### The University of the State of New York

#### REGENTS HIGH SCHOOL EXAMINATION

# **GEOMETRY (Common Core)**

**Friday**, June 17, 2016 — 1:15 to 4:15 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. Write 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...

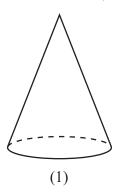
A graphing calculator, a straightedge (ruler), and a compass must be available for you to use while taking this examination.

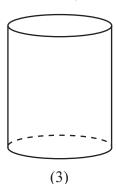
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

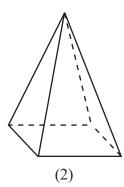
Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression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

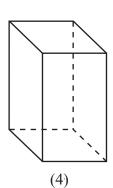
Use this space for computations.

1 A student has a rectangular postcard that he folds in half lengthwise. Next, he rotates it continuously about the folded edge. Which three-dimensional object below is generated by this rotation?









- **2** A three-inch line segment is dilated by a scale factor of 6 and centered at its midpoint. What is the length of its image?
  - (1) 9 inches

(3) 15 inches

(2) 2 inches

(4) 18 inches

3 Kevin's work for deriving the equation of a circle is shown below.

$$x^2 + 4x = -(y^2 - 20)$$

STEP 1 
$$x^2 + 4x = -y^2 + 20$$

STEP 2 
$$x^2 + 4x + 4 = -y^2 + 20 - 4$$

STEP 3 
$$(x + 2)^2 = -y^2 + 20 - 4$$

STEP 4 
$$(x + 2)^2 + y^2 = 16$$

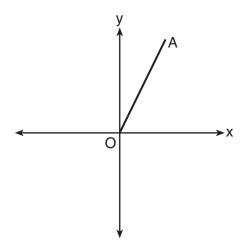
In which step did he make an error in his work?

(1) Step 1

(3) Step 3

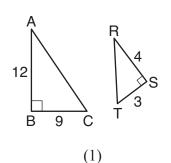
(2) Step 2

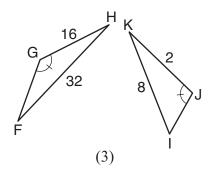
- (4) Step 4
- **4** Which transformation of  $\overline{OA}$  would result in an image parallel to  $\overline{OA}$ ?

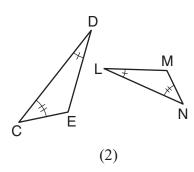


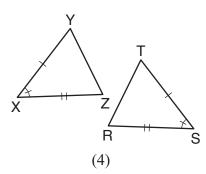
- (1) a translation of two units down
- (2) a reflection over the x-axis
- (3) a reflection over the y-axis
- (4) a clockwise rotation of  $90^{\circ}$  about the origin

**5** Using the information given below, which set of triangles can *not* be proven similar?









**6** A company is creating an object from a wooden cube with an edge length of 8.5 cm. A right circular cone with a diameter of 8 cm and an altitude of 8 cm will be cut out of the cube. Which expression represents the volume of the remaining wood?

$$(1) \ (8.5)^3 - \pi(8)^2(8)$$

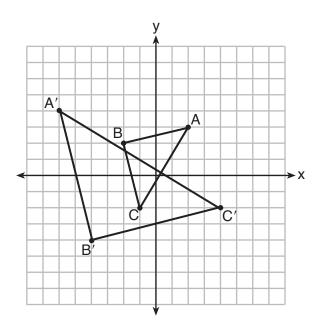
(3) 
$$(8.5)^3 - \frac{1}{3}\pi(8)^2(8)$$

(2) 
$$(8.5)^3 - \pi(4)^2(8)$$

(2) 
$$(8.5)^3 - \pi(4)^2(8)$$
 (4)  $(8.5)^3 - \frac{1}{3}\pi(4)^2(8)$ 

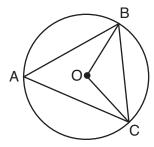
- 7 Two right triangles must be congruent if
  - (1) an acute angle in each triangle is congruent
  - (2) the lengths of the hypotenuses are equal
  - (3) the corresponding legs are congruent
  - (4) the areas are equal

**8** Which sequence of transformations will map  $\triangle ABC$  onto  $\triangle A'B'C'$ ?



- (1) reflection and translation
- (2) rotation and reflection
- (3) translation and dilation
- (4) dilation and rotation
- **9** In parallelogram ABCD, diagonals  $\overline{AC}$  and  $\overline{BD}$  intersect at E. Which statement does not prove parallelogram ABCD is a rhombus?
  - $(1) \ \overline{AC} \cong \overline{DB}$
  - (2)  $\overline{AB} \cong \overline{BC}$
  - (3)  $\overline{AC} \perp \overline{DB}$
  - (4)  $\overline{AC}$  bisects  $\angle DCB$ .

**10** In the diagram below of circle O,  $\overline{OB}$  and  $\overline{OC}$  are radii, and chords AB, BC, and AC are drawn.



Which statement must always be true?

- (1)  $\angle BAC \cong \angle BOC$
- (2)  $m \angle BAC = \frac{1}{2} m \angle BOC$
- (3)  $\triangle BAC$  and  $\triangle BOC$  are isosceles.
- (4) The area of  $\triangle BAC$  is twice the area of  $\triangle BOC$ .
- 11 A 20-foot support post leans against a wall, making a 70° angle with the ground. To the nearest tenth of a foot, how far up the wall will the support post reach?
  - (1) 6.8

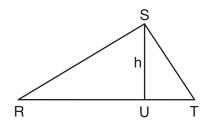
(3) 18.7

(2) 6.9

- (4) 18.8
- 12 Line segment NY has endpoints N(-11,5) and Y(5,-7). What is the equation of the perpendicular bisector of  $\overline{NY}$ ?

  - (1)  $y + 1 = \frac{4}{3}(x + 3)$  (3)  $y 6 = \frac{4}{3}(x 8)$
  - (2)  $y + 1 = -\frac{3}{4}(x + 3)$  (4)  $y 6 = -\frac{3}{4}(x 8)$

**13** In  $\triangle RST$  shown below, altitude  $\overline{SU}$  is drawn to  $\overline{RT}$  at U.



If SU = h, UT = 12, and RT = 42, which value of h will make  $\triangle RST$  a right triangle with  $\angle RST$  as a right angle?

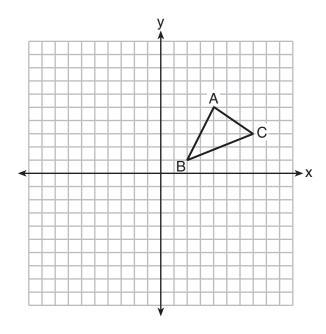
(1)  $6\sqrt{3}$ 

(3)  $6\sqrt{14}$ 

(2)  $6\sqrt{10}$ 

 $(4) 6\sqrt{35}$ 

**14** In the diagram below,  $\triangle ABC$  has vertices A(4,5), B(2,1), and C(7,3).



What is the slope of the altitude drawn from A to  $\overline{BC}$ ?

 $(1) \frac{2}{5}$ 

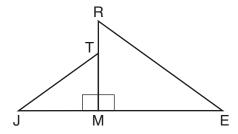
 $(3) -\frac{1}{2}$ 

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

 $(4) -\frac{5}{2}$ 

[7]

**15** In the diagram below,  $\triangle ERM \sim \triangle JTM$ .



Which statement is always true?

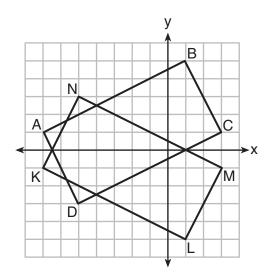
(1) 
$$\cos J = \frac{RM}{RE}$$

(3) 
$$\tan T = \frac{RM}{EM}$$

(2) 
$$\cos R = \frac{JM}{JT}$$

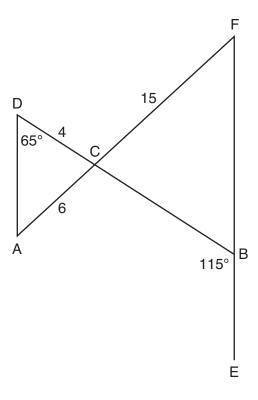
(4) 
$$\tan E = \frac{TM}{JM}$$

**16** On the set of axes below, rectangle *ABCD* can be proven congruent to rectangle *KLMN* using which transformation?



- (1) rotation
- (2) translation
- (3) reflection over the x-axis
- (4) reflection over the y-axis

17 In the diagram below,  $\overline{DB}$  and  $\overline{AF}$  intersect at point C, and  $\overline{AD}$  and  $\overline{FBE}$  are drawn.



If AC = 6, DC = 4, FC = 15,  $m \angle D = 65^{\circ}$ , and  $m \angle CBE = 115^{\circ}$ , what is the length of  $\overline{CB}$ ?

(1) 10

(3) 17

(2) 12

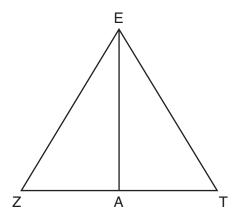
- (4) 22.5
- 18 Seawater contains approximately 1.2 ounces of salt per liter on average. How many gallons of seawater, to the *nearest tenth of a gallon*, would contain 1 pound of salt?
  - (1) 3.3

(3) 4.7

(2) 3.5

(4) 13.3

19 Line segment EA is the perpendicular bisector of  $\overline{ZT}$ , and  $\overline{ZE}$  and  $\overline{TE}$  are drawn.



Which conclusion can *not* be proven?

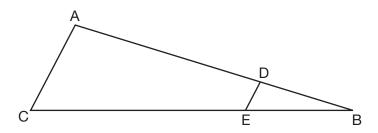
- (1)  $\overline{EA}$  bisects angle ZET.
- (2) Triangle EZT is equilateral.
- (3)  $\overline{EA}$  is a median of triangle EZT.
- (4) Angle Z is congruent to angle T.
- **20** A hemispherical water tank has an inside diameter of 10 feet. If water has a density of 62.4 pounds per cubic foot, what is the weight of the water in a full tank, to the *nearest pound*?
  - (1) 16,336

(3) 130,690

(2) 32,673

(4) 261,381

**21** In the diagram of  $\triangle ABC$ , points D and E are on  $\overline{AB}$  and  $\overline{CB}$ , respectively, such that  $\overline{AC} \parallel \overline{DE}$ .



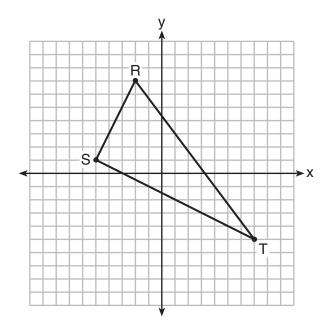
If AD = 24, DB = 12, and DE = 4, what is the length of  $\overline{AC}$ ?

(1) 8

(3) 16

(2) 12

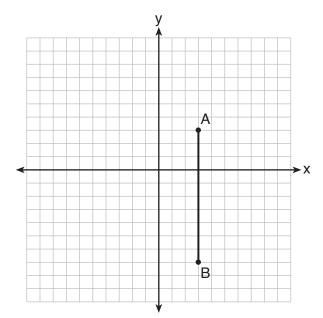
- (4) 72
- **22** Triangle *RST* is graphed on the set of axes below.



How many square units are in the area of  $\triangle RST$ ?

- $(1) 9\sqrt{3} + 15$
- (3) 45
- (2)  $9\sqrt{5} + 15$
- (4) 90

**23** The graph below shows  $\overline{AB}$ , which is a chord of circle O. The coordinates of the endpoints of  $\overline{AB}$  are A(3,3) and B(3,-7). The distance from the midpoint of  $\overline{AB}$  to the center of circle O is 2 units.



What could be a correct equation for circle *O*?

