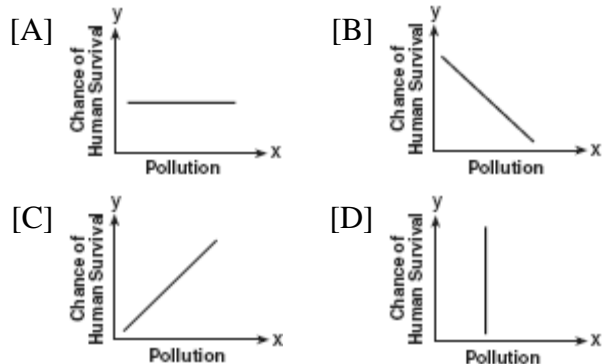


1. 080301b, P.I. A.G.3

Which graph does not represent a function of x ?



2. 080302b, P.I. A2.A.22

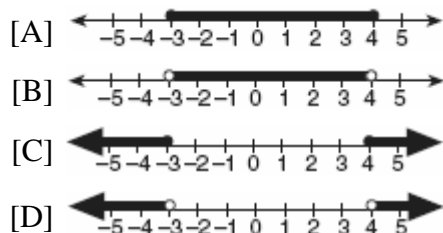
What is the value of x in the equation

$$\sqrt{5-2x} = 3i?$$

- [A] 7 [B] 1 [C] 4 [D] -2

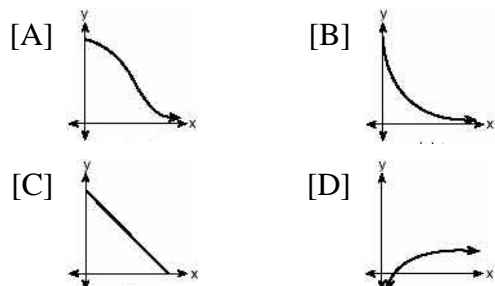
3. 080303b, P.I. A2.A.1

Which graph represents the solution set of $|2x-1| < 7$?



4. 080304b, P.I. A.G.4

The strength of a medication over time is represented by the equation $y = 200(1.5)^{-x}$, where x represents the number of hours since the medication was taken and y represents the number of micrograms per millimeter left in the blood. Which graph best represents this relationship?



5. 080305b, P.I. A.A.16

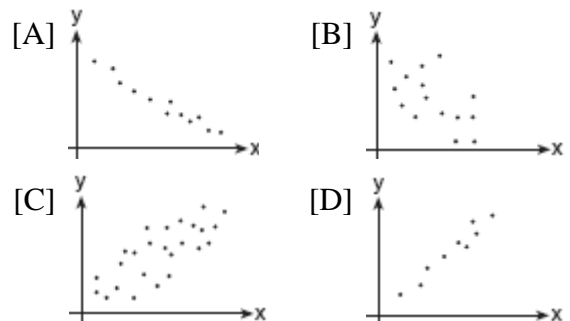
Written in simplest form, the expression

$$\frac{x^2y^2 - 9}{3 - xy}$$
 is equivalent to

- [A] $\frac{1}{3+xy}$ [B] -1
[C] $3+xy$ [D] $-(3+xy)$

6. 080306b, P.I. A2.S.8

Which graph represents data used in a linear regression that produces a correlation coefficient closest to -1 ?



7. 080307b, P.I. A2.N.5

Which expression is equal to $\frac{2+\sqrt{3}}{2-\sqrt{3}}$?

- [A] $1-4\sqrt{3}$ [B] $\frac{7+4\sqrt{3}}{7}$
[C] $7+4\sqrt{3}$ [D] $\frac{1-4\sqrt{3}}{7}$

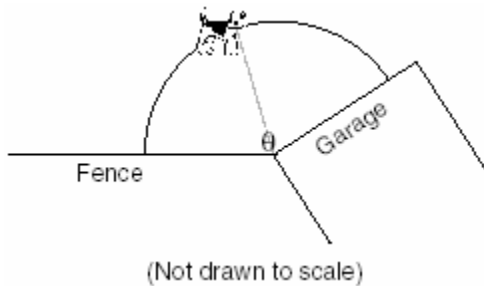
8. 080308b, P.I. G.G.54

Which transformation is *not* an isometry?

