

JEFFERSON MATH PROJECT

REGENTS BY DATE

The NY Algebra 2/Trigonometry Regents Exams
Fall, 2009-January, 2012
(Answer Key)

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Dear Sir

I have to acknowledge the receipt 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 indispensable 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.

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

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

PTS: 2

REF: fall0902a2 STA: A2.A.42

TOP: Compositions of Functions

KEY: numbers

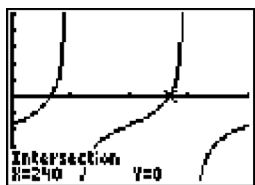
3 ANS: 1

$$\tan \theta - \sqrt{3} = 0$$

$$\tan \theta = \sqrt{3}$$

$$\theta = \tan^{-1} \sqrt{3}$$

$$\theta = 60, 240$$



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

$$6x - 7 \leq 5 \quad 6x - 7 \geq -5$$

$$6x \leq 12 \quad 6x \geq 2$$

$$x \leq 2 \quad x \geq \frac{1}{3}$$

PTS: 2

REF: fall0905a2 STA: A2.A.1

TOP: Absolute Value Inequalities

KEY: graph

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

$$2 \times 12 = 24$$

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

12 ANS: 3

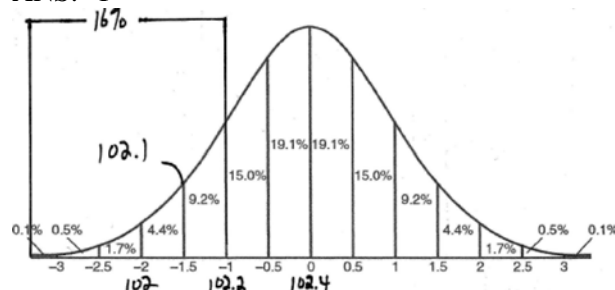
$$S = \frac{-b}{a} = \frac{-(-3)}{4} = \frac{3}{4}; P = \frac{c}{a} = \frac{-8}{4} = -2$$

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.8
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

1-Var Stats L1, L2	σx^2
	67.31102041

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:

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

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

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

$$4 \neq 2$$

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

KEY: rational solutions

31 ANS:

3.45*180/π
197.6704393
Ans → DMS
197°40'13.582"

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

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

KEY: degrees

32 ANS:

1200e^(0.065*10)
2298.648995

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:

9 nCr 2 * 20 nCr 3
41040

41,040.

