10

TENTH YEAR MATHEMATICS

Wednesday, August 12, 1970 — 8:30 to 11:30 a.m., only

The last page of the booklet is the answer sheet, which is perforated. Fold the last page along the perforation and then, slowly and carefully, tear off the answer sheet. Now fill in the heading of your answer sheet. When you have finished the heading, you may begin the examination immediately.

Part I

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 π or in radical form. Write your answers in the spaces provided on the separate answer sheet.

1 Find the coordinates of the midpoint of the line segment joining the points whose coordinates are $(-3,5)$ and $(5,-9)$.

2 The measures of the angles of a quadrilateral are in the ratio $3:4:5:6$. Find the number of degrees in the measure of the largest angle of the quadrilateral.

3 The measure of each base angle of an isosceles triangle is $15°$ less than the measure of the vertex angle. Find the number of degrees in the measure of the vertex angle.

4 The area of a rhombus is 24. The length of one diagonal is 8. Find the length of the other diagonal.

5 If an altitude of an equilateral triangle is $5\sqrt{3}$, what is the length of a side?

6 The coordinates of the center of a circle are $(0,0)$. The circle passes through the point whose coordinates are $(-5,12)$. Find the length of the radius of this circle.

7 Two chords, $\overline{FG}$ and $\overline{HK}$, intersect inside a circle at point P. If $FP = 3$, $PG = 4$, and $KP = 6$, find PH.

8 In $\triangle ABC$, $m\angle B = 70$ and $m\angle C = 60$. If the bisectors of the angles of the triangle meet at point E, find $m\angle BEC$.

9 Two tangents drawn to a circle from a point intercept an arc which measures $80°$. Find, in degrees, the measure of the angle between the tangents.

10 In isosceles trapezoid $ABCD$, $m\angle C = 120$, and diagonal $\overline{BD}$ is perpendicular to leg $\overline{AD}$. Find $m\angle ABD$.

11 The radius of a circle is 6. Find the area of a sector of this circle if the central angle of the sector measures $100°$.

12 The diameter $\overline{DC}$ of circle O is extended through C to point P, and secant $\overline{PAB}$ is drawn. If $m\widehat{AB} = 100$ and $m\widehat{AC} = 30$, find $m\angle BPD$.

13 If the lengths of the sides of a right triangle are 8, 15, and 17, express in fractional form the sine of the smallest angle.

14 In the figure below, the nonparallel sides of trapezoid $ABCD$ are extended to intersect at point E.

If $AB = 8$, $DC = 4$, and $AD = 5$, find DE.

15 Find the number of degrees in the measure of an exterior angle of a regular pentagon.

16 Write an equation of the locus of points whose abscissas are 3 less than twice their ordinates.

Directions (17–28): For *each* statement or question, write on the separate answer sheet the *numeral* preceding the word or expression that, of those given, best completes the statement or answers the question.

17 The greatest number of diagonals of a hexagon that may be drawn from one vertex of the hexagon is
(1) 5   (3) 3
(2) 6   (4) 4

18 The ratio of the circumference of a circle to its diameter is
(1) 1   (3) π
(2) 2   (4) 2π

19 The central angle AOB in circle O measures 60°. If the radius of the circle is 8, the distance from the center of the circle to chord $\overline{AB}$ is
(1) 8   (3) $4\sqrt{3}$
(2) $4\sqrt{2}$ (4) 4

20 Which *must* be similar?
(1) two squares   (3) two triangles
(2) two rectangles   (4) two hexagons

21 Two parallel lines m and n are 4 inches apart. Point A lies on line m. The total number of points equidistant from m and n and 4 inches from A is
(1) 1   (3) 3
(2) 2   (4) 4

22 Chord $\overline{AB}$ in circle O subtends an arc of 110°. Tangents are drawn to the circle at points A and B, intersecting at P. Triangle APB is
(1) acute   (3) right
(2) scalene   (4) obtuse

23 In acute scalene triangle ABC, altitude $\overline{CD}$ is drawn to base $\overline{AB}$. The ratio of the area of triangle ACD to the area of triangle BCD is
(1) $AD:DB$ (3) $CA:BC$
(2) $BC:CA$ (4) $AD:BC$

24 If two sides of a triangle are 8 and 11, respectively, then the third side may be
(1) 20   (3) 3
(2) 2   (4) 16

25 Which statement about parallelograms is true?
(1) A circle can be circumscribed about any parallelogram.
(2) The bisectors of the opposite angles of any parallelogram are perpendicular to each other.
(3) The area of any parallelogram equals one-half the product of its diagonals.
(4) The opposite angles of any parallelogram are congruent.

