REFERENCE DATA

SOLID	VOLUME	OTHER		
Right circular cone	$V = \frac{1}{3}\pi r^2 h$	$L = cl$	V = volume r = radius h = height	L = lateral area c = circumference of base l = slant height
Sphere	$V = \frac{4}{3}\pi r^3$	$S = 4\pi r^2$	V = volume r = radius S = surface area	
Pyramid	$V = \frac{1}{3}Bh$		V = volume B = area of base h = height	

PRACTICE TEST 1

MATH LEVEL IIC

50 Questions • Time—60 Minutes

1. The number of roots of the equation $9 + \sqrt{x-3} = x$, is

(A) 0
(B) 1
(C) 2
(D) 3
(E) ∞

2. The operation □ is defined as $a \square b = a^b - b^a$. What is the approximate value of $\left(\frac{1}{2}\right)^3 \square (3)^{\frac{1}{2}}$?

(A) 2.36
(B) 1.93
(C) .47
(D) –.75
(E) –1.04

3. If $f(x) = 3x^2 - 5x - 4$ then $f(-2x)$ is equal to

(A) $2f(-x)$
(B) $-f(x)$
(C) $4f(x)$
(D) $-4f(x)$
(E) none of these

4. If $P = Ke^{-xt}$, then x equals

(A) $\dfrac{\log K}{t \log e \log P}$

(B) $\dfrac{P}{Ke^t}$

(C) $\dfrac{Pe^t}{K}$

(D) $\dfrac{\log K - \log P}{t \log e}$

(E) none of these

5. The vertices of a triangle are the intersections of the lines whose equations are $y = 0$, $x = 3y$, and $3x + y = 7$. This triangle is

(A) isosceles
(B) equilateral
(C) right
(D) acute
(E) obtuse

6. The area bounded by the closed curve whose equation is $x^2 - 6x + y^2 + 8y = 0$ is

(A) 12π
(B) 25π
(C) 36π
(D) 48π
(E) cannot be determined

7. The ratio of the diagonal of a cube to the diagonal of a face of the cube is

(A) $2 : \sqrt{3}$
(B) $3 : \sqrt{6}$
(C) $3 : \sqrt{2}$
(D) $\sqrt{3} : 1$
(E) $\sqrt{6} : 3$

8. A regular octagon is inscribed in a circle of radius 1. Find a side of the octagon.

(A) $\sqrt{2}$

(B) $\dfrac{\sqrt{3}}{2}$

(C) $\sqrt{2+\sqrt{2}}$

(D) $\sqrt{2-\sqrt{2}}$

(E) none of these

9. Two circles of radii 3 inches and 6 inches have their centers 15 inches apart. Find the length in inches of the common internal tangent.

(A) 8"
(B) 10"
(C) 12"
(D) 14"
(E) 15"

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10. The graph of the equation $y = 5 \cos 3x$ has a period, in radians, of

(A) $\frac{2\pi}{3}$
(B) $\frac{2\pi}{5}$
(C) 3π
(D) 5
(E) 4

11. If $2^x = 8^{y+1}$ and $9^y = 3^{x-9}$ then y equals

(A) 3
(B) 6
(C) 9
(D) 12
(E) 21

12. Express in terms of an inverse function the angle formed at the intesection of the diagonals of a cube.

(A) $\sin^{-1} 2/3$
(B) $\cos^{-1} 2/3$
(C) $\tan^{-1} 1/3$
(D) $\sin^{-1} 1/3$
(E) $\cos^{-1} 1/3$

13. If $y = \frac{10^{\log x}}{x^2}$, for $x > 0$, then

(A) y varies directly with x
(B) y is independent of x
(C) y varies as the square of x
(D) $(xy)^2 = 3$
(E) y varies inversely with x

14. If $\log_r 6 = m$ and $\log_r 3 = n$, then $\log_r \left(\frac{r}{2}\right)$ is equal to

(A) $\frac{1}{2}\log_2 r$
(B) $1 - m - n$
(C) $1 - \log_r 2$
(D) $\frac{r}{2}$
(E) $1 - m + n$

15. The inequality $-x^2 + x - 10 < -2x^2 - 4$ is satisfied if

(A) $x < -3$
(B) $|x| < 3$
(C) $-3 < x < 2$
(D) $-2 < x < 3$
(E) $x < -3$ or $x > 2$

16. The contrapositive of the sentence $\sim p \rightarrow q$ is equivalent to

(A) $p \rightarrow \sim q$
(B) $q \rightarrow \sim p$
(C) $q \rightarrow p$
(D) $\sim p \rightarrow \sim q$
(E) $\sim q \rightarrow p$

17. A point moves so that its distance from the origin is always twice its distance from the point (3, 0). Its locus is

(A) a circle
(B) an ellipse
(C) a hyperbola
(D) a straight line
(E) a parabola

18. The function f is defined as $f = \{(x, y) \mid y = \frac{2x+1}{x-3} \text{ where } x \neq 3\}$.

Find the value of K so that the inverse of f will be

$f^{-1} = \{(x, y) \mid y = \frac{3x+1}{x-K} \text{ where } x \neq K\}$.

