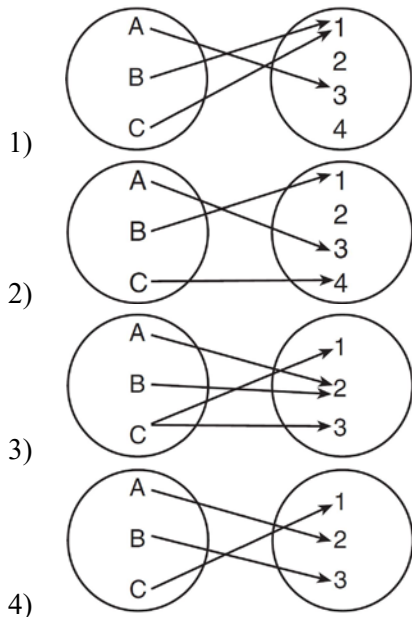


0613a2

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

- 2 What is the number of degrees in an angle whose radian measure is $\frac{8\pi}{5}$?
- 1) 576
 - 2) 288
 - 3) 225
 - 4) 113

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

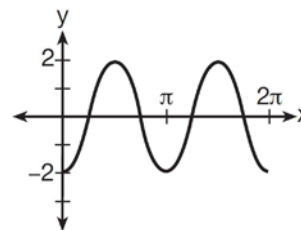


- 4 The sum of the first eight terms of the series $3 - 12 + 48 - 192 + \dots$ is
- 1) -13,107
 - 2) -21,845
 - 3) -39,321
 - 4) -65,535

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

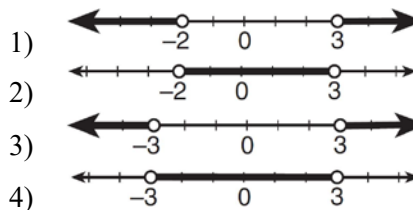
- 1) $\frac{1}{2}$
- 2) $\frac{x}{x+2}$
- 3) $\frac{x}{3}$
- 4) $-\frac{x}{x-2}$

- 6 Which equation represents the graph below?

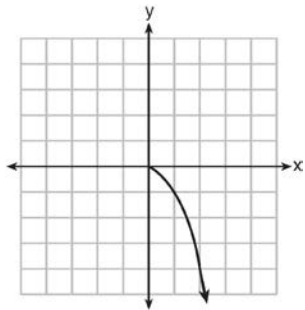


- 1) $y = -2 \sin 2x$
- 2) $y = -2 \sin \frac{1}{2}x$
- 3) $y = -2 \cos 2x$
- 4) $y = -2 \cos \frac{1}{2}x$

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



8 What is the range of the function shown below?



- 1) $x \leq 0$
- 2) $x \geq 0$
- 3) $y \leq 0$
- 4) $y \geq 0$

9 The expression $\sin(\theta + 90)^\circ$ is equivalent to

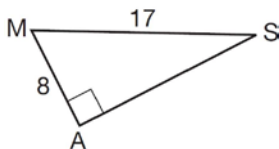
- 1) $-\sin \theta$
- 2) $-\cos \theta$
- 3) $\sin \theta$
- 4) $\cos \theta$

10 The points $(2,3)$, $(4, \frac{3}{4})$, and $(6,d)$ lie on the graph

of a function. If y is inversely proportional to the square of x , what is the value of d ?

- 1) 1
- 2) $\frac{1}{3}$
- 3) 3
- 4) 27

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



- 1) $28^\circ 1'$
- 2) $28^\circ 4'$
- 3) $61^\circ 56'$
- 4) $61^\circ 93'$

12 Which ordered pair is in the solution set of the system of equations shown below?

$$y^2 - x^2 + 32 = 0$$

$$3y - x = 0$$

- 1) (2,6)
- 2) (3,1)
- 3) (-1,-3)
- 4) (-6,-2)

13 Susie invests \$500 in an account that is compounded continuously at an annual interest rate of 5%, according to the formula $A = Pe^{rt}$, where A is the amount accrued, P is the principal, r is the rate of interest, and t is the time, in years. Approximately how many years will it take for Susie's money to double?

- 1) 1.4
- 2) 6.0
- 3) 13.9
- 4) 14.7

14 If n is a negative integer, then which statement is always true?

- 1) $6n^{-2} < 4n^{-1}$
- 2) $\frac{n}{4} > -6n^{-1}$
- 3) $6n^{-1} < 4n^{-1}$
- 4) $4n^{-1} > (6n)^{-1}$

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

- 1) $58 - 4x$
- 2) $46 - 4x$
- 3) $58 - 12x$
- 4) $46 - 12x$

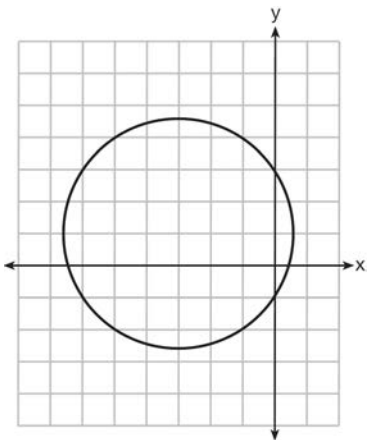
16 Which value of r represents data with a strong positive linear correlation between two variables?

