

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

GEOMETRY

Wednesday, January 28, 2015 — 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.

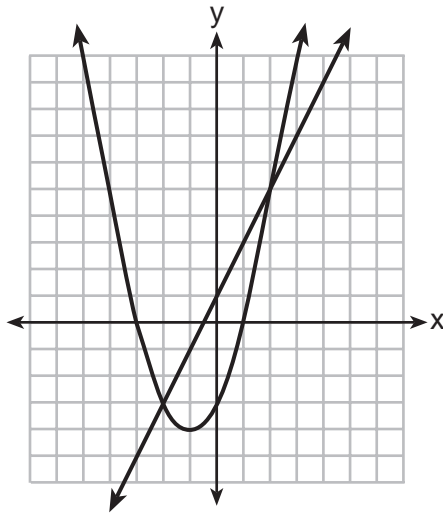
Part I

Answer all 28 questions in this part. Each correct answer will receive 2 credits. 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 What is the solution of the system of equations graphed below?

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



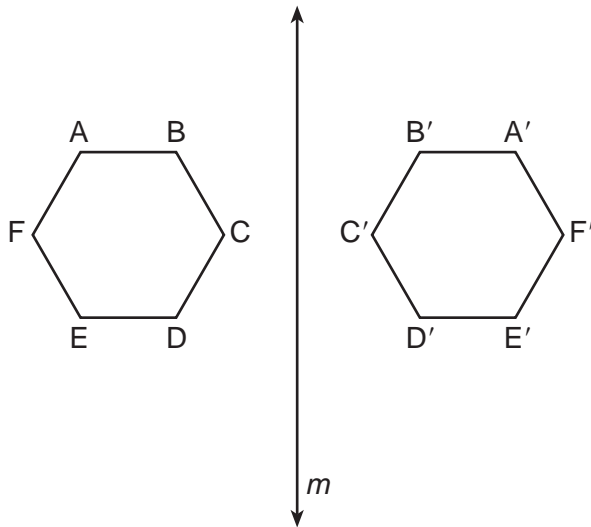
- (1) $(0, -3)$ (3) $(-3, 0)$ and $(1, 0)$
(2) $(-1, -4)$ (4) $(-2, -3)$ and $(2, 5)$

2 What are the coordinates of the midpoint of the line segment with endpoints $(2, -5)$ and $(8, 3)$?

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

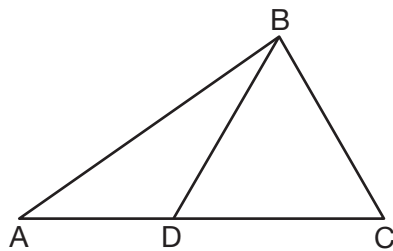
**Use this space for
computations.**

- 3 As shown in the diagram below, when hexagon $ABCDEF$ is reflected over line m , the image is hexagon $A'B'C'D'E'F'$.



Under this transformation, which property is *not* preserved?

- (1) area
(2) distance
(3) orientation
(4) angle measure
- 4 In the diagram of $\triangle ABC$ below, \overline{BD} is drawn to side \overline{AC} .

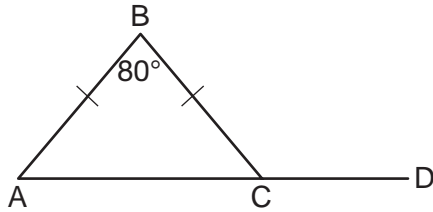


If $m\angle A = 35$, $m\angle ABD = 25$, and $m\angle C = 60$, which type of triangle is $\triangle BCD$?

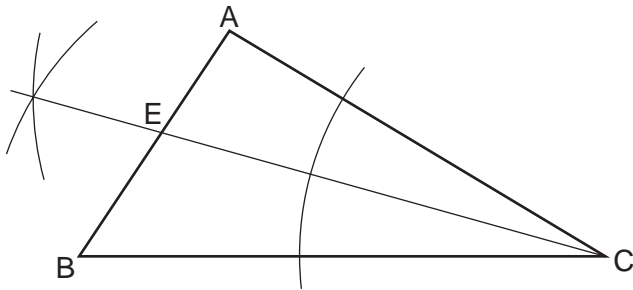
- (1) equilateral
(2) scalene
(3) obtuse
(4) right

Use this space for
computations.

- 8 In the diagram below of isosceles $\triangle ABC$, the measure of vertex angle B is 80° . If \overline{AC} extends to point D , what is $m\angle BCD$?



- (1) 50
(2) 80
(3) 100
(4) 130
- 9 A student used a compass and a straightedge to construct \overline{CE} in $\triangle ABC$ as shown below.



Which statement must always be true for this construction?

- (1) $\angle CEA \cong \angle CEB$
(2) $\angle ACE \cong \angle BCE$
(3) $\overline{AE} \cong \overline{BE}$
(4) $\overline{EC} \cong \overline{AC}$
- 10 In $\triangle ABC$, $AB = 4$, $BC = 7$, and $AC = 10$. Which statement is true?
- (1) $m\angle B > m\angle C > m\angle A$
(2) $m\angle B > m\angle A > m\angle C$
(3) $m\angle C > m\angle B > m\angle A$
(4) $m\angle C > m\angle A > m\angle B$

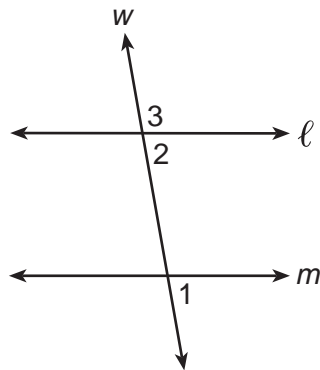
11 A circle whose center has coordinates $(-3,4)$ passes through the origin. What is the equation of the circle?

- (1) $(x + 3)^2 + (y - 4)^2 = 5$
- (2) $(x + 3)^2 + (y - 4)^2 = 25$
- (3) $(x - 3)^2 + (y + 4)^2 = 5$
- (4) $(x - 3)^2 + (y + 4)^2 = 25$

12 Point W is located in plane \mathcal{R} . How many distinct lines passing through point W are perpendicular to plane \mathcal{R} ?

- (1) one
- (2) two
- (3) zero
- (4) infinite

13 In the diagram below, line ℓ is parallel to line m , and line w is a transversal.



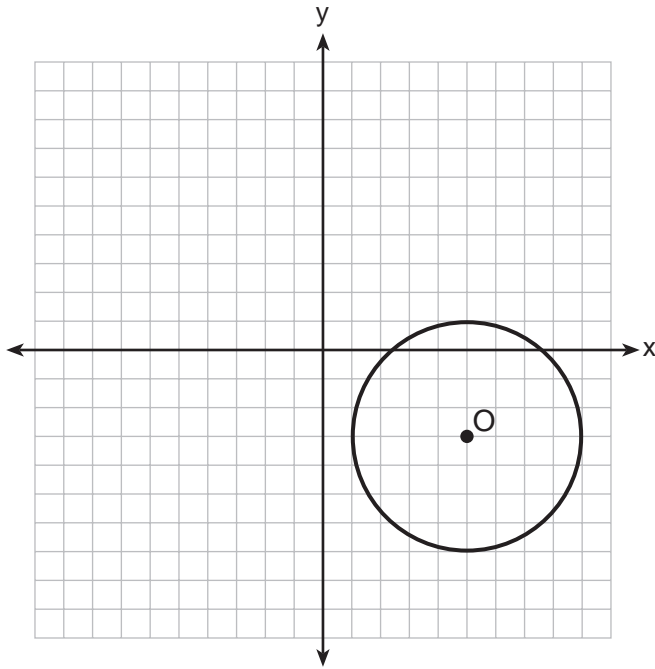
(Not drawn to scale)

If $m\angle 2 = 3x + 17$ and $m\angle 3 = 5x - 21$, what is $m\angle 1$?

- (1) 19
- (2) 23
- (3) 74
- (4) 86

Use this space for computations.

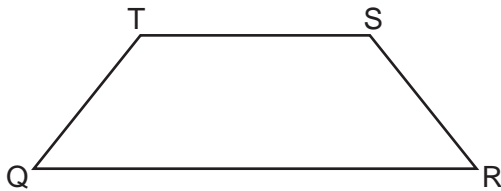
14 The diagram below is a graph of circle O .



Which equation represents circle O ?

- (1) $(x - 5)^2 + (y + 3)^2 = 4$
- (2) $(x + 5)^2 + (y - 3)^2 = 4$
- (3) $(x - 5)^2 + (y + 3)^2 = 16$
- (4) $(x + 5)^2 + (y - 3)^2 = 16$

15 In isosceles trapezoid $QRST$ shown below, \overline{QR} and \overline{TS} are bases.

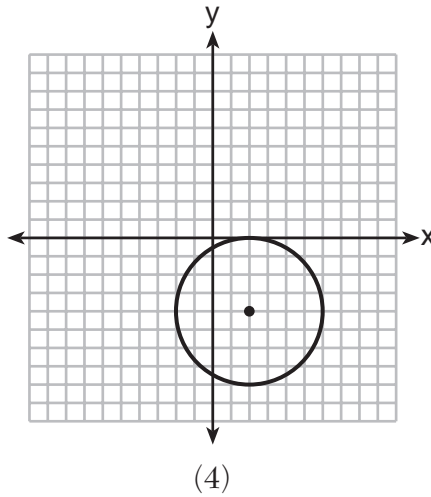
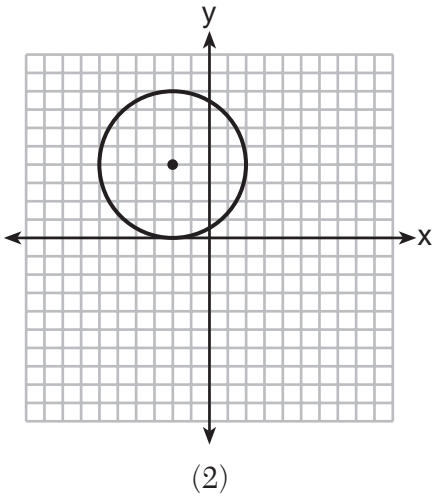
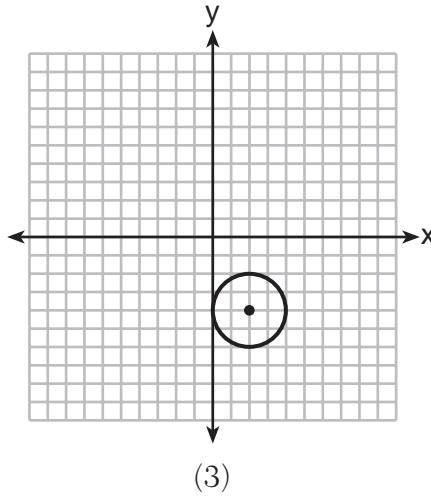
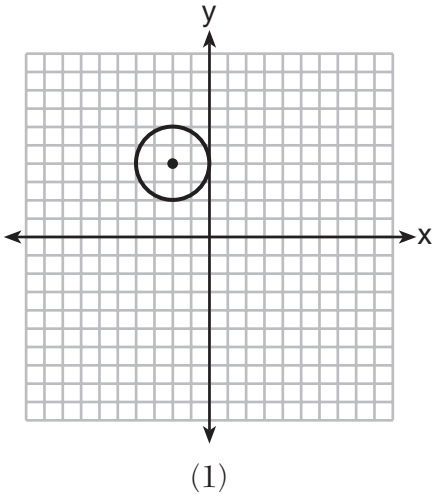


If $m\angle Q = 5x + 3$ and $m\angle R = 7x - 15$, what is $m\angle Q$?

- (1) 83
- (2) 48
- (3) 16
- (4) 9

Use this space for computations.

- 18 Which graph represents a circle whose equation is $(x - 2)^2 + (y + 4)^2 = 4$?



- 19 If two sides of a triangle have lengths of 4 and 10, the third side could be

- (1) 8 (3) 16
(2) 2 (4) 4

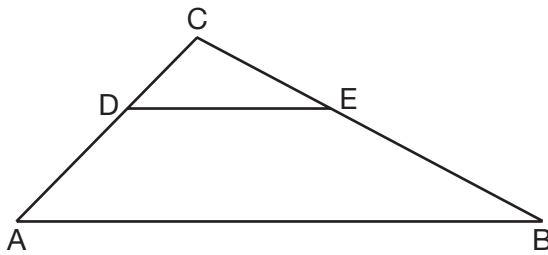
**Use this space for
computations.**

20 The lines represented by the equations $4x + 6y = 6$ and

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

- (1) parallel
- (2) the same line
- (3) perpendicular
- (4) intersecting, but *not* perpendicular

21 In the diagram below of $\triangle ABC$, $\overline{DE} \parallel \overline{AB}$.

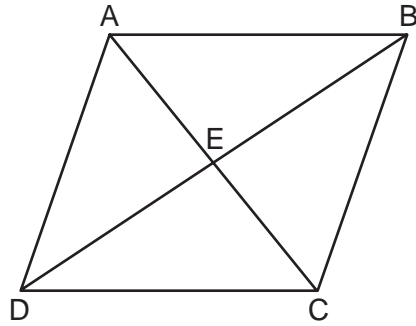


If $CD = 4$, $CA = 10$, $CE = x + 2$, and $EB = 4x - 7$, what is the length of \overline{CE} ?

- (1) 10
- (2) 8
- (3) 6
- (4) 4

Use this space for computations.

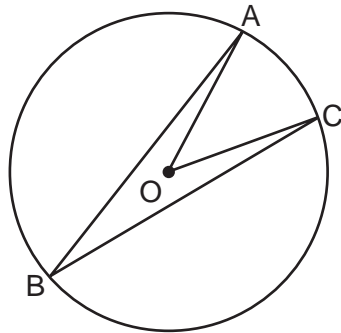
22 Parallelogram $ABCD$ with diagonals \overline{AC} and \overline{BD} intersecting at E is shown below.



Which statement must be true?

- (1) $\overline{BE} \cong \overline{CE}$ (3) $\overline{AB} \cong \overline{BC}$
(2) $\angle BAE \cong \angle DCE$ (4) $\angle DAE \cong \angle CBE$

23 In the diagram below of circle O , $m\angle ABC = 24$.



What is $m\angle AOC$?

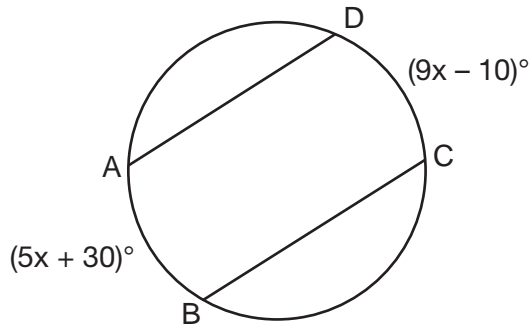
- (1) 12 (3) 48
(2) 24 (4) 60

24 Triangle $A'B'C'$ is the image of $\triangle ABC$ after a dilation of 2.
Which statement is true?

- (1) $AB = A'B'$ (3) $m\angle B = m\angle B'$
(2) $BC = 2(B'C')$ (4) $m\angle A = \frac{1}{2}(m\angle A')$

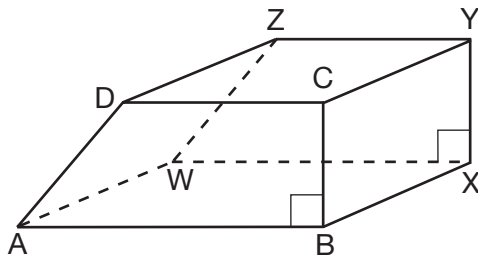
Use this space for computations.

- 25 In the diagram of the circle below, $\overline{AD} \parallel \overline{BC}$, $\widehat{AB} = (5x + 30)^\circ$, and $\widehat{CD} = (9x - 10)^\circ$.



What is $m\widehat{AB}$?

