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REGENTS HIGH SCHOOL EXAMINATION

~~PARTIAL~~ 78-694

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Wednesday, June 20, 1990 – 9:15 a.m. to 12:15 p.m., only

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.

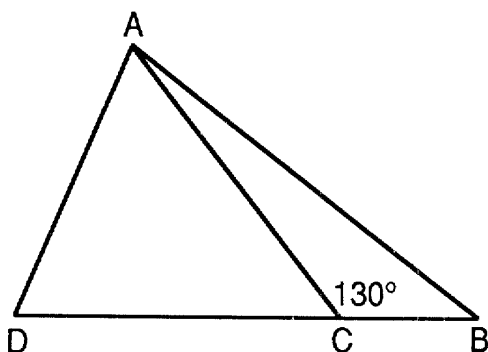
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during 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]

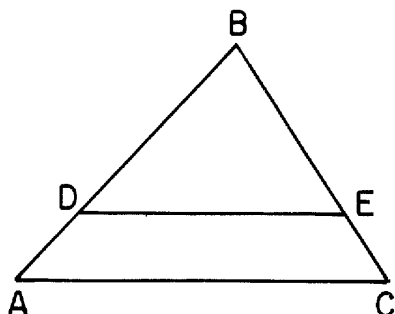
- 1 In the accompanying diagram of $\triangle ADB$, \overline{DCB} , $\overline{CD} \cong \overline{CA}$, and $m\angle ACB = 130$. Find $m\angle D$.



- 2 The @ operation for the set $\{T, A, B, L, E\}$ is defined in the accompanying chart. What is the identity element for @?

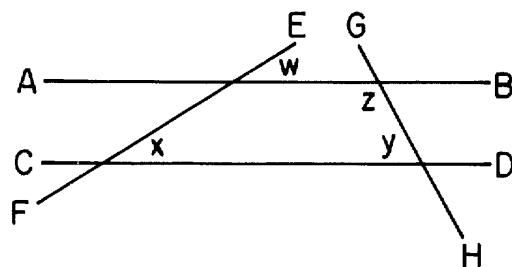
| @ | T | A | B | L | E |
|---|---|---|---|---|---|
| T | L | E | T | A | B |
| A | E | T | A | B | L |
| B | T | A | B | L | E |
| L | A | B | L | E | T |
| E | B | L | E | T | A |

- 3 In the accompanying diagram, \overline{DE} is parallel to \overline{AC} . If the ratio of $AD:DB$ is 2:5 and \overline{CE} measures 6, find the measure of \overline{EB} .



- 4 In parallelogram $ABCD$, diagonals \overline{AC} and \overline{BD} intersect at E . If $BE = 4x - 12$ and $DE = 2x + 8$, find x .

- 5 In the accompanying diagram, \overleftrightarrow{AB} , \overleftrightarrow{CD} , \overleftrightarrow{EF} , and \overleftrightarrow{GH} are straight lines. If $m\angle w = 30$, $m\angle x = 30$, and $m\angle z = 120$, find $m\angle y$.

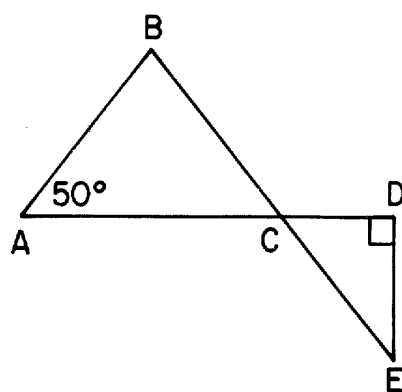


- 6 Find A' , the image of $A(3,5)$, after a reflection in the line $y = x$.

- 7 In right triangle ABC , hypotenuse $AB = 10$ and $m\angle B = 53$. Find AC to the nearest integer.

- 8 In $\triangle ABC$, an exterior angle at A measures 40° . Which is the longest side of the triangle?

- 9 In the accompanying diagram, \overline{BCE} , $\overline{AB} \cong \overline{CB}$, $\overline{ACD} \perp \overline{DE}$, and $m\angle A = 50$. Find $m\angle E$.



