MATHEMATICS B

Thursday, January 30, 2003 — 9:15 a.m. to 12:15 p.m., only

Print Your Name:				
Print Your School's Nam	e:			

Print your name and the name of your school in the boxes above. Then turn to the last page of this booklet, which is the answer sheet for Part I. 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.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. Any work done on this sheet of scrap graph paper will not be scored. All work should be written in pen, except graphs and drawings, which should be done in pencil.

This examination has four parts, with a total of 34 questions. You must answer all questions in this examination. Write your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in Parts II, III, and IV directly in this booklet. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. The formulas that you may need to answer some questions in this examination are found on page 2.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, 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 sheet cannot be accepted if you fail to sign this declaration.

Notice...

A graphing calculator, a straightedge (ruler), and a compass must be available for your use while taking this examination.

Formulas

Area of Triangle

$$K = \frac{1}{2}ab \sin C$$

Functions of the Sum of Two Angles

$$\sin (A + B) = \sin A \cos B + \cos A \sin B$$

 $\cos (A + B) = \cos A \cos B - \sin A \sin B$

Functions of the Difference of Two Angles

$$\sin (A - B) = \sin A \cos B - \cos A \sin B$$

 $\cos (A - B) = \cos A \cos B + \sin A \sin B$

Law of Sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Functions of the Double Angle

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\cos 2A = 2 \cos^2 A - 1$$

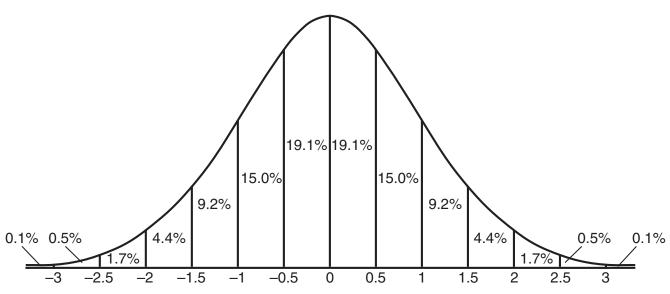
$$\cos 2A = 1 - 2 \sin^2 A$$

Functions of the Half Angle

$$\sin \frac{1}{2}A = \pm \sqrt{\frac{1 - \cos A}{2}}$$
$$\cos \frac{1}{2}A = \pm \sqrt{\frac{1 + \cos A}{2}}$$

Normal Curve

Standard Deviation



Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Record your answers in the spaces provided on the separate answer sheet. [40]

1 A monitor displays the graph $y = 3 \sin 5x$. What will be the amplitude after a dilation of 2?

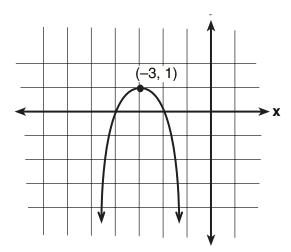
Use this space for computations.

(1) 5

(3) 7

(2) 6

- (4) 10
- 2 The probability that Kyla will score above a 90 on a mathematics test is $\frac{4}{5}$. What is the probability that she will score above a 90 on three of the four tests this quarter?
 - $(1) {}_{4}C_{3}(\frac{4}{5})^{3}(\frac{1}{5})^{1}$
- (3) $\frac{3}{4} \left(\frac{4}{5}\right)^3 \left(\frac{1}{5}\right)^1$
- (2) ${}_{4}C_{3}\left(\frac{4}{5}\right)^{1}\left(\frac{1}{5}\right)^{3}$
- $(4) \quad \frac{3}{4} \left(\frac{4}{5}\right)^1 \left(\frac{1}{5}\right)^3$
- 3 Which equation represents the parabola shown in the accompanying graph?



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

Use this space for computations.

- 4 What is the value of $\sum_{b=0}^{3} (2 (b)i)$?
 - (1) 2 5i

(3) 8-5i

(2) 2-6i

- (4) 8 6*i*
- **5** What is the solution set of the equation $\sqrt{9x + 10} = x$?
 - $(1) \{-1\}$

(3) {10}

(2) {9}

- (4) {10,-1}
- **6** Which statements could be used to prove that $\triangle ABC$ and $\triangle A'B'C'$ are congruent?
 - (1) $\overline{AB} \cong \overline{A'B'_{,}} \ \overline{BC} \cong \overline{B'C'_{,}} \text{ and } \angle A \cong \angle A'$
 - (2) $\overline{AB} \cong \overline{A'B'}$, $\angle A \cong \angle A'$, and $\angle C \cong \angle C'$
 - (3) $\angle A \cong \angle A'$, $\angle B \cong \angle B'$, and $\angle C \cong \angle C'$
 - (4) $\angle A \cong \angle A'$, $\overline{AC} \cong \overline{A'C'}$, and $\overline{BC} \cong \overline{B'C'}$
- 7 Ileana buys a large circular pizza that is divided into eight equal slices. She measures along the outer edge of the crust from one piece and finds it to be $5\frac{1}{2}$ inches. What is the diameter of the pizza to the *nearest inch*?
 - (1) 14

