

Code No.

V – 2350

**Entrance Examination for Admission to the P.G. Courses in the
Teaching Departments, 2025**

CSS

MATHEMATICS/MATHEMATICS WITH FINANCE AND COMPUTATION

For office use only

General Instructions

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be (✓) 'tick marked' **only** in the "**Response Sheet**" provided.
3. **Negative marking : 0.25 marks** will be deducted for each wrong answer .

Time : 2 Hours

Max. Marks : 100

To be filled in by the Candidate

Register Number	in Figures								
	in words								

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Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \begin{cases} x & \text{if } x \neq 0 \\ 2 & \text{if } x = 0. \end{cases}$ Then the value of $\lim_{x \rightarrow 0} f(x)$

is

A. x

B. 0

C. 2

D. $-x$

DO NOT WRITE HERE

2. If $y = \sin^{-1} \left(\frac{2x}{1+x^2} \right)$, then $\frac{dy}{dx}$ is given by

A. $\frac{1}{1+x^2}$

B. $\frac{x}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2x}{1+x^2}$

3. If $x = a \cos^3 t$ and $y = a \sin^3 t$, the value of $\frac{dy}{dx}$ is

A. $-\tan t$

B. $\tan t$

C. $\cot t$

D. $-\cot t$

4. The maximum value of $\left(\frac{1}{x}\right)^x$ is
 - A. $-e^{\frac{1}{e}}$
 - B. $e^{\frac{-1}{e}}$
 - C. $e^{\frac{1}{e}}$
 - D. $-e^{\frac{-1}{e}}$
5. The points on the curve $xy = 20$ at which the tangents are parallel to the line $5x + y = 1$ are
 - A. $(2, 10)$ and $(-2, -10)$
 - B. $(-2, 10)$ and $(-2, -10)$
 - C. $(2, 10)$ and $(2, -10)$
 - D. $(2, 10)$ and $(-2, 10)$
6. The value of $\iiint_D xyz \, dx \, dy \, dz$ where D is the region bounded by the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$ is
 - A. $\frac{a}{48}$
 - B. $\frac{a^2}{48}$
 - C. $\frac{a^2}{24}$
 - D. $\frac{a}{24}$
7. The Jacobian of the transformation $x + y = u, 2x - 3y = v$ is
 - A. $\frac{-1}{5}$
 - B. $\frac{1}{5}$
 - C. $\frac{1}{4}$
 - D. $\frac{-1}{3}$
8. The value of $\int_0^\infty x^4 e^{-x} \, dx$ is
 - A. 12
 - B. 18
 - C. 24
 - D. 30

9. The equation of the tangent to $2y = x^2 - 3x + 4$ at the point $(1, 1)$ is
 - A. $x - 2y = 3$
 - B. $2x - y = 1$
 - C. $2x + y = 1$
 - D. $x + 2y = 3$
10. The area bounded by the curve $y = \frac{x^2}{4}$, the x -axis and the ordinates $x = 2$ and $x = 4$ is
 - A. $\frac{13}{3}$
 - B. $\frac{14}{3}$
 - C. $\frac{12}{5}$
 - D. $\frac{15}{4}$
11. The volume of the solid generated by the rotation about the y -axis of the curve $y^2 = 4x$ between $x = 0$ and $x = 4$ is
 - A. 12π
 - B. 16π
 - C. 24π
 - D. 32π
12. The maximum and minimum values of $y = 3x^3 - 9x^2 - 27x + 30$ are respectively
 - A. 41 and -51
 - B. 45 and -51
 - C. 41 and -54
 - D. 45 and -54
13. The slope of the line making an angle of 60° with the positive direction of the x -axis is
 - A. $\sqrt{3}$
 - B. $\frac{1}{\sqrt{3}}$
 - C. $\frac{1}{2}$
 - D. $\frac{1}{3}$

