1. 010301b, P.I. A2.A.69
A monitor displays the graph $y = 3\sin 5x$. What will be the amplitude after a dilation of 2?

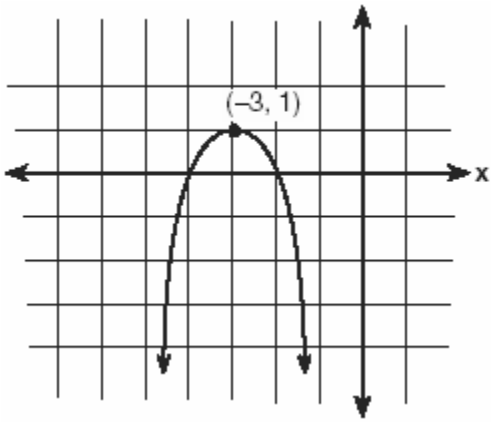
[A] 10 [B] 6 [C] 5 [D] 7

2. 010302b, P.I. A2.S.15
The probability that Kyla will score above a 90 on a mathematics test is $\frac{4}{5}$. What is the probability that she will score above a 90 on three of the four tests this quarter?

[A] $\frac{3}{4}\left(\frac{4}{5}\right)^1\left(\frac{1}{5}\right)^3$ [B] ${}_4C_3\left(\frac{4}{5}\right)^3\left(\frac{1}{5}\right)^1$

[C] ${}_4C_3\left(\frac{4}{5}\right)^1\left(\frac{1}{5}\right)^3$ [D] $\frac{3}{4}\left(\frac{4}{5}\right)^3\left(\frac{1}{5}\right)^1$

3. 010303b, P.I. A.G.4
Which equation represents the parabola shown in the accompanying graph?



[A] $f(x) = -(x-3)^2 + 1$

[B] $f(x) = -(x-3)^2 - 3$

[C] $f(x) = -(x+3)^2 + 1$

[D] $f(x) = (x+1)^2 - 3$

4. 010304b, P.I. A2.N.10
What is the value of $\sum_{b=0}^{3}(2-(b)i)$?

[A] 2-6i [B] 8-6i [C] 2-5i [D] 8-5i

5. 010305b, P.I. A2.A.22
What is the solution set of the equation $\sqrt{9x+10} = x$

[A] {9} [B] {10, -1}

[C] {10} [D] {-1}

6. 010306b, P.I. G.G.28
Which statements could be used to prove that ΔABC and $\Delta A'B'C'$ are congruent?

[A] $\overline{AB} \cong \overline{A'B'}$, $\overline{BC} \cong \overline{B'C'}$, and $\angle A \cong \angle A'$

[B] $\angle A \cong \angle A'$, $\overline{AC} \cong \overline{A'C'}$, and $\overline{BC} \cong \overline{B'C'}$

[C] $\overline{AB} \cong \overline{A'B'}$, $\angle A \cong \angle A'$, and $\angle C \cong \angle C'$

[D] $\angle A \cong \angle A'$, $\angle B \cong \angle B'$, and $\angle C \cong \angle C'$

7. 010307b
Ileana buys a large circular pizza that is divided into eight equal slices. She measures along the outer edge of the crust from one piece and finds it to be $5\frac{1}{2}$ inches. What is the diameter of the pizza to the *nearest inch*?

[A] 8 [B] 14 [C] 4 [D] 7

8. 010308b, P.I. A2.S.5
The national mean for verbal scores on an exam was 428 and the standard deviation was 113. Approximately what percent of those taking this test had verbal scores between 315 and 541?

[A] 38.2% [B] 52.8%

[C] 68.2% [D] 26.4%

9. 010309b, P.I. A2.A.75
In ΔABC, if $AC = 12$, $BC = 11$, and $m\angle A = 30$, angle C could be

[A] either an obtuse angle or an acute angle

[B] a right angle, only

[C] an obtuse angle, only

[D] an acute angle, only

10. 010310b
For a rectangular garden with a fixed area, the length of the garden varies inversely with the width. Which equation represents this situation for an area of 36 square units?

[A] $x + y = 36$ [B] $y = 36x$

[C] $x - y = 36$ [D] $y = \frac{36}{x}$

11. 010311b, P.I. G.G.58
In which quadrant would the image of point $(5, -3)$ fall after a dilation using a factor of -3?

