

# JEFFERSON MATH PROJECT

## REGENTS BY TOPIC

All 923 NY Math A Regents Exam Questions  
from June 1999 to August 2007 Sorted by Topic  
(Answer Key)

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Dear Sir

I have to acknowledge the receipt 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 indispensable 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] D

[2] An irrational number is written, and an appropriate explanation is written, such as an irrational number cannot be written as a fraction or as a repeating or terminating decimal.

[1] An irrational number is written, such as  $\pi$  or the square root of a nonperfect square, but no explanation or an inappropriate explanation is written.

or [1] A correct definition of an irrational number is written, but the example is missing or is inappropriate.

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

[2] incorrect procedure.

[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

[3] obviously incorrect procedure.

[4] A

[5] B

[6] B

[7] C

[8] A

[9] A

[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

[10] incorrect procedure.

[11] D

[12] A

[13] D

[14] C

[15] A

[2]  $2\frac{4}{5}$ ,  $\sqrt{8}$ ,  $3.\bar{1}$ ,  $\pi$ ,  $2\sqrt{3}$  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]  $2\frac{4}{5}$ ,  $\sqrt{8}$ ,  $3.\bar{1}$ ,  $\pi$ ,  $2\sqrt{3}$ , 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

[16] incorrect procedure.

[17] A

[18] A

[19] C

[20] A

[21] C

[22] B

[23] A

[24] C

[25] D

[26] D

[27] A

[28] A

[29] C

[30] B

[31] B

[32] C

[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

[33] obviously incorrect procedure.

[34] D

[35] C

[36] B

[37] A

[38] C

[39] A

[40] C

[41] A

[42] C

[43] B

[44] B

[45] A

[46] B

[47] C

[48] A

[49] D

[50] A

[51] B

[52] B

[53] A

[54] A

[55] D

[56] B

[57] C

[58] B

[59] D

[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

[60] incorrect procedure.

[61] B

[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

[62] incorrect procedure.

[63] B

[64] B

[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

[65] incorrect procedure.

[66] D

[67] A

[68] D

[69] A

[70] C

[71] A

[72] C

[73] C

[74] A

[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

[75] incorrect procedure.

[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

[76] incorrect procedure.

[77] D

[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

[78] incorrect procedure.

*a* [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.  
[79] \_\_\_\_\_

*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 incorrect procedure.  
[80] \_\_\_\_\_

[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.

[81] \_\_\_\_\_

[4] The table is completed correctly, and an appropriate cumulative frequency histogram is drawn and labeled.

[3] The table is completed correctly, but one error is made in drawing the cumulative frequency histogram or one or more labeling errors are made.

or [3] The table is not completed correctly, but an appropriate cumulative frequency histogram is drawn, based on the table.

[2] One error is made in completing the table, and one graphing error is made in drawing the cumulative frequency histogram.

or [2] The table is completed correctly, but one conceptual error is made, such as drawing a frequency histogram or a cumulative frequency bar graph.

[1] The table is completed correctly, but no histogram 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.

[82] \_\_\_\_\_

[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

[83] obviously incorrect procedure.

[84] B

[85] D

[86] A

[87] D

[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

[88] incorrect procedure.

[89] B

[90] C

[91] 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

[92] 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

[93] incorrect procedure.

- [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 incorrect procedure.
- [94] \_\_\_\_\_
- [2] 8, and appropriate work is shown.
- [1] Appropriate work is shown, but one computational error is made.  
or [1] Appropriate work is shown, but one conceptual error is made.  
or [1] 8, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [95] \_\_\_\_\_
- [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 incorrect procedure.
- [96] \_\_\_\_\_
- [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 obviously incorrect procedure.
- [97] \_\_\_\_\_
- [98] C \_\_\_\_\_
- [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.
- [99] \_\_\_\_\_
- [2] 6, 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] 1, the number of friends with only a VGR player, is found, and appropriate work is 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.
- [100] \_\_\_\_\_
- [101] D \_\_\_\_\_



[102] B

[103] B

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

[104] incorrect procedure.

[105] A

[106] B

[107] 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

[108] incorrect procedure.

[2] 77, and appropriate work is shown, such as  $(76 + 78) \div 2$ .

[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

[109] incorrect procedure.

[110] D

[111] C

[112] D

[3] Mean = 79, median = 79, and mode = 78, and appropriate work is shown.

[2] Appropriate work is shown, but only two of the three measures of central tendency are determined and identified correctly.

or [2] Appropriate work is shown and all three measures of central tendency are determined correctly, but the measures are not identified or are identified incorrectly.

[1] Appropriate work is shown, but only one of the three measures of central tendency is determined and identified correctly.

or [1] Mean = 79, median = 79, and mode = 78, but no work is shown.

[0] 79, 79, and 78, but no work is shown, and the answers are not identified or are identified incorrectly.

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

[113] obviously incorrect procedure.

[114] A

[115] B

[116] C

[117] D

[3] 34 and an appropriate explanation is given, such as  $38 = \frac{46 + 2x}{3}$ .

[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

[118] incorrect procedure.

[119] A

[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  $5 \times 360 = 1800$ , 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

[120] incorrect procedure.

[121] C

[122] B

[3] 59 or  $59^\circ$ , and appropriate work is shown,  
such as  $63 = \frac{256+x}{5}$  or

$56 + 72 + 67 + 61 = 256$ ,  $63 \times 5 = 315$ , 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  $59^\circ$ , 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

[123] incorrect procedure.

[124] B

[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

[125] incorrect procedure.

[126] C

[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

[127] incorrect procedure.

[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

[128] incorrect procedure.

- [4] Angelo is 66, Brandon is 26, and Carl is 31, and appropriate work is shown, such as solving an equation or trial and error with at least three trials and appropriate checks.
- [3] Appropriate work is shown, but one computational error is made.
- or [3] 66, 26, and 31, and appropriate work is shown, but the solutions 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] The trial-and-error method is used to find a correct solution, 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] Carl is 31, and appropriate work is shown, but the ages of the other men are not found.
- or [2] An incorrect equation of equal difficulty is solved appropriately.
- [1] Appropriate work is shown, but one conceptual error and one computational error are made.
- or [1] A correct equation is written, but no further correct work is shown.
- or [1] Angelo is 66, Brandon is 26, and Carl is 31, but no work or only one trial with an appropriate check is shown.
- [0] Angelo is 66 or Brandon is 26 or Carl is 31, but no work is shown.
- or [0] 66, 26, and 31, but no work is shown, and the answers 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 obviously incorrect procedure.
- [129] \_\_\_\_\_
- [130] D
- [131] B
- [132] B
- [133] B
- [134] A
- [135] C
- [136] C
- [137] A
- [138] C
- [139] C
- [140] B
- [141] C
- [142] B
- [143] A
- [144] A
- [145] 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

[146] incorrect procedure.

[3]  $\frac{7}{20}$  or an equivalent answer, and

appropriate work is shown, such as  $\frac{15}{25} \cdot \frac{14}{24}$

or  $\frac{{}_{15}C_2}{{}_{25}C_2}$ .

[2]  $\frac{15}{25} \cdot \frac{14}{24}$  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

[147] incorrect procedure.

[148] A

[2]  $\frac{800}{900}$  or an equivalent answer, and

appropriate work is shown, such as finding the areas of the two squares, subtracting the area of the smaller square from the area of the larger square, and setting up a correct ratio.

[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 calculating the perimeters of the squares instead of the areas.

or [1] Appropriate work is shown, but  $\frac{100}{900}$  or

an equivalent answer (the complement of the correct answer) is found.

or [1] The areas of the squares are calculated incorrectly, but an appropriate probability is found.

or [1]  $\frac{800}{900}$  or an equivalent answer, but no work is shown.

[0] The areas of the squares are calculated correctly, but no probability is stated.

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

[149] obviously incorrect procedure.

[4]  $\frac{8}{36}$  or  $\frac{2}{9}$  or 2:9, and all three lines are

graphed correctly and the triangle's area is shown to be 8 and the square's area is shown to be 36.

[3] The three lines are graphed correctly, but one area is incorrect, but the probability is appropriate, based on this error.

or [3] The graphs and areas are correct, but the probability is incorrect, based on one computational error.

or [3] The three lines are graphed correctly and both areas are calculated correctly, but the probability is not found.

or [3] One equation is graphed incorrectly, but the area is appropriate, based on the graph, and the probability is appropriate, based on the areas.

[2] The three lines are graphed correctly, but the area of the smaller triangle is used, but the probability is appropriate, such as  $\frac{2}{36}$ .

or [2] Two or three lines are graphed incorrectly, but the areas and the probability are appropriate.

or [2] The lines are graphed correctly, but the areas are incorrect, but the probability is appropriate, based on the errors.

[1] All graphs and the areas are incorrect, but the probability is appropriate.

or [1]  $\frac{8}{36}$  or  $\frac{2}{9}$  or 2:9, 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

[150] incorrect procedure.

[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 incorrect procedure.

---

[151] \_\_\_\_\_

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 incorrect procedure.

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[152] \_\_\_\_\_

[2] 12, and a correct tree diagram or a correct sample space is shown.  
[1] An incomplete tree diagram or sample space is shown with at least 8 possible combinations shown, and an appropriate number of outfits is found.  
or [1] A correct tree diagram or sample space is shown, but the number of possible outfits is missing or is incorrect.  
or [1] 12, but  $3 \times 4$  is used to find the number of outfits.  
[0] 12, 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.

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[153] \_\_\_\_\_

[154]       D      

[155]       D      

[156]       D      

[157]       D      

[158]       B      

[159]       B      

[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 incorrect procedure.

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[160] \_\_\_\_\_

[161]       D      

[162]       C      

[163]       C      

[164]       B      

[165]       B      

[166]       C      

[3] 1,344, and appropriate work is shown, such as  $8 \cdot 7 \cdot 6 \cdot 4$ .  
[2] Appropriate work is shown, but one computational error is made.  
[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, such as basing the answer on ordering an appetizer and a soup, using  $5 \cdot 3 \cdot 7 \cdot 6 \cdot 4$ .  
or [1] 1,344, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

---

[167] \_\_\_\_\_

[168]       D

[169] C

[170] D

[171] C

[172] A

[173] B

[174] B

[175] C

[176] B

[177] B

[178] C

[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

[179] obviously incorrect procedure.

[180] C

[2] 120, and appropriate work is shown, such as  $1 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ .

[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

[181] incorrect procedure.

[2] 210, and appropriate work is shown, such as  $7 \cdot 6 \cdot 5$  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

[182] incorrect procedure.

[4]  $7.98 \times 10^6$  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,  $8 \times 10^6$  or  $2 \times 10^4$ , 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,  $8 \times 9^6$  or  $2 \times 9^4$ .

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

[183] incorrect procedure.

[2] 37,440 and appropriate work is shown, such as  $2 \times 26 \times 10 \times 9 \times 8$  or  ${}_2P_1 \times {}_{26}P_1 \times {}_{10}P_1 \times {}_9P_3$ .

[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  $2 \times 26$  or  $10 \times 9 \times 8$ .

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

[184] incorrect procedure.



[3] Option 2 will yield 82,576,000 more possibilities, and appropriate work is shown, such as  $26^3 \cdot 10^4$  and  ${}_{26}P_4 \cdot {}_{10}P_3$ .

[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

[185] obviously incorrect procedure.

[186] D

[187] C

[188] C

[189] D

[190] C

[191] D

[192] A

[193] B

[194] B

[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  $4 \times 3$ .

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

[195] obviously incorrect procedure.

[196] D

[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

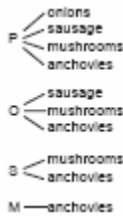
[197] incorrect procedure.

