JEFFERSON MATH PROJECT REGENTS BY CHAPTER

All 1165 NY Math A & B Regents Exam Questions from June 1999 to August 2005 Sorted by Prentice Hall Chapter

ADVANCED ALGEBRA

(Answer Key)

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Dear Sir

I have to acknolege the reciept of your favor of May 14. in which you mention that you have finished the 6. first books of Euclid, plane trigonometry, surveying & algebra and ask whether I think a further pursuit of that branch of science would be useful to you. there are some propositions in the latter books of Euclid, & some of Archimedes, which are useful, & I have no doubt you have been made acquainted with them. trigonometry, so far as this, is most valuable to every man, there is scarcely a day in which he will not resort to it for some of the purposes of common life. the science of calculation also is indispensible as far as the extraction of the square & cube roots; Algebra as far as the quadratic equation & the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence. in this light I view the conic sections, curves of the higher orders, perhaps even spherical trigonometry, Algebraical operations beyond the 2d dimension, and fluxions.

Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.

[1] C

[2] A

[3] B

[4] D

[5] B

[6] D

[7] D

[8] A

[9] A

[10] A

[11] D

[4] $(f \circ g)(x) = 4x^{-\frac{1}{3}}$ or $\left(8x^{-\frac{1}{2}}\right)^{\frac{2}{3}}$ or an equivalent answer and $(f \circ g)(27) = \frac{4}{3}$ or an equivalent answer, and appropriate work is shown.

[3] Simplification is shown to at least $4x^{-\frac{1}{3}}$, but one computational error or an error in the Law of Exponents is made when finding $(f \circ g)(27)$.
[2] $(f \circ g)(x)$ is determined correctly, but $(f \circ g)(27)$ is not found or is found incorrectly.
or [2] $\frac{4}{3}$ or an equivalent answer, and appropriate work is shown, but an expression for $(f \circ g)(x)$ is not found or is found incorrectly.
[1] $4x^{-\frac{1}{3}}$ and $\frac{4}{3}$ or equivalent answers, 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
[12] procedure.

[2] 255, and appropriate work is shown, such as $g(3) = 3^2 - 1$ and $f(8) = 2^8 - 1 = 255$.
[1] Appropriate work is shown, but one computational error is made.
or [1] One conceptual error is made, such as evaluating $(g \circ f)(3)$.
or [1] 255, 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
[13] procedure.

[14] B

[15] B

[16] D

[17] B

[18] B

[19] C

[2] 95, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as calculating g(h(4)).
or [1] 95, 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
[20] procedure.

[21] B

[4] 161, and appropriate work is shown, such as $500x > \frac{3{,}200{,}000}{x} + 60{,}000$.
[3] Appropriate work is shown, but one computational error is made or –40 is not rejected.
[2] A correct inequality is given in standard form, but it is not solved.
[1] An incorrect quadratic inequality of equal difficulty is solved appropriately.
or [1] 161, 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.

[22]

[4] 29 hammers to make a profit and 45 hammers to make a profit of $100, and appropriate 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] Either the number of hammers to make a profit or the number of hammers to make a profit of $100 is determined correctly, and appropriate work is shown.
[1] One conceptual and one computational error are made.
or [1] The correct equation and inequality or the correct equations are written, but no further correct work is shown.
or [1] 29 hammers to make a profit and 45 hammers to make a profit of $100, but no work is shown.
[0] 29 and 45, but no work is shown and the answers are not labeled.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[23]

[2] $20 < x < 100$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or graphing error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown to solve for 20 and 100, but the solution is not expressed as a correct inequality or interval.
or [1] $20 < x < 100$, 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.

[24]

[25] A

[26] B

[27] D

[28] D

[29] A

[30] A

[31] B

[2] $-4 \le C \le 36$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but only one extreme value is found.
or [1] $-4 \le C \le 36$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[32]

[4] 590.5 and 652.6, and appropriate work is shown, such as $|d - 620| \le 0.05d$.
[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] 590.5 or 652.6, and appropriate work is shown.
[1] 590.5 and 652.6, but no work is shown.
[0] 590.5 or 652.6, 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.

[33]

[4] 4.3-5.3, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Appropriate work is shown, but the answer is not stated as an interval.
or [3] Appropriate work is shown, but the answer is expressed in inches.
[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] An appropriate inequality, such as $-3.25 \le \left|\frac{h - 57.5}{2}\right| \le 3.25$, 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] Only half of the inequality is solved, but an appropriate answer is found and expressed to the nearest tenth of a foot.
or [1] 4.3-5.3, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[34]

[35] B

[36] B

[37] C

[2] A complete and correct explanation is written, such as stating that since the graph lies entirely above the x-axis, there is no point on the graph where y = 0.
[1] An incomplete or partially correct explanation is written, such as stating that the equation has imaginary roots.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[38]

[39] C

[40] A

[41] C

[2] Maximum, and an appropriate reason is given, such as the value of a is negative (less than 0) or the graph opens downward.
[1] Minimum, but an appropriate reason is given, based on an incorrect equation, such as an error in finding the axis of symmetry.
[0] Maximum or minimum, but no reason or an inappropriate reason 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.

[42]

[2] 1.4, and appropriate work is shown, such as finding the axis of symmetry.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 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.

[43]

[2] 20.1, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The time when the ball reaches its maximum height is found correctly, but no further correct work is shown.
or [1] 20.1, 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.

[44]

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[2] 5, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] 5, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[45]

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[2] 300, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] 300, 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.

[46]

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[4] 3 and 42, and appropriate work is shown, such as a graph, substitution, or a table of values.
[3] Appropriate work is shown, but one computational or graphing error is made.
[2] Appropriate work is shown, but two or more computational or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The number of seconds is found correctly, and appropriate work is shown, but the height is not found or is found incorrectly.
or [2] The height is found correctly, and appropriate work is shown, but the number of seconds is not found or is found incorrectly.
[1] 3 and 42, but no work is shown.
[0] 3 or 42, 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.

[47]

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[4] Time of maximum height = 2.45, maximum height = 31.39, time when it hit the ground = 4.98, and appropriate algebraic or graphic work is shown. [Answers for time, in seconds, may vary based on method of solution.]
[3] Appropriate algebraic or graphic work is shown, but one computational or graphing error is made.
or [3] The times are found correctly, but the maximum height is incorrect.
[2] The rock's maximum height and the time it takes to reach that height are found correctly, but the time it takes to hit the ground is incorrect.
or [2] The time it takes the rock to hit the ground is found correctly, but the maximum height and the time it takes to reach that height are incorrect.
[1] Time of maximum height = 2.45, maximum height = 31.39, time when it hit the ground = 4.98, 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.

