Use this space for computations.

11 Segment CD is the perpendicular bisector of $\overline{AB}$ at E. Which pair of segments does *not* have to be congruent?

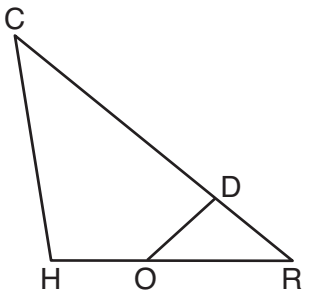
(1) $\overline{AD}, \overline{BD}$

(2) $\overline{AC}, \overline{BC}$

(3) $\overline{AE}, \overline{BE}$

(4) $\overline{DE}, \overline{CE}$

12 In triangle CHR, O is on $\overline{HR}$, and D is on $\overline{CR}$ so that $\angle H \cong \angle RDO$.



If $RD = 4$, $RO = 6$, and $OH = 4$, what is the length of $\overline{CD}$?

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

(2) $6\frac{2}{3}$

(3) 11

(4) 15

13 The cross section of a regular pyramid contains the altitude of the pyramid. The shape of this cross section is a

(1) circle

(2) square

(3) triangle

(4) rectangle

14 The diagonals of rhombus $TEAM$ intersect at $P(2,1)$. If the equation of the line that contains diagonal $\overline{TA}$ is $y = -x + 3$, what is the equation of a line that contains diagonal $\overline{EM}$?

(1) $y = x - 1$

(2) $y = x - 3$

(3) $y = -x - 1$

(4) $y = -x - 3$

Use this space for computations.

15 The coordinates of vertices A and B of $\triangle ABC$ are $A(3,4)$ and $B(3,12)$. If the area of $\triangle ABC$ is 24 square units, what could be the coordinates of point C?

(1) $(3,6)$
(2) $(8,-3)$
(3) $(-3,8)$
(4) $(6,3)$

16 What are the coordinates of the center and the length of the radius of the circle represented by the equation $x^2 + y^2 - 4x + 8y + 11 = 0$?

(1) center $(2,-4)$ and radius 3
(2) center $(-2,4)$ and radius 3
(3) center $(2,-4)$ and radius 9
(4) center $(-2,4)$ and radius 9

17 The density of the American white oak tree is 752 kilograms per cubic meter. If the trunk of an American white oak tree has a circumference of 4.5 meters and the height of the trunk is 8 meters, what is the approximate number of kilograms of the trunk?

(1) 13
(2) 9694
(3) 13,536
(4) 30,456

Use this space for computations.

18 Point P is on the directed line segment from point $X(-6,-2)$ to point $Y(6,7)$ and divides the segment in the ratio 1:5. What are the coordinates of point P?

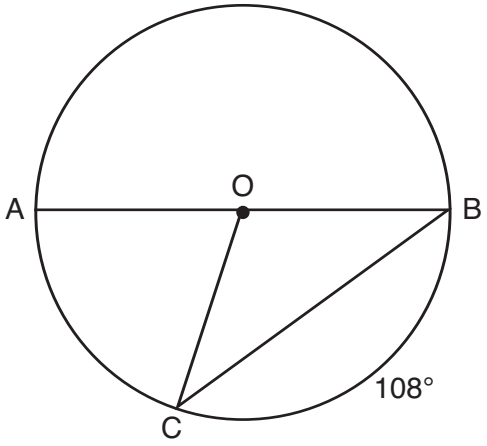
(1) $(4,5\frac{1}{2})$

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

(3) $(-4\frac{1}{2},0)$

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

19 In circle O, diameter $\overline{AB}$, chord $\overline{BC}$, and radius $\overline{OC}$ are drawn, and the measure of arc BC is 108°.



Some students wrote these formulas to find the area of sector COB:

Amy $\frac{3}{10} \cdot \pi \cdot (BC)^2$

Beth $\frac{108}{360} \cdot \pi \cdot (OC)^2$

Carl $\frac{3}{10} \cdot \pi \cdot (\frac{1}{2}AB)^2$

Dex $\frac{108}{360} \cdot \pi \cdot \frac{1}{2}(AB)^2$

Which students wrote correct formulas?

(1) Amy and Dex

(2) Beth and Carl

(3) Carl and Amy

(4) Dex and Beth

Use this space for computations.

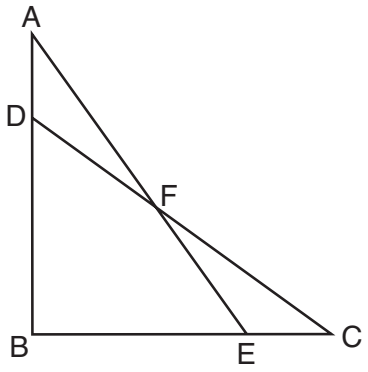
20 Tennis balls are sold in cylindrical cans with the balls stacked one on top of the other. A tennis ball has a diameter of 6.7 cm. To the *nearest cubic centimeter*, what is the minimum volume of the can that holds a stack of 4 tennis balls?

