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

GEOMETRY

Tuesday, June 23, 2026 — 1:15 to 4:15 p.m., only

Student Name: Mr. Sibol

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.

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 Which transformation would result in the area of a rectangle's image being different from the area of its pre-image?

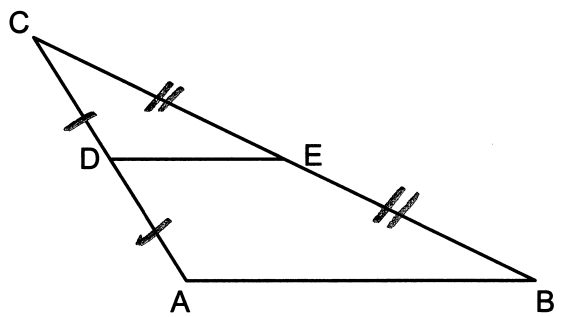
(1) a reflection over the y-axis

(2) a translation 4 units to the right

(3) a rotation of 90° counterclockwise about the origin

(4) a vertical stretch of scale factor 3 with respect to $y = 0$

2 In the diagram below of $\triangle ABC$, points D and E are the midpoints of $\overline{CA}$ and $\overline{CB}$, respectively.



Which statement must always be true?

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

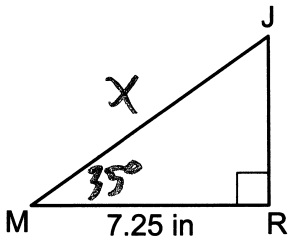
(2) $DE = \frac{1}{2}AC$

(3) $AD = \frac{1}{2}AB$

(4) $AB = \frac{1}{2}DE$

3 In triangle RJM below, $m\angle R = 90°$ and $MR = 7.25$ inches.

Use this space for computations.



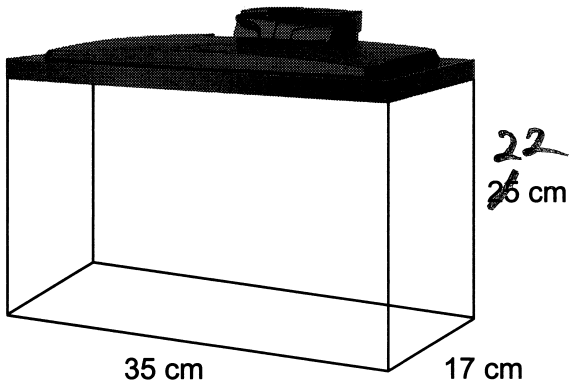
$\cos 35 = \frac{7.25}{x}$

$x \approx 8.85$

If the measure of angle M is 35°, what is the length of $\overline{MJ}$, to the *nearest hundredth of an inch*?

(1) 4.16
(3) 8.85
(2) 5.94
(4) 12.64

4 A fish tank in the shape of a rectangular prism with a length of 35 cm, width of 17 cm, and a height of 25 cm is shown below.



If the fish tank is filled with water to a height 3 centimeters from the top, how many liters of water are in this tank, to the *nearest liter*?

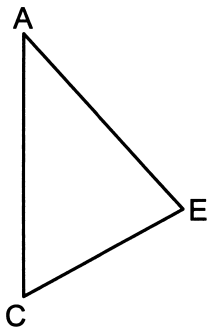
[1 liter = 1000 cubic centimeters]

(1) 10
(3) 15
(2) 13
(4) 17

$35\text{cm} \cdot 17\text{cm} \cdot 22\text{cm} \cdot \frac{1\ell}{1000\text{cm}^3}$

Use this space for computations.

5 Triangle ACE is drawn below. Triangle ACE is mapped onto triangle AXE after a reflection over side $\overline{AE}$. Triangle AXE is then mapped onto triangle LXE after a reflection over side $\overline{XE}$.



Which side of $\triangle LXE$ is the image of $\overline{AC}$?

(1) $\overline{LE}$

(2) $\overline{AX}$

(3) $\overline{XE}$

(4) $\overline{LX}$

6 The lines whose equations are represented by $y = -\frac{1}{2}x + 2$ and $x + 2y = 8$ are

(1) parallel

(2) perpendicular

(3) the same line

(4) neither parallel nor perpendicular

$m = -\frac{1}{2}$

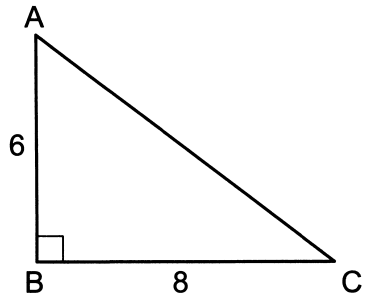
$2y = -x + 8$

$y = -\frac{1}{2}x + 4 \quad m = -\frac{1}{2}$

different y-intercepts → different lines

Use this space for computations.

