

GEOMETRY

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

GEOMETRY

Wednesday, August 19, 2026 — 12:30 to 3:30 p.m., only

Student Name:

My. Si. (60)

School Name:

JMAP

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

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

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

This examination has four parts, with a total of 35 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II, III, and IV** directly in this booklet. All work should be written in pen, except 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.

GEOMETRY

Part I

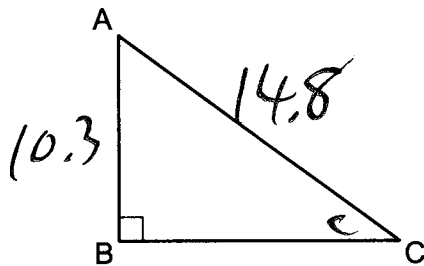
Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression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

Use this space for computations.

1 If $\triangle R'S'T'$ is the image of $\triangle RST$, under which transformation will the triangles be congruent?

- (1) a vertical stretch with a scale factor of 4
- (2) a horizontal stretch with a scale factor of 3
- (3) a translation of 3 units to the right and 4 units up
- (4) a dilation centered at the origin with a scale factor of 3

2 In right triangle ABC below, $m\angle B = 90^\circ$.



$$\sin C = \frac{10.3}{14.8}$$
$$C \approx 44$$

If $AB = 10.3$ and $AC = 14.8$, the measure of $\angle C$, to the nearest degree, is

- (1) 35°
- (2) 44°
- (3) 46°
- (4) 55°

3 Scalene triangle ABC is mapped onto triangle KLM by a rotation. Another triangle, XYZ , is mapped onto triangle KLM by a translation. Which statement is always true?

- (1) $\overline{BC} \cong \overline{XY}$
- (2) $\overline{KM} \cong \overline{YZ}$
- (3) $\angle A \cong \angle L$
- (4) $\angle B \cong \angle Y$

- 4 A solid spherical metal ball has a diameter of 3.5 cm. The density of the metal is 10.5 g/cm^3 . What is the mass of the metal ball, to the nearest tenth of a gram?

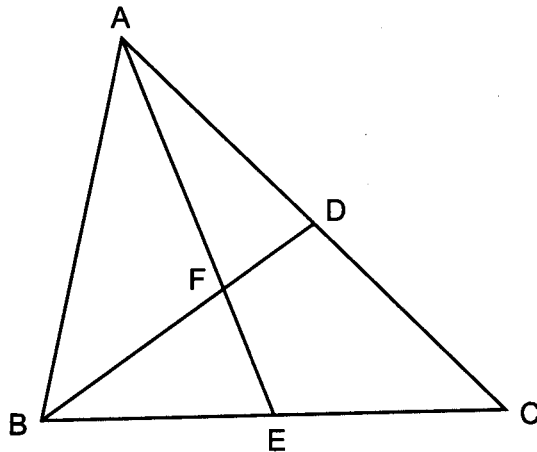
Use this space for computations.

- (1) 134.7
(2) 179.6

- (3) 235.7
(4) 1885.7

$$\frac{4}{3}\pi (1.75)^3 (10.5) \approx 235.7$$

- 5 In the diagram below of $\triangle ABC$, the midpoint of $\overline{AC}$ is D , the midpoint of $\overline{BC}$ is E , and $\overline{AE}$ and $\overline{BD}$ intersect at F .



Which statement is always true?

(1) $AE = 3(FE)$

(3) $AF = BF$

(2) $BF = 3(FD)$

(4) $AD = BE$

- 6 A square is rotated continuously around one of its sides. The three-dimensional object formed is a

(1) cube

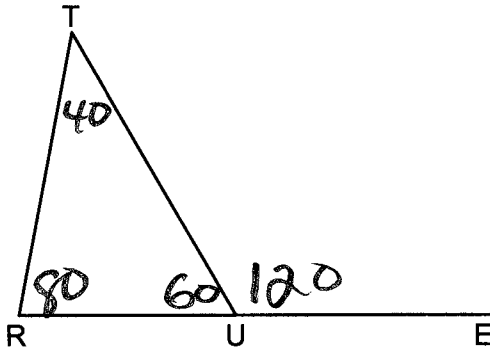
(3) cylinder

(2) sphere

(4) pyramid

Use this space for
computations.

