0810a2

1 The product of $(3 + \sqrt{5})$ and $(3 - \sqrt{5})$ is
1) $4 - 6\sqrt{5}$
2) $14 - 6\sqrt{5}$
3) 14
4) 4

2 What is the radian measure of an angle whose measure is $-420°$?
1) $-\dfrac{7\pi}{3}$
2) $-\dfrac{7\pi}{6}$
3) $\dfrac{7\pi}{6}$
4) $\dfrac{7\pi}{3}$

3 What are the domain and the range of the function shown in the graph below?
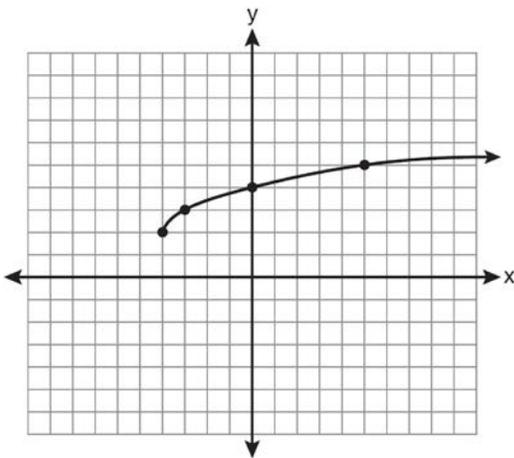
1) $\{x|x > -4\}; \{y|y > 2\}$
2) $\{x|x \geq -4\}; \{y|y \geq 2\}$
3) $\{x|x > 2\}; \{y|y > -4\}$
4) $\{x|x \geq 2\}; \{y|y \geq -4\}$

4 The expression $2i^2 + 3i^3$ is equivalent to
1) $-2 - 3i$
2) $2 - 3i$
3) $-2 + 3i$
4) $2 + 3i$

5 In which graph is θ coterminal with an angle of $-70°$?
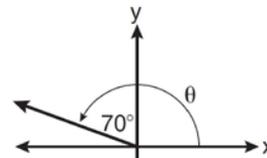
1)
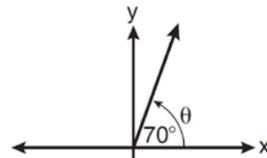
2)
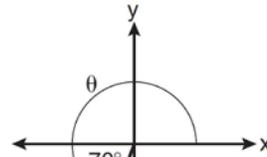
3)
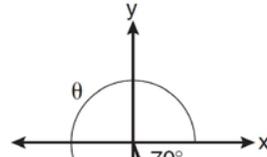
4)

6 In $\triangle ABC$, $m\angle A = 74$, $a = 59.2$, and $c = 60.3$. What are the two possible values for $m\angle C$, to the *nearest tenth*?
1) 73.7 and 106.3
2) 73.7 and 163.7
3) 78.3 and 101.7
4) 78.3 and 168.3

7 What is the principal value of $\cos^{-1}\left(-\dfrac{\sqrt{3}}{2}\right)$?

1) $-30°$
2) $60°$
3) $150°$
4) $240°$

8 What is the value of x in the equation
$9^{3x+1} = 27^{x+2}$?

1) 1
2) $\dfrac{1}{3}$
3) $\dfrac{1}{2}$
4) $\dfrac{4}{3}$

9 The roots of the equation $2x^2 + 7x - 3 = 0$ are

1) $-\dfrac{1}{2}$ and -3
2) $\dfrac{1}{2}$ and 3
3) $\dfrac{-7 \pm \sqrt{73}}{4}$
4) $\dfrac{7 \pm \sqrt{73}}{4}$

10 Which ratio represents $\csc A$ in the diagram below?
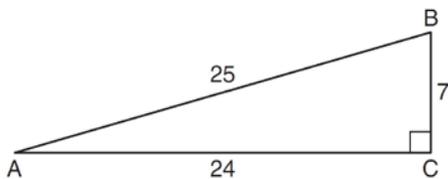
1) $\dfrac{25}{24}$
2) $\dfrac{25}{7}$
3) $\dfrac{24}{7}$
4) $\dfrac{7}{24}$

11 When simplified, the expression $\left(\dfrac{w^{-5}}{w^{-9}}\right)^{\frac{1}{2}}$ is equivalent to

1) w^{-7}
2) w^2
3) w^7
4) w^{14}

12 The principal would like to assemble a committee of 8 students from the 15-member student council. How many different committees can be chosen?