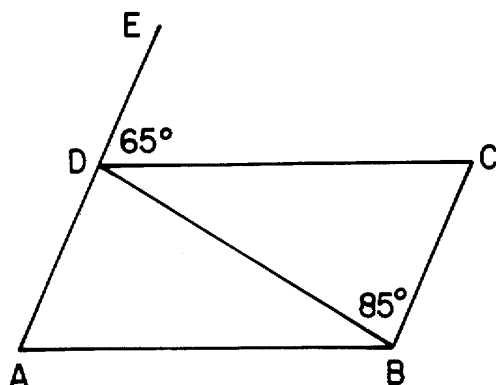
- 10 Find the positive root of $x^2 - 2x = 8$.

- 11 A translation moves $A(-3,2)$ to $A'(0,0)$. Find B' , the image of $B(5,4)$, under the same translation.

12 If $a * b = a + b^a$, find $2 * 3$.

13 If the length of the line segment joining the midpoints of two sides of an equilateral triangle is 6, find the perimeter of the triangle.

14 In the accompanying diagram of parallelogram $ABCD$, side \overline{AD} is extended through D to E and \overline{DB} is a diagonal. If $m\angle EDC = 65$ and $m\angle CBD = 85$, find $m\angle CDB$.



15 How many three-person committees can be chosen from a group of eight people?

16 What is the slope of the line that passes through the points (1,3) and (3,7)?

17 Write an equation of the line that passes through the point (0,3) and whose slope is 2.

18 Given these distinct quadrilaterals: parallelogram, rhombus, rectangle, square, and isosceles trapezoid.

What is the probability of choosing at random a quadrilateral whose diagonals are *always* congruent?

19 How many different arrangements of seven letters can be made using the letters in the name "ULYSSES"?

Directions (20–34): 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.

20 Given: $p \rightarrow q$
 $q \rightarrow r$

What is a logically valid conclusion?

- (1) $q \rightarrow \sim r$ (3) $r \rightarrow \sim q$
(2) $\sim r \rightarrow q$ (4) $\sim r \rightarrow \sim p$

21 The statement $\sim(p \wedge \sim q)$ is logically equivalent to

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

22 The measures of the acute angles of right triangle ABC are in the ratio 2:3. The measure of the *smaller* acute angle must equal

- (1) 18° (3) 54°
(2) 36° (4) 90°

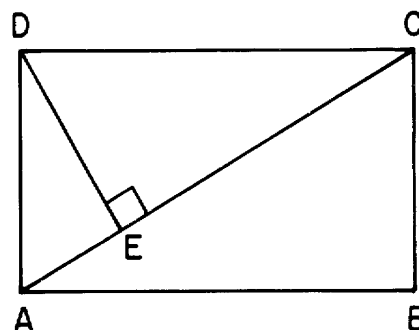
23 The length of the line segment connecting (2,-2) and (-3,-1) is

- (1) $\sqrt{10}$ (3) $\sqrt{26}$
(2) 2 (4) $\sqrt{34}$

24 An equation of the locus of points equidistant from the points (0,6) and (0,-2) is

- (1) $x = 2$ (3) $x = -2$
(2) $y = 2$ (4) $y = -2$

25 In the accompanying diagram of rectangle $ABCD$, \overline{DE} is perpendicular to diagonal \overline{AC} . If $AE = 3$ and $EC = 9$, what is the length of \overline{AD} ?



- (1) $\sqrt{27}$ (3) 5
(2) 6 (4) 4

26 In a circle, diameter \overline{AB} is drawn. The coordinates of A are (3,-4) and the coordinates of the center of the circle are (1,1). What are the coordinates of B?

- (1) (-1,6) (3) (1,-6)
(2) $(2, -\frac{3}{2})$ (4) $(1, -\frac{5}{2})$

27 The legs of a right triangle are in the ratio 3:4. If the hypotenuse is 10, what is the length of the longer leg?

- (1) 6 (3) 3
(2) 8 (4) 4

28 What is the slope of a line that is perpendicular to the line whose equation is $y = 4x + 1$?

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

29 The measure of the altitude of an equilateral triangle whose side has length 6 is

- (1) $\sqrt{3}$ (3) $3\sqrt{3}$
(2) $2\sqrt{3}$ (4) $4\sqrt{3}$

30 An urn contains four red marbles and five blue marbles. What is the probability of selecting at random, without replacement, two blue marbles?

