JEFFERSON MATH PROJECT
REGENTS AT RANDOM

The NY Algebra 2/Trigonometry Regents Exams
Fall 2009-January 2012

(Answer Key)

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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 at Random
Answer Section

1 ANS: 2

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

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

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

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

4 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

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

6 ANS:

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

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

7 ANS: 4   PTS: 2   REF: 061124a2   STA: A2.S.3
TOP: Central Tendency

8 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

9 ANS: 1

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

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

10 ANS: 1

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

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

11 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

12 ANS:
$y = 10.596(1.586)^x$

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

13 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

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

15 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

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

17 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

18 ANS: 1   PTS: 2   REF: fall0914a2   STA: A2.A.8
TOP: Negative and Fractional Exponents

19 ANS:

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

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

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

20 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

21 ANS:

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

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

22 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

23 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

24 ANS:

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

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

25 ANS: 4   PTS: 2   REF: 011111a2   STA: A2.N.8

TOP: Conjugates of Complex Numbers

26 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

27 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

28 ANS: 2

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

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

29 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

30 ANS: 2

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

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

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

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

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

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

31 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

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

33 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

34 ANS:

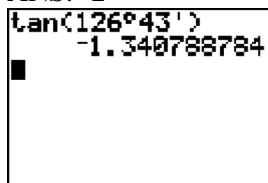Sum $\dfrac{-b}{a} = -\dfrac{11}{5}$. Product $\dfrac{c}{a} = -\dfrac{3}{5}$

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

35 ANS: 2

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tan(126°43')
        -1.340788784
■
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PTS: 2   REF: 061115a2   STA: A2.A.66   TOP: Determining Trigonometric Functions

36 ANS: 2

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

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

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

$$4x + 10 = 9x$$

$$10 = 5x$$

$$2 = x$$

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

37 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

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

39 ANS: 3

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

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

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

PTS: 2   REF: 081025a2   STA: A2.A.31   TOP: Conjugates of Complex Numbers

40 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

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

42 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

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

44 ANS: 3
$$\frac{-b}{a} = \frac{-6}{2} = -3. \ \frac{c}{a} = \frac{4}{2} = 2$$

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

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

$$C \approx 78.3$$

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

46 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

47 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

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

49 ANS: 3

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

PTS: 2　　REF: 061003a2　　STA: A2.A.8　　TOP: Negative and Fractional Exponents

50 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
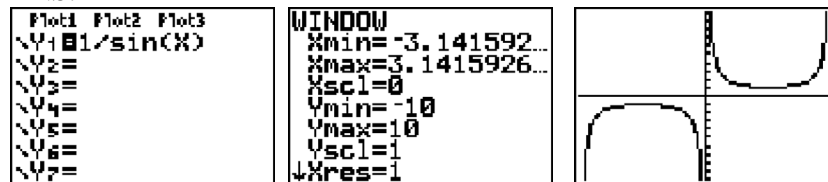KEY: single variable

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

52 ANS: 1

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

53 ANS: 1

$$\frac{9}{\sin A} = \frac{10}{\sin 70}. \quad 58° + 70° \text{ is possible.} \quad 122° + 70° \text{ is not possible.}$$

$$A = 58$$

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

54 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

55 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

56 ANS: 4

$$\frac{2\pi}{b} = 30$$

$$b = \frac{\pi}{15}$$

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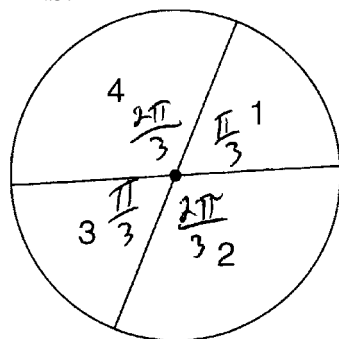TOP: Identifying the Equation of a Trigonometric Graph

57 ANS:

$$\frac{5(3+\sqrt{2})}{7} \cdot \quad \frac{5}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{5(3+\sqrt{2})}{9-2} = \frac{5(3+\sqrt{2})}{7}$$

