JMAP
REGENTS BY DATE

The NY Algebra 2/Trigonometry Regents Exams
Fall, 2009-June, 2013

www.jmap.org

Dear Sir

I have to acknolege the reciept of your favor of May 14. in which you mention that you have finished the 6. first books of Euclid, plane trigonometry, surveying & algebra and ask whether I think a further pursuit of that branch of science would be useful to you. there are some propositions in the latter books of Euclid, & some of Archimedes, which are useful, & I have no doubt you have been made acquainted with them. trigonometry, so far as this, is most valuable to every man, there is scarcely a day in which he will not resort to it for some of the purposes of common life. the science of calculation also is indispensible as far as the extraction of the square & cube roots; Algebra as far as the quadratic equation & the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence. in this light I view the conic sections, curves of the higher orders, perhaps even spherical trigonometry, Algebraical operations beyond the 2d dimension, and fluxions.

Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.

Algebra 2/Trigonometry Regents Exam Test Sampler fall09
www.jmap.org

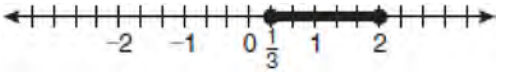
fall09a2

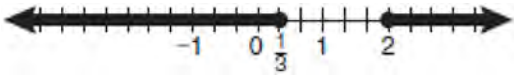
1 The expression $(3-7i)^2$ is equivalent to
1) $-40+0i$
2) $-40-42i$
3) $58+0i$
4) $58-42i$

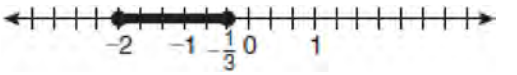
2 If $f(x)=\frac{1}{2}x-3$ and $g(x)=2x+5$, what is the value of $(g\circ f)(4)$?
1) -13
2) 3.5
3) 3
4) 6

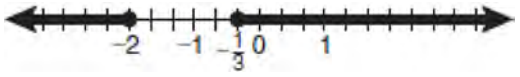
3 What are the values of θ in the interval $0°\le\theta<360°$ that satisfy the equation $\tan\theta-\sqrt{3}=0$?
1) 60º, 240º
2) 72º, 252º
3) 72º, 108º, 252º, 288º
4) 60º, 120º, 240º, 300º

4 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

5 Which graph represents the solution set of $|6x-7|\le 5$?
1) 

2) 

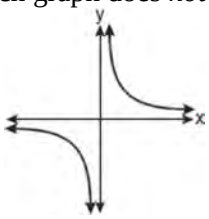
3) 

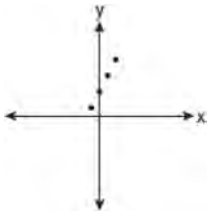
4) 

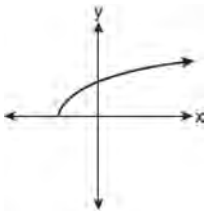
6 Which function is *not* one-to-one?
1) $\{(0,1),(1,2),(2,3),(3,4)\}$
2) $\{(0,0),(1,1),(2,2),(3,3)\}$
3) $\{(0,1),(1,0),(2,3),(3,2)\}$
4) $\{(0,1),(1,0),(2,0),(3,2)\}$

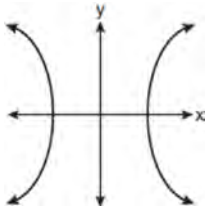
7 In $\triangle ABC$, $m\angle A=120$, $b=10$, and $c=18$. What is the area of $\triangle ABC$ to the *nearest square inch*?
1) 52
2) 78
3) 90
4) 156

8 Which graph does *not* represent a function?

1) 

2) 

3) 

4) 

9 The expression $\log_8 64$ is equivalent to

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

10 The expression $\cos 4x \cos 3x + \sin 4x \sin 3x$ is equivalent to

1) $\sin x$
2) $\sin 7x$
3) $\cos x$
4) $\cos 7x$

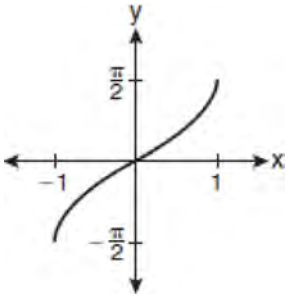
11 The value of the expression $2\sum_{n=0}^{2}(n^2 + 2^n)$ is

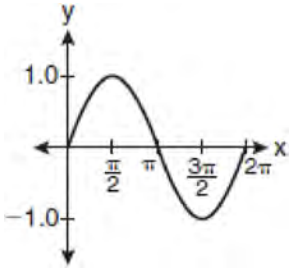
1) 12
2) 22
3) 24
4) 26

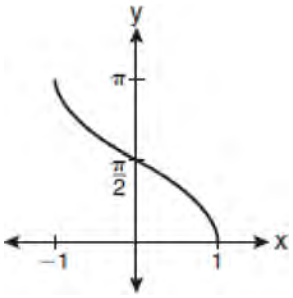
12 For which equation does the sum of the roots equal $\frac{3}{4}$ and the product of the roots equal –2?

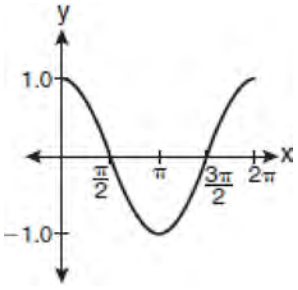
1) $4x^2 - 8x + 3 = 0$
2) $4x^2 + 8x + 3 = 0$
3) $4x^2 - 3x - 8 = 0$
4) $4x^2 + 3x - 2 = 0$

13 Which graph represents the equation $y = \cos^{-1} x$?

1) 

2) 

3) 

4) 

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

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

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

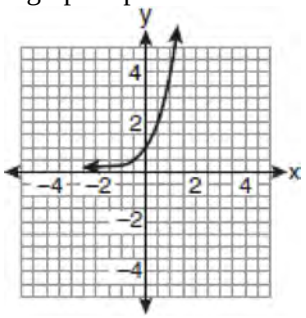
3) $\frac{a^2}{b}$

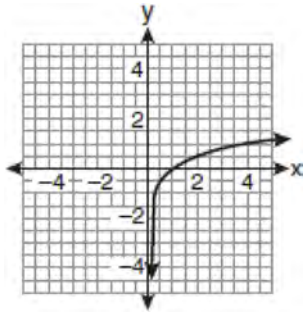
4) $a^{-2}b^{-1}$

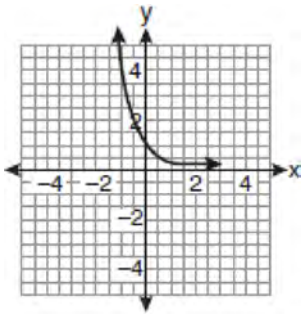
15 The lengths of 100 pipes have a normal distribution with a mean of 102.4 inches and a standard deviation of 0.2 inch. If one of the pipes measures exactly 102.1 inches, its length lies

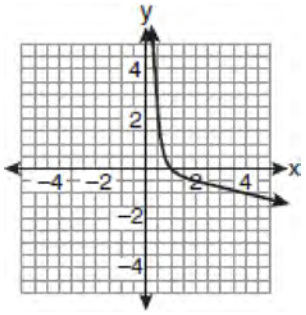
1) below the 16th percentile
2) between the 50th and 84th percentiles
3) between the 16th and 50th percentiles
4) above the 84th percentile

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

1) 

2) 

3) 

4) 

17 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) $-x(x+3)(x-2)$

18 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) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

19 What is the fourth term in the expansion of $(3x-2)^5$?

1) $-720x^2$
2) $-240x$
3) $720x^2$
4) $1,080x^3$

20 Written in simplest form, the expression $\dfrac{\frac{x}{4}-\frac{1}{x}}{\frac{1}{2x}+\frac{1}{4}}$ is equivalent to

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

21 What is the solution of the equation $2\log_4(5x) = 3$?

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

22 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) 2π
2) 2
3) 8π
4) 8

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

1) $(-\infty, \infty)$
2) $(2, \infty)$
3) $[2, \infty)$
4) $[3, \infty)$

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

Statistics Class Averages

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

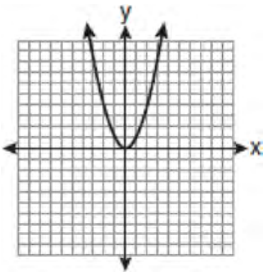
What is the population variance for this set of data?

1) 8.2
2) 8.3
3) 67.3
4) 69.3

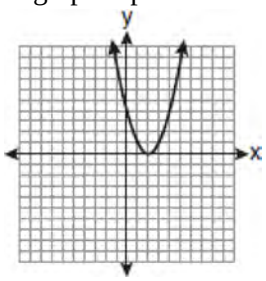
25 Which formula can be used to determine the total number of different eight-letter arrangements that can be formed using the letters in the word *DEADLINE*?

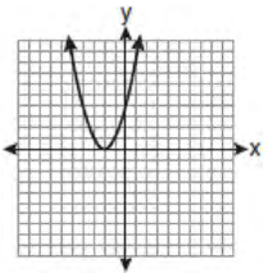
1) 8!
2) $\frac{8!}{4!}$
3) $\frac{8!}{2!+2!}$
4) $\frac{8!}{2!\cdot 2!}$

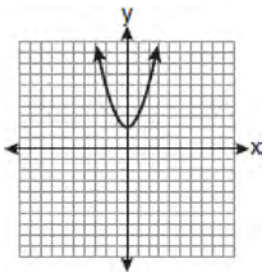
26 The graph below shows the function f(x).

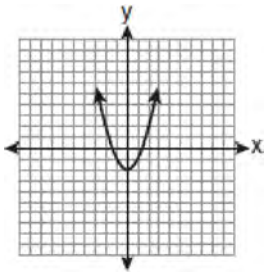


Which graph represents the function f($x+2$)?

1)


2)


3)


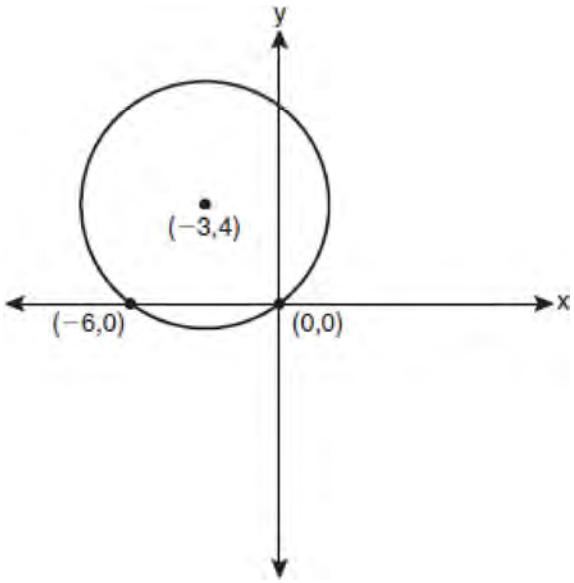
4)


27 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(θ) $=2\sin\theta+3$

28 Express $\dfrac{5}{3-\sqrt{2}}$ with a rational denominator, in simplest radical form.

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



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

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

32 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.

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

34 Find the first four terms of the recursive sequence defined below.

$$a_1 = -3$$

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

35 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.

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

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

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

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

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

39 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.

Algebra 2/Trigonometry Regents Exam 0610
www.jmap.org

0610a2

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

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

2 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

3 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) $\frac{8}{9}$

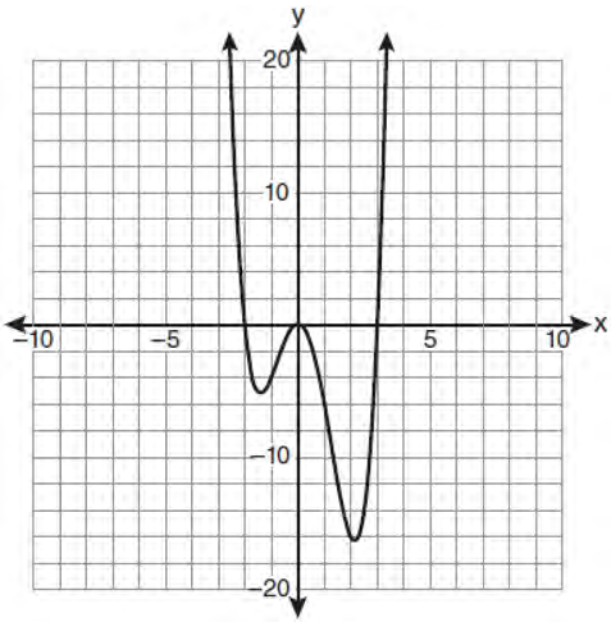
4 Four points on the graph of the function f(x) are shown below.

$$\{(0,1),(1,2),(2,4),(3,8)\}$$

Which equation represents f(x)?

1) $f(x) = 2^x$
2) $f(x) = 2x$
3) $f(x) = x + 1$
4) $f(x) = \log_2 x$

5 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) $\{-2, 0, 3\}$

6 In simplest form, $\sqrt{-300}$ is equivalent to

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

7 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) ${}_{20}C_3$
4) ${}_{20}P_3$

8 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) $2x^2(2x+3)(3x-2)$

9 The solutions of the equation $y^2 - 3y = 9$ are

1) $\frac{3 \pm 3i\sqrt{3}}{2}$
2) $\frac{3 \pm 3i\sqrt{5}}{2}$
3) $\frac{-3 \pm 3\sqrt{5}}{2}$
4) $\frac{3 \pm 3\sqrt{5}}{2}$

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

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

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

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

12 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) $\frac{17+5\sqrt{3}}{14}$

13 Which relation is *not* a function?

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

14 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) $\cot(90° - A) = \frac{1}{3}$

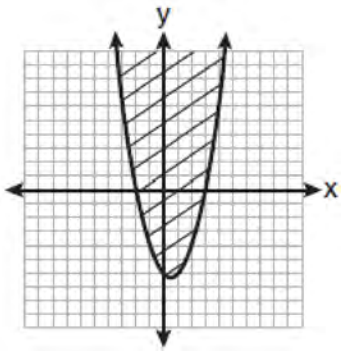
15 The solution set of $4^{x^2+4x} = 2^{-6}$ is

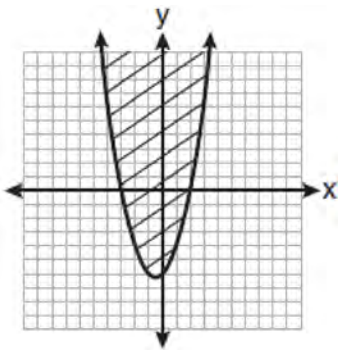
1) $\{1, 3\}$
2) $\{-1, 3\}$
3) $\{-1, -3\}$
4) $\{1, -3\}$

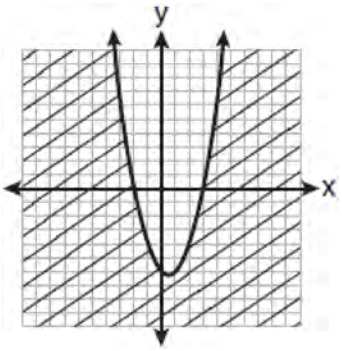
16 The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to

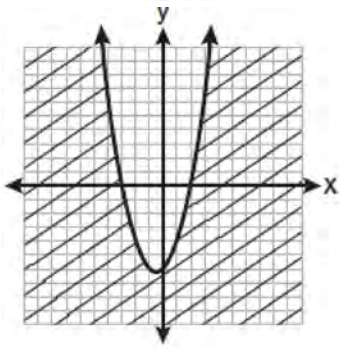
1) $(x-1)^2 + (y+3)^2 = -3$
2) $(x-1)^2 + (y+3)^2 = 7$
3) $(x+1)^2 + (y+3)^2 = 7$
4) $(x+1)^2 + (y+3)^2 = 10$

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

1) 

2) 

