

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

# MATHEMATICS B

Tuesday, January 27, 2009 — 9:15 a.m. to 12:15 p.m., only

Print Your Name:

Print Your School's Name:

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. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will *not* be scored. Write all your work in pen, except graphs and drawings, which should be done in pencil.

The formulas that you may need to answer some questions in this examination are found on page 23. This sheet is perforated so you may remove it from this booklet.

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.

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 you to use while taking this examination.

The use of any communications device is strictly prohibited when taking this examination. If you use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

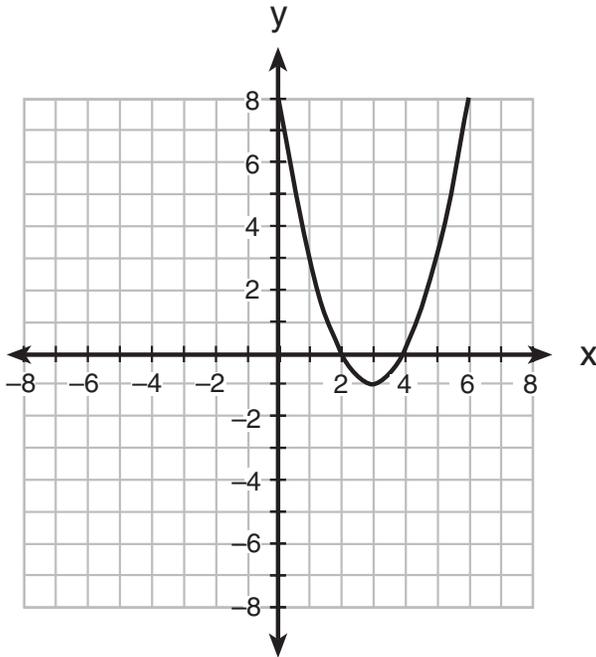
**DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.**

### Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [40]

Use this space for  
computations.

- 1 The parabola shown in the accompanying diagram undergoes a reflection in the  $y$ -axis.



What will be the coordinates of the turning point after the reflection?

- (1)  $(3, -1)$                       (3)  $(-3, 1)$   
(2)  $(3, 1)$                         (4)  $(-3, -1)$
- 2 The expression  $\frac{5}{3 + \sqrt{2}}$  is equivalent to
- (1)  $\frac{\sqrt{2} - 15}{3}$                       (3)  $\frac{15 - 5\sqrt{2}}{7}$   
(2)  $\frac{5\sqrt{2} - 15}{5}$                       (4)  $15 - 5\sqrt{2}$

**Use this space for  
computations.**

**3** If the probability that the Islanders will beat the Rangers in a game is  $\frac{2}{5}$ , which expression represents the probability that the Islanders will win *exactly* four out of seven games in a series against the Rangers?

(1)  $\left(\frac{2}{5}\right)^4 \left(\frac{3}{5}\right)^3$

(3)  ${}_7C_4 \left(\frac{2}{5}\right)^4 \left(\frac{2}{5}\right)^3$

(2)  ${}_5C_2 \left(\frac{4}{7}\right)^2 \left(\frac{3}{7}\right)^3$

(4)  ${}_7C_4 \left(\frac{2}{5}\right)^4 \left(\frac{3}{5}\right)^3$

**4** What is the solution of the inequality  $x^2 - x - 6 < 0$ ?

(1)  $-3 < x < -2$

(3)  $1 < x < 6$

(2)  $-2 < x < 3$

(4)  $-3 < x < 2$

**5** Which expression is equivalent to  $i^{55}$ ?

(1) 1

(3)  $i$

(2)  $-1$

(4)  $-i$

**6** What is the translation that maps the function  $f(x) = x^2 - 1$  onto the function  $g(x) = x^2 + 1$ ?

(1)  $T_{0,2}$

(3)  $T_{1,-1}$

(2)  $T_{0,1}$

(4)  $T_{-1,1}$

**7** The height of a swimmer's dive off a 10-foot platform into a diving pool is modeled by the equation  $y = 2x^2 - 12x + 10$ , where  $x$  represents the number of seconds since the swimmer left the diving board and  $y$  represents the number of feet above or below the water's surface. What is the farthest depth below the water's surface that the swimmer will reach?

(1) 6 feet

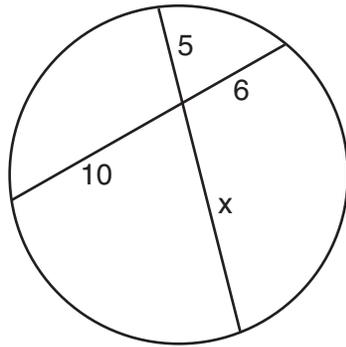
(3) 10 feet

(2) 8 feet

(4) 12 feet

Use this space for  
computations.

- 8 The accompanying diagram shows two intersecting paths within a circular garden.



What is the length of the portion of the path marked  $x$ ?

- (1)  $8\frac{1}{3}$                       (3) 3  
(2) 11                          (4) 12
- 9 If  $f(x) = 3x - 5$  and  $g(x) = x - 9$ , which expression is equivalent to  $(f \circ g)(x)$ ?
- (1)  $4x - 14$                       (3)  $3x - 32$   
(2)  $3x - 14$                       (4)  $3x^2 - 32x + 45$
- 10 A central angle of a circular garden measures 2.5 radians and intercepts an arc of 20 feet. What is the radius of the garden?
- (1) 8 ft                              (3) 100 ft  
(2) 50 ft                            (4) 125 ft

- 11 What is a value of  $\text{Arc sin} \left( -\frac{\sqrt{2}}{2} \right)$ ?
- (1)  $\frac{\pi}{4}$                               (3)  $\frac{\pi}{2}$   
(2)  $-\frac{\pi}{4}$                             (4)  $-\frac{\pi}{2}$

**Use this space for  
computations.**

- 12** A graphic designer is drawing a pattern of four concentric circles on the coordinate plane. The center of the circles is located at  $(-2,1)$ . The smallest circle has a radius of 1 unit. If the radius of each of the circles is one unit greater than the largest circle within it, what would be the equation of the fourth circle?

