The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA 2/TRIGONOMETRY

Thursday, January 29, 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.

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 In $\triangle FGH$, $f = 6$, $g = 9$, and $m\angle H = 57$. Which statement can be used to determine the numerical value of h?

(1) $h^2 = 6^2 + 9^2 - 2(9)(h)\cos 57°$

(2) $h^2 = 6^2 + 9^2 - 2(6)(9)\cos 57°$

(3) $6^2 = 9^2 + h^2 - 2(9)(h)\cos 57°$

(4) $9^2 = 6^2 + h^2 - 2(6)(h)\cos 57°$

2 The table of values below can be modeled by which equation?

x	y
–2	5
–1	4
0	3
1	4
2	5

(1) $f(x) = |x + 3|$

(2) $f(x) = |x| + 3$

(3) $f(y) = |y + 3|$

(4) $f(y) = |y| + 3$

3 The equation $\log_a x = y$ where $x > 0$ and $a > 1$ is equivalent to

(1) $x^y = a$

(2) $y^a = x$

(3) $a^y = x$

(4) $a^x = y$

Use this space for computations.

4 Which expression is equivalent to the sum of the sequence 6, 12, 20, 30?

(1) $\sum_{n=4}^{7} 2^n - 10$

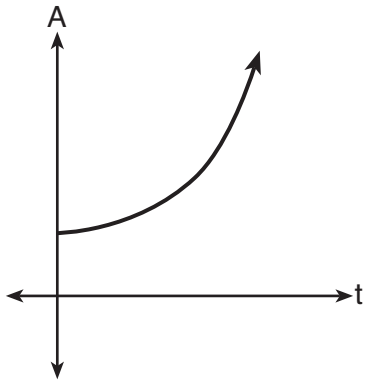
(2) $\sum_{n=3}^{6} \frac{2n^2}{3}$

(3) $\sum_{n=2}^{5} 5n - 4$

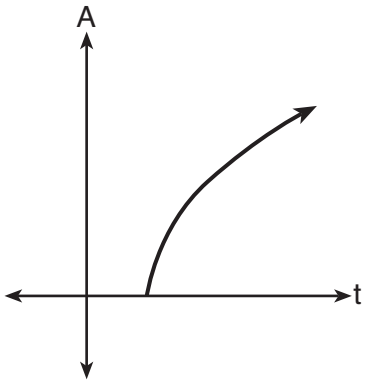
(4) $\sum_{n=2}^{5} n^2 + n$

5 An investment is earning 5% interest compounded quarterly. The equation $A = P\left(1 + \frac{r}{n}\right)^{nt}$ represents the total amount of money, A, where P is the original investment, r is the interest rate, t is the number of years, and n represents the number of times per year the money earns interest.

Which graph could represent this investment over at least 50 years?



(1)



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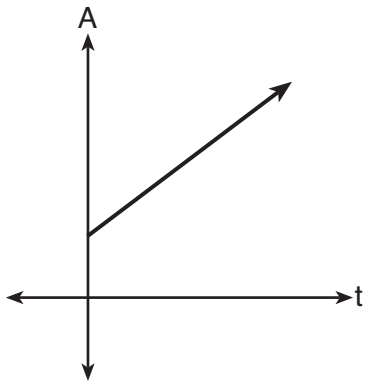
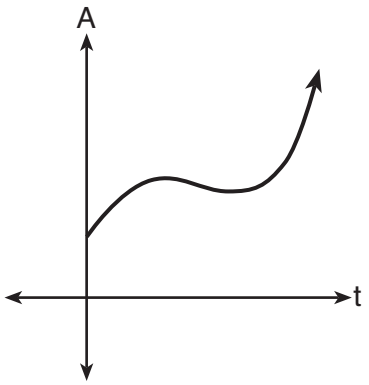


(2)



(4)

Use this space for computations.

6 Which equation has real, rational, and unequal roots?

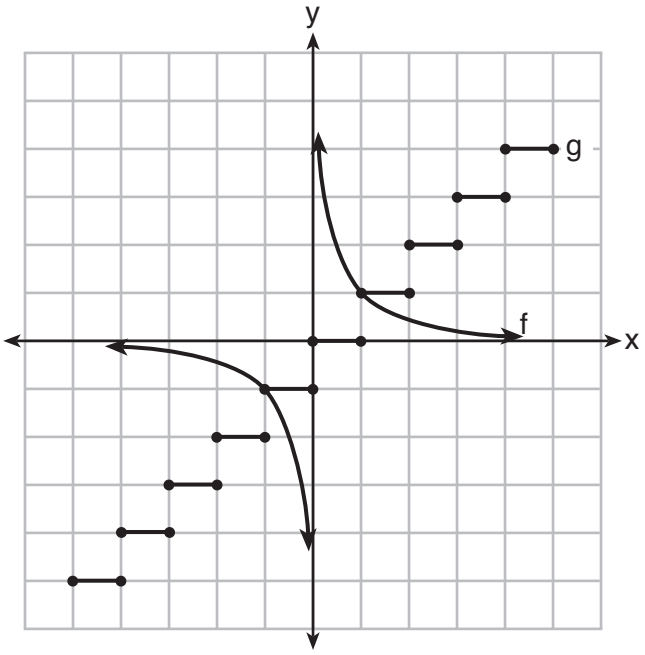
(1) $x^2 + 10x + 25 = 0$

(2) $x^2 - 5x + 4 = 0$

(3) $x^2 - 3x + 1 = 0$

(4) $x^2 - 2x + 5 = 0$

7 Which statement is true about the graphs of f and g shown below?



(1) f is a relation and g is a function.

(2) f is a function and g is a relation.

(3) Both f and g are functions.

(4) Neither f nor g is a function.

8 The common ratio of the sequence $-\frac{1}{2}, \frac{3}{4}, -\frac{9}{8}$ is

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

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

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

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

Use this space for computations.

9 How many different ways can teams of four members be formed from a class of 20 students?

(1) 5
(2) 80
(3) 4,845
(4) 116,280

10 If $\sin A = \frac{3}{8}$, what is the value of $\cos 2A$?

(1) $-\frac{9}{64}$
(2) $\frac{1}{4}$
(3) $\frac{23}{32}$
(4) $\frac{55}{64}$

11 When factored completely, the expression $x^3 - 2x^2 - 9x + 18$ is equivalent to

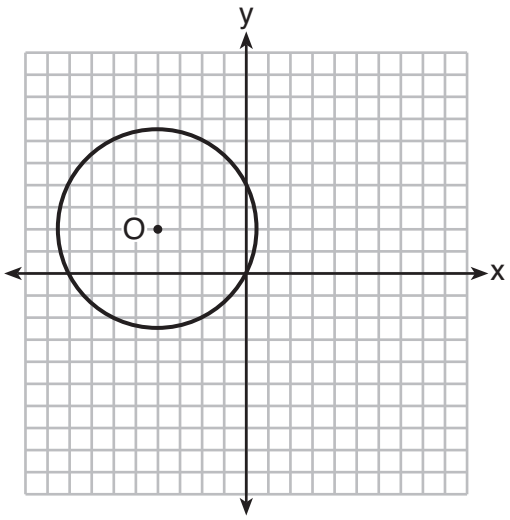
(1) $(x^2 - 9)(x - 2)$
(2) $(x - 2)(x - 3)(x + 3)$
(3) $(x - 2)^2(x - 3)(x + 3)$
(4) $(x - 3)^2(x - 2)$

12 When $-3 - 2i$ is multiplied by its conjugate, the result is

(1) -13
(2) -5
(3) 5
(4) 13

Use this space for computations.

13 A circle with center O and passing through the origin is graphed below.



What is the equation of circle O?

(1) $x^2 + y^2 = 2\sqrt{5}$

(2) $x^2 + y^2 = 20$

(3) $(x + 4)^2 + (y - 2)^2 = 2\sqrt{5}$

(4) $(x + 4)^2 + (y - 2)^2 = 20$

14 Which expression is equivalent to $(5^{-2}a^3b^{-4})^{-1}$?

(1) $\frac{10b^4}{a^3}$

(2) $\frac{25b^4}{a^3}$

(3) $\frac{a^3}{25b^4}$

(4) $\frac{a^2}{125b^5}$

15 Which trigonometric expression does *not* simplify to 1?

(1) $\sin^2 x(1 + \cot^2 x)$

(2) $\sec^2 x(1 - \sin^2 x)$

(3) $\cos^2 x(\tan^2 x - 1)$

(4) $\cot^2 x(\sec^2 x - 1)$

Use this space for computations.

16 What is the product of $\sqrt[3]{4a^2b^4}$ and $\sqrt[3]{16a^3b^2}$?

(1) $4ab^2\sqrt[3]{a^2}$

(2) $4a^2b^3\sqrt[3]{a}$

(3) $8ab^2\sqrt[3]{a^2}$

(4) $8a^2b^3\sqrt[3]{a}$

17 What is the product of the roots of $4x^2 - 5x = 3$?

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

(2) $\frac{5}{4}$

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

(4) $-\frac{5}{4}$

18 How many different 11-letter arrangements are possible using the letters in the word "ARRANGEMENT"?

(1) 2,494,800

(2) 4,989,600

(3) 19,958,400

(4) 39,916,800

19 What is the third term in the expansion of $(2x - 3)^5$?

(1) $720x^3$

(2) $180x^3$

(3) $-540x^2$

(4) $-1080x^2$

20 Angle θ is in standard position and $(-4,0)$ is a point on the terminal side of θ. What is the value of $\sec\theta$?

(1) -4

(2) -1

(3) 0

(4) undefined

Use this space for computations.

21 The domain of $f(x) = -\frac{3}{\sqrt{2-x}}$ is the set of all real numbers

(1) greater than 2
(2) less than 2
(3) except 2
(4) between -2 and 2

22 Which equation could be used to solve $\frac{5}{x-3} - \frac{2}{x} = 1$?

(1) $x^2 - 6x - 3 = 0$
(2) $x^2 - 6x + 3 = 0$
(3) $x^2 - 6x - 6 = 0$
(4) $x^2 - 6x + 6 = 0$

23 How many distinct triangles can be constructed if $m\angle A = 30$, side $a = \sqrt{34}$, and side $b = 12$?

(1) one acute triangle
(2) one obtuse triangle
(3) two triangles
(4) none

24 The expression $\left(\frac{3}{2}x + 1\right)\left(\frac{3}{2}x - 1\right) - \left(\frac{3}{2}x - 1\right)^2$ is equivalent to

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

Use this space for computations.

25 The table below shows five numbers and their frequency of occurrence.

Number	Frequency
5	9
7	5
8	8
12	8
14	8

The interquartile range for these data is

(1) 7
(2) 5
(3) 7 to 12
(4) 6 to 13

26 A wheel has a radius of 18 inches. Which distance, to the *nearest inch*, does the wheel travel when it rotates through an angle of $\frac{2\pi}{5}$ radians?

(1) 45
(2) 23
(3) 13
(4) 11

27 If $f(x) = 4x^2 - x + 1$, then $f(a + 1)$ equals

(1) $4a^2 - a + 6$
(2) $4a^2 - a + 4$
(3) $4a^2 + 7a + 6$
(4) $4a^2 + 7a + 4$

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 If p and q vary inversely and p is 25 when q is 6, determine q when p is equal to 30.

