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

# GEOMETRY

**Wednesday,** January 23, 2019 — 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 35 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II, III,** and **IV** directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

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

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

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

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

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

## Part I

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

**Use this space for computations.**

**1** After a dilation with center (0,0), the image of $\overline{DB}$ is $\overline{D'B'}$. If $DB = 4.5$ and $D'B' = 18$, the scale factor of this dilation is

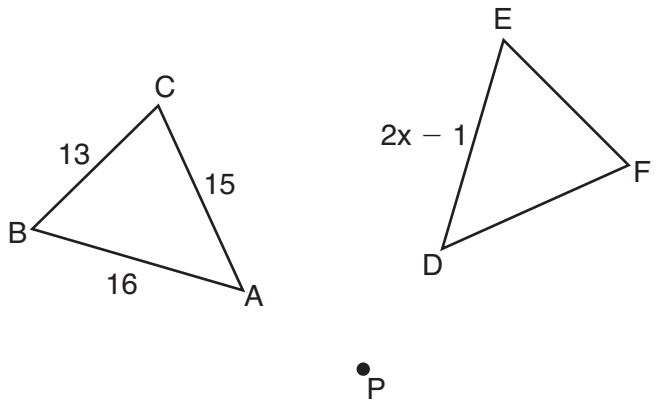
(1) $\frac{1}{5}$

(2) 5

(3) $\frac{1}{4}$

(4) 4

**2** In the diagram below, $\triangle ABC$ with sides of 13, 15, and 16, is mapped onto $\triangle DEF$ after a clockwise rotation of 90° about point $P$.




If $DE = 2x - 1$, what is the value of $x$?

(1) 7

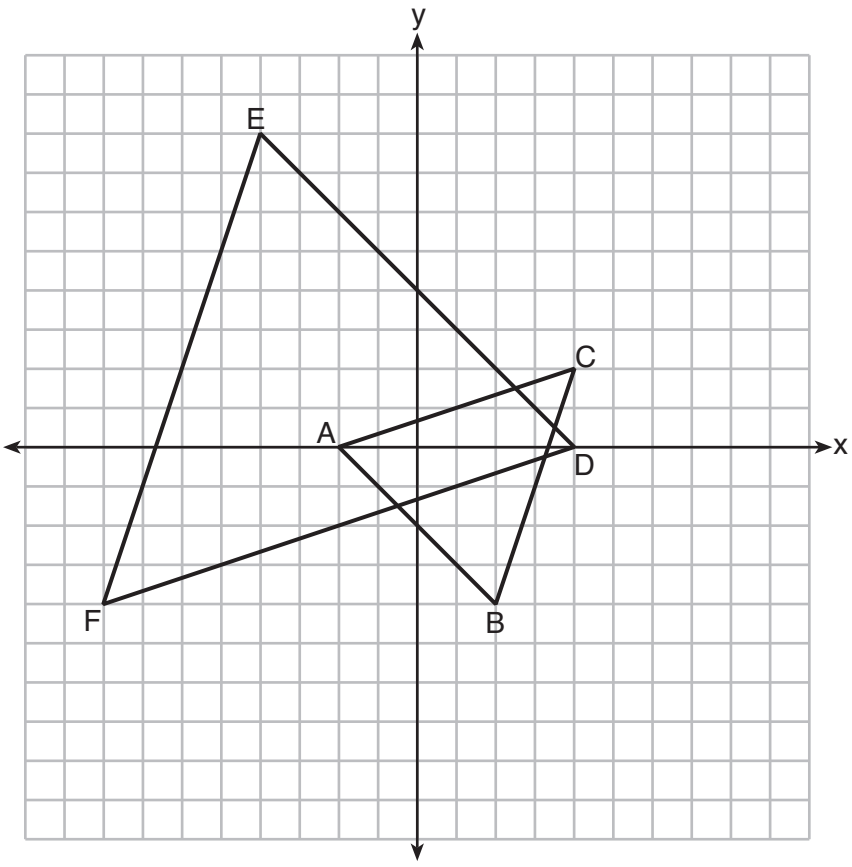
(2) 7.5

(3) 8

(4) 8.5

**Use this space for computations.**

**3** On the set of axes below, $\triangle ABC$ has vertices at $A(-2,0)$, $B(2,-4)$, $C(4,2)$, and $\triangle DEF$ has vertices at $D(4,0)$, $E(-4,8)$, $F(-8,-4)$.




Which sequence of transformations will map $\triangle ABC$ onto $\triangle DEF$?

(1) a dilation of $\triangle ABC$ by a scale factor of 2 centered at point $A$

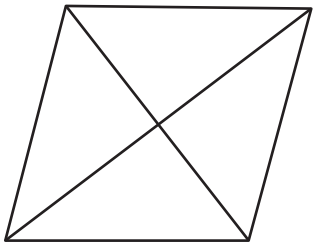
(2) a dilation of $\triangle ABC$ by a scale factor of $\frac{1}{2}$ centered at point $A$

(3) a dilation of $\triangle ABC$ by a scale factor of 2 centered at the origin, followed by a rotation of 180° about the origin

(4) a dilation of $\triangle ABC$ by a scale factor of $\frac{1}{2}$ centered at the origin, followed by a rotation of 180° about the origin

**Use this space for computations.**

**4** The figure below shows a rhombus with noncongruent diagonals.



Which transformation would *not* carry this rhombus onto itself?

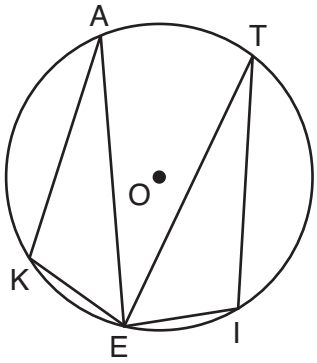
(1) a reflection over the shorter diagonal

(2) a reflection over the longer diagonal

(3) a clockwise rotation of 90° about the intersection of the diagonals

(4) a counterclockwise rotation of 180° about the intersection of the diagonals

**5** In the diagram below of circle $O$, points $K$, $A$, $T$, $I$, and $E$ are on the circle, $\triangle KAE$ and $\triangle ITE$ are drawn, $\overset{\frown}{KE} \cong \overset{\frown}{EI}$, and $\angle EKA \cong \angle EIT$.




Which statement about $\triangle KAE$ and $\triangle ITE$ is always true?

(1) They are neither congruent nor similar.

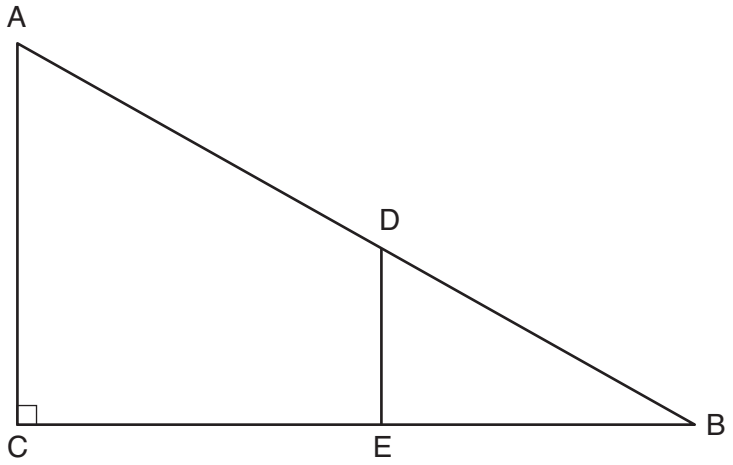
(2) They are similar but not congruent.

(3) They are right triangles.

(4) They are congruent.

**Use this space for computations.**

**6** In right triangle $ABC$ shown below, point $D$ is on $\overline{AB}$ and point $E$ is on $\overline{CB}$ such that $\overline{AC} \| \overline{DE}$.




If $AB = 15$, $BC = 12$, and $EC = 7$, what is the length of $\overline{BD}$?

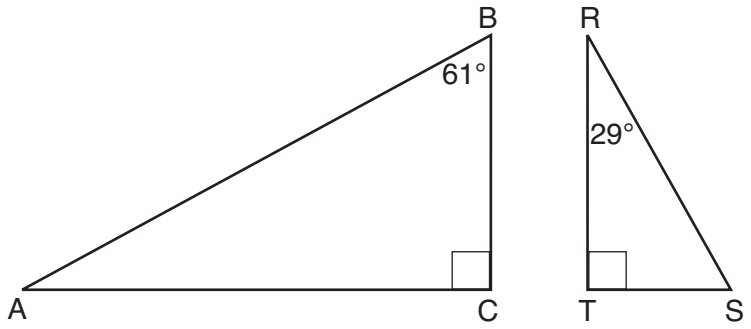
(1) 8.75
(2) 6.25
(3) 5
(4) 4

**7** In rhombus $VENU$, diagonals $\overline{VN}$ and $\overline{EU}$ intersect at $S$. If $VN = 12$ and $EU = 16$, what is the perimeter of the rhombus?

(1) 80
(2) 40
(3) 20
(4) 10

**Use this space for computations.**

**8** Given right triangle $ABC$ with a right angle at $C$, $m\angle B = 61°$. Given right triangle $RST$ with a right angle at $T$, $m\angle R = 29°$.




Which proportion in relation to $\triangle ABC$ and $\triangle RST$ is *not* correct?

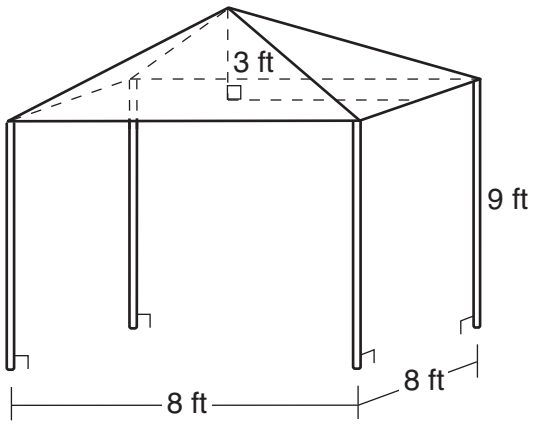
(1) $\frac{AB}{RS} = \frac{RT}{AC}$

(2) $\frac{BC}{ST} = \frac{AB}{RS}$

(3) $\frac{BC}{ST} = \frac{AC}{RT}$

(4) $\frac{AB}{AC} = \frac{RS}{RT}$

**9** A vendor is using an 8-ft by 8-ft tent for a craft fair. The legs of the tent are 9 ft tall and the top forms a square pyramid with a height of 3 ft.




What is the volume, in cubic feet, of space the tent occupies?

(1) 256

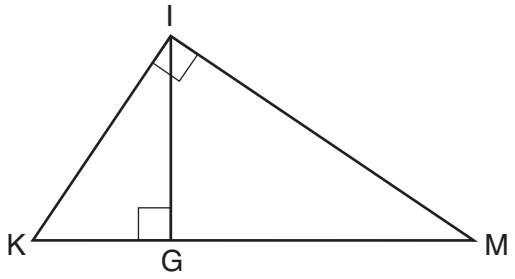
(2) 640

(3) 672

(4) 768

**Use this space for computations.**

**10** In the diagram below of right triangle $KMI$, altitude $\overline{IG}$ is drawn to hypotenuse $\overline{KM}$.




If $KG = 9$ and $IG = 12$, the length of $\overline{IM}$ is

(1) 15
(2) 16
(3) 20
(4) 25

**11** Which three-dimensional figure will result when a rectangle 6 inches long and 5 inches wide is continuously rotated about the longer side?

(1) a rectangular prism with a length of 6 inches, width of 6 inches, and height of 5 inches
(2) a rectangular prism with a length of 6 inches, width of 5 inches, and height of 5 inches
(3) a cylinder with a radius of 5 inches and a height of 6 inches
(4) a cylinder with a radius of 6 inches and a height of 5 inches

**12** Which statement about parallelograms is always true?

(1) The diagonals are congruent.
(2) The diagonals bisect each other.
(3) The diagonals are perpendicular.
(4) The diagonals bisect their respective angles.

**Use this space for computations.**

**13** From a point on the ground one-half mile from the base of a historic monument, the angle of elevation to its top is 11.87°. To the *nearest foot*, what is the height of the monument?

(1) 543
(2) 555
(3) 1086
(4) 1110

**14** The area of a sector of a circle with a radius measuring 15 cm is $75\pi$ cm$^2$. What is the measure of the central angle that forms the sector?

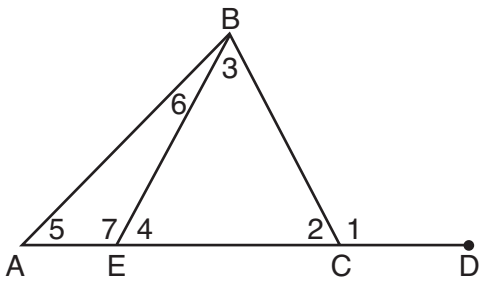
(1) 72°
(2) 120°
(3) 144°
(4) 180°

**15** Point $M$ divides $\overline{AB}$ so that $AM{:}MB = 1{:}2$. If $A$ has coordinates $(-1,-3)$ and $B$ has coordinates $(8,9)$, the coordinates of $M$ are

(1) $(2,1)$
(2) $\left(\frac{5}{3},0\right)$
(3) $(5,5)$
(4) $\left(\frac{23}{3},8\right)$

**Use this space for computations.**

**16** In the diagram below of triangle $ABC$, $\overline{AC}$ is extended through point $C$ to point $D$, and $\overline{BE}$ is drawn to $\overline{AC}$.




Which equation is always true?

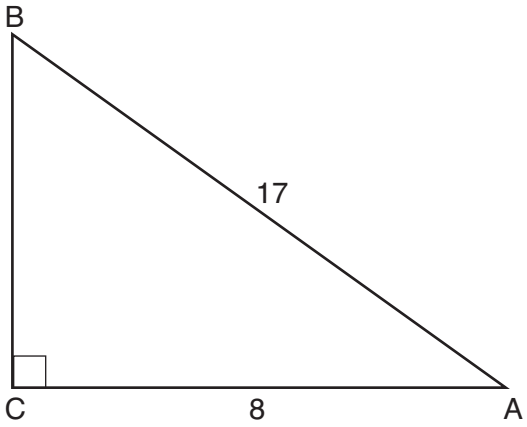
(1) $m\angle 1 = m\angle 3 + m\angle 2$

(2) $m\angle 5 = m\angle 3 - m\angle 2$

(3) $m\angle 6 = m\angle 3 - m\angle 2$

(4) $m\angle 7 = m\angle 3 + m\angle 2$

**17** In the diagram below of right triangle $ABC$, $AC = 8$, and $AB = 17$.




Which equation would determine the value of angle $A$?

(1) $\sin A = \frac{8}{17}$

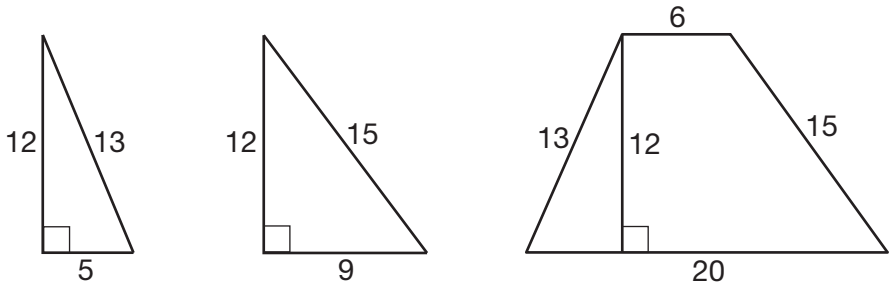
(2) $\tan A = \frac{8}{15}$

(3) $\cos A = \frac{15}{17}$

(4) $\tan A = \frac{15}{8}$

**Use this space for computations.**

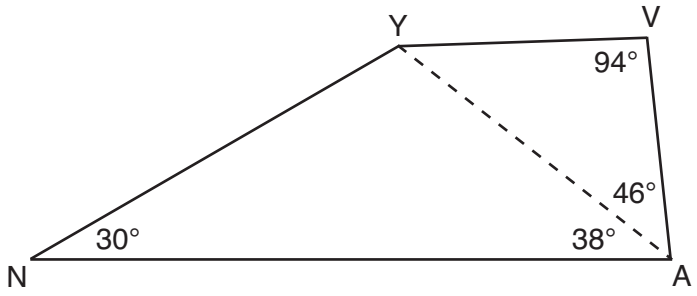
**18** Francisco needs the three pieces of glass shown below to complete a stained glass window. The shapes, two triangles and a trapezoid, are measured in inches.




Glass can be purchased in rectangular sheets that are 12 inches wide. What is the minimum length of a sheet of glass, in inches, that Francisco must purchase in order to have enough to complete the window?

(1) 20
(2) 25
(3) 29
(4) 34

**19** In the diagram of quadrilateral *NAVY* below, m$\angle YNA$ = 30°, m$\angle YAN$ = 38°, m$\angle AVY$ = 94°, and m$\angle VAY$ = 46°.




Which segment has the shortest length?

(1) $\overline{AY}$
(2) $\overline{NY}$
(3) $\overline{VA}$
(4) $\overline{VY}$

**Use this space for computations.**

**20** What is an equation of a circle whose center is (1,4) and diameter is 10?

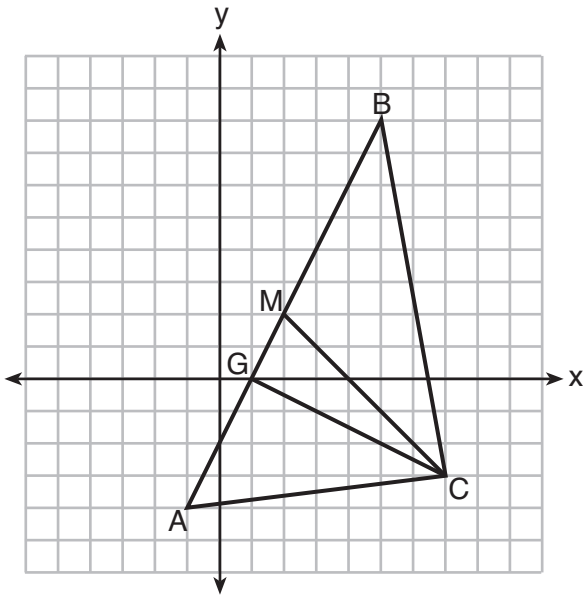
(1) $x^2 - 2x + y^2 - 8y = 8$

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

(3) $x^2 - 2x + y^2 - 8y = 83$

(4) $x^2 + 2x + y^2 + 8y = 83$

**21** On the set of axes below, $\triangle ABC$, altitude $\overline{CG}$, and median $\overline{CM}$ are drawn.




Which expression represents the area of $\triangle ABC$?

(1) $\frac{(BC)(AC)}{2}$

(2) $\frac{(GC)(BC)}{2}$

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

(4) $\frac{(GC)(AB)}{2}$

**22** In right triangle $ABC$, $m\angle C = 90°$ and $AC \neq BC$. Which trigonometric ratio is equivalent to sin $B$?

(1) cos $A$

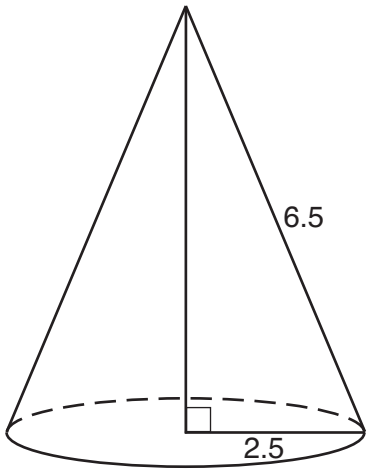
(2) cos $B$

(3) tan $A$

(4) tan $B$

**Use this space for computations.**

**23** As shown in the diagram below, the radius of a cone is 2.5 cm and its slant height is 6.5 cm.




How many cubic centimeters are in the volume of the cone?

(1) $12.5\pi$

(2) $13.5\pi$

(3) $30.0\pi$

(4) $37.5\pi$

**24** What is an equation of the image of the line $y = \frac{3}{2}x - 4$ after a dilation of a scale factor of $\frac{3}{4}$ centered at the origin?

(1) $y = \frac{9}{8}x - 4$

(2) $y = \frac{9}{8}x - 3$

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

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

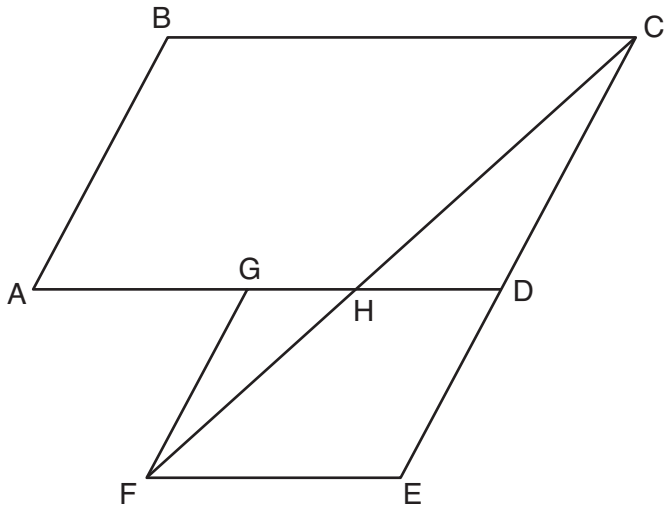
**GO RIGHT ON TO THE NEXT PAGE ➡**

## Part II

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

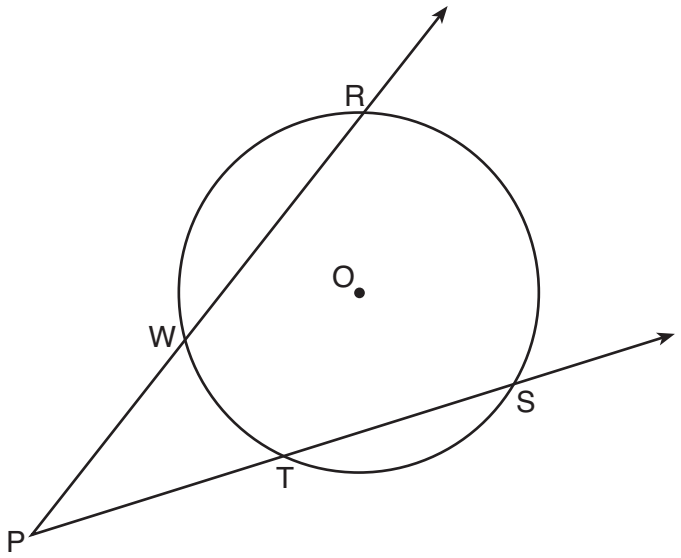
**25** Write an equation of the line that is parallel to the line whose equation is $3y + 7 = 2x$ and passes through the point (2,6).

**26** Parallelogram $ABCD$ is adjacent to rhombus $DEFG$, as shown below, and $\overline{FC}$ intersects $\overline{AGD}$ at $H$.



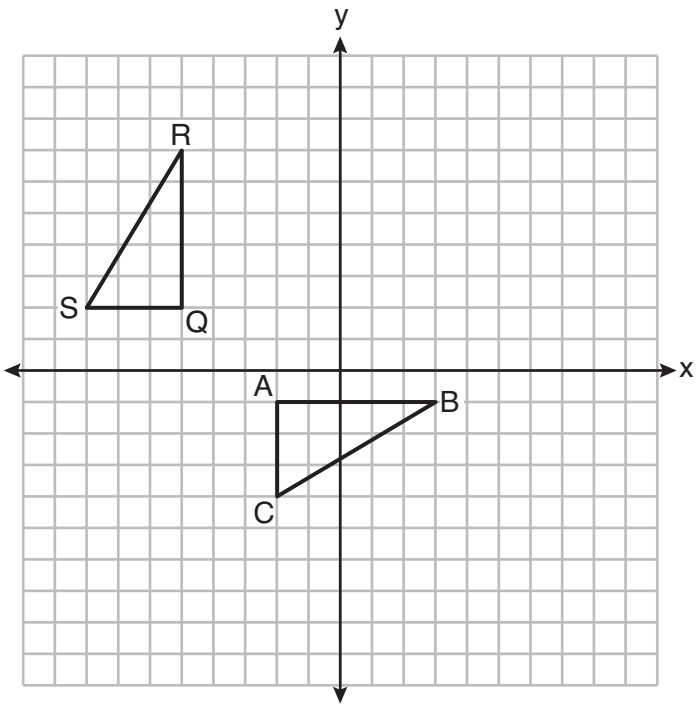

If $m\angle B = 118°$ and $m\angle AHC = 138°$, determine and state $m\angle GFH$.

