

0117a2

- 1 What is 510° expressed in radian measure?
- 2.83
 - $\frac{5\pi}{6}$
 - $\frac{17\pi}{6}$
 - $\frac{17\pi}{12}$
- 2 Four surveys are described below. Which survey methodology would lead to the *least* biased conclusion?
- One hundred randomly chosen heart surgeons were polled by telephone about how to get children to eat healthier foods.
 - A country and western radio station asked one hundred of its listeners to call a telephone number and answer a question about rap music.
 - From calls made to one hundred randomly generated telephone numbers, people replied to a question about television shows they watch.
 - The first one hundred people who left the World of Baseball Bookstore replied to a question about the importance of baseball to society.
- 3 When factored completely, $x^4 - 13x^2 + 36$ is equivalent to
- $(x^2 - 6)(x^2 - 6)$
 - $(x^2 - 4)(x^2 - 9)$
 - $(x - 2)(x - 2)(x - 3)(x - 3)$
 - $(x - 2)(x + 2)(x - 3)(x + 3)$
- 4 Which ordered pair is a solution to the system below?
- $$x^2 - 4y^2 = 16$$
- $$y = x - 4$$
- (0, -4)
 - (4, 0)
 - (6, 2)
 - (2, -2)
- 5 Three freshmen, five sophomores, and four juniors are on the school's chess team. The coach must select three students to attend the citywide tournament. Which expression could be used to determine how many different groups of three students can be made from this team?
- ${}_{12}C_3$
 - ${}_{12}P_3$
 - ${}_3C_1 \bullet {}_5C_1 \bullet {}_4C_1$
 - ${}_3P_1 \bullet {}_5P_1 \bullet {}_4P_1$
- 6 A survey of high school girls found that the mean number of text messages sent per day by the girls was 62, with a standard deviation of 12. If a normal distribution is assumed, which interval represents the number of texts sent by 68.2% of the girls?
- 38–86
 - 44–80
 - 50–74
 - 56–68
- 7 The expression $9^{\frac{3}{2}} \bullet 27^{\frac{1}{2}}$ is equivalent to
- 3^2
 - $3^{\frac{9}{2}}$
 - 243^2
 - $243^{\frac{3}{4}}$

- 8 The ratio $\frac{\text{Arc cos } \frac{1}{2}}{\text{Arc tan } 1}$ is equal to
- 1) $\frac{3}{4}$
 - 2) $\frac{3\pi}{4}$
 - 3) $\frac{4}{3}$
 - 4) $\frac{4\pi}{3}$
- 9 Which summation will *not* produce $2 + 4 + 6 + 8 + 10 + 12$?
- 1) $\sum_{b=2}^{12} b$
 - 2) $\sum_{a=1}^6 2a$
 - 3) $\sum_{d=2}^7 (2d - 2)$
 - 4) $2\sum_{c=0}^5 (c + 1)$
- 10 The expression $\frac{1}{3}\sqrt{6}(3m\sqrt{2} - k\sqrt{3})$ is equivalent to
- 1) $2m\sqrt{3} - k\sqrt{2}$
 - 2) $2m\sqrt{3} - 3k\sqrt{2}$
 - 3) $2m - k\sqrt{2}$
 - 4) $12m - k\sqrt{6}$
- 11 If $\log_3(x + 1) - \log_3 x = 2$, then x equals
- 1) $-\frac{9}{8}$
 - 2) $-\frac{6}{5}$
 - 3) $\frac{1}{8}$
 - 4) $\frac{1}{5}$
- 12 Which relation is *not* a function?
- 1) $xy = 4$
 - 2) $y = \log_4 x$
 - 3) $y = 4 \sin x$
 - 4) $4x^2 - y^2 = 4$
- 13 What is the area of parallelogram $ABCD$ if $AB = 4$, $AD = 5\sqrt{3}$, and $m\angle A = 60^\circ$?
- 1) 15
 - 2) 30
 - 3) $5\sqrt{3}$
 - 4) $10\sqrt{3}$
- 14 The maximum point on the graph of the equation $y = f(x)$ is $(2, -3)$. What is the maximum point on the graph of the equation $y = f(x - 4)$?
- 1) $(2, -7)$
 - 2) $(-2, -3)$
 - 3) $(6, -7)$
 - 4) $(6, -3)$
- 15 The formula of the n th term of the sequence $3, -6, 12, -24, 48, \dots$ is
- 1) $a_n = -2(3)^n$
 - 2) $a_n = 3(-2)^n$
 - 3) $a_n = -2(3)^{n-1}$
 - 4) $a_n = 3(-2)^{n-1}$

