QU-Placer Math Sample Test No. 2

Section 1: Elementary Algebra

<u>Answer the following questions:</u>

1. From the set $\{-12, -\frac{11}{2}, -\sqrt{13}, -2.2, 0, \sqrt{2}, \frac{8}{3}, 10.8472\}$, list all the elements that are rational numbers.

    (A) $\{-12, -\frac{11}{2}, -2.2, 0, \frac{8}{3}, 10.8472\}$

    (B) $\{-12, -\frac{11}{2}, -2.2, \frac{8}{3}, 10.8472\}$

    (C) $\{-\frac{11}{2}, \frac{8}{3}, 10.8472\}$

    (D) $\{-\frac{11}{2}, \frac{8}{3}\}$

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2. In the set $A=\{-9, -\frac{7}{2}, -2.7, -\sqrt{5}, -1, 0, 3, \frac{10}{3}, 5.87, 8\}$ which elements are integers?

    (A) $\{3, 8\}$

    (B) $\{0, 3, 8\}$

    (C) $\{-9, -1, 0, 3, 8\}$

    (D) $\{-9, -\frac{7}{2}, -2.7, -\sqrt{5}, -1, 0, 3, \frac{10}{3}, 5.87, 8\}$

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3. Evaluate the expression $5\left(1-\frac{1}{5}\right)-2\left(2-\frac{1}{2}\right)$

    (A) 2

    (B) -2

    (C) 1

    (D) -1

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4. Evaluate $|-6-2|-|1-12|$

    (A) -7

    (B) -5

    (C) -3

    (D) -1

5. Which of the following is equal to the expression
$$\frac{3x}{(x-1)^2} - \frac{2}{(x+2)(x-1)} \qquad x \neq 1, \; x \neq -2 \; ?$$

(A) $\dfrac{3x-2}{(x-1)^2(x+2)}$

(B) $\dfrac{3x^2+4x-2}{(x-1)^2(x+2)}$

(C) $\dfrac{3x^2+4x+2}{(x-1)^2(x+2)}$

(D) $\dfrac{3x^3+x^2+4x-2}{(x-1)^3(x+2)}$

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6. Evaluate $\;-2^3 + \dfrac{1}{3^{-2}}$

(A) 0

(B) 1

(C) 3

(D) $-\dfrac{37}{6}$

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7. Simplify $3(5x-y) - 2(x-y)$

(A) $13x - 5y$

(B) $13x - 4y$

(C) $13x - 2y$

(D) $13x - y$

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8. Find the value of the expression $\dfrac{2x+3y}{y-x}$ when $x = 2$ and $y = -3$

(A) -1

(B) 0

(C) 1

(D) 2

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9. The inequality $x \geq -1$ can be expressed as _____.

(A) $(-1, \infty)$

(B) $[-1, \infty)$

(C) $(-\infty, -1)$

(D) $(-\infty, -1]$

10. One of the factors of $8x^3 + 27$ is _____.

(A) $(4x^2 + 6x - 9)$

(B) $(4x^2 + 6x + 9)$

(C) $(4x^2 - 6x - 9)$

(D) $(4x^2 - 6x + 9)$

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11. Factor completely the expression $2(x - 1)(x + 2) + 4(x - 1)(x - 2)$

(A) $2(x - 1)(3x - 2)$

(B) $2(x - 1)(3x + 2)$

(C) $6(x - 1)(x - 2)$

(D) $6(x - 1)(x + 2)$

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12. Factor completely the expression $4 - 36m^2$

(A) $(2 - 6m)(2 + 6m)$

(B) $(2 - 6m)^2$

(C) $4(1 - 3m)^2$

(D) $4(1 - 3m)(1 + 3m)$

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13. Which of the following values should be excluded from the domain of $\frac{x+5}{x^4 - 81x^2}$?