- (1) 5 (3) 55
(2) 10 (4) 80
- 26 The bases of a prism are right trapezoids, as shown in the diagram below.

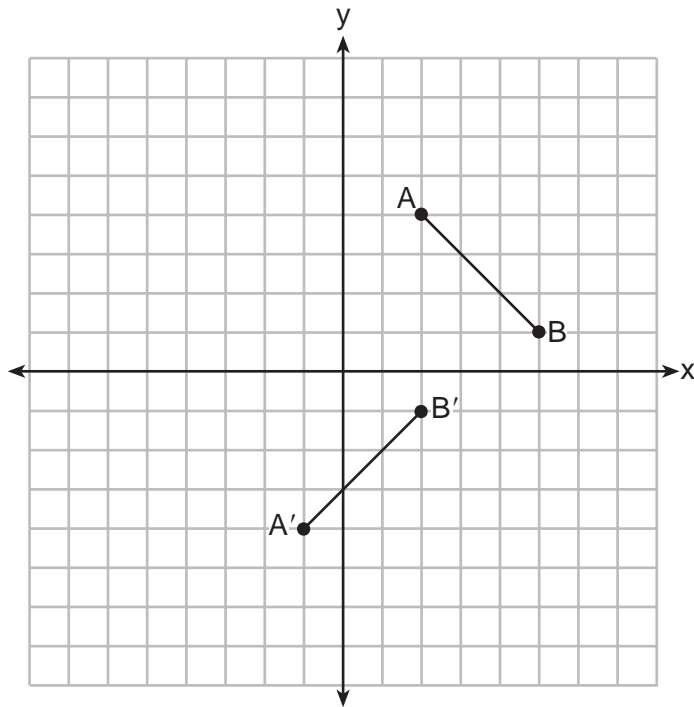


Which two edges do *not* lie in the same plane?

- (1) \overline{BC} and \overline{WZ} (3) \overline{DC} and \overline{WX}
(2) \overline{AW} and \overline{CY} (4) \overline{BX} and \overline{AB}

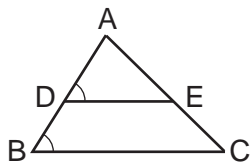
Use this space for computations.

27 In the diagram below, $\overline{A'B'}$ is the image of \overline{AB} under which single transformation?

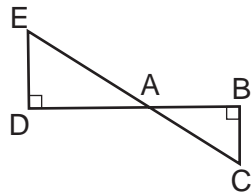


- (1) dilation
- (2) rotation
- (3) translation
- (4) glide reflection

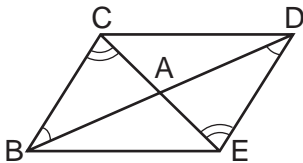
28 For which diagram is the statement $\triangle ABC \sim \triangle ADE$ not always true?



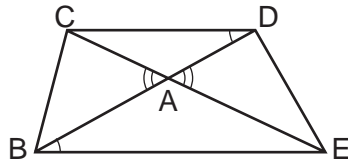
(1)



(3)



(2)



(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]

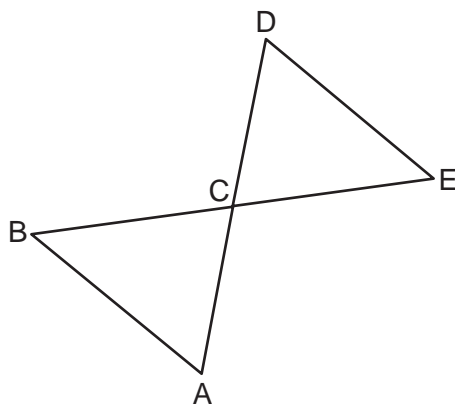
29 Given: \overline{BE} and \overline{AD} intersect at point C

$$\overline{BC} \cong \overline{EC}$$

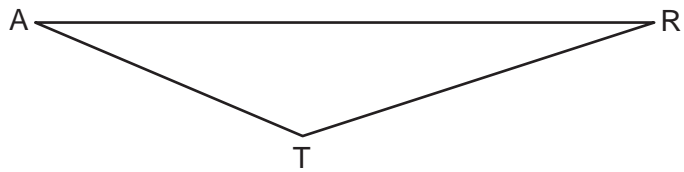
$$\overline{AC} \cong \overline{DC}$$

\overline{AB} and \overline{DE} are drawn

Prove: $\triangle ABC \cong \triangle DEC$



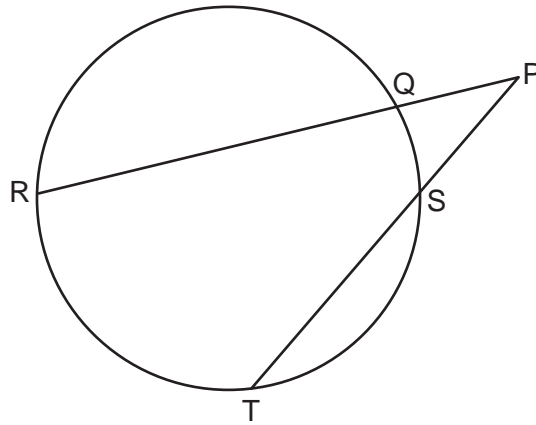
30 Using a compass and straightedge, construct the perpendicular bisector of side \overline{AR} in $\triangle ART$ shown below. [Leave all construction marks.]



31 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

32 Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(-3,4)$.

33 In the diagram below, secants \overline{PQR} and \overline{PST} are drawn to a circle from point P .



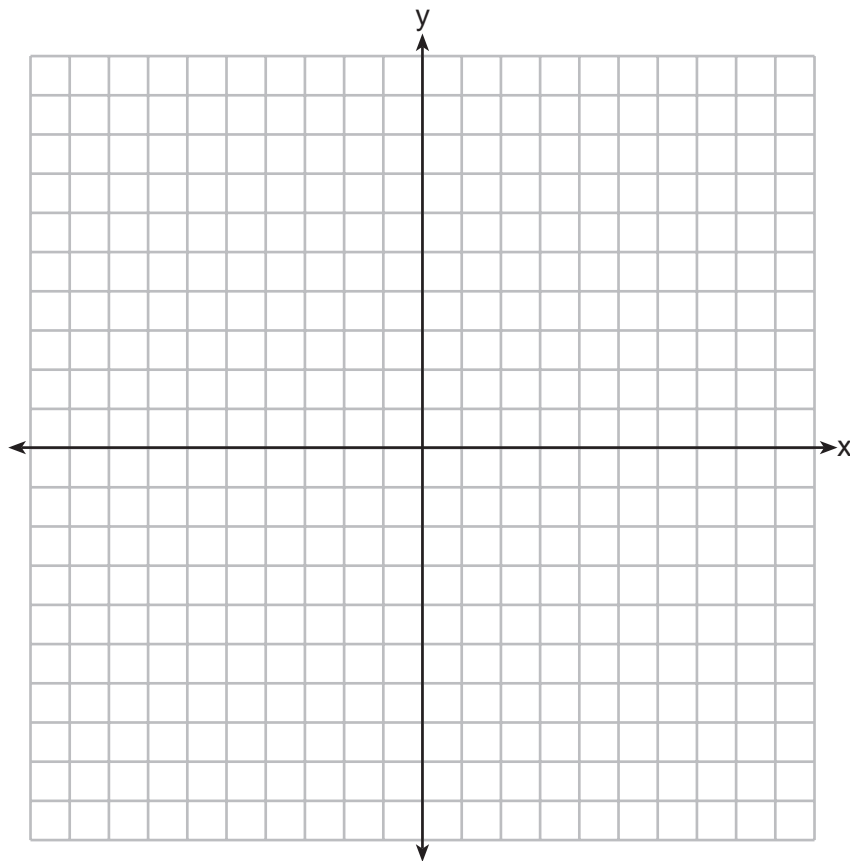
If $PR = 24$, $PQ = 6$, and $PS = 8$, determine and state the length of \overline{PT} .

34 The slope of \overline{QR} is $\frac{x-1}{4}$ and the slope of \overline{ST} is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of x .

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 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

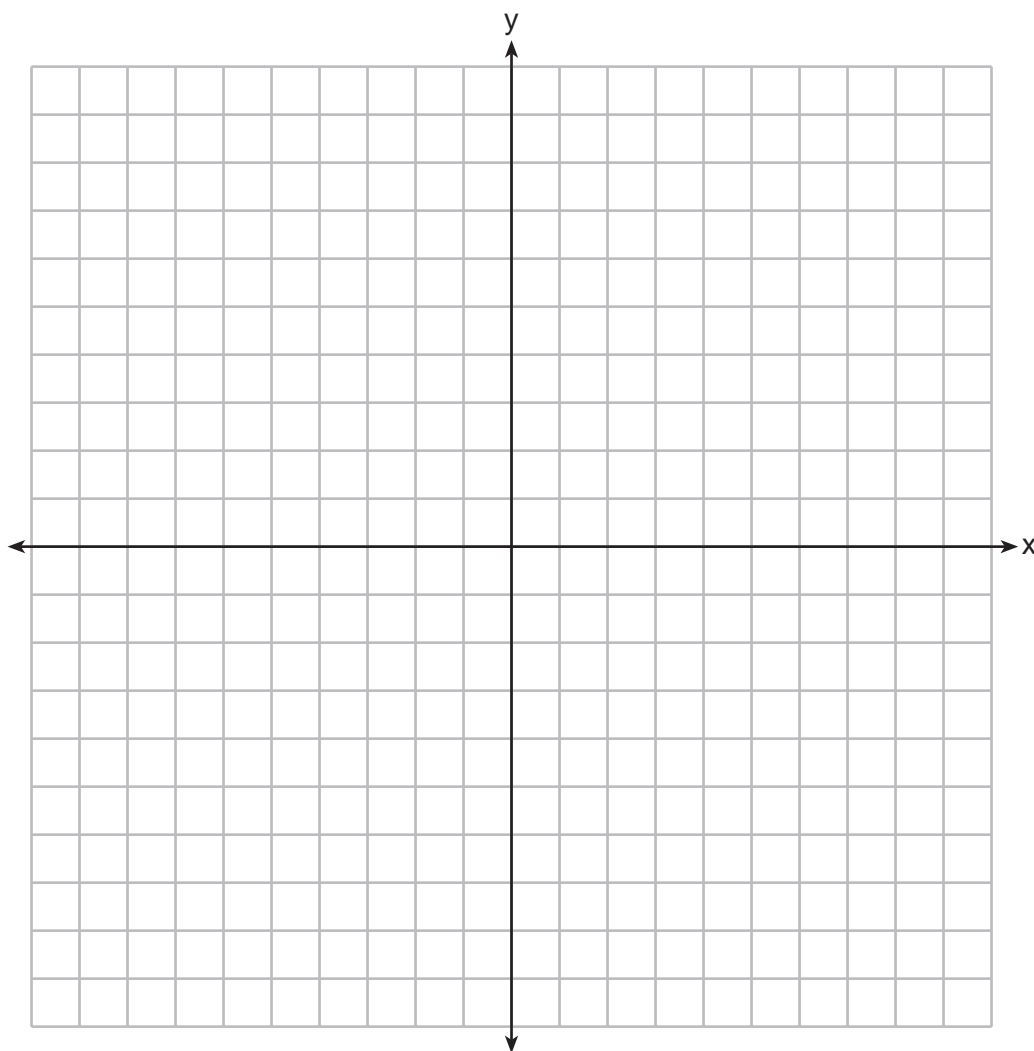


36 On the set of axes below, graph two horizontal lines whose y -intercepts are $(0, -2)$ and $(0, 6)$, respectively.

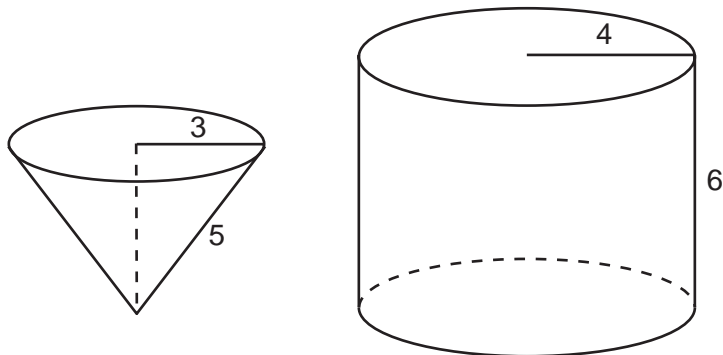
Graph the locus of points equidistant from these horizontal lines.

Graph the locus of points 3 units from the y -axis.

State the coordinates of the points that satisfy both loci.



37 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches.



Determine and state the number of full cones of water needed to completely fill the cylinder with water.

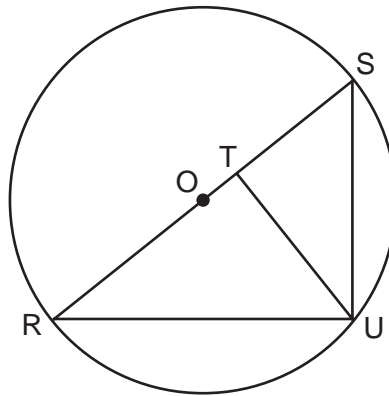
Part IV

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 below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



