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

GEOMETRY

Friday, June 21, 2024 — 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 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.

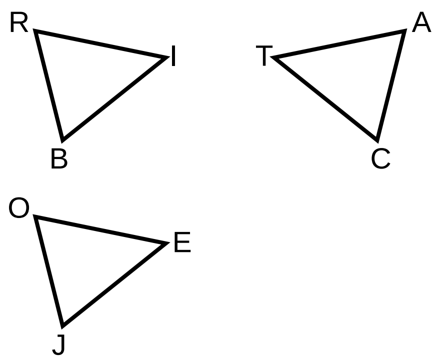
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

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 In the diagram below, $\triangle BRI$ is the image of $\triangle JOE$ after a translation. Triangle CAT is the image of $\triangle BRI$ after a line reflection.



Which statement is always true?

(1) $\angle R \cong \angle T$ (3) $\overline{JE} \cong \overline{RI}$

(2) $\angle J \cong \angle A$ (4) $\overline{OE} \cong \overline{AT}$

2 A right cylinder is cut parallel to its base. The shape of this cross section is a

(1) cone (3) triangle

(2) circle (4) rectangle

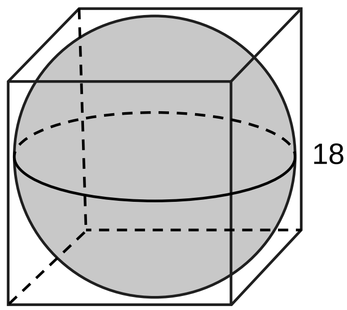
3 What is the minimum number of degrees that a regular hexagon must rotate about its center to carry it onto itself?

(1) 45° (3) 60°

(2) 72° (4) 120°

Use this space for computations.

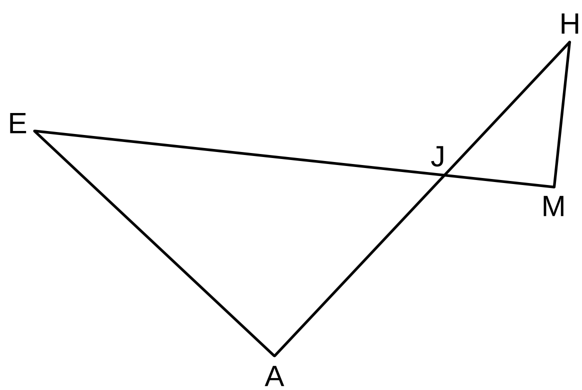
4 In the diagram below, a sphere is inscribed inside a cube. The cube has edge lengths of 18.



What is the volume of the sphere, in terms of π?

(1) 108π
(2) 432π
(3) 972π
(4) 7776π

5 In the diagram below, $\overline{EM}$ intersects $\overline{HA}$ at J, $\overline{EA} \perp \overline{HA}$, and $\overline{EM} \perp \overline{HM}$.



If $EA = 7.2$, $EJ = 9$, $AJ = 5.4$, and $HM = 3.29$, what is the length of $\overline{MJ}$, to the *nearest hundredth*?

(1) 2.47
(2) 2.63
(3) 4.11
(4) 4.39

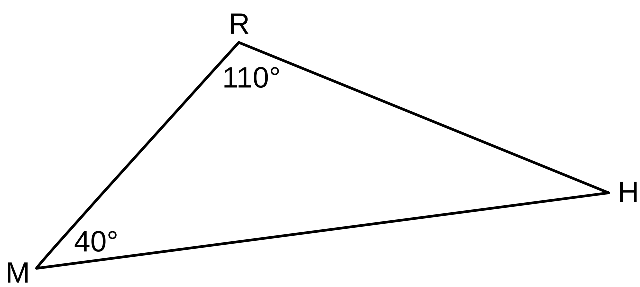
Use this space for computations.

6 Which equation represents the line that passes through the point $(2,-7)$ and is perpendicular to the line whose equation is $y = \frac{3}{4}x + 4$?

(1) $y + 7 = \frac{3}{4}(x - 2)$ (3) $y + 7 = -\frac{4}{3}(x - 2)$

(2) $y - 7 = \frac{3}{4}(x + 2)$ (4) $y - 7 = -\frac{4}{3}(x + 2)$

7 In $\triangle RHM$ below, $m\angle R = 110°$ and $m\angle M = 40°$.



If $\triangle RHM$ is reflected over side $\overline{HM}$ to form quadrilateral $RHR'M$, which statement is always true?

(1) Quadrilateral $RHR'M$ is a parallelogram.

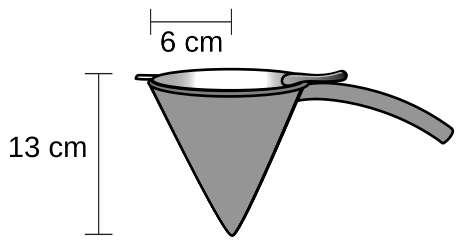
(2) $m\angle MHR' = 40°$

(3) $m\angle HMR' = 40°$

(4) $\overline{MR} \cong \overline{HR'}$

Use this space for computations.

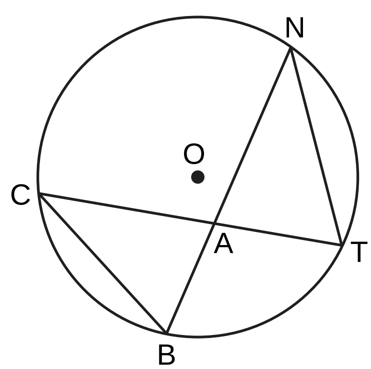
8 The funnel shown below can be used to decorate cookies with melted chocolate. The funnel can be modeled by a cone whose radius is 6 cm and height is 13 cm.



The baker uses 2 cubic centimeters of chocolate to decorate each cookie. When the funnel is completely filled, what is the maximum number of cookies that can be decorated with the melted chocolate?

(1) 78
(2) 245
(3) 490
(4) 735

9 In circle O below, chords $\overline{CT}$ and $\overline{BN}$ intersect at point A. Chords $\overline{CB}$ and $\overline{NT}$ are drawn.

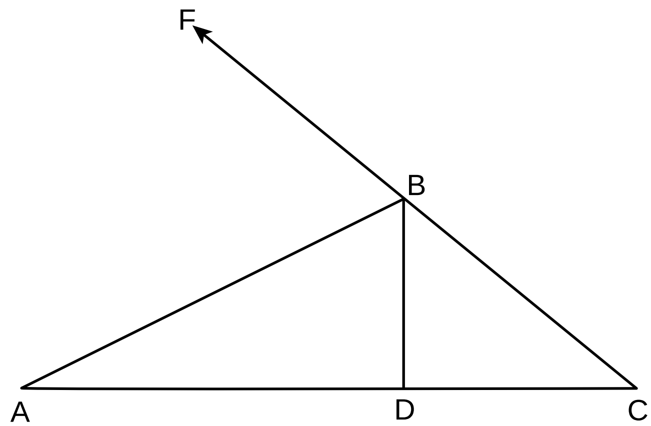


Which statement is always true?

(1) $\frac{NT}{TA} = \frac{CB}{BA}$
(2) $\angle BAC \cong \angle ATN$
(3) $\frac{NA}{AB} = \frac{TA}{AC}$
(4) $\angle BCA \cong \angle NTA$

Use this space for computations.

10 In the diagram below of $\triangle ABC$, $\overrightarrow{CBF}$ is drawn, $\overline{AB}$ bisects $\angle FBD$, and $\overline{BD} \perp \overline{AC}$.

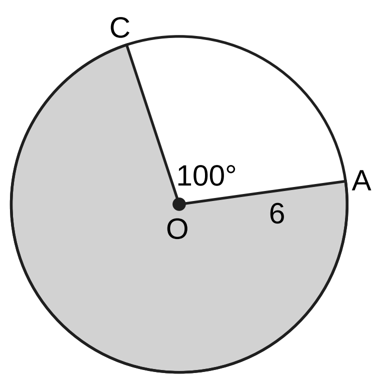


If $m\angle C = 42°$, what is $m\angle A$?

(1) 24° (3) 48°

(2) 33° (4) 66°

11 In circle O below, $OA = 6$, and $m\angle COA = 100°$.



What is the area of the shaded sector?

(1) 10π (3) $\frac{10\pi}{3}$

(2) 26π (4) $\frac{26\pi}{3}$

Use this space for computations.

12 In rectangle $ABCD$, diagonal $\overline{AC}$ is drawn. The measure of $\angle ACD$ is $37°$ and the length of $\overline{BC}$ is 7.6 cm. What is the length of $\overline{AC}$, to the *nearest tenth of a centimeter*?

(1) 4.6
(2) 9.5
(3) 10.1
(4) 12.6

13 A peanut butter manufacturer would like to use a cylindrical jar with a volume of 1180 cm^3. The jar has a height of 10 cm. What is the diameter of the jar, to the *nearest tenth of a centimeter*?

(1) 3.8
(2) 6.1
(3) 10.9
(4) 12.3

14 Triangle KLM is dilated by a scale factor of 3 to map onto triangle DRS. Which statement is *not* always true?

(1) $\angle K \cong \angle D$
(2) $KM = \frac{1}{3}DS$
(3) The area of $\triangle DRS$ is 3 times the area of $\triangle KLM$.
(4) The perimeter of $\triangle DRS$ is 3 times the perimeter of $\triangle KLM$.

Use this space for computations.

15 A rectangle with dimensions of 4 feet by 7 feet is continuously rotated about one of its 4-foot sides. The resulting three-dimensional object is a

(1) cylinder with a height of 7 feet and a base radius of 4 feet.

(2) cylinder with a height of 4 feet and a base radius of 7 feet.

(3) cone with a height of 7 feet and a base radius of 7 feet.

(4) cone with a height of 4 feet and a base radius of 7 feet.

16 In right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. If $AD = 4$ and $CD = 8$, the length of $\overline{BD}$ is

(1) $\sqrt{48}$

(2) $\sqrt{80}$

(3) 12

(4) 16

17 If $ABCD$ is a parallelogram, which additional information is sufficient to prove that $ABCD$ is a rectangle?

(1) $\overline{AB} \cong \overline{BC}$

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

(3) $\overline{AC} \cong \overline{BD}$

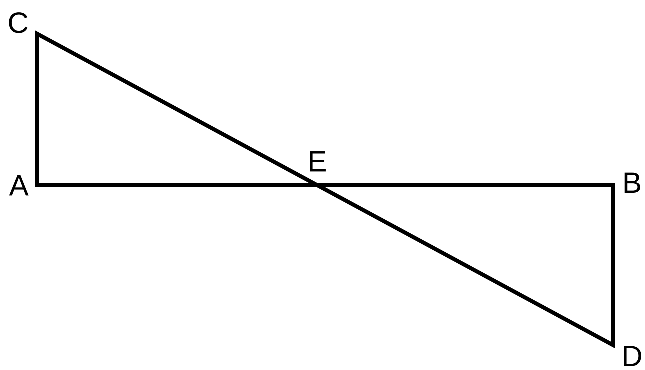
(4) $\overline{AC} \perp \overline{BD}$

Use this space for computations.

18 Line segment APB has endpoints $A(-5,4)$ and $B(7,-4)$. What are the coordinates of P if $AP:PB$ is in the ratio 1:3?

(1) (–2,2)
(2) (–1,1.3)
(3) (1,0)
(4) (4,–2)

19 In the diagram below, $\overline{AB}$ and $\overline{CD}$ intersect at E, and $\overline{CA}$ and $\overline{DB}$ are drawn.



If $\overline{CA} \parallel \overline{BD}$, which statement is always true?

(1) $\overline{AE} \cong \overline{BE}$
(2) $\overline{CA} \cong \overline{DB}$
(3) $\triangle AEC \sim \triangle BED$
(4) $\triangle AEC \cong \triangle BED$

Use this space for computations.

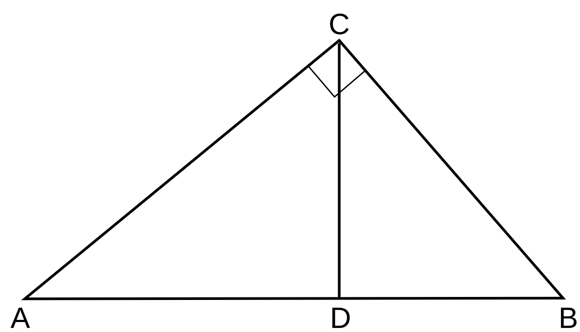
20 If $\sin(3x + 9)° = \cos(5x - 7)°$, what is the value of x?

(1) 8
(2) 11
(3) 33
(4) 42

21 Which set of integers could represent the lengths of the sides of an isosceles triangle?

(1) $\{1, 1, 3\}$
(2) $\{2, 2, 5\}$
(3) $\{3, 3, 6\}$
(4) $\{4, 4, 7\}$

22 In the diagram shown below, altitude $\overline{CD}$ is drawn to the hypotenuse of right triangle ABC.



Which equation can always be used to find the length of $\overline{AC}$?

(1) $\frac{AC}{CD} = \frac{CD}{AD}$
(2) $\frac{CD}{AC} = \frac{AC}{AB}$
(3) $\frac{AC}{CD} = \frac{CD}{BC}$
(4) $\frac{AB}{AC} = \frac{AC}{AD}$

Use this space for computations.

23 Which congruence statement is sufficient to prove parallelogram *MARK* is a rhombus?

(1) $\overline{MA} \cong \overline{MK}$ (3) $\angle K \cong \angle A$

(2) $\overline{MA} \cong \overline{KR}$ (4) $\angle R \cong \angle A$

24 A line whose equation is $y = -2x + 3$ is dilated by a scale factor of 4 centered at (0,3). Which equation represents the image of the line after the dilation?

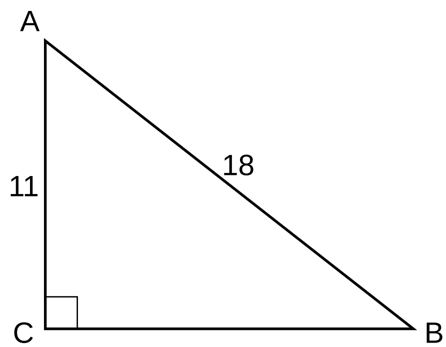
(1) $y = -2x + 3$ (3) $y = -8x + 3$

(2) $y = -2x + 12$ (4) $y = -8x + 12$

Part II

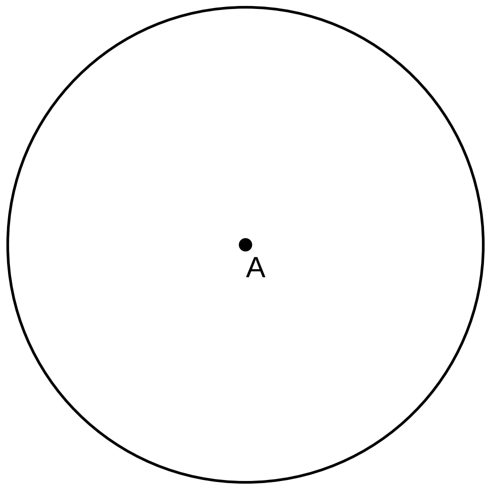
Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily 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 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.

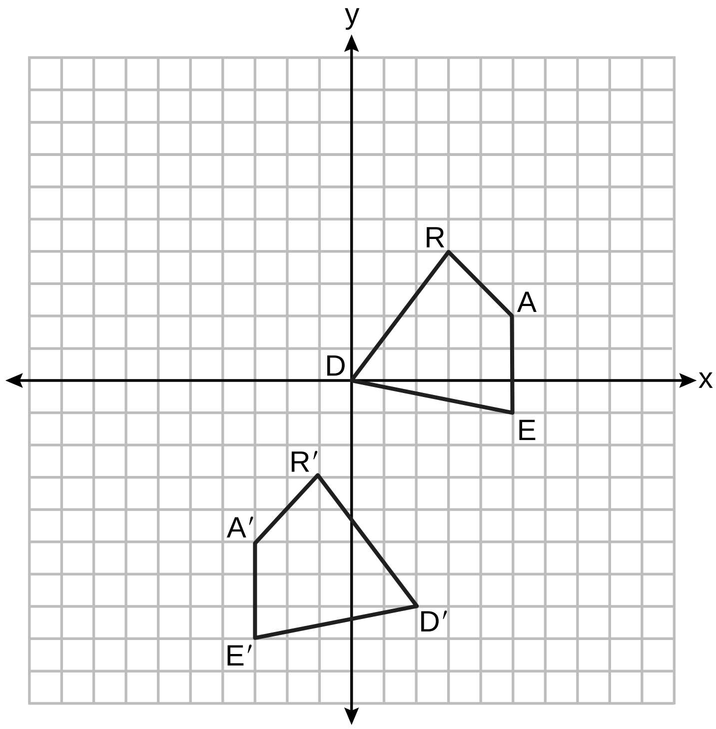


Determine and state the measure of angle A, to the *nearest degree*.

26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle A below. [Leave all construction marks.]

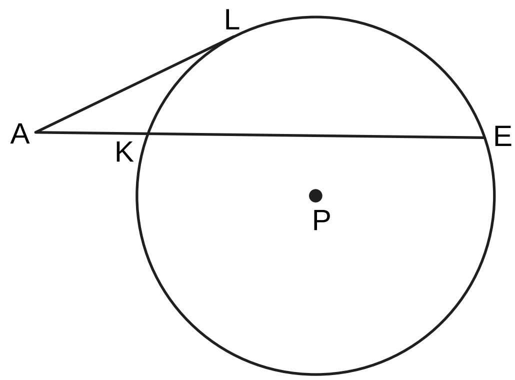


27 Quadrilateral *DEAR* and its image, quadrilateral $D'E'A'R'$, are graphed on the set of axes below.



Describe a sequence of transformations that maps quadrilateral *DEAR* onto quadrilateral $D'E'A'R'$.

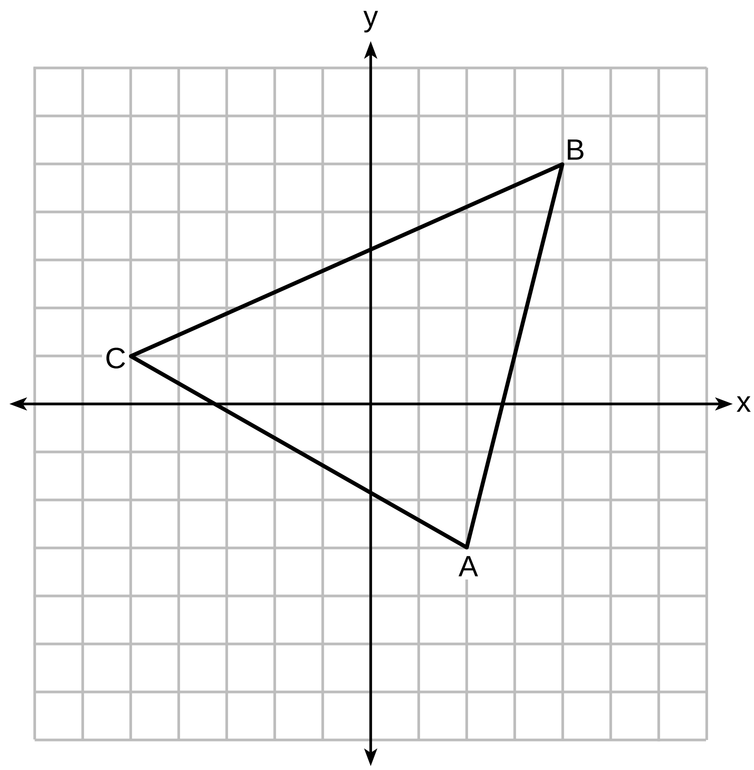
28 In circle P below, tangent $\overline{AL}$ and secant $\overline{AKE}$ are drawn.



If $AK = 12$ and $KE = 36$, determine and state the length of $\overline{AL}$.

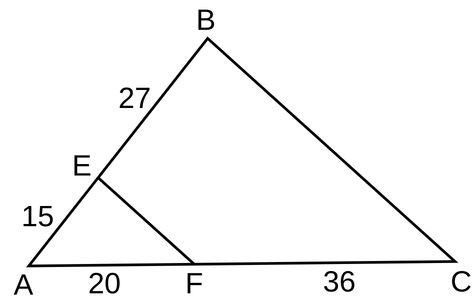
29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

30 On the set of axes below, $\triangle ABC$ is drawn with vertices that have coordinates $A(2,-3)$, $B(4,5)$, and $C(-5,1)$.



Determine and state the area of $\triangle ABC$.

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.

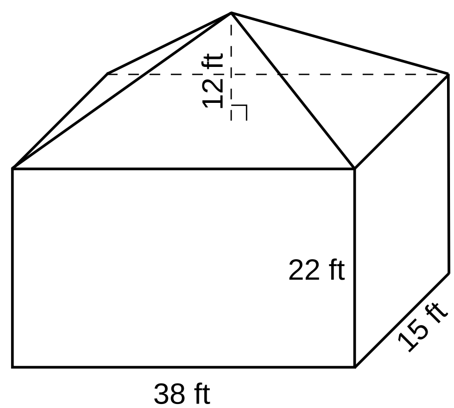


Explain why $\overline{EF} \parallel \overline{BC}$.

Part III

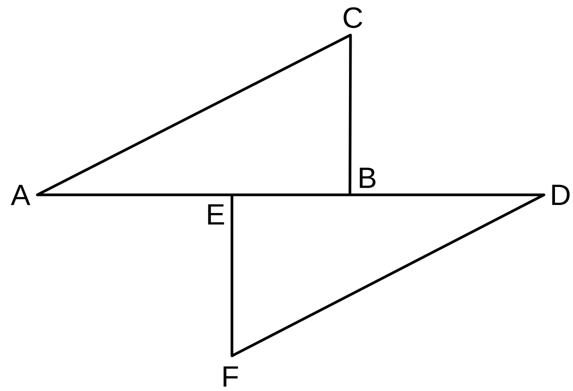
Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily 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 building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



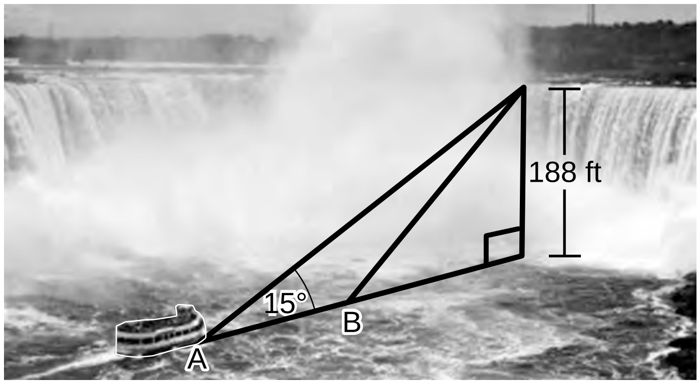
An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



Prove: $\triangle ABC \cong \triangle DEF$

34 In the diagram below, a boat at point *A* is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point *A* to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point *B* to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point *A* to point *B*.

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 to determine your answer. Note that diagrams are not necessarily drawn to scale. 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 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

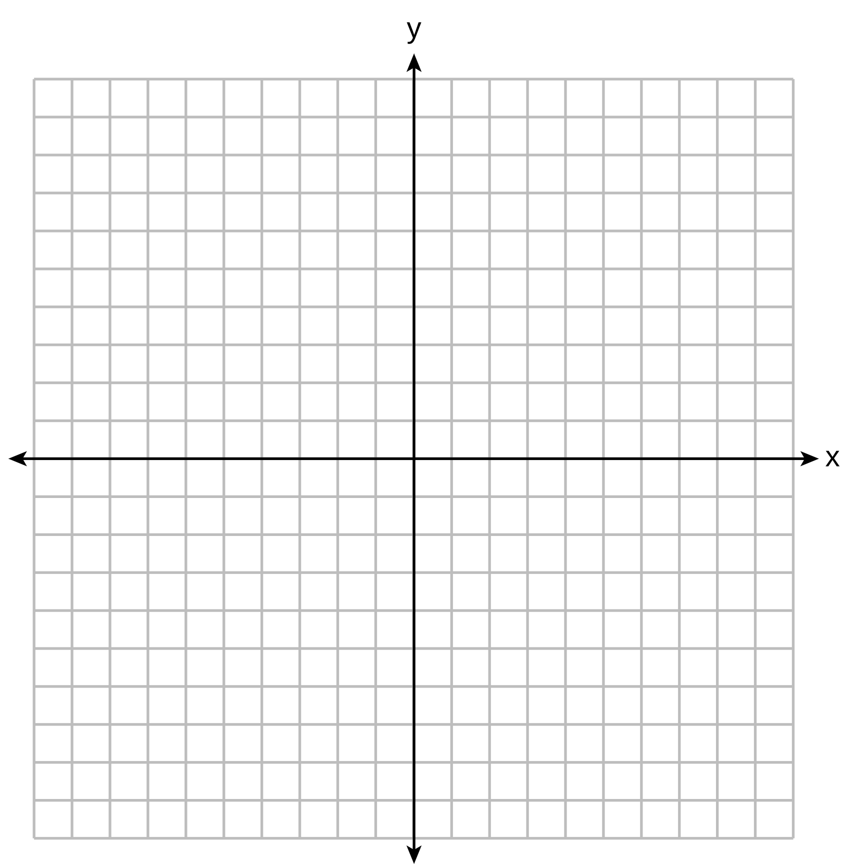
[The use of the set of axes on the next page is optional.]

