

ALGEBRA 2/TRIGONOMETRY

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

ALGEBRA 2/TRIGONOMETRY

Friday, June 19, 2015 — 9:15 a.m. to 12:15 p.m., only

Student Name: _____

School Name: _____

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

Print your name and the name of your school on the lines above.

A separate answer sheet for Part I has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 39 questions. You must answer all questions in this examination. Record 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. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

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.

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 and a straightedge (ruler) must be available for you to use while taking this examination.

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

ALGEBRA 2/TRIGONOMETRY

Part I

Answer all 27 questions in this part. Each correct answer will receive 2 credits. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [54]

Use this space for
computations.

1 Which list of ordered pairs does *not* represent a one-to-one function?

- (1) $(1, -1), (2, 0), (3, 1), (4, 2)$
- (2) $(1, 2), (2, 3), (3, 4), (4, 6)$
- (3) $(1, 3), (2, 4), (3, 3), (4, 1)$
- (4) $(1, 5), (2, 4), (3, 1), (4, 0)$

2 The terminal side of an angle measuring $\frac{4\pi}{5}$ radians lies in Quadrant

- (1) I
- (2) II
- (3) III
- (4) IV

3 If $f(x) = 2x^2 + 1$ and $g(x) = 3x - 2$, what is the value of $f(g(-2))$?

- (1) -127
- (2) -23
- (3) 25
- (4) 129

4 The expression $\sqrt[3]{27a^3} \cdot \sqrt[4]{16b^8}$ is equivalent to

- (1) $6ab^2$
- (2) $6ab^4$
- (3) $12ab^2$
- (4) $12ab^4$

5 If $x^2 = 12x - 7$ is solved by completing the square, one of the steps in the process is

- (1) $(x - 6)^2 = -43$
- (2) $(x + 6)^2 = -43$
- (3) $(x - 6)^2 = 29$
- (4) $(x + 6)^2 = 29$

Use this space for
computations.

6 Which expression is equivalent to $\frac{x^{-1}y^2}{x^2y^{-4}}$?

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

(3) $\frac{y^2}{x}$

(2) $\frac{x^3}{y^6}$

(4) $\frac{y^6}{x^3}$

7 What is the solution of the inequality $9 - x^2 < 0$?

(1) $\{x \mid -3 < x < 3\}$

(3) $\{x \mid x > 3\}$

(2) $\{x \mid x > 3 \text{ or } x < -3\}$

(4) $\{x \mid x < -3\}$

8 What is the area of a parallelogram that has sides measuring 8 cm and 12 cm and includes an angle of 120° ?

(1) $24\sqrt{3}$

(3) $83\sqrt{3}$

(2) $48\sqrt{3}$

(4) $96\sqrt{3}$

9 The expression $\frac{5}{4 - \sqrt{11}}$ is equivalent to

(1) $4 + \sqrt{11}$

(3) $4 - \sqrt{11}$

(2) $\frac{20 + 5\sqrt{11}}{27}$

(4) $\frac{20 - 5\sqrt{11}}{27}$

10 Given y varies inversely as x , when y is multiplied by $\frac{1}{2}$, then x is multiplied by

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

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

(2) 2

(4) -2

Use this space for computations.

11 What is the total number of different nine-letter arrangements that can be formed using the letters in the word “TENNESSEE”?

- (1) 3,780
- (2) 15,120
- (3) 45,360
- (4) 362,880

12 What is the fourth term of the sequence defined by

$$a_1 = 3xy^5$$

$$a_n = \left(\frac{2x}{y}\right)a_{n-1}?$$

- (1) $12x^3y^3$
- (2) $24x^2y^4$
- (3) $24x^4y^2$
- (4) $48x^5y$

13 What is the solution set of $|x - 2| = 3x + 10$?

- (1) $\{ \}$
- (2) $\{-2\}$
- (3) $\{-6\}$
- (4) $\{-2, -6\}$

14 By law, a wheelchair service ramp may be inclined no more than 4.76° . If the base of a ramp begins 15 feet from the base of a public building, which equation could be used to determine the maximum height, h , of the ramp where it reaches the building's entrance?

- (1) $\sin 4.76^\circ = \frac{h}{15}$
- (2) $\sin 4.76^\circ = \frac{15}{h}$
- (3) $\tan 4.76^\circ = \frac{h}{15}$
- (4) $\tan 4.76^\circ = \frac{15}{h}$

Use this space for computations.

15 When $\frac{7}{8}x^2 - \frac{3}{4}x$ is subtracted from $\frac{5}{8}x^2 - \frac{1}{4}x + 2$, the difference is

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

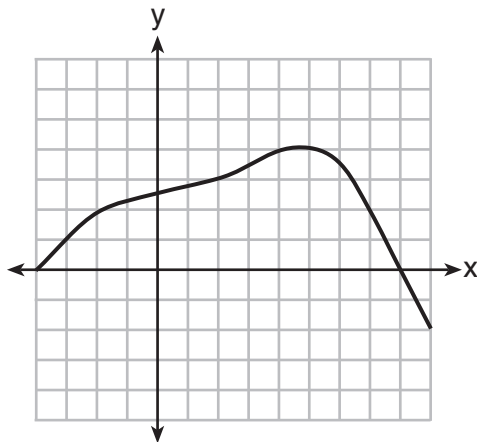
16 Which transformation of $y = f(x)$ moves the graph 7 units to the left and 3 units down?

- (1) $y = f(x + 7) - 3$ (3) $y = f(x - 7) - 3$
(2) $y = f(x + 7) + 3$ (4) $y = f(x - 7) + 3$

17 If $\log x = 2 \log a + \log b$, then x equals

- (1) a^2b (3) $a^2 + b$
(2) $2ab$ (4) $2a + b$

18 Which value is in the domain of the function graphed below, but is *not* in its range?



- (1) 0 (3) 3
(2) 2 (4) 7

**Use this space for
computations.**

24 The roots of $3x^2 + x = 14$ are

- (1) imaginary (3) real, rational, and unequal
(2) real, rational, and equal (4) real, irrational, and unequal

25 Circle O has a radius of 2 units. An angle with a measure of $\frac{\pi}{6}$ radians is in standard position. If the terminal side of the angle intersects the circle at point B , what are the coordinates of B ?

- (1) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ (3) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
(2) $(\sqrt{3}, 1)$ (4) $(1, \sqrt{3})$

26 What is the value of $\sum_{x=0}^2 (3 - 2a)^x$?

- (1) $4a^2 - 2a + 12$ (3) $4a^2 - 14a + 12$
(2) $4a^2 - 2a + 13$ (4) $4a^2 - 14a + 13$

27 A population, $p(x)$, of wild turkeys in a certain area is represented by the function $p(x) = 17(1.15)^{2x}$, where x is the number of years since 2010. How many more turkeys will be in the population for the year 2015 than 2010?

- (1) 46 (3) 51
(2) 49 (4) 68

Part II

Answer all 8 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. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

28 Solve algebraically for x :

$$5^{4x} = 125^{x-1}$$

29 In triangle ABC , determine the number of distinct triangles that can be formed if $m\angle A = 85$, side $a = 8$, and side $c = 2$. Justify your answer.

30 The probability that Kay and Joseph Dowling will have a redheaded child is 1 out of 4. If the Dowlings plan to have three children, what is the *exact* probability that only one child will have red hair?

31 If $\log_{(x+1)} 64 = 3$, find the value of x .

32 Factor completely:

$$x^3 - 6x^2 - 25x + 150$$

33 Express $xi^8 - yi^6$ in simplest form.

34 Given the equation $3x^2 + 2x + k = 0$, state the sum and product of the roots.

35 Determine which set of data given below has the stronger linear relationship between x and y . Justify your choice.

Set A

x	1	2	3	4	5	6
y	24	30	36	51	70	86

Set B

x	1	2	3	4	5	6
y	81	64	49	36	25	16

Part III

Answer all 3 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. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

36 Find the measure of the smallest angle, to the *nearest degree*, of a triangle whose sides measure 28, 47, and 34.

37 Solve algebraically for x :

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*.

Determine the number of students whose scores are within one population standard deviation of the mean.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. A correct numerical answer with no work shown will receive only 1 credit. The answer should be written in pen. [6]

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the *nearest tenth of a degree*.

