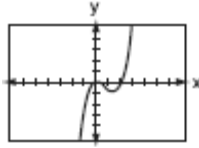
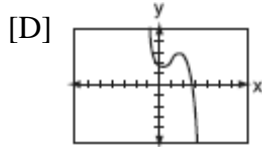
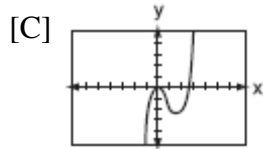
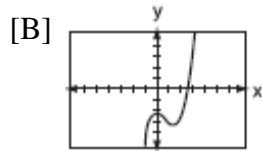
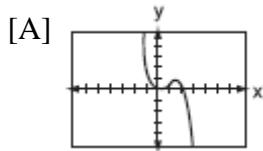


1. 060701b, P.I. A2.A.46

The accompanying graph represents the equation  $y = f(x)$ .



Which graph represents  $g(x)$ , if  $g(x) = -f(x)$ ?



2. 060702b, P.I. A2.S.15

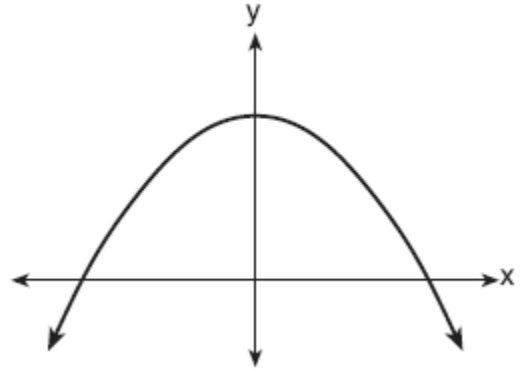
During a single day at radio station WMZH, the probability that a particular song is played is .38. Which expression represents the probability that this song will be played on *exactly* 5 days out of 7 days?

[A]  ${}_7C_5(.38)^2(.62)^5$       [B]  ${}_5C_2(.38)^5(.62)^2$

[C]  ${}_7C_5(.38)^5(.62)^2$       [D]  ${}_7P_5(.38)^5(.62)^2$

3. 060703b, P.I. A.G.4

Which equation is best represented by the accompanying graph?



[A]  $y = 6x^2$       [B]  $y = 6x + 1$

[C]  $y = -x^2 + 1$       [D]  $y = 6^x$

4. 060704b, P.I. A2.A.74

Jack is planting a triangular rose garden. The lengths of two sides of the plot are 8 feet and 12 feet, and the angle between them is  $87^\circ$ . Which expression could be used to find the area of this garden?

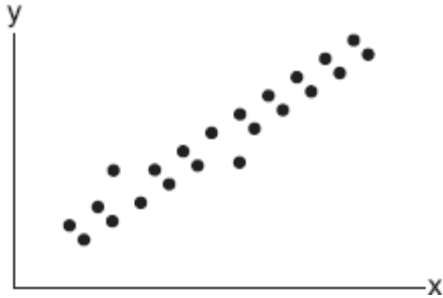
[A]  $8 \cdot 12 \cdot \sin 87^\circ$       [B]  $8 \cdot 12 \cdot \cos 87^\circ$

[C]  $\frac{1}{2} \cdot 8 \cdot 12 \cdot \cos 87^\circ$

[D]  $\frac{1}{2} \cdot 8 \cdot 12 \cdot \sin 87^\circ$

5. 060705b, P.I. A2.S.8

What could be the approximate value of the correlation coefficient for the accompanying scatter plot?



- [A] -0.85    [B] -0.16    [C] 0.90    [D] 0.21

6. 060706b

What is one solution of the accompanying

system of equations?  
 $y = -x^2 + 5$   
 $y = -0.5x^2 + 3$

- [A] (3,5)                      [B] (0,3)  
 [C] (0,5)                      [D] (-2,1)

7. 060707b, P.I. A2.A.1

Which inequality is represented by the accompanying graph?



- [A]  $|x - 1| \leq 5$               [B]  $|x + 2| > 5$   
 [C]  $|x + 3| \geq 2$               [D]  $|x - 5| \geq 2$

8. 060708b, P.I. A2.A.11

The volume of a soap bubble is represented by the equation  $V = 0.094\sqrt{A^3}$ , where  $A$  represents the surface area of the bubble. Which expression is also equivalent to  $V$ ?