- 16 The expression $\frac{3}{a-1} + \frac{3}{1-a}$ is equivalent to
- 0
 - $\frac{6}{a^2-1}$
 - 6
 - $\frac{6}{1-a^2}$
- 17 The product of $(2\sqrt{2} + 5i)$ and $(5\sqrt{2} - 2i)$ is
- 30
 - $30 + 21i\sqrt{2}$
 - $30 + 29i\sqrt{2}$
 - $10 + 21i\sqrt{2}$
- 18 Which quadratic equation has roots with a sum of $\frac{7}{6}$ and a product of $-\frac{1}{2}$?
- $6x^2 + 7x + 3 = 0$
 - $6x^2 + 7x - 3 = 0$
 - $6x^2 - 7x - 3 = 0$
 - $6x^2 - 7x + 3 = 0$
- 19 The range of the function $f(x) = 3|x - 4| - 5$ is
- $x \geq 0$
 - $f(x) \geq 0$
 - $x \geq -5$
 - $f(x) \geq -5$
- 20 The graph of the equation $y = m^x$ passes through the point
- $(1, m)$
 - $(0, m)$
 - $(m, 0)$
 - $(m, 1)$
- 21 If $\sin \theta = \frac{1}{2}$ and θ terminates in Quadrant II, what is the value of $\csc \theta \cdot \cot \theta$?
- $-2\sqrt{3}$
 - $\frac{\sqrt{3}}{2}$
 - 2
 - $\frac{2\sqrt{3}}{3}$
- 22 A circle has a radius of 12 units. For this circle, which expression *incorrectly* states the length of the arc intercepted by the given central angle?
- angle = 120°
arc length = 8π
 - angle = 6°
arc length = 72
 - angle = $\frac{2}{3}$ radian
arc length = 8
 - angle = $\frac{\pi}{3}$ radians
arc length = 4π
- 23 How many different four-letter arrangements can be made from the letters in the word "CHAIRS," if the same letter may be used only once?
- 360
 - 420
 - 720
 - 840

- 24 The sets below represent test scores for two students in Mrs. Silvio's trigonometry class.

Michelle: {71, 68, 84, 88}

Valerie: {78, 82, 76, 80}

Which statement correctly describes the relationship between the two students' test scores?

- 1) Michelle's mean test score is greater and her test scores have a greater interquartile range.
- 2) Michelle's population standard deviation is greater, but her range is smaller.
- 3) Valerie's mean test score is greater and her interquartile range is greater.
- 4) Valerie's mean test score is greater, but her population standard deviation is smaller.

- 25 A support wire 20 meters long runs from the top of a utility pole to a point on the ground 17 meters from the base of the pole. What is the measure, to the nearest minute, of the angle formed by the pole and the wire?

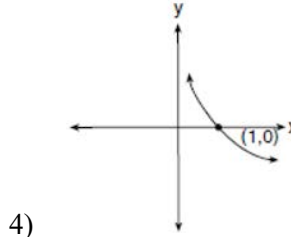
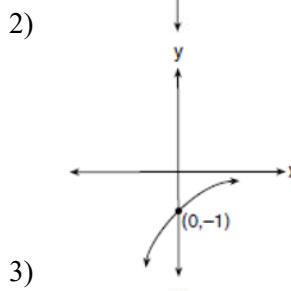
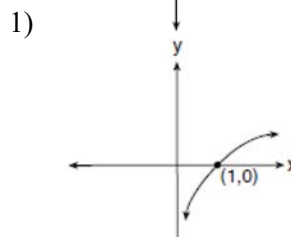
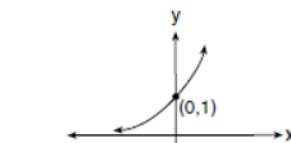
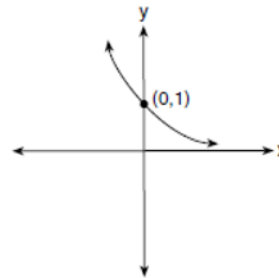
- 1) $31^\circ 47'$
- 2) $31^\circ 48'$
- 3) $58^\circ 12'$
- 4) $58^\circ 13'$

- 26 If $f(x) = 3x - 2$ and $f^{-1}(x) = \frac{x+2}{3}$, then $f \circ f^{-1}(x)$

equals

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

- 27 The graph of $f(x)$ is shown below. Which graph represents $f^{-1}(x)$?