1) 120
2) 6,435
3) 32,432,400
4) 259,459,200

13 An amateur bowler calculated his bowling average for the season. If the data are normally distributed, about how many of his 50 games were within one standard deviation of the mean?

1) 14
2) 17
3) 34
4) 48

14 What is a formula for the nth term of sequence B shown below?
$$B = 10, 12, 14, 16, \ldots$$

1) $b_n = 8 + 2n$
2) $b_n = 10 + 2n$
3) $b_n = 10(2)^n$
4) $b_n = 10(2)^{n-1}$

15 Which values of x are in the solution set of the following system of equations?
$$y = 3x - 6$$
$$y = x^2 - x - 6$$

1) $0, -4$
2) $0, 4$
3) $6, -2$
4) $-6, 2$

16 The roots of the equation $9x^2 + 3x - 4 = 0$ are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

17 In $\triangle ABC$, $a = 3$, $b = 5$, and $c = 7$. What is m$\angle C$?
1) 22
2) 38
3) 60
4) 120

18 When $x^{-1} - 1$ is divided by $x - 1$, the quotient is
1) -1
2) $-\dfrac{1}{x}$
3) $\dfrac{1}{x^2}$
4) $\dfrac{1}{(x-1)^2}$

19 The fraction $\dfrac{3}{\sqrt{3a^2 b}}$ is equivalent to
1) $\dfrac{1}{a\sqrt{b}}$
2) $\dfrac{\sqrt{b}}{ab}$
3) $\dfrac{\sqrt{3b}}{ab}$
4) $\dfrac{\sqrt{3}}{a}$

20 Which graph represents a one-to-one function?
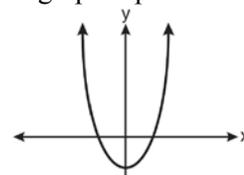
1)
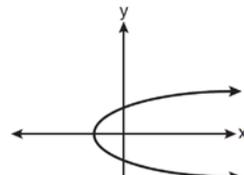
2)
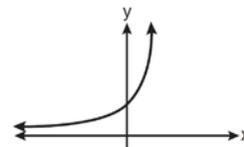
3)
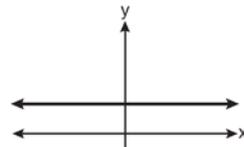
4)

21 The sides of a parallelogram measure 10 cm and 18 cm. One angle of the parallelogram measures 46 degrees. What is the area of the parallelogram, to the *nearest square centimeter*?
1) 65
2) 125
3) 129
4) 162

22 The minimum point on the graph of the equation $y = f(x)$ is $(-1, -3)$. What is the minimum point on the graph of the equation $y = f(x) + 5$?
1) $(-1, 2)$
2) $(-1, -8)$
3) $(4, -3)$
4) $(-6, -3)$

23 The graph of $y = x^3 - 4x^2 + x + 6$ is shown below.
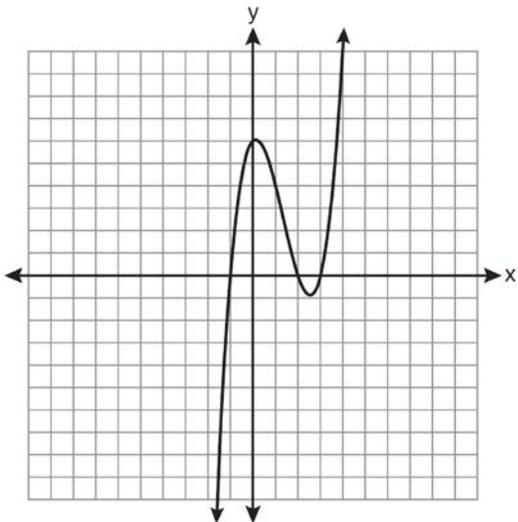
What is the product of the roots of the equation $x^3 - 4x^2 + x + 6 = 0$?
1) −36
2) −6
3) 6
4) 4