29 Express in simplest form:

$$\frac{\dfrac{36 - x^2}{(x + 6)^2}}{\dfrac{x - 3}{x^2 + 3x - 18}}$$

30 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.

31 Determine, to the *nearest minute*, the degree measure of an angle of $\frac{5}{11}\pi$ radians.

32 The probability of Ashley being the catcher in a softball game is $\frac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.

33 If x is a real number, express $2xi\left(i - 4i^2\right)$ in simplest $a + bi$ form.

34 On a test that has a normal distribution of scores, a score of 57 falls one standard deviation below the mean, and a score of 81 is two standard deviations above the mean. Determine the mean score of this test.

35 The area of a parallelogram is 594, and the lengths of its sides are 32 and 46. Determine, to the *nearest tenth of a degree*, the measure of the acute angle of the parallelogram.

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 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

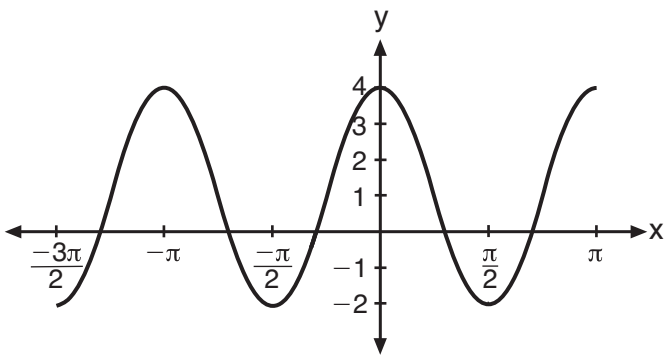
Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

37 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.

$$a_1 = 2$$

$$a_n = 3\left(a_{n-1}\right)^{-2}$$

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

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 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]

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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

$$(a + b)^n = {}_nC_0a^nb^0 + {}_nC_1a^{n-1}b^1 + {}_nC_2a^{n-2}b^2 + \ldots + {}_nC_na^0b^n$$
$$(a + b)^n = \sum_{r=0}^{n} {}_nC_r a^{n-r}b^r$$

Law of Cosines

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

Functions of the Double Angle

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

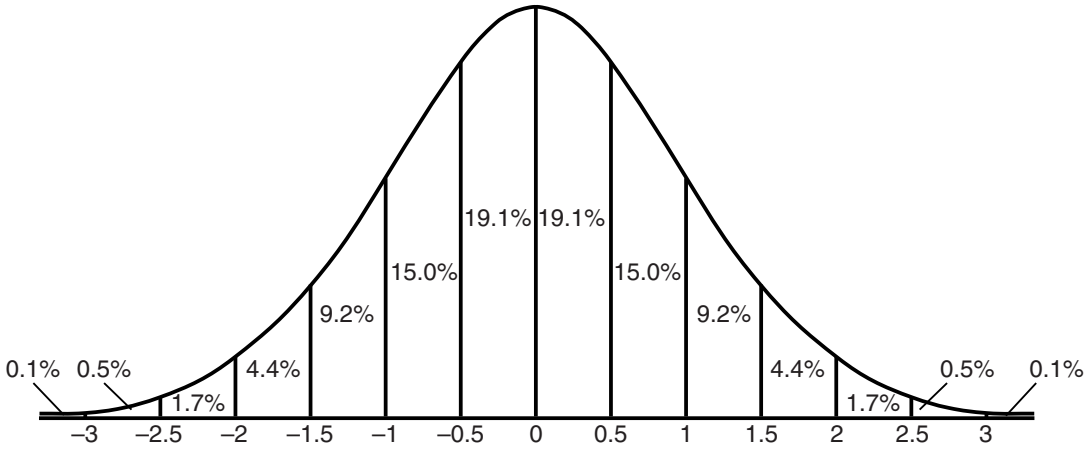
Functions of the Half Angle

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

Sum of a Finite Geometric Series

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

Normal Curve
Standard Deviation



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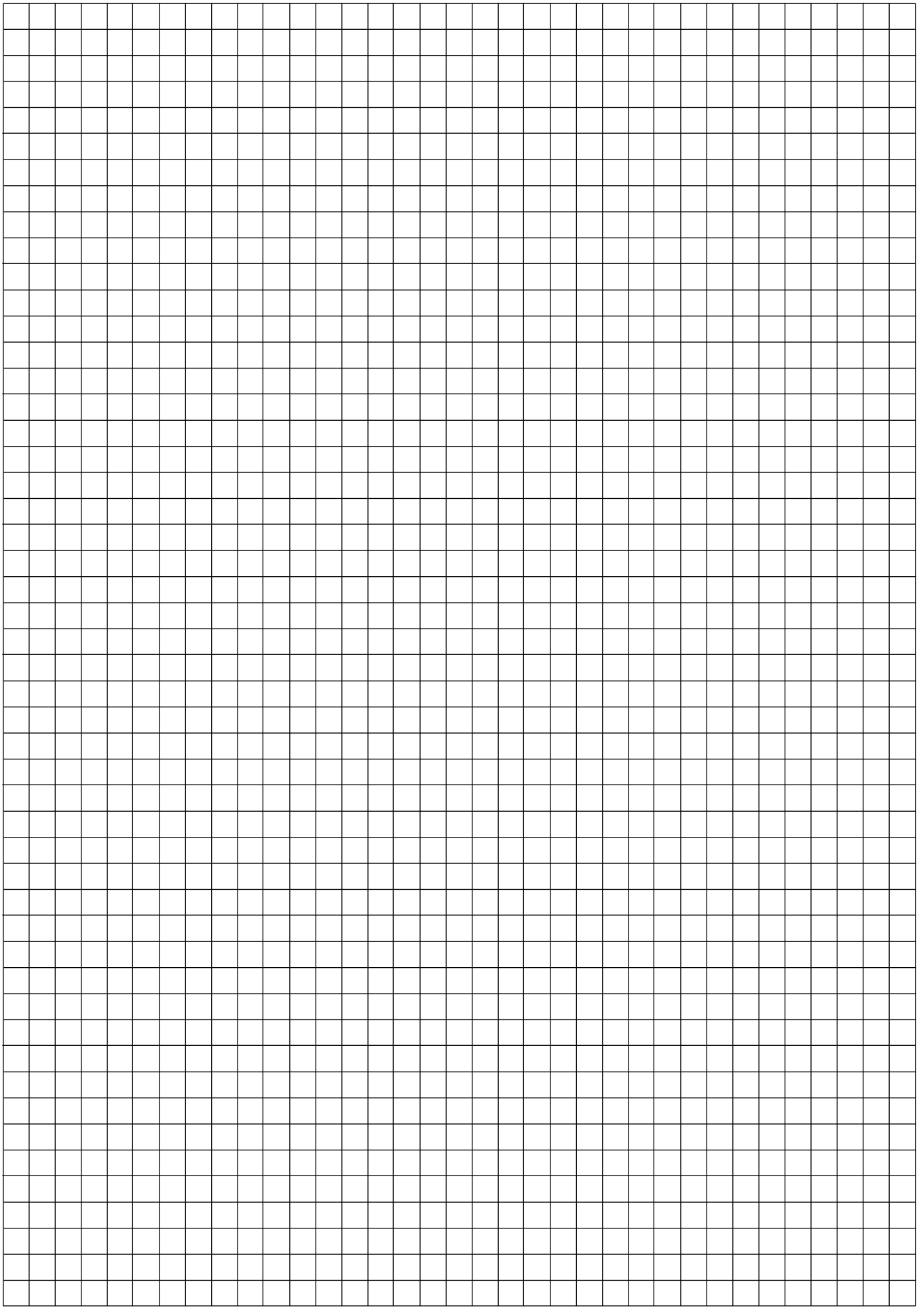

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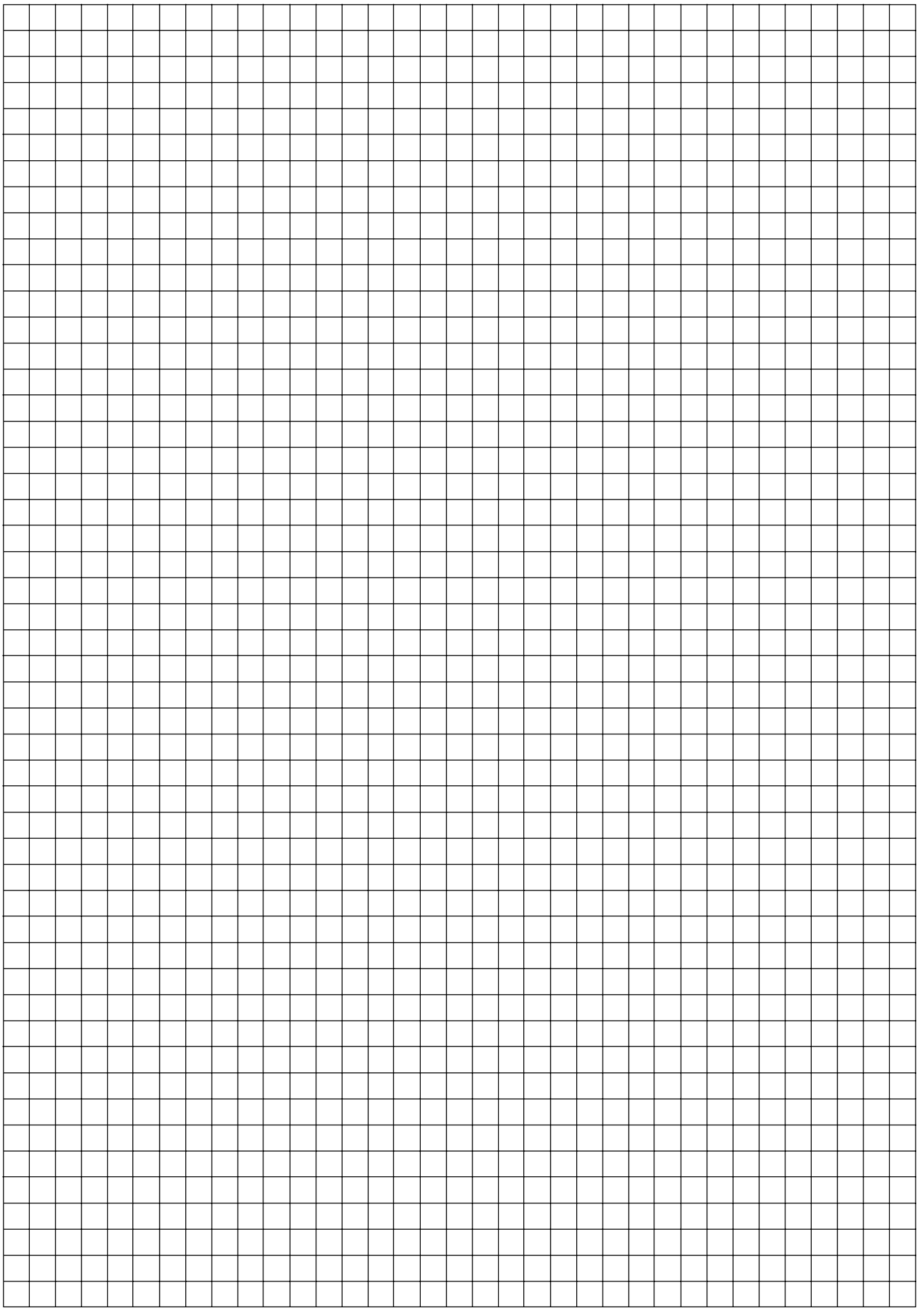

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SCORING KEY AND RATING GUIDE

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 Thursday, January 29, 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) 2	(10) 3	(19) . . . . . 1 . . . . .
(2) 2	(11) 2	(20) . . . . . 2 . . . . .
(3) 3	(12) 4	(21) . . . . . 2 . . . . .
(4) 4	(13) 4	(22) . . . . . 3 . . . . .
(5) 1	(14) 2	(23) . . . . . 4 . . . . .
(6) 2	(15) 3	(24) . . . . . 4 . . . . .
(7) 2	(16) 1	(25) . . . . . 2 . . . . .
(8) 1	(17) 3	(26) . . . . . 2 . . . . .
(9) 3	(18) 1	(27) . . . . . 4 . . . . .