14. The distance between the two parallel lines $6x - 3y + 8 = 0$ and $6x - 3y + 19 = 0$ is
- A. $\frac{8}{3\sqrt{5}}$ B. $\frac{10}{3\sqrt{5}}$
 C. $\frac{11}{3\sqrt{5}}$ D. $\frac{19}{3\sqrt{5}}$
15. The co-ordinates of the foot of the perpendicular from the point $(2, -1)$ to the line $6x - 2y + 7 = 0$ is
- A. $\left(\frac{23}{20}, \frac{-1}{20}\right)$ B. $\left(\frac{-23}{20}, \frac{1}{20}\right)$
 C. $\left(\frac{-23}{20}, \frac{-1}{20}\right)$ D. $\left(\frac{23}{20}, \frac{1}{20}\right)$
16. The point $(7, -5)$ lies on the circle $x^2 + y^2 - 6x + 4y - 12 = 0$. The co-ordinates of the end of the diameter through this point is
- A. $(1, 1)$ B. $(-1, -1)$
 C. $(1, -1)$ D. $(-1, 1)$
17. A tangent to the circle $x^2 + y^2 = a^2$ meets the axes of co-ordinates at P and Q . Prove that the locus of mid point of PQ is
- A. $\frac{1}{x^2} + \frac{1}{y^2} = \frac{4}{a^2}$ B. $\frac{1}{x^2} + \frac{1}{y^2} = \frac{1}{a^2}$
 C. $\frac{1}{x^2} - \frac{1}{y^2} = \frac{4}{a^2}$ D. $\frac{1}{x^2} - \frac{1}{y^2} = \frac{1}{a^2}$
18. The direction cosines of the line joining the points $(3, -5, 4)$ and $(1, -8, -2)$ are
- A. $\frac{-2}{7}, \frac{3}{7}, \frac{6}{7}$ B. $\frac{2}{7}, \frac{3}{7}, \frac{6}{7}$
 C. $\frac{2}{7}, \frac{-3}{7}, \frac{6}{7}$ D. $\frac{2}{7}, \frac{3}{7}, \frac{-6}{7}$

30. The equation $p \tan y + q \tan x = \sec^2 z$ is of order

- A. 1
- B. 2
- C. 3
- D. none of the above

31. The partial differential equation $\left(\frac{\partial z}{\partial x}\right)\left(\frac{\partial z}{\partial y}\right) = 3xy$ is

- A. linear
- B. non-linear
- C. quasi - linear
- D. semi-linear

32. The Laplace transform of \sqrt{x} is

- A. $\frac{\pi}{2s^{3/2}}$
- B. $\frac{\sqrt{\pi}}{\sqrt{2} s^{3/2}}$
- C. $\frac{\sqrt{\pi}}{2s^{3/2}}$
- D. $\frac{\pi}{s^{3/2}}$

