MATHEMATICS A

Thursday, August 12, 1999 — 8:30 to 11:30 a.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. 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 35 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 for the questions in Parts II, III, and IV directly in this booklet. Clearly indicate the necessary steps you take, 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 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.

Notice...

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

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. Record your answers in the spaces provided on the separate answer sheet. [40]

1 A roll of candy is shown in the accompanying diagram.

The shape of the candy is best described as a

(1) rectangular solid   (3) cone
(2) pyramid   (4) cylinder

2 The expression $\sqrt{50}$ can be simplified to

(1) $5\sqrt{2}$ (3) $2\sqrt{25}$
(2) $5\sqrt{10}$ (4) $25\sqrt{2}$

3 The transformation of $\triangle ABC$ to $\triangle AB\,C$ is shown in the accompanying diagram.
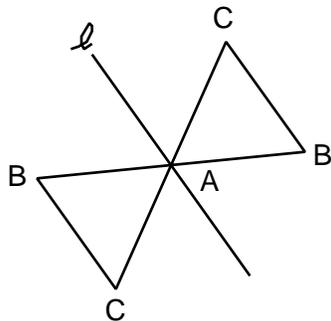
This transformation is an example of a

(1) line reflection in line ℓ
(2) rotation about point A
(3) dilation
(4) translation

4 Which expression is equivalent to 6.02×10^{23}?

(1) 0.602×10^{21} (3) 602×10^{21}
(2) 60.2×10^{21} (4) 6020×10^{21}

5 The Pentagon building in Washington, D.C., is shaped like a regular pentagon. If the length of one side of the Pentagon is represented by $n + 2$, its perimeter would be represented by

(1) $5n + 10$ (3) $n + 10$
(2) $5n + 2$ (4) $10n$

6 The product of $4x^2y$ and $2xy^3$ is

(1) $8x^2y^3$　　　　　(3) $8x^3y^4$

(2) $8x^3y^3$　　　　　(4) $8x^2y^4$

7 Which equation is an illustration of the additive identity property?

(1) $x \cdot 1 = x$　　　　(3) $x - x = 0$

(2) $x + 0 = x$　　　　(4) $x \cdot \frac{1}{x} = 1$

8 The formula $C = \frac{5}{9}(F - 32)$ can be used to find the Celsius temperature (C) for a given Fahrenheit temperature (F). What Celsius temperature is equal to a Fahrenheit temperature of 77°?

(1) 8°　　　　　(3) 45°

(2) 25°　　　　　(4) 171°

9 In the accompanying diagram of rectangle *ABCD*, m∠*BAC* = $3x + 4$ and m∠*ACD* = $x + 28$.
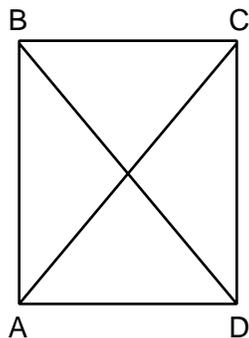
What is m∠*CAD*?

(1) 12　　　　　(3) 40

(2) 37　　　　　(4) 50

10 On June 17, the temperature in New York City ranged from 90° to 99°, while the temperature in Niagara Falls ranged from 60° to 69°. The difference in the temperatures in these two cities must be between

(1) 20° and 30°　　　　(3) 25° and 35°

(2) 20° and 40°　　　　(4) 30° and 40°

11 Which expression is equivalent to $\frac{a}{x} + \frac{b}{2x}$?

(1) $\frac{2a+b}{2x}$　　　　(3) $\frac{a+b}{3x}$

(2) $\frac{2a+b}{x}$　　　　(4) $\frac{a+b}{2x}$

12 What is true about the statement "If two angles are right angles, the angles have equal measure" and its converse "If two angles have equal measure then the two angles are right angles"?

(1) The statement is true but its converse is false.
(2) The statement is false but its converse is true.
(3) Both the statement and its converse are false.
(4) Both the statement and its converse are true.