[198] D

- [2] 10, and appropriate work is shown, such as  ${}_5C_2$  or a diagram or a list.
- [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] 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.
- [199] \_\_\_\_\_
- [3] 490, and appropriate work is shown, such as  $7 \cdot 7 \cdot 10$ .
- [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 incorrect procedure.
- [200] \_\_\_\_\_
- [201] A

- [3] 150, and appropriate work is shown, such as  ${}_5C_2 \cdot {}_6C_2$ .
- [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.
- [202] \_\_\_\_\_
- 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.
- [203] \_\_\_\_\_

[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  $0 \leq \text{fraction} \leq 1$  or  $0 \leq \text{percent} \leq 100$  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

[204] incorrect procedure.

[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  $\frac{3}{5} \cdot \frac{3}{5} + \frac{2}{5} \cdot \frac{2}{5} = \frac{13}{25}$ .

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

[205] incorrect procedure.

[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

[206] obviously incorrect procedure.

*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

[207] incorrect procedure.

- [3] 4, and appropriate work is shown.  
[2] Appropriate work is shown, but one computational error is made.  
[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] 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.
- [208] \_\_\_\_\_
- [209] D
- [210] A
- [211] D
- [212] B
- [213] B
- [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 incorrect procedure.
- [214] \_\_\_\_\_

- [2] 6, and appropriate work is shown, such as solving the equation  $2x + 3 = 15$  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 one conceptual error is made.  
or [1] A correct equation is written, but no further correct work is shown.  
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] 6, but no work or fewer than three trials and 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.
- [215] \_\_\_\_\_
- [216] D
- [217] A
- [218] D
- [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 incorrect procedure.
- [219] \_\_\_\_\_
- [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 incorrect procedure.
- [220] \_\_\_\_\_
- [221] C
- [222] B

[223] D

[2] 2.1, and appropriate work is shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] Appropriate work is shown, but one conceptual error is made.  
or [1] 2.1, 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

[224] incorrect procedure.

[225] A

[226] A

[2] 10, and appropriate work is shown, such as solving the equation 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 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 no solution is found.  
or [1] 10, but no work or fewer than three trials and 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

[227] incorrect procedure.

[228] C

[229] A

[230] D

[231] D

[232] A

[233] A

[234] C

[235] D

[236] 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

[237] 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

[238] incorrect procedure.

[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

[239] incorrect procedure.

[240] C

[241] A

[242] B

[243] D

[244] B

[245] C

[246] C

[247] B

[2] 5 and appropriate work is shown, such as substituting \$18.11 for  $p$  and solving the equation correctly, 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 one conceptual error is made.

or [1] 5, 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

[248] incorrect procedure.

[249] A

[250] D

[251] A

[252] C

[253] D

[254] B

[255] A

[256] C

[257] B

[258] D

[259] C

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

[260] incorrect procedure.

[261] A

[2]  $6\frac{2}{3}$  or 6 hr 40 min or  $6.\overline{66}$  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  $6.\overline{66}$  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

[262] incorrect procedure.

[263] A

[264] B

[265] B

[266] D

[267] C

[268] B

[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

[269] incorrect procedure.

[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 obviously

[270] incorrect procedure.

[271] C

[272] C

[273] C

[2] 70.92, and appropriate work is shown, such as a proportion.

[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] 70.92, 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

[274] incorrect procedure.

[275] D

[276] D



[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

[277] incorrect procedure.

[2] 50, and appropriate work is shown, such as solving the equation  $10 = \frac{5}{9}(F - 32)$ .

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

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

or [1] Correct substitution is made into the equation, 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

[278] incorrect procedure.

[3] A correct graph is shown, and an answer between  $-6^{\circ}$  and  $-2^{\circ}$  is found.

[2] A correct formula is used, and  $-4^{\circ}\text{C}$  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  $5^{\circ}\text{C}$  instead of  $-5^{\circ}\text{C}$ .

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  $-6^{\circ}$  and  $-2^{\circ}$  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

[279] obviously incorrect procedure.

[280] B

[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

[281] incorrect procedure.

[282] D

[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

[283] 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

[284] incorrect procedure.

[285] C

[286] B

[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

[287] incorrect procedure.

[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

[288] 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  $\frac{1}{2}(\frac{8}{10}) = \frac{4}{10}$  have been restored,

therefore  $\frac{2}{10} + \frac{4}{10} = \frac{6}{10}$  have power; on

Wednesday  $\frac{2}{10}$  lose power, therefore

$(\frac{8}{10})(\frac{6}{10}) = \frac{48}{100}$  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

[289] incorrect procedure.

[2] 78.6%, and appropriate work is shown.

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

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

or [1] 78.6%, but no work is shown.

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

[290] incorrect procedure.

[2] 20.7, and appropriate work is shown, such as  $\frac{141288}{683748} = \frac{x}{100}$ .

[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] 20.7, 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

[291] incorrect procedure.

[292] A

[2] 20, and appropriate work is shown, such as  $(180 \div 0.9) - 180$ .

[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  $180 \times 0.9$  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

[293] incorrect procedure.

[294] C

[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

[295] incorrect procedure.

[296] A

[3] No, it will not differ and the student shows that both methods lead to \$47.08, such as  $\$55 \times .80 = \$44$ ,  $\$44 \times 1.07 = \$47.08$ ,  $\$55 \times 1.07 = \$58.85$ , and  $\$58.85 \times .80 = \$47.08$ .

[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 obviously incorrect procedure.

[297] \_\_\_\_\_

[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

[298] \_\_\_\_\_

[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

[299] \_\_\_\_\_

[300] A

[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

[301] \_\_\_\_\_

- [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.
- [302] \_\_\_\_\_
- [303] C \_\_\_\_\_
- [304] B \_\_\_\_\_
- [2] 20, and appropriate work is shown, such as  $\frac{15}{150} = \frac{2}{x}$ .
- [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 expressing the answer as  $\frac{1}{3}$  hour.
- 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 incorrect procedure.
- [305] \_\_\_\_\_

- [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.
- [306] \_\_\_\_\_
- [307] C \_\_\_\_\_
- [308] B \_\_\_\_\_
- [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.
- [309] \_\_\_\_\_
- [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.
- [310] \_\_\_\_\_
- [311] C \_\_\_\_\_

[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

[312] incorrect procedure.

[313] B

[3] 499 days and appropriate work is shown,

such as  $\frac{17,000,000 \text{ miles}}{1420 \frac{\text{miles}}{\text{hour}} \times 24 \frac{\text{hours}}{\text{day}}}$ .

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

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

[1]  $1.7 \times 10^7 = 17,000,000$  is shown.

or [1]  $\frac{1.7 \times 10^7}{1420} = 11,971.831$  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

[314] obviously incorrect procedure.

[315] C

[316] C

[317] B

[318] A

[319] B

[320] C

[321] B

[322] B

[323] D

[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

[324] incorrect procedure.

- [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 obviously incorrect procedure.
- [325] \_\_\_\_\_
- [326] C \_\_\_\_\_
- [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 incorrect procedure.
- [327] \_\_\_\_\_
- [328] C \_\_\_\_\_
- [329] B \_\_\_\_\_
- [330] C \_\_\_\_\_
- [331] B \_\_\_\_\_
- [332] 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.
- [333] \_\_\_\_\_
- [334] A \_\_\_\_\_
- [335] D \_\_\_\_\_
- [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.
- [336] \_\_\_\_\_
- [337] A \_\_\_\_\_
- [338] A \_\_\_\_\_
- [339] C \_\_\_\_\_
- [340] B \_\_\_\_\_
- [341] A \_\_\_\_\_
- [342] A \_\_\_\_\_
- [343] A \_\_\_\_\_
- [344] C \_\_\_\_\_

[345] D

[346] A

[347] B

[348] B

[349] D

[350] A

[351] 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

[352] incorrect procedure.

[353] B

[354] C

[355] A

[356] C

[357] C

[358] B

[359] C

[360] A

[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

[361] incorrect procedure.

[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  $\overline{AM}$   $(-\frac{3}{2}, 2)$  is found.

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

[362] incorrect procedure.

[363] D

[364] A



[365] D

[366] B

[367] A

[368] C

[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

[369] 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

[370] 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

[371] obviously incorrect procedure.

[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

[372] incorrect procedure.

[373] C

[374] B

[375] C

[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

[376] obviously incorrect procedure.

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 (1) 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

[377] 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

[378] obviously incorrect procedure.

[2] 4.5 and an appropriate method is shown, such as the equation  $3x + x + 2 = 20$  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

[379] incorrect procedure.

[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

[380] incorrect procedure.

[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

[381] 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

[382] 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

[383] 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 incorrect procedure.
- 
- [384] 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.
- 
- [385] incorrect procedure.
- [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.
- 
- [386] incorrect procedure.

[4] 17 nickels and 15 dimes, and appropriate work is shown, such as the equation  $0.05x + 0.10(32 - x) = 2.35$  or trial and error with at least three trials and appropriate checks.  
[3] Appropriate work is shown, but one computational error is made.  
or [3] Appropriate work is shown, and the correct answers are found, but they are not labeled or are labeled incorrectly.  
or [3] Appropriate work is shown, but only the correct number of nickels or the correct number of dimes is found and labeled.  
[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 trial-and-error method is used to find the correct solution, 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] An incorrect system of equations of equal difficulty is solved appropriately for both the number of nickels and dimes.  
or [2] A correct equation is solved for  $x$ , but no further correct work is shown.  
[1] Appropriate work is shown, but one conceptual error and one computational error are made.  
or [1] A correct equation is written, but no further correct work is shown.  
or [1] 17 nickels and 15 dimes, but no work or only one trial with an appropriate check is shown.  
[0] 17 nickels or 15 dimes, but no work or only one trial with an appropriate check is shown.  
or [0] 17 and 15, but no work is shown, and the answers 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

[387] obviously incorrect procedure.

[388] C

[389] A

[390] 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

[391] incorrect procedure.

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

[392] obviously incorrect procedure.

[3] 345, and appropriate work is shown, such as solving the inequality  $1450x > 500,000$ , solving an equation, or trial and error with at least three trials and appropriate checks.

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

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

or [1] A correct inequality or equation is written, but no further correct work is shown.

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] 345, 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

[393] incorrect procedure.

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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

[394] obviously incorrect procedure.

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[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

[395] incorrect procedure.

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[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

[396] incorrect procedure.

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[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

[397] incorrect procedure.

[398] B

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 (1) 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

[399] obviously incorrect procedure.

[400] C

[401] C

[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  $x^2 + 2x - 3 = 0$ .

[1] Any correct substitution is shown, such as  $2x + 1 = x^2 + 3x - 2$ .

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

[402] 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]  $(-1,-2)$  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 obviously incorrect procedure.  
[403] \_\_\_\_\_

[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.  
[404] \_\_\_\_\_

[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 incorrect procedure.  
[405] \_\_\_\_\_

[406] B \_\_\_\_\_

[407] C \_\_\_\_\_

a [2] A correct circle is sketched with its center at (2,1) and a radius of 3 and the line  $2x + y = 8$  is drawn.

[1] Only one of the graphs is sketched correctly.

b [1] 2

or [1] The correct number of intersections is found, based on the incorrect graphs 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

[408] obviously incorrect procedure.

[4] (3,4) and (-3,-4), and a correct algebraic or graphic solution is shown.

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

or [3] Appropriate work is shown for an algebraic or graphic solution, but only one correct ordered pair is found or the correct values are found only for  $x$  or for  $y$ .

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

or [2] Both equations are graphed correctly, but neither ordered pair is identified.

or [2] The line is graphed correctly, but the circle is graphed as a semicircle, and only one correct solution is identified.

or [2] An incorrect quadratic equation of equal difficulty is solved appropriately, and an appropriate solution or solutions are found.

or [2] The linear equation is graphed correctly and correct points of the circle are graphed, but the points are connected to form a quadrilateral, but appropriate ordered pairs are identified.

[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, and an appropriate solution or solutions are found.

or [1] A correct quadratic equation is set equal to zero, but no further correct work is shown.

or [1] (3,4) and (-3,-4), but no work is shown.

[0] (3,4) or (-3,-4), 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

[409] obviously incorrect procedure.

