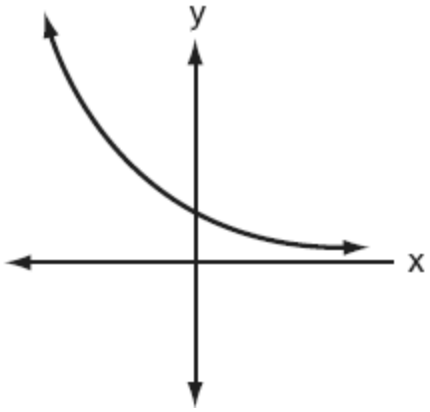
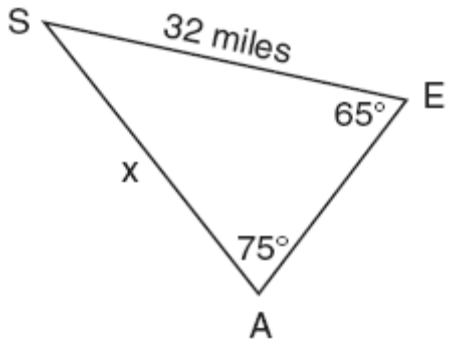
1. 010701b, P.I. A.G.4
Which equation best represents the accompanying graph?



[A] $y = -2^x$ [B] $y = 2^x$

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

2. 010702b, P.I. A2.A.73
The accompanying diagram shows the approximate linear distances traveled by a sailboat during a race. The sailboat started at point *S*, traveled to points *E* and *A*, respectively, and ended at point *S*.



Based on the measures shown in the diagram, which equation can be used to find *x*, the distance from point *A* to point *S*?

[A] $\frac{x}{65} = \frac{32}{75}$ [B] $\frac{x}{\sin 65°} = \frac{\sin 75°}{32}$

[C] $\frac{65}{x} = \frac{32}{75}$ [D] $\frac{\sin 65°}{x} = \frac{\sin 75°}{32}$

3. 010703b, P.I. A.A.23
If $\sqrt{x-a} = b, x > a,$ which expression is equivalent to *x*?

[A] $b - a$ [B] $b^2 - a$

[C] $b^2 + a$ [D] $b + a$

4. 010704b
What is the total number of points of intersection of the graphs of the equations $xy = 12$ and $y = -x^2 + 3$?

[A] 3 [B] 1 [C] 2 [D] 4

5. 010705b, P.I. A2.N.7
The expression i^{25} is equivalent to

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

6. 010706b, P.I. A2.A.17
The expression $\frac{\frac{1}{3} + \frac{1}{3x}}{\frac{1}{x} + \frac{1}{3}}$ is equivalent to

[A] 2 [B] $\frac{x+1}{x+3}$ [C] $\frac{3x+3}{x+3}$ [D] $\frac{1}{3}$

7. 010707b, P.I. A2.S.4
The term “snowstorms of note” applies to all snowfalls over 6 inches. The snowfall amounts for snowstorms of note in Utica, New York, over a four-year period are as follows: 7.1, 9.2, 8.0, 6.1, 14.4, 8.5, 6.1, 6.8, 7.7, 21.5, 6.7, 9.0, 8.4, 7.0, 11.5, 14.1, 9.5, 8.6. What are the mean and population standard deviation for these data, to the *nearest hundredth*?

[A] mean = 9.46; standard deviation = 3.74

[B] mean = 9.46; standard deviation = 3.85

[C] mean = 9.45; standard deviation = 3.85

[D] mean = 9.45; standard deviation = 3.74

8. 010708b, P.I. A2.N.5

The expression $\frac{4}{5-\sqrt{13}}$ is equivalent to

[A] $\frac{5+\sqrt{13}}{3}$ [B] $\frac{2(5-\sqrt{13})}{19}$

[C] $\frac{2(5+\sqrt{13})}{19}$ [D] $\frac{5-\sqrt{13}}{3}$

9. 010709b, P.I. A2.A.27

What is the value of b in the equation $4^{2b-3}=8^{1-b}$?