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.

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]** 5, 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] 5, 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]** $6 - x$ or an equivalent answer, and correct work is shown.

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

or

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

or

[1] All the expressions are factored correctly, but no further correct work is shown.

or

[1] $6 - x$, 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.

(30) **[2]** 0.62, and correct algebraic 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] A correct logarithmic equation, such as $\ln 12 = 4x$, is written, but no further correct work is shown.

or

[1] 0.62, but a method other than algebraic is used.

or

[1] 0.62, 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]** $81° 49'$

[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] Appropriate work is shown, but the answer is expressed as a decimal.

[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]** $\frac{576}{15,625}$ or 0.036864, 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] ${}_6C_5\left(\frac{2}{5}\right)^5\left(\frac{1}{5}\right)$ is written, but no further correct work is shown.

or

[1] $\frac{576}{15,625}$ or 0.036864, 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.

(33) **[2]** $-2x + 8xi$, and correct work is shown.

[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.

or

[1] $-2x + 8xi$, 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.

(34) **[2]** 65, 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] Appropriate work is shown to find 8, but no further correct work is shown.

or

[1] 65, 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.

(35) **[2]** 23.8, 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] 23.8, but no work is shown.

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

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]** $y = 733.646(0.786)^x$ and 41, and correct work is shown.

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

or

[3] $y = 733.646(0.786)^x$ and 41, but no work is shown.

or

[3] The expression $733.646(0.786)^x$ is written and 41, and appropriate work is shown.

[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.

or

[2] $y = 733.646(0.786)^x$, but no further correct work is shown.

or

[2] An incorrect regression equation is solved appropriately.

or

[2] The expression $733.646(0.786)^x$ is written and 41, but no work is shown.

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

or

[1] The expression $733.646(0.786)^x$ is written, but no further correct work is shown.

or

[1] 41, 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]** $\frac{3}{4}, \frac{16}{3}, \frac{27}{256}$, and correct work is shown.

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

or

[3] Correct work is shown to find $\frac{3}{4}$ and $\frac{16}{3}$, but no further correct work is shown.

or

[3] Appropriate work is shown, but the answers are expressed as decimals.

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

or

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

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

or

[1] Correct work is shown to find $\frac{3}{4}$, but no further correct work is shown.

or

[1] $\frac{3}{4}, \frac{16}{3}, \frac{27}{256}$, 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]** $a = 3, b = 2, c = 1$, and $y = 3 \cos 2x + 1$ or an equivalent equation is written.

[3] $y = 3 \cos 2x + 1$ or an equivalent equation is written, but a, b, and c are not specifically stated.

or

[3] $a = 3, b = 2, c = 1$, and the expression $3 \cos 2x + 1$ is written.

or

[3] $a = 3, b = 2, c = 1$, but no further correct work is shown.

or

[3] Two of the values are correct, and an appropriate equation is written.

[2] One conceptual error is made, but appropriate values and an appropriate equation are written.

or

[2] Two of the values are correct, but no further correct work is shown.

or

[2] One of the values is correct, and an appropriate equation is written.

[1] One conceptual error is made, but an appropriate equation is written.

or

[1] One of the values is correct, but no further correct work is shown.

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

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]** 10, and correct algebraic work is shown.

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

or

[5] Appropriate work is shown to find x, but the required solution is not found.

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

or

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

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

or

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

or

[3] $x^2 + 36x - 492 \leq 0$ is written, but no further correct work is shown.

or

[3] 10, but a method other than algebraic is used.

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

or

[2] $x^2 + 36x - 492 = 0$ is written, but no further correct work is shown.

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

or

[1] $(x + 14)(x + 22) \leq 800$ is written, but no further correct work is shown.

or

[1] 10, but no work is shown.

[0] $(x + 14)(x + 22) = 800$ is written, but no further correct work is shown.

or

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

Map to Core Curriculum

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

Regents Examination in Algebra 2/Trigonometry
January 2015
Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the January 2015 Regents Examination in Algebra 2/Trigonometry* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Thursday, January 29, 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
THE STATE EDUCATION DEPARTMENT
Office of State Assessment
Albany, New York 12234

IMPORTANT NOTICE

Scoring Clarification for Teachers

Regents Examination in Algebra 2/Trigonometry

Thursday, January 29, 2015—9:15 a.m.

Question 32, only

Due to a typographical error in the third example of a 1-credit response, a revised rubric for this example has been provided. In this instance, the second fraction should be "$\frac{3}{5}$" rather than "$\frac{1}{5}$". Please verify that all students' responses to Question 32 have been scored in accordance with the corrected rubric below.

(32) **[1]** ${}_6C_5\left(\frac{2}{5}\right)^5\left(\frac{\mathbf{3}}{\mathbf{5}}\right)$ is written, but no further correct work is shown.

Please photocopy this notice and give a copy of it to each teacher scoring the Regents Examination in Algebra 2/Trigonometry.

We apologize for any inconvenience this may cause you. Thank you for your hard work on behalf of the students in New York State.

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA 2/ TRIGONOMETRY

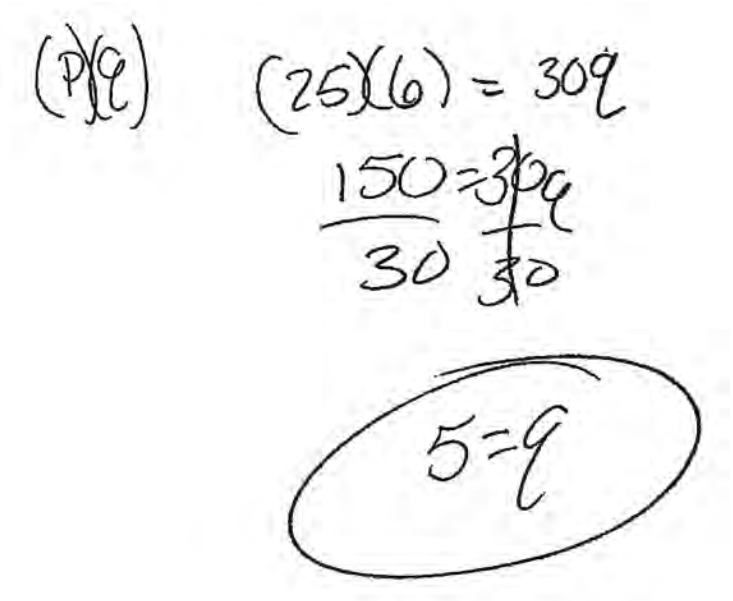
Thursday, January 29, 2015 — 9:15 a.m. – 12:15 p.m.

SAMPLE RESPONSE SET

Table of Contents

Question 28

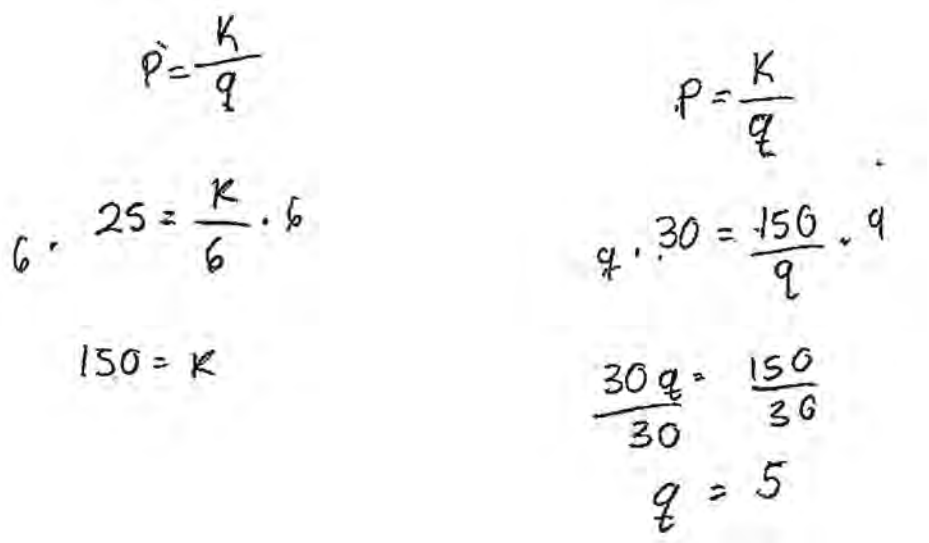
28 If p and q vary inversely and p is 25 when q is 6, determine q when p is equal to 30.



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

Question 28

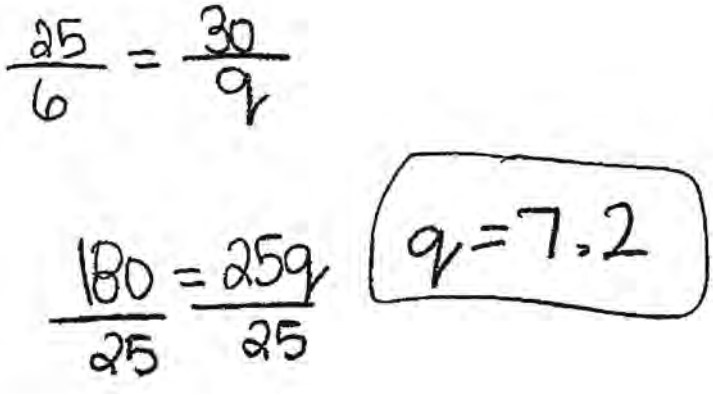
28 If p and q vary inversely and p is 25 when q is 6, determine q when p is equal to 30.