PTS: 2 REF: fall0935a2 STA: A2.S.12 TOP: Combinations

36 ANS:

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

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

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

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

$$(x-3)^2 = 7$$

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

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

PTS: 4

REF: fall0936a2

STA: A2.A.24

TOP: Completing the Square

37 ANS:

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

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

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

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

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

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

PTS: 4

REF: fall0937a2

STA: A2.A.26

TOP: Solving Polynomial Equations

38 ANS:

$$y = 2.001x^{2.298}, 1,009. \quad y = 2.001(15)^{2.298} \approx 1009$$

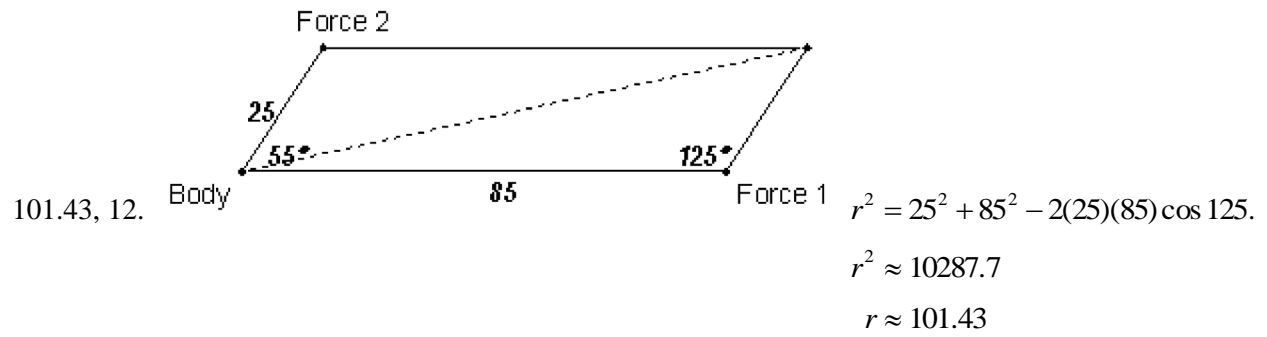
PTS: 4

REF: fall0938a2

STA: A2.S.7

TOP: Power Regression

39 ANS:



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

$$x \approx 12$$

PTS: 6

REF: fall0939a2

STA: A2.A.73

TOP: Vectors

0610a2

Answer Section

1 ANS: 3 PTS: 2 REF: 061001a2 TOP: Sequences

2 ANS: 2

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

PTS: 2 REF: 061002a2 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 TOP: Negative and Fractional Exponents

4 ANS: 1 PTS: 2 REF: 061004a2 TOP: Identifying the Equation of a Graph

5 ANS: 4 PTS: 2 REF: 061005a2 TOP: Solving Polynomial Equations

6 ANS: 3

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

PTS: 2 REF: 061006a2 TOP: Square Roots of Negative Numbers

7 ANS: 3 PTS: 2 REF: 061007a2

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 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 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 TOP: Properties of Logarithms

11 ANS: 2 PTS: 2 REF: 061011a2 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 TOP: Rationalizing Denominators

13 ANS: 1 PTS: 2 REF: 061013a2 TOP: Defining Functions

14 ANS: 3

Cofunctions tangent and cotangent are complementary

PTS: 2 REF: 061014a2 TOP: Cofunction Trigonometric Relationships

15 ANS: 3

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

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

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

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

$$x = -3 \quad x = -1$$

PTS: 2 REF: 061015a2 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 TOP: Equations of Circles

17 ANS: 1

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

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

PTS: 2 REF: 061017a2 TOP: Quadratic Inequalities

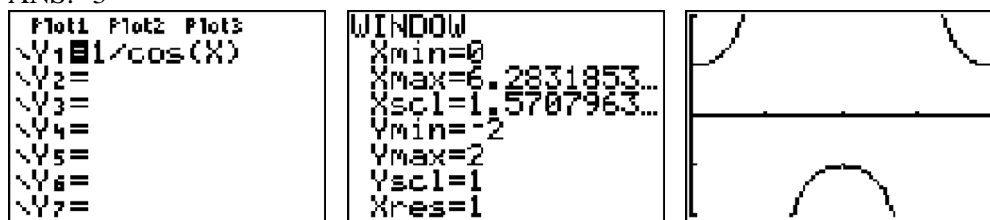
KEY: two variables

18 ANS: 1 PTS: 2 REF: 061018a2 TOP: Solving Radicals

KEY: extraneous solutions

19 ANS: 1 PTS: 2 REF: 061019a2 TOP: Imaginary Numbers

20 ANS: 3

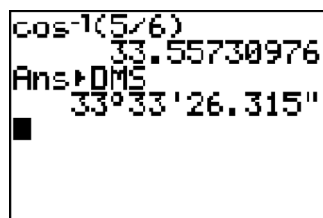


PTS: 2 REF: 061020a2 TOP: Graphing Trigonometric Functions

21 ANS: 2 PTS: 2 REF: 061021a2 TOP: Correlation Coefficient

22 ANS: 3 PTS: 2 REF: 061022a2 TOP: Domain and Range

23 ANS: 1



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

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

$$K \approx 33^\circ 33'$$

PTS: 2 REF: 061023a2 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 TOP: Double Angle Identities