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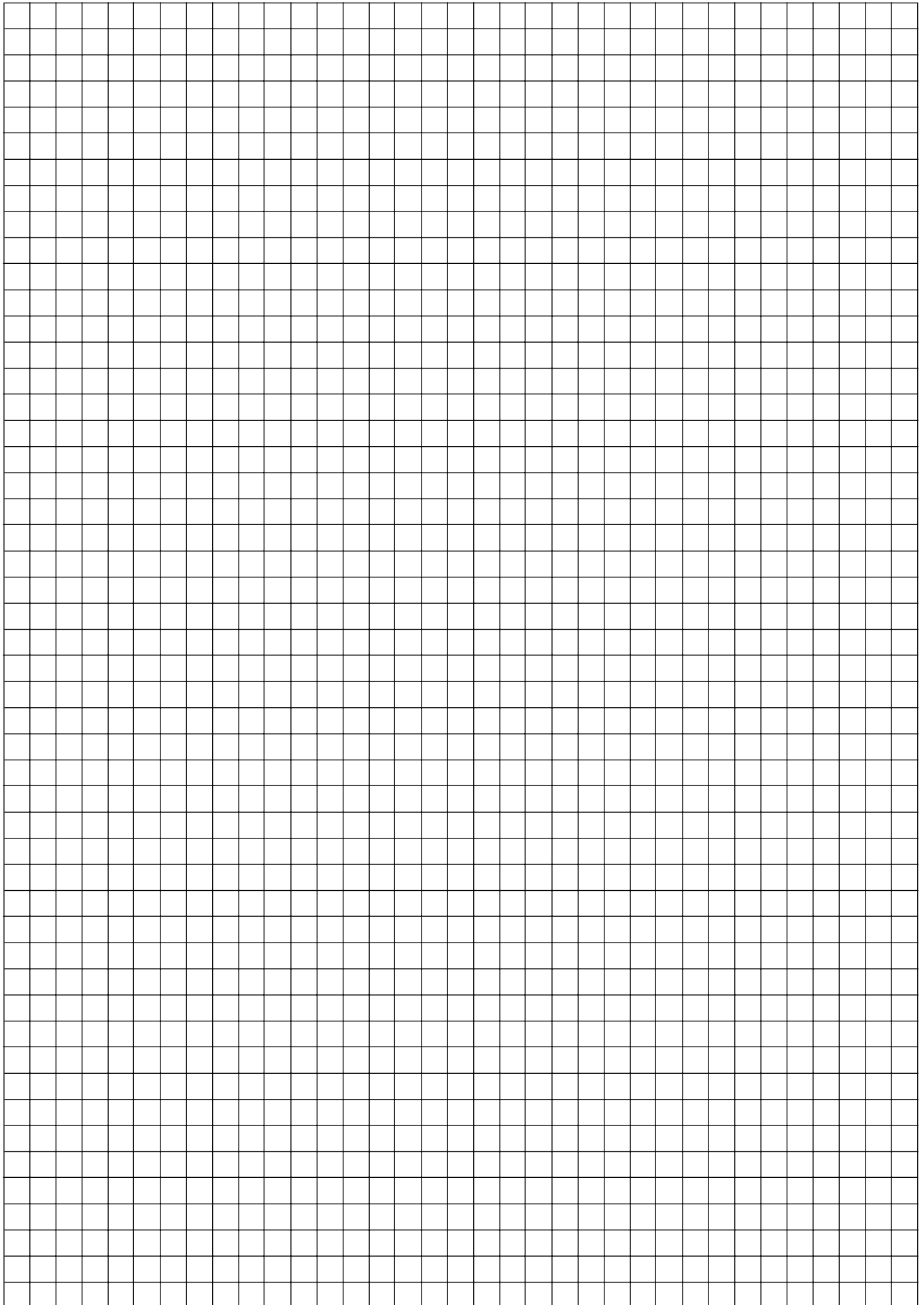
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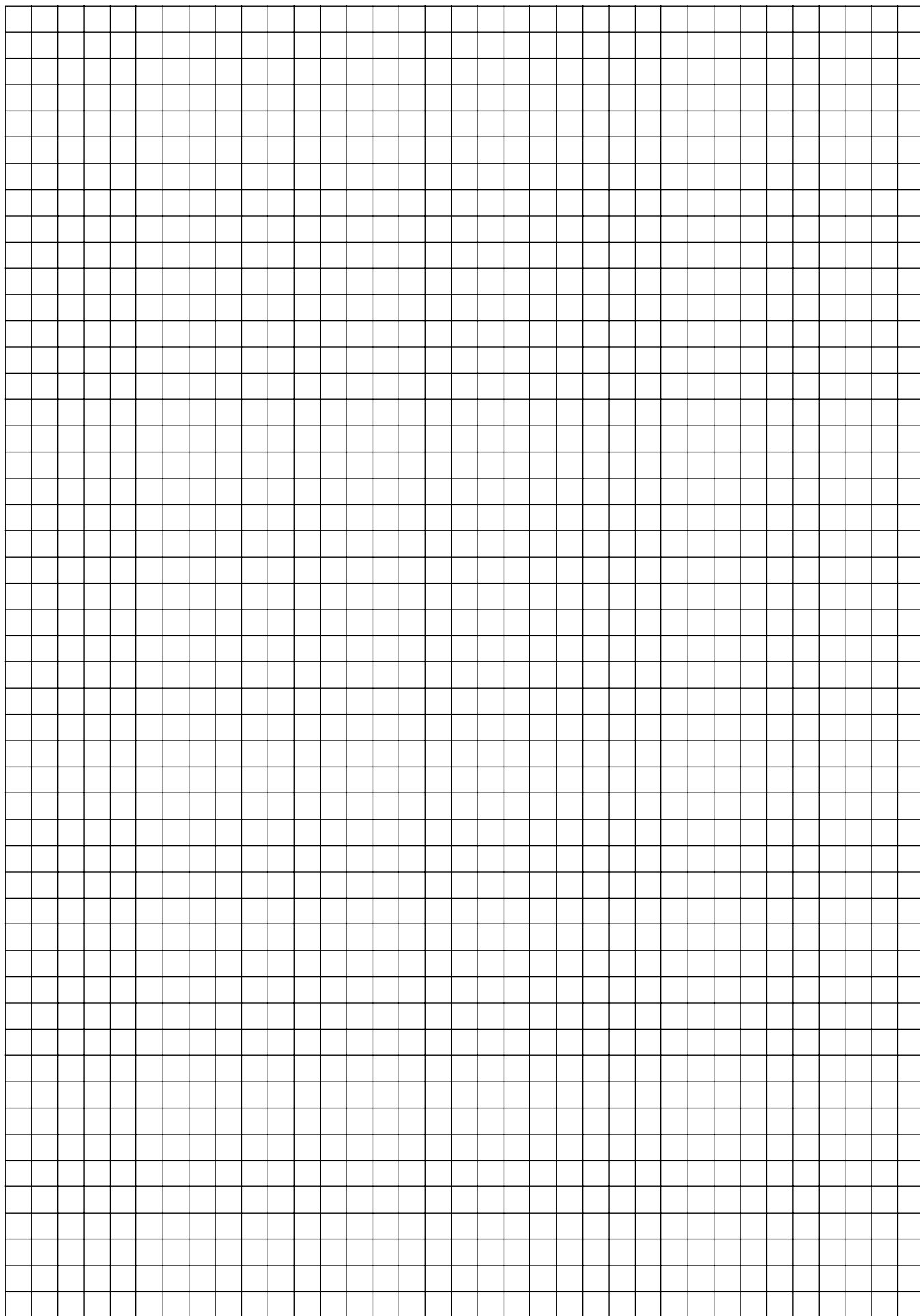
Scrap Graph Paper — This sheet will *not* be scored.

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



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GEOMETRY

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GEOMETRY

FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Wednesday, January 28, 2015 — 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 28, 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) 4 | (11) 2 | (21) 3 |
| (2) 4 | (12) 1 | (22) 2 |
| (3) 3 | (13) 4 | (23) 3 |
| (4) 1 | (14) 3 | (24) 3 |
| (5) 1 | (15) 2 | (25) 4 |
| (6) 3 | (16) 1 | (26) 1 |
| (7) 1 | (17) 2 | (27) 4 |
| (8) 4 | (18) 3 | (28) 4 |
| (9) 2 | (19) 1 | |
| (10) 2 | (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] A complete and correct proof that includes a concluding statement is written.

[1] $\angle BCA \cong \angle ECD$ is proven, but no further correct work is shown.

or

[1] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.

[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 of \overline{AR} is drawn.

[1] Appropriate work is shown, but one construction error is made, such as not drawing the perpendicular bisector line or constructing the perpendicular bisector of \overline{AT} or \overline{RT} .

or

[1] Appropriate work is shown to construct a line perpendicular to \overline{AR} through point T , but the line does not bisect \overline{AR} .

[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] 144, 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] 144, 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] $y = \frac{1}{3}x + 5$ or an equivalent equation, 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 $m = \frac{1}{3}$ and $b = 5$, but no further correct work is shown.

or

[1] $y = \frac{1}{3}x + 5$, but no work is shown.

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

(33) [2] 18, 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, the length of \overline{ST} , but no further correct work is shown.

or

[1] 18, 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] $-\frac{1}{2}$, 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] $-\frac{1}{2}$, 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.

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] $H''(7,0)$, $Y''(6,-4)$, $P''(3,-4)$, and $E''(3,-1)$, and correct work is shown.

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

or

[3] Quadrilateral $H''Y''P''E''$ is graphed and labeled correctly, but the coordinates are not stated or are stated 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 performing the reflection before the translation.

or

[2] $H'(7,0)$, $Y'(6,4)$, $P'(3,4)$, and $E'(3,1)$, 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] $H''(7,0)$, $Y''(6,-4)$, $P''(3,-4)$, and $E''(3,-1)$, but no work is shown.

[0] $(7,0)$, $(6,-4)$, $(3,-4)$, and $(3,-1)$, but no work is shown.

or

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

- (36) [4] Both loci are graphed correctly, and $(-3,2)$ and $(3,2)$ are stated.
- [3] Appropriate work is shown, but one graphing error is made.
- or***
- [3] Both loci are graphed correctly, but only the coordinates of one point are stated correctly.
- or***
- [3] Both loci are graphed correctly and the points that satisfy both are marked on the graph, but the coordinates are not stated.
- [2] Appropriate work is shown, but two or more graphing errors are made.
- or***
- [2] Appropriate work is shown, but one conceptual error is made.
- or***
- [2] Both loci are graphed correctly, but the points of intersection are not stated or are stated incorrectly.
- [1] Appropriate work is shown, but one conceptual error and one graphing error are made.
- or***
- [1] Only one locus is graphed correctly.
- or***
- [1] $(-3,2)$ 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.

(37) [4] 8, and correct work is shown.

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

or

[3] Appropriate work is shown to find 96π , the volume of the cylinder, and 12π , the volume of the cone, 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 12π , the volume of the cone, but no further correct work is shown.

[1] Appropriate work is shown to find 96π , the volume of the cylinder, but no further correct work is shown.

or

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

or

[1] Appropriate work is shown to find 4, the height of the cone, but no further correct work is shown.

or

[1] 8, 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] 9 and $5\sqrt{34}$, and correct work is shown.

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

or

[5] Appropriate work is shown to find 9, but the length of \overline{SU} ($3\sqrt{34}$), is found.

[4] Appropriate work is shown, but two computational, factoring, or simplification errors are made.

or

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

or

[4] Appropriate work is shown to find $TS = 9$ and either $RS = 34$ or $RT = 25$, but no further correct work is shown.

[3] Appropriate work is shown, but three or more computational, factoring, or simplification errors are made.

or

[3] Appropriate work is shown, but one conceptual error and one computational, factoring, or simplification error are made.

or

[3] Appropriate work is shown to find 9, but no further correct work is shown.

[2] Appropriate work is shown, but one conceptual error and two or more computational, factoring, or simplification errors are made.

or

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

or

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

or

[2] 9 and $5\sqrt{34}$, but no work is shown.

[1] $\frac{x}{15} = \frac{15}{x+16}$ or an equivalent proportion is written, but no further correct work is shown.

or

[1] 9, 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.

Map to Core Curriculum

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

Regents Examination in Geometry

January 2015

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

The Chart for Determining the Final Examination Score for the January 2015 Regents Examination in Geometry will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Wednesday, January 28, 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
THE STATE EDUCATION DEPARTMENT
Office of State Assessment
Albany, New York 12234**

IMPORTANT NOTICE

Notice to Teachers

**Regents Examination in Geometry
Wednesday, January 28, 9:15 a.m.
Question 27, only**

This notice pertains to the scoring of Question 27 only, of the Regents Examination in Geometry.

Due to the lack of specificity in the wording of Question 27, either choice 4, the correct answer indicated in the Scoring Key, or choice 2 should be accepted as a correct answer and awarded 2 credits.

Please photocopy this notice and give a copy of it to each teacher scoring the Regents Examination in Geometry.

We apologize for any inconvenience this may cause you. Thank you for your hard work on behalf of the students in New York State.

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

GEOMETRY

Wednesday, January 28, 2015 — 9:15 a.m.

SAMPLE RESPONSE SET

Table of Contents

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Question 29

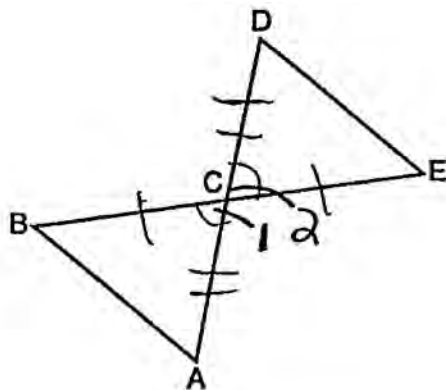
29 Given: \overline{BE} and \overline{AD} intersect at point C

$$\overline{BC} \cong \overline{EC}$$

$$\overline{AC} \cong \overline{DC}$$

\overline{AB} and \overline{DE} are drawn

Prove: $\triangle ABC \cong \triangle DEC$



| S | R |
|-------------------------------------|---|
| $\overline{BC} \cong \overline{EC}$ | Given |
| $\overline{AC} \cong \overline{DC}$ | Given |
| $\angle 1 \cong \angle 2$ | Intersecting lines form congruent vertical angles. |
| $\triangle ABC \cong \triangle DEC$ | SAS postulate |

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

Question 29

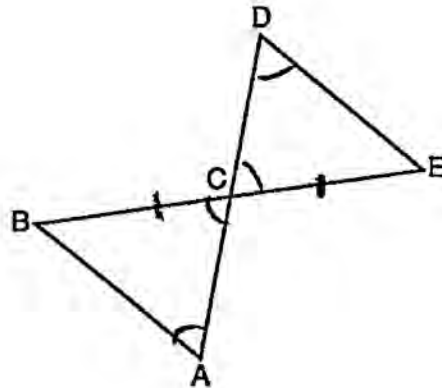
29 Given: \overline{BE} and \overline{AD} intersect at point C

$$\overline{BC} \cong \overline{EC}$$

$$\overline{AC} \cong \overline{DC}$$

\overline{AB} and \overline{DE} are drawn

Prove: $\triangle ABC \cong \triangle DEC$



| statement | reason |
|---|---|
| 1. $\overline{BC} \cong \overline{EC}$ $\overline{AC} \cong \overline{DC}$ | 1. given |
| 2. $\angle BCA \cong \angle DCE$ | 2. vertical \angle s are \cong |
| 3. $\angle C \cong \angle A$ | 3. alt. interior \angle s are \cong |
| 4. $\triangle ABC \cong \triangle DEC$ | 4. AAS \cong AAS |

Score 1: The student made a conceptual error in line 3, but had an appropriate concluding statement.

Question 29

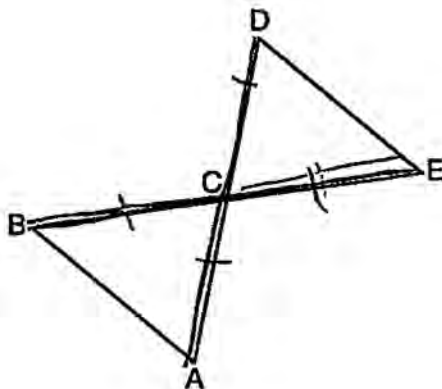
29 Given: \overline{BE} and \overline{AD} intersect at point C

$$\overline{BC} \cong \overline{EC}$$

$$\overline{AC} \cong \overline{DC}$$

\overline{AB} and \overline{DE} are drawn

Prove: $\triangle ABC \cong \triangle DEC$

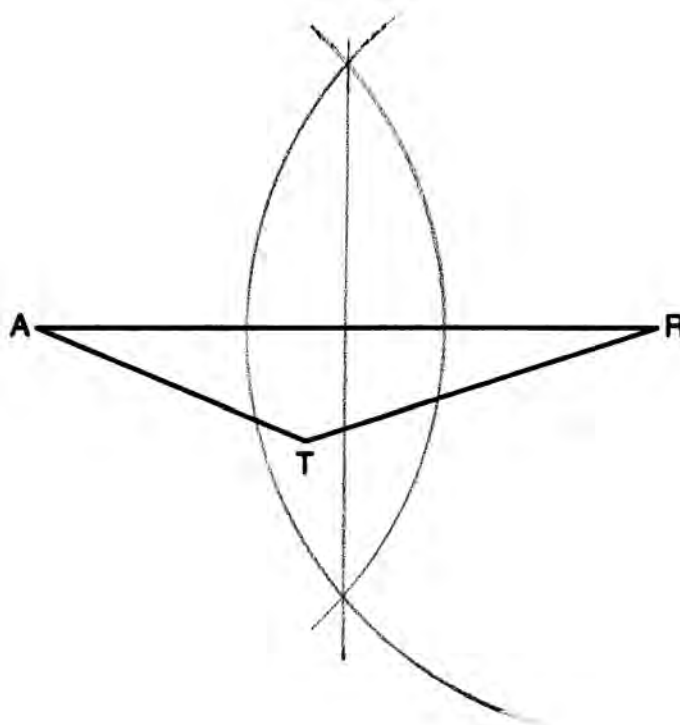


| G | R |
|---|---|
| <p>① \overline{BE} + \overline{AD} intersect at point C $\overline{BC} \cong \overline{EC}$ $\overline{AC} \cong \overline{DC}$ \overline{AB} and \overline{DE} are drawn</p> | <p>① Given</p> |
| <p>② $\overline{BE} \cong \overline{AD}$</p> | <p>② Def of \perp bisect</p> |
| <p>③ $\overline{AD} \cong \overline{EB}$</p> | <p>③ CPCTC</p> |
| <p>④ $\overline{DA} \cong \overline{AE}$</p> | <p>④ reflexive prop</p> |
| <p>⑤ $\overline{BA} \cong \overline{DE}$</p> | <p>⑤</p> |
| <p>⑥ $\triangle ABC \cong \triangle DEC$</p> | <p>⑥ AAS Thm</p> |

Score 0: The student has only the given correct.