- 1) 0.89
- 2) 0.34
- 3) 1.04
- 4) 0.01

17 Which problem involves evaluating ${}_6P_4$?

- 1) How many different four-digit ID numbers can be formed using 1, 2, 3, 4, 5, and 6 without repetition?
- 2) How many different subcommittees of four can be chosen from a committee having six members?
- 3) How many different outfits can be made using six shirts and four pairs of pants?
- 4) How many different ways can one boy and one girl be selected from a group of four boys and six girls?

18 Which equation is represented by the graph below?



- 1) $(x - 3)^2 + (y + 1)^2 = 5$
- 2) $(x + 3)^2 + (y - 1)^2 = 5$
- 3) $(x - 1)^2 + (y + 3)^2 = 13$
- 4) $(x + 3)^2 + (y - 1)^2 = 13$

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

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

20 An angle, P , drawn in standard position, terminates in Quadrant II if

- 1) $\cos P < 0$ and $\csc P < 0$
- 2) $\sin P > 0$ and $\cos P > 0$
- 3) $\csc P > 0$ and $\cot P < 0$
- 4) $\tan P < 0$ and $\sec P > 0$

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

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

22 In $\triangle PQR$, p equals

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

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

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

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

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

- 25 Expressed with a rational denominator and in simplest form, $\frac{x}{x - \sqrt{x}}$ is
- 1) $\frac{x^2 + x\sqrt{x}}{x^2 - x}$
 - 2) $-\sqrt{x}$
 - 3) $\frac{x + \sqrt{x}}{1 - x}$
 - 4) $\frac{x + \sqrt{x}}{x - 1}$
- 26 What is the common ratio of the sequence $\frac{1}{64}a^5b^3, -\frac{3}{32}a^3b^4, \frac{9}{16}ab^5, \dots$?
- 1) $-\frac{3b}{2a^2}$
 - 2) $-\frac{6b}{a^2}$
 - 3) $-\frac{3a^2}{b}$
 - 4) $-\frac{6a^2}{b}$
- 27 In $\triangle KLM$, $KL = 20$, $LM = 13$, and $m\angle K = 40$. The measure of $\angle M$?
- 1) must be between 0° and 90°
 - 2) must equal 90°
 - 3) must be between 90° and 180°
 - 4) is ambiguous
- 28 Determine the sum and the product of the roots of the equation $12x^2 + x - 6 = 0$.
- 29 Solve algebraically for x : $\log_{27}(2x - 1) = \frac{4}{3}$
- 30 Find the number of possible different 10-letter arrangements using the letters of the word "STATISTICS."
- 31 Express the product of $\cos 30^\circ$ and $\sin 45^\circ$ in simplest radical form.
- 32 Find, algebraically, the measure of the obtuse angle, to the *nearest degree*, that satisfies the equation $5 \csc \theta = 8$.
- 33 If $g(x) = (ax\sqrt{1-x})^2$, express $g(10)$ in simplest form.
- 34 Express $\frac{\cot x \sin x}{\sec x}$ as a single trigonometric function, in simplest form, for all values of x for which it is defined.
- 35 On a multiple-choice test, Abby randomly guesses on all seven questions. Each question has four choices. Find the probability, to the *nearest thousandth*, that Abby gets *exactly* three questions correct.
- 36 Solve the equation below algebraically, and express the result in simplest radical form:
- $$\frac{13}{x} = 10 - x$$
- 37 A ranch in the Australian Outback is shaped like triangle ACE , with $m\angle A = 42$, $m\angle E = 103$, and $AC = 15$ miles. Find the area of the ranch, to the *nearest square mile*.
- 38 Ten teams competed in a cheerleading competition at a local high school. Their scores were 29, 28, 39, 37, 45, 40, 41, 38, 37, and 48. How many scores are within one population standard deviation from the mean? For these data, what is the interquartile range?
- 39 Solve algebraically for all values of x : $x^4 + 4x^3 + 4x^2 = -16x$

