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

GEOMETRY
(Common Core)

Friday, June 16, 2017 — 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 36 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.
1 In the diagram below, △ABC ≡ △DEF.

Which sequence of transformations maps △ABC onto △DEF?

(1) a reflection over the x-axis followed by a translation
(2) a reflection over the y-axis followed by a translation
(3) a rotation of 180° about the origin followed by a translation
(4) a counterclockwise rotation of 90° about the origin followed by a translation

Use this space for computations.
2 On the set of axes below, the vertices of \( \triangle PQR \) have coordinates \( P(-6,7), Q(2,1), \) and \( R(-1,-3) \).

What is the area of \( \triangle PQR \)?

(1) 10  (3) 25  
(2) 20  (4) 50

3 In right triangle \( ABC \), \( m\angle C = 90^\circ \). If \( \cos B = \frac{5}{13} \), which function also equals \( \frac{5}{13} \)?

(1) \( \tan A \)  (3) \( \sin A \)  
(2) \( \tan B \)  (4) \( \sin B \)
4 In the diagram below, $m\overarc{ABC} = 268^\circ$.

What is the number of degrees in the measure of $\angle ABC$?

(1) 134°   (3) 68°
(2) 92°   (4) 46°

5 Given $\triangle MRO$ shown below, with trapezoid $PTRO$, $MR = 9$, $MP = 2$, and $PO = 4$.

What is the length of $TR$?

(1) 4.5   (3) 3
(2) 5   (4) 6
6 A line segment is dilated by a scale factor of 2 centered at a point not on the line segment. Which statement regarding the relationship between the given line segment and its image is true?

(1) The line segments are perpendicular, and the image is one-half of the length of the given line segment.

(2) The line segments are perpendicular, and the image is twice the length of the given line segment.

(3) The line segments are parallel, and the image is twice the length of the given line segment.

(4) The line segments are parallel, and the image is one-half of the length of the given line segment.

7 Which figure always has exactly four lines of reflection that map the figure onto itself?

(1) square

(2) rectangle

(3) regular octagon

(4) equilateral triangle

8 In the diagram below of circle $O$, chord $DF$ bisects chord $BC$ at $E$.

If $BC = 12$ and $FE$ is 5 more than $DE$, then $FE$ is

(1) 13

(2) 9

(3) 6

(4) 4
9 Kelly is completing a proof based on the figure below.

![Triangle Diagram]

She was given that $\angle A \equiv \angle EDF$, and has already proven $AB \equiv DE$. Which pair of corresponding parts and triangle congruency method would not prove $\triangle ABC \equiv \triangle DEF$?

(1) $AC \equiv DF$ and SAS  
(2) $BC \equiv EF$ and SAS  
(3) $\angle C \equiv \angle F$ and AAS  
(4) $\angle CBA \equiv \angle FED$ and ASA

10 In the diagram below, $DE$ divides $AB$ and $AC$ proportionally, $\text{m} \angle C = 26^\circ$, $\text{m} \angle A = 82^\circ$, and $DF$ bisects $\angle BDE$.

![Triangle Diagram]

The measure of angle $DFB$ is

(1) $36^\circ$  
(2) $54^\circ$  
(3) $72^\circ$  
(4) $82^\circ$
11 Which set of statements would describe a parallelogram that can always be classified as a rhombus?

I. Diagonals are perpendicular bisectors of each other.
II. Diagonals bisect the angles from which they are drawn.
III. Diagonals form four congruent isosceles right triangles.

(1) I and II  (3) II and III
(2) I and III  (4) I, II, and III

12 The equation of a circle is \( x^2 + y^2 - 12y + 20 = 0 \). What are the coordinates of the center and the length of the radius of the circle?

(1) center (0,6) and radius 4
(2) center (0,−6) and radius 4
(3) center (0,6) and radius 16
(4) center (0,−6) and radius 16

13 In the diagram of \( \triangle RST \) below, \( m\angle T = 90^\circ \), \( RS = 65 \), and \( ST = 60 \).

What is the measure of \( \angle S \), to the nearest degree?

(1) 23°  (3) 47°
(2) 43°  (4) 67°
14 Triangle $A'B'C'$ is the image of $\triangle ABC$ after a dilation followed by a translation.

Which statement(s) would always be true with respect to this sequence of transformations?

I. $\triangle ABC \cong \triangle A'B'C'$
II. $\triangle ABC \sim \triangle A'B'C'$
III. $AB \parallel A'B'$
IV. $AA' = BB'$

(1) II, only  (3) II and III
(2) I and II  (4) II, III, and IV

15 Line segment $RW$ has endpoints $R(-4,5)$ and $W(6,20)$. Point $P$ is on $RW$ such that $RP:PW$ is 2:3. What are the coordinates of point $P$?

(1) (2,9)  (3) (2,14)
(2) (0,11)  (4) (10,2)

16 The pyramid shown below has a square base, a height of 7, and a volume of 84.

![Pyramid Diagram]

What is the length of the side of the base?

(1) 6  (3) 18
(2) 12  (4) 36
17 In the diagram below of triangle $MNO$, $\angle M$ and $\angle O$ are bisected by $\overline{MS}$ and $\overline{OR}$, respectively. Segments $MS$ and $OR$ intersect at $T$, and $m\angle N = 40^\circ$.

![Diagram of triangle MNO with bisectors MS and OR intersecting at T, and m\angle N = 40^\circ.]

If $m\angle TMR = 28^\circ$, the measure of angle $OTS$ is

(1) $40^\circ$  
(2) $50^\circ$  
(3) $60^\circ$  
(4) $70^\circ$

18 In the diagram below, right triangle $ABC$ has legs whose lengths are 4 and 6.

![Diagram of right triangle ABC with legs 4 and 6.]

What is the volume of the three-dimensional object formed by continuously rotating the right triangle around $\overline{AB}$?

(1) $32\pi$  
(2) $48\pi$  
(3) $96\pi$  
(4) $144\pi$
19 What is an equation of a line that is perpendicular to the line whose equation is $2y = 3x - 10$ and passes through $(-6,1)$?

(1) $y = -\frac{2}{3}x - 5$  
(2) $y = -\frac{2}{3}x - 3$  
(3) $y = \frac{2}{3}x + 1$  
(4) $y = \frac{2}{3}x + 10$

20 In quadrilateral $BLUE$ shown below, $BE \equiv UL$.

Which information would be sufficient to prove quadrilateral $BLUE$ is a parallelogram?

(1) $BL \parallel EU$  
(2) $LU \parallel BE$  
(3) $BE \equiv BL$  
(4) $LU \equiv EU$

21 A ladder 20 feet long leans against a building, forming an angle of $71^\circ$ with the level ground. To the nearest foot, how high up the wall of the building does the ladder touch the building?