33. $L^{-1}\left[\frac{1}{(s-a)^2}\right]$ is

- A. e^{ax}
- B. xe^{ax}
- C. x
- D. $\sin ax$

34. $L^{-1}\left[\frac{s+1}{s^2+2s+2}\right]$ is

- A. $e^x \cos x$
- B. $e^x \sin x$
- C. $e^{-x} \sin x$
- D. $e^{-x} \cos x$

35. If \vec{r} is a unit vector, the angle between \vec{r} and $\frac{d\vec{r}}{dt}$ is
- A. $\frac{\pi}{4}$ B. $\frac{\pi}{3}$
C. $\frac{\pi}{2}$ D. π
36. A particle moves along a curve whose parametric equations are $x = e^{-t}$, $y = 2 \cos 3t$, $z = \sin 3t$. Then the velocity at $t = 0$ is
- A. $\vec{i} + 3\vec{k}$ B. $-\vec{i} + 3\vec{k}$
C. $\vec{i} - 3\vec{k}$ D. $2\vec{i} + 3\vec{k}$
37. Directional derivative of the function xyz^2 in the direction of the vector $2\vec{i} + \vec{j} - \vec{k}$ at the point $(2, 3, 1)$ is
- A. $\frac{4}{\sqrt{6}}$ B. $\frac{2}{\sqrt{6}}$
C. $\frac{-2}{\sqrt{6}}$ D. $\frac{-4}{\sqrt{6}}$
38. Which of the following is zero?
- A. $\text{div}(\text{grad } \vec{f})$ B. $\text{grad}(\text{div } \vec{f})$
C. $\text{div}(\text{curl } \vec{f})$ D. $\text{curl}(\text{curl } \vec{f})$
39. If $\vec{f} = xyz^2 \vec{i} + 2x^2yz \vec{j} - 3yz^2 \vec{k}$ then $\text{div } \vec{f}$ at the point $(1, -1, 1)$ is
- A. 9 B. 7
C. 6 D. 5
40. If $|\vec{a}| = 2$, $|\vec{b}| = 5$, $|\vec{a} \times \vec{b}| = 8$, then $|\vec{a} \cdot \vec{b}|$ equals
- A. 4 B. 6
C. 5 D. 8

41. The points with position vectors $60\vec{i} + 3\vec{j}$, $40\vec{i} - 8\vec{j}$, $a\vec{i} - 52\vec{j}$ are collinear if
- A. $a = -40$ B. $a = 40$
C. $a = 20$ D. $a = 10$
42. The number of unit vectors perpendicular to $\vec{a} = (1, 1, 0)$ and $\vec{b} = (0, 1, 1)$ is
- A. 1 B. 2
C. 3 D. 4
43. If $\vec{f} = x^2 y \vec{i} + xz \vec{j} + 2yz \vec{k}$, the value of $\text{curl curl } \vec{f}$ at $(1, 1, 1)$ is
- A. $4\vec{i}$ B. $4\vec{j}$
C. $5\vec{j}$ D. $8\vec{k}$
44. The value of $\int_2^3 \int_1^5 (x + 2y) dx dy$ is
- A. 12 B. 15
C. 16 D. 32
45. The value of $\int_0^1 \int_y^1 e^{x^2} dx dy$ is
- A. $\frac{e}{2}$ B. $e - 1$
C. e^2 D. $\frac{(e-1)}{2}$
46. The volume V in the first octant bounded by $z = y^2$, $x = 2$ and $y = 4$ is
- A. $\frac{125}{3}$ B. $\frac{127}{3}$
C. $\frac{128}{3}$ D. $\frac{130}{3}$

47. The value of $\lim_{n \rightarrow \infty} \left(\frac{1^2 + 2^2 + \dots + n^2}{n^3} \right)$ is
- A. $\frac{2}{3}$ B. $\frac{1}{3}$
C. $\frac{1}{6}$ D. $\frac{2}{5}$
48. The number of peak points of the sequence $1, \frac{1}{2}, \frac{1}{3}, -1, -1, \dots$ is
- A. 0 B. 1
C. 2 D. 3
49. The area bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4by$ is
- A. $\frac{8ab}{3}$ B. $\frac{16ab}{3}$
C. $\frac{14ab}{3}$ D. $\frac{10ab}{3}$
50. The value of $\int_0^{\pi/2} \sin^6 x \, dx$ is
- A. $\frac{3\pi}{32}$ B. $\frac{5\pi}{32}$
C. $\frac{7\pi}{32}$ D. $\frac{9\pi}{32}$
51. The area of the cardioid $r = a(1 + \cos \theta)$ is
- A. $\frac{\pi a^2}{2}$ B. $\frac{3\pi a^2}{2}$
C. $\frac{5\pi a^2}{2}$ D. $\frac{7\pi a^2}{2}$