- (1) $\frac{20}{81}$ (3) $\frac{20}{72}$
(2) $\frac{16}{81}$ (4) $\frac{16}{72}$

31 The coordinates of the turning point of the graph of $y = 2x^2 - 4x + 1$ are

- (1) (1,-1) (3) (-1,5)
(2) (1,1) (4) (2,1)

32 Which is an illustration of the associative property?

- (1) $ab = ba$
(2) $a(b + c) = ab + ac$
(3) $a(bc) = (ab)c$
(4) $a + 0 = a$

33 If the graphs of $x^2 + y^2 = 4$ and $y = -4$ are drawn on the same axes, what is the total number of points common to both graphs?

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

34 If $\frac{a}{x} + 1 = \frac{c}{x}$, which is an expression for x in terms of c and a ?

- (1) $x = c + a$ (3) $x = a - c$
(2) $x = c - a$ (4) $x = a + c + 1$

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

35 *On the answer sheet*, construct equilateral triangle ABC using line segment \overline{AB} as one side.

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

Part II

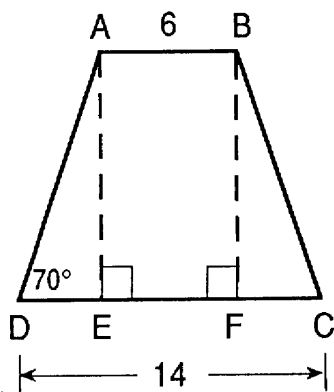
Answer three questions from this part. Show all work unless otherwise directed. [30]

- 36 a Solve for x and express the answer in radical form.

$$\frac{1}{x+1} = x - 4 \quad [8]$$

- b Between which two consecutive integers does the positive root of this equation lie? [2]

- 37 In isosceles trapezoid $ABCD$, $m\angle D = 70^\circ$, $AB = 6$, and $DC = 14$.



- a Find DE . [1]
 b Find altitude AE to the nearest integer. [3]
 c Using the answer to part b, find the area of trapezoid $ABCD$. [2]
 d Find AD to the nearest integer. [4]
- 38 Triangle ABC has coordinates $A(1,2)$, $B(4,2)$, and $C(6,4)$.
- a On graph paper, draw and label $\triangle ABC$. [1]
 b Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection in the x -axis. [3]
 c Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after a reflection in the origin. [3]
 d Graph and label $\triangle A'''B'''C'''$, the image of $\triangle ABC$ after a dilation of constant 2. [3]

- 39 a On graph paper, sketch the graph of the function $y = x^2 - 4x + 2$ over the interval $-1 \leq x \leq 5$. [5]

- b On the same set of axes, sketch the graph of the straight line with slope 1 that passes through the y -intercept of $y = x^2 - 4x + 2$. [2]

- c Write an equation of the line sketched in part b. [2]

- d Write the coordinates of a point inside the closed region formed by the line drawn in part b and the graph of $y = x^2 - 4x + 2$. [1]

- 40 Given: If I buy a shirt, then I will buy a vest.
 If I do not have money, then I will not buy a vest.
 Either I buy a shirt or I will not go to the dance.
 I am going to the dance.

Let S represent: "I buy a shirt."
 Let V represent: "I buy a vest."
 Let M represent: "I have money."
 Let D represent: "I go to the dance."
 Prove: I have money. [10]

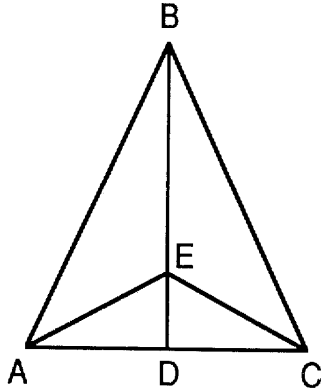
GO RIGHT ON TO THE NEXT PAGE.

