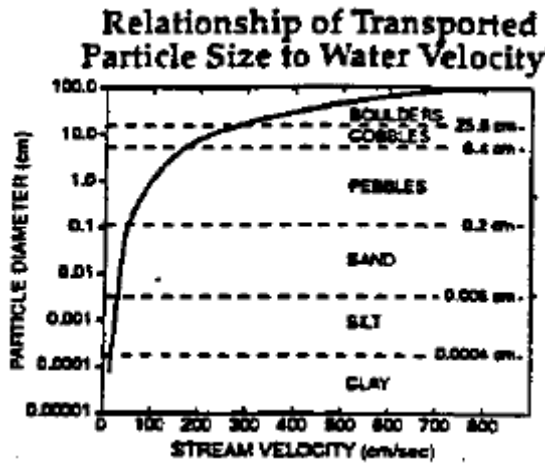1. fall9901b
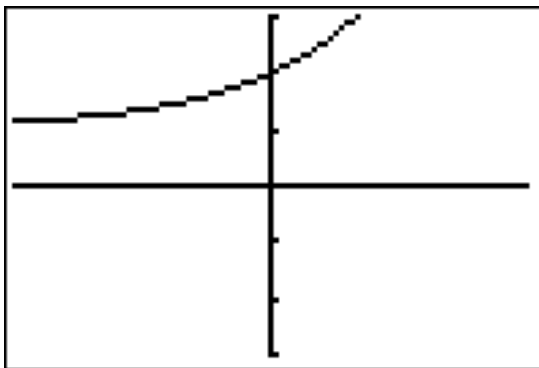
    The graph below represents the relationship of transported particle size to water velocity. The graph best models which type of function?

    [A] quadratic   [B] linear

    [C] trigonometric   [D] logarithmic

2. fall9902b, P.I. A.G.4

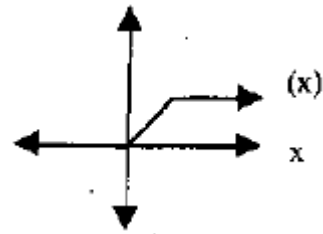   The graph below can be represented by which equation?

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

    [C] $y = 2^x$ [D] $y = 2^{x+1}$

3. fall9903b, P.I. A2.A.46

    The graph below represents f(x).

    Which of the following is the graph of -f(x)?

    [A]

    [B]

    [C]

    [D]

4. fall9904b

    The expression $\log_2(x-4)$ is undefined for all values of x such that

    [A] $x \le 0$ [B] $x > 0$

    [C] $x > 1$ [D] $x \le 4$

5. fall9905b, P.I. A2.A.77

If x is an acute angle, and $\cos x = \dfrac{4}{5}$, then $\cos 2x$ is equal to

[A] $\dfrac{-1}{25}$ [B] $\dfrac{6}{25}$ [C] $\dfrac{2}{25}$ [D] $\dfrac{7}{25}$

6. fall9906b, P.I. A2.N.5

Which expression is equivalent to $\dfrac{\sqrt{7}+\sqrt{2}}{\sqrt{7}-\sqrt{2}}$?

[A] $\dfrac{11+\sqrt{2}}{14}$ [B] $\dfrac{9}{5}$

[C] -1   [D] $\dfrac{9+2\sqrt{14}}{5}$

7. fall9907b, P.I. A2.A.27
Solve for x: $64^{x-2} = 256^{2x}$

[A] $\dfrac{-6}{11}$ [B] $\dfrac{-6}{5}$ [C] 0   [D] $\dfrac{-1}{5}$

8. fall9908b, P.I. A2.A.46

If $y = 2^x$ and $y = (\dfrac{1}{2})^x$ are graphed on the same set of coordinate axes, which transformation would map one of these curves onto the other?

[A] reflection in the origin

[B] reflection in the x-axis

[C] reflection in the line $y = x$

[D] reflection in the y-axis

9. fall9909b
Which is the correct arrangement of these terms in order of value, from smallest to greatest?