52. Number of limit points of the sequence $1, -1, 2, -2, \dots, n, -n, \dots$ is
- A. 0
B. 1
C. 2
D. 3
53. Which of the following is a cauchy sequence?
- A. $(-1)^n$
B. (n)
C. (n^2)
D. $\left(\frac{1}{n!}\right)$
54. Consider the sequence $(a_n) = 1, 2, 3, 1, 2, 3, \dots$. The $\overline{\lim} a_n$ and $\underline{\lim} a_n$ are respectively
- A. 1 and 3
B. 1 and 2
C. 3 and 1
D. 3 and 2
55. Which of the following is a property of the sequence (2^n) ?
- A. It is bounded above
B. It is bounded below
C. It is monotonic decreasing
D. It is convergent
56. The harmonic series $\sum \frac{1}{n^p}$ converges if
- A. $p \leq 1$
B. $p \geq 1$
C. $p < 1$
D. $p > 1$
57. The value of $\sum \left[\frac{1}{4n^2 - 1} \right]$ is
- A. 1
B. $\frac{1}{2}$
C. $\frac{1}{3}$
D. $\frac{1}{4}$

58. The value of $\lim_{z \rightarrow 1-i} [x + i(2x + y)]$ equals
- A. $1 + i$ B. $1 - i$
C. $2 + i$ D. $2 - i$
59. Which of the following is differentiable at every point?
- A. $f(z) = \bar{z}$ B. $f(z) = \operatorname{Re} z$
C. $f(z) = \operatorname{Im} z$ D. $f(z) = z^2$
60. The value of the constant a so that $u(x, y) = ax^2 - y^2 + xy$ is harmonic is
- A. 1 B. 2
C. 3 D. 4
61. The angle of rotation for the transformation $w = z^2$ at $z = 2 + i$ is
- A. $\tan^{-1}\left(\frac{1}{3}\right)$ B. $\tan^{-1}\left(\frac{1}{2}\right)$
C. $\tan^{-1}\left(\frac{1}{4}\right)$ D. $\tan^{-1}\left(\frac{1}{5}\right)$
62. The first points of the transformation $w = \frac{1}{z}$ are
- A. 0 and ∞ B. 0 and 1
C. 1 and -1 D. ∞ and -1
63. The residue of $\cot z$ at $z = 0$ is
- A. 0 B. 1
C. 2 D. 3

64. If C is the circle $|z - 2| = 5$, the value of $\int_C \frac{dz}{z - 3}$ is
- A. $2\pi i$ B. $3\pi i$
C. $4\pi i$ D. $5\pi i$
65. The function $f(z) = \frac{e^z}{z^2 + (z^2 + 9)}$ has
- A. 4 simple poles B. 2 double poles
C. 1 pole of order 4 D. 1 double pole and 2 simple poles
66. Let G be the additive group of integers modulo n . Then $O(G)$ is
- A. n B. $n!$
C. $\phi(n)$ D. n^2
67. Which of the following is not a group?
- A. set of all real numbers under usual multiplication
B. set of all $n \times n$ real matrices under addition
C. set of all permutations of a non-empty set x under composition
D. set of all integers under multiplication modulo n , where n is arbitrary
68. Let G be a group such that $a^2 = e$ for all $a \in G$. What best can you say of G ?
- A. G is cyclic B. G is abelian
C. G is a semigroup D. G is non-abelian

69. Let $GL(n, F)$ be the general linear group of dimension n . Let F be a field with 2 elements. Then $GL(2, F)$ is
 - A. S_3
 - B. S_4
 - C. D_3
 - D. D_4
70. Let G be the cyclic group (\mathbb{Z}_6, \oplus) and H be (\mathbb{Z}_2, \oplus) . Let $f: \mathbb{Z}_6 \rightarrow \mathbb{Z}_2$ be defined by $f(g) = g \bmod 2$. Then $\ker f$ equals
 - A. $\{0\}$
 - B. $\{0, 2\}$
 - C. $\{0, 4\}$
 - D. $\{0, 2, 4\}$
71. Let G be a group and $a, b \in G$ be such that $ab = ba$. If $o(a) = 5$ and $o(b) = 7$, then $o(ab)$ is
 - A. 7
 - B. 5
 - C. 35
 - D. 12
72. Let G be a cyclic group of order n . Then number of generators of G is
 - A. 1
 - B. 2
 - C. n
 - D. $\phi(n)$
73. Let A be a subgroups of G and B be a normal subgroup of G . Then when best can you say of $A \cap B$?
 - A. It is a subgroup of A
 - B. It is a subgroup of B
 - C. It is a normal subgroup of A
 - D. It is a normal subgroup of B
74. If the centre of a group G , $Z(G) = \{e\}$, then which of the following is always true?
 - A. $G \simeq \text{Aut}(G)$
 - B. $\text{Aut}(G) \simeq \text{In}(G)$
 - C. $G \simeq \text{In}(G)$
 - D. None of the above