(3) 7

(2) 8

- (4) 4
- 8 The national mean for verbal scores on an exam was 428 and the standard deviation was 113. Approximately what percent of those taking this test had verbal scores between 315 and 541?
 - (1) 68.2%

(3) 38.2%

(2) 52.8%

(4) 26.4%

9 In $\triangle ABC$, if AC = 12, BC = 11, and $m \angle A = 30$, angle C could be

Use this space for computations.

(1) an obtuse angle, only

(2) an acute angle, only

(3) a right angle, only

(4) either an obtuse angle or an acute angle

10 For a rectangular garden with a fixed area, the length of the garden varies inversely with the width. Which equation represents this situation for an area of 36 square units?

(1)
$$x + y = 36$$

$$(2) \ y = \frac{36}{x}$$

(3)
$$x - y = 36$$

(4)
$$y = 36x$$

11 In which quadrant would the image of point (5,–3) fall after a dilation using a factor of –3?

12 The fraction $\frac{\frac{x}{y} + x}{\frac{1}{y} + 1}$ is equivalent to

$$(1) \quad \frac{2xy}{1+y}$$

$$(3)$$
 x

$$(2) \quad \frac{x^2y}{1+y}$$

$$(4)$$
 $2x$

13 If the roots of $ax^2 + bx + c = 0$ are real, rational, and equal, what is true about the graph of the function $y = ax^2 + bx + c$?

- (1) It intersects the x-axis in two distinct points.
- (2) It lies entirely below the *x*-axis.
- (3) It lies entirely above the x-axis.
- (4) It is tangent to the *x*-axis.

14 If $f(x) = \frac{1}{\sqrt{2x-4}}$, the domain of f(x) is

(1) x = 2

(3) $x \ge 2$

Use this space for computations.

(2) x < 2

(4) x > 2

15 What is the sum of $\frac{3}{x-3}$ and $\frac{x}{3-x}$?

(1) 1

(3) $\frac{x+3}{x-3}$

(2) -1

(4) 0

16 The expression $\log 10^{(x+2)} - \log 10^x$ is equivalent to

(1) -2

(3) 100

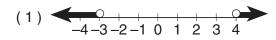
(2) 2

 $(4) \frac{1}{100}$

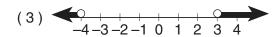
17 If $(\sec x - 2)(2 \sec x - 1) = 0$, then *x* terminates in

- (1) Quadrant I, only
- (2) Quadrants I and II, only
- (3) Quadrants I and IV, only
- (4) Quadrants I, II, III, and IV

18 Which graph represents the solution set of $x^2 - x - 12 < 0$?







[6]

 $(1) \frac{1}{3}$

- (3) $\frac{1}{9}$
- $(2) -\frac{1}{3}$

 $(4) -\frac{1}{9}$

20 If $\sin 6A = \cos 9A$, then m∠A is equal to

(1) 6

(3) 54

(2) 36

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

Part II

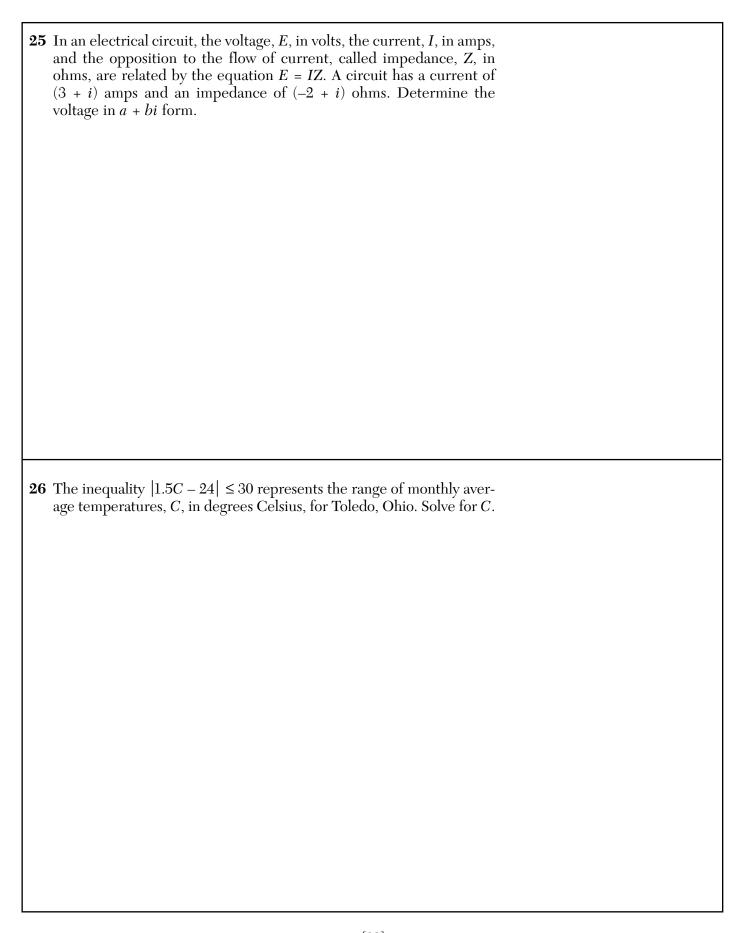
Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