[A] I [B] II [C] IV [D] III

12. 010312b, P.I. A2.A.17
The fraction $\frac{\frac{x}{y} + x}{\frac{1}{y} + 1}$ is equivalent to

[A] $2x$ [B] $\frac{2xy}{1+y}$ [C] x [D] $\frac{x^2y}{1+y}$

13. 010313b, P.I. A2.A.2
If the roots of $ax^2 + bx + c = 0$ are real, rational, and equal, what is true about the graph of the function $y = ax^2 + bx + c$?

[A] It lies entirely above the *x*-axis.

[B] It is tangent to the *x*-axis.

[C] It intersects the *x*-axis in two distinct points.

[D] It lies entirely below the *x*-axis.

14. 010314b, P.I. A2.A.39
If $f(x) = \frac{1}{\sqrt{2x-4}}$, the domain of $f(x)$ is

[A] $x \geq 2$ [B] $x > 2$

[C] $x = 2$ [D] $x < 2$

15. 010315b, P.I. A2.A.16
What is the sum of $\frac{3}{x-3}$ and $\frac{x}{3-x}$?

[A] $\frac{x+3}{x-3}$ [B] 0 [C] 1 [D] -1

16. 010316b, P.I. A2.A.19
The expression $\log 10^{x+2} - \log 10^{x}$ is equivalent to

[A] -2 [B] 100 [C] 2 [D] $\frac{1}{100}$

17. 010317b, P.I. A2.A.58
If $(\sec x - 2)(2\sec x - 1) = 0$, then x terminates in

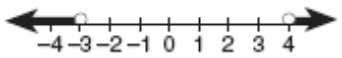
[A] Quadrants I and IV, only

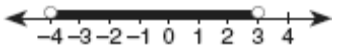
[B] Quadrants I, II, III, and IV

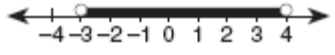
[C] Quadrant I, only

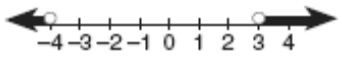
[D] Quadrants I and II, only

18. 010318b, P.I. A2.A.4
Which graph represents the solution set of $x^2 - x - 12 < 0$?

[A] 

[B] 

[C] 

[D] 

19. 010319b, P.I. A2.A.77
If $\sin\theta = \frac{\sqrt{5}}{3}$, then $\cos 2\theta$ equals

[A] $-\frac{1}{3}$ [B] $\frac{1}{9}$ [C] $-\frac{1}{9}$ [D] $\frac{1}{3}$

20. 010320b, P.I. A2.A.66
If sin 6*A* = cos 9*A*, then $m\angle A$ is equal to

[A] 36 [B] $1\frac{1}{2}$ [C] 6 [D] 54

21. 010321b, P.I. A.S.4
Two social studies classes took the same current events examination that was scored on the basis of 100 points. Mr. Wong's class had a median score of 78 and a range of 4 points, while Ms. Rizzo's class had a median score of 78 and a range of 22 points. Explain how these classes could have the same median score while having very different ranges.

22. 010322b, P.I. A.A.8
The height of an object, $h(t)$, is determined by the formula $h(t) = -16t^2 + 256t$, where *t* is time, in seconds. Will the object reach a maximum or a minimum? Explain or show your reasoning.

23. 010323b, P.I. A2.A.22
A wrecking ball suspended from a chain is a type of pendulum. The relationship between the rate of speed of the ball, *R*, the mass of the ball, *m*, the length of the chain, *L*, and the force, *F*, is $R = 2\pi\sqrt{\frac{mL}{F}}$. Determine the force, *F*, to the *nearest hundredth*, when *L* = 12, *m* = 50, and *R* = 0.6.

24. 010324b, P.I. A2.A.28
The relationship between the relative size of an earthquake, *S*, and the measure of the earthquake on the Richter scale, *R*, is given by the equation log *S* = *R*. If an earthquake measured 3.2 on the Richter scale, what was its relative size to the *nearest hundredth*?

25. 010325b, P.I. A2.N.9
In an electrical circuit, the voltage, *E*, in volts, the current, *I*, in amps, and the opposition to the flow of current, called impedance, *Z*, in ohms, are related by the equation *E* = *IZ*. A circuit has a current of (3 + *i*) amps and an impedance of (-2 + *i*) ohms. Determine the voltage in *a* + *bi* form.