75. Which of the following is not an isomorphism?
- A. $\phi: G \rightarrow H$ where $\phi(x) = e' \forall x \in G$. Hence G and H are groups and e' is the identity of H
 - B. $\phi: G \rightarrow G \rightarrow \phi(x) = x \forall x \in G$
 - C. $\phi: (\mathbb{R}^+, \cdot) \rightarrow \mathbb{R} \rightarrow \phi(x) = \log x$
 - D. $\phi_a: G \rightarrow G \rightarrow \phi_a(x) = axa^{-1} \forall x \in G$ and for a fixed $a \in G$
76. Let R be the polynomial ring $\mathbb{Z}_2[x]$ and let $(f(x))$ denote the ideal generated by $f(x)$. If $f(x) = x^2 + x + 1$ in R , then what best can you say of the quotient ring $R/(f(x))$?
- A. It is a ring but not an integral domain
 - B. It is a finite field of order 4
 - C. It is an infinite field
 - D. It is an integral domain but not a field
77. Let P be a prime ideal in a commutative ring R and let S be the complement of P in R . Pick out the true statement
- A. S is a subring of R
 - B. S is an ideal of R
 - C. S is closed under addition
 - D. S is closed under multiplication
78. If R is an integral domain, the number of nilpotent elements of R is
- A. 0
 - B. 1
 - C. 2
 - D. 3
79. The characteristic of the ring of integers is
- A. 0
 - B. 1
 - C. 2
 - D. 3

80. Let R be the ring of integers \mathbb{Z} and let the $A=(5)$, $B=(6)$ be two ideals in R . Which of the following is true?
- A. Both A and B are maximal ideals
 - B. A is a maximal ideal but B is not
 - C. A is not a maximal ideal but B is a maximal ideal
 - D. Both A and B are not maximal ideals
81. Let R be a commutative ring with unity in which each ideal is prime. What best can you say of R ?
- A. R is a field
 - B. R is an integral domain
 - C. R is a principal ideal domain
 - D. None of the above
82. Which of the following is true?
- A. Every Euclidean domain is a principal ideal domain
 - B. Every Euclidean domain is a unique factorization domain
 - C. Every principal ideal domain is a unique factorization domain
 - D. Every unique factorization domain is a principal ideal domain
83. If G is a group of order 5, what best can you say of the centre of G , $Z(G)$?
- A. $Z(G)$ is a subgroup of G
 - B. $Z(G)=G$
 - C. $Z(G)$ is abelian
 - D. none of the above
84. The smallest integer n such that there are 2 non-isomorphic groups of order n is
- A. 2
 - B. 3
 - C. 4
 - D. 5
85. The smallest non-trivial abelian simple group is
- A. \mathbb{Z}_2
 - B. \mathbb{Z}_3
 - C. \mathbb{Z}_4
 - D. \mathbb{Z}_5

