1. 060201b, P.I. A2.N.10

   What is the value of $\sum_{m=2}^{5}(m^2-1)$?

   [A] 58   [B] 50   [C] 54   [D] 53

2. 060202b, P.I. A.A.16

   For all values of x for which the expression is

   defined, $\dfrac{2x+x^2}{x^2+5x+6}$ is equivalent to

   [A] $\dfrac{1}{x+2}$ [B] $\dfrac{x}{x+2}$

   [C] $\dfrac{1}{x+3}$ [D] $\dfrac{x}{x+3}$

3. 060203b, P.I. G.G.53

   In the accompanying diagram, the length of

   $\overparen{ABC}$ is $\dfrac{3\pi}{2}$ radians.
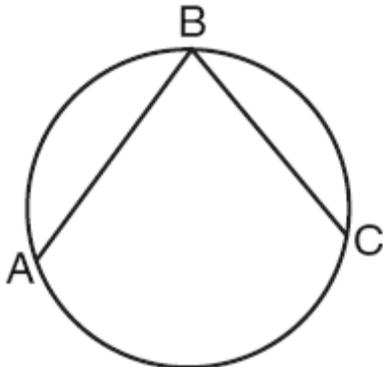
   (Not drawn to scale)

   What is $m\angle ABC$?

   [A] 36   [B] 45   [C] 72   [D] 53

4. 060204b, P.I. G.G.28

   In the accompanying diagram of $\triangle ABC$,

   $\overline{AB}\cong\overline{AC}$, $\overline{BD}=\dfrac{1}{3}\overline{BA}$, and $\overline{CE}=\dfrac{1}{3}\overline{CA}$.
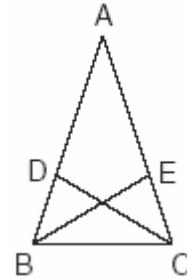
   Triangle EBC can be proved congruent to
   triangle DCB by

   [A] HL $\cong$ HL   [B] SAS $\cong$ SAS

   [C] ASA $\cong$ ASA   [D] SSS $\cong$ SSS

5. 060205b, P.I. A2.A.22

   The path of a rocket is represented by the

   equation $y=\sqrt{25-x^2}$. The path of a missile
   designed to intersect the path of the rocket is

   represented by the equation $x=\dfrac{3}{2}\sqrt{y}$. The

   value of x at the point of intersection is 3.
   What is the corresponding value of y?

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

6. 060206b, P.I. A2.S.5

   On a standardized test, the distribution of
   scores is normal, the mean of the scores is 75,
   and the standard deviation is 5.8. If a student
   scored 83, the student's score ranks

   [A] between the 75th percentile and the 84th
       percentile

   [B] below the 75th percentile

   [C] between the 84th percentile and the 97th
       percentile

   [D] above the 97th percentile

7. 060207b
    Which statement is true for all real number
    values of x?

    [A] $|x - 1| > 0$ [B] $\sqrt{x^2} = |x|$

    [C] $\sqrt{x^2} = x$ [D] $|x - 1| > (x - 1)$

8. 060208b, P.I. A2.A.10

    If x is a positive integer, $4x^{\frac{1}{2}}$ is equivalent to

    [A] $2x$ [B] $\dfrac{2}{x}$ [C] $4\sqrt{x}$ [D] $4\dfrac{1}{x}$

9. 060209b, P.I. A2.S.7
    What is the equation of a parabola that goes
    through points (0,1), (-1,6), and (2,3)?

    [A] $y = 2x^2 - 3x + 1$ [B] $y = x^2 - 3x + 1$

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

10. 060210b, P.I. A2.A.42
    If $f(x) = 2x^2 + 4$ and $g(x) = x - 3$, which
    number satisfies $f(x) = (f \circ g)(x)$?

    [A] $\dfrac{3}{4}$ [B] 5   [C] $\dfrac{3}{2}$ [D] 4

11. 060211b, P.I. A2.S.8
    A linear regression equation of best fit
    between a student's attendance and the degree
    of success in school is $h = 0.5x + 68.5$. The
    correlation coefficient, r, for these data would
    be

    [A] $0 < r < 1$ [B] $r = -1$
    [C] $-1 < r < 0$ [D] $r = 0$

12. 060212b, P.I. A2.A.23
    What is the solution set of the equation
    $\dfrac{x}{x-4} - \dfrac{1}{x+3} = \dfrac{28}{x^2 - x - 12}$?

    [A] { }   [B] {4}   [C] {-6}   [D] {4,-6}

13. 060213b, P.I. A2.A.38
    Which equation represents a function?