[A] $\frac{10}{7}$ [B] $\frac{7}{9}$ [C] $\frac{-3}{7}$ [D] $\frac{9}{7}$

10. 010710b, P.I. A2.A.1

What is the solution set of the inequality $|2x-1|<9$?

[A] $\{x|x<-4\}$ [B] $\{x|x<5\}$

[C] $\{x|-4<x<5\}$ [D] $\{x|x<-4 \text{ or } x>5\}$

11. 010711b

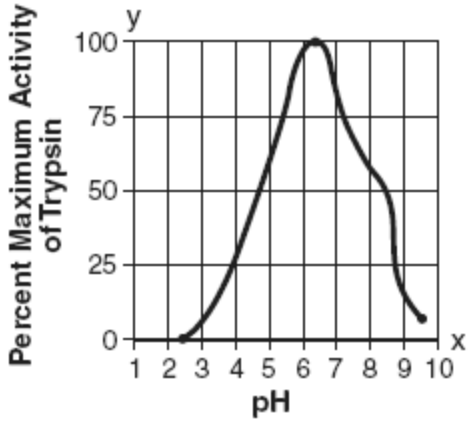
Which transformation could be used to make the graph of the equation $y=\sin x$ coincide with the graph of the equation $y=\cos x$?

[A] dilation [B] translation

[C] point reflection [D] rotation

12. 010712b, P.I. A2.A.51

Data collected during an experiment are shown in the accompanying graph.



What is the range of this set of data?

[A] $0\le y\le 100$ [B] $1\le x\le 10$

[C] $2.5\le y\le 9.5$ [D] $2.5\le x\le 9.5$

13. 010713b, P.I. A2.A.2

Which is a true statement about the graph of the equation $y=x^2-7x-60$?

[A] It intersects the x-axis in two distinct points that have irrational coordinates.

[B] It intersects the x-axis in two distinct points that have rational coordinates.

[C] It does not intersect the x-axis.

[D] It is tangent to the x-axis.

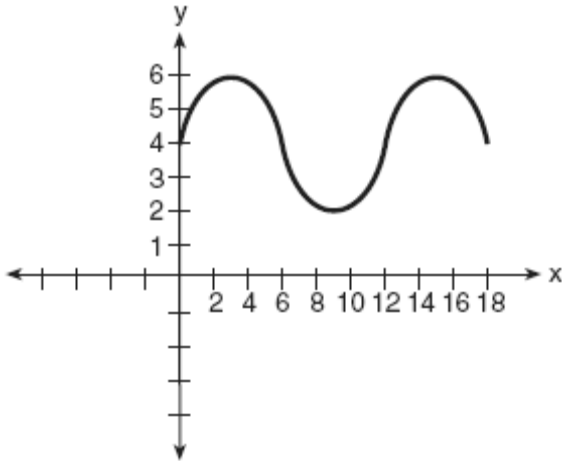
14. 010714b

Which quadratic equation has the roots $3+i$ and $3-i$?

[A] $x^2-6x+10=0$ [B] $x^2-6x-8=0$

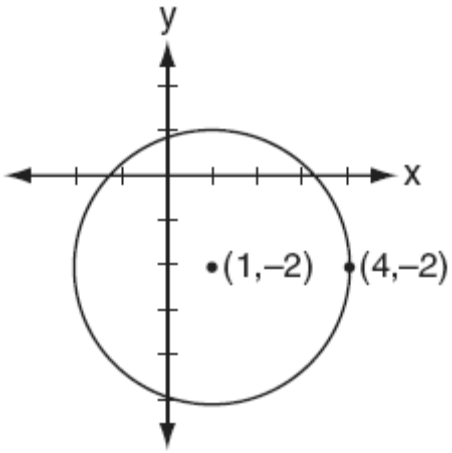
[C] $x^2+6x+8=0$ [D] $x^2+6x-10=0$

15. 010715b, P.I. A2.A.69
What is the amplitude of the function shown in the accompanying graph?



