

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Tuesday, June 22, 1999 — 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. 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]

Use this space for computations.

1 A fair coin is thrown in the air four times. If the coin lands with the head up on the first three tosses, what is the probability that the coin will land with the head up on the fourth toss?

- (1) 0 (3) $\frac{1}{8}$
(2) $\frac{1}{16}$ (4) $\frac{1}{2}$

2 The statement “If x is divisible by 8, then it is divisible by 6” is false if x equals

- (1) 6 (3) 32
(2) 14 (4) 48

3 What is the image of point $(2,5)$ under the translation that shifts (x,y) to $(x + 3, y - 2)$?

- (1) $(0,3)$ (3) $(5,3)$
(2) $(0,8)$ (4) $(5,8)$

4 The sum of $3x^2 + x + 8$ and $x^2 - 9$ can be expressed as

- (1) $4x^2 + x - 1$ (3) $4x^4 + x - 1$
(2) $4x^2 + x - 17$ (4) $3x^4 + x - 1$

5 The direct distance between city A and city B is 200 miles. The direct distance between city B and city C is 300 miles. Which could be the direct distance between city C and city A ?

- (1) 50 miles (3) 550 miles
(2) 350 miles (4) 650 miles

6 Expressed as a single fraction, what is $\frac{1}{x+1} + \frac{1}{x}$, $x \neq 0, -1$?

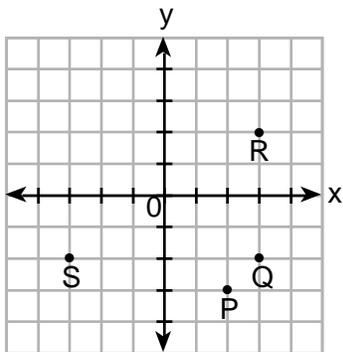
- (1) $\frac{2x+3}{x^2+x}$ (3) $\frac{2}{2x+1}$
(2) $\frac{2x+1}{x^2+x}$ (4) $\frac{3}{x^2}$

7 How many different three-member teams can be formed from six students?

- (1) 20 (3) 216
(2) 120 (4) 720

8 If $x = -3$ and $y = 2$, which point on the accompanying graph represents $(-x, -y)$?

Use this space for computations.



- (1) P (3) R
 (2) Q (4) S

9 The larger root of the equation $(x + 4)(x - 3) = 0$ is

- (1) -4 (3) 3
 (2) -3 (4) 4

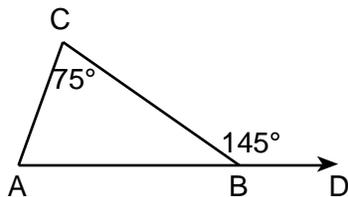
10 Linda paid \$48 for a jacket that was on sale for 25% of the original price. What was the original price of the jacket?

- (1) \$60 (3) \$96
 (2) \$72 (4) \$192

11 The expression $2^3 \cdot 4^2$ is equivalent to

- (1) 2^7 (3) 8^5
 (2) 2^{12} (4) 8^6

12 In the accompanying diagram of $\triangle ABC$, \overline{AB} is extended to D , exterior angle CBD measures 145° , and $m \angle C = 75$.



What is $m \angle CAB$?

- (1) 35 (3) 110
 (2) 70 (4) 220

Use this space for computations.

13 A total of \$450 is divided into equal shares. If Kate receives four shares, Kevin receives three shares, and Anna receives the remaining two shares, how much money did Kevin receive?

- (1) \$100
- (2) \$150
- (3) \$200
- (4) \$250

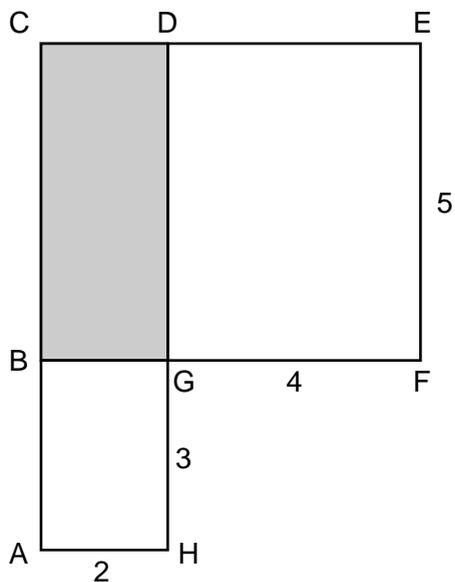
14 What is the diameter of a circle whose circumference is 5?

