The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II (Common Core)

Thursday, August 18, 2016 — 12:30 to 3:30 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 37 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 graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

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 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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. [48]

Use this space for computations.

1 Which equation has $1 - i$ as a solution?

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

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

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

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

2 Which statement(s) about statistical studies is true?

I. A survey of all English classes in a high school would be a good sample to determine the number of hours students throughout the school spend studying.

II. A survey of all ninth graders in a high school would be a good sample to determine the number of student parking spaces needed at that high school.

III. A survey of all students in one lunch period in a high school would be a good sample to determine the number of hours adults spend on social media websites.

IV. A survey of all Calculus students in a high school would be a good sample to determine the number of students throughout the school who don't like math.

(1) I, only

(2) II, only

(3) I and III

(4) III and IV

Use this space for computations.

3 To the *nearest tenth*, the value of x that satisfies $2^x = -2x + 11$ is

(1) 2.5
(2) 2.6
(3) 5.8
(4) 5.9

4 The lifespan of a 60-watt lightbulb produced by a company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. If a 60-watt lightbulb produced by this company is selected at random, what is the probability that its lifespan will be between 1440 and 1465 hours?

(1) 0.3803
(2) 0.4612
(3) 0.8415
(4) 0.9612

5 Which factorization is *incorrect*?

(1) $4k^2 - 49 = (2k + 7)(2k - 7)$
(2) $a^3 - 8b^3 = (a - 2b)(a^2 + 2ab + 4b^2)$
(3) $m^3 + 3m^2 - 4m + 12 = (m - 2)^2(m + 3)$
(4) $t^3 + 5t^2 + 6t + t^2 + 5t + 6 = (t + 1)(t + 2)(t + 3)$

Use this space for computations.

6 Sally's high school is planning their spring musical. The revenue, R, generated can be determined by the function $R(t) = -33t^2 + 360t$, where t represents the price of a ticket. The production cost, C, of the musical is represented by the function $C(t) = 700 + 5t$. What is the highest ticket price, to *the nearest dollar*, they can charge in order to *not* lose money on the event?

(1) $t = 3$

(2) $t = 5$

(3) $t = 8$

(4) $t = 11$

7 The set of data in the table below shows the results of a survey on the number of messages that people of different ages text on their cell phones each month.

Age Group	Text Messages per Month		
	0–10	11–50	Over 50
15–18	4	37	68
19–22	6	25	87
23–60	25	47	157

If a person from this survey is selected at random, what is the probability that the person texts over 50 messages per month given that the person is between the ages of 23 and 60?

(1) $\frac{157}{229}$

(2) $\frac{157}{312}$

(3) $\frac{157}{384}$

(4) $\frac{157}{456}$

8 A recursive formula for the sequence 18, 9, 4.5, ... is

(1) $g_1 = 18$
$g_n = \frac{1}{2} g_{n-1}$

(2) $g_n = 18\left(\frac{1}{2}\right)^{n-1}$

(3) $g_1 = 18$
$g_n = 2g_{n-1}$

(4) $g_n = 18(2)^{n-1}$

Use this space for computations.

9 Kristin wants to increase her running endurance. According to experts, a gradual mileage increase of 10% per week can reduce the risk of injury. If Kristin runs 8 miles in week one, which expression can help her find the total number of miles she will have run over the course of her 6-week training program?

(1) $\sum_{n=1}^{6} 8(1.10)^{n-1}$

(2) $\sum_{n=1}^{6} 8(1.10)^{n}$

(3) $\frac{8 - 8(1.10)^6}{0.90}$

(4) $\frac{8-8(0.10)^n}{1.10}$

10 A sine function increasing through the origin can be used to model light waves. Violet light has a wavelength of 400 nanometers. Over which interval is the height of the wave *decreasing*, only?

(1) (0, 200)

(2) (100, 300)

(3) (200, 400)

(4) (300, 400)

11 The expression $\frac{x^3 + 2x^2 + x + 6}{x + 2}$ is equivalent to

(1) $x^2 + 3$

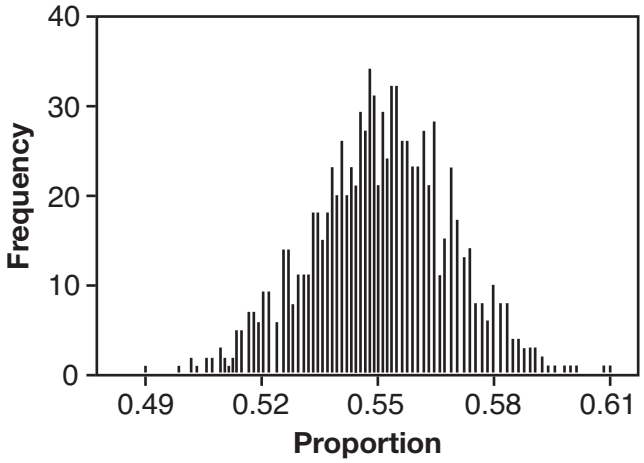
(2) $x^2 + 1 + \frac{4}{x + 2}$

(3) $2x^2 + x + 6$

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

Use this space for computations.

12 A candidate for political office commissioned a poll. His staff received responses from 900 likely voters and 55% of them said they would vote for the candidate. The staff then conducted a simulation of 1000 more polls of 900 voters, assuming that 55% of voters would vote for their candidate. The output of the simulation is shown in the diagram below.



Given this output, and assuming a 95% confidence level, the margin of error for the poll is closest to

(1) 0.01
(2) 0.03
(3) 0.06
(4) 0.12

13 An equation to represent the value of a car after t months of ownership is $v = 32{,}000(0.81)^{\frac{t}{12}}$. Which statement is *not* correct?

(1) The car lost approximately 19% of its value each month.
(2) The car maintained approximately 98% of its value each month.
(3) The value of the car when it was purchased was \$32,000.
(4) The value of the car 1 year after it was purchased was \$25,920.

Use this space for computations.

14 Which equation represents an odd function?

(1) $y = \sin x$

(2) $y = \cos x$

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

(4) $y = e^{5x}$

15 The completely factored form of $2d^4 + 6d^3 - 18d^2 - 54d$ is

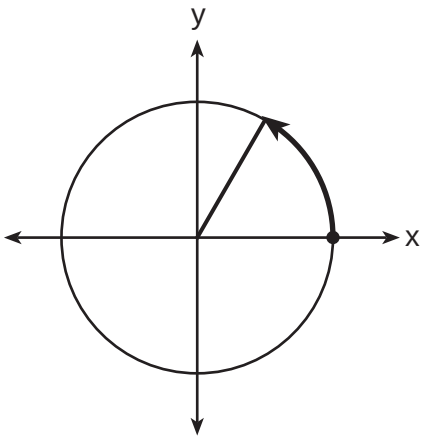
(1) $2d(d^2 - 9)(d + 3)$

(2) $2d(d^2 + 9)(d + 3)$

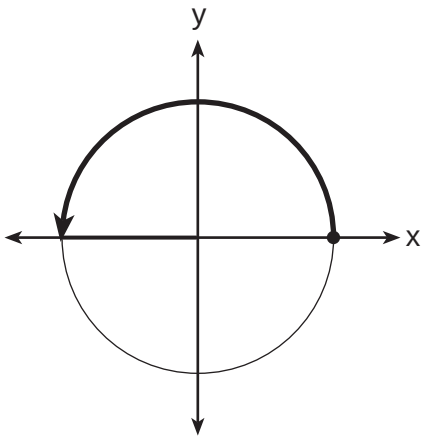
(3) $2d(d + 3)^2(d - 3)$

(4) $2d(d - 3)^2(d + 3)$

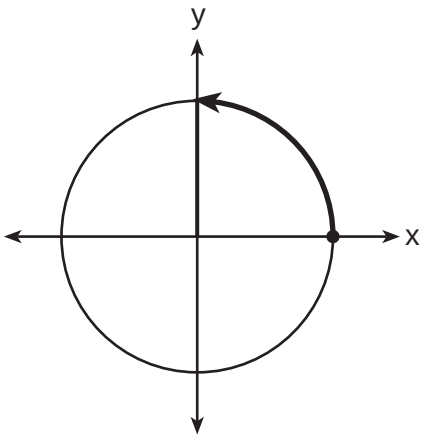
16 Which diagram shows an angle rotation of 1 radian on the unit circle?



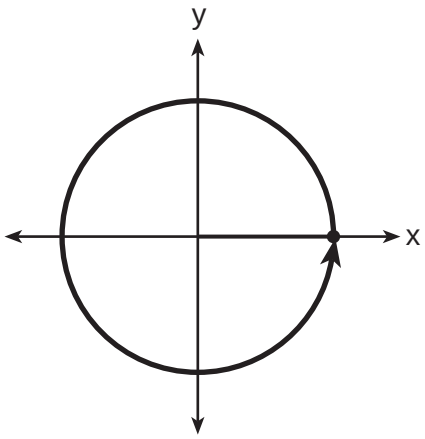
(1)



(3)



(2)



(4)

Use this space for computations.

17 The focal length, F, of a camera's lens is related to the distance of the object from the lens, J, and the distance to the image area in the camera, W, by the formula below.

$$\frac{1}{J} + \frac{1}{W} = \frac{1}{F}$$

When this equation is solved for J in terms of F and W, J equals

(1) $F - W$

(2) $\frac{FW}{F - W}$

(3) $\frac{FW}{W - F}$

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

18 The sequence $a_1 = 6$, $a_n = 3a_{n-1}$ can also be written as

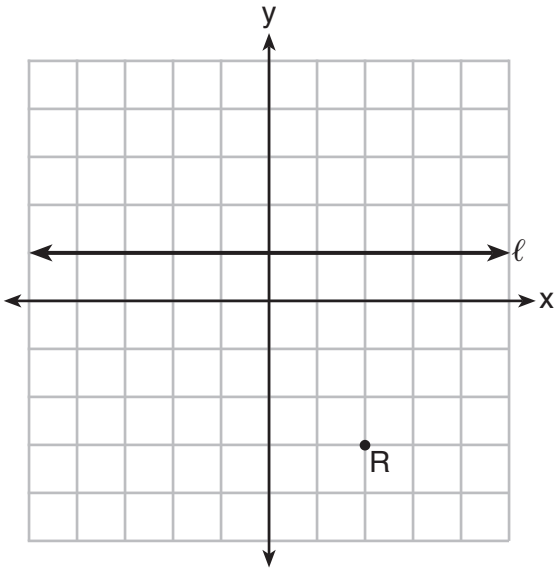
(1) $a_n = 6 \bullet 3^n$

(2) $a_n = 6 \bullet 3^{n+1}$

(3) $a_n = 2 \bullet 3^n$

(4) $a_n = 2 \bullet 3^{n+1}$

19 Which equation represents the set of points equidistant from line l and point R shown on the graph below?



(1) $y = -\frac{1}{8}(x + 2)^2 + 1$

(2) $y = -\frac{1}{8}(x + 2)^2 - 1$

(3) $y = -\frac{1}{8}(x - 2)^2 + 1$

(4) $y = -\frac{1}{8}(x - 2)^2 - 1$

Use this space for computations.

20 Mr. Farison gave his class the three mathematical rules shown below to either prove or disprove. Which rules can be proved for all real numbers?

I $(m + p)^2 = m^2 + 2mp + p^2$

II $(x + y)^3 = x^3 + 3xy + y^3$

III $(a^2 + b^2)^2 = (a^2 - b^2)^2 + (2ab)^2$

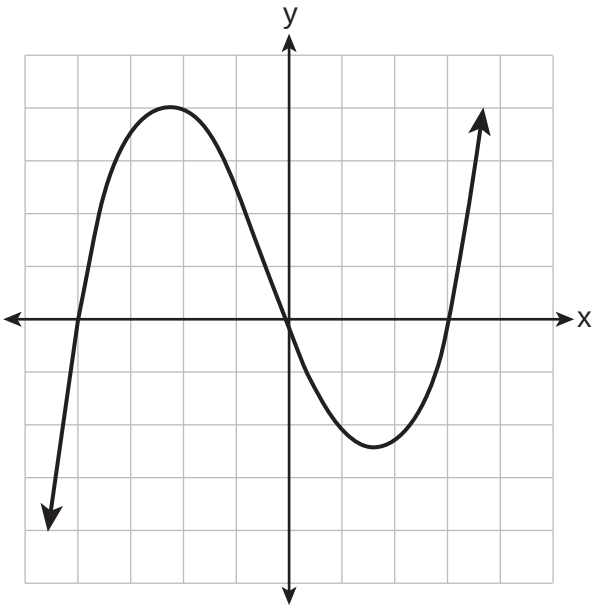
(1) I, only

(2) I and II

(3) II and III

(4) I and III

21 The graph of $p(x)$ is shown below.



What is the remainder when $p(x)$ is divided by $x + 4$?

(1) $x - 4$

(2) -4

(3) 0

(4) 4

Use this space for computations.

22 A payday loan company makes loans between \$100 and \$1000 available to customers. Every 14 days, customers are charged 30% interest with compounding. In 2013, Remi took out a \$300 payday loan. Which expression can be used to calculate the amount she would owe, in dollars, after one year if she did not make payments?

(1) $300(.30)^{\frac{14}{365}}$

(2) $300(1.30)^{\frac{14}{365}}$

(3) $300(.30)^{\frac{365}{14}}$

(4) $300(1.30)^{\frac{365}{14}}$

23 Which value is *not* contained in the solution of the system shown below?

$$a + 5b - c = -20$$
$$4a - 5b + 4c = 19$$
$$-a - 5b - 5c = 2$$

(1) -2

(2) 2

(3) 3

(4) -3

24 In 2010, the population of New York State was approximately 19,378,000 with an annual growth rate of 1.5%. Assuming the growth rate is maintained for a large number of years, which equation can be used to predict the population of New York State t years after 2010?

(1) $P_t = 19{,}378{,}000(1.5)^t$

(2) $P_0 = 19{,}378{,}000$
$P_t = 19{,}378{,}000 + 1.015P_{t-1}$

(3) $P_t = 19{,}378{,}000(1.015)^{t-1}$

(4) $P_0 = 19{,}378{,}000$
$P_t = 1.015P_{t-1}$

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. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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]

25 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.

26 Explain how $\left(3^{\frac{1}{5}}\right)^2$ can be written as the equivalent radical expression $\sqrt[5]{9}$.

27 Simplify $xi(i - 7i)^2$, where i is the imaginary unit.

28 Using the identity $\sin^2 \theta + \cos^2 \theta = 1$, find the value of $\tan \theta$, to the *nearest hundredth*, if $\cos \theta$ is -0.7 and θ is in Quadrant II.

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

30 The x-value of which function's x-intercept is larger, f or h? Justify your answer.

$f(x) = \log(x - 4)$

x	h(x)
−1	6
0	4
1	2
2	0
3	−2

31 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

Explain what this rate of change means as it relates to braking distance.

