The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

GEOMETRY

Thursday, June 17, 2010—1:15 to 4:15 p.m., only

Student Name: Mr. Sibol

School Name: HS for Civil Rights

Print your name and the name of your school on the lines above. Then turn to the last page of this booklet, which is the answer sheet for Part I. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

This examination has four parts, with a total of 38 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 graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.

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.

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

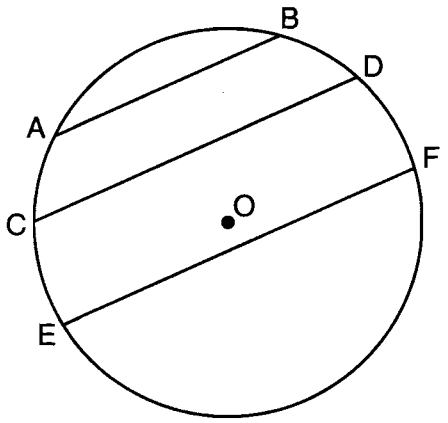
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

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. [56]

Use this space for computations.

1 In the diagram below of circle O, chord $\overline{AB} \parallel$ chord $\overline{CD}$, and chord $\overline{CD} \parallel$ chord $\overline{EF}$.



Which statement must be true?

(1) $\overset{\frown}{CE} \cong \overset{\frown}{DF}$

(2) $\overset{\frown}{AC} \cong \overset{\frown}{DF}$

(3) $\overset{\frown}{AC} \cong \overset{\frown}{CE}$

(4) $\overset{\frown}{EF} \cong \overset{\frown}{CD}$

2 What is the negation of the statement "I am not going to eat ice cream"?

(1) I like ice cream.

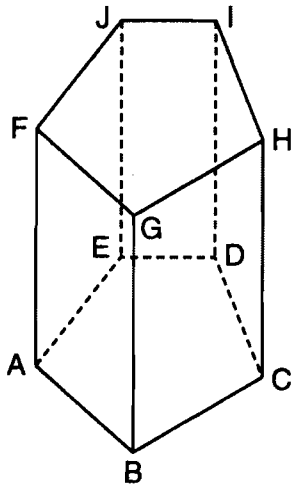
(2) I am going to eat ice cream.

(3) If I eat ice cream, then I like ice cream.

(4) If I don't like ice cream, then I don't eat ice cream.

Use this space for computations.

3 The diagram below shows a right pentagonal prism.



Which statement is always true?

(1) $\overline{BC} \parallel \overline{ED}$

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

(3) $\overline{FJ} \parallel \overline{IH}$

(4) $\overline{GB} \parallel \overline{HC}$

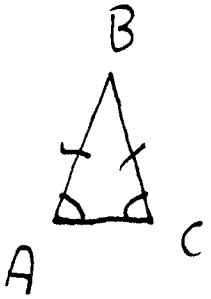
4 In isosceles triangle ABC, $AB = BC$. Which statement will always be true?

(1) $m\angle B = m\angle A$

(2) $m\angle A > m\angle B$

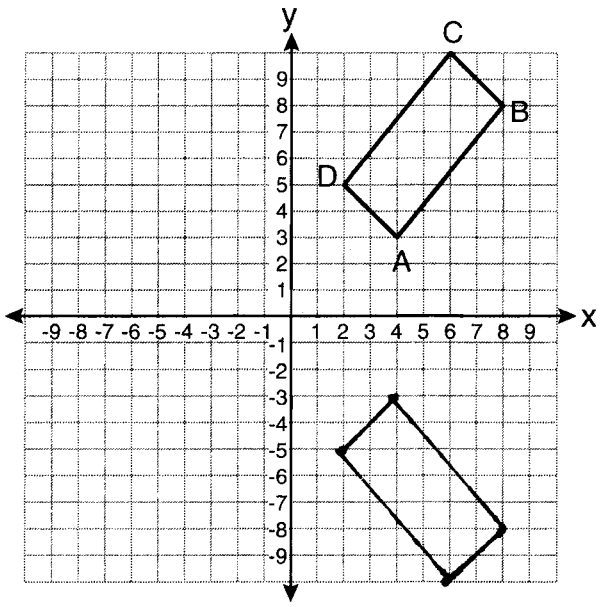
(3) $m\angle A = m\angle C$

(4) $m\angle C < m\angle B$



Use this space for computations.

5 The rectangle $ABCD$ shown in the diagram below will be reflected across the x-axis.



What will *not* be preserved?

