

1. 080401b, P.I. G.G.28
Which condition does *not* prove that two triangles are congruent?

[A] $SAS \cong SAS$ [B] $SSA \cong SSA$
[C] $ASA \cong ASA$ [D] $SSS \cong SSS$

2. 080402b, P.I. A2.A.5
The speed of a laundry truck varies inversely with the time it takes to reach its destination. If the truck takes 3 hours to reach its destination traveling at a constant speed of 50 miles per hour, how long will it take to reach the same location when it travels at a constant speed of 60 miles per hour?

[A] $2\frac{2}{3}$ hours [B] $2\frac{1}{3}$ hours
[C] $2\frac{1}{2}$ hours [D] 2 hours

3. 080403b, P.I. A.G.3
Which set of ordered pairs is *not* a function?

[A] $\{(3,1), (2,1), (1,2), (3,2)\}$
[B] $\{(0,0), (1,1), (2,2), (3,3)\}$
[C] $\{(1,2), (3,4), (4,5), (5,6)\}$
[D] $\{(4,1), (5,1), (6,1), (7,1)\}$

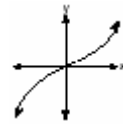
4. 080404b, P.I. G.G.73
A circle has the equation $(x+1)^2 + (y-3)^2 = 16$. What are the coordinates of its center and the length of its radius?

[A] (1,-3) and 4 [B] (-1,3) and 4
[C] (1,-3) and 16 [D] (-1,3) and 16

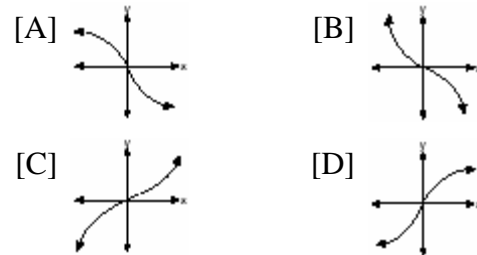
5. 080405b, P.I. A2.S.5
The mean of a normally distributed set of data is 56, and the standard deviation is 5. In which interval do approximately 95.4% of all cases lie?

[A] 56-71 [B] 46-56
[C] 51-61 [D] 46-66

6. 080406b, P.I. A2.A.46
The graph below represents $f(x)$.



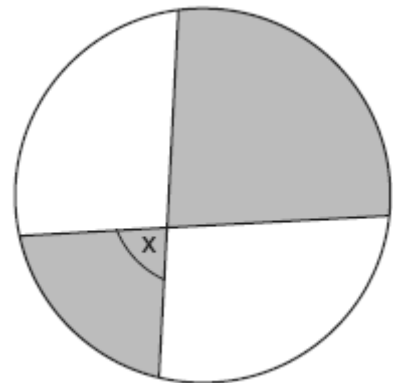
Which graph best represents $f(-x)$?



7. 080407b, P.I. A2.N.9
When simplified, $i^{27} + i^{34}$ is equal to

[A] $i-1$ [B] i [C] $-i-1$ [D] i^{61}

8. 080408b, P.I. G.G.53
The accompanying diagram shows a child's spin toy that is constructed from two chords intersecting in a circle. The curved edge of the larger shaded section is one-quarter of the circumference of the circle, and the curved edge of the smaller shaded section is one-fifth of the circumference of the circle.

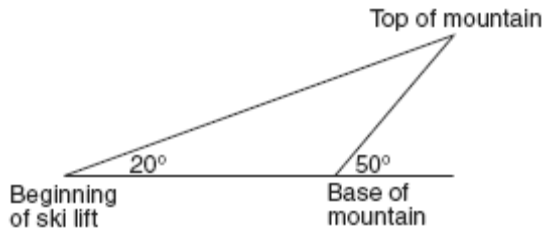


What is the measure of angle x ?

