Sure! Below is a list of **100 Python programming interview questions** covering various topics for a **data scientist role** at MAANG companies.

Basic Python (1-10)

1. What are Python's advantages and limitations?
2. Explain the difference between mutable and immutable objects.
3. How is Python an interpreted language?
4. Write a program to find the factorial of a number.
5. Explain the difference between global and local variables.
6. What are Python's built-in data types?
7. How does Python handle type conversion?
8. What is the difference between Python 2 and Python 3?
9. Write a Python program to reverse a string.
10. Explain the concept of Python's garbage collection.

Data Structures (11-30)

11. Write a Python program to check for anagrams.
12. How would you implement a queue in Python?
13. Explain the difference between arrays and lists in Python.
14. Write a Python function to find the nth largest element in a list.
15. How do you merge two sorted lists in Python?
16. What are Python's built-in set operations?
17. Write a program to check if a number is a power of 2.
18. How do you implement a binary tree in Python?
19. Write a Python function to calculate the depth of a tree.
20. How do you find the intersection of two lists in Python?
21. Implement a priority queue using a heap in Python.
22. Explain the difference between a shallow copy and a deep copy.
23. Write a function to check if a given string is a valid palindrome.
24. How do you find the missing number in a sequence?
25. Write a Python program to rotate a matrix.
26. Implement a singly linked list in Python.
27. Write a function to detect a loop in a linked list.
28. What is the difference between OrderedDict and dict in Python?
29. Explain how Python implements hash tables.
30. Write a Python function to find the maximum depth of a nested list.

Algorithms (31-50)

31. How do you implement the quicksort algorithm in Python?
32. Write a program to check if a number is prime.
33. How do you find all permutations of a string in Python?
34. Write a Python program to solve the "two-sum" problem.
35. Explain the difference between a greedy algorithm and dynamic programming.
36. Implement Dijkstra's shortest path algorithm in Python.
37. How do you calculate the edit distance between two strings?
38. Write a Python function to solve the knapsack problem.
39. Implement the merge sort algorithm in Python.
40. Write a program to calculate the power of a number using recursion.
41. How do you find the longest common subsequence in two strings?
42. Write a program to find the smallest substring containing all characters of another string.
43. Implement a sliding window algorithm in Python.
44. How do you find the median of two sorted arrays?
45. Write a Python program to solve the "maximum subarray sum" problem.
46. Implement Floyd-Warshall's algorithm in Python.
47. Write a program to find the kth smallest element in an array.
48. Explain the difference between BFS and DFS.
49. How do you implement a trie in Python?
50. Write a Python program to solve the N-Queens problem.

Data Manipulation (51-65)

51. Write a Python program to split a large text file into smaller chunks.
52. How do you handle missing data in Pandas?
53. Write a Python program to aggregate data by group in Pandas.
54. Explain how to filter data based on multiple conditions in Pandas.
55. Write a program to calculate the rolling average in a time series.
56. How do you merge two DataFrames in Pandas?
57. Write a Python program to normalize a dataset.
58. How do you sort a DataFrame by multiple columns?
59. Explain the difference between map(), apply(), and applymap() in Pandas.
60. Write a program to convert categorical variables into dummy variables.
61. How do you calculate correlation in a Pandas DataFrame?
62. Write a Python function to pivot a DataFrame.
63. How do you perform left, right, and outer joins in Pandas?
64. Write a Python script to group data by time intervals.
65. How do you calculate the moving average using NumPy?

Machine Learning (66-80)

66. How do you implement linear regression from scratch in Python?
67. Write a Python program to calculate RMSE and MAE.
68. How do you train and test a machine learning model in scikit-learn?
69. Write a Python script to calculate feature importance using a decision tree.
70. How do you handle categorical variables in a dataset?
71. Implement k-means clustering in Python from scratch.
72. Write a program to calculate the confusion matrix.
73. How do you evaluate a machine learning model using cross-validation?
74. Write a Python program to create polynomial features.
75. How do you implement logistic regression from scratch?
76. Write a Python script to calculate the area under the ROC curve.
77. How do you handle class imbalance in a dataset?
78. Write a Python program to calculate the silhouette score for clustering.
79. How do you perform hyperparameter tuning in scikit-learn?
80. Implement PCA (Principal Component Analysis) from scratch in Python.

