The last page of the booklet is the answer sheet. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

On page 5 you will find the "Tables of Natural Trigonometric Functions" which you may need to answer some questions in this examination. Fold this page along the perforations, and tear it off also slowly and carefully.

When you have completed the examination, you must sign the statement printed at the end of the answer paper, 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 paper cannot be accepted if you fail to sign this declaration.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN
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 \( \pi \) or in radical form. Write your answers in the spaces provided on the separate answer sheet.

1 In the accompanying diagram, \( ABCDE \) is a regular pentagon and diagonals \( CE \) and \( CA \) are drawn. If \( CE = 6 \), what is the length of \( CA \)?

2 In \( \triangle ABC \), \( D \) is the midpoint of \( \overline{AB} \), \( E \) is the midpoint of \( \overline{BC} \), and \( \overline{DE} \) is drawn. If \( \angle A = 75 \), find \( \angle BDE \).

3 In \( \triangle RST \), \( m\angle T = 60 \) and \( m\angle S > m\angle R \). Which is the longest side of the triangle?

4 In \( \triangle ABC \), \( \overline{AB} = \overline{AC} \) and \( m\angle A = 70 \). Find the number of degrees in the measure of an exterior angle at \( C \).

5 The lengths of the diagonals of a rhombus are 10 and 15. Find the area of the rhombus.

6 In the accompanying diagram, \( \overline{CD} \) is parallel to \( \overline{AB} \), \( CA = 4 \), \( DB = 5 \), and \( EC = 8 \). Find \( ED \).

7 In the accompanying figure, \( \overrightarrow{BD} \) bisects \( \angle ABC \). If \( m\angle A = 44 \) and \( m\angle C = 34 \), find \( m\angle DBC \).

8 The length of a side of an equilateral triangle is 8. What is the length, in radical form, of an altitude of the triangle?

9 The length of a side of a square is 4. What is the length, in radical form, of a diagonal of the square?

10 In the accompanying diagram, \( \triangle ABC \) is a right triangle with \( \angle ACB = 90 \), \( \overline{AD} \), and \( \overline{CD} \perp \overline{AB} \). If \( AB = 8 \) and \( AD = 2 \), find the length of \( \overline{AC} \).

11 Find the distance from point \( A(3, -1) \) to point \( B(9, 7) \).

12 The area of a sector of a circle is 8 square inches and the measure of the central angle of the sector is 90\(^\circ\). Find the number of square inches in the area of the circle.

13 Quadrilateral \( ABCD \) is inscribed in a circle. If \( m\overline{AB} = 70 \), \( m\overline{BC} = 100 \), and \( m\overline{CD} = 130 \), find \( m\angle ABC \).

14 The length of a side of a triangle is 12 and the length of the altitude drawn to that side is 11. Find the area of the triangle.

15 In the accompanying diagram, diameter \( \overline{CE} \) of circle \( O \) is perpendicular to chord \( \overline{AB} \) at \( D \). If \( AB = 8 \) and \( OD = 3 \), find \( OA \).

16 A line which passes through the points \( (5, 3) \) and \( (x, 6) \) has a slope of 1. What is the value of \( x \)?

17 In \( \triangle \) \( AB = \)

18 Which

diagon.

A

B

C

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(2) \( A \ a \)

19 In the

\( \overline{CD} \) an

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20 If the \( l \)

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(1) 7

(2) 2

21 The ex

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(1) 1

(2) 2

22 Two ta:

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(1) 90\(^\circ\)

(2) 110\(^\circ\)

23 Which

(1) To

isos

(2) To 1

(3) To

(4) To

not

Math. 10–June
17 In triangle $ABC$, $m\angle C = 90$, $m\angle A = 30$, and $AB = 4$. Find $BC$.

**Directions** (18–29): Write in the space provided on the separate answer sheet the numeral preceding the expression that best completes each statement or answers each question.

18 Which of the following must be true about the diagonals of a rectangle?

A The diagonals are perpendicular.
B The diagonals have the same length.
C The diagonals bisect each other.