(1) 
$$(x-1)^2 + (y+2)^2 = 29$$

(2) 
$$(x + 5)^2 + (y - 2)^2 = 29$$

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

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

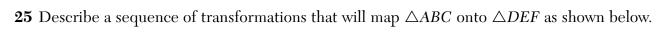
- **24** What is the area of a sector of a circle with a radius of 8 inches and formed by a central angle that measures 60°?
  - $(1) \quad \frac{8\pi}{3}$

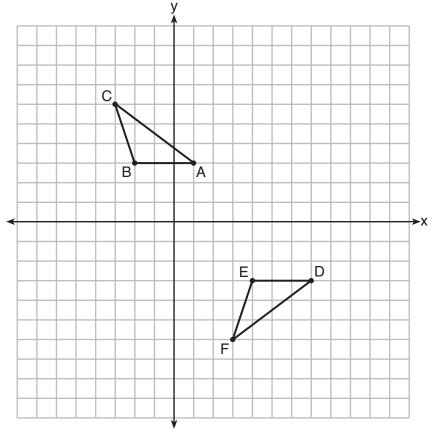
(3)  $\frac{32\pi}{3}$ 

(2)  $\frac{16\pi}{3}$ 

 $(4) \quad \frac{64\pi}{3}$ 

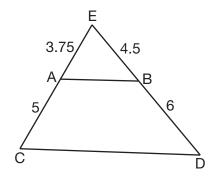
Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily 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]





<b>26</b> Point $P$ is on segment $AB$ such that $AP:PB$ is 4:5. If $A$ has coordinates $(4,2)$ , and $B$ has coordinates $(22,2)$ , determine and state the coordinates of $P$ .

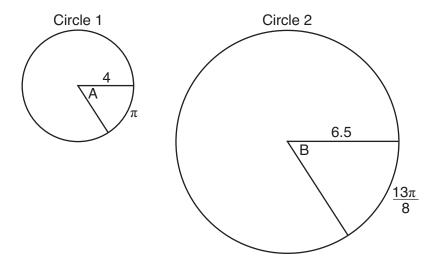
**27** In  $\triangle CED$  as shown below, points A and B are located on sides  $\overline{CE}$  and  $\overline{ED}$ , respectively. Line segment AB is drawn such that AE = 3.75, AC = 5, EB = 4.5, and BD = 6.



Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .

<b>28</b> Find the value of $R$ that will make the equation $\sin 73^\circ = \cos R$ true when $0^\circ < R < 90^\circ$ . Explain your answer.

**29** In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length  $\pi$ , and angle B intercepts an arc of length  $\frac{13\pi}{8}$ .



Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

<b>30</b> A ladder leans against a building. The top of the ladder touches the building 1 ground. The foot of the ladder is 4 feet from the building. Find, to the <i>nearest o</i> that the ladder makes with the level ground.	0 feet above the degree, the angle

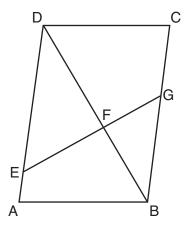
 $\overline{31}$  In the diagram below, radius  $\overline{OA}$  is drawn in circle O. Using a compass and a straightedge, construct a line tangent to circle *O* at point *A*. [Leave all construction marks.]

#### **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]

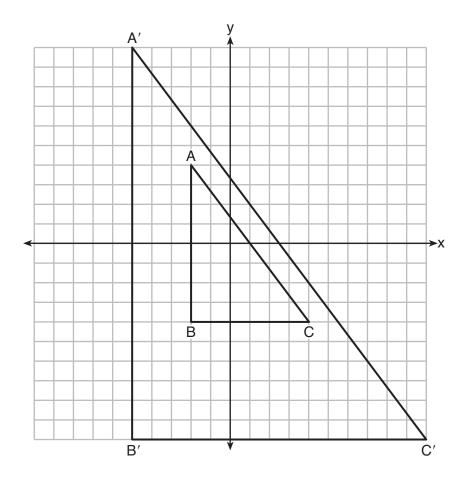
<b>32</b> A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the <i>nearest tenth</i> , the gallons of fuel that are in a barrel of fuel oil.				

**33** Given: Parallelogram ABCD,  $\overline{EFG}$ , and diagonal  $\overline{DFB}$ 



Prove:  $\triangle DEF \sim \triangle BGF$ 

**34** In the diagram below,  $\triangle A'B'C'$  is the image of  $\triangle ABC$  after a transformation.

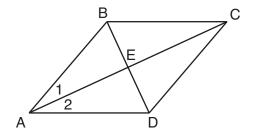


Describe the transformation that was performed.

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

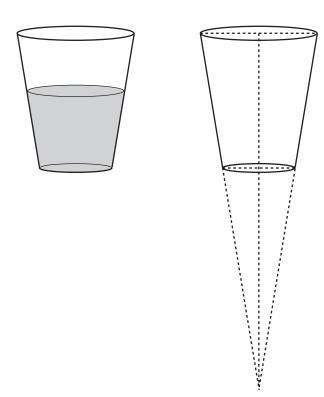
Answer the 2 questions in this part. Each correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily 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. [12]

**35** Given: Quadrilateral *ABCD* with diagonals  $\overline{AC}$  and  $\overline{BD}$  that bisect each other, and  $\angle 1 \cong \angle 2$ 



Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

Question 36 is continued on the next page.

Question 36 continued
Determine and state, in inches, the height of the larger cone.
Determine and state, to the <i>nearest tenth of a cubic inch</i> , the volume of the water glass.

# Fear Her

## **High School Math Reference Sheet**

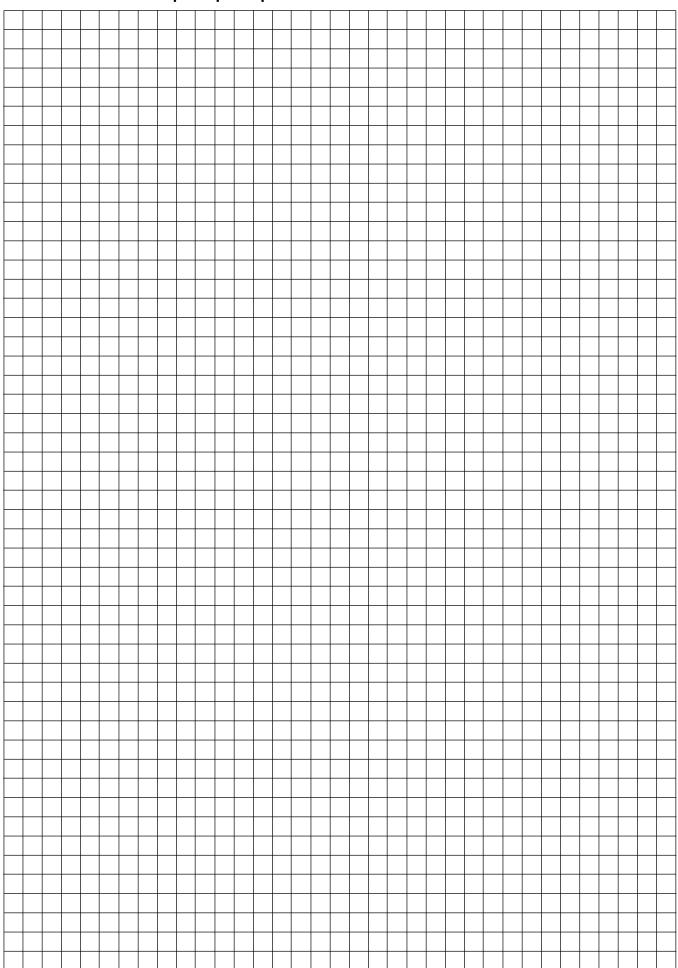
1 liter = 0.264 gallon 1 liter = 1000 cubic centimeters

$A = \frac{1}{2}bh$
A = bh
$A=\pi r^2$
$C = \pi d \text{ or } C = 2\pi r$
V = Bh
$V = \pi r^2 h$
$V = \frac{4}{3}\pi r^3$
$V = \frac{1}{3}\pi r^2 h$
$V = \frac{1}{3}Bh$

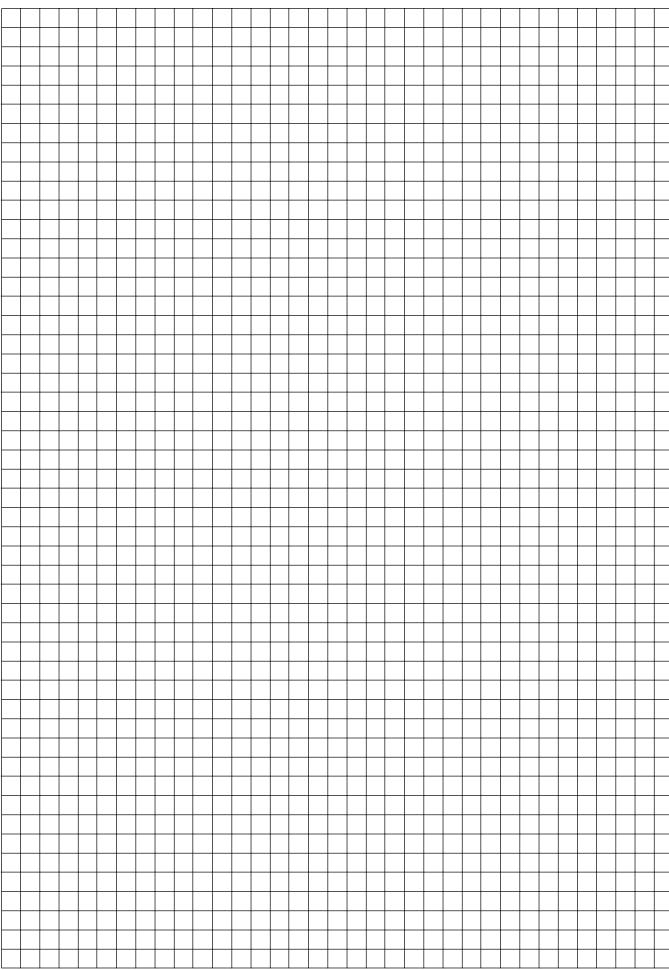
Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n-1)d$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r} \text{ where } r \neq 1$
Radians	$1 \text{ radian} = \frac{180}{\pi} \text{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

Tear Here
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# $\label{eq:conditional} \textbf{Scrap Graph Paper} - \textbf{This sheet will } \textit{not} \ \textbf{be scored}.$



## Scrap Graph Paper - This sheet will not be scored.



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# FOR TEACHERS ONLY

The University of the State of New York

#### REGENTS HIGH SCHOOL EXAMINATION

## **GEOMETRY (COMMON CORE)**

**Friday,** June 17, 2016 — 1:15 to 4:15 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. 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: <a href="http://www.p12.nysed.gov/assessment/">http://www.p12.nysed.gov/assessment/</a> on Friday, June 17, 2016. 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)3	(9)1	(17) 1
$(2)\ldots 4\ldots$	$(10)\ldots 2\ldots .$	$(18)\ldots 2\ldots$
$(3)\ldots 2\ldots$	$(11)\ldots 4\ldots$	$(19)\ldots 2\ldots$
(4) 1	$(12)\ldots\ldots 1\ldots\ldots$	$(20)\ldots 1\ldots$
(5) 3	$(13)\ldots 2\ldots .$	$(21)\ldots 2\ldots \ldots$
(6) 4	$(14)\ldots 4\ldots$	$(22)\ldots 3\ldots$
$(7)\ldots 3\ldots$	$(15)\ldots\ldots4\ldots\ldots$	$(23)\ldots 1\ldots$
(8)4	$(16)\ldots 3\ldots$	$(24)\ldots 3\ldots$

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: <a href="http://www.p12.nysed.gov/assessment/">http://www.p12.nysed.gov/assessment/</a> 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: <a href="http://www.nysedregents.org/geometrycc/">http://www.nysedregents.org/geometrycc/</a>.