**27** As shown in the diagram below, secants $\overrightarrow{PWR}$ and $\overrightarrow{PTS}$ are drawn to circle $O$ from external point $P$.




If $m\angle RPS = 35°$ and $m\overset{\frown}{RS} = 121°$, determine and state $m\overset{\frown}{WT}$.

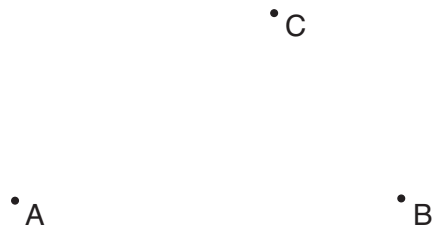
**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.




Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

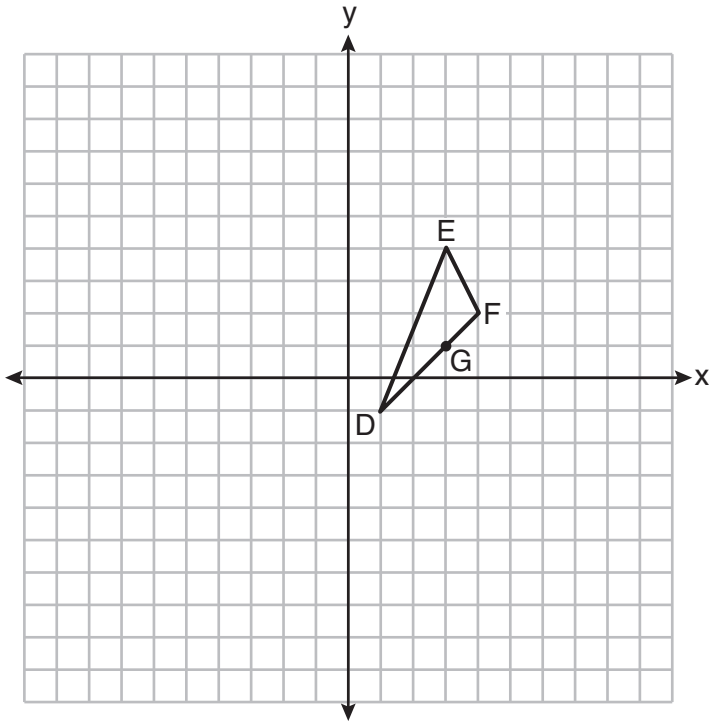
**29** Given points $A$, $B$, and $C$, use a compass and straightedge to construct point $D$ so that $ABCD$ is a parallelogram.

[Leave all construction marks.]

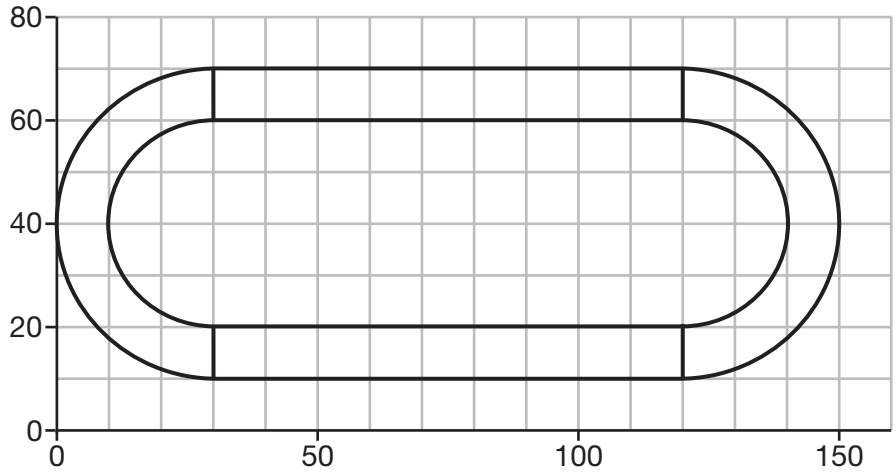


**30** On the set of axes below, $\triangle DEF$ has vertices at the coordinates $D(1,-1)$, $E(3,4)$, and $F(4,2)$, and point $G$ has coordinates $(3,1)$. Owen claims the median from point $E$ must pass through point $G$.

Is Owen correct? Explain why.



**31** A walking path at a local park is modeled on the grid below, where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.



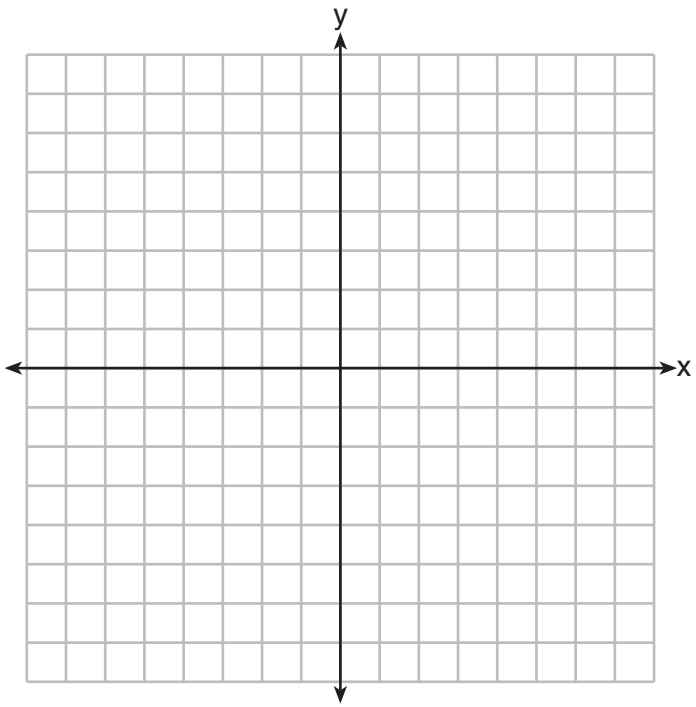
## Part III

**Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.** [12]

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.

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

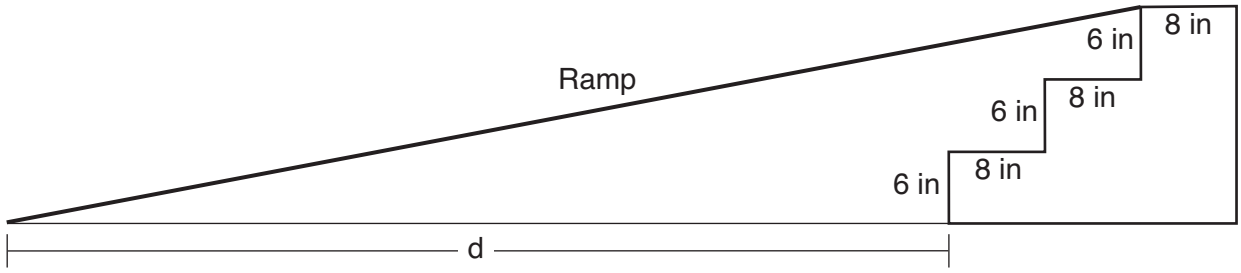


**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of $3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of $200 per 6000 gallons.

If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.



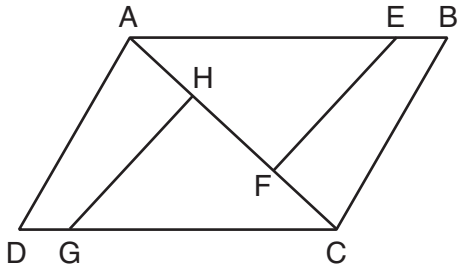

If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, $d$, from the bottom of the stairs to the bottom of the ramp.

## Part IV

**Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for the question to determine your answer. Note that diagrams are not necessarily drawn to scale. For the question in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil.** [6]

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

**Work space for question 35 is continued on the next page.**

**Question 35 continued**

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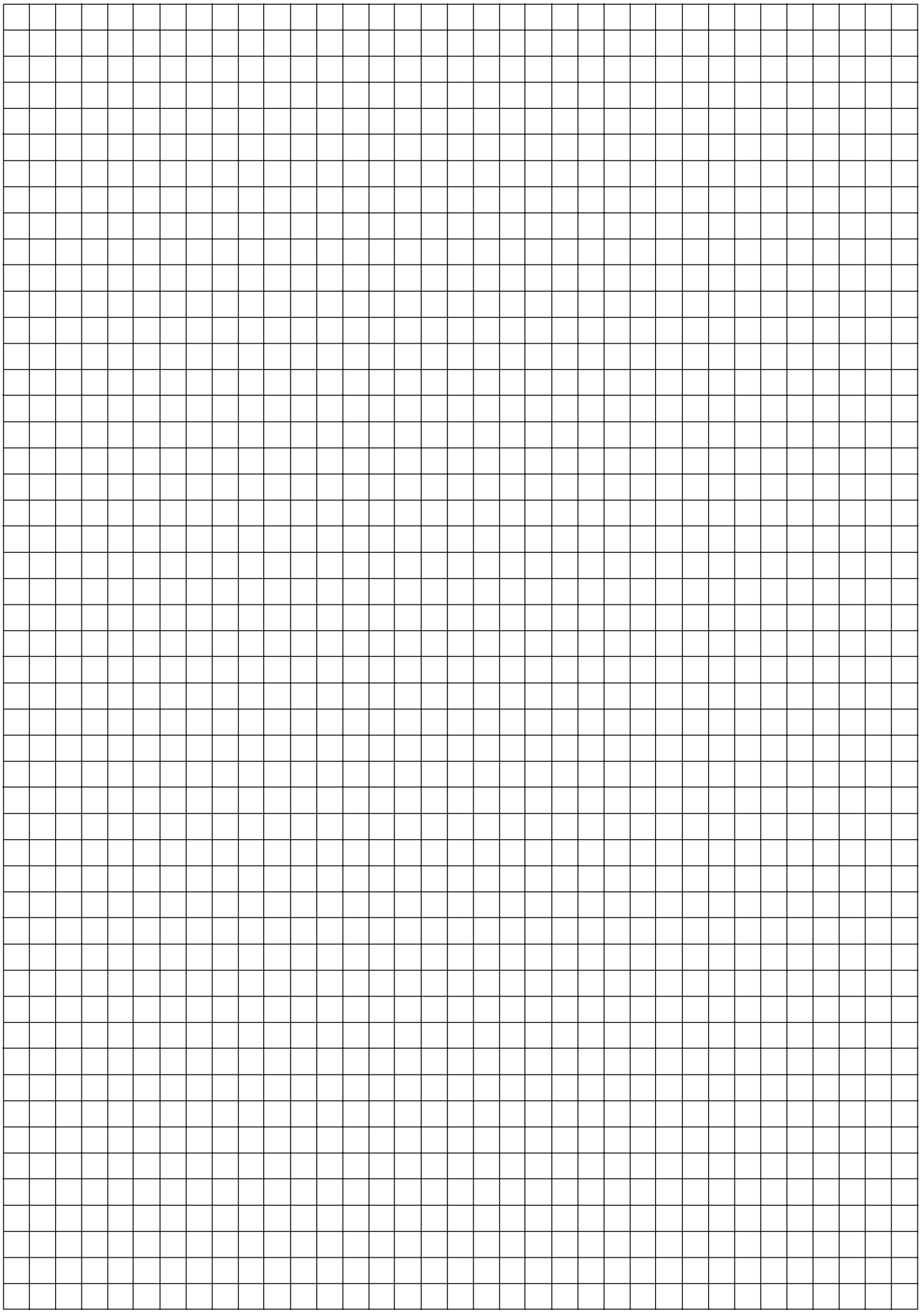
**Scrap Graph Paper — This sheet will *not* be scored.**



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## High School Math Reference Sheet

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

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

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 gallon = 3.785 liters
1 liter = 0.264 gallon
1 liter = 1000 cubic centimeters

| | |
|---|---|
| Triangle | $A = \frac{1}{2}bh$ |
| Parallelogram | $A = bh$ |
| Circle | $A = \pi r^2$ |
| Circle | $C = \pi d$ or $C = 2\pi r$ |
| General Prisms | $V = Bh$ |
| Cylinder | $V = \pi r^2 h$ |
| Sphere | $V = \frac{4}{3}\pi r^3$ |
| Cone | $V = \frac{1}{3}\pi r^2 h$ |
| Pyramid | $V = \frac{1}{3}Bh$ |

| | |
|---|---|
| Pythagorean Theorem | $a^2 + b^2 = c^2$ |
| Quadratic Formula | $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ |
| Arithmetic Sequence | $a_n = a_1 + (n - 1)d$ |
| Geometric Sequence | $a_n = a_1 r^{n-1}$ |
| Geometric Series | $S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$ |
| Radians | 1 radian $= \frac{180}{\pi}$ degrees |
| Degrees | 1 degree $= \frac{\pi}{180}$ radians |
| Exponential Growth/Decay | $A = A_0 e^{k(t - t_0)} + B_0$ |

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GEOMETRY

# FOR TEACHERS ONLY

**The University of the State of New York**

**REGENTS HIGH SCHOOL EXAMINATION**

# GEOMETRY

**Wednesday,** January 23, 2019 — 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 Examination in Geometry*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the open-ended questions, use check marks to indicate student errors. Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. No one teacher is to score more than approximately one-third of the open-ended questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

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

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Wednesday, January 23, 2019. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

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

## Part I

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

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

The Department is providing supplemental scoring guidance, the "Model Response Set," for the Regents Examination in Geometry. This guidance is intended to be part of the scorer training. Schools should use the Model Response Set along with the rubrics in the Scoring Key and Rating Guide to help guide scoring of student work. While not reflective of all scenarios, the Model Response Set illustrates how less common student responses to constructed-response questions may be scored. The Model Response Set will be available on the Department's web site at: http://www.nysedregents.org/geometryre/.

# General Rules for Applying Mathematics Rubrics

## I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Geometry are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examination in Geometry*, use their own professional judgment, confer with other mathematics teachers, and/or contact the State Education Department for guidance. During each Regents Examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

## II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase "such as"), it does not mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

## III. Appropriate Work

*Full-Credit Responses:* The directions in the examination booklet for all the constructed-response questions state: "Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc." The student has the responsibility of providing the correct answer ***and*** showing how that answer was obtained. The student must "construct" the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

*Responses With Errors:* Rubrics that state "Appropriate work is shown, but…" are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete; i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has ***not*** been shown. Other rubrics address incomplete responses.

## IV. Multiple Errors

*Computational Errors, Graphing Errors, and Rounding Errors:* Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

*Conceptual Errors:* A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

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

## Part II

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

(25) **[2]** $y = \frac{2}{3}x + 4\frac{2}{3}$ or an equivalent equation is written, 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.

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

(26) **[2]** 20, and correct work is shown, such as a correctly 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]** 20, but no work is shown.

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

(27) **[2]** 51, 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]** $35 = \frac{1}{2}(121 - x)$ or an equivalent equation is written, but no further correct work is shown.

***or***

**[1]** 51, but no work is shown.

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

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

**[1]** An appropriate sequence is described, but one graphing error is made.

***or***

**[1]** An appropriate sequence of transformations is described, but it is incomplete or partially correct.

***or***

**[1]** An appropriate sequence of transformations is identified, but no specific description is written.

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

(29) **[2]** A correct construction is drawn showing all appropriate arcs.

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

***or***

**[1]** An appropriate construction is drawn showing all appropriate arcs to construct parallelogram *ADBC* or parallelogram *ABDC*.

**[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.

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

**[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]** No, but the explanation is incomplete or partially correct.

***or***

**[1]** Appropriate work is shown to find (2.5,0.5), but no further correct work is shown.

**[0]** No, 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.

(31) **[2]** 3371, and correct work is shown.

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

***or***

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

***or***

**[1]** Correct work is shown to find the area of the two concentric circles and/or two concentric semicircles, but no further correct work is shown.

***or***

**[1]** 3371, 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.

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## Part III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(32) **[4]** Correct work is shown to prove $\triangle ABC$ is an isosceles right triangle, and correct concluding statements are written.

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

***or***

**[3]** Correct work is shown to prove $\triangle ABC$ is an isosceles right triangle, but only one concluding statement is correct.

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

***or***

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

***or***

**[2]** Correct work is shown to prove $\triangle ABC$ is an isosceles right triangle, but both concluding statements are missing, incorrect, or incomplete.

***or***

**[2]** Correct work is shown to prove $\triangle ABC$ is a right triangle or an isosceles triangle, and a correct concluding statement is written, but no further correct work is shown.

**[1]** Appropriate work is shown to find the slopes or lengths of the sides of $\triangle ABC$, 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.

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

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

***or***

**[3]** Correct work is shown to find both costs, but Theresa is not stated.

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

***or***

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

***or***

**[2]** Correct work is shown to determine the volume of water in each pool, but no further correct work is shown.

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

***or***

**[1]** One correct volume of water is found, but no further correct work is shown.

**[0]** Theresa, 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.

(34) **[4]** 18.1, 16.7, and correct work is shown.

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

***or***

**[3]** Appropriate work is shown, but an incorrect trigonometric ratio is used in finding the length of the ramp or the horizontal distance from the bottom of the stairs to the bottom of the ramp.

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

***or***

**[2]** Correct work is shown to find the length of the ramp, but no further correct work is shown.

**or**

**[2]** Correct work is shown to find the horizontal distance from the bottom stair to the bottom of the ramp, but no further correct work is shown.

***or***

**[2]** Appropriate work is shown, but incorrect trigonometric ratios are used in finding both lengths.

**[1]** One correct relevant trigonometric equation is written, but no further correct work is shown.

***or***

**[1]** 18.1 and 16.7, but no work is shown.

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

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## Part IV

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

(35) **[6]** A complete and correct proof that includes a concluding statement 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 or reason is missing or incorrect.

***or***

**[5]** $\triangle GHC \cong \triangle EFA$ is proven, 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 incorrect.

***or***

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

**[3]** A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but three statements and/or reasons are missing or incorrect.

***or***

**[3]** A proof is written that demonstrates a method of proof, but one conceptual error is made, and one statement and/or reason is missing or incorrect.

***or***

**[3]** $\angle GCH \cong \angle EAF$ is proven, but no further correct work is shown.

**[2]** A proof is written that demonstrates a good understanding of the method of proof, but two conceptual errors are made.

***or***

**[2]** Some correct relevant statements about the proof are made, but four or more statements and/or reasons are missing or incorrect.

***or***

**[2]** $\triangle ACD \cong \triangle CAB$ and/or $ABCD$ is a parallelogram is proven, but no further correct work is shown.

**[1]** Only one correct relevant statement and reason are written.

**[0]** The "given" and/or the "prove" statements are rewritten in the style of a formal proof, 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.

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**Map to the Learning Standards**
**Geometry**
**January 2019**

| Question | Type | Credits | Cluster |
|---|---|---|---|
| 1 | Multiple Choice | 2 | G-SRT.A |
| 2 | Multiple Choice | 2 | G-CO.B |
| 3 | Multiple Choice | 2 | G-SRT.A |
| 4 | Multiple Choice | 2 | G-CO.A |
| 5 | Multiple Choice | 2 | G-SRT.B |
| 6 | Multiple Choice | 2 | G-SRT.B |
| 7 | Multiple Choice | 2 | G-CO.C |
| 8 | Multiple Choice | 2 | G-SRT.B |
| 9 | Multiple Choice | 2 | G-MG.A |
| 10 | Multiple Choice | 2 | G-SRT.B |
| 11 | Multiple Choice | 2 | G-GMD.B |
| 12 | Multiple Choice | 2 | G-CO.C |
| 13 | Multiple Choice | 2 | G-SRT.C |
| 14 | Multiple Choice | 2 | G-C.B |
| 15 | Multiple Choice | 2 | G-GPE.B |
| 16 | Multiple Choice | 2 | G-CO.C |
| 17 | Multiple Choice | 2 | G-SRT.C |
| 18 | Multiple Choice | 2 | G-MG.A |
| 19 | Multiple Choice | 2 | G-CO.C |
| 20 | Multiple Choice | 2 | G-GPE.A |
| 21 | Multiple Choice | 2 | G-GPE.B |
| 22 | Multiple Choice | 2 | G-SRT.C |
| 23 | Multiple Choice | 2 | G-GMD.A |
| 24 | Multiple Choice | 2 | G-SRT.A |
| 25 | Constructed Response | 2 | G-GPE.B |
| 26 | Constructed Response | 2 | G-CO.C |
| 27 | Constructed Response | 2 | G-C.A |
| 28 | Constructed Response | 2 | G-CO.A |
| 29 | Constructed Response | 2 | G-CO.D |
| 30 | Constructed Response | 2 | G-GPE.B |
| 31 | Constructed Response | 2 | G-MG.A |
| 32 | Constructed Response | 4 | G-GPE.B |
| 33 | Constructed Response | 4 | G-MG.A |
| 34 | Constructed Response | 4 | G-SRT.C |
| 35 | Constructed Response | 6 | G-CO.C |

## Regents Examination in Geometry

## January 2019

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

**The *Chart for Determining the Final Examination Score for the January 2019 Regents Examination in Geometry* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Wednesday, January 23, 2019. Conversion charts provided for previous administrations of the Regents Examination in Geometry must NOT be used to determine students' final scores for this administration.**

## Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm.

2. Select the test title.

3. Complete the required demographic fields.

4. Complete each evaluation question and provide comments in the space provided.

5. Click the SUBMIT button at the bottom of the page to submit the completed form.

**The University of the State of New York**

**REGENTS HIGH SCHOOL EXAMINATION**

# GEOMETRY

**Wednesday,** January 23, 2019 — 9:15 a.m. to 12:15 p.m.

## MODEL RESPONSE SET

**Table of Contents**

## Question 25

**25** Write an equation of the line that is parallel to the line whose equation is $3y + 7 = 2x$ and passes through the point (2,6).

$3y + 7 = 2x$

$-7 \quad -7$

$\frac{3y}{3} = \frac{2x - 7}{3}$

$y = \frac{2}{3}x - \frac{7}{3}$

$y - 6 = \frac{2}{3}(x - 2)$

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

**Question 25**

**25** Write an equation of the line that is parallel to the line whose equation is $3y + 7 = 2x$ and passes through the point (2,6).