(1) slope of $\overline{AB}$

(2) parallelism of $\overline{AB}$ and $\overline{CD}$

(3) length of $\overline{AB}$

(4) measure of $\angle A$

6 A right circular cylinder has an altitude of 11 feet and a radius of 5 feet. What is the lateral area, in square feet, of the cylinder, to the *nearest tenth*?

(1) 172.7

(2) 172.8

(3) 345.4

(4) 345.6

$L = 2\pi rh$

$= 2\pi \cdot 5 \cdot 11$

≈ 345.6

Use this space for computations.

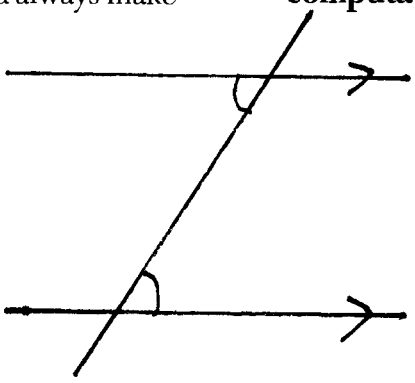
7 A transversal intersects two lines. Which condition would always make the two lines parallel?

(1) Vertical angles are congruent.

(2) Alternate interior angles are congruent.

(3) Corresponding angles are supplementary.

(4) Same-side interior angles are complementary.



8 If the diagonals of a quadrilateral do *not* bisect each other, then the quadrilateral could be a

(1) rectangle

(2) rhombus

(3) square

(4) trapezoid

9 What is the converse of the statement "If Bob does his homework, then George gets candy"?

(1) If George gets candy, then Bob does his homework.

(2) Bob does his homework if and only if George gets candy.

(3) If George does not get candy, then Bob does not do his homework.

(4) If Bob does not do his homework, then George does not get candy.

Use this space for computations.

10 In $\triangle PQR$, $PQ = 8$, $QR = 12$, and $RP = 13$. Which statement about the angles of $\triangle PQR$ must be true?

(1) $m\angle Q > m\angle P > m\angle R$
(2) $m\angle Q > m\angle R > m\angle P$
(3) $m\angle R > m\angle P > m\angle Q$
(4) $m\angle P > m\angle R > m\angle Q$

11 Given:

$$y = \frac{1}{4}x - 3$$

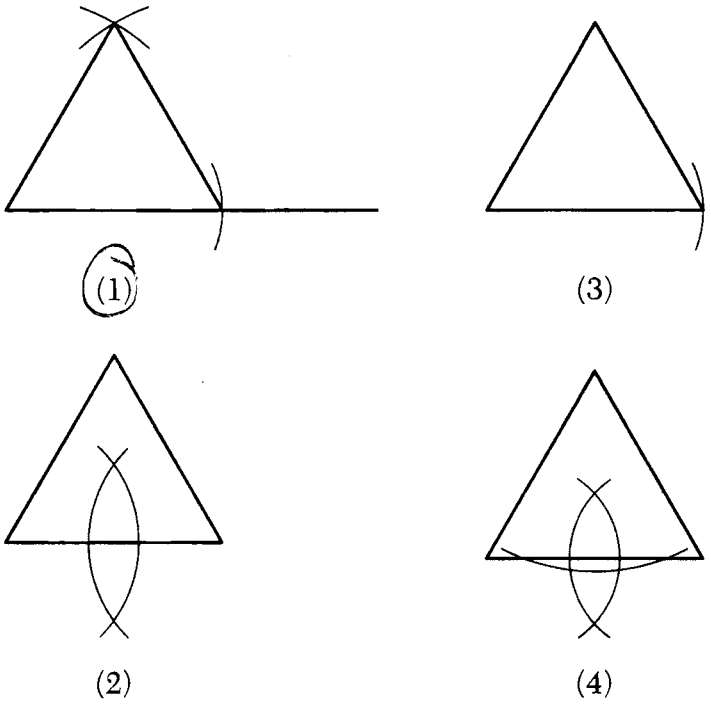
$$y = x^2 + 8x + 12$$

In which quadrant will the graphs of the given equations intersect?

(1) I
(2) II
(3) III
(4) IV

Use this space for computations.

12 Which diagram shows the construction of an equilateral triangle?



(1)

(3)

(2)

(4)

13 Line segment AB is tangent to circle O at A. Which type of triangle is always formed when points A, B, and O are connected?