26. 010326b, P.I. A2.A.1
The inequality $|1.5C - 24| \le 30$ represents the range of monthly average temperatures, *C*, in degrees Celsius, for Toledo, Ohio. Solve for *C*.

27. 010327b, P.I. A2.S.5
A shoe manufacturer collected data regarding men's shoe sizes and found that the distribution of sizes exactly fits the normal curve. If the mean shoe size is 11 and the standard deviation is 1.5, find:
a the probability that a man's shoe size is greater than or equal to 11
b the probability that a man's shoe size is greater than or equal to 12.5
c $\frac{P(size \ge 12.5)}{P(size \ge 8)}$

28. 010328b, P.I. A2.S.7

In a mathematics class of ten students, the teacher wanted to determine how a homework grade influenced a student's performance on the subsequent test. The homework grade and subsequent test grade for each student are given in the accompanying table.

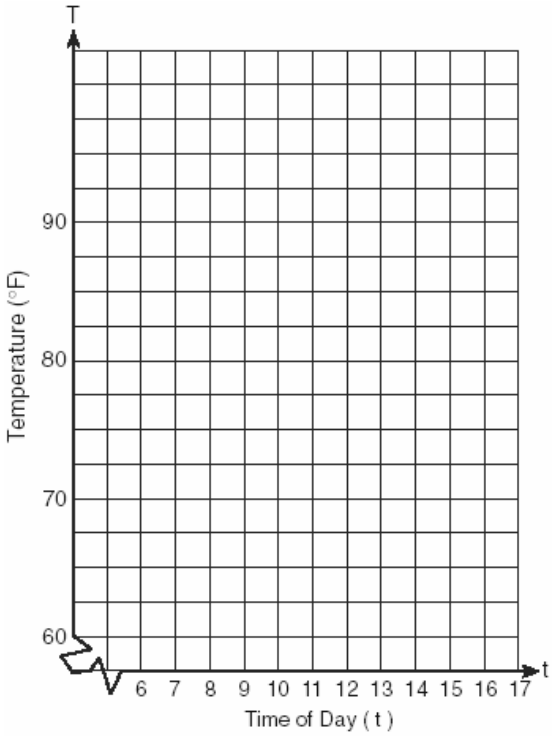
Homework Grade (x)	Test Grade (y)
94	98
95	94
92	95
87	89
82	85
80	78
75	73
65	67
50	45
20	40

a Give the equation of the linear regression line for this set of data.

b A new student comes to the class and earns a homework grade of 78. Based on the equation in part *a*, what grade would the teacher predict the student would receive on the subsequent test, to the *nearest integer*?

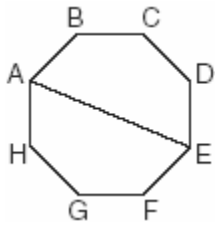
29. 010329b

A building's temperature, *T*, varies with time of day, *t*, during the course of 1 day, as follows: $T = 8\cos t + 78$. The air-conditioning operates when $T \geq 80° F$. Graph this function for $6 \leq t < 17$ and determine, to the *nearest tenth of an hour*, the amount of time in 1 day that the air-conditioning is on in the building.



30. 010330b

A picnic table in the shape of a regular octagon is shown in the accompanying diagram. If the length of $\overline{AE}$ is 6 feet, find the length of one side of the table to the *nearest tenth of a foot*, and find the area of the table's surface to the *nearest tenth of a square foot.*



31. 010331b, P.I. A2.A.42

If $f(x) = x^{\frac{2}{3}}$ and $g(x) = 8x^{-\frac{1}{2}}$, find $(f \circ g)(x)$ and $(f \circ g)(27)$.

32. 010332b, P.I. A2.A.44

Given: $f(x) = x^2$ and $g(x) = 2^x$

a The inverse of g is a function, but the inverse of f is not a function. Explain why this statement is true.

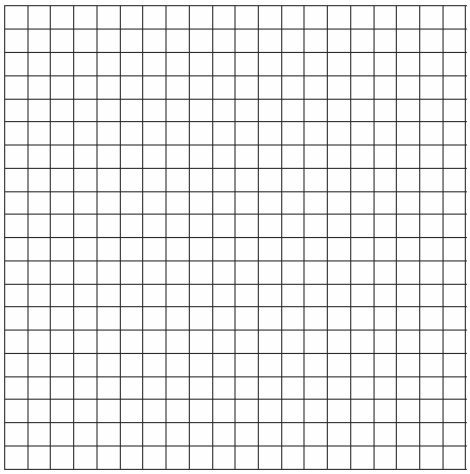
b Find $g^{-1}(f(3))$ to the *nearest tenth*.