- (1)  $(x - 2)^2 + (y + 1)^2 = 4$
- (2)  $(x + 2)^2 + (y - 1)^2 = 4$
- (3)  $(x - 2)^2 + (y + 1)^2 = 16$
- (4)  $(x + 2)^2 + (y - 1)^2 = 16$

- 13** Carol notices that the number of customers who visit her coffee shop varies inversely with the average daily temperature. Yesterday, the average temperature was  $40^\circ$  and she had 160 customers. If today's average temperature is  $25^\circ$ , how many customers should she expect?

- (1) 100
- (2) 145
- (3) 256
- (4) 1,000

- 14** Given the relation  $A: \{(3,2), (5,3), (6,2), (7,4)\}$

Which statement is true?

- (1) Both  $A$  and  $A^{-1}$  are functions.
- (2) Neither  $A$  nor  $A^{-1}$  is a function.
- (3) Only  $A$  is a function.
- (4) Only  $A^{-1}$  is a function.

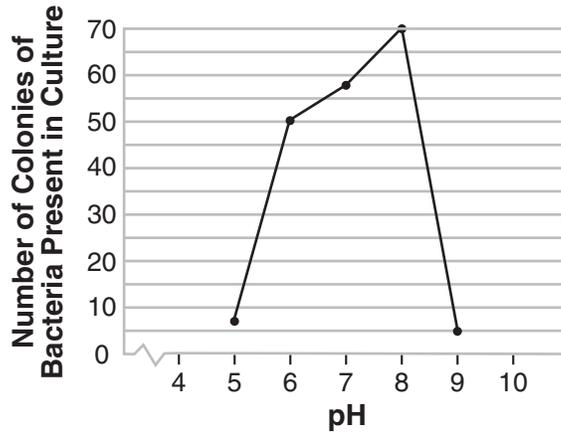
- 15** The expression  $\cot \theta \cdot \sec \theta$  is equivalent to

- (1)  $\frac{\cos \theta}{\sin^2 \theta}$
- (2)  $\frac{\sin \theta}{\cos^2 \theta}$
- (3)  $\csc \theta$
- (4)  $\sin \theta$



Use this space for  
computations.

- 18 The accompanying graph illustrates the presence of a certain strain of bacteria at various pH levels.



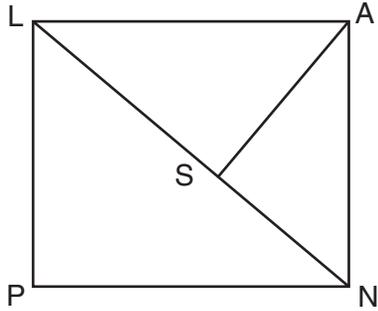
What is the range of this set of data?

- (1)  $5 \leq x \leq 9$                       (3)  $0 \leq y \leq 70$   
(2)  $5 \leq x \leq 70$                       (4)  $5 \leq y \leq 70$
- 19 Juan has been told to write a quadratic equation where the sum of the roots is equal to  $-3$  and the product of the roots is equal to  $-9$ . Which equation meets these requirements?

- (1)  $x^2 + 3x + 9 = 0$                       (3)  $2x^2 + 6x - 18 = 0$   
(2)  $x^2 - 12x + 27 = 0$                       (4)  $(x + 3)(x + 9) = 0$

Use this space for  
computations.

- 20 The accompanying diagram shows part of the architectural plans for a structural support of a building.  $PLAN$  is a rectangle and  $\overline{AS} \perp \overline{LN}$ .



Which equation can be used to find the length of  $\overline{AS}$ ?

- (1)  $\frac{LS}{AS} = \frac{AS}{SN}$                       (3)  $\frac{AS}{SN} = \frac{AS}{LS}$   
(2)  $\frac{AN}{LN} = \frac{AS}{LS}$                       (4)  $\frac{AS}{LS} = \frac{LS}{SN}$
-

## Part II

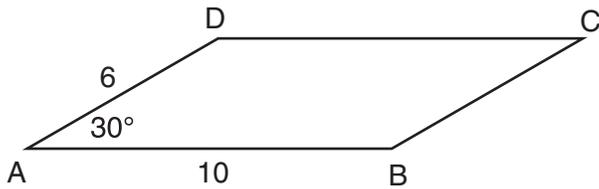
Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

21 Solve for  $x$ :  $\sqrt{x + 18} - 2 = 2$

**22** Evaluate:  $\sum_{n=1}^3 \left( \sin \frac{n\pi}{2} \right)$

**23** Given a starting population of 100 bacteria, the formula  $b = 100(2^t)$  can be used to find the number of bacteria,  $b$ , after  $t$  periods of time. If each period is 15 minutes long, how many minutes will it take for the population of bacteria to reach 51,200?

24 In the accompanying diagram of parallelogram  $ABCD$ ,  $m\angle A = 30$ ,  $AB = 10$ , and  $AD = 6$ . What is the area of parallelogram  $ABCD$ ?



**25** What is the solution of the inequality  $|2x - 5| \leq 11$ ?

**26** The volume of Earth can be calculated by using the formula  
 $V = \frac{4}{3}\pi r^3$ . Solve for  $r$  in terms of  $V$ .