[410] B

[2] 65, and appropriate work is shown, such as solving the inequality  $15x \geq 225 + 750$  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 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 no solution is found.

or [1] 65, but no work or fewer than three trials and 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

[411] incorrect procedure.

[412] A

[413] A

[414] D

[415] B

[416] C

[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

[417] incorrect procedure.

[418] A

[419] D

[420] B

[421] A

[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

[422] incorrect procedure.

[423] A

[424] 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

[425] incorrect procedure.

[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

[426] incorrect procedure.

[427] C

[428] D

[429] B

[430] B

[431] B

[432] C

[4] Both inequalities are graphed correctly and at least one is labeled, and the solution set is labeled  $S$ .

[3] Appropriate work is shown, but one graphing error is made, such as drawing a solid line for  $y > x - 4$  or shading incorrectly, but the solution set is labeled  $S$ .

or [3] Both inequalities are graphed correctly and at least one is labeled, but the solution set is not labeled or is labeled incorrectly.

or [3] Both inequalities are graphed correctly, the solution set is labeled, but neither inequality is labeled.

[2] Appropriate work is shown, but two or more graphing errors are made, but an appropriate solution set is labeled.

or [2] Appropriate work is shown, but one conceptual error is made, such as graphing the lines  $y = -x + 2$  and  $y = x - 4$  and labeling the point of intersection  $S$ .

[1] One inequality is graphed and shaded correctly, but no further correct work is shown.

or [1] The lines  $y = -x + 2$  and  $y = x - 4$  are graphed correctly, but no solution is indicated.

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

[433] incorrect procedure.

- [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 incorrect procedure.
- [434] \_\_\_\_\_
- [435] A
- [436] D
- [437] C
- [438] D
- [439] A
- [440] B
- [441] A
- [442] B
- [443] B
- [444] D
- [445] B
- [446] C

- [447] 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 incorrect procedure.
- [448] \_\_\_\_\_
- [449] A
- [450] C
- [451] D
- [452] C
- [453] A
- [454] B
- [455] C
- [456] B
- [457] C
- [458] D
- [459] B
- [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 incorrect procedure.
- [460] \_\_\_\_\_
- [461] B
- [462] B

[463] D

[464] C

[465] A

[466] A

[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

[467] incorrect procedure.

[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

[468] incorrect procedure.

[469] C

[470] D

[471] B

[472] B

[473] A

[474] C

[475] B

[476] D

[477] C

[478] A

[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

[479] incorrect procedure.

[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

[480] incorrect procedure.

- [3] -6 and 4, and appropriate work is shown, such as factoring 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, but only one correct value for  $x$  is found.  
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 equation is factored correctly, but no values are found.  
or [1] The equation is factored incorrectly, but two appropriate values are found.  
or [1] -6 and 4, but no work or only one trial with an appropriate check is shown.  
[0] -6 or 4, 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 obviously incorrect procedure.
- [481] \_\_\_\_\_
- [482] D
- [2] 3, and appropriate work is shown, such as factoring 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 one conceptual error is made, such as not rejecting the negative root.  
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] 3, but no work or fewer than three trials and 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.
- [483] \_\_\_\_\_

- [484] A
- [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.
- [485] \_\_\_\_\_



[3] 5, and appropriate work is shown, such as the quadratic equation  $(x + 7)(x - 3) = 24$  or trial and error with at least three trials and appropriate checks.

[2] A correct quadratic equation is written, but one computational error is made in finding Tamara's age.

or [2] 12 and 2 are found as the sisters' ages, but Tamara's age is not found.

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] A correct quadratic equation is written, but no further correct work is shown.

or [1] An incorrect equation of equal difficulty is solved appropriately for Tamara's age.

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] 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

[486] incorrect procedure.

[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

[487] incorrect procedure.

[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

[488] incorrect procedure.

[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

[489] incorrect procedure.

[490] C

[491] D

[492] C

[493] 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

[494] obviously incorrect procedure.

[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  $0 \leq x \leq 20$ .

[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

[495] incorrect procedure.

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

[496] \_\_\_\_\_

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.

[497] \_\_\_\_\_

[498] C \_\_\_\_\_

[499] B \_\_\_\_\_

[500] A \_\_\_\_\_

[501] D \_\_\_\_\_

[502] B \_\_\_\_\_

[503] C \_\_\_\_\_

[504] C \_\_\_\_\_

[505] B \_\_\_\_\_

[506] D \_\_\_\_\_

[507] A \_\_\_\_\_

[508] A \_\_\_\_\_

[509] A \_\_\_\_\_

[510] B \_\_\_\_\_

[511] B \_\_\_\_\_

[512] C \_\_\_\_\_

- [513]   B
- [514]   D
- [515]   B
- [516]   C
- [517]   B
- [518]   D
- [519]   D
- [520]   C
- [521]   A
- [522]   A
- [523]   B
- [524]   B
- [525]   C
- [526]   A
- [527]   C
- [528]   B
- [529]   B
- [530]   D
- [531]   A
- [532]   D
- [533]   D
- [534]   A
- [535]   A
- [536]   A
- [537]   B
- [538]   C
- [539]   D
- [540]   B

- [541]   C
- [542]   B
- [543]   B
- [544]   D
- [545]   D
- [546]   D

[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

[547] incorrect procedure.

- [548]   A
- [549]   D
- [550]   C
- [551]   C
- [552]   B
- [553]   A
- [554]   C
- [555]   A
- [556]   C
- [557]   C
- [558]   A
- [559]   C
- [560]   A
- [561]   D

[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

[562] incorrect procedure.

[563] C

[564] B

[565] C

[566] A

[567] B

[568] C

[569] D

[570] B

[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

[571] incorrect procedure.

[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

[572] obviously incorrect procedure.

[573] B

[574] C

[575] D

[576] D

[577] D

[578] C

[579] A

[2]  $\frac{x+1}{x-5}$ , and appropriate work is shown.

[1] Only one expression is factored correctly, such as  $(x + 5)(x + 1)$  or  $(x + 5)(x - 5)$ , but an appropriate simplification is done.

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

[580] incorrect procedure.

[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

[581] incorrect procedure.

[1] D

[2] A correct construction is drawn to find the midpoint of  $\overline{BC}$ , showing both sets of arcs and a line connecting A with the midpoint.

[1] A correct construction is drawn to find the midpoint of  $\overline{BC}$ , but the median is not drawn.

or [1] The construction is appropriate, but a compass and a straightedge are not used.

[0] No construction arcs are shown.

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

[2] obviously incorrect procedure.

---

[2] A correct construction is drawn, showing the arcs intersecting above and below  $\overline{AB}$ , and the perpendicular line is drawn.

[1] All of the construction arcs are drawn, but the perpendicular line is not drawn.

[0] A drawing that is not an appropriate construction is shown.

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

[3] obviously incorrect procedure.

---

[2] A correct construction is drawn, showing the arcs intersecting above and below  $\overline{AB}$ , and line c is drawn.

[1] A correct construction is drawn, but line c is not labeled.

[0] A drawing that is not a construction is shown with arc marks sketched.

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

[4] obviously incorrect procedure.

---

[2] A correct construction is drawn to find the midpoint of  $\overline{BC}$ , showing both sets of arcs and a line connecting A with the midpoint.

[1] A correct construction is drawn to find the midpoint of  $\overline{BC}$ , but the median is not drawn.

or [1] The construction is appropriate, but a compass and a straightedge are not used.

[0] No construction arcs are shown.

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

[5] obviously incorrect procedure.

---

[2] A correct triangle with the longest side on  $\overline{PQ}$  and a vertex at P is drawn, and three appropriate arcs are shown.

[1] A correct triangle is constructed on  $\overline{PQ}$ , but P is not a vertex.

or [1] A correct triangle is constructed with no sides on  $\overline{PQ}$ .

[0] A triangle that is not congruent to the correct solution or a triangle with less than three arcs is shown.

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

[6] obviously incorrect procedure.

---

[7] A

- [3] 80, and appropriate work is shown.  
[2]  $x = 30$  is shown, but the student fails to substitute to find  $m\angle AEC$ .  
or [2]  $x = 30$  is shown, but the student states that the answer is  $100^\circ$ , by finding the supplement of  $\angle AEC$ .  
or [2] The student makes one computational error in the solution of the correct equation  $4x - 40 = x + 50$  but appropriately substitutes the incorrect value to solve for  $m\angle AEC$ .  
[1] The student makes one computational error in the solution of the correct equation  $4x - 40 = x + 50$  and fails to substitute to find  $m\angle AEC$ .  
or [1] The student makes more than one computational error in the solution of the correct equation  $4x - 40 = x + 50$ , but appropriately substitutes the incorrect value to solve for  $m\angle AEC$ .  
or [1] 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.
- [8] \_\_\_\_\_
- [3] 120, and appropriate work is shown, such as  $6t + 30 + 8t - 60 = 180$ .  
[2] The student finds correctly the unknown,  $t = 15$ , but does not find the measure of angle 4.  
or [2] Appropriate work is shown, but one computational error is made.  
[1] The student forms an incorrect equation, such as setting the two angles equal, and arrives at  $t = 45$  and an angle of 300.  
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 incorrect procedure.
- [9] \_\_\_\_\_
- [10] C \_\_\_\_\_

- [4] 112.5, and appropriate work is shown, such as solving the equation  $5x - 20 = x + 50$ .  
[3] Appropriate work is shown, but one computational error is made.  
or [3]  $m\angle BED = 67.5$  or  $m\angle AEC = 67.5$ , but no further correct work is shown.  
[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, but an appropriate measure for  $\angle CEB$  is found.  
or [2] A correct equation is written and solved for  $x$ , but no further correct work is shown.  
[1] Appropriate work is shown, but one conceptual error and one computational error are made.  
or [1] 112.5, 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.
- [11] \_\_\_\_\_
- [12] C \_\_\_\_\_
- [13] C \_\_\_\_\_
- [14] A \_\_\_\_\_
- [15] B \_\_\_\_\_
- [2] 75, and appropriate work is shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] An incorrect equation of equal difficulty, such as  $x + 5x = 180$ , is solved appropriately, and an appropriate angle measure is found.  
or [1] A correct equation is written and solved for  $x$ , but no further correct work is shown.  
or [1] 75, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [16] \_\_\_\_\_
- [17] B \_\_\_\_\_
- [18] D \_\_\_\_\_
- [19] A \_\_\_\_\_



[20] D

[21] C

[2]  $57^\circ$ , and appropriate work is shown, such as determining that  $m\angle FYD \cong m\angle BXY$  and  $\angle AXY$  is supplementary to  $\angle BXY$ .

or [2]  $57^\circ$ , and a correctly labeled diagram with appropriate angles is shown.

[1]  $\angle CYX$  or  $\angle BXY$  is determined, but one computational error is made in subtracting to find  $m\angle AXY$ .

or [1] An angle is determined incorrectly, but an appropriate solution is found.

or [1]  $57^\circ$ , 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

[22] incorrect procedure.

[23] D

[2] 31, and appropriate work is shown, such as  $5x + 25 = 180$ .

[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 setting the given angles equal to each other.

or [1] A correct equation is written, but no further correct work is shown.

or [1] 31, 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

[24] incorrect procedure.

[3] 65, and appropriate work is shown, such as setting the given angles equal to each other and determining the value of  $x$  to be 16, and correct substitution is shown.

[2] The given angles are set equal to each other, the correct value of  $x$  is determined, but no substitution is shown.

or [2] The given angles are set equal to each other, and substitution is shown, but one computational or substitution error is made.

[1] The given angles are set equal to each other, but no further work is shown.

or [1] An incorrect equation is solved appropriately, such as  $5x - 15 + 2x + 33 = 180$ .

or [1] 65, but no work is shown.

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

[25] incorrect procedure.

[4] 146, and appropriate work is shown, such as solving the equation  $2x = 5x - 51$ .

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

or [3] The measure of  $\angle FHB$  or  $\angle DGH$  is found to be 34, and appropriate work is shown, but no further correct work is shown.