[A] 12 [B] 6 [C] 2 [D] 1.5

16. 010716b, P.I. G.G.72
Which equation represents the circle shown in the accompanying graph?



[A] $(x+1)^2-(y-2)^2=9$

[B] $(x-1)^2+(y+2)^2=9$

[C] $(x+1)^2+(y-2)^2=9$

[D] $(x-1)^2-(y+2)^2=9$

17. 010717b, P.I. A2.A.19
A black hole is a region in space where objects seem to disappear. A formula used in the study of black holes is the Schwarzschild formula, $R=\frac{2GM}{c^2}$. Based on the laws of logarithms, $\log R$ can be represented by

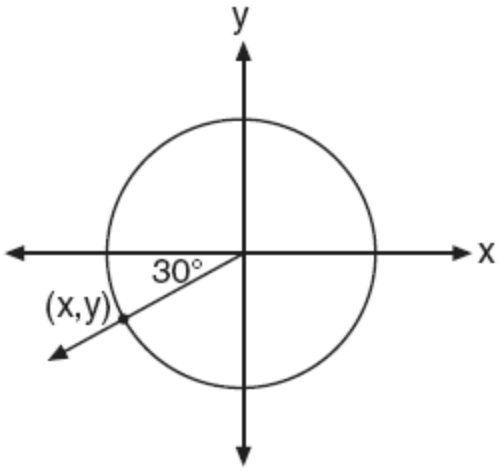
[A] $\log 2+\log G+\log M-2\log c$

[B] $2\log GM-2\log c$

[C] $2\log G+\log M-\log 2c$

[D] $\log 2G+\log M-\log 2c$

18. 010718b
In the unit circle shown in the accompanying diagram, what are the coordinates of (x,y)?



[A] $(-\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2})$ [B] $(-0.5,-\frac{\sqrt{3}}{2})$

[C] $(-\frac{\sqrt{3}}{2},-0.5)$ [D] $(-30,-210)$

19. 010719b, P.I. G.G.61
Which transformation represents a dilation?

[A] $(8,4)\rightarrow(11,7)$ [B] $(8,4)\rightarrow(4,2)$

[C] $(8,4)\rightarrow(-8,4)$ [D] $(8,4)\rightarrow(-4,-8)$

20. 010720b, P.I. A2.A.75
In ΔABC, $m\angle A = 30$, $a = 14$, and $b = 20$. Which type of angle is $\angle B$?

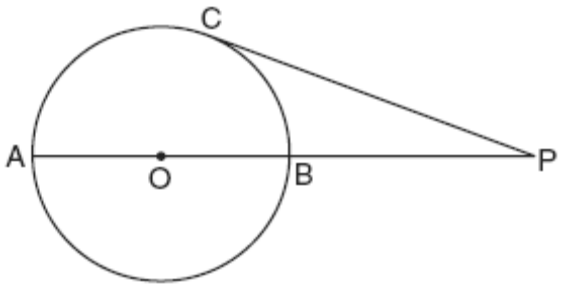
[A] It may be either an acute angle or an obtuse angle.

[B] It must be an acute angle.

[C] It must be a right angle.

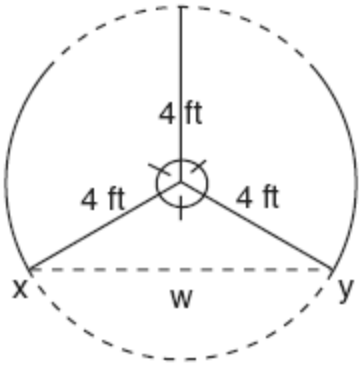
[D] It must be an obtuse angle.

21. 010721b, P.I. G.G.53
In the accompanying diagram of circle *O*, diameter $\overline{AOB}$ is extended through *B* to external point *P*, tangent $\overline{PC}$ is drawn to point *C* on the circle, and $m\overset{\frown}{AC} : m\overset{\frown}{BC} = 7:2$. Find $m\angle CPA$.