13 If 6 and *x* have the same mean (average) as 2, 4, and 24, what is the value of *x*?

(1) 5   (3) 14
(2) 10   (4) 36

14 In a hockey league, 87 players play on seven different teams. Each team has at least 12 players. What is the largest possible number of players on any one team?

(1) 13   (3) 15
(2) 14   (4) 21

15 In the accompanying diagram of equilateral triangle *ABC*, *DE* = 5 and $\overline{DE} \parallel \overline{AB}$.
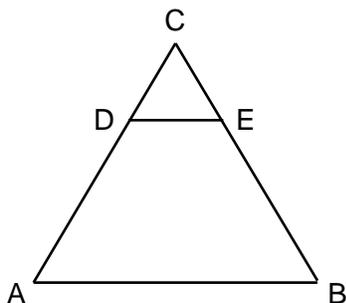
If *AB* is three times as long as *DE*, what is the perimeter of quadrilateral *ABED*?

(1) 20   (3) 35
(2) 30   (4) 40

16 At a concert, $720 was collected for hot dogs, hamburgers, and soft drinks. All three items sold for $1.00 each. Twice as many hot dogs were sold as hamburgers. Three times as many soft drinks were sold as hamburgers. The number of soft drinks sold was

(1) 120   (3) 360
(2) 240   (4) 480

17 How many different 6-letter arrangements can be formed using the letters in the word "ABSENT," if each letter is used only once?

(1) 6   (3) 720
(2) 36   (4) 46,656

18 The ratio of the corresponding sides of two similar squares is 1 to 3. What is the ratio of the area of the smaller square to the area of the larger square?

(1) 1:$\sqrt{3}$ (3) 1:6
(2) 1:3 (4) 1:9

19 What is the slope of the line whose equation is $3x - 4y - 16 = 0$?

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

20 What is the perimeter of an equilateral triangle whose height is $2\sqrt{3}$?

(1) 6 (3) $6\sqrt{3}$
(2) 12 (4) $12\sqrt{3}$

**Use this space for computations.**

Math. A – Aug. '99 [5] [OVER]

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.   [10]

21 Solve for x: $2(x - 3) = 1.2 - x$

22 The Grimaldis have three children born in different years.

   a Draw a tree diagram or list a sample space to show all the possible arrangements of boy and girl children in the Grimaldi family.

   b Using your information from part *a*, what is the probability that the Grimaldis have three boys?

23 Paloma has 3 jackets, 6 scarves, and 4 hats. Determine the number of different outfits consisting of a jacket, a scarf, and a hat that Paloma can wear.

24 In a recent poll, 600 people were asked whether they liked Chinese food. A circle graph was constructed to show the results. The central angles for two of the three sectors are shown in the accompanying diagram. How many people had no opinion?

Chinese Food
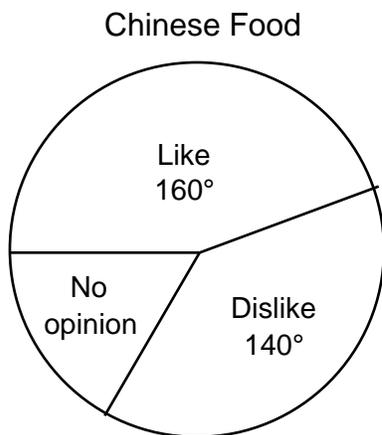
25 Maria's backyard has two trees that are 40 feet apart, as shown in the accompanying diagram. She wants to place lampposts so that the posts are 30 feet from both of the trees. Draw a sketch to show where the lampposts could be placed in relation to the trees. How many locations for the lampposts are possible?