$3y + 7 = 2x$
$-7 \quad -7$
$\frac{3y}{3} = \frac{2x - 7}{3}$
$y = \frac{2}{3}x - \frac{7}{3}$

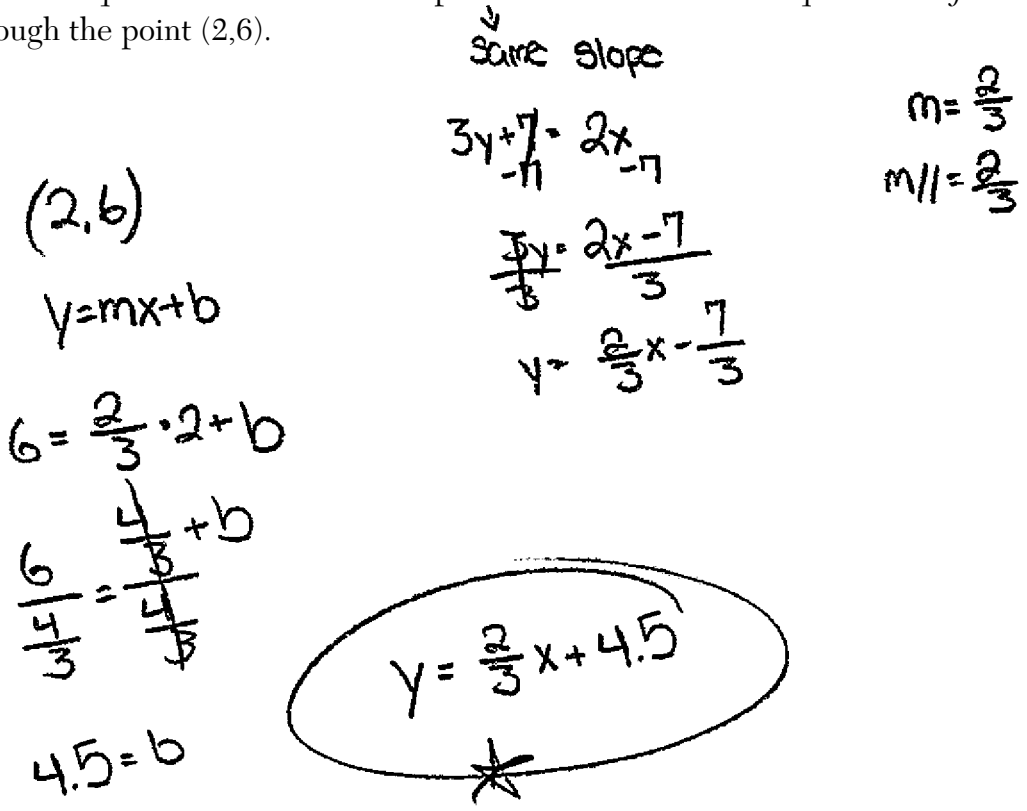
$6 = \frac{2}{3}(2) + b$
$6 = \frac{4}{3} + b$
$-\frac{4}{3} \quad -\frac{4}{3}$
$b = \frac{14}{3}$

$y = \frac{2}{3}x + \frac{14}{3}$

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

**Question 25**

**25** Write an equation of the line that is parallel to the line whose equation is $3y + 7 = 2x$ and passes through the point (2,6).




**Score 1:** The student made an error in determining the $y$-intercept.

**Question 25**

**25** Write an equation of the line that is parallel to the line whose equation is $3y + 7 = 2x$ and passes through the point (2,6).

$3y + 7 = 2x$
$-7 \quad -7$
$\frac{3y}{3} = \frac{2x}{3} - \frac{7}{3}$
$y = \frac{2}{3}x - 7/3$

$y = \frac{2}{3}x + b$
$6 = 2/3(2) + b$
$6 = 1.3 + b$
$-1.3 \quad -1.3$
$b = 4.7$
$y = \frac{2}{3}x + 4.7$

**Score 1:** The student made one rounding error in determining the $y$-intercept.

## Question 25

**25** Write an equation of the line that is parallel to the line whose equation is $3y + 7 = 2x$ and passes through the point (2,6).

$3y+7=2x$
$-7 \quad -7$
$3y=2x-7$
$\frac{3y=2x-7}{3}$
$y=\frac{2}{3}x-2.\overline{3}$
$y=\frac{2}{3}x-6$

**Score 1:** The student made an error using the $y$-coordinate of the given point as the $y$-intercept.

**Question 25**

**25** Write an equation of the line that is parallel to the line whose equation is $3y + 7 = 2x$ and passes through the point (2,6).

x y

$y = mx + b$

$y = 6$

$m = \frac{4}{3}$

$b = \frac{-7}{3}$

$y = \frac{4}{3}x - \frac{7}{3}$

$-7$

$3y = 2x - 7$

$3$

$y = 2/3x - 7/3$

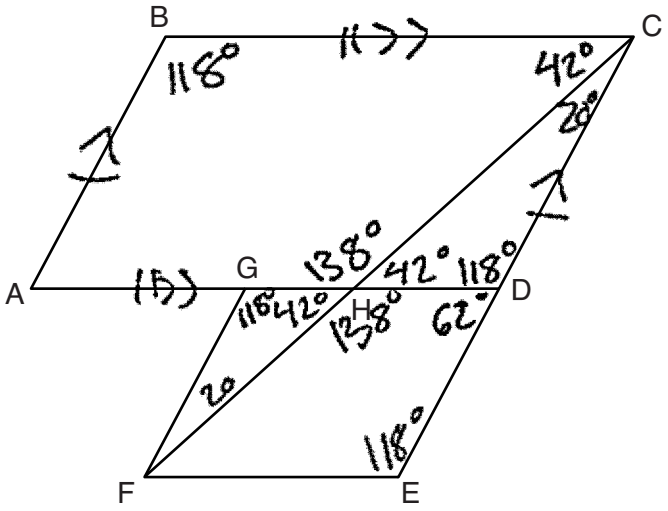
$6 = 2/3(2) - \frac{7}{3}$

$6 = \frac{4}{3} - \frac{7}{3}$

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

**Question 26**

**26** Parallelogram *ABCD* is adjacent to rhombus *DEFG*, as shown below, and $\overline{FC}$ intersects $\overline{AGD}$ at *H*.



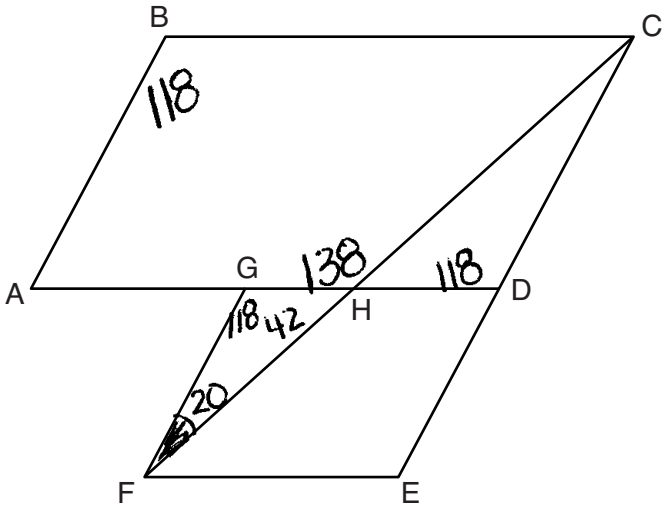

If m∠*B* = 118° and m∠*AHC* = 138°, determine and state m∠*GFH*.

m∠GFH = 20°

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

**Question 26**

**26** Parallelogram *ABCD* is adjacent to rhombus *DEFG*, as shown below, and $\overline{FC}$ intersects $\overline{AGD}$ at *H*.



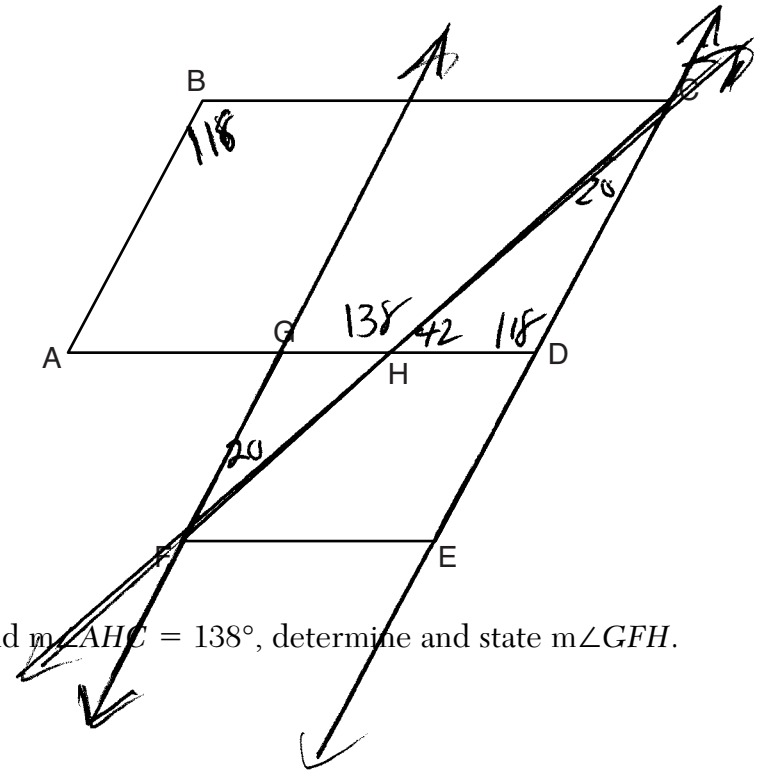

If m∠*B* = 118° and m∠*AHC* = 138°, determine and state m∠*GFH*.

∠GFH = 20°

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

## Question 26

**26** Parallelogram *ABCD* is adjacent to rhombus *DEFG*, as shown below, and $\overline{FC}$ intersects $\overline{AGD}$ at *H*.



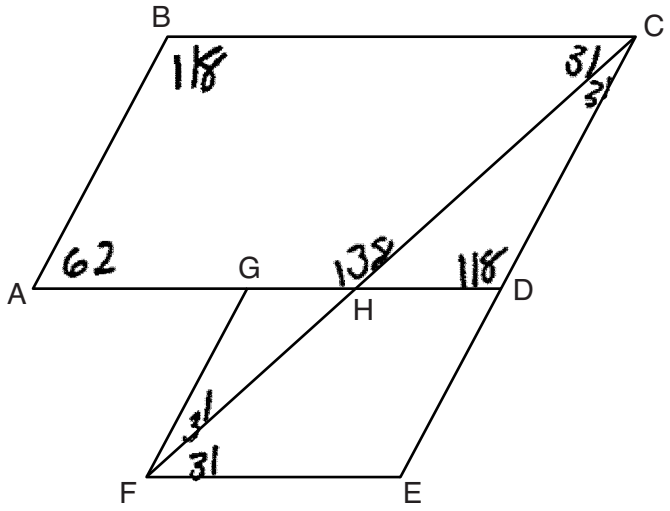

If m∠*B* = 118° and m∠*AHC* = 138°, determine and state m∠*GFH*.

m∠GFH = 28°

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

**Question 26**

**26** Parallelogram *ABCD* is adjacent to rhombus *DEFG*, as shown below, and $\overline{FC}$ intersects $\overline{AGD}$ at *H*.



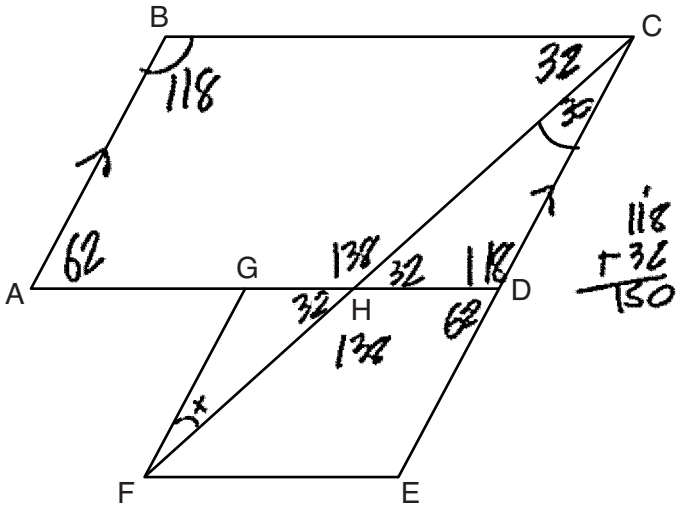

If m∠*B* = 118° and m∠*AHC* = 138°, determine and state m∠*GFH*.

∠GFH = 31

**Score 1:** The student made an error that $\overline{CF}$ bisects ∠*BCD*.

**Question 26**

**26** Parallelogram *ABCD* is adjacent to rhombus *DEFG*, as shown below, and $\overline{FC}$ intersects $\overline{AGD}$ at *H*.



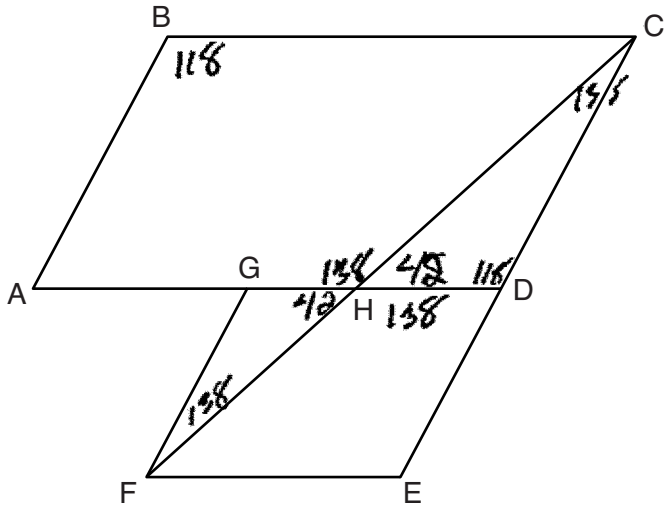

If m∠*B* = 118° and m∠*AHC* = 138°, determine and state m∠*GFH*.

m∠GFH = 30°

**Score 1:** The student made a computational error in determining m∠*CHD*.

**Question 26**

**26** Parallelogram *ABCD* is adjacent to rhombus *DEFG*, as shown below, and $\overline{FC}$ intersects $\overline{AGD}$ at *H*.



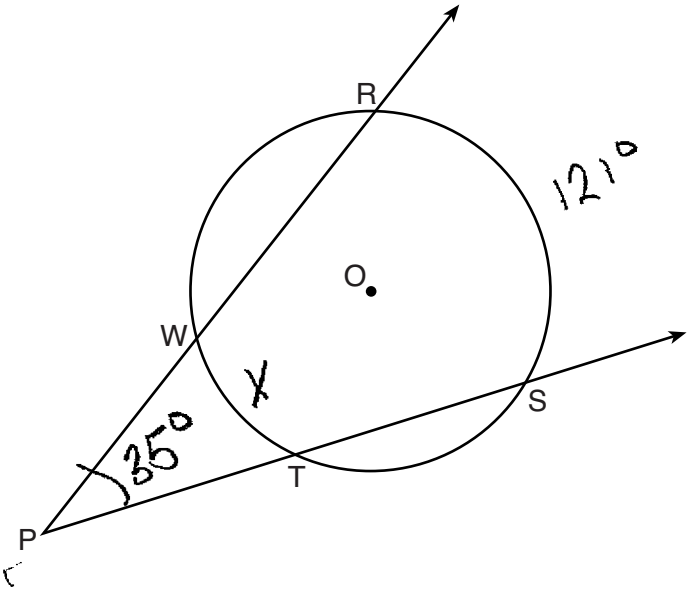

If m∠*B* = 118° and m∠*AHC* = 138°, determine and state m∠*GFH*.

m∠GFH = 138° because opposite adjacent angles are congruent and because ∠AHC = 138°, ∠C = 138° so ∠GFH = 138°.

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

**Question 27**

**27** As shown in the diagram below, secants $\overrightarrow{PWR}$ and $\overrightarrow{PTS}$ are drawn to circle $O$ from external point $P$.




If $m\angle RPS = 35°$ and $m\overset{\frown}{RS} = 121°$, determine and state $m\overset{\frown}{WT}$.

$2 \cdot \frac{121 - X}{2} = 35 \cdot 2$

$121 - X = 70$
$-121 \quad -121$

$\frac{-X}{-1} = \frac{-51}{-1}$

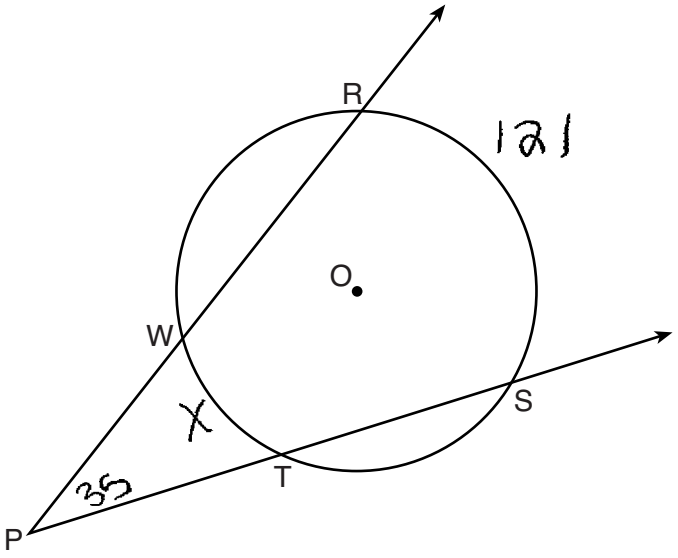
$X = 51$

$m\overset{\frown}{WT} = 51°$

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

## Question 27

**27** As shown in the diagram below, secants $\overrightarrow{PWR}$ and $\overrightarrow{PTS}$ are drawn to circle $O$ from external point $P$.




If $m\angle RPS = 35°$ and $m\overset{\frown}{RS} = 121°$, determine and state $m\overset{\frown}{WT}$.

$35 = \frac{1}{2}(121 - X)$

$35 = 60.5 - \frac{1}{2}X$

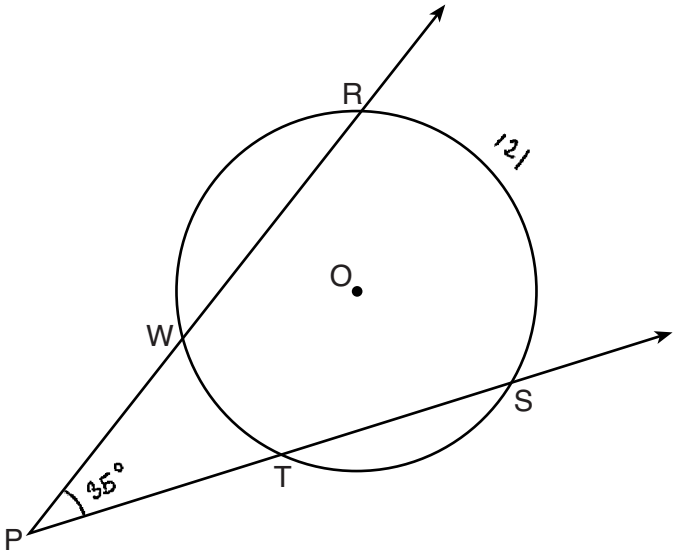
$-25.5 = -\frac{1}{2}X$

$51 = X$

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

## Question 27

**27** As shown in the diagram below, secants $\overrightarrow{PWR}$ and $\overrightarrow{PTS}$ are drawn to circle $O$ from external point $P$.




If $m\angle RPS = 35°$ and $m\overset{\frown}{RS} = 121°$, determine and state $m\overset{\frown}{WT}$.

$35 = \frac{1}{2}(121 - ?)$

$35° = \frac{1}{2}(121 - 41)$

$35° = \frac{1}{2}(70)$

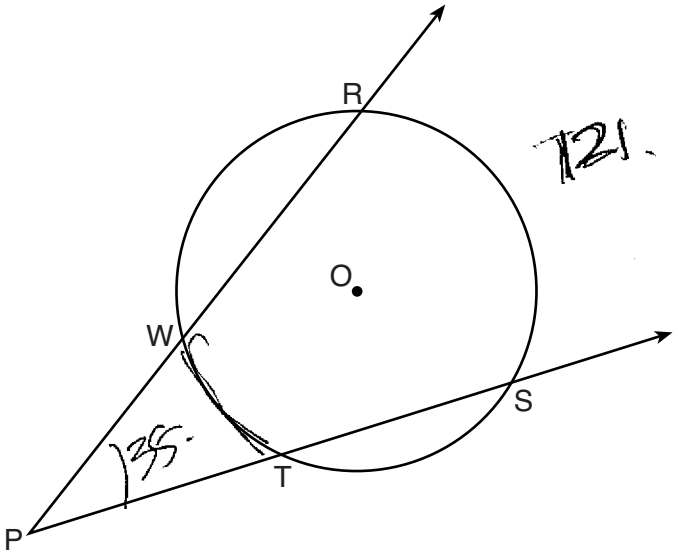
$35° = 35°$ ✓

$m\overset{\frown}{WT} = 70°$

**Score 1:** The student wrote a correct equation.

## Question 27

**27** As shown in the diagram below, secants $\overrightarrow{PWR}$ and $\overrightarrow{PTS}$ are drawn to circle $O$ from external point $P$.



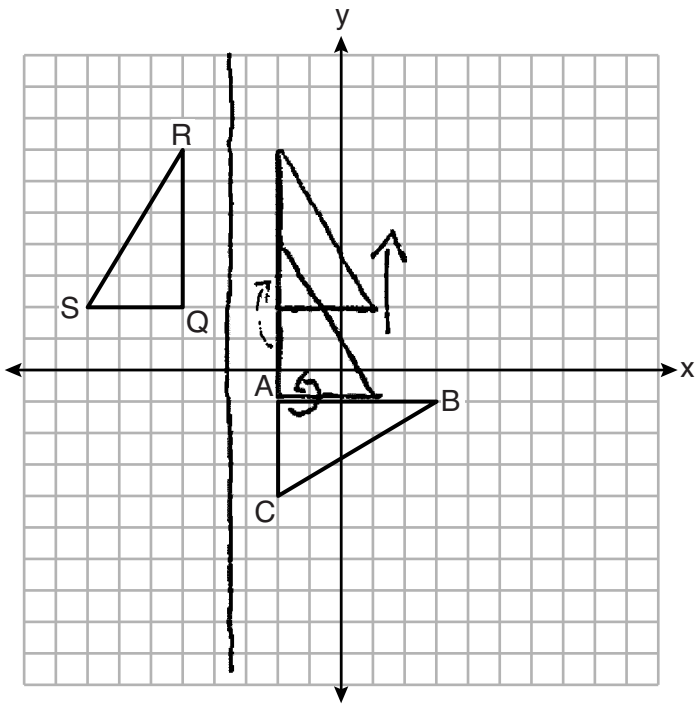

If $m\angle RPS = 35°$ and $m\overset{\frown}{RS} = 121°$, determine and state $m\overset{\frown}{WT}$.

$\frac{35 + 121}{2} = 78.$

**Score 0:** The student gave a completely incorrect response.

**Question 28**

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.



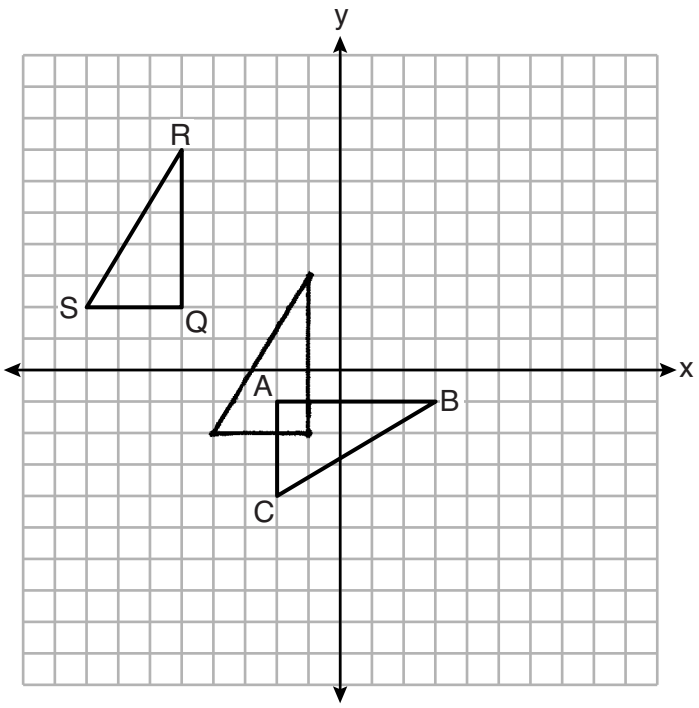

Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

Ans: A rotatation of 90° counterclockwise around point A, Then a translation of 3 units up and finally a reflection over the line $x = -3.5$ would map $\triangle ABC$ onto $\triangle QRS$.

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

## Question 28

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.



