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

GEOMETRY

Tuesday, January 23, 2018 — 9:15 a.m. to 12:15 p.m., only

Student Name: _____

School Name: _____

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

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

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

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

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

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

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

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

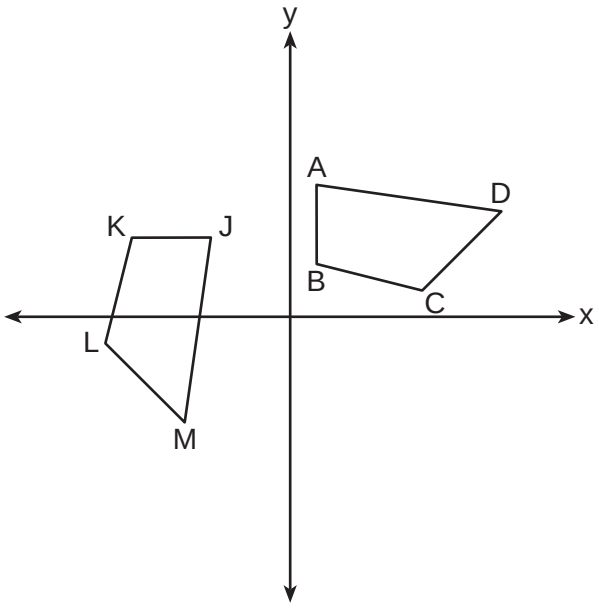
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

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

Use this space for computations.

1 In the diagram below, a sequence of rigid motions maps *ABCD* onto *JKLM*.



If m$\angle A$ = 82°, m$\angle B$ = 104°, and m$\angle L$ = 121°, the measure of $\angle M$ is

(1) 53°

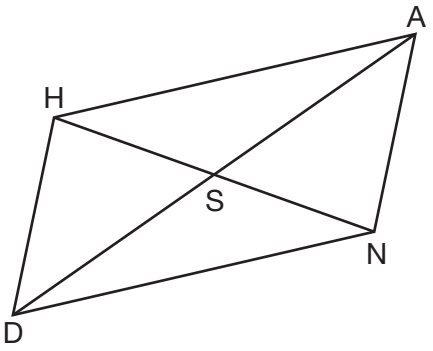
(2) 82°

(3) 104°

(4) 121°

Use this space for computations.

2 Parallelogram $HAND$ is drawn below with diagonals $\overline{HN}$ and $\overline{AD}$ intersecting at S.



Which statement is always true?

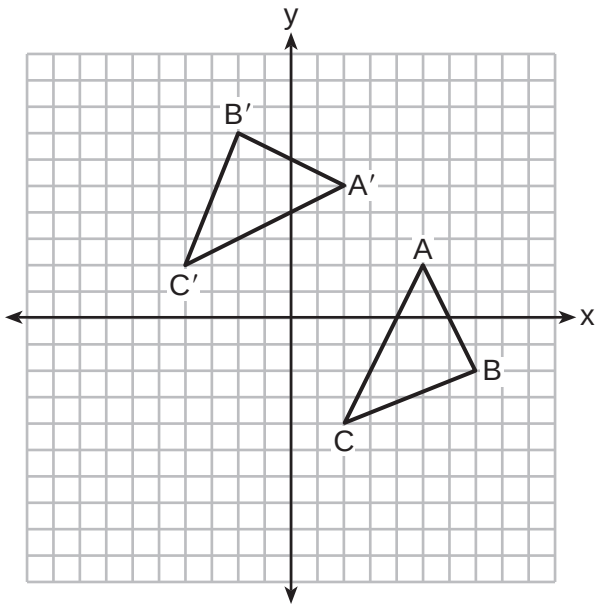
(1) $HN = \frac{1}{2}AD$

(2) $AS = \frac{1}{2}AD$

(3) $\angle AHS \cong \angle ANS$

(4) $\angle HDS \cong \angle NDS$

3 The graph below shows two congruent triangles, ABC and $A'B'C'$.



Which rigid motion would map $\triangle ABC$ onto $\triangle A'B'C'$?

(1) a rotation of 90 degrees counterclockwise about the origin

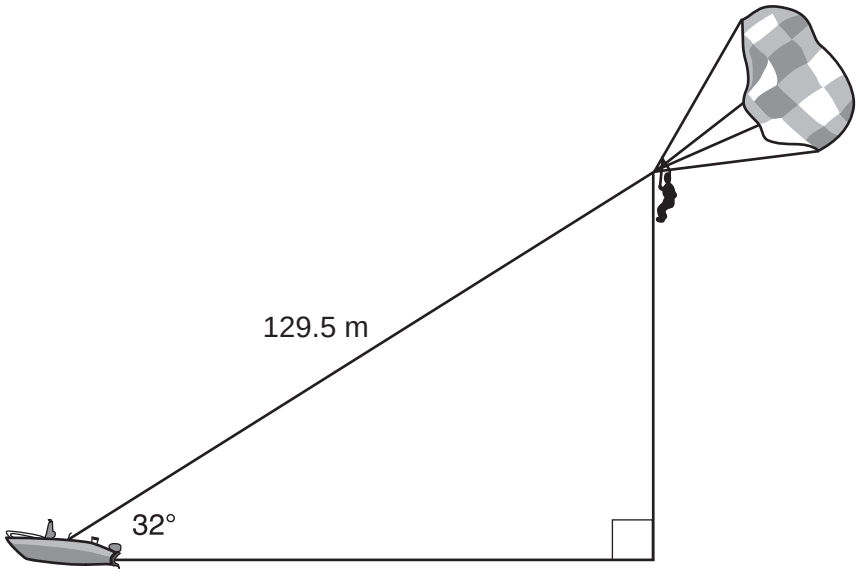
(2) a translation of three units to the left and three units up

(3) a rotation of 180 degrees about the origin

(4) a reflection over the line $y = x$

Use this space for computations.

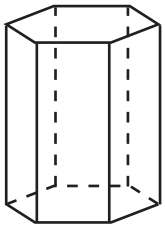
4 A man was parasailing above a lake at an angle of elevation of 32° from a boat, as modeled in the diagram below.



If 129.5 meters of cable connected the boat to the parasail, approximately how many meters above the lake was the man?

(1) 68.6
(2) 80.9
(3) 109.8
(4) 244.4

5 A right hexagonal prism is shown below. A two-dimensional cross section that is perpendicular to the base is taken from the prism.

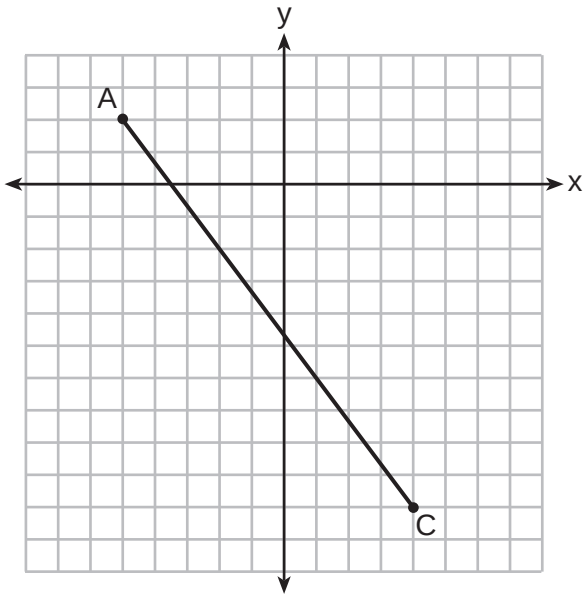


Which figure describes the two-dimensional cross section?

(1) triangle
(2) rectangle
(3) pentagon
(4) hexagon

Use this space for computations.

6 In the diagram below, $\overline{AC}$ has endpoints with coordinates $A(-5,2)$ and $C(4,-10)$.



If B is a point on $\overline{AC}$ and $AB{:}BC = 1{:}2$, what are the coordinates of B?

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

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

(3) $\left(0,-\frac{14}{3}\right)$

(4) $(1,-6)$

7 An ice cream waffle cone can be modeled by a right circular cone with a base diameter of 6.6 centimeters and a volume of 54.45π cubic centimeters. What is the number of centimeters in the height of the waffle cone?

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

(2) 5

(3) 15

(4) $24\frac{3}{4}$

8 The vertices of $\triangle PQR$ have coordinates $P(2,3)$, $Q(3,8)$, and $R(7,3)$. Under which transformation of $\triangle PQR$ are distance and angle measure preserved?

(1) $(x,y) \rightarrow (2x, 3y)$

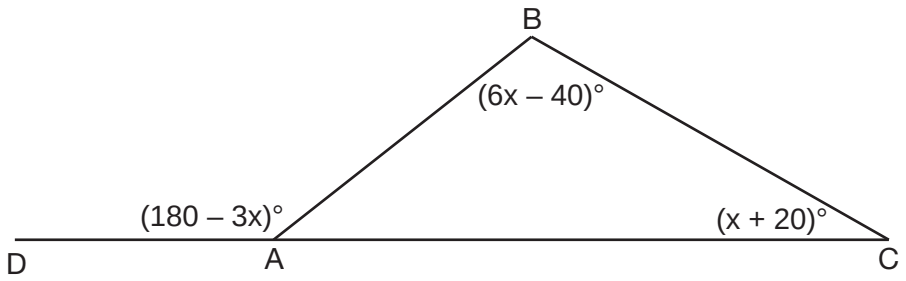
(2) $(x,y) \rightarrow (x + 2, 3y)$

(3) $(x,y) \rightarrow (2x, y + 3)$

(4) $(x,y) \rightarrow (x + 2, y + 3)$

Use this space for computations.

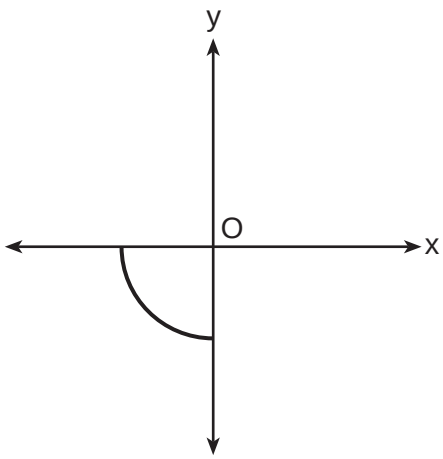
9 In $\triangle ABC$ shown below, side $\overline{AC}$ is extended to point D with $m\angle DAB = (180 - 3x)°$, $m\angle B = (6x - 40)°$, and $m\angle C = (x + 20)°$.



What is $m\angle BAC$?

(1) 20°
(2) 40°
(3) 60°
(4) 80°

10 Circle O is centered at the origin. In the diagram below, a quarter of circle O is graphed.



Which three-dimensional figure is generated when the quarter circle is continuously rotated about the y-axis?

(1) cone
(2) sphere
(3) cylinder
(4) hemisphere

Use this space for computations.

11 Rectangle $A'B'C'D'$ is the image of rectangle $ABCD$ after a dilation centered at point A by a scale factor of $\frac{2}{3}$. Which statement is correct?

(1) Rectangle $A'B'C'D'$ has a perimeter that is $\frac{2}{3}$ the perimeter of rectangle $ABCD$.

(2) Rectangle $A'B'C'D'$ has a perimeter that is $\frac{3}{2}$ the perimeter of rectangle $ABCD$.

(3) Rectangle $A'B'C'D'$ has an area that is $\frac{2}{3}$ the area of rectangle $ABCD$.

(4) Rectangle $A'B'C'D'$ has an area that is $\frac{3}{2}$ the area of rectangle $ABCD$.

12 The equation of a circle is $x^2 + y^2 - 6x + 2y = 6$. What are the coordinates of the center and the length of the radius of the circle?

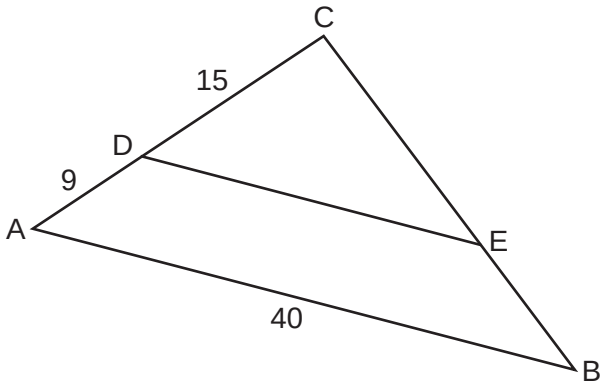
(1) center $(-3,1)$ and radius 4

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

(3) center $(-3,1)$ and radius 16

(4) center $(3,-1)$ and radius 16

13 In the diagram of $\triangle ABC$ below, $\overline{DE}$ is parallel to $\overline{AB}$, $CD = 15$, $AD = 9$, and $AB = 40$.



The length of $\overline{DE}$ is

(1) 15

(2) 24

(3) 25

(4) 30

Use this space for computations.

14 The line whose equation is $3x - 5y = 4$ is dilated by a scale factor of $\frac{5}{3}$ centered at the origin. Which statement is correct?

(1) The image of the line has the same slope as the pre-image but a different y-intercept.

(2) The image of the line has the same y-intercept as the pre-image but a different slope.

(3) The image of the line has the same slope and the same y-intercept as the pre-image.

(4) The image of the line has a different slope and a different y-intercept from the pre-image.

15 Which transformation would *not* carry a square onto itself?

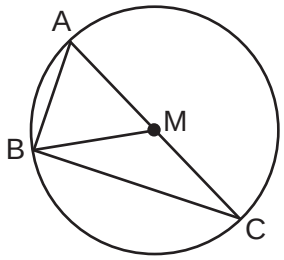
(1) a reflection over one of its diagonals

(2) a 90° rotation clockwise about its center

(3) a 180° rotation about one of its vertices

(4) a reflection over the perpendicular bisector of one side

16 In circle M below, diameter $\overline{AC}$, chords $\overline{AB}$ and $\overline{BC}$, and radius $\overline{MB}$ are drawn.



Which statement is *not* true?

(1) $\triangle ABC$ is a right triangle.

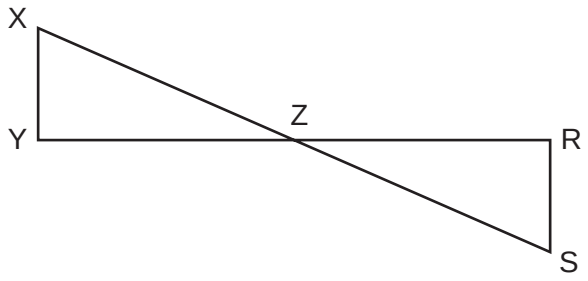
(2) $\triangle ABM$ is isosceles.

(3) $m\overset{\frown}{BC} = m\angle BMC$

(4) $m\overset{\frown}{AB} = \frac{1}{2}m\angle ACB$

Use this space for computations.

17 In the diagram below, $\overline{XS}$ and $\overline{YR}$ intersect at Z. Segments XY and RS are drawn perpendicular to $\overline{YR}$ to form triangles XYZ and SRZ.



Which statement is always true?

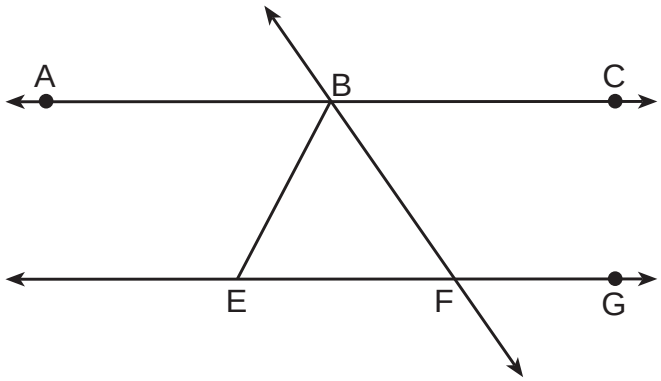
(1) $(XY)(SR) = (XZ)(RZ)$

(2) $\triangle XYZ \cong \triangle SRZ$

(3) $\overline{XS} \cong \overline{YR}$

(4) $\frac{XY}{SR} = \frac{YZ}{RZ}$

18 As shown in the diagram below, $\overleftrightarrow{ABC} \parallel \overleftrightarrow{EFG}$ and $\overline{BF} \cong \overline{EF}$.



If $m\angle CBF = 42.5°$, then $m\angle EBF$ is

(1) 42.5°

(2) 68.75°

(3) 95°

(4) 137.5°

19 A parallelogram must be a rhombus if its diagonals

(1) are congruent

(2) bisect each other

(3) do not bisect its angles

(4) are perpendicular to each other

Use this space for computations.

20 What is an equation of a line which passes through (6,9) and is perpendicular to the line whose equation is $4x - 6y = 15$?

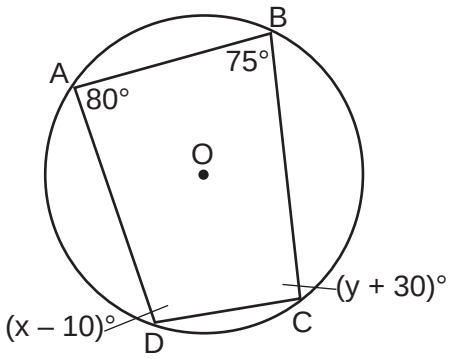
(1) $y - 9 = -\frac{3}{2}(x - 6)$

(2) $y - 9 = \frac{2}{3}(x - 6)$

(3) $y + 9 = -\frac{3}{2}(x + 6)$

(4) $y + 9 = \frac{2}{3}(x + 6)$

21 Quadrilateral $ABCD$ is inscribed in circle O, as shown below.



If $m\angle A = 80°$, $m\angle B = 75°$, $m\angle C = (y + 30)°$, and $m\angle D = (x - 10)°$, which statement is true?

(1) $x = 85$ and $y = 50$

(2) $x = 90$ and $y = 45$

(3) $x = 110$ and $y = 75$

(4) $x = 115$ and $y = 70$

22 A regular pyramid has a square base. The perimeter of the base is 36 inches and the height of the pyramid is 15 inches. What is the volume of the pyramid in cubic inches?