Question 35 is continued on the next page.

Question 35 continued

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.



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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

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

Regents Examination in Geometry – June 2024

Scoring Key: Part I (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Geometry	June '24	**1**	4	MC	2
Geometry	June '24	**2**	2	MC	2
Geometry	June '24	**3**	3	MC	2
Geometry	June '24	**4**	3	MC	2
Geometry	June '24	**5**	1	MC	2
Geometry	June '24	**6**	3	MC	2
Geometry	June '24	**7**	3	MC	2
Geometry	June '24	**8**	2	MC	2
Geometry	June '24	**9**	1	MC	2
Geometry	June '24	**10**	1	MC	2
Geometry	June '24	**11**	2	MC	2
Geometry	June '24	**12**	4	MC	2
Geometry	June '24	**13**	4	MC	2
Geometry	June '24	**14**	3	MC	2
Geometry	June '24	**15**	2	MC	2
Geometry	June '24	**16**	4	MC	2
Geometry	June '24	**17**	3	MC	2
Geometry	June '24	**18**	1	MC	2
Geometry	June '24	**19**	3	MC	2
Geometry	June '24	**20**	2	MC	2
Geometry	June '24	**21**	4	MC	2
Geometry	June '24	**22**	4	MC	2
Geometry	June '24	**23**	1	MC	2
Geometry	June '24	**24**	1	MC	2

Regents Examination in Geometry – June 2024

Scoring Key: Parts II, III, and IV (Constructed-Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit
Geometry	June '24	**25**	-	CR	2
Geometry	June '24	**26**	-	CR	2
Geometry	June '24	**27**	-	CR	2
Geometry	June '24	**28**	-	CR	2
Geometry	June '24	**29**	-	CR	2
Geometry	June '24	**30**	-	CR	2
Geometry	June '24	**31**	-	CR	2
Geometry	June '24	**32**	-	CR	4
Geometry	June '24	**33**	-	CR	4
Geometry	June '24	**34**	-	CR	4
Geometry	June '24	**35**	-	CR	6

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **June 2024 Regents Examination in Geometry** will be posted on the Department's web site at: https://www.nysedregents.org/geometryre/ on the day of the examination. Conversion charts provided for the previous administrations of the Regents Examination in Geometry must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

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

GEOMETRY

Friday, June 21, 2024 — 9:15 a.m. to 12:15 p.m., only

RATING GUIDE

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: https://www.nysed.gov/state-assessment/high-school-regents-examinations 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: https://www.nysedregents.org/geometryre/.

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 constructed-response 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 constructed-response 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 constructed-response 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: https://www.nysed.gov/state-assessment/high-school-regents-examinations by Friday, June 21, 2024. 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.

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]** 52, 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] A correct relevant trigonometric equation is written, but no further correct work is shown.

or

[1] 52, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(26) **[2]** A correct construction is drawn showing all appropriate arcs, and the equilateral triangle is drawn.

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

or

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

[0] A drawing that is not an appropriate construction is shown.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(27) **[2]** A correct sequence of transformations is written.

[1] An appropriate sequence of transformations is written, but one computational or graphing error is made.

or

[1] An appropriate sequence of transformations is written, but one conceptual error is made.

or

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

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(28) **[2]** 24, and correct work is shown.

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

or

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

or

[1] A correct equation is written to find the length of $\overline{AL}$, but no further correct work is shown.

or

[1] 24, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(29) **[2]** $(-4,3)$, $\sqrt{18}$ or equivalent, 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] Correct work is shown to find $(x + 4)^2 + (y - 3)^2 = 18$.

or

[1] Correct work is shown to find $(-4,3)$.

or

[1] Correct work is shown to find $\sqrt{18}$.

or

[1] $(-4,3)$ and $\sqrt{18}$, but no work is shown.

[0] $(-4,3)$ or $\sqrt{18}$, but no work is shown.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(30) **[2]** 32, 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] 32, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(31) **[2]** Correct work is shown, 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] A correct proportion is written, but the explanation is incomplete or partially correct.

[0] A correct proportion is written, but the explanation is missing or incorrect.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

Part III

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

(32) **[4]** 6.2, 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 the total volume of the building, but no further correct work is shown.

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

or

[2] Correct work is shown to find the volume of the rectangular prism and the volume of the rectangular pyramid. No further correct work is shown.

[1] Correct work is shown to find the volume of the rectangular prism or the volume of the rectangular pyramid. No further correct work is shown.

or

[1] 6.2, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(33) **[4]** A complete and correct proof that includes a concluding statement is written.

[3] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement and/or reason is missing or incorrect, or the concluding statement is missing.

[2] 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.

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

[0] The "given" and/or the "prove" statements are written, but no further correct relevant statements are written.

or

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

(34) **[4]** 259, 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 the distance from the base of the waterfall to point *A* and the base of the waterfall to point *B*, but no further correct work is shown.

[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 find the distance from the base of the waterfall to either point *A* or point *B*, 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] At least one correct relevant trigonometric equation is written, but no further correct work is shown.

or

[1] 259, but no work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

Part IV

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

(35) **[6]** Correct work is shown to prove JOE is an isosceles triangle and $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$. Correct concluding statements are written.

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

or

[5] Appropriate work is shown, but one concluding statement is missing or incorrect.

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

or

[4] Appropriate work is shown, but one conceptual error is made in proving $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

or

[4] Appropriate work is shown, but two concluding statements are missing or incorrect.

or

[4] Correct work is shown to prove $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$ and correct concluding statements are written. No further correct work is shown.

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

or

[3] Appropriate work is shown, but two or more computational or graphing errors are made, and one concluding statement is missing or incorrect.

or

[3] Appropriate work is shown, but one conceptual error is made in proving $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$ and one computational or graphing error is made.

or

[3] Appropriate work is shown, but three concluding statements are missing or incorrect.

[2] Correct work is shown to prove JOE is an isosceles triangle, and a correct concluding statement is written. No further correct work is shown.

or

[2] Correct work is shown to prove $\overline{JY}$ and $\overline{OE}$ are perpendicular, and a correct concluding statement is written. No further correct work is shown.

or

[2] Correct work is shown to prove $\overline{JY}$ bisects $\overline{OE}$ and a correct concluding statement is written. No further correct work is shown.

[1] Correct work is shown to find the lengths of $\overline{JO}$ and $\overline{JE}$, but no further correct work is shown.

or

[1] Correct work is shown to find the slopes of $\overline{JY}$ and $\overline{OE}$, but no further correct work is shown.

or

[1] Correct work is shown to find the midpoint of $\overline{OE}$ or the lengths of $\overline{OY}$ and $\overline{EY}$, but no further correct work is shown.

[0] A zero response does not contain enough relevant course-level work to receive any credit, does not satisfy the criteria for one or more credits, or is a correct response that was obtained by an obviously incorrect procedure.

Map to the Learning Standards
Geometry
June 2024

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

Regents Examination in Geometry

June 2024

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

The *Chart for Determining the Final Examination Score for the June 2024 Regents Examination in Geometry* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Friday, June 21, 2024. 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 https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments.

2. Select the test title.

3. Complete the required demographic fields.

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

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

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Friday, June 21, 2024 — 9:15 a.m. to 12:15 p.m., only

MODEL RESPONSE SET

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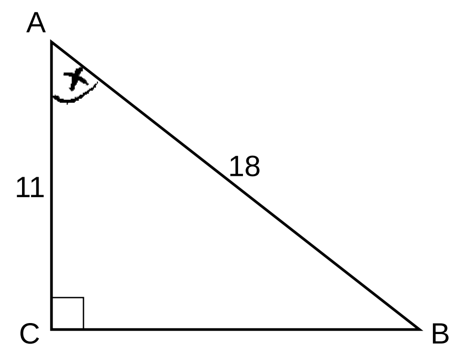
Question 25

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



Determine and state the measure of angle *A*, to the *nearest degree*.

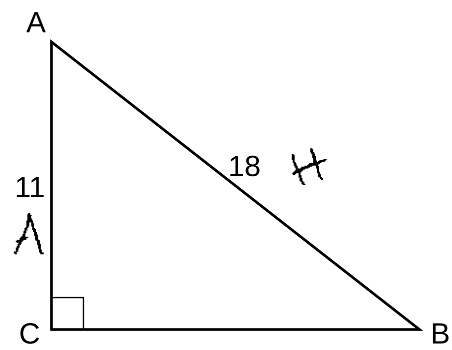
$\cos x = \frac{11}{18}$

$x = 52.33011304$

$\boxed{52°}$

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

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



Determine and state the measure of angle A, to the *nearest degree*.

$A = \cos^{-1}\left(\frac{11}{18}\right)$

$A = 52.33611...$

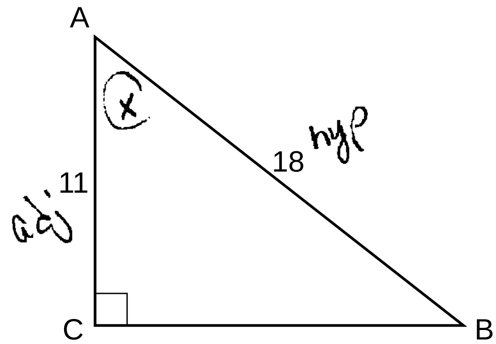
$A \approx 52$

$m\angle A = 52$

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

Question 25

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



Determine and state the measure of angle A, to the *nearest degree*.

$$\cos x = \frac{11}{18}$$

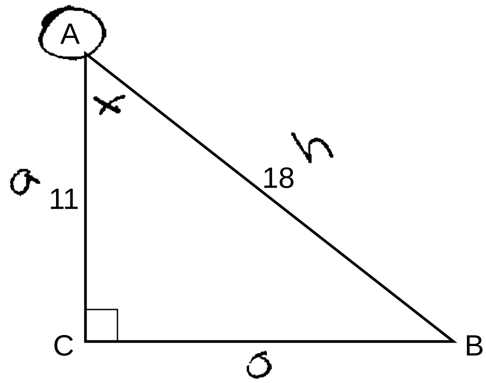
$$\cancel{\cos}^{-1}(\cancel{\cos} x) = \cos^{-1}\left(\frac{11}{18}\right)$$

$$x = 52°$$

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

Question 25

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



Determine and state the measure of angle A, to the *nearest degree*.

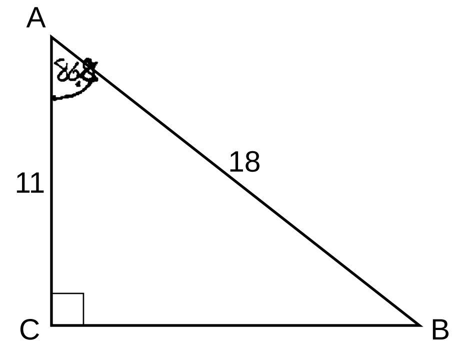
$\cos = a/h$

$\cos(x) = 11/18$

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

Question 25

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



Determine and state the measure of angle A, to the *nearest degree*.

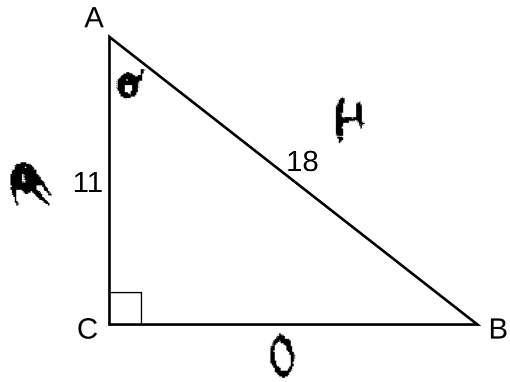
$\cos^{-1}\left(\frac{11}{18}\right) =$

$A = 86.8$

Score 1: The student wrote a correct relevant trigonometric equation, but no further correct work is shown.

Question 25

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



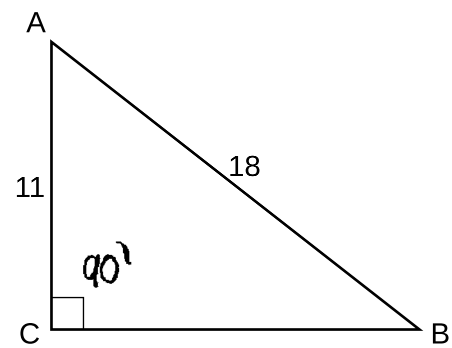
Determine and state the measure of angle A, to the *nearest degree*.

52°

Score 1: The student correctly determined the measure of $\angle A$, but showed no work.

Question 25

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



Determine and state the measure of angle A, to the *nearest degree*.

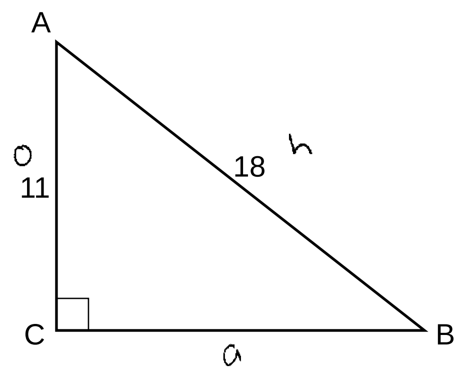
$\cos(\angle BAC = \frac{\overline{AC}}{\overline{AB}}$

$\cos(\angle BAC) = \frac{11}{18}$ $\quad \angle BAC = 52.3$

Score 1: The student made a rounding error.

Question 25

25 In $\triangle ABC$ below, $m\angle C = 90°$, $AC = 11$, and $AB = 18$.



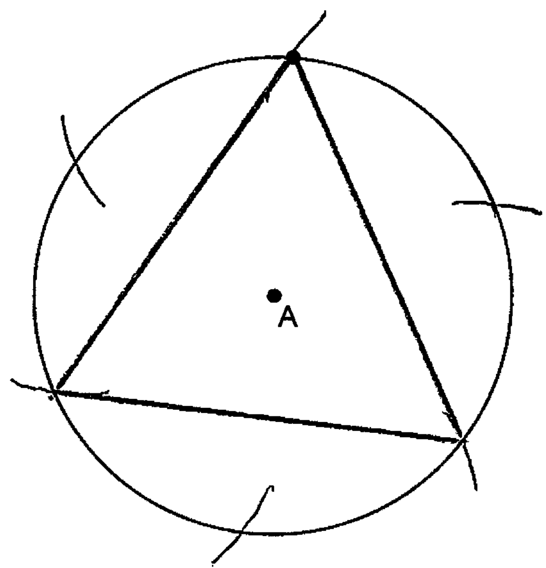
Determine and state the measure of angle A, to the *nearest degree*.

$$S\frac{o}{h} = 11/\sin(18)$$
$$= 35.59674775$$
$$m\angle A = 36$$

Score 0: The student gave a completely incorrect response.

Question 26

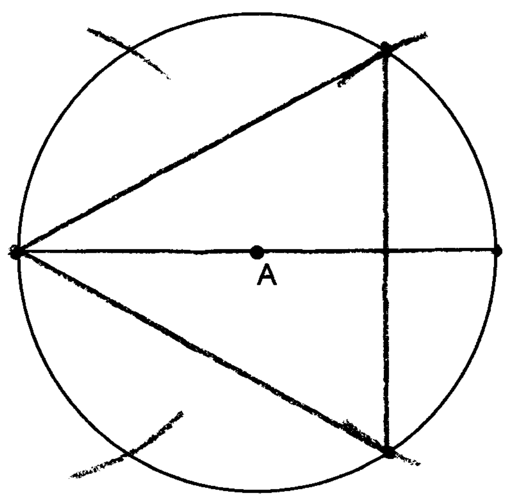
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle *A* below. [Leave all construction marks.]



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

Question 26

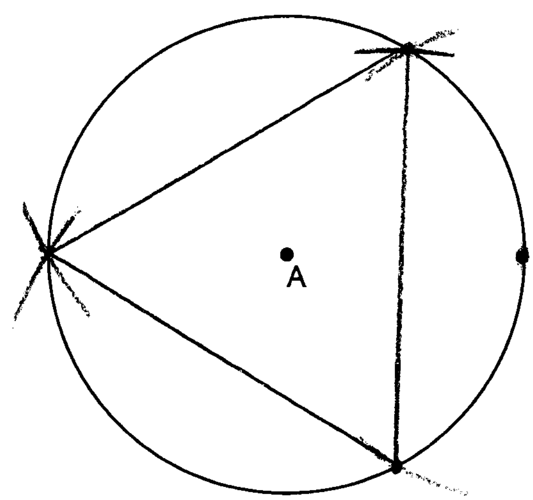
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle *A* below. [Leave all construction marks.]



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

Question 26

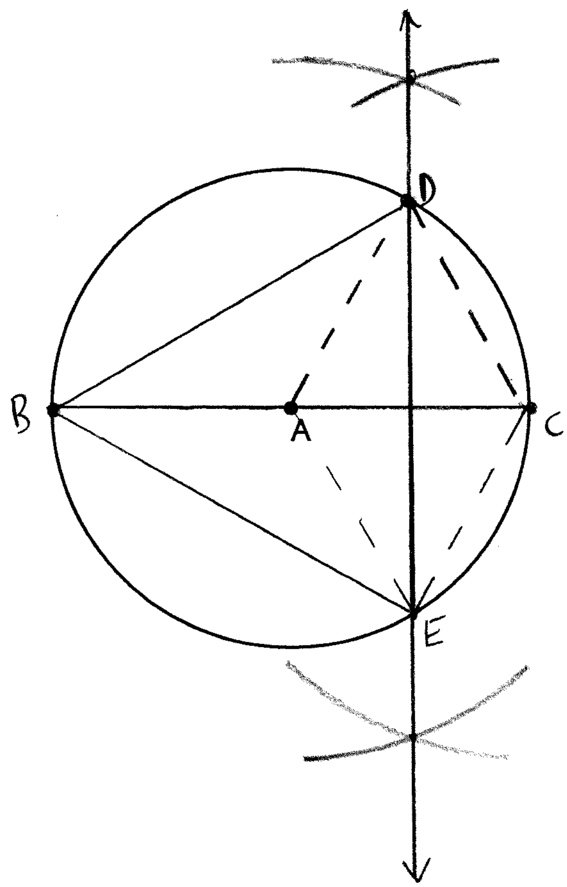
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle *A* below. [Leave all construction marks.]



Score 2: The student gave a complete and correct response. Using a compass the student measured the length of the radius and from a point on the circle, two arcs were drawn intersecting the circle forming two endpoints of one side of the triangle. Copying the length of the first side, two intersecting arcs were drawn intersecting the circle, forming the third vertex. The equilateral triangle was drawn.

Question 26

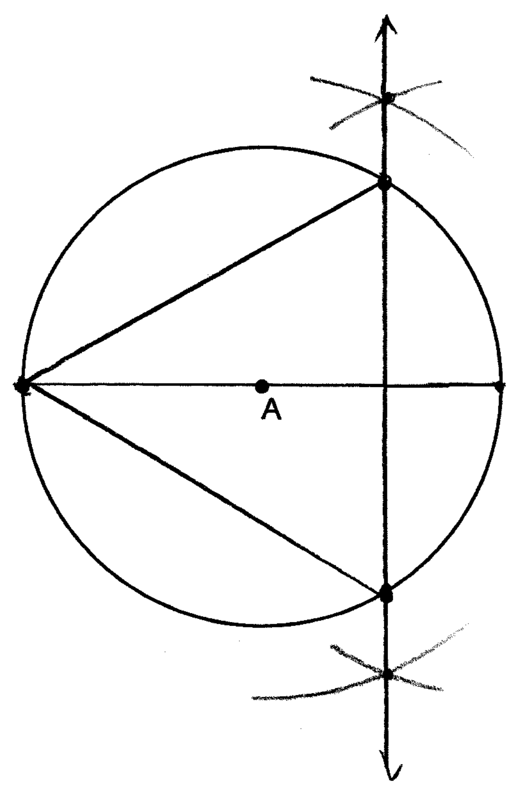
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle A below. [Leave all construction marks.]



Score 2: The student gave a complete and correct response. The student drew diameter $\overline{BC}$ and constructed the perpendicular bisector of radius $\overline{AC}$ resulting in equilateral triangles ADC and AEC. Central angles DAE, DAB, and BAE each measure 120° resulting in arcs $\overset{\frown}{BD}$, $\overset{\frown}{DCE}$, and $\overset{\frown}{BE}$ each measuring 120°. Equilateral triangle BDE was then drawn.

Question 26

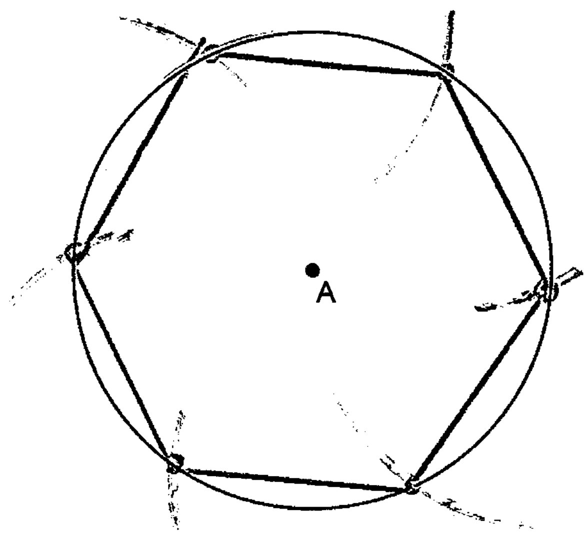
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle *A* below. [Leave all construction marks.]



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

Question 26

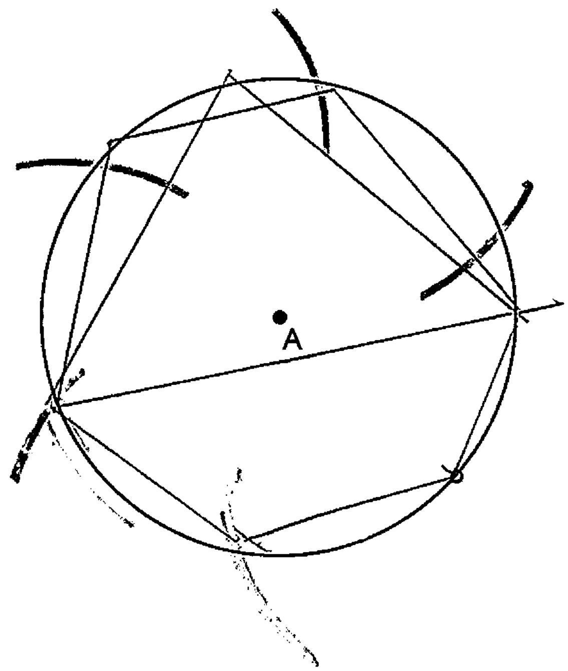
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle *A* below. [Leave all construction marks.]



Score 1: The student constructed all appropriate arcs, but the equilateral triangle was not drawn.

