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 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] B

[2] D

[3] A

[4] B

[5] D

[2] 77, and appropriate work is shown, such as (76 + 78) ÷ 2.
[1] 76 and 78 are identified.
or [1] 77, 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
[6] incorrect procedure.

[7] A

[8] B

[2] 1,225, and appropriate work is shown, such as solving an equation or writing an explanation.
[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 conversion from years to months is incorrect, but an appropriate solution is found.
or [1] 1,225, 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
[9] incorrect procedure.

[10] D

[3] 34 and an appropriate explanation is given, such as .
[2] An appropriate method or equation is shown, but one computational mistake is made.
or [2] The student does not take into consideration two dogs of equal weight and gives an answer of 68.
[1] The student understands weighted average in that three dogs averaging 38 pounds must have a total weight of 114 pounds but does not subtract the known weight.
or [1] 34 and no explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[11] incorrect procedure.

[12] A

[13] C

[14] C

[2] $350, and appropriate work is shown, such as $\frac{1450+x}{5}=360$ or trial and error with at least three trials and appropriate checks.
[1] Appropriate work is shown, but one computational error is made.
or [1] The total of the five salaries is shown to be 5 x 360 = 1800, but no further correct work is shown.
or [1] $350, but no work is shown or fewer than three trials with appropriate checks are shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[15] incorrect procedure.

[3] 59 or 59º, and appropriate work is shown, such as $63 = \frac{256 + x}{5}$ or
56 + 72 + 67 + 61 = 256, 63 x 5 = 315, and 315 – 256 = 59.
[2] Appropriate work is shown, but one computational error is made.
or [2] A value is chosen for Friday's temperature that rounds to 63, such as 57 or 61,
but whose mean is not exactly 63, and appropriate work is shown.
[1] A limited understanding of the concept of the mean is shown, such as the sum of the temperatures must be 315, but the given temperatures are not subtracted.
or [1] The correct mean of the four given temperatures is calculated.
or [1] 59 or 59º, 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.

[16]

[17] D

[3] 95 and an appropriate method is shown that obtains an answer, such as 344 - 249 or a similar equation or method.
or [3] Four scores are tried that round off to an average of 86, such as 93 or 94. Round off to 86 must be shown.
[2] An appropriate method is shown, but one computational mistake is made.
[1] The student understands weighted average and shows that the average of 83 for 3 tests is a total of 249 points.
or [1] 95 and no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[18]

[3] 63, and appropriate work is shown, such as 400 - (81 + 88 + 88) and determining the highest and lowest possible scores remaining that total 143.
[2] Appropriate work is shown, but one computational error is made.
[1] A total of 400 is shown, but one conceptual error is made, such as 257 is subtracted, and then 143 is split into 72 and 71, resulting in an answer of 71.
or [1] Appropriate work is shown, but more than one computational error is made.
or [1] No answer or an incorrect answer is found, but a list such as ___, ___, 81, 88, 88 is shown.
or [1] 63, 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.

[19]

[4] Median = 91.5, mode = 92, and seventh test score = 96, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
or [3] Seventh test score = 96, but only the median or the mode is found correctly, but appropriate work is shown.
or [3] 91.5, 92, and 96, and appropriate work is shown, but the median and mode are not labeled or are labeled incorrectly.
[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] Both the median and the mode are found and labeled correctly, and appropriate work is shown, but the seventh test score is not found or is found incorrectly.
or [2] Seventh test score = 96, and appropriate work is shown, but the median and the mode are not found or are found incorrectly.
[1] Either the median or the mode is found and labeled correctly, and appropriate work is shown, but no further correct work is shown.
or [1] Median = 91.5, mode = 92, and seventh test score = 96, but no work is shown.
[0] Median = 91.5 or mode = 92 or seventh test score = 96, but no work is shown.
or [0] 91.5, 92, and 96, 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.

[20]

[21] D

[3] The frequency table is completed correctly, showing frequencies of 6, 2, 4, 5, and 3, and a frequency histogram is drawn and labeled correctly.
[2] The frequency table is completed correctly, but one graphing error is made, such as not labeling the axes, having nonequal intervals, or starting the x-axis at 50.
or [2] The frequency table is completed incorrectly, but an appropriate frequency histogram is drawn.
or [2] The frequency histogram is drawn and labeled correctly, but the frequency table is not completed.
[1] The frequency table is completed correctly, but two or more graphing errors are made.
or [1] The frequency table is completed correctly, but no frequency histogram is drawn or a bar 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 procedure.

[22]

[4] A correct table and histogram with appropriate labels and scales are shown, such as
the table below.

SCORE	TALLY	FREQUENCY
40-49	/	1
50-59	/	1
60-69	///	3
70-79	///	3
80-89	///	3

[3] An incorrect table is shown, but the histogram is appropriate, based on this table.
or [3] A correct table is shown, but one error is made on the histogram, such as using incorrect labels or no labels.
or [3] An incomplete table is shown, but the histogram is correct.
[2] An incomplete table is shown, and the histogram is partially correct.
or [2] A correct table is shown, and a correct bar graph is made.
[1] A correct table is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[23] incorrect procedure.

[4] The student draws a histogram, a stem-and-leaf plot, or any other acceptable statistical graph, with proper labels and a title.
[3] The student makes one or two minor errors, such as a lack of label, title, or connected dots.
[2] The student makes several minor errors or one major error, such as not accounting for all 20 scores.
[1] The student draws just the beginning of a graph.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[24] incorrect procedure.

a [2] An appropriate histogram is drawn with both axes labeled with a correct numerical scale.
[1] A correct bar graph is drawn.
or [1] The parts of the histogram are not labeled.
or [1] Equal interval scales are not shown.
or [1] One error on frequency calculation is made.
[0] Two or more mistakes on frequency calculation are made.
b [2] 60% and an appropriate explanation is given.
[1] An appropriate method to find percent is shown, but a mistake is made in reading the chart, such as $\frac{6}{15} = 40\%$ *or* $\frac{9}{15}$ is shown but not given as a percent answer.
or [1] 60% and no explanation is given.
a and b
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[25] incorrect procedure.

[4] Correct cumulative frequencies of 7, 14, 24, and 30 and a fully labeled correct histogram are shown.
[3] Incorrect cumulative frequencies are shown, but the histogram is appropriate for the data.
or [3] Correct cumulative frequencies are shown, but a partially incorrect histogram is shown, such as the axes not being labeled, having nonequal intervals, or the x-axis starting at 50.
[2] Only a frequency histogram is completed correctly.
or [2] Only a correct cumulative frequency table and a correct bar graph are shown.
[1] An appropriate bar graph is shown, but it is based on frequencies, not the cumulative frequency.
or [1] Only a correct cumulative frequency table 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.

[26]

[3] The frequency table is completed correctly, and a histogram is drawn with a correct scale and is labeled correctly.
[2] One or two errors are made in the frequency table, but an appropriate histogram is drawn.
or [2] The frequency table is completed correctly, but one error is made in drawing the histogram.
[1] A correct histogram is drawn, but the frequency table is not completed.
b [1] The interval 91-100 is identified as containing the 75th percentile.
or [1] The appropriate interval is identified, based on an incorrect frequency table in part a.
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.

[27]

[28] B

[2] A correct stem-and-leaf plot is drawn, including a key.
[1] The data are arranged correctly, but incorrect labels are written on the stem-and-leaf columns. [Columns do not need to be labeled for a full-credit response, but full credit may not be awarded if the columns are labeled incorrectly.]
or [1] The data are listed in the stem-and-leaf plot, but not in ascending order.
or [1] One or two of the scores are left out of the stem-and-leaf plot.
or [1] Duplicate values are left out of the stem-and-leaf plot.
[0] Incorrect labels are written on the stem-and-leaf columns, and scores are left out of the plot.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[29]

[30] B

[31] B

[32] C

[33] A

[34] D

[35] B

[36] C

[37] A

[38] C

[39] D

[2] No, and an appropriate explanation is given or the expression is evaluated correctly.
[1] No, and the correct order of operations is used to evaluate 2(3)2 + 5, but one computational error is made.
or [1] One conceptual error is made in evaluating the expression, but the question is answered appropriately.
or [1] Appropriate work is shown, but the question is not answered.
[0] No, but no explanation or an inappropriate explanation is given.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[40] obviously incorrect procedure.

[41] A

[42] D

[43] B

[44] C

[45] D

[46] B

[47] C

[48] B

[49] C

[2] No, and a correct justification is given.
[1] No, but an incomplete or partially incorrect explanation is given.
[0] No, but no explanation is given.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[50] obviously incorrect procedure.

[51] C

[52] B

[53] D

[54] A

[55] D

[56] A

[57] A

[58] A

[59] D

[60] D

[61] A

[2] $\sqrt{20}$ and an appropriate explanation is given, such as the number cannot be written as a repeating or terminating decimal or it cannot be written as a fraction or it is not a perfect square.
[1] $\sqrt{20}$ and an inappropriate explanation or no explanation is given.
or [1] $\sqrt{20}$ and a correct explanation is given, but one other number is also identified as irrational.
[0] All three numbers are identified as irrational.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[62] obviously incorrect procedure.

[2] $\sqrt{196}$, and an appropriate explanation is given.
[1] An incorrect answer is chosen, but an appropriate explanation is given.
or [1] $\sqrt{196}$, but no explanation or an incorrect explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[63] incorrect procedure.

[64] C

[65] D

[66] B

[2] $2\frac{4}{5}, \sqrt{8}, 3.\overline{1}, \pi, 2\sqrt{3}$ and appropriate work is shown, such as converting each value to a decimal equivalent.
[1] All values are correctly converted to decimal equivalents, but the order is not indicated or is indicated incorrectly.
or [1] One or two computational errors are made in finding decimal equivalents, but the appropriate order is indicated.
or [1] Appropriate work is shown, but one conceptual error is made, such as indicating the order from greatest to least.
or [1] $2\frac{4}{5}, \sqrt{8}, 3.\overline{1}, \pi, 2\sqrt{3}$, 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.

[67]

[68] D

[69] A

[70] A

[71] C

[72] A

[73] D

[74] D

[75] B

[76] A

[77] B

[78] C

[79] B

[80] B

[81] C

[82] B

[83] C

[84] A

[85] C

[86] D

[87] C

[88] B

[3] All three examples are illustrated under division correctly, such as $2 \div 0, -2 \div 4, -2 \div -4$, and correct explanations are given.
[2] Only two of the three examples are illustrated and explained correctly.
or [2] All three examples are illustrated correctly, but only one explanation is given or is correct.
or [2] The division examples and explanations are correct, but at most two incorrect examples are also shown, such as examples for addition, subtraction, or multiplication.
[1] The division examples and explanations are correct, but more than two incorrect examples are shown, such as examples for addition, subtraction, or multiplication.
or [1] All three examples are illustrated correctly, but no correct explanation is given.
or [1] Only one correct example with a correct 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.

[89]

[90] D

[91] A

[92] A

[2] 1, and an appropriate explanation is given, such as when 1 is added to 3, the result is the identity element, 4; therefore 1 is the inverse of 3.
[1] 1 + 3 = 4, but the identity element is not identified.
or [1] 4 is identified as the inverse because the identity element and inverse element are confused.
or [1] 1, but no explanation or an incorrect explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[93] incorrect procedure.

[2] 0, and an appropriate explanation is given, such as 0 is the number that when added to any number results in that number or does not change it, or 1 + 0 = 1, 2 + 0 = 2, and 3 + 0 = 3.
[1] 0, but no explanation or an incorrect explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[94] incorrect procedure.

[95] D

[96] D

a [1] B, and an appropriate explanation is given.
b [1] 5 minutes
a and b
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[97] incorrect procedure.

