# JMAP
# REGENTS AT RANDOM

The NY Algebra 2/Trigonometry Regents Exams
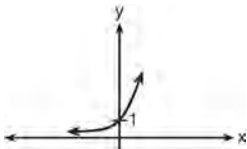Spring 2009-January 2016

**Algebra 2/Trigonometry Regents at Random**

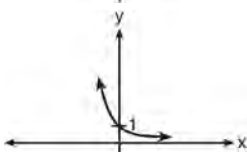1  If $p$ varies inversely as $q$, and $p = 10$ when $q = \frac{3}{2}$, what is the value of $p$ when $q = \frac{3}{5}$?

1)  25
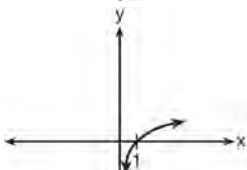2)  15
3)  9
4)  4

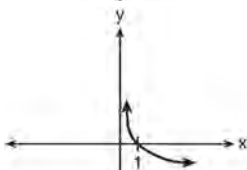2  Which sketch shows the inverse of $y = a^x$, where $a > 1$?



1)



2)



3)



4)

3  Which equation represents a graph that has a period of $4\pi$?

1)  $y = 3\sin\frac{1}{2}x$
2)  $y = 3\sin 2x$
3)  $y = 3\sin\frac{1}{4}x$
4)  $y = 3\sin 4x$

4  What is the domain of the function shown below?
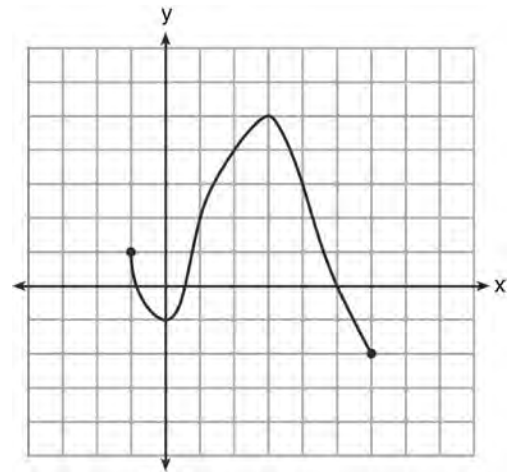


1)  $-1 \le x \le 6$
2)  $-1 \le y \le 6$
3)  $-2 \le x \le 5$
4)  $-2 \le y \le 5$

5  Perform the indicated operations and simplify completely:
$$\frac{x^3 - 3x^2 + 6x - 18}{x^2 - 4x} \cdot \frac{2x - 4}{x^4 - 3x^3} \div \frac{x^2 + 2x - 8}{16 - x^2}$$

6 What is the common difference of the arithmetic sequence below?
$$-7x, -4x, -x, 2x, 5x, \ldots$$
1) $-3$
2) $-3x$
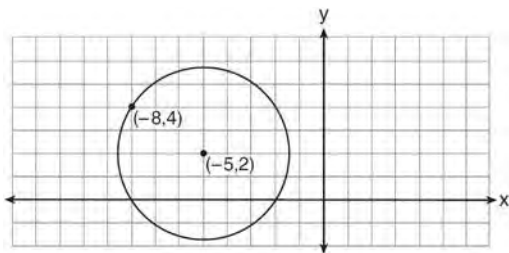3) $3$
4) $3x$

7 The solution set of the equation $\sqrt{2x-4} = x - 2$ is
1) $\{-2, -4\}$
2) $\{2, 4\}$
3) $\{4\}$
4) $\{\ \}$

8 Find the number of possible different 10-letter arrangements using the letters of the word "STATISTICS."

9 Convert 2.5 radians to degrees, and express the answer to the *nearest minute*.

10 Write an equation of the circle shown in the diagram below.



11 A sequence has the following terms: $a_1 = 4$, $a_2 = 10$, $a_3 = 25$, $a_4 = 62.5$. Which formula represents the $n$th term in the sequence?
1) $a_n = 4 + 2.5n$
2) $a_n = 4 + 2.5(n - 1)$
3) $a_n = 4(2.5)^n$
4) $a_n = 4(2.5)^{n-1}$

12 As shown in the table below, a person's target heart rate during exercise changes as the person gets older.

| Age (years) | Target Heart Rate (beats per minute) |
|---|---|
| 20 | 135 |
| 25 | 132 |
| 30 | 129 |
| 35 | 125 |
| 40 | 122 |
| 45 | 119 |
| 50 | 115 |

Which value represents the linear correlation coefficient, rounded to the *nearest thousandth*, between a person's age, in years, and that person's target heart rate, in beats per minute?
1) $-0.999$
2) $-0.664$
3) $0.998$
4) $1.503$

13 Ten teams competed in a cheerleading competition at a local high school. Their scores were 29, 28, 39, 37, 45, 40, 41, 38, 37, and 48. How many scores are within one population standard deviation from the mean? For these data, what is the interquartile range?

14 What is the equation of the graph shown below?
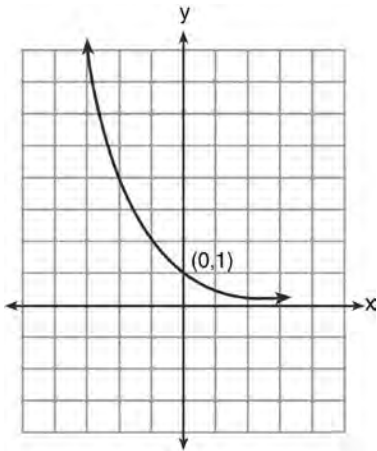


1) $y = 2^x$

2) $y = 2^{-x}$

3) $x = 2^y$

4) $x = 2^{-y}$

15 When $x^2 + 3x - 4$ is subtracted from $x^3 + 3x^2 - 2x$, the difference is

1) $x^3 + 2x^2 - 5x + 4$

2) $x^3 + 2x^2 + x - 4$

3) $-x^3 + 4x^2 + x - 4$

4) $-x^3 - 2x^2 + 5x + 4$

16 The expression $\left(2 - 3\sqrt{x}\right)^2$ is equivalent to

1) $4 - 9x$

2) $4 - 3x$

3) $4 - 12\sqrt{x} + 9x$

4) $4 - 12\sqrt{x} + 6x$

17 Solve algebraically for $x$: $4 - \sqrt{2x - 5} = 1$

18 A cup of soup is left on a countertop to cool. The table below gives the temperatures, in degrees Fahrenheit, of the soup recorded over a 10-minute period.

| Time in Minutes $(x)$ | Temperature in $^0$F $(y)$ |
|---|---|
| 0 | 180.2 |
| 2 | 165.8 |
| 4 | 146.3 |
| 6 | 135.4 |
| 8 | 127.7 |
| 10 | 110.5 |

Write an exponential regression equation for the data, rounding all values to the *nearest thousandth*.

19 The points $(2,3)$, $\left(4, \dfrac{3}{4}\right)$, and $(6, d)$ lie on the graph of a function. If $y$ is inversely proportional to the square of $x$, what is the value of $d$?

1) 1

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

3) 3

4) 27

3

20  The table below displays the results of a survey regarding the number of pets each student in a class has. The average number of pets per student in this class is 2.

| Number of Pets | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Number of Students | 4 | 6 | 10 | 0 | $k$ | 2 |

What is the value of $k$ for this table?
1)  9
2)  2
3)  8
4)  4

21  The value of $\csc 138°23'$ rounded to four decimal places is
1)  −1.3376
2)  −1.3408
3)  1.5012
4)  1.5057

22  Solve $\sec x - \sqrt{2} = 0$ algebraically for all values of $x$ in $0° \le x < 360°$.

23  What is a positive value of $\tan \frac{1}{2} x$, when $\sin x = 0.8$?
1)  0.5
2)  0.4
3)  0.33
4)  0.25

24  Which survey is *least* likely to contain bias?
1)  surveying a sample of people leaving a movie theater to determine which flavor of ice cream is the most popular
2)  surveying the members of a football team to determine the most watched TV sport
3)  surveying a sample of people leaving a library to determine the average number of books a person reads in a year
4)  surveying a sample of people leaving a gym to determine the average number of hours a person exercises per week

25  The expression $(x+i)^2 - (x-i)^2$ is equivalent to
1)  0
2)  −2
3)  −2 + 4xi
4)  4xi

26  Which expression is equivalent to $\left(9x^2 y^6\right)^{-\frac{1}{2}}$?
1)  $\dfrac{1}{3xy^3}$
2)  $3xy^3$
3)  $\dfrac{3}{xy^3}$
4)  $\dfrac{xy^3}{3}$

27  In $\triangle DEF$, $d = 5$, $e = 8$, and $m\angle D = 32$. How many distinct triangles can be drawn given these measurements?
1)  1
2)  2
3)  3
4)  0

28 Which graph represents the function $\log_2 x = y$?



1)



2)



3)



4)
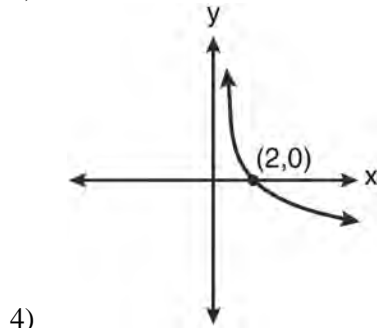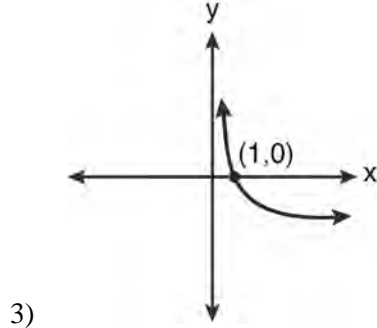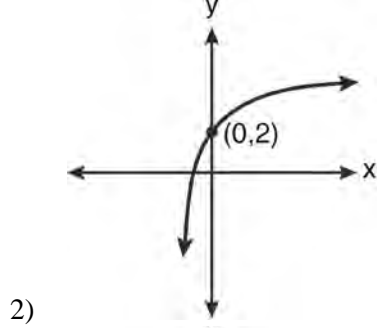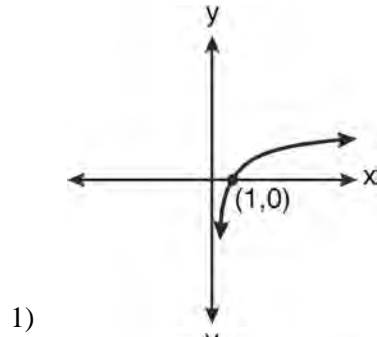
29 The expression $\left( \sqrt[3]{27x^2} \right)\left( \sqrt[3]{16x^4} \right)$ is equivalent to

1)  $12x^2\sqrt[3]{2}$
2)  $12x\sqrt[3]{2x}$
3)  $6x\sqrt[3]{2x^2}$
4)  $6x^2\sqrt[3]{2}$

30 Expressed in simplest form, $\dfrac{3y}{2y-6} + \dfrac{9}{6-2y}$ is equivalent to

1)  $\dfrac{-6y^2 + 36y - 54}{(2y-6)(6-2y)}$
2)  $\dfrac{3y-9}{2y-6}$
3)  $\dfrac{3}{2}$
4)  $-\dfrac{3}{2}$

31 Expressed in simplest form, $\sqrt{-18} - \sqrt{-32}$ is
1)  $-\sqrt{2}$
2)  $-7\sqrt{2}$
3)  $-i\sqrt{2}$
4)  $7i\sqrt{2}$

32 If $g(x) = \left( ax\sqrt{1-x} \right)^2$, express g(10) in simplest form.

33 Determine the sum and the product of the roots of the equation $12x^2 + x - 6 = 0$.

34 On a multiple-choice test, Abby randomly guesses on all seven questions. Each question has four choices. Find the probability, to the *nearest thousandth*, that Abby gets *exactly* three questions correct.

35 In parallelogram *BFLO*, $OL = 3.8$, $LF = 7.4$, and $m\angle O = 126$. If diagonal $\overline{BL}$ is drawn, what is the area of $\triangle BLF$?
1) 11.4
2) 14.1
3) 22.7
4) 28.1

36 Which value of *k* satisfies the equation $8^{3k+4} = 4^{2k-1}$?
1) $-1$
2) $-\dfrac{9}{4}$
3) $-2$
4) $-\dfrac{14}{5}$

37 Solve algebraically for all values of *x*:
$\log_{(x+4)}(17x - 4) = 2$

38 Find the third term in the recursive sequence $a_{k+1} = 2a_k - 1$, where $a_1 = 3$.

39 If $\log_4 x = 2.5$ and $\log_y 125 = -\dfrac{3}{2}$, find the numerical value of $\dfrac{x}{y}$, in simplest form.

40 Which summation represents $5 + 7 + 9 + 11 + \ldots + 43$?
1) $\displaystyle\sum_{n=5}^{43} n$
2) $\displaystyle\sum_{n=1}^{20} (2n + 3)$
3) $\displaystyle\sum_{n=4}^{24} (2n - 3)$
4) $\displaystyle\sum_{n=3}^{23} (3n - 4)$

41 If order does *not* matter, which selection of students would produce the most possible committees?
1) 5 out of 15
2) 5 out of 25
3) 20 out of 25
4) 15 out of 25

42 A school cafeteria has five different lunch periods. The cafeteria staff wants to find out which items on the menu are most popular, so they give every student in the first lunch period a list of questions to answer in order to collect data to represent the school. Which type of study does this represent?
1) observation
2) controlled experiment
3) population survey
4) sample survey

43  The expression $(2a)^{-4}$ is equivalent to
1)  $-8a^4$
2)  $\dfrac{16}{a^4}$
3)  $-\dfrac{2}{a^4}$
4)  $\dfrac{1}{16a^4}$

44  The formula for continuously compounded interest is $A = Pe^{rt}$, where $A$ is the amount of money in the account, $P$ is the initial investment, $r$ is the interest rate, and $t$ is the time in years.  Using the formula, determine, to the *nearest dollar*, the amount in the account after 8 years if $750 is invested at an annual rate of 3%.

45  What is the solution set of the equation $\dfrac{30}{x^2 - 9} + 1 = \dfrac{5}{x - 3}$?
1)  $\{2, 3\}$
2)  $\{2\}$
3)  $\{3\}$
4)  $\{\ \}$

46  Which equation has roots with the sum equal to $\dfrac{9}{4}$ and the product equal to $\dfrac{3}{4}$?
1)  $4x^2 + 9x + 3 = 0$
2)  $4x^2 + 9x - 3 = 0$
3)  $4x^2 - 9x + 3 = 0$
4)  $4x^2 - 9x - 3 = 0$

47  Which expression represents the third term in the expansion of $(2x^4 - y)^3$?
1)  $-y^3$
2)  $-6x^4 y^2$
3)  $6x^4 y^2$
4)  $2x^4 y^2$

48  The table below shows the concentration of ozone in Earth's atmosphere at different altitudes.  Write the exponential regression equation that models these data, rounding *all* values to the *nearest thousandth*.

**Concentration of Ozone**

| Altitude ($x$) | Ozone Units ($y$) |
| --- | --- |
| 0 | 0.7 |
| 5 | 0.6 |
| 10 | 1.1 |
| 15 | 3.0 |
| 20 | 4.9 |

49  What is the equation of the circle passing through the point $(6, 5)$ and centered at $(3, -4)$?
1)  $(x - 6)^2 + (y - 5)^2 = 82$
2)  $(x - 6)^2 + (y - 5)^2 = 90$
3)  $(x - 3)^2 + (y + 4)^2 = 82$
4)  $(x - 3)^2 + (y + 4)^2 = 90$

50  The measures of the angles between the resultant and two applied forces are 60° and 45°, and the magnitude of the resultant is 27 pounds.  Find, to the *nearest pound*, the magnitude of each applied force.

51 What is the product of the roots of $x^2 - 4x + k = 0$ if one of the roots is 7?
1) 21
2) −11
3) −21
4) −77

52 In an arithmetic sequence, $a_4 = 19$ and $a_7 = 31$. Determine a formula for $a_n$, the $n^{th}$ term of this sequence.

53 Which expression is equivalent to $\dfrac{2x^{-2}y^{-2}}{4y^{-5}}$?

1) $\dfrac{y^3}{2x^2}$

2) $\dfrac{2y^3}{x^2}$

3) $\dfrac{2x^2}{y^3}$

4) $\dfrac{x^2}{2y^3}$

54 During a particular month, a local company surveyed all its employees to determine their travel times to work, in minutes. The data for all 15 employees are shown below.

| | | | | |
|---|---|---|---|---|
| 25 | 55 | 40 | 65 | 29 |
| 45 | 59 | 35 | 25 | 37 |
| 52 | 30 | 8 | 40 | 55 |

Determine the number of employees whose travel time is within one standard deviation of the mean.

55 Express $\cos\theta(\sec\theta - \cos\theta)$, in terms of $\sin\theta$.

56 A market research firm needs to collect data on viewer preferences for local news programming in Buffalo. Which method of data collection is most appropriate?
1) census
2) survey
3) observation
4) controlled experiment

57 What is the sum of the first 19 terms of the sequence $3, 10, 17, 24, 31, \ldots$?
1) 1188
2) 1197
3) 1254
4) 1292

58 Given $\triangle ABC$ with $a = 9$, $b = 10$, and $m\angle B = 70$, what type of triangle can be drawn?
1) an acute triangle, only
2) an obtuse triangle, only
3) both an acute triangle and an obtuse triangle
4) neither an acute triangle nor an obtuse triangle

59 What is the solution set for the equation $\sqrt{5x + 29} = x + 3$?
1) {4}
2) {−5}
3) {4,5}
4) {−5,4}

60 Which expression is equivalent to $\sum\limits_{n=1}^{4}(a-n)^2$?

1) $2a^2 + 17$
2) $4a^2 + 30$
3) $2a^2 - 10a + 17$
4) $4a^2 - 20a + 30$

61 Whenever Sara rents a movie, the probability that it is a horror movie is 0.57. Of the next five movies she rents, determine the probability, to the *nearest hundredth*, that *no more than* two of these rentals are horror movies.

62 The simplest form of $\dfrac{1-\dfrac{4}{x}}{1-\dfrac{2}{x}-\dfrac{8}{x^2}}$ is

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

2) $\dfrac{x}{x+2}$

3) $\dfrac{x}{3}$

4) $-\dfrac{x}{x-2}$

63 If $\sin x = \sin y = a$ and $\cos x = \cos y = b$, then $\cos(x-y)$ is

1) $b^2 - a^2$
2) $b^2 + a^2$
3) $2b - 2a$
4) $2b + 2a$

64 What is the fourth term in the binomial expansion $(x-2)^8$?

1) $448x^5$
2) $448x^4$
3) $-448x^5$
4) $-448x^4$

65 The two sides and included angle of a parallelogram are 18, 22, and 60°. Find its exact area in simplest form.

66 Solve algebraically for all values of $x$:

$$81^{x^3 + 2x^2} = 27^{\frac{5x}{3}}$$

67 Solve the equation $6x^2 - 2x - 3 = 0$ and express the answer in simplest radical form.

68 What is the period of the graph $y = \dfrac{1}{2}\sin 6x$?

1) $\dfrac{\pi}{6}$

2) $\dfrac{\pi}{3}$

3) $\dfrac{\pi}{2}$

4) $6\pi$

9

69 The yearbook staff has designed a survey to learn student opinions on how the yearbook could be improved for this year. If they want to distribute this survey to 100 students and obtain the most reliable data, they should survey
1) every third student sent to the office
2) every third student to enter the library
3) every third student to enter the gym for the basketball game
4) every third student arriving at school in the morning

70 The data collected by a biologist showing the growth of a colony of bacteria at the end of each hour are displayed in the table below.

| Time, hour, (x) | Population (y) |
| --- | --- |
| 0 | 250 |
| 1 | 330 |
| 2 | 580 |
| 3 | 800 |
| 4 | 1650 |
| 5 | 3000 |

Write an exponential regression equation to model these data. Round all values to the *nearest thousandth*. Assuming this trend continues, use this equation to estimate, to the nearest *ten*, the number of bacteria in the colony at the end of 7 hours.

71 What is the solution set of the equation $3x^5 - 48x = 0$?
1) $\{0, \pm 2\}$
2) $\{0, \pm 2, 3\}$
3) $\{0, \pm 2, \pm 2i\}$
4) $\{\pm 2, \pm 2i\}$

72 What is the solution set for $2\cos\theta - 1 = 0$ in the interval $0° \le \theta < 360°$?
1) $\{30°, 150°\}$
2) $\{60°, 120°\}$
3) $\{30°, 330°\}$
4) $\{60°, 300°\}$

73 Which expression is equivalent to $\left(3x^2\right)^{-1}$?
1) $\dfrac{1}{3x^2}$
2) $-3x^2$
3) $\dfrac{1}{9x^2}$
4) $-9x^2$

74 Which expression is equivalent to $(n \circ m \circ p)(x)$, given $m(x) = \sin x$, $n(x) = 3x$, and $p(x) = x^2$?
1) $\sin(3x)^2$
2) $3\sin x^2$
3) $\sin^2(3x)$
4) $3\sin^2 x$

75 What is the common difference in the sequence $2a + 1, 4a + 4, 6a + 7, 8a + 10, \ldots$?
1) $2a + 3$
2) $-2a - 3$
3) $2a + 5$
4) $-2a + 5$

76 The function f(x) is graphed on the set of axes below. On the same set of axes, graph $f(x+1)+2$.
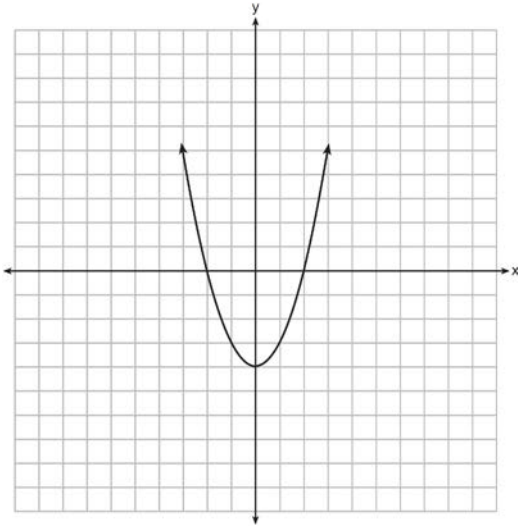


77 For which value of $k$ will the roots of the equation $2x^2 - 5x + k = 0$ be real and rational numbers?
1) 1
2) −5
3) 0
4) 4

78 If $5000 is invested at a rate of 3% interest compounded quarterly, what is the value of the investment in 5 years? (Use the formula $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$, where $A$ is the amount accrued, $P$ is the principal, $r$ is the interest rate, $n$ is the number of times per year the money is compounded, and $t$ is the length of time, in years.)
1) $5190.33
2) $5796.37
3) $5805.92
4) $5808.08

79 If $\sin\theta < 0$ and $\cot\theta > 0$, in which quadrant does the terminal side of angle $\theta$ lie?
1) I
2) II
3) III
4) IV

80 How many negative solutions to the equation $2x^3 - 4x^2 + 3x - 1 = 0$ exist?
1) 1
2) 2
3) 3
4) 0

81 Solve algebraically for all values of $x$:
$x^4 + 4x^3 + 4x^2 = -16x$

82 The expression $\log 4m^2$ is equivalent to
1) $2(\log 4 + \log m)$
2) $2\log 4 + \log m$
3) $\log 4 + 2\log m$
4) $\log 16 + 2\log m$

83 The expression $\sqrt[3]{64a^{16}}$ is equivalent to
1) $8a^4$
2) $8a^8$
3) $4a^5\sqrt[3]{a}$
4) $4a\sqrt[3]{a^5}$

11

84 Which equation is graphed in the diagram below?
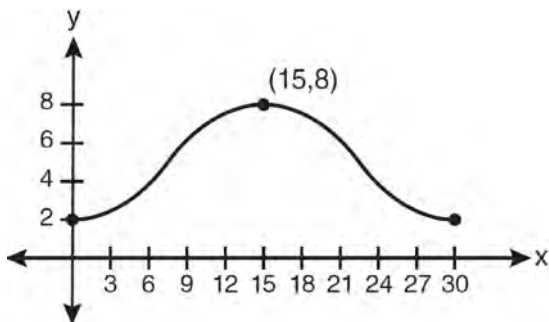


1) $y = 3\cos\left(\dfrac{\pi}{30}x\right) + 8$

2) $y = 3\cos\left(\dfrac{\pi}{15}x\right) + 5$

3) $y = -3\cos\left(\dfrac{\pi}{30}x\right) + 8$

4) $y = -3\cos\left(\dfrac{\pi}{15}x\right) + 5$

85 The diagram below shows the plans for a cell phone tower. A guy wire attached to the top of the tower makes an angle of 65 degrees with the ground. From a point on the ground 100 feet from the end of the guy wire, the angle of elevation to the top of the tower is 32 degrees. Find the height of the tower, to the *nearest foot*.
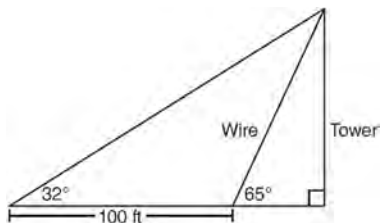


86 Solve $x^3 + 5x^2 = 4x + 20$ algebraically.

87 Express the product of cos 30° and sin 45° in simplest radical form.

88 What are the coordinates of the center of a circle whose equation is $x^2 + y^2 - 16x + 6y + 53 = 0$?
1) $(-8,-3)$
2) $(-8,3)$
3) $(8,-3)$
4) $(8,3)$

89 Express in simplest form: $\dfrac{\dfrac{4-x^2}{x^2+7x+12}}{\dfrac{2x-4}{x+3}}$

90 A math club has 30 boys and 20 girls. Which expression represents the total number of different 5-member teams, consisting of 3 boys and 2 girls, that can be formed?
1) $_{30}P_3 \cdot _{20}P_2$
2) $_{30}C_3 \cdot _{20}C_2$
3) $_{30}P_3 + _{20}P_2$
4) $_{30}C_3 + _{20}C_2$

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

12

92 Which calculator output shows the strongest linear relationship between $x$ and $y$?

    Lin Reg
    $y = a + bx$
    $a = 59.026$
    $b = 6.767$
1)   $r = .8643$
    Lin Reg
    $y = a + bx$
    $a = .7$
    $b = 24.2$
2)   $r = .8361$
    Lin Reg
    $y = a + bx$
    $a = 2.45$
    $b = .95$
3)   $r = .6022$
    Lin Reg
    $y = a + bx$
    $a = -2.9$
    $b = 24.1$
4)   $r = -.8924$

93 Which expression is equivalent to $\dfrac{x^{-1}y^4}{3x^{-5}y^{-1}}$?

1) $\dfrac{x^4 y^5}{3}$

2) $\dfrac{x^5 y^4}{3}$

3) $3x^4 y^5$

4) $\dfrac{y^4}{3x^5}$

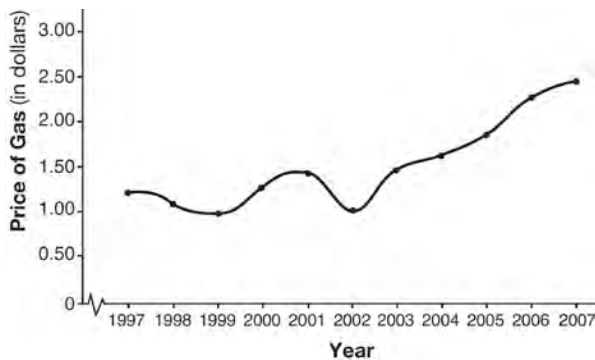94 Solve algebraically for $x$:
$$\sqrt{x^2 + x - 1} + 11x = 7x + 3$$

95 On the axes below, for $-2 \le x \le 2$, graph $y = 2^{x+1} - 3$.



96 What is the range of the function shown below?
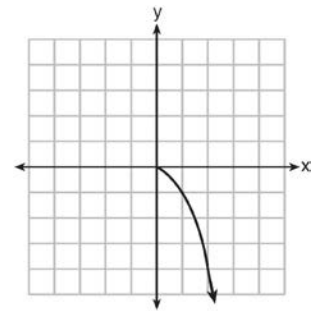


1)  $x \le 0$
2)  $x \ge 0$
3)  $y \le 0$
4)  $y \ge 0$

97 The graph below shows the average price of gasoline, in dollars, for the years 1997 to 2007.



What is the approximate range of this graph?
1) $1997 \le x \le 2007$
2) $1999 \le x \le 2007$
3) $0.97 \le y \le 2.38$
4) $1.27 \le y \le 2.38$

98 What is the number of degrees in an angle whose measure is 2 radians?
1) $\dfrac{360}{\pi}$
2) $\dfrac{\pi}{360}$
3) $360$
4) $90$

99 In $\triangle PQR$, $p$ equals
1) $\dfrac{r\sin P}{\sin Q}$
2) $\dfrac{r\sin P}{\sin R}$
3) $\dfrac{r\sin R}{\sin P}$
4) $\dfrac{q\sin R}{\sin Q}$

100 Max solves a quadratic equation by completing the square. He shows a correct step:
$$(x+2)^2 = -9$$
What are the solutions to his equation?
1) $2 \pm 3i$
2) $-2 \pm 3i$
3) $3 \pm 2i$
4) $-3 \pm 2i$

101 As shown in the diagram below, fire-tracking station $A$ is 100 miles due west of fire-tracking station $B$. A forest fire is spotted at $F$, on a bearing 47° northeast of station $A$ and 15° northeast of station $B$. Determine, to the *nearest tenth of a mile*, the distance the fire is from *both* station $A$ and station $B$. [N represents due north.]
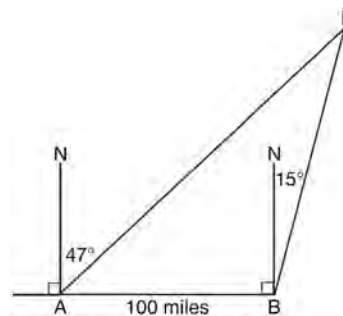


102 The heights, in inches, of 10 high school varsity basketball players are 78, 79, 79, 72, 75, 71, 74, 74, 83, and 71. Find the interquartile range of this data set.

103 Express in simplest terms: $\dfrac{1+\dfrac{3}{x}}{1-\dfrac{5}{x}-\dfrac{24}{x^2}}$

14

104 A blood bank needs twenty people to help with a blood drive. Twenty-five people have volunteered. Find how many different groups of twenty can be formed from the twenty-five volunteers.

105 Approximately how many degrees does five radians equal?
1) 286
2) 900
3) $\dfrac{\pi}{36}$
4) $5\pi$

106 What is the graph of the solution set of $|2x - 1| > 5$?
1) 
2) 
3) 
4) 

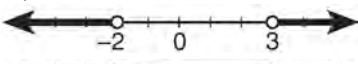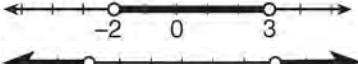107 Which value of $r$ represents data with a strong positive linear correlation between two variables?
1) 0.89
2) 0.34
3) 1.04
4) 0.01

108 If $x = 3i$, $y = 2i$, and $z = m + i$, the expression $xy^2z$ equals
1) $-12 - 12mi$
2) $-6 - 6mi$
3) $12 - 12mi$
4) $6 - 6mi$

109 Which expression represents the total number of different 11-letter arrangements that can be made using the letters in the word "MATHEMATICS"?
1) $\dfrac{11!}{3!}$
2) $\dfrac{11!}{2! + 2! + 2!}$
3) $\dfrac{11!}{8!}$
4) $\dfrac{11!}{2! \cdot 2! \cdot 2!}$

110 The conjugate of the complex expression $-5x + 4i$ is
1) $5x - 4i$
2) $5x + 4i$
3) $-5x - 4i$
4) $-5x + 4i$

111 A circle is drawn to represent a pizza with a 12 inch diameter. The circle is cut into eight congruent pieces. What is the length of the outer edge of any one piece of this circle?
1) $\dfrac{3\pi}{4}$
2) $\pi$
3) $\dfrac{3\pi}{2}$
4) $3\pi$

112 If $n$ is a negative integer, then which statement is always true?
1) $6n^{-2} < 4n^{-1}$
2) $\dfrac{n}{4} > -6n^{-1}$
3) $6n^{-1} < 4n^{-1}$
4) $4n^{-1} > (6n)^{-1}$

15
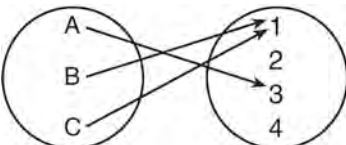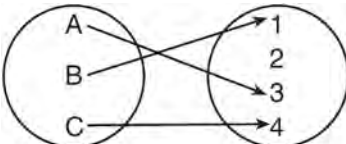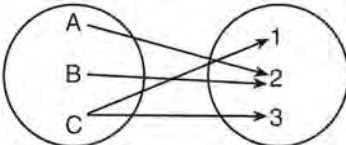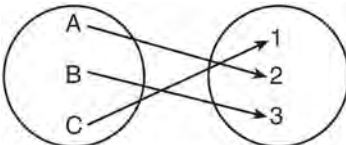
113 Which expression, when rounded to three decimal places, is equal to $-1.155$?

1) $\sec\left(\dfrac{5\pi}{6}\right)$

2) $\tan(49°20')$

3) $\sin\left(-\dfrac{3\pi}{5}\right)$

4) $\csc(-118°)$

114 If $\sin A = \dfrac{1}{3}$, what is the value of $\cos 2A$?

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

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

3) $-\dfrac{7}{9}$

4) $\dfrac{7}{9}$

115 Which diagram represents a relation that is both one-to-one and onto?



1)

2)

3)

4)

116 If $\sin A = -\dfrac{7}{25}$ and $\angle A$ terminates in Quadrant IV, $\tan A$ equals

1) $-\dfrac{7}{25}$

2) $-\dfrac{7}{24}$

3) $-\dfrac{24}{7}$

4) $-\dfrac{24}{25}$

117 What is the solution set of the equation $-\sqrt{2}\sec x = 2$ when $0° \le x < 360°$?

1) $\{45°, 135°, 225°, 315°\}$

2) $\{45°, 315°\}$

3) $\{135°, 225°\}$

4) $\{225°, 315°\}$

118 What is the middle term in the expansion of $\left(\dfrac{x}{2} - 2y\right)^6$?

1) $20x^3 y^3$

2) $-\dfrac{15}{4}x^4 y^2$

3) $-20x^3 y^3$

4) $\dfrac{15}{4}x^4 y^2$

119 Find, to the *nearest tenth*, the radian measure of $216°$.

120 The value of $\sin(180 + x)$ is equivalent to
1) $-\sin x$
2) $-\sin(90 - x)$
3) $\sin x$
4) $\sin(90 - x)$

121 Which function is one-to-one?
1) $f(x) = |x|$
2) $f(x) = 2^x$
3) $f(x) = x^2$
4) $f(x) = \sin x$
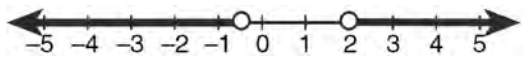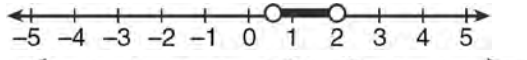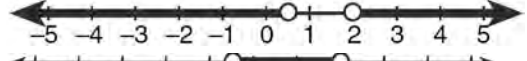
122 Find, algebraically, the measure of the obtuse angle, to the *nearest degree*, that satisfies the equation $5 \csc \theta = 8$.

123 A jogger ran $\frac{1}{3}$ mile on day 1, and $\frac{2}{3}$ mile on day 2, and $1\frac{1}{3}$ miles on day 3, and $2\frac{2}{3}$ miles on day 4, and this pattern continued for 3 more days. Which expression represents the total distance the jogger ran?

1) $\displaystyle\sum_{d=1}^{7} \frac{1}{3}(2)^{d-1}$

2) $\displaystyle\sum_{d=1}^{7} \frac{1}{3}(2)^{d}$

3) $\displaystyle\sum_{d=1}^{7} 2\left(\frac{1}{3}\right)^{d-1}$

4) $\displaystyle\sum_{d=1}^{7} 2\left(\frac{1}{3}\right)^{d}$

124 Which graph represents the solution set of
$\left|\dfrac{4x-5}{3}\right| > 1$?

1) 
2) 
3) 
4) 

125 A population of single-celled organisms was grown in a Petri dish over a period of 16 hours. The number of organisms at a given time is recorded in the table below.

| Time, hrs (x) | Number of Organisms (y) |
|---|---|
| 0 | 25 |
| 2 | 36 |
| 4 | 52 |
| 6 | 68 |
| 8 | 85 |
| 10 | 104 |
| 12 | 142 |
| 16 | 260 |

Determine the exponential regression equation model for these data, rounding all values to the *nearest ten-thousandth*. Using this equation, predict the number of single-celled organisms, to the *nearest whole number*, at the end of the 18th hour.

126 If $\sec(a + 15)° = \csc(2a)°$, find the smallest positive value of $a$, in degrees.

17

127 The expression $\dfrac{1}{7-\sqrt{11}}$ is equivalent to

1) $\dfrac{7+\sqrt{11}}{38}$

2) $\dfrac{7-\sqrt{11}}{38}$

3) $\dfrac{7+\sqrt{11}}{60}$

4) $\dfrac{7-\sqrt{11}}{60}$

128 If $d$ varies inversely as $t$, and $d = 20$ when $t = 2$, what is the value of $t$ when $d = -5$?
1) 8
2) 2
3) $-8$
4) $-2$

129 The formula to determine continuously compounded interest is $A = Pe^{rt}$, where $A$ is the amount of money in the account, $P$ is the initial investment, $r$ is the interest rate, and $t$ is the time, in years. Which equation could be used to determine the value of an account with an \$18,000 initial investment, at an interest rate of 1.25% for 24 months?
1) $A = 18,000e^{1.25 \cdot 2}$
2) $A = 18,000e^{1.25 \cdot 24}$
3) $A = 18,000e^{0.0125 \cdot 2}$
4) $A = 18,000e^{0.0125 \cdot 24}$

130 A ranch in the Australian Outback is shaped like triangle $ACE$, with $m\angle A = 42$, $m\angle E = 103$, and $AC = 15$ miles. Find the area of the ranch, to the *nearest square mile*.

131 What is the range of $f(x) = |x - 3| + 2$?
1) $\{x \,|\, x \geq 3\}$
2) $\{y \,|\, y \geq 2\}$
3) $\{x \,|\, x \in \text{real numbers}\}$
4) $\{y \,|\, y \in \text{real numbers}\}$

132 When factored completely, $x^3 + 3x^2 - 4x - 12$ equals
1) $(x+2)(x-2)(x-3)$
2) $(x+2)(x-2)(x+3)$
3) $(x^2-4)(x+3)$
4) $(x^2-4)(x-3)$

133 Which expression always equals 1?
1) $\cos^2 x - \sin^2 x$
2) $\cos^2 x + \sin^2 x$
3) $\cos x - \sin x$
4) $\cos x + \sin x$

134 Two sides of a parallelogram measure 27 cm and 32 cm. The included angle measures 48°. Find the length of the longer diagonal of the parallelogram, to the *nearest centimeter*.

135 There are eight people in a tennis club. Which expression can be used to find the number of different ways they can place first, second, and third in a tournament?
1) ${}_8P_3$
2) ${}_8C_3$
3) ${}_8P_5$
4) ${}_8C_5$

136 Express the exact value of csc 60°, with a rational denominator.

142 Express $\dfrac{\cot x \sin x}{\sec x}$ as a single trigonometric function, in simplest form, for all values of $x$ for which it is defined.

137 Two sides of a triangular-shaped sandbox measure 22 feet and 13 feet. If the angle between these two sides measures 55°, what is the area of the sandbox, to the *nearest square foot*?
1) 82
2) 117
3) 143
4) 234

143 An angle, $P$, drawn in standard position, terminates in Quadrant II if
1) $\cos P < 0$ and $\csc P < 0$
2) $\sin P > 0$ and $\cos P > 0$
3) $\csc P > 0$ and $\cot P < 0$
4) $\tan P < 0$ and $\sec P > 0$

138 Solve algebraically for all values of $x$:
$\log_{(x+3)}(2x+3) + \log_{(x+3)}(x+5) = 2$

144 What is the common ratio of the geometric sequence shown below?
$$-2, 4, -8, 16, \ldots$$
1) $-\dfrac{1}{2}$
2) $2$
3) $-2$
4) $-6$

139 The discriminant of a quadratic equation is 24. The roots are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

145 Determine the value of $n$ in simplest form:
$i^{13} + i^{18} + i^{31} + n = 0$

140 Two forces of 40 pounds and 28 pounds act on an object. The angle between the two forces is 65°. Find the magnitude of the resultant force, to the *nearest pound*. Using this answer, find the measure of the angle formed between the resultant and the *smaller* force, to the *nearest degree*.