- [A]  $(0.094A^3)^{\frac{1}{2}}$               [B]  $0.094A^{\frac{3}{2}}$   
 [C]  $0.094A^{\frac{2}{3}}$                   [D]  $0.094A^6$

9. 060709b, P.I. A2.N.5

The fraction  $\frac{3}{\sqrt{6}-1}$  is equivalent to

- [A]  $3\sqrt{6}-3$                   [B]  $\frac{3\sqrt{6}-3}{5}$   
 [C]  $\frac{3\sqrt{6}+3}{5}$                       [D]  $3\sqrt{6}+3$

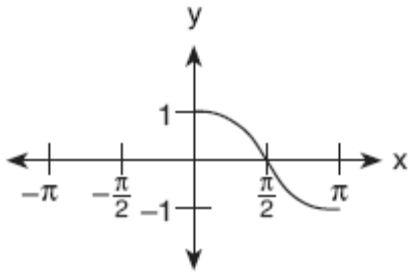
10. 060710b, P.I. A2.A.46

A function,  $f$ , is defined by the set  $\{(2,3), (4,7), (-1,5)\}$ . If  $f$  is reflected in the line  $y = x$ , which point will be in the reflection?

- [A] (1,-5)                      [B] (-1,5)  
 [C] (5,-1)                      [D] (-5,1)

11. 060711b, P.I. A2.A.72

Which equation is represented by the accompanying graph?



- [A]  $y = \cos 2x$       [B]  $y = \frac{1}{2} \cos x$   
 [C]  $y = \cos x$       [D]  $y = \cos \frac{1}{2} x$

12. 060712b, P.I. A.A.16

Which expression is in simplest form?

- [A]  $\frac{x}{x^2}$       [B]  $\frac{9}{x^2 + 9}$   
 [C]  $\frac{x^2 - 6x + 9}{x^2 - x - 6}$       [D]  $\frac{x^2 - 4}{x + 2}$

13. 060713b, P.I. A2.A.17

The expression  $\frac{\frac{1}{3} - \frac{1}{x}}{\frac{3}{x} - 1}$  is equivalent to

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

14. 060714b, P.I. A2.N.10

The expression  $1 + \sqrt{2} + \sqrt[3]{3}$  is equivalent to

- [A]  $\sum_{n=1}^3 n^{-n}$       [B]  $\sum_{n=1}^3 \sqrt{n}$   
 [C]  $\sum_{n=0}^3 n^n$       [D]  $\sum_{n=1}^3 n^{\frac{1}{n}}$

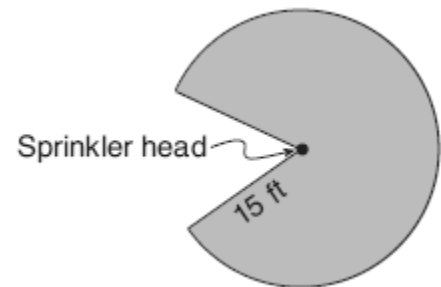
15. 060715b, P.I. A.G.3

Which set of ordered pairs does *not* represent a function?

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

16. 060716b, P.I. 6.G.8

Cerise waters her lawn with a sprinkler that sprays water in a circular pattern at a distance of 15 feet from the sprinkler. The sprinkler head rotates through an angle of  $300^\circ$ , as shown by the shaded area in the accompanying diagram.



What is the area of the lawn, to the *nearest square foot*, that receives water from this sprinkler?

- [A] 589      [B] 94      [C] 79      [D] 707

17. 060717b, P.I. A2.A.2

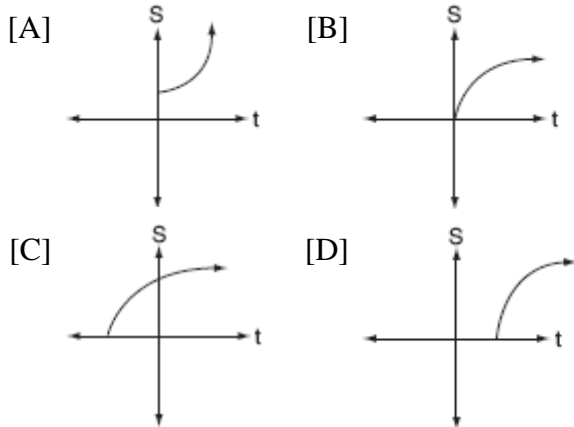
Which number is the discriminant of a quadratic equation whose roots are real, unequal, and irrational?

- [A] 7      [B] 4      [C] -5      [D] 0

18. 060718b, P.I. A2.A.13

The formula  $S = 20\sqrt{t + 273}$  is used to determine the speed of sound,  $S$ , in meters per second, near Earth's surface, where  $t$  is the surface temperature, in degrees Celsius.