[48]

[49] B

[50] B

[51] C

a [2] Appropriate sketches of the functions are shown, and the horizontal line tests are used to explain why the statement is true.
or [2] An explanation is given that the inverse of g is a function and the inverse of f is not a function, which includes a definition of the relationship between a function and its inverse or the vertical line test.
or [2] Appropriate sketches of the inverses are shown that use the vertical line test to explain why the statement is true.
or [2] The correct inverses are found algebraically, and appropriate explanations are given.
[1] An explanation is given that indicates only that g is a 1:1 function or that g passes the horizontal line test.
or [1] An explanation is given that indicates only that f is not a 1:1 function or that f does not pass the horizontal line test.
b [2] 3.2, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 3.2, but no work is shown.
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[52]

[53] B

[54] B

[4] $(0,0)$ and $\left(\frac{1}{2},\frac{1}{2}\right)$, and both graphs are drawn correctly.
[3] Both graphs are drawn correctly, but one or both points of intersection are stated incorrectly.
or [3] The graph of $y = 2x^2$ is incorrect, but the inverse is appropriate or correct, and the appropriate points of intersection are stated correctly.
[2] Both points of intersection are found correctly, using an algebraic solution.
or [2] The graph of $y = 2x^2$ is incorrect, but the inverse is appropriate or correct, but no further work is shown.
or [2] The graph of $y = 2x^2$ is correct, but the inverse is incorrect, but the appropriate points of intersection are stated.
or [2] The graph of $y = 2x^2$ is incorrect, but the inverse is correct, but the points of intersection are not stated or are incorrect.
[1] Both graphs are incorrect, but the points of intersection are appropriate, based on the incorrect graphs.
or [1] The graph of $y = 2x^2$ is correct, but the inverse is incorrect, and the points of intersection are labeled or stated incorrectly.
or [1] $(0,0)$ and $\left(\frac{1}{2},\frac{1}{2}\right)$, but no work is shown.
[0] Straight lines are used as graphs of the functions.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[55]

[2] An appropriate reflection of f(x) in the line y = x is sketched, and the coordinates of one point are stated correctly.
[1] An appropriate graph is sketched, but no coordinates or incorrect coordinates are stated.
or [1] A reflection in some other line is sketched, but appropriate coordinates are stated.
or [1] An incorrect graph is sketched, based on an error in plotting one of the points, but appropriate coordinates are stated.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[56]

[57] B

[58] C

[4] $1 \le t \le 3$, and appropriate work is shown, such as $-16t^2 + 64t + 4 \ge 52$.
[3] Appropriate work is shown, but one computational error is made.
or [3] An incorrect inequality is written, but the resulting quadratic inequality is solved appropriately.
[2] Appropriate work is shown, but more than one computational error is made.
or [2] The quadratic equation $-16t^2 + 64t + 4 = 52$ is solved appropriately, and both solutions are found.
[1] An incorrect quadratic equation of equal difficulty is solved appropriately, but one computational error is made.
or [1] $1 \le t \le 3$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[59]

[4] $15 < x < 60$, and appropriate work is shown, such as solving the algebraic inequality $-10x^2 + 750x - 9000 > 0$ or a graphic solution.
[3] Appropriate work is shown, but one computational or graphing error is made.
[3] $15 \le x \le 60$, and appropriate work is shown.
[2] Appropriate work is shown, but two or more computational or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as solving the equation $-10x^2 + 750x - 9000 > 0$ for 15 and 60.
or [2] An incorrect inequality of equal difficulty is solved appropriately.
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [1] $15 < x < 60$, but no work is shown.
[0] $15 \le x \le 60$, and 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.

[60]

[4] $3.8 \le x \le 15.2$, and appropriate work is shown, such as using the quadratic formula or sketching the graph of the parabola and the line.
[3] Appropriate work is shown, but one computational, rounding, or graphing error is made.
or [3] $3.8 < x < 15.2$, and appropriate work is shown.
[2] Appropriate work is shown, but two or more computational, rounding, or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The graph of the parabola and the line are sketched correctly, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational, rounding, or graphing error are made.
or [1] Correct substitution is made into the quadratic formula, but no further correct work is shown.
or [1] The graph of the parabola is sketched correctly, but no further correct work is shown.
or [1] $3.8 \le x \le 15.2$, but no work is shown.
[0] $3.8 < x < 15.2$, 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.

[61]

[62] D

[63] D

[64] A

[65] B

[66] C

[67] A

[68] C

[69] C

[2] $8.5 + 7i\sqrt{3}$, and appropriate 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] $8.5 + 7i\sqrt{3}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[70]

[71] C

[72] C

[73] D

[74] C

[75] A

[76] B

[77] D

[78] B

[2] Appropriate work is shown, such as (a + bi)(a – bi) = $a^2 + b^2$.
[1] The conjugate is incorrect, but multiplication and substitution for i^2 are appropriate.
or [1] The conjugate is correct, but one or more errors in multiplication and/or substitution for i^2 are made.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[79]

[2] –7 + i, and appropriate work is shown, such as (–2 + i)(3 + i).
[1] Appropriate work is shown, but one computational error is made.
or [1] –7 + i, but no work is shown.
[0] (–2 + i)(3 + i) is shown but not multiplied, or the values are added instead of multiplied.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[80] procedure.

[81] D

[82] C

[83] B

[84] D

[85] B

[4] 2 ± i, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made, but the result is expressed as a complex number in simplest a + bi form.
or [3] Appropriate work is shown, but the roots are not expressed in simplest a + bi form.
or [3] Appropriate work is shown, but only one complex root, in simplest a + bi form, is found.
[2] Appropriate work is shown, but one computational error is made, resulting in a solution that is not a complex number.
or [2] Appropriate work is shown, but two or more computational errors are made, but the result is expressed as a complex number in simplest a + bi form.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] An incorrect quadratic formula is used, but the result is expressed as a complex number in simplest a + bi form.
[1] Incorrect substitution is made into the quadratic formula, such as a = 1, b = 5, and c = –4, but the resulting equation is solved appropriately.
or [1] 2 ± i, 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
[86] procedure.

[2] –4 ± 3i, and appropriate work is shown.
[1] The quadratic formula is used correctly, but one computational error is made.
or [1] $\frac{-8 \pm 6i}{2}$, but appropriate work is shown.
or [1] –4 ± 3i, 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
[87] procedure.

[88] D

[89] A

[90] C

[91] C

[92] C

[93] D

[94] C

[95] A

[96] C

[97] B

[98] C

[99] A

[100] [2] $k > \frac{1}{3}$, and appropriate work is shown, such as the solution of $4 - 4(3)(k) < 0$.
[1] Appropriate work is shown, but one conceptual error or one computational error is made.
or [1] Appropriate work is shown, but the answer is written as $k < \frac{1}{3}$.
or [1] $k > \frac{1}{3}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[101] [2] 4, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The second root of the equation is found, but the sum of the roots is not calculated or is calculated incorrectly.
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.

[102] A

[103] A

[104] B

[105] C

[106] B

[107] C

[108] [2] $1\frac{1}{4}$ or an equivalent answer, and appropriate 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] $1\frac{1}{4}$ or an equivalent answer, 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.

[109] D

[2] 16.6, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] A correct substitution of 4.75 for t is made, but no further correct work is shown.
or [1] 16.6, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[110]

[111] A

[112] B

[113] C

[2] 0.3 or an equivalent answer, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but no answer is found.
or [1] 0.3 or an equivalent answer, 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.

[114]

[4] $\frac{41}{59,049}$, and appropriate work is shown, such as ${}_5C_5\left(\frac{1}{9}\right)^5 + {}_5C_4\left(\frac{1}{9}\right)^4\left(\frac{8}{9}\right)^1$.
[3] Appropriate work is shown, but one computational error is made.
or [3] The combination includes an incorrect setup for determining the probability of hitting the bull's-eye five times but a correct setup for determining the probability of hitting the bull's-eye four times, but an appropriate probability is found.
[2] The probability of "exactly 4" is found.
or [2] The probability of "at most 3" is found.
[1] A probability of $\frac{1}{9}$ is found, based on the area of the two circles.
or [1] $\frac{41}{59,049}$, 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.

[115]

[4] $\frac{51}{243}$, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
[2] Appropriate work is shown, but the probabilities for the teams are switched.
or [2] Correct substitution is made, but no further work is shown.
or [2] Correct substitution is made, but an incorrect mathematical operation is used, such as multiplication instead of addition.
or [2] The probability for "at most three" or "more than 3" is found, but appropriate work is shown.
[1] $\frac{40}{243}$, and exactly three games are shown.
or [1] $\frac{51}{243}$, 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.