(1) 15  
(2) 16  
(3) 18  
(4) 19

22 In the two distinct acute triangles $ABC$ and $DEF$, $\angle B \equiv \angle E$. Triangles $ABC$ and $DEF$ are congruent when there is a sequence of rigid motions that maps

(1) $\angle A$ onto $\angle D$, and $\angle C$ onto $\angle F$  
(2) $AC$ onto $DF$, and $BC$ onto $EF$  
(3) $\angle C$ onto $\angle F$, and $BC$ onto $EF$  
(4) point $A$ onto point $D$, and $AB$ onto $DE$
23 A fabricator is hired to make a 27-foot-long solid metal railing for the stairs at the local library. The railing is modeled by the diagram below. The railing is 2.5 inches high and 2.5 inches wide and is comprised of a rectangular prism and a half-cylinder.

How much metal, to the nearest cubic inch, will the railing contain?
(1) 151 (3) 1808
(2) 795 (4) 2025

24 In the diagram below, \( AC = 7.2 \) and \( CE = 2.4 \).

Which statement is not sufficient to prove \( \triangle ABC \sim \triangle EDC \)?
(1) \( AB \parallel ED \)
(2) \( DE = 2.7 \) and \( AB = 8.1 \)
(3) \( CD = 3.6 \) and \( BC = 10.8 \)
(4) \( DE = 3.0, AB = 9.0, CD = 2.9, \) and \( BC = 8.7 \)
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: Trapezoid $JKLM$ with $JK \parallel ML$

Using a compass and straightedge, construct the altitude from vertex $J$ to $ML$. [Leave all construction marks.]
26 Determine and state, in terms of $\pi$, the area of a sector that intercepts a $40^\circ$ arc of a circle with a radius of 4.5.
The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

Use Cavalieri’s Principle to explain why the volumes of these two triangular prisms are equal.
When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in$^3$. After being fully inflated, its volume is approximately 294 in$^3$. To the nearest tenth of an inch, how much does the radius increase when the volleyball is fully inflated?
29 In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$.
Explain why $\triangle ABC \sim \triangle ACD$. 

![Diagram of right triangle with altitude CD drawn to hypotenuse AB]
30 Triangle $ABC$ and triangle $DEF$ are drawn below.

If $AB \cong DE$, $AC \cong DF$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle $ABC$ onto triangle $DEF$. 
31 Line \( n \) is represented by the equation \( 3x + 4y = 20 \). Determine and state the equation of line \( p \), the image of line \( n \), after a dilation of scale factor \( \frac{1}{3} \) centered at the point (4,2).

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

Explain your answer.
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 has vertices at A(−5,2), B(−4,7), and C(−2,7), and triangle DEF has vertices at D(3,2), E(2,7), and F(0,7). Graph and label △ABC and △DEF on the set of axes below.

Determine and state the single transformation where △DEF is the image of △ABC.

Use your transformation to explain why △ABC ≅ △DEF.
Given: \( RS \) and \( TV \) bisect each other at point \( X \)
\( TR \) and \( SV \) are drawn

Prove: \( TR \parallel SV \)
A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.

A metal pole is used to measure how much gas is in the tank. To the nearest tenth of a foot, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft³ = 7.48 gallons]
Part IV

Answer the 2 questions in this part. Each 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. 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.

35 Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.

[The use of the set of axes on the next page is optional.]
Prove that $PQRS$ is not a square.
[The use of the set of axes below is optional.]
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

Determine and state the speed of the airplane, to the nearest mile per hour.
# 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

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<thead>
<tr>
<th>Shape</th>
<th>Formula</th>
<th>Units</th>
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<tr>
<td>Triangle</td>
<td>$A = \frac{1}{2}bh$</td>
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<td>Parallelogram</td>
<td>$A = bh$</td>
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<td>Circle</td>
<td>$A = \pi r^2$</td>
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<td>Circle</td>
<td>$C = \pi d$ or $C = 2\pi r$</td>
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<td>General Prisms</td>
<td>$V = Bh$</td>
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<td>Cylinder</td>
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<td>Sphere</td>
<td>$V = \frac{4}{3}\pi r^3$</td>
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<td>Cone</td>
<td>$V = \frac{1}{3}\pi r^2h$</td>
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<tr>
<td>Pyramid</td>
<td>$V = \frac{1}{3} Bh$</td>
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<tr>
<th>Theorem</th>
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<tr>
<td>Pythagorean Theorem</td>
<td>$a^2 + b^2 = c^2$</td>
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<tr>
<td>Quadratic Formula</td>
<td>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$</td>
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<tr>
<td>Arithmetic Sequence</td>
<td>$a_n = a_1 + (n - 1)d$</td>
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<tr>
<td>Geometric Sequence</td>
<td>$a_n = a_1r^n - 1$</td>
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<td>Geometric Series</td>
<td>$S_n = \frac{a_1 - a_1r^n}{1 - r}$ where $r \neq 1$</td>
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<tr>
<td>Radians</td>
<td>1 radian = $\frac{180}{\pi}$ degrees</td>
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<td>Degrees</td>
<td>1 degree = $\frac{\pi}{180}$ radians</td>
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<tr>
<td>Exponential Growth/Decay</td>
<td>$A = A_0e^{kt} + B_0$</td>
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Scrap Graph Paper — This sheet will *not* be scored.
Scrap Graph Paper — This sheet will not be scored.
FOR TEACHERS ONLY

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

GEOMETRY (Common Core)

Friday, June 16, 2017 — 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 (Common Core). More detailed information about scoring is provided in the publication Information Booklet for Scoring the Regents Examination in Geometry (Common Core).

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. Units need not be given when the wording of the questions allows such omissions.

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

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

Raters should record the student’s scores for all questions and the total raw score on the student’s separate answer sheet. Then the student’s total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department’s web site at: http://www.p12.nysed.gov/assessment/ on Friday, June 16, 2017. 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.

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* **Question 14** — When scoring this question, either choice 1 or choice 3 should be awarded credit.

** **Question 22** — When scoring this question, all students should be awarded credit regard-less of the answer, if any, they record on the answer sheet for this question.

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/](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 (Common Core). 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/geometrycc/](http://www.nysedregents.org/geometrycc/).
General Rules for Applying Mathematics Rubrics

I. General Principles for Rating
The rubrics for the constructed-response questions on the Regents Examination in Geometry (Common Core) 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 (Common Core), 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 correct construction is drawn showing all appropriate arcs.