[A] $4\dfrac{1}{8}, \sqrt[3]{75}, \left|-4.24\right|, 3\sqrt{2}$

[B] $\sqrt[3]{75}, \left|-4.24\right|, 4\dfrac{1}{8}, 3\sqrt{2}$

[C] $3\sqrt{2}, 4\dfrac{1}{8}, \left|-4.24\right|, \sqrt[3]{75}$

[D] $4\dfrac{1}{8}, \left|-4.24\right|, \sqrt[3]{75}, 3\sqrt{2}$

10. fall9910b, P.I. A2.S.8
The points in the scatter plot below represent the ages of automobiles and their values. Based on this scatter plot, it would be reasonable to conclude:

[A] Age and value have a coefficient of correlation that is less than zero.

[B] Age and value have a coefficient of correlation that is greater than 0.5.

[C] Age and value have a coefficient of correlation that is between zero and 0.5.

[D] Age and value have a coefficient of correlation that is equal to zero.

11. 060712b, P.I. A.A.16

Written in simplest form, the expression

$\dfrac{x^2 y - 4}{4 - x^2 y}$ is:

[A] 1   [B] 0   [C] -1   [D] $\dfrac{x^2 y - 4}{4 - x^2 y}$
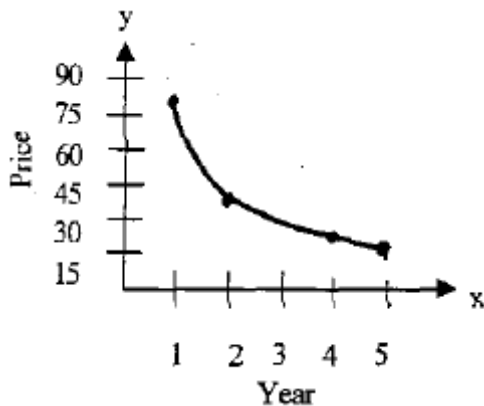
12. fall9912b, P.I. A2.S.5

The scores on a 100 point exam are normally distributed with a mean of 80 and a standard deviation of 6. A student's score places him between the 69th and 70th percentile. Which of the following best represents his score?

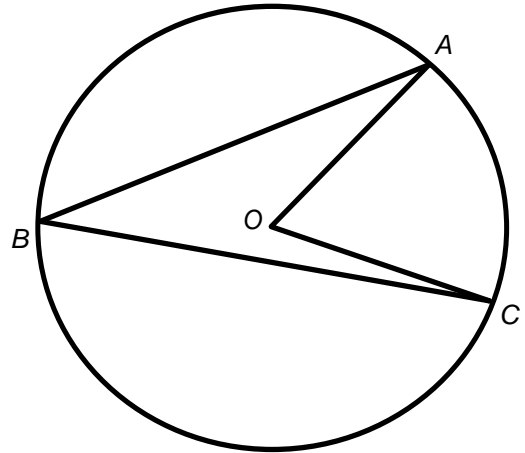[A] 84   [B] 86   [C] 81   [D] 66

13. fall9913b, P.I. A.G.4

The price of a certain stock has decreased over 5 years, as shown in the graph below. Which of the following equations best represents this graph?

[A] $y = 63 \log x$ [B] $y = 60x^2$

[C] $y = \dfrac{80}{x}$ [D] $y = -25x$

14. fall9914b, G.G.53

In the diagram below, circle O has $m\angle ABC = z$. What is $m\angle AOC$?

[A] z [B] z^2 [C] $\dfrac{1}{2}z$ [D] $2z$

15. fall9915b, P.I. A.A.41

A model rocket is launched from ground level. Its height, h meters above the ground, is a function of time t seconds after launch and is given by the equation $h = -4.9t^2 + 68.6t$. What would be the maximum height, to the *nearest meter*, attained by the model?