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

58 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

59 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

60 ANS:

$$12 \cdot 6 = 9w$$

$$8 = w$$

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

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

62 ANS: 1

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

$169 = 421 - 420\cos C$

$-252 = -420\cos C$

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

$53 \approx C$

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

63 ANS: 4

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

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

64 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

65 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

66 ANS: 4

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

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

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

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

69 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

70 ANS:

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

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

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

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

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

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

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

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

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

71 ANS: 3

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

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

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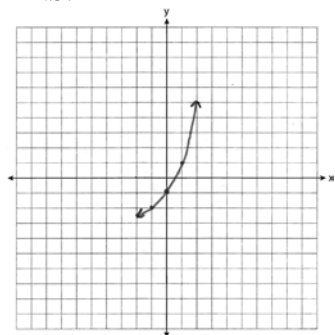
     PTS: 2   REF: 011234a2   STA: A2.A.53   TOP: Graphing Exponential Functions

73 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

74 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

75 ANS: 2

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

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

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

76 ANS: 1   PTS: 2   REF: 081022a2   STA: A2.A.46

TOP: Transformations with Functions and Relations

77 ANS: 3

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

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

$\quad 0 = x^2 + x - 12$

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

$\quad x = -4 \ \ x = 3$

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

KEY: extraneous solutions

78 ANS: 4

$y - 2\sin \theta = 3$

$\quad\quad y = 2\sin \theta + 3$

$\quad f(\theta) = 2\sin \theta + 3$

PTS: 2   REF: fall0927a2   STA: A2.A.40   TOP: Functional Notation

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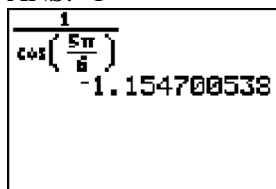
TOP: Graphing Trigonometric Functions

80 ANS: 1

$10 \cdot \dfrac{3}{2} = \dfrac{3}{5}p$

$\quad 15 = \dfrac{3}{5}p$

$\quad 25 = p$

PTS: 2   REF: 011226a2   STA: A2.A.5   TOP: Inverse Variation

81 ANS: 1

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

82 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

83 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

84 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

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

86 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

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

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

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

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

90 ANS: 4

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

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

91 ANS:

$-104.$

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

92 ANS: 2

sum: $\dfrac{-b}{a} = \dfrac{4}{6} = \dfrac{2}{3}.$ product: $\dfrac{c}{a} = \dfrac{-12}{6} = -2$

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

93 ANS:
$-3, -5, -8, -12$

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

94 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

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

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

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

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

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

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

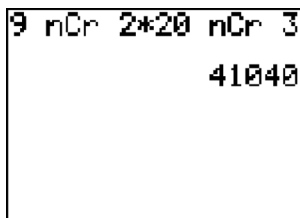$$\theta = 0,180 \quad \cos \theta = \frac{1}{2}$$

$$\theta = 60,300$$

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

97 ANS:

```
9 nCr 2*20 nCr 3
            41040
```

41,040.

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

98 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

99 ANS:

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

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

100 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

101 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

102 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

103 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

104 ANS: 4
$$s = \theta\, r = 2 \cdot 4 = 8$$

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

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

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

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

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

107 ANS: 3
$$x = 5^4 = 625$$

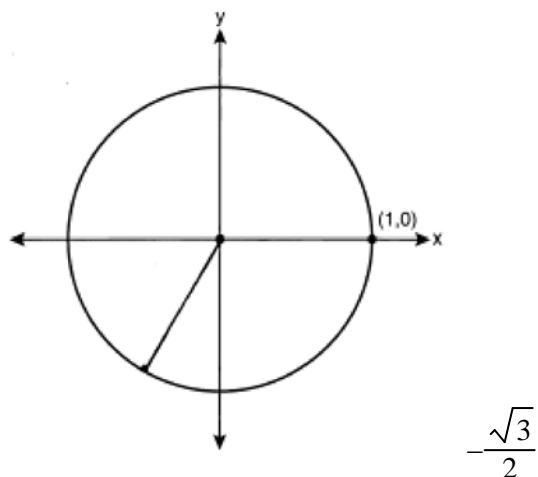PTS: 2   REF: 061106a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic

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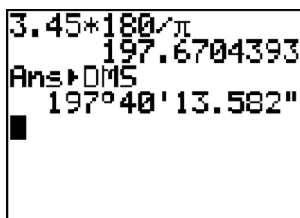TOP: Domain and Range   KEY: real domain