[98] A

[99] D

[100] B

[101] C

[102] B

[103] C

[2] 18 and correct substitution, $F = \frac{9}{5}(-8) + 32$, is shown.
[1] A correct substitution method is shown, but one computational error is made.
or [1] The answer is not rounded to the nearest integer, such as 17.6 or 17 .
or [1] The student substitutes -8 for F, but then solves appropriately for C.
or [1] The student substitutes +8 for C, but then solves appropriately for F.
or [1] 18 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
[104] incorrect procedure.

[3] A correct graph is shown, and an answer between -6° and -2° is found.
[2] A correct formula is used, and -4°C or an equivalent answer is found, but no graph is shown.
or [2] An appropriate graph is shown, and the correct answer is marked, but it is stated incorrectly, such as 5°C instead of -5°C.
or [2] An appropriate graph is shown, but answers outside the given range are found.
or [2] The line graph passes through at least one correct point, and an appropriate answer is found.
[1] The formula is used correctly, but the answer is not in the range, and no graph is shown.
or [1] An answer between -6° and -2° is found, but no graph is shown.
[0] A completely incorrect graph is shown.
or [0] No graph is shown and the formula is used incorrectly.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[105] obviously incorrect procedure.

[106] C

[107] C

[108] D

[109] C

[110] D

[111] C

[2] 6, and a correct tree diagram is drawn or sample space is listed.
[1] A correct tree diagram is drawn or sample space is listed, but no answer or an incorrect answer is found.
or [1] An appropriate answer is found, based on an incorrect tree diagram or sample space.
or [1] 6, but no tree diagram is drawn or sample space is listed.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[112] incorrect procedure.

a [1] A correct tree diagram or listing of all 8 possibilities is shown.
b [1] $\frac{1}{8}$
or [1] An appropriate answer is given for an incorrect part a tree diagram or listing.
a and b
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[113] incorrect procedure.

[114] C

[115] B

[116] B

[117] C

[4] $167.50, and appropriate work is shown, such as 350x + (150)(130) = 1.25(62,500) or trial and error with at least three trials with appropriate checks.
[3] Appropriate work is shown, but one computational error is made.
[2] Appropriate work is shown, but more than one computational error is made.
or [2] $167.50, but only one trial with an appropriate check is shown.
[1] $167.50, 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
[118] incorrect procedure.

[2] 7x - 2 or x + 3x + 3x - 2, and appropriate work is shown, such as x + 3x + 3x - 2 when chips = x, pretzels = 3x, and nachos = 3x - 2.
[1] The expressions for snacks are represented correctly, but one computational error is made in adding the expressions.
or [1] The expressions for snacks are represented incorrectly, but the expressions are added appropriately.
or [1] 7x - 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
[119] incorrect procedure.

[120] C

[2] 38 and an appropriate method is shown, such as 36.64 - (21 + 6.14) = 9.50 and $\frac{9.50}{.25}$ = 38 or an equation such as 21 + .25c + 6.14 = 36.64.
[1] 38 and no work is shown.
or [1] An appropriate method or equation is shown, but one computational mistake is made.
or [1] The answer of $9.50 for local calls is found but is not divided by .25.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[121] incorrect procedure.

[122] C

[123] [2] 21 and the student shows an appropriate solution, such as the equation x + x + 1 + x + 2 = 63 or trial and error.
[1] Appropriate work is shown, but an incorrect answer is found.
or [1] An incorrect equation is shown, but it is solved appropriately to find an answer, such as x + x + 2 + x + 4 = 63.
or [1] 21 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.

[124] C

[125] [2] 4.5 and an appropriate method is shown, such as the equation 3x -t- x + 2 = 20 or some trial and error or arithmetic process.
[1] An appropriate method is shown, but the correct answer is not found.
or [1] 4.5 and no work is shown.
or [1] The student solves the equation x + 3x - 2 = 20 and answers 5.5.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[126] C

[127] A

[128] D

[129] A

[130] B

[131] [3] 7, and appropriate work is shown or an appropriate explanation is given.
[2] Appropriate work is shown, but one computational error is made.
or [2] No answer or an incorrect answer is found, but $\frac{1}{4}$ of 28 and $\frac{1}{3}$ of 21 are calculated correctly to arrive at 14.
[1] Appropriate work is shown, but more than one computational error is made.
or [1] No answer or an incorrect answer is found, but $\frac{1}{4}$ of 28 is calculated correctly to arrive at 21.
or [1] 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.

[132] [3] 7,625 and 66.7%, and appropriate work is shown.
[2] Appropriate work is shown, but one computational error is made.
or [2] Only the number of votes for candidate B is found correctly, but appropriate work is shown.
[1] Appropriate work is shown, but more than one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The percent of votes cast for candidate A is found correctly, but no further correct work is shown.
or [1] 7,625 and 66.7%, but no work is shown.
[0] 7,625 or 66.7%, 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.

[3] $\frac{48}{100}$ or any equivalent fraction or 0.48 or 48% and appropriate work is shown, such as on Monday $\frac{2}{10}$ have power, $\frac{8}{10}$ lost power; on Tuesday $\frac{1}{2}\left(\frac{8}{10}\right)=\frac{4}{10}$ have been restored, therefore $\frac{2}{10}+\frac{4}{10}=\frac{6}{10}$ have power; on Wednesday $\frac{2}{10}$ lose power, therefore $\left(\frac{8}{10}\right)\left(\frac{6}{10}\right)=\frac{48}{100}$ have power.

[2] Appropriate work is shown, but one computational error is made, leading to a fractional answer.

or [2] One error of having or losing power is made, such as taking 20% of $\frac{4}{10}$.

[1] Appropriate work is shown, but multiple computational errors are made.

or [1] The correct answer is found, 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]

[134] C

[135] C

[136] B

[137] B

[3] $\frac{2}{24}$ or an equivalent answer, and an appropriate explanation is given or appropriate work is shown, such as a tree diagram, sample space, or permutations.

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

or [2] Appropriate work is shown, but only a numerator or a denominator is determined correctly.

or [2] $\frac{2}{24}$ or an equivalent answer, but only work for either the numerator or the denominator is shown.

[1] The probability of the tallest or the probability of the shortest student being in the proper position is correct, such as .

or [1] Only a tree diagram, sample space, or permutations are shown.

or [1] $\frac{2}{24}$ 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.

[138]

[3] $\frac{7}{20}$ or an equivalent answer, and appropriate work is shown, such as $\frac{15}{25} \bullet \frac{14}{24}$ or $\frac{{}_{15}C_2}{{}_{25}C_2}$.
[2] $\frac{15}{25} \bullet \frac{14}{24}$ or $\frac{{}_{15}C_2}{{}_{25}C_2}$ is shown, but one computational error is made or no further work is shown.
or [2] ${}_{15}C_2$ and ${}_{25}C_2$ are computed correctly, but no further work is shown.
or [2] Appropriate work is shown, but one computational error is made.
[1] The correct probabilities are found, but they are added instead of multiplied.
or [1] Only one of the two parts of the probability is correct.
or [1] Appropriate work is shown, but more than one error is made.
or [1] $\frac{7}{20}$ 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.

[139] _____

a [2] $\frac{30}{72}$ or an equivalent value is found and an appropriate explanation is given.
[1] An acceptable method is used correctly, such as a tree diagram, sample space, or combinations, but the correct answer is not given.
or [1] Replacement is used, and an answer of $\frac{36}{81}$ or an equivalent is found.
or [1] $\frac{30}{72}$ and no work is shown.

b [2] $\frac{36}{72}$ or an equivalent value is found and an appropriate explanation is given.
or [2] An appropriate probability for an incorrect denominator for part a is found.
[1] An appropriate method is shown, but one computational mistake is made.
or [1] Replacement is shown, and the answer $\frac{36}{81}$ or an equivalent is found.
or [1] The student does not take into account both orders and answers $\frac{18}{72}$ or an equivalent.
or [1] $\frac{36}{72}$ and no work is shown.

or a and b
[1] An error in method is made but the erroneous answer is interpreted correctly in either part a or b or both.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[140] _____

[141] C

[2] 20, and appropriate work is shown, such as (180 ÷ 0.9) - 180.
[1] A partial answer is found, such as 200 students are enrolled, but 180 is not subtracted from the answer.
or [1] An appropriate equation is shown, but one computational error is made, but 180 is subtracted.
or [1] An answer of 18 is found by subtracting 180 x 0.9 from 180.
or [1] 20, 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
[142] incorrect procedure.

[143] D

[3] No, it will not differ and the student shows that both methods lead to $47.08, such as $55 x .80 = $44, $44 x 1.07 = $47.08, $55 x 1.07 = $58.85, and $58.85 x .80 = $47.08.
[2] Both ways are computed, one computational mistake is made, and an appropriate answer is found.
or [2] Both ways are computed correctly, but no comparison is found.
[1] At least one way is computed correctly, but no comparison is found.
or [1] Both ways are computed incorrectly, but an appropriate comparison is found.
[0] Both ways are computed incorrectly, and no comparison is found.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[144] obviously incorrect procedure.

[2] 44, and appropriate work is shown, such as 0.8(200 - 145).
[1] Appropriate work is shown, but one computational or conceptual error is 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
[145] incorrect procedure.

[2] $40, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] $40, 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
[146] incorrect procedure.

[3] $800, and appropriate work is shown, such as 0.15x + 50 = 170 or a table of values or trial and error with at least three trials and appropriate checks.
[2] Appropriate work is shown, but one computational error is made.
or [2] The trial-and-error method is used to find the correct solution, but only two trials and appropriate checks are shown.
[1] Appropriate work is shown, but two or more computational errors are made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown, but the $50 per day is not included in his pay, resulting in an answer of $1,133.33.
or [1] The trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but no solution is found.
or [1] $800, but no work or only one trial with an appropriate check is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[147] incorrect procedure.

[2] 42.85714286 or an equivalent answer, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] An answer of 30 is found by dividing 1.8 by 6.
or [1] An answer of 70 is found by dividing 4.2 by 6.
or [1] 42.85714286 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.

[148]

[149] C

[3] 1,095 and 1,209, and appropriate work is shown.
[2] Appropriate work is shown, but one computational error is made.
or [2] Appropriate work is shown, but a whole-number solution is not found.
or [2] 5% of CD cases is rounded to 58, but 58 is added to or subtracted from 1,152 appropriately.
or [2] Appropriate work is shown, but only one correct solution is found.
[1] Appropriate work is shown, but more than one computational error is made.
or [1] 5% of CD cases is rounded to 58, but 58 is added to or subtracted from 1,152, but one computational error is made.
or [1] 5% of 1,152 is found, but no further work is shown.
or [1] 1,095 and 1,209, 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.

[150]

[2] \$178.50, and appropriate work is shown, such as solving a proportion, using a table, or trial and error with at least three trials and appropriate checks.
[1] Appropriate work is shown, but one computational error is made.
or [1] An appropriate proportion is set up, but no solution or an incorrect solution is found.
or [1] An incorrect proportion is set up, but an appropriate solution is found.
or [1] \$178.50, but no work is shown or fewer than three trials with appropriate checks are shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[151]

[2] $6\frac{2}{3}$ or 6 hr 40 min or $6.6\overline{6}$ or an equivalent answer, and appropriate work is shown.
[1] 400 min, but the answer is not converted into hours.
or [1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but the answer is rounded to the nearest hour.
or [1] 6 or 6 hr 40 min or $6.6\overline{6}$ 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.

[152]

[153] A

[154] C

[155] A

[3] 3 hours and an appropriate method or equation is shown, such as $45(x + 1) = 60x$.
[2] An appropriate method is shown, but an incorrect answer is found, such as 4 hours (the truck's time) or 180 miles traveled.
[1] An appropriate equation or method is shown, but no answer is found, such as showing an equation that reflects a one-hour difference in time but it is not solved.
or [1] 3 hours and no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[156]

[157] C

[2] Bob, and appropriate work is shown, such as using the distance formula to calculate the two travel times or setting up a proportion.
[1] Appropriate work is shown, but one computational or conceptual error is made, but an appropriate answer is found.
or [1] Appropriate work is shown, but no answer or an incorrect answer is found.
[0] Bob, but no work or inappropriate 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.

