📘 100 Python, 100 SQL, and 100 ML Coding Questions (Based on Interview Syllabus)

# 🐍 Python Coding Questions (100)

1. Swap two variables without using a third variable.

2. Check if a string is a palindrome.

3. Count number of vowels in a string.

4. Convert a string to a list and vice versa.

5. Reverse a list in Python (3 methods).

6. Remove duplicates from a list.

7. Find the second largest number in a list.

8. Flatten a nested list.

9. Merge two dictionaries.

10. Count the frequency of elements in a list.

11. Create a function to check if a number is prime.

12. Create a function using \*args to return sum.

13. Create a function using \*\*kwargs and print key-value pairs.

14. Generate Fibonacci sequence using a function.

15. Write a function to check for anagrams.

16. Demonstrate list comprehension to square even numbers.

17. Write a program to get common items from two lists.

18. Use zip() to pair elements from two lists.

19. Sort a list of tuples by the second element using lambda.

20. Use map() to double values in a list.

21. Use filter() to filter out odd numbers.

22. Use reduce() to calculate factorial of a number.

23. Implement a simple class `Student` with attributes and method.

24. Implement inheritance in Python with `Employee` and `Manager`.

25. Demonstrate polymorphism using two classes.

26. Override a method from parent class.

27. Use `@staticmethod` and `@classmethod` in a class.

28. Read a file and print number of lines.

29. Write to a new file from a string.

30. Extract all emails from a text file using regex.

31. Catch ZeroDivisionError using try-except.

32. Raise a custom exception if input is not integer.

33. Create a generator for even numbers up to N.

34. Use a decorator to measure execution time of a function.

35. Check if a number is Armstrong.

36. Count characters in a string using dictionary.

37. Create a matrix using nested list comprehension.

38. Check if two strings are isomorphic.

39. Remove punctuation from a string using regex.

40. Convert camelCase to snake\_case using regex.

41. Convert date string into datetime object.

42. Calculate number of days between two dates.

43. Get current time in HH:MM:SS format.

44. Write unit tests for a math function.

45. Mock a file read in a unit test.

46. Sort a dictionary by values.

47. Get all permutations of a string.

48. Use `collections.Counter` to count letters.

49. Implement a queue using deque.

50. Implement stack using list.

51. Use namedtuple for employee records.

52. Implement memoization with lru\_cache.

53. Reverse a linked list using recursion.

54. Implement binary search recursively.

55. Check if a list is sorted.

56. Find GCD of two numbers.

57. Find LCM of two numbers.

58. Compute factorial iteratively.

59. Find duplicates in a list.

60. Check if string contains only digits.

61. Split a sentence into words and count.

62. Capitalize the first letter of every word.

63. Write a class with encapsulation example.

64. Use `enumerate()` to index a list.

65. Use `any()` and `all()` with conditions.

66. Simulate dice roll using `random.randint`.

67. Validate a phone number using regex.

68. Validate PAN card number with regex.

69. Extract hashtags from a tweet.

70. Convert list of strings to a single string.

71. Count frequency of each character in a file.

72. Sort list of dictionaries by key.

73. Group values in list of dicts by common key.

74. Convert CSV to JSON in Python.

75. Handle missing keys using `defaultdict`.

76. Find top 3 frequent words in a paragraph.

77. Print prime numbers from 1 to 100.

78. Reverse words in a sentence.

79. Check if a year is a leap year.

80. Simulate tossing a coin 10 times.

81. Implement `\_\_str\_\_` and `\_\_repr\_\_` in class.

82. Create a context manager using `with`.

83. Serialize and deserialize Python object using pickle.

84. Use `os` module to list all files in a directory.

85. Compress and decompress a string.

86. Get size of file in KB.

87. Find intersection of two sets.

88. Difference between two lists.

89. Get system time zone using datetime.

90. Send email using `smtplib`.

91. Create a simple REST API using Flask.

92. Sort list based on last character.

93. Rotate a list by K positions.

94. Transpose a matrix.

95. Calculate dot product of two lists.

96. Check if list has all unique elements.