### **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 sequence of transformations is described.

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

or

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

or

- [1] An appropriate sequence is described, 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.
- (26) [2] (12,2), and correct work is shown.
  - [1] Appropriate work is shown, but one computational error is made.

or

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

or

[1] Appropriate work is shown to find 12, but no further correct work is shown.

or

- [1] (12,2), 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.

- (27) [2] Correct work is shown, and a correct explanation is written.
  - [1] Appropriate work is shown, but one computational error is made.

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

or

- [1] Appropriate work is shown, but the explanation is missing or incorrect.
- [0] A correct proportion is written, but no further correct work is shown.

or

- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (28) [2] 17, and a correct explanation is written.
  - [1] Appropriate work is shown, but one computational error is made.

or

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

or

[1] Appropriate work is shown, but the explanation is incomplete.

or

- [1] 17, but the explanation is missing or incorrect.
- [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] Yes, and a correct explanation is written.
  - [1] Appropriate work is shown, but one computational error is made.

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

or

- [1] Yes, and appropriate work is shown, but the explanation is missing or incorrect.
- [0] Yes, and a correct proportion is written, 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.

- (30) [2] 68, and appropriate work is shown.
  - [1] Appropriate work is shown, but one computational or rounding error is made.

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

or

[1] Tan  $x = \frac{10}{4}$  or an equivalent equation is written, but no further correct work is shown.

or

- [1] 68, 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.
- (31) [2] A correct construction is drawn showing all appropriate arcs.
  - [1] An appropriate construction is drawn showing all appropriate arcs, but the tangent line is not drawn.
  - [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.

#### **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]** 57.7, and correct work is shown.
  - [3] Appropriate work is shown, but one computational or rounding error is made.
  - [2] Appropriate work is shown, but two or more computational or rounding errors are made.

or

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

or

- [2] The volume of a barrel is found in cubic inches, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or

- [1] 57.7, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (33) [4] A complete and correct proof that includes a concluding statement is written.
  - [3] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement and/or reason is missing or incorrect or no concluding statement is written.
  - [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.

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

- (34) [4] Dilation of  $\frac{5}{2}$  centered at the origin is written. A correct explanation is written.
  - [3] Appropriate work is shown, but one computational error is made.

[3] The description of the dilation is incomplete. A correct explanation is written.

or

- [3] A correct description of a dilation is written. An appropriate explanation is written, but it is incomplete.
- [2] A correct description of a dilation is written, but the explanation is missing.

or

[2] The description of the dilation is incomplete. An appropriate explanation is written, but it is incomplete.

or

- [2] A correct explanation is written, but no further correct work is shown.
- [1] The description of the dilation 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.

#### 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 is written that includes both concluding statements.
  - [5] 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.
  - [4] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but two statements and/or reasons are missing or incorrect.

or

- [4]  $\triangle ACD$  is an isosceles triangle or  $\triangle AEB$  is a right triangle is proven, but no further correct work is shown.
- [3] A proof is written that demonstrates a thorough understanding of the method of proof, but three statements and/or reasons are incorrect.

or

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

or

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

or

- [2] Appropriate work is shown to prove *ABCD* is a rhombus, but no further correct work is shown.
- [1] Only one or two correct relevant statements and reasons 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.

- (36) [6] 15, 24.9, and correct work is shown. A correct explanation is written.
  - [5] Appropriate work is shown, but one computational or rounding error is made.

- [5] 15, 24.9, and correct work is shown, but the explanation is missing or incorrect.
- [4] Appropriate work is shown, but two computational or rounding errors are made.

or

- [4] Appropriate work is shown, but one conceptual error is made in finding the volume of the glass.
- [3] Appropriate work is shown, but three or more computational or rounding errors are made.

or

- [3] Appropriate work is shown, but one conceptual error in finding the volume of the glass and one computational or rounding error are made.
- [2] Appropriate work is shown, but one conceptual error in finding the volume of the glass and two computational or rounding errors are made.

or

- [2] Correct work is shown to find 15, the height of the cone, but no further correct work is shown.
- [1] A correct explanation is written, but no further correct work is shown.

or

[1] Correct work is shown to find the volume of either cone, but no further correct work is shown.

or

- [1] 15, and 24.9, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

#### Map to the Common Core Learning Standards Geometry (Common Core) June 2016

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

## Regents Examination in Geometry (Common Core) June 2016

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

The Chart for Determining the Final Examination Score for the June 2016 Regents Examination in Geometry (Common Core) will be posted on the Department's web site at: <a href="http://www.p12.nysed.gov/assessment/">http://www.p12.nysed.gov/assessment/</a> on Friday, June 17, 2016. 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:

- 1. Go to <a href="http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm">http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm</a>.
- 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 (COMMON CORE)**

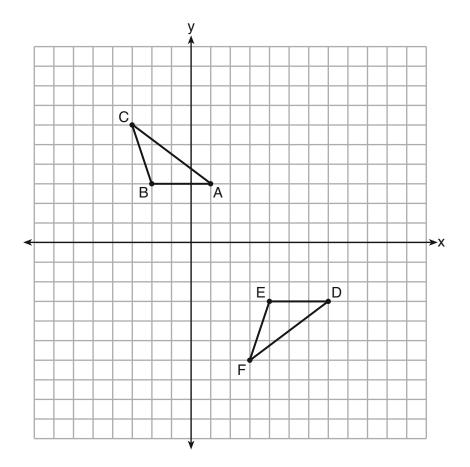
**Friday,** June 17, 2016 — 1:15 to 4:15 p.m.

### **MODEL RESPONSE SET**

#### **Table of Contents**

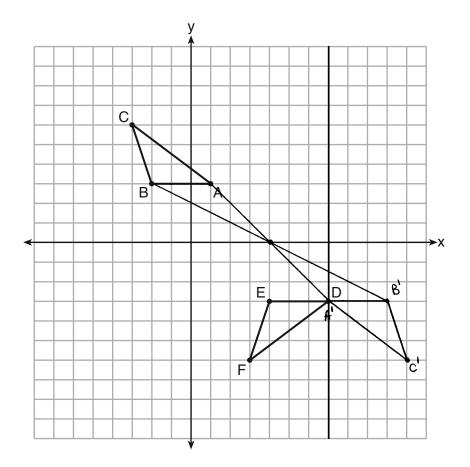
Question 25 2
Question 26
Question 27
Question 28
Question 29
Question 30
Question 31
Question 32
Question 33 50
Question 34
Question 35
Question 36

**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



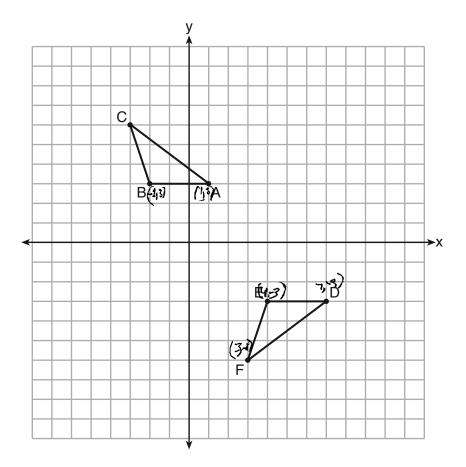
A reflection over the x-axis followed by a translation 6 units to the right.

**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



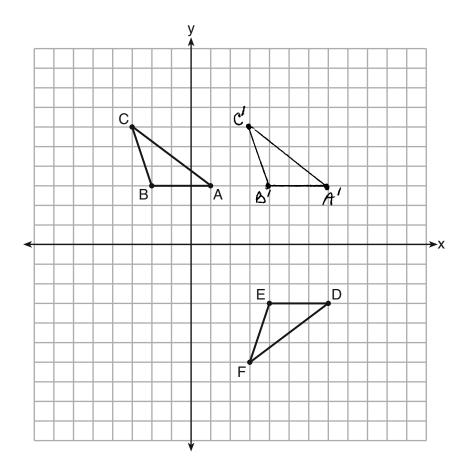
Rotate DARC 150° about point (4p) and then reflect DARC' over the line x=7

**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



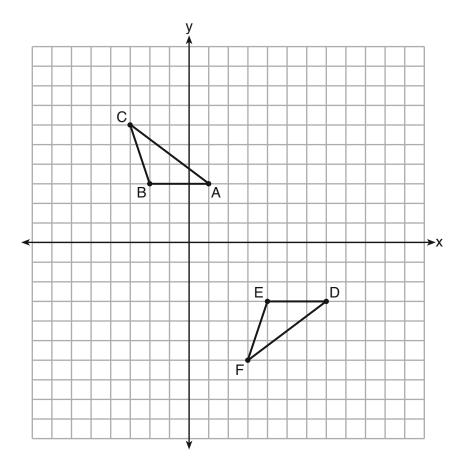
T6,07 0 RX exis

**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



moved 6 units right flipped over x axis

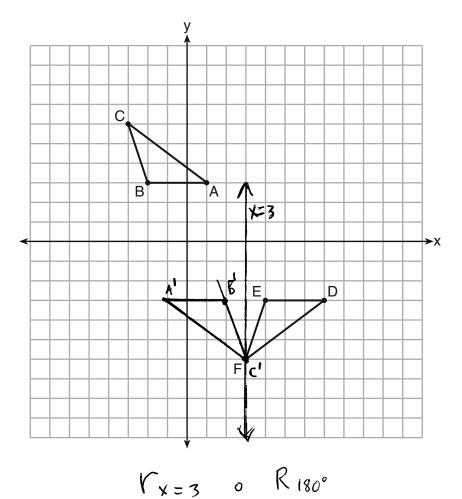
**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



Refextion our He x-axis Slide Gunids

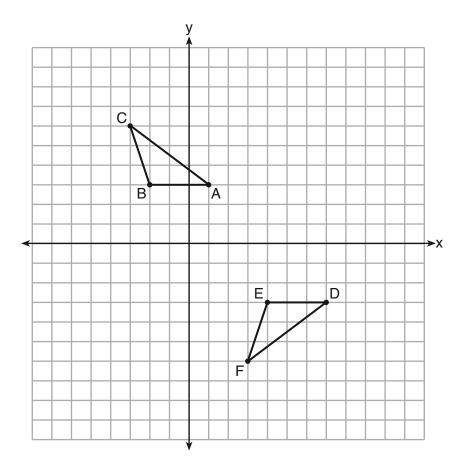
**Score 1:** The student gave a correct description of the reflection, but gave an incomplete description of the translation.

**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



**Score 1:** The student gave a correct description of the reflection, but the description of the rotation did not include the center.

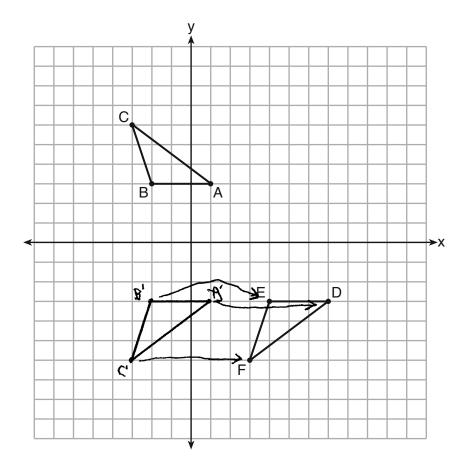
**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



It is a glide reflection

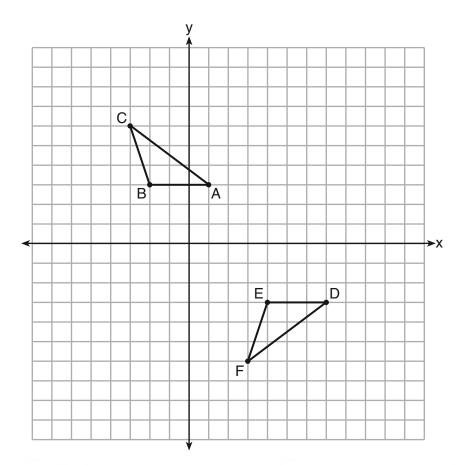
**Score 1:** The student described an appropriate sequence, but the description was incomplete.