[1] An appropriate construction is drawn showing all appropriate arcs, but an altitude is drawn from a vertex other than J.

or

[1] An appropriate construction is drawn showing all appropriate arcs, but the altitude is missing or incorrect.

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

or

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

(26) [2] $2.25\pi$ or an equivalent area in terms of pi is written, and appropriate 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] $2.25\pi$, but no work is shown.

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

(27) [2] A complete and correct explanation is written.

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

or

[1] An incomplete or partially correct explanation is written.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
(28) [2] 0.6, 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] 0.6, 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] A complete and correct explanation is written.

[1] An explanation that contains one conceptual error is written.

or

[1] A correct explanation of why one pair of angles is congruent is written.

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

(30) [2] A correct sequence of transformations is written.

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

or

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

[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] \( y = -\frac{3}{4}x + 5 \) or an equivalent equation is written, and a correct explanation is written.

[1] Appropriate work is shown, but one computational or graphing error is made. A correct explanation is written.

or

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

or

[1] \( y = -\frac{3}{4}x + 5 \) or an equivalent equation is written, but the explanation is incomplete or incorrect.

[0] The equation \( 3x + 4y = 20 \) or an equivalent equation is written, but the explanation is missing.

or

[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] Triangles $ABC$ and $DEF$ are graphed and labeled correctly, a reflection over the correct line is stated, and a correct explanation is written.

[3] Appropriate work is shown, but one or more graphing or labeling errors are made. An appropriate line of reflection is stated, and an appropriate explanation is written.

or

[3] Appropriate work is shown, but the line of reflection is missing or incorrect. An appropriate explanation is written.

[2] Appropriate work is shown, but one or more graphing or labeling errors are made. An appropriate line of reflection is stated, but an incomplete or partially correct explanation is written.

or

[2] Appropriate work is shown to graph and label both triangles, and a correct line of reflection is stated. No further correct work is shown.

[1] Appropriate work is shown to graph and label both triangles, 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.
[4] A complete and correct proof that includes a conclusion is written.

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

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

or

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

or

[2] A proof is written that shows $\triangle TXR \cong \triangle VXS$, but no further correct work is shown.

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

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

or

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

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

or

3. Correct work is shown to find the radius of the cylinder, but no further correct work is shown.

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

or

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

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

or

1. Appropriate work is shown to find the number of cubic feet in the tank, but no further correct work is shown.

or

1. 10.9, but no work is shown.

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

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

(35)  [6] A complete and correct proof that includes concluding statements that $PQRS$ is a rhombus and $PQRS$ is not a square is written.

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

or

[5] Appropriate work is shown to prove $PQRS$ is a rhombus, and work is shown to prove $PQRS$ is not a square. One concluding statement is missing or incorrect.

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

or

[4] Appropriate work is shown, but one conceptual error is made. Appropriate concluding statements are written.

or

[4] Appropriate work is shown to prove $PQRS$ is a rhombus and a concluding statement is written. No further correct work is shown.

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

or

[3] Appropriate work is shown to prove $PQRS$ is a parallelogram and a concluding statement is written. No further correct work is shown.

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

or

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

or
[2] Appropriate work is shown to prove two pairs of opposite sides are parallel. No further correct work is shown.

or

[2] Appropriate work is shown to find the lengths of all four sides. No further correct work is shown.

or

[2] Appropriate work is shown to prove the diagonals are perpendicular bisectors of each other. No further correct work is shown.

or

[2] Appropriate work is shown to prove $PQRS$ is not a square and a concluding statement is written. No further correct work is shown.

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

or

[1] Appropriate work is shown to find the slopes of all four sides. No further correct work is shown.

or

[1] Appropriate work is shown to find the slopes and lengths of one pair of opposite sides. 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.
18,442 and 210, and correct work is shown.

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

[5] Correct work is shown to find 18,442, and the speed of the airplane in miles per minute or feet per hour, but no further correct work is shown.

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

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

[4] Correct work is shown to find the distance the airplane has traveled, 18,442, but no further correct work is shown.

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

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

[2] Two correct trigonometric equations are written to determine how far the airplane has traveled, but no further correct work is shown.

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

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

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

[1] 18,442 and 210, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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 Regents Examination in Geometry (Common Core)  
June 2017  
Chart for Converting Total Test Raw Scores to  
Final Examination Scores (Scale Scores)

The Chart for Determining the Final Examination Score for the June 2017 Regents Examination in Geometry (Common Core) will be posted on the Department's website at: http://www.p12.nysed.gov/assessment/ on Friday, June 16, 2017. Conversion charts provided for previous administrations of the Regents Examination in Geometry (Common Core) 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:


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.
IMPORTANT NOTICE
Notice to Teachers

Regents Examination in Geometry (Common Core)
All Editions

Friday, June 16, 2017, 9:15 a.m.
Questions 14 and 22, Only

This notice applies to students who took the June 16, 2017 Regents Examination in Geometry (Common Core).

As a result of discrepancies in the wording, Questions 14 and 22 do not have only one clear and correct answer.

Question 14
When scoring this examination, either choice 3, the correct answer indicated in the Scoring Key, or choice 1 should be accepted and awarded credit.

Question 22
When scoring this examination, all students should be awarded credit regardless of the answer, if any, they record on the answer sheet for this question.

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

We apologize for any inconvenience this may cause you, and we thank you for your hard work on behalf of the students in New York State.
The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY
(Common Core)

Friday, June 16, 2017 — 9:15 a.m. to 12:15 p.m.

MODEL RESPONSE SET

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25 Given: Trapezoid $JKLM$ with $JK \parallel ML$

Using a compass and straightedge, construct the altitude from vertex $J$ to $ML$. [Leave all construction marks.]

Score 2: The student gave a complete and correct response.
25 Given: Trapezoid $JKLM$ with $JK \parallel ML$

Using a compass and straightedge, construct the altitude from vertex $J$ to $ML$. [Leave all construction marks.]

Score 2: The student gave a complete and correct response.
Given: Trapezoid $JKLM$ with $JK \parallel ML$

Using a compass and straightedge, construct the altitude from vertex $J$ to $ML$.
[Leave all construction marks.]

Score 2: The student gave a complete and correct response.
25 Given: Trapezoid $JKLM$ with $JK \parallel ML$

Using a compass and straightedge, construct the altitude from vertex $J$ to $ML$. [Leave all construction marks.]

**Score 1:** The student did not extend side $ML$ through vertex $M$ to locate the intersection of the extension of $ML$ and the arc drawn from vertex $J$. 
25 Given: Trapezoid $JKLM$ with $JK \parallel ML$

Using a compass and straightedge, construct the altitude from vertex $J$ to $ML$. [Leave all construction marks.]

