REGENTS EXAMINATION IN GEOMETRY
TEST SAMPLER

FALL 2008

October 2008

Dear Colleagues:

Thank you for your support as we begin the second year of the transition to the new Regents Examinations in mathematics. We are continuing to develop the new Regents Examination in Geometry, which will be administered for the first time in June 2009. That administration will be the second step in the transition from Mathematics A and Mathematics B to Integrated Algebra, Geometry, and Algebra 2/Trigonometry that will take place over the next two years.

The Regents Examination in Geometry is being developed to evaluate student achievement of the Mathematics Learning Standard 3 and the core curriculum, revised 2005. This Regents Examination in Geometry Test Sampler consists of the types of questions, the formatting, and the scoring guides that are being developed for the examination. It also includes examples of student work from field tests. This Test Sampler may be printed and duplicated for use in classroom instruction.

The Department is proud of its tradition of involving New York State teachers in a variety of curriculum guidance initiatives. Over the years, thousands of teachers have worked with us, and the expertise of diverse educators representing New York's diverse student population is essential in guiding this important work.

Through our Call for Expertise on the Department's web site, **we encourage teachers to become involved in test development and standard-setting activities**. Please download and complete the Call for Expertise application found at:

http://www.emsc.nysed.gov/ciai/call.htm

Thank you for all the work that you do on behalf of the students in New York State.

Sincerely,

David Abrams

Contents

Introduction

In March 2005, the Board of Regents adopted a new Learning Standard for Mathematics and issued a revised Mathematics Core Curriculum, resulting in the need for the development and phasing in of three new Regents Examinations in mathematics: Integrated Algebra, Geometry, and Algebra 2/Trigonometry. These new Regents Examinations in mathematics will replace the current Regents Examinations in Mathematics A and Mathematics B. Students must pass any one of these new commencement-level Regents Examinations in order to fulfill the mathematics Regents Examination requirement for graduation. The first administration of the Regents Examination in Integrated Algebra took place in June 2008. The first administration will take place in June 2009 for the Regents Examination in Geometry and in June 2010 for the Regents Examination in Algebra 2/Trigonometry. The Regents Examination in Geometry will be based on the content of the Mathematics Core Curriculum (Revised 2005).

The Regents Examination in Geometry Test Sampler provides examples of the format and types of questions that will comprise the operational examination. The scoring guide in the sampler includes examples of student responses from field testing and the credit allowed for each response.

The reference sheet included in the test sampler will also be provided as part of the operational examination booklet. A straightedge (ruler), a compass, and a graphing calculator must be available for the exclusive use of each student taking the examination. For the operational examination, the memory of any calculator with programming capability must be cleared, reset, or disabled when students enter the testing room. If the memory of a student's calculator is password-protected and cannot be cleared, the calculator must not be used. Students may not use calculators that are capable of symbol manipulation or that can communicate with other calculators through infrared sensors, nor may students use operating manuals, instruction or formula cards, or other information concerning the operation of calculators during the examination.

The sampler may be duplicated for use in your classroom.

GEOMETRY
TEST SAMPLER
FALL 2008

GENERAL DIRECTIONS TO THE STUDENT

Answer all 38 questions in this examination. Write your answers to the Part I multiple-choice questions on the separate answer sheet. No partial credit will be allowed on the multiple-choice section.

For Parts II, III, and IV, clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in these parts, a correct numerical answer with no work shown will receive only 1 credit.

A reference sheet that you may need to answer some questions in this examination is included.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this examination as scrap paper. Scrap graph paper is provided at the end of this examination for any question for which graphing may be helpful but is not required. Any work done on this sheet of scrap graph paper will *not* be scored. Write all your work in pen, except graphs and drawings, which should be done in pencil.

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

Part I

Answer all 28 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question.

1 Isosceles trapezoid $ABCD$ has diagonals $\overline{AC}$ and $\overline{BD}$. If $AC = 5x + 13$ and $BD = 11x - 5$, what is the value of x?

(1) 28

(3) 3

(2) $10\frac{3}{4}$

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

2 What is the negation of the statement "The Sun is shining"?
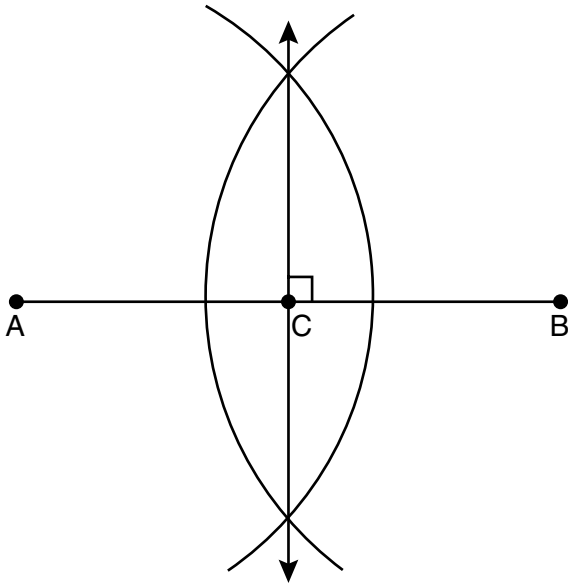
(1) It is cloudy.

(2) It is daytime.

(3) It is not raining.

(4) The Sun is not shining.

3 Triangle ABC has vertices $A(1,3)$, $B(0,1)$, and $C(4,0)$. Under a translation, A', the image point of A, is located at $(4,4)$. Under this same translation, point C' is located at

(1) (7,1)

(3) (3,2)

(2) (5,3)

(4) (1,–1)

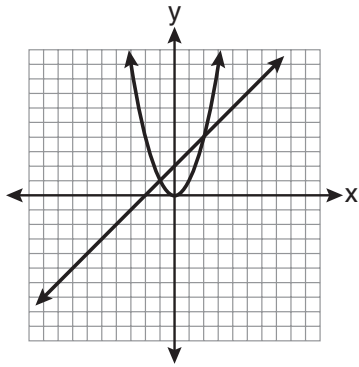**4** The diagram below shows the construction of the perpendicular bisector of $\overline{AB}$.

Which statement is *not* true?

(1) $AC = CB$

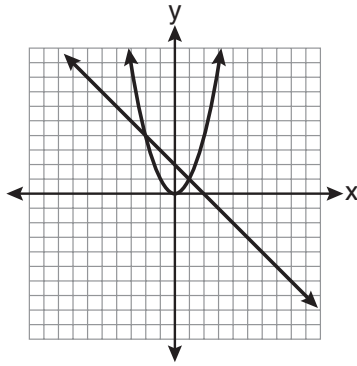(2) $CB = \frac{1}{2}AB$

(3) $AC = 2AB$

(4) $AC + CB = AB$

5 Which graph could be used to find the solution to the following system of equations?
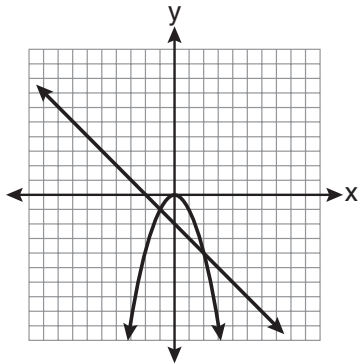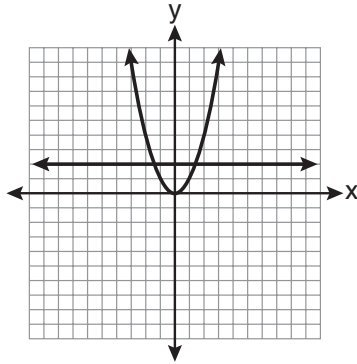
$$y = -x + 2$$
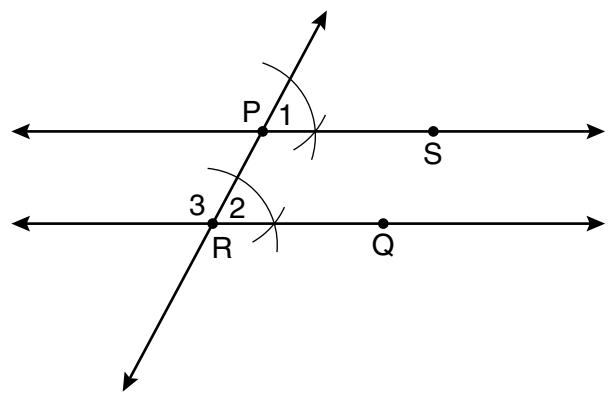$$y = x^2$$

(1)

(3)

(2)

(4)

6 Line k is drawn so that it is perpendicular to two distinct planes, P and R. What must be true about planes P and R?

(1) Planes P and R are skew.

(2) Planes P and R are parallel.

(3) Planes P and R are perpendicular.

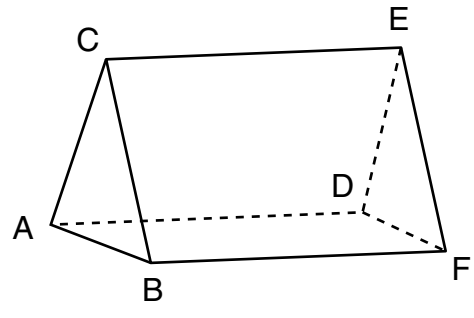(4) Plane P intersects plane R but is not perpendicular to plane R.

7 The diagram below illustrates the construction of $\overleftrightarrow{PS}$ parallel to $\overrightarrow{RQ}$ through point P.

Which statement justifies this construction?

(1) $m\angle 1 = m\angle 2$ (3) $\overline{PR} \cong \overline{RQ}$

(2) $m\angle 1 = m\angle 3$ (4) $\overline{PS} \cong \overline{RQ}$

8 The figure in the diagram below is a triangular prism.

Which statement must be true?

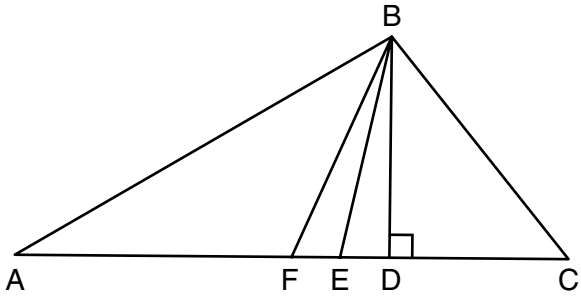(1) $\overline{DE} \cong \overline{AB}$ (3) $\overline{AD} \parallel \overline{CE}$

(2) $\overline{AD} \cong \overline{BC}$ (4) $\overline{DE} \parallel \overline{BC}$

9 The vertices of △*ABC* are *A*(−1,−2), *B*(−1,2), and *C*(6,0). Which conclusion can be made about the angles of △*ABC*?

(1) m∠*A* = m∠*B*   (3) m∠*ACB* = 90
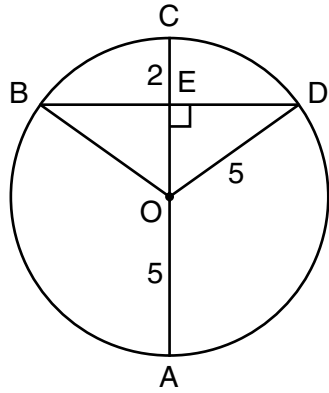
(2) m∠*A* = m∠*C*   (4) m∠*ABC* = 60

10 Given △*ABC* with base $\overline{AFEDC}$, median $\overline{BF}$, altitude $\overline{BD}$, and $\overline{BE}$ bisects ∠*ABC*, which conclusion is valid?

(1) ∠*FAB* ≅ ∠*ABF*   (3) $\overline{CE}$ ≅ $\overline{EA}$

(2) ∠*ABF* ≅ ∠*CBD*   (4) $\overline{CF}$ ≅ $\overline{FA}$

11 In the diagram below, circle O has a radius of 5, and $CE = 2$. Diameter $\overline{AC}$ is perpendicular to chord $\overline{BD}$ at E.

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

(1) 12   (3) 8

(2) 10   (4) 4

12 What is the equation of a line that passes through the point $(-3,-11)$ and is parallel to the line whose equation is $2x - y = 4$?

(1) $y = 2x + 5$ (3) $y = \frac{1}{2}x + \frac{25}{2}$

(2) $y = 2x - 5$ (4) $y = -\frac{1}{2}x - \frac{25}{2}$

13 Line segment *AB* has endpoints *A*(2,−3) and *B*(−4,6). What are the coordinates of the midpoint of $\overline{AB}$?

(1) (−2,3)

(3) (−1,3)

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

(4) $\left(3,4\frac{1}{2}\right)$

14 What are the center and radius of a circle whose equation is $(x - A)^2 + (y - B)^2 = C$?

(1) center = (*A*,*B*); radius = *C*

(2) center = (−*A*,−*B*); radius = *C*

(3) center = (*A*,*B*); radius = $\sqrt{C}$

(4) center = (−*A*,−*B*); radius = $\sqrt{C}$

15 A rectangular prism has a volume of $3x^2 + 18x + 24$. Its base has a length of *x* + 2 and a width of 3. Which expression represents the height of the prism?

(1) *x* + 4

(3) 3

(2) *x* + 2

(4) $x^2 + 6x + 8$

16 Lines k_1 and k_2 intersect at point E. Line m is perpendicular to lines k_1 and k_2 at point E.
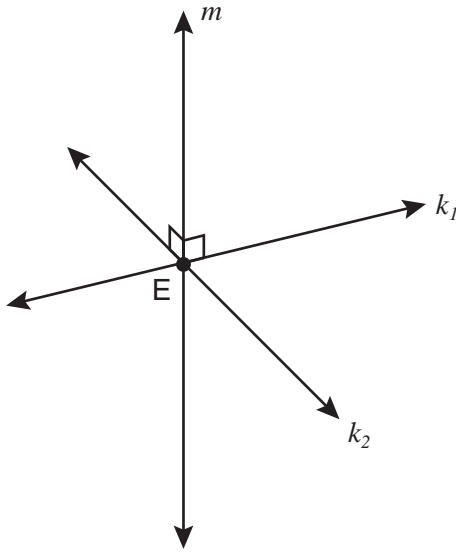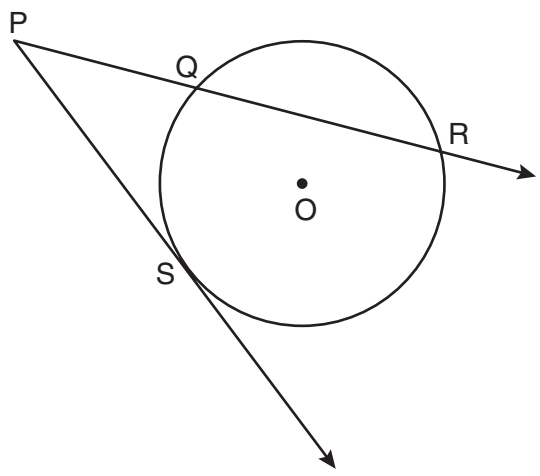

Which statement is always true?

(1) Lines k_1 and k_2 are perpendicular.

(2) Line m is parallel to the plane determined by lines k_1 and k_2.

(3) Line m is perpendicular to the plane determined by lines k_1 and k_2.

(4) Line m is coplanar with lines k_1 and k_2.

17 In the diagram below, $\overline{PS}$ is a tangent to circle O at point S, $\overline{PQR}$ is a secant, $PS = x$, $PQ = 3$, and $PR = x + 18$.