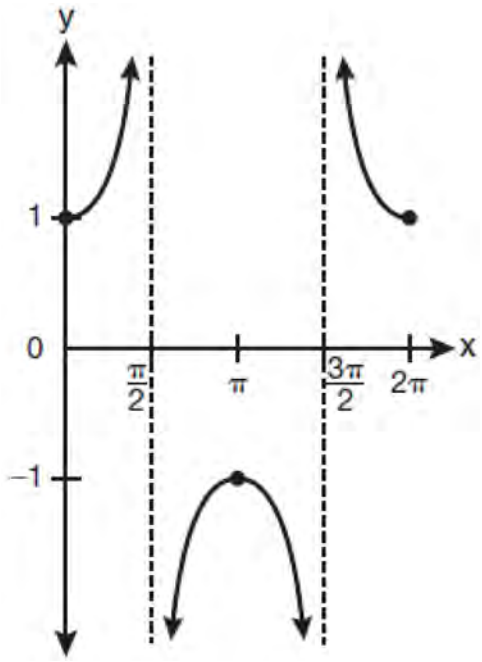
3) 

4) 

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

19 The product of i^7 and i^5 is equivalent to
1) 1
2) –1
3) i
4) $-i$

20 Which equation is represented by the graph below?



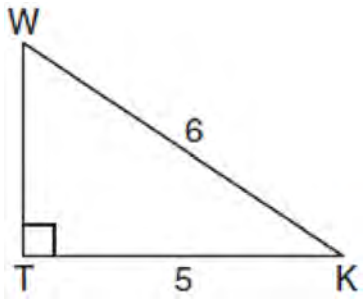
1) $y = \cot x$
2) $y = \csc x$
3) $y = \sec x$
4) $y = \tan x$

21 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

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

1) $\{x \mid 0 \le x \le \pi\}$
2) $\{x \mid 0 \le x \le 2\pi\}$
3) $\left\{x \mid -\frac{\pi}{2} < x < \frac{\pi}{2}\right\}$
4) $\left\{x \mid -\frac{\pi}{2} < x < \frac{3\pi}{2}\right\}$

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



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

1) 33°33'
2) 33°34'
3) 33°55'
4) 33°56'

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

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

26 What is the formula for the *n*th term of the sequence $54, 18, 6, \ldots$?

1) $a_n = 6\left(\frac{1}{3}\right)^n$
2) $a_n = 6\left(\frac{1}{3}\right)^{n-1}$
3) $a_n = 54\left(\frac{1}{3}\right)^n$
4) $a_n = 54\left(\frac{1}{3}\right)^{n-1}$

27 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) 6π

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

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

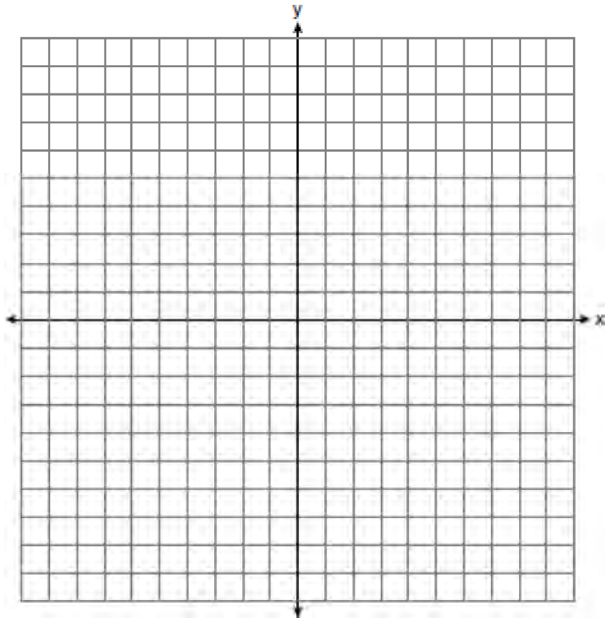
Unit 2 Mathematics Test

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

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

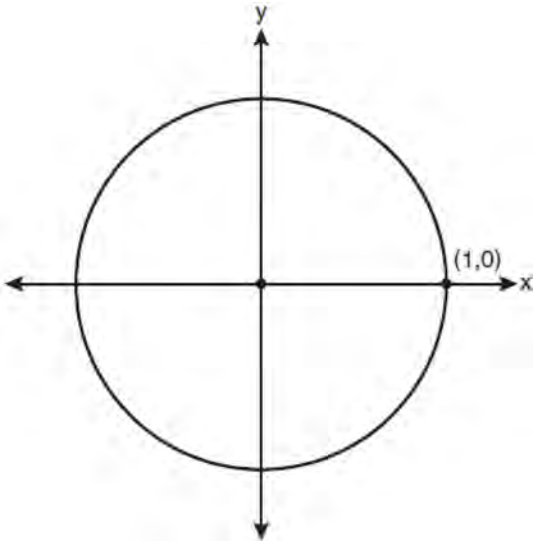
30 Find the sum and product of the roots of the equation $5x^2 + 11x - 3 = 0$.

31 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.



32 Express $5\sqrt{3x^3} - 2\sqrt{27x^3}$ in simplest radical form.

33 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 $\sin 240°$.



34 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*.

35 Express in simplest form: $\dfrac{\frac{1}{2} - \frac{4}{d}}{\frac{1}{d} + \frac{3}{2d}}$

36 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?

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

38 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.

39 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.

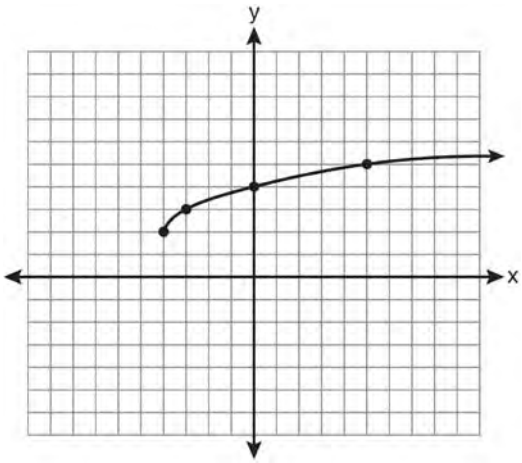
Algebra 2/Trigonometry Regents Exam 0810
www.jmap.org

0810a2

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

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

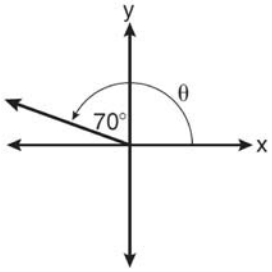
3 What are the domain and the range of the function shown in the graph below?

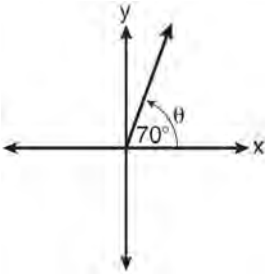


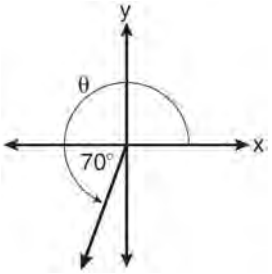
1) $\{x|x>-4\}$; $\{y|y>2\}$
2) $\{x|x\geq -4\}$; $\{y|y\geq 2\}$
3) $\{x|x>2\}$; $\{y|y>-4\}$
4) $\{x|x\geq 2\}$; $\{y|y\geq -4\}$

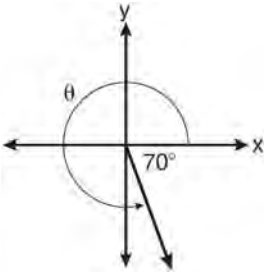
4 The expression $2i^2+3i^3$ is equivalent to
1) $-2-3i$
2) $2-3i$
3) $-2+3i$
4) $2+3i$

5 In which graph is θ coterminal with an angle of −70°?

1)


2)


3)


4)


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

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

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

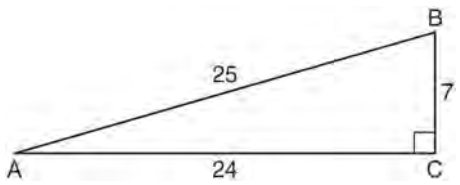
8 What is the value of x in the equation $9^{3x+1} = 27^{x+2}$?

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

9 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) $\frac{7 \pm \sqrt{73}}{4}$

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



1) $\frac{25}{24}$
2) $\frac{25}{7}$
3) $\frac{24}{7}$
4) $\frac{7}{24}$

11 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}

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

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

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

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

14 What is a formula for the nth term of sequence B shown below?

$$B = 10, 12, 14, 16, \ldots$$

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

15 Which values of x are in the solution set of the following system of equations?

$$y = 3x - 6$$
$$y = x^2 - x - 6$$

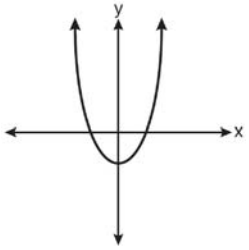
1) $0, -4$
2) $0, 4$
3) $6, -2$
4) $-6, 2$

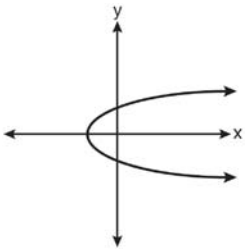
16 The roots of the equation $9x^2 + 3x - 4 = 0$ are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

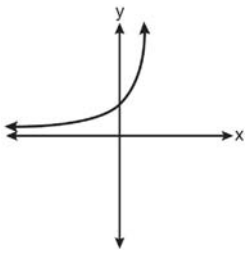
17 In ΔABC, $a = 3$, $b = 5$, and $c = 7$. What is $m\angle C$?
1) 22
2) 38
3) 60
4) 120

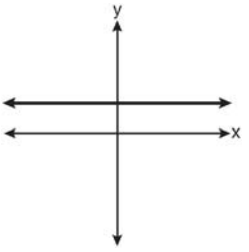
18 When $x^{-1} - 1$ is divided by $x - 1$, the quotient is
1) -1
2) $-\frac{1}{x}$
3) $\frac{1}{x^2}$
4) $\frac{1}{(x-1)^2}$

19 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) $\frac{\sqrt{3}}{a}$

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

2) 

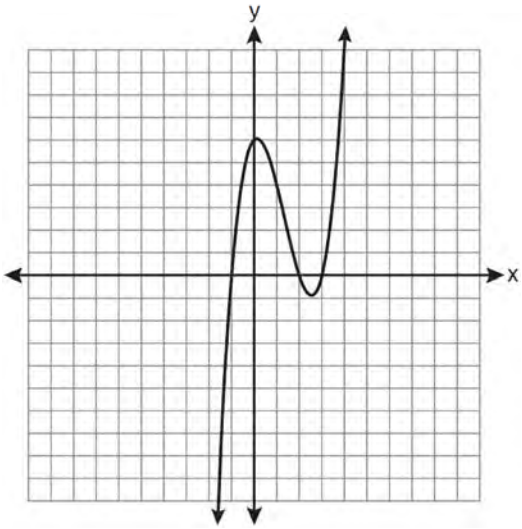
3) 

4) 

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

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

23 The graph of $y = x^3 - 4x^2 + x + 6$ is shown below.



What is the product of the roots of the equation $x^3 - 4x^2 + x + 6 = 0$?

1) -36
2) -6
3) 6
4) 4

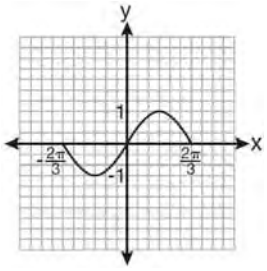
24 What is the conjugate of $-2 + 3i$?

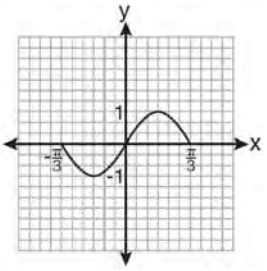
1) $-3 + 2i$
2) $-2 - 3i$
3) $2 - 3i$
4) $3 + 2i$

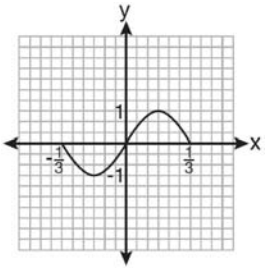
25 What is the common ratio of the geometric sequence whose first term is 27 and fourth term is 64?

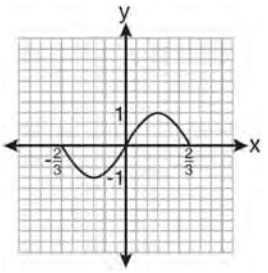
1) $\frac{3}{4}$
2) $\frac{64}{81}$
3) $\frac{4}{3}$
4) $\frac{37}{3}$

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

1)


2)


3)


4)


27 Which two functions are inverse functions of each other?

1) $f(x) = \sin x$ and $g(x) = \cos(x)$
2) $f(x) = 3 + 8x$ and $g(x) = 3 - 8x$
3) $f(x) = e^x$ and $g(x) = \ln x$
4) $f(x) = 2x - 4$ and $g(x) = -\frac{1}{2}x + 4$

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

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

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

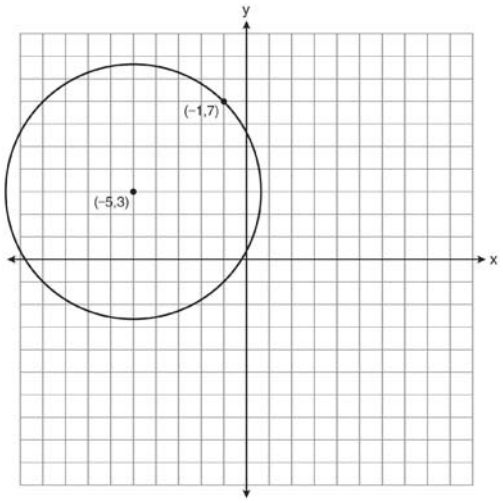
31 The table below shows the number of new stores in a coffee shop chain that opened during the years 1986 through 1994.

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

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

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

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



Write an equation that represents the circle.

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

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

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

37 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 $\tan(A + B)$.

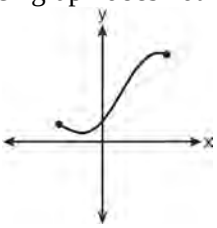
38 A study shows that 35% of the fish caught in a local lake had high levels of mercury. Suppose that 10 fish were caught from this lake. Find, to the *nearest tenth of a percent,* the probability that *at least* 8 of the 10 fish caught did *not* contain high levels of mercury.

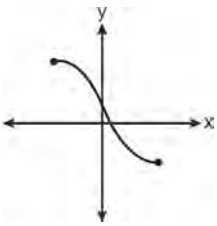
39 Solve algebraically for x: $\log_{x+3} \frac{x^3 + x - 2}{x} = 2$

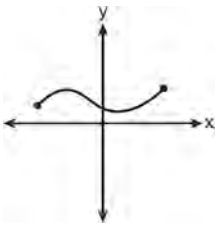
Algebra 2/Trigonometry Regents Exam 0111
www.jmap.org

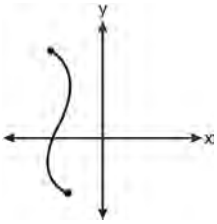
0111a2

1 Which graph does *not* represent a function?

1) 

2) 

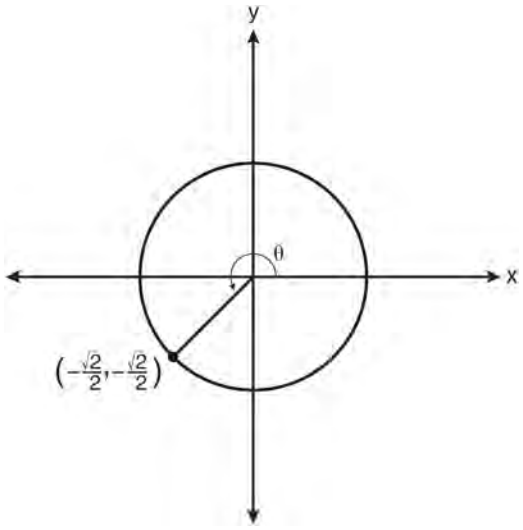
3) 

4) 

2 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

3 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) $0, -1, -2$

4 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 θ intersects the unit circle.



What is m$\angle\theta$?
1) 45
2) 135
3) 225
4) 240

5 What is the fifteenth term of the sequence $5, -10, 20, -40, 80, \ldots$?
1) $-163,840$
2) $-81,920$
3) 81,920
4) 327,680

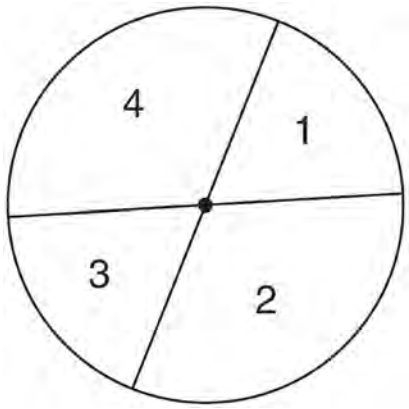
6 What is the solution set of the equation $|4a + 6| - 4a = -10$?