Reference Sheet

Area of a Triangle

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

Functions of the Sum of Two Angles

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

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

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

Functions of the Difference of Two Angles

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

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

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Law of Sines

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

Sum of a Finite Arithmetic Series

$$S_n = \frac{n(a_1 + a_n)}{2}$$

Binomial Theorem

$$(a + b)^n = {}_n C_0 a^n b^0 + {}_n C_1 a^{n-1} b^1 + {}_n C_2 a^{n-2} b^2 + \dots + {}_n C_n a^0 b^n$$

$$(a + b)^n = \sum_{r=0}^n {}_n C_r a^{n-r} b^r$$

Law of Cosines

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

Functions of the Double Angle

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

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

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

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

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

Functions of the Half Angle

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

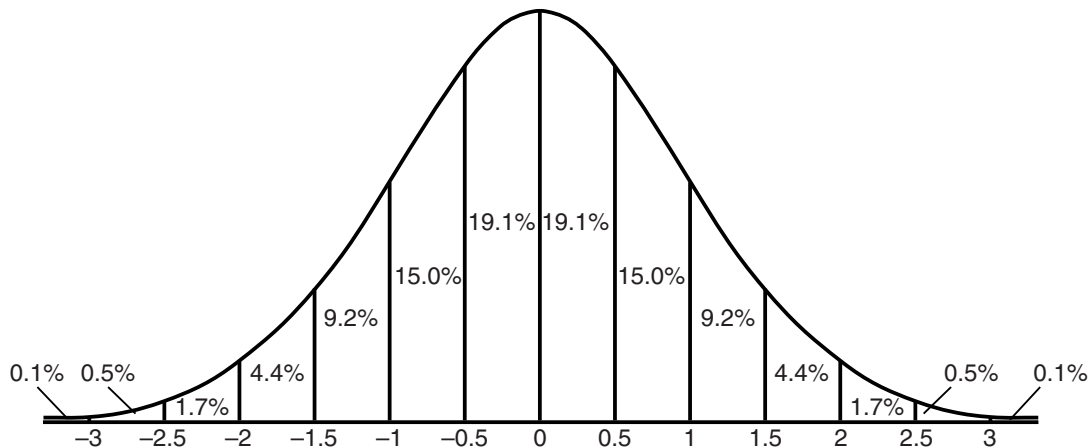
$$\cos \frac{1}{2} A = \pm \sqrt{\frac{1 + \cos A}{2}}$$

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

Sum of a Finite Geometric Series

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

Normal Curve Standard Deviation



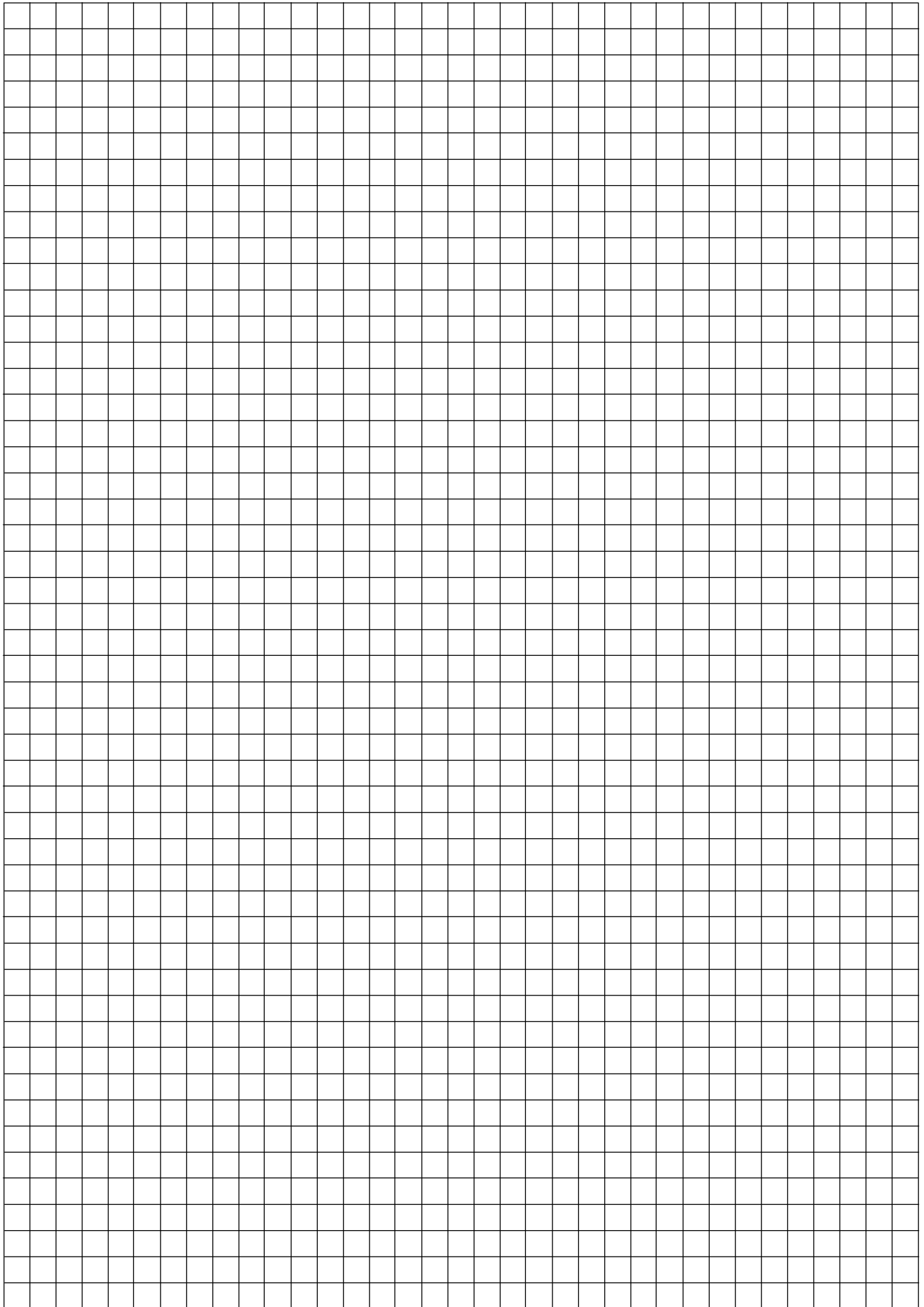
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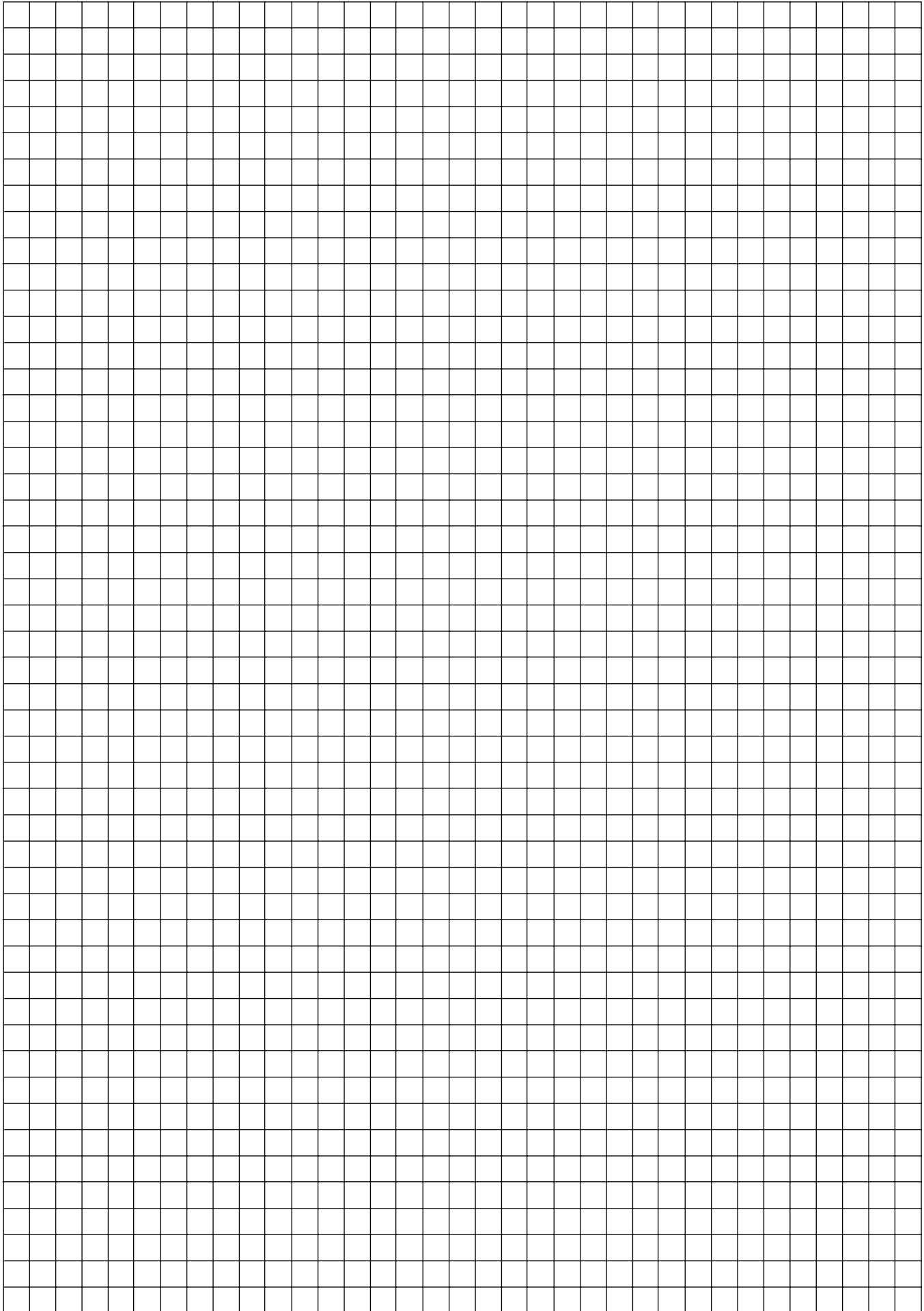
Scrap Graph Paper – This sheet will *not* be scored.