**Score 1:** The student constructed an altitude correctly, but constructed the altitude from vertex $K$. 
25 Given: Trapezoid $JKLM$ with $JK \parallel ML$

Using a compass and straightedge, construct the altitude from vertex $J$ to $ML$.
[Leave all construction marks.]

**Score 0:** The student had a completely incorrect response.
Determine and state, in terms of \( \pi \), the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

\[
A = \frac{1}{2} (2\pi) \left( \frac{40}{360} \right) \left( \frac{8.1}{4} \right)
\]

\[
A = \frac{1}{2} \left( \frac{9\pi}{2} \right)
\]

\[
A = \frac{9\pi}{4}
\]

**Score 2:** The student gave a complete and correct response.
26 Determine and state, in terms of π, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

\[ A = \pi r^2 \]
\[ A = 4.5^2 \times \pi \]
\[ A = 20.25\pi \]

\[
\frac{\text{Angle}}{\text{Area}} = \frac{40^\circ}{x} = \frac{360^\circ}{20.25\pi}
\]
\[ 360x = 5100\pi \]
\[ x = \frac{9\pi}{4} \]

Score 2: The student gave a complete and correct response.
26 Determine and state, in terms of $\pi$, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

\[
\frac{40}{360} \cdot \pi \cdot (4.5)^2
\]

\[
= \frac{1}{9} \cdot \frac{20.25}{\pi}
\]

\[
= \frac{2.25}{\pi}
\]

\[
= \frac{9}{4\pi}
\]

Score 2: The student gave a complete and correct response.
26 Determine and state, in terms of $\pi$, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

\[ A = \frac{1}{2} \theta \cdot r^2 \]
\[ A = \frac{1}{2} \left( \frac{\pi}{4.5} \right)^2 \]
\[ A = \frac{1}{2} \left( \frac{\pi}{2.25} \right) (20.25) \]
\[ A = \frac{20.25\pi}{2.25} \]
\[ A = 9\pi \]

Score 1: The student made one computational error when multiplying $\left( \frac{1}{2} \right) \left( \frac{\pi}{4.5} \right)$. 
26 Determine and state, in terms of $\pi$, the area of a sector that intercepts a $40^\circ$ arc of a circle with a radius of 4.5.

Score 1: The student made one rounding error.
26 Determine and state, in terms of $\pi$, the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

Score 0: The student had a correct answer with incorrect work.
26 Determine and state, in terms of \(\pi\), the area of a sector that intercepts a 40° arc of a circle with a radius of 4.5.

\[
\begin{align*}
A &= \pi r^2 \\
A &= \pi \cdot 4.5^2 \\
A &= 20.25\pi
\end{align*}
\]

**Score 0:** The student did not show enough correct work to receive any credit.
The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

Use Cavalieri’s Principle to explain why the volumes of these two triangular prisms are equal.

The volumes of these 2 triangular prisms are equal because of Cavalieri’s principle which states that if the base area is the same in the 2 figures, in this case 20 units$^2$, the height is the same in the 2 figures, in this case 14, and the cross sections remain the same area as the base area, the volumes are the same:

\[
\begin{align*}
20(14) & = 280 \\
14(20) & = 280
\end{align*}
\]

Score 2: The student gave a complete and correct response.
The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

Use Cavalieri’s Principle to explain why the volumes of these two triangular prisms are equal.

\[
\text{V of Figure A } 14 \left( \frac{5 \times 8}{2} \right) = 280 \\
\text{V of Figure B } 14 \left( \frac{8 \times 5}{2} \right) = 280
\]

A and B have the same base area and height. So, their volumes are equal.

**Score 2:** The student gave a complete and correct response.
27 The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

Use Cavalieri’s Principle to explain why the volumes of these two triangular prisms are equal.

Figure A: \[ B = \frac{1}{2}(5)(8) = 20 \]

Figure B: \[ B = \frac{1}{2}(8)(5) = 20 \]

The base areas of the two figures are the same so the volumes of the prisms are equal.

Score 1: The student wrote an incomplete explanation.
The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

Use Cavalieri’s Principle to explain why the volumes of these two triangular prisms are equal.

\[
\begin{align*}
V_A &= \frac{1}{2} \cdot 8 \cdot 5 \cdot 14 \\
V_B &= \frac{1}{2} \cdot 5 \cdot 8 \cdot 14 \\
V_A &= \frac{1}{2} \cdot 40 \cdot 14 \\
V_B &= \frac{1}{2} \cdot 40 \cdot 14 \\
V_A &= 280 \\
V_B &= 280
\end{align*}
\]

Score 1: The student showed algebraically that both prisms have equal volumes, but did not write an explanation using Cavalieri’s Principle.
The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

Use Cavalieri’s Principle to explain why the volumes of these two triangular prisms are equal.

\[ V_{\text{of } \triangle} = \frac{1}{2} b h \]

\[ V = \frac{1}{2} (5) \cdot (8) \]

\[ V = 20 \]

\[ V_{\text{of } \triangle} = \frac{1}{2} b h \]

\[ V = \frac{1}{2} (8) \cdot (5) \]

\[ V = 20 \]

The volume of the \( \triangle \) will be the same making the prisms equal because the base and height can be used interchangeably in the volume of a \( \triangle \) formula. It is shown in the work above.

Score 0: The student wrote an incorrect explanation.
27 The diagram below shows two figures. Figure A is a right triangular prism and figure B is an oblique triangular prism. The base of figure A has a height of 5 and a length of 8 and the height of prism A is 14. The base of figure B has a height of 8 and a length of 5 and the height of prism B is 14.

Use Cavalieri’s Principle to explain why the volumes of these two triangular prisms are equal.