[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 solving the equation  $2x + 5x - 51 = 180$ .

or [2] The correct equation is solved for  $x = 17$ , but no further correct work is shown.

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

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

or [1] 146, 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

[26] incorrect procedure.

[27] C

[28] B

[2] 29, and appropriate work is shown, such as  $92 - 63 = 29$ .

[1] The correct application of the exterior angle theorem is shown, but one or more computational errors are made.

or [1] The correct application of supplementary angles and the sum of the angles of a triangle are shown, but one or more computational errors are made.

or [1]  $m\angle BCA$  is calculated incorrectly, but the sum of the angles in a triangle is used appropriately.

or [1] 29, 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

[29] incorrect procedure.

[30] A

[2] 120, and appropriate work is shown, such as  $m\angle CDB = 180 - 130 = 150$  and  $m\angle CBA = 70 + 50 = 120$  or correctly labeled angles in a 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]  $m\angle CBD = 60$  is found, but no further correct work 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

[31] incorrect procedure.

[32] A

[4]  $m\angle A = 20$ ,  $m\angle B = 59$ , and  $m\angle C = 101$ , and appropriate work is shown.

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

or [3] A correct equation is written and solved, and the correct measures for the angles are found, but they 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] A correct equation is written and solved for  $x$ , but the measures of the angles are not found.

or [2] An incorrect equation of equal difficulty is solved appropriately, and the three angles are found.

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

or [1] A correct equation is written, but no further correct work is shown.

or [1]  $m\angle A = 20$ ,  $m\angle B = 59$ , and  $m\angle C = 101$ ., but no work is shown.

[0]  $m\angle A = 20$  or  $m\angle B = 59$  or  $m\angle C = 101$ , 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

[33] obviously incorrect procedure.

[34] C

[35] B

[36] A

[37] A

[38] D

[39] B

- [2] 32, and appropriate work is shown, such as a diagram or “let” statements and an appropriate equation, such as  $5x + 20 = 180$ .  
or [2] 32, and an appropriate trial-and-error method with at least two trials and appropriate checks are shown.  
[1] Appropriate work is shown, but one computational error is made.  
or [1] An incorrect equation set equal to  $180^\circ$  is shown, but it is solved appropriately, such as  $4x + 20 = 180$ ; or an incorrect equation set equal to  $360^\circ$  is shown, such as  $5x + 20 = 360$ .  
or [1] 32, and an appropriate trial-and-error method with less than two trials and appropriate checks are 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.
- [40] \_\_\_\_\_
- [41] A \_\_\_\_\_
- [3] 135 and appropriate work is shown.  
[2] The two correct angles of  $65^\circ$  and  $70^\circ$  are found, but their sum is not identified as the answer to the question.  
or [2]  $65^\circ$  or  $70^\circ$  and an appropriate sum is found.  
[1] Either the  $65^\circ$  or the  $70^\circ$  is correctly identified.  
or [1] Two incorrect angle measures are found, but they are added correctly.  
or [1] 135 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.
- [42] \_\_\_\_\_

- [2] 30, and appropriate work is shown or an appropriate explanation is given.  
[1] Angles of the equilateral triangle are shown to be  $60^\circ$ , but  $x$  is not determined or is determined incorrectly.  
or [1] 30, but no work is shown or 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.
- [43] \_\_\_\_\_
- [44] D \_\_\_\_\_
- [2] 40, and appropriate work is shown, such as  $x = 180 - (70 + 70)$  or correctly labeling all the angles in the 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] A correct equation is written, but no further correct work is shown.  
or [1] The measures of  $\angle ACB$  and  $\angle ABC$  are both found to be  $70^\circ$ , but no further correct work is shown.  
or [1] An incorrect equation of equal difficulty is solved appropriately.  
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 incorrect procedure.
- [45] \_\_\_\_\_
- [46] D \_\_\_\_\_
- [47] B \_\_\_\_\_

- [2] An isosceles triangle that is not acute is drawn, and its three angles are labeled, such as 20, 20, 140 or 45, 45, 90.
- [1] An isosceles triangle is drawn that shows an angle that is not acute, but the base angles are not labeled.  
or [1] The three angles are stated correctly, but no triangle is drawn.
- [0] The triangle that is drawn and labeled is not isosceles or is acute.  
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [48] \_\_\_\_\_
- [3] The student draws an obtuse triangle and all sides and all angles are correctly calculated, such as by using  $120^\circ$ ,  $30^\circ$ , and  $30^\circ$  and sides 4, 4, and 10.
- [2] The student has the angles correctly indicated and the two congruent sides marked, but the length of the longest side is incorrect or is missing.  
or [2] All sides are correctly marked, but the angles do not add to  $180^\circ$ , but an obtuse angle and two congruent angles are shown.
- [1] Only the angles are correctly shown.  
or [1] Only the sides are correctly shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [49] \_\_\_\_\_
- [50] A \_\_\_\_\_
- [51] D \_\_\_\_\_
- [52] A \_\_\_\_\_
- [53] D \_\_\_\_\_
- [54] D \_\_\_\_\_

- [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 incorrect procedure.
- [55] \_\_\_\_\_
- [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.
- [56] \_\_\_\_\_
- [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 incorrect procedure.
- [57] \_\_\_\_\_
- [58] B \_\_\_\_\_
- [59] A \_\_\_\_\_

[2] 2.8, and appropriate work is shown, such as  $3^2 = 1^2 + (BC)^2$ .

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

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

or [1] The length of  $\overline{BD}$  is found to be 3, but no further correct work is shown.

or [1] 2.8, 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

[60] incorrect procedure.

[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

[61] incorrect procedure.

[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

[62] incorrect procedure.

[63] A

[64] A

[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

[65] incorrect procedure.

- [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.
- [66] \_\_\_\_\_
- [2] 5, and appropriate work is shown, such as the distance formula, the Pythagorean theorem, or a Pythagorean triple.
- [1] Appropriate work is shown, but one computational or graphing error is made.
- or [1] Appropriate work is shown, but one conceptual error is made.
- or [1] A correct equation is written, but no further correct work is shown.
- 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.
- [67] \_\_\_\_\_

- [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.
- [68] \_\_\_\_\_

[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

[69] incorrect procedure.

[70] D

[71] B

[3] 7, 11, 16, and yes, and appropriate work is shown, and an appropriate explanation of the Triangle Inequality theorem is given.

[2] 7, 11, 16, and yes, and appropriate work is shown, but no explanation or an incorrect explanation of the Triangle Inequality theorem is given.

or [2] One computational error is made, but appropriate substitution is shown, and an appropriate explanation is given.

or [2] The correct equation is written but not solved, but the Triangle Inequality theorem is stated correctly.

[1] Appropriate work is shown, and  $x = 4$  is determined, but no further work is shown.

or [1] The Triangle Inequality theorem is stated correctly but not evaluated for the sides, or the correct equation is written, but no further work is shown.

or [1] 7, 11, 16, and yes, 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

[72] incorrect procedure.

[73] A

[2] 22, 27 and 24.5, 24.5, or 22, 27, and 24.5, and appropriate work is shown, such as a labeled 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] Appropriate work is shown, but only one of the two possible sets of numbers is found.

or [1] 22, 27 and 24.5, 24.5, or 22, 27, and 24.5, 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

[74] incorrect procedure.

[75] D

[76] A

- [4] All lines are graphed and labeled correctly and area = 10, and appropriate work is shown.  
[3] The lines are graphed and labeled correctly, but the area of the triangle is missing or is incorrect.  
or [3] One of the lines is graphed incorrectly, but the area for the given triangle is found appropriately.  
[2] One of the lines is graphed incorrectly, and the area of the triangle is missing or is incorrect.  
[1] Only one line is graphed and labeled correctly, and no further correct work is shown.  
or [1] All three lines are graphed incorrectly, but the area for the given triangle is found appropriately.  
or [1] Area = 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.
- 
- [77]

- [4] 270 and an appropriate method is shown, such as using the Pythagorean theorem or trigonometry to find base  $AC = 36$ .  
[3] An appropriate method is shown, but one computational mistake is made.  
[2] An inappropriate formula for the area of the triangle is used, but work is carried to a solution.  
or [2] The Pythagorean theorem is used correctly, but only the area of triangle  $ADB$  is found, as 150.  
or [2] The Pythagorean theorem is used incorrectly arriving at incorrect  $AB$ , but work is carried to its appropriate solution for triangle  $ADC$ .  
[1] Only the area of triangle  $DBC$  is found, as 120.  
or [1] The Pythagorean theorem is used incorrectly, and the area is not found.  
or [1] 270 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.
- 
- [78]

- [4] 260, and appropriate work is shown, such as applying the appropriate area formula, or  $A = \frac{1}{2}bh$  or  $A = \frac{1}{2}h(b_1 + b_2)$ , to find the length of  $\overline{AE}$  and using the Pythagorean theorem or stating the Pythagorean triple to determine  $AB$ .  
[3] 300, because  $\overline{BE}$  is added to the perimeter.  
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.  
or [2] Only  $AB$  and  $AE$  are determined correctly.  
[1] Only  $AB$  or  $AE$  is determined correctly.  
or [1] 260, 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.
- 
- [79]

- [4] Quadrilaterals  $ABCD$  and  $A'B'C'D'$  are drawn and labeled correctly and 24 is found as the area, and appropriate work is shown.  
[3] One graphing error is made in the transformation, but an appropriate area of  $A'B'C'D'$  is found.  
or [3] Correct quadrilaterals are drawn and labeled, but one computational error is made in determining the area.  
or [3] Quadrilaterals  $ABCD$  and  $A'B'C'D'$  are drawn correctly and 24 is found as the area, but the vertices are not labeled.  
[2] Correct quadrilaterals are drawn and labeled, but no further correct work is shown.  
or [2] One conceptual error is made, such as reflecting in the  $x$ -axis, but the correct area is found.  
[1] 24, 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.
- 
- [80]
- [81] D
- [82] B



[83] D

[84] B

[85] C

[86] B

[87] B

[2] The statements  $7 + 8 = 15$  and “15 is not greater than 16” are written or the explanation is given that the sum of any two sides of a triangle must be greater than the third side.

[1] An explanation is written that includes a reference to the triangle inequality, but the explanation is not complete or an incorrect conclusion is stated.

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

[88] incorrect procedure.

[89] B

[90] A

[91] B

[3] 109 meters and appropriate work is shown by using an appropriate trigonometric ratio,

such as  $\tan 32^\circ = \frac{y}{175}$ .

[2] 109 meters but one rounding error is made.

or [2] The student uses an appropriate trigonometric function with an inverted ratio,

such as  $\tan 32^\circ = \frac{175}{y}$ , 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

[92] incorrect procedure.

[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

[93] incorrect procedure.

[94] D

[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

[95] incorrect procedure.

[2] 117.6, and appropriate work is shown, such as  $\tan 78^\circ = \frac{x}{25}$ .

[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, but an appropriate solution is found.

or [1] A correct trigonometric equation is written, but no further correct work is shown.

or [1] 117.6, 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

[96] incorrect procedure.

[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

[97] incorrect procedure.

[3] 45, and appropriate work is shown, such as  $\tan 66^\circ = \frac{x}{20}$ .

[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

[98] incorrect procedure.

[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

[99] incorrect procedure.

[4] 114" (9 feet 6 inches) and 37" (3 feet 1 inch) and appropriate work is shown, such as

$$\sin 72^\circ = \frac{x}{10} \text{ and } \cos 72^\circ = \frac{y}{10} \text{ or use of the}$$

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

[100] incorrect procedure.

[4]  $x = 19.62990915$  and  $y = 9.814954576$  or equivalent answers, and appropriate work is shown, such as  $\sin 60^\circ = \frac{17}{x}$  and

$$\tan 60^\circ = \frac{17}{y} \text{ or the Pythagorean theorem.}$$

[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

$$\sin 60^\circ = \frac{x}{17} .$$

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

$$\sin 60^\circ = \frac{x}{17} \text{ and } \tan 60^\circ = \frac{y}{17} .$$

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

[101] incorrect procedure.