(Not drawn to scale)

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

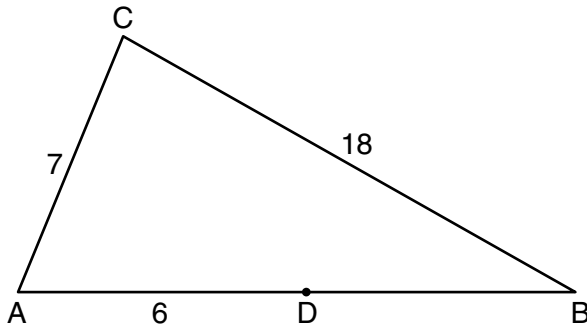(1) 6   (3) 3

(2) 9   (4) 27

18 A polygon is transformed according to the rule: $(x, y) \rightarrow (x + 2, y)$. Every point of the polygon moves two units in which direction?

(1) up   (3) left

(2) down   (4) right

19 In the diagram below of $\triangle ABC$, D is a point on $\overline{AB}$, $AC = 7$, $AD = 6$, and $BC = 18$.

C

7   18

A   6   D   B

(Not drawn to scale)

The length of $\overline{DB}$ could be

(1) 5   (3) 19

(2) 12   (4) 25

20 The diameter of a circle has endpoints at $(-2,3)$ and $(6,3)$. What is an equation of the circle?

(1) $(x - 2)^2 + (y - 3)^2 = 16$

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

(3) $(x + 2)^2 + (y + 3)^2 = 16$

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

21 In the diagram below of $\triangle PRT$, Q is a point on $\overline{PR}$, S is a point on $\overline{TR}$, $\overline{QS}$ is drawn, and $\angle RPT \cong \angle RSQ$.
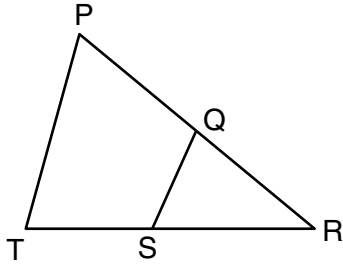
Which reason justifies the conclusion that $\triangle PRT \sim \triangle SRQ$?

(1) AA   (3) SAS

(2) ASA   (4) SSS

22 The lines $3y + 1 = 6x + 4$ and $2y + 1 = x - 9$ are

(1) parallel

(2) perpendicular

(3) the same line

(4) neither parallel nor perpendicular

23 The endpoints of $\overline{AB}$ are $A(3,2)$ and $B(7,1)$. If $\overline{A''B''}$ is the result of the transformation of $\overline{AB}$ under $D_2 \circ T_{-4,3}$ what are the coordinates of A'' and B''?

(1) $A''(-2,10)$ and $B''(6,8)$

(2) $A''(-1,5)$ and $B''(3,4)$

(3) $A''(2,7)$ and $B''(10,5)$

(4) $A''(14,-2)$ and $B''(22,-4)$

24 In the diagram below, circle *A* and circle *B* are shown.

What is the total number of lines of tangency that are common to circle *A* and circle *B*?

(1) 1   (3) 3

(2) 2   (4) 4

25 In which triangle do the three altitudes intersect outside the triangle?

(1) a right triangle

(2) an acute triangle

(3) an obtuse triangle

(4) an equilateral triangle

26 Two triangles are similar, and the ratio of each pair of corresponding sides is 2 : 1. Which statement regarding the two triangles is *not* true?

(1) Their areas have a ratio of 4 : 1.

(2) Their altitudes have a ratio of 2 : 1.

(3) Their perimeters have a ratio of 2 : 1.

(4) Their corresponding angles have a ratio of 2 : 1.

27 What is the measure of an interior angle of a regular octagon?

(1) 45°

(3) 120°

(2) 60°

(4) 135°

28 What is the slope of a line perpendicular to the line whose equation is $5x + 3y = 8$?

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

(3) $-\frac{3}{5}$

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

(4) $-\frac{5}{3}$

Part II

Answer all 6 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

29 In the diagram below of right triangle ACB, altitude $\overline{CD}$ intersects $\overline{AB}$ at D. If $AD = 3$ and $DB = 4$, find the length of $\overline{CD}$ in simplest radical form.
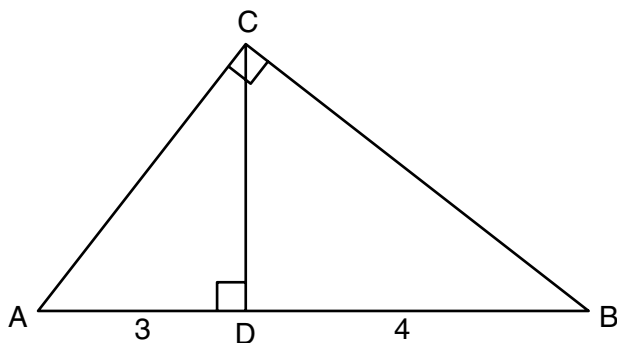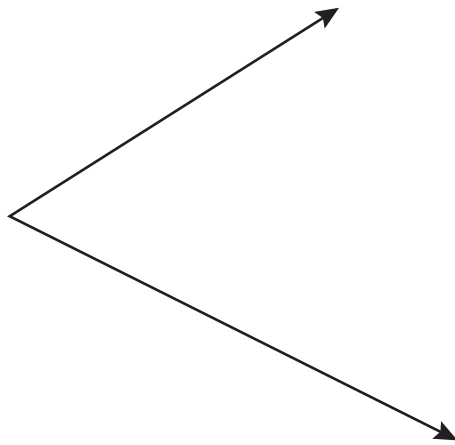
30 The vertices of $\triangle ABC$ are $A(3,2)$, $B(6,1)$, and $C(4,6)$. Identify and graph a transformation of $\triangle ABC$ such that its image, $\triangle A'B'C'$, results in $\overline{AB} \parallel \overline{A'B'}$.
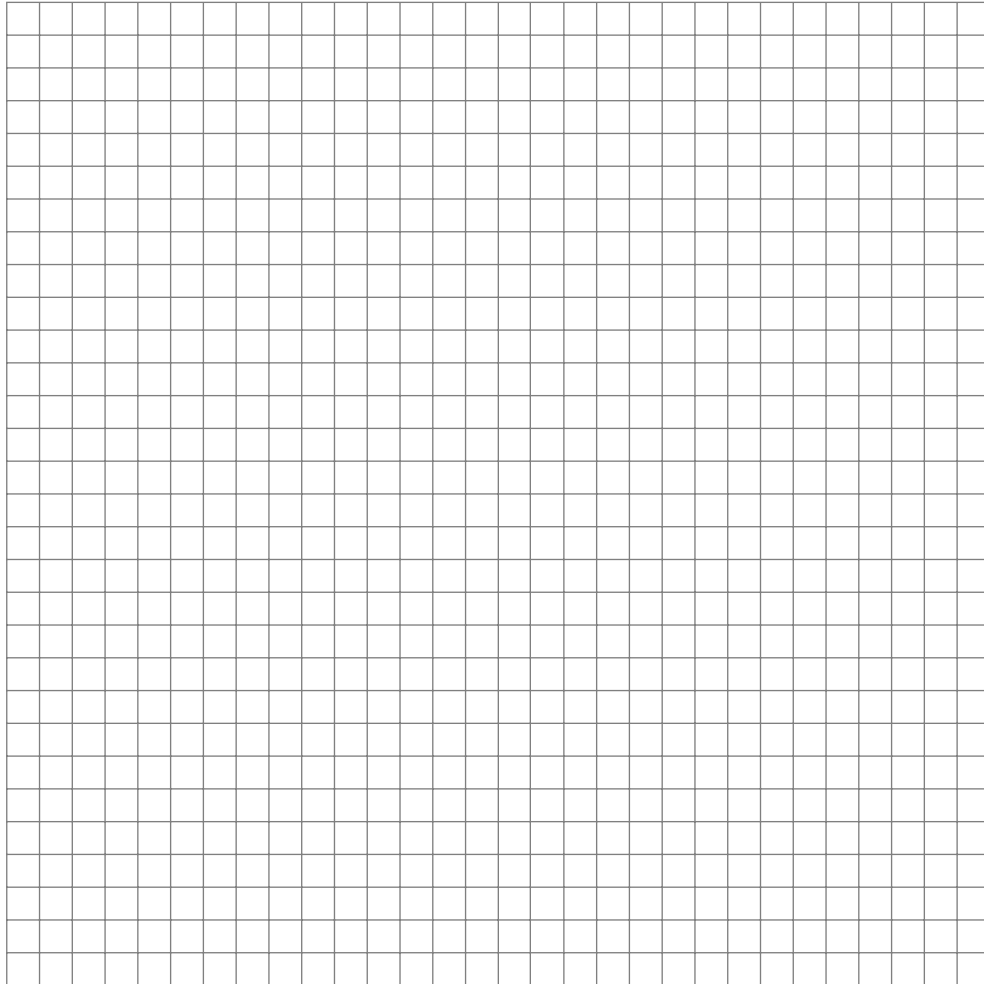
31 The endpoints of $\overline{PQ}$ are $P(-3,1)$ and $Q(4,25)$. Find the length of $\overline{PQ}$.

32 Using a compass and straightedge, construct the bisector of the angle shown below. [*Leave all construction marks.*]

33 The volume of a cylinder is 12,566.4 cm^3. The height of the cylinder is 8 cm. Find the radius of the cylinder to the *nearest tenth of a centimeter*.

34 Write a statement that is logically equivalent to the statement "If two sides of a triangle are congruent, the angles opposite those sides are congruent."

Identify the new statement as the converse, inverse, or contrapositive of the original statement.

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. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

35 On the set of axes below, graph and label $\triangle DEF$ with vertices at $D(-4,-4)$, $E(-2,2)$, and $F(8,-2)$.

If G is the midpoint of $\overline{EF}$ and H is the midpoint of $\overline{DF}$, state the coordinates of G and H and label each point on your graph.

Explain why $\overline{GH} \parallel \overline{DE}$.
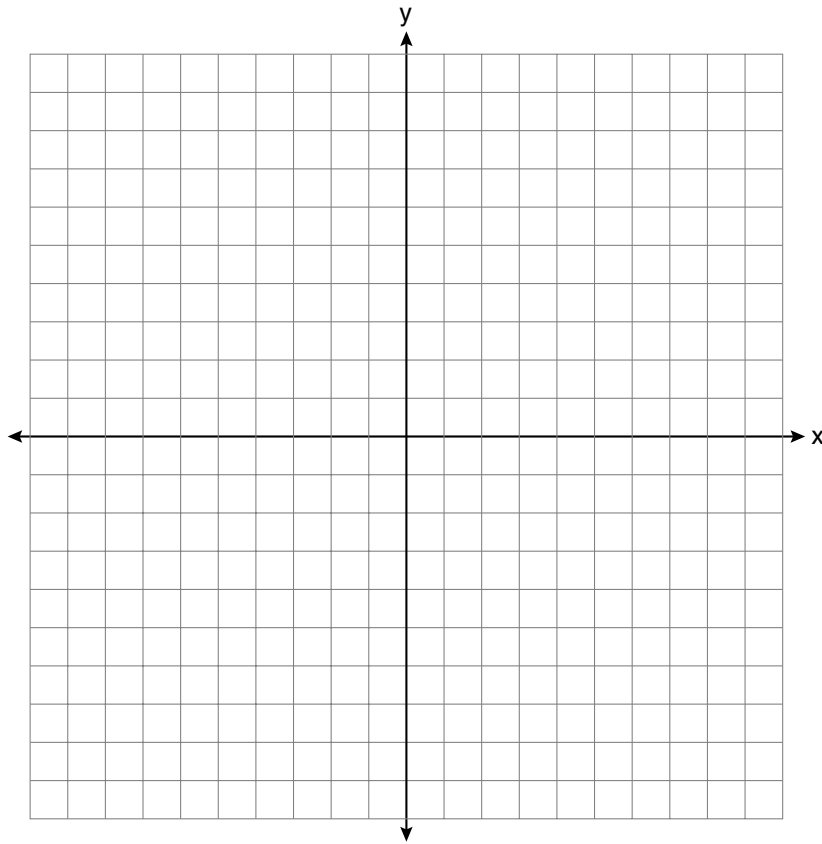
36 In the diagram below of circle O, chords $\overline{DF}$, $\overline{DE}$, $\overline{FG}$, and $\overline{EG}$ are drawn such that $m\widehat{DF} : m\widehat{FE} : m\widehat{EG} : m\widehat{GD} = 5 : 2 : 1 : 7$. Identify one pair of inscribed angles that are congruent to each other and give their measure.
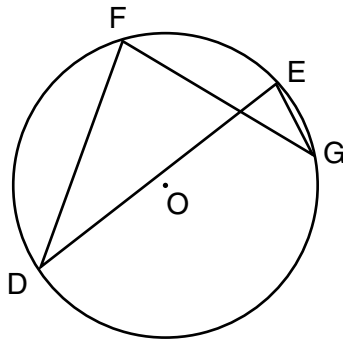
37 A city is planning to build a new park. The park must be equidistant from school A at $(3,3)$ and school B at $(3,-5)$. The park also must be exactly 5 miles from the center of town, which is located at the origin on the coordinate graph. Each unit on the graph represents 1 mile.

On the set of axes below, sketch the compound loci and label with an **X** all possible locations for the new park.
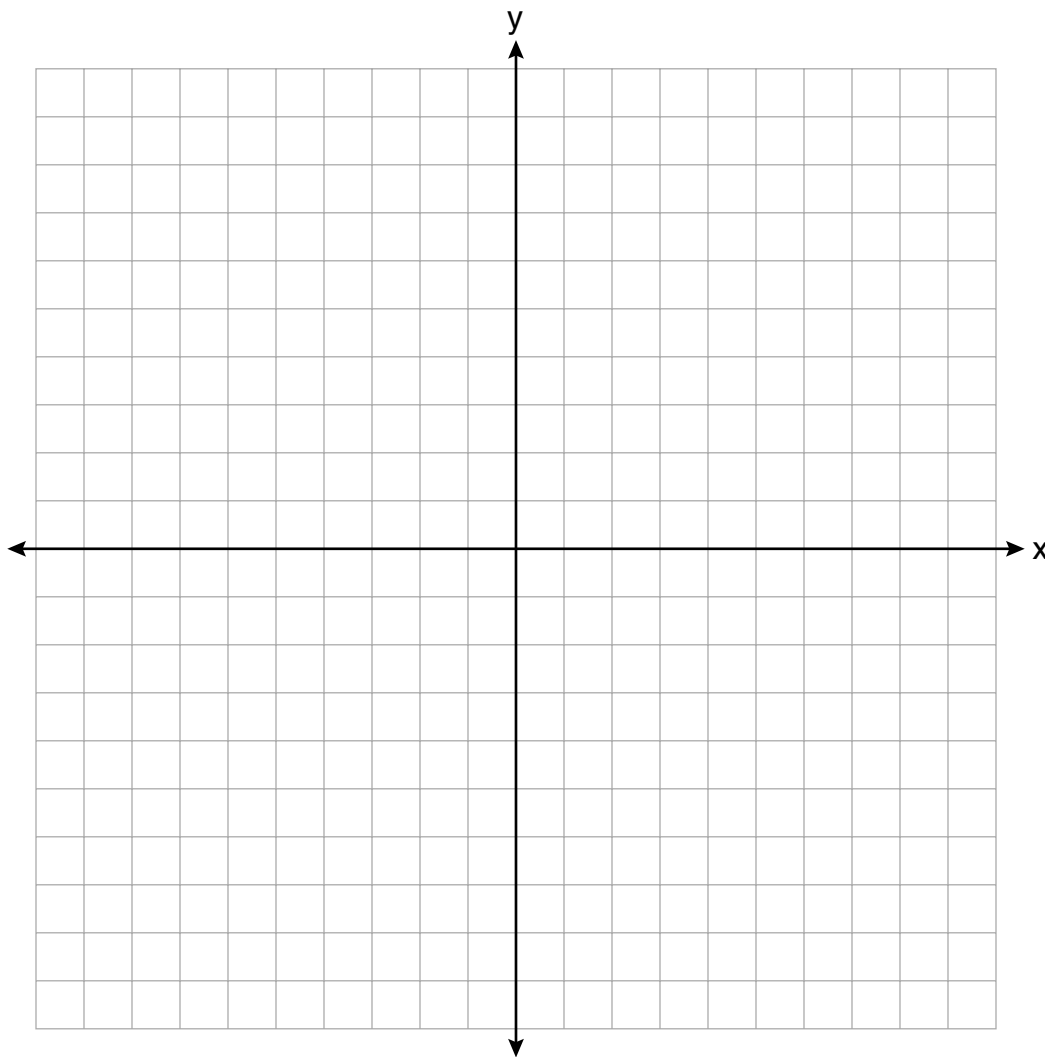
Part IV

Answer the question in this part. The correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For the question in this part, a correct numerical answer with no work shown will receive only 1 credit. [6]

38 In the diagram below, quadrilateral $ABCD$ is inscribed in circle O, $\overline{AB} \parallel \overline{DC}$, and diagonals $\overline{AC}$ and $\overline{BD}$ are drawn.