146 Determine the sum and the product of the roots of $3x^2 = 11x - 6$.

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

141 Find, to the *nearest tenth of a square foot*, the area of a rhombus that has a side of 6 feet and an angle of 50°.

19

148 Which equation is represented by the graph below?
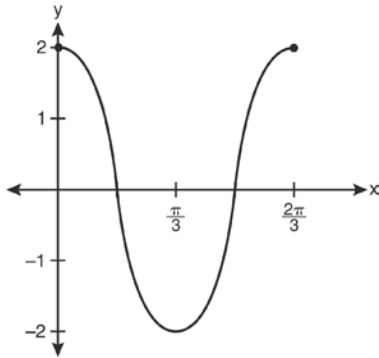


1) $y = 2\cos 3x$
2) $y = 2\sin 3x$
3) $y = 2\cos \dfrac{2\pi}{3} x$
4) $y = 2\sin \dfrac{2\pi}{3} x$

149 The expression $\sin(\theta + 90)°$ is equivalent to
1) $-\sin \theta$
2) $-\cos \theta$
3) $\sin \theta$
4) $\cos \theta$

150 What are the sum and product of the roots of the equation $6x^2 - 4x - 12 = 0$?
1) sum $= -\dfrac{2}{3}$; product $= -2$
2) sum $= \dfrac{2}{3}$; product $= -2$
3) sum $= -2$; product $= \dfrac{2}{3}$
4) sum $= -2$; product $= -\dfrac{2}{3}$

151 Which statement about the graph of the equation $y = e^x$ is *not* true?
1) It is asymptotic to the *x*-axis.
2) The domain is the set of all real numbers.
3) It lies in Quadrants I and II.
4) It passes through the point $(e, 1)$.

152 In the diagram below, the length of which line segment is equal to the exact value of $\sin \theta$?
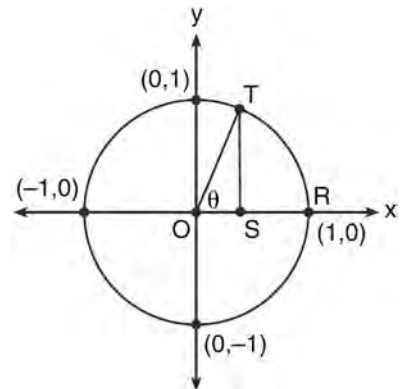


1) $\overline{TO}$
2) $\overline{TS}$
3) $\overline{OR}$
4) $\overline{OS}$

153 A population of rabbits doubles every 60 days according to the formula $P = 10(2)^{\frac{t}{60}}$, where *P* is the population of rabbits on day *t*. What is the value of *t* when the population is 320?
1) 240
2) 300
3) 660
4) 960

154 Write an equation for the graph of the trigonometric function shown below.
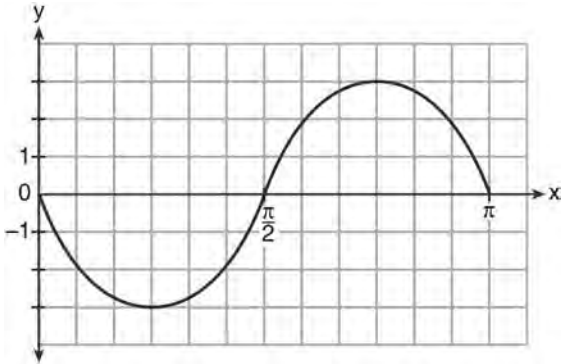


155 If $\log_b x = 3\log_b p - \left(2\log_b t + \frac{1}{2}\log_b r\right)$, then the value of $x$ is

1) $\dfrac{p^3}{\sqrt{t^2 r}}$

2) $p^3 t^2 r^{\frac{1}{2}}$

3) $\dfrac{p^3 t^2}{\sqrt{r}}$

4) $\dfrac{p^3}{t^2 \sqrt{r}}$

156 If the amount of time students work in any given week is normally distributed with a mean of 10 hours per week and a standard deviation of 2 hours, what is the probability a student works between 8 and 11 hours per week?
1) 34.1%
2) 38.2%
3) 53.2%
4) 68.2%

157 The number of possible different 12-letter arrangements of the letters in the word "TRIGONOMETRY" is represented by

1) $\dfrac{12!}{3!}$

2) $\dfrac{12!}{6!}$

3) $\dfrac{_{12}P_{12}}{8}$

4) $\dfrac{_{12}P_{12}}{6!}$

158 A study finds that 80% of the local high school students text while doing homework. Ten students are selected at random from the local high school. Which expression would be part of the process used to determine the probability that, *at most*, 7 of the 10 students text while doing homework?

1) $_{10}C_6\left(\dfrac{4}{5}\right)^6\left(\dfrac{1}{5}\right)^4$

2) $_{10}C_7\left(\dfrac{4}{5}\right)^{10}\left(\dfrac{1}{5}\right)^7$

3) $_{10}C_8\left(\dfrac{7}{10}\right)^{10}\left(\dfrac{3}{10}\right)^2$

4) $_{10}C_9\left(\dfrac{7}{10}\right)^9\left(\dfrac{3}{10}\right)^1$

159 Which step can be used when solving $x^2 - 6x - 25 = 0$ by completing the square?
1) $x^2 - 6x + 9 = 25 + 9$
2) $x^2 - 6x - 9 = 25 - 9$
3) $x^2 - 6x + 36 = 25 + 36$
4) $x^2 - 6x - 36 = 25 - 36$

21

160 Susie invests $500 in an account that is compounded continuously at an annual interest rate of 5%, according to the formula $A = Pe^{rt}$, where $A$ is the amount accrued, $P$ is the principal, $r$ is the rate of interest, and $t$ is the time, in years. Approximately how many years will it take for Susie's money to double?
1) 1.4
2) 6.0
3) 13.9
4) 14.7

161 Which equation is represented by the graph below?
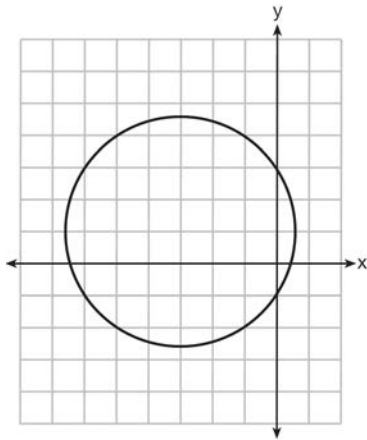


1) $(x-3)^2 + (y+1)^2 = 5$
2) $(x+3)^2 + (y-1)^2 = 5$
3) $(x-1)^2 + (y+3)^2 = 13$
4) $(x+3)^2 + (y-1)^2 = 13$

162 Evaluate: $\sum\limits_{n=1}^{3} (-n^4 - n)$

163 Which is a graph of $y = \cot x$?
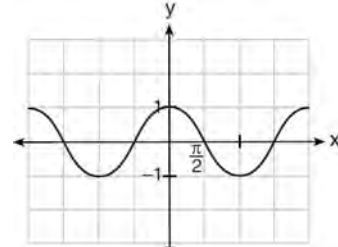


1)
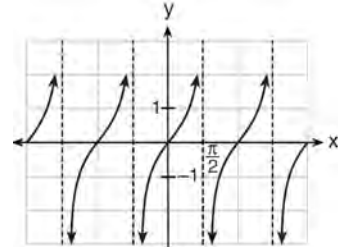


2)
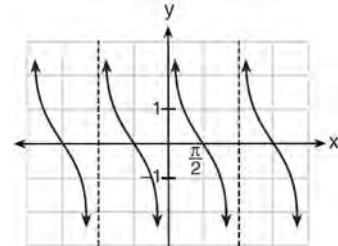


3)
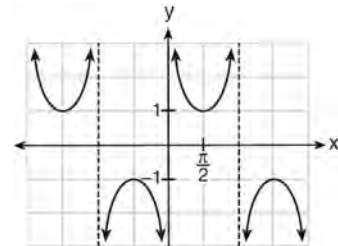


4)

164 The expression $\dfrac{x^2 + 9x - 22}{x^2 - 121} \div (2 - x)$ is equivalent to
1) $x - 11$
2) $\dfrac{1}{x - 11}$
3) $11 - x$
4) $\dfrac{1}{11 - x}$

22

165  Given angle $A$ in Quadrant I with $\sin A = \dfrac{12}{13}$ and

angle $B$ in Quadrant II with $\cos B = -\dfrac{3}{5}$, what is the

value of $\cos(A - B)$?

1)  $\dfrac{33}{65}$

2)  $-\dfrac{33}{65}$

3)  $\dfrac{63}{65}$

4)  $-\dfrac{63}{65}$

166  Which problem involves evaluating $_6P_4$?
1)  How many different four-digit ID numbers can be formed using 1, 2, 3, 4, 5, and 6 without repetition?
2)  How many different subcommittees of four can be chosen from a committee having six members?
3)  How many different outfits can be made using six shirts and four pairs of pants?
4)  How many different ways can one boy and one girl be selected from a group of four boys and six girls?

167  Determine the sum of the first twenty terms of the sequence whose first five terms are 5, 14, 23, 32, 41.

168  Solve the equation below algebraically, and express the result in simplest radical form:
$$\frac{13}{x} = 10 - x$$

169  A school math team consists of three juniors and five seniors.  How many different groups can be formed that consist of one junior and two seniors?
1)  13
2)  15
3)  30
4)  60

170  Which graph represents a function?
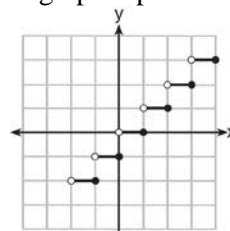


1)
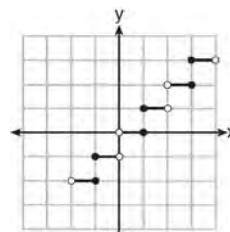


2)
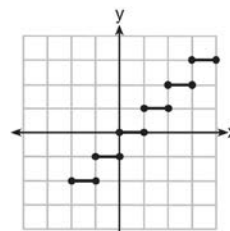


3)
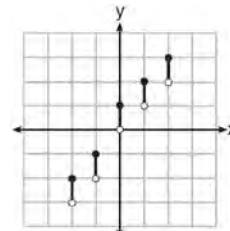


4)

171 The expression $\dfrac{a + \dfrac{b}{c}}{d - \dfrac{b}{c}}$ is equivalent to

1) $\dfrac{c+1}{d-1}$

2) $\dfrac{a+b}{d-b}$

3) $\dfrac{ac+b}{cd-b}$

4) $\dfrac{ac+1}{cd-1}$

172 In the interval $0° \le x < 360°$, $\tan x$ is undefined when $x$ equals
1) 0° and 90°
2) 90° and 180°
3) 180° and 270°
4) 90° and 270°

173 Which function is one-to-one?
1) $k(x) = x^2 + 2$
2) $g(x) = x^3 + 2$
3) $f(x) = |x| + 2$
4) $j(x) = x^4 + 2$

174 If $2x^3 = y$, then $\log y$ equals
1) $\log(2x) + \log 3$
2) $3\log(2x)$
3) $3\log 2 + 3\log x$
4) $\log 2 + 3\log x$

175 Determine algebraically the $x$-coordinate of all points where the graphs of $xy = 10$ and $y = x + 3$ intersect.

176 If $m\angle\theta = -50$, which diagram represents $\theta$ drawn in standard position?



1)



2)



3)



4)
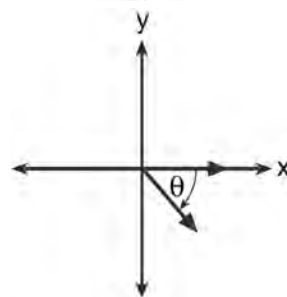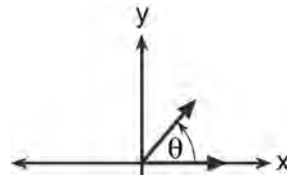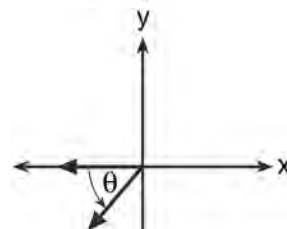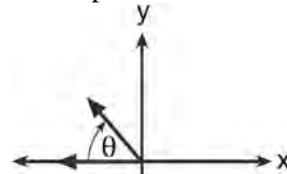
177 The expression $4 + \sum_{k=2}^{5} 3(k - x)$ is equal to

1) $58 - 4x$
2) $46 - 4x$
3) $58 - 12x$
4) $46 - 12x$

178 Which ordered pair is a solution of the system of equations shown below? $x + y = 5$

$$(x + 3)^2 + (y - 3)^2 = 53$$

1) $(2,3)$
2) $(5,0)$
3) $(-5,10)$
4) $(-4,9)$

179 What is the conjugate of $\frac{1}{2} + \frac{3}{2}i$?

1) $-\frac{1}{2} + \frac{3}{2}i$

2) $\frac{1}{2} - \frac{3}{2}i$

3) $\frac{3}{2} + \frac{1}{2}i$

4) $-\frac{1}{2} - \frac{3}{2}i$

180 Which graph represents the solution set of $\frac{x + 16}{x - 2} \le 7$?

1) 

2) 

3) 

4) 

181 Which relation is both one-to-one and onto?

1) 

2) 

3) 

4) 

182 Solve algebraically for all exact values of $x$ in the interval $0 \le x < 2\pi$: $2\sin^2 x + 5\sin x = 3$

183 If $f(x) = 4x - x^2$ and $g(x) = \frac{1}{x}$, then $(f \circ g)\left(\frac{1}{2}\right)$ is equal to

1) $\frac{4}{7}$

2) $-2$

3) $\frac{7}{2}$

4) $4$

184 Solve $|2x - 3| > 5$ algebraically.

25

185 Given the relation $\{(8,2),(3,6),(7,5),(k,4)\}$, which value of $k$ will result in the relation *not* being a function?
1) 1
2) 2
3) 3
4) 4

186 In $\triangle KLM$, $KL = 20$, $LM = 13$, and $m\angle K = 40$. The measure of $\angle M$?
1) must be between $0°$ and $90°$
2) must equal $90°$
3) must be between $90°$ and $180°$
4) is ambiguous

187 The sum of the first eight terms of the series $3 - 12 + 48 - 192 + \ldots$ is
1) $-13,107$
2) $-21,845$
3) $-39,321$
4) $-65,535$

188 Theresa is comparing the graphs of $y = 2^x$ and $y = 5^x$. Which statement is true?
1) The $y$-intercept of $y = 2^x$ is $(0,2)$, and the $y$-intercept of $y = 5^x$ is $(0,5)$.
2) Both graphs have a $y$-intercept of $(0,1)$, and $y = 2^x$ is steeper for $x > 0$.
3) Both graphs have a $y$-intercept of $(0,1)$, and $y = 5^x$ is steeper for $x > 0$.
4) Neither graph has a $y$-intercept.

189 The sum of $\sqrt[3]{6a^4b^2}$ and $\sqrt[3]{162a^4b^2}$, expressed in simplest radical form, is
1) $\sqrt[6]{168a^8b^4}$
2) $2a^2b\sqrt[3]{21a^2b}$
3) $4a\sqrt[3]{6ab^2}$
4) $10a^2b\sqrt[3]{8}$

190 A spinner is divided into eight equal sections. Five sections are red and three are green. If the spinner is spun three times, what is the probability that it lands on red *exactly* twice?
1) $\dfrac{25}{64}$
2) $\dfrac{45}{512}$
3) $\dfrac{75}{512}$
4) $\dfrac{225}{512}$

191 Which equation represents the graph below?
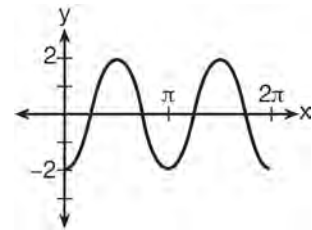


1) $y = -2\sin 2x$
2) $y = -2\sin \dfrac{1}{2}x$
3) $y = -2\cos 2x$
4) $y = -2\cos \dfrac{1}{2}x$

192 A cliff diver on a Caribbean island jumps from a height of 105 feet, with an initial upward velocity of 5 feet per second. An equation that models the height, h(t), above the water, in feet, of the diver in time elapsed, t, in seconds, is
h(t) = −16t² + 5t + 105. How many seconds, to the *nearest hundredth*, does it take the diver to fall 45 feet below his starting point?
1) 1.45
2) 1.84
3) 2.10
4) 2.72

193 The expression $x^2(x+2) - (x+2)$ is equivalent to
1) $x^2$
2) $x^2 - 1$
3) $x^3 + 2x^2 - x + 2$
4) $(x+1)(x-1)(x+2)$

194 The number of bacteria present in a Petri dish can be modeled by the function $N = 50e^{3t}$, where N is the number of bacteria present in the Petri dish after t hours. Using this model, determine, to the *nearest hundredth*, the number of hours it will take for N to reach 30,700.

195 The quantities p and q vary inversely. If p = 20 when q = −2, and p = x when q = −2x + 2, then x equals
1) −4 and 5
2) $\dfrac{20}{19}$
3) −5 and 4
4) $-\dfrac{1}{4}$

196 What is the common ratio of the sequence
$$\frac{1}{64}a^5b^3, -\frac{3}{32}a^3b^4, \frac{9}{16}ab^5, \ldots?$$
1) $-\dfrac{3b}{2a^2}$
2) $-\dfrac{6b}{a^2}$
3) $-\dfrac{3a^2}{b}$
4) $-\dfrac{6a^2}{b}$

197 Show that $\sec\theta \sin\theta \cot\theta = 1$ is an identity.

198 Multiply $x + yi$ by its conjugate, and express the product in simplest form.

199 Circle O shown below has a radius of 12 centimeters. To the *nearest tenth of a centimeter*, determine the length of the arc, x, subtended by an angle of 83°50'.



27
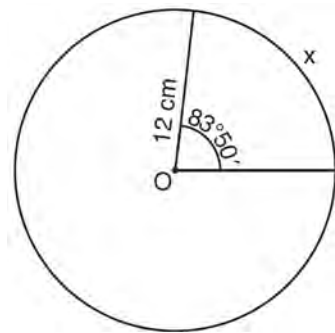
200 For $y = \dfrac{3}{\sqrt{x-4}}$, what are the domain and range?

1) $\{x \mid x > 4\}$ and $\{y \mid y > 0\}$
2) $\{x \mid x \geq 4\}$ and $\{y \mid y > 0\}$
3) $\{x \mid x > 4\}$ and $\{y \mid y \geq 0\}$
4) $\{x \mid x \geq 4\}$ and $\{y \mid y \geq 0\}$

201 Find the solution of the inequality $x^2 - 4x > 5$, algebraically.

202 Which ordered pair is in the solution set of the system of equations shown below?
$$y^2 - x^2 + 32 = 0$$
$$3y - x = 0$$

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

203 Solve algebraically for $x$: $\log_{5x-1} 4 = \dfrac{1}{3}$

204 What is the number of degrees in an angle whose radian measure is $\dfrac{8\pi}{5}$?

1) 576
2) 288
3) 225
4) 113

205 Solve algebraically for $x$: $\log_{27}(2x-1) = \dfrac{4}{3}$

206 In a certain school, the heights of the population of girls are normally distributed, with a mean of 63 inches and a standard deviation of 2 inches. If there are 450 girls in the school, determine how many of the girls are *shorter than* 60 inches. Round the answer to the *nearest integer*.

207 Which statement regarding the inverse function is true?

1) A domain of $y = \sin^{-1} x$ is $[0, 2\pi]$.
2) The range of $y = \sin^{-1} x$ is $[-1, 1]$.
3) A domain of $y = \cos^{-1} x$ is $(-\infty, \infty)$.
4) The range of $y = \cos^{-1} x$ is $[0, \pi]$.

208 The relationship between $t$, a student's test scores, and $d$, the student's success in college, is modeled by the equation $d = 0.48t + 75.2$. Based on this linear regression model, the correlation coefficient could be

1) between $-1$ and $0$
2) between $0$ and $1$
3) equal to $-1$
4) equal to $0$

209 Express $4xi + 5yi^8 + 6xi^3 + 2yi^4$ in simplest $a + bi$ form.

210  If $\tan\left(\operatorname{Arc}\cos\dfrac{\sqrt{3}}{k}\right) = \dfrac{\sqrt{3}}{3}$, then $k$ is

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

211  The expression $\dfrac{\cot x}{\csc x}$ is equivalent to

1)  $\sin x$
2)  $\cos x$
3)  $\tan x$
4)  $\sec x$

212  Expressed with a rational denominator and in simplest form, $\dfrac{x}{x - \sqrt{x}}$ is

1)  $\dfrac{x^2 + x\sqrt{x}}{x^2 - x}$
2)  $-\sqrt{x}$
3)  $\dfrac{x + \sqrt{x}}{1 - x}$
4)  $\dfrac{x + \sqrt{x}}{x - 1}$

213  The area of triangle $ABC$ is 42. If $AB = 8$ and $m\angle B = 61$, the length of $\overline{BC}$ is approximately
1)  5.1
2)  9.2
3)  12.0
4)  21.7

214  What is the product of $\left(\dfrac{x}{4} - \dfrac{1}{3}\right)$ and $\left(\dfrac{x}{4} + \dfrac{1}{3}\right)$?

1)  $\dfrac{x^2}{8} - \dfrac{1}{9}$
2)  $\dfrac{x^2}{16} - \dfrac{1}{9}$
3)  $\dfrac{x^2}{8} - \dfrac{x}{6} - \dfrac{1}{9}$
4)  $\dfrac{x^2}{16} - \dfrac{x}{6} - \dfrac{1}{9}$

215  In the right triangle shown below, what is the measure of angle $S$, to the *nearest minute*?
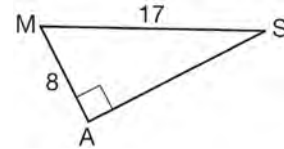


1)  28°1'
2)  28°4'
3)  61°56'
4)  61°93'

216  In $\triangle MNP$, $m = 6$ and $n = 10$. Two distinct triangles can be constructed if the measure of angle $M$ is
1)  35
2)  40
3)  45
4)  50

217  Express in simplest form: $\sqrt[3]{\dfrac{a^6 b^9}{-64}}$

218  If $\log x^2 - \log 2a = \log 3a$, then $\log x$ expressed in terms of $\log a$ is equivalent to

1)  $\dfrac{1}{2}\log 5a$

2)  $\dfrac{1}{2}\log 6 + \log a$

3)  $\log 6 + \log a$

4)  $\log 6 + 2\log a$

219  In which interval of $f(x) = \cos(x)$ is the inverse also a function?

1)  $-\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$

2)  $-\dfrac{\pi}{2} \le x \le \dfrac{\pi}{2}$

3)  $0 \le x \le \pi$

4)  $\dfrac{\pi}{2} \le x \le \dfrac{3\pi}{2}$

220  The following is a list of the individual points scored by all twelve members of the Webster High School basketball team at a recent game:
2  2  3  4  6  7  9  10  10  11  12  14
Find the interquartile range for this set of data.

221  Because Sam's backyard gets very little sunlight, the probability that a geranium planted there will flower is 0.28.  Sam planted five geraniums. Determine the probability, to the *nearest thousandth*, that *at least* four geraniums will flower.

222  Solve $|-4x + 5| < 13$ algebraically for $x$.

223  If $f(x) = 2x^2 - 3x + 1$ and $g(x) = x + 5$, what is $f(g(x))$?

1)  $2x^2 + 17x + 36$

2)  $2x^2 + 17x + 66$

3)  $2x^2 - 3x + 6$

4)  $2x^2 - 3x + 36$

224  If $g(x) = \dfrac{1}{2}x + 8$ and $h(x) = \dfrac{1}{2}x - 2$, what is the value of $g(h(-8))$?

1)  0

2)  9

3)  5

4)  4

225  Convert 3 radians to degrees and express the answer to the *nearest minute*.

226  What is the product of $\left(\dfrac{2}{5}x - \dfrac{3}{4}y^2\right)$ and $\left(\dfrac{2}{5}x + \dfrac{3}{4}y^2\right)$?

1)  $\dfrac{4}{25}x^2 - \dfrac{9}{16}y^4$

2)  $\dfrac{4}{25}x - \dfrac{9}{16}y^2$

3)  $\dfrac{2}{5}x^2 - \dfrac{3}{4}y^4$

4)  $\dfrac{4}{5}x$

227 Liz has applied to a college that requires students to score in the top 6.7% on the mathematics portion of an aptitude test. The scores on the test are approximately normally distributed with a mean score of 576 and a standard deviation of 104. What is the minimum score Liz must earn to meet this requirement?
1) 680
2) 732
3) 740
4) 784

228 How many different six-letter arrangements can be made using the letters of the word "TATTOO"?
1) 60
2) 90
3) 120
4) 720

229 Determine the solution of the inequality $|3 - 2x| \geq 7$. [The use of the grid below is optional.]
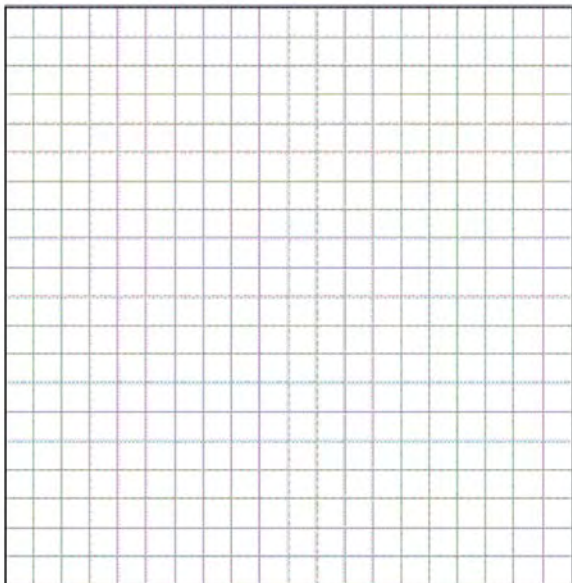


230 If $f(x) = \sqrt{9 - x^2}$, what are its domain and range?
1) domain: $\{x \mid -3 \leq x \leq 3\}$; range: $\{y \mid 0 \leq y \leq 3\}$
2) domain: $\{x \mid x \neq \pm 3\}$; range: $\{y \mid 0 \leq y \leq 3\}$
3) domain: $\{x \mid x \leq -3 \text{ or } x \geq 3\}$; range: $\{y \mid y \neq 0\}$
4) domain: $\{x \mid x \neq 3\}$; range: $\{y \mid y \geq 0\}$

231 When factored completely, the expression $3x^3 - 5x^2 - 48x + 80$ is equivalent to
1) $(x^2 - 16)(3x - 5)$
2) $(x^2 + 16)(3x - 5)(3x + 5)$
3) $(x + 4)(x - 4)(3x - 5)$
4) $(x + 4)(x - 4)(3x - 5)(3x - 5)$

232 If $\log 2 = a$ and $\log 3 = b$, the expression $\log \dfrac{9}{20}$ is equivalent to
1) $2b - a + 1$
2) $2b - a - 1$
3) $b^2 - a + 10$
4) $\dfrac{2b}{a + 1}$

233 What is the product of the roots of the quadratic equation $2x^2 - 7x = 5$?
1) 5
2) $\dfrac{5}{2}$
3) $-5$
4) $-\dfrac{5}{2}$

## Algebra 2/Trigonometry Regents at Random

234  If $\log x = 2\log a + \log b$, then $x$ equals
   1)  $a^2 b$
   2)  $2ab$
   3)  $a^2 + b$
   4)  $2a + b$

238  What is the value of $\displaystyle\sum_{x=0}^{2}(3-2a)^x$?
   1)  $4a^2 - 2a + 12$
   2)  $4a^2 - 2a + 13$
   3)  $4a^2 - 14a + 12$
   4)  $4a^2 - 14a + 13$

235  If $m = \{(-1,1),(1,1),(-2,4),(2,4),(-3,9),(3,9)\}$, which statement is true?
   1)  $m$ and its inverse are both functions.
   2)  $m$ is a function and its inverse is not a function.
   3)  $m$ is not a function and its inverse is a function.
   4)  Neither $m$ nor its inverse is a function.

239  Given the sequence: $x,(x+y),(x+2y),\dots$
   Which expression can be used to determine the common difference of this sequence?
   1)  $x - (x+y)$
   2)  $(x+2y) - (x+y)$
   3)  $\dfrac{x}{(x+y)}$
   4)  $\dfrac{(x+2y)}{(x+y)}$

236  By law, a wheelchair service ramp may be inclined no more than $4.76°$. If the base of a ramp begins 15 feet from the base of a public building, which equation could be used to determine the maximum height, $h$, of the ramp where it reaches the building's entrance?
   1)  $\sin 4.76° = \dfrac{h}{15}$
   2)  $\sin 4.76° = \dfrac{15}{h}$
   3)  $\tan 4.76° = \dfrac{h}{15}$
   4)  $\tan 4.76° = \dfrac{15}{h}$

240  The table below shows the amount of a decaying radioactive substance that remained for selected years after 1990.

| Years After 1990 (x) | 0 | 2 | 5 | 9 | 14 | 17 | 19 |
|---|---|---|---|---|---|---|---|
| Amount (y) | 750 | 451 | 219 | 84 | 25 | 12 | 8 |

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*. Using this equation, determine the amount of the substance that remained in 2002, to the *nearest integer*.

237  Determine, to the *nearest minute*, the degree measure of an angle of $\dfrac{5}{11}\pi$ radians.

241  Solve $e^{4x} = 12$ algebraically for $x$, rounded to the *nearest hundredth*.

242 The roots of $3x^2 + x = 14$ are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

243 How many distinct triangles can be constructed if $m\angle A = 30$, side $a = \sqrt{34}$, and side $b = 12$?
1) one acute triangle
2) one obtuse triangle
3) two triangles
4) none

244 What is the equation of a circle with its center at $(0,-2)$ and passing through the point $(3,-5)$?
1) $x^2 + (y+2)^2 = 9$
2) $(x+2)^2 + y^2 = 9$
3) $x^2 + (y+2)^2 = 18$
4) $(x+2)^2 + y^2 = 18$

245 Which equation could be used to solve $\dfrac{5}{x-3} - \dfrac{2}{x} = 1?$
1) $x^2 - 6x - 3 = 0$
2) $x^2 - 6x + 3 = 0$
3) $x^2 - 6x - 6 = 0$
4) $x^2 - 6x + 6 = 0$

246 Solve algebraically for the *exact* value of $x$:
$\log_8 16 = x + 1$

247 An investment is earning 5% interest compounded quarterly. The equation represents the total amount of money, $A$, where $P$ is the original investment, $r$ is the interest rate, $t$ is the number of years, and $n$ represents the number of times per year the money earns interest. Which graph could represent this investment over at least 50 years?

1)

2)

3)

4)
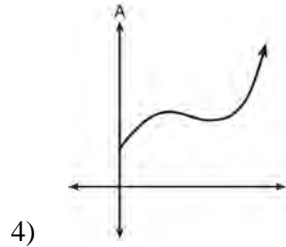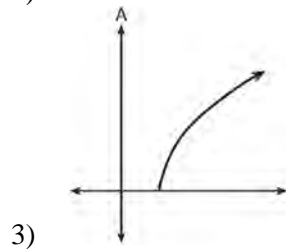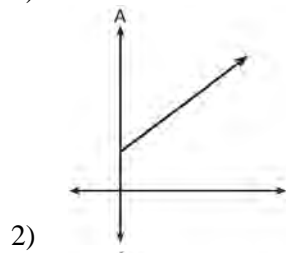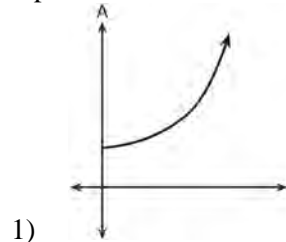
248 What is the solution of the inequality $9 - x^2 < 0$?
1) $\{x \mid -3 < x < 3\}$
2) $\{x \mid x > 3 \text{ or } x < -3\}$
3) $\{x \mid x > 3\}$
4) $\{x \mid x < -3\}$

249 The legs of a right triangle are represented by $x + \sqrt{2}$ and $x - \sqrt{2}$. The length of the hypotenuse of the right triangle is represented by
1) $\sqrt{2x^2 + 4}$
2) $2x^2 + 4$
3) $x\sqrt{2} + 2$
4) $\sqrt{x^2 - 2}$

250 The amount of money in an account can be determined by the formula $A = Pe^{rt}$, where $P$ is the initial investment, $r$ is the annual interest rate, and $t$ is the number of years the money was invested. What is the value of a \$5000 investment after 18 years, if it was invested at 4% interest compounded continuously?
1) \$9367.30
2) \$9869.39
3) \$10,129.08
4) \$10,272.17

251 Yusef deposits \$50 into a savings account that pays 3.25% interest compounded quarterly. The amount, $A$, in his account can be determined by the formula $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$, where $P$ is the initial amount invested, $r$ is the interest rate, $n$ is the number of times per year the money is compounded, and $t$ is the number of years for which the money is invested. What will his investment be worth in 12 years if he makes no other deposits or withdrawals?
1) \$55.10
2) \$73.73
3) \$232.11
4) \$619.74

252 Solve for $x$: $\dfrac{1}{16} = 2^{3x-1}$

253 If $f(x) = x^2 - x$ and $g(x) = x + 1$, determine $f(g(x))$ in simplest form.

254 Which value is in the domain of the function graphed below, but is *not* in its range?
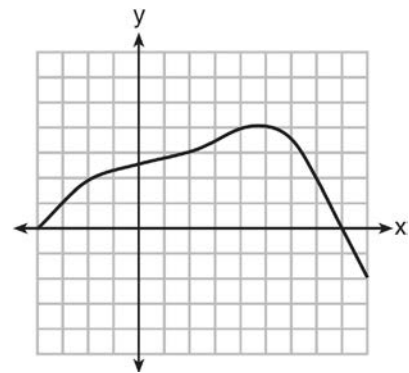


1) 0
2) 2
3) 3
4) 7

255 What is the product of the roots of $4x^2 - 5x = 3$?
1) $\dfrac{3}{4}$
2) $\dfrac{5}{4}$
3) $-\dfrac{3}{4}$
4) $-\dfrac{5}{4}$

256 What is the third term of the recursive sequence below?

$$a_1 = -6$$

$$a_n = \frac{1}{2} a_{n-1} - n$$

1) $-\frac{11}{2}$

2) $-\frac{5}{2}$

3) $-\frac{1}{2}$

4) $-4$

257 What is the area of a parallelogram that has sides measuring 8 cm and 12 cm and includes an angle of 120°?

1) $24\sqrt{3}$

2) $48\sqrt{3}$

3) $83\sqrt{3}$

4) $96\sqrt{3}$

258 In a circle with a diameter of 24 cm, a central angle of $\frac{4\pi}{3}$ radians intercepts an arc. The length of the arc, in centimeters, is

1) $8\pi$

2) $9\pi$

3) $16\pi$

4) $32\pi$

259 Determine how many eleven-letter arrangements can be formed from the word "CATTARAUGUS."

260 What is the domain of the function $g(x) = 3^x - 1$?

1) $(-\infty, 3]$

2) $(-\infty, 3)$

3) $(-\infty, \infty)$

4) $(-1, \infty)$

261 If $T = \frac{10x^2}{y}$, then $\log T$ is equivalent to

1) $(1 + 2\log x) - \log y$

2) $\log(1 + 2x) - \log y$

3) $(1 - 2\log x) + \log y$

4) $2(1 - \log x) + \log y$

262 The ninth term of the expansion of $(3x + 2y)^{15}$ is

1) $_{15}C_9 (3x)^6 (2y)^9$

2) $_{15}C_9 (3x)^9 (2y)^6$

3) $_{15}C_8 (3x)^7 (2y)^8$

4) $_{15}C_8 (3x)^8 (2y)^7$

263 A video-streaming service can choose from six half-hour shows and four one-hour shows. Which expression could be used to calculate the number of different ways the service can choose four half-hour shows and two one-hour shows?

1) $_6P_4 \cdot _4P_2$

2) $_6P_4 + _4P_2$

3) $_6C_4 \cdot _4C_2$

4) $_6C_4 + _4C_2$

35

264 The scores of 1000 students on a standardized test were normally distributed with a mean of 50 and a standard deviation of 5. What is the expected number of students who had scores greater than 60?
1) 1.7
2) 23
3) 46
4) 304

265 Express $xi^8 - yi^6$ in simplest form.

266 Solve algebraically for $x$: $\sqrt{2x+1} + 4 = 8$

267 A customer will select three different toppings for a supreme pizza. If there are nine different toppings to choose from, how many different supreme pizzas can be made?
1) 12
2) 27
3) 84
4) 504

268 The expression $\dfrac{3 - \sqrt{8}}{\sqrt{3}}$ is equivalent to

1) $\dfrac{\sqrt{3} - 2\sqrt{6}}{\sqrt{3}}$

2) $-\sqrt{3} + \dfrac{2}{3}\sqrt{6}$

3) $\dfrac{3 - \sqrt{24}}{3}$

4) $\sqrt{3} - \dfrac{2}{3}\sqrt{6}$

269 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code. [Only an algebraic solution can receive full credit.]

270 Solve the equation $\cos 2x = \cos x$ algebraically for all values of $x$ in the interval $0° \le x < 360°$.

271 In a triangle, two sides that measure 8 centimeters and 11 centimeters form an angle that measures 82°. To the *nearest tenth of a degree*, determine the measure of the *smallest* angle in the triangle.

272 Determine which set of data given below has the stronger linear relationship between $x$ and $y$. Justify your choice.

| Set A | x | 1 | 2 | 3 | 4 | 5 | 6 |
|-------|---|----|----|----|----|----|----|
|       | y | 24 | 30 | 36 | 51 | 70 | 86 |

| Set B | x | 1 | 2 | 3 | 4 | 5 | 6 |
|-------|---|----|----|----|----|----|----|
|       | y | 81 | 64 | 49 | 36 | 25 | 16 |

273 The probability of Ashley being the catcher in a softball game is $\dfrac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.

274 Which statement is true about the graphs of *f* and *g* shown below?
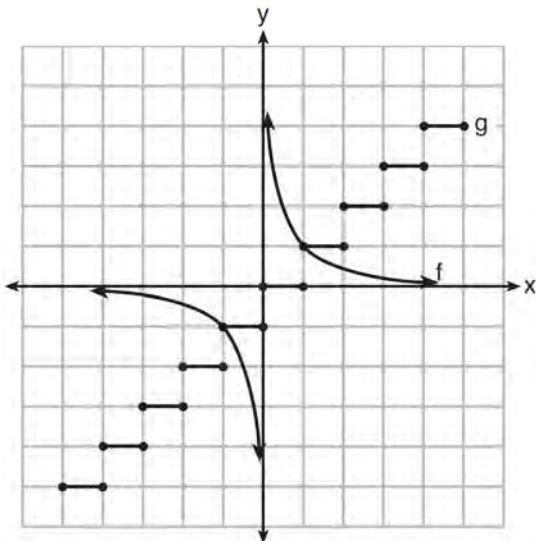


1) *f* is a relation and *g* is a function.
2) *f* is a function and *g* is a relation.
3) Both *f* and *g* are functions.
4) Neither *f* nor *g* is a function.

275 If $f(x) = 2x^2 - 3x + 4$, then $f(x + 3)$ is equal to
1) $2x^2 - 3x + 7$
2) $2x^2 - 3x + 13$
3) $2x^2 + 9x + 13$
4) $2x^2 + 9x + 25$

276 How many different 11-letter arrangements are possible using the letters in the word "ARRANGEMENT"?
1) 2,494,800
2) 4,989,600
3) 19,958,400
4) 39,916,800

277 Which expression is equivalent to the sum of the sequence $6, 12, 20, 30$?

1) $\sum_{n=4}^{7} 2^n - 10$

2) $\sum_{n=3}^{6} \frac{2n^2}{3}$

3) $\sum_{n=2}^{5} 5n - 4$

4) $\sum_{n=2}^{5} n^2 + n$

278 What is the sum of the roots of the equation $-3x^2 + 6x - 2 = 0$?
1) $\frac{2}{3}$
2) 2
3) $-\frac{2}{3}$
4) $-2$

279 The table below displays the number of siblings of each of the 20 students in a class.

| Number of Siblings | Frequency |
|---|---|
| 0 | 2 |
| 1 | 5 |
| 2 | 7 |
| 3 | 4 |
| 4 | 2 |

What is the population standard deviation, to the *nearest hundredth*, for this group?
1) 1.11
2) 1.12
3) 1.14
4) 1.15

37

280 In the diagram below, the spinner is divided into eight equal regions.



Which expression represents the probability of the spinner landing on *B exactly* three times in five spins?