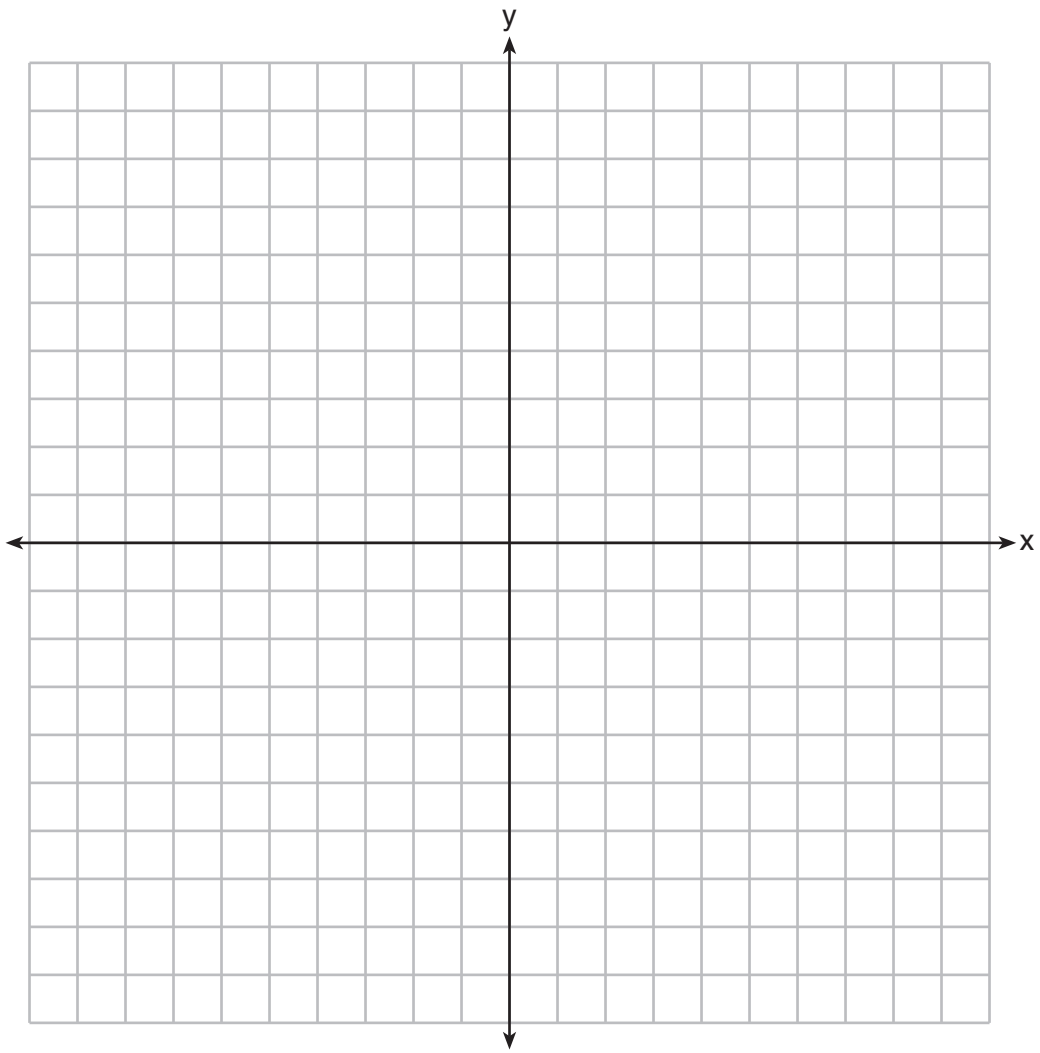
32 Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$, determine whether A and B are independent or dependent.

Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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]

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

On the set of axes below, graph $y = p(x)$.



34 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

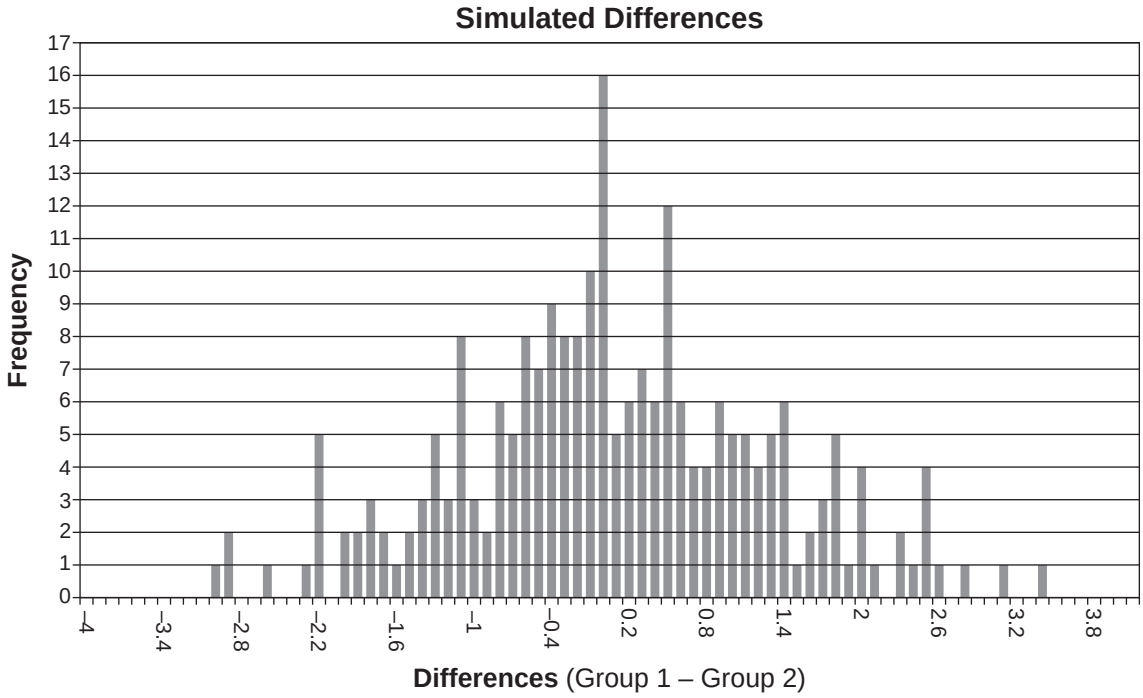
35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

36 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

Group 1 (seconds)	**Group 2** (seconds)
17.4	23.3
18.1	18.8
18.2	22.1
19.6	12.7
18.6	16.9
16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



b) Ayva has decided that the difference in mean reading times is *not* an unusual occurence. Support her decision using the results of the simulation. Explain your reasoning.

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. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. 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. [6]

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

Algebraically determine, to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

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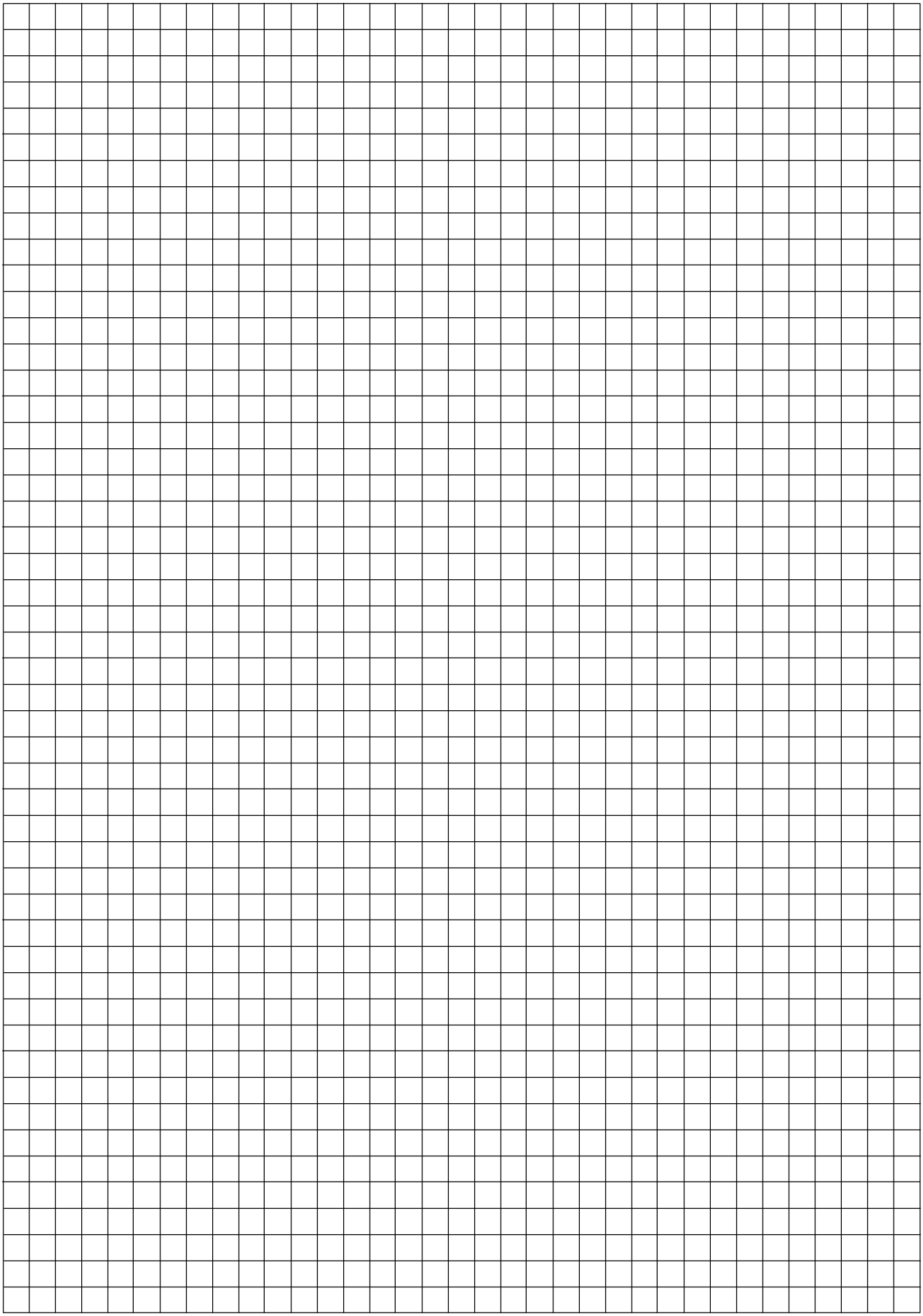
Scrap Graph Paper — This sheet will *not* be scored.



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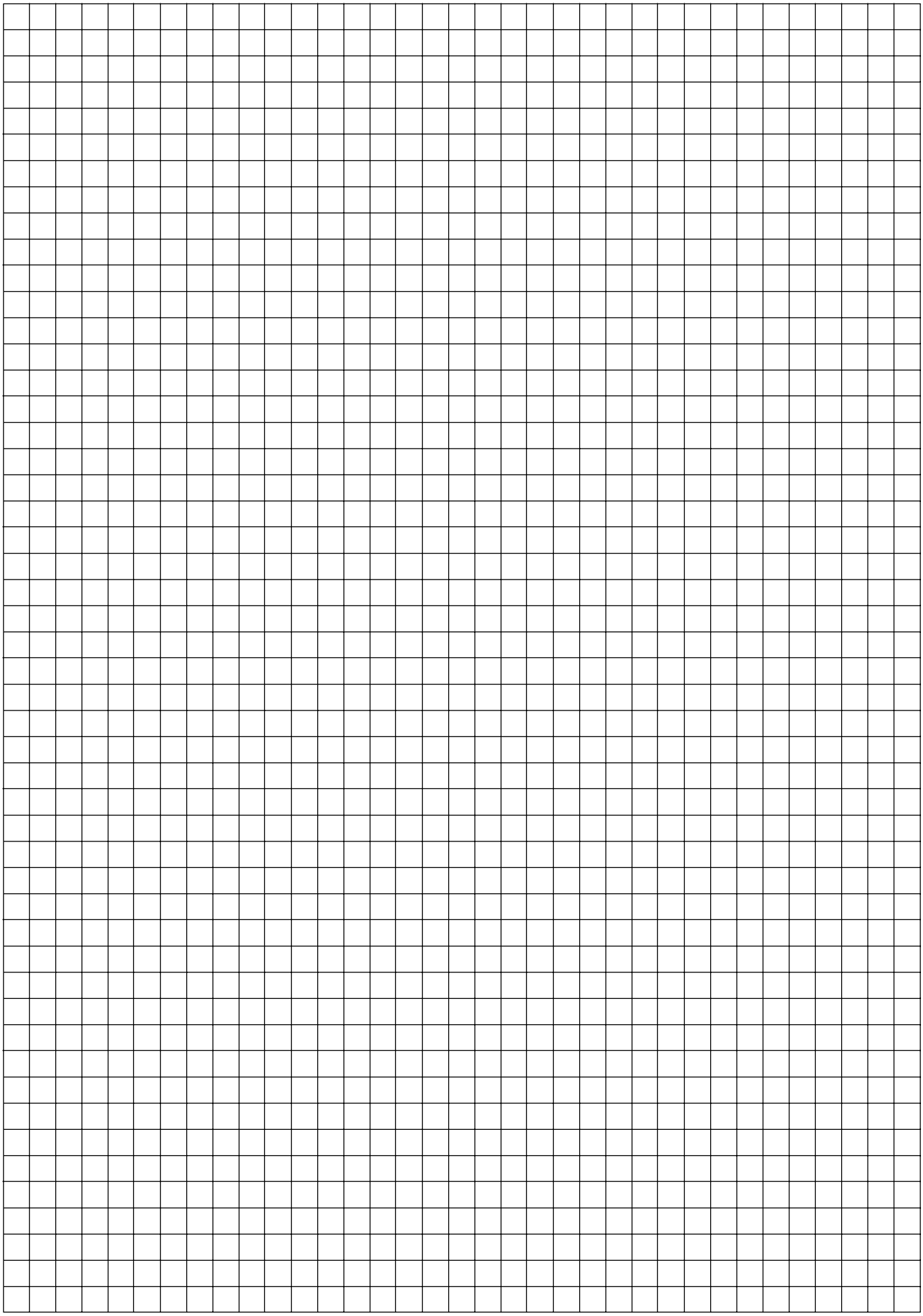

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High School Math Reference Sheet

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile = 1.609 kilometers

1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds
1 ton = 2000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 gallon = 3.785 liters
1 liter = 0.264 gallon
1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian $= \frac{180}{\pi}$ degrees
Degrees	1 degree $= \frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

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ALGEBRA II (COMMON CORE)

FOR TEACHERS ONLY

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REGENTS HIGH SCHOOL EXAMINATION

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Thursday, August 18, 2016 — 12:30 to 3:30 p.m., only

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 II (Common Core). More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Algebra II (Common Core)*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the constructed-response 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 constructed-response 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/ by Thursday, August 18, 2016. 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 48 credits, 2 credits for each of the following.

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

The Department is providing supplemental scoring guidance, the "Model Response Set," for the Regents Examination in Algebra II (Common Core). This guidance is recommended to be part of the scorer training. Schools are encouraged to incorporate the Model Response Sets into the scorer training or to use them as additional information during scoring. While not reflective of all scenarios, the model responses selected for the Model Response Set illustrate how less common student responses to constructed-response questions may be scored. The Model Response Set will be available on the Department's web site at http://www.nysedregents.org/algebratwo/.

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra II (Common Core) 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 Examination in Algebra II (Common Core)*, 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 a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. 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.

(25) **[2]** Amplitude, and a correct explanation is given.

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

or

[1] Amplitude, but the explanation is incomplete.

[0] Amplitude, but the explanation is incorrect or missing.

or

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

(26) **[2]** A correct explanation is written.

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

or

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

or

[1] Appropriate work is shown, but the explanation is incomplete.

or

[1] Appropriate work is shown to demonstrate $\left(3^{\frac{1}{5}}\right)^2 = \sqrt[5]{9}$, but the explanation is missing or is incorrect.

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

(27) **[2]** $-36xi$, 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] $-36xi$, 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.

(28) **[2]** −1.02, and correct work using the identity 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] Correct work is shown to find sin θ but no further correct work is shown.

or

[1] −1.02, but a method other than using the identity is used.

or

[1] −1.02, 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]** Yes, and a correct justification is given, 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] Correct work is shown to find (150, 302), but no further correct work is shown.

[0] Yes, 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.

(30) **[2]** f, 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 the x-intercept of f, but no further correct work is shown.

or

[1] An incomplete justification is given.

[0] f, but no work is shown, and no justification is written.

or

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

(31) **[2]** 7.5, and a correct explanation is written.

[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] 7.5, but no explanation or an incorrect explanation is written.

[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]** Independent, 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] $P(A \cap B) = 0.3$ is found, but no further correct work is shown.

[0] Independent, but no 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.

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.

(33) **[4]** -1, ± 2, and correct algebraic work is shown and $P(x)$ is graphed correctly.

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

or

[3] Appropriate work is shown to find two zeros and a correct graph is drawn.

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

or

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

or

[2] Appropriate work is shown to find -1 and ± 2, but no graph is drawn.

or

[2] A correct graph is drawn, but no further correct work is shown.

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

or

[1] -1 and ± 2, but a method other than algebraic is used and no graph is drawn.

or

[1] -1 and ± 2, 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) **[4]** 12, 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.

or

[2] A correct equation, such as $7 = 20\left(\frac{1}{2}\right)^{\frac{t}{8.02}}$ or $7 = 20e^{-0.0864t}$ is written, 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] 12, 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) **[4]** 4, correct algebraic work is shown, and a correct justification and rejection are given.

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

or

[3] 4, and appropriate work is shown, but the justification is incomplete or 8 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] Appropriate work is shown to find 8 and 4, but no further correct work is shown.

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

or

[1] A correct quadratic equation in standard form is written, but no further correct work is shown.

or

[1] 4, but no work is shown.

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

(36) **[4]** Both explanations are correctly written.

[3] One explanation is correct, and the other is incomplete.

[2] One conceptual error is made.

or

[2] Only one explanation is stated correctly.

or

[2] Appropriate work is shown, but two partially correct explanations are written.

[1] One incomplete explanation is written.

