The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, January 28, 1992 — 9:15 a.m. to 12:15 p.m., only

Notice . . .

If your school allows the use of calculators for this examination, they may be used for checking purposes, **only**. In Parts II and III, all work, including calculations, must be shown on your answer paper.

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 9 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.

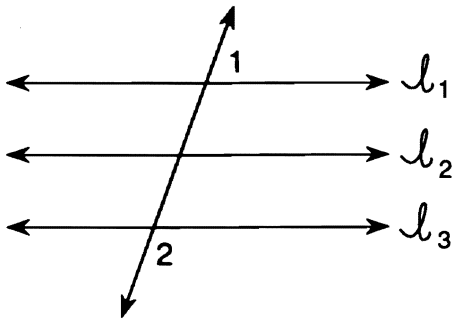
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during 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 30 questions from this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in radical form. [60]

1 In the accompanying diagram, $\ell_1 \parallel \ell_2 \parallel \ell_3$. If $m\angle 1 = 70$, find $m\angle 2$.

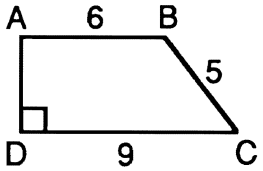


2 The sides of a triangle measure 4, 6, and 7. If the *shortest* side of a similar triangle is 12, what is the perimeter of the larger triangle?

3 In $\triangle RST$, an exterior angle at vertex S measures 100°. If $m\angle R = 30$, which is the longest side of the triangle?

4 The point $R(-2,5)$ is reflected in the x-axis. In which quadrant does the image of point R lie?

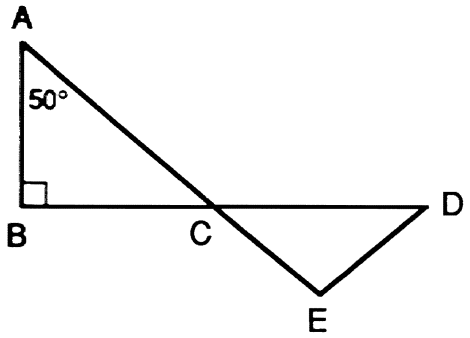
5 In the accompanying diagram of trapezoid $ABCD$, $\overline{AD} \perp \overline{DC}$, $AB = 6$, $DC = 9$, and $CB = 5$. Find AD.



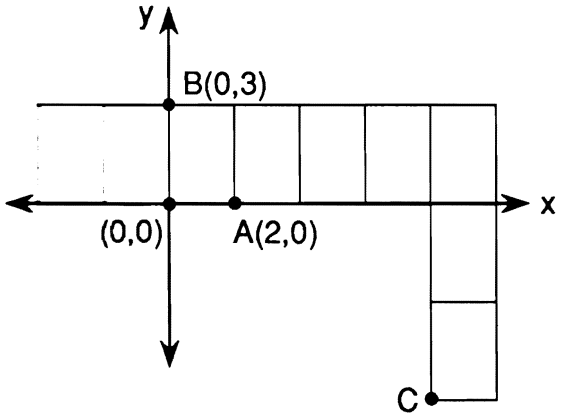
6 In right triangle ABC, $\overline{CD}$ is the altitude drawn to hypotenuse $\overline{AB}$. If $AD = 6$ and $DB = 24$, find CD.

7 Factor completely: $2a^2 + 2a - 84$

8 In the accompanying diagram, $\overline{BCD}$, $\overline{ACE}$, $\overline{AB} \perp \overline{BCD}$, and $\overline{CE} \cong \overline{ED}$. If $m\angle A = 50$, find the measure of $\angle E$.



9 The accompanying diagram contains congruent rectangles that measure 2 units by 3 units. If the coordinates of A are (2,0) and the coordinates of B are (0,3), find the coordinates of C.