    [A] $x^2 + y^2 = 4$ [B] $x = y^2 - 6x + 8$

    [C] $y = x^2 - 3x - 4$ [D] $4y^2 = 36 - 9x^2$

14. 060214b, P.I. A2.A.22
    What is the solution set of the equation
    $x = 2\sqrt{2x - 3}$?

    [A] {2}   [B] {6}   [C] { }   [D] {2,6}

15. 060215b, P.I. A2.N.9
    What is the sum of $\sqrt{-2}$ and $\sqrt{-18}$?

    [A] $5i\sqrt{2}$ [B] $4i\sqrt{2}$

    [C] $2i\sqrt{5}$ [D] $6i$

16. 060216b, P.I. A2.A.43

Which diagram represents a one-to-one function?

[A]

[B]

[C]

[D]
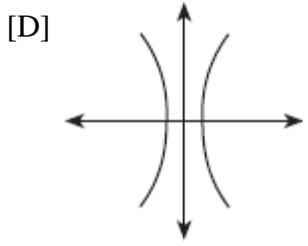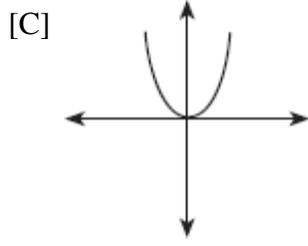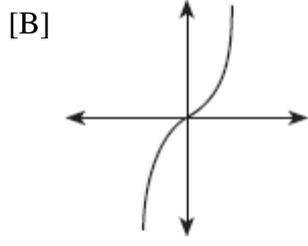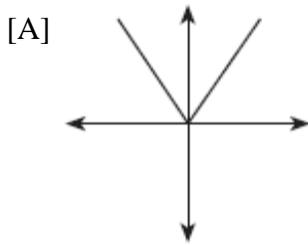
17. 060217b, P.I. G.G.61

Point P' is the image of point $P(-3,4)$ after a translation defined by $T_{(7,-1)}$. Which other transformation on P would also produce P'?

[A] $R_{90°}$ [B] $R_{-90°}$

[C] $r_{y=-x}$ [D] r_{y-axis}

18. 060218b, P.I. G.G.54

Which transformation does *not* preserve orientation?

[A] rotation   [B] dilation

[C] reflection in the *y*-axis

[D] translation

19. 060219b, P.I. A2.A.2

The roots of the equation $2x^2 - x = 4$ are

[A] real, rational, and unequal

[B] imaginary   [C] real and irrational

[D] real, rational, and equal

20. 060220b, P.I. A2.A.44

Which graph represents the inverse of f(x) = {(0,1),(1,4),(2,3)}?

[A]

[B]

[C]

[D]
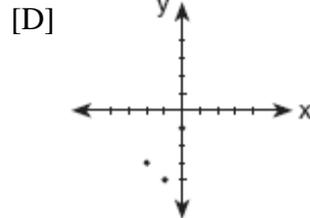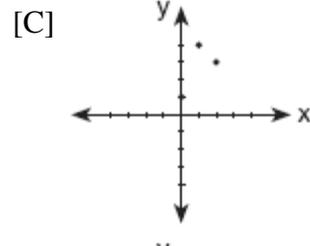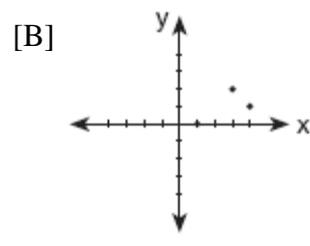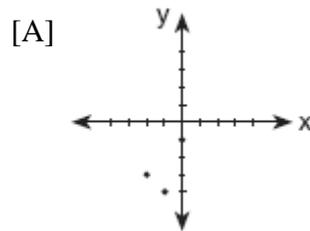
21. 060221b

On a nationwide examination, the Adams School had a mean score of 875 and a standard deviation of 12. The Boswell School had a mean score of 855 and a standard deviation of 20. In which school was there greater consistency in the scores? Explain how you arrived at your answer.

22. 060222b, P.I. A2.A.66

Is $\frac{1}{2}\sin 2x$ the same expression as $\sin x$?

Justify your answer.

23. 060223b, P.I. A2.S.15

After studying a couple's family history, a doctor determines that the probability of any child born to this couple having a gene for disease X is 1 out of 4. If the couple has three children, what is the probability that *exactly* two of the children have the gene for disease X?

24. 060224b, P.I. A2.A.27

Growth of a certain strain of bacteria is modeled by the equation $G = A(2.7)^{0.584t}$, where: G = final number of bacteria, A = initial number of bacteria, t = time (in hours). In approximately how many hours will 4 bacteria first increase to 2,500 bacteria? Round your answer to the *nearest hour*.

