EXPRESSWALA ACADEMY

Maths 1A: Functions

MCQ Test, Set 08

Time: 30 minutes | Maximum marks: 25

Name: _____ Class: _____ Date: _____

1. There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
2. Each correct answer carries 1 mark. There is no negative marking.
3. The key sheet and worked solutions are at the end of this test.

1. If $A = \{2, 3\}$ and $B = \{p, q, s\}$, find the number of relations from A to B.

A. 32 **B.** 6 **C.** 64 **D.** 9

2. Find the range of $f : A \to \mathbb{Z}$, $f(x) = |2x - 3|$, where $A = \{-3, -2, -1, 1, 4\}$.

A. $\{1, 2, 4, 5, 6\}$ **B.** $\{1, 5, 7, 9\}$ **C.** $\{-9, -7, -5, -1, 5\}$ **D.** $\{-3, -2, -1, 1, 4\}$

3. Find the point where the line $y = -3x - 2$ meets the x-axis.

A. $(0, -\frac{2}{3})$ **B.** $(\frac{2}{3}, 0)$ **C.** $(0, -2)$ **D.** $(-\frac{2}{3}, 0)$

4. Find the minimum value of $f(x) = x^2 + 2x - 4$.

A. -5 **B.** 5 **C.** -4 **D.** -1

5. The roots of $-2x^2 - 6x + 4 = 0$ are

A. complex (imaginary) **B.** real and equal
C. rational and equal in sign **D.** real and distinct

6. Solve $3x^2 + 8x + 5 \leq 0$.

A. $(-\frac{5}{3}, -1)$ **B.** $[-\frac{5}{3}, -1]$
C. $(-\infty, -\frac{5}{3}) \cup (-1, \infty)$ **D.** $(-\infty, -\frac{5}{3}] \cup [-1, \infty)$

7. Solve $-x^2 - 2x + 24 < 0$.

A. $(-6, 4)$ **B.** $(-\infty, -6) \cup (4, \infty)$
C. $(-\infty, -6] \cup [4, \infty)$ **D.** $[-6, 4]$

8. Solve $|3x + 4| < 6$.

A. $(-\infty, -\frac{10}{3}] \cup [\frac{2}{3}, \infty)$ **B.** $(-\infty, -\frac{10}{3}) \cup (\frac{2}{3}, \infty)$
C. $(-\frac{10}{3}, \frac{2}{3})$ **D.** $[-\frac{10}{3}, \frac{2}{3}]$