(A) $x = 0 , x = 9$

(B) $x = 0 , x = -9$

(C) $x = 0 , x = 9 , x = -9$

(D) $x = 0 , x = 9 , x = -9 , x = -5$

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14. Perform the operation $\frac{x - 1}{x^2 + 4x + 3} \div \frac{x^2 + x - 2}{x^2 + 3x + 2}$

(A) $\dfrac{(x - 3)(x + 1)^2}{(x - 1)^2}$

(B) $\dfrac{(x - 1)^2}{(x - 3)(x + 1)^2}$

(C) $\dfrac{1}{x^2 + 3}$

(D) $\dfrac{1}{x + 3}$

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15. The domain of the expression $\frac{2x-1}{x^2-4}$ is _____.

(A) $\{x \mid x \neq 4\}$

(B) $\{x \mid x \neq -4\}$

(C) $\{x \mid x \neq -4 , 4\}$

(D) $\{x \mid x \neq -2 , 2\}$

16. The least common multiple (LCM) of $24x^2$ and $8x^2 - 16x$ is _____.

    (A) $8x$

    (B) $8x(x - 2)$

    (C) $24x^2(x - 2)$

    (D) $24x^2(8x^2 - 16x)$

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17. Rationalize the denominator $\dfrac{2}{5 - \sqrt{2}}$

    (A) $\dfrac{10 - 2\sqrt{2}}{23}$

    (B) $\dfrac{10 - 2\sqrt{2}}{3}$

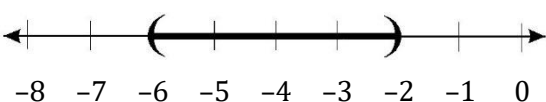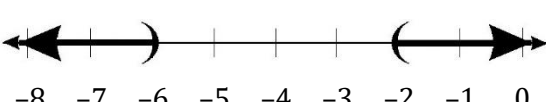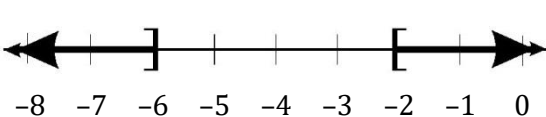   (C) $\dfrac{10 + 2\sqrt{2}}{3}$

    (D) $\dfrac{10 + 2\sqrt{2}}{23}$

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18. Simplify $\sqrt[3]{54x^3 y^2} - 3x \sqrt[3]{16y^2}$

    (A) $-3x \sqrt[3]{54x^3 y^2 - 16y^2}$

    (B) $(1 - 3x) \sqrt[3]{54x^3 y^2 - 16y^2}$

    (C) $-2x \sqrt[3]{38y^2}$

    (D) $-3x \sqrt[3]{2y^2}$

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19. The solution set of the equation $\sqrt{(x + 3)^2} - x = 3$ is _____.

    (A) $(-3 , \infty)$

    (B) $[-3 , \infty)$

    (C) $(-\infty, -3]$

    (D) $(-\infty , \infty)$

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20. Which of the following is the graph of the solution set for the inequality $x^2 + 8x + 12 \geq 0$?

(A)
  -8 -7 -6 -5 -4 -3 -2 -1 0

(B)
  -8 -7 -6 -5 -4 -3 -2 -1 0

(C)
  -8 -7 -6 -5 -4 -3 -2 -1 0

(D)
  -8 -7 -6 -5 -4 -3 -2 -1 0

21. Solve the rational Inequality $\frac{(1-x)(x-3)}{(x-2)^2} \leq 0$

(A) $[1,2) \cup (2,3]$

(B) $[1,3]$

(C) $(-\infty,1) \cup (3,\infty)$
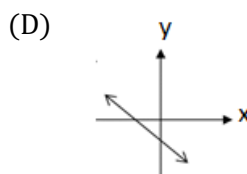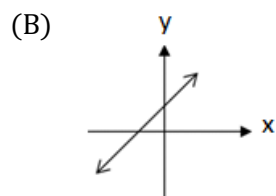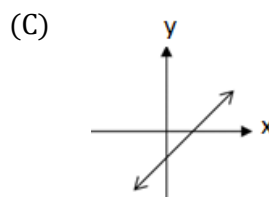
(D) $(-\infty, 1] \cup [3,\infty)$

$[1,2) \cup (2,3]$

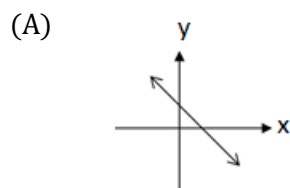**22.** The solution of the equation $\frac{x+2}{x-2} = \frac{x+3}{x-3}$ is _____.