(1) right

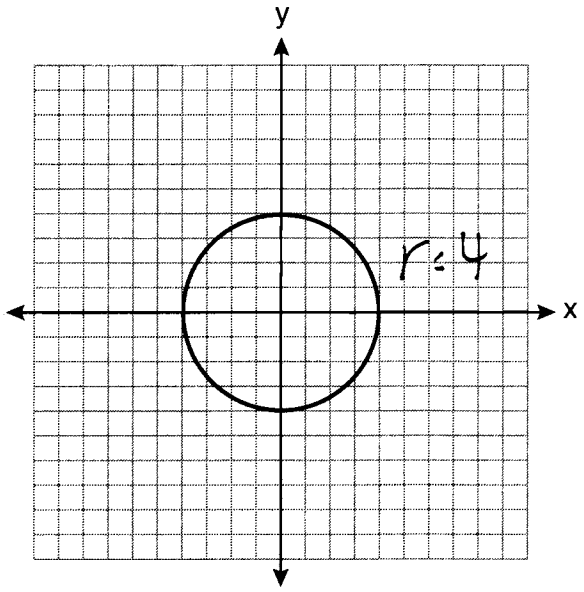
(2) obtuse

(3) scalene

(4) isosceles

Use this space for computations.

14 What is an equation for the circle shown in the graph below?



(1) $x^2 + y^2 = 2$
(2) $x^2 + y^2 = 4$
(3) $x^2 + y^2 = 8$
(4) $x^2 + y^2 = 16$

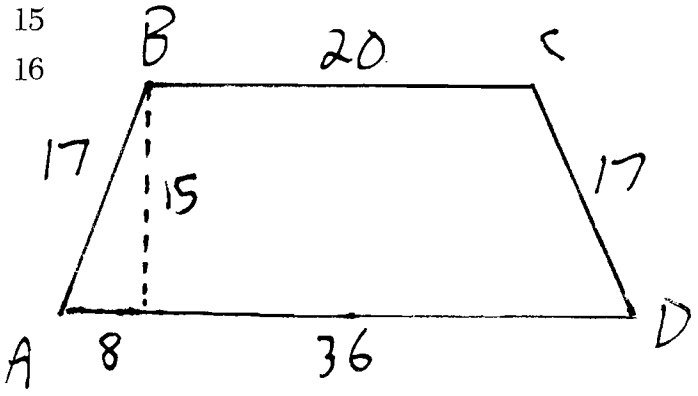
15 Which transformation can map the letter **S** onto itself?

(1) glide reflection
(2) translation
(3) line reflection
(4) rotation

16 In isosceles trapezoid $ABCD$, $\overline{AB} \cong \overline{CD}$. If $BC = 20$, $AD = 36$, and $AB = 17$, what is the length of the altitude of the trapezoid?

(1) 10
(2) 12
(3) 15
(4) 16

$\sqrt{17^2 - 8^2}$

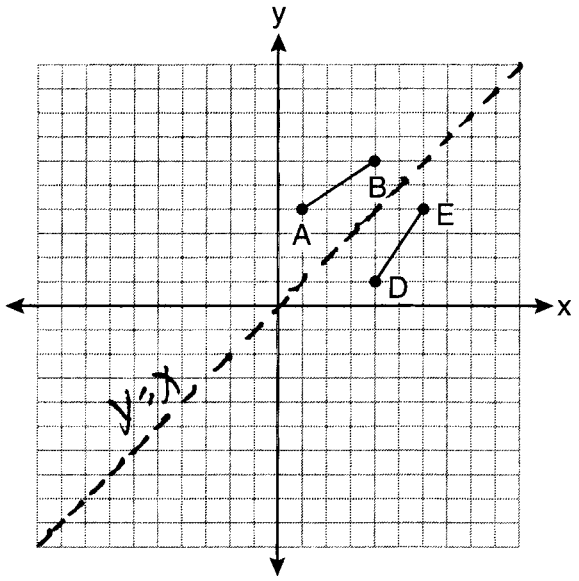


Use this space for computations.

17 In plane $\mathcal{P}$, lines m and n intersect at point A. If line k is perpendicular to line m and line n at point A, then line k is

(1) contained in plane $\mathcal{P}$
(2) parallel to plane $\mathcal{P}$
(3) perpendicular to plane $\mathcal{P}$
(4) skew to plane $\mathcal{P}$

18 The diagram below shows $\overline{AB}$ and $\overline{DE}$.

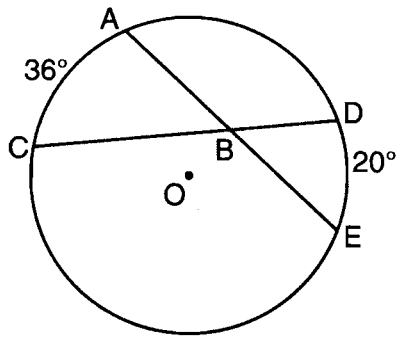


Which transformation will move $\overline{AB}$ onto $\overline{DE}$ such that point D is the image of point A and point E is the image of point B?