Score 0: The student did not show enough correct relevant work to receive any credit.
When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in$^3$. After being fully inflated, its volume is approximately 294 in$^3$. To the nearest tenth of an inch, how much does the radius increase when the volleyball is fully inflated?

\[
\frac{180}{\frac{4}{3}} = \frac{\frac{4}{3} \pi r^3}{\frac{4}{3}} \\
135 = \pi r^3 \\
\frac{135}{\pi} = r^3 \\
\sqrt[3]{42.97183463} = \sqrt[3]{r^3} \\
r = 3.502632975
\]

\[
\frac{294}{\frac{4}{3}} = \frac{\frac{4}{3} \pi r^3}{\frac{4}{3}} \\
220.5 = \pi r^3 \\
\sqrt[3]{220.5} = \sqrt[3]{\pi r^3} \\
\sqrt[3]{70.1673299} = \sqrt[3]{r^3} \\
r = 4.124958408
\]

the radius increased
0.6 of an inch

Score 2: The student gave a complete and correct response.
When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in\(^3\). After being fully inflated, its volume is approximately 294 in\(^3\). To the nearest tenth of an inch, how much does the radius increase when the volleyball is fully inflated?

\[
\frac{3}{4} \times 180 = \frac{4 \pi r^3}{3} \\
\frac{540}{4 \pi} = \frac{4 \pi r^3}{4 \pi} \\
\frac{\frac{540}{4 \pi}}{\frac{4 \pi}{4 \pi}} = \frac{135}{\pi} \\
V = 135 \pi \\
\frac{3}{4}V = \frac{4 \pi r^3}{3} \\
\frac{3}{4} \times 294 = \frac{4 \pi r^3}{3} \\
\frac{867}{4 \pi} = \frac{4 \pi r^3}{4 \pi} \\
\frac{867}{4 \pi} \approx 8.8 \\
\frac{8.8 - 7.5}{2} = 1.3
\]

**Score 1:** The student made a computational error when dividing by \(4\pi\).
28 When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately $180 \text{ in}^3$. After being fully inflated, its volume is approximately $294 \text{ in}^3$. To the nearest tenth of an inch, how much does the radius increase when the volleyball is fully inflated?

\[
\frac{3}{4} \left( 180 = \frac{4}{3} \pi r^2 \right)
\]
\[
135 = \pi r^2
\]
\[
r^2 = \frac{135}{\pi}
\]
\[
r_1 = 6.555290584
\]

\[
\frac{3}{4} \left( 294 = \frac{4}{3} \pi r^2 \right)
\]
\[
220.5 = \pi r^2
\]
\[
r^2 = \frac{220.5}{\pi}
\]
\[
r_2 = 8.37787888
\]

\[
r_2 - r_1 = 1.822497304
\]

**Score 1:** The student calculated the square root in both equations rather than the cube root.
When volleyballs are purchased, they are not fully inflated. A partially inflated volleyball can be modeled by a sphere whose volume is approximately 180 in$^3$. After being fully inflated, its volume is approximately 294 in$^3$. To the nearest tenth of an inch, how much does the radius increase when the volleyball is fully inflated?

\[
\begin{align*}
V &= 180 \\
V &= \frac{4}{3}\pi r^3 \\
180 &= \frac{4}{3}\pi r^3 \\
294 &= \frac{4}{3}\pi r^3 \\
98 &= \frac{4}{3}\pi r^3 \\
94 &= \pi r^3 \\
\sqrt{94.5} &\approx r^3 \\
\approx 4.4 \\
\end{align*}
\]

The volleyball increased 0.7 inches.

Score 0:  The student did not show enough correct work to receive any credit.
In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$. Explain why $\triangle ABC \sim \triangle ACD$.

Score 2: The student gave a complete and correct response.
29 In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$. Explain why $\triangle ABC \sim \triangle ACD$.

If an altitude is drawn to the hypotenuse of a right triangle, it divides the $\triangle$ into 2 right $\triangle$s each similar to each other and to the original right $\triangle$.

**Score 2:** The student gave a complete and correct response.
29 In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$. Explain why $\triangle ABC \sim \triangle ACD$.

Score 2: The student gave a complete and correct response.
In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$. Explain why $\triangle ABC \sim \triangle ACD$.

$\triangle ABC \sim \triangle ACD$ because they both share the side $CA$, so it's congruent. In triangle $ABC$, angle $C$ is a right angle, in $\triangle ACD$, $\angle D$ is a right angle because $CD$ is an altitude to $AB$ so $\angle D$ is congruent to $\angle C$.

**Score 1:** The student explained correctly why one pair of angles is congruent.
29 In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$. Explain why $\triangle ABC \sim \triangle ACD$.

The triangles are similar, because they have a pair of $\angle$'s.

Score 1: The student wrote an incomplete explanation.
29 In right triangle $ABC$ shown below, altitude $CD$ is drawn to hypotenuse $AB$. Explain why $\triangle ABC \sim \triangle ACD$.

$\triangle ABC$ is $\sim$ to $\triangle ACD$ because all of their corresponding angles have the same measurement.

**Score 1:** The student used a specific example to make a general conclusion of triangle similarity.
29 In right triangle ABC shown below, altitude CD is drawn to hypotenuse AB. Explain why \( \triangle ABC \sim \triangle ACD \).

Score 0: The student wrote an incorrect explanation.

The altitude creates a perpendicular line. This makes right angles. Right angles means right triangles. Right triangles are similar.
Triangle $ABC$ and triangle $DEF$ are drawn below.

If $AB \cong DE$, $AC \cong DF$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle $ABC$ onto triangle $DEF$.

A translation along vector $\overrightarrow{CF}$ so $C$ maps onto $F$, followed by a rotation about $F$ that maps $\angle A$ to $\angle D$, $\overrightarrow{AB}$ to $\overrightarrow{DE}$, and $\overrightarrow{AC}$ to $\overrightarrow{DF}$.

**Score 2:** The student gave a complete and correct response.
30 Triangle $ABC$ and triangle $DEF$ are drawn below.

If $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle $ABC$ onto triangle $DEF$.

Score 2: The student gave a complete and correct response.
30 Triangle $ABC$ and triangle $DEF$ are drawn below.

If $AB \cong DE$, $AC \cong DF$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle $ABC$ onto triangle $DEF$.

Rotation about point $P$ until $\angle A$ maps onto $\angle D$.

**Score 2:** The student wrote a correct transformation based upon a correct construction to find the point of rotation, which is the point of intersection of the perpendicular bisectors of the segments whose endpoints are the corresponding vertices of the triangles.
30 Triangle $ABC$ and triangle $DEF$ are drawn below.

If $AB \equiv DE$, $AC \equiv DF$, and $\angle A \equiv \angle D$, write a sequence of transformations that maps triangle $ABC$ onto triangle $DEF$.

First you would translate triangle $ABC$ to the right. Next you would then translate triangle $ABC$ up. Last you would rotate triangle $ABC$ clockwise until $\angle A$ matched up with $\angle D$.

Score 1: The student wrote an incomplete sequence of transformations.
30 Triangle $ABC$ and triangle $DEF$ are drawn below.

If $AB \cong DE$, $AC \cong DF$, and $\angle A \cong \angle D$, write a sequence of transformations that maps triangle $ABC$ onto triangle $DEF$.

Score 1: The student demonstrated knowledge of the transformation, but the written sequence was incomplete.
If $AB \equiv DE$, $AC \equiv DF$, and $\angle A \equiv \angle D$, write a sequence of transformations that maps triangle $ABC$ onto triangle $DEF$.