(A) 3

(B) 2

(C) 1

(D) 0

23. If $-5 \leq x \leq -1$, find a and b such that $a \leq \frac{1-x}{2} \leq b$.

(A) $a = 1, b = 3$

(B) $a = -1, b = 3$

(C) $a = -3, b = 1$

(D) $a = -3, b = -1$

24. The graph that best represents $3x + 2y = 4$ is _____.

(A)

(C)

(B)

(D)

25. Determine the equation of the line that passes through the points $\left(-\frac{1}{2}, 0\right)$ and $(0, -1)$.

(A) $y = -2x - 1$

(B) $y = -2x + 1$

(C) $y = 2x - 1$

(D) $y = 2x + 1$

26. For which value(s) of b, does the equation $x^2 + bx + 9 = 0$ have one solution?

   (A) $b = 0$

   (B) $b = 3$

   (C) $b = -3$

   (D) $b = -3$ and $b = 3$

___

27. Multiply $(x^2 + 4)(x + 2)(x - 2)$

   (A) $(x^4 - 16)$

   (B) $(x^4 + 16)$

   (C) $(x^4 + 4x^2 + 4)$

   (D) $(x^4 - 4x^2 - 4)$

___

28. Solve $\frac{1}{x^2 - x} = \frac{1}{x^2 - 4x}$

   (A) $x = -3$

   (B) $x = 3$

   (C) $x = 0$

   (D) The equation has no solutions

___

29. If the line $y = mx + b$ passes through the point $(-2, -3)$, then _____.

   (A) $b = -3 - 2m$

   (B) $b = -3 + 2m$

   (C) $b = -2 - 3m$

   (D) $b = -2 + 3m$

___

30. The equation $|x - 1| = x - 2$ has _____.

   (A) no solutions

   (B) exactly one solution

   (C) exactly 2 solutions

   (D) infinitely many solutions

___

Section 2: Pre-Calculus

Answer the following questions:

31. If $f(x) = \frac{1}{x}$, then $\frac{f(x+h) - f(x)}{h} = $ _____.

   (A) $\dfrac{1}{x(x + h)}$

   (B) $-\dfrac{1}{x(x + h)}$

   (C) 1

   (D) $\dfrac{h-2}{xh(x+h)}$

___

32. If $f(x) = x^2 - x$, then $\frac{f(a)-f(2)}{a-2} =$ _____.

(A) $a^2 - 2$

(B) $a^2 - 1$

(C) $a + 1$

(D) $a + 2$

33. The annual profit for a company that manufactures cell phone accessories can be modeled by the function $P(x) = -0.0001x^2 + 70x + 12{,}500$ where x is the number of units sold and P is the total profit in Qatari Riyals. The sales level that maximizes the company's annual profit is _____.

(A) 12,500

(B) 25,000

(C) 350,000

(D) 700,000

34. The domain of $f(x) = \begin{cases} -x^2 & x \le -1 \\ 2 & -1 < x \le 1 \\ \sqrt{x} & x > 1 \end{cases}$

(A) $[0, \infty)$

(B) $(-\infty, \infty)$

(C) $(-\infty, -1] \cup [1, \infty)$

(D) $(-\infty, -1] \cup (1, \infty)$

35. If $f(x) = \frac{x+2}{x}$ and $g(x) = \frac{x+2}{x^2}$ then the domain of $\frac{f(x)}{g(x)}$ is _____.

(A) $\{x: x \ne 0\}$

(B) $\{x: x \ne -2\}$

(C) $(-\infty, \infty)$

(D) $\{x: x \ne 0, -2\}$

36. The vertex of $f(x) = -3x^2 + 6x + 2$ is at the point _____.

(A) $(-1, -7)$

(B) $(2, 2)$

(C) $(1, 5)$

(D) $(0, 2)$

37. The average rate of the function $f(x) = \frac{2x}{x^2+1}$ from 1 to 3 is _____.

(A) $\dfrac{2}{5}$

(B) $\dfrac{1}{5}$

(C) $-\dfrac{1}{5}$

(D) $-\dfrac{2}{5}$

38. Given $f(x) = \frac{3x-1}{x+2}$ and its inverse $f^{-1}(x) = \frac{2x+1}{3-x}$ then the range of $f^{-1}(x)$ is _____.