[A] 242   [B] 240   [C] 243   [D] 241
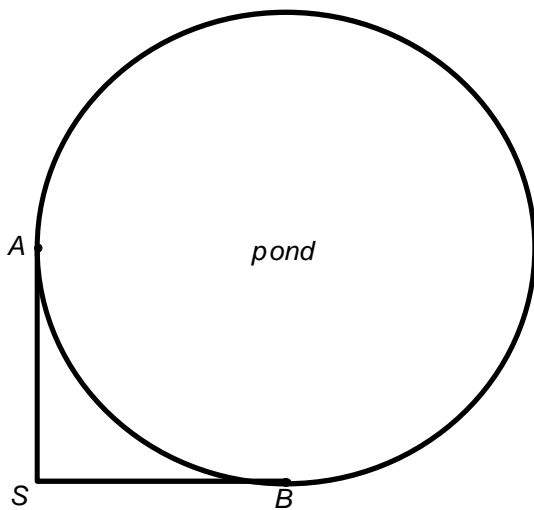
16. fall9916b, P.I. A.A.9

The population of Henderson City was 3,381,000 in 1994, and is growing at an annual rate of 1.8%. If this growth rate continues, what will the approximate population of Henderson City be in the year 2000?

[A] 3,831,000   [B] 3,763,000

[C] 3,696,000   [D] 3,798,000

17. fall9917b, P.I. G.G.73
The center and radius of the given circle
$(x-3)^2 + (y+8)^2 = 39$ are:

[A] (-3, 8), $r = \sqrt{39}$ [B] (3, -8), $r = \sqrt{39}$

[C] (-3, -8), $r = \sqrt{39}$ [D] (3, -8), $r = 39$

18. fall9918b, P.I. A2.S.15
A fair coin is tossed 5 times. What is the
probability that it lands tails up *exactly* 3
times?

[A] $\dfrac{3}{5}$ [B] $(\dfrac{1}{2})^3$

[C] $10(\dfrac{1}{2})^3$ [D] $10(\dfrac{1}{2})^5$

19. fall9919b
If $f(x) = 2\sin 3x + C,$ then the maximum
value of f(x) is:

[A] $C + 2$ [B] C [C] $C + 3$ [D] $C + 6$

20. fall9920b, P.I. A2.A.62
The origin of a coordinate grid is labeled A.
Line segment AB forms an angle of 30° with
the x-axis. If $AB = 8$, the coordinates of B
are:

[A] $(4, 4\sqrt{3})$ [B] $(6, 4)$

[C] $(8\sin 30°, 8\cos 30°)$

[D] $(8\cos 30°, 8\sin 30°)$

21. fall9921b, P.I. 7.N.3
Show that the following can be ordered from
smallest to largest for all $x > 1$. Describe the
method you used and state the correct order.

$$1, \quad x, \quad \sqrt{x}, \quad \dfrac{1}{x}, \quad \text{and} \quad \dfrac{1}{\sqrt{x}}$$

22. fall9922b, P.I. A2.S.15
Jim can drive a golf ball over 220 yards 40%
of the time. He regularly plays on a golf
course where drives of that distance are
needed on 12 holes. Determine the
probability that *exactly* 7 of his drives will be
over 220 yards.

23. fall9923b, P.I. A2.A.22
The period of a pendulum (T), in seconds, is
the length of time it takes for the pendulum to
make one complete swing back and forth.

The formula $T = 2\pi\sqrt{\dfrac{L}{32}}$ gives the period T

for a pendulum of length L in feet. If you
want to build a grandfather clock with a
pendulum that swings back and forth once
every 3 seconds, how long, to the *nearest
tenth of a foot*, would you make the
pendulum?

24. fall9924b, P.I. A2.S.5
A survey of the soda drinking habits of the
population in a high school revealed the mean
number of cans of soda consumed per person
per week to be 20 with a standard deviation of
3.5. If a normal distribution is assumed, find
an interval that contains the total number of
cans per week approximately 95% of the
population of this school will drink. Explain
why you selected that interval.

