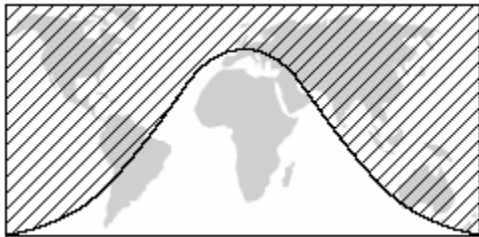1. 010501b, P.I. A2.A.42

   If $f(x) = -2x + 7$ and $g(x) = x^2 - 2$, then $f(g(3))$ is equal to

   [A] -7   [B] -3   [C] -1   [D] 7

2. 010502b

   The shaded portion of the accompanying map indicates areas of night, and the unshaded portion indicates areas of daylight at a particular moment in time.

   Which type of function best represents the curve that divides the area of night from the area of daylight?

   [A] logarithmic   [B] tangent

   [C] quadratic   [D] cosine

3. 010503b

   If R varies inversely as S, when S is doubled, R is multiplied by

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

4. 010504b, P.I. A2.A.39

   What is the domain of the function

   $f(x) = \dfrac{3x^2}{x^2 - 49}$?

   [A] $\{x \mid x \in \text{real numbers}, x \neq 7\}$

   [B] $\{x \mid x \in \text{real numbers}, x \neq 0\}$

   [C] $\{x \mid x \in \text{real numbers}, x \neq \pm 7\}$

   [D] $\{x \mid x \in \text{real numbers}\}$

5. 010505b, P.I. A2.N.10

   The value of $\sum_{r=2}^{4} {}_5C_r$ is

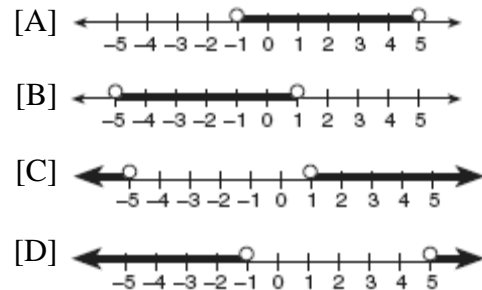   [A] 5   [B] 45   [C] 10   [D] 25

6. 010506a, P.I. A.A.12

   The product of $(5ab)$ and $(-2a^2b)^3$ is

   [A] $-30a^7b^4$ [B] $-40a^7b^4$

   [C] $-40a^6b^4$ [D] $-30a^6b^4$

7. 010507b, P.I. G.G.54

   Which transformation is an example of an opposite isometry?

   [A] $(x,y) \rightarrow (y,-x)$

   [B] $(x,y) \rightarrow (x + 3, y - 6)$

   [C] $(x,y) \rightarrow (3x,3y)$ [D] $(x,y) \rightarrow (y,x)$

8. 010508b, P.I. A2.A.58

   The expression $\dfrac{\tan\theta}{\sec\theta}$ is equivalent to

   [A] $\dfrac{\cos^2\theta}{\sin\theta}$ [B] $\dfrac{\sin\theta}{\cos^2\theta}$

   [C] $\cos\theta$ [D] $\sin\theta$

9. 010509b, P.I. A2.A.4

   Which graph represents the solution set of the inequality $x^2 - 4x - 5 < 0$?

   [A]


   [B]

   [C]

   [D]

10. 010510b, P.I. G.G.51

A small fragment of something brittle, such as pottery, is called a shard. The accompanying diagram represents the outline of a shard from a small round plate that was found at an archaeological dig.

If $\overrightarrow{BC}$ is a tangent to $\overset{\frown}{AC}$ at B and $m\angle ABC = 45,$ what is the measure of $\overset{\frown}{AC}$, the outside edge of the shard?

[A] 135°   [B] 225°   [C] 90°   [D] 45°

11. 010511b, P.I. A.G.3

Which graph is *not* a function?

[A]

[B]

[C]

[D]
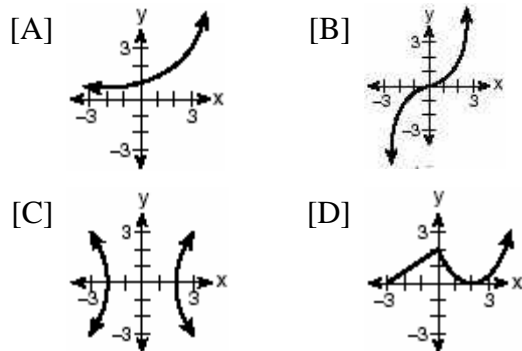
12. 010512b, P.I. A2.A.77

If A is a positive acute angle and $\sin A = \dfrac{\sqrt{5}}{3}$, what is $\cos 2A$?