Question 26

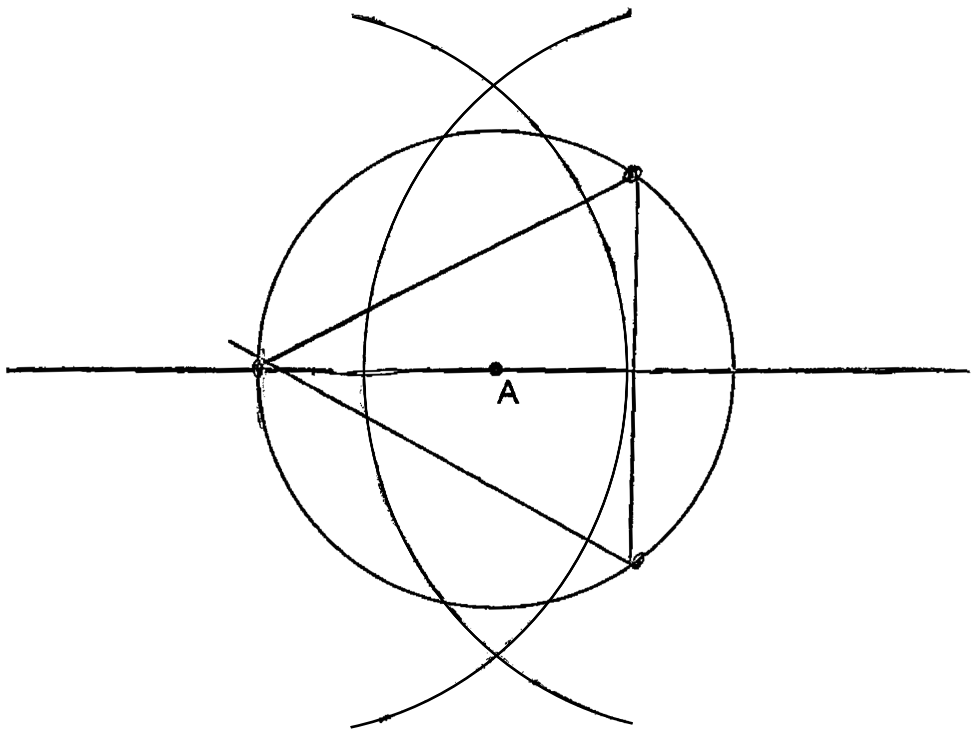
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle *A* below. [Leave all construction marks.]



Score 1: The student constructed all appropriate arcs, but made an error drawing the triangle.

Question 26

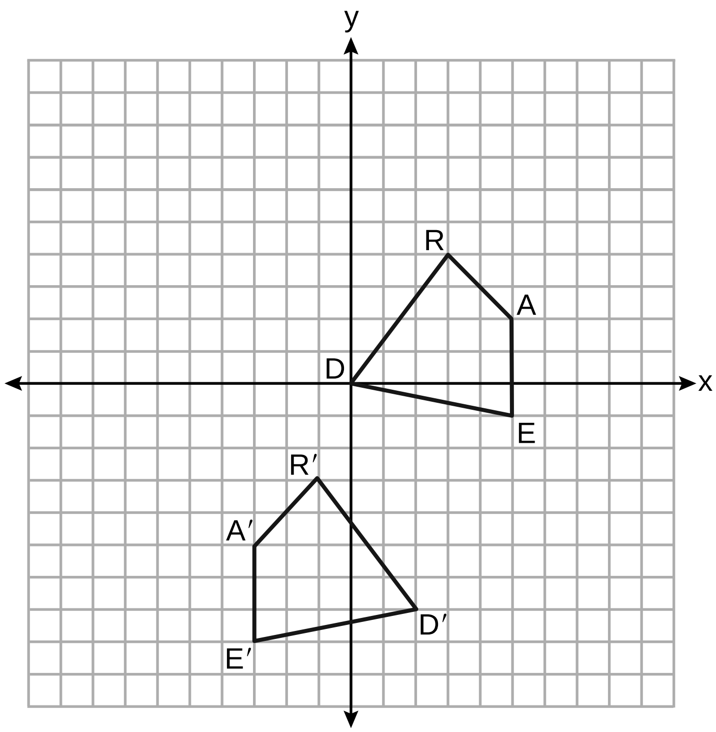
26 Use a compass and straightedge to construct an equilateral triangle inscribed in circle *A* below. [Leave all construction marks.]



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

Question 27

27 Quadrilateral *DEAR* and its image, quadrilateral *D'E'A'R'*, are graphed on the set of axes below.



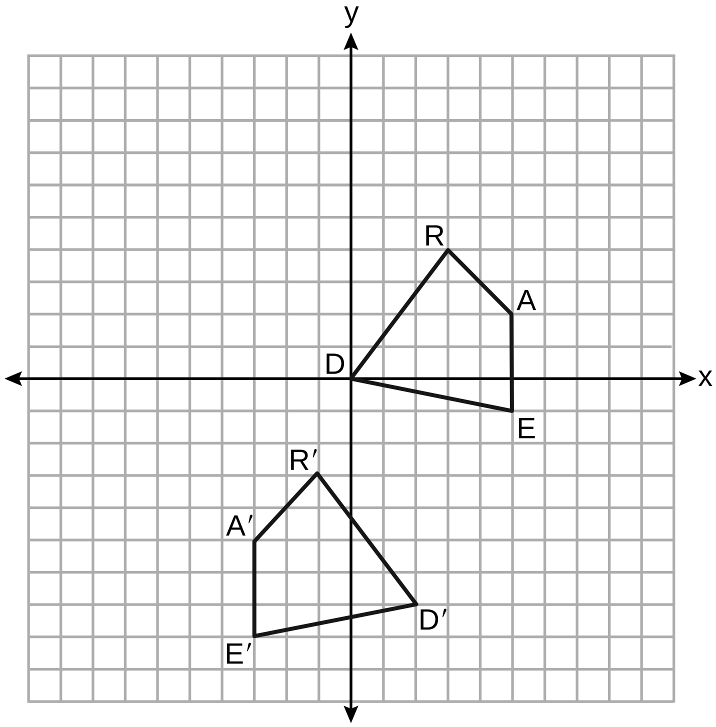
Describe a sequence of transformations that maps quadrilateral *DEAR* onto quadrilateral *D'E'A'R'*.

Reflection in the y-axis followed by a translation right 2 and down 7.

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

Question 27

27 Quadrilateral *DEAR* and its image, quadrilateral *D'E'A'R'*, are graphed on the set of axes below.



Describe a sequence of transformations that maps quadrilateral *DEAR* onto quadrilateral *D'E'A'R'*.

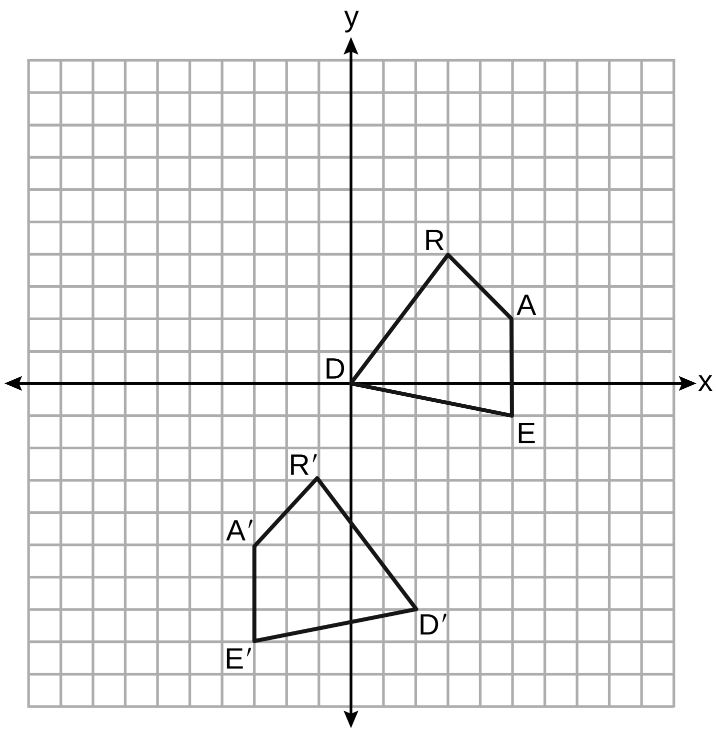
Reflection over line x=1

Translation of 0,-7

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

Question 27

27 Quadrilateral *DEAR* and its image, quadrilateral *D′E′A′R′*, are graphed on the set of axes below.



Describe a sequence of transformations that maps quadrilateral *DEAR* onto quadrilateral *D′E′A′R′*.

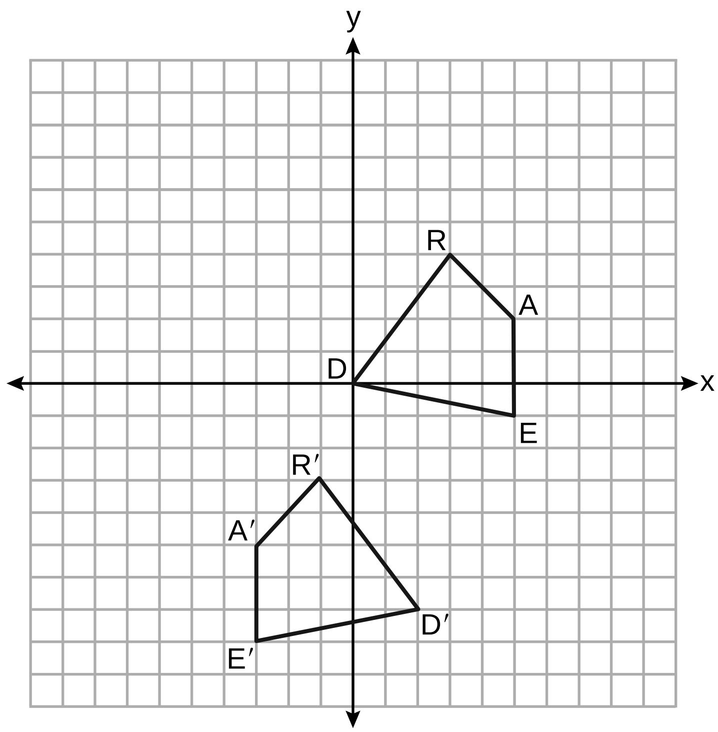
Reflect over y-axis

Translate 7 units down, 2 units Left

Score 1: The student wrote a correct reflection, but wrote an incorrect translation.

Question 27

27 Quadrilateral *DEAR* and its image, quadrilateral *D′E′A′R′*, are graphed on the set of axes below.



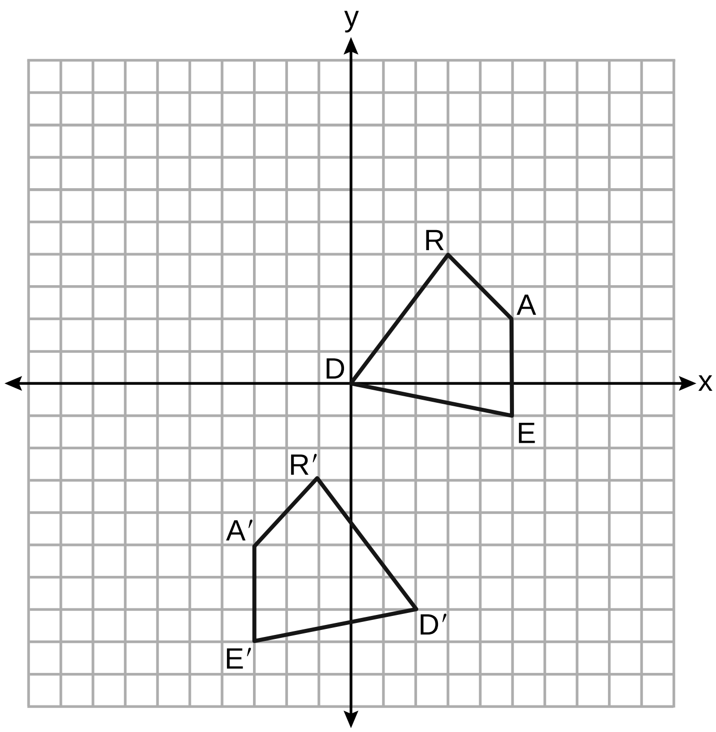
Describe a sequence of transformations that maps quadrilateral *DEAR* onto quadrilateral *D′E′A′R′*.

Reflection over the y-axes followed by transalion over the x-axes

Score 1: The student wrote a correct reflection, but wrote an incorrect translation.

Question 27

27 Quadrilateral *DEAR* and its image, quadrilateral *D′E′A′R′*, are graphed on the set of axes below.



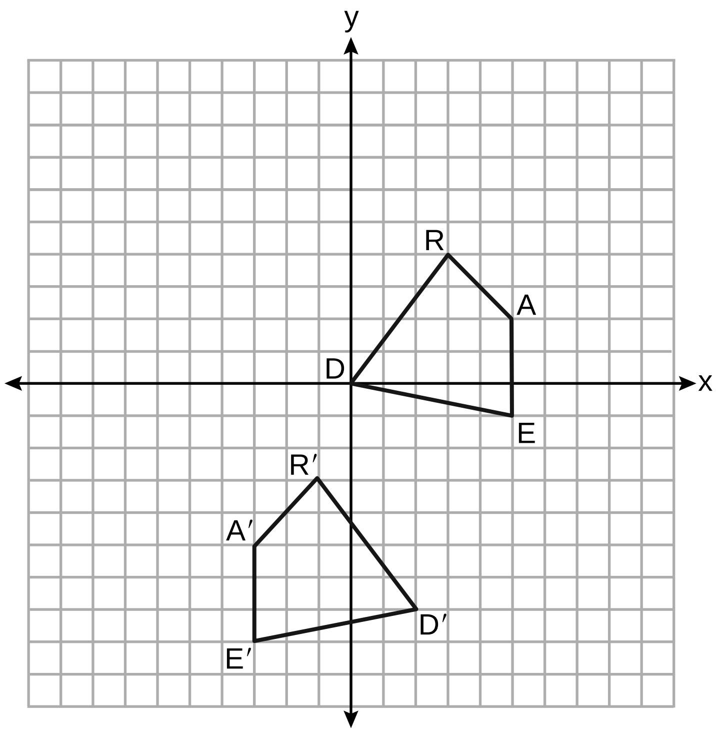
Describe a sequence of transformations that maps quadrilateral *DEAR* onto quadrilateral *D′E′A′R′*.

To map D'E'A'R' onto DEAR you would need a reflection on the y axis and a translation 7 units up and 3 units left

Score 0: The student made an error mapping D′E′A′R′ onto DEAR, and stated an incorrect translation.

Question 27

27 Quadrilateral *DEAR* and its image, quadrilateral *D′E′A′R′*, are graphed on the set of axes below.



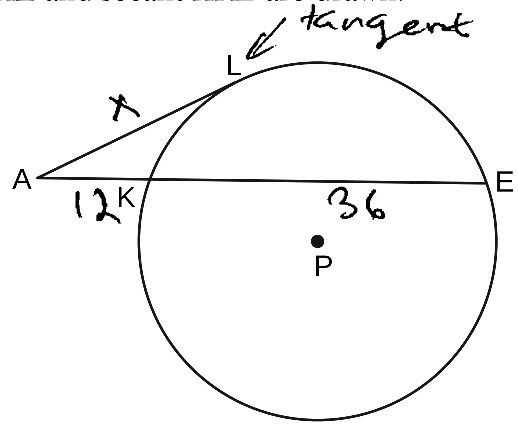
Describe a sequence of transformations that maps quadrilateral *DEAR* onto quadrilateral *D′E′A′R′*.

rotation 180° clockwise

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

Question 28

28 In circle P below, tangent $\overline{AL}$ and secant $\overline{AKE}$ are drawn.



If $AK = 12$ and $KE = 36$, determine and state the length of $\overline{AL}$.

outside × whole = tangent^2

$12 \times 48 = x^2$

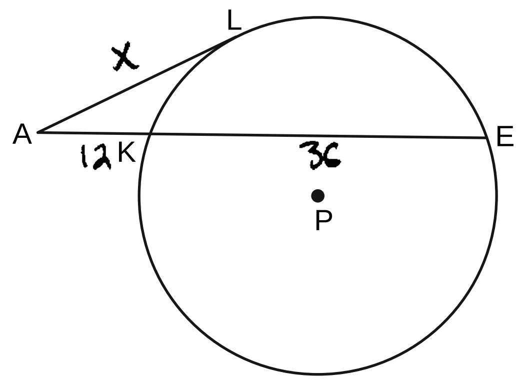
$\sqrt{576} = \sqrt{x^2}$

$\boxed{x = 24}$

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

Question 28

28 In circle P below, tangent $\overline{AL}$ and secant $\overline{AKE}$ are drawn.



If $AK = 12$ and $KE = 36$, determine and state the length of $\overline{AL}$.

$12 + 36 = 48$

$12(48) = x^2$

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

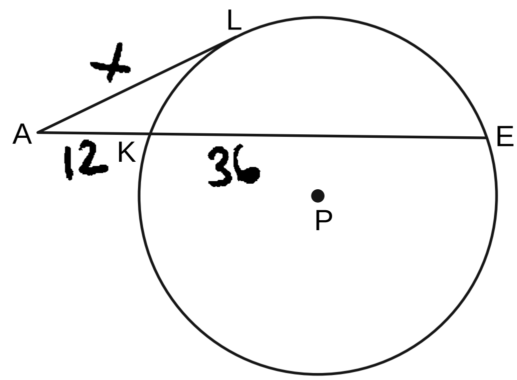
$x = 24$

$\boxed{AL = 24}$

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

Question 28

28 In circle P below, tangent $\overline{AL}$ and secant $\overline{AKE}$ are drawn.



If $AK = 12$ and $KE = 36$, determine and state the length of $\overline{AL}$.

$36+12=48$

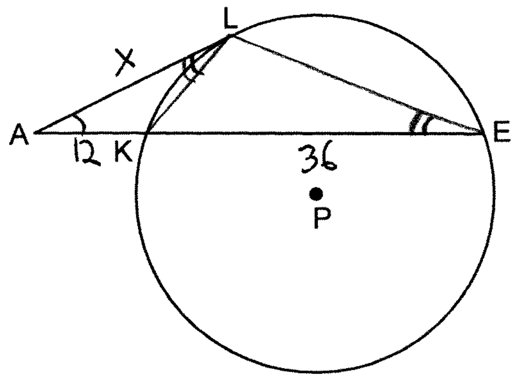
$48 \cdot 12 = x$

$576 = x$

Score 1: The student wrote an incorrect equation in not squaring the tangent length.

Question 28

28 In circle P below, tangent $\overline{AL}$ and secant $\overline{AKE}$ are drawn.



If $AK = 12$ and $KE = 36$, determine and state the length of $\overline{AL}$.

$\triangle ALE \sim \triangle AKL$

$$\frac{x}{12} = \frac{12}{48}$$

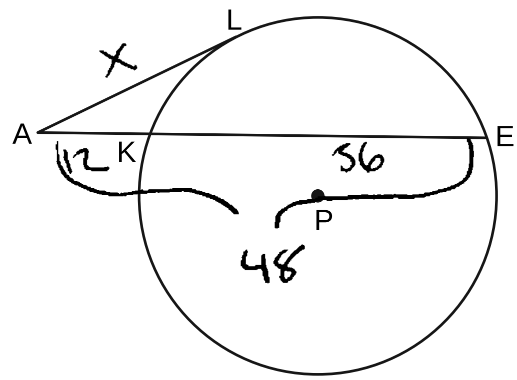
$$\frac{48x}{48} = \frac{144}{48}$$

$x = 3$

Score 1: The student wrote an incorrect proportion using 12 as the geometric mean.

Question 28

28 In circle P below, tangent $\overline{AL}$ and secant $\overline{AKE}$ are drawn.



If $AK = 12$ and $KE = 36$, determine and state the length of $\overline{AL}$.

$12 + 36 = 48$

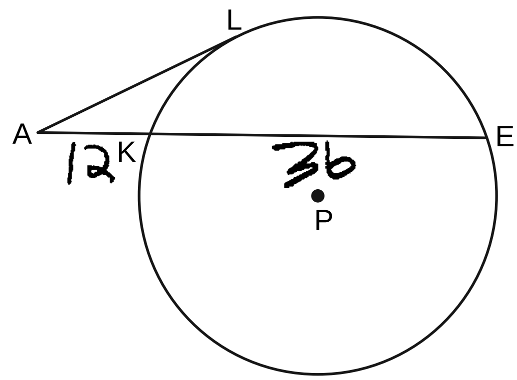
$\frac{48}{2} = 24$

$m\overline{AL} = 24$

Score 0: The student determined a correct answer by an obviously incorrect procedure.

Question 28

28 In circle P below, tangent $\overline{AL}$ and secant $\overline{AKE}$ are drawn.



If $AK = 12$ and $KE = 36$, determine and state the length of $\overline{AL}$.

$(\text{out})(\text{whole}) = \text{tangent}^2$

$(12)(36) = x$

$432 = x$

$\overline{AL} \cong 432$

Score 0: The student made two errors in not using the length of the entire secant and not taking the square root.

Question 29

29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

$$x^2 + y^2 + 8x - 6y \cancel{+7} = 0$$
$$\cancel{-7}\ -7$$

$$x^2 + 8x + 16 + y^2 - 6y + 9 = -7 + 16 + 9$$

$$(x+4)(x+4) + (y-3)(y-3) = 18$$

$$(x+4)^2 + (y-3)^2 = 18$$

Center: $(-4, 3)$

$r: \sqrt{18}$

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

Question 29

29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

$$x^2+y^2+8x-6y+\cancel{7}=0$$
$$\cancel{-7}\quad -7$$

$$\left(\frac{b}{2}\right)^2$$

$$x^2+8x+y^2-6y=-7$$
$$+16 \quad +9 \quad +25$$

$$x^2+8x+16+y^2-6y+9=18$$
$$(x+4)^2+(y-3)^2=(3\sqrt{2})^2$$

$$\boxed{\begin{array}{l}\text{center: } (-4,3)\\ \text{radius: } 3\sqrt{2}\end{array}}$$

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

Question 29

29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

$\frac{8}{2} = 4 \quad 4^2 = 16$

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

$(-3)^2 = 9$

$x^2 + 8x + \boxed{16} + y^2 - 6y + \boxed{9} = -7 + 16 + 9$

$(x+4)^2 + (y-3)^2 = 18$

$(-4, 3)$ ↑ Center

~~18~~ $\sqrt{18}$ ↑ Radius

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

Question 29

29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

$$x^2+y^2+8x-6y+7=0$$
$$\underline{\qquad\qquad\qquad -7\ \ -7}$$
$$x^2+y^2+8x-6y=-7$$
$$x^2+y^2+8x+16-6y+9=-7+16+9$$
$$(x+4)(x+4)+(y-3)(y-3)=18$$

Center $(-4,3)$ Radius : 9

Score 1: The student made an error when determining the length of the radius.

29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

$x^2 + y^2 + 8x - 6y + 7 = 0$

$x^2 + 8x + y^2 - 6y = -7$

$x^2 + 8x + 16 \quad y^2 - 6y + 9$

$(x+4)(x+4) + (y-3)(y-3) = -7$

$(x+4)^2 + (y-3)^2 = -7$

center $= (-4, 3)$

radius $= 7$

Score 1: The student determined the center of the circle correctly.

Question 29

29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

$x^2 + y^2 + 8x - 6y + \cancel{7} = 0$
$\quad\quad\quad\quad\quad\quad\quad\; -\cancel{7} \quad -7$

$x^2 + 8x + y^2 - 6y = -7 + 64 + 36$

$\sqrt{93}$

$(x+4)(x-3)$

center $= (4, -3)$

RADIUS $= 9$

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

Question 29

29 The equation of a circle is $x^2 + y^2 + 8x - 6y + 7 = 0$. Determine and state the coordinates of the center and the length of the radius of the circle.

$$x^2 + y^2 + \frac{8x}{2} - \frac{6y}{2} + 7 = 0$$

$$4^2 = 16 \quad -3^2 = 9 \quad -7 \quad -7$$

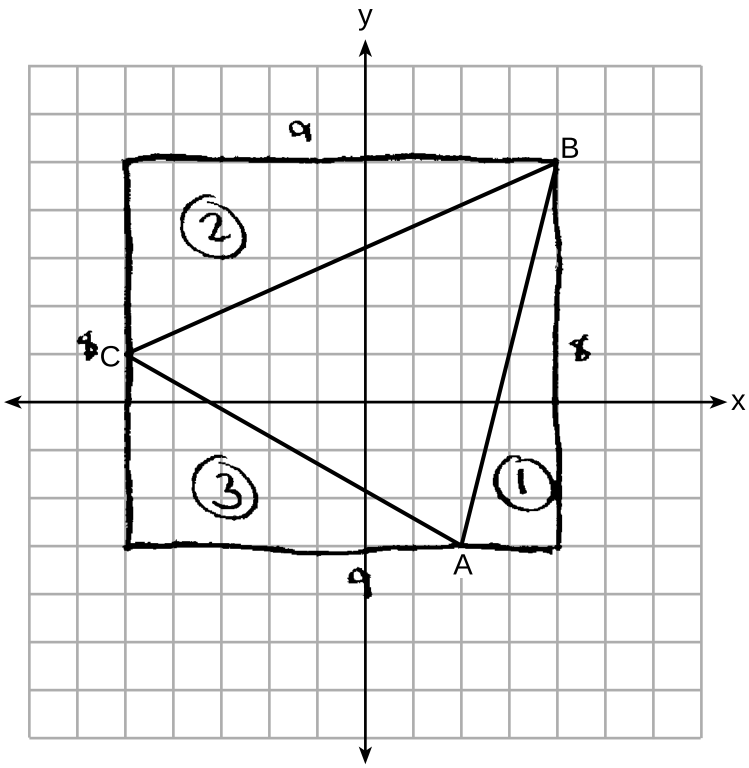
$$(x + 16)^2 + (y + 9)^2 = -7 + 16 + 9$$

$$(x+16)^2 + (y+9)^2 = 18$$

$$\boxed{\begin{array}{l} \text{Coordinates} = (-16, -9) \\ \text{Radius} = 18 \end{array}}$$

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

30 On the set of axes below, $\triangle ABC$ is drawn with vertices that have coordinates $A(2,-3)$, $B(4,5)$, and $C(-5,1)$.