Question 30

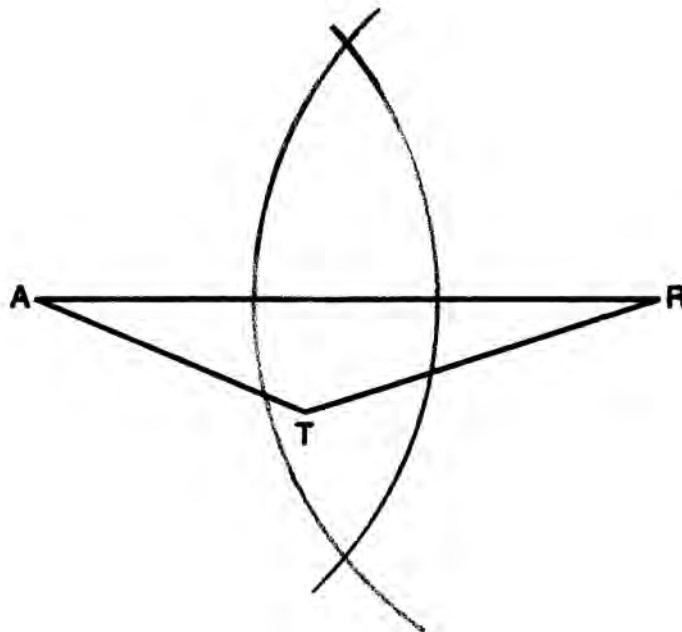
30 Using a compass and straightedge, construct the perpendicular bisector of side \overline{AR} in $\triangle ART$ shown below. [Leave all construction marks.]



Score 2: The student drew a correct construction showing all appropriate arcs, and the perpendicular bisector is drawn.

Question 30

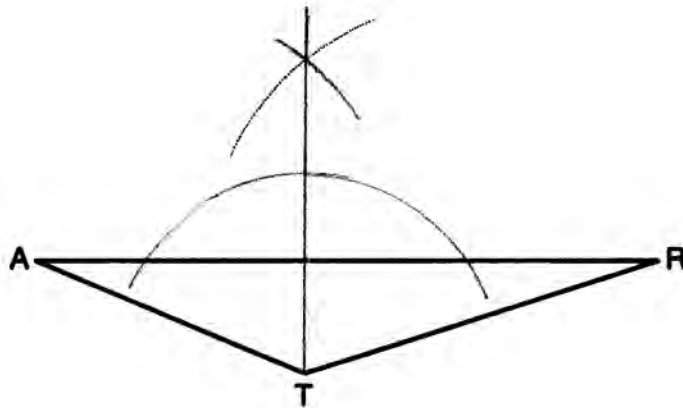
30 Using a compass and straightedge, construct the perpendicular bisector of side \overline{AR} in $\triangle ART$ shown below. [Leave all construction marks.]



Score 1: The student constructed all appropriate arcs, but did not draw the perpendicular bisector.

Question 30

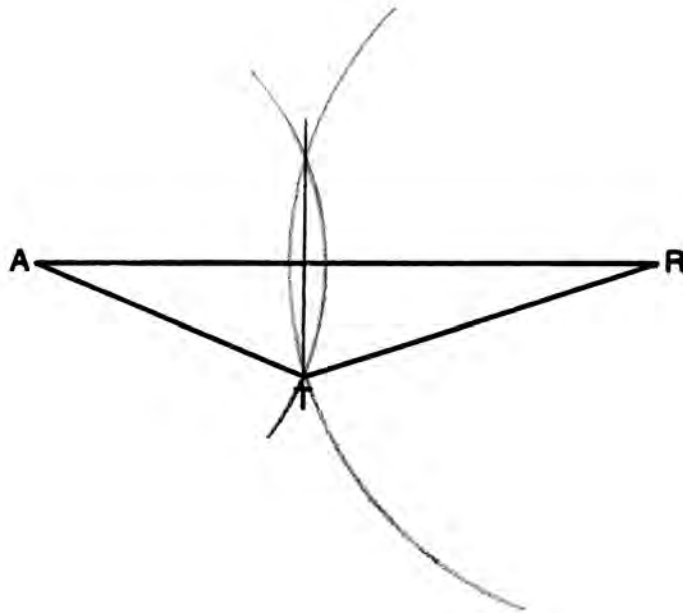
30 Using a compass and straightedge, construct the perpendicular bisector of side \overline{AR} in $\triangle ART$ shown below. [Leave all construction marks.]



Score 1: The student constructed a line perpendicular to \overline{AR} from vertex T . The line does not bisect \overline{AR} .

Question 30

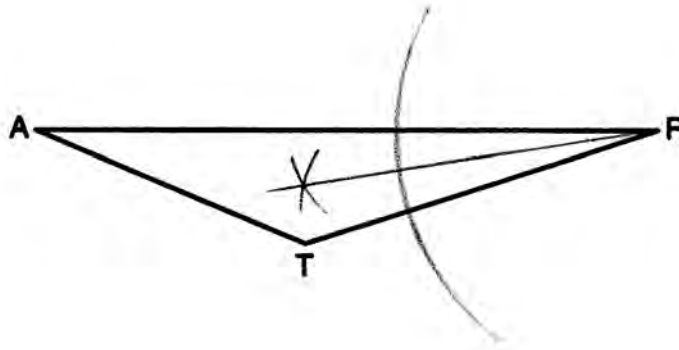
30 Using a compass and straightedge, construct the perpendicular bisector of side \overline{AR} in $\triangle ART$ shown below. [Leave all construction marks.]



Score 1: The student constructed a line perpendicular to \overline{AR} , but it does not bisect \overline{AR} .

Question 30

30 Using a compass and straightedge, construct the perpendicular bisector of side \overline{AR} in $\triangle ART$ shown below. [Leave all construction marks.]



Score 0: The student constructed the bisector of angle R . This construction is not relevant to the problem.

Question 31

31 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

10 side

$$\frac{180(n-2)}{n}$$
$$\frac{180(10-2)}{10}$$
$$\frac{180(8)}{10}$$
$$\frac{1440}{10}$$

1 Int \angle = 144

Score 2: The student has a complete and correct response to find the measure of an interior angle.

Question 31

31 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

10



$$\text{exterior } \angle = \frac{360^\circ}{10} = 36^\circ$$

$$\begin{array}{r} 180 \\ - 36 \\ \hline 144 \end{array}$$

$$\text{An interior } \angle = 144^\circ$$

Score 2: The student has a complete and correct response. The student showed the correct work to find the measure of an exterior angle and used it to find the correct measure of an interior angle.

Question 31

31 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

180

180 3

180 4

180 2

180 6

180 7

194 8

180 9

180 10

1440

Score 1: The student did not show enough work to earn full credit, but the correct answer was stated.

Question 31

31 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

$$(n-2) \cdot 180$$

$$(10-2) \cdot 180$$

$$8 \cdot 180$$

$$1440$$

Score 1: The student showed appropriate work to find the sum of the interior angles of a decagon, but no further correct work is shown.

Question 31

31 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

$$\frac{360}{10} = 36$$

Score 1: The student showed appropriate work to find the measure of an exterior angle of a decagon, but no further correct work is shown.

Question 31

31 Determine and state the measure, in degrees, of an interior angle of a regular decagon.

$$10 \overline{) 180} \quad 18^\circ$$

Score 0: The student showed no relevant work.

Question 32

32 Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(-3, 4)$.

$$\frac{3y}{3} = \frac{x+6}{3}$$

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

$$4 = \frac{1}{3}(-3) + b$$

$$4 = -1 + b$$

$$5 = b$$

$$y = \frac{1}{3}x + 5$$

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

Question 32

32 Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(-3, 4)$.

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

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

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

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

Question 32

32 Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(-3, 4)$.

$$\begin{array}{l} 3y = x + 6 \\ \div 3 \quad \div 3 \\ \hline y = \frac{1}{3}x + 2 \end{array}$$

$(-3, 4)$

← substitute

$$4 = \frac{1}{3}(-3) + b$$
$$4 = -1 + b$$
$$+ 1 \quad + 1$$

$5 = b$

Score 1: The student found the correct slope and y -intercept, but did not write an equation.

Question 32

32 Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(-3, 4)$.

$$\frac{3y = x + 6}{3 \quad 3}$$

$$y = 3x + 2$$

~~$$y = 3x + 2$$~~

$$4 = 3(-3) + b$$

$$4 = -9 + b$$

+9 +9

$$13 = b$$

$$y = 3x + 13$$

Score 1: The student made an error when solving for y . The student wrote an appropriate equation.

Question 32

32 Write an equation of a line that is parallel to the line whose equation is $3y = x + 6$ and that passes through the point $(-3, 4)$.

$$\frac{3Y}{3} = \frac{x+6}{3}$$

$$Y = \frac{x}{3} + 2$$

$(-3, 4)$

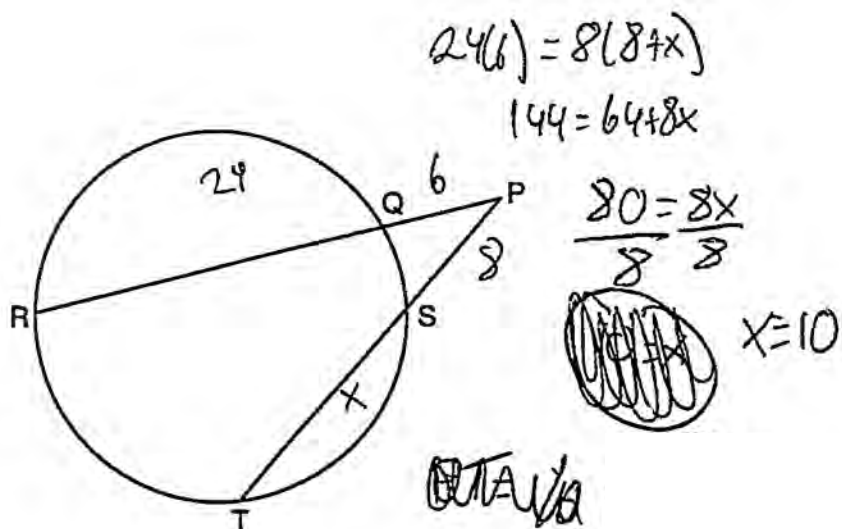
$$m = -3$$
$$b = 4$$

$$Y = -3x + 4$$

Score 0: The student used the wrong slope and made a conceptual error when finding the value of b .

Question 33

33 In the diagram below, secants \overline{PQR} and \overline{PST} are drawn to a circle from point P .



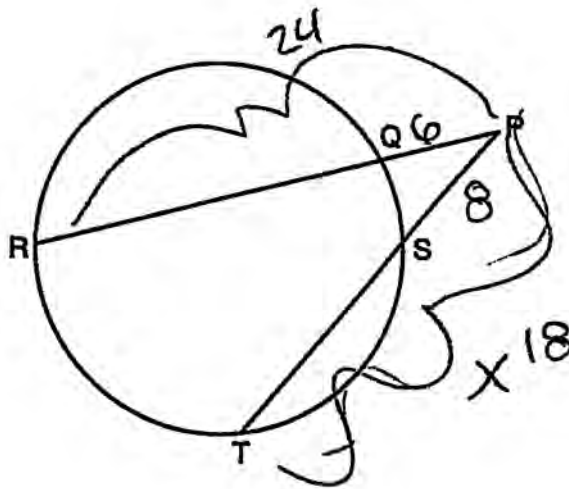
If $PR = 24$, $PQ = 6$, and $PS = 8$, determine and state the length of \overline{PT} .

PT = 18

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

Question 33

33 In the diagram below, secants \overline{PQR} and \overline{PST} are drawn to a circle from point P .



If $PR = 24$, $PQ = 6$, and $PS = 8$, determine and state the length of \overline{PT} .

$$(PR)(PQ) = (PT)(PS)$$
$$(24)(6) = (x)(8)$$

$$\frac{144}{8} = \frac{8x}{8}$$

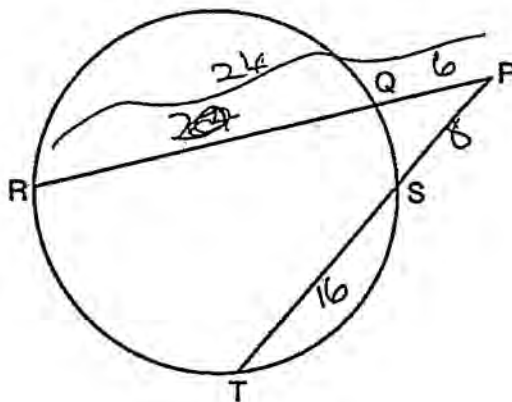
$$\boxed{x=18}$$

$$\overline{PT} = 18$$

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

Question 33

33 In the diagram below, secants \overline{PQR} and \overline{PST} are drawn to a circle from point P .



If $PR = 24$, $PQ = 6$, and $PS = 8$, determine and state the length of \overline{PT} .

~~(PR)~~

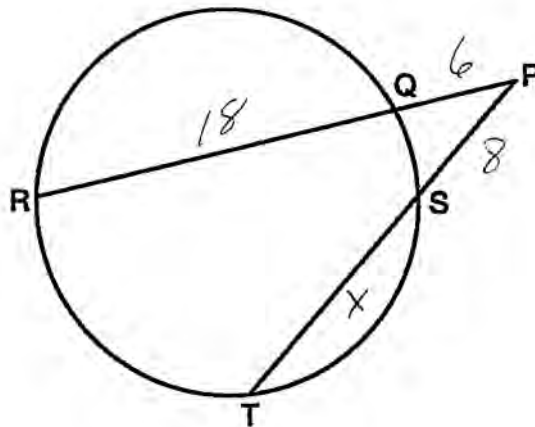
~~$(PQ)(QR) = (PS)(ST)$~~
 ~~$(6)(24) = (8)(x)$~~
 ~~$144 = 8x$~~
 ~~$18 = x$~~

$(PQ)(PR) = (PS)(PT)$
 $(6)(24) = (8)(x+8)$
 $144 = 16 + 8x$
 $-16 \quad -16$
 $128 = 8x$
 $\frac{128}{8} = \frac{8x}{8}$
 $16 = x$
 $16 + 8 = 24$
 $PT = 24$

Score 1: The student made a computational error when distributing 8. The student showed appropriate work to find a length for \overline{PT} .

Question 33

33 In the diagram below, secants \overline{PQR} and \overline{PST} are drawn to a circle from point P .



If $PR = 24$, $PQ = 6$, and $PS = 8$, determine and state the length of \overline{PT} .

$$6 \cdot 18 = 8 \cdot x$$

$$108 = 8x$$

$$13\frac{1}{2} = x$$

Score 0: The student made a conceptual error in finding the length of \overline{ST} , and did not find the length of \overline{PT} .

Question 34

34 The slope of \overline{QR} is $\frac{x-1}{4}$ and the slope of \overline{ST} is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of x .

$$\begin{array}{l} \overline{ST} = \frac{8}{3} \\ \overline{QR} = \frac{x-1}{4} \end{array} \quad \frac{8}{3} \perp \frac{-3}{8}$$

$$\frac{x-1}{4} \times \frac{-3}{8}$$

$$-12 = 8(x-1)$$

$$\begin{array}{r} -12 = 8x - 8 \\ +8 \quad \quad +8 \end{array}$$

$$\begin{array}{r} -4 = 8x \\ \frac{-4}{8} = \frac{8x}{8} \end{array}$$

$$x = -0.5$$

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

Question 34

34 The slope of \overline{QR} is $\frac{x-1}{4}$ and the slope of \overline{ST} is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of x .