[116]

[2] $\frac{9}{64}$, and appropriate work is shown, such as ${}_3C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^1$.
[1] Only ${}_3C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^1$ is shown.
or [1] Appropriate work is shown, but one computational error is made.
or [1] $\frac{9}{64}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[117]

[118] D

[119] B

[4] $\frac{1{,}472}{78{,}125}$, and appropriate work is shown, such as ${}_7C_6\left(\frac{2}{5}\right)^6\left(\frac{3}{5}\right)^1+{}_7C_7\left(\frac{2}{5}\right)^7\left(\frac{3}{5}\right)^0$.
[3] Appropriate work is shown, but one computational error is made.
or [3] The probabilities for exactly six times and exactly seven times are calculated correctly, but they are not added.
or [3] The probability for at most six times is calculated correctly.
[2] Appropriate work is shown, but more than one computational error is made.
or [2] Appropriate work is shown, but one conceptual error is made, such as multiplying the probabilities.
[1] A correct expression is written for finding the probability, but no further correct work is shown.
or [1] The probability for exactly six times is calculated correctly.
or [1] $\frac{1{,}472}{78{,}125}$, 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.

[120]

[6] 19, and appropriate work is shown, such as P(at least three) = ${}_4C_3(0.6)^3(0.4)+{}_4C_4(0.6)^4$ and $P(0) = (0.4)^4$.
[5] Appropriate work is shown, but one computational error is made.
or [5] Correct probabilities are computed, but no answer or an incorrect answer is found.
[4] Appropriate work is shown, but two or more computational errors are made.
or [4] Only the probability for at least three strikes is found correctly, but an appropriate ratio is determined.
[3] The probability for at least three strikes is found correctly, and no further correct work is shown.
or [3] Only the probability for zero strikes is found correctly, but an appropriate ratio is determined.
[2] Only the probability for zero strikes is found correctly, and no further correct work is shown.
or [2] Only the equation for the probability for at least three strikes is written, and it is not solved.
[1] Conceptual errors are made in finding the probabilities, but an appropriate ratio is determined, based on the incorrect probabilities.
or [1] 19, 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.

[121]

[4] $\frac{513}{625}$ or 0.821 or an equivalent answer, and appropriate work is shown, such as ${}_4C_2\left(\frac{2}{5}\right)^2\left(\frac{3}{5}\right)^2+{}_4C_1\left(\frac{2}{5}\right)^1\left(\frac{3}{5}\right)^3+{}_4C_0\left(\frac{2}{5}\right)^0\left(\frac{3}{5}\right)^4$.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but a value for at least two, $\frac{328}{625}$, is found.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] An appropriate answer is found, but one conceptual error is made, such as multiplying the probabilities or using five as the number of spins.
or [2] Appropriate work is shown, but a value for less than two, $\frac{297}{625}$, is found.
[1] Appropriate work is shown, but a value for exactly two, $\frac{216}{625}$, is found.
or [1] $\frac{513}{625}$ or 0.821 or an equivalent answer, 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.

[122]

[123] A

[4] .00046 or $\frac{46}{100,000}$ or an equivalent answer, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but the probability of hitting at most four home runs is found.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The probabilities of hitting exactly four and exactly five home runs are found, but the probabilities are not added.
[1] Appropriate work is shown, but the probability of hitting exactly four home runs is found.
or [1] Correct substitution into the Bernoulli equation for exactly four and exactly five home runs is made, but no further correct work is shown.
or [1] .00046 or $\frac{46}{100,000}$ or an equivalent answer, 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
[124] procedure.

[2] $\frac{15,120}{78,125}$ or 19.35% or an equivalent answer, and appropriate work is shown, such as ${}_7C_3(.6)^3(.4)^4$.
[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] A correct expression, such as ${}_7C_3(.6)^3(.4)^4$, is written, but no further correct work is shown.
or [1] An incorrect expression of equal difficulty is evaluated appropriately.
or
[1] $\frac{15,120}{78,125}$ or 19.35% or an equivalent answer, 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
[125] procedure.

[4] .7564 or an equivalent answer, and appropriate work is shown, such as finding the sum of the exact probabilities that five, six, or seven seeds will sprout.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] The probability that at most five seeds will sprout is calculated correctly, and appropriate work is shown.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The three exact probabilities are found correctly, but they are not added.
or [2] The sum of only two of the three probabilities is found correctly, such as exactly six plus exactly seven, and appropriate work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] The probability that exactly five seeds will sprout is determined appropriately.
or [1] The substitution for the sum of the three probabilities is indicated, but no further correct work is shown.
or [1] .7564 or an equivalent answer, 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
[126] procedure.

[2] $\frac{40}{243}$ or an equivalent fraction or .1646, and appropriate work is shown, such as ${}_5C_3(\frac{1}{3})^3(\frac{2}{3})^2$.
[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, such as finding the probability of choosing at least three even-numbered channels.
or [1] $\frac{40}{243}$ or an equivalent fraction or .1646, 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
[127] procedure.

[128] A

[129] C

[130] D

[131] C

[2] $1.48, and appropriate work is shown, such as providing a correctly labeled table or solving the equation $1.39(1.005)^{12} = C$.
[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, such as using 1.05 or 1.5 or using an incorrect exponent.
or [1] A correct equation is written, but no further correct work is shown.
or [1] An incorrect equation of equal difficulty is solved appropriately.
or [1] $1.48, 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
[132] procedure.

[2] 7,800, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 7,800, 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.

[133]

[4] (0,1) and (1,2), and a correct graph is drawn with at least one function labeled.
[3] Appropriate work is shown, but one graphing error is made, such as plotting one point incorrectly or not labeling either function.
or [3] The graphs are drawn correctly, but only one correct solution is found or only the x- or the y-values are found correctly.
[2] Appropriate work is shown, but two or more graphing errors are made.
or [2] (0,1) and (1,2), but the solution is found by a nongraphic method.
or [2] The graphs are drawn correctly, but no correct solutions are found.
[1] The graph of only one equation is drawn correctly, and no further correct work is shown.
or [1] (0,1) and (1,2), but no work is shown.
[0] (0,1) or (1,2), 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.

[134]

[135] A

[4] $y = 1{,}018.2839(0.5969)^x$ and 16, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] $y = 1{,}018.2839(0.5969)^x$ and 16, but the substitution is not shown.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] An appropriate regression equation is written, but the number of coins returned after the eighth trial is not found.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] An incorrect regression equation is written, but the number of coins returned after the eighth trial is found appropriately.
or [1] $y = 1{,}018.2839(0.5969)^x$ and 16, but no work is shown.
[0] $y = 1{,}018.2839(0.5969)^x$ or 16, 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.

[136]

[6] A correct scatter plot, $y = 0.002(1.070)^x$, and \$1.52 or an equivalent answer, and appropriate work is shown.
[5] Appropriate work is shown, but one computational or rounding error is made.
[4] A correct scatter plot is shown, but an incorrect equation of equal difficulty is used, but an appropriate fare for 1998 is determined, based on the incorrect equation.
or [4] A correct scatter plot with a function other than exponential is used, but an appropriate equation and fare derived from that equation are shown.
[3] A correct scatter plot is shown, and an appropriate fare based on the scatter plot is found, but no equation or work is shown.
[2] Only a correct scatter plot is shown.
[1] \$1.52, 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.