- [A] line reflection [B] dilation
[C] translation [D] rotation

9. 080309b

A dog has a 20-foot leash attached to the corner where a garage and a fence meet, as shown in the accompanying diagram. When the dog pulls the leash tight and walks from the fence to the garage, the arc the leash makes is 55.8 feet.

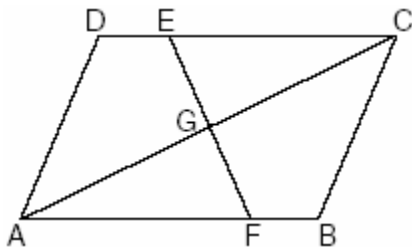


What is the measure of angle θ between the garage and the fence, in radians?

- [A] 160 [B] 0.36 [C] 2.79 [D] 3.14

10. 080310b, P.I. G.G.28

In the accompanying diagram of parallelogram $ABCD$, $\overline{DE} \cong \overline{BF}$.



Triangle EGC can be proved congruent to triangle FGA by

- [A] $AAS \cong AAS$ [B] $SSA \cong SSA$
[C] $AAA \cong AAA$ [D] $HL \cong HL$

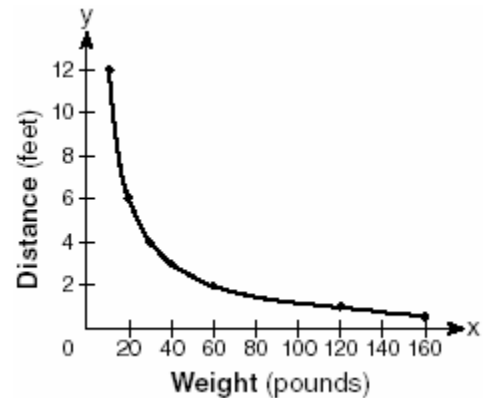
11. 080311b, P.I. A2.A.75

An architect commissions a contractor to produce a triangular window. The architect describes the window as $\triangle ABC$, where $m\angle A = 50$, $BC = 10$ inches, and $AB = 12$ inches. How many distinct triangles can the contractor construct using these dimensions?

- [A] 1 [B] 2 [C] 0 [D] more than 2

12. 080312b

The accompanying graph shows the relationship between a person's weight and the distance that the person must sit from the center of a seesaw to make it balanced.



Which equation best represents this graph?

- [A] $y = 2 \log x$ [B] $y = \frac{120}{x}$
[C] $y = -120x$ [D] $y = 12x^2$

13. 080313b, P.I. A2.A.42

If f and g are two functions defined by $f(x) = 3x + 5$ and $g(x) = x^2 + 1$, then $g(f(x))$ is

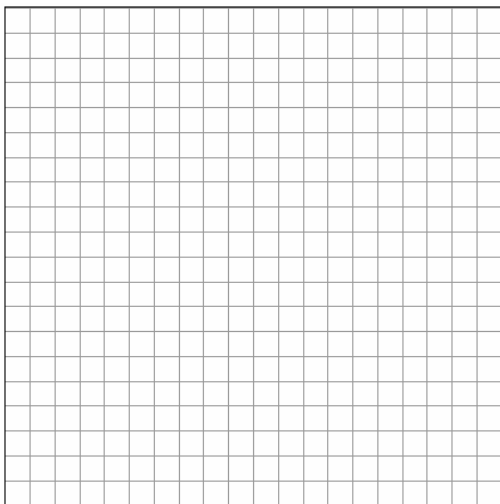
- [A] $9x^2 + 26$ [B] $x^2 + 3x + 6$
[C] $3x^2 + 8$ [D] $9x^2 + 30x + 26$