The student's work shows the following steps:

$$\frac{x-1}{4} = \frac{8}{3}$$
$$3x - 3 = \frac{32}{3}$$
$$\frac{3x}{3} = \frac{35}{3}$$
$$x = 11.6667$$

The final answer $x = 11.6667$ is circled. The work indicates a conceptual error where the student set the slopes equal instead of using the negative reciprocal relationship for perpendicular lines.

Score 1: The student made a conceptual error by setting the slopes equal, but found an appropriate value of x .

Question 34

34 The slope of \overline{QR} is $\frac{x-1}{4}$ and the slope of \overline{ST} is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of x .

$$\frac{x-1}{4} = \frac{3}{8}$$

$$12 = 8(x-1)$$

$$12 = 8x - \cancel{8} \\ + 8 \quad + 8$$

$$\frac{20}{8} = \frac{8x}{8}$$

$$\boxed{x=2.5}$$

Score 1: The student made a conceptual error by using a slope of $\frac{3}{8}$, but found an appropriate value of x .

Question 34

34 The slope of \overline{QR} is $\frac{x-1}{4}$ and the slope of \overline{ST} is $\frac{8}{3}$. If $\overline{QR} \perp \overline{ST}$, determine and state the value of x .

The student's work is as follows:

$$\frac{x-1}{4} = \frac{3}{8}$$
$$6x - 8 = 12$$
$$\begin{array}{r} 6x - 8 = 12 \\ +8 \quad +8 \\ \hline 6x = 20 \\ \frac{6x}{6} = \frac{20}{6} \\ x = \frac{10}{3} \end{array}$$

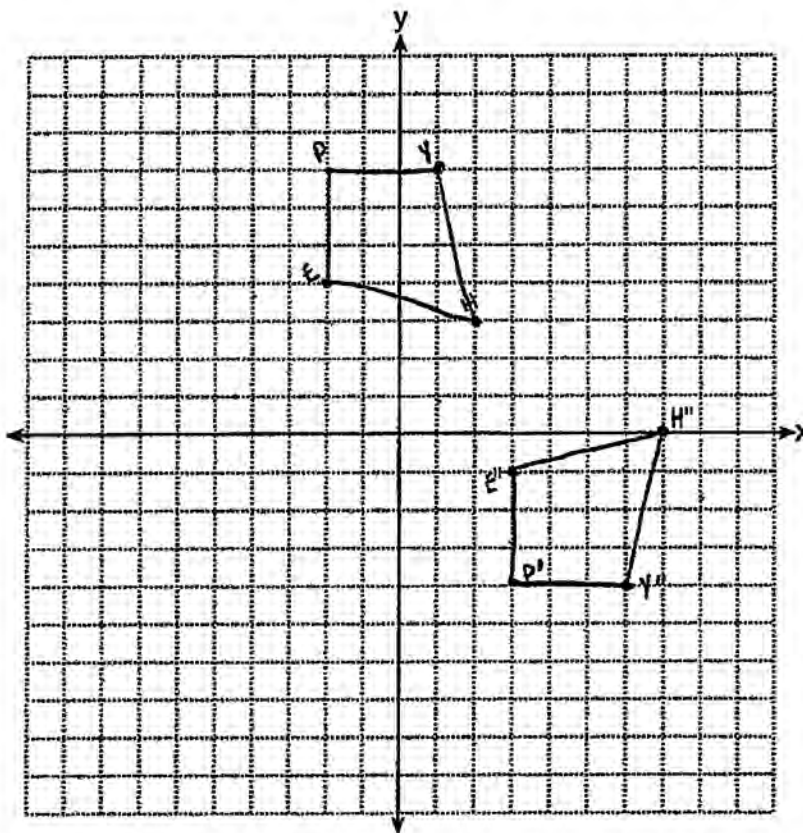
The final answer $x = \frac{10}{3}$ is circled.

Score 0: The student made a conceptual error by using a slope of $\frac{3}{8}$ and made two computational errors.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

| | | | |
|--------------|-----------|------------|------------|
| $H: 2, 3$ | $Y: 1, 7$ | $P: -2, 7$ | $E: -2, 4$ |
| $+5, -3$ | $+5, -3$ | $+5, -3$ | $+5, -3$ |
| $H' (7, 0)$ | $(6, 4)$ | $(3, 4)$ | $(3, 1)$ |
| $H'' (7, 0)$ | $(6, -4)$ | $(3, -4)$ | $(3, -1)$ |



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

Question 35

35 Quadrilateral *HYPE* has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

$$H' = (7, 0)$$

$$Y' = (6, 4)$$

$$P' = (3, 4)$$

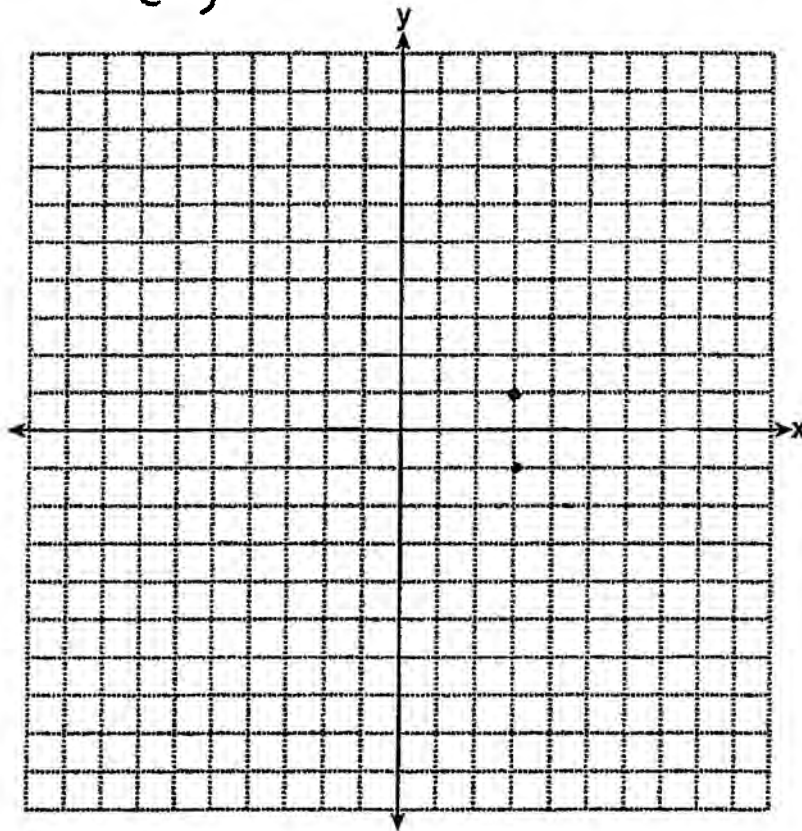
$$E' = (3, 1)$$

$$H'' = (7, 0)$$

$$Y'' = (6, -4)$$

$$P'' = (3, -4)$$

$$E'' = (3, -1)$$

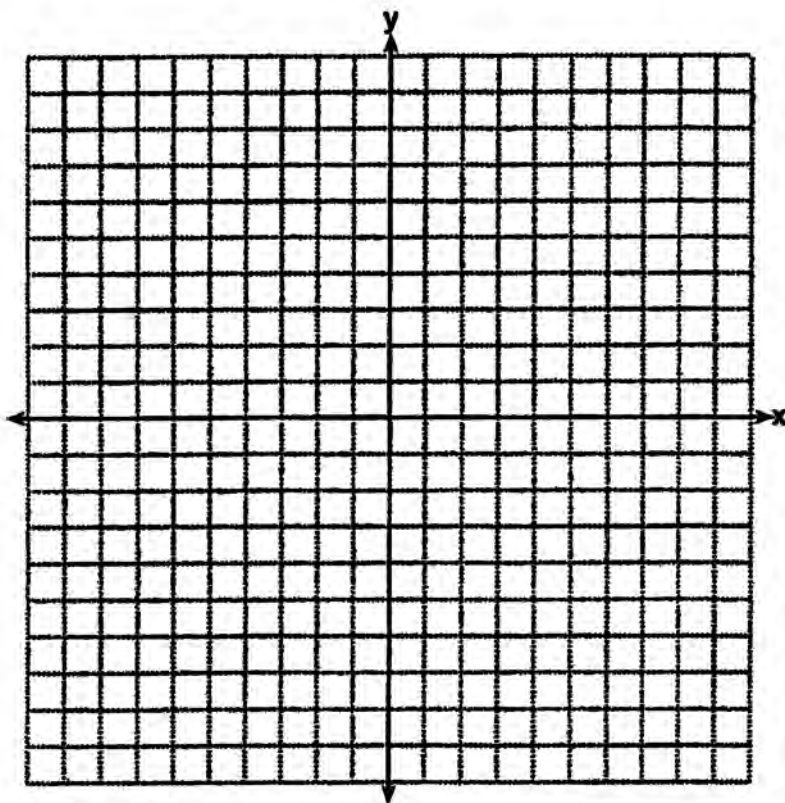


Score 4: The student has a complete and correct response. The student showed the middle step in mapping *HYPE* onto $H''Y''P''E''$. The correct coordinates were stated.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

| | | | | |
|-----------|--------------------------|---------|---------------------|----------|
| $H(2,3)$ | | $(7,0)$ | | $(7,0)$ |
| $Y(1,7)$ | $\xrightarrow{T_{5,-3}}$ | $(6,4)$ | $\xrightarrow{r_x}$ | $(6,-4)$ |
| $P(-2,7)$ | | $(3,4)$ | | $(3,-4)$ |
| $E(-2,4)$ | | $(3,1)$ | | $(3,-1)$ |

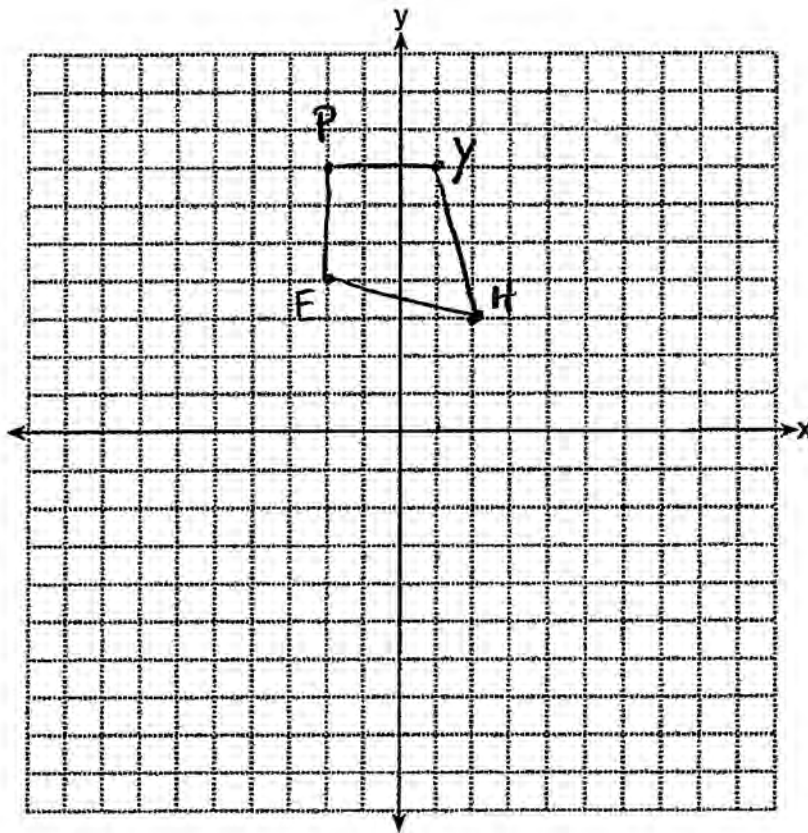


Score 4: The student showed the minimum amount of work to receive full credit.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

$T_{5,-3}$
 $H'(7,0)$ $Y'(6,4)$ $P'(3,4)$ $E'(3,-1)$
 $r_{x\text{-axis}}$
 $H''(7,0)$ $Y''(6,-4)$ $P''(3,-4)$ $E''(3,1)$

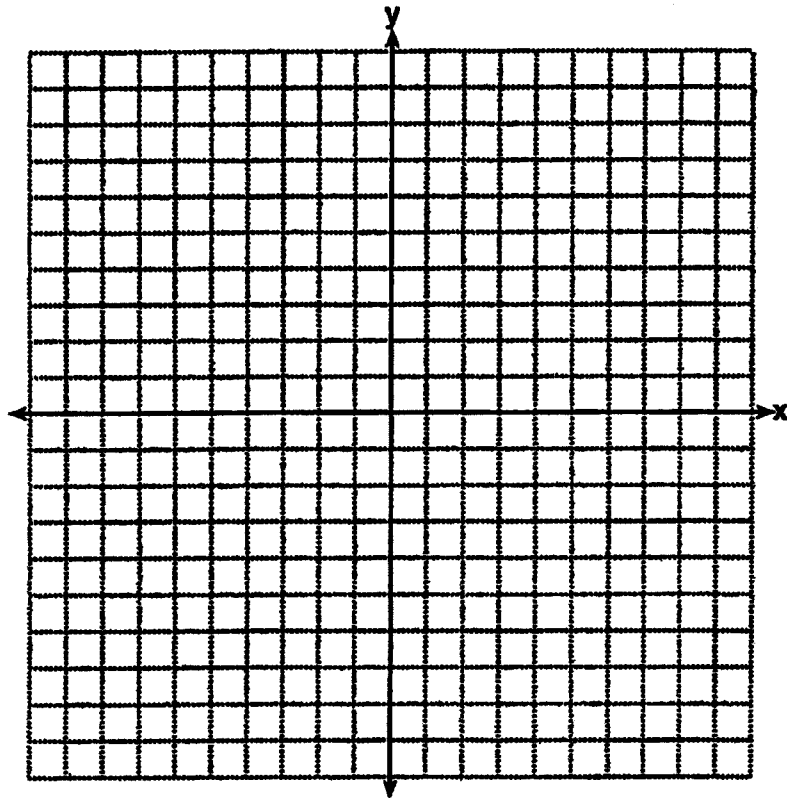


Score 3: The student made a computational error in finding the coordinates for E' . Appropriate coordinates for $H''Y''P''E''$ were stated.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