10 Find the length of a leg of an isosceles right triangle whose hypotenuse has a length of $8\sqrt{2}$.

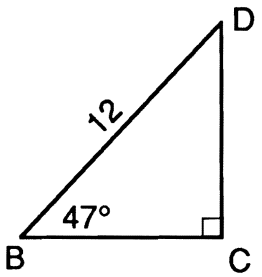
11 In a plane, point P lies on line ℓ. What is the total number of points in the plane 3 centimeters from P and 2 centimeters from ℓ?

12 In $\triangle RST$, $\overline{RS} \cong \overline{ST}$. If $m\angle R = 2x - 10$ and $m\angle S = x$, find the value of x.

13 Solve for x: $\frac{5}{x} = \frac{3}{x} - 2$

14 The vertices of parallelogram $ABCD$ are $A(2,4)$, $B(0,0)$, $C(6,2)$, and $D(8,6)$. Find the coordinates of the intersection of the diagonals.

15 In right triangle BCD, $BD = 12$, $m\angle C = 90$, and $m\angle DBC = 47$. Find DC to the *nearest tenth*.



Directions (16–35): For *each* question chosen, write on the separate answer sheet the *numeral* preceding the word or expression that best completes the statement or answers the question.

16 If ⊠ is a binary operation defined by $a \boxtimes b = \sqrt{ab}$, what is the value of $8 \boxtimes 2$?
(1) 10 (3) −4
(2) 8 (4) 4

17 An equation of the line that passes through the point (0,−1) and whose slope is 2 is
(1) $y = 2x - 1$ (3) $y = -x + 2$
(2) $y = 2x + 2$ (4) $y = -2x - 1$

18 If two cards are drawn at random from a standard deck of cards without replacement, which expression represents the probability of drawing two aces?
(1) $\frac{4}{52} \cdot \frac{4}{52}$ (3) $\frac{4}{52} \cdot \frac{3}{51}$
(2) $\frac{4}{52} \cdot \frac{4}{51}$ (4) $\frac{4}{52} \cdot \frac{3}{52}$

19 Two sides of a triangle are 2 and 3. The third side can *not* be
(1) 1 (3) 3
(2) 2 (4) 4

20 If $\tan A = \frac{1}{2}$, what is the measure of $\angle A$ to the *nearest degree*?
(1) 79° (3) 30°
(2) 60° (4) 27°

21 Given: $p \rightarrow q$
$\sim q$
Which is a logical conclusion?
(1) p (3) q
(2) $\sim p$ (4) $\sim p \wedge q$

22 In $\triangle DEF$, X is a point on $\overline{EF}$ and Y is a point on $\overline{DF}$ so that $\overline{XY} \parallel \overline{DE}$. If $XF = 10$, $YF = 6$, and $EF = 13$, what is DY?
(1) 1.8 (3) 14.8
(2) 11.2 (4) 18

23 Which is an equation of the circle whose center is (5,−2) and whose radius is 7?
(1) $(x + 5)^2 + (y - 2)^2 = 49$
(2) $(x + 5)^2 + (y - 2)^2 = 7$
(3) $(x - 5)^2 + (y + 2)^2 = 49$
(4) $(x - 5)^2 + (y + 2)^2 = 7$

24 Which is the negation of "It rains or it shines"?
(1) It rains and it shines.
(2) It rains or it does not shine.
(3) It does not rain or it does not shine.
(4) It does not rain and it does not shine.

25 Which is the axis of symmetry of the graph of the equation $y = -x^2 - 2x - 1$?
(1) $x = -1$ (3) $x = 1$
(2) $y = -1$ (4) $y = 1$

26 Which statement is *always* true?
(1) Rhombuses are squares.
(2) Parallelograms are rectangles.
(3) Rectangles are squares.
(4) Squares are rectangles.