- (1) $\frac{2.5}{2}$
- (2) $\frac{2.5}{5}$
- (3) $\frac{5}{2}$
- (4) $\frac{5}{5}$

15 During a recent winter, the ratio of deer to foxes was 7 to 3 in one county of New York State. If there were 210 foxes in the county, what was the number of deer in the county?

- (1) 90
- (2) 147
- (3) 280
- (4) 490

16 In the accompanying figure, $ACDH$ and $BCEF$ are rectangles, $AH = 2$, $GH = 3$, $GF = 4$, and $FE = 5$.



What is the area of $BCDG$?

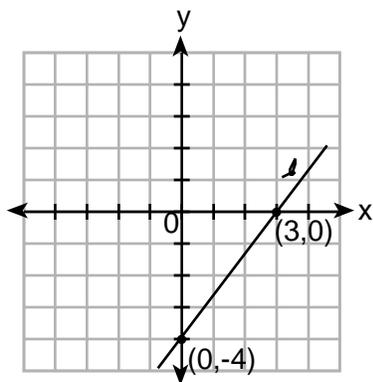
- (1) 6
- (2) 8
- (3) 10
- (4) 20

17 If $t^2 < t < \sqrt{t}$, then t could be

- (1) $-\frac{1}{4}$
- (2) 0
- (3) $\frac{1}{4}$
- (4) 4

18 What is the slope of line ℓ shown in the accompanying diagram?

Use this space for computations.



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

(3) $-\frac{3}{4}$

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

(4) $-\frac{4}{3}$

19 In a class of 50 students, 18 take music, 26 take art, and 2 take both art and music. How many students in the class are not enrolled in either music or art?

(1) 6

(3) 16

(2) 8

(4) 24

20 The expression $\sqrt{27} + \sqrt{12}$ is equivalent to

(1) $5\sqrt{3}$

(3) $5\sqrt{6}$

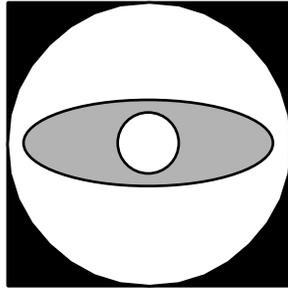
(2) $13\sqrt{3}$

(4) $\sqrt{39}$

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. [10]

21 Draw all the symmetry lines on the accompanying figure.



22 Shoe sizes and foot length are related by the formula $S = 3F - 24$, where S represents the shoe size and F represents the length of the foot, in inches.

a Solve the formula for F .

b To the nearest tenth of an inch, how long is the foot of a person who wears a size $10\frac{1}{2}$ shoe?

23 Which number below is irrational?

$$\sqrt{\frac{4}{9}}, \quad \sqrt{20}, \quad \sqrt{121}$$

Why is the number you chose an irrational number?

24 Simplify: $\frac{9x^2 - 15xy}{9x^2 - 25y^2}$

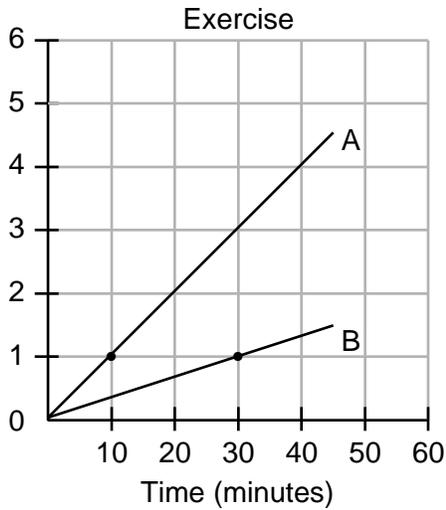
25 Sara's telephone service costs \$21 per month plus \$0.25 for each local call, and long-distance calls are extra. Last month, Sara's bill was \$36.64, and it included \$6.14 in long-distance charges. How many local calls did she make?

Part III

Answer all questions in this part. Each correct answer will receive 3 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.

[15]

- 26** During a 45-minute lunch period, Albert (*A*) went running and Bill (*B*) walked for exercise. Their times and distances are shown in the accompanying graph. How much faster was Albert running than Bill was walking, in miles per hour?

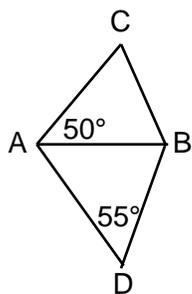


27 The dimensions of a brick, in inches, are 2 by 4 by 8. How many such bricks are needed to have a total volume of exactly 1 cubic foot?

28 A swimmer plans to swim at least 100 laps during a 6-day period. During this period, the swimmer will increase the number of laps completed each day by one lap. What is the *least* number of laps the swimmer must complete on the first day?