24 What is the conjugate of $-2 + 3i$?
1) $-3 + 2i$
2) $-2 - 3i$
3) $2 - 3i$
4) $3 + 2i$

25 What is the common ratio of the geometric sequence whose first term is 27 and fourth term is 64?
1) $\dfrac{3}{4}$
2) $\dfrac{64}{81}$
3) $\dfrac{4}{3}$
4) $\dfrac{37}{3}$

26 Which graph represents one complete cycle of the equation $y = \sin 3\pi x$?
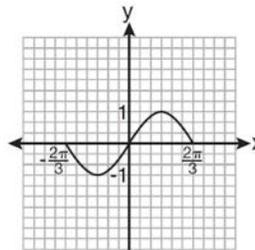

1)
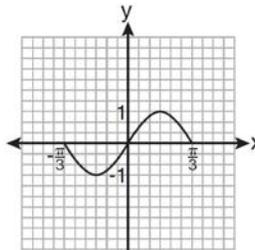
2)
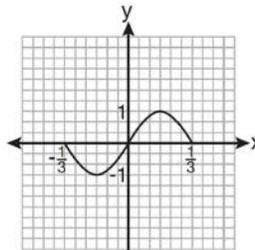
3)
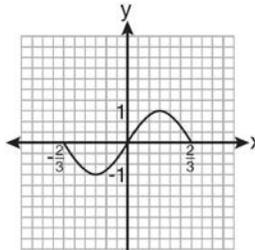
4)

27 Which two functions are inverse functions of each other?
1) $f(x) = \sin x$ and $g(x) = \cos(x)$
2) $f(x) = 3 + 8x$ and $g(x) = 3 - 8x$
3) $f(x) = e^x$ and $g(x) = \ln x$
4) $f(x) = 2x - 4$ and $g(x) = -\dfrac{1}{2}x + 4$

28 Factor completely: $10ax^2 - 23ax - 5a$

29 Express the sum $7 + 14 + 21 + 28 + \ldots + 105$ using sigma notation.

4

30 Howard collected fish eggs from a pond behind his house so he could determine whether sunlight had an effect on how many of the eggs hatched. After he collected the eggs, he divided them into two tanks. He put both tanks outside near the pond, and he covered one of the tanks with a box to block out all sunlight. State whether Howard's investigation was an example of a controlled experiment, an observation, or a survey. Justify your response.

31 The table below shows the number of new stores in a coffee shop chain that opened during the years 1986 through 1994.

Year	Number of New Stores
1986	14
1987	27
1988	48
1989	80
1990	110
1991	153
1992	261
1993	403
1994	681

Using $x = 1$ to represent the year 1986 and y to represent the number of new stores, write the exponential regression equation for these data. Round all values to the *nearest thousandth.*

32 Solve the equation $2\tan C - 3 = 3\tan C - 4$ algebraically for all values of C in the interval $0° \le C < 360°$.

33 A circle shown in the diagram below has a center of $(-5, 3)$ and passes through point $(-1, 7)$.
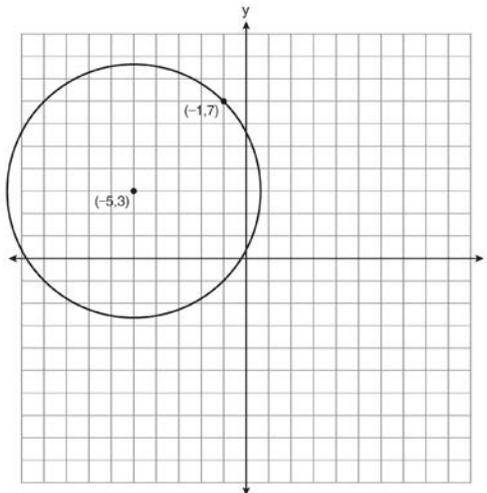
Write an equation that represents the circle.