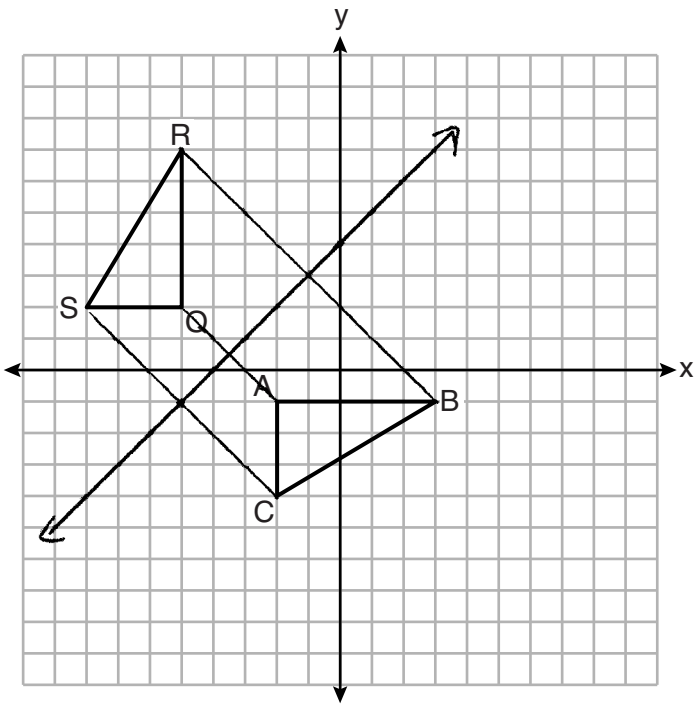

Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

Reflect over y=x then translate 4 left and 4 up.

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

## Question 28

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.



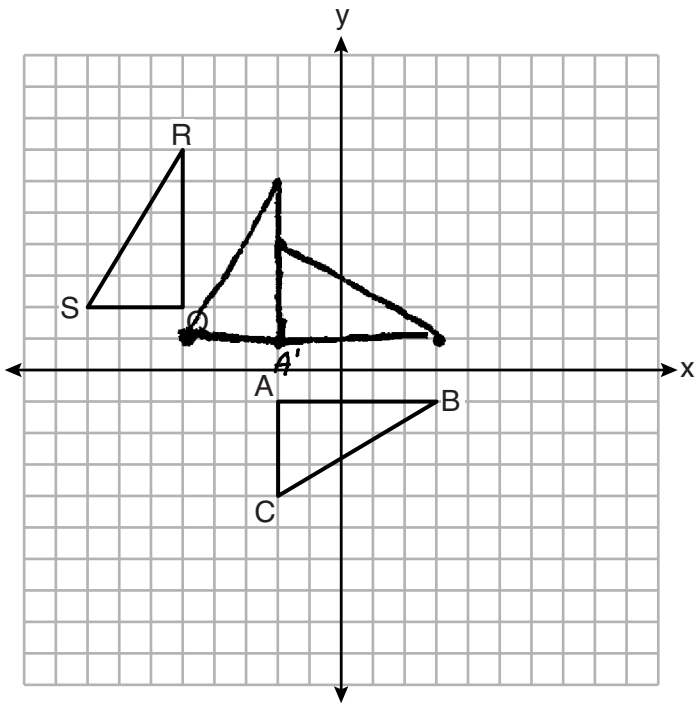

Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

Reflection over $y = x + 4$

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

**Question 28**

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.




Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

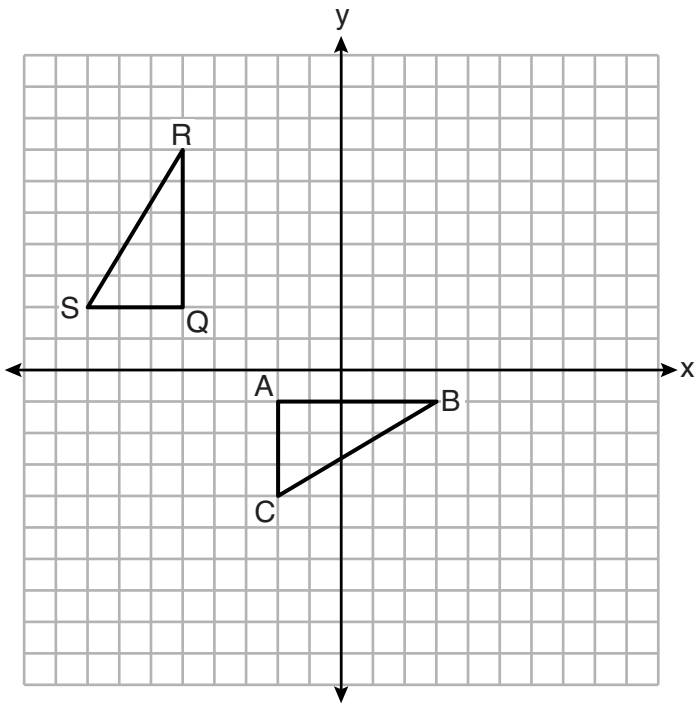
Reflection over X-axis

Rotate about point A' 90° counter clockwise, translate 3 left, and 1 up.

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

**Question 28**

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.




Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

Translation (-3, 3)

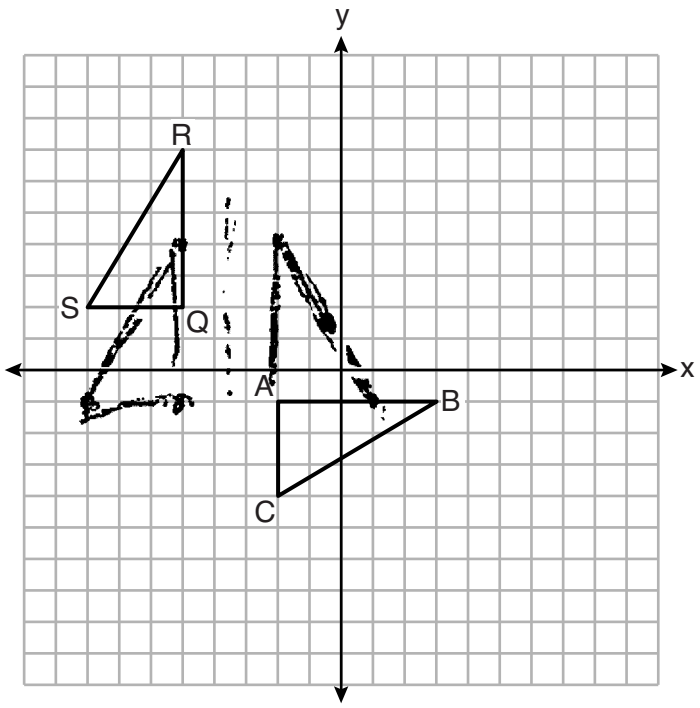
Rotation counter-clockwise 90°

Reflection over x = -5

**Score 1:** The student did not state the center of rotation.

**Question 28**

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.



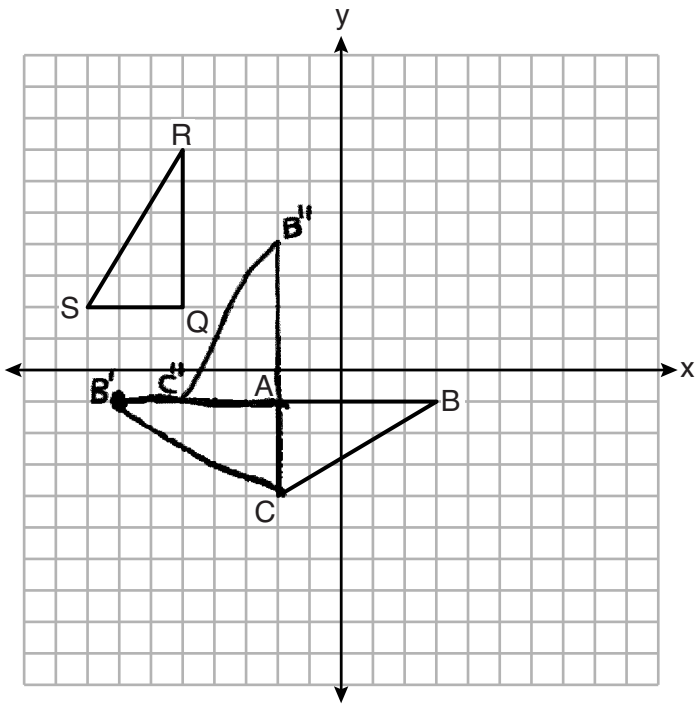

Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

- 90° counterclockwise rotation of $\triangle ABC$ on point A
- reflection across x=3.5
- translation of (0,3)

**Score 1:** The student wrote an incorrect line of reflection.

**Question 28**

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.



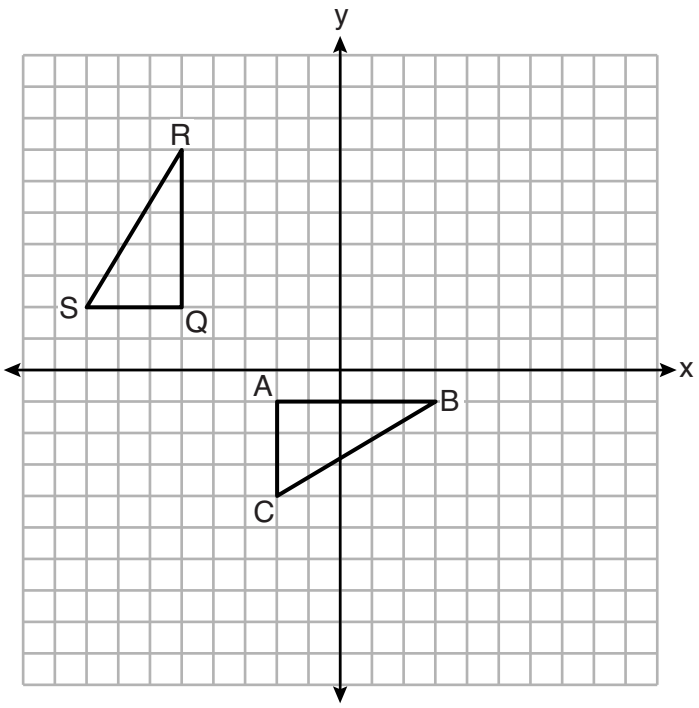

Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

Reflection
↓
Rotation
↓
Translation

**Score 1:** The student demonstrated the sequence graphically and wrote an appropriate sequence of transformations, but no specific description was written.

## Question 28

**28** On the set of axes below, $\triangle ABC$ is graphed with coordinates $A(-2,-1)$, $B(3,-1)$, and $C(-2,-4)$. Triangle $QRS$, the image of $\triangle ABC$, is graphed with coordinates $Q(-5,2)$, $R(-5,7)$, and $S(-8,2)$.




Describe a sequence of transformations that would map $\triangle ABC$ onto $\triangle QRS$.

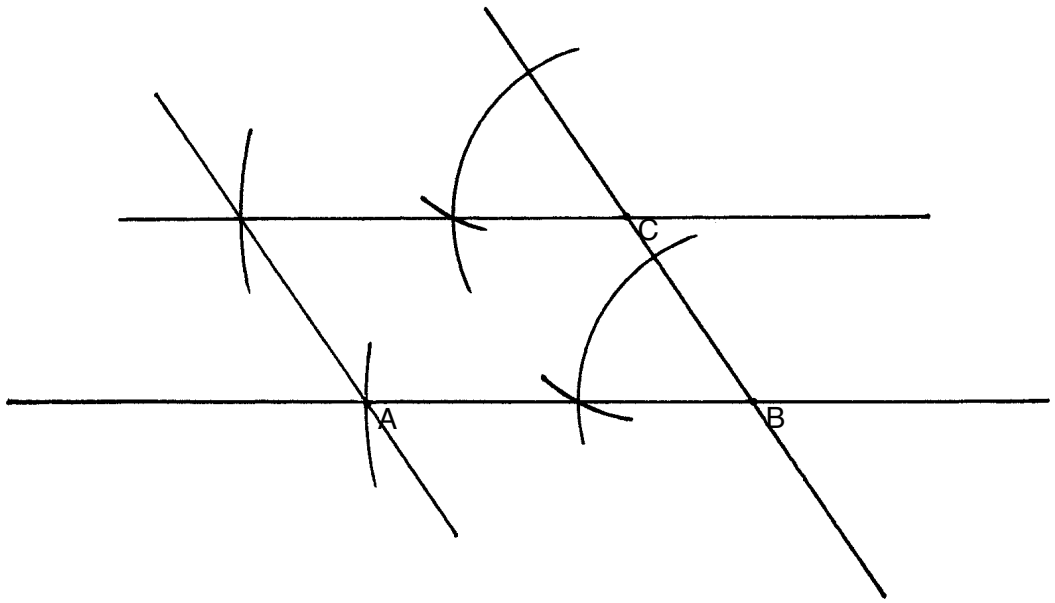
reflection over X axis

**Score 0:** The student wrote an incomplete description of a sequence of transformations.

**Question 29**

**29** Given points *A*, *B*, and *C*, use a compass and straightedge to construct point *D* so that *ABCD* is a parallelogram.

[Leave all construction marks.]

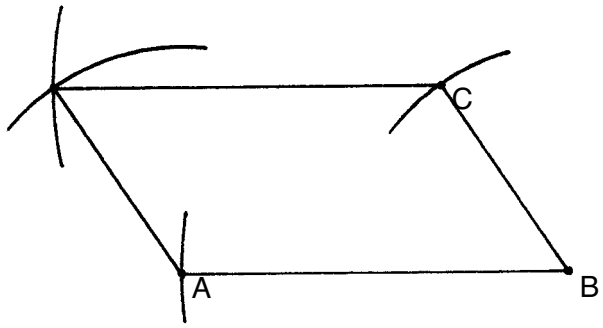



**Score 2:** The student gave a complete and correct response.

## Question 29

**29** Given points *A*, *B*, and *C*, use a compass and straightedge to construct point *D* so that *ABCD* is a parallelogram.

[Leave all construction marks.]

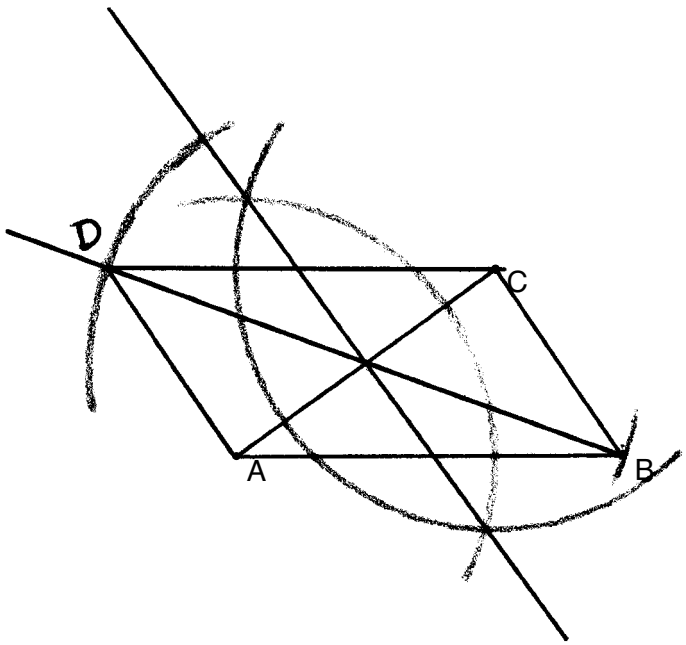



**Score 2:** The student gave a complete and correct response.

## Question 29

**29** Given points *A*, *B*, and *C*, use a compass and straightedge to construct point *D* so that *ABCD* is a parallelogram.

[Leave all construction marks.]

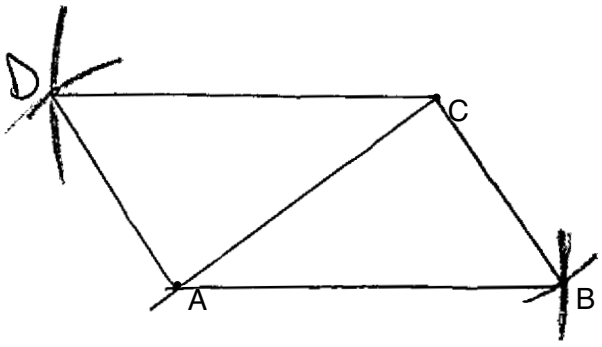



**Score 2:** The student gave a complete and correct response.

## Question 29

**29** Given points *A*, *B*, and *C*, use a compass and straightedge to construct point *D* so that *ABCD* is a parallelogram.

[Leave all construction marks.]

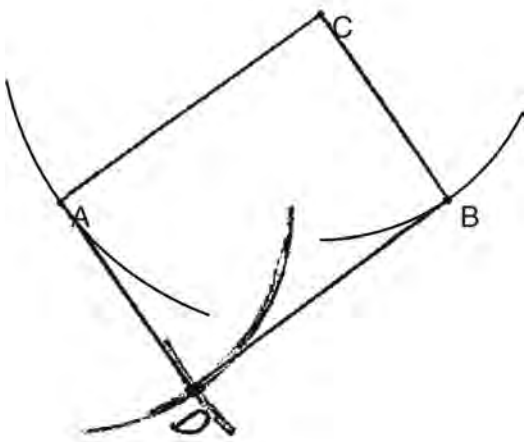



**Score 2:** The student gave a complete and correct response.

## Question 29

**29** Given points *A*, *B*, and *C*, use a compass and straightedge to construct point *D* so that *ABCD* is a parallelogram.

[Leave all construction marks.]

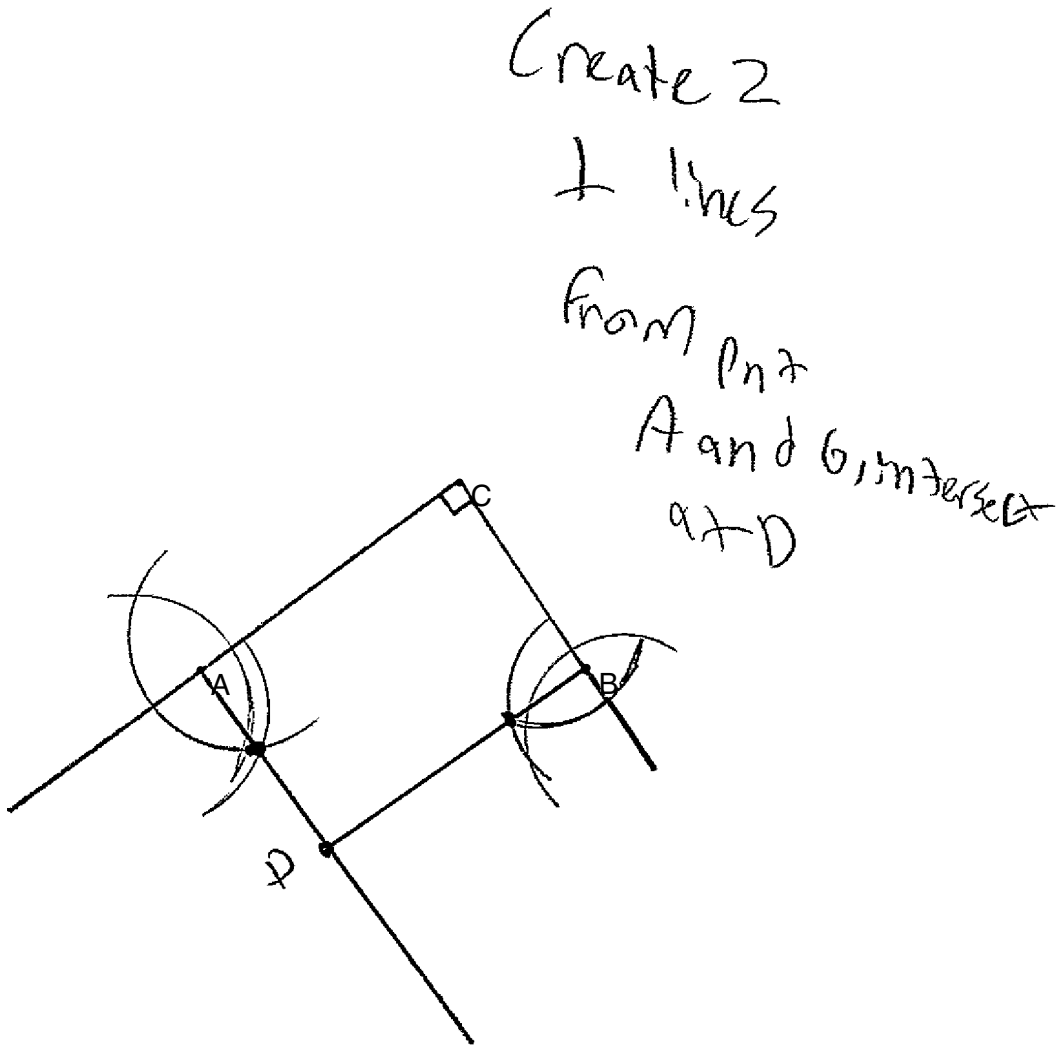



**Score 1:** The student constructed parallelogram *ADBC* instead of parallelogram *ABCD*.

## Question 29

**29** Given points *A*, *B*, and *C*, use a compass and straightedge to construct point *D* so that *ABCD* is a parallelogram.

[Leave all construction marks.]

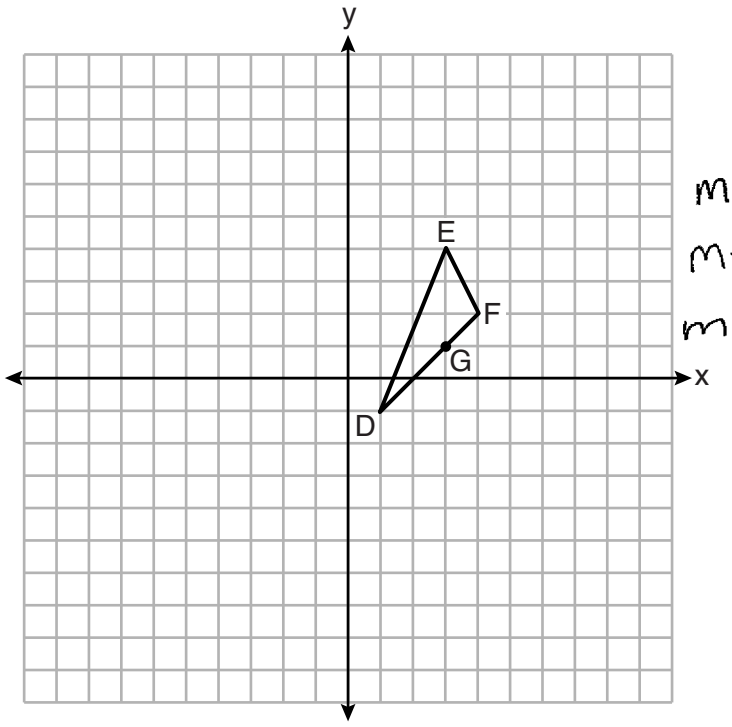



**Score 0:** The student made an error by constructing *ADBC* and made an incorrect assumption that $m\angle C = 90°$.

**Question 30**

**30** On the set of axes below, $\triangle DEF$ has vertices at the coordinates $D(1,-1)$, $E(3,4)$, and $F(4,2)$, and point $G$ has coordinates $(3,1)$. Owen claims the median from point $E$ must pass through point $G$.

Is Owen correct? Explain why.