### Part III

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 The average monthly high temperatures, in degrees Fahrenheit, for Binghamton, New York, are given below.

January	28	July	78
February	31	August	76
March	41	September	68
April	53	October	57
May	68	November	44
June	73	December	33

For these temperatures, find, to the *nearest tenth*, the mean, the population standard deviation, and the number of months that fall within one standard deviation of the mean.

**28** Perform the indicated operations and express in simplest form:

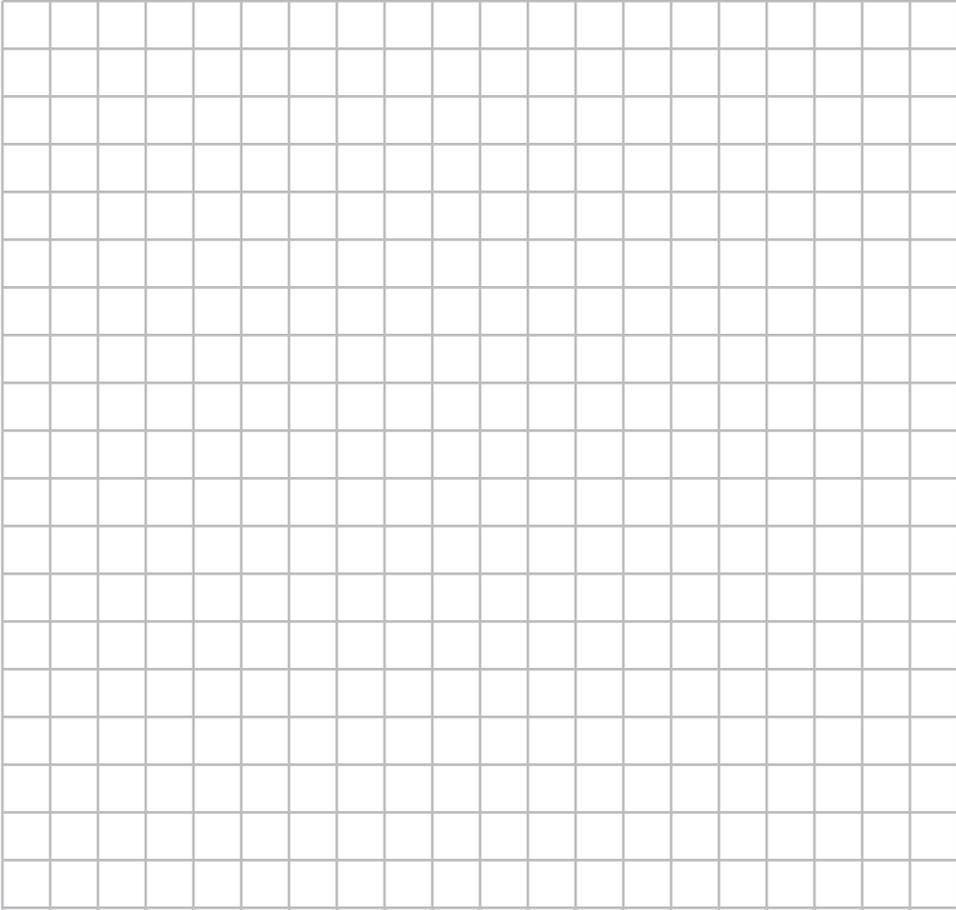
$$\frac{3x^2 + 12x - 15}{x^2 + 2x - 15} \div \frac{3x^2 - 3x}{3x - x^2}$$

**29** In  $\triangle ABC$ ,  $a = 24$ ,  $b = 36$ , and  $c = 30$ . Find  $m\angle A$  to the *nearest tenth of a degree*.

**30** Farmington, New York, has plans for a new triangular park. If plotted on a coordinate grid, the vertices would be  $A(3,3)$ ,  $B(5,-2)$ , and  $C(-3,-1)$ . However, a tract of land has become available that would enable the planners to increase the size of the park, which is based on the following transformation of the original triangular park,  $R_{270^\circ} \circ D_2$ .

On the grid on the next page, graph and label both the original park  $\triangle ABC$  and its image, the new park  $\triangle A''B''C''$ , following the transformation.