[158]

[2] 5, and appropriate work is shown, such as solving the linear equation $80x + 100x = 900$, using a diagram or proportion or trial and error.
[1] Appropriate work is shown, but one computational 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.

[159]

[160] A

[161] B

[162] B

[163] D

[164] A

[165] A

[4] $52,950, $35,300, and $88,250 and an appropriate method is shown, such as $3x + 2x + 5x = \$176,500$.
[3] A correct equation is set up or multiplied by correct fractional values $\frac{3}{10}$, $\frac{2}{10}$, and $\frac{5}{10}$, but a computational mistake is made, and three appropriate values are found.
or [3] An appropriate method is shown, but not all three values are found.
[2] The equation is set up correctly, but numerous computational mistakes are made, and three appropriate values are found.
or [2] An incorrect equation is shown, but three appropriate values are found.
or [2] An appropriate equation is shown but is solved only for x (17,650).
[1] The equation is set up correctly, but no appropriate values are found.
or [1] Three correct answers are found, and no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[166]

[4] $68,000, and appropriate work is shown.
[3] $119,000 and $51,000, and appropriate work is shown, but the answers are not subtracted to find the difference.
or [3] Appropriate work is shown, but one computational error is made.
[2] Appropriate work is shown, but more than one computational error is made.
[1] The value for one share ($17,000) is found, but no further correct work is shown.
or [1] $68,000, but no work is shown.
[0] $17,000 or $119,000 or $51,000, 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
[167] obviously incorrect procedure.

[168] D

[2] 319, and appropriate work is shown.
[1] A correct proportion is shown, but no solution or an incorrect solution is found.
or [1] An incorrect proportion of equal difficulty is solved appropriately.
or [1] Appropriate work is shown, but one computational error is made.
or [1] 319, 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
[169] incorrect procedure.

[2] 45, and appropriate work is shown, such as a diagram or $\frac{1.2}{2} = \frac{x}{75}$.
[1] Appropriate work is shown, but no answer or an incorrect answer is found.
or [1] 45, 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
[170] incorrect procedure.

[2] 15, and any equivalent proportion, equation, or fraction conversion is shown, such as $\frac{12}{16} = \frac{x}{20}$.
[1] An appropriate proportion, equation, or fraction conversion is shown, but one computational or conceptual error is made.
or [1] An incorrect proportion, equation, or fraction conversion is shown, but an appropriate answer is found for the incorrect proportion.
or [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
[171] incorrect procedure.

[172] D

[173] A

[174] B

[175] B

[176] D

[177] B

[178] B

[2] 2, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error or 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
[179] incorrect procedure.

[2] 2.4 and appropriate work is shown.
[1] The student shows correct use of the distributive property to obtain $2x - 6$ or other appropriate algebraic technique.
or [1] 2.4 and no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[180] incorrect procedure.

[181] D

[182] D

[183] B

[184] B

[185] D

[186] D

[187] A

[188] a [1] $\frac{S+24}{3}$ or $\frac{S}{3}+8$
b [1] 11.5
or [1] Correct substitution into an incorrect part a is shown, and the answer is given to the nearest tenth of an inch.
a and b
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[189] D

[190] D

[191] A

[192] B

[193] C

[194] C

[195] B

[196] C

[197] C

[198] [2] A correct graph is drawn on the number line, with a closed circle at the left end and an open circle at the right end.
[1] Appropriate work is shown, but one graphing error is made, such as writing an incorrect scale on the number line.
or [1] Appropriate work is shown, but one conceptual error is made, such as using a closed circle instead of an open circle.
or [1] A correct inequality is written, but the graph is not drawn.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[199] B

[200] [3] 84% and appropriate work is shown, such as mathematics or technology = 42, the total = 50, and the percentage = 84%.
[2] The correct numbers of students are shown, but the percentage is incorrect.
or [2] One error in computing the numbers of students is made, but the percentage is appropriate for those numbers.
[1] Only one number is correct, such as 28 taking mathematics.
or [1] An appropriate percentage is shown for two incorrect values.
or [1] 84% 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.

[201] D

[2] 60, and appropriate work is shown, such as 300 - 120 - 90 - 30 = 60.
or [2] 60, and an appropriate Venn diagram to illustrate the answer is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] An appropriate Venn diagram is drawn, and 240 is determined to be the total number of students given, but no further work is shown.
or [1] 60, but no work is shown.
[0] 240 is not subtracted from 300 and is given as the solution.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[202] obviously incorrect procedure.

[203] C

[204] D

[3] 50, and appropriate work is shown, such as a Venn diagram.
[2] Appropriate work is shown, but one computational error is made.
or [2] 200, and appropriate work is shown to find the number of students that have brown hair and/or brown eyes.
[1] Appropriate work is shown, but two or more computational errors are made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The numbers of students who have brown hair only (40) and brown eyes only (70) are found, but no further correct work is shown.
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

[205] incorrect procedure.

[3] 33, and appropriate work is shown, such as a Venn diagram.
[2] Appropriate work is shown, but the number of households that purchased only Brand A and only Brand B is found, 22 + 35 = 57.
or [2] Appropriate work is shown, but one computational error is made.
[1] A conceptual error is made, such as subtracting 87 from 100.
or [1] 33, 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

[206] incorrect procedure.

[2] 2, and appropriate work is shown, such as a Venn diagram, a listing, or an explanation.
[1] Appropriate work is shown, but one computational or 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

[207] incorrect procedure.

[208] C

[2] 40, and appropriate work is shown, such as a Venn diagram or (240 + 210) - 90 = 360 and 400 - 360 = 40.
[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] 40, 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

[209] incorrect procedure.

[2] 4, and appropriate work is shown, such as a Venn diagram.
[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.

[210]

[211] D

[212] B

[3] -5, -3, -1, and appropriate work is shown, such as solving the inequality or trial and error with at least three trials and appropriate checks.
[2] Appropriate work is shown, but one computational error is made.
or [2] Appropriate work is shown, and the inequality $x \geq -5\frac{1}{3}$ is written, but no further correct work is shown.
or [2] The trial-and-error method is used to find the correct solutions, but only two trials and appropriate checks are shown.
[1] Appropriate work is shown, but two or more computational errors are made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but the solutions are not found.
or [1] -5, -3, -1, but no work or only one trial with an appropriate check 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.

[213]

[214] D

[215] A

[2] 6, and appropriate work is shown, such as $0.70x + 0.30 \leq 5.00$ or trial and error with three trials and appropriate checks.
[1] The inequality is solved correctly, but the number of doughnuts is not found.
or [1] The trial-and-error method is used to find a correct solution, but fewer than three trials are shown.
or [1] 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.

[216]

[3] 15 and an appropriate method or explanation is shown, such as trial and error or the inequality $6x + 15 \geq 100$.
[2] An appropriate method is shown, but it stops at 14.
[1] An appropriate method is shown, but no answer is found.
or [1] 15 and no explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[217]

[218] A

[219] D

[220] C

[221] A

[222] C

[2] 12 and an appropriate explanation is given.
[1| The student uses an appropriate method, such as showing $\frac{k-2}{3-1} = 5$ or graphing of a line through (1,2) having a slope of 5, but the correct answer is not found.
or [1] 12 and no explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[223]

[3] 4 and an appropriate method is shown, such as calculating A at 6 mph and B at 2 mph through arithmetic, formula, or extending the graph to 60 minutes.
[2] The speeds of 6 and 2 are found but not their difference.
or [2] Their difference is found but not in miles per hour.
[1] Only distances of 4.5 miles and 1.5 miles are found.
or [1] The speeds found are incorrect but then are subtracted appropriately.
or [1] 3 times as fast and no appropriate explanation is given.
or [1] 4 and no appropriate explanation is given.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[224] incorrect procedure.

[225] A

[226] A

[227] C

[228] C

[2] y = 2x - 3 or an equivalent equation, and appropriate work is shown, or an appropriate explanation is given, such as the slope is 2 and the y-intercept is -3.
[1] y = 2x - 3, but the slope and intercept are incorrect, or the explanation is not given or is incorrect, such as m = 2 and b = -3.
or [1] The slope and intercept are explained correctly, but the equation is incorrect.
or [1] y = 2x - 3, but no work is shown and no explanation is given.
[0] The equation is incorrect, and the explanation of slope and intercept is not given or is incorrect.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[229] obviously incorrect procedure.

[2] $390 or 390 and appropriate work is shown, such as a numerical table or the equation y = 30x + 90 or the expression 90 + 30N.
[1] Appropriate work is shown, but one computational error is made.
or [1] $300 or 300 or a slope of 30 but appropriate work is shown.
or [1] $390 or 390 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
[230] incorrect procedure.

[3] The student says the point does not lie on the line and an appropriate method is shown, such as slope of -2 does not work with the new point (-25,81) and either other point (0,4) or (2,0), or accurately shows a graph where (-25,81) is not on line .
[2] The student says the point does not lie on the line but gives an inappropriate explanation of slope.
or [2] The student tries to use slope concept but makes one computational mistake and gives an appropriate answer based on this mistake.
[1] Only the slope of -2 is found.
or [1] The correct diagram is drawn with no interpretation.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[231] incorrect procedure.

[6] $\overline{W} = 44.6$ and $\overline{L} = 43.2$, the line of best-fit equation (y = –1.007559x + 88.137149) is shown, and an appropriate justification of point ($\overline{W}$, $\overline{L}$) fitting or not fitting, depending on the rounding of the equation, is given.
[5] $\overline{W}$ or $\overline{L}$ is incorrect, but the rest of the work is appropriate.
or [5] All conditions of the problem are met, except it is not stated whether ($\overline{W}$, $\overline{L}$) lies or does not lie on the line of best fit.
or [5] $\overline{W}$ and $\overline{L}$ and the equation of the line of best fit are correct, but one error results in an incorrect conclusion, such as the calculation or interchanging of $\overline{W}$ and $\overline{L}$.
[4] Both $\overline{W}$ and $\overline{L}$ are incorrect, but the rest of the work is appropriate.
or [4] $\overline{W}$ and $\overline{L}$ are correct, but the equation of the line of best fit is incorrect, but the justification is appropriate, based on the incorrect equation.
or [4] $\overline{W}$ and $\overline{L}$ are correct, a correct scatter plot is drawn, a correct line of best fit is drawn, ($\overline{W}$, $\overline{L}$) is plotted correctly, and a statement indicating that the point does or does not fit the line is given, with an appropriate explanation, but no equation is used.
or [4] All conditions of the problem are met, except for the justification of whether ($\overline{W}$, $\overline{L}$) lies on the line.
[3] $\overline{W}$ and $\overline{L}$ are correct, but the equation of the line of best fit is stated incorrectly, and no further work is shown.
[2] Only $\overline{W}$ and $\overline{L}$ are found correctly.
[1] Only one mean is found correctly.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[232]

[4] y = –34739.71292x + 313309.0909 and 209,090, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] An incorrect linear equation with a negative slope is written, but an appropriate price is found for three blocks from the beach.
[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 linear function is written, but no further correct work is shown.
or [2] An incorrect linear equation with a positive slope is written, but an appropriate price is found for three blocks from the beach.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] 209,090, 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.