(1) 180

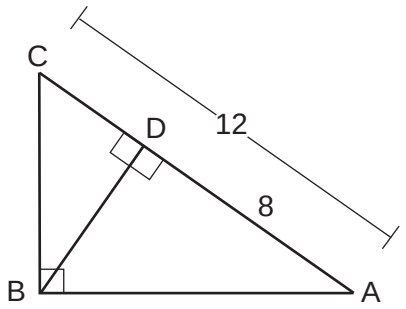
(2) 405

(3) 540

(4) 1215

Use this space for computations.

23 In the diagram below of $\triangle ABC$, $\angle ABC$ is a right angle, $AC = 12$, $AD = 8$, and altitude $\overline{BD}$ is drawn.



What is the length of $\overline{BC}$?

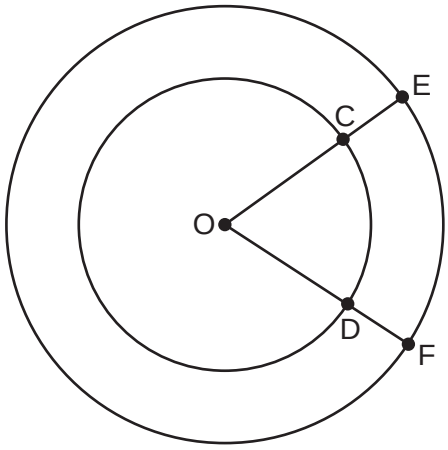
(1) $4\sqrt{2}$

(2) $4\sqrt{3}$

(3) $4\sqrt{5}$

(4) $4\sqrt{6}$

24 In the diagram below, two concentric circles with center O, and radii $\overline{OC}$, $\overline{OD}$, $\overline{OCE}$, and $\overline{ODF}$ are drawn.



If $OC = 4$ and $OE = 6$, which relationship between the length of arc EF and the length of arc CD is always true?

(1) The length of arc EF is 2 units longer than the length of arc CD.

(2) The length of arc EF is 4 units longer than the length of arc CD.

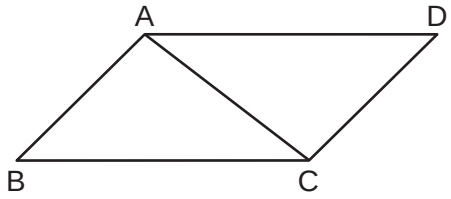
(3) The length of arc EF is 1.5 times the length of arc CD.

(4) The length of arc EF is 2.0 times the length of arc CD.

Part II

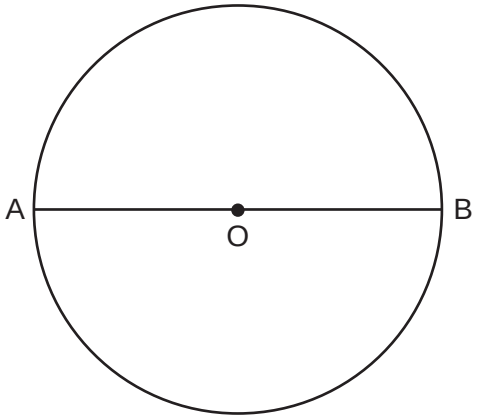
Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily 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 Given: Parallelogram $ABCD$ with diagonal $\overline{AC}$ drawn



Prove: $\triangle ABC \cong \triangle CDA$

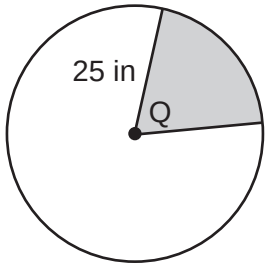
26 The diagram below shows circle O with diameter $\overline{AB}$. Using a compass and straightedge, construct a square that is inscribed in circle O. [Leave all construction marks.]



27 Given: Right triangle ABC with right angle at C

If sin A increases, does cos B increase or decrease? Explain why.

28 In the diagram below, the circle has a radius of 25 inches. The area of the *unshaded* sector is 500π in^2.

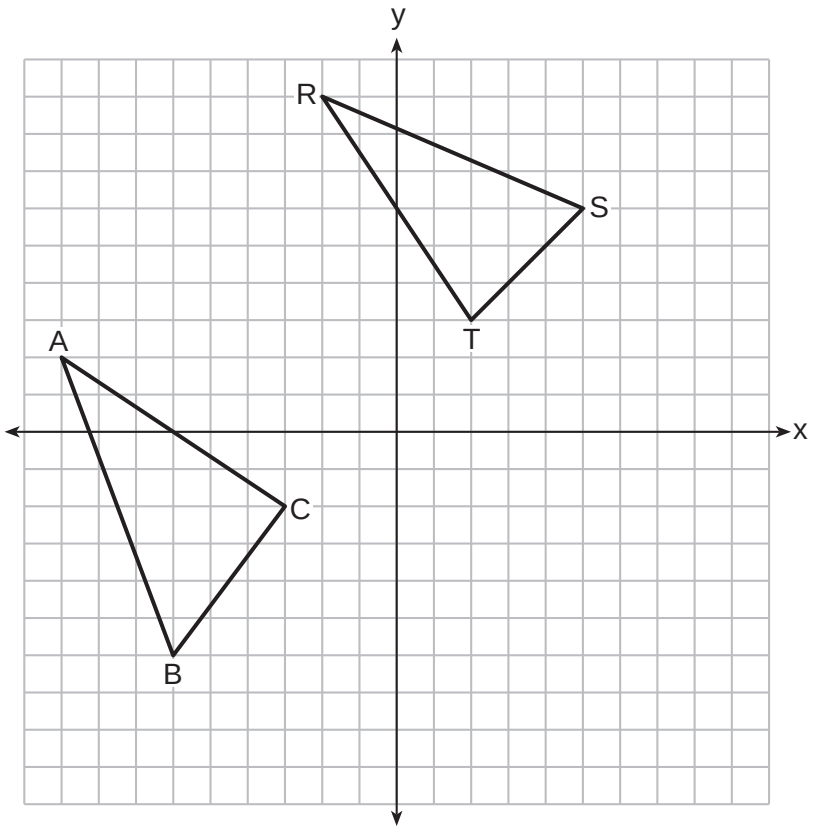


Determine and state the degree measure of angle Q, the central angle of the shaded sector.

29 A machinist creates a solid steel part for a wind turbine engine. The part has a volume of 1015 cubic centimeters. Steel can be purchased for \$0.29 per kilogram, and has a density of 7.95 g/cm^3.

If the machinist makes 500 of these parts, what is the cost of the steel, to the *nearest dollar*?

30 In the graph below, $\triangle ABC$ has coordinates $A(-9,2)$, $B(-6,-6)$, and $C(-3,-2)$, and $\triangle RST$ has coordinates $R(-2,9)$, $S(5,6)$, and $T(2,3)$.



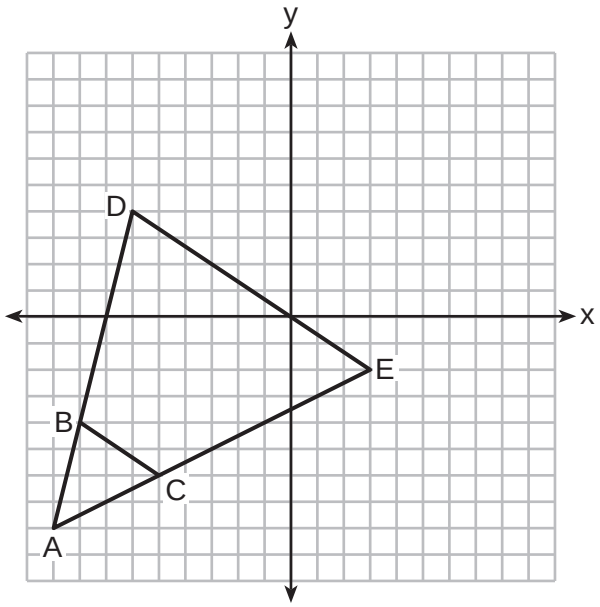
Is $\triangle ABC$ congruent to $\triangle RST$? Use the properties of rigid motions to explain your reasoning.

31 Bob places an 18-foot ladder 6 feet from the base of his house and leans it up against the side of his house. Find, to the *nearest degree,* the measure of the angle the bottom of the ladder makes with the ground.

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]

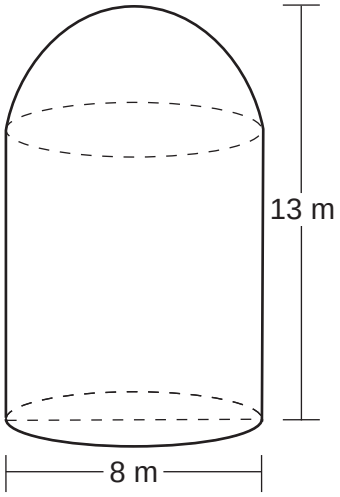
32 Triangle *ABC* and triangle *ADE* are graphed on the set of axes below.



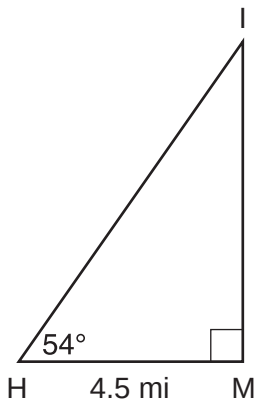
Describe a transformation that maps triangle *ABC* onto triangle *ADE*.

Explain why this transformation makes triangle *ADE* similar to triangle *ABC*.

33 A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the *nearest cubic meter,* the total volume inside the storage tank.



34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question 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]

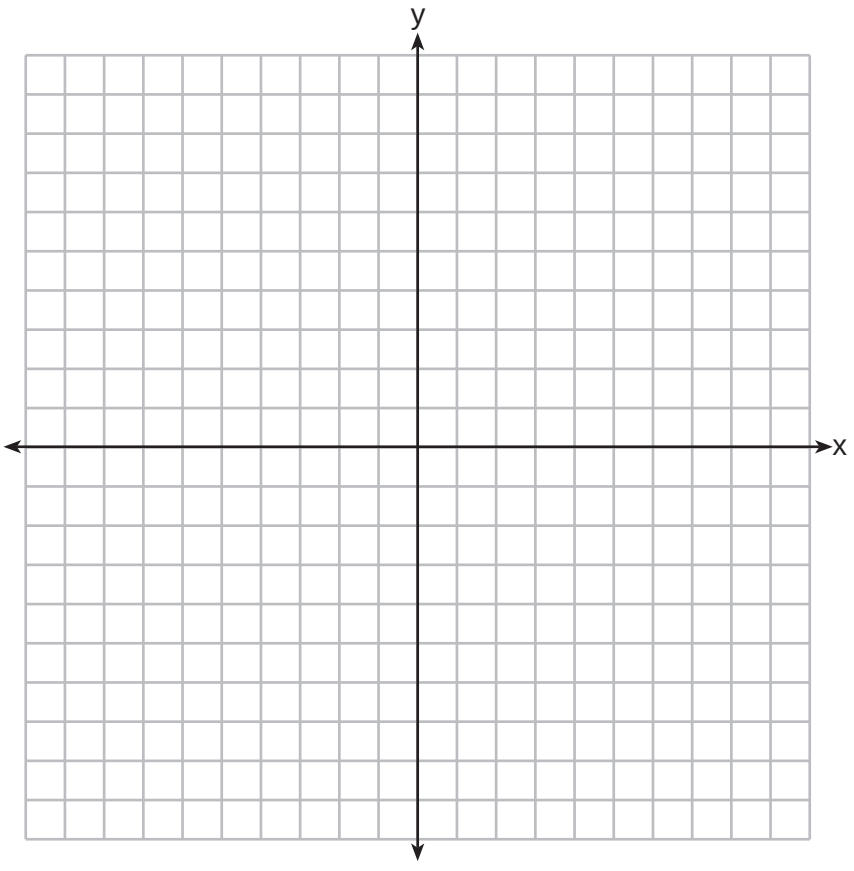
35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

State the coordinates of R so that quadrilateral *PART* is a parallelogram.

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.



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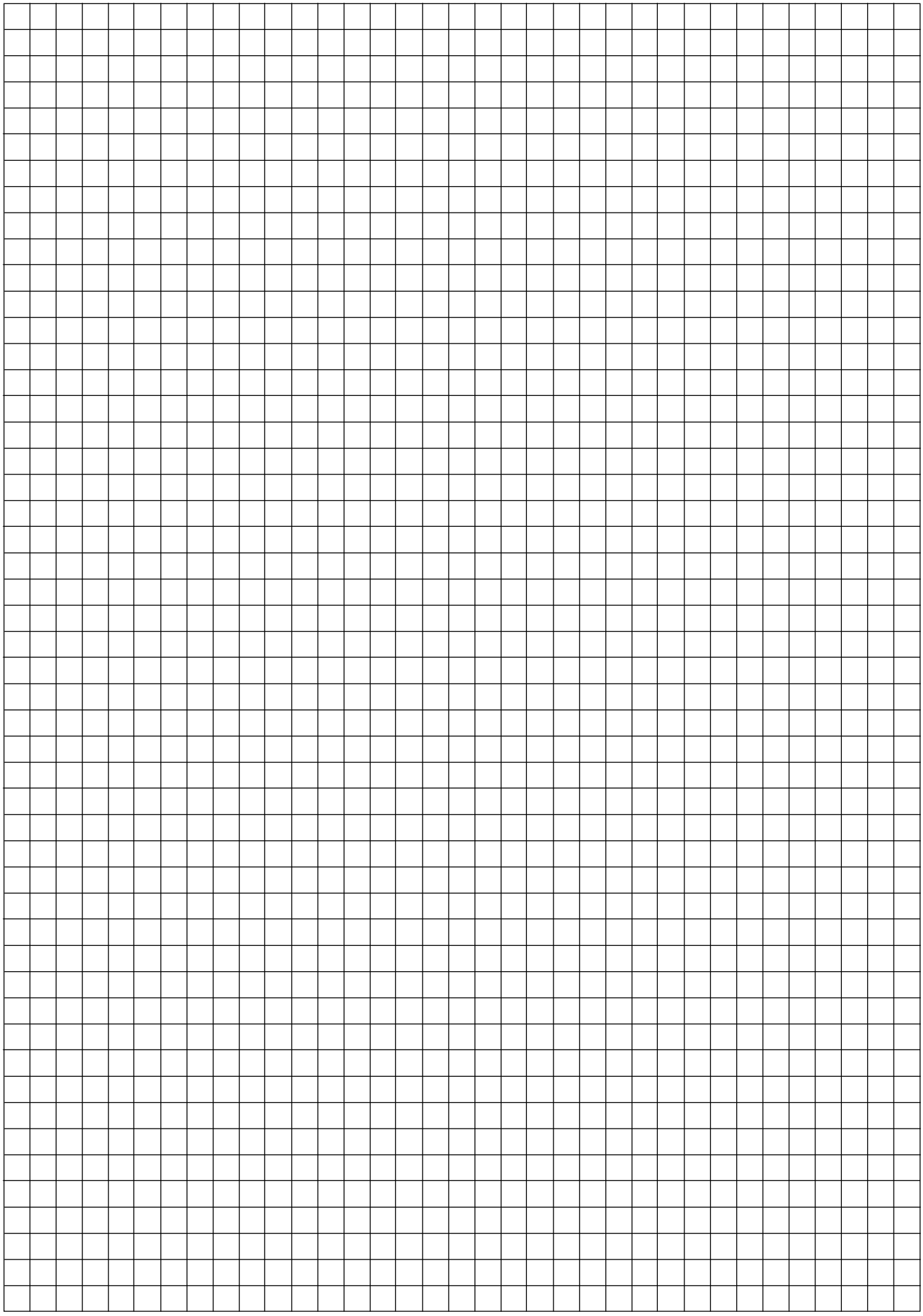
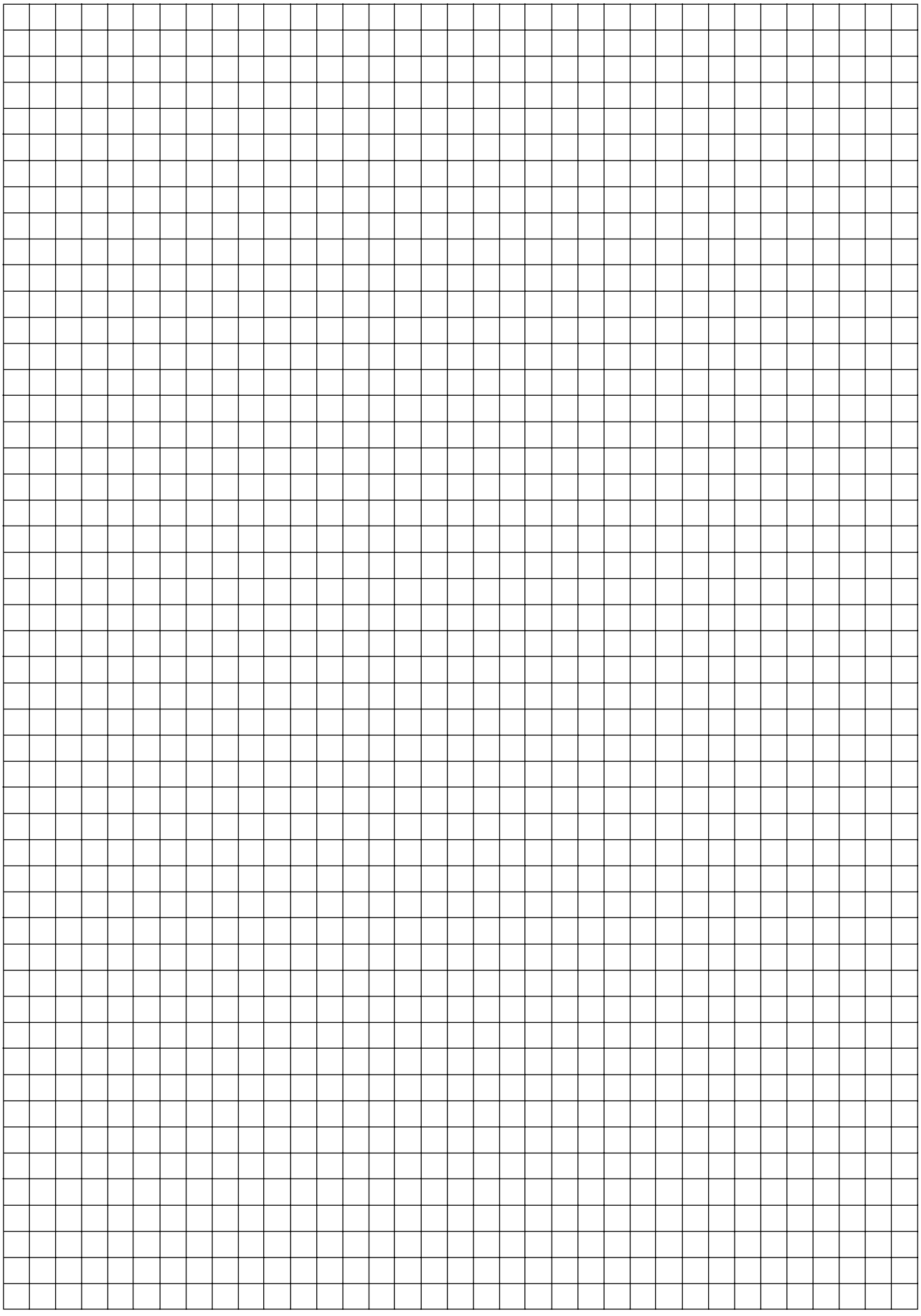
Scrap Graph Paper — This sheet will *not* be scored.