KEY: simplifying

25 ANS: 1 PTS: 2 REF: 061025a2 TOP: Sigma Notation

26 ANS: 4 PTS: 2 REF: 061026a2 TOP: Sequences

27 ANS: 4

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

PTS: 2 REF: 061027a2 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 TOP: Using the Discriminant

KEY: determine equation given nature of roots

29 ANS:

7.4

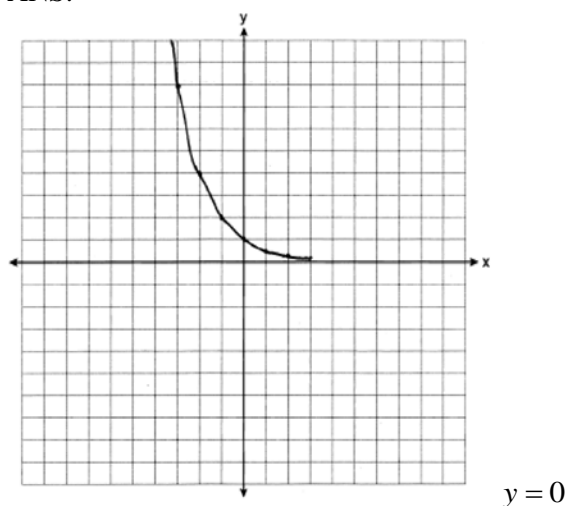
PTS: 2 REF: 061029a2 TOP: Dispersion KEY: basic, group frequency distributions

30 ANS:

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

PTS: 2 REF: 061030a2 TOP: Roots of Quadratics

31 ANS:



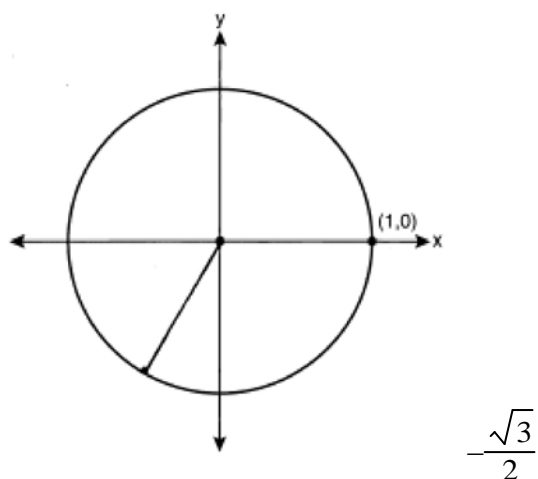
PTS: 2 REF: 061031a2 TOP: Graphing Exponential Functions

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 TOP: Operations with Radicals

33 ANS:



PTS: 2 REF: 061033a2 TOP: Unit Circle

34 ANS:

$$K = ab \sin C = 24 \cdot 30 \sin 57 \approx 604$$

PTS: 2 REF: 061034a2 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 TOP: Complex Fractions

36 ANS:

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

PTS: 4 REF: 061036a2 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

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

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

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.2

TOP: Operations with Radicals

2 ANS: 1

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

PTS: 2

REF: 081002a2

STA: A2.M.2

TOP: Radian Measure

KEY: radians

3 ANS: 2

PTS: 2

REF: 081003a2

STA: A2.A.51

TOP: Domain and Range

4 ANS: 1

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

PTS: 2

REF: 081004a2

STA: A2.N.7

TOP: Imaginary Numbers

5 ANS: 4

PTS: 2

REF: 081005a2

STA: A2.A.60

TOP: Unit Circle

6 ANS: 3

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

$$C \approx 78.3$$

PTS: 2

REF: 081006a2

STA: A2.A.75

TOP: Law of Sines - The Ambiguous Case

7 ANS: 3

PTS: 2

REF: 081007a2

STA: A2.A.64

TOP: Using Inverse Trigonometric Functions

KEY: basic

8 ANS: 4

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

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

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

$$6x+2 = 3x+6$$

$$3x = 4$$

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

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 Sines

KEY: angle, without calculator

18 ANS: 2

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

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: Conjugates of Complex Numbers

