1. 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

2. 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) $\{y | y \in \text{real numbers}\}$

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

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

5. If $\angle \theta = -50^\circ$, which diagram represents $\theta$ drawn in standard position?
   1)
   2)
   3)
   4)
6 The expression \( \sin(\theta + 90)^\circ \) is equivalent to
1) \( -\sin \theta \)
2) \( -\cos \theta \)
3) \( \sin \theta \)
4) \( \cos \theta \)

7 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) \( (x - 3)^2 + (y + 4)^2 = 90 \)

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

9 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

10 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) \( -3 \pm 2i \)

11 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

12 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
\[ h(t) = -16t^2 + 5t + 105. \]
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
13. What is the equation of the graph shown below?

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

14. Which equation represents the graph below?

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

15. 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

16. 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) $(x^2 - 4)(x - 3)$

17. 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

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

1) 576
2) 288
3) 225
4) 113
19 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) \( a_n = 4(2.5)^{n-1} \)

20 The expression \( \frac{a + b}{c} - \frac{d - b}{c} \) is equivalent to
1) \( \frac{c + 1}{d - 1} \)
2) \( \frac{a + b}{d - b} \)
3) \( \frac{ac + b}{cd - b} \)
4) \( \frac{ac + 1}{cd - 1} \)

21 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) \( \frac{3\pi}{4} \)
2) \( \pi \)
3) \( \frac{3\pi}{2} \)
4) \( 3\pi \)

22 What is the solution set for the equation \( \sqrt{5x + 29} = x + 3 \)?
1) \{4\}
2) \{-5\}
3) \{4, 5\}
4) \{-5, 4\}

23 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

24 If \( \log{x^2 - \log{2a}} = \log{3a} \), then \( \log{x} \) expressed in terms of \( \log{a} \) is equivalent to
1) \( \frac{1}{2} \log{5a} \)
2) \( \frac{1}{2} \log{6} + \log{a} \)
3) \( \log{6} + \log{a} \)
4) \( \log{6} + 2 \log{a} \)

25 Expressed in simplest form, \( \frac{3y}{2y - 6} + \frac{9}{6 - 2y} \) is equivalent to
1) \( \frac{-6y^2 + 36y - 54}{(2y - 6)(6 - 2y)} \)
2) \( \frac{3y - 9}{2y - 6} \)
3) \( \frac{3}{2} \)
4) \( -\frac{3}{2} \)
26 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) $\sum_{d=1}^{7} \frac{1}{3} (2)^{d-1}$
2) $\sum_{d=1}^{7} \frac{1}{3} (2)^d$
3) $\sum_{d=1}^{7} 2 \left( \frac{1}{3} \right)^{d-1}$
4) $\sum_{d=1}^{7} 2 \left( \frac{1}{3} \right)^{d}$

27 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

28 The expression $(2a)^{-4}$ is equivalent to

1) $-8a^4$
2) $\frac{16}{a^4}$
3) $-\frac{2}{a^4}$
4) $\frac{1}{16a^4}$

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

30 What is the solution set of the equation $\sqrt{2} \sec x = 2$ when $0^\circ \leq x < 360^\circ$?

1) $\{45^\circ, 135^\circ, 225^\circ, 315^\circ\}$
2) $\{45^\circ, 315^\circ\}$
3) $\{135^\circ, 225^\circ\}$
4) $\{225^\circ, 315^\circ\}$
31 If \( g(x) = \frac{1}{2} x + 8 \) and \( h(x) = \frac{1}{2} x - 2 \), what is the value of \( g(h(-8)) \)?
1) 0
2) 9
3) 5
4) 4

32 The expression \( \log_4 m^2 \) is equivalent to
1) \( 2(\log_4 + \log m) \)
2) \( 2 \log_4 + \log m \)
3) \( \log_4 + 2 \log m \)
4) \( \log_16 + 2 \log m \)

33 In which interval of \( f(x) = \cos(x) \) is the inverse also a function?
1) \( -\frac{\pi}{2} < x < \frac{\pi}{2} \)
2) \( -\frac{\pi}{2} \leq x \leq \frac{\pi}{2} \)
3) \( 0 \leq x \leq \pi \)
4) \( \frac{\pi}{2} \leq x \leq \frac{3\pi}{2} \)

34 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) \( -x^3 - 2x^2 + 5x + 4 \)

35 Which equation is graphed in the diagram below?

![Graph of a cosine function with amplitude and phase shift]

1) \( y = 3 \cos \left( \frac{\pi}{30}x \right) + 8 \)
2) \( y = 3 \cos \left( \frac{\pi}{15}x \right) + 5 \)
3) \( y = -3 \cos \left( \frac{\pi}{30}x \right) + 8 \)
4) \( y = -3 \cos \left( \frac{\pi}{15}x \right) + 5 \)

36 The simplest form of \( \frac{1 - \frac{4}{x}}{1 - \frac{2}{x} - \frac{8}{x^2}} \) is
1) \( \frac{1}{2} \)
2) \( \frac{x}{x + 2} \)
3) \( \frac{x}{3} \)
4) \( -\frac{x}{x - 2} \)
37 The solution set of the equation $\sqrt{2x - 4} = x - 2$ is
1) $\{-2, -4\}$
2) $\{2, 4\}$
3) $\{4\}$
4) $\{\}$

38 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) $8C_5$

39 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

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

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

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

43 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) $30P_3 \cdot 20P_2$
2) $30C_3 \cdot 20C_2$
3) $30P_3 + 20P_2$
4) $30C_3 + 20C_2$
44 Which graph represents a function?

1)  

2)  

3)  

4)  

45 What is the graph of the solution set of \( |2x - 1| > 5 \)?

1)  

2)  

3)  

4)  

46 If \( x = 3i \), \( y = 2i \), and \( z = m + i \), the expression \( xy^2z \) equals

1) \(-12 - 12mi\)
2) \(-6 - 6mi\)
3) \(12 - 12mi\)
4) \(6 - 6mi\)

47 Which calculator output shows the strongest linear relationship between \( x \) and \( y \)?

<table>
<thead>
<tr>
<th>Lin Reg</th>
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<tbody>
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<td>( y = a + bx )</td>
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<td>( b = 6.767 )</td>
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1) \( r = .8643 \)

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<td>( b = 24.2 )</td>
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2) \( r = .8361 \)

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<td>( b = .95 )</td>
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3) \( r = .6022 \)

<table>
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<td></td>
</tr>
<tr>
<td>( b = 24.1 )</td>
<td></td>
</tr>
</tbody>
</table>

4) \( r = -.8924 \)

48 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) \(0.25\)
49 The expression $\sqrt[3]{64a^{16}}$ is equivalent to
1) $8a^4$
2) $8a^8$
3) $4a^{\frac{5}{3}}a\sqrt[5]{a}$
4) $4a^{\frac{3}{5}}a^5$

50 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

51 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) $\frac{20}{19}$
3) $-5$ and $4$
4) $-\frac{1}{4}$

52 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: $\{y \mid y \geq 0\}$

53 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%

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

55 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 ≤ $x$ ≤ 2007
2) 1999 ≤ $x$ ≤ 2007
3) 0.97 ≤ $y$ ≤ 2.38
4) 1.27 ≤ $y$ ≤ 2.38
56 Approximately how many degrees does five radians equal?
1) 286
2) 900
3) \( \frac{\pi}{36} \)
4) \( 5\pi \)

57 Expressed with a rational denominator and in simplest form, \( \frac{x}{x - \sqrt{x}} \) is
1) \( \frac{x^2 + x\sqrt{x}}{x^2 - x} \)
2) \( -\sqrt{x} \)
3) \( \frac{x + \sqrt{x}}{1 - x} \)
4) \( \frac{x + \sqrt{x}}{x - 1} \)

59 In \( \triangle PQR \), \( p \) equals
1) \( \frac{r\sin P}{\sin Q} \)
2) \( \frac{r\sin P}{\sin R} \)
3) \( \frac{r\sin R}{\sin P} \)
4) \( \frac{q\sin R}{\sin Q} \)

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

61 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) \( \frac{p^3}{\sqrt{t^2 r}} \)
2) \( p^3 t^2 r^{\frac{1}{2}} \)
3) \( \frac{p^3 t^2}{\sqrt{r}} \)
4) \( \frac{p^3}{t^2 \sqrt{r}} \)
62 The value of \( \sin(180 + x) \) is equivalent to

1) \(-\sin x\)
2) \(-\sin(90 - x)\)
3) \(\sin x\)
4) \(\sin(90 - x)\)

63 The area of triangle \( ABC \) is 42. If \( AB = 8 \) and \( m\angle B = 61 \), the length of \( BC \) is approximately

1) 5.1
2) 9.2
3) 12.0
4) 21.7

64 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) \(4 - 12\sqrt{x} + 6x\)

65 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 \textit{exactly} twice?

1) \(\frac{25}{64}\)
2) \(\frac{45}{512}\)
3) \(\frac{75}{512}\)
4) \(\frac{225}{512}\)

66 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) \(\cos x + \sin x\)

67 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) \(-2a + 5\)

68 Which diagram represents a relation that is both one-to-one and onto?
69. What is the fourth term in the binomial expansion \((x - 2)^8\)?
   1) \(448x^5\)
   2) \(448x^4\)
   3) \(-448x^5\)
   4) \(-448x^4\)

70. What is the common ratio of the geometric sequence shown below?
   \(-2, 4, -8, 16, \ldots\)
   1) \(-\frac{1}{2}\)
   2) 2
   3) -2
   4) -6

71. In the interval \(0^\circ \leq x < 360^\circ\), \(\tan x\) is undefined when \(x\) equals
   1) \(0^\circ\) and \(90^\circ\)
   2) \(90^\circ\) and \(180^\circ\)
   3) \(180^\circ\) and \(270^\circ\)
   4) \(90^\circ\) and \(270^\circ\)

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

73. 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 \((e, 1)\).

74. 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) \(x^2 - 6x - 36 = 25 - 36\)

75. 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) \(50\)

76. 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) \((-4, 9)\)
77 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

78 What is the product of the roots of the quadratic equation \( 2x^2 - 7x = 5 \)?
1) 5
2) \( \frac{5}{2} \)
3) -5
4) \( -\frac{5}{2} \)

79 In the right triangle shown below, what is the measure of angle \( S \), to the nearest minute?

80 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)

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

82 The expression \( 4 + \sum_{k=2}^{5} 3(k - x) \) is equal to
1) \( 58 - 4x \)
2) \( 46 - 4x \)
3) \( 58 - 12x \)
4) \( 46 - 12x \)

83 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.

<table>
<thead>
<tr>
<th>Number of Pets</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>0</td>
<td>( k )</td>
<td>2</td>
</tr>
</tbody>
</table>

What is the value of \( k \) for this table?
1) 9
2) 2
3) 8
4) 4
84. What are the sum and product of the roots of the equation \(6x^2 - 4x - 12 = 0\)?
   1) sum = \(-2\); product = \(-2\)
   2) sum = \(-2\); product = \(-\frac{2}{3}\)
   3) sum = \(-2\); product = \(\frac{2}{3}\)
   4) sum = \(-2\); product = \(-\frac{2}{3}\)

85. 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) \((x + 4)(x - 4)(3x - 5)(3x - 5)\)

86. 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) \(\log 2 + 3 \log x\)

87. The expression \(\frac{1}{7 - \sqrt{11}}\) is equivalent to
   1) \(\frac{7 + \sqrt{11}}{38}\)
   2) \(\frac{7 - \sqrt{11}}{38}\)
   3) \(\frac{7 + \sqrt{11}}{60}\)
   4) \(\frac{7 - \sqrt{11}}{60}\)

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

89. For \(y = \frac{3}{\sqrt{x - 4}}\), what are the domain and range?
   1) \(\{x|x > 4\} \text{ and } \{y|y > 0\}\)
   2) \(\{x|x \geq 4\} \text{ and } \{y|y > 0\}\)
   3) \(\{x|x > 4\} \text{ and } \{y|y \geq 0\}\)
   4) \(\{x|x \geq 4\} \text{ and } \{y|y \geq 0\}\)

90. 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

91. Which expression is equivalent to \(\left(9x^2y^6\right)^{\frac{1}{2}}\)?
   1) \(\frac{1}{3xy^3}\)
   2) \(3xy^3\)
   3) \(\frac{3}{xy^3}\)
   4) \(\frac{xy^3}{3}\)
92 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

93 The value of \( \csc 138^\circ 23' \) rounded to four decimal places is
1) \(-1.3376\)
2) \(-1.3408\)
3) \(1.5012\)
4) \(1.5057\)

94 Which function is one-to-one?
1) \( f(x) = |x| \)
2) \( f(x) = 2^x \)
3) \( f(x) = x^2 \)
4) \( f(x) = \sin x \)

95 What is the solution set of the equation
\[
\frac{30}{x^2 - 9} + 1 = \frac{5}{x - 3} ?
\]
1) \(\{2, 3\}\)
2) \(\{2\}\)
3) \(\{3\}\)
4) \(\{\}\)

96 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) \(2x^2 - 3x + 36\)

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

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

99 Which graph represents the solution set of
\[
\left| \frac{4x - 5}{3} \right| > 1?
\]
1)
2)
3)
4)
100 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 \([0, \pi]\).

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

102 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) \(-65,535\)

103 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) \((x + 1)(x - 1)(x + 2)\)

104 What is the range of the function shown below?

1) \(x \leq 0\)
2) \(x \geq 0\)
3) \(y \leq 0\)
4) \(y \geq 0\)

105 Which expression is equivalent to \(\frac{x^{-1}y^4}{3x^{-5}y^{-1}}\)?
1) \(\frac{x^4y^5}{3}\)
2) \(\frac{x^5y^4}{3}\)
3) \(3x^4y^5\)
4) \(\frac{y^4}{3x^5}\)

106 The points \((2, 3), \left(4, \frac{3}{4}\right)\), 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) \(\frac{1}{3}\)
3) \(3\)
4) \(27\)
107 What is the common difference of the arithmetic sequence below? 
\[-7x, -4x, -x, 2x, 5x, \ldots\]
1) \(-3\)  
2) \(-3x\)  
3) \(3\)  
4) \(3x\)

108 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) \(4\)

109 If \(\sin A = -\frac{7}{25}\) and \(\angle A\) terminates in Quadrant IV, \(\tan A\) equals
1) \(-\frac{7}{25}\)  
2) \(-\frac{7}{24}\)  
3) \(-\frac{24}{7}\)  
4) \(-\frac{24}{25}\)

110 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) \(960\)

111 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

112 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) \(142 - 175\)

113 Which expression is equivalent to \(\sum_{n=1}^{4}(a - n)^2\)?
1) \(2a^2 + 17\)  
2) \(4a^2 + 30\)  
3) \(2a^2 - 10a + 17\)  
4) \(4a^2 - 20a + 30\)

114 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) \(234\)
115 Which equation is represented by the graph below?

![Graph](image)

1) \( y = 2 \cos 3x \)
2) \( y = 2 \sin 3x \)
3) \( y = 2 \cos \frac{2\pi}{3}x \)
4) \( y = 2 \sin \frac{2\pi}{3}x \)

116 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) \( A = 18,000e^{0.0125 \cdot 24} \)

117 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

118 Which expression is equivalent to \( \frac{2x^2 - y^2}{4y^5} \)?

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

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

1) \( \frac{x^2}{8} - \frac{1}{9} \)
2) \( \frac{x^2}{16} - \frac{1}{9} \)
3) \( \frac{x^2}{8} - \frac{x}{6} - \frac{1}{9} \)
4) \( \frac{x^2}{16} - \frac{x}{6} - \frac{1}{9} \)

120 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?
121 In the diagram below, the length of which line segment is equal to the exact value of \( \sin \theta \)?

![Diagram of a circle with points labeled O, T, R, S, and (0,1), (0,-1), (1,0), (-1,0)]

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

122 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.