29 The mean (average) weight of three dogs is 38 pounds. One of the dogs, Sparky, weighs 46 pounds. The other two dogs, Eddie and Sandy, have the same weight. Find Eddie's weight.

- 30** In the accompanying diagram, $\triangle ABC$ and $\triangle ABD$ are isosceles triangles with $m \angle CAB = 50$ and $m \angle BDA = 55$. If $AB = AC$ and $AB = BD$, what is $m \angle CBD$?

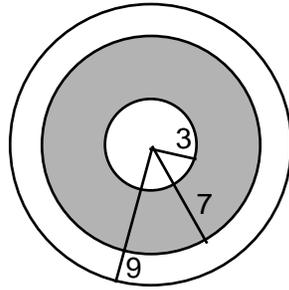


Part IV

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.

[20]

- 31 A target shown in the accompanying diagram consists of three circles with the same center. The radii of the circles have lengths of 3 inches, 7 inches, and 9 inches.



- a What is the area of the shaded region to the *nearest tenth of a square inch*?

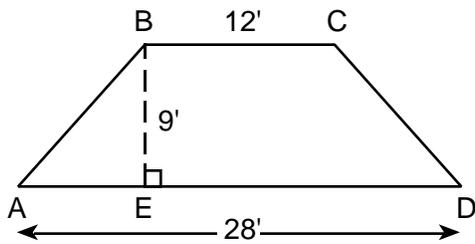
- b To the *nearest percent*, what percent of the target is shaded?

32 A bookshelf contains six mysteries and three biographies. Two books are selected at random without replacement.

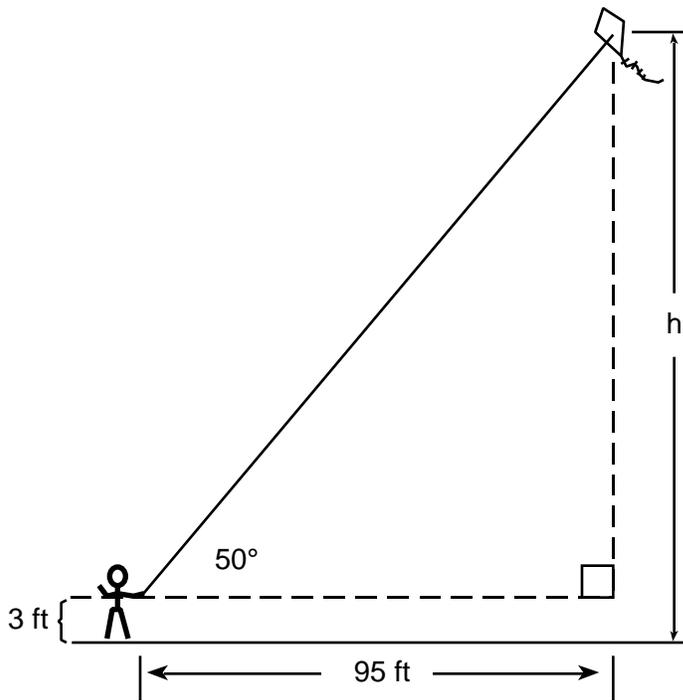
a What is the probability that both books are mysteries?

b What is the probability that one book is a mystery and the other is a biography?

- 33** The cross section of an attic is in the shape of an isosceles trapezoid, as shown in the accompanying figure. If the height of the attic is 9 feet, $BC = 12$ feet, and $AD = 28$ feet, find the length of \overline{AB} to the nearest foot.



34 Joe is holding his kite string 3 feet above the ground, as shown in the accompanying diagram. The distance between his hand and a point directly under the kite is 95 feet. If the angle of elevation to the kite is 50° , find the height, h , of his kite, to the nearest foot.



(Not drawn to scale)

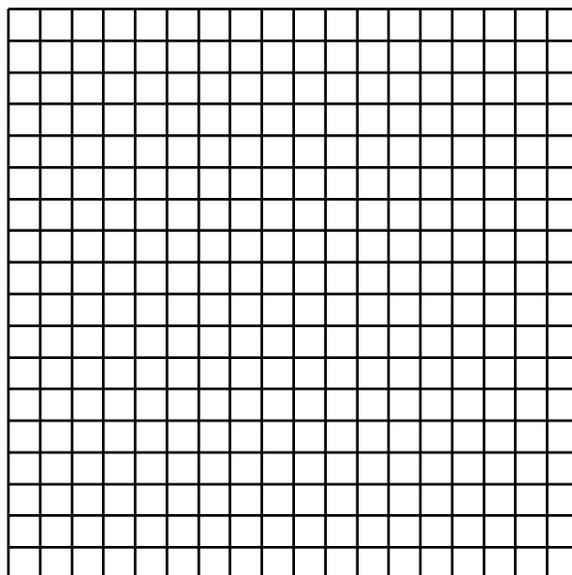
35 Solve the following system of equations algebraically *or* graphically for x and y :

$$y = x^2 + 2x - 1$$

$$y = 3x + 5$$

For an algebraic solution, show your work here.