(1) $T_{3,-3}$
(2) $D_{\frac{1}{2}}$
(3) $R_{90°}$
(4) $r_{y=x}$

Use this space for computations.

19 In the diagram below of circle O, chords $\overline{AE}$ and $\overline{DC}$ intersect at point B, such that $m\widehat{AC} = 36$ and $m\widehat{DE} = 20$.



$\frac{36+20}{2} = \frac{56}{2} = 28$

What is $m\angle ABC$?

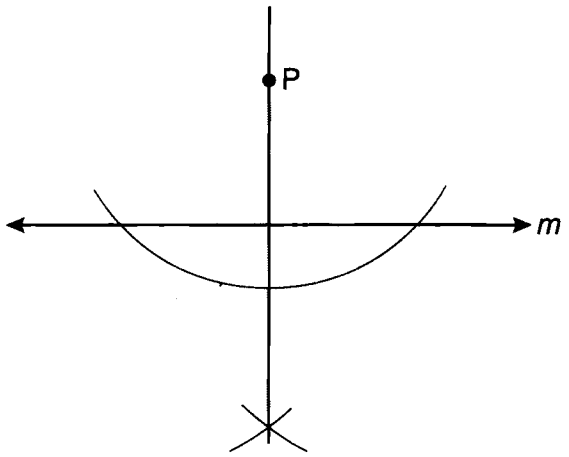
(1) 56

(3) 28

(2) 36

(4) 8

20 The diagram below shows the construction of a line through point P perpendicular to line m.



Which statement is demonstrated by this construction?

(1) If a line is parallel to a line that is perpendicular to a third line, then the line is also perpendicular to the third line.

(2) The set of points equidistant from the endpoints of a line segment is the perpendicular bisector of the segment.

(3) Two lines are perpendicular if they are equidistant from a given point.

(4) Two lines are perpendicular if they intersect to form a vertical line.

Use this space for computations.

21 What is the length, to the *nearest tenth*, of the line segment joining the points $(-4,2)$ and $(146,52)$?

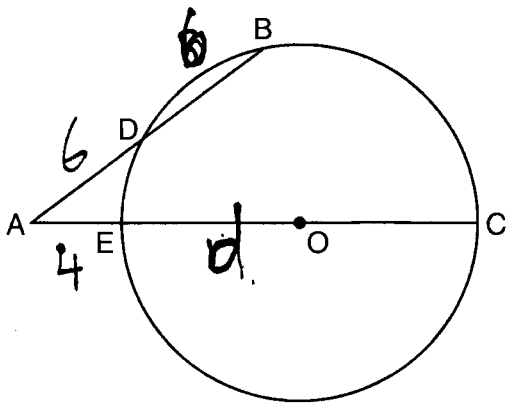
(1) 141.4
(3) 151.9
(2) 150.5
(4) 158.1

$\sqrt{(146-(-4))^2+(52-2)^2} \approx 158.1$

22 What is the slope of a line perpendicular to the line whose equation is $y = 3x + 4$?

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

23 In the diagram below of circle O, secant $\overline{AB}$ intersects circle O at D, secant $\overline{AOC}$ intersects circle O at E, $AE = 4$, $AB = 12$, and $DB = 6$.



(Not drawn to scale)

$WE = WE$

$(d+4)4 = 12(6)$

$4d + 16 = 72$

$\frac{4d}{4} = \frac{56}{4}$

$d = 14$

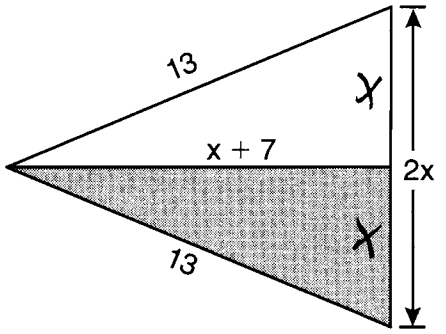
$r = 7$

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

(1) 4.5
(3) 9
(2) 7
(4) 14

Use this space for computations.

24 The diagram below shows a pennant in the shape of an isosceles triangle. The equal sides each measure 13, the altitude is $x + 7$, and the base is $2x$.