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

Part IV

For each question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(37) **[6]** Correct functions are written, such as $A = 5000(1.045)^n$, $B = 5000(1.0115)^{4n}$ and 67.57, 15.2, and correct work is shown.

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

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

or

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

[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 and one computational or rounding errors are made.

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

or

[2] Appropriate work is shown, but two conceptual errors are made.

or

[2] Correct functions are written, but no further correct work is shown.

or

[2] Appropriate work is shown to find 67.57 or 15.2, but no further correct work is shown.

or

[2] 67.57 and 15.2, but no work is shown.

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

or

[1] Only one correct function is written.

or

[1] $5000(1.045)^n$ and $5000\left(1 + \frac{0.046}{4}\right)^{4n}$, but no further correct work is shown.

or

[1] 67.57 or 15.2, 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 the Common Core Learning Standards
Algebra II (Common Core)
August 2016

Question	Type	Credits	Cluster
1	Multiple Choice	2	A-REI.B
2	Multiple Choice	2	S-IC.B
3	Multiple Choice	2	A-REI.D
4	Multiple Choice	2	S-ID.A
5	Multiple Choice	2	A-SSE.A
6	Multiple Choice	2	A-REI.D
7	Multiple Choice	2	S-CP.A
8	Multiple Choice	2	F-IF.A
9	Multiple Choice	2	A-SSE.B
10	Multiple Choice	2	F-IF.B
11	Multiple Choice	2	A-APR.D
12	Multiple Choice	2	S-IC.B
13	Multiple Choice	2	F-LE.B
14	Multiple Choice	2	F-BF.B
15	Multiple Choice	2	A-SSE.A
16	Multiple Choice	2	F-TF.A
17	Multiple Choice	2	A-REI.A
18	Multiple Choice	2	F-BF.A
19	Multiple Choice	2	G-GPE.A
20	Multiple Choice	2	A-APR.C

21	Multiple Choice	2	A-APR.B
22	Multiple Choice	2	A-SSE.B
23	Multiple Choice	2	A-REI.C
24	Multiple Choice	2	F-BF.A
25	Constructed Response	2	N-Q.A
26	Constructed Response	2	N-RN.A
27	Constructed Response	2	N-CN.A
28	Constructed Response	2	F-TF.C
29	Constructed Response	2	S-IC.B
30	Constructed Response	2	F-IF.C
31	Constructed Response	2	F-IF.B
32	Constructed Response	2	S-CP.A
33	Constructed Response	4	A-APR.B
34	Constructed Response	4	F-LE.A
35	Constructed Response	4	A-REI.A
36	Constructed Response	4	S-IC.B
37	Constructed Response	6	F-BF.A

Regents Examination in Algebra II (Common Core)

August 2016

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

The *Chart for Determining the Final Examination Score for the August 2016 Regents Examination in Algebra II (Common Core)* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ by Thursday, August 18, 2016. Conversion charts provided for previous administrations of the Regents Examination in Algebra II (Common Core) 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 II (Common Core)

Thursday, August 18, 2016 — 12:30 to 3:30 p.m.

MODEL RESPONSE SET

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Question 25

25 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.

amplitude because it shows how much air gets into someones lungs with a deep breath compared to a shallow breath when the person is at rest.

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

Question 25

25 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.

Amplitude → show difference in height of graph as to how much volume is being taken in

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

Question 25

25 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.

All 3, The amplitude will show how heavy they breathe in and out. The period would show frequent they breathe. The midline would show when they breathe the most

Score 1: The student correctly explained why amplitude should be used, but the remainder of the explanation was erroneous.

Question 25

25 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.

Midline because it is the average volume of air in their lungs.

Score 1: The student correctly explained an incorrect choice within the context of the problem.

Question 25

25 The volume of air in a person's lungs, as the person breathes in and out, can be modeled by a sine graph. A scientist is studying the differences in this volume for people at rest compared to people told to take a deep breath. When examining the graphs, should the scientist focus on the amplitude, period, or midline? Explain your choice.

The scientist should focus on the period because it is the frequency of breaths taken.

Score 0: The student gave a completely incorrect response.

Question 26

26 Explain how $\left(3^{\frac{1}{5}}\right)^2$ can be written as the equivalent radical expression $\sqrt[5]{9}$.

The $\frac{1}{5}$ power means to do the fifth root, but since you can apply either power first you can square the 3 first and then take the fifth root of it (commutative property)

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

Question 26

26 Explain how $\left(3^{\frac{1}{5}}\right)^2$ can be written as the equivalent radical expression $\sqrt[5]{9}$.

$(3^{1/5})^2 = (3^2)^{1/5} = 9^{1/5} = \sqrt[5]{9}$

I reversed the order of the exponents

I squared the 3 to get 9

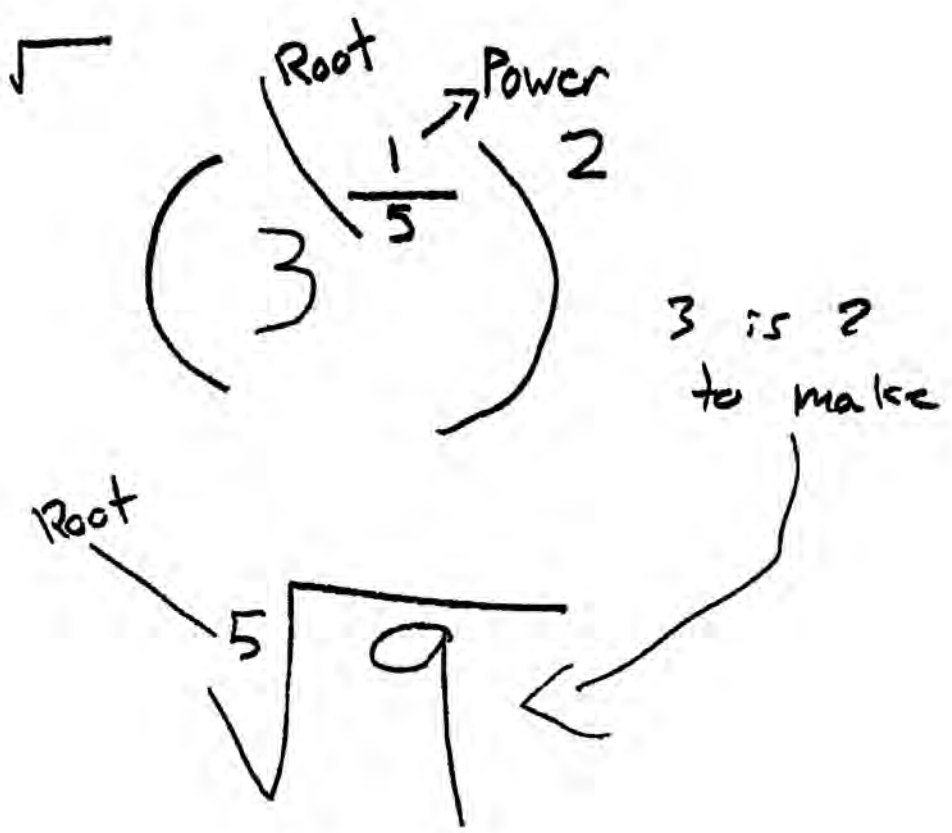
The $1/5$ power is the same as $\sqrt[5]{\ }$

So $(3^{1/5})^2 = \sqrt[5]{9}$

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

Question 26

26 Explain how $\left(3^{\frac{1}{5}}\right)^2$ can be written as the equivalent radical expression $\sqrt[5]{9}$.



Score 1: The student demonstrated the equivalence, but gave an incomplete explanation.

Question 26

26 Explain how $\left(3^{\frac{1}{5}}\right)^2$ can be written as the equivalent radical expression $\sqrt[5]{9}$.

1.55

The exponent (fraction) $(\frac{1}{5})$ is equivalent to taking the root with the denominator $(\sqrt[5]{\ })$ base five. Squaring the first value is equivalent to square rooting the second value. $(\sqrt[5]{9})$ Because $9 = 3^2$, these operations are equal.

Score 1: The student gave an incomplete explanation.

Question 26

26 Explain how $\left(3^{\frac{1}{5}}\right)^2$ can be written as the equivalent radical expression $\sqrt[5]{9}$.

you flip the $\frac{1}{5}$ to $\frac{5}{1}$ and square the 3, making it 9. To square the 5, you make it the square root, giving you $\sqrt[5]{9}$.

Score 0: The student gave a completely incorrect explanation.

Question 27

27 Simplify $xi(i - 7i)^2$, where i is the imaginary unit.

$xi(-6i)^2$

$xi(36i^2)$

$36xi^3$

$-36xi$

(1)

i^0

$(-i)i^2$ $\quad$ $i^1(i)$

i^2

(-1)

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

Question 27

27 Simplify $xi(i - 7i)^2$, where i is the imaginary unit.

$xi(i-7i)^2$

$i^2=-1$

$xi(i-7i)(i-7i)$ foil

$i^2-7i^2-7i^2+49i^2$

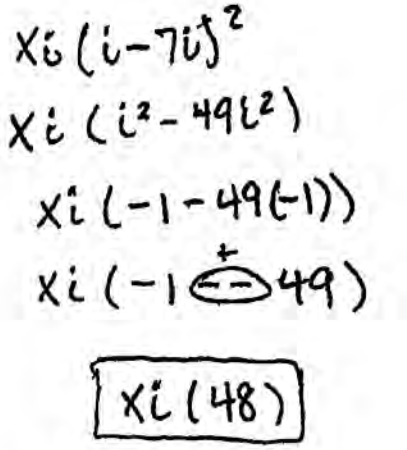
$-1-7(-1)-7(-1)+49(-1)$

-36

Score 1: The student did not multiply by xi.

Question 27

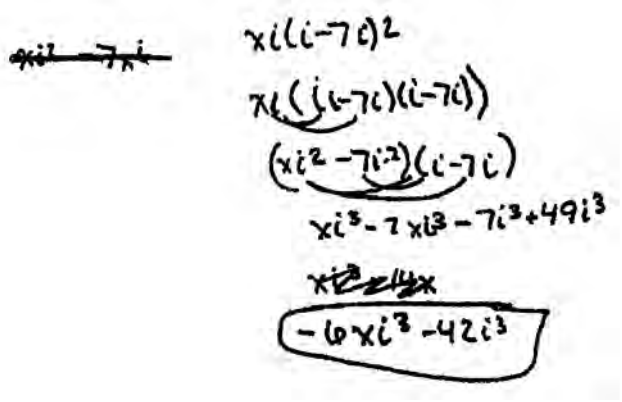
27 Simplify $xi(i - 7i)^2$, where i is the imaginary unit.



Score 1: The student did not square the binomial correctly.

Question 27

27 Simplify $xi(i - 7i)^2$, where i is the imaginary unit.



Score 0: The student made an error when distributing the xi and did not reduce the powers of i to simplify the answer.

Question 28

28 Using the identity $\sin^2\theta + \cos^2\theta = 1$, find the value of $\tan\theta$, to the *nearest hundredth*, if $\cos\theta$ is –0.7 and θ is in Quadrant II.

$\sin^2\theta + \cos^2\theta = 1$

$\sin^2\theta + -.7^2 = 1$

$\sin^2\theta + .49 = 1$

$\sin^2\theta = .51$

$\sin\theta = \sqrt{.51}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\tan\theta = \frac{\sqrt{.51}}{-.7}$

$\tan\theta = -1.02$

$\tan\theta = -1.02$

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

Question 28

28 Using the identity $\sin^2\theta + \cos^2\theta = 1$, find the value of $\tan\theta$, to the *nearest hundredth*, if $\cos\theta$ is -0.7 and θ is in Quadrant II.

$$\frac{\sin^2\theta}{\cos^2\theta} + \frac{\cos^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$$

$$\tan^2\theta + 1 = \frac{1}{\cos^2\theta}$$

$$\tan^2\theta = \frac{1}{(-.7)^2} - 1 = 1.0408$$

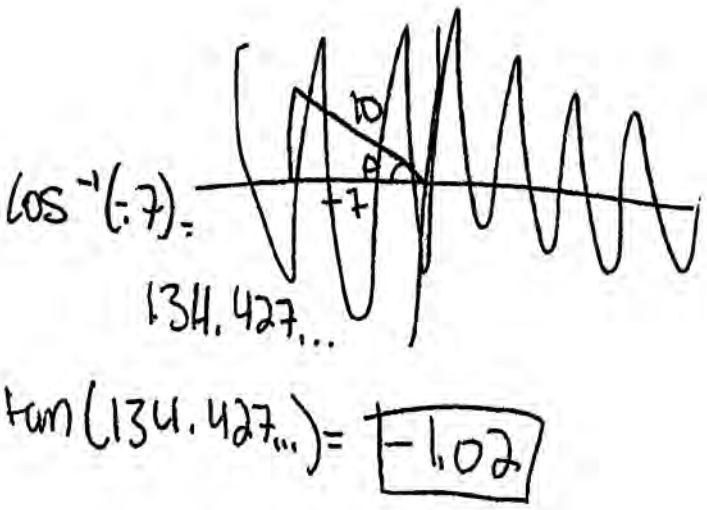
$$\tan\theta = \sqrt{1.0408}$$

$$= -1.02 \text{ in QII}$$

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

Question 28

28 Using the identity $\sin^2 \theta + \cos^2 \theta = 1$, find the value of $\tan \theta$, to the *nearest hundredth*, if $\cos \theta$ is –0.7 and θ is in Quadrant II.



Score 1: The student did not use the identity.

Question 28

28 Using the identity $\sin^2\theta + \cos^2\theta = 1$, find the value of tan θ, to the *nearest hundredth*, if cos θ is –0.7 and θ is in Quadrant II.

$\sin^2\theta + (-0.7)^2 = 1$

$\sin^2\theta + .49 = 1$

$\sqrt{\sin^2\theta} = \sqrt{.51}$

$\tan\theta = -\frac{0.71}{0.7}$

Score 1: The student correctly found the value for sin θ.

Question 28

28 Using the identity $\sin^2\theta + \cos^2\theta = 1$, find the value of $\tan\theta$, to the *nearest hundredth*, if $\cos\theta$ is -0.7 and θ is in Quadrant II.

$\frac{\sin^2\theta}{\sin^2\theta} + \frac{\cos^2\theta}{\sin^2\theta} = \frac{1}{\sin^2\theta}$

$\tan\theta$

$1 + \tan^2\theta = \frac{1}{\sin^2\theta}$ $\quad (0.7)$

$\frac{y}{x}$

$-1 \quad -1$

$1 + \tan^2\theta = \frac{1}{0.49}$

$\sqrt{\tan^2\theta} = \sqrt{1.0408}$

$\tan\theta = 1.0202$

$\theta \approx 1.02$

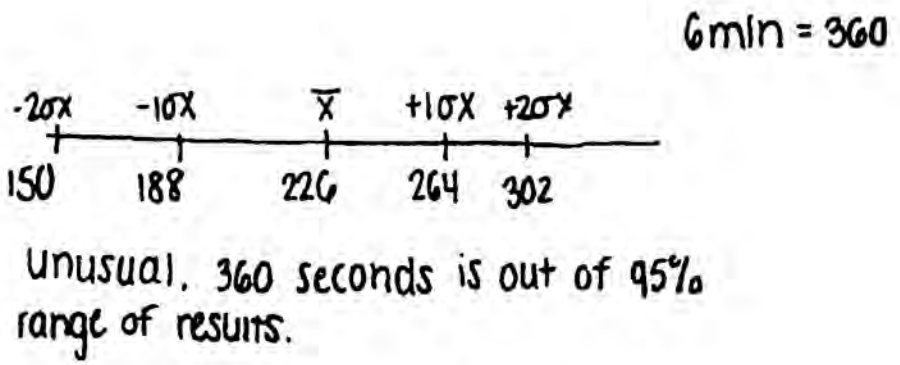
-1.02

Score 0: The student obtained a correct response by an incorrect procedure. The student wrote $\tan^2\theta$ instead of $\cot^2\theta$ and used 0.7 for $\sin^2\theta$.