(A) $(-\infty, -3) \cup (-3, \infty)$

(B) $(-\infty, -2) \cup (-2, \infty)$

(C) $(-\infty, -3) \cup (-2, \infty)$

(D) $(-2, -3)$

39. Given $f(x) = |1 - x| + 2x + 1$ can be written as _____.

(A) $f(x) \begin{cases} 3x & x \le 0 \\ x + 2 & x > 0 \end{cases}$

(B) $f(x) \begin{cases} 3x & x \le 1 \\ x + 2 & x > 1 \end{cases}$

(C) $f(x) \begin{cases} x + 2 & x \le 0 \\ 3x & x > 0 \end{cases}$

(D) $f(x) \begin{cases} x + 2 & x \le 1 \\ 3x & x > 1 \end{cases}$

40. The graph of a function f contains the point $A(a, b)$. Which of the following points is contained in the graph of $g(x) = f(-x) + 1$.

(A) $(-a + 1, b)$

(B) $(a + 1, b)$

(C) $(a, -b + 1)$

(D) $(-a, b + 1)$

41. Suppose that a given function $f(x)$ intercepts with x-axis at -1 and 2 then the x intercepts of the graph of $y = -3f(x - 2)$ are _____.

(A) -12 and -3

(B) -3 and 0

(C) 1 and 4

(D) -1 and -4

42. Functions $f(x) = -x^2 + 3x$ and $g(x) = 4x - 2$ intersects at $x = $ _____.

    (A) $-2, 1$

    (B) $-3, 2$

    (C) $2, -1$

    (D) $0, 2$

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43. The parabola $y = 2(x - 1)^2 - 3$ has a vertex at _____.

    (A) $(-1, -3)$

    (B) $(1, -3)$

    (C) $(2, -3)$

    (D) $(-2, -3)$

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44. The equation of axis of symmetry of $f(x) = -x^2 + 4x - 3$, $x = $ _____.

    (A) -2

    (B) $-\dfrac{3}{4}$

    (C) $x = \dfrac{3}{4}$

    (D) $x = 2$

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45. The domain of $f(x) = \sqrt{1 + x} - \sqrt{1 - x}$ is _____.

    (A) $(-1, 1)$

    (B) $[-1, 1]$

    (C) $(0, \infty)$

    (D) $[0, \infty)$

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46. If $7^{-2x} = 3$, then $49^{2x+1} = $ _____.

    (A) -42

    (B) $\dfrac{49}{9}$

    (C) $\dfrac{49}{21}$

    (D)   None of the above

---

47. The domain of the function $f(x) = \dfrac{1}{3} 2^{-x}$ is _____.

    (A) $(-\infty, 0)$

    (B) $(0, +\infty)$

    (C) $(-\infty, +\infty)$

    (D) $(3, \infty)$

48. The range of $f(x) = 2^{-x+1} + 2$ is _____.

    (A) $(-\infty, 0)$

    (B) $(-\infty, 2)$

    (C) $(0, \infty)$

    (D) $(2, \infty)$

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49. If $a = 5^b + 1$, then $b =$ _____.

    (A) $\log_5(a) - 1$

    (B) $\log_5(a - 1)$

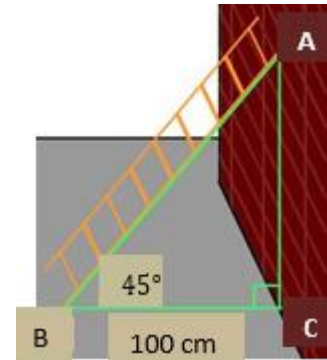   (C) $\log_a(5) - 1$

    (D) $(a - 1)^{\frac{1}{5}}$

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50. The domain of $f(x) = \ln(1 - x^2)$ is _____.