1) $_8C_3\left(\dfrac{1}{5}\right)^3\left(\dfrac{4}{5}\right)^5$

2) $_8C_3\left(\dfrac{1}{5}\right)^5\left(\dfrac{4}{5}\right)^3$

3) $_5C_3\left(\dfrac{1}{8}\right)^2\left(\dfrac{7}{8}\right)^3$

4) $_5C_3\left(\dfrac{1}{8}\right)^3\left(\dfrac{7}{8}\right)^2$

281 Expressed as a function of a positive acute angle, $\sin 230°$ is equal to
1) $-\sin 40°$
2) $-\sin 50°$
3) $\sin 40°$
4) $\sin 50°$

282 The expression $\dfrac{1+\cos 2A}{\sin 2A}$ is equivalent to
1) $\cot A$
2) $\tan A$
3) $\sec A$
4) $1+\cot 2A$

283 If $\cos\theta=\dfrac{3}{4}$, then what is $\cos 2\theta$?

1) $\dfrac{1}{8}$

2) $\dfrac{9}{16}$

3) $-\dfrac{1}{8}$

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

284 Find the exact roots of $x^2+10x-8=0$ by completing the square.

285 The expression $\dfrac{\dfrac{1}{x}+\dfrac{3}{y}}{\dfrac{2}{xy}}$ is equivalent to

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

2) $\dfrac{3x+y}{2xy}$

3) $\dfrac{3xy}{2}$

4) $\dfrac{3x+y}{2}$

286 Which list of ordered pairs does *not* represent a one-to-one function?
1) $(1,-1),(2,0),(3,1),(4,2)$
2) $(1,2),(2,3),(3,4),(4,6)$
3) $(1,3),(2,4),(3,3),(4,1)$
4) $(1,5),(2,4),(3,1),(4,0)$

287 A study compared the number of years of education a person received and that person's average yearly salary. It was determined that the relationship between these two quantities was linear and the correlation coefficient was 0.91. Which conclusion can be made based on the findings of this study?
1) There was a weak relationship.
2) There was a strong relationship.
3) There was no relationship.
4) There was an unpredictable relationship.

288 A scholarship committee rewards the school's top math students. The amount of money each winner receives is inversely proportional to the number of scholarship recipients. If there are three winners, they each receive $400. If there are eight winners, how much money will each winner receive?
1) $1067
2) $400
3) $240
4) $150

289 The periodic graph below can be represented by the trigonometric equation $y = a \cos bx + c$ where $a$, $b$, and $c$ are real numbers.
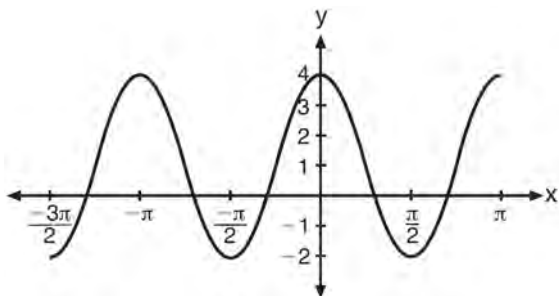


State the values of $a$, $b$, and $c$, and write an equation for the graph.

290 When the inverse of $\tan \theta$ is sketched, its domain is
1) $-1 \le \theta \le 1$
2) $-\dfrac{\pi}{2} \le \theta \le \dfrac{\pi}{2}$
3) $0 \le \theta \le \pi$
4) $-\infty < \theta < \infty$

291 What is the fourth term of the sequence defined by
$$a_1 = 3xy^5$$
$$a_n = \left(\frac{2x}{y}\right)a_{n-1}?$$
1) $12x^3y^3$
2) $24x^2y^4$
3) $24x^4y^2$
4) $48x^5y$

292 Determine the area, to the *nearest integer*, of $\triangle SRO$ shown below.
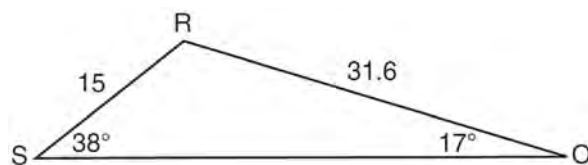


293 The common ratio of the sequence $-\dfrac{1}{2}, \dfrac{3}{4}, -\dfrac{9}{8}$ is
1) $-\dfrac{3}{2}$
2) $-\dfrac{2}{3}$
3) $-\dfrac{1}{2}$
4) $-\dfrac{1}{4}$

294 The table below gives the relationship between $x$ and $y$.

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 4.2 | 33.5 | 113.1 | 268.1 | 523.6 |

Use exponential regression to find an equation for $y$ as a function of $x$, rounding all values to the *nearest hundredth*. Using this equation, predict the value of $x$ if $y$ is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

295 Which values of $x$ in the interval $0° \leq x < 360°$ satisfy the equation $2\sin^2 x + \sin x - 1 = 0$?
1) $\{30°, 270°\}$
2) $\{30°, 150°, 270°\}$
3) $\{90°, 210°, 330°\}$
4) $\{90°, 210°, 270°, 330°\}$

296 Which expression is equivalent to $(5^{-2}a^3 b^{-4})^{-1}$?
1) $\dfrac{10b^4}{a^3}$
2) $\dfrac{25b^4}{a^3}$
3) $\dfrac{a^3}{25b^4}$
4) $\dfrac{a^2}{125b^5}$

297 Solve algebraically for the exact values of $x$:
$$\frac{5x}{2} = \frac{1}{x} + \frac{x}{4}$$

298 Angle $\theta$ is in standard position and $(-4,0)$ is a point on the terminal side of $\theta$. What is the value of $\sec\theta$?
1) $-4$
2) $-1$
3) $0$
4) undefined

299 If $\sin A = \dfrac{3}{8}$, what is the value of $\cos 2A$?
1) $-\dfrac{9}{64}$
2) $\dfrac{1}{4}$
3) $\dfrac{23}{32}$
4) $\dfrac{55}{64}$

300 What is the product of $\sqrt[3]{4a^2 b^4}$ and $\sqrt[3]{16a^3 b^2}$?
1) $4ab^2 \sqrt[3]{a^2}$
2) $4a^2 b^3 \sqrt[3]{a}$
3) $8ab^2 \sqrt[3]{a^2}$
4) $8a^2 b^3 \sqrt[3]{a}$

301 If $x^2 = 12x - 7$ is solved by completing the square, one of the steps in the process is
1) $(x - 6)^2 = -43$
2) $(x + 6)^2 = -43$
3) $(x - 6)^2 = 29$
4) $(x + 6)^2 = 29$

302 Which expression is equivalent to $\dfrac{x^{-1}y^2}{x^2y^{-4}}$?

1) $\dfrac{x}{y^2}$

2) $\dfrac{x^3}{y^6}$

3) $\dfrac{y^2}{x}$

4) $\dfrac{y^6}{x^3}$

303 Given the equation $3x^2 + 2x + k = 0$, state the sum and product of the roots.

304 What is the value of $\tan\left(\text{Arc }\cos\dfrac{15}{17}\right)$?

1) $\dfrac{8}{15}$

2) $\dfrac{8}{17}$

3) $\dfrac{15}{8}$

4) $\dfrac{17}{8}$

305 Which statement about the equation $3x^2 + 9x - 12 = 0$ is true?
1) The product of the roots is $-12$.
2) The product of the roots is $-4$.
3) The sum of the roots is 3.
4) The sum of the roots is $-9$.

306 The table of values below can be modeled by which equation?

| x | y |
|----|---|
| -2 | 5 |
| -1 | 4 |
| 0 | 3 |
| 1 | 4 |
| 2 | 5 |

1) $f(x) = |x + 3|$
2) $f(x) = |x| + 3$
3) $f(y) = |y + 3|$
4) $f(y) = |y| + 3$

307 What is the inverse of the function $f(x) = \log_4 x$?
1) $f^{-1}(x) = x^4$
2) $f^{-1}(x) = 4^x$
3) $f^{-1}(x) = \log_x 4$
4) $f^{-1}(x) = -\log_x 4$

308 Which graph is the solution to the inequality $4|2x + 6| - 5 < 27$?

1) 

2) 

3) 

4) 
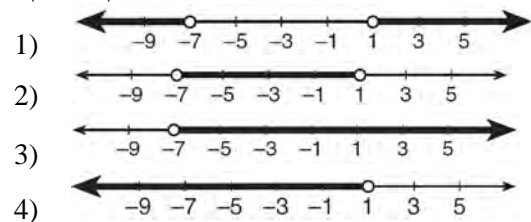
309 If $\log_{(x+1)} 64 = 3$, find the value of $x$.

310 The scores on a standardized exam have a mean of 82 and a standard deviation of 3.6. Assuming a normal distribution, a student's score of 91 would rank
1) below the 75th percentile
2) between the 75th and 85th percentiles
3) between the 85th and 95th percentiles
4) above the 95th percentile

311 The expression $\dfrac{5}{4-\sqrt{11}}$ is equivalent to
1) $4+\sqrt{11}$
2) $\dfrac{20+5\sqrt{11}}{27}$
3) $4-\sqrt{11}$
4) $\dfrac{20-5\sqrt{11}}{27}$

312 A wheel has a radius of 18 inches. Which distance, to the *nearest inch*, does the wheel travel when it rotates through an angle of $\dfrac{2\pi}{5}$ radians?
1) 45
2) 23
3) 13
4) 11

313 The equation $\log_a x = y$ where $x > 0$ and $a > 1$ is equivalent to
1) $x^y = a$
2) $y^a = x$
3) $a^y = x$
4) $a^x = y$

314 What is the value of $\displaystyle\sum_{n=1}^{3}\cos\dfrac{n\pi}{2}$?
1) 1
2) −1
3) 0
4) $-\dfrac{1}{2}$

315 The expression $\sqrt[3]{27a^3}\cdot\sqrt[4]{16b^8}$ is equivalent to
1) $6ab^2$
2) $6ab^4$
3) $12ab^2$
4) $12ab^4$

316 If $f(x) = 2x^2 + 1$ and $g(x) = 3x - 2$, what is the value of $f(g(-2))$?
1) −127
2) −23
3) 25
4) 129

317 Which value of $k$ will make $x^2 - \dfrac{1}{4}x + k$ a perfect square trinomial?
1) $\dfrac{1}{64}$
2) $\dfrac{1}{16}$
3) $\dfrac{1}{8}$
4) $\dfrac{1}{4}$

318 The expression $\left(\frac{3}{2}x+1\right)\left(\frac{3}{2}x-1\right)-\left(\frac{3}{2}x-1\right)^2$ is

equivalent to
1) 0
2) $-3x$
3) $\frac{3}{4}x-2$
4) $3x-2$

319 Which statement regarding correlation is *not* true?
1) The closer the absolute value of the correlation coefficient is to one, the closer the data conform to a line.
2) A correlation coefficient measures the strength of the linear relationship between two variables.
3) A negative correlation coefficient indicates that there is a weak relationship between two variables.
4) A relation for which most of the data fall close to a line is considered strong.

320 The exact value of csc 120° is
1) $\frac{2\sqrt{3}}{3}$
2) 2
3) $-\frac{2\sqrt{3}}{3}$
4) $-2$

321 Find the measure of the smallest angle, to the *nearest degree*, of a triangle whose sides measure 28, 47, and 34.

322 What is the total number of points of intersection of the graphs of the equations $2x^2 - y^2 = 8$ and $y = x + 2$?
1) 1
2) 2
3) 3
4) 0

323 A circle with center $O$ and passing through the origin is graphed below.
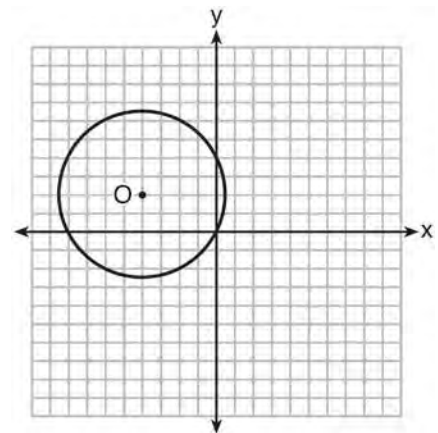


What is the equation of circle $O$?
1) $x^2 + y^2 = 2\sqrt{5}$
2) $x^2 + y^2 = 20$
3) $(x+4)^2 + (y-2)^2 = 2\sqrt{5}$
4) $(x+4)^2 + (y-2)^2 = 20$

324 What is the solution set of $|x-2| = 3x + 10$?
1) { }
2) {−2}
3) {−6}
4) {−2,−6}

325 What are the zeros of the polynomial function graphed below?
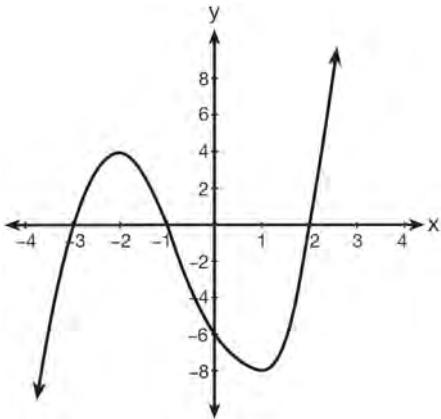


1) $\{-3,-1,2\}$
2) $\{3,1,-2\}$
3) $\{4,-8\}$
4) $\{-6\}$

326 Solve algebraically, to the *nearest hundredth*, for all values of $x$:
$\log_2(x^2 - 7x + 12) - \log_2(2x - 10) = 3$

327 A population, $p(x)$, of wild turkeys in a certain area is represented by the function $p(x) = 17(1.15)^{2x}$, where $x$ is the number of years since 2010. How many more turkeys will be in the population for the year 2015 than 2010?
1) 46
2) 49
3) 51
4) 68

328 If $p$ and $q$ vary inversely and $p$ is 25 when $q$ is 6, determine $q$ when $p$ is equal to 30.

329 A survey is to be conducted in a small upstate village to determine whether or not local residents should fund construction of a skateboard park by raising taxes. Which segment of the population would provide the most unbiased responses?
1) a club of local skateboard enthusiasts
2) senior citizens living on fixed incomes
3) a group opposed to any increase in taxes
4) every tenth person 18 years of age or older walking down Main St.

330 Use the recursive sequence defined below to express the next three terms as fractions reduced to lowest terms.
$$a_1 = 2$$
$$a_n = 3(a_{n-1})^{-2}$$

331 Solve the equation $2x^3 - x^2 - 8x + 4 = 0$ algebraically for all values of $x$.

332 Express $-130°$ in radian measure, to the *nearest hundredth*.

333 The domain of $f(x) = -\dfrac{3}{\sqrt{2-x}}$ is the set of all real numbers
1) greater than 2
2) less than 2
3) except 2
4) between $-2$ and 2

44

334  Factor completely: $x^3 + 3x^2 + 2x + 6$

335  In triangle *ABC*, determine the number of distinct triangles that can be formed if m$\angle A$ = 85, side $a = 8$, and side $c = 2$.  Justify your answer.

336  What are the amplitude and the period of the graph represented by the equation $y = -3\cos\dfrac{\theta}{3}$ ?

1)  amplitude: $-3$;  period: $\dfrac{\pi}{3}$

2)  amplitude: $-3$;  period: $6\pi$

3)  amplitude: 3;  period: $\dfrac{\pi}{3}$

4)  amplitude: 3;  period: $6\pi$

337  What is the total number of different nine-letter arrangements that can be formed using the letters in the word "TENNESSEE"?
1)  3,780
2)  15,120
3)  45,360
4)  362,880

338  Which angle does *not* terminate in Quadrant IV when drawn on a unit circle in standard position?
1)  $-300°$
2)  $-50°$
3)  $280°$
4)  $1030°$

339  The expression $\sqrt[4]{81x^2 y^5}$ is equivalent to

1)  $3x^{\frac{1}{2}} y^{\frac{5}{4}}$

2)  $3x^{\frac{1}{2}} y^{\frac{4}{5}}$

3)  $9xy^{\frac{5}{2}}$

4)  $9xy^{\frac{2}{5}}$

340  If angles *A* and *B* are complementary, then sec *B* equals
1)  $\csc(90° - B)$
2)  $\csc(B - 90°)$
3)  $\cos(B - 90°)$
4)  $\cos(90° - B)$

341  Which equation represents a circle with its center at $(2, -3)$ and that passes through the point $(6, 2)$?
1)  $(x - 2)^2 + (y + 3)^2 = \sqrt{41}$
2)  $(x + 2)^2 + (y - 3)^2 = \sqrt{41}$
3)  $(x - 2)^2 + (y + 3)^2 = 41$
4)  $(x + 2)^2 + (y - 3)^2 = 41$

342  When $-3 - 2i$ is multiplied by its conjugate, the result is
1)  $-13$
2)  $-5$
3)  $5$
4)  $13$

343  The area of a parallelogram is 594, and the lengths of its sides are 32 and 46. Determine, to the *nearest tenth of a degree*, the measure of the acute angle of the parallelogram.

344  What is the period of the graph of the equation $y = \frac{1}{3}\sin 2x$?

1)  $\frac{1}{3}$

2)  $2$

3)  $\pi$

4)  $6\pi$

345  Determine, to the *nearest minute*, the number of degrees in an angle whose measure is 2.5 radians.

346  How many full cycles of the function $y = 3\sin 2x$ appear in $\pi$ radians?

1)  1

2)  2

3)  3

4)  4

347  Which trigonometric expression does *not* simplify to 1?

1)  $\sin^2 x(1 + \cot^2 x)$

2)  $\sec^2 x(1 - \sin^2 x)$

3)  $\cos^2 x(\tan^2 x - 1)$

4)  $\cot^2 x(\sec^2 x - 1)$

348  If $x$ is a real number, express $2xi(i - 4i^2)$ in simplest $a + bi$ form.

349  What is $\dfrac{x}{x-1} - \dfrac{1}{2-2x}$ expressed as a single fraction?

1)  $\dfrac{x+1}{x-1}$

2)  $\dfrac{2x-1}{2-2x}$

3)  $\dfrac{2x+1}{2(x-1)}$

4)  $\dfrac{2x-1}{2(x-1)}$

350  A theater has 35 seats in the first row. Each row has four more seats than the row before it. Which expression represents the number of seats in the $n$th row?

1)  $35 + (n + 4)$

2)  $35 + (4n)$

3)  $35 + (n + 1)(4)$

4)  $35 + (n - 1)(4)$

351  The roots of the equation $4(x^2 - 1) = -3x$ are

1)  imaginary

2)  real, rational, equal

3)  real, rational, unequal

4)  real, irrational, unequal

352  The expression $\sqrt{-180x^{16}}$ is equivalent to
1)  $-6x^4\sqrt{5}$
2)  $-6x^8\sqrt{5}$
3)  $6x^4i\sqrt{5}$
4)  $6x^8i\sqrt{5}$

353  When factored completely, the expression
$x^3 - 2x^2 - 9x + 18$ is equivalent to
1)  $(x^2 - 9)(x - 2)$
2)  $(x - 2)(x - 3)(x + 3)$
3)  $(x - 2)^2(x - 3)(x + 3)$
4)  $(x - 3)^2(x - 2)$

354  How many distinct ways can the eleven letters in
the word "TALLAHASSEE" be arranged?
1)  831,600
2)  1,663,200
3)  3,326,400
4)  5,702,400

355  Express in simplest form: $\dfrac{\dfrac{36 - x^2}{(x + 6)^2}}{\dfrac{x - 3}{x^2 + 3x - 18}}$

356  Solve algebraically for $x$:  $|3x - 5| - x < 17$

357  The expression $\sqrt[3]{27a^{-6}b^3c^2}$ is equivalent to
1)  $\dfrac{3bc^{\frac{2}{3}}}{a^2}$
2)  $\dfrac{3b^9c^6}{a^{18}}$
3)  $\dfrac{3b^6c^5}{a^3}$
4)  $\dfrac{3b\sqrt[3]{3c^2}}{a^2}$

358  The table below shows five numbers and their
frequency of occurrence.

| Number | Frequency |
|--------|-----------|
| 5      | 9         |
| 7      | 5         |
| 8      | 8         |
| 12     | 8         |
| 14     | 8         |

The interquartile range for these data is
1)  7
2)  5
3)  7 to 12
4)  6 to 13

359  Which equation has real, rational, and unequal
roots?
1)  $x^2 + 10x + 25 = 0$
2)  $x^2 - 5x + 4 = 0$
3)  $x^2 - 3x + 1 = 0$
4)  $x^2 - 2x + 5 = 0$

360  The first four terms of the sequence defined by $a_1 = \dfrac{1}{2}$ and $a_{n+1} = 1 - a_n$ are

1)  $\dfrac{1}{2}, \dfrac{1}{2}, \dfrac{1}{2}, \dfrac{1}{2}$

2)  $\dfrac{1}{2}, 1, 1\dfrac{1}{2}, 2$

3)  $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{8}, \dfrac{1}{16}$

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

361  When $\dfrac{7}{8}x^2 - \dfrac{3}{4}x$ is subtracted from $\dfrac{5}{8}x^2 - \dfrac{1}{4}x + 2$, the difference is

1)  $-\dfrac{1}{4}x^2 - x + 2$

2)  $\dfrac{1}{4}x^2 - x + 2$

3)  $-\dfrac{1}{4}x^2 + \dfrac{1}{2}x + 2$

4)  $\dfrac{1}{4}x^2 - \dfrac{1}{2}x - 2$

362  Show that $\dfrac{\sec^2 x - 1}{\sec^2 x}$ is equivalent to $\sin^2 x$.

363  Find the difference when $\dfrac{4}{3}x^3 - \dfrac{5}{8}x^2 + \dfrac{7}{9}x$ is subtracted from $2x^3 + \dfrac{3}{4}x^2 - \dfrac{2}{9}$.

364  Circle $O$ has a radius of 2 units.  An angle with a measure of $\dfrac{\pi}{6}$ radians is in standard position.  If the terminal side of the angle intersects the circle at point $B$, what are the coordinates of $B$?

1)  $\left( \dfrac{\sqrt{3}}{2}, \dfrac{1}{2} \right)$

2)  $\left( \sqrt{3}, 1 \right)$

3)  $\left( \dfrac{1}{2}, \dfrac{\sqrt{3}}{2} \right)$

4)  $\left( 1, \sqrt{3} \right)$

365  Simplify: $\displaystyle\sum_{a=1}^{4} \left( x - a^2 \right)$.

366  Solve algebraically for $x$: $5^{4x} = 125^{x-1}$

367  Six people met at a dinner party, and each person shook hands once with everyone there.  Which expression represents the total number of handshakes?

1)  $6!$

2)  $6! \cdot 2!$

3)  $\dfrac{6!}{2!}$

4)  $\dfrac{6!}{4! \cdot 2!}$

368 The table below shows the final examination scores for Mr. Spear's class last year.

| Test Score | Frequency |
|------------|-----------|
| 72 | 1 |
| 76 | 1 |
| 79 | 4 |
| 83 | 5 |
| 85 | 7 |
| 88 | 5 |
| 94 | 3 |

Find the population standard deviation based on these data, to the *nearest hundredth*. Determine the number of students whose scores are within one population standard deviation of the mean.

369 The expression $x(3i^2)^3 + 2xi^{12}$ is equivalent to
1) $2x + 27xi$
2) $-7x$
3) $-25x$
4) $-29x$

370 Given $y$ varies inversely as $x$, when $y$ is multiplied by $\frac{1}{2}$, then $x$ is multiplied by
1) $\frac{1}{2}$
2) $2$
3) $-\frac{1}{2}$
4) $-2$

371 Factor completely: $x^3 - 6x^2 - 25x + 150$

372 In the interval $0° \le \theta < 360°$, solve the equation $5\cos\theta = 2\sec\theta - 3$ algebraically for all values of $\theta$, to the *nearest tenth of a degree*.

373 On a test that has a normal distribution of scores, a score of 57 falls one standard deviation below the mean, and a score of 81 is two standard deviations above the mean. Determine the mean score of this test.

374 Which transformation of $y = f(x)$ moves the graph 7 units to the left and 3 units down?
1) $y = f(x + 7) - 3$
2) $y = f(x + 7) + 3$
3) $y = f(x - 7) - 3$
4) $y = f(x - 7) + 3$

375 Prove that the equation shown below is an identity for all values for which the functions are defined:
$\csc\theta \cdot \sin^2\theta \cdot \cot\theta = \cos\theta$

376 In $\triangle FGH$, $f = 6$, $g = 9$, and m$\angle H = 57$. Which statement can be used to determine the numerical value of $h$?
1) $h^2 = 6^2 + 9^2 - 2(9)(h)\cos 57°$
2) $h^2 = 6^2 + 9^2 - 2(6)(9)\cos 57°$
3) $6^2 = 9^2 + h^2 - 2(9)(h)\cos 57°$
4) $9^2 = 6^2 + h^2 - 2(6)(h)\cos 57°$

377 How many different ways can teams of four members be formed from a class of 20 students?
1) 5
2) 80
3) 4,845
4) 116,280

378 An arithmetic sequence has a first term of 10 and a sixth term of 40. What is the 20th term of this sequence?
1) 105
2) 110
3) 124
4) 130

379 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$, $m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$, $\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$
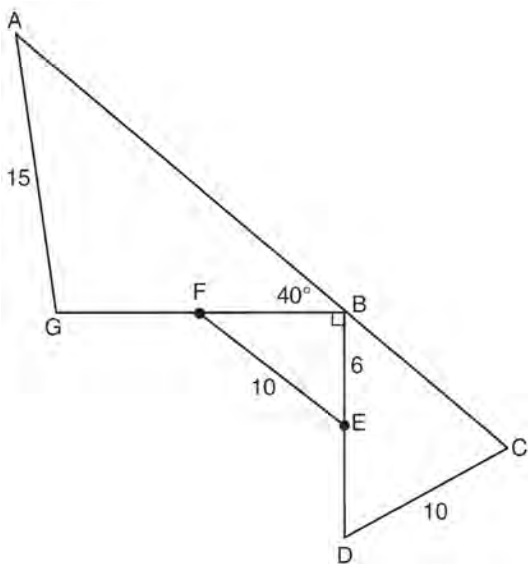


Find $m\angle A$ to the *nearest tenth*. Find $BC$ to the *nearest tenth*.

380 Which relation does *not* represent a function?



1) Domain    Range



2) Domain    Range



3) Domain    Range



4) Domain    Range
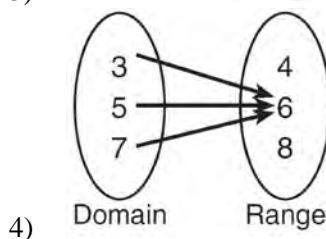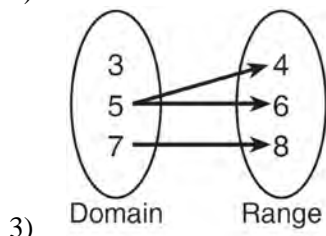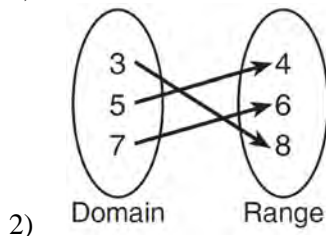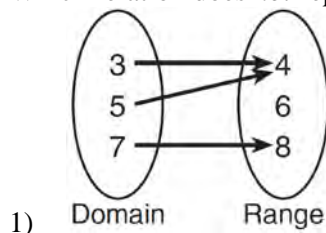
381 If the terminal side of angle $\theta$ passes through point $(-3,-4)$, what is the value of $\sec \theta$?
1) $\dfrac{5}{3}$
2) $-\dfrac{5}{3}$
3) $\dfrac{5}{4}$
4) $-\dfrac{5}{4}$

382  The terminal side of an angle measuring $\dfrac{4\pi}{5}$ radians lies in Quadrant
1)  I
2)  II
3)  III
4)  IV

383  The probability of winning a game is $\dfrac{2}{3}$.
Determine the probability, expressed as a fraction, of winning *exactly* four games if seven games are played.

384  Solve algebraically for $x$: $\dfrac{3}{x} + \dfrac{x}{x+2} = -\dfrac{2}{x+2}$

385  In a circle, an arc length of 6.6 is intercepted by a central angle of $\dfrac{2}{3}$ radians. Determine the length of the radius.

386  What is the value of $4x^{\frac{1}{2}} + x^0 + x^{-\frac{1}{4}}$ when $x = 16$?
1)  $7\dfrac{1}{2}$
2)  $9\dfrac{1}{2}$
3)  $16\dfrac{1}{2}$
4)  $17\dfrac{1}{2}$

387  In a certain high school, a survey revealed the mean amount of bottled water consumed by students each day was 153 bottles with a standard deviation of 22 bottles. Assuming the survey represented a normal distribution, what is the range of the number of bottled waters that approximately 68.2% of the students drink?
1)  $131 - 164$
2)  $131 - 175$
3)  $142 - 164$
4)  $142 - 175$

388  What is the third term in the expansion of $(2x - 3)^5$?
1)  $720x^3$
2)  $180x^3$
3)  $-540x^2$
4)  $-1080x^2$

389  If $f(x) = 4x^2 - x + 1$, then $f(a + 1)$ equals
1)  $4a^2 - a + 6$
2)  $4a^2 - a + 4$
3)  $4a^2 + 7a + 6$
4)  $4a^2 + 7a + 4$

390  The probability that Kay and Joseph Dowling will have a redheaded child is 1 out of 4. If the Dowlings plan to have three children, what is the *exact* probability that only one child will have red hair?

51

## Algebra 2/Trigonometry Regents at Random

391 The expression $\dfrac{a^2 b^{-3}}{a^{-4} b^2}$ is equivalent to

1) $\dfrac{a^6}{b^5}$

2) $\dfrac{b^5}{a^6}$

3) $\dfrac{a^2}{b}$

4) $a^{-2} b^{-1}$

392 Which equation is represented by the graph below?
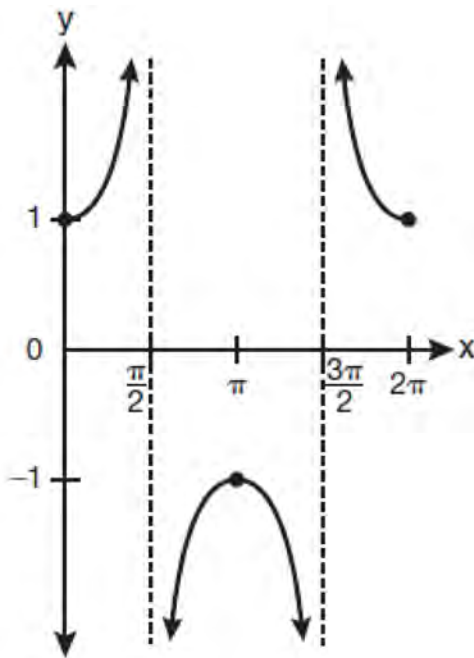


1) $y = \cot x$
2) $y = \csc x$
3) $y = \sec x$
4) $y = \tan x$

393 Assume that the ages of first-year college students are normally distributed with a mean of 19 years and standard deviation of 1 year. To the *nearest integer*, find the percentage of first-year college students who are between the ages of 18 years and 20 years, inclusive. To the *nearest integer*, find the percentage of first-year college students who are 20 years old or older.

394 What are the domain and the range of the function shown in the graph below?
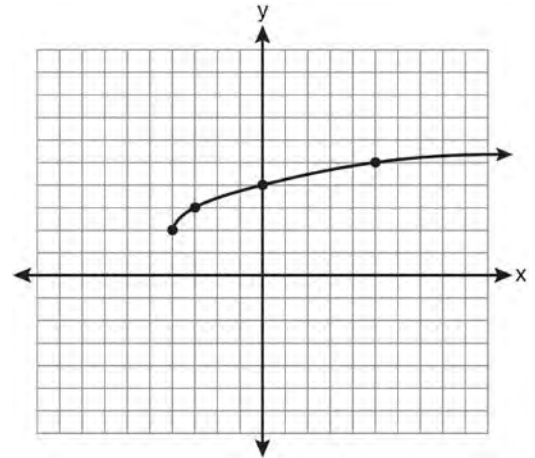


1) $\{x \mid x > -4\}$; $\{y \mid y > 2\}$
2) $\{x \mid x \geq -4\}$; $\{y \mid y \geq 2\}$
3) $\{x \mid x > 2\}$; $\{y \mid y > -4\}$
4) $\{x \mid x \geq 2\}$; $\{y \mid y \geq -4\}$

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

396  Mrs. Hill asked her students to express the sum $1+3+5+7+9+\ldots+39$ using sigma notation. Four different student answers were given.  Which student answer is correct?

1)  $\sum_{k=1}^{20}(2k-1)$

2)  $\sum_{k=2}^{40}(k-1)$

3)  $\sum_{k=-1}^{37}(k+2)$

4)  $\sum_{k=1}^{39}(2k-1)$

397  If $f(x) = x^2 - 5$ and $g(x) = 6x$, then $g(f(x))$ is equal to
1)  $6x^3 - 30x$
2)  $6x^2 - 30$
3)  $36x^2 - 5$
4)  $x^2 + 6x - 5$

398  Matt places $1,200 in an investment account earning an annual rate of 6.5%, compounded continuously.  Using the formula $V = Pe^{rt}$, where $V$ is the value of the account in $t$ years, $P$ is the principal initially invested, $e$ is the base of a natural logarithm, and $r$ is the rate of interest, determine the amount of money, to the *nearest cent*, that Matt will have in the account after 10 years.

399  If $\theta$ is an angle in standard position and its terminal side passes through the point $(-3,2)$, find the exact value of $\csc \theta$.

400  Which graph does *not* represent a function?



1)

2)

3)

4)
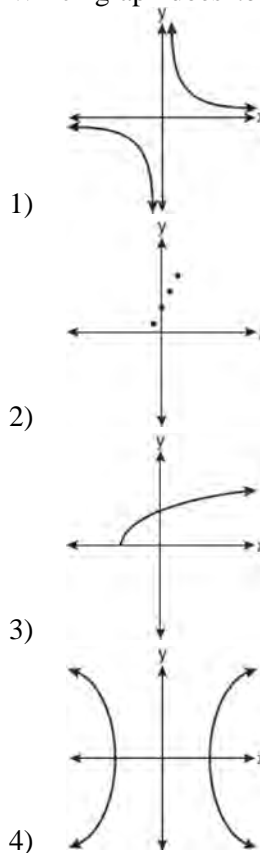
401  Find the first four terms of the recursive sequence defined below.

$$a_1 = -3$$

$$a_n = a_{(n-1)} - n$$

402  What is the solution of the equation $2\log_4(5x) = 3$?
1)  6.4
2)  2.56
3)  $\frac{9}{5}$
4)  $\frac{8}{5}$

403 The graph below shows the function f(x).
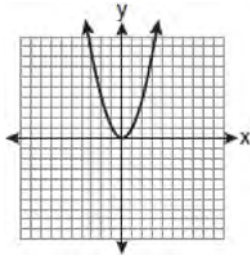


Which graph represents the function f(x + 2)?
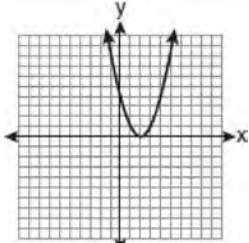


1)
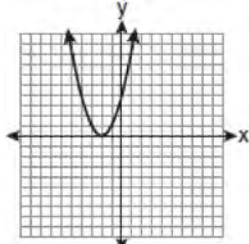


2)
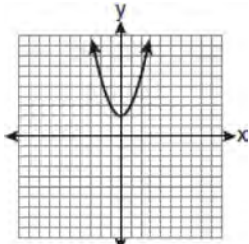


3)
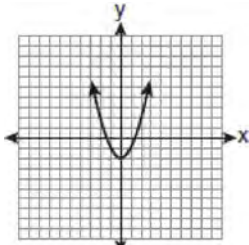


4)

404 Which arithmetic sequence has a common difference of 4?
1) $\{0, 4n, 8n, 12n, \dots\}$
2) $\{n, 4n, 16n, 64n, \dots\}$
3) $\{n + 1, n + 5, n + 9, n + 13, \dots\}$
4) $\{n + 4, n + 16, n + 64, n + 256, \dots\}$

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

406 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 $\tan(A + B)$.

407 What is the fourth term in the expansion of $(3x - 2)^5$?
1) $-720x^2$
2) $-240x$
3) $720x^2$
4) $1{,}080x^3$

408 What is the number of degrees in an angle whose radian measure is $\dfrac{11\pi}{12}$?
1) 150
2) 165
3) 330
4) 518

409 The expression $\log_5\left(\dfrac{1}{25}\right)$ is equivalent to

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

2) 2

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

4) $-2$

410 A survey completed at a large university asked 2,000 students to estimate the average number of hours they spend studying each week. Every tenth student entering the library was surveyed. The data showed that the mean number of hours that students spend studying was 15.7 per week. Which characteristic of the survey could create a bias in the results?
1) the size of the sample
2) the size of the population
3) the method of analyzing the data
4) the method of choosing the students who were surveyed

411 The expression $4ab\sqrt{2b} - 3a\sqrt{18b^3} + 7ab\sqrt{6b}$ is equivalent to
1) $2ab\sqrt{6b}$
2) $16ab\sqrt{2b}$
3) $-5ab + 7ab\sqrt{6b}$
4) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

412 Express $\dfrac{\sqrt{108x^5y^8}}{\sqrt{6xy^5}}$ in simplest radical form.

413 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 $g(x) = -\dfrac{1}{2}x + 4$

414 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

415 Four points on the graph of the function $f(x)$ are shown below.
$$\{(0,1),(1,2),(2,4),(3,8)\}$$
Which equation represents $f(x)$?
1) $f(x) = 2^x$
2) $f(x) = 2x$
3) $f(x) = x + 1$
4) $f(x) = \log_2 x$

416 The expression $\sqrt[4]{16x^2y^7}$ is equivalent to
1) $2x^{\frac{1}{2}}y^{\frac{7}{4}}$
2) $2x^8y^{28}$
3) $4x^{\frac{1}{2}}y^{\frac{7}{4}}$
4) $4x^8y^{28}$

417 The table below shows the results of an experiment involving the growth of bacteria.

| Time (x) (in minutes) | 1 | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|---|
| Number of Bacteria (y) | 2 | 25 | 81 | 175 | 310 | 497 |

Write a power regression equation for this set of data, rounding all values to *three decimal places*. Using this equation, predict the bacteria's growth, to the *nearest integer*, after 15 minutes.

418 A circle shown in the diagram below has a center of $(-5,3)$ and passes through point $(-1,7)$.
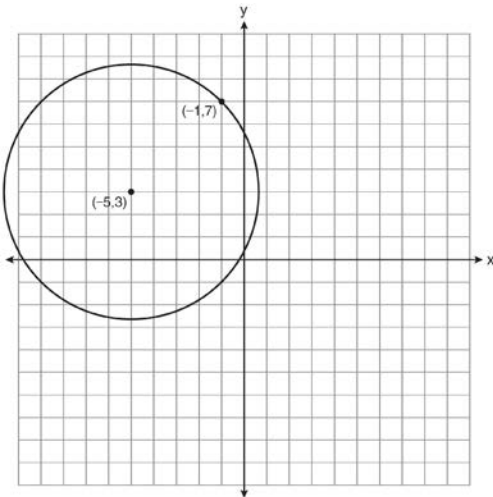


Write an equation that represents the circle.

419 For a given set of rectangles, the length is inversely proportional to the width. In one of these rectangles, the length is 12 and the width is 6. For this set of rectangles, calculate the width of a rectangle whose length is 9.

420 The graph of $y = f(x)$ is shown below.
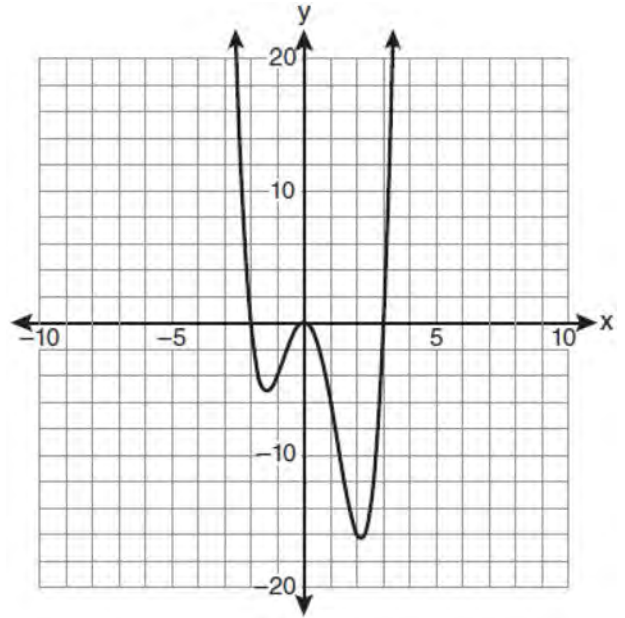


Which set lists all the real solutions of $f(x) = 0$?
1) $\{-3,2\}$
2) $\{-2,3\}$
3) $\{-3,0,2\}$
4) $\{-2,0,3\}$

421 If $a = 3$ and $b = -2$, what is the value of the expression $\dfrac{a^{-2}}{b^{-3}}$?

1) $-\dfrac{9}{8}$

2) $-1$

3) $-\dfrac{8}{9}$

4) $\dfrac{8}{9}$

422 The table below shows the first-quarter averages for Mr. Harper's statistics class.

**Statistics Class Averages**

| Quarter Averages | Frequency |
|---|---|
| 99 | 1 |
| 97 | 5 |
| 95 | 4 |
| 92 | 4 |
| 90 | 7 |
| 87 | 2 |
| 84 | 6 |
| 81 | 2 |
| 75 | 1 |
| 70 | 2 |
| 65 | 1 |

What is the population variance for this set of data?
1) 8.2
2) 8.3
3) 67.3
4) 69.3

423 The expression $(x^2 - 1)^{-\frac{2}{3}}$ is equivalent to

1) $\sqrt[3]{(x^2 - 1)^2}$

2) $\dfrac{1}{\sqrt[3]{(x^2 - 1)^2}}$

3) $\sqrt{(x^2 - 1)^3}$

4) $\dfrac{1}{\sqrt{(x^2 - 1)^3}}$

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

425 Write a quadratic equation such that the sum of its roots is 6 and the product of its roots is $-27$.

426 What is the period of the function $y = \dfrac{1}{2}\sin\left(\dfrac{x}{3} - \pi\right)$?

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

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

3) $\dfrac{2}{3}\pi$

4) $6\pi$

427 The scores of one class on the Unit 2 mathematics test are shown in the table below.

**Unit 2 Mathematics Test**

| Test Score | Frequency |
|---|---|
| 96 | 1 |
| 92 | 2 |
| 84 | 5 |
| 80 | 3 |
| 76 | 6 |
| 72 | 3 |
| 68 | 2 |

Find the population standard deviation of these scores, to the *nearest tenth*.