Question 29

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

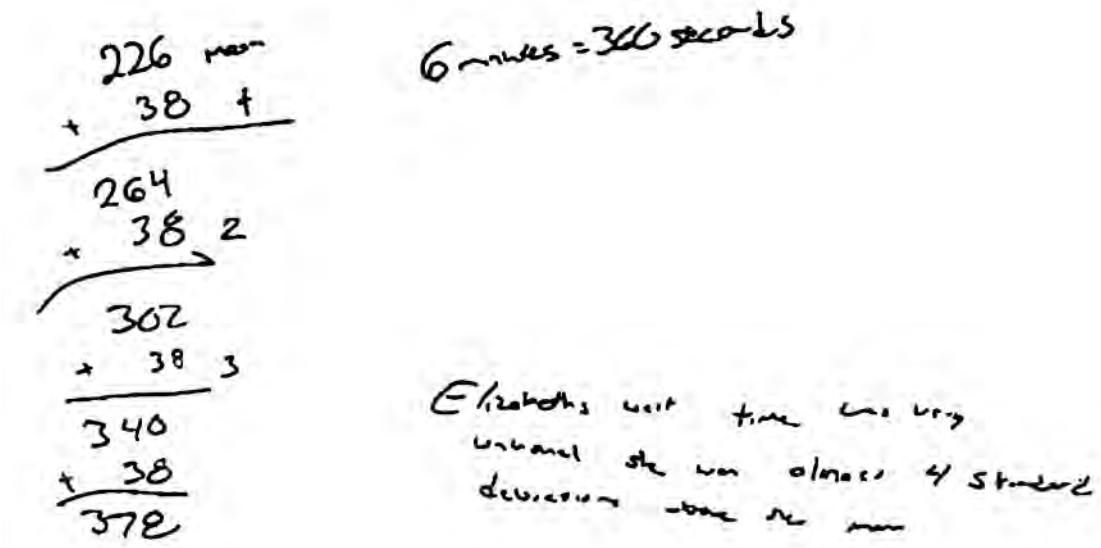


Score 2: The student gave a complete and correct response.

Question 29

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.



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

Question 29

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

6 min = 360 sec

$\mu = 226$

$\sigma = 38$

$z = \frac{\bar{x} - \mu}{\sigma} = \frac{360 - 226}{38}$

$z \simeq 3.53$

Yes, her wait time was unusual being 3.53 std dev above the mean

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

Question 29

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

$226+38+38 = \frac{302}{60} \approx 5$ min.

Yes it was unusual.

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

Question 29

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

$\bar{x} = 226 \text{ sec} = 3.7\overline{6} \text{ min}$

$SD = 38 \text{ sec} = .6\overline{3} \text{ min}$

$\bar{x} + 2SD = 5.0\overline{3}$

$\bar{x} - 2SD = 2.5$

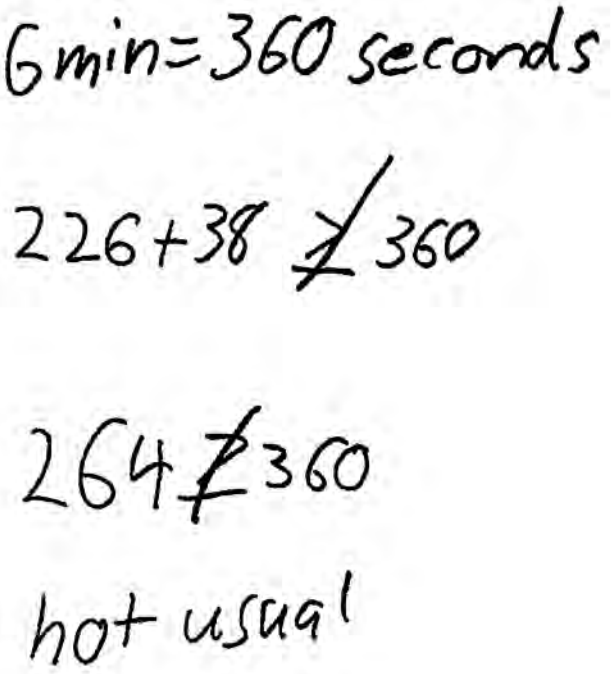
$2.5 - 5.0\overline{3}$

Score 1: The student obtained the correct interval in minutes.

Question 29

29 Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again.

A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.



Score 0: The student gave a completely incorrect response.

Question 30

30 The x-value of which function's x-intercept is larger, f or h? Justify your answer.

$f(x) = \log(x - 4)$

x	h(x)
−1	6
0	4
1	2
2	0
3	−2

$0 = \log(x-4)$

$10^0 = x - 4$

$1 = x - 4$

$x = 5$

function f has the larger x-intercept, because at the x-intercept, $y = 0$, and $5 > 2$.

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

Question 30

30 The x-value of which function's x-intercept is larger, f or h? Justify your answer.

$f(x) = \log(x - 4)$

x	h(x)
−1	6
0	4
1	2
2	0
3	−2

f because it's x-intercept is 5 while h's x-intercept is 2

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

Question 30

30 The x-value of which function's x-intercept is larger, f or h? Justify your answer.

$f(x) = \log(x - 4)$

this came up as an error

x	h(x)
−1	6
0	4
1	2
2	0
3	−2

f b/c when graphed in the calculator it has a larger x-intercept

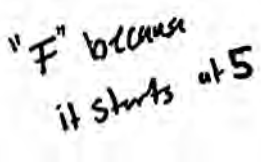
Score 1: The student gave an incomplete justification.

Question 30

30 The x-value of which function's x-intercept is larger, f or h? Justify your answer.

$f(x) = \log(x - 4)$

x	h(x)
−1	6
0	4
1	2
2	0
3	−2



Score 1: The student gave an incomplete justification.

Question 30

30 The x-value of which function's x-intercept is larger, f or h? Justify your answer.

$f(x) = \log(x - 4)$

x	h(x)
−1	6
0	4
1	2
2	0
3	−2

$f(-1) = \log(-1-4)$
$= \log(-5)$
not real
$f(1) = \log(1-4)$
$= \log(-3)$
not real

$h(x) = \log(k-4)$
$= \log 2$
$= .30102999957$

Most of h(x) has real answeres so h has a larger x-intercept

Score 0: The student gave a completely incorrect response.

Question 31

31 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

$\frac{150}{20} = 7.5$

Explain what this rate of change means as it relates to braking distance.

As the speed of the car increases by 1mph over 50 mph the braking distance goes up by 7.5ft

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

Question 31

31 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

$$\frac{(306.25 - 156.25)}{(70 - 50)} = \frac{150}{20} = 7.5 \text{ ft/mph}$$

Explain what this rate of change means as it relates to braking distance.

As the speed of the car increases by 1 mph, the car will need 7.5 ft more to stop after breaking.

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

Question 31

31 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

10

81.25

8.125 ~~ft~~/mile

Explain what this rate of change means as it relates to braking distance.

It mean that with every increase by 1 mile per hour the breaking distance increases 8.125 ft.

Score 1: The student gave a correct explanation based on an incorrect rate of change.

Question 31

31 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

$$\frac{306.25 - 156.25}{20} = 7.5$$

Explain what this rate of change means as it relates to braking distance.

The faster the longer to stop

Score 1: The student gave an incomplete explanation.

Question 31

31 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

50
156.25 = 3.125 70
306.25 = 4.375

Explain what this rate of change means as it relates to braking distance.

The faster the speed, the longer distance the car needs to stop.

Score 0: The student did not find the rate of change and gave an incomplete explanation.

Question 31

31 The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

50mph - 156.25 +150 = 306.25
70mph - 306.25
Average rate of change = 150

Explain what this rate of change means as it relates to braking distance.

At 10 mph the rate of change to 30 mph is 50. Every 20 mph relationship the rate of change goes up 25.
20 → 40 mph - rate of change = 75
30 → 50 mph - rate of change = 100
40 → 60 mph - rate of change = 125
50 → 70 mph - rate of change = 150

Score 0: The student gave a completely incorrect response.

Question 32

32 Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$, determine whether A and B are independent or dependent.

$0.8 = 0.6 + 0.5 - P(A \text{ and } B)$

$0.8 = 1.1 - P(A \text{ and } B)$

$P(A \text{ and } B) = 0.3$

$P(A \mid B) = P(A)$

$\frac{P(A \text{ and } B)}{P(B)} = P(A)$

$\frac{0.3}{0.5} = 0.6$

$0.6 = 0.6$

A and B are independent

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

Question 32

32 Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$, determine whether A and B are independent or dependent.

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$0.8 = 0.6 + 0.5 - P(A \cap B)$

$0.8 = 1.1 - P(A \cap B)$

$P(A \cap B) = 0.3$

A AND B are independent if

$P(A \cap B) = P(A)\,P(B)$

$0.3 = (0.6)(0.5)$

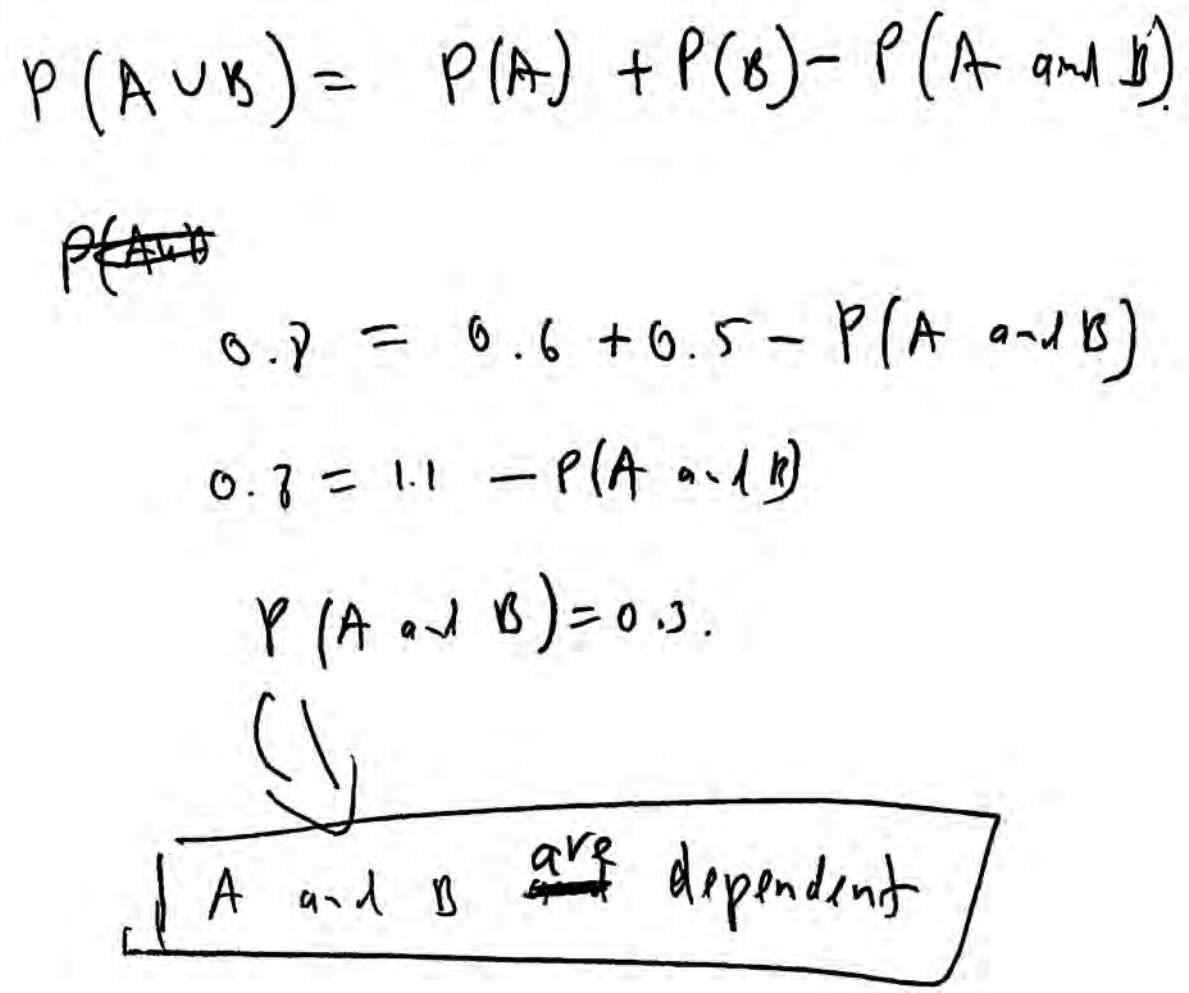
$0.3 = 0.3$

independent

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

Question 32

32 Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$, determine whether A and B are independent or dependent.



Score 1: The student found $P(A \cap B)$, but did not show further correct work.

Question 32

32 Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$, determine whether A and B are independent or dependent.

p(A or B) = 0.8

p(A) = 0.6

p(B = 0.5

A and b are dependent event, because p(A ∪ B) = 0.8, independent mean p(A) × p(B) = 0.3, so it dependent event.

Score 0: The student gave a completely incorrect response.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

x^3+x^2-4x-4

$x^2(x+1)\ (-4)(x+1)$

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

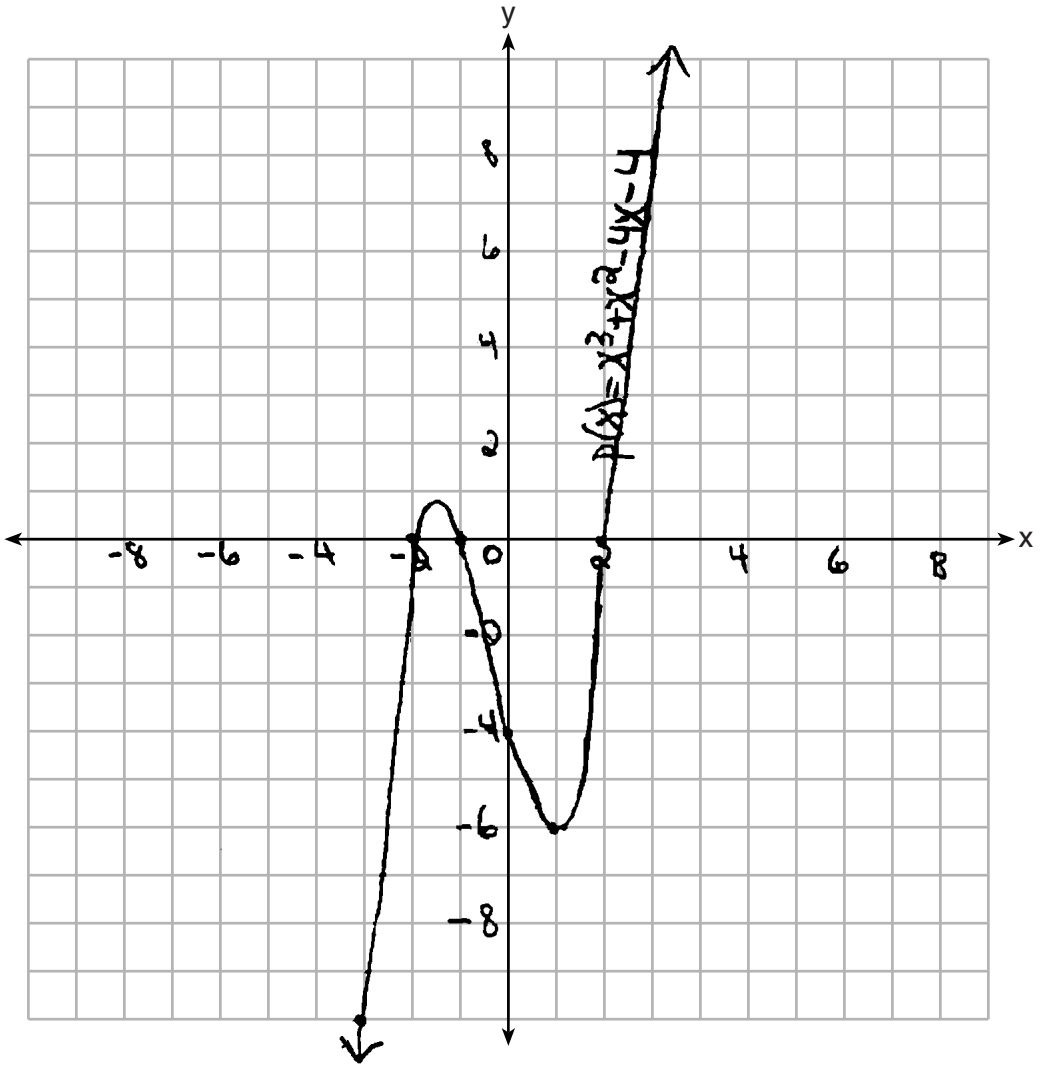
$(x+1)(x+2)(x-2)$

$x+1=0 \quad x+2=0 \quad x-2=0$

$x=-1 \quad x=-2 \quad x=2$

$\boxed{x=\{-2,-1,2\}}$

On the set of axes below, graph $y = p(x)$.