40 ft
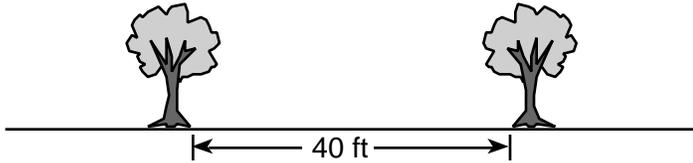
Answer all questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessar y steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 cr edit. [15]

26 Solve for x: $x^2 + 3x - 40 = 0$

27 A person standing on level ground is 2,000 feet away from the foot of a 420-foot-tall building, as shown in the accompanying diagram. To the *nearest degree*, what is the value of x?
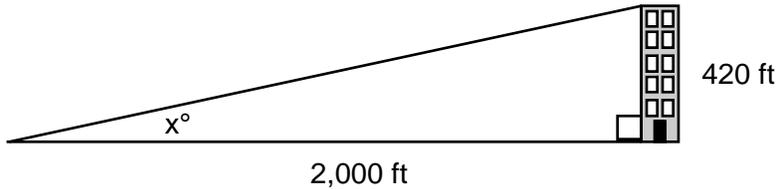
28 Bob and Ray are describing the same number. Bob says, "The number is a positive even integer less than or equal to 20." Ray says, "The number is divisible by 4." If Bob's statement is true and Ray's statement is false, what are all the possible numbers?

29 Line ℓ contains the points (0,4) and (2,0). Show that the point (–25,81) does *or* does not lie on line ℓ.

30 A painting that regularly sells for a price of $55 is on sale for 20% off. The sales tax on the painting is 7%. Will the final total cost of the painting differ depending on whether the salesperson deducts the discount before adding the sales tax or takes the discount after computing the sum of the original price and the sales tax on $55?

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessar y 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 cr   edit.   [20]

31 The profits in a business are to be shared by the three partners in the ratio of 3 to 2 to 5. The profit for the year was $176,500. Determine the number of dollars each partner is to receive.

32 If asphalt pavement costs $0.78 per square foot, determine, to the *nearest cent,* the cost of paving the shaded circular road with center *O,* an outside radius of 50 feet, and an inner radius of 36 feet, as shown in the accompanying diagram.
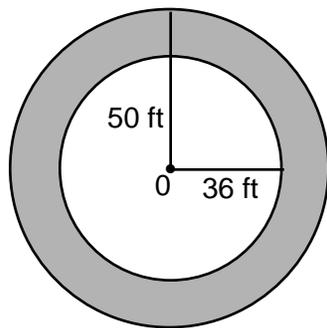
33 An arch is built so that it is 6 feet wide at the base. Its shape can be represented by a parabola with the equation $y = -2x^2 + 12x$, where y is the height of the arch.

a Graph the parabola from $x = 0$ to $x = 6$ on the grid below.
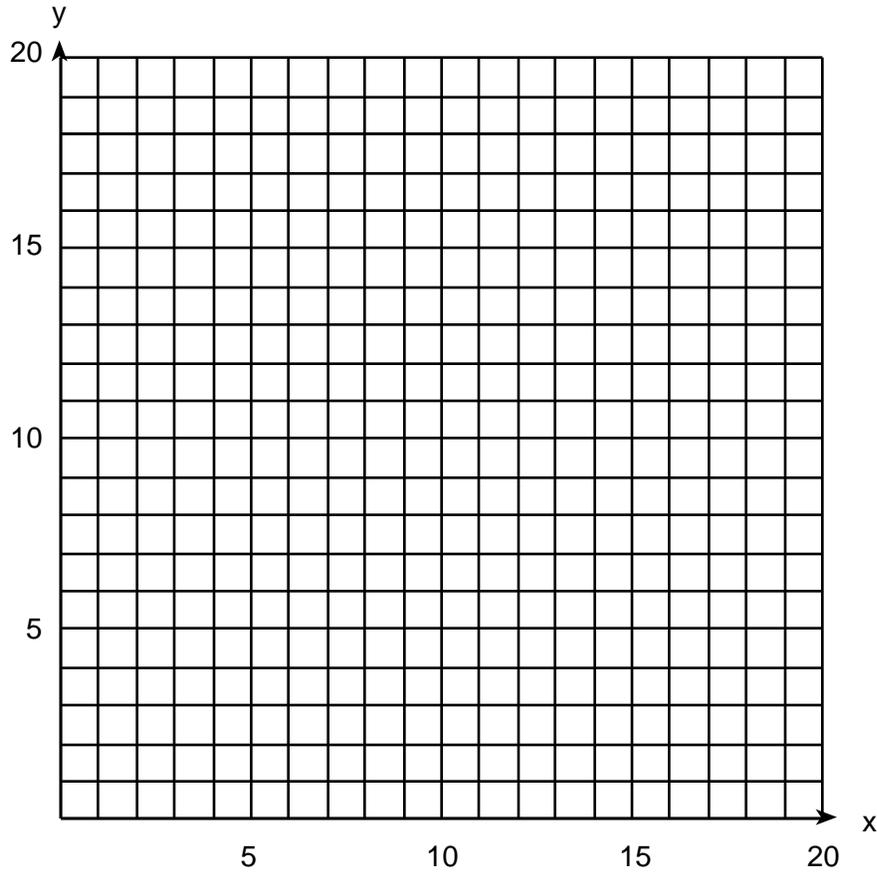
b Determine the maximum height, y, of the arch.