$x^2 + (x+7)^2 = 13^2$

$x^2 + x^2 + 7x + 7x + 49 = 169$

$2x^2 + 14x - 120 = 0$

$x^2 + 7x - 60 = 0$

$(x + 12)(x - 5) = 0$

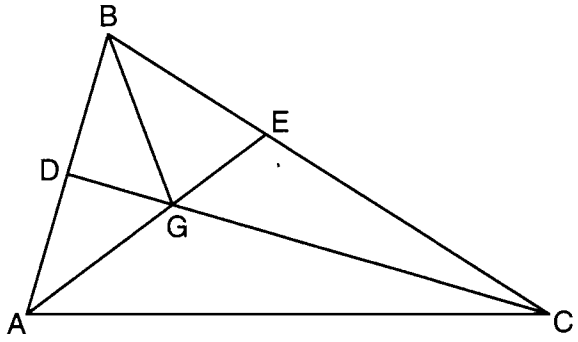
$x = -12 \quad x = 5$

$2x = 10$

What is the length of the base?

(1) 5
(3) 12
(2) 10
(4) 24

25 In the diagram below of $\triangle ABC$, $\overline{CD}$ is the bisector of $\angle BCA$, $\overline{AE}$ is the bisector of $\angle CAB$, and $\overline{BG}$ is drawn.



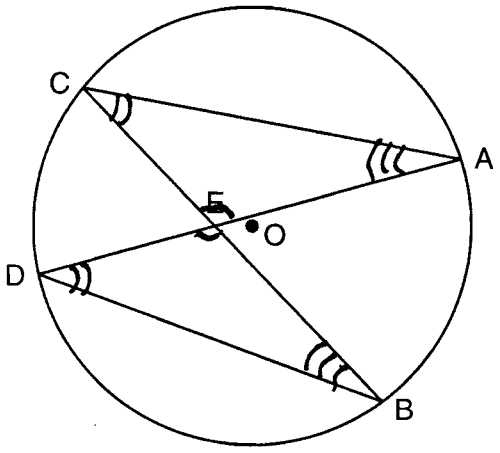
$\overline{BG}$ is also an angle bisector since it intersects the concurrence of $\overline{CD}$ & $\overline{AE}$.

Which statement must be true?

(1) $DG = EG$
(3) $\angle AEB \cong \angle AEC$
(2) $AG = BG$
(4) $\angle DBG \cong \angle EBG$

Use this space for computations.

26 In the diagram below of circle O, chords $\overline{AD}$ and $\overline{BC}$ intersect at E.



Which relationship must be true?

(1) $\triangle CAE \cong \triangle DBE$

(2) $\triangle AEC \sim \triangle BED$

(3) $\angle ACB \cong \angle CBD$

(4) $\overset{\frown}{CA} \cong \overset{\frown}{DB}$

27 Two lines are represented by the equations $-\frac{1}{2}y = 6x + 10$ and $y = mx$. For which value of m will the lines be parallel?

(1) -12

(2) -3

(3) 3

(4) 12

$y = -12x - 20$

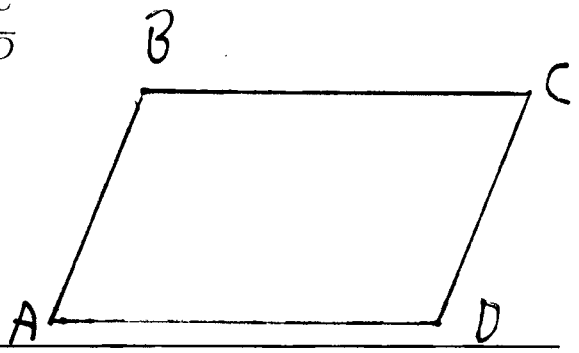
28 The coordinates of the vertices of parallelogram $ABCD$ are $A(-3,2)$, $B(-2,-1)$, $C(4,1)$, and $D(3,4)$. The slopes of which line segments could be calculated to show that $ABCD$ is a rectangle?

(1) $\overline{AB}$ and $\overline{DC}$

(2) $\overline{AB}$ and $\overline{BC}$

(3) $\overline{AD}$ and $\overline{BC}$

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



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. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

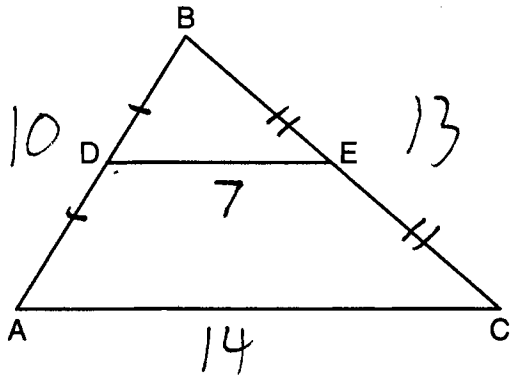
29 Tim is going to paint a wooden sphere that has a diameter of 12 inches. Find the surface area of the sphere, to the *nearest square inch*.