[137]

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[4] The scatter plot is completed correctly, and the correct regression equation is given, such as $y = 4.8(6.8)^x$.
[3] Appropriate work is shown, but one graphing or rounding error is made.
[2] The scatter plot is completed correctly, but the coefficients of the regression equation are transposed.
or [2] The scatter plot is inaccurate, but the correct regression equation is given.
[1] No scatter plot is drawn, but the correct regression equation is given.
or [1] The scatter plot is completed correctly, but no regression equation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[138]

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[6] An appropriate scatter plot is drawn, and either $y = 276.67(1.21)^x$ and \$15,151,000 or $y = 276673.91(1.21)^x$ and \$15,152,000.
[5] Appropriate work is shown, but one computational error is made.
or [5] Appropriate work is shown, but one error is made in rounding the coefficients or by substituting an incorrect value of x for the year 2005.
or [5] Appropriate work is shown, but an incorrect nonlinear function for the regression equation is written, but an appropriate salary is found.
or [5] No scatter plot or an incorrect scatter plot is drawn, but the correct regression equation is written, and the correct salary is found.
[4] Appropriate work is shown, but two or more computational errors are made.
or [4] No scatter plot or an incorrect scatter plot is drawn, and one rounding error is made, but the correct regression equation is written, and an appropriate salary is found.
[3] Appropriate work is shown, but a linear function for the regression equation is written, but an appropriate salary is found.
or [3] An appropriate scatter plot is drawn, and the correct regression equation is written, but no further correct work is shown.
[2] An appropriate scatter plot is drawn, and the correct salary is found, but no work or regression equation is shown.
or [2] An appropriate scatter plot is drawn, but an incorrect regression equation is written, but an appropriate salary is found.
[1] No scatter plot or an incorrect scatter plot is drawn, and an incorrect regression equation is written, but an appropriate salary is found.
[1] An appropriate scatter plot is drawn, but no further correct work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[139]

[140] D

[141] B

[142] D

[143] A

[4] The function is graphed over the specified interval, and 96, and appropriate work is shown, such as calculating the revenue at 95 and 96 to show that 96 will make the hotel profitable or writing an explanation.
[3] Appropriate work is shown, but one computational, graphing, or rounding error is made.
[2] Appropriate work is shown, but two or more computational, graphing, or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] 96, and appropriate work is shown, but no graph is drawn.
or [2] The function is graphed correctly, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational, graphing, or rounding error are made.
or [1] 96, but no work is shown and no graph is drawn.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[144] procedure.

[145] D

[146] A

[147] B

[148] D

[149] A

[150] A

[151] A

[4] 5 and –4, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
[2] The correct log equation, $\log_4 \frac{x^2+3x}{x+5} = \log_4 4$, is shown, but no further work or incorrect work is shown.
[1] One correct logarithmic step is shown, such as $\log_4 \frac{x^2+3x}{x+5}$.
or [1] 5 and –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
[152] procedure.

[153] C

[154] A

[2] 1,584.89, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 1,584.89, 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
[155] procedure.

[156] D

[2] 13.3, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] The correct value is substituted for n, and the equation is converted to exponential form, but it is not solved.
or [1] 13.3, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[157] procedure.

[158] C

[159] B

[2] $\frac{3}{2}$, and appropriate work is shown.
[1] Appropriate work is shown, but one conceptual error or one computational error is made.
or [1] $\frac{3}{2}$, but a graphic solution is provided.
or [1] $\frac{3}{2}$, 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
[160] procedure.

[161] B

[2] 2, and appropriate 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] 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
[162] procedure.

[2] 5,279.61, and appropriate work is shown, such as $3{,}500\left(1+\frac{0.0825}{12}\right)^{12\times 5}$.
[1] Appropriate work is shown, but one computational or substitution error is made.
or [1] 5,279.61, 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
[163] procedure.

[4] 4.5, and appropriate work is shown, such as using logs to solve the equation $0.2 = 0.7^t$.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Substitution with r = 30 is shown and the log of both sides is determined, but the domain error is not recognized, such as $\log 0.2 = t \log(-29)$.
or [2] The order of operations is used incorrectly and an exponential function is maintained, but t is solved for appropriately, using logs.
[1] Substitution with r = 0.3 is shown, resulting in $0.2 = 0.7^t$, but no further work is shown.
or [1] 4.5, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[164] procedure.

[4] 3.1, and appropriate work is shown, such as $5 = 10(0.8)^t$.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] An incorrect value for A is used, but the equation is solved appropriately.
[2] An incorrect value for A is used, but the equation is solved appropriately, but one computational or rounding error is made.
[1] 3.1, 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
[165] procedure.

[2] 12, and appropriate work is shown, such as solving $2{,}500 = 4(2.7)^{0.584t}$.
[1] Appropriate work is shown, but the answer is not rounded or is rounded to 11.
or [1] Appropriate work is shown, but one computational error is 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
[166] procedure.

[4] 14,000, and appropriate 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 $\log\frac{1}{5} = \left(\frac{t}{6{,}000}\right)\log 0.5$ is written, but no further correct work is shown.
[1] The correct substitutions are made, but no further correct work is shown.
or [1] 14,000, 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.

[167]

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[4] 1,500, and appropriate 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.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] A correct equation is written, but no further correct work is shown.
or [1] 1,500, 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.

[168]

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[4] 32.8, and appropriate work is shown.
[3] Appropriate work is shown, but one computational, rounding, or graphing error is made.
or [3] An incorrect substitution is made, but appropriate work is shown and an appropriate solution is found.
[2] Appropriate work is shown, but two or more computational, rounding, or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as incorrect application of a logarithm rule.
[1] Correct substitutions are made, but no further correct work is shown.
or [1] 32.8, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[169]

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[4] 11,052 and 14, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] 14, and appropriate work is shown, but the amount of money he will have after 2 years is not found.
[2] Appropriate work is shown, but more than one computational or rounding error is made.
or [2] 11,052, and appropriate work is shown, and a correct log equation, such as $\log 2 = .05x \log 2.718$ is written, but it is not solved.
[1] 11,052, and appropriate work is shown, but the number of years to double his investment is not found or is found incorrectly.
or [1] Appropriate substitutions are made for both equations, but neither equation is solved.
or [1] 11,052 and 14, but no work is shown.
[0] 11,052 or 14, 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
[170] procedure.

[2] An explanation is given that indicates that a set of data can represent inverse variation if the product of two variables is constant, and a correct table of values is shown.
[1] The rule for direct rather than inverse variation is stated, but an appropriate equation and table of values are shown.
or [1] An example of inverse variation is shown, but no explanation of why it is an inverse variation is given.
or [1] An explanation is given that indicates that a set of data can represent inverse variation, but no table of values is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[171] procedure.

[172] A

[2] 8, and appropriate work is shown, such as $5(70) = 43.75x$.
[1] 4, and \$87.50 is used instead of \$43.75 per person.
or [1] Appropriate work is shown, but one computational error is made.
or [1] 8, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[173] procedure.

[174] C

[175] D

[2] 30, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] 30, but no work is shown.
[0] Direct variation is used to find a solution.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[176] procedure.

[2] 1,032, and appropriate 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] 1,032, but no work is shown.
[0] Direct variation is used instead of inverse variation.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[177] procedure.

[2] 32, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Only the constant of variation, 28,800, is found.
or [1] 32, but no work is shown.
[0] Direct variation is used.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[178] procedure.

[179] D

[180] A

[181] B

[182] B

[183] D

[184] A

[185] C

[2] $\frac{-x-3}{10x+2}$ or an equivalent answer in simplest form, and appropriate work is shown.
[1] Either the numerator or the denominator is factored completely.
or [1] Appropriate work is shown, but $\frac{3-x}{x-3}=-1$ is not recognized.
or [1] $\frac{-x-3}{10x+2}$ or an equivalent answer in simplest form, 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
[186] procedure.