7 Right triangle ABC below has legs whose lengths are 6 and 8.



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

$= \frac{\pi}{3}(8)^2(6)$

$= 128\pi$

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

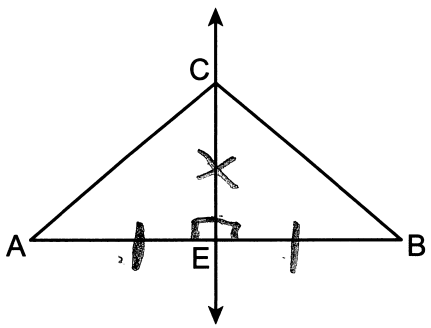
(1) 96π

(2) 128π

(3) 288π

(4) 384π

8 In $\triangle ABC$ below, $\overleftrightarrow{CE}$ is the perpendicular bisector of $\overline{AEB}$.



Which statement is always true?

(1) $\overline{AC} \cong \overline{BC}$

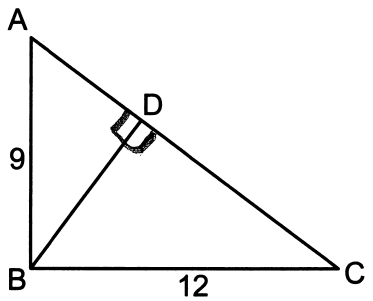
(2) $\overline{AE} \cong \overline{CE}$

(3) $\angle EAC \cong \angle BCE$

(4) $m\angle A + m\angle B = 90°$

Use this space for computations.

9 In right triangle ABC below, $AB = 9$, $BC = 12$, and altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.



Which equation is always true for $\overline{BD}$?

(1) $\cos A = \frac{BD}{9}$

(3) $\tan A = \frac{BD}{9}$

(2) $\sin C = \frac{BD}{12}$

(4) $\sin C = \frac{BD}{15}$

10 Which regular polygon, when rotated about its center, carries onto itself after both a 120° rotation and a 180° rotation?

(1) triangle $\frac{360}{3} = 120$

(2) square $\frac{360}{4} = 90$

(3) hexagon $\frac{360}{6} = 60$

(4) octagon $\frac{360}{8} = 40$

120 & 180 are both multiples of 60

11 The coordinates of the endpoints of $\overline{PA}$ are $P(3, -6)$ and $A(-2, 9)$. If point C is on $\overline{PA}$, what are the coordinates of C such that $PC:CA = 1:4$?

(1) $(-1, 6)$

(2) $(0, 3)$

(3) $(1, 0)$

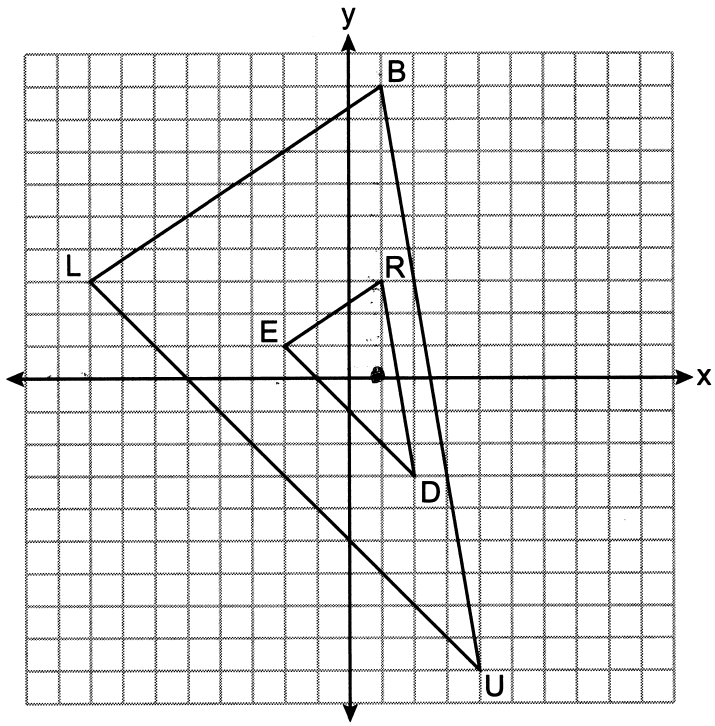
(4) $(2, -3)$

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

$y = -6 + \frac{1}{5}(9 - -6) = -6 + 3 = -3$

12 On the set of axes below, $\triangle BLU$ is the image of $\triangle RED$ after a dilation.

Use this space for computations.