Determine and state the area of $\triangle ABC$.

$A = bh$
$A = 9 \cdot 8$
$A = 72$

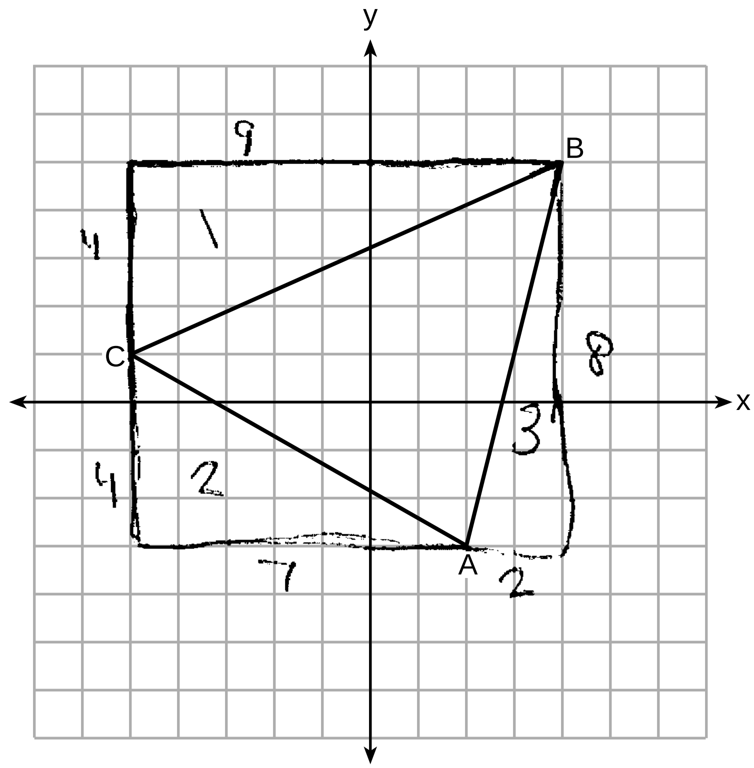
$\Delta 1 = \frac{1}{2} 2(8)$
$= 8$
$\Delta 2 = \frac{1}{2} 4(9)$
$= 18$
$\Delta 3 = \frac{1}{2} 7(4)$
$= 14$

$72 - 8 - 18 - 14$
$\boxed{= 32}$

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

Question 30

30 On the set of axes below, $\triangle ABC$ is drawn with vertices that have coordinates $A(2,-3)$, $B(4,5)$, and $C(-5,1)$.



Determine and state the area of $\triangle ABC$.

$A = 9 \cdot 8$
$= 72$

$A_\triangle = A_\square - (A_1 + A_2 + A_3)$

$A_\triangle = 72 - (18 + 14 + 8)$

$\boxed{32}$

$\triangle 1 - \frac{1}{2} 4(9)$

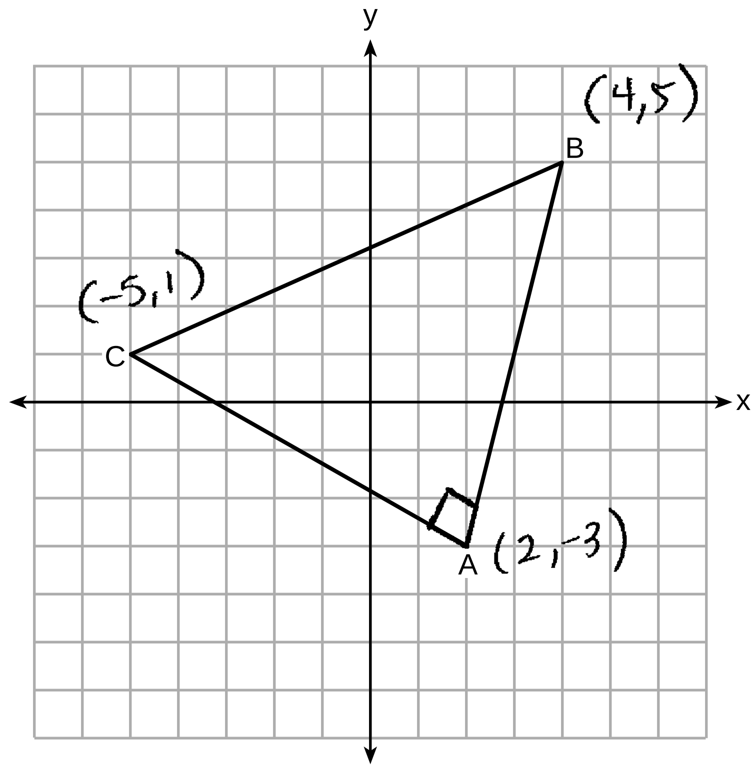
$\triangle 2 - \frac{1}{2} 7(4)$

$\triangle 3 - \frac{1}{2} 8(2)$

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

Question 30

30 On the set of axes below, $\triangle ABC$ is drawn with vertices that have coordinates $A(2,-3)$, $B(4,5)$, and $C(-5,1)$.



Determine and state the area of $\triangle ABC$.

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

$\sqrt{68}$

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

$= \sqrt{65}$

$A = \frac{1}{2}bh$

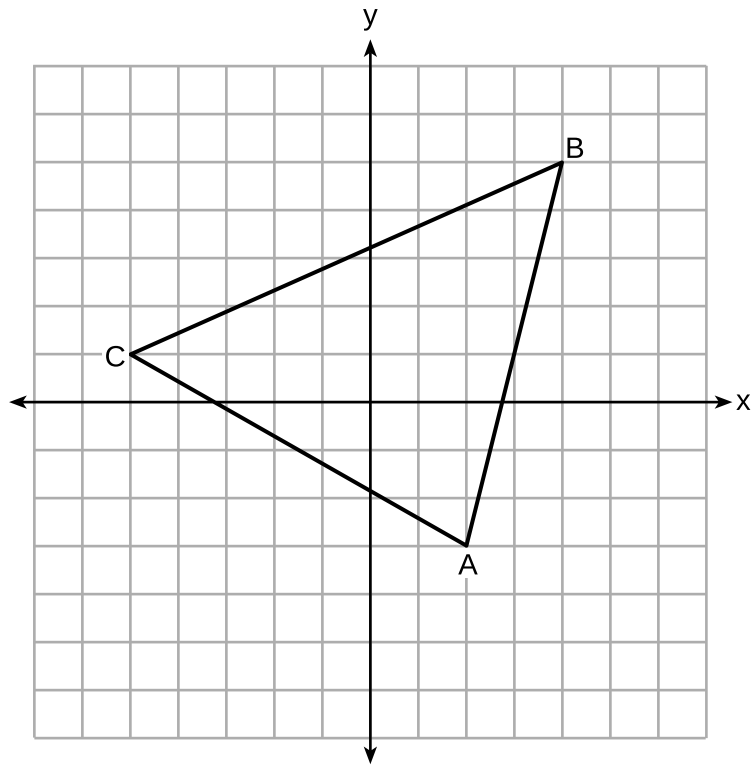
$= \frac{1}{2}(\sqrt{65})(\sqrt{68})$

$= 33.24154028$

Score 1: The student made an error in thinking $\overline{AC}$ was an altitude to $\overline{AB}$.

Question 30

30 On the set of axes below, $\triangle ABC$ is drawn with vertices that have coordinates $A(2,-3)$, $B(4,5)$, and $C(-5,1)$.



Determine and state the area of $\triangle ABC$.

AC

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

$D = \sqrt{(7)^2 + (-2)2}$

$D = \sqrt{49+4}$

$D = \sqrt{53}$

AB

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

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

$D = \sqrt{4+64}$

$D = \sqrt{68}$

$A = 1/2\sqrt{53}(\sqrt{68})$

$A = 60.033 \div 2$

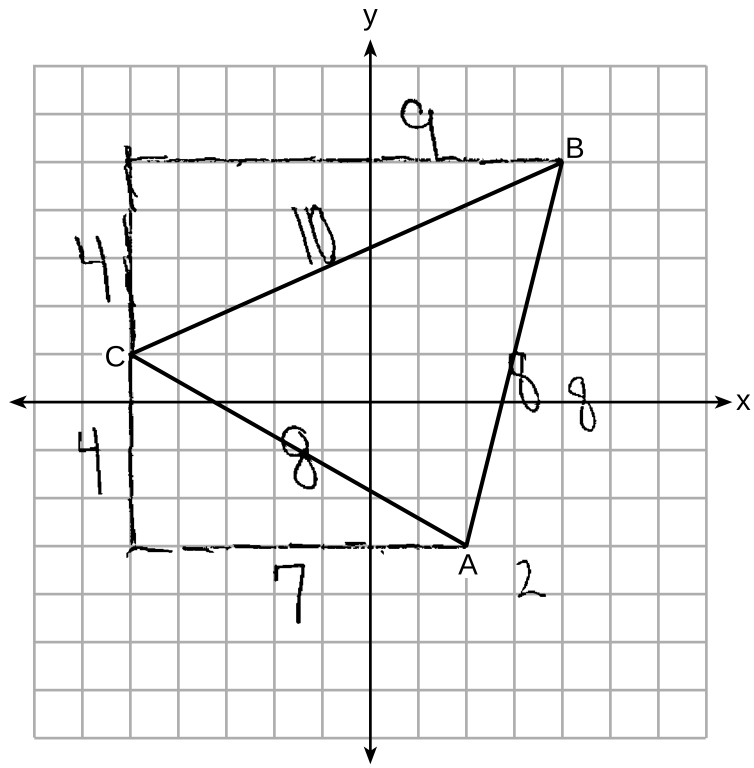
$A = 30.01$

$\boxed{A = 30}$

Score 0: The student made an error in determining the length of $\overline{AC}$. The student made an error in thinking $\overline{AC}$ was an altitude to $\overline{AB}$.

Question 30

30 On the set of axes below, $\triangle ABC$ is drawn with vertices that have coordinates $A(2,-3)$, $B(4,5)$, and $C(-5,1)$.



Determine and state the area of $\triangle ABC$.

$4^2+9^2=c^2$
$16+81=c^2$

$4^2+7^2=c^2$
$16+49=c^2$

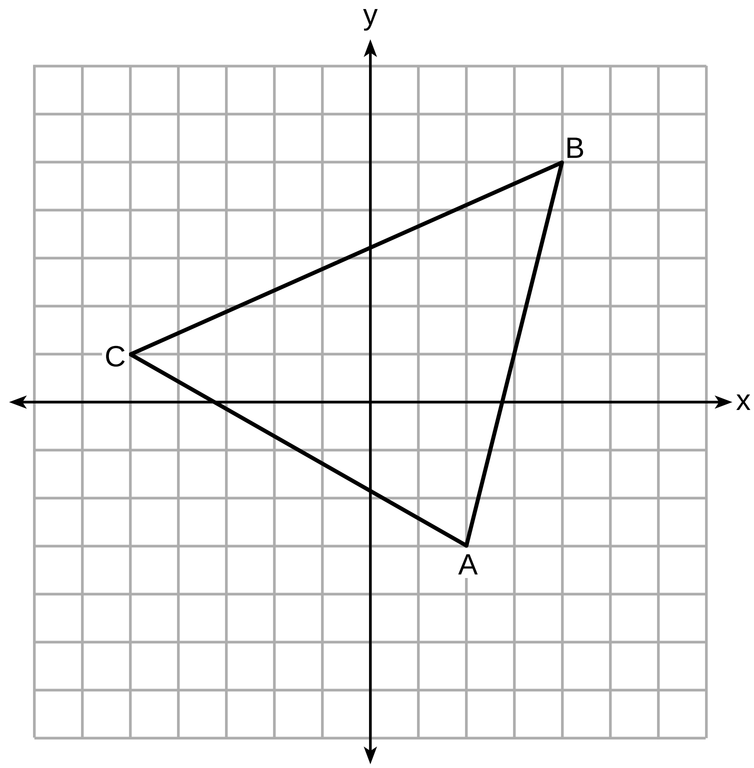
$2^2+8^2=c^2$
$4+64=c^2$

$A=\frac{1}{2}bh$
$A=\frac{1}{2}(8)(8)$
A32

Score 0: The student made an error in thinking $\overline{AC}$ was an altitude to $\overline{AB}$. The student made rounding errors in determining the lengths of $\overline{AC}$ and $\overline{AB}$.

Question 30

30 On the set of axes below, $\triangle ABC$ is drawn with vertices that have coordinates $A(2,-3)$, $B(4,5)$, and $C(-5,1)$.



Determine and state the area of $\triangle ABC$.

$A = \frac{1}{h} Bh$ $B = 7$ $h = 8$

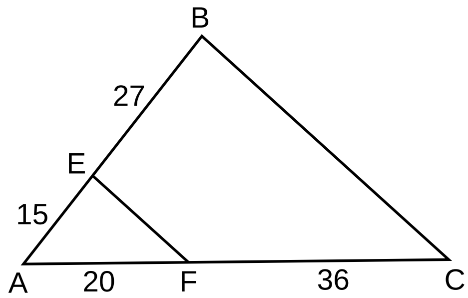
$A = \frac{1}{2}(7)(8)$

$A = 28$

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

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



Explain why $\overline{EF} \parallel \overline{BC}$.

$$\frac{15}{27} = \frac{20}{36}$$

$$\frac{5}{9} = \frac{5}{9} \checkmark$$

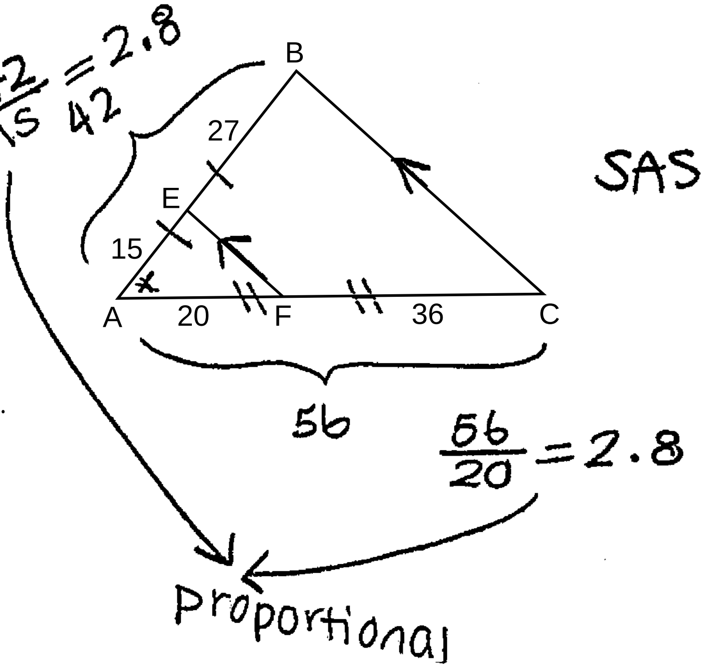
A line segment parallel to one side of a $\triangle$ divides the other 2 sides proportionally.

Since $\overline{EF}$ divides $\overline{AB}$ + $\overline{AC}$ proportionally, $\overline{EF} \parallel \overline{BC}$.

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

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



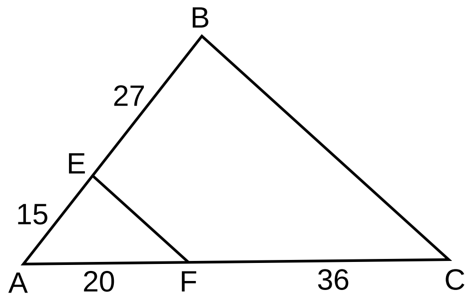
Explain why $\overline{EF} \parallel \overline{BC}$.

Statements	Reasons
(1) AE = 15, EB = 27, AF = 20, FC = 36	(1) Given
(2) $\frac{AB}{AE} = \frac{AC}{AF}$	(2) $\overline{AE} = 15$, $\overline{AB} = 42$, and $\overline{AF} = 20$, $\overline{AC} = 56$, $42 \div 15 = 2.8$, $56 \div 20 = 2.8$, making both sides proportionate.
(3) $\angle EAF \cong \angle BAC$	(3) reflexive property
(4) $\triangle EAF \sim \triangle BAC$	(4) SAS ~
(5) $AEF \cong \angle B$	(5) corresponding angles in similar $\triangle$'s are congruent
(6) $\overline{EF} \parallel \overline{BC}$	(6) congruent corresponding angles gives parallel lines

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

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



Explain why $\overline{EF} \parallel \overline{BC}$.

$\frac{15}{27} = \frac{20}{36}$, so $\frac{AE}{EB} = \frac{AF}{FC}$ are proportional.

$540 = 540$

$\angle A$ is a shared angle, so $\angle A \cong \angle A$.

$\triangle AEF \sim \triangle ABC$ by SAS~

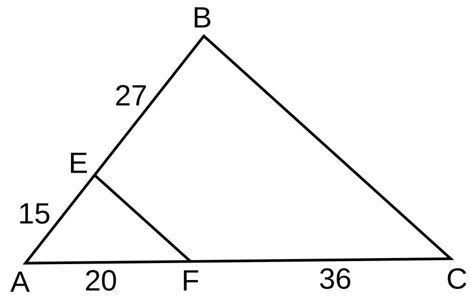
$\angle AEF \cong \angle ABC$, as corresponding $\angle$'s of similar $\triangle$'s are $\cong$.

Since these angles are corresponding congruent angles, $\overline{EF} \parallel \overline{BC}$

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

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



Explain why $\overline{EF} \parallel \overline{BC}$.

$\overline{EF}$ + $\overline{BC}$ are parallel because the side splitter theorm proves that the sides are proportional, resulting in parallel lines

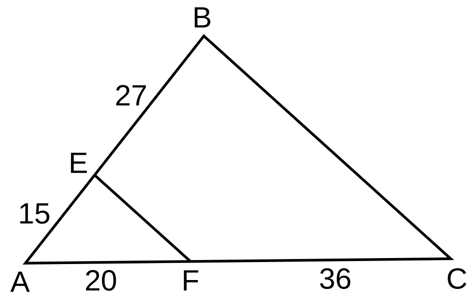
$$\frac{20}{36} = \frac{15}{27}$$

$$540 = 540$$

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

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



Explain why $\overline{EF} \parallel \overline{BC}$.

$\frac{15}{20} = \frac{27}{36}$

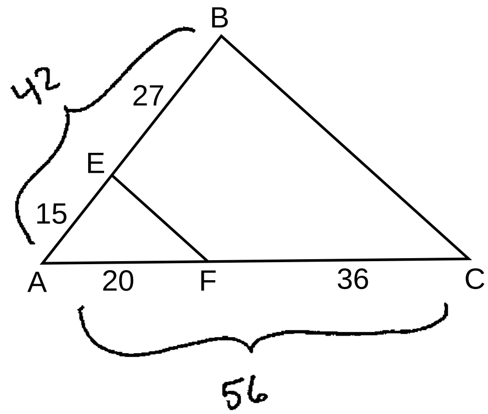
$\frac{3}{4} = \frac{3}{4}$

since the ratio $\frac{15}{20}$ is equal to $\frac{27}{36}$, $\overline{EF}$ and $\overline{BC}$ are congruent.

Score 1: The student wrote a partially correct explanation.

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



Explain why $\overline{EF} \parallel \overline{BC}$.

because two sides of $\triangle ABC$ an $\triangle AEF$ are proportional. Meaning, the third side is in the same proportion. Similar triangles have parrallel sides.

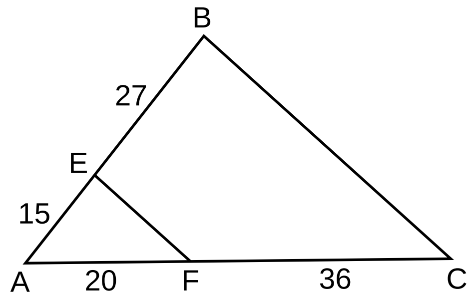
$$\frac{15}{42} = \frac{5}{14}$$

$$\frac{20}{56} = \frac{5}{14}$$

Score 1: The student wrote a partially correct explanation.

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



Explain why $\overline{EF} \parallel \overline{BC}$.

$$\frac{42}{15} = 2.8$$

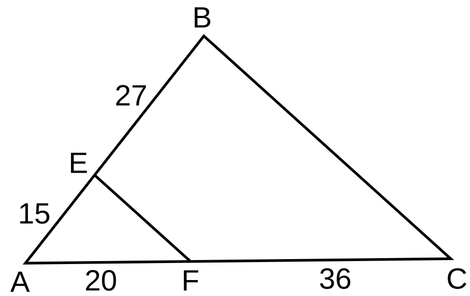
$$\frac{56}{20} = 2.8$$

$\triangle ABC$ is a dilation of $\triangle AEF$
of scale factor 2.8
Centered at Point A.

Score 1: The student wrote an incomplete explanation.

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



$$\frac{15}{20} = \frac{42}{56}$$

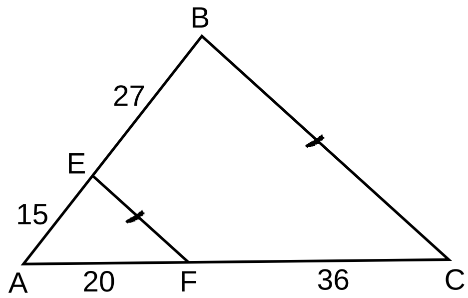
Explain why $\overline{EF} \parallel \overline{BC}$.

$\overline{EF} \parallel \overline{BC}$ because $\triangle AEF \cong \triangle ABC$. so $\overline{EF} \parallel \overline{BC}$ through simular sides of a simular triangle.

Score 0: The student wrote a correct proportion, but no further correct work is shown.

Question 31

31 In the diagram below, $AE = 15$, $EB = 27$, $AF = 20$, and $FC = 36$.



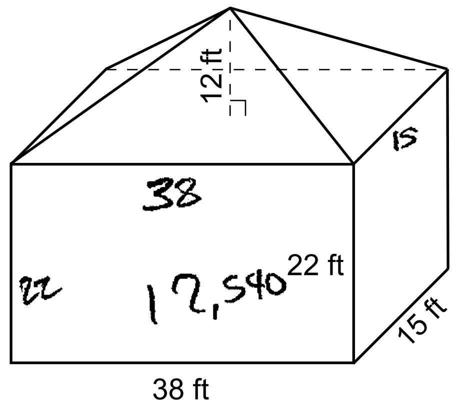
Explain why $\overline{EF} \parallel \overline{BC}$.

$\overline{EF}$ is parallel to $\overline{BC}$ because these two line never cross eachother no matter what.

