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

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

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

(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) $\frac{1}{16}$

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

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

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

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

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

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

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

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

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

(E) $15-8i$

29. Evaluate $\lim_{n\to\infty} \frac{3n^2}{n^2+10,000n}$.

(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) $x - y = 3$

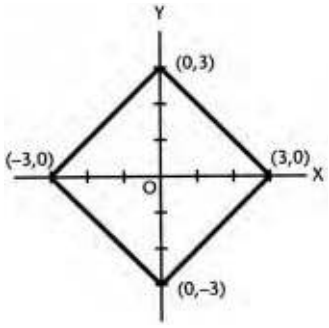

Fig. 33

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 360°, 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

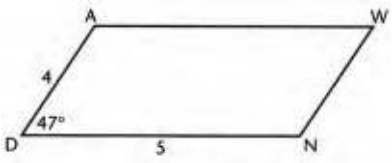

Fig. 44

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.

PRACTICE TEST I

Answer Key

Math Level IIC

1. B	**11.** B	**21.** B	**31.** D	**41.** B
2. E	**12.** E	**22.** E	**32.** C	**42.** E
3. E	**13.** E	**23.** B	**33.** D	**43.** B
4. D	**14.** E	**24.** D	**34.** D	**44.** C
5. C	**15.** C	**25.** C	**35.** A	**45.** A
6. B	**16.** E	**26.** B	**36.** B	**46.** E
7. B	**17.** A	**27.** E	**37.** A	**47.** C
8. D	**18.** B	**28.** C	**38.** D	**48.** D
9. C	**19.** A	**29.** D	**39.** C	**49.** A
10. A	**20.** D	**30.** D	**40.** E	**50.** C

SOLUTIONS

1. The correct answer is (B).

$$\sqrt{x-3} = x-9 \text{ Square both sides}$$
$$x-3 = x^2-18x+81$$
$$x^2-19x+84=0$$
$$(x-12)(x-7)=0$$
$$x=12 \text{ and } x=7$$

Check: $\sqrt{12-3}=12-9$
$\sqrt{9}=3$

Check: $\sqrt{7-3}=7-9$
$\sqrt{4}=-2$
does not check
reject $x=7$

So there is only 1 root.

2. The correct answer is (E). $\left(\frac{1}{2}\right)^3 \cdot (3)^{\frac{1}{2}}$

$$=\frac{1}{8}\cdot\sqrt{3}$$
$$=\left(\frac{1}{8}\right)^{\sqrt{3}}-\left(\sqrt{3}\right)^{\frac{1}{8}}$$
$$\approx .027277-1.07107$$
$$\approx -1.044$$

3. **The correct answer is (E).** $f(-2x) = 3(-2x)^2 5(-2x) - 4$
$= 12x^2 + 10x - 4$

This is not a multiple of the original function

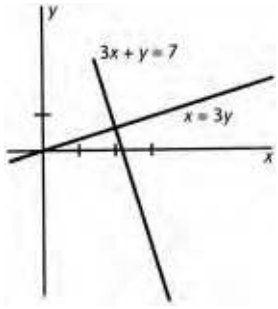
4. **The correct answer is (D).**

$\frac{P}{K} = e^{-xt}$ or $-tx = \log_e \frac{P}{K}$

$x = -\frac{1}{t}(\log_e P - \log_e K) = \frac{\log_e K - \log_e P}{t}$

$x = \frac{\log K - \log P}{t \log e}$

5. **The correct answer is (C).** Slope of $x = 3y$ is 1/3.
Slope of $y = -3x + 7$ is –3. Hence, since slopes are negative reciprocals, the lines are ⊥, and the Δ is right.



6. **The correct answer is (B).** $x^2 - 6x + 9 + y^2 + 8y + 16 = 25$
$(x-3)^2 + (y+4)^2 = 25$

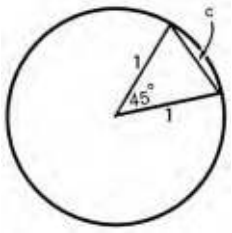
Curve is circle of radius 5.
Hence, area is 25π.

