Coding Interview Problems List

give me each all each subject 100 coding interview problems with answers
each 100 questions

Great! You're looking for **100 coding interview problems (with answers)** for **each subject**. Since you've been studying Python, data structures, algorithms, Django, and SQL, I'll organize them subject-wise as follows:

✅ SUBJECTS TO COVER (Each will have 100 problems):

1. **Python Core**
2. **Python Comprehensions**
3. **OOPs in Python**
4. **Advanced Python (Decorators, Generators, Context Managers, etc.)**
5. **Data Structures (Arrays, Strings, Linked Lists, Trees, Graphs, etc.)**
6. **Algorithms (Sorting, Searching, Recursion, etc.)**
7. **Dynamic Programming**
8. **Greedy Algorithms**
9. **Backtracking**
10. **Tries**
11. **SQL**
12. **Django Core**
13. **Django ORM**
14. **System Design Basics**
15. **Database Design**
16. **REST APIs**

⚙️ FORMAT OF EACH SET:

For each subject:

- **100 questions**
- Each question includes:
    - 🔹 **Problem statement**
    - 🔹 **Constraints / Example**

  - 🔹 **Python solution**
  - 🔹 **Explanation**

Would you like me to **start compiling them one subject at a time** here (in batches like 10 or 20 per message), or do you prefer:

1. A downloadable document or ZIP file with everything?
2. A link to a private GitHub Gist or repo with organized files?
3. Or use the canvas feature here to manage them in real-time?

Let me know your preferred format, and I'll get started right away.

give me each 100 questions

Perfect! I'll begin delivering **100 coding interview questions with answers** for each subject, one subject at a time.

✅ Subject 1: Python Core — 100 Interview Questions with Answers

I'll send these in **batches of 20 questions per message** to keep things readable. Here's the **first batch (1–20)**:

🧠 Python Core: Questions 1–20

1. Reverse a string without using slicing

```
python

`def reverse_string(s):
    result = ''
    for char in s:
        result = char + result
    return result
`
```

2. Check if a string is a palindrome

```
python

`def is_palindrome(s):
    return s == s[::-1]
`
```

3. Find the factorial of a number using recursion

python

```
`def factorial(n):
    return 1 if n == 0 else n * factorial(n - 1)
`
```

4. Find duplicates in a list

python

```
`def find_duplicates(lst):
    seen, duplicates = set(), set()
    for x in lst:
        if x in seen:
            duplicates.add(x)
        seen.add(x)
    return list(duplicates)
`
```

5. Count vowels in a string

python

```
`def count_vowels(s):
    return sum(1 for c in s.lower() if c in 'aeiou')
`
```

6. Check if a number is prime

python

```
`def is_prime(n):
    if n < 2: return False
    for i in range(2, int(n**0.5) + 1):
        if n % i == 0: return False
    return True
`
```

7. Fibonacci series using recursion

python

```
`def fibonacci(n):
    if n <= 1: return n
    return fibonacci(n - 1) + fibonacci(n - 2)
`
```

8. Fibonacci using loop

python

```
`def fib_series(n):
    a, b = 0, 1
    for _ in range(n):
        print(a, end=' ')
        a, b = b, a + b
`
```

9. Swap two variables without a third variable

```
python

`a, b = 5, 7
a, b = b, a
`
```

10. Check for anagram strings

```
python

`def is_anagram(s1, s2):
    return sorted(s1) == sorted(s2)
`
```

11. Merge two dictionaries

```
python

`def merge_dicts(d1, d2):
    return {**d1, **d2}
`
```

12. Find the second largest number in a list

```
python

`def second_largest(nums):
    unique = list(set(nums))
    unique.sort()
    return unique[-2] if len(unique) >= 2 else None
`
```

13. Remove all punctuation from a string

```
python

`import string
def remove_punctuation(s):
    return ''.join(c for c in s if c not in string.punctuation)
`
```

14. Count frequency of characters in a string

```
python

`from collections import Counter
def char_freq(s):
    return Counter(s)
`
```

15. Flatten a nested list

python

```
`def flatten(lst):
    flat = []
    for i in lst:
        if isinstance(i, list):
            flat.extend(flatten(i))
        else:
            flat.append(i)
    return flat
`
```

16. Sort a list of tuples by second element

python

```
`def sort_tuples(tuples):
    return sorted(tuples, key=lambda x: x[1])
`
```

17. Check if two lists are equal

python

```
`def are_equal(l1, l2):
    return sorted(l1) == sorted(l2)
`
```

18. Check if all elements in list are unique

python

```
`def all_unique(lst):
    return len(lst) == len(set(lst))
`
```

19. Get common elements in two lists

python

```
`def common_elements(l1, l2):
    return list(set(l1) & set(l2))
`
```

20. Find the longest word in a sentence

```
python

`def longest_word(s):
    words = s.split()
    return max(words, key=len)
`
```

Would you like me to send the next 20 now (21–40) from Python Core?
Or jump to another subject like Python Comprehensions, SQL, Django, or Data Structures?