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

1) \( \frac{4}{25} x^2 - \frac{9}{16} y^4 \)
2) \( \frac{4}{25} x - \frac{9}{16} y^2 \)
3) \( \frac{2}{5} x^2 - \frac{3}{4} y^4 \)
4) \( \frac{4}{5} x \)

124 What is the solution set for \( 2 \cos \theta - 1 = 0 \) in the interval \( 0^\circ \leq \theta < 360^\circ \)?

1) \{30^\circ, 150^\circ\}
2) \{60^\circ, 120^\circ\}
3) \{30^\circ, 330^\circ\}
4) \{60^\circ, 300^\circ\}

125 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
126 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) \( \binom{10}{6} \left( \frac{4}{5} \right)^6 \left( \frac{1}{5} \right)^4 \)
2) \( \binom{10}{7} \left( \frac{4}{5} \right)^7 \left( \frac{1}{5} \right)^3 \)
3) \( \binom{10}{8} \left( \frac{7}{10} \right)^{10} \left( \frac{3}{10} \right)^2 \)
4) \( \binom{10}{9} \left( \frac{7}{10} \right)^9 \left( \frac{3}{10} \right)^1 \)

127 If \( \log 2 = a \) and \( \log 3 = b \), the expression \( \log \frac{9}{20} \) is equivalent to:
1) \( 2b - a + 1 \)
2) \( 2b - a - 1 \)
3) \( b^2 - a + 10 \)
4) \( \frac{2b}{a + 1} \)

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

129 The expression \((x + i)^2 - (x - i)^2\) is equivalent to:
1) 0
2) \(-2\)
3) \(-2 + 4xi\)
4) \(4xi\)

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

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Target Heart Rate (beats per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>135</td>
</tr>
<tr>
<td>25</td>
<td>132</td>
</tr>
<tr>
<td>30</td>
<td>129</td>
</tr>
<tr>
<td>35</td>
<td>125</td>
</tr>
<tr>
<td>40</td>
<td>122</td>
</tr>
<tr>
<td>45</td>
<td>119</td>
</tr>
<tr>
<td>50</td>
<td>115</td>
</tr>
</tbody>
</table>

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) \(1.503\)
131 What is the period of the graph \( y = \frac{1}{2} \sin 6x \)?

1) \( \frac{\pi}{6} \)
2) \( \frac{\pi}{3} \)
3) \( \frac{\pi}{2} \)
4) \( 6\pi \)

132 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) \( 2b + 2a \)

133 When \( x^{-1} + 1 \) is divided by \( x + 1 \), the quotient equals

1) 1
2) \( \frac{1}{x} \)
3) \( x \)
4) \( -\frac{1}{x} \)

134 If \( \tan \left( \arccos \frac{\sqrt{3}}{k} \right) = \frac{\sqrt{3}}{3} \), then \( k \) is

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

135 Which expression is equivalent to \( \left( 3x^2 \right)^{-1} \)?

1) \( \frac{1}{3x^2} \)
2) \(-3x^2\)
3) \( \frac{1}{9x^2} \)
4) \(-9x^2\)

136 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

137 What is the solution set of the equation \( 3x^3 - 48x = 0 \)?

1) \( \{0, \pm 2\} \)
2) \( \{0, \pm 2, 3\} \)
3) \( \{0, \pm 2, \pm 2i\} \)
4) \( \{\pm 2, \pm 2i\} \)

138 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
139 Which value of $k$ satisfies the equation $8^{3k+4} = 4^{2k-1}$?

1) $-1$
2) $-\frac{9}{4}$
3) $-2$
4) $-\frac{14}{5}$

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

141 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 $A = P\left(1 + \frac{r}{n}\right)^{nt}$, 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) $\$5808.08$

142 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) $\sin^7(3x)$
4) $3\sin^2 x$

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

144 The expression $\frac{\cot x}{\csc x}$ is equivalent to

1) $\sin x$
2) $\cos x$
3) $\tan x$
4) $\sec x$
145 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 $0$

146 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) $(-6, -2)$

147 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 $\sec P > 0$

148 The expression $\left( \frac{\sqrt[3]{27x^2}}{\sqrt[3]{16x^4}} \right)$ is equivalent to
1) $12x^{\frac{3}{2}}\sqrt{2}$
2) $12x^{\frac{1}{2}}\sqrt{2}$
3) $6x^{\frac{3}{2}}\sqrt{2x^2}$
4) $6x^{\frac{3}{2}}\sqrt{2}$

149 What is the domain of the function shown below?

150 Which relation is both one-to-one and onto?
151 If $\sin A = \frac{1}{3}$, what is the value of $\cos 2A$?

1) $\frac{-2}{3}$
2) $\frac{2}{3}$
3) $\frac{-7}{9}$
4) $\frac{7}{9}$

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

1) $\sec \left( \frac{5\pi}{6} \right)$
2) $\tan(49^\circ 20')$
3) $\sin \left( -\frac{3\pi}{5} \right)$
4) $\csc(-118^\circ)$

153 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

155 What is the common ratio of the sequence

1 \quad \frac{1}{64} a^5 b^3, -\frac{3}{32} a^3 b^4, \frac{9}{16} a b^5, \ldots$

1) $-\frac{3b}{2a^2}$
2) $-\frac{6b}{a^2}$
3) $-\frac{3a^2}{b}$
4) $-\frac{6a^2}{b}$

156 Given angle $A$ in Quadrant I with $\sin A = \frac{12}{13}$ and angle $B$ in Quadrant II with $\cos B = -\frac{3}{5}$, what is the value of $\cos(A - B)$?

1) $\frac{33}{65}$
2) $-\frac{33}{65}$
3) $\frac{63}{65}$
4) $-\frac{63}{65}$

157 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) $-\frac{1}{2} - \frac{3}{2}i$
158  What is the middle term in the expansion of \( \left( \frac{x}{2} - 2y \right)^6 \)?

1) \(20x^3y^3\)
2) \(-\frac{15}{4}x^4y^2\)
3) \(-20x^3y^3\)
4) \(\frac{15}{4}x^4y^2\)

159  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

160  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

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

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

162  Which graph represents the function \(\log_2 x = y\)?

1) 2) 3) 4)
163 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) \((x - 6)^2 = 34\)

164 The solutions of the equation \( y^2 - 3y = 9 \) are
1) \(\frac{3 \pm 3i \sqrt{5}}{2}\)
2) \(\frac{3 \pm 3i \sqrt{5}}{2}\)
3) \(\frac{-3 \pm 3 \sqrt{5}}{2}\)
4) \(\frac{3 \pm 3 \sqrt{5}}{2}\)

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

166 The product of \(i^7\) and \(i^5\) is equivalent to
1) 1
2) \(-1\)
3) \(i\)
4) \(-i\)

167 In which graph is \(\theta\) coterminal with an angle of \(-70^\circ\)?
1)
2)
3)
4)
168 If \( f(x) = \frac{x}{x^2 - 16} \), what is the value of \( f(-10) \)?

1) \( \frac{5}{2} \)
2) \( \frac{5}{42} \)
3) \( \frac{5}{58} \)
4) \( \frac{5}{18} \)

169 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) \( 8 \)

170 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 \( 168.3 \)

171 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) \( f(\theta) = 2 \sin \theta + 3 \)

172 The solution set of the inequality \( x^2 - 3x > 10 \) is

1) \( \{x | -2 < x < 5\} \)
2) \( \{x | 0 < x < 3\} \)
3) \( \{x | x < -2 \text{ or } x > 5\} \)
4) \( \{x | x < -5 \text{ or } x > 2\} \)

173 The value of \( x \) in the equation \( 4^{2x+5} = 8^{3x} \) is

1) 1
2) 2
3) 5
4) -10

174 Which graph represents the solution set of \( |6x - 7| \leq 5 \)?

1) 
2) 
3) 
4) 

175 In simplest form, \( \sqrt{-300} \) is equivalent to

1) \( 3i\sqrt{10} \)
2) \( 5i\sqrt{12} \)
3) \( 10i\sqrt{3} \)
4) \( 12i\sqrt{5} \)
176 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) $16384\sqrt{10}$

177 What are the values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$ that satisfy the equation $\tan \theta - \sqrt{3} = 0$?

1) $60^\circ, 240^\circ$
2) $72^\circ, 252^\circ$
3) $72^\circ, 108^\circ, 252^\circ, 288^\circ$
4) $60^\circ, 120^\circ, 240^\circ, 300^\circ$

178 The solution set of $\sqrt{3x + 16} = x + 2$ is

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

179 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) $(-6, -3)$

180 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?
181  The expression $2i^2 + 3i^3$ is equivalent to
1) $-2 - 3i$
2) $2 - 3i$
3) $-2 + 3i$
4) $2 + 3i$

182  The expression $\frac{a^2b^{-3}}{a^{-4}b^2}$ is equivalent to
1) $\frac{a^6}{b^5}$
2) $\frac{b^5}{a^6}$
3) $\frac{a^2}{b}$
4) $a^{-2}b^{-1}$

183  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

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

185  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) $4$

186  What is the radian measure of the smaller angle formed by the hands of a clock at 7 o’clock?
1) $\frac{\pi}{2}$
2) $\frac{2\pi}{3}$
3) $\frac{5\pi}{6}$
4) $\frac{7\pi}{6}$
187 The expression \((3 - 7i)^2\) is equivalent to
1) \(-40 + 0i\)
2) \(-40 - 42i\)
3) \(58 + 0i\)
4) \(58 - 42i\)

188 Which values of \(x\) are in the solution set of the following system of equations?
\[
\begin{align*}
y &= 3x - 6 \\
y &= x^2 - x - 6
\end{align*}
\]
1) \(-6, 2\)
2) \(0, 4\)
3) \(0, -4\)
4) \(-6, 2\)

189 In the diagram below of right triangle \(JTM\), \(JT = 12\), \(JM = 6\), and \(\angle JMT = 90\).

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

190 What is the range of \(f(x) = (x + 4)^2 + 7\)?
1) \(y \geq -4\)
2) \(y \geq 4\)
3) \(y = 7\)
4) \(y \geq 7\)

191 Which equation is sketched in the diagram below?

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

192 What is the conjugate of \(-2 + 3i\)?
1) \(-3 + 2i\)
2) \(-2 - 3i\)
3) \(2 - 3i\)
4) \(3 + 2i\)
193. 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) \( \{-2, 0, 3\} \)

194. What is the value of \( x \) in the equation \( 9^{3x+1} = 27^{x+2} \)?
1) 1
2) \( \frac{1}{3} \)
3) \( \frac{1}{2} \)
4) \( \frac{4}{3} \)

195. The solution set of \( 4^{x^2 + 4x} = 2^{-6} \) is
1) \( \{1, 3\} \)
2) \( \{-1, 3\} \)
3) \( \{-1, -3\} \)
4) \( \{1, -3\} \)

196. Which graph represents a relation that is not a function?
197 The graph below shows the function \( f(x) \).

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

1)  

2)  

3)  

4)  

198 Which ratio represents \( \csc A \) in the diagram below?

\[
\begin{align*}
\text{1)} & \quad \frac{25}{24} \\
\text{2)} & \quad \frac{25}{7} \\
\text{3)} & \quad \frac{24}{7} \\
\text{4)} & \quad \frac{7}{24}
\end{align*}
\]

199 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

200 What is the period of the function

\[
y = \frac{1}{2} \sin \left( \frac{x}{3} - \pi \right)
\]

1) \( \frac{1}{2} \)  
2) \( \frac{1}{3} \)  
3) \( \frac{2}{3} \pi \)  
4) \( 6\pi \)
201 The expression \( x^{-\frac{2}{5}} \) is equivalent to
1) \( -\sqrt[5]{x^2} \)
2) \( -\sqrt{x^2} \)
3) \( \frac{1}{\sqrt[5]{x^2}} \)
4) \( \frac{1}{\sqrt{x^2}} \)

202 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) \( \frac{7 \pm \sqrt{73}}{4} \)

203 If \( \sin A = \frac{2}{3} \) where \( 0^\circ < A < 90^\circ \), what is the value of \( \sin 2A \)?
1) \( \frac{2\sqrt{5}}{3} \)
2) \( \frac{2\sqrt{5}}{9} \)
3) \( \frac{4\sqrt{5}}{9} \)
4) \( -\frac{4\sqrt{5}}{9} \)

204 Which graph shows \( y = \cos^{-1}x \)?

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

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

207 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) $\frac{20!}{3!}$
3) $20C_3$
4) $20P_3$

208 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) $b_n = 10(2)^n - 1$

209 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) $x^2 + 6x - 5$

210 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) $f(x) = \log_2 x$
211 Which arithmetic sequence has a common difference of 4?
1) \{0,4n,8n,12n,\ldots\}
2) \{n,4n,16n,64n,\ldots\}
3) \{n+1,n+5,n+9,n+13,\ldots\}
4) \{n+4,n+16,n+64,n+256,\ldots\}

212 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

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

![Diagram of right triangle KTW]

What is the measure of $\angle K$, to the nearest minute?
1) 33°33'
2) 33°34'
3) 33°55'
4) 33°56'

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

215 What is the fifteenth term of the sequence 5,−10,20,−40,80,…?
1) −163,840
2) −81,920
3) 81,920
4) 327,680

216 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.
The table below shows the first-quarter averages for Mr. Harper’s statistics class.

<table>
<thead>
<tr>
<th>Quarter Averages</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>1</td>
</tr>
<tr>
<td>97</td>
<td>5</td>
</tr>
<tr>
<td>95</td>
<td>4</td>
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<td>92</td>
<td>4</td>
</tr>
<tr>
<td>90</td>
<td>7</td>
</tr>
<tr>
<td>87</td>
<td>2</td>
</tr>
<tr>
<td>84</td>
<td>6</td>
</tr>
<tr>
<td>81</td>
<td>2</td>
</tr>
<tr>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>70</td>
<td>2</td>
</tr>
<tr>
<td>65</td>
<td>1</td>
</tr>
</tbody>
</table>

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

The expression \( \frac{\sin^2 \theta + \cos^2 \theta}{1 - \sin^2 \theta} \) is equivalent to
1) \( \cos^2 \theta \)
2) \( \sin^2 \theta \)
3) \( \sec^2 \theta \)
4) \( \csc^2 \theta \)

The value of the expression \( \sum_{r=3}^{5} (-r^2 + r) \) is
1) -38
2) -12
3) 26
4) 62

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

Which equation is represented by the graph below?
1) \( y = 5^x \)
2) \( y = 0.5^x \)
3) \( y = 5^{-x} \)
4) \( y = 0.5^{-x} \)
Algebra 2/Trigonometry Multiple Choice Regents Exam Questions

222 Written in simplest form, the expression \( \frac{x - 1}{2x + \frac{1}{4}} \) is equivalent to
1) \( x - 1 \)
2) \( x - 2 \)
3) \( \frac{x - 2}{2} \)
4) \( \frac{x^2 - 4}{x + 2} \)

223 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

224 The solution set of the equation \( \sqrt{x + 3} = 3 - x \) is
1) \{1\}
2) \{0\}
3) \{1, 6\}
4) \{2, 3\}

225 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

226 Which graph best represents the inequality \( y + 6 \geq x^2 - x \)?

1) 
2) 
3) 
4)
227 The expression \( \frac{4}{5 - \sqrt{13}} \) is equivalent to

1) \( \frac{4\sqrt{13}}{5\sqrt{13} - 13} \)
2) \( \frac{4(5 - \sqrt{13})}{38} \)
3) \( \frac{5 + \sqrt{13}}{3} \)
4) \( \frac{4(5 + \sqrt{13})}{38} \)

228 The expression \( \log_{8}64 \) is equivalent to

1) 8
2) 2
3) \( \frac{1}{2} \)
4) \( \frac{1}{8} \)

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

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

230 When \( \frac{3}{2} x^2 - \frac{1}{4} x - 4 \) is subtracted from \( \frac{5}{2} x^2 - \frac{3}{4} x + 1 \), the difference is

1) \( -x^2 + \frac{1}{2} x - 5 \)
2) \( x^2 - \frac{1}{2} x + 5 \)
3) \( -x^2 - x - 3 \)
4) \( x^2 - x - 3 \)

231 Which graph does not represent a function?
232 What are the domain and the range of the function shown in the graph below?

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

233 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) \(2x^2(2x + 3)(3x - 2)\)

234 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

235 If a function is defined by the equation \(f(x) = 4^x\), which graph represents the inverse of this function?
236 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) \(2x^2 - 6x + 4 = 0\)

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

1) \(-30^\circ\)
2) \(60^\circ\)
3) \(150^\circ\)
4) \(240^\circ\)

238 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) \(4x^2 + 3x - 2 = 0\)

239 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) \(0, -1, -2\)

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

241 If \(r = \sqrt[3]{\frac{A^2 B}{C}}\), then \(\log r\) can be represented by

1) \(\frac{1}{6} \log A + \frac{1}{3} \log B - \log C\)
2) \(3 \log A^2 + \log B - \log C\)
3) \(\frac{1}{3} \log (A^2 + B) - C\)
4) \(\frac{2}{3} \log A + \frac{1}{3} \log B - \frac{1}{3} \log C\)

242 When \(x^{-1} - 1\) is divided by \(x - 1\), the quotient is

1) \(-1\)
2) \(-\frac{1}{x}\)
3) \(\frac{1}{x^2}\)
4) \(\frac{1}{(x - 1)^2}\)
243 What is the solution of the equation $2 \log_4(5x) = 3$?

1) $6.4$
2) $2.56$
3) $\frac{9}{5}$
4) $\frac{8}{5}$

244 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

245 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?

![Diagram of triangle ABC with sides 13, 15, and 14]

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

246 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

247 What is the value of $x$ in the equation $\log_5x = 4$?

1) 1.16
2) 20
3) 625
4) 1,024

248 In the diagram below of a unit circle, the ordered pair $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$ represents the point where the terminal side of $\theta$ intersects the unit circle. What is $m\angle \theta$?