[233]

[6] y = 0.01021x - 1.66787, 4.56, and 913, and appropriate work is shown.
[5] Appropriate work is shown, but one computational or rounding error is made.
or [5] The expression 0.01021x - 1.66787 is written and 4.56 and 913 are found, and appropriate work is shown.
[4] Appropriate work is shown, but two or more computational or rounding errors are made.
or [4] A correct equation is written, but either the gross earnings or the number of theaters is not found, but appropriate work is shown.
or [4] An incorrect equation of equal difficult)7 is written, but appropriate answers are found, and appropriate work is shown.
[3] Appropriate work is shown, but one conceptual error is made.
or [3] y = 0.01021x - 1.66787, 4.56, and 913, but no work is shown.
or [3] The expression 0.01021x - 1.66787 is written and either 4.56 or 913 is found, and appropriate work is shown.
[2] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [2] A correct equation is written, but no further correct work is shown.
[1] 4.56 and 913, but no work is shown.
or [1] The expression 0.01021x - 1.66787 is written, but no further correct work is shown.
[0] Either 4.56 or 913, 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
[234] obviously incorrect procedure.

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[6] y = –6.2x + 12,451.2; 20.2 thousand; and 2008; and appropriate work is shown.
[5] The correct equation is shown, but only the number of gallons or the year is correct.
[4] The slope and y-intercept are incorrect, but the slope is negative and the number of gallons and the year are appropriate, based on the incorrect equation.
[3] The slope and y-intercept are incorrect, but the slope is negative, but only the number of gallons or the year is appropriate, based on the incorrect equation.
[2] The correct equation is shown, but the number of gallons and the year are not determined or are determined incorrectly.
or [2] The incorrect equation y = 6.2x + 12,451.2 is shown, but appropriate work is shown for the number of gallons and the year.
[1] An incorrect equation is shown with a negative slope, and the number of gallons and the year are not determined.
or [1] 20.2 thousand and 2008, 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
[235] incorrect procedure.

[4] a y= 0.8344648562x + 14.64960064 or an equivalent answer expressed to three significant digits
and b 80, and appropriate work is shown.
[3] One computational error is made or one rounding error is made with one of the numbers in the equation, such as truncating or not giving at least three significant digits.
[2] Only the correct answer for either part a or part b is found.
or [2] Appropriate work is shown, but more than one computational or rounding error is made.
[1] 78 is substituted into an incorrect linear equation, but it is evaluated appropriately.
or [1] y = 0.8344648562x + 14.64960064 and 80, 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]

[4] $\bar{x} = 80$, $\bar{y} = 20.8$, and y = 0.25x + 0.8, and appropriate work is shown to prove that ($\bar{x}$, $\bar{y}$) is a point on the line of regression.
[3] Appropriate work is shown, but one computational error is made.
[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.
[1] $\bar{x} = 80$, $\bar{y} = 20.8$, and y = 0.25x + 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.

[237]

[6] A correct scatter plot, y = 0.62x + 29.18, r = 0.92, and 83; and appropriate work is shown.
[5] Appropriate work is shown, but one computational or rounding error is made.
or [5] A correct scatter plot, equation, and score are shown, but no r-value is found.
[4] A correct scatter plot and equation are shown, but the r-value and score are missing or incorrect.
or [4] An incorrect equation is shown, but all further work is appropriate.
or [4] The scatter plot is missing or incorrect, but all further work is appropriate.
[3] The scatter plot is incorrect, but a correct equation and either a correct r-value or score are found.
or [3] The scatter plot is correct, but an incorrect equation and either an appropriate r-value or score based on the incorrect equation are found.
[2] Only a correct scatter plot is shown, and all further work is missing or incorrect.
or [2] Only a correct equation is shown, and all further work is missing or incorrect.
[1] An incorrect equation is shown, but an appropriate score is found.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[238]

[239] D

[240] C

[241] A

[242] D

[243] B

[244] D

[3] Three correct equations are shown, such as $y = x + 7$, $y = -x - 6$, and $2y = 2x - 12$.
[2] Only two correct equations are shown.
[1] Only one correct equation is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[245] incorrect procedure.

[246] B

[247] B

[248] C

[249] B

[250] C

[251] B

[252] B

[4] $1.50 for one slice of pizza and $0.75 for one cola, and appropriate work is shown, such as $3x + 2y = \$6$ and $2x + 3y = \$5.25$.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but only the price of one slice of pizza or the price of one cola is found correctly.
[2] Appropriate work is shown, but more than one computational error is made.
or [2] An incorrect system of equations of equal difficulty is solved appropriately to calculate the cost of one slice of pizza and one cola.
[1] $1.50 for one slice of pizza and $0.75 for one cola, 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
[253] incorrect procedure.

[4] Milk Chocolate bar = $0.75 and Creamy Nougat bar = $0.50, and appropriate work is shown, such as equations, a trial-and-error method with at least two trials and appropriate checks, or an algebraic or graphic solution.
[3] Appropriate work is shown, but one computational error is made.
[2] The cost of one candy bar is determined correctly with appropriate work shown, but no attempt is made to find the cost of the other candy bar.
or [2] Appropriate work is shown, but more than one computational error is made.
[1] Appropriate work is shown, but no answer is found.
or [1] Milk Chocolate bar = $0.75 and Creamy Nougat bar = $0.50, 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
[254] incorrect procedure.

[4] One doughnut is $0.75 and one cookie is $0.60, and appropriate work is shown, such as a system of equations, trial and error with at least three trials and appropriate checks, or a table.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but only one correct answer is found, or two correct answers are found, but they are not identified clearly as doughnuts or cookies, or the doughnuts and cookies are labeled incorrectly.
[2] Appropriate work is shown, but more than one computational error is made.
or [2] Two equations are written, one correct and one incorrect, but two appropriate answers are found.
or [2] The trial-and-error method is used to find a correct solution, but only two trials and appropriate checks are shown.
[1] Two correct equations are written, but no further correct work is shown.
or [1] One doughnut is $0.75 and one cookie is $0.60, but no work or only one trial with an appropriate check is shown.
[0] One correct equation is shown, and no answer or only one appropriate answer is found.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[255]

[4] $5 for the sprayer and $10 for the generator, and appropriate work is shown, such as x = hourly cost of sprayer and y = hourly cost of generator, and an appropriate system of equations is solved or a trial-and-error method is used, showing at least two trials with appropriate checks.
[3] Both correct equations are shown or an appropriate chart or trial-and-error method is used, but one computational error is made.
or [3] Both correct equations are shown, and they are solved for one value, but no further work is shown.
[2] Only one of the two equations is correct, but they are solved appropriately for both values.
or [2] Both correct equations are shown, but more than one computational error is made.
or [2] $5 for the sprayer and $10 for the generator, but only one trial is shown with appropriate checks.
[1] Both equations are incorrect, but they are solved appropriately for both values.
or [1] Both correct equations are shown, but they are not solved.
or [1] $5 for the sprayer and $10 for the generator, 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.

[256]

[257] C

a [2] An appropriate equation or system is shown, such as $x + y = 148$ and $12x + 9y = 1410$ or one equation such as $12(148 - x) + 9x = 1410$ with variables identified.
[1] The student shows appropriate equation(s), but variables are not defined.
or [1] One mistake in equation(s) is made, or only one equation with two variables is shown, but variables are defined.
b(1) [1] 26 and an appropriate method is shown, such as solving the equation or making a table.
or [1] An appropriate answer is found based on incorrect equation(s) obtained in part a.
b(2) [1] 122 and an appropriate method is shown, such as 148 - 26.
or [1] An appropriate answer is found based on incorrect equation(s) obtained in part a.
b (l) and b (2) [1] 26 and 122 and 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
[258] obviously incorrect procedure.

[3] Seth had 101, Jason had 51, and Raoul had 104, and appropriate work is shown, such as $x + 25 = (2x - 1) - 25$ or trial and error with at least three trials and appropriate checks.
[2] Appropriate work is shown, but one computational error is made.
or [2] 101, 51, and 104, and appropriate work is shown, but the solutions are not labeled or are labeled incorrectly.
or [2] A correct equation is solved, but the number of CDs for only one boy is found.
or [2] The trial-and-error method is used to find a correct solution, but only two trials and appropriate checks are shown.
[1] Appropriate work is shown, but more than one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made, but an appropriate number of CDs is found for each boy.
or [1] A correct equation is written, but no further correct work is shown.
or [1] Seth had 101, Jason had 51, and Raoul had 104, but no work or only one trial with an appropriate check is shown.
[0] Seth had 101 or Jason had 51 or Raoul had 104, but no work is shown.
or [0] 101, 51, and 104, but no work is shown and the solutions are not labeled or are labeled incorrectly.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[259] obviously incorrect procedure.

[3] 374 grasshoppers and 187 crickets, and appropriate work is shown.
[2] An appropriate equation is solved or appropriate work is shown, but only one correct answer is found, or two correct answers are found but they are not identified clearly as grasshoppers or crickets, or the grasshoppers and crickets are labeled incorrectly.
or [2] Appropriate work is shown, but one computational error is made.
[1] Appropriate work is shown, but more than one computational error is made.
or [1] An incorrect equation of equal difficulty is solved appropriately.
or [1] 374 grasshoppers and 187 crickets, but no work is shown.
[0] 374 and 187, but no work is shown, and the answers are not identified clearly as grasshoppers or crickets.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[260] obviously incorrect procedure.

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[2] 42 nickels and 21 dimes, and appropriate work is shown, such as $0.1x + (0.05)2x = 4.20$ or a guess and a check with a minimum of two trials and appropriate checks or another appropriate method.
[1] 42 nickels or 21 dimes, but appropriate work is shown.
or [1] Appropriate work is shown, but no answer or an incorrect answer is found.
or [1] 42 nickels and 21 dimes, 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
[261] incorrect procedure.

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[3] Four 20-cent and eight 32-cent stamps, and appropriate work is shown, such as a system of equations, or a linear equation such as $2x(.32) + .20x = 3.36$, or trial and error with at least three trials and appropriate checks.
[2] Appropriate work is shown, but one computational error is made, but appropriate quantities are found for each stamp.
or [2] Appropriate work is shown, but the quantity for only one of the stamps is found.
or [2] Appropriate work is shown, but the solutions are not labeled or the labels are reversed.
or [2] The trial-and-error method is used to find correct solutions, but only two trials and appropriate checks are shown.
[1] Appropriate work is shown, but two or more computational errors are made, but appropriate quantities are found for each stamp.
or [1] The trial-and-error method is attempted, and at least six systematic trials and appropriate checks are shown, but no solution is found.
or [1] An incorrect equation or system of equations of equal difficulty is solved appropriately for both solutions.
or [1] A correct equation or system of equations is written, but no further correct work is shown.
or [1] Four 20-cent and eight 32-cent stamps, but no work or only one trial with an appropriate check is shown.
[0] Four and eight, but no work is shown, and the solutions are not labeled.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[262] obviously incorrect procedure.

[4] 65 adult tickets and 85 student tickets and an appropriate equation is shown, such as 7.50x + 4.75(150 - x) = 891.25, or any other acceptable method is used.
[3] Either 65 or 85 and appropriate work is shown.
or [3] Appropriate work is shown, but one computational error is made that leads to two appropriate answers.
[2] An incorrect equation is shown, but it is solved appropriately for two answers.
or [2] The correct equation is shown, but two computational errors are made.
[1] Appropriate work is shown, but no answer is found.
or [1] 65 and 85 but no work is shown.
[0] Either 65 or 85 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
[263] obviously incorrect procedure.

a [2] The student writes an appropriate system of equations, such as b = f + 100 and 4b + 12f = 3,056, and defines the variables.
or [2] The student writes an appropriate equation, such as 4(100 + x) + 12x = 3,056, and defines the variable.
[1] A correct equation or correct equations are shown, but the variables are not defined.
or [1] One error is made in the setup, such as b+ f = 100.
[0] The student only defines the variables.
b [2] 266, and appropriate work is shown, using an algebraic solution or a correct trial-and-error method.
or [2] Appropriate work is shown for an incorrect part a equation or system of equations.
[1] Work is shown, but the answer is inappropriate, such as $1,064.
or [1] 266, 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
[264] obviously incorrect procedure.