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

19. Find the sum of the reciprocals of the roots of the equation $x^2 + px + q = 0$.

(A) $-\frac{p}{q}$
(B) $\frac{q}{p}$
(C) $\frac{p}{q}$
(D) $-\frac{q}{p}$
(E) $p + q$

20. A cube 4 inches on each side is painted red and cut into 64 1-inch cubes. How many 1-inch cubes are painted red on two faces only?

(A) 8
(B) 12
(C) 16
(D) 24
(E) 32

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21. The set $\{x/|x - L| < K\}$ is the same for all $K > 0$ and for all L, as

(A) $\{x/0 < x < L + K\}$
(B) $\{x/L - K < x < L + K\}$
(C) $\{x/|L - K| < x < |L + K|\}$
(D) $\{x/|L - x| > K\}$
(E) $\{x/ - K < x < L\}$

22. Write $\left[\sqrt{2}\left(\cos 30° + i \sin 30°\right)\right]^2$ in the form $a + bi$.

(A) $2 + i\sqrt{3}$
(B) $\frac{3}{2} + \frac{1}{2}i$
(C) $1 - i\sqrt{3}$
(D) $\frac{3}{2} - \frac{1}{2}i$
(E) $1 + i\sqrt{3}$

23. What is the approximate magnitude of $8 + 4i$?

(A) 4.15
(B) 8.94
(C) 12.00
(D) 18.64
(E) 32.00

24. $\tan \frac{A}{2} + \cot \frac{A}{2}$ is equivalent to

(A) $2 \sin A$
(B) $2 \sec A$
(C) $2 \cos A$
(D) $2 \csc A$
(E) $2 \tan A$

25. Find the coordinates of the center of a circle whose equation is $x^2 + y^2 - 4x - 2y = 75$.

(A) (4, 1)
(B) (1, 4)
(C) (2, 1)
(D) (1, 2)
(E) (3, 1)

26. From two ships due east of a lighthouse and in line with its foot, the angles of elevation of the top of the lighthouse are x and y, with $x > y$. The distance between the ships is m. The distance from the lighthouse to the nearer ship is

(A) $\dfrac{m \sin x \cos y}{\sin (x - y)}$

(B) $\dfrac{m \cos x \sin y}{\sin (x - y)}$

(C) $\dfrac{\cos x \sin y}{m \sin (x + y)}$

(D) $m \cot x \sin y$

(E) $m \sec x \cos y$

27. What is the probability of getting 80% or more of the questions correct on a 10-question true-false exam merely by guessing?

(A) $\dfrac{1}{16}$

(B) $\dfrac{5}{32}$

(C) $\dfrac{3}{16}$

(D) $\dfrac{7}{32}$

(E) $\dfrac{7}{128}$

28. The expression $\dfrac{3-4i}{5+3i}$ is equivalent to

(A) $\dfrac{27-29i}{34}$

(B) $\dfrac{27-29i}{16}$

(C) $\dfrac{3-29i}{34}$

(D) $\dfrac{1}{8}$

(E) $15 - 8i$

29. Evaluate $\lim\limits_{n\to\infty} \dfrac{3n^2}{n^2 + 10,000n}$.

(A) 0

(B) 1

(C) 2

(D) 3

(E) ∞

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30. If $w = w_0 e^{-kt}$, find the approximate value of t when $w = 7$, $w_0 = 50$, and $k = 3.4$.

(A) .52
(B) .54
(C) .56
(D) .58
(E) .60

31. Find the cube root of 27 (cos 30° + i sin 30°) that, when represented graphically, lies in the second quadrant.

(A) 3 (cos 10° + i sin 10°)
(B) 3 (cos 170° + i sin 170°)
(C) 3 (cos 100° + i sin 100°)
(D) 3 (cos 130° + i sin 130°)
(E) 3 (cos 150° + i sin 150°)

32. If $y = \frac{\pi}{5}$, find the value of $2 \cos \pi \sin (\pi - y) \sin \left(\frac{3}{2}\pi + y\right)$.

(A) $\cos\frac{2}{5}\pi$
(B) $-\cos\frac{2}{5}\pi$
(C) $\sin\frac{2}{5}\pi$
(D) $-\sin\frac{2}{5}\pi$
(E) $\tan\frac{2}{5}\pi$

33. Figure 33 is a graph of which of the following?

(A) $x^2 + y^2 = 9$
(B) $|x| = 3$ and $|y| = 3$
(C) $|x + y| = 3$
(D) $|x| + |y| = 3$
(E) $x - y = 3$