$\overline{DF}$

$m = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$m = \left(\frac{1+4}{2}, \frac{-1+2}{2}\right)$

$m = \left(\frac{5}{2}, \frac{1}{2}\right)$

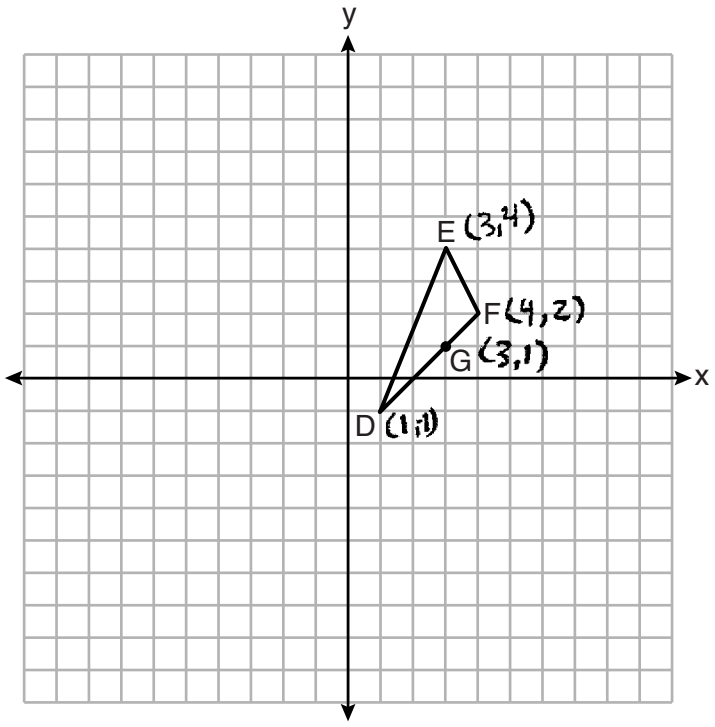
No, a median from point E would intersect the midpoint of $\overline{DF}$. The midpoint of $\overline{DF}$ is $(5/2, 1/2)$, not point G $(3,1)$

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

## Question 30

**30** On the set of axes below, $\triangle DEF$ has vertices at the coordinates $D(1,-1)$, $E(3,4)$, and $F(4,2)$, and point $G$ has coordinates $(3,1)$. Owen claims the median from point $E$ must pass through point $G$.

Is Owen correct? Explain why.




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

$d\overline{DG} = \sqrt{(3-1)^2+(1+1)^2}$

$d\overline{DG} = \sqrt{4+4}$

$d\overline{DG} = \sqrt{8}$

$d\overline{DG} = 2\sqrt{2}$

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

$d\overline{FG} = \sqrt{1+1}$

$d\overline{FG} = \sqrt{2}$

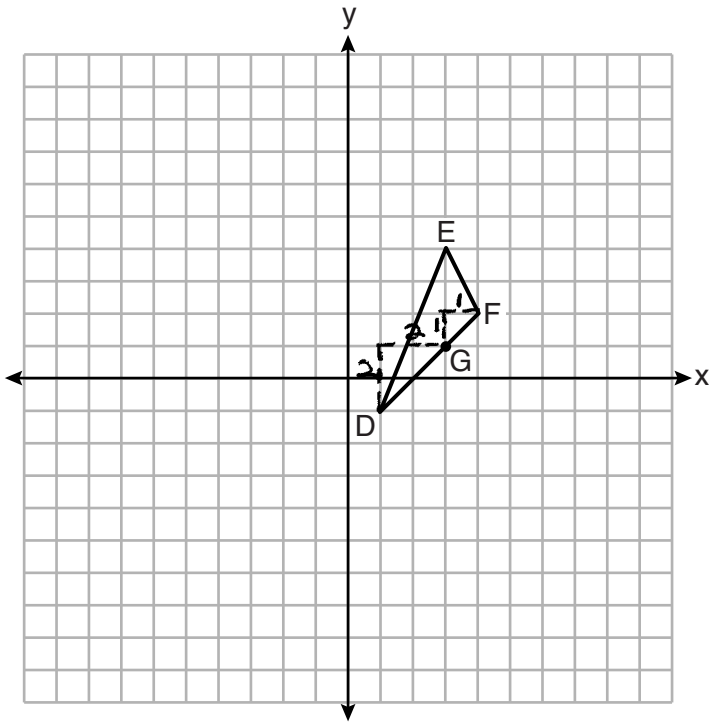
Owen is not correct the median intersects at the midpoint of the segment opposite the < its coming from. Using distance formula I found that the distance of $\overline{DG} = 2\sqrt{2}$ and the distance of $\overline{FG}$ is $\sqrt{2}$ they are not equal ∴ G is not the midpoint.

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

## Question 30

**30** On the set of axes below, $\triangle DEF$ has vertices at the coordinates $D(1,-1)$, $E(3,4)$, and $F(4,2)$, and point $G$ has coordinates $(3,1)$. Owen claims the median from point $E$ must pass through point $G$.

Is Owen correct? Explain why.



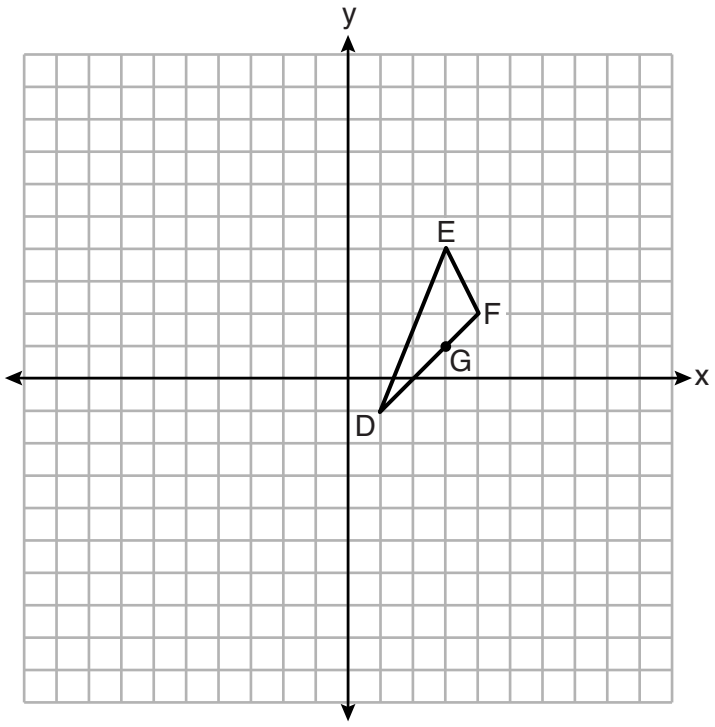

Owen is incorrect. G is not the midpoint of $\overline{DF}$ so $\overline{EG}$ would not be a median.

**Score 2:** The student gave a complete and correct response. The student supported their claim graphically that $G$ is not the midpoint.

**Question 30**

**30** On the set of axes below, $\triangle DEF$ has vertices at the coordinates $D(1,-1)$, $E(3,4)$, and $F(4,2)$, and point $G$ has coordinates $(3,1)$. Owen claims the median from point $E$ must pass through point $G$.

Is Owen correct? Explain why.



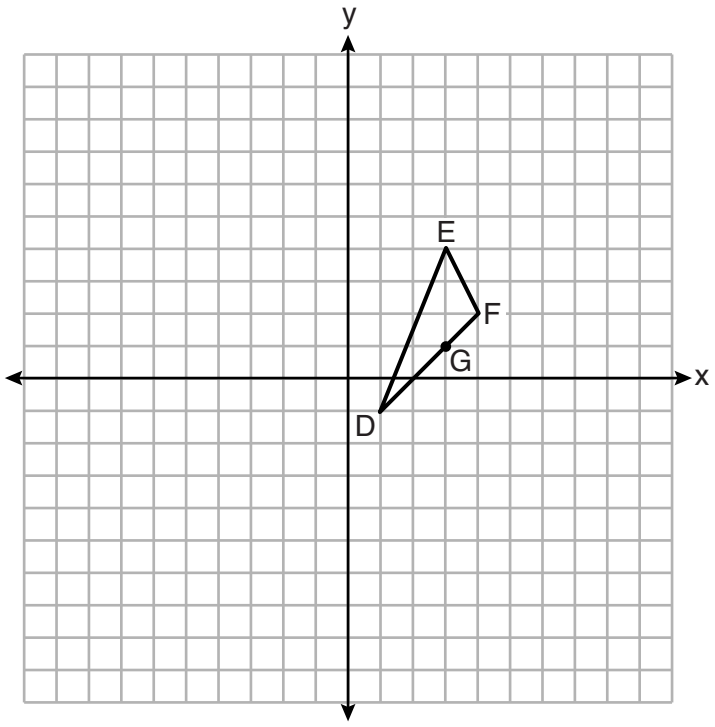

Owen is incorrect, the median from point E must pass through the midpoint of $\overline{DF}$ and G is not the midpoint.

**Score 1:** The student did not support their claim that point $G$ is not the midpoint.

## Question 30

**30** On the set of axes below, $\triangle DEF$ has vertices at the coordinates $D(1,-1)$, $E(3,4)$, and $F(4,2)$, and point $G$ has coordinates $(3,1)$. Owen claims the median from point $E$ must pass through point $G$.

Is Owen correct? Explain why.




$m\overline{DE} = 5/2$

$m\overline{EF} = -2$

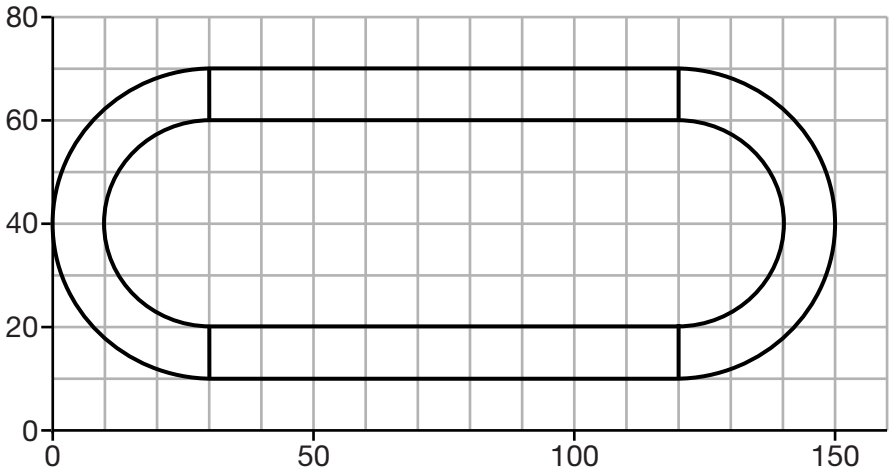
$m\overline{DF} = 1$

he is incorrect because $\overline{EF}$ and $\overline{ED}$ do not have opposite slopes, so because of that, G would not be on the line that would be the median for E.

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

## Question 31

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.




$A = LW$ $A = LW$ $A = \pi r^2$ $A = \pi r^2$

$= 90 \cdot 60$ $= 90 \cdot 40$ $= \pi \cdot 30^2$ $= \pi 20^2$

$= 5400$ $= 3600$ $= 900\pi$ $= 400\pi$

$A = 1800$ $A = 500\pi$

$= 1570.79$

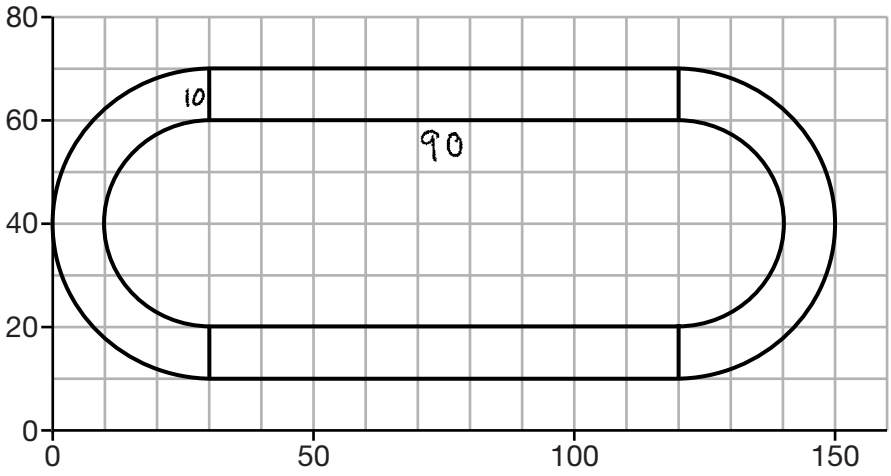
$A = 1800 + 1570.79$

$= 3371 \text{ ft}^2$

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

## Question 31

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.




Rectangles = $A = 2(b \cdot h)$
$= 2(90 \cdot 10)$
$= 2(900)$
$A = 1800$

Lg curve
$A = \frac{1}{2}\pi r^2$
$= \frac{1}{2}\pi 3^2$
$= \frac{1}{2}\pi 9$
$A = 4.5\pi$

Sm curve
$A = \frac{1}{2}\pi r^2$
$= \frac{1}{2}\pi 2^2$
$= \frac{1}{2}\pi 4$
$A = 2\pi$

$4.5\pi$
$- \ 2\pi$
$2.5\pi$

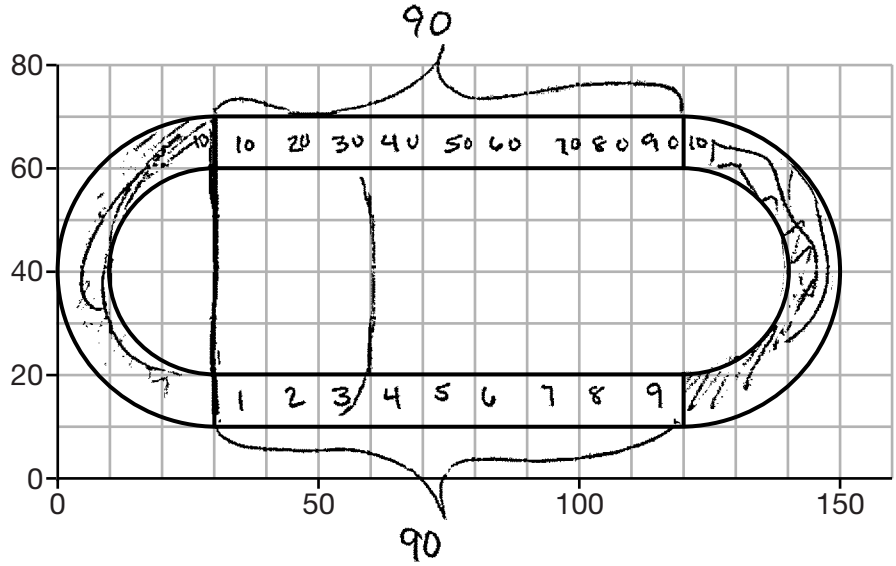
$2(2.5\pi) = 5\pi$

$A = 1800 + 5\pi$
$\approx 1815.707\ldots$
$A \approx 1816\ ft^2$

**Score 1:** The student made a scale error in determining the radii of the two concentric circles.

**Question 31**

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.




$A = lw$
$A = 90 \cdot 10$
$A = 900(2)$

$A = \frac{\pi r^2}{2}$
$A = \pi \cdot 30^2$
$A = 900\pi$
$A \approx \frac{2826}{2}$
$A \approx 1413$

$A = \pi r^2$
$A = \pi \cdot 20^2$
$A = 400\pi$
$A \approx \frac{1256}{2}$
$A \approx 628$

$A = 785(2)$
$A = 1570$

1800
+ 1570
3370

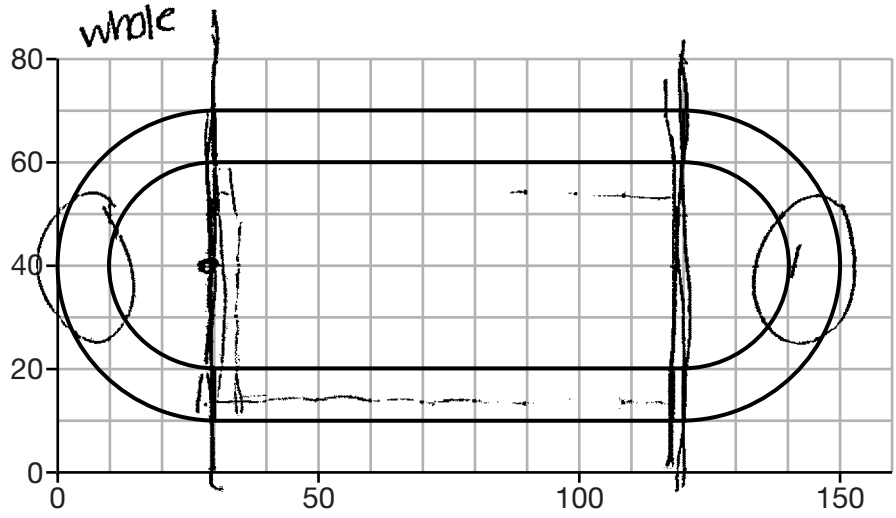
900
+900
1800

$A = 3370 ft^2$

**Score 1:** The student rounded incorrectly by using $\pi = 3.14$, which resulted in an incorrect final answer.

## Question 31

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.




whole — inside

$\pi r^2$ — $\pi r^2$

$\pi 30^2$ — $\pi 20^2$

$900\pi$ — $400\pi$

$500\pi$

$l \cdot w$ — $l \cdot w$

$90 \cdot 60$ — $90 \cdot 50$

$5400 - 4500$

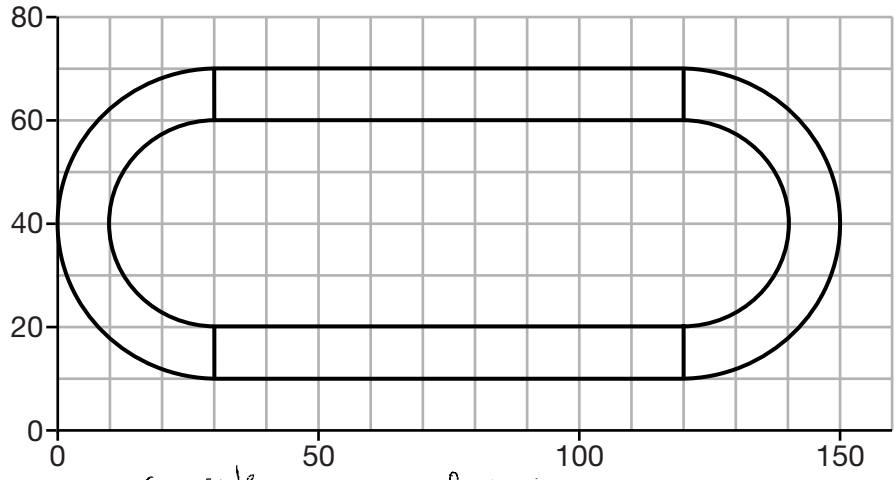
$+ \quad 900 = 2470.80$

The area of the walkway is 2,470 ft²

**Score 1:** The student found the correct areas of the two concentric circles.

## Question 31

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.




Semicircle
$A = \frac{1}{2}\pi r^2$
$A = \frac{1}{2}\pi 30^2$
$A = \frac{1}{2} 900\pi$
$A = 450\pi$

Semicircle
$A = \frac{1}{2}\pi r^2$
$A = \frac{1}{2}\pi 20^2$
$A = \frac{1}{2} 400\pi$
$A = 200\pi$

$A = 450\pi - 200\pi$
$A = 250\pi$

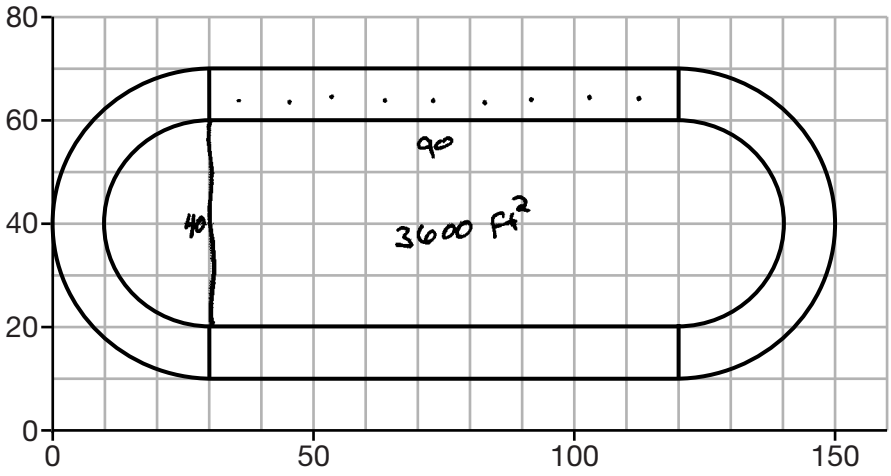
Rectangle
$A = 90 \times 10$
$A = 900$

$A = 250\pi + 900$
$A = 785.398 + 900$
$A = 1685.398$
$A = 1685\ ft^2$

**Score 1:** The student found the correct areas of two concentric semicircles.

## Question 31

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.




$A = \pi(20)^2$

$A = 1256.64$

$A = \pi(30)^2$

$A = 2827.43$

180

$2827.43 - 1256.64 = 1570.79$

$3600 - 180 = 3420$

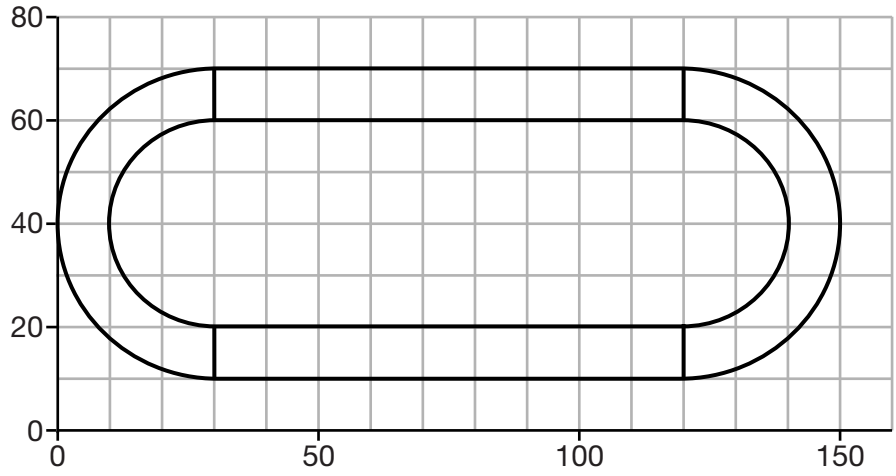
$3420 + 1570.79 = 4990.79$

~~4990~~ 4991 ft²

**Score 1:** The student found appropriate areas of the two concentric circles.

## Question 31

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.



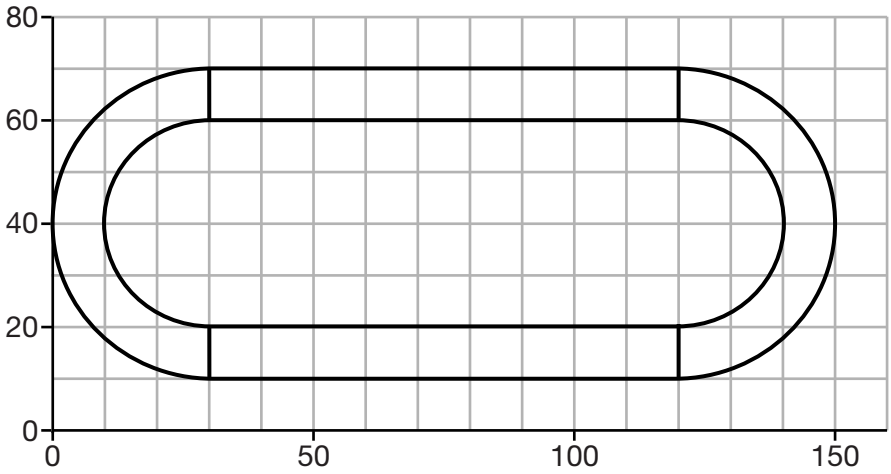

Rectangles: $90 \cdot 10 = 900 \cdot 2 = 18000\ ft^2$

Circle $= \pi r^2 = \pi \cdot 30^2 = 900\pi$

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

## Question 31

**31** A walking path at a local park is modeled on the grid below where the length of each grid square is 10 feet. The town needs to submit paperwork to pave the walking path. Determine and state, to the *nearest square foot*, the area of the walking path.




$90(10)(2) = 1800$

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

## Question 32

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.
[The use of the set of axes below is optional.]