7 In $\triangle TRU$ below, $\overline{RU}$ is extended through U to point E .

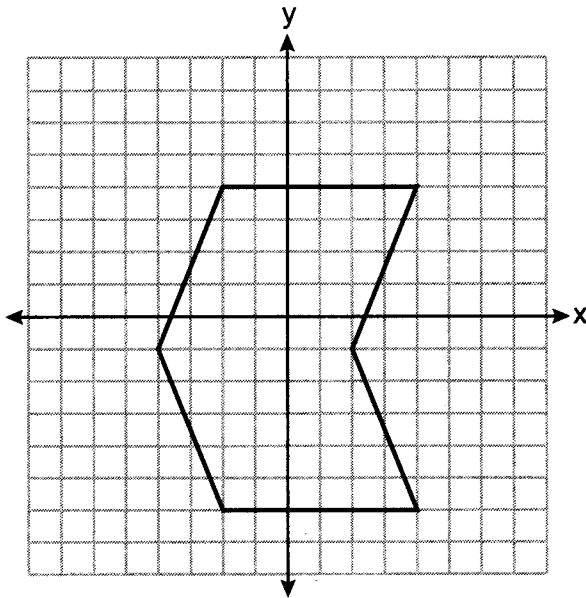


$$\begin{aligned} T + 2T + 60 &= 180 \\ 3T &= 120 \\ T &= 40 \end{aligned}$$

If $m\angle TUE = 120^\circ$ and $m\angle R$ is twice $m\angle T$, then $m\angle R$ is

- (1) 40° (3) 80°
(2) 60° (4) 120°

8 A hexagon is graphed on the set of axes below.

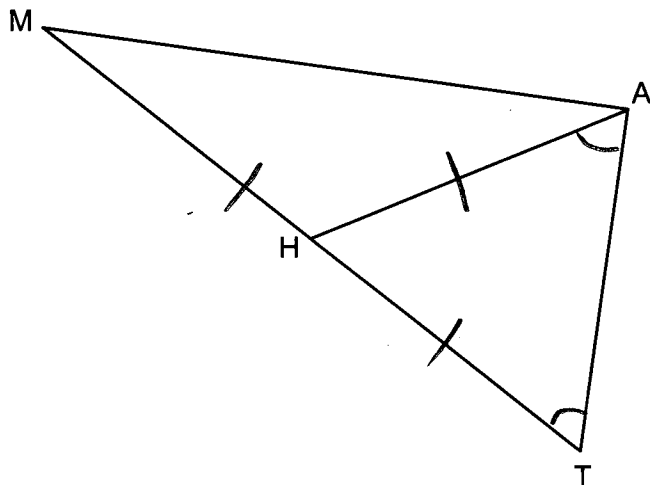


A reflection over which line would carry the hexagon onto itself?

- (1) $y = -1$ (3) y -axis
(2) $x = -1$ (4) x -axis

Use this space for
computations.

- 9 In scalene triangle MAT below, $\overline{AH}$ is drawn such that $\overline{MH} \cong \overline{TH} \cong \overline{AH}$.



Which angle is always congruent to $\angle HTA$?

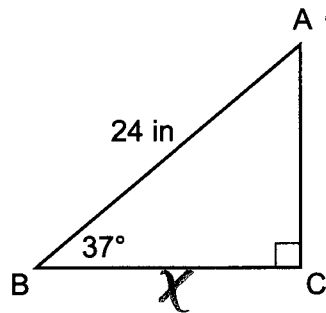
- (1) $\angle MAH$ (3) $\angle AMH$
(2) $\angle TAH$ (4) $\angle THA$

- 10 A rectangular pyramid has a base whose dimensions are 16 by 12. If the volume of the pyramid is 1536, what is its height?

- (1) 24 (3) 12
(2) 16 (4) 8

$$\begin{aligned} (16)(12)h &= 1536 \\ 192h &= 1536 \\ h &= 8 \end{aligned}$$

- 11 In $\triangle ABC$ below, $\angle C$ is a right angle, $AB = 24$ inches, and $m\angle B = 37^\circ$.



Use this space for computations.

$$\cos 37 = \frac{x}{24}$$

$$x \approx 19$$

What is the length of $\overline{BC}$, to the nearest inch?

- (1) 14
(2) 18
(3) 19
(4) 30
- 12 The coordinates of the endpoints of $\overline{RST}$ are $R(-5, 6)$ and $T(3, 2)$.
If $RS:ST = 3:1$, what are the coordinates of point S ?

