

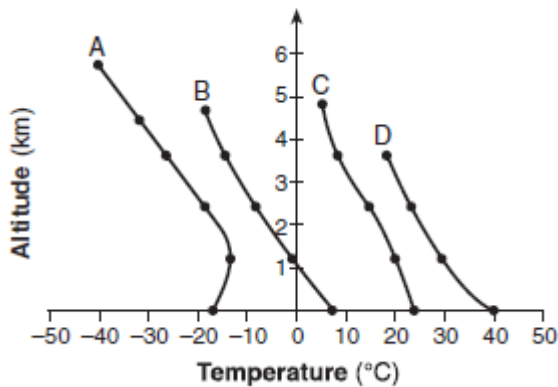
1. 060901b, P.I. A2.M.2

The number of degrees equal to $\frac{5}{9}\pi$ radians is

- [A] 90 [B] 45 [C] 900 [D] 100

2. 060902b, P.I. A.G.3

The accompanying graph shows the curves of best fit for data points comparing temperature to altitude in four different regions, represented by the relations A , B , C , and D .



Which relation is *not* a function?

- [A] C [B] A [C] D [D] B

3. 060903b, P.I. A2.N.10

What is the value of $\sum_{k=1}^3 (2-k)^2$?

- [A] 2 [B] 1 [C] 0 [D] 3

4. 060904b, P.I. A2.A.58

If $\sin x = \frac{1}{a}$, $a \neq 0$, which statement must be true?

- [A] $\csc x = -\frac{1}{a}$ [B] $\sec x = -\frac{1}{a}$
[C] $\sec x = a$ [D] $\csc x = a$

5. 060905b, P.I. A2.N.5

The expression $\frac{5+\sqrt{7}}{5-\sqrt{7}}$ is equivalent to

- [A] $\frac{16-5\sqrt{7}}{9}$ [B] $\frac{16+5\sqrt{7}}{16}$
[C] $\frac{16+5\sqrt{7}}{9}$ [D] $\frac{16-5\sqrt{7}}{16}$

6. 060906b

When the sum of $-4 + 8i$ and $2 - 9i$ is graphed, in which quadrant does it lie?

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

7. 060907b, P.I. A2.A.1

What is the solution of the inequality $|2x - 5| < 1$?

- [A] $2 < x < 3$ [B] $x < 3$
[C] $x \leq 2$ or $x \geq 3$ [D] $x > -3$

8. 060908b, P.I. G.G.54

Point $A(1,0)$ is a point on the graph of the equation $y = x^2 - 4x + 3$. When point A is reflected across the axis of symmetry, what are the coordinates of its image, point A' ?

- [A] (2,-1) [B] (3,0)
[C] (-1,2) [D] (0,3)

15. 060915b, P.I. A2.A.22
What is the solution set of the equation
 $y = 2 + \sqrt{y^2 - 12}$?
[A] {4} [B] {} [C] {-4,4} [D] {2}

16. 060916b, P.I. A2.A.36
What is the third term in the expansion of
 $(2x - 3)^5$?
[A] $-720x^3$ [B] $720x^3$
[C] $-1080x^2$ [D] $1080x^3$

17. 060917b, P.I. A2.S.4
The accompanying table shows the scores on a classroom test.

x_i	f_i
100	7
90	10
80	4
70	4

What is the population standard deviation for this set of scores?

- [A] 88 [B] 25 [C] 10.2 [D] 10.4

18. 060918b, P.I. A2.A.5
The manager of Stuart Siding Company found that the number of workers used to side a house varies inversely with the number of hours needed to finish the job. If four workers can side the house in 48 hours, how many hours will it take six workers working at the same speed to do the same job?
[A] 32 [B] 42 [C] 72 [D] 36

19. 060919b, P.I. A2.A.17
The expression $1 - \frac{x}{\frac{x-y}{x-y}}$ is equivalent to
[A] $-y$ [B] $x-y$ [C] y [D] $1-x$

20. 060920b, P.I. A2.A.69
The Sea Dragon, a pendulum ride at an amusement park, moves from its central position at rest according to the trigonometric function $P(t) = -10\sin(\frac{\pi}{3}t)$, where t represents time, in seconds. How many seconds does it take the pendulum to complete one full cycle?
[A] 6 [B] 3 [C] 10 [D] 5

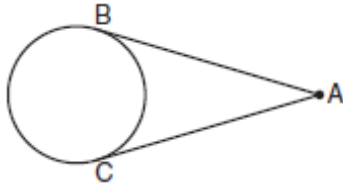
21. 060921b, P.I. A2.A.42
If $f(x) = x^2 + 4$ and $g(x) = 2x + 3$, find $f(g(-2))$.

