

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

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Thursday, August 12, 1999 — 8:30 to 11:30 a.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.

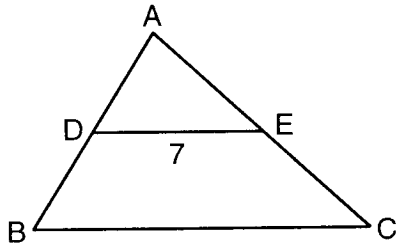
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during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

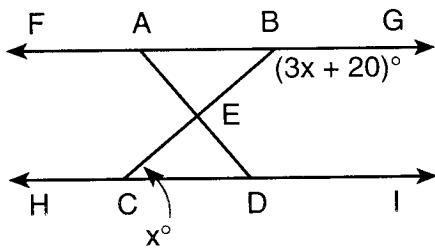
- If $a \heartsuit b$ is defined as $a \heartsuit b = a^2 + b$, find the value of $2 \heartsuit 3$.
- In the accompanying diagram of scalene triangle ABC , D and E are the midpoints of \overline{AB} and \overline{AC} , respectively, and $DE = 7$. Find the length of \overline{BC} .



- Using the accompanying table, compute $(I \rightarrow E) \rightarrow (R \rightarrow D)$.

\rightarrow	R	I	D	E
R	I	E	R	D
I	E	D	I	R
D	R	I	D	E
E	D	R	E	I

- In the accompanying diagram, $\overleftrightarrow{FABG} \parallel \overleftrightarrow{HCDI}$, \overline{BC} and \overline{AD} intersect at E , $m\angle GBE = 3x + 20$, and $m\angle ECD = x$. What is the value of x ?



- If the legs of a right triangle have lengths of 9 and 7, what is the length of the hypotenuse, expressed in radical form?

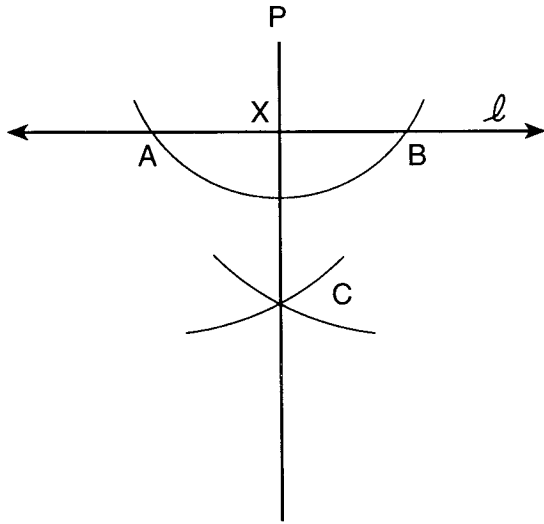
- In $\triangle SUM$, $m\angle S = 75$ and $m\angle U = 43$. Which side of $\triangle SUM$ is the *shortest*?
- In $\triangle ABC$, $m\angle A$ measures twice $m\angle B$. If an exterior angle at C measures 126° , find $m\angle A$.
- The lengths of the sides of a triangle are 8, 11, and 14. Find the perimeter of a similar triangle whose longest side measures 21.
- Find the slope of the line segment that contains points $(-3, -1)$ and $(1, 2)$.
- How many different five-letter arrangements can be made using the letters in the word "SLEEP"?
- If 5 is a root of the equation $x^2 - kx - 10 = 0$, what is the value of k ?
- In parallelogram $CARS$, $m\angle C = 5x - 20$ and $m\angle A = 3x + 40$. Find the value of x .
- Solve for x : $\frac{8}{x} - 2 = \frac{2}{3}$, $x \neq 0$
- Find the area of a triangle whose vertices are $(4, 8)$, $(4, 3)$, and $(7, 3)$.

Directions (15–35): 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.

- Which statement is logically equivalent to $\sim(\sim a \vee b)$?

(1) $a \vee \sim b$	(3) $a \wedge \sim b$
(2) $a \wedge b$	(4) $a \vee b$

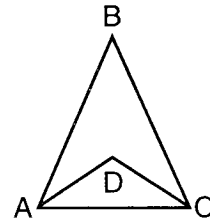
- 16 The diagram below shows the construction of dropping perpendicular \overline{PX} from point P to line ℓ . The arc drawn from point P intersects line ℓ at A and B , and the arcs drawn from points A and B intersect \overline{PX} at C .



Which statement is *not* always true about this construction?