$H(2,3) H'(7,0) H''(0,7)$
 $Y(1,7) Y'(6,4) Y''(4,6)$
 $P(-2,7) P'(3,4) P''(4,3)$
 $E(-2,4) E'(3,1) E''(1,3)$



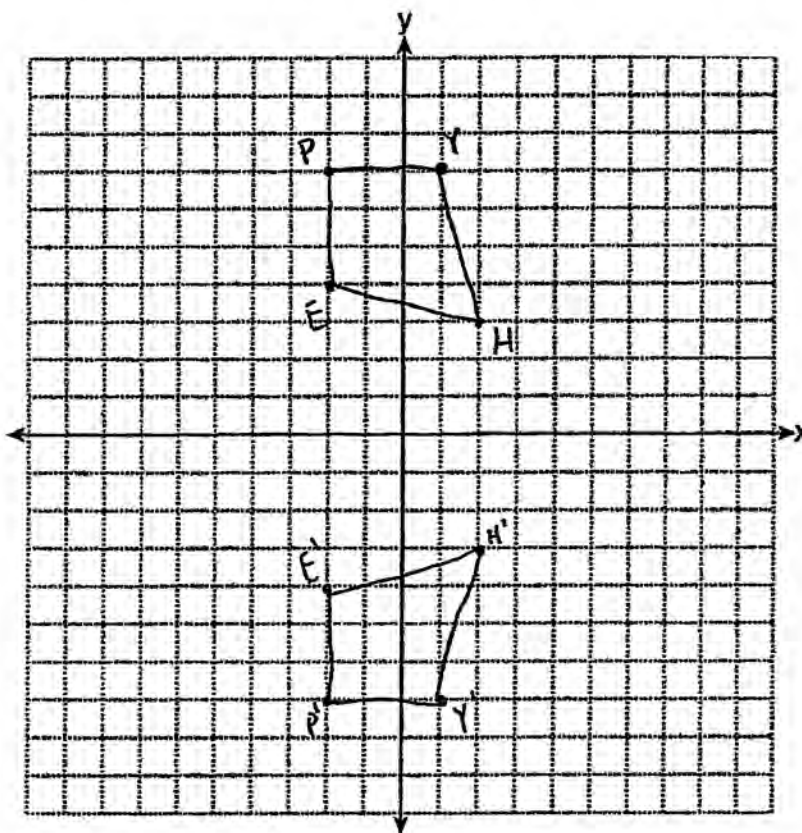
Score 2: The student stated the correct coordinates of $H'Y'P'E'$, but made a conceptual error in finding $H''Y''P''E''$.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

$$H' (2, -3) \quad Y' (1, -7) \quad P' (-2, -7) \quad E' (-2, -4)$$

$$H'' (7, -6) \quad Y'' (6, -10) \quad P'' (3, -10) \quad E'' (3, -7)$$



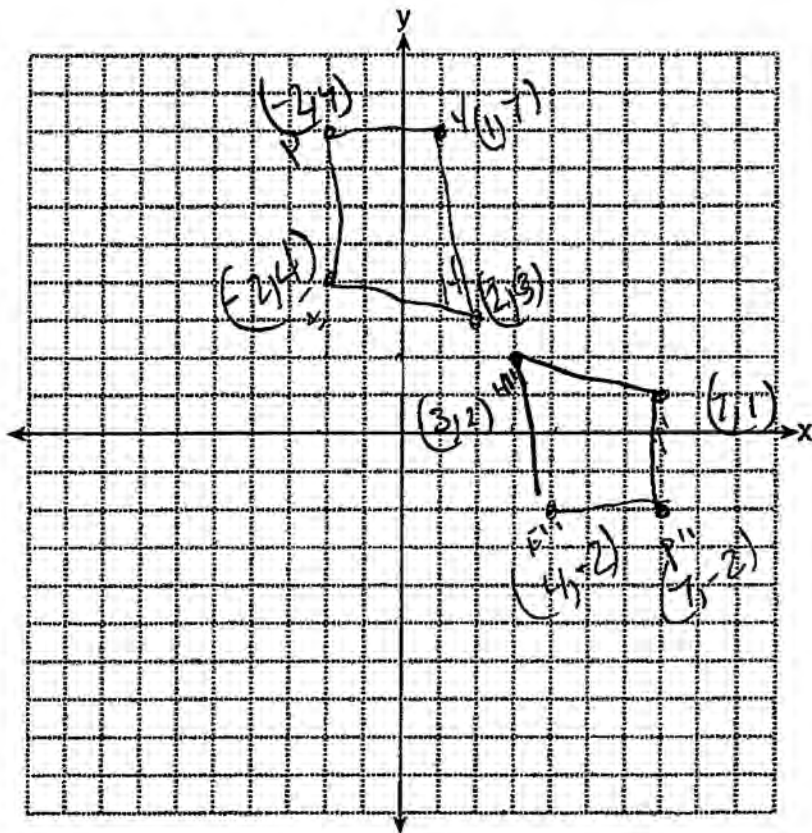
Score 2: The student made a conceptual error by performing the reflection before the translation.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

$\begin{matrix} 2, 3 \\ +5, -3 \\ H' 7, 0 \end{matrix}$
 $\begin{matrix} Y 1, 7 \\ +5, -3 \\ Y' 6, 4 \end{matrix}$
 $\begin{matrix} P -2, 7 \\ +5, -3 \\ P' 3, 4 \\ E -2, 4 \\ +5, -3 \\ E' 3, 1 \end{matrix}$

$H'' 3, 2$ $Y'' 7, 1$ $P'' 7, -2$ $E'' 4, -2$

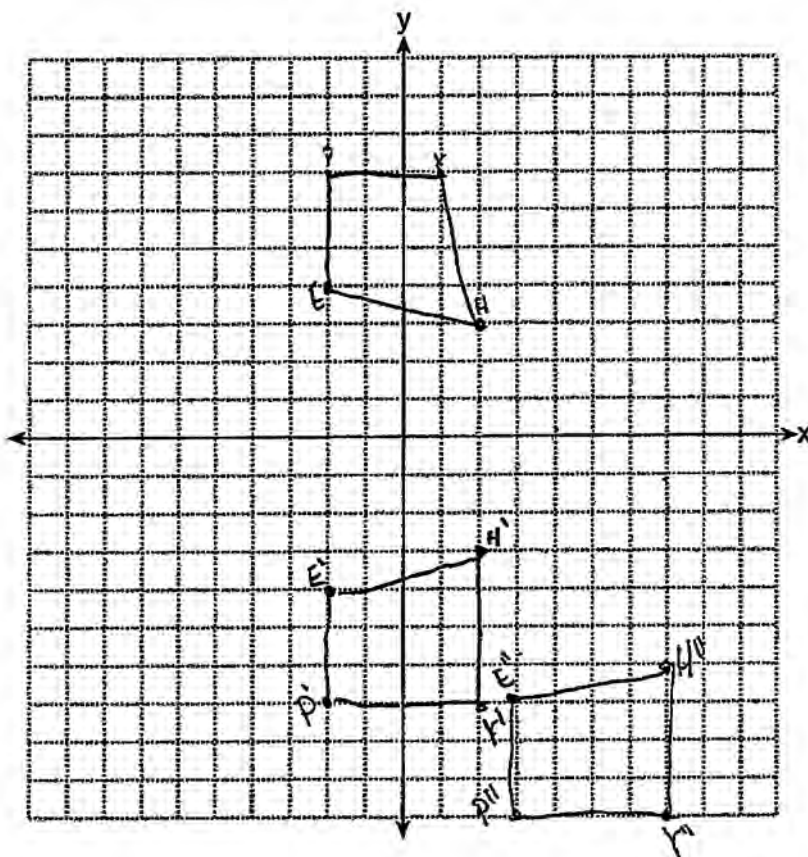


Score 1: The student stated appropriate coordinates for $H'Y'P'E'$, but the parentheses are missing. No further correct work is shown.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

$$H''(7,-6) \quad Y''(7,-10) \quad P''(3,-10) \quad E''(3,-7)$$

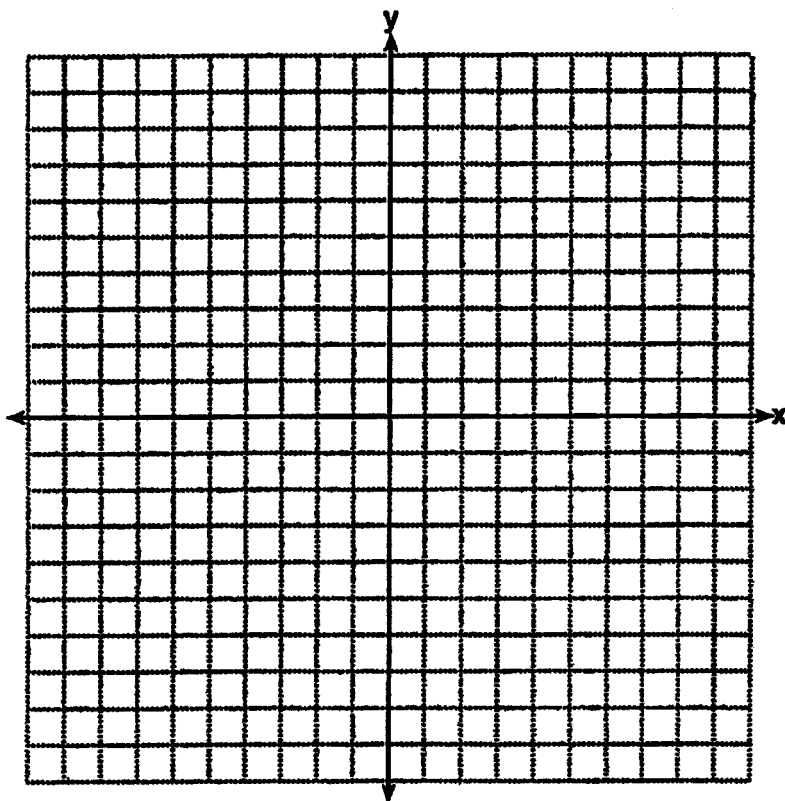


Score 1: The student made a conceptual error by performing the reflection before the translation and graphed Y'' incorrectly. Appropriate coordinates were stated.

Question 35

35 Quadrilateral $HYPE$ has vertices $H(2,3)$, $Y(1,7)$, $P(-2,7)$, and $E(-2,4)$. State and label the coordinates of the vertices of $H''Y''P''E''$ after the composition of transformations $r_{x\text{-axis}} \circ T_{5,-3}$. [The use of the set of axes below is optional.]

$H(2,3)$ $Y(1,7)$ $P(-2,7)$ $E(-2,4)$
 $H'(10,-9)$ $Y'(5,-2)$ $P'(-10,-2)$ $E'(-10,-12)$



Score 0: The student had a completely incorrect response.

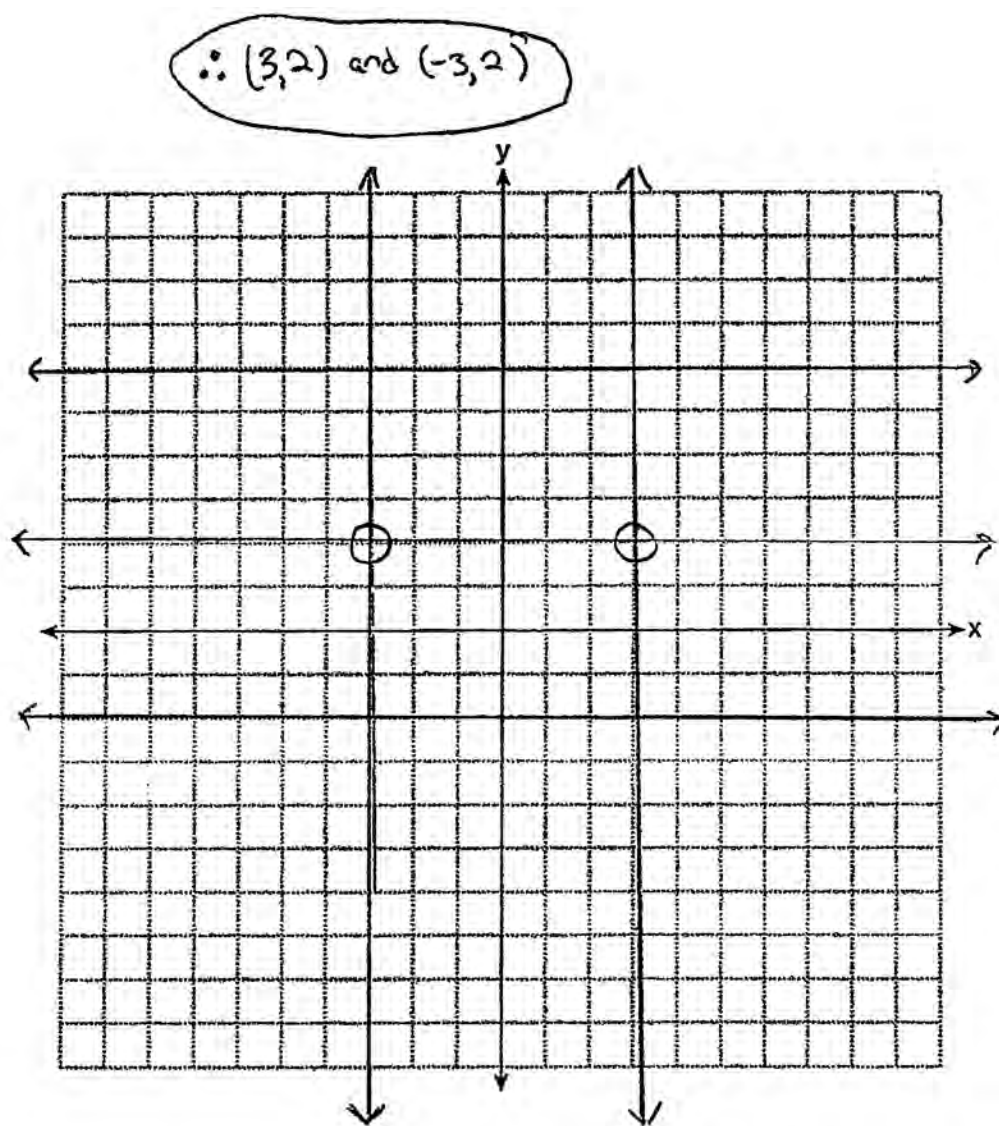
Question 36

36 On the set of axes below, graph two horizontal lines whose y -intercepts are $(0, -2)$ and $(0, 6)$, respectively.

Graph the locus of points equidistant from these horizontal lines.

Graph the locus of points 3 units from the y -axis.

State the coordinates of the points that satisfy both loci.



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

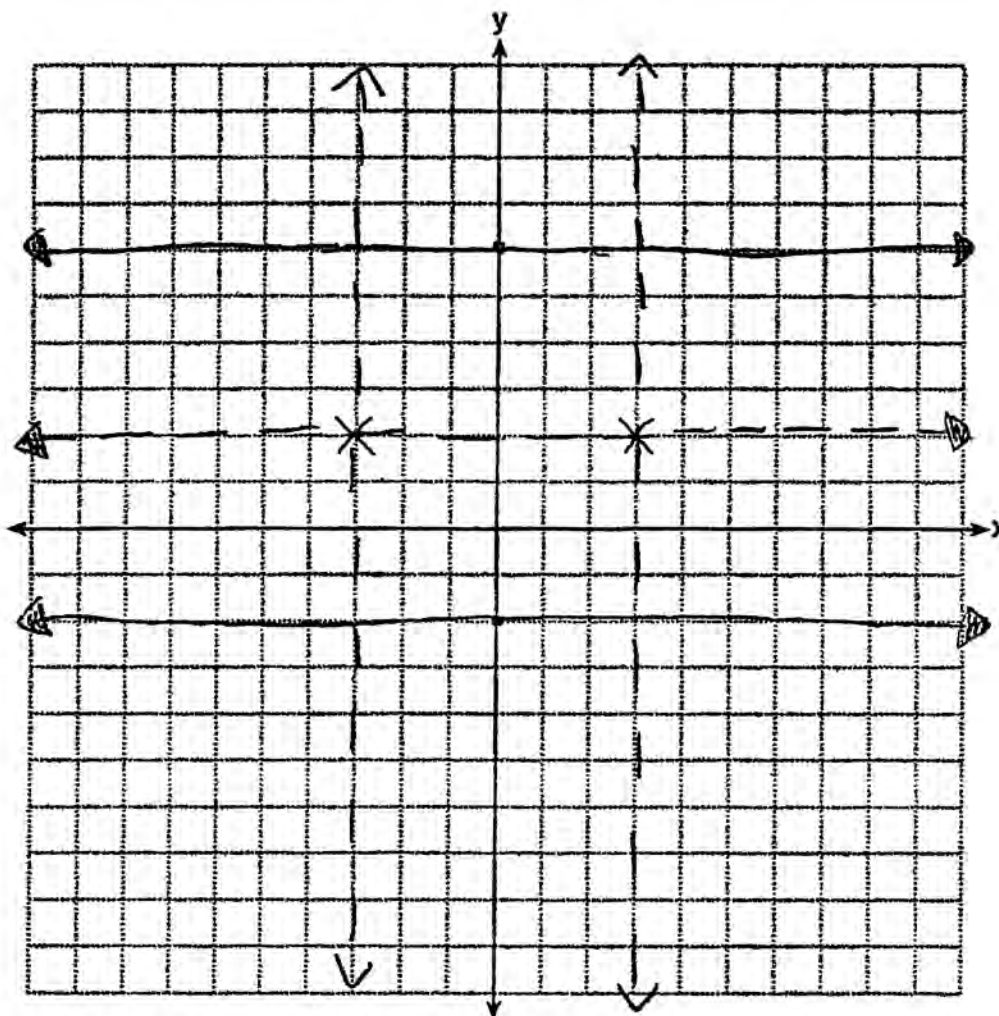
Question 36

36 On the set of axes below, graph two horizontal lines whose y -intercepts are $(0, -2)$ and $(0, 6)$, respectively.

Graph the locus of points equidistant from these horizontal lines.