7. **The correct answer is (B).**

Let each side of cube = 1
then diagonal of cube: $D = \sqrt{1^2 + 1^2 + 1^2}$
$= \sqrt{3}$
diagonal of face: $D' = \sqrt{1^2 + 1^2} = \sqrt{2}$

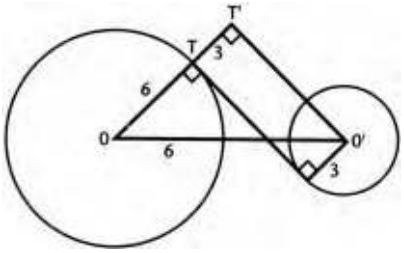
$\frac{D}{D'} = \frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{3}{\sqrt{6}}$ So the ratio is $3 : \sqrt{6}$

8. The correct answer is (D). Using the law of cosines:



$$c^2 = a^2 + b^2 - ab\cos C$$
$$c^2 = 1 + 1 - 2\cos 45$$
$$c^2 = 2 - 2\cos 45$$
$$c^2 = 2 - \sqrt{2}$$
$$c = \sqrt{2 - \sqrt{2}}$$

9. The correct answer is (C).



Extend $\overline{OT}$ 3″ to T' and draw $\overline{O'T'}$.
Then in right $\Delta OT'O'$, $OO' = 15''$
and $OT' = 9''$ so that $O'T' = 12''$.

10. The correct answer is (A). The cosine function $y = \cos x$ has a period of 2π radians.

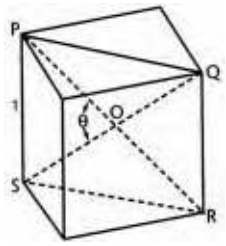
Hence $y = 5\cos 3x$ has a period of $\frac{2\pi}{3}$ radians.

11. The correct answer is (B).

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

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

12. The correct answer is (E).



Let each edge =1

PQRS is a rectangle

$$PR = SQ = \sqrt{3}$$

$$PO = SO = \frac{\sqrt{3}}{2}$$

then $1^2 = \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 - 2\frac{\sqrt{3}}{2}\frac{\sqrt{3}}{2}\cos\theta$

$$\frac{3}{2}\cos\theta = 1/2$$

$$\cos\theta = 1/3$$

$$\theta = \cos^{-1}\left(\frac{1}{3}\right)$$

13. The correct answer is (E).

$$x^2 y = 10^{\log x}$$

$$\log x^2 y = \log x$$

$$x^2 y = x$$

$$xy = 1$$

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

y varies inversely with *x*.

14. The correct answer is (E). $\log_r\left(\frac{r}{2}\right) = \log_r r - \log_r 2 = 1 - \log_r 2$

$$\log_r 2 = \log_r\left(\frac{6}{3}\right) = \log_r 6 - \log_r 3 = m - n$$

$$\log_r\left(\frac{r}{2}\right) = 1 - (m - n) = 1 - m + n$$

15. The correct answer is (C).

$x^2 + x - 6 < 0$
$(x+3)(x-2) < 0$
Either $(x+3) > 0$ and $(x-2) < 0$
or $(x+3) < 0$ and $(x-2) > 0$
Either $x > -3$ and $x < 2 \quad \Rightarrow \quad -3 < x < 2$
or $x < -3$ and $x > 2 \quad \Rightarrow \quad$ Impossible
Therefore, $-3 < x < 2$.

16. The correct answer is (E). The contrapositive is the converse of the inverse. Thus, form the converse and negate the hypothesis and conclusion. Hence $\sim q \rightarrow p$.

17. The correct answer is (A).

$\sqrt{x^2 + y^2} = 2\sqrt{(x-3)^2 + y^2}$
$x^2 + y^2 = 4(x^2 - 6x + 9 + y^2)$
$3x^2 - 24x + 36 + 3y^2 = 0$
$x^2 - 8x + y^2 = -12$
Hence, a circle.

18. The correct answer is (B). Solve for x in terms of y:

$xy - 3y = 2x + 1$
$xy - 2x = 3y + 1$

$$x = \frac{3y+1}{x-2}$$

Now interchange x and y.

$$y = \frac{3x+1}{x-2}$$

Hence $K = 2$.