33. 010333b, P.I. G.G.69

Quadrilateral *KATE* has vertices *K*(1,5), *A*(4,7), *T*(7,3), and *E*(1,-1).

a Prove that *KATE* is a trapezoid. [The use of the grid is optional.]

b Prove that *KATE* is *not* an isosceles trapezoid.



34. 010334b, P.I. A2.A.73

A ship captain at sea uses a sextant to sight an angle of elevation of 37° to the top of a lighthouse. After the ship travels 250 feet directly toward the lighthouse, another sighting is made, and the new angle of elevation is 50°. The ship's charts show that there are dangerous rocks 100 feet from the base of the lighthouse. Find, to the *nearest foot*, how close to the rocks the ship is at the time of the second sighting.

[1] B

[2] B

[3] C

[4] B

[5] C

[6] C

[7] B

[8] C

[9] A

[10] D

[11] B

[12] C

[13] B

[14] B

[15] D

[16] C

[17] A

[18] C

[19] C

[20] C

[21]
[2] An appropriate explanation is given, such as:
One very high or very low score in either class would have a great effect on the range for that class, but might not affect the median at all. The range is the difference between the two most extreme values, the lowest and the highest. The median, being the middle value, is not very sensitive to outliers or to extreme values.
or [2] Specific examples are shown to illustrate the situation.
[1] An understanding of median and range is demonstrated, but the specific situation is not explained.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[22]
[2] Maximum, and an appropriate reason is given, such as the value of a is negative (less than 0) or the graph opens downward.
[1] Minimum, but an appropriate reason is given, based on an incorrect equation, such as an error in finding the axis of symmetry.
[0] Maximum or minimum, but no reason or an inappropriate reason 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.

[23]
[2] 65,797.36, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] An incorrect derivation of the equation is solved appropriately.
or [1] 65,797.36, 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.

[2] 1,584.89, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 1,584.89, 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.

[24]

[2] $-7+i$, and appropriate work is shown, such as $(-2+i)(3+i)$.
[1] Appropriate work is shown, but one computational error is made.
or [1] $-7+i$, but no work is shown.
[0] (–2 + i)(3 + i) is shown but not multiplied, or the values are added instead of multiplied.
or [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] $-4 \le C \le 36$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but only one extreme value is found.
or [1] $-4 \le C \le 36$, 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]

[4] $\frac{1}{2}$ or 50%, $\frac{15.9}{100}$ or 0.159, and $\frac{0.159}{0.977}$ or an equivalent answer, and appropriate work is shown.
[3] Correct answers are found for either part a or part b and for part c.
[2] Correct answers are found for part a and part b, but the answer for part c is missing or is incorrect.
or [2] Only the correct answer for part b is found, and one computational or substitution error is made in determining the answer to part c.
[1] Only the correct answer for either part a or part b is found.
or [1] $\frac{1}{2}$ or 50%, $\frac{15.9}{100}$ or 0.159, and $\frac{0.159}{0.977}$ 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 incorrect procedure.

[27]

[4] a $y = 0.8344648562x + 14.64960064$ or an equivalent answer expressed to three significant digits
and b 80, and appropriate work is shown.
[3] One computational error is made or one rounding error is made with one of the numbers in the equation, such as truncating or not giving at least three significant digits.
[2] Only the correct answer for either part a or part b is found.
or [2] Appropriate work is shown, but more than one computational or rounding error is made.
[1] 78 is substituted into an incorrect linear equation, but it is evaluated appropriately.
or [1] $y = 0.8344648562x + 14.64960064$ and 80, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[28]

[4] 4.1 and the equation $T = 8 \cos t + 78$ is graphed correctly and appropriate work is shown to determine the amount of time, such as using the table function of the graphing calculator or estimating (3.9-4.3 hours) based on the graph.
[3] The equation $T = 8 \cos t + 78$ is graphed correctly and the correct intervals are stated, but the number of hours is not found or is incorrect.
[2] The equation $T = 8 \cos t + 78$ is graphed correctly, but no further correct work is shown.
or [2] The equation $T = 8 \cos t + 78$ is graphed incorrectly, but an appropriate number of hours is found, based on the incorrect graph.
[1] 4.1, 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.