- (1) $(-3, 5)$
(2) $(-1, 4)$
(3) $(0, 3)$
(4) $(1, 3)$

$$x = -5 + \frac{3}{4}(3 - (-5))$$

$$= -5 + \frac{3}{4}(8)$$

$$= -5 + 6$$

$$= 1$$

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

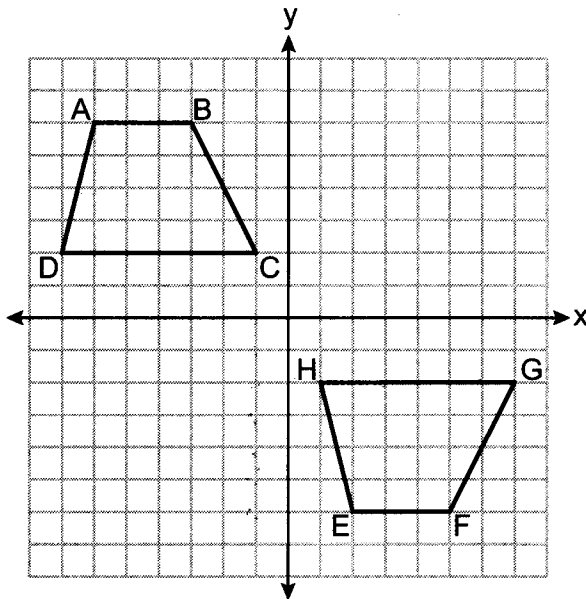
$$= 6 + \frac{3}{4}(-4)$$

$$= 6 + -3$$

$$= 3$$

13 Trapezoids $ABCD$ and $EFGH$ are graphed on the set of axes below.

Use this space for
computations.



Which sequence of transformations maps trapezoid $ABCD$ onto trapezoid $EFGH$?

- (1) a translation of 8 units down followed by a 90° counterclockwise rotation about the origin
- (2) a reflection over the x -axis followed by a translation of 8 units right
- (3) a 180° rotation about the origin
- (4) a reflection over the line $y = x$

14 In parallelogram $PARK$, $m\angle P = (3x + 42)^\circ$ and $m\angle K = (5x - 22)^\circ$.
The measure of $\angle R$ is

- (1) 138°
- (2) 102°
- (3) 78°
- (4) 42°

$$3x + 42 + 5x - 22 = 180$$

$$8x + 20 = 180$$

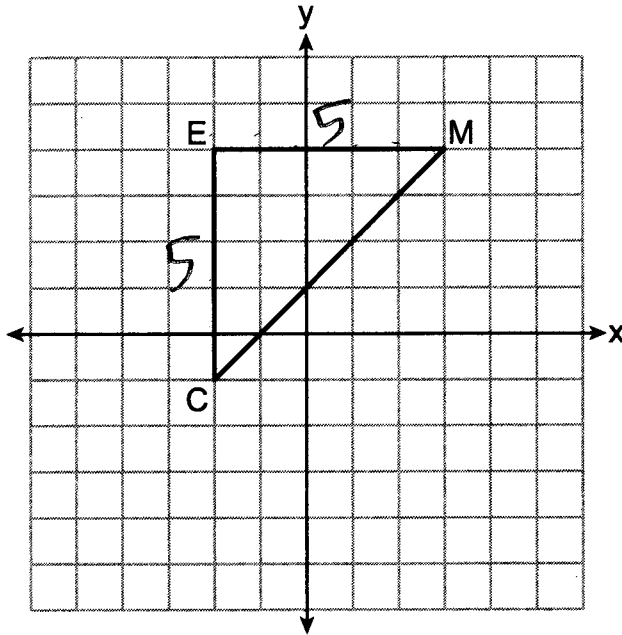
$$8x = 160$$

$$x = 20$$

$$m\angle P = m\angle R = 3(20) + 42 = 102$$

- 15 Triangle CEM , with vertices at coordinates $C(-2, -1)$, $E(-2, 4)$, and $M(3, 4)$, is graphed on the set of axes below.

Use this space for computations.



$$A = \frac{1}{2}(5)(5) = 12.5$$

What is the perimeter of $\triangle CEM$?

- (1) $10 + 5\sqrt{2}$ (3) 12.5
(2) $15\sqrt{2}$ (4) 25

- 16 What is the slope of the perpendicular bisector of $\overline{MT}$ with endpoints whose coordinates are $M(-2, -7)$ and $T(3, 8)$?