428 Which values of $x$ are solutions of the equation $x^3 + x^2 - 2x = 0$?
1) $0, 1, 2$
2) $0, 1, -2$
3) $0, -1, 2$
4) $0, -1, -2$

429 In the diagram below of right triangle $JTM$, $JT = 12$, $JM = 6$, and m$\angle JMT = 90$.
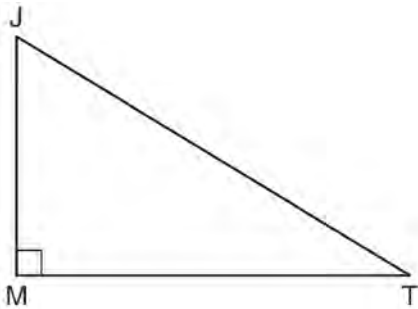


What is the value of $\cot J$?
1) $\dfrac{\sqrt{3}}{3}$
2) $2$
3) $\sqrt{3}$
4) $\dfrac{2\sqrt{3}}{3}$

430 The solutions of the equation $y^2 - 3y = 9$ are
1) $\dfrac{3 \pm 3i\sqrt{3}}{2}$
2) $\dfrac{3 \pm 3i\sqrt{5}}{2}$
3) $\dfrac{-3 \pm 3\sqrt{5}}{2}$
4) $\dfrac{3 \pm 3\sqrt{5}}{2}$

431 Which value of $r$ represents data with a strong negative linear correlation between two variables?
1) $-1.07$
2) $-0.89$
3) $-0.14$
4) $0.92$

432 The expression $x^{-\frac{2}{5}}$ is equivalent to
1) $-\sqrt[2]{x^5}$
2) $-\sqrt[5]{x^2}$
3) $\dfrac{1}{\sqrt[2]{x^5}}$
4) $\dfrac{1}{\sqrt[5]{x^2}}$

433 Find the sum and product of the roots of the equation $5x^2 + 11x - 3 = 0$.

434 Simplify the expression $\dfrac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}}$ and write the answer using only positive exponents.

435 The solution set of $\sqrt{3x + 16} = x + 2$ is
1) $\{-3, 4\}$
2) $\{-4, 3\}$
3) $\{3\}$
4) $\{-4\}$

436  Use the discriminant to determine all values of $k$ that would result in the equation $x^2 - kx + 4 = 0$ having equal roots.

437  The temperature, $T$, of a given cup of hot chocolate after it has been cooling for $t$ minutes can best be modeled by the function below, where $T_0$ is the temperature of the room and $k$ is a constant.
$$\ln(T - T_0) = -kt + 4.718$$
A cup of hot chocolate is placed in a room that has a temperature of $68°$. After 3 minutes, the temperature of the hot chocolate is $150°$. Compute the value of $k$ to the nearest thousandth. [Only an algebraic solution can receive full credit.] Using this value of $k$, find the temperature, $T$, of this cup of hot chocolate if it has been sitting in this room for a total of 10 minutes. Express your answer to the *nearest degree*. [Only an algebraic solution can receive full credit.]
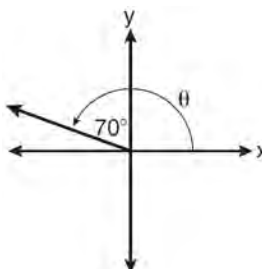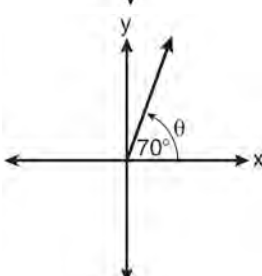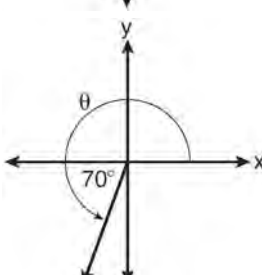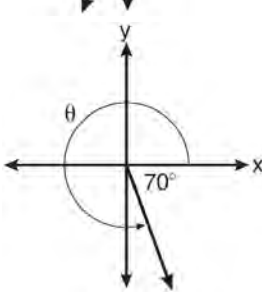
438  An auditorium has 21 rows of seats. The first row has 18 seats, and each succeeding row has two more seats than the previous row. How many seats are in the auditorium?
1)  540
2)  567
3)  760
4)  798

439  Solve for $x$: $\dfrac{4x}{x-3} = 2 + \dfrac{12}{x-3}$

440  In a study of 82 video game players, the researchers found that the ages of these players were normally distributed, with a mean age of 17 years and a standard deviation of 3 years. Determine if there were 15 video game players in this study over the age of 20. Justify your answer.

441  In which graph is $\theta$ coterminal with an angle of $-70°$?



1)

2)

3)

4)

442 The expression $(3 - 7i)^2$ is equivalent to
1) $-40 + 0i$
2) $-40 - 42i$
3) $58 + 0i$
4) $58 - 42i$

443 The expression $\cos 4x \cos 3x + \sin 4x \sin 3x$ is equivalent to
1) $\sin x$
2) $\sin 7x$
3) $\cos x$
4) $\cos 7x$

444 Which graph does *not* represent a function?
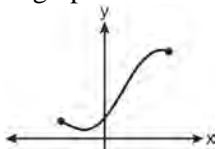


1)
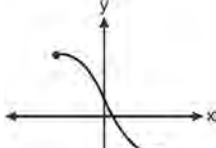


2)
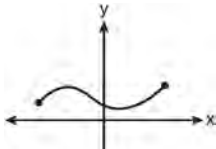


3)
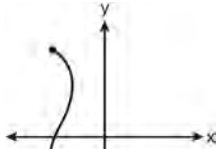


4)

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

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

447 What is the solution set of the equation $|4a + 6| - 4a = -10$?
1) $\varnothing$
2) $\{0\}$
3) $\left\{ \dfrac{1}{2} \right\}$
4) $\left\{ 0, \dfrac{1}{2} \right\}$

448 Solve $2x^2 - 12x + 4 = 0$ by completing the square, expressing the result in simplest radical form.

449 The solution set of the inequality $x^2 - 3x > 10$ is
1) $\{x \mid -2 < x < 5\}$
2) $\{x \mid 0 < x < 3\}$
3) $\{x \mid x < -2 \text{ or } x > 5\}$
4) $\{x \mid x < -5 \text{ or } x > 2\}$

450 What is the value of $x$ in the equation $\log_5 x = 4$?
1) 1.16
2) 20
3) 625
4) 1,024

451 If a function is defined by the equation $f(x) = 4^x$, which graph represents the inverse of this function?

1)



2)



3)



4)
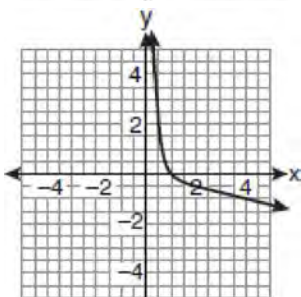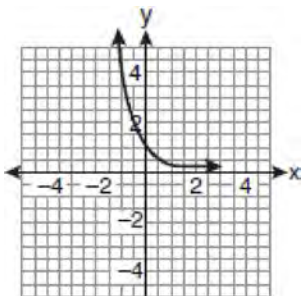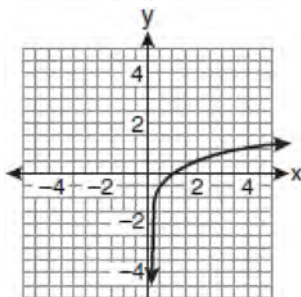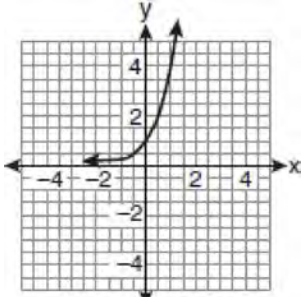


452 The minimum point on the graph of the equation $y = f(x)$ is $(-1, -3)$. What is the minimum point on the graph of the equation $y = f(x) + 5$?
1) $(-1, 2)$
2) $(-1, -8)$
3) $(4, -3)$
4) $(-6, -3)$

453 The number of minutes students took to complete a quiz is summarized in the table below.

| Minutes | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|
| Number of Students | 5 | 3 | x | 5 | 2 | 10 | 1 |

If the mean number of minutes was 17, which equation could be used to calculate the value of $x$?

1) $17 = \dfrac{119 + x}{x}$

2) $17 = \dfrac{119 + 16x}{x}$

3) $17 = \dfrac{446 + x}{26 + x}$

4) $17 = \dfrac{446 + 16x}{26 + x}$

454 Which formula can be used to determine the total number of different eight-letter arrangements that can be formed using the letters in the word *DEADLINE*?
1) $8!$
2) $\dfrac{8!}{4!}$
3) $\dfrac{8!}{2! + 2!}$
4) $\dfrac{8!}{2! \cdot 2!}$

455 The graph of the equation $y = \left(\dfrac{1}{2}\right)^x$ has an asymptote. On the grid below, sketch the graph of $y = \left(\dfrac{1}{2}\right)^x$ and write the equation of this asymptote.
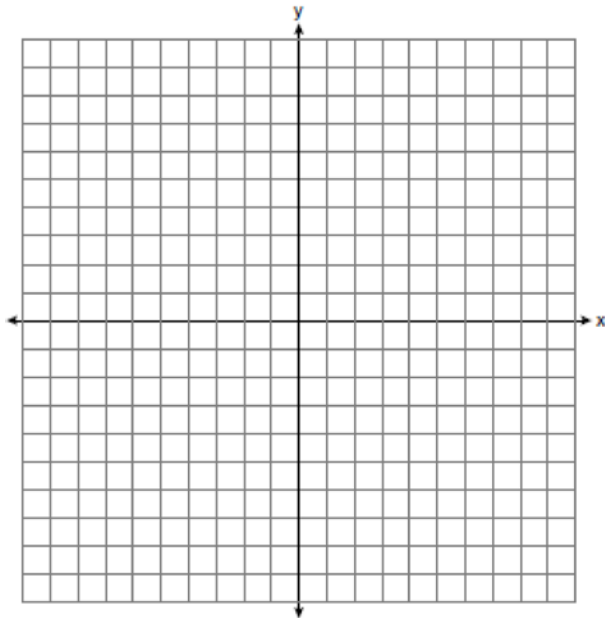


456 Factored completely, the expression $6x - x^3 - x^2$ is equivalent to
1) $x(x+3)(x-2)$
2) $x(x-3)(x+2)$
3) $-x(x-3)(x+2)$
4) $-x(x+3)(x-2)$

457 Which relation is *not* a function?
1) $(x-2)^2 + y^2 = 4$
2) $x^2 + 4x + y = 4$
3) $x + y = 4$
4) $xy = 4$

458 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) $\dfrac{7\pi}{3}$

459 Find, to the *nearest minute*, the angle whose measure is 3.45 radians.

460 The lengths of 100 pipes have a normal distribution with a mean of 102.4 inches and a standard deviation of 0.2 inch. If one of the pipes measures exactly 102.1 inches, its length lies
1) below the 16th percentile
2) between the 50th and 84th percentiles
3) between the 16th and 50th percentiles
4) above the 84th percentile

461 Factor the expression $12t^8 - 75t^4$ completely.

462 If $\angle A$ is acute and $\tan A = \dfrac{2}{3}$, then
1) $\cot A = \dfrac{2}{3}$
2) $\cot A = \dfrac{1}{3}$
3) $\cot(90° - A) = \dfrac{2}{3}$
4) $\cot(90° - A) = \dfrac{1}{3}$

463  Which graph represents a relation that is *not* a function?



1)



2)



3)



4)
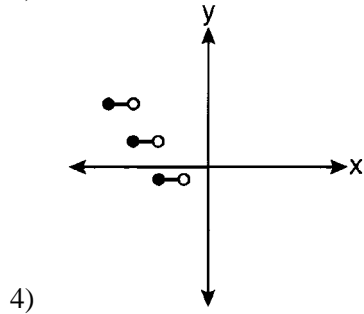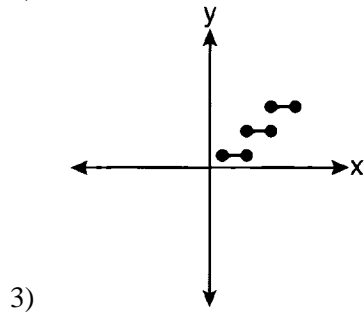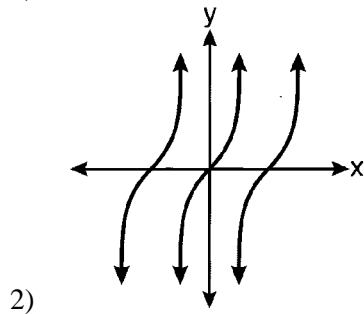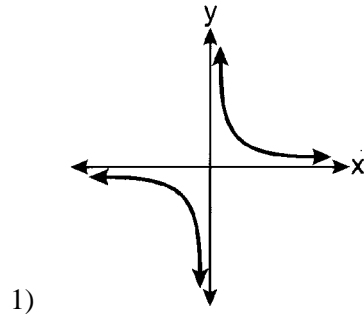
464  Express as a single fraction the exact value of $\sin 75°$.

465  The letters of any word can be rearranged.  Carol believes that the number of different 9-letter arrangements of the word "TENNESSEE" is greater than the number of different 7-letter arrangements of the word "VERMONT."  Is she correct?  Justify your answer.

466  What is the coefficient of the fourth term in the expansion of $(a - 4b)^9$?
1)   −5,376
2)   −336
3)   336
4)   5,376

467  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

468  Akeem invests $25,000 in an account that pays 4.75% annual interest compounded continuously.

Using the formula $A = Pe^{rt}$, where $A$ = the amount in the account after $t$ years, $P$ = principal invested, and $r$ = the annual interest rate, how many years, to the *nearest tenth*, will it take for Akeem's investment to triple?
1)   10.0
2)   14.6
3)   23.1
4)   24.0

469  Find, to the *nearest tenth of a degree*, the angle whose measure is 2.5 radians.

63

470 How many distinct triangles can be formed if
$m\angle A = 35$, $a = 10$, and $b = 13$?
1) 1
2) 2
3) 3
4) 0

471 If $f(x) = \frac{1}{2}x - 3$ and $g(x) = 2x + 5$, what is the value
of $(g \circ f)(4)$?
1) −13
2) 3.5
3) 3
4) 6

472 For which equation does the sum of the roots equal
$\frac{3}{4}$ and the product of the roots equal −2?
1) $4x^2 - 8x + 3 = 0$
2) $4x^2 + 8x + 3 = 0$
3) $4x^2 - 3x - 8 = 0$
4) $4x^2 + 3x - 2 = 0$

473 The expression $\frac{2x + 4}{\sqrt{x + 2}}$ is equivalent to
1) $\frac{(2x + 4)\sqrt{x - 2}}{x - 2}$
2) $\frac{(2x + 4)\sqrt{x - 2}}{x - 4}$
3) $2\sqrt{x - 2}$
4) $2\sqrt{x + 2}$

474 A dartboard is shown in the diagram below. The
two lines intersect at the center of the circle, and
the central angle in sector 2 measures $\frac{2\pi}{3}$.
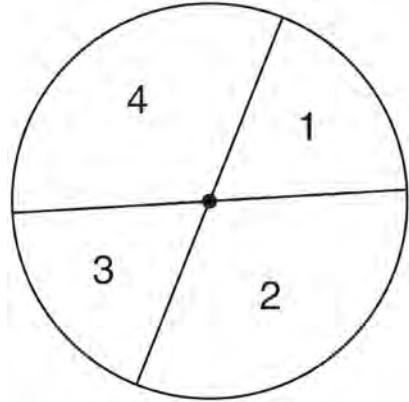


If darts thrown at this board are equally likely to
land anywhere on the board, what is the probability
that a dart that hits the board will land in either
sector 1 or sector 3?
1) $\frac{1}{6}$
2) $\frac{1}{3}$
3) $\frac{1}{2}$
4) $\frac{2}{3}$

475 Solve algebraically for $x$: $16^{2x + 3} = 64^{x + 2}$

476 What is the common difference of the arithmetic
sequence $5, 8, 11, 14$?
1) $\frac{8}{5}$
2) −3
3) 3
4) 9

477 If $r = \sqrt[3]{\dfrac{A^2 B}{C}}$, then $\log r$ can be represented by

1) $\dfrac{1}{6} \log A + \dfrac{1}{3} \log B - \log C$

2) $3(\log A^2 + \log B - \log C)$

3) $\dfrac{1}{3} \log(A^2 + B) - C$

4) $\dfrac{2}{3} \log A + \dfrac{1}{3} \log B - \dfrac{1}{3} \log C$

478 The function $f(x) = \tan x$ is defined in such a way that $f^{-1}(x)$ is a function. What can be the domain of $f(x)$?

1) $\{x \mid 0 \le x \le \pi\}$

2) $\{x \mid 0 \le x \le 2\pi\}$

3) $\left\{ x \mid -\dfrac{\pi}{2} < x < \dfrac{\pi}{2} \right\}$

4) $\left\{ x \mid -\dfrac{\pi}{2} < x < \dfrac{3\pi}{2} \right\}$

479 What is the fifteenth term of the sequence $5, -10, 20, -40, 80, \ldots$?

1) $-163,840$

2) $-81,920$

3) $81,920$

4) $327,680$

480 The solution set of the equation $\sqrt{x+3} = 3 - x$ is

1) $\{1\}$

2) $\{0\}$

3) $\{1, 6\}$

4) $\{2, 3\}$

481 If $f(x) = x^2 - 6$, find $f^{-1}(x)$.

482 In the diagram below of right triangle $KTW$, $KW = 6$, $KT = 5$, and $m\angle KTW = 90$.
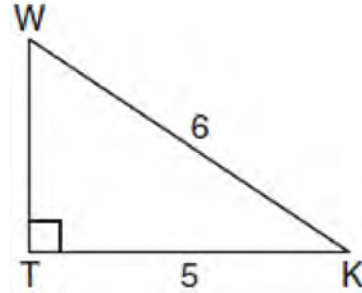


What is the measure of $\angle K$, to the *nearest minute*?

1) $33°33'$

2) $33°34'$

3) $33°55'$

4) $33°56'$

483 A circle has a radius of 4 inches. In inches, what is the length of the arc intercepted by a central angle of 2 radians?

1) $2\pi$

2) $2$

3) $8\pi$

4) $8$

484 What is the domain of the function $f(x) = \sqrt{x - 2} + 3$?

1) $(-\infty, \infty)$

2) $(2, \infty)$

3) $[2, \infty)$

4) $[3, \infty)$

485 Which graph represents one complete cycle of the equation $y = \sin 3\pi x$?
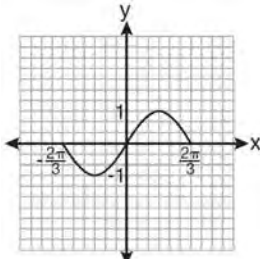
1)
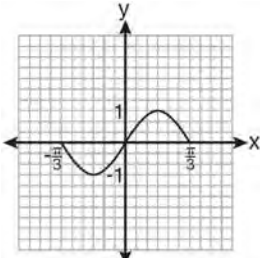
2)
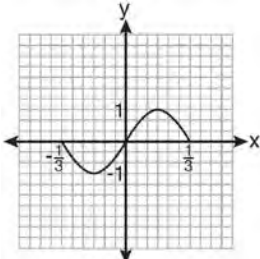
3)
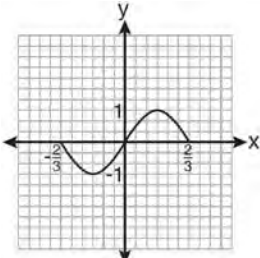
4)

486 Two forces of 25 newtons and 85 newtons acting on a body form an angle of 55°. Find the magnitude of the resultant force, to the *nearest hundredth of a newton*. Find the measure, to the *nearest degree*, of the angle formed between the resultant and the larger force.

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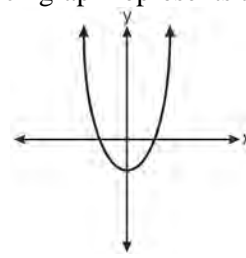
1)
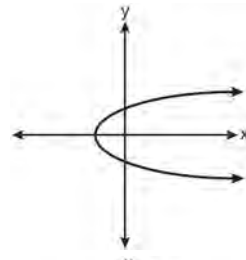
2)
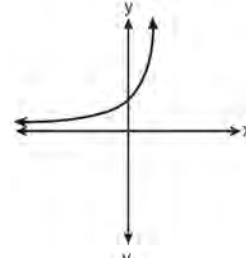
3)
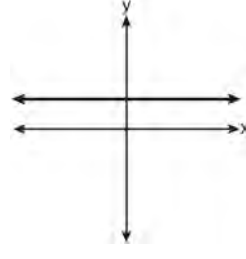
4)

488 The members of a men's club have a choice of wearing black or red vests to their club meetings. A study done over a period of many years determined that the percentage of black vests worn is 60%. If there are 10 men at a club meeting on a given night, what is the probability, to the *nearest thousandth*, that *at least* 8 of the vests worn will be black?

489  Write an equation of the circle shown in the graph below.
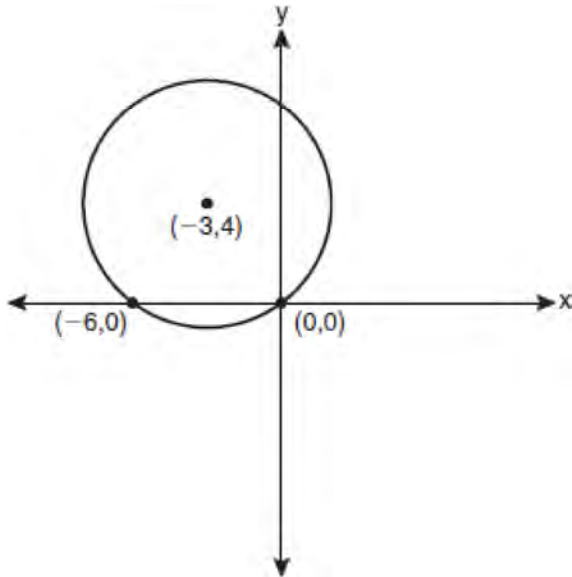


490  When simplified, the expression $\left(\dfrac{w^{-5}}{w^{-9}}\right)^{\frac{1}{2}}$ is equivalent to
1)  $w^{-7}$
2)  $w^{2}$
3)  $w^{7}$
4)  $w^{14}$

491  What are the values of $\theta$ in the interval $0° \le \theta < 360°$ that satisfy the equation $\tan\theta - \sqrt{3} = 0$?
1)  60°, 240°
2)  72°, 252°
3)  72°, 108°, 252°, 288°
4)  60°, 120°, 240°, 300°

492  Which graph best represents the inequality $y + 6 \ge x^2 - x$?



1)



2)



3)



4)
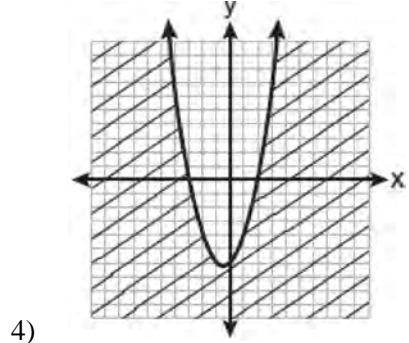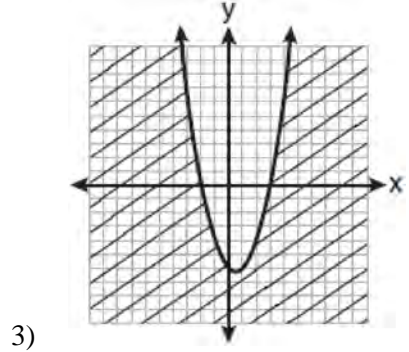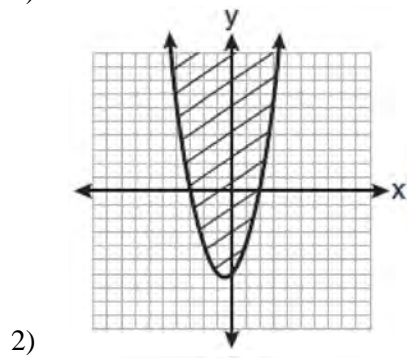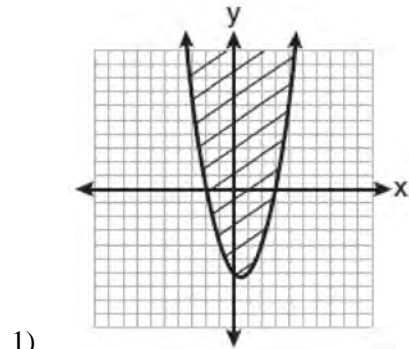
493 The solution set of $4^{x^2 + 4x} = 2^{-6}$ is
1) {1,3}
2) {−1,3}
3) {−1,−3}
4) {1,−3}

494 The conjugate of $7 - 5i$ is
1) $-7 - 5i$
2) $-7 + 5i$
3) $7 - 5i$
4) $7 + 5i$

495 Evaluate $e^{x \ln y}$ when $x = 3$ and $y = 2$.

496 A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study *best* describes this situation?
1) census
2) survey
3) observation
4) controlled experiment

497 The expression $\cos^2 \theta - \cos 2\theta$ is equivalent to
1) $\sin^2 \theta$
2) $-\sin^2 \theta$
3) $\cos^2 \theta + 1$
4) $-\cos^2 \theta - 1$

498 Which graph represents the solution set of $|6x - 7| \le 5$?

1)
2)
3)
4)
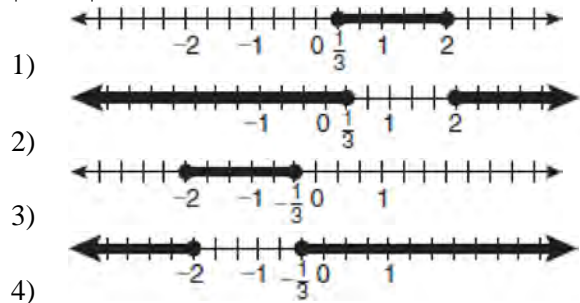
499 A study shows that 35% of the fish caught in a local lake had high levels of mercury. Suppose that 10 fish were caught from this lake. Find, to the *nearest tenth of a percent,* the probability that *at least* 8 of the 10 fish caught did *not* contain high levels of mercury.

500 The probability that a professional baseball player will get a hit is $\frac{1}{3}$. Calculate the exact probability that he will get *at least* 3 hits in 5 attempts.

501 Which expression is equivalent to $\dfrac{\sqrt{3} + 5}{\sqrt{3} - 5}$?
1) $-\dfrac{14 + 5\sqrt{3}}{11}$
2) $-\dfrac{17 + 5\sqrt{3}}{11}$
3) $\dfrac{14 + 5\sqrt{3}}{14}$
4) $\dfrac{17 + 5\sqrt{3}}{14}$

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

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

503 Which task is *not* a component of an observational study?
1) The researcher decides who will make up the sample.
2) The researcher analyzes the data received from the sample.
3) The researcher gathers data from the sample, using surveys or taking measurements.
4) The researcher divides the sample into two groups, with one group acting as a control group.

504 In $\triangle ABC$, $a = 15$, $b = 14$, and $c = 13$, as shown in the diagram below. What is the m$\angle C$, to the *nearest degree*?
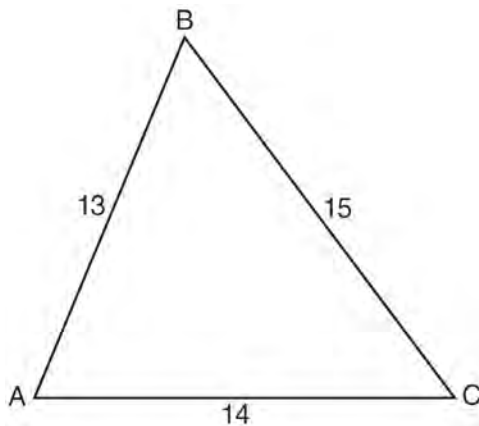


1) 53
2) 59
3) 67
4) 127

505 On January 1, a share of a certain stock cost $180. Each month thereafter, the cost of a share of this stock decreased by one-third. If $x$ represents the time, in months, and $y$ represents the cost of the stock, in dollars, which graph best represents the cost of a share over the following 5 months?

1)


2)


3)


4)
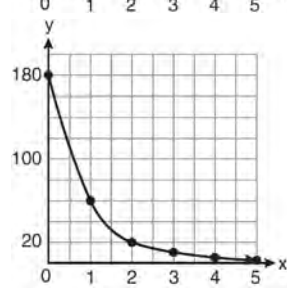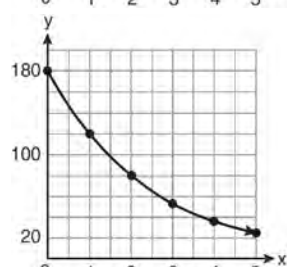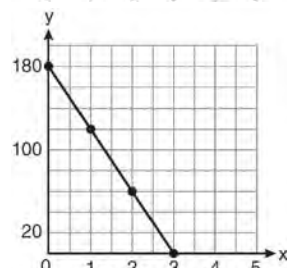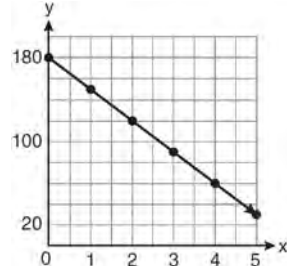

506 Solve the equation $8x^3 + 4x^2 - 18x - 9 = 0$ algebraically for all values of $x$.

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

1) $\dfrac{4\sqrt{13}}{5\sqrt{13} - 13}$

2) $\dfrac{4(5 - \sqrt{13})}{38}$

3) $\dfrac{5 + \sqrt{13}}{3}$

4) $\dfrac{4(5 + \sqrt{13})}{38}$

508 For which equation does the sum of the roots equal $-3$ and the product of the roots equal 2?

1) $x^2 + 2x - 3 = 0$
2) $x^2 - 3x + 2 = 0$
3) $2x^2 + 6x + 4 = 0$
4) $2x^2 - 6x + 4 = 0$

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

510 The expression $\log_8 64$ is equivalent to
1) 8
2) 2
3) $\dfrac{1}{2}$
4) $\dfrac{1}{8}$

511 Samantha constructs the scatter plot below from a set of data.
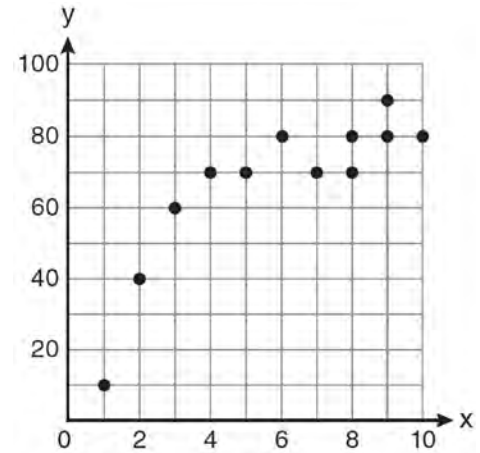


Based on her scatter plot, which regression model would be most appropriate?
1) exponential
2) linear
3) logarithmic
4) power

512 Solve the inequality $-3|6 - x| < -15$ for $x$. Graph the solution on the line below.

513 The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to

1) $(x - 1)^2 + (y + 3)^2 = -3$
2) $(x - 1)^2 + (y + 3)^2 = 7$
3) $(x + 1)^2 + (y + 3)^2 = 7$
4) $(x + 1)^2 + (y + 3)^2 = 10$

70

514 The value of $\tan 126°43'$ to the *nearest ten-thousandth* is
1) $-1.3407$
2) $-1.3408$
3) $-1.3548$
4) $-1.3549$

515 Write the binomial expansion of $(2x-1)^5$ as a polynomial in simplest form.

516 Which equation represents the circle shown in the graph below that passes through the point $(0,-1)$?
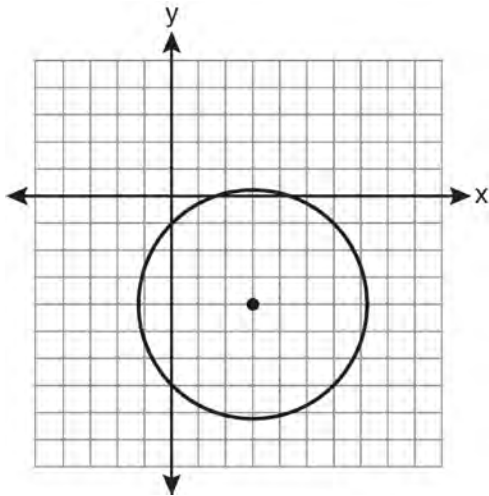


1) $(x-3)^2 + (y+4)^2 = 16$
2) $(x-3)^2 + (y+4)^2 = 18$
3) $(x+3)^2 + (y-4)^2 = 16$
4) $(x+3)^2 + (y-4)^2 = 18$

517 Find all values of $\theta$ in the interval $0° \le \theta < 360°$ that satisfy the equation $\sin 2\theta = \sin \theta$.

518 Which ratio represents $\csc A$ in the diagram below?
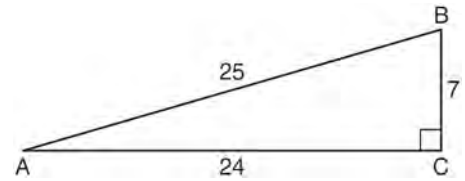


1) $\dfrac{25}{24}$

2) $\dfrac{25}{7}$

3) $\dfrac{24}{7}$

4) $\dfrac{7}{24}$

519 The graph below represents the function $y = f(x)$.
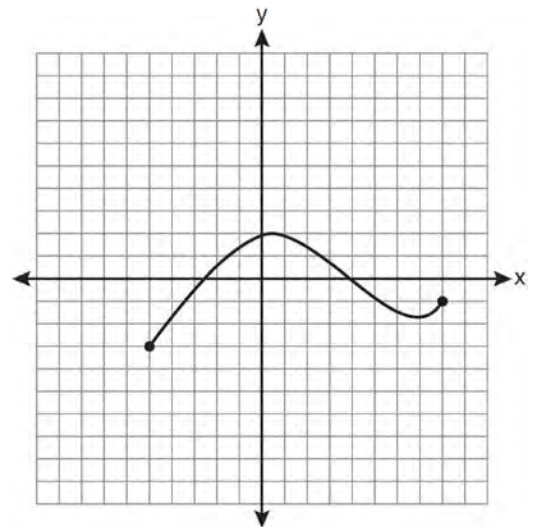


State the domain and range of this function.

71

520 Twenty different cameras will be assigned to several boxes. Three cameras will be randomly selected and assigned to box $A$. Which expression can be used to calculate the number of ways that three cameras can be assigned to box $A$?
1) $20!$
2) $\dfrac{20!}{3!}$
3) $_{20}C_3$
4) $_{20}P_3$

521 The value of the expression $2\sum\limits_{n=0}^{2}(n^2+2^n)$ is
1) 12
2) 22
3) 24
4) 26

522 Brian correctly used a method of completing the square to solve the equation $x^2+7x-11=0$. Brian's first step was to rewrite the equation as $x^2+7x=11$. He then added a number to both sides of the equation. Which number did he add?
1) $\dfrac{7}{2}$
2) $\dfrac{49}{4}$
3) $\dfrac{49}{2}$
4) $49$

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

524 Which graph shows $y=\cos^{-1}x$?
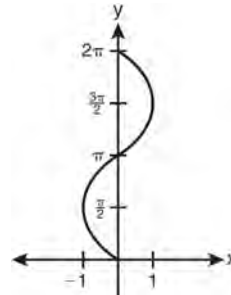


1)
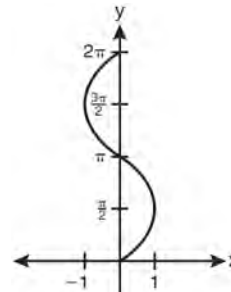


2)
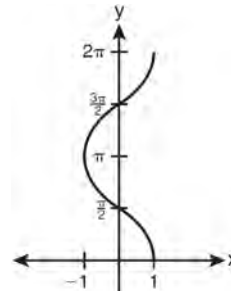


3)
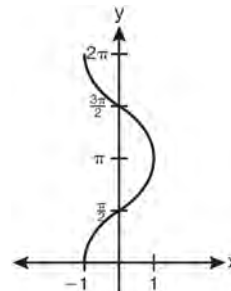


4)

525 What is the fifteenth term of the geometric sequence $-\sqrt{5}, \sqrt{10}, -2\sqrt{5}, \ldots$?
1) $-128\sqrt{5}$
2) $128\sqrt{10}$
3) $-16384\sqrt{5}$
4) $16384\sqrt{10}$

528 The expression $\dfrac{\sin^2\theta + \cos^2\theta}{1 - \sin^2\theta}$ is equivalent to
1) $\cos^2\theta$
2) $\sin^2\theta$
3) $\sec^2\theta$
4) $\csc^2\theta$

526 If $x^2 + 2 = 6x$ is solved by completing the square, an intermediate step would be
1) $(x+3)^2 = 7$
2) $(x-3)^2 = 7$
3) $(x-3)^2 = 11$
4) $(x-6)^2 = 34$

529 In the diagram below of a unit circle, the ordered pair $\left(-\dfrac{\sqrt{2}}{2}, -\dfrac{\sqrt{2}}{2}\right)$ represents the point where the terminal side of $\theta$ intersects the unit circle.



527 The graph of $y = x^3 - 4x^2 + x + 6$ is shown below.
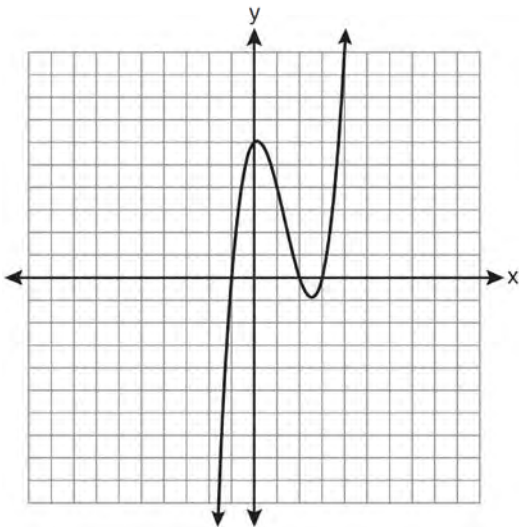


What is the product of the roots of the equation $x^3 - 4x^2 + x + 6 = 0$?
1) $-36$
2) $-6$
3) 6
4) 4
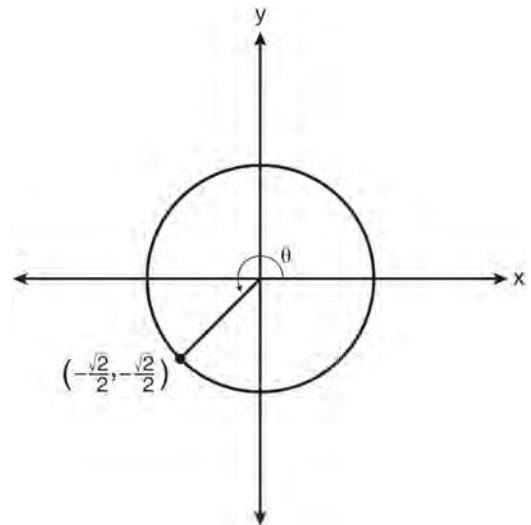
What is $m\angle\theta$?
1) 45
2) 135
3) 225
4) 240

530 In $\triangle ABC$, $m\angle A = 32$, $a = 12$, and $b = 10$. Find the measures of the missing angles and side of $\triangle ABC$. Round each measure to the *nearest tenth*.