What are the scale factor and the coordinates of the center of dilation of this transformation?

(1) 2 and (0, 0)
(2) 2 and (1, 0)
(3) 3 and (0, 0)
(4) 3 and (1, 0)

13 What are the coordinates of the center and the length of the radius of the circle whose equation is $x^2 + y^2 = 45 + 4x$?

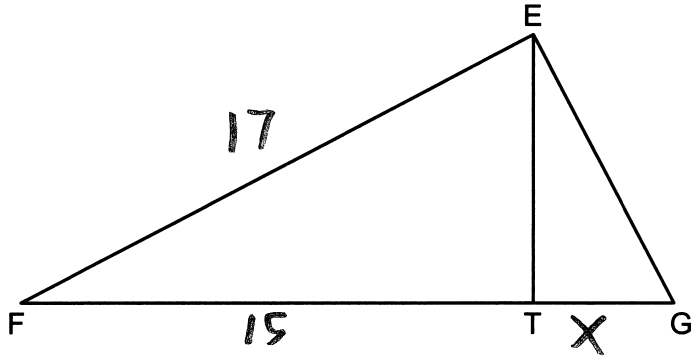
(1) center (2, 0) and radius 7
(2) center (−2, 0) and radius 7
(3) center (2, 0) and radius 49
(4) center (−2, 0) and radius 49

$x^2 - 4x + 4 + y^2 = 45 + 4$

$(x-2)^2 + y^2 = 49$

14 In right triangle EFG below, altitude $\overline{ET}$ is drawn to hypotenuse $\overline{FG}$.

Use this space for computations.



$15(15+x) = 17^2$

$225 + 15x = 289$

$\frac{15x}{15} = \frac{64}{15}$

$x \approx 4.3$

If $EF = 17$ and $FT = 15$, what is the length of $\overline{TG}$, to the *nearest tenth*?

(1) 3.8
(2) 4.3
(3) 8.0
(4) 9.1

15 In trapezoid $ERJT$, sides $\overline{ER}$ and $\overline{TJ}$ are parallel.
If $m\angle R = (2x + 15)°$ and $m\angle J = (3x - 40)°$, what is $m\angle J$?

(1) 125°
(2) 97°
(3) 83°
(4) 55°

$2x + 15 + 3x - 40 = 180$

$5x - 25 = 180$

$5x = 205$

$x = 41$

$m\angle J = 3(41) - 40 = 83$

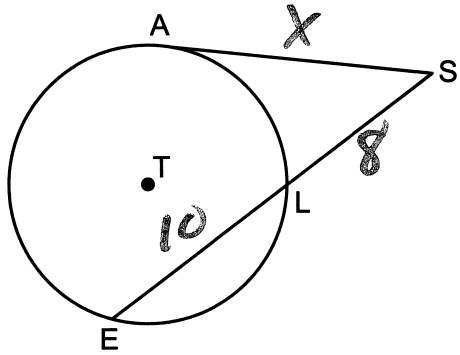
Use this space for computations.

16 In isosceles right triangle ABC, the length of hypotenuse $\overline{AC}$ is 14. What is the length of $\overline{BC}$, to the *nearest tenth*?

(1) 7.0
(3) 9.9
(2) 8.1
(4) 19.8

$x^2 + x^2 = 14^2$
$2x^2 = 196$
$x^2 = 98$
$x \approx 9.9$

17 In circle T below, tangent $\overline{AS}$ and secant $\overline{ELS}$ are drawn.



$x^2 = 18 \cdot 8$
$x^2 = 144$
$x = 12$

If $SL = 8$ and $LE = 10$, the length of $\overline{AS}$ is

(1) $\sqrt{18}$
(3) 9
(2) $\sqrt{80}$
(4) 12

18 Parallelogram $MERT$ has diagonals that intersect at I. Which additional statement is sufficient to prove $MERT$ is a rhombus?