[4] 36 T-shirts and 12 caps, and appropriate work is shown, such as an appropriate system of equations or a correct trial-and-error method with at least two trials and appropriate checks.
[3] Appropriate work is shown, but only the correct number of T-shirts or the correct number of caps is determined.
or [3] One error is made, resulting in an incorrect number of T-shirts or caps, but the corresponding number of the other item is determined appropriately.
[2] An appropriate method is shown, but no answer is found.
or [2] The variables are represented correctly, and a correct equation or system of equations is written, but the process is not completed.
or [2] 36 T-shirts and 12 caps, but only one trial and appropriate checks are shown.
or [2] The variables are represented correctly, but an incorrect equation is written, but the solution is completed appropriately.
[1] 36 T-shirts and 12 caps, 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
[265] incorrect procedure.

[4] 210, and appropriate work is shown, such as a system of equations or the linear equation $5x + 2(295 – x) = 1,220$.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but the number of children's tickets is found as the answer.
[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 equation of equal difficulty is solved appropriately.
or [2] 210, but a method other than an algebraic solution is used.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] The correct system of equations or linear equation is written, but no further correct work is shown.
or [1] 210, 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.

[266]

[2] 14 and 42, and appropriate work is shown, such as $x + 3x = 56$, a table, or trial and error with at least three trials and appropriate checks.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but only one of the two lengths is found.
or [1] A correct equation is written and solved, but the lengths are not stated.
or [1] An incorrect equation of equal difficulty is solved appropriately.
or [1] 14 and 42, but no work or fewer than three trials with appropriate checks are 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]

[268] A

[269] C

[270] B

[3] $16,400, and appropriate work is shown, such as

200 tickets sold at the door	$32 =	$ 6,400
400 tickets sold in advance	$25 =	$10,000
		$16,400

[2] The correct number of tickets is shown, but one computational error is made in computing the total amount of money collected.
or [2] $6,400 and $10,000 are calculated correctly, but they are not added to obtain the total.
[1] The numbers of tickets, 200 and 400, are calculated correctly.
or [1] An appropriate solution is found, but it is based on incorrect numbers of tickets.
or [1] $16,400, 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

[271]

[4] $6.15, and appropriate work is shown, such as solving simultaneous equations or using a trial-and-error method.
[3] $2.95 (movie) and $3.20 (game) are found, but they are not added.
or [3] Appropriate work is shown, but one computational error is made.
[2] The system of equations is set up correctly, but one conceptual error leads to an appropriate solution.
or [2] $2.95 (movie) or $3.20 (game), and appropriate work is shown.
[1] $6.15, 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.

[272]

[2] $6.85, and appropriate work is shown.
[1] The correct rate for the first 5 minutes and the correct rate for each additional minute is shown, but the cost of a 30-minute call is not found.
or [1] Appropriate work is shown, but one computational error is made.
or [1] $6.85, but no work is shown.
[0] The student calculates either the rate for the first 5 minutes or the rate for each additional minute, but no further 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.

[273]

a [1] $50
b (1) [1] 5
(2) [1] $125
c [1] $10
a, b, and c [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[274]

a [1] c = 10m + 100 for Ron's Rental and c = 20m + 20 for Josie's Rental.
b [2] Two lines, rays, or segments are graphed and labeled correctly, using values arrived at by using a table or by using the slope and y-intercept.
[1] Two lines, rays, or segments are graphed correctly, but they are not labeled.
or [1] One line, ray, or segment is graphed and labeled correctly, using values arrived at by using a table or by using the slope and y-intercept.
c [1] 8
or [1] An appropriate number of months is found, based on an incorrect graph in part b.
a, b, and c [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] y = 2x - 40, a correctly drawn graph with a slope of 2 and a y-intercept of -40, and 20, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or graphing error is made.
or [3] The equation and graph are correct, but the breakeven point is missing or is incorrect.
[2] Appropriate work is shown, but more than one computational or graphing error is made.
or [2] An incorrect equation is written, but an appropriate graph is drawn, and an appropriate breakeven point is identified.
[1] An incorrect equation is written, but an appropriate graph is drawn, but the breakeven point is missing or is incorrect.
or [1] A correct equation is written, but the graph is incorrect, and the breakeven point is not identified.
or [1] y = 2x - 40 and 20, 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 procedure.

[276]

[3] 5, and appropriate work is shown, such as the equation 60 + 5x = 135 - 10x, or trial and error with at least three trials and appropriate checks, or a graph.
[2] Appropriate work is shown, but one computational or graphing error is made.
or [2] The trial-and-error method is used to find a correct solution, but only two trials and appropriate checks are shown.
[1] Appropriate work is shown, but more than one computational or graphing error is made.
or [1] 5, but no work or only one trial with an appropriate check 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]

[3] 20, and appropriate work is shown, such as an equation, trial and error, or a graph.
[2] Appropriate work is shown, such as 12.95 + 0.25x = 14.95 + 0.15x, but one computational error is made.
or [2] Appropriate work is shown, but an answer of $17.95 is found.
or [2] 20, and only a check is shown.
[1] The student starts appropriate work to find when the prices are equal but does not complete it, such as starting to solve the correct equation, showing one incorrect trial, or drawing an incomplete graph.
or [1] 20, 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
[278] incorrect procedure.

[279] A

a [2] 3 and an appropriate method is shown, such as trial and error or the equation $32+8x=26+10x$.
[1] 3 and no work is shown.
or [1] An appropriate method is shown, but an incorrect answer is found.
b (1) [1] Best Cable Company and an appropriate explanation is given.
b (2) [1] $24 and an appropriate explanation is given.
b (l) and b (2) [1] Best Cable Company and $24 and 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
[280] obviously incorrect procedure.

[281] B

[2] More than 6 hours, and appropriate work is shown, using a graphic or algebraic solution.
[1] Appropriate work is shown, but one computational error or an error in analyzing the results is made.
or [1] More than 6 hours, 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
[282] incorrect procedure.

[283] B

[284] B

[285] B

[4] The inequalities $x \leq 10$, $y \leq 12$, and $x + y \leq 16$ are graphed and shaded correctly on the given set of axes.
[3] All inequalities are graphed and shaded correctly, but one incorrect type of line (dashed or broken) is used.
or [3] All three inequalities are graphed correctly, but one inequality is not shaded or is shaded incorrectly.
or [3] The inequality $x + y \leq 16$ is graphed correctly, but an error is made in graphing either the horizontal or vertical line, but they are shaded appropriately.
or [3] Only two of the three inequalities are graphed correctly, but all three are shaded appropriately.
[2] All three inequalities are graphed correctly, but two are shaded incorrectly.
or [2] Only two of the three inequalities are graphed and shaded correctly.
[1] Only one of the three inequalities is graphed and shaded correctly.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[286] incorrect procedure.

[287] B

[4] (10,0) and (1,9), and both graphs are drawn correctly.
[3] Both graphs are drawn correctly, but only one solution is stated correctly.
or [3] One graph of equal difficulty is drawn incorrectly, but the solutions are appropriate, based on the graphs.
[2] (10,0) and (1,9), but the problem is solved algebraically instead of graphically.
or [2] One graph of equal difficulty is drawn incorrectly, and only one solution is appropriate, based on the graphs.
[1] Both the parabola and the line are graphed incorrectly, but the solutions are appropriate, based on the graphs.
or [1] Incorrect solutions result from an algebraic method.
or [1] (10,0) and (1,9), 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
[288] incorrect procedure.

[4] (-1,-2) and (2,13), and appropriate work is shown, such as an algebraic or graphic solution or trial and error with at least three trials and appropriate checks.
[3] Appropriate work is shown, but one computational or graphing error is made.
or [3] Appropriate work is shown, but only one solution is found or only the x- or the y-values are found.
[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 trial-and-error method is used to find the correct solutions, but only two trials and appropriate checks are shown.
or [2] The trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but no solution is found.
or [2] Both equations are graphed correctly, but neither ordered pair is identified.
or [2] Only one equation is graphed correctly, but an appropriate solution is found.
or [2] An incorrect quadratic equation of equal difficulty is solved appropriately, and appropriate solutions are found.
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [1] One equation is graphed correctly, but no further correct work is shown.
or [1] An incorrect equation of a lesser degree of difficulty, such as a linear equation, is solved appropriately.
or [1] A correct substitution is made and the system of equations is simplified to a single quadratic equation set equal to zero, but no further correct work is shown.
or [1] (-l,-2) and (2,13), but no work or only one trial with an appropriate check is shown.
[0] (-1,-2) or (2,13), but no work or only one trial with an appropriate check is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[289] obviously incorrect procedure.

[290] C

[4] Yes, and appropriate work is shown, and an appropriate justification is given.
[3] Appropriate work is shown, and an appropriate justification is given, but one computational error is made, or the negative value of t is not rejected.
[2] An appropriate graph or equation is shown, such as $16t^2 - 8t - 15 = 0$.
[1] An incorrect graph or equation of equal difficulty is used, but an appropriate solution is found.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[291]

[4] 9 and 26, and appropriate work is shown, such as graphing and labeling the equations and identifying the points of intersection.
[3] Both functions are graphed correctly, and the points of intersection are indicated, but the prices are not stated.
or [3] The parabola is graphed correctly, but the line is graphed incorrectly, but appropriate prices are stated.
[2] The line and the parabola are graphed and labeled, but a conceptual error is made, such as only one price is found because the graph of the parabola is incomplete.
or [2] The line is graphed correctly, but the parabola is graphed incorrectly, but appropriate prices are stated.
or [2] 9 and 26, but only an algebraic solution is shown.
[1] Both the line and the parabola are graphed incorrectly, but appropriate prices are stated.
or [1] 9 and 26, but no work is shown.
[0] 9 or 26, 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.

[292]

[293] B

a [3] A parabola is correctly graphed through (0,0), (1,5), (2,8), (3,9), (4,8), (5,5), and (6,0).
[2] The correct table of values is shown but is not graphed through the entire domain.
or [2] The correct points are graphed but as a broken line graph not a curve.
or [2] At least three values are correctly calculated and graphed.
[1] At least two of the values are correctly calculated, and the student tried to graph all points.
b [1] 3
or [1] The correct time, x, for an incorrect graph in part a is found.
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.

[294]

[4] 100 and a correct parabolic arch is drawn, and appropriate work is shown, such as a table of values for the parabola or correctly labeled points.
[3] 100 and a correct parabolic arch is drawn, but no table of values or labeled points are shown.
or [3] 100 and a correct parabolic arch is drawn, and appropriate work is shown, but no scale or an incorrect scale is shown.
or [3] A correct parabolic arch is drawn, but the maximum height is missing or is incorrect.
[2] An incorrect parabolic arch is drawn, but an appropriate maximum height is found.
or [2] A correct height is determined algebraically, but a parabolic arch is not drawn.
or [2] 100 and an appropriate parabolic arch is drawn, but it is not drawn between $0 \le x \le 20$.
[1] A correct parabolic arch is drawn, but no work is shown, such as a table of values or correctly labeled points, and the maximum height is missing or is incorrect.
or [1] 100, but no work is shown and no parabolic arch 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.

[295]

a [3] A parabola with points graphed at (0,0), (1,32), (2,48), (3,48), (4,32), and (5,0) is shown. [Points do not have to be labeled on the graph for full credit.]
[2] Appropriate work is shown, such as a table of values, but one graphing error is made.
or [2] The correct points are graphed, but the parabola is drawn incorrectly, such as connecting (2,48) and (3,48) as a line segment or not connecting the points at all.
or [2] At least four correct values are found, and the parabola is graphed appropriately.
or [2] A correct table of values is shown for all values from 0 to 5, but no graph is drawn.
[1] Two or three correct values are found, and the parabola is graphed appropriately.
or [1] A correct table of values is shown for an incorrectly transcribed equation, such as $h = 8t^2 + 40t$, but no graph is drawn.
b [1] 2.5 is found algebraically or identified from a table or from the graph of the parabola.
or [1] An appropriate value of t is found, based on an incorrect graph.
or [1] $2 < t < 3$ is given as the range of values based on the line segment drawn in part a.
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.