73

531 The fraction $\dfrac{3}{\sqrt{3a^2b}}$ is equivalent to

1) $\dfrac{1}{a\sqrt{b}}$

2) $\dfrac{\sqrt{b}}{ab}$

3) $\dfrac{\sqrt{3b}}{ab}$

4) $\dfrac{\sqrt{3}}{a}$

532 Solve the following systems of equations algebraically: $5 = y - x$

$$4x^2 = -17x + y + 4$$

533 The equation $y - 2\sin\theta = 3$ may be rewritten as

1) $f(y) = 2\sin x + 3$
2) $f(y) = 2\sin\theta + 3$
3) $f(x) = 2\sin\theta + 3$
4) $f(\theta) = 2\sin\theta + 3$

534 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

535 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) $\dfrac{4}{3}$

536 If $\sin^{-1}\left(\dfrac{5}{8}\right) = A$, then

1) $\sin A = \dfrac{5}{8}$

2) $\sin A = \dfrac{8}{5}$

3) $\cos A = \dfrac{5}{8}$

4) $\cos A = \dfrac{8}{5}$

537 When $\dfrac{3}{2}x^2 - \dfrac{1}{4}x - 4$ is subtracted from $\dfrac{5}{2}x^2 - \dfrac{3}{4}x + 1$, the difference is

1) $-x^2 + \dfrac{1}{2}x - 5$

2) $x^2 - \dfrac{1}{2}x + 5$

3) $-x^2 - x - 3$

4) $x^2 - x - 3$

538 What is the range of $f(x) = (x+4)^2 + 7$?
   1) $y \geq -4$
   2) $y \geq 4$
   3) $y = 7$
   4) $y \geq 7$

539 What is a formula for the $n$th 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) $b_n = 10(2)^{n-1}$

540 What is the period of the function $f(\theta) = -2\cos 3\theta$?
   1) $\pi$
   2) $\dfrac{2\pi}{3}$
   3) $\dfrac{3\pi}{2}$
   4) $2\pi$

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

542 The probability that the Stormville Sluggers will win a baseball game is $\dfrac{2}{3}$. Determine the probability, to the *nearest thousandth*, that the Stormville Sluggers will win *at least* 6 of their next 8 games.

543 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) $-6, 2$

544 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) $\dfrac{37}{3}$

545 Express in simplest form: $\dfrac{\dfrac{1}{2} - \dfrac{4}{d}}{\dfrac{1}{d} + \dfrac{3}{2d}}$

546 Expressed as a function of a positive acute angle, $\cos(-305°)$ is equal to
   1) $-\cos 55°$
   2) $\cos 55°$
   3) $-\sin 55°$
   4) $\sin 55°$

547  If $f(x) = x^2 - 6$ and $g(x) = 2^x - 1$, determine the value of $(g \circ f)(-3)$.

548  In $\triangle ABC$, $m\angle A = 120$, $b = 10$, and $c = 18$. What is the area of $\triangle ABC$ to the *nearest square inch*?
1)  52
2)  78
3)  90
4)  156

549  Express $5\sqrt{3x^3} - 2\sqrt{27x^3}$ in simplest radical form.

550  Which equation is represented by the graph below?
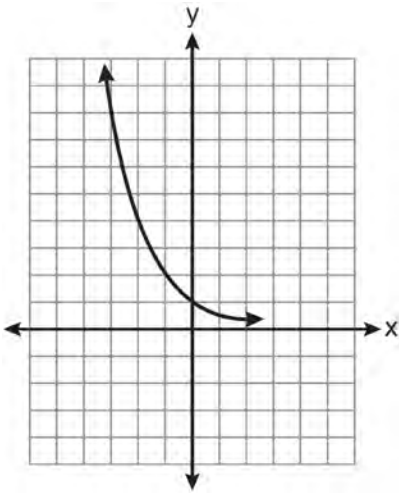


1)  $y = 5^x$
2)  $y = 0.5^x$
3)  $y = 5^{-x}$
4)  $y = 0.5^{-x}$

551  Express the product of $\left( \frac{1}{2} y^2 - \frac{1}{3} y \right)$ and $\left( 12y + \frac{3}{5} \right)$ as a trinomial.

552  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

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

554  Ms. Bell's mathematics class consists of 4 sophomores, 10 juniors, and 5 seniors. How many different ways can Ms. Bell create a four-member committee of juniors if each junior has an equal chance of being selected?
1)  210
2)  3,876
3)  5,040
4)  93,024

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

556 Which graph represents the equation $y = \cos^{-1} x$?
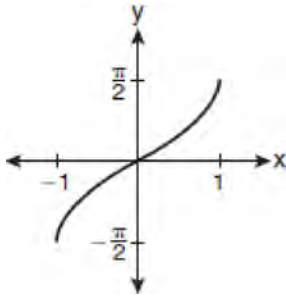
1)
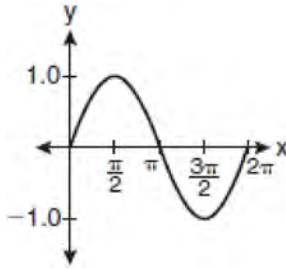
2)
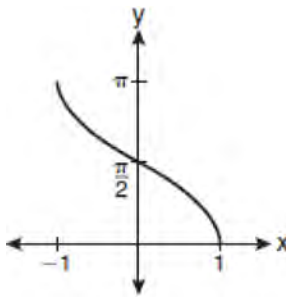
3)
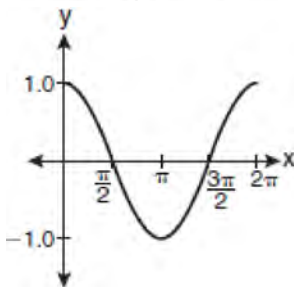
4)

557 In a triangle, two sides that measure 6 cm and 10 cm form an angle that measures 80°. Find, to the *nearest degree*, the measure of the smallest angle in the triangle.

558 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*.

559 What is the radian measure of the smaller angle formed by the hands of a clock at 7 o'clock?

1) $\dfrac{\pi}{2}$

2) $\dfrac{2\pi}{3}$

3) $\dfrac{5\pi}{6}$

4) $\dfrac{7\pi}{6}$

560 Express $\dfrac{5}{3 - \sqrt{2}}$ with a rational denominator, in simplest radical form.

561 The value of $x$ in the equation $4^{2x+5} = 8^{3x}$ is
1) 1
2) 2
3) 5
4) −10

562 Evaluate: $10 + \sum\limits_{n=1}^{5} (n^3 - 1)$

563 Which equation is sketched in the diagram below?
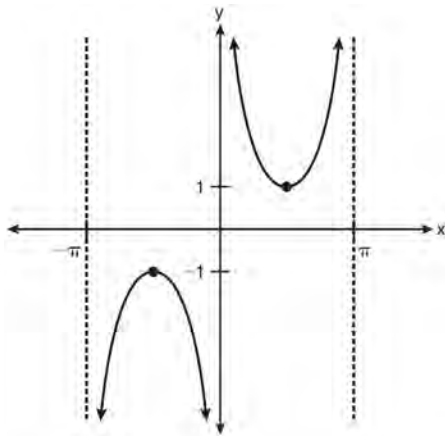


1) $y = \csc x$
2) $y = \sec x$
3) $y = \cot x$
4) $y = \tan x$

564 A committee of 5 members is to be randomly selected from a group of 9 teachers and 20 students. Determine how many different committees can be formed if 2 members must be teachers and 3 members must be students.

565 Starting with $\sin^2 A + \cos^2 A = 1$, derive the formula $\tan^2 A + 1 = \sec^2 A$.

566 Three marbles are to be drawn at random, without replacement, from a bag containing 15 red marbles, 10 blue marbles, and 5 white marbles. Which expression can be used to calculate the probability of drawing 2 red marbles and 1 white marble from the bag?

1) $\dfrac{{}_{15}C_2 \cdot {}_5 C_1}{{}_{30}C_3}$

2) $\dfrac{{}_{15}P_2 \cdot {}_5 P_1}{{}_{30}C_3}$

3) $\dfrac{{}_{15}C_2 \cdot {}_5 C_1}{{}_{30}P_3}$

4) $\dfrac{{}_{15}P_2 \cdot {}_5 P_1}{{}_{30}P_3}$

567 The expression $2\log x - (3\log y + \log z)$ is equivalent to

1) $\log \dfrac{x^2}{y^3 z}$

2) $\log \dfrac{x^2 z}{y^3}$

3) $\log \dfrac{2x}{3yz}$

4) $\log \dfrac{2xz}{3y}$

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

78

569 On the unit circle shown in the diagram below, sketch an angle, in standard position, whose degree measure is 240 and find the exact value of $\sin 240°$.
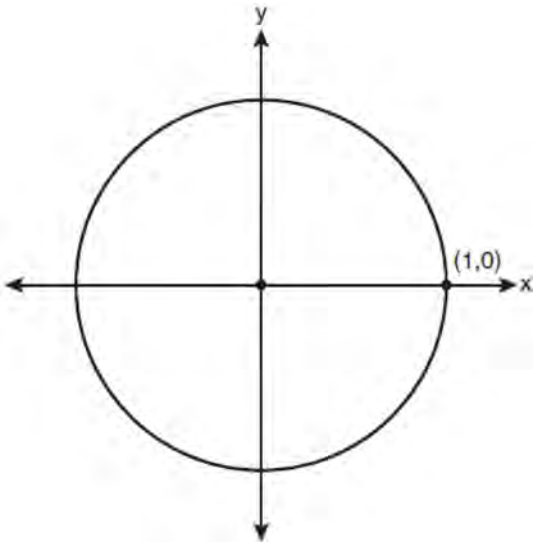


570 If $\sin A = \dfrac{2}{3}$ where $0° < A < 90°$, what is the value of $\sin 2A$?

1) $\dfrac{2\sqrt{5}}{3}$

2) $\dfrac{2\sqrt{5}}{9}$

3) $\dfrac{4\sqrt{5}}{9}$

4) $-\dfrac{4\sqrt{5}}{9}$

571 The product of $i^7$ and $i^5$ is equivalent to
1) 1
2) $-1$
3) $i$
4) $-i$

572 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

573 In simplest form, $\sqrt{-300}$ is equivalent to
1) $3i\sqrt{10}$
2) $5i\sqrt{12}$
3) $10i\sqrt{3}$
4) $12i\sqrt{5}$

574 The roots of the equation $x^2 - 10x + 25 = 0$ are
1) imaginary
2) real and irrational
3) real, rational, and equal
4) real, rational, and unequal

575 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.

576 Two sides of a parallelogram are 24 feet and 30 feet. The measure of the angle between these sides is 57°. Find the area of the parallelogram, to the *nearest square foot*.

577 Factored completely, the expression $12x^4 + 10x^3 - 12x^2$ is equivalent to
1) $x^2(4x + 6)(3x - 2)$
2) $2(2x^2 + 3x)(3x^2 - 2x)$
3) $2x^2(2x - 3)(3x + 2)$
4) $2x^2(2x + 3)(3x - 2)$

578 The roots of the equation $2x^2 + 7x - 3 = 0$ are
1) $-\frac{1}{2}$ and $-3$
2) $\frac{1}{2}$ and $3$
3) $\frac{-7 \pm \sqrt{73}}{4}$
4) $\frac{7 \pm \sqrt{73}}{4}$

579 What is the formula for the *n*th term of the sequence $54, 18, 6, \ldots$?
1) $a_n = 6\left(\frac{1}{3}\right)^n$
2) $a_n = 6\left(\frac{1}{3}\right)^{n-1}$
3) $a_n = 54\left(\frac{1}{3}\right)^n$
4) $a_n = 54\left(\frac{1}{3}\right)^{n-1}$

580 Written in simplest form, the expression $\dfrac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}}$ is equivalent to
1) $x - 1$
2) $x - 2$
3) $\dfrac{x - 2}{2}$
4) $\dfrac{x^2 - 4}{x + 2}$

581 If $f(x) = \dfrac{x}{x^2 - 16}$, what is the value of f(−10)?
1) $-\dfrac{5}{2}$
2) $-\dfrac{5}{42}$
3) $\dfrac{5}{58}$
4) $\dfrac{5}{18}$

582 A four-digit serial number is to be created from the digits 0 through 9. How many of these serial numbers can be created if 0 can *not* be the first digit, no digit may be repeated, and the last digit must be 5?
1) 448
2) 504
3) 2,240
4) 2,520

80

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

584 Which function is *not* one-to-one?
    1)   $\{(0,1),(1,2),(2,3),(3,4)\}$
    2)   $\{(0,0),(1,1),(2,2),(3,3)\}$
    3)   $\{(0,1),(1,0),(2,3),(3,2)\}$
    4)   $\{(0,1),(1,0),(2,0),(3,2)\}$

585 The value of the expression $\displaystyle\sum_{r=3}^{5}(-r^2 + r)$ is
    1)   $-38$
    2)   $-12$
    3)   26
    4)   62

# Algebra 2/Trigonometry Regents at Random
## Answer Section

1  ANS: 1

$$10 \cdot \frac{3}{2} = \frac{3}{5} p$$

$$15 = \frac{3}{5} p$$

$$25 = p$$

    PTS: 2          REF: 011226a2    STA: A2.A.5    TOP: Inverse Variation

2  ANS: 3          PTS: 2          REF: 011422a2    STA: A2.A.54

    TOP: Graphing Logarithmic Functions

3  ANS: 1

$$\frac{2\pi}{b} = 4\pi$$

$$b = \frac{1}{2}$$

    PTS: 2          REF: 011425a2    STA: A2.A.69

    TOP: Properties of Graphs of Trigonometric Functions        KEY: period

4  ANS: 1          PTS: 2          REF: 061202a2    STA: A2.A.51

    TOP: Domain and Range        KEY: graph

5  ANS:

$$\frac{-2(x^2 + 6)}{x^4} \cdot \frac{x^2(x-3) + 6(x-3)}{x^2 - 4x} \cdot \frac{2x - 4}{x^4 - 3x^3} \div \frac{x^2 + 2x - 8}{16 - x^2}$$

$$\frac{(x^2 + 6)(x-3)}{x(x-4)} \cdot \frac{2(x-2)}{x^3(x-3)} \cdot \frac{(4+x)(4-x)}{(x+4)(x-2)}$$

$$\frac{-2(x^2 + 6)}{x^4}$$

    PTS: 6          REF: 011239a2    STA: A2.A.16    TOP: Multiplication and Division of Rationals

    KEY: division

6  ANS: 4          PTS: 2          REF: 061411a2    STA: A2.A.30

    TOP: Sequences

7  ANS: 2
$$\sqrt{2x-4} = x-2$$
$$2x-4 = x^2 - 4x + 4$$
$$0 = x^2 - 6x + 8$$
$$0 = (x-4)(x-2)$$
$$x = 4, 2$$

PTS: 2    REF: 061406a2    STA: A2.A.22    TOP: Solving Radicals
KEY: extraneous solutions

8  ANS:
$$\frac{_{10}P_{10}}{3! \cdot 3! \cdot 2!} = \frac{3,628,800}{72} = 50,400$$

PTS: 2    REF: 061330a2    STA: A2.S.10    TOP: Permutations

9  ANS:
$$2.5 \cdot \frac{180}{\pi} \approx 143°14'$$

PTS: 2    REF: 061431a2    STA: A2.M.2    TOP: Radian Measure
KEY: degrees

10  ANS:
$$r = \sqrt{2^2 + 3^2} = \sqrt{13}. \ (x+5)^2 + (y-2)^2 = 13$$

PTS: 2    REF: 011234a2    STA: A2.A.49    TOP: Writing Equations of Circles

11  ANS: 4
$$\frac{10}{4} = 2.5$$

PTS: 2    REF: 011217a2    STA: A2.A.29    TOP: Sequences

12  ANS: 1



PTS: 2    REF: 061225a2    STA: A2.S.8    TOP: Correlation Coefficient

13  ANS:
$\sigma_x \approx 6.2$. 6 scores are within a population standard deviation of the mean. $Q_3 - Q_1 = 41 - 37 = 4$
$$\overline{x} \approx 38.2$$

PTS: 4    REF: 061338a2    STA: A2.S.4    TOP: Dispersion
KEY: advanced

14  ANS:  2          PTS:  2          REF:  011301a2     STA:  A2.A.52
    TOP:  Families of Functions
15  ANS:  1          PTS:  2          REF:  011314a2     STA:  A2.N.3
    TOP:  Operations with Polynomials     KEY:  subtraction
16  ANS:  3          PTS:  2          REF:  061407a2     STA:  A2.A.14
    TOP:  Operations with Radicals      KEY:  with variables | index = 2
17  ANS:

$7.\ 4 - \sqrt{2x - 5} = 1$

$-\sqrt{2x - 5} = -3$

$2x - 5 = 9$

$2x = 14$

$x = 7$

PTS:  2          REF:  011229a2     STA:  A2.A.22     TOP:  Solving Radicals
KEY:  basic

18  ANS:

$y = 180.377(0.954)^x$

PTS:  2          REF:  061231a2     STA:  A2.S.7     TOP:  Regression
KEY:  exponential

19  ANS:  2

$2^2 \cdot 3 = 12$ .  $6^2 d = 12$

$4^2 \cdot \dfrac{3}{4} = 12$   $36d = 12$

$d = \dfrac{1}{3}$

PTS:  2          REF:  061310a2     STA:  A2.A.5     TOP:  Inverse Variation

20  ANS:  4

$\dfrac{4 \cdot 0 + 6 \cdot 1 + 10 \cdot 2 + 0 \cdot 3 + 4k + 2 \cdot 5}{4 + 6 + 10 + 0 + k + 2} = 2$

$\dfrac{4k + 36}{k + 22} = 2$

$4k + 36 = 2k + 44$

$2k = 8$

$k = 4$

PTS:  2          REF:  061221a2     STA:  A2.S.3     TOP:  Average Known with Missing Data

21 ANS: 4
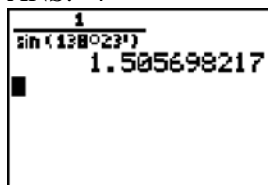


PTS: 2    REF: 061217a2    STA: A2.A.66    TOP: Determining Trigonometric Functions

22 ANS:

$\sec x = \sqrt{2}$

$\cos x = \dfrac{1}{\sqrt{2}}$

$\cos x = \dfrac{\sqrt{2}}{2}$

$x = 45°, 315°$

PTS: 2    REF: 061434a2    STA: A2.A.68    TOP: Trigonometric Equations
KEY: reciprocal functions

23 ANS: 1

If $\sin x = 0.8$, then $\cos x = 0.6$. $\tan\dfrac{1}{2}x = \sqrt{\dfrac{1-0.6}{1+0.6}} = \sqrt{\dfrac{0.4}{1.6}} = 0.5$.

PTS: 2    REF: 061220a2    STA: A2.A.77    TOP: Half Angle Identities

24 ANS: 1    PTS: 2    REF: 061401a2    STA: A2.S.2
TOP: Analysis of Data

25 ANS: 4

$(x+i)^2 - (x-i)^2 = x^2 + 2xi + i^2 - (x^2 - 2xi + i^2) = 4xi$

PTS: 2    REF: 011327a2    STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

26 ANS: 1    PTS: 2    REF: 011306a2    STA: A2.A.8
TOP: Negative and Fractional Exponents

27 ANS: 2

$\dfrac{5}{\sin 32} = \dfrac{8}{\sin E}$        $57.98 + 32 < 180$

$E \approx 57.98$        $(180 - 57.98) + 32 < 180$

PTS: 2    REF: 011419a2    STA: A2.A.75    TOP: Law of Sines - The Ambiguous Case

28 ANS: 1    PTS: 2    REF: 061211a2    STA: A2.A.54
TOP: Graphing Logarithmic Functions

29  ANS: 4

$$\left(\sqrt[3]{27x^2}\right)\left(\sqrt[3]{16x^4}\right) = \sqrt[3]{3^3 \cdot 2^4 \cdot x^6} = 3 \cdot 2 \cdot x^2 \sqrt[3]{2} = 6x^2\sqrt[3]{2}$$

PTS: 2          REF: 011421a2     STA: A2.N.2      TOP: Operations with Radicals

30  ANS: 3

$$\frac{3y}{2y-6} + \frac{9}{6-2y} = \frac{3y}{2y-6} - \frac{9}{2y-6} = \frac{3y-9}{2y-6} = \frac{3(y-3)}{2(y-3)} = \frac{3}{2}$$

PTS: 2          REF: 011325a2     STA: A2.A.16     TOP: Addition and Subtraction of Rationals

31  ANS: 3

$$\sqrt{9}\sqrt{-1}\sqrt{2} - \sqrt{16}\sqrt{-1}\sqrt{2} = 3i\sqrt{2} - 4i\sqrt{2} = -i\sqrt{2}$$

PTS: 2          REF: 061404a2     STA: A2.N.6      TOP: Square Roots of Negative Numbers

32  ANS:

$$g(10) = \left(a(10)\sqrt{1-10}\right)^2 = 100a^2(-9) = -900a^2$$

PTS: 2          REF: 061333a2     STA: A2.A.41     TOP: Functional Notation

33  ANS:

$$\text{Sum } \frac{-b}{a} = -\frac{1}{12}. \text{ Product } \frac{c}{a} = -\frac{1}{2}$$

PTS: 2          REF: 061328a2     STA: A2.A.20     TOP: Roots of Quadratics

34  ANS:

$$_7C_3\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^4 = 35\left(\frac{1}{64}\right)\left(\frac{81}{256}\right) = \frac{2835}{16384} \approx 0.173$$

PTS: 2          REF: 061335a2     STA: A2.S.15     TOP: Binomial Probability
KEY: exactly

35  ANS: 1

$$\frac{1}{2}(7.4)(3.8)\sin 126 \approx 11.4$$

PTS: 2          REF: 011218a2     STA: A2.A.74     TOP: Using Trigonometry to Find Area
KEY: basic

36  ANS: 4

$$8^{3k+4} = 4^{2k-1}$$

$$(2^3)^{3k+4} = (2^2)^{2k-1}$$

$$2^{9k+12} = 2^{4k-2}$$

$$9k + 12 = 4k - 2$$

$$5k = -14$$

$$k = -\frac{14}{5}$$

PTS: 2        REF: 011309a2        STA: A2.A.27        TOP: Exponential Equations
KEY: common base not shown

37  ANS:

$$(x+4)^2 = 17x - 4$$

$$x^2 + 8x + 16 = 17x - 4$$

$$x^2 - 9x + 20 = 0$$

$$(x-4)(x-5) = 0$$

$$x = 4, 5$$

PTS: 4        REF: 011336a2        STA: A2.A.28        TOP: Logarithmic Equations
KEY: basic

38  ANS:
$a_1 = 3$. $a_2 = 2(3) - 1 = 5$. $a_3 = 2(5) - 1 = 9$.

PTS: 2        REF: 061233a2        STA: A2.A.33        TOP: Sequences

39  ANS:

800. $x = 4^{2.5} = 32$. $y^{-\frac{3}{2}} = 125$    . $\dfrac{x}{y} = \dfrac{32}{\frac{1}{25}} = 800$

$$y = 125^{-\frac{2}{3}} = \frac{1}{25}$$

PTS: 4        REF: 011237a2        STA: A2.A.28        TOP: Logarithmic Equations
KEY: advanced

40  ANS: 2        PTS: 2        REF: 061205a2        STA: A2.A.34
TOP: Sigma Notation

41  ANS: 4
$_{15}C_5 = 3,003$. $_{25}C_5 = {}_{25}C_{20} = 53,130$. $_{25}C_{15} = 3,268,760$.

PTS: 2        REF: 061227a2        STA: A2.S.11        TOP: Combinations

42  ANS: 4        PTS: 2        REF: 011406a2        STA: A2.S.1
TOP: Analysis of Data

43  ANS:  4          PTS:  2          REF:  061402a2          STA:  A2.A.8
    TOP:  Negative and Fractional Exponents

44  ANS:
$A = 750e^{(0.03)(8)} \approx 953$

PTS:  2          REF:  061229a2          STA:  A2.A.12          TOP:  Evaluating Exponential Expressions

45  ANS:  2
$\dfrac{30}{(x+3)(x-3)} + \dfrac{(x+3)(x-3)}{(x+3)(x-3)} = \dfrac{5(x+3)}{(x-3)(x+3)}$  3 is an extraneous root.

$$30 + x^2 - 9 = 5x + 15$$
$$x^2 - 5x + 6 = 0$$
$$(x-3)(x-2) = 0$$
$$x = 2$$

PTS:  2          REF:  061417a2          STA:  A2.A.23          TOP:  Solving Rationals
KEY:  rational solutions

46  ANS:  3
sum of the roots, $\dfrac{-b}{a} = \dfrac{-(-9)}{4} = \dfrac{9}{4}$.  product of the roots, $\dfrac{c}{a} = \dfrac{3}{4}$

PTS:  2          REF:  061208a2          STA:  A2.A.21          TOP:  Roots of Quadratics
KEY:  basic

47  ANS:  3
$_3C_2(2x^4)^1(-y)^2 = 6x^4y^2$

PTS:  2          REF:  011215a2          STA:  A2.A.36          TOP:  Binomial Expansions

48  ANS:
$y = 0.488(1.116)^x$

PTS:  2          REF:  061429a2          STA:  A2.S.7          TOP:  Regression
KEY:  exponential

49  ANS:  4
$r = \sqrt{(6-3)^2 + (5-(-4))^2} = \sqrt{9+81} = \sqrt{90}$

PTS:  2          REF:  061415a2          STA:  A2.A.48          TOP:  Equations of Circles

50 ANS:
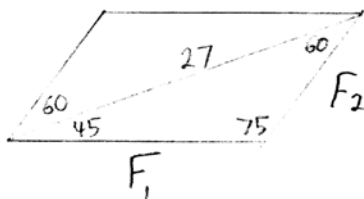


$$\frac{27}{\sin 75} = \frac{F_1}{\sin 60}. \quad \frac{27}{\sin 75} = \frac{F_2}{\sin 45}.$$

$$F_1 \approx 24 \qquad F_2 \approx 20$$

PTS: 4      REF: 061238a2      STA: A2.A.73      TOP: Vectors

51 ANS: 3

$$\frac{-b}{a} = \frac{-(-4)}{1} = 4. \text{ If the sum is 4, the roots must be 7 and } -3.$$

PTS: 2      REF: 011418a2      STA: A2.A.21      TOP: Roots of Quadratics
KEY: advanced

52 ANS:

$$\frac{31-19}{7-4} = \frac{12}{3} = 4 \quad x + (4-1)4 = 19 \quad a_n = 7 + (n-1)4$$
$$x + 12 = 19$$
$$x = 7$$

PTS: 2      REF: 011434a2      STA: A2.A.29      TOP: Sequences

53 ANS: 1      PTS: 2      REF: 061324a2      STA: A2.A.9
TOP: Negative Exponents

54 ANS:

$\sigma_x = 14.9. \ \bar{x} = 40.$ There are 8 scores between 25.1 and 54.9.

PTS: 4      REF: 061237a2      STA: A2.S.4      TOP: Dispersion
KEY: advanced

55 ANS:

$$\cos\theta \cdot \frac{1}{\cos\theta} - \cos^2\theta = 1 - \cos^2\theta = \sin^2\theta$$

PTS: 2      REF: 061230a2      STA: A2.A.58      TOP: Reciprocal Trigonometric Relationships

56 ANS: 2      PTS: 2      REF: 061301a2      STA: A2.S.1
TOP: Analysis of Data

57 ANS: 3

$$S_n = \frac{n}{2}[2a + (n-1)d] = \frac{19}{2}[2(3) + (19-1)7] = 1254$$

PTS: 2      REF: 011202a2      STA: A2.A.35      TOP: Summations
KEY: arithmetic

58  ANS:  1

$\dfrac{9}{\sin A} = \dfrac{10}{\sin 70}$.  $58° + 70°$ is possible.  $122° + 70°$ is not possible.

$\quad A \approx 58$

PTS:  2            REF:  011210a2      STA:  A2.A.75      TOP:  Law of Sines - The Ambiguous Case

59  ANS:  1

$5x + 29 = (x + 3)^2$        .  $(-5) + 3$ shows an extraneous solution.

$5x + 29 = x^2 + 6x + 9$

$\quad 0 = x^2 + x - 20$

$\quad 0 = (x + 5)(x - 4)$

$\quad x = -5, 4$

PTS:  2            REF:  061213a2      STA:  A2.A.22      TOP:  Solving Radicals
KEY:  extraneous solutions

60  ANS:  4

$$(a - 1)^2 + (a - 2)^2 + (a - 3)^2 + (a - 4)^2$$

$$(a^2 - 2a + 1) + (a^2 - 4a + 4) + (a^2 - 6a + 9) + (a^2 - 8a + 16)$$

$$4a^2 - 20a + 30$$

PTS:  2            REF:  011414a2      STA:  A2.N.10      TOP:  Sigma Notation
KEY:  advanced

61  ANS:

$_5C_0 \cdot 0.57^0 \cdot 0.43^5 +_5 C_1 \cdot 0.57^1 \cdot 0.43^4 +_5 C_2 \cdot 0.57^2 \cdot 0.43^3 \approx 0.37$

PTS:  4            REF:  061438a2      STA:  A2.S.15      TOP:  Binomial Probability
KEY:  at least or at most

62  ANS:  2

$\dfrac{1 - \dfrac{4}{x}}{1 - \dfrac{2}{x} - \dfrac{8}{x^2}} \times \dfrac{x^2}{x^2} = \dfrac{x^2 - 4x}{x^2 - 2x - 8} = \dfrac{x(x - 4)}{(x - 4)(x + 2)} = \dfrac{x}{x + 2}$

PTS:  2            REF:  061305a2      STA:  A2.A.17      TOP:  Complex Fractions

63  ANS:  2

$\cos(x - y) = \cos x \cos y + \sin x \sin y$

$\quad\quad = b \cdot b + a \cdot a$

$\quad\quad = b^2 + a^2$

PTS:  2            REF:  061421a2      STA:  A2.A.76      TOP:  Angle Sum and Difference Identities
KEY:  simplifying

64 ANS: 3

$_8C_3 \cdot x^{8-3} \cdot (-2)^3 = 56x^5 \cdot (-8) = -448x^5$

PTS: 2        REF: 011308a2        STA: A2.A.36        TOP: Binomial Expansions

65 ANS:

$K = ab\sin C = 18 \cdot 22\sin 60 = 396\dfrac{\sqrt{3}}{2} = 198\sqrt{3}$

PTS: 2        REF: 061234a2        STA: A2.A.74        TOP: Using Trigonometry to Find Area
KEY: parallelograms

66 ANS:

$$81^{x^3 + 2x^2} = 27^{\frac{5x}{3}}$$

$$\left(3^4\right)^{x^3 + 2x^2} = \left(3^3\right)^{\frac{5x}{3}}$$

$$3^{4x^3 + 8x^2} = 3^{5x}$$

$$4x^3 + 8x^2 - 5x = 0$$

$$x(4x^2 + 8x - 5) = 0$$

$$x(2x - 1)(2x + 5) = 0$$

$$x = 0, \frac{1}{2}, -\frac{5}{2}$$

PTS: 6        REF: 061239a2        STA: A2.A.27        TOP: Exponential Equations
KEY: common base not shown

67 ANS:

$$\frac{2 \pm \sqrt{(-2)^2 - 4(6)(-3)}}{2(6)} = \frac{2 \pm \sqrt{76}}{12} = \frac{2 \pm \sqrt{4}\sqrt{19}}{12} = \frac{2 \pm 2\sqrt{19}}{12} = \frac{1 \pm \sqrt{19}}{6}$$

PTS: 2        REF: 011332a2        STA: A2.A.25        TOP: Solving Quadratics
KEY: quadratic formula

68 ANS: 2

$\dfrac{2\pi}{6} = \dfrac{\pi}{3}$

PTS: 2        REF: 061413a2        STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions        KEY: period

69 ANS: 4        PTS: 2        REF: 011201a2        STA: A2.S.2
TOP: Analysis of Data

70 ANS:
$y = 215.983(1.652)^x$ . $215.983(1.652)^7 \approx 7250$

PTS: 4      REF: 011337a2      STA: A2.S.7      TOP: Regression
KEY: exponential

71 ANS: 3

$$3x^5 - 48x = 0$$

$$3x(x^4 - 16) = 0$$

$$3x(x^2 + 4)(x^2 - 4) = 0$$

$$3x(x^2 + 4)(x + 2)(x - 2) = 0$$

PTS: 2      REF: 011216a2      STA: A2.A.26      TOP: Solving Polynomial Equations

72 ANS: 4
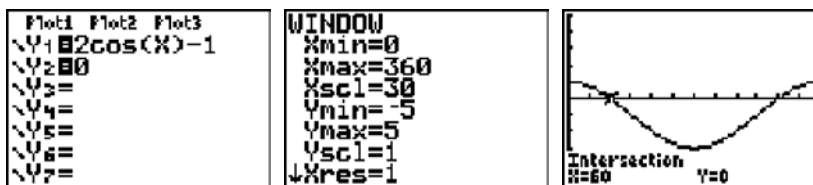
$2\cos\theta = 1$

$\cos\theta = \dfrac{1}{2}$

$\theta = \cos^{-1}\dfrac{1}{2} = 60, 300$

PTS: 2      REF: 061203a2      STA: A2.A.68      TOP: Trigonometric Equations
KEY: basic

73 ANS: 1      PTS: 2      REF: 011402a2      STA: A2.A.8
TOP: Negative and Fractional Exponents

74 ANS: 2      PTS: 2      REF: 061216a2      STA: A2.A.42
TOP: Compositions of Functions      KEY: variables

75 ANS: 1
$(4a + 4) - (2a + 1) = 2a + 3$

PTS: 2      REF: 011401a2      STA: A2.A.30      TOP: Sequences

76  ANS:
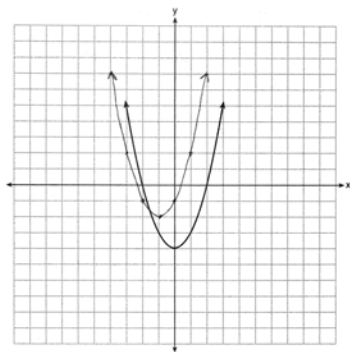


PTS: 2          REF: 061435a2      STA: A2.A.46      TOP: Graphing Quadratic Functions

77  ANS: 3

$(-5)^2 - 4(2)(0) = 25$

PTS: 2          REF: 061423a2      STA: A2.A.2       TOP: Using the Discriminant
KEY: determine equation given nature of roots

78  ANS: 3

$5000\left(1 + \dfrac{.03}{4}\right)^{4 \cdot 5} = 5000(1.0075)^{20} \approx 5805.92$

PTS: 2          REF: 011410a2      STA: A2.A.12      TOP: Evaluating Functions

79  ANS: 3          PTS: 2          REF: 061412a2      STA: A2.A.60
TOP: Finding the Terminal Side of an Angle

80  ANS: 4
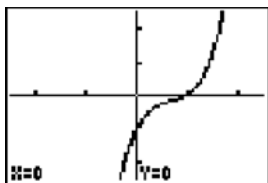


PTS: 2          REF: 061222a2      STA: A2.A.50      TOP: Solving Polynomial Equations

81  ANS:

$x^4 + 4x^3 + 4x^2 + 16x = 0$

$x(x^3 + 4x^2 + 4x + 16) = 0$

$x(x^2(x + 4) + 4(x + 4)) = 0$

$x(x^2 + 4)(x + 4) = 0$

$x = 0, \pm 2i, -4$

PTS: 6          REF: 061339a2      STA: A2.A.26      TOP: Solving Polynomial Equations

82  ANS:  3

$\log 4m^2 = \log 4 + \log m^2 = \log 4 + 2\log m$

PTS:  2          REF:  061321a2          STA:  A2.A.19          TOP:  Properties of Logarithms
KEY:  splitting logs

83  ANS:  3

$\sqrt[3]{4^3 a^{15} a} = 4a^5 \sqrt[3]{a}$

PTS:  2          REF:  061204a2          STA:  A2.A.13          TOP:  Simplifying Radicals
KEY:  index > 2

84  ANS:  4

$\dfrac{2\pi}{b} = 30$

$b = \dfrac{\pi}{15}$

PTS:  2          REF:  011227a2          STA:  A2.A.72
TOP:  Identifying the Equation of a Trigonometric Graph

85  ANS:

88.  $\dfrac{100}{\sin 33} = \dfrac{x}{\sin 32}$.  $\sin 66 \approx \dfrac{T}{97.3}$

      $x \approx 97.3$          $t \approx 88$

PTS:  4          REF:  011236a2          STA:  A2.A.73          TOP:  Law of Sines
KEY:  advanced

86  ANS:

$x^3 + 5x^2 - 4x - 20 = 0$

$x^2(x + 5) - 4(x + 5) = 0$

$(x^2 - 4)(x + 5) = 0$

$(x + 2)(x - 2)(x + 5) = 0$

$x = \pm 2, -5$

PTS:  4          REF:  061437a2          STA:  A2.A.26          TOP:  Solving Polynomial Equations

87  ANS:

$\dfrac{\sqrt{3}}{2} \times \dfrac{\sqrt{2}}{2} = \dfrac{\sqrt{6}}{4}$

PTS:  2          REF:  061331a2          STA:  A2.A.56          TOP:  Determining Trigonometric Functions
KEY:  degrees, common angles

88  ANS:  3

$$x^2 + y^2 - 16x + 6y + 53 = 0$$

$$x^2 - 16x + 64 + y^2 + 6y + 9 = -53 + 64 + 9$$

$$(x - 8)^2 + (y + 3)^2 = 20$$

PTS:  2          REF:  011415a2     STA:  A2.A.47     TOP:  Equations of Circles

89  ANS:

$$\frac{-(x^2 - 4)}{(x + 4)(x + 3)} \times \frac{x + 3}{2(x - 2)} = \frac{-(x + 2)(x - 2)}{x + 4} \times \frac{1}{2(x - 2)} = \frac{-(x + 2)}{2(x + 4)}$$

PTS:  4          REF:  061236a2     STA:  A2.A.17     TOP:  Complex Fractions

90  ANS:  2          PTS:  2          REF:  011417a2     STA:  A2.S.9
    TOP:  Differentiating Permutations and Combinations

91  ANS:  2

$$\frac{x^{-1} + 1}{x + 1} = \frac{\dfrac{1}{x} + 1}{x + 1} = \frac{\dfrac{1 + x}{x}}{x + 1} = \frac{1}{x}$$

PTS:  2          REF:  011211a2     STA:  A2.A.9     TOP:  Negative Exponents

92  ANS:  1
    (4) shows the strongest linear relationship, but if $r < 0$, $b < 0$. The Regents announced that a correct solution was
    not provided for this question and all students should be awarded credit.

PTS:  2          REF:  011223a2     STA:  A2.S.8     TOP:  Correlation Coefficient

93  ANS:  1          PTS:  2          REF:  061210a2     STA:  A2.A.9
    TOP:  Negative Exponents

94  ANS:

$$\sqrt{x^2 + x - 1} = -4x + 3 \qquad -4\left(\frac{2}{3}\right) + 3 \geq 0$$

$$x^2 + x - 1 = 16x^2 - 24x + 9$$

$$0 = 15x^2 - 25x + 10 \qquad \frac{1}{3} \geq 0$$

$$0 = 3x^2 - 5x + 2 \qquad -4(1) + 3 < 0$$

$$0 = (3x - 2)(x - 1) \qquad \text{1 is extraneous}$$

$$x = \frac{2}{3}, \ x \neq 1$$

PTS:  6          REF:  011339a2     STA:  A2.A.22     TOP:  Solving Radicals
KEY:  extraneous solutions

95  ANS:
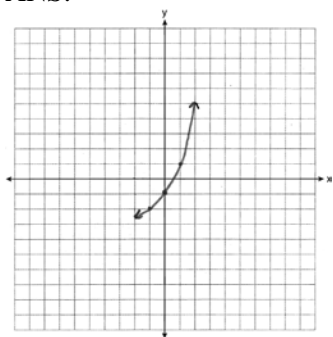


　　　PTS:  2　　　　　REF:  011234a2　　　STA:  A2.A.53　　　TOP:  Graphing Exponential Functions
96  ANS:  3　　　　　PTS:  2　　　　　REF:  061308a2　　　TOP:  Domain and Range
　　　KEY:  graph
97  ANS:  3　　　　　PTS:  2　　　　　REF:  061418a2　　　STA:  A2.A.51
　　　TOP:  Domain and Range　　　　　　KEY:  graph
98  ANS:  1

$$2 \cdot \frac{180}{\pi} = \frac{360}{\pi}$$

　　　PTS:  2　　　　　REF:  011220a2　　　STA:  A2.M.2　　　TOP:  Radian Measure
　　　KEY:  degrees
99  ANS:  2　　　　　PTS:  2　　　　　REF:  061322a2　　　STA:  A2.A.73
　　　TOP:  Law of Sines　　　　　　KEY:  modeling
100  ANS:  2

$$(x+2)^2 = -9$$

$$x+2 = \pm\sqrt{-9}$$

$$x = -2 \pm 3i$$

　　　PTS:  2　　　　　REF:  011408a2　　　STA:  A2.A.24　　　TOP:  Solving Quadratics
　　　KEY:  completing the square
101  ANS:

$$\frac{100}{\sin 32} = \frac{b}{\sin 105} \cdot \quad \frac{100}{\sin 32} = \frac{a}{\sin 43}$$

$$b \approx 182.3 \qquad a \approx 128.7$$

　　　PTS:  4　　　　　REF:  011338a2　　　STA:  A2.A.73　　　TOP:  Law of Sines
　　　KEY:  basic
102  ANS:
　　　Ordered, the heights are 71, 71, 72, 74, 74, 75, 78, 79, 79, 83.  $Q_1 = 72$ and $Q_3 = 79$.  $79 - 72 = 7$.