34 Express $\left(\dfrac{2}{3}x - 1\right)^2$ as a trinomial.

35 Find the total number of different twelve-letter arrangements that can be formed using the letters in the word *PENNSYLVANIA.*

36 Solve algebraically for x: $\dfrac{1}{x+3} - \dfrac{2}{3-x} = \dfrac{4}{x^2 - 9}$

37 If $\tan A = \dfrac{2}{3}$ and $\sin B = \dfrac{5}{\sqrt{41}}$ and angles A and B are in Quadrant I, find the value of $\tan(A + B)$.

38 A study shows that 35% of the fish caught in a local lake had high levels of mercury. Suppose that 10 fish were caught from this lake. Find, to the *nearest tenth of a percent,* the probability that *at least* 8 of the 10 fish caught did *not* contain high levels of mercury.

39 Solve algebraically for x: $\log_{x+3}\dfrac{x^3 + x - 2}{x} = 2$

5

0810a2
Answer Section

1 ANS: 4
$$(3 + \sqrt{5})(3 - \sqrt{5}) = 9 - \sqrt{25} = 4$$

PTS: 2   REF: 081001a2   STA: A2.N.4   TOP: Operations with Irrational Expressions
KEY: without variables | index = 2

2 ANS: 1
$$-420\left(\frac{\pi}{180}\right) = -\frac{7\pi}{3}$$

PTS: 2   REF: 081002a2   STA: A2.M.2   TOP: Radian Measure
KEY: radians

3 ANS: 2   PTS: 2   REF: 081003a2   STA: A2.A.51
TOP: Domain and Range

4 ANS: 1
$$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$$

PTS: 2   REF: 081004a2   STA: A2.N.7   TOP: Imaginary Numbers

5 ANS: 4   PTS: 2   REF: 081005a2   STA: A2.A.60
TOP: Unit Circle

6 ANS: 3
$$\frac{59.2}{\sin 74} = \frac{60.3}{\sin C} \quad 180 - 78.3 = 101.7$$
$$C \approx 78.3$$

PTS: 2   REF: 081006a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

7 ANS: 3   PTS: 2   REF: 081007a2   STA: A2.A.64
TOP: Using Inverse Trigonometric Functions   KEY: basic

8 ANS: 4
$$9^{3x+1} = 27^{x+2} \quad .$$
$$(3^2)^{3x+1} = (3^3)^{x+2}$$
$$3^{6x+2} = 3^{3x+6}$$
$$6x + 2 = 3x + 6$$
$$3x = 4$$
$$x = \frac{4}{3}$$

PTS: 2   REF: 081008a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

9   ANS: 3

$$\frac{-7 \pm \sqrt{7^2 - 4(2)(-3)}}{2(2)} = \frac{-7 \pm \sqrt{73}}{4}$$

PTS: 2   REF: 081009a2   STA: A2.A.25   TOP: Quadratic Formula

10 ANS: 2   PTS: 2   REF: 081010a2   STA: A2.A.55
TOP: Trigonometric Ratios

11 ANS: 2

$$\left(\frac{w^{-5}}{w^{-9}} \right)^{\frac{1}{2}} = (w^4)^{\frac{1}{2}} = w^2$$

PTS: 2   REF: 081011a2   STA: A2.A.8   TOP: Negative and Fractional Exponents

12 ANS: 2
$_{15}C_8 = 6,435$

PTS: 2   REF: 081012a2   STA: A2.S.11   TOP: Combinations

13 ANS: 3
$68\% \times 50 = 34$

PTS: 2   REF: 081013a2   STA: A2.S.5   TOP: Normal Distributions
KEY: predict

14 ANS: 1
common difference is 2. $b_n = x + 2n$

$$10 = x + 2(1)$$
$$8 = x$$

PTS: 2   REF: 081014a2   STA: A2.A.29   TOP: Sequences

15 ANS: 2

$$x^2 - x - 6 = 3x - 6$$
$$x^2 - 4x = 0$$
$$x(x - 4) = 0$$
$$x = 0, 4$$

PTS: 2   REF: 081015a2   STA: A2.A.3   TOP: Quadratic-Linear Systems
KEY: equations