$SA = 4\pi r^2$

$= 4\pi \cdot 6^2$

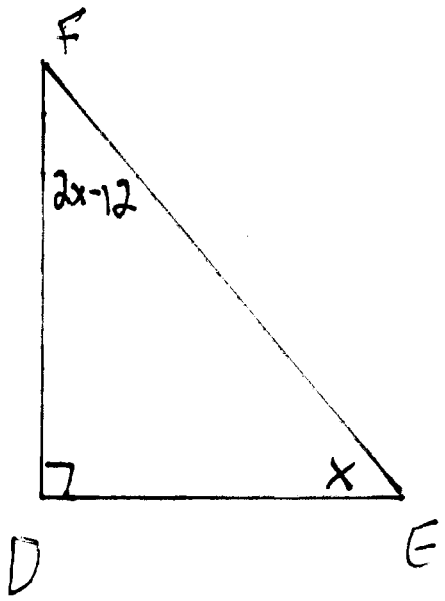
≈ 452

30 In the diagram below of $\triangle ABC$, $\overline{DE}$ is a midsegment of $\triangle ABC$, $DE = 7$, $AB = 10$, and $BC = 13$. Find the perimeter of $\triangle ABC$.



$10 + 13 + 14 = 37$

31 In right $\triangle DEF$, $m\angle D = 90$ and $m\angle F$ is 12 degrees less than twice $m\angle E$. Find $m\angle E$.