(1) 236
(2) 282
(3) 564
(4) 945

21 Line segment $A'B'$, whose endpoints are $(4,-2)$ and $(16,14)$, is the image of $\overline{AB}$ after a dilation of $\frac{1}{2}$ centered at the origin. What is the length of $\overline{AB}$?

(1) 5
(2) 10
(3) 20
(4) 40

22 Given: $\triangle ABE$ and $\triangle CBD$ shown in the diagram below with $\overline{DB} \cong \overline{BE}$

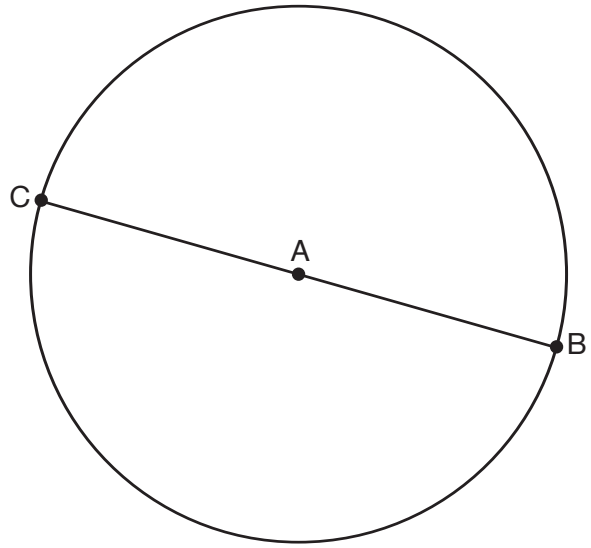


Which statement is needed to prove $\triangle ABE \cong \triangle CBD$ using only SAS $\cong$ SAS?

(1) $\angle CDB \cong \angle AEB$
(2) $\angle AFD \cong \angle EFC$
(3) $\overline{AD} \cong \overline{CE}$
(4) $\overline{AE} \cong \overline{CD}$

23 In the diagram below, $\overline{BC}$ is the diameter of circle A.

Use this space for computations.



Point D, which is unique from points B and C, is plotted on circle A. Which statement must always be true?

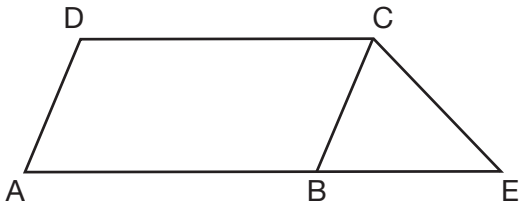
(1) $\triangle BCD$ is a right triangle.

(2) $\triangle BCD$ is an isosceles triangle.

(3) $\triangle BAD$ and $\triangle CBD$ are similar triangles.

(4) $\triangle BAD$ and $\triangle CAD$ are congruent triangles.

24 In the diagram below, $ABCD$ is a parallelogram, $\overline{AB}$ is extended through B to E, and $\overline{CE}$ is drawn.



If $\overline{CE} \cong \overline{BE}$ and $m\angle D = 112°$, what is $m\angle E$?