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FOR TEACHERS ONLY

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ALGEBRA 2/TRIGONOMETRY

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SCORING KEY AND RATING GUIDE

Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Algebra 2/Trigonometry. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examinations in Mathematics*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the open-ended questions, 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. No one teacher is to score more than approximately one-third of the open-ended questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Friday, June 19, 2015. Because scale scores corresponding to raw scores in the conversion chart may change from one administration 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 student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

Part I

Allow a total of 54 credits, 2 credits for each of the following.

(1) 3	(10) 2	(19) 1
(2) 2	(11) 1	(20) 4
(3) 4	(12) 3	(21) 2
(4) 1	(13) 2	(22) 1
(5) 3	(14) 3	(23) 3
(6) 4	(15) 3	(24) 3
(7) 2	(16) 1	(25) 2
(8) 2	(17) 1	(26) 4
(9) 1	(18) 4	(27) 3

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 at: <http://www.p12.nysed.gov/assessment/> and select the link "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.

Beginning in June 2013, the Department is providing supplemental scoring guidance, the "Sample Response Set," for the Regents Examination in Algebra 2/Trigonometry. This guidance is not required as part of the scorer training. It is at the school's discretion to incorporate it into the scorer training or to use it as supplemental information during scoring. While not reflective of all scenarios, the sample student responses selected for the Sample Response Set illustrate how less common student responses to open-ended questions may be scored. The Sample Response Set will be available on the Department's web site at: <http://www.nysedregents.org/a2trig/home.html>.

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra 2/Trigonometry 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*, use their own professional judgment, confer with other mathematics teachers, and/or contact 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, graphs, 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. 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.

For 4- and 6-credit questions, 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. Refer to the rubric for specific scoring guidelines.

Part II

For each question, use the specific criteria to award a maximum of 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(28) [2] -3 , and correct algebraic 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] -3 , but a method other than algebraic is used.

or

[1] -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.

(29) [2] 1 , and a correct justification is given.

[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 all three angles of the triangle, but no further correct work is shown.

or

[1] 1 , but no justification 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) [2] 0.421875 or $\frac{27}{64}$, and correct work is shown.
- [1] Appropriate work is shown, but one computational or rounding error is made.
- or**
- [1] Appropriate work is shown, but one conceptual error is made.
- or**
- [1] ${}_3C_1 \left(\frac{1}{4}\right)^1 \left(\frac{3}{4}\right)^2$, but no further correct work is shown.
- or**
- [1] 0.421875 or $\frac{27}{64}$, 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.
- (31) [2] 3, and correct 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] The equation $(x + 1)^3 = 64$ is written, but no further correct work is shown.
- or**
- [1] 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.
- (32) [2] $(x - 6)(x - 5)(x + 5)$, and correct work is shown.
- [1] Appropriate work is shown, but one computational or factoring error is made.
- or**
- [1] Appropriate work is shown, but one conceptual error is made.
- or**
- [1] $x^2(x - 6) - 25(x - 6)$ is written, but no further correct work is shown.
- or**
- [1] $(x - 6)(x - 5)(x + 5)$, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct answer that was obtained by an obviously incorrect procedure.

(33) [2] $x + y$

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

or

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

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

(34) [2] Sum = $-\frac{2}{3}$ and product = $\frac{k}{3}$.

[1] Either sum = $-\frac{2}{3}$ or product = $\frac{k}{3}$.

or

[1] $-\frac{2}{3}$ and $\frac{k}{3}$, but the answers are not labeled or are labeled 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) [2] Set B , and a correct justification is given.

[1] One computational error is made, but an appropriate set and justification are given.

or

[1] One conceptual error is made.

or

[1] Set B , but an incorrect justification is given.

[0] Set B , but no justification is given.

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 III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(36) [4] 36, and correct 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, such as finding the wrong angle.

or

[2] A correct substitution is made into the Law of Cosines, but no further correct work is shown.

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

or

[1] 36, 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.

- (37) [4] -3 , and correct algebraic work is shown.
- [3] Appropriate work is shown, but one computational or factoring error is made.
- or***
- [3] Correct work is shown, but -2 is not rejected.
- [2] Appropriate work is shown, but two or more computational or factoring errors are made.
- or***
- [2] Appropriate work is shown, but one conceptual error is made.
- or***
- [2] $x^2 + 5x + 6 = 0$ is written, but no further correct work is shown.
- or***
- [2] -3 , but a method other than algebraic is used.
- [1] Appropriate work is shown, but one conceptual error and one computational or factoring error are made.
- or***
- [1] -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.

- (38) [4] 5.17 and 17, and correct work is shown to find the number of students.
- [3] Appropriate work is shown, but one computational or rounding error is made, such as including the test score of 79, which results in 21 students.
- [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, such as using 5.27 (the sample standard deviation) or 6.90 (population standard deviation based only on test scores).
- or*
- [2] The population standard deviation and mean are found correctly, but no further correct work is shown.
- or*
- [2] 5.17 and 17, but no work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
- or*
- [1] 5.17
- or*
- [1] 17, 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 this question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

- (39) [6] 66.4, 180, and 293.6, and correct algebraic work is shown.
- [5] Appropriate work is shown, but one computational, factoring, or rounding error is made.
- or**
- [5] Appropriate work is shown, but only two correct values of θ are found.
- [4] Appropriate work is shown, but two computational, factoring, or rounding errors are made.
- or**
- [4] Correct work is shown to find $\cos \theta = \frac{2}{5}$ and $\cos \theta = -1$, or $\sec \theta = \frac{5}{2}$ and $\sec \theta = -1$, but no further correct work is shown.
- [3] Appropriate work is shown, but three or more computational, factoring, or rounding errors are made.
- or**
- [3] Appropriate work is shown, but one conceptual error is made.
- or**
- [3] Correct work is shown to find $(5 \cos \theta - 2)(\cos \theta + 1) = 0$, or $(2 \sec \theta - 5)(\sec \theta + 1) = 0$, but no further correct work is shown.
- or**
- [3] A correct substitution is made into the quadratic formula, but no further correct work is shown.
- or**
- [3] 66.4, 180, and 293.6, but a method other than algebraic is used.
- [2] Appropriate work is shown, but one conceptual error and one computational, factoring, or rounding error are made.
- or**
- [2] A correct quadratic equation in standard form is written, but no further correct work is shown.
- or**
- [2] A trigonometric equation of lesser degree is solved appropriately.