109 ANS:

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

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

110 ANS:

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

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

111 ANS: 2
$\cos(-305° + 360°) = \cos(55°)$

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

112 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

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

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

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

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

116 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
117 ANS: 4 PTS: 2 REF: 061101a2 STA: A2.S.1
TOP: Analysis of Data
118 ANS: 3 PTS: 2 REF: 061001a2 STA: A2.A.30
TOP: Sequences
119 ANS: 3 PTS: 2 REF: 011104a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: unit circle
120 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
121 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
122 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
123 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
124 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

125 ANS: 2

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

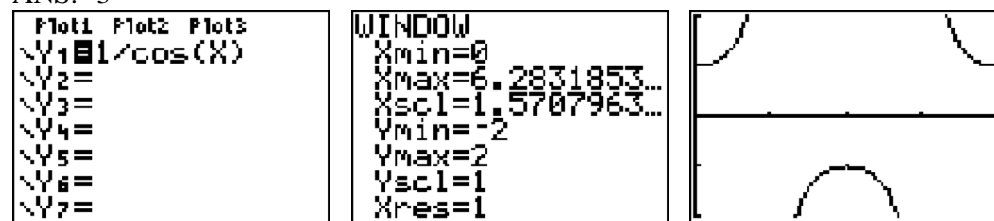PTS: 2 REF: fall0920a2 STA: A2.A.17 TOP: Complex Fractions

126 ANS:

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

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

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

127 ANS: 3

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

128 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

129 ANS: 2

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

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

130 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

131 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

132 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

133 ANS:

$\left(-\dfrac{9}{2}, \dfrac{1}{2}\right)$ and $\left(\dfrac{1}{2}, \dfrac{11}{2}\right)$. $\begin{aligned} y &= x + 5 \\ y &= 4x^2 + 17x - 4 \end{aligned}$ $\begin{aligned} 4x^2 + 17x - 4 &= x + 5 \\ 4x^2 + 16x - 9 &= 0 \end{aligned}$

$$(2x + 9)(2x - 1) = 0$$
$$x = -\frac{9}{2} \text{ and } x = \frac{1}{2}$$
$$y = -\frac{9}{2} + 5 = \frac{1}{2} \text{ and } y = \frac{1}{2} + 5 = \frac{11}{2}$$

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

134 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

135 ANS: 2

The binomials are conjugates, so use FL.

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

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

137 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

138 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

139 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

140 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

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

142 ANS: 3

$x^2 - 3x - 10 > 0$ or

$(x - 5)(x + 2) > 0$ $x - 5 < 0$ and $x + 2 < 0$

$x - 5 > 0$ and $x + 2 > 0$ $x < 5$ and $x < -2$

$x > 5$ and $x > -2$ $x < -2$

$x > 5$

PTS: 2 REF: 011115a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: one variable

143 ANS: 4
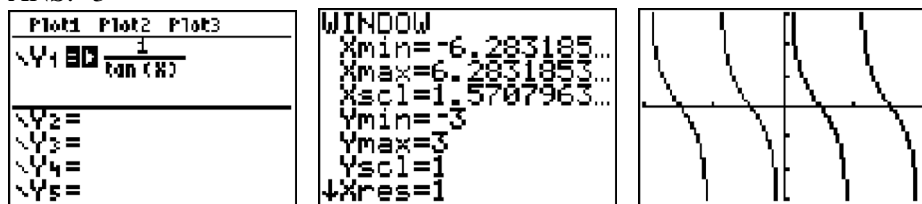$\dfrac{10}{4} = 2.5$

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

144 ANS: 3

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

145 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

146 ANS: 4   PTS: 2   REF: 061005a2   STA: A2.A.50

TOP: Solving Polynomial Equations

147 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
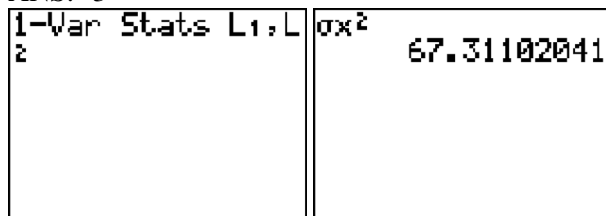
148 ANS: 3