1) $\varnothing$
2) $\{0\}$
3) $\left\{\frac{1}{2}\right\}$
4) $\left\{0, \frac{1}{2}\right\}$

7 If $\sin A = \frac{2}{3}$ where $0° < A < 90°$, 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) $-\frac{4\sqrt{5}}{9}$

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



If darts thrown at this board are equally likely to land anywhere on the board, what is the probability that a dart that hits the board will land in either sector 1 or sector 3?

1) $\frac{1}{6}$
2) $\frac{1}{3}$
3) $\frac{1}{2}$
4) $\frac{2}{3}$

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

10 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) $\{n + 4, n + 16, n + 64, n + 256, \ldots\}$

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

12 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) $\cos A=\frac{8}{5}$

13 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

14 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

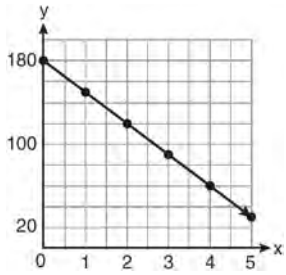
15 The solution set of the inequality $x^2-3x>10$ is
1) $\{x\,|\,-2<x<5\}$
2) $\{x\,|\,0<x<3\}$
3) $\{x\,|\,x<-2 \text{ or } x>5\}$
4) $\{x\,|\,x<-5 \text{ or } x>2\}$

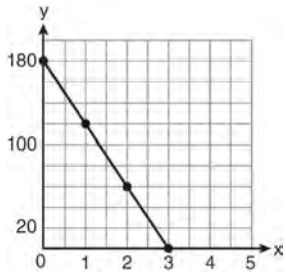
16 If $x^2+2=6x$ is solved by completing the square, an intermediate step would be
1) $(x+3)^2=7$
2) $(x-3)^2=7$
3) $(x-3)^2=11$
4) $(x-6)^2=34$

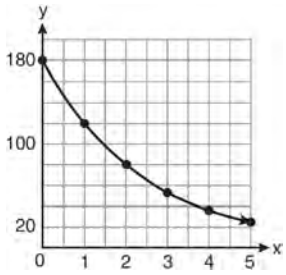
17 Three marbles are to be drawn at random, without replacement, from a bag containing 15 red marbles, 10 blue marbles, and 5 white marbles. Which expression can be used to calculate the probability of drawing 2 red marbles and 1 white marble from the bag?
1) $\frac{{}_{15}C_2\cdot{}_5C_1}{{}_{30}C_3}$
2) $\frac{{}_{15}P_2\cdot{}_5P_1}{{}_{30}C_3}$
3) $\frac{{}_{15}C_2\cdot{}_5C_1}{{}_{30}P_3}$
4) $\frac{{}_{15}P_2\cdot{}_5P_1}{{}_{30}P_3}$

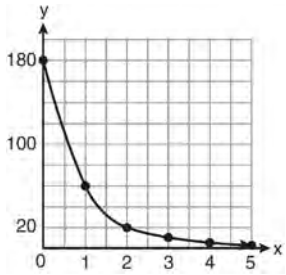
18 The expression $x^{-\frac{2}{5}}$ is equivalent to
1) $-\sqrt[2]{x^5}$
2) $-\sqrt[5]{x^2}$
3) $\frac{1}{\sqrt[2]{x^5}}$
4) $\frac{1}{\sqrt[5]{x^2}}$

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

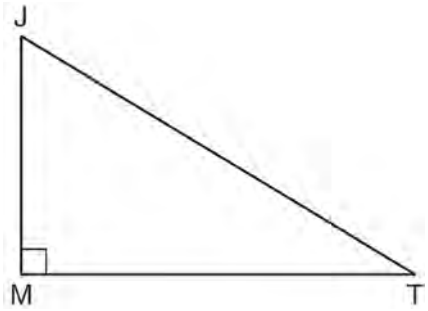
1) 

2) 

3) 

4) 

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



What is the value of $\cot J$?

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

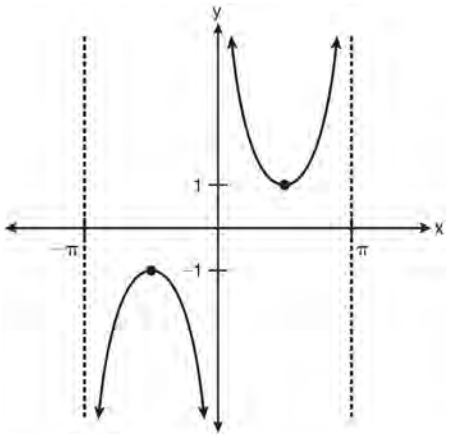
21 For which equation does the sum of the roots equal –3 and the product of the roots equal 2?

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

22 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) $2\sqrt{x+2}$

23 Which equation is sketched in the diagram below?



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

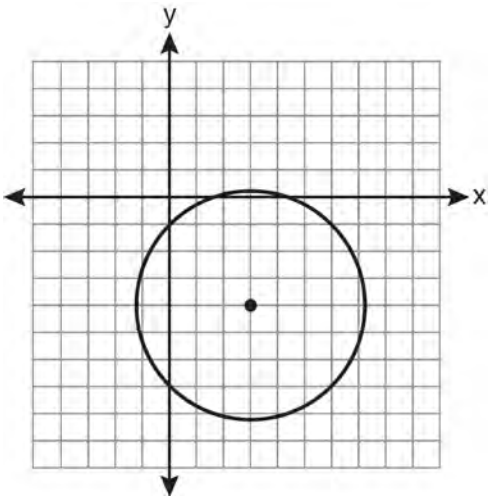
24 The expression $\log_5\left(\frac{1}{25}\right)$ is equivalent to

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

25 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

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

27 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.

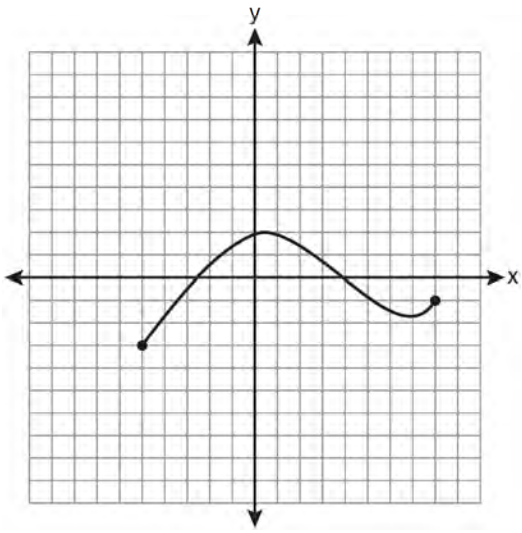
28 Solve algebraically for x: $16^{2x+3} = 64^{x+2}$

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

30 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.

31 Evaluate: $10 + \sum_{n=1}^{5} (n^3 - 1)$

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



State the domain and range of this function.

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

34 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.

35 Starting with $\sin^2 A + \cos^2 A = 1$, derive the formula $\tan^2 A + 1 = \sec^2 A$.

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

37 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*.

38 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.

39 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.]

Algebra 2/Trigonometry Regents Exam 0611
www.jmap.org

0611a2

1 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

2 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) $\frac{5}{18}$

3 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

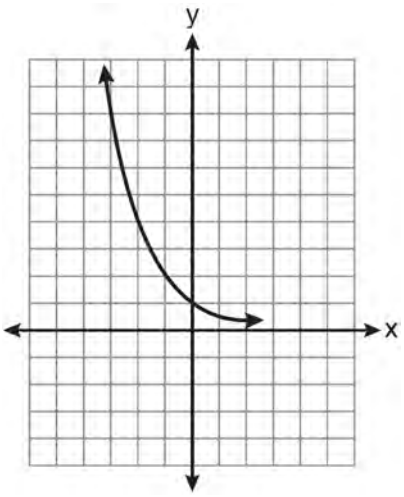
4 Expressed as a function of a positive acute angle, $\cos(-305°)$ is equal to
1) $-\cos 55°$
2) $\cos 55°$
3) $-\sin 55°$
4) $\sin 55°$

5 The value of x in the equation $4^{2x+5} = 8^{3x}$ is
1) 1
2) 2
3) 5
4) -10

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

7 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) $4x^8y^{28}$

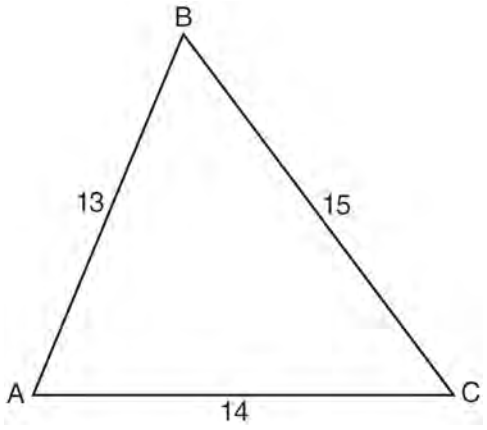
8 Which equation is represented by the graph below?



1) $y = 5^x$
2) $y = 0.5^x$
3) $y = 5^{-x}$
4) $y = 0.5^{-x}$

9 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) $16384\sqrt{10}$

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



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

11 What is the period of the function $f(\theta) = -2\cos 3\theta$?

1) π
2) $\frac{2\pi}{3}$
3) $\frac{3\pi}{2}$
4) 2π

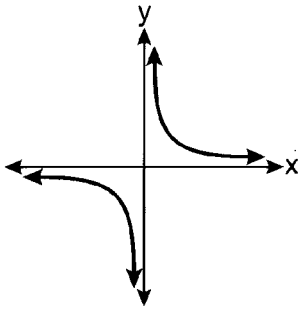
12 What is the range of $f(x) = (x+4)^2 + 7$?

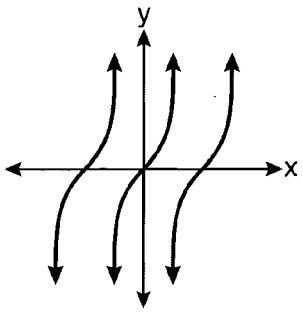
1) $y \geq -4$
2) $y \geq 4$
3) $y = 7$
4) $y \geq 7$

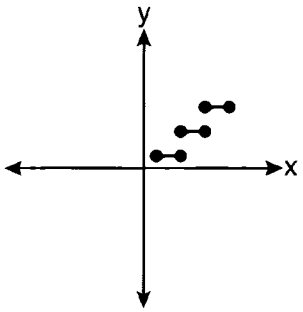
13 Ms. Bell's mathematics class consists of 4 sophomores, 10 juniors, and 5 seniors. How many different ways can Ms. Bell create a four-member committee of juniors if each junior has an equal chance of being selected?

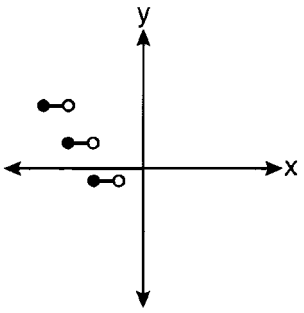
1) 210
2) 3,876
3) 5,040
4) 93,024

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

1)


2)


3)


4)


15 The value of $\tan 126°43'$ to the *nearest ten-thousandth* is

1) –1.3407
2) –1.3408
3) –1.3548
4) –1.3549

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

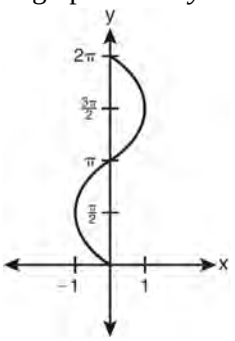
17 Akeem invests $25,000 in an account that pays 4.75% annual interest compounded continuously. Using the formula $A = Pe^{rt}$, where A = the amount in the account after t years, P = principal invested, and r = the annual interest rate, how many years, to the *nearest tenth*, will it take for Akeem's investment to triple?

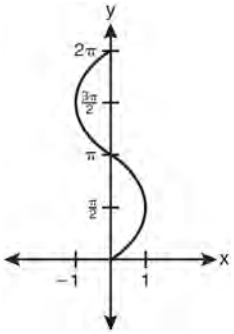
1) 10.0
2) 14.6
3) 23.1
4) 24.0

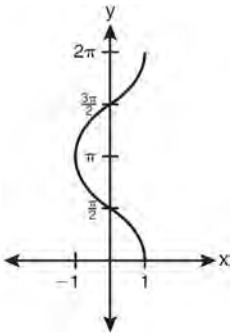
18 The value of the expression $\sum_{r=3}^{5}(-r^2+r)$ is

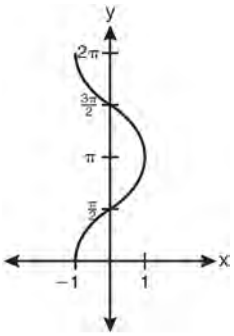
1) –38
2) –12
3) 26
4) 62

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

1)


2)


3)


4)


20 If $r = \sqrt[3]{\frac{A^2B}{C}}$, 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) $\frac{2}{3}\log A + \frac{1}{3}\log B - \frac{1}{3}\log C$

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

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

22 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

23 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) $\csc^2\theta$

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

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

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

1) $17 = \frac{119 + x}{x}$
2) $17 = \frac{119 + 16x}{x}$
3) $17 = \frac{446 + x}{26 + x}$
4) $17 = \frac{446 + 16x}{26 + x}$

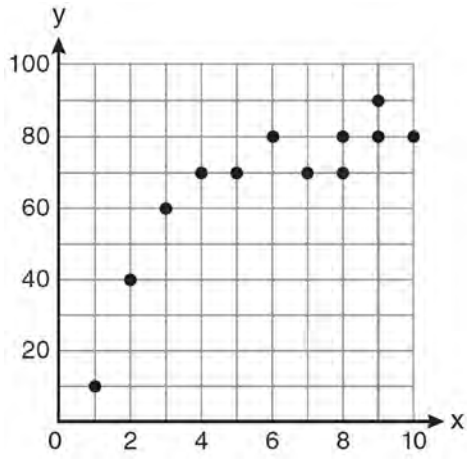
25 What is the radian measure of the smaller angle formed by the hands of a clock at 7 o'clock?

1) $\frac{\pi}{2}$
2) $\frac{2\pi}{3}$
3) $\frac{5\pi}{6}$
4) $\frac{7\pi}{6}$

26 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

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



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

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

29 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.

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

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

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

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

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

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

36 Express as a single fraction the exact value of $\sin 75°$.

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

38 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.