Prove that $\triangle ACD \cong \triangle BDC$.
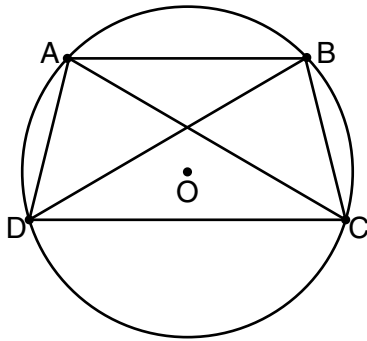
Geometry Reference Sheet

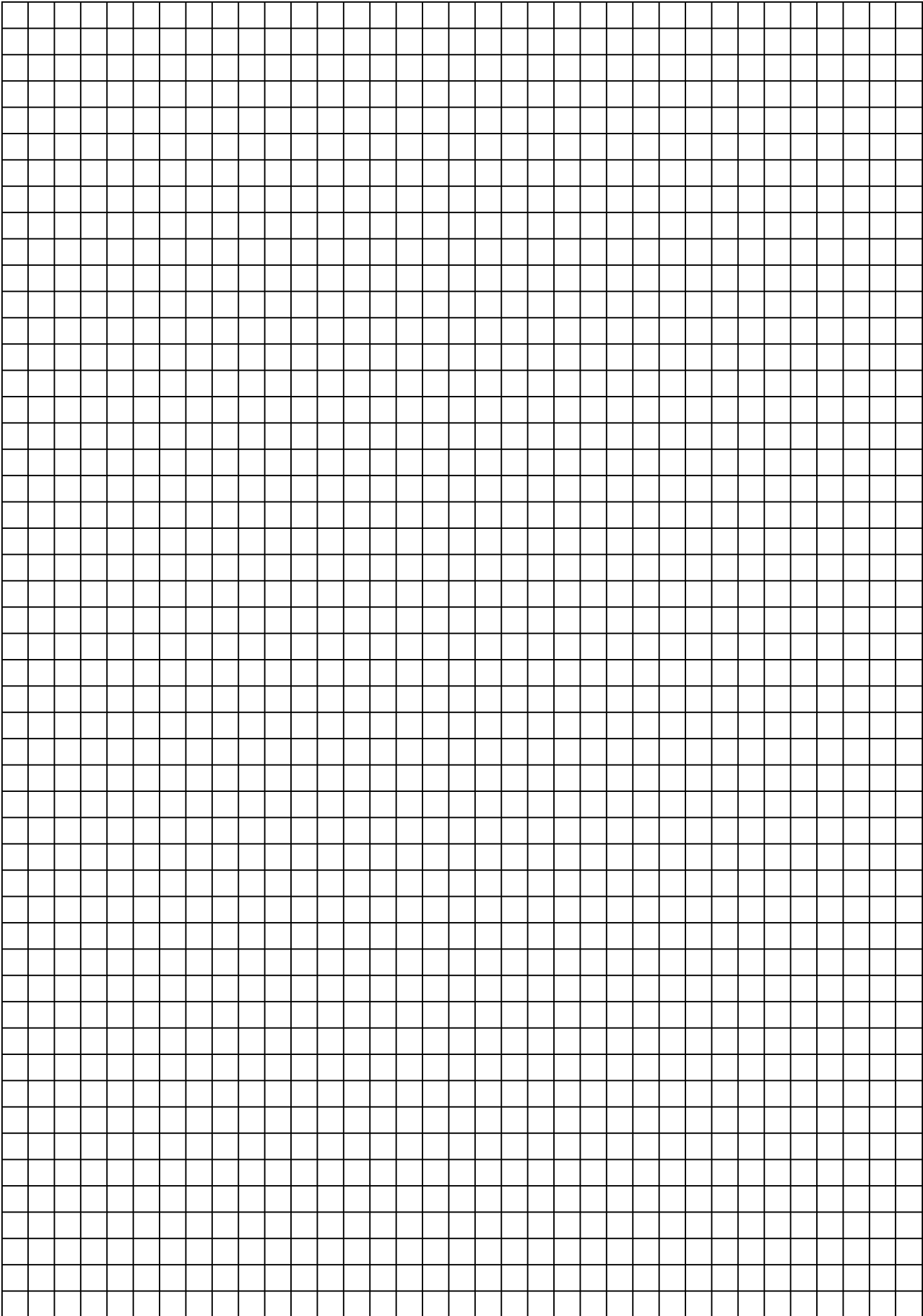|		
Volume	Cylinder	$V = Bh$ where B is the area of the base
	Pyramid	$V = \frac{1}{3}Bh$ where B is the area of the base
	Right Circular Cone	$V = \frac{1}{3}Bh$ where B is the area of the base
	Sphere	$V = \frac{4}{3}\pi r^3$

Lateral Area (L)	Right Circular Cylinder	$L = 2\pi rh$
	Right Circular Cone	$L = \pi rl$ where l is the slant height

Surface Area	Sphere	$SA = 4\pi r^2$

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION
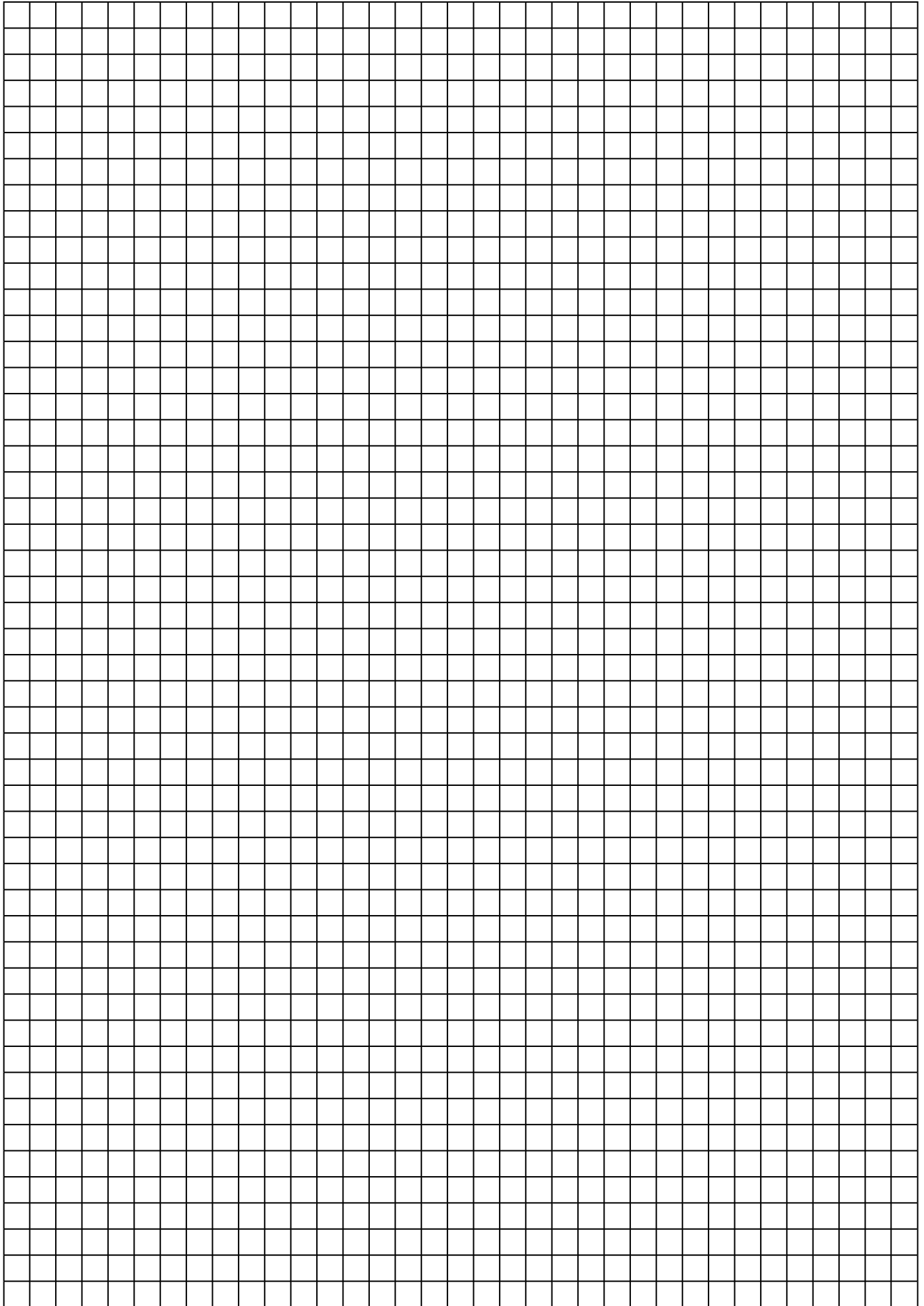
GEOMETRY TEST SAMPLER

Fall 2008

ANSWER SHEET

Student .... Sex: ❏ Male ❏ Female Grade ....

Teacher .... School ....

Your answers to Part I should be recorded on this answer sheet.

Part I

Answer all 28 questions in this part.

1	8	15	22 ....
2	9	16	23 ....
3	10	17	24 ....
4	11	18	25 ....
5	12	19	26 ....
6	13	20	27 ....
7	14	21	28 ....

SAMPLE

Your answers for Parts II, III, and IV should be written in the test booklet.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.
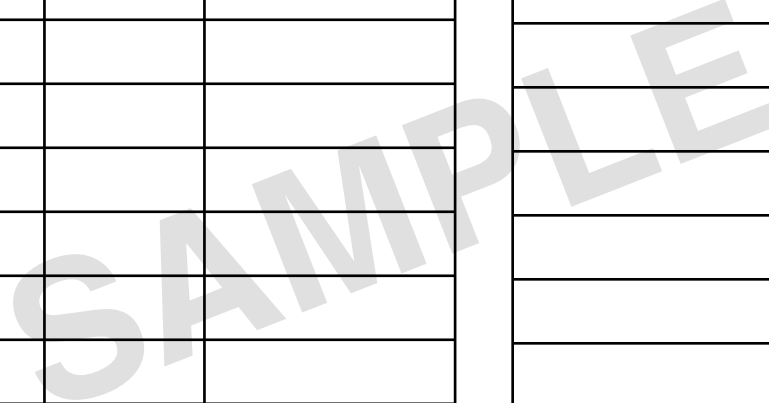
_____

Signature

GEOMETRY TEST SAMPLER

GEOMETRY TEST SAMPLER			
Question	**Maximum Credit**	**Credits Earned**	**Rater's/Scorer's Initials**
Part I 1–28	**56**		
Part II 29	**2**		
30	**2**		
31	**2**		
32	**2**		
33	**2**		
34	**2**		
Part III 35	**4**		
36	**4**		
37	**4**		
Part IV 38	**6**		
Maximum Total	**86**		
		Total Raw Score	**Checked by**

Rater's/Scorer's Name (minimum of three)

SAMPLE

Scoring Guide for the Geometry Test Sampler

      Answers to multiple-choice questions 1 through 28, and the specific rubrics for open-ended questions 29 through 38, are provided on the following pages. A complete and correct student response is provided for each open-ended question. The response shows one example of how to solve the problem. In most cases there are other acceptable solutions. Other student responses are shown for each score level.

      The maximum raw score for the Regents Examination in Geometry is allocated as follows:

Part I	28 two-credit multiple-choice questions	56 credits
Part II	6 two-credit open-ended questions	12 credits
Part III	3 four-credit open-ended questions	12 credits
Part IV	1 six-credit open-ended question	6 credits

Part I

(1)	3	(8)	3	(15)	1	(22)	4
(2)	4	(9)	1	(16)	3	(23)	1
(3)	1	(10)	4	(17)	2	(24)	4
(4)	3	(11)	3	(18)	4	(25)	3
(5)	3	(12)	2	(19)	2	(26)	4
(6)	2	(13)	2	(20)	1	(27)	4
(7)	1	(14)	3	(21)	1	(28)	2

Part II

(29) In the diagram below of right triangle ACB, altitude $\overline{CD}$ intersects $\overline{AB}$ at D. If $AD = 3$ and $DB = 4$, find the length of $\overline{CD}$ in simplest radical form.
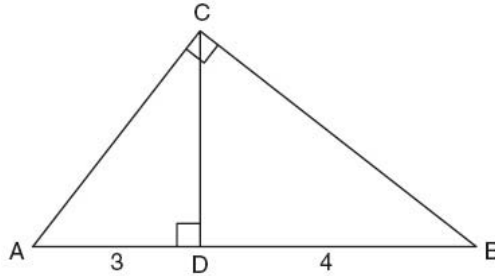
Rubric

[2] $2\sqrt{3}$, and appropriate work is shown.

[1] Appropriate work is shown, but the answer is not written in simplest radical form.

or

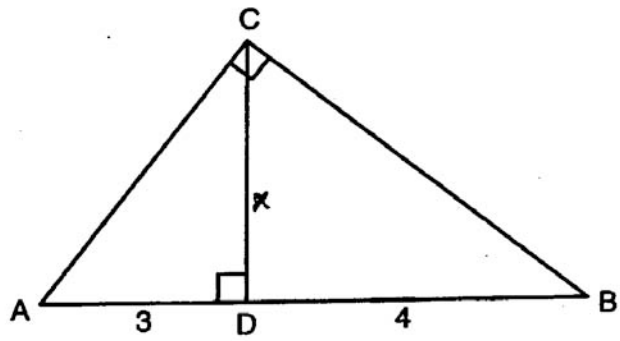[1] Appropriate work is shown, but one computational error is made.

or

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

or

[1] $2\sqrt{3}$, 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.

