# Examination January, 1979

## Tenth Year Mathematics

**PART ONE** *Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of $\pi$ or in radical form. Write your answers in the spaces provided.*

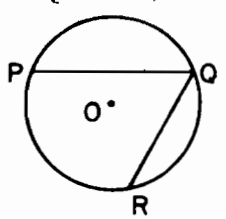
1. If one of the legs of a right triangle has length 5 and the hypotenuse has length 13, what is the length of the other leg? 1_____

2. In rhombus $ABCD$, $AB = 3x + 12$ and $BC = 5x$. What is the value of $x$? 2_____

3. The circumferences of two circles are $7\pi$ and $15\pi$, respectively. What is the ratio of the radius of the smaller circle to that of the larger circle? 3_____

4. In a right triangle, the measures of the acute angles are $x$ degrees and $5x$ degrees. Find $x$. 4_____

5. In the accompanying diagram, $\angle PQR$ is inscribed in circle $O$. If $m\overset{\frown}{PQ} = 130$ and $m\overset{\frown}{QR} = 90$, find $m\angle Q$.




5_____

6. Triangle $ABC$ has a right angle at $C$. If median $\overline{CD}$ is drawn and $AB = 10$, find $CD$. 6_____

7. An exterior angle at the base of an isosceles triangle measures 100°. How many degrees are there in the measure of the vertex angle of the triangle? 7_____

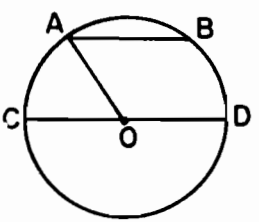
**8.** Find the number of degrees in the sum of the exterior angles of a quadrilateral. 8_____

**9.** The coordinates of two of the vertices of parallelogram $ABCD$ are $A(2,6)$ and $C(5,10)$. What is the length of diagonal $\overline{AC}$? 9_____

**10.** The area of an equilateral triangle is $\frac{25\sqrt{3}}{4}$. Find the length of a side of the triangle. 10_____

**11.** Find the slope of the line that passes through the points $(-1,4)$ and $(5,9)$. 11_____

**12.** In the accompanying diagram, chord $\overline{AB}$ is parallel to diameter $\overline{CD}$ and radius $\overline{OA}$ is drawn. If $\overset{\frown}{mAB} = 50$, find $m\angle AOC$.




12_____

**13.** The circumference of a circle is $18\pi$ centimeters. If the length of an arc of this circle is $3\pi$ centimeters, find the number of degrees in the measure of the arc. 13_____

**14.** In parallelogram $ABCD$, the bisectors of angles $A$ and $B$ intersect at $E$. Find $m\angle AEB$. 14_____

**15.** The lengths of the diagonals of a rhombus are 5 and 8. What is the area of the rhombus? 15_____

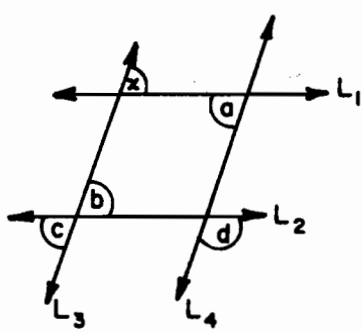
DIRECTIONS (16-29): *Write in the space provided the* numeral *preceding the expression that best completes* each *statement or answers* each *question.*

**16.** "If a student is in Homeroom 203, then she is a senior." If this statement is true, then which must be true?
(1) If a senior is not in Homeroom 203, she is not a senior.
(2) If a student is not a senior, she is not in Homeroom 203.
(3) Room 203 is the only senior homeroom.
(4) Room 202 is not a senior homeroom. 16_____

**17.** The locus of points equidistant from two distinct points $A$ and $B$ is
(1) one line (3) two lines
(2) one circle (4) two circles 17_____

**18.** Which set could represent the lengths of the sides of a triangle?
(1) {1,3,6} (3) {2,10,12}
(2) {2,4,7{ (4) {4,6,8} 18_____

**19.** In the accompanying diagram, if $L_1 \parallel L_2$ and $L_3 \parallel L_4$, then $\angle x$ is *not* always congruent to which angle?




