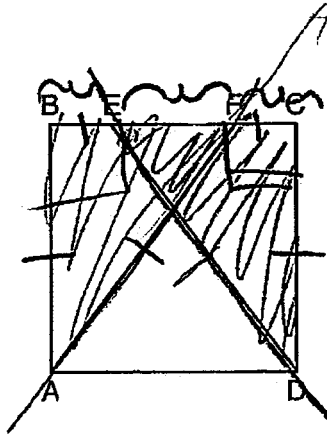
- 1) Given
- 2) Reflexive Postulate
- 3) ~~If~~ Equals added to equals then the results are equal.
- 4) All sides of square are equal.
- 5) SSS
- 6) Corresponding parts of congruent triangles are congruent.

Score 3: The student made one conceptual error by using SSS to prove the triangles congruent.

Question 38

38 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



Statements

- 1 $\overline{BE} \cong \overline{FC}$
- 2 $\angle B$ + $\angle C$
are rt \angle 's
- 3 $\angle B \cong \angle C$
- 4 $\overline{BE} + \overline{EF} \cong \overline{CF} + \overline{EF}$
- 5 $\overline{BA} \cong \overline{CD}$
- 4 $\triangle ABF \cong \triangle DEC$
- 5 $\overline{AF} \cong \overline{DE}$

Reasons

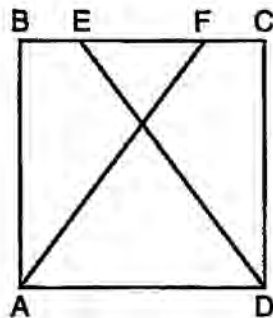
- 1 given
- 2 all squares sides meet to form rt \angle 's,
- 3 all rt \angle 's are \cong
- 4 Addition Postulate
- 5 all sides of a \square are \cong
- 4 SAS \cong SAS
- 5 CPCTC.

Score 2: The student wrote some correct statements and reasons, but three or four statements and/or reasons were missing or were incorrect.

Question 38

38 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



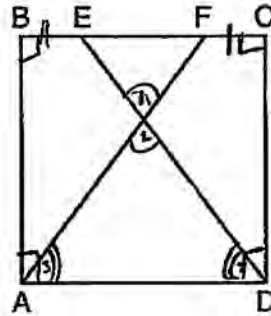
$ABCD$ is a square with $\overline{BE} \cong \overline{FC}$ is given.
All sides of a square are equal so $\overline{BA} \cong \overline{CD}$.
 $\triangle ABF \cong \triangle DCE$ by SSS so parts are equal.

Score 1: The student wrote only one correct statement and reason.

Question 38

38 The diagram below shows square $ABCD$ where E and F are points on \overline{BC} such that $\overline{BE} \cong \overline{FC}$, and segments AF and DE are drawn.

Prove that $\overline{AF} \cong \overline{DE}$.



Statements	Reasons
1. $\overline{BE} \cong \overline{FC}$	1. Given
2. $\angle 1 \cong \angle 2$	2. Vertical angles are congruent.
3. $\angle BAD, \angle CBA, \angle ODA,$ and $\angle BCD$ form right angles.	3. Definition of a square
4. \overline{ED} and \overline{FA} bisect $\angle ODA$ and $\angle BAD$.	4. Definition of bisector.
5. $\angle 3$ and $\angle 4$ are congruent.	5. Substitution
6. CPCTC	6. $\overline{AF} \cong \overline{DE}$

Score 0: The student wrote no correct statements.

Regents Examination in Geometry – June 2015

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

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.