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

$$12 = x^2$$

$$x = \sqrt{12}$$

$$\sqrt{4}\ \sqrt{3}$$

$$\boxed{x = 2\sqrt{3}}$$

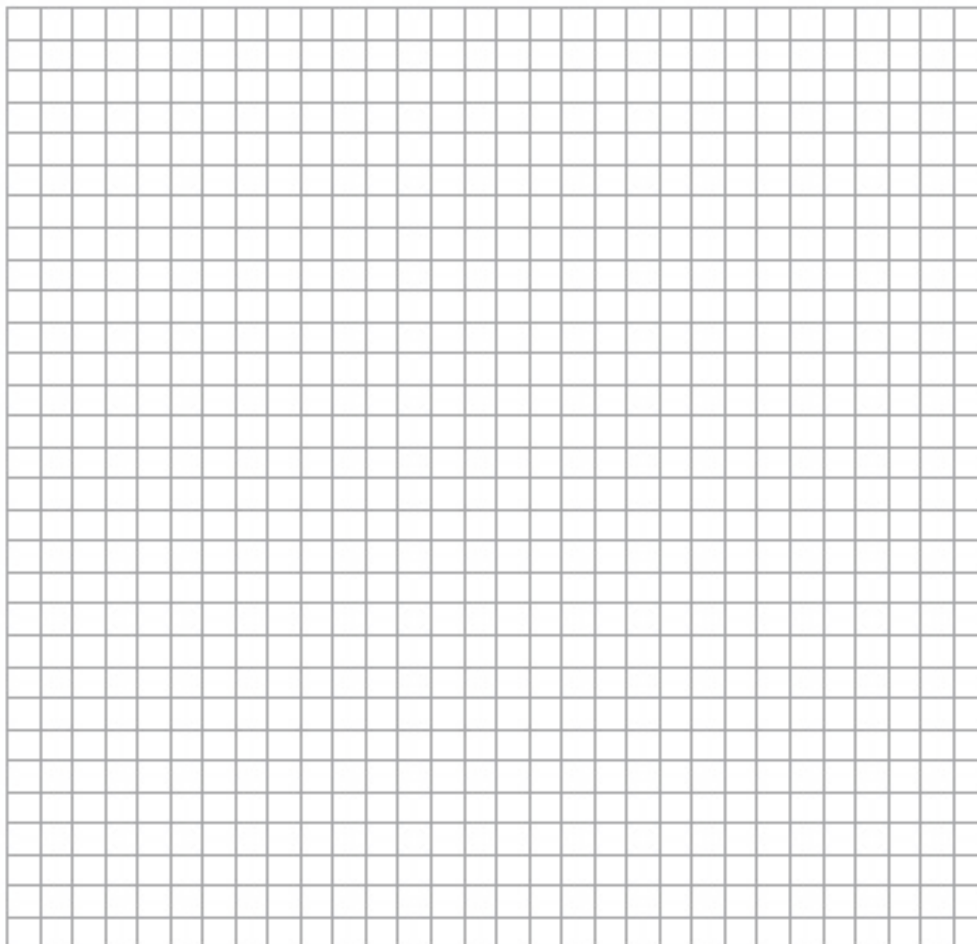**Student work for Item 29 – Score 1**
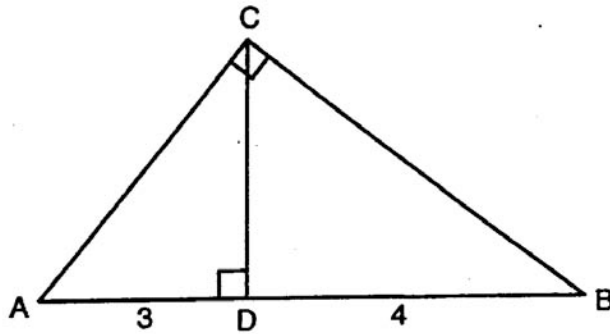
$$3 \cdot 4 = x \cdot x$$
$$12 = x^2$$

$$\boxed{3 = x}$$

Student work for Item 29 – Score 0
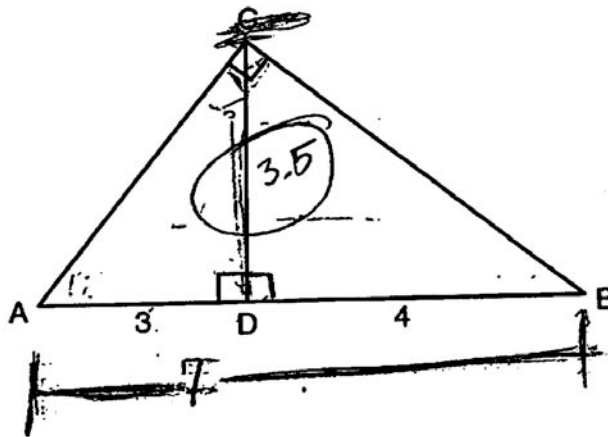
(30) The vertices of △ABC are A(3,2), B(6,1), and C(4,6). Identify and graph a transformation of △ABC such that its image, △A′B′C′, results in $\overline{AB} \parallel \overline{A'B'}$.
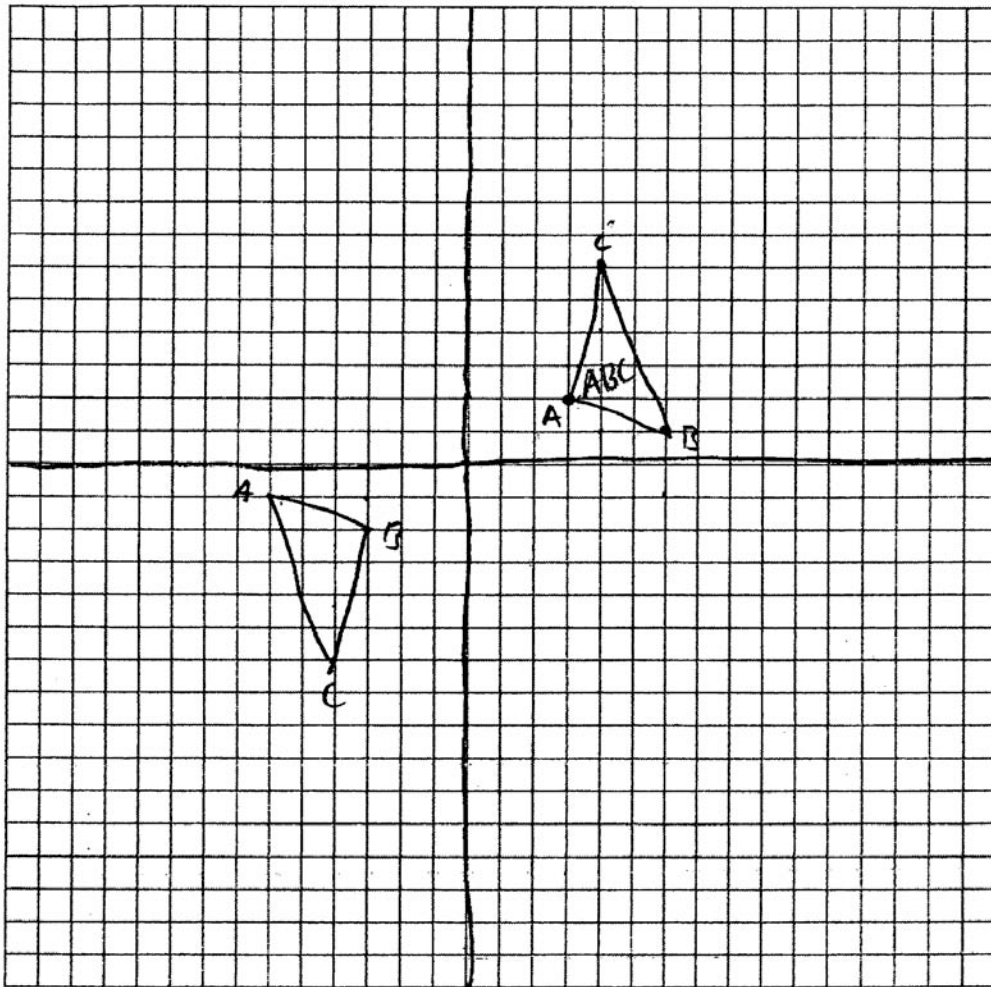

Rubric

[2] A correct transformation is stated and drawn, such as a translation, a dilation, a reflection through the origin, a rotation of 180° around the origin, or any description of a transformation.

[1] A correct transformation is stated, but the graph is missing or incorrect.

or

[1] A correct graph is drawn, but a transformation is not stated or is stated incorrectly.

or

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

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
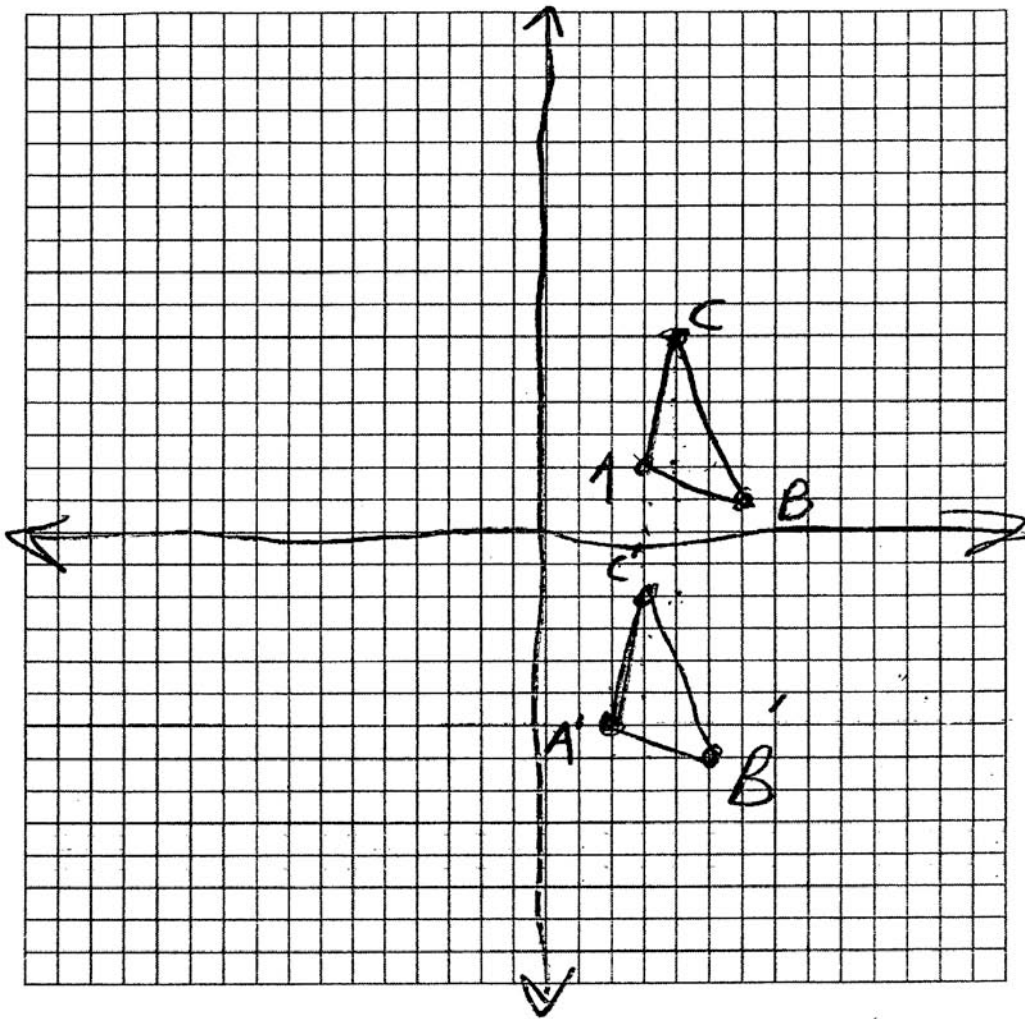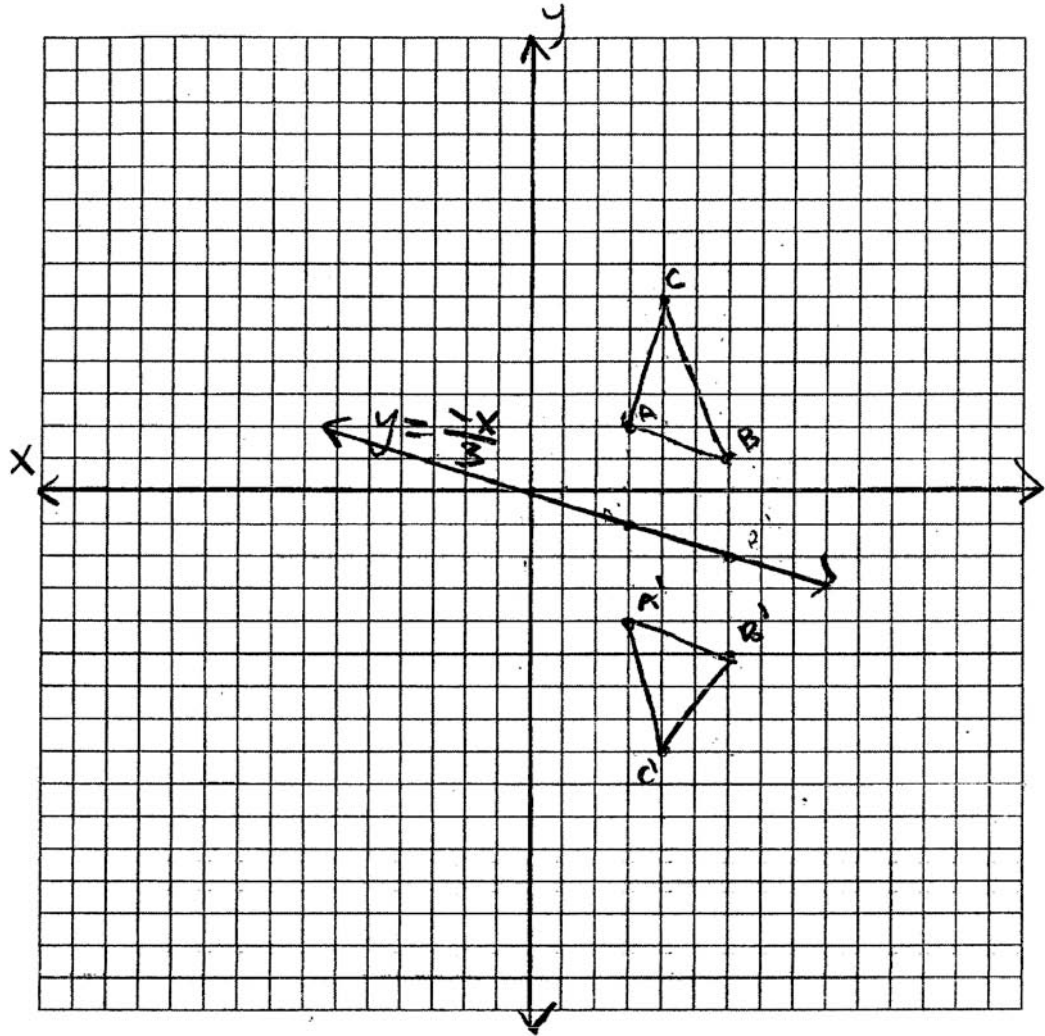
Down 6
left 1

reflection through origin

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{1 - 2}{6 - 3}$$

$$= \frac{-1}{3}$$

$y = \frac{-x}{3} \rightarrow$ tranformation over line

$A'(3, -4)$

$B'(6, -5)$

$C'(4, -8)$

(31) The endpoints of $\overline{PQ}$ are $P(-3,1)$ and $Q(4,25)$. Find the length of $\overline{PQ}$.

Rubric

[2] 25, and appropriate work is shown.