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

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

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

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

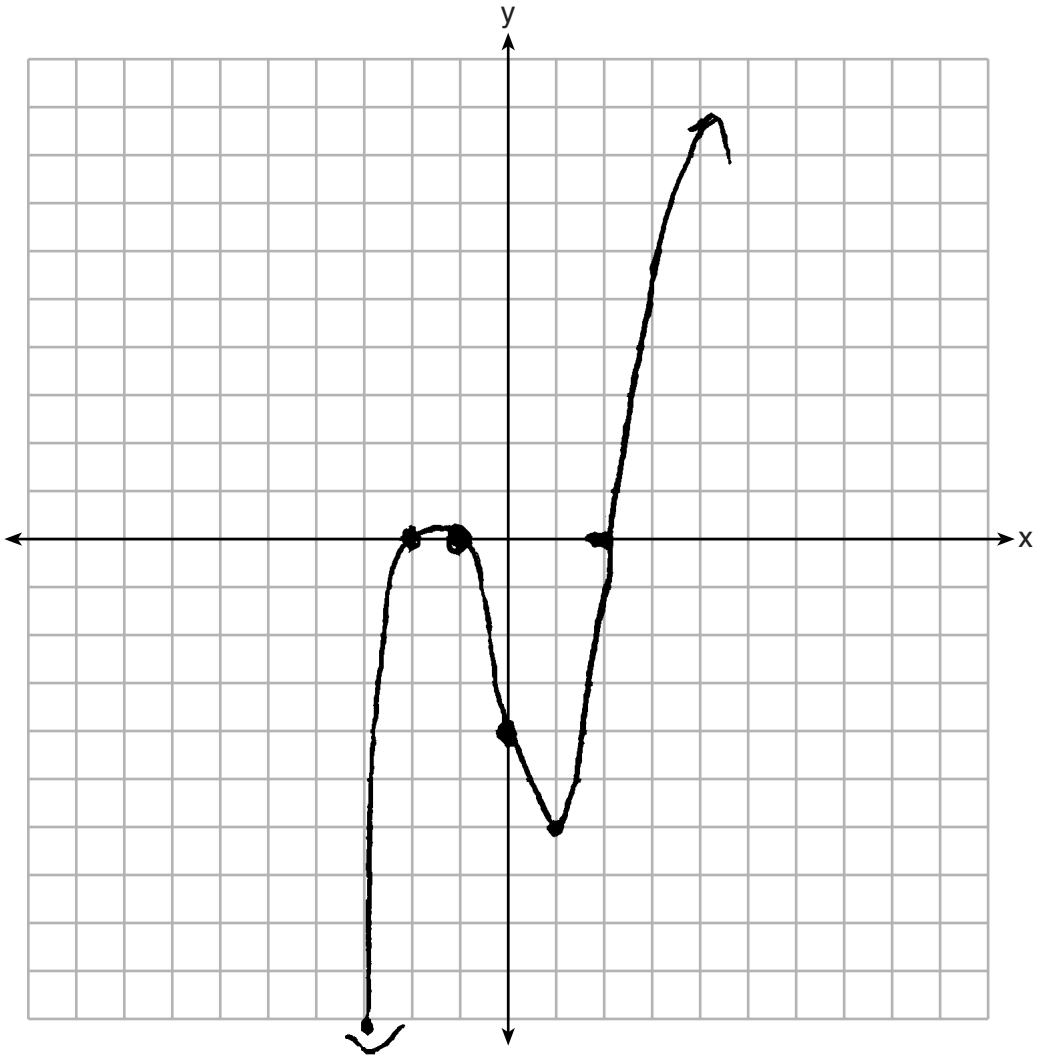
$(x+2)(x-2)(x+1)$

$x+2=0 \quad x-2=0 \quad x+1=0$

$-2 \quad +2 \quad -1$

$x=-2 \quad x=2 \quad x=-1$

On the set of axes below, graph $y = p(x)$.



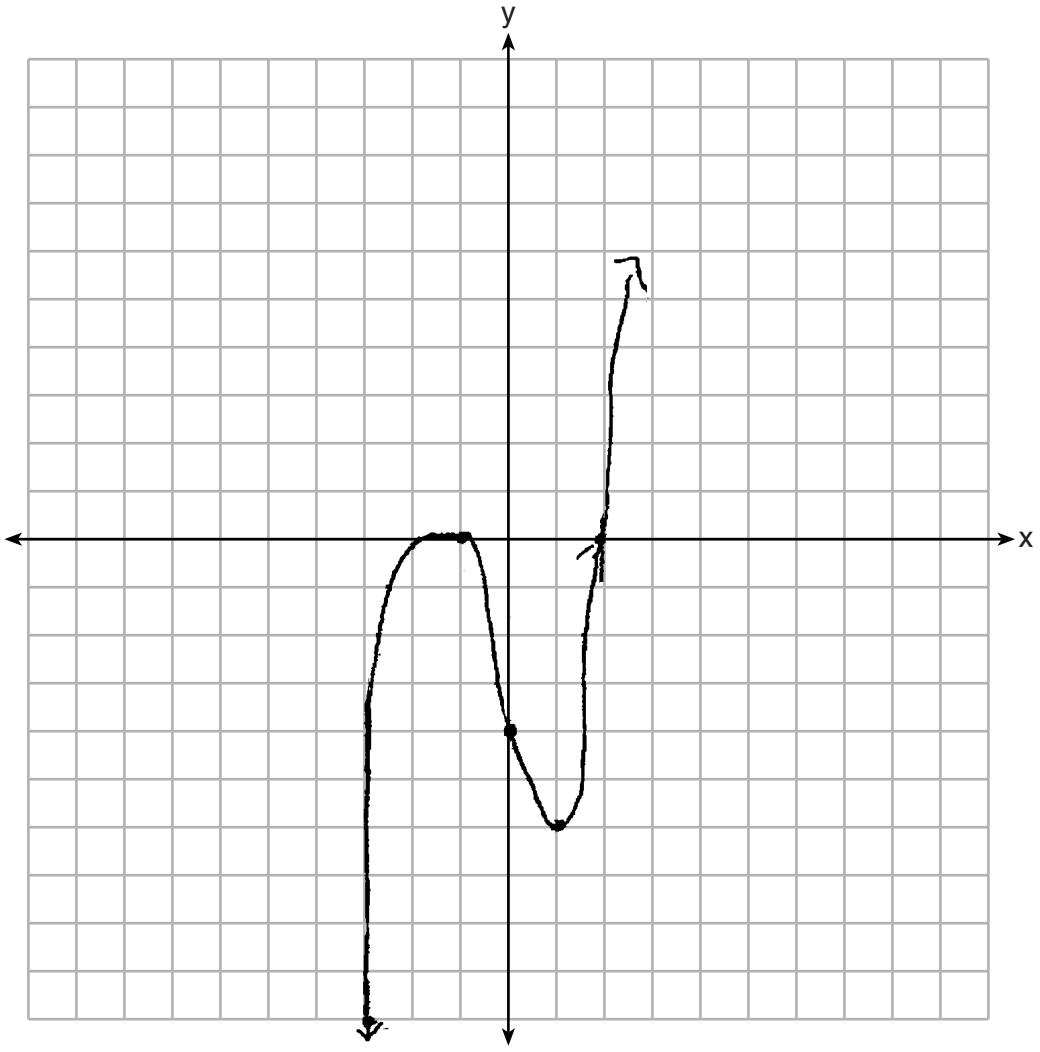
Score 4: The student gave a complete and correct response.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

$x^2(x+1)-4(x+1)$
$(x^2-4)(x+1)$
$(x-2)(x+2)(x+1)$
$x=2;-2;-1$

On the set of axes below, graph $y = p(x)$.



Score 3: The student incorrectly graphed between $x = -1$ and $x = -2$.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

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

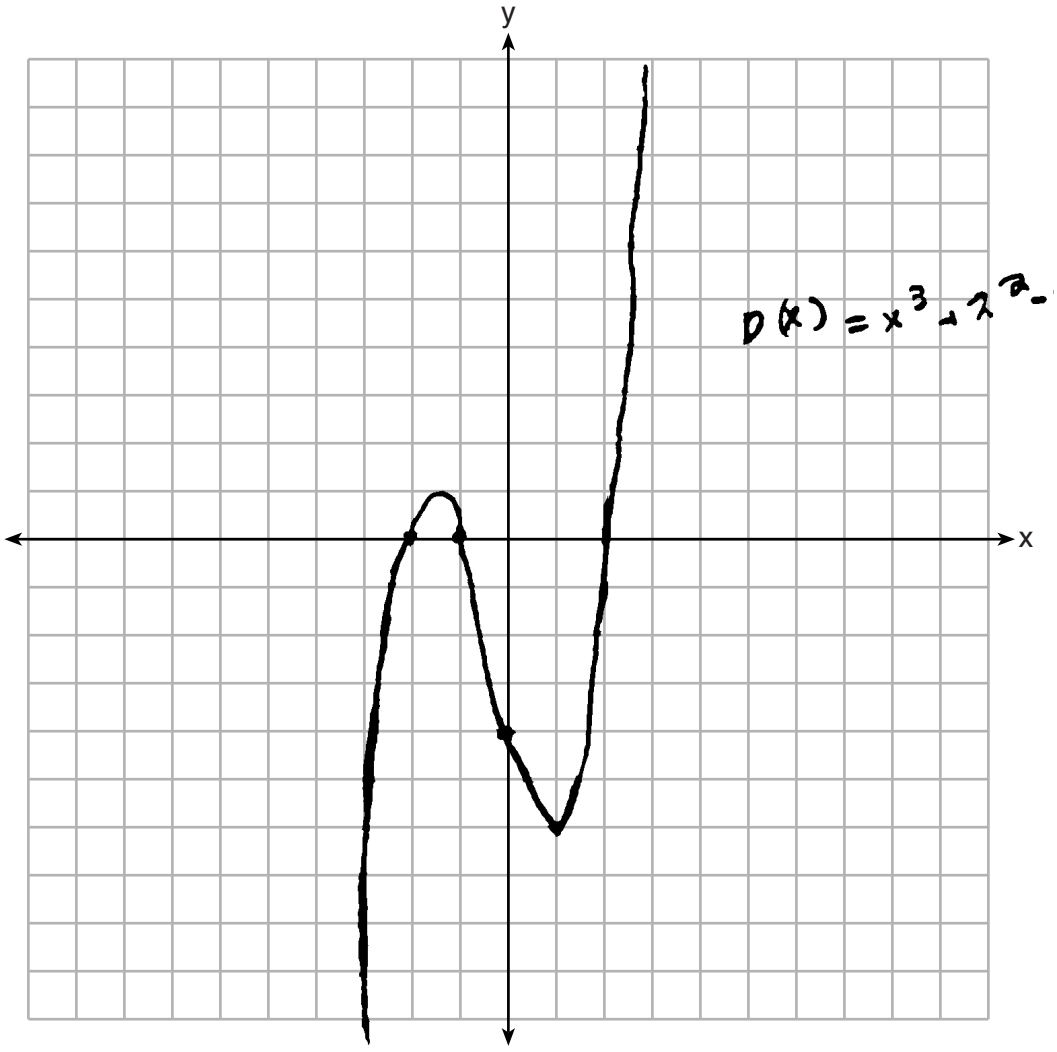
$\frac{4 \pm \sqrt{16-4(-4)}}{2}$

$\sqrt{16+16}$

$\frac{4 \pm \sqrt{32}}{2}$

-1
-2
2

On the set of axes below, graph $y = p(x)$.



Score 3: The student obtained the zeros by a method other than algebraic and graphed the function correctly.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

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

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

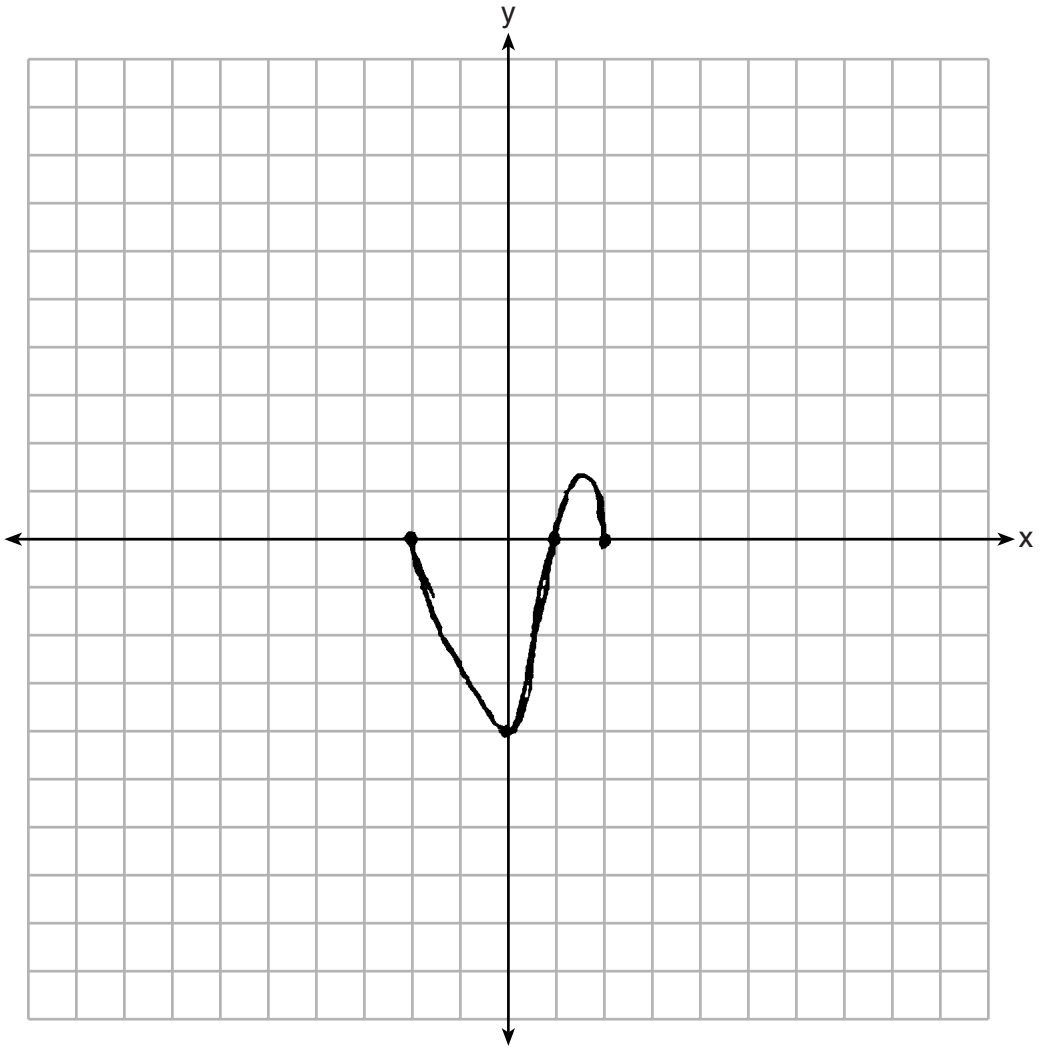
$(x-2)(x+2)(x+1)=0$

$x-2=0$, $+2\ +2$, $x=2$

$x+2=0$, $-2\ -2$, $x=-2$

$x+1=0$, $-1\ -1$, $x=-1$

On the set of axes below, graph $y = p(x)$.