[296]

a [3] A parabola is correctly graphed through (0,0), (1,10), (2,16), (3,18), (4,16), (5,10), and (6,0).
[2] A correct table of values is shown, but not all the points are graphed correctly.
or [2] The correct points are graphed but as a broken-line graph, not a curve.
or [2] At least four values are calculated correctly and graphed.
[1] The student has at least two of the values calculated correctly and has tried to graph all the points.
[0] Fewer than two values are calculated correctly.
b [1] A maximum height of 18 is found.
or [1] Correct y is found for an incorrect graph in part a.
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.

[297]

[298] A

[299] C

[300] B

[301] C

[302] A

[303] B

[304] C

[4] 3, and an appropriate algebraic or graphic solution is shown.
[3] The equation is graphed correctly, but the time to reach the ground is not identified.
or [3] Appropriate work is shown for an algebraic solution, but either no solution is found or the negative root is not rejected.
or [3] An appropriate algebraic solution is shown, but one computational error is made.
[2] The equation is graphed incorrectly, but an appropriate time to reach the ground is identified.
or [2] The equation is factored incorrectly, but an appropriate solution is found.
[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.

[305]

[4] A correct graph is sketched and 1.25, and appropriate work is shown.
[3] A correct graph is sketched, but one computational or rounding error is made in determining the time.
or [3] Appropriate work is shown, but one error is made in sketching the graph, such as the axes are not labeled or are labeled incorrectly, but the time is determined correctly.
or [3] A correct graph is sketched and appropriate work is shown to calculate the time, but the negative root is not rejected.
[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] A correct graph is sketched, but no further correct work is shown.
or [2] Appropriate work is shown to calculate the time, but no graph or an incorrect graph is sketched.
[1] Appropriate work is shown to calculate the time, but one computational or rounding error is made, and no graph or an incorrect graph is sketched.
or [1] Appropriate work is shown to calculate the time, but the negative root is not rejected, and no graph or an incorrect graph is sketched.
or [1] 1.25, but no graph or an incorrect graph is sketched, and no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[306]

[307] B

[308] B

[309] C

[310] C

[2] $\frac{4}{3}$ or $1\frac{1}{3}$ or $1.\overline{3}$, 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] $\frac{4}{3}$ or $1\frac{1}{3}$ or $1.\overline{3}$, 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.

[311]

[312] B

[313] D

[314] A

[315] C

[316] C

[317] B

[318] C

[319] D

[320] C

[321] D

[322] C

[323] A

[324] C

[3] 499 days and appropriate work is shown, such as $\frac{17{,}000{,}000\,miles}{1420\frac{miles}{hour}\times 24\frac{hours}{day}}$.

[2] Appropriate work is shown, but one computational error is made or the student incorrectly calculates 1.7×10^7 by one decimal place.

or [2] Appropriate work is shown, but the answer is rounded incorrectly or is not rounded.

[1] $1.7\times10^7 = 17{,}000{,}000$ is shown.

or [1] $\frac{1.7\times10^7}{1420} = 11{,}971.831$ hours is shown.

or [1] 34,080 miles in 1 day is shown.

or [1] 499 but no work is shown.

[0] The student does not understand scientific notation.

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

[325] obviously incorrect procedure.

[326] B

[327] C

[328] C

[329] C

[330] B

[331] B

[332] B

[333] B

[334] D

[335] D

[336] A

[337] A

[338] C

[339] C

[340] C

[341] C

[3] 3, and appropriate work is shown, such as using a 3:4:5 right triangle, correct proportions, or the Pythagorean theorem with a proportion.

[2] Appropriate work is shown, and the value of the side is determined to be 5, but n = 3 is not found.

[1] A correct proportion is set up, but no answer or an incorrect answer is found.

or [1] 3, but no work is shown.

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

[342] incorrect procedure.

[2] 8 and the use of trigonometry, the Pythagorean theorem, or Pythagorean triple is shown.

[1] The Pythagorean theorem or trigonometry is used, but a computational mistake is made or substitution is incorrect, such as $6^2 = 10^2 + x^2$.

[1] 8 and no work is shown.

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

[343] incorrect procedure.

[344] B

[2] 15, and appropriate work is shown, such as using the Pythagorean theorem, Pythagorean triples, or trigonometric functions.

[1] The data are substituted incorrectly, but an appropriate answer is found and is rounded correctly.

or [1] Appropriate work is shown, but one or more computational errors are made.

or [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

[345] incorrect procedure.

[346] A

[347] C

[348] A

[4] 9.4, and appropriate work is shown, such as the use of the Pythagorean theorem.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but more than one computational or rounding error is made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] An incorrect diagonal of the base is found, but an appropriate solution is found.
or [2] Only the diagonal of the base is found correctly, but appropriate work is shown, such as $3^2 + 4^2 = d^2$ or use of 3–4–5 right triangles.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] The Pythagorean theorem is used to find the length of the straw, but the appropriate legs are not used.
or [1] 9.4, 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.

[349]

[2] 16, and appropriate work is shown, such as the Pythagorean theorem, the Pythagorean triple, or trigonometry.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.
or [1] 16, 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.

[350]

[4] 10 and $y - 1 = -\frac{3}{4}(x - 2)$ or an equivalent equation, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
[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 in determining the distance or the equation of the line.
or [2] The length, the midpoint, and the slope of $\overline{AB}$ are found correctly, but no equation or an incorrect equation is given for the perpendicular bisector.
or [2] Only a correct equation of the perpendicular bisector is found.
[1] The correct distance is found, but no attempt is made to find the equation of the perpendicular bisector.
or [1] The midpoint and slope of $\overline{AB}$ are found correctly, but no further correct work is shown.
or [1] The slope of $\overline{AB}$ and the slope of the perpendicular bisector are calculated correctly.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[351]

[352] A

[3] Jerry, and appropriate work is shown, such as the following explanation: Jerry traveled 7 miles at a rate of 5 miles per hour and his time was $1\frac{2}{5}$ hours; Jean traveled 5 miles at a rate of 3 miles per hour for a time of $1\frac{2}{3}$ hours.
[2] The time for each jogger is calculated appropriately, but an error is made in determining one of the distances, but an appropriate answer is found.
or [2] The time for each jogger is calculated correctly, but the question of which person reached C first is not answered.
or [2] Both distances are calculated correctly, but an error is made in determining times, but an appropriate answer is found.
[1] Only the distances are calculated correctly. No answer to the question is found or an answer is found based on distance only.
or [1] The time for only one jogger is calculated correctly, and the question of which person reached C first is not answered.
or [1] The time for both joggers is calculated appropriately, but multiple computational errors are made.
or [1] Jerry and $1\frac{2}{5}$ hours and $1\frac{2}{3}$ hours, but no work is shown.
[0] Jerry, 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.

[353]

[3] 10.6 and the Pythagorean theorem, $C^2 = 8^2 + 7^2$, or any other appropriate method is shown.
[2] Appropriate work is shown, but the answer is left as $\sqrt{113}$ or is rounded incorrectly.
or [2] Appropriate work is shown, but one computational error is made.
[1] Appropriate work is shown, but multiple errors are made.
or [1] The only correct work shown is a correctly drawn diagram with three distances labeled.
or [1] 10.6 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.

[354]

[3] 6.7, and appropriate work is shown, such as using the distance formula.
[2] Appropriate work is shown, but one computational or rounding or graphing error is made or the answer is left in radical form.
[1] Appropriate work is shown, but more than one computational or rounding or graphing error is made.
or [1] Only an appropriate diagram or graph is shown.
or [1] The horizontal distance is determined to be 3, and the vertical distance is determined to be 6, but the shortest distance is not found.
or [1] 6.7, 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.

[355]

[2] (1,1), and appropriate work is shown, such as a correct graph of $\overline{AB}$ and an appropriate explanation of how point A is found or the use of the midpoint formula.
[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, such as finding the midpoint of the given coordinates.
or [1] The midpoint and points A and B are graphed correctly, but the coordinates of point A are not stated or are stated incorrectly.
or [1] (1,1), 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.

[356]

[2] (-6,8) or -6,8 or x = -6 and y = 8 and an appropriate explanation is given, such as graphing the line or doubling the coordinates.
[1] One correct coordinate and one incorrect coordinate are found.
or [1] An appropriate method is shown, such as algebraic or graphing, but computational mistakes are made.
or [1] (-6,8) or -6,8 or x = -6 and y = 8 and no explanation is given.
or [1] Substitutions are correct for the midpoint formula, but computational mistakes are made.
or [1] The student properly locates point B on the graph but does not state its coordinates.
or [1] Point A and point M are reversed, resulting in B(3,-4), and an explanation is given.

[0] Only the midpoint of $\overline{AM}$ $\left(-\frac{3}{2}\right)$ is found.

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

[357]

[358] B

[359] C

[360] C

[361] C

[362] D

[4] 116 and an appropriate method is shown.
[3] An appropriate method is shown, but the answer is left in an inappropriate form, such as 116.2.
or [3] An appropriate method is shown, but 3 feet is not added, and the answer is left 113.
or [3] Tangent function is used, but computational mistakes are made, but 3 feet is added to the incorrect value and the answer is found correctly.
[2] An incorrect trigonometric function is used, 3 feet is added, and the answer is rounded correctly.
or [2] Tangent function is used, but computational mistakes are made, and 3 feet is not added to an incorrect answer.
[1] 116 and no work is shown.
or [1] An incorrect trigonometric function is used, and 3 feet is added to the incorrect answer, but the answer is rounded incorrectly.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[363]

[3] 12 and the equation $\tan x = \frac{420}{2000} = .21$ is shown.
or [3] 12 and the Pythagorean theorem and an appropriate trigonometric function are correctly used.
[2] Tan function is correctly used, but the answer is not rounded, such as 11.859.
or [2] The setup is correct, but one computational mistake is made, and an appropriate angle is found.
or [2] The answer is incorrectly expressed, such as tan x = 12.
[1] The tan function is set up correctly, but the angle is not computed.
or [1] 12 and no work is shown.
or [1] 12 and $\sin x = \frac{420}{2000}$ is used.
or [1] 78 and $\cos x = \frac{420}{2000}$ is used.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[364]

[3] 109 meters and appropriate work is shown by using an appropriate trigonometric ratio, such as $\tan 32° = \frac{y}{175}$.
[2] 109 meters but one rounding error is made.
or [2] The student uses an appropriate trigonometric function with an inverted ratio, such as $\tan 32° = \frac{175}{y}$, but completes the calculation appropriately, such as showing 280 meters.
[1] The student uses an incorrect trigonometric ratio but completes the calculation appropriately.
or [1] The student uses an inverted tangent ratio and makes one computational or rounding error.
or [1] The student uses the correct trigonometric ratio but solves it incorrectly or does not solve it at all.
or [1] 109 meters but no work or explanation 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.

[365]

[4] 114" (9 feet 6 inches) and 37" (3 feet 1 inch) and appropriate work is shown, such as $\sin 72° = \frac{x}{10}$ *and* $\cos 72° = \frac{y}{10}$ or use of the Pythagorean theorem.
[3] An incorrect diagram is drawn, but appropriate work and an appropriate solution for that diagram are shown.
or [3] Appropriate work is shown, but the answers are rounded to the nearest foot and then converted to inches, arriving at 120" and 36".
or [3] The setup is correct, but the answers are not converted to the nearest inch.
[2] One correct dimension is shown, such as 114" (9 feet 6 inches) or 37" (3 feet 1 inch).
or [2] Only one error involving interchanging sine and cosine is made.
or [2] An incorrect diagram is drawn, and the solution is appropriate for the diagram but is not rounded to the nearest inch.
[1] The student switches sine and cosine and does not round to the nearest inch.
or [1] The student uses the correct trigonometric function to compute one side correctly but does not convert it to the nearest inch.
or [1] 114" (9 feet 6 inches) and 37" (3 feet 1 inch) 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.