[29]

[4] The side equals 2.3 and the area equals 25.5, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] Appropriate work is shown, but one incorrect formula is used, such as using an incorrect trigonometric function, but appropriate answers are found.
or [2] Appropriate work is shown to find the correct side, but no further correct work is shown.
[1] The radius equals 3 and the central angle equals 45°, but no further correct work is shown.
or [1] The side equals 2.3 and the area equals 25.5, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[30]

[4] $(f \circ g)(x) = 4x^{-\frac{1}{3}}$ or $(8x^{-\frac{1}{2}})^{\frac{2}{3}}$ or an equivalent answer and $(f \circ g)(27) = \frac{4}{3}$ or an equivalent answer, and appropriate work is shown.

[3] Simplification is shown to at least $4x^{-\frac{1}{3}}$, but one computational error or an error in the Law of Exponents is made when finding $(f \circ g)(27)$.
[2] $(f \circ g)(x)$ is determined correctly, but $(f \circ g)(27)$ is not found or is found incorrectly.
or [2] $\frac{4}{3}$ or an equivalent answer, and appropriate work is shown, but an expression for $(f \circ g)(x)$ is not found or is found incorrectly.
[1] $4x^{-\frac{1}{3}}$ and $\frac{4}{3}$ or equivalent answers, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[31]

a [2] Appropriate sketches of the functions are shown, and the horizontal line tests are used to explain why the statement is true.
or [2] An explanation is given that the inverse of g is a function and the inverse of f is not a function, which includes a definition of the relationship between a function and its inverse or the vertical line test.
or [2] Appropriate sketches of the inverses are shown that use the vertical line test to explain why the statement is true.
or [2] The correct inverses are found algebraically, and appropriate explanations are given.
[1] An explanation is given that indicates only that g is a 1:1 function or that g passes the horizontal line test.
or [1] An explanation is given that indicates only that f is not a 1:1 function or that f does not pass the horizontal line test.
b [2] 3.2, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] 3.2, but no work is shown.
a and b [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[32]

[6] $\overline{KA} \parallel \overline{ET}$, $\overline{AT}$ not $\parallel \overline{KE}$, and $\overline{KE} \neq \overline{AT}$, and appropriate work is shown.
[5] Appropriate work is shown, but one computational error leads to incorrect conclusions that are appropriate, based on that error.
[4] Appropriate work is shown to find $\overline{KA} \parallel \overline{ET}$ or $\overline{AT}$ not $\parallel \overline{KE}$ and $\overline{KE} \neq \overline{AT}$, but no further correct work is shown.
[3] Appropriate work is shown to find $\overline{KE} \neq \overline{AT}$, and at least three of the four slopes are found correctly, but no statement regarding parallelism is made.
or [3] Appropriate work is shown to find the four slopes, and correct statements of parallelism are made, but no further correct work is shown.
[2] Appropriate work is shown to find unequal sides, but no further correct work is shown.
or [2] Appropriate work is shown to find the four slopes, but no conclusion is drawn.
or [2] The four slopes are correct, but no work is shown, but appropriate opposite sides are stated to be parallel and nonparallel.
or [2] The slope and distance formulas are used, but more than one computational error is made, but one accurate conclusion is drawn.
[1] Only two correct slopes or distances are found.
[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] 330, and appropriate work is shown, such as solving $\frac{\sin 13}{250} = \frac{\sin 37}{y}$ and calculating $\cos 50 = \frac{x}{668.8288536}$ and subtracting 100.
[5] Appropriate work is shown, but one computational or rounding error is made.
or [5] Appropriate work is shown, but 100 is not subtracted from the answer.
or [5] An incorrect trigonometric function is used, but the rest of the work is appropriate.
[4] The Law of Sines is used incorrectly, such as using the wrong angle measure, but an appropriate distance from the rocks is found.
[3] The Law of Sines is used correctly, but no answer or an incorrect answer is found.
[2] The Law of Sines is used without finding the angles correctly, and no answer or an incorrect answer is found.
[1] Only a correct diagram is drawn.
or [1] 330, 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.

[34]