86. The vectors 1 and i are
- linearly dependent over the reals
 - linearly dependent over the complexes
 - linearly independent over the complexes
 - linearly dependent over the rationals
87. The span of x – axis and the xy – plane in \mathbb{R}^3 is
- x – axis
 - xy – plane
 - yz – plane
 - zx – plane
88. The dimension of the subspace $[S]$ of \mathbb{R}^3 where $S = \{(1, 2, 3), (3, 1, 0), (-2, 1, 3)\}$ is
- 0
 - 1
 - 2
 - 3
89. Every 1- dimensional subspace of \mathbb{R}^3 is
- a point
 - a straight line passing through the origin
 - a plane passing through the origin
 - none of the above
90. Which of the following is not a linear map?
- $T: \mathbb{R} \rightarrow \mathbb{R}^3$ defined by $T(x) = (x, 2x, 3x)$
 - $T: \mathbb{R} \rightarrow \mathbb{R}^3$ defined by $T(x) = (x, x^2, x^3)$
 - $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $T(x, y) = (2x + 3y, 3x - 4y)$
 - $T: \mathbb{R}^3 \rightarrow \mathbb{R}^2$ defined by $T(x, y, z) = (x, y)$
91. The range and the rank of the linear transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $T(x_1, x_2) = (x_1 + x_2, x_1)$ are respectively
- $\mathbb{R}, 1$
 - $\mathbb{R}, 2$
 - $\mathbb{R}^2, 1$
 - $\mathbb{R}^2, 2$

92. Let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ and $S : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be defined by $T(x_1, x_2) = (x_1 + x_2, 0)$ and $S(x_1, x_2) = (2x_1, 3x_1 + 4x_2)$. Then ST is defined by
- A. $ST(x_1, x_2) = (2x_1 + 2x_2, 3x_1 + 3x_2)$
- B. $ST(x_1, x_2) = (x_1 + x_2, 3x_1 + 4x_2)$
- C. $ST(x_1, x_2) = (2x_1 + 2x_2, 3x_1 + 4x_2)$
- D. $ST(x_1, x_2) = (x_1 + x_2, 3x_1 + 3x_2)$
93. If A is a skew symmetric matrix of odd order n , then $\det A$ is
- A. 0
- B. 1
- C. n
- D. n^2
94. The eigen values of the matrix $\begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix}$ are
- A. 3, 2
- B. 3, -2
- C. -3, 2
- D. -3, -2
95. If λ is an eigen values of a matrix A , then which of the following is not true?
- A. λ^2 is an eigen value of A^2
- B. $\alpha \lambda$ is an eigen values of αA where α is a scalar
- C. λ is an eigen value of A^T
- D. $\frac{1}{\lambda}$ is an eigen values of A^T
96. Which of the following is not a Hermitian matrix?
- A. $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$
- B. $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
- C. $\begin{bmatrix} 1 & i \\ -i & 1 \end{bmatrix}$
- D. $\begin{bmatrix} 1 & -i \\ i & 1 \end{bmatrix}$

97. Which of the following is a valid C expression?
- A. `int my_num = 1,00,000;`
 - B. `int my_num = 100000;`
 - C. `int my num = 100000;`
 - D. `int $ my_num = 100000;`
98. What is `#include <stdio.h>` in C language?
- A. inclusion directive
 - B. preprocessor directive
 - C. file inclusion directive
 - D. none of the above
99. What is the result of the expression `ptr++` in C, where `ptr` is a pointer?
- A. increase the value of `ptr` by 1
 - B. decrease the value of `ptr` by 1
 - C. move `ptr` to the next memory location
 - D. none of the above
100. What will be the output of the following C code
- ```
#include <stdio.h>
int main ()
{
 int y = 10000;
 int y = 34 ;
 printf ("Hello World ! % d \ n", y);
 return 0;
}
```
- A. compile time error
  - B. Hello world ! 34
  - C. Hello world ! 10000
  - D. Hello world ! followed by a junk value
-