34 Mr. Gonzalez owns a triangular plot of land *BCD* with *DB* = 25 yards and *BC* = 16 yards. He wishes to purchase the adjacent plot of land in the shape of right triangle *ABD*, as shown in the accompanying diagram, with *AD* = 15 yards. If the purchase is made, what will be the total number of square yards in the area of his plot of land, △*ACD*?

D

15 yd   25 yd

A   B   16 yd   C

(not drawn to scale)
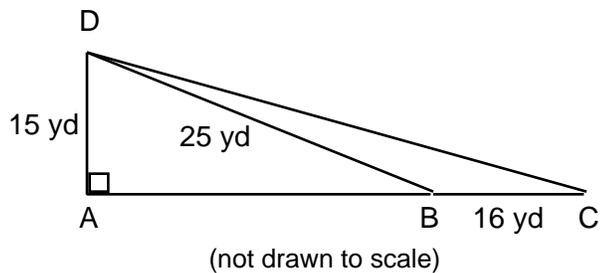
35 Two health clubs offer different membership plans. The graph below represents the total cost of belonging to Club *A* and Club *B* for one year.

Health Club Fees
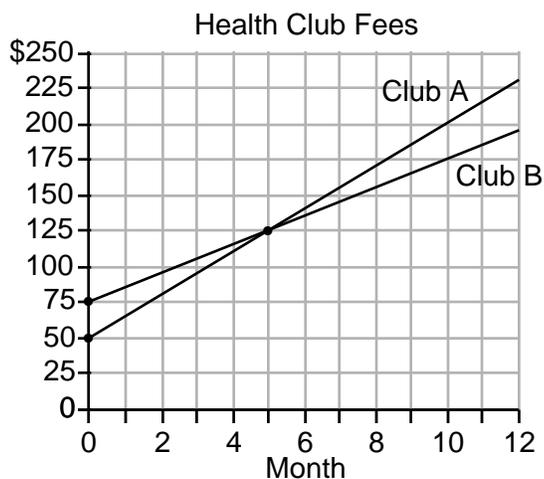
a If the yearly cost includes a membership fee plus a monthly charge, what is the membership fee for Club *A*?

b (1) What is the number of the month when the total cost is the same for both clubs?

   (2) What is the total cost for Club *A* when both plans are the same?

c What is the monthly charge for Club *B*?

The University of the State of New York

MATHEMATICS A

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

ANSWER SHEET

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

MATHEMATICS A			
Question	Maximum Credit	Credits Earned	Rater/Scorer's Initials
Part I 1–20	40		
Part II 21	2		
22	2		
23	2		
24	2		
25	2		
Part III 26	3		
27	3		
28	3		
29	3		
30	3		
Part IV 31	4		
32	4		
33	4		
34	4		
35	4		
Maximum Total	85		

Rater/Scorer's Name (minimum of three)

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 scor   e.**

FOR TEACHERS ONLY

MATHEMATICS A

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

SCORING KEY

Mechanics of Rating

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

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 checkmarks 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/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 printed at the end of this key. 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) 3	(11) 1	(16) 3
(2) 1	(7) 2	(12) 1	(17) 3
(3) 2	(8) 2	(13) 3	(18) 4
(4) 3	(9) 4	(14) 3	(19) 1
(5) 1	(10) 2	(15) 4	(20) 2

Part II

For each question, use the specific criteria to award a maximum of two credits.