**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



**Score 1:** The student graphed the transformation correctly, but did not write a description.

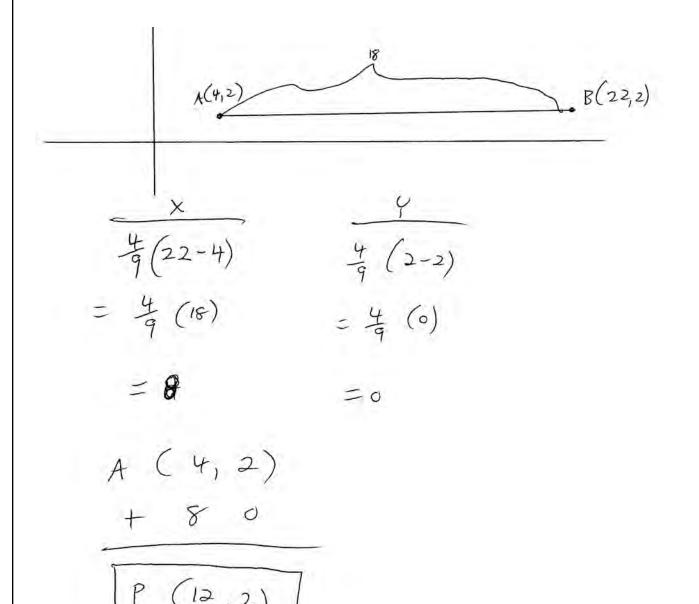
**25** Describe a sequence of transformations that will map  $\triangle ABC$  onto  $\triangle DEF$  as shown below.



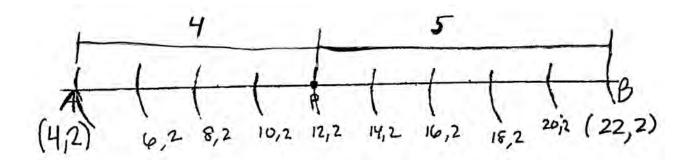
How Flip It and more it

**Score 0:** The student gave an incomplete description of the reflection (flip) and described the translation (move) incorrectly.

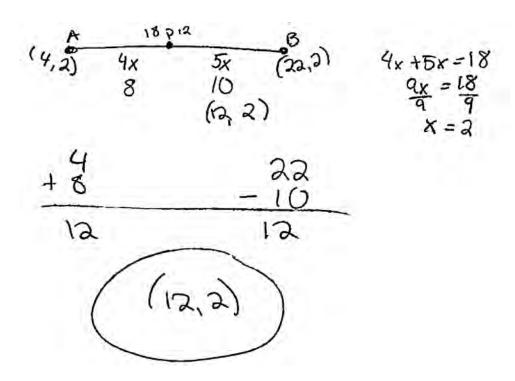
**26** Point P is on segment AB such that AP:PB is 4:5. If A has coordinates (4,2), and B has coordinates (22,2), determine and state the coordinates of P.



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A (4,2) B(22,2)

Run 4 Rise 2 Scala Factor = 
$$\frac{4}{445} = \frac{4}{9}$$

-18

$$P = (22 + 4(-18), 2 + 4(0))$$

$$P = (22 + -8, 2 + 0)$$

$$Q = (14, 2)$$

**Score 1:** The student showed correct work to partition the segment in a 5:4 ratio.

**26** Point P is on segment AB such that AP:PB is 4:5. If A has coordinates (4,2), and B has coordinates (22,2), determine and state the coordinates of P.

$$A(4,2) \quad 4x \quad 6 \quad 5x \quad 8(22,2)$$

$$d = \sqrt{(22-4)^2 + (2-2)^2} \quad 4x + 5x = 18$$

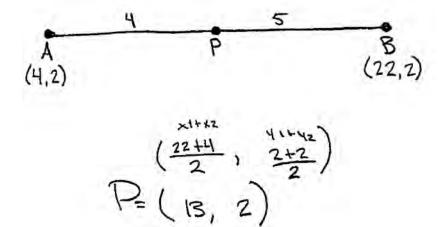
$$\sqrt{324} = 18$$

$$P = A(4+8, 2+8)$$

$$P = (12, 10)$$

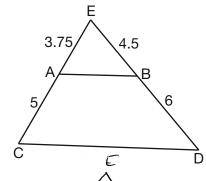
**Score 1:** The student showed correct work to determine the x-coordinate of P, but made an error in determining the y-coordinate.

**26** Point P is on segment AB such that AP:PB is 4:5. If A has coordinates (4,2), and B has coordinates (22,2), determine and state the coordinates of P.

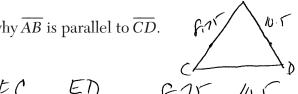


**Score 0:** The student determined the correct y-coordinate by calculating the midpoint of  $\overline{AB}$ , but the midpoint was not relevant to the problem.

**27** In  $\triangle CED$  as shown below, points A and B are located on sides CE and ED, respectively. Line segment AB is drawn such that AE = 3.75, AC = 5, EB = 4.5, and BD = 6.



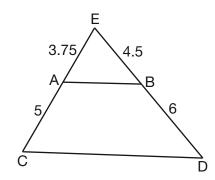
Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .



Since XE = XE by the reflexive property and the corresponding sides shown above are in proportion A CED ~ D AEB.

IN Similar 25, Curresponding angles are = 50 XC=XEAB. WILL CE as a Homsversal & XC=XEAB, AB/ICD because the corresponding angles are =.

**27** In  $\triangle CED$  as shown below, points A and B are located on sides  $\overline{CE}$  and  $\overline{ED}$ , respectively. Line segment AB is drawn such that AE = 3.75, AC = 5, EB = 4.5, and BD = 6.

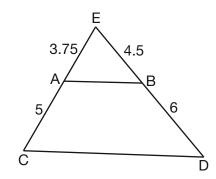


Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .

$$\frac{3.75}{8.75} = \frac{4.5}{10.5}$$

AB is parallel to CD b/c AB divides the sides proportionally

**27** In  $\triangle CED$  as shown below, points A and B are located on sides  $\overline{CE}$  and  $\overline{ED}$ , respectively. Line segment AB is drawn such that AE = 3.75, AC = 5, EB = 4.5, and BD = 6.



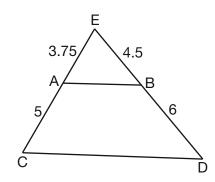
Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .

Sides AO adivides sides

OF and DE proportionally

So AB 11 CD

**27** In  $\triangle CED$  as shown below, points A and B are located on sides  $\overline{CE}$  and  $\overline{ED}$ , respectively. Line segment AB is drawn such that AE = 3.75, AC = 5, EB = 4.5, and BD = 6.



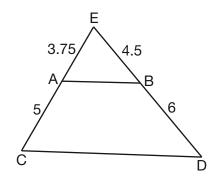
Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .

AB is paralled to to because AB is a midsegment of LOED. A midsegment is half the length of side its parallel to. Lidsegment also makes congruent parts.

AE BE > MOPON CLUMI 5.45 = 6 5(4.5) = 6(3.75) 22.5 = 22.5

**Score 1:** The student showed that the cross products of the proportion are equal, but the explanation was incorrect.

**27** In  $\triangle CED$  as shown below, points A and B are located on sides  $\overline{CE}$  and  $\overline{ED}$ , respectively. Line segment AB is drawn such that AE = 3.75, AC = 5, EB = 4.5, and BD = 6.

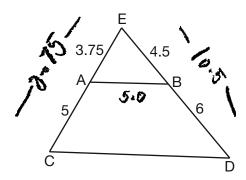


Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .



**Score 0:** The student only wrote a correct proportion.

**27** In  $\triangle CED$  as shown below, points A and B are located on sides  $\overline{CE}$  and  $\overline{ED}$ , respectively. Line segment AB is drawn such that AE = 3.75, AC = 5, EB = 4.5, and BD = 6.



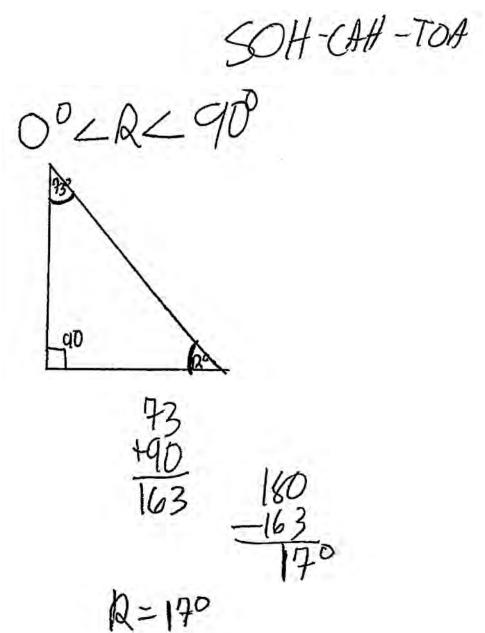
Explain why  $\overline{AB}$  is parallel to  $\overline{CD}$ .

They are funded to cach other cube these unos don't meet.

**28** Find the value of R that will make the equation  $\sin 73^{\circ} = \cos R$  true when  $0^{\circ} < R < 90^{\circ}$ . Explain your answer.

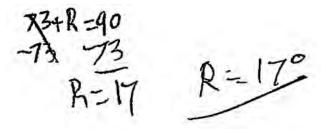
The sin and cos of complimentary angles are equal

**28** Find the value of R that will make the equation  $\sin 73^\circ = \cos R$  true when  $0^\circ < R < 90^\circ$ . Explain your answer.



**Score 1:** The student correctly determined the value of R, but the explanation was missing.

**28** Find the value of R that will make the equation  $\sin 73^\circ = \cos R$  true when  $0^\circ < R < 90^\circ$ . Explain your answer.

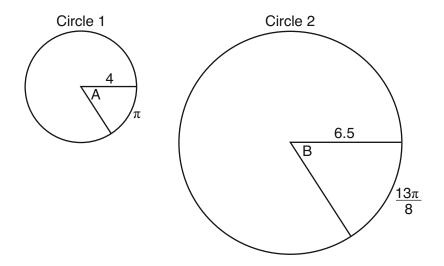


sine and cosine sign are complimentary so they must equal 90° when added together

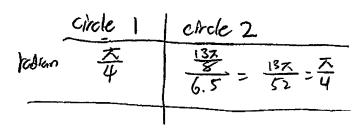
**Score 1:** The student correctly determined the value of R, but the explanation was incorrect.

**28** Find the value of R that will make the equation  $\sin 73^\circ = \cos R$  true when  $0^\circ < R < 90^\circ$ . Explain your answer.

**29** In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length  $\pi$ , and angle B intercepts an arc of length  $\frac{13\pi}{8}$ .

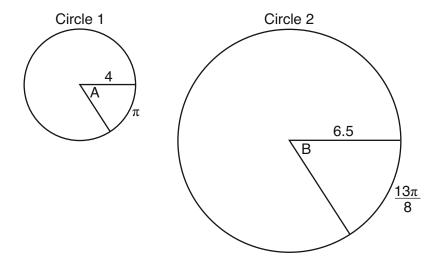


Dominic thinks that <u>angles</u> A and B have the same radian measure. State whether Dominic is correct or not. Explain why.



Circle 2 Pominic is correct because by caculating intercepted are we have  $\frac{137}{6.5} = \frac{18}{52} = \frac{7}{4}$  will find the radian. As a result  $\frac{7}{4}$  radian from angle A is equal to  $\frac{133}{6.5}$  radian from angle B.

**29** In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length  $\pi$ , and angle B intercepts an arc of length  $\frac{13\pi}{8}$ .



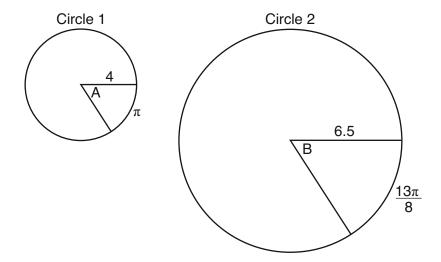
Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

Circle 1

$$S = 0$$
 |  $S = 0$  |  $S =$ 

pominic is correct. Using the formula for are length, 5=00, both angles are equal.