Graph the locus of points 3 units from the y -axis.

State the coordinates of the points that satisfy both loci.



Score 3: The student graphed both loci correctly and labeled points that satisfied both with an **X**, but the coordinates were not stated.

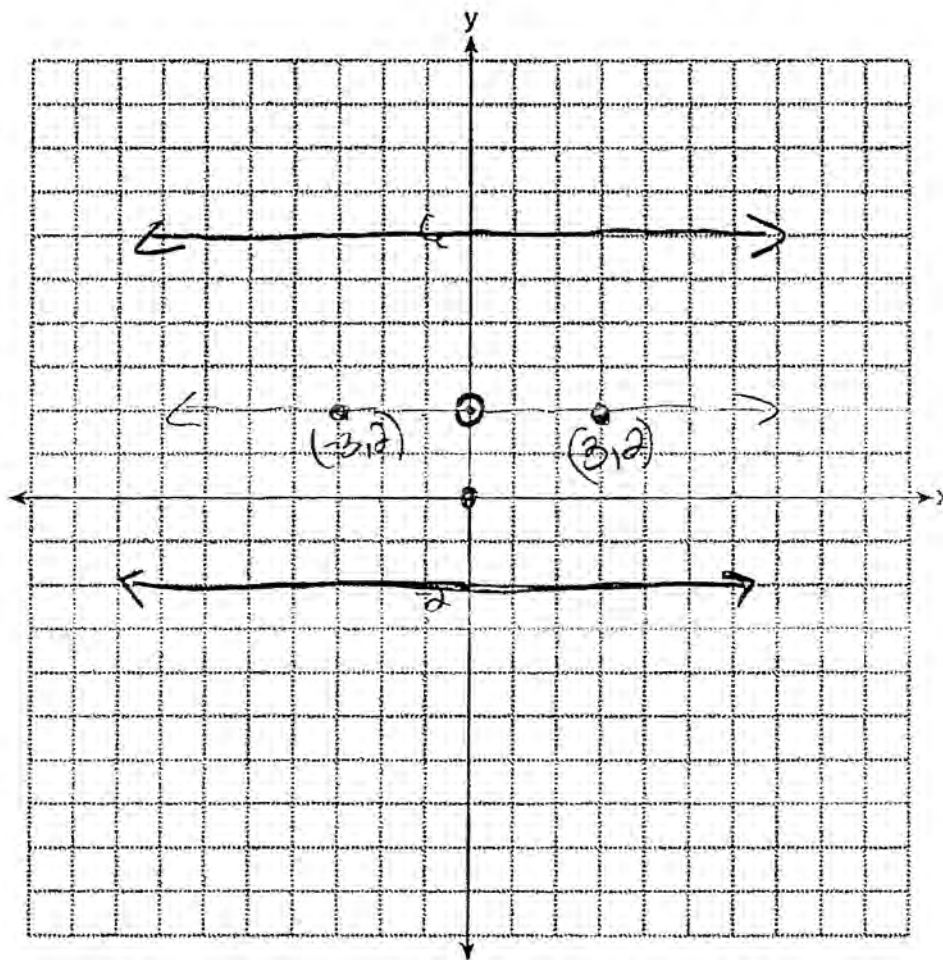
Question 36

36 On the set of axes below, graph two horizontal lines whose y -intercepts are $(0, -2)$ and $(0, 6)$, respectively.

Graph the locus of points equidistant from these horizontal lines.

Graph the locus of points 3 units from the y -axis.

State the coordinates of the points that satisfy both loci.



Score 2: The student graphed one locus correctly and appropriate points were stated.

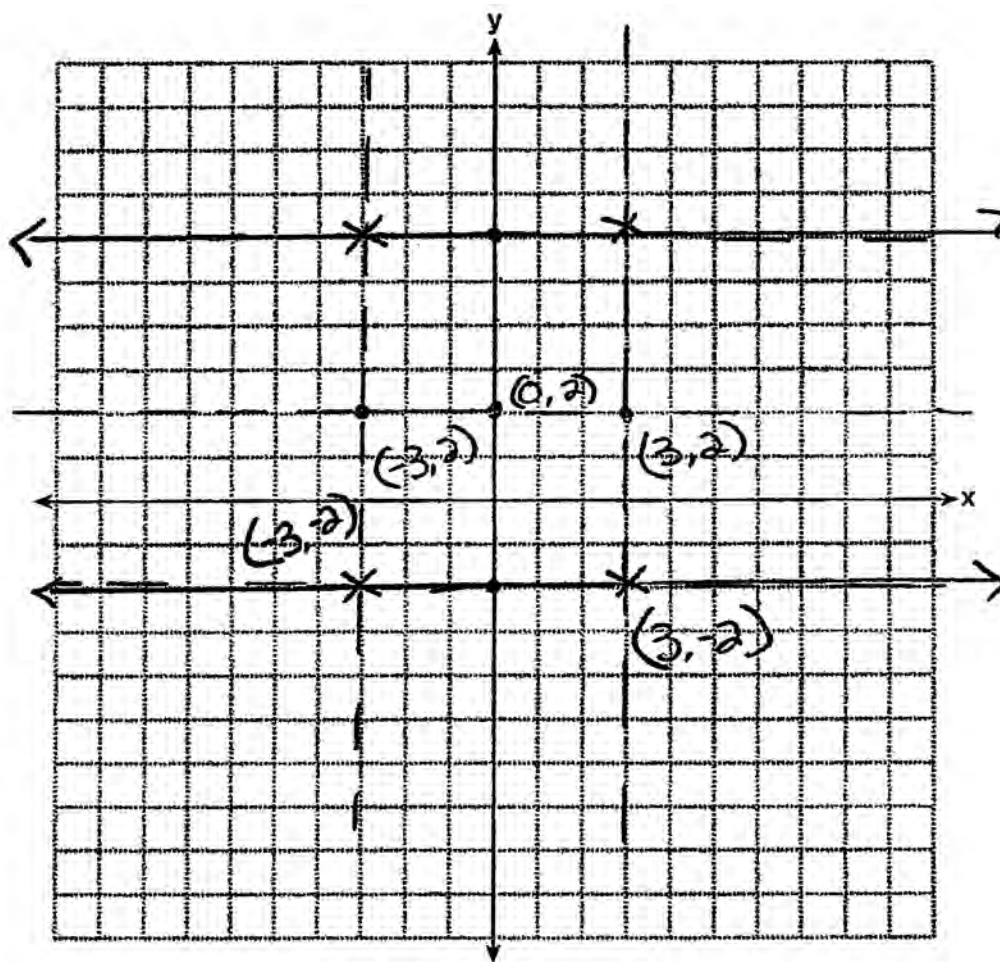
Question 36

36 On the set of axes below, graph two horizontal lines whose y -intercepts are $(0, -2)$ and $(0, 6)$, respectively.

Graph the locus of points equidistant from these horizontal lines.

Graph the locus of points 3 units from the y -axis.

State the coordinates of the points that satisfy both loci.



Score 2: The student graphed both loci correctly, but the coordinates of more than two points were stated.

Question 36

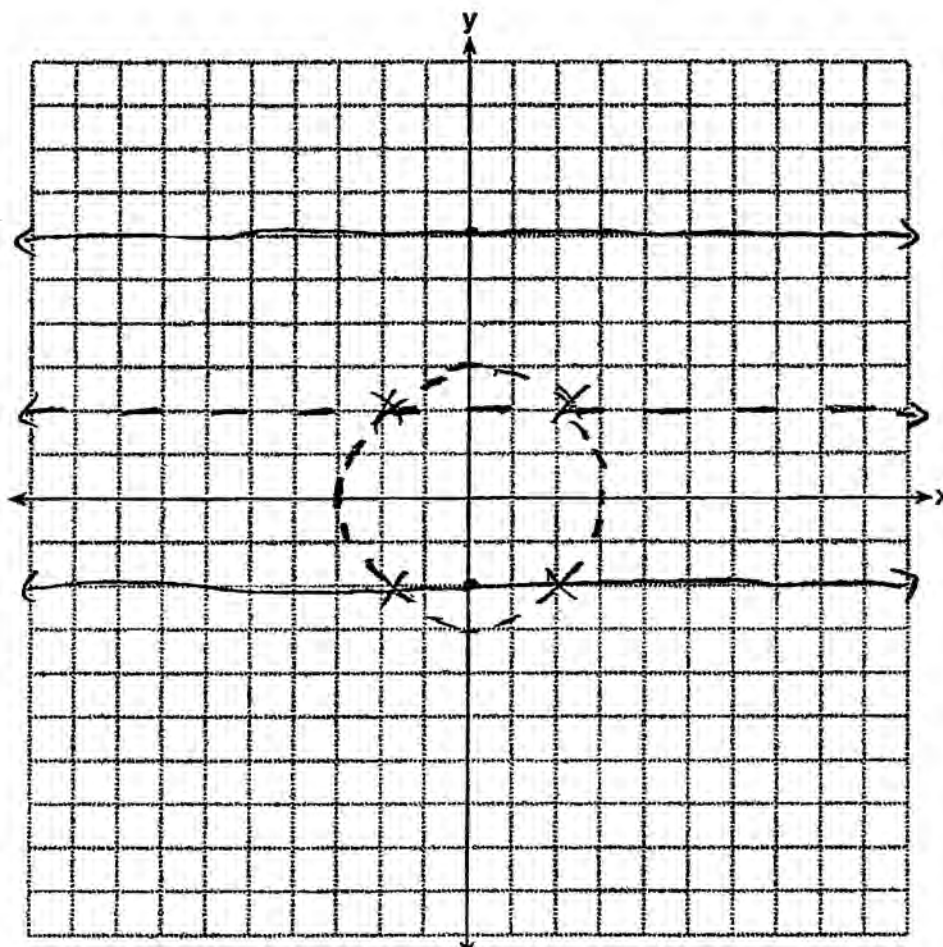
36 On the set of axes below, graph two horizontal lines whose y -intercepts are $(0, -2)$ and $(0, 6)$, respectively.

Graph the locus of points equidistant from these horizontal lines.

Graph the locus of points 3 units from the y -axis.

State the coordinates of the points that satisfy both loci.

$(-2, 2) (2, 2) (-2, -2) (2, -2)$



Score 1: The student graphed only one locus correctly.

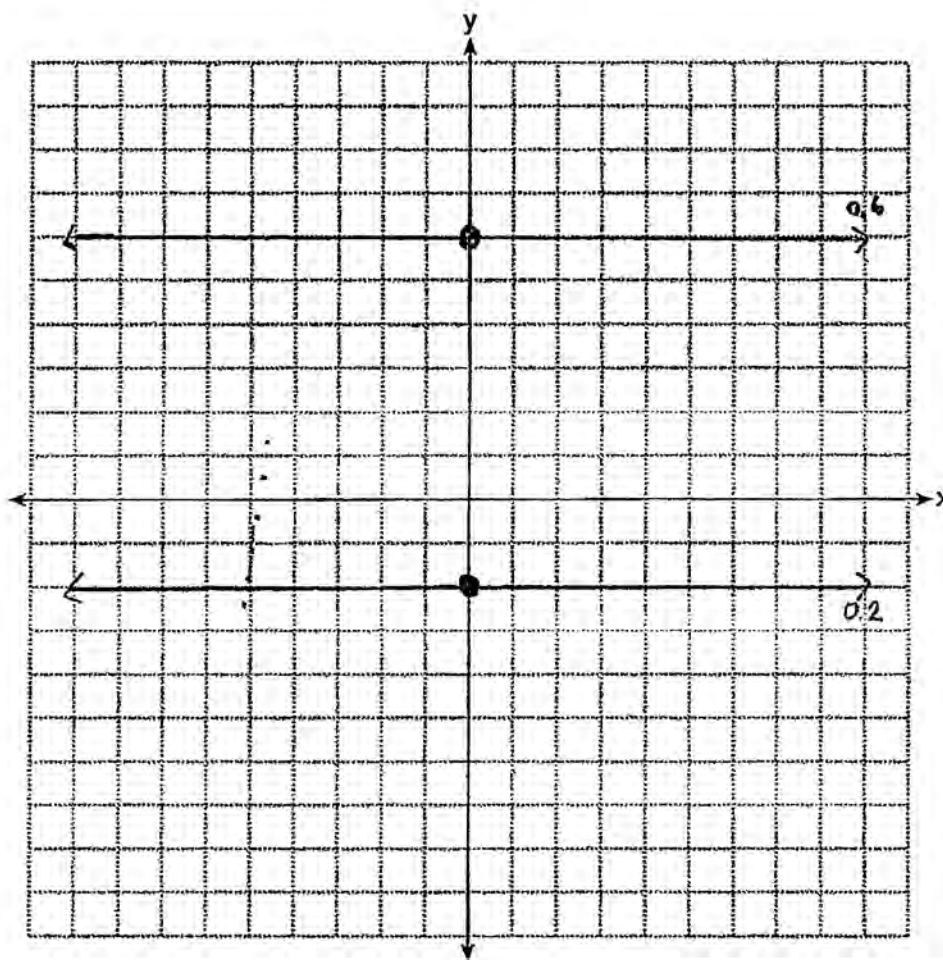
Question 36

36 On the set of axes below, graph two horizontal lines whose y -intercepts are $(0, -2)$ and $(0, 6)$, respectively.

Graph the locus of points equidistant from these horizontal lines.

Graph the locus of points 3 units from the y -axis.

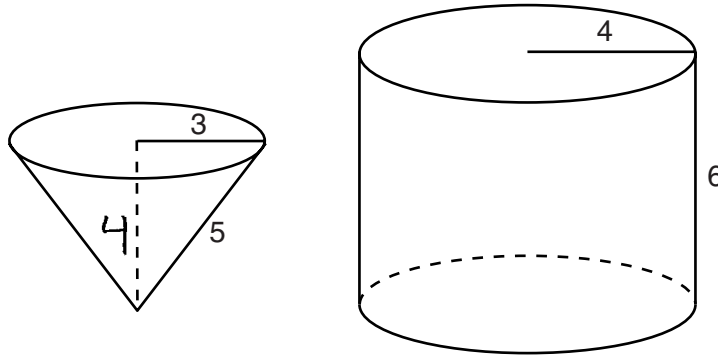
State the coordinates of the points that satisfy both loci.



Score 0: The student only graphed the two horizontal lines correctly.

Question 37

37 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches.



Determine and state the number of full cones of water needed to completely fill the cylinder with water.