14. 080314b, P.I. A2.N.9
What is the product of $5 + \sqrt{-36}$ and $1 - \sqrt{-49}$, expressed in simplest $a + bi$ form?
[A] $47 - 29i$ [B] $-37 + 41i$
[C] $47 + 41i$ [D] $5 - 71i$
15. 080315b, P.I. A2.A.77
The expression $\frac{2\cos\theta}{\sin 2\theta}$ is equivalent to
[A] $\sin \theta$ [B] $\sec \theta$
[C] $\csc \theta$ [D] $\cot \theta$
16. 080316b, P.I. A2.A.76
If $\sin x = \frac{12}{13}$, $\cos y = \frac{3}{5}$, and x and y are acute angles, the value of $\cos(x - y)$ is
[A] $\frac{63}{65}$ [B] $-\frac{33}{65}$ [C] $-\frac{14}{65}$ [D] $\frac{21}{65}$
17. 080317b, P.I. A2.S.5
The amount of ketchup dispensed from a machine at Hamburger Palace is normally distributed with a mean of 0.9 ounce and a standard deviation of 0.1 ounce. If the machine is used 500 times, approximately how many times will it be expected to dispense 1 or more ounces of ketchup?
[A] 5 [B] 16 [C] 100 [D] 80
18. 080318b
A commercial artist plans to include an ellipse in a design and wants the length of the horizontal axis to equal 10 and the length of the vertical axis to equal 6. Which equation could represent this ellipse?
[A] $9x^2 + 25y^2 = 225$
[B] $x^2 + y^2 = 100$ [C] $9x^2 - 25y^2 = 225$
[D] $3y = 20x^2$
19. 080319b, P.I. A2.A.44
A function is defined by the equation $y = \frac{1}{2}x - \frac{3}{2}$. Which equation defines the inverse of this function?
[A] $y = 2x + 3$ [B] $y = 2x - \frac{3}{2}$
[C] $y = 2x - 3$ [D] $y = 2x + \frac{3}{2}$
20. 080320b, P.I. A2.A.2
In the equation $ax^2 + 6x - 9 = 0$, imaginary roots will be generated if
[A] $-1 < a < 1$ [B] $a < -1$
[C] $a > -1$, only [D] $a < 1$, only
21. 080321b, P.I. A.A.41
The height, h , in feet, a ball will reach when thrown in the air is a function of time, t , in seconds, given by the equation $h(t) = -16t^2 + 30t + 6$. Find, to the nearest tenth, the maximum height, in feet, the ball will reach.
22. 080322b, P.I. A2.N.1
Find the value of $(x + 2)^0 + (x + 1)^{-\frac{2}{3}}$ when $x = 7$.
23. 080323b, P.I. A2.A.17
Express in simplest form: $\frac{\frac{x}{4} - \frac{4}{x}}{1 - \frac{4}{x}}$
24. 080324b, P.I. A2.A.73
The triangular top of a table has two sides of 14 inches and 16 inches, and the angle between the sides is 30° . Find the area of the tabletop, in square inches.

25. 080325b
Meteorologists can determine how long a storm lasts by using the function
 $t(d) = 0.07d^{\frac{3}{2}}$, where d is the diameter of the storm, in miles, and t is the time, in hours. If the storm lasts 4.75 hours, find its diameter, to the *nearest tenth of a mile*.

26. 080326b, P.I. 7.N.11
Tom scored 23 points in a basketball game. He attempted 15 field goals and 6 free throws. If each successful field goal is 2 points and each successful free throw is 1 point, is it possible he successfully made all 6 of his free throws? Justify your answer.