Which graph best represents this function?



19. 060719b

If  $2 + i$  and  $2 - i$  are the roots of the equation  $x^2 - 4x + c = 0$ , what is the value of  $c$ ?

- [A] 5      [B] 4      [C] -5      [D] -4

20. 060720b, P.I. A2.A.67

The expression  $\sin A + \frac{\cos^2 A}{\sin A}$  is equivalent to

- [A] 1                      [B]  $\sin A$   
[C]  $\sec A$                 [D]  $\csc A$

21. 060721b, P.I. A.A.9

A population of wolves in a county is represented by the equation  $P(t) = 80(0.98)^t$ , where  $t$  is the number of years since 1998. Predict the number of wolves in the population in the year 2008.

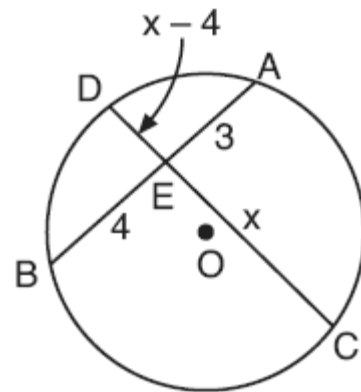
22. 060722b, P.I. A2.S.7

The accompanying table shows the enrollment of a preschool from 1980 through 2000. Write a linear regression equation to model the data in the table.

Year ( $x$ )	Enrollment ( $y$ )
1980	14
1985	20
1990	22
1995	28
2000	37

23. 060723b

In the accompanying diagram of circle  $O$ , chords  $\overline{AB}$  and  $\overline{CD}$  intersect at  $E$ . If  $AE = 3$ ,  $EB = 4$ ,  $CE = x$ , and  $ED = x - 4$ , what is the value of  $x$ ?



24. 060724b

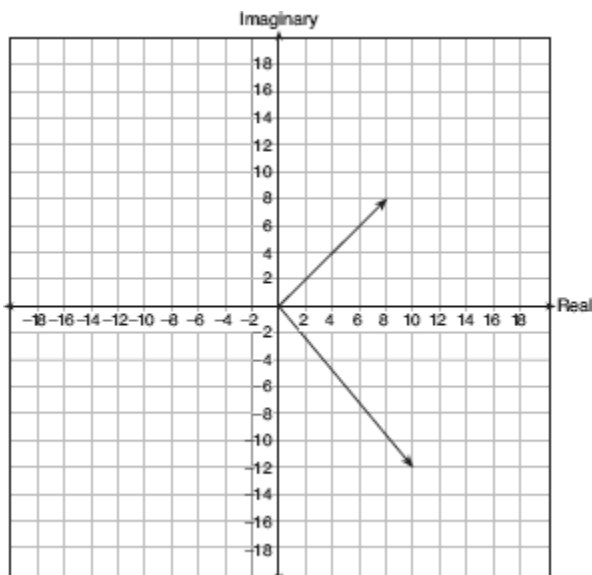
Denise is designing a storage box in the shape of a cube. Each side of the box has a length of 10 inches. She needs more room and decides to construct a larger box in the shape of a cube with a volume of 2,000 cubic inches. By how many inches, to the nearest tenth, should she increase the length of each side of the original box?

25. 060725b, P.I. A2.A.42

If  $f(x) = \log_2 x$  and  $g(x) = 2x^2 + 14$ ,  
determine the value of  $(f \circ g)(5)$ .

26. 060726b

On a stamp honoring the German mathematician Carl Gauss, several complex numbers appear. The accompanying graph shows two of these numbers. Express the sum of these numbers in  $a + bi$  form.

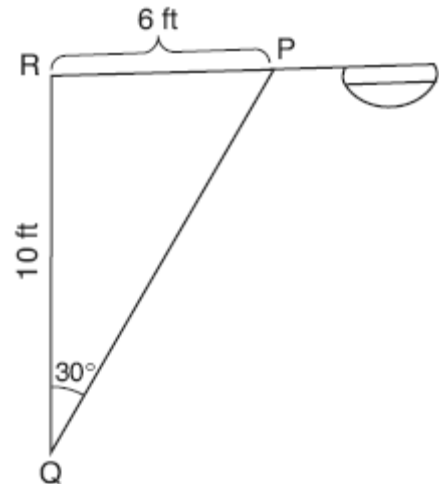


27. 060727b, P.I. A2.A.16

If  $f(x) = \frac{3x^2 - 27}{18x + 30}$  and  $g(x) = \frac{x^2 - 7x + 12}{3x^2 - 7x - 20}$ ,  
find  $f(x) \div g(x)$  for all values of  $x$  for which  
the expression is defined and express your  
answer in simplest form.