[187] D

[188] B

[189] B

[190] B

[191] C

[2] $\frac{x+4}{4}$, and appropriate 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] $\frac{x+4}{4}$, 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
[192] procedure.

[193] D

[194] C

[195] A

[2] $-\frac{s}{r(r+s)}$ or $-\frac{s}{r^2+rs}$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown, but the answer is not expressed in simplest form.
or [1] $-\frac{s}{r(r+s)}$ or $-\frac{s}{r^2+rs}$, 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
[196] procedure.

[197] B

[198] C

[199] A

[2] $\frac{2x+3}{x(x+3)}$ or $\frac{2x+3}{x^2+3x}$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made or the answer is not simplified completely.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] $\frac{2x+3}{x(x+3)}$ or $\frac{2x+3}{x^2+3x}$, 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.

[200]

[2] 4(x – 2) or 4x – 8, and appropriate work is shown.
[1] The problem is factored correctly but not reduced to simplest form.
or [1] Only two of the expressions are factored correctly, but an appropriate answer is found.
or [1] 4(x – 2) or 4x – 8, but no work is shown.
[0] Only the formula for volume 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.

[201]

[202] C

[6] $-\frac{8}{3}$, and appropriate work is shown.
[5] Appropriate work is shown, but one computational error is made.
[4] Appropriate work is shown, but two or more computational errors are made.
[3] Appropriate work is shown, but one conceptual error is made, such as not factoring out –1 when canceling out 2 – x.
[2] Appropriate work is shown, but one conceptual error and one computational error are made.
[1] $-\frac{8}{3}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[203]

[2] 1 and 2, $1 < x < 2$, or $1 < 1.854 < 2$, and appropriate work is shown.
[1] $\frac{3}{h} = \frac{h}{3-h}$ is shown, but one computational error is made.
or [1] The positive root, 1.854, is obtained from the quadratic, but the two correct consecutive integers are not stated.
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.

[204]

[205] A

[4] $\frac{-3\pm\sqrt{37}}{7}$ or an equivalent answer, and appropriate work is shown.
[3] A correct quadratic equation is written and appropriate work is shown, but one computational or simplification error is made.
or [3] An incorrect quadratic equation of equal difficulty is solved appropriately.
[2] A correct quadratic equation is written and appropriate work is shown, but two or more computational or simplification errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] A correct quadratic equation is written in standard form, but no further correct work is shown.
[1] An incorrect equation of a lesser degree of difficulty is solved appropriately.
or [1] $\frac{-3\pm\sqrt{37}}{7}$ or an equivalent answer, 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.

[206]

[4] 3 and $\frac{1}{2}$, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but only one of the values is found.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The correct quadratic equation is written in standard form, but no further correct work is shown.
or [2] An incorrect quadratic equation of equal difficulty is solved appropriately.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] An incorrect equation of a lesser degree of difficulty is solved appropriately.
or [1] 3 and $\frac{1}{2}$ but no work is shown.
[0] 3 or $\frac{1}{2}$, 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.

[207]

[2] 8 or an equivalent answer, and appropriate work is shown.
[1] The denominators are cleared correctly, such as $6(t + 16) + 6t = t(t + 16)$, but the factoring is incorrect, or one error is made using the quadratic formula.
or [1] The denominators are not cleared correctly, but an equation of equal difficulty is solved.
or [1] 8 or an equivalent answer, 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.

[208]

[6] 3.5, and appropriate work is shown.
[5] Appropriate work is shown, but one computational or rounding error is made.
[4] A substitution error is made, resulting in an incorrect quadratic equation of equal difficulty, but the incorrect equation is solved appropriately.
[3] A correct substitution is made, resulting in the correct quadratic equation in standard form, but the equation is not solved.
[2] A substitution error is made, resulting in an incorrect equation of equal difficulty, and one computational or rounding error is made.
[1] 3.5, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[209] procedure.

[210] C

[211] C

[2] 307, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown to find the value of the reference angle, but no further correct work is shown.
or [1] 307, 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
[212] procedure.

[213] D

[214] D

[215] A

[216] A

[2] No, and appropriate work is shown, such as setting the expressions equal to each other, with one trials showing that the two expressions are not always equal.
[1] No, but only one trial shows that the two expressions are not always equal.
or [1] Yes, but appropriate work is shown, such as using 0° and 180° as trials.
[0] No or yes, and no work or incorrect 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
[217] procedure.

[218] B

[219] D

[220] C

[221] A

[222] C

[223] D

[224] C

[2] $\frac{p}{3}$, and appropriate work or an appropriate diagram is shown.
[1] Appropriate work is shown, but the answer is not expressed in simplest form.
or [1] A correct diagram is drawn, but no answer or an incorrect answer is found.
or [1] 60°, and appropriate work or an appropriate diagram is shown.
or [1] $\frac{p}{3}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[225] procedure.

[2] 4, and appropriate 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] 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.

[226]

[227] B

[2] $\frac{5p}{4}$ or an equivalent answer in radian measure, and appropriate 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] 225 or 225°, but appropriate work is shown.
or [1] The measure of the angle in a counterclockwise rotation is found, resulting in an answer of $\frac{3p}{4}$.
or [1] $\frac{5p}{4}$ or an equivalent answer in radian measure, 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.

[228]

[229] A

[230] C

[2] 8, and appropriate 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] 8, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[231]

[232] C

[233] D

[234] D

[235] D

[4] y = $2\sin\frac{1}{2}x+3$ or $y=-2\sin\frac{1}{2}x+3$, and appropriate work is shown.
[3] The fact that c is equal to 3 is not recognized, resulting in an answer of $y=2\sin\frac{1}{2}x$ or $y=-2\sin\frac{1}{2}x$.
or [3] The values of a, b, and c are determined correctly, and appropriate work is shown, but the equation is not written.
or [3] The value of a or c is determined incorrectly, but the value of b is determined correctly, and appropriate work is shown, and an appropriate equation is written.
[2] Only the value of b is determined correctly, but appropriate work is shown, and an appropriate equation is written.
or [2] Only the values of a and c are determined correctly, but appropriate work is shown, and an appropriate equation is written.
[1] The value of a or c is determined incorrectly, and the value of b is not determined or is determined incorrectly, but appropriate work is shown, and an appropriate equation is written.
or [1] $y=2\sin\frac{1}{2}x+3$ or $y=-2\sin\frac{1}{2}x+3$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[236]

[237] A

[238] B

[4] 4.1 and the equation T = 8 cos t + 78 is graphed correctly and appropriate work is shown to determine the amount of time, such as using the table function of the graphing calculator or estimating (3.9–4.3 hours) based on the graph.
[3] The equation T = 8 cos t + 78 is graphed correctly and the correct intervals are stated, but the number of hours is not found or is incorrect.
[2] The equation T = 8 cos t + 78 is graphed correctly, but no further correct work is shown.
or [2] The equation T = 8 cos t + 78 is graphed incorrectly, but an appropriate number of hours is found, based on the incorrect graph.
[1] 4.1, 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.