0613a2

Answer Section

1 ANS: 2 PTS: 2 REF: 061301a2 STA: A2.S.1
TOP: Analysis of Data

2 ANS: 2
 $\frac{8\pi}{5} \cdot \frac{180}{\pi} = 288$

PTS: 2 REF: 061302a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

3 ANS: 4 PTS: 2 REF: 061303a2 STA: A2.A.43
TOP: Defining Functions

4 ANS: 3
 $S_8 = \frac{3(1 - (-4)^8)}{1 - (-4)} = \frac{196,605}{5} = -39,321$

PTS: 2 REF: 061304a2 STA: A2.A.35 TOP: Summations
KEY: geometric

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

PTS: 2 REF: 061305a2 STA: A2.A.17 TOP: Complex Fractions
6 ANS: 3 PTS: 2 REF: 061306a2 STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

7 ANS: 1
 $2x - 1 > 5$ $2x - 1 < -5$
 $2x > 6$ $2x > -4$
 $x > 3$ $x < -2$

PTS: 2 REF: 061307a2 STA: A2.A.1 TOP: Absolute Value Inequalities
KEY: graph

8 ANS: 3 PTS: 2 REF: 061308a2 STA: A2.A.51
TOP: Domain and Range

9 ANS: 4
 $\sin(\theta + 90) = \sin \theta \cdot \cos 90 + \cos \theta \cdot \sin 90 = \sin \theta \cdot (0) + \cos \theta \cdot (1) = \cos \theta$

PTS: 2 REF: 061309a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities
KEY: identities

10 ANS: 2

$$2^2 \cdot 3 = 12 \cdot 6^2 d = 12$$

$$4^2 \cdot \frac{3}{4} = 12 \quad 36d = 12$$

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

PTS: 2

REF: 061310a2

STA: A2.A.5

TOP: Inverse Variation

11 ANS: 2

$$\sin S = \frac{8}{17}$$

$$S = \sin^{-1} \frac{8}{17}$$

$$S \approx 28^\circ 4'$$

PTS: 2

REF: 061311a2

STA: A2.A.55

TOP: Trigonometric Ratios

12 ANS: 4

$$x = 3y. \quad y^2 - (3y)^2 + 32 = 0 \quad . \quad x = 3(-2) = -6$$

$$y^2 - 9y^2 = -32$$

$$-8y^2 = -32$$

$$y^2 = 4$$

$$y = \pm 2$$

PTS: 2

REF: 061312a2

STA: A2.A.3

TOP: Quadratic-Linear Systems

KEY: equations

13 ANS: 3

$$1000 = 500e^{.05t}$$

$$2 = e^{.05t}$$

$$\ln 2 = \ln e^{.05t}$$

$$\frac{\ln 2}{.05} = \frac{.05t \cdot \ln e}{.05}$$

$$13.9 \approx t$$

PTS: 2

REF: 061313a2

STA: A2.A.6

TOP: Exponential Growth

14 ANS: 3

$6n^{-1} < 4n^{-1}$. Flip sign when multiplying each side of the inequality by n , since a negative number.