Score 2: The student found the zeros algebraically, but graphed the function incorrectly.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

$P(x) = x^3 + x^2 - 4x - 4$

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

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

$x^2 - 4 = 0$ $\quad x+1=0$

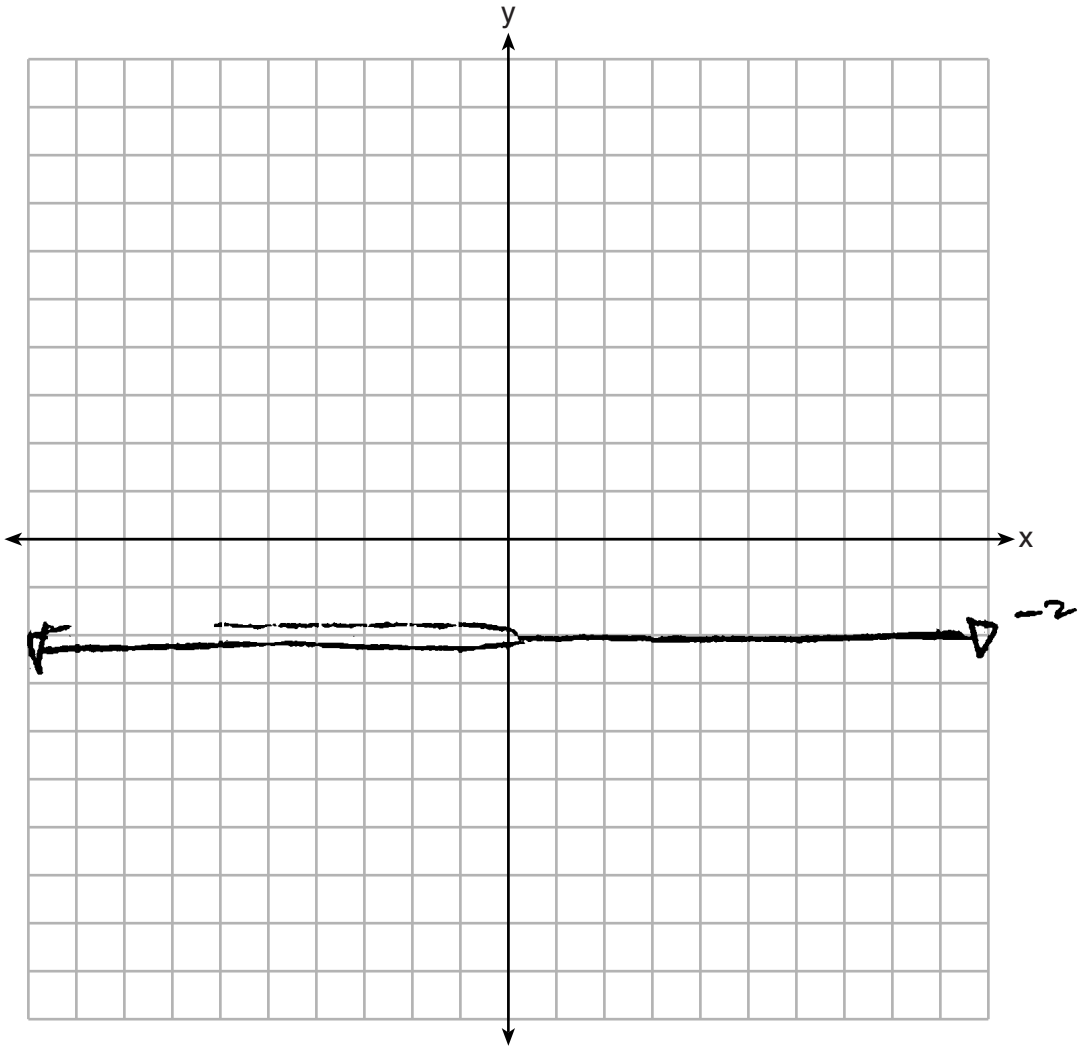
$x^2 = 4$ $\quad x = -1$

$\sqrt{x^2} = \sqrt{4}$

$x = 2$

$2, -1$

On the set of axes below, graph $y = p(x)$.



Score 1: The student found two zeros correctly.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

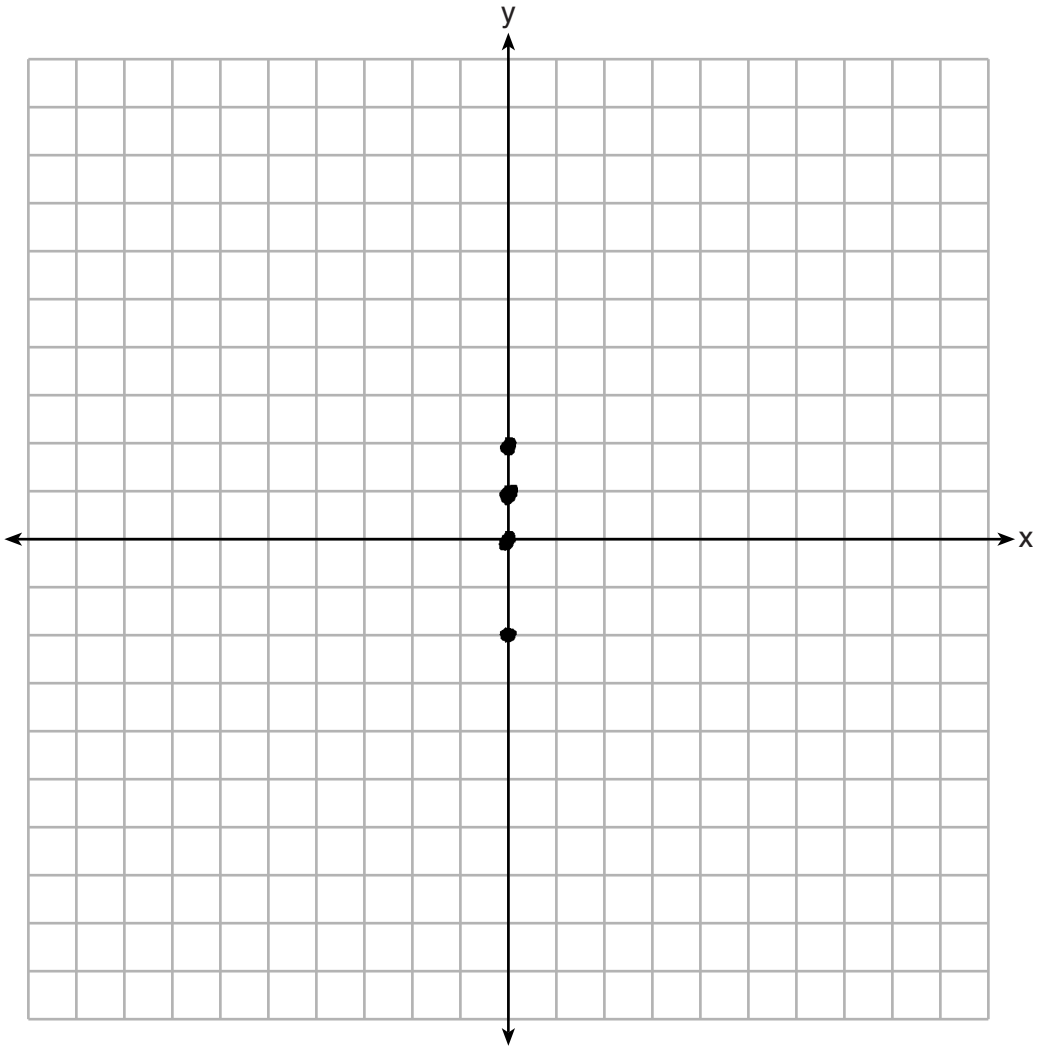
$p(x) = x^3 + x^2 - 4x - 4$

$x^2(x+1) \quad -4(x+1)$

$x^2 - 4 \quad (x+1)$

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

On the set of axes below, graph $y = p(x)$.



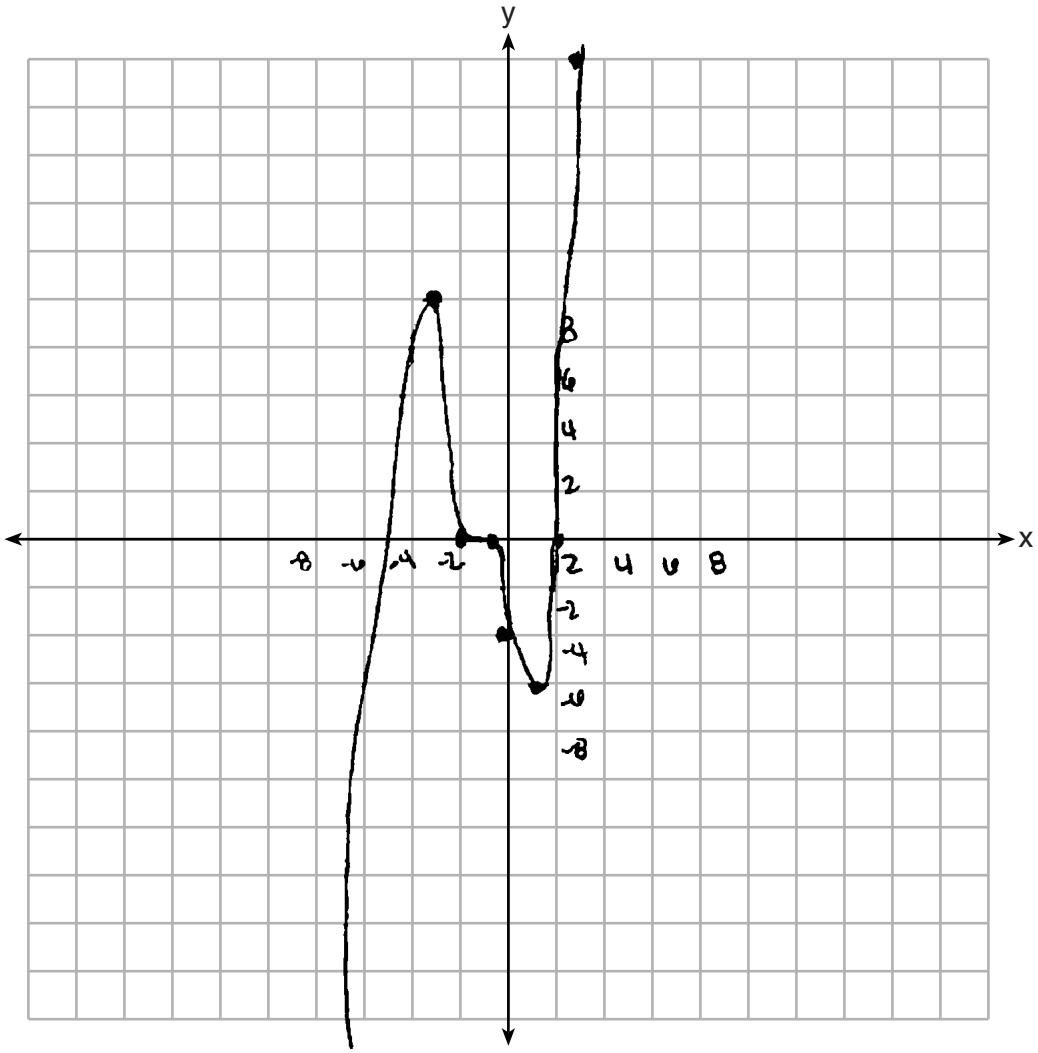
Score 0: The student did not provide enough correct work to receive any credit.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

(-2,0) (-1,0) (2,0)

On the set of axes below, graph $y = p(x)$.



Score 0: The student stated the x-intercepts, but not the zeros, and made numerous graphing errors.

Question 33

33 Find algebraically the zeros for $p(x) = x^3 + x^2 - 4x - 4$.

$x^3+x^2=0$ $\quad -4x-4=0$

$\sqrt{x^2}=0$ $\quad x^2(x+1)=0$ $\quad -4(x+1)=0$

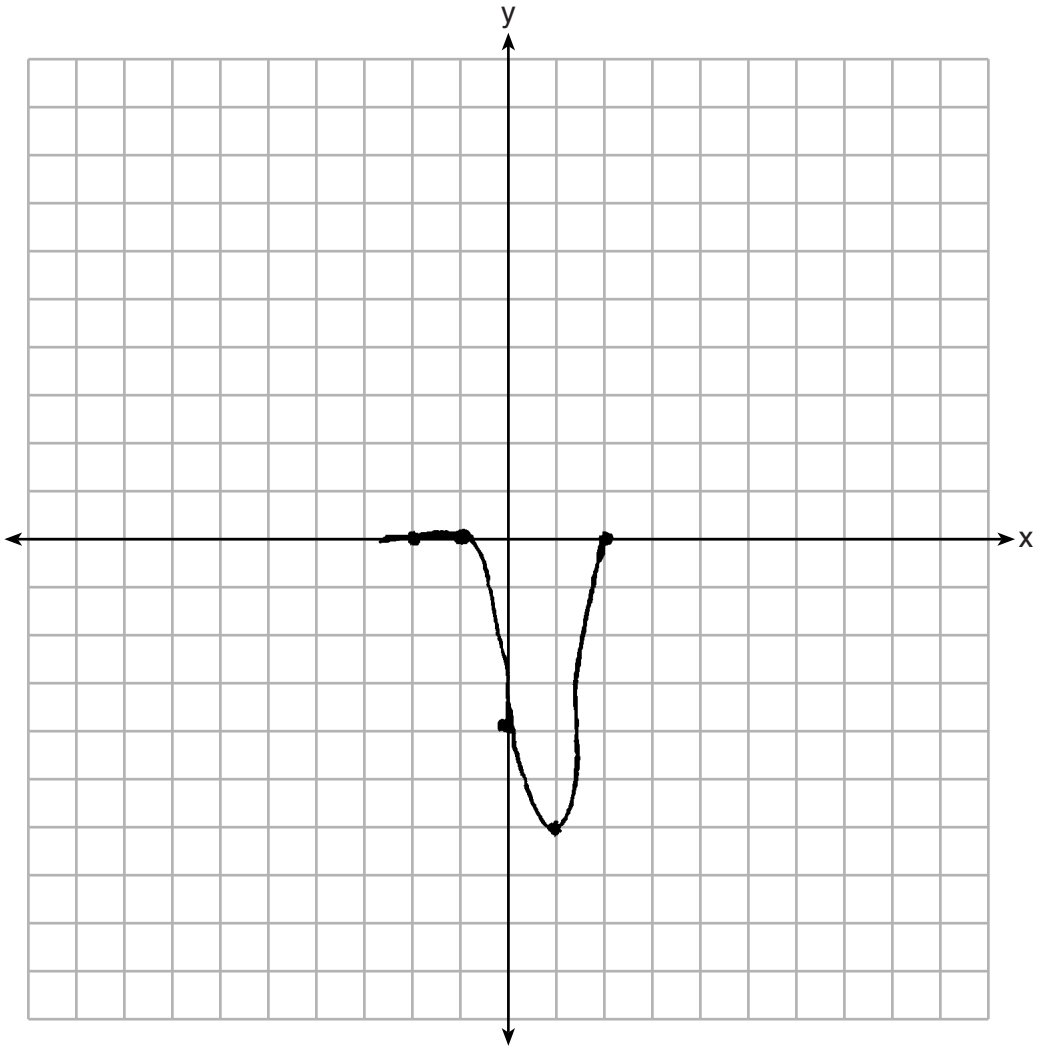
$-4=0$ $\quad x+1=0$

$x=-1$ $\quad x=-1$

$x=-1$

$0,-1$

On the set of axes below, graph $y = p(x)$.



Score 0: The student found the zeros incorrectly and made numerous graphing errors.

Question 34

34 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

$$7 = 20(.5)^{\frac{t}{8.02}}$$

$$.35 = (.5)^{\frac{t}{8.02}}$$

$$\log_{.5} .35 = \frac{t}{8.02}$$

$$1.51457 = \frac{t}{8.02}$$

$$12.14 = t$$

12

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

Question 34

34 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

$7 = 20(1 - .5)^t$

t = number of 8.02 day cycles

$7 = 20(.5)^t$

$\frac{7}{20} = .5^t$

$t = \log_{.5} \frac{7}{20}$

$t = 1.51457$

$1.51457 \cdot 8.02 = 12.146877$

≈ 12 days

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

Question 34

34 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

$$\frac{7}{20} = \frac{20\left(\frac{1}{2}\right)^{\frac{x}{8.02}}}{20}$$

$$\frac{7}{20} = \left(\frac{1}{2}\right)^{x/8.02}$$

$$8.02\left(\log_{\frac{1}{2}} 7/20\right) = \left(\frac{x}{8.02}\right)8.02$$

$$x = 8.02\left(\log_{\frac{1}{2}} 7/20\right)$$

$$x = 12.14687685$$

$$x = 13 \text{ days}$$

Score 3: The student stated the wrong number of days.

Question 34

34 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

$\frac{20}{2} \cdot 10$

$\frac{7}{20} = \frac{20}{20}(.5)^x$

$\frac{7}{20} = .5^x$

$\log_{.5}\left(\frac{7}{20}\right) = x$

$1.5 = x$

2 days

Score 2: The student found the number of half-lives correctly.

Question 34

34 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

$20\left(\frac{1}{2}\right)^{\frac{x}{8.02}}$ 7

$20(.546$

Score 1: The student wrote a correct expression.

Question 34

34 One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

I-131	Time
20	0
10	8.02 days
7	X
5	16.04 days

$\left(\frac{a_1}{a_n}\right) * 2 \cdot 8.02 = x$

$\left(\frac{a_1}{a_2}\right) \div 2 \cdot 8.02 = x$

$\left(\frac{20}{7}\right) \div 2 \cdot 8.02 = x$

$(2.857142857) \div 2 \cdot 8.02 = x$

$1.428571429 \cdot 8.02 = x$

$11.45714286 = x$

$x \approx 11.$ days

Score 0: The student gave a completely incorrect response.