[239]

[4] Two, and the paths are sketched and labeled correctly, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or graphing error is made, but the appropriate number of points of intersection is stated.
or [3] Only one path is sketched correctly, but the correct interval is used, and an appropriate number of points of intersection is stated.
or [3] The paths are sketched correctly, but an incorrect interval is used, but the appropriate number of points of intersection is stated.
or [3] The paths are sketched correctly in the correct interval, but the number of points of intersection is not stated or is stated incorrectly.
[2] Appropriate work is shown, but more than one computational or graphing error is made, but the appropriate number of points of intersection is stated.
or [2] Only one path is sketched correctly in the correct interval, and the number of points of intersection is not stated or is stated incorrectly.
or [2] Only one path is sketched appropriately in an incorrect interval, but an appropriate number of points of intersection is stated.
[1] A basic sine and cosine curve are sketched, but they do not have the correct traits of the equation, but an appropriate number of points of intersection is stated.
or [1] One path is sketched correctly in the correct interval, but the second graph is not sketched.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[240] procedure.

[6] 8, and appropriate work is shown, such as a correctly labeled graph, a table of values, or an algebraic solution.
[5] Appropriate work is shown, but one computational or graphing error is made.
[4] Appropriate work is shown, but two or more computational or graphing errors are made.
or [4] Appropriate work is shown, and the correct values of t where the height of the tide is 7 are identified (2 and 10), but the correct number of hours is not stated.
[3] Appropriate work is shown, but one conceptual error is made.
or [3] A correct table or graph is constructed, but no further correct work is shown.
[2] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [2] The correct values of t (2 and 10) and 8 are written, but no work is shown.
[1] 8, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect
[241] procedure.

[4] Both equations are graphed correctly over the specified domain and the interval $-\frac{p}{3} < x < \frac{p}{3}$ is identified.
[3] Appropriate work is shown, but one computational or graphing error is made.
or [3] Both equations are graphed correctly over the specified domain, but the interval is not identified or is written as $-1.0472 \leq x \leq 1.0472$ or $-60° \leq x \leq 60°$ or $-\frac{p}{3} < x < \frac{p}{3}$.
[2] Appropriate work is shown, but two or more computational or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as graphing $y = 4 \sin x$.
or [2] The equation $y = 4 \cos x$ is graphed correctly over the specified domain, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [1] $-\frac{p}{3} \leq x \leq \frac{p}{3}$, but no work is shown and no graphs are drawn.
[0] The equation $y = 2$ is graphed correctly, but no further correct work is shown.
or [0] $-1.0472 < x < 1.0472$ or $-60° < x < 60°$ or $-\frac{p}{3} < x < \frac{p}{3}$, and 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.

[242]

[243] B

[244] B

[4] A = 1.5, B = 0.5, and D = 6.5 or an equivalent answer, and appropriate work is shown or an appropriate explanation is given for each number found.
[3] Correct answers are found, but appropriate work is shown or an appropriate explanation is given for only two of the numbers found.
[2] Only two correct answers are found, but appropriate work is shown or an appropriate explanation is given for the two answers.
[1] Only one correct answer is found, but appropriate work is shown or an appropriate explanation is given for that answer.
or [1] A = 1.5, B = 0.5, and D = 6.5 or an equivalent answer, 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.

[245]

[246] D

[247] B

[248] D

[249] A

[250] D

[2] $2 \cos x$, and appropriate work is shown, such as factoring the numerator and substituting $\cos^2 x$ for $1 - \sin^2 x$.
[1] Appropriate work is shown, but one factoring or substitution error is made, or the expression is not simplified completely.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] $2 \cos x$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[251]

[2] $-\frac{4}{5}$ or –0.8, and appropriate work is shown.

[1] $\frac{4}{5}$ or 0.8, and appropriate work is shown, but the quadrant was not taken into consideration.

or [1] $-\frac{4}{5}$ or –0.8, but no work is shown.

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

[252]

[2] $-\frac{3}{5}$, and appropriate work is shown, such as cos(x + 180) = cos x cos 180° – sin x sin 180° = $\frac{3}{5}(0)-1\left(-\frac{4}{5}\right)(0)$.

or [2] $-\frac{3}{5}$, and appropriate work is shown, such as cos(x + 180) = –cos x.

or [2] $-\frac{3}{5}$, and angle x is found, and correct substitution leads to cos(x + 180).

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

or [1] cos x = $\frac{4}{5}$ is found, but substitution errors are made.

or [1] $-\frac{3}{5}$, but no work is shown.

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

[253]

[254] D

[255] D

[256] A

[257] C

[258] B

[259] B

[260] D

[6] 30, 150, and 270, and appropriate work is shown.

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

[4] The correct equation is shown, but only two correct solutions are found.

[3] The correct equation is shown, but only one correct solution is found.

[2] The correct equation is solved for x, but no further work is shown.

[1] The correct equation is shown, but no further work is shown.

or [1] 30, 150, and 270, 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.

[261]

[262] D

[263] B

[264] C

[265] D

[266] C

[4] 44, and appropriate work is shown, such as solving the equation $6{,}076 = 6{,}077 - 31\cos 2q$.
[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] An incorrect equation of equal difficulty is solved appropriately.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] 44, 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.

[267]

[4] 90 and 270, and appropriate work is shown, such as solving $\sin^2 q = 1 + \cos q$.
[3] Appropriate work is shown, but one computational error is made or the answers are expressed in radians.
or [3] Appropriate work is shown, but 180 is not rejected as a solution.
or [3] Appropriate work is shown, but only one solution is found.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] An incorrect trigonometric substitution is made, but the equation is solved appropriately.
or [2] A trigonometric equation set equal to zero is written, but no further correct work is shown.
or [2] 90 and 270, but a graphic solution is provided.
[1] The equation $\sin^2 q - \cos q - 1 = 0$ is found, but no further correct work is shown.
or [1] A graphic solution is provided, and one computational or graphing error is made.
or [1] 90 and 270, but no work is shown.
[0] 90 or 270, but no work is shown.
or [0] 90, 180, and 270, 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.

[268]

[2] 30 and 150, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown, but only 30 or 150 is found.
or [1] 30 and 150, but no work is shown.
[0] 30 or 150, but no work is shown.
or [0] The value of $\sin q$ is shown to be $\frac{1}{2}$.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[269]

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[4] 210° and 330°, and appropriate work is shown.
[3] Correct substitution and factoring are shown, with at least the reference angle of 30° found.
or [3] Correct substitution is shown, and the equation is put in standard form and factored correctly, but an incorrect reference angle is used to find appropriate answers.
or [3] An incorrect quadratic equation is solved correctly, and appropriate angles are determined.
[2] Correct substitution is shown, and the equation is put in standard form and factored correctly, but no angles are found.
[1] Correct substitution is shown, but the equation is not factored or is factored incorrectly.
or [1] 210° and 330°, but no work is shown.
[0] 210° or 330° or 30°, 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.

[270]

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[4] 42, 138, 210, and 330, and appropriate work is shown, such as substituting for $\cos 2q$ and solving the resulting quadratic equation.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Incorrect substitution is made for $\cos 2q$, such as $1-\sin^2 q$, but all further work is appropriate.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] Correct substitution is made, and appropriate work is shown to obtain the values of $\sin q$, but the values of q are not found.
or [2] A quadratic equation in terms of $\sin q$ is written in standard form, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] Correct substitution is made for $\cos 2q$, but no further correct work is shown.
or [1] 42, 138, 210, and 330, but no work is shown. [All four answers must be identified to receive this credit.]
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[271]

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[4] 174, and appropriate work is shown, such as the use of the Law of Cosines.
[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] One conceptual error is made when applying the Law of Cosines, but an appropriate answer is found.
[1] Correct substitution is made into the Law of Cosines, but no further correct work is shown.
or [1] 174, 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.