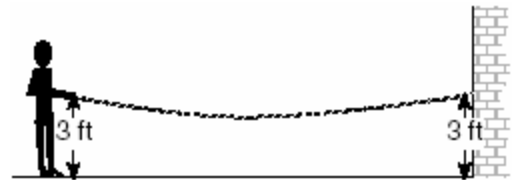
27. 080327b, P.I. G.G.61
On the accompanying grid, graph and label \overline{AB} , where A is $(0,5)$ and B is $(2,0)$. Under the transformation $r_{x\text{-axis}} \circ r_{y\text{-axis}}(\overline{AB})$, A maps to A'' and B maps to B'' . Graph and label $\overline{A''B''}$. What single transformation would map \overline{AB} to $\overline{A''B''}$?



28. 080328b, P.I. A2.A.25
Express, in simplest $a + bi$ form, the roots of the equation $x^2 + 5 = 4x$.

29. 080329b, P.I. A2.A.73
A ship at sea is 70 miles from one radio transmitter and 130 miles from another. The angle between the signals sent to the ship by the transmitters is 117.4° . Find the distance between the two transmitters, to the *nearest mile*.

30. 080330b, P.I. A2.A.72
A student attaches one end of a rope to a wall at a fixed point 3 feet above the ground, as shown in the accompanying diagram, and moves the other end of the rope up and down, producing a wave described by the equation $y = a \sin bx + c$. The range of the rope's height above the ground is between 1 and 5 feet. The period of the wave is 4π . Write the equation that represents this wave.

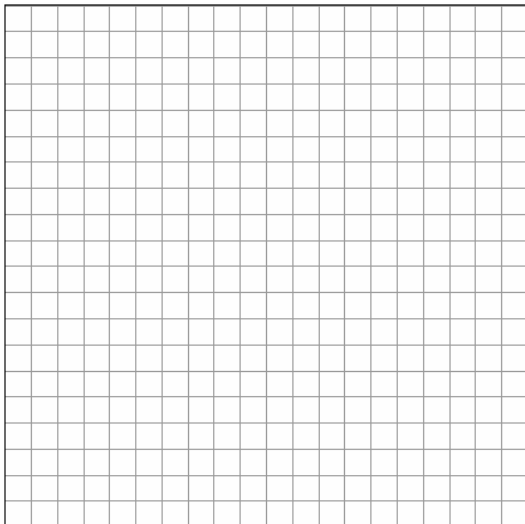


31. 080331b, P.I. A2.S.7

The table below shows the results of an experiment that relates the height at which a ball is dropped, x , to the height of its first bounce, y .

Drop Height (x) (cm)	Bounce Height (y) (cm)
100	26
90	23
80	21
70	18
60	16

Find \bar{x} , the mean of the drop heights. Find \bar{y} , the mean of the bounce heights. Find the linear regression equation that best fits the data. Show that (\bar{x}, \bar{y}) is a point on the line of regression. [The use of the grid is optional.]

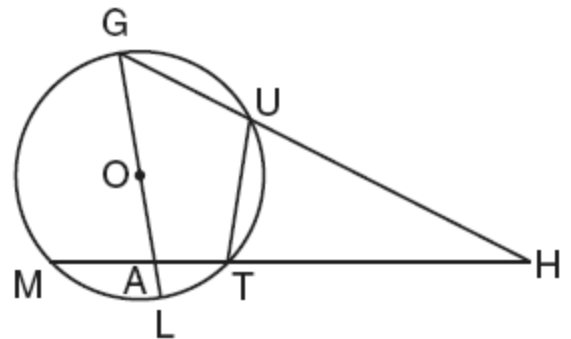


32. 080332b, P.I. A.A.6

A company calculates its profit by finding the difference between revenue and cost. The cost function of producing x hammers is $C(x) = 4x + 170$. If each hammer is sold for \$10, the revenue function for selling x hammers is $R(x) = 10x$. How many hammers must be sold to make a profit? How many hammers must be sold to make a profit of \$100?