- 28 The number of bacteria that grow in a petri dish is approximated by the function $G(t) = 500e^{0.216t}$, where t is time, in minutes. Use this model to approximate, to the nearest integer, the number of bacteria present after one half-hour.

29 Determine the exact value of $\left(\frac{27}{64}\right)^{-\frac{2}{3}}$ as a fraction in simplest form.

30 State the conjugate of $7 - \sqrt{-48}$ expressed in simplest $a + bi$ form.

31 Express $\frac{12x^{-5}y^5}{24x^{-3}y^{-2}}$ in simplest form, using only positive exponents.

32 In a theater with 30 rows, the number of seats in a row increases by two with each successive row. The front row has 15 seats. Find the total seating capacity of the theater.

36 The table below shows the minimum hourly wage, in U.S. dollars, for selected years since 1955.

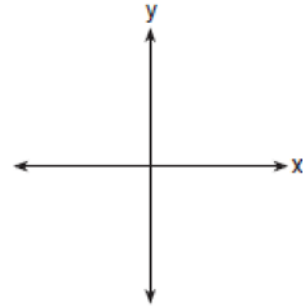
Years Since 1955 (x)	0	5	10	15	20	25	30	35	40	45	50
Minimum Wage (y)	.75	1.00	1.25	1.45	2.00	3.10	3.35	3.80	4.25	5.15	5.15

Write the linear regression equation for this set of data, rounding all values to *three decimal places*. State the strength and direction indicated by the correlation coefficient.

37 Solve the system of equations algebraically for x and y :
 $\frac{y}{x} = \frac{x-3}{2}$
 $y + 2 = x$

33 Given $f(x) = x^2$ and $g(x) = x - 3$, express $g(f(x+2))$ as a polynomial in simplest form.

34 Sketch an angle of 250° in standard position and then express $\cos 250^\circ$ as a cosine function of a positive acute angle.



35 Solve the inequality $x^2 - 3x - 4 > 0$ algebraically for x .

38 A rocket is shot vertically into the air. Its height, h , at any time, t , in seconds, can be modeled by the equation $h = -16t^2 + 184t$. Determine algebraically, the number of seconds it will take the rocket to reach a height of 529 feet.

39 Forces of 22 pounds and 43 pounds act on an object at an angle of 52° . Determine, to the *nearest pound*, the magnitude of the resultant force. Find, to the *nearest degree*, the angle between the smaller force and the resultant force.

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Answer Section

1 ANS: 3

$$510 \left(\frac{\pi}{180} \right) = \frac{17\pi}{6}$$

PTS: 2

REF: 011701a2

STA: A2.M.2

TOP: Radian Measure

KEY: radians

2 ANS: 3

PTS: 2

REF: 011702a2

STA: A2.S.2

TOP: Analysis of Data

KEY: bias

3 ANS: 4

$$x^4 - 13x^2 + 36 = (x^2 - 4)(x^2 - 9) = (x - 2)(x + 2)(x - 3)(x + 3)$$

PTS: 2

REF: 011703a2

STA: A2.A.7

TOP: Factoring Polynomials

KEY: higher power

4 ANS: 2

$$x^2 - 4(x - 4)^2 = 16 \quad y = (4) - 4 = 0$$

$$x^2 - 4(x^2 - 8x + 16) = 16 \quad y = \left(\frac{20}{3} \right) - 4 = \frac{8}{3}$$

$$x^2 - 4x^2 + 32x - 64 = 16$$

$$3x^2 - 32x + 80 = 0$$

$$(3x - 20)(x - 4) = 0$$

$$x = 4, \frac{20}{3}$$

PTS: 2

REF: 011704a2

STA: A2.A.3

TOP: Quadratic-Linear Systems

KEY: algebraically

5 ANS: 1

PTS: 2

REF: 011705a2

STA: A2.S.9

TOP: Differentiating Permutations and Combinations

6 ANS: 3

$$\bar{x} \pm \sigma$$

$$62 \pm 12$$

$$50 - 74$$

PTS: 2

REF: 011706a2

STA: A2.S.5

TOP: Normal Distributions

KEY: interval

7 ANS: 2

$$9^{\frac{3}{2}} \cdot 27^{\frac{1}{2}} = \left(3^2 \right)^{\frac{3}{2}} \cdot \left(3^3 \right)^{\frac{1}{2}} = 3^3 \cdot 3^{\frac{3}{2}} = 3^{\frac{9}{2}}$$