22. 060922b, P.I. A2.A.73
In $\triangle ABC$, $\sin A = 0.6$, $a = 10$, and $b = 7$. Find $\sin B$.

23. 060923b, P.I. A2.A.27
Solve algebraically for x : $9^{3x} = 3^{3x+1}$

24. 060924b, P.I. G.G.50

The accompanying diagram shows two lengths of wire attached to a wheel, so that \overline{AB} and \overline{AC} are tangent to the wheel. If the major arc \widehat{BC} has a measure of 220° , find the number of degrees in $m\angle A$.

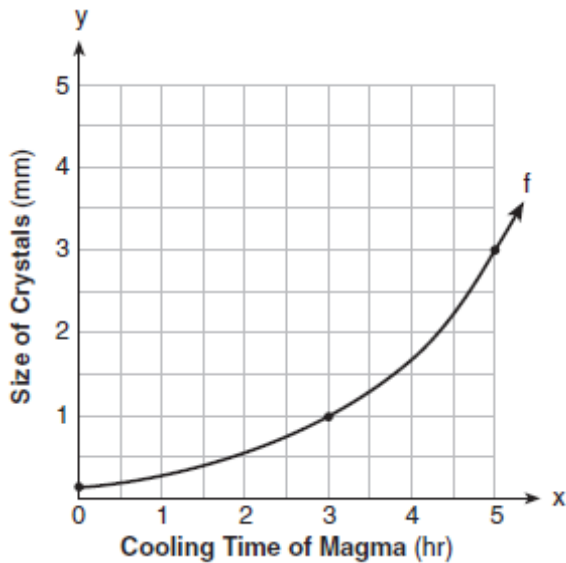


25. 060925b, P.I. A2.A.28

Solve for x : $\log_8(x+1) = \frac{2}{3}$

26. 060926b, P.I. A2.A.44

The accompanying graph shows the relationship between the cooling time of magma and the size of the crystals produced after a volcanic eruption. On the same graph, sketch the inverse of this function.



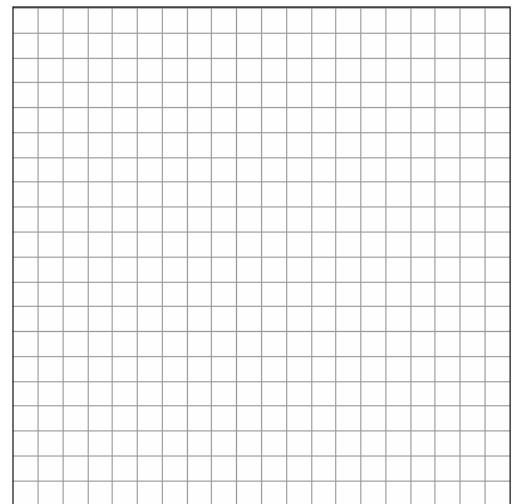
27. 060927b, P.I. A2.S.7

The number of newly reported crime cases in a county in New York State is shown in the accompanying table. Write the linear regression equation that represents this set of data. (Let $x = 0$ represent 1999.) Using this equation, find the projected number of new cases for 2009, rounded to the *nearest whole number*.

Year (x)	New Cases (y)
1999	440
2000	457
2001	369
2002	351

28. 060928b, P.I. G.G.58

On the accompanying grid, graph and label $\triangle ABC$ with vertices $A(3,1)$, $B(0,4)$, and $C(-5,3)$. On the same grid, graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the transformation $r_{x\text{-axis}} \circ r_{y=x}$.



29. 060929b, P.I. A2.A.16

Express in simplest form: $\frac{3x}{2x-6} + \frac{9}{6-2x}$

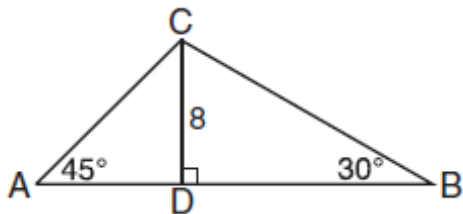
30. 060930b, P.I. A2.S.15

Dave does *not* tell the truth $\frac{3}{4}$ of the time.