25. 060225b, P.I. A.A.41

The equation $W = 120I - 12I^2$ represents the power (W), in watts, of a 120-volt circuit having a resistance of 12 ohms when a current (I) is flowing through the circuit. What is the maximum power, in watts, that can be delivered in this circuit?

26. 060226b, P.I. A.A.7

Island Rent-a-Car charges a car rental fee of $40 plus $5 per hour or fraction of an hour. Wayne's Wheels charges a car rental fee of $25 plus $7.50 per hour or fraction of an hour. Under what conditions does it cost *less* to rent from Island Rent-a-Car? [The use of the accompanying grid is optional.]
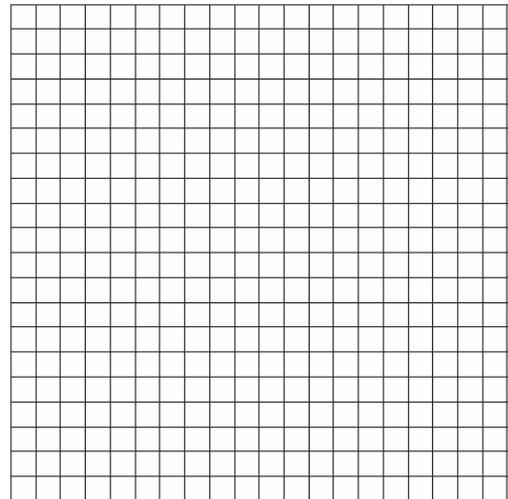
27. 060227b, P.I. A2.S.4

An electronics company produces a headphone set that can be adjusted to accommodate different-sized heads. Research into the distance between the top of people's heads and the top of their ears produced the following data, in inches: 4.5, 4.8, 6.2, 5.5, 5.6, 5.4, 5.8, 6.0, 5.8, 6.2, 4.6, 5.0, 5.4, 5.8. The company decides to design their headphones to accommodate three standard deviations from the mean. Find, to the *nearest tenth*, the mean, the standard deviation, and the range of distances that must be accommodated.

28. 060228b, P.I. A.A.11

A pelican flying in the air over water drops a crab from a height of 30 feet. The distance the crab is from the water as it falls can be represented by the function $h(t) = -16t^2 + 30$, where t is time, in seconds. To catch the crab as it falls, a gull flies along a path represented by the function $g(t) = -8t + 15$. Can the gull catch the crab before the crab hits the water? Justify your answer. [The use of the accompanying grid is optional.]
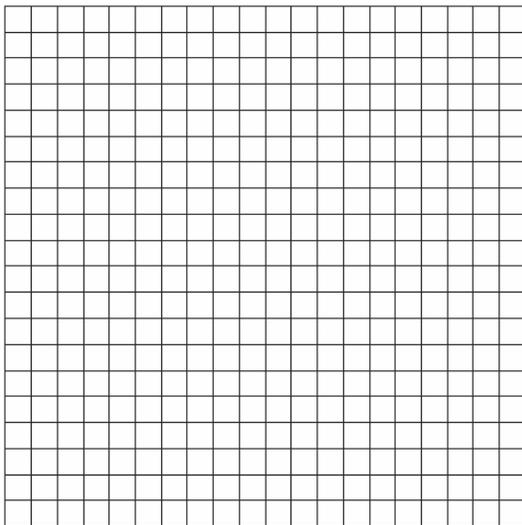
29. 060229b, P.I. G.G.27

Complete the partial proof below for the accompanying diagram by providing reasons for steps 3, 6, 8, and 9.

Given: $\overline{AFCD}$
$\overline{AB} \perp \overline{BC}$
$\overline{DE} \perp \overline{EF}$
$\overline{BC} \parallel \overline{FE}$
$\overline{AB} = \overline{DE}$
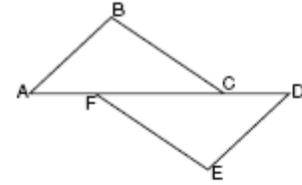
Prove: $\overline{AC} = \overline{FD}$

Statements		Reasons
1 $\overline{AFCD}$		1 Given
2 $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$		2 Given
3 $\angle B$ and $\angle E$ are right angles.		3 _____
4 $\angle B = \angle E$		4 All right angles are congruent.
5 $\overline{BC} \parallel \overline{FE}$		5 Given
6 $\angle BCA = \angle EFD$		6 _____
7 $\overline{AB} = \overline{DE}$		7 Given
8 $\triangle ABC = \triangle DEF$		8 _____
9 $\overline{AC} = \overline{FD}$		9 _____