    (A) $(-1, \infty) \cup (-1, 1) \cup (1, \infty)$

    (B) $(-1, \infty) \cup (1, \infty)$

    (C) $(-1, 1)$

    (D) $(0, \infty)$

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51. If the $\sin \theta = a$ and $\cos \theta = b$ where a and b are positive, then $\sec(\pi + \theta) =$ _____.

    (A) $-\frac{1}{b}$

    (B) $-\frac{1}{a}$

    (C) $\frac{1}{a}$

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

52. In the given figure, a ladder leans on a wall and makes an angle of 45° with the ground. The distance from the ladder to the wall on the ground is 100 cm.
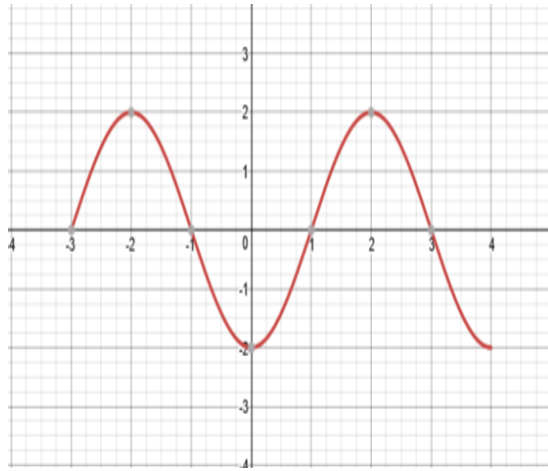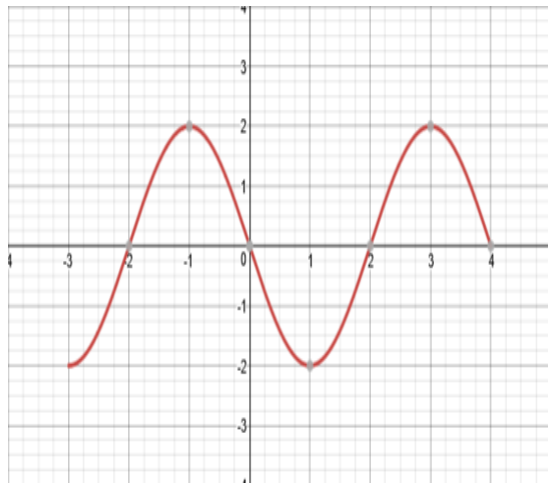

The length of the ladder is _____.

(A) $50\sqrt{2}\ cm$

(B) $100\sqrt{2}\ cm$

(C) $200\sqrt{2}\ cm$

(D) None of the above

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53. The period of the function $y = -3\ \cos\left(\frac{\pi}{2}x\right)$ is _____.

(A) $\frac{1}{3}$

(B) 1

(C) $\frac{4}{3}$

(D) 4

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54. The range of the function $y = -2\ \cos(3x) + 1$ is _____.