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

Part III

Answer one question from this part. Show all work unless otherwise directed. [10]

- 41 Given: $\triangle ABC$, $\overleftrightarrow{BE} \perp \overline{AC}$, $\overline{AB} \cong \overline{CB}$, and D is the midpoint of \overline{AC} .



Prove: $\overline{AE} \cong \overline{CE}$ [10]

- 42 Quadrilateral $ABCD$ has vertices $A(-3,-2)$, $B(9,2)$, $C(1,6)$, and $D(-5,4)$. Using coordinate geometry, prove that quadrilateral $ABCD$ is a trapezoid and contains a right angle. [10]

THE UNIVERSITY OF THE STATE OF NEW YORK
 THE STATE EDUCATION DEPARTMENT
 DIVISION OF EDUCATIONAL TESTING

Tables of Natural Trigonometric Functions
 (For use with Sequential Math - Course II Regents Examinations)

| Angle | Sine | Cosine | Tangent | Angle | Sine | Cosine | Tangent |
|-------|-------|--------|---------|-------|--------|--------|---------|
| 1° | .0175 | .9998 | .0175 | 46° | .7193 | .6947 | 1.0355 |
| 2° | .0349 | .9994 | .0349 | 47° | .7314 | .6820 | 1.0724 |
| 3° | .0523 | .9986 | .0524 | 48° | .7431 | .6691 | 1.1106 |
| 4° | .0698 | .9976 | .0699 | 49° | .7547 | .6561 | 1.1504 |
| 5° | .0872 | .9962 | .0875 | 50° | .7660 | .6428 | 1.1918 |
| 6° | .1045 | .9945 | .1051 | 51° | .7771 | .6293 | 1.2349 |
| 7° | .1219 | .9925 | .1228 | 52° | .7880 | .6157 | 1.2799 |
| 8° | .1392 | .9903 | .1405 | 53° | .7986 | .6018 | 1.3270 |
| 9° | .1564 | .9877 | .1584 | 54° | .8090 | .5878 | 1.3764 |
| 10° | .1736 | .9848 | .1763 | 55° | .8192 | .5736 | 1.4281 |
| 11° | .1908 | .9816 | .1944 | 56° | .8290 | .5592 | 1.4826 |
| 12° | .2079 | .9781 | .2126 | 57° | .8387 | .5446 | 1.5399 |
| 13° | .2250 | .9744 | .2309 | 58° | .8480 | .5299 | 1.6003 |
| 14° | .2419 | .9703 | .2493 | 59° | .8572 | .5150 | 1.6643 |
| 15° | .2588 | .9659 | .2679 | 60° | .8660 | .5000 | 1.7321 |
| 16° | .2756 | .9613 | .2867 | 61° | .8746 | .4848 | 1.8040 |
| 17° | .2924 | .9563 | .3057 | 62° | .8829 | .4695 | 1.8807 |
| 18° | .3090 | .9511 | .3249 | 63° | .8910 | .4540 | 1.9626 |
| 19° | .3256 | .9455 | .3443 | 64° | .8988 | .4384 | 2.0503 |
| 20° | .3420 | .9397 | .3640 | 65° | .9063 | .4226 | 2.1445 |
| 21° | .3584 | .9336 | .3839 | 66° | .9135 | .4067 | 2.2460 |
| 22° | .3746 | .9272 | .4040 | 67° | .9205 | .3907 | 2.3559 |
| 23° | .3907 | .9205 | .4245 | 68° | .9272 | .3746 | 2.4751 |
| 24° | .4067 | .9135 | .4452 | 69° | .9336 | .3584 | 2.6051 |
| 25° | .4226 | .9063 | .4663 | 70° | .9397 | .3420 | 2.7475 |
| 26° | .4384 | .8988 | .4877 | 71° | .9455 | .3256 | 2.9042 |
| 27° | .4540 | .8910 | .5095 | 72° | .9511 | .3090 | 3.0777 |
| 28° | .4695 | .8829 | .5317 | 73° | .9563 | .2924 | 3.2709 |
| 29° | .4848 | .8746 | .5543 | 74° | .9613 | .2756 | 3.4874 |
| 30° | .5000 | .8660 | .5774 | 75° | .9659 | .2588 | 3.7321 |
| 31° | .5150 | .8572 | .6009 | 76° | .9703 | .2419 | 4.0108 |
| 32° | .5299 | .8480 | .6249 | 77° | .9744 | .2250 | 4.3315 |
| 33° | .5446 | .8387 | .6494 | 78° | .9781 | .2079 | 4.7046 |
| 34° | .5592 | .8290 | .6745 | 79° | .9816 | .1908 | 5.1446 |
| 35° | .5736 | .8192 | .7002 | 80° | .9848 | .1736 | 5.6713 |
| 36° | .5878 | .8090 | .7265 | 81° | .9877 | .1564 | 6.3138 |
| 37° | .6018 | .7986 | .7536 | 82° | .9903 | .1392 | 7.1154 |
| 38° | .6157 | .7880 | .7813 | 83° | .9925 | .1219 | 8.1443 |
| 39° | .6293 | .7771 | .8098 | 84° | .9945 | .1045 | 9.5144 |
| 40° | .6428 | .7660 | .8391 | 85° | .9962 | .0872 | 11.4301 |
| 41° | .6561 | .7547 | .8693 | 86° | .9976 | .0698 | 14.3007 |
| 42° | .6691 | .7431 | .9004 | 87° | .9986 | .0523 | 19.0811 |
| 43° | .6820 | .7314 | .9325 | 88° | .9994 | .0349 | 28.6363 |
| 44° | .6947 | .7193 | .9657 | 89° | .9998 | .0175 | 57.2900 |
| 45° | .7071 | .7071 | 1.0000 | 90° | 1.0000 | .0000 | |