19. The correct answer is (A). Let the roots be r and s.

Then $r + s = -p$ and $rs = q$.

$$\frac{1}{r} + \frac{1}{s} = \frac{r+s}{rs} = -\frac{p}{q}$$

20. The correct answer is (D). A 1-inch cube will be painted on two sides only if it lies on one edge of the 4-inch cube but does not touch a vertex of the original cube. On each edge there are two such cubes. Since a cube has 12 edges, there are 24 such cubes.

21. The correct answer is (B). If $x > L$, then $|x - L| < K$ means $x - L < K$ or $x < L + K$

If $x < L$, then $|x - L| < K$ means $L - x < K$

or $-x < K - L$ or $x > L - K$

so that $L - K < x < L + K$

22. The correct answer is (E). By De Moivre's Theorem,

$$\left[\sqrt{2}(\cos 30^\circ + i\sin 30^\circ)\right]^2 = 2(\cos 60^\circ + i\sin 60^\circ)$$
$$= 2\left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)$$
$$= 1 + i\sqrt{3}$$

23. The correct answer is (B). The magnitude $= |8+4i| = \sqrt{8^2+4^2}$
$$= \sqrt{80}$$
$$\approx 8.94$$

24. The correct answer is (D).

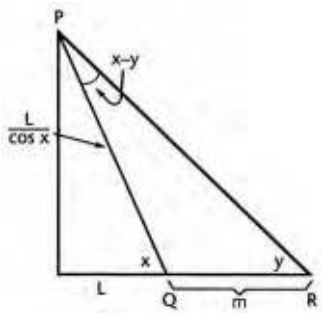
$$\tan\frac{A}{2} + \cot\frac{A}{2} = \tan\frac{A}{2} + \frac{1}{\tan\frac{A}{2}}$$
$$= \frac{\tan^2\frac{A}{2}+1}{\tan\frac{A}{2}} = \frac{\sec^2\frac{A}{2}}{\tan\frac{A}{2}}$$
$$= \frac{1}{\cos^2\frac{A}{2}} \cdot \frac{\cos\frac{A}{2}}{\sin\frac{A}{2}}$$
$$= \frac{1}{\sin\frac{A}{2}\cos\frac{A}{2}}$$
$$= \frac{1}{\frac{1}{2}\sin A} = \frac{2}{\sin A}$$
$$= 2\csc A$$

25. The correct answer is (C).

$$x^2 - 4x + 4 + y^2 - 2y + 1 = 75 + 4 + 1$$
$$(x-2)^2 + (y-1)^2 = 80$$

Center is at (2, 1).

26. The correct answer is (B). In ΔPQR, by law of sines,



$$\frac{m}{\sin(x-y)} = \frac{\frac{L}{\cos x}}{\sin y}$$

$$m\sin y = \frac{L\sin(x-y)}{\cos x}$$

$$\frac{m\cos x\sin y}{\sin(x-y)} = L$$

27. The correct answer is (E). May get 8 or 9 or 10 correct

Probability of getting 10 right $= \left(\frac{1}{2}\right)^{10}$

Probability of getting 9 right =

${}_{10}C_1\left(\frac{1}{2}\right)^9\left(\frac{1}{2}\right) =$

$10\left(\frac{1}{2}\right)^{10}$

Probability of getting 8 right =

${}_{10}C_2\left(\frac{1}{2}\right)^8\left(\frac{1}{2}\right)^2 = \frac{10}{1}\cdot\frac{9}{2}\left(\frac{1}{2}\right)^{10} =$

$45\left(\frac{1}{2}\right)^{10}$

Probability of getting 8 or 9 or 10 right =

$\left(\frac{1}{2}\right)^{10} + 10\left(\frac{1}{2}\right)^{10} + 45\left(\frac{1}{2}\right)^{10} =$

$\left(\frac{1}{2}\right)^{10}\cdot 56 = \frac{7}{2^7} = \frac{7}{128}$

28. The correct answer is (C).

$$\frac{3-4i}{5+3i}\cdot\frac{5-3i}{5-3i}=\frac{15-29i-12}{25+9}=\frac{3-29i}{34}$$

29. The correct answer is (D). Divide numerator and denominator by n^2.

$$\lim_{n\to\infty}\frac{3n^2}{n^2+10,000n}=\lim_{n\to\infty}\frac{3}{1+\frac{10,000}{n}}=\frac{3}{1}=3$$