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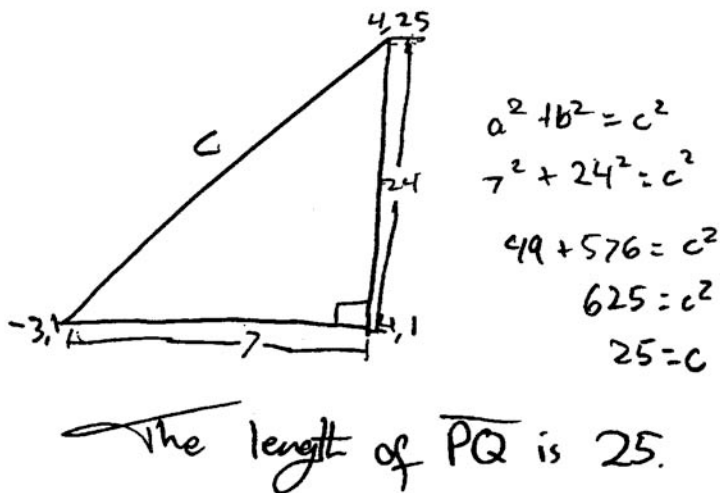
or

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

or

[1] 25, 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.

Student work for Item 31 – Score 2

Student work for Item 31 – Score 2

$$d = \sqrt{(-3-4)^2 + (1-25)^2}$$

$$d = \sqrt{(-7)^2 + (24)^2}$$

$$d = \sqrt{49 + 576}$$

$$d = \sqrt{625}$$

$$d = 25$$

Student work for Item 31 – Score 1

$$\text{Distance formula} = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$
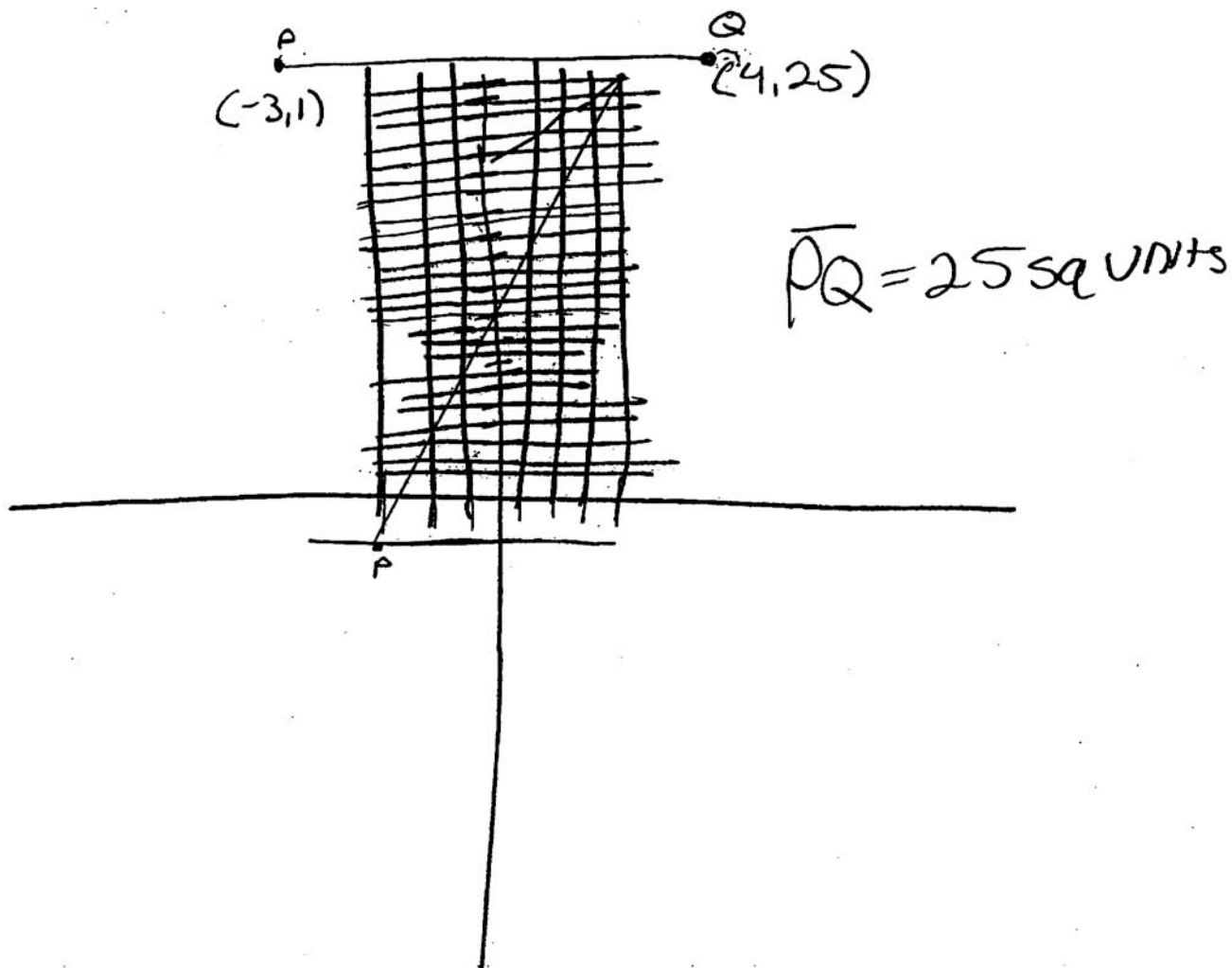
$$D = \sqrt{(4-3)^2 + (25-1)^2}$$

$$D = \sqrt{49 + 576}$$

$$D = \sqrt{627}$$

$$\begin{array}{r} 24 \\ \underline{24} \\ 96 \\ 480 \\ \hline 576 \\ \underline{49} \\ \hline 627 \end{array}$$
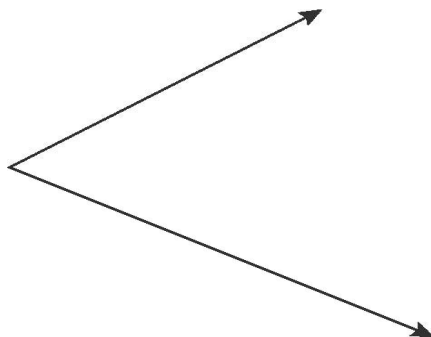
Student work for Item 31 – Score 1

$$D = \sqrt{(x^2 - x_1)^2 - (y^2 - y^1)^2}$$

$$D = \sqrt{(4 - -3)^2 - (25 - 1)^2}$$

$$D = \sqrt{49 - 576}$$

$$D = \sqrt{-527}$$

Student work for Item 31 – Score 0

P (-3,1)

Q (4,25)

$\overline{PQ} = 25$ sq units

(32) Using a compass and straightedge, construct the bisector of the angle shown below. [*Leave all construction marks.*]

Rubric

[2] A correct construction is drawn showing all appropriate arcs, and the angle bisector is drawn.

**[1]** All construction arcs are drawn, but the angle bisector is not drawn.

or

[1] The appropriate method is demonstrated, but one construction error is made, such as not extending the sides to show points of intersection by the arc.

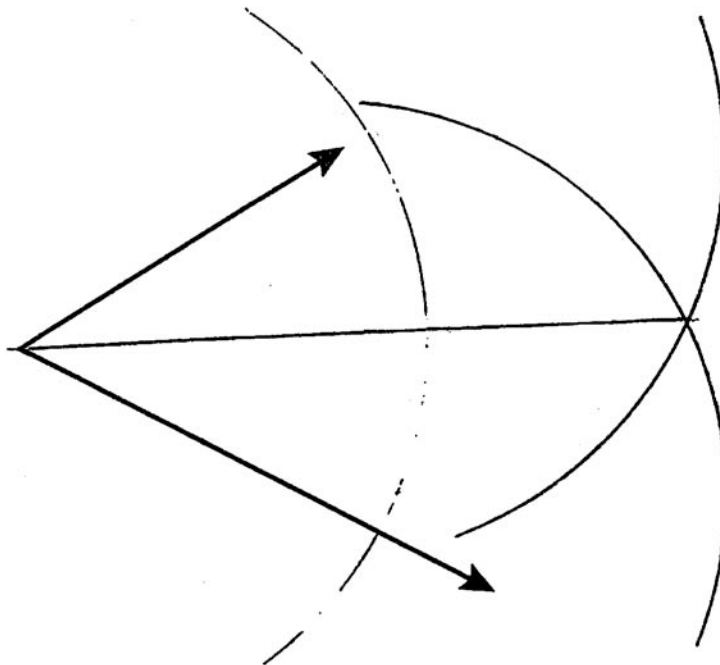**[0]** A drawing that is not an appropriate construction is shown.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
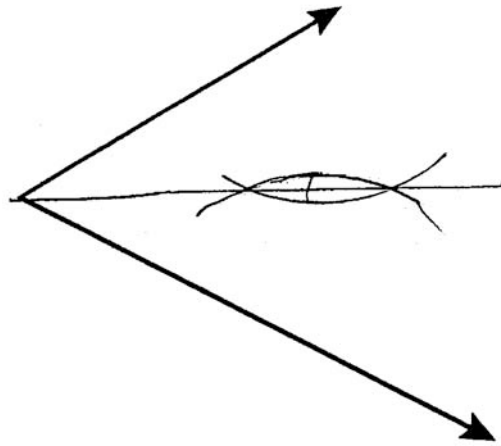
Student work for Item 32 – Score 2
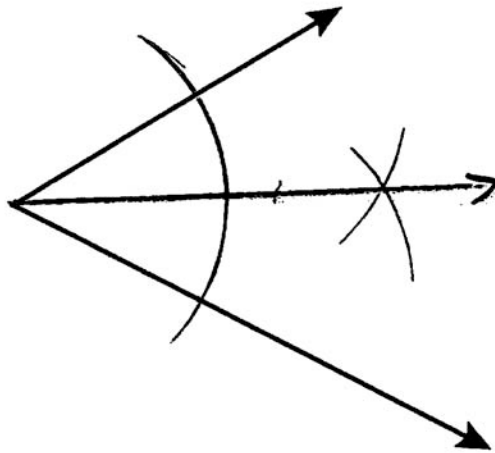
Student work for Item 32 – Score 1

(33) The volume of a cylinder is 12,566.4 cm^3. The height of the cylinder is 8 cm. Find the radius of the cylinder to the *nearest tenth of a centimeter*.

Rubric

[2] 22.4, and appropriate work is shown.

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

or

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

or

[1] 22.4, 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.
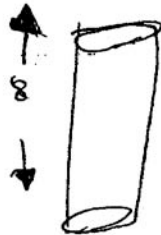
Student work for Item 33 – Score 2

$$\frac{12,566.4}{8} = \frac{B(8)}{8}$$

$$1570.8 = B$$

$$\frac{1570.8}{\pi} = \frac{\pi r^2}{\pi}$$

$$\sqrt{\frac{1570.8}{\pi}} = \sqrt{r^2}$$

$$\boxed{22.4} \approx r$$

Student work for Item 33 – Score 1

$12,566.4 \text{ cm}^3 = B \cdot 8$ $A = \pi \cdot r^2$

$12,566.4 = \pi \cdot r^2 \cdot 8$

$ - 8 - 8$

$V = 12,566$

$\dfrac{12558.4}{\pi \cdot 3} = \dfrac{\pi \cdot r^2}{\pi}$
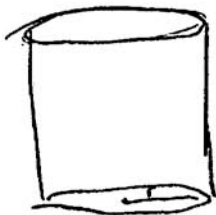
$\sqrt{3999.49} = \sqrt{r^2}$

63.24

$\boxed{r = 63.2}$

Student work for item 33 – Score 0

$V = Bh.$

$n = 8.$

$V = 12,566.4 \text{ cm}^3$

$\dfrac{12,566.4}{8} = 1570.8 = B$

$\dfrac{1570.8}{3.14} = 500.254 = r^2.$

$r = 22.366. \approx \boxed{r = 22.}$

(34) Write a statement that is logically equivalent to the statement "If two sides of a triangle are congruent, the angles opposite those sides are congruent."

Identify the new statement as the converse, inverse, or contrapositive of the original statement.

Rubric

[2] A correct logically equivalent statement is written and identified as the contrapositive.

[1] An incorrect statement is written, but it is identified appropriately.

or

[1] Contrapositive is identified, but the statement 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.

Student work for Item 34 – Score 2

If the angles opposite 2 sides of a triangle are not congruent, then the two sides are not congruent.

This statement is the contrapositive of the original statement

Student work for Item 34 – Score 1

If the angles opposite of two side of a triangle are congruent, then those two side of a triangle are congruent

The statement above is t. converse of the original statement.

Student work for Item 34 – Score 1

If two sides of a triangle are ~~not~~ congruent, the angles opposite those sides are not congruent.
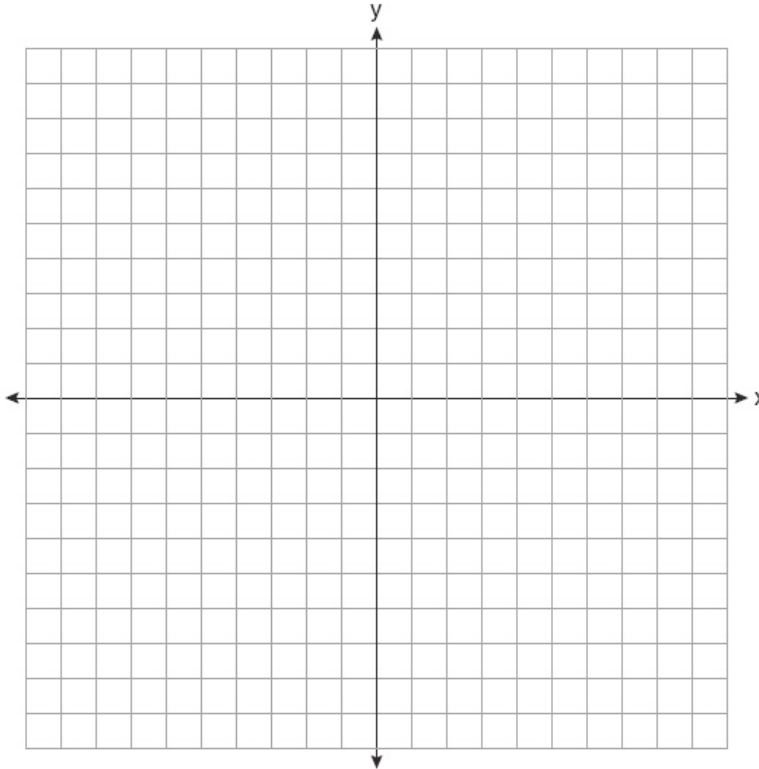
contrapositive

Part III

(35)   On the set of axes below, graph and label △*DEF* with vertices at *D*(–4,–4), *E*(–2,2), and
F(8,–2).

If *G* is the midpoint of $\overline{EF}$ and *H* is the midpoint of $\overline{DF}$, state the coordinates of *G* and *H* and label
each point on your graph.

Explain why $\overline{GH} \parallel \overline{DE}$.

Rubric for Item 35

[4] △*DEF* is graphed and labeled correctly, *G*(3,0) and *H*(2,–3) are stated and labeled correctly, and an appropriate explanation is written, such as the slopes are congruent or the midsegment theorem.

or

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

or

[3] Appropriate work is shown, and an appropriate explanation is written, but the coordinates of *G* and *H* are missing or incorrect.

or

[3] △*DEF* is graphed and labeled correctly, *G*(3,0) and *H*(2,–3) are stated and labeled correctly, appropriate work is shown to find the slopes of $\overline{GH}$ and $\overline{ED},$ but the explanation is missing or incorrect.

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

or

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

or

[2] △*DEF* is graphed and labeled correctly, *G*(3,0) and *H*(2,–3) are stated and labeled correctly, but no further correct work is shown.