Question 35

35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

$\sqrt{2x-7} + x = 5$

$\sqrt{2x-7} = 5-x$

$2x-7 = (5-x)^2$

$2x-7 = 25-10x+x^2$

$x^2-12x+32 = 0$

$(x-8)(x-4) = 0$

$x_1 = 8$ reject $\quad x_2 = 4$

$\sqrt{2(8)-7} + 8 = 5$

$\sqrt{9} + 8 = 5$

$3 + 8 \neq 5$

$11 \neq 5$

$\sqrt{2(4)-7} + 4 = 5$

$\sqrt{1} + 4 = 5$

$1 + 4 = 5$

$5 = 5$ ✓

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

Question 35

35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

$\sqrt{2x-7} + x = 5$

$-x \quad -x$

$(\sqrt{2x-7})^2 = (-x+5)^2$

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

$x^2 - 5x - 5x + 25$

$x^2 - 10x + 25$

$2x-7 = x^2 - 10x + 25$

$-2x+7 \quad -2x+7$

$x^2 - 12x + 32 = 0$

$(x-8)(x-4) = 0$

$x-8=0 \quad x-4=0$

$x = 8, 4$

CHECK

$\sqrt{2x-7} + x = 5$

$\sqrt{2(8)-7} + (8) = 5$

$11 \neq 5$

$\sqrt{2(4)-7} + 4 = 5$

$5 = 5$

The value of x is 4 because when 8 is plugged into the equation it does not equal 5, but when 4 is plugged back in it equals 5.

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

Question 35

35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

$\sqrt{2x-7} + x = 5$

$-x \quad -x$

$\sqrt{2x-7}^2 = (5-x)^2 \quad (5-x)(5-x)$

$2x-7 = 25 - 10x + x^2$

$-2x+7 \qquad +7 \quad -2x$

$x^2 - 12x + 32 = 0$

$(x-4)(x-8) = 0$

$x-4=0 \qquad x-8=0$

$x=4 \qquad x=8$

$\sqrt{2(4)-7} + 4 = 5$

$\sqrt{8-7} + 4 = 5$

$\sqrt{1} + 4 = 5$

~~$-1 + 4 = 5$~~

$5 = 5$

$\sqrt{2(8)-7} + 8 = 5$

$\sqrt{16-7} + 8 = 5$

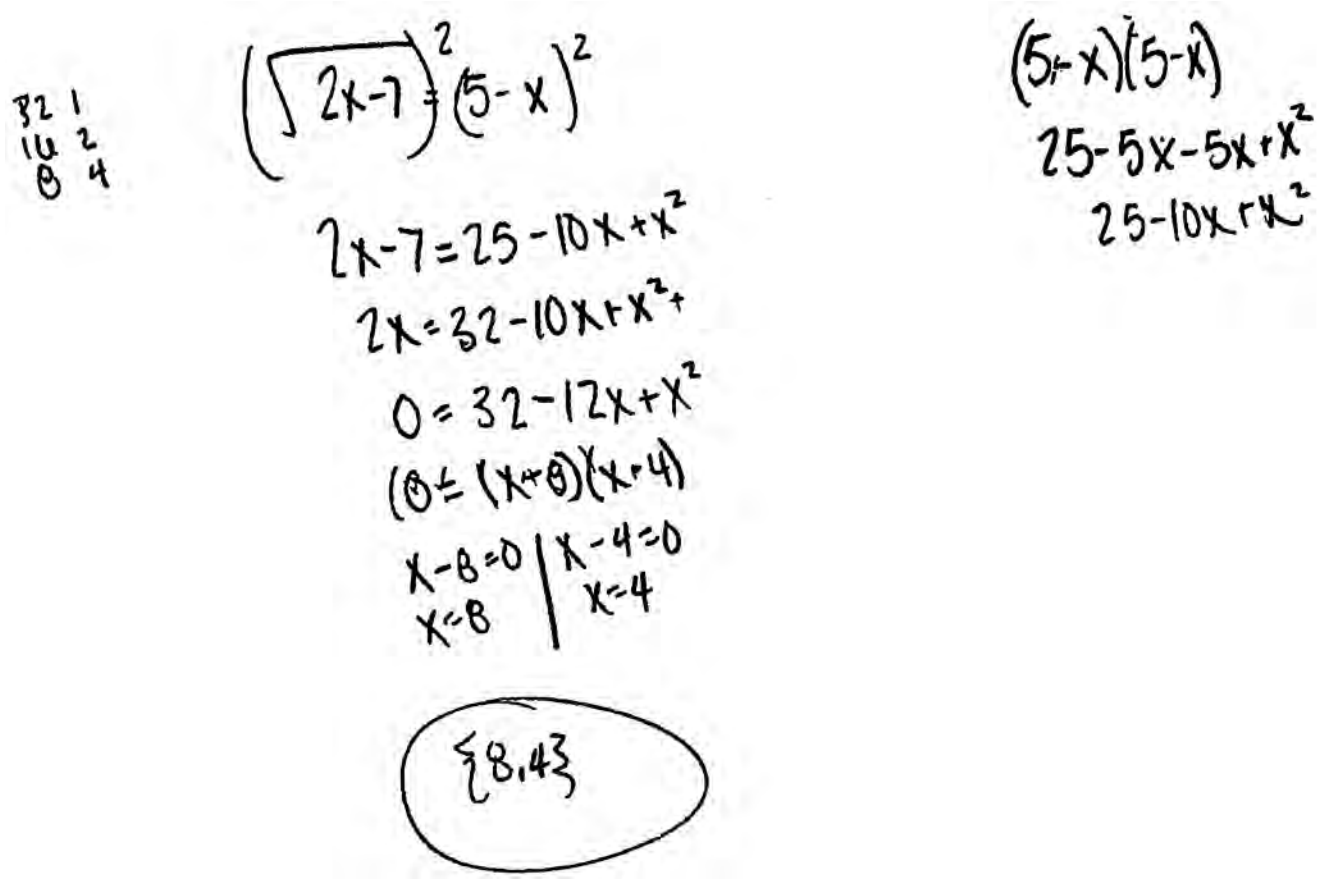
$\sqrt{9} + 8 = 5$

~~$3 + 8 = 5$~~ $\quad -3 + 8 = 5$

Score 3: The student incorrectly justified the 8.

Question 35

35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.



Score 2: The student found 8 and 4, but did not justify the solution set.

Question 35

35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

$\sqrt{2x-7}+x=5$

Solution set

4

Score 1: The student stated 4, but showed no work.

Question 35

35 Solve the equation $\sqrt{2x-7} + x = 5$ algebraically, and justify the solution set.

$\sqrt{2x-7} + x = 5$

$+7 \quad -x \quad -x$

$+7$

$\sqrt{2x+x} = 12$

$\sqrt{3x} = 12$

$x = 4$

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

Question 36

36 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

Group 1 (seconds)	**Group 2** (seconds)
17.4	23.3
18.1	18.8
18.2	22.1
19.6	12.7
18.6	16.9
16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

1,47 3.9

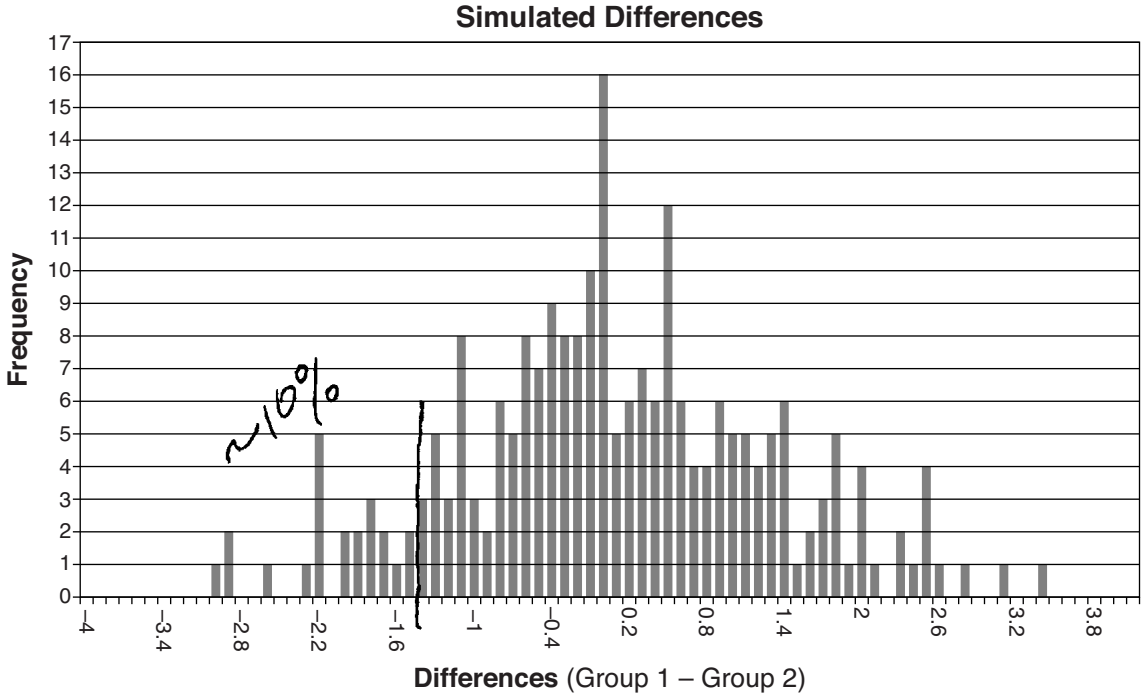
a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.

Group 2 has several students that read faster than group 1.

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

Question 36

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



b) Ayva has decided that the difference in mean reading times is *not* an unusual occurence. Support her decision using the results of the simulation. Explain your reasoning.

Since the difference of -1.4 or less (extreme) occurs about 10% of the time in the simulation, this difference is not that unusual.

Question 36

36 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

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18.6	16.9
16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

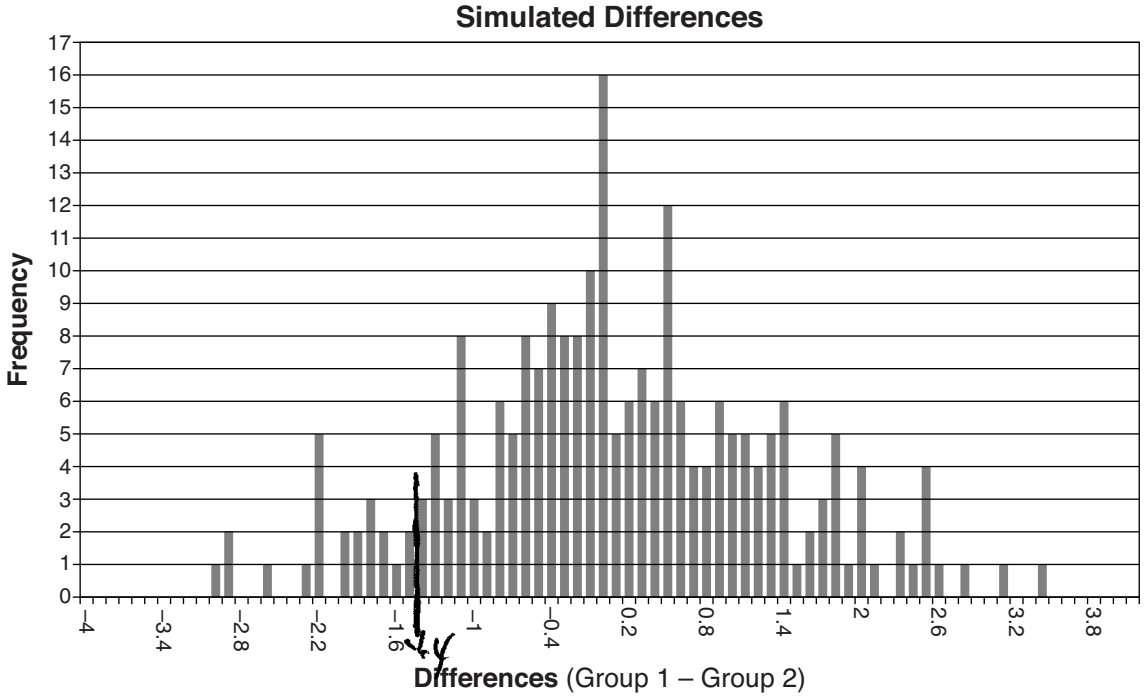
a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.

Ayva did not take into consideration the standard deviations of each group
Group 1 = 1.471 Group 2 = 3.921
(there is an outlier)

Score 3: The student wrote a partially correct first explanation and a correct second explanation.

Question 36

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



b) Ayva has decided that the difference in mean reading times is *not* an unusual occurence. Support her decision using the results of the simulation. Explain your reasoning.

17.7 − 19.1 = −1.4

I support her decision because scores less than −2 occurs 5% of the time so −1.4 is not that unusual.

Question 36

36 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

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16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

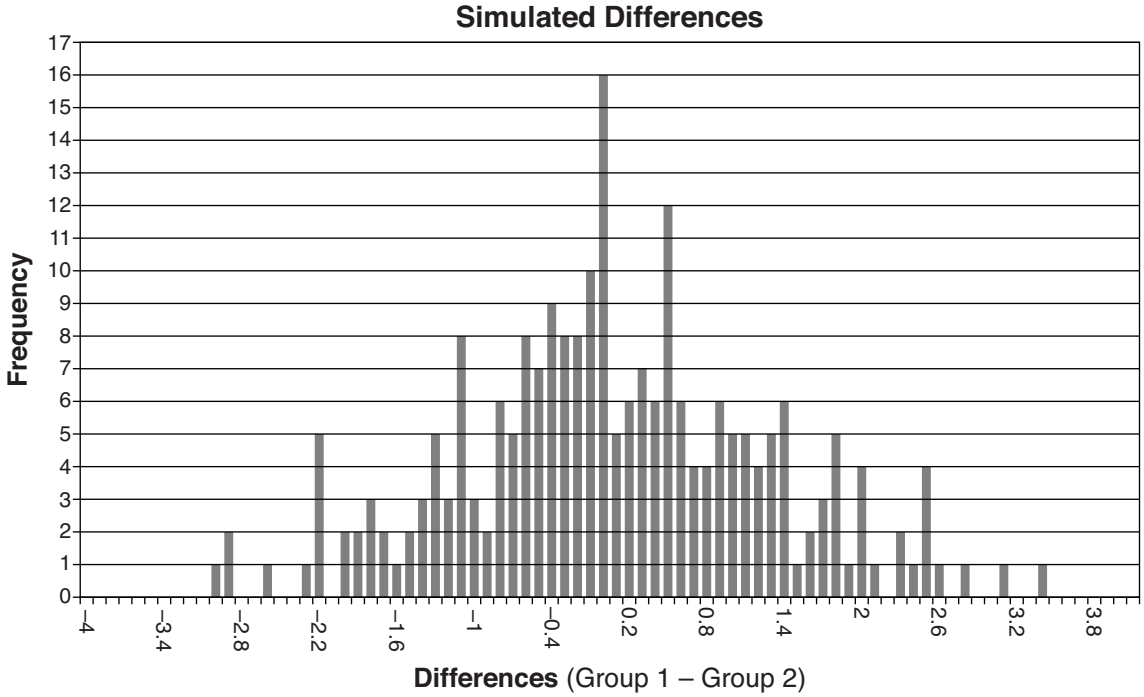
a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.

The Group given the energy drinks had a quicker mean time because there was a small deviation from the mean. The second group had many quicker times than the first group, and some slower creating a larger standard deviation

Score 2: The student wrote two partially correct explanations.

Question 36

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



b) Ayva has decided that the difference in mean reading times is *not* an unusual occurence. Support her decision using the results of the simulation. Explain your reasoning.