(1) $\angle ERT \cong \angle RTM$
(3) $m\angle TIM = 90°$
(2) $\angle MEI \cong \angle RTI$
(4) $\overline{ME} \cong \overline{RT}$

60 30

Use this space for computations.

19 For the acute angles in right triangle ABC, $\sin(3x)° = \cos(x + 10)°$. What is the measure of the *smallest* angle in $\triangle ABC$?

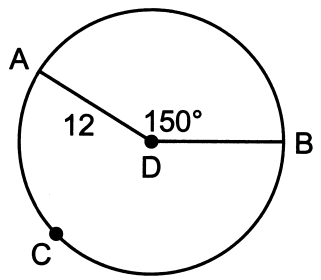
(1) 5°
(3) 30°
(2) 15°
(4) 60°

$3x + x + 10 = 90$
$4x = 80$
$x = 20$

20 Which two-dimensional shape below can *not* be a plane section of a rectangular prism?

(1) triangle
(3) pentagon
(2) octagon
(4) trapezoid

21 Points A, B, and C are on circle D below such that $DA = 12$ and $m\angle ADB = 150°$.



$\frac{150}{360} \cdot 24\pi = 10\pi$

The length of $\overset{\frown}{AB}$ is

(1) 5π
(3) 24π
(2) 10π
(4) 60π

Use this space for computations.

22 The lengths of two sides of a triangle are 12 and 30. The length of the third side could be

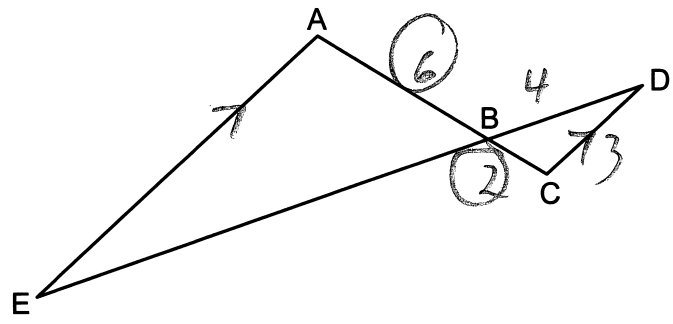
(1) 12 $12+12 \not> 30$

(2) 18 $12+18 \not> 30$

(3) 28 $12+28 > 30$

(4) 42 $12+30 \not> 42$

23 In the diagram below, $\overline{AC}$ and $\overline{ED}$ intersect at B, and $\overline{AE} \parallel \overline{CD}$.



$\frac{6}{2} \times (2+3+4)$

If $AB = 6$, $BC = 2$, $CD = 3$, and $BD = 4$, what is the perimeter of $\triangle ABE$?

(1) 9

(2) 18

(3) 21

(4) 27

24 On the coordinate plane, a line is dilated by a scale factor, centered at a point on the line. The image of the line has