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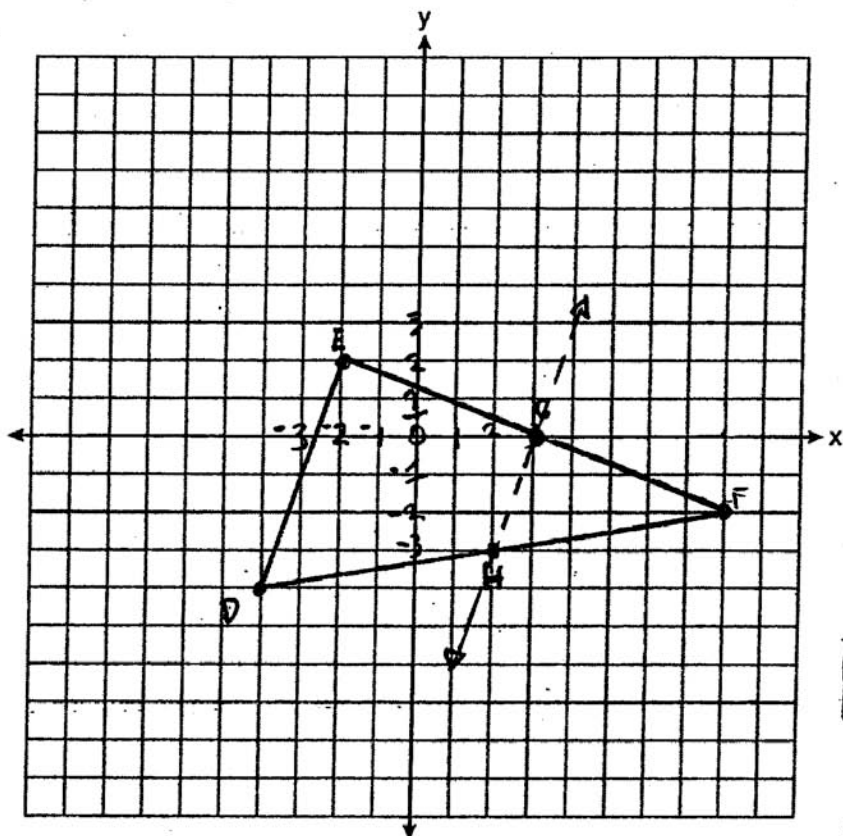
or

[1] The midsegment theorem is written, but no work is shown.

or

[1] *G*(3,0) and *H*(2,–3), 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.

midpt $\overline{EF}$: $\left(\dfrac{-2+8}{2}, \dfrac{2-2}{2}\right)$

$= \left(\dfrac{6}{2}, \dfrac{0}{2}\right)$

$G = (3, 0)$

midpt $\overline{DF}$: $\left(\dfrac{-4+8}{2}, \dfrac{-2-4}{2}\right)$

$= \left(\dfrac{4}{2}, \dfrac{-6}{2}\right)$
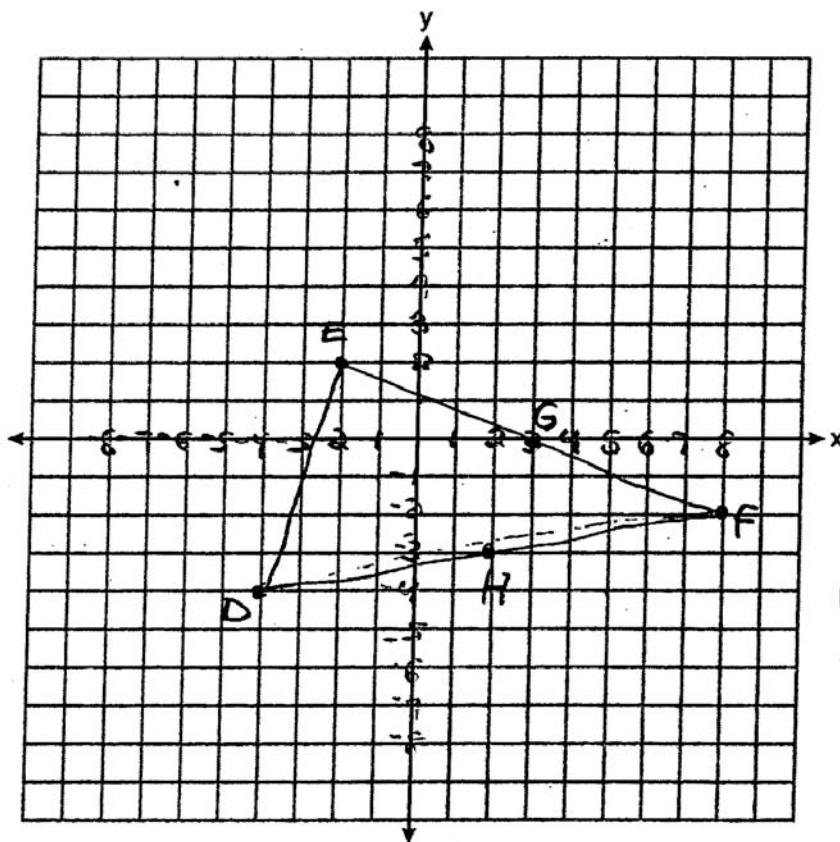
$H = (2, -3)$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$\overline{GH}$
$m = \dfrac{0+3}{3-2}$

$\overline{DE}$
$m = \dfrac{2+4}{-2+4}$

$= \dfrac{3}{1}$

$= \dfrac{6}{2}$

$\boxed{m^{\overline{GH}} = 3}$

$\boxed{m^{\overline{DE}} = 3}$

$\therefore \overline{GH} \parallel \overline{DE}$ because their slopes are both equal to 3, they have the same slopes

$\overline{GH} \parallel \overline{DE}$ because mid points of 2 lines on a △ are ∥ to its base

midpoint G = $\dfrac{-2+8}{2}$, $\dfrac{2+(-2)}{2}$

(3, 0) is the midpoint of $\overline{EF}$

midpoint H = $\dfrac{-4+8}{2}$, $\dfrac{-4-2}{2}$

(2, -3) is the midpoint of $\overline{DF}$
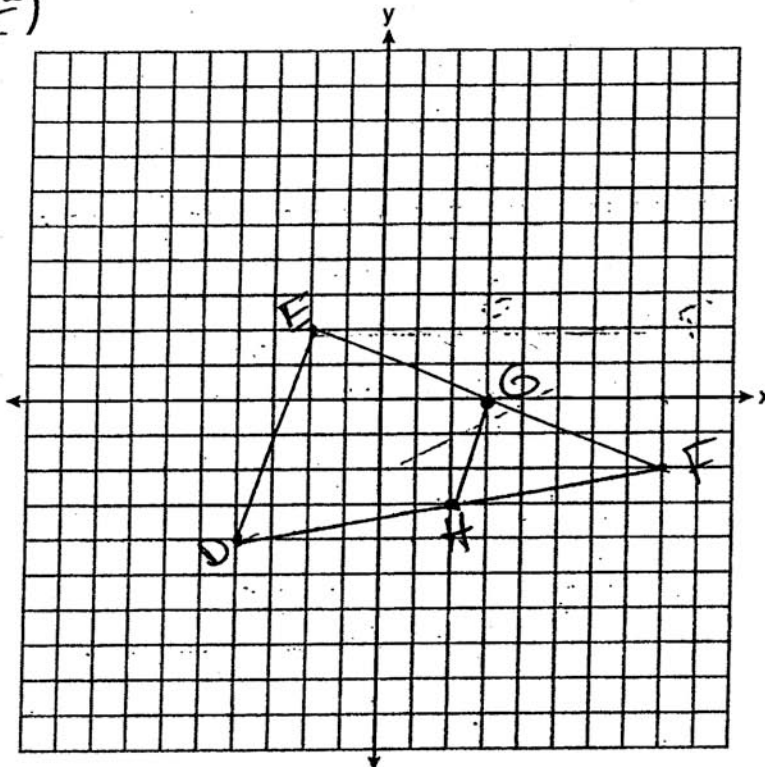
$midpt = \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

$H\left(\dfrac{-4+8}{2}, \dfrac{-4-2}{2}\right)$
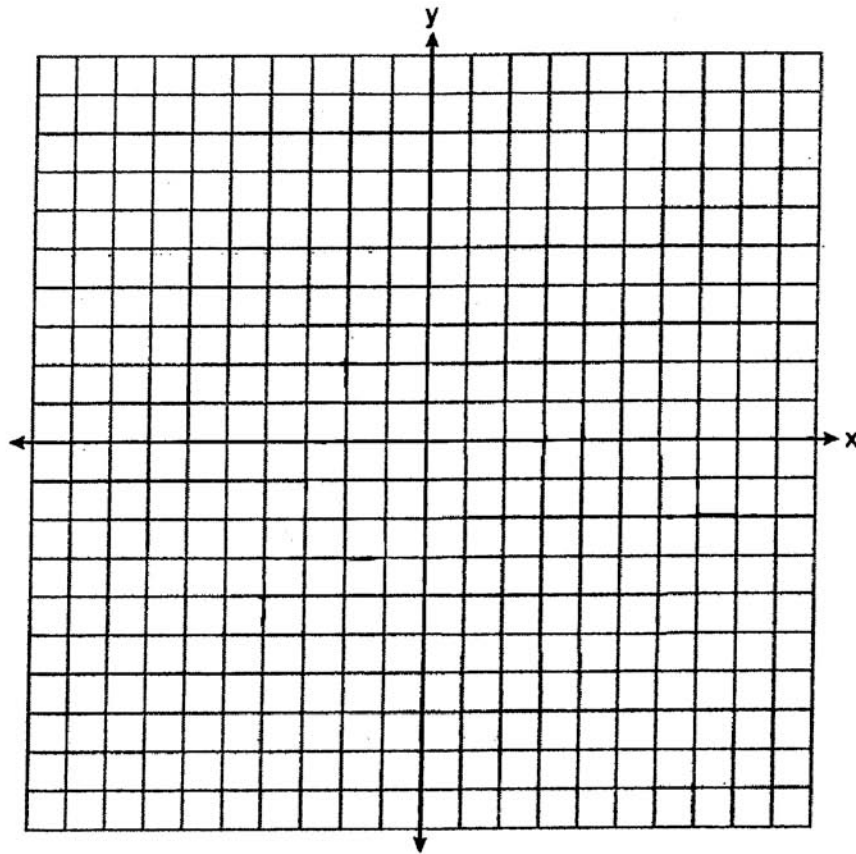
$H\left(2, -3\right)$

$G\left(\dfrac{-2+8}{2}, \dfrac{2-2}{2}\right)$

$G(3, 0)$

$G(3, 2)$

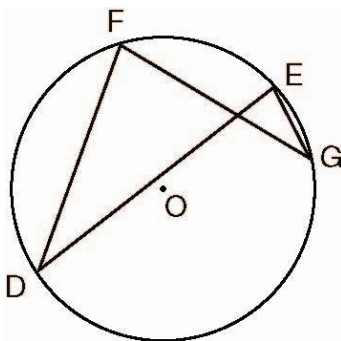$\overline{GH} \parallel \overline{DE}$ because $\triangle HGF$ is similar to $\triangle DEF$.

Slope Formula: $\dfrac{x_2 - x_1}{y_2 - y_1}$

$\overline{GH} \parallel \overline{DE}$

$\overline{GH} = \dfrac{3-2}{0--3} = \dfrac{1}{3}$

$G(3,0)$

$H(-2,-3)$

$\overline{DE} = \dfrac{-4-2}{-4-2} = \dfrac{-2}{-6} = \dfrac{1}{3}$

$D(-4,-4)$

$E(-2,2)$

(36) In the diagram below of circle O, chords $\overline{DF}$, $\overline{DE}$, $\overline{FG}$, and $\overline{EG}$ are drawn such that

$\text{m}\overset{\frown}{DF} : \text{m}\overset{\frown}{FE} : \text{m}\overset{\frown}{EG} : \text{m}\overset{\frown}{GD} = 5 : 2 : 1 : 7$. Identify one pair of inscribed angles that are congruent to each other and give their measure.

Rubric for Item 36

[4] $\angle D$ and $\angle G$ and 24, or $\angle E$ and $\angle F$ and 84, and appropriate work is shown.

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

or

[3] The measure of at least one inscribed angle is found correctly, and appropriate work is shown, but a pair of angles is not identified or is identified incorrectly.

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

or

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

or

[2] Appropriate work is shown to find the measures of all four arcs, but no further correct work is shown.

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

or

[1] One pair of inscribed angles is correctly identified, but no further correct work is shown.

or

[1] Appropriate work is shown to find $x = 24$, the measure of $\overset{\frown}{EG}$, but no further correct work is shown.
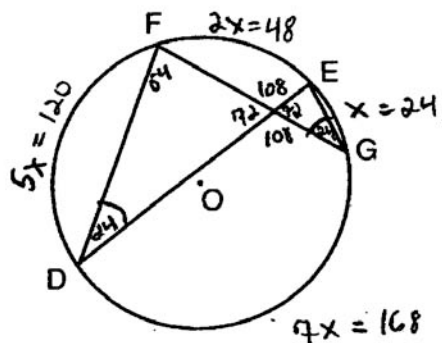
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Student work for Item 36 – Score 4
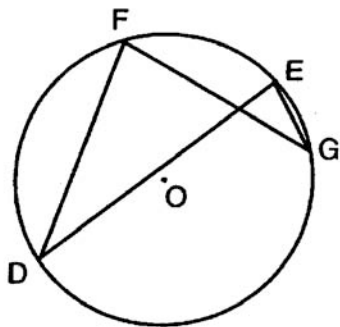
$5x + 2x + x + 7x = 360$

$15x = \dfrac{360}{15}$

$\dfrac{15}{15}$

$x = 24$

F $2x = 48$

E

108

72 $x = 24$

108 G

$5x = 120$

64

D

O

$7x = 168$

$m\angle FGE = 24$

$m\angle FDE = 24$

Student work for Item 36 – Score 3

F

E

G

O

D

$5x + 2x + x + 7x = 360$

$\dfrac{15x}{15} = \dfrac{360}{15}$

$x = 24$

$5x = 120 = \overset{\frown}{DF}$

$2x = 48 = \overset{\frown}{FE}$

$x = 24 = \overset{\frown}{EG}$

$7x = 188 = \overset{\frown}{GD}$

Inscribed angles are equal to one-half the measure of their intercepted arcs

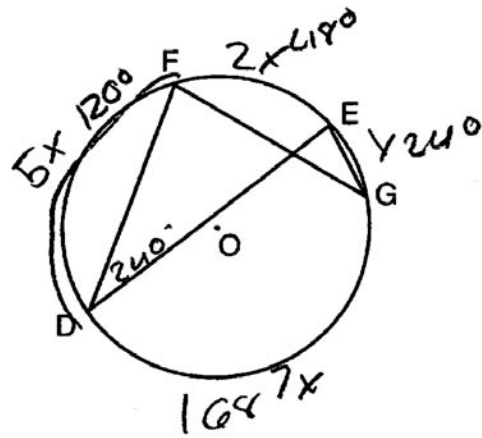$\angle F$ and $\angle E$ both intercept $\overset{\frown}{GD}$

$188 \div 2 = 94$

$\angle F$ and $\angle E = 94°$

Student work for Item 36 – Score 3

$$5x + 2x + 1x + 7x =$$

$$\frac{15x}{15} = \frac{360}{15}$$

$$x = 24$$

$$m\angle FDE = 240$$

$5x \, 120°$ F $2x \angle 180°$

E $y \, 240°$

G

$240°$ O

D

$168 \, 7x$

Student work for Item 36 – Score 2

F 48

120 E 24

G

O

D

168
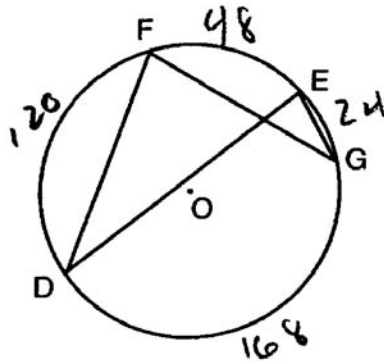
$$5x + 2x + x + 7x = 360$$

$$15x = 360$$

$$x = 24$$

$$2x = 48$$

$$5x = 120$$

$$7x = 168$$

$\angle DEG \cong \angle DFG$

$\angle DEG = 168°$

$\angle DFG = 168°$
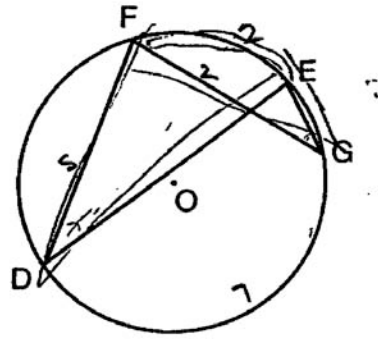
$\angle \, FDE \approx \angle \, FGE$

(37) A city is planning to build a new park. The park must be equidistant from school *A* at (3,3) and school *B* at (3,– 5). The park also must be exactly 5 miles from the center of town, which is located at the origin on the coordinate graph. Each unit on the graph represents 1 mile.