- [4] Length of ladder = 11 and distance from the base of the ladder to the wall = 4, and appropriate work is shown, such as using sine and then tangent or the Pythagorean theorem.
- [3] Appropriate work is shown, but one computational or rounding error is made.  
or [3] Appropriate work is shown, but the correct answers are not labeled or are labeled incorrectly.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.  
or [2] Appropriate work is shown, but one conceptual error is made, such as using one incorrect trigonometric ratio.  
or [2] Appropriate work is shown, but only the length of the ladder or the distance from the base of the ladder to the wall is found.  
or [2] Two correct trigonometric equations are written, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.  
or [1] Only one correct trigonometric equation is written, and no further correct work is shown.  
or [1] Length of ladder = 11 and distance from the base of the ladder to the wall = 4, but no work is shown.
- [0] Length of ladder = 11 or distance from the base of the ladder to the wall = 4, but no work is shown.  
or [0] 11 and 4, 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 obviously incorrect procedure.
- [102] \_\_\_\_\_
- [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.
- [103] \_\_\_\_\_
- [2] 25.4, and appropriate work is shown, such as solving the equation  $\sin x = \frac{3}{7}$ .
- [1] Appropriate work is shown, but one computational or rounding error is made.  
or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.  
or [1] A correct trigonometric equation is written, but no further correct work is shown.  
or [1] 25.4, 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.
- [104] \_\_\_\_\_

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  $59^\circ$ .

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.

[105]

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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.

[106]

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[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  $r$  and  $s$  are found correctly, but no further correct work is shown.

or [2] Incorrect lengths are found for  $r$  and  $s$ , 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

[107] incorrect procedure.

[4] 153, and appropriate work is shown, such as  $\sin 50^\circ = \frac{x}{200}$ .

[3] An appropriate analysis is shown, but one computational or rounding error is made.

[2] An incorrect trigonometric function is

used, such as  $\cos 50^\circ = \frac{x}{200}$ , 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

[108] obviously incorrect procedure.

[4] 79.4, and appropriate work is shown, such as  $\tan 52 = \frac{x}{62}$ .

[3] Appropriate work is shown, but one computational or rounding error is made.  
or [3] An incorrectly labeled diagram is drawn, but the appropriate trigonometric function is used, and an appropriate answer is found.

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

or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function or ratio.

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

or [1] A correctly labeled diagram is drawn, but no further correct work is shown.

or [1] A correct equation is written, but no further correct work is shown.

or [1] An incorrectly labeled diagram is drawn, but an appropriate equation is written, but no further correct work is shown.

or [1] 79.4, 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

[109] incorrect procedure.

[110] A

[111] A

[112] B

[113] D

[114] C

[115] D

[116] B

[117] B

[118] A

[119] B

[120] B

[121] C

[122] D

[2] The student draws a parallelogram, which is not a rectangle, with four sides and four angles labeled, such as angles of 60, 120, 60, and 120 and sides of 4, 6, 4, and 6.

[1] A parallelogram or rhombus, not a square, is drawn, which does not have measures for all lengths or angles.

[0] Angles and/or lengths are not appropriate for a parallelogram.

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

[123] obviously incorrect procedure.

[2] 40, and appropriate work is shown, such as  $x = 180 - (70 + 70)$  or correctly labeling all the angles in the 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] A correct equation is written, but no further correct work is shown.

or [1] The measures of  $\angle ACB$  and  $\angle ABC$  are both found to be  $70^\circ$ , but no further correct work is shown.

or [1] An incorrect equation of equal difficulty is solved appropriately.

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

[124] incorrect procedure.

[125] D

[126] A



[2] 75, and appropriate work is shown, such as  $3x + 15 = 4x - 5$ .

[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 showing  $\overline{AC}$  and  $\overline{BD}$  as congruent opposite sides.

or [1] A correct equation is written, but no further correct work is shown.

or [1] A correct equation is written and solved for  $x$ , but the length of  $\overline{AC}$  is not found.

or [1] An incorrect equation of equal difficulty, such as  $3x + 15 + 4x - 5 = 180$ , is solved appropriately, and an appropriate length of  $\overline{AC}$  is found.

or [1] 75, but no work is shown.

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

[127] incorrect procedure.

[128] C

[3] 102, and appropriate work is shown, such as using the equation  $2x + 10 + 3x = 180$  or an equivalent equation.

[2] The equation  $2x + 10 + 3x = 180$  is solved correctly for  $x$ , but  $m\angle B$  is not determined or is determined incorrectly.

[1] Appropriate work is shown, but one computational error is made or  $x$  is not determined.

or [1] The equation  $2x + 10 + 3x = 360$  is solved correctly, and an answer of 210 is found.

or [1] 102, but no work is shown.

[0] The equation  $2x + 10 = 3x$  where  $x = 10$  is given.

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

[129] obviously incorrect procedure.

[3] 120, and appropriate work is shown, such as solving the equation  $5x + 2x + 12 = 180$ .

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

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

or [1] An incorrect equation of equal difficulty is solved appropriately, and an appropriate measure is found for  $\angle D$ .

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

[130] incorrect procedure.

[131] A

[4] 12 and an appropriate method is shown, such as  $(AB)^2 = 9^2 + 8^2$ .

[3] An incorrect length is found for  $AE$ , but then it is used to correctly complete the problem.

or [3] An appropriate method is shown, but one computational mistake is made.

or [3] An appropriate method is shown, but the answer is not given to the nearest foot, such as  $\sqrt{145}$ .

[2]  $AE = 8$  and one computational mistake is made using the Pythagorean theorem.

or [2] An incorrect length is found for  $AE$ , but then it is used to complete the problem correctly, but the answer is not rounded.

[1]  $AE = 8$  is found, but the Pythagorean theorem is not used.

or [1] 12 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

[132] incorrect procedure.

[133] A

[134] D

[2]  $6x - 2$  or an equivalent expression, and appropriate work is shown, such as  $2(2x + 3) + 2(x - 4) = 6x - 2$ .

[1] The length is represented correctly as  $2x + 3$  and the width as  $x - 4$ , but the representation of the perimeter is determined incorrectly.

or [1] The length, the width, and the perimeter are represented appropriately, but by a variable other than  $x$ .

or [1] One or both dimensions are represented incorrectly, but the perimeter is represented appropriately.

[0] One or both dimensions are represented incorrectly, and the perimeter is not determined.

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

[135] obviously incorrect procedure.

[136] C

[137] D

[138] B

[3] Perimeter =  $4x + 4$  or  $4(x + 1)$  and area =  $x^2 + 2x - 24$ , and appropriate work is shown.

[2]  $4x + 4$  and  $x^2 + 2x - 24$ , and appropriate work is shown, but the answers are not labeled or are labeled incorrectly.

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

or [2] Area =  $x^2 + 2x - 24$ , and appropriate work is shown, but the perimeter is not found or is found incorrectly.

or [2] The area and perimeter are represented correctly, but only one of them is expressed in simplest form.

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

or [1] Perimeter =  $4x + 4$ , and appropriate work is shown, but the area is not found or is found incorrectly.

or [1] The area and perimeter are represented correctly, but neither is expressed in simplest form.

or [1] Perimeter =  $4x + 4$  or  $4(x + 1)$  and area =  $x^2 + 2x - 24$ , but no work is shown.

[0] Perimeter =  $4x + 4$  or area =  $x^2 + 2x - 24$ , but no work is shown.

or [0]  $4x + 4$  and  $x^2 + 2x - 24$ , but no work is shown and the answers 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

[139] obviously incorrect procedure.

a [2] 15 and an appropriate method is shown, such as finding  $GB = JC = 2x$  and  $FC = ED = HJ = 3$ .

[1] 15 and no work is shown.

or [1] At least one of the values is correct, as shown above, and the area is calculated based on the incorrect value.

b [1] Any form equivalent to  $(2x + 5)(x + 3)$  is shown, such as  $5x + 2x^2 + 6x + 15$ .

or [1] Any correct total area based on the student's incorrect answer 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

[140] obviously incorrect procedure.

[3]  $14\sqrt{2}$ , and appropriate work is shown, such as using the Pythagorean theorem or drawing a correctly labeled diagram that shows the isosceles right triangle.

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

or [2] Appropriate work is shown, but the answer is expressed as a decimal or the radical is not simplified.

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

or [1] Appropriate work is shown, but one computational error is made, and the answer is not expressed as a radical in simplest form.

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

or [1] 14, the side of the square is found correctly, but no further correct work is shown.

or [1]  $14\sqrt{2}$ , 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

[141] incorrect procedure.

[142] D

[143] C

[144] C

[145] D

[4] 16 and appropriate work is shown, such as  $W(W + 2) = 15$ .

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

or [3]  $L = 5$ ,  $W = 3$ , and the perimeter = 16, but no work is shown.

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

or [2]  $L = 5$ ,  $W = 3$ , and appropriate work is shown, but the perimeter is not found.

or [2] The length and width are incorrect, but the perimeter is computed appropriately.

[1] Length and width are appropriately defined in terms of a single variable.

or [1] 16 but no work is shown.

[0]  $L = 5$  and  $W = 3$  but no work is shown, and the perimeter is not found.

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

[146] obviously incorrect procedure.

[4] Width = 20 and length = 25 and an appropriate algebraic equation is shown, such as  $x^2 + 5x - 500 = 0$ .

[3] A correct quadratic equation is shown, but one error is made.

or [3] A correct quadratic equation is shown, but solved for only one dimension.

[2] An appropriate solution is shown, but the student fails to reject the negative root and finds two sets of dimensions.

or [2] The quadratic equation  $(5x)(x) = 500$  is solved appropriately for both dimensions,  $x = 10$  and  $5x = 50$ .

[1] The student writes only the correct quadratic equation or only the equation  $x(x + 5) = 500$  or fails to solve the equation correctly.

or [1] The student writes a linear equation from  $x(x + 5) = 500$ , such as  $2x + 5x = 500$ , but solves that equation appropriately.

or [1] A correct equation is shown for the perimeter and solved appropriately.

or [1]  $(5x)(x) = 500$  is solved correctly for only one dimension.

or [1] 20 and 25 but no work is shown.

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

[147] incorrect procedure.

[4]  $x(x + 10) = 144$  or an equivalent equation and  $8 = \text{width}$  and  $18 = \text{length}$ , and appropriate work is shown.

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

or [3] A correct equation is used and a correct solution is found, but only one dimension is identified.

[2] An appropriate solution is found to an incorrect equation of equal difficulty.

or [2] A correct equation set equal to zero is shown, with no further work or incorrect work.

[1] A conceptual error is made, such as writing the equation  $2x + 2(x + 10) = 144$ , but the dimensions are found appropriately.

or [1]  $x(x + 10) = 144$  and  $8 = \text{width}$  and  $18 = \text{length}$ , 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

[148] incorrect procedure.

[4]  $w(w + 3) = 40$ , width = 5, and length = 8, and appropriate work is shown.

[3]  $w(w + 3) = 40$  and appropriate work is shown, but one computational error is made in finding the length and width.

or [3]  $w(w + 3) = 40$  and appropriate work is shown, but only the width is found.

[2]  $w(w + 3) = 40$  and appropriate work is shown, but the length and width are not identified.

or [2]  $w(w + 3) = 40$  and appropriate work is shown, but more than one computational error is made in finding the length and width.

or [2] An incorrect equation of equal difficulty is solved appropriately for the length and width.

[1]  $w(w + 3) = 40$ , but no further correct work is shown.

or [1] Appropriate work is shown, but one conceptual error is made, such as solving the equation  $2w + 2w + 6 = 40$ .

or [1]  $w(w + 3) = 40$ , width = 5, and length = 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

[149] incorrect procedure.

[4] 283.5 or 284 and appropriate work or an explanation is shown, such as  $4x + 12 = 96$ ,  $\frac{21 \times 27}{2}$ , or trial and error.