# RESPONSE SHEET

|     |   |   |   |   |   |
|-----|---|---|---|---|---|
| 1   | A | B | C | D | E |
| 2   | A | B | C | D | E |
| 3   | A | B | C | D | E |
| 4   | A | B | C | D | E |
| 5   | A | B | C | D | E |
| 6   | A | B | C | D | E |
| 7   | A | B | C | D | E |
| 8   | A | B | C | D | E |
| 9   | A | B | C | D | E |
| 10  | A | B | C | D | E |
| 11  | A | B | C | D | E |
| 12  | A | B | C | D | E |
| 13  | A | B | C | D | E |
| 14  | A | B | C | D | E |
| 15  | A | B | C | D | E |
| 16  | A | B | C | D | E |
| 17  | A | B | C | D | E |
| 18  | A | B | C | D | E |
| 19  | A | B | C | D | E |
| 20  | A | B | C | D | E |
| 21  | A | B | C | D | E |
| 22  | A | B | C | D | E |
| 23  | A | B | C | D | E |
| 24  | A | B | C | D | E |
| 25  | A | B | C | D | E |
| 26  | A | B | C | D | E |
| 27  | A | B | C | D | E |
| 28  | A | B | C | D | E |
| 29  | A | B | C | D | E |
| 30  | A | B | C | D | E |
| 31  | A | B | C | D | E |
| 32  | A | B | C | D | E |
| 33  | A | B | C | D | E |
| 34  | A | B | C | D | E |
| 35  | A | B | C | D | E |
| 36  | A | B | C | D | E |
| 37  | A | B | C | D | E |
| 38  | A | B | C | D | E |
| 39  | A | B | C | D | E |
| 40  | A | B | C | D | E |
| 41  | A | B | C | D | E |
| 42  | A | B | C | D | E |
| 43  | A | B | C | D | E |
| 44  | A | B | C | D | E |
| 45  | A | B | C | D | E |
| 46  | A | B | C | D | E |
| 47  | A | B | C | D | E |
| 48  | A | B | C | D | E |
| 49  | A | B | C | D | E |
| 50  | A | B | C | D | E |
| 51  | A | B | C | D | E |
| 52  | A | B | C | D | E |
| 53  | A | B | C | D | E |
| 54  | A | B | C | D | E |
| 55  | A | B | C | D | E |
| 56  | A | B | C | D | E |
| 57  | A | B | C | D | E |
| 58  | A | B | C | D | E |
| 59  | A | B | C | D | E |
| 60  | A | B | C | D | E |
| 61  | A | B | C | D | E |
| 62  | A | B | C | D | E |
| 63  | A | B | C | D | E |
| 64  | A | B | C | D | E |
| 65  | A | B | C | D | E |
| 66  | A | B | C | D | E |
| 67  | A | B | C | D | E |
| 68  | A | B | C | D | E |
| 69  | A | B | C | D | E |
| 70  | A | B | C | D | E |
| 71  | A | B | C | D | E |
| 72  | A | B | C | D | E |
| 73  | A | B | C | D | E |
| 74  | A | B | C | D | E |
| 75  | A | B | C | D | E |
| 76  | A | B | C | D | E |
| 77  | A | B | C | D | E |
| 78  | A | B | C | D | E |
| 79  | A | B | C | D | E |
| 80  | A | B | C | D | E |
| 81  | A | B | C | D | E |
| 82  | A | B | C | D | E |
| 83  | A | B | C | D | E |
| 84  | A | B | C | D | E |
| 85  | A | B | C | D | E |
| 86  | A | B | C | D | E |
| 87  | A | B | C | D | E |
| 88  | A | B | C | D | E |
| 89  | A | B | C | D | E |
| 90  | A | B | C | D | E |
| 91  | A | B | C | D | E |
| 92  | A | B | C | D | E |
| 93  | A | B | C | D | E |
| 94  | A | B | C | D | E |
| 95  | A | B | C | D | E |
| 96  | A | B | C | D | E |
| 97  | A | B | C | D | E |
| 98  | A | B | C | D | E |
| 99  | A | B | C | D | E |
| 100 | A | B | C | D | E |

## **ROUGH WORK**

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