Score 0: The student wrote an incorrect sequence of transformations.
Line $n$ is represented by the equation $3x + 4y = 20$. Determine and state the equation of line $p$, the image of line $n$, after a dilation of scale factor $\frac{1}{3}$ centered at the point (4,2).

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

Explain your answer.

\[\begin{align*}
\text{Line } p \\
3x + 4y &= 20 \\
\text{The line was on the center of dilation, therefore the line remains invariant.}
\end{align*}\]

\[\begin{align*}
-3x + 4y &= 20 \\
4y &= -3x + 20 \\
y &= -\frac{3}{4}x + 5
\end{align*}\]

Score 2: The student gave a complete and correct response.
**Question 31**

31 Line \( n \) is represented by the equation \( 3x + 4y = 20 \). Determine and state the equation of line \( p \), the image of line \( n \), after a dilation of scale factor \( \frac{1}{3} \) centered at the point \( (4,2) \). [The use of the set of axes below is optional.]

Explain your answer.

\[
\begin{align*}
\left(y = 3x + 20\right) & \quad \frac{1}{3} \\
y & = \frac{-3}{4}x + \frac{5}{3}
\end{align*}
\]

**Score 2:** The student gave a complete and correct response.
Line $n$ is represented by the equation $3x + 4y = 20$. Determine and state the equation of line $p$, the image of line $n$, after a dilation of scale factor $\frac{1}{3}$ centered at the point $(4,2)$. 

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

Explain your answer.

The line is on the center of dilation so the line doesn't change.

Score 1: The student wrote a correct explanation, but did not write the equation of line $p$. 
31 Line $n$ is represented by the equation $3x + 4y = 20$. Determine and state the equation of line $p$, the image of line $n$, after a dilation of scale factor $\frac{1}{3}$ centered at the point $(4,2)$. [The use of the set of axes below is optional.]

Explain your answer.

$$3x + 4y = 20$$

$$-3x - 3x$$

$$4y = 20 - 3x$$

$$\frac{4y}{4} = \frac{20 - 3x}{4}$$

$$y = 5 - \frac{3}{4}x$$

$$5 \times \frac{1}{3} = \frac{5}{3}$$

$$y = \frac{5}{3} - \frac{3}{4}x$$

The $y$ intercept is dilated but the slope stays the same.

Score 1: The student did not account for the center of dilation being on line $n$. 

Geometry (Common Core) – June ’17 [41]
31 Line \( n \) is represented by the equation \( 3x + 4y = 20 \). Determine and state the equation of line \( p \), the image of line \( n \), after a dilation of scale factor \( \frac{1}{3} \) centered at the point \((4,2)\).

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

Explain your answer.

Score 0:  The student wrote an incorrect equation and did not write an explanation.
31 Line $n$ is represented by the equation $3x + 4y = 20$. Determine and state the equation of line $p$, the image of line $n$, after a dilation of scale factor $\frac{1}{3}$ centered at the point $(4,2)$. [The use of the set of axes below is optional.]

Explain your answer.

Score 0: The student rewrote the given equation to graph the line, but did not write an explanation.
Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Reflect $\triangle ABC$ over the line $x = -1$.

Reflections are rigid motions that preserve angle measures and side lengths, so $\triangle ABC \cong \triangle DEF$.

Score 4: The student gave a complete and correct response.
Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

\begin{itemize}
  \item Reflection over $x = -2$
  \item $\triangle ABC \cong \triangle DEF$ because reflections don't change side or angle measures
\end{itemize}

**Score 3:** The student miscounted when writing the equation of the line of reflection.
Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

$\triangle DEF$ was reflected over line $x = -1$. I know because all the points are equidistant from that line that are the images.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

$\triangle ABC \cong \triangle DEF$ by SSS because all the sides are the same length because of Pythagorean theorem.

Score 3: The student gave an explanation for why the triangles are congruent, but did not use the transformation to explain why.
32 Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Score 3: The student wrote a partially correct explanation.
Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

**Score 2:** The student graphed and labeled the triangles correctly and stated the correct line of reflection, but no further correct work was shown.
Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Reflected $\triangle ABC$ over line $l$ onto $\triangle DEF$.

They are congruent because they are the same size.

Score 2:  The triangles were graphed and labeled correctly and a correct transformation was written, but no further correct work was shown.
Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Score 1: The student graphed and labeled both triangles correctly, but no further correct work was shown.
32 Triangle $ABC$ has vertices at $A(-5,2)$, $B(-4,7)$, and $C(-2,7)$, and triangle $DEF$ has vertices at $D(3,2)$, $E(2,7)$, and $F(0,7)$. Graph and label $\triangle ABC$ and $\triangle DEF$ on the set of axes below.

Determine and state the single transformation where $\triangle DEF$ is the image of $\triangle ABC$.

Use your transformation to explain why $\triangle ABC \cong \triangle DEF$.

Score 0: The student had a completely incorrect response.
33 Given: \( \overline{RS} \) and \( \overline{TV} \) bisect each other at point \( X \)
\( \overline{TR} \) and \( \overline{SV} \) are drawn

Prove: \( \overline{TR} \parallel \overline{SV} \)

**Score 4:** The student gave a complete and correct response.
33 Given: $RS$ and $TV$ bisect each other at point $X$
$TR$ and $SV$ are drawn

Prove: $TR \parallel SV$

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $RS$ and $TV$ bisect each other</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. $TX = VX$; $SX = RX$</td>
<td>2. A segment bisector divides a segment into two parts.</td>
</tr>
<tr>
<td>3. $\angle TXR$ and $\angle SXV$ are vertical angles</td>
<td>3. 2 lines intersect to create vertical angle.</td>
</tr>
<tr>
<td>4. $\triangle TRX \cong \triangle SVX$</td>
<td>4. Vertical angles one $\cong$</td>
</tr>
<tr>
<td>5. $\triangle TRX \cong \triangle SVX$</td>
<td>5. $S, A, S \cong S, A, S$</td>
</tr>
<tr>
<td>6. $\angle TSE = \angle V$</td>
<td>6. CPCTC</td>
</tr>
<tr>
<td>7. $TR \parallel SV$</td>
<td>7. Congruent alternate interior angles create parallel lines</td>
</tr>
</tbody>
</table>

**Score 4:** The student gave a complete and correct response.
33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point $X$
$\overline{TR}$ and $\overline{SV}$ are drawn