26 Two parallel lines are cut by a transversal, as shown in the diagram below.
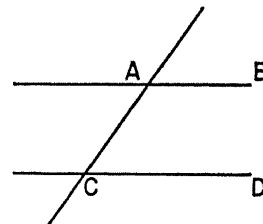
If m $\angle BAC = (a + 30)$, then m $\angle ACD$ expressed in terms of a is
(1) $a + 30$ (3) $150 - a$
(2) $a + 120$ (4) $60 - a$

27 Consider these statements:
(*A*) If a triangle is a right triangle, the square of the length of one of the sides is equal to the sum of the squares of the lengths of the other two sides.
(*B*) If the square of the length of one side of a triangle is equal to the sum of the squares of the lengths of the other two sides, the triangle is a right triangle.

Which is true?
(1) A is the converse of B.
(2) A is the same as B.
(3) A is the inverse of B.
(4) A is the converse of the inverse of B.

28 If, in triangle ABC, $AB > BC$, which relationship is *not* possible?
(1) $AC > AB$ (3) m $\angle C <$ m $\angle A$
(2) $AC = CB$ (4) m $\angle C =$ m $\angle B$

Directions (29–30): Leave all construction lines on the answer sheet.

29 *On the answer sheet*, given point P on circle O. Construct the tangent to circle O at point P.

30 *On the answer sheet*, construct rhombus $ABCD$ with C on $\overline{BE}$.

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Answers to the following questions are to be written on paper provided by the school.

Part II
Answer four questions from this part. Show all work unless otherwise directed.

31 Prove *either a* or *b* but *not* both: [10]

    a An angle formed by a tangent and a secant is measured by one-half the difference of the intercepted arcs.

<div align="center">OR</div>

   *b* The area of a trapezoid is equal to one-half the product of the altitude and the sum of the bases.

32 Given convex quadrilateral $ABCD$ with $\overline{AB} \cong \overline{AD}$ and $\overline{CB} \cong \overline{CD}$. Prove that the diagonals of the quadrilateral are perpendicular to each other. [10]

33 In a regular 18-sided polygon, the length of the apothem is 8.4. Find the

    a length of a side of the polygon to the *nearest integer* [8]

    b sum, in degrees, of the measures of the interior angles of the polygon [2]

34 Given: chords $\overline{AB}$ and $\overline{CD}$ intersecting at E so that $\overline{DE} \cong \overline{EB}$. Chord $\overline{AC}$ is drawn. [10]
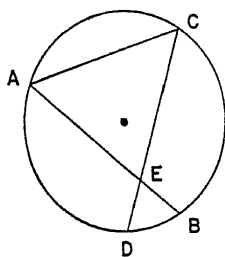
Prove: $\triangle ACE$ is isosceles

35 *a* Using graph paper draw the locus of points 5 units from the origin. [2]

    b Write an equation of this locus. [2]

    c Verify that the point C (—3,4) lies on this locus. [2]

    d Write the coordinates of the points at which the graph intersects the x-axis. [2]

    e Write an equation of a tangent to the locus at one of the points mentioned in part *d*. [2]

36 Given: triangle ABC with E a point on $\overline{BC}$. $\overline{ADE}$ and $\overline{DC}$ are drawn.
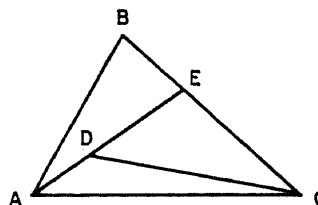
    Prove: $m\angle ADC > m\angle B$ [10]

*37 The coordinates of the vertices of triangle ABC are A (—3,—1), B (7,4), and C (2,—6).

    a Show by means of coordinate geometry that $\triangle ABC$ is isosceles. State a reason for your conclusion. [4]

    b Find the coordinates of the midpoint of side $\overline{AC}$. [2]

    c Find the slope of $\overleftrightarrow{AC}$. [2]

    d The slope of the altitude of $\triangle ABC$ from B to $\overline{AC}$ is [2]

        (1) 1   (3) ½

        (2) 2   (4) —1

    * This question is based on optional topics in the syllabus.