[A] 81° [B] 108° [C] 72° [D] 40°

9. 080409b, P.I. A2.A.76
If $\sin A = \frac{4}{5}$, $\tan B = \frac{5}{12}$, and angles A and B are in Quadrant I, what is the value of $\sin(A + B)$?
- [A] $-\frac{63}{65}$ [B] $\frac{63}{65}$ [C] $\frac{33}{65}$ [D] $-\frac{33}{65}$
10. 080410b, P.I. A2.A.58
If the tangent of an angle is negative and its secant is positive, in which quadrant does the angle terminate?
- [A] III [B] II [C] IV [D] I
11. 080411b, P.I. A2.A.2
The equation $2x^2 + 8x + n = 0$ has imaginary roots when n is equal to
- [A] 6 [B] 4 [C] 8 [D] 10
12. 080412b, P.I. A2.A.36
What is the middle term in the expansion of $(x + y)^4$?
- [A] $2x^2y^2$ [B] x^2y^2
[C] $4x^2y^2$ [D] $6x^2y^2$
13. 080413b, P.I. G.G.61
What is the image of point $(1,1)$ under $r_{x\text{-axis}} \circ R_{0,90^\circ}$?
- [A] $(-1,-1)$ [B] $(1,-1)$
[C] $(1,1)$ [D] $(-1,1)$
14. 080414b, P.I. A2.A.75
How many distinct triangles can be formed if $m\angle A = 30$, side $b = 12$, and side $a = 8$?
- [A] 2 [B] 0 [C] 3 [D] 1
15. 080415b, P.I. A.A.12
The expression $\frac{(b^{2n+1})^3}{b^n \cdot b^{4n+3}}$ is equivalent to
- [A] b^{-3n} [B] b^n [C] b^{-3n+1} [D] $\frac{b^n}{2}$
16. 080416b, P.I. A2.A.44
What is the inverse of the function $y = \log_4 x$?
- [A] $4^y = x$ [B] $4^x = y$
[C] $y^4 = x$ [D] $x^4 = y$
17. 080417b
Which angle is coterminal with an angle of 125° ?
- [A] 425° [B] -235°
[C] -125° [D] 235°
18. 080418b, P.I. A2.N.10
A ball is dropped from a height of 8 feet and allowed to bounce. Each time the ball bounces, it bounces back to half its previous height. The vertical distance the ball travels, d , is given by the formula $d = 8 + 16 \sum_{k=1}^n \left(\frac{1}{2}\right)^k$, where n is the number of bounces. Based on this formula, what is the total vertical distance that the ball has traveled after four bounces?
- [A] 15.0 ft [B] 22.0 ft
[C] 23.0 ft [D] 8.9 ft
19. 080419b
The path traveled by a roller coaster is modeled by the equation $y = 27 \sin 13x + 30$. What is the maximum altitude of the roller coaster?
- [A] 27 [B] 57 [C] 30 [D] 13
20. 080420b, P.I. A2.N.5
The expression $\frac{11}{\sqrt{3}-5}$ is equivalent to
- [A] $\frac{\sqrt{3}-5}{2}$ [B] $\frac{-\sqrt{3}-5}{2}$
[C] $\frac{-\sqrt{3}+5}{2}$ [D] $\frac{\sqrt{3}+5}{2}$

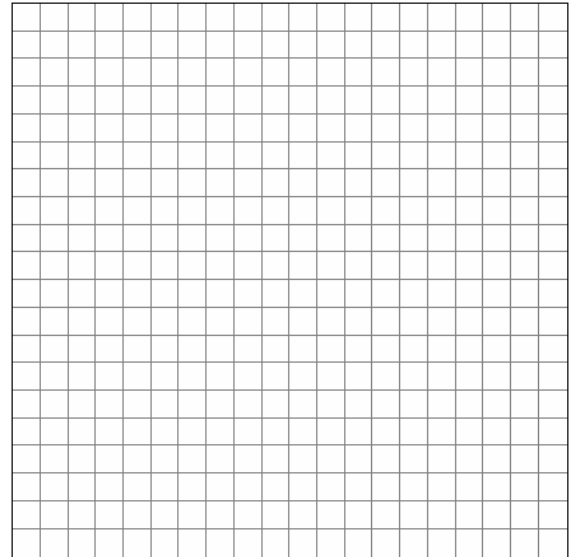
21. 080421b, P.I. A2.A.73
A ski lift begins at ground level 0.75 mile from the base of a mountain whose face has a 50° angle of elevation, as shown in the accompanying diagram. The ski lift ascends in a straight line at an angle of 20° . Find the length of the ski lift from the beginning of the ski lift to the top of the mountain, to the nearest hundredth of a mile.



22. 080422b, P.I. A2.N.9
Express $\sqrt{-48} + 3.5 + \sqrt{25} + \sqrt{-27}$ in simplest $a + bi$ form.

23. 080423b
Solve for x : $x^{-3} = \frac{27}{64}$

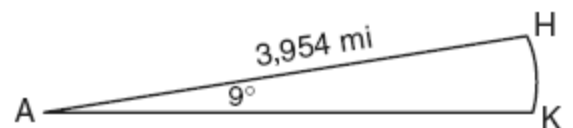
24. 080424b, P.I. A2.A.4
The profit a coat manufacturer makes each day is modeled by the equation $P(x) = -x^2 + 120x - 2000$, where P is the profit and x is the price for each coat sold. For what values of x does the company make a profit? [The use of the accompanying grid is optional.]