PTS: 2

REF: 011707a2

STA: A2.A.8

TOP: Negative and Fractional Exponents

8 ANS: 3

$$\frac{\text{Arc cos } \frac{1}{2}}{\text{Arc tan } 1} = \frac{60^\circ}{45^\circ} = \frac{4}{3}$$

PTS: 2 REF: 011708a2 STA: A2.A.64 TOP: Using Inverse Trigonometric Functions
KEY: basic

9 ANS: 1 PTS: 2 REF: 011709a2 STA: A2.A.34
TOP: Sigma Notation

10 ANS: 1

$$\frac{1}{3} \sqrt{6} (3m\sqrt{2} - k\sqrt{3}) = m\sqrt{12} - \frac{k}{3} \sqrt{18} = 2m\sqrt{3} - k\sqrt{2}$$

PTS: 2 REF: 011710a2 STA: A2.A.14 TOP: Operations with Radicals
KEY: with variables | index = 2

11 ANS: 3
 $\log_3(x+1) - \log_3 x = 2$

$$\log_3 \frac{x+1}{x} = 2$$

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

$$9x = x + 1$$

$$x = \frac{1}{8}$$

PTS: 2 REF: 011711a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: applying properties of logarithms

12 ANS: 4 PTS: 2 REF: 011712a2 STA: A2.A.38
TOP: Defining Functions

13 ANS: 2

$$A = 4 \cdot 5\sqrt{3} \sin 60 = 20\sqrt{3} \cdot \frac{\sqrt{3}}{2} = 30$$

PTS: 2 REF: 011713a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: parallelograms

14 ANS: 4 PTS: 2 REF: 011714a2 STA: A2.A.46
TOP: Transformations with Functions

15 ANS: 4 PTS: 2 REF: 011715a2 STA: A2.A.29
TOP: Sequences

16 ANS: 1

$$\frac{3}{a-1} + \frac{3}{1-a} = \frac{3}{a-1} - \frac{3}{a-1} = 0$$

PTS: 2 REF: 011716a2 STA: A2.A.16 TOP: Addition and Subtraction of Rationals

17 ANS: 2

$$(2\sqrt{2} + 5i)(5\sqrt{2} - 2i) = 10\sqrt{4} - 4i\sqrt{2} + 25i\sqrt{2} - 10i^2 = 30 + 21i\sqrt{2}$$

PTS: 2 REF: 011717a2 TOP: Operations with Complex Numbers

18 ANS: 3

$$\frac{-b}{a} = \frac{-(-7)}{6} = \frac{7}{6}, \frac{c}{a} = \frac{-3}{6} = -\frac{1}{2}$$

PTS: 2 REF: 011718a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic19 ANS: 4 PTS: 2 REF: 011719a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain, absolute value

20 ANS: 1 PTS: 2 REF: 011720a2 TOP: Graphing Exponential Functions

21 ANS: 1

If $\sin \theta = \frac{1}{2}$ and θ terminates in Quadrant II, $\cos \theta = -\frac{\sqrt{3}}{2}$. $\csc \theta \cdot \cot \theta = \frac{1}{\sin \theta} \cdot \frac{\cos \theta}{\sin \theta} = \frac{-\frac{\sqrt{3}}{2}}{\left(\frac{1}{2}\right)^2} = -2\sqrt{3}$

PTS: 2 REF: 011721a2 TOP: Determining Trigonometric Functions

22 ANS: 2

$$\frac{72}{6 \cdot \frac{\pi}{180}} \neq 12$$

PTS: 2 REF: 011722a2 STA: A2.A.61 TOP: Arc Length
KEY: arc length23 ANS: 1
 ${}_6P_4 = 360$