Find the probability that he will tell the truth *at most* twice out of the next five times.

31. 060931b

In the accompanying diagram, \overline{CD} is an altitude of $\triangle ABC$. If $CD = 8$, $m\angle A = 45^\circ$, and $m\angle B = 30^\circ$, find the perimeter of $\triangle ABC$ in simplest radical form.

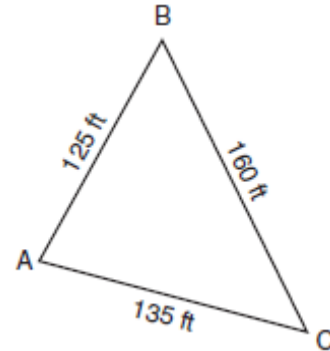


32. 060932b, P.I. A2.A.68

Solve the equation $\cos\theta = 2 + 3\cos 2\theta$ for all values of θ to the *nearest tenth of a degree*, in the interval $0^\circ \leq \theta < 360^\circ$.

33. 060933b, P.I. A2.A.73

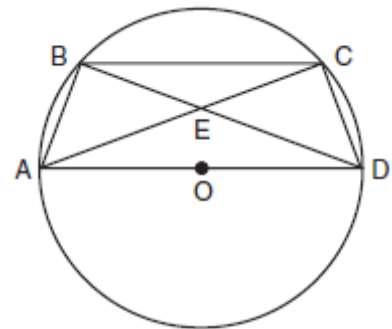
The accompanying diagram shows a triangular plot of land located in Moira's garden.



Find the area of the plot of land, and round your answer to the *nearest hundred square feet*.

34. 060934b, P.I. G.G.28

In the accompanying diagram of circle O , \overline{AD} is a diameter with \overline{AD} parallel to chord \overline{BC} , chords \overline{AB} and \overline{CD} are drawn, and chords \overline{BD} and \overline{AC} intersect at E .
Prove: $\overline{BE} \cong \overline{CE}$



- [1] D
- [2] B
- [3] A
- [4] D
- [5] C
- [6] A
- [7] A
- [8] B
- [9] A
- [10] C
- [11] B
- [12] D
- [13] D
- [14] B
- [15] A
- [16] B
- [17] C
- [18] A
- [19] A
- [20] A

[2] 5, 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, such as finding
or [1] 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
[21] incorrect procedure.

[2] 0.42, 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] A correct equation is written, but $\sin B$ is not found.
or [1] 0.42, 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
[22] incorrect procedure.

[2] $\frac{1}{3}$, and appropriate algebraic 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 equation $(3^2)^{3x} = 3^{3x+1}$ or an equivalent equation is written, but no further correct work is shown.
or [1] $\frac{1}{3}$, but a method other than algebraic is used.
or [1] $\frac{1}{3}$, 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
[23] incorrect procedure.

[2] 40, 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] 40, 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] 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] $8^{\frac{2}{3}} = x + 1$, but no further correct work is shown.
or [1] 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.
- [25] _____
- [2] The inverse function is graphed correctly.
[1] One graphing error is made.
[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] $y = -35.5x + 457.5$ and 103, and appropriate work is shown, such as substituting 10 into the regression equation.
[3] Appropriate work is shown, but one computational, rounding, or substitution error is made.
or [3] The expression $-35.5x + 457.5$ is written and 103, and appropriate substitution is shown, but no equation is written.
or [3] $y = -35.5x + 457.5$ and 103, but no substitution is shown.
[2] Appropriate work is shown, but two or more computational, rounding, or substitution errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] An incorrect linear regression equation is written, but an appropriate number of new cases is found.
or [2] $y = -35.5x + 457.5$, but no further correct work is shown.
or [2] The expression $-35.5x + 457.5$ is written and 103, but no substitution is shown.
[1] Appropriate work is shown, but one conceptual error and one computational, rounding, or substitution error are made.
or [1] The expression $-35.5x + 457.5$ is written or 103, but no substitution 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] Both $\triangle ABC$ and $\triangle A''B''C''$ are graphed and labeled correctly.
- [3] Appropriate work is shown, but one graphing or labeling error is made.
- or [3] Appropriate work is shown, but only $\triangle A''B''C''$ is graphed and labeled correctly.
- [2] Appropriate work is shown, but two or more graphing or labeling errors are made.
- or [2] Appropriate work is shown, but one conceptual error is made, such as reflecting over the x -axis before reflecting over the line $y = x$.
- [1] Appropriate work is shown, but one conceptual error and one graphing or labeling error are made.
- or [1] $A''(1,-3)$, $B''(4,0)$, and $C''(3,5)$ are stated, but no work is shown.
- or [1] $\triangle ABC$ is graphed and labeled correctly, but only $r_{y=x}$ or $r_{x\text{-axis}}$ is graphed correctly.
- [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] $\frac{3}{2}$, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational, factoring, or simplification error is made.
- [2] Appropriate work is shown, but two or more computational, factoring, or simplification errors are made.
- or [2] Appropriate work is shown, but one conceptual error is made, such as not factoring out -1 .
- or [2] Appropriate work is shown, but the answer is left as $\frac{3x-9}{2(x-3)}$ or as an equivalent expression.
- [1] Appropriate work is shown, but one conceptual error and one computational, factoring, or simplification error are made.
- or [1] Appropriate work is shown, but the answer is left as $\frac{3x}{2(x-3)} + \frac{9}{2(3-x)}$.
- or [1] $\frac{3}{2}$, 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] $\frac{918}{1024}$ or an equivalent answer, and