25. fall9925b, P.I. G.G.64
Given two lines whose equations are
$3x + y - 8 = 0$ and $-2x + by + 9 = 0,$
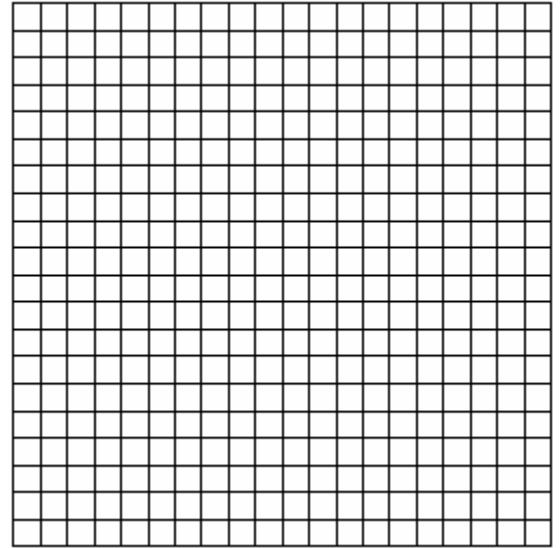determine the value of b such that the two
lines will be perpendicular.

26. fall9926b, P.I. G.G.50

Two docks, *A* and *B*, are located on a circular pond as shown in the diagram below. A surveyor wants to determine the distance these two docks are from each other across the pond. The surveyor, located at point *S*, knows that he is 200 yards from both docks and his measuring equipment indicates that there is a 90° angle between his sight lines to dock *A* and to dock *B*. How far, to the *nearest tenth of a yard*, is it across the pond from dock *A* to dock *B*?

27. fall9927b, P.I. A2.A.54

Sketch the graph of the functions $f(x) = 3^x$ and $g(x) = \log_3 x$. Considering the graphs, describe the relationship between f(x) and g(x). Specify the domain and the range of g.

28. fall9928b, P.I. A2.A.25

Solve the equation $x^2 = 6x - 12$ and express the roots in simplest $a + bi$ form.
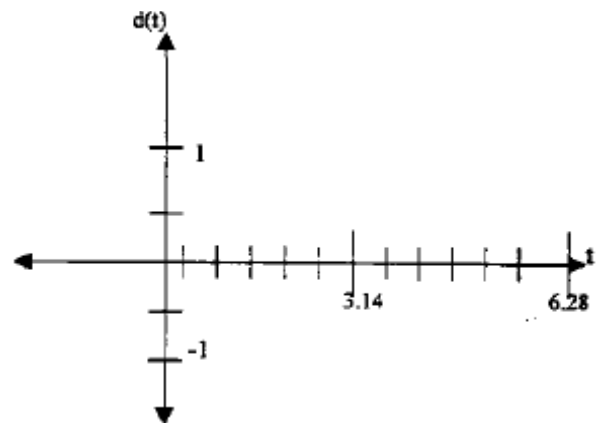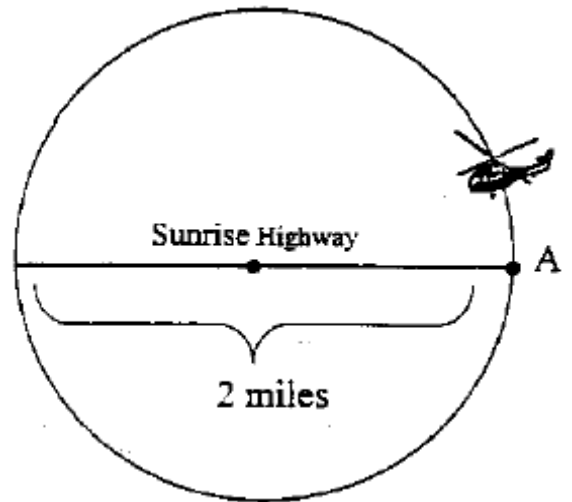
29. fall9929b, P.I. A2.A.73

The Vietnam Veteran's Memorial in Washington, DC consists of two walls of black, polished granite, each 246.75 feet long, which meet at an angle of 125.2°. If extended, the west wall would reach to the Lincoln Memorial, 900 feet away from the end of the wall and the east wall would reach to the Washington Monument, 3,500 feet away from the end of the wall. Find the distance between the Lincoln Memorial and the Washington Monument to the *nearest foot*.

30. fall9930b, P.I. A2.A.27

In the equation $y = 0.5(1.21)^x$, y represents the number of snowboarders in millions and x represents the number of years since 1988. Find the year in which the number of snowboarders will be 10 million for the first time. (Only an algebraic solution will be accepted.)

