

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Tuesday, January 27, 1998 — 1:15 to 4:15 p.m., only

Notice . . .

Scientific 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.

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.

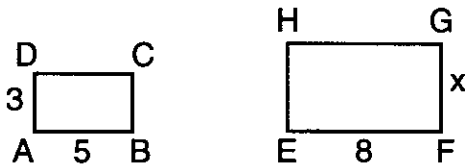
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

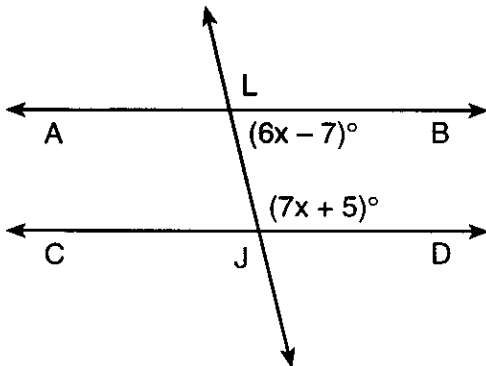
Answer 30 questions from this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in terms of π or in radical form. [60]

1 If a binary operation is defined as $a \circ b = \frac{2a + b}{b}$, evaluate $6 \circ 3$.

2 In the accompanying diagram, rectangle $ABCD$ is similar to rectangle $EFGH$, $AD = 3$, $AB = 5$, $EF = 8$, and $FG = x$. Find the value of x .

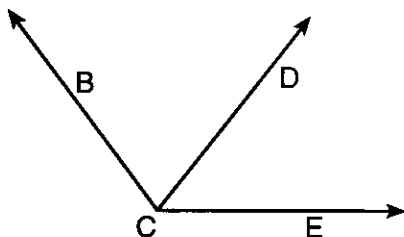


3 In the accompanying diagram, $\overleftrightarrow{ALB} \parallel \overleftrightarrow{CJD}$ and \overleftrightarrow{LJ} is a transversal. If $m\angle JLB = 6x - 7$ and $m\angle LJD = 7x + 5$, find the value of x .



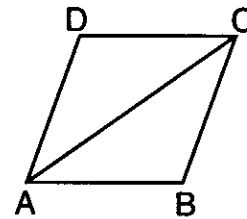
4 Factor completely: $2x^2 - 18$

5 In the accompanying diagram, $m\angle ECB = 6x$, $m\angle ECD = 3x - 11$, and $m\angle DCB = 74$. What is the value of x ?



6 In $\triangle MEC$, an exterior angle at C measures 115° , and the measure of $\angle M$ is 60° . Which is the *shortest* side of $\triangle MEC$?

7 In the accompanying diagram of rhombus $ABCD$, $m\angle CAB = 35$. Find $m\angle CDA$.



8 Find the positive root of $\frac{1}{x-1} = \frac{x+2}{4}$, $x \neq 1$.

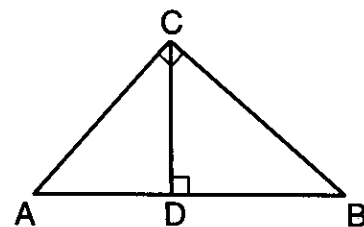
9 The length of a side of a square is 5. In simplest radical form, find the length of a diagonal of the square.

10 In which quadrant does the image of $(4, -7)$ lie after the translation that shifts (x, y) to $(x - 6, y + 3)$?

11 If the endpoints of the diameter of a circle are $A(5, 2)$ and $B(-3, 4)$, find the coordinates of the center of the circle.

12 Solve for x : $\frac{2}{x} + \frac{4}{3} = \frac{14}{3x}$

13 In right triangle ABC , $m\angle C = 90$ and altitude \overline{CD} is drawn to hypotenuse \overline{AB} . If $AD = 4$ and $DB = 5$, find AC .



- 14 Find the slope of a line that passes through points $(-6,8)$ and $(2,-4)$.

Directions (15–34): 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.

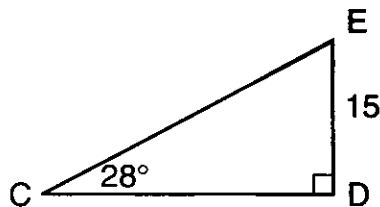
- 15 If the statements $s \rightarrow t$ and $t \rightarrow u$ are true, then what is a logically valid conclusion?

- (1) $\sim u \rightarrow \sim s$ (3) $u \rightarrow \sim t$
 (2) $\sim u \rightarrow t$ (4) $t \rightarrow \sim u$

- 16 What is the image of $(-4,-5)$ when reflected in the x -axis?

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

- 17 In the accompanying diagram of $\triangle CDE$, $m\angle D = 90$, $m\angle C = 28$, and $ED = 15$.



Which equation can be used to find CD ?

- (1) $\sin 28^\circ = \frac{15}{CD}$ (3) $\tan 28^\circ = \frac{15}{CD}$
 (2) $\sin 28^\circ = \frac{CD}{15}$ (4) $\tan 28^\circ = \frac{CD}{15}$

- 18 The expression $\frac{12!}{8!4!}$ is equivalent to

- (1) 1 (3) 2970
 (2) 495 (4) 3960

- 19 What is the locus of points at a given distance from a line?