- (1) $PA = PB$ (3) $PX = CX$
 (2) $AX = BX$ (4) $AC = BC$
- 17 Which equation represents the locus of points equidistant from points $(4,2)$ and $(8,2)$?
- (1) $x = 6$ (3) $x = 12$
 (2) $y = 6$ (4) $y = 12$
- 18 What is the image of point $(-5,4)$ under a reflection in the origin?
- (1) $(-4,5)$ (3) $(5,-4)$
 (2) $(-4,-5)$ (4) $(-5,-4)$
- 19 What is the equation of a line that is parallel to the x -axis and passes through point $(3,5)$?
- (1) $x = 3$ (3) $x = 5$
 (2) $y = 3$ (4) $y = 5$
- 20 Which equation represents a line that is perpendicular to the line whose equation is $y = \frac{2}{3}x + 4$?
- (1) $y = -\frac{2}{3}x - 4$ (3) $y = -\frac{2}{3}x + 4$
 (2) $y = -\frac{3}{2}x + 4$ (4) $y = \frac{3}{2}x + 4$

- 21 In the accompanying diagram of $\triangle ABC$, $\overline{BA} \cong \overline{BC}$, $m\angle ABC = 48$, \overline{DA} bisects $\angle CAB$, and \overline{DC} bisects $\angle ACB$.



What is $m\angle ADC$?

- (1) 48 (3) 114
 (2) 66 (4) 134
- 22 Point $(2,1)$ is the midpoint of a line segment whose endpoints are $(3,2)$ and $(1,a)$. What is the value of a ?
- (1) 1 (3) 3
 (2) 2 (4) 0
- 23 A quadrilateral must be a parallelogram if one pair of opposite sides is
- (1) congruent, only
 (2) parallel, only
 (3) congruent and parallel
 (4) parallel and the other pair of opposite sides is congruent
- 24 The sum of $\frac{y-4}{2y}$ and $\frac{3y-5}{5y}$ is
- (1) $\frac{11y-30}{10y}$ (3) $11y-30$
 (2) $\frac{4y-9}{10y}$ (4) $\frac{4y-9}{7y}$
- 25 In right triangle ABC , $m\angle C = 90$. If $\tan A = 10$, what is $m\angle A$ to the nearest degree?
- (1) 45 (3) 85
 (2) 84 (4) 89
- 26 The distance between points $(4a,3b)$ and $(3a,2b)$ is
- (1) $a^2 + b^2$ (3) $a + b$
 (2) $\sqrt{a^2 + b^2}$ (4) $\sqrt{a + b}$

- 27 Which statement is logically equivalent to "If the traffic light is red, then the cars stop"?
- (1) If the traffic light is not red, then the cars do not stop.
 - (2) If the cars stop, then the traffic light is red.
 - (3) If the cars do not stop, then the traffic light is not red.
 - (4) If the traffic light is not red, then the cars stop.
- 28 What are the roots of the equation $x^2 - 5x + 3 = 0$?
- (1) $\frac{5 \pm \sqrt{13}}{2}$
 - (2) $\frac{-5 \pm \sqrt{13}}{2}$
 - (3) $\frac{-5 \pm \sqrt{37}}{2}$
 - (4) $\frac{5 \pm \sqrt{37}}{2}$
- 29 Which equation represents a circle whose center is $(4, -5)$ and whose radius is 8?
- (1) $(x + 4)^2 + (y - 5)^2 = 64$
 - (2) $(x - 4)^2 + (y + 5)^2 = 64$
 - (3) $(x + 4)^2 + (y - 5)^2 = 8$
 - (4) $(x - 4)^2 + (y + 5)^2 = 8$
- 30 A classroom has 12 girls and 15 boys. If a committee of two students is selected at random, what is the probability that both students are girls?
- (1) $\frac{{}^{12}C_2}{{}^{27}C_2}$
 - (2) $\frac{{}^{12}C_2}{{}^{15}C_2 \cdot {}^{12}C_2}$
 - (3) $\frac{{}^{15}C_2}{{}^{27}C_2}$
 - (4) $\frac{{}^{12}P_2}{{}^{15}P_2 \cdot {}^{12}P_2}$
- 31 Which equation illustrates the multiplicative inverse property?
- (1) $b \cdot 0 = 0$
 - (2) $b + (-b) = 0$
 - (3) $b + 0 = b$
 - (4) $b \cdot \frac{1}{b} = 1$
- 32 If two consecutive sides of a rhombus are represented by $3x - 6$ and $x + 14$, then the perimeter of the rhombus is
- (1) 10
 - (2) 24
 - (3) 72
 - (4) 96
- 33 If the graphs of the equations $y = x + 2$ and $y = x^2 - 3x + 6$ are drawn on the same set of axes, at which point will the graphs intersect?
- (1) $(-2, 0)$
 - (2) $(1, 3)$
 - (3) $(1, 4)$
 - (4) $(2, 4)$
- 34 Which equation represents the axis of symmetry of the graph of the equation $y = -x^2 + 4x - 2$?
- (1) $x = 2$
 - (2) $y = 2$
 - (3) $x = -2$
 - (4) $y = -2$
- 35 What is the sum of the measures of the exterior angles of a regular hexagon?
- (1) 60
 - (2) 120
 - (3) 360
 - (4) 720