For a graphic solution, show your work here.



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MATHEMATICS A

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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

FOR TEACHERS ONLY

The University of the State of New York

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MATHEMATICS A

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

Part II

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

- (21) **[2]** Both correct lines of symmetry are drawn: one horizontal, one vertical.
[1] Only one correct line is drawn.
or
[1] Two correct and one or two incorrect lines, such as the diagonals, are drawn.
[0] More than two incorrect lines are drawn.
or
[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]** $\frac{S + 24}{3}$ *or* $\frac{S}{3} + 8$
 b **[1]** 11.5
or
[1] Correct substitution into an incorrect part *a* is shown, and the answer is given to the nearest tenth of an inch.
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]** $\sqrt{20}$ and an appropriate explanation is given, such as the number cannot be written as a repeating or terminating decimal or it cannot be written as a fraction or it is not a perfect square.
[1] $\sqrt{20}$ and an inappropriate explanation *or* no explanation is given.
or
[1] $\sqrt{20}$ and a correct explanation is given, but one other number is also identified as irrational.
[0] All three numbers are identified as irrational.
or
[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]** $\frac{3x}{3x + 5y}$
[1] One correct factoring is shown, either $3x(3x - 5y)$ *or* $(3x - 5y)(3x + 5y)$.
[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]** 38 and an appropriate method is shown, such as $36.64 - (21 + 6.14) = 9.50$ and $\frac{9.50}{.25} = 38$ or an equation such as $21 + .25c + 6.14 = 36.64$.

[1] 38 and no work is shown.

or

[1] An appropriate method or equation is shown, but one computational mistake is made.

or

[1] The answer of \$9.50 for local calls is found but is not divided by .25.

[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]** 4 and an appropriate method is shown, such as calculating *A* at 6 mph and *B* at 2 mph through arithmetic, formula, or extending the graph to 60 minutes.

[2] The speeds of 6 and 2 are found but not their difference.

or

[2] Their difference is found but not in miles per hour.

[1] Only distances of 4.5 miles and 1.5 miles are found.

or

[1] The speeds found are incorrect but then are subtracted appropriately.

or

[1] 3 times as fast and no appropriate explanation is given.

or

[1] 4 and no appropriate explanation is given.

[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]** 27 and an appropriate method or explanation is shown, such as $\left(\frac{1}{6}\right)\left(\frac{1}{3}\right)\left(\frac{2}{3}\right) = \frac{1}{27}$ of a cubic foot, thus 27 bricks needed or, in inches, $\frac{1728}{64} = 27$. A labeled drawing is an acceptable explanation.
- [2]** An appropriate method for finding volume is shown, but one computational mistake is made.
- [1]** Correct conversion into feet is shown.
- or***
- [1]** The volume of 64 cubic inches is found.
- or***
- [1]** 27 and no explanation is given.
- [0]** A zero response is completely incorrect, irrelevant, or incoherent *or* is a correct response that was obtained by an obviously incorrect procedure.
- (28) **[3]** 15 and an appropriate method or explanation is shown, such as trial and error or the inequality $6x + 15 < 100$.
- [2]** An appropriate method is shown, but it stops at 14.
- [1]** An appropriate method is shown, but no answer is found.
- or***
- [1]** 15 and no explanation is given.
- [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]** 34 and an appropriate explanation is given, such as $38 = \frac{46 + 2x}{3}$.
- [2]** An appropriate method or equation is shown, but one computational mistake is made.
- or***
- [2]** The student does not take into consideration two dogs of equal weight and gives an answer of 68.
- [1]** The student understands weighted average in that three dogs averaging 38 pounds must have a total weight of 114 pounds but does not subtract the known weight.
- or***
- [1]** 34 and no explanation is given.
- [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]** 135 and appropriate work is shown.
- [2]** The two correct angles of 65° and 70° are found, but their sum is not identified as the answer to the question.
- or***
- [2]** 65° *or* 70° and an appropriate sum is found.
- [1]** Either the 65° *or* the 70° is correctly identified.
- or***
- [1]** Two incorrect angle measures are found, but they are added correctly.
- or***
- [1]** 135 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.
-

Part IV

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

(31) *a* **[2]** 125.6 *or* 125.7 (correct for the value of π used) and appropriate work is shown.