- (1) 1 point (3) 1 circle
 (2) 2 points (4) 2 parallel lines

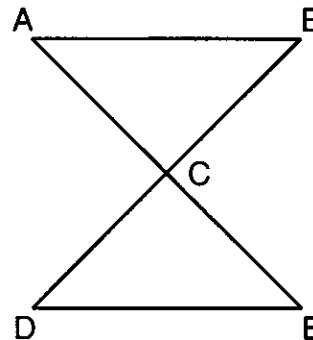
- 20 Which statement is *false* about the line whose equation is $y = -2x - 5$?

- (1) Its slope is -2 .
 (2) It is parallel to the line whose equation is $y = 2x + 5$.
 (3) Its y -intercept is -5 .
 (4) It is perpendicular to the line whose equation is $y = \frac{1}{2}x - 5$.

- 21 What is the total number of different six-letter permutations that can be formed from the letters in the word "MUUMUU"?

- (1) 6 (3) 120
 (2) 15 (4) 180

- 22 In the accompanying diagram, \overline{ACE} , \overline{BCD} , \overline{AB} , and \overline{DE} , $\angle A \cong \angle E$, and C is the midpoint of \overline{AE} .



Which theorem justifies $\triangle ABC \cong \triangle EDC$?

- (1) SSS \cong SSS (3) ASA \cong ASA
 (2) SAS \cong SAS (4) SSA \cong SSA

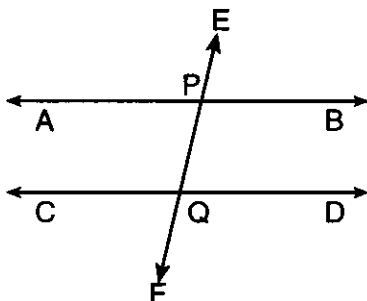
- 23 What is the value of $(P \blacksquare S) \blacksquare (L \blacksquare U)$ in the system defined below?

\blacksquare	P	L	U	S
P	U	S	P	L
L	S	P	L	U
U	P	L	U	S
S	L	U	S	P

- (1) P (3) U
 (2) L (4) S

- 24 In right triangle ABC , angle C is the right angle. If the coordinates of A are $(-1,1)$ and the coordinates of B are $(4,-2)$, the coordinates of C may be
- (1) $(-1,-2)$ (3) $(1,2)$
 (2) $(-1,2)$ (4) $(1,-2)$

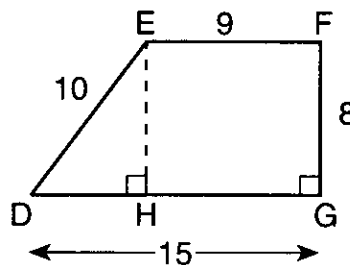
- 25 In the accompanying diagram, parallel lines \overleftrightarrow{AB} and \overleftrightarrow{CD} are cut by transversal \overleftrightarrow{EF} at P and Q , respectively.



Which statement must always be true?

- (1) $m\angle APE = m\angle CQF$
 (2) $m\angle APE < m\angle CQF$
 (3) $m\angle APE + m\angle CQF = 90$
 (4) $m\angle APE + m\angle CQF = 180$
- 26 What is the distance between points $(6,-9)$ and $(-3,4)$?
- (1) $\sqrt{34}$ (3) $\sqrt{178}$
 (2) $\sqrt{106}$ (4) $\sqrt{250}$
- 27 Which equation represents the axis of symmetry of the graph of the equation $y = x^2 - 6x + 5$?
- (1) $y = 3$ (3) $x = 3$
 (2) $y = -3$ (4) $x = -3$
- 28 If the statements $\sim(n \wedge \sim c)$ and n are true, then which statement is a logical conclusion?
- (1) c (3) $\sim n \wedge c$
 (2) $\sim c$ (4) $\sim n \vee \sim c$
- 29 Which set of numbers may be the measure of the sides of a triangle?
- (1) $\{10,10,20\}$ (3) $\{2,4,6\}$
 (2) $\{4,6,12\}$ (4) $\{8,10,12\}$

- 30 In the accompanying diagram, altitude \overline{EH} is drawn in trapezoid $DEFG$, $DE = 10$, $EF = 9$, $FG = 8$, and $GD = 15$



What is $m\angle D$ to the nearest degree?

- (1) 37 (3) 60
 (2) 53 (4) 80
- 31 Which set is closed under the operation of subtraction?
- (1) odd numbers (3) integers
 (2) counting numbers (4) prime numbers
- 32 What are the roots of the equation $x^2 - 2x - 1 = 0$?
- (1) $x = -1 \pm \sqrt{2}$ (3) $x = -1 \pm 2\sqrt{2}$
 (2) $x = 1 \pm \sqrt{2}$ (4) $x = 1 \pm 2\sqrt{2}$
- 33 What are the coordinates of the image of point $(-1,2)$ under a dilation of 3 with respect to the origin?
- (1) $(-6,3)$ (3) $(3,6)$
 (2) $(6,-3)$ (4) $(-3,6)$
- 34 The number of degrees in the measure of one exterior angle of a regular pentagon is
- (1) 72 (3) 360
 (2) 108 (4) 540
- Directions (35):* Leave all construction lines on the answer sheet.
- 35 *On the answer sheet*, construct the perpendicular bisector of \overline{AB} , a chord of circle O .