(A) $[-3, -1]$

(B) $[-2, 2]$

(C) $[-1, 1]$

(D) $[-1, 3]$

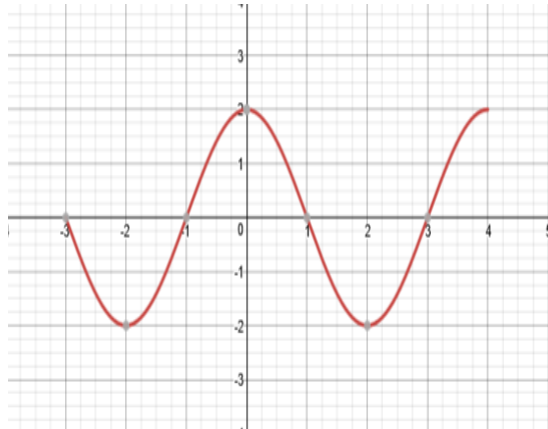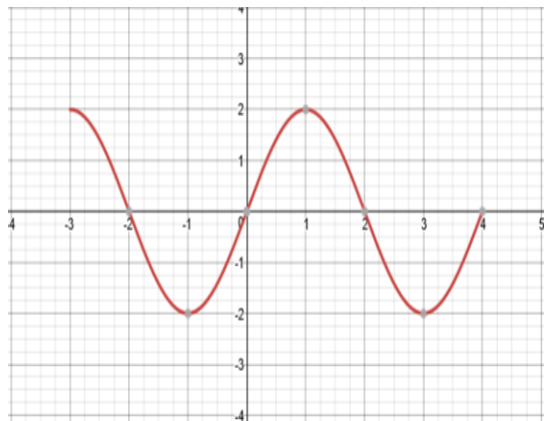**55.** The graph of $y = -2sin(2\pi x)$ is _____.
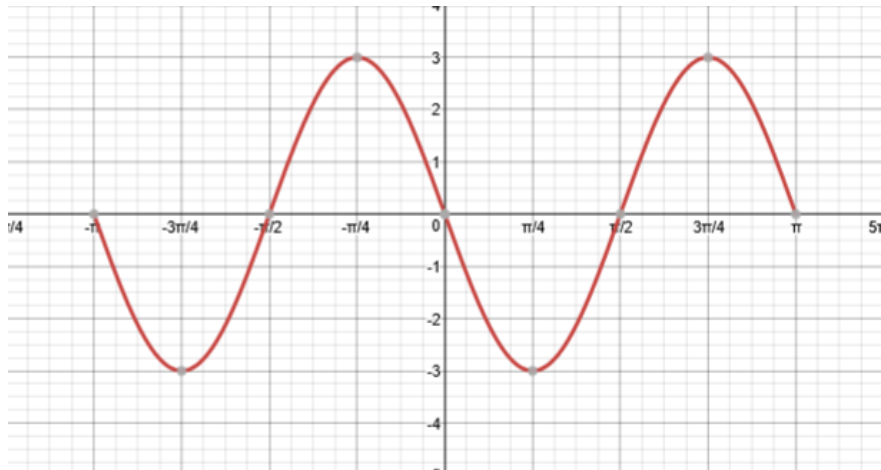
(A)

(B)

(C)

(D)

56. The reference angle of $-240°$ is _____.

(A) $-120°$

(B) $-60°$

(C) $60°$

(D) $120°$

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57. Which of the given functions represents the below graph?

(A) $y = -3\cos(2x)$

(B) $y = -3\sin(2x)$

(C) $y = 3\cos(2x)$

(D) $y = 3\sin(2x)$

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58. If $\sin\beta > 0$ and $\cot\beta < 0$, then the angle β lies in _____ quadrant.

(A) first

(B) second

(C) third

(D) fourth

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59. The acute angle that satisfies $\sin(4\alpha + 15°) = \cos(5\alpha - 24°)$ is _____.

(A) $11°$

(B) $21°$

(C) $39°$

(D) None of the above

60. The domain of $f(x) = \sqrt{2 + \sin x}$ is _____.

(A) $(-\infty, \infty)$

(B) $[-2, \infty)$

(C) $[-1, 1]$

(D) $[1, 3]$

Answer Key

Section 1	Section 2
1. A	31. B
2. C	32. C
3. C	33. C
4. C	34. B
5. C	35. D
6. B	36. C
7. D	37. C
8. C	38. B
9. B	39. D
10. D	40. D
11. A	41. C
12. D	42. A
13. C	43. B
14. D	44. D
15. D	45. B
16. C	46. B
17. D	47. C
18. D	48. D
19. B	49. B
20. D	50. C
21. D	51. A
22. D	52. B
23. A	53. D
24. A	54. D
25. A	55. B
26. D	56. C
27. A	57. B
28. D	58. B
29. B	59. A
30. A	60. A