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

Question 28

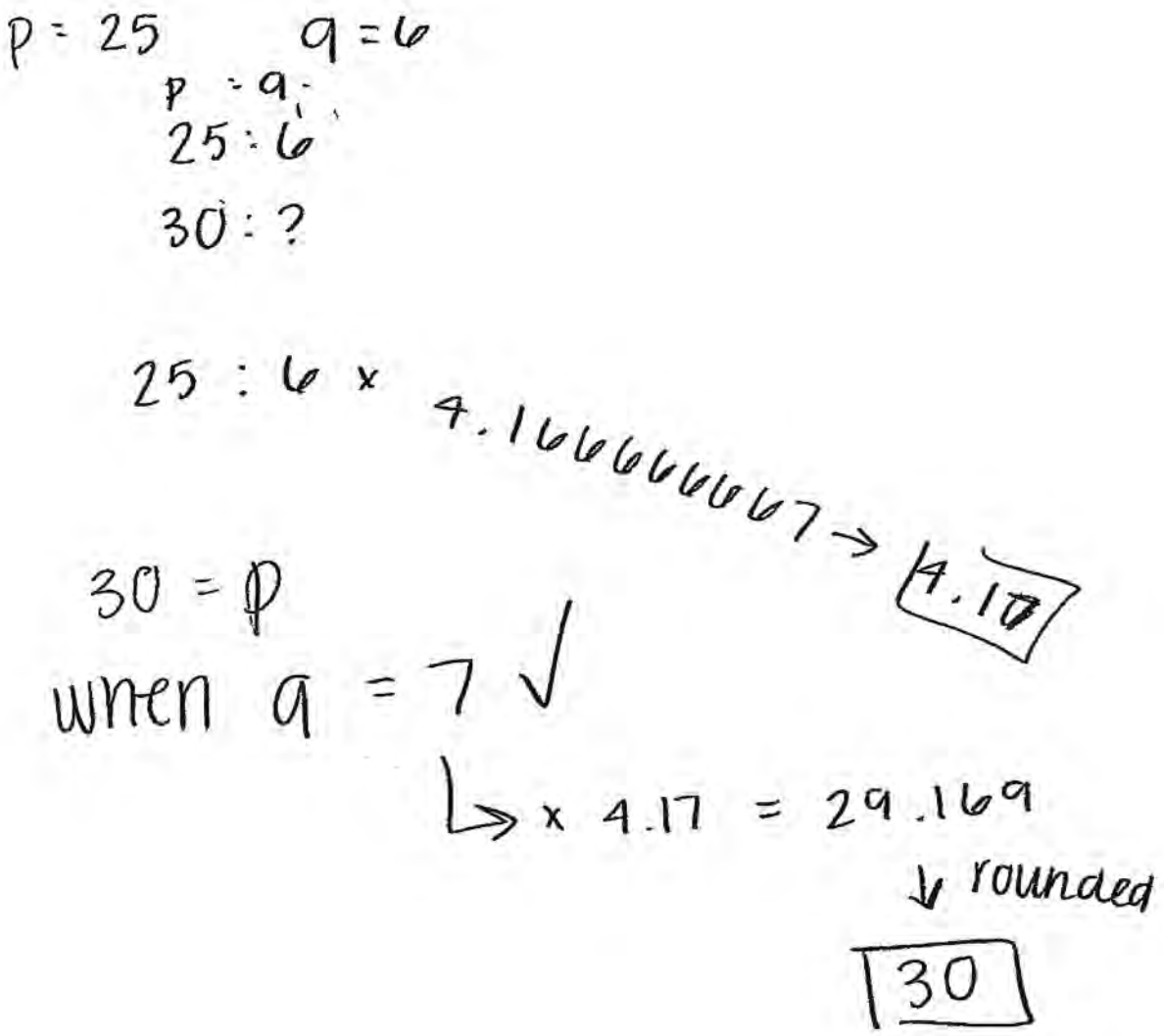
28 If p and q vary inversely and p is 25 when q is 6, determine q when p is equal to 30.



Score 1: The student applied direct variation.

Question 28

28 If p and q vary inversely and p is 25 when q is 6, determine q when p is equal to 30.

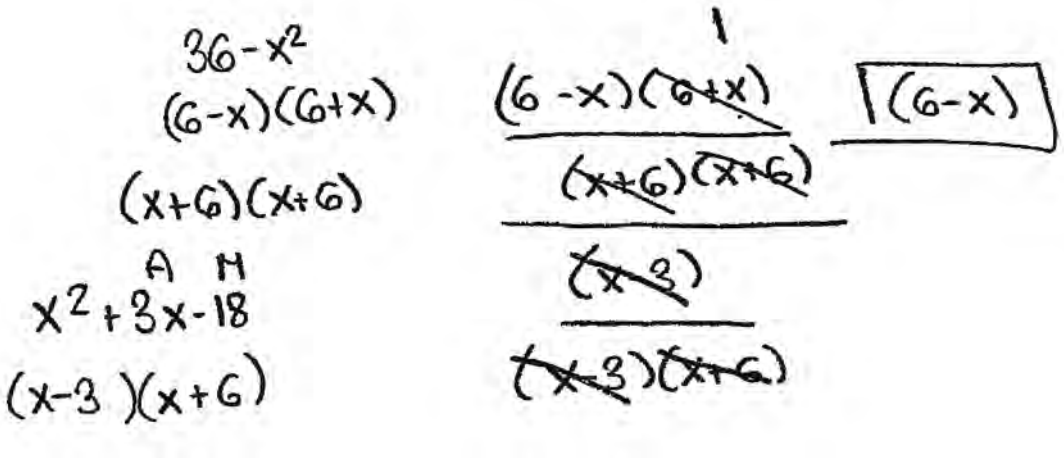


Score 0: The student applied direct variation and made multiple rounding errors.

Question 29

29 Express in simplest form:

$$\frac{\dfrac{36 - x^2}{(x+6)^2}}{\dfrac{x-3}{x^2+3x-18}}$$

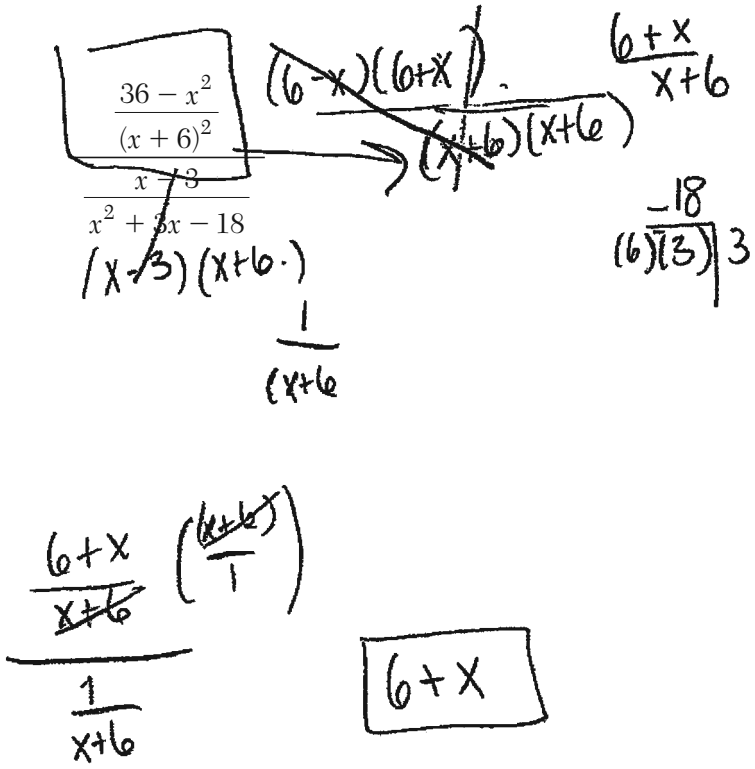


Score 2: The student has a complete and correct response.

Question 29

29 Express in simplest form:

$$\frac{\dfrac{36-x^2}{(x+6)^2}}{\dfrac{x+3}{x^2+3x-18}}$$



Score 1: The student factored all the expressions correctly, but made one simplification error.

Question 29

29 Express in simplest form:

$$\frac{\dfrac{36 - x^2}{(x+6)^2}}{\dfrac{x-3}{x^2+3x-18}}$$

$$\frac{(x-6)(x+6)}{(x+6)(x+6)} \Big/ \frac{x-3}{(x+6)(x-3)}$$

$$\frac{x-6}{x+6} \cdot \frac{x+6}{1}$$

$$x-6$$

Score 1: The student made one factoring error when factoring $36 - x^2$.

Question 29

29 Express in simplest form:

$$\frac{\frac{36 - x^2}{(x+6)^2}}{\frac{x-3}{x^2+3x-18}}$$

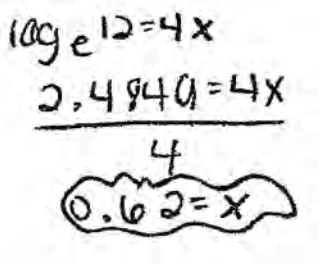
6 - x

$(x-6)(x+3)$

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

Question 30

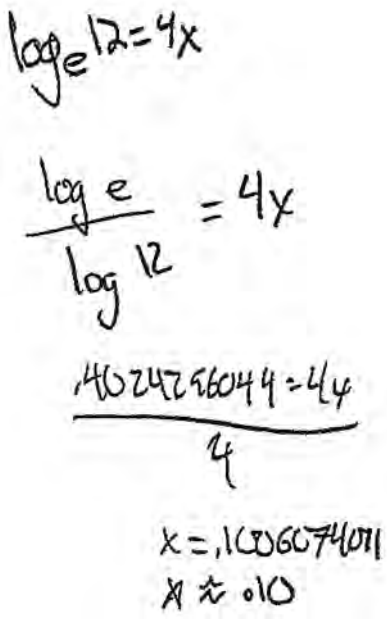
30 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.



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

Question 30

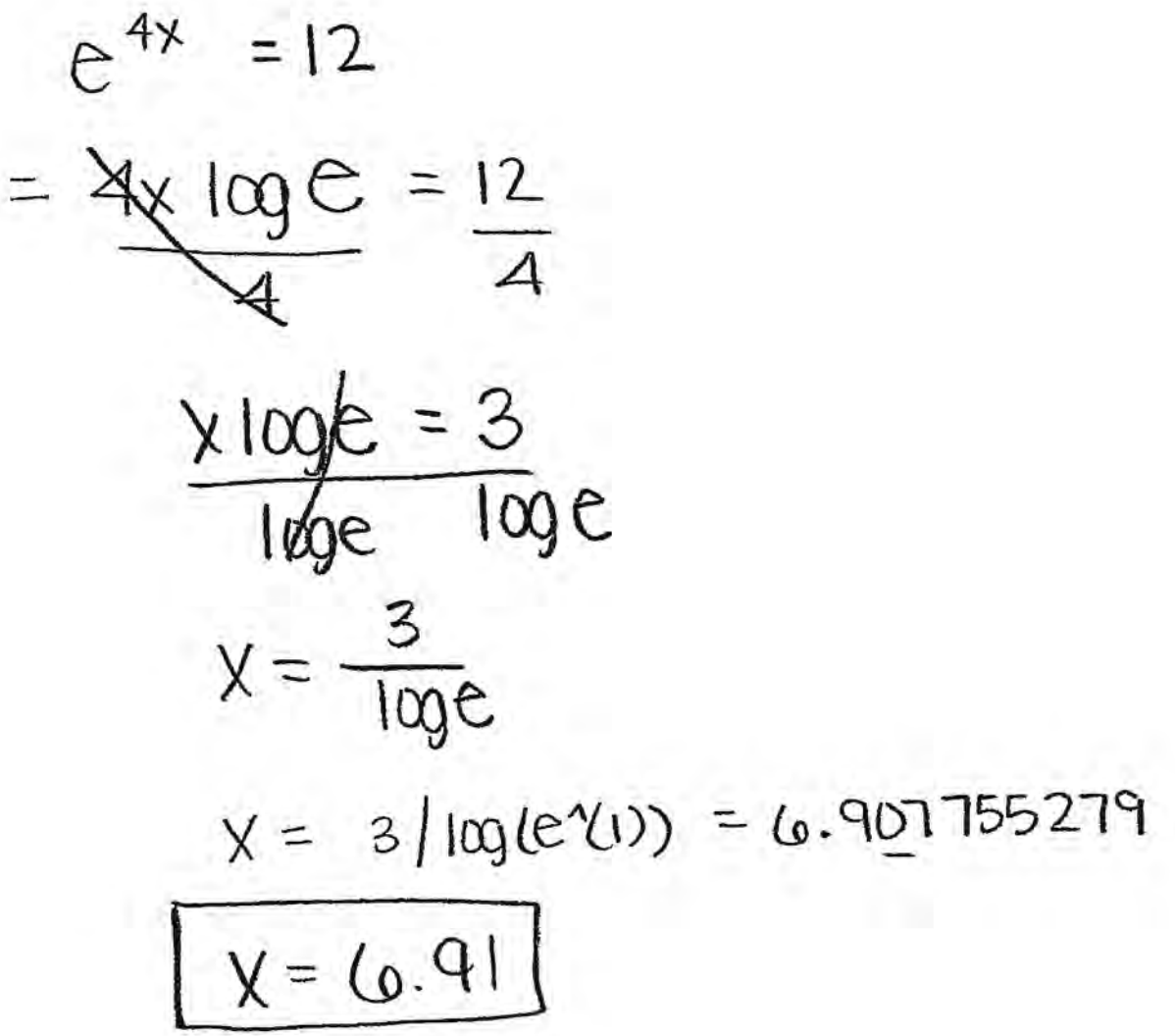
30 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.