[1] The area is left as 40 *or* the answer is not rounded correctly.

or

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

or

[1] The correct areas of both circles are found, but the two areas are not subtracted.

or

[1] The circumference formula is used correctly for both circles and the circumferences are subtracted for an answer of 25.1.

or

[1] 125.6 *or* 125.7 and no work is shown.

b **[2]** 49 and an appropriate explanation is given.

or

[2] An appropriate percent for an incorrect part *a* is found and supported by area formulas.

[1] The answer is left as $\frac{40}{81}$.

or

[1] An appropriate fraction for an incorrect part *a* is found but not given as a percent.

or

[1] An appropriate percent for an incorrect part *a* is found and is supported by circumference formulas.

or

[1] 49 and no work is shown.

[0] $\frac{4}{9}$ *or* 44% and no work is shown.

or

[0] 4 is found by subtracting the radii.

or

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.

(32) a [2] $\frac{30}{72}$ or an equivalent value is found and an appropriate explanation is given.

[1] An acceptable method is used correctly, such as a tree diagram, sample space, or combinations, but the correct answer is not given.

or

[1] Replacement is used, and an answer of $\frac{36}{81}$ or an equivalent is found.

or

[1] $\frac{30}{72}$ and no work is shown.

b [2] $\frac{36}{72}$ or an equivalent value is found and an appropriate explanation is given.

or

[2] An appropriate probability for an incorrect denominator for part *a* is found.

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

or

[1] Replacement is shown, and the answer $\frac{36}{81}$ or an equivalent is found.

or

[1] The student does not take into account both orders and answers $\frac{18}{72}$ or an equivalent.

or

[1] $\frac{36}{72}$ and no work is shown.

or

a and *b*

[1] An error in method is made but the erroneous answer is interpreted correctly in either part *a* or *b* or both.

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

- (33) **[4]** 12 and an appropriate method is shown, such as $(AB)^2 = 9^2 + 8^2$.
- [3]** An incorrect length is found for AE , but then it is used to correctly complete the problem.
- or***
- [3]** An appropriate method is shown, but one computational mistake is made.
- or***
- [3]** An appropriate method is shown, but the answer is not given to the nearest foot, such as $\sqrt{145}$.
- [2]** $AE = 8$ and one computational mistake is made using the Pythagorean theorem.
- or***
- [2]** An incorrect length is found for AE , but then it is used to complete the problem correctly, but the answer is not rounded.
- [1]** $AE = 8$ is found, but the Pythagorean theorem is not used.
- or***
- [1]** 12 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) **[4]** 116 and an appropriate method is shown.
- [3]** An appropriate method is shown, but the answer is left in an inappropriate form, such as 116.2.
- or***
- [3]** An appropriate method is shown, but 3 feet is not added, and the answer is left 113.
- or***
- [3]** Tangent function is used, but computational mistakes are made, but 3 feet is added to the incorrect value and the answer is found correctly.
- [2]** An incorrect trigonometric function is used, 3 feet is added, and the answer is rounded correctly.
- or***
- [2]** Tangent function is used, but computational mistakes are made, and 3 feet is not added to an incorrect answer.
- [1]** 116 and no work is shown.
- or***
- [1]** An incorrect trigonometric function is used, and 3 feet is added to the incorrect answer, but the answer is rounded incorrectly.
- [0]** A zero response is completely incorrect, irrelevant, or incoherent *or* is a correct response that was obtained by an obviously incorrect procedure.

- (35) **[4]** (3,14) and (-2,-1) and either an algebraic *or* a graphic solution is shown.
- [3]** An appropriate method is shown, but only one correct ordered pair is identified.
- or***
- [3]** An appropriate method is shown, but one computational mistake is made.
- or***
- [3]** An appropriate method is shown, but values are given only for x .
- [2]** The substitution is correct, but the quadratic produced is not factored correctly.
- or***
- [2]** Both equations are graphed correctly, but neither ordered pair is identified.
- [1]** Only one equation is graphed correctly.
- or***
- [1]** The substitution is incorrect, but it produces a linear equation that is solved correctly.
- or***
- [1]** Only the substitution is correct.
- [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

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

65	86	36	58	7	26
64	85	35	56	6	25
63	84	34	55	5	24
62	83	33	54	4	23
61	82	32	53	3	22
60	81	31	52	2	21
59	80	30	51	1	10
58	79	29	49	0	0
57	78	28	48		

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.