![Diagram of unit circle with point $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$]

1) 45
2) 135
3) 225
4) 240
249 Samantha constructs the scatter plot below from a set of data.

![Scatter Plot](image)

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

250 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) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

252 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) $-\cos^2 \theta - 1$

253 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

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

255 What is the period of the function $f(\theta) = -2\cos 3\theta$?
1) $\pi$
2) $\frac{2\pi}{3}$
3) $\frac{3\pi}{2}$
4) $2\pi$
256 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) \( \frac{15 \cdot C_2 \cdot 5 \cdot C_1}{30 \cdot C_3} \)
2) \( \frac{15 \cdot P_2 \cdot 5 \cdot P_1}{30 \cdot P_3} \)
3) \( \frac{15 \cdot C_2 \cdot 5 \cdot C_1}{30 \cdot P_3} \)
4) \( \frac{15 \cdot P_2 \cdot 5 \cdot P_1}{30 \cdot P_3} \)

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

258 The expression \( \log_5 \left( \frac{1}{25} \right) \) is equivalent to
1) \( \frac{1}{2} \)
2) 2
3) \( -\frac{1}{2} \)
4) -2

259 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

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

<table>
<thead>
<tr>
<th>Minutes</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td>5</td>
<td>3</td>
<td>x</td>
<td>5</td>
<td>2</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

If the mean number of minutes was 17, which equation could be used to calculate the value of \( x \)?
1) \( 17 = \frac{119 + x}{x} \)
2) \( 17 = \frac{119 + 16x}{x} \)
3) \( 17 = \frac{446 + x}{26 + x} \)
4) \( 17 = \frac{446 + 16x}{26 + x} \)

261 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) \( (x + 3)^2 + (y - 4)^2 = 18 \)
262 What is the formula for the $n$th term of the sequence 54, 18, 6, . . .?

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) $a_n = 54 \left( \frac{1}{3} \right)^{n-1}$

265 What is the number of degrees in an angle whose radian measure is $\frac{11\pi}{12}$?

1) 150

2) 165

3) 330

4) 518

263 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 $g(x) = -\frac{1}{2} x + 4$

266 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) $6$

264 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) $2\sqrt{x + 2}$

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

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

2) $(2, \infty)$

3) $[2, \infty)$

4) $[3, \infty)$

268 What is the solution set of the equation $|4a + 6| - 4a = -10$?

1) $\emptyset$

2) $\{0\}$

3) $\left\{ \frac{1}{2} \right\}$

4) $\left\{ 0, \frac{1}{2} \right\}$
269 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 \(\frac{2\pi}{3}\).

![Diagram of a dartboard with sectors labeled 1 to 4.]

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) \(\frac{2}{3}\)

270 What is the common ratio of the geometric sequence whose first term is 27 and fourth term is 64?

1) \(\frac{3}{4}\)
2) \(\frac{64}{81}\)
3) \(\frac{4}{3}\)
4) \(\frac{37}{3}\)

271 Expressed as a function of a positive acute angle, \(\cos(-305^\circ)\) is equal to

1) \(-\cos 55^\circ\)
2) \(\cos 55^\circ\)
3) \(-\sin 55^\circ\)
4) \(\sin 55^\circ\)

272 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

273 Which equation is represented by the graph below?

1) \(y = \cot x\)
2) \(y = \csc x\)
3) \(y = \sec x\)
4) \(y = \tan x\)
274 What is the fourth term in the expansion of 
\((3x - 2)^5\)?
1) \(-720x^2\)
2) \(-240x\)
3) \(720x^2\)
4) \(1,080x^3\)

275 If \(a = 3\) and \(b = -2\), what is the value of the 
expression \(\frac{a^2}{b^3}\)?
1) \(-\frac{9}{8}\)
2) \(-1\)
3) \(-\frac{8}{9}\)
4) \(\frac{8}{9}\)

276 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

277 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)\}

278 What is the radian measure of an angle whose 
measure is \(-420^\circ\)?
1) \(-\frac{7\pi}{3}\)
2) \(-\frac{7\pi}{6}\)
3) \(\frac{7\pi}{6}\)
4) \(\frac{7\pi}{3}\)

279 The value of \(\tan 126^\circ 43'\) to the nearest 
ten-thousandth is
1) \(-1.3407\)
2) \(-1.3408\)
3) \(-1.3548\)
4) \(-1.3549\)

280 Which expression is equivalent to \(\frac{\sqrt{3} + 5}{\sqrt{3} - 5}\)?
1) \(-\frac{14 + 5\sqrt{3}}{11}\)
2) \(-\frac{17 + 5\sqrt{3}}{11}\)
3) \(\frac{14 + 5\sqrt{3}}{14}\)
4) \(\frac{17 + 5\sqrt{3}}{14}\)

281 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
282 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) \(\frac{8!}{4!}\)
3) \(\frac{8!}{2!} + \frac{2!}{2!}\)
4) \(\frac{8!}{2!} \cdot 2!\)

283 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) \(4x^8y^{28}\)

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

285 Which graph represents a one-to-one function?

1) [Graph 1]
2) [Graph 2]
3) [Graph 3]
4) [Graph 4]

286 The value of the expression \(2 \sum_{n=0}^{2}(n^2 + 2^n)\) is
1) 12
2) 22
3) 24
4) 26
287 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) \( (x + 1)^2 + (y + 3)^2 = 10 \)

288 Which graph does not represent a function?

1) ![Graph 1](image1)
2) ![Graph 2](image2)
3) ![Graph 3](image3)
4) ![Graph 4](image4)

289 The expression \( 2 \log x - (3 \log y + \log z) \) is equivalent to

1) \( \frac{x^2}{y^3 z} \)
2) \( \frac{x^2 z}{y^3} \)
3) \( \frac{2x}{3yz} \)
4) \( \log \frac{2xz}{3y} \)

290 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) \( \frac{7}{2} \)
2) \( \frac{49}{4} \)
3) \( \frac{49}{2} \)
4) 49

291 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
292 Which graph represents the equation \( y = \cos^{-1}x \)?

1)

2)

3)

4)

293 What is the common difference of the arithmetic sequence 5, 8, 11, 14?

1) \( \frac{8}{5} \)
2) \(-3\)
3) 3
4) 9

294 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) \( \{x | 0 \leq x \leq \pi\} \)
2) \( \{x | 0 \leq x \leq 2\pi\} \)
3) \( \{x | -\frac{\pi}{2} < x < \frac{\pi}{2}\} \)
4) \( \{x | -\frac{\pi}{2} < x < \frac{3\pi}{2}\} \)

295 If \( \sin^{-1}\left(\frac{5}{8}\right) = A \), then

1) \( \sin A = \frac{5}{8} \)
2) \( \sin A = \frac{8}{5} \)
3) \( \cos A = \frac{5}{8} \)
4) \( \cos A = \frac{8}{5} \)

296 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) \( -x(x + 3)(x - 2) \)

297 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) \(0.92\)

49
298 Show that \( \sec \theta \sin \theta \cot \theta = 1 \) is an identity.

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

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

301 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.

302 Find, algebraically, the measure of the obtuse angle, to the nearest degree, that satisfies the equation \( 5 \csc \theta = 8 \).

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

304 Starting with \( \sin^2 A + \cos^2 A = 1 \), derive the formula \( \tan^2 A + 1 = \sec^2 A \).

305 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.

<table>
<thead>
<tr>
<th>Time in Minutes ((x))</th>
<th>Temperature in °F ((y))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>180.2</td>
</tr>
<tr>
<td>2</td>
<td>165.8</td>
</tr>
<tr>
<td>4</td>
<td>146.3</td>
</tr>
<tr>
<td>6</td>
<td>135.4</td>
</tr>
<tr>
<td>8</td>
<td>127.7</td>
</tr>
<tr>
<td>10</td>
<td>110.5</td>
</tr>
</tbody>
</table>

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

306 Convert 3 radians to degrees and express the answer to the nearest minute.
307 Convert 2.5 radians to degrees, and express the answer to the nearest minute.

308 The graph below represents the function \( y = f(x) \).

![Graph](image)

State the domain and range of this function.

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

310 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.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of New Stores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>14</td>
</tr>
<tr>
<td>1987</td>
<td>27</td>
</tr>
<tr>
<td>1988</td>
<td>48</td>
</tr>
<tr>
<td>1989</td>
<td>80</td>
</tr>
<tr>
<td>1990</td>
<td>110</td>
</tr>
<tr>
<td>1991</td>
<td>153</td>
</tr>
<tr>
<td>1992</td>
<td>261</td>
</tr>
<tr>
<td>1993</td>
<td>403</td>
</tr>
<tr>
<td>1994</td>
<td>681</td>
</tr>
</tbody>
</table>

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.

312 Solve algebraically for \( x \): \( 16^{2x + 3} = 64^{x + 2} \)

313 If \( f(x) = x^2 - 6 \) and \( g(x) = 2^x - 1 \), determine the value of \((g \circ f)(-3)\).

314 Solve algebraically for \( x \): \( 4 - \sqrt{2x - 5} = 1 \)

315 Factor the expression \( 12t^8 - 75t^4 \) completely.
316 Find the third term in the recursive sequence
\(a_k + 1 = 2a_k - 1\), where \(a_1 = 3\).

317 Solve algebraically for \(x\):
\[\log_{27}(2x - 1) = \frac{4}{3}\]

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

319 Determine the sum and the product of the roots of
\(3x^2 = 11x - 6\).

320 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.

<table>
<thead>
<tr>
<th>Concentration of Ozone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Altitude (x)</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

322 Find the solution of the inequality \(x^2 - 4x > 5\), algebraically.

323 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%.

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

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

326 If \(\sec(a + 15)^{\circ} = \csc(2a)^{\circ}\), find the smallest positive value of \(a\), in degrees.
327 If \( g(x) = \left( ax \sqrt{1 - x} \right)^2 \), express \( g(10) \) in simplest form.

328 Determine the value of \( n \) in simplest form:
\[ i^{13} + i^{18} + i^{31} + n = 0 \]

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

330 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.

331 Solve \( \sec x - \sqrt{2} = 0 \) algebraically for all values of \( x \) in \( 0^\circ \leq x < 360^\circ \).

332 Express the exact value of \( \csc 60^\circ \), with a rational denominator.

333 Express in simplest form:
\[ \frac{\frac{1}{2} - \frac{4}{d}}{\frac{1}{d} + \frac{3}{2d}} \]

334 Find the sum and product of the roots of the equation \( 5x^2 + 11x - 3 = 0 \).

335 Express \( 4xi + 5yi^8 + 6xi^3 + 2yi^4 \) in simplest \( a + bi \) form.

336 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.

337 Determine algebraically the \( x \)-coordinate of all points where the graphs of \( xy = 10 \) and \( y = x + 3 \) intersect.
338 Write an equation for the graph of the trigonometric function shown below.

339 Solve \(|-4x + 5| < 13\) algebraically for \(x\).

340 Evaluate \(e^{\ln y}\) when \(x = 3\) and \(y = 2\).

341 Express \(5\sqrt{3x^3} - 2\sqrt{27x^3}\) in simplest radical form.

342 Express in simplest form: \(\sqrt[3]{\frac{a^6b^9}{-64}}\)

343 Express \(\frac{5}{3 - \sqrt{2}}\) with a rational denominator, in simplest radical form.

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

345 On the axes below, for \(-2 \leq x \leq 2\), graph \(y = 2^{x+1} - 3\).

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

347 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 \(50^\circ\).
348 Factor completely: \(10ax^2 - 23ax - 5a\)

349 Determine the sum and the product of the roots of the equation \(12x^2 + x - 6 = 0\).

350 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 \(\sin 240^\circ\).

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

352 Express the product of \(\cos 30^\circ\) and \(\sin 45^\circ\) in simplest radical form.

353 Find the first four terms of the recursive sequence defined below.
\[
\begin{align*}
a_1 &= -3 \\
a_n &= a_{n-1} - n
\end{align*}
\]

354 Solve the equation \(2\tan C - 3 = 3\tan C - 4\) algebraically for all values of \(C\) in the interval \(0^\circ \leq C < 360^\circ\).

355 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.

356 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.
357 Solve algebraically for \( x \): \( \log_{5x-1} 4 = \frac{1}{3} \)

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

359 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 \( 83°50' \).

360 Solve the equation \( 6x^2 - 2x - 3 = 0 \) and express the answer in simplest radical form.

361 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.

362 Express the sum \( 7 + 14 + 21 + 28 + \ldots + 105 \) using sigma notation.

363 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.

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

365 Express \( \sqrt[6]{108x^5y^8} \) in simplest radical form.

366 Evaluate: \( 10 + \sum_{n=1}^{5} (n^3 - 1) \)
367 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.

368 Multiply \( x + yi \) by its conjugate, and express the product in simplest form.

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

<table>
<thead>
<tr>
<th>Test Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>96</td>
<td>1</td>
</tr>
<tr>
<td>92</td>
<td>2</td>
</tr>
<tr>
<td>84</td>
<td>5</td>
</tr>
<tr>
<td>80</td>
<td>3</td>
</tr>
<tr>
<td>76</td>
<td>6</td>
</tr>
<tr>
<td>72</td>
<td>3</td>
</tr>
<tr>
<td>68</td>
<td>2</td>
</tr>
</tbody>
</table>

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

370 Express \( \frac{\cot x \sin x}{\sec x} \) as a single trigonometric function, in simplest form, for all values of \( x \) for which it is defined.

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

372 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.

373 Solve \(|2x - 3| > 5\) algebraically.

374 Simplify the expression \( \frac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}} \) and write the answer using only positive exponents.
375 If \( f(x) = x^2 - 6 \), find \( f^{-1}(x) \).

376 Find, to the nearest tenth, the radian measure of \( 216^\circ \).

377 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.

378 Express \( \left( \frac{2}{3}x - 1 \right)^2 \) as a trinomial.

379 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.

380 Express the product of \( \left( \frac{1}{2}y^2 - \frac{1}{3}y \right) \) and \( 12y + \frac{3}{5} \) as a trinomial.

381 Evaluate: \( \sum_{n=1}^{3} (-n^4 - n) \)

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

383 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.

384 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.

385 Find the number of possible different 10-letter arrangements using the letters of the word “STATISTICS.”
Algebra 2/Trigonometry 4 Point Regents Exam Questions

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

387 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.

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

389 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.

<table>
<thead>
<tr>
<th>Time, hour, $(x)$</th>
<th>Population $(y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>1</td>
<td>330</td>
</tr>
<tr>
<td>2</td>
<td>580</td>
</tr>
<tr>
<td>3</td>
<td>800</td>
</tr>
<tr>
<td>4</td>
<td>1650</td>
</tr>
<tr>
<td>5</td>
<td>3000</td>
</tr>
</tbody>
</table>

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.

390 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.

<table>
<thead>
<tr>
<th>Time, hrs $(x)$</th>
<th>Number of Organisms $(y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>6</td>
<td>68</td>
</tr>
<tr>
<td>8</td>
<td>85</td>
</tr>
<tr>
<td>10</td>
<td>104</td>
</tr>
<tr>
<td>12</td>
<td>142</td>
</tr>
<tr>
<td>16</td>
<td>260</td>
</tr>
</tbody>
</table>

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.

391 The probability that the Stormville Sluggers will win a baseball game is $\frac{2}{3}$. Determine the probability, to the nearest thousandth, that the Stormville Sluggers will win at least 6 of their next 8 games.

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


393. 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.

394. 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.]

395. Express as a single fraction the exact value of $\sin 75^\circ$.

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

<table>
<thead>
<tr>
<th>Time ($x$, in minutes)</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Bacteria ($y$)</td>
<td>2</td>
<td>25</td>
<td>81</td>
<td>175</td>
<td>310</td>
<td>497</td>
</tr>
</tbody>
</table>

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.

397. 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.

398. Find all values of $\theta$ in the interval $0^\circ \leq \theta < 360^\circ$ that satisfy the equation $\sin 2\theta = \sin \theta$.

399. 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.

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

401. 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?
402 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.

403 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.

404 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.

405 Solve algebraically for all exact values of \( x \) in the interval \( 0 \leq x < 2\pi \): \( 2\sin^2 x + 5\sin x = 3 \)

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

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

408 Express in simplest terms: \( \frac{1 + \frac{3}{x}}{1 - \frac{5}{x} - \frac{24}{x^2}} \)

409 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.

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

411 If \( \log_4 x = 2.5 \) and \( \log_y 125 = -\frac{3}{2} \), find the numerical value of \( \frac{x}{y} \), in simplest form.
412 Solve \( x^3 + 5x^2 = 4x + 20 \) algebraically.

413 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.

414 Express in simplest form:
\[
\frac{4 - x^2}{x^2 + 7x + 12} \quad \frac{2x - 4}{x + 3}
\]

415 Solve \( 2x^2 - 12x + 4 = 0 \) by completing the square, expressing the result in simplest radical form.

416 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?