[1] Appropriate work is shown, but one conceptual error and two or more computational, factoring, or rounding errors are made.

or

[1] An equation in one function is written, but no further correct work is shown.

or

[1] 66.4, 180, and 293.6, 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.

Map to Core Curriculum

Content Strands	Item Numbers
Number Sense and Operations	9, 15, 26, 33
Algebra	1, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 24, 25, 27, 28, 29, 31, 32, 34, 36, 37, 39
Measurement	2
Statistics and Probability	11, 23, 30, 35, 38

Regents Examination in Algebra 2/Trigonometry

June 2015

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

The *Chart for Determining the Final Examination Score for the June 2015 Regents Examination in Algebra 2/Trigonometry* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Friday, June 19, 2015. Conversion charts provided for previous administrations of the Regents Examination in Algebra 2/Trigonometry 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.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm>.
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.

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

ALGEBRA 2/ TRIGONOMETRY

Friday, June 19, 2015 — 9:15 a.m. – 12:15 p.m.

SAMPLE RESPONSE SET

Table of Contents

Question 28	2
Question 29	5
Question 30	9
Question 31	12
Question 32	17
Question 33	21
Question 34	26
Question 35	30
Question 36	34
Question 37	40
Question 38	50
Question 39	58

Question 28

28 Solve algebraically for x :

$$5^{4x} = 125^{x-1}$$

$$\frac{4x \log 5}{\log 5} = \frac{(x-1) \log 125}{\log 5}$$
$$4x = (x-1) \cdot 3$$
$$4x = 3x - 3$$
$$\begin{array}{r} -3x \\ \hline x = -3 \end{array}$$

Score 2: The student has a complete and correct response.

Question 28

28 Solve algebraically for x :

$$5^{4x} = 125^{x-1}$$

$$5^{4x} = 125^{x-1}$$

Handwritten scribbles and crossed-out work, possibly representing an attempt to solve the equation by dividing both sides by 5 or 125, which is incorrect.

$$\frac{4x \log 5}{\log 5} = \frac{(x-1) \log 125}{\log 5}$$

$$\frac{4x}{x-1} = 4$$

Score 1: The student wrote a correct logarithmic equation, but failed to complete the process to get the solution.

Question 28

28 Solve algebraically for x :

$$5^{4x} = 125^{x-1}$$

$$20x = 125x - 125$$

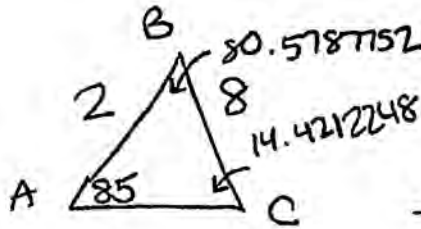
$$20x + 125 = 125x$$

$$x = \frac{125}{105}$$

Score 0: The student gave a completely incorrect answer.

Question 29

29 In triangle ABC , determine the number of distinct triangles that can be formed if $m\angle A = 85$, side $a = 8$, and side $c = 2$. Justify your answer.



$$\frac{8}{\sin 85} = \frac{2}{\sin x}$$

$$\frac{2 \sin 85}{8} = \frac{8 \sin x}{8}$$

$$\sin x = 0.2490486745$$

$$x = 14.4212248$$

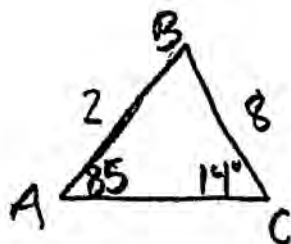
$$180 - 14.4212248 = 165.5787752$$

Only one triangle can be made because $\angle C$'s alternate \angle would result in the triangle's \angle 's adding up to more than 180° , which cannot happen.

Score 2: The student has a complete and correct response.

Question 29

29 In triangle ABC , determine the number of distinct triangles that can be formed if $m\angle A = 85^\circ$, side $a = 8$, and side $c = 2$. Justify your answer.



$$\frac{\sin 85}{8} = \frac{\sin x}{2}$$

$$\frac{8 \sin x}{8} = \frac{2 \sin 85}{8}$$

$$\sin x = .2490486745$$

$$\sin^{-1}(\text{Ans}) = 14^\circ$$

$$\begin{array}{r} 180 \\ -99 \\ \hline \end{array}$$

$$\begin{array}{r} 85 \\ +14 \\ \hline 99 \end{array}$$

$$\begin{array}{c|c|c|c} \Delta 1 & 85 & 99 & 81 \checkmark \\ \hline \Delta 2 & 85 & 81 & 14 \checkmark \end{array}$$

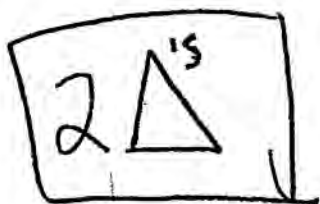
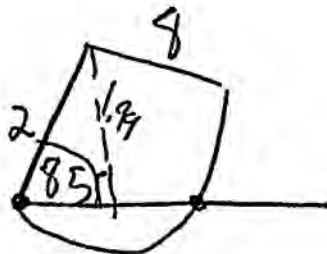
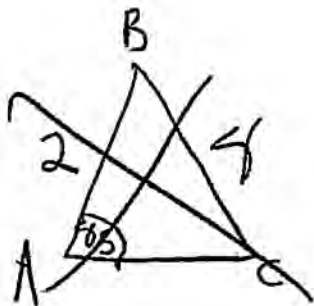
$$\boxed{2\Delta}$$

$$\begin{array}{r} 85 \\ +81 \\ \hline 166 \end{array} \quad \begin{array}{r} 180 \\ -166 \\ \hline 14 \end{array}$$

Score 1: The student found all three angles correctly ($\Delta 2$), but no further correct work was shown.

Question 29

29 In triangle ABC , determine the number of distinct triangles that can be formed if $m\angle A = 85^\circ$, side $a = 8$, and side $c = 2$. Justify your answer.



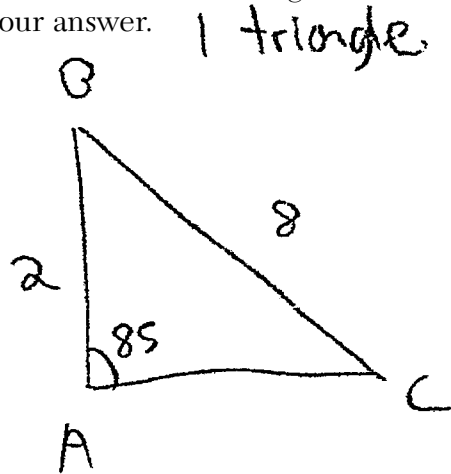
$$\frac{2}{\sin 90} = \frac{x}{\sin 85}$$

$$\frac{2 \sin 85}{\sin 90} = \frac{x \sin 90}{\sin 90}$$

Score 1: The student found the height of the triangle correctly, but determined the number of possible triangles incorrectly.

Question 29

29 In triangle ABC , determine the number of distinct triangles that can be formed if $m\angle A = 85$, side $a = 8$, and side $c = 2$. Justify your answer.



$$\begin{aligned} a^2 + b^2 &= c^2 \\ 2^2 + b^2 &= 8^2 \\ 4 + x^2 &= 64 \\ -4 &\quad -4 \\ \hline \sqrt{x^2} &= \sqrt{60} \\ x &= 2.7 \end{aligned}$$

Score 0: The student obtained a correct response by an obviously incorrect procedure.

Question 30

30 The probability that Kay and Joseph Dowling will have a redheaded child is 1 out of 4. If the Dowlings plan to have three children, what is the *exact* probability that only one child will have red hair?

$$3C_1 \left(\frac{1}{4}\right)^1 \left(\frac{3}{4}\right)^2$$

$$\frac{27}{64}$$

Score 2: The student has a complete and correct response.

Question 30

30 The probability that Kay and Joseph Dowling will have a redheaded child is 1 out of 4. If the Dowlings plan to have three children, what is the *exact* probability that only one child will have red hair?

$$N = 3$$

$$R = 1$$

$$F = 3/4$$

$$S = 1/4$$

$$3C_1 \left(\frac{3}{4}\right)^3 \left(\frac{1}{4}\right)^1$$

$$\frac{81}{256}$$

Score 1: The student made an error in the exponent when writing the probability of “not red.”