(1) $\angle a$ (2) $\angle b$ (3) $\angle c$ (4) $\angle d$ 19_____

**20.** In triangle $ABC$, $m\angle A = 30$, $m\angle C = 90$, and $BC = 10$. What is the length of $\overline{AB}$?
(1) 20 (2) $10\sqrt{3}$ (3) 10 (4) 5 20_____

**21.** In triangle $ABC$, $CB > CA$, $D$ is a point on $\overline{AC}$, and $E$ is a point on $\overline{BC}$ such that $CE = CD$. Which statement is always true?

(1) $m\angle CDE > m\angle A$ (3) $EB > AD$
(2) $m\angle B = m\angle CED$ (4) $EB = AD$ 21_____

**22.** In a trapezoid, the length of the median is 14 and the length of one base is 10. The length of the other base is

(1) 18 (2) 12 (3) 6 (4) 4 22_____

**23.** What are the coordinates of the midpoint of the line segment which joins the points whose coordinates are $(4,-1)$ and $(0,2)$?

(1) $2,{}^1/_2)$ (3) $(2,-{}^3/_2)$
(2) $(2,-{}^1/_2)$ (4) $(-2,{}^3/_2)$ 23_____

**24.** If two triangles have equal bases and the altitudes drawn to these bases are equal, then the two triangles are *always*

(1) obtuse (3) congruent
(2) equal in area (4) similar 24_____

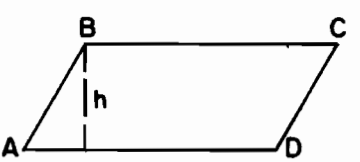
**25.** Which figures are *always* similar?

(1) two rectangles (3) two hexagons
(2) two parallelograms (4) two circles 25_____

**26.** The coordinates of point $A$ are $(3,0)$ and the coordinates of point $B$ are $(7,0)$. An equation of the locus of points equidistant from $A$ and $B$ is

(1) $x = 10$ (2) $y = 10$ (3) $x = 5$ (4) $y = 5$ 26_____

**27.** As shown in the accompanying diagram, $h$ is an altitude of parallelogram $ABCD$. Which equation can be used to find the length of $h$?

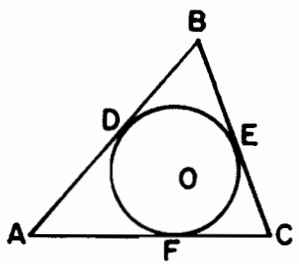



(1) $h = AB \cos A$ (3) $h = AD \tan A$
(2) $h = AB \sin A$ (4) $h = AD \cos A$ 27_____

**28.** In circle $O$, chords $\overline{AB}$ and $\overline{CD}$ intersect at $E$. If $AE = 2$, $EB = 8$, and $CE = 4$, then $ED$ equals

(1) 16 (2) 10 (3) 6 (4) 4 28_____

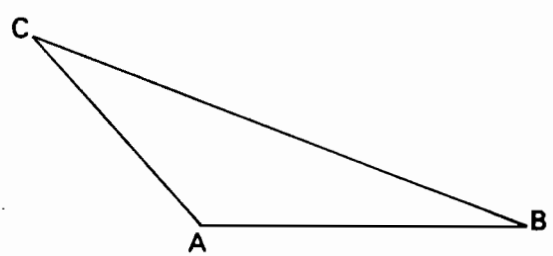
**29.** In the accompanying diagram, $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$ are tangent to circle $O$ at points $D$, $E$, and $F$, respectively. If $AB = 14$, $BE = 6$, and $EC = 5$, then what is the length of $\overline{AC}$?