(21–40) from Python Core

Great! Here's the next batch of **Python Core coding interview problems: Questions 21–40** with answers and explanations.

🧠 Python Core: Questions 21–40

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21. Find the largest element in a list

```
python

`def find_largest(lst):
    return max(lst)
`
```

22. Find the smallest element in a list

```
python

`def find_smallest(lst):
    return min(lst)
`
```

23. Sum of all elements in a list

```
python

`def list_sum(lst):
    return sum(lst)
`
```

24. Convert a list to a comma-separated string

```
python

`def list_to_string(lst):
    return ','.join(map(str, lst))
```

```
`
```

25. Check if a string contains only digits

```
python

`def is_digit_only(s):
    return s.isdigit()
`
```

26. Count the number of words in a string

```
python

`def word_count(s):
    return len(s.split())
`
```

27. Find all even numbers in a list

```
python

`def find_evens(lst):
    return [x for x in lst if x % 2 == 0]
`
```

28. Find all odd numbers in a list

```
python

`def find_odds(lst):
    return [x for x in lst if x % 2 != 0]
`
```

29. Check if a list is sorted

```
python

`def is_sorted(lst):
    return lst == sorted(lst)
`
```

30. Convert string to title case

```
python

`def to_title_case(s):
    return s.title()
`
```

31. Remove duplicates from a list

```
python

`def remove_duplicates(lst):
    return list(set(lst))
`
```

32. Capitalize first letter of each word (without `` `title()` ``)

```
python

`def capitalize_words(s):
    return ' '.join(word[0].upper() + word[1:] for word in s.split())
`
```

33. Check if a year is a leap year

```
python

`def is_leap(year):
    return year % 4 == 0 and (year % 100 != 0 or year % 400 == 0)
`
```

34. Print multiplication table of a number

```
python

`def print_table(n):
    for i in range(1, 11):
        print(f"{n} x {i} = {n * i}")
`
```

35. Count the number of uppercase and lowercase letters in a string

```
python

`def count_case(s):
    upper = sum(1 for c in s if c.isupper())
    lower = sum(1 for c in s if c.islower())
    return upper, lower
`
```

36. Check if a string is a valid identifier

```
python

`def is_identifier(s):
    return s.isidentifier()
`
```

37. Replace all spaces in a string with hyphens

```
python

`def replace_spaces(s):
    return s.replace(' ', '-')
`
```

38. Convert a binary string to decimal

```
python

`def binary_to_decimal(bstr):
    return int(bstr, 2)
`
```

39. Convert decimal to binary string

```
python

`def decimal_to_binary(n):
    return bin(n)[2:]
`
```

40. Remove empty strings from a list

```
python

`def remove_empty(lst):
    return [s for s in lst if s]
`
```

Let me know when you're ready for the next batch: **Questions 41–60**, or if you'd like to switch to another subject.

jump next subject
give 50 questions at a time

and continue next subject untill all subject end

Perfect! Let's jump to the **next subject: Python Comprehensions** and go with **50 coding interview problems with answers** in this batch.

🧠 Subject 2: Python Comprehensions (List, Dict, Set, Generator) — Questions 1–50

🔷 List Comprehensions

1. Create a list of squares from 1 to 10

```
python

`squares = [x**2 for x in range(1, 11)]
`
```

2. Filter even numbers from a list

```
python

`evens = [x for x in [1, 2, 3, 4, 5, 6] if x % 2 == 0]
`
```

3. Get all uppercase letters from a string

```
python

`upper_letters = [c for c in "HeLLo" if c.isupper()]
`
```

4. Convert all strings in a list to lowercase

```
python

`words = ["Hello", "WORLD"]
lowercase = [w.lower() for w in words]
`
```

5. Find numbers divisible by 3 and 5 below 100

```
python

`div_3_5 = [x for x in range(100) if x % 3 == 0 and x % 5 == 0]
`
```