39 Solve the following systems of equations algebraically: $5 = y - x$

$$4x^2 = -17x + y + 4$$

Algebra 2/Trigonometry Regents Exam 0112
www.jmap.org

0112a2

1 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

2 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

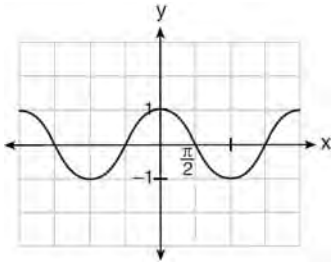
3 Which expression, when rounded to three decimal places, is equal to -1.155?
1) $\sec\left(\frac{5\pi}{6}\right)$
2) $\tan(49°20')$
3) $\sin\left(-\frac{3\pi}{5}\right)$
4) $\csc(-118°)$

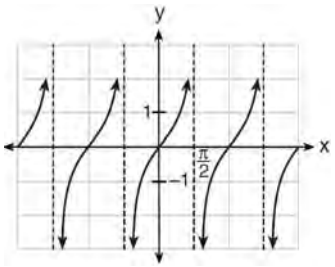
4 If $f(x) = 4x - x^2$ and $g(x) = \frac{1}{x}$, then $(f \circ g)\left(\frac{1}{2}\right)$ is equal to
1) $\frac{4}{7}$
2) -2
3) $\frac{7}{2}$
4) 4

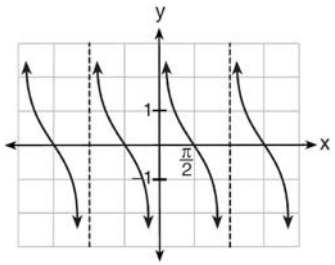
5 A population of rabbits doubles every 60 days according to the formula $P = 10(2)^{\frac{t}{60}}$, where P is the population of rabbits on day t. What is the value of t when the population is 320?
1) 240
2) 300
3) 660
4) 960

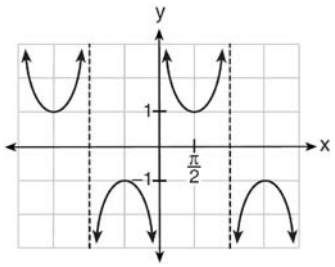
6 What is the product of $\left(\frac{x}{4} - \frac{1}{3}\right)$ and $\left(\frac{x}{4} + \frac{1}{3}\right)$?
1) $\frac{x^2}{8} - \frac{1}{9}$
2) $\frac{x^2}{16} - \frac{1}{9}$
3) $\frac{x^2}{8} - \frac{x}{6} - \frac{1}{9}$
4) $\frac{x^2}{16} - \frac{x}{6} - \frac{1}{9}$

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

1) 

2) 

3) 

4) 

8 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) $\cos x + \sin x$

9 What are the sum and product of the roots of the equation $6x^2 - 4x - 12 = 0$?

1) sum = $-\frac{2}{3}$; product = -2
2) sum = $\frac{2}{3}$; product = -2
3) sum = -2; product = $\frac{2}{3}$
4) sum = -2; product = $-\frac{2}{3}$

10 Given ΔABC 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

11 When $x^{-1} + 1$ is divided by $x + 1$, the quotient equals

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

12 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%

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

14 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) $-\frac{63}{65}$

15 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) $2x^4y^2$

16 What is the solution set of the equation $3x^5 - 48x = 0$?

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

17 A sequence has the following terms: $a_1 = 4$, $a_2 = 10$, $a_3 = 25$, $a_4 = 62.5$. Which formula represents the nth 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) $a_n = 4(2.5)^{n-1}$

18 In parallelogram $BFLO$, $OL = 3.8$, $LF = 7.4$, and $m\angle O = 126$. If diagonal $\overline{BL}$ is drawn, what is the area of ΔBLF?

1) 11.4
2) 14.1
3) 22.7
4) 28.1

19 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 $(e, 1)$.

20 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

21 A spinner is divided into eight equal sections. Five sections are red and three are green. If the spinner is spun three times, what is the probability that it lands on red *exactly* twice?

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

22 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) $\{y|y \in \text{real numbers}\}$

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

1) Lin Reg
$y = a + bx$
$a = 59.026$
$b = 6.767$
$r = .8643$

2) Lin Reg
$y = a + bx$
$a = .7$
$b = 24.2$
$r = .8361$

3) Lin Reg
$y = a + bx$
$a = 2.45$
$b = .95$
$r = .6022$

4) Lin Reg
$y = a + bx$
$a = -2.9$
$b = 24.1$
$r = -.8924$

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) $\log 6 + 2\log a$

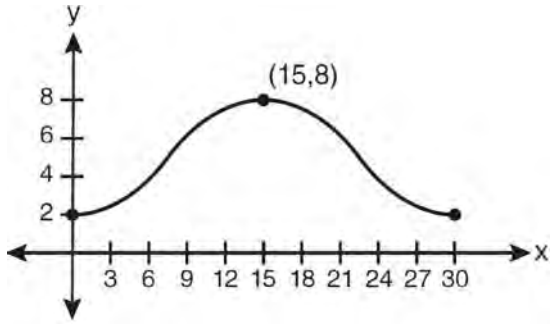
25 Which function is one-to-one?

1) $f(x) = |x|$
2) $f(x) = 2^x$
3) $f(x) = x^2$
4) $f(x) = \sin x$

26 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

27 Which equation is graphed in the diagram below?



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

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

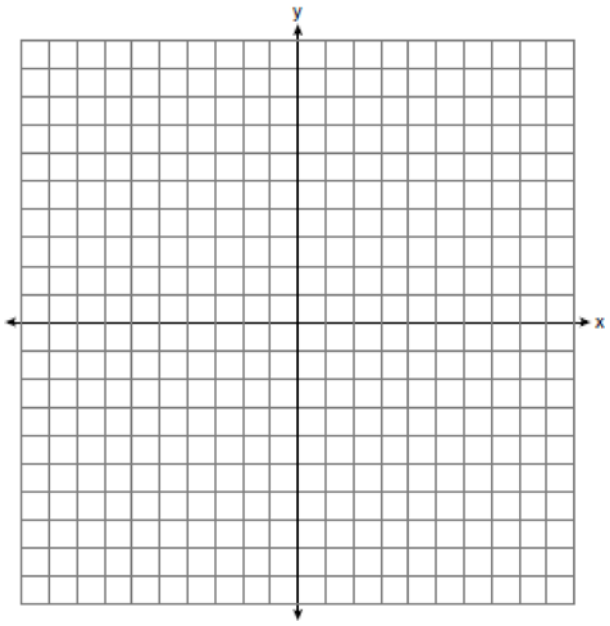
29 Solve algebraically for x: $4 - \sqrt{2x - 5} = 1$

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

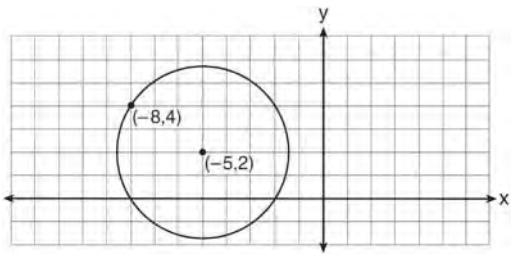
31 Express in simplest form: $\sqrt[3]{\frac{a^6b^9}{-64}}$

32 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.

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

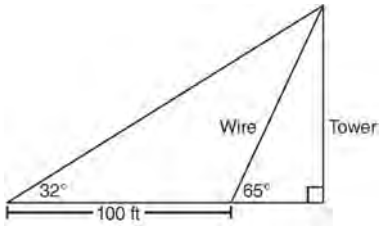


34 Write an equation of the circle shown in the diagram below.



35 Express the exact value of $\csc 60°$, with a rational denominator.

36 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*.



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

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

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

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

39 Perform the indicated operations and simplify completely:

$$\frac{x^3 - 3x^2 + 6x - 18}{x^2 - 4x} \cdot \frac{2x - 4}{x^4 - 3x^3} \div \frac{x^2 + 2x - 8}{16 - x^2}$$

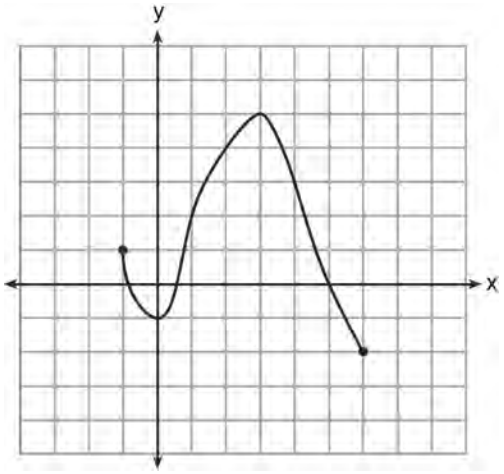
Algebra 2/Trigonometry Regents Exam 0612
www.jmap.org

0612a2

1 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) $\frac{4}{5}x$

2 What is the domain of the function shown below?



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

3 What is the solution set for $2\cos\theta - 1 = 0$ in the interval $0° \le \theta < 360°$?

1) $\{30°, 150°\}$
2) $\{60°, 120°\}$
3) $\{30°, 330°\}$
4) $\{60°, 300°\}$

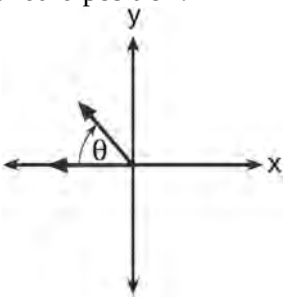
4 The expression $\sqrt[3]{64a^{16}}$ is equivalent to

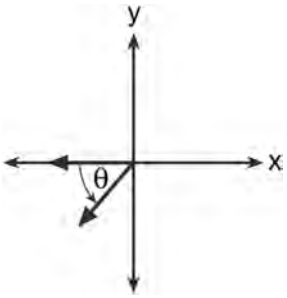
1) $8a^4$
2) $8a^8$
3) $4a^5\sqrt[3]{a}$
4) $4a\sqrt[3]{a^5}$

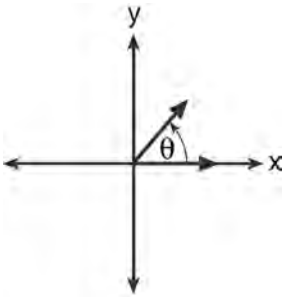
5 Which summation represents $5 + 7 + 9 + 11 + \ldots + 43$?

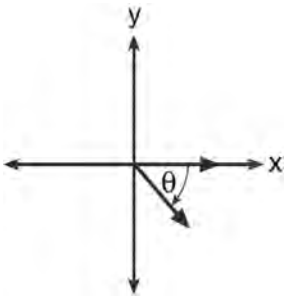
1) $\sum_{n=5}^{43} n$
2) $\sum_{n=1}^{20} (2n + 3)$
3) $\sum_{n=4}^{24} (2n - 3)$
4) $\sum_{n=3}^{23} (3n - 4)$

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

1) 

2) 

3) 

4) 

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

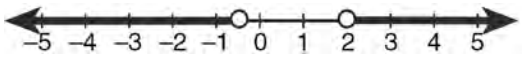
3) $\frac{p^3 t^2}{\sqrt{r}}$

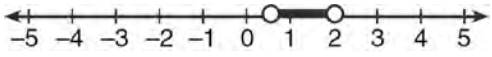
4) $\frac{p^3}{t^2\sqrt{r}}$

8 Which equation has roots with the sum equal to $\frac{9}{4}$ and the product equal to $\frac{3}{4}$?

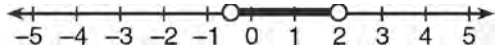
1) $4x^2 + 9x + 3 = 0$
2) $4x^2 + 9x - 3 = 0$
3) $4x^2 - 9x + 3 = 0$
4) $4x^2 - 9x - 3 = 0$

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

1) 

2) 

3) 

4) 

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

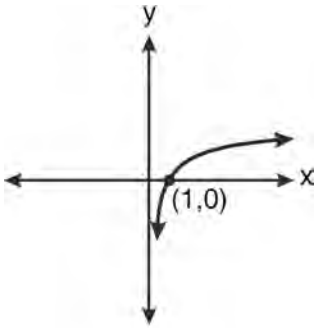
1) $\frac{x^4 y^5}{3}$

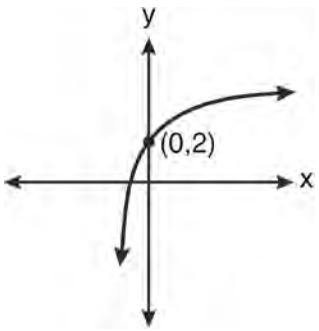
2) $\frac{x^5 y^4}{3}$

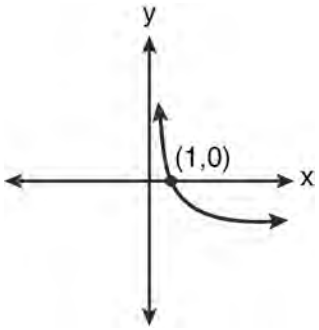
3) $3x^4 y^5$

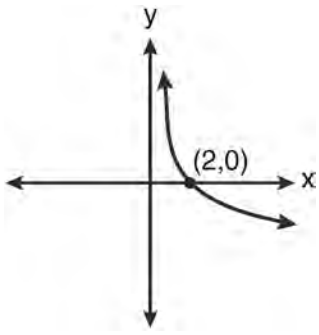
4) $\frac{y^4}{3x^5}$

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

1) 

2) 

3) 

4) 

12 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) π
3) $\frac{3\pi}{2}$
4) 3π

13 What is the solution set for the equation $\sqrt{5x+29} = x+3$?

1) $\{4\}$
2) $\{-5\}$
3) $\{4,5\}$
4) $\{-5,4\}$

14 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) $(x^2-4)(x-3)$

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

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

1) $\sin(3x)^2$
2) $3\sin x^2$
3) $\sin^2(3x)$
4) $3\sin^2 x$

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

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

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

20 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

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

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

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

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

23 A study finds that 80% of the local high school students text while doing homework. Ten students are selected at random from the local high school. Which expression would be part of the process used to determine the probability that, *at most*, 7 of the 10 students text while doing homework?
1) $_{10}C_6\left(\frac{4}{5}\right)^6\left(\frac{1}{5}\right)^4$
2) $_{10}C_7\left(\frac{4}{5}\right)^{10}\left(\frac{1}{5}\right)^7$
3) $_{10}C_8\left(\frac{7}{10}\right)^{10}\left(\frac{3}{10}\right)^2$
4) $_{10}C_9\left(\frac{7}{10}\right)^9\left(\frac{3}{10}\right)^1$

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

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

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

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

26 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

27 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

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

29 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%.

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

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

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

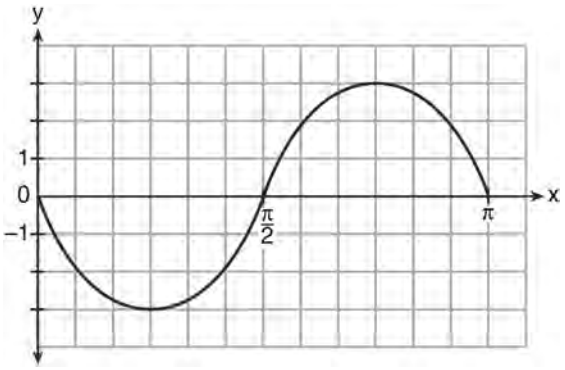
Write an exponential regression equation for the data, rounding all values to the *nearest thousandth.*

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

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

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

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



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

37 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.

38 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.

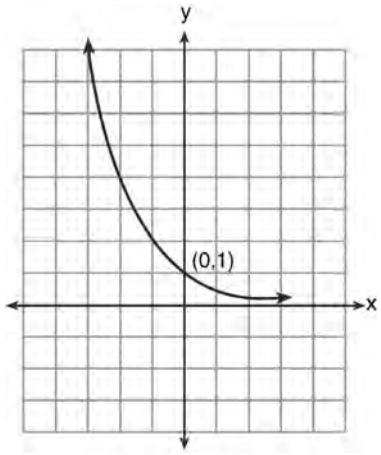
39 Solve algebraically for all values of x:

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

Algebra 2/Trigonometry Regents Exam 0113
www.jmap.org

0113a2

1 What is the equation of the graph shown below?



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

2 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) $(-4, 9)$

3 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

4 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

5 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

6 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) $\frac{xy^3}{3}$

7 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

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

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

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

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

10 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) ${}_8C_5$

11 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) $\frac{7}{9}$

12 In the interval $0° \le x < 360°$, $\tan x$ is undefined when x equals

1) 0º and 90º
2) 90º and 180º
3) 180º and 270º
4) 90º and 270º

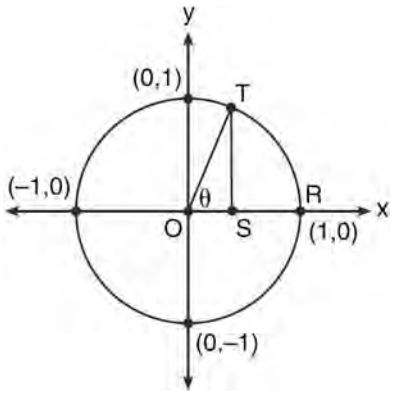
13 If $f(x) = \sqrt{9-x^2}$, what are its domain and range?

