The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Thursday, August 13, 1992 — 8:30 to 11:30 a.m., only

Notice . . .

Calculators must be available to all students taking this examination.

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 The sides of a quadrilateral are 5, 6, 7, and 8. If the shortest side of a similar quadrilateral is 15, find the longest side of this quadrilateral.

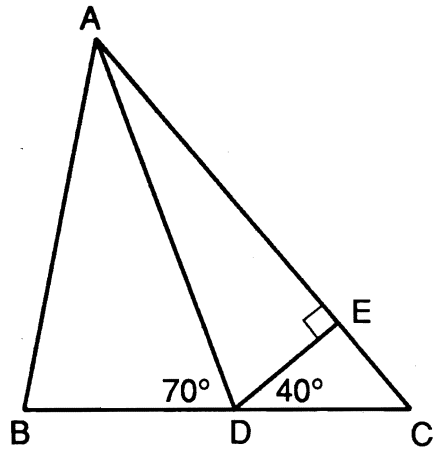
2 If ☺ is a binary operation defined by $s \text{ ☺ } t = \frac{2(s + t)}{3}$, find the value of 5 ☺ 4.

3 If point A is 6 meters due east of point C and point B is 8 meters due north of point C, find the distance, in meters, between A and B.

4 What is the image of (4,–3) after a reflection in the x-axis?

5 The sides of a triangle are 10, 11, and 13. Find the perimeter of the triangle that is formed by connecting the midpoints of the sides of the triangle.

6 In the accompanying diagram of $\triangle ABC$, $\overline{BDC}$, $\overline{DE} \perp \overline{AEC}$, $m\angle BDA = 70$, and $m\angle EDC = 40$. What is $m\angle DAC$?



7 In right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. If $AD = 4$ and $DB = 16$, find CD.

8 An exterior angle at the vertex of an isosceles triangle measures 150°. Find the measure, in degrees, of a base angle of the triangle.

9 Find the midpoint of the line segment connecting (1,1) and (3,–3).

10 From a group of eight people, how many different five-member committees can be randomly selected?

11 The measures of two consecutive angles of a parallelogram are in the ratio 3:7. Find the measure of an acute angle of the parallelogram.

12 If $\tan A = 1.3000$, find $m\angle A$ to the *nearest degree*.

13 The measure of the supplement of $\angle R$ is 60° more than twice the measure of $\angle R$. Find $m\angle R$.

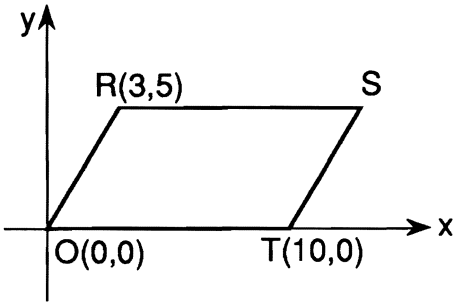
14 What is the length of the line segment whose endpoints are (–1,–2) and (4,10)?

15 An angle is picked at random. What is the probability that the cosine of that angle is greater than 1?

16 Find the positive root of the equation $\frac{4}{x - 1} = \frac{x + 1}{12}$.

Directions (17–34): 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.

17 In the accompanying diagram of parallelogram $ORST$, the coordinates of vertices O, R, and T are (0,0), (3,5), and (10,0), respectively.



What are the coordinates of vertex S?

(1) (7,5)
(2) (10,5)
(3) (13,5)
(4) (13,0)

18 Which statement can *not* be true?

(1) $p \wedge \sim p$
(2) $p \vee \sim p$
(3) $\sim(p \rightarrow q)$
(4) $\sim(\sim p)$

19 In which quadrilateral are the diagonals always perpendicular?

(1) trapezoid
(2) square
(3) parallelogram
(4) rectangle

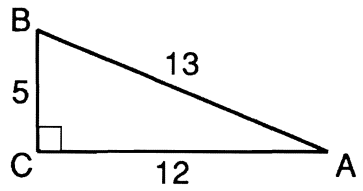
20 In a plane, what is the locus of points 8 centimeters from a given line?