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

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

KEY: basic

149 ANS: 3

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

KEY: variance

150 ANS: 3   PTS: 2   REF: 061119a2   STA: A2.A.65

TOP: Graphing Trigonometric Functions

151 ANS: 2   PTS: 2   REF: 061122a2   STA: A2.A.24

TOP: Completing the Square

152 ANS: 3   PTS: 2   REF: 061127a2   STA: A2.S.6

TOP: Regression

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

154 ANS:

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

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

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

156 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

157 ANS: 1

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

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

158 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

159 ANS: 3
$34.1\% + 19.1\% = 53.2\%$

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

160 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

161 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

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

163 ANS: 4

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

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

164 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

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

166 ANS:

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

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

167 ANS: 1

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

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

$\quad\quad x \le 2 \qquad x \ge \dfrac{1}{3}$

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

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

169 ANS: 1

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

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

170 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

171 ANS: 2

$x^3 + x^2 - 2x = 0$

$x(x^2 + x - 2) = 0$

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

$\quad x = 0, -2, 1$

PTS: 2   REF: 011103a2   STA: A2.A.26   TOP: Solving Polynomial Equations

172 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

173 ANS:

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

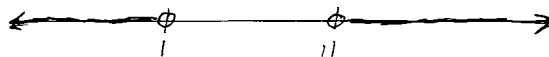PTS: 2   REF: 061035a2   STA: A2.A.17   TOP: Complex Fractions

174 ANS:

$$-3|6-x| < -15$$.

$$|6-x| > 5$$

$$6 - x > 5 \text{ or } 6 - x < -5$$

$$1 > x \text{ or } 11 < x$$

PTS: 2   REF: 061137a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

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

176 ANS:

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

$$y = 125^{-\frac{2}{3}} = \frac{1}{25}$$

PTS: 4   REF: 011237a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced

177 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

178 ANS: 1

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

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

$$8 - 2 \neq -10$$

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

PTS: 2   REF: 011106a2   STA: A2.A.1   TOP: Absolute Value Equations
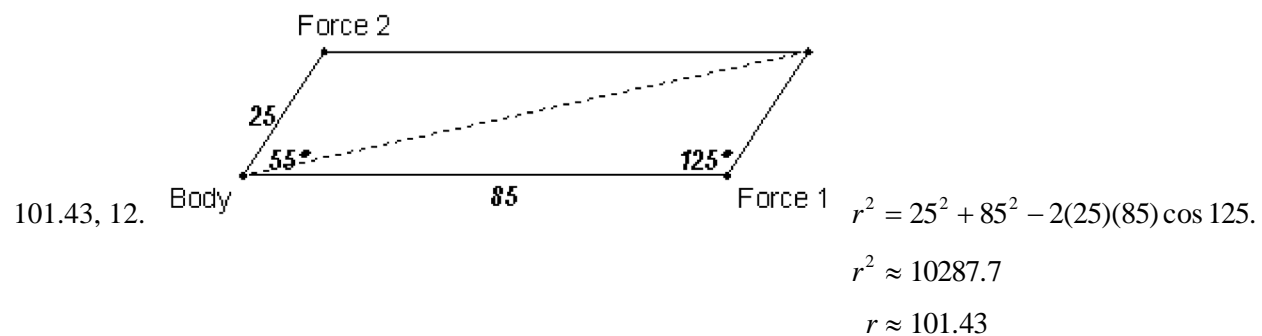
179 ANS: 3

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

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

180 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

181 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

182 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

183 ANS: 3

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

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

184 ANS: 2

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

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

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

186 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

187 ANS: 3

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

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

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

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

188 ANS: 1

(4) shows the strongest linear relationship, but if $r < 0$, $b < 0$.