9. Find the domain of $f(x) = \dfrac{x - 3}{x^2 - 3x - 18}$.

A. $\mathbb{R} - \{-3, 6\}$ **B.** $\mathbb{R}$ **C.** $\mathbb{R} - \{-6, 3\}$ **D.** $\mathbb{R} - \{3\}$

10. Find $\lceil -7.2 \rceil - [3.1]$.

A. -12 **B.** -9 **C.** -11 **D.** -10

11. Solve $3[x] - 4 = [x] + 6$, where $[x]$ is the greatest integer function.

A. $\{5\}$ **B.** $[5, 6)$ **C.** $[5, 6]$ **D.** $(5, 6]$

12. Find $\log_{343} 16807$.

A. 49 **B.** $\frac{5}{3}$ **C.** $\frac{3}{5}$ **D.** 2

13. The graph of $y = \log_4 x$ passes through

A. $(1, 0)$ **B.** $(0, 1)$ **C.** $(0, 0)$ **D.** $(1, 1)$

14. If $f(x) = \dfrac{-3x - 7}{3x + 3}$, find $(f \circ f)(5)$.

A. $-\frac{11}{9}$ **B.** 5 **C.** -5 **D.** $-\frac{9}{11}$

15. The function $f(x) = |x| - 2x^2$ is

A. odd **B.** neither even nor odd

C. both even and odd **D.** even

16. If $f(x) = \tan x$ and $g(x) = x^5$, then $f \circ g$ is

A. a constant function **B.** even

C. odd **D.** neither even nor odd

17. If $f(x) = \sqrt{3 - x}$ and $g(x) = \sqrt{x + 1}$, find the domain of $\dfrac{g}{f}$.

A. $(-1, 3]$ **B.** $(-1, 3)$ **C.** $[-1, 3)$ **D.** $[-1, 3]$

18. If a non-zero function f satisfies $f(xy) = f(x)\, f(y)$ for all x, y in its domain, then f is of the form

A. $f(x) = x^n$ **B.** $f(x) = k \log_e x$ **C.** $f(x) = kx$ **D.** $f(x) = a^{kx}$

19. How many bijections are there from $A = \{3, 9, 12\}$ to $B = \{d, g, h\}$?

A. 9 **B.** 8 **C.** 6 **D.** 27

20. How many onto functions are there from $A = \{1, 3, 6, 10, 11, 12\}$ to $B = \{a, b, g\}$?

A. 540 **B.** 729 **C.** 537 **D.** 216

21. If $f(x) = x - 3$ and $g(x) = 5x$ are functions from $\mathbb{R}$ to $\mathbb{R}$, find $(g \circ f)^{-1}(5)$.

A. 28 **B.** $\frac{8}{5}$ **C.** 4 **D.** 10

22. Find the domain of $f(x) = \log_e(-x^2 + 3x - 2)$.

A. $(-\infty, 1) \cup (2, \infty)$ **B.** $[1, 2]$

C. $(-2, -1)$ **D.** $(1, 2)$

23. Find the range of $f(x) = 2x^2 - 8x + 4$ on $[3, 3]$.

A. $\{3\}$ **B.** $\{-2\}$ **C.** $[-3, -2]$ **D.** $[-4, \infty)$

24. Find the range of $f(x) = |x + 4| + |x - 2|$.

A. $[0, \infty)$ **B.** $(6, \infty)$ **C.** $[6, \infty)$ **D.** $[2, \infty)$

---

25. The graph of $y = f(x - 5)$ is obtained by

A. shifting the graph of $y = f(x)$ down by 5 units

B. shifting the graph of $y = f(x)$ to the left by 5 units

C. shifting the graph of $y = f(x)$ to the right by 5 units

D. shifting the graph of $y = f(x)$ up by 5 units

Key sheet

1. C	**2.** B	**3.** D	**4.** A	**5.** D
6. B	**7.** B	**8.** C	**9.** A	**10.** D
11. B	**12.** B	**13.** A	**14.** B	**15.** D
16. C	**17.** A	**18.** A	**19.** C	**20.** A
21. C	**22.** D	**23.** B	**24.** C	**25.** C

Solutions

1. If $A = \{2, 3\}$ and $B = \{p, q, s\}$, find the number of relations from A to B.

$n(A \times B) = 2 \times 3 = 6$

Every subset of $A \times B$ is a relation.

$\text{Number of relations} = 2^6 = 64$

Ans: (C) 64

---

2. Find the range of $f : A \to \mathbb{Z}$, $f(x) = |2x - 3|$, where $A = \{-3, -2, -1, 1, 4\}$.

$f(-3) = 9$, $f(-2) = 7$, $f(-1) = 5$, $f(1) = 1$, $f(4) = 5$

Range $= \{1, 5, 7, 9\}$

Ans: (B) $\{1, 5, 7, 9\}$

---

3. Find the point where the line $y = -3x - 2$ meets the x-axis.

$y = 0 \Rightarrow -3x - 2 = 0$

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

The point is $(-\frac{2}{3}, 0)$.

Ans: (D) $(-\frac{2}{3}, 0)$

---

4. Find the minimum value of $f(x) = x^2 + 2x - 4$.

$\frac{4ac-b^2}{4a} = \frac{4(1)(-4)-(2)^2}{4(1)} = -5$

It occurs at $x = -\frac{b}{2a} = -1$.

Ans: (A) -5

---

5. The roots of $-2x^2 - 6x + 4 = 0$ are

$\Delta = (-6)^2 - 4(-2)(4) = 68$

$\Delta > 0$, so the roots are real and distinct.

Ans: (D) real and distinct

---

6. Solve $3x^2 + 8x + 5 \leq 0$.

$3x^2 + 8x + 5 = (x + 1)(3x + 5)$

The roots are $-\frac{5}{3}$ and -1, and $a = 3 > 0$.

The expression has the sign opposite to a between the roots.

Solution set: $[-\frac{5}{3}, -1]$

Ans: (B) $[-\frac{5}{3}, -1]$

---

7. Solve $-x^2 - 2x + 24 < 0$.

$-x^2 - 2x + 24 = -(x - 4)(x + 6)$

The roots are -6 and 4, and $a = -1 < 0$.

The expression has the sign of a outside the roots.

Solution set: $(-\infty, -6) \cup (4, \infty)$

Ans: (B) $(-\infty, -6) \cup (4, \infty)$

---

8. Solve $|3x + 4| < 6$.

$-6 < 3x + 4 < 6$

Solution set: $(-\frac{10}{3}, \frac{2}{3})$

Ans: (C) $(-\frac{10}{3}, \frac{2}{3})$

---

9. Find the domain of $f(x) = \dfrac{x - 3}{x^2 - 3x - 18}$.

The denominator must not be zero.