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 *a* On graph paper, draw the graph of the equation $y = x^2 + 2x - 3$ for all values in the interval $-4 \leq x \leq 2$. [6]

b On the same set of axes, draw the graph of the equation $(x + 1)^2 + (y + 4)^2 = 16$. [3]

c Determine the total number of points the graphs drawn in parts *a* and *b* have in common. [1]

37 Solve the following system of equations algebraically and check:

$$\begin{aligned} y &= x^2 + 2x - 4 & [8,2] \\ y - 5 &= 2x \end{aligned}$$

38 Five students will be selected to represent their school at a conference. The principal has nominated 4 students graduating in 1998, 2 in 1999, 2 in 2000, and 1 in 2001.

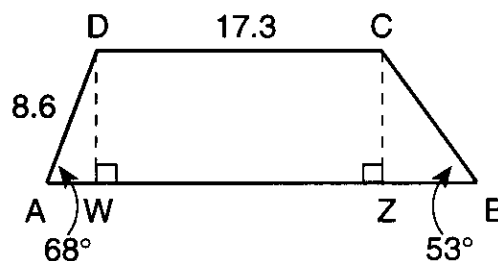
a How many five-student groups can be formed from the nine students? [2]

b What is the probability that all of the five students selected will graduate before 2000? [2]

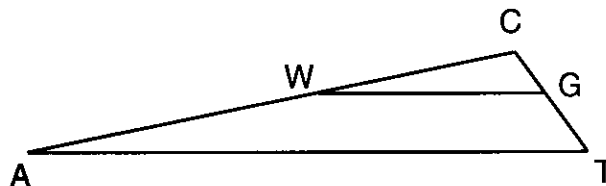
c What is the probability that of the five students selected 2 will graduate in 1998, 1 in 1999, 1 in 2000, and 1 in 2001? [4]

d What is the probability that all of the five students selected will graduate after 1999? [2]

39 In the accompanying diagram, $ABCD$ is a trapezoid with altitudes \overline{DW} and \overline{CZ} drawn, $CD = 17.3$, $DA = 8.6$, $m\angle A = 68$, and $m\angle B = 53$. Find, to the nearest tenth, the perimeter of $ABCD$. [10]



40 *a* In the accompanying diagram of $\triangle CAT$, W is a point on \overline{AC} and G is a point on \overline{TC} such that \overline{WG} is parallel to \overline{AT} , $TG = x$, $GC = x - 1$, $CW = x + 5$, and $WA = 2x + 6$. Find the length of \overline{TG} . [Only an algebraic solution will be accepted.] [6]



b For all values of y for which these expressions are defined, express the product in simplest form.

$$\frac{y^2 - 49}{y^2 - 3y - 28} \cdot \frac{3y + 12}{y^2 + 5y - 14} \quad [4]$$

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 Given: If I get a summer job, then I will earn money.
If I fail mathematics, then I will not earn money.
I get a summer job or I am not happy.
I am happy or I am not successful.
I am successful.

Let J represent: "I get a summer job."

Let E represent: "I will earn money."

Let F represent: "I fail mathematics."

Let H represent: "I am happy."

Let S represent: "I am successful."

Prove: I did not fail mathematics. [10]

42 Quadrilateral $ABCD$ has vertices $A(-3,6)$, $B(6,0)$, $C(9,-9)$, and $D(0,-3)$. Prove that $ABCD$ is

a a parallelogram [8]

b not a rhombus [2]

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REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE II

Tuesday, January 27, 1998 — 1:15 to 4:15 p.m., only

Part I Score
Part II Score
Part III Score	<u>.....</u>
Total Score
Rater's Initials:

ANSWER SHEET

Pupil Sex: Male Female Grade

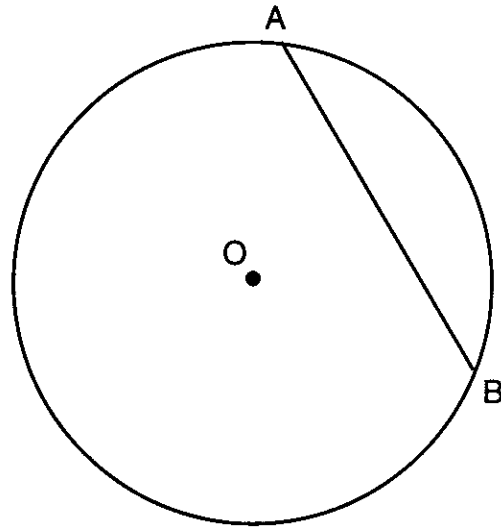
Teacher School

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 | |



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