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

189 ANS: 2

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

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

190 ANS: 1

$_{10}C_4 = 210$

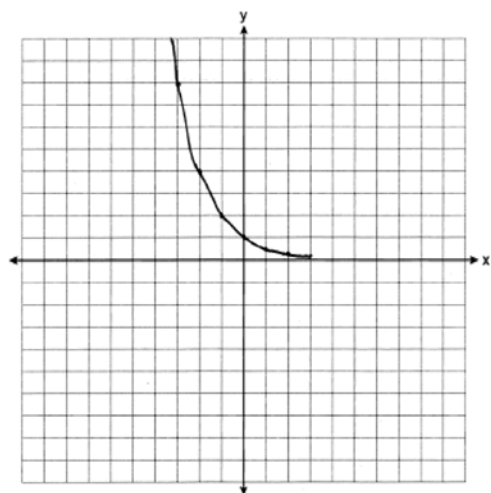PTS: 2 REF: 061113a2 STA: A2.S.11 TOP: Combinations

191 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

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

193 ANS:

$$y = 0$$

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

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

195 ANS: 1

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

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

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

197 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

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

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

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

201 ANS:

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

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

202 ANS:

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

$$C \approx 33$$

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

203 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

204 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

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

206 ANS:

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

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

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

$$4x^2 - 9 = 0 \text{ or } 2x + 1 = 0$$

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

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

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

207 ANS: 1

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

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

208 ANS: 2

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

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

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

210 ANS: 2

$$8^2 = 64$$

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

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

212 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

213 ANS:

7.4

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

214 ANS:

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

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

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

$$4 \neq 2$$

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

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

216 ANS: 3

Cofunctions tangent and cotangent are complementary

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

217 ANS: 4

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

PTS: 2 REF: 081001a2 STA: A2.N.2 TOP: Operations with Radicals

218 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

219 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

220 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

221 ANS:

$10ax^2 - 23ax - 5a = a(10x^2 - 23x - 5) = a(5x + 1)(2x - 5)$
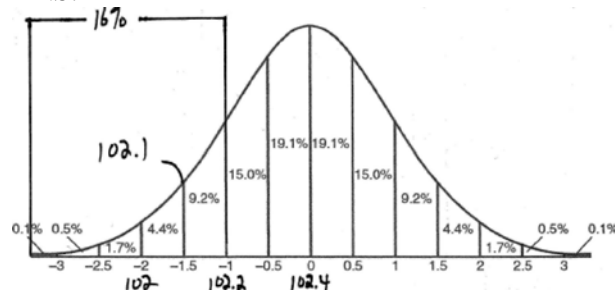
PTS: 2　　　　REF: 081028a2　　STA: A2.A.7　　TOP: Factoring Polynomials
KEY: multiple variables

222 ANS: 1

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

223 ANS:

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

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

224 ANS: 3

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

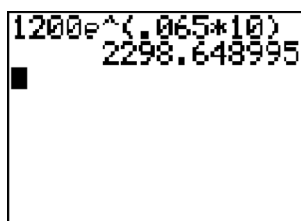PTS: 2 REF: 061006a2 STA: A2.N.6 TOP: Square Roots of Negative Numbers

225 ANS: 1

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

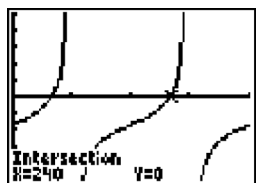PTS: 2 REF: 011220a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

226 ANS:

2,298.65.

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

227 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

228 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

229 ANS:
$_{25}C_{20} = 53,130$

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

230 ANS:

$\dfrac{23}{2}$ $\cos^2 B + \sin^2 B = 1$ $\tan B = \dfrac{\sin B}{\cos B} = \dfrac{\dfrac{5}{\sqrt{41}}}{\dfrac{4}{\sqrt{41}}} = \dfrac{5}{4}$ $\tan(A+B) = \dfrac{\dfrac{2}{3} + \dfrac{5}{4}}{1 - \left(\dfrac{2}{3}\right)\left(\dfrac{5}{4}\right)} = \dfrac{\dfrac{8+15}{12}}{\dfrac{12}{12} - \dfrac{10}{12}} = \dfrac{\dfrac{23}{12}}{\dfrac{2}{12}} = \dfrac{23}{2}$

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

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

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

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

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

231 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

232 ANS:
$\dfrac{2\sqrt{3}}{3}$. If $\sin 60 = \dfrac{\sqrt{3}}{2}$, then $\csc 60 = \dfrac{2}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{2\sqrt{3}}{3}$

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

233 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

234 ANS: 1
$y \ge x^2 - x - 6$

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

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