[272]

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[4] 11.8, and an appropriate application of the Law of Cosines is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] The Law of Cosines is correctly applied, but the square root is not found.
[2] The Law of Cosines is applied correctly, and correct substitutions are shown, but no further work is shown.
or [2] Appropriate work is shown, but more than one computational error is made.
[1] The diagram is set up with the correct sides and angles, and the Law of Cosines is written, but substitution is not made.
or [1] The diagram is set up with the correct sides and angles, but no further work is shown.
or [1] 11.8, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[273]

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[4] 3.8, and the Law of Cosines is used.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but one computational error and one rounding error are made.
or [2] The Law of Cosines is shown, but sine is used instead of cosine, such as $x^2 = 3.2^2 + 5.6^2 - 2(3.2)(5.6)\sin 40$, but an appropriate answer is determined, based on that error.
[1] Substitution into the Law of Cosines is used, but no further work is shown.
or [1] 3.8, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[274]

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[4] 0.15 hour or 9 minutes or an appropriately rounded answer, and appropriate work is shown, such as using the Law of Cosines.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] The correct distance along County Route 21 is found, but no further work or incorrect work is shown.
or [2] Appropriate work is shown, but one computational and one rounding error are made.
[1] The Pythagorean theorem is used to find the distance along County Route 21, and this distance is used to compare travel times.
or [1] 0.15 hour or an equivalent answer, 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.

[275]

[4] 5,513 and a correct diagram is drawn, and appropriate work is shown, such as using the Law of Cosines.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] 5,513, and appropriate work is shown, but no diagram is drawn.
or [3] Appropriate work is shown, but the calculations are performed in radians, resulting in an answer of 6,698.
or [3] An incorrect diagram is drawn, but an appropriate solution is found using the Law of Cosines.
[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] Appropriate work is shown, but an incorrect substitution is made into the Law of Cosines, but an appropriate solution is found.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] Correct substitution is made into the Law of Cosines, but no further correct work is shown.
or [1] A correctly labeled diagram is drawn, but no further correct work is shown.
or [1] 5,513, but no work is shown and no diagram is drawn.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[276]

[6] 312 and 30,642, and appropriate work is shown, such as using the Law of Cosines and the area formula.
[5] Appropriate work is shown, but one computational or rounding error is made.
[4] Appropriate work is shown, but two or more computational or rounding errors are made.
or [4] Appropriate work is shown, but one conceptual error is made.
or [4] Appropriate work is shown, but the square root is not computed to find the length of the third side, but an appropriate area is found.
or [4] The length of the third side is found correctly, but no further correct work is shown.
[3] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
[2] The area of the triangle is found correctly, but no further correct work is shown.
or [2] 312 and 30,642, but no work is shown.
[1] Appropriate work is shown to find the area of the triangle, but one computational or rounding error is made, and no further correct work is shown.
or [1] 312 or 30,642, 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.

[277]

[6] 2,700, and appropriate work is shown, such as using the Law of Cosines and finding the area of the triangle.
[5] Appropriate work is shown, but one computational or rounding error is made.
[4] Appropriate work is shown, but more than one computational or rounding error is made.
or [4] Appropriate work is shown, and the area of the triangle is determined correctly, but the dollar amount is not determined or is determined incorrectly.
or [4] The Law of Cosines is used correctly to determine an angle, but an incorrect procedure is used to find the area, but an appropriate dollar amount is found.
or [4] The Law of Cosines is used incorrectly to determine an angle, but a correct procedure is used to find the area, and an appropriate dollar amount is found.
[3] The Law of Cosines is used correctly to determine an angle, but an incorrect procedure is used to find the area, and the dollar amount is not determined or is determined incorrectly.
[2] The Law of Cosines is used correctly to determine an angle, but no further correct work is shown.
[1] A correct equation using the Law of Cosines is written, but no further correct work is shown.
or [1] 2,700, 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.

[278]

[4] BC= 6.75 and the area of ΔABC = 16.7055 or 16.71 or an equivalent answer, and appropriate work is shown, such as using the Law of Sines and the formula for the area of a triangle.
[3] Appropriate work is shown, but one computational error is made.
[2] Only the correct length of $\overline{BC}$ is found, and appropriate work is shown.
or [2] The length of $\overline{BC}$ is found incorrectly, but an appropriate area of the triangle is found, based on the incorrect value of $\overline{BC}$.
[1] The Law of Sines is used, and appropriate substitution is made, but no further work is shown.
or [1] BC = 6.75 and the area of ΔABC = 16.7055 or 16.71 or an equivalent answer, 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.

[279]

[6] 6,246 and a correct diagram is drawn, and appropriate work is shown, such as the use of the Law of Sines twice or the Law of Sines followed by right triangle trigonometry or another valid method.
[5] Appropriate work is shown, but one computational or rounding error is made.
[4] One of the two unknown sides of the triangle is calculated correctly and appropriate work is shown, but an incorrect method is used for calculating the altitude.
[3] A correct diagram is drawn, and the Law of Sines is used, but one computational or rounding error is made, and the altitude is not found.
[2] 6,246 and a correct diagram is drawn, but no further work is shown.
or [2] A correct diagram is drawn, but the assumption is made that the altitude bisects the base, and an appropriate altitude is found.
[1] Only a correct diagram is drawn, and no further correct work is shown.
or [1] 6,246, 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.

[280]

[6] 330, and appropriate work is shown, such as solving $\frac{\sin 13}{250} = \frac{\sin 37}{y}$ and calculating $\cos 50 = \frac{x}{668.8288536}$ and subtracting 100.
[5] Appropriate work is shown, but one computational or rounding error is made.
or [5] Appropriate work is shown, but 100 is not subtracted from the answer.
or [5] An incorrect trigonometric function is used, but the rest of the work is appropriate.
[4] The Law of Sines is used incorrectly, such as using the wrong angle measure, but an appropriate distance from the rocks is found.
[3] The Law of Sines is used correctly, but no answer or an incorrect answer is found.
[2] The Law of Sines is used without finding the angles correctly, and no answer or an incorrect answer is found.
[1] Only a correct diagram is drawn.
or [1] 330, 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.

[281]

[4] 91.5, and appropriate work is shown, such as using the Law of Sines to find either side of the obtuse triangle and then using the sine function to find the height of the lighthouse.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] The angles in the obtuse triangle are found incorrectly, but appropriate work is shown, and an appropriate height of the lighthouse is found.
[2] Appropriate work is shown, but more than one computational or rounding error is made.
or [2] A correct length of a side of the obtuse triangle is found, but no further correct work is shown.
[1] An appropriate equation is set up for one triangle, but it is not solved.
or [1] 91.5, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[282]

[6] A correct diagram is drawn and 134, and appropriate work is shown.
[5] Appropriate work is shown, but one computational or rounding error is made.
or [5] 134, and appropriate work is shown, but the diagram is not drawn or is drawn incorrectly.
[4] Appropriate work is shown, but two or more computational or rounding errors are made.
or [4] A correct diagram is drawn and one correct equation using the Law of Sines is solved appropriately, but no further correct work is shown.
[3] Appropriate work is shown, but one conceptual error is made.
or [3] An incorrect diagram is drawn, but an appropriate solution with an equal degree of difficulty is provided.
or [3] A correct diagram is drawn and correct equations are written, but no further correct work is shown.
[2] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [2] A correct diagram is drawn, but only one correct trigonometric equation is written, and no further correct work is shown.
[1] A correct diagram is drawn, but no further correct work is shown.
or [1] An incorrect diagram is drawn, but one correct trigonometric equation is solved appropriately.
or [1] 134, but no work is shown and no diagram is drawn.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[283]

[2] 1.15, and appropriate work is shown, such as $\frac{x}{\sin 130} = \frac{0.75}{\sin 30}$.
[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, such as using an incorrect trigonometric function.
or [1] A correct trigonometric equation is written, but no further correct work is shown.
or [1] 1.15, 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.