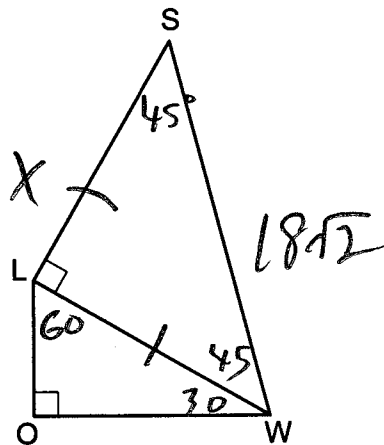
- (1) $\frac{1}{3}$ (3) 3
(2) $-\frac{1}{3}$ (4) -3

$$m = \frac{8 - (-7)}{3 - (-2)} = \frac{15}{5} = 3$$

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

Use this space for
computations.

17 In the diagram below, right triangles SLW and LOW are drawn.



$$\begin{aligned} 2x^2 &= (18\sqrt{2})^2 \\ 2x^2 &= 648 \\ x^2 &= 324 \\ x &= 18 \end{aligned}$$

If $m\angle S = 45^\circ$, $m\angle LWO = 30^\circ$, and $SW = 18\sqrt{2}$, the length of $\overline{OW}$ is

(1) 9

(3) $9\sqrt{3}$

(2) $9\sqrt{2}$

(4) 18

18 What is an equation of a circle with its center at $(0, -4)$ and a diameter of 30?

(1) $x^2 + (y - 4)^2 = 225$

(3) $x^2 + (y - 4)^2 = 900$

(2) $x^2 + (y + 4)^2 = 225$

(4) $x^2 + (y + 4)^2 = 900$

19 Jane is baking a cake in an 8-inch, square-base baking pan that is 2 inches deep. If she filled the pan with batter to a height of 1.5 inches, approximately how many cups of batter did she pour into this pan?
[1 cup = 14.4375 in³]

(1) 7

(3) 9

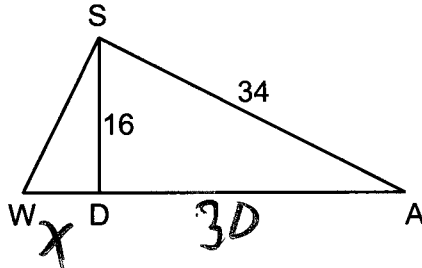
(2) 2

(4) 4

$$\frac{(8^2)(1.5)}{14.4375} \approx 7$$

Use this space for
computations.

- 20 In the diagram below of right triangle WSA , altitude $\overline{SD}$ is drawn to hypotenuse $\overline{AW}$, $SD = 16$, and $SA = 34$.



$$\overline{AD} = \sqrt{34^2 - 16^2} \\ = 30$$

What is the length of $\overline{WD}$, to the nearest tenth?

- (1) 4.3 (3) 7.5
(2) 6.8 (4) 8.5

$$30(x+30) = 34^2 \\ 30x + 900 = 1156 \\ 30x = 256 \\ x \approx 8.5$$

- 21 Quadrilateral $WXYZ$ is the image of quadrilateral $ABCD$ after a dilation of scale factor $\frac{1}{2}$. Which statement is always true?

- (1) $AB = \frac{1}{2}(WX)$
(2) $m\angle W = \frac{1}{2}(m\angle A)$
(3) $\text{area of } WXYZ = \frac{1}{2}(\text{area of } ABCD)$
(4) $\text{perimeter of } WXYZ = \frac{1}{2}(\text{perimeter of } ABCD)$

- 22 In $\triangle AHL$, $AH = 10$, $HL = 12$, and $m\angle H = 40^\circ$. The area of $\triangle AHL$, to the nearest square unit, is

- (1) 39 (3) 60
(2) 46 (4) 77

$$\frac{1}{2}(10)(12) \sin 40 \approx 39$$

Use this space for
computations.

23 Parallelogram $ABCD$ has diagonals $\overline{AC}$ and $\overline{BD}$, which intersect at point E . Which additional information is sufficient to prove $ABCD$ is a rhombus?