26 ANS: 3

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

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

KEY: recognize

27 ANS: 3

PTS: 2

REF: 081027a2

STA: A2.A.44

TOP: Inverse of Functions

KEY: equations

28 ANS:

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

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

KEY: multiple variables

29 ANS:

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

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

30 ANS:

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

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

31 ANS:

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

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

32 ANS:

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

$$1 = \tan C$$

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

$$C = 45, 225$$

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

KEY: basic

33 ANS:

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

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

34 ANS:

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

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

35 ANS:

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

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

36 ANS:

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

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

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

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

$$3x=1$$

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

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

KEY: rational solutions

37 ANS:

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

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

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

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

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

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

KEY: evaluating

38 ANS:

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

PTS: 4 REF: 081038a2 STA: A2.S.15 TOP: Binomial Probability

KEY: at least or at most

39 ANS:

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

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

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

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

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

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

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

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

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

KEY: basic

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

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

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

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

PTS: 2

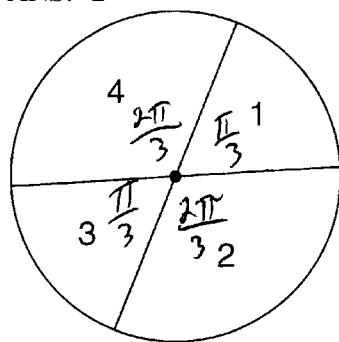
REF: 011107a2

STA: A2.A.77

TOP: Double Angle Identities

KEY: evaluating

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

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

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

PTS: 2

REF: 011113a2

STA: A2.A.75

TOP: Law of Sines - The Ambiguous Case

14 ANS: 2

PTS: 2

REF: 011114a2

STA: A2.N.3

TOP: Operations with Polynomials

15 ANS: 3

$$x^2 - 3x - 10 > 0 \quad \text{or}$$

$$(x-5)(x+2) > 0 \quad x-5 < 0 \text{ and } x+2 < 0$$

$$x-5 > 0 \text{ and } x+2 > 0 \quad x < 5 \text{ and } x < -2$$

$$x > 5 \text{ and } x > -2 \quad x < -2$$

$$x > 5$$

PTS: 2 REF: 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

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

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

19 ANS: 3 PTS: 2 REF: 011119a2 STA: A2.A.52

TOP: Families of Functions

20 ANS: 1

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

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

21 ANS: 3

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

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

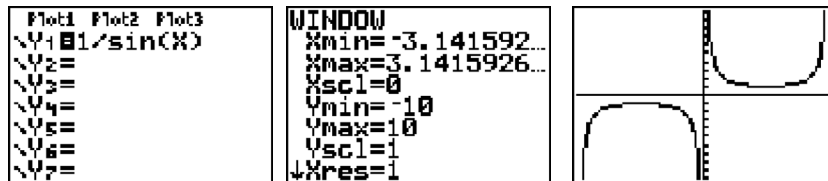
22 ANS: 4

$$\frac{2x+4}{\sqrt{x+2}} \cdot \frac{\sqrt{x+2}}{\sqrt{x+2}} = \frac{2(x+2)\sqrt{x+2}}{x+2} = 2\sqrt{x+2}$$

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:

$$2.5 \cdot \frac{180}{\pi} \approx 143.2^\circ$$

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:

$$D: -5 \leq x \leq 8. \quad R: -3 \leq y \leq 2$$

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:

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

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

37 ANS:

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

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

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:

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

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

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

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

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: Summations

KEY: arithmetic

4 ANS: 2

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

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

5 ANS: 2

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

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

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

$$4x + 10 = 9x$$

$$10 = 5x$$

$$2 = x$$

PTS: 2 REF: 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

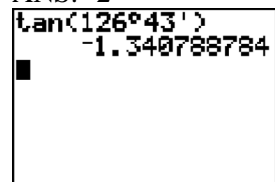
REF: 061114a2

STA: A2.A.38

TOP: Defining Functions

KEY: graphs

15 ANS: 2



A calculator screen showing the calculation of the tangent of an angle. The input is $\tan(126^\circ 43')$ and the output is -1.340788784 .