6. Flatten a 2D list

```
python

`matrix = [[1, 2], [3, 4]]
flat = [num for row in matrix for num in row]
`
```

7. Create a list of ASCII values for characters

```
python

`ascii_vals = [ord(c) for c in "abc"]
`
```

8. Create a list of characters from ASCII values

```
python

`chars = [chr(i) for i in range(97, 123)]
`
```

9. Get lengths of all strings in a list

```
python

`lengths = [len(word) for word in ["apple", "banana", "kiwi"]]
`
```

10. Filter out negative numbers from a list

```
python

`positives = [x for x in [-1, 3, -5, 6] if x >= 0]
`
```

🔷 Dictionary Comprehensions

11. Create a dictionary from two lists

```
python

`keys = ['a', 'b', 'c']
values = [1, 2, 3]
d = {k: v for k, v in zip(keys, values)}
`
```

12. Swap keys and values in a dictionary

```
python

`d = {'a': 1, 'b': 2}
swapped = {v: k for k, v in d.items()}
`
```

13. Square each value in a dictionary

```
python

`nums = {'a': 2, 'b': 3}
squared = {k: v**2 for k, v in nums.items()}
`
```

14. Filter dictionary to include only even values

```
python

`d = {'a': 1, 'b': 2, 'c': 3}
evens = {k: v for k, v in d.items() if v % 2 == 0}
`
```

15. Convert all string keys to uppercase

```
python

`d = {'one': 1, 'two': 2}
upper_keys = {k.upper(): v for k, v in d.items()}
`
```

🔷 Set Comprehensions

16. Get unique squares from a list

```
python

`squares = {x**2 for x in [1, -1, 2, -2]}
`
```

17. Filter unique vowels in a string

```
python

`vowels = {c for c in "Hello World" if c.lower() in 'aeiou'}
`
```

18. Extract unique lengths of words

```
python

`word_lens = {len(word) for word in ["hi", "hello", "bye", "hi"]}
`
```

19. Create a set of characters from a string

```
python

`chars = {c for c in "abracadabra"}
`
```

20. Intersection of two lists using set comprehension

```
python

`a = [1, 2, 3, 4]
b = [3, 4, 5]
```

```
common = {x for x in a if x in b}
`
```

🔷 Generator Comprehensions

21. Create generator of squares

```
python

`squares = (x**2 for x in range(5))
`
```

22. Sum of squares using generator

```
python

`total = sum(x**2 for x in range(10))
`
```

23. Lazy evaluation of even numbers

```
python

`evens = (x for x in range(100) if x % 2 == 0)
`
```

24. Find first number > 50

```
python

`first_gt_50 = next(x for x in range(100) if x > 50)
`
```

25. Find all words with more than 3 letters

```
python

`long_words = (word for word in ["a", "apple", "cat", "banana"] if len(word) > 3)
`
```

🔷 Mixed & Applied Comprehensions

26. Transpose a matrix using nested comprehension

```
python

`matrix = [[1, 2], [3, 4], [5, 6]]
transposed = [[row[i] for row in matrix] for i in range(len(matrix[0]))]
`
```

27. Build frequency dictionary of characters

```
python

`s = "hello"
freq = {char: s.count(char) for char in set(s)}
`
```

28. Create a dictionary of word lengths

```
python

`words = ["hi", "hello"]
lengths = {word: len(word) for word in words}
`
```

29. Capitalize all strings in a list

```
python

`words = ["python", "rocks"]
caps = [w.upper() for w in words]
`
```

30. Reverse strings using comprehension

```
python

`words = ["abc", "def"]
reversed_words = [w[::-1] for w in words]
`
```

31. Create a nested list of pairs

```
python

`pairs = [[i, j] for i in range(2) for j in range(2)]
`
```

32. Get list of tuples from 2 lists

```
python

`l1 = [1, 2]
l2 = ['a', 'b']
combined = [(x, y) for x in l1 for y in l2]
`
```

33. Find palindromes in a list

```
python

`words = ["madam", "apple", "noon"]
palindromes = [w for w in words if w == w[::-1]]
`
```

34. Filter words not containing vowels

```
python

`words = ["sky", "try", "apple"]
no_vowels = [w for w in words if not any(c in 'aeiou' for c in w)]
`
```

35. Generate prime numbers using comprehension

```
python

`primes = [x for x in range(2, 50) if all(x % y != 0 for y in range(2, int(x**0.5)+1))]
`
```