[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] 283.5 or 284 and only a check is shown.

[1] Appropriate work is shown, but no answer is found.

or [1] 283.5 or 284 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

[150] incorrect procedure.

[2] Kerry is incorrect and an explanation is given that the original area is  $24 \text{ ft}^2$  and the area of the rose plot is  $6 \text{ ft}^2$ , which is not half of  $24 \text{ ft}^2$ .

or [2] Kerry is incorrect and an explanation is given that since the original area is  $24 \text{ ft}^2$ , the area of the rose plot should be  $12 \text{ ft}^2$ , so the new dimensions should multiply to 12, such as  $3 \times 4$ ,  $4 \times 3$ ,  $2 \times 6$ ,  $2 \times 6$ .

or [2] Kerry is incorrect and a diagram is used to show the original area is  $24 \text{ ft}^2$  and the area of the rose plot is  $6 \text{ ft}^2$ .

[1] Kerry is incorrect but the work or diagram shows one error.

or [1] Appropriate work is shown, but the incorrect conclusion is found.

[0] Kerry is incorrect or correct but no explanation is given.

or [0] Kerry is correct and  $\frac{1}{2}(4) = 2$  or

$\frac{1}{2}(6) = 3$  is shown.

or [0] Kerry is correct and the student uses the perimeter.

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

[151] obviously incorrect procedure.

[2] 256, and appropriate work is shown, such as finding the side of the square and calculating the area.

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

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

or [1] Appropriate work is shown, but only the area of the circle is found.

or [1] An incorrect value for the side of the square is determined, but an appropriate area is found.

or [1] A correct value for the side of the square is determined, but the area is not found or is found incorrectly.

or [1] The area for the square inscribed in the circle is found, resulting in an answer of 128.

or [1] 256, but no work is shown.

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

[152] incorrect procedure.

[4] \$148.54, and appropriate work is shown.

[3] The correct pre-tax amount of \$137.54 is found, but no tax or an incorrect tax is shown.

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

[2] The correct area of  $46 \text{ ft}^2$  is found, but no cost is shown.

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

or [2] An incorrect area is determined, such as by adding or multiplying all sides, but then a final cost including tax is determined appropriately.

[1] An incorrect area is shown, and one computational error is made.

or [1] \$148.54, 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

[153] incorrect procedure.

[4] 4, and appropriate work is shown.

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

or [3] Appropriate work is shown to find 4,860, the area of the parking lot, but no further correct work is shown.

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

or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect conversion.

or [2] The property has been divided into appropriate sections (e.g.,  $108 \times 72$ , the entire property, and  $52 \times 52$ , the building) and correct areas are found, but no further correct work is shown.

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

or [1] 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

[154] incorrect procedure.

[3] 162, and appropriate work is shown.

[2] The Pythagorean theorem is used correctly to find the hypotenuse, but the result is not multiplied by 6.

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

[1] Appropriate work is shown, but more than one computational or rounding error is made.

or [1] 162, 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

[155] incorrect procedure.

- [3] 10 and 30, and appropriate work is shown, such as  $2x + 2(2x + 10) = 80$  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, but only one of the dimensions 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 two or more computational errors are made.
- 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 of equal difficulty is solved appropriately.
- or [1] Appropriate solutions are found based on the incorrect use of the perimeter formula, such as  $3x + 10 = 80$ .
- or [1] 10 and 30, but no work or only one trial with an appropriate check is shown.
- [0] 10 or 30, 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 obviously incorrect procedure.
- 
- [156] \_\_\_\_\_

- [3] 18, and appropriate work is shown.
- [2] Appropriate work is shown, but one computational error is made.
- or [2] Appropriate work is shown, and the value of  $x$  is found, but no further correct work is 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] A correct expression is written for the perimeter of each figure, but no further correct work is shown.
- 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 incorrect procedure.
- 
- [157] \_\_\_\_\_
- [4] 2,050, and appropriate work is shown, such as finding the length of one side of the field, finding the perimeter, and calculating  $(2.50 \cdot 800) + 50$ .
- [3] Appropriate work is shown, but one computational error is made.
- or [3] Appropriate work is shown, but the installation fee is not added to the cost of the fencing.
- [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] Appropriate work is shown, but one conceptual error and one computational error are made.
- or [1] 2,050, 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.
- 
- [158] \_\_\_\_\_
- [159]      B \_\_\_\_\_
- [160]      A \_\_\_\_\_
- [161]      A \_\_\_\_\_

[2] 2, and appropriate work is shown.

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

or [1] Appropriate work is shown to find the number of students for any flavor other than coffee.

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

[162] incorrect procedure.

[163] C

[2] 50, and appropriate work is shown, such as using a proportion.

[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] An incorrect fractional part is determined, but an appropriate number of students is found.

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

[164] incorrect procedure.

[2] 100 and an appropriate method is shown, such as  $360 - 300 = 60$  degrees, which is  $\frac{1}{6}$

of the circle so  $\frac{1}{6}$  of 600 is 100.

[1] 100 and no explanation is given.

or [1] An incorrect degree measure is used to develop a fraction by which to multiply 600, obtaining an appropriate answer.

or [1] A correct degree measure is used to develop  $\frac{1}{6}$ .

or [1] 60 degrees is used, but an incorrect number of people is found.

[0] Only 60 degrees is found.

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

[165] obviously incorrect procedure.

[2] 600, and appropriate work is shown, such as  $\frac{240}{360} \cdot 900 = 600$ .

[1] Appropriate work is shown, but one computational error is made or the answer is expressed as a fraction.

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

or [1] The central angle of  $240^\circ$  is found, but the number of students is not calculated.

or [1] An incorrect equation of equal difficulty is solved appropriately.

or [1] A correct equation is written, but no further correct work is shown.

or [1] 600, 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

[166] incorrect procedure.

[167] D



[4] A correct circle graph is drawn and labeled, and appropriate work is shown, such as using proportions. [A correct graph will show  $150^\circ$  for brown,  $120^\circ$  for black,  $60^\circ$  for blond, and  $30^\circ$  for red.]

[3] Appropriate work is shown, but one computational error is made, but an appropriate graph is drawn.

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

or [3] Appropriate work is shown and a correct graph is drawn, but the sectors are not labeled or are labeled incorrectly.

[2] Appropriate work is shown, but two or more computational errors are made, but an appropriate graph is drawn.

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

or [2] Correct numbers of degrees or correct proportional values are found, but two or more graphing errors are made.

or [2] Correct numbers of degrees or correct proportional values are found, but no graph is drawn.

or [2] A correct circle graph is drawn and labeled, but no work is shown.

[1] Appropriate work is shown and a graph is drawn, but two or more computational errors and two or more graphing errors are made.

or [1] At least two numbers of degrees or proportional values are found correctly, but no graph or an incorrect graph is drawn.

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

[168] incorrect procedure.

---

[169] C \_\_\_\_\_

[2] (5,1), and appropriate work is shown, such as a graph using the slope or  $2 = \frac{x-1}{2}$  and

$$3 = \frac{y+5}{2}.$$

[1] Both (2,3) and (-1,5) are plotted correctly, but one graphing error is made in finding the other endpoint.

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

or [1] Appropriate work is shown, but only  $x = 5$  or  $y = 1$  is found.

or [1] Appropriate work is shown, and the correct endpoint is designated, but the coordinates are not stated.

or [1] (5,1), 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

[170] incorrect procedure.

---

[171] D \_\_\_\_\_

[3] The circle is graphed correctly, and appropriate work shows that (5,-2) does not lie on the circle.

[2] The circle is graphed correctly, but the work fails to show that (5,-2) does not lie on the circle.

[1] The circle is graphed incorrectly, but the location of (5,-2) is determined appropriately, based on the incorrect graph.

[0] Yes or 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

[172] obviously incorrect procedure.

---

[173] A \_\_\_\_\_

[174] B \_\_\_\_\_

[3] 32, and appropriate work is shown, such as finding the circumference to be  $10\pi$  and dividing 1,000 by  $10\pi$ .

[2] Appropriate work is shown, but one computational or rounding error is made or the answer is expressed in terms of  $\pi$ .

[1] An incorrect circumference formula is used, but an appropriate number of revolutions is found.

or [1] The circumference of the wheel is found to be  $10\pi$  or an equivalent decimal, 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

[175] incorrect procedure.

[3] 1.3 and appropriate work is shown, such as calculating the circumference of the wheel and the length of the trail in feet, and converting them to miles, such as

$$\frac{2 \cdot \pi \cdot 1100.5}{5280}$$

[2] The student correctly calculates the circumference and length in feet but does not convert them to miles.

or [2] Correct calculations are shown, but the answer is rounded incorrectly or is not rounded.

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

[1] The correct circumference is calculated.

or [1] Appropriate work is shown, but more than one error is made.

or [1] 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

[176] incorrect procedure.

[177] D

[178] A

[179] A

[4] 145, and appropriate work is shown, such as  $(\frac{1}{2}\pi 13^2) - (\frac{1}{2} \cdot 10 \cdot 24)$ .

[3] Appropriate work is shown, but one computational or rounding error is made or the answer is expressed in terms of  $\pi$ .

or [3] Appropriate work is shown, but the area of the entire circle is used to calculate the area of the shaded region.

or [3] The areas of the semicircle and triangle are found correctly, but they are not subtracted to find the shaded area.

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

or [2] An incorrect formula is used to find the area of the triangle or the semicircle, but an appropriate shaded area is found.

or [2] Only the area of the semicircle or the area of the triangle is found correctly, and no further correct work is shown.

[1] Both the areas of the semicircle and the triangle are found incorrectly, but they are subtracted to find an appropriate shaded area.

or [1] Only the length of  $\overline{AC}$  is found correctly.

or [1] 145, 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

[180] incorrect procedure.

- [3] 2,827.4, and appropriate work is shown, such as  $50^2\pi - 40^2\pi$ .
- [2] The areas of both circles are found correctly, but the two areas are not subtracted.
- or [2] Appropriate work is shown, but one computational error is made.
- [1] The correct area is found for only one of the circles.
- or [1] The circumference formula is used, but the appropriate difference is shown, such as  $100\pi - 80\pi = 20\pi$ .
- or [1] 2,827.4, 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.
- [181] \_\_\_\_\_

- [3] 78.5 square feet or  $25\pi$  or an equivalent answer, and appropriate work is shown.
- [2] Appropriate work is shown, but one computational error is made.
- or [2] Appropriate work is shown, but the measure of one side of the square is used as the radius of the circle.
- or [2] Appropriate work is shown, but the perimeter is used to find a side of the square.
- [1] The correct length of the side of the square is shown, but further work is missing or is incorrect.
- or [1] The equation for the circumference of the circle instead of the equation for the area of the circle is solved appropriately.
- or [1] Appropriate work is shown, but more than one error is made.
- or [1] 78.5 square feet or  $25\pi$ , 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.
- [182] \_\_\_\_\_

- [183]     A

- [4] \$2,950.33 and a correct method is shown, such as area  $1204\pi$  square feet multiplied by \$0.78.
- or [4] Various correct values of  $\pi$  are used that lead to slightly different totals such as \$2,948.84 (if 3.14 is used).
- [3] The shaded area is found, such as  $1204\pi$  (or similar values based on  $\pi$  approximation).
- or [3] The correct shaded area is found, but one computational mistake is made in the price, or the final cost is not rounded correctly.
- [2] The two separate areas are found but not correctly used.
- or [2] An inappropriate formula for areas is shown, but work is carried to an appropriate value.
- or [2] Only one appropriate area is found and an appropriate cost is computed.
- or [2] The area found is incorrect but calculated to an appropriate cost.
- [1] Only one appropriate area is found, either  $2500\pi$  or  $1296\pi$ .
- or [1] An inappropriate area is found, and one computational mistake is made in calculating the cost.
- or [1] \$2,948.84 through \$2,950.33 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.
- [184] \_\_\_\_\_

a [2] 125.6 or 125.7 (correct for the value of  $\pi$  used) and appropriate work is shown.