Score 1: The student applied the change of base rule for logarithms incorrectly.

Question 30

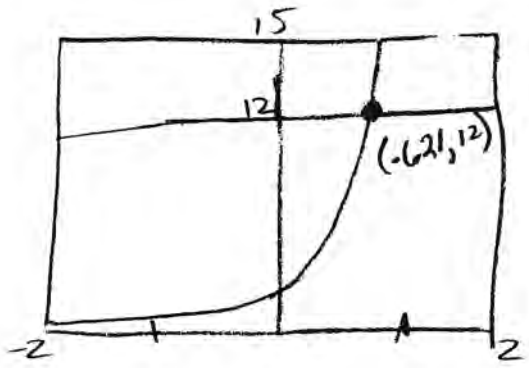
30 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.



Score 1: The student did not take the log of both sides of the equation.

Question 30

30 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.

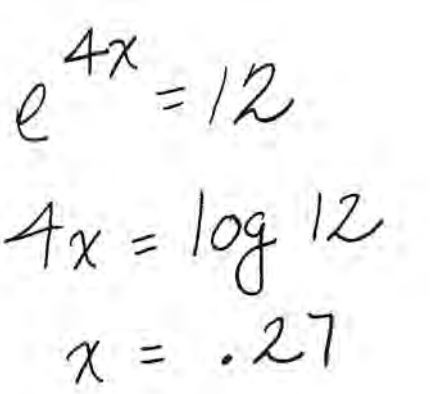


$X = .62$

Score 1: The student solved the problem graphically instead of algebraically.

Question 30

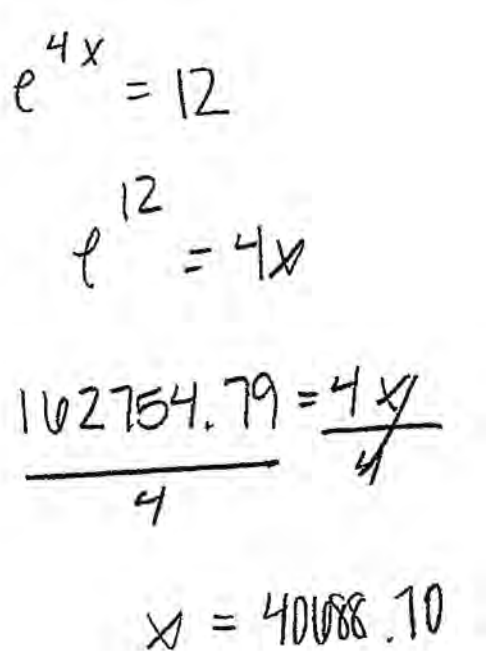
30 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.



Score 1: The student used log base 10 instead of using log base e. The student then solved for x correctly.

Question 30

30 Solve $e^{4x} = 12$ algebraically for x, rounded to the *nearest hundredth*.



Score 0: The student has a completely incorrect response.

Question 31

31 Determine, to the *nearest minute*, the degree measure of an angle of $\frac{5}{11}\pi$ radians.

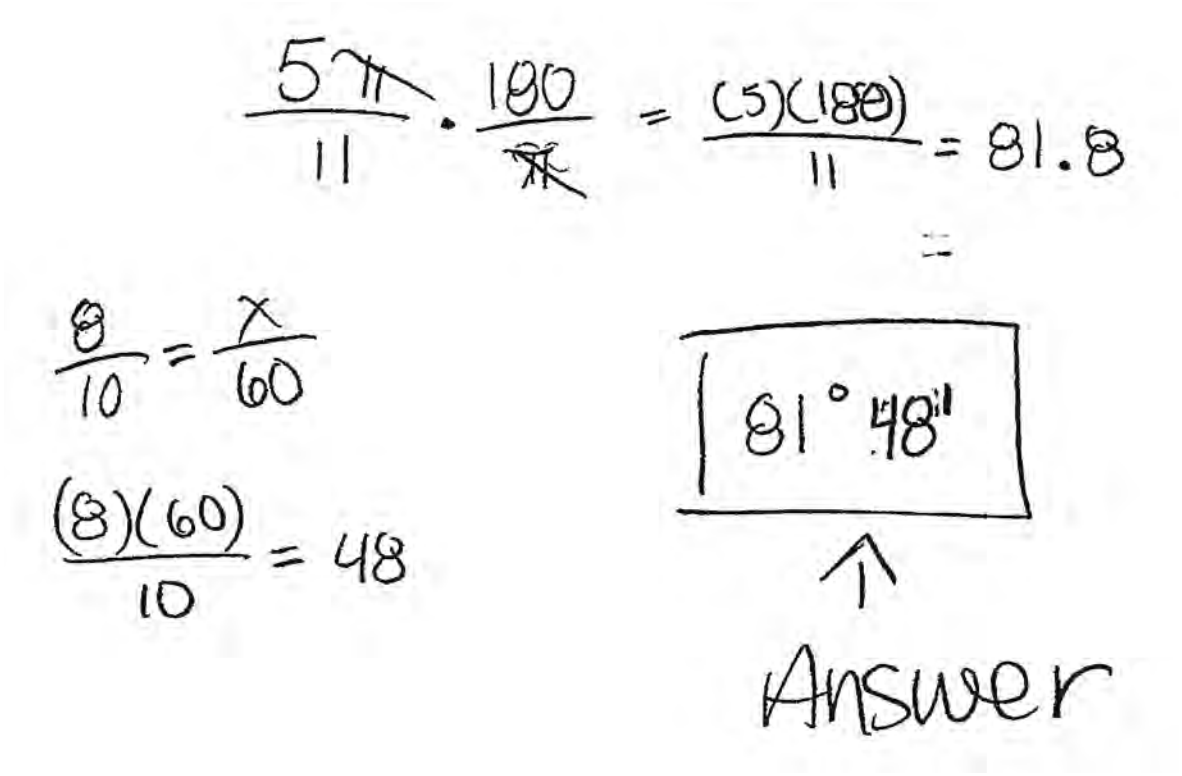
$\frac{5(180)}{11} = 81.8$

$81°49'$

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

Question 31

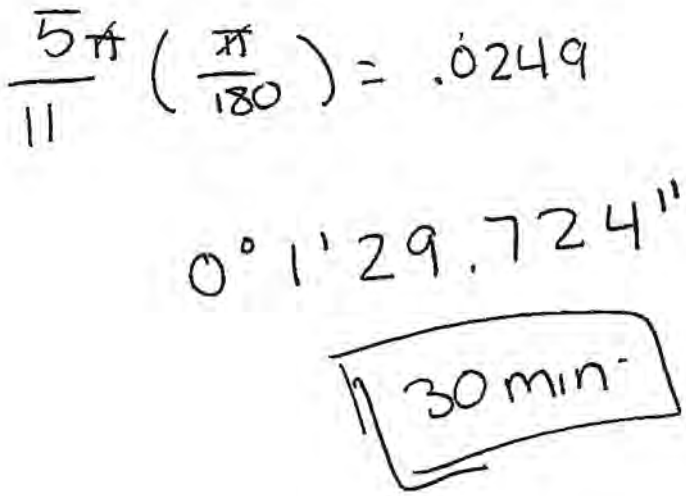
31 Determine, to the *nearest minute*, the degree measure of an angle of $\frac{5}{11}\pi$ radians.



Score 1: The student rounded prematurely.

Question 31

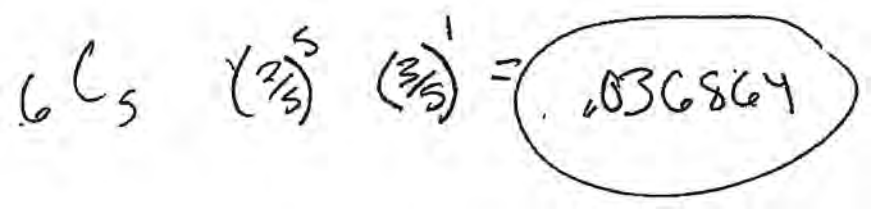
31 Determine, to the *nearest minute*, the degree measure of an angle of $\frac{5}{11}\pi$ radians.



Score 0: The student made multiple errors.

Question 32

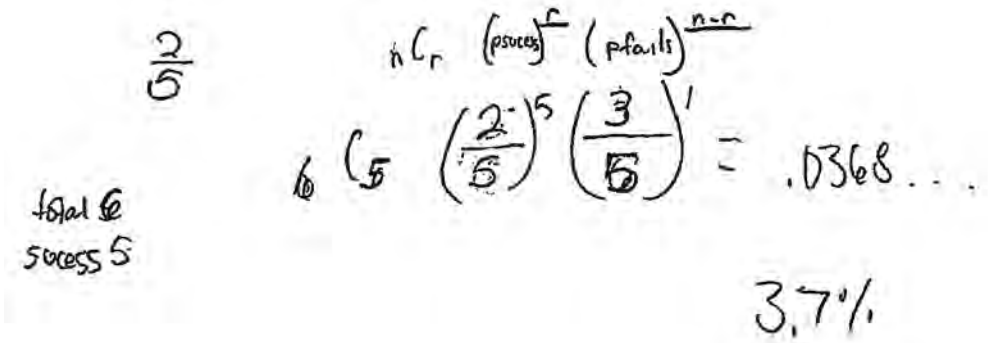
32 The probability of Ashley being the catcher in a softball game is $\frac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.