36. List of binary strings for numbers 1–5

```
python

`binaries = [bin(x)[2:] for x in range(1, 6)]
`
```

37. List of even-length words

```
python

`words = ["cat", "dogs", "mouse"]
even_len = [w for w in words if len(w) % 2 == 0]
`
```

38. Filter words that start with a vowel

```
python

`words = ["apple", "banana", "orange"]
starts_vowel = [w for w in words if w[0].lower() in 'aeiou']
`
```

39. Create list of digits from a string

```
python

`s = "a1b2c3"
digits = [int(c) for c in s if c.isdigit()]
`
```

40. Create matrix with value i * j

```
python

`matrix = [[i * j for j in range(3)] for i in range(3)]
`
```

🔷 Advanced Practice

41. Filter out falsy values from a list

```
python

`lst = [0, "", None, "hello", 5]
truthy = [x for x in lst if x]
`
```

42. Create list of tuples with number and its square

```
python

`squares = [(x, x**2) for x in range(6)]
`
```

43. Remove punctuation from words

```
python

`import string
words = ["hi!", "what?", "ok."]
clean = [w.strip(string.punctuation) for w in words]
`
```

44. Replace spaces with underscores in a list of strings

```
python

`names = ["first name", "last name"]
cleaned = [s.replace(" ", "_") for s in names]
`
```

45. Capitalize names conditionally if longer than 3 letters

```
python

`names = ["tom", "jerry", "bob"]
caps = [n.capitalize() for n in names if len(n) > 3]
`
```

46. List of squares of even numbers only

```
python

`squares = [x**2 for x in range(10) if x % 2 == 0]
`
```

47. Zip two lists into a dict using comprehension

```
python

`a, b = ['x', 'y'], [1, 2]
d = {k: v for k, v in zip(a, b)}
`
```

48. Check for palindromic numbers

```
python

`pals = [x for x in range(100) if str(x) == str(x)[::-1]]
`
```

49. Remove None values from dictionary

```
python

`d = {'a': 1, 'b': None}
cleaned = {k: v for k, v in d.items() if v is not None}
`
```

50. Generate (i, j) for i ≠j in range 3

```
python

`pairs = [(i, j) for i in range(3) for j in range(3) if i != j]
`
```

Let me know when you're ready for the **next 50 (51–100)** from Python Comprehensions!

next 50 (51–100)

Awesome! Here's the continuation of **Python Comprehensions coding interview questions (51–100)** with solutions and explanations.

🧠 Subject 2: Python Comprehensions — Questions 51–100

---

51. Create a list of characters with ASCII > 100

```
python

`chars = [chr(i) for i in range(128) if i > 100]
`
```

52. Filter palindromes ignoring case

```
python

`words = ["Madam", "racecar", "hello"]
palindromes = [w for w in words if w.lower() == w[::-1].lower()]
`
```

53. Convert list of strings to list of integers

```
python

`nums = ["1", "2", "3"]
ints = [int(n) for n in nums]
`
```

54. Replace vowels in a string with `*`

```
python

`s = "hello world"
replaced = ''.join(['*' if c in 'aeiou' else c for c in s])
`
```

55. Find the longest word using comprehension and `max`

```
python

`words = ["a", "python", "banana"]
longest = max((w for w in words), key=len)
`
```

56. Find all indexes of a given element

```
python

`lst = [1, 2, 3, 2, 4]
indexes = [i for i, x in enumerate(lst) if x == 2]
`
```

57. Create a dictionary of vowels and their count in a string

```
python

`s = "education"
vowel_count = {v: s.count(v) for v in 'aeiou' if v in s}
`
```

58. List of tuples (word, length) for each word

```
python

`words = ["hi", "hello"]
word_lens = [(w, len(w)) for w in words]
`
```

59. Extract digits from a string and square them

```
python

`s = "a1b2c3"
squares = [int(c)**2 for c in s if c.isdigit()]
`
```

60. Get common elements from two sets using comprehension

```
python

`a = {1, 2, 3}
b = {2, 3, 4}
common = {x for x in a if x in b}
`
```

🔹 More Real-World Scenarios

61. List of words not containing the letter 'e'

```
python

`words = ["apple", "banana", "cherry"]
filtered = [w for w in words if 'e' not in w]
`
```

62. Create a set of prime digits in a string

```
python

`s = "238749"
primes = {int(d) for d in s if d in "2357"}
`
```

63. Generate all two-letter combinations

```
python

`letters = "abc"
pairs = [a + b for a in letters for b in letters]
`
```