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

Question 32

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

Volume - rectangular prism - lwh

$(22)(38)(15) = 12540$

Volume - pyramid - $\frac{1}{3}Bh$

$\left(\frac{1}{3}\right)(38 \times 15)(12) = 2280$

$12540 + 2280 = 14{,}820 \text{ ft}^3$

$\frac{14{,}820 \text{ ft}^3}{2{,}400} = 6.175$

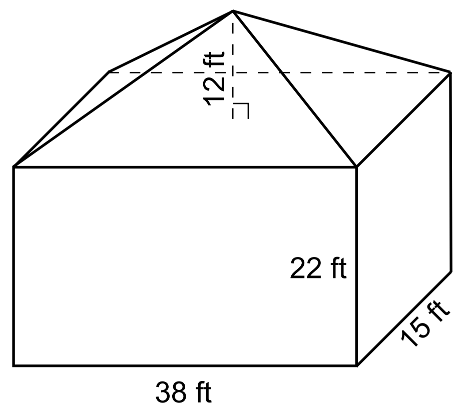
6.2

$\boxed{6.2 \text{ minutes}}$

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

Question 32

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

$V = lwh$

$V = 38(15)(22)$

$V = 12540$

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

$V = \frac{1}{3}(38 \cdot 15)(12)$

$V = 2280$

$V = 14820 \text{ ft}^3$

$\frac{14820}{2400} \rightarrow \boxed{6.2 \text{ minutes}}$

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

Question 32

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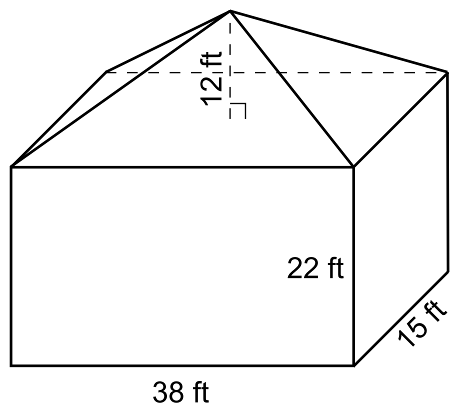


An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

$V = lwh$

$= 38 \times 22 \times 15$

$= 12{,}540$

$\boxed{6.18 \text{ minutes}}$

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

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

$= \frac{1}{3}(570)(12)$

$= \frac{1}{3}(6840)$

$= 2280$

$2280 + 12540 = 14820$

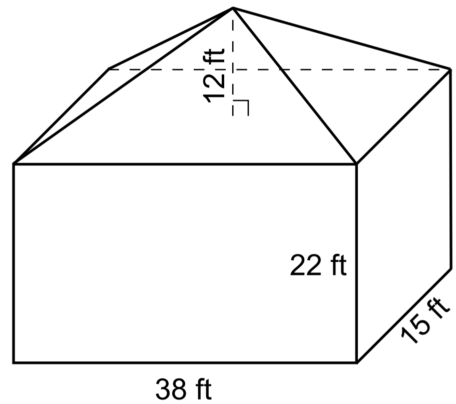
$\frac{1}{2400} = \frac{x}{14820}$

$\frac{2400x}{2400} = \frac{14820}{2400}$

$x = 6.175$ minutes

Score 3: The student made one rounding error in determining the time.

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

volume of rect. prism + rect. pyramid

Prism

$V = lwh$

$V = (38)(15)(22)$

$V = 12540 \text{ ft}^3$

Pyramid

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

$V = \frac{1}{3}(38)(12)$

$V = 152 \text{ ft}^3$

$12540 + 152 = 12692 \text{ ft}^3$

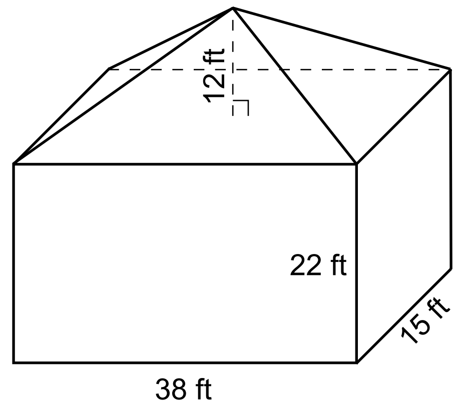
$\frac{12692}{2400} = 5.3 \text{ min}$

It will take 5.3 minutes to clean the volume of air in the building

Score 3: The student made an error in determining the volume of the pyramid.

Question 32

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

$v = \frac{1}{3}(Bh)$

$v = \frac{1}{3}(l \cdot w \cdot h)$

$v = \frac{1}{3}(38, 15 \cdot 22)$

$V = \frac{1}{3}(12540)$

$v = 4{,}180 \longrightarrow v = 6460$

$v = \frac{1}{3}(Bh)$

$v = \frac{1}{3}(l \cdot w \cdot h)$

$v = \frac{1}{3}(38 \cdot 15 \cdot 12)$

$v = \frac{1}{3}(6840)$

$v = 2280$

$\frac{1}{2400} = \frac{x}{6{,}460}$

$\frac{\cancel{2400x}}{2{,}400} = \frac{6460}{2{,}400}$

$x = 2.691$

$x = 2.7$

Score 3: The student made an error in determining the volume of the pyramid.

Question 32

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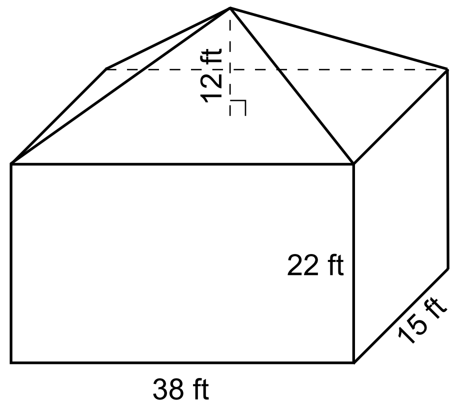


An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

$V = lwh$

$38 \cdot 15 \cdot 22$

$V = 12540$

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

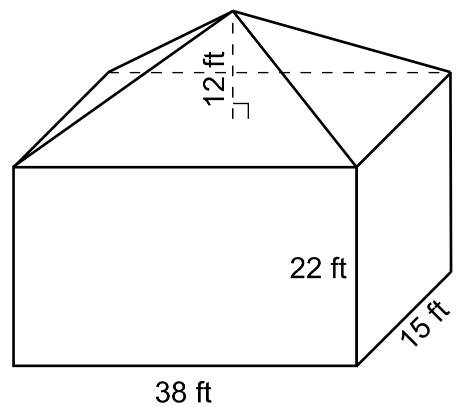
$V = \frac{1}{3}lwh$

$V = \frac{1}{3} 38 \cdot 15 \cdot 12$

$V = 2280$

Score 2: The student correctly determined the volumes of the prism and the pyramid.

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



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$V = lwh$

$V = (38\text{ ft})(15\text{ ft})(22\text{ ft})$

$V = 12540$

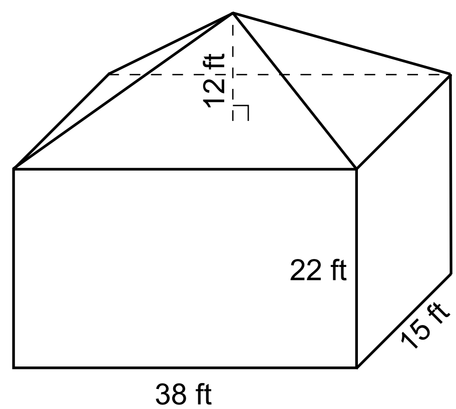
$12540/2400$

$\boxed{5.2\text{ minutes}}$

Score 2: The student found an appropriate time for the volume of the prism only.

Question 32

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

$V = lwh$

$V = (38)(22)(15)$

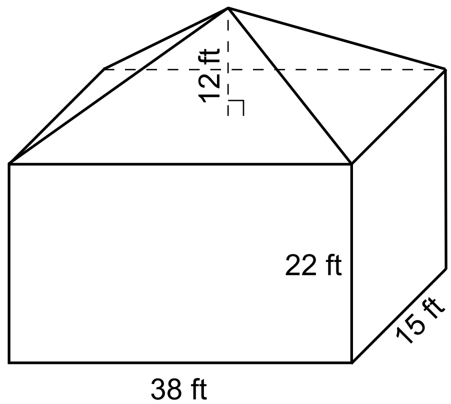
$V = 12540$

$60 \overline{)12540}$ = 209

$\boxed{209 \text{ minutes}}$

Score 1: The student correctly determined the volume of the prism.

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

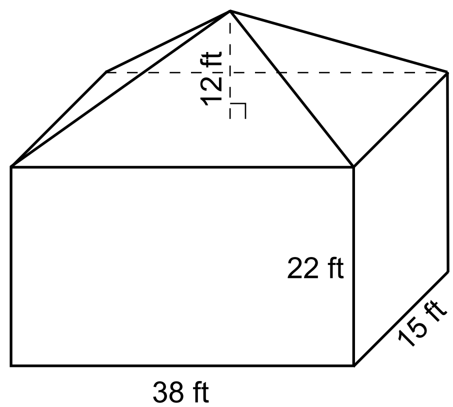
$V = l \cdot w \cdot h$

$2400 = 38 \cdot 15 \cdot 22$

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

Question 32

32 A building is composed of a rectangular pyramid on top of a rectangular prism, as shown in the diagram below. The rectangular prism has a length of 38 feet, a width of 15 feet, and a height of 22 feet. The rectangular pyramid sits directly on top of the rectangular prism, and its height is 12 feet.



An air purification filter was installed that will clean all the air in the building at a rate of 2400 cubic feet per minute. Determine and state how long it will take, to the *nearest tenth of a minute*, for the filter to clean the air contained in the building.

$A = bh$
$= 38(15)$
$= 570$

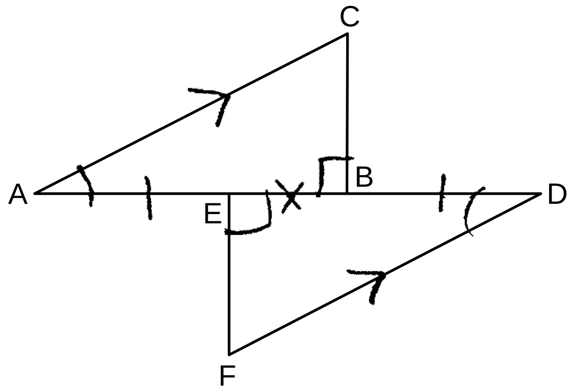
$A = \frac{1}{2}bh$
$= \frac{1}{2}(38)(12)$
$= 228$

598

Score 0: The student did not show enough course-level work to receive any credit.

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



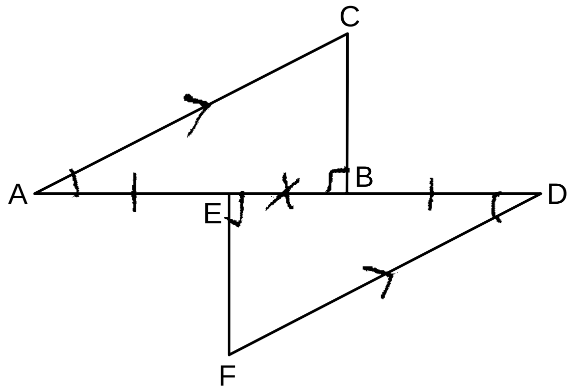
Prove: $\triangle ABC \cong \triangle DEF$

Statement	Reasons
1. $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$	1. Given
2. $\angle DEF \cong \angle CBA$	2. Perpendicular lines form congruent right angles.
3. $\angle CAB \cong \angle EDF$	3. If lines are parallel alternate interior angles are congruent.
4. $\overline{EB} \cong \overline{EB}$	4. Reflexive Property
5. $\overline{AE} + \overline{EB} \cong \overline{DB} + \overline{BE}$, $\overline{AB} \cong \overline{ED}$	5. Addition
6. $\triangle ABC \cong \triangle DEF$	6. ASA

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

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



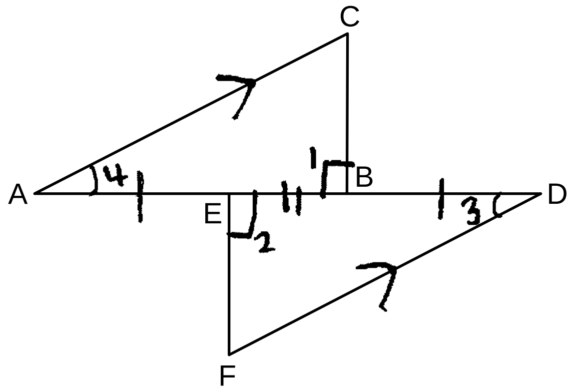
Prove: $\triangle ABC \cong \triangle DEF$

Statements	Reasons
1. $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$ $\overline{AC} \parallel \overline{FD}$	1. Given
2. $\overline{EB} \cong \overline{EB}$	2. Reflexive
3. $\overline{AB} \cong \overline{ED}$	3. Addition
4. $\angle CBA$ and $\angle FED$ are right $\angle$'s	4. Def. of $\perp$ lines
5. $\angle CBA \cong \angle FED$	5. All right $\angle$'s $\cong$
6. $\angle CAB \cong \angle EDF$	6. When // lines w/ transversal, alt. int. $\angle$'s $\cong$
7. $\triangle ABC \cong \triangle DEF$	7. ASA

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

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



Prove: $\triangle ABC \cong \triangle DEF$

$\boxed{\overline{AB} \perp \overline{BC},\ \overline{DE} \perp \overline{EF}}$
Given

$\boxed{\angle 1 \text{ and } \angle 2 \text{ are right}}$
$\perp$ lines form right $\angle$s

$\boxed{\angle 1 \cong \angle 2}$
all right $\angle$s are $\cong$

$\boxed{\overline{AC} \parallel \overline{FD}}$
given

$\boxed{\angle 3 \cong \angle 4}$
$\parallel$ lines $\rightarrow \cong$ alt int. $\angle$s

$\boxed{\overline{AE} \cong \overline{DB}}$
given

$\boxed{\overline{BE} \cong \overline{BE}}$
reflexive

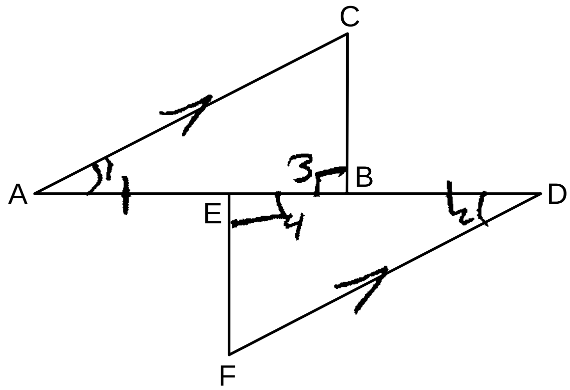
$\boxed{\overline{AB} \cong \overline{DE}}$
addition

$\boxed{\triangle ABC \cong \triangle DEF}$
AAS

Score 3: The student had an incorrect reason in proving $\triangle ABC \cong \triangle DEF$.

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



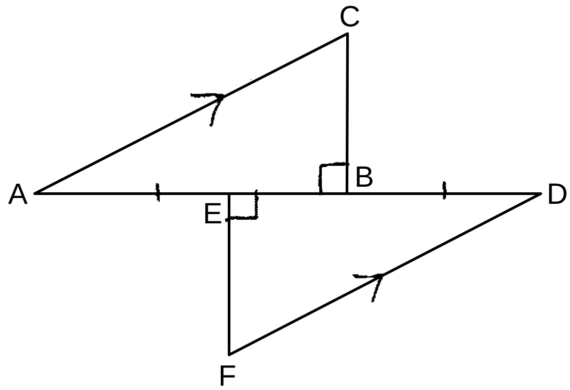
Prove: $\triangle ABC \cong \triangle DEF$

Statements	Reasons
① $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$ and $\overline{AC} \parallel \overline{FD}$	① given
② $\angle 1 \cong \angle 2$	② $\parallel$ Lines $\rightarrow$ $\cong$ Alt int $\angle$s
③ $\angle 3 \cong \angle 4$	③ $\perp$ Lines $\rightarrow$ $\cong$ Right $\angle$s
④ $\overline{AB} \cong \overline{ED}$	④ Addition
⑤ $\triangle ABC \cong \triangle DEF$	⑤ ASA $\cong$

Score 3: The student had one missing statement and reason to prove step 4.

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$

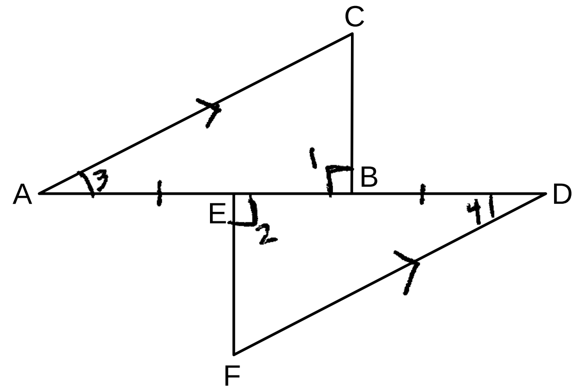


Prove: $\triangle ABC \cong \triangle DEF$

Statement	Reason
① $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, $\overline{AC} \parallel \overline{FD}$	① Given
② $\angle CBA \cong \angle FED$	② Perpendicular lines form ≅ right angles
③ $\overline{EB} \cong \overline{EB}$	③ Reflexive
④ $\overline{AE} + \overline{EB} \cong \overline{EB} + \overline{BD}$	④ Addition
⑤ $\overline{AB} \cong \overline{ED}$	⑤ Partition
⑥ $\angle CAB \cong \angle FDE$	⑥ Alternate Interior Angles
⑦ $\triangle ABC \cong \triangle DEF$	⑦ ASA

Score 2: The student had an incorrect reason in step 5 and an incomplete reason in step 6.

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



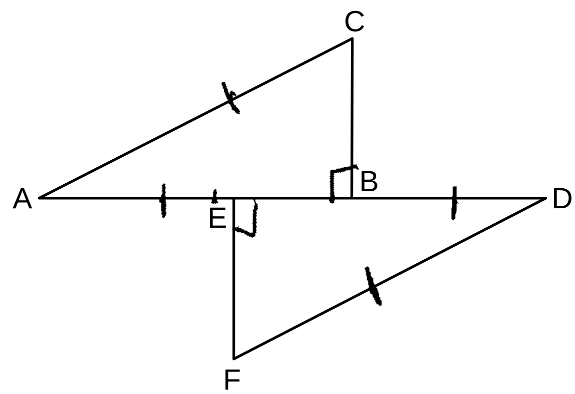
Prove: $\triangle ABC \cong \triangle DEF$

Statement	Reason
① $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$ $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$ and $\overline{AC} // \overline{FD}$	① given
② $\angle 1 + \angle 2$ are right $\angle$s	② Def of $\perp$
③ $\angle 3 \cong \angle 4$	③ alt int $\angle$s
④ $\overline{EB} \cong \overline{EB}$	④ reflexive
⑤ $\overline{AE} + \overline{EB} \cong \overline{EB} + \overline{BD}$	⑤ addition
⑥ $\overline{AE} \cong \overline{BD}$	⑥ substitution
⑦ $\triangle ABC \cong \triangle DEF$	⑦ ASA
5a $\overline{AE} + \overline{EB} \cong \overline{AB}$ $\overline{EB} + \overline{BD} \cong \overline{ED}$	5a whole = sum parts

Score 2: The student did not prove $\angle 1 \cong \angle 2$ and had an incomplete reason in step 3.

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



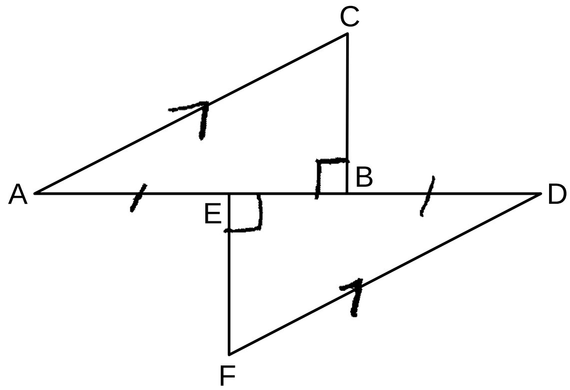
Prove: $\triangle ABC \cong \triangle DEF$

reason ~~statements~~	explenation
1 - $\overline{AE} \cong \overline{DB}$	1 - given
2 - <CAB ≅ <EDF	2 - // lines form ≅ alternate interior angles.
3 - <CBA ≅ <DEF	3 - ⊥ lines form 90° angles
4 - ΔABC ≅ ΔDEF	4 - HL

Score 1: The student had only one correct statement and reason in step 2.

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



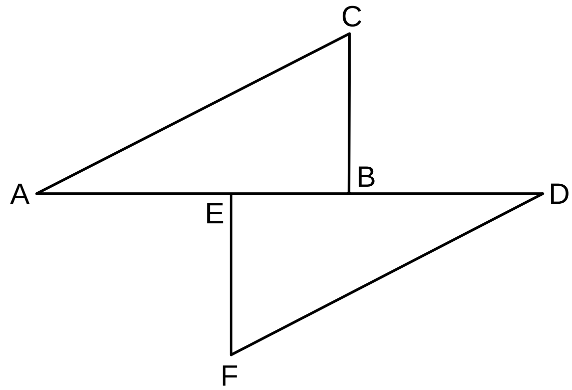
Prove: $\triangle ABC \cong \triangle DEF$

Statement	reason
① $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$ $AC \parallel FD$	① given
② $\angle CBA \cong \angle DEF$	② perp lines form right angles, all right angles are congruent
③	③

Score 1: The student had only one correct statement and reason in step 2.

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



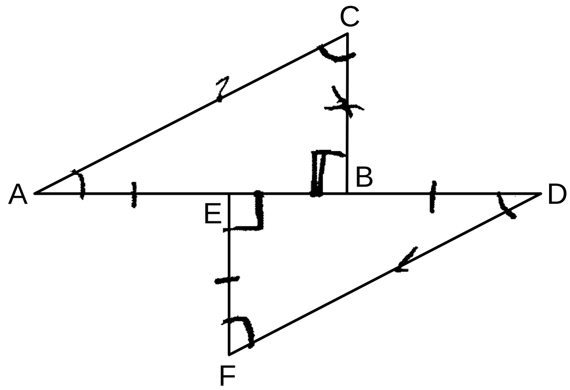
Prove: $\triangle ABC \cong \triangle DEF$

Statements	Reasons
① $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, $\overline{AC} \parallel \overline{FD}$	① Given
② $\overline{FE} \parallel \overline{BC}$	② RT are $\cong$
③ $\overline{BE}$ bisects $\overline{AB}$	③
④ $\triangle ABC \cong \triangle DEF$	④ ASA

Score 0: The student gave a completely incorrect response.

Question 33

33 Given: $\triangle ABC$, $\triangle DEF$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{AE} \cong \overline{DB}$, and $\overline{AC} \parallel \overline{FD}$



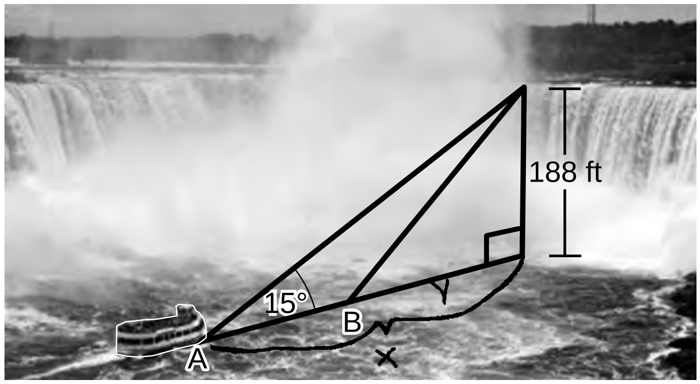
Prove: $\triangle ABC \cong \triangle DEF$

s	p
$\angle A \cong \angle D$ $\angle BEF \cong \angle C$	alt int $\angle$'s
$\angle CB \cong \angle FE$	all right angles are $\cong$
$ABC \cong EFD$	SAS

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

Question 34

34 In the diagram below, a boat at point A is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point A to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point B to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point A to point B.

$\tan 15^\circ = \frac{188}{x}$

$x \tan 15^\circ = 188$

$x = \frac{188}{\tan 15^\circ}$

$= 701.6255$

$\tan 23 = \frac{188}{y}$

$y = 442.9$

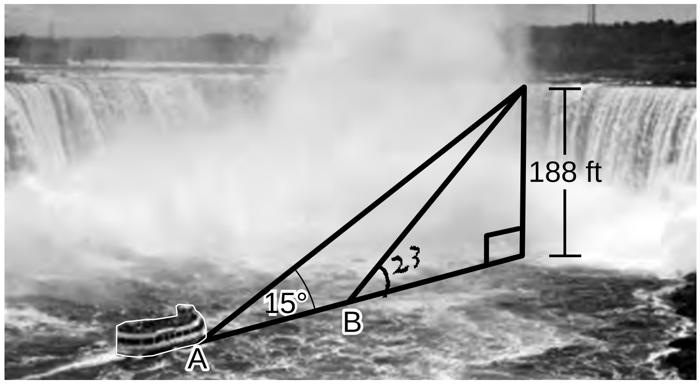
$701.6255 - 442.9002 = 258.7253$

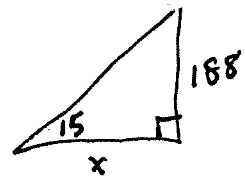
The distance is 259 ft.