417 Solve algebraically for \( x \):
\[
\frac{1}{x + 3} - \frac{2}{3 - x} = \frac{4}{x^2 - 9}
\]

418 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.
Algebra 2/Trigonometry 6 Point Regents Exam Questions

Algebra 2/Trigonometry 6 Point Regents Exam Questions

419 Solve algebraically for all values of \( x \):
\[ 81x^3 + 2x^2 = \frac{5x^3}{3} \]

420 Solve algebraically for \( x \):
\[ \sqrt{x^2 + x - 1 + 11x} = 7x + 3 \]

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

422 Solve algebraically for \( x \):
\[ \log_{x+3} \left( \frac{x^3 + x - 2}{x} \right) = 2 \]

423 Solve algebraically for all values of \( x \):
\[ x^4 + 4x^3 + 4x^2 = -16x \]

424 Solve the following systems of equations algebraically:
\[ 5 = y - x \]
\[ 4x^2 = -17x + y + 4 \]

425 Solve algebraically for all values of \( x \):
\[ \log_{x+3}(2x + 3) + \log_{x+3}(x + 5) = 2 \]

426 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.

427 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.]

428 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.

429 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.
Algebra 2/Trigonometry Multiple Choice Regents Exam Questions
Answer Section

1 ANS: 3
\((-5)^2 - 4(2)(0) = 25\)

PTS: 2 REFS: 061423a2 STA: A2.A.2 TOP: Using the Discriminant
KEY: determine equation given nature of roots

2 ANS: 2 PTS: 2 REFS: 011222a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain

3 ANS: 4 PTS: 2 REFS: 011409a2 STA: A2.S.10
TOP: Permutations

4 ANS: 1
\(\frac{1}{2} (7.4)(3.8)\sin 126 \approx 11.4\)

PTS: 2 REFS: 011218a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: basic

5 ANS: 4 PTS: 2 REFS: 061206a2 STA: A2.A.60
TOP: Unit Circle

6 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 REFS: 061309a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities
KEY: identities

7 ANS: 4
\(r = \sqrt{(6-3)^2 + (5-(-4))^2} = \sqrt{9 + 81} = \sqrt{90}\)


8 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 REFS: 061314a2 STA: A2.N.1 TOP: Negative and Fractional Exponents

9 ANS: 4 PTS: 2 REFS: 011323a2 STA: A2.A.2
TOP: Using the Discriminant KEY: determine nature of roots given equation

10 ANS: 2
\((x+2)^2 = -9\)
\[ x + 2 = \pm \sqrt{-9} \]
\[ x = -2 \pm 3i \]

PTS: 2 REFS: 011408a2 STA: A2.A.24 TOP: Completing the Square
11 ANS: 2
Top 6.7% = 1.5 s.d. + σ = 1.5(104) + 576 = 732

PTS: 2 REF: 011420a2 STA: A2.S.5 TOP: Normal Distributions
KEY: predict

12 ANS: 2
60 = −16t^2 + 5t + 105 \Rightarrow t = \frac{-5 \pm \sqrt{5^2 - 4(-16)(45)}}{2(-16)} \approx -5 \pm 53.89 \approx 1.84
0 = -16t^2 + 5t + 45

PTS: 2 REF: 061424a2 STA: A2.A.25 TOP: Quadratics with Irrational Solutions

13 ANS: 2 PTS: 2 REF: 011301a2 STA: A2.A.53 TOP: Graphing Exponential Functions

14 ANS: 3 PTS: 2 REF: 061306a2 STA: A2.A.72 TOP: Identifying the Equation of a Trigonometric Graph

15 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

16 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
TOP: Analysis of Data

17 ANS: 2 PTS: 2 REF: 061301a2 STA: A2.S.1

18 ANS: 2
\frac{8\pi}{5} \cdot \frac{180}{\pi} = 288

PTS: 2 REF: 061302a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

19 ANS: 4
\frac{10}{4} = 2.5

PTS: 2 REF: 011217a2 STA: A2.A.29 TOP: Sequences
\[
\frac{a + b}{c} \cdot \frac{c}{c} = \frac{ac + b}{cd - b}
\]

PTS: 2  REF: 011405a2  STA: A2.A.17  TOP: Complex Fractions

21 ANS: 3
\[s = \theta \cdot \frac{2 \pi}{8} \cdot 6 = \frac{3 \pi}{2}\]

PTS: 2  REF: 061212a2  STA: A2.A.61  TOP: Arc Length
KEY: arc length

22 ANS: 1
\[5x + 29 = (x + 3)^2 \quad \text{(-5) + 3 shows an extraneous solution.}\]
\[5x + 29 = x^2 + 6x + 9\]
\[0 = x^2 + x - 20\]
\[0 = (x + 5)(x - 4)\]
\[x = -5, 4\]

PTS: 2  REF: 061213a2  STA: A2.A.22  TOP: Solving Radicals
KEY: extraneous solutions

23 ANS: 3
\[3C_1 \cdot 3C_2 = 3 \cdot 10 = 30\]

PTS: 2  REF: 061422a2  STA: A2.S.12  TOP: Combinations

24 ANS: 2
\[\log x^2 = \log 3a + \log 2a\]
\[2 \log x = \log 6a^2\]
\[\log x = - \frac{\log 6}{2} + \frac{\log a^2}{2}\]
\[\log x = \frac{1}{2} \log 6 + \frac{2 \log a}{2}\]
\[\log x = \frac{1}{2} \log 6 + \log a\]

KEY: splitting logs

25 ANS: 3
\[\frac{3y}{2y - 6} + \frac{9}{6 - 2y} = \frac{3y}{2y - 6} - \frac{9}{2y - 6} = \frac{3y - 9}{2y - 6} = \frac{3(y - 3)}{2(y - 3)} = \frac{3}{2}\]

26. ANS: 1  PTS: 2  REF: 061420a2  STA: A2.A.34  
   TOP: Sigma Notation

27. ANS: 4  PTS: 2  REF: 011406a2  STA: A2.S.1  
   TOP: Analysis of Data

28. ANS: 4  PTS: 2  REF: 061402a2  STA: A2.A.8  
   TOP: Negative and Fractional Exponents

29. ANS: 3  
   PTS: 2  REF: 011207a2  STA: A2.A.71  TOP: Graphing Trigonometric Functions

30. 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

31. 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

32. ANS: 3  
   \[ \log_4 m^2 = \log_4 + \log m^2 = \log 4 + 2 \log m \]
   
   KEY: splitting logs

33. ANS: 3  
   PTS: 2  REF: 061224a2  STA: A2.A.63  
   TOP: Domain and Range

34. ANS: 1  
   PTS: 2  REF: 011314a2  STA: A2.N.3  
   TOP: Operations with Polynomials
35 ANS: 4
\[
\frac{2\pi}{b} = 30
\]
\[
b = \frac{\pi}{15}
\]

PTS: 2 REF: 011227a2 STA: A2.A.72 TOP: Identifying the Equation of a Trigonometric Graph

36 ANS: 2
\[
\frac{1 - \frac{4}{x}}{1 - \frac{2}{x} - \frac{8}{x^2}} \times \frac{x^2}{x^2} = \frac{x^2 - 4x}{x^2 - 2x - 8} = \frac{x(x - 4)}{(x - 4)(x + 2)} = \frac{x}{x + 2}
\]

PTS: 2 REF: 061305a2 STA: A2.A.17 TOP: Complex Fractions

37 ANS: 2
\[
\sqrt{2x - 4} = x - 2
\]
\[2x - 4 = x^2 - 4x + 4\]
\[0 = x^2 - 6x + 8\]
\[0 = (x - 4)(x - 2)\]
\[x = 4, 2\]


38 ANS: 1 PTS: 2 REF: 011310a2 STA: A2.S.9 TOP: Differentiating Permutations and Combinations

39 ANS: 4
\[
g\left(\frac{1}{2}\right) = \frac{\frac{1}{2}}{1} = 2. \ f(2) = 4(2) - 2^2 = 4
\]

PTS: 2 REF: 011204a2 STA: A2.A.42 TOP: Compositions of Functions KEY: numbers

40 ANS: 2 PTS: 2 REF: 061218a2 STA: A2.A.43 TOP: Defining Functions


42 ANS: 3 PTS: 2 REF: 061219a2 STA: A2.N.8 TOP: Conjugates of Complex Numbers

43 ANS: 2 PTS: 2 REF: 011417a2 STA: A2.S.9 TOP: Differentiating Permutations and Combinations

44 ANS: 1 PTS: 2 REF: 061409a2 STA: A2.A.38 TOP: Defining Functions KEY: graphs
45 ANS: 1
\[2x - 1 > 5, \quad 2x - 1 < -5\]
\[2x > 6, \quad 2x > -4\]
\[x > 3, \quad x < -2\]

PTS: 2  REF: 061307a2  STA: A2.A.1  TOP: Absolute Value Inequalities
KEY: graph

46 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

47 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

48 ANS: 1
If \(\sin x = 0.8\), then \(\cos x = 0.6\). \(
\tan \frac{1}{2} x = \sqrt{\frac{1 - 0.6}{1 + 0.6}} = \sqrt{\frac{0.4}{1.6}} = 0.5
\)

PTS: 2  REF: 011223a2  STA: A2.S.8  TOP: Correlation Coefficient

49 ANS: 3
\[\frac{3}{4}^{\frac{3}{15}}a^{15}a = 4a^{5\cdot\frac{3}{15}}\]

PTS: 2  REF: 061220a2  STA: A2.A.77  TOP: Half Angle Identities
KEY: index > 2

50 ANS: 1  PTS: 2  REF: 061401a2  STA: A2.S.2  TOP: Analysis of Data
51 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

52 ANS: 1 PTS: 2 REF: 011313a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain

53 ANS: 3
34.1% + 19.1% = 53.2%

PTS: 2 KEY: probability
REF: 011212a2 STA: A2.S.5 TOP: Normal Distributions

54 ANS: 1
\[ 2 \cdot \frac{180}{\pi} = \frac{360}{\pi} \]

PTS: 2 REF: 01120a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

55 ANS: 3 PTS: 2 REF: 061418a2 STA: A2.A.51
TOP: Domain and Range

56 ANS: 1
\[ 5 \cdot \frac{180}{\pi} \approx 286 \]

PTS: 2 KEY: degrees
REF: 011427a2 STA: A2.M.2 TOP: Radian Measure

57 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

58 ANS: 3
2! · 2! · 2! = 8

PTS: 2 REF: 061425a2 STA: A2.S.10 TOP: Permutations

59 ANS: 2 PTS: 2 REF: 061322a2 STA: A2.A.73
TOP: Law of Sines KEY: modeling
\[
\frac{5}{\sin 32} = \frac{8}{\sin E} \quad 57.98 + 32 < 180
\]
\[
E \approx 57.98 \quad (180 - 57.98) + 32 < 180
\]

PTS: 2  
REF: 011419a2  
STA: A2.A.75  
TOP: Law of Sines - The Ambiguous Case

60 ANS: 2

\[
\sin(180 + x) = (\sin 180)(\cos x) + (\cos 180)(\sin x) = 0 + (-\sin x) = -\sin x
\]

PTS: 2  
KEY: identities  
REF: 011318a2  
STA: A2.A.76  
TOP: Angle Sum and Difference Identities

61 ANS: 4

\[
\sin 32 \approx 57.98
\]

PTS: 2  
REF: 061207a2  
STA: A2.A.19  
TOP: Properties of Logarithms  
KEY: antilogarithms

62 ANS: 1

\[
42 = \frac{1}{2} (a)(8)\sin 61
\]

PTS: 2  
KEY: basic  
REF: 011316a2  
STA: A2.A.74  
TOP: Using Trigonometry to Find Area

63 ANS: 3

\[
42 \approx 3.5a
\]

PTS: 2  
REF: 011221a2  
STA: A2.S.15  
TOP: Binomial Probability  
KEY: spinner

64 ANS: 4

\[
\binom{\frac{5}{8}}{2} \left( \frac{3}{8} \right)^1 = \frac{225}{512}
\]

PTS: 2  
REF: 011407a2  
STA: A2.A.67  
TOP: Proving Trigonometric Identities

65 ANS: 3

\[
(4a + 4) - (2a + 1) = 2a + 3
\]

PTS: 2  
REF: 011401a2  
STA: A2.A.30  
TOP: Sequences

66 ANS: 3

\[
8 \binom{x^8}{3} \cdot (-2)^3 = 56x^5 \cdot (-8) = -448x^5
\]

PTS: 2  
REF: 011408a2  
STA: A2.A.36  
TOP: Binomial Expansions

67 ANS: 2

\[
\frac{4}{2} = -2
\]

PTS: 2  
REF: 011304a2  
STA: A2.A.31  
TOP: Sequences
\[ \sqrt{9} \cdot \sqrt[16]{-1} \cdot \sqrt[2]{-16} \cdot \sqrt[2]{-2} = 3i\sqrt{2} - 4i\sqrt{2} = -i\sqrt{2} \]

\[ (180 - 73) + 35 < 180 \]

\[ x = -5, 4 \]

\[ \frac{6}{\sin 35} = \frac{10}{\sin N} \]

\[ N \approx 73 \]

\[ 73 + 35 < 180 \]

\[ (180 - 73) + 35 < 180 \]

\[ (x + 3)^2 + (-x + 5 - 3)^2 = 53 \]

\[ x^2 + 6x + 9 + x^2 - 4x + 4 = 53 \]

\[ 2x^2 + 2x - 40 = 0 \]

\[ x^2 + x - 20 = 0 \]

\[ (x + 5)(x - 4) = 0 \]

\[ x = -5, 4 \]
79 ANS: 2

\[
\sin^{-1}\left(\frac{8}{17}\right)\text{ DMS}
\]

\[
28^\circ 4' 20.953''
\]

\[
\sin S = \frac{8}{17}
\]

\[
S = \sin^{-1}\frac{8}{17}
\]

\[
S \approx 28^\circ 4'
\]

PTS: 2 REF: 061311a2 STA: A2.A.55 TOP: Trigonometric Ratios

80 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

81 ANS: 3

sum of the roots, \( \frac{-b}{a} = \frac{-(9)}{4} = \frac{9}{4} \). product of the roots, \( \frac{c}{a} = \frac{3}{4} \)

PTS: 2 REF: 061208a2 STA: A2.A.21 TOP: Roots of Quadratics

KEY: basic

82 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

83 ANS: 4

\[
\frac{4 \cdot 0 + 6 \cdot 1 + 10 \cdot 2 + 0 \cdot 3 + 4k + 2 \cdot 5}{4 + 6 + 10 + 0 + k + 2} = 2
\]

\[
\frac{4k + 36}{k + 22} = 2
\]

\[
4k + 36 = 2k + 44
\]

\[
2k = 8
\]

\[
k = 4
\]

PTS: 2 REF: 061221a2 STA: A2.S.3 TOP: Average Known with Missing Data
84 ANS: 2
sum: $\frac{-b}{a} = \frac{4}{6} = \frac{2}{3}$, product: $\frac{c}{a} = \frac{-12}{6} = -2$

PTS: 2 REF: 011209a2 STA: A2.A.20 TOP: Roots of Quadratics

85 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

86 ANS: 4
$log_2 x^3 = \log_2 x + \log x^3 = \log_2 x + 3 \log x$

PTS: 2 REF: 061426a2 STA: A2.A.19 TOP: Properties of Logarithms

87 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

88 ANS: 1
$6P_6 \div 3!2! = \frac{720}{12} = 60$

PTS: 2 REF: 011324a2 STA: A2.S.10 TOP: Permutations

89 ANS: 1 PTS: 2 REF: 011416a2 STA: A2.A.39 TOP: Domain and Range

90 ANS: 3 PTS: 2 REF: 061412a2 STA: A2.A.60 TOP: Finding the Terminal Side of an Angle

91 ANS: 1 PTS: 2 REF: 011306a2 STA: A2.A.8 TOP: Negative and Fractional Exponents

92 ANS: 1
$\frac{9}{\sin A} = \frac{-10}{\sin 70°}$. $58° + 70°$ is possible. $122° + 70°$ is not possible.

$A = 58$

PTS: 2 REF: 011210a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case
93 ANS: 4

94 ANS: 2

95 ANS: 2

\[
\frac{30}{(x+3)(x-3)} + \frac{(x+3)(x-3)}{(x+3)(x-3)} = \frac{5(x+3)}{(x-3)(x+3)}
\]

3 is an extraneous root.

\[
30 + x^2 - 9 = 5x + 15
\]

\[
x^2 - 5x + 6 = 0
\]

\[
(x-3)(x-2) = 0
\]

\[
x = 2
\]

96 ANS: 1

\[
\sqrt[3]{6a^4b^2} + \sqrt[3]{(27 \cdot 6)a^4b^2}
\]

\[
= a^3\sqrt[3]{6ab^2} + 3a^2\sqrt[3]{6ab^2}
\]

\[
= 4a^3\sqrt[3]{6ab^2}
\]