$d_{\overline{AC}} = \sqrt{(1-(-2))^2+(-1-4)^2}$
$= \sqrt{3^2+(-5)^2}$
$= \sqrt{9+25}$
$= \sqrt{34}$

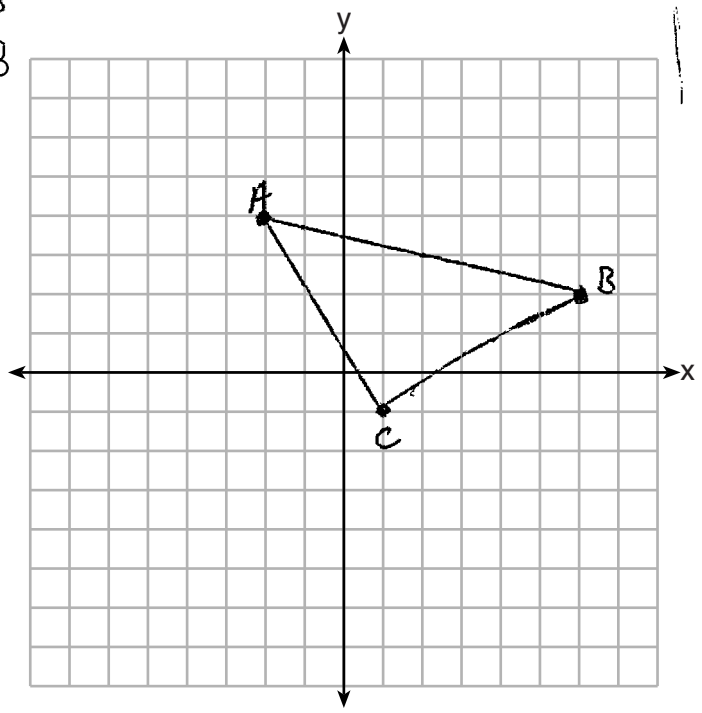
$d_{\overline{AB}} = \sqrt{(6-(-2))^2+(2-4)^2}$
$= \sqrt{8^2+(-2)^2}$
$= \sqrt{64+4}$
$= \sqrt{68}$

$d_{\overline{BC}} = \sqrt{(1-6)^2+(-1-2)^2}$
$= \sqrt{(-5)^2+(-3)^2}$
$= \sqrt{25+9}$
$= \sqrt{34}$

$\overline{AC} \cong \overline{BC}$

$(\sqrt{34})^2 + (\sqrt{34})^2 = (\sqrt{68})^2$
$34+34 = 68$
$68 = 68$

| | |
|---|---|
| 1. $\overline{AC} \cong \overline{BC}$ | 1. distance formula |
| 2. $\triangle ABC$ is a r$\triangle$ | 2. r$\triangle$s check with the pythag. theorem. |
| 3. $\triangle ABC$ is isos. | 3. Isos. $\triangle$ have two congruent sides |




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

## Question 32

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.

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

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

$m_{\overline{BC}} = \frac{-1-2}{1-6} = \frac{-3}{-5} = \frac{3}{5}$

$\therefore$ neg. reciprocal slopes

$\therefore \overline{AC} \perp \overline{BC}$

$\therefore \angle C$ is a rt $\angle$

$\therefore \triangle ABC$ is a rt $\triangle$ since it has a rt $\angle$ at C.

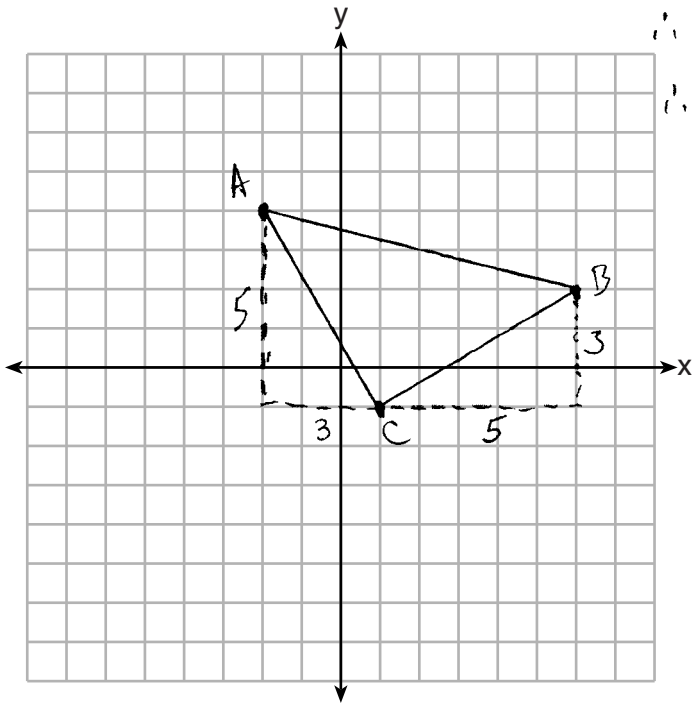
$AC = \sqrt{(-2-1)^2+(4-(-1))^2} = \sqrt{(-3)^2+(5)^2} = \sqrt{34}$

$BC = \sqrt{(6-1)^2+(2-(-1))^2} = \sqrt{5^2+3^2} = \sqrt{34}$

$\therefore AC = BC$

$\therefore \triangle ABC$ has 2 $\cong$ sides

$\therefore \triangle ABC$ is an isosceles $\triangle$




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

## Question 32

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.

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

I WILL PROVE $\triangle ABC$ AN ISOSCELES RIGHT TRIANGLE USING SLOPE & DISTANCE FORMULAS.

$m(\overline{AC})$: $d = \sqrt{(1--2)^2+(-1-4)^2} = \sqrt{34}$

$m(BC)$: $d = \sqrt{(1-6)^2+(-1-2)^2} = \sqrt{34}$

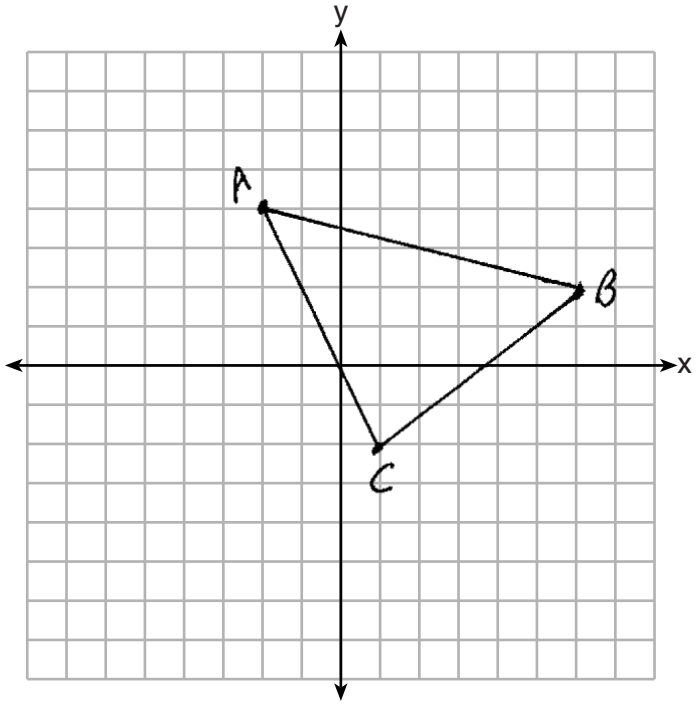
slope $\overline{AC}$: $\frac{-1-4}{1--2} = \frac{-5}{3}$

slope $\overline{BC}$: $\frac{-1-2}{1-6} = \frac{-3}{-5} = \frac{3}{5}$

$\overline{AC} \perp \overline{BC}$ b/c SLOPES ARE OPPOSITE, &

$\overline{AC} \cong BC$ b/c DISTANCE IS THE SAME.

THEREFORE, $\triangle ABC$ IS AN ISOSCELES RIGHT TRIAGLE.




**Score 3:** The student wrote an incomplete conclusion when proving $\triangle ABC$ is a right triangle. The student's proof does not rely on the graph, therefore the graphing error is not penalized.

## Question 32

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.

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

$(-2,4)$ $(6,2)$

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

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

$d = \sqrt{(8)^2 + (-2)^2}$

$d = \sqrt{64+4}$

$d = \sqrt{68}$

$(1,-1)$ $(6,2)$

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

$d = \sqrt{(6-1)^2 + (2+1)^2}$

$d = \sqrt{5^2 + 3^2}$

$d = \sqrt{25+9}$

$d = \sqrt{34}$

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

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

$d = \sqrt{(1+2)^2 + (-1-4)^2}$

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

$d = \sqrt{9+25}$

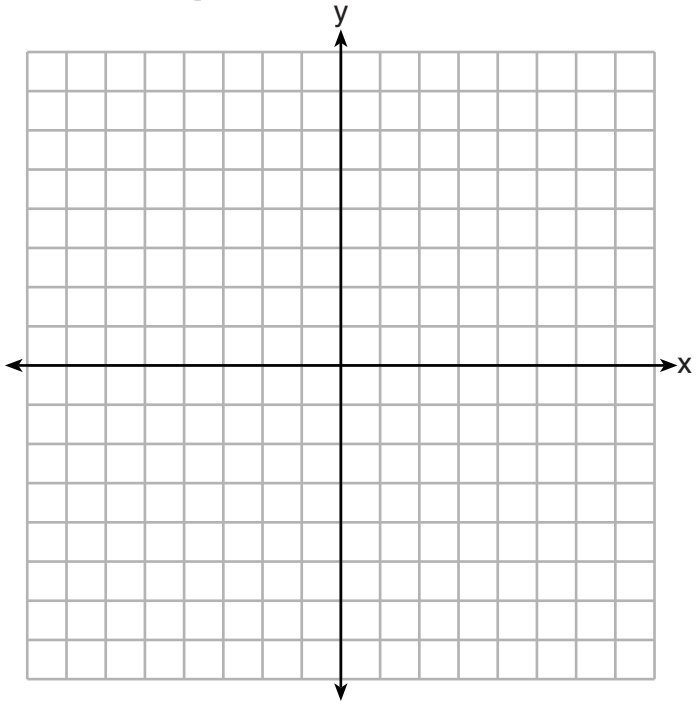
$d = \sqrt{34}$

$\overline{AB} = \sqrt{68}$

$\overline{AC} = \sqrt{34}$

$\overline{BC} = \sqrt{34}$

Since the distances of $\overline{AC}$ and $\overline{BC}$ are equal, and $\overline{AB}$ is different in value, Triangle ABC must be isosceles.




**Score 2:** The student correctly proved $\triangle ABC$ is isosceles, but no further correct work was shown.

## Question 32

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.

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

slope $\overline{AB} = \frac{\Delta y}{\Delta x}$

$= \frac{4-2}{-2-6}$

$= \frac{2}{-8}$

slope $\overline{AB} = \frac{-1}{4}$

slope $\overline{BC} = \frac{\Delta y}{\Delta x}$

$= \frac{2--1}{6-1}$

slope $\overline{BC} = \frac{3}{5}$

slope $\overline{CA} = \frac{\Delta y}{\Delta x}$

$= \frac{-1-4}{1--2}$

slope $\overline{CA} = \frac{-5}{3}$

Conclusion:

Using the slope formula:

slope $\overline{AB} = \frac{-1}{4}$, slope $\overline{BC} = \frac{3}{5}$

slope $\overline{CA} = \frac{-5}{3}$,

If two lines have negative reciprocal slopes, then they are $\perp$

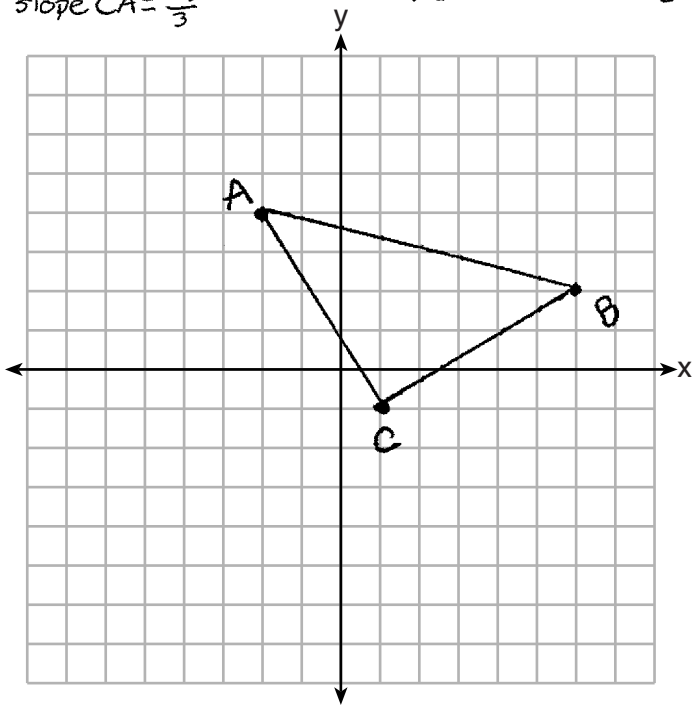
$\therefore \overline{CA} \perp \overline{BC}$

If two $\perp$ lines intersect, then they form a right $\angle$

$\therefore \angle C$ is a right $\angle$

If a triangle has one right $\angle$, then it is a right $\Delta$

$\therefore \Delta ABC$ is a right $\Delta$




**Score 2:** The student correctly proved $\triangle ABC$ is a right triangle, but no further correct work was shown.

**Question 32**

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.

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

I will prove $\Delta ABC$ an isosceles right triangle using slope & distance formulas.

$\overline{AC}$: $\frac{-1-4}{1--2} = \frac{-5}{3}$ { $\overline{BC}$: $\frac{-1-2}{1-6} \quad \frac{-3}{-5} = \frac{3}{5}$

$\overline{AC}$: $d = \sqrt{(1--2)^2+(-1-4)^2}$

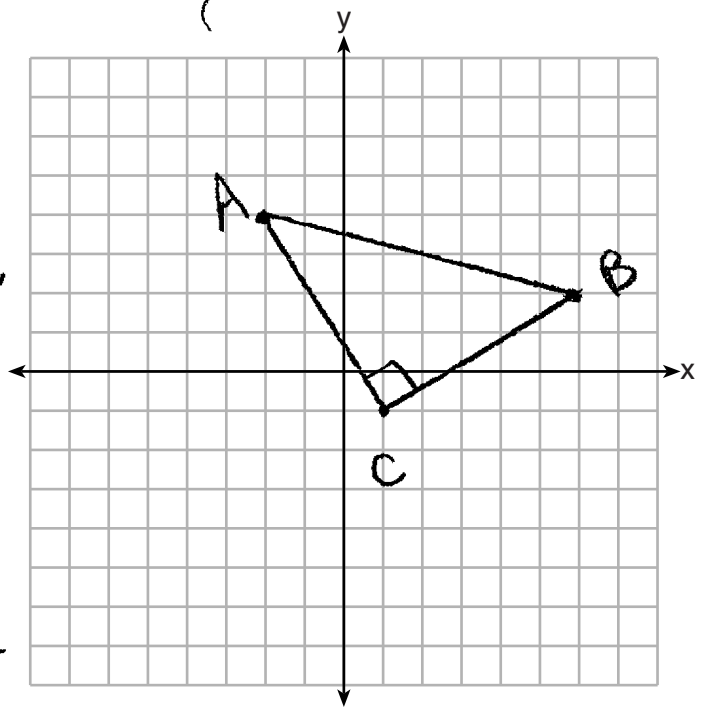
$d = \sqrt{9+25}$

$d = \sqrt{34}$

$\overline{BC}$: $d = \sqrt{(1-6)^2+(-1-2)^2}$

$d = \sqrt{25+9}$

$d = \sqrt{34}$




$\overline{AC} \perp \overline{BC}$ b/c slopes are opposite reciprocal, & $\overline{AC} \parallel \overline{BC}$ b/c distance is the same. therefore, $\Delta ABC$ is a isosceles right triangle

**Score 2:** The student wrote one incomplete conclusion and one incorrect conclusion.

## Question 32

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.

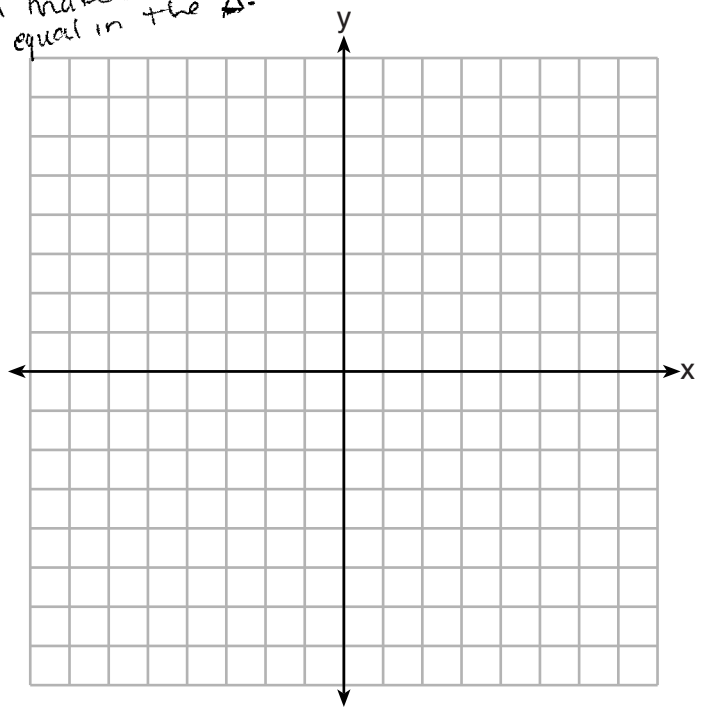
[The use of the set of axes below is optional.]

AB $D = \sqrt{(-2-6)^2 + (4-2)^2}$ $\sqrt{68}$ $\sqrt{4}\sqrt{17}$ $2\sqrt{17}$

BC $D = \sqrt{(6-1)^2 + (2--1)^2}$ $\sqrt{34}$

AC $D = \sqrt{(-2-1)^2 + (4--1)^2}$ $\sqrt{34}$

$\overline{AC} \cong \overline{BC}$ has the same distance, which makes two sides equal in the $\triangle$.



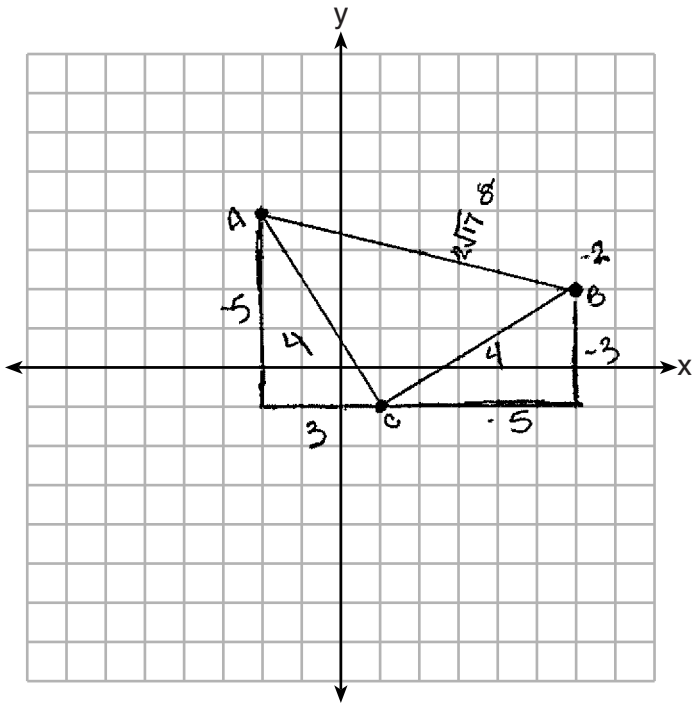

**Score 1:** The student wrote an incomplete conclusion when proving $\triangle ABC$ is isosceles. No further correct work was shown.

## Question 32

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

Prove that $\triangle ABC$ is an isosceles right triangle.
[The use of the set of axes below is optional.]

$\triangle ABC$ is an isosceles right triangle because $\overline{AC} \cong \overline{BC}$, they have the same length of 4. $\overline{AC}$ and $\overline{BC}$ make up a 90° angle. So $\triangle ABC$ is an isosceles right triangle.




**Score 1:** The student used a Pythagorean Triple incorrectly, but made an appropriate conclusion. No further correct work was shown.

**Question 32**

**32** A triangle has vertices $A(-2,4)$, $B(6,2)$, and $C(1,-1)$.

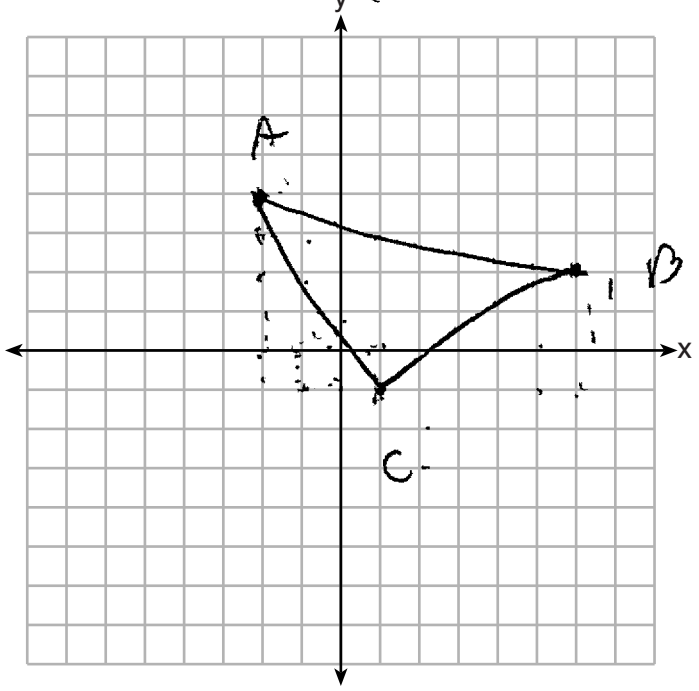
Prove that $\triangle ABC$ is an isosceles right triangle.

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

Slope formula AC: the slope is (3, 5)

Slope formula CB: the slope is (5, 3)

When the slopes are opposite it means that the lines are perpidicular Meaning △ ABC is a right triangle




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

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of \$3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of \$200 per 6000 gallons.

3 ft 6 in = 3.5

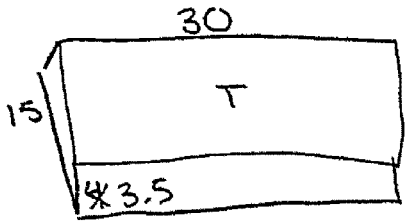
If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]

$V = l \times w \times h$

$V = 30 \times 15 \times 3.5$

$V = 1575\ ft^3 = 11781\ g$

$11781 \times .0395 =$ \$465.35

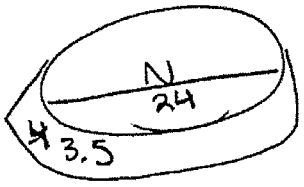



$V = 2\pi r^2 h$

$V = 2\pi 12^2 3.5$

$V = 1583.36\ ft^3 = 11843.55\ g$

$(2\pi 12^2 3.5 \times 7.48) \times .033 =$ \$394.79




$\frac{3.95}{100} = 0.0395$ per g

$\frac{200}{6000} = .033$ per g

Theresa paid more to fill her pool than Nancy did.

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

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of \$3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of \$200 per 6000 gallons.

If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]

$V=30(15)(3.5)$

$V=1575$

$1575(7.48)=11781$

$11781(3.95)\div 100$

\$465.35

$V=\pi 24^2(3.5)$

$V=2016\pi$

$2016\pi(7.48)=$

47374.21191

$\frac{47374.21191(200)}{6000}$

\$1579.14

Nancy

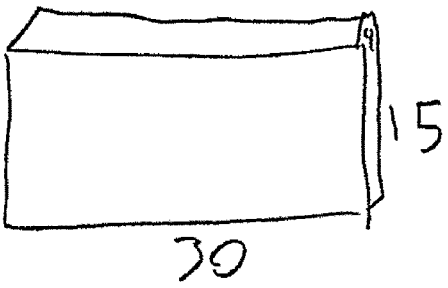
**Score 3:** The student used 24, the diameter, as the radius of Nancy's pool.

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of $3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of $200 per 6000 gallons.