30. 060230b, P.I. A2.A.28

Solve for x: $\log_4(x^2 + 3x) - \log_4(x + 5) = 1$

31. 060231b, P.I. A2.A.73

A ship at sea heads directly toward a cliff on the shoreline. The accompanying diagram shows the top of the cliff, D, sighted from two locations, A and B, separated by distance S. If $m\angle DAC = 30$, $m\angle DBC = 45$, and $S = 30$ feet, what is the height of the cliff, to the *nearest foot*?
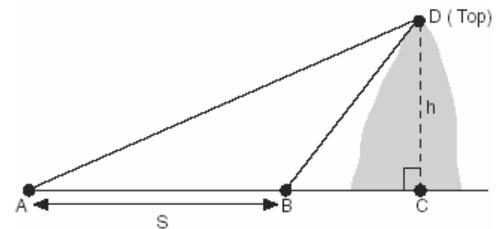
32. 060232b, P.I. A2.A.73

Kieran is traveling from city *A* to city *B*. As the accompanying map indicates, Kieran could drive directly from *A* to *B* along County Route 21 at an average speed of 55 miles per hour or travel on the interstates, 45 miles along I-85 and 20 miles along I-64. The two interstates intersect at an angle of 150° at *C* and have a speed limit of 65 miles per hour. How much time will Kieran save by traveling along the interstates at an average speed of 65 miles per hour?
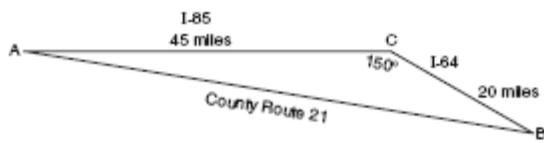
33. 060233b

On a monitor, the graphs of two impulses are recorded on the same screen, where $0° \le x < 360°$. The impulses are given by the following equations:

$$y = 2\sin^2 x$$

$$y = 1 - \sin x$$

Find all values of *x*, in degrees, for which the two impulses meet in the interval $0° \le x < 360°$. [Only an algebraic solution will be accepted.]

34. 060234b, P.I. A2.S.7

The table below, created in 1996, shows a history of transit fares from 1955 to 1995. On the accompanying grid, construct a scatter plot where the independent variable is years. State the exponential regression equation with the coefficient and base rounded to the *nearest thousandth*. Using this equation, determine the prediction that should have been made for the year 1998, to the *nearest cent*.

Year	Fare ($)
55	0.10
60	0.15
65	0.20
70	0.30
75	0.40
80	0.60
85	0.80
90	1.15
95	1.50
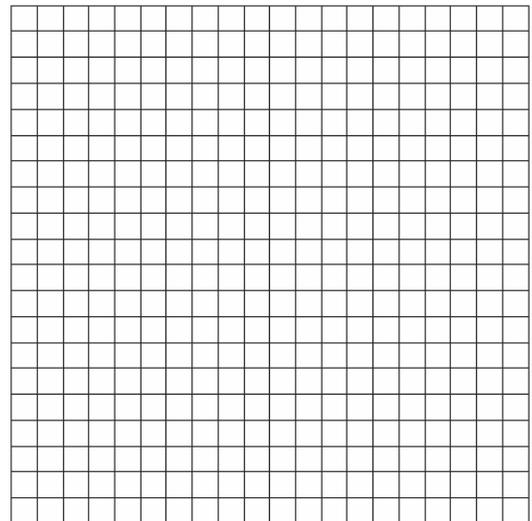
[1]   B _____

[2]   D _____

[3]   B _____

[4]   B _____

[5]   D _____

[6]   C _____

[7]   B _____

[8]   C _____

[9]   A _____

[10] C _____

[11] A _____

[12] C _____

[13] C _____

[14] D _____

[15] B _____

[16] B _____

[17] B _____

[18] C _____

[19] C _____

[20] B _____

[21] [2] The Adams School, and an appropriate explanation is given, such as the standard deviation is a measure of dispersion, which is how much the scores, on the average, differ from the mean. Therefore, the school with the smaller standard deviation would have the more consistent scores.
[1] The Adams School, but an incomplete explanation is given, or the school is not stated, but an appropriate explanation is given.
[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] No, and appropriate work is shown, such as setting the expressions equal to each other, with one trial showing that the two expressions are not always equal.
[1] No, but only one trial shows that the two expressions are not always equal.
or [1] Yes, but appropriate work is shown, such as using 0° and 180° as trials.
[0] No or yes, and no work or incorrect 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.