27 Which is an equation of a line parallel to the line whose equation is $3y = 2x + 3$?
(1) $3y = -2x + 1$ (3) $y = \frac{3}{2}x - 3$
(2) $y = \frac{2}{3}x + 3$ (4) $2y = 3x + 3$

28 What are the roots of the equation $x^2 - 9x + 5 = 0$?

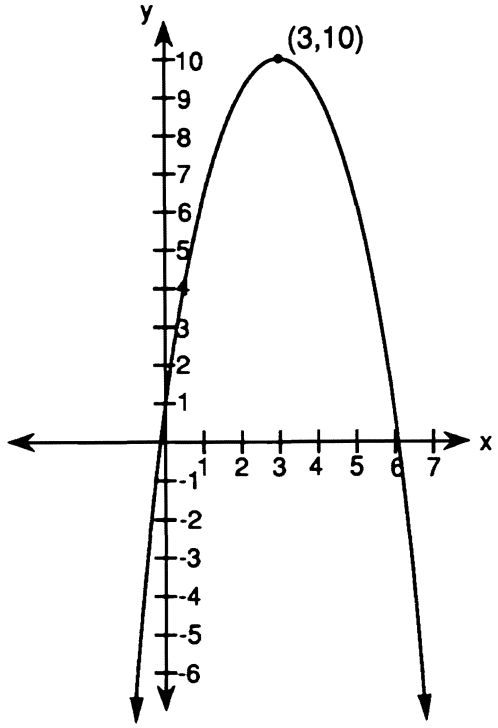
(1) $x = \frac{9 \pm \sqrt{61}}{2}$ (3) $x = \frac{-9 \pm \sqrt{101}}{2}$

(2) $x = \frac{9 \pm \sqrt{101}}{2}$ (4) $x = \frac{-9 \pm \sqrt{61}}{2}$

29 How many different five-letter arrangements can be made from the letters in the name "EULER"?

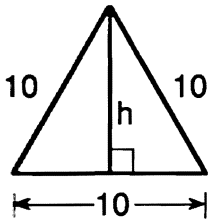
(1) 10 (3) 60
(2) 30 (4) 120

30 Which equation defines the graph in the diagram below?



(1) $y = x^2 + 6x + 1$
(2) $y = -x^2 + 6x + 1$
(3) $y = x^2 + 3x$
(4) $y = -x^2 + 3x - 1$

31 In the accompanying diagram, the length of each side of the equilateral triangle is 10.



What is the length of altitude h?

(1) 5 (3) $5\sqrt{3}$
(2) $5\sqrt{2}$ (4) $10\sqrt{3}$

32 If $\frac{y - b}{x - a} = m$, then x is equal to

(1) $\frac{y - b - am}{m}$ (3) $\frac{y - b + a}{m}$

(2) $\frac{y - b - am}{m}$ (4) $y - b + am$

33 What is the total number of points that the graphs of $x^2 + y^2 = 16$ and $y = x$ have in common?

(1) 1 (3) 0
(2) 2 (4) 4

34 If $x \neq 2$, then $\frac{x^2 - 4}{2x - 4}$, in simplest form, is equivalent to

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

(2) $\frac{x}{2}$ (4) $\frac{x + 2}{2}$

35 The value of ${}_5C_5$ is

(1) 15 (3) 84
(2) 54 (4) 504

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

Part II

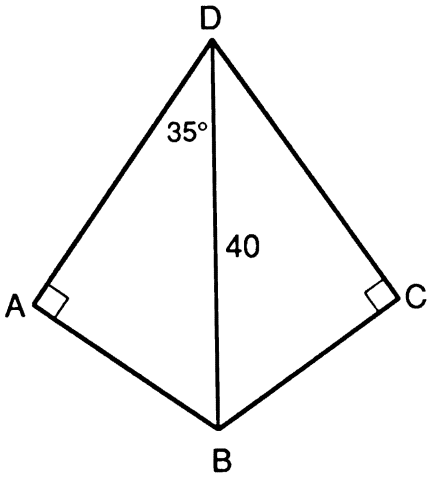
Answer three questions from this part. All work, including calculations, must be shown on your answer paper. [30]

36 *a* Solve the following system of equations and check:

$$y = 6 - x$$
$$y = x^2 - 6x + 6$$ [8]

b Add: $\frac{4}{a} + \frac{a}{4}, a \neq 0$ [2]

37 Quadilaterial $ABCD$ is a kite with $\overline{AB} \cong \overline{BC}$, $\overline{AD} \cong \overline{CD}$, $\overline{AD} \perp \overline{AB}$, $\overline{DC} \perp \overline{BC}$, $DB = 40$, and $m\angle ADB = 35$.