If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]

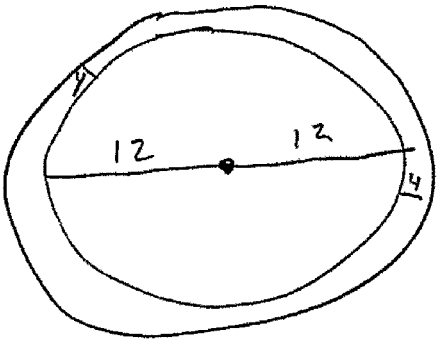



30 · 15 · 4
1800 ft³

1800 · 7.84 = 14112 / 100

Theresa paid more

141.12 × 3.95
$557.42




$4\pi r^2 h$

$4\pi(12)^2 \cdot 4$

1809.5574 ft³

1809.5574 · 7.84 = 14186.9300 / 6000

2.3645 · 200

$472.90

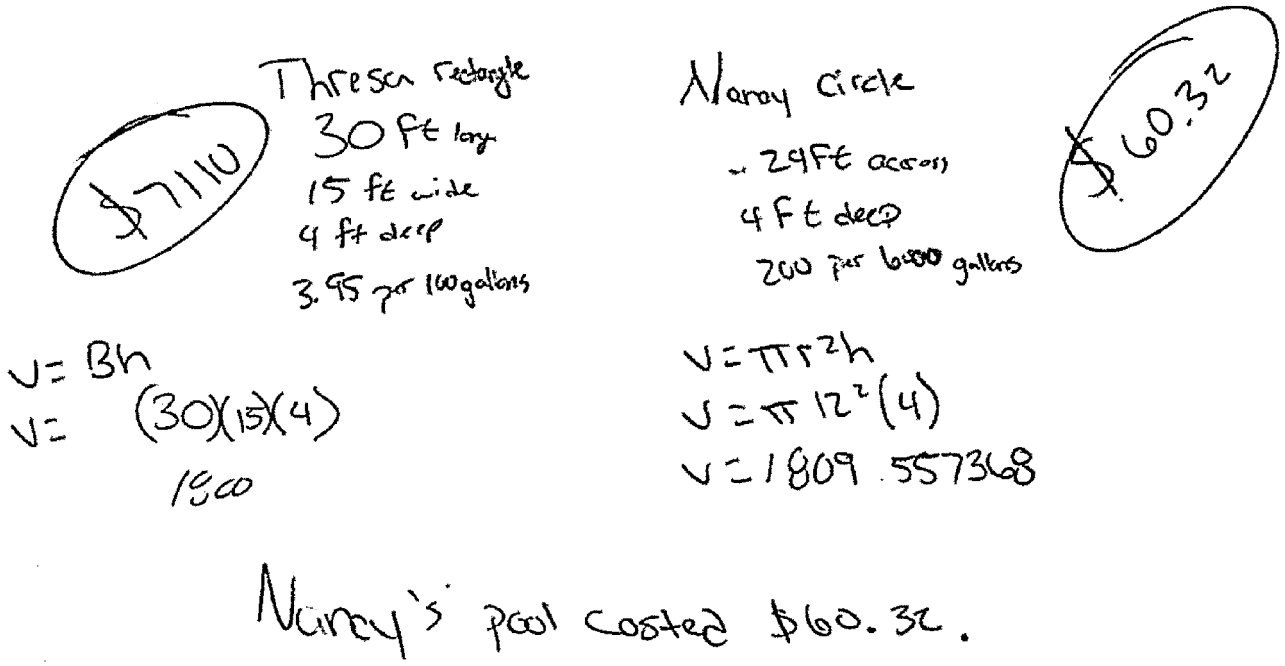
**Score 2:** The student made an error in using 4 feet for the depth. The student made a transcription error by using 7.84 when converting to gallons.

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of $3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of $200 per 6000 gallons.

If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]



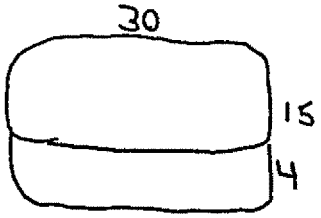

**Score 1:** The student found both volumes using 4 feet for the depth.

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of $3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of $200 per 6000 gallons.

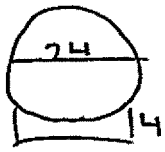
If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]




$V = l \cdot w \cdot h$
$V = 30 \cdot 15 \cdot 4$
$V = 1800$

1800
x 7.48
13464 gallons

$531.83




$V = \frac{1}{3}\pi r^2 h$
$V = \frac{1}{3}\pi (12)^2 (4)$
$V = \frac{1}{3}\pi 144 \cdot 4$
$V = \frac{1}{3}\pi 576$
$V = 192\pi$
$V = 603.18$

603.18
x 7.48
4511.7464

Theresa paid more because her pool is bigger.

**Score 1:** The student made a conceptual error using the volume of a cone for the volume of the cylinder. The student made a computational error using 4 feet for the depth.

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of \$3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of \$200 per 6000 gallons.

If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]

$V = 30'(15')(3.5')$

$V = 1575\ ft^3$

$\#\text{gallons} = \frac{1575\ ft^3}{7.48} = 210.56\ gal$

$\text{Cost} = 210.56(\$3.95)$

$\text{Cost} = \$831.72$

$V = \frac{1}{3}\pi(24')^2(3.5')$

$V = 2111.150623\ ft^3$

$\#\text{gallons} = \frac{2111.150625\ ft^3}{7.48}$

$= 282.2393\ gal$

$\text{Cost} = \frac{\$56447.868}{6000}$

$= \$9.41$

**Score 1:** The student found the correct volume of water in one pool, but no further correct work was shown.

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of $3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of $200 per 6000 gallons.

If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]

1,800

Theresa = 531.828

Nancy = 451.829

Theresa paid more to fill her pool because the depth of each pool would have been the same and when you compare volume to cost, Theresa paid 79.999

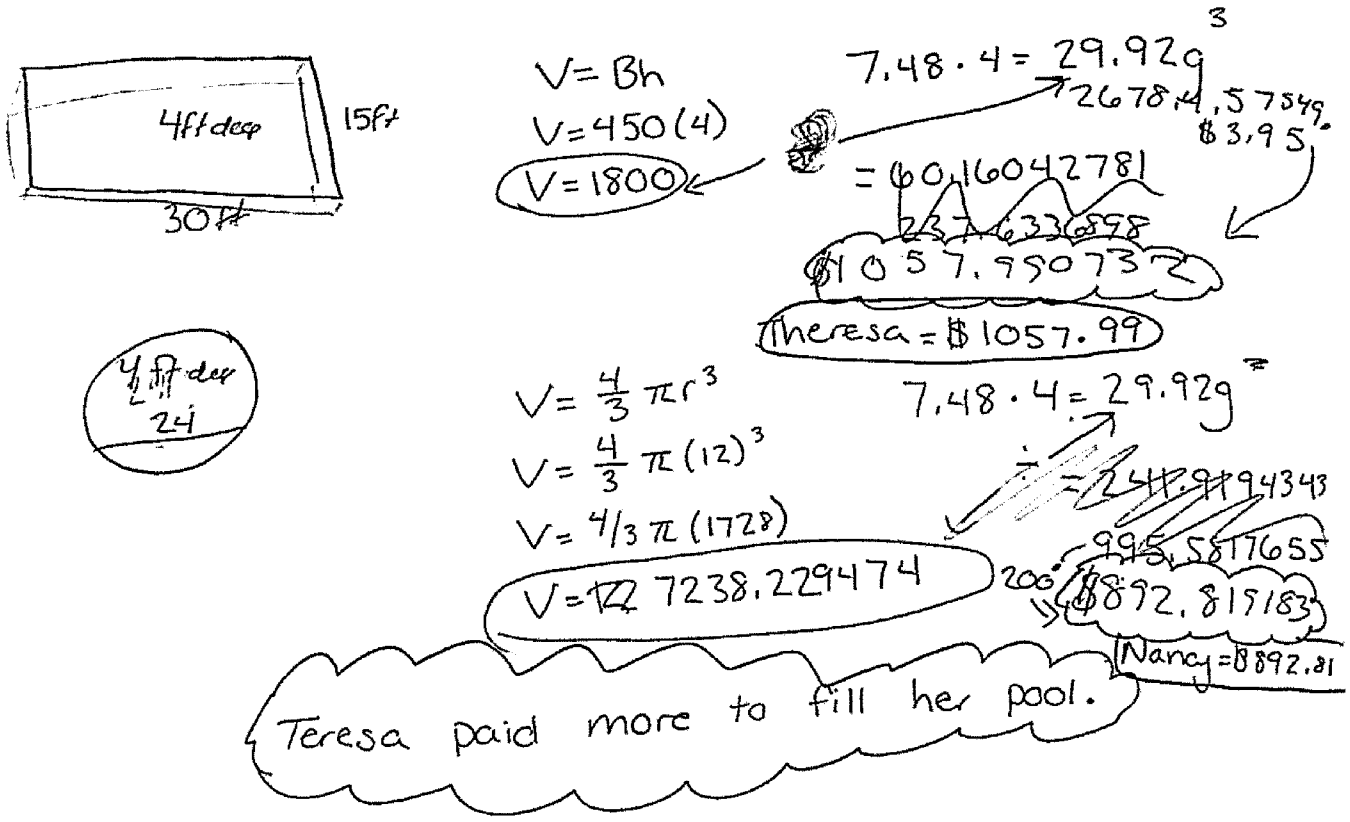
**Score 0:** The student did not show enough correct relevant work to receive any credit.

**Question 33**

**33** Theresa has a rectangular pool 30 ft long, 15 ft wide, and 4 ft deep. Theresa fills her pool using city water at a rate of $3.95 per 100 gallons of water.

Nancy has a circular pool with a diameter of 24 ft and a depth of 4 ft. Nancy fills her pool with a water delivery service at a rate of $200 per 6000 gallons.

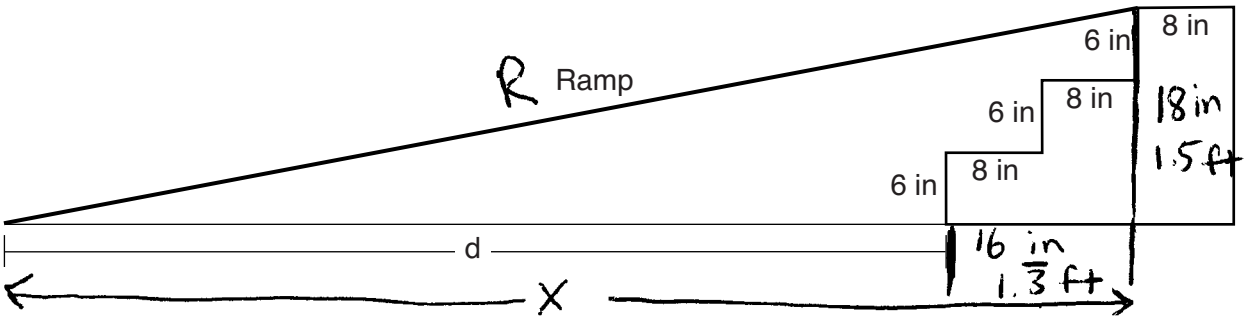
If Theresa and Nancy both fill their pools 6 inches from the top of the pool, determine and state who paid more to fill her pool. [1 $ft^3$ water = 7.48 gallons]




**Score 0:** The student gave a completely incorrect response.

**Question 34**

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.




If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

$\sin 4.76 = \frac{1.5}{R}$

18.1

$R = \frac{1.5}{\sin 4.76}$ $R = 18.07617886$

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, *d*, from the bottom of the stairs to the bottom of the ramp.

$\cos 4.76 = \frac{X}{18.1}$

$X = 18.1 \cos 4.76$

$X = 18.03757373$

$d = 18.03757373 - 1.\overline{3}$

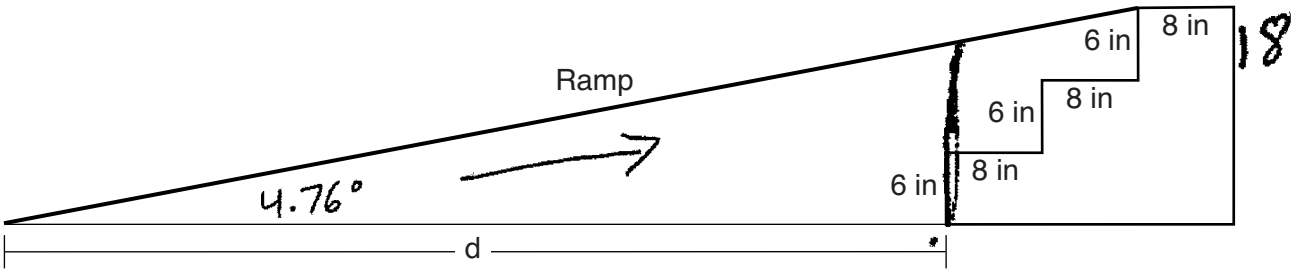
$d = 16.70424039$

16.7

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

**Question 34**

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.




If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

$\sin 4.76 = \frac{18}{x}$

$x = 216.9141463 / 12$

$x = 18.07617886$

The ramp is 18.1 feet long.

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, *d*, from the bottom of the stairs to the bottom of the ramp.

$\tan 4.76 = \frac{18}{y}$

$d = 216.1660169 - 16$

$d = 200.1660169 / 12$

$d = 16.68050141$

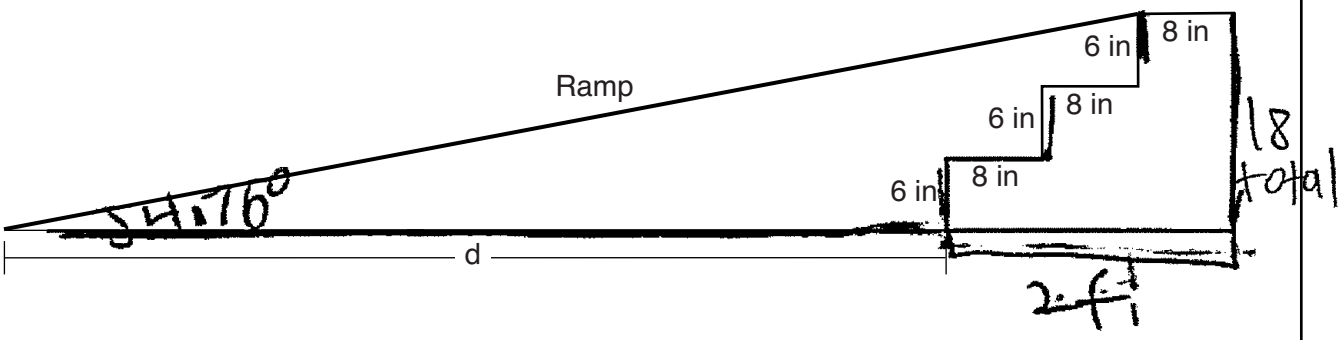
The distance from the bottom of the stairs to the bottom of the ramp is 16.7 feet long.

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

**Question 34**

5/5

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.




If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

$\frac{6 \text{ in}}{\sin 4.76} = \frac{18}{x}$

$18 = .08298213471x$

$.08298213471$

$x = 216.9 \text{ inches}$

18.1 ft

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, *d*, from the bottom of the stairs to the bottom of the ramp.

$\frac{\tan 4.76}{1} = \frac{18}{y}$

$\frac{18}{\tan 4.76} = \frac{(\tan 4.76)y}{\tan 4.76}$

length in inches

$y = \frac{216.1660169 \text{ in}}{12}$

16.0 feet

length of stairs

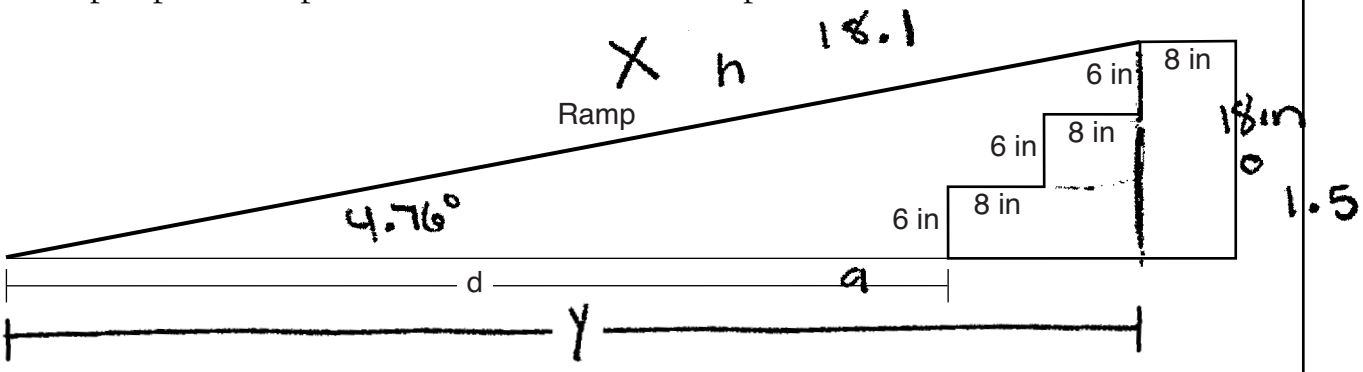
18 ft total

−2 ft

**Score 3:** The student incorrectly subtracted 2 feet in determining the horizontal distance.

**Question 34**

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.




If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

$\sin 4.76 = \frac{18}{x}$

$\sin 4.76(x) = 18$

$\frac{18}{\sin 4.76} = x$

$x = 216.914$ in

$12\overline{)216.9}$

RAMP LENGTH IS 18.1 FT.

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, *d*, from the bottom of the stairs to the bottom of the ramp.

$1.5^2 + y^2 = 18.1^2$

$2.25 + y^2 = 327.61$

$-2.25 \quad -2.25$

$y^2 = 325.36$

$y = 18.03$

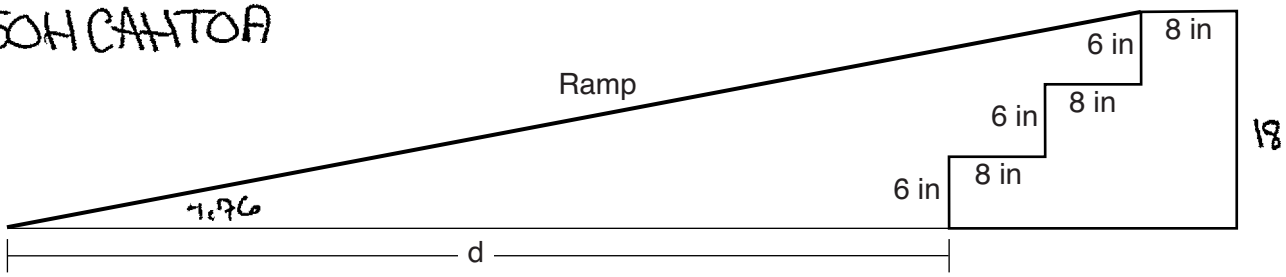
$y \approx 18.0$ FEET

**Score 3:** The student did not subtract 16 inches when determining the horizontal distance.

**Question 34**

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.

SOH CAH TOA




If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

$\sin(4.76) = \frac{18}{x}$

$x = 216.9$ in

$216.9 \text{ in} = 18.1 \text{ ft}$

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, $d$, from the bottom of the stairs to the bottom of the ramp.

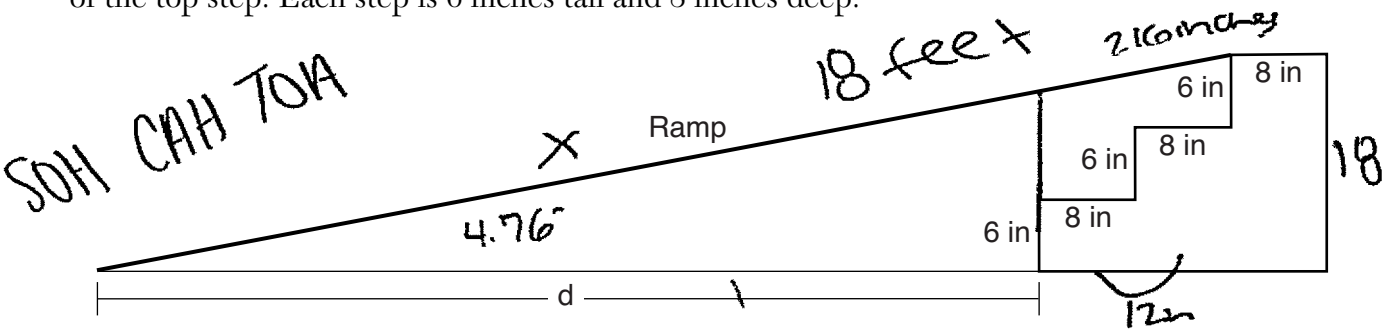
$\cos(4.76) = \frac{2}{18}$

$d = 17.9$

**Score 2:** The student found the correct length of the ramp, but no further correct work was shown.

**Question 34**

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.




If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

6 x 3 = 18 height = 18 in

$\tan 4.76 = \frac{18}{x}$

$x = \frac{18}{\tan 4.76} = \frac{216.16 \text{ inches}}{12 \text{ inches}}$

18.013

length = 18.0 feet

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, *d*, from the bottom of the stairs to the bottom of the ramp.

18 ft = 216 inches
- 12 inches
204

$\frac{204}{12} = 17$ ft

$\cos 4.76 = \frac{d}{17}$

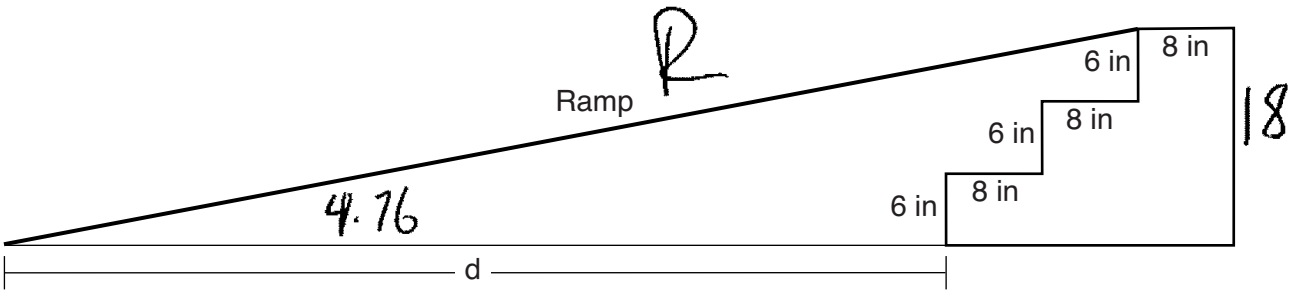
$d = \cos 4.76 (17) = 16.9413$

16.9 feet

**Score 2:** The student used an incorrect trigonometric equation when determining the length of the ramp. The student incorrectly subtracted 12 inches when determining the horizontal distance.

**Question 34**

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.



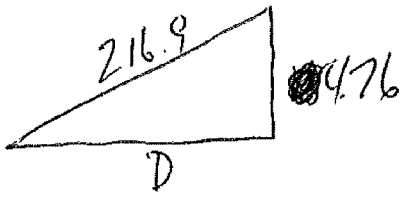

If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

$\sin 4.76 = \frac{18}{R}$ $\quad R \sin 4.76 = 18$

$\frac{R \sin 4.76}{\sin 4.76} = \frac{18}{\sin 4.76}$

$R \approx 216.9$ ft

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, $d$, from the bottom of the stairs to the bottom of the ramp.