[23] [2] $\frac{9}{64}$, and appropriate work is shown, such as $_3C_2(\frac{1}{4})^2(\frac{3}{4})^1$.

[1] Only $_3C_2(\frac{1}{4})^2(\frac{3}{4})^1$ is shown.

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

or [1] $\frac{9}{64}$, 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] 12, and appropriate work is shown, such as solving $2,500 = 4(2.7)^{0.584t}$.
[1] Appropriate work is shown, but the answer is not rounded or is rounded to 11.
or [1] Appropriate work is shown, but one computational error is made.
or [1] 12, 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] 300, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] 300, 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] More than 6 hours, and appropriate work is shown, using a graphic or algebraic solution.
[1] Appropriate work is shown, but one computational error or an error in analyzing the results is made.
or [1] More than 6 hours, 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] $\bar{x} = 5.5$, $\sigma = 0.5$, and the range is 4-7, and appropriate work is shown.
[3] $\bar{x} = 5.5$, $\sigma = 0.5$, but one computational error is made when finding the range, but appropriate work is shown.
or [3] $\bar{x}$ is correct, but σ is incorrect, but the range is appropriate, based on the incorrect σ.
or [3] $\bar{x}$ is incorrect, but σ and the range are appropriate, based on the incorrect $\bar{x}$.
[2] $\bar{x}$ is incorrect and σ is incorrect, but the range is appropriate, based on the incorrect $\bar{x}$ and σ.
or [2] $\bar{x}$ is correct and σ is correct, but the range is not determined.
[1] $\bar{x} = 5.5$, $\sigma = 0.5$, and the range is 4-7, 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] Yes, and appropriate work is shown, and an appropriate justification is given.
[3] Appropriate work is shown, and an appropriate justification is given, but one computational error is made, or the negative value of t is not rejected.
[2] An appropriate graph or equation is shown, such as $16t^2 - 8t - 15 = 0$.
[1] An incorrect graph or equation of equal difficulty is used, but an appropriate solution is found.
[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] The reasons for all four steps are correct, such as:
Step 3: Perpendicular line segments form right angles.
Step 6: If two parallel lines are cut by a transversal, the alternate interior angles are congruent.
Step 8: $AAS \cong AAS$.
Step 9: Corresponding parts of congruent triangles are congruent.
[3] The reasons for only three steps are correct.
[2] The reasons for only two steps are correct.
[1] The reason for only one step is correct.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[29]   incorrect procedure.

[4] 5 and -4, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
[2] The correct log equation,

$$\log_4 \frac{x^2 + 3x}{x+5} = \log_4 4, \text{ is shown, but no further}$$

work or incorrect work is shown.
[1] One correct logarithmic step is shown,

such as $\log_4 \dfrac{x^2 + 3x}{x+5}$.

or [1] 5 and -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

[30]   incorrect procedure.

[4] 41, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] One incorrect formula is used, but an appropriate answer is found.
or [2] Appropriate work is shown, but one computational and one rounding error are made.
[1] 41, 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] 0.15 hour or 9 minutes or an appropriately rounded answer, and appropriate work is shown, such as using the Law of Cosines.
[3] Appropriate work is shown, but one computational or rounding error is made.
[2] The correct distance along County Route 21 is found, but no further work or incorrect work is shown.
or [2] Appropriate work is shown, but one computational and one rounding error are made.
[1] The Pythagorean theorem is used to find the distance along County Route 21, and this distance is used to compare travel times.
or [1] 0.15 hour 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

[32]   incorrect procedure.

[6] 30, 150, and 270, and appropriate work is shown.
[5] Appropriate work is shown, but one computational error is made.
[4] The correct equation is shown, but only two correct solutions are found.
[3] The correct equation is shown, but only one correct solution is found.
[2] The correct equation is solved for x, but no further work is shown.
[1] The correct equation is shown, but no further work is shown.
or [1] 30, 150, and 270, 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] A correct scatter plot, $y = (0.002)(1.070)^x$, and $1.52 or an equivalent answer, and appropriate work is shown.
[5] Appropriate work is shown, but one computational or rounding error is made.
[4] A correct scatter plot is shown, but an incorrect equation of equal difficulty is used, but an appropriate fare for 1998 is determined, based on the incorrect equation.
or [4] A correct scatter plot with a function other than exponential is used, but an appropriate equation and fare derived from that equation are shown.
[3] A correct scatter plot is shown, and an appropriate fare based on the scatter plot is found, but no equation or work is shown.
[2] Only a correct scatter plot is shown.
[1] $1.52, 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.