1) domain: $\{x \mid -3 \le x \le 3\}$; range: $\{y \mid 0 \le y \le 3\}$
2) domain: $\{x \mid x \ne \pm 3\}$; range: $\{y \mid 0 \le y \le 3\}$
3) domain: $\{x \mid x \le -3 \text{ or } x \ge 3\}$; range: $\{y \mid y \ne 0\}$
4) domain: $\{x \mid x \ne 3\}$; range: $\{y \mid y \ge 0\}$

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

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



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

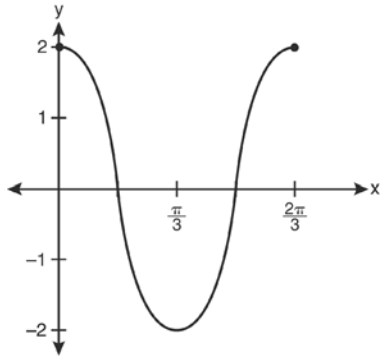
16 The area of triangle ABC is 42. If $AB = 8$ and $m\angle B = 61$, the length of $\overline{BC}$ is approximately
1) 5.1
2) 9.2
3) 12.0
4) 21.7

17 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) $(x + 4)(x - 4)(3x - 5)(3x - 5)$

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

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

20 Which equation is represented by the graph below?



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

21 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) $-\frac{1}{4}$

22 What is the solution set of the equation $-\sqrt{2}\sec x = 2$ when $0° \le x < 360°$?
1) $\{45°, 135°, 225°, 315°\}$
2) $\{45°, 315°\}$
3) $\{135°, 225°\}$
4) $\{225°, 315°\}$

23 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

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

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 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) $\frac{2b}{a+1}$

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

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

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

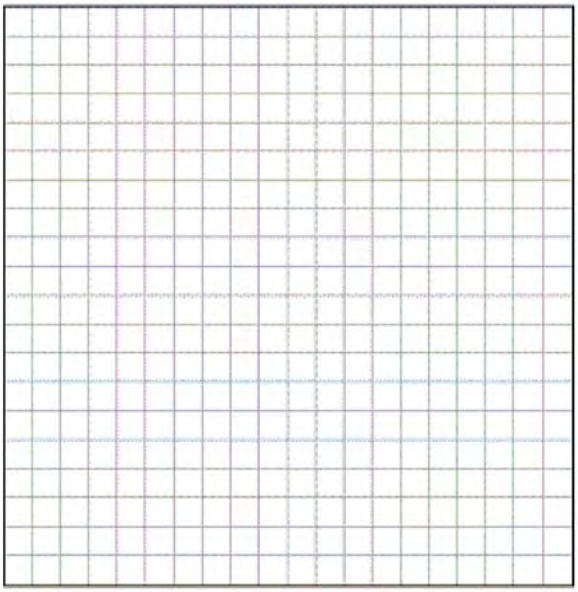
30 If $\sec(a+15)° = \csc(2a)°$, find the smallest positive value of a, in degrees.

31 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.

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

33 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.

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



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

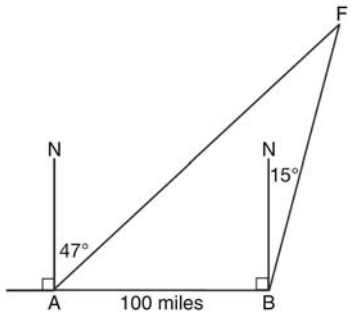
36 Solve algebraically for all values of x: $\log_{(x+4)}(17x - 4) = 2$

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

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

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

38 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.]



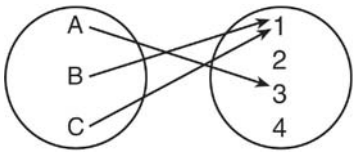
39 Solve algebraically for x: $\sqrt{x^2 + x - 1} + 11x = 7x + 3$

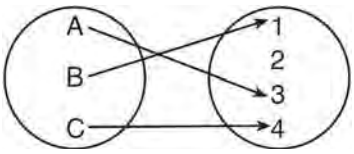
Algebra 2/Trigonometry Regents Exam 0613
www.jmap.org

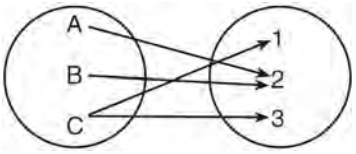
0613a2

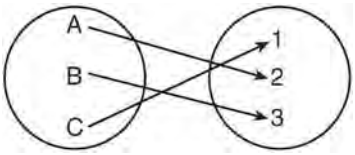
1 A market research firm needs to collect data on viewer preferences for local news programming in Buffalo. Which method of data collection is most appropriate?
1) census
2) survey
3) observation
4) controlled experiment

2 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

3 Which diagram represents a relation that is both one-to-one and onto?
1) 

2) 

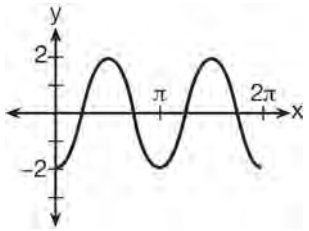
3) 

4) 

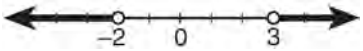
4 The sum of the first eight terms of the series $3 - 12 + 48 - 192 + \ldots$ is
1) $-13,107$
2) $-21,845$
3) $-39,321$
4) $-65,535$

5 The simplest form of $\dfrac{1-\frac{4}{x}}{1-\frac{2}{x}-\frac{8}{x^2}}$ is
1) $\frac{1}{2}$
2) $\frac{x}{x+2}$
3) $\frac{x}{3}$
4) $-\frac{x}{x-2}$

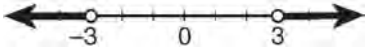
6 Which equation represents the graph below?



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

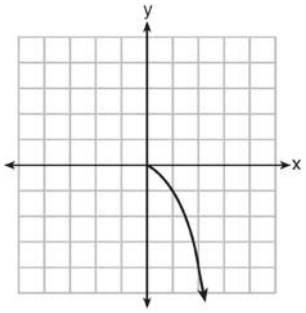
7 What is the graph of the solution set of $|2x - 1| > 5$?
1) 

2) 

3) 

4) 

8 What is the range of the function shown below?

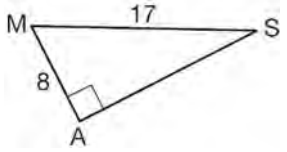


1) $x \le 0$
2) $x \ge 0$
3) $y \le 0$
4) $y \ge 0$

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

10 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

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



1) 28°1'
2) 28°4'
3) 61°56'
4) 61°93'

12 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) $(-6,-2)$

13 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

14 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) $4n^{-1} > (6n)^{-1}$

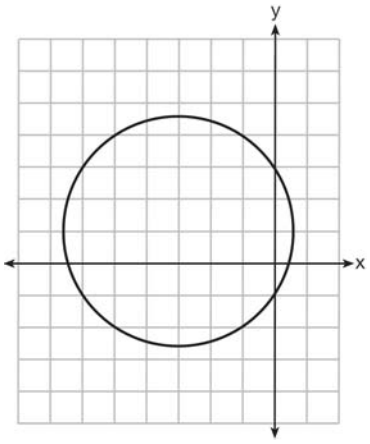
15 The expression $4 + \sum_{k=2}^{5} 3(k - x)$ is equal to
1) $58 - 4x$
2) $46 - 4x$
3) $58 - 12x$
4) $46 - 12x$

16 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

17 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?

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

19 If $x=3i$, $y=2i$, and $z=m+i$, the expression xy^2z equals

1) $-12-12mi$
2) $-6-6mi$
3) $12-12mi$
4) $6-6mi$

20 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 $\sec P>0$

21 The expression $\log 4m^2$ is equivalent to

1) $2(\log 4+\log m)$
2) $2\log 4+\log m$
3) $\log 4+2\log n$
4) $\log 16+2\log m$

22 In ΔPQR, p equals

1) $\dfrac{r\sin P}{\sin Q}$
2) $\dfrac{r\sin P}{\sin R}$
3) $\dfrac{r\sin R}{\sin P}$
4) $\dfrac{q\sin R}{\sin Q}$

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

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

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

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

25 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) $\frac{x+\sqrt{x}}{x-1}$

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

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

27 In ΔKLM, $KL = 20$, $LM = 13$, 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

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

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

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

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

32 Find, algebraically, the measure of the obtuse angle, to the *nearest degree*, that satisfies the equation $5\csc\theta = 8$.

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

34 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.

35 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.

36 Solve the equation below algebraically, and express the result in simplest radical form:

$$\frac{13}{x} = 10 - x$$

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

38 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?

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

fall09a2
Answer Section

1 ANS: 2

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

PTS: 2 REF: fall0901a2 STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

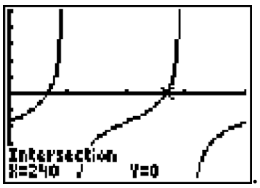
2 ANS: 3

$f(4) = \frac{1}{2}(4) - 3 = -1.\ \ g(-1) = 2(-1) + 5 = 3$

PTS: 2 REF: fall0902a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: numbers

3 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

4 ANS: 4

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

PTS: 2 REF: fall0904a2 STA: A2.S.2 TOP: Analysis of Data

5 ANS: 1

$6x - 7 \le 5 \quad 6x - 7 \ge -5$

$6x \le 12 \qquad 6x \ge 2$

$x \le 2 \qquad x \ge \frac{1}{3}$

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

6 ANS: 4

(4) fails the horizontal line test. Not every element of the range corresponds to only one element of the domain.

PTS: 2 REF: fall0906a2 STA: A2.A.43 TOP: Defining Functions

7 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

8 ANS: 4 PTS: 2 REF: fall0908a2 STA: A2.A.38
TOP: Defining Functions KEY: graphs

9 ANS: 2

$8^2 = 64$

PTS: 2 REF: fall0909a2 STA: A2.A.18 TOP: Evaluating Logarithmic Expressions

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

11 ANS: 3

n	0	1	2	Σ
$n^2 + 2^n$	$0^2 + 2^0 = 1$	$1^2 + 2^2 = 3$	$2^2 + 2^2 = 8$	12

$2 \times 12 = 24$

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

12 ANS: 3

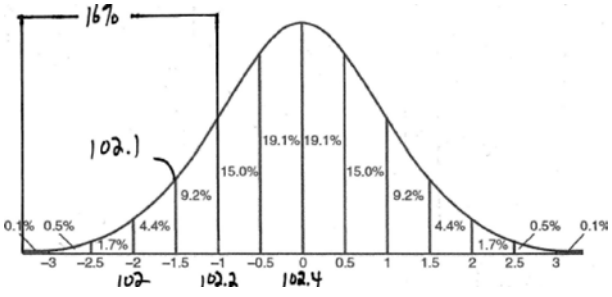
$S = \frac{-b}{a} = \frac{-(-3)}{4} = \frac{3}{4}.\ P = \frac{c}{a} = \frac{-8}{4} = -2$

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

13 ANS: 3 PTS: 2 REF: fall0913a2 STA: A2.A.65
TOP: Graphing Trigonometric Functions

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

15 ANS: 1



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

16 ANS: 2

$f^{-1}(x) = \log_4 x$

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

17 ANS: 4

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

PTS: 2 REF: fall0917a2 STA: A2.A.7 TOP: Factoring Polynomials
KEY: single variable

18 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

19 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

20 ANS: 2

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

PTS: 2 REF: fall0920a2 STA: A2.A.17 TOP: Complex Fractions

21 ANS: 4

$2\log_4(5x) = 3$

$$\log_4(5x) = \frac{3}{2}$$

$$5x = 4^{\frac{3}{2}}$$

$$5x = 8$$

$$x = \frac{8}{5}$$

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

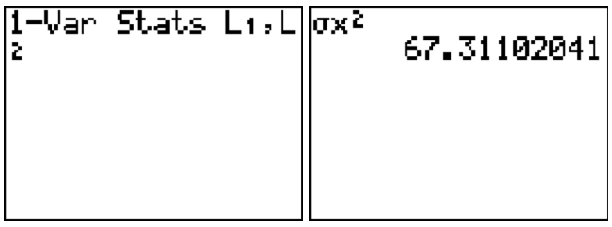
22 ANS: 4

$s = \theta r = 2 \cdot 4 = 8$

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

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

24 ANS: 3



PTS: 2 REF: fall0924a2 STA: A2.S.4 TOP: Dispersion
KEY: variance

25 ANS: 4 PTS: 2 REF: fall0925a2 STA: A2.S.10
TOP: Permutations

26 ANS: 2 PTS: 2 REF: fall0926a2 STA: A2.A.46
TOP: Transformations with Functions and Relations

27 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

28 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

29 ANS:

$(x+3)^2 + (y-4)^2 = 25$

PTS: 2 REF: fall0929a2 STA: A2.A.49 TOP: Writing Equations of Circles

30 ANS:

no solution. $\frac{4x}{x-3} = 2 + \frac{12}{x-3}$

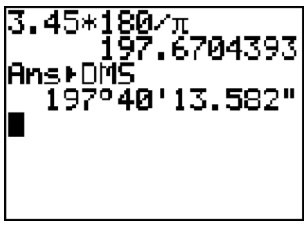
$\frac{4x-12}{x-3} = 2$

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

$4 \neq 2$

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

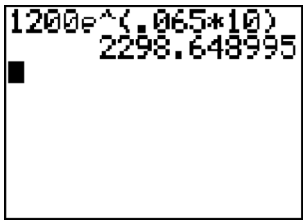
31 ANS:



197°40'. $3.45 \times \frac{180}{\pi} \approx 197°40'$.

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

32 ANS:



2,298.65.

PTS: 2 REF: fall0932a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

33 ANS:

$\frac{\sqrt{13}}{2}$. $\sin\theta = \frac{y}{\sqrt{x^2+y^2}} = \frac{2}{\sqrt{(-3)^2+2^2}} = \frac{2}{\sqrt{13}}$. $\csc\theta = \frac{\sqrt{13}}{2}$.

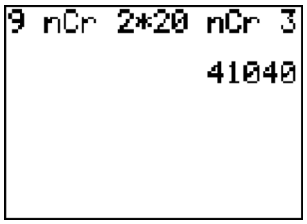
PTS: 2 REF: fall0933a2 STA: A2.A.62 TOP: Determining Trigonometric Functions

34 ANS:

$-3, -5, -8, -12$

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

35 ANS:



41,040.

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

36 ANS:

$3 \pm \sqrt{7}$. $2x^2 - 12x + 4 = 0$

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

$x^2 - 6x = -2$

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

$(x-3)^2 = 7$

$x - 3 = \pm\sqrt{7}$

$x = 3 \pm \sqrt{7}$

PTS: 4 REF: fall0936a2 STA: A2.A.24 TOP: Completing the Square

37 ANS:

$\pm\frac{3}{2}, -\frac{1}{2}$. $8x^3 + 4x^2 - 18x - 9 = 0$

$4x^2(2x+1) - 9(2x+1) = 0$

$(4x^2 - 9)(2x+1) = 0$

$4x^2 - 9 = 0$ or $2x + 1 = 0$

$(2x+3)(2x-3) = 0$ $x = -\frac{1}{2}$

$x = \pm\frac{3}{2}$

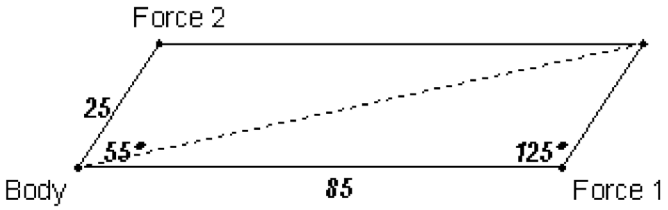
PTS: 4 REF: fall0937a2 STA: A2.A.26 TOP: Solving Polynomial Equations

38 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

39 ANS:



101.43, 12.