On the set of axes below, sketch the compound loci and label with an **X** all possible locations for the new park.
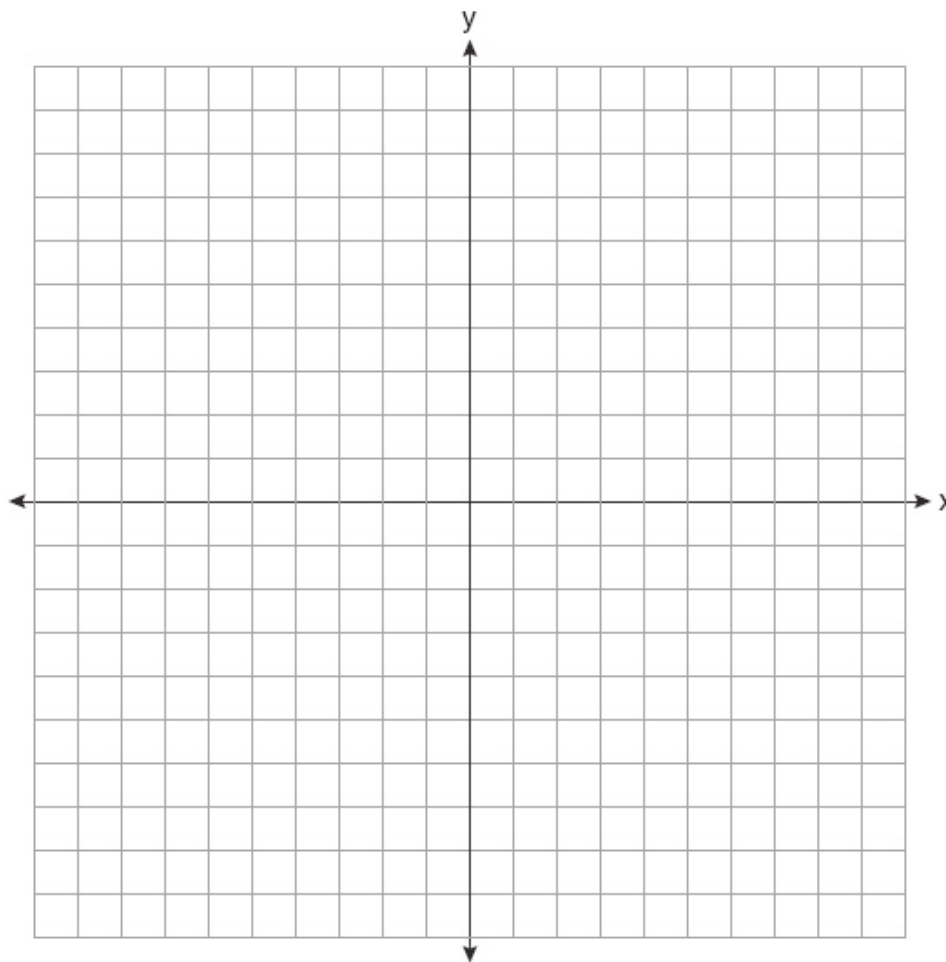
Rubric for Item 37

[4] Both loci are drawn correctly and the two points of intersection are labeled with an **X**.

[3] Both loci are drawn correctly, but only one correct point of intersection is labeled.

or

[3] Both loci are drawn, but one graphing error is made, but appropriate points of intersection are labeled.

[2] Both loci are drawn correctly, but the points of intersection are not labeled or are labeled incorrectly.

or

[2] Both loci are drawn, but two or more graphing errors are made, but appropriate points of intersection are labeled.

or

[2] One conceptual error is made, such as drawing two parallel lines instead of a circle, but appropriate points of intersection are labeled.
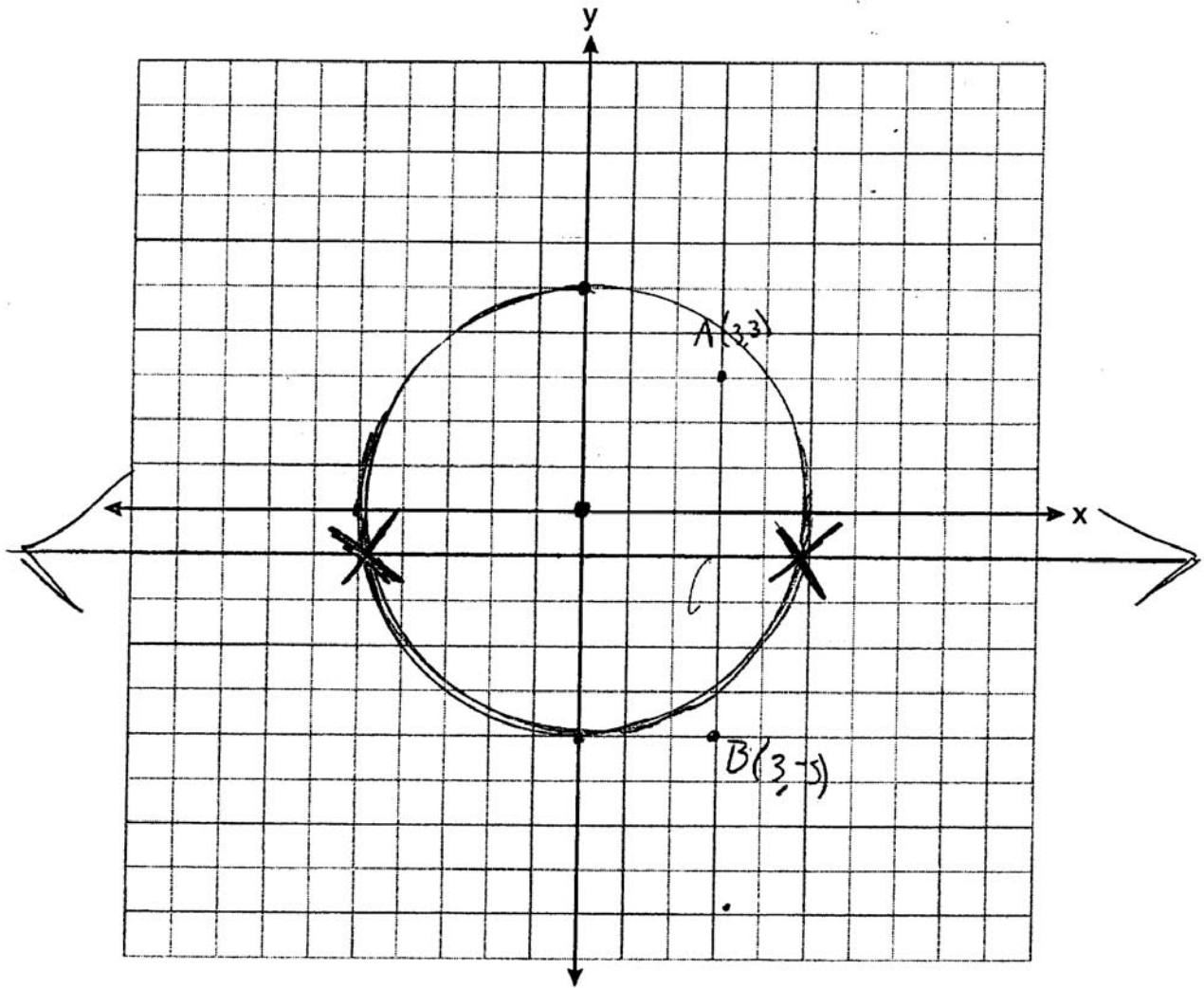
[1] One locus is drawn correctly, but no further correct work is shown.
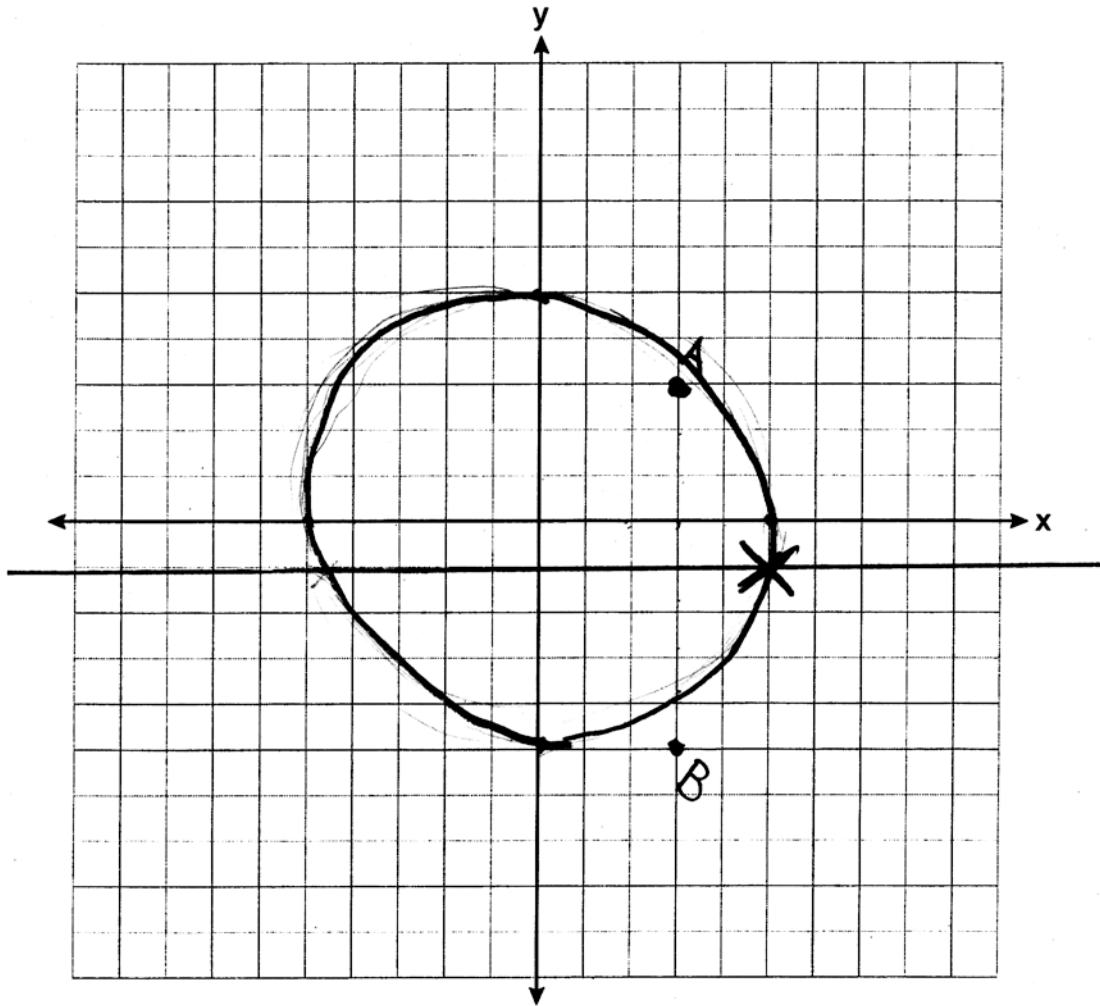
or

[1] **X**s are placed appropriately, but no loci are drawn.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
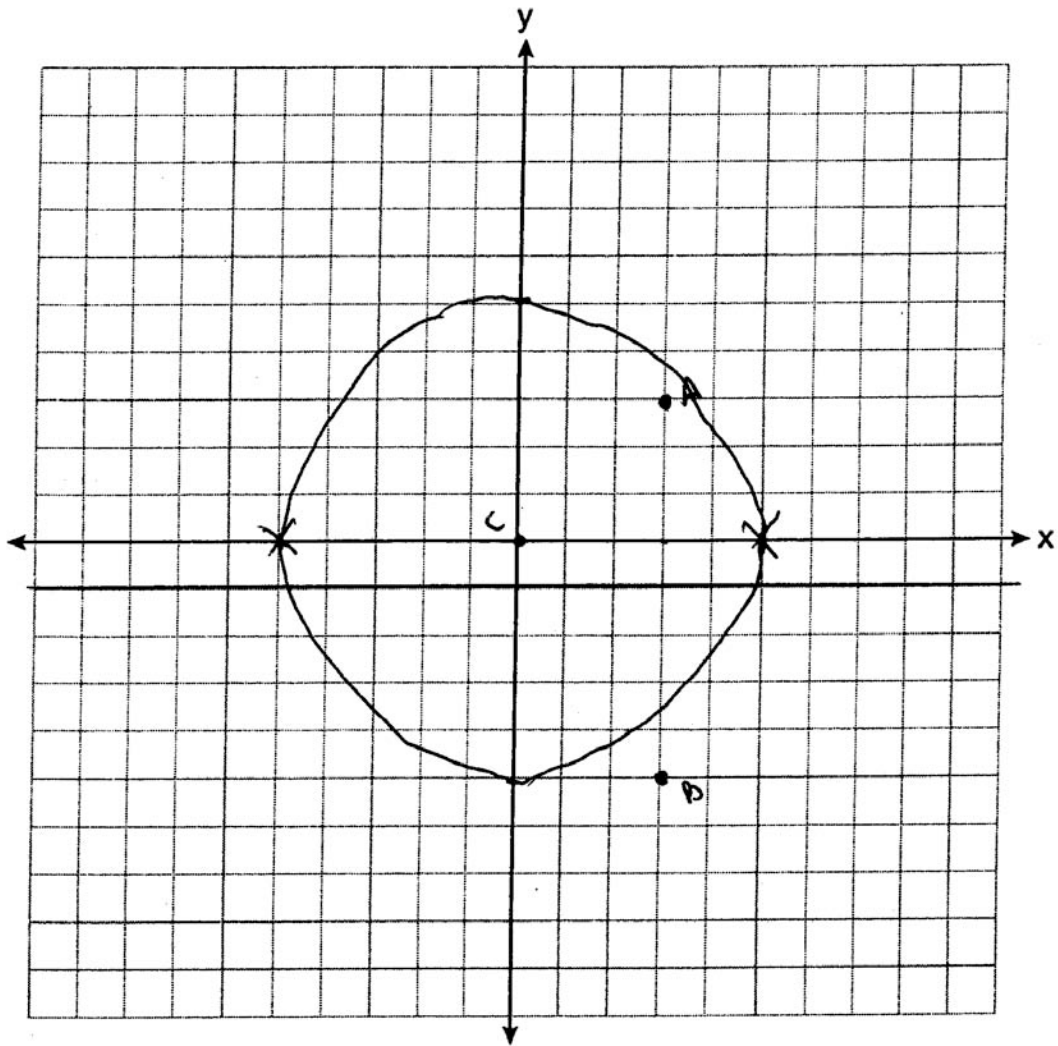
A(3,3)