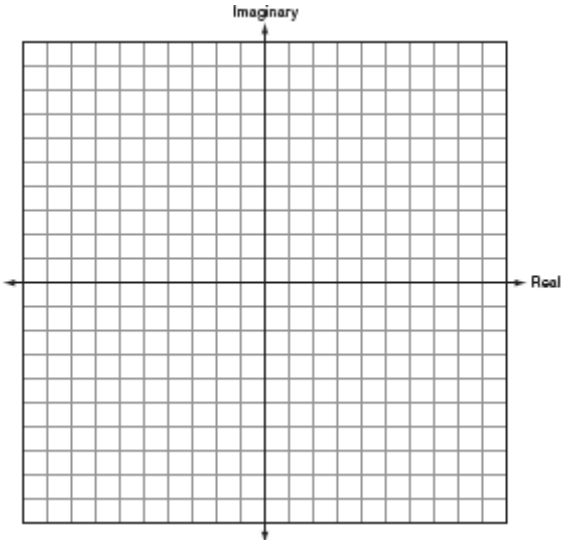
(Not drawn to scale)

22. 010722b
The accompanying diagram shows a revolving door with three panels, each of which is 4 feet long. What is the width, *w*, of the opening between *x* and *y*, to the *nearest tenth of a foot*?

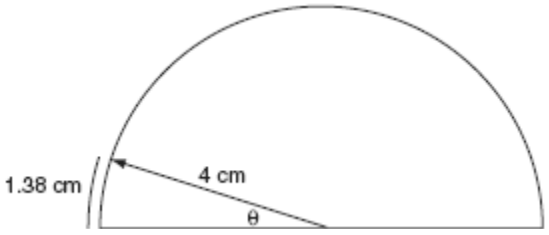


23. 010723b
In ΔABC, $AC = 18$, $BC = 10$, and $\cos C = \frac{1}{2}$.
Find the area of ΔABC to the *nearest tenth of a square unit*.

24. 010724b, P.I. A2.A.4
On the accompanying set of axes, graphically represent the sum of $3+4i$ and $-1+2i$.



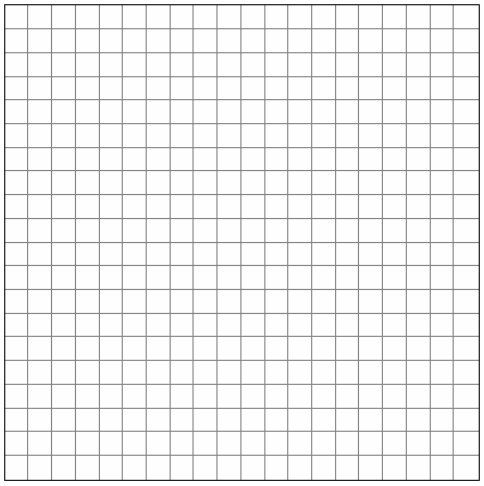
25. 010725b
As shown in the accompanying diagram, a dial in the shape of a semicircle has a radius of 4 centimeters. Find the measure of θ, in radians, when the pointer rotates to form an arc whose length is 1.38 centimeters.



26. 010726b, P.I. A2.A.36
What is the fourth term in the expansion of $(2x-y)^5$?

27. 010727b, P.I. A2.A.68
Find, to the *nearest degree*, all values of θ in the interval $0° \le \theta \le 180°$ that satisfy the equation $8\cos^2\theta - 2\cos\theta - 1 = 0$.

28. 010728b, P.I. A2.A.27
Since January 1980, the population of the city of Brownville has grown according to the mathematical model $y = 720{,}500(1.022)^x$, where x is the number of years since January 1980. Explain what the numbers 720,500 and 1.022 represent in this model. If this trend continues, use this model to predict the year during which the population of Brownville will reach 1,548,800. [The use of the grid is optional.]



29. 010729b, P.I. A2.A.25
Matt's rectangular patio measures 9 feet by 12 feet. He wants to increase the patio's dimensions so its area will be twice the area it is now. He plans to increase both the length and the width by the same amount, x. Find x, to the *nearest hundredth of a foot*.