33. 080333b, P.I. G.G.53

Given circle O with diameter \overline{GOAL} ; secants \overline{HUG} and \overline{HTAM} intersect at point H ; $m\widehat{GM} : m\widehat{ML} : m\widehat{LT} = 7 : 3 : 2$; and chord $\overline{GU} \cong$ chord \overline{UT} . Find the ratio of $m\angle UGL$ to $m\angle H$.



34. 080334b, P.I. A2.S.15

When Joe bowls, he can get a strike (knock down all the pins) 60% of the time. How many times more likely is it for Joe to bowl *at least* three strikes out of four tries as it is for him to bowl zero strikes out of four tries? Round your answer to the *nearest whole number*.

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

[2] 20.1, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The time when the ball reaches its maximum height is found correctly, but no further correct work is shown.
or [1] 20.1, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[21] incorrect procedure.

- [2] $1\frac{1}{4}$ or an equivalent answer, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] $1\frac{1}{4}$ or an equivalent answer, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[22] incorrect procedure.
- [2] $\frac{x+4}{4}$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] $\frac{x+4}{4}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[23] incorrect procedure.
- [2] 56, and appropriate work is shown, such as $\frac{1}{2} \cdot 14 \cdot 16 \cdot \sin 30$.
[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] 56, but no 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.

- [2] 16.6, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] A correct substitution of 4.75 for t is made, but no further correct work is shown.
or [1] 16.6, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [25] [2] No, and a correct justification is given.
[1] No, but an incomplete or partially incorrect explanation is given.
[0] No, but no explanation is given.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

- [4] \overline{AB} and $\overline{A''B''}$ are graphed and labeled correctly, $A''(0,-5)$ and $B''(-2,0)$, and a correct transformation is identified, such as R_{180° , R_{-180° , or $r_{(0,0)}$.
- [3] One error is made in graphing \overline{AB} , but $\overline{A''B''}$ is graphed and labeled appropriately, and an appropriate transformation is identified.
- [2] \overline{AB} is graphed and labeled correctly but one mistake is made in finding $\overline{A''B''}$, but an appropriate transformation is identified.
- or [2] Both \overline{AB} and $\overline{A''B''}$ are graphed and labeled correctly, but the transformation is missing or is incorrect.
- [1] \overline{AB} is graphed and labeled correctly, but one mistake is made in finding $\overline{A''B''}$, and the transformation is missing or is incorrect.
- or [1] One error is made in graphing \overline{AB} , but $\overline{A''B''}$ is graphed and labeled appropriately, but the transformation is missing or is incorrect.
- or [1] R_{180° , R_{-180° , or $r_{(0,0)}$, 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.
-
- [27] [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-

- [4] $2 \pm i$, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational error is made, but the result is expressed as a complex number in simplest $a + bi$ form.
- or [3] Appropriate work is shown, but the roots are not expressed in simplest $a + bi$ form.
- or [3] Appropriate work is shown, but only one complex root, in simplest $a + bi$ form, is found.
- [2] Appropriate work is shown, but one computational error is made, resulting in a solution that is not a complex number.
- or [2] Appropriate work is shown, but two or more computational errors are made, but the result is expressed as a complex number in simplest $a + bi$ form.
- or [2] Appropriate work is shown, but one conceptual error is made.
- or [2] An incorrect quadratic formula is used, but the result is expressed as a complex number in simplest $a + bi$ form.
- [1] Incorrect substitution is made into the quadratic formula, such as $a = 1$, $b = 5$, and $c = -4$, but the resulting equation is solved appropriately.
- or [1] $2 \pm i$, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [28] incorrect procedure.

- [4] 174, and appropriate work is shown, such as the use of the Law of Cosines.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.
- or [2] One conceptual error is made when applying the Law of Cosines, but an appropriate answer is found.
- [1] Correct substitution is made into the Law of Cosines, but no further correct work is shown.
- or [1] 174, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [29] incorrect procedure.