Question 30

30 The probability that Kay and Joseph Dowling will have a redheaded child is 1 out of 4. If the Dowlings plan to have three children, what is the *exact* probability that only one child will have red hair?

$$\frac{1}{4}$$

$${}_4C_1$$

$$nC_r \times P^r \times Q^{n-r}$$

$${}_4C_1 \cdot \frac{1}{4} \wedge^1 \cdot \frac{3}{4} \wedge^3$$

$$\frac{27}{256}$$

Score 0: The student made one conceptual error by using ${}_4C_1$, and one computational error when solving.

Question 31

31 If $\log_{(x+1)} 64 = 3$, find the value of x .

$${}^3\sqrt{(x+1)^3} = {}^3\sqrt{64}$$

$$x+1 = 4$$

$$\begin{array}{r} -1 \\ -1 \end{array}$$

$$\boxed{x=3}$$

Score 2: The student has a complete and correct response.

Question 31

31 If $\log_{(x+1)} 64 = 3$, find the value of x .

$$\log_{(x+1)} 64 = 3$$

$$\frac{\log 64}{\log (x+1)}$$

$$(x+1)^3 = 64$$

$$2^3 = 8$$

$$3^3 = 27$$

$$5^3 = 125$$

$$4^3 = 64$$

$$(3+1)^3 = 64$$

$$x = 3$$

Score 2: The student has a complete and correct response by using trial and error after writing a correct exponential equation.

Question 31

31 If $\log_{(x+1)} 64 = 3$, find the value of x .

$$\log_{x+1} 64 = 3$$

$$(x+1)^3 = 64$$

$$(x+1)(x+1)(x+1)$$

$$(x^2 + 2x + 1)(x+1)$$

$$x^3 + x^2 + 2x^2 + 2x + 1x + 1$$

$$x^3 + 3x^2 + 3x + 1$$

$$x^3 + 3x^2 + 3x = -1$$

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

$$x(x+1)(x+3) = -1$$

$$\boxed{x = -1}$$

$$x+1 = -1$$

$$\boxed{x = -2}$$

$$x+3 = -1$$

$$\boxed{x = -4}$$

$$\{x \mid -1, -2, -4\}$$

Score 1: The student wrote a correct exponential equation.

Question 31

31 If $\log_{(x+1)} 64 = 3$, find the value of x .

$$\frac{\log 64}{\log x+1} = 3$$

$$\frac{\log 64}{3} = \log x+1$$

$$\cdot 602\dots = \log x+1$$

$$-.397\dots = \log x$$

$$x = .4$$

Score 1: The student did not put parentheses around $x + 1$ when rewriting the equation, but found an appropriate answer.

Question 31

31 If $\log_{(x+1)} 64 = 3$, find the value of x .

$$3^{x+1} = 64$$

$$3^{(x+1)} = 2^6$$

$$x+1 = 6$$

$$\begin{array}{r} -1 \\ -1 \end{array}$$

$$\boxed{x = 5}$$

Score 0: The student made one conceptual error by confusing the base and exponent and a second conceptual error by equating the exponents of different bases.

Question 32

32 Factor completely: $x^3 - 6x^2 - 25x + 150$

$$x^3 - 6x^2 - 25x + 150$$

$$x^2(x-6) - 25(x-6)$$

$$(x^2 - 25)(x-6)$$

$$(x+5)(x-5)(x-6)$$

Score 2: The student has a complete and correct response.

Question 32

32 Factor completely: $x^3 - 6x^2 - 25x + 150$

$$x^3 - 6x^2 - 25x + 150$$

$$x^2(x-6) - 25(x-6)$$

$$(x^2 - 25)(x-6)$$

Score 1: The student did not completely factor the expression.

Question 32

32 Factor completely: $x^3 - 6x^2 - 25x + 150$

$$x^3 - 6x^2 - 25x + 150$$

$$x^2(x-6) - 25(x-6)$$

$$(x^2 - 25)(x-6)^2$$

$$(x+5)(x-5)(x-6)(x-6)$$

Score 1: The student made an error when factoring out the $(x - 6)$.

Question 32

32 Factor completely: $x^3 - 6x^2 - 25x + 150$

$$x^3 - 6x^2 - 25x + 150$$

$$x(x^2 - 6x - 25) + 150$$

$$x^2(x - 6 - 25) + 150$$

$$x^2(x - 31) + 150$$

Score 0: The student made multiple errors.

Question 33

33 Express $xi^8 - yi^6$ in simplest form.

$$\begin{array}{c} x \text{ (circled)} \\ \boxed{x+y} \end{array}$$

$$\begin{array}{l} i^8 = 1 \\ i^6 = -1 \end{array}$$

$$i^8 x - i^6 y$$

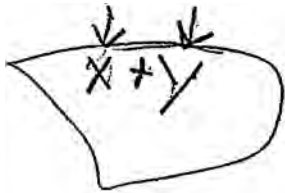
$$(x \cdot 1) - (y \cdot -1)$$

$$(x) + (-(-y))$$

Score 2: The student has a complete and correct response.

Question 33

33 Express $xi^8 - yi^6$ in simplest form.



The image shows a handwritten student response. It consists of a hand-drawn, irregular shape containing the expression $x + y$. Two arrows point downwards from the top of the shape towards the expression, one pointing to the x and the other pointing to the y . This appears to be a student's attempt to represent the original expression $xi^8 - yi^6$ in a simplified form, possibly indicating a misunderstanding of the problem.

Score 2: The student has a complete and correct response.

Question 33

33 Express xi^8/yi^6 in simplest form.

$$\begin{aligned} &xi^2 - yi^6 \\ &x(-1) - y(-1) \\ &\underline{-x + y} \end{aligned}$$

Score 1: The student made an error in simplifying i^8 .

Question 33

33 Express $xi^8 - yi^6$ in simplest form.

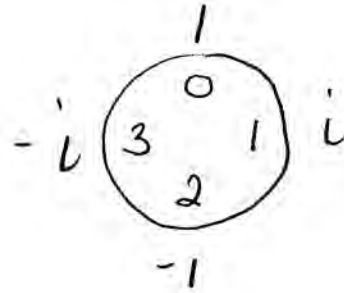
$$\begin{aligned} xi^0 - yi^2 \\ x(1) - y(-1) \\ x + (+y) \\ \boxed{\begin{array}{r} x \quad y \\ - \quad - \end{array}} \end{aligned}$$

Score 1: The student made an error after the correct answer was written.

Question 33

33 Express $xi^8 - yi^6$ in simplest form.

$$xi^8 - yi^6$$



$$(x-y)i^2$$

$$(x-y)(-1)$$

$$x+y$$

Score 0: The student obtained a correct response by an obviously incorrect procedure.

Question 34

34 Given the equation $3x^2 + 2x + k = 0$, state the sum and product of the roots.

~~$$0 = x^2 - 5x + 6$$
$$(x-3)(x-2)$$
$$x=3 \quad x=2$$~~

$$\frac{-2}{3} = \text{sum}$$
$$\frac{k}{3} = \text{product}$$

$$\frac{-b}{a} = \text{sum}$$
$$\frac{c}{a} = \text{product}$$

Score 2: The student has a complete and correct response.

Question 34

34 Given the equation $3x^2 + 2x + k = 0$, state the sum and product of the roots.

$$\begin{aligned} (11) \quad & 3x^2 + 2x + k = 0 \\ & a = 3 \quad b = 2 \quad c = k \end{aligned}$$

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-2 \pm \sqrt{(2)^2 - 4(3)(k)}}{2(3)} \\ &= \frac{-2 \pm \sqrt{4 - 12k}}{6} \end{aligned}$$

$$\text{sum} = -\frac{b}{a} = \boxed{-\frac{2}{3}}$$

$$\text{prod} = -\frac{c}{a} = \boxed{-\frac{k}{3}}$$

Score 1: The student correctly stated the sum.

Question 34

34 Given the equation $3x^2 + 2x + k = 0$, state the sum and product of the roots.

$$\text{sum} = \frac{-b}{2a} \quad \frac{-2}{2(3)} \quad \frac{-2}{6} = \left(\text{sum} \right) \left(-\frac{1}{3} \right)$$

Score 0: The student used the wrong formula for the sum and did not find the product.

Question 34

34 Given the equation $3x^2 + 2x + k = 0$, state the sum and product of the roots.

$$\frac{2a}{a} = \frac{2(3)}{3} = \frac{6}{3} = 2$$
$$\frac{-b}{a} = \frac{-2}{3}$$

Score 0: The student did not label the answers and used an incorrect formula.