(21) **[2]** 2.4 and appropriate work is shown.

[1] The student shows correct use of the distributive property to obtain $2x - 6$ *or* other appropriate algebraic technique.

or

[1] 2.4 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.

(22) *a* **[1]** A correct tree diagram *or* listing of all 8 possibilities is shown.

 b **[1]** $\frac{1}{8}$

or

[1] An appropriate answer is given for an incorrect part *a* tree diagram or listing.

a and *b*

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

(23) **[2]** 72 and an appropriate method, such as $3 \times 6 \times 4$, is shown.

[1] 72 and no explanation is given.

or

[1] An appropriate method is shown, but the student has one computational mistake or an incomplete listing, such as 2 of the 3 clothing categories.

[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]** 100 and an appropriate method is shown, such as 360 – 300 = 60 degrees, which
is $\frac{1}{6}$ of the circle so $\frac{1}{6}$ of 600 is 100.

[1] 100 and no explanation is given.

or

[1] An incorrect degree measure is used to develop a fraction by which to multiply
600, obtaining an appropriate answer.

or

[1] A correct degree measure is used to develop $\frac{1}{6}$.

or

[1] 60 degrees is used, but an incorrect number of people is found.

[0] Only 60 degrees is found.

or

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

(25) **[2]** 2 and an appropriate sketch of two circles intersecting in two points is shown.

[1] 2 and no sketch is shown.

or

[1] An appropriate sketch is shown, without indicating 2 as the possibilities.

or

[1] An appropriate number is found, based on an inappropriate sketch.

[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 three credits.

(26) **[3]** –8 and 5 and appropriate work is shown, such as factoring or trial and error.

  [2] The student shows correct factoring into $(x + 8)(x - 5)$ *or* correct use of the quadratic formula but finds only one correct value for *x*.

  [1] Correct factoring is shown, but no values are found.

or

  [1] Incorrect factoring is shown, but two appropriate values are found.

or

  [1] Either –8 *or* 5 is arrived at by trial and error.

or

  [1] –8 and 5 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.

(27) **[3]** 12 and the equation $\tan x = \dfrac{420}{2000} = .21$ is shown.

or

  [3] 12 and the Pythagorean theorem and an appropriate trigonometric function are correctly used.

  [2] Tan function is correctly used, but the answer is not rounded, such as 11.859.

or

  [2] The setup is correct, but one computational mistake is made, and an appropriate angle is found.

or

  [2] The answer is incorrectly expressed, such as $\tan x = 12$.

  [1] The tan function is set up correctly, but the angle is not computed.

or

  [1] 12 and no work is shown.

or

  [1] 12 and $\sin x = \dfrac{420}{2000}$ is used.

or

  [1] 78 and $\cos x = \dfrac{420}{2000}$ is used.

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

[4]

(28) **[3]** 2, 6, 10, 14, and 18 and an appropriate method is shown.

[2] One mistake is made with selection, such as including 0.

[1] One of the appropriate sets is found: either 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 *or* not 4, 8, 12, 16, 20.

or

[1] The correct numbers are found, 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.

(29) **[3]** The student says the point does not lie on the line and an appropriate method is shown, such as slope of –2 does not work with the new point (–25,81) and either other point (0,4) or (2,0), or accurately shows a graph where (–25,81) is not on line ℓ.

[2] The student says the point does not lie on the line but gives an inappropriate explanation of slope.

or

[2] The student tries to use slope concept but makes one computational mistake and gives an appropriate answer based on this mistake.

[1] Only the slope of –2 is found.

or

[1] The correct diagram is drawn with no interpretation.