25. 080425b, P.I. A2.A.17

Express in simplest form: $\frac{\frac{1}{r} - \frac{1}{s}}{\frac{r^2}{s^2} - 1}$

26. 080426b, P.I. A2.A.61
Cities H and K are located on the same line of longitude and the difference in the latitude of these cities is 9° , as shown in the accompanying diagram. If Earth's radius is 3,954 miles, how many miles north of city K is city H along arc HK ? Round your answer to the nearest tenth of a mile.

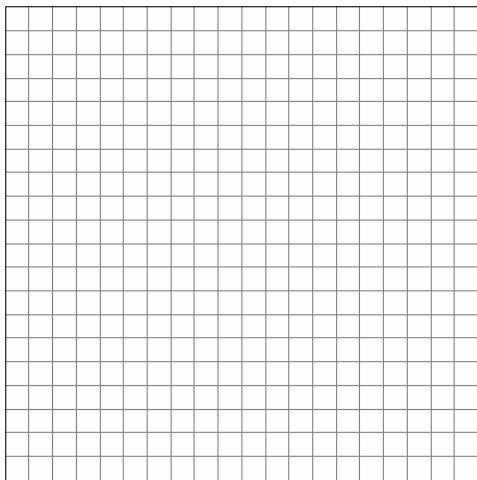


(Not drawn to scale)

27. 080427b, P.I. A2.A.1
A depth finder shows that the water in a certain place is 620 feet deep. The difference between d , the actual depth of the water, and the reading is $|d - 620|$ and must be less than or equal to $0.05d$. Find the minimum and maximum values of d , to the *nearest tenth of a foot*.

28. 080428b, P.I. A2.A.27
An amount of P dollars is deposited in an account paying an annual interest rate r (as a decimal) compounded n times per year. After t years, the amount of money in the account, in dollars, is given by the equation
$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Rachel deposited \$1,000 at 2.8% annual interest, compounded monthly. In how many years, to the *nearest tenth of a year*, will she have \$2,500 in the account? [The use of the grid is optional.]



29. 080429b, P.I. A2.S.7
A box containing 1,000 coins is shaken, and the coins are emptied onto a table. Only the coins that land heads up are returned to the box, and then the process is repeated. The accompanying table shows the number of trials and the number of coins returned to the box after each trial.

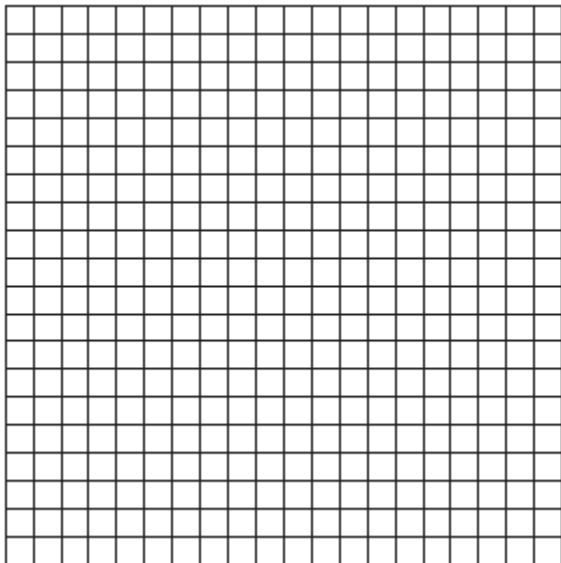
Trial	0	1	3	4	6
Coins Returned	1,000	610	220	132	45

Write an exponential regression equation, rounding the calculated values to the *nearest ten-thousandth*. Use the equation to predict how many coins would be returned to the box after the eighth trial.