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 $y = x^2 - 4x + 3$ for all values of x in the interval $-1 \leq x \leq 5$. [6]

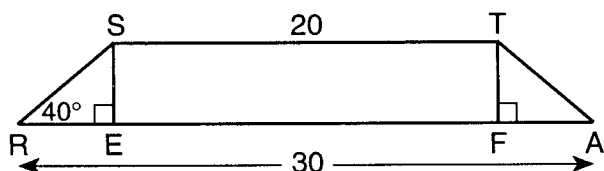
b On the same set of axes, draw the image of the graph drawn in part *a* after a translation that maps $(x,y) \rightarrow (x - 4, y + 2)$. Label the image *b*. [3]

c State the coordinates of the turning point for the graph drawn in part *b*. [1]

37 Solve the following system of equations algebraically and check.

$$\begin{aligned} x^2 + y^2 &= 40 \\ y - x &= 4 \end{aligned} \quad [8,2]$$

38 In the accompanying diagram, $STAR$ is an isosceles trapezoid with $\overline{SR} \cong \overline{TA}$, $ST = 20$, $RA = 30$, $m\angle SRA = 40$, and altitudes \overline{SE} and \overline{TF} are drawn.



- a* Find SE to the nearest tenth. [4]
- b* Find SR to the nearest tenth. [2]
- c* Find the perimeter of trapezoid $STAR$ to the nearest integer. [2]
- d* Find the area of trapezoid $STAR$ to the nearest integer. [2]

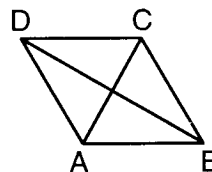
39 Emily receives a box of chocolates containing ten candies: 4 nut clusters, 1 peppermint, 2 jellies, 3 caramels.

- a* How many different sets of five candies may Emily select? [2]
- b* How many of these selections will contain 2 nut clusters, 2 jellies, and 1 caramel? [3]
- c* What is the probability that a selection of five candies will contain 2 nut clusters, 2 jellies, and 1 caramel? [2]
- d* What is the probability that a five-candy selection will contain 4 nut clusters and 1 peppermint? [2]
- e* What is the probability that a five-candy selection will contain all caramels? [1]

40 *a* Given: $Q \rightarrow R$
 $R \rightarrow T$
 S
 $\sim(S \wedge \sim Q)$

Prove: T [6]

b In the accompanying diagram of rhombus $ABCD$, $AB = 10$ and diagonal $AC = 10$. Find the length of diagonal \overline{BD} to the nearest tenth. [4]

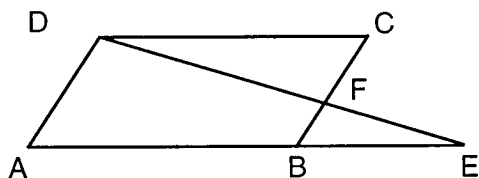


Answers to the following questions are to be written on paper provided by the school.

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: parallelogram $ABCD$ with \overline{AB} extended to E , \overline{DFE} intersects \overline{BC} at F .



Prove: $\frac{AE}{CD} = \frac{AD}{CF}$ [10]

- 42 The vertices of quadrilateral $DEFG$ are $D(3,2)$, $E(7,4)$, $F(9,8)$, and $G(5,6)$. Using coordinate geometry, prove that

a \overline{DF} and \overline{GE} bisect each other [5]

b $DEFG$ is a rhombus [5]

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REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE II

Thursday, August 12, 1999 — 8:30 to 11:30 a.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 |
| 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

Tear Here

Tear Here

Tear Here

Tear Here