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

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

$$V = \frac{1}{3} (\pi 3^2) 4$$

$$V = \frac{1}{3} (36\pi)$$

$$V = 12\pi$$

$$3^2 + b^2 = 5^2$$

$$9 + b^2 = 25$$

$$-9 \quad -9$$

$$\hline \sqrt{16}$$

$$b = 4$$

$$V = Bh$$

$$V = \pi r^2 (h)$$

$$V = \pi 4^2 (6)$$

$$V = 96\pi$$

$$12\pi \overline{) 96\pi}$$

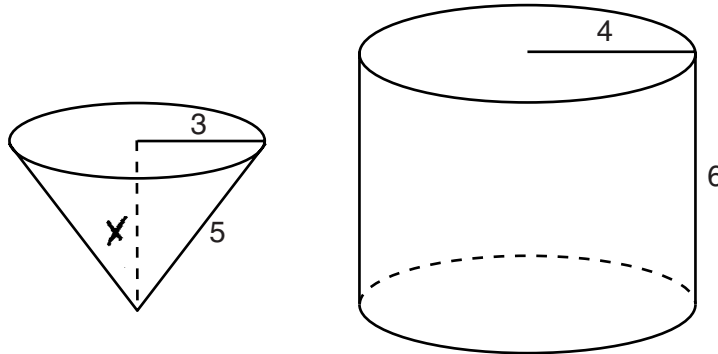
$$\underline{8}$$

8 Cones

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

Question 37

37 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches.



Determine and state the number of full cones of water needed to completely fill the cylinder with water.

$$\begin{aligned}3^2 + x^2 &= 5^2 \\9 + x^2 &= 25 \\x^2 &= 16 \\x &= 4\end{aligned}$$

$$\begin{aligned}V &= \frac{1}{3} Bh \\V &= \frac{1}{3} \cdot \pi \cdot 3^2 \cdot 4 \\V &= 37.6\end{aligned}$$

$$\begin{aligned}V &= Bh \\V &= \pi \cdot 4^2 \cdot 6 \\V &= 301.6\end{aligned}$$

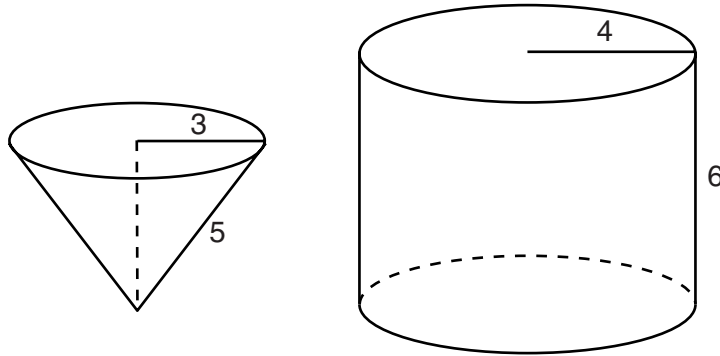
$$\frac{301.6}{37.6} = 8.02$$

9 cups

Score 3: The student made a rounding error when finding the volume of the cone. An appropriate answer was stated.

Question 37

37 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches.



Determine and state the number of full cones of water needed to completely fill the cylinder with water.

$$V = \pi r^2 \cdot h$$

$$V = \pi 4^2 \cdot 6$$

$$V = 96\pi$$

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

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

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

$$V = 15\pi$$

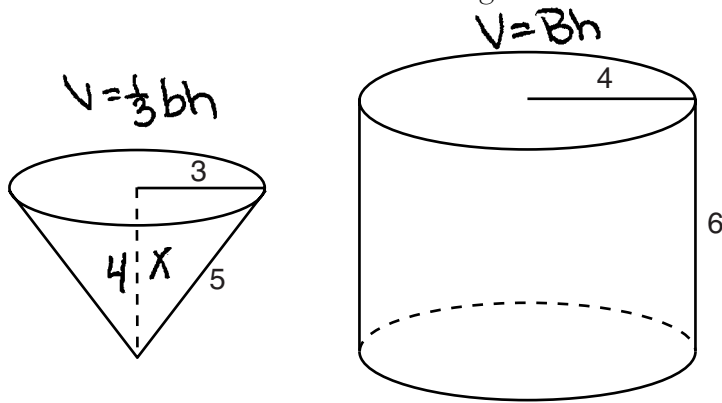
$$\frac{96}{15} = 6.4$$

7 cones of water

Score 2: The student made a conceptual error using 5 for the height when finding the volume of the cone. An appropriate solution was stated.

Question 37

37 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches.



Determine and state the number of full cones of water needed to completely fill the cylinder with water.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 3^2 + x^2 &= 5^2 \\ 9 + x^2 &= 25 \\ -9 & \quad -9 \\ \hline \sqrt{x^2} &= \sqrt{16} \\ x &= 4 \end{aligned}$$

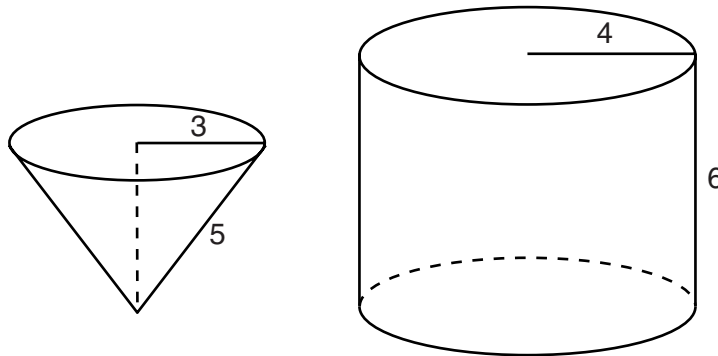
$$\begin{aligned} V &= \frac{1}{3}bh \\ V &= \frac{1}{3}(4)(4) \\ V &= 8 \end{aligned}$$

$$\begin{aligned} V &= Bh \\ V &= (8)(6) \\ V &= 48 \text{ in} \end{aligned}$$

Score 1: The student showed appropriate work to find 4. No further correct work is shown.

Question 37

37 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches.



Determine and state the number of full cones of water needed to completely fill the cylinder with water.

$$\begin{aligned} \text{Cone: } V &= \frac{1}{3} B h \\ &= \frac{1}{3} \pi (4)^2 \cdot 6 \\ &= \frac{1}{3} \pi (16) \cdot 6 \\ &= \frac{1}{3} \pi 22 \\ \text{one cone} &\approx 7.3 \pi \text{ in}^3 \\ \text{one cone} &\approx 23 \text{ in}^3 \end{aligned}$$

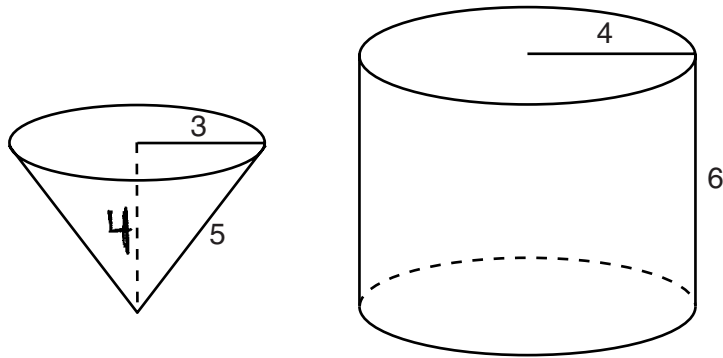
$$\begin{aligned} \text{Cylinder: } V &= B h \\ &= \pi r^2 h \\ &= \pi (3)^2 (5) \\ &= \pi 45 \\ \text{one cylinder} &\approx 141 \text{ in}^3 \\ 141 \div 23 &\approx 6.1 \end{aligned}$$

\therefore 7 full cones of water are needed to fill the cylinder with water completely

Score 0: The student made more than one conceptual error.

Question 37

37 In the diagram below, a right circular cone with a radius of 3 inches has a slant height of 5 inches, and a right cylinder with a radius of 4 inches has a height of 6 inches.



Determine and state the number of full cones of water needed to completely fill the cylinder with water.

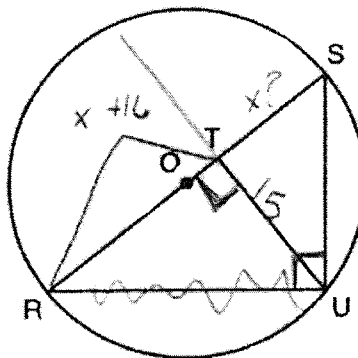
Score 0: The student stated 4, the height of the cone, but no work is shown.

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



15^2

~~$$\begin{array}{r} \dots = 30 \\ 2 \dots = 30 \\ \dots = 16 \\ \dots = 14 \\ \dots = x \end{array}$$~~

~~$$\frac{x+16}{15} \cdot \frac{15}{x}$$~~

~~$$x^2 + 16x = 225$$~~

~~$$x^2 + 16x - 225 = 0$$~~

~~$$(x + 25)(x - 9)$$~~

~~$$x = -25 \quad x = 9$$~~

$$TS = 9$$

$$RU = 5\sqrt{34}$$

~~$$\begin{aligned} a^2 + b^2 &= c^2 \\ 15^2 + 23^2 &= c^2 \\ 225 + 529 &= c^2 \\ \sqrt{754} &= c \end{aligned}$$~~

$$\begin{aligned} 25^2 + 15^2 &= c^2 \\ \sqrt{850} &= c \\ \sqrt{34 \cdot 25} &= c \end{aligned}$$

~~$$\sqrt{754}$$~~

$$5\sqrt{34}$$

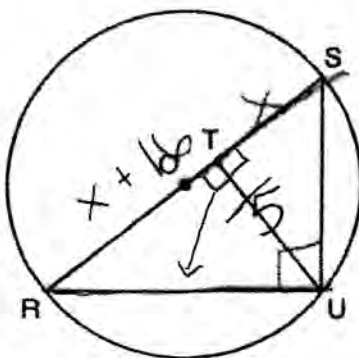
Score 6: The student has a complete and correct response.

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



$$\frac{15}{x+16} = \frac{x}{15}$$

$$x^2 + 16x = 225$$

$$x^2 + 16x - 225 = 0$$

$$(x+25)(x-9) = 0$$

$$x = \cancel{25} \quad \boxed{x = 9}$$

$$\overline{RT} = x + 16$$

$$\overline{RT} = 9 + 16$$

$$\overline{RT} = 25$$

$$25^2 + 15^2 = \overline{RU}^2$$

$$850 = \overline{RU}^2$$

$$\boxed{\sqrt{850} = \overline{RU}}$$

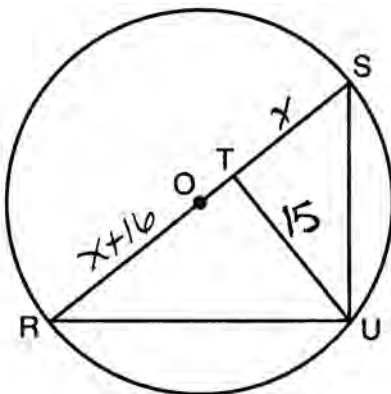
Score 5: The student showed appropriate work to find the lengths of \overline{TS} and \overline{RU} , but did not simplify the radical.

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



$$\frac{x+16}{15} = \frac{15}{x}$$

$$x^2 + 16x = 225$$

$$x^2 + 16x - 225 = 0$$

$$(x-9)(x+25) = 0$$

$$x-9 = 0$$

$$x+25 = 0$$

$$x = 9, TS$$

$$x = -25$$

$$x+16 = 25, RT$$

$$x+x+16 = 36, RS$$

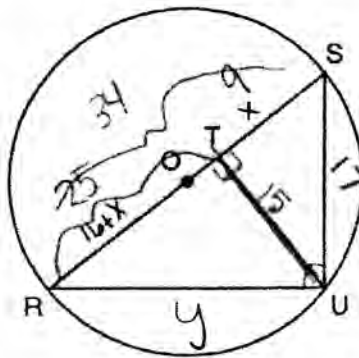
Score 4: The student showed appropriate work to find $TS = 9$ and $RT = 25$. No further correct work is shown.

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



$$\frac{LL}{SL} = \frac{15}{x} = \frac{16+x}{15}$$

$$225 = x^2 + 16x$$

$$x^2 + 16x - 225 = 0$$

$$(x+25)(x-9) = 0$$

$$\boxed{x=9} ; 25 \text{ reject}$$

$$225 = x^2 + 16$$

$$\frac{x}{15} = \frac{16+x}{15}$$

$$\frac{LL}{h} = \frac{25}{y} = \frac{4}{15}$$

$$\sqrt{y^2} = \sqrt{375}$$

$$RU = \sqrt{375}$$

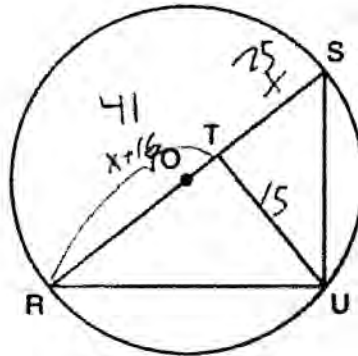
Score 3: The student made a conceptual error in finding the length of \overline{RU} , and the radical was not written in simplest radical form.

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



$$\frac{\text{proj}_1}{\text{alt}} = \frac{\text{alt}}{\text{proj}_2}$$

$$TS = 25$$

$$\frac{x}{15} = \frac{15}{x+16}$$

$$225 = x^2 + 16x$$

$$\begin{array}{r} 225 = x^2 + 16x \\ -225 \quad -225 \\ \hline \end{array}$$

$$15^2 + 41^2 = x^2$$

$$225 + 1681 = x^2$$

$$1906 = x^2$$

$$x = 43.65$$

$$x = \sqrt{43}$$

~~43~~
~~16~~

$$0 = x^2 + 16 - 225$$

$$(x + 9)(x - 25)$$

$$x = -9 \quad x = 25$$

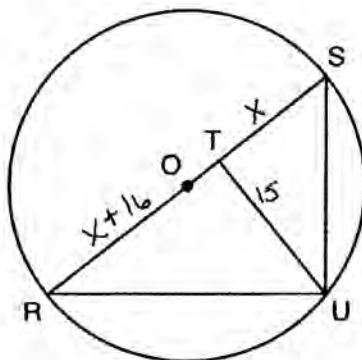
Score 3: The student made a factoring error in finding the length of \overline{TS} . The student made a conceptual error in finding the length of \overline{RU} .

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



$$\frac{x}{15} = \frac{15}{x+16}$$

$$x(x+16) = 225$$

$$x^2 + 16x - 225 = 0$$

$$(x \quad)(\quad) \quad ??$$

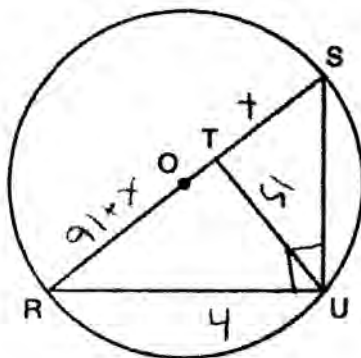
Score 2: The student wrote a correct quadratic equation. No further correct work is shown.

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

Find, in simplest radical form, the length of \overline{RU} .



$$\frac{x}{15} = \frac{15}{9+x}$$

$$(9+x)(x)$$

$$\frac{15}{x+16} = \frac{x}{15}$$

Score 1: The student wrote a correct proportion. No further correct work is shown.

Question 38

38 In the diagram below, right triangle RSU is inscribed in circle O , and \overline{UT} is the altitude drawn to hypotenuse \overline{RS} . The length of \overline{RT} is 16 more than the length of \overline{TS} and $TU = 15$.

Find the length of \overline{TS} .

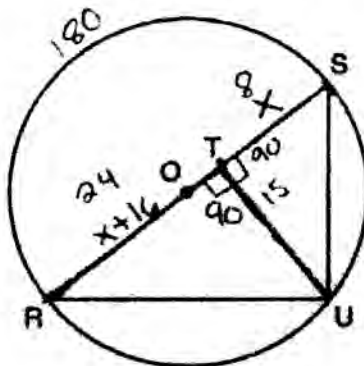
Find, in simplest radical form, the length of \overline{RU} .

$$x + 16 = x$$

$$-x - 16 = -x$$

$$\frac{2x + 16}{2} = \frac{2x}{2}$$

$$x = 8$$



$$\overline{TS} = 24$$

$$\overline{RU} = 18.73$$

$$24^2 + 15^2 =$$

$$576 + 225 = 351$$

Score 0: The student showed no relevant work.

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

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.