　　　PTS:  2　　　　　REF:  011331a2　　　STA:  A2.S.4　　　TOP:  Central Tendency and Dispersion
　　　KEY:  compute

103  ANS:

$$\frac{1+\dfrac{3}{x}}{1-\dfrac{5}{x}-\dfrac{24}{x^2}} \cdot \frac{x^2}{x^2} = \frac{x^2+3x}{x^2-5x-24} = \frac{x(x+3)}{(x-8)(x+3)} = \frac{x}{x-8}$$

PTS:  4          REF:  061436a2          STA:  A2.A.17          TOP:  Complex Fractions

104  ANS:

$$_{25}C_{20} = 53,130$$

PTS:  2          REF:  011232a2          STA:  A2.S.11          TOP:  Combinations

105  ANS:  1

$$5 \cdot \frac{180}{\pi} \approx 286$$

PTS:  2          REF:  011427a2          STA:  A2.M.2          TOP:  Radian Measure
KEY:  degrees

106  ANS:  1

$2x-1 > 5.$   $2x-1 < -5$

$2x > 6$       $2x > -4$

$x > 3$        $x < -2$

PTS:  2          REF:  061307a2          STA:  A2.A.1          TOP:  Absolute Value Inequalities
KEY:  graph

107  ANS:  1          PTS:  2          REF:  061316a2          STA:  A2.S.8
TOP:  Correlation Coefficient

108  ANS:  3

$(3i)(2i)^2(m+i)$

$(3i)(4i^2)(m+i)$

$(3i)(-4)(m+i)$

$(-12i)(m+i)$

$-12mi - 12i^2$

$-12mi + 12$

PTS:  2          REF:  061319a2          STA:  A2.N.9
TOP:  Multiplication and Division of Complex Numbers

109  ANS:  4          PTS:  2          REF:  011409a2          STA:  A2.S.10
TOP:  Permutations

110  ANS:  3          PTS:  2          REF:  061219a2          STA:  A2.N.8
TOP:  Conjugates of Complex Numbers

111  ANS:  3

$$s = \theta \, r = \frac{2\pi}{8} \cdot 6 = \frac{3\pi}{2}$$

PTS:  2          REF:  061212a2          STA:  A2.A.61          TOP:  Arc Length
KEY:  arc length

112  ANS:  3
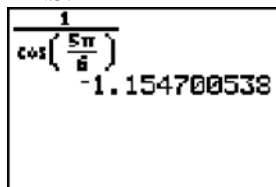
$6n^{-1} < 4n^{-1}$.  Flip sign when multiplying each side of the inequality by $n$, since a negative number.

$$\frac{6}{n} < \frac{4}{n}$$

$$6 > 4$$

PTS:  2          REF:  061314a2          STA:  A2.N.1          TOP:  Negative and Fractional Exponents

113  ANS:  1



PTS:  2          REF:  011203a2          STA:  A2.A.66          TOP:  Determining Trigonometric Functions

114  ANS:  4

$$\cos 2A = 1 - 2\sin^2 A = 1 - 2\left(\frac{1}{3}\right)^2 = 1 - \frac{2}{9} = \frac{7}{9}$$

PTS:  2          REF:  011311a2          STA:  A2.A.77          TOP:  Double Angle Identities
KEY:  evaluating

115  ANS:  4          PTS:  2          REF:  061303a2          STA:  A2.A.43
TOP:  Defining Functions

116  ANS:  2

$$\text{If } \sin A = -\frac{7}{25}, \ \cos A = \frac{24}{25}, \text{ and } \tan A = \frac{\sin A}{\cos A} = \frac{-\dfrac{7}{25}}{\dfrac{24}{25}} = -\frac{7}{24}$$

PTS:  2          REF:  011413a2          STA:  A2.A.64          TOP:  Using Inverse Trigonometric Functions
KEY:  advanced

117 ANS: 3

$-\sqrt{2}\sec x = 2$

$$\sec x = -\frac{2}{\sqrt{2}}$$

$$\cos x = -\frac{\sqrt{2}}{2}$$

$$x = 135, 225$$

PTS: 2    REF: 011322a2    STA: A2.A.68    TOP: Trigonometric Equations
KEY: reciprocal functions

118 ANS: 3

$_6C_3\left(\frac{x}{2}\right)^3(-2y)^3 = 20 \cdot \frac{x^3}{8} \cdot -8y^3 = -20x^3y^3$

PTS: 2    REF: 061215a2    STA: A2.A.36    TOP: Binomial Expansions

119 ANS:

$216\left(\frac{\pi}{180}\right) \approx 3.8$

PTS: 2    REF: 061232a2    STA: A2.M.2    TOP: Radian Measure
KEY: radians

120 ANS: 1

$\sin(180 + x) = (\sin 180)(\cos x) + (\cos 180)(\sin x) = 0 + (-\sin x) = -\sin x$

PTS: 2    REF: 011318a2    STA: A2.A.76    TOP: Angle Sum and Difference Identities
KEY: identities

121 ANS: 2    PTS: 2    REF: 011225a2    STA: A2.A.43
TOP: Defining Functions

122 ANS:

$5\csc\theta = 8$

$$\csc\theta = \frac{8}{5}$$

$$\sin\theta = \frac{5}{8}$$

$$\theta \approx 141$$

PTS: 2    REF: 061332a2    STA: A2.A.68    TOP: Trigonometric Equations
KEY: reciprocal functions

123 ANS: 1    PTS: 2    REF: 061420a2    STA: A2.A.34
TOP: Sigma Notation

124 ANS: 3

$$\frac{4x-5}{3} > 1 \text{ or } \frac{4x-5}{3} < -1$$

$$4x - 5 > 3 \qquad 4x - 5 < -3$$

$$4x > 8 \qquad 4x < 2$$

$$x > 2 \qquad x < \frac{1}{2}$$

PTS: 2          REF: 061209a2     STA: A2.A.1        TOP: Absolute Value Inequalities
KEY: graph

125 ANS:

$$y = 27.2025(1.1509)^x. \quad y = 27.2025(1.1509)^{18} \approx 341$$

PTS: 4          REF: 011238a2     STA: A2.S.7        TOP: Regression
KEY: exponential

126 ANS:

$$a + 15 + 2a = 90$$

$$3a + 15 = 90$$

$$3a = 75$$

$$a = 25$$

PTS: 2          REF: 011330a2     STA: A2.A.58       TOP: Cofunction Trigonometric Relationships

127 ANS: 1

$$\frac{1}{7-\sqrt{11}} \cdot \frac{7+\sqrt{11}}{7+\sqrt{11}} = \frac{7+\sqrt{11}}{49-11} = \frac{7+\sqrt{11}}{38}$$

PTS: 2          REF: 011404a2     STA: A2.N.5        TOP: Rationalizing Denominators

128 ANS: 3

$$20 \cdot 2 = -5t$$

$$-8 = t$$

PTS: 2          REF: 011412a2     STA: A2.A.5        TOP: Inverse Variation

129 ANS: 3          PTS: 2          REF: 061416a2     STA: A2.A.12
TOP: Evaluating Exponential Expressions

130 ANS:

$$\frac{15}{\sin 103} = \frac{a}{\sin 42}. \quad \frac{1}{2}(15)(10.3)\sin 35 \approx 44$$

$$a \approx 10.3$$

PTS: 4          REF: 061337a2     STA: A2.A.74       TOP: Using Trigonometry to Find Area
KEY: advanced

131 ANS: 2          PTS: 2          REF: 011222a2     STA: A2.A.39
TOP: Domain and Range          KEY: real domain, absolute value

132 ANS: 2

$x^3 + 3x^2 - 4x - 12$

$x^2(x + 3) - 4(x + 3)$

$(x^2 - 4)(x + 3)$

$(x + 2)(x - 2)(x + 3)$

PTS: 2 REF: 061214a2 STA: A2.A.7 TOP: Factoring by Grouping

133 ANS: 2 PTS: 2 REF: 011208a2 STA: A2.A.67
TOP: Simplifying Trigonometric Expressions

134 ANS:

$\sqrt{27^2 + 32^2 - 2(27)(32)\cos 132} \approx 54$

PTS: 4 REF: 011438a2 STA: A2.A.73 TOP: Law of Cosines
KEY: applied

135 ANS: 1 PTS: 2 REF: 011310a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

136 ANS:

$\dfrac{2\sqrt{3}}{3}$. If $\sin 60 = \dfrac{\sqrt{3}}{2}$, then $\csc 60 = \dfrac{2}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{2\sqrt{3}}{3}$

PTS: 2 REF: 011235a2 STA: A2.A.59 TOP: Reciprocal Trigonometric Relationships

137 ANS: 2

$\dfrac{1}{2}(22)(13)\sin 55 \approx 117$

PTS: 2 REF: 061403a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: basic

138 ANS:

$\log_{(x+3)}(2x + 3)(x + 5) = 2$          $-6$ is extraneous

$(x + 3)^2 = (2x + 3)(x + 5)$

$x^2 + 6x + 9 = 2x^2 + 13x + 15$

$x^2 + 7x + 6 = 0$

$(x + 6)(x + 1) = 0$

$x = -1$

PTS: 6 REF: 011439a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: applying properties of logarithms

139 ANS: 4 PTS: 2 REF: 011323a2 STA: A2.A.2
TOP: Using the Discriminant KEY: determine nature of roots given equation

140 ANS:
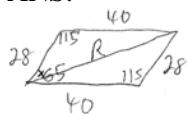


$$R = \sqrt{28^2 + 40^2 - 2(28)(40)\cos 115} \approx 58 \quad \frac{58}{\sin 115} = \frac{40}{\sin x}$$

$$x \approx 39$$

PTS: 6     REF: 061439a2     STA: A2.A.73     TOP: Vectors

141 ANS:
$K = ab\sin C = 6 \cdot 6\sin 50 \approx 27.6$

PTS: 2     REF: 011429a2     STA: A2.A.74     TOP: Using Trigonometry to Find Area
KEY: parallelograms

142 ANS:

$$\frac{\cot x \sin x}{\sec x} = \frac{\frac{\cos x}{\sin x}\sin x}{\frac{1}{\cos x}} = \cos^2 x$$

PTS: 2     REF: 061334a2     STA: A2.A.58     TOP: Reciprocal Trigonometric Relationships

143 ANS: 3
If $\csc P > 0$, $\sin P > 0$. If $\cot P < 0$ and $\sin P > 0$, $\cos P < 0$

PTS: 2     REF: 061320a2     STA: A2.A.60     TOP: Finding the Terminal Side of an Angle

144 ANS: 3
$$\frac{4}{-2} = -2$$

PTS: 2     REF: 011304a2     STA: A2.A.31     TOP: Sequences

145 ANS:
$$i^{13} + i^{18} + i^{31} + n = 0$$
$$i + (-1) - i + n = 0$$
$$-1 + n = 0$$
$$n = 1$$

PTS: 2     REF: 061228a2     STA: A2.N.7     TOP: Imaginary Numbers

146 ANS:
$3x^2 - 11x + 6 = 0$. Sum $\frac{-b}{a} = \frac{11}{3}$. Product $\frac{c}{a} = \frac{6}{3} = 2$

PTS: 2     REF: 011329a2     STA: A2.A.20     TOP: Roots of Quadratics

147 ANS: 2
$b^2 - 4ac = (-9)^2 - 4(2)(4) = 81 - 32 = 49$

    PTS: 2               REF: 011411a2     STA: A2.A.2      TOP: Using the Discriminant
    KEY: determine nature of roots given equation
148 ANS: 1             PTS: 2          REF: 011320a2     STA: A2.A.72
    TOP: Identifying the Equation of a Trigonometric Graph
149 ANS: 4
$\sin(\theta + 90) = \sin\theta \cdot \cos 90 + \cos\theta \cdot \sin 90 = \sin\theta \cdot (0) + \cos\theta \cdot (1) = \cos\theta$

    PTS: 2               REF: 061309a2     STA: A2.A.76      TOP: Angle Sum and Difference Identities
    KEY: identities
150 ANS: 2
sum: $\dfrac{-b}{a} = \dfrac{4}{6} = \dfrac{2}{3}$.  product: $\dfrac{c}{a} = \dfrac{-12}{6} = -2$

    PTS: 2               REF: 011209a2     STA: A2.A.20      TOP: Roots of Quadratics
151 ANS: 4             PTS: 2          REF: 011219a2     STA: A2.A.52
    TOP: Properties of Graphs of Functions and Relations
152 ANS: 2             PTS: 2          REF: 011315a2     STA: A2.A.55
    TOP: Trigonometric Ratios
153 ANS: 2

$$320 = 10(2)^{\frac{t}{60}}$$

$$32 = (2)^{\frac{t}{60}}$$

$$\log 32 = \log(2)^{\frac{t}{60}}$$

$$\log 32 = \frac{t \log 2}{60}$$

$$\frac{60 \log 32}{\log 2} = t$$

$$300 = t$$

    PTS: 2               REF: 011205a2     STA: A2.A.6      TOP: Exponential Growth
154 ANS:
$y = -3\sin 2x$. The period of the function is $\pi$, the amplitude is 3 and it is reflected over the $x$-axis.

    PTS: 2               REF: 061235a2     STA: A2.A.72
    TOP: Identifying the Equation of a Trigonometric Graph
155 ANS: 4             PTS: 2          REF: 061207a2     STA: A2.A.19
    TOP: Properties of Logarithms         KEY: antilogarithms

156  ANS:  3
$34.1\% + 19.1\% = 53.2\%$

PTS:  2          REF:  011212a2          STA:  A2.S.5          TOP:  Normal Distributions
KEY:  probability

157  ANS:  3
$2! \cdot 2! \cdot 2! = 8$

PTS:  2          REF:  061425a2          STA:  A2.S.10          TOP:  Permutations

158  ANS:  1          PTS:  2          REF:  061223a2          STA:  A2.S.15
TOP:  Binomial Probability          KEY:  modeling

159  ANS:  1          PTS:  2          REF:  061408a2          STA:  A2.A.24
TOP:  Solving Quadratics          KEY:  completing the square

160  ANS:  3
$1000 = 500e^{.05t}$

$\quad 2 = e^{.05t}$

$\ln 2 = \ln e^{.05t}$

$\dfrac{\ln 2}{.05} = \dfrac{.05t \cdot \ln e}{.05}$

$13.9 \approx t$

PTS:  2          REF:  061313a2          STA:  A2.A.6          TOP:  Exponential Growth

161  ANS:  4          PTS:  2          REF:  061318a2          STA:  A2.A.49
TOP:  Equations of Circles

162  ANS:



$-104.$
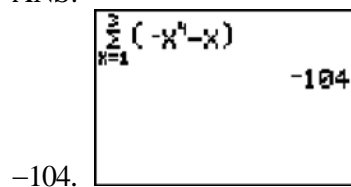
PTS:  2          REF:  011230a2          STA:  A2.N.10          TOP:  Sigma Notation
KEY:  basic

163  ANS:  3
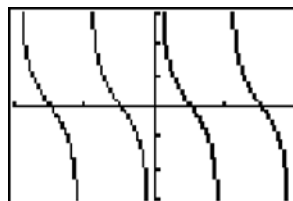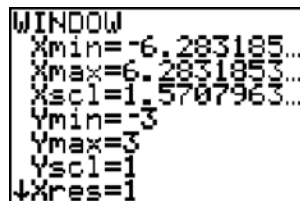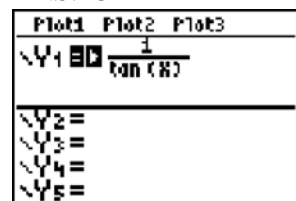


PTS:  2          REF:  011207a2          STA:  A2.A.71          TOP:  Graphing Trigonometric Functions

164 ANS: 4

$$\frac{x^2 + 9x - 22}{x^2 - 121} \div (2 - x) = \frac{(x+11)(x-2)}{(x+11)(x-11)} \cdot \frac{-1}{x-2} = \frac{-1}{x-11}$$

PTS: 2     REF: 011423a2     STA: A2.A.16     TOP: Multiplication and Division of Rationals
KEY: division

165 ANS: 1

$$\cos(A - B) = \left(\frac{5}{13}\right)\left(-\frac{3}{5}\right) + \left(\frac{12}{13}\right)\left(\frac{4}{5}\right) = -\frac{15}{65} + \frac{48}{65} = \frac{33}{65}$$

PTS: 2     REF: 011214a2     STA: A2.A.76     TOP: Angle Sum and Difference Identities
KEY: evaluating

166 ANS: 1     PTS: 2     REF: 061317a2     STA: A2.S.9
TOP: Differentiating Permutations and Combinations

167 ANS:

$$a_n = 9n - 4 \qquad . \quad S_n = \frac{20(5 + 176)}{2} = 1810$$

$$a_1 = 9(1) - 4 = 5$$

$$a_{20} = 9(20) - 4 = 176$$

PTS: 2     REF: 011328a2     STA: A2.A.35     TOP: Summations
KEY: arithmetic

168 ANS:

$$\frac{13}{x} = 10 - x \qquad . \quad x = \frac{10 \pm \sqrt{100 - 4(1)(13)}}{2(1)} = \frac{10 \pm \sqrt{48}}{2} = \frac{10 \pm 4\sqrt{3}}{2} = 5 \pm 2\sqrt{3}$$

$$13 = 10x - x^2$$

$$x^2 - 10x + 13 = 0$$

PTS: 4     REF: 061336a2     STA: A2.A.23     TOP: Solving Rationals
KEY: irrational and complex solutions

169 ANS: 3
$$_3C_1 \cdot {}_5C_2 = 3 \cdot 10 = 30$$

PTS: 2     REF: 061422a2     STA: A2.S.12     TOP: Combinations

170 ANS: 1     PTS: 2     REF: 061409a2     STA: A2.A.38
TOP: Defining Functions     KEY: graphs

171 ANS: 3

$$\frac{a + \dfrac{b}{c}}{d - \dfrac{b}{c}} = \frac{\dfrac{ac + b}{c}}{\dfrac{cd - b}{c}} = \frac{ac + b}{c} \cdot \frac{c}{cd - b} = \frac{ac + b}{cd - b}$$

PTS: 2     REF: 011405a2     STA: A2.A.17     TOP: Complex Fractions

172 ANS: 4 PTS: 1 REF: 011312a2 STA: A2.A.56
TOP: Determining Trigonometric Functions KEY: degrees, common angles

173 ANS: 2 PTS: 2 REF: 061218a2 STA: A2.A.43
TOP: Defining Functions

174 ANS: 4

$$\log 2x^3 = \log 2 + \log x^3 = \log 2 + 3 \log x$$

PTS: 2 REF: 061426a2 STA: A2.A.19 TOP: Properties of Logarithms
KEY: splitting logs

175 ANS:

$$x(x + 3) = 10$$

$$x^2 + 3x - 10 = 0$$

$$(x + 5)(x - 2) = 0$$

$$x = -5, 2$$

PTS: 2 REF: 011431a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: equations

176 ANS: 4 PTS: 2 REF: 061206a2 STA: A2.A.60
TOP: Unit Circle

177 ANS: 4

$$4 + 3(2 - x) + 3(3 - x) + 3(4 - x) + 3(5 - x)$$

$$4 + 6 - 3x + 9 - 3x + 12 - 3x + 15 - 3x$$

$$46 - 12x$$

PTS: 2 REF: 061315a2 STA: A2.N.10 TOP: Sigma Notation
KEY: advanced

178 ANS: 3

$$x + y = 5 \qquad . \quad -5 + y = 5$$

$$y = -x + 5 \qquad y = 10$$

$$(x + 3)^2 + (-x + 5 - 3)^2 = 53$$

$$x^2 + 6x + 9 + x^2 - 4x + 4 = 53$$

$$2x^2 + 2x - 40 = 0$$

$$x^2 + x - 20 = 0$$

$$(x + 5)(x - 4) = 0$$

$$x = -5, 4$$

PTS: 2 REF: 011302a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: circle

179 ANS: 2 PTS: 2 REF: 011213a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

180 ANS: 3

$\dfrac{x+16}{x-2} - \dfrac{7(x-2)}{x-2} \le 0$  $-6x+30=0$  $x-2=0$. Check points such that $x<2$, $2<x<5$, and $x>5$. If $x=1$,

$\dfrac{-6x+30}{x-2} \le 0$  $\quad -6x=-30 \quad x=2$

$\quad\quad\quad\quad\quad x=5$

$\dfrac{-6(1)+30}{1-2} = \dfrac{24}{-1} = -24$, which is less than 0. If $x=3$, $\dfrac{-6(3)+30}{3-2} = \dfrac{12}{1} = 12$, which is greater than 0. If $x=6$,

$\dfrac{-6(6)+30}{6-2} = \dfrac{-6}{4} = -\dfrac{3}{2}$, which is less than 0.

PTS: 2     REF: 011424a2     STA: A2.A.23     TOP: Rational Inequalities

181 ANS: 2     PTS: 2     REF: 011407a2     STA: A2.A.43
TOP: Defining Functions

182 ANS:

$2\sin^2 x + 5\sin x - 3 = 0$

$(2\sin x - 1)(\sin x + 3) = 0$

$\sin x = \dfrac{1}{2}$

$x = \dfrac{\pi}{6}, \dfrac{5\pi}{6}$

PTS: 4     REF: 011436a2     STA: A2.A.68     TOP: Trigonometric Equations
KEY: quadratics

183 ANS: 4

$g\left(\dfrac{1}{2}\right) = \dfrac{1}{\frac{1}{2}} = 2$.  $f(2) = 4(2) - 2^2 = 4$

PTS: 2     REF: 011204a2     STA: A2.A.42     TOP: Compositions of Functions
KEY: numbers

184 ANS:

$2x - 3 > 5$ or $2x - 3 < -5$

$\quad 2x > 8 \quad\quad 2x < -2$

$\quad\quad x > 4 \quad\quad\quad x < -1$

PTS: 2     REF: 061430a2     STA: A2.A.1     TOP: Absolute Value Inequalities

185 ANS: 3     PTS: 2     REF: 011305a2     STA: A2.A.37
TOP: Defining Functions     KEY: ordered pairs

186 ANS: 4

$\dfrac{13}{\sin 40} = \dfrac{20}{\sin M}$.  $81 + 40 < 180$.  $(180 - 81) + 40 < 180$

$\quad M \approx 81$

PTS: 2     REF: 061327a2     STA: A2.A.75     TOP: Law of Sines - The Ambiguous Case

187  ANS:  3

$$S_8 = \frac{3(1-(-4)^8)}{1-(-4)} = \frac{196,605}{5} = -39,321$$

PTS:  2          REF:  061304a2     STA:  A2.A.35     TOP:  Summations
KEY:  geometric

188  ANS:  3
As originally written, alternatives (2) and (3) had no domain restriction, so that both were correct.

PTS:  2          REF:  061405a2     STA:  A2.A.52
TOP:  Properties of Graphs of Functions and Relations

189  ANS:  3

$$\sqrt[3]{6a^4b^2} + \sqrt[3]{(27 \cdot 6)a^4b^2}$$

$$a\sqrt[3]{6ab^2} + 3a\sqrt[3]{6ab^2}$$

$$4a\sqrt[3]{6ab^2}$$

PTS:  2          REF:  011319a2     STA:  A2.N.2      TOP:  Operations with Radicals

190  ANS:  4

$$_3C_2\left(\frac{5}{8}\right)^2\left(\frac{3}{8}\right)^1 = \frac{225}{512}$$

PTS:  2          REF:  011221a2     STA:  A2.S.15     TOP:  Binomial Probability
KEY:  spinner

191  ANS:  3     PTS:  2          REF:  061306a2     STA:  A2.A.72
TOP:  Identifying the Equation of a Trigonometric Graph

192  ANS:  2

$$60 = -16t^2 + 5t + 105 \quad t = \frac{-5 \pm \sqrt{5^2 - 4(-16)(45)}}{2(-16)} \approx \frac{-5 \pm 53.89}{-32} \approx 1.84$$

$$0 = -16t^2 + 5t + 45$$

PTS:  2          REF:  061424a2     STA:  A2.A.25     TOP:  Solving Quadratics
KEY:  quadratic formula

193  ANS:  4

$$x^2(x+2) - (x+2)$$

$$(x^2-1)(x+2)$$

$$(x+1)(x-1)(x+2)$$

PTS:  2          REF:  011426a2     STA:  A2.A.7      TOP:  Factoring by Grouping

194 ANS:

$$30700 = 50e^{3t}$$

$$614 = e^{3t}$$

$$\ln 614 = \ln e^{3t}$$

$$\ln 614 = 3t \ln e$$

$$\ln 614 = 3t$$

$$2.14 \approx t$$

PTS: 2     REF: 011333a2     STA: A2.A.6     TOP: Exponential Growth

195 ANS: 1

$$20(-2) = x(-2x + 2)$$

$$-40 = -2x^2 + 2x$$

$$2x^2 - 2x - 40 = 0$$

$$x^2 - x - 20 = 0$$

$$(x + 4)(x - 5) = 0$$

$$x = -4, 5$$

PTS: 2     REF: 011321a2     STA: A2.A.5     TOP: Inverse Variation

196 ANS: 2

$$\frac{-\dfrac{3}{32}a^3 b^4}{\dfrac{1}{64}a^5 b^3} = -\dfrac{6b}{a^2}$$

PTS: 2     REF: 061326a2     STA: A2.A.31     TOP: Sequences

197 ANS:

$$\sec\theta \sin\theta \cot\theta = \frac{1}{\cos\theta} \cdot \sin\theta \cdot \frac{\cos\theta}{\sin\theta} = 1$$

PTS: 2     REF: 011428a2     STA: A2.A.67     TOP: Proving Trigonometric Identities

198 ANS:

$$(x + yi)(x - yi) = x^2 - y^2 i^2 = x^2 + y^2$$

PTS: 2     REF: 061432a2     STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

199 ANS:

$$83°50' \cdot \frac{\pi}{180} \approx 1.463 \text{ radians } \quad s = \theta r = 1.463 \cdot 12 \approx 17.6$$

PTS: 2     REF: 011435a2     STA: A2.A.61     TOP: Arc Length
KEY: arc length

200 ANS: 1          PTS: 2          REF: 011416a2     STA: A2.A.39
   TOP: Domain and Range          KEY: real domain, rational

201 ANS:

$x < -1$ or $x > 5$.     $x^2 - 4x - 5 > 0$.  $x - 5 > 0$ and $x + 1 > 0$ or  $x - 5 < 0$ and $x + 1 < 0$

$\qquad\qquad\qquad (x - 5)(x + 1) > 0$     $x > 5$ and $x > -1$     $x < 5$ and $x < -1$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad x > 5 \qquad\qquad\qquad\qquad x < -1$

   PTS: 2          REF: 011228a2     STA: A2.A.4          TOP: Quadratic Inequalities
   KEY: one variable

202 ANS: 4

$x = 2y$.  $y^2 - (3y)^2 + 32 = 0$  .  $x = 3(-2) = -6$

$\qquad\qquad y^2 - 9y^2 = -32$

$\qquad\qquad\quad -8y^2 = -32$

$\qquad\qquad\qquad y^2 = 4$

$\qquad\qquad\qquad y = \pm 2$

   PTS: 2          REF: 061312a2     STA: A2.A.3          TOP: Quadratic-Linear Systems
   KEY: equations

203 ANS:

$(5x - 1)^{\frac{1}{3}} = 4$

$\quad 5x - 1 = 64$

$\qquad 5x = 65$

$\qquad\quad x = 13$

   PTS: 2          REF: 061433a2     STA: A2.A.28          TOP: Logarithmic Equations
   KEY: advanced

204 ANS: 2

$\dfrac{8\pi}{5} \cdot \dfrac{180}{\pi} = 288$

   PTS: 2          REF: 061302a2     STA: A2.M.2          TOP: Radian Measure
   KEY: degrees

205 ANS:

$$2x - 1 = 27^{\frac{4}{3}}$$

$$2x - 1 = 81$$

$$2x = 82$$

$$x = 41$$

PTS: 2          REF: 061329a2          STA: A2.A.28          TOP: Logarithmic Equations
KEY: advanced

206 ANS:

Less than 60 inches is below 1.5 standard deviations from the mean. $0.067 \cdot 450 \approx 30$

PTS: 2          REF: 061428a2          STA: A2.S.5          TOP: Normal Distributions
KEY: predict

207 ANS: 4          PTS: 2          REF: 061427a2          STA: A2.A.63
TOP: Domain and Range

208 ANS: 2

Since the coefficient of $t$ is greater than 0, $r > 0$.

PTS: 2          REF: 011303a2          STA: A2.S.8          TOP: Correlation Coefficient

209 ANS:

$$4xi + 5yi^8 + 6xi^3 + 2yi^4 = 4xi + 5y - 6xi + 2y = 7y - 2xi$$

PTS: 2          REF: 011433a2          STA: A2.N.7          TOP: Imaginary Numbers

210 ANS: 2

$$\tan 30 = \frac{\sqrt{3}}{3}. \text{ Arc} \cos \frac{\sqrt{3}}{k} = 30$$

$$\frac{\sqrt{3}}{k} = \cos 30$$

$$k = 2$$

PTS: 2          REF: 061323a2          STA: A2.A.64          TOP: Using Inverse Trigonometric Functions
KEY: advanced

211 ANS: 2

$$\frac{\cot x}{\csc x} = \frac{\frac{\cos x}{\sin x}}{\frac{1}{\sin x}} = \cos x$$

PTS: 2          REF: 061410a2          STA: A2.A.58          TOP: Reciprocal Trigonometric Relationships

212 ANS: 4

$$\frac{x}{x - \sqrt{x}} \times \frac{x + \sqrt{x}}{x + \sqrt{x}} = \frac{x^2 + x\sqrt{x}}{x^2 - x} = \frac{x(x + \sqrt{x})}{x(x - 1)} = \frac{x + \sqrt{x}}{x - 1}$$

PTS: 2          REF: 061325a2          STA: A2.A.15          TOP: Rationalizing Denominators
KEY: index = 2

213 ANS: 3

$$42 = \frac{1}{2}(a)(8)\sin 61$$

$$42 \approx 3.5a$$

$$12 \approx a$$

PTS: 2          REF: 011316a2          STA: A2.A.74          TOP: Using Trigonometry to Find Area
KEY: basic

214 ANS: 2

The binomials are conjugates, so use FL.

PTS: 2          REF: 011206a2          STA: A2.N.3          TOP: Operations with Polynomials
KEY: multiplication

215 ANS: 2



$$\sin S = \frac{8}{17}$$

$$S = \sin^{-1}\frac{8}{17}$$

$$S \approx 28°4'$$

PTS: 2          REF: 061311a2          STA: A2.A.55          TOP: Trigonometric Ratios

216 ANS: 1

$$\frac{6}{\sin 35} = \frac{10}{\sin N}$$

$$N \approx 73$$

$$73 + 35 < 180$$

$$(180 - 73) + 35 < 180$$

PTS: 2          REF: 061226a2          STA: A2.A.75          TOP: Law of Sines - The Ambiguous Case

217 ANS:

$$-\frac{a^2 b^3}{4}$$

PTS: 2      REF: 011231a2      STA: A2.A.13      TOP: Simplifying Radicals
KEY: index > 2

218 ANS: 2

$\log x^2 = \log 3a + \log 2a$

$2 \log x = \log 6a^2$

$\log x = \dfrac{\log 6}{2} + \dfrac{\log a^2}{2}$

$\log x = \dfrac{1}{2} \log 6 + \dfrac{2 \log a}{2}$

$\log x = \dfrac{1}{2} \log 6 + \log a$

PTS: 2      REF: 011224a2      STA: A2.A.19      TOP: Properties of Logarithms
KEY: splitting logs

219 ANS: 3      PTS: 2      REF: 061224a2      STA: A2.A.63
TOP: Domain and Range

220 ANS:
$Q_1 = 3.5$ and $Q_3 = 10.5$. $10.5 - 3.5 = 7$.

PTS: 2      REF: 011430a2      STA: A2.S.4      TOP: Central Tendency and Dispersion
KEY: compute

221 ANS:
$_5C_4 \cdot 0.28^4 \cdot 0.72^1 + _5C_5 \cdot 0.28^5 \cdot 0.72^0 \approx 0.024$

PTS: 4      REF: 011437a2      STA: A2.S.15      TOP: Binomial Probability
KEY: at least or at most

222 ANS:
$-4x + 5 < 13$  $-4x + 5 > -13$  $-2 < x < 4.5$

$\quad -4x < 8 \qquad -4x > -18$

$\quad\quad x > -2 \qquad x < 4.5$

PTS: 2      REF: 011432a2      STA: A2.A.1      TOP: Absolute Value Inequalities

223 ANS: 1
$f(g(x)) = 2(x+5)^2 - 3(x+5) + 1 = 2(x^2 + 10x + 25) - 3x - 15 + 1 = 2x^2 + 17x + 36$

PTS: 2      REF: 061419a2      STA: A2.A.42      TOP: Compositions of Functions
KEY: variables

224 ANS: 3

$h(-8) = \frac{1}{2}(-8) - 2 = -4 - 2 = -6.$  $g(-6) = \frac{1}{2}(-6) + 8 = -3 + 8 = 5$

PTS: 2 REF: 011403a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: numbers

225 ANS:



$3 \times \frac{180}{\pi} \approx 171.89° \approx 171°53'.$

PTS: 2 REF: 011335a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

226 ANS: 1
The binomials are conjugates, so use FL.

PTS: 2 REF: 061201a2 STA: A2.N.3 TOP: Operations with Polynomials
KEY: multiplication

227 ANS: 2
Top 6.7% = 1.5 s.d. $+ \sigma = 1.5(104) + 576 = 732$

PTS: 2 REF: 011420a2 STA: A2.S.5 TOP: Normal Distributions
KEY: predict

228 ANS: 1

$\frac{_6P_6}{3!2!} = \frac{720}{12} = 60$

PTS: 2 REF: 011324a2 STA: A2.S.10 TOP: Permutations

229 ANS:
$3 - 2x \geq 7$  or $3 - 2x \leq -7$

$-2x \geq 4$ $\qquad -2x \leq -10$

$x \leq -2$ $\qquad x \geq 5$

PTS: 2 REF: 011334a2 STA: A2.A.1 TOP: Absolute Value Inequalities
KEY: graph

230 ANS: 1 PTS: 2 REF: 011313a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain, radical

231 ANS: 3

$3x^3 - 5x^2 - 48x + 80$

$x^2(3x - 5) - 16(3x - 5)$

$(x^2 - 16)(3x - 5)$

$(x + 4)(x - 4)(3x - 5)$

PTS: 2     REF: 011317a2     STA: A2.A.7     TOP: Factoring by Grouping

232 ANS: 2

$\log 9 - \log 20$

$\log 3^2 - \log(10 \cdot 2)$

$2\log 3 - (\log 10 + \log 2)$

$2b - (1 + a)$

$2b - a - 1$

PTS: 2     REF: 011326a2     STA: A2.A.19     TOP: Properties of Logarithms
KEY: expressing logs algebraically

233 ANS: 4

$2x^2 - 7x - 5 = 0$

$$\frac{c}{a} = \frac{-5}{2}$$

PTS: 2     REF: 061414a2     STA: A2.A.20     TOP: Roots of Quadratics

## Algebra 2/Trigonometry Regents at Random
## Answer Section

234 ANS: 1

$\log x = \log a^2 + \log b$

$\log x = \log a^2 b$

$x = a^2 b$

PTS: 2      REF: 061517a2      STA: A2.A.19      TOP: Properties of Logarithms
KEY: antilogarithms

235 ANS: 2      PTS: 2      REF: 081523a2      STA: A2.A.44
TOP: Inverse of Functions      KEY: ordered pairs

236 ANS: 3      PTS: 2      REF: 061514a2      STA: A2.A.55
TOP: Trigonometric Ratios

237 ANS:

$\dfrac{5}{11} \pi \left( \dfrac{180}{\pi} \right) = 81°49'$

PTS: 2      REF: 011531a2      STA: A2.M.2      TOP: Radian Measure
KEY: degrees

238 ANS: 4

$(3 - 2a)^0 + (3 - 2a)^1 + (3 - 2a)^2 = 1 + 3 - 2a + 9 - 12a + 4a^2 = 4a^2 - 14a + 13$

PTS: 2      REF: 061526a2      STA: A2.N.10      TOP: Sigma Notation
KEY: advanced

239 ANS: 2      PTS: 2      REF: 011610a2      STA: A2.A.30
TOP: Sequences

240 ANS:

$y = 733.646(0.786)^x$    $733.646(0.786)^{12} \approx 41$

PTS: 4      REF: 011536a2      STA: A2.S.7      TOP: Regression
KEY: exponential

241 ANS:

$\ln e^{4x} = \ln 12$

$4x = \ln 12$

$x = \dfrac{\ln 12}{4}$

$\approx 0.62$

PTS: 2      REF: 011530a2      STA: A2.A.27      TOP: Exponential Equations
KEY: without common base

242  ANS: 3
$3x^2 + x - 14 = 0$  $1^2 - 4(3)(-14) = 1 + 168 = 169 = 13^2$

PTS: 2          REF: 061524a2     STA: A2.A.2          TOP: Using the Discriminant
KEY: determine nature of roots given equation

243  ANS: 4
$$\frac{\sqrt{34}}{\sin 30} = \frac{12}{\sin B}$$

$$B = \sin^{-1} \frac{12\sin 30}{\sqrt{34}}$$

$$\approx \sin^{-1} \frac{6}{5.8}$$

PTS: 2          REF: 011523a2     STA: A2.A.75         TOP: Law of Sines - The Ambiguous Case

244  ANS: 3
$$r = \sqrt{(3-0)^2 + (-5-(-2))^2} = \sqrt{9+9} = \sqrt{18}$$

PTS: 2          REF: 011624a2     STA: A2.A.48         TOP: Equations of Circles

245  ANS: 3
$$\frac{5x}{x(x-3)} - \frac{2(x-3)}{x(x-3)} = \frac{x(x-3)}{x(x-3)}$$

$$5x - 2x + 6 = x^2 - 3x$$

$$0 = x^2 - 6x - 6$$

PTS: 2          REF: 011522a2     STA: A2.A.23         TOP: Solving Rationals
KEY: irrational and complex solutions

246  ANS:
$$8^{x+1} = 16$$

$$2^{3(x+1)} = 2^4$$

$$3x + 3 = 4$$

$$3x = 1$$

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

PTS: 2          REF: 011630a2     STA: A2.A.28         TOP: Logarithmic Equations
KEY: basic

247  ANS: 1          PTS: 2          REF: 011505a2     STA: A2.A.53
TOP: Graphing Exponential Functions

248 ANS: 2

$$9 - x^2 < 0 \qquad\qquad \text{or } x + 3 < 0 \text{ and } x - 3 < 0$$

$$x^2 - 9 > 0 \qquad\qquad x < -3 \text{ and } x < 3$$

$$(x + 3)(x - 3) > 0 \qquad\quad x < -3$$

$$x + 3 > 0 \text{ and } x - 3 > 0$$

$$x > -3 \text{ and } x > 3$$

$$x > 3$$

PTS: 2 REF: 061507a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

249 ANS: 1

$$c = \sqrt{\left(x + \sqrt{2}\right)^2 + \left(x - \sqrt{2}\right)^2} = \sqrt{x^2 + 2\sqrt{2}x + 2 + x^2 - 2\sqrt{2}x + 2} = \sqrt{2x^2 + 4}$$

PTS: 2 REF: 011626a2 STA: A2.A.14 TOP: Operations with Radicals
KEY: with variables | index = 2

250 ANS: 4

$$A = 5000e^{(.04)(18)} \approx 10272.17$$

PTS: 2 REF: 011607a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

251 ANS: 2

$$A = 50\left(1 + \frac{.0325}{4}\right)^{4 \cdot 12} = 50(1.008125)^{48} \approx 73.73$$

PTS: 2 REF: 081511a2 STA: A2.A.12 TOP: Evaluating Functions

252 ANS:

$$2^{-4} = 2^{3x-1}$$

$$-4 = 3x - 1$$

$$-3 = 3x$$

$$-1 = x$$

PTS: 2 REF: 081529a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base shown

253 ANS:

$$(x + 1)^2 - (x + 1) = x^2 + 2x + 1 - x - 1 = x^2 + x$$

PTS: 2 REF: 081530a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: variables

254 ANS: 4 PTS: 2 REF: 061518a2 STA: A2.A.51
TOP: Domain and Range KEY: graph

255 ANS: 3

$$\frac{c}{a} = \frac{-3}{4}$$

PTS: 2    REF: 011517a2    STA: A2.A.20    TOP: Roots of Quadratics

256 ANS: 1

$$a_2 = \frac{1}{2}(-6) - 2 = -5$$

$$a_3 = \frac{1}{2}(-5) - 3 = -\frac{11}{2}$$

PTS: 2    REF: 011623a2    STA: A2.A.33    TOP: Sequences

257 ANS: 2

$$K = 8 \cdot 12 \sin 120 = 96 \cdot \frac{\sqrt{3}}{2} = 48\sqrt{3}$$

PTS: 2    REF: 061508a2    STA: A2.A.74    TOP: Using Trigonometry to Find Area
KEY: parallelograms

258 ANS: 3

$$s = \theta\, r = \frac{4\pi}{3} \cdot \frac{24}{2} = 16\pi$$

PTS: 2    REF: 011611a2    STA: A2.A.61    TOP: Arc Length
KEY: arc length

259 ANS:

$$\frac{11!}{3! \cdot 2! \cdot 2!} = 1,663,200$$

PTS: 2    REF: 011631a2    STA: A2.S.10    TOP: Permutations

260 ANS: 3    PTS: 2    REF: 081517a2    STA: A2.A.39
TOP: Domain and Range    KEY: real domain, exponential

261 ANS: 1

$$\log T = \log \frac{10x^2}{y} = \log 10 + \log x^2 - \log y = 1 + 2\log x - \log y$$

PTS: 2    REF: 011615a2    STA: A2.A.19    TOP: Properties of Logarithms
KEY: splitting logs

262 ANS: 3    PTS: 2    REF: 081525a2    STA: A2.A.36
TOP: Binomial Expansions

263 ANS: 3    PTS: 2    REF: 061523a2    STA: A2.S.9
TOP: Differentiating Permutations and Combinations

4

264  ANS: 2

$\dfrac{60-50}{5} = 2$ standards above the mean or 2.3%   $2.3\% \cdot 1000 = 23$

PTS: 2            REF: 011614a2      STA: A2.S.5      TOP: Normal Distributions
KEY: predict

265  ANS:

$xi^8 - yi^6 = x(1) - y(-1) = x + y$

PTS: 2            REF: 061533a2      STA: A2.N.7      TOP: Imaginary Numbers

266  ANS:

$\sqrt{2x+1} = 4$

$2x + 1 = 16$

$2x = 15$

$x = \dfrac{15}{2}$

PTS: 2            REF: 011628a2      STA: A2.A.22      TOP: Solving Radicals
KEY: basic

267  ANS: 3

$_9C_3 = 84$

PTS: 2            REF: 081513a2      STA: A2.S.11      TOP: Combinations

268  ANS: 4

$\dfrac{3 - \sqrt{8}}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{3\sqrt{3} - \sqrt{24}}{3} = \dfrac{3\sqrt{3} - 2\sqrt{6}}{3} = \sqrt{3} - \dfrac{2}{3}\sqrt{6}$

PTS: 2            REF: 081518a2      STA: A2.N.5      TOP: Rationalizing Denominators

269  ANS:

$(x+14)(x+22) = 800$   $x = \dfrac{-36 \pm \sqrt{(-36)^2 - 4(1)(-492)}}{2(1)} = \dfrac{-36 + \sqrt{3264}}{2} \approx 10.6$   10 feet increase.