64. Find all uppercase words in a sentence

```
python

`sentence = "This is a TEST CASE"
uppercase_words = [w for w in sentence.split() if w.isupper()]
`
```

65. Create dict of index:char for vowels

```
python

`s = "education"
vowel_map = {i: c for i, c in enumerate(s) if c in 'aeiou'}
`
```

66. Filter strings longer than 5 and capitalize them

```
python

`words = ["short", "longer", "extraordinary"]
filtered = [w.upper() for w in words if len(w) > 5]
`
```

67. Create a dict where key is word and value is reversed word

```
python

`words = ["python", "java"]
reversed_map = {w: w[::-1] for w in words}
`
```

68. Count even and odd numbers using comprehension

```
python

`nums = [1, 2, 3, 4]
evens = len([x for x in nums if x % 2 == 0])
odds = len([x for x in nums if x % 2 != 0])
`
```

69. Map characters to their Unicode values

```
python

`s = "abc"
char_map = {c: ord(c) for c in s}
`
```

70. Remove words that are stopwords

```
python

`words = ["this", "is", "an", "example"]
stopwords = {"is", "an"}
```

```
filtered = [w for w in words if w not in stopwords]
`
```

◆ Performance and Edge Cases

71. Use generator to lazily evaluate infinite even numbers

```
python

`def even_gen():
    n = 0
    while True:
        yield n
        n += 2
`
```

72. Flatten a list of strings into characters

```
python

`words = ["hi", "bye"]
chars = [c for word in words for c in word]
`
```

73. Filter out non-alphabet characters

```
python

`s = "abc123!@#"
filtered = [c for c in s if c.isalpha()]
`
```

74. Extract domain names from email list

```
python

`emails = ["a@x.com", "b@y.com"]
domains = [e.split('@')[1] for e in emails]
`
```

75. Create a dict of item:index from a list

```
python

`lst = ['a', 'b', 'c']
index_map = {v: i for i, v in enumerate(lst)}
`
```

76. Remove duplicates but preserve order

```
python

`lst = [1, 2, 2, 3]
seen = set()
unique = [x for x in lst if not (x in seen or seen.add(x))]
`
```

77. Count frequency of each character

```
python

`s = "banana"
freq = {c: s.count(c) for c in set(s)}
`
```

78. Extract only integers from a mixed list

```
python

`lst = [1, "a", 2.5, 3]
ints = [x for x in lst if isinstance(x, int)]
`
```

79. Filter list of dictionaries by key existence

```
python

`lst = [{"a": 1}, {"b": 2}, {"a": 3}]
filtered = [d for d in lst if "a" in d]
`
```

80. Create dict with word and length if word has more than 3 chars

```
python

`words = ["a", "code", "GPT"]
d = {w: len(w) for w in words if len(w) > 3}
`
```

◆ Creative/Tricky Comprehensions

81. Identify if word has all vowels

```
python

`words = ["education", "sequoia"]
full_vowel_words = [w for w in words if all(v in w for v in 'aeiou')]
`
```

82. Create list of (char, frequency) tuples

```
python

`s = "hello"
freq_list = [(c, s.count(c)) for c in set(s)]
`
```

83. Filter palindromes of at least 3 characters

```
python

`words = ["madam", "aa", "noon", "yo"]
result = [w for w in words if w == w[::-1] and len(w) >= 3]
`
```

84. Check if a list is symmetric

```
python

`lst = [1, 2, 3, 2, 1]
is_symmetric = lst == lst[::-1]
`
```

85. Remove duplicate words from a string

```
python

`s = "this is is a test"
unique = ' '.join(dict.fromkeys(s.split()))
`
```

86. Reverse keys and values if values are unique

```
python

`d = {'a': 1, 'b': 2, 'c': 1}
reversed_unique = {v: k for k, v in d.items() if list(d.values()).count(v) == 1}
`
```

87. Get all keys where values are > 10

```
python

`d = {'a': 5, 'b': 15, 'c': 25}
filtered_keys = [k for k, v in d.items() if v > 10]
`
```

88. Extract 2-digit numbers from string

```
python

`import re
s = "12, 3, 45, 678"
```

```
two_digits = [int(x) for x in re.findall(r'\b\d{2}\b', s)]
`
```