30. 080430b, P.I. A2.S.15
Tim Parker, a star baseball player, hits one home run for every ten times he is at bat. If Parker goes to bat five times during tonight's game, what is the probability that he will hit *at least* four home runs?
31. 080431b, P.I. A.A.8
A rectangular piece of cardboard is to be formed into an uncovered box. The piece of cardboard is 2 centimeters longer than it is wide. A square that measures 3 centimeters on a side is cut from each corner. When the sides are turned up to form the box, its volume is 765 cubic centimeters. Find the dimensions, in centimeters, of the original piece of cardboard.
32. 080432b, P.I. A2.A.68
Solve algebraically for all values of θ in the interval $0^\circ \leq \theta \leq 360^\circ$ that satisfy the equation
$$\frac{\sin^2 \theta}{1 + \cos \theta} = 1.$$

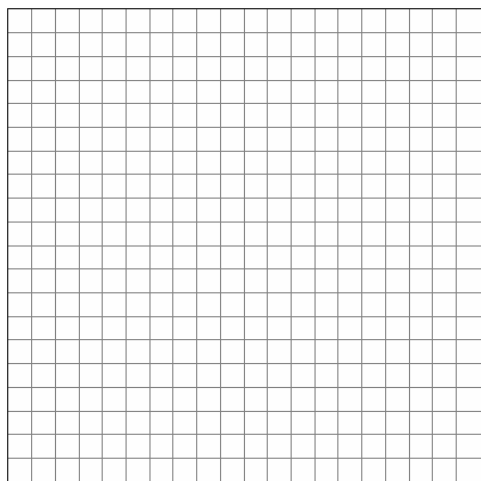
33. 080433b

The tide at a boat dock can be modeled by the equation $y = -2 \cos\left(\frac{\pi}{6}t\right) + 8$, where t is the number of hours past noon and y is the height of the tide, in feet. For how many hours between $t = 0$ and $t = 12$ is the tide at least 7 feet? [The use of the grid is optional.]



34. 080434b, P.I. G.G.69

The coordinates of quadrilateral $JKLM$ are $J(1,-2)$, $K(13,4)$, $L(6,8)$, and $M(-2,4)$. Prove that quadrilateral $JKLM$ is a trapezoid but not an isosceles trapezoid. [The use of the grid is optional.]



- [1] B
- [2] C
- [3] A
- [4] B
- [5] D
- [6] B
- [7] C
- [8] A
- [9] B
- [10] C
- [11] D
- [12] D
- [13] A
- [14] A
- [15] B
- [16] B
- [17] B
- [18] C
- [19] B
- [20] B

[2] 1.15, and appropriate work is shown, such as $\frac{x}{\sin 130} = \frac{0.75}{\sin 30}$.

[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as using an incorrect trigonometric function.
or [1] A correct trigonometric equation is written, but no further correct work is shown.
or [1] 1.15, but no work is shown.

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

[21] incorrect procedure.

[2] $8.5 + 7i\sqrt{3}$, and appropriate work is shown.

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

or [1] $8.5 + 7i\sqrt{3}$, but no work is shown.

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

[22] incorrect procedure.

[2] $\frac{4}{3}$ or $1\frac{1}{3}$ or $1.\bar{3}$, and appropriate work is shown.

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

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

[23] incorrect procedure.

- [2] $20 < x < 100$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or graphing error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown to solve for 20 and 100, but the solution is not expressed as a correct inequality or interval.
or [1] $20 < x < 100$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [2] $-\frac{s}{r(r+s)}$ or $-\frac{s}{r^2+rs}$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown, but the answer is not expressed in simplest form.
or [1] $-\frac{s}{r(r+s)}$ or $-\frac{s}{r^2+rs}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [2] 621.1, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] A correct formula is written, but incorrect substitutions are made.
or [1] An incorrect proportion is written, but an appropriate solution is found.
or [1] The correct circumference is found, but no further correct work is shown.
or [1] 621.1, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [4] 590.5 and 652.6, and appropriate work is shown, such as $|d - 620| \leq 0.05d$.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] 590.5 or 652.6, and appropriate work is shown.
[1] 590.5 and 652.6, but no work is shown.
[0] 590.5 or 652.6, but no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [4] 32.8, and appropriate work is shown.
[3] Appropriate work is shown, but one computational, rounding, or graphing error is made.
or [3] An incorrect substitution is made, but appropriate work is shown and an appropriate solution is found.
[2] Appropriate work is shown, but two or more computational, rounding, or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made, such as incorrect application of a logarithm rule.
[1] Correct substitutions are made, but no further correct work is shown.
or [1] 32.8, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [4] $y = 1,018.2839(0.5969)^x$ and 16, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] $y = 1,018.2839(0.5969)^x$ and 16, but the substitution is not shown.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] An appropriate regression equation is written, but the number of coins returned after the eighth trial is not found.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] An incorrect regression equation is written, but the number of coins returned after the eighth trial is found appropriately.
or [1] $y = 1,018.2839(0.5969)^x$ and 16, but no work is shown.
[0] $y = 1,018.2839(0.5969)^x$ or 16, but no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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[4] .00046 or $\frac{46}{100,000}$ or an equivalent

answer, and appropriate work is shown.