(1) A, only  
(2) A and C, only  
(3) B and C, only  
(4) A, B, and C

19 In the accompanying diagram, parallel lines $\overline{AB}$ and $\overline{CD}$ are intersected by transversal $\overline{EF}$ at $G$ and $H$, respectively. If $m\angle BGE = 70^\circ$, then what is $m\angle CHG$?

E
A
G
B
C
H
D
F

(1) 35  
(2) 70  
(3) 90  
(4) 110

20 If the lengths of two sides of a triangle are 7 and 10, the length of the third side may be

(1) 7  
(2) 2  
(3) 3  
(4) 17

21 The exact number of points equidistant from the $x$- and $y$-axes and also two inches from the origin is

(1) 1  
(2) 2  
(3) 3  
(4) 4

22 Two tangents are drawn to a circle from an exterior point. If the measure of the angle formed by the two tangents is $40^\circ$, then the measure of the minor intercepted arc is

(1) $20^\circ$  
(2) $110^\circ$  
(3) $140^\circ$  
(4) $220^\circ$

23 Which is not a good example of indirect reasoning?

(1) To prove a triangle is scalene, prove it is not isosceles and not equilateral.
(2) To prove an angle is acute, prove it is not obtuse.
(3) To prove two lines in a plane intersect, prove they are not parallel.
(4) To prove $AB$ is greater than $BC$, prove $AB$ is not less than $BC$ and $AB$ is not equal to $BC$.

24 In the accompanying figure, $\overline{AB} \cong \overline{AD}$ and $\overline{BC} \cong \overline{CD}$. Which statement must be true?

A $\overline{BD} \perp \overline{AC}$
B $\overline{BD} = \overline{AC}$
C $ABCD$ is a parallelogram.
D $\angle BAD \cong \angle BCD$

25 If two circles have exactly three common tangents, then the circles

(1) are internally tangent
(2) are externally tangent
(3) intersect in two distinct points
(4) are nonintersecting

26 An isosceles trapezoid has two base angles whose measures are each 45 degrees. If the bases are 8 and 12, respectively, then the length of an altitude of the trapezoid must be

(1) 6  
(2) 2  
(3) 10  
(4) 4

27 What is a converse of the statement, “If the altitude is drawn to the base of an isosceles triangle, then it bisects the base”?

(1) If a triangle is isosceles, then the altitude does not bisect the base.
(2) If a triangle is not isosceles, then the altitude does not bisect the base.
(3) If the altitude bisects the base of a triangle, then the triangle is isosceles.
(4) The altitude bisects the base of an isosceles triangle.

28 In the accompanying diagram, $\overline{BD}$ is an altitude of $\triangle ABC$, $m\angle A = 36$, $AB = 6$, and $AC = 8$. What is the length of $\overline{BD}$ to the nearest tenth?

A $3.5$  
B $4.7$  
C $4.9$  
D $6.5$

(Math. 10–June '88)
29. If the area of a square is 64, then the length of its apothem is

(1) 32  (3) 8
(2) 16  (4) 4

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

30. On the answer sheet, locate by construction a point on \( \overline{DC} \) that is equidistant from points \( A \) and \( B \).

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:

\( a \) The square of the length of the hypotenuse of a right triangle is equal to the sum of the squares of the lengths of the legs. \[10\]

\( OR \)

\( b \) If three angles of one triangle are congruent to the three angles of another triangle, the triangles are similar. \[10\]

32. Given: \( \triangle ABC \) with \( \overline{AB} \cong \overline{AC} \), \( \overline{BDC} \), \( \overline{AED} \), and \( m\angle 1 = m\angle 2 \).

Prove: \( \triangle BDE \cong \triangle CDE \) \[10\]

33. In the accompanying diagram, \( ABCD \) is a parallelogram, and diagonals \( \overline{AC} \) and \( \overline{DB} \) intersect at \( E \). The midpoints of \( \overline{AE} \), \( \overline{BE} \), \( \overline{CE} \), and \( \overline{DE} \) are \( S \), \( P \), \( Q \), and \( R \), respectively.

Prove: \( PQRS \) is a parallelogram. \[10\]

34. Given: \( \overline{AD} \) and \( \overline{BC} \) intersect at point \( E \), \( \overline{AB} \parallel \overline{CD} \).