28. 060728b, P.I. A2.A.73

In the accompanying diagram of a streetlight,  
the light is attached to a pole at  $R$  and  
supported by a brace,  $\overline{PQ}$ ,  $RQ = 10$  feet,  
 $RP = 6$  feet,  $\angle PRQ$  is an obtuse angle, and  
 $m\angle PQR = 30$ . Find the length of the brace,  
 $\overline{PQ}$ , to the *nearest foot*.



29. 060729b, P.I. A2.S.4

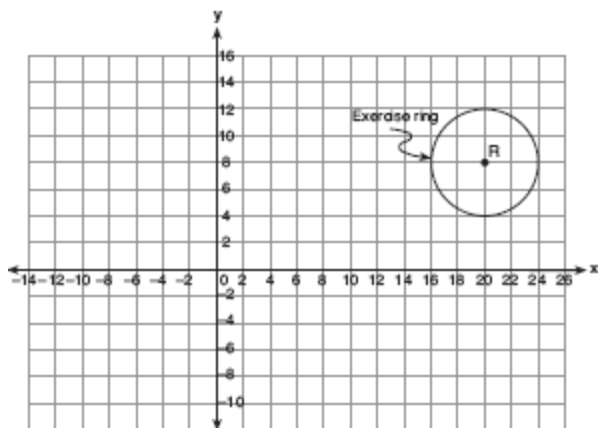
Conant High School has 17 students on its  
championship bowling team. Each student  
bowled one game. The scores are listed in the  
accompanying table.

Score ( $x_i$ )	Frequency ( $f_i$ )
140	4
145	3
150	2
160	3
170	2
180	2
194	1

Find, to the *nearest tenth*, the population  
standard deviation of these scores. How  
many of the scores fall within one standard  
deviation of the mean?

30. 060730b

A landscape architect is working on the plans for a new horse farm. He is laying out the exercise ring and racetrack on the accompanying graph. The location of the circular exercise ring, with point  $R$  as its center, has already been plotted.



Write an equation that represents the outside edge of the exercise ring. The equation of the outside edge of the racetrack is  $\frac{x^2}{144} + \frac{y^2}{36} = 1$ .

Sketch the outside edge of the racetrack on the graph.

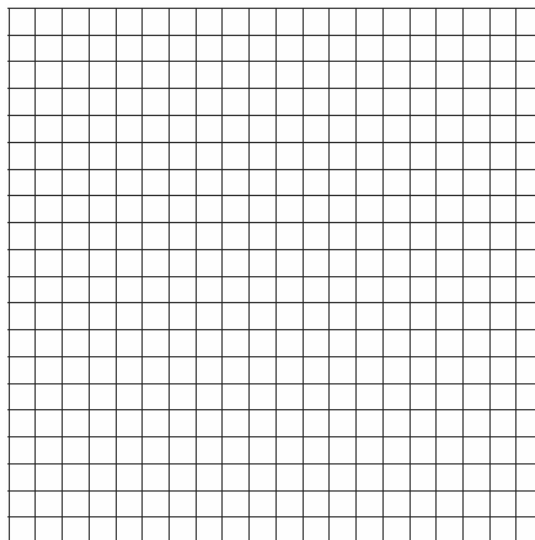
31. 060731b, P.I. A2.A.68

The average annual snowfall in a certain region is modeled by the function

$$S(t) = 20 + 10 \cos\left(\frac{\pi}{5}t\right),$$

where  $S$  represents the

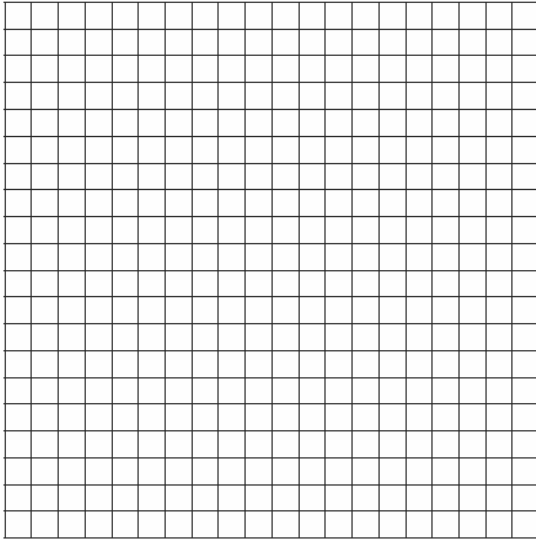
annual snowfall, in inches, and  $t$  represents the number of years since 1970. What is the minimum annual snowfall, in inches, for this region? In which years between 1970 and 2000 did the minimum amount of snow fall? [The use of the grid is optional.]