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

or [3] Appropriate work is shown, but the probability of hitting at most four home runs is found.

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

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

or [2] The probabilities of hitting exactly four and exactly five home runs are found, but the probabilities are not added.

[1] Appropriate work is shown, but the probability of hitting exactly four home runs is found.

or [1] Correct substitution into the Bernoulli equation for exactly four and exactly five home runs is made, but no further correct work is shown.

or [1] .00046 or $\frac{46}{100,000}$ or an equivalent

answer, but no work is shown.

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

[30] incorrect procedure.

[4] 21 by 23, and appropriate work is shown, such as solving the equation

$$765 = 3(x - 4)(x - 6).$$

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

or [3] Appropriate work is shown, but only one dimension is found.

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

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

or [2] An incorrect equation of equal difficulty is solved appropriately, and appropriate dimensions are found.

or [2] A correct quadratic equation is written in standard form, but no further correct work is shown.

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

or [1] An incorrect equation of equal difficulty is written, and one computational error is made, but appropriate dimensions are found.

or [1] An incorrect equation of equal difficulty is solved appropriately, but one computational error is made when finding the length.

or [1] 21 by 23, but no work is shown.

[0] 21 or 23, 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

[31] obviously incorrect procedure.

- [4] 90 and 270, and appropriate work is shown, such as solving $\sin^2 \theta = 1 + \cos \theta$.
- [3] Appropriate work is shown, but one computational error is made or the answers are expressed in radians.
- or [3] Appropriate work is shown, but 180 is not rejected as a solution.
- or [3] Appropriate work is shown, but only one solution is found.
- [2] Appropriate work is shown, but two or more computational errors are made.
- or [2] Appropriate work is shown, but one conceptual error is made.
- or [2] An incorrect trigonometric substitution is made, but the equation is solved appropriately.
- or [2] A trigonometric equation set equal to zero is written, but no further correct work is shown.
- or [2] 90 and 270, but a graphic solution is provided.
- [1] The equation $\sin^2 \theta - \cos \theta - 1 = 0$ is found, but no further correct work is shown.
- or [1] A graphic solution is provided, and one computational or graphing error is made.
- or [1] 90 and 270, but no work is shown.
- [0] 90 or 270, but no work is shown.
- or [0] 90, 180, and 270, but no work is shown.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [32] obviously incorrect procedure.
- [6] 8, and appropriate work is shown, such as a correctly labeled graph, a table of values, or an algebraic solution.
- [5] Appropriate work is shown, but one computational or graphing error is made.
- [4] Appropriate work is shown, but two or more computational or graphing errors are made.
- or [4] Appropriate work is shown, and the correct values of t where the height of the tide is 7 are identified (2 and 10), but the correct number of hours is not stated.
- [3] Appropriate work is shown, but one conceptual error is made.
- or [3] A correct table or graph is constructed, but no further correct work is shown.
- [2] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
- or [2] The correct values of t (2 and 10) and 8 are written, but no work is shown.
- [1] 8, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [33] incorrect procedure.

[6] $\overline{JK} \parallel \overline{ML}, \overline{MJ} \not\parallel \overline{KL}, \overline{MJ} \neq \overline{KL}$, and

appropriate work is shown or a complete and correct proof is written, and a concluding statement is written.

[5] Appropriate work is shown and a correct concluding statement is written, but one computational error is made in determining the slopes or the lengths of the legs.

or [5] Appropriate work is shown, but the concluding statement is missing or is incomplete.

[4] Appropriate work is shown and a correct concluding statement is written, but two or more computational errors are made.

or [4] The quadrilateral is proved to be a trapezoid, but the two nonparallel sides are not proved to be unequal.

or [4] A proof is written that shows that $\overline{JK} \parallel \overline{ML}$ and $\overline{MJ} \neq \overline{KL}$, but the difference

between a quadrilateral and a trapezoid is not addressed.

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

[2] The quadrilateral is proved to be a trapezoid, but one conceptual error is made, and the two nonparallel sides are not proved to be unequal.

or [2] The lengths of all four sides are found correctly, but no further correct work is shown.

or [2] The two nonparallel sides are proved to be unequal, but no further correct work is shown.

[1] The proof shows that the first set of sides is parallel, but no further correct work is shown.

or [1] JKLM is graphed correctly and the definition of an isosceles trapezoid is written, but no proof is written.

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

[34] incorrect procedure.