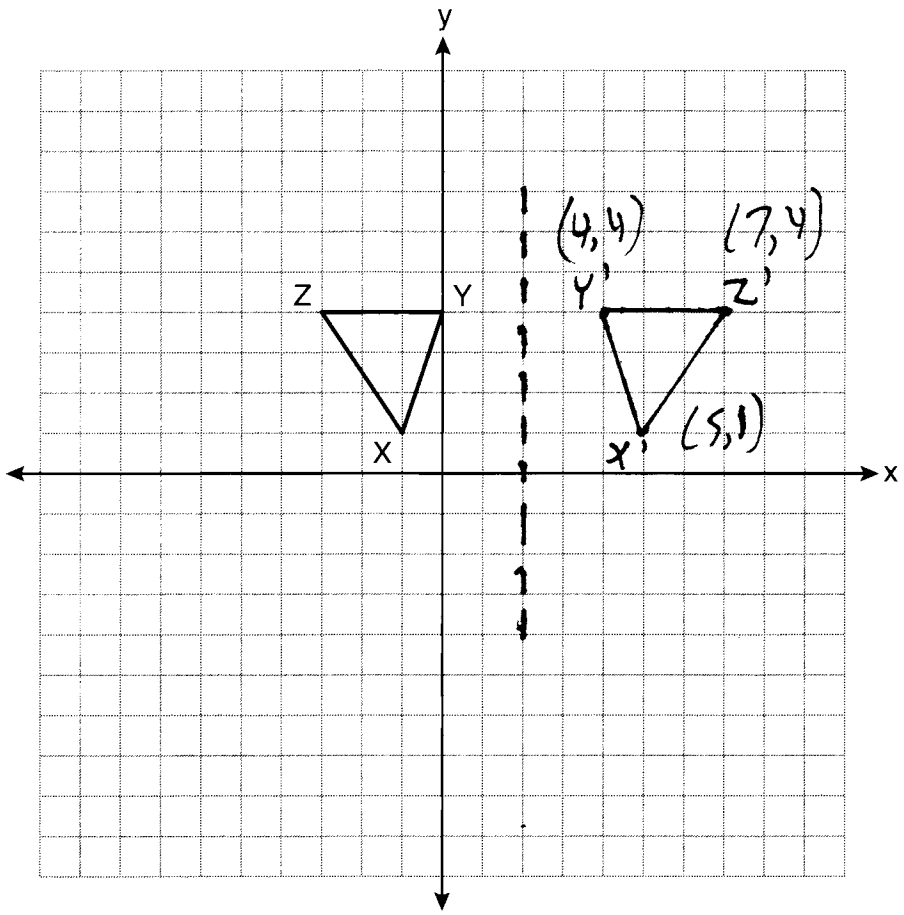
$2x-12+x+90=180$

$3x+78=180$

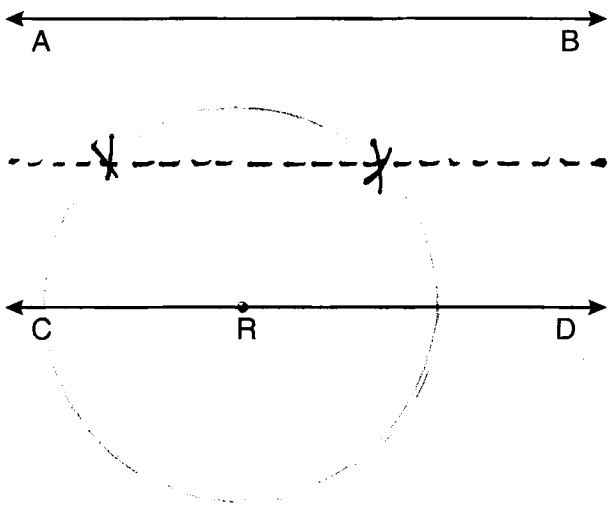
$\frac{3x}{3}=\frac{102}{3}$

$x=34$

32 Triangle XYZ, shown in the diagram below, is reflected over the line $x = 2$. State the coordinates of $\triangle X'Y'Z'$, the image of $\triangle XYZ$.



33 Two lines, $\overleftrightarrow{AB}$ and $\overleftrightarrow{CRD}$, are parallel and 10 inches apart. Sketch the locus of all points that are equidistant from $\overleftrightarrow{AB}$ and $\overleftrightarrow{CRD}$ and 7 inches from point R. Label with an **X** each point that satisfies both conditions.



34 The base of a pyramid is a rectangle with a width of 6 cm and a length of 8 cm. Find, in centimeters, the height of the pyramid if the volume is 288 cm^3.

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

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

$288 = \frac{1}{3} \cdot 8 \cdot 6 \cdot h$

$\frac{288}{16} = \frac{16h}{16}$

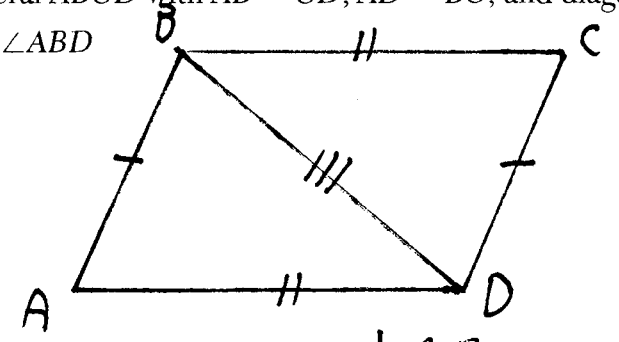
$18 = h$

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. 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 $\overline{AB} \cong \overline{CD}$, $\overline{AD} \cong \overline{BC}$, and diagonal $\overline{BD}$ is drawn

Prove: $\angle BDC \cong \angle ABD$



STATEMENT	REASON
(1) Quadrilateral ABCD with $\overline{AB} \cong \overline{CD}$, $\overline{AD} \cong \overline{BC}$, and diagonal $\overline{BD}$	(1) Given
(2) $\overline{BD} \cong \overline{DB}$	(2) Reflexive Property
(3) $\triangle ABD \cong \triangle CDB$	(3) SSS
(4) $\angle BDC \cong \angle ABD$	(4) CPCTC

36 Find an equation of the line passing through the point (6,5) and perpendicular to the line whose equation is $2y + 3x = 6$.

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

$y = \frac{-3}{2}x + 3$

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

$m_{\perp} = \frac{2}{3}$

$y - 5 = \frac{2}{3}(x - 6)$

or $y = mx + b$

$5 = \frac{2}{3}(6) + b$

$5 = 4 + b$

$1 = b$

$y = +\frac{2}{3}x + 1$

37 Write an equation of the circle whose diameter $\overline{AB}$ has endpoints $A(-4,2)$ and $B(4,-4)$. [The use of the grid below is optional.]