30. The correct answer is (D).

$$w=w_0e^{-kt}$$
$$7=50e^{-3.4t}$$
$$\frac{7}{50}=e^{-3.4t}$$
$$ln\left(\frac{7}{50}\right)=ln\left(e^{-3.4t}\right)=-3.4t$$
$$\Downarrow$$
$$-3.4t=ln\left(\frac{7}{50}\right)$$
$$t=\frac{ln\left(\frac{7}{50}\right)}{-3.4}\approx\frac{-1.966}{-3.4}\approx.578$$

31. The correct answer is (D).

$27(\cos 30° + i \sin 30°) = 27(\cos 390° + i \sin 390°)$

$[27(\cos 390° + i \sin 390°)]^{1/3} = 3(\cos 130° + i \sin 130°)$

32. The correct answer is (C).

$$\cos\pi=-1,\ \sin(\pi-y)=\sin y$$
$$\sin\left(\frac{3}{2}\pi+y\right)=\sin\frac{3}{2}\pi\cos y+\cos\frac{3}{2}\pi\sin y=(-1)\cos y+0=-\cos y$$

So, $2\cos\pi\sin(\pi-y)\sin\left(\frac{3}{2}\pi+y\right)$

$= 2(-1)\sin y(-\cos y)$

$= 2\sin y\cos y = \sin 2y$

$= \sin\frac{2\pi}{5}$

33. The correct answer is (D).

(A) Graphs as a circle.

(B) Graphs as vertical and horizontal lines.

(C) $|x + y| = 3$ consists of 2 lines, $x + y = 3$ and $-x - y = 3$.

(E) Graphs as one straight line.

(D) Graphs as $x + y = 3$, $x - y = 3$, $-x + y = 3$, and $x + y = 3$, which are the four lines in the graph.

34. The correct answer is (D).

$$8\sin^2\theta + 6\sin\theta - 9 = 0$$
$$(4\sin\theta - 3)(2\sin\theta + 3) = 0$$

$\sin\theta = \frac{3}{4}$	$\sin\theta = -\frac{3}{2}$
$\theta = \sin^{-1}\frac{3}{4}$	reject, not second quadrant

The second quadrant solution is $180° - 48.6°$

$= 131.4°$

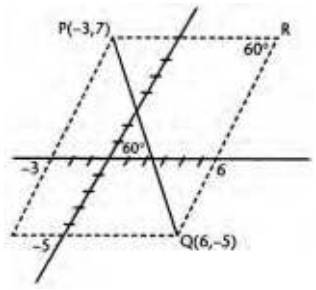
35. The correct answer is (A).

$$\left|\frac{10 - x}{3}\right| < 2$$
$$|10 - x| < 6$$
$$-6 < 10 - x < 6$$
$$-16 < -x < -4$$
or $4 < x < 16$

36. The correct answer is (B). The center of the circle is (1, 3). The value of r is then equal to the distance from the center to the given line. Thus

$$r = \left|\frac{5x_1 + 12y_1 - 60}{\sqrt{5^2 + 12^2}}\right| = \left|\frac{5(1) + 12(3) - 60}{13}\right|$$
$$r = \frac{19}{13}$$

37. The correct answer is (A).



From the figure, $\overline{PQ}$ is the side of ΔPQR opposite $\angle R$ which measures 60°.

$PR = 9$ and $QR = 12$. Thus

$$PQ^2 = 9^2 + 12^2 - 2 \cdot 9 \cdot 12 \cos 60°$$
$$= 225 - 108$$
$$= 117$$
$$PQ = \sqrt{117}$$

38. The correct answer is (D).

$$3(3)^4 - 2(3)^3 + 3(3)^2 - 2(3) + 1 = 211$$

or

3	−2	3	−2	1	|3
	9	21	72	210	
3	7	24	70	|211	

or

$$3x^3 + 7x^2 + 24x + 70 + \frac{211}{x-3}$$
$$x - 3 \overline{|3x^4 - 2x^3 + 3x^2 - 2x + 1}$$