$r^2 = 25^2 + 85^2 - 2(25)(85)\cos 125.$

$r^2 \approx 10287.7$

$r \approx 101.43$

$\frac{2.5}{\sin x} = \frac{101.43}{\sin 125}$

$x \approx 12$

PTS: 6 REF: fall0939a2 STA: A2.A.73 TOP: Vectors

0610a2
Answer Section

1 ANS: 3 PTS: 2 REF: 061001a2 STA: A2.A.30
TOP: Sequences

2 ANS: 2

$$\frac{11\pi}{12} \cdot \frac{180}{\pi} = 165$$

PTS: 2 REF: 061002a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

3 ANS: 3

$$\frac{3^{-2}}{(-2)^{-3}} = \frac{\frac{1}{9}}{-\frac{1}{8}} = -\frac{8}{9}$$

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

4 ANS: 1 PTS: 2 REF: 061004a2 STA: A2.A.52
TOP: Identifying the Equation of a Graph

5 ANS: 4 PTS: 2 REF: 061005a2 STA: A2.A.50
TOP: Solving Polynomial Equations

6 ANS: 3

$$\sqrt{-300} = \sqrt{100}\sqrt{-1}\sqrt{3}$$

PTS: 2 REF: 061006a2 STA: A2.N.6 TOP: Square Roots of Negative Numbers

7 ANS: 3 PTS: 2 REF: 061007a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

8 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

9 ANS: 4

$$\frac{3 \pm \sqrt{(-3)^2 - 4(1)(-9)}}{2(1)} = \frac{3 \pm \sqrt{45}}{2} = \frac{3 \pm 3\sqrt{5}}{2}$$

PTS: 2 REF: 061009a2 STA: A2.A.25 TOP: Quadratic Formula

10 ANS: 1

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

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

11 ANS: 2 PTS: 2 REF: 061011a2 STA: A2.A.10
TOP: Fractional Exponents as Radicals

12 ANS: 1

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

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

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

14 ANS: 3
Cofunctions tangent and cotangent are complementary

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

15 ANS: 3

$4^{x^2+4x}=2^{-6}$. $2x^2+8x=-6$

$(2^2)^{x^2+4x}=2^{-6}$ $2x^2+8x+6=0$

$2^{2x^2+8x}=2^{-6}$ $x^2+4x+3=0$

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

$x=-3$ $x=-1$

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

16 ANS: 2

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

$x^2-2x+1+y^2+6y+9=-3+1+9$

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

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

17 ANS: 1

$y\geq x^2-x-6$

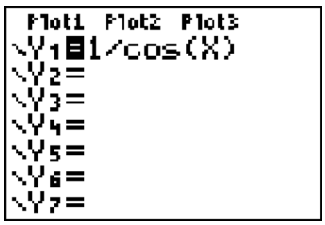
$y\geq(x-3)(x+2)$

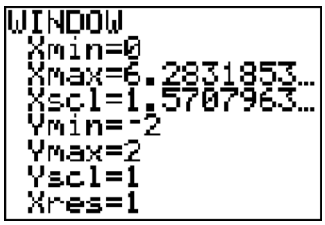
PTS: 2 REF: 061017a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: two variables

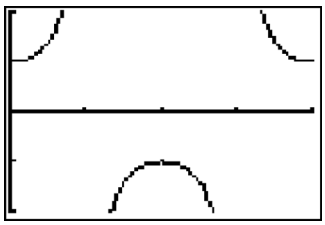
18 ANS: 1 PTS: 2 REF: 061018a2 STA: A2.A.22
TOP: Solving Radicals KEY: extraneous solutions

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

20 ANS: 3





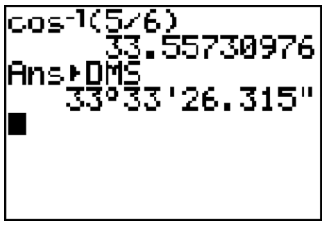


PTS: 2 REF: 061020a2 STA: A2.A.71 TOP: Graphing Trigonometric Functions

21 ANS: 2 PTS: 2 REF: 061021a2 STA: A2.S.8
TOP: Correlation Coefficient

22 ANS: 3 PTS: 2 REF: 061022a2 STA: A2.A.63
TOP: Domain and Range

23 ANS: 1



$\cos K = \frac{5}{6}$

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

$K \approx 33°33'$

PTS: 2 REF: 061023a2 STA: A2.A.55 TOP: Trigonometric Ratios

24 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

25 ANS: 1 PTS: 2 REF: 061025a2 STA: A2.A.34
TOP: Sigma Notation

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

27 ANS: 4

$\frac{2\pi}{b} = \frac{2\pi}{\frac{1}{3}} = 6\pi$

PTS: 2 REF: 061027a2 STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions KEY: period

28 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

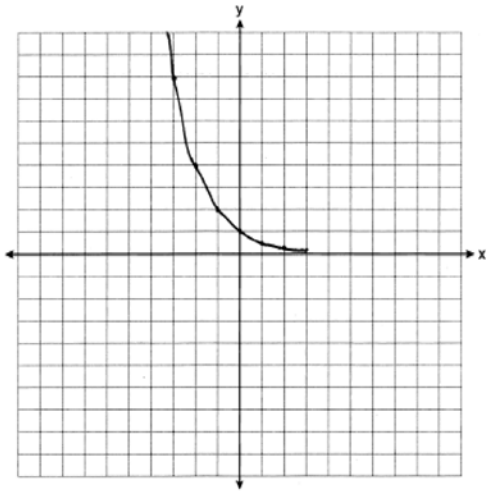
29 ANS:
7.4

PTS: 2 REF: 061029a2 STA: A2.S.4 TOP: Dispersion
KEY: basic, group frequency distributions

30 ANS:
Sum $\frac{-b}{a} = -\frac{11}{5}$. Product $\frac{c}{a} = -\frac{3}{5}$

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

31 ANS:



$y = 0$

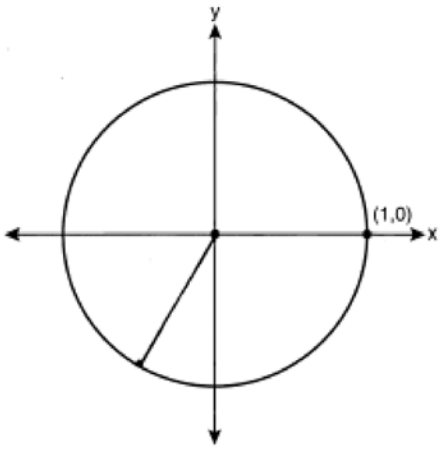
PTS: 2 REF: 061031a2 STA: A2.A.53 TOP: Graphing Exponential Functions

32 ANS:

$$5\sqrt{3x^3} - 2\sqrt{27x^3} = 5\sqrt{x^2}\sqrt{3x} - 2\sqrt{9x^2}\sqrt{3x} = 5x\sqrt{3x} - 6x\sqrt{3x} = -x\sqrt{3x}$$

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

33 ANS:



$-\frac{\sqrt{3}}{2}$

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

34 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

35 ANS:

$$\frac{\frac{1}{2}-\frac{4}{d}}{\frac{1}{d}+\frac{3}{2d}} = \frac{\frac{d-8}{2d}}{\frac{2d+3d}{2d^2}} = \frac{d-8}{2d} \times \frac{2d^2}{5d} = \frac{d-8}{5}$$

PTS: 2 REF: 061035a2 STA: A2.A.17 TOP: Complex Fractions

36 ANS:

0.167. ${}_{10}C_8 \cdot 0.6^8 \cdot 0.4^2 + {}_{10}C_9 \cdot 0.6^9 \cdot 0.4^1 + {}_{10}C_{10} \cdot 0.6^{10} \cdot 0.4^0 \approx 0.167$

PTS: 4 REF: 061036a2 STA: A2.S.15 TOP: Binomial Probability
KEY: at least or at most

37 ANS:
0, 60, 180, 300. $\sin 2\theta = \sin\theta$

$$\sin 2\theta - \sin\theta = 0$$

$$2\sin\theta\cos\theta - \sin\theta = 0$$

$$\sin\theta(2\cos\theta - 1) = 0$$

$$\sin\theta = 0 \quad 2\cos\theta - 1 = 0$$

$$\theta = 0, 180 \quad \cos\theta = \frac{1}{2}$$

$$\theta = 60, 300$$

PTS: 4 REF: 061037a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: double angle identities

38 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

39 ANS:
33. $a = \sqrt{10^2 + 6^2 - 2(10)(6)\cos 80} \approx 10.7$. $\angle C$ is opposite the shortest side. $\frac{6}{\sin C} = \frac{10.7}{\sin 80}$

$$C \approx 33$$

PTS: 6 REF: 061039a2 STA: A2.A.73 TOP: Law of Cosines
KEY: advanced

0810a2
Answer Section

1 ANS: 4

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

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

2 ANS: 1

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

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

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

4 ANS: 1

$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$

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

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

6 ANS: 3

$\frac{59.2}{\sin 74} = \frac{60.3}{\sin C}$ $180 - 78.3 = 101.7$

$C \approx 78.3$

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

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

8 ANS: 4

$9^{3x+1} = 27^{x+2}$.

$(3^2)^{3x+1} = (3^3)^{x+2}$

$3^{6x+2} = 3^{3x+6}$

$6x + 2 = 3x + 6$

$3x = 4$

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

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

9 ANS: 3

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

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

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

11 ANS: 2

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

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

12 ANS: 2

$${}_{15}C_8 = 6,435$$

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

13 ANS: 3

$68\% \times 50 = 34$

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

14 ANS: 1

common difference is 2. $b_n = x + 2n$

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

$$8 = x$$

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

15 ANS: 2

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

$x^2 - 4x = 0$

$x(x - 4) = 0$

$x = 0, 4$

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

16 ANS: 4

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

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

17 ANS: 4

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

$49 = 34 - 30\cos A$

$15 = -30\cos A$

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

$120 = \cos A$

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

18 ANS: 2

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

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

19 ANS: 3

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

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

20 ANS: 3

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

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

21 ANS: 3

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

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

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

23 ANS: 2

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

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

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

25 ANS: 3

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

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

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

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

26 ANS: 3

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

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

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

28 ANS:

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

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

29 ANS:

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

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

30 ANS:

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

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

31 ANS:

$y = 10.596(1.586)^x$

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

32 ANS:

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

$1 = \tan C$

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

$C = 45, 225$

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

33 ANS:

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

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

34 ANS:

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

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

35 ANS:

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

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

36 ANS:

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

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

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

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

$3x=1$

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

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

37 ANS:

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

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

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

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

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

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

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

38 ANS:

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

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

39 ANS:

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

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

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

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

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

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

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

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

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

0111a2
Answer Section

1 ANS: 4 PTS: 2 REF: 011101a2 STA: A2.A.38
TOP: Defining Functions KEY: graphs

2 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

3 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

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

5 ANS: 3

$a_n = 5(-2)^{n-1}$

$a_{15} = 5(-2)^{15-1} = 81,920$

PTS: 2 REF: 011105a2 STA: A2.A.32 TOP: Sequences

6 ANS: 1

$4a + 6 = 4a - 10.$ $4a + 6 = -4a + 10.$ $\left|4\left(\frac{1}{2}\right) + 6\right| - 4\left(\frac{1}{2}\right) = -10$

$6 \neq -10$ $8a = 4$ $8 - 2 \neq -10$

$a = \frac{4}{8} = \frac{1}{2}$

PTS: 2 REF: 011106a2 STA: A2.A.1 TOP: Absolute Value Equations

7 ANS: 3

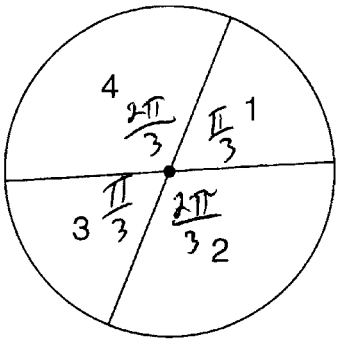
$\left(\frac{2}{3}\right)^2 + \cos^2 A = 1$ $\sin 2A = 2\sin A\cos A$

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

$\cos A = +\frac{\sqrt{5}}{3}$, sin A is acute. $= \frac{4\sqrt{5}}{9}$

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

8 ANS: 2



$\frac{\frac{\pi}{3} + \frac{\pi}{3}}{2\pi} = \frac{\frac{2\pi}{3}}{2\pi} = \frac{1}{3}$

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

9 ANS: 2

$6(x^2 - 5) = 6x^2 - 30$

PTS: 2 REF: 011109a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: variables

10 ANS: 3 PTS: 2 REF: 011110a2 STA: A2.A.30
TOP: Sequences

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

12 ANS: 1 PTS: 2 REF: 011112a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: advanced

13 ANS: 2

$\frac{10}{\sin 35} = \frac{13}{\sin B}$. $35 + 48 < 180$

$B \approx 48, 132$ $35 + 132 < 180$

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

14 ANS: 2 PTS: 2 REF: 011114a2 STA: A2.N.3
TOP: Operations with Polynomials

15 ANS: 3

$x^2 - 3x - 10 > 0$ 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: 011115a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

16 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

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

18 ANS: 4

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

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

19 ANS: 3 PTS: 2 REF: 011119a2 STA: A2.A.52
TOP: Families of Functions

20 ANS: 1

$\sqrt{12^2 - 6^2} = \sqrt{108} = \sqrt{36}\sqrt{3} = 6\sqrt{3}.\ \cot J = \dfrac{A}{O} = \dfrac{6}{6\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\sqrt{3}}{3}$

PTS: 2 REF: 011120a2 STA: A2.A.55 TOP: Trigonometric Ratios

21 ANS: 3

$\dfrac{-b}{a} = \dfrac{-6}{2} = -3.\ \dfrac{c}{a} = \dfrac{4}{2} = 2$

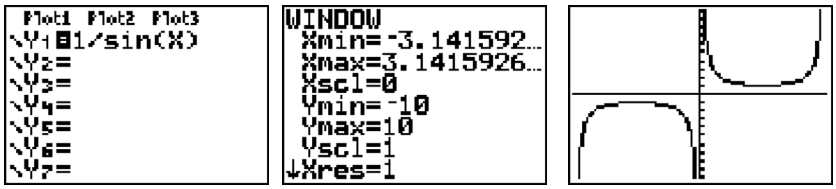
PTS: 2 REF: 011121a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

22 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

23 ANS: 1



PTS: 2 REF: 011123a2 STA: A2.A.71 TOP: Graphing Trigonometric Functions

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

25 ANS: 1

$8 \times 8 \times 7 \times 1 = 448$. The first digit cannot be 0 or 5. The second digit cannot be 5 or the same as the first digit. The third digit cannot be 5 or the same as the first or second digit.

PTS: 2 REF: 011125a2 STA: A2.S.10 TOP: Permutations

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

27 ANS: 4 PTS: 2 REF: 011127a2 STA: A2.S.1
TOP: Analysis of Data

28 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

29 ANS:

$$2.5 \cdot \frac{180}{\pi} \approx 143.2°$$

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

30 ANS:

$$12 \cdot 6 = 9w$$

$$8 = w$$

PTS: 2 REF: 011130a2 STA: A2.A.5 TOP: Inverse Variation

31 ANS:
230. $10 + (1^3 - 1) + (2^3 - 1) + (3^3 - 1) + (4^3 - 1) + (5^3 - 1) = 10 + 0 + 7 + 26 + 63 + 124 = 230$

PTS: 2 REF: 011131a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

32 ANS:
D: $-5 \le x \le 8$. R: $-3 \le y \le 2$

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

33 ANS:
$$\frac{\sqrt{108x^5y^8}}{\sqrt{6xy^5}} = \sqrt{18x^4y^3} = 3x^2y\sqrt{2y}$$

PTS: 2 REF: 011133a2 STA: A2.A.14 TOP: Operations with Radicals
KEY: with variables | index = 2

34 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

35 ANS:
$$\frac{\sin^2 A}{\cos^2 A} + \frac{\cos^2 A}{\cos^2 A} = \frac{1}{\cos^2 A}$$

$$\tan^2 A + 1 = \sec^2 A$$

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

36 ANS:
$32x^5 - 80x^4 + 80x^3 - 40x^2 + 10x - 1$. ${}_5C_0(2x)^5(-1)^0 = 32x^5$. ${}_5C_1(2x)^4(-1)^1 = -80x^4$. ${}_5C_2(2x)^3(-1)^2 = 80x^3$. ${}_5C_3(2x)^2(-1)^3 = -40x^2$. ${}_5C_4(2x)^1(-1)^4 = 10x$. ${}_5C_5(2x)^0(-1)^5 = -1$

PTS: 4 REF: 011136a2 STA: A2.A.36 TOP: Binomial Expansions

37 ANS:
$\frac{12}{\sin 32} = \frac{10}{\sin B}$. $C \approx 180 - (32 + 26.2) \approx 121.8$. $\frac{12}{\sin 32} = \frac{c}{\sin 121.8}$

$B = \sin^{-1}\frac{10\sin 32}{12} \approx 26.2$ $c = \frac{12\sin 121.8}{\sin 32} \approx 19.2$

PTS: 4 REF: 011137a2 STA: A2.A.73 TOP: Law of Sines
KEY: basic

38 ANS:

0.468. ${}_8C_6\left(\frac{2}{3}\right)^6\left(\frac{1}{3}\right)^2 \approx 0.27313$. ${}_8C_7\left(\frac{2}{3}\right)^7\left(\frac{1}{3}\right)^1 \approx 0.15607$. ${}_8C_8\left(\frac{2}{3}\right)^8\left(\frac{1}{3}\right)^0 \approx 0.03902$.