97 ANS: 3

98 ANS: 4

\[
\frac{x^2 + 9x - 22}{x^2 - 121} + (2 - x) = \frac{(x + 11)(x - 2)}{(x + 11)(x - 11)}
\]

\[
= \frac{-1}{x - 2} = \frac{-1}{x - 11}
\]
\[
\frac{4x - 5}{3} > 1 \quad \text{or} \quad \frac{4x - 5}{3} < -1
\]
\[
4x - 5 > 3 \quad 4x - 5 < -3
\]
\[
x > 2 \quad x < \frac{1}{2}
\]

PTS: 2  REF: 061209a2  STA: A2.A.1  TOP: Absolute Value Inequalities

KEY: graph

100  ANS: 4  PTS: 2  REF: 061427a2  STA: A2.A.63
TOP: Domain and Range

101  ANS: 2  PTS: 2  REF: 061205a2  STA: A2.A.34
TOP: Sigma Notation

102  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

103  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

104  ANS: 3  PTS: 2  REF: 061308ge  STA: A2.A.51
TOP: Domain and Range

105  ANS: 1  PTS: 2  REF: 061210a2  STA: A2.A.9
TOP: Negative Exponents

106  ANS: 2
\[
2^2 \cdot 3 = 12 \quad 6^2 d = 12
\]
\[
4^2 \cdot \frac{3}{4} = 12 \quad 36d = 12
\]
\[
d = \frac{1}{3}
\]

PTS: 2  REF: 061310a2  STA: A2.A.5  TOP: Inverse Variation

107  ANS: 4  PTS: 2  REF: 061411a2  STA: A2.A.30
TOP: Sequences
108 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

109 ANS: 2
If \(\sin A = -\frac{7}{25}\), \(\cos A = \frac{24}{25}\), and \(\tan A = \frac{\sin A}{\cos A} = -\frac{7}{24}\)

PTS: 2     REF: 011413a2     STA: A2.A.64     TOP: Using Inverse Trigonometric Functions

110 ANS: 2
\[320 = 10(2)^\frac{t}{60}\]
\[32 = (2)^\frac{t}{60}\]
\[\log 32 = \log(2)^\frac{t}{60}\]
\[\log 32 = \frac{t \log 2}{60}\]
\[60 \log 32 = t \log 2\]
\[300 = t\]

PTS: 2     REF: 011205a2     STA: A2.A.6     TOP: Exponential Growth

111 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

112 ANS: 2
\[x \pm \sigma\]
\[153 \pm 22\]
\[131 - 175\]

PTS: 2     REF: 011307a2     STA: A2.S.5     TOP: Normal Distributions
\[ (a - 1)^2 + (a - 2)^2 + (a - 3)^2 + (a - 4)^2 \]
\[ (a^2 - 2a + 1) + (a^2 - 4a + 4) + (a^2 - 6a + 9) + (a^2 - 8a + 16) \]
\[ 4a^2 - 20a + 30 \]

PTS: 2  REF: 011414a2  STA: A2.N.10  TOP: Sigma Notation

ANS: 2

\[ \frac{1}{2} (22)(13) \sin 55 \approx 117 \]

PTS: 2  REF: 061403a2  STA: A2.A.74  TOP: Using Trigonometry to Find Area

ANS: 1  PTS: 2  REF: 011320a2  STA: A2.A.72  TOP: Identifying the Equation of a Trigonometric Graph

ANS: 3  PTS: 2  REF: 061416a2  STA: A2.A.12  TOP: Evaluating Exponential Expressions

\[ \frac{-b}{a} = \frac{-(-4)}{1} = 4. \text{ If the sum is 4, the roots must be 7 and } -3. \]

PTS: 2  REF: 011418a2  STA: A2.A.21  TOP: Roots of Quadratics

ANS: 1  PTS: 2  REF: 061324a2  STA: A2.A.9  TOP: Negative Exponents

ANS: 2

The binomials are conjugates, so use FL.

PTS: 2  REF: 061206a2  STA: A2.N.3  TOP: Operations with Polynomials

ANS: 1  PTS: 2  REF: 061317a2  STA: A2.S.9  TOP: Differentiating Permutations and Combinations

ANS: 2  PTS: 2  REF: 011315a2  STA: A2.A.55  TOP: Trigonometric Ratios

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

ANS: 1

The binomials are conjugates, so use FL.

PTS: 2  REF: 061201a2  STA: A2.N.3  TOP: Operations with Polynomials
\[ 2 \cos \theta = 1 \]
\[ \cos \theta = \frac{1}{2} \]
\[ \theta = \cos^{-1} \frac{1}{2} = 60, 300 \]

PTS: 2  REF: 061203a2  STA: A2.A.68  TOP: Trigonometric Equations
KEY: basic

125 ANS: 3  PTS: 2  REF: 011305a2  STA: A2.A.38
TOP: Defining Functions  KEY: graphs

126 ANS: 1  PTS: 2  REF: 061223a2  STA: A2.S.15
TOP: Binomial Probability  KEY: modeling

127 ANS: 2
\[ \log_9 - \log_{20} \]
\[ \log_3^2 - \log(10 \cdot 2) \]
\[ 2 \log_3 - (\log 10 + \log 2) \]
\[ 2b - (1 + a) \]
\[ 2b - a - 1 \]

KEY: expressing logs algebraically

128 ANS: 3
\[ 3C_2(2x^4)(-y)^2 = 6x^4y^2 \]

PTS: 2  REF: 011215a2  STA: A2.A.36  TOP: Binomial Expansions

129 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

130 ANS: 1

PTS: 2  REF: 061225a2  STA: A2.S.8  TOP: Correlation Coefficient
131 ANS: 2
\[
\frac{2\pi}{6} = \frac{\pi}{3}
\]

132 ANS: 2
\[
cos(x - y) = \cos x \cos y + \sin x \sin y = b \cdot b + a \cdot a = b^2 + a^2
\]
PTS: 2 REF: 061421a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities KEY: simplifying

133 ANS: 2
\[
x^{-1} + 1 + \frac{1}{x} = \frac{1}{x} + 1 = \frac{1 + x}{x + 1} = \frac{1}{x}
\]
PTS: 2 REF: 011211a2 STA: A2.A.9 TOP: Negative Exponents

134 ANS: 2
\[
\tan 30 = \frac{\sqrt{3}}{3}. \ Arc \cos \frac{\sqrt{3}}{k} = 30
\]
\[
\frac{\sqrt{3}}{k} = \cos 30
\]
\[
k = 2
\]
PTS: 2 REF: 061323a2 STA: A2.A.64 TOP: Using Inverse Trigonometric Functions KEY: advanced

135 ANS: 1 PTS: 2 REF: 011402a2 STA: A2.A.8 TOP: Negative and Fractional Exponents

136 ANS: 4 PTS: 2 REF: 011201a2 STA: A2.S.2 TOP: Analysis of Data

137 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

138 ANS: 4
\[
\begin{align*}
15C_5 &= 3,003. \\
25C_5 &= 25C_{20} = 53,130. \\
25C_{15} &= 3,268,760.
\end{align*}
\]
PTS: 2 REF: 061227a2 STA: A2.S.11 TOP: Combinations
139 ANS: 4

\[
8^{3k + 4} = 4^{2k - 1}.
\]

\[
(2^3)^{3k + 4} = (2^2)^{2k - 1}
\]

\[
2^{9k + 12} = 2^{4k - 2}
\]

\[
9k + 12 = 4k - 2
\]

\[
k = -14
\]

PTS: 2 REF: 011309a2 STA: A2.A.27 TOP: Exponential Equations KEY: common base not shown

140 ANS: 3 PTS: 2 REF: 011422a2 STA: A2.A.54 TOP: Graphing Logarithmic Functions

141 ANS: 3

\[
5000 \left( 1 + \frac{0.03}{4} \right)^{4 \cdot 5} = 5000(1.0075)^{20} \approx 5805.92
\]

PTS: 2 REF: 011410a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions KEY: variables

142 ANS: 2 PTS: 2 REF: 061216a2 STA: A2.A.42 TOP: Compositions of Functions

\[
\frac{x + 16}{x - 2} - \frac{7(x - 2)}{x - 2} \leq 0 \quad -6x + 30 = 0 \quad x - 2 = 0.
\]

Check points such that \( x < 2, 2 < x < 5, \) and \( x > 5. \)

If \( x = 1, \)

\[
-6x + 30 \leq 0
\]

\[
x = 2
\]

\[
\frac{-6(1) + 30}{1 - 2} = \frac{24}{-1} = -24, \text{ which is less than 0.}
\]

If \( x = 3, \)

\[
\frac{-6(3) + 30}{3 - 2} = \frac{12}{1} = 12, \text{ which is greater than 0.}
\]

If \( x = 6, \)

\[
\frac{-6(6) + 30}{6 - 2} = \frac{-6}{4} = -\frac{3}{2}, \text{ which is less than 0.}
\]

PTS: 2 REF: 011424a2 STA: A2.A.23 TOP: Rational Inequalities

143 ANS: 2

\[
\cot x = \frac{\cos x}{\sin x}
\]

\[
\csc x = \frac{1}{\sin x} = \cos x
\]

PTS: 2 REF: 011410a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships

144 ANS: 2

Since the coefficient of \( t \) is greater than 0, \( r > 0. \)

PTS: 2 REF: 011303a2 STA: A2.S.8 TOP: Correlation Coefficient
146 ANS: 4
\[ x = 2y \quad y^2 - (3y)^2 + 32 = 0 \quad x = 3(-2) = -6 \]
\[ y^2 - 9y^2 = -32 \]
\[ -8y^2 = -32 \]
\[ y^2 = 4 \]
\[ y = \pm 2 \]

PTS: 2          REF: 061312a2          STA: A2.A.3          TOP: Quadratic-Linear Systems

KEY: equations

147 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

148 ANS: 4
\[ \left( \frac{1}{27}x^2 \right) \left( \frac{1}{16}x^4 \right) = \frac{1}{3} \cdot 2^4 \cdot x^6 = 3 \cdot 2 \cdot x^2 \sqrt{2} = 6x^{3\sqrt{2}} \]

PTS: 2          REF: 011421a2          STA: A2.N.2          TOP: Operations with Radicals

149 ANS: 1          PTS: 2          REF: 061202a2          STA: A2.A.51
TOP: Domain and Range

150 ANS: 2          PTS: 2          REF: 011407a2          STA: A2.A.43
TOP: Defining Functions

151 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

152 ANS: 1
\[ \cos \left( \frac{5\pi}{6} \right) \]
\[ -1.154700538 \]

PTS: 2          REF: 011203a2          STA: A2.A.66          TOP: Determining Trigonometric Functions

153 ANS: 3
\[ 20 \cdot 2 = -5t \]
\[ -8 = t \]

PTS: 2          REF: 011412a2          STA: A2.A.5          TOP: Inverse Variation
154 ANS: 1
\[ \frac{2\pi}{b} = 4\pi \]
\[ b = \frac{1}{2} \]


155 ANS: 2
\[ -\frac{3}{32} a^3 b^4 = \frac{6b}{a^2} \]
\[ \frac{1}{64} a^5 b^3 = \frac{6b}{a^2} \]

PTS: 2 REF: 061326a2 STA: A2.A.31 TOP: Sequences

156 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

157 ANS: 3
\[ \binom{6}{3} \left( \frac{x}{2} \right)^3 (-2y)^3 = 20 \cdot \frac{x^3}{8} \cdot -8y^3 = -20x^3y^3 \]

PTS: 2 REF: 061215a2 STA: A2.A.36 TOP: Binomial Expansions

158 ANS: 3
\[ 1000 = 500e^{0.05t} \]
\[ 2 = e^{0.05t} \]
\[ \ln 2 = \ln e^{0.05t} \]
\[ \frac{\ln 2}{0.05} = \frac{0.05t \cdot \ln e}{0.05} \]
\[ 13.9 \approx t \]

PTS: 2 REF: 061313a2 STA: A2.A.6 TOP: Exponential Growth

159 ANS: 4
\[ \frac{13}{\sin 40} = \frac{20}{\sin M}. \quad 81 + 40 < 180. \quad (180 - 81) + 40 < 180 \]
\[ M \approx 81 \]

PTS: 2 REF: 061327a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case
PTS: 2  REF: 061222a2  STA: A2.A.50  TOP: Solving Polynomial Equations
162 ANS: 1  PTS: 2  REF: 061211a2  STA: A2.A.54
TOP: Graphing Logarithmic Functions
Algebra 2/Trigonometry Multiple Choice Regents Exam Questions
Answer Section

163 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: Completing the Square

164 ANS: 4
\[ 3 \pm \frac{\sqrt{(-3)^2 - 4(1)(-9)}}{2(1)} = 3 \pm \frac{\sqrt{45}}{2} = 3 \pm \frac{3\sqrt{5}}{2} \]

PTS: 2 REF: 061009a2 STA: A2.A.25 TOP: Quadratics with Irrational Solutions

165 ANS: 1 PTS: 2 REF: 061013a2 STA: A2.A.38 TOP: Defining Functions

166 ANS: 1 PTS: 2 REF: 061019a2 STA: A2.N.7 TOP: Imaginary Numbers

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

168 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

169 ANS: 4
\[ s = \theta r = 2 \cdot 4 = 8 \]

PTS: 2 REF: fall0922a2 STA: A2.A.61 TOP: Arc Length

170 ANS: 3
\[ \frac{59.2}{\sin 74} = \frac{60.3}{\sin C} \]
\[ 180 - 78.3 = 101.7 \]
\[ C \approx 78.3 \]

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

171 ANS: 4
\[ y - 2 \sin \theta = 3 \]
\[ y = 2 \sin \theta + 3 \]
\[ f(\theta) = 2 \sin \theta + 3 \]

PTS: 2 REF: fall0927a2 STA: A2.A.40 TOP: Functional Notation
172 ANS: 3
\[ x^2 - 3x - 10 > 0 \quad \text{or} \]
\[ (x - 5)(x + 2) > 0 \quad x - 5 < 0 \text{ and } x + 2 < 0 \]
\[ x - 5 > 0 \text{ and } x + 2 > 0 \quad x < 5 \text{ and } x < -2 \]
\[ x > 5 \text{ and } x > -2 \quad x < -2 \]
\[ x > 5 \]

PTS: 2 REF: 01115a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

173 ANS: 2
\[ 4^{2x+5} = 8^{3x} \]
\[ \left(2^2\right)^{2x+5} = \left(2^3\right)^{3x} \]
\[ 2^{4x+10} = 2^{9x} \]
\[ 4x + 10 = 9x \]
\[ 10 = 5x \]
\[ 2 = x \]

PTS: 2 REF: 06115a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base not shown

174 ANS: 1
\[ 6x - 7 \leq 5 \quad 6x - 7 \geq -5 \]
\[ 6x \leq 12 \quad 6x \geq 2 \]
\[ x \leq 2 \quad x \geq \frac{1}{3} \]

PTS: 2 REF: fall0905a2 STA: A2.A.1 TOP: Absolute Value Inequalities
KEY: graph

175 ANS: 3
\[ \sqrt{-300} = \sqrt{100} \sqrt{-1} \sqrt{3} \]

PTS: 2 REF: 06106a2 STA: A2.N.6 TOP: Square Roots of Negative Numbers

176 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
177 ANS: 1

\[ \tan \theta - \sqrt{3} = 0 \]
\[ \tan \theta = \sqrt{3} \]
\[ \theta = \tan^{-1} \sqrt{3} \]
\[ \theta = 60, 240 \]

PTS: 2 REF: fall0903a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: basic

178 ANS: 3

\[ 3x + 16 = (x + 2)^2 \]
\[-4 \text{ is an extraneous solution.} \]
\[ 3x + 16 = x^2 + 4x + 4 \]
\[ 0 = x^2 + x - 12 \]
\[ 0 = (x + 4)(x - 3) \]
\[ x = -4, x = 3 \]

PTS: 2 REF: 061121a2 STA: A2.A.22 TOP: Solving Radicals
KEY: extraneous solutions

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

180 ANS: 3 PTS: 2 REF: 01119a2 STA: A2.A.52
TOP: Families of Functions

181 ANS: 1

\[ 2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i \]

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

182 ANS: 1 PTS: 2 REF: fall0914a2 STA: A2.A.9
TOP: Negative and Fractional Exponents

183 ANS: 1

\[ 8 \times 8 \times 7 \times 1 = 448. \text{ The first digit cannot be 0 or 5. The second digit cannot be 5 or the same as the first digit.} \]
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

184 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
The roots are $-1, 2, 3$.