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

Question 32

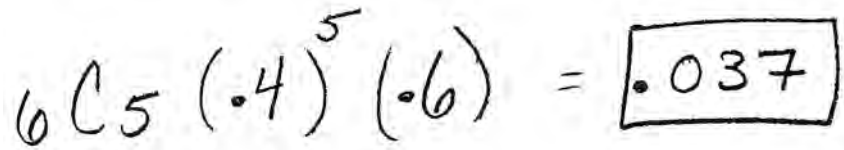
32 The probability of Ashley being the catcher in a softball game is $\frac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.



Score 1: The student did not state the exact probability.

Question 32

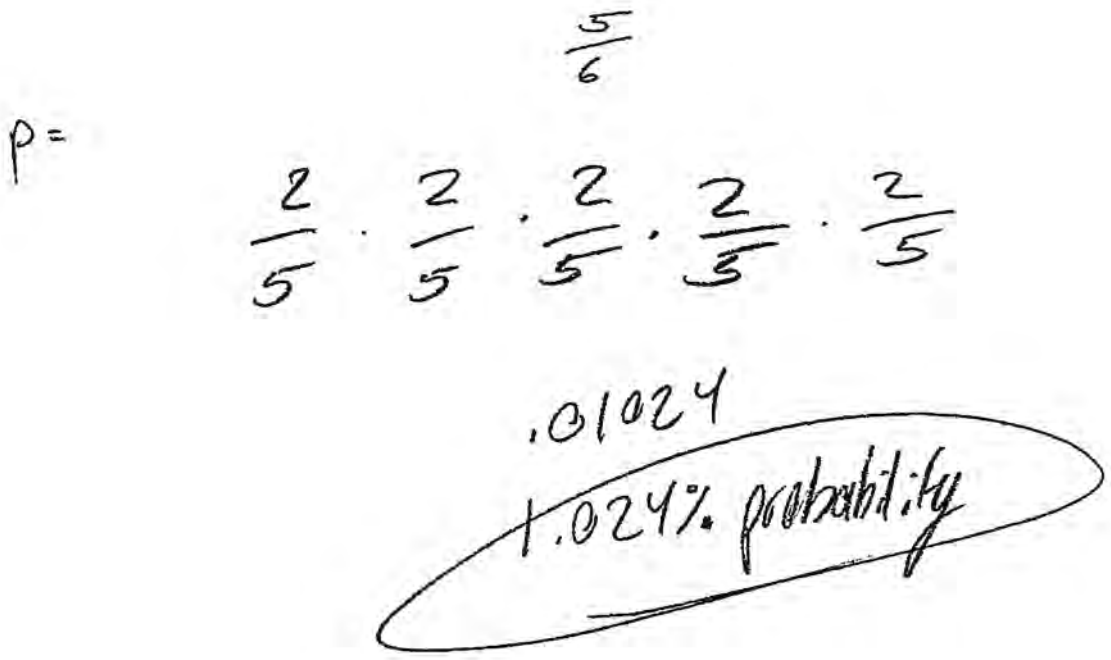
32 The probability of Ashley being the catcher in a softball game is $\frac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.



Score 1: The student did not state the exact probability.

Question 32

32 The probability of Ashley being the catcher in a softball game is $\frac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.



Score 0: The student has a completely incorrect response.

Question 33

33 If x is a real number, express $2xi\left(i - 4i^2\right)$ in simplest $a + bi$ form.

$2xi(i-4(-1))$

$2xi(i+4)$

$2xi^2+8xi$

$2x(-1)+8xi$

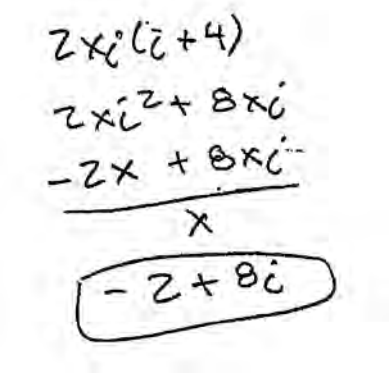
$-2x+8xi$

$x(-2+8i)$

Score 2: The student has a complete and correct response, followed by a correct factorization.

Question 33

33 If x is a real number, express $2xi\left(i - 4i^2\right)$ in simplest $a + bi$ form.



Score 1: The student made an error by dividing by x.

Question 33

33 If x is a real number, express $2xi(i - 4i^2)$ in simplest $a + bi$ form.

$2xi(i-4i^2)$

$2xi^2 - 8xi^3$

$-8xi^3 + 2xi^2$

$-8x(-i) + 2x(-1)$

$8xi - 2x$

Score 1: The student did not express the answer in $a + bi$ form.

Question 33

33 If x is a real number, express $2xi(i - 4i^2)$ in simplest $a + bi$ form.

$2xi(i - 4i^2)$

$2xi^2 - 8xi^3$

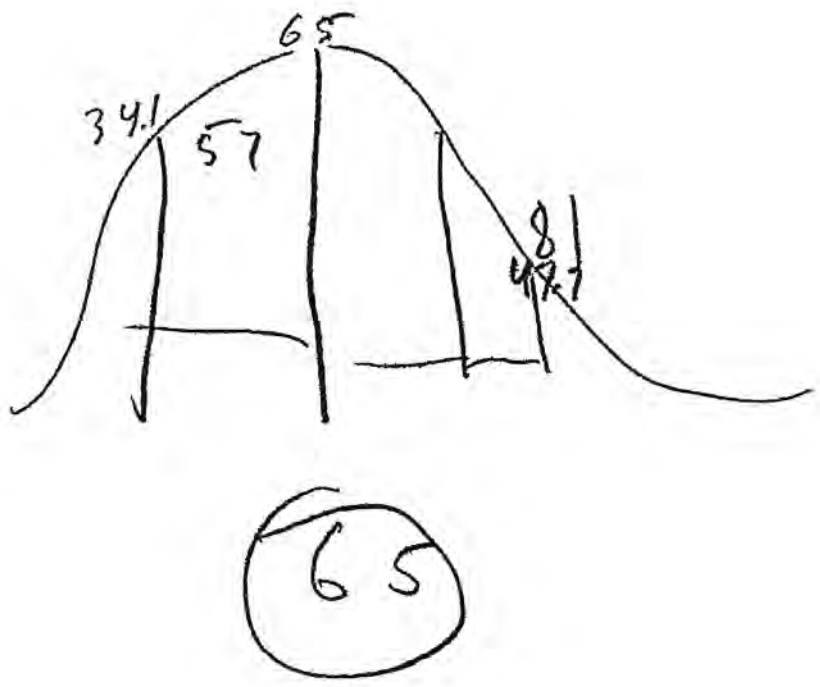
$-2x - 8x$

$-6x$

Score 0: The student made two errors, simplifying i^3 and combining the resulting like terms.

Question 34

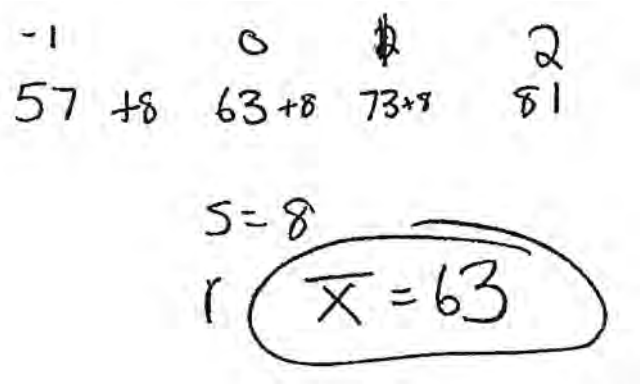
34 On a test that has a normal distribution of scores, a score of 57 falls one standard deviation below the mean, and a score of 81 is two standard deviations above the mean. Determine the mean score of this test.



Score 2: The student has a complete and correct response. The student has enough work to justify the solution of 65.

Question 34

34 On a test that has a normal distribution of scores, a score of 57 falls one standard deviation below the mean, and a score of 81 is two standard deviations above the mean. Determine the mean score of this test.

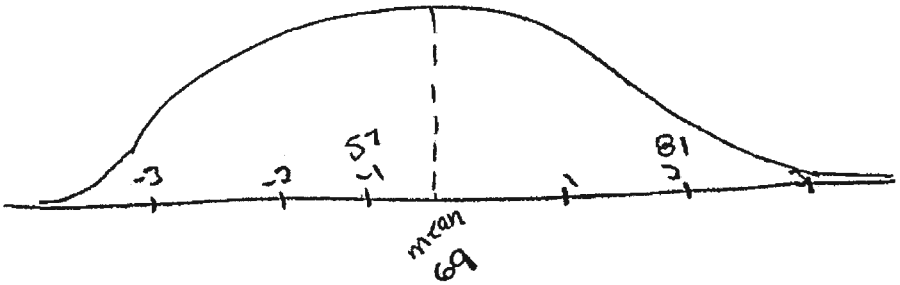


Score 1: The student made a computational error when adding 8 to 57.

Question 34

34 On a test that has a normal distribution of scores, a score of 57 falls one standard deviation below the mean, and a score of 81 is two standard deviations above the mean. Determine the mean score of this test.

81.870



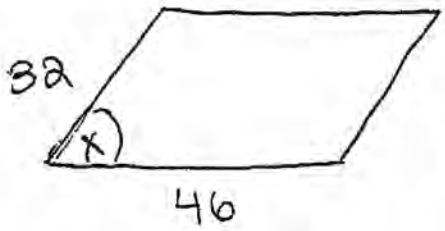
81
+57
138
2 = 69

mean = 69

Score 0: The student has a completely incorrect response.

Question 35

35 The area of a parallelogram is 594, and the lengths of its sides are 32 and 46. Determine, to the *nearest tenth of a degree*, the measure of the acute angle of the parallelogram.



area = 594

$594 = (32)(46)(\sin x)$

$\frac{594}{1472} = \frac{1472(\sin x)}{1472}$

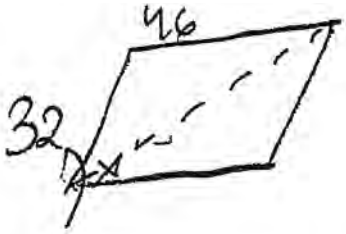
$.4035326087 = \sin x$

$\sin^{-1}(.4035326087) = 23.8° = x$

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

Question 35

35 The area of a parallelogram is 594, and the lengths of its sides are 32 and 46. Determine, to the *nearest tenth of a degree*, the measure of the acute angle of the parallelogram.



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

$297 = \frac{1}{2}(32)(46)\sin C$

$594/2 = 297$

$\frac{297}{736} = \frac{736\sin C}{736}$

$.4035326087 = \sin C$

$\sin^{-1}(.4035326087)$

$\sin = 23.79920549$

$= 23.8$

23.8×2

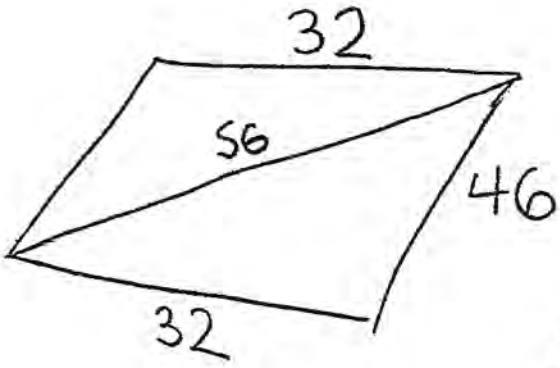
47.6

$47.6°$

Score 1: The student made an error by doubling 23.8.