[4]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Wednesday, August 12, 1970 — 8:30 to 11:30 a.m., only

ANSWER SHEET

Pupil...Teacher...

School...

Name and author of textbook used...

Your answers to Part I should be recorded on this answer sheet.

Part I
Answer all questions in this part.

1..   9.............................   17.............................

2..   10.............................   18.............................

3..   11.............................   19.............................

4..   12.............................   20.............................

5..   13.............................   21.............................

6..   14.............................   22.............................

7..   15.............................   23.............................

8..   16.............................   24.............................

Questions 25 through 30 should be answered on the back of this page.

25. . . . .

26. . . . .

27. . . . .
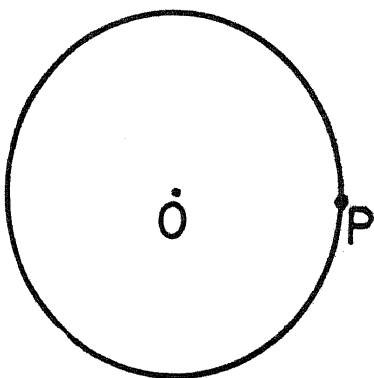
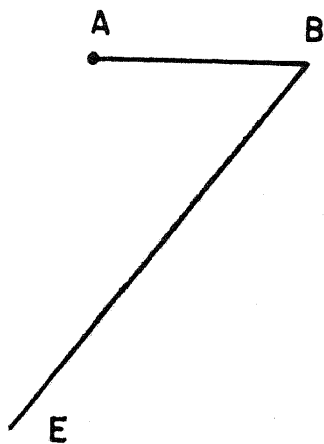28. . . . .

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FOR TEACHERS ONLY

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SCORING KEY

TENTH YEAR MATHEMATICS

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Use only *red* ink or pencil in rating Regents papers. Do not attempt to *correct* the pupil's work by making insertions or changes of any kind. Use checkmarks to indicate pupil errors.

Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Part I

Allow 2 credits for each correct answer; allow no partial credit. For questions 17–28, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3, or 4.

(1)	$(1,-2)$	(15)	72
(2)	120	(16)	$x = 2y - 3$
(3)	70	(17)	3
(4)	6	(18)	3
(5)	10	(19)	3
(6)	13	(20)	1
(7)	2	(21)	2
(8)	115	(22)	1
(9)	100	(23)	1
(10)	30	(24)	4
(11)	10π	(25)	4
(12)	10	(26)	3
(13)	$\frac{8}{17}$	(27)	1
(14)	5	(28)	3

[OVER]

Part II

Please refer to the Department's pamphlet *Suggestions on the Rating of Regents Examination Papers in Mathematics*. Care should be exercised in making deductions as to whether the error is purely a mechanical one or due to a violation of some principle. A mechanical error generally should receive a deduction of 10 percent, while an error due to a violation of some cardinal principle should receive a deduction ranging from 30 percent to 50 percent, depending on the relative importance of the principle in the solution of the problem.

(33) *a* 3   [8]
     b 2,880   [2]

(37) *b* $(-\frac{1}{2}, -\frac{7}{2})$ [2]
     c -1 [2]
     d 1   [2]

(35) *b* $x^2 + y^2 = 25$ [2]
     d (5,0) and (—5,0)   [2]
     e $x = 5$ or $x = -5$ [2]

DO YOU KNOW ...

    . . . that most questions used on Regents examinations have been tried out in advance in representative classrooms throughout the State?

    Each year more than 40,000 pupils in about 300 schools "pretest" questions intended for use in future Regents examinations. When committees of classroom teachers meet to assemble Regents examinations, the information obtained from this pretesting is to aid them in determining which questions are appropriate, which questions need revision, and which questions should be eliminated.