(1) $\overline{AE} \cong \overline{EC}$

(3) $m\angle DEC = 90^\circ$

(2) $\overline{AC} \cong \overline{BD}$

(4) $m\angle CDA = 90^\circ$

24 The line whose equation is $y = -2x - 6$ is dilated by a scale factor of $\frac{1}{2}$ centered at $(-1, -4)$. An equation of the line's image is

(1) $y = -x - 3$

(3) $y = -2x - 3$

(2) $y = -x - 6$

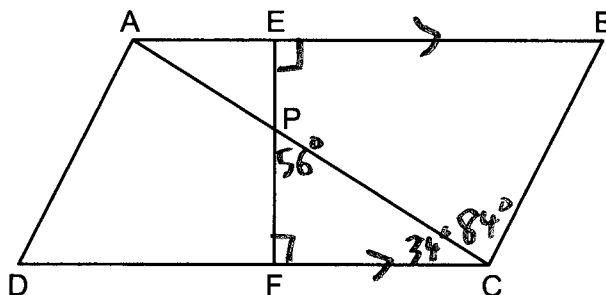
(4) $y = -2x - 6$

$(-1, -4)$ is on the line $y = -2x - 6$

Part II

Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [14]

25 In the diagram below of parallelogram $ABCD$, $\overline{AE} \perp \overline{EF}$, and $\overline{EF}$ and $\overline{AC}$ intersect at P .



If $m\angle BCP = 84^\circ$ and $m\angle CPF = 56^\circ$, determine and state $m\angle D$.

$$180 - (34 + 84) = 62$$

- 26 The city of Buffalo, New York is approximately 40.5 square miles and has a population of 258,959 people. The city of Albany, New York is approximately 21.5 square miles and has a population of 98,424 people. (Data collected in 2013.)

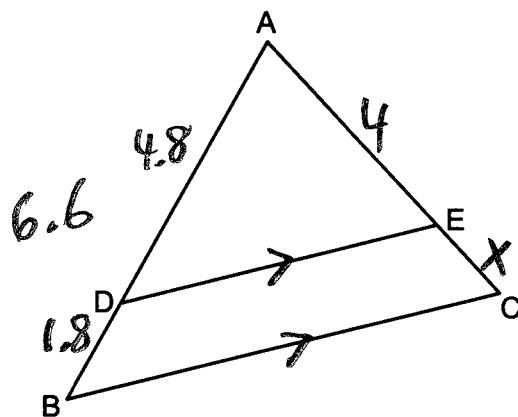
Which city has the higher population density? Justify your answer.

$$\frac{258959}{40.5} > \frac{98424}{21.5}$$

$$6394 > 4578$$

Buffalo

27 In $\triangle ABC$ below, points D and E are on $\overline{AB}$ and $\overline{AC}$, respectively, such that $\overline{DE} \parallel \overline{BC}$.



If $AB = 6.6$, $DB = 1.8$, and $AE = 4$, determine and state the length of $\overline{EC}$.

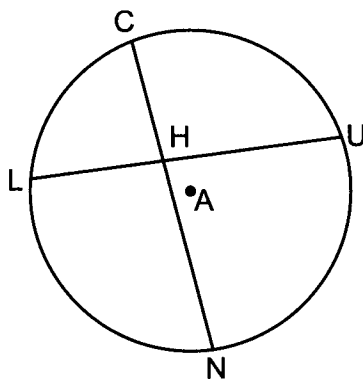
$$\frac{4.8}{4} = \frac{6.6}{x+4}$$

$$4.8x + 19.2 = 26.4$$

$$\frac{4.8x}{4.8} = \frac{7.2}{4.8}$$

$$x = 1.5$$

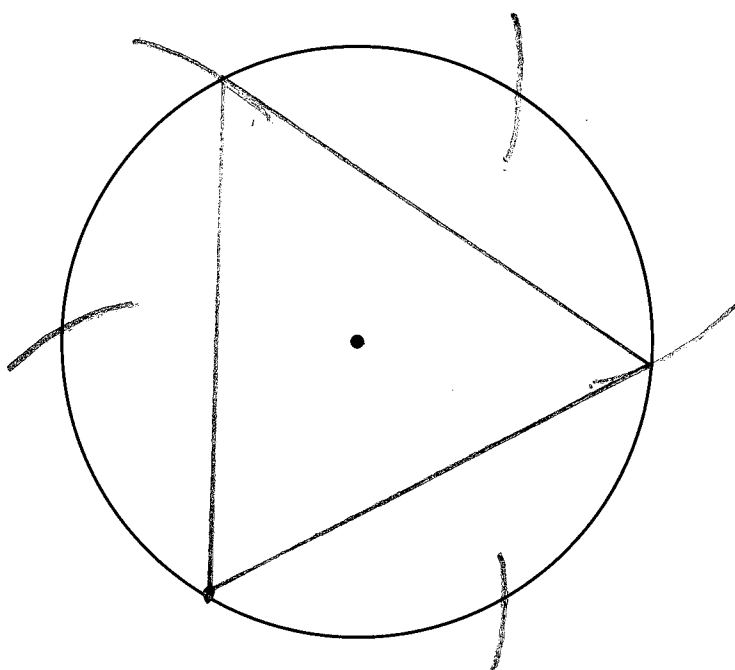
28 In circle A below, chords $\overline{CN}$ and $\overline{UL}$ intersect at H.