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

13. 010513b, P.I. A2.A.2

The roots of the equation $2x^2 - 8x - 4 = 0$ are

[A] imaginary

[B] real, rational, and unequal

[C] real, rational, and equal

[D] real, irrational, and unequal

14. 010514b, P.I. G.G.71

What is the equation of a circle with center $(-3,1)$ and radius 7?

[A] $(x-3)^2 + (y+1)^2 = 49$

[B] $(x-3)^2 + (y+1)^2 = 7$

[C] $(x+3)^2 + (y-1)^2 = 49$

[D] $(x+3)^2 + (y-1)^2 = 7$

15. 010515b, P.I. A2.S.8

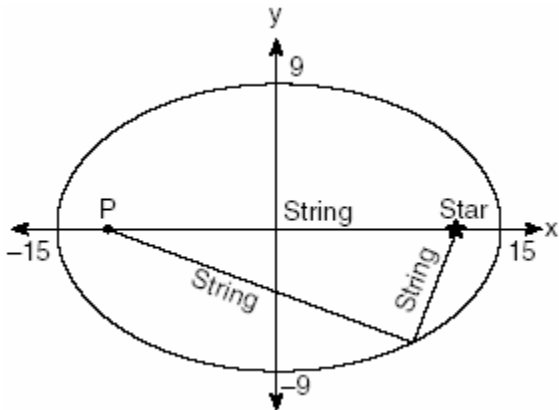Which scatter diagram shows the strongest positive correlation?

[A]

[B]

[C]

[D]
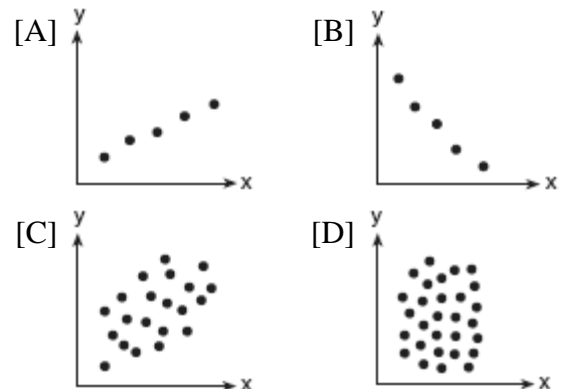
16. 010516b, P.I. A2.N.5

The expression $\dfrac{7}{3-\sqrt{2}}$ is equivalent to

[A] $\dfrac{21+\sqrt{2}}{7}$ [B] $3-\sqrt{2}$

[C] $3+\sqrt{2}$ [D] $\dfrac{3+\sqrt{2}}{7}$

17. 010517b

The accompanying diagram shows the construction of a model of an elliptical orbit of a planet traveling around a star. Point P and the center of the star represent the foci of the orbit.

Which equation could represent the relation shown?

[A] $\dfrac{x^2}{81} + \dfrac{y^2}{225} = 1$ [B] $\dfrac{x^2}{15} - \dfrac{y^2}{9} = 1$

[C] $\dfrac{x^2}{225} + \dfrac{y^2}{81} = 1$ [D] $\dfrac{x^2}{15} + \dfrac{y^2}{9} = 1$

18. 010518b, P.I. A2.N.9

The expression $\dfrac{i^{16}}{i^3}$ is equivalent to

[A] 1   [B] $-i$ [C] i [D] -1

19. 010519b, P.I. A2.A.28

If $\log_5 x = 2$, what is the value of $\sqrt{x}$?

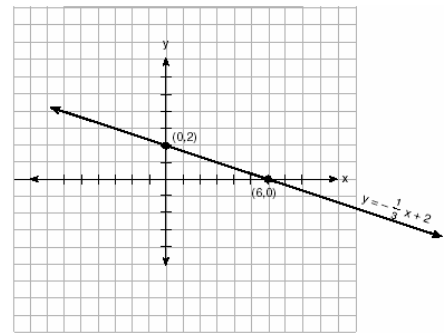[A] $2^{\frac{2}{5}}$ [B] 25   [C] $\sqrt{5}$ [D] 5

20. 010520b, P.I. G.G.61

If the coordinates of point A are (-2,3), what is the image of A under $r_{y-axis} \circ D_3$?

[A] (9,-6)   [B] (-6,-9)

[C] (6,9)   [D] (5,6)

21. 010521b, P.I. A2.A.44

The accompanying diagram shows the graph of the line whose equation is $y = -\dfrac{1}{3}x + 2.$

On the same set of axes, sketch the graph of the inverse of this function. State the coordinates of a point on the inverse function.