**29** In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length  $\pi$ , and angle B intercepts an arc of length  $\frac{13\pi}{8}$ .



Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

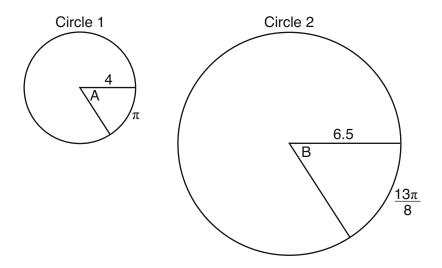
$$\frac{4}{6.5} = \frac{11}{1358}$$

$$1306.9 = 20.4$$

No because the radii is Not proportional to the arc length

Score 1: The student made an error in transcribing  $\frac{13\pi}{8}$ , but wrote a correct explanation based on the error.

**29** In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length  $\pi$ , and angle B intercepts an arc of length  $\frac{13\pi}{8}$ .



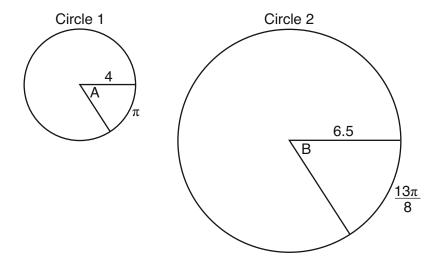
Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

$$\frac{4}{6.5} = \frac{\pi}{\frac{12\pi}{8}}$$

$$\frac{\mathcal{H}}{1} \cdot \frac{8}{13\mathcal{K}} = \frac{8}{13}$$

Score 1: The student wrote a correct proportion and showed work with a correct conclusion, but the explanation was missing.

**29** In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length  $\pi$ , and angle B intercepts an arc of length  $\frac{13\pi}{8}$ .

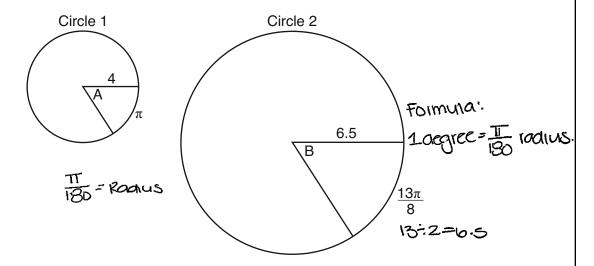


Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

$$\frac{4}{11} = \frac{6.5}{13.11}$$

**Score 0:** The student wrote a correct proportion, but no explanation was written.

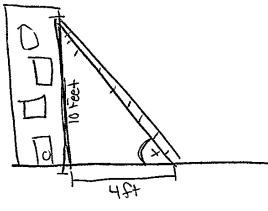
**29** In the diagram below, Circle 1 has radius 4, while Circle 2 has radius 6.5. Angle A intercepts an arc of length  $\pi$ , and angle B intercepts an arc of length  $\frac{13\pi}{8}$ .



Dominic thinks that angles A and B have the same radian measure. State whether Dominic is correct or not. Explain why.

Dominic is incorrect because if you simply Plug the numbers into the formula you would do 14th over 180 and you would get two different radians which means Both wouldn't equal 6.5

30 A ladder leans against a building. The top of the ladder touches the building 10 feet above the ground. The foot of the ladder is 4 feet from the building. Find, to the nearest degree, the angle that the ladder makes with the level ground.



4 feet Adjacent



Sme Opposite

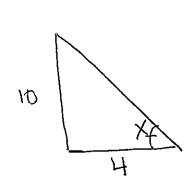
Hypotenuse Cosine

Adjacent Hypotenuse

Tan = 10 57 Tan = 19 = X

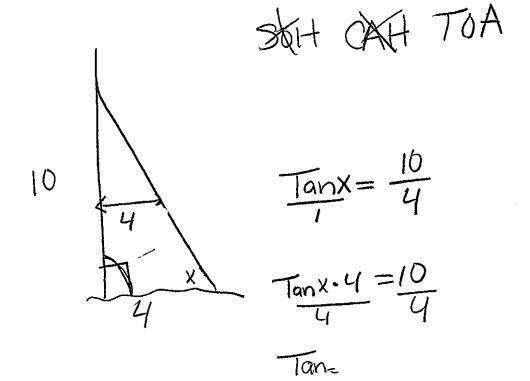
X=68.19859051

**30** A ladder leans against a building. The top of the ladder touches the building 10 feet above the ground. The foot of the ladder is 4 feet from the building. Find, to the *nearest degree*, the angle that the ladder makes with the level ground.

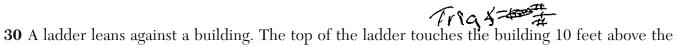


$$7001 \times = \frac{0}{A}$$
 $1001 \times = \frac{0}{4}$ 
 $1001 \times = \frac{0}{4}$ 

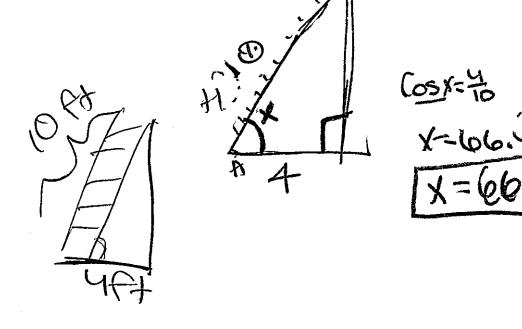
**30** A ladder leans against a building. The top of the ladder touches the building 10 feet above the ground. The foot of the ladder is 4 feet from the building. Find, to the *nearest degree*, the angle that the ladder makes with the level ground.



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

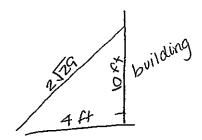


**30** A ladder leans against a building. The top of the ladder touches the building 10 feet above the ground. The foot of the ladder is 4 feet from the building. Find, to the *nearest degree*, the angle that the ladder makes with the level ground.



**Score 1:** The student incorrectly labeled the height, but found an appropriate angle measure.

**30** A ladder leans against a building. The top of the ladder touches the building 10 feet above the ground. The foot of the ladder is 4 feet from the building. Find, to the *nearest degree*, the angle that the ladder makes with the level ground.



$$0^{2}+b^{2}=c^{2}$$

$$4^{2}+10^{2}=c^{2}$$

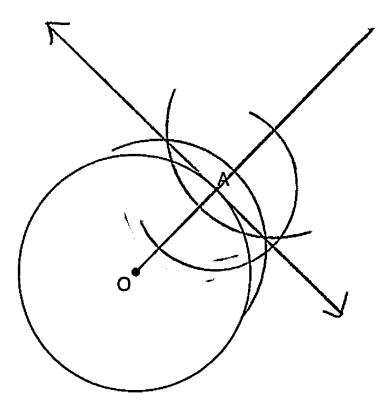
$$10+100=c^{2}$$

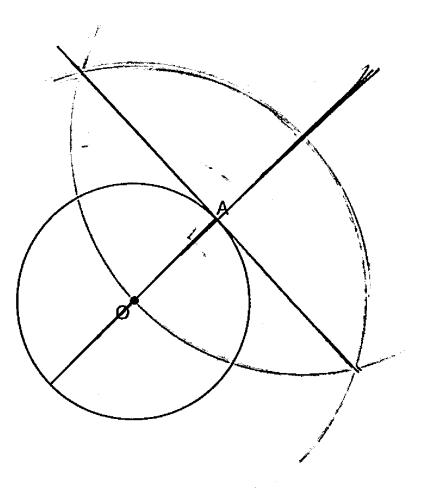
$$\sqrt{116}=c^{2}$$

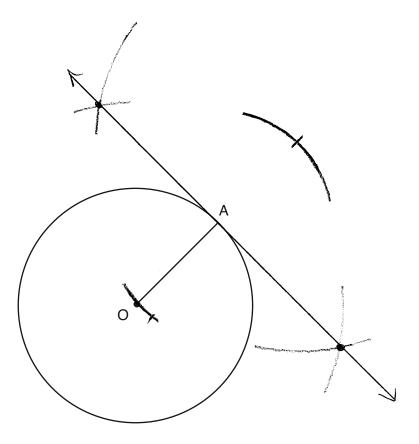
$$\sqrt{4\sqrt{29}}=c^{2}$$

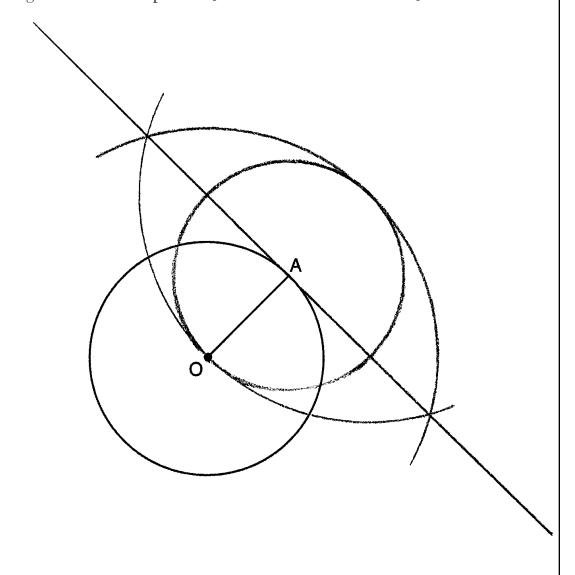
$$2\sqrt{29}=c$$

**Score 0:** The student used the Pythagorean Theorem to find the length of the ladder and made no attempt to find the measure of the angle.



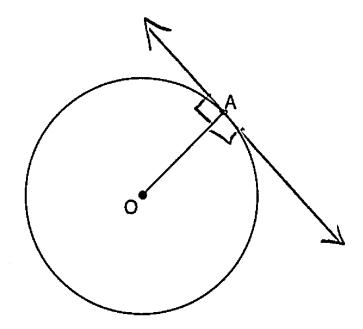






**Score 1:** The student did not indicate the endpoint of the diameter of circle *A*, which was necessary to construct the other arcs.

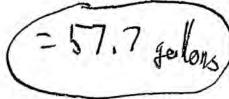
**31** In the diagram below, radius  $\overline{OA}$  is drawn in circle O. Using a compass and a straightedge, construct a line tangent to circle O at point A. [Leave all construction marks.]



**Score 0:** The student made a drawing that was not a construction.

**32** A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

=57.6617 4016 gallors



**32** A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

V=13220.5 V=13220.5

13220.5 = 231= 57.2

There are (57.2) gallons of fine

**Score 3:** The student made an error in calculating the volume.

**32** A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

$$V = \pi (1.25)^{2}(33.5)$$

$$V = \pi (126.5625(33.5))$$

$$V = \frac{4239.84375}{231} = \frac{18.3 \text{ gallon5.}}{231}$$

**Score 2:** The student did not multiply by  $\pi$  and made a rounding error.

**32** A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.



$$V = \pi r^{2}h$$

$$V = \pi (22.5^{2})(33.5)$$

$$V = 53,279.44791$$

$$V = 53,279.4$$

**Score 1:** The student made an error in using the diameter to find the volume of the barrel, and did not find the number of gallons.

**32** A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

$$V = \frac{1}{3} \pi r^{2} \ln r = \frac{22.7}{2} = 11.27$$

$$\frac{1}{3} \pi (11.27)^{2} (33.7)$$

$$V = \frac{4439.954}{231} = \frac{19 \text{ gallons}}{19 \text{ gallons}}$$

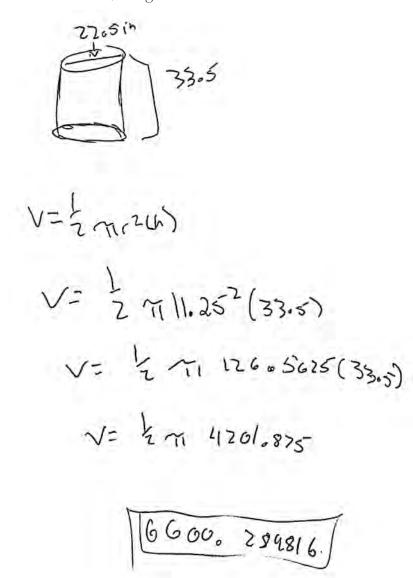
**Score 1:** The student used an incorrect volume formula and made a rounding error.