16 ANS: 4

$$b^2 - 4ac = 3^2 - 4(9)(-4) = 9 + 144 = 153$$

PTS: 2   REF: 081016a2   STA: A2.A.2   TOP: Using the Discriminant
KEY: determine nature of roots given equation

17 ANS: 4

$$7^2 = 3^2 + 5^2 - 2(3)(5)\cos A$$

$$49 = 34 - 30\cos A$$

$$15 = -30\cos A$$

$$-\frac{1}{2} = \cos A$$

$$120 = A$$

PTS: 2   REF: 081017a2   STA: A2.A.73   TOP: Law of Cosines
KEY: angle, without calculator

18 ANS: 2

$$\frac{x^{-1} - 1}{x - 1} = \frac{\frac{1}{x} - 1}{x - 1} = \frac{\frac{1 - x}{x}}{x - 1} = \frac{\frac{-(x - 1)}{x}}{x - 1} = -\frac{1}{x}$$

PTS: 2   REF: 081018a2   STA: A2.A.9   TOP: Negative Exponents

19 ANS: 3

$$\frac{3}{\sqrt{3a^2 b}} = \frac{3}{a\sqrt{3b}} \cdot \frac{\sqrt{3b}}{\sqrt{3b}} = \frac{3\sqrt{3b}}{3ab} = \frac{\sqrt{3b}}{ab}$$

PTS: 2   REF: 081019a2   STA: A2.A.15   TOP: Rationalizing Denominators
KEY: index = 2

20 ANS: 3

(1) and (4) fail the horizontal line test and are not one-to-one. Not every element of the range corresponds to only one element of the domain. (2) fails the vertical line test and is not a function. Not every element of the domain corresponds to only one element of the range.

PTS: 2   REF: 081020a2   STA: A2.A.43   TOP: Defining Functions

21 ANS: 3

$$K = (10)(18)\sin 46 \approx 129$$

PTS: 2   REF: 081021a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: parallelograms

22 ANS: 1   PTS: 2   REF: 081022a2   STA: A2.A.46
TOP: Transformations with Functions and Relations

23 ANS: 2

The roots are $-1, 2, 3$.

PTS: 2   REF: 081023a2   STA: A2.A.50   TOP: Solving Polynomial Equations

24 ANS: 2   PTS: 2   REF: 081024a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers

25 ANS: 3

$$27r^{4-1} = 64$$

$$r^3 = \frac{64}{27}$$

$$r = \frac{4}{3}$$

PTS: 2　　　　REF: 081025a2　　STA: A2.A.31　　TOP: Sequences

26 ANS: 3

$$\text{period} = \frac{2\pi}{b} = \frac{2\pi}{3\pi} = \frac{2}{3}$$

PTS: 2　　　　REF: 081026a2　　STA: A2.A.70　　TOP: Graphing Trigonometric Functions
KEY: recognize

27 ANS: 3　　　　PTS: 2　　　　REF: 081027a2　　STA: A2.A.44
TOP: Inverse of Functions　　　　KEY: equations

28 ANS:

$$10ax^2 - 23ax - 5a = a(10x^2 - 23x - 5) = a(5x + 1)(2x - 5)$$

PTS: 2　　　　REF: 081028a2　　STA: A2.A.7　　TOP: Factoring Polynomials
KEY: multiple variables

29 ANS:

$$\sum_{n=1}^{15} 7n$$

PTS: 2　　　　REF: 081029a2　　STA: A2.A.34　　TOP: Sigma Notation

30 ANS:
Controlled experiment because Howard is comparing the results obtained from an experimental sample against a control sample.