wa sec sec	vo social studies classes took the same current events examination that as scored on the basis of 100 points. Mr. Wong's class had a median ore of 78 and a range of 4 points, while Ms. Rizzo's class had a median ore of 78 and a range of 22 points. Explain how these classes could vee the same median score while having very different ranges.
h(t)	the height of an object, $h(t)$, is determined by the formula $h(t) = -16t^2 + 256t$, where $h(t)$ is time, in seconds. Will the object reach a aximum or a minimum? Explain or show your reasoning.

Math. B - Jan. '03 [8]

23 A wrecking ball suspended from a chain is a type of pendulum. The relationship between the rate of speed of the ball, R, the mass of the ball, m, the length of the chain, L, and the force, F, is $R = 2\pi \sqrt{\frac{mL}{F}}$. Determine the force, F, to the *nearest hundredth*, when L = 12, m = 50, and R = 0.6.

24 The relationship between the relative size of an earthquake, S, and the measure of the earthquake on the Richter scale, R, is given by the equation $\log S = R$. If an earthquake measured 3.2 on the Richter scale, what was its relative size to the *nearest hundredth*?



Math. B - Jan. '03 [10]

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [24]

27	A shoe manufacturer collected data regarding men's shoe sizes and
	found that the distribution of sizes exactly fits the normal curve. If the
	mean shoe size is 11 and the standard deviation is 1.5, find:

a the probability that a man's shoe size is greater than or equal to 11

 $\,b\,$ the probability that a man's shoe size is greater than or equal to 12.5

$$c \quad \frac{P(\text{size} \ge 12.5)}{P(\text{size} \ge 8)}$$

28 In a mathematics class of ten students, the teacher wanted to determine how a homework grade influenced a student's performance on the subsequent test. The homework grade and subsequent test grade for each student are given in the accompanying table.

Homework Grade (x)	Test Grade (y)
94	98
95	94
92	95
87	89
82	85
80	78
75	73
65	67
50	45
20	40

a Give the equation of the linear regression line for this set of data.

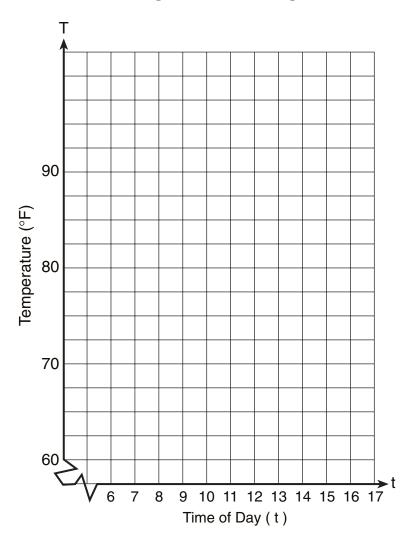
b A new student comes to the class and earns a homework grade of 78. Based on the equation in part a, what grade would the teacher predict the student would receive on the subsequent test, to the nearest integer?

Math. B - Jan. '03 [12]

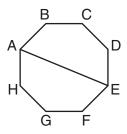
29 A building's temperature, T, varies with time of day, t, during the course of 1 day, as follows:

$$T = 8\cos t + 78$$

The air-conditioning operates when $T \ge 80^{\circ}$ F. Graph this function for $6 \le t < 17$ and determine, to the *nearest tenth of an hour*, the amount of time in 1 day that the air-conditioning is on in the building.



30 A picnic table in the shape of a regular octagon is shown in the accompanying diagram. If the length of \overline{AE} is 6 feet, find the length of one side of the table to the *nearest tenth of a foot*, and find the area of the table's surface to the *nearest tenth of a square foot*.