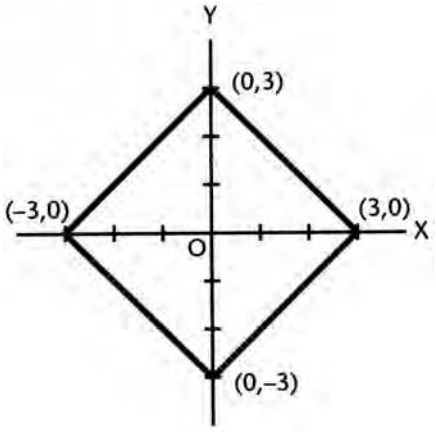

Fig. 33

34. What is the degree measure of the second quadrant angle θ for which $8 \sin^2 \theta + 6 \sin \theta = 9$?

(A) 48.6°
(B) 101.6°
(C) 121.4°
(D) 131.4°
(E) 172.8°

35. Find the set of values satisfying the inequality $\left|\frac{10-x}{3}\right| < 2$.

(A) $4 < x < 16$
(B) $-4 > x > -16$
(C) $4 > x > -16$
(D) $x < 16$
(E) $x > 4$

36. If the circle $(x-1)^2 + (y-3)^2 = r^2$ is tangent to the line $5x + 12y = 60$, the value of r is

(A) $\sqrt{10}$
(B) $\frac{19}{13}$
(C) $\frac{13}{12}$
(D) $\frac{60}{13}$
(E) $2\sqrt{3}$

37. In a coordinate system in which the y-axis is inclined 60° to the positive x-axis, find the distance PQ between the points $P(-3, 7)$ and $Q(6, -5)$.

(A) $\sqrt{117}$
(B) 15
(C) $\sqrt{189}$
(D) $\sqrt{333}$
(E) $\sqrt{108}$

38. What is the remainder when $3x^4 - 2x^3 + 3x^2 - 2x + 1$ is divided by $x - 3$?

(A) 70
(B) 102
(C) 200
(D) 211
(E) 241

39. For what positive value(s) of K will the graph of the equation $2x + y = K$ be tangent to the graph of the equation $x^2 + y^2 = 45$?

(A) 5
(B) 10
(C) 15
(C) 20
(E) 25

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40. What positive value(s) of x, less than 360º, will give a minimum value for $4 - 2 \sin x \cos x$?

(A) $\frac{\pi}{4}$ only

(B) $\frac{5\pi}{4}$ only

(C) $\frac{\pi}{2}$ and $\frac{5\pi}{2}$

(D) $\frac{3\pi}{2}$

(E) $\frac{\pi}{4}$ and $\frac{5\pi}{4}$

41. Express in radians the period of the graph of the equation $y = \frac{1}{3}(\cos^2 x - \sin^2 x)$.

(A) $\frac{\pi}{2}$

(B) π

(C) $\frac{3\pi}{2}$

(D) 2π

(E) 3π

42. For what value of m is $4x^2 + 8xy + my^2 = 9$ the equation of a pair of straight lines?

(A) 0

(B) 1

(C) $\frac{3}{2}$

(D) $\frac{9}{4}$

(E) 4

43. Two roots of the equation $4x^3 - px^2 + qx - 2p = 0$ are 4 and 7. What is the third root?

(A) $\frac{11}{27}$

(B) $\frac{11}{13}$

(C) 11

(D) $\frac{11}{15}$

(E) $-\frac{22}{27}$

44. In figure 44, what is the approximate area of parallelogram DAWN?

(A) 11.57
(B) 13.64
(C) 14.63
(D) 17.25
(E) 20.00

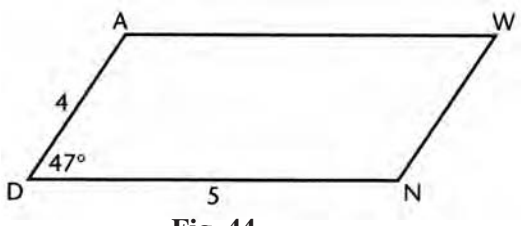

Fig. 44

45. If $\log_{6.2} x = e$, what is the approximate value of x?

(A) 142.54
(B) 173.82
(C) 227.31
(D) 386.42
(E) 492.75

46. If $x = 1 - e^t$ and $y = 1 + e^{-t}$, find y in terms of x.

(A) $y = x$
(B) $y = 1 - x$
(C) $y = \frac{x-1}{x}$
(D) $y = \frac{x}{x+1}$
(E) $y = \frac{2-x}{1-x}$

47. Find the value of $\log_8 (\sqrt[3]{.25})$.

(A) $\frac{1}{2}$
(B) $\frac{2}{3}$
(C) $-\frac{2}{9}$
(D) $\frac{2}{9}$
(E) $-\frac{1}{3}$

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48. If two sides of a parallelogram are 6 and 8 and one diagonal is 7, what is the length of the other diagonal?

(A) $\sqrt{123}$
(B) $\sqrt{11}$
(C) $\sqrt{131}$
(D) $\sqrt{151}$
(E) 9

49. When $5x^{13} + 3x^{10} - K$ is divided by $x + 1$, the remainder is 20. The value of K is

(A) –22
(B) –12
(C) 8
(D) 28
(E) 14

50. What is the smallest possible value of x (in degrees) for which $\cos x - \sin x = \frac{1}{\sqrt{2}}$?

(A) 5°
(B) 12°
(C) 15°
(D) 18°
(E) 30°

STOP

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS TEST ONLY. DO NOT WORK ON ANY OTHER TEST IN THIS BOOK.