PTS: 2　　　　REF: 081030a2　　STA: A2.S.1　　TOP: Analysis of Data

31 ANS:

$$y = 10.596(1.586)^x$$

PTS: 2　　　　REF: 081031a2　　STA: A2.S.7　　TOP: Exponential Regression

32 ANS:

$$45, 225 \quad 2\tan C - 3 = 3\tan C - 4$$

$$1 = \tan C$$

$$\tan^{-1} 1 = C$$

$$C = 45, 225$$

PTS: 2　　　　REF: 081032a2　　STA: A2.A.68　　TOP: Trigonometric Equations
KEY: basic

33 ANS:

$(x + 5)^2 + (y - 3)^2 = 32$

PTS: 2   REF: 081033a2   STA: A2.A.49   TOP: Writing Equations of Circles

34 ANS:

$\frac{4}{9}x^2 - \frac{4}{3}x + 1.$ $\left(\frac{2}{3}x - 1\right)^2 = \left(\frac{2}{3}x - 1\right)\left(\frac{2}{3}x - 1\right) = \frac{4}{9}x^2 - \frac{2}{3}x - \frac{2}{3}x + 1 = \frac{4}{9}x^2 - \frac{4}{3}x + 1$

PTS: 2   REF: 081034a2   STA: A2.N.3   TOP: Operations with Polynomials

35 ANS:

$39{,}916{,}800.$ $\frac{{}_{12}P_{12}}{3! \cdot 2!} = \frac{479{,}001{,}600}{12} = 39{,}916{,}800$

PTS: 2   REF: 081035a2   STA: A2.S.10   TOP: Permutations

36 ANS:

$\frac{1}{3}$ $\frac{1}{x+3} - \frac{2}{3-x} = \frac{4}{x^2 - 9}$

$\frac{1}{x+3} + \frac{2}{x-3} = \frac{4}{x^2 - 9}$

$\frac{x - 3 + 2(x + 3)}{(x+3)(x-3)} = \frac{4}{(x+3)(x-3)}$

$x - 3 + 2x + 6 = 4$

$3x = 1$

$x = \frac{1}{3}$

PTS: 4   REF: 081036a2   STA: A2.A.23   TOP: Solving Rationals
KEY: rational solutions

37 ANS:

$\dfrac{23}{2}$ $\cos^2 B + \sin^2 B = 1$ $\tan B = \dfrac{\sin B}{\cos B} = \dfrac{\dfrac{5}{\sqrt{41}}}{\dfrac{4}{\sqrt{41}}} = \dfrac{5}{4}$

$$\cos^2 B + \left(\dfrac{5}{\sqrt{41}}\right)^2 = 1$$

$$\cos^2 B + \dfrac{25}{41} = \dfrac{41}{41}$$

$$\cos^2 B = \dfrac{16}{41}$$

$$\cos B = \dfrac{4}{\sqrt{41}}$$

$$\tan(A + B) = \dfrac{\dfrac{2}{3} + \dfrac{5}{4}}{1 - \left(\dfrac{2}{3}\right)\left(\dfrac{5}{4}\right)} = \dfrac{\dfrac{8 + 15}{12}}{\dfrac{12}{12} - \dfrac{10}{12}} = \dfrac{\dfrac{23}{12}}{\dfrac{2}{12}} = \dfrac{23}{2}$$

PTS: 4   REF: 081037a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: evaluating

38 ANS:

26.2%. $_{10}C_8 \cdot 0.65^8 \cdot 0.35^2 + {}_{10}C_9 \cdot 0.65^9 \cdot 0.35^1 + {}_{10}C_{10} \cdot 0.65^{10} \cdot 0.35^0 \approx 0.262$

PTS: 4   REF: 081038a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

39 ANS:

$x = -\dfrac{1}{3}, -1$ $\log_{x+3} \dfrac{x^3 + x - 2}{x} = 2$

$$\dfrac{x^3 + x - 2}{x} = (x + 3)^2$$

$$\dfrac{x^3 + x - 2}{x} = x^2 + 6x + 9$$

$$x^3 + x - 2 = x^3 + 6x^2 + 9x$$

$$0 = 6x^2 + 8x + 2$$

$$0 = 3x^2 + 4x + 1$$

$$0 = (3x + 1)(x + 1)$$

$$x = -\dfrac{1}{3}, -1$$

PTS: 6   REF: 081039a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic