JEFFERSON MATH PROJECT REGENTS BY PERFORMANCE INDICATOR: TOPIC

NY Integrated Algebra Regents Exam Questions
from Fall 2007 to January 2012 Sorted by PI: Topic
(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 Exam Questions by Performance Indicator: Topic
Answer Section

1 ANS: 4   PTS: 2   REF: 011127a2   STA: A2.S.1
   TOP: Analysis of Data
2 ANS: 4   PTS: 2   REF: 061101a2   STA: A2.S.1
   TOP: Analysis of Data
3 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
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: 4   PTS: 2   REF: 011201a2   STA: A2.S.2
   TOP: Analysis of Data
6 ANS: 4   PTS: 2   REF: 061124a2   STA: A2.S.3
   TOP: Central Tendency
7 ANS:
   7.4

   PTS: 2   REF: 061029a2   STA: A2.S.4   TOP: Dispersion
   KEY: basic, group frequency distributions
8 ANS: 3

   PTS: 2   REF: fall0924a2   STA: A2.S.4   TOP: Dispersion
   KEY: variance
9 ANS: 3   PTS: 2   REF: 061127a2   STA: A2.S.6
   TOP: Regression
10 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
11 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

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

PTS: 2   REF: 081031a2   STA: A2.S.7   TOP: Exponential Regression
13 ANS: 2   PTS: 2   REF: 061021a2   STA: A2.S.8
    TOP: Correlation Coefficient
14 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
15 ANS: 3
    $68\% \times 50 = 34$

PTS: 2   REF: 081013a2   STA: A2.S.5   TOP: Normal Distributions
    KEY: predict
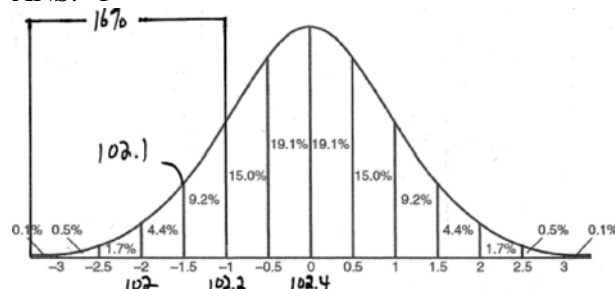16 ANS: 3
    $34.1\% + 19.1\% = 53.2\%$

PTS: 2   REF: 011212a2   STA: A2.S.5   TOP: Normal Distributions
    KEY: probability
17 ANS: 1

PTS: 2   REF: fall0915a2   STA: A2.S.5   TOP: Normal Distributions
    KEY: interval
18 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
19 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
20 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

2

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

22 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

23 ANS:

No. TENNESSEE: $\dfrac{{}_{9}P_{9}}{4!\cdot 2!\cdot 2!} = \dfrac{362,880}{96} = 3,780$. VERMONT: ${}_{7}P_{7} = 5,040$

    PTS: 4   REF: 061038a2   STA: A2.S.10   TOP: Permutations

24 ANS: 2
    ${}_{15}C_{8} = 6,435$

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

25 ANS: 1
    ${}_{10}C_{4} = 210$

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

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

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

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

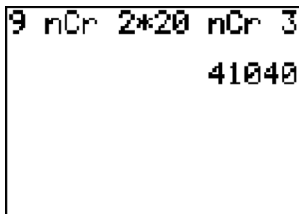28 ANS: 1   PTS: 2   REF: 011117a2   STA: A2.S.9
    TOP: Differentiating Permutations and Combinations
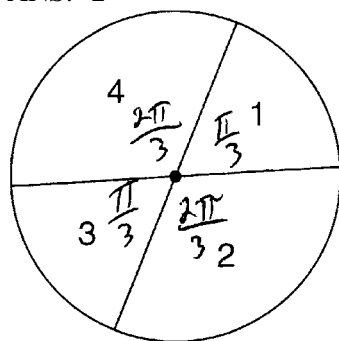
29 ANS:

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9 nCr 2*20 nCr 3
           41040
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41,040.

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

30 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

31 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

32 ANS:

0.167. $_{10}C_8\cdot0.6^8\cdot0.4^2+_{10}C_9\cdot0.6^9\cdot0.4^1+_{10}C_{10}\cdot0.6^{10}\cdot0.4^0\approx0.167$

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

33 ANS:

26.2%. $_{10}C_8\cdot0.65^8\cdot0.35^2+_{10}C_9\cdot0.65^9\cdot0.35^1+_{10}C_{10}\cdot0.65^{10}\cdot0.35^0\approx0.262$

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

34 ANS:

0.468. $_8C_6\left(\frac{2}{3}\right)^6\left(\frac{1}{3}\right)^2\approx0.27313.$ $_8C_7\left(\frac{2}{3}\right)^7\left(\frac{1}{3}\right)^1\approx0.15607.$ $_8C_8\left(\frac{2}{3}\right)^8\left(\frac{1}{3}\right)^0\approx0.03902.$

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

35 ANS:

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

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

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

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

36 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

37 ANS: 1

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

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

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

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

38 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

39 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

40 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

41 ANS: 3

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

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

42 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

43 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

44 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

45 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

46 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

47 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

48 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

49 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

50 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

51 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

52 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

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

54 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

55 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

56 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

57 ANS: 3

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

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

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

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

$$x > 5$$

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

58 ANS:

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

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

$$x > 5 \qquad\qquad x < -1$$

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

59 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

60 ANS:

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

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

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

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

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

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

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

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

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

63 ANS:

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

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

64 ANS:

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

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

65 ANS: 3

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

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

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

67 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

68 ANS: 2

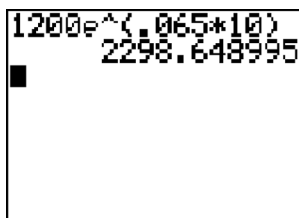$$\frac{x^{-1}+1}{x+1} = \frac{\frac{1}{x}+1}{x+1} = \frac{\frac{1+x}{x}}{x+1} = \frac{1}{x}$$

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

69 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

70 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

71 ANS:

```
1200e^(.065*10)
        2298.648995
■
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2,298.65.

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

72 ANS:

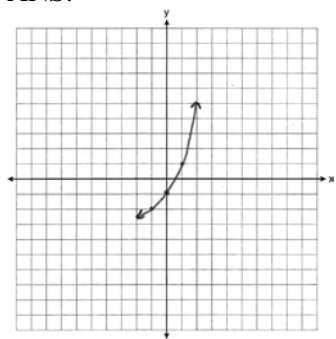$$e^{3\ln 2} = e^{\ln 2^3} = e^{\ln 8} = 8$$

PTS: 2   REF: 061131a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

73 ANS: 2
    $8^2 = 64$

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

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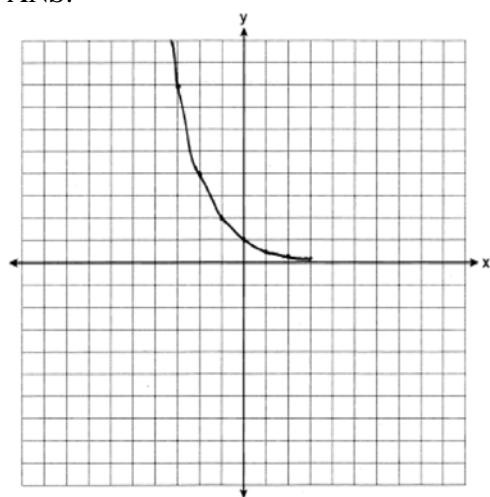   TOP: Evaluating Logarithmic Expressions

75 ANS:

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

76 ANS:

$y = 0$

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

77 ANS: 2

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

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

78 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

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

80 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

81 ANS: 3

$$x = 5^4 = 625$$

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

82 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

83 ANS:

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

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

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

84 ANS:

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

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

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

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

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

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

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

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

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

85 ANS:

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

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

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

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

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

86 ANS: 2

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

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

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

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

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

$$300 = t$$

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

87 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

88 ANS: 3

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

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

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

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

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

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

89 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

90 ANS: 4
$$9^{3x+1} = 27^{x+2} \quad .$$

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

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

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

$$3x = 4$$

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

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

91 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

92 ANS: 1
$$_9C_3 a^6 (-4b)^3 = -5376a^6 b^3$$

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

93 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

94 ANS: 3
$$_3C_2 (2x^4)^1 (-y)^2 = 6x^4 y^2$$

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

95 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

96 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

97 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

98 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

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

100 ANS: 2
The roots are $-1, 2, 3$.

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

101 ANS:

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

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

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

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

103 ANS:

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

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

104 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

105 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

106 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

107 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

108 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

109 ANS: 3

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

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

110 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

111 ANS: 3

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

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

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

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

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

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

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

113 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

114 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

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

116 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

117 ANS: 3
$$\sqrt{-300} = \sqrt{100}\sqrt{-1}\sqrt{3}$$

PTS: 2   REF: 061006a2   STA: A2.N.6   TOP: Square Roots of Negative Numbers
118 ANS: 1   PTS: 2   REF: 061019a2   STA: A2.N.7
TOP: Imaginary Numbers
119 ANS: 1
$$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$$

PTS: 2   REF: 081004a2   STA: A2.N.7   TOP: Imaginary Numbers
120 ANS: 2   PTS: 2   REF: 081024a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers
121 ANS: 4   PTS: 2   REF: 011111a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers
122 ANS: 2   PTS: 2   REF: 011213a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers
123 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
124 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
125 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

126 ANS:

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

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

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

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

$$3x = 1$$

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

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

127 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

128 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

129 ANS: 1

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

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

$\quad 25 = p$

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

130 ANS:

$12 \cdot 6 = 9w$

$\quad 8 = w$

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

131 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

132 ANS: 2

$f(10) = \dfrac{-10}{(-10)^2 - 16} = \dfrac{-10}{84} = -\dfrac{5}{42}$

    PTS: 2   REF: 061102a2   STA: A2.A.41   TOP: Functional Notation

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

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

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

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

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

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

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

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

141 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

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

143 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

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

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

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

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

148 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

149 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

150 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

151 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

152 ANS: 2
     $6(x^2 - 5) = 6x^2 - 30$

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

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

154 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

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

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

157 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

158 ANS: 4
$$\frac{10}{4} = 2.5$$

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

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

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

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

162 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

163 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

164 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

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

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

166 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

167 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

168 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

169 ANS:

-104.

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

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

171 ANS:

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

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

172 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

173 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

174 ANS: 1
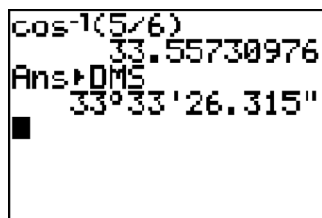
$$\cos K = \frac{5}{6}$$

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

$$K \approx 33°33'$$

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

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

176 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

177 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

178 ANS: 2

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

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

179 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

180 ANS: 1

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

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

181 ANS:

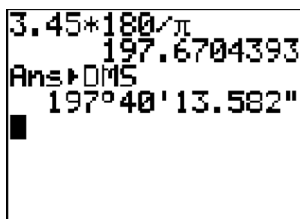$$2.5 \cdot \frac{180}{\pi} \approx 143.2°$$

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

182 ANS:

```
3.45*180/π
          197.6704393
Ans▶DMS
     197°40'13.582"
■
```

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

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

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

184 ANS:

$-\dfrac{\sqrt{3}}{2}$
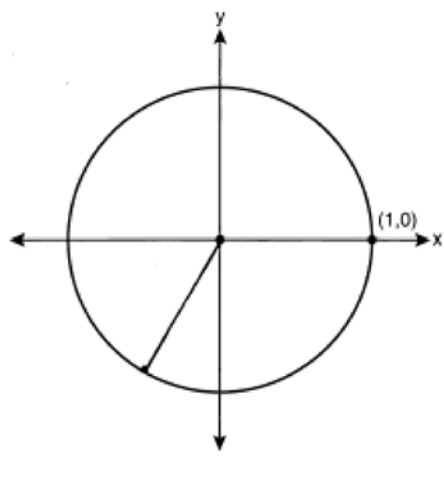
PTS: 2   REF: 061033a2   STA: A2.A.60   TOP: Unit Circle

185 ANS:

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

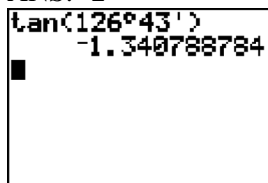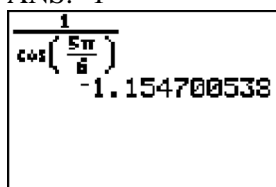PTS: 2   REF: fall0933a2   STA: A2.A.62   TOP: Determining Trigonometric Functions

186 ANS: 2

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

187 ANS: 1

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

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

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

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

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

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

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

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

193 ANS: 3
Cofunctions tangent and cotangent are complementary

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

194 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

195 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

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

197 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

198 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

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

200 ANS:

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

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

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

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

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

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

201 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

202 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

203 ANS: 3

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

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

$$\cos A = +\frac{\sqrt{5}}{3}, \sin A \text{ is acute.} \qquad = \frac{4\sqrt{5}}{9}$$
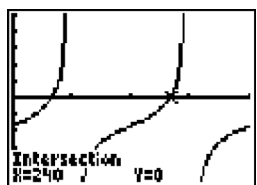
PTS: 2   REF: 011107a2   STA: A2.A.77   TOP: Double Angle Identities
KEY: evaluating

204 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

205 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

206 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

207 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

208 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

209 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

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

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

212 ANS: 3

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

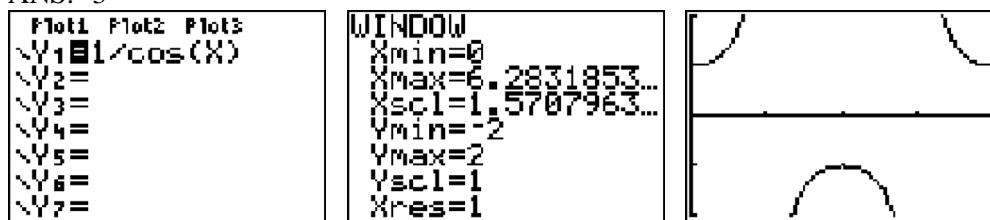PTS: 2   REF: 081026a2   STA: A2.A.70   TOP: Graphing Trigonometric Functions
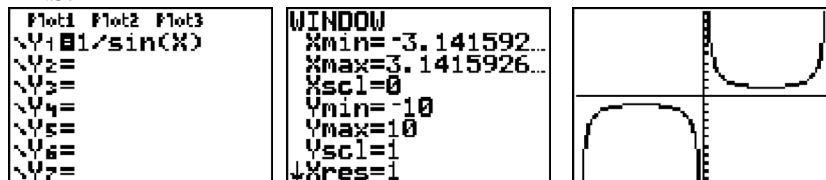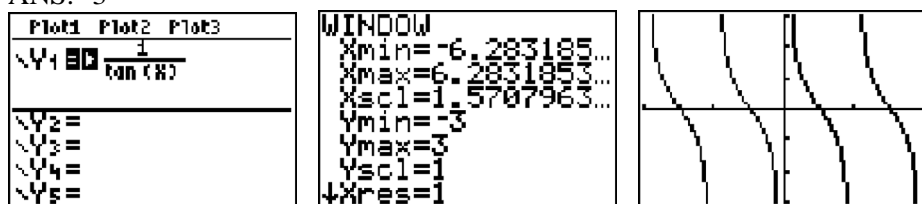KEY: recognize

213 ANS: 3

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

214 ANS: 1

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

215 ANS: 3

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

216 ANS: 3   PTS: 2   REF: 061022a2   STA: A2.A.63

TOP: Domain and Range

217 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

218 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

219 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

220 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

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

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

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

222 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

223 ANS: 3
$\dfrac{59.2}{\sin 74} = \dfrac{60.3}{\sin C}$ $180 - 78.3 = 101.7$

$C \approx 78.3$

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

224 ANS: 2
$\dfrac{10}{\sin 35} = \dfrac{13}{\sin B}$. $35 + 48 < 180$

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

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

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

$A = 58$

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

226 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

227 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

228 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

229 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

33

230 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

231 ANS: 2   PTS: 2   REF: 011126a2   STA: A2.A.49

    TOP: Equations of Circles

232 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

233 ANS:

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

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

234 ANS:

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

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