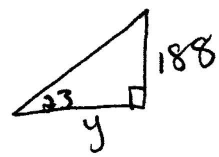
Score 4: The student gave a complete and correct response.

Question 34

34 In the diagram below, a boat at point A is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point A to the top of the waterfall is 15°.







After the boat travels toward the falls, the angle of elevation at point B to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point A to point B.

$\tan 15° = \frac{188}{x}$

$\tan 15° \cdot x = 188$

$x = \frac{188}{\tan 15}$

$x = 701.6$

$\tan 23 = \frac{188}{y}$

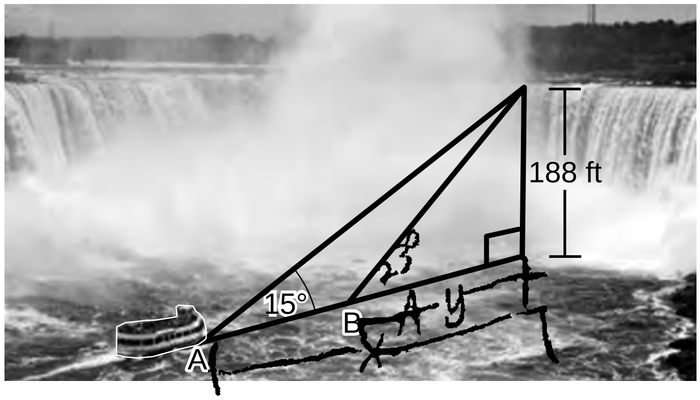
$y = 442.9$

$701.6 - 442.4 = \boxed{259 \text{ feet}}$

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

Question 34

34 In the diagram below, a boat at point A is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point A to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point B to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point A to point B.

from point A

$$\frac{\tan 15}{1} = \frac{188}{x}$$

$$\frac{188}{\tan 15} = \frac{\tan 15 x}{\tan 15}$$

$x = 701.626\text{ft}$

$$\frac{\tan 23}{1} = \frac{188}{y}$$

$$\frac{188}{\tan 23} = \frac{\tan 23 y}{\tan 23}$$

$y = 442.900\text{ft}$

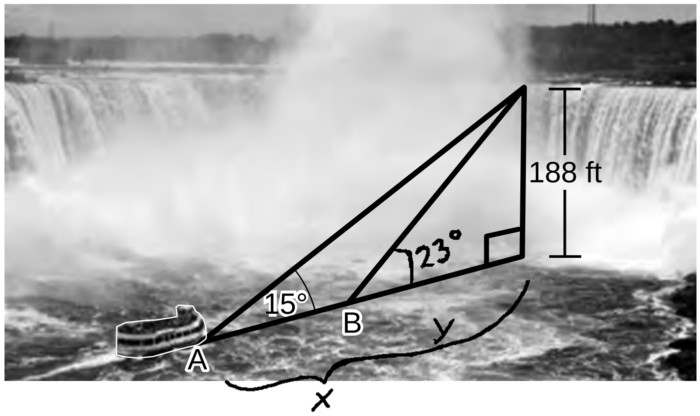
$$\begin{array}{r} 701.626 \\ -\,442.900 \\ \hline 258.726 \end{array}$$

258.726ft from A to B

Score 3: The student made a rounding error.

Question 34

34 In the diagram below, a boat at point *A* is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point *A* to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point *B* to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point *A* to point *B*.

$\tan 15 = \frac{188}{x} = 701$

$\tan 23 = \frac{188}{y} = 443$

$701 - 443 = 258$

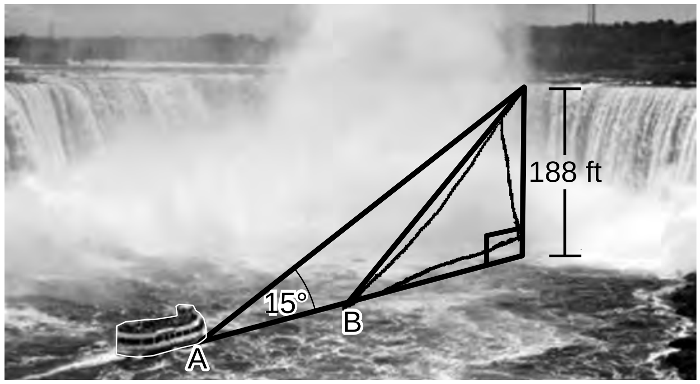
258 ft

Score 3: The student made a rounding error.

Question 34

34 In the diagram below, a boat at point A is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point A to the top of the waterfall is 15°.

$S\frac{O}{H}C\frac{A}{H}T\frac{O}{A}$



After the boat travels toward the falls, the angle of elevation at point B to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point A to point B.

$$\tan 15 = \frac{188}{x}$$

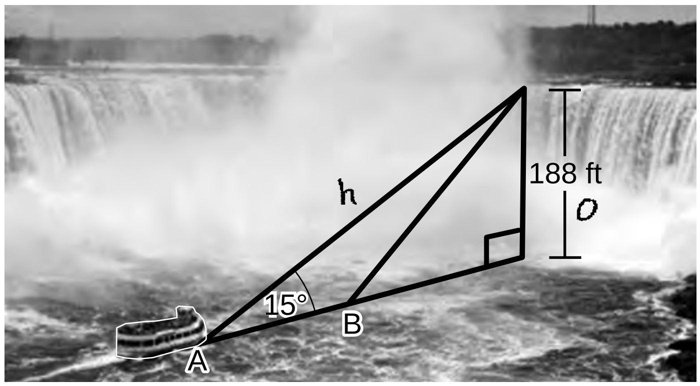
$$\frac{\tan 15\, x}{\tan 15} = \frac{188}{\tan 15}$$

$$x = 701.6255$$

Score 2: The student correctly determined the distance from point A to the base of the waterfall, but no further correct work is shown.

Question 34

34 In the diagram below, a boat at point *A* is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point *A* to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point *B* to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point *A* to point *B*.

$$x \cdot \tan 15^\circ = \frac{188}{x} \cdot x$$

$$\frac{x \tan 15^\circ}{\tan 15^\circ} = \frac{188}{\tan 15^\circ}$$

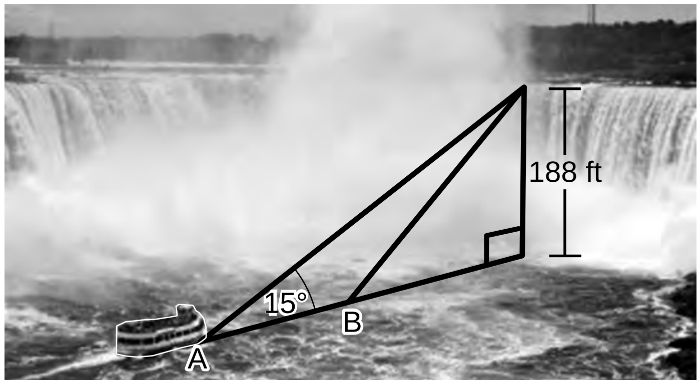
$$x = 701.625$$

702 ft from point A to B

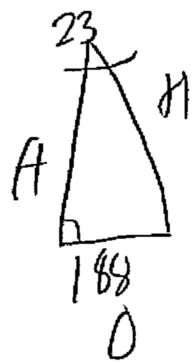
Score 2: The student correctly determined the distance from point *A* to the base of the waterfall, but no further correct work is shown.

Question 34

34 In the diagram below, a boat at point *A* is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point *A* to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point *B* to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point *A* to point *B*.



$\boxed{x = 443\text{ft}}$

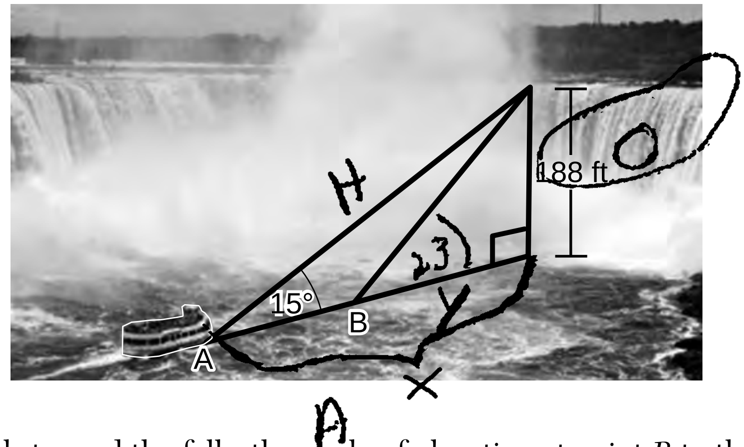
$$\frac{\tan 23}{1} = \frac{188}{x}$$

They are 443 ft away from the waterfall

Score 2: The student correctly determined the distance from point *B* to the base of the waterfall, but no further correct work is shown.

Question 34

34 In the diagram below, a boat at point *A* is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point *A* to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point *B* to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point *A* to point *B*.

SOH CAH TOA

$\frac{\cancel{\tan 15}}{1} \overset{0.2679}{} = \frac{118}{x}$ $\qquad$ $\frac{\cancel{\tan 23}}{1} \overset{0.4245}{} = \frac{118}{y}$

$\frac{0.2679x}{0.2679} = \frac{118}{0.2679}$ $\qquad$ $\frac{0.4245y}{0.4245} = \frac{118}{0.4245}$

$x = 440.5$ $\qquad$ $y = 277.9$

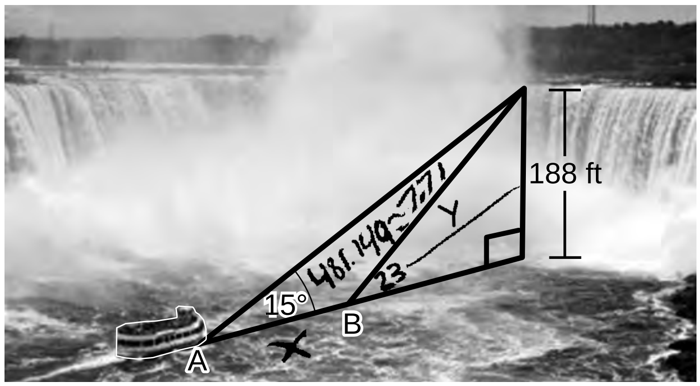
$$\begin{array}{r} 440.5 \\ -277.9 \\ \hline \end{array}$$

$AB = 162.6$

Score 2: The student made a transposition error in stating the height was 118. The student made the same rounding error multiple times.

Question 34

34 In the diagram below, a boat at point *A* is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point *A* to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point *B* to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point *A* to point *B*.

$\frac{\sin(23)}{1} = \frac{188}{Y}$

$\frac{\sin(23) \cdot Y}{\sin(23)} = \frac{188}{\sin(23)}$

$Y = 481.1492771$

$\frac{\tan 15}{1} = \frac{481.1492771}{X}$

$\frac{\tan 15 \cdot X}{\tan 15} = \frac{481.1492771}{\tan 15}$

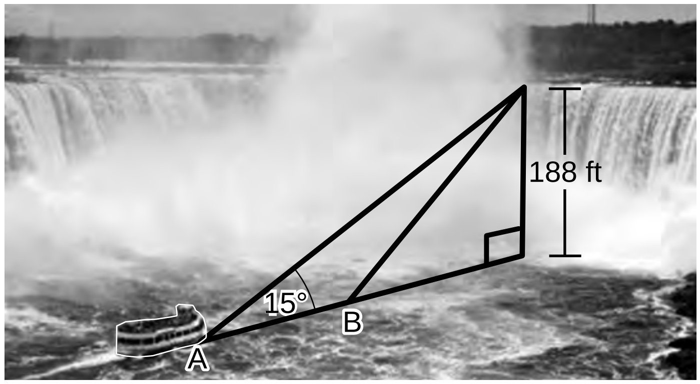
$\boxed{1795.673548 \text{ ft}}$

$\boxed{X = 1796 \text{ ft from point A – point B}}$

Score 2: The student made a conceptual error in using right triangle trigonometry in a non-right triangle.

Question 34

34 In the diagram below, a boat at point *A* is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point *A* to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point *B* to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point *A* to point *B*.

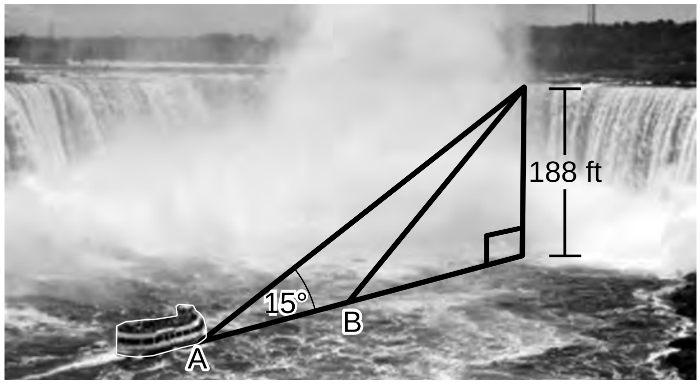
$$(188)\tan 15 = \frac{\cancel{188}}{X}\cancel{(188)}$$

$$50.3744 = X$$

Score 1: The student wrote one correct relevant trigonometric equation.

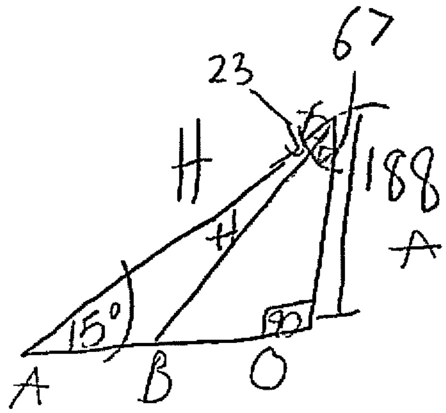
Question 34

34 In the diagram below, a boat at point A is traveling toward the most powerful waterfall in North America, the Horseshoe Falls. The Horseshoe Falls has a vertical drop of 188 feet. The angle of elevation from point A to the top of the waterfall is 15°.



After the boat travels toward the falls, the angle of elevation at point B to the top of the waterfall is 23°. Determine and state, to the *nearest foot*, the distance the boat traveled from point A to point B.

482 feet



39073 $\frac{\cos(67)}{1} = \frac{188}{H}$

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

Question 35

35 Triangle *JOE* has vertices whose coordinates are *J*(4,6), *O*(−2,4), and *E*(6,0).

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$D_{JO}: \sqrt{(-2-4)^2+(4-6)^2}$
$\sqrt{(-6)^2+(-2)^2}$
$\sqrt{36+4}$
$\sqrt{40}$

$D_{OE}: \sqrt{(6+2)^2+(-4)^2}$
$\sqrt{64+16}$
$\sqrt{80}$

$D_{JE}: \sqrt{(4-6)^2+(0-6)^2}$
$\sqrt{(-2)^2+(-6)^2}$
$\sqrt{4+36}$
$\sqrt{40}$

$\triangle JOE$ is an isosceles $\triangle$ because it has 2 congruent sides, $\overline{JO} \cong \overline{JE}$, therefore it follows the definition of an isosceles $\triangle$.

Question 35 is continued on the next page.

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

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

$\overline{JY}$ is the perpendicular bisector of $\overline{OE}$ b/c y is the midpoint of $\overline{OE}$ & $\overline{JY}$ and $\overline{OE}$ have neg. reciprical slopes so $\overline{JY} \perp \overline{OE}$.

Slope $\overline{OE}$: $\frac{0-4}{6+2} \rightarrow -\frac{4}{8} \rightarrow -1/2$

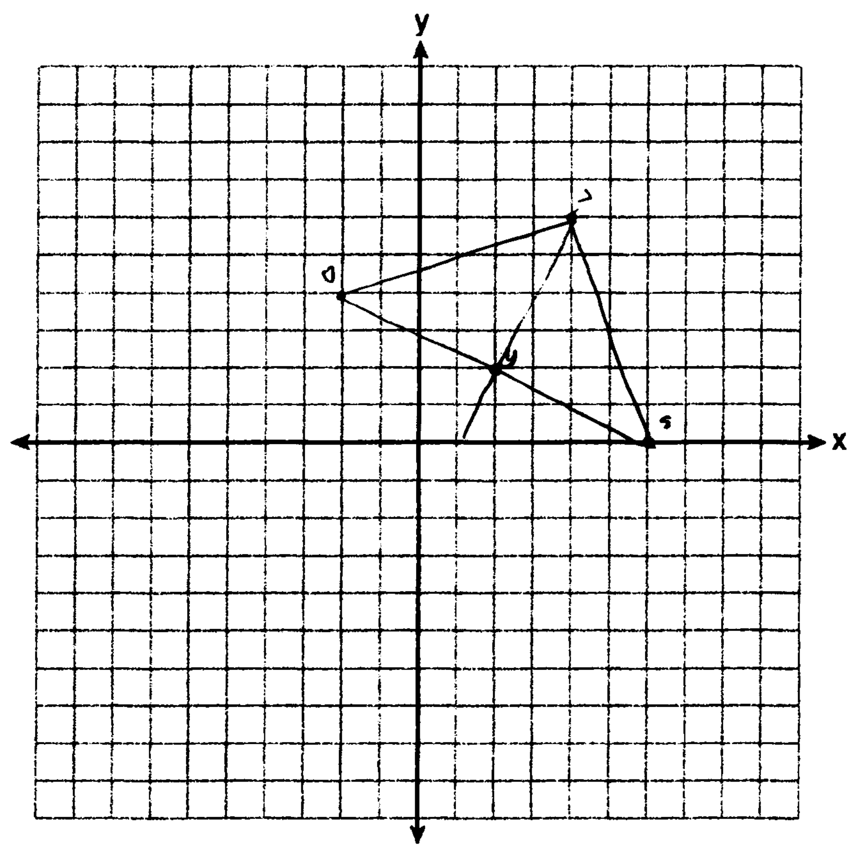
Slope $\overline{JY}$: $\frac{2-6}{2-4} \rightarrow \frac{-4}{-2} \rightarrow 2$

$\left(\frac{6-2}{2}, \frac{0+4}{2}\right)$

$\left(\frac{4}{2}, \frac{4}{2}\right)$

$\downarrow$

$y(2,2)$



Question 35

35 Triangle *JOE* has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

Plan: Find 2 sides with the same distance.

work:

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

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

$JO = \sqrt{36+4} = \sqrt{40}$

$JE = \sqrt{(6-4)^2 + (0-6)^2}$

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

$JE = \sqrt{4+36}$

$JE = \sqrt{40}$

Conclusion Triangle JOE is isosceles because ~~JE~~ the distance of $\overline{JE}$ and $\overline{JO}$ are =.

Question 35 is continued on the next page.

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

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

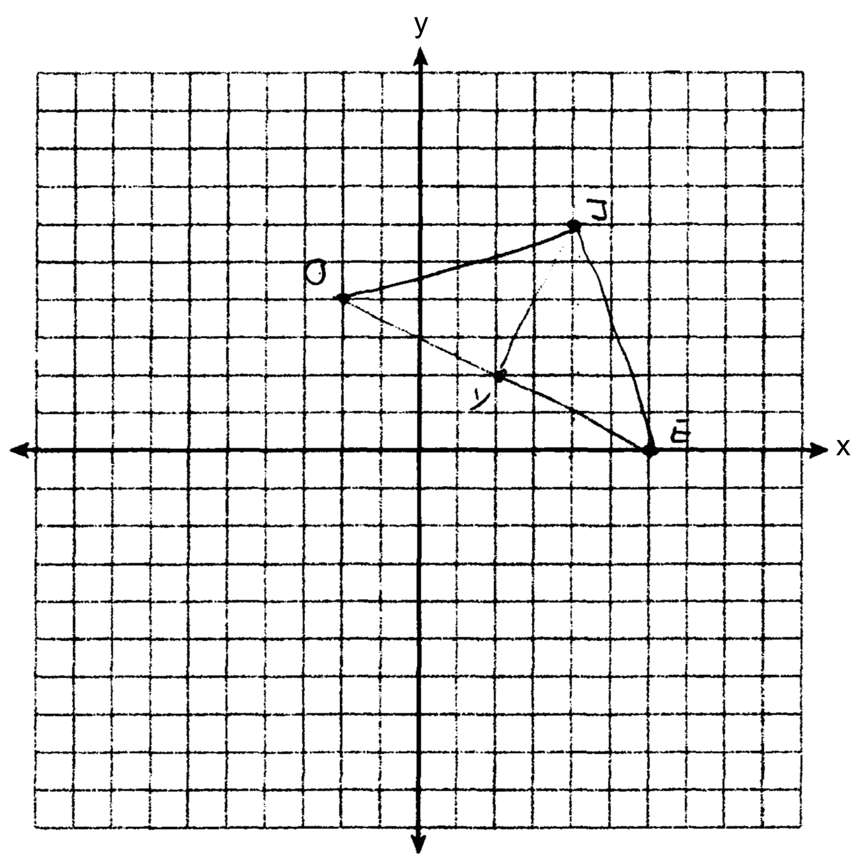
Plan: Find the distance of $\overline{OY}$ & $\overline{YE}$
Find the neg reciprical slope of
$\overline{JY}$ & $\overline{YE}$

Work: $\sqrt{(2+2)^2+(2-4)^2} = \sqrt{(4)^2+(-2)^2} = \sqrt{16+4} = \sqrt{20} = OY$

$\sqrt{(6-2)^2+(0-2)^2} = \sqrt{(4)^2+(-2)^2} = \sqrt{16+4} = \sqrt{20} = YE$

Slope $\overline{JY}$: $\frac{2-6}{2-4} = \frac{4}{2}$ Slope $\overline{YE}$ = $\frac{0-2}{6-2} = -\frac{2}{4}$

Conclusion: ∠JYE is a right ∡ because $\overline{JY}$ and $\overline{YE}$'s slopes are negitive recipricols of each other making $\overline{JY}$ perpendicular to $\overline{YE}$. $\overline{JY}$ bisects $\overline{OE}$ because $\overline{OY}$ & $\overline{YE}$ are ≅, and bisectors split a segment into 2 ≅ parts.



Question 35

35 Triangle *JOE* has vertices whose coordinates are *J*(4,6), *O*(−2,4), and *E*(6,0).

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$d\,\overline{JO}$

$$2^2+6^2=x^2$$
$$4+36=x^2$$
$$\sqrt{40}=\sqrt{x^2}$$
$$\sqrt{40}=x$$
$$d\,\overline{JO}=\sqrt{40}$$

$d\,\overline{EJ}$

$$2^2+6^2=x^2$$
$$4+36=x^2$$
$$\sqrt{40}=\sqrt{x^2}$$
$$\sqrt{40}=x$$
$$d\,\overline{EJ}=\sqrt{40}$$

$\triangle$ JOE is an isosceles $\triangle$ because it has 2 $\cong$ sides.

Question 35 is continued on the next page.

Score 5: The student did not write a concluding statement when proving $\overline{JY}$ bisects $\overline{OE}$.

Question 35 continued.