Prove: $\overline{TR} \parallel \overline{SV}$

Score 3: The student had an incorrect reason to prove statement 8.
Question 33

33 Given: \(RS\) and \(TV\) bisect each other at point \(X\)
\(TR\) and \(SV\) are drawn

Prove: \(TR \parallel SV\)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (RS \text{ and } TV) bisect each other at (X)</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. (TX = VX, RX = XS)</td>
<td>2. Definition of bisector</td>
</tr>
<tr>
<td>3. (L1 = L2)</td>
<td>3. Vertical angles are (\cong)</td>
</tr>
<tr>
<td>4. (\triangle TRX \cong \triangle VXS)</td>
<td>4. (\angle ASA \cong \angle ASA)</td>
</tr>
<tr>
<td>5. (TR \parallel SV)</td>
<td>5. (CPCTAC)</td>
</tr>
</tbody>
</table>

Score 2: The triangles were proven congruent, but no further correct work was shown.
33 Given: $RS$ and $TV$ bisect each other at point $X$
$TR$ and $SV$ are drawn

Prove: $TR \parallel SV$

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $RS$ and $TV$ bisect each other, $TR$ and $SV$ are drawn.</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. $X$ is the midpoint of $RS$ and $TV$</td>
<td>2. Bisector definition</td>
</tr>
<tr>
<td>3. $XR \cong XS$, $XT \cong XV$</td>
<td>3. Midpoint definition</td>
</tr>
<tr>
<td>4. $\angle 1 \cong \angle 2$</td>
<td>4. Vertical $\angle$'s are $\cong$</td>
</tr>
<tr>
<td>5. $\triangle TRX \cong \triangle VXS$</td>
<td>5. SAS</td>
</tr>
<tr>
<td>6. $TR \parallel SV$</td>
<td>6. CPCTC</td>
</tr>
</tbody>
</table>

Score 2: The triangles were proven congruent, but no further correct work was shown.
33 Given: $\overline{RS}$ and $\overline{TV}$ bisect each other at point $X$
$\overline{TR}$ and $\overline{SV}$ are drawn

Prove: $\overline{TR} \parallel \overline{SV}$

Score 1: The student correctly proved $\overline{TX} \cong \overline{XV}$ and $\overline{RX} \cong \overline{XS}$, but no further correct work was shown.
33 Given: $RS$ and $TV$ bisect each other at point $X$

$TR$ and $SV$ are drawn

Prove: $TR \parallel SV$

Score 0: The student had a completely incorrect response.
A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.

A metal pole is used to measure how much gas is in the tank. To the nearest tenth of a foot, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft³ = 7.48 gallons]

\[ V = \pi r^2 h \]
\[ V = \frac{20,000}{7.48} \]
\[ r = \sqrt{\frac{V}{\pi h}} \]
\[ r = \sqrt{\frac{2673.796}{\pi 34.5}} \]
\[ r = 4.908 \text{ ft} \]
\[ d = 9.9 \text{ ft} \]
\[ r + 1 \text{ ft} \]
\[ 10.9 \text{ ft} \]

The pole must be 10.9 ft to reach the bottom w/one foot of metal still outside the tank.

Score 4: The student gave a complete and correct response.
A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.

A metal pole is used to measure how much gas is in the tank. To the nearest tenth of a foot, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft³ = 7.48 gallons]

\[
\frac{\pi}{3} = \frac{20000}{7.48} \approx 2673.8 \text{ ft}^3 \\
\text{Volume of tank} = \pi r^2 h \\
2673.8 = \pi r^2 (34.5) \\
r^2 = \frac{2673.8}{34.5} \\
r = 8.8035 \\
\text{Length of pole} = 2r + 1 \\
= 2(8.8035) + 1 = 18.6 \\
\]

Score 3: The student did not divide by \(\pi\) when finding the radius.
A metal pole is used to measure how much gas is in the tank. To the nearest tenth of a foot, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft³ = 7.48 gallons]

Score 3: The student found the length of the radius, but no further correct work was shown.
A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.

A metal pole is used to measure how much gas is in the tank. To the nearest tenth of a foot, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft³ = 7.48 gallons]

\[ V = \pi r^2 h \]
\[ 20,000 = \pi r^2 (34.5) \]
\[ 20,000 = 108.38 r^2 \]
\[ \frac{20,000}{108.38} = r^2 \]
\[ \sqrt{184.54} = r \]
\[ 13.58 = r \]
\[ 13.58 \times 2 + 1 = (28.2) \text{ ft} \]

**Score 2:** The student did not convert gallons to cubic feet.
A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.

A metal pole is used to measure how much gas is in the tank. To the nearest tenth of a foot, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft$^3$ = 7.48 gallons]

Score 1: The student found the volume in cubic feet, but no further correct work was shown.
A gas station has a cylindrical fueling tank that holds the gasoline for its pumps, as modeled below. The tank holds a maximum of 20,000 gallons of gasoline and has a length of 34.5 feet.

A metal pole is used to measure how much gas is in the tank. To the nearest tenth of a foot, how long does the pole need to be in order to reach the bottom of the tank and still extend one foot outside the tank? Justify your answer. [1 ft³ = 7.48 gallons]

Score 0: The student had a completely incorrect response.
Quadrilateral \(PQRS\) has vertices \(P(-2,3), Q(3,8), R(4,1),\) and \(S(-1,-4)\).

Prove that \(PQRS\) is a rhombus.

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

```
Prove \(PQRS\) is a rhombus.
Distance Formula:
\[
\begin{align*}
\overline{PQ} &= \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} = \sqrt{(-2-3)^2 + (3-8)^2} = 5 \sqrt{2} \\
\overline{QR} &= \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} = \sqrt{(3-4)^2 + (8-1)^2} = 5 \sqrt{2} \\
\overline{RS} &= \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} = \sqrt{(4-1)^2 + (1+4)^2} = 5 \sqrt{2} \\
\overline{PS} &= \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} = \sqrt{(-1+2)^2 + (-4+3)^2} = 5 \sqrt{2}
\end{align*}
\]

\(\overline{PQ} = \overline{QR} = \overline{RS} = \overline{PS}\)

\(\therefore\) \(PQRS\) is a rhombus because all sides are equal.
```
Prove that $PQRS$ is not a square.

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

Score 6: The student gave a complete and correct response.
Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.

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

Since all 4 sides of quadrilateral $PQRS$ are equal, $PQRS$ is a rhombus.
Prove that $PQRS$ is not a square.
[The use of the set of axes below is optional.]

\[
\begin{align*}
PR &= \sqrt{(4-(\cdot \cdot \cdot))^2 + (1-3)^2} \\
&= \sqrt{6^2 + (-2)^2} \\
&= \sqrt{36 + 4} \\
&= \sqrt{40}
\end{align*}
\]

\[
\begin{align*}
QS &= \sqrt{(-1-3)^2 + (-4-8)^2} \\
&= \sqrt{(-4)^2 + (-12)^2} \\
&= \sqrt{16 + 144} \\
&= \sqrt{160}
\end{align*}
\]

Since diagonals $PR$ and $QS$ are not congruent, rhombus $PQRS$ is not a square.