(1) the same slope and the same y-intercept as the original line

(2) the same y-intercept but a different slope as the original line

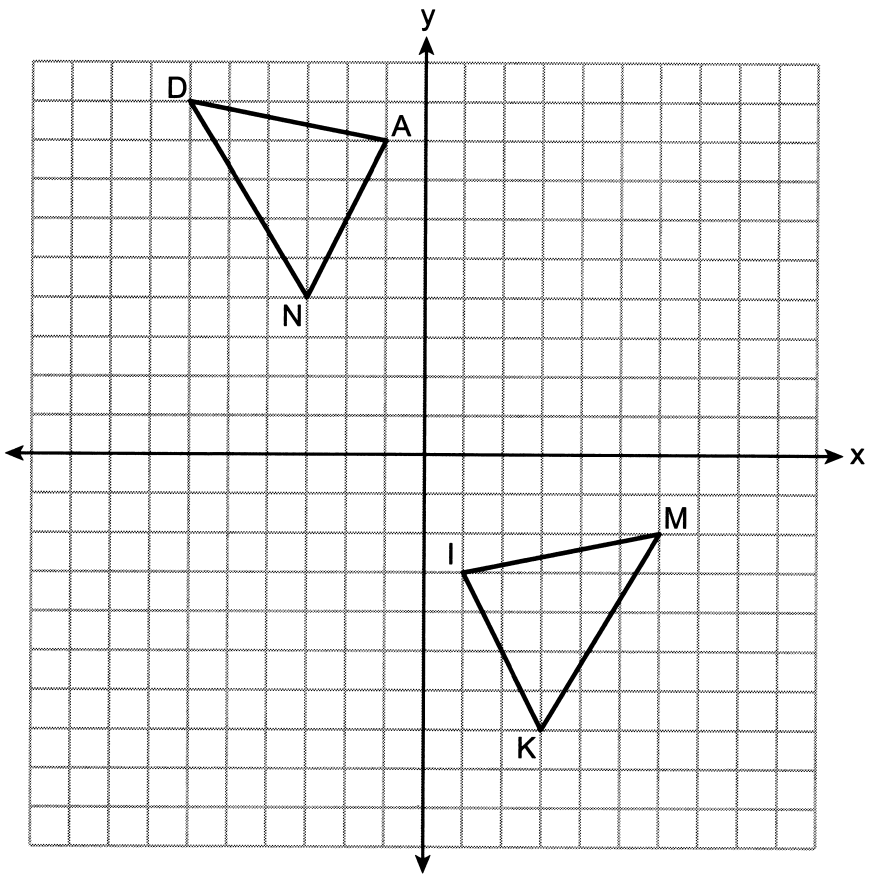
(3) the same slope but a different y-intercept as the original line

(4) a different slope and a different y-intercept than the original line

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]

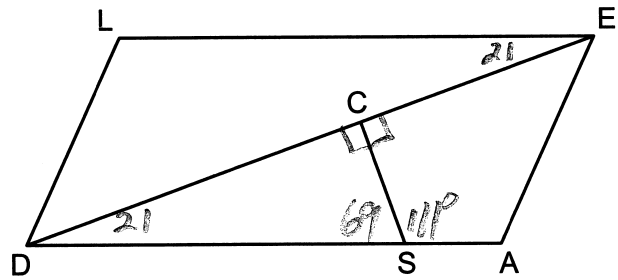
25 On the set of axes below, $\triangle DAN \cong \triangle MIK$.



Describe a sequence of rigid motions that maps $\triangle DAN$ onto $\triangle MIK$.

$T_{0,-11} \circ r_{y\text{-axis}}$

26 In parallelogram *LEAD* below, *C* is on $\overline{DE}$ and *S* is on $\overline{DA}$ such that $\overline{SC} \perp \overline{DE}$.



If m$\angle LED = 21°$, determine and state the measure of $\angle CSA$.

$180 - (90 + 21) = 69$

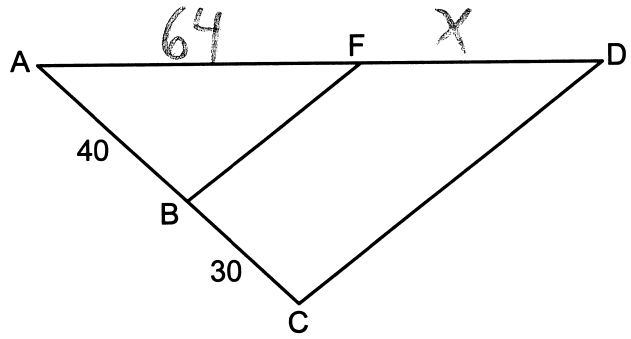
$180 - 69 = 111$

27 A section of tree trunk from a white pine tree can be modeled by a cylinder. The diameter of the trunk is 1.5 feet, and the height of this section is 8 feet.

If white pine weighs 25 pounds per cubic foot, determine and state the weight of this section of the white pine tree, to the *nearest pound*.

$\pi\left(\frac{1.5}{2}\right)^2(8) \cdot 25 \approx 353$

28 In $\triangle ADC$ below, points B and F are on $\overline{AC}$ and $\overline{AD}$, respectively, such that $AB = 40$, $BC = 30$, and $\overline{BF}$ is drawn.



If $AF = 64$, determine and state the length of $\overline{FD}$ that would prove $\overline{BF} \parallel \overline{CD}$.