$$2\pi \cdot \frac{5}{12} = \frac{10\pi}{12} = \frac{5\pi}{6}$$

$$(3 - 7i)(3 - 7i) = 9 - 21i - 21i + 49i^2 = 9 - 42i - 49 = -40 - 42i$$

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

$$\sqrt{12^2 - 6^2} = \sqrt{108} = \sqrt{36 \cdot 3} = 6\sqrt{3} \cdot \cot J = \frac{A}{O} = \frac{6}{6\sqrt{3}} \cdot \frac{\sqrt{3}}{3} = \frac{\sqrt{3}}{3}$$
194 ANS: 4
\[9^{3x+1} = 27^{x+2}\]
\[(3^2)^{3x+1} = (3^3)^{x+2}\]
\[3^{6x+2} = 3^{3x+6}\]
\[6x + 2 = 3x + 6\]
\[3x = 4\]
\[x = \frac{4}{3}\]

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

195 ANS: 3
\[4^{x^2+4x} = 2^{-6}\]
\[2x^2 + 8x = -6\]
\[(2^2)^{x^2+4x} = 2^{-6}\]
\[2x^2 + 4x + 3 = 0\]
\[2x^2 + 8x = 2^{-6}\]
\[(x+3)(x+1) = 0\]
\[x = -3, x = -1\]

PTS: 2 REF: 061015a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base shown

196 ANS: 3 PTS: 2 REF: 061114a2 STA: A2.A.38
TOP: Defining Functions KEY: graphs
197 ANS: 2 PTS: 2 REF: fall0926a2 STA: A2.A.46
TOP: Transformations with Functions and Relations
198 ANS: 2 PTS: 2 REF: 081010a2 STA: A2.A.55
TOP: Trigonometric Ratios
199 ANS: 1

PTS: 2 REF: fall0915a2 STA: A2.S.5 TOP: Normal Distributions
KEY: interval
200 ANS: 4

\[ \frac{2\pi}{b} = \frac{2\pi}{1} = 6\pi \]


201 ANS: 4

\[ \frac{-\frac{2}{5}}{x} = \frac{1}{\frac{5}{\sqrt{x^2}}} \]

PTS: 2 REF: 011118a2 STA: A2.A.10 TOP: Fractional Exponents as Radicals

202 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: Quadratics with Irrational Solutions

203 ANS: 3

\[
\left(\frac{2}{3}\right)^2 + \cos^2 A = 1 \quad \sin 2A = 2 \sin A \cos A
\]

\[
\cos^2 A = \frac{5}{9} = 2 \left(\frac{2}{3}\right)\left(\frac{\sqrt{5}}{3}\right)
\]

\[
\cos A = +\frac{\sqrt{5}}{3}, \sin A \text{ is acute.} \quad = \frac{4\sqrt{5}}{9}
\]

PTS: 2 REF: 011107a2 STA: A2.A.77 TOP: Double Angle Identities KEY: evaluating

204 ANS: 3 PTS: 2 REF: 061119a2 STA: A2.A.65 TOP: Graphing Trigonometric Functions

205 ANS: 4 PTS: 2 REF: 011111a2 STA: A2.N.8 TOP: Conjugates of Complex Numbers

206 ANS: 3

\[
\text{period} = \frac{2\pi}{b} = \frac{2\pi}{\frac{3\pi}{3}} = \frac{2}{3}
\]

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

207 ANS: 3 PTS: 2 REF: 061007a2 STA: A2.S.9 TOP: Differentiating Permutations and Combinations
common difference is 2. \( b_n = x + 2n \)
\[
10 = x + 2(1) \]
\[
8 = x 
\]

\[
6x^2 - 5 = 6x^2 - 30
\]

\[
6(x^2 - 5) = 6x^2 - 30
\]

Students entering the library are more likely to spend more time studying, creating bias.

\[
\cos K = \frac{5}{6}
\]

\[
K = \cos^{-1} \frac{5}{6}
\]

\[
K \approx 33^\circ 33'
\]

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

\[
a_n = 5(-2)^{n-1}
\]
\[
a_{15} = 5(-2)^{15-1} = 81,920
\]

\[
\cos \theta = \frac{5}{6}
\]

\[
\theta \approx 33^\circ 33'
\]
216 ANS: 4 PTS: 2 REF: 011127a2 STA: A2.S.1
TOP: Analysis of Data

217 ANS: 3

\[
\begin{array}{c|cc}
\text{I-Var Stats L1,L2} & 0.8x^2 \\
\hline
\text{Mean} & 67.31 & 0.2041
\end{array}
\]

PTS: 2 REF: fall0924a2 STA: A2.S.4 TOP: Dispersion
KEY: range, quartiles, interquartile range, variance

218 ANS: 3

\[
\frac{\sin^2 \theta + \cos^2 \theta}{1 - \sin^2 \theta} = \frac{1}{\cos^\theta} = \sec^2 \theta
\]

PTS: 2 REF: 061123a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships

219 ANS: 1

\[
\begin{array}{c|cccc}
\text{n} & 3 & 4 & 5 & \Sigma \\
\hline
-r^2 + r & -3^2 + 3 = -6 & -4^2 + 4 = -12 & -5^2 + 5 = -20 & \text{38}
\end{array}
\]

PTS: 2 REF: 061118a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

220 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

221 ANS: 2 PTS: 2 REF: 061108a2 STA: A2.A.52 TOP: Identifying the Equation of a Graph

222 ANS: 2

\[
\frac{x}{4} - \frac{1}{x} = \frac{x^2 - 4}{4x} = \frac{(x + 2)(x - 2)}{4x} \times \frac{8x}{2(x + 2)} = x - 2
\]

PTS: 2 REF: fall0920a2 STA: A2.A.17 TOP: Complex Fractions
223 ANS: 3
75000 = 25000e^{0.0475t}
3 = e^{0.0475t}
\ln 3 = \ln e^{0.0475t}
\frac{\ln 3}{0.0475} = \frac{0.0475 \cdot \ln e}{0.0475}
23.1 \approx t

PTS: 2 REF: 061117a2 STA: A2.A.6 TOP: Exponential Growth
224 ANS: 1
TOP: Solving Radicals KEY: extraneous solutions

PTS: 2 REF: 061018a2 STA: A2.A.2
225 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
226 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
227 ANS: 3
\frac{4}{5 - \sqrt{13}} \cdot \frac{5 + \sqrt{13}}{5 + \sqrt{13}} = \frac{4(5 + \sqrt{13})}{25 - 13} = \frac{5 + \sqrt{13}}{3}

PTS: 2 REF: 061116a2 STA: A2.N.5 TOP: Rationalizing Denominators
228 ANS: 2
8^2 = 64

PTS: 2 REF: fall0909a2 STA: A2.A.18 TOP: Evaluating Logarithmic Expressions
229 ANS: 2
TOP: Fractional Exponents as Radicals

PTS: 2 REF: 061011a2 STA: A2.A.10
230 ANS: 2
TOP: Operations with Polynomials

PTS: 2 REF: 011114a2 STA: A2.N.3
231 ANS: 4
TOP: Defining Functions KEY: graphs

PTS: 2 REF: fall0908a2 STA: A2.A.38
232 ANS: 2
TOP: Domain and Range

PTS: 2 REF: 081003a2 STA: A2.A.51
233 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
234 ANS: 4
\[ S_n = \frac{n}{2} [2a + (n - 1)d] = \frac{21}{2} [2(18) + (21 - 1)2] = 798 \]

PTS: 2 REF: 061103a2 STA: A2.A.35 TOP: Series
KEY: arithmetic

235 ANS: 2
\[ f^{-1}(x) = \log_4 x \]

PTS: 2 REF: fall0916a2 STA: A2.A.54 TOP: Graphing Logarithmic Functions

236 ANS: 3
\[ \frac{-b}{a} = -\frac{6}{2} = -3, \quad \frac{c}{a} = \frac{4}{2} = 2 \]

PTS: 2 REF: 011121a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

237 ANS: 3
\[ S = \frac{-b}{a} = \frac{-(-3)}{4} = \frac{3}{4}, \quad P = \frac{c}{a} = \frac{-8}{4} = -2 \]

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

238 ANS: 3
\[ x^3 + x^2 - 2x = 0 \]
\[ x(x^2 + x - 2) = 0 \]
\[ x(x + 2)(x - 1) = 0 \]
\[ x = 0, -2, 1 \]

PTS: 2 REF: fall0912a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

239 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

240 ANS: 1
\[ \frac{x^{-1} - 1}{x - 1} = \frac{1}{x} - 1 = \frac{1 - x}{x - 1} = \frac{x}{x - 1} = \frac{-x}{x} = -\frac{1}{x} \]

PTS: 2 REF: 081018a2 STA: A2.A.9 TOP: Negative Exponents
243 ANS: 4
\[2 \log_4(5x) = 3\]
\[\log_4(5x) = \frac{3}{2}\]
\[\frac{1}{2} \quad 5x = 4 \quad 5x = 8 \quad x = \frac{8}{5}\]

PTS: 2 REF: fall0921a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

244 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

245 ANS: 1
\[13^2 = 15^2 + 14^2 - 2(15)(14)\cos C\]
\[169 = 421 - 420\cos C\]
\[-252 = -420\cos C\]
\[\frac{252}{420} = \cos C\]
\[53 \approx C\]

KEY: find angle

246 ANS: 2
\[\frac{10}{\sin 35^\circ} = \frac{13}{\sin B}\quad 35 + 48 < 180\]
\[B \approx 48, 132\quad 35 + 132 < 180\]

PTS: 2 REF: 011113a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case

247 ANS: 3
\[x = 5^4 = 625\]

PTS: 2 REF: 061106a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: basic

248 ANS: 3 PTS: 2 REF: 011104a2 STA: A2.A.64 TOP: Using Inverse Trigonometric Functions
KEY: unit circle

249 ANS: 3 PTS: 2 REF: 061127a2 STA: A2.S.6 TOP: Regression
250 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

251 ANS: 3
\[68\% \times 50 = 34\]

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

252 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

253 ANS: 4  PTS: 2  REF: 061101a2  STA: A2.S.1
TOP: Analysis of Data

254 ANS: 3  PTS: 2  REF: fall0910a2  STA: A2.A.76
TOP: Angle Sum and Difference Identities
KEY: simplifying

255 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

256 ANS: 1  PTS: 2  REF: 011117a2  STA: A2.S.9
TOP: Differentiating Permutations and Combinations

257 ANS: 4
\[7^2 = 3^2 + 5^2 - 2(3)(5)\cos A\]
\[49 = 34 - 30\cos A\]
\[15 = -30\cos A\]
\[-\frac{1}{2} = \cos A\]
\[120 = A\]

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

258 ANS: 4  PTS: 2  REF: 011124a2  STA: A2.A.18
TOP: Evaluating Logarithmic Expressions

259 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
260 ANS: 4  PTS: 2  REF: 061124a2  STA: A2.S.3  
TOP: Average Known with Missing Data

261 ANS: 2  PTS: 2  REF: 011126a2  STA: A2.A.49  
TOP: Equations of Circles

262 ANS: 4  PTS: 2  REF: 061026a2  STA: A2.A.29  
TOP: Sequences

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

264 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

265 ANS: 2  
\[
\frac{11\pi}{12} \cdot \frac{180}{\pi} = 165
\]
PTS: 2  REF: 061002a2  STA: A2.M.2  TOP: Radian Measure  KEY: degrees

266 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

267 ANS: 3  PTS: 2  REF: fall0923a2  STA: A2.A.39  
TOP: Domain and Range  KEY: real domain

268 ANS: 1  
\[
4a + 6 = 4a - 10, \quad 4a + 6 = -4a + 10, \quad \left| 4\left(\frac{1}{2}\right) + 6 \right| - 4\left(\frac{1}{2}\right) = -10
\]
\[6 \neq -10\]  \[8a = 4\]  \[a = \frac{4}{8} = \frac{1}{2}\]  \[8 - 2 \neq -10\]  
PTS: 2  REF: 011106a2  STA: A2.A.1  TOP: Absolute Value Equations
\[
\frac{\frac{\pi}{3} + \frac{\pi}{3}}{2\pi} = \frac{\frac{2\pi}{3}}{2\pi} = \frac{1}{3}
\]

PTS: 2  REF: 011108a2  STA: A2.S.13  TOP: Geometric Probability

270  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

271  ANS: 2

\[\cos(-305^\circ + 360^\circ) = \cos(55^\circ)\]

PTS: 2  REF: 061104a2  STA: A2.A.57  TOP: Reference Angles

272  ANS: 2

\[K = \frac{1}{2}(10)(18)\sin 120 = 45\sqrt{3} \approx 78\]

PTS: 2  REF: fall0907a2  STA: A2.A.74  TOP: Using Trigonometry to Find Area

KEY: basic

273  ANS: 3

PTS: 2  REF: 061020a2  STA: A2.A.71  TOP: Graphing Trigonometric Functions

274  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
\[
\frac{3^{-2}}{(-2)^3} = \frac{\frac{1}{9}}{-\frac{8}{9}} = -\frac{8}{9}
\]

PTS: 2  REF: 061003a2  STA: A2.N.1  TOP: Negative and Fractional Exponents

\[\binom{10}{4} = 210\]

PTS: 2  REF: 061113a2  STA: A2.S.11  TOP: Combinations

\((4)\) 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

\[\left(-420\left(-\frac{x}{180}\right)\right) = -\frac{7x}{3}\]

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

KEY: radians

\[\tan\left(126^\circ 43'\right) = -1.34\]

PTS: 2  REF: 061115a2  STA: A2.A.66  TOP: Determining Trigonometric Functions

\[\frac{3 + 5}{\sqrt{3} + 5} \cdot \frac{3 + 5}{\sqrt{3} + 5} = \frac{3 + 5\sqrt{3} + 5\sqrt{3} + 25}{3 - 25} = \frac{28 + 10\sqrt{3}}{-22} = -\frac{14 + 5\sqrt{3}}{11}\]

PTS: 2  REF: 061012a2  STA: A2.N.5  TOP: Rationalizing Denominators

\[gC_3a^6(-4b)^3 = -5376a^6b^3\]

PTS: 2  REF: 061126a2  STA: A2.A.36  TOP: Binomial Expansions

TOP: Permutations

\[4\sqrt{16x^2y^7} = 16^4x^4y^7 = 2x^2y^4\]

PTS: 2  REF: 061107a2  STA: A2.A.11  TOP: Radicals as Fractional Exponents
Cofunctions tangent and cotangent are complementary

PTS: 2  REF: 061014a2  STA: A2.A.58  TOP: Cofunction Trigonometric Relationships

(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

\[
\begin{array}{c|c|c|c|c}
 n & 0 & 1 & 2 & \Sigma \\
\hline
 n^2 + 2^n & 0^2 + 2^0 = 1 & 1^2 + 2^2 = 3 & 2^2 + 2^2 = 8 & 12 \\
\hline
2 \times 12 = 24
\end{array}
\]

PTS: 2  REF: fall0911a2  STA: A2.N.10  TOP: Sigma Notation

\[x^2 - 2x + y^2 + 6y = -3\]
\[x^2 - 2x + 1 + y^2 + 6y + 9 = -3 + 1 + 9\]
\[(x - 1)^2 + (y + 3)^2 = 7\]

PTS: 2  REF: 061016a2  STA: A2.A.47  TOP: Equations of Circles

\[2 \log x - (3 \log y + \log z) = \log x^2 - \log y^3 - \log z = \log \frac{x^2}{y^3z}\]

PTS: 2  REF: 061010a2  STA: A2.A.19  TOP: Properties of Logarithms

\[C_8^5 = 6,435\]

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

ANS: 3  PTS: 2  REF: fall0913a2  STA: A2.S.12  TOP: Using Inverse Trigonometric Functions

ANS: 3  PTS: 2  REF: 061022a2  STA: A2.A.63  TOP: Domain and Range
\[6x - x^3 - x^2 = -x(x^2 + x - 6) = -x(x + 3)(x - 2)\]
Algebra 2/Trigonometry 2 Point Regents Exam Questions
Answer Section

298 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.58 TOP: Reciprocal Trigonometric Relationships

299 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

300 ANS:
\[
3 - 2x \geq 7 \quad \text{or} \quad 3 - 2x \leq -7
\]
\[
-2x \geq 4 \quad -2x \leq -10
\]
\[
x \leq -2 \quad x \geq 5
\]

PTS: 2 REF: 011334a2 STA: A2.A.1 TOP: Absolute Value Inequalities
KEY: graph

301 ANS:
\[
\binom{3}{4} \left( \frac{1}{4} \right)^3 \left( \frac{3}{4} \right)^4 = 35 \left( \frac{1}{64} \right) \left( \frac{81}{256} \right) = \frac{2835}{16384} \approx 0.173
\]

PTS: 2 REF: 061335a2 STA: A2.S.15 TOP: Binomial Probability
KEY: exactly

302 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

303 ANS:
\[
x^2 - 6x - 27 = 0, \quad \frac{-b}{a} = 6, \quad \frac{c}{a} = -27. \quad \text{If} \ a = 1 \ \text{then} \ b = -6 \ \text{and} \ c = -27
\]

PTS: 4 REF: 061130a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic
\[
\frac{\sin^2 A + \cos^2 A}{\cos^2 A + \cos^2 A} = \frac{1}{\cos^2 A + \cos^2 A}
\]
\[
\tan^2 A + 1 = \sec^2 A
\]