32. 060732b, P.I. A.A.41

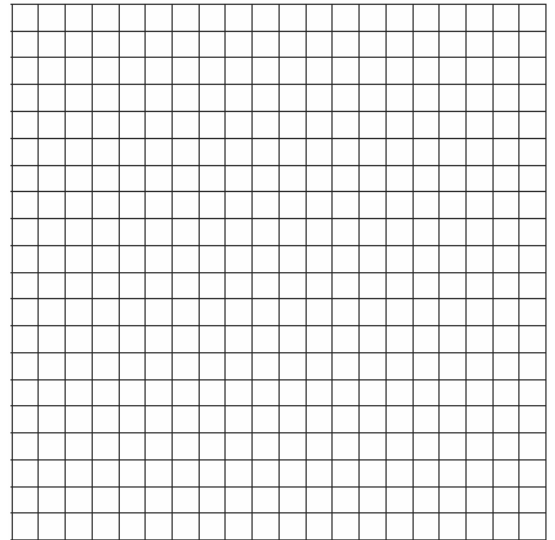
The path of a rocket fired during a fireworks display is given by the equation

$s(t) = 64t - 16t^2$ , where  $t$  is the time, in seconds, and  $s$  is the height, in feet. What is the maximum height, in feet, the rocket will reach? In how many seconds will the rocket hit the ground? [The grid is optional.]



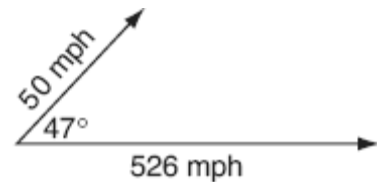
33. 060733b, P.I. G.G.69

Given: quadrilateral  $ABCD$  with vertices  $A(-2,2)$ ,  $B(8,-4)$ ,  $C(6,-10)$ , and  $D(-4,-4)$ . State the coordinates of  $A'B'C'D'$ , the image of quadrilateral  $ABCD$  under a dilation of factor  $\frac{1}{2}$ . Prove that  $A'B'C'D'$  is a parallelogram. [The use of the grid is optional.]



34. 060734b, P.I. A2.A.73

A jet is flying at a speed of 526 miles per hour. The pilot encounters turbulence due to a 50-mile-per-hour wind blowing at an angle of  $47^\circ$ , as shown in the accompanying diagram.



Find the resultant speed of the jet, to the nearest tenth of a mile per hour. Use this answer to find the measure of the angle between the resultant force and the wind vector, to the nearest tenth of a degree.

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

[2] 65, and appropriate work is shown, such as  $P(10) = 80(0.98)^{10}$ .

[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] 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

[21] incorrect procedure.

[2]  $y = 1.08x - 2125$  or an equivalent equation is written.

[1] One conceptual error is made, such as writing a regression equation that is not linear.

or [1] The expression  $1.08x - 2125$  is written, but no equation is written.

or [1] The correct values are identified for  $a$  and  $b$ , but no equation is written.

[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] 6, 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 negative root is not rejected.

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

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

or [1] 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

[23] incorrect procedure.

[2] 2.6, and appropriate work is shown, such as solving the equation  $(10 + x)^3 = 2000$ .

[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 equation  $(10 + x)^3 = 2000$  is

written, but no further correct work is shown.

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

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

[24] incorrect procedure.



- [2] 6, 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, such as evaluating  $(g \circ f)(5)$ , resulting in an answer of 24.78270016.  
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.
- 
- [25] incorrect procedure.
- [2]  $18 - 4i$ , and appropriate work is shown, such as  $(8 + 8i) + (10 - 12i)$ .  
[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 graphic solution is drawn, but the sum is not expressed in  $a + bi$  form.  
or [1]  $18 - 4i$ , but no 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.
- 
- [26] incorrect procedure.