31. fall9931b, P.I. A2.A.70

A helicopter, starting at point A on Sunrise Highway, circles a 2-mile section of the highway in a counterclockwise direction. If the helicopter is traveling at a constant speed and it takes approximately 6.28 minutes to make one complete revolution to return to point A, sketch a possible graph of distance (dependent variable) from the helicopter to the highway, versus time (independent variable). If the helicopter is north of the highway, distance (d) is positive; if the helicopter is south of the highway, distance (d) is negative. (Disregard the height of the helicopter.) State the equation of this graph.
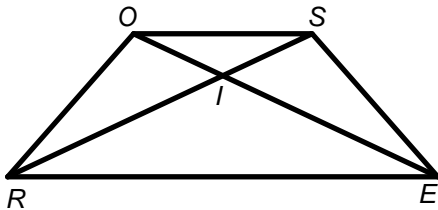
32. fall9932b, P.I. A2.A.61

If an arc of 60° on circle *A* has the same length as an arc of 45° on circle *B*, what is the ratio of the area of circle *B* to the area of circle *A*?
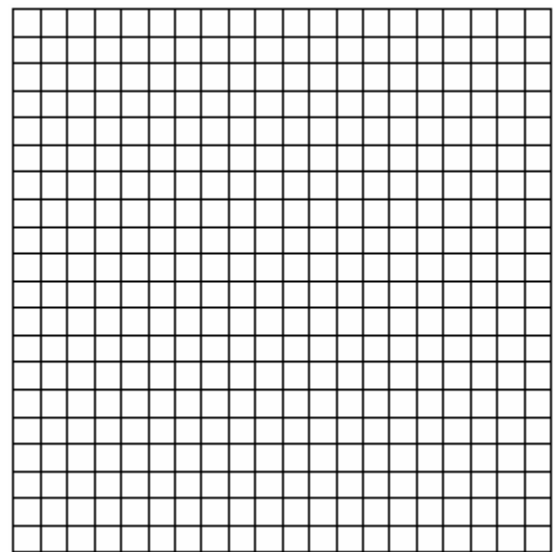
33. fall9933b, P.I. G.G.27

Given trapezoid *ROSE* with diagonals $\overline{RS}$ and $\overline{EO}$ intersecting at point *I*, prove that the diagonals of the trapezoid do *not* bisect each other.

34. fall9934b, P.I. A2.S.7

The volume of a particular gas was determined at various pressures. *P* is the pressure (in atmospheres) and is the independent variable on the horizontal axis, and *V* is the volume (in liters) and is the dependent variable on the vertical axis: Create a scatter plot and find the equation of the curve of best fit. (Round answer constants to *nearest tenth*) and then, using the regression equation found, estimate *V* if *P* = 2.5.

P	V
0.1	225
0.3	74.999
0.5	45
0.7	32.139
0.9	25
1.1	20.45
1.5	15
1.7	13.24
1.9	11.84
2.1	10.71
2.3	9.78

[1] D

[2] A

[3] A

[4] D

[5] D

[6] D

[7] B

[8] D

[9] A

[10] A

[11] C

[12] A

[13] C

[14] D

[15] B

[16] B

[17] B

[18] D

[19] A

[20] D

[2] $\dfrac{1}{x}$, $\dfrac{1}{\sqrt{x}}$, 1, $\sqrt{x}$, x

Explanation: $\sqrt{x}$ is less than x, therefore $x > \sqrt{x}$ for values $x > 1$; also expressed as a fraction $\dfrac{1}{\sqrt{x}} > \dfrac{1}{x}$ since for unit fractions the larger the denominator, the smaller the fraction.

or [2] Equivalent explanation.

or [2] Uses a numerical value for x to establish order and then ranks the correctly in terms of x.

[1] Correct answer with no explanation.

or [1] At least three in the correct order with some supporting explanation.

or [1] Correctly orders an answer using a numerical value rather than "in terms of x" such as if $x = 4$ the order would be $\dfrac{1}{4}$, $\dfrac{1}{2}$, 1, 2, 4.

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

[21] incorrect procedure.