PTS: 4 REF: 011138a2 STA: A2.S.15 TOP: Binomial Probability
KEY: at least or at most

39 ANS:

$\ln(T - T_0) = -kt + 4.718$. $\ln(T - 68) = -0.104(10) + 4.718$.

$\ln(150 - 68) = -k(3) + 4.718$ $\ln(T - 68) = 3.678$

$4.407 \approx -3k + 4.718$ $T - 68 \approx 39.6$

$k \approx 0.104$ $T \approx 108$

PTS: 6 REF: 011139a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

0611a2
Answer Section

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

2 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

3 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

4 ANS: 2

$\cos(-305° + 360°) = \cos(55°)$

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

5 ANS: 2

$$4^{2x+5} = 8^{3x} \quad .$$

$$\left(2^2\right)^{2x+5} = \left(2^3\right)^{3x}$$

$$2^{4x+10} = 2^{9x}$$

$$4x + 10 = 9x$$

$$10 = 5x$$

$$2 = x$$

PTS: 2 REF: 061105a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base not shown

6 ANS: 3

$x = 5^4 = 625$

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

7 ANS: 1

$$\sqrt[4]{16x^2y^7} = 16^{\frac{1}{4}} x^{\frac{2}{4}} y^{\frac{7}{4}} = 2x^{\frac{1}{2}} y^{\frac{7}{4}}$$

PTS: 2 REF: 061107a2 STA: A2.A.11 TOP: Radicals as Fractional Exponents

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

9 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

10 ANS: 1

$13^2 = 15^2 + 14^2 - 2(15)(14)\cos C$

$169 = 421 - 420\cos C$

$-252 = -420\cos C$

$\frac{252}{420} = \cos C$

$53 \approx C$

PTS: 2 REF: 061110a2 STA: A2.A.73 TOP: Law of Cosines
KEY: find angle

11 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

12 ANS: 4 PTS: 2 REF: 061112a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain

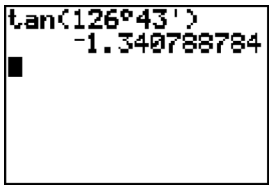
13 ANS: 1

${}_{10}C_4 = 210$

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

14 ANS: 3 PTS: 2 REF: 061114a2 STA: A2.A.38
TOP: Defining Functions KEY: graphs

15 ANS: 2



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

16 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

17 ANS: 3

$75000 = 25000e^{.0475t}$

$3 = e^{.0475t}$

$\ln 3 = \ln e^{.0475t}$

$\frac{\ln 3}{.0475} = \frac{.0475t \cdot \ln e}{.0475}$

$23.1 \approx t$

PTS: 2 REF: 061117a2 STA: A2.A.6 TOP: Exponential Growth

18 ANS: 1

n	3	4	5	Σ
$-r^2 + r$	$-3^2 + 3 = -6$	$-4^2 + 4 = -12$	$-5^2 + 5 = -20$	-38

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

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

20 ANS: 4 PTS: 2 REF: 061120a2 STA: A2.A.19
TOP: Properties of Logarithms KEY: splitting logs

21 ANS: 3

$3x + 16 = (x + 2)^2$. -4 is an extraneous solution.

$3x + 16 = x^2 + 4x + 4$

$0 = x^2 + x - 12$

$0 = (x + 4)(x - 3)$

$x = -4 \quad x = 3$

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

22 ANS: 2 PTS: 2 REF: 061122a2 STA: A2.A.24
TOP: Completing the Square

23 ANS: 3

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

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

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

25 ANS: 3

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

PTS: 2 REF: 061125a2 STA: A2.M.1 TOP: Radian Measure

26 ANS: 1

${}_9C_3 a^6(-4b)^3 = -5376a^6b^3$

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

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

28 ANS:

$6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y. \left(\frac{1}{2}y^2 - \frac{1}{3}y\right)\left(12y + \frac{3}{5}\right) = 6y^3 + \frac{3}{10}y^2 - 4y^2 - \frac{1}{5}y = 6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y$

PTS: 2 REF: 061128a2 STA: A2.N.3 TOP: Operations with Polynomials

29 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

30 ANS:

$x^2 - 6x - 27 = 0$, $\frac{-b}{a} = 6$. $\frac{c}{a} = -27$. If $a = 1$ then $b = -6$ and $c = -27$

PTS: 4 REF: 061130a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic

31 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

32 ANS:

$y = x^2 - 6$. $f^{-1}(x)$ is not a function.

$x = y^2 - 6$

$x + 6 = y^2$

$\pm\sqrt{x+6} = y$

PTS: 2 REF: 061132a2 STA: A2.A.44 TOP: Inverse of Functions
KEY: equations

33 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

34 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

35 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

36 ANS:

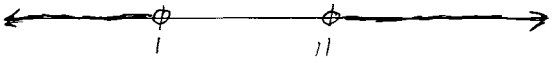
$$\sin(45+30) = \sin 45\cos 30 + \cos 45\sin 30$$

$$= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6}+\sqrt{2}}{4}$$

PTS: 4 REF: 061136a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities
KEY: evaluating

37 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

38 ANS:

$$\frac{51}{243}. \quad {}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2 = \frac{40}{243}$$

$${}_5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)^1 = \frac{10}{243}$$

$${}_5C_3\left(\frac{1}{3}\right)^5\left(\frac{2}{3}\right)^0 = \frac{1}{243}$$

PTS: 4 REF: 061138a2 STA: A2.S.15 TOP: Binomial Probability
KEY: at least or at most

39 ANS:

$\left(-\frac{9}{2}, \frac{1}{2}\right)$ and $\left(\frac{1}{2}, \frac{11}{2}\right)$. $y = x + 5$. $4x^2 + 17x - 4 = x + 5$

$y = 4x^2 + 17x - 4$ $4x^2 + 16x - 9 = 0$

$(2x + 9)(2x - 1) = 0$

$x = -\frac{9}{2}$ and $x = \frac{1}{2}$

$y = -\frac{9}{2} + 5 = \frac{1}{2}$ and $y = \frac{1}{2} + 5 = \frac{11}{2}$

PTS: 6 REF: 061139a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: equations

0112a2
Answer Section

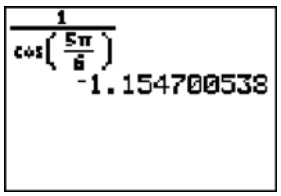
1 ANS: 4 PTS: 2 REF: 011201a2 STA: A2.S.2
TOP: Analysis of Data

2 ANS: 3

$S_n = \frac{n}{2}[2a + (n-1)d] = \frac{19}{2}[2(3) + (19-1)7] = 1254$

PTS: 2 REF: 011202a2 STA: A2.A.35 TOP: Summations
KEY: arithmetic

3 ANS: 1



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

4 ANS: 4

$g\left(\frac{1}{2}\right) = \frac{1}{\frac{1}{2}} = 2.$ $f(2) = 4(2) - 2^2 = 4$

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

5 ANS: 2

$320 = 10(2)^{\frac{t}{60}}$

$32 = (2)^{\frac{t}{60}}$

$\log 32 = \log(2)^{\frac{t}{60}}$

$\log 32 = \frac{t \log 2}{60}$

$\frac{60 \log 32}{\log 2} = t$

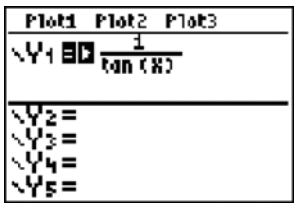
$300 = t$

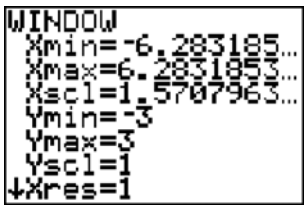
PTS: 2 REF: 011205a2 STA: A2.A.6 TOP: Exponential Growth

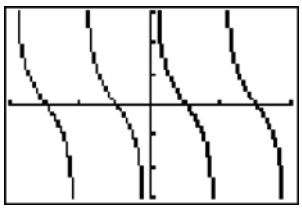
6 ANS: 2
The binomials are conjugates, so use FL.

PTS: 2 REF: 011206a2 STA: A2.N.3 TOP: Operations with Polynomials

7 ANS: 3







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

8 ANS: 2 PTS: 2 REF: 011208a2 STA: A2.A.67
TOP: Proving Trigonometric Identities

9 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

10 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

11 ANS: 2

$$\frac{x^{-1}+1}{x+1} = \frac{\frac{1}{x}+1}{x+1} = \frac{\frac{1+x}{x}}{x+1} = \frac{1}{x}$$

PTS: 2 REF: 011211a2 STA: A2.A.9 TOP: Negative Exponents

12 ANS: 3

$34.1\% + 19.1\% = 53.2\%$

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

13 ANS: 2 PTS: 2 REF: 011213a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

14 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

15 ANS: 3

${}_3C_2(2x^4)^1(-y)^2 = 6x^4y^2$

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

16 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

17 ANS: 4

$$\frac{10}{4} = 2.5$$

PTS: 2 REF: 011217a2 STA: A2.A.29 TOP: Sequences

18 ANS: 1

$$\frac{1}{2}(7.4)(3.8)\sin 126 \approx 11.4$$

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

19 ANS: 4 PTS: 2 REF: 011219a2 STA: A2.A.52
TOP: Properties of Graphs of Functions and Relations

20 ANS: 1

$$2 \cdot \frac{180}{\pi} = \frac{360}{\pi}$$

PTS: 2 REF: 011220a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

21 ANS: 4

$${}_3C_2\left(\frac{5}{8}\right)^2\left(\frac{3}{8}\right)^1 = \frac{225}{512}$$

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

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

23 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

24 ANS: 2

$\log x^2 = \log 3a + \log 2a$

$2\log x = \log 6a^2$

$\log x = \frac{\log 6}{2} + \frac{\log a^2}{2}$

$\log x = \frac{1}{2}\log 6 + \frac{2\log a}{2}$

$\log x = \frac{1}{2}\log 6 + \log a$

PTS: 2 REF: 011224a2 STA: A2.A.19 TOP: Properties of Logarithms
KEY: splitting logs

25 ANS: 2 PTS: 2 REF: 011225a2 STA: A2.A.43
TOP: Defining Functions

26 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

27 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

28 ANS:

$x < -1$ or $x > 5$. $x^2 - 4x - 5 > 0$. $x - 5 > 0$ and $x + 1 > 0$ or $x - 5 < 0$ and $x + 1 < 0$

$(x - 5)(x + 1) > 0$ $x > 5$ and $x > -1$ $x < 5$ and $x < -1$

$x > 5$ $x < -1$

PTS: 2 REF: 011228a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

29 ANS:

7. $4 - \sqrt{2x-5} = 1$

$-\sqrt{2x-5} = -3$

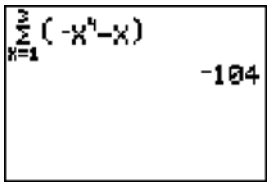
$2x - 5 = 9$

$2x = 14$

$x = 7$

PTS: 2 REF: 011229a2 STA: A2.A.22 TOP: Solving Radicals
KEY: basic

30 ANS:



−104.

PTS: 2 REF: 011230a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

31 ANS:

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

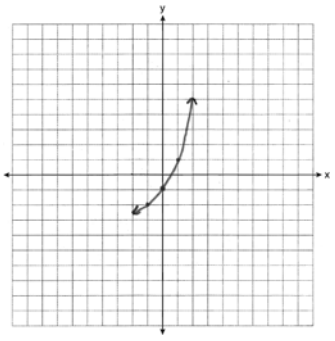
PTS: 2 REF: 011231a2 STA: A2.A.13 TOP: Simplifying Radicals
KEY: index > 2

32 ANS:

${}_{25}C_{20} = 53,130$

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

33 ANS:



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

34 ANS:

$r = \sqrt{2^2 + 3^2} = \sqrt{13}$. $(x+5)^2 + (y-2)^2 = 13$

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

35 ANS:

$\frac{2\sqrt{3}}{3}$. If $\sin 60 = \frac{\sqrt{3}}{2}$, then $\csc 60 = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

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

36 ANS:

88. $\frac{100}{\sin 33} = \frac{x}{\sin 32}$. $\sin 66 \approx \frac{T}{97.3}$

$x \approx 97.3$ $t \approx 88$

PTS: 4 REF: 011236a2 STA: A2.A.73 TOP: Law of Sines
KEY: advanced

37 ANS:

800. $x = 4^{2.5} = 32$. $y^{-\frac{3}{2}} = 125$. $\frac{x}{y} = \frac{32}{\frac{1}{25}} = 800$

$y = 125^{-\frac{2}{3}} = \frac{1}{25}$

PTS: 4 REF: 011237a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

38 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

39 ANS:

$\frac{-2(x^2+6)}{x^4} \cdot \frac{x^2(x-3)+6(x-3)}{x^2-4x} \cdot \frac{2x-4}{x^4-3x^3} \div \frac{x^2+2x-8}{16-x^2}$

$\frac{(x^2+6)(x-3)}{x(x-4)} \cdot \frac{2(x-2)}{x^3(x-3)} \cdot \frac{(4+x)(4-x)}{(x+4)(x-2)}$

$\frac{-2(x^2+6)}{x^4}$

PTS: 6 REF: 011239a2 STA: A2.A.16 TOP: Multiplication and Division of Rationals
KEY: division

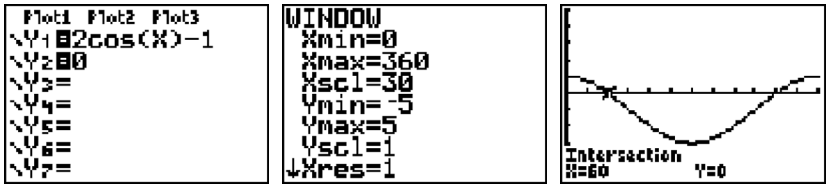
0612a2
Answer Section

1 ANS: 1
The binomials are conjugates, so use FL.

PTS: 2 REF: 061201a2 STA: A2.N.3 TOP: Operations with Polynomials

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

3 ANS: 4



$2\cos\theta = 1$

$\cos\theta = \frac{1}{2}$

$\theta = \cos^{-1}\frac{1}{2} = 60, 300$

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

4 ANS: 3
$\sqrt[3]{4^3 a^{15} a} = 4a^5\sqrt[3]{a}$

PTS: 2 REF: 061204a2 STA: A2.A.13 TOP: Simplifying Radicals
KEY: index > 2

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

6 ANS: 4 PTS: 2 REF: 061206a2 STA: A2.A.60
TOP: Unit Circle

7 ANS: 4 PTS: 2 REF: 061207a2 STA: A2.A.19
TOP: Properties of Logarithms KEY: antilogarithms

8 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

9 ANS: 3

$\frac{4x-5}{3} > 1$ or $\frac{4x-5}{3} < -1$

$4x-5>3 \qquad 4x-5<-3$

$4x>8 \qquad 4x<2$

$x>2 \qquad x<\frac{1}{2}$

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

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

11 ANS: 1 PTS: 2 REF: 061211a2 STA: A2.A.54
TOP: Graphing Logarithmic Functions

12 ANS: 3

$s = \theta r = \frac{2\pi}{8} \cdot 6 = \frac{3\pi}{2}$

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

13 ANS: 1

$5x+29=(x+3)^2$. $(-5)+3$ 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

14 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

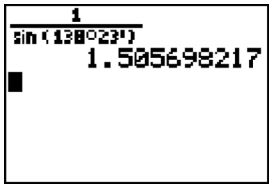
15 ANS: 3

$_6C_3\left(\frac{x}{2}\right)^3(-2y)^3 = 20 \cdot \frac{x^3}{8} \cdot -8y^3 = -20x^3y^3$

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

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

17 ANS: 4



PTS: 2 REF: 061217a2 STA: A2.A.66 TOP: Determining Trigonometric Functions

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

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

20 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: 061220a2 STA: A2.A.77 TOP: Half Angle Identities

21 ANS: 4

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

$$\frac{4k+36}{k+22} = 2$$

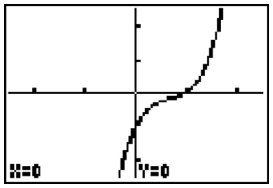
$$4k + 36 = 2k + 44$$

$$2k = 8$$

$$k = 4$$

PTS: 2 REF: 061221a2 STA: A2.S.3 TOP: Average Known with Missing Data

22 ANS: 4

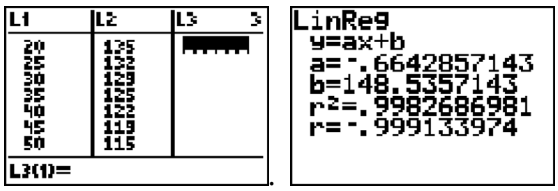


PTS: 2 REF: 061222a2 STA: A2.A.50 TOP: Solving Polynomial Equations

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

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

25 ANS: 1



PTS: 2 REF: 061225a2 STA: A2.S.8 TOP: Correlation Coefficient

26 ANS: 1

$$\frac{6}{\sin 35} = \frac{10}{\sin N}$$

$$N \approx 73$$

$$73 + 35 < 180$$

$$(180 - 73) + 35 < 180$$

PTS: 2 REF: 061226a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case

27 ANS: 4

${}_{15}C_5 = 3,003.\ {}_{25}C_5 = {}_{25}C_{20} = 53,130.\ {}_{25}C_{15} = 3,268,760.$

PTS: 2 REF: 061227a2 STA: A2.S.11 TOP: Combinations

28 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

29 ANS:

$A = 750e^{(0.03)(8)} \approx 953$

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

30 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

31 ANS:

$y = 180.377(0.954)^x$

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

32 ANS:

$216\left(\frac{\pi}{180}\right) \approx 3.8$

PTS: 2 REF: 061232a2 STA: A2.M.2 TOP: Radian Measure
KEY: radians

33 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

34 ANS:

$K = ab\sin C = 18 \cdot 22\sin 60 = 396\frac{\sqrt{3}}{2} = 198\sqrt{3}$

PTS: 2 REF: 061234a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: Parallelograms

35 ANS:

$y = -3\sin 2x$. The period of the function is π, the amplitude is 3 and it is reflected over the *x*-axis.