**Question 30 continued**



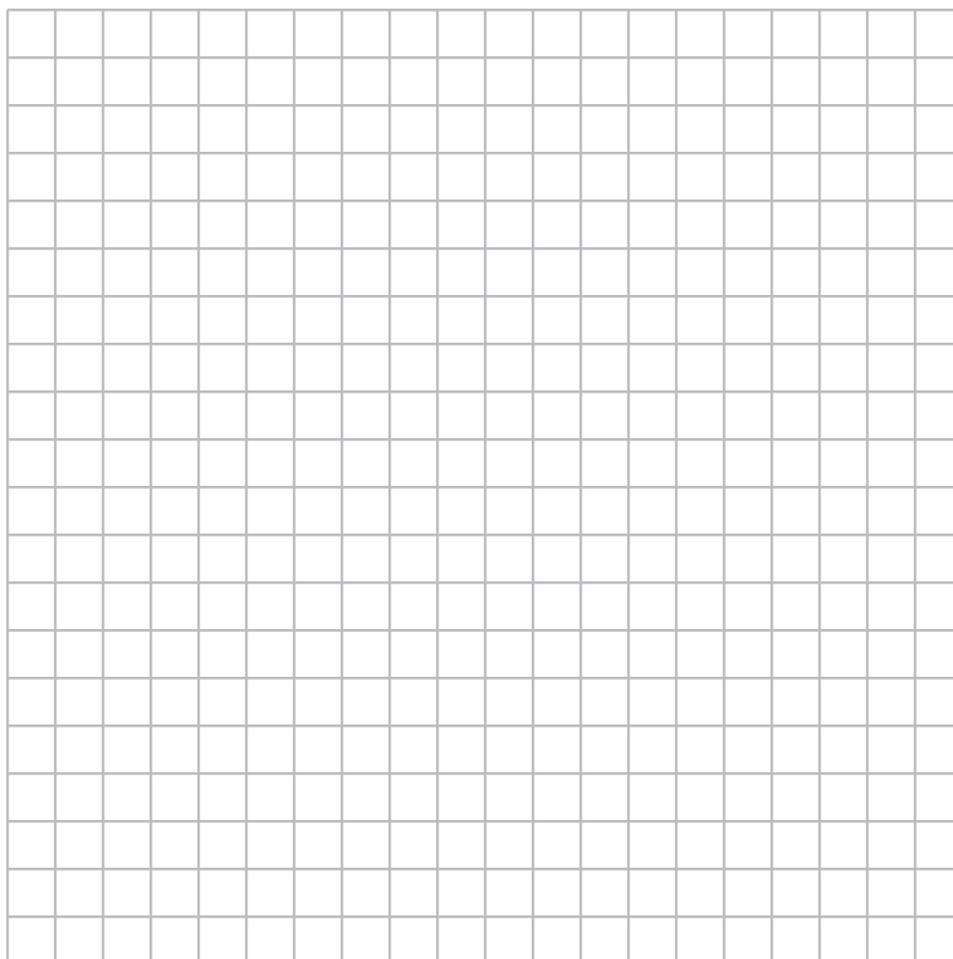
**31** Find the roots of the equation  $x^2 + 7 = 2x$  and express your answer in simplest  $a + bi$  form.

**32** On the accompanying grid, graph the following system of equations over the interval  $-6 \leq x \leq 6$ .

$$x^2 + y^2 = 25$$

$$xy = 12$$

State the points of intersection.



### 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 The accompanying table shows wind speed and the corresponding wind chill factor when the air temperature is  $10^{\circ}\text{F}$ .

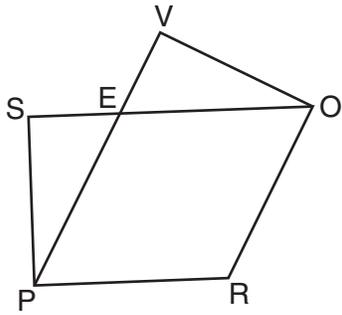
Wind Speed (mi/h) $x$	Wind Chill Factor ( $^{\circ}\text{F}$ ) $y$
4	3
5	1
12	-5
16	-7
22	-10
31	-12

Write the logarithmic regression equation for this set of data, rounding coefficients to the *nearest ten thousandth*.

Using this equation, find the wind chill factor, to the *nearest degree*, when the wind speed is 50 miles per hour.

Based on your equation, if the wind chill factor is  $0^{\circ}$ , what is the wind speed, to the *nearest mile per hour*?