$$\frac{6}{n} < \frac{4}{n}$$

$$6 > 4$$

PTS: 2 REF: 061314a2 STA: A2.N.1 TOP: Negative and Fractional Exponents

15 ANS: 4

$$4 + 3(2 - x) + 3(3 - x) + 3(4 - x) + 3(5 - x)$$

$$4 + 6 - 3x + 9 - 3x + 12 - 3x + 15 - 3x$$

$$46 - 12x$$

PTS: 2 REF: 061315a2 STA: A2.N.10 TOP: Sigma Notation

KEY: basic

16 ANS: 1

PTS: 2

REF: 061316a2

STA: A2.S.8

TOP: Correlation Coefficient

17 ANS: 1

PTS: 2

REF: 061317a2

STA: A2.S.9

TOP: Differentiating Permutations and Combinations

18 ANS: 4

PTS: 2

REF: 061318a2

STA: A2.A.49

TOP: Equations of Circles

19 ANS: 3

$$(3i)(2i)^2(m+i)$$

$$(3i)(4i^2)(m+i)$$

$$(3i)(-4)(m+i)$$

$$(-12i)(m+i)$$

$$-12mi - 12i^2$$

$$-12mi + 12$$

PTS: 2 REF: 061319a2 STA: A2.N.9

TOP: Multiplication and Division of Complex Numbers

20 ANS: 3

If $\csc P > 0$, $\sin P > 0$. If $\cot P < 0$ and $\sin P > 0$, $\cos P < 0$

PTS: 2 REF: 061320a2 STA: A2.A.60 TOP: Finding the Terminal Side of an Angle

21 ANS: 3

$$\log 4m^2 = \log 4 + \log m^2 = \log 4 + 2 \log m$$

PTS: 2 REF: 061321a2 STA: A2.A.19 TOP: Properties of Logarithms

KEY: splitting logs

22 ANS: 2

PTS: 2

REF: 061322a2

STA: A2.A.73

TOP: Law of Sines KEY: side, without calculator

23 ANS: 2

$$\tan 30 = \frac{\sqrt{3}}{3}. \text{ Arc cos } \frac{\sqrt{3}}{k} = 30$$

$$\frac{\sqrt{3}}{k} = \cos 30$$

$$k = 2$$

PTS: 2

REF: 061323a2

STA: A2.A.64

TOP: Using Inverse Trigonometric Functions

KEY: advanced

24 ANS: 1

PTS: 2

REF: 061324a2

STA: A2.A.9

TOP: Negative Exponents

25 ANS: 4

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

PTS: 2

REF: 061325a2

STA: A2.A.15

TOP: Rationalizing Denominators

KEY: index = 2

26 ANS: 2

$$\frac{-\frac{3}{32}a^3b^4}{\frac{1}{64}a^5b^3} = -\frac{6b}{a^2}$$

PTS: 2

REF: 061326a2

STA: A2.A.31

TOP: Sequences

27 ANS: 4

$$\frac{13}{\sin 40} = \frac{20}{\sin M}. 81 + 40 < 180. (180 - 81) + 40 < 180$$

$$M \approx 81$$

PTS: 2

REF: 061327a2

STA: A2.A.75

TOP: Law of Sines - The Ambiguous Case

28 ANS:

$$\text{Sum } \frac{-b}{a} = -\frac{1}{12}. \text{ Product } \frac{c}{a} = -\frac{1}{2}$$

PTS: 2

REF: 061328a2

STA: A2.A.20

TOP: Roots of Quadratics

29 ANS:

$$2x - 1 = 27^{\frac{4}{3}}$$

$$2x - 1 = 81$$

$$2x = 82$$

$$x = 41$$

PTS: 2 REF: 061329a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

30 ANS:

$$\frac{{}_{10}P_{10}}{3! \cdot 3! \cdot 2!} = \frac{3,628,800}{72} = 50,400$$

PTS: 2 REF: 061330a2 STA: A2.S.10 TOP: Permutations

31 ANS:

$$\frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2} = \frac{\sqrt{6}}{4}$$

PTS: 2 REF: 061331a2 STA: A2.A.56 TOP: Determining Trigonometric Functions
KEY: degrees, common angles

32 ANS:

$$5 \csc \theta = 8$$

$$\csc \theta = \frac{8}{5}$$

$$\sin \theta = \frac{5}{8}$$

$$\theta \approx 141$$

PTS: 2 REF: 061332a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: reciprocal functions

33 ANS:

$$g(10) = \left(a(10)\sqrt{1-10} \right)^2 = 100a^2(-9) = -900a^2$$

PTS: 2 REF: 061333a2 STA: A2.A.41 TOP: Functional Notation

34 ANS:

$$\frac{\cot x \sin x}{\sec x} = \frac{\frac{\cos x}{\sin x} \sin x}{\frac{1}{\cos x}} = \cos^2 x$$

PTS: 2 REF: 061334a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships

35 ANS:

$${}^7C_3 \left(\frac{1}{4}\right)^3 \left(\frac{3}{4}\right)^4 = 35 \left(\frac{1}{64}\right) \left(\frac{81}{256}\right) = \frac{2835}{16384} \approx 0.173$$

PTS: 2 REF: 061335a2 STA: A2.S.15 TOP: Binomial Probability

KEY: exactly

36 ANS:

$$\frac{13}{x} = 10 - x \quad \cdot \quad x = \frac{10 \pm \sqrt{100 - 4(1)(13)}}{2(1)} = \frac{10 \pm \sqrt{48}}{2} = \frac{10 \pm 4\sqrt{3}}{2} = 5 \pm 2\sqrt{3}$$

$$13 = 10x - x^2$$

$$x^2 - 10x + 13 = 0$$

PTS: 4 REF: 061336a2 STA: A2.A.23 TOP: Solving Rationals

KEY: irrational and complex solutions

37 ANS:

$$\frac{15}{\sin 103} = \frac{a}{\sin 42} \cdot \frac{1}{2} (15)(10.3) \sin 35 \approx 44$$

$$a \approx 10.3$$

PTS: 4 REF: 061337a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area

KEY: advanced

38 ANS:

$\sigma_x \approx 5.9$ 6 scores are within a population standard deviation of the mean. $Q_3 - Q_1 = 41 - 37 = 4$

$$\bar{x} \approx 38.2$$

PTS: 4 REF: 061338a2 STA: A2.S.4 TOP: Dispersion

KEY: advanced

39 ANS:

$$x^4 + 4x^3 + 4x^2 + 16x = 0$$

$$x(x^3 + 4x^2 + 4x + 16) = 0$$

$$x(x^2(x + 4) + 4(x + 4)) = 0$$

$$x(x^2 + 4)(x + 4) = 0$$

$$x = 0, \pm 2i, -4$$

PTS: 6 REF: 061339a2 STA: A2.A.26 TOP: Solving Polynomial Equations