$x^2 + 36x + 308 = 800$

$x^2 + 36x - 492 = 0$

PTS: 6            REF: 011539a2      STA: A2.A.25      TOP: Solving Quadratics
KEY: quadratic formula

270 ANS:

$$2\cos^2 x - 1 = \cos x$$

$$2\cos^2 x - \cos x - 1 = 0$$

$$(2\cos x + 1)(\cos x - 1) = 0$$

$$\cos x = -\frac{1}{2}, 1$$

$$x = 0, 120, 240$$

PTS: 4    REF: 011638a2    STA: A2.A.68    TOP: Trigonometric Equations
KEY: double angle identities

271 ANS:

$a = \sqrt{8^2 + 11^2 - 2(8)(11)\cos 82} \approx 12.67$.   The angle opposite the shortest side: $\dfrac{8}{\sin x} = \dfrac{12.67}{\sin 82}$

$$x \approx 38.7$$

PTS: 4    REF: 081536a2    STA: A2.A.73    TOP: Law of Cosines
KEY: advanced

272 ANS:

$r_A \approx 0.976$ $r_B \approx 0.994$  Set $B$ has the stronger linear relationship since $r$ is higher.

PTS: 2    REF: 061535a2    STA: A2.S.8    TOP: Correlation Coefficient

273 ANS:

$$_6C_5\left(\frac{2}{5}\right)^5\left(\frac{3}{5}\right) = 6\left(\frac{32}{3125}\right)\left(\frac{3}{5}\right) = \frac{576}{15,625}$$

PTS: 2    REF: 011532a2    STA: A2.S.15    TOP: Binomial Probability
KEY: exactly

274 ANS: 2    PTS: 2    REF: 011507a2    STA: A2.A.38
TOP: Defining Functions    KEY: graphs

275 ANS: 3

$$f(x + 3) = 2(x + 3)^2 - 3(x + 3) + 4 = 2x^2 + 12x + 18 - 3x - 9 + 4 = 2x^2 + 9x + 13$$

PTS: 2    REF: 011619a2    STA: A2.A.41    TOP: Functional Notation

276 ANS: 1

$$\frac{_{11}P_{11}}{2!2!2!2!} = \frac{39,916,800}{16} = 2,494,800$$

PTS: 2    REF: 011518a2    STA: A2.S.10    TOP: Permutations

277 ANS: 4    PTS: 2    REF: 011504a2    STA: A2.A.34
TOP: Sigma Notation

278 ANS: 2

$$\frac{-b}{a} = \frac{-6}{-3} = 2$$

PTS: 2      REF: 011613a2      STA: A2.A.20      TOP: Roots of Quadratics

279 ANS: 2      PTS: 2      REF: 081509a2      STA: A2.S.4
TOP: Dispersion      KEY: basic, group frequency distributions

280 ANS: 4      PTS: 2      REF: 011605a2      STA: A2.S.15
TOP: Binomial Probability      KEY: modeling

281 ANS: 2      PTS: 2      REF: 081515a2      STA: A2.A.57
TOP: Reference Angles

282 ANS: 1

$$\frac{1+\cos 2A}{\sin 2A} = \frac{1+2\cos^2 A - 1}{2\sin A \cos A} = \frac{\cos A}{\sin A} = \cot A$$

PTS: 2      REF: 061522a2      STA: A2.A.77      TOP: Double Angle Identities
KEY: simplifying

283 ANS: 1

$$\cos 2\theta = 2\left(\frac{3}{4}\right)^2 - 1 = 2\left(\frac{9}{16}\right) - 1 = \frac{9}{8} - \frac{8}{8} = \frac{1}{8}$$

PTS: 2      REF: 081522a2      STA: A2.A.77      TOP: Double Angle Identities
KEY: evaluating

284 ANS:

$$x^2 + 10x + 25 = 8 + 25$$
$$(x+5)^2 = 33$$
$$x + 5 = \pm\sqrt{33}$$
$$x = -5 \pm \sqrt{33}$$

PTS: 4      REF: 011636a2      STA: A2.A.24      TOP: Completing the Square

285 ANS: 4

$$\frac{\dfrac{3x+y}{xy}}{\dfrac{2}{xy}} = \frac{3x+y}{xy} \cdot \frac{xy}{2} = \frac{3x+y}{2}$$

PTS: 2      REF: 011603a2      STA: A2.A.17      TOP: Complex Fractions

286 ANS: 3      PTS: 2      REF: 061501a2      STA: A2.A.43
TOP: Defining Functions

287 ANS: 2      PTS: 2      REF: 081502a2      STA: A2.S.8
TOP: Correlation Coefficient

288  ANS: 4
$$3 \cdot 400 = 8x$$
$$150 = x$$

PTS: 2          REF: 081507a2     STA: A2.A.5     TOP: Inverse Variation
289  ANS:
$$a = 3, b = 2, c = 1 \quad y = 3\cos 2x + 1.$$

PTS: 2          REF: 011538a2     STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph
290  ANS: 4          PTS: 2          REF: 011622a2     STA: A2.A.63
TOP: Domain and Range
291  ANS: 3

$$a_4 = 3xy^5 \left( \frac{2x}{y} \right)^3 = 3xy^5 \left( \frac{8x^3}{y^3} \right) = 24x^4 y^2$$

PTS: 2          REF: 061512a2     STA: A2.A.33     TOP: Sequences
292  ANS:

$$\frac{1}{2} \cdot 15 \cdot 31.6 \sin 125 \approx 194$$

PTS: 2          REF: 011633a2     STA: A2.A.74     TOP: Using Trigonometry to Find Area
KEY: advanced
293  ANS: 1

$$\frac{\frac{3}{4}}{-\frac{1}{2}} = -\frac{3}{2}$$

PTS: 2          REF: 011508a2     STA: A2.A.31     TOP: Sequences
294  ANS:
$$y = 2.19(3.23)^x \quad 426.21 = 2.19(3.23)^x$$

$$\frac{426.21}{2.19} = (3.23)^x$$

$$\log \frac{426.21}{2.19} = x \log(3.23)$$

$$\frac{\log \frac{426.21}{2.19}}{\log(3.23)} = x$$

$$x \approx 4.5$$

PTS: 4          REF: 011637a2     STA: A2.S.7     TOP: Exponential Regression

295 ANS: 2

$(2\sin x - 1)(\sin x + 1) = 0$

$\sin x = \dfrac{1}{2}, -1$

$x = 30, 150, 270$

PTS: 2          REF: 081514a2     STA: A2.A.68     TOP: Trigonometric Equations
KEY: quadratics

296 ANS: 2

$5^2 a^{-3} b^4 = \dfrac{25b^4}{a^3}$

PTS: 2          REF: 011514a2     STA: A2.A.9      TOP: Negative Exponents

297 ANS:

$\dfrac{10x}{4} = \dfrac{1}{x} + \dfrac{x}{4}$

$\dfrac{9x}{4} = \dfrac{1}{x}$

$9x^2 = 4$

$x^2 = \dfrac{4}{9}$

$x = \pm\dfrac{2}{3}$

PTS: 2          REF: 081534a2     STA: A2.A.23     TOP: Solving Rationals
KEY: rational solutions

298 ANS: 2

$\sec\theta = \dfrac{\sqrt{x^2 + y^2}}{x} = \dfrac{\sqrt{(-4)^2 + 0^2}}{-4} = \dfrac{4}{-4} = -1$

PTS: 2          REF: 011520a2     STA: A2.A.62     TOP: Determining Trigonometric Functions

299 ANS: 3

$\cos 2A = 1 - 2\sin^2 A = 1 - 2\left(\dfrac{3}{8}\right)^2 = \dfrac{32}{32} - \dfrac{9}{32} = \dfrac{23}{32}$

PTS: 2          REF: 011510a2     STA: A2.A.77     TOP: Double Angle Identities
KEY: evaluating

300 ANS: 1

$\sqrt[3]{64a^5 b^6} = \sqrt[3]{4^3 a^3 a^2 b^6} = 4ab^2 \sqrt[3]{a^2}$

PTS: 2          REF: 011516a2     STA: A2.N.2      TOP: Operations with Radicals

301 ANS: 3

$$x^2 = 12x - 7$$

$$x^2 - 12x = -7$$

$$x^2 - 12x + 36 = -7 + 36$$

$$(x - 6)^2 = 29$$

PTS: 2    REF: 061505a2    STA: A2.A.24    TOP: Solving Quadratics
KEY: completing the square

302 ANS: 4    PTS: 2    REF: 061506a2    STA: A2.A.9
TOP: Negative Exponents

303 ANS:
Sum $\dfrac{-b}{a} = \dfrac{-2}{3}$.  Product $\dfrac{c}{a} = \dfrac{k}{3}$

PTS: 2    REF: 061534a2    STA: A2.A.20    TOP: Roots of Quadratics

304 ANS: 1

If $\sin \theta = \dfrac{15}{17}$, then $\cos \theta = \dfrac{8}{17}$.  $\tan \theta = \dfrac{\dfrac{8}{17}}{\dfrac{15}{17}} = \dfrac{8}{15}$

PTS: 2    REF: 081508a2    STA: A2.A.64    TOP: Using Inverse Trigonometric Functions
KEY: advanced

305 ANS: 2
$$P = \dfrac{c}{a} = \dfrac{-12}{3} = -4$$

PTS: 2    REF: 081506a2    STA: A2.A.20    TOP: Roots of Quadratics

306 ANS: 2    PTS: 2    REF: 011502a2    STA: A2.A.52
TOP: Identifying the Equation of a Graph

307 ANS: 2    PTS: 2    REF: 061521a2    STA: A2.A.44
TOP: Inverse of Functions    KEY: equations

308 ANS: 2
$4|2x + 6| < 32 \quad 2x + 6 < 8 \quad 2x + 6 > -8$

$\quad |2x + 6| < 8 \qquad 2x < 2 \qquad 2\dot{x} > -14$

$\qquad\qquad\qquad\qquad x < 1 \qquad x > -7$

PTS: 2    REF: 011612a2    STA: A2.A.1    TOP: Absolute Value Inequalities
KEY: graph

309 ANS:

$(x + 1)^3 = 64$

$x + 1 = 4$

$x = 3$

PTS: 2 REF: 061531a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: basic

310 ANS: 4

$\dfrac{91 - 82}{3.6} = 2.5\,\text{sd}$

PTS: 2 REF: 081521a2 STA: A2.S.5 TOP: Normal Distributions
KEY: interval

311 ANS: 1

$\dfrac{5}{4 - \sqrt{11}} \cdot \dfrac{4 + \sqrt{11}}{4 + \sqrt{11}} = \dfrac{5(4 + \sqrt{11})}{16 - 11} = \dfrac{5(4 + \sqrt{11})}{5} = 4 + \sqrt{11}$

PTS: 2 REF: 061509a2 STA: A2.N.5 TOP: Rationalizing Denominators

312 ANS: 2

$s = \theta\, r = \dfrac{2\pi}{5} \cdot 18 \approx 23$

PTS: 2 REF: 011526a2 STA: A2.A.61 TOP: Arc Length
KEY: arc length

313 ANS: 3 PTS: 2 REF: 011503a2 STA: A2.A.28
TOP: Logarithmic Equations KEY: basic

314 ANS: 2

$\cos\dfrac{\pi}{2} + \cos\pi + \cos\dfrac{3\pi}{2} = 0 + -1 + 0 = -1$

PTS: 2 REF: 011617a2 STA: A2.N.10 TOP: Sigma Notation
KEY: advanced

315 ANS: 1

$\sqrt[3]{27a^3} \cdot \sqrt[4]{16b^8} = 3a \cdot 2b^2 = 6ab^2$

PTS: 2 REF: 061504a2 STA: A2.A.14 TOP: Operations with Radicals
KEY: with variables | index > 2

316 ANS: 4

$g(-2) = 3(-2) - 2 = -8 \quad f(-8) = 2(-8)^2 + 1 = 128 + 1 = 129$

PTS: 2 REF: 061503a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: numbers

317 ANS: 1

$$\left(\frac{1}{2}\left(-\frac{1}{4}\right)\right)^2 = \frac{1}{64}$$

PTS: 2　　　　REF: 081527a2　　STA: A2.A.24　　TOP: Solving Quadratics
KEY: completing the square

318 ANS: 4

$$\left(\frac{3}{2}x - 1\right)\left[\left(\frac{3}{2}x + 1\right) - \left(\frac{3}{2}x - 1\right)\right] = \left(\frac{3}{2}x - 1\right)(2) = 3x - 2$$

PTS: 2　　　　REF: 011524a2　　STA: A2.N.3　　TOP: Operations with Polynomials
KEY: multiplication

319 ANS: 3　　　　PTS: 2　　　　REF: 011616a2　　STA: A2.S.8
TOP: Correlation Coefficient

320 ANS: 1

$$\sin 120 = \frac{\sqrt{3}}{2} \quad \csc 120 = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

PTS: 2　　　　REF: 081505a2　　STA: A2.A.59　　TOP: Reciprocal Trigonometric Relationships

321 ANS:

$$28^2 = 47^2 + 34^2 - 2(47)(34)\cos A$$

$$784 = 3365 - 3196\cos A$$

$$-2581 = -3196\cos A$$

$$\frac{2581}{3196} = \cos A$$

$$36 \approx A$$

PTS: 4　　　　REF: 061536a2　　STA: A2.A.73　　TOP: Law of Cosines
KEY: find angle

322 ANS: 2

$$2x^2 - (x + 2)^2 = 8$$

$$2x^2 - (x^2 + 4x + 4) - 8 = 0$$

$$x^2 - 4x - 12 = 0$$

$$(x - 6)(x + 2) = 0$$

$$x = 6, -2$$

PTS: 2　　　　REF: 011609a2　　STA: A2.A.3　　TOP: Quadratic-Linear Systems
KEY: equations

323 ANS: 4　　　　PTS: 2　　　　REF: 011513a2　　STA: A2.A.49
TOP: Equations of Circles

324 ANS: 2

$x - 2 = 3x + 10$ $-6$ is extraneous. $x - 2 = -3x - 10$

$-12 = 2x$ $\qquad\qquad\qquad$ $4x = -8$

$-6 = x$ $\qquad\qquad\qquad$ $x = -2$

PTS: 2 $\qquad$ REF: 061513a2 $\qquad$ STA: A2.A.1 $\qquad$ TOP: Absolute Value Equations

325 ANS: 1 $\qquad$ PTS: 2 $\qquad$ REF: 081501a2 $\qquad$ STA: A2.A.50
TOP: Zeros of Polynomials

326 ANS:

$\log_2 \left( \dfrac{x^2 - 7x + 12}{2x - 10} \right) = 3$ $\qquad$ $x = \dfrac{23 \pm \sqrt{(-23)^2 - 4(1)(92)}}{2(1)} \approx 17.84, 5.16$

$\dfrac{x^2 - 7x + 12}{2x - 10} = 8$

$x^2 - 7x + 12 = 16x - 80$

$x^2 - 23x + 92 = 0$

PTS: 6 $\qquad$ REF: 081539a2 $\qquad$ STA: A2.A.28 $\qquad$ TOP: Logarithmic Equations
KEY: applying properties of logarithms

327 ANS: 3

$p(5) - p(0) = 17(1.15)^{2(5)} - 17(1.15)^{2(0)} \approx 68.8 - 17 \approx 51$

PTS: 2 $\qquad$ REF: 061527a2 $\qquad$ STA: A2.A.12 $\qquad$ TOP: Functional Notation

328 ANS:

$25 \cdot 6 = 30q$

$5 = q$

PTS: 2 $\qquad$ REF: 011528a2 $\qquad$ STA: A2.A.5 $\qquad$ TOP: Inverse Variation

329 ANS: 4 $\qquad$ PTS: 2 $\qquad$ REF: 011601a2 $\qquad$ STA: A2.S.2
TOP: Analysis of Data

330 ANS:

$a_2 = 3(2)^{-2} = \dfrac{3}{4}$ $\quad$ $a_3 = 3\left(\dfrac{3}{4}\right)^{-2} = \dfrac{16}{3}$ $\quad$ $a_4 = 3\left(\dfrac{16}{3}\right)^{-2} = \dfrac{27}{256}$

PTS: 4 $\qquad$ REF: 011537a2 $\qquad$ STA: A2.A.33 $\qquad$ TOP: Sequences

331 ANS:

$$x^2(2x-1) - 4(2x-1) = 0$$

$$(x^2 - 4)(2x-1) = 0$$

$$(x+2)(x-2)(2x-1) = 0$$

$$x = \pm 2, \frac{1}{2}$$

PTS: 4      REF: 081537a2      STA: A2.A.26      TOP: Solving Polynomial Equations

332 ANS:

$$-130 \cdot \frac{\pi}{180} \approx -2.27$$

PTS: 2      REF: 011632a2      STA: A2.M.2      TOP: Radian Measure
KEY: radians

333 ANS: 2      PTS: 2      REF: 011521a2      STA: A2.A.39
TOP: Domain and Range      KEY: real domain, rational

334 ANS:

$$x^2(x+3) + 2(x+3) = (x^2+2)(x+3)$$

PTS: 2      REF: 011629a2      STA: A2.A.7      TOP: Factoring by Grouping

335 ANS:

$$\frac{8}{\sin 85} = \frac{2}{\sin C} \qquad 85 + 14.4 < 180 \quad \text{1 triangle}$$

$$C = \sin^{-1}\left(\frac{2\sin 85}{8}\right) \qquad 85 + 165.6 \geq 180$$

$$C \approx 14.4$$

PTS: 2      REF: 061529a2      STA: A2.A.75      TOP: Law of Sines - The Ambiguous Case

336 ANS: 4      PTS: 2      REF: 011627a2      STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions      KEY: period

337 ANS: 1

$$\frac{{}_9P_9}{4! \cdot 2! \cdot 2!} = \frac{362,880}{96} = 3,780$$

PTS: 2      REF: 061511a2      STA: A2.S.10      TOP: Permutations

338 ANS: 1
$-300° + 360° = 60°$, which terminates in Quadrant I.

PTS: 2      REF: 011602a2      STA: A2.A.60      TOP: Unit Circle

339 ANS: 1

$$\sqrt[4]{81x^2y^5} = 81^{\frac{1}{4}} x^{\frac{2}{4}} y^{\frac{5}{4}} = 3x^{\frac{1}{2}} y^{\frac{5}{4}}$$

PTS: 2      REF: 081504a2      STA: A2.A.11      TOP: Radicals as Fractional Exponents

340 ANS: 3
Cofunctions secant and cosecant are complementary

PTS: 2         REF: 011625a2     STA: A2.A.58     TOP: Cofunction Trigonometric Relationships

341 ANS: 3
$$r = \sqrt{(6-2)^2 + (2--3)^2} = \sqrt{16+25} = \sqrt{41}$$

PTS: 2         REF: 081516a2     STA: A2.A.48     TOP: Equations of Circles

342 ANS: 4
$$(-3-2i)(-3+2i) = 9 - 4i^2 = 9 + 4 = 13$$

PTS: 2         REF: 011512a2     STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

343 ANS:
$$594 = 32 \cdot 46 \sin C$$

$$\frac{594}{1472} = \sin C$$

$$23.8 \approx C$$

PTS: 2         REF: 011535a2     STA: A2.A.74     TOP: Using Trigonometry to Find Area
KEY: parallelograms

344 ANS: 3
$$\frac{2\pi}{2} = \pi$$

PTS: 2         REF: 081519a2     STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions          KEY: period

345 ANS:
$$2.5\left(\frac{180}{\pi}\right) = 143°14'$$

PTS: 2         REF: 081528a2     STA: A2.M.2     TOP: Radian Measure
KEY: degrees

346 ANS: 1
$$\frac{2\pi}{2} = \pi$$

$$\frac{\pi}{\pi} = 1$$

PTS: 2         REF: 061519a2     STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions          KEY: period

347 ANS: 3

$$\sin^2 x \left( 1 + \frac{\cos^2 x}{\sin^2 x} \right) = \sin^2 x + \cos^2 x = 1 \quad \frac{1}{\cos^2 x}(\cos^2 x) = 1 \quad \cos^2 x \left( \frac{\sin^2 x}{\cos^2 x} - 1 \right) = \sin^2 x - \cos^2 x \ne 1$$

$$\frac{\cos^2 x}{\sin^2 x} \left( \frac{1}{\cos^2 x} - 1 \right) = \frac{1}{\sin^2 x} - \frac{\cos^2 x}{\sin^2 x} = \csc^2 x - \cot x = 1$$

PTS: 2     REF: 011515a2     STA: A2.A.58     TOP: Reciprocal Trigonometric Relationships

348 ANS:

$$2xi(i - 4i^2) = 2xi^2 - 8xi^3 = 2xi^2 - 8xi^3 = -2x + 8xi$$

PTS: 2     REF: 011533a2     STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

349 ANS: 3

$$\frac{x}{x-1} + \frac{1}{2x-2} = \frac{2x}{2(x-1)} + \frac{1}{2(x-1)} = \frac{2x+1}{2(x-1)}$$

PTS: 2     REF: 011608a2     STA: A2.A.16     TOP: Addition and Subtraction of Rationals

350 ANS: 4     PTS: 2     REF: 061520a2     STA: A2.A.29
TOP: Sequences

351 ANS: 4

$$4x^2 + 3x - 4 = 0 \quad b^2 - 4ac = 3^2 - 4(4)(-4) = 9 + 64 = 73$$

PTS: 2     REF: 011618a2     STA: A2.A.2     TOP: Using the Discriminant
KEY: determine nature of roots given equation

352 ANS: 4

$$\sqrt{-180x^{16}} = 6x^8 i\sqrt{5}$$

PTS: 2     REF: 081524a2     STA: A2.N.6     TOP: Square Roots of Negative Numbers

353 ANS: 2

$$x^3 - 2x^2 - 9x + 18$$

$$x^2(x-2) - 9(x-2)$$

$$(x^2 - 9)(x - 2)$$

$$(x+3)(x-3)(x-2)$$

PTS: 2     REF: 011511a2     STA: A2.A.7     TOP: Factoring by Grouping

354 ANS: 1

$$\frac{_{11}P_{11}}{3!2!2!2!} = \frac{39,916,800}{48} = 831,600$$

PTS: 2     REF: 081512a2     STA: A2.S.10     TOP: Permutations

355 ANS:

$$\frac{(6-x)(6+x)}{(x+6)(x+6)} \cdot \frac{(x+6)(x-3)}{x-3} = 6-x$$

PTS: 2     REF: 011529a2     STA: A2.A.17     TOP: Complex Fractions

356 ANS:

$|3x-5| < x+17$  $3x-5 < x+17$ and $3x-5 > -x-17$  $-3 < x < 11$

$$2x < 22 \qquad\qquad 4x > -12$$

$$x < 11 \qquad\qquad x > -3$$

PTS: 4     REF: 081538a2     STA: A2.A.1     TOP: Absolute Value Inequalities

357 ANS: 1

$$\sqrt[3]{27a^{-6}b^3c^2} = 3a^{-2}bc^{\frac{2}{3}} = \frac{3bc^{\frac{2}{3}}}{a^2}$$

PTS: 2     REF: 011606a2     STA: A2.A.11     TOP: Radicals as Fractional Exponents

358 ANS: 2

$12 - 7 = 5$

PTS: 2     REF: 011525a2     STA: A2.S.4     TOP: Central Tendency and Dispersion
KEY: frequency

359 ANS: 2

$(-5)^2 - 4(1)(4) = 9$

PTS: 2     REF: 011506a2     STA: A2.A.2     TOP: Using the Discriminant

360 ANS: 1     PTS: 2     REF: 081520a2     STA: A2.A.33
TOP: Sequences

361 ANS: 3     PTS: 2     REF: 061515a2     STA: A2.N.3
TOP: Operations with Polynomials     KEY: subtraction

362 ANS:

$$\frac{\dfrac{1}{\cos^2 x} - 1}{\dfrac{1}{\cos^2 x}} \cdot \frac{\cos^2 x}{\cos^2 x} = \frac{1 - \cos^2 x}{1} = \sin^2 x$$

PTS: 2     REF: 081533a2     STA: A2.A.58     TOP: Reciprocal Trigonometric Relationships

363 ANS:

$$\frac{2}{3}x^3 + \frac{11}{8}x^2 - \frac{7}{9}x - \frac{2}{9}$$

PTS: 2     REF: 011635a2     STA: A2.N.3     TOP: Operations with Polynomials
KEY: subtraction

364  ANS: 2

$$x = 2 \cdot \frac{\sqrt{3}}{2} = \sqrt{3} \quad y = 2 \cdot \frac{1}{2} = 1$$

PTS: 2        REF: 061525a2        STA: A2.A.62        TOP: Determining Trigonometric Functions

365  ANS:
$x - 1 + x - 4 + x - 9 + x - 16 = 4x - 30$

PTS: 2        REF: 081535a2        STA: A2.N.10        TOP: Sigma Notation
KEY: advanced

366  ANS:

$$5^{4x} = \left(5^3\right)^{x-1}$$

$4x = 3x - 3$

$x = -3$

PTS: 2        REF: 061528a2        STA: A2.A.27        TOP: Exponential Equations
KEY: common base shown

367  ANS: 4        PTS: 2        REF: 081526a2        STA: A2.S.9
TOP: Differentiating Permutations and Combinations

368  ANS:
5.17   $84.46 \pm 5.17$

$79.29 - 89.63$

$5 + 7 + 5 = 17$

PTS: 4        REF: 061538a2        STA: A2.S.4        TOP: Dispersion
KEY: advanced, group frequency distributions

369  ANS: 3
$x(27i^6) + x(2i^{12}) = -27x + 2x = -25x$

PTS: 2        REF: 011620a2        STA: A2.N.7        TOP: Imaginary Numbers

370  ANS: 2        PTS: 2        REF: 061510a2        STA: A2.A.5
TOP: Inverse Variation

371  ANS:
$x^2(x - 6) - 25(x - 6)$

$(x^2 - 25)(x - 6)$

$(x + 5)(x - 5)(x - 6)$

PTS: 2        REF: 061532a2        STA: A2.A.7        TOP: Factoring by Grouping

372 ANS:

$$5\cos\theta - 2\sec\theta + 3 = 0$$

$$5\cos\theta - \frac{2}{\cos\theta} + 3 = 0$$

$$5\cos^2\theta + 3\cos\theta - 2 = 0$$

$$(5\cos\theta - 2)(\cos\theta + 1) = 0$$

$$\cos\theta = \frac{2}{5}, -1$$

$$\theta \approx 66.4, 293.6, 180$$

PTS: 6 REF: 061539a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: reciprocal functions

373 ANS:

$$\text{sd} = \frac{81 - 57}{3} = 8$$

$$57 + 8 = 65$$

$$81 - 2(8) = 65$$

PTS: 2 REF: 011534a2 STA: A2.S.5 TOP: Normal Distributions
KEY: mean and standard deviation

374 ANS: 1 PTS: 2 REF: 061516a2 STA: A2.A.46
TOP: Transformations with Functions

375 ANS:

$$\frac{1}{\sin\theta} \cdot \sin^2\theta \cdot \frac{\cos\theta}{\sin\theta} = \cos\theta$$

$$\cos\theta = \cos\theta$$

PTS: 2 REF: 011634a2 STA: A2.A.67 TOP: Proving Trigonometric Identities

376 ANS: 2 PTS: 2 REF: 011501a2 STA: A2.A.73
TOP: Law of Cosines KEY: side, without calculator

377 ANS: 3

$$_{20}C_4 = 4,845$$

PTS: 2 REF: 011509a2 STA: A2.S.11 TOP: Combinations

378 ANS: 3

$$\frac{40 - 10}{6 - 1} = \frac{30}{5} = 6 \quad a_n = 6n + 4$$

$$a_{20} = 6(20) + 4 = 124$$

PTS: 2 REF: 081510a2 STA: A2.A.32 TOP: Sequences

379 ANS:

$$\frac{16}{\sin A} = \frac{15}{\sin 40} \qquad \frac{10}{\sin 50} = \frac{12}{\sin C} \qquad \frac{d}{\sin 63.2} = \frac{12}{\sin 66.8}$$

$$\sin A = \frac{16\sin 40}{15} \qquad \sin C = \frac{12\sin 50}{10} \qquad d = \frac{12\sin 63.2}{\sin 66.8}$$

$$A \approx 43.3 \qquad\qquad C \approx 66.8 \qquad\qquad d \approx 11.7$$

PTS: 6      REF: 011639a2      STA: A2.A.73      TOP: Law of Sines
KEY: advanced

380 ANS: 3      PTS: 2      REF: 011604a2      STA: A2.A.38
TOP: Defining Functions      KEY: ordered pairs

381 ANS: 4

$$\cos \theta = -\frac{3}{5} \quad \sec \theta = -\frac{5}{3}$$

PTS: 2      REF: 011621a2      STA: A2.A.62      TOP: Determining Trigonometric Functions

382 ANS: 2      PTS: 2      REF: 061502a2      STA: A2.M.1
TOP: Radian Measure

383 ANS:

$$_7C_4\left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^3 = 35\left(\frac{16}{81}\right)\left(\frac{1}{27}\right) = \frac{560}{2187}$$

PTS: 2      REF: 081531a2      STA: A2.S.15      TOP: Binomial Probability
KEY: exactly

384 ANS:

$$\frac{3}{x} + \frac{x}{x+2} = -\frac{2}{x+2}$$

$$\frac{x+2}{x+2} = -\frac{3}{x}$$

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

$$x = -3$$

PTS: 4      REF: 061537a2      STA: A2.A.23      TOP: Solving Rationals
KEY: rational solutions

385 ANS:

$$r = \frac{6.6}{\frac{2}{3}} = 9.9$$

PTS: 2      REF: 081532a2      STA: A2.A.61      TOP: Arc Length
KEY: radius

386 ANS: 4

$$f(16) = 4(16)^{\frac{1}{2}} + 16^0 + 16^{-\frac{1}{4}}$$

$$= 4(4) + 1 + \frac{1}{2}$$

$$= 17\frac{1}{2}$$

PTS: 2      REF: 081503a2      STA: A2.N.1      TOP: Negative and Fractional Exponents

387 ANS: 2

$$\bar{x} \pm \sigma$$

$$153 \pm 22$$

$$131 - 175$$

PTS: 2      REF: 011307a2      STA: A2.S.5      TOP: Normal Distributions

KEY: interval

388 ANS: 1

$$_5C_2(2x)^{5-2}(-3)^2 = 720x^3$$

PTS: 2      REF: 011519a2      STA: A2.A.36      TOP: Binomial Expansions

389 ANS: 4

$$f(a+1) = 4(a+1)^2 - (a+1) + 1$$

$$= 4(a^2 + 2a + 1) - a$$

$$= 4a^2 + 8a + 4 - a$$

$$= 4a^2 + 7a + 4$$

PTS: 2      REF: 011527a2      STA: A2.A.41      TOP: Functional Notation

390 ANS:

$$_3C_1\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^2 = 3 \cdot \frac{1}{4} \cdot \frac{9}{16} = \frac{27}{64}$$

PTS: 2      REF: 061530a2      STA: A2.S.15      TOP: Binomial Probability

KEY: exactly

## Algebra 2/Trigonometry Regents at Random
## Answer Section

391 ANS: 1        PTS: 2        REF: fall0914a2     STA: A2.A.9
     TOP: Negative and Fractional Exponents

392 ANS: 3
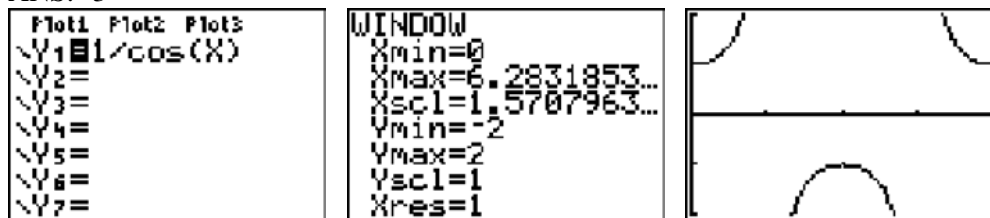


     PTS: 2        REF: 061020a2     STA: A2.A.71     TOP: Graphing Trigonometric Functions

393 ANS:
68% of the students are within one standard deviation of the mean. 16% of the students are more than one standard deviation above the mean.

     PTS: 2        REF: 011134a2     STA: A2.S.5     TOP: Normal Distributions
     KEY: percent

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

395 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

396 ANS: 1        PTS: 2        REF: 061025a2     STA: A2.A.34
     TOP: Sigma Notation

397 ANS: 2
$6(x^2 - 5) = 6x^2 - 30$

     PTS: 2        REF: 011109a2     STA: A2.A.42     TOP: Compositions of Functions
     KEY: variables

398 ANS:

```
1200e^(.065*10)
        2298.648995
■
```

2,298.65.

PTS: 2    REF: fall0932a2    STA: A2.A.12    TOP: Evaluating Exponential Expressions

399 ANS:

$\dfrac{\sqrt{13}}{2}$. $\sin \theta = \dfrac{y}{\sqrt{x^2 + y^2}} = \dfrac{2}{\sqrt{(-3)^2 + 2^2}} = \dfrac{2}{\sqrt{13}}$. $\csc \theta = \dfrac{\sqrt{13}}{2}$.

PTS: 2    REF: fall0933a2    STA: A2.A.62    TOP: Determining Trigonometric Functions

400 ANS: 4    PTS: 2    REF: fall0908a2    STA: A2.A.38
TOP: Defining Functions    KEY: graphs

401 ANS:
$-3, -5, -8, -12$

PTS: 2    REF: fall0934a2    STA: A2.A.33    TOP: Sequences

402 ANS: 4
$2 \log_4 (5x) = 3$

$\log_4 (5x) = \dfrac{3}{2}$

$5x = 4^{\frac{3}{2}}$

$5x = 8$

$x = \dfrac{8}{5}$

PTS: 2    REF: fall0921a2    STA: A2.A.28    TOP: Logarithmic Equations
KEY: advanced

403 ANS: 2    PTS: 2    REF: fall0926a2    STA: A2.A.46
TOP: Graphing Quadratic Functions

404 ANS: 3    PTS: 2    REF: 011110a2    STA: A2.A.30
TOP: Sequences

405 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

406 ANS:

$$\frac{23}{2} \qquad \cos^2 B + \sin^2 B = 1 \qquad \tan B = \frac{\sin B}{\cos B} = \frac{\frac{5}{\sqrt{41}}}{\frac{4}{\sqrt{41}}} = \frac{5}{4} \quad \tan(A+B) = \frac{\frac{2}{3} + \frac{5}{4}}{1 - \left(\frac{2}{3}\right)\left(\frac{5}{4}\right)} = \frac{\frac{8+15}{12}}{\frac{12}{12} - \frac{10}{12}} = \frac{\frac{23}{12}}{\frac{2}{12}} = \frac{23}{2}$$

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

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

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

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

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

407 ANS: 1
$$_5C_3 (3x)^2 (-2)^3 = 10 \cdot 9x^2 \cdot -8 = -720x^2$$

PTS: 2          REF: fall0919a2          STA: A2.A.36          TOP: Binomial Expansions

408 ANS: 2
$$\frac{11\pi}{12} \cdot \frac{180}{\pi} = 165$$

PTS: 2          REF: 061002a2          STA: A2.M.2          TOP: Radian Measure
KEY: degrees

409 ANS: 4          PTS: 2          REF: 011124a2          STA: A2.A.18
TOP: Evaluating Logarithmic Expressions

410 ANS: 4
Students entering the library are more likely to spend more time studying, creating bias.

PTS: 2          REF: fall0904a2          STA: A2.S.2          TOP: Analysis of Data

411 ANS: 4
$$4ab\sqrt{2b} - 3a\sqrt{9b^2}\sqrt{2b} + 7ab\sqrt{6b} = 4ab\sqrt{2b} - 9ab\sqrt{2b} + 7ab\sqrt{6b} = -5ab\sqrt{2b} + 7ab\sqrt{6b}$$

PTS: 2          REF: fall0918a2          STA: A2.A.14          TOP: Operations with Radicals
KEY: with variables | index = 2

412 ANS:
$$\frac{\sqrt{108x^5 y^8}}{\sqrt{6xy^5}} = \sqrt{18x^4 y^3} = 3x^2 y\sqrt{2y}$$

PTS: 2          REF: 011133a2          STA: A2.A.14          TOP: Operations with Radicals
KEY: with variables | index = 2

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

414 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

415 ANS: 1      PTS: 2      REF: 061004a2      STA: A2.A.52
TOP: Identifying the Equation of a Graph

416 ANS: 1

$$\sqrt[4]{16x^2y^7} = 16^{\frac{1}{4}} x^{\frac{2}{4}} y^{\frac{7}{4}} = 2x^{\frac{1}{2}} y^{\frac{7}{4}}$$

PTS: 2      REF: 061107a2      STA: A2.A.11      TOP: Radicals as Fractional Exponents

417 ANS:

$$y = 2.001x^{2.298}, \; 1,009. \; y = 2.001(15)^{2.298} \approx 1009$$

PTS: 4      REF: fall0938a2      STA: A2.S.7      TOP: Power Regression

418 ANS:

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

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

419 ANS:

$$12 \cdot 6 = 9w$$

$$8 = w$$

PTS: 2      REF: 011130a2      STA: A2.A.5      TOP: Inverse Variation

420 ANS: 4      PTS: 2      REF: 061005a2      STA: A2.A.50
TOP: Zeros of Polynomials

421 ANS: 3

$$\frac{3^{-2}}{(-2)^{-3}} = \frac{\frac{1}{9}}{-\frac{1}{8}} = -\frac{8}{9}$$

PTS: 2      REF: 061003a2      STA: A2.N.1      TOP: Negative and Fractional Exponents

422 ANS: 3

```
1-Var Stats L₁,L  σx²
2                    67.31102041
```

PTS: 2　　　　　REF: fall0924a2　　STA: A2.S.4　　　TOP: Dispersion
KEY: basic, group frequency distributions

423 ANS: 2　　　　　PTS: 2　　　　REF: 061011a2　　STA: A2.A.10
TOP: Fractional Exponents as Radicals

424 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

425 ANS:

$x^2 - 6x - 27 = 0,$ $\dfrac{-b}{a} = 6.$ $\dfrac{c}{a} = -27.$ If $a = 1$ then $b = -6$ and $c = -27$

PTS: 4　　　　　REF: 061130a2　　STA: A2.A.21　　TOP: Roots of Quadratics
KEY: basic

426 ANS: 4

$$\frac{2\pi}{b} = \frac{2\pi}{\frac{1}{3}} = 6\pi$$

PTS: 2　　　　　REF: 061027a2　　STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions　　　　KEY: period

427 ANS:
7.4

PTS: 2　　　　　REF: 061029a2　　STA: A2.S.4　　　TOP: Dispersion
KEY: basic, group frequency distributions

428 ANS: 2

$$x^3 + x^2 - 2x = 0$$

$$x(x^2 + x - 2) = 0$$

$$x(x + 2)(x - 1) = 0$$

$$x = 0, -2, 1$$

PTS: 2   REF: 011103a2   STA: A2.A.26   TOP: Solving Polynomial Equations

429 ANS: 1

$$\sqrt{12^2 - 6^2} = \sqrt{108} = \sqrt{36}\sqrt{3} = 6\sqrt{3}. \ \cot J = \frac{A}{O} = \frac{6}{6\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

PTS: 2   REF: 011120a2   STA: A2.A.55   TOP: Trigonometric Ratios

430 ANS: 4

$$\frac{3 \pm \sqrt{(-3)^2 - 4(1)(-9)}}{2(1)} = \frac{3 \pm \sqrt{45}}{2} = \frac{3 \pm 3\sqrt{5}}{2}$$

PTS: 2   REF: 061009a2   STA: A2.A.25   TOP: Quadratics with Irrational Solutions

431 ANS: 2   PTS: 2   REF: 061021a2   STA: A2.S.8
TOP: Correlation Coefficient

432 ANS: 4

$$x^{-\frac{2}{5}} = \frac{1}{x^{\frac{2}{5}}} = \frac{1}{\sqrt[5]{x^2}}$$

PTS: 2   REF: 011118a2   STA: A2.A.10   TOP: Fractional Exponents as Radicals

433 ANS:

Sum $\dfrac{-b}{a} = -\dfrac{11}{5}$. Product $\dfrac{c}{a} = -\dfrac{3}{5}$

PTS: 2   REF: 061030a2   STA: A2.A.20   TOP: Roots of Quadratics

434 ANS:

$$\frac{12x^2}{y^9} \cdot \frac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}} = \frac{3y^5(2x^3y^{-7})^2}{x^4} = \frac{3y^5(4x^6y^{-14})}{x^4} = \frac{12x^6y^{-9}}{x^4} = \frac{12x^2}{y^9}$$

PTS: 2   REF: 061134a2   STA: A2.A.9   TOP: Negative Exponents

435 ANS: 3

$3x + 16 = (x + 2)^2$     . −4 is an extraneous solution.