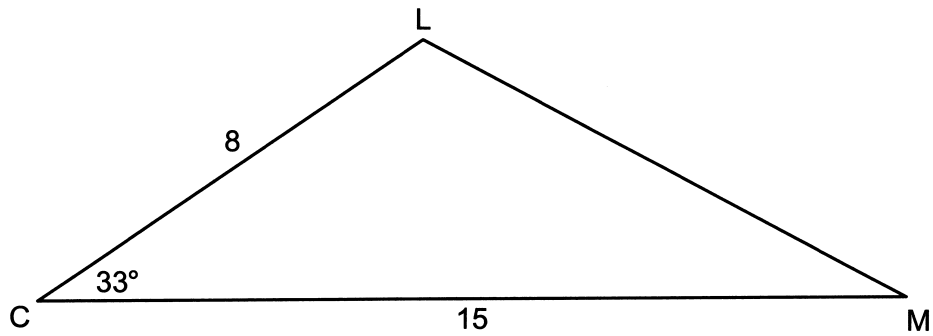
$$\frac{40}{70} = \frac{64}{64+x}$$

$$2560 + 40x = 4480$$

$$40x = 1920$$

$$x = 48$$

29 In $\triangle CLM$ below, $m\angle C = 33°$, $CL = 8$, and $CM = 15$.

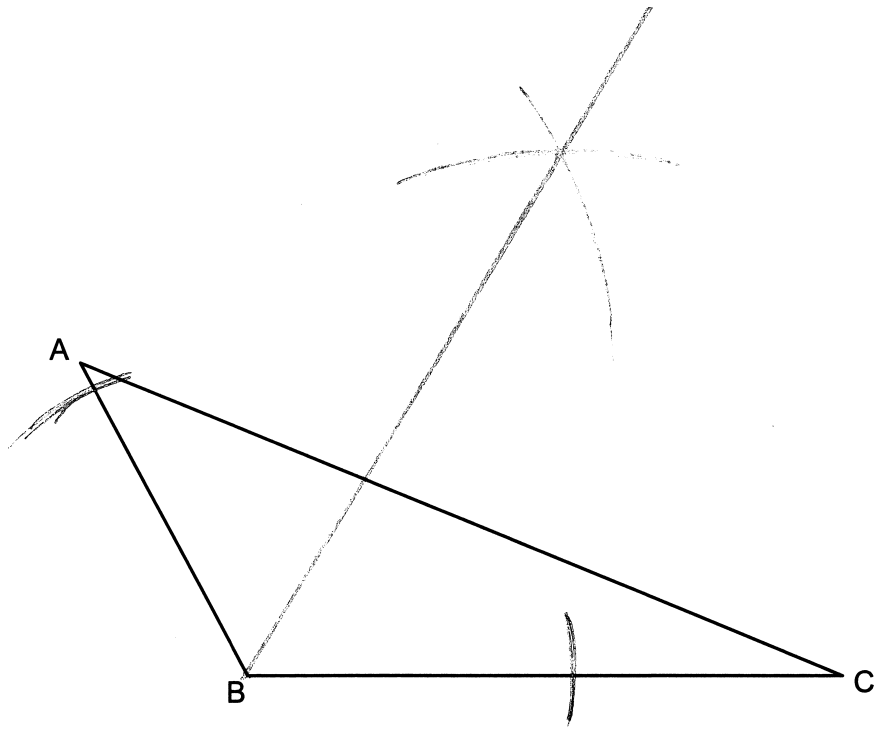


Determine and state, to the *nearest tenth*, the area of $\triangle CLM$.

$\frac{1}{2}(8)(15)\sin 33 \approx 32.7$

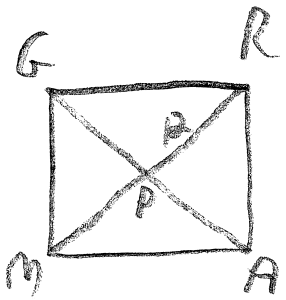
30 In the diagram of $\triangle ABC$ below, use a compass and straightedge to construct the angle bisector of $\angle ABC$.

[Leave all construction marks.]



31 The diagonals of parallelogram *GRAM* intersect at *P*.

If $RP = 12$ and $GA = 24$, explain why *GRAM* is a rectangle.