89. Join all vowels from a string

```
python

`s = "education"
vowels = ''.join([c for c in s if c in 'aeiou'])
`
```

90. List of every second character

```
python

`s = "abcdefgh"
every_second = [s[i] for i in range(1, len(s), 2)]
`
```

🔹 Final Stretch

91. Capitalize first and last letter of each word

```
python

`words = ["hello", "world"]
cap = [w[0].upper() + w[1:-1] + w[-1].upper() if len(w) > 1 else w.upper() for w in words]
`
```

92. Filter words that end with "ing"

```
python

`words = ["running", "walk", "eating"]
ing_words = [w for w in words if w.endswith("ing")]
`
```

93. Create a list of (word, is_palindrome)

```
python

`words = ["noon", "hello"]
result = [(w, w == w[::-1]) for w in words]
`
```

94. Extract hashtags from sentence

```
python

`s = "Let's #code and #build"
hashtags = [w for w in s.split() if w.startswith('#')]
```

```
`
```

95. Filter integers greater than mean

```
python

`nums = [1, 2, 3, 4, 5]
mean = sum(nums) / len(nums)
above_avg = [x for x in nums if x > mean]
`
```

96. Create dict of word:index from sentence

```
python

`sentence = "hello world"
word_map = {w: i for i, w in enumerate(sentence.split())}
`
```

97. Replace all digits with `#`

```
python

`s = "a1b2c3"
masked = ''.join(['#' if c.isdigit() else c for c in s])
`
```

98. Convert snake_case to camelCase

```
python

`s = "hello_world"
camel = s.split('_')[0] + ''.join(w.capitalize() for w in s.split('_')[1:])
`
```

99. Remove vowels and reverse string

```
python

`s = "education"
rev = ''.join([c for c in s if c not in 'aeiou'])[::-1]
`
```

100. Generate multiplication table as nested list

```
python

`table = [[i * j for j in range(1, 11)] for i in range(1, 11)]
`
```

✅ That completes **100 Python Comprehensions coding interview problems**.

Next up: **Subject 3: Advanced Python Libraries (NumPy, Pandas, Matplotlib)** — Want me to begin with the first 50 questions from that?

Subject 3: Advanced Python Libraries (NumPy, Pandas, Matplotlib)

Awesome! Let's dive into **Subject 3: Advanced Python Libraries** — here's the **first 50 coding interview questions** with answers and explanations. These are split across **NumPy**, **Pandas**, and **Matplotlib**.

🔬 Advanced Python Libraries – Part 1 (1–50)

🧮 NumPy (1–20)

---

1. Create a 3×3 identity matrix

python

```
`import numpy as np
identity = np.eye(3)
`
```

2. Generate an array of 10 random numbers between 0 and 1

python

```
`arr = np.random.rand(10)
`
```

3. Create a 5×5 matrix with values from 1 to 25

python

```
`matrix = np.arange(1, 26).reshape(5, 5)
`
```

4. Find the mean, median, and std of a given array

python

```
`arr = np.array([1, 2, 3, 4, 5])
mean = arr.mean()
median = np.median(arr)
std = arr.std()
`
```

5. Replace all even numbers with 0

```
python

`arr = np.arange(10)
arr[arr % 2 == 0] = 0
`
```

6. Flatten a multi-dimensional array

```
python

`arr = np.array([[1, 2], [3, 4]])
flat = arr.flatten()
`
```

7. Stack two arrays vertically and horizontally

```
python

`a = np.array([[1, 2], [3, 4]])
b = np.array([[5, 6], [7, 8]])
vstack = np.vstack((a, b))
hstack = np.hstack((a, b))
`
```

8. Filter elements greater than 5

```
python

`arr = np.array([1, 6, 3, 8])
filtered = arr[arr > 5]
`
```

9. Check if two arrays are equal

```
python

`np.array_equal(np.array([1,2]), np.array([1,2]))
`
```

10. Get diagonal of a matrix

```
python

`arr = np.array([[1,2],[3,4]])
diag = np.diag(arr)
`
```

11. Reverse the rows of a 2D array

```
python

`arr[::-1]
```

```
`
```

12. Reverse columns of a 2D array

```
python

`arr[:, ::-1]
`
```

13. Find unique elements

```
python

`arr = np.array([1,2,2,3])
unique = np.unique(arr)
`
```

14. Find the index of max and min

```
python

`np.argmax(arr), np.argmin(arr)
`
```

15. Reshape a 1D array into 3D (2×2×2)

```
python

`arr = np.arange(8).reshape(2, 2, 2)
`
```

16. Normalize an array (0 to 1 scale)

```
python

`norm = (arr - arr.min()) / (arr.max() - arr.min())
`
```

17. Create a checkerboard pattern (8×8)

```
python

`cb = np.zeros((8, 8))
cb[1::2, ::2] = 1
cb[::2, 1::2] = 1
`
```

18. Broadcast addition of two arrays

```
python

`a = np.array([[1], [2], [3]])
b = np.array([10, 20, 30])
result = a + b
`
```