The mean differences varies enough that the energy drink may not have effected the times, and that it was by chance

Question 36

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16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

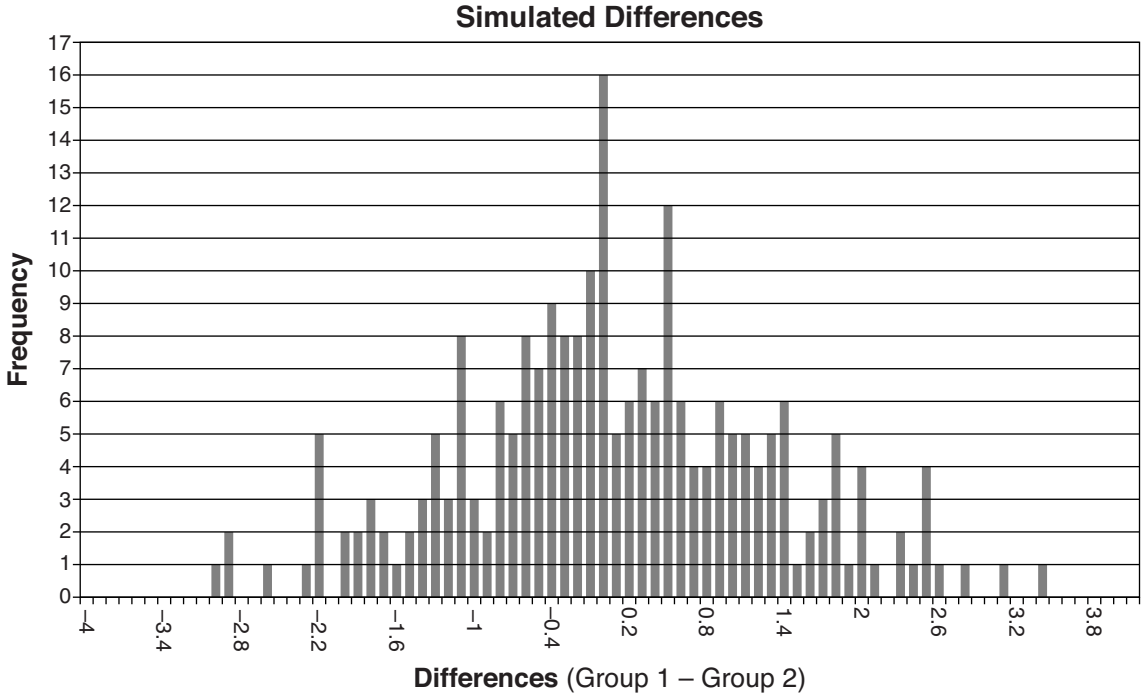
a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.

some of the students who drank Colax read faster than the ones who drank energy drinks, it has to do with how well the kid can read

Score 2: The student wrote a correct first explanation.

Question 36

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



b) Ayva has decided that the difference in mean reading times is *not* an unusual occurence. Support her decision using the results of the simulation. Explain your reasoning.

The data is not very consistant at all showing that it would not be very accurate

Question 36

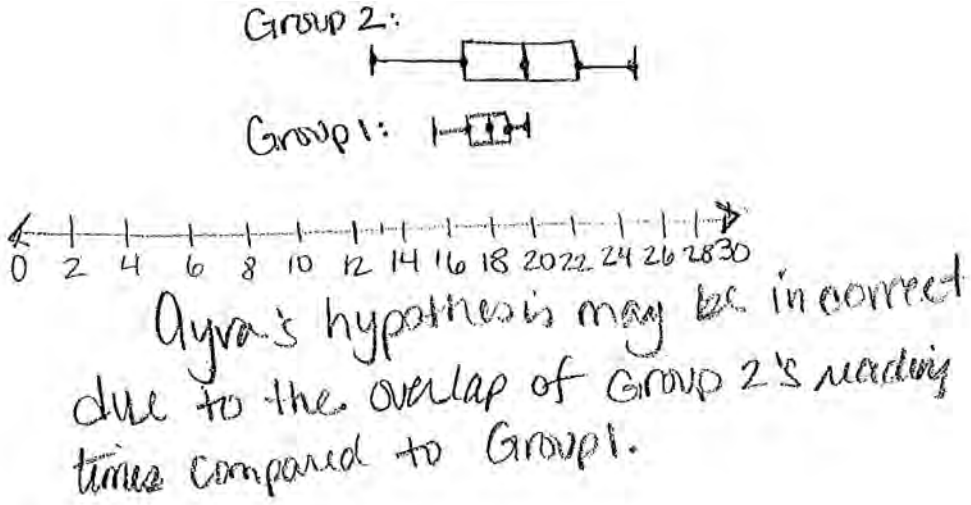
36 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

min 15.3
max 19.7
Q_1 16.2
Q_3 18.6
med. 17.95

min 12.7
max 24.4
Q_1 16.3
Q_3 22.1
med 20

Group 1 (seconds)	Group 2 (seconds)
17.4	23.3
18.1	18.8
18.2	22.1
19.6	12.7
18.6	16.9
16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

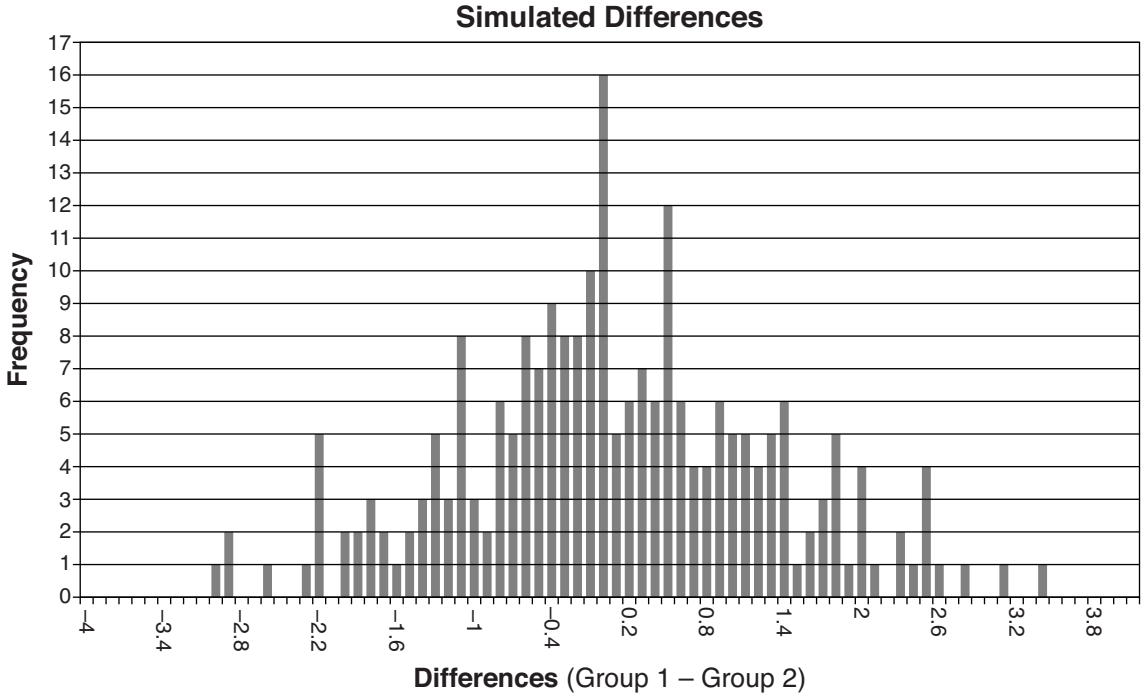
a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.



Score 1: The student wrote a partially correct first explanation.

Question 36

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



b) Ayva has decided that the difference in mean reading times is *not* an unusual occurence. Support her decision using the results of the simulation. Explain your reasoning.

Question 36

36 Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

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16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

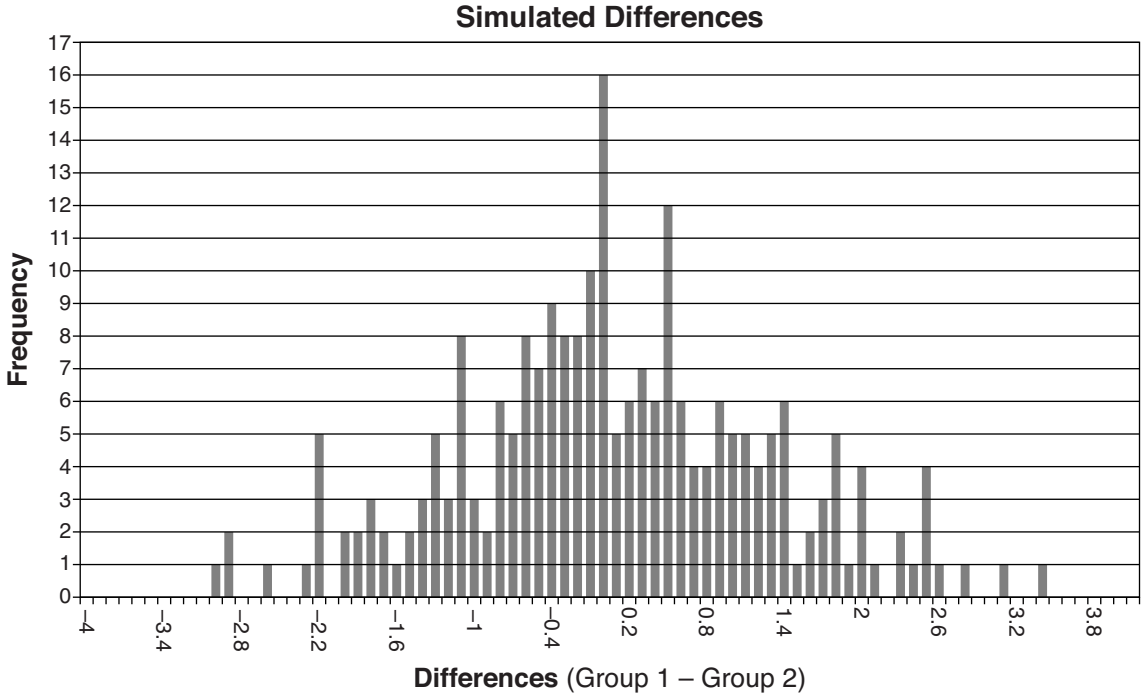
a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.

For each student, the rate differs. If one student is a much faster/slower reader that another, it provides a bias to the experiment.

Score 0: The student gave a completely incorrect response.

Question 36

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



b) Ayva has decided that the difference in mean reading times is *not* an unusual occurence. Support her decision using the results of the simulation. Explain your reasoning.

I support her decision to reject the hypothesis because the graph does not show significant differences, it has a bell curve shape (although it is a bar graph), not two opposite ends of the graph.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

$A = 5000\left(1+\frac{.045}{1}\right)^{n(1)}$ $B = 5000\left(1+\frac{.046}{4}\right)^{n(4)}$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

A $A = \$6511.30$

$B = \$6578.87$ $\$67.57$ more

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$10{,}000 = 5{,}000\left(1+\frac{.046}{4}\right)^{4n}$

$2 = 1.0115^{4n}$

$4n = \log_{1.0115}(2)$

$4n = 60.61958099$

$n = 15.2$ yrs

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

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

$5000\left(1+\frac{.045}{1}\right)^{1n}$ $5000\left(1+\frac{.046}{4}\right)^{4n}$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

A = \$6511.30

B = \$6578.87

\$67.57 more

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$10,000 = 5,000\left(1+\frac{.046}{4}\right)^{4n}$

$2 = 1.0115^{4n}$

$4n = \log_{1.0115}(2)$

$4n = 60.61958099$

$n = 15.2$ yrs.

Score 5: The student wrote expressions instead of functions.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

$A: \quad 5000(1.045)^n$

$B = 5000\left(1+\frac{.046}{4}\right)^{n\cdot 4}$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

$A: 5000(1.045)^6$

$A = \$6511.30$

$B: 5000\left(1+\frac{.046}{4}\right)^{24}$

$B = \$6578.87$

$-\ 6511.30$

$\$67.57$

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$10000 = 5000\left(1+\frac{.046}{4}\right)^{n\cdot 4}$

$2 = \left(1+\frac{.046}{4}\right)^{4n\cdot 1}$

$2 = (1.0115)^{4n}$

Score 4: The student received no credit for the insufficient work done in the third part.

37 Seth's parents gave him $5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

$A = P\left(1 + \frac{r}{n}\right)^{nt}$

a) $A = 5000\left(1 + \frac{.045}{1}\right)^{1n}$

b) $A = 5000\left(1 + \frac{.046}{4}\right)^{4n}$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

a) $5000\left(1 + \frac{.045}{1}\right)^{1 \cdot 6}$

6511.30062...

b will make $67.57 more

$6511.30

b) $5000\left(1 + \frac{.046}{4}\right)^{4 \cdot 6}$

6578.8698...

$6578.87

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$5000\left(1 + \frac{.046}{1}\right)^{4n}$

5057.5^{4n}

21 years

Score 4: The student received no credit for the third part.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

A → $f(x) = \$5000 + (.045n\$5000)$

B → $f(x) = \$5000 + (.046n\$5000)$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

B → $\$5000 + (.046(6)\$5000) = \$6380$

A → $\$5000 + (.045(6)\$5000) = \$6350$

\$30 more

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$\$5000 + (.046n\$5000) = 10{,}000$

-5000

$.046n\$5000 = 5000$

$\frac{230n}{230} = \frac{5000}{230}$

$n = 21.7$ years

Score 4: The student wrote incorrect functions, but completed the remaining parts appropriately.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

$a_1 = a_1 + (n-1)d$

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

OPTION A: $a_1 = 5000 + (n-1)(.225)$ OPTION B: $a_1 = 5000 + (n-1)(.230)$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

A) $a_6 = 5000 + (6-1)(.225)$ B) $a_6 = 5000 + (6-1)(.230)$

$a_6 = 6185$ $a_6 = 6150$

$6150 - 6185 = \$25.00$

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$10000 = 5000 + (n-1)(.230)$

$5000 = (n-1)(.230)$

$5000 = .230n - .230$

$5230 = .230n$

$22.7 \approx n$

Score 3: The student wrote incorrect functions, but completed the second part appropriately and made a rounding error in the third part.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

Op A: $f(x) = 5000\left(1 + \frac{.045}{12}\right)^n$

Op B: $f(x) = 5000\left(1 + \frac{.046}{3}\right)^n$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

A: $y = 5000\left(1 + \frac{.045}{12}\right)^6$

$= 5000(1.00375)^6$

$= \$5113.56$

B: $y = 5000\left(1 + \frac{.046}{3}\right)^6$

$= 5000($

$= \$5478.00$

\$364.44

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$y = 5000\left(1 + \frac{.046}{3}\right)^n$

$10{,}000 = 5000\left(1 + \frac{.046}{3}\right)^n$

$5000 = \left(1 + \frac{.046}{3}\right)^n$

$\therefore \log_{(1.015333333)}(5000) = n$

$n = 3.7$ years

Score 2: The student wrote incorrect functions, but completed the second part appropriately.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

$A = 5000(1 + .045)^{(1)(n)}$ $B = 5000(1 + .046)^{(4)(n)}$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

$5000(1.045)^6$
\$6511.30

$5000(1.046)^{(4)(6)}$
\$6548.78

\$6548.78
$-$ \$6511.30
\$37.48

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$\frac{10{,}000}{5{,}000} = \frac{5000(1.046)^n}{5{,}000}$

Score 1: The student wrote function *A* correctly, but did not use function *B* appropriately in the remaining parts.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

Pe^{rt} $A = 5000e^{.045t}$

$B = 5000e^{.046t}$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

$A = 5000e^{.045(6)}$

$A = \$6549.82$

$B = 5000e^{\frac{.046}{4}(6)}$

$= 5357.18$

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

$10{,}000 = 5000e^{\frac{.046}{4}(4)}$

$2 = e^{\frac{.046}{4}t}$

$\log_e 2 = \frac{.046}{4}t$

Score 1: The student evaluated functions *A* and *B* appropriately in the second part, but did not calculate the difference.

Question 37

37 Seth's parents gave him \$5000 to invest for his 16th birthday. He is considering two investment options. Option *A* will pay him 4.5% interest compounded annually. Option *B* will pay him 4.6% compounded quarterly.

Write a function of option *A* and option *B* that calculates the value of each account after *n* years.

$A = 5000(.045 \cdot 365)^n$

$B = 5000(.046 \cdot 91.25)^n$

Seth plans to use the money after he graduates from college in 6 years. Determine how much more money option *B* will earn than option *A* to the *nearest cent*.

$A = 5000(.045 \cdot 365)^6$

9.817530829

9.8

$B = 5000(.046 \cdot 91.25)^6$

27347286.04

Algebraically determine to the *nearest tenth of a year*, how long it would take for option *B* to double Seth's initial investment.

5 years

Score 0: The student gave a completely incorrect response.

The State Education Department / The University of the State of New York

Regents Examination in Algebra II (Common Core) – August 2016

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

(Use for the August 2016 exam only.)

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

To determine the student's final examination score (scale 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 II (Common Core).