34 Given:  $PROE$  is a rhombus,  $\overline{SEO}$ ,  $\overline{PEV}$ ,  $\angle SPR \cong \angle VOR$



Prove:  $\overline{SE} \cong \overline{EV}$

# 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

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

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

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

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

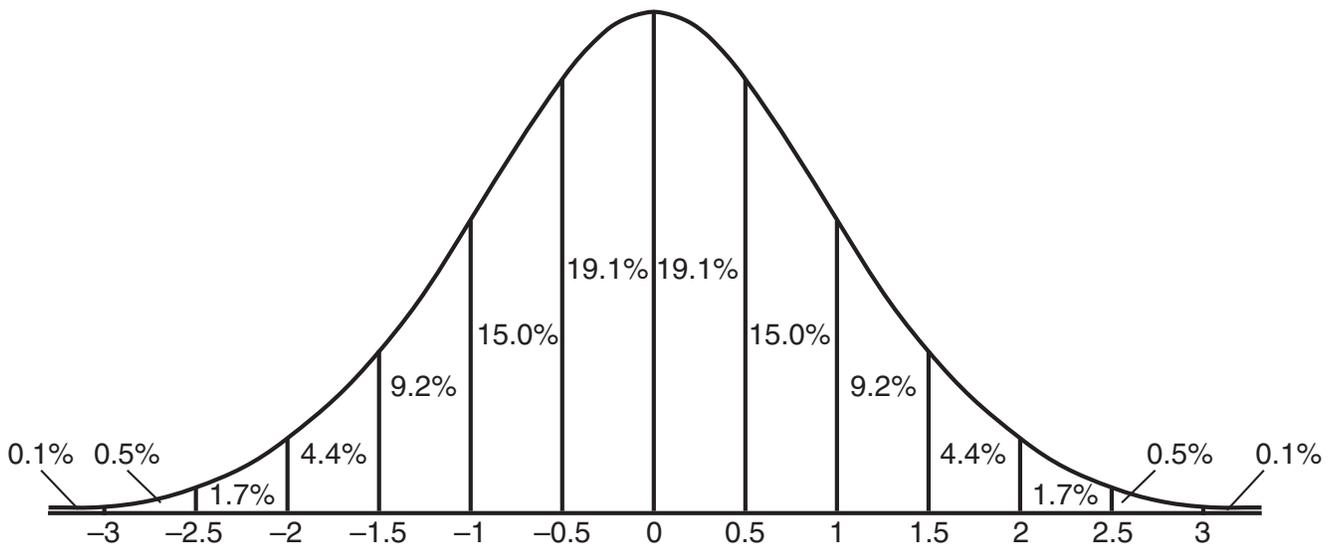
## Functions of the Half Angle

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

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

## Normal Curve

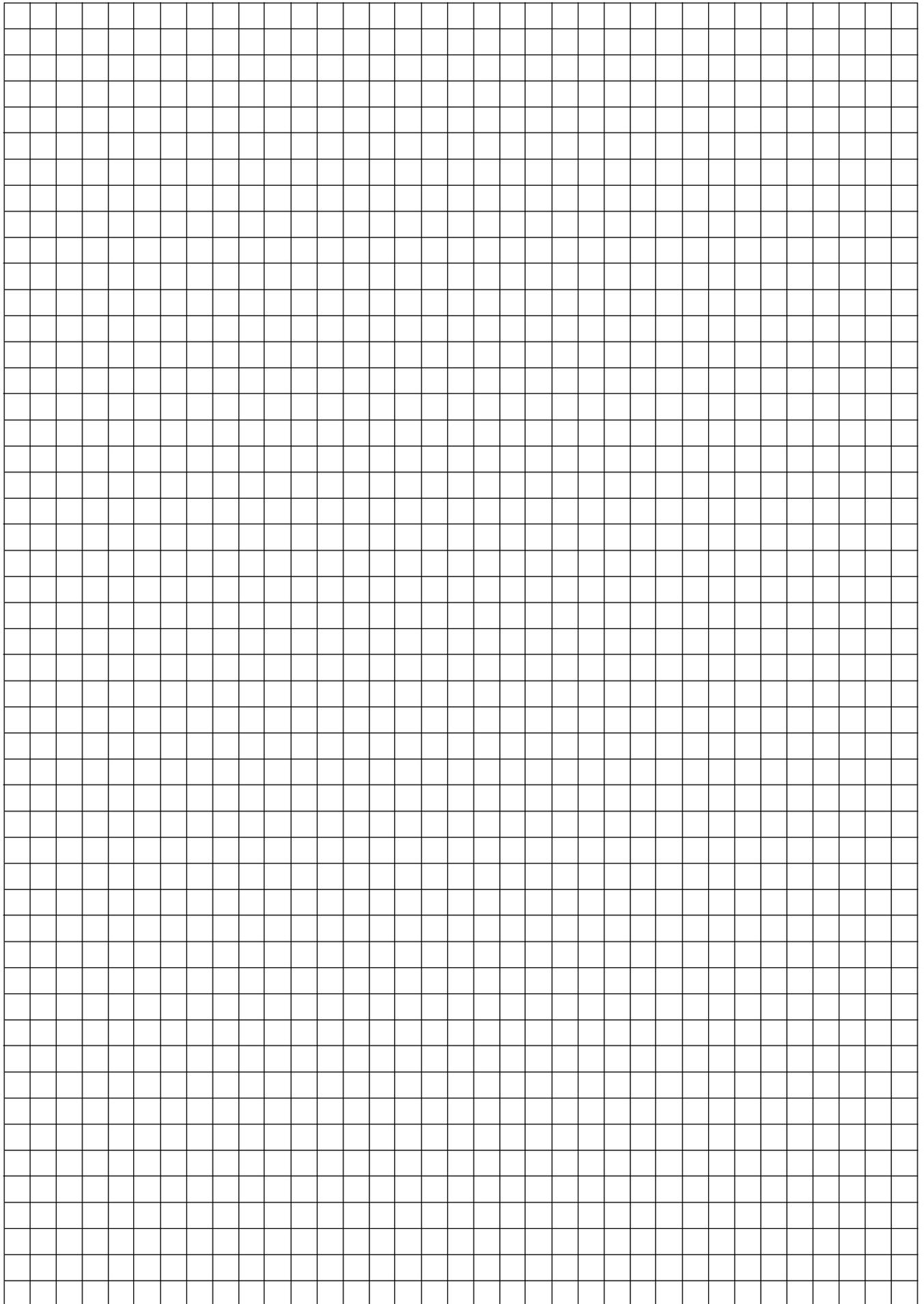
### Standard Deviation



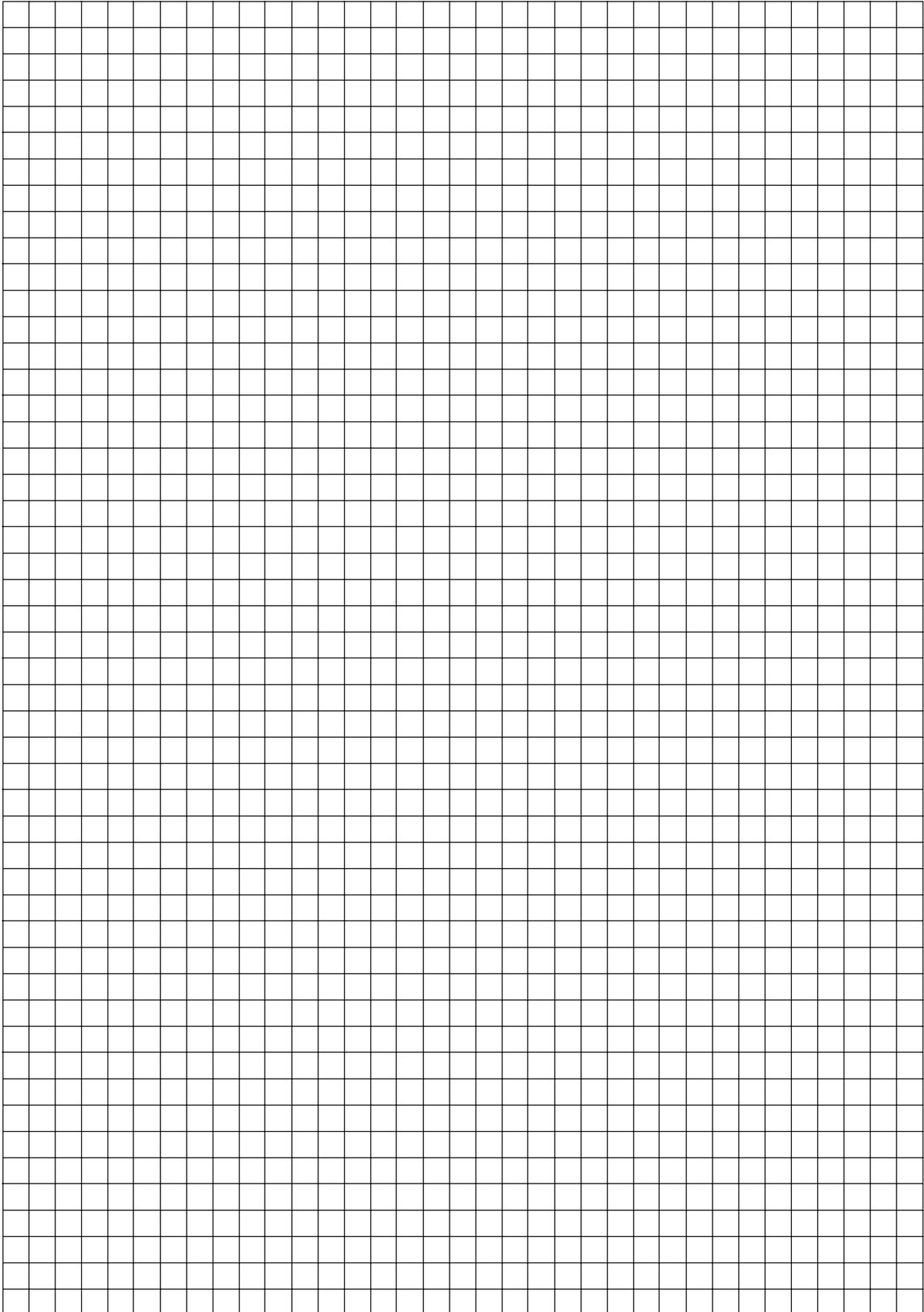
**Scrap Graph Paper — This sheet will *not* be scored.**

Tear Here

Tear Here



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

Tuesday, January 27, 2009 — 9:15 a.m. to 12:15 p.m., only

ANSWER SHEET

Student ..... Sex:  Male  Female Grade .....

Teacher ..... School .....

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

Part I

Answer all 20 questions in this part.

- 1 ..... 6 ..... 11 ..... 16 .....
2 ..... 7 ..... 12 ..... 17 .....
3 ..... 8 ..... 13 ..... 18 .....
4 ..... 9 ..... 14 ..... 19 .....
5 ..... 10 ..... 15 ..... 20 .....

Your answers for Parts II, III, and IV should be written in the test booklet.

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



# FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

## MATHEMATICS B

Tuesday, January 27, 2009 — 9:15 a.m. to 12:15 p.m., only

### SCORING KEY

#### Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Mathematics B examination. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examinations in Mathematics A and Mathematics B*.

Use only *red* ink or *red* pencil in rating Regents papers. Do *not* attempt to correct the student's work by making insertions or changes of any kind. Use check marks to indicate student 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.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. On the back of the student's detachable answer sheet, raters must enter their initials in the boxes next to the questions they have scored and also write their name in the box under the heading "Rater's/Scorer's Name."