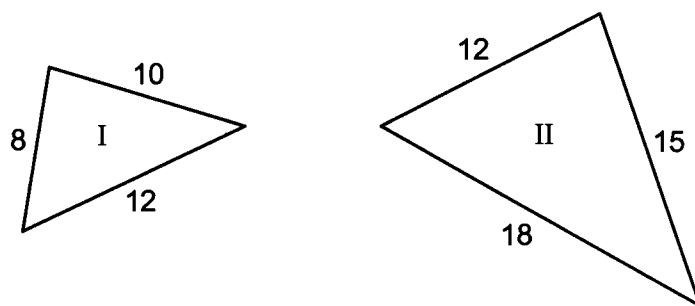
If $m\widehat{LC} = 64^\circ$ and $m\widehat{NU} = 108^\circ$, determine and state $m\angle CHL$.

$$\frac{64 + 108}{2} = 86$$

- 29** Use a compass and straightedge to construct an equilateral triangle inscribed in the circle below.
[Leave all construction marks.]



- 30 In the diagram below, triangle I has side lengths of 8, 10, and 12, and triangle II has side lengths of 12, 15, and 18.

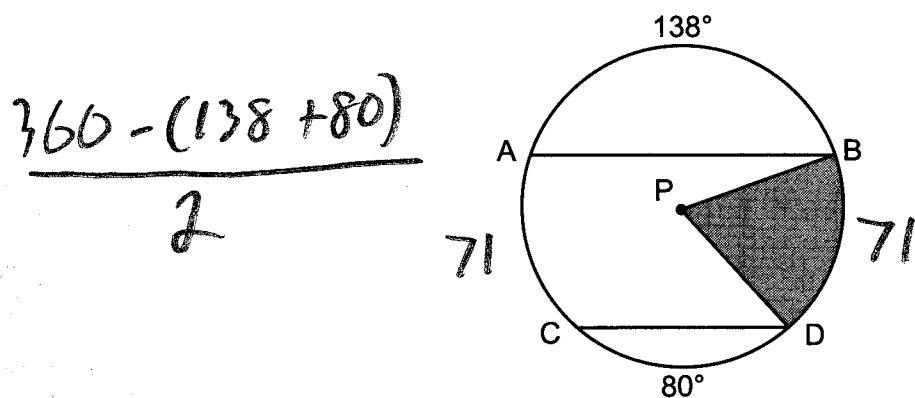


Explain why triangle I is similar to triangle II.

$$\frac{8}{12} = \frac{10}{15} = \frac{12}{18}$$

The triangles are similar because the sides are proportional.

- 31 In circle P below, chords $\overline{AB}$ and $\overline{CD}$ are parallel, radii $\overline{PB}$ and $\overline{PD}$ are drawn, $m\widehat{AB} = 138^\circ$, and $m\widehat{CD} = 80^\circ$.



If $PB = 14$ inches, determine and state the area of shaded sector BPD , to the *nearest square inch*.

$$\left(\frac{71}{360}\right)\pi(14)^2 \approx 121$$

Part III

Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

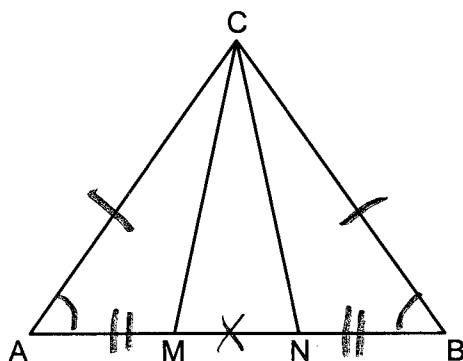
- 32 A cylindrical container is completely filled with water. The inside of the cylinder has a diameter of 10 inches and is 20 inches tall.

Cone-shaped cups are filled from the container. The inside of a cone cup has a diameter of 3.25 inches and a height of 4.25 inches.