**Score 6:** The student gave a complete and correct response.
35 Quadrilateral $PQRS$ has vertices $P(-2,3), Q(3,8), R(4,1),$ and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.
[The use of the set of axes on the next page is optional.]
Prove that \( PQRS \) is not a square.

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

\[ m = \frac{y_1 - y_2}{x_1 - x_2} \]
\[ PQ \ m = \frac{3 - 8}{2 - 3} = \frac{-5}{-1} = -5 \]
\[ QR \ m = \frac{5 - 5}{-5 - 2} = 0 \]
\[ RS \ m = \frac{3 + 11}{-2 + 1} = \frac{14}{-1} = -7 \]

\[ PQRS \text{ is not a square because the slopes are not negative reciprocals.} \]

**Score 5:** The student wrote an incomplete concluding statement when proving \( PQRS \) is not a square.
35 Quadrilateral $PQRS$ has vertices $P(-2,3), Q(3,8), R(4,1), \text{ and } S(-1,-4)$.

Prove that $PQRS$ is a rhombus.
[The use of the set of axes on the next page is optional.]

Question 35 is continued on the next page.
Prove that $PQRS$ is not a square.

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

\begin{itemize}
  \item $PQRS$ is a rhombus because all of its sides are congruent.
\end{itemize}

\textbf{Score 4:} $PQRS$ is a rhombus was proven, but no further correct work was shown.
35 Quadrilateral PQRS has vertices P\((-2,3)\), Q\((3,8)\), R\((4,1)\), and S\((-1,-4)\).

Prove that PQRS is a rhombus.

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

Question 35 is continued on the next page.
Prove that $PQRS$ is not a square.

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

**Score 3:** $PQRS$ is a parallelogram was proven, but no further correct work was shown.
35 Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.

[The use of the set of axes on the next page is optional.]
Prove that $PQRS$ is not a square.

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

**Score 2:** The student found the lengths of all four sides, but no further correct work was shown.
Quadrilateral $PQRS$ has vertices $P(-2,3)$, $Q(3,8)$, $R(4,1)$, and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.

[The use of the set of axes on the next page is optional.]
Prove that $PQRS$ is not a square.

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

Score 1: The student found the slopes of two consecutive sides, but wrote an incomplete concluding statement about why $PQRS$ is not a square.
35 Quadrilateral $PQRS$ has vertices $P(-2,3), Q(3,8), R(4,1),$ and $S(-1,-4)$.

Prove that $PQRS$ is a rhombus.

[The use of the set of axes on the next page is optional.]
Prove that $PQRS$ is not a square.

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

Score 0: The student did not show enough correct work to receive any credit.
36 Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

Determine and state the speed of the airplane, to the nearest mile per hour.

Score 6:  The student gave a complete and correct response.
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

\[
\begin{align*}
n &= \frac{6250}{\tan 15} = 23,325.3' \\
x &= \frac{6250}{\tan 52} = -4,883.0' \\
\end{align*}
\]

Distance traveled in 1 min.

\[
\frac{18,442'}{1 \text{ min.}} \cdot \frac{60 \text{ min.}}{1 \text{ hr.}} \cdot \frac{1 \text{ mi}}{5,280'} = 210 \text{ mi/h}
\]

Determine and state the speed of the airplane, to the nearest mile per hour.

\[
\text{Score 6: } \quad \text{The student gave a complete and correct response.}
\]
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

Determine and state the speed of the airplane, to the nearest mile per hour.

Score 5:  The student used an acceptable alternative method to find the correct distance traveled by the airplane, but found the speed of the airplane in feet per hour.
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

Determine and state the speed of the airplane, to the nearest mile per hour.

Score 4: The student found the correct distance traveled by the airplane, but no further correct work was shown.
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

Determine and state the speed of the airplane, to the nearest mile per hour.

\[
\sin 15° = \frac{6250}{x} \\
2414.81
\]

\[
\sin 52° = \frac{6250}{x} \\
7931.36
\]

Determine and state the speed of the airplane, to the nearest mile per hour.

\[
1 \text{ mile} = 5280 \text{ feet} \\
1 \text{ hour} = 60 \text{ minutes}
\]

\[
\frac{16217 \text{ ft/min}}{5280} = 3.0714 \text{ ft/min}
\]

\[
3.0714 \times 60 = 184.884
\]

185 miles per hour

Score 3: The student made an error by using the sine function and made a transcription error.
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

The airplane traveled 3,276 ft

Determine and state the speed of the airplane, to the nearest mile per hour.

\[
\begin{align*}
\sin 15^\circ &= \frac{6250}{x} \\
6250 &= x \sin 15^\circ \\
x &= \frac{6250}{\sin 15^\circ} \\
x &= 9611
\end{align*}
\]

\[
\begin{align*}
\sin 52^\circ &= \frac{6250}{x} \\
6250 &= x \sin 52^\circ \\
x &= \frac{6250}{\sin 52^\circ} \\
x &= 6335
\end{align*}
\]

The speed of the airplane is 19,6560 miles per hour.

1 min = 60 sec
1 hour = 60 minutes
3276 \times 60 = 196560

Score 2: The student made one conceptual error by using the sine function and two other errors by using radian measure and not dividing by 5280.
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

\[
\begin{align*}
\tan 15^\circ &= \frac{6250}{x} \\
0.27 &= \frac{6250}{x} \\
x &= \frac{6250}{0.27} = 23148.15
\end{align*}
\]

The airplane has traveled 23379.6 feet for 23148.15.

Determine and state the speed of the airplane, to the nearest mile per hour.

\[
\begin{align*}
\text{minute} &= 29629.6 \text{ foot} \\
60 \text{ min} &= (60 \times 29629.6) \\
&= 1777776
\end{align*}
\]

The nearest mile per hour is 1777776.

Score 1: The student wrote only one correct relevant trigonometric equation. No further correct work was shown.
Freda, who is training to use a radar system, detects an airplane flying at a constant speed and heading in a straight line to pass directly over her location. She sees the airplane at an angle of elevation of 15° and notes that it is maintaining a constant altitude of 6250 feet. One minute later, she sees the airplane at an angle of elevation of 52°. How far has the airplane traveled, to the nearest foot?

Determine and state the speed of the airplane, to the nearest mile per hour.

Score 0: The student had a completely incorrect response.
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 (Common Core).