Raters should record the student's scores for all questions and the total raw score on the student's detachable answer sheet. Then the student's total raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Tuesday, January 27, 2009. The student's scaled score should be entered in the box provided on the student's detachable answer sheet. The scaled score is the student's final examination score.

#### Part I

Allow a total of 40 credits, 2 credits for each of the following. Allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 4	(6) 1	(11) 2	(16) 4
(2) 3	(7) 2	(12) 4	(17) 1
(3) 4	(8) 4	(13) 3	(18) 4
(4) 2	(9) 3	(14) 3	(19) 3
(5) 4	(10) 1	(15) 3	(20) 1

Updated information regarding the rating of this examination may be posted on the New York State Education Department’s web site during the rating period. Check this web site <http://www.emsc.nysed.gov/osa/> and select the link “Examination Scoring Information” for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents examination period.

### General Rules for Applying Mathematics Rubrics

#### I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examinations in Mathematics A and Mathematics B are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher’s professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examinations in Mathematics A and Mathematics B*, use their own professional judgment, confer with other mathematics teachers, and/or contact the consultants at the State Education Department for guidance. During each Regents examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

#### II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase “such as”), it does **not** mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

#### III. Appropriate Work

*Full-Credit Responses:* The directions in the examination booklet for all the constructed-response questions state: “Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, charts, etc.” The student has the responsibility of providing the correct answer **and** showing how that answer was obtained. The student must “construct” the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

*Responses With Errors:* Rubrics that state “Appropriate work is shown, but ...” are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete, i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has **not** been shown. Other rubrics address incomplete responses.

#### IV. Multiple Errors

*Computational Errors, Graphing Errors, and Rounding Errors:* Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in any response. The teacher must carefully review the student’s work to determine what errors were made and what type of errors they were.