Question 35

35 Determine which set of data given below has the stronger linear relationship between x and y . Justify your choice.

Set A

x	1	2	3	4	5	6
y	24	30	36	51	70	86

$$r = 0.9763726986$$

Set B

x	1	2	3	4	5	6
y	81	64	49	36	25	16

$$r = -0.9937474961$$

Set B

Score 2: The student has a complete and correct response.

Question 35

35 Determine which set of data given below has the stronger linear relationship between x and y . Justify your choice.

Set A

x	1	2	3	4	5	6
y	24	30	36	51	70	86

Set B

x	1	2	3	4	5	6
y	81	64	49	36	25	16

Set A, Lin Reg.

$$y = ax + b$$

$$a = 12.71928571$$

$$b = 5$$

$$r^2 = 0.9533036766$$

$$r = 0.9763726288$$

Set B, Lin Reg

$$y = ax + b$$

$$a = -13$$

$$b = 90.66666667$$

$$r^2 = 0.9875390865$$

$$r = -0.9937777963$$

Set A has a stronger linear relationship between the x and y variables because its value of r is closer to one.

Score 1: The student made one conceptual error by not realizing $|r|$ should be closest to 1.

Question 35

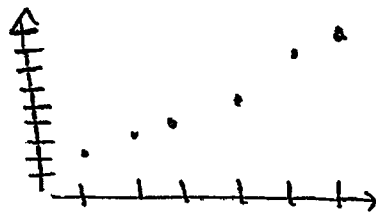
35 Determine which set of data given below has the stronger linear relationship between x and y . Justify your choice.

Set A

x	1	2	3	4	5	6
y	24	30	36	51	70	86

Set B

x	1	2	3	4	5	6
y	81	64	49	36	25	16



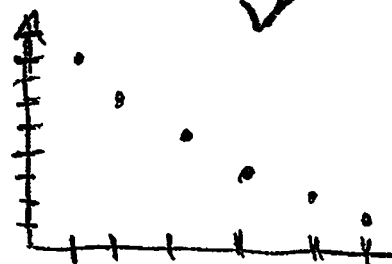
↑

$$y = ax + b$$

$$a = 13.63488415$$

$$b = 1.554802032$$

$$r = 0.9818226836$$



↑

$$y = ax + b$$

$$a = -13$$

$$b = 90.\bar{6}$$

$$r = -0.9937474963$$

Set B

Score 1: The student made one computational error, but made an appropriate choice.

Question 35

35 Determine which set of data given below has the stronger linear relationship between x and y . Justify your choice.

Set A

x	1	2	3	4	5	6
y	24	30	36	51	70	86

$$y = 12.7x + 5$$

Set B

x	1	2	3	4	5	6
y	81	64	49	36	25	16

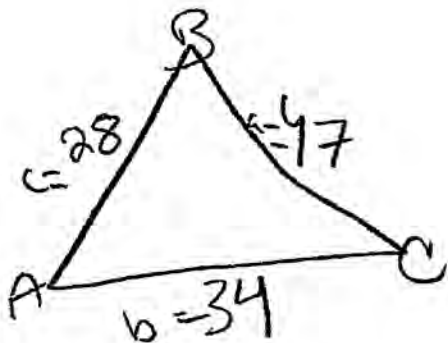
$$y = -13x + 90.7$$

Set A, because Set B includes negative numbers

Score 0: The student had a response that was incorrect.

Question 36

36 Find the measure of the smallest angle, to the nearest degree, of a triangle whose sides measure 28, 47, and 34.



$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$28^2 = 47^2 + 34^2 - 2(47)(34) \cos C$$

$$784 = 2209 + 1156 - 3196 \cos C$$

$$784 = 3365 - 3196 \cos C$$

$$\frac{-2581 = -3196 \cos C}{-3196}$$

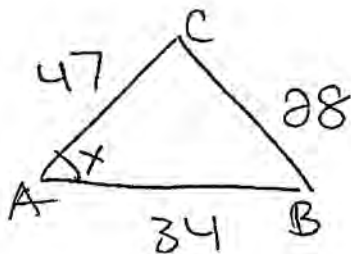
$$.807571965 = \cos C$$

$$C = 36^\circ$$

Score 4: The student has a complete and correct response.

Question 36

36 Find the measure of the smallest angle, to the *nearest degree*, of a triangle whose sides measure 28, 47, and 34.



SAS

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

$$28^2 = 47^2 + 34^2 - 2(47)(34) \cos X$$

$$784 = 2209 + 1156 - 3196 \cos X$$

$$784 = 3365 - 3196 \cos X$$

$$\begin{array}{r} -3365 \\ \hline -2581 \end{array} = \begin{array}{r} -3196 \cos X \\ \hline -3196 \end{array}$$

$$\cos X = \frac{-2581}{-3196}$$

$$\cos X = .807571965$$

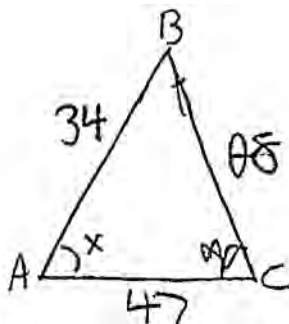
$$\cos X = 36.14062034$$

$$\boxed{\cos X = 36^\circ}$$

Score 3: The student should have indicated that $x = 36^\circ$.

Question 36

36 Find the measure of the smallest angle, to the *nearest degree*, of a triangle whose sides measure 28, 47, and 34.



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

$$K = \frac{1}{2} (34)(47) \sin C$$

$$K = 799 \sin C$$

$$28^2 = 47^2 + 34^2 - 2(47)(34) \cos A$$

$$3784 = 2209 + 1156 - 3196 \cos A$$

$$784 = 3365 - 3196 \cos A$$

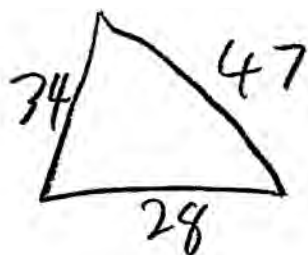
$$784 = 169 \cos A$$

$$\frac{-169}{615} = \cos A$$

Score 2: The student made a correct substitution into the Law of Cosines, but no further correct work was shown.

Question 36

36 Find the measure of the smallest angle, to the *nearest degree*, of a triangle whose sides measure 28, 47, and 34.



$$28^2 = 34^2 + 47^2 - 2(34)(47)\cos x$$

$$28^2 = 1885 - 3196 \cos x$$

$$-1885$$

$$\frac{-1101}{-3196} = \frac{-3196 \cos x}{-3196}$$

$$.34449 = \cos x$$

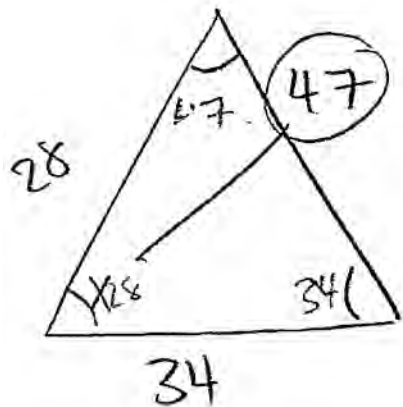
$$\cos^{-1} \quad \cos^{-1}$$

$$\boxed{69.85^\circ}$$

Score 2: The student made one computational error in obtaining 1885, and one rounding error by stating 69.85°.

Question 36

36 Find the measure of the smallest angle, to the nearest degree, of a triangle whose sides measure 28, 47, and 34.



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

$$47^2 = 34^2 + 28^2 - 2(34)(28) \cos X$$

$$2209 = 1156 + 784 - (1904 \cos X)$$

$$2209 = 1940 - (1904 \cos X)$$

$$-1940 \quad -1940$$

$$\frac{269}{1904} = \frac{-1904 \cos X}{1904}$$

$$\frac{269}{1904} = \cos X$$

$$.141 \dots = \cos X$$

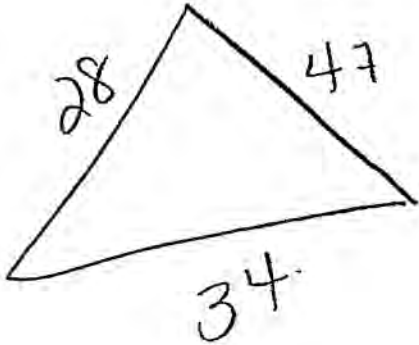
82°

~~81°~~

Score 1: The student made one conceptual error by not finding the measure of the smallest angle. One computational error was made by ignoring the negative sign.