B(3,-5)
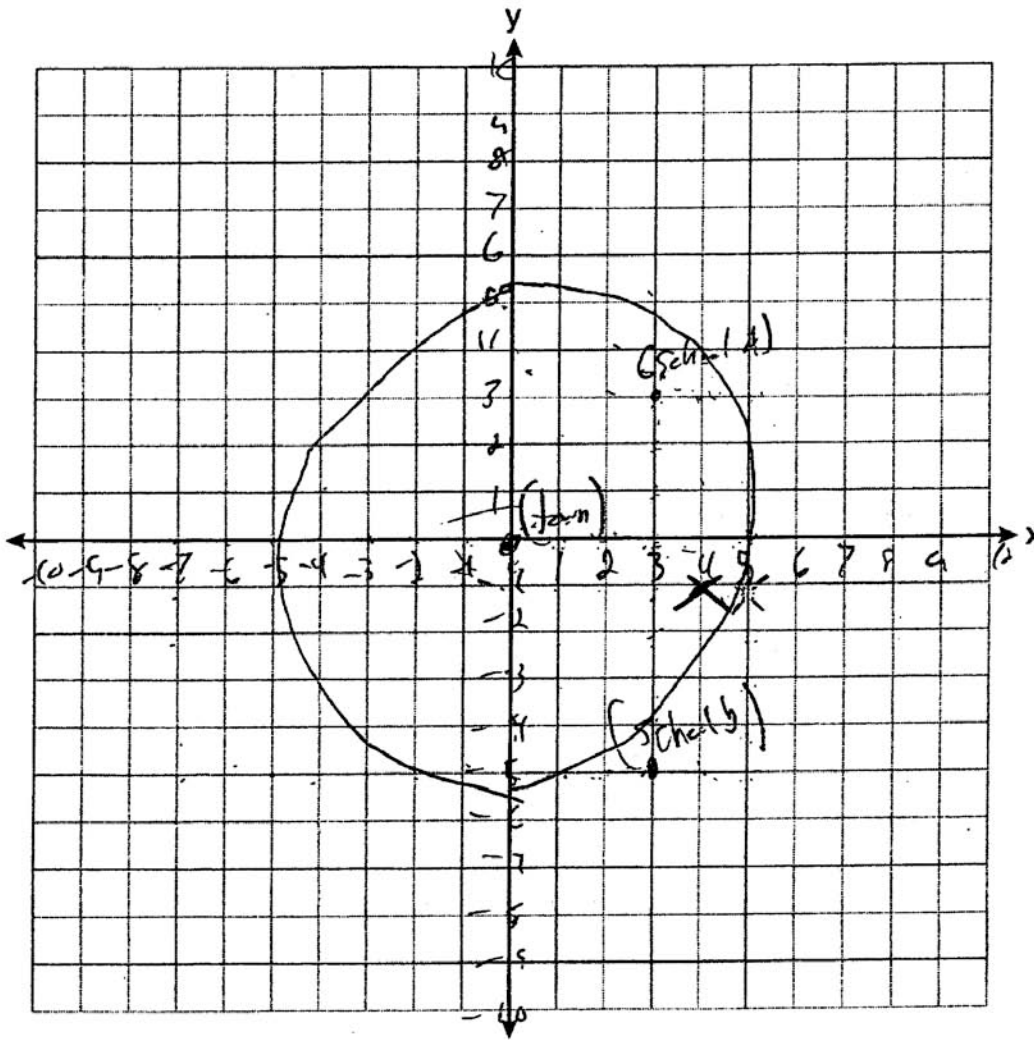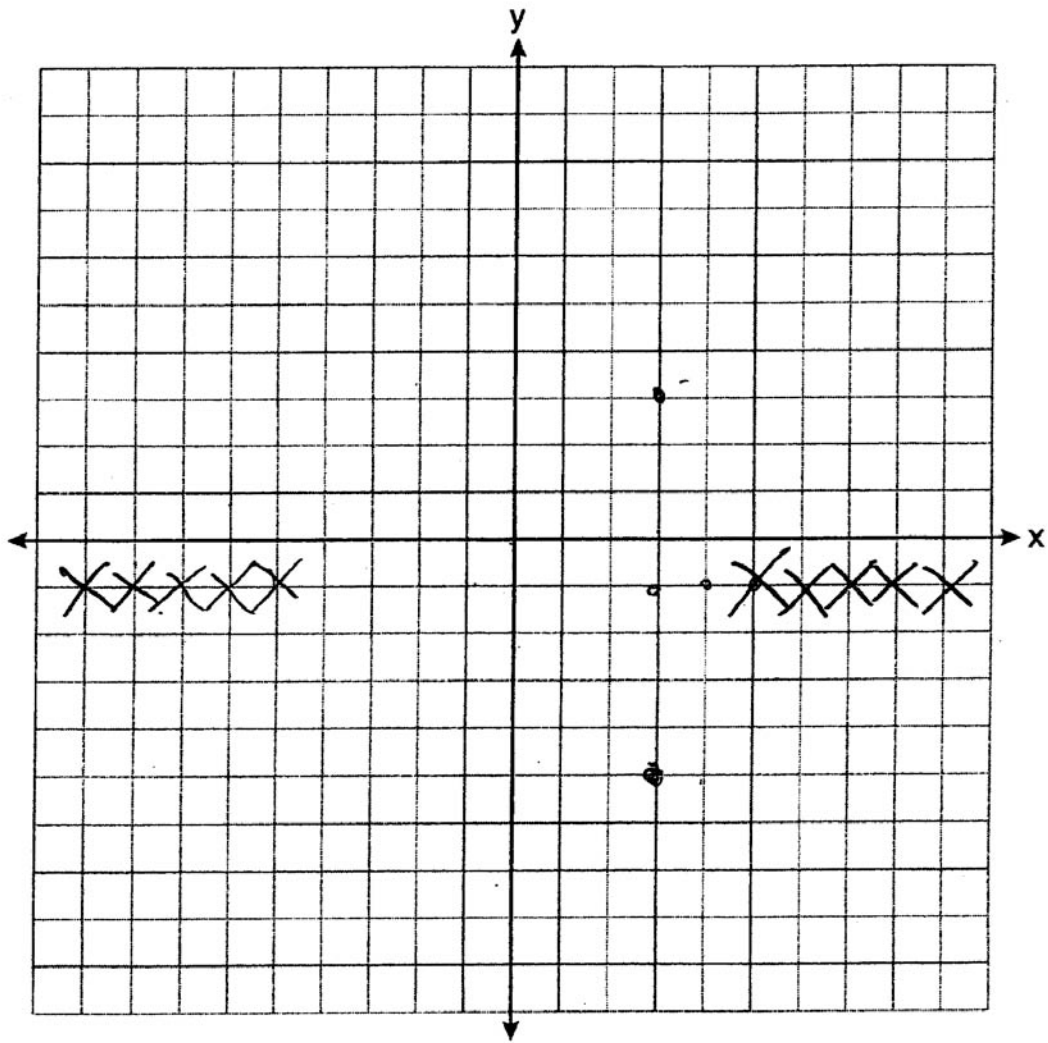
Part IV

(38) In the diagram below, quadrilateral *ABCD* is inscribed in circle *O*, $\overline{AB} \parallel \overline{DC}$, and diagonals $\overline{AC}$ and $\overline{BD}$ are drawn.

Prove that $\triangle ACD \cong \triangle BDC$.
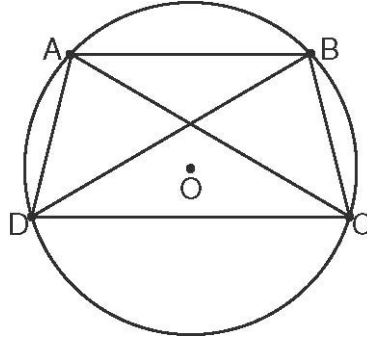
Rubric for Item 38

[6] A complete and correct proof that includes a concluding statement is written.

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

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

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

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

or

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

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

[0] The "given" and/or the "prove" statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.

or

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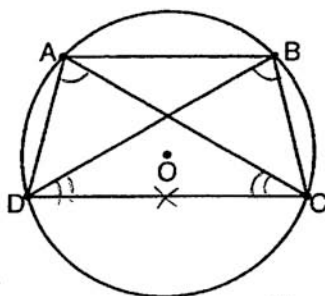
Statement

1. $\overline{AB} \parallel \overline{DC}$

2. $\angle DAC \cong \angle DBC$

3. $\overline{DC} \cong \overline{DC}$

4. $\overarc{AD} \cong \overarc{BC}$

5. $\angle BDC \cong \angle ACD$

6. $\triangle ACD \cong \triangle BDC$

Reason

1. Given

2. Inscribed angles intercepting the same arc are congruent

3. Reflexive Property

4. Parallel Lines intercept congruent arcs

5. Inscribed angles intercepting congruent arcs are congruent

6. AAS

Statements	Reasons
① _____	① Given
② $\overline{DC} \cong \overline{DC}$	② Reflexive Prop. of $\cong$
③ $\angle ACD \cong \angle BDC$	③ Inscribed angles that intercept $\cong$ arcs are $\cong$
④ $\angle DAC \cong \angle CBD$	④ Inscribed angles that intercept the same arc are $\cong$
⑤ $\triangle ACD \cong \triangle BDC$	⑤ $AAS \cong AAS$.

Statements

1. _____

2. $\overline{AD} \cong \overline{BC}$

3. $\overline{AD} \cong \overline{BC}$

4. $\overline{DC} \cong \overline{DC}$

5. $\overline{AD} \cong \overline{BC}$

$\overarc{AB} = \overarc{AB}$
$\overarc{AD+AB} = \overarc{BC}$

6. $\overarc{DAB} \cong \overarc{CBA}$

7. $\overline{DB} \cong \overline{AC}$

8. $\triangle ACD \cong \triangle BDC$

1. given

2. // lines intercept $\cong$ arcs

3. $\cong$ arcs have $\cong$ chords

4. Reflexive

5. // lines intercept $\cong$ arcs   1st

6. Addition

7. $\cong$ arcs have $\cong$ chords

8. SSS $\cong$ SSS
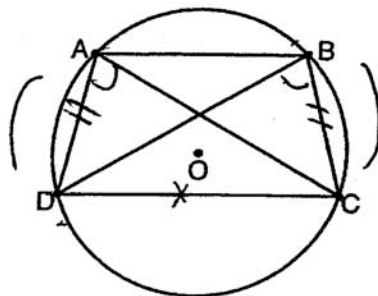
1. Given
2. $\overarc{AD} \cong \overarc{BC}$
3. $\overline{AD} \cong \overline{BC}$
4. $\angle DAC \cong \angle CBD$
5. $\overline{DC} \cong \overline{DC}$
6. $\triangle ACD \cong \triangle BDC$
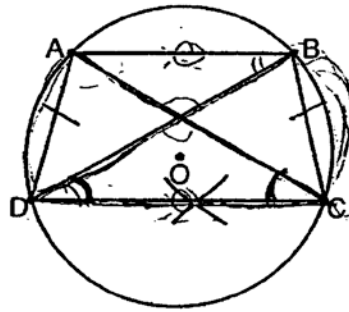 $\triangle ACD \cong \triangle BDC$

1.
2. || lines intercept $\cong$ arcs
3. $\cong$ arcs intercept $\cong$ chords
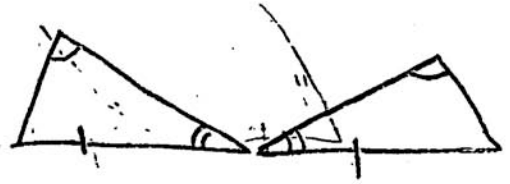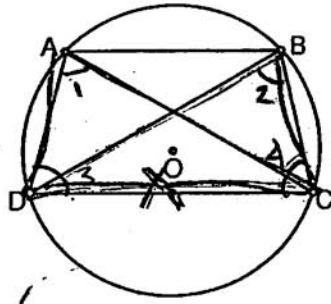4. Inscribed angles that intercept the same chord are $\cong$
5. Reflexive Prop $\cong$
6. SSA

① Quad $\overline{ABCD}$

② $\overline{AB} \parallel \overline{DC}$

③ Quad $\overline{ABCD}$ is a trap

④ ~~$\overline{AD} \cong \overline{BC}$~~

④ $DC = DC$

⑤ $\overline{AD} \cong \overline{BC}$

⑥ ($\angle C \cong \angle D$)

⑦ $\overline{AD} = \overline{BC}$

⑧ $\triangle ACD \cong \triangle BDC$

① Given

② Given

③ only One pair of opposite sides are ∥

④

④ Reflextive

⑤ Two Arcs are ≅ if they connect ∥ lines

⑥ Same Arcs have same inscribed ∠

⑦ Lines of ≅ Arc are ≅

⑧ SAS

Statement	Reason
1. ABCD is inscribed in circle O, AB∥DC, and AC & BD are diagonals	1. given
2. DC ≅ DC	2. Reflexive Property
3. ∠1 & ∠2 ≅ ∠3 & 4 ≅	3. alt interior ∠s are ≅
4. △ACD ≅ △BDC	4. AAS ≅ AAS

Appendix A

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Albany, New York 12234

Specifications for the Regents Examination in Geometry
(First Administration – June 2009)

The questions on the Regents Examination in Geometry will assess both the content and the process strands of New York State Mathematics Standard 3. Each question will be aligned to one content performance indicator but will also be aligned to one or more process performance indicators, as appropriate for the concepts embodied in the task. As a result of the alignment to both content and process strands, the examination will assess students' conceptual understanding, procedural fluency, and problem-solving abilities rather than assessing knowledge of isolated skills and facts.

There will be 38 questions on the Regents Examination in Geometry. The table below shows the percentage of total credits that will be aligned with each content band.

Content Band	% of Total Credits
Geometric Relationships	8–12%
Constructions	3–7%
Locus	4–8%
Informal and Formal Proofs	41–47%
Transformational Geometry	8–13%
Coordinate Geometry	23–28%

Question Types

The Regents Examination in Geometry will include the following types and numbers of questions.

Question Type	Number of Questions
Multiple Choice	28
2-credit open ended	6
4-credit open ended	3
6-credit open ended	1
Total Credits	86

Calculators

Schools must make a graphing calculator available for the exclusive use of each student while that student takes the Regents Examination in Geometry.

Appendix B

Map to Learning Standards

The table below shows which content band each item is aligned to. The numbers in the table represent the question numbers on the test.

Content Band	Multiple-Choice Item Number	2-Credit Item Number	4-Credit Item Number	6-Credit Item Number
Geometric Relationships	6, 8, 15, 16	33		
Constructions	4, 7	32		
Locus	25		37	
Informal and Formal Proofs	1, 2, 9, 10, 11, 17, 19, 21, 24, 26, 27	29, 34	36	38
Transformational Geometry	3, 18, 23	30		
Coordinate Geometry	5, 12, 13, 14, 20, 22, 28	31	35	