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH — COURSE II

Wednesday, June 20, 1990 — 9:15 a.m. to 12:15 p.m., only

| |
|-------------------------|
| Part I Score |
| Part II Score |
| Part III Score |
| Total Score |
| Rater's Initials: |

ANSWER SHEET

Pupil Sex: Male Female Grade

Teacher School

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

Part I

Answer 30 questions from this part.

- | | | | |
|----------|----------|----------|--|
| 1 | 11 | 21 | 31 |
| 2 | 12 | 22 | 32 |
| 3 | 13 | 23 | 33 |
| 4 | 14 | 24 | 34 |
| 5 | 15 | 25 | 35 Answer question 35 on the other side of this sheet. |
| 6 | 16 | 26 | |
| 7 | 17 | 27 | |
| 8 | 18 | 28 | |
| 9 | 19 | 29 | |
| 10 | 20 | 30 | |

A _____ B

**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.

Signature

FOR TEACHERS ONLY

SCORING KEY

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Wednesday, June 20, 1990 — 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 20–34, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

| | | | |
|---------------------|--------------------|--------|-------------------|
| (1) 65 | (11) $B'(8,2)$ | (21) 4 | (31) 1 |
| (2) B | (12) 11 | (22) 2 | (32) 3 |
| (3) 15 | (13) 36 | (23) 3 | (33) 4 |
| (4) 10 | (14) 30 | (24) 2 | (34) 2 |
| (5) 60 | (15) 56 | (25) 2 | (35) construction |
| (6) $A'(5,3)$ | (16) 2 | (26) 1 | |
| (7) 8 | (17) $y = 2x + 3$ | (27) 2 | |
| (8) \overline{BC} | (18) $\frac{3}{5}$ | (28) 1 | |
| (9) 40 | (19) 840 | (29) 3 | |
| (10) 4 | (20) 4 | (30) 3 | |

[OVER]

SEQUENTIAL MATH—COURSE II — *concluded*

Part II

Please refer to the Department publication *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) $a \frac{3 \pm \sqrt{29}}{2}$ [8]

b 4 and 5 [2]

(37) a 4 [1]

b 11 [3]

c 110 [2]

d 12 [4]

(38) b $A'(1,-2), B'(4,-2), C'(6,-4)$ [3]

c $A''(-1,-2), B''(-4,-2), C''(-6,-4)$ [3]

d $A'''(2,4), B'''(8,4), C'''(12,8)$ [3]

(39) c $y = x + 2$ [2]