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

$d\,\overline{OY} \Rightarrow$ $2^2+4^2=x^2$

$4+16=x^2$

$\sqrt{20}=\sqrt{x^2}$

$\overline{OY}=\sqrt{20}$

$d\,\overline{EY} \Rightarrow$ $2^2+4^2=x^2$

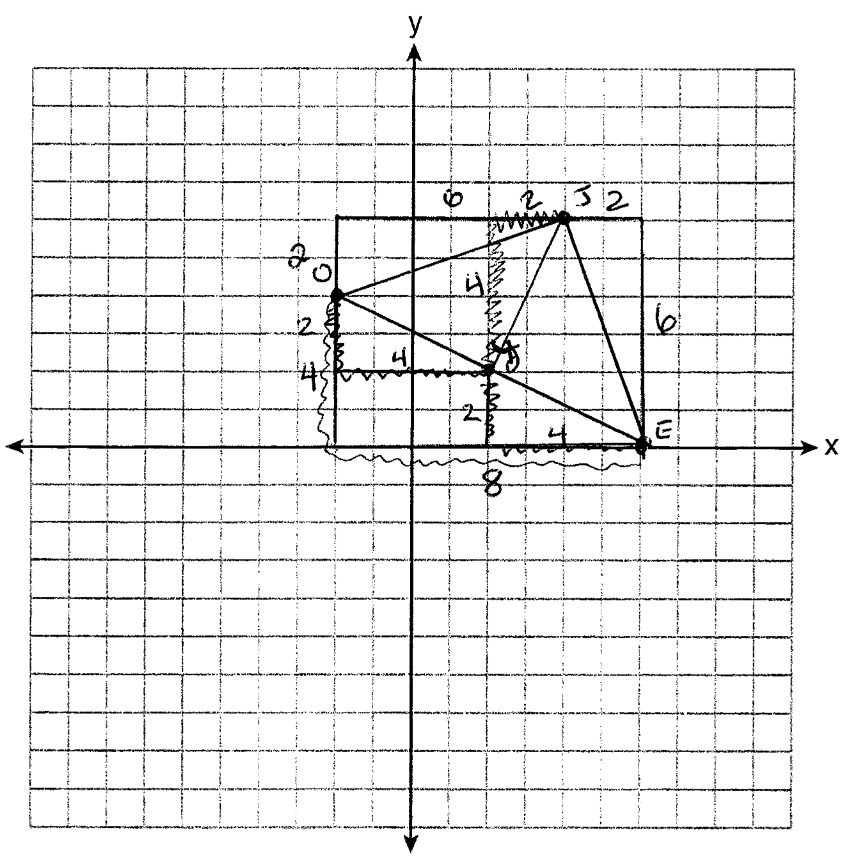
$4+16=x^2$

$\sqrt{20}=\sqrt{x^2}$

$EY=\sqrt{20}$

$\overline{OE}$ is $\perp$ to $\overline{JY}$ because $\overline{OE}$ and $\overline{JY}$ have opposite signed reciprocal slopes.

$m\,\overline{OE}=\frac{-4}{8}=\frac{-1}{2}$ $m\,\overline{YJ}=\frac{4}{2}=2$



Question 35

35 Triangle *JOE* has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$$JO = \sqrt{2^2 + 6^2} = \sqrt{40}$$

$$JE = \sqrt{2^2 + 6^2} = \sqrt{40}$$

Question 35 is continued on the next page.

Score 5: The student did not write a concluding statement when proving $\triangle JOE$ was isosceles.

Question 35 continued.

Point $Y(2,2)$ is on $\overline{OE}$.

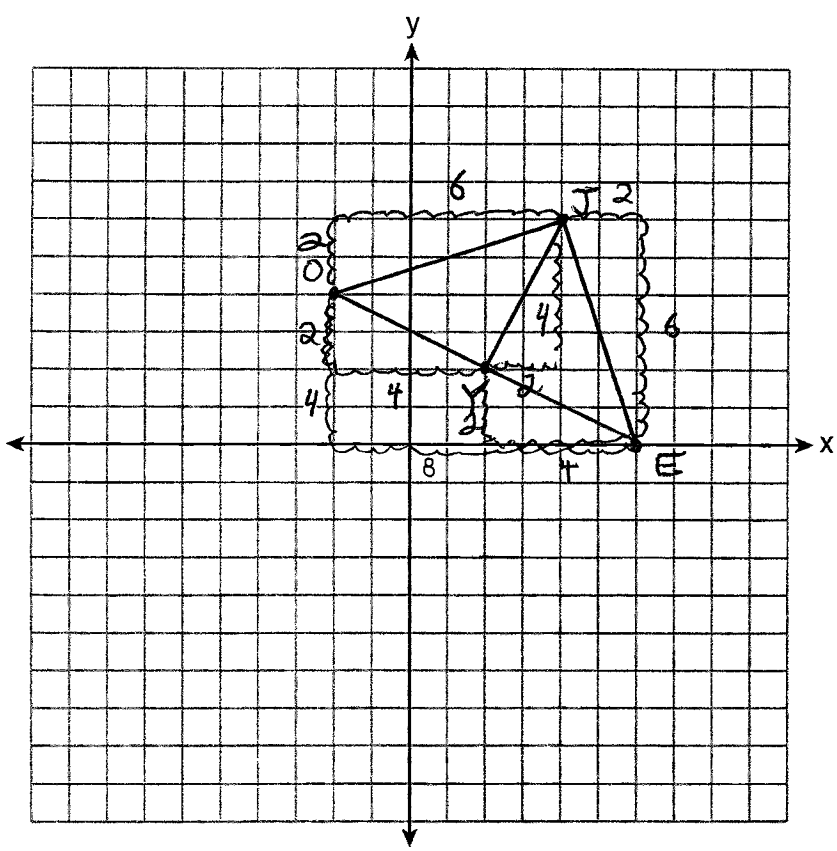
Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

slope of $\overline{JY}$: $\frac{4}{2}=2$ slope of $\overline{OE}$: $\frac{-4}{8}=-\frac{1}{2}$

$\overline{JY} \perp \overline{OE}$ because their slopes are neg. reciprocals.

$OY=\sqrt{2^2+4^2}=\sqrt{20}$ $EY=\sqrt{2^2+4^2}=\sqrt{20}$

$\overline{JY}$ is the perpendicular bisector of $\overline{OE}$ since $\overline{JY} \perp \overline{OE}$ and $\overline{OY} \cong \overline{EY}$.



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

Distance formula 3x

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

$JO \rightarrow \sqrt{(-2-4)^2+(4-6)^2}$

$\sqrt{36+4}$

$\sqrt{40}$

$JE \rightarrow \sqrt{(6-4)^2+(0-6)^2}$

$\sqrt{4+36}$

$\sqrt{40}$

$OE \rightarrow \sqrt{(6+2)^2+(0-4)^2}$

$\sqrt{64+16}$

$\sqrt{80}$

$\sqrt{40}=\sqrt{40}\neq\sqrt{80}$

$\triangle JOE$ is isosceles b/c it has one pair of congruent legs, lengths $\overline{JO}$ and $\overline{JE}$.

Question 35 is continued on the next page.

Score 4: The student made a computational error when determining the slope of $\overline{OE}$ and wrote an incorrect concluding statement when proving $\overline{JY}\perp\overline{OE}$.

Point $Y(\overset{x^1}{2},\overset{x^2}{2})$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

Distance 2x

$OY \rightarrow \sqrt{(2+2)^2 + (2-4)^2}$

$\sqrt{16+4}$

$\sqrt{20}$

$YE \rightarrow \sqrt{(6-2)^2 + (0-2)^2}$

$\sqrt{16+4}$

$\sqrt{20}$

Point Y is a midpoint of $\overline{OE}$ because

$\overline{OY} \cong \overline{YE}$

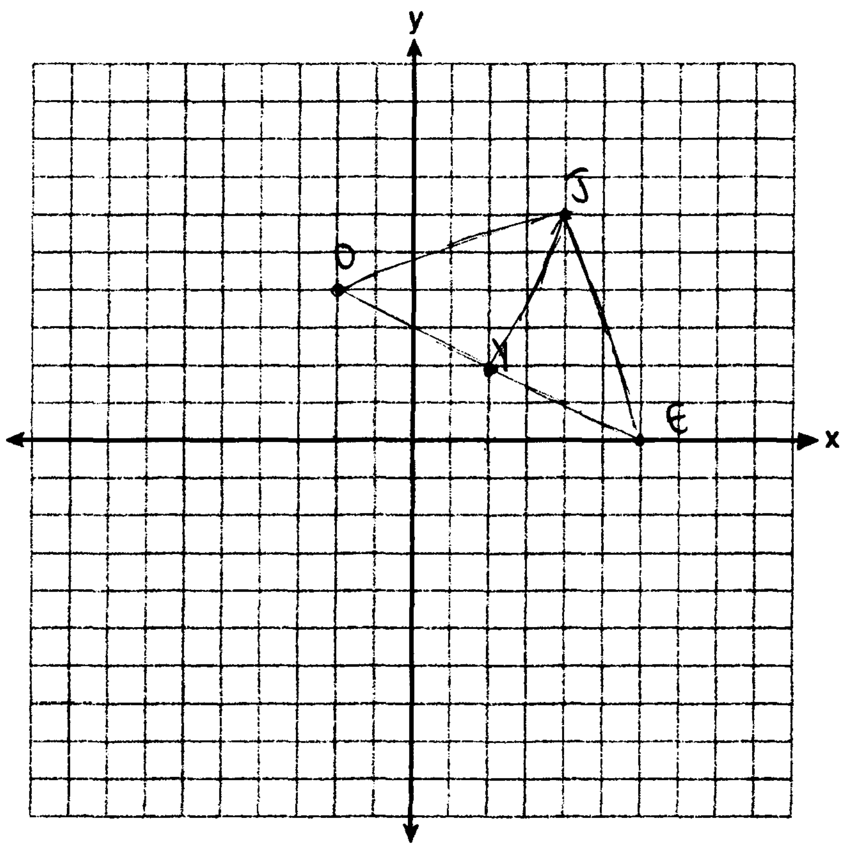
Slope formula 2x to show neg reciprocal

$\frac{y_2 - y_1}{x_2 - x_1}$

$\overline{JY} \rightarrow \frac{2-6}{2-4} = \frac{-4}{-2} \rightarrow 2$

$\overline{OE} \rightarrow \frac{0-4}{6-4} \; \frac{-4}{2} \rightarrow -2$

$\overline{JY}$ is perpendicular to $\overline{OE}$ b/c of negative reciprocal slopes.



$\overline{JY}$ is the perpendicular bisector of $\overline{OE}$ b/c point Y is a midpoint and the $\overline{JY}$ is perpendicular to $\overline{OE}$ b/c of negative reciprocal slopes

Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

JO distance: $\sqrt{(6-4)^2 + (4+2)^2} \rightarrow \sqrt{40}$

JE distance $= \sqrt{(6-4)^2 + (0-6)^2} \rightarrow \sqrt{40}$

OE distance $= \sqrt{(6+2)^2 + (0-4)^2} \rightarrow \sqrt{80}$

$\triangle$ JOE is isosceles b/c it has 2 congruent sides

Question 35 is continued on the next page.

Score 4: The student did not write concluding statements when proving $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

Point $Y(2,2)$ is on $\overline{OE}$. $J(4,6)$ $O(-2,4)$ $E(6,0)$

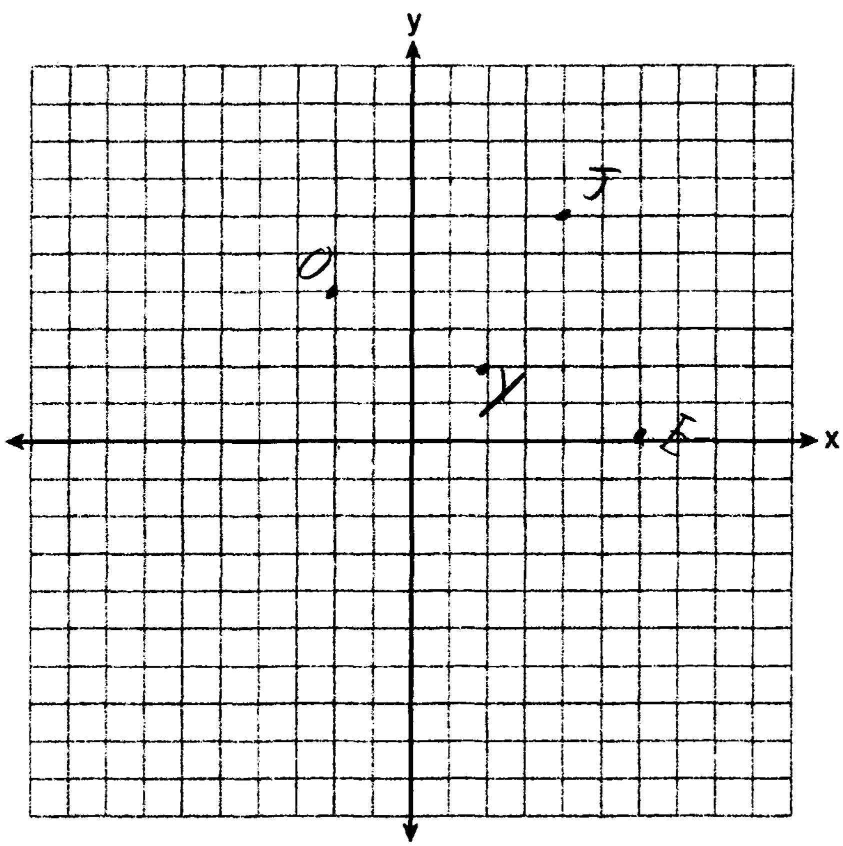
Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

$\overline{JY}$ slope $= \frac{6-2}{4-2} = 2$ $\overline{JY}$ is $\perp$ to $\overline{OE}$

$\overline{OE}$ slope $= \frac{0-4}{6+2} = \frac{-4}{8} = -\frac{1}{2}$

$\overline{OY}$ distance $= \sqrt{(2+2)^2+(2-4)^2} \to \sqrt{20}$ congruent

$\overline{YE}$ distance $= \sqrt{(6-2)^2+(0-2)^2} \to \sqrt{20}$



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$JO \sqrt{(4--2)^2+(6-4)^2} = \sqrt{40}$

$OE \sqrt{(-2-6)^2+(4-0)^2} = \sqrt{80}$

$EJ \sqrt{(6-4)^2+(0-6)^2} = \sqrt{40}$

$\cong$

$\triangle JOE$ is isos b/c it has 2 $\cong$ sides.

Question 35 is continued on the next page.

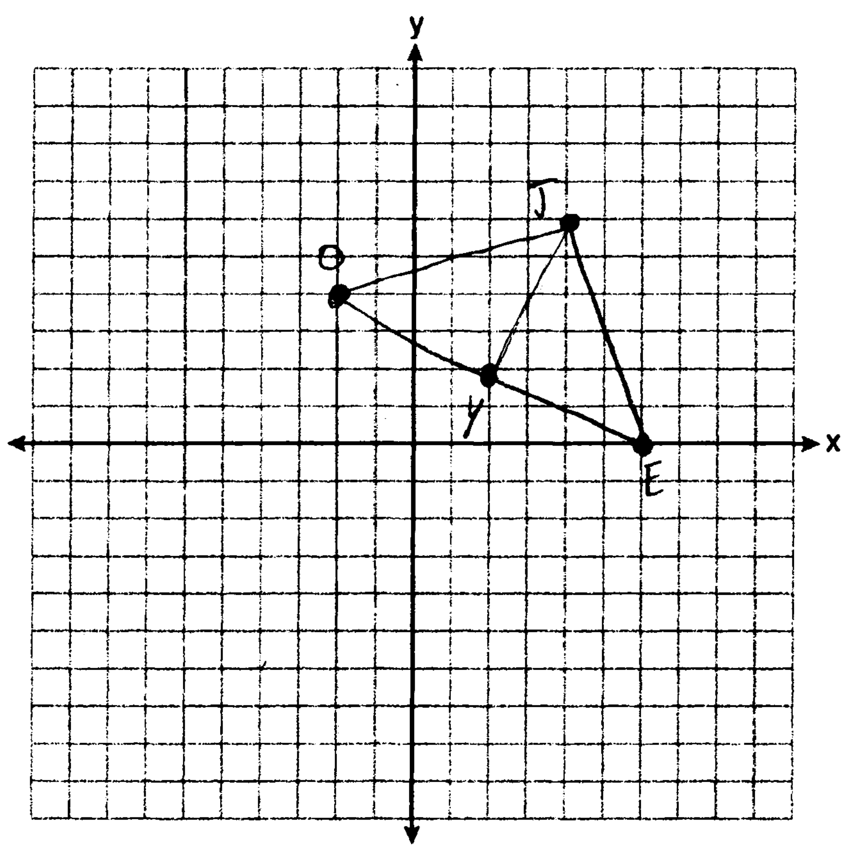
Score 4: The student did not prove $\overline{JY}$ was perpendicular to $\overline{OE}$.

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

$$\left(\frac{-2+6}{2}, \frac{4+0}{2}\right) = (2,2)$$

$\overline{JY}$ is the perpendicular bisector of $\overline{OE}$ because $\overline{JY}$ connects to point Y which is the midpt. of $\overline{OE}$.



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$$M = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\overline{JO}: M = \frac{4-6}{-2-4} = \frac{-2}{-6} = \frac{1}{3}$$

$$\overline{JE}: m = \frac{0-6}{6-4} = \frac{-6}{2} = \frac{-3}{1}$$

ΔJOE is isosceles because when 2 Sides Of a triangle are negative reciprocals if eachother they are also $\cong$.

Question 35 is continued on the next page.

Score 4: The student did not prove $\triangle JOE$ was isosceles.

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

$\overline{OE}$ (slope): $m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{0-4}{6-(-2)}$

$m = \frac{-4}{8}$

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

O(-2,4)

E(6,0)

J(4,6)

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

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

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

$d = \sqrt{4+16}$

$d = \sqrt{20}$

$\overline{EY}$: $d = \sqrt{(2-0)^2 + (2-6)^2}$

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

$d = \sqrt{4+16}$

$d = \sqrt{20}$

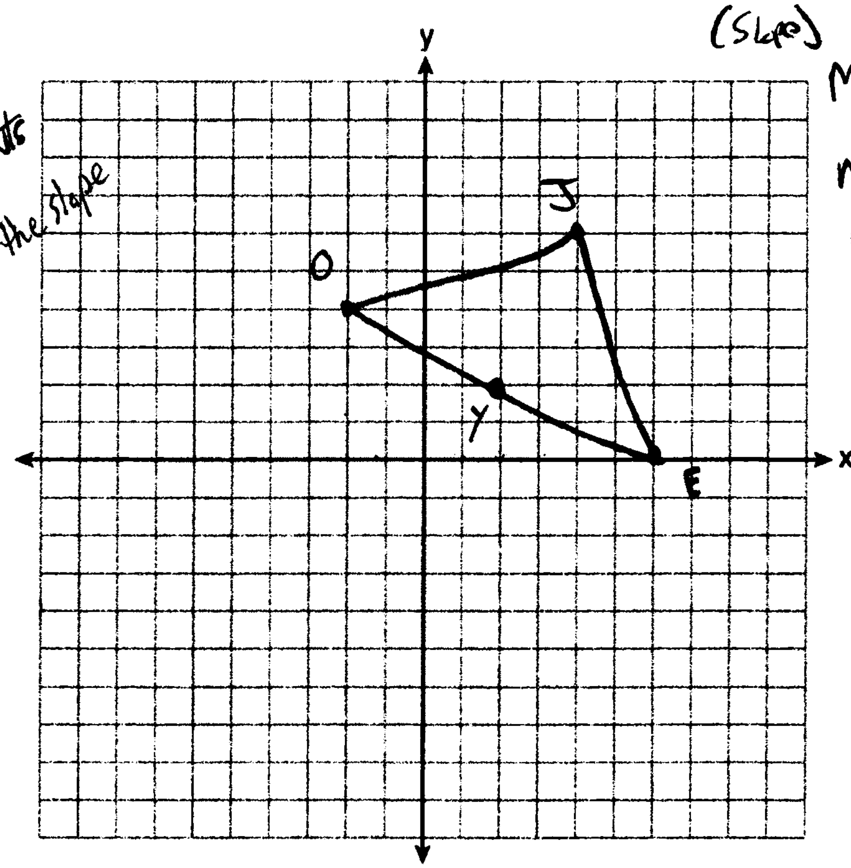
$\overline{JY}$ (slope): $m = \frac{y_2 - y_1}{x_2 - x_1}$

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

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

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

When a point divides a line segment into 2 ≅ segments and the slope of $\overline{JY}$ is the negative recipical of the slope of $\overline{OE}$, $\overline{JY}$ is a perp. bisector of $\overline{OE}$.



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

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

$d=\sqrt{(4)+(36)}$

$d=\sqrt{40}$

$d=\sqrt{(0-4)^2+(6+2)^2}$ $\overline{OE}$

$d=\sqrt{(16)+(64)}$

$d=\sqrt{80}$

$d=\sqrt{(0-6)^2+(6-4)^2}$ $\overline{EJ}$

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

$d=\sqrt{36+4}$

$d=\sqrt{40}$

$\overline{JO}\cong\overline{EJ}$, therefore ΔJOE is an isosceles triangle.

Question 35 is continued on the next page.

Score 3: The student proved $\triangle JOE$ was isosceles and determined the slopes of $\overline{JY}$ and $\overline{OE}$. No further correct work was shown.

Question 35 continued.

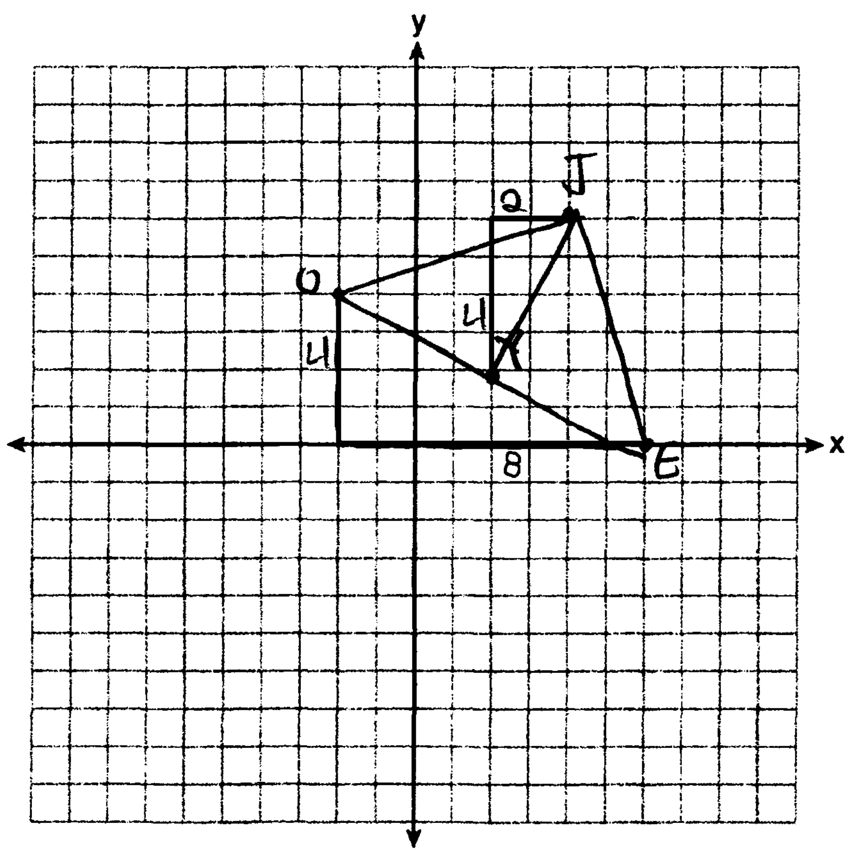
Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

Slope of $\overline{OE} = \frac{-4}{8} = -\frac{1}{2}$

Slope of $\overline{JY} = \frac{4}{2} = 2$

The slope of $\overline{JY}$ is perp. to the slope of $\overline{OE}$ so it is the perpendicular bisector.



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$$JO = \sqrt{(-2-4)^2+(4-6)^2}$$
$$= \sqrt{(-6)^2+(-2)^2}$$
$$= \sqrt{36+4}$$
$$= \sqrt{40}$$

$$JE = \sqrt{(6-4)^2+(0-6)^2}$$
$$= \sqrt{(2)^2+(-6)^2}$$
$$= \sqrt{4+36}$$
$$= \sqrt{40}$$

$$\overline{JO} \cong \overline{JE}$$

2 $\cong$ sides

$\therefore$ $\triangle JOE$ is isosceles

Question 35 is continued on the next page.

Score 3: The student proved $\triangle JOE$ was isosceles and found the midpoint of $\overline{OE}$, but no further correct work was shown.