(1) a line
(2) a circle
(3) two intersecting lines
(4) two parallel lines

21 If two angles of a triangle measure 43° and 48°, the triangle is

(1) acute
(2) obtuse
(3) isosceles
(4) right

22 In the accompanying diagram of right triangle ABC, $AC = 12$, $AB = 13$, and $BC = 5$.



What is the value of $\sin A - \cos A$?

(1) $\frac{7}{13}$
(2) $-\frac{7}{13}$
(3) $\frac{17}{13}$
(4) $-\frac{17}{13}$

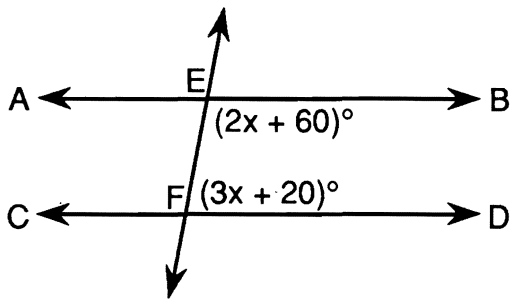
23 Given points $A(-4,-2)$, $B(16,8)$, and $C(8,4)$, which statement is true?

(1) A, B, and C are vertices of a triangle.
(2) $\overline{AB}$ is perpendicular to $\overline{BC}$.
(3) A, B, and C are collinear.
(4) $\angle ACB$ is an acute angle.

24 Expressed in simplest form, $\frac{x-7}{2} + \frac{x+2}{6}$ is equivalent to

(1) $\frac{2x-5}{8}$
(2) $\frac{4x-19}{6}$
(3) $\frac{8x-5}{12}$
(4) $\frac{x^2-14}{12}$

25 In the accompanying diagram, $\overleftrightarrow{AB}$ is parallel to $\overleftrightarrow{CD}$, and $\overleftrightarrow{EF}$ is a transversal.



If $m\angle BEF = 2x + 60$ and $m\angle DFE = 3x + 20$, what is $m\angle BEF$?

(1) 100
(2) 20
(3) 140
(4) 40

26 Which statement below expresses a conclusion that logically follows from "All members of Arista are honor students"?

(1) If Juan is an honor student, he is a member of Arista.
(2) If Marty is not an honor student, he is not a member of Arista.
(3) If Lynette is not a member of Arista, she is not an honor student.
(4) If Dawn is not an honor student, she is a member of Arista.

27 Which set is *not* closed under addition?

(1) $\{1,2,3,4,\ldots\}$
(2) $\{2,4,6,8,\ldots\}$
(3) $\{3,6,9,12,\ldots\}$
(4) $\{1,3,5,7,\ldots\}$

28 Which point lies on the circle whose equation is $x^2 + y^2 = 100$?

(1) (5,5)
(2) (10,10)
(3) (0,0)
(4) (−6,8)

29 What is the slope of a line that is perpendicular to the line whose equation is $y = 3x + 5$?

(1) $-\frac{1}{3}$
(2) -3
(3) 3
(4) $\frac{1}{5}$

30 What is an equation of the axis of symmetry of the graph of the equation $y = 2x^2 - 3x - 1$?

(1) $x = \frac{3}{2}$
(2) $y = -\frac{3}{2}$
(3) $x = \frac{3}{4}$
(4) $y = \frac{3}{4}$

31 The solution of the quadratic equation $2x^2 - x - 14 = 0$ is

(1) $\frac{-1 \pm \sqrt{111}}{2}$
(2) $\frac{1 \pm \sqrt{111}}{4}$
(3) $\frac{1 \pm \sqrt{113}}{4}$
(4) $\frac{-1 \pm \sqrt{113}}{2}$

32 Which is a point of intersection of the equations $y = x$ and $y = x^2 + x - 1$?

(1) (0,0)
(2) (1,0)
(3) (−1,0)
(4) (−1,−1)

33 If two sides of a triangle are 1 and 4, then the third side could be

(1) 8
(2) 5
(3) 3
(4) 4

34 The diagonals of square $ABCD$ intersect at point O. If $AO = 3$, what is the area of $ABCD$?

(1) $\frac{9}{2}$
(2) 9
(3) 18
(4) 36

Directions (35): Leave all construction lines on the answer sheet.