97. Chunk a list into N parts.

98. Create a simple chatbot using if-else.

99. Simulate traffic light using class and time.sleep.

100. Web scrape headlines using BeautifulSoup.

101. Create a bar chart using matplotlib.

102. Read Excel file using pandas.

103. Group pandas DataFrame by column and sum.

104. Merge two pandas DataFrames.

# 🗃️ SQL Coding Questions (100)

1. Select all records from 'Employees'.

2. Select unique departments from 'Employees'.

3. Select employees with salary > 50000.

4. Get employee count per department.

5. Select employees who joined after 2020.

6. Get top 5 highest paid employees.

7. Find second highest salary.

8. Select employees with NULL manager\_id.

9. Update salary by 10% for all employees.

10. Delete employees in 'Intern' role.

11. Add new column 'experience\_years'.

12. Find departments with more than 10 employees.

13. Count total number of employees.

14. List employees whose name starts with 'A'.

15. Find employees with duplicate email addresses.

16. List department names having no employees.

17. Get average salary per role.

18. Find roles where avg salary > 60000.

19. List all employee names and their department names.

20. Write INNER JOIN between Employees and Departments.

21. Write LEFT JOIN to get all departments and employees.

22. Write RIGHT JOIN to get all employees and their managers.

23. Create a new table from selected columns.

24. Use GROUP BY with HAVING clause.

25. Use CASE to label salaries as 'High', 'Low'.

26. Find employees working under the same manager.

27. Retrieve only first 10 records.

28. Get last 5 employees to join.

29. Write a correlated subquery.

30. Use EXISTS to check employee record.

31. Get count of employees by year of joining.

32. Use DATEPART() to extract year from date.

33. Get number of working days between two dates.

34. Write a CTE for department-wise max salary.

35. Use RANK() to rank employees within department.

36. Use ROW\_NUMBER() for employee listing.

37. Compare employees' salaries with department avg.

38. Create a view to show employee summary.

39. Create a stored procedure to update salary.

40. Create a user-defined function to calculate tax.

41. Write query to transpose rows to columns.

42. Find most frequent job title.

43. Detect and remove duplicate rows.

44. Write SQL query to check for palindrome names.

45. Find employees whose email contains 'hr'.

46. Use CHARINDEX or INSTR for pattern matching.

47. Use string functions to split full name.

48. Join 3 tables using INNER JOIN.

49. Get department-wise highest and lowest salary.

50. Use UNION to merge results from two tables.

51. Write a query with nested SELECT.

52. Calculate running total of salary.

53. Fetch even and odd employee IDs separately.

54. Create index on 'email' column.

55. Optimize a slow performing query.

56. Backup and restore a table data.

57. Change column data type.

58. Drop a constraint from a table.

59. Add NOT NULL constraint to column.

60. Calculate mode of a column using subquery.

61. Find Nth highest salary using LIMIT OFFSET.

62. Compare performance with and without index.

63. Create materialized view for monthly hires.

64. Delete all rows except the top 100.

65. Select employees hired in last 30 days.

66. Extract domain from email address.

67. Select duplicate employee names.

68. Write a recursive CTE to find hierarchy.

69. Update multiple columns in one query.

70. Join employees table with itself for manager tree.

71. Extract initials from full name.

72. Create and use temp tables.

73. Select column with alias name.

74. Filter rows using BETWEEN.

75. Use aggregate functions with GROUP BY.

76. Write an SQL trigger for audit.

77. Use IF-ELSE logic in stored procedure.

78. Get employee count by joining year.

79. Query system views for metadata.

80. Find top 3 salaries per department.

81. Replace NULLs with default values.

82. Get length of employee names.

83. Round off salary to nearest 1000.

84. Show employees with birthdays this month.

85. Find average age of employees.

86. Query JSON fields in SQL (if supported).

87. Use CASE for conditional bonus.

88. Create partitioned table.

89. List employees with same hire date.

90. Find difference between two dates.

91. Write a query to find leap year joiners.

92. Use HAVING with COUNT.

93. Drop column from table.