*Conceptual Errors:* A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents. A response with one conceptual error can receive no more than half credit.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

If a response shows two (or more) different major conceptual errors, it should be considered completely incorrect and receive no credit.

If a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors: i.e., awarding half credit for the conceptual error and deducting 1 credit for each mechanical error (maximum of two deductions for mechanical errors).

**Part II**

For each question, use the specific criteria to award a maximum of two credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

- (21) [2]  $-2$ , and appropriate work is shown, such as solving the equation algebraically, graphically, or using trial and error with at least three trials and appropriate checks.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] The trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but no solution is found.

*or*

[1]  $-2$ , but no work or fewer than three trials and appropriate checks are shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (22) [2]  $0$ , and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1]  $0$ , but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS B – *continued*

(23) [2] 135, and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made.

**or**

[1] Appropriate work is shown, but one conceptual error is made.

**or**

[1] Appropriate work is shown to find 9, the number of periods, but it is not converted to minutes.

**or**

[1] 135, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(24) [2] 30, and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made.

**or**

[1] Appropriate work is shown, but one conceptual error is made, such as finding only half the area of the parallelogram.

**or**

[1] The altitude of the parallelogram is found to be 3, but no further correct work is shown.

**or**

[1] 30, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS B – *continued*

- (25) [2]  $-3 \leq x \leq 8$  or an equivalent expression, and appropriate work is shown.
- [1] Appropriate work is shown, but one computational error is made.
- or**
- [1] Appropriate work is shown, but one conceptual error is made.
- or**
- [1] Appropriate work is shown, but only  $x \leq 8$  or  $-3 \leq x$  is found.
- or**
- [1]  $-3 \leq x \leq 8$ , but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (26) [2]  $r = \sqrt[3]{\frac{3V}{4\pi}}$  or an equivalent answer, and appropriate work is shown.
- [1] Appropriate work is shown, but one computational error is made.
- or**
- [1] Appropriate work is shown, but one conceptual error is made.
- or**
- [1]  $r = \sqrt[3]{\frac{3V}{4\pi}}$  or an equivalent answer, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

**Part III**

For each question, use the specific criteria to award a maximum of four credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(27) [4]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , and the number of months is 6, and appropriate work is shown.

[3]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , but one computational error is made in determining the number of months.

*or*

[3]  $\bar{x} = 54.2$ , but  $\sigma$  is incorrect, but work is shown to find an appropriate number of months.

*or*

[3]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , and the number of months is 6, but no work is shown.

[2]  $\bar{x}$  and  $\sigma$  are incorrect, but work is shown to find an appropriate number of months.

*or*

[2]  $\bar{x} = 54.2$ ,  $\sigma = 17.6$ , but the number of months is not determined.

[1] 6, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS B – *continued*

- (28) [4]  $-1$ , and appropriate work is shown.
- [3] Appropriate work is shown, but one computational, factoring, or simplification error is made.
- [2] Appropriate work is shown, but two or more computational, factoring, or simplification errors are made.
- or***
- [2] Appropriate work is shown, but one conceptual error is made, such as not factoring out  $-1$  or not multiplying by the reciprocal.
- [1] Appropriate work is shown, but one conceptual error and one computational, factoring, or simplification error are made.
- or***
- [1]  $-1$ , but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS B – *continued*

- (29) [4] 41.4, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.
- or***
- [2] Appropriate work is shown, but one conceptual error is made.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
- or***
- [1] A correct substitution is made into the Law of Cosines, but no further correct work is shown.
- or***
- [1] 41.4, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS B – *continued*

(30) [4] Triangles  $ABC$  and  $A''B''C''$  are graphed and labeled correctly. [Students are *not* required to state the coordinates  $A''(6,-6)$ ,  $B''(-4,-10)$ , and  $C''(-2,6)$ .]

[3] Appropriate work is shown, but one computational or graphing error is made.

**or**

[3] Only triangle  $A''B''C''$  is graphed and labeled correctly.

[2] Appropriate work is shown, but two or more computational or graphing errors are made.

**or**

[2] Appropriate work is shown, but one conceptual error is made.

**or**

[2] Triangle  $ABC$  is graphed and labeled correctly, and either the rotation or dilation is graphed and labeled correctly.

**or**

[2] The coordinates  $A''(6,-6)$ ,  $B''(-4,-10)$ , and  $C''(-2,6)$  are stated, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.

**or**

[1] Triangle  $ABC$  is graphed and labeled correctly, but no further correct work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS B – *continued*

(31) [4]  $1 \pm i\sqrt{6}$ , and appropriate work is shown.

[3] Appropriate work is shown, but one computational error is made.

*or*

[3] Appropriate work is shown, but the solution is expressed as  $\frac{2 \pm 2i\sqrt{6}}{2}$ .

[2] Appropriate work is shown, but two or more computational errors are made.

*or*

[2] Appropriate work is shown, but one conceptual error is made.

*or*

[2] Appropriate work is shown, but the solution is expressed as  $\frac{2 \pm \sqrt{-24}}{2}$ .

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

*or*

[1] A correct substitution is made in the quadratic formula, but no further correct work is shown.