35 *On the answer sheet*, bisect the line segment $\overline{AB}$.

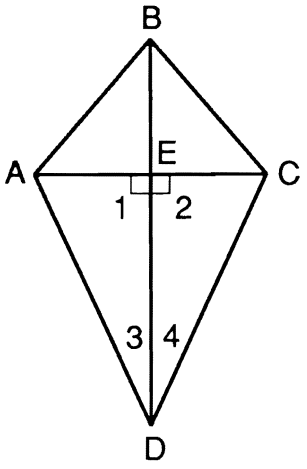
Answers to the following questions are to be written on paper provided by the school.

Part II

Answer three questions from this part. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Calculations that may be obtained by mental arithmetic or the calculator do not need to be shown. [30]

36 *On your answer paper*, write the numerals 1 through 8, and next to each numeral, give a reason for each statement in the proof.

Given: $\overline{AD} \cong \overline{CD}$ and $\overline{BD} \perp \overline{AC}$.



Prove: $\triangle ABD \cong \triangle CBD$

Statements	Reasons	
(1) $\overline{AD} \cong \overline{CD}$, $\overline{BD} \perp \overline{AC}$	(1)	[1]
(2) $\angle 1$ and $\angle 2$ are right angles	(2)	[1]
(3) $\triangle ADE$ and $\triangle CDE$ are right triangles	(3)	[1]
(4) $\overline{DE} \cong \overline{DE}$	(4)	[1]
(5) $\triangle ADE \cong \triangle CDE$	(5)	[2]
(6) $\angle 3 \cong \angle 4$	(6)	[2]
(7) $\overline{BD} \cong \overline{BD}$	(7)	[1]
(8) $\triangle ABD \cong \triangle CBD$	(8)	[1]

37 The vertex angle of an isosceles triangle measures 56° and each leg measures 8. Find the area of the triangle to the *nearest tenth*. [10]

38 In right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$, $AD = 3$, and BD is 3 more than CD. Find the length of $\overline{CD}$ in simplest radical form *or* to the *nearest tenth*. [10]

39 The coordinates of the endpoints of $\overline{AB}$ are $A(5,2)$ and $B(6,5)$.

a (1) Find the slope of $\overline{AB}$. [2]

(2) Write an equation of the line containing $\overline{AB}$. [3]

b On the same set of axes, graph and label

(1) $\overline{AB}$ [1]

(2) $\overline{A'B'}$, the image of $\overline{AB}$ after a reflection over the line $y = x$ [2]

(3) $\overline{A''B''}$, the image of $\overline{A'B'}$ after the translation that shifts coordinates (x,y) to $(x - 6, y - 6)$ [2]

40 A math test contains only geometry questions and logic questions. The number of logic questions is two less than the number of geometry questions.

a If the probability of selecting a logic question is $\frac{2}{5}$, how many questions are on the test? [5]

b If five questions are selected at random from this test, find the probability that all five are

(1) geometry questions [3]

(2) logic questions [2]

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

Part III

Answer one question from this part. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Calculations that may be obtained by mental arithmetic or the calculator do not need to be shown. [10]

41 The vertices of quadrilateral $ABCD$ are $A(2,3)$, $B(11,6)$, $C(10,9)$, and $D(1,6)$.

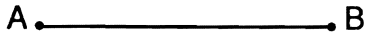
a Using coordinate geometry, show that diagonals $\overline{AC}$ and $\overline{BD}$ bisect each other. [5]

b Using coordinate geometry, show that quadrilateral $ABCD$ is a rectangle. [5]

42 Given: $A \rightarrow \sim(B \wedge C)$
$C \vee E$
$\sim A \rightarrow \sim D$
B
D

Prove: E [10]

35



Your answers for Part II and Part III 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.

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Signature

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