22. 010522b

If $2 + 3i$ is one root of a quadratic equation with real coefficients, what is the sum of the roots of the equation?

23. 010523b, P.I. A2.A.68

Solve the following equation algebraically for all values of θ in the interval $0° \le \theta \le 180°$.
$$2\sin\theta - 1 = 0$$

24. 010524b, P.I. A2.S.15

If the probability that it will rain on any given day this week is 60%, find the probability it will rain *exactly* 3 out of 7 days this week.

25. 010525b, P.I. A.A.9

On January 1, 1999, the price of gasoline was $1.39 per gallon. If the price of gasoline increased by 0.5% per month, what was the cost of one gallon of gasoline, to the *nearest cent*, on January 1 one year later?
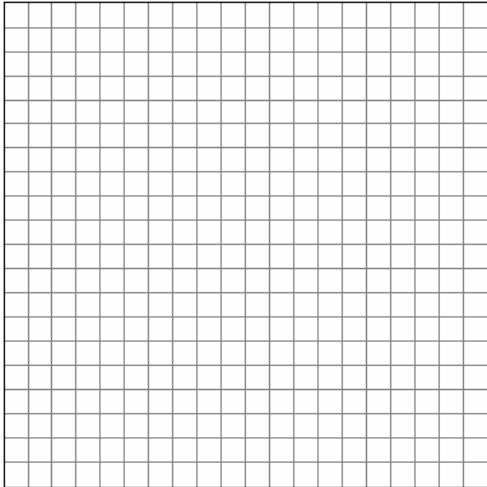
26. 010526b, P.I. A2.A.56

An arc of a circle that is 6 centimeters in length intercepts a central angle of 1.5 radians. Find the number of centimeters in the radius of the circle.

27. 010527b

On the accompanying grid, solve the following system of equations graphically:

$$y = -x^2 + 2x + 1$$

$$y = 2^x$$

28. 010528b, P.I. A2.A.73

To measure the distance through a mountain for a proposed tunnel, surveyors chose points A and B at each end of the proposed tunnel and a point C near the mountain. They determined that $AC = 3{,}800$ meters, $BC = 2{,}900$ meters, and $m\angle ACB = 110$. Draw a diagram to illustrate this situation and find the length of the tunnel, to the *nearest meter*.

29. 010529b, P.I. A2.S.4

From 1984 to 1995, the winning scores for a golf tournament were 276, 279, 279, 277, 278, 278, 280, 282, 285, 272, 279, and 278. Using the standard deviation for the sample, S_x, find the percent of these winning scores that fall within one standard deviation of the mean.

30. 010530b, P.I. A2.S.7

A real estate agent plans to compare the price of a cottage, y, in a town on the seashore to the number of blocks, x, the cottage is from the beach. The accompanying table shows a random sample of sales and location data. Write a linear regression equation that relates the price of a cottage to its distance from the beach. Use the equation to predict the price of a cottage, to the *nearest dollar*, located three blocks from the beach.

| Number of Blocks from the Beach (x)	Price of a Cottage (y)
5	$132,000
0	$310,000
4	$204,000
2	$238,000
1	$275,000
7	$60,800

31. 010531b, P.I. A2.A.1

The heights, h, of the students in the chorus at Central Middle School satisfy the inequality $\left| \dfrac{h - 57.5}{2} \right| \le 3.25$, when h is measured *in inches*. Determine the interval in which these heights lie and express your answer to the *nearest tenth of a foot*. [Only an algebraic solution can receive full credit.]

32. 010532b, P.I. A2.A.22

The number of people, y, involved in recycling in a community is modeled by the function $y = 90\sqrt{3x} + 400$, where x is the number of months the recycling plant has been open.

Construct a table of values, sketch the function on the grid, and find the number of people involved in recycling exactly 3 months after the plant opened. After how many months will 940 people be involved in recycling?
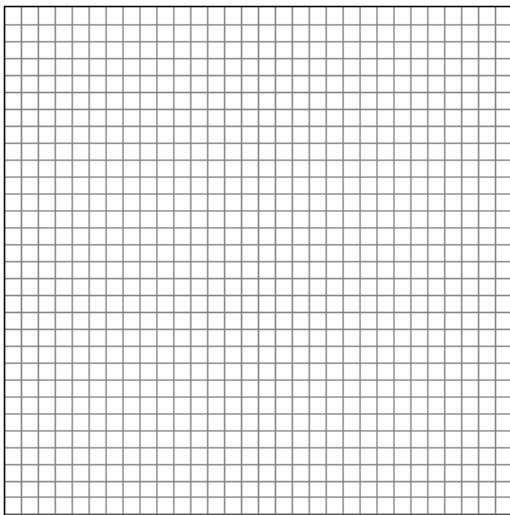
33. 010533b, P.I. G.G.69