Prove: \( AB \times DE = DC \times AE \) \[10\]

35. In the accompanying diagram, \( EOF \) is a diameter of circle \( O \), \( \overline{CD} \) is tangent to the circle at \( C \), \( \overline{CD} \parallel \overline{EF} \), and \( m\overline{FG} = 40 \). Chords \( \overline{CG} \) and \( \overline{EF} \) intersect at \( M \), and \( \overline{FG} \) is drawn.

\( a \) Find \( m\angle FGC \). \[2\]

\( b \) Find \( m\overline{CF} \). \[2\]

\( c \) Find \( m\angle DCG \). \[3\]

\( d \) Find \( m\angle EMG \). \[3\]

36. The vertices of parallelogram \( ABCD \) are \( A(4,6) \), \( B(3,-7) \), \( C(6,-8) \), and \( D(r,t) \).

\( a \) Find the coordinates of the midpoint of \( \overline{AC} \). \[2\]

\( b \) Find the coordinates of the midpoint of \( \overline{BD} \) in terms of \( r \) and \( t \). \[4\]

\( c \) Find the numerical value of \( r \). \[2\]

\( d \) Find the numerical value of \( t \). \[2\]

37. The vertices of triangle \( ABC \) are \( A(-4,4) \), \( B(6,4) \), and \( C(5,1) \).

\( a \) Using graph paper, draw \( \triangle ABC \). \[1\]

\( b \) Using methods of coordinate geometry, show that triangle \( ABC \) is a right triangle, and state a reason for your conclusion. \[5\]

\( c \) Using methods of coordinate geometry, show that the median to the hypotenuse equals one-half the hypotenuse. \[4\]
# Tables of Natural Trigonometric Functions

(For use with 9th and 10th Year Mathematics Regents Examinations)

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

Part 1
Answer all questions in this part.

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Answer question 30 on the other side of this sheet.
Your answers for Part II should be placed on paper provided by the school.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination, and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature
**FOR TEACHERS ONLY**

**SCORING KEY**

**TENTH YEAR MATHEMATICS**

Friday, June 23, 1978 — 1:15 to 4:15 p.m., only

Use only red ink or red 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.

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### Part I

Allow 2 credits for each correct answer; allow no partial credit. For questions 18–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

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<tbody>
<tr>
<td>(1) 6</td>
<td>(11) 10</td>
<td>(21) 4</td>
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<tr>
<td>(2) 75</td>
<td>(12) 32</td>
<td>(22) 3</td>
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<tr>
<td>(3) TR or s</td>
<td>(13) 95</td>
<td>(23) 2</td>
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<tr>
<td>(4) 125</td>
<td>(14) 66</td>
<td>(24) 1</td>
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<tr>
<td>(5) 75</td>
<td>(15) 5</td>
<td>(25) 2</td>
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<tr>
<td>(6) 10</td>
<td>(16) 8</td>
<td>(26) 2</td>
</tr>
<tr>
<td>(7) 51</td>
<td>(17) 2</td>
<td>(27) 3</td>
</tr>
<tr>
<td>(8) $4\sqrt{3}$ or $\sqrt{48}$</td>
<td>(18) 3</td>
<td>(28) 1</td>
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<tr>
<td>(9) $4\sqrt{2}$ or $\sqrt{32}$</td>
<td>(19) 4</td>
<td>(29) 4</td>
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<tr>
<td>(10) 4</td>
<td>(20) 1</td>
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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.

\[(35) \ a \quad 70 \quad [2] \quad \quad (36) \ a \quad (5,-1) \quad or \quad x = 5, \ y = -1 \quad [2] \]
\[b \quad 90 \quad [2] \quad \quad b \left( \frac{3 + r}{2}, \frac{-7 + t}{2} \right) \]
\[c \quad 65 \quad [3] \quad \quad \text{or} \quad x = \frac{3 + r}{2}, \ y = \frac{-7 + t}{2} \quad [4] \]
\[d \quad 115 \quad [3] \]

\[c \quad 7 \quad [2] \]
\[d \quad 5 \quad [2] \]