appropriate work is shown, such as

$${}_5C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^5 + {}_5C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^4 + {}_5C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^3.$$

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

or [3] ${}_5C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^5$, ${}_5C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^4$, and

${}_5C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^3$ are evaluated, but the values are not added.

[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 of "not telling the truth at most twice" or the probability of "telling the truth at least twice."

or [2]

$${}_5C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^5 + {}_5C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^4 + {}_5C_2\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right)^3,$$

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] Appropriate work is shown to find $\frac{270}{1024}$, the probability of telling the truth

exactly twice out of five times.

or [1] $\frac{918}{1024}$ 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

[30] incorrect procedure.

[4] $24 + 8\sqrt{2} + 8\sqrt{3}$, and appropriate work is shown, such as labeling the diagram using special right triangle rules or right triangle trigonometry.

[3] Appropriate work is shown, but one computational error is made or the answer is not in simplest radical form.

or [3] The measures of the four segments are found correctly, but the perimeter is not found or is found incorrectly.

[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] The measures of three segments are found 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] The measures of two segments are found correctly, but no further correct work is shown.

or [1] $24 + 8\sqrt{2} + 8\sqrt{3}$, 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] 60, 109.5, 250.5, 300, and appropriate work is shown algebraically or graphically.
- [3] Appropriate work is shown, but one computational, factoring, graphing, or rounding error is made.
- or [3] Appropriate work is shown, but only three correct values of θ are found.
- [2] Appropriate work is shown, but two or more computational, factoring, graphing, or rounding errors are made.
- or [2] Appropriate work is shown, but one conceptual error is made.
- or [2] Appropriate work is shown, but only two correct values of θ are found.
- [1] Appropriate work is shown, but one conceptual error and one computational, factoring, graphing, or rounding error are made.
- or [1] Appropriate substitutions are made and the equation is written in standard form, but no further correct work is shown.
- or [1] 60, 109.5, 250.5, 300, but no work is shown.
- [0] 60 or 109.5 or 250.5 or 300, 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.
- [32] _____
- [6] 8,200, and appropriate work is shown, such as using the Law of Cosines or Hero(n)'s formula.
- [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.
- [3] Appropriate work is shown, but one conceptual error is made.
- or [3] The Law of Cosines is used to find an angle, but no further correct work is shown.
- [2] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
- [1] A correct substitution is made into the Law of Cosines, but no further correct work is shown.
- or [1] 8,200, 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] A complete and correct proof that includes a conclusion is written.

[5] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement and/or reason is missing or is incorrect.

or [5] $\triangle BEA \cong \triangle CED$ is proven or $\triangle BEC$ is proven to be isosceles, but no further correct work is shown.

[4] A proof is written that demonstrates a good understanding of the method of proof, but two statements and/or reasons are missing or are incorrect.

[3] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.

[2] Some correct relevant statements about the proof are made, but three or four statements and/or reasons are missing or are incorrect.

or [2] A proof is written that demonstrates understanding of the method of proof, but one conceptual error is made, and one statement or reason is missing or is incorrect.

[1] Only one correct relevant statement and reason are written.

[0] The "given" and/or the "prove" statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.

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

[34] obviously incorrect procedure.