*or*

[1]  $1 \pm i\sqrt{6}$ , but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS B – *continued*

- (32) [4]  $(3,4)$ ,  $(4,3)$ ,  $(-3,-4)$ , and  $(-4,-3)$ , and appropriate graphs are drawn.
- [3] Appropriate work is shown, but one computational or graphing error is made.
- or*
- [3] Appropriate graphs are drawn, but only two or three points of intersection are identified.
- [2] Appropriate work is shown, but two or more computational or graphing errors are made.
- or*
- [2] Appropriate work is shown, but one conceptual error is made, such as only graphing half of the hyperbola and finding two points of intersection.
- or*
- [2] Appropriate graphs are drawn, but no points of intersection are identified.
- [1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
- or*
- [1] Either the circle or the hyperbola is graphed correctly, but no further correct work is shown.
- or*
- [1]  $(3,4)$ ,  $(4,3)$ ,  $(-3,-4)$ , and  $(-4,-3)$ , but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

**Part IV**

For each question, use the specific criteria to award a maximum of six credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(33) [6]  $y = 13.0134 - 7.3135 \ln x$ ,  $-16$ , and  $6$ , and appropriate work is shown.

[5] Appropriate work is shown, but one computational or rounding error is made.

***or***

[5] The expression  $13.0134 - 7.3135 \ln x$  is written and  $-16$  and  $6$  are found, and appropriate work is shown.

[4] Appropriate work is shown, but two or more computational or rounding errors are made.

***or***

[4] A correct logarithmic regression equation is written, but either the wind chill factor or the wind speed is not found, but appropriate work is shown.

***or***

[4] An incorrect logarithmic regression equation of equal difficulty is written, but appropriate answers are found for the wind chill factor and the wind speed, and appropriate work is shown.

[3] Appropriate work is shown, but one conceptual error is made.

***or***

[3]  $y = 13.0134 - 7.3135 \ln x$ ,  $-16$ , and  $6$ , but no work is shown.

***or***

[3] The expression  $13.0134 - 7.3135 \ln x$  is written and either  $-16$  or  $6$  is found, and appropriate work is shown.

[2] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

***or***

[2]  $y = 13.0134 - 7.3135 \ln x$ , but no further correct work is shown.

***or***

[2] An incorrect logarithmic regression equation of equal difficulty is written, but an appropriate answer is found for either the wind chill factor or the wind speed, and appropriate work is shown.

***or***

MATHEMATICS B – *continued*

[2] An incorrect regression equation of a lesser degree of difficulty is written, but appropriate answers are found for the wind chill factor and the wind speed, and appropriate work is shown.

*or*

[2]  $-16$  and  $6$ , but no equation is written and no work is shown.

[1] An incorrect regression equation of a lesser degree of difficulty is written, but an appropriate answer is found for either the wind chill factor or the wind speed, and appropriate work is shown.

*or*

[1] The expression  $13.0134 - 7.3135 \ln x$  is written, but no further correct work is shown.

*or*

[1]  $-16$  *or*  $6$ , but no equation is written and no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (34) [6] A complete and correct proof that includes a conclusion is written.
- [5] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement and/or reason is missing or is incorrect.

*or*

- [5]  $\triangle SEP \cong \triangle VEO$  is proven, but no further correct work is shown.
- [4] A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two statements and/or reasons are missing or are incorrect.
- [3] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
- [2] Some correct relevant statements about the proof are made, but three or four statements and/or reasons are missing or are incorrect.
- [1] Only one correct statement and reason are written.
- [0] The “given” and/or the “prove” statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.

*or*

- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

**Map to Learning Standards**

<b>Key Ideas</b>	<b>Item Numbers</b>
Mathematical Reasoning	34
Number and Numeration	2, 5, 9, 19
Operations	1, 26, 28
Modeling/Multiple Representation	7, 12, 13, 16, 17, 23, 30, 32
Measurement	8, 10, 11, 20, 24, 27, 29
Uncertainty	3, 18, 22, 33
Patterns/Functions	4, 6, 14, 15, 21, 25, 31

**Regents Examination in Mathematics B**

**January 2009**

**Chart for Converting Total Test Raw Scores to  
Final Examination Scores (Scaled Scores)**

**The *Chart for Determining the Final Examination Score for the January 2009 Regents Examination in Mathematics B* will be posted on the Department’s web site <http://www.emsc.nysed.gov/osa/> on Tuesday, January 27, 2009. Conversion charts provided for the previous administrations of the Regents Examination in Mathematics B must NOT be used to determine students’ final scores for this administration.**

**Online Submission of Teacher Evaluations of the Test to the Department**

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to <http://www.emsc.nysed.gov/osa/exameval>.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

**As a reminder . . .**

**Regents examinations based on the Mathematics A syllabus will not be offered after January 2009.**

**Regents examinations based on the Mathematics B syllabus will not be offered after June 2010.**



## Regents Examination in Mathematics B January 2009

Chart for Converting Total Test Raw Scores to  
Final Examination Scores (Scale Scores)

Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score
88	100	58	74	28	44
87	99	57	73	27	43
86	98	56	72	26	42
85	97	55	71	25	41
84	96	54	70	24	40
83	95	53	69	23	39
82	95	52	68	22	37
81	94	51	67	21	36
80	93	50	66	20	35
79	92	49	65	19	34
78	91	48	64	18	32
77	90	47	63	17	31
76	90	46	62	16	30
75	89	45	61	15	28
74	88	44	60	14	27
73	87	43	59	13	25
72	86	42	58	12	24
71	85	41	57	11	22
70	84	40	56	10	21
69	84	39	55	9	19
68	83	38	54	8	17
67	82	37	53	7	15
66	81	36	52	6	13
65	80	35	51	5	11
64	79	34	50	4	9
63	78	33	49	3	7
62	77	32	48	2	5
61	76	31	47	1	3
60	76	30	46	0	0
59	75	29	45		

To determine the student's final examination score, find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

All student answer papers that receive a scale score of 60 through 64 **must** be scored a second time to ensure the accuracy of the score. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper.

Because scale scores corresponding to raw scores in the conversion chart change from one examination to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Mathematics B.