30. 010730b, P.I. A2.S.7
The accompanying table shows the number of new cases reported by the Nassau and Suffolk County Police Crime Stoppers program for the years 2000 through 2002.

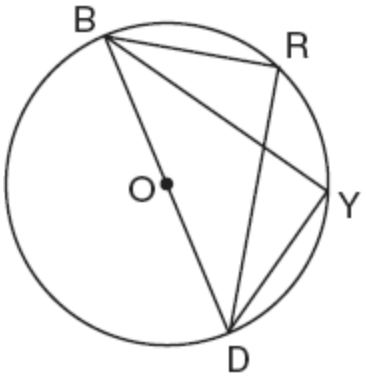
Year (x)	New Cases (y)
2000	457
2001	369
2002	353

If $x = 1$ represents the year 2000, and y represents the number of new cases, find the equation of best fit using a power regression, rounding all values to the *nearest thousandth*. Using this equation, find the estimated number of new cases, to the *nearest whole number*, for the year 2007.

31. 010731b, P.I. A2.S.15
Dr. Glendon, the school physician in charge of giving sports physicals, has compiled his information and has determined that the probability a student will be on a team is 0.39. Yesterday, Dr. Glendon examined five students chosen at random. Find, to the *nearest hundredth*, the probability that at least four of the five students will be on a team. Find, to the *nearest hundredth*, the probability that exactly one of the five students will not be on a team.

32. 010732b, P.I. G.G.27

In the accompanying diagram, $m\overset{\frown}{BR} = 70$, $m\overset{\frown}{YD} = 70$, and $\overline{BOD}$ is the diameter of circle O. Write an explanation or a proof that shows ΔRBD and ΔYDB are congruent.



33. 010733b, P.I. A.A.18

Perform the indicated operations and simplify completely:

$$\frac{x^2-9}{x^2-5x} \bullet \frac{5x-x^2}{x^2-x-12} \div \frac{x-4}{x^2-8x+16}$$

34. 010734b, P.I. A2.A.73

Two forces of 40 pounds and 20 pounds, respectively, act simultaneously on an object. The angle between the two forces is 40°. Find the magnitude of the resultant, to the *nearest tenth of a pound*. Find the measure of the angle, to the *nearest degree*, between the resultant and the larger force.

[1] D

[2] D

[3] C

[4] B

[5] B

[6] B

[7] A

[8] A

[9] D

[10] C

[11] B

[12] A

[13] B

[14] A

[15] C

[16] B

[17] A

[18] C

[19] B

[20] A

[21]
[2] 50, and appropriate work is shown, such as $m\overset{\frown}{AC}=140,\ m\overset{\frown}{BC}=40,$ and $m\angle CPA=\frac{1}{2}(140-40)$.
[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] $m\overset{\frown}{AC}$ and $m\overset{\frown}{BC}$ are found correctly, but no further correct work is shown.
or [1] 50, 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.

[22]
[2] 6.9, and appropriate work is shown, such as using special right triangles, the Law of Cosines, or the Law of Sines.
[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] 6.9, 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] 77.9, and appropriate work is shown, such as evaluating $\frac{1}{2}ab\sin C$.
[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 writing $\cos C$.
or [1] 77.9, 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] A correct graph is drawn to represent $2+6i$.
[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] The sum 2 + 6*i* is written, but no graph is drawn.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[24]

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[2] 0.345, and appropriate work is shown, such as solving the equation $\theta = \frac{1.38}{4}$.
[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] 0.345, 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]

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[2] $-40x^2y^3$, 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] $-40x^2y^3$, 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 incorrect procedure.

[26]

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[4] 60 and 104, and appropriate work is shown either algebraically or graphically.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Appropriate work is shown, but only one correct angle is found.
or [3] 60 and 104, and appropriate work is shown, but additional angles outside the interval are found.
[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] $\cos\theta = -\frac{1}{4}$ and $\cos\theta = -\frac{1}{2}$, 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] 60 and 104, but no work is shown.
[0] 60 or 104, 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.