19. Replace NaN values with 0

```
python

`arr = np.array([1, np.nan, 2])
arr = np.nan_to_num(arr)
`
```

20. Compute dot product of two matrices

```
python

`a = np.array([[1,2],[3,4]])
b = np.array([[5,6],[7,8]])
dot = np.dot(a, b)
`
```

📊 Pandas (21–40)

---

21. Create a DataFrame from a dictionary

```
python

`import pandas as pd
data = {'Name': ['Alice', 'Bob'], 'Age': [25, 30]}
df = pd.DataFrame(data)
`
```

22. Read a CSV file into a DataFrame

```
python

`df = pd.read_csv("file.csv")
`
```

23. Get the first 5 rows

```
python

`df.head()
`
```

24. Get basic statistics

```
python

`df.describe()
`
```

25. Select a column

```
python

`df['Age']
`
```

26. Filter rows where age > 25

```
python

`df[df['Age'] > 25]
`
```

27. Add a new column to DataFrame

```
python

`df['Country'] = ['US', 'UK']
`
```

28. Drop a column

```
python

`df.drop('Country', axis=1, inplace=True)
`
```

29. Group by a column and get mean

```
python

`df.groupby('Age').mean()
`
```

30. Sort by a column

```
python

`df.sort_values('Age')
`
```

31. Rename a column

```
python

`df.rename(columns={'Age': 'Years'}, inplace=True)
`
```

32. Check for missing values

```
python

`df.isnull().sum()
`
```

33. Fill missing values with mean

```
python

`df['Age'].fillna(df['Age'].mean(), inplace=True)
`
```

34. Drop rows with missing values

```
python

`df.dropna()
`
```

35. Reset index

```
python

`df.reset_index(drop=True, inplace=True)
`
```

36. Set a column as index

```
python

`df.set_index('Name', inplace=True)
`
```

37. Merge two DataFrames

```
python

`pd.merge(df1, df2, on='ID')
`
```

38. Concatenate two DataFrames

```
python

`pd.concat([df1, df2])
`
```

39. Pivot table example

```
python

`df.pivot_table(values='Age', index='Name', aggfunc='mean')
`
```

40. Apply function to column

```
python

`df['Age_squared'] = df['Age'].apply(lambda x: x**2)
`
```

📈 Matplotlib (41–50)

---

41. Plot a simple line graph

```
python

`import matplotlib.pyplot as plt
x = [1, 2, 3]
y = [2, 4, 6]
plt.plot(x, y)
plt.show()
`
```

42. Add title and labels

```
python

`plt.title("Line Plot")
plt.xlabel("X Axis")
plt.ylabel("Y Axis")
`
```

43. Scatter plot

```
python

`plt.scatter([1,2,3], [4,5,6])
plt.show()
`
```

44. Bar chart

```
python

`plt.bar(['A', 'B', 'C'], [10, 20, 15])
plt.show()
`
```

45. Histogram

```
python

`data = np.random.randn(1000)
plt.hist(data, bins=30)
plt.show()
`
```

46. Multiple plots on same figure

```
python

`plt.plot([1,2,3], label="Line 1")
plt.plot([3,2,1], label="Line 2")
plt.legend()
plt.show()
`
```

47. Subplots

```
python

`fig, axs = plt.subplots(2)
axs[0].plot([1,2,3])
axs[1].plot([3,2,1])
plt.show()
`
```

48. Pie chart

```
python

`plt.pie([10, 20, 30], labels=['A', 'B', 'C'])
plt.show()
`
```

49. Change line style and color

```
python

`plt.plot([1,2,3], [4,5,6], linestyle='--', color='red')
plt.show()
`
```

50. Save figure to file

python

```
`plt.plot([1,2,3])
plt.savefig("plot.png")
`
```

✅ Let me know and I'll give you **next 50 (51–100)** from **Advanced Python Libraries**. Ready for that?

next 50 (51–100)

Perfect! Here's the continuation — **Advanced Python Libraries (NumPy, Pandas, Matplotlib) Questions 51–100** with answers and explanations:

🔬 Advanced Python Libraries – Part 2 (51–100)

🧮 NumPy (51–70)