$x^2 - 3x - 18 = (x - 6)(x + 3) = 0 \Rightarrow x = -3, 6$

Domain $= \mathbb{R} - \{-3, 6\}$

Ans: (A) $\mathbb{R} - \{-3, 6\}$

---

10. Find $\lceil -7.2 \rceil - [3.1]$.

$\lceil -7.2 \rceil = -7,\ [3.1] = 3$

$\lceil -7.2 \rceil - [3.1] = -10$

Ans: (D) -10

---

11. Solve $3[x] - 4 = [x] + 6$, where $[x]$ is the greatest integer function.

$2[x] = 10 \Rightarrow [x] = 5$

$[x] = 5 \iff 5 \leq x < 6$

So $x \in [5, 6)$.

Ans: (B) $[5, 6)$

---

12. Find $\log_{343} 16807$.

$\log_{343} 16807 = \log_{7^3} 7^5$

$= \frac{5}{3} \log_7 7 = \frac{5}{3}$

Ans: (B) $\frac{5}{3}$

---

13. The graph of $y = \log_4 x$ passes through

$\log_a 1 = 0$, so $(1, 0)$ lies on every log graph.

Ans: (A) $(1, 0)$

---

14. If $f(x) = \dfrac{-3x - 7}{3x + 3}$, find $(f \circ f)(5)$.

f has the form $\dfrac{ax + b}{cx - a}$ with $a = -3$, so $(f \circ f)(x) = x$.

$(f \circ f)(5) = 5$

Ans: (B) 5

---

15. The function $f(x) = |x| - 2x^2$ is

$f(-x) = -2x^2 + |x|$

$f(-x) = f(x)$, so f is even.

Ans: (D) even

---

16. If $f(x) = \tan x$ and $g(x) = x^5$, then $f \circ g$ is

f is odd and g is odd.

From the table, $f \circ g$ is odd.

Ans: (C) odd

---

17. If $f(x) = \sqrt{3 - x}$ and $g(x) = \sqrt{x + 1}$, find the domain of $\frac{g}{f}$.

$D_f = [-1, \infty),\ D_g = (-\infty, 3]$

We also need $f(x) \neq 0$, which removes $x = -1$.

Domain $= (-1, 3]$

Ans: (A) $(-1, 3]$

---

18. If a non-zero function f satisfies $f(xy) = f(x)\, f(y)$ for all x, y in its domain, then f is of the form

Products to products belongs to $f(x) = x^n$.

Ans: (A) $f(x) = x^n$

---

19. How many bijections are there from $A = \{3, 9, 12\}$ to $B = \{d, g, h\}$?

$n(A) = n(B) = 3$

$\text{Number of bijections} = 3! = 6$

Ans: (C) 6

---

20. How many onto functions are there from $A = \{1, 3, 6, 10, 11, 12\}$ to $B = \{a, b, g\}$?

$3^6 - {}^3C_1\, 2^6 + {}^3C_2\, 1^6$

$= 729 - 192 + 3 = 540$

Ans: (A) 540

---

21. If $f(x) = x - 3$ and $g(x) = 5x$ are functions from $\mathbb{R}$ to $\mathbb{R}$, find $(g \circ f)^{-1}(5)$.

$(g \circ f)^{-1} = f^{-1} \circ g^{-1}$

$g^{-1}(x) = \frac{x}{5},\ f^{-1}(x) = x + 3$

$(g \circ f)^{-1}(5) = f^{-1}\left(\frac{5}{5}\right) = 4$

Ans: (C) 4

---

22. Find the domain of $f(x) = \log_e(-x^2 + 3x - 2)$.

$-x^2 + 3x - 2 > 0$

$\Rightarrow (x - 1)(x - 2) < 0$

Domain $= (1, 2)$

Ans: (D) $(1, 2)$

---

23. Find the range of $f(x) = 2x^2 - 8x + 4$ on $[3, 3]$.

$f(3) = -2$, $f(3) = -2$; the vertex $x = 2$ is outside, so f is monotonic here.

Least value -2, greatest value -2, so the range is $\{-2\}$.

Ans: (B) $\{-2\}$

---

24. Find the range of $f(x) = |x + 4| + |x - 2|$.

For $b > a$, the range of $|x - a| + |x - b|$ is $[b - a, \infty)$.

Here $b - a = 2 - (-4) = 6$, so the range is $[6, \infty)$.

Ans: (C) $[6, \infty)$

---

25. The graph of $y = f(x - 5)$ is obtained by

Rule: shifting the graph of $y = f(x)$ to the right by 5 units.

Ans: (C) shifting the graph of $y = f(x)$ to the right by 5 units

---