$3x + 16 = x^2 + 4x + 4$

$0 = x^2 + x - 12$

$0 = (x + 4)(x - 3)$

$x = -4 \quad x = 3$

PTS: 2          REF: 061121a2      STA: A2.A.22      TOP: Solving Radicals
KEY: extraneous solutions

436 ANS:

$b^2 - 4ac = 0$

$k^2 - 4(1)(4) = 0$

$k^2 - 16 = 0$

$(k + 4)(k - 4) = 0$

$k = \pm 4$

PTS: 2          REF: 061028a2      STA: A2.A.2      TOP: Using the Discriminant
KEY: determine equation given nature of roots

437 ANS:

$\ln(T - T_0) = -kt + 4.718$   . $\ln(T - 68) = -0.104(10) + 4.718$.

$\ln(150 - 68) = -k(3) + 4.718$   $\ln(T - 68) = 3.678$

$4.407 \approx -3k + 4.718$        $T - 68 \approx 39.6$

$k \approx 0.104$                  $T \approx 108$

PTS: 6          REF: 011139a2      STA: A2.A.28      TOP: Logarithmic Equations
KEY: advanced

438 ANS: 4

$S_n = \dfrac{n}{2}[2a + (n - 1)d] = \dfrac{21}{2}[2(18) + (21 - 1)2] = 798$

PTS: 2          REF: 061103a2      STA: A2.A.35      TOP: Series
KEY: arithmetic

439 ANS:

no solution.   $\dfrac{4x}{x-3} = 2 + \dfrac{12}{x-3}$

$\dfrac{4x - 12}{x - 3} = 2$

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

$4 \neq 2$

PTS: 2          REF: fall0930a2     STA: A2.A.23     TOP: Solving Rationals
KEY: rational solutions

440 ANS:

no. over 20 is more than 1 standard deviation above the mean. $0.159 \cdot 82 \approx 13.038$

PTS: 2          REF: 061129a2     STA: A2.S.5     TOP: Normal Distributions
KEY: predict

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

442 ANS: 2
$(3 - 7i)(3 - 7i) = 9 - 21i - 21i + 49i^2 = 9 - 42i - 49 = -40 - 42i$

PTS: 2          REF: fall0901a2     STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

443 ANS: 3          PTS: 2          REF: fall0910a2     STA: A2.A.76
TOP: Angle Sum and Difference Identities          KEY: simplifying

444 ANS: 4          PTS: 2          REF: 011101a2     STA: A2.A.38
TOP: Defining Functions          KEY: graphs

445 ANS:

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

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

446 ANS:

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

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

447  ANS:  1

$4a + 6 = 4a - 10.$  $4a + 6 = -4a + 10.$  $\left|4\left(\dfrac{1}{2}\right) + 6\right| - 4\left(\dfrac{1}{2}\right) = -10$

$6 \neq -10$       $8a = 4$

$8 - 2 \neq -10$

$a = \dfrac{4}{8} = \dfrac{1}{2}$

PTS:  2       REF:  011106a2       STA:  A2.A.1       TOP:  Absolute Value Equations

448  ANS:

$3 \pm \sqrt{7}.$  $2x^2 - 12x + 4 = 0$

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

$x^2 - 6x = -2$

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

$(x - 3)^2 = 7$

$x - 3 = \pm\sqrt{7}$

$x = 3 \pm \sqrt{7}$

PTS:  4       REF:  fall0936a2       STA:  A2.A.24       TOP:  Solving Quadratics
KEY:  completing the square

449  ANS:  3

$x^2 - 3x - 10 > 0$               or

$(x - 5)(x + 2) > 0$     $x - 5 < 0$ and $x + 2 < 0$

$x - 5 > 0$ and $x + 2 > 0$     $x < 5$ and $x < -2$

$x > 5$ and $x > -2$               $x < -2$

$x > 5$

PTS:  2       REF:  011115a2       STA:  A2.A.4       TOP:  Quadratic Inequalities
KEY:  one variable

450  ANS:  3
$x = 5^4 = 625$

PTS:  2       REF:  061106a2       STA:  A2.A.28       TOP:  Logarithmic Equations
KEY:  basic

451  ANS:  2
$f^{-1}(x) = \log_4 x$

PTS:  2       REF:  fall0916a2       STA:  A2.A.54       TOP:  Graphing Logarithmic Functions

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

453   ANS:  4               PTS:  2            REF:  061124a2      STA:  A2.S.3
      TOP:  Average Known with Missing Data
454   ANS:  4               PTS:  2            REF:  fall0925a2     STA:  A2.S.10
      TOP:  Permutations
455   ANS:



$y = 0$
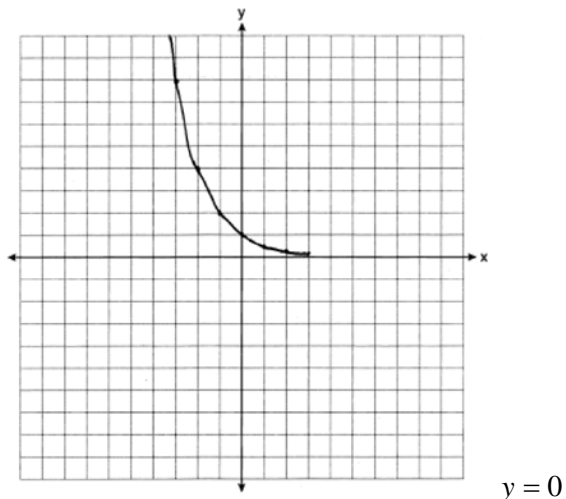
      PTS:  2               REF:  061031a2      STA:  A2.A.53      TOP:  Graphing Exponential Functions
456   ANS:  4
      $6x - x^3 - x^2 = -x(x^2 + x - 6) = -x(x + 3)(x - 2)$

      PTS:  2               REF:  fall0917a2     STA:  A2.A.7       TOP:  Factoring Polynomials
      KEY:  single variable
457   ANS:  1               PTS:  2            REF:  061013a2      STA:  A2.A.38
      TOP:  Defining Functions
458   ANS:  1
      $-420\left(\dfrac{\pi}{180}\right) = -\dfrac{7\pi}{3}$

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

```
3.45*180/π
        197.6704393
Ans▶DMS
    197°40'13.582"
■
```
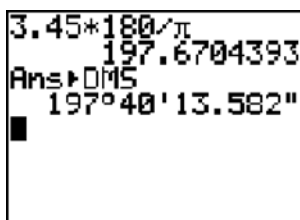
      197°40'.  $3.45 \times \dfrac{180}{\pi} \approx 197°40'$.

      PTS:  2               REF:  fall0931a2     STA:  A2.M.2       TOP:  Radian Measure
      KEY:  degrees

460 ANS: 1
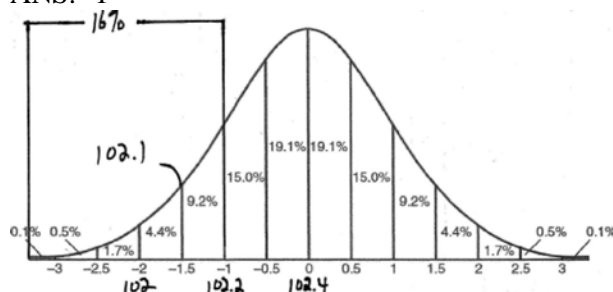


PTS: 2        REF: fall0915a2      STA: A2.S.5      TOP: Normal Distributions
KEY: interval

461 ANS:

$12t^8 - 75t^4 = 3t^4(4t^4 - 25) = 3t^4(2t^2 + 5)(2t^2 - 5)$

PTS: 2        REF: 061133a2      STA: A2.A.7
TOP: Factoring the Difference of Perfect Squares

462 ANS: 3

Cofunctions tangent and cotangent are complementary

PTS: 2        REF: 061014a2      STA: A2.A.58      TOP: Cofunction Trigonometric Relationships

463 ANS: 3        PTS: 2        REF: 061114a2      STA: A2.A.38
TOP: Defining Functions        KEY: graphs

464 ANS:

$\sin(45 + 30) = \sin 45 \cos 30 + \cos 45 \sin 30$

$$= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4}$$

PTS: 4        REF: 061136a2      STA: A2.A.76      TOP: Angle Sum and Difference Identities
KEY: evaluating

465 ANS:

No. TENNESSEE: $\dfrac{_9P_9}{4! \cdot 2! \cdot 2!} = \dfrac{362,880}{96} = 3,780.$ VERMONT: $_7P_7 = 5,040$

PTS: 4        REF: 061038a2      STA: A2.S.10      TOP: Permutations

466 ANS: 1

$_9C_3 a^6(-4b)^3 = -5376a^6b^3$

PTS: 2        REF: 061126a2      STA: A2.A.36      TOP: Binomial Expansions

467 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

468 ANS: 3

$$75000 = 25000e^{.0475t}$$

$$3 = e^{.0475t}$$

$$\ln 3 = \ln e^{.0475t}$$

$$\frac{\ln 3}{.0475} = \frac{.0475t \cdot \ln e}{.0475}$$

$$23.1 \approx t$$

PTS: 2        REF: 061117a2       STA: A2.A.6       TOP: Exponential Growth

469 ANS:

$$2.5 \cdot \frac{180}{\pi} \approx 143.2°$$

PTS: 2        REF: 011129a2       STA: A2.M.2       TOP: Radian Measure
KEY: degrees

470 ANS: 2

$$\frac{10}{\sin 35} = \frac{13}{\sin B} \quad . \quad 35 + 48 < 180$$

$$B \approx 48, 132 \quad 35 + 132 < 180$$

PTS: 2        REF: 011113a2       STA: A2.A.75       TOP: Law of Sines - The Ambiguous Case

471 ANS: 3

$$f(4) = \frac{1}{2}(4) - 3 = -1. \quad g(-1) = 2(-1) + 5 = 3$$

PTS: 2        REF: fall0902a2       STA: A2.A.42       TOP: Compositions of Functions
KEY: numbers

472 ANS: 3

$$S = \frac{-b}{a} = \frac{-(-3)}{4} = \frac{3}{4}. \quad P = \frac{c}{a} = \frac{-8}{4} = -2$$

PTS: 2        REF: fall0912a2       STA: A2.A.21       TOP: Roots of Quadratics
KEY: basic

473 ANS: 4

$$\frac{2x+4}{\sqrt{x+2}} \cdot \frac{\sqrt{x+2}}{\sqrt{x+2}} = \frac{2(x+2)\sqrt{x+2}}{x+2} = 2\sqrt{x+2}$$

PTS: 2        REF: 011122a2       STA: A2.A.15       TOP: Rationalizing Denominators
KEY: index = 2

474 ANS: 2
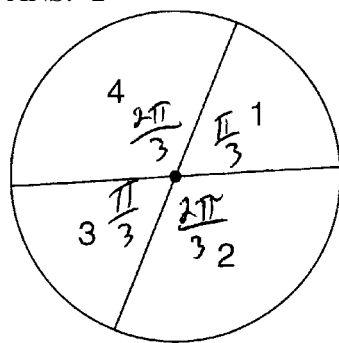


$$\frac{\frac{\pi}{3}+\frac{\pi}{3}}{2\pi}=\frac{\frac{2\pi}{3}}{2\pi}=\frac{1}{3}$$

     PTS: 2          REF: 011108a2     STA: A2.S.13     TOP: Geometric Probability

475 ANS:

$$16^{2x+3}=64^{x+2}$$

$$(4^2)^{2x+3}=(4^3)^{x+2}$$

$$4x+6=3x+6$$

$$x=0$$

     PTS: 2          REF: 011128a2     STA: A2.A.27     TOP: Exponential Equations
     KEY: common base not shown

476 ANS: 3          PTS: 2          REF: 061001a2     STA: A2.A.30
     TOP: Sequences

477 ANS: 4          PTS: 2          REF: 061120a2     STA: A2.A.19
     TOP: Properties of Logarithms     KEY: splitting logs

478 ANS: 3          PTS: 2          REF: 061022a2     STA: A2.A.63
     TOP: Domain and Range

479 ANS: 3

$$a_n=5(-2)^{n-1}$$

$$a_{15}=5(-2)^{15-1}=81,920$$

     PTS: 2          REF: 011105a2     STA: A2.A.32     TOP: Sequences

480 ANS: 1          PTS: 2          REF: 061018a2     STA: A2.A.22
     TOP: Solving Radicals     KEY: extraneous solutions

481 ANS:

     $y=x^2-6$. $f^{-1}(x)$ is not a function.

$$x=y^2-6$$

$$x+6=y^2$$

$$\pm\sqrt{x+6}=y$$

     PTS: 2          REF: 061132a2     STA: A2.A.44     TOP: Inverse of Functions
     KEY: equations

482 ANS: 1
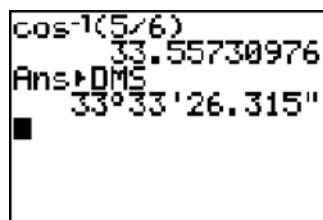


$$\cos K = \frac{5}{6}$$

$$K = \cos^{-1}\frac{5}{6}$$

$$K \approx 33°33'$$

PTS: 2    REF: 061023a2    STA: A2.A.55    TOP: Trigonometric Ratios

483 ANS: 4
$s = \theta\, r = 2 \cdot 4 = 8$

PTS: 2    REF: fall0922a2    STA: A2.A.61    TOP: Arc Length
KEY: arc length

484 ANS: 3    PTS: 2    REF: fall0923a2    STA: A2.A.39
TOP: Domain and Range    KEY: real domain, radical

485 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

486 ANS:
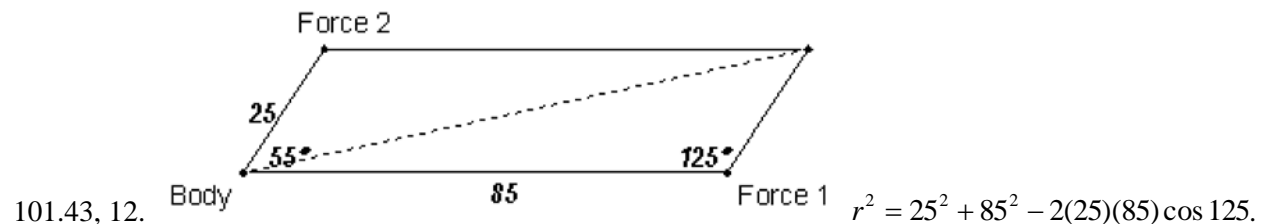


101.43, 12.

$r^2 = 25^2 + 85^2 - 2(25)(85)\cos 125.$

$r^2 \approx 10287.7$

$r \approx 101.43$

$$\frac{2.5}{\sin x} = \frac{101.43}{\sin 125}$$

$$x \approx 12$$

PTS: 6    REF: fall0939a2    STA: A2.A.73    TOP: Vectors

14

487 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

488 ANS:

0.167. $_{10}C_8 \cdot 0.6^8 \cdot 0.4^2 + _{10}C_9 \cdot 0.6^9 \cdot 0.4^1 + _{10}C_{10} \cdot 0.6^{10} \cdot 0.4^0 \approx 0.167$

PTS: 4   REF: 061036a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

489 ANS:

$(x+3)^2 + (y-4)^2 = 25$

PTS: 2   REF: fall0929a2   STA: A2.A.49   TOP: Writing Equations of Circles

490 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

491 ANS: 1
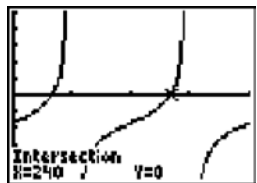


$\tan\theta - \sqrt{3} = 0$

$\quad \tan\theta = \sqrt{3}$

$\qquad \theta = \tan^{-1}\sqrt{3}$

$\qquad \theta = 60, 240$

PTS: 2   REF: fall0903a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: basic

492 ANS: 1

$y \geq x^2 - x - 6$

$y \geq (x-3)(x+2)$

PTS: 2   REF: 061017a2   STA: A2.A.4   TOP: Quadratic Inequalities
KEY: two variables

493 ANS: 3

$$4^{x^2+4x} = 2^{-6}. \qquad 2x^2 + 8x = -6$$

$$(2^2)^{x^2+4x} = 2^{-6} \qquad 2x^2 + 8x + 6 = 0$$

$$2^{2x^2+8x} = 2^{-6} \qquad x^2 + 4x + 3 = 0$$

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

$$x = -3 \quad x = -1$$

PTS: 2 REF: 061015a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base shown

494 ANS: 4 PTS: 2 REF: 011111a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

495 ANS:

$$e^{3\ln 2} = e^{\ln 2^3} = e^{\ln 8} = 8$$

PTS: 2 REF: 061131a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

496 ANS: 4 PTS: 2 REF: 061101a2 STA: A2.S.1
TOP: Analysis of Data

497 ANS: 1
$$\cos^2\theta - \cos 2\theta = \cos^2\theta - (\cos^2\theta - \sin^2\theta) = \sin^2\theta$$

PTS: 2 REF: 061024a2 STA: A2.A.77 TOP: Double Angle Identities
KEY: simplifying

498 ANS: 1
$$6x - 7 \le 5 \quad 6x - 7 \ge -5$$

$$6x \le 12 \qquad 6x \ge 2$$

$$x \le 2 \qquad x \ge \frac{1}{3}$$

PTS: 2 REF: fall0905a2 STA: A2.A.1 TOP: Absolute Value Inequalities
KEY: graph

499 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

500 ANS:

$$\frac{51}{243}. \quad {}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2 = \frac{40}{243}$$

$$\quad {}_5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)^1 = \frac{10}{243}$$

$$\quad {}_5C_5\left(\frac{1}{3}\right)^5\left(\frac{2}{3}\right)^0 = \frac{1}{243}$$

    PTS: 4           REF: 061138a2    STA: A2.S.15    TOP: Binomial Probability
    KEY: at least or at most

501 ANS: 1

$$\frac{\sqrt{3}+5}{\sqrt{3}-5}\cdot\frac{\sqrt{3}+5}{\sqrt{3}+5} = \frac{3+5\sqrt{3}+5\sqrt{3}+25}{3-25} = \frac{28+10\sqrt{3}}{-22} = -\frac{14+5\sqrt{3}}{11}$$

    PTS: 2           REF: 061012a2    STA: A2.N.5    TOP: Rationalizing Denominators

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

503 ANS: 4           PTS: 2           REF: 011127a2    STA: A2.S.1
    TOP: Analysis of Data

504 ANS: 1

$$13^2 = 15^2 + 14^2 - 2(15)(14)\cos C$$

$$169 = 421 - 420\cos C$$

$$-252 = -420\cos C$$

$$\frac{252}{420} = \cos C$$

$$53 \approx C$$

    PTS: 2           REF: 061110a2    STA: A2.A.73    TOP: Law of Cosines
    KEY: find angle

505 ANS: 3           PTS: 2           REF: 011119a2    STA: A2.A.52
    TOP: Families of Functions

506 ANS:

$\pm\dfrac{3}{2}, -\dfrac{1}{2}.$      $8x^3 + 4x^2 - 18x - 9 = 0$

$$4x^2(2x + 1) - 9(2x + 1) = 0$$

$$(4x^2 - 9)(2x + 1) = 0$$

$$4x^2 - 9 = 0 \text{ or } 2x + 1 = 0$$

$$(2x + 3)(2x - 3) = 0 \quad x = -\dfrac{1}{2}$$

$$x = \pm\dfrac{3}{2}$$

PTS: 4          REF: fall0937a2     STA: A2.A.26     TOP: Solving Polynomial Equations

507 ANS: 3

$$\dfrac{4}{5 - \sqrt{13}} \cdot \dfrac{5 + \sqrt{13}}{5 + \sqrt{13}} = \dfrac{4(5 + \sqrt{13})}{25 - 13} = \dfrac{5 + \sqrt{13}}{3}$$

PTS: 2          REF: 061116a2       STA: A2.N.5      TOP: Rationalizing Denominators

508 ANS: 3

$\dfrac{-b}{a} = \dfrac{-6}{2} = -3. \quad \dfrac{c}{a} = \dfrac{4}{2} = 2$

PTS: 2          REF: 011121a2       STA: A2.A.21     TOP: Roots of Quadratics
KEY: basic

509 ANS: 4

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

$49 = 34 - 30\cos A$

$15 = -30\cos A$

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

$120 = A$

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

510 ANS: 2

$8^2 = 64$

PTS: 2          REF: fall0909a2     STA: A2.A.18     TOP: Evaluating Logarithmic Expressions

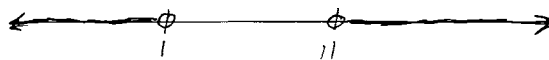511 ANS: 3          PTS: 2          REF: 061127a2      STA: A2.S.6
TOP: Regression

512  ANS:

$-3|6-x| < -15$  .

$|6-x| > 5$

$6 - x > 5$ or $6 - x < -5$

$1 > x$ or $11 < x$

PTS: 2          REF: 061137a2     STA: A2.A.1       TOP: Absolute Value Inequalities
KEY: graph

513  ANS: 2

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

$x^2 - 2x + 1 + y^2 + 6y + 9 = -3 + 1 + 9$

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

PTS: 2          REF: 061016a2     STA: A2.A.47      TOP: Equations of Circles

514  ANS: 2

```
tan(126°43')
    -1.340788784
■
```
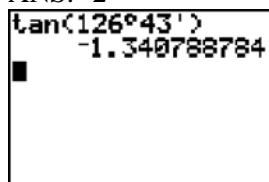
PTS: 2          REF: 061115a2     STA: A2.A.66      TOP: Determining Trigonometric Functions

515  ANS:

$32x^5 - 80x^4 + 80x^3 - 40x^2 + 10x - 1$.  $_5C_0(2x)^5(-1)^0 = 32x^5$.  $_5C_1(2x)^4(-1)^1 = -80x^4$.  $_5C_2(2x)^3(-1)^2 = 80x^3$.

$_5C_3(2x)^2(-1)^3 = -40x^2$.  $_5C_4(2x)^1(-1)^4 = 10x$.  $_5C_5(2x)^0(-1)^5 = -1$

PTS: 4          REF: 011136a2     STA: A2.A.36      TOP: Binomial Expansions

516  ANS: 2          PTS: 2          REF: 011126a2     STA: A2.A.49
TOP: Equations of Circles

517  ANS:

$0, 60, 180, 300$.          $\sin 2\theta = \sin \theta$

$\sin 2\theta - \sin \theta = 0$

$2\sin \theta \cos \theta - \sin \theta = 0$

$\sin \theta(2\cos \theta - 1) = 0$

$\sin \theta = 0 \quad 2\cos \theta - 1 = 0$

$\theta = 0, 180 \quad \cos \theta = \dfrac{1}{2}$

$\theta = 60, 300$

PTS: 4          REF: 061037a2     STA: A2.A.68      TOP: Trigonometric Equations
KEY: double angle identities

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

519 ANS:
D: $-5 \le x \le 8$. R: $-3 \le y \le 2$

PTS: 2 REF: 011132a2 STA: A2.A.51 TOP: Domain and Range
KEY: graph

520 ANS: 3 PTS: 2 REF: 061007a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

521 ANS: 3

| $n$ | 0 | 1 | 2 | Σ |
|---|---|---|---|---|
| $n^2 + 2^n$ | $0^2 + 2^0 = 1$ | $1^2 + 2^2 = 3$ | $2^2 + 2^2 = 8$ | 12 |

$2 \times 12 = 24$

PTS: 2 REF: fall0911a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

522 ANS: 2 PTS: 2 REF: 061122a2 STA: A2.A.24
TOP: Solving Quadratics KEY: completing the square

523 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

524 ANS: 3 PTS: 2 REF: 061119a2 STA: A2.A.65
TOP: Graphing Trigonometric Functions

525 ANS: 1
$a_n = -\sqrt{5}(-\sqrt{2})^{n-1}$

$a_{15} = -\sqrt{5}(-\sqrt{2})^{15-1} = -\sqrt{5}(-\sqrt{2})^{14} = -\sqrt{5} \cdot 2^7 = -128\sqrt{5}$

PTS: 2 REF: 061109a2 STA: A2.A.32 TOP: Sequences

20

526 ANS: 2

$$x^2 + 2 = 6x$$

$$x^2 - 6x = -2$$

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

$$(x - 3)^2 = 7$$

PTS: 2          REF: 011116a2     STA: A2.A.24       TOP: Solving Quadratics
KEY: completing the square

527 ANS: 2
The roots are $-1, 2, 3$.

PTS: 2          REF: 081023a2     STA: A2.A.50       TOP: Zeros of Polynomials

528 ANS: 3

$$\frac{\sin^2 \theta + \cos^2 \theta}{1 - \sin^2 \theta} = \frac{1}{\cos^2 \theta} = \sec^2 \theta$$

PTS: 2          REF: 061123a2     STA: A2.A.58       TOP: Reciprocal Trigonometric Relationships

529 ANS: 3          PTS: 2          REF: 011104a2     STA: A2.A.64
TOP: Using Inverse Trigonometric Functions          KEY: unit circle

530 ANS:

$$\frac{12}{\sin 32} = \frac{10}{\sin B} \qquad .\ C \approx 180 - (32 + 26.2) \approx 121.8.\ \frac{12}{\sin 32} = \frac{c}{\sin 121.8}$$

$$B = \sin^{-1} \frac{10 \sin 32}{12} \approx 26.2 \qquad\qquad c = \frac{12 \sin 121.8}{\sin 32} \approx 19.2$$

PTS: 4          REF: 011137a2     STA: A2.A.73       TOP: Law of Sines
KEY: basic

531 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

532 ANS:

$\left(-\dfrac{9}{2}, \dfrac{1}{2}\right)$ and $\left(\dfrac{1}{2}, \dfrac{11}{2}\right)$. $y = x + 5$ . $4x^2 + 17x - 4 = x + 5$

$\qquad\qquad\qquad\qquad y = 4x^2 + 17x - 4 \quad 4x^2 + 16x - 9 = 0$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad (2x + 9)(2x - 1) = 0$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad x = -\dfrac{9}{2} \text{ and } x = \dfrac{1}{2}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad y = -\dfrac{9}{2} + 5 = \dfrac{1}{2} \text{ and } y = \dfrac{1}{2} + 5 = \dfrac{11}{2}$

PTS: 6　　　REF: 061139a2　　STA: A2.A.3　　TOP: Quadratic-Linear Systems
KEY: algebraically

533 ANS: 4

$y - 2\sin\theta = 3$

$\qquad y = 2\sin\theta + 3$

$\quad f(\theta) = 2\sin\theta + 3$

PTS: 2　　　REF: fall0927a2　　STA: A2.A.40　　TOP: Functional Notation

534 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

535 ANS: 4

$9^{3x+1} = 27^{x+2}$ .

$(3^2)^{3x+1} = (3^3)^{x+2}$

$3^{6x+2} = 3^{3x+6}$

$6x + 2 = 3x + 6$

$3x = 4$

$x = \dfrac{4}{3}$

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

536 ANS: 1　　　PTS: 2　　　REF: 011112a2　　STA: A2.A.64
TOP: Using Inverse Trigonometric Functions　　　　KEY: advanced

537 ANS: 2　　　PTS: 2　　　REF: 011114a2　　STA: A2.N.3
TOP: Operations with Polynomials　　KEY: subtraction

538 ANS: 4　　　PTS: 2　　　REF: 061112a2　　STA: A2.A.39
TOP: Domain and Range　　KEY: real domain, quadratic

539 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

540 ANS: 2
$$\frac{2\pi}{b} = \frac{2\pi}{3}$$

PTS: 2      REF: 061111a2      STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions      KEY: period

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

542 ANS:
$0.468.$ $_8C_6\left(\frac{2}{3}\right)^6\left(\frac{1}{3}\right)^2 \approx 0.27313.$ $_8C_7\left(\frac{2}{3}\right)^7\left(\frac{1}{3}\right)^1 \approx 0.15607.$ $_8C_8\left(\frac{2}{3}\right)^8\left(\frac{1}{3}\right)^0 \approx 0.03902.$

PTS: 4      REF: 011138a2      STA: A2.S.15      TOP: Binomial Probability
KEY: at least or at most

543 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: algebraically

544 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

545 ANS:
$$\frac{\frac{1}{2} - \frac{4}{d}}{\frac{1}{d} + \frac{3}{2d}} = \frac{\frac{d-8}{2d}}{\frac{2d+3d}{2d^2}} = \frac{d-8}{2d} \times \frac{2d^2}{5d} = \frac{d-8}{5}$$

PTS: 2      REF: 061035a2      STA: A2.A.17      TOP: Complex Fractions

546 ANS: 2
$\cos(-305° + 360°) = \cos(55°)$

PTS: 2      REF: 061104a2      STA: A2.A.57      TOP: Reference Angles

547 ANS:
7. $f(-3) = (-3)^2 - 6 = 3$. $g(x) = 2^3 - 1 = 7$.

PTS: 2      REF: 061135a2      STA: A2.A.42      TOP: Compositions of Functions
KEY: numbers

548 ANS: 2
$K = \dfrac{1}{2}(10)(18)\sin 120 = 45\sqrt{3} \approx 78$

PTS: 2      REF: fall0907a2      STA: A2.A.74      TOP: Using Trigonometry to Find Area
KEY: basic

549 ANS:
$5\sqrt{3x^3} - 2\sqrt{27x^3} = 5\sqrt{x^2}\sqrt{3x} - 2\sqrt{9x^2}\sqrt{3x} = 5x\sqrt{3x} - 6x\sqrt{3x} = -x\sqrt{3x}$

PTS: 2      REF: 061032a2      STA: A2.N.2      TOP: Operations with Radicals

550 ANS: 2      PTS: 2      REF: 061108a2      STA: A2.A.52
TOP: Families of Functions

551 ANS:
$6y^3 - \dfrac{37}{10}y^2 - \dfrac{1}{5}y.$ $\left(\dfrac{1}{2}y^2 - \dfrac{1}{3}y\right)\left(12y + \dfrac{3}{5}\right) = 6y^3 + \dfrac{3}{10}y^2 - 4y^2 - \dfrac{1}{5}y = 6y^3 - \dfrac{37}{10}y^2 - \dfrac{1}{5}y$

PTS: 2      REF: 061128a2      STA: A2.N.3      TOP: Operations with Polynomials
KEY: multiplication

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

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

553 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

554 ANS: 1
${}_{10}C_4 = 210$

PTS: 2      REF: 061113a2      STA: A2.S.11      TOP: Combinations

555 ANS: 2
$\dfrac{x^{-1} - 1}{x - 1} = \dfrac{\dfrac{1}{x} - 1}{x - 1} = \dfrac{\dfrac{1-x}{x}}{x - 1} = \dfrac{\dfrac{-(x-1)}{x}}{x - 1} = -\dfrac{1}{x}$

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

556  ANS: 3               PTS:  2               REF:  fall0913a2     STA:  A2.A.65
TOP:  Graphing Trigonometric Functions

557  ANS:

33.  $a = \sqrt{10^2 + 6^2 - 2(10)(6)\cos 80} \approx 10.7$.  $\angle C$ is opposite the shortest side.  $\dfrac{6}{\sin C} = \dfrac{10.7}{\sin 80}$

$$C \approx 33$$

PTS:  6               REF:  061039a2     STA:  A2.A.73     TOP:  Law of Cosines
KEY:  advanced

558  ANS:

$y = 10.596(1.586)^x$

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

559  ANS: 3

$2\pi \cdot \dfrac{5}{12} = \dfrac{10\pi}{12} = \dfrac{5\pi}{6}$

PTS:  2               REF:  061125a2     STA:  A2.M.1      TOP:  Radian Measure

560  ANS:

$\dfrac{5(3+\sqrt{2})}{7}$.  $\dfrac{5}{3-\sqrt{2}} \times \dfrac{3+\sqrt{2}}{3+\sqrt{2}} = \dfrac{5(3+\sqrt{2})}{9-2} = \dfrac{5(3+\sqrt{2})}{7}$

PTS:  2               REF:  fall0928a2     STA:  A2.N.5      TOP:  Rationalizing Denominators

561  ANS: 2

$$4^{2x+5} = 8^{3x} \qquad .$$
$$\left(2^2\right)^{2x+5} = \left(2^3\right)^{3x}$$
$$2^{4x+10} = 2^{9x}$$
$$4x + 10 = 9x$$
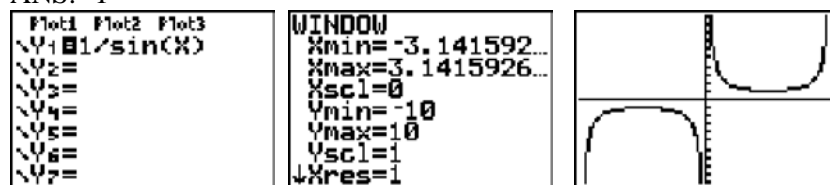$$10 = 5x$$
$$2 = x$$

PTS:  2               REF:  061105a2     STA:  A2.A.27     TOP:  Exponential Equations
KEY:  common base not shown

562  ANS:

230.  $10 + (1^3 - 1) + (2^3 - 1) + (3^3 - 1) + (4^3 - 1) + (5^3 - 1) = 10 + 0 + 7 + 26 + 63 + 124 = 230$
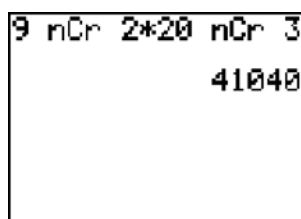
PTS:  2               REF:  011131a2     STA:  A2.N.10     TOP:  Sigma Notation
KEY:  basic

563  ANS: 1



PTS: 2        REF: 011123a2      STA: A2.A.71      TOP: Graphing Trigonometric Functions

564  ANS:



41,040.

PTS: 2        REF: fall0935a2      STA: A2.S.12      TOP: Sample Space

565  ANS:

$$\frac{\sin^2 A}{\cos^2 A} + \frac{\cos^2 A}{\cos^2 A} = \frac{1}{\cos^2 A}$$

$$\tan^2 A + 1 = \sec^2 A$$

PTS: 2        REF: 011135a2      STA: A2.A.67      TOP: Proving Trigonometric Identities

566  ANS: 1       PTS: 2        REF: 011117a2      STA: A2.S.9
     TOP: Differentiating Permutations and Combinations

567  ANS: 1

$$2\log x - (3\log y + \log z) = \log x^2 - \log y^3 - \log z = \log \frac{x^2}{y^3 z}$$

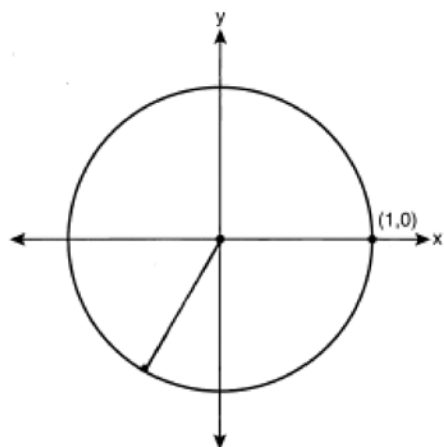PTS: 2        REF: 061010a2      STA: A2.A.19      TOP: Properties of Logarithms

568  ANS:

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

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

569 ANS:



$$-\frac{\sqrt{3}}{2}$$

PTS: 2  REF: 061033a2  STA: A2.A.60  TOP: Unit Circle

570 ANS: 3

$$\left(\frac{2}{3}\right)^2 + \cos^2 A = 1 \qquad\qquad \sin 2A = 2\sin A \cos A$$

$$\cos^2 A = \frac{5}{9} \qquad\qquad = 2\left(\frac{2}{3}\right)\left(\frac{\sqrt{5}}{3}\right)$$

$$\cos A = +\frac{\sqrt{5}}{3}, \sin A \text{ is acute.} \qquad = \frac{4\sqrt{5}}{9}$$

PTS: 2  REF: 011107a2  STA: A2.A.77  TOP: Double Angle Identities
KEY: evaluating

571 ANS: 1  PTS: 2  REF: 061019a2  STA: A2.N.7
TOP: Imaginary Numbers

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

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

573 ANS: 3
$$\sqrt{-300} = \sqrt{100}\sqrt{-1}\sqrt{3}$$

PTS: 2  REF: 061006a2  STA: A2.N.6  TOP: Square Roots of Negative Numbers

574 ANS: 3
$$b^2 - 4ac = (-10)^2 - 4(1)(25) = 100 - 100 = 0$$

PTS: 2  REF: 011102a2  STA: A2.A.2  TOP: Using the Discriminant
KEY: determine nature of roots given equation

575 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

576 ANS:
$K = ab\sin C = 24 \cdot 30 \sin 57 \approx 604$

PTS: 2 REF: 061034a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: parallelograms

577 ANS: 4
$12x^4 + 10x^3 - 12x^2 = 2x^2(6x^2 + 5x - 6) = 2x^2(2x + 3)(3x - 2)$

PTS: 2 REF: 061008a2 STA: A2.A.7 TOP: Factoring Polynomials
KEY: single variable

578 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: Solving Quadratics
KEY: quadratic formula

579 ANS: 4 PTS: 2 REF: 061026a2 STA: A2.A.29
TOP: Sequences

580 ANS: 2

$$\frac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}} = \frac{\dfrac{x^2 - 4}{4x}}{\dfrac{2x + 4}{8x}} = \frac{(x + 2)(x - 2)}{4x} \times \frac{8x}{2(x + 2)} = x - 2$$

PTS: 2 REF: fall0920a2 STA: A2.A.17 TOP: Complex Fractions

581 ANS: 2

$$f(10) = \frac{-10}{(-10)^2 - 16} = \frac{-10}{84} = -\frac{5}{42}$$

PTS: 2 REF: 061102a2 STA: A2.A.41 TOP: Functional Notation

582 ANS: 1
$8 \times 8 \times 7 \times 1 = 448$. The first digit cannot be 0 or 5. The second digit cannot be 5 or the same as the first digit. The third digit cannot be 5 or the same as the first or second digit.

PTS: 2 REF: 011125a2 STA: A2.S.10 TOP: Permutations

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

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

584 ANS: 4
(4) fails the horizontal line test. Not every element of the range corresponds to only one element of the domain.

PTS: 2      REF: fall0906a2      STA: A2.A.43      TOP: Defining Functions

585 ANS: 1

| $n$ | 3 | 4 | 5 | $\Sigma$ |
|---|---|---|---|---|
| $-r^2 + r$ | $-3^2 + 3 = -6$ | $-4^2 + 4 = -12$ | $-5^2 + 5 = -20$ | $-38$ |

PTS: 2      REF: 061118a2      STA: A2.N.10      TOP: Sigma Notation
KEY: basic