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



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High School Math Reference Sheet

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

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

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

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

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

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GEOMETRY

FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Tuesday, January 23, 2018 — 9:15 a.m. to 12:15 p.m., only

SCORING KEY AND RATING GUIDE

Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Geometry. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Geometry*.

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

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

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

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Tuesday, January 23, 2018. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

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

Part I

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

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

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: http://www.p12.nysed.gov/assessment/ and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

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

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

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

II. Full-Credit Responses

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

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

III. Appropriate Work

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

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

IV. Multiple Errors

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

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

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

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

Part II

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

(25) **[2]** A complete and correct proof that includes a concluding statement is written.

[1] A proof is written that demonstrates a good understanding of the method of proof, but one statement and/or reason is missing or incorrect.

or

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

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

or

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

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

[1] An appropriate method of construction is shown, but one construction error is made.

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

or

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

(27) **[2]** Increases, and a correct explanation is written.

[1] Increases, but the explanation is incomplete or partially correct.

[0] Increases, but no explanation or an incorrect explanation is written.

or

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

(28) **[2]** 72, and correct work is shown.

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

or

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

or

[1] Appropriate work is shown to find 288, the central angle of the unshaded area, or to find 125π, the area of the shaded sector, but no further correct work is shown.

or

[1] 72, but no work is shown.

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

(29) **[2]** 1170, 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] Appropriate work is shown to find the correct mass of one steel part, but no further correct work is shown.

or

[1] 1170, but no work is shown.

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

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

[1] An appropriate explanation is written, but one conceptual error is made.

or

[1] No, and an explanation is written, but it is incomplete or partially correct.

or

[1] No, but an explanation that does not use the properties of rigid motions is written.

[0] No, and the explanation is missing or incorrect.

or

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

(31) **[2]** 71, 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 trigonometric equation is written, but no further correct work is shown.

or

[1] 71, but no work is shown.

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

Part III

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

(32) **[4]** A correct transformation is described. A correct explanation is written.

[3] A correct transformation is described, but the explanation is incomplete.

or

[3] A correct explanation is written, but the description of the transformation is incomplete.

[2] A correct transformation is described, but no further correct work is shown.

or

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

[1] An appropriate transformation is written, but it is incomplete. No further correct work is shown.

or

[1] An appropriate explanation is written, but it is incomplete. No further correct work is shown.

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

(33) **[4]** 586, and correct work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made. An appropriate volume is stated.

or

[3] The volumes of both the cylinder and hemisphere are found correctly, but the volumes are not added.

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

or

[2] Appropriate work is shown, but one conceptual error is made. An appropriate volume is stated.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made. An appropriate volume is stated.

or

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

or

[1] Appropriate work is shown to find the volume of a sphere, but no further correct work is shown.

or

[1] 586, but no work is shown.

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

(34) **[4]** 7.7 and 6.2, and appropriate work is shown. **

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

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

or

[2] Appropriate work is shown to find either 7.7 or 6.2, but no further work is shown.

or

[2] Two correct equations are written to find the required distances, but no further correct work is shown.

[1] Only one correct equation is written to find a required distance, but no further correct work is shown.

or

[1] 7.7 and 6.2, but no work is shown.

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

** If there is no indication in the exam booklet that the typographical error in the label of the length of line segment *HM* was corrected, and the student's work clearly shows an attempt to convert 4.5 meters to miles, the student should be awarded full credit for this question.

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 $\triangle PAT$ is an isosceles triangle. Point $R(2,9)$ is stated, and correct work is shown to prove $PART$ is a parallelogram.

[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.

or

[5] Correct proofs are written, but the coordinates of point R are not stated or are stated incorrectly.

or

[5] Correct proofs are written to prove PAT is an isosceles triangle, and either parallelogram $PRAT$ or $PRTA$ is proven.

[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.

or

[4] Correct work is shown to find $R(2,9)$ and prove quadrilateral $PART$ is a parallelogram.

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

or

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

or

[3] Correct work is shown to prove $PART$ is a parallelogram. No further correct work is shown.

or

[3] Correct work is shown to prove $\triangle PAT$ is an isosceles triangle, and point $R(2,9)$ is stated. No further correct work is shown.

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

or

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

or

[2] Correct work is shown to prove $\triangle PAT$ is an isosceles triangle, but no further correct work is shown.

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

or

[1] Appropriate work is shown to find the slopes and/or lengths of all four sides and/or the midpoint of the diagonals of quadrilateral *PART*, but no further correct work is shown.

or

[1] Appropriate work is shown to find the lengths of $\overline{PA}$ and $\overline{AT}$, but no further correct work is shown.

or

[1] Point $R(2,9)$ is stated, but no further correct work is shown.

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

Map to the Learning Standards
Geometry
January 2018

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

Regents Examination in Geometry

January 2018

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

The *Chart for Determining the Final Examination Score for the January 2018 Regents Examination in Geometry* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Tuesday, January 23, 2018. Conversion charts provided for previous administrations of the Regents Examination in Geometry must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

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

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

2. Select the test title.

3. Complete the required demographic fields.

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

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

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

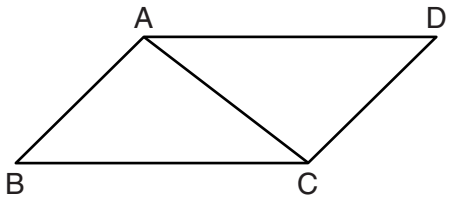
Tuesday, January 23, 2018 — 9:15 a.m. to 12:15 p.m.

MODEL RESPONSE SET

Table of Contents

Question 25

25 Given: Parallelogram $ABCD$ with diagonal $\overline{AC}$ drawn



Prove: $\triangle ABC \cong \triangle CDA$

1) ▱ Parallelogram ABCD, $\overline{AC}$ 1) Given

2) $\overline{AB} \cong \overline{CD}$, $\overline{AD} \cong \overline{BC}$ 2) opposite sides of a parallelogram are $\cong$ and $\parallel$

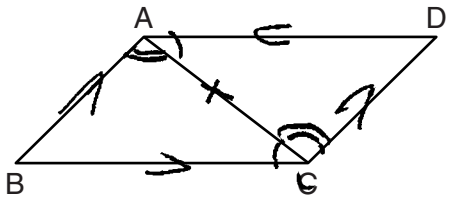
3) $\overline{AC} \cong \overline{AC}$ 3) reflexive ∅

4) $\triangle ABC \cong \triangle CDA$ 4) SSS $\cong$ SSS

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

Question 25

25 Given: Parallelogram $ABCD$ with diagonal $\overline{AC}$ drawn



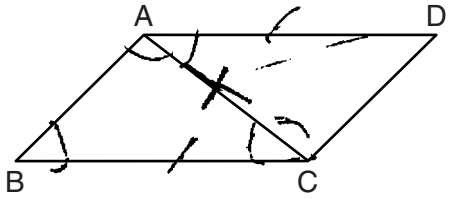
Prove: $\triangle ABC \cong \triangle CDA$

Statements	Reasons
1. ABCD is a parallogram, $\overline{AC}$	1. Given
2. $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$	2. Defintion of a parellogram
3. $m\angle DAC = m\angle ACB$ $m\angle BAC = m\angle ACD$	3. If two parralle lines are cut by a transversal, then alternate interior angles are equal.
4. $\overline{AC} = \overline{AC}$	4. Reflexive
5. $\triangle ABC \cong \triangle CDA$	5. ASA

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

Question 25

25 Given: Parallelogram $ABCD$ with diagonal $\overline{AC}$ drawn



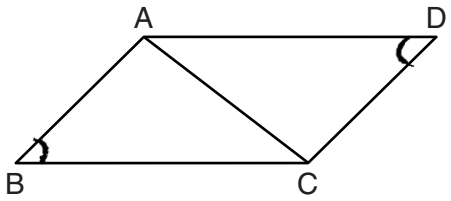
Prove: $\triangle ABC \cong \triangle CDA$

S	R
1. Parallelogram ABCD with Diagonal $\overline{AC}$ Dawn	1. Given
2. $\overline{AD} \parallel \overline{BC}$	2. Parallelogram has 4 $\cong$ // sides
3. $\angle PAC \cong \angle BCA$	3. 2 // lines cut by a trans alt interior $\angle$'s are $\cong$.
4. $\overline{AC} \cong \overline{AC}$	4. Reflexive
5. $\angle B = \angle C$ $\angle A = \angle D$	5. in a $\triangle$ $\cong$ sides of $\cong$ $\triangle$'s are $\cong$
6. $\triangle ABC \cong \triangle CDA$	6. ASA

Score 1: The student wrote a proof that demonstrates a good understanding of the method of proof, but some statements and/or reasons are missing or incorrect.

Question 25

25 Given: Parallelogram $ABCD$ with diagonal $\overline{AC}$ drawn



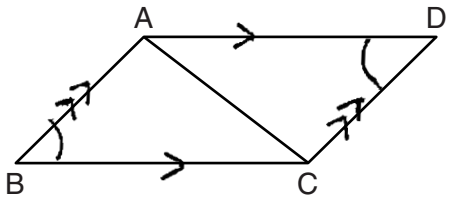
Prove: $\triangle ABC \cong \triangle CDA$

Statements	Reasons
1) Para. ABCD 2) diagonal $\overline{AC}$	1) 2) } Given
3) $\angle B \cong \angle D$	3) in a para. opp. $\angle$'s are $\cong$
4) $\overline{BC} \cong \overline{AD}$	4) in a para. opp. sides are $\cong$
5) $\overline{AB} \cong \overline{CD}$	5) in a para. opp. sides are $\cong$
$\triangle ABC \cong \triangle CDA$	By congruent parts

Score 1: The student did not state a correct reason of congruency in step 6.

Question 25

25 Given: Parallelogram $ABCD$ with diagonal $\overline{AC}$ drawn



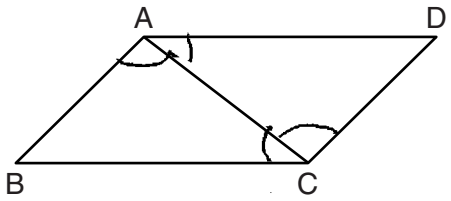
Prove: $\triangle ABC \cong \triangle CDA$

Statement	reason
Parallelogram ABCD with diagonal $\overline{AC}$ drawn	given
$\overline{AD} // \overline{BC}$ and $\overline{AB} // \overline{DC}$	parallelograms have parallel sides
$\angle CA \cong \angle C$	alternet interor angles are congruent
$\triangle ABC \cong \triangle CDA$	SAS

Score 0: The student did not state enough correct relevant statements and/or reasons to conclude the triangles are congruent by SAS.

Question 25

25 Given: Parallelogram $ABCD$ with diagonal $\overline{AC}$ drawn



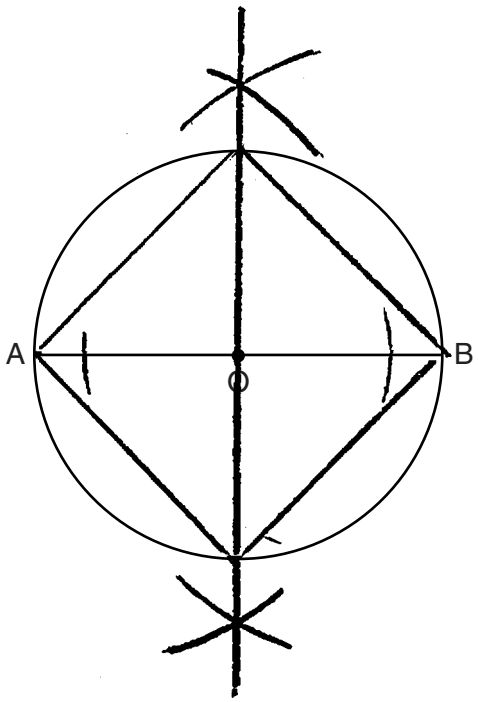
Prove: $\triangle ABC \cong \triangle CDA$

Statement	Reason
① $\angle A \cong \angle C$	① opp. $\angle$'s are $\cong$
② $\angle B \cong \angle D$	② opp. $\angle$'s are $\cong$
③ $\triangle ABC \cong \triangle CDA$	③ AAA

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

Question 26

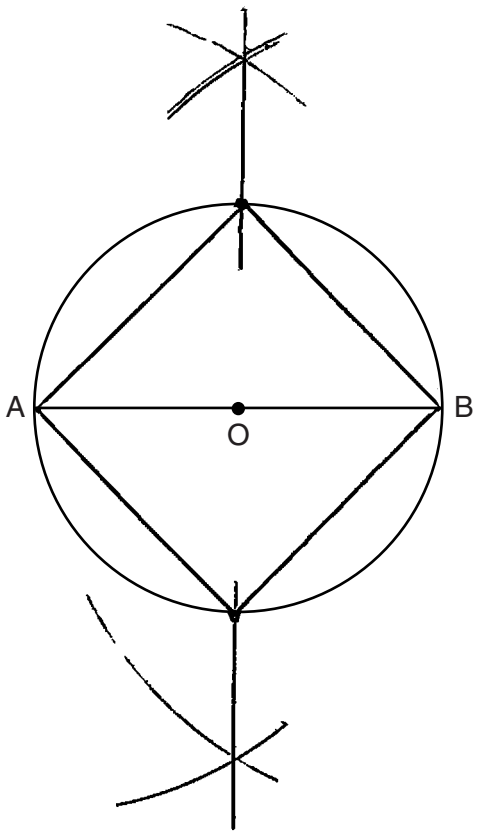
26 The diagram below shows circle O with diameter $\overline{AB}$. Using a compass and straightedge, construct a square that is inscribed in circle O. [Leave all construction marks.]



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

Question 26

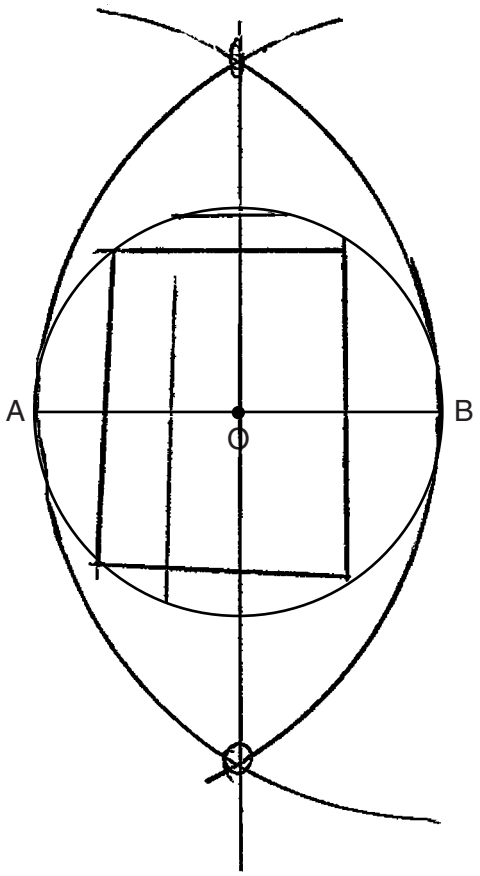
26 The diagram below shows circle O with diameter $\overline{AB}$. Using a compass and straightedge, construct a square that is inscribed in circle O. [Leave all construction marks.]



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

Question 26

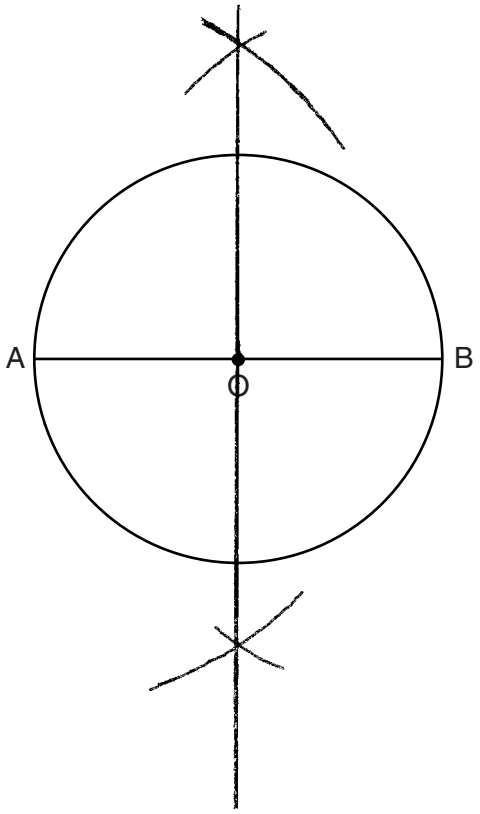
26 The diagram below shows circle O with diameter $\overline{AB}$. Using a compass and straightedge, construct a square that is inscribed in circle O. [Leave all construction marks.]



Score 1: The student drew an appropriate construction, but drew the square incorrectly.

Question 26

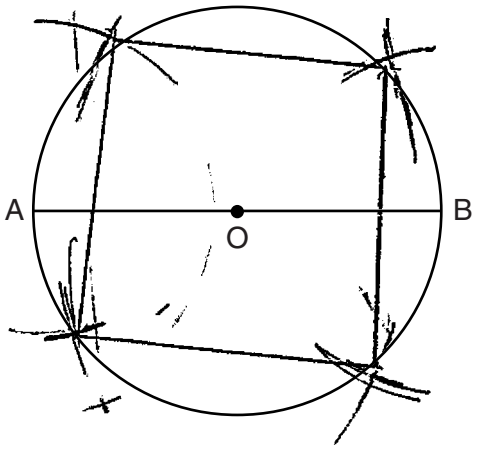
26 The diagram below shows circle O with diameter $\overline{AB}$. Using a compass and straightedge, construct a square that is inscribed in circle O. [Leave all construction marks.]



Score 1: The student drew an appropriate construction, but did not draw the square.

Question 26

26 The diagram below shows circle O with diameter $\overline{AB}$. Using a compass and straightedge, construct a square that is inscribed in circle O. [Leave all construction marks.]

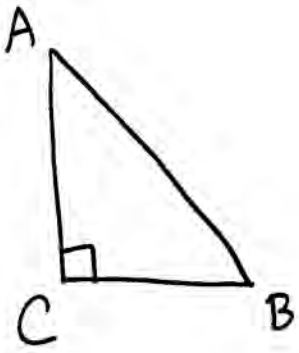


Score 0: The student had a completely incorrect response.

Question 27

27 Given: Right triangle ABC with right angle at C

If sin A increases, does cos B increase or decrease? Explain why.



Since sine and Cosine are cofunctions and $\angle A$ and $\angle B$ are Complementary, $\sin A = \cos B$.

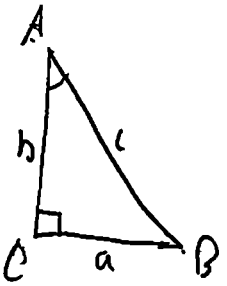
Therefore when sin A increases Cos B increases.

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

Question 27

27 Given: Right triangle ABC with right angle at C

If sin A increases, does cos B increase or decrease? Explain why.



$\sin A = \frac{a}{c}$

$\cos B = \frac{a}{c}$

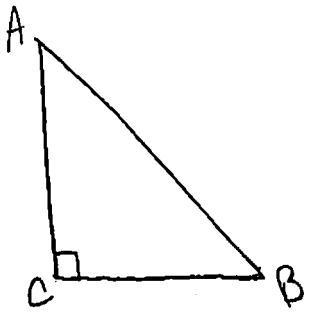
It also increases because the same ratio is used for sin A and cos B.

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

Question 27

27 Given: Right triangle ABC with right angle at C

If sin A increases, does cos B increase or decrease? Explain why.



$\sin A = \cos B$

So if A increases so does B

Score 1: The student wrote a partially correct explanation.

Question 27

27 Given: Right triangle ABC with right angle at C

If sin A increases, does cos B increase or decrease? Explain why.

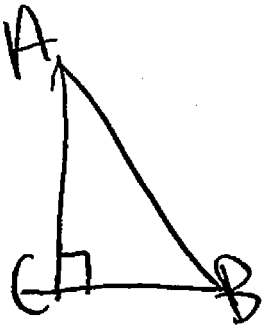
It increases because cos B and Sin A are the same thing.

Score 1: The student wrote an incomplete explanation.

Question 27

27 Given: Right triangle ABC with right angle at C

If sin A increases, does cos B increase or decrease? Explain why.



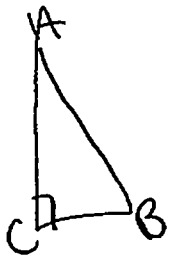
When Sin A increases Cos B increases

Score 0: The student wrote increases, but no explanation was written.

Question 27

27 Given: Right triangle ABC with right angle at C

If sin A increases, does cos B increase or decrease? Explain why.

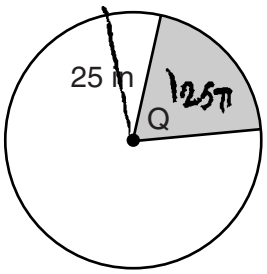


If sin A increases than cos B will decrease because there is only 180° in a triangle and if they both increase the degrees will go above 180.

Score 0: The student had a completely incorrect response.

Question 28

28 In the diagram below, the circle has a radius of 25 inches. The area of the *unshaded* sector is 500π in^2.



Determine and state the degree measure of angle Q, the central angle of the shaded sector.

$a = \pi r^2$

$a = \pi 25^2$

$a = \pi 625$

$360 \cdot .2 =$

$625\pi - 500\pi = 125\pi$

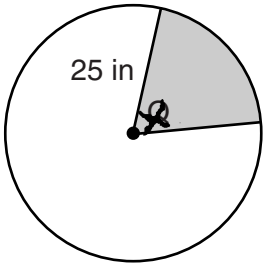
$\frac{125\pi}{625\pi}$ 20%

$\angle Q$ is 72°

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

Question 28

28 In the diagram below, the circle has a radius of 25 inches. The area of the *unshaded* sector is 500π in^2.



Determine and state the degree measure of angle Q, the central angle of the shaded sector.

$(360)500\pi = \frac{x}{360}\pi(25)^2(360)$

$\frac{180000}{625} = \frac{625x}{625}$

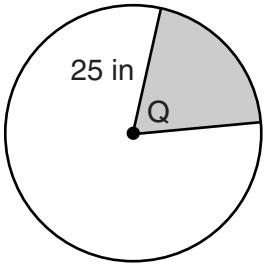
$288 = x$

$m\angle Q = 288°$

Score 1: The student calculated the measure of the central angle for the unshaded region.

Question 28

28 In the diagram below, the circle has a radius of 25 inches. The area of the *unshaded* sector is 500π in^2.



Determine and state the degree measure of angle Q, the central angle of the shaded sector.

$A = \pi r^2$

$A = \pi \cdot 25^2$

$A = 625\pi$

$625\pi - 500\pi = 125\pi$

Area of sector $= \frac{1}{2} r^2 \theta$

$(2) \cdot 125\pi = \frac{1}{2} \cdot 25^2 \theta \cdot (2)$

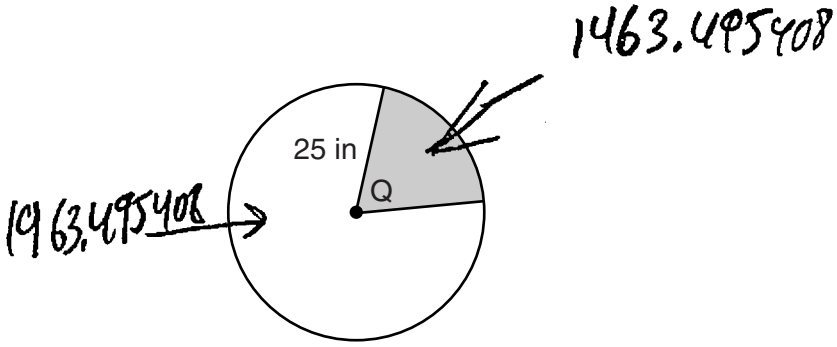
$\frac{250\pi}{625} = \frac{625\theta}{625}$

$\frac{2\pi}{5} = \theta$

Score 1: The student wrote the measure of the central angle in radian measure.

Question 28

28 In the diagram below, the circle has a radius of 25 inches. The area of the *unshaded* sector is 500π in^2.



Determine and state the degree measure of angle Q, the central angle of the shaded sector.

$\frac{25}{500\pi \text{ in}^2} = \frac{x}{360}$

$A = \pi r^2$
$A = \pi(25)^2$
$A = 1963.495408$

$\frac{500x}{500} = \frac{9000}{500}$

$x = 18°$ answer

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

Question 29

29 A machinist creates a solid steel part for a wind turbine engine. The part has a volume of 1015 cubic centimeters. Steel can be purchased for \$0.29 per kilogram, and has a density of 7.95 g/cm^3.

If the machinist makes 500 of these parts, what is the cost of the steel, to the *nearest dollar*?

$V = 1015\ cm^3$

\$0.29 per kilo

density = $7.95\ g/cm^3$

$D = \frac{m}{V}$

$7.95 = \frac{m}{1015}$ $m = 8069.25\ g$

$m = 8.06925$ kilograms

8.06925×0.29

\$2.34008025

2.34008025×500

\$1,170.04125

\$1,170

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

Question 29

29 A machinist creates a solid steel part for a wind turbine engine. The part has a volume of 1015 cubic centimeters. Steel can be purchased for $0.29 per kilogram, and has a density of 7.95 g/cm^3.

If the machinist makes 500 of these parts, what is the cost of the steel, to the *nearest dollar*?

1015 cm^3
x 500
507500

507500
x 7.95
4,034,625 grams

4034.625 kg
x $0.29 per kg

Roughly $1170

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

Question 29

29 A machinist creates a solid steel part for a wind turbine engine. The part has a volume of 1015 cubic centimeters. Steel can be purchased for \$0.29 per kilogram, and has a density of 7.95 g/cm^3.

If the machinist makes 500 of these parts, what is the cost of the steel, to the *nearest dollar*?

1015 · 7.95 = 8069.25 grams 80.6925 Kilograms

~~80 · 6925 · .29 = 23.400725~~

80 · 6925 · 506 = 40346.25

40346.25 · .29 = 11700.4125

It will cost ≈ 11,700 dollars

Score 1: The student did not correctly convert from grams to kilograms.

Question 29

29 A machinist creates a solid steel part for a wind turbine engine. The part has a volume of 1015 cubic centimeters. Steel can be purchased for \$0.29 per kilogram, and has a density of 7.95 g/cm^3.

If the machinist makes 500 of these parts, what is the cost of the steel, to the *nearest dollar*?

1 pound = 0.454 kilograms

$\frac{1015}{7.95} = 127.672956$

$127.672956 \cdot 0.29 = 37.02515724$

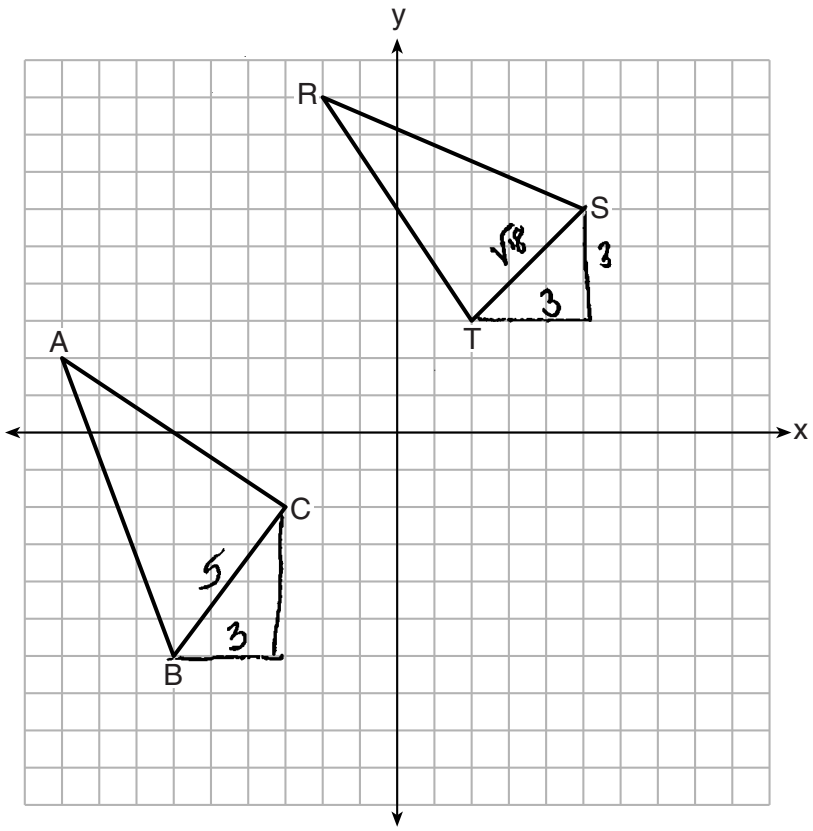
$37.02515724 \cdot 500 = 18512.57862$

∴ The machinist will pay \$18,513 for the steel

Score 0: The student did not convert from grams to kilograms and divided by the density instead of multiplying.

Question 30

30 In the graph below, $\triangle ABC$ has coordinates $A(-9,2)$, $B(-6,-6)$, and $C(-3,-2)$, and $\triangle RST$ has coordinates $R(-2,9)$, $S(5,6)$, and $T(2,3)$.



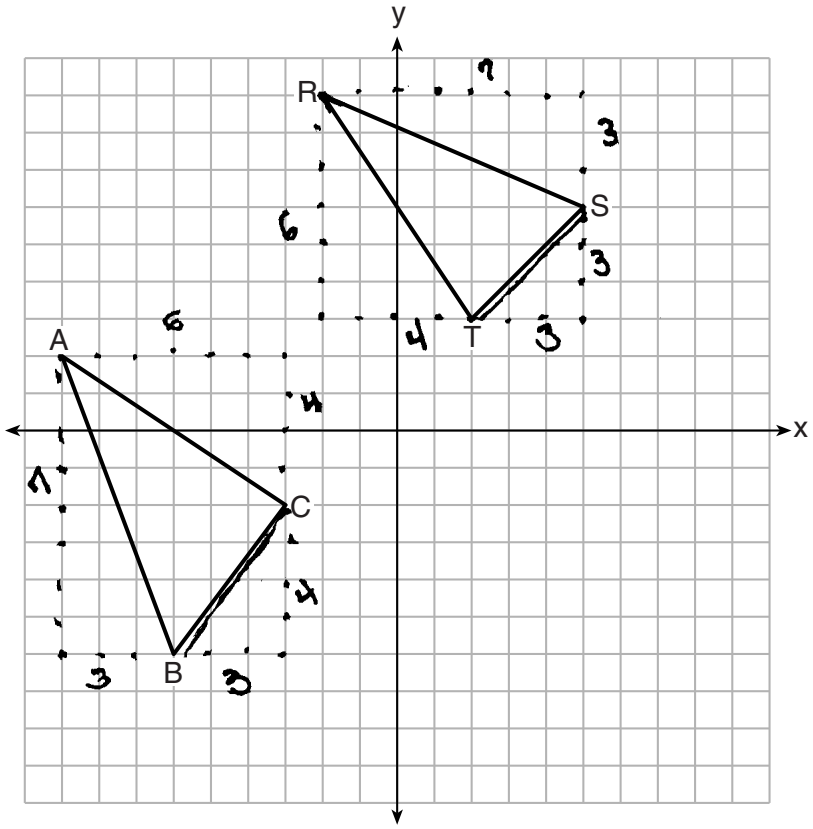
Is $\triangle ABC$ congruent to $\triangle RST$? Use the properties of rigid motions to explain your reasoning.

NO, $\overline{BC} \neq \overline{ST}$ so $\triangle ABC \neq \triangle RST$, there is no sequence of rigid motions that would map $\triangle ABC$ onto $\triangle RST$

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

Question 30

30 In the graph below, $\triangle ABC$ has coordinates $A(-9,2)$, $B(-6,-6)$, and $C(-3,-2)$, and $\triangle RST$ has coordinates $R(-2,9)$, $S(5,6)$, and $T(2,3)$.



Is $\triangle ABC$ congruent to $\triangle RST$? Use the properties of rigid motions to explain your reasoning.

No

No. You could flip $\triangle ABC$ to map over $\triangle RST$, but $\overline{BC}$ and $\overline{ST}$ would not match since they are not $\cong$.

$\overline{ST} \cong \sqrt{(5,-2)^2+(6-3)^2}$ $\quad \overline{BC} = \sqrt{(-6+3)^2+(-6+2)^2}$ $\quad d = \sqrt{(x_2-x_1)+(y_2-y_1)}$ distance formula

(5,6) (2,3) $= \sqrt{9+9}$ $\quad (-6,-6)(-3,-2) = \sqrt{9+16}$

$= \sqrt{18}$ $\quad = \sqrt{25}$

$= 3\sqrt{2}$ $\quad = 5$

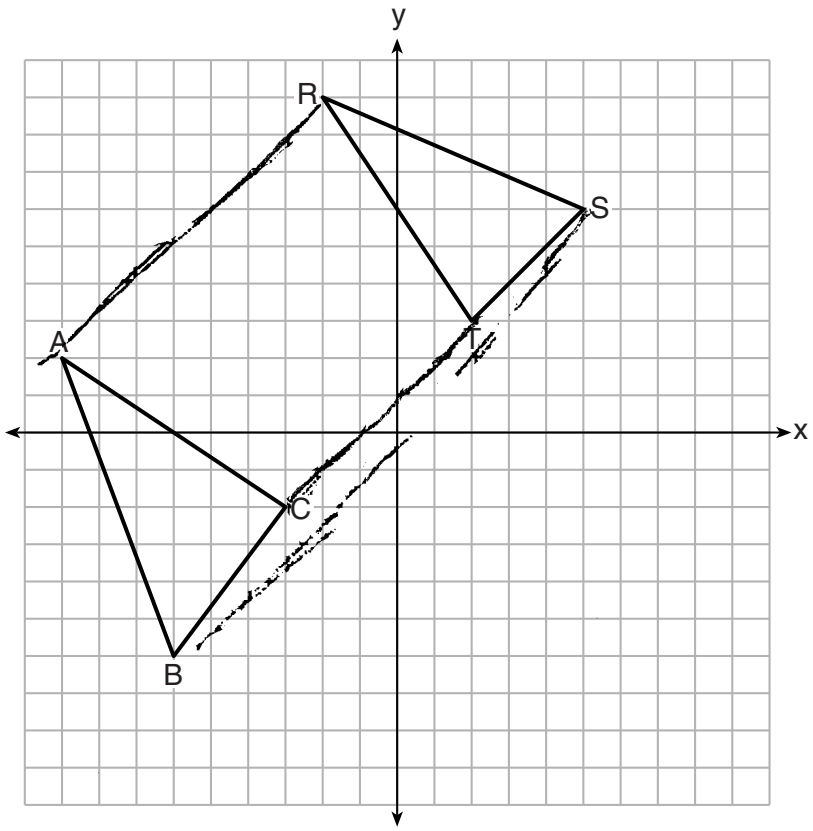
The distances are different

therefore, triangles are not congruent.

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

Question 30

30 In the graph below, $\triangle ABC$ has coordinates $A(-9,2)$, $B(-6,-6)$, and $C(-3,-2)$, and $\triangle RST$ has coordinates $R(-2,9)$, $S(5,6)$, and $T(2,3)$.



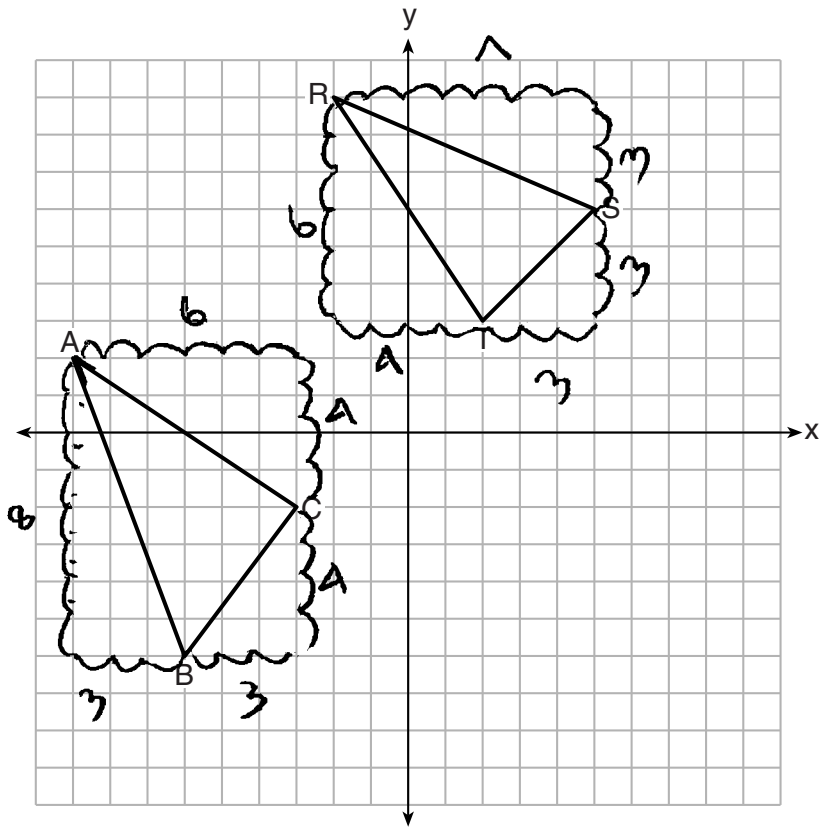
Is $\triangle ABC$ congruent to $\triangle RST$? Use the properties of rigid motions to explain your reasoning.

$\triangle ABC$ isn't congruent to $\triangle RST$ because in order for the rigid motion to properly work each point would have to change in the $(-y, -x)$ format. Point B to Point S doesn't follow this rule.

Score 1: The student wrote an incomplete explanation by not using the properties of rigid motions.

Question 30

30 In the graph below, $\triangle ABC$ has coordinates $A(-9,2)$, $B(-6,-6)$, and $C(-3,-2)$, and $\triangle RST$ has coordinates $R(-2,9)$, $S(5,6)$, and $T(2,3)$.



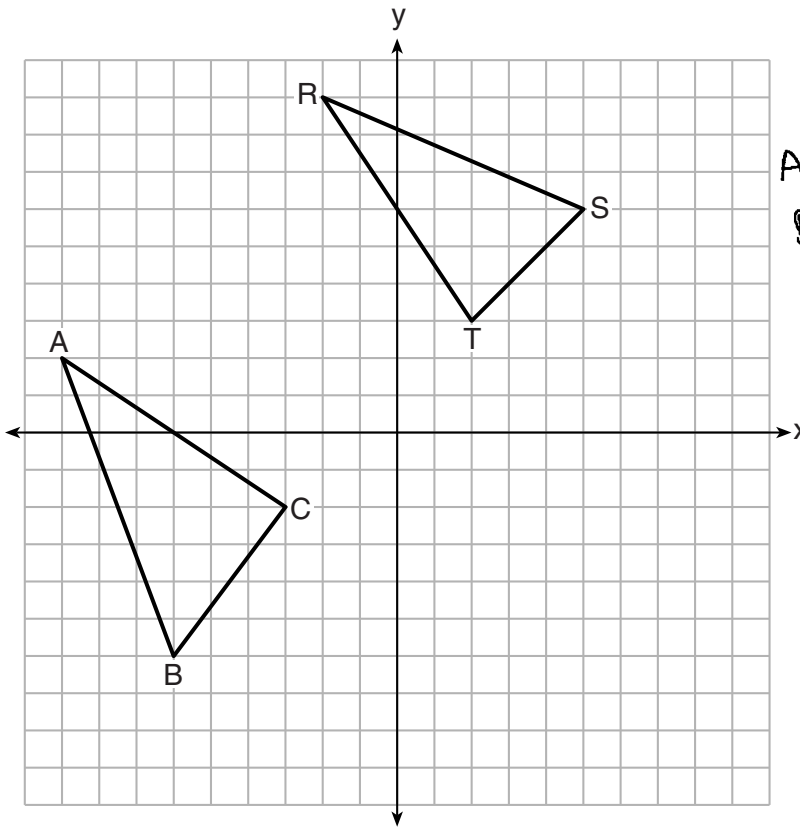
Is $\triangle ABC$ congruent to $\triangle RST$? Use the properties of rigid motions to explain your reasoning.

△ABC is not congruent to △RST because the sides are not equal and it have different length of sides and the slope of the two triangle are different.

Score 1: The student wrote an incomplete explanation by not using the properties of rigid motions.

Question 30

30 In the graph below, $\triangle ABC$ has coordinates $A(-9,2)$, $B(-6,-6)$, and $C(-3,-2)$, and $\triangle RST$ has coordinates $R(-2,9)$, $S(5,6)$, and $T(2,3)$.



A (-9,2) R (-2,9)
B (-6,-6) S (5,6)
C (-3,-2) T (2,3)

$\frac{y-y}{x-x}$ $\frac{2-9}{-9-2} = \frac{-7}{-7}$

$\frac{-6-6}{-6-5} \quad \frac{-12}{-11}$

$\frac{-2-3}{-3-2} \quad \frac{-5}{-5}$

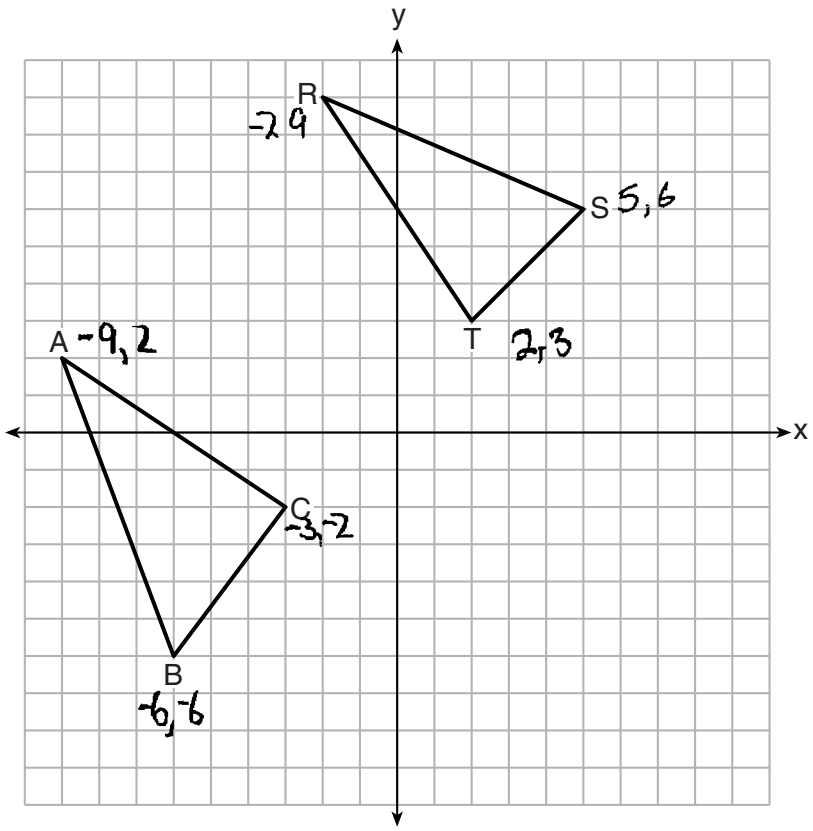
Is $\triangle ABC$ congruent to $\triangle RST$? Use the properties of rigid motions to explain your reasoning.

no, because they have different slopes
So therefore they aren't congruent.

Score 0: The student had a completely incorrect response. Preserving slope is not a property of rigid motions.

Question 30

30 In the graph below, $\triangle ABC$ has coordinates $A(-9,2)$, $B(-6,-6)$, and $C(-3,-2)$, and $\triangle RST$ has coordinates $R(-2,9)$, $S(5,6)$, and $T(2,3)$.



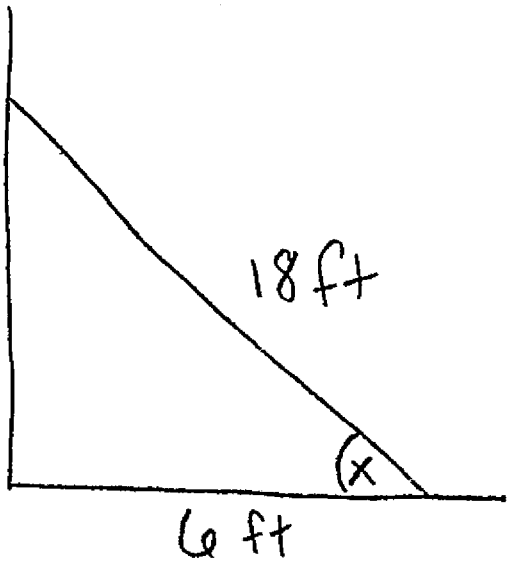
Is $\triangle ABC$ congruent to $\triangle RST$? Use the properties of rigid motions to explain your reasoning.

No they are not congruent!

Score 0: The student did not write an explanation.

Question 31

31 Bob places an 18-foot ladder 6 feet from the base of his house and leans it up against the side of his house. Find, to the *nearest degree,* the measure of the angle the bottom of the ladder makes with the ground.



$\cos\theta = \frac{6}{18}$

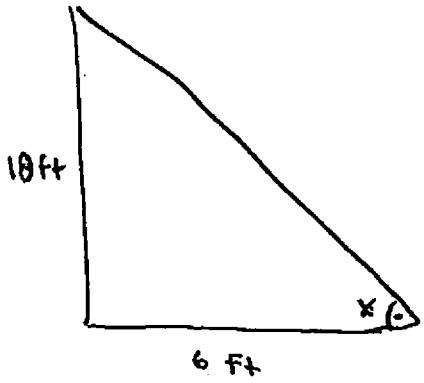
$x^\circ = 70.5$

$\approx 71^\circ$

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

Question 31

31 Bob places an 18-foot ladder 6 feet from the base of his house and leans it up against the side of his house. Find, to the *nearest degree,* the measure of the angle the bottom of the ladder makes with the ground.



SOH CAH TOA

$\tan x = \frac{18}{6}$

$\tan x = 3$

$\tan^{-1}(3)$

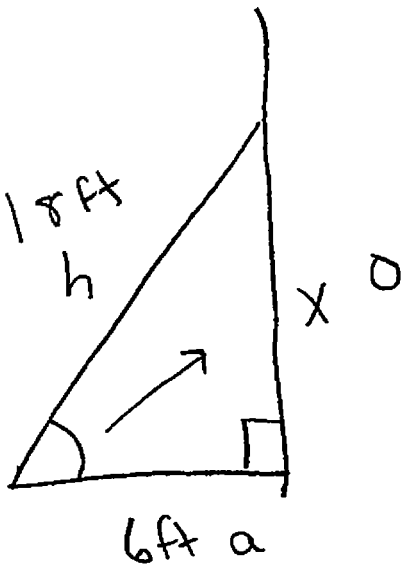
$x = 72°$

The measure of angle is 72

Score 1: The student wrote an incorrect trigonometric equation, but solved the equation correctly.

Question 31

31 Bob places an 18-foot ladder 6 feet from the base of his house and leans it up against the side of his house. Find, to the *nearest degree,* the measure of the angle the bottom of the ladder makes with the ground.



SOH CAH TOA

$\cos = \frac{a}{H}$

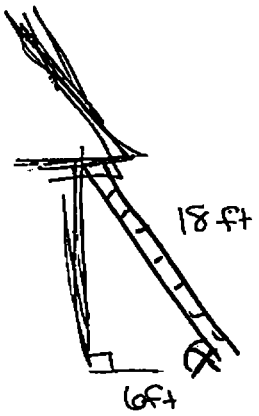
$\frac{\cos x}{1} = \frac{6}{18}$

$\frac{6}{18} = \frac{\cos x (18)}{18}$

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

Question 31

31 Bob places an 18-foot ladder 6 feet from the base of his house and leans it up against the side of his house. Find, to the *nearest degree*, the measure of the angle the bottom of the ladder makes with the ground.



$a^2 + b^2 = c^2$

$18^2 + b^2 = c^2$

$324 + 36 = c^2$

$\sqrt{360} = \sqrt{c^2}$

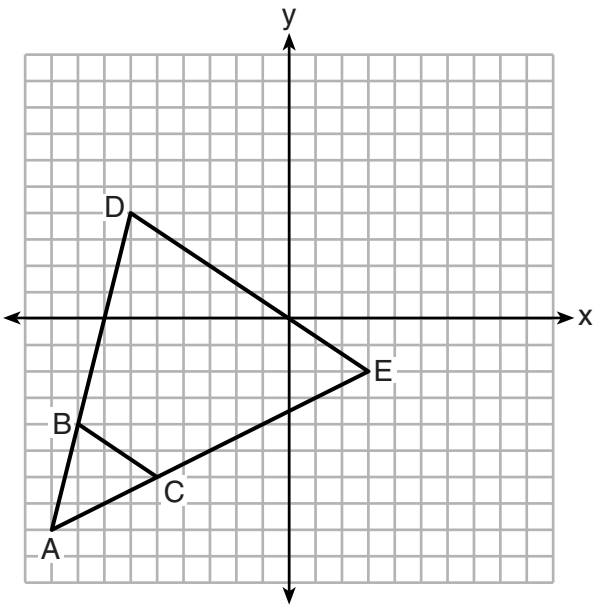
$c = 18.97366596$

$x = 19°$

Score 0: The student had a completely incorrect response.

Question 32

32 Triangle *ABC* and triangle *ADE* are graphed on the set of axes below.



Describe a transformation that maps triangle *ABC* onto triangle *ADE*.

△ABC is dilated by a scale factor of 3 ~~#A~~ centered at point A

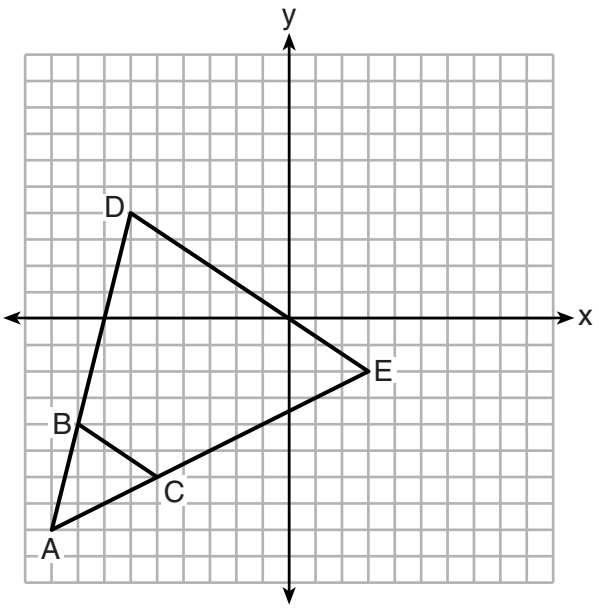
Explain why this transformation makes triangle *ADE* similar to triangle *ABC*.

Dilations preserve angle measure, so ∠A ≅ ∠A
∠ABC ≅ ∠D
∠ACB ≅ ∠E
Uses ans 2 pairs of angles
△ABC ~ △ADE by AA

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

Question 32

32 Triangle *ABC* and triangle *ADE* are graphed on the set of axes below.



Describe a transformation that maps triangle *ABC* onto triangle *ADE*.

A dilation of 3 about point A would map △ABC onto △ADE.

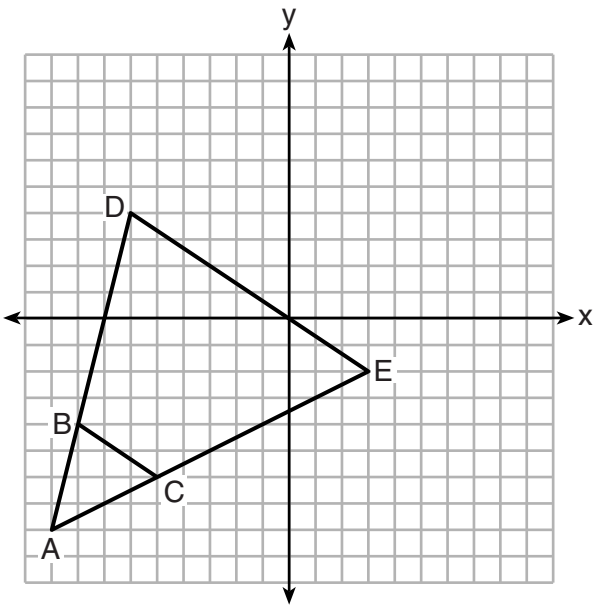
Explain why this transformation makes triangle *ADE* similar to triangle *ABC*.

A dilation makes two figures proportional, therefore △ADE is similar to △ABC.

Score 3: The student made an incorrect statement that figures are proportional.

Question 32

32 Triangle *ABC* and triangle *ADE* are graphed on the set of axes below.



Describe a transformation that maps triangle *ABC* onto triangle *ADE*.

A transformation that maps triangle ABC onto ADE would be a dialation

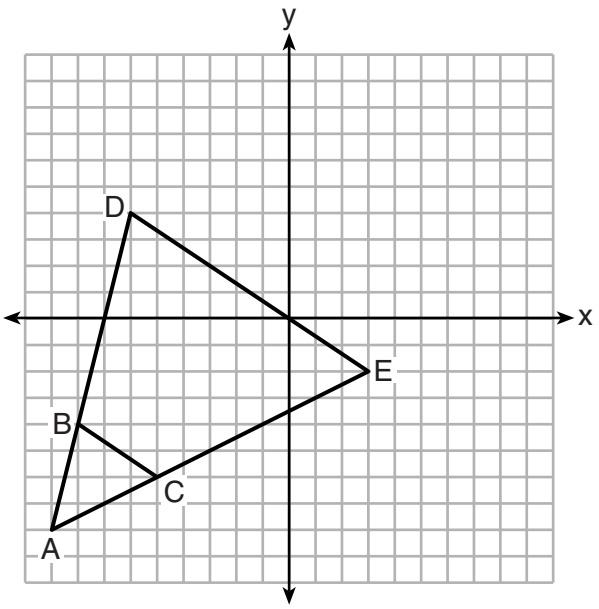
Explain why this transformation makes triangle *ADE* similar to triangle *ABC*.

This transformation makes triangle ADE similar to △ ABC b/c the angles are the same.

Score 2: The student did not identify the center of dilation and the scale factor. The student did not provide a complete explanation connecting the transformation and the similarity.

Question 32

32 Triangle *ABC* and triangle *ADE* are graphed on the set of axes below.



Describe a transformation that maps triangle *ABC* onto triangle *ADE*.

A Dilation of 3 would map △ABC onto △ADE.

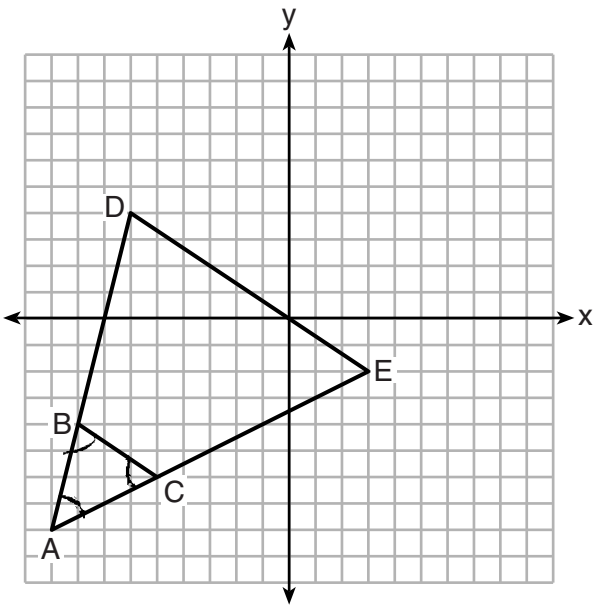
Explain why this transformation makes triangle *ADE* similar to triangle *ABC*.

The triangle is the same just dilated.

Score 1: The student wrote an incomplete description of the dilation by not stating the center of dilation. No further correct work was shown.

Question 32

32 Triangle *ABC* and triangle *ADE* are graphed on the set of axes below.



Describe a transformation that maps triangle *ABC* onto triangle *ADE*.

Transformation o

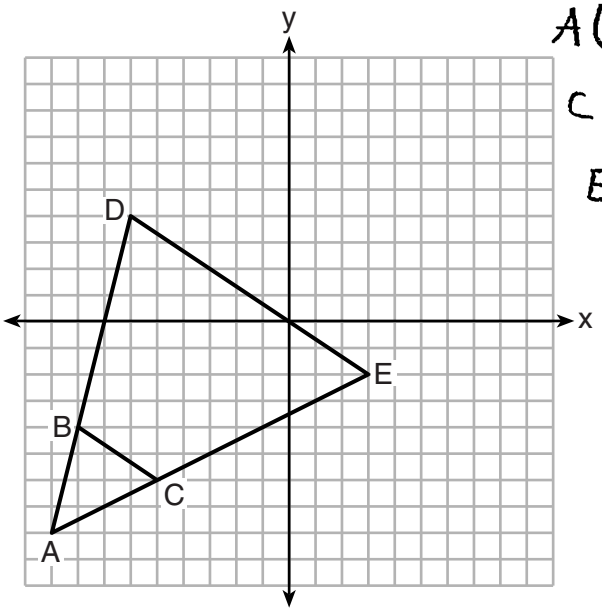
Explain why this transformation makes triangle *ADE* similar to triangle *ABC*.

because Transformation preserves the angle measurement

Score 1: The student did not describe the transformation. The student did not provide a complete explanation.

Question 32

32 Triangle *ABC* and triangle *ADE* are graphed on the set of axes below.



A(-9,-8) B(-8,-4)
C(-5,-6) D(-6,4)
E(3,-2)

Describe a transformation that maps triangle *ABC* onto triangle *ADE*.

A dialation of (3, 12) would map △ABC onto △ADE.

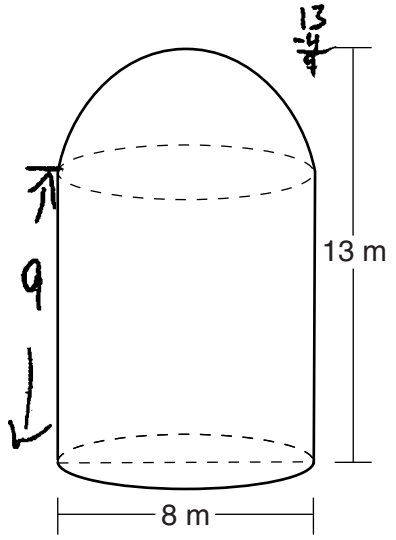
Explain why this transformation makes triangle *ADE* similar to triangle *ABC*.

It does because they would have the same coordinate points, making all of their sides congruent.

Score 0: The student had a completely incorrect response.

Question 33

33 A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the *nearest cubic meter,* the total volume inside the storage tank.



$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi 4^3$

$V = \frac{4}{3}\pi 64$

$V = 268.0825731$

$\div 2$

$V \approx 134.0412866$

$V = \pi r^2 h$

$V = \pi 4^2 (9)$

$V = \pi 16(9)$

$V = \pi 144$

$V = 452.3893421$

134.0412866

$+ 452.3893421$

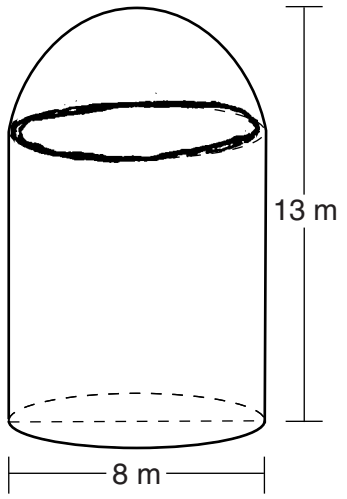
$V = 586.4306287$

$V \approx 586 m^3$

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

Question 33

33 A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the *nearest cubic meter*, the total volume inside the storage tank.



$V = \frac{4}{3}\pi r^3$
$V = \frac{4}{3}\pi(4)^3$
$V = \frac{4}{3}(64)\pi$
$V = \frac{268}{2}$ 134

$V = \pi r^2 h$
$V = \pi(4)^2(13)$
$V = 208\pi$
$V = 653$

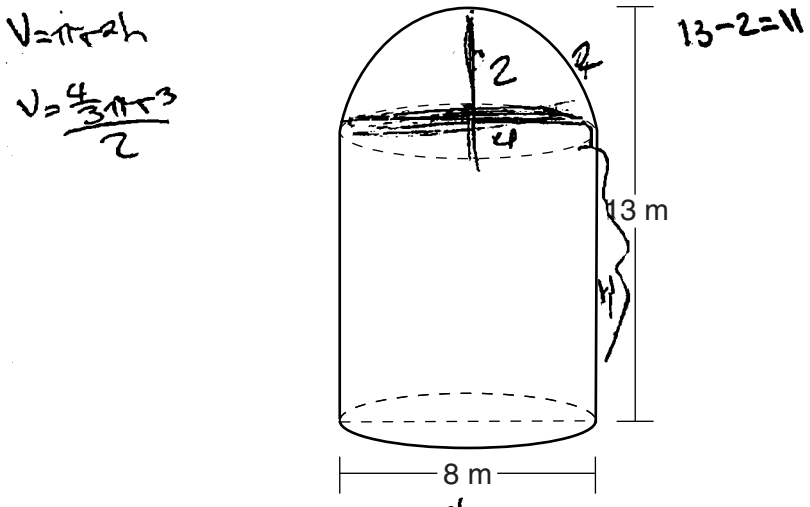
134
+663

$V = 787 m^3$

Score 3: The student used 13 instead of 9 for the height of the cylinder.

Question 33

33 A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the *nearest cubic meter*, the total volume inside the storage tank.



$V=\pi r^2 h$

$V=\frac{4}{3}\pi r^3$

$13-2=11$

$r=4$

Cylinder

$V=\pi 4^2(11)$

$V=16(11)\pi$

$V=176\pi$ +

Sphere

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

$V=\frac{4}{3}\left(\frac{8}{1}\right)\pi$

$V=10.666666667\pi$

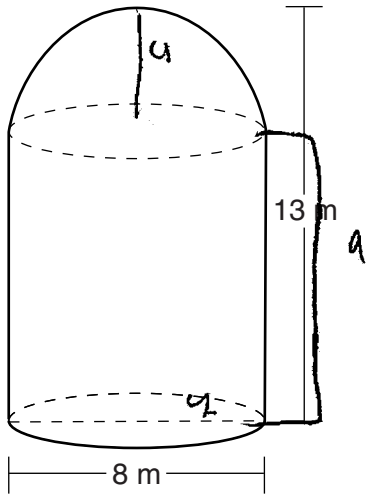
$\frac{4}{3}\times\frac{8}{1}=\frac{32}{3}$

569.7 m^3

Score 2: The student made one computational error in determining the radius and one rounding error.

Question 33

33 A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the *nearest cubic meter*, the total volume inside the storage tank.



$V = \pi r^2 h$

$V = 4^2 \cdot 9 \cdot \pi$

$V = 144\pi$

$V = 4/3\ \pi r^3$

$V = 4/3\ \pi (4)^3$

$V = 4/3\ \pi (64)$

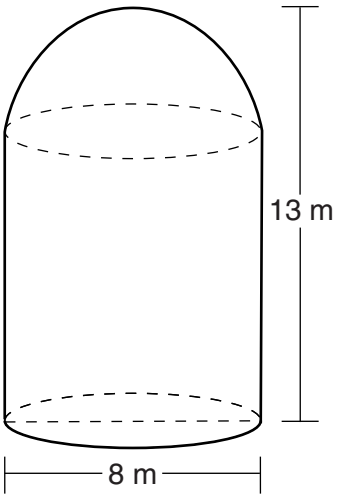
$V = (144\pi) + (4/3\pi(64))$

$V = 720.5\ m^3$

Score 2: The student did not divide the volume of a sphere by two and then rounded incorrectly.

Question 33

33 A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the *nearest cubic meter*, the total volume inside the storage tank.



$V = \pi r^2 h$

$V = \pi 4^2 13$

$V = \pi(16)(13)$

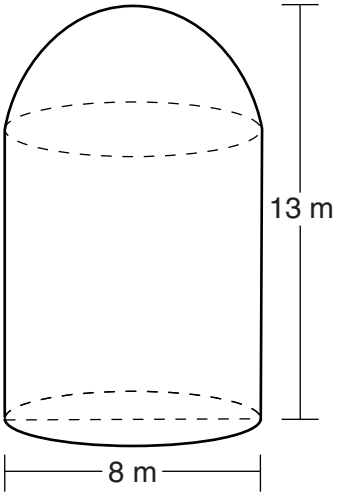
$V = 653.45271$

$V = 653.5$

Score 1: The student made one conceptual error by assuming the entire tank is a cylinder and made one rounding error.

Question 33

33 A storage tank is in the shape of a cylinder with a hemisphere on the top. The highest point on the inside of the storage tank is 13 meters above the floor of the storage tank, and the diameter inside the cylinder is 8 meters. Determine and state, to the *nearest cubic meter*, the total volume inside the storage tank.



$V = \pi r^3$

$V = \pi 4^3$

$V = 16\pi$

$V = 50$

$L = 2\pi r^2$

$L = 2\pi 4^2$

$L = 2\pi 16$

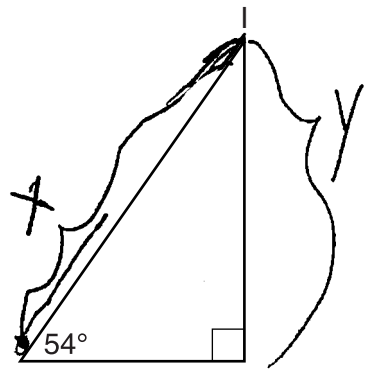
$L = 101$

151

Score 0: The student had a completely incorrect response.

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



4.5 miles

Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

$x \cos 54° = \frac{4.5}{x}$

$\frac{4.5}{\cos 54}$

7.7 mi

Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

TOA

$\tan 54° = \frac{y}{4.5}$

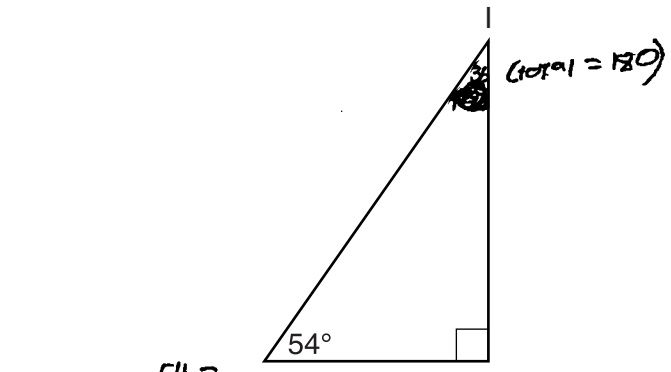
$4.5 \tan 54$

6.2 mi

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

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



tan 54 = $\frac{x}{4.5}$; $I\wedge = 6.193$

Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

Pythagorean theorem:

$4.5^2 + 6.2^2 = x^2$

$20.25 + 38.44 = \sqrt{58.69} = 7.66 =$ 7.7 miles

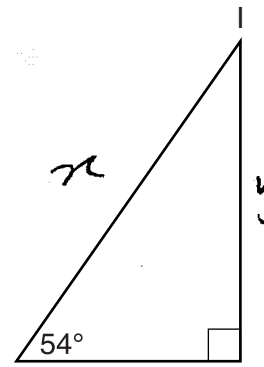
Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

6.2 miles

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

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



4.5 miles

Distance from boat house (H) to Island is = 7.7 mi

Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

$\frac{\cos 54°}{1} = \frac{4.5}{x}$

$x \cos 54° = 4.5$

$\frac{x \cos 54°}{\cos 54°} = \frac{4.5}{\cos 45°}$

$x = 7.65$

$x = 7.7$ mi answer

Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

$\frac{\tan 54°}{1} = \frac{y}{4.5}$

$y = 4.5(\tan 54°)$

$y = 0.35$

$y = 0.4$ mi answer

Distance from Island (I) to marina (M) is = 0.4mi

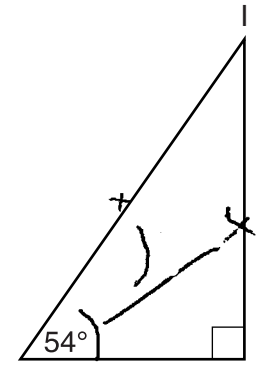
Score 3: The student made a computational error in finding IM.

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.

So Hc A H Toa

Tan



4.5 miles

Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

$\cos 54 = \frac{4.5}{x}$

7.7 miles

$4.5 = \cos 54 x$

10

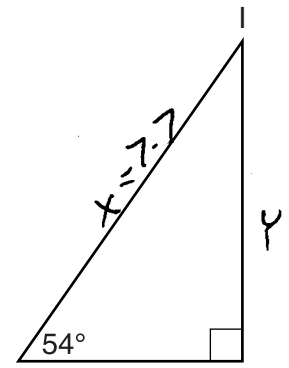
Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

6.2 miles

Score 3: The student showed no work to determine *IM*.

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

$\cos 54° = \frac{4.5}{x}$

$\frac{x \cos 54°}{\cos 54°} = \frac{4.5}{\cos 54°}$

$x = 7.655857$

$x = 7.7$

Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

$\tan 54° = \frac{4.5}{y}$

$\frac{y \tan 54°}{\tan 54°} = \frac{4.5}{\tan 54°}$

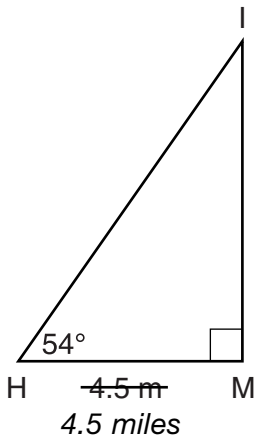
$y = 3.2694$

$y = 3.2$

Score 2: The student found HI correctly, but wrote an incorrect trigonometric equation and rounded incorrectly.

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

$\cos 54° = \frac{4.5}{X}$

$\overline{HI} = 2.6$ miles

Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

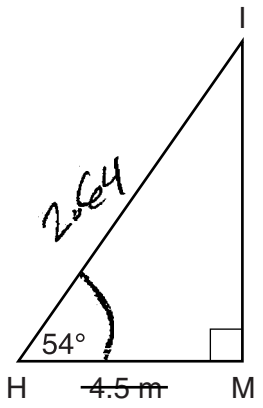
$\tan 54° = \frac{2.6}{X}$

$\overline{IM} = 3.6$ miles

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

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



4.5 miles

$\cos 54 = \frac{x}{4.5}$

1

$x = 4.5 \cos 54$

$x = 2.64$

$\frac{\tan 54 = x}{1} \quad \frac{}{4.5}$

$x = 4.5 \tan 54 \quad x = 6.19$

Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

From H to I = 2.64

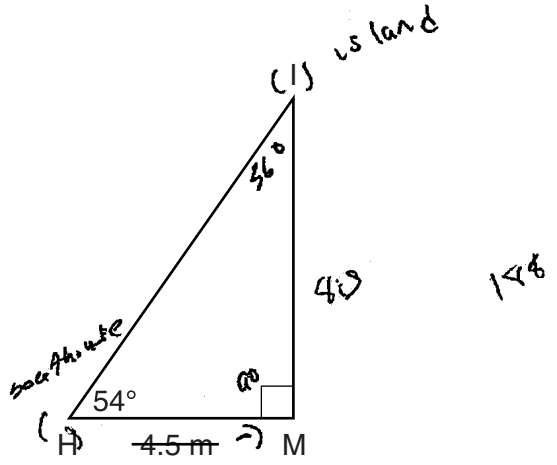
Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

From I to M = 6.19

Score 1: The student made two rounding errors and wrote an incorrect trigonometric equation to find HI.

Question 34

34 As shown in the diagram below, an island (I) is due north of a marina (M). A boat house (H) is 4.5 miles due west of the marina. From the boat house, the island is located at an angle of 54° from the marina.



4.5 miles

Determine and state, to the *nearest tenth of a mile,* the distance from the boat house (H) to the island (I).

The nearest distance from the boat

$4.5^2+5^2=c^2$

$4.5(4.5) = 54^2$

$(4.5)^2 + 20.25 + 20.25 = 20.25$ $= 6.4$

Determine and state, to the *nearest tenth of a mile,* the distance from the island (I) to the marina (M).

The nearest tenth of a mile is

4.5

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

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

$AT = \sqrt{(-4-5)^2+(5--2)^2} = \sqrt{130}$

$PA = \sqrt{(-4--1)^2+(5--6)^2} = \sqrt{130}$

$\triangle PAT$ is isosceles b/c $AT = PA$.

State the coordinates of R so that quadrilateral *PART* is a parallelogram.

(2, 9)

Question 35 is continued on the next page.

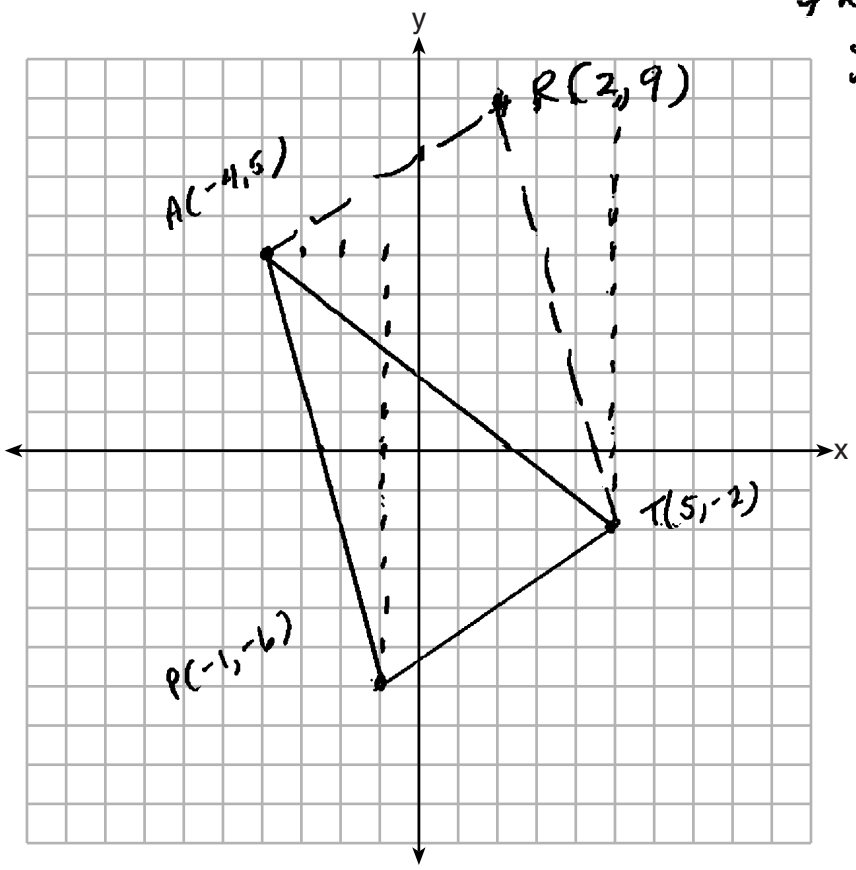
Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.

Slope of AP = $-11/3$ PA = $\sqrt{130}$

Slope of RT = $-11/3$ RT = $\sqrt{(2-5)^2+(9--2)^2} = \sqrt{130}$

PART is a parallelogram b/c one pair of opp. sides are both $\parallel$, as demonstrated by the equal slopes, and $\cong$, as demonstrated by the distance formula



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

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

$\overline{PA} = \sqrt{3^2+11^2} = \sqrt{130}$

$TA = \sqrt{9^2+7^2} = \sqrt{130}$

$\therefore$ ΔPAT is isosceles b/c 2 sides are $\cong$

State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

$R(2,9)$

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.

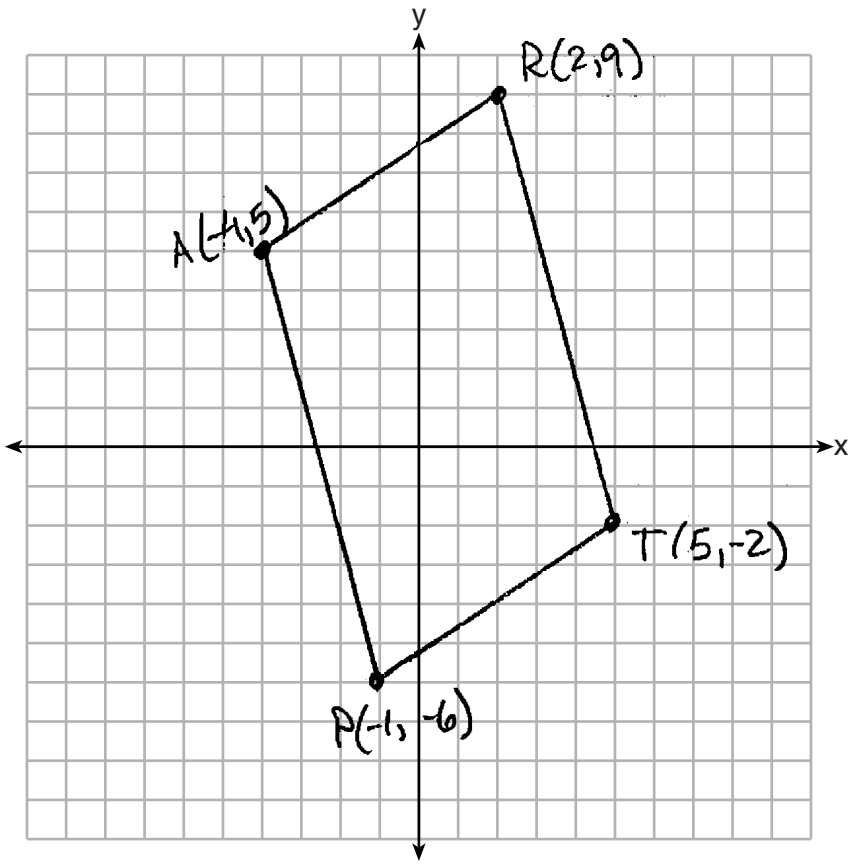
Slope of $\overline{AR} = \frac{y_2-y_1}{x_2-x_1} = \frac{-4}{-6} = \frac{2}{3}$

slope of $\overline{PT} = \frac{y_2-y_1}{x_2-x_1} = \frac{-4}{-6} = \frac{2}{3}$

Slope of $\overline{PA} = \frac{-6-5}{-1+4} = -\frac{11}{3}$

Slope of $\overline{TR} = \frac{9+2}{2-5} = -\frac{11}{3}$

∴ PART is a parallelogram



Score 5: The student wrote an incomplete conclusion when proving *PART* is a parallelogram.

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

$\triangle PAT$ is an isos $\triangle$ because $\overline{AT}$ and $\overline{PA}$ are = lengths.

Distance of:

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

$\sqrt{(-4--1)^2+(5--6)^2}$

$\sqrt{9+121}$ $\sqrt{130}$

$\overline{TA} =$

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

$\sqrt{81+49}$

$\sqrt{130}$

State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

R (2, 9)

Question 35 is continued on the next page.

Question 35

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.

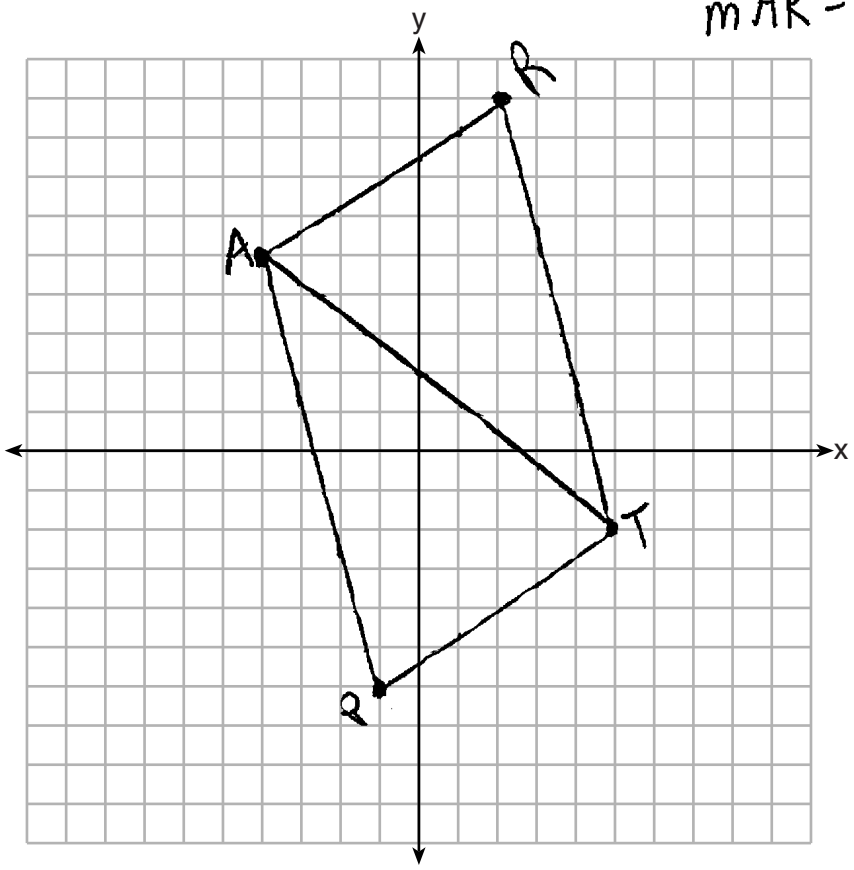
PART is a parallelogram because it has 2 sets of 11 sides.

$m\overline{AP} = \frac{11}{3}$

$m\overline{RT} = \frac{-11}{3}$

$m\overline{PT} = \frac{4}{6} = \frac{2}{3}$

$m\overline{AR} = \frac{4}{6} = \frac{2}{3}$



Score 5: The student did not connect the equal slopes to parallelism in proving *PART* as a parallelogram, therefore the concluding statement is incomplete.

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

PA

$d = \sqrt{3^2 + 11^2}$

$d = \sqrt{9 + 121}$

$\boxed{d = \sqrt{130}}$

TA

$d = \sqrt{7^2 + 9^2}$

$d = \sqrt{49 + 81}$

$\boxed{d = \sqrt{130}}$

State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

$\boxed{R = (2, 9)}$

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.

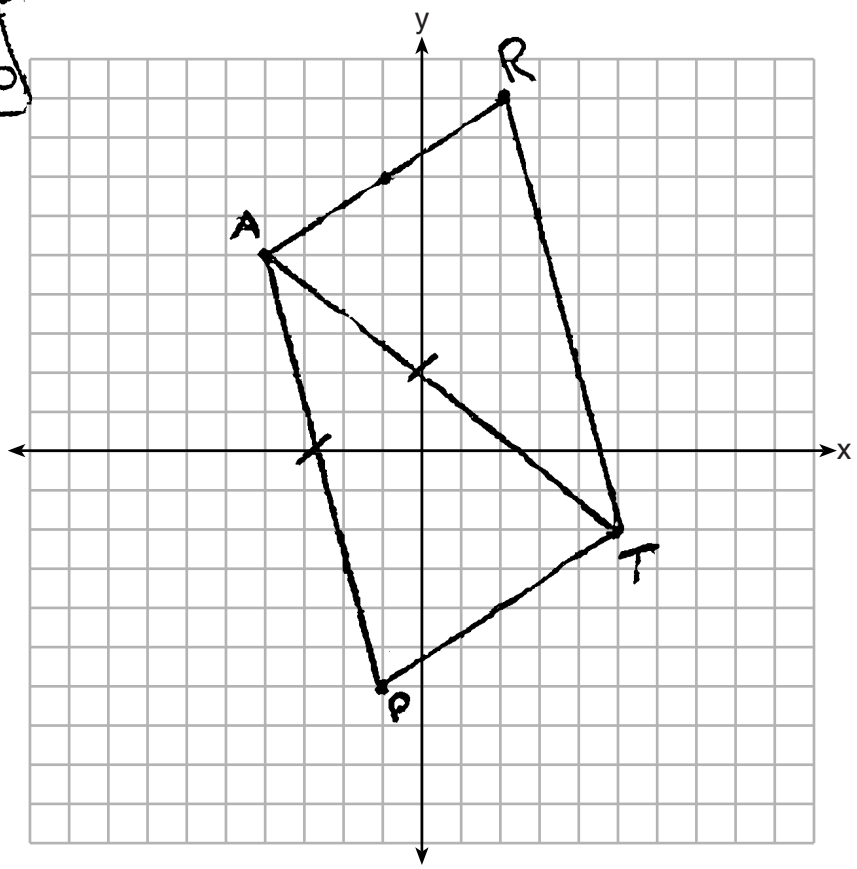
AR: $y = mx + b$ $y = \frac{2}{3}x + b$

PT: $y = mx + b$ $y = \frac{2}{3}x + b$

RT: $y = mx + b$ $y = \frac{-11}{3x} + b$

PA: $y = mx + b$ $y = \frac{-11}{3}x + b$

PART is a parallelogram because opposite sides are parallel



Score 4: In proving $\triangle PAT$ is isosceles, no conclusion was written. In proving *PART* as a parallelogram, the student did not connect the equal slopes to parallelism.

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

R(2,9)

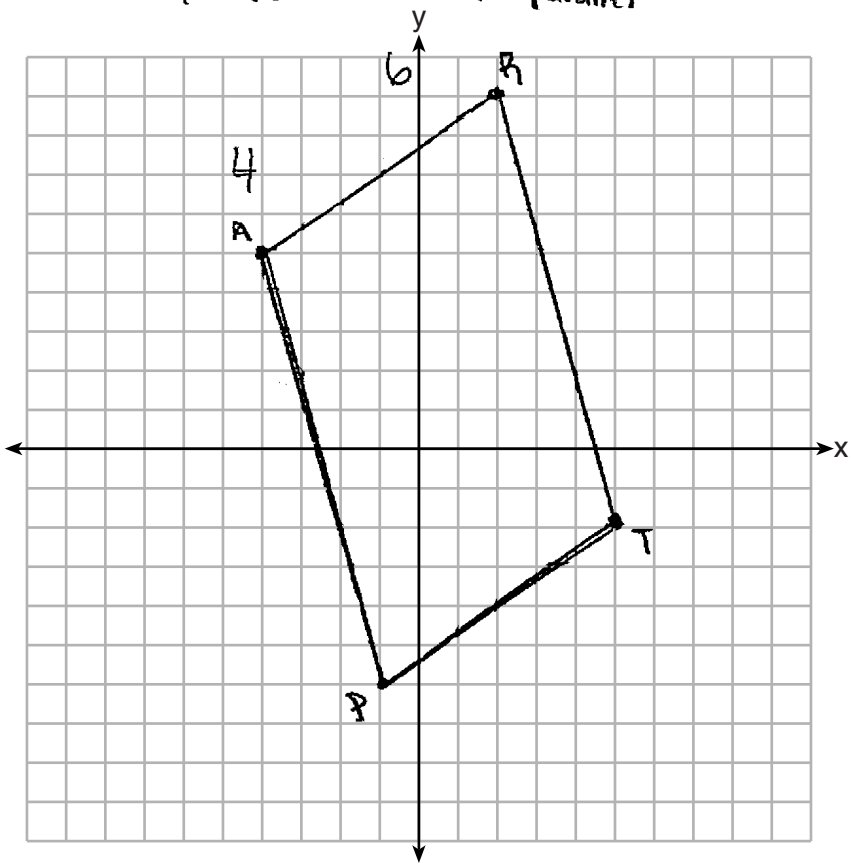
Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.

D: $\overline{PA}\ \frac{y_2-y_1}{x_2-x_1} \Rightarrow \frac{5+6}{-4+1} \Rightarrow \frac{11}{-3} \neq -\frac{11}{3}$

Statements	Reasons
1) $\overline{PA}$ has a slope of $-\frac{11}{3}$	1) slope formula $\left(\frac{y_2-y_1}{x_2-x_1}\right)$
2) $\overline{RT}$ has a slope of $-\frac{11}{3}$	2) slope formula $\left(\frac{y_2-y_1}{x_2-x_1}\right)$
3) $\overline{PA} \parallel \overline{RT}$	3) $\overline{PA}$ & $\overline{RT}$ have the same slope
4) $\overline{AR}$ has a slope of $\frac{2}{3}$	4) slope formula $\left(\frac{y_2-y_1}{x_2-x_1}\right)$
5) $\overline{PT}$ has a slope of $\frac{2}{3}$	5) slope formula $\left(\frac{y_2-y_1}{x_2-x_1}\right)$
6) $\overline{AR} \parallel \overline{PT}$	6) $\overline{AR}$ & $\overline{PT}$ have the same slope
7) quadrilateral PART	7) opposite sides are parallel



Score 3: The student did not prove $\triangle PAT$ is an isosceles triangle. The student wrote an incomplete statement in proving *PART* is a parallelogram (step 7).

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

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

$D=\sqrt{(-4+(1))^2+(5+(+6))^2}$

$D=\sqrt{(-3)^2+11^2}$

$D=\sqrt{9+121}$

$D=\sqrt{130}$

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

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

$D=\sqrt{9^2+(-7)^2}$

$D=\sqrt{81+49}$

$D=\sqrt{130}$

Using the distance formula

$\overline{AP}\cong\overline{AT}=\sqrt{130}$

$\therefore \overline{AP}\cong\overline{AT}$

If two legs of a triangle are congruent, then the triangle is isosceles.

$\therefore$ PAT is an isosceles triangle

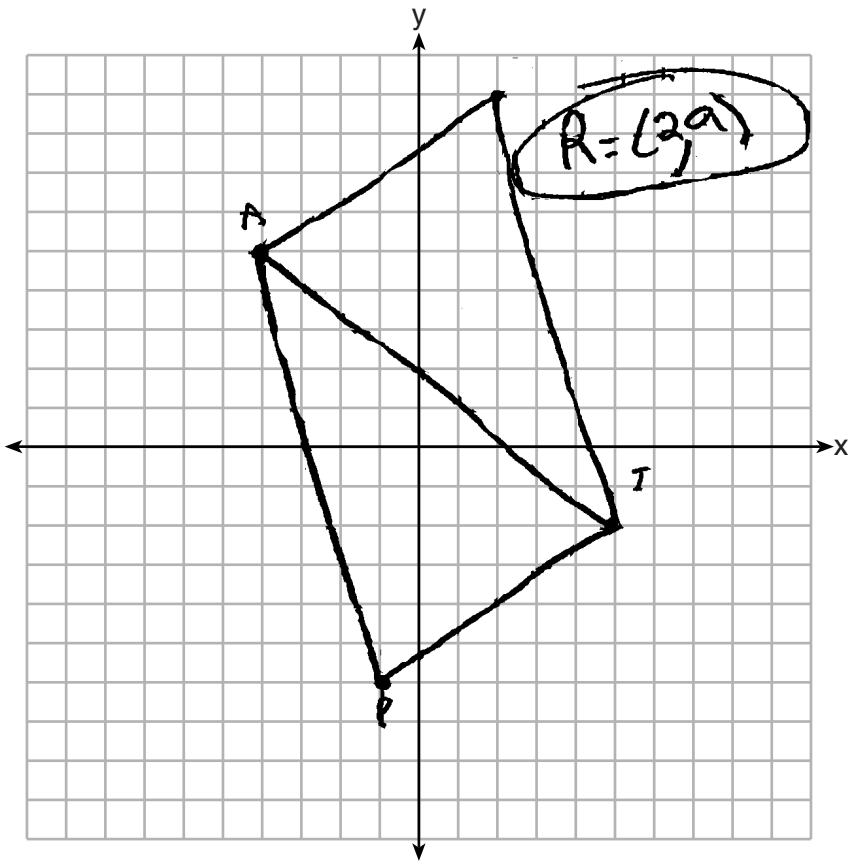
State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

R=(3,9)

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.



Score 3: The student correctly proved that $\triangle PAT$ is isosceles and correctly identified point (2,9). No further correct work was shown.

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

$PA = \sqrt{(-4-(-1))^2+(5-(-6))^2}$

$= \sqrt{(-3)^2+11^2}$

$= \sqrt{9+121}$

$= \sqrt{130}$

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

$= \sqrt{9^2+(-7)^2}$

$= \sqrt{81+49}$

$= \sqrt{130}$

$\triangle PAT$ is isosceles because two of its sides are congruent

$\sqrt{130} = \sqrt{(x-(-4))^2+(y-5)^3}$

$\sqrt{130} = \sqrt{x^2+16+y^2+25}$

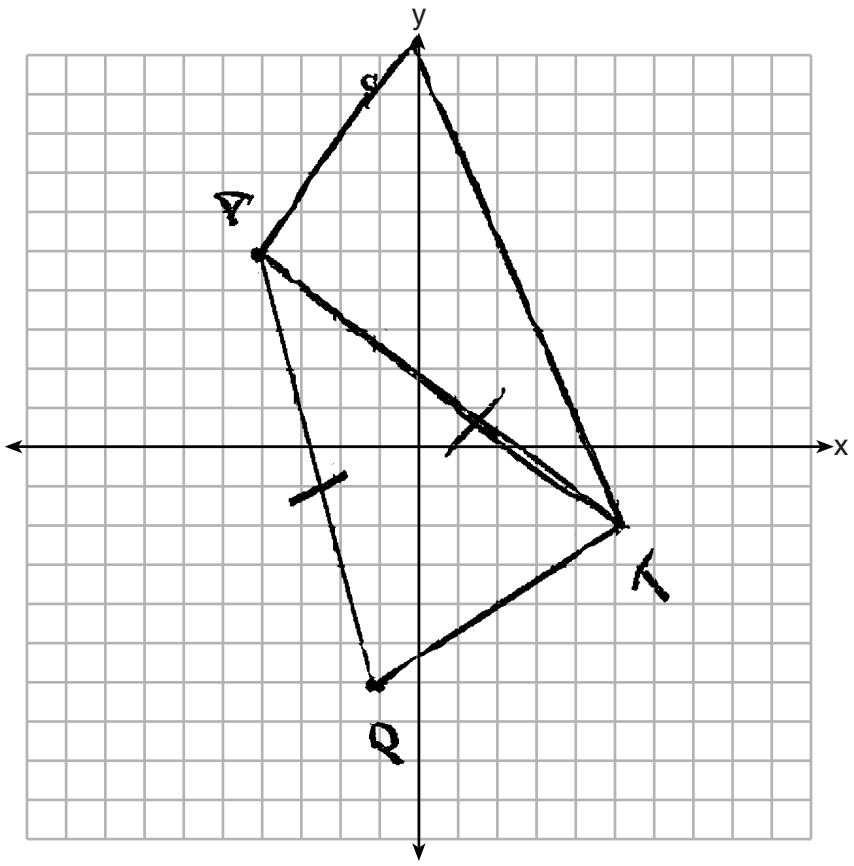
$\sqrt{130} = \sqrt{x^2+y^2+41}$

State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.



Score 2: Isosceles triangle *PAT* was proven, but no further correct work was shown.

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

$9^2+7^2=d^2$

You can tell
ΔPAT is
iscocelese
be cause
$\overline{PA}$ is paralle l
+o $\overline{TA}$.

$11^2+3^2=c^2$

State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

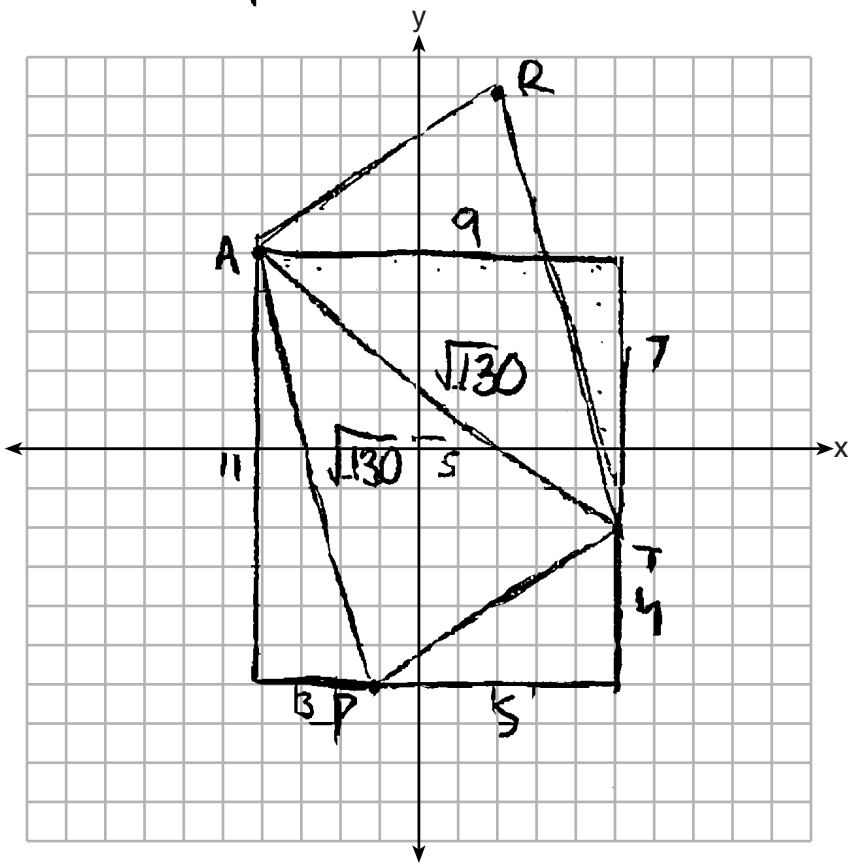
$R=2,9$

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.

Part is a parallelogram because $\overline{AP}$ and $\overline{RT}$ have the same slopes and $\overline{AR}$ and $\overline{PT}$ have the same slope meaning opposite sides have the same slope.



Score 1: The student correctly found the lengths of $\overline{AP}$ and $\overline{AT}$, but no further correct work was shown. Point *R* was not written as coordinates.

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]

Statements	Reasons
① $\angle RAP \cong \angle PTR$ $\angle ART \cong ART$	① Opposite angles are congruent
② $\overline{AR} \parallel \overline{PT}$ $\overline{AP} \parallel \overline{AT}$	② Parallel sides are congruent
③ $\overline{AT} \cong \overline{AT}$	③ Reflexive postulate
④ $\triangle ART \cong \triangle TRR$	④ Triangles reflected over the reflexive postulate are congruent

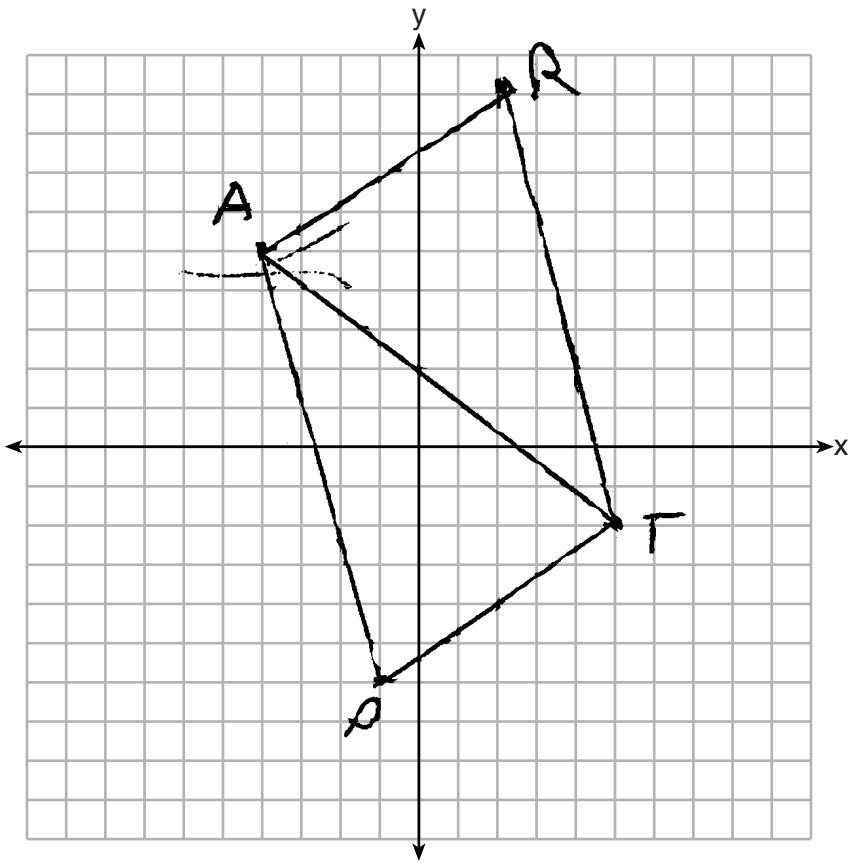
State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

R(2, 9)

Question 35 is continued on the next page.

Question 35 continued

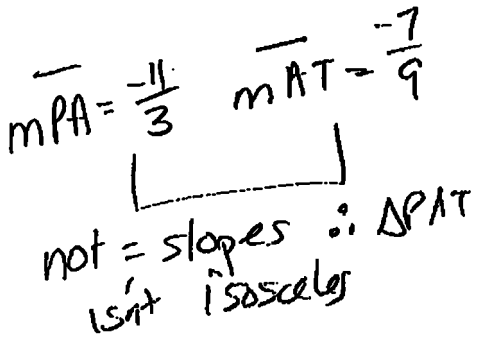
Prove that quadrilateral *PART* is a parallelogram.



Score 1: The student found the correct coordinates of point *R*, but no further correct work was shown.

Question 35

35 In the coordinate plane, the vertices of triangle *PAT* are $P(-1,-6)$, $A(-4,5)$, and $T(5,-2)$. Prove that $\triangle PAT$ is an isosceles triangle. [The use of the set of axes on the next page is optional.]



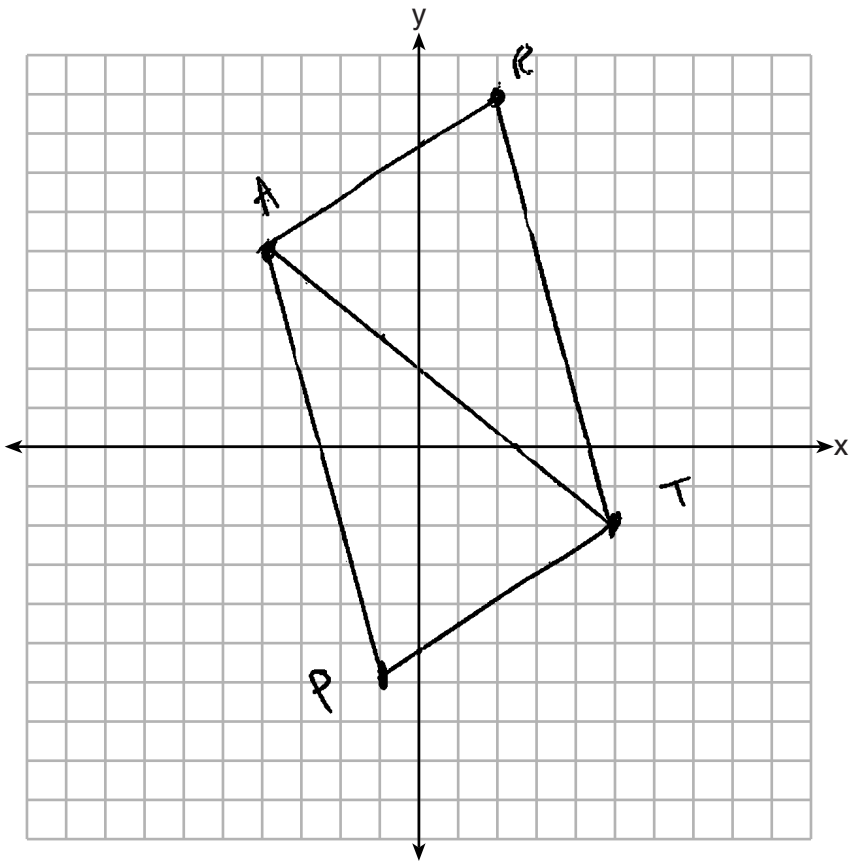
State the coordinates of *R* so that quadrilateral *PART* is a parallelogram.

Question 35 is continued on the next page.

Question 35 continued

Prove that quadrilateral *PART* is a parallelogram.

PART is a □ because it has 2 sets of opposite sides that intersect.



Score 0: The student had a completely incorrect response.

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

Regents Examination in Geometry – January 2018

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

(Use for the January 2018 exam only.)

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

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

Raw Score	Scale Score	Performance Level
26	**61**	2
25	**60**	2
24	**59**	2
23	**57**	2
22	**56**	2
21	**55**	2
20	**53**	1
19	**51**	1
18	**49**	1
17	**47**	1
16	**45**	1
15	**43**	1
14	**41**	1
13	**39**	1
12	**37**	1
11	**34**	1
10	**32**	1
9	**29**	1
8	**26**	1
7	**23**	1
6	**20**	1
5	**17**	1
4	**14**	1
3	**11**	1
2	**7**	1
1	**4**	1
0	**0**	1

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

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

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