[366]

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[4] 28.2, and an appropriate equation is shown, such as $\tan 62 = \frac{x}{15}$.
[3] Appropriate work is shown, but the answer is rounded incorrectly.
or [3] The student uses the correct tangent function and rounds the answer, but makes one computational error.
[2] The student uses the correct tangent function, but makes several errors.
or [2] An incorrect trigonometric function is used, but appropriate work is shown.
[1] The tangent function is indicated, but the ratio is set up incorrectly.
or [1] 28.2, 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.

[367]

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[4] 153, and appropriate work is shown, such as $\sin 50° = \frac{x}{200}$.
[3] An appropriate analysis is shown, but one computational or rounding error is made.
[2] An incorrect trigonometric function is used, such as $\cos 50° = \frac{x}{200}$, but it is carried to an appropriate final answer and is rounded correctly.
[1] An incorrect trigonometric function is used and solved appropriately, but it is rounded incorrectly.
or [1] Only an appropriate diagram is shown.
or [1] 153, but no work is shown.
[0] Use of the Pythagorean theorem, such as $200^2 = 50^2 + x^2$, 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.

[368]

a [2] 59, and the equation $\tan x = \frac{280}{170}$ is shown, or the Pythagorean theorem is used first to find the hypotenuse, and either sine or cosine is used correctly to find x.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 59, but no work is shown.
b [2] 122, if the Pythagorean theorem is used or if a trigonometric function of the angle is used before it was rounded to 59°.
or [2] 120, if $\cos 59 = \frac{170}{hyp}$ is used.
or [2] 123, if $\sin 59 = \frac{170}{hyp}$ is used.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 122 or 120 or 123, 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.

[369]

a [2] 56, and appropriate work is shown, such as $\tan A = \frac{6}{4}$ or finding the hypotenuse and then using sine or cosine or using proportional sides of similar triangles.
[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 length of the hypotenuse is found correctly, but no further correct work is shown.
or [1] 56, but no work is shown.
b [2] 12, and appropriate work is shown, such as $\sin 56 = \frac{h}{15}$.
or [2] An appropriate answer is found based on an incorrect angle found in part a.
[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] 12, 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.

[370]

[2] 10, 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 using an incorrect trigonometric function.
or [1] Appropriate work is shown, but the length of the ladder is found.
or [1] 10, 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.

[371]

[4] 2,058, and appropriate work is shown, such as the accompanying diagram and equation.

[3] Appropriate work is shown, including a correct diagram and the use of the tangent function, but one computational error is made.
or [3] Appropriate work is shown, including a correct diagram and the use of the tangent function, but the answer is not rounded or is rounded incorrectly.
[2] A correct diagram is drawn, but an incorrect trigonometric function is selected, but it is solved and rounded appropriately.
or [2] A correct diagram is drawn and the tangent function is selected, but no further work is shown.
or [2] An incorrect diagram is drawn, but the appropriate trigonometric function, based on the drawing, is selected, solved, and rounded appropriately.
[1] An incorrect diagram is drawn and an incorrect trigonometric function is selected, but it is solved and rounded appropriately.
or [1] Only a correct diagram is drawn.
or [1] 2,058, 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.

[372]

[4] x = 19.62990915 and y = 9.814954576 or equivalent answers, and appropriate work is shown, such as $\sin 60° = \frac{17}{x}$ and $\tan 60° = \frac{17}{y}$ or the Pythagorean theorem.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Appropriate work is shown, and the correct answers are found, but not identified.
[2] Appropriate work is shown, but one conceptual error is made, such as $\sin 60° = \frac{x}{17}$.
or [2] Appropriate work is shown, but more than one computational or rounding error is made.
[1] Appropriate work is shown, but two conceptual errors are made, such as $\sin 60° = \frac{x}{17}$ and $\tan 60° = \frac{y}{17}$.
or [1] x = 19.62990915 and y = 9.814954576 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 procedure.

[373]

[4] 32, and appropriate work is shown, such as $12^2 + 16^2 = r^2$, $50 - r = s$, and $\sin x = \frac{16}{30}$.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown to find r = 20 and s = 30 and the trigonometric equation $\sin x = \frac{16}{30}$ is written, but it is not solved or is solved incorrectly.
[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, such as using an incorrect trigonometric function to find the angle.
or [2] The lengths of rand s are found correctly, but no further correct work is shown.
or [2] Incorrect lengths are found for rand s, but the sine function is used correctly to find an appropriate angle.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] The length of r is found correctly, but no further correct work is shown.
or [1] 32, 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.

[374]

[3] 45, and appropriate work is shown, such as $\tan 66° = \frac{x}{20}$.
[2] A correct trigonometric ratio is used, and values are substituted correctly, but one computational or rounding error is made, or the calculator is left in radian mode.
[1] Appropriate work is shown, but two or more computational or rounding errors are made.
or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric ratio.
or [1] An incorrect diagram is drawn, but an appropriate solution is found.
or [1] A correctly labeled diagram is drawn, but no further correct work is shown.
or [1] A correct trigonometric ratio is written, but no further correct work is shown.
or [1] 45, 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.

[375]

[376] C

[377] B

[378] C

[379] B

[380] D

[381] D

[382] A

[383] C

[2] $5rs^2\sqrt{2}$, and appropriate work is shown.
[1] A partially correct answer is found, such as $5r\sqrt{2s^4}$ or $5s^2\sqrt{2r^2}$, and appropriate work is shown.
or [1] $7.07rs^2$, but appropriate work is shown.
or [1] $5rs^2\sqrt{2}$, 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
[384] incorrect procedure.

[385] D

[386] A

[387] C

[388] C

[389] C

[390] D

[391] C

[392] A

[393] D

[394] A

[395] D

[396] C

[4] 4, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
or [3] Appropriate work is shown, but x = –1 is not rejected.
[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] A quadratic equation of equal difficulty is solved appropriately.
[1] Both sides of the equation are squared correctly, but no further correct work is shown.
or [1] 4, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[397] incorrect procedure.

[398] B

[4] –2 and –1, 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 value of q 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, such as squaring only the left side of the equation.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] –2 and –1, but no work is shown.
[0] –2 or –1, 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
[399] obviously incorrect procedure.

[2] 65,797.36, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] An incorrect derivation of the equation is solved appropriately.
or [1] 65,797.36, 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.

[400]

[4] 15.13, and appropriate work is shown, such as solving the equation $236.64 = \pi(4.75)\sqrt{(4.75)^2 + h^2}$.
[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] Correct substitution of values is made into the equation, but no further correct work is shown.
or [1] 15.13, 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.

[401]

[2] –17, and appropriate work is shown.
[1] Appropriate work is shown, but one conceptual error or one computational or graphing error is made.
or [1] –17, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[402]

[4] A correct table of values is provided, a correct graph is drawn, and 670; 12, and appropriate work is shown, such as extending the graph or solving algebraically.
[3] Appropriate work is shown, but one computational or graphing error is made.
or [3] A correct table of values is provided, a correct graph is drawn, and 670, but no further correct 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.
or [2] 670 and 12, but an algebraic solution is provided.
or [2] 670 and 12, but either the graph is not drawn or the table of values is not provided.
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [1] A correct graph is drawn, but no further correct work is shown.
or [1] A correct table of values is provided, but no further correct work is shown.
or [1] 670 and 12, but no work is shown and no graph is drawn.
[0] 670 or 12, but no work is shown and no graph is drawn.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[403]

[404] D

[405] D

[406] B

[407] D

[408] C

[409] A

[410] C

[411] A

[412] B

[413] B

[414] D

[415] B

[2] $4x^2 + 10x + 2$, and appropriate work is shown, such as $(9x^2 + 3x - 4) - (5x^2 - 7x - 6)$.
[1] The setup is correct, but the distribution of the negative sign is incorrect.
or [1] $14x^2 - 4x - 10$, but appropriate work is shown.
or [1] $4x^2 + 10x + 2$, 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
[416] incorrect procedure.

[417] D

[418] B

[419] B

[420] B

[421] D

[422] D

[423] A

[424] A

[425] D

[2] 3(x + 7)(x - 2), and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] A conceptual error is made, such as incomplete factoring.
or [1] 3(x + 7)(x - 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
[426] incorrect procedure.

[427] C

[428] B

[429] D

[430] A

[431] B

[2] 3a(x – 3)(x + 3), and appropriate work is shown.
[1] Appropriate work is shown, but one factoring error is made, or the expression is not factored completely.
or [1] 3a(x – 3)(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
[432] incorrect procedure.

[2] 5(n + 4)(n - 4), and appropriate work is shown.
[1] Appropriate work is shown, but one factoring error is made or the expression is not simplified completely.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[433] incorrect procedure.

[434] D

[435] B

[436] B

[437] C

[438] C

[439] C

[440] C

[441] B

[442] D

[443] B

[444] D

[3] –8 and 5 and appropriate work is shown, such as factoring or trial and error.
[2] The student shows correct factoring into $(x + 8)(x – 5)$ or correct use of the quadratic formula but finds only one correct value for x.
[1] Correct factoring is shown, but no values are found.
or
[1] Incorrect factoring is shown, but two appropriate values are found.
or
[1] Either –8 or 5 is arrived at by trial and error.
or
[1] –8 and 5 and no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[445]

[3] –7 and 4, and appropriate work is shown, such as factoring.
[2] Correct factoring (x + 7)(x – 4) is shown, but only one correct value of x is found.
or [2] Correct factoring is shown, but the negative value of x is rejected.
[1] Correct factoring is shown, but the values of x are not found.
or [1] Incorrect factoring is shown, but appropriate values are found.
or [1] Only one value is found by trial and error.
or [1] –7 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 procedure.

[446]

[4] (3,14) and (–2,–1) and either an algebraic or a graphic solution is shown.
[3] An appropriate method is shown, but only one correct ordered pair is identified.
or [3] An appropriate method is shown, but one computational mistake is made.
or [3] An appropriate method is shown, but values are given only for x.
[2] The substitution is correct, but the quadratic produced is not factored correctly.
or [2] Both equations are graphed correctly, but neither ordered pair is identified.
[1] Only one equation is graphed correctly.
or [1] The substitution is incorrect, but it produces a linear equation that is solved correctly.
or [1] Only the substitution is correct.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[447]

[4] (–3,–5) and (1,3), and appropriate algebraic work is shown.
[3] Appropriate algebraic work is shown, but x = –3 and x = 1 are given as the solution.
or [3] Appropriate algebraic work is shown, but only one correct solution is given, such as (1,3).
[2] (–3,–5) and (1,3), but a graphic solution is shown.
or [2] Correct substitution and an algebraic equation set equal to zero are shown, but the result is not factored, such as x2 + 2x – 3 = 0.
[1] Any correct substitution is shown, such as 2x + 1 = x2 + 3x – 2.
or [1] (–3,–5) and (1,3), but no algebraic 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.

[448]

[3] $y = x^2 + 3x - 18$, and appropriate work leading from the roots to the equation is shown.
[2] Appropriate work is shown, but one computational error is made.
or [2] $x^2 + 3x - 18 = 0$, but appropriate work is shown.
or [2] Only the correct factors (x + 6) and (x – 3) are shown.
[1] Appropriate work is shown, but more than one computational error is made.
or [1] Only the roots –6 and 3 are shown, such as x = –6, x = 3.
or [1] $y = x^2 + 3x - 18$, 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.