[4] $y = 2 \sin \frac{1}{2}x + 3$ or $y = -2 \sin \frac{1}{2}x + 3$, and

appropriate work is shown.

[3] The fact that c is equal to 3 is not recognized, resulting in an answer of

$$y = 2 \sin \frac{1}{2}x \text{ or } y = -2 \sin \frac{1}{2}x.$$

or [3] The values of a , b , and c are determined correctly, and appropriate work is shown, but the equation is not written.

or [3] The value of a or c is determined incorrectly, but the value of b is determined correctly, and appropriate work is shown, and an appropriate equation is written.

[2] Only the value of b is determined correctly, but appropriate work is shown, and an appropriate equation is written.

or [2] Only the values of a and c are determined correctly, but appropriate work is shown, and an appropriate equation is written.

[1] The value of a or c is determined incorrectly, and the value of b is not determined or is determined incorrectly, but appropriate work is shown, and an appropriate equation is written.

or [1] $y = 2 \sin \frac{1}{2}x + 3$ or $y = -2 \sin \frac{1}{2}x + 3$,

but no work is shown.

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

[30] incorrect procedure.

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

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

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

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

[1] $\bar{x} = 80$, $\bar{y} = 20.8$, and $y = 0.25x + 0.8$, but no work is shown.

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

[31] incorrect procedure.

[4] 29 hammers to make a profit and 45 hammers to make a profit of \$100, and appropriate work is shown.

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

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

or [2] Either the number of hammers to make a profit or the number of hammers to make a profit of \$100 is determined correctly, and appropriate work is shown.

[1] One conceptual and one computational error are made.

or [1] The correct equation and inequality or the correct equations are written, but no further correct work is shown.

or [1] 29 hammers to make a profit and 45 hammers to make a profit of \$100, but no work is shown.

[0] 29 and 45, but no work is shown and the answers are not labeled.

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

[32] obviously incorrect procedure.

[6] $\frac{2}{1}$ or 2:1 or an equivalent ratio, and

appropriate work is shown.

[5] Appropriate work is shown, but one computational error is made, but an appropriate ratio is found.

or [5] Appropriate work is shown, but the answer is not written as a ratio.

or [5] Appropriate work is shown, but the ratio is reversed or is simplified incorrectly.

[4] Appropriate work is shown, but two or more computational errors are made, but an appropriate ratio is found.

or [4] Correct measures are found for all the arcs and the angles, and appropriate work is shown, but no ratio is found.

or [4] Correct measures are found for all the arcs, but the measure of one angle is found incorrectly, but an appropriate ratio is found.

[3] One conceptual error is made, but appropriate work is shown, and an appropriate ratio is found.

or [3] Correct measures are found for all the arcs, but the measures of both angles are found incorrectly, but an appropriate ratio is found.

[2] Correct measures are found for all the arcs, but no further correct work is shown.

[1] Only the value of x is found correctly, and appropriate work is shown.

or [1] $\frac{2}{1}$ or 2:1 or an equivalent ratio, but no work is shown.

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

[33] incorrect procedure.

[6] 19, and appropriate work is shown, such as $P(\text{at least three}) =$

${}_4C_3(0.6)^3(0.4) + {}_4C_4(0.6)^4$ and $P(0) = (0.4)^4$.

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

or [5] Correct probabilities are computed, but no answer or an incorrect answer is found.

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

or [4] Only the probability for at least three strikes is found correctly, but an appropriate ratio is determined.

[3] The probability for at least three strikes is found correctly, and no further correct work is shown.

or [3] Only the probability for zero strikes is found correctly, but an appropriate ratio is determined.

[2] Only the probability for zero strikes is found correctly, and no further correct work is shown.

or [2] Only the equation for the probability for at least three strikes is written, and it is not solved.

[1] Conceptual errors are made in finding the probabilities, but an appropriate ratio is determined, based on the incorrect probabilities.

or [1] 19, but no work is shown.

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

[34] incorrect procedure.