Determine and state the maximum number of full cups of water that can be filled from the cylindrical container.

$$\frac{\pi \left(\frac{10}{2}\right)^2 (20)}{\frac{1}{3} \pi \left(\frac{3.25}{2}\right)^2 (4.25)} \approx 133$$

33 Given: Isosceles triangle ABC with vertex angle ACB , $\overline{AM} \cong \overline{BN}$



Prove: $\triangle CAN \cong \triangle CBM$

Statements

Reasons

① Isosceles $\triangle ABC$ with vertex angle ACB ,
 $\overline{AM} \cong \overline{BN}$

① Given

② $\angle CAM \cong \angle CBN$

② Base angles of an isosceles $\triangle$ are $\cong$.

③ $\overline{MN} \cong \overline{MN}$

③ Reflexive Property

④ $\overline{AM} + \overline{MN} \cong \overline{MN} + \overline{NB}$

④ Addition Postulate

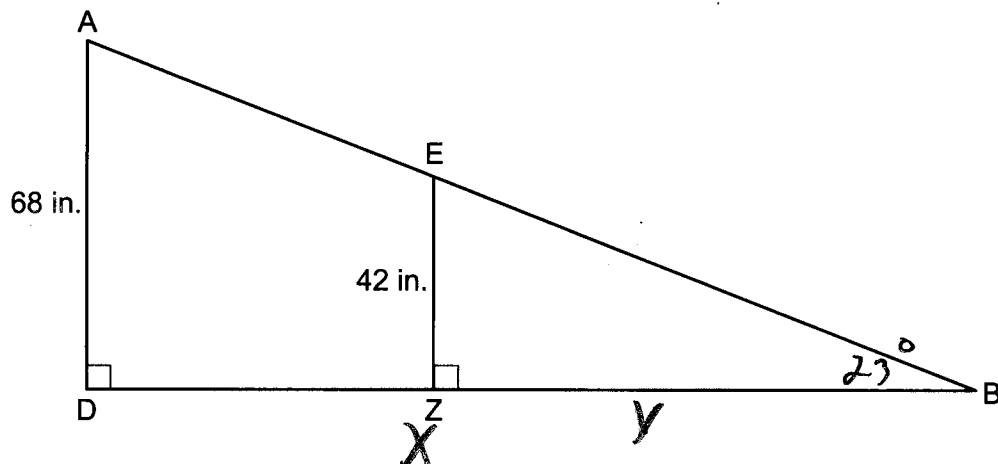
⑤ $\overline{AN} \cong \overline{MB}$

⑤ An isosceles $\triangle$ has two congruent sides

⑥ $\triangle CAN \cong \triangle CBM$

⑥ SAS

- 34 Deshawn and Ziggy are standing on the ground at points D and Z , respectively. Deshawn is 68 inches tall, Ziggy is 42 inches tall, and $\overline{DZB}$ and $\overline{AEB}$ are drawn, as modeled below.



The angle of elevation from point B to the tops of their heads at A and E is 23° . Determine and state the distance between D and Z , to the *nearest inch*.

$$\tan 23 = \frac{68}{x}$$

$$x \approx 160$$

$$\tan 23 = \frac{42}{y}$$

$$y \approx 99$$

$$160 - 99 = 61$$

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

35 The coordinates of the vertices of quadrilateral $SHED$ are $S(0, 0)$, $H(3, 4)$, $E(8, 0)$, and $D(5, -4)$.

Prove $SHED$ is a parallelogram.

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

$$m_{\overline{SH}} = m_{\overline{ED}} = \frac{4}{3}$$

$$m_{\overline{HE}} = m_{\overline{DS}} = -\frac{4}{5}$$

$SHED$ is a parallelogram because its opposite sides have the same slope & are therefore parallel

Prove $SHED$ is *not* a rectangle.

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

The slopes of $\overline{SH}$ & $\overline{HE}$ are not opposite reciprocals, are not perpendicular & therefore do not form a right angle. Since one of the angles of $SHED$ is not right, it is not a rectangle because all of the angles of a rectangle are right.

Question 35 is continued on the next page.

Question 35 continued

Prove $SHED$ is not a rhombus.

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

The lengths of $\overline{SH}$ (5) & $\overline{HE}$ ($\sqrt{41}$) are not equal. Since two of the sides of $SHED$ are not congruent, it is not a rhombus because all the sides of a rhombus are congruent.