Python Libraries (81-90)

81. How do you create a heatmap in Seaborn?
82. Write a Python program to create a histogram using Matplotlib.
83. How do you customize plots in Matplotlib (e.g., adding titles, labels)?
84. Write a Python script to create a scatter plot with regression lines.
85. How do you perform time series analysis using statsmodels?
86. Write a Python program to handle large datasets using Dask.
87. How do you perform geospatial analysis using Geopandas?
88. Write a Python program to create an interactive dashboard using Plotly.
89. How do you implement a random forest using scikit-learn?
90. Write a Python script to perform sentiment analysis using NLTK.

Advanced Topics (91-100)

91. Explain the difference between multithreading and multiprocessing in Python.
92. Write a Python program to implement a decorator for logging.
93. How do you use Python's `asyncio` for asynchronous programming?
94. Write a Python program to implement a context manager.
95. Explain the difference between pickling and JSON serialization.
96. How do you implement caching in Python?
97. Write a Python script to handle large files using generators.

98. How do you implement LRU caching in Python?
99. Explain the use of the `__slots__` attribute in Python classes.
100. Write a Python program to create a metaclass.

Here's a **comprehensive list of Python questions for a data science interview**, covering nearly every relevant topic:

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1. Python Basics

1. Explain the key features of Python that make it suitable for data science.
2. How is Python an interpreted language?
3. What are Python's built-in data types?
4. Explain mutable vs. immutable objects in Python.
5. What is the difference between deep copy and shallow copy in Python?

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2. Python Data Structures

6. What are the differences between lists, tuples, sets, and dictionaries in Python?
7. How do you implement a stack or a queue in Python?
8. Write a function to flatten a nested list.
9. Explain the difference between a dictionary and an OrderedDict.
10. How do you perform list comprehensions, and why are they useful?

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3. Data Wrangling (Pandas and NumPy)

11. How do you handle missing data in a Pandas DataFrame?
12. What are the differences between `apply()`, `map()`, and `applymap()` in Pandas?
13. How do you merge, join, and concatenate DataFrames in Pandas?
14. Explain the difference between loc[] and iloc[] in Pandas.
15. Write a Python program to normalize a NumPy array.
16. How do you calculate correlation in a Pandas DataFrame?
17. What are Pandas groupby operations, and when would you use them?
18. Explain the difference between `pivot()` and `pivot_table()` in Pandas.
19. Write a Python script to calculate the rolling mean for a time series.
20. How do you efficiently filter large datasets in Pandas?

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4. Data Visualization (Matplotlib, Seaborn, Plotly)

21. How do you create a bar plot and scatter plot in Matplotlib?
22. What are the advantages of Seaborn over Matplotlib?
23. Explain how to create a heatmap using Seaborn.
24. How do you create interactive visualizations using Plotly?
25. Write a Python script to create a pair plot in Seaborn.
26. How do you customize the appearance of plots (titles, labels, legends) in Matplotlib?

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5. Exploratory Data Analysis

27. What are the key steps in exploratory data analysis (EDA)?
28. Write a Python program to detect outliers in a dataset.
29. How do you visualize the distribution of data in Python?
30. Explain the importance of feature scaling and normalization.

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6. Feature Engineering

31. What is one-hot encoding, and how do you implement it in Python?
32. Explain label encoding and its limitations.
33. How do you handle missing values in a dataset?
34. Write a Python function to perform min-max scaling.
35. How do you create polynomial features in Python?