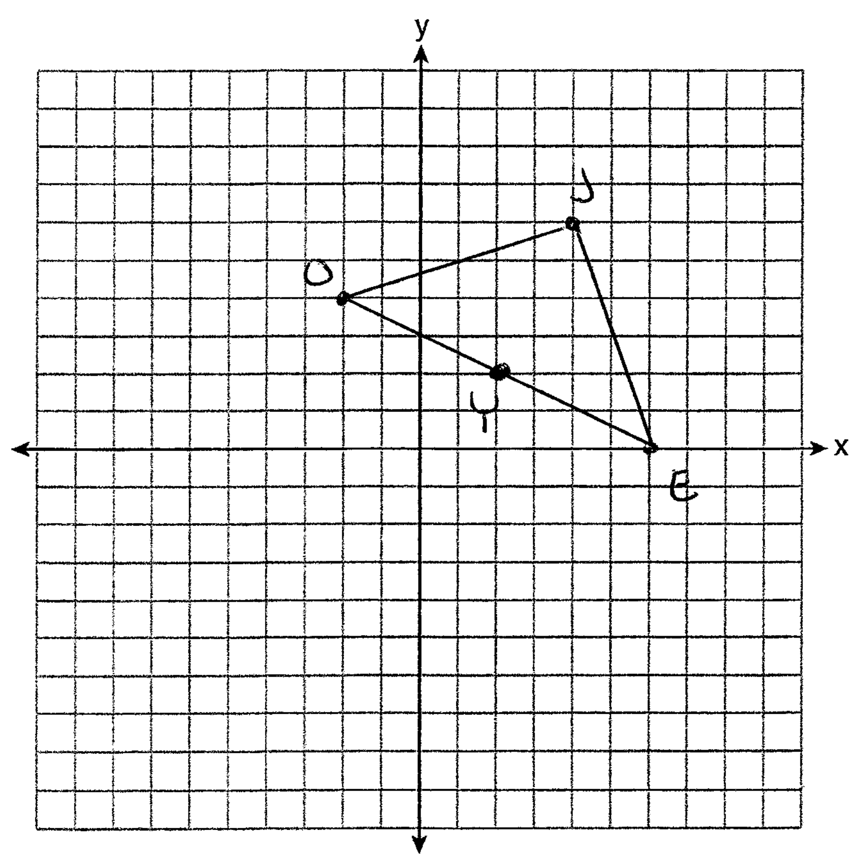
Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

Midpoint of $\overline{OE}$: $\left(\frac{-2+6}{2}, \frac{4+0}{2}\right)$

$\left(\frac{4}{2}, \frac{4}{2}\right)$

$(2,2)$



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$OJ = 2^2+6^2=x^2$

$OJ = 4+36=x^2$

$OJ = \sqrt{40}$

$JE = 6^2+2^2=x^2$

$36+4=x^2$

$JE = \sqrt{40}$

$\overline{OJ} \cong \overline{JE}$

$OE = 4^2+8^2=x^2$

$=16+64=x^2$

$OE = \sqrt{80}$

Question 35 is continued on the next page.

Score 2: The student did not write a concluding statement when proving $\triangle JOE$ was isosceles. The student found the lengths of $\overline{OY}$ and $\overline{EY}$, but no further correct work was shown.

Question 35 continued.

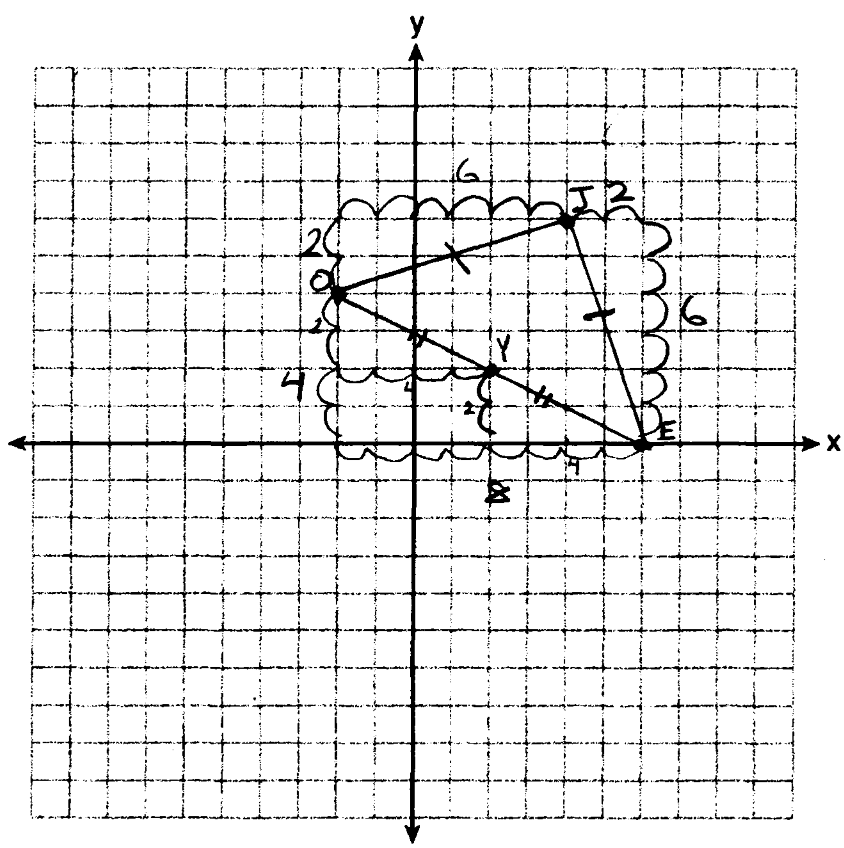
Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

$OY = 2^2 + 4^2 = x^2$
$= 4 + 16 = x^2$
$= \sqrt{20}$

$\overline{OY} \cong \overline{YE}$

$YE = 4^2 + 2^2 = x^2$
$= 16 + 4 = x^2$
$= \sqrt{20}$



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

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

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

$\sqrt{36 + 4} = \sqrt{40}$

$OE = \sqrt{(6+2)^2 + (0-4)^2}$

$\sqrt{(8)^2 + (-4)^2}$

$\sqrt{64 + 16} = \sqrt{80}$

$JE \sqrt{(6-4)^2 + (0-6)^2}$

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

$\sqrt{4 + 36} = \sqrt{40}$

Δ JOE is isosceles because for a Δ to be isosceles two of its sides have to be equal. $\overline{JO}$ and $\overline{JE}$ are equal. Resulting in Δ JOE being an isosceles Δ.

Question 35 is continued on the next page.

Score 2: The student proved $\triangle JOE$ was isosceles. No further correct work was shown.

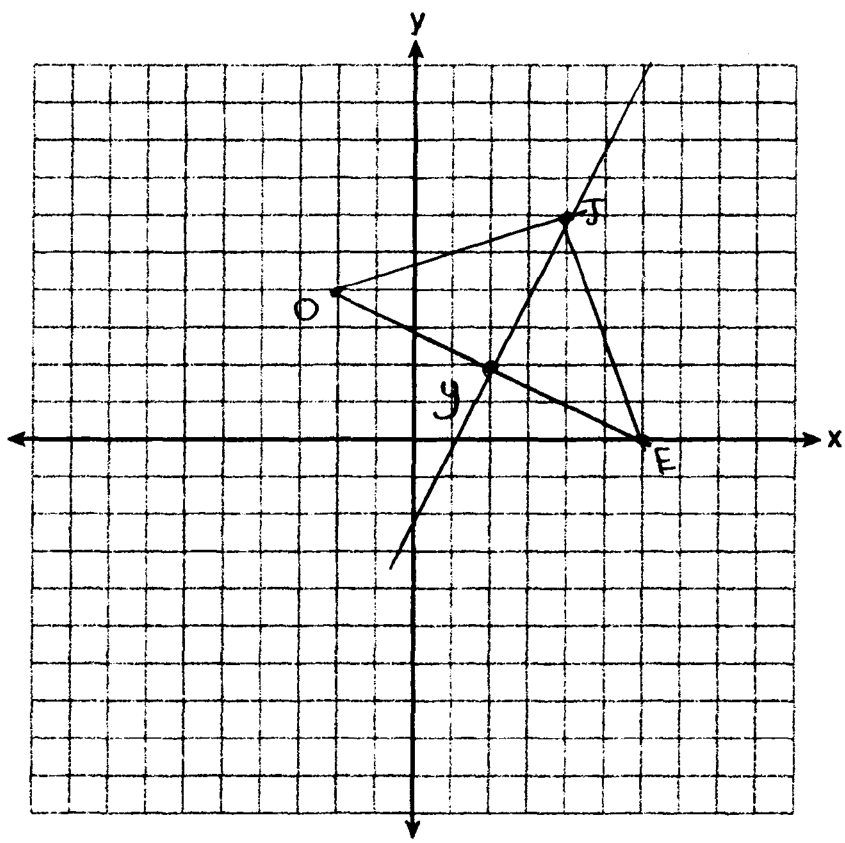
Question 35 continued.

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

Statements	Reasons
(1) point $Y(2,2)$ is on $\overline{OE}$	(1) given
(2) $\overline{JY}$ bisects $\overline{OE}$	(2) A bisector is a line that splits up a segment
(3) $\overline{JY}$ is a $\perp$ bisector of $\overline{OE}$	(3) a $\perp$ bisector splits a segment

J(4,6)
O(-2,4)
E(6,0)



Question 35

35 Triangle JOE has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

distance from O to E = $d=\sqrt{(0-(4))^2+(6-(-2))^2}$

$d=\sqrt{(-4)^2+8^2}$

$d=\sqrt{80}$

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

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

$d=\sqrt{40}$

distance of JE = $d=\sqrt{(0-6)^2+(6-4)^2}$

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

$d=\sqrt{40}$

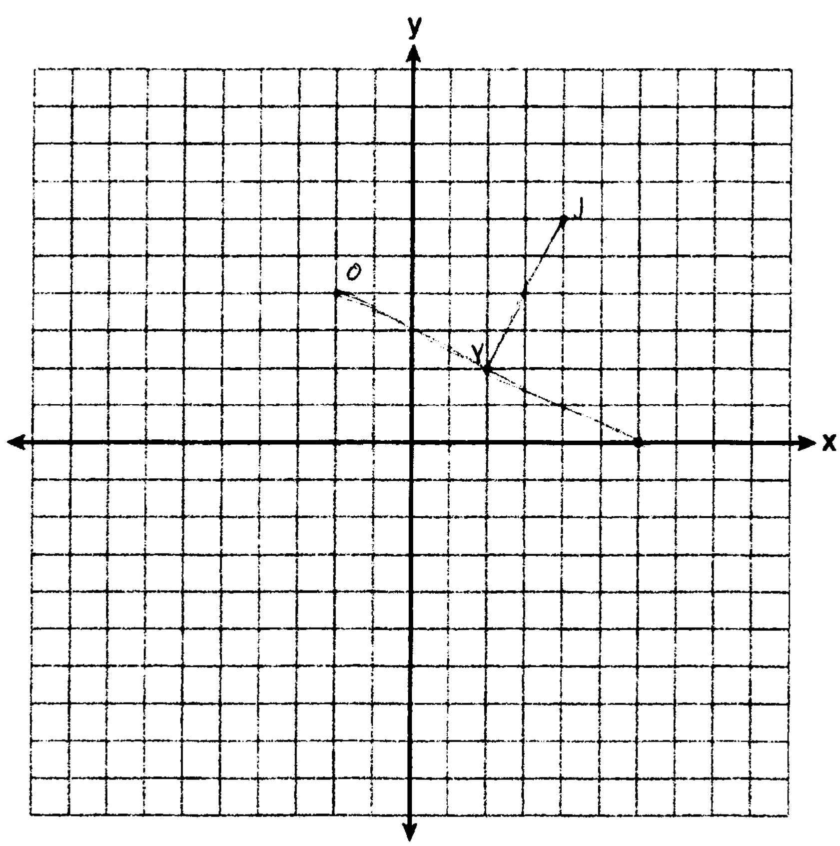
Two sides of JOE are equal but the last side isn't so its isosceles

Question 35 is continued on the next page.

Score 2: The student proved $\triangle JOE$ was isosceles. No further correct work was shown.

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.



Question 35

35 Triangle *JOE* has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$JO = \sqrt{(-2-4)^2+(4-6)^2}$
$= \sqrt{(-6)^2+(-2)^2}$
$= \sqrt{36+4}$
$= \sqrt{40}$

$OE = \sqrt{(6-(-2))^2+(0-4)^2}$
$= \sqrt{8^2+(-4)^2}$
$= \sqrt{64+16}$
$= \sqrt{80}$

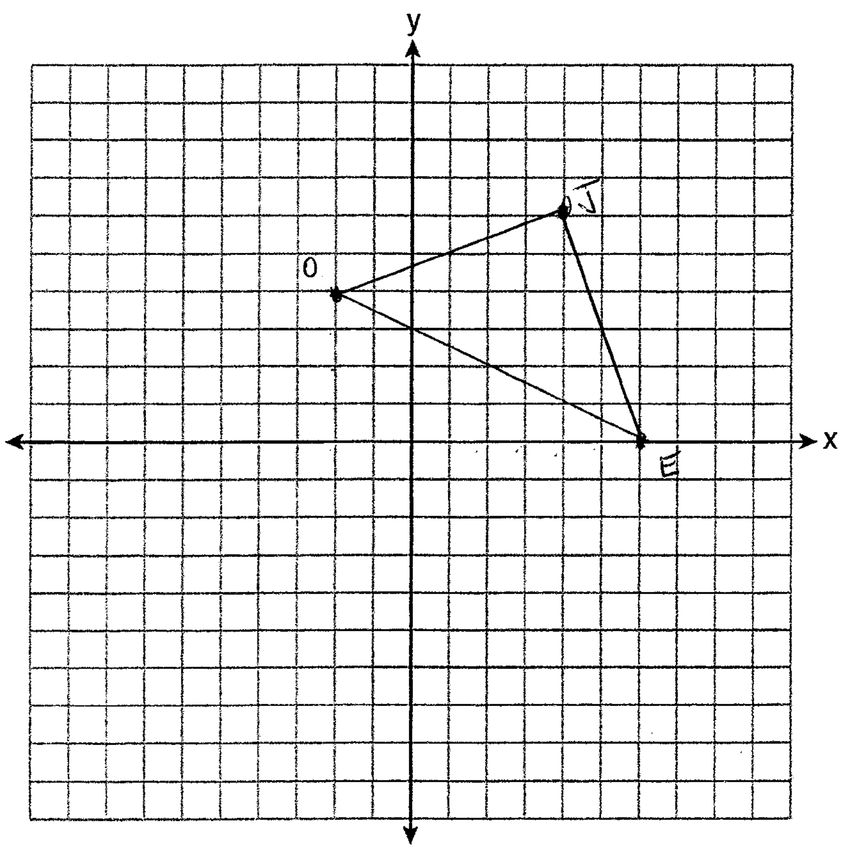
$JE = \sqrt{(6-4)^2+(0-6)^2}$
$= \sqrt{2^2+(-6)^2}$
$= \sqrt{4+36}$
$= \sqrt{40}$

Question 35 is continued on the next page.

Score 1: The student determined the lengths of the sides of $\triangle JOE$, but no further correct work was shown.

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.



Question 35

35 Triangle *JOE* has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

2 ≅ sides

∴ Joe is isosceles

Question 35 is continued on the next page.

Score 1: The student determined the midpoint of $\overline{OE}$, but no further correct work was shown.

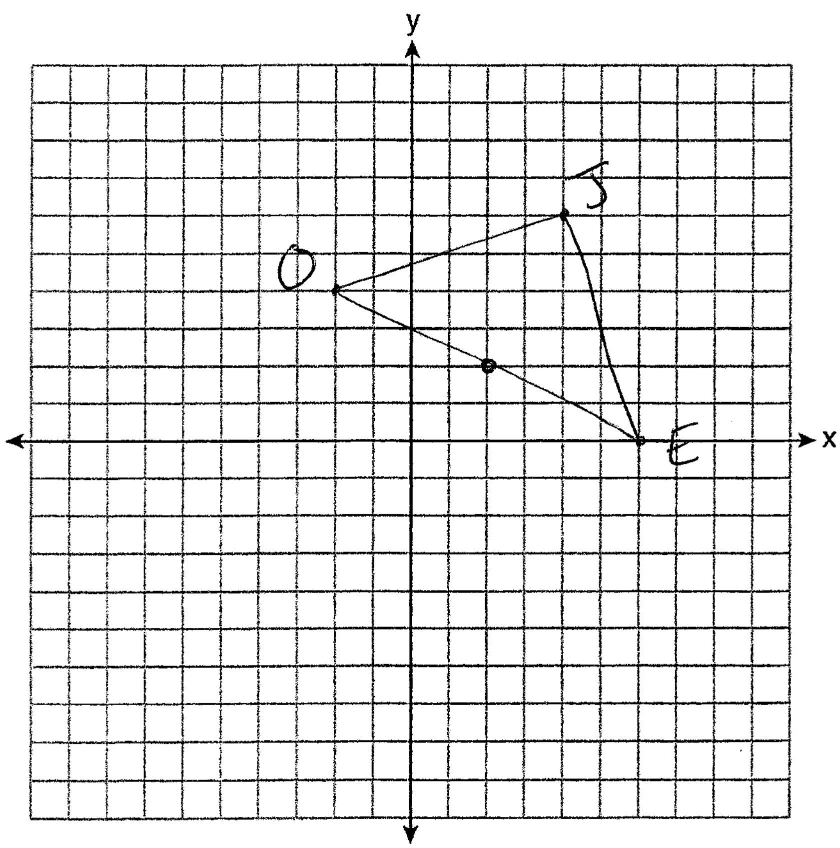
Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

$\overline{OE}$ midpoint!

$$\left(\frac{-2+6}{2}, \frac{4+0}{2}\right)$$

$$(2, 2)$$



Question 35

35 Triangle *JOE* has vertices whose coordinates are *J*(4,6), *O*(−2,4), and *E*(6,0).

Prove that △*JOE* is isosceles.

[The use of the set of axes on the next page is optional.]

JO $\sqrt{(4--2)^2+(6-4)^2}=\sqrt{40}$

OE $\sqrt{(-2-6)^2+(4-0)^2}=\sqrt{80}$

EJ $\sqrt{(6-4)^2+(0-4)^2}=\sqrt{20}$

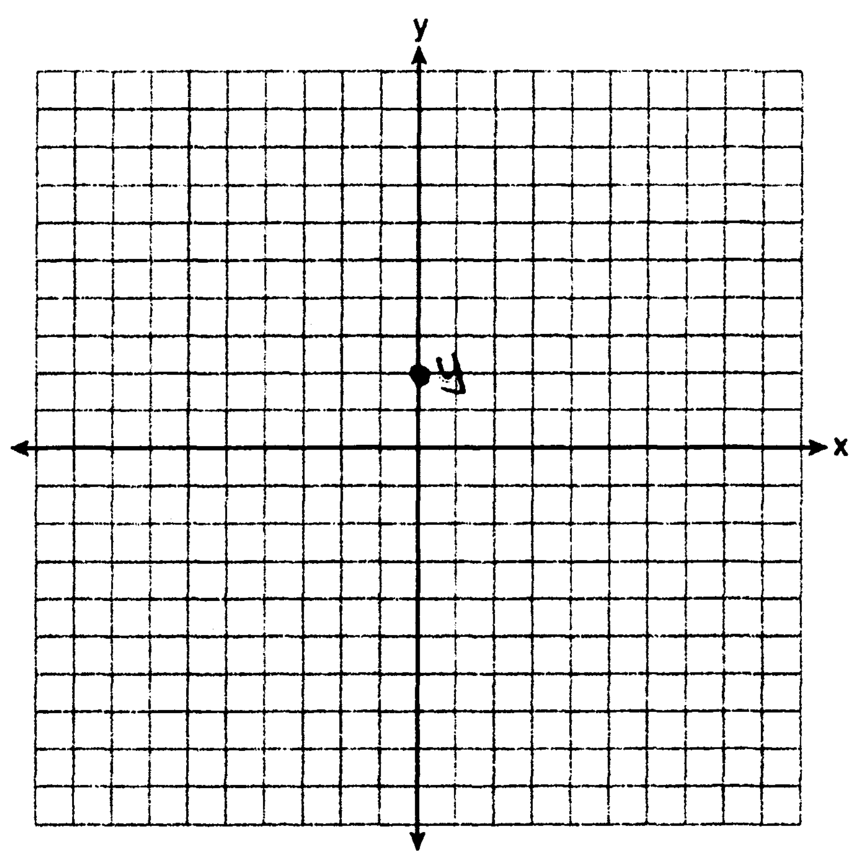
Question 35 is continued on the next page.

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

Question 35 continued.

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.



Question 35

35 Triangle *JOE* has vertices whose coordinates are $J(4,6)$, $O(-2,4)$, and $E(6,0)$.

Prove that $\triangle JOE$ is isosceles.

[The use of the set of axes on the next page is optional.]

$\overline{JO}$ & $\overline{JE}$ are congruent which makes the two corresponding ∠s be equal, which is only producing an isoceles △'s

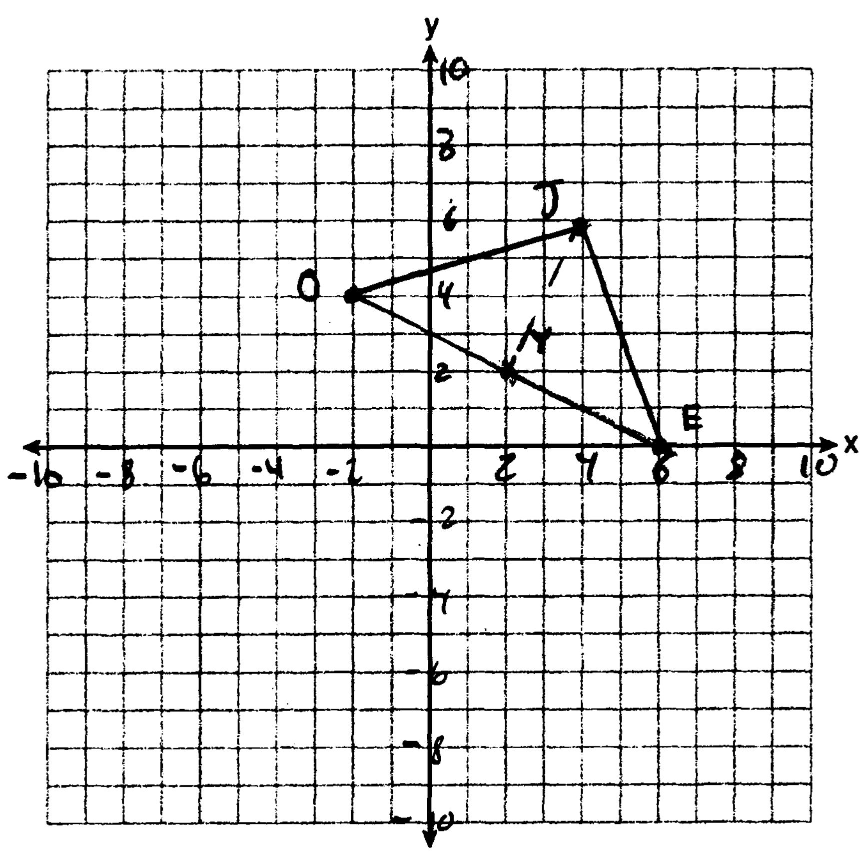
Question 35 is continued on the next page.

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

Point $Y(2,2)$ is on $\overline{OE}$.

Prove that $\overline{JY}$ is the perpendicular bisector of $\overline{OE}$.

The resulting ∠s of JYE ~~&~~ ∠JYO are right Δ's which means they have to be made from ⊥ lines. Also, any bisected line in an isoceles Δ, that Point connected to the top of a triangle will almost always make a ⊥ lines.



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

Regents Examination in Geometry – June 2024

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

(Use for the June 2024 exam only.)

Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level
80	**100**	5	53	**79**	3	26	**61**	2
79	**99**	5	52	**78**	3	25	**60**	2
78	**97**	5	51	**78**	3	24	**59**	2
77	**96**	5	50	**77**	3	23	**58**	2
76	**95**	5	49	**77**	3	22	**57**	2
75	**94**	5	48	**76**	3	21	**55**	2
74	**93**	5	47	**76**	3	20	**54**	1
73	**92**	5	46	**75**	3	19	**52**	1
72	**91**	5	45	**75**	3	18	**51**	1
71	**90**	5	44	**74**	3	17	**49**	1
70	**89**	5	43	**74**	3	16	**47**	1
69	**89**	5	42	**73**	3	15	**46**	1
68	**88**	5	41	**73**	3	14	**44**	1
67	**87**	5	40	**72**	3	13	**42**	1
66	**86**	5	39	**71**	3	12	**39**	1
65	**86**	5	38	**71**	3	11	**37**	1
64	**85**	5	37	**70**	3	10	**35**	1
63	**84**	4	36	**69**	3	9	**32**	1
62	**84**	4	35	**69**	3	8	**29**	1
61	**83**	4	34	**68**	3	7	**27**	1
60	**82**	4	33	**67**	3	6	**24**	1
59	**82**	4	32	**67**	3	5	**20**	1
58	**81**	4	31	**66**	3	4	**17**	1
57	**81**	4	30	**65**	3	3	**13**	1
56	**80**	4	29	**64**	2	2	**9**	1
55	**80**	4	28	**63**	2	1	**5**	1
54	**79**	3	27	**62**	2	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.