31 If $f(x) = x^{\frac{2}{3}}$ and $g(x) = 8x^{-\frac{1}{2}}$, find $(f \circ g)(x)$ and find $(f \circ g)(27)$.

32	Given:	f(x)	=	x^2	and	g(x)	=	2^{x}
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 $\it a$ The inverse of g is a function, but the inverse of f is not a function. Explain why this statement is true.

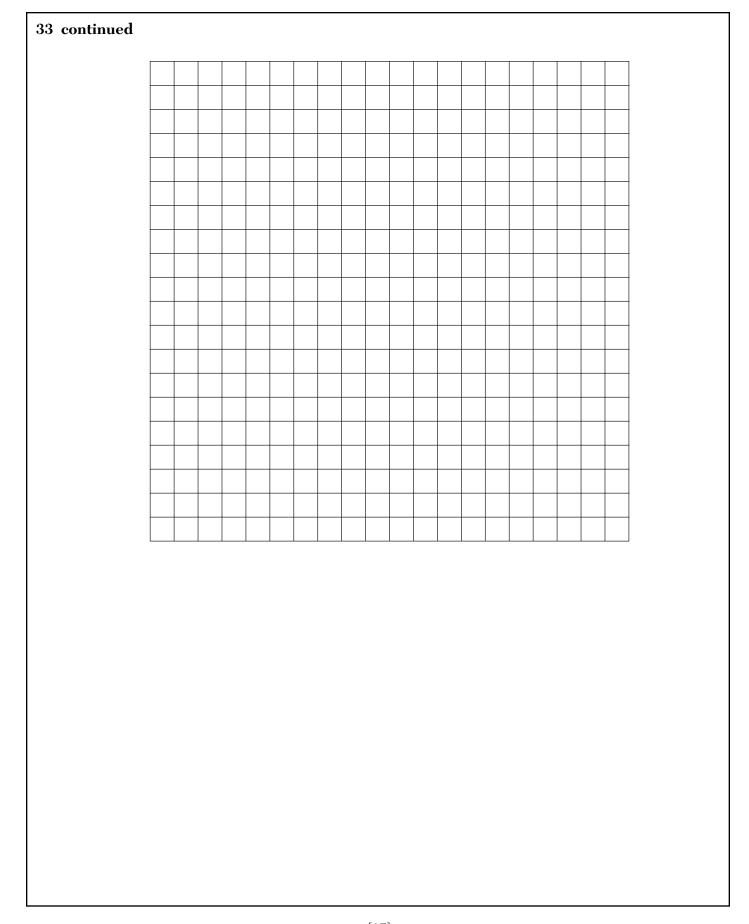
b Find $g^{-1}(f(3))$ to the nearest tenth.

Part IV

Answer all questions in this part. Each correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

33 Quadrilateral <i>KATE</i> has vertices $K(1,5)$, $A(4,7)$, $T(7,3)$, and $E(1,-1)$.
a Prove that KATE is a trapezoid. [The use of the grid on the next page is optional.]
b Prove that KATE is not an isosceles trapezoid.

Math. B - Jan. '03 [16]

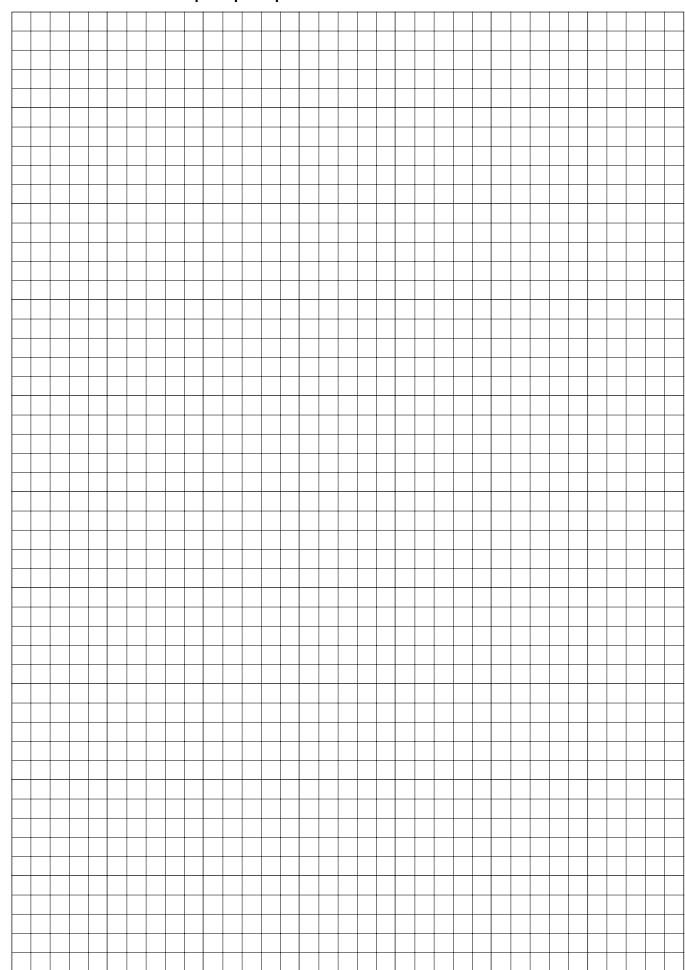


Math. B – Jan. '03 [17]

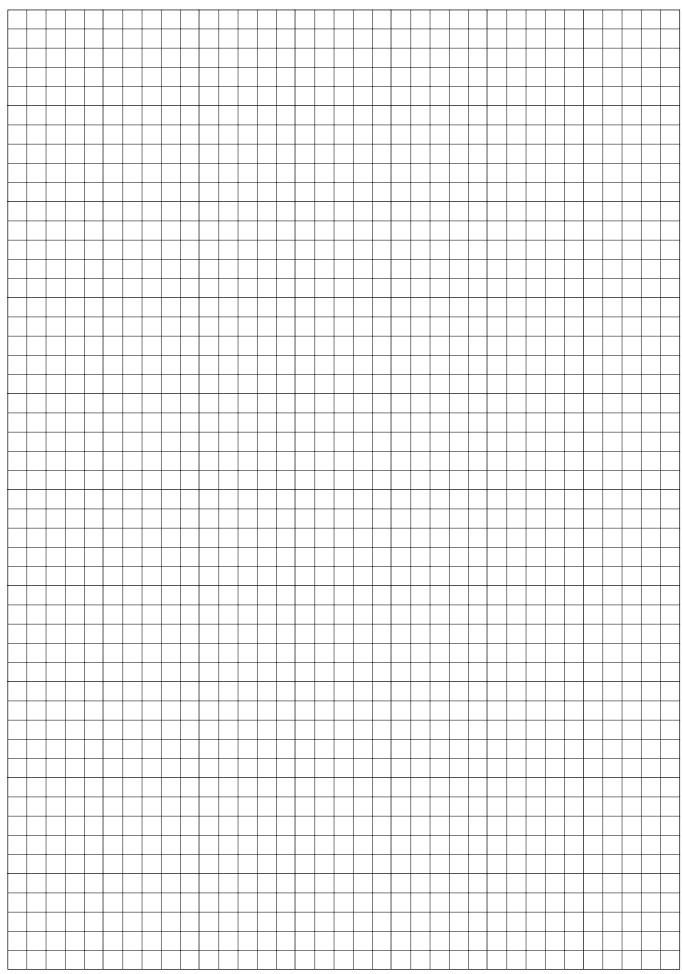
34 A ship captain at sea uses a sextant to sight an angle of elevation of 37° to the top of a lighthouse. After the ship travels 250 feet directly toward the lighthouse, another sighting is made, and the new angle of elevation is 50°. The ship's charts show that there are dangerous rocks 100 feet from the base of the lighthouse. Find, to the <i>nearest foot</i> , how close to the rocks the ship is at the time of the second sighting.

Math. B – Jan. '03 [18]

 ${\bf Scrap\ Graph\ Paper-This\ sheet\ will\ } {\it not\ } {\bf be\ scored.}$



Scrap Graph Paper — This sheet will *not* be scored.



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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS B

Thursday, January 30, 2003 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

			emale Grade
Your		e recorded on this answer rt I estions in this part.	sheet.
	7 8 9	13 14	
The declaration I do hereby affirm, at the	ers for Parts II, III, and IV so a below should be signed who close of this examination, that I has neither given nor received assist	hen you have completed the	e examination. e questions or answers prior to
		Signature	

		MATH	EMATICS	В	
Questi	on	Maximum Credit	Credits Earned	Rater's/Scorer's Initials	
Part I 1	-20	40			
Part II	21	2			Rate (m
	22	2			(
	23	2			
	24	2			
	25	2			
	26	2			
Part III	27	4			
	28	4			
	29	4			
	30	4			
	31	4			
	32	4			
Part IV	33	6			
	34	6			
Maximu Total	ım	88			
			Total Raw Score	Checked by	Scaled Score

Notes to raters. . .

- Each paper should be scored by a minimum of three raters.
- The table for converting the total raw score to the scaled score is provided in the scoring key for this examination.
- The scaled score is the student's final examination score.