Question 35

35 The area of a parallelogram is 594, and the lengths of its sides are 32 and 46. Determine, to the *nearest tenth of a degree*, the measure of the acute angle of the parallelogram.



$32^2+46^2=x^2$

$32^2=56^2+46^2-2(56)(46)\cos A$

$1024=3136+2116-(5152)\cos A$

$-5252 \quad -5252$

$\frac{-4288}{-5152}=\frac{-5152\cos A}{-5152}$

$(.8206521739)^{-1}=(\cos A)^{-1}$

$\cos A=34.84986775$

34.8°

Score 0: The student made multiple errors. The student used the Pythagorean Theorem and then found the measure of an acute angle of the triangle that was not an acute angle of the parallelogram.

Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

$y = 733.646(.786)^x$

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

$y = 733.646(.786)^{12}$

$y = 40.7 = \boxed{41}$

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

Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

$y = ab^x$

$a = 733.646$

$b = 0.786$

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

$733.646\,(0.786)^{12}$

41

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

Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

$y = 743.477(0.784)^x$

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

$y = 743.477(.784)^{12}$

$y = 40.092237$

40

$2002 - 1990 = 12$

Score 3: The student did not clear the frequency list (on the TI-84 Plus 2.55 operating system) that was left after doing question #25. All work after that is complete and correct.

Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

1990 1992 1995 1999 2004 2007 2009

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

$733.646 \cdot 0.786^{x}$

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

$733.646 \cdot 0.786^{12} = 40.7903$

≈ 41

in the year 2002

Score 3: The student wrote an expression instead of an equation.

Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

$y = 672.704(0.787)^x$

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

$2002 - 1990 = 12$

$y = 672.704(0.787)^{12}$

37.977

38

Score 2: The student solved an incorrect regression equation appropriately.

Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

$y = ab^x$

$y = (733.6446)(.786^{19})$

$y = (733.6446)(.010)$

$y = 7.336446$

$y = 7.34$

$a = 733.6458141$

$a = 733.6446$

$b = .786$

$.01030453244$

$.010$

$y = (733.6446)(.786^{02})$

$y = 453.2435642$

year 2002

$y = 453.244$

Score 2: The student wrote the correct equation and found a and b to the nearest thousandth. No further correct work was shown.

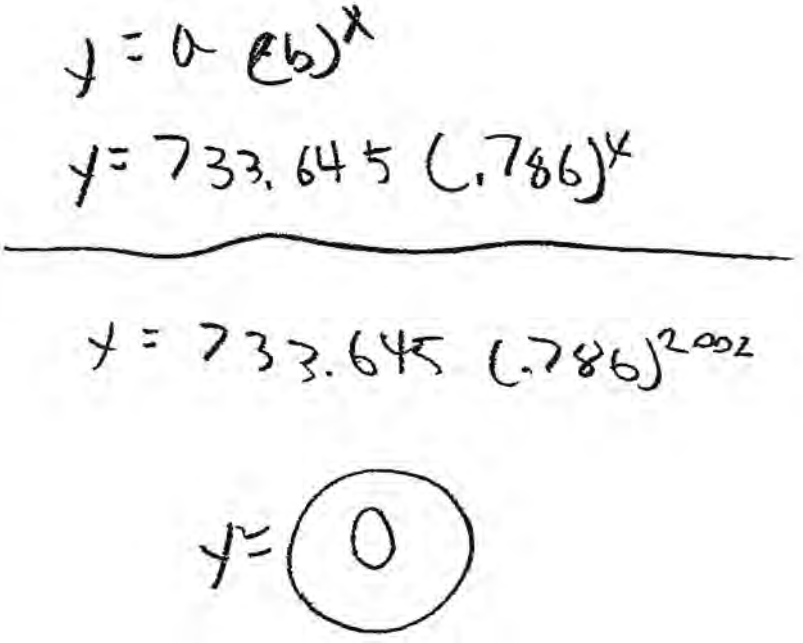
Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.



Score 1: The student made a rounding error when writing the equation and made a conceptual error by substituting in 2002 for x.

Question 36

36 The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

Years After 1990 (x)	0	2	5	9	14	17	19
Amount (y)	750	451	219	84	25	12	8

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*.

$733.646 \times 0.78649^{x}$

Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

$y = 733.646 \times 0.78649^{2002}$

$= 1.1047$

Score 0: The student wrote an expression instead of an equation, made multiple rounding errors, and used 2002 for x.

Question 37

37 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.

$$a_1 = 2$$

$$a_n = 3\left(a_{n-1}\right)^{-2}$$

$a_2 = 3(a_1)^{-2} \rightarrow a_2 = 3(2)^{-2}$

$a2 = 3/4 = .75$

$a3 = 16/3 = 5.333\overline{3}$

$a4 = 27/256 = .1054687\overline{5}$

Score 4: The student has a complete and correct response. The work beyond the correct solution is also correct.

Question 37

37 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.

$$a_1 = 2$$

$$a_n = 3\left(a_{n-1}\right)^{-2}$$

$a_2 = 3(2)^{-2}$ $= .75$

$a_3 = 3(.75)^{-2}$ $= \frac{16}{3}$

$a_4 = 3\left(\frac{16}{3}\right)^{-2}$ $= \frac{27}{256}$

$2, .75, \frac{16}{3}, \frac{27}{256}$

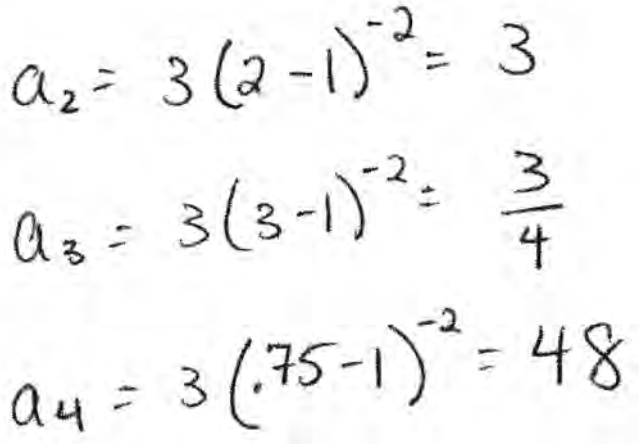
Score 3: The student did not express a_2 as a fraction.

Question 37

37 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.

$$a_1 = 2$$

$$a_n = 3\left(a_{n-1}\right)^{-2}$$



Score 2: The student made a conceptual error by interpreting the subscript index as an operation of subtracting 1.

Question 37

37 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.

$$a_1 = 2$$

$$a_n = 3\left(a_{n-1}\right)^{-2}$$

$a_2 = 3(2-1)^{-2} = 3$

$a_3 = 3(3-1)^{-2} = .75$

$a_4 = 3(.75-1)^{-2} = 48$

Score 1: The student made a conceptual error by interpreting the subscript index as an operation of subtracting 1 and the student did not express a_2 as a fraction.

Question 37

37 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.

$$a_1 = 2$$

$$a_n = 3\left(a_{n-1}\right)^{-2}$$

$a_2 =$

$a_2 = 3(a_2 - 1)^{-2}$

$a_2 = 3(4-1)^{-2}$

$a_2 = \frac{1}{81}$

$a_3 = 6$

$a_3 = 3(a_3 - 1)^{-2}$

$a_3 = 3(6-1)^{-2}$

$a_3 = \frac{1}{225}$

$a_4 = 8$

$a_4 = 3(a_4 - 1)^{-2}$

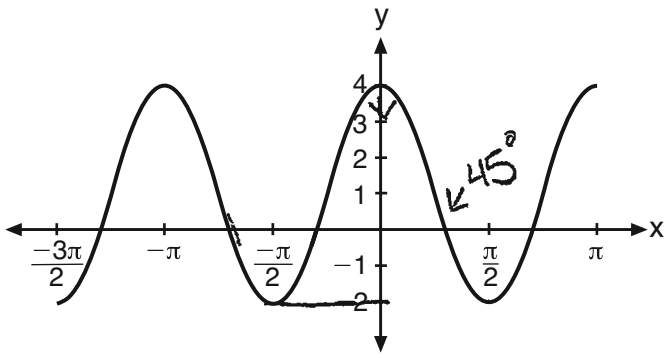
$a_4 = 3(8-1)^{-2}$

$a_4 = \frac{1}{441}$

Score 0: The student has a completely incorrect response.

Question 38

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

$a = 3$

$b = 2$

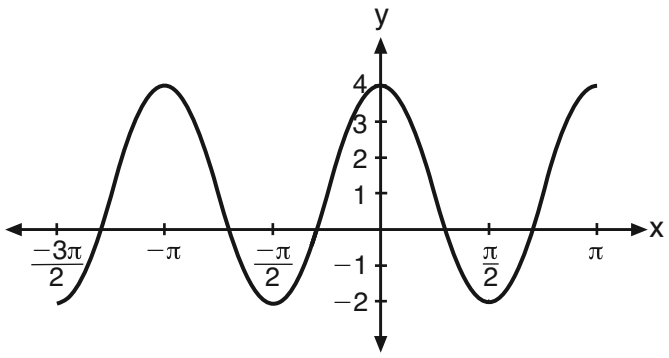
$c = 1$

$y = 3\cos 2x + 1$

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

Question 38

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

$a = 3$

$b = 2$

$c = 1$

$\frac{2\pi}{\pi} = 2$

b is period

$a = \text{amp} = 3 \cdot \frac{4-(-2)}{2} = 3$

$c = \text{MS} = \frac{4+-2}{2} = 1$

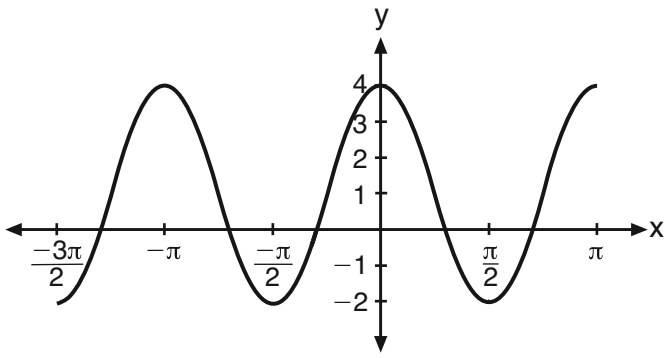
$\frac{2\pi}{\text{Freq}}$ $\quad \text{Amp} = \frac{\text{high} - \text{low}}{2}$

$\text{MS} = \frac{\text{high} + \text{low}}{2}$

Score 3: The student stated the correct values of a, b, and c, but did not write the equation for the graph.