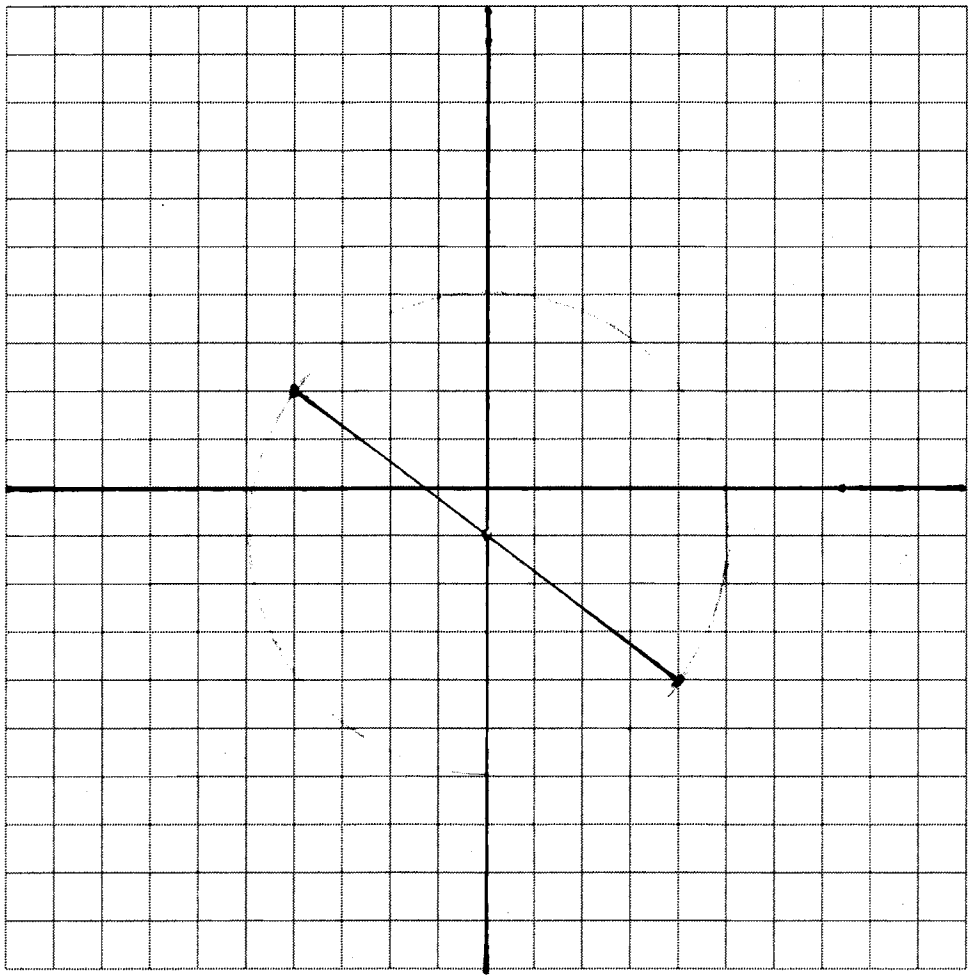
MIDPOINT $\left(\frac{-4+4}{2}, \frac{2+4}{2}\right) = (0,-1)$

DISTANCE $d = \sqrt{(-4-4)^2+(2--4)^2} = \sqrt{100} = 10$

$r = 5$

$r^2 = 25$

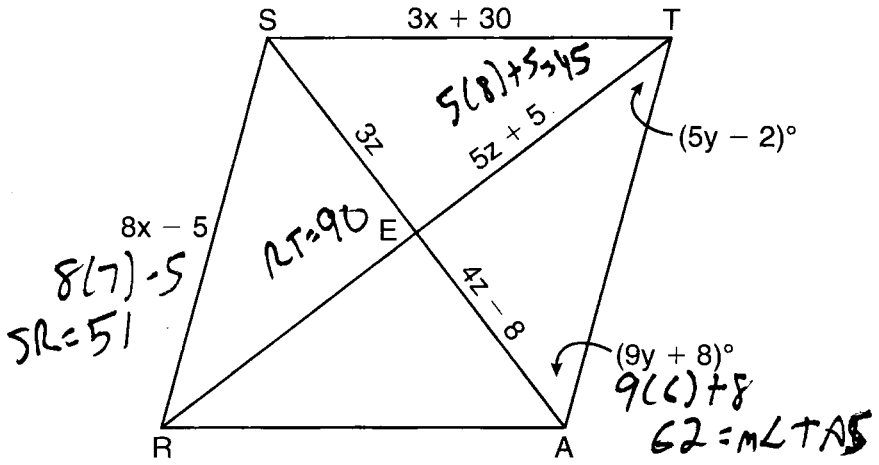
$x^2+(y+1)^2 = 25$



Part IV

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

38 In the diagram below, quadrilateral $STAR$ is a rhombus with diagonals $\overline{SA}$ and $\overline{TR}$ intersecting at E. $ST = 3x + 30$, $SR = 8x - 5$, $SE = 3z$, $TE = 5z + 5$, $AE = 4z - 8$, $m\angle RTA = 5y - 2$, and $m\angle TAS = 9y + 8$. Find SR, RT, and $m\angle TAS$.



$8x - 5 = 3x + 30$

$5x = 35$

$x = 7$

$4z - 8 = 3z$

$z = 8$

$9y + 8 + 5y - 2 = 90$

$14y + 6 = 90$

$\frac{14y}{14} = \frac{84}{14}$

$y = 6$