94. Write a trigger to auto-fill timestamps.

95. Encrypt and decrypt column values (if supported).

96. Schedule query as a job.

97. Create table with composite key.

98. Select employees with salary in top 10%.

99. Create audit table for updates.

100. Get job titles having vowels only.

101. Use COALESCE to replace NULL.

102. Export table to CSV (SQL Server/MySQL).

# 🤖 Machine Learning Coding Questions (100)

1. Load dataset using pandas and display first 5 rows.

2. Check for null values in a dataset.

3. Impute missing values with mean.

4. Convert categorical column using one-hot encoding.

5. Normalize a column using MinMaxScaler.

6. Standardize numerical data using StandardScaler.

7. Split data into train and test.

8. Train a linear regression model.

9. Evaluate regression model using RMSE.

10. Train logistic regression on binary data.

11. Plot confusion matrix.

12. Calculate precision, recall, F1-score.

13. Draw ROC curve and compute AUC.

14. Train decision tree classifier.

15. Visualize decision tree.

16. Train random forest model.

17. Use GridSearchCV for hyperparameter tuning.

18. Use RandomizedSearchCV.

19. Train KNN model.

20. Train and plot SVM with linear kernel.

21. Implement KMeans clustering.

22. Use elbow method to choose K.

23. Plot clusters using PCA 2D projection.

24. Train DBSCAN and visualize clusters.

25. Use silhouette score for clustering.

26. Perform PCA and plot variance explained.

27. Implement feature selection using SelectKBest.

28. Check multicollinearity using VIF.

29. Handle class imbalance using SMOTE.

30. Train Naive Bayes classifier.

31. Perform cross-validation.

32. Plot learning curve.

33. Use Lasso for regression.

34. Use Ridge regression.

35. Apply polynomial features.

36. Plot actual vs predicted values.

37. Perform stratified sampling.

38. Tune model with early stopping.

39. Serialize model using pickle.

40. Deploy model using Flask.

41. Create ML pipeline using sklearn.

42. Train XGBoost model.

43. Use SHAP for feature importance.

44. Visualize feature importance.

45. Train LightGBM model.

46. Compare models on same dataset.

47. Create pipeline with preprocessing and model.

48. Tune threshold for binary classifier.

49. Generate synthetic dataset using make\_classification.

50. Plot correlation heatmap.

51. Train a time series ARIMA model.

52. Check stationarity using ADF test.

53. Create lag features for time series.

54. Decompose time series.

55. Use Prophet for forecasting.

56. Train linear SVM classifier.

57. Perform text classification using TF-IDF.

58. Clean text data using NLTK.

59. Remove stopwords and punctuation from text.

60. Tokenize and stem text.

61. Use CountVectorizer for BoW model.

62. Train sentiment analysis model.

63. Classify SMS spam using logistic regression.

64. Build a recommendation system using cosine similarity.

65. Use collaborative filtering matrix factorization.

66. Use t-SNE for dimensionality reduction.

67. Train model on image data using sklearn.

68. Download dataset from sklearn.datasets.

69. Create ensemble using voting classifier.

70. Apply stacking on 2 models.

71. Build churn prediction model.

72. Build fraud detection pipeline.

73. Simulate underfitting scenario.

74. Simulate overfitting scenario.

75. Plot validation curve.

76. Apply bagging technique.

77. Extract date parts from timestamp.

78. Use datetime as index in pandas.

79. Train model with date as feature.

80. Compare training and validation loss.

81. Predict using test set.

82. Create confusion matrix heatmap.

83. Explain bias-variance tradeoff with code.

84. Track experiment using MLflow.

85. Automate pipeline using sklearn pipeline.

86. Log metrics with wandb.

87. Deploy model on Streamlit.

88. Export model to ONNX format.

89. Use LightGBM with categorical features.

90. Train CatBoost model.

91. Implement regression from scratch using NumPy.

92. Compute gradient manually for MSE.

93. Create mini-batch gradient descent.

94. Apply threshold on probability output.

95. Plot PR curve.

96. Generate classification report.

97. Plot feature distribution for target classes.

98. Create model card for ML model.

99. Create unit tests for ML pipeline.

100. Train multiple models and compare metrics.

101. Build custom scoring function for GridSearch.

102. Log confusion matrix to file.