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

36 ANS:

$\frac{-(x^2-4)}{(x+4)(x+3)} \times \frac{x+3}{2(x-2)} = \frac{-(x+2)(x-2)}{x+4} \times \frac{1}{2(x-2)} = \frac{-(x+2)}{2(x+4)}$

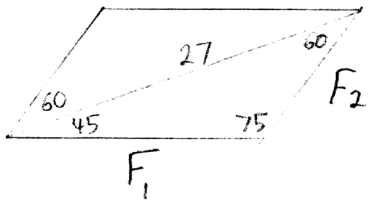
PTS: 4 REF: 061236a2 STA: A2.A.16 TOP: Multiplication and Division of Rationals
KEY: division

37 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

38 ANS:



$\frac{27}{\sin 75} = \frac{F_1}{\sin 60}.\ \frac{27}{\sin 75} = \frac{F_2}{\sin 45}.$

$F_1 \approx 24$ $F_1 \approx 20$

PTS: 4 REF: 061238a2 STA: A2.A.73 TOP: Vectors

39 ANS:

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

$$\left(3^4\right)^{x^3+2x^2} = \left(3^3\right)^{\frac{5x}{3}}$$

$$3^{4x^3+8x^2} = 3^{5x}$$

$$4x^3 + 8x^2 - 5x = 0$$

$$x(4x^2 + 8x - 5) = 0$$

$$x(2x-1)(2x+5) = 0$$

$$x = 0, \frac{1}{2}, -\frac{5}{2}$$

PTS: 6 REF: 061239a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base not shown

0113a2
Answer Section

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

2 ANS: 3

$$x + y = 5 \quad . \quad -5 + y = 5$$

$$y = -x + 5 \qquad y = 10$$

$$(x+3)^2 + (-x+5-3)^2 = 53$$

$$x^2 + 6x + 9 + x^2 - 4x + 4 = 53$$

$$2x^2 + 2x - 40 = 0$$

$$x^2 + x - 20 = 0$$

$$(x+5)(x-4) = 0$$

$$x = -5, 4$$

PTS: 2 REF: 011302a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: equations

3 ANS: 2
Since the coefficient of t is greater than 0, $r > 0$.

PTS: 2 REF: 011303a2 STA: A2.S.8 TOP: Correlation Coefficient

4 ANS: 3

$$\frac{4}{-2} = -2$$

PTS: 2 REF: 011304a2 STA: A2.A.31 TOP: Sequences

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

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

7 ANS: 2

$$\bar{x} \pm \sigma$$

$$153 \pm 22$$

$$131 - 175$$

PTS: 2 REF: 011307a2 STA: A2.S.5 TOP: Normal Distributions
KEY: interval

8 ANS: 3

$${}_8C_3 \cdot x^{8-3} \cdot (-2)^3 = 56x^5 \cdot (-8) = -448x^5$$

PTS: 2 REF: 011308a2 STA: A2.A.36 TOP: Binomial Expansions

9 ANS: 4

$8^{3k+4} = 4^{2k-1}$.

$(2^3)^{3k+4} = (2^2)^{2k-1}$

$2^{9k+12} = 2^{4k-2}$

$9k + 12 = 4k - 2$

$5k = -14$

$k = -\frac{14}{5}$

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

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

11 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

12 ANS: 4 PTS: 1 REF: 011312a2 STA: A2.A.56
TOP: Determining Trigonometric Functions KEY: degrees, common angles

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

14 ANS: 1 PTS: 2 REF: 011314a2 STA: A2.N.3
TOP: Operations with Polynomials

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

16 ANS: 3

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

$42 \approx 3.5a$

$12 \approx a$

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

17 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

18 ANS: 1

$\sin(180 + x) = (\sin 180)(\cos x) + (\cos 180)(\sin x) = 0 + (-\sin x) = -\sin x$

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

19 ANS: 3

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

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

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

PTS: 2 REF: 011319a2 STA: A2.N.2 TOP: Operations with Radicals

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

21 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

22 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

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

24 ANS: 1

$\frac{{}_6P_6}{3!2!} = \frac{720}{12} = 60$

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

25 ANS: 3

$$\frac{3y}{2y-6}+\frac{9}{6-2y}=\frac{3y}{2y-6}-\frac{9}{2y-6}=\frac{3y-9}{2y-6}=\frac{3(y-3)}{2(y-3)}=\frac{3}{2}$$

PTS: 2 REF: 011325a2 STA: A2.A.16 TOP: Addition and Subtraction of Rationals

26 ANS: 2

$$\log 9-\log 20$$

$$\log 3^2-\log(10\cdot 2)$$

$$2\log 3-(\log 10+\log 2)$$

$$2b-(1+a)$$

$$2b-a-1$$

PTS: 2 REF: 011326a2 STA: A2.A.19 TOP: Properties of Logarithms
KEY: expressing logs algebraically

27 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

28 ANS:

$a_n=9n-4$. $S_n=\frac{20(5+176)}{2}=1810$

$a_1=9(1)-4=5$

$a_{20}=9(20)-4=176$

PTS: 2 REF: 011328a2 STA: A2.A.35 TOP: Summations
KEY: arithmetic

29 ANS:

$3x^2-11x+6=0$. Sum $\frac{-b}{a}=\frac{11}{3}$. Product $\frac{c}{a}=\frac{6}{3}=2$

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

30 ANS:

$$a+15+2a=90$$

$$3a+15=90$$

$$3a=75$$

$$a=25$$

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

31 ANS:
Ordered, the heights are 71, 71, 72, 74, 74, 75, 78, 79, 79, 83. $Q_1 = 72$ and $Q_3 = 79$. $79 - 72 = 7$.

PTS: 2 REF: 011331a2 STA: A2.S.4 TOP: Dispersion
KEY: range, quartiles, interquartile range, variance

32 ANS:
$$\frac{2 \pm \sqrt{(-2)^2 - 4(6)(-3)}}{2(6)} = \frac{2 \pm \sqrt{76}}{12} = \frac{2 \pm \sqrt{4}\sqrt{19}}{12} = \frac{2 \pm 2\sqrt{19}}{12} = \frac{1 \pm \sqrt{19}}{6}$$

PTS: 2 REF: 011332a2 STA: A2.A.25 TOP: Quadratics with Irrational Solutions

33 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

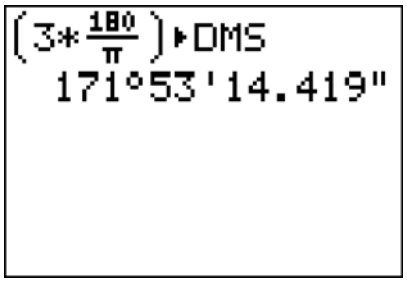
34 ANS:
$3 - 2x \geq 7$ or $3 - 2x \leq -7$

$-2x \geq 4$ $\quad -2x \leq -10$

$x \leq -2$ $\quad x \geq 5$

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

35 ANS:



$3 \times \frac{180}{\pi} \approx 171.89° \approx 171°53'$.

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

36 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

37 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

38 ANS:

$$\frac{100}{\sin 32} = \frac{b}{\sin 105}. \quad \frac{100}{\sin 32} = \frac{a}{\sin 43}$$

$b \approx 182.3$ $a \approx 128.7$

PTS: 4 REF: 011338a2 STA: A2.A.73 TOP: Law of Sines
KEY: basic

39 ANS:

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

$$x^2 + x - 1 = 16x^2 - 24x + 9$$

$$0 = 15x^2 - 25x + 10$$

$$0 = 3x^2 - 5x + 2$$

$$0 = (3x-2)(x-1)$$

$$x = \frac{2}{3},\ x \neq 1$$

$$-4\left(\frac{2}{3}\right) + 3 \geq 0$$

$$\frac{1}{3} \geq 0$$

$$-4(1) + 3 < 0$$

1 is extraneous

PTS: 6 REF: 011339a2 STA: A2.A.22 TOP: Solving Radicals
KEY: extraneous solutions

0613a2
Answer Section

1 ANS: 2 PTS: 2 REF: 061301a2 STA: A2.S.1
TOP: Analysis of Data

2 ANS: 2

$$\frac{8\pi}{5} \cdot \frac{180}{\pi} = 288$$

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

3 ANS: 4 PTS: 2 REF: 061303a2 STA: A2.A.43
TOP: Defining Functions

4 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

5 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

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

7 ANS: 1

$2x-1>5$. $2x-1<-5$

$2x>6$ $2x>-4$

$x>3$ $x<-2$

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

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

9 ANS: 4

$$\sin(\theta+90) = \sin\theta \cdot \cos 90 + \cos\theta \cdot \sin 90 = \sin\theta \cdot (0) + \cos\theta \cdot (1) = \cos\theta$$

PTS: 2 REF: 061309a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities
KEY: identities

10 ANS: 2

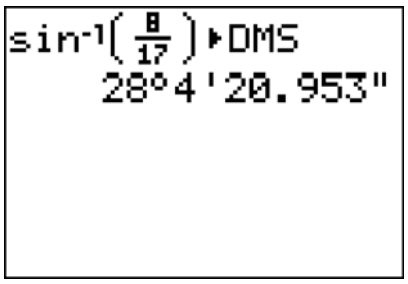
$2^2 \cdot 3 = 12 \quad . \quad 6^2 d = 12$

$4^2 \cdot \frac{3}{4} = 12 \quad 36d = 12$

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

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

11 ANS: 2



$\sin S = \frac{8}{17}$

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

$S \approx 28°4'$

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

12 ANS: 4

$x = 2y. \quad y^2 - (3y)^2 + 32 = 0 \quad . \quad x = 3(-2) = -6$

$y^2 - 9y^2 = -32$

$-8y^2 = -32$

$y^2 = 4$

$y = \pm 2$

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

KEY: equations

13 ANS: 3

$1000 = 500e^{.05t}$

$2 = e^{.05t}$

$\ln 2 = \ln e^{.05t}$

$\frac{\ln 2}{.05} = \frac{.05t \cdot \ln e}{.05}$

$13.9 \approx t$

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

14 ANS: 3

$6n^{-1} < 4n^{-1}$. Flip sign when multiplying each side of the inequality by n, since a negative number.

$$\frac{6}{n} < \frac{4}{n}$$

$$6 > 4$$

PTS: 2 REF: 061314a2 STA: A2.N.1 TOP: Negative and Fractional Exponents

15 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: basic

16 ANS: 1 PTS: 2 REF: 061316a2 STA: A2.S.8
TOP: Correlation Coefficient

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

18 ANS: 4 PTS: 2 REF: 061318a2 STA: A2.A.49
TOP: Equations of Circles

19 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

20 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

21 ANS: 3

$$\log 4m^2 = \log 4 + \log m^2 = \log 4 + 2\log m$$

PTS: 2 REF: 061321a2 STA: A2.A.19 TOP: Properties of Logarithms
KEY: splitting logs

22 ANS: 2 PTS: 2 REF: 061322a2 STA: A2.A.73
TOP: Law of Sines KEY: side, without calculator

23 ANS: 2

$\tan 30 = \frac{\sqrt{3}}{3}$. $\text{Arc}\cos\frac{\sqrt{3}}{k} = 30$

$\frac{\sqrt{3}}{k} = \cos 30$

$k = 2$

PTS: 2 REF: 061323a2 STA: A2.A.64 TOP: Using Inverse Trigonometric Functions
KEY: advanced

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

25 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

26 ANS: 2

$\frac{-\frac{3}{32}a^3b^4}{\frac{1}{64}a^5b^3} = -\frac{6b}{a^2}$

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

27 ANS: 4

$\frac{13}{\sin 40} = \frac{20}{\sin M}$. $81 + 40 < 180$. $(180 - 81) + 40 < 180$

$M \approx 81$

PTS: 2 REF: 061327a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case

28 ANS:

Sum $\frac{-b}{a} = -\frac{1}{12}$. Product $\frac{c}{a} = -\frac{1}{2}$

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

29 ANS:

$2x - 1 = 27^{\frac{4}{3}}$

$2x - 1 = 81$

$2x = 82$

$x = 41$

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

30 ANS:

$$\frac{{}_{10}P_{10}}{3!\cdot 3!\cdot 2!} = \frac{3,628,800}{72} = 50,400$$

PTS: 2 REF: 061330a2 STA: A2.S.10 TOP: Permutations

31 ANS:

$$\frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2} = \frac{\sqrt{6}}{4}$$

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

32 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

33 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

34 ANS:

$$\frac{\cot x \sin x}{\sec x} = \frac{\frac{\cos x}{\sin x}\sin x}{\frac{1}{\cos x}} = \cos^2 x$$

PTS: 2 REF: 061334a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships

35 ANS:

$${}_7C_3\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^4 = 35\left(\frac{1}{64}\right)\left(\frac{81}{256}\right) = \frac{2835}{16384} \approx 0.173$$

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

36 ANS:

$\frac{13}{x} = 10 - x$. $x = \frac{10 \pm \sqrt{100 - 4(1)(13)}}{2(1)} = \frac{10 \pm \sqrt{48}}{2} = \frac{10 \pm 4\sqrt{3}}{2} = 5 \pm 2\sqrt{3}$

$13 = 10x - x^2$

$x^2 - 10x + 13 = 0$

PTS: 4 REF: 061336a2 STA: A2.A.23 TOP: Solving Rationals
KEY: irrational and complex solutions

37 ANS:

$\frac{15}{\sin 103} = \frac{a}{\sin 42}$. $\frac{1}{2}(15)(10.3)\sin 35 \approx 44$

$a \approx 10.3$

PTS: 4 REF: 061337a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: advanced

38 ANS:

$\sigma_x \approx 6.2$. 6 scores are within a population standard deviation of the mean. $Q_3 - Q_1 = 41 - 37 = 4$

$\bar{x} \approx 38.2$

PTS: 4 REF: 061338a2 STA: A2.S.4 TOP: Dispersion
KEY: advanced

39 ANS:

$x^4 + 4x^3 + 4x^2 + 16x = 0$

$x(x^3 + 4x^2 + 4x + 16) = 0$

$x(x^2(x+4) + 4(x+4)) = 0$

$x(x^2 + 4)(x + 4) = 0$

$x = 0, \pm 2i, -4$

PTS: 6 REF: 061339a2 STA: A2.A.26 TOP: Solving Polynomial Equations