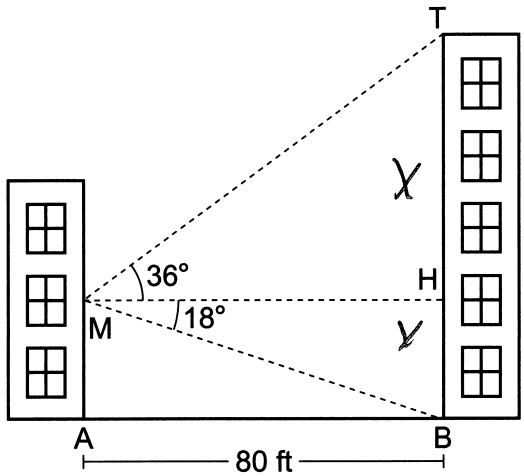


Since GRAM is a parallelogram, the diagonals bisect each other, & RM = 24. Since the diagonals are congruent, GRAM is a rectangle.

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 As modeled below, Maria wants to determine the height of the building across the street from her position, M. The angle of elevation from M to the top of the building, T, is 36°. From M, the angle of depression to the base of the building, B, is 18°. The buildings are 80 feet apart.



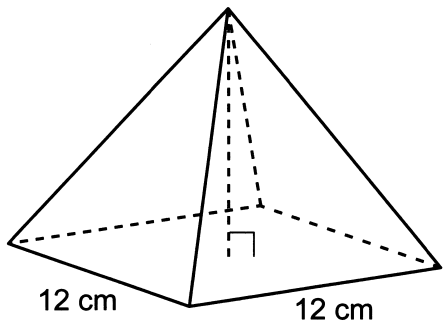
Determine and state, to the *nearest foot*, the height of the building, TB, across the street from Maria.

$\tan 36 = \frac{X}{80}$ $\tan 18 = \frac{Y}{80}$

$X \approx 58.12$ $Y \approx 25.99$

84 total

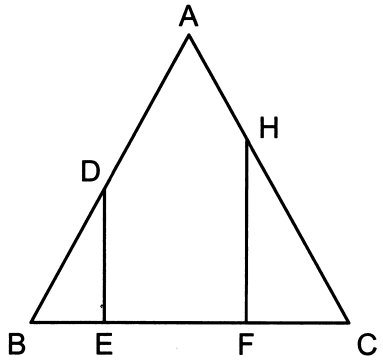
33 An artist uses clay to make solid pyramids with a square base whose sides measure 12 cm, as modeled below.



The height of each pyramid is 8 cm, and the density of the clay is 1.25 g/cm^3. If the artist has 15 kilograms of clay, determine and state the maximum number of pyramids that can be made.

$$\frac{15000}{\frac{1}{3}(12)^2(8)(1.25)} \approx 31$$

34 Given: Triangle ABC, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, and $\overline{HF} \perp \overline{BC}$



Prove: $\frac{DE}{BE} = \frac{HF}{CF}$

Statement	Reason
(1) $\triangle ABC$, $\overline{AB} \cong \overline{AC}$, $\overline{DE} \perp \overline{BC}$, $\overline{HF} \perp \overline{BC}$	(1) Given
(2) $\angle B \cong \angle C$	(2) Isosceles $\triangle$ Theorem
(3) $\angle DEB$ & $\angle HFC$ are right angles	(3) Perpendicular lines form right angles
(4) $\angle DEB \cong \angle HFC$	(4) All right angles are congruent
(5) $\triangle DEB \sim \triangle HFC$	(5) AA
(6) $\frac{DE}{BE} = \frac{HF}{CF}$	(6) Similar triangles have proportional corresponding sides

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 Triangle ABC has vertices whose coordinates are $A(-3, -1)$, $B(-5, 2)$, and $C(-1, 8)$.

State the coordinates of point D such that quadrilateral $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$(1, 5)$

Prove $ABCD$ is a parallelogram.
[The use of the set of axes on the next page is optional.]

$m_{\overline{AB}} = -\frac{3}{2} = m_{\overline{CD}}$ Sides that have the same slope are parallel

$m_{\overline{BC}} = \frac{6}{4} = m_{\overline{AD}}$

ABCD is a parallelogram because both pairs of opposite sides are parallel.

State the coordinates of point E, the midpoint of $\overline{BC}$.
[The use of the set of axes on the next page is optional.]

$(-3, 5)$

Question 35 is continued on the next page.

Question 35 continued

Prove $\triangle ABE$ is an isosceles triangle.
[The use of the set of axes below is optional.]

$BE = \sqrt{3^2+2^2} = \sqrt{13}$

$AB = \sqrt{3^2+2^2} = \sqrt{13}$

$\triangle ABE$ is isosceles because 2 sides are congruent.