Question 36

36 Find the measure of the smallest angle, to the *nearest degree*, of a triangle whose sides measure 28, 47, and 34.



$$\begin{aligned}c^2 &= a^2 + b^2 - 2ab \cos C \\34 &= (47)^2 + (28)^2 - 2(47)(28) \cos X \\34 &= 2993 - 2632 \cos X \\-2959 &= -2632 \cos X \\1.12 &= \cos X\end{aligned}$$

Score 0: The student made one conceptual error by not finding the measure of the smallest angle. The student made a second conceptual error by not recognizing that a value of $\cos x$ cannot be greater than 1. The student also did not square the 34.

Question 37

37 Solve algebraically for x:

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

$$\frac{3}{-3} + \frac{3}{3+2} = -\frac{2}{3+2} \frac{3x+6}{x(x+2)} + \frac{x^2}{x(x+2)} = -\frac{2}{x+2}$$

$$\frac{1}{5} + \frac{3}{5} = -\frac{2}{5} \frac{x^2+3x+6}{x(x+2)} + \frac{-2}{x+2}$$

$$-\frac{2}{5} = -\frac{2}{5} \left[\frac{x^2+3x+6}{x(x+2)} + \frac{2}{x+2} \right] = 0$$

$$\frac{x^2+3x+6}{x(x+2)} + \frac{2x}{x(x+2)} = 0$$

$$\frac{x^2+5x+6}{x(x+2)} = 0$$

$$\frac{(x+2)(x+3)}{x(x+2)} = 0$$

$$\frac{x+3}{x} = 0$$

$$x+3 = 0$$

$$x = -3$$

Score 4: The student has a complete and correct response.

Question 37

37 Solve algebraically for x:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$$x+2 \left(\frac{3}{x} + \frac{x}{x+2} \right) = -\left(\frac{2}{x+2} \right) x+2$$

$$\cancel{x} \left(\frac{3x+6}{x} \right) + \frac{x}{\cancel{1}} = (-2)^1$$

$$3x+6 + x^{\cancel{2}} = -2x$$

$$x^{\cancel{2}} + 3x + 6 = -2x$$

$\quad \quad \quad +2x \quad \quad +2x$

$$x^{\cancel{2}} + 5x + 6$$

$$(x+2)(x+3)$$

$$\cancel{x=-2} \quad x=-3$$

$$\boxed{x=-3}$$

Score 4: The student has a complete and correct response.

Question 37

37 Solve algebraically for x:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$$\frac{3}{x} + \frac{x}{x+2} + \frac{2}{x+2} = 0$$

$$\frac{3}{x} + \frac{x+2}{x+2} = 0$$

$$\frac{3}{x} + 1 = 0$$

$$3 + x = 0$$

$$x = -3$$

Score 4: The student has a complete and correct response.

Question 37

37 Solve algebraically for x:

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

$$3x + 6 + x^2 = -2x$$

$$-6 = x^2 - 2x$$

$$-3x - x^2 - 5x - 6 = 0$$

$$(-x + 1)(x - 6) = 0$$

$$-x + 1 = 0$$

$$\begin{array}{r} = 1 - 1 \\ -x = -1 \\ \frac{-x}{-1} = \frac{-1}{-1} \end{array}$$

$$x = 1$$

$$x - 6 = 0$$

$$\begin{array}{r} +6 \quad +6 \\ x = 6 \end{array}$$

Score 3: The student made one factoring error, but stated an appropriate solution.

Question 37

37 Solve algebraically for x:

$$\frac{3}{x} + \frac{x}{x+2} = \frac{2}{x+2}$$

$$3x + 6 + x^2 = 2x$$

$$x^2 + x + 6 = 0$$

$$x = \frac{-1 \pm \sqrt{1 - 4(6)(1)}}{2}$$

$$x = \frac{-1 \pm \sqrt{-23}}{2}$$

$$x = \frac{-1 \pm i\sqrt{23}}{2}$$

Score 3: The student made one computational error by not using the negative sign.

Question 37

37 Solve algebraically for x:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$$\frac{\overset{3x+6}{\cancel{3(x+2)}}}{x(x+2)} + \frac{x^2}{x(x+2)} = \frac{-2x}{x(x+2)}$$

$$\frac{x^2+3x+6}{\cancel{x(x+2)}} = \frac{-2x}{\cancel{x(x+2)}}$$

$$x^2+3x+6 = -2x$$

+2x +2x

$$x^2+5x+6=0$$

$$(x+3)(x+2)=0$$

$$\cancel{x=-3} \quad x=-2$$

$$x = \emptyset$$

Score 3: The student made one error by also rejecting -3 .

Question 37

37 Solve algebraically for x:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$$\frac{(x+2) 3}{(x+2) x} + \frac{x(x)}{x+2(x)} = -\frac{2(x)}{x+2(x)}$$

$$\frac{3x+6+x^2}{x^2+2x} = -2x$$

$$\frac{x^2+5x+6}{x^2+2x}$$

$$\frac{(x+3)(\cancel{x+2})}{(\cancel{x+2})(x)}$$

$$\frac{x+3}{x}$$

Score 2: The student made one conceptual error by not solving an equation.

Question 37

37 Solve algebraically for x:

$$\frac{\cancel{(x)}(x+2)}{1} \cdot \frac{3}{\cancel{x}} + \frac{\cancel{(x)}(x+2)}{x} = \frac{\cancel{(x)}(x+2)}{x+2}$$

$$\begin{array}{r} 3x + 6 + x^2 = 2x \\ -2x \qquad \qquad -2x \\ \hline x^2 + x + 6 = 0 \end{array}$$

Score 1: The student made one computational error by not using the negative sign. The student did not solve for x.

Question 37

37 Solve algebraically for x:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$$\frac{3}{x} \left(\frac{x+2}{x+2} \right) + \frac{x}{x+2} = \frac{-2}{x+2}$$

$$\frac{5}{x+2} + \frac{x}{x+2} = \frac{-2}{x+2}$$

$$\frac{5+x}{x+2} = \frac{-2}{x+2}$$

$$5+x = -2$$

$$x = -3$$

Score 1: The student made one conceptual error by adding 2 to the numerator and denominator of the first fraction. The student made one computational error when solving the equation.

Question 37

37 Solve algebraically for x:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$x(x+2)$ $\frac{3}{\cancel{x(x+2)}} + \frac{x}{\cancel{x(x+2)}} = -\frac{2}{\cancel{x(x+2)}}$

$3 + x = 2$
 $-3 \quad -$

$x = -5$

Score 0: The student had a response that was completely incorrect.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*.

a)

$$\sigma = 5.17$$

Determine the number of students whose scores are within one population standard deviation of the mean.

b) $\bar{x} = 84.46$

-1SD	\bar{x}	1SD
79.29	84.46	89.63

17 students

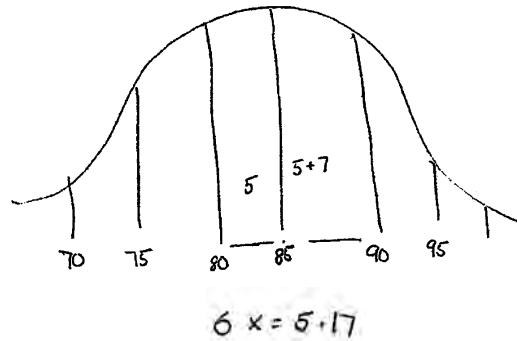
Score 4: The student has a complete and correct response.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*.



Determine the number of students whose scores are within one population standard deviation of the mean.

17 students -

Score 3: The student had an appropriate answer based upon an incorrect mean of 85.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*.

stat, CLAC, 1-Var Stats L1, L2

$$\sigma x = 5.17$$

$$\bar{x} = 84.56$$

Determine the number of students whose scores are within one population standard deviation of the mean.