Question 38

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

a = amplitude

$a = \left|\frac{4 - -2}{2}\right|$

$a = 3$

b = frequency

$b = \frac{2\pi}{\text{period}}$

$b = \frac{2\pi}{\pi}$

$b = 2$

c = vertical translation

$c = \frac{4 + -2}{2}$

$c = \frac{2}{2}$

$c = 1$

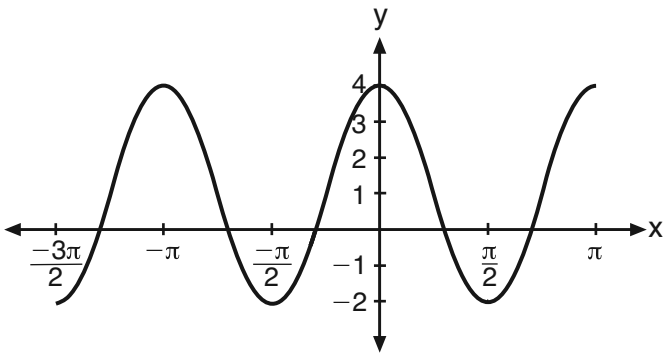
$a \cos bx + c$

$3 \cos 2x + 1$

Score 3: The student stated the correct values of a, b, and c, but wrote an expression instead of an equation for the graph.

Question 38

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

$a = 3$ amplitude

$b = \pi$ period

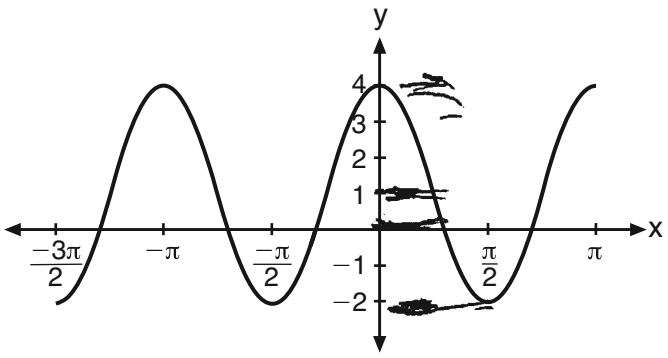
$c = 1$ vertical shift

$y = 3 \cos \pi x + 1$

Score 3: The student only stated the correct values for a and c, but an appropriate equation was written.

Question 38

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

$a = 3$

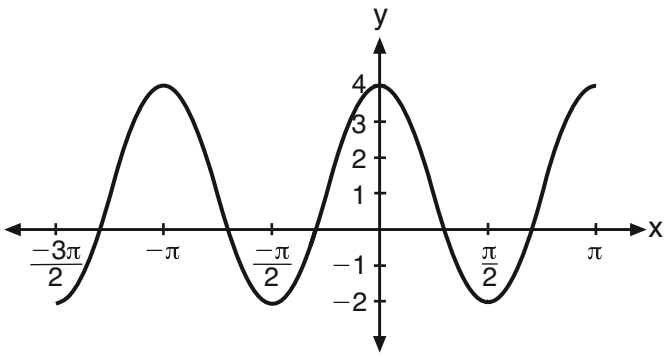
$b = 1$

$c = 1$

Score 2: The student only stated the correct values for a and c. No further correct work was shown.

Question 38

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

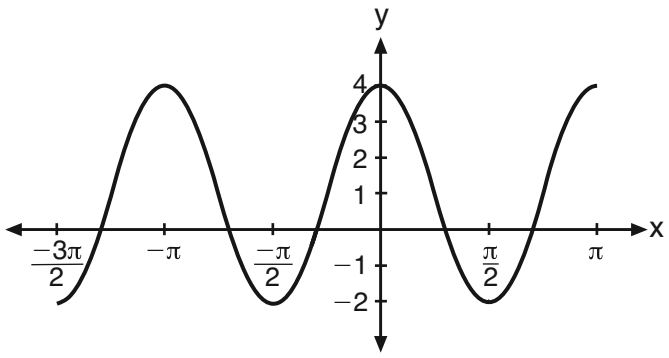
a = amp.
b = period
c = freq.

4 cos 2x + 2

Score 1: The student only wrote the correct value for b and wrote an expression instead of an equation for the graph.

Question 38

38 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where a, b, and c are real numbers.



State the values of a, b, and c, and write an equation for the graph.

$a = -2$
$b = \pi/2$
$c = +4$

$y = -2\cos \pi/2 x + 4$

Score 0: The student has a completely incorrect response.

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]

$(l+x)\cdot(W+x)\leq 800$

$(22+x)(14+x)\leq 800$

$308+36x+x^2\leq 800$

$x^2+36x=492$

$x^2+36x+324=492+324$

$\sqrt{(x+18)^2}=\sqrt{816}$

Can be expanded 10 feet

$x+18=28.57$

$x=10.57$

must round down

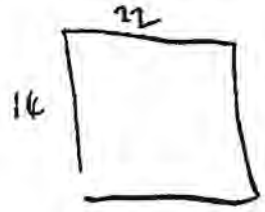
$x=10$ ft

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

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]



$14+x \cdot 22+x = 800$

$(14+x)(22+x)$

$308 + 36x + x^2 = 800$
$-800 \qquad -800$

$x^2 + 36x - 492$,

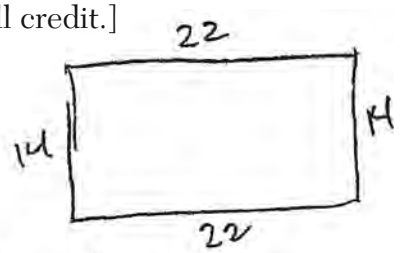
$\frac{-36 \pm \sqrt{36^2 - 4(-492)}}{2}$ = 10

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

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]



$(14+x)(22+x) \leq 800$

$308 + 36x + x^2 \leq 800$

$x^2 + 36x + 308 \leq 800$

$x^2 + 36x - 492 \leq 0$

$\frac{-36 \pm \sqrt{1296 + 1968}}{2}$

$\frac{-36 \pm \sqrt{3264}}{2}$

$\frac{-36 \pm 57.131427 43}{2}$ rejected neg.

$\frac{21.131427 43}{2}$

10.5657 feet

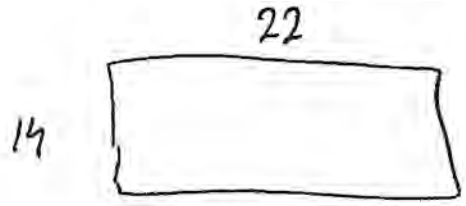
≈11 feet

Score 5: The student showed appropriate work to find x, but an incorrect solution was stated.

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]



$A \leq 800$

$(x+22)(x+14) \leq 800$

$x^2 + 14x + 22x + 308 = 800$

$-800 \quad -800$

$x^2 + 36x - 492 \leq 0$

22×14

88

220

308

$800 - 308 = 492$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-36 \pm \sqrt{1296 - 4(1)(-492)}}{2}$

$x = \frac{-36 \pm \sqrt{2264}}{2}$

$x = \frac{-36 \pm 2\sqrt{566}}{2}$

$x = -13 \pm \sqrt{566}$

$x = 10.791$

$2 \overline{)492}$ 246

$12 \overline{)492}$ 41, 48

$16 \overline{)492}$ 3, 48, 12

$\frac{3}{12} \frac{41}{12}$ 9

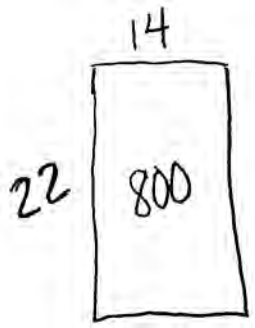
$x = 10$ ft

Score 4: The student made two computational errors. A computational error was made in simplifying under the radical and a computational error was made in dividing by 2.

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]



add 12 (26)(34) = 884
add 11 (25)(33) = 825
add 10 (24)(32) = 768

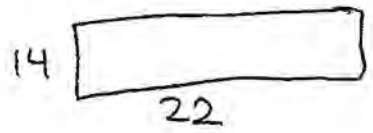
10 Feet

Score 3: The student used a method other than algebraic to solve the problem.

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]



$(14+x)(22+x) = 800$

$308+14x+22x+x^2 = 800$

$x^2+36x+308 = 800$

$-800 \quad -800$

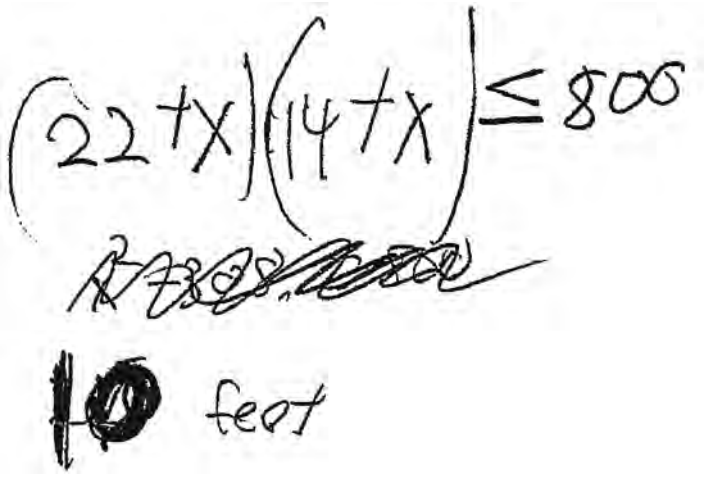
$x^2+36x-492 = 0$

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

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]

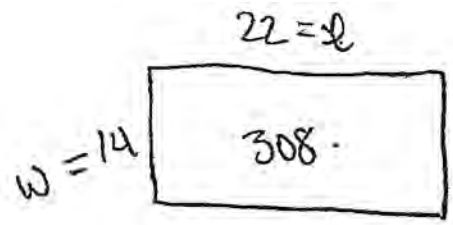


Score 1: The student did not show algebraic work to support a correct answer.

Question 39

39 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code.

[Only an algebraic solution can receive full credit.]



area = 800 ft.²

A = ℓw

-w + 3 · ℓ + 3 = area

17 · 25 = 425

20 · 28 = 560

23 · 31 = 713

24 · 32 = 768

26 · 34 = 884

width = 24.5 ft

length = 32.5 ft

area = 796.25 ft.²

Score 0: The student used a method other than algebraic, but did not obtain a correct solution.

Regents Examination in Algebra 2/Trigonometry – January 2015

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

Raw Score	Scale Score
88	**100**
87	**99**
86	**99**
85	**98**
84	**98**
83	**97**
82	**96**
81	**96**
80	**95**
79	**94**
78	**93**
77	**93**
76	**92**
75	**91**
74	**90**
73	**89**
72	**89**
71	**88**
70	**87**
69	**86**
68	**86**
67	**85**
66	**84**

Raw Score	Scale Score
65	**83**
64	**82**
63	**81**
62	**80**
61	**79**
60	**78**
59	**78**
58	**77**
57	**76**
56	**75**
55	**74**
54	**73**
53	**72**
52	**71**
51	**70**
50	**69**
49	**68**
48	**67**
47	**66**
46	**65**
45	**64**
44	**63**

Raw Score	Scale Score
43	**62**
42	**61**
41	**60**
40	**59**
39	**58**
38	**57**
37	**55**
36	**54**
35	**53**
34	**52**
33	**51**
32	**50**
31	**48**
30	**47**
29	**46**
28	**45**
27	**43**
26	**42**
25	**41**
24	**39**
23	**38**
22	**36**

Raw Score	Scale Score
21	**35**
20	**34**
19	**32**
18	**31**
17	**29**
16	**28**
15	**26**
14	**25**
13	**23**
12	**21**
11	**20**
10	**18**
9	**17**
8	**15**
7	**13**
6	**12**
5	**10**
4	**8**
3	**6**
2	**4**
1	**2**
0	**0**

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.