Jim is experimenting with a new drawing program on his computer. He created quadrilateral *TEAM* with coordinates $T(-2,3)$, $E(-5,-4)$, $A(2,-1)$, and $M(5,6)$. Jim believes that he has created a rhombus but not a square. Prove that Jim is correct. [The use of the grid is optional.]
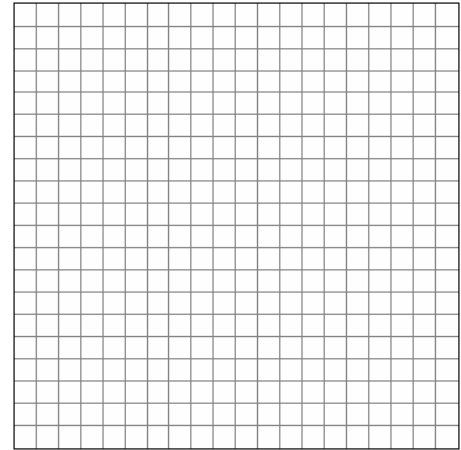
34. 010534b, P.I. A2.A.73

A sign 46 feet high is placed on top of an office building. From a point on the sidewalk level with the base of the building, the angle of elevation to the top of the sign and the angle of elevation to the bottom of the sign are 40° and 32°, respectively. Sketch a diagram to represent the building, the sign, and the two angles, and find the height of the building to the *nearest foot*.

[1]   A

[2]   D

[3]   C

[4]   C

[5]   D

[6]   B

[7]   D

[8]   D

[9]   A

[10] C

[11] C

[12] C

[13] D

[14] C

[15] A

[16] C

[17] C

[18] C

[19] D

[20] C

[21] [2] An appropriate reflection of f(x) in the line y = x is sketched, and the coordinates of one point are stated correctly.
[1] An appropriate graph is sketched, but no coordinates or incorrect coordinates are stated.
or [1] A reflection in some other line is sketched, but appropriate coordinates are stated.
or [1] An incorrect graph is sketched, based on an error in plotting one of the points, but appropriate coordinates are stated.
[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] 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] The second root of the equation is found, but the sum of the roots is not calculated or is calculated incorrectly.
or [1] 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 incorrect procedure.

[23] [2] 30 and 150, 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 only 30 or 150 is found.
or [1] 30 and 150, but no work is shown.
[0] 30 or 150, but no work is shown.
or [0] The value of $\sin \theta$ is shown to be $\frac{1}{2}$.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[2] $\frac{15,120}{78,125}$ or 19.35% or an equivalent

answer, and appropriate work is shown, such
as $_7C_3(.6)^3(.4)^4$.
[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] A correct expression, such as
$_7C_3(.6)^3(.4)^4$, is written, but no further correct
work is shown.
or [1] An incorrect expression of equal
difficulty is evaluated appropriately.
or
[1] $\frac{15,120}{78,125}$ or 19.35% 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
[24]   incorrect procedure.

[2] $1.48, and appropriate work is shown,
such as providing a correctly labeled table or
solving the equation $(1.39)(1.005)^{12} = C$.
[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, such as using 1.05
or 1.5 or using an incorrect exponent.
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] $1.48, 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
[25]   incorrect procedure.

[2] 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] 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
[26]   incorrect procedure.

[4] (0,1) and (1,2), and a correct graph is
drawn with at least one function labeled.
[3] Appropriate work is shown, but one
graphing error is made, such as plotting one
point incorrectly or not labeling either
function.
or [3] The graphs are drawn correctly, but
only one correct solution is found or only the
x- or the y-values are found correctly.
[2] Appropriate work is shown, but two or
more graphing errors are made.
or [2] (0,1) and (1,2), but the solution is found
by a nongraphic method.
or [2] The graphs are drawn correctly, but no
correct solutions are found.
[1] The graph of only one equation is drawn
correctly, and no further correct work is
shown.
or [1] (0,1) and (1,2), but no work is shown.
[0] (0,1) or (1,2), 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
[27]   obviously incorrect procedure.

[4] 5,513 and a correct diagram is drawn, 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.

or [3] 5,513, and appropriate work is shown, but no diagram is drawn.

or [3] Appropriate work is shown, but the calculations are performed in radians, resulting in an answer of 6,698.

or [3] An incorrect diagram is drawn, but an appropriate solution is found using the Law of Cosines.