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

(30) **[3]** No, it will not differ and the student shows that both methods lead to $47.08, such as $55 × .80 = $44, $44 × 1.07 = $47.08, $55 × 1.07 = $58.85, and $58.85 × .80 = $47.08.

[2] Both ways are computed, one computational mistake is made, and an appropriate answer is found.

or

[2] Both ways are computed correctly, but no comparison is found.

[1] At least one way is computed correctly, but no comparison is found.

or

[1] Both ways are computed incorrectly, but an appropriate comparison is found.

[0] Both ways are computed incorrectly, and no comparison is found.

or

[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 four credits.

(31) **[4]** $52,950, $35,300, and $88,250 and an appropriate method is shown, such as $3x + 2x + 5x = \$176,500$.

[3] A correct equation is set up or multiplied by correct fractional values $\frac{3}{10}$, $\frac{2}{10}$, and $\frac{5}{10}$, but a computational mistake is made, and three appropriate values are found.

or

[3] An appropriate method is shown, but not all three values are found.

[2] The equation is set up correctly, but numerous computational mistakes are made, and three appropriate values are found.

or

[2] An incorrect equation is shown, but three appropriate values are found.

or

[2] An appropriate equation is shown but is solved only for x (17,650).

[1] The equation is set up correctly, but no appropriate values are found.

or

[1] Three correct answers are found, 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.

(32) **[4]** $2,950.33 and a correct method is shown, such as area 1204 square feet multiplied by $0.78.

or

[4] Various correct values of are used that lead to slightly different totals such as $2,948.84 (if 3.14 is used).

[3] The shaded area is found, such as 1204 (or similar values based on approximation).

or

[3] The correct shaded area is found, but one computational mistake is made in the price, *or* the final cost is not rounded correctly.

[2] The two separate areas are found but not correctly used.

or

[2] An inappropriate formula for areas is shown, but work is carried to an appropriate value.

or

[2] Only one appropriate area is found and an appropriate cost is computed.

or

[2] The area found is incorrect but calculated to an appropriate cost.

[1] Only one appropriate area is found, either 2500 or 1296 .

or

[1] An inappropriate area is found, and one computational mistake is made in calculating the cost.

or

[1] $2,948.84 through $2,950.33 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.

(33) *a* **[3]** A parabola is correctly graphed through (0,0), (1,10), (2,16), (3,18), (4,16), (5,10), and (6,0).

[2] A correct table of values is shown, but not all the points are graphed correctly.

or

[2] The correct points are graphed but as a broken-line graph, not a curve.

or

[2] At least four values are calculated correctly and graphed.

[1] The student has at least two of the values calculated correctly and has tried to graph all the points.

[0] Fewer than two values are calculated correctly.

b **[1]** A maximum height of 18 is found.

or

[1] Correct *y* is found for an incorrect graph in part *a*.

a and *b*

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

(34) **[4]** 270 and an appropriate method is shown, such as using the Pythagorean theorem or trigonometry to find base $AC = 36$.

[3] An appropriate method is shown, but one computational mistake is made.

[2] An inappropriate formula for the area of the triangle is used, but work is carried to a solution.

or

[2] The Pythagorean theorem is used correctly, but only the area of triangle *ADB* is found, as 150.

or

[2] The Pythagorean theorem is used incorrectly arriving at incorrect *AB*, but work is carried to its appropriate solution for triangle *ADC*.

[1] Only the area of triangle *DBC* is found, as 120.

or

[1] The Pythagorean theorem is used incorrectly, and the area is not found.

or

[1] 270 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.

(35) *a* **[1]** $50

b (1) **[1]** 5

(2) **[1]** $125

c **[1]** $10

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

Regents Examination in Mathematics A

August 1999

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

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

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 scaled score that corresponds to that raw score. The scaled score is the student's final examination score. Enter this score in the space labeled "Scaled Score" on the student's answer sheet.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. 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. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination to another, it is crucial that for each administration, the conversion chart provided in the scoring key for that administration be used to determine the student's final score. The chart above is usable only for this administration of the mathematics A examination.