$(4.76)^2 + (D)^2 = (216.9)^2$

$22.6576 + D^2 = 47045.61$

$D^2 = 47022.9524$

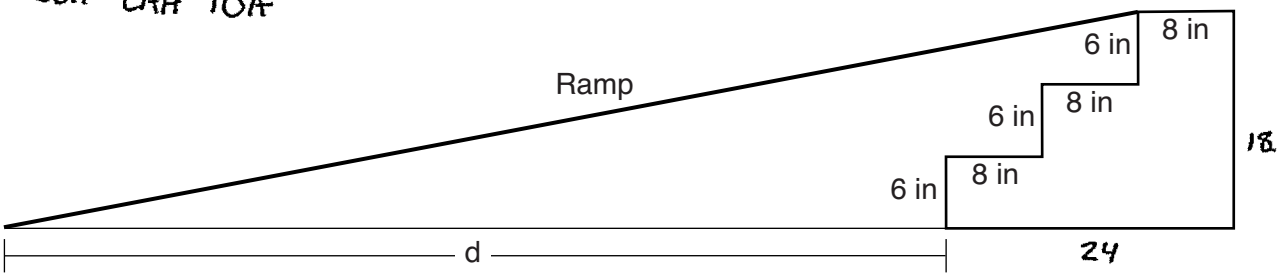
$D = 216.8$

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

## Question 34

**34** As modeled in the diagram below, an access ramp starts on flat ground and ends at the beginning of the top step. Each step is 6 inches tall and 8 inches deep.

SOH CAH TOA




If the angle of elevation of the ramp is 4.76°, determine and state the length of the ramp, to the *nearest tenth of a foot*.

$\tan x = \frac{18}{24}$

$\tan^{-1}\left(\frac{18}{24}\right) = 36.8699$

36.9 Ft

Determine and state, to the *nearest tenth of a foot*, the horizontal distance, $d$, from the bottom of the stairs to the bottom of the ramp.

$\sin X = \frac{18}{36.9}$

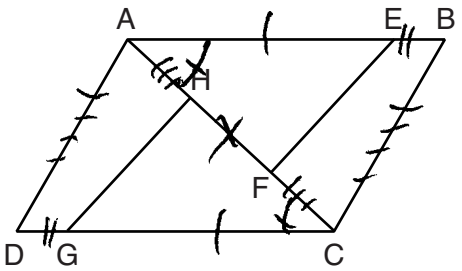
$\sin^{-1}\left(\frac{18}{36.9}\right) = 29.1694$

29.2 Ft

**Score 0:** The student gave a completely incorrect response.

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

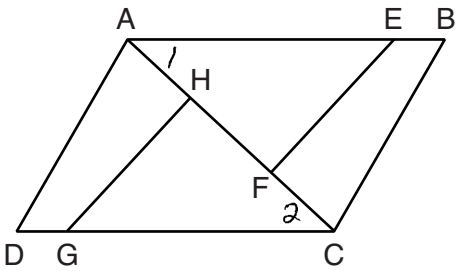
Given $\overline{AE} \cong \overline{CG}$ & $\overline{BE} \cong \overline{DG}$ $\overline{AH} \cong \overline{CF}$. If we add the $\cong$ parts $\overline{AE} + \overline{EB} \cong \overline{CG} + \overline{GD}$ by the addition postulate $\overline{AB} \cong \overline{CD}$. We were also given $\overline{AD} \cong \overline{BC}$ Therefore ABCD is a ||gram as it has opposite sides $\cong$ Therefore $\overline{AB} \parallel \overline{DC}$ and $\overline{AC}$ is a diagonal so the alternate interior angles along this diagonal $\angle EAF$ & $\angle HCG$ are $\cong$. By reflexive property $\overline{HF} \cong \overline{HF}$, using the addition postulate again $\overline{AH} + \overline{HF} \cong \overline{HF} + \overline{FC}$ ($\overline{AF} \cong \overline{CH}$). So, along with given $\overline{CG} \cong \overline{AE}$, by SAS $\cong$ SAS $\triangle AEF \cong \triangle CGH$. Their corresponding parts $\overline{EF}$ & $\overline{GH}$ are congruent as well by CPCTC.

**Work space for question 35 is continued on the next page.**

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

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

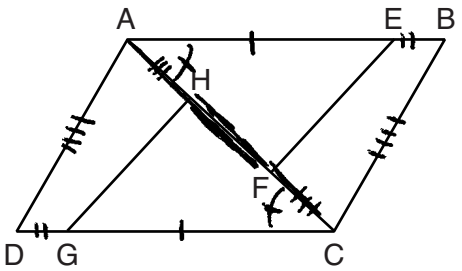
| Statements | Reasons |
|---|---|
| 1. Quad $ABCD$ w/ diagonal $\overline{AC}$, $\overline{GH} \cong \overline{EF}$, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, $\overline{AD} \cong \overline{CB}$ | 1. Given |
| 2. $\overline{HF} \cong \overline{HF}$, $\overline{AC} \cong \overline{AC}$ | 2. Reflexive (PIC) |
| 3. $\overline{AH} + \overline{HF} \cong \overline{CF} + \overline{HF}$, $\overline{AF} \cong \overline{CH}$ | 3. Addition (1,2) |
| 4. $\overline{AE} + \overline{BE} \cong \overline{CG} + \overline{DG}$, $\overline{AB} \cong \overline{CD}$ | 4. Addition (1) |
| 5. $\triangle ABC \cong \triangle CDA$ | 5. SSS $\cong$ SSS (1,2,4) |
| 6. $\angle 1 \cong \angle 2$ | 6. CPCTC (5) |
| 7. $\triangle AEF \cong \triangle CGH$ | 7. SAS $\cong$ SAS (1,6,3) |
| 8. $\overline{EF} \cong \overline{GH}$ | 8. CPCTC (7) |

**Work space for question 35 is continued on the next page.**

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

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.



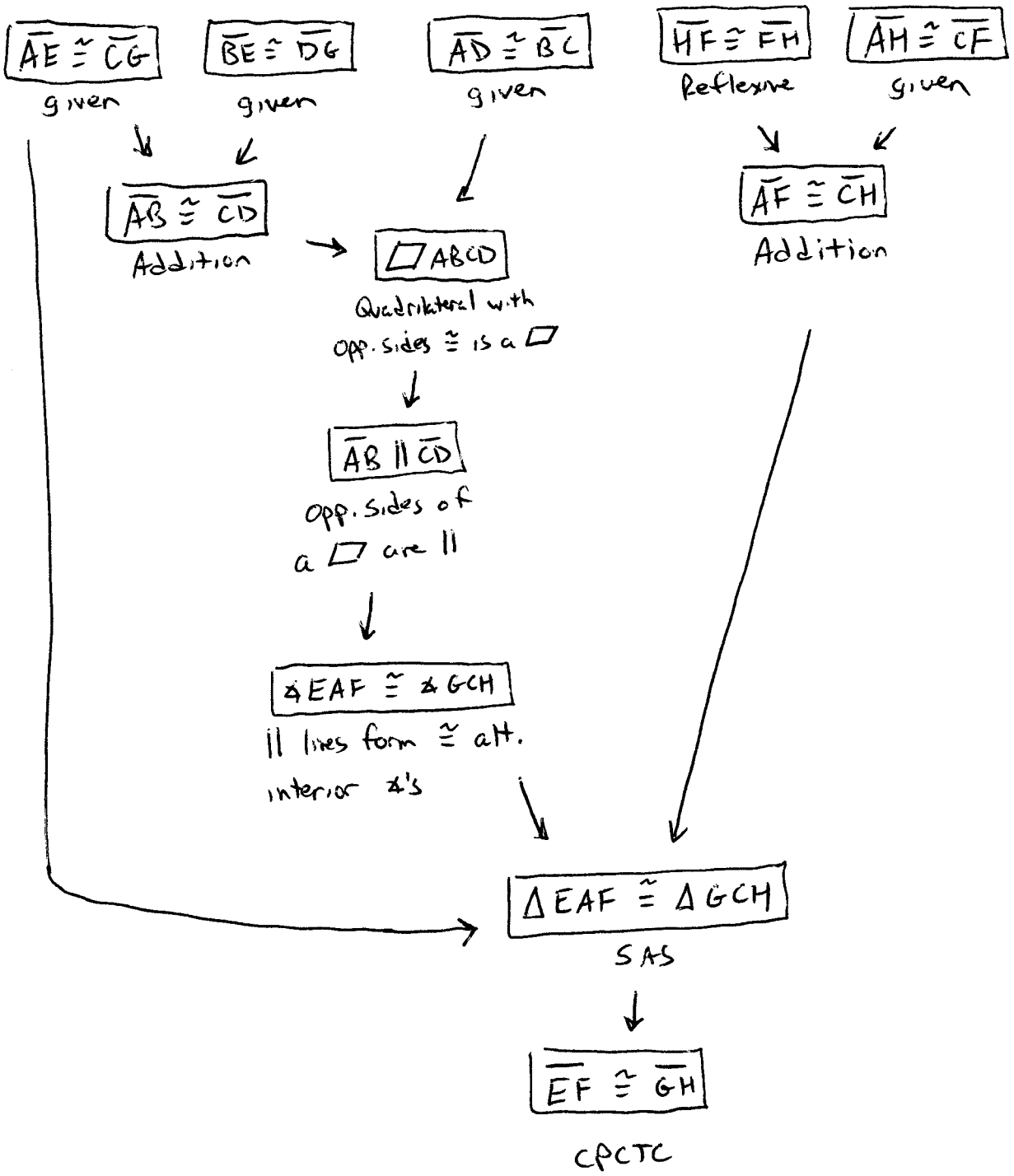

make ▱;
△s ≅

Prove: $\overline{EF} \cong \overline{GH}$

**Work space for question 35 is continued on the next page.**

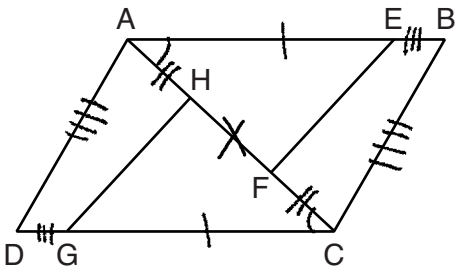
**Score 6:** The student gave a complete and correct response.

**Question 35 continued**



**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

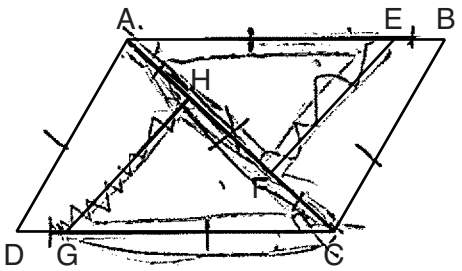
| S | R |
|---|---|
| ① quadrilateral ABCD; diag $\overline{AC}$; $\overline{GH}$ and $\overline{EF}$; $\overline{AE} \cong \overline{CG}$; $\overline{AH} \cong \overline{CF}$; $\overline{BE} \cong \overline{DG}$; $\overline{AD} \cong \overline{CB}$ | ① Given |
| ② $\overline{HF} \cong \overline{HF}$ | ② reflexive |
| ③ $\overline{AH} + \overline{HF} \cong \overline{CF} + \overline{HF}$ or $\overline{AF} \cong \overline{CH}$; $\overline{AE} + \overline{BE} \cong \overline{CG} + \overline{GD}$ or $\overline{BA} \cong \overline{CD}$ | ③ addition |
| ④ quad ABCD is a $\square$ | ④ if both pairs of opp. sides are $\cong$, the quad. is a $\square$. |
| ⑤ $\overline{AB} \parallel \overline{CD}$ | ⑤ opp. sides of a $\square$ are $\parallel$ |
| ⑥ $\angle BAF \cong \angle DCA$ | ⑥ alt. int. $\angle$s are $\cong$. |
| ⑦ $\triangle AEF \cong \triangle CGH$ | ⑦ SAS $\cong$ SAS |
| ⑧ $\overline{EF} \cong \overline{GH}$ | ⑧ cpctc |

**Work space for question 35 is continued on the next page.**

**Score 5:** The student had an incomplete reason in step 6.

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

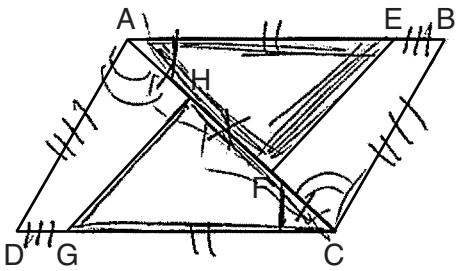
| Statements | Reasons |
|---|---|
| 1) $\overline{AH} \cong \overline{CF}$ | 1) given |
| 2) $\overline{HF} \cong \overline{HF}$ | 2) reflexive prop. |
| 3) $\overline{AF} \cong \overline{CH}$ | 3) addition. Postulate of equality |
| 4) quadrilateral ABCD | 4) given |
| 5) $\overline{AB} \parallel \overline{CD}$ | 5) If quad. then opp. sides $\parallel$ |
| 6) diagonal $\overline{AC}$ | 6) given |
| 7) $\angle FAE \cong \angle HCG$ | 7) If 2 $\parallel$ lines are crossed by a transversal, then alt. int. $\angle$s are $\cong$ |
| 8) $\overline{AE} \cong \overline{CG}$ | 8) given |
| 9) $\triangle AFE \cong \triangle CHG$ | 9) SAS $\cong$ |
| 10) $\overline{EF} \cong \overline{GH}$ | 10) CPCTC |

**Work space for question 35 is continued on the next page.**

**Score 4:** The student made a conceptual error by claiming parallel sides came from the quadrilateral in step 5.

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

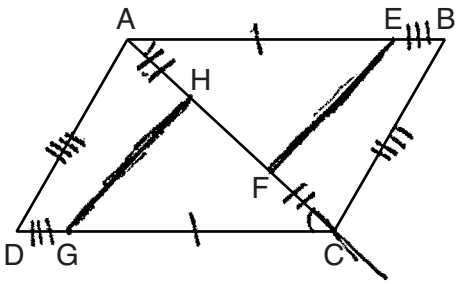
| Statement | Reason |
|---|---|
| (1) Quadrilateral ABCD with diagnol $\overline{AC}$, segments GH + EF $\overline{AE} \cong \overline{CG}$, $\overline{AH} \cong \overline{CF}$, $\overline{BE} \cong \overline{DG}$ $\overline{AD} \cong \overline{CB}$ | (1) Given |
| (2) $\overline{HF} \cong \overline{HF}$ | (2) Reflexive property |
| (3) $\overline{AF} \cong \overline{HC}$ | (3) Addition postulate |
| (4) $\overline{AB} \cong \overline{DC}$ | (4) Addition postulate |
| (5) ABCD is a parallelogram | (5) both pairs of opposite sides are congruent |
| (6) $\overline{AD} \parallel \overline{BC}$ | (6) ABCD is a parallelogram with $\parallel$ sides |
| (7) $\angle EAF \cong \angle ACG$ | (7) alternate exterior angles are congruent |
| (8) $\triangle AFE \cong \triangle CHG$ | (8) SAS $\cong$ SAS |
| (9) $\overline{EF} \cong \overline{GH}$ | (9) CPCTC |

**Work space for question 35 is continued on the next page.**

**Score 4:** The student stated the wrong parallel sides in step 6, followed by an incorrect reason in step 7.

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




$\triangle FAE \cong \triangle HGC$
CPCTC

Prove: $\overline{EF} \cong \overline{GH}$

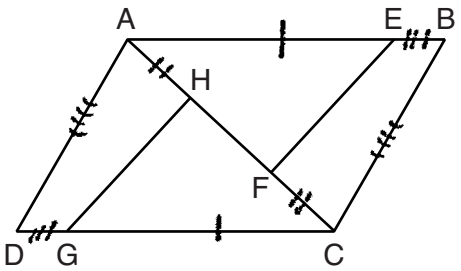
| Statements | Reasons |
|---|---|
| ① $\overline{AE} \cong \overline{GC}$ | ① Given |
| ② $\overline{AH} \cong \overline{FC}$ | ② Given |
| ③ $\overline{HF} \cong \overline{HF}$ | ③ Reflexive |
| ④ $AH + HF = AF$; $FC + HF = HC$ | ④ partition |
| ⑤ $AH + HF = HF + FC$ | ⑤ Addition property of equality |
| ⑥ $\overline{AF} \cong \overline{HC}$ | ⑥ substitution |
| ⑦ $\overline{GH} \parallel \overline{EF}$ | ⑦ Given |
| ⑧ $\angle HAE \cong \angle FCG$ | ⑧ If 2 ∥ lines crossed by transv., opposite interior ∠'s ≅ |
| ⑨ $\triangle FAE \cong \triangle HCG$ | ⑨ SAS |
| ⑩ $\overline{EF} \cong \overline{GH}$ | ⑩ CPCTC. |

**Work space for question 35 is continued on the next page.**

**Score 3:** The student made a conceptual error by assuming $\overline{GH} \parallel \overline{EF}$ in step 7 and wrote an incorrect statement in step 8 based on the wrong parallel sides.

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

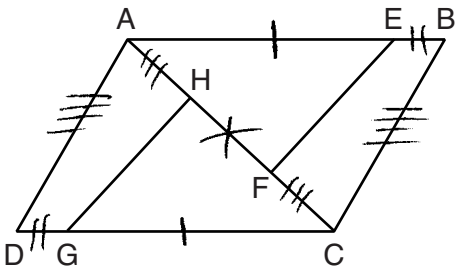
| S | R |
|---|---|
| 1) $\overline{AE} \cong \overline{CG}$, $\overline{AH} \cong \overline{CF}$, $\overline{BE} \cong \overline{DG}$, $\overline{AD} \cong \overline{CB}$ | 1) Given |
| 2) $\overline{AE} + \overline{EB} \cong \overline{CG} + \overline{DG}$ $\overline{AB} \cong \overline{CD}$ | 2) segment addition postulate |
| 3) $\square ABCD$ | 3) opposite sides are congruent, then it's a parallelogram |
| 4) $AC = AC$ | 4) reflexive property |
| 5) $\triangle ADC \cong \triangle BCA$ | 5) SSS |
| 6) $\overline{GH} \cong \overline{EF}$ | 6) CPCTC |

**Work space for question 35 is continued on the next page.**

**Score 2:** The student combined two different approaches by proving $ABCD$ is a parallelogram and $\triangle ADC \cong \triangle BCA$, but no further relevant work was shown.

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

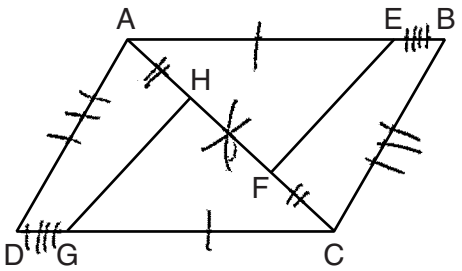
| Statement | Reason |
|---|---|
| (1) Quad ABCD with diagonal $\overline{AC}$, $\overline{GH}$ & $\overline{EF}$; $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, $\overline{AD} \cong \overline{CB}$ | (1) Given |
| (2) $\overline{AB} \cong \overline{DC}$ | (2) Addition Postulate |
| (3) $\overline{AC} \cong \overline{AC}$ | (3) Reflexive |
| (4) $\triangle ACD \cong \triangle CAB$ | (4) SSS |
| (5) $\overline{GH} \cong \overline{EF}$ | (5) CPCTC |

**Work space for question 35 is continued on the next page.**

**Score 2:** The student proved $\triangle ACD \cong \triangle CAB$, but no further correct work was shown.

## Question 35

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

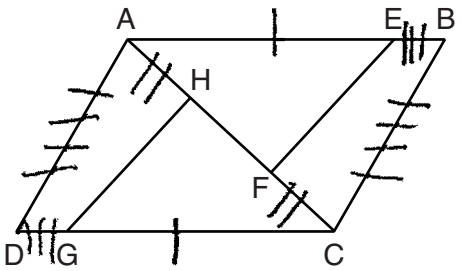
| Statements | Reasons |
| --- | --- |
| 1. $\overline{AE} \cong \overline{CG}$, $\overline{AH} \cong \overline{CF}$, $\overline{BE} \cong \overline{DG}$, $\overline{AD} \cong \overline{CB}$ | 1. Given |
| 2. $\overline{HF} \cong \overline{FH}$ | 2. Reflexive Property |

**Work space for question 35 is continued on the next page.**

**Score 1:** The student had one correct relevant statement and reason.

**Question 35**

**35** In the diagram of quadrilateral $ABCD$ with diagonal $\overline{AC}$ shown below, segments $GH$ and $EF$ are drawn, $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, and $\overline{AD} \cong \overline{CB}$.




Prove: $\overline{EF} \cong \overline{GH}$

| S | R |
|---|---|
| 1. $\overline{AE} \cong \overline{CG}$, $\overline{AH} \cong \overline{CF}$, $\overline{BE} \cong \overline{DG}$, and $\overline{AD} \cong \overline{CB}$ | 1. Given |
| 2. $\angle ADC$ and $\angle CBA$ are vertical $\angle$'s | 2. Intersecting lines form vertical $\angle$'s |
| 3. $\angle ADC \cong \angle CBA$ | 3. All vertical $\angle$'s are $\cong$ |
| 4. $\triangle ADC \cong \triangle CBA$ | 4. SSS $\cong$ SSS |
| 5. $\overline{EF} \cong \overline{GH}$ | 5. CPCTC |

**Work space for question 35 is continued on the next page.**

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

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

# Regents Examination in Geometry – January 2019

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

(Use for the January 2019 exam only.)

| Raw Score | Scale Score | Performance Level |
|---|---|---|
| 80 | **100** | 5 |
| 79 | **99** | 5 |
| 78 | **98** | 5 |
| 77 | **97** | 5 |
| 76 | **96** | 5 |
| 75 | **95** | 5 |
| 74 | **94** | 5 |
| 73 | **93** | 5 |
| 72 | **92** | 5 |
| 71 | **91** | 5 |
| 70 | **91** | 5 |
| 69 | **90** | 5 |
| 68 | **89** | 5 |
| 67 | **88** | 5 |
| 66 | **88** | 5 |
| 65 | **87** | 5 |
| 64 | **86** | 5 |
| 63 | **86** | 5 |
| 62 | **85** | 5 |
| 61 | **84** | 4 |
| 60 | **84** | 4 |
| 59 | **83** | 4 |
| 58 | **83** | 4 |
| 57 | **82** | 4 |
| 56 | **82** | 4 |
| 55 | **81** | 4 |
| 54 | **81** | 4 |

| Raw Score | Scale Score | Performance Level |
|---|---|---|
| 53 | **80** | 4 |
| 52 | **80** | 4 |
| 51 | **79** | 3 |
| 50 | **79** | 3 |
| 49 | **78** | 3 |
| 48 | **78** | 3 |
| 47 | **77** | 3 |
| 46 | **77** | 3 |
| 45 | **76** | 3 |
| 44 | **76** | 3 |
| 43 | **75** | 3 |
| 42 | **75** | 3 |
| 41 | **74** | 3 |
| 40 | **73** | 3 |
| 39 | **73** | 3 |
| 38 | **72** | 3 |
| 37 | **71** | 3 |
| 36 | **71** | 3 |
| 35 | **70** | 3 |
| 34 | **69** | 3 |
| 33 | **68** | 3 |
| 32 | **68** | 3 |
| 31 | **67** | 3 |
| 30 | **66** | 3 |
| 29 | **65** | 3 |
| 28 | **64** | 2 |
| 27 | **62** | 2 |

| Raw Score | Scale Score | Performance Level |
|---|---|---|
| 26 | **61** | 2 |
| 25 | **60** | 2 |
| 24 | **59** | 2 |
| 23 | **57** | 2 |
| 22 | **56** | 2 |
| 21 | **55** | 2 |
| 20 | **53** | 1 |
| 19 | **51** | 1 |
| 18 | **49** | 1 |
| 17 | **48** | 1 |
| 16 | **46** | 1 |
| 15 | **44** | 1 |
| 14 | **42** | 1 |
| 13 | **39** | 1 |
| 12 | **37** | 1 |
| 11 | **35** | 1 |
| 10 | **32** | 1 |
| 9 | **30** | 1 |
| 8 | **27** | 1 |
| 7 | **24** | 1 |
| 6 | **21** | 1 |
| 5 | **18** | 1 |
| 4 | **15** | 1 |
| 3 | **11** | 1 |
| 2 | **8** | 1 |
| 1 | **4** | 1 |
| 0 | **0** | 1 |

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

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

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