PTS: 2 REF: 011723a2 STA: A2.S.10 TOP: Permutations

24 ANS: 4

	\bar{x}	IQR	σ_x	Range
Michelle	77.8	16.5	8.4	20
Valerie	79	4	2.2	6

PTS: 2 REF: 011724a2 TOP: Central Tendency and Dispersion

25 ANS: 4

$$\sin^{-1} \frac{17}{20} \approx 58.21^\circ \quad 0.21 \cdot 60 = 12.6$$

PTS: 2 REF: 011725a2 STA: A2.A.55 TOP: Trigonometric Ratios

26 ANS: 1

$$f \circ f^{-1}(x) = 3\left(\frac{x+2}{3}\right) - 2 = x + 2 - 2 = x$$

PTS: 2 REF: 011726a2 STA: A2.A.45 TOP: Inverse of Functions

27 ANS: 4 PTS: 2 REF: 011727a2 STA: A2.A.44
TOP: Inverse of Functions KEY: graphs

28 ANS:

$$G(30) = 500e^{0.216(30)} \approx 325,985$$

PTS: 2 REF: 011728a2 STA: A2.A.12 TOP: Evaluating Exponential Expressions

29 ANS:

$$\left(\frac{27}{64}\right)^{-\frac{2}{3}} = \left(\frac{64}{27}\right)^{\frac{2}{3}} = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$$

PTS: 2 REF: 011729a2 STA: A2.N.1
TOP: Evaluating Expressions with Negative/Fractional Exponents

30 ANS:

$$7 + \sqrt{-48} = 7 + 4i\sqrt{3}$$

PTS: 2 REF: 011730a2 STA: A2.N.8 TOP: Conjugates of Complex Numbers

31 ANS:

$$\frac{y^7}{2x^2}$$

PTS: 2 REF: 011731a2 STA: A2.A.9 TOP: Negative Exponents

32 ANS:

$$a_n = 15 + 2(n-1) \quad s_{30} = \frac{30(15+73)}{2} = 1320$$

$$a_{30} = 15 + 2(30-1) = 73$$

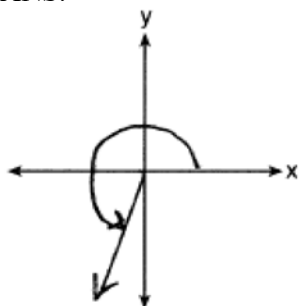
PTS: 2 REF: 011732a2 STA: A2.A.35 TOP: Series

33 ANS:

$$f(x+2) = (x+2)^2 = x^2 + 4x + 4 \quad g(f(x+2)) = x^2 + 4x + 4 - 3 = x^2 + 4x + 1$$

PTS: 2 REF: 011733a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: variables

34 ANS:

 $-\cos 70^\circ$

PTS: 2 REF: 011734a2 STA: A2.A.57 TOP: Reference Angles

35 ANS:

$$x^2 - 3x - 4 > 0. \quad x - 4 > 0 \text{ and } x + 1 > 0 \text{ or } x - 4 < 0 \text{ and } x + 1 < 0$$

$$(x - 4)(x + 1) > 0 \quad x > 4 \text{ and } x > -1 \quad x < 4 \text{ and } x < -1$$

$$x > 4 \quad x < -1$$

PTS: 2 REF: 011735a2 STA: A2.A.4 TOP: Quadratic Inequalities

KEY: one variable

36 ANS:

$$y = 0.098x + 0.402 \text{ high, positive correlation}$$

PTS: 4 REF: 011736a2 TOP: Regression KEY: linear

37 ANS:

$$\frac{x-2}{x} = \frac{x-3}{2} \quad y = 4 - 2 = 2 \quad (4, 2), (1, -1)$$

$$x^2 - 3x = 2x - 4 \quad y = 1 - 2 = -1$$

$$x^2 - 5x + 4 = 0$$

$$(x - 4)(x - 1) = 0$$

$$x = 4, 1$$

PTS: 4 REF: 011737a2 STA: A2.A.3 TOP: Other Systems

KEY: All

38 ANS:

$$16t^2 - 184t + 529 = 0 \quad t = \frac{184 \pm \sqrt{(-184)^2 - 4(16)(529)}}{2(16)} = \frac{184 + \sqrt{0}}{32} \approx 5.75$$

PTS: 4 REF: 011738a2 STA: A2.A.25 TOP: Solving Quadratics

KEY: quadratic formula

39 ANS:

$$x = \sqrt{22^2 + 43^2 - 2(22)(43)\cos 128} \approx 59 \quad \frac{\sin y}{43} = \frac{\sin 128}{59}$$

$$y = \sin^{-1}\left(\frac{43 \sin 128}{59}\right) \approx 35$$

PTS: 6

REF: 011739a2

STA: A2.A.73

TOP: Vectors