21 students } 9.63
79.29

Score 3: The student made one computational error by including students with a test score of 79.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*. 5.17

$$\begin{array}{l} 84 \div \text{mean} \\ - 5.17 \div \text{psd} \\ \hline \end{array}$$

Determine the number of students whose scores are within one population standard deviation of the mean.

$$78.83 - 84 - 89.17 \quad 21 \text{ students}$$

Score 3: The student had an appropriate answer based upon a prematurely rounded mean.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*.

$$\sigma_x = 6.90$$

Determine the number of students whose scores are within one population standard deviation of the mean.

$$\bar{x} = 82.43$$

$$75.53 - 89.33$$

$$22$$

Score 2: The student made one conceptual error by not using the frequencies when finding the standard deviation, but found an appropriate number of students.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*.

$$\sigma_x = 5.27$$

$$\bar{x} = 84.46$$

Determine the number of students whose scores are within one population standard deviation of the mean.

$$\begin{array}{r} 84.46 \\ + 5.27 \\ \hline 89.73 \end{array}$$

$$\begin{array}{r} 84.46 \\ - 5.27 \\ \hline 79.19 \end{array}$$

$$\begin{array}{r} 4 \\ 5 \\ 7 \\ + 5 \\ \hline \end{array}$$

21 students

Score 1: The student made one conceptual error by using the sample standard deviation. The student made one computational error by including the test score of 79.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76	1
79	4
83	5
85	7
88	5
94	3

Find the population standard deviation based on these data, to the *nearest hundredth*.

5.17

Determine the number of students whose scores are within one population standard deviation of the mean.

26

Calc { Stat → Edit
Enter list 1 and 2
Stat → 1-Var Stats
L1, L2
Enter

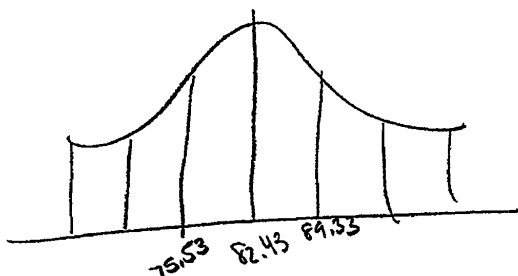
Score 1: The student found 5.17, but no further correct work was shown.

Question 38

38 The table below shows the final examination scores for Mr. Spear's class last year.

Test Score	Frequency
72	1
76 ✓	1
79 ✓	4
83 ✓	5
85 ✓	7
88 ✓	5
94	3

a) Find the population standard deviation based on these data, to the *nearest hundredth*.



a) $\sigma_x = 6.90$

b) Determine the number of students whose scores are within one population standard deviation of the mean.

b) 5 students

Score 0: The student's response was completely incorrect since the student disregarded the frequency.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$\begin{aligned}5 \cos \theta &= 2 \sec \theta - 3 \\ \cos \theta \left(5 \cos \theta &= \frac{2}{\cos \theta} - 3 \right) \\ 5 \cos^2 \theta &= 2 - 3 \cos \theta \\ 5 \cos^2 \theta + 3 \cos \theta - 2 &= 0 \\ (5 \cos \theta - 2)(\cos \theta + 1) &= 0 \\ 5 \cos \theta = 2 & \quad \cos \theta = -1 \\ \cos \theta = \frac{2}{5} & \\ \{66.4, 180, 293.6\} &\end{aligned}$$

Score 6: The student has a complete and correct response.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$5 \left(\frac{1}{\sec \theta} \right) = 2 \sec \theta - 3$$

$$5 = 2 \sec^2 \theta - 3 \sec \theta$$

$$0 = 2 \sec^2 \theta - 3 \sec \theta - 5$$

$$0 = (2 \sec \theta - 5)(\sec \theta + 1)$$

$$2 \sec \theta - 5 = 0$$

$$\sec \theta + 1 = 0$$

$$2 \sec \theta = 5$$

$$\sec \theta = -1$$

$$\sec \theta = \frac{5}{2}$$

$$\cos \theta = -1$$

$$\cos \theta = \frac{2}{5}$$

$$\theta = 180$$

$$\theta = 66.4218215218$$

$$360 - \theta = 293.578178478$$

$$\boxed{66.4, 180, 293.6}$$

Score 6: The student has a complete and correct response.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$5 \cos \theta = 2 \left(\frac{1}{\cos \theta} \right) - 3$$

$$5 \cos^2 \theta = 2 - 3 \cos \theta$$

$$5 \cos^2 \theta + 3 \cos \theta - 2 = 0$$

$$(5 \cos \theta - 2)(\cos \theta + 1) = 0$$

$$5 \cos \theta = 2$$

$$\cos \theta = \frac{2}{5}$$

$$\theta = 66.4$$

$$\cos \theta = -1$$

$$\theta = 180.0$$

Score 5: The student only found two correct values of θ .

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$5 \cos \theta = 2 \sec \theta - 3$$

$$\cos \theta \left(5 \cos \theta = \frac{2}{\cos \theta} - 3 \right)$$

$$5 \cos^2 \theta = 2 - 3 \cos \theta$$

$$5 \cos^2 \theta + 3 \cos \theta - 2 = 0$$

$$(5 \cos \theta + 2)(\cos \theta - 1) = 0$$

$$\cos \theta = -\frac{2}{5} \quad \cos \theta = 1$$

$$113.6, 246.4, 0.0$$

$$\{114, 246, 0\}$$

Score 4: The student made one error in factoring the trinomial, and then made one rounding error when stating the final answer.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$5 \cos \theta - 2 \left(\frac{1}{\cos \theta} \right) + 3 = 0$$

$$5 \cos^2 \theta - 2 + 3 \cos \theta = 0$$

$$\cos \theta = \frac{-3 \pm \sqrt{9 - (4 \cdot 5 \cdot -2)}}{10}$$

$$\cos \theta = \frac{-3 \pm \sqrt{149}}{10}$$

$$\cos \theta = \frac{-3 \pm 7}{10}$$

$$\cos \theta = \frac{4}{10} \text{ or } \cos \theta = -1$$

Score 4: The student found correct values for $\cos \theta$, but no further correct work was shown.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$5 \cos \theta = \frac{2}{\cos \theta} - 3$$

$$5 \cos^2 \theta + 3 \cos \theta - 2 = 0$$

$$(5 \cos \theta + 2)(\cos \theta - 1) = 0$$

$$\cos \theta = -\frac{2}{5} \quad \cos \theta = 1$$

$$\cos \theta = -0.6 \quad \theta = 0$$

$$\theta = \cos^{-1}(-0.6)$$

$$\theta = 126.869897646$$

$$\theta = 127$$

$$\theta = 233$$

$$\boxed{0, 127, 233}$$

Score 3: The student made an error in factoring the trinomial, one computational error in writing the decimal, and rounded incorrectly.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$\begin{aligned} \cos \theta [5 \cos \theta = 2 \sec \theta - 3] \\ 5 \cos^2 \theta = 2 \cos \theta \frac{1}{\cos \theta} - 3 \cos \theta \\ 5 \cos^2 \theta = 2 - 3 \cos \theta \\ 5 \cos^2 \theta + 3 \cos \theta - 2 = 0 \\ \cancel{\cos \theta} (5 \cos \theta + 3) = \frac{2}{\cos \theta} \\ 5 \cos \theta + 3 = 0 \quad \cancel{\frac{2}{\cos \theta} = 0} \\ \cos \theta = -\frac{3}{5} \end{aligned}$$

Score 2: The student wrote a correct quadratic equation in standard form, but no further correct work was shown.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the *nearest tenth of a degree*.

$$5 \cos \theta = 2 \left(\frac{1}{\cos \theta} \right) - 3$$

$$5 \cos^2 \theta = 2 - 3 \cos \theta$$

Score 1: The student wrote an equation in terms of cosine, but did not solve for $\cos \theta$.

Question 39

39 In the interval $0^\circ \leq \theta < 360^\circ$, solve the equation $5 \cos \theta = 2 \sec \theta - 3$ algebraically for all values of θ , to the nearest tenth of a degree.

$$5 \cos \theta = 0$$

$$\cos \theta = 0$$

$$\theta = 90.0$$

$$2 \sec \theta - 3 = 0$$

$$\sec \theta = \frac{3}{2}$$

$$\theta = 48.1897$$

$$\theta = 48.2$$

Score 0: The student had a response that was completely incorrect.

Regents Examination in Algebra 2/Trigonometry – June 2015

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

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.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration 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 Algebra 2/Trigonometry.