[2] 0.1, 0.101, 0.099, or 10% or equivalent answer with appropriate work shown such as $_{12}C_{7}(0.4)^{7}(0.6)^{5}$.

[1] Finds an appropriate answer based on an incorrect value for one of the variables.

or [1] Makes correct substitutions, but has a rounding, percent conversion error, or arithmetic mistake.

or [1] Correct answer with no work shown.

or [1] Does not come to final answer, such as $792(\dfrac{128}{78125})(\dfrac{243}{3125})$.

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

[22] incorrect procedure.

[2] Answer of 7.3, with appropriate substitution shown.
[1] Answer given, but not rounded correctly.
or [1] Correct answer only, no work shown.
or [1] Shows correct substitution, but answer is incorrect.
or [1] Log equation, no substitution of values.
[0] A zero response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an obviously incorrect procedure.
[23] or [0] Substitutes 3 for *L*.

[2] Interval from 13 - 27, and correctly drawn and labeled curve with the correct explanation.
or [2] A statement explaining how to interpret the curve and the correct answer, but no curve drawn.
[1] Makes a mathematical error.
or [1] Has the correct answer based on an incorrect curve.
or [1] Just has a correct answer with no curve drawn, and no explanation of the curve.
or [0] Response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an obviously incorrect procedure.
[24] incorrect procedure.

[2] $b = 6$ by determining the slopes of both lines, sets $\frac{2}{b} = $ negative reciprocal slope of -3 (i.e. $\frac{1}{3}$).
or [2] $b = 6$ by determining the product of the slopes $= -1$.
[1] Sets $\frac{2}{b} = -3$ and solves for $b = \frac{-2}{3}$.
or [1] Finds slope of perpendicular as $\frac{1}{3}$, but does not solve *b*.
or [1] $b = 6$ and no work shown.
[0] Does not identify slopes.
or [0] A zero response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an
[25] obviously incorrect procedure.

[2] 282.8 using an appropriate method such as law of cosines, Pythagorean Theorem, right triangle trig or special right triangle 45, 45, 90.
[1] Gives a correct answer of 282.8 with no work shown.
or [1] Gives an incorrectly rounded answer such as 283, or 282.84, or 282.
or [1] Uses the Pythagorean Theorem correctly, but makes an incorrect substitution for one of the sides, and then rounds correctly.
or [1] Uses an appropriate method, but makes a calculation mistake and then rounds answer correctly.
[0] A zero response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an obviously
[26] incorrect procedure.

[4] Correct graphs, relationship, domain, and range:
f(*x*) and g(*x*) are reflections in the line $y = x$
or f (*x*) and g(*x*) are inverses.
and Domain of g: The set of all real numbers such that $x > 0$.
and Range of g: The set of all real numbers.
[3] Correct graphs and relationship; incorrect domain and/or range.
or [3] Correct graphs, domain, and range; incorrect relationship.
or [3] One correct graph; correct relationship, domain, and range.
[2] Correct graphs; incorrect relationship, and domain and/or range.
or [2] Incorrect graphs; correct relationship and domain and range.
or [2] One correct graph and either relationship, or domain and range correct.
[1] No graphs, or incorrect graph with correct relationship.
or [1] No graphs, or incorrect graphs with correct domain and range.
or [1] One correct graph only.
[0] Response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an obviously
[27] incorrect procedure.

[4] Finds $3+i\sqrt{3}$ and $3-i\sqrt{3}$, or $3+1.73i$ and $3-1.73i$ by using the quadratic formula or some other valid method.

[3] Finds a correct answer, but does not simplify.

or [3] Uses a correct procedure, but makes an arithmetic mistake or simplifies improperly.

or [3] Finds incorrect roots based upon a mistake in the quadratic formula which keeps the discriminant negative.

[2] Writes a correct equation: $x^2-6x+12=0$, and a correct discriminant of $i\sqrt{12}$ or $2i\sqrt{3}$, but incorrect roots.

or [2] Uses a correct procedure, but makes more than one error.

[1] Writes the correct equation only.

or [1] Obtains correct answer, but no work is shown.

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

[28] incorrect procedure.