[284]

[4] 41, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] One incorrect formula is used, but an appropriate answer is found.
or [2] Appropriate work is shown, but one computational and one rounding error are made.
[1] 41, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[285]

[286] A

[287] B

[288] B

[4] 234, and appropriate work is shown, such as using the Law of Sines.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Appropriate work is shown, but one substitution error is made, such as using 42 as $m\angle FAB$.
or [3] Appropriate work is shown, but the correct distance to station B (180 miles) is found.
[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] Correct substitution is made into the Law of Sines, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] 234, 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.

[289]

[4] 88, and appropriate work is shown, such as $\frac{y}{\sin 32} = \frac{100}{\sin 33}$ and $\sin 65 = \frac{x}{y}$.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as setting up an incorrect proportion.
or [2] The hypotenuse of one of the right triangles is found correctly, 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] The obtuse triangle is treated as a right triangle, but an appropriate height is found for the tower.
or [1] 88, 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.

[290]

[291] D

[292] B

a [2] Both circles are drawn and labeled correctly.
[1] Both circles are drawn, but one conceptual error is made.
or [1] Only one circle is drawn and labeled correctly.
b [4] 0.7722345326 or an equivalent decimal answer, and appropriate work is shown, such as $\frac{400 - 29p}{400}$.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] The probability that point (x,y) lies inside the circles is found, and appropriate work is shown.
[2] Appropriate work is shown, but more than one computational or rounding error is made.
or [2] Only the correct areas of the square and the circles are found.
[1] Only the correct area of the square or the circles is found.
or [1] 0.7722345326 or an equivalent answer, but no work is shown.
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[293]

[294] A

[295] A

[296] D

[297] C

[298] A

[299] D

[300] C

[301] A

[302] B

[2] An appropriate explanation is given, such as: One very high or very low score in either class would have a great effect on the range for that class, but might not affect the median at all. The range is the difference between the two most extreme values, the lowest and the highest. The median, being the middle value, is not very sensitive to outliers or to extreme values.
or [2] Specific examples are shown to illustrate the situation.
[1] An understanding of median and range is demonstrated, but the specific situation is not explained.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[303]

[304] C

[305] C

[306] D

[307] D

[308] A

[2] The Adams School, and an appropriate explanation is given, such as the standard deviation is a measure of dispersion, which is how much the scores, on the average, differ from the mean. Therefore, the school with the smaller standard deviation would have the more consistent scores.
[1] The Adams School, but an incomplete explanation is given, or the school is not stated, but an appropriate explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[309]

[4] $\bar{x} = 5.5$, $s = 0.5$, and the range is 4–7, and appropriate work is shown.
[3] $\bar{x} = 5.5$, $s = 0.5$, but one computational error is made when finding the range, but appropriate work is shown.
or [3] $\bar{x}$ is correct, but s is incorrect, but the range is appropriate, based on the incorrect s.
or [3] $\bar{x}$ is incorrect, but s and the range are appropriate, based on the incorrect $\bar{x}$.
[2] $\bar{x}$ is incorrect and s is incorrect, but the range is appropriate, based on the incorrect $\bar{x}$ and s.
or [2] $\bar{x}$ is correct and s is correct, but the range is not determined.
[1] $\bar{x} = 5.5$, $s = 0.5$, and the range is 4–7, 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.

[310]

[311] C

[2] Mean = 31 and standard deviation = 3.2, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Either the mean or the standard deviation is determined correctly, and appropriate work is shown.
or [1] Mean = 31 and standard deviation = 3.2, but no work is shown.
[0] Mean = 31 or standard deviation = 3.2, 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.

[312]

[2] 25, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] The solution is incomplete, such as only the correct percent is shown.
or [1] 25, 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.

[313]

[314] C

[315] A

[316] B

[317] D

[4] 8.7 standard deviation, 70% within one standard deviation, and "Yes," and appropriate work is shown, and an appropriate justification is given.
or [4] 8.7 standard deviation, 70% within one standard deviation, and "No," and appropriate work is shown, and an appropriate justification is given.
[3] One error is made in determining the standard deviation or the percent, but all the other work is appropriate.
[2] 8.7 and 70%, and appropriate work is shown, but no justification is given.
or [2] The standard deviation is determined correctly, but more than one error is made when calculating the percent, but the justification is appropriate.
[1] The standard deviation is determined correctly, but no further work is shown.
or [1] The standard deviation is determined incorrectly, but the percent is appropriate, based on the incorrect standard deviation.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[318]

[319] A

[320] A

[4] 75, and appropriate work is shown, such as determining the mean (278.5833333) and the standard deviation for the sample (3.146667309).
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Appropriate work is shown, but the standard deviation for the population (s) is used.
or [3] The mean, standard deviation for the sample, and interval are determined correctly, but an error is made in determining the percentage.
or [3] The mean and standard deviation for the sample are determined correctly, but an appropriate percentage is determined for an incorrect interval.
[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] The mean and standard deviation for the sample are determined correctly, but no further correct work is shown.
or [2] Either the mean or the standard deviation for the sample is determined incorrectly, but an appropriate percentage is found.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] The standard deviation for the sample is determined correctly, but no further correct work is shown.
or [1] 75, 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.

[321]

[322] D

[323] A

[4] 84, and appropriate work is shown, and correct explanations are written.
[3] Appropriate work is shown, but one computational or rounding error is made, but both explanations are correct.
or [3] 84, but only one of the explanations is correct.
[2] 84, but both explanations are only partially correct.
[1] 84, but both explanations are missing or are incorrect.
or [1] One correct explanation is written, but no further correct work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[324]

[2] 0.624 or 62.4%, and appropriate work is shown.
[1] The correct standard deviations of –1.5 and +0.5 are found, but an incorrect probability is calculated.
or [1] Appropriate work is shown, but one computational error is made.
or [1] 0.624 or 62.4%, 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.

[325]

[2] 0.341 or 34.1% or an equivalent answer, and appropriate work is shown.
[1] 0.682 or 0.841 or some other probability related to one standard deviation from the mean is shown.
or [1] 0.341 or 34.1% or an equivalent answer, 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.

[326]

[4] $\frac{1}{2}$ or 50%, $\frac{15.9}{100}$ or 0.159, and $\frac{0.159}{0.977}$ or an equivalent answer, and appropriate work is shown.
[3] Correct answers are found for either part a or part b and for part c.
[2] Correct answers are found for part a and part b, but the answer for part c is missing or is incorrect.
or [2] Only the correct answer for part b is found, and one computational or substitution error is made in determining the answer to part c.
[1] Only the correct answer for either part a or part b is found.
or [1] $\frac{1}{2}$ or 50%, $\frac{15.9}{100}$ or 0.159, and $\frac{0.159}{0.977}$ or an equivalent answer, 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.

[327]

[328] A

[329] C

[2] 50, and appropriate work is shown, such as $2(1 + 3 + 5 + 7 + 9)$.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but $(1 + 3 + 5 + 7 + 9)$ is not multiplied by 2, resulting in an answer of 25.
or [1] 50, 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.

[330]

[2] 70, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The values for n = 1 through n = 5 are computed correctly, but they are not added.
or [1] 70, 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.

[331]

[2] 41,583, and appropriate work is shown.
[1] Appropriate work is shown, but one conceptual error or one computational error is made.
or [1] 41,583, 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.

[332]

[333] A

[334] D

[335] B

[2] 4, and appropriate 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] 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.

[336]

[337] B