**32** A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

$$V = \mathcal{U}(11.92)$$
 (33.2)

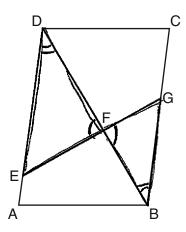
**Score 1:** The student made correct substitutions into the volume formula of a cylinder, but no further correct work was shown.

**32** A barrel of fuel oil is a right circular cylinder where the inside measurements of the barrel are a diameter of 22.5 inches and a height of 33.5 inches. There are 231 cubic inches in a liquid gallon. Determine and state, to the *nearest tenth*, the gallons of fuel that are in a barrel of fuel oil.

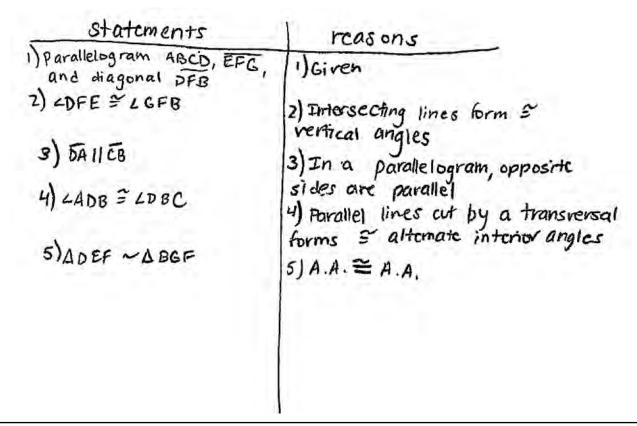


**Score 0:** The student used an incorrect formula, made a computational error, and did not determine the number of gallons of fuel.

**33** Given: Parallelogram ABCD,  $\overline{EFG}$ , and diagonal  $\overline{DFB}$ 

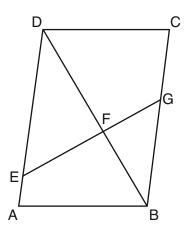


Prove:  $\triangle DEF \sim \triangle BGF$ 



**Score 4:** The student had a complete and correct proof.

**33** Given: Parallelogram *ABCD*, *EFG*, and diagonal *DFB* 



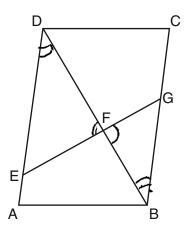
Prove:  $\triangle DEF \sim \triangle BGF$ 

In parallelogram ABCD, the opposite sides

AD and CB are parallel. Since AD11CB are cut by transversals EFG and DFB, then you have congruent alternate interior angles,  $\angle EDF \cong \angle LGBF$  and  $\angle DEF \cong \angle LGBF$ . Since two pairs of angles in the triangles are congruent, then DDEF ~ DBGF by AA triangle similarity.

The student had a complete and correct response.

**33** Given: Parallelogram *ABCD*,  $\overline{EFG}$ , and diagonal  $\overline{DFB}$ 



Prove:  $\triangle DEF \sim \triangle BGF$ 

Statement. Reason.

1. Pavallelogram ABCD, EFG, and diagonal

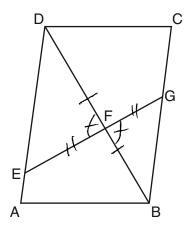
2. < DFE and < BFG are Z, opposite and share a Vertical angle. Vertex.

3. < DFE = < BFG (A) 3. Vertical angle are =.

3. < DFE & < BFG(A)

4. <ADB = <CBD(A) 4. 11 lines cut by transversal, ∴ altervate interior angles are ≥ 5. ADEF~ABGF 5. AA

Score 3: The student omitted one statement and reason. **33** Given: Parallelogram ABCD,  $\overline{EFG}$ , and diagonal  $\overline{DFB}$ 



Prove:  $\triangle DEF \sim \triangle BGF$ 

STAPEMERTS

REASONS

D Parallelogam ACKD, EFG + Disparel Total Divin

(2) JF= FB, EF= FG

3X DFE = XBFG

(4) A DEF = A BGF

(5) a DEF - 1 BGF

2) Diagonals of a Parallologram bosist each other.

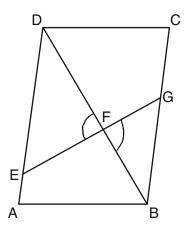
3) Vertical Anglos are Congruent

SAS = SAS

© All congreent translos One Similar

**Score 2:** The student made an error in assuming that  $\overline{DFB}$  and  $\overline{EFG}$  are both diagonals, which significantly reduced the difficulty of the proof.

**33** Given: Parallelogram *ABCD*,  $\overline{EFG}$ , and diagonal  $\overline{DFB}$ 



Prove:  $\triangle DEF \sim \triangle BGF$ 

2. 4 DFE = X GFB

3. \*D= \*B

4. DDEFNABGF

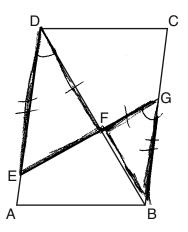
1- Fiven

Z. Vertical angles are 3.

3. opposite angles = ?.
4. Because they are similar

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

**33** Given: Parallelogram *ABCD*,  $\overline{EFG}$ , and diagonal  $\overline{DFB}$ 



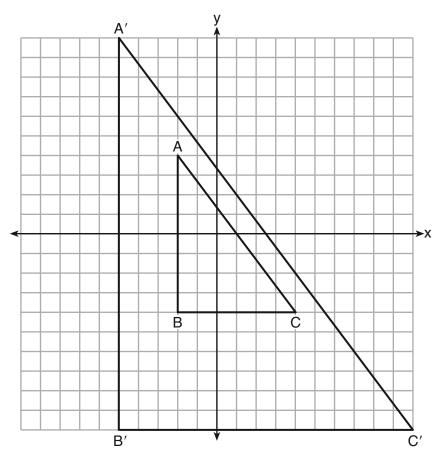
Prove:  $\triangle DEF \sim \triangle BGF$ 

1. I ABCD, EFG, Liagonal DFB 1- Fiven

z opposite sides are = in
a parallelogram.
3. Angles are = 1.
4. Bisector
5. SAS

The student had no correct reasons. Score 0:

**34** In the diagram below,  $\triangle A'B'C'$  is the image of  $\triangle ABC$  after a transformation.

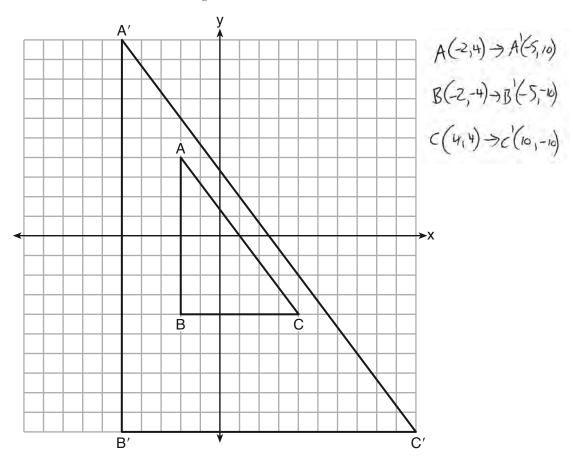


Describe the transformation that was performed.

A dilation of 5/2 about the origin.

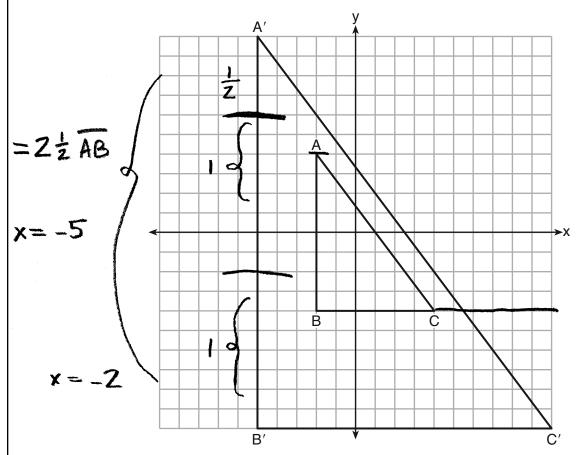
Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

Dilations preserve angle measure so DABC~DABC' by AA similarity.



Describe the transformation that was performed.

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .



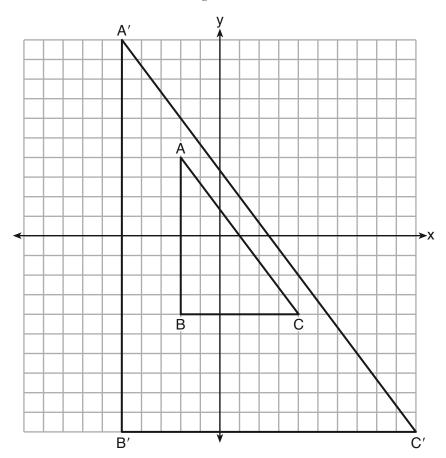
Describe the transformation that was performed.

a dialation of 2.5 (Scale factor)

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

In a dialation the angles remain the same however the tenghal of the sides change (in proportion to their original lenghts definition of similarly

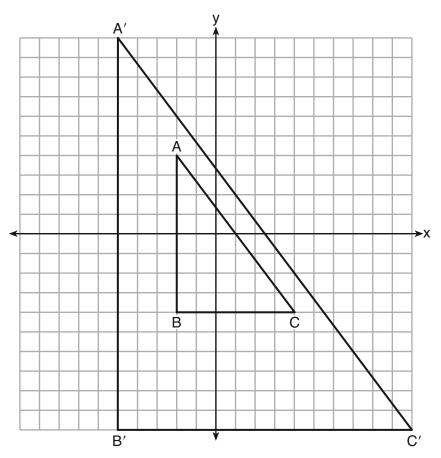
Score 3: The student did not state the center of dilation.



Describe the transformation that was performed.

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

**Score 2:** The student did not state the center of dilation. The student explained why the angles are congruent, but did not explain why the triangles are similar.



Describe the transformation that was performed.

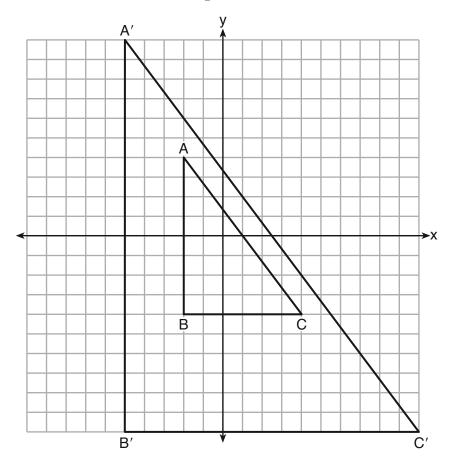
a center at origin.

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

All Similar triengles have congruent curgles.

**Score 1:** The student did not state the scale factor of the dilation and did not write a correct explanation.

**34** In the diagram below,  $\triangle A'B'C'$  is the image of  $\triangle ABC$  after a transformation.



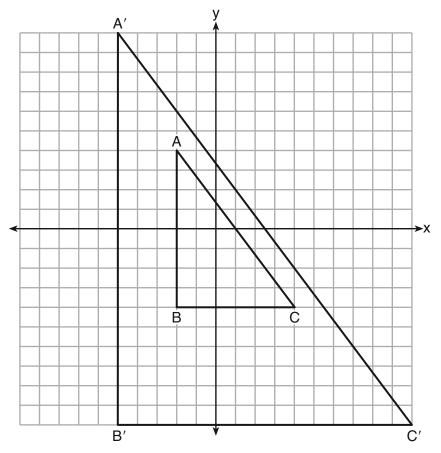
Describe the transformation that was performed.