[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.

or [2] Appropriate work is shown, but an incorrect substitution is made into the Law of Cosines, but an appropriate solution is found.

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

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

or [1] A correctly labeled diagram is drawn, but no further correct work is shown.

or [1] 5,513, but no work is shown and no diagram is drawn.

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

[28] incorrect procedure. _____

[4] 75, and appropriate work is shown, such as determining the mean (278.5833333) and the standard deviation for the sample (3.146667309).

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

or [3] Appropriate work is shown, but the standard deviation for the population (σ) is used.

or [3] The mean, standard deviation for the sample, and interval are determined correctly, but an error is made in determining the percentage.

or [3] The mean and standard deviation for the sample are determined correctly, but an appropriate percentage is determined for an incorrect interval.

[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.

or [2] The mean and standard deviation for the sample are determined correctly, but no further correct work is shown.

or [2] Either the mean or the standard deviation for the sample is determined incorrectly, but an appropriate percentage is found.

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

or [1] The standard deviation for the sample is determined correctly, but no further correct work is shown.

or [1] 75, 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

[29] incorrect procedure. _____

[4] $y = -34739.71292x + 313309.0909$ and 209,090, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] An incorrect linear equation with a negative slope is written, but an appropriate price is found for three blocks from the beach.
[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.
or [2] A correct linear function is written, but no further correct work is shown.
or [2] An incorrect linear equation with a positive slope is written, but an appropriate price is found for three blocks from the beach.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] 209,090, 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] 4.3-5.3, 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 answer is not stated as an interval.
or [3] Appropriate work is shown, but the answer is expressed in inches.
[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.
or [2] An appropriate inequality, such as
$$-3.25 \le \left|\frac{h-57.5}{2}\right| \le 3.25,$$ is written, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] Only half of the inequality is solved, but an appropriate answer is found and expressed to the nearest tenth of a foot.
or [1] 4.3-5.3, 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

[31]   incorrect procedure.

[4] A correct table of values is provided, a correct graph is drawn, and 670; 12, and appropriate work is shown, such as extending the graph or solving algebraically.
[3] Appropriate work is shown, but one computational or graphing error is made.
or [3] A correct table of values is provided, a correct graph is drawn, and 670, but no further correct work is shown.
[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] 670 and 12, but an algebraic solution is provided.
or [2] 670 and 12, but either the graph is not drawn or the table of values is not provided.
[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
or [1] A correct graph is drawn, but no further correct work is shown.
or [1] A correct table of values is provided, but no further correct work is shown.
or [1] 670 and 12, but no work is shown and no graph is drawn.
[0] 670 or 12, but no work is shown and no graph is drawn.
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] A complete and correct proof is shown.
[5] Appropriate work is shown, but one computational error is made.
or [5] Appropriate work is shown, but the final conclusion is not justified or is justified incorrectly.
[4] Appropriate work is shown, but two or more computational errors are made.
or [4] Appropriate work is shown to prove TEAM is a parallelogram and not a square, but no work is shown to prove it is a rhombus.
or [4] Appropriate work is shown to prove TEAM is a rhombus, and partial work is shown to prove TEAM is not a square, but the conclusion is not adequately justified.
[3] Appropriate work is shown to prove TEAM is a rhombus, but no further correct work is shown.
or [3] Appropriate work is shown to prove TEAM is not a square, but an incorrect method is used to prove TEAM is a rhombus.
or [3] An accurate explanation of the process required to complete the proof is stated, and needed formulas are given, but no further correct work is shown.
[2] Appropriate work is shown to prove TEAM is a parallelogram, but no further correct work is shown.
[1] A complete explanation of the method of the proof is written, but no further correct work is shown.
or [1] A statement that TEAM is not a square and a correct reason are written, but no further correct 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 diagram is drawn and 134, and appropriate work is shown.

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

or [5] 134, and appropriate work is shown, but the diagram is not drawn or is drawn incorrectly.

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

or [4] A correct diagram is drawn and one correct equation using the Law of Sines is solved appropriately, but no further correct work is shown.

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

or [3] An incorrect diagram is drawn, but an appropriate solution with an equal degree of difficulty is provided.

or [3] A correct diagram is drawn and correct equations are written, but no further correct work is shown.

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

or [2] A correct diagram is drawn, but only one correct trigonometric equation is written, and no further correct work is shown.

[1] A correct diagram is drawn, but no further correct work is shown.

or [1] An incorrect diagram is drawn, but one correct trigonometric equation is solved appropriately.

or [1] 134, but no work is shown and no diagram is drawn.

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

[34] incorrect procedure.