[4] 4506 and shows an appropriate application of the Law of Cosines such as
$$a^2 = 1146.75^2 + 3746.75^2$$
$$-2(1146.75)(3746.75)\cos 125.2°.$$

[3] Makes an appropriate application of the Law of Cosines, but does not add the wall length to the distances. (answer 4086)

or [3] Uses the appropriate method, but makes a minor mathematical or rounding error.

or [3] 4506 showing a correct diagram but showing no Law of Cosines.

[2] Correctly uses the Law of Cosines, with or without the wall added, but does not find the square root.

or [2] Uses Law of Cosines without the wall added and makes a minor mathematical mistake.

or [2] Finds the distance between the ends of the two walls (answer 438) using the Law of Sines or Cosines.

[1] Obtains the correct answer of 4506, but does not show any work.

or [1] Sets up diagram with correct sides (1146.75 and 3746.75) and angle, but does not solve problem.

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

[29] incorrect procedure

[4] 2003 or 2004 (since the calculator yields 15.7 either year is acceptable) and correctly solves the log problem algebraically with work shown.
[3] Algebraically solves, with work shown, for 15.7, but does not find the correct year.
or [3] Makes a computational error in solving the log problem, but uses the answer to find a year.
[2] Sketches a graph and gets 15.7, and finds the year.
or [2] Uses trail and error method (with at least 3 trials) and finds the correct year.
or [2] Tries to use logs and makes multiple mechanical errors, but finds a year.
or [2] Sets up correct log equation.
[1] Finds 15.7, or gives the year with no work shown.
or [1] Sets equation equal to 10 or 10,000,000 but does not solve.
[0] Response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an obviously
[30] incorrect procedure.

[4] Correct graph of $d(t) = \sin t$ over the specified interval and a correct equation written.
[3] Correct graph with an incorrect equation, such as $y = \sin x$, or graph contains minor flaws.
[2] Incorrect trig graph with an appropriate equation such as $y = -\sin x$.
or [2] Correct trig graph with incorrect equation or no equation, such as $d(t) = \cos t$.
[1] Identifies sine function correctly, but no work and no graph are shown.
or [1] Recognizes the graph as a form of the sine function, such as $d(t) = -\sin t$ and graph contains minor flaws.
[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] $\dfrac{16}{9}$ or 16:9 is found by determining the ratio of their radii and the correct areas ratio.
[3] Incorrectly identifies radian measure, but produces a ratio based on areas.
or [3] Incorrect statement of correct area ratio such as 9:16.
[2] Gets correct ratio of radii, but uses $C = 2\pi r$, instead of $A = \pi r^2$, giving answer of 4:3.
[1] Finds correct ratio of radii, 4:3 only.
or [1] $\dfrac{16}{9}$ with no work.
[0] A zero response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an obviously
[32] incorrect procedure.

[6] Complete and correct proof (statement and reason or paragraph form).
[5] 1 statement and/or reason incorrect/incomplete, but leads to the conclusion.
[4] No or incorrect conclusion drawn to correct proof of parallel lines *OR* and *SE.*
or [4] 2 statements and/or reasons incorrect/incomplete, but leads to proper conclusion.
[3] Partial proof, missing more than two steps, with correct conclusion.
[2] Assumes bisection and only proves triangles congruent.
[1] Gives proper assumption and conclusion only.
[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] Correct scatter plot including labeled axes, equation of best fit ($V = 22.5P^{-1}$), and at $P = 2.5$, the value of V is 9.

[5] All correct but:

No or improper labels on axes.

or Incorrectly plotted points.

or Arithmetic error finding the equation or V.

[4] Incorrect type of function for equation.

or [4] No labels on axes and some incorrectly plotted points.

or [4] No functional value at 2.5 and single graphing error.

[3] Completely incorrect graph, but correct equation and functional value at 2.5.

or [3] Correctly drawn graph, but no or incorrect equation, and no or incorrect functional value at 2.5.

[2] Correct scatterplot, but no labels on axes.

or [2] Correct equation only.

[1] Correct value at 2.5, but no work shown.

or [1] Correct scatter plot but minor errors on intervals of axes.

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

[34] incorrect procedure.