Dilation of {

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

They have the same shape

**Score 1:** The student had an incomplete description of the dilation and an incorrect explanation of the similar triangles.



Describe the transformation that was performed.

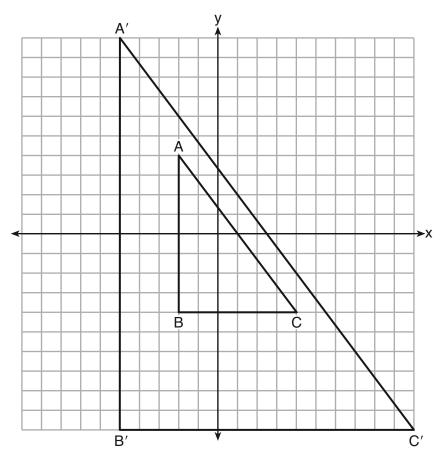
triangle ABC was dialosted to make It larger.

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

Because 14 was dialoxed

**Score 0:** The student did not describe the dilation, and had an incorrect explanation of the similar triangles.

**34** In the diagram below,  $\triangle A'B'C'$  is the image of  $\triangle ABC$  after a transformation.



Describe the transformation that was performed.

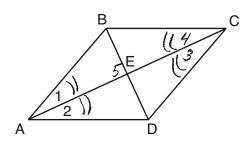
Translation took place.

Explain why  $\triangle A'B'C' \sim \triangle ABC$ .

because they came shapes

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

**35** Given: Quadrilateral ABCD with diagonals AC and BD that bisect each other, and  $\angle 1 \cong \angle 2$ 



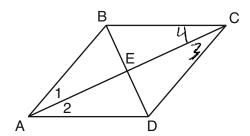
Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle

- 1) Quad ABCD, Diagonal ACTBC BISect L12- L2
- @ Quad ABCD is A parallelogram
  - 3 AR 11CO
  - Ø L1=L3 L2=L4
  - L2ºL3 and L3ºL4
  - 6 DACD is Isoceles
  - DADE DC
- (8) Quad ABCO is a Rhombus
- AE L BE
- 10 L5 is a Right L
- W D AEB is a RIGHT D

- 1 Given
- @ a parallelogram has diagonal that bisect.
- @ opposite sides of a parallelogram are parallel
- 1) LI + L3 and L2 + L4 are alt Interior L's and ALT interior L's are = when lines are
- 3 Substitution
- B An Isosceles D has 2 = base L'a
- 1) The sides of an isosceles a are 3
- PIF two consecutive sides of a parallelogram

  are congruent it is a Rhombus
- THE Diagonals of a Rhombus form I lines
- D + segments form RGHT L's
- (1) A RIGHT O has a RIGHT angle

Score 6: The student had a complete and correct proof.



Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle

-quad ABCD is a parallelogram because the diagonals

AC and BD bisect each other

-ABICD because of p sides of I are II

-XI3X3, XX23X4 because II lives and a transferral

Form 3 alt intargles

-Single XI3C2 xun X23C3 by substitution.

-AD 3CD because the sides off 3 xis of a Date 3

-DACD is an isose triagle means any 1 with 3 kgs is

Toose

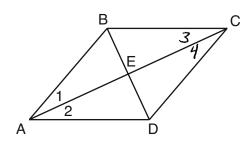
-I ABCD is a chambus decause it has 2 are cubile

3 sides

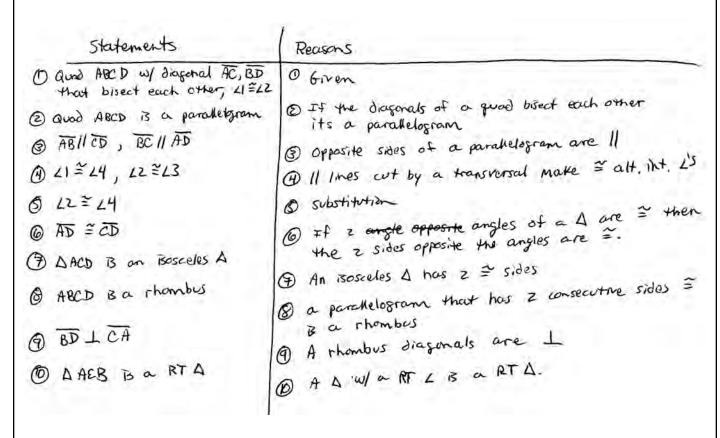
-ABEA is a right & because ABCD & a chambus and

ACLBD

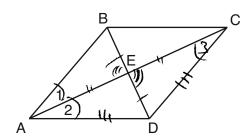
**Score 6:** The student had a complete and correct response.



Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle



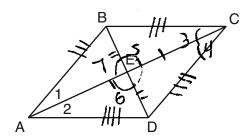
**Score 5:** The student had a statement and reason missing between steps 9 and 10.



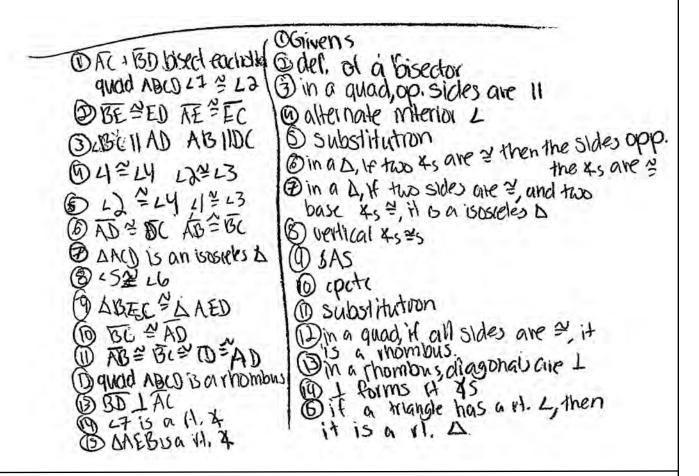
Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle

Statements	Reasons
1. Quad ABCD with AC and	1. Grein
BD that buest each other,	į.
2. LBEA > LDEC	2. Vertical Ls are =.
3. A BEA S' A DEC	3 SAS
4 4 = 63	4. CPCTC
5. 62=13	5. Substitution
6. AD = OC	6. If 2 Ls of a D are =, their opp sides are =.
7. AACD is isosceles	7. Det of isas D
P. DARD = DCED	& S\$\$
9. LAED = LCED	9. CPCTC
10. LAED, LCED form a linear	10. Def of linear pair
11. LAED, LCED are rt LS	11. If two angles are of and form a linear pair, they are right
12. LAEB is art L	12. Substitution
13. DAB is art D	13. Def of rt $\Delta$

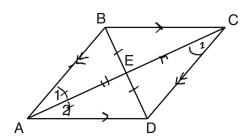
**Score 4:** The student had a statement and reason missing to prove step 3 and a statement and reason missing to prove step 8.



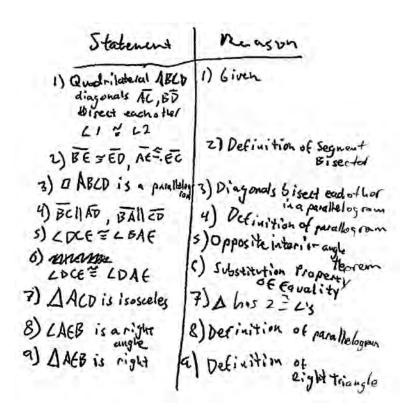
Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle



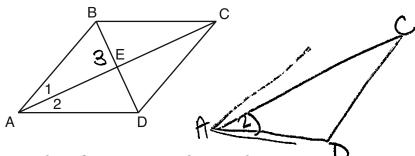
**Score 4:** The student had an incorrect reason in step 3 and an incomplete reason in step 4.



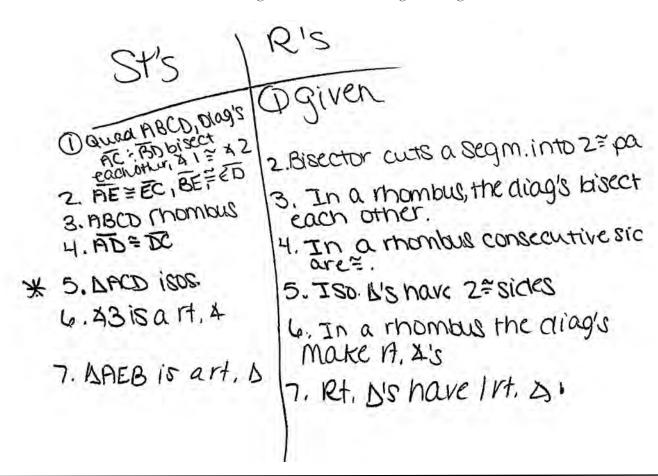
Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle



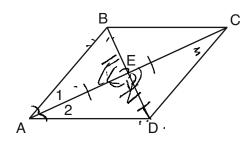
**Score 3:** The student had an incorrect reason in proving the isosceles triangle, and no further correct work was shown.



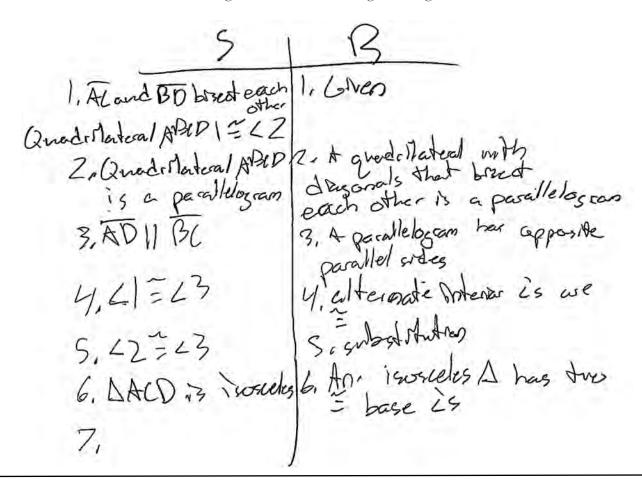
Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle



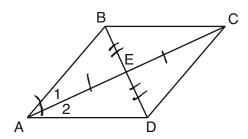
**Score 2:** The student made one conceptual error in step 3 and had one missing statement and reason to prove step 6.



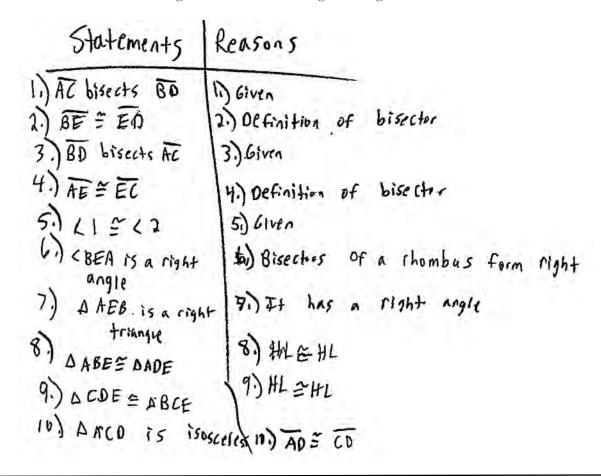
Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle



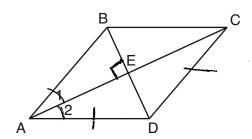
**Score 2:** The student used the incorrect parallel sides to conclude  $\angle 1 \cong \angle 3$ , had an incomplete reason in step 4, and did not prove the right triangle.



Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle



**Score 1:** The student had only two correct statements and reasons. (Steps 2 and 4 can be combined.)



Prove:  $\triangle ACD$  is an isosceles triangle and  $\triangle AEB$  is a right triangle

D Quadrilateral ABCD

with a lag nats AC and BD lossed each other

@<BAE = < DAE

3 AD = DC

9 AEC 1 BD ON E

3 < A has congruent angles

@ A ACD is isoseceles and A AEB is right

1505celes + Right

Reasoning

) Given

② Given

3 Definition of Isosceles

(90°) Definition of bijector

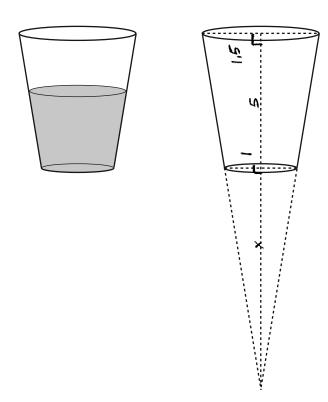
6) Complementary ongles which form a right triangle

@ ASA + HL

DCPCTC

**Score 0:** The student had no correct work.

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

Baramer you need similar triangly in order to set up and solve a proportion.

## Question 36 continued

Determine and state, in inches, the height of the larger cone.

From diagram above
$$\frac{X+5}{1.5} = \frac{X}{1}$$

$$X+5 = 1.5X$$

$$5 = 0.5X$$

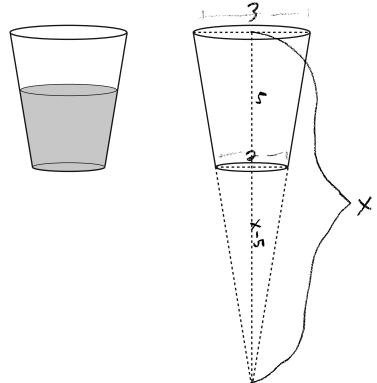
$$X = 10$$
The height of the cone is 15 inches.

Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

Volume of large cone = 
$$\frac{1}{3}\pi (1.5)^2 15 = 35.343 \text{ in}^3$$
  
Volume of small cone =  $\frac{1}{3}\pi (1)^2 (10) = 10.472 \text{ in}^3$   
Volume of glass = (Volume of large cone). Volume of small circle)  
= 24.9 in<sup>3</sup>

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

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

Parallel lines form 2 corresponding angles resulting in similar triangles.

Corresponding sides of similar triangles are in proportion. The proportion can be used to find the height.

## **Question 36 continued**

Determine and state, in inches, the height of the larger cone.

$$\frac{1.5}{x} = \frac{1}{x-5}$$

$$\frac{1.5}{x} = \frac{1}{x-5}$$

$$\frac{1.5}{x} = \frac{1}{x-5}$$

$$\frac{1.5}{x-1.5} = \frac{1}{x-5}$$

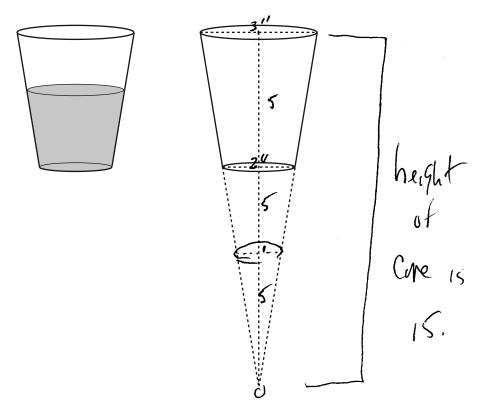
$$\frac{1.5}{x-1.5} = \frac{1}{x-5}$$

$$\frac{1.5}{x-5} = \frac{1}$$

Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

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

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



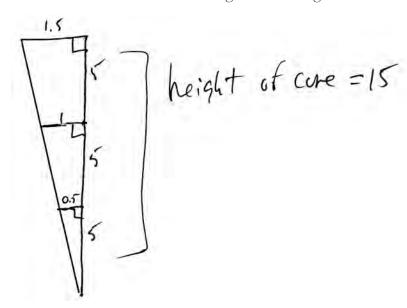
The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

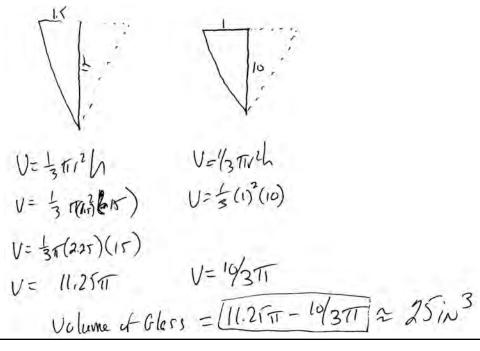
The height of the core is perpudicular to the horses of every come in the figure. This fixes the planes that curtain the horses to be parallel, and a series of similar right triangles are formed

## Question 36 continued

Determine and state, in inches, the height of the larger cone.

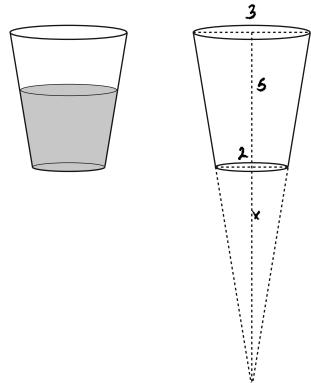


Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.



**Score 5:** The student made one rounding error.

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

The bases are both I to the height, so they are 11 to each other. This lets us use similar triangles to find the height of the cone

## **Question 36 continued**

Determine and state, in inches, the height of the larger cone.

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

$$3x = 2x + 10$$

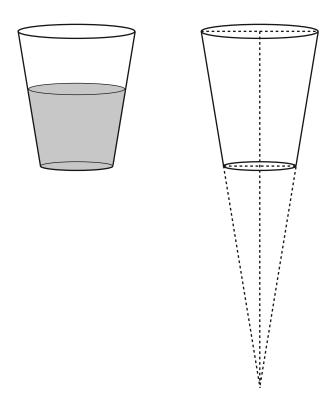
$$x = 10$$
height = 5 + 10
$$15$$

Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

$$V_{B} - V_{S}$$
 $V = \pi r^{2}h - \pi r^{2}h$ 
 $V = \pi (1.5)^{2} (15) - \pi (1)^{2} (10)$ 
 $V = 33.75\pi - 10\pi$ 
 $V = 23.75\pi$ 
 $V = 74.6$ 

**Score 4:** The student made a conceptual error in using the wrong formula in determine the volume of the water glass.

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



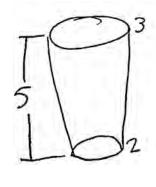
The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

If the bases were not parallel, the centers, wellow be skew and the cylinder could be oblique. - also if they werent // then the couldn't find the ratio of a in diameter to a height

### **Question 36 continued**

Determine and state, in inches, the height of the larger cone.



Change in 1"diameter = 5" hight

$$3:2$$
  $\frac{2}{3}$  total hight

 $2"+1"=5"$  hight

 $\frac{2}{3}(5)=3\frac{1}{3}$ 

1"-0" = 5" hight

Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

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

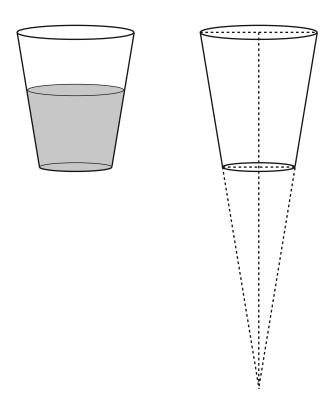
$$= \frac{11.5^{2}(15)}{3}$$

$$= \frac{33.75\pi}{3}$$

$$\approx 35.3in^{3}$$

**Score 3:** The student correctly determined the height and the volume of the larger cone.

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

Because ... 7

## **Question 36 continued**

Determine and state, in inches, the height of the larger cone.

Every time the diameter decreases by 1 the length increases by 5. So going from a diameter of 3 down to 0 makes the length 15.

Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

$$V = 11r^{2}h$$

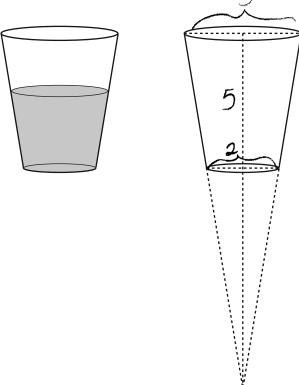
$$= 11(15)^{2}(5)$$

$$= 35.34$$

$$= 35.3 \text{ in }^{2}$$

**Score 2:** The student only found the correct value of the height.

36 A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

The base with the 2" diameter must be parallel to the base with the 3" diameter to create right triangles that are similar create right triangles that are similar so the sides are in proportion.

### **Question 36 continued**

Determine and state, in inches, the height of the larger cone.

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

Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

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

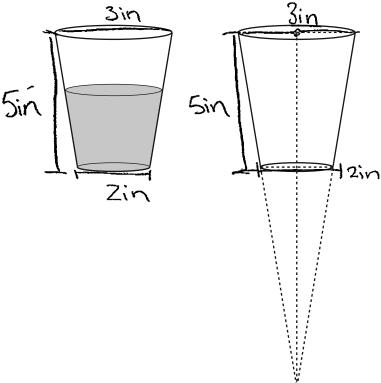
$$V = \frac{1}{3}\pi (1.5)^2 (5)$$

$$V = 3.75\pi$$

$$V = 11.8$$

**Score 1:** The student had a correct explanation.

**36** A water glass can be modeled by a truncated right cone (a cone which is cut parallel to its base) as shown below.



The diameter of the top of the glass is 3 inches, the diameter at the bottom of the glass is 2 inches, and the height of the glass is 5 inches.

The base with a diameter of 2 inches must be parallel to the base with a diameter of 3 inches in order to find the height of the cone. Explain why.

If they are not parrelled then they are not a cone because the tour tops shout not intersect.

## **Question 36 continued**

Determine and state, in inches, the height of the larger cone.

$$V = \frac{13\pi r^2 h + 2\pi r^2}{V = \frac{113\pi (1.5)^2}{5} + 2\pi (1.5)^2}$$

$$V = \frac{11.78097245}{V = \frac{11.78097245}{246in^2}}$$

$$V = \frac{11.78097245}{V = \frac{14.13716494}{24in^2}}$$

Determine and state, to the *nearest tenth of a cubic inch*, the volume of the water glass.

$$V = \frac{1}{3}m^2h$$
  
 $V = \frac{1}{3}m(1.5)^2(5)$   
 $V = 11.7809$   
 $V = 12.0 \text{ in}^3$ 

**Score 0:** The student had no correct work.

# Regents Examination in Geometry (Common Core) – June 2016

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

(Use for the June 2016 exam only.)

Raw	Scale	Performance
Score	Score	Level
86	100	5
85	99	5
84	98	5
83	97	5
82	96	5
81	95	5
80	94	5
79	93	5
78	92	5
77	91	5
76	90	5
75	89	5
74	89	5
73	88	5
72	87	5
71	87	5
70	86	5
69	86	5
68	85	5
67	84	4
66	83	4
65	83	4
64	82	4
63	82	4
62	81	4
61	81	4
60	80	4
59	80	4
58	79	3

Raw	Scale	Performance
Score	Score	Level
57	79	3
56	78	3
55	78	3
54	77	3
53	77	3
52	76	3
51	76	3
50	75	3
49	75	3
48	74	3
47	74	3
46	73	3
45	73	3
44	72	3
43	71	3
42	71	3
41	70	3
40	69	3
39	69	3
38	68	3
37	67	3
36	66	3
35	66	3
34	65	3
33	64	2
32	63	2
31	62	2
30	61	2
29	60	2

Raw	Scale	Performance
Score	Score	Level
28	59	2
27	58	2
26	57	2
25	55	2
24	54	1
23	53	1
22	51	1
21	50	1
20	48	1
19	47	1
18	45	1
17	43	1
16	41	1
15	39	1
14	38	1
13	35	1
12	33	1
11	31	1
10	29	1
9	27	1
8	24	1
7	22	1
6	19	1
5	16	1
4	13	1
3	10	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 (Common Core).