[1] The area is left as  $40\pi$  or the answer is not rounded correctly.

or [1] An appropriate method is shown, but one computational mistake is made.

or [1] The correct areas of both circles are found, but the two areas are not subtracted.

or [1] The circumference formula is used correctly for both circles and the circumferences are subtracted for an answer of 25.1.

or [1] 125.6 or 125.7 and no work is shown.

b [2] 49 and an appropriate explanation is given.

or [2] An appropriate percent for an incorrect part a is found and supported by area formulas.

[1] The answer is left as  $\frac{40\pi}{81\pi}$ .

or [1] An appropriate fraction for an incorrect part a is found but not given as a percent.

or [1] An appropriate percent for an incorrect part a is found and is supported by circumference formulas.

or [1] 49 and no work is shown.

[0]  $\frac{4}{9}$  or 44% and no work is shown.

or [0] 4 is found by subtracting the radii.

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

[185] obviously incorrect procedure.

[4] 9, and appropriate work is shown.

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

or [3] Appropriate work is shown, and the areas of the rectangle and one circle are found correctly, but the area of the circle is not doubled, but an appropriate number of bags is found.

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

or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect formula for the area of a circle, but an appropriate number of bags is found.

or [2] The areas of the rectangle and the circle are found correctly, but no further correct work is shown.

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

or [1] 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

[186] incorrect procedure.

[187] B

[188] D

[189] A

[190] B

[191] C

[192] D

- a [2] The student draws a circle with its center at (0,0) and a radius of 3.  
[1] The student draws a circle, but it has an incorrect center or radius.  
b [2] 28, and appropriate work or the expression  $9\pi$  is shown, which rounds to 28.  
or [2] An appropriate area is shown for the incorrect figure in part a.  
[1] The correct expression is shown, but the answer is left as  $9\pi$ , not rounded, or not rounded correctly.  
or [1] An incorrect radius is used, but the area is rounded appropriately.  
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.
- [193] \_\_\_\_\_
- [194] D
- [195] C
- [196] B
- [197] D
- [198] C
- a [1] Either  $(x - 2)(x + 1)(2x) = V$  or the same expression without “= V” is shown.  
or [1]  $2x^3 - 2x^2 - 4x$  or an equivalent expression is shown.  
b [1] 864  
or [1] The student substitutes appropriately into an incorrect part a equation.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [199] \_\_\_\_\_
- [200] C
- [201] B
- [202] A

- [3] 3, 12, and 30 and an appropriate arithmetic method or equation is shown, such as  $40x^3 = 1080$ .  
[2] An appropriate equation or method is shown, but not all three dimensions are found.  
or  
[2] An appropriate method is shown, and although one computational mistake is made, the student does find three dimensions based on this mistake, such as dividing 1080 by 40 incorrectly.  
[1] The student shows that multiplication is required to find volume but sets up an incorrect method and does not find three dimensions.  
or  
[1] 3, 12, and 30 and no work is shown.  
[0] The sum is used instead of the product,  
or  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [203] \_\_\_\_\_
- [2] 20, and appropriate work is shown, such as  $3,360 \div (14 \times 12)$ .  
[1] Appropriate work is shown, but one computational error is made.  
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 incorrect procedure.
- [204] \_\_\_\_\_
- [205] A

[3] 27 and an appropriate method or explanation is shown, such as

$$\left(\frac{1}{6}\right)\left(\frac{1}{3}\right)\left(\frac{2}{3}\right) = \frac{1}{27} \text{ of a cubic foot, thus } 27$$

bricks needed or, in inches,  $\frac{1728}{64} = 27$ . A

labeled drawing is an acceptable explanation.

[2] An appropriate method for finding volume is shown, but one computational mistake is made.

[1] Correct conversion into feet is shown.

or

[1] The volume of 64 cubic inches is found.

or

[1] 27 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

[206] incorrect procedure.

[3] 64, and appropriate work is shown, such

as calculating  $\frac{(36 \times 144)}{(9 \times 9)}$  or drawing a

labeled diagram.

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

or

[1] 64, but no work is shown.

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

[207] incorrect procedure.

[3] 2.6, and appropriate work is shown, such as  $(5 \bullet 5 \bullet 5) = (7 \bullet 7)h$ .

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

[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 formula.

or [1] The volume of both of the cubes is found correctly, but no further correct work is shown.

or [1] 2.6, 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

[208] incorrect procedure.

[3] 12, and appropriate work is shown, such as calculating volume =  $5,760 \text{ in}^3$  and dividing by  $500 \text{ in}^3$ .

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

or

[2] The volume is found incorrectly by multiplying  $24 \cdot 16 \cdot 18$ , but it is divided by 500 and rounded appropriately, resulting in an answer of 14.

[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.

or

[1] The volume of 5,760 is found correctly, but no further correct work is shown.

or

[1] 12, but no work is shown.

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

[209] incorrect procedure.

- [3] 47, and appropriate work is shown.  
[2] Appropriate work is shown, but one computational or rounding error is made.  
or  
[2] The correct numerical value of the volume of the cup ( $20\pi$  or its equivalent) and the volume of the tank (3,000) are shown, but the solution is not completed.  
[1] The correct volume of only the cup or only the tub is shown.  
or  
[1] 47, 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] [3] 5-inch box and appropriate work is shown, including showing a diameter between 4 and 5.  
[2] The correct diameter is shown, but the wrong box size is chosen.  
or  
[2] The correct radius is shown, but the 3-inch box is chosen.  
[1] The correct diameter or radius is shown, but no box is chosen.  
or  
[1] An appropriate radius between 2 and 3 is shown, using the incorrect formula  $A = \pi r^2$ , and the 3-inch box is chosen.  
or  
[1] An appropriate diameter, using  $A = \pi r^2$ , is shown, but the appropriate box is chosen.  
or  
[1] An appropriate radius, using  $A = \pi r^2$ , is shown, but no box is chosen.  
or  
[1] The 5-inch box is chosen, 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.
- 
- [211] \_\_\_\_\_

- [4] 11, and appropriate work is shown, such as solving the quadratic equation  $3x(x + 5) = 150$  or trial and error with at least three trials and appropriate checks.  
[3] Appropriate work is shown, but one computational error is made.  
or [3] Appropriate work is shown to determine that 5 is the shorter side of the box, but the shorter side of the original sheet is not found or is found incorrectly.  
or [3] An incorrect quadratic equation of equal difficulty is solved appropriately, and an appropriate shorter side of the original sheet is found.  
[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.  
or [2] An incorrect quadratic equation of equal difficulty is solved appropriately, but the shorter side of the original sheet is not found.  
or [2] A correct quadratic equation is set equal to zero, but no further correct work is shown.  
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 one conceptual error and one computational error are made.  
or [1] One conceptual error is made in finding the shorter side of the box, and the corresponding shorter side of the original sheet is not found or is found incorrectly.  
or [1] A correct quadratic equation is written, but it is not set equal to zero, and no further correct work is shown.  
or [1] 11, 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.
- 
- [212] \_\_\_\_\_
- [213] B \_\_\_\_\_

- [2] 24 feet and appropriate work is shown,  
such as  $\frac{10}{15} = \frac{16}{x}$  or  $\frac{10}{16} = \frac{15}{x}$ .
- [1] An appropriate proportion is shown, but  
an incorrect solution or no solution is found.  
or [1] An incorrect proportion of equal  
difficulty is shown, but an appropriate  
solution for the proportion written is found.  
or [1] 24 feet 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.
- [214] \_\_\_\_\_
- [215] C \_\_\_\_\_
- [2] 24 miles and appropriate work is shown,  
such as using a proportion, showing doubling  
of the sides, or using any other appropriate  
method.  
[1] Appropriate work is shown, but one  
computational or substitution error is made.  
or [1] An incorrect proportion is appropriately  
solved.  
or [1] 24 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] \_\_\_\_\_
- [2] 16, and appropriate work is shown, such  
as  $\frac{6}{4} = \frac{24}{x}$  or a labeled 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] An incorrect proportion is written, but  
it is solved appropriately.  
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.
- [217] \_\_\_\_\_
- [218] D \_\_\_\_\_
- [219] C \_\_\_\_\_

- [220] D \_\_\_\_\_
- [221] A \_\_\_\_\_
- [222] D \_\_\_\_\_
- [223] A \_\_\_\_\_
- [2] 160, and appropriate work is shown, such  
as the proportion  $\frac{25}{16} = \frac{250}{x}$ .
- [1] Appropriate work is shown, but one  
computational error or one conceptual error is  
made, such as  $\frac{5}{4} = \frac{250}{x}$ .
- or [1] 160, 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.
- [224] \_\_\_\_\_
- [225] D \_\_\_\_\_
- [226] D \_\_\_\_\_
- [227] D \_\_\_\_\_
- [228] B \_\_\_\_\_
- [229] D \_\_\_\_\_
- [230] B \_\_\_\_\_
- [231] C \_\_\_\_\_
- [232] B \_\_\_\_\_
- [233] B \_\_\_\_\_
- [234] C \_\_\_\_\_
- [235] C \_\_\_\_\_
- [236] B \_\_\_\_\_
- [237] D \_\_\_\_\_
- [238] C \_\_\_\_\_
- [239] C \_\_\_\_\_



[2] Both correct lines of symmetry are drawn:  
one horizontal, one vertical.  
[1] Only one correct line is drawn.  
or [1] Two correct and one or two incorrect  
lines, such as the diagonals, are drawn.  
[0] More than two incorrect lines are 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.

[240]

[2] The four correct lines of symmetry are  
drawn.  
[1] At least two correct lines of symmetry are  
drawn, and no inappropriate lines are drawn.  
or [1] All four correct lines of symmetry are  
drawn, but one or more inappropriate lines are  
also drawn.  
[0] At least one of the correct lines of  
symmetry is missing, and one or more  
inappropriate lines are 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.

[241]

[242] C

[243] A

[244] D

[245] D

[246] C

[247] A

[248] A

[249] B

[250] D

[251] C

[252] C

[253] C

[254] A

[255] C

[256] D

[257] B

[258] C

[259] A

[260] D

[261] D

[262] B

[263] D

[3]  $\triangle ABC$  and  $\triangle A'B'C'$ ,  $A'(-2,4)$ ,  $B'(0,12)$ ,  
 $C'(10,8)$ , are graphed correctly.

[2]  $\triangle ABC$  is graphed correctly, but only two  
image points are graphed correctly.

or [2]  $\triangle ABC$  is graphed incorrectly, but  
 $\triangle A'B'C'$ , is graphed appropriately, based on  
an incorrect  $\triangle ABC$ .

[1] Only  $\triangle ABC$  is graphed correctly.

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

[264]

[265] A

[266] A

[267] B

[268] C

[269] A

[270] C

- [2]  $A'$  (0,-2) and  $B'$  (4,-6) are stated, and an appropriate graph is drawn.
- [1] Only one endpoint,  $A'$  or  $B'$ , is graphed and stated correctly.
- or [1] Both endpoints are reflected in other than the  $x$ -axis, and the coordinates are graphed and stated correctly, such as:  
y-axis  $A'$  (0,2) and  $B'$  (-4,6)  
 $y = x$   $A'$  (2,0) and  $B'$  (6,4)  
Origin  $A'$  (0,-2) and  $B'$  (-4,-6)
- or [1] Both points  $A'$  and  $B'$  are stated correctly, but no graph is drawn.
- or [1] An appropriate graph is drawn, but no coordinates or incorrect coordinates are labeled.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [271] incorrect procedure.