39. The correct answer is (C).

$$y = K - 2x$$
$$x^2 + (K - 2x)^2 = 45$$
$$x^2 + 4x^2 - 4Kx + (K^2 - 45) = 0$$
$$5x^2 - 4Kx + (K^2 - 45) = 0$$

If the line is tangent, the quadratic equation will have two equal roots.Thus the discriminant = 0.

$$16K^2 - 20(K^2 - 45) = 0$$
$$4K^2 = 900$$
$$2K = 30$$
$$K = 15$$

40. The correct answer is (E). If $y = 4 - 2 \sin x \cos x = 4 - \sin 2x$, y will be a minimum when $\sin 2x$ is at a maximum; that is, at

$$2x = \frac{\pi}{2} \text{ and } \frac{5\pi}{2}$$

$$\text{or } x = \frac{\pi}{4} \text{ and } \frac{5\pi}{4}$$

41. The correct answer is (B).

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

Since $\cos x$ has a period of 2π radians, $\cos 2x$ has a period of π.

42. The correct answer is (E). In order to make the left member a perfect square, m must equal 4. Then

$$4x^2 + 8xy + 4y^2 = 4(x + y)^2 = 9$$

$$\text{or} \qquad (x + y)^2 = \frac{9}{4}$$

$$\text{and} \qquad x + y = \pm\frac{3}{2}$$

which graphs as a pair of straight lines.

Thus $m = 4$.

43. The correct answer is (B). Let r be the root, then

$$4 + 7 + r = \frac{p}{4} = 11 + r$$

$$4 \cdot 7 \cdot r = \frac{p}{2} = 28r \text{ or } \frac{p}{4} = 14r$$

Thus $14r = 11 + r$ and $r = \frac{11}{13}$

44. The correct answer is (C).

$$\begin{aligned} A &= ab \sin C \\ &= (AD)(DN)\sin D \\ &= (4)(5) \sin 47° \\ &= 20 \sin 47° \\ &\approx 14.627 \end{aligned}$$

45. The correct answer is (A).

$$\log_{6.2} x = e$$

$$\Downarrow$$

$$x = (6.2)^e$$

recall $e = 2.71828\ldots$

$$x \approx 142.54$$

46. The correct answer is (E).

$y = 1 + \frac{1}{e^t}$ and $e^t = 1 - x$

$y = 1 + \frac{1}{1-x} = \frac{1-x+1}{1-x} = \frac{2-x}{1-x}$

47. The correct answer is (C).

Let $x = \log_8 \sqrt[3]{.25}$

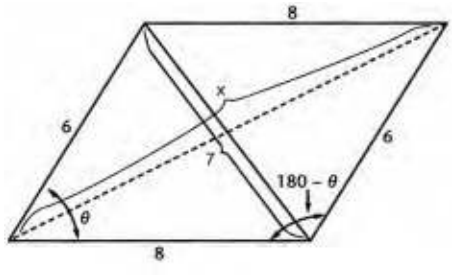
Then $8^x = \sqrt[3]{.25} = \frac{1}{4^{1/3}}$

Or $2^{3x} = 2^{-2/3}$

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

$x = -\frac{2}{9}$

48. The correct answer is (D).



$7^2 = 6^2 + 8^2 - 2 \cdot 6 \cdot 8 \cos\theta$

$49 = 100 - 96\cos\theta$

$\cos\theta = \frac{51}{96}$

$x^2 = 6^2 + 8^2 - 2 \cdot 6 \cdot 8 \cos(180 - \theta)$

$x^2 = 100 - 96\cos(180 - \theta)$

$x^2 = 100 + 96\cos\theta = 100 + 96\left(\frac{51}{96}\right)$

$x = \sqrt{151}$

49. The correct answer is (A).

$$P(x) = 5x^{13} + 3x^{10} - K$$
$$P(-1) = 5(-1)^{13} + 3(-1)^{10} - K = 20$$
$$-5 + 3 - K = 20$$
$$K = -22$$

50. The correct answer is (C).

Square both sides of the equation.

$$(\cos x - \sin x)^2 = \frac{1}{2}$$

$$\cos^2 x + \sin^2 x - 2\sin x \cos x = \frac{1}{2}$$
$$1 - \frac{1}{2} = \sin 2x = \frac{1}{2}$$
$$2x = 30°$$
$$x = 15°$$