(1) 44°

(2) 56°

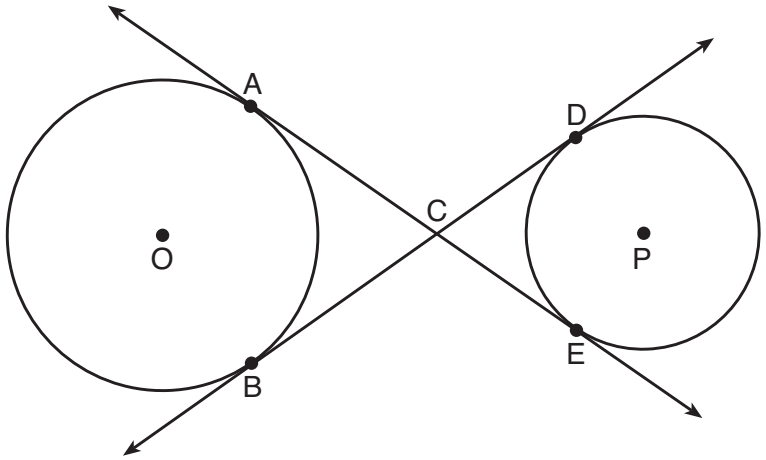
(3) 68°

(4) 112°

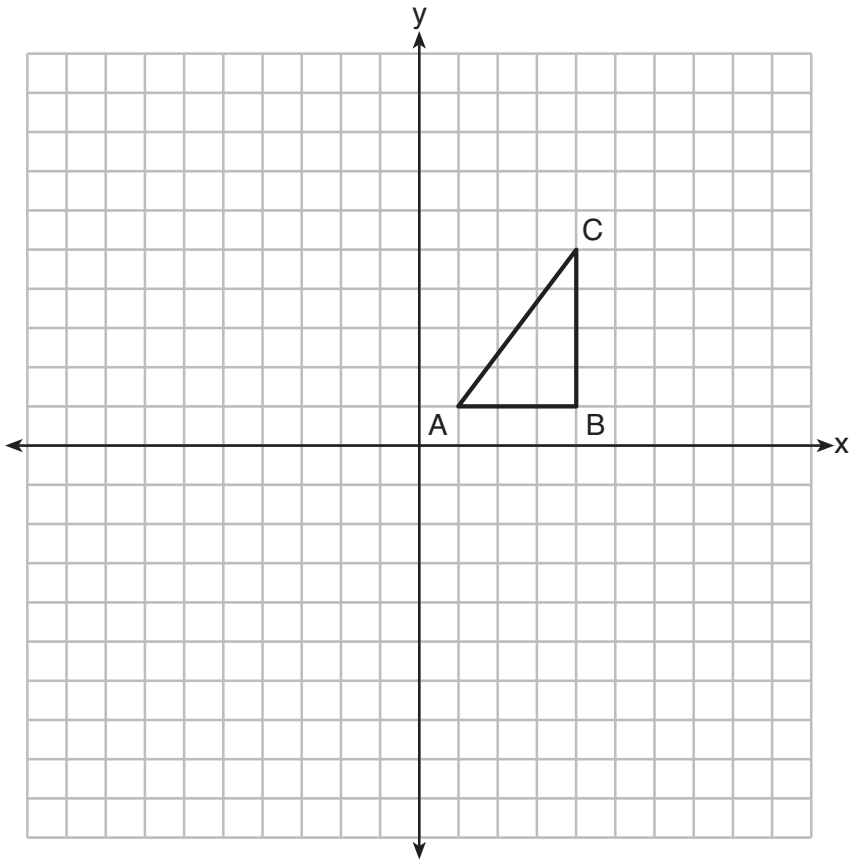
Part II

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 Lines AE and BD are tangent to circles O and P at A, E, B, and D, as shown in the diagram below. If $AC:CE = 5:3$, and $BD = 56$, determine and state the length of $\overline{CD}$.

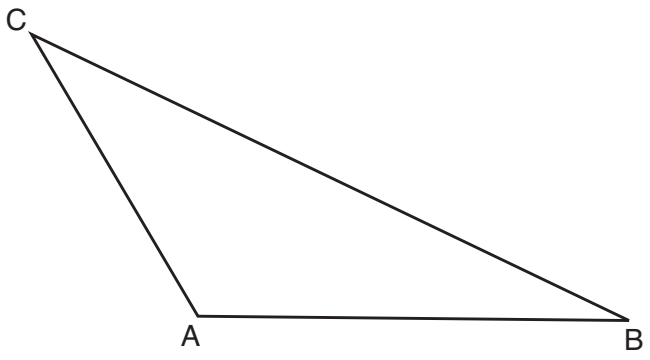


26 In the diagram below, $\triangle ABC$ has coordinates $A(1,1)$, $B(4,1)$, and $C(4,5)$. Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the translation five units to the right and two units up followed by the reflection over the line $y = 0$.

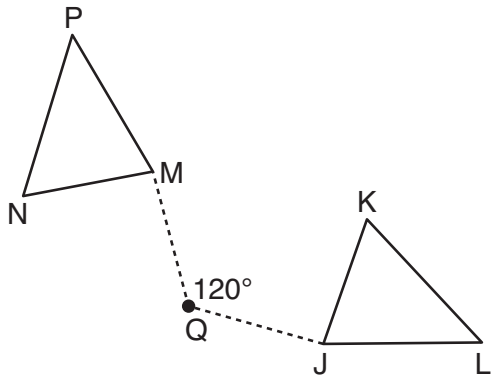


27 A regular hexagon is rotated in a counterclockwise direction about its center. Determine and state the minimum number of degrees in the rotation such that the hexagon will coincide with itself.

28 In the diagram of $\triangle ABC$ shown below, use a compass and straightedge to construct the median to $\overline{AB}$. [Leave all construction marks.]



29 Triangle *MNP* is the image of triangle *JKL* after a 120° counterclockwise rotation about point *Q*. If the measure of angle *L* is 47° and the measure of angle *N* is 57°, determine the measure of angle *M*. Explain how you arrived at your answer.



30 A circle has a center at (1,–2) and radius of 4. Does the point (3.4,1.2) lie on the circle? Justify your answer.

31 In the diagram below, a window of a house is 15 feet above the ground. A ladder is placed against the house with its base at an angle of 75° with the ground. Determine and state the length of the ladder to the *nearest tenth of a foot*.