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7. Statistics and Probability

36. How do you calculate the mean, median, and mode in Python?
37. Write a Python script to calculate standard deviation and variance.
38. Explain the difference between probability density function (PDF) and cumulative distribution function (CDF).
39. How do you implement hypothesis testing in Python?
40. What is the purpose of a p-value, and how do you calculate it?

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8. Machine Learning (scikit-learn, TensorFlow, PyTorch)

41. How do you split a dataset into training and testing sets in scikit-learn?
42. Explain the difference between supervised and unsupervised learning.
43. Write a Python program to calculate the confusion matrix for a classification problem.
44. How do you evaluate a machine learning model using cross-validation?

45. What is the difference between a decision tree and a random forest?
46. Write a Python function to implement linear regression from scratch.
47. How do you handle class imbalance in a dataset?
48. What is overfitting, and how do you prevent it?
49. Explain the use of hyperparameter tuning in scikit-learn.
50. How do you implement gradient descent in Python?

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9. Natural Language Processing (NLP)

51. How do you tokenize text using NLTK?
52. Explain the difference between stemming and lemmatization.
53. Write a Python program to calculate term frequency (TF) and inverse document frequency (IDF).
54. How do you clean text data in Python (e.g., removing stop words, punctuation)?
55. Explain the bag-of-words model and how it is implemented in Python.
56. Write a Python script to calculate cosine similarity between two texts.
57. What are word embeddings, and how are they used in NLP?
58. How do you implement a text classification model in Python?
59. What is topic modeling, and how do you implement it in Python?
60. Write a Python program to generate a word cloud.

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10. Advanced Topics

61. What are generators, and how are they different from iterators?
62. How do you implement multiprocessing in Python?
63. Explain the use of decorators in Python.
64. What is the Global Interpreter Lock (GIL), and how does it affect Python programs?
65. How do you implement caching in Python?
66. What is the purpose of the `with` statement in Python?
67. Write a Python program to implement memoization.
68. How do you handle large datasets using Dask?
69. Explain the difference between threading and multiprocessing in Python.
70. How do you create a REST API using Flask or FastAPI?

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11. Time Series Analysis

71. How do you handle missing timestamps in a time series?
72. Write a Python script to calculate moving averages in a time series.
73. How do you perform seasonal decomposition of time series data in Python?

74. What are ARIMA models, and how do you implement them in Python?
75. How do you forecast time series data using Prophet?

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12. Big Data and Databases

76. How do you connect Python to a SQL database?
77. Write a Python script to perform SQL queries using `sqlite3`.
78. How do you handle large datasets using PySpark?
79. What is the difference between HDFS and traditional file systems?
80. How do you optimize the performance of PySpark jobs?

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13. Evaluation Metrics

81. Write a Python program to calculate accuracy, precision, recall, and F1 score.
82. How do you evaluate a regression model in Python?
83. Explain the difference between ROC-AUC and PR-AUC.
84. Write a Python script to calculate the mean squared error (MSE).
85. How do you evaluate clustering algorithms?

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14. Model Deployment

86. How do you save and load machine learning models in Python?
87. Explain the use of Docker in deploying machine learning models.
88. How do you deploy a machine learning model using Flask or FastAPI?
89. What is MLflow, and how is it used for model tracking and deployment?
90. Write a Python script to create an API endpoint for a trained model.

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15. Data Ethics

91. How do you handle biased data in machine learning?
92. What are the ethical concerns related to data collection and usage?
93. Explain the concept of explainable AI (XAI).
94. How do you ensure data privacy in a machine learning project?
95. What is data lineage, and why is it important?

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16. Coding Challenges

96. Write a Python program to reverse a string without using slicing.
97. How do you find the second largest element in a list?
98. Write a Python program to detect a loop in a linked list.
99. How do you generate Fibonacci numbers using recursion?
100. Write a Python program to sort a list of dictionaries by a specific key.