[27]

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[4] 720,500 is the population in 1980, 1.022 represents a growth rate of 2.2% added to the current population, and the population will reach the given number in 2015, and appropriate work is shown.
[3] Appropriate work is shown, but one computational error is made.
or [3] 720,500 and 1.022 are explained correctly, and 2015 is found as the year, but no work is shown to indicate how the year was obtained.
or [3] Either 720,500 or 1.022 is explained correctly, and 2015 is found as the year, and appropriate work is shown.
or [3] 720,500 and 1.022 are explained correctly, but 35.167 years is found as an answer, but appropriate work is shown.
[2] Appropriate work is shown, but two or more computational errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] 720,500 and 1.022 are not explained or are explained incorrectly, but 2015 is found as the year, and appropriate work is shown.
or [2] 720,500 and 1.022 are explained correctly, but no further correct work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational error are made.
or [1] Either 720,500 or 1.022 is explained correctly, but no further correct work is shown.
or [1] 35.167 or 35 years, and appropriate work is shown, but the year is not found, and no explanations or incorrect explanations are given.
or [1] 2015, 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] 4.27, and appropriate work is shown, such as solving the equation $(9+x)(12+x)=216$.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] Appropriate work is shown, but the negative root is not rejected.
[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 equation is written in standard form, but no further correct work is shown.
or [2] An incorrect quadratic equation of equal difficulty is solved appropriately.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] An incorrect quadratic equation of a lesser degree of difficulty is solved appropriately.
or [1] 4.27, 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] $y = 451.431x^{-0.243}$ and 272, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] $y = 451.431x^{-0.243}$, but 7, instead of 8, is substituted for x to find the number of new cases.
or [3] $y = 451.431x^{-0.243}$ and 272, but no work is shown to find the number of cases.
or [3] The expression $451.431x^{-0.243}$ is written, and appropriate work is shown to find 272, but no equation is written.
[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 correct regression equation is written, but no further correct work is shown.
or [2] An incorrect regression equation of equal difficulty is solved appropriately for the number of new cases, and appropriate work is shown.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] An incorrect regression equation of a lesser degree of difficulty is solved appropriately for the number of new cases, and appropriate work is shown.
or [1] The expression $451.431x^{-0.243}$ is written, but no further correct work is shown.
or [1] 272, 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] .08 and .07, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] The probability that at least four students will be on a team is found correctly, and appropriate work is shown, but the probability that exactly one student will not be on a team is not found or is found incorrectly.
[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, such as finding the probability that at most four or exactly four students will be on the team.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] The probability that at least one student will not be on a team is found correctly, and appropriate work is shown, but the probability that at least four students will be on a team is not found.
or [1] .08 and .07, but no work is shown.
[0] .08 or .07, 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.

[31]

[4] Appropriate work is shown to explain why or prove the triangles are congruent.
[3] An explanation 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.
[2] An explanation is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
[1] Some correct relevant statements about the method of proof are made, but two or three statements or reasons are missing or are incorrect.
[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] $-(x-3)$, $-x+3$, or $3-x$, and appropriate work is shown.
[5] Appropriate work is shown, but one computational, factoring, or simplification error is made.
[4] Appropriate work is shown, but two computational, factoring, or simplification errors are made.
or [4] $x-3$, and appropriate work is shown.
[3] Appropriate work is shown, but three or more computational, factoring, or simplification errors are made.
or [3] Appropriate work is shown, but one conceptual error is made, such as not multiplying by the multiplicative inverse.
[2] Appropriate work is shown, but one conceptual error and one computational, factoring, or simplification error are made.
[1] $-(x-3)$, $-x+3$, or $3-x$, 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.

[33]

[6] 56.8 and 13, 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 Law of Cosines is used correctly to determine the magnitude of the resultant, 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.
or [2] 56.8 and 13, but no work is shown.
[1] Appropriate work is shown to find the measure of the angle, but one computational or rounding error is made, and no further correct work is shown.
or [1] Correct substitutions are made into the Law of Cosines, but no further correct work is shown.
or [1] 56.8, 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]