(1) 12 (2) 13 (3) 17 (4) 25 29_____

DIRECTIONS (30): *Leave all construction lines on the answer sheet.*

**30.** *On the answer sheet,* find by construction the midpoint of $\overline{AB}$ and draw the median to side $\overline{AB}$ in given triangle $ABC$. 30_____




**PART TWO** *Answer four questions from this part. Show all work unless otherwise directed.*

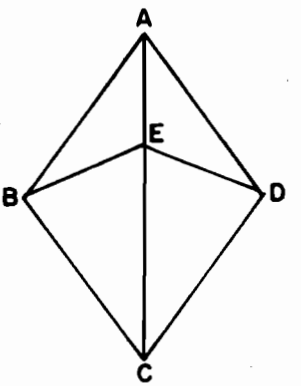
**31.** Prove either *a* or *b*, but *not* both.

*a* Two right triangles are congruent if the hypotenuse and a leg of one are congruent to the corresponding parts of the other. [10]

*OR*

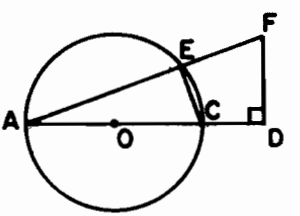
*b* The measure of an angle formed by two tangents is equal to one-half the difference of the measures of the intercepted arcs. [10]

**32.** Given: quadrilateral $ABCD$, diagonal $\overline{AEC}$, $\overline{BE} \cong \overline{ED}$, $\overline{BC} \cong \overline{CD}$.



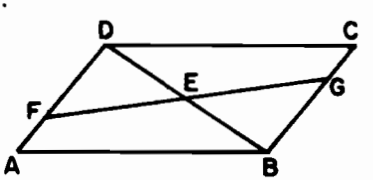

Prove: $\triangle AEB \cong \triangle AED$ [10]

**33.** In the accompanying diagram, diameter $\overline{AC}$ of circle $O$ is extended to point $D$, $\overline{DF} \perp \overline{AD}$, $\overline{AEF}$, where $E$ is a point on circle $O$ and $\overline{EC}$ are drawn.




Prove: $AF \times EC = AC \times FD$ [10]

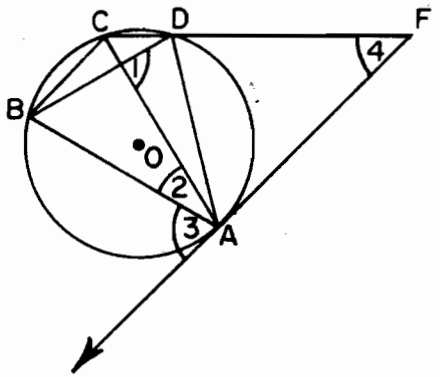
**34.** Given: parallelogram $ABCD$, $\overline{FEG}$, $\overline{AFD}$, $\overline{BGC}$, $E$ is the midpoint of diagonal $\overline{BD}$.



Prove: *a* $\triangle FED \cong \triangle GEB$ [6]

*b* area of $ABEF$ = area of $CDEG$ [4]

**35.** Given: quadrilateral $ABCD$ inscribed in circle $O$, diagonals $\overline{BD}$ and $\overline{CA}$, secant $\overline{FDC}$; tangent $\overrightarrow{FA}$; $m\overset{\frown}{BC}:m\overset{\frown}{CD}:m\overset{\frown}{DA}:m\overset{\frown}{AB} = 2:1:4:5$.




*a* Find $m\overset{\frown}{CD}$. [2]

*b* Find $m\angle 1$. [2]

*c* Find $m\angle 2$. [2]

*d* Find $m\angle 3$. [2]

*e* Find $m\angle 4$. [2]

**36.** Regular pentagon $ABCDE$ has a side of length 10. Find the length of an apothem of the pentagon to the *nearest integer*. [10]

**37.** The vertices of triangle $ABC$ are $A(2,1)$, $B(4,7)$, and $C(8,3)$.

*a* Using the methods of coordinate geometry, show that $\triangle ABC$ is isosceles and state a reason for your conclusion. [5]

*b* Find the area of $\triangle ABC$. [5]