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

$$3x + 16 = (x + 2)^2 \quad . \quad -4 \text{ is an extraneous solution.}$$

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

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

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

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

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: Central Tendency

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

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

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:

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

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:

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

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

KEY: basic

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:

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

$$x = y^2 - 6$$

$$x + 6 = y^2$$

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

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

KEY: equations

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:

$$\begin{aligned} \sin(45 + 30) &= \sin 45 \cos 30 + \cos 45 \sin 30 \\ &= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4} \end{aligned}$$

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

37 ANS:

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


$$|6-x| > 5$$

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

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

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

38 ANS:

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

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

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

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

39 ANS:

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

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

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

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

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

PTS: 6

REF: 061139a2

STA: A2.A.3

TOP: Quadratic-Linear Systems

KEY: equations

0112a2

Answer Section

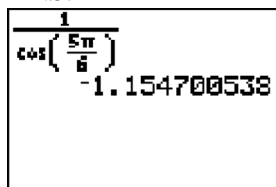
1 ANS: 4 PTS: 2 REF: 011201a2 STA: A2.S.2
TOP: Analysis of Data

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



A calculator screen showing the expression $\cos\left(\frac{5\pi}{6}\right)$ and the result -1.154700538 .

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

4 ANS: 4

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

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

5 ANS: 2

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

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

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

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

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

$$300 = t$$

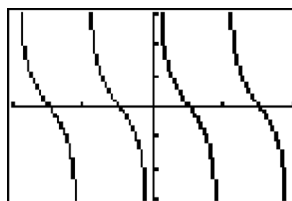
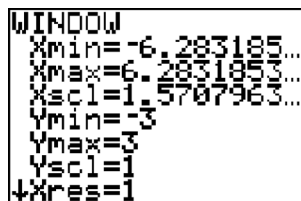
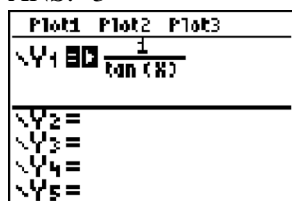
PTS: 2 REF: 011205a2 STA: A2.A.6 TOP: Exponential Growth

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

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

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

10 ANS: 1

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

$$A = 58$$

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 $r < 0$, $b < 0$.

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:

$$x < -1 \text{ or } x > 5. \quad x^2 - 4x - 5 > 0. \quad x - 5 > 0 \text{ and } x + 1 > 0 \text{ or } x - 5 < 0 \text{ and } x + 1 < 0$$

$$(x - 5)(x + 1) > 0 \quad x > 5 \text{ and } x > -1 \quad x < 5 \text{ and } x < -1$$

$$x > 5$$

$$x < -1$$

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

29 ANS:

$$\begin{aligned}
 7. \quad 4 - \sqrt{2x-5} &= 1 \\
 -\sqrt{2x-5} &= -3 \\
 2x - 5 &= 9 \\
 2x &= 14 \\
 x &= 7
 \end{aligned}$$

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

30 ANS:

$$\sum_{x=1}^4 (-x^4 - x) = -104$$

-104.

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

31 ANS:

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

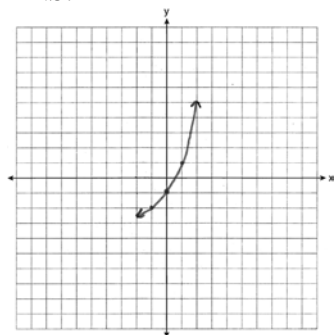
PTS: 2 REF: 011231a2 STA: A2.A.13 TOP: Simplifying Radicals
 KEY: index > 2

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:

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

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

35 ANS:

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

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

36 ANS:

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

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

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

37 ANS:

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

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

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