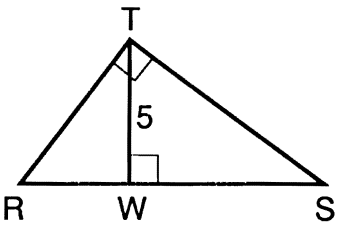


a Find the length of $\overline{AB}$ to the *nearest integer*. [4]

b Find AD to the *nearest integer*. [4]

c Using the answers from parts *a* and *b*, find the area of quadrilateral $ABCD$. [2]

38 In the accompanying diagram of right triangle RST, $\overline{TW}$ is the altitude to hypotenuse $\overline{RS}$, $TW = 5$, and WS is 2 more than RW.



a Find the value of RW. [*Answer may be left in radical form.*] [8]

b Between which two consecutive integers does the value of RW lie? [2]

39 Triangle ABC has coordinates $A(1,2)$, $B(0,5)$, and $C(5,4)$.

a On graph paper, draw and label $\triangle ABC$. [1]

b Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after the translation which maps (x,y) to $(x - 6, y + 3)$. [3]

c Graph and state the coordinates of $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after a reflection in the x-axis. [3]

d Graph and state the coordinates of $\triangle A'''B'''C'''$, the image of $\triangle A''B''C''$ after a reflection in the origin. [3]

40 The vertices of quadrilateral $ABCD$ are $A(3,0)$, $B(4,3)$, $C(7,3)$, and $D(6,0)$.

a Prove, by means of coordinate geometry, that quadrilateral $ABCD$ is a parallelogram. [6]

b Prove that $ABCD$ is *not* a rhombus. [4]

☞ GO RIGHT ON TO THE NEXT PAGE.

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

Part III

Answer one question from this part. All work, including calculations, must be shown on your answer paper. [10]

41 Given: If Sandy takes logic, then he will take psychology.
If Sandy takes psychology and music, then he will not take French.
Sandy takes music.
Sandy takes French.

Let L represent: "Sandy takes logic."
Let P represent: "Sandy takes psychology."
Let M represent: "Sandy takes music."
Let F represent: "Sandy takes French."

Prove: Sandy does not take logic. [10]

42 Prove: In an isosceles triangle, the median to the base bisects the vertex angle. [10]

FOR TEACHERS ONLY

SCORING KEY

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, January 28, 1992 — 9:15 a.m. to 12:15 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.

Part I

Allow a total of 60 credits, 2 credits for each of 30 of the following. [If more than 30 are answered, only the first 30 answered should be considered.] Allow no partial credit. For questions 16–35, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 110

(2) 51

(3) $\overline{RT}$

(4) III

(5) 4

(6) 12

(7) $2(a + 7)(a - 6)$

(8) 100°

(9) (8,–6)

(10) 8

(11) 4

(12) 40

(13) –1

(14) (4,3)

(15) 8.8

(16) 4

(17) 1

(18) 3

(19) 1

(20) 4

(21) 2

(22) 1

(23) 3

(24) 4

(25) 1

(26) 4

(27) 2

(28) 1

(29) 3

(30) 2

(31) 3

(32) 2

(33) 2

(34) 4

(35) 3

[OVER]

Part II

Please refer to the Department's pamphlet *Guide for Rating Regents Examinations 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.

(36) *a* (0,6) and (5,1) [8]

b $\frac{16 + a^2}{4a}$ [2]

(37) *a* 23 [4]

b 33 [4]

c 759 [2]

(38) *a* $-1 + \sqrt{26}$ [8]

b 4 and 5 [2]

(39) *b* $A'(-5,5)$, $B'(-6,8)$, $C'(-1,7)$ [3]

c $A''(-5,-5)$, $B''(-6,-8)$, $C''(-1,-7)$ [3]

d $A'''(5,5)$, $B'''(6,8)$, $C'''(1,7)$ [3]

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