PTS: 2       REF: 011135a2       STA: A2.A.67       TOP: Proving Trigonometric Identities

305 ANS:
\[y = 180.377(0.954)^x\]

PTS: 2       REF: 061231a2       STA: A2.S.7       TOP: Exponential Regression

306 ANS:
\[
\left(3 \times \frac{180}{\pi}\right) \text{^DMS} = 171^\circ 53' 14.419''
\]
\[
3 \times \frac{180}{\pi} \approx 171.89^\circ \approx 171^\circ 53',
\]

PTS: 2       REF: 011335a2       STA: A2.M.2       TOP: Radian Measure

KEY: degrees

307 ANS:
\[
2.5 \times \frac{180}{\pi} \approx 143^\circ 14'
\]

PTS: 2       REF: 061431a2       STA: A2.M.2       TOP: Radian Measure

KEY: degrees

308 ANS:
D: \(-5 \leq x \leq 8\). R: \(-3 \leq y \leq 2\)

PTS: 2       REF: 011132a2       STA: A2.A.51       TOP: Domain and Range

309 ANS:
\[
\frac{\sqrt{13}}{2} \cdot \sin \theta = \frac{y}{\sqrt{x^2 + y^2}} = \frac{2}{\sqrt{(-3)^2 + 2^2}} = -\frac{2}{\sqrt{13}}. \ \csc \theta = -\frac{\sqrt{13}}{2}.
\]

PTS: 2       REF: fall0933a2       STA: A2.A.62       TOP: Determining Trigonometric Functions

310 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
311 ANS:  
\[ y = 10.596(1.586)^x \]

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

312 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

313 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

314 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

315 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
KEY: binomial

316 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: Recursive Sequences
317 ANS:
\[2x - 1 = 27\]
\[2x - 1 = 81\]
\[2x = 82\]
\[x = 41\]

PTS: 2 REF: 061329a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

318 ANS:
\[2.5 \cdot \frac{180}{\pi} \approx 143.2^\circ\]

PTS: 2 REF: 011129a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

319 ANS:
\[3x^2 - 11x + 6 = 0. \text{ Sum } \frac{-b}{a} = \frac{11}{3}. \text{ Product } \frac{c}{a} = \frac{6}{3} = 2\]

PTS: 2 REF: 011329a2 STA: A2.A.20 TOP: Roots of Quadratics

320 ANS:
\[y = 0.488(1.116)^x\]

PTS: 2 REF: 061429a2 STA: A2.S.7 TOP: Exponential Regression

321 ANS:
no solution. \[\frac{4x}{x-3} = 2 + \frac{12}{x-3}\]
\[\frac{4x - 12}{x-3} = 2\]
\[\frac{4(x-3)}{x-3} = 2\]
\[4 \neq 2\]

PTS: 2 REF: fall0930a2 STA: A2.A.23 TOP: Solving Rationals
KEY: rational solutions

322 ANS:
\[x < -1 \text{ or } x > 5. \quad x^2 - 4x - 5 > 0. \quad x - 5 > 0 \text{ and } x + 1 > 0 \text{ or } x - 5 < 0 \text{ and } x + 1 < 0\]
\[(x - 5)(x + 1) > 0 \quad x > 5 \text{ and } x > -1 \quad x < 5 \text{ and } x < -1\]
\[x > 5 \quad x < -1\]

PTS: 2 REF: 011228a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable
323 ANS:
\[ A = 750e^{0.03(8)} \approx 953 \]

PTS: 2  REF: 061229a2  STA: A2.A.12  TOP: Evaluating Exponential Expressions

324 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

325 ANS:
\[ r = \sqrt{2^2 + 3^2} = \sqrt{13} \quad (x + 5)^2 + (y - 2)^2 = 13 \]

PTS: 2  REF: 011234a2  STA: A2.A.49  TOP: Writing Equations of Circles

326 ANS:
\[ a + 15 + 2a = 90 \]
\[ 3a + 15 = 90 \]
\[ 3a = 75 \]
\[ a = 25 \]

PTS: 2  REF: 011330a2  STA: A2.A.58  TOP: Cofunction Trigonometric Relationships

327 ANS:
\[ g(10) = \left( a(10)\sqrt{1 - x} \right)^2 = 100a^2(-9) = -900a^2 \]

PTS: 2  REF: 061333a2  STA: A2.A.41  TOP: Functional Notation

328 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
329 ANS:

\[ y = 0 \]

PTS: 2  REF: 061031a2  STA: A2.A.53  TOP: Graphing Exponential Functions

330 ANS:

\[ 25_c^6C_2 = 53, 130 \]

PTS: 2  REF: 011232a2  STA: A2.S.11  TOP: Combinations

331 ANS:

\[ \sec x = \sqrt{2} \]
\[ \cos x = \frac{1}{\sqrt{2}} \]
\[ \cos x = \frac{\sqrt{2}}{2} \]

\[ x = 45^\circ, 315^\circ \]

PTS: 2  REF: 061434a2  STA: A2.A.68  TOP: Trigonometric Equations

KEY: reciprocal functions

332 ANS:

\[ \frac{2\sqrt{3}}{3} \cdot \text{If } \sin 60^\circ = \frac{\sqrt{3}}{2}, \text{ then } \csc 60^\circ = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3} \]

PTS: 2  REF: 011235a2  STA: A2.A.59  TOP: Reciprocal Trigonometric Relationships

333 ANS:

\[ \frac{1}{2} - \frac{4}{d} = \frac{d - 8}{2d} \]
\[ \frac{1}{d} + \frac{3}{2d} = \frac{2d + 3d}{2d^2} \]

\[ \frac{d - 8}{2d} \times \frac{2d^2}{5d} = \frac{d - 8}{5} \]

PTS: 2  REF: 061035a2  STA: A2.A.17  TOP: Complex Fractions
334 ANS:
\[ \frac{-b}{a} = -\frac{11}{5} \text{. Product } \frac{c}{a} = -\frac{3}{5} \]

PTS: 2 REF: 061030a2 STA: A2.A.20 TOP: Roots of Quadratics

335 ANS:
\[ 4x - 5yi^8 + 6xi^3 + 2yi^4 = 4xi + 5y - 6xi + 2y = 7y - 2xi \]

PTS: 2 REF: 011433a2 STA: A2.N.7 TOP: Imaginary Numbers

336 ANS:
\[ 9 \text{ nCr } 2 \times 20 \text{ nCr } 3 \]
\[ 41040. \]

PTS: 2 REF: fall0935a2 STA: A2.S.12 TOP: Sample Space

337 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

338 ANS:
\[ y = -3 \sin 2x \text{. The period of the function is } \pi \text{, the amplitude is 3 and it is reflected over the } x\text{-axis.} \]

PTS: 2 REF: 061235a2 STA: A2.A.72 TOP: Identifying the Equation of a Trigonometric Graph

339 ANS:
\[ -4x + 5 < 13 \quad -4x + 5 > -13 \quad -2 < x < 4.5 \]
\[ -4x < 8 \quad -4x > -18 \]
\[ x > -2 \quad x < 4.5 \]

PTS: 2 REF: 011432a2 STA: A2.A.1 TOP: Absolute Value Inequalities

340 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
341 ANS:
\[ 5\sqrt{3x^3} - 2\sqrt{27x^3} = 5\sqrt{x^2 \cdot 3x} - 2\sqrt{9x^2 \cdot 3x} = 5x\sqrt{3x} - 6x\sqrt{3x} = -x\sqrt{3x} \]

PTS: 2 REF: 061032a2 STA: A2.N.2 TOP: Operations with Radicals

342 ANS:
\[ -\frac{a^2b^3}{4} \]

PTS: 2 REF: 011231a2 STA: A2.A.13 TOP: Simplifying Radicals
KEY: index > 2

343 ANS:
\[ \frac{5(3 + \sqrt{2})}{7} \cdot \frac{5}{3 - \sqrt{2}} \times \frac{3 + \sqrt{2}}{3 + \sqrt{2}} = \frac{5(3 + \sqrt{2})}{9 - 2} = \frac{5(3 + \sqrt{2})}{7} \]

PTS: 2 REF: fall0928a2 STA: A2.N.5 TOP: Rationalizing Denominators

344 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

345 ANS:

PTS: 2 REF: 011234a2 STA: A2.A.53 TOP: Graphing Exponential Functions

346 ANS:
\[ 39,916,800 = \frac{12P_{12}}{3! \cdot 2!} = \frac{479,001,600}{12} = 39,916,800 \]

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

\[ K = \text{absinC} = 6 \cdot 6 \sin 50 \approx 27.6 \]

PTS: 2 REF: 011429a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area

KEY: Parallelograms

348 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

349 ANS:

\[ \text{Sum } \frac{-b}{a} = -\frac{1}{12}, \quad \text{Product } \frac{c}{a} = -\frac{1}{2} \]

PTS: 2 REF: 061328a2 STA: A2.A.20 TOP: Roots of Quadratics

350 ANS:

\[
\begin{align*}
\text{Unit Circle: } & x = \frac{\sqrt{3}}{2} \\
& y = \frac{1}{2}
\end{align*}
\]

PTS: 2 REF: 061033a2 STA: A2.A.60 TOP: Unit Circle

351 ANS:

\[ 197^\circ 40'. \quad 3.45 \times \frac{180}{\pi} \approx 197^\circ 40' \]

PTS: 2 REF: fall0931a2 STA: A2.M.2 TOP: Radian Measure

KEY: degrees
\[
\frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2} = \frac{\sqrt{6}}{4}
\]

PTS: 2  REF: 061331a2  STA: A2.A.56  TOP: Determining Trigonometric Functions
KEY: degrees, common angles

353 ANS:
\[\{-3, -5, -8, -12\}\]

PTS: 2  REF: fall0934a2  STA: A2.A.33  TOP: Recursive Sequences

354 ANS:
\[45, 225\]
\[2\tan C - 3 = 3\tan C - 4\]
\[1 = \tan C\]
\[\tan^{-1} 1 = C\]
\[C = 45, 225\]

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

355 ANS:
\[(x + 5)^2 + (y - 3)^2 = 32\]

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

356 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

357 ANS:
\[\left(\frac{1}{3}\right) = 4\]
\[5x - 1 = 64\]
\[5x = 65\]
\[x = 13\]

PTS: 2  REF: 061433a2  STA: A2.A.28  TOP: Logarithmic Equations
KEY: advanced

358 ANS:
\[(x + 3)^2 + (y - 4)^2 = 25\]

PTS: 2  REF: fall0929a2  STA: A2.A.49  TOP: Writing Equations of Circles
\[
83^\circ 50' \cdot \frac{\pi}{180} \approx 1.463 \text{ radians } \quad s = \theta r = 1.463 \cdot 12 \approx 17.6
\]

**KEY:** arc length

**PT:** 2  **REF:** 011435a2  **STA:** A2.A.61  **TOP:** Arc Length

\[
\frac{2 \pm \sqrt{(-2)^2 - 4(6)(-3)}}{2(6)} = \frac{2 \pm \sqrt{76}}{12} = \frac{2 \pm \sqrt{4} \sqrt{19}}{12} = \frac{2 \pm 2\sqrt{19}}{12} = 1 \pm \sqrt{19}
\]

**PT:** 2  **REF:** 011332a2  **STA:** A2.A.25  **TOP:** Quadratics with Irrational Solutions

Ordered, the heights are 71, 71, 72, 74, 74, 75, 78, 79, 79, 83. \( Q_1 = 72 \) and \( Q_3 = 79 \). \( 79 - 72 = 7 \).

**KEY:** range, quartiles, interquartile range, variance

**PT:** 2  **REF:** 011331a2  **STA:** A2.S.4  **TOP:** Dispersion

\[
\sum_{n=1}^{15} 7n
\]

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

\[
12 \cdot 6 = 9w
\]

8 = w

**PT:** 2  **REF:** 011130a2  **STA:** A2.A.5  **TOP:** Inverse Variation

\[
a_n = 9n - 4 \quad . \quad S_n = \frac{20(5 + 176)}{2} = 1810
\]

\[
a_1 = 9(1) - 4 = 5
\]

\[
a_{20} = 9(20) - 4 = 176
\]

**PT:** 2  **REF:** 011328a2  **STA:** A2.A.35  **TOP:** Summations

**KEY:** arithmetic

\[
\sqrt{\frac{108x^5y^8}{6xy^5}} = \sqrt{18x^4y^3} = 3x^2y\sqrt{2y}
\]

**PT:** 2  **REF:** 011133a2  **STA:** A2.A.14  **TOP:** Operations with Radicals

**KEY:** with variables | index = 2
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

367 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

368 ANS: 
\((x + yi)(x - yi) = x^2 - y^2i^2 = x^2 + y^2\)

PTS: 2 REF: 061432a2 STA: A2.N.8 TOP: Conjugates of Complex Numbers

369 ANS: 
7.4

PTS: 2 REF: 061029a2 STA: A2.S.4 TOP: Dispersion

KEY: basic, group frequency distributions

370 ANS: 
\[
\frac{\cot x \sin x}{\sec x} = \frac{\cos x \sin x}{\sin x} \frac{1}{\cos x} = \cos^2 x
\]

PTS: 2 REF: 061334a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships

371 ANS: 

PTS: 2 REF: 061435a2 STA: A2.A.46 TOP: Transformations with Functions and Relations

372 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
373 ANS:

\[ 2x - 3 > 5 \text{ or } 2x - 3 < -5 \]

\[ \begin{align*}
2x & > 8 \\
x & > 4
\end{align*} \]

\[ \begin{align*}
2x & < -2 \\
x & < -1
\end{align*} \]

PTS: 2  REF: 061430a2  STA: A2.A.1  TOP: Absolute Value Inequalities

374 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

375 ANS:

\[ y = x^2 - 6. \text{ } f^{-1}(x) \text{ is not a function.} \]

\[ x = y^2 - 6 \]

\[ x + 6 = y^2 \]

\[ \pm \sqrt{x + 6} = y \]

PTS: 2  REF: 061132a2  STA: A2.A.44  TOP: Inverse of Functions

KEY: equations

376 ANS:

\[ 216 \left(\frac{\pi}{180}\right) \approx 3.8 \]

PTS: 2  REF: 061232a2  STA: A2.M.2  TOP: Radian Measure

KEY: radians

377 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

378 ANS:

\[ \frac{4}{9} x^2 - \frac{4}{3} x + 1 \cdot \left(\frac{2}{3} x - 1\right)^2 = \left(\frac{2}{3} x - 1\right) \left(\frac{2}{3} x - 1\right) = \frac{4}{9} x^2 - \frac{2}{3} x - \frac{2}{3} x + 1 = \frac{4}{9} x^2 - \frac{4}{3} x + 1 \]

PTS: 2  REF: 081034a2  STA: A2.N.3  TOP: Operations with Polynomials
379 ANS: 
\[ Q_1 = 3.5 \text{ and } Q_3 = 10.5. \text{ } 10.5 - 3.5 = 7. \]
PTS: 2  REF: 011430a2  STA: A2.S.4  TOP: Dispersion  
KEY: range, quartiles, interquartile range, variance

380 ANS: 
\[ 6y^3 - \frac{37}{10} y^2 - \frac{1}{5} y \cdot \left( \frac{1}{2} y^2 - \frac{3}{5} y \right) = 12y^3 + \frac{3}{10} y^2 - 4y^2 - \frac{1}{5} y = 6y^3 - \frac{37}{10} y^2 - \frac{1}{5} y \]
PTS: 2  REF: 061128a2  STA: A2.N.3  TOP: Operations with Polynomials

381 ANS: 
\[ \begin{array}{c}
-\frac{3}{5} (x^n - x) \\
-104
\end{array} \]
PTS: 2  REF: 011230a2  STA: A2.N.10  TOP: Sigma Notation  
KEY: basic

382 ANS: 
\[ K = ab \sin C = 18 \cdot 22 \sin 60 = 396 \cdot \frac{\sqrt{3}}{2} = 198 \sqrt{3} \]
PTS: 2  REF: 061234a2  STA: A2.A.74  TOP: Using Trigonometry to Find Area  
KEY: Parallelograms

383 ANS: 
\[ 2,298.65 \]
PTS: 2  REF: fall0932a2  STA: A2.A.12  TOP: Evaluating Exponential Expressions

384 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

385 ANS: 
\[ \frac{10 \cdot P_{10}^{10}}{3! \cdot 3! \cdot 2!} = \frac{3,628,800}{72} = 50,400 \]
PTS: 2  REF: 061330a2  STA: A2.S.10  TOP: Permutations
Algebra 2/Trigonometry 4 Point Regents Exam Questions
Answer Section

386 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

387 ANS:
\[\frac{51}{243} \cdot sC_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2 = \frac{40}{243}\]
\[sC_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)^1 = \frac{10}{243}\]
\[sC_5\left(\frac{1}{3}\right)^5\left(\frac{2}{3}\right)^0 = \frac{1}{243}\]