- [4]  $\frac{x+3}{2}$ , and appropriate work is shown.  
[3] Appropriate work is shown, but one computational, factoring, or simplification error is made.  
[2] Appropriate work is shown, but two or more computational, factoring, or simplification errors are made.  
or [2] Appropriate work is shown, but one conceptual error is made, such as failing to multiply by the reciprocal of  $g(x)$  or trying to solve for  $x$ .  
[1] Appropriate work is shown, but one conceptual error and one computational, factoring, or simplification error are made.  
or [1]  $\frac{x+3}{2}$ , but no work is shown.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 
- [27] incorrect procedure.
- [4] 12, and appropriate work is shown, such as using the Law of Sines twice or the Law of Sines and 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] Appropriate work is shown, but one conceptual error is made.  
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.  
or [1] 12, but no work is shown.  
[0] The Pythagorean theorem is used to solve the problem.  
or [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] 16.2 and 10, and appropriate work is shown.  
[3] Appropriate work is shown, but one computational or rounding error is made.  
or [3] Appropriate work is shown, but the sample standard deviation(s) is used, resulting in answers of 16.7 and 10.  
[2] Appropriate work is shown, but two or more computational or rounding errors are made.  
or [2] Appropriate work is shown, but one conceptual error is made.  
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.  
or [1] 16.2 and 10, but no work is shown.  
[0] 16.2 or 10, 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.
- 

- [4]  $(x - 20)^2 + (y - 8)^2 = 16$  and the ellipse is sketched correctly.  
[3] Appropriate work is shown, but one computational or graphing error is made.  
[2] Appropriate work is shown, but two or more computational or graphing errors are made.  
or [2] Appropriate work is shown, but one conceptual error is made.  
or [2] The equation of the circle is written correctly or the ellipse is sketched correctly, but no further correct work is shown.  
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.  
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 

- [4] 10 and 1975, 1985, and 1995, and appropriate work is shown or an appropriate explanation is written.  
[3] Appropriate work is shown, but one computational or graphing error is made.  
or [3] 10, and appropriate work is shown, but only two of the years 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, such as graphing an incorrect function.  
or [2] An incorrect equation of equal difficulty is solved appropriately.  
or [2] 1975, 1985, and 1995, and appropriate work is shown or an appropriate explanation is written, but the minimum snowfall is not found.  
[2] 10, and appropriate work is shown, but only one of the years is found.  
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.  
or [1] 10, and appropriate work is shown or an appropriate explanation is written, but the years are not found.  
or [1] 10 and 1975, 1985, and 1995, but no work is shown.  
[0] 10 or 1975, 1985, and 1995, 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.
-

- [4] Maximum height = 64 and time = 4, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational or graphing error is made.
- or [3] The correct time is found, and appropriate work is shown, but the maximum height is not 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 maximum height is found correctly, and appropriate work is shown, but an incorrect value is found for  $t$ .
- or [2] Appropriate work is shown, but only the time that the maximum height occurs is found, and the quadratic equation  $64t - 16t^2 = 0$  is factored, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
- or [1] Appropriate work is shown, but only the time that the maximum height occurs is found, or the quadratic equation  $64t - 16t^2 = 0$  is factored.
- or [1] Maximum height = 64 and time = 4, but no work is shown.
- [0] Maximum height = 64 or time = 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 obviously incorrect procedure.
- 
- [32]

- [6] The vertices  $A'(-1,1)$ ,  $B'(4,-2)$ ,  $C'(3,-5)$ , and  $D'(-2,-2)$  are stated and a complete and correct proof that includes a conclusion is written.
- [5] The vertices are stated, and a proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one reason is missing or is incorrect.
- or [5] A complete proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but the vertices of  $A'B'C'D'$  are not stated.
- [4] The vertices are stated, and a proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
- [3] The vertices are stated, and a proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two reasons are missing or are incorrect.
- [2] The vertices are stated, and some correct relevant statements about the proof are made, but three or four statements or reasons are missing or are incorrect.
- [1] The vertices  $A'(-1,1)$ ,  $B'(4,-2)$ ,  $C'(3,-5)$ , and  $D'(-2,-2)$  are stated, but no proof is written.
- [0] The “given” and/or the “prove” statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.
- or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- 
- [33]

[6] 561.3 and 43.3, and appropriate work is shown, such as using the Law of Cosines and the Law of Sines.

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

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

or [4] The resultant speed is found correctly, but no further correct work is shown.

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

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

[1] Correct substitutions are made into the Law of Cosines, but no further correct work is shown.

or [1] 561.3 and 43.3, but no work is shown.

[0] 561.3 or 43.3, 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

[34] obviously incorrect procedure.