- [4]  $S'$ (0,6),  $U'$ (-3,5),  $N'$ (-3,0), and the correct graphs of both triangles are shown.
- [3] The correct graphs of both triangles are shown, but the coordinates of  $\Delta S'U'N'$  are not stated correctly.
- or [3]  $\Delta SUN$  is graphed and labeled correctly, and the coordinates of  $\Delta S'U'N'$  are stated correctly but not graphed correctly.
- or [3] The coordinates of  $\Delta S'U'N'$  are graphed and stated correctly, but  $\Delta SUN$  is not graphed or labeled.
- or [3]  $\Delta SUN$  is graphed incorrectly, but the graph and the coordinates of  $\Delta S'U'N'$  are appropriate, based on that error.
- [2]  $\Delta S'U'N'$  is graphed correctly, but the coordinates of  $\Delta S'U'N'$  are not stated, and  $\Delta SUN$  is not graphed.
- or [2]  $\Delta SUN$  is graphed and labeled correctly, but  $\Delta S'U'N'$  is reflected in the  $x$ -axis, and the coordinates  $S'$ (0,-6),  $U'$ (3,-5),  $N'$ (3,0) are stated.
- or [2]  $\Delta SUN$  is graphed incorrectly, but  $\Delta S'U'N'$  is graphed appropriately, based on that error, but the coordinates of  $\Delta S'U'N'$  are not stated.
- [1]  $\Delta SUN$  is graphed and labeled correctly, but no other work or completely incorrect work for  $\Delta S'U'N'$  is shown.
- or [1]  $\Delta S'U'N'$  is graphed correctly, but the coordinates of  $\Delta S'U'N'$  are not stated, and  $\Delta SUN$  is not graphed or is graphed incorrectly.
- or [1]  $S'$ (0,6),  $U'$ (-3,5),  $N'$ (-3,0), but no work or graph 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] incorrect procedure.

[3] The figure is drawn accurately and the new coordinates are labeled and stated as  $J'(7,-2)$ ,  $B'(2,-1)$ ,  $C'(3,-2)$ , and  $D'(2,-4)$ .

[2] One error is made in drawing the figure, such as misplotting one point, but the new coordinates are labeled and stated appropriately, based on that figure.

or [2] The figure is drawn and labeled accurately, but the new coordinates are not stated or are stated incorrectly.

or [2] The new coordinates are labeled and stated correctly, but the figure is not drawn.

[1] Two errors are made in drawing the reflected figure, but the new coordinates are labeled and stated appropriately, based on that figure.

or [1] Appropriate work is shown, but one conceptual error is made, such as reflecting the figure in the  $x$ -axis or the origin.

or [1] Correct points are plotted and labeled, but the figure is not drawn, and the coordinates are not stated.

or [1] The figure is drawn correctly, but the new coordinates are not labeled or stated.

[0] An appropriate reflection in the  $x$ -axis is drawn, and the coordinates are not labeled or stated.

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

[273] obviously incorrect procedure.

[3]  $A'(-2,0)$ ,  $B'(-1,7)$ , and  $C'(-5,1)$  are graphed, labeled, and stated correctly.

[2] Appropriate work is shown, but one graphing or labeling error is made.

or [2]  $A'(-2,0)$ ,  $B'(-1,7)$ , and  $C'(-5,1)$ , but no graph is drawn.

[1] Appropriate work is shown, but two or more graphing or labeling errors are made.

or [1] Appropriate work is shown, but one conceptual error is made, such as reflecting over the  $x$ -axis.

or [1] The three points are plotted correctly, but the coordinates  $A'$ ,  $B'$ , and  $C'$  are not stated.

[0]  $(-2,0)$ ,  $(-1,7)$ , and  $(-5,1)$ , but no further correct work is shown.

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

[274] obviously incorrect procedure.

- [4]  $ABCD$  and its image  $A'B'C'D'$  are graphed and labeled correctly and 29, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational or graphing error is made.  
or [3]  $A'B'C'D'$  is graphed and labeled correctly and 29, but  $ABCD$  is not graphed.  
or [3]  $ABCD$  is graphed incorrectly, but an appropriate image is graphed and labeled, and an appropriate area is found.  
or [3]  $ABCD$  and  $A'B'C'D'$  are graphed correctly and 29, but neither quadrilateral is labeled.
- [2] Appropriate work is shown, but two or more computational or graphing errors are made.  
or [2] Appropriate work is shown, but one conceptual error is made, such as an incorrect transformation, but the graphs are labeled, and an appropriate area is found.  
or [2] Both  $ABCD$  and  $A'B'C'D'$  are graphed and labeled correctly, but the area is not found.  
or [2] 29, and appropriate work is shown, such as using the distance formula and finding the area, but neither  $ABCD$  nor  $A'B'C'D'$  is graphed.
- [1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.  
or [1] Either  $ABCD$  or  $A'B'C'D'$  is graphed and labeled correctly, but no further correct work is shown.  
or [1] 29, 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.
- [275] \_\_\_\_\_
- [276] A
- [277] A
- [3] Yes,  $A''$  is (1,-3) and  $B''$  is (2,-1) and appropriate work is shown, algebraically or graphically.
- [2] Correct coordinates for  $A''$  and  $B''$  are found, but no conclusion is shown.  
or [2] Either  $A''$  or  $B''$  is correct, and an appropriate conclusion is shown.  
or [2] One transformation is correct and one is incorrect, such as the reflection in  $y$ , but an appropriate conclusion is shown.  
[1] Neither transformation is correct, but an appropriate conclusion is shown.  
or [1] One transformation 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.
- [278] \_\_\_\_\_
- [279] D
- [280] C
- [281] D
- [2] 23, and appropriate work is shown.  
[1] Appropriate work is shown, but no answer or an incorrect answer is found.  
or [1] 23, but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [282] \_\_\_\_\_
- [283] C
- [284] D
- [3] 2, 6, 10, 14, and 18 and an appropriate method is shown.  
[2] One mistake is made with selection, such as including 0.  
[1] One of the appropriate sets is found: either 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 or not 4, 8, 12, 16, 20.  
or [1] The correct numbers 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.
- [285] \_\_\_\_\_

[286] B

[287] B

[2] False, and an appropriate explanation is given.

[1] Appropriate work is shown, but the truth value is missing or is incorrect.

[0] False, 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

[288] obviously incorrect procedure.

[3] At least one example is shown that makes the statement true, such as 2, 3, 5, 7, 9, or a defined variable; and one example is shown that makes the statement false, such as any even number other than 2, with a correct explanation that shows that the student can recognize odd numbers and prime numbers. The explanation can be in words or as a Venn diagram.

[2] Two correct examples are shown, one that shows the statement is true and one that shows the statement is false, but no explanation or an inappropriate explanation is given.

or [2] Only one correct example is shown, but an appropriate explanation is given.

[1] Only one correct example is shown, and 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

[289] incorrect procedure.

[290] D

[291] D

[292] B

[293] D

[294] B

[295] D

[296] C

[3] Juliet and an explanation is given of how the identification was reached, such as by a narrative or table.

[2] One error is made in the logic statements or the table, but appropriate results are found.

[1] More than one error is made in the logic statements or the table, but appropriate work is shown.

or [1] Juliet 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

[297] incorrect procedure.

[298] A

[299] D

[300] B

[301] C

[302] A

[303] B

[304] C

[305] A

[306] D

- [4] Contrapositive, and all three statements are written correctly.  
[3] Contrapositive, and only two of the statements are written correctly  
or [3] All three statements are written correctly, but the contrapositive is not identified.  
[2] Contrapositive, and only one statement is written correctly.  
or [2] Only two statements are written correctly, and the contrapositive is not identified.  
[1] All three statements are written incorrectly, but the contrapositive is identified.  
or [1] Only one statement is written correctly, and the contrapositive is not identified.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [307] \_\_\_\_\_
- [308] D
- [309] A
- [310] A
- [311] C
- [312] C
- [313] C
- [314] B
- [315] B
- [316] B
- [317] C
- [318] B
- [319] A
- [320] C
- [321] A
- [322] D

- [323] B
- [324] A
- [325] C
- [326] C
- [327] D
- [328] C
- [329] B
- [330] C
- [331] C
- [332] B
- [333] C
- [334] C

- [4] A correct diagram is drawn, two X points are marked, a numerical 2 is given for the places to dig, and appropriate work is shown.  
[3] The diagram is correct including two X points, but an incorrect answer or no answer is found.  
[2] One correct locus situation and one incorrect locus situation are drawn, but the answer is appropriate according to the diagram.  
or [2] Each locus situation is correctly drawn, but no X points are marked, and no numerical answer is found.  
[1] Only one locus situation is correctly drawn and an incorrect conclusion or no conclusion is shown.  
or [1] 2 but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [335] \_\_\_\_\_

[2] 2 and an appropriate sketch of two circles intersecting in two points is shown.  
[1] 2 and no sketch is shown.  
or [1] An appropriate sketch is shown, without indicating 2 as the possibilities.  
or [1] An appropriate number is found, based on an inappropriate sketch.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

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a [2] A correct sketch is drawn that shows two possible locations, such as parallel lines and a perpendicular bisector. Students can draw their own sketch or use the diagram given.  
[1] A correct sketch is drawn, but with no indication of where the treasure is buried.  
or [1] A partial sketch is drawn, showing either the distances from the fence or the distance from the trees.  
b [1] 5 feet  
or [1] An appropriate answer is found for an incorrect 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.

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[337]

[4] Two Xs are indicated at the intersections of the angle bisector and the parallel lines in the correct sketch of the loci.  
[3] All loci are drawn correctly, but no Xs are drawn to indicate the locations, or only one X is drawn.  
or [3] The angle bisector is drawn correctly, but only one line is drawn parallel to the walkway, but an X is indicated appropriately.  
[2] Only one correct locus is drawn, but Xs indicate the two appropriate locations of the intersection of the loci.  
[1] Xs are drawn in the correct locations, but no loci are shown.  
or [1] Only one correct locus is drawn, and no Xs are indicated.  
or [1] Both loci are drawn incorrectly, but Xs are drawn on the appropriate points of intersection.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

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[338]

[2] The points  $D$  and  $M$  are plotted, the graph of the line  $x = 3$  is drawn, and its equation is stated.  
[1] One graphing error is made, but an appropriate equation is stated for the locus of points.  
or [1] A correct graph is drawn, but the equation is not stated or is stated incorrectly.  
or [1]  $x = 3$ , but 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.

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[339]

- [3] 4, and an appropriate sketch is drawn that shows a circle with  $C$  as its center and a radius of 6 and two parallel lines, one 3 units above and one 3 units below line  $p$ .
- [2] An appropriate sketch is drawn, but the answer 4 is not found.
- or [2] Only one locus is drawn correctly, but the appropriate number of points of intersection is found.
- [1] Only one locus is drawn correctly, and no further correct work is shown.
- or [1] Both loci are drawn incorrectly, but the appropriate number of points of intersection is found.
- or [1] 4, but no work or sketch 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.
- [340] \_\_\_\_\_

- a [3] Two parallel lines, one 3 units above and one 3 units below  $\overline{AB}$ , and a circle with its center at  $P$  with a radius of 5 units are described correctly in words or drawn.
- [2] Only one parallel line 3 units above or 3 units below  $\overline{AB}$  and a correct circle are described in words or drawn.
- or [2] Appropriate parallel lines are shown, but the circle is incomplete.
- [1] Both parallel lines and the circle have incomplete descriptions or drawings.
- [0] Only one incomplete locus is described or drawn.
- b [1] 4, and appropriate work is shown.
- or [1] An appropriate answer for an incorrect 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.
- [341] \_\_\_\_\_

- [4] The student draws parallelogram  $ABCD$  correctly, identifies  $D(1,3)$ , and justifies the coordinates of  $D$  by using any appropriate method to show  $ABCD$  is a parallelogram.
- [3] The student draws parallelogram  $ABCD$  incorrectly but justifies  $D$  appropriately.
- or [3] The student draws parallelogram  $ABCD$  correctly and identifies  $D(1,3)$ , but the justification is incomplete.
- [2] The student draws parallelogram  $ABCD$  correctly and identifies  $D(1,3)$ , but no justification is shown.
- [1] The student either draws parallelogram  $ABCD$  correctly or identifies  $D(1,3)$  correctly.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [342] \_\_\_\_\_