KEY: at least or at most

388 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

389 ANS:
\[y = 215.983(1.652)^x\].  \[215.983(1.652)^7 \approx 7250\]

PTS: 4  REF: 011337a2  STA: A2.S.7  TOP: Exponential Regression

390 ANS:
\[y = 27.2025(1.1509)^x\].  \[y = 27.2025(1.1509)^{18} \approx 341\]

PTS: 4  REF: 011238a2  STA: A2.S.7  TOP: Exponential Regression
391 ANS:
\[
\begin{align*}
0.468. \ \binom{2}{3}^6 \left(\frac{1}{3}\right)^2 & \approx 0.27313. \ \binom{2}{3}^7 \left(\frac{1}{3}\right)^1 & \approx 0.15607. \ \binom{2}{3}^8 \left(\frac{1}{3}\right)^0 & \approx 0.03902.
\end{align*}
\]

KEY: at least or at most

392 ANS:
\[
\pm \frac{3}{2}, -\frac{1}{2}. \quad 8x^3 + 4x^2 - 18x - 9 = 0
\]
\[
4x^2(2x + 1) - 9(2x + 1) = 0
\]
\[
(4x^2 - 9)(2x + 1) = 0
\]
\[
4x^2 - 9 = 0 \quad \text{or} \quad 2x + 1 = 0
\]
\[
(2x + 3)(2x - 3) = 0 \quad x = -\frac{1}{2}
\]
\[
x = \pm \frac{3}{2}
\]

PTS: 4 REF: fall0937a2 STA: A2.A.26 TOP: Solving Polynomial Equations

393 ANS:
\[
\begin{align*}
\frac{27}{\sin 75} = \frac{F_1}{\sin 60}, & \quad \frac{27}{\sin 75} = \frac{F_2}{\sin 45}. \\
F_1 & \approx 24 \quad F_1 \approx 20
\end{align*}
\]

PTS: 4 REF: 061238a2 STA: A2.A.73 TOP: Vectors

394 ANS:
\[
\begin{align*}
\frac{100}{\sin 32} = \frac{b}{\sin 105}, & \quad \frac{100}{\sin 32} = \frac{a}{\sin 43}\quad b \approx 182.3 \quad a \approx 128.7
\end{align*}
\]

PTS: 4 REF: 011338a2 STA: A2.A.73 TOP: Law of Sines
KEY: basic

395 ANS:
\[
\begin{align*}
\sin(45 + 30) = \sin 45 \cos 30 + \cos 45 \sin 30
\end{align*}
\]
\[
= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4}
\]

PTS: 4 REF: 061136a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities
KEY: evaluating
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

ANS:
No. TENNESSEE: \( \frac{9P_9}{4! \cdot 2! \cdot 2!} = \frac{362,880}{96} = 3,780 \). VERMONT: \( 7P_7 = 5,040 \)

PTS: 4  
REF: 061038a2  
STA: A2.S.10  
TOP: Permutations

ANS:
0, 60, 180, 300.  
\[
\begin{align*}
\sin 2\theta &= \sin \theta \\
\sin 2\theta - \sin \theta &= 0 \\
2\sin \theta \cos \theta - \sin \theta &= 0 \\
\sin (2\cos \theta - 1) &= 0 \\
\sin \theta = 0 \quad 2\cos \theta - 1 &= 0 \\
\theta &= 0, 180 \quad \cos \theta = \frac{1}{2} \\
\theta &= 60, 300
\end{align*}
\]

PTS: 4  
REF: 061037a2  
STA: A2.A.68  
TOP: Trigonometric Equations  
KEY: double angle identities

ANS:
26.2\%.  
\[
\begin{align*}
10C_8 \cdot 0.65^8 \cdot 0.35^2 + 10C_9 \cdot 0.65^9 \cdot 0.35^1 + 10C_{10} \cdot 0.65^{10} \cdot 0.35^0 & \approx 0.262
\end{align*}
\]

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

ANS:
\[
\frac{15}{\sin 103^\circ} = \frac{a}{\sin 42^\circ} \cdot \frac{1}{2} (15)(10.3)\sin 35 \approx 44
\]
a \approx 10.3

PTS: 4  
REF: 061337a2  
STA: A2.A.74  
TOP: Using Trigonometry to Find Area  
KEY: advanced

ANS:
0.167.  
\[
\begin{align*}
10C_8 \cdot 0.6^8 \cdot 0.4^2 + 10C_9 \cdot 0.6^9 \cdot 0.4^1 + 10C_{10} \cdot 0.6^{10} \cdot 0.4^0 & \approx 0.167
\end{align*}
\]

PTS: 4  
REF: 061036a2  
STA: A2.S.15  
TOP: Binomial Probability  
KEY: at least or at most

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
403 ANS:
\[
\frac{100}{\sin 33} = \frac{x}{\sin 32}. \quad \sin 66 \approx \frac{T}{97.3}
\]
x \approx 97.3 \quad t \approx 88

PTS: 4  
REF: 011236a2  
STA: A2.A.73  
TOP: Law of Sines

KEY: advanced

404 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

405 ANS:
\[
2 \sin^2 x + 5 \sin x - 3 = 0
\]

\[
(2 \sin x - 1)(\sin x + 3) = 0
\]

\[
\sin x = \frac{1}{2}
\]

\[
x = \frac{\pi}{6}, \frac{5\pi}{6}
\]

PTS: 4  
REF: 011436a2  
STA: A2.A.68  
TOP: Trigonometric Equations

KEY: quadratics

406 ANS:
\[
\frac{13}{x} = 10 - x \quad , \quad x = \frac{10 \pm \sqrt{100 - 4(1)(13)}}{2(1)} = \frac{10 \pm \sqrt{48}}{2} = \frac{10 \pm 4\sqrt{3}}{2} = 5 \pm 2\sqrt{3}
\]

\[
13 = 10x - x^2
\]

\[
x^2 - 10x + 13 = 0
\]

PTS: 4  
REF: 061336a2  
STA: A2.A.23  
TOP: Solving Rationals

KEY: irrational and complex solutions

407 ANS:
\[
32x^3 - 80x^4 + 80x^3 - 40x^2 + 10x - 1. \quad \xi C_0(2x)^5(-1)^0 = 32x^5. \quad \xi C_1(2x)^4(-1)^1 = -80x^4. \quad \xi C_2(2x)^3(-1)^2 = 80x^3.
\]
\[
\xi C_3(2x)^2(-1)^3 = -40x^2. \quad \xi C_4(2x)^1(-1)^4 = 10x. \quad \xi C_5(2x)^0(-1)^5 = -1
\]

PTS: 4  
REF: 011136a2  
STA: A2.A.36  
TOP: Binomial Expansions

408 ANS:
\[
\frac{1 + \frac{3}{x}}{1 - \frac{5}{x} - \frac{24}{x^2}} = \frac{x^2 + 3x}{x^2 - 5x - 24} = \frac{x(x + 3)}{(x - 8)(x + 3)} = \frac{x}{x - 8}
\]

PTS: 4  
REF: 061436a2  
STA: A2.A.17  
TOP: Complex Fractions
\[ 5C_4 \cdot 0.28^4 \cdot 0.72^1 + 5C_5 \cdot 0.28^5 \cdot 0.72^0 \approx 0.024 \]

**Key:** at least or at most

**TOP:** Binomial Probability

---

\[
\frac{23}{2} \cos^2 B + \sin^2 B = 1 \quad \tan B = \frac{\sin B}{\cos B} = \frac{\frac{5}{\sqrt{41}}}{\frac{4}{\sqrt{41}}} = \frac{5}{4}
\]

\[
\cos^2 B + \left( \frac{\frac{5}{\sqrt{41}}}{\frac{4}{\sqrt{41}}} \right)^2 = 1
\]

\[
\cos^2 B + \frac{25}{41} = \frac{41}{41}
\]

\[
\cos^2 B = \frac{16}{41}
\]

\[
\cos B = \frac{4}{\sqrt{41}}
\]

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

**Key:** evaluating

**TOP:** Angle Sum and Difference Identities

---

\[ 800. \quad x = 4^{2.5} = 32. \quad y^{\frac{-3}{2}} = 125 \quad \Rightarrow \quad \frac{x}{y} = \frac{32}{\frac{1}{25}} = 800 \]

\[
y = 125 \cdot \frac{-3}{2} = \frac{1}{25}
\]

**Key:** advanced

**TOP:** Logarithmic Equations

---

\[
x^3 + 5x^2 - 4x - 20 = 0
\]

\[
x^2(x + 5) - 4(x + 5) = 0
\]

\[
(x^2 - 4)(x + 5) = 0
\]

\[
(x + 2)(x - 2)(x + 5) = 0
\]

\[
x = \pm 2, -5
\]

**Key:** advanced

**TOP:** Solving Polynomial Equations
\[ C_0 \cdot 0.57^0 \cdot 0.43^5 + C_1 \cdot 0.57^1 \cdot 0.43^4 + C_2 \cdot 0.57^2 \cdot 0.43^3 \approx 0.37 \]

\[ \frac{-(x^2 - 4)}{(x + 4)(x + 3)} \times \frac{x + 3}{2(x - 2)} = \frac{-(x + 2)(x - 2)}{x + 4} \times \frac{1}{2(x - 2)} = \frac{-(x + 2)}{2(x + 4)} \]

\[ 3 \pm \sqrt{7}. \quad 2x^2 - 12x + 4 = 0 \]
\[ x^2 - 6x + 2 = 0 \]
\[ x^2 - 6x = -2 \]
\[ x^2 - 6x + 9 = -2 + 9 \]
\[ (x - 3)^2 = 7 \]
\[ x - 3 = \pm \sqrt{7} \]
\[ x = 3 \pm \sqrt{7} \]

\[ \sigma_x \approx 6.2. \quad 6 \text{ scores are within a population standard deviation of the mean.} \quad Q_3 - Q_1 = 41 - 37 = 4 \]
\[ x \approx 38.2 \]

\[ \frac{1}{3} \frac{1}{x + 3} - \frac{2}{3 - x} = \frac{4}{x^2 - 9} \]
\[ \frac{1}{x + 3} + \frac{2}{x - 3} = \frac{4}{x^2 - 9} \]
\[ \frac{x - 3 + 2(x + 3)}{(x + 3)(x - 3)} = \frac{4}{(x + 3)(x - 3)} \]
\[ x - 3 + 2x + 6 = 4 \]
\[ 3x = 1 \]
\[ x = \frac{1}{3} \]
\[
\frac{12}{\sin 32} = \frac{10}{\sin B}
\]

\[
C \approx 180 - (32 + 26.2) \approx 121.8.
\]

\[
\frac{12}{\sin 32} = \frac{c}{\sin 121.8}
\]

\[
B = \sin^{-1} \left( \frac{10 \sin 32}{12} \right) \approx 26.2
\]

\[
c = \frac{12 \sin 121.8}{\sin 32} \approx 19.2
\]

PTS: 4  REF: 011137a2  STA: A2.A.73  TOP: Law of Sines

KEY: basic
Algebra 2/Trigonometry 6 Point Regents Exam Questions
Answer Section

419 ANS:

\[ 81 x^3 + 2x^2 = 27 \]
\[ \left( 3^4 \right) x^3 + 2x^2 = \left( 3^3 \right) \]
\[ 3^{4x^3 + 8x^2} = 3^{5x} \]
\[ 4x^3 + 8x^2 - 5x = 0 \]
\[ x(4x^2 + 8x - 5) = 0 \]
\[ x(2x - 1)(2x + 5) = 0 \]
\[ x = 0, \frac{1}{2}, -\frac{5}{2} \]

PTS: 6       REF: 061239a2       STA: A2.A.27       TOP: Exponential Equations
KEY: common base not shown

420 ANS:

\[ \sqrt{x^2 + x - 1} = -4x + 3 \]
\[ -4 \left( \frac{2}{3} \right) + 3 \geq 0 \]
\[ x^2 + x - 1 = 16x^2 - 24x + 9 \]
\[ 0 = 15x^2 - 25x + 10 \]
\[ \frac{1}{3} \geq 0 \]
\[ 0 = 3x^2 - 5x + 2 \]
\[ -4(1) + 3 < 0 \]
\[ 0 = (3x - 2)(x - 1) \]
\[ 1 \text{ is extraneous} \]
\[ x = \frac{2}{3}, x \neq 1 \]

PTS: 6       REF: 011339a2       STA: A2.A.22       TOP: Solving Radicals
KEY: extraneous solutions

421 ANS:

\[ \frac{-2(x^2 + 6)}{x^4} \cdot \frac{x^2(x - 3) + 6(x - 3)}{x^2 - 4x} \cdot \frac{2x - 4}{x^4 - 3x^3} + \frac{x^2 + 2x - 8}{16 - x^2} \]
\[ \frac{(x^2 + 6)(x - 3)}{x(x - 4)} \cdot \frac{2(x - 2)}{x^3(x - 3)} + \frac{(4 + x)(4 - x)}{(x + 4)(x - 2)} \]
\[ \frac{-2(x^2 + 6)}{x^4} \]

PTS: 6       REF: 011239a2       STA: A2.A.16       TOP: Multiplication and Division of Rationals
KEY: division
422 ANS:
\[ x = -\frac{1}{3}, -1 \log_{x+3} \frac{x^3 + x - 2}{x} = 2 \]
\[ \frac{x^3 + x - 2}{x} = (x + 3)^2 \]
\[ \frac{x^3 + x - 2}{x} = x^2 + 6x + 9 \]
\[ x^3 + x - 2 = x^3 + 6x^2 + 9x \]
\[ 0 = 6x^2 + 8x + 2 \]
\[ 0 = 3x^2 + 4x + 1 \]
\[ 0 = (3x + 1)(x + 1) \]
\[ x = -\frac{1}{3}, -1 \]

KEY: basic

423 ANS:
\[ x^4 + 4x^3 + 4x^2 + 16x = 0 \]
\[ x(x^3 + 4x^2 + 4x + 16) = 0 \]
\[ x(x^2(x + 4) + 4(x + 4)) = 0 \]
\[ x(x^2 + 4)(x + 4) = 0 \]
\[ x = 0, \pm 2i, -4 \]


424 ANS:
\[ \left( -\frac{9}{2}, \frac{1}{2} \right) \text{ and } \left( \frac{1}{2}, \frac{11}{2} \right) \]
\[ y = x + 5 \]
\[ 4x^2 + 17x - 4 = x + 5 \]
\[ y = 4x^2 + 17x - 4 \]
\[ 4x^2 + 16x - 9 = 0 \]
\[ (2x + 9)(2x - 1) = 0 \]
\[ x = -\frac{9}{2} \text{ and } x = \frac{1}{2} \]
\[ y = -\frac{9}{2} + 5 = \frac{1}{2} \text{ and } y = \frac{1}{2} + 5 = \frac{11}{2} \]

PTS: 6  REF: 061139a2  STA: A2.A.3  TOP: Quadratic-Linear Systems
KEY: equations
\[
\log_{(x+3)}((2x+3)(x+5)) = 2 \quad \text{--6 is extraneous}
\]

\[
(x+3)^2 = (2x+3)(x+5)
\]

\[
x^2 + 6x + 9 = 2x^2 + 13x + 15
\]

\[
x^2 + 7x + 6 = 0
\]

\[
(x+6)(x+1) = 0
\]

\[
x = -1
\]

KEY: applying properties of logarithms

426 ANS:

33. \( a = \sqrt{10^2 + 6^2 - 2(10)(6) \cos 80} \approx 10.7. \) \( \angle C \) is opposite the shortest side. 

\[
\frac{6}{\sin C} = \frac{10.7}{\sin 80}
\]

\[
C \approx 33
\]

KEY: advanced

427 ANS:

\[
\ln(T - T_0) = -kt + 4.718 \quad \ln(T - 68) = -0.104(10) + 4.718.
\]

\[
\ln(150 - 68) = -k(3) + 4.718 \quad \ln(T - 68) = 3.678
\]

\[
4.407 \approx -3k + 4.718 \quad T - 68 \approx 39.6
\]

\[
k \approx 0.104 \quad T \approx 108
\]

KEY: advanced

428 ANS:

\[
r^2 = 25^2 + 85^2 - 2(25)(85) \cos 125.
\]

\[
r^2 \approx 10287.7
\]

\[
r \approx 101.43
\]

\[
\frac{2.5}{\sin x} = \frac{101.43}{\sin 125}
\]

\[
x \approx 12
\]

PTS: 6 REF: fall0939a2 STA: A2.A.73 TOP: Vectors
ANS:

\[ R = \sqrt{28^2 + 40^2 - 2(28)(40)\cos 115} \approx 58 \]

\[ \frac{58}{\sin 115} = \frac{40}{\sin x} \]

\[ x \approx 39 \]

PTS: 6  REF: 061439a2  STA: A2.A.73  TOP: Vectors