[449]

[3] 4, 6, and 8, and appropriate work is shown, such as the correct quadratic equation or trial and error with at least three trials and appropriate checks.
[2] The correct quadratic equation is solved, but one computational error is made, but three appropriate ages are listed.
or [2] The correct quadratic equation is solved, but the negative root is not rejected, but three appropriate ages are listed.
or [2] The correct quadratic equation is solved, but only one age is found.
or [2] The trial-and-error method is used to find a correct solution, but only two trials and appropriate checks are shown.
[1] An incorrect equation of lesser difficulty is solved appropriately, and the three ages are listed.
or [1] An incorrect quadratic equation of equal difficulty is solved appropriately, and the three ages are listed.
or [1] The correct quadratic equation is shown, but more than one computational error is made.
or [1] The correct quadratic equation is shown, but no further correct work is shown.
or [1] 4, 6, and 8, but no work or only one trial with an appropriate check 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.

[450]

[4] 3, 5, and 7, and appropriate work is shown, such as an appropriate quadratic equation or trial-and-error method.
[3] An appropriate equation is written and solved, but one computational error is made.
or [3] An appropriate equation is written and solved, but the even solutions are also listed.
[2] An incorrect quadratic equation is shown, but it is solved appropriately.
or [2] Integers are misrepresented, but the subsequent quadratic equation is solved appropriately.
or [2] An appropriate equation is written and solved, but more than one computational error is made.
or [2] The correct solution is given, but only one trial is shown with appropriate checks when a trial-and-error method is used.
[1] A linear equation is solved appropriately.
or [1] 3, 5, and 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
[451] incorrect procedure.

[452] A

[453] A

[454] B

[455] C

[456] C

[457] C

[458] C

[459] C

[2] $\frac{3x}{3x+5y}$
[1] One correct factoring is shown, either 3x(3x – 5y) or (3x – 5y)(3x + 5y).
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[460] incorrect procedure.

[2] $\frac{x-3}{3}$ and multiplication by the reciprocal, correct factoring, and canceling are shown.
[1] The difference of two squares, $x^2-9=(x+3)(x-3)$, is factored correctly.
or [1] Appropriate work is shown, but the final answer is incorrect.
or [1] $\frac{x-3}{3}$ 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
[461] incorrect procedure.

[462] B

[463] D

[464] C

[465] A

[466] C

[467] B

[4] 3 and –5, and appropriate work is shown, such as $x(x + 7) = 5(x + 3)$ or trial and error with at least three trials and appropriate checks for each solution.
[3] Appropriate work is shown, but one computational or factoring error is made.
or [3] Appropriate work is shown, but only one correct solution is found.
or [3] The trial-and-error method is used to find both correct solutions, but only two trials and appropriate checks are shown for each solution.
[2] Appropriate work is shown, but two or more computational or factoring errors are made.
or [2] A correct quadratic equation is written and factored, but no further correct work is shown.
or [2] The trial-and-error method is attempted and at least six systematic trials and appropriate checks are shown, but neither solution is found.
[1] A correct quadratic equation is written, but no further correct work is shown.
or [1] 3 and –5, but no work or only one trial with an appropriate check is shown.
[0] 3 or –5, but no work or only one trial with an appropriate check is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[468] obviously incorrect procedure.

[4] 2 and –3, and a correct quadratic equation is shown, such as $x(x + 1) = 6$, and solved algebraically.
[3] The student shows a correct quadratic equation but makes one algebraic error and carries it to solution or no solution for the equation generated.
or [3] Correct work is shown, but only one root is found as the answer.
[2] A correct quadratic equation is used, but two or more errors are made.
or [2] An incorrect quadratic equation of equal difficulty is shown and solved appropriately.
[1] The student cross multiplies but produces only a linear equation that is solved appropriately.
or [1] 2 and –3, but no algebraic work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[469] incorrect procedure.

[470] C

[471] B

[472] D

[473] C

[474] A

[475] B

[476] B

[477] B

[3] 490, and appropriate work is shown, such as 7•7•10.
[2] Appropriate work is shown, but one computational error is made.
or [2] Appropriate work is shown, but an incorrect answer is found, based on an incorrect number of possible dessert combinations or an incorrect number of soup or appetizer choices.
or [2] Appropriate work is shown, but an incorrect answer is found, based on one error in the tree diagram.
or [2] $\frac{1}{490}$, but appropriate work is shown.
[1] 7, 7, and 10 are added instead of multiplied.
or [1] The counting principle is used correctly, but incorrect substitutions are made, but an appropriate answer is shown.
or [1] 490, 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
[478] incorrect procedure.

[2] 72 and an appropriate method, such as $3 \times 6 \times 4$, is shown.
[1] 72 and no explanation is given.
or [1] An appropriate method is shown, but the student has one computational mistake or an incomplete listing, such as 2 of the 3 clothing categories.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[479] incorrect procedure.

[480] D

[481] B

[482] D

[483] D

[484] C

[485] A

[486] D

[487] A

[488] A

[2] 8,100 and appropriate work is shown, such as $9 \times 10 \times 10 \times 9$.
[1] 10,000 but appropriate work is shown.
or [1] Appropriate work is shown, but the student multiplies incorrectly.
or [1] An appropriate pattern is shown, such as $9 \times 10 \times 10 \times 9$.
or [1] 8,100 but no work is shown.
[0] 38 is shown.
or [0] The student attempts to use the counting principle, but adds.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[489] obviously incorrect procedure.

[4] 7.98×10^6 or 7,980,000 and appropriate work is shown, such as $8 \times 10^6 - 2 \times 10^4$.
[3] Appropriate work is shown, but one computational error is made.
or [3] The student uses 1–9 instead of 0–9 as the number of digits in $8 \times 9^6 - 2 \times 9^4$.
[2] The student correctly produces only one part, 8×10^6 or 2×10^4, but carries the process to an appropriate result.
or [2] Appropriate work is shown, but more than one error is made.
[1] The student produces only one part, 8×9^6 or 2×9^4.
or [1] 7,980,000 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
[490] incorrect procedure.

[2] 37,440 and appropriate work is shown, such as 2 x 26 x 10 x 9 x 8 or ${}_2P_1 \times {}_{26}P_1 \times {}_{10}P_3$.
[1] Appropriate work is shown, but one computational or conceptual error is made.
or [1] Appropriate work is shown for at least one restriction, such as 2 x 26 or 10 x 9 x 8.
or [1] 37,440 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
[491] incorrect procedure.

[3] Option 2 will yield 82,576,000 more possibilities, and appropriate work is shown, such as $26^3 \bullet 10^4$ and ${}_{26}P_4 \bullet {}_{10}P_3$.
[2] Appropriate work is shown, but one computational error is made, but the appropriate option is identified.
or [2] The correct numbers of arrangements are found for both Option 1 and Option 2, but the question of which option will yield more arrangements is not answered or is answered incorrectly.
[1] Appropriate work is shown, but more than one computational error is made, but the appropriate option is identified.
or [1] Appropriate work is shown, but one conceptual error is made, but the appropriate option is identified.
or [1] Either Option 1 or Option 2 is found correctly, but no further correct work is shown.
or [1] Option 2 will yield 82,576,000 more possibilities, but no work is shown.
[0] Option 2, but no work or inappropriate work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[492] obviously incorrect procedure.

[2] 120, and appropriate work is shown, such as 1 • 5 • 4 • 3 • 2 • 1.
[1] Appropriate work is shown, but one computational error is made.
or [1] 720 and ${}_6P_6$ or 6! is shown.
or [1] 120, 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
[493] incorrect procedure.

[2] 210, and appropriate work is shown, such as 7 • 6 • 5 or ${}_7P_3$.
[1] Appropriate work is shown, but no answer or an incorrect answer is found.
or [1] 210, 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
[494] incorrect procedure.

[495] B

[496] C

[497] D

[498] C

[499] A

[500] D

[501] A

[3] 150, and appropriate work is shown, such as ${}_5C_2 \bullet {}_6C_2$.
[2] Appropriate work is shown, but one computational error is made.
or [2] All the possible combinations of two mystery books and all the possible combinations of two biographies are calculated, but the answers are not multiplied.
[1] Appropriate work is shown, but more than one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as the computation ${}_{11}C_4 = 330$.
or [1] 150, 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.

[502]

[2] 6 and appropriate work is shown, such as using the combination ${}_4C_2$, listing all six possible outcomes, or drawing a correct tree diagram.
[1] A correct setup of combinations is shown, but an incorrect solution, such as leaving ${}_4C_2$, or no integral solution is found.
or [1] An appropriate list or tree diagram is shown, but an incorrect solution is found, such as 5, by omitting one of the possible combinations.
or [1] 12 but a complete list or tree diagram is shown.
or [1] 6 but no work is shown.
[0] The answer is completely incorrect, such as ${}_4P_2$ or 4×3.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[503]

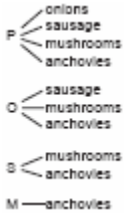
[2] 20,349, and appropriate work is shown, such as ${}_{21}C_5 = 20{,}349$.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as determining the value of ${}_{21}P_5$.
or [1] 20,349, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[504]

a [2] 10 and an appropriate tree diagram, list, sample space, or ${}_5C_3 = 10$ is shown.
[1] 10 and no work is shown.
or [1] An appropriate method is shown, but not all 10 possible combinations are listed
b [1] $\frac{1}{10}$
or [1] An appropriate answer is found for an incorrect response in part a.
c [1] $\frac{4}{10}$ *or* $\frac{2}{5}$ *or* 0.4
or [1] An appropriate answer is found for an incorrect response in part a.
a and b and c [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[505]

[4] $\frac{4}{10}$ and appropriate work is shown, such as the following illustration or any other correct method:



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

or [3] Appropriate work and complement $\frac{6}{10}$ are shown.

or [3] Appropriate work is shown, but the answer is incomplete.

[2] ${}_5C_2$ and the work is appropriate but incomplete.

or [2] 10 but appropriate work is shown.

or [2] A correct sample space or tree diagram is shown.

[1] Incorrect work leading to $0 \le \text{fraction} \le 1$ or $0 \le \text{percent} \le 100$ is shown.

or [1] $\frac{4}{10}$ 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.

[506]

[3] $\frac{8}{20}$ or an equivalent answer, and appropriate work is shown, such as using a tree diagram or writing the equation $\frac{6}{20}+\frac{2}{20}=\frac{8}{20}$.

[2] One computational error is made in finding $\frac{6}{20}$ or $\frac{2}{20}$, but an appropriate sum is found.

or [2] $\frac{2}{20}$ and $\frac{6}{20}$ are found, but no sum is shown.

[1] $\frac{6}{20}$ or $\frac{2}{20}$, and appropriate work is shown.

or [1] An appropriate answer is found, using replacement with a tree diagram or an equation such as $\frac{3}{5}\bullet\frac{3}{5}+\frac{2}{5}\bullet\frac{2}{5}=\frac{13}{25}$.

or [1] $\frac{8}{20}$, 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.

[507]

[4] No, and an appropriate explanation is given, such as $P(15) = \frac{6}{56} < P(2) = \frac{12}{56}$.

[3] One of the two probabilities is found correctly, but one computational error is made in finding the other, but an appropriate conclusion is drawn, based on the values found.

or [3] Replacement is used to conclude $P(15) = \frac{6}{64} < P(2) = \frac{12}{64}$.

or [3] The two probabilities are found correctly, but no conclusion or the incorrect conclusion is drawn.

[2] One of the probabilities is found correctly, but one computational error is made in finding the other, and no conclusion or the incorrect conclusion is drawn.

[1] An appropriate method is used, such as a tree diagram or sample space, but the probabilities are not determined or are determined incorrectly.

or [1] $P(15) = \frac{6}{56} < P(2) = \frac{12}{56}$, but no work is shown.

[0] No, 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.

[508]