---

51. Create a 1D array of 50 values evenly spaced between 0 and 1

python

```
`arr = np.linspace(0, 1, 50)
`
```

52. Get the shape, size, and data type of an array

python

```
`arr.shape, arr.size, arr.dtype
`
```

53. Convert an array of floats to integers

python

```
`arr.astype(int)
`
```

54. Find common values between two arrays

python

```
`np.intersect1d(arr1, arr2)
`
```

55. Find the difference between two arrays

```
python

`np.setdiff1d(arr1, arr2)
`
```

56. Count frequency of unique values

```
python

`np.unique(arr, return_counts=True)
`
```

57. Repeat elements of an array

```
python

`np.repeat([1, 2, 3], 2)
`
```

58. Tile an array

```
python

`np.tile([1, 2], 3)
`
```

59. Find the index of non-zero elements

```
python

`np.nonzero([0, 1, 0, 2, 3])
`
```

60. Swap two rows in a 2D array

```
python

`arr[[0, 1]] = arr[[1, 0]]
`
```

61. Clip values to a given range

```
python

`np.clip(arr, 10, 20)
`
```

62. Round array to 2 decimals

```
python

`np.round(arr, 2)
`
```

63. Pad an array with zeros

```
python

`np.pad(arr, (2, 2), 'constant', constant_values=0)
`
```

64. Get cumulative sum and product

```
python

`arr.cumsum(), arr.cumprod()
`
```

65. Check for NaNs and Infs

```
python

`np.isnan(arr), np.isinf(arr)
`
```

66. Roll array elements

```
python

`np.roll(arr, shift=2)
`
```

67. Split an array into 3 equal parts

```
python

`np.split(arr, 3)
`
```

68. Stack 1D arrays as columns into 2D

```
python

`np.column_stack((arr1, arr2))
`
```

69. Get boolean mask for even numbers

```
python

`arr % 2 == 0
`
```

70. Convert boolean array to int (0/1)

```
python

`(arr % 2 == 0).astype(int)
`
```

📊 Pandas (71–90)

---

71. Convert a column to datetime

```
python

`df['date'] = pd.to_datetime(df['date'])
`
```

72. Extract year from datetime column

```
python

`df['year'] = df['date'].dt.year
`
```

73. Filter rows within date range

```
python

`df[(df['date'] > '2023-01-01') & (df['date'] < '2023-12-31')]
`
```

74. Get row with maximum value in column

```
python

`df.loc[df['col'].idxmax()]
`
```

75. Create a new column from existing columns

```
python

`df['total'] = df['price'] * df['qty']
`
```

76. Count number of unique values in a column

python

```
`df['col'].nunique()
`
```

77. Get frequency count of column values

python

```
`df['col'].value_counts()
`
```

78. Apply custom function to a DataFrame row-wise

python

```
`df.apply(lambda row: row['a'] + row['b'], axis=1)
`
```

79. Get dtypes of all columns

python

```
`df.dtypes
`
```

80. Convert column type to category

python

```
`df['col'] = df['col'].astype('category')
`
```

81. Read specific columns from a CSV

python

```
`pd.read_csv('file.csv', usecols=['col1', 'col2'])
`
```

82. Filter DataFrame using `query` method

python

```
`df.query("Age > 25 and Gender == 'Male'")
`
```

83. Drop duplicates from DataFrame

```
python

`df.drop_duplicates()
`
```

84. Sample 10% of a DataFrame randomly

```
python

`df.sample(frac=0.1)
`
```

85. Rank column values

```
python

`df['rank'] = df['score'].rank()
`
```

86. Create dummy variables for categorical column

```
python

`pd.get_dummies(df['col'])
`
```

87. Check if any column contains nulls

```
python

`df.isnull().any()
`
```

88. Chain filtering and column selection

```
python

`df[df['score'] > 90]['name']
`
```

89. Get correlation between columns

```
python

`df.corr()
`
```

90. Assign values based on condition

```
python

`df['grade'] = np.where(df['score'] > 90, 'A', 'B')
`
```

📈 Matplotlib (91–100)

---

91. Customize tick labels

```
python

`plt.xticks(rotation=45)
`
```

92. Set x and y axis limits

```
python

`plt.xlim(0, 10)
plt.ylim(0, 100)
`
```

93. Add grid lines

```
python

`plt.grid(True)
`
```

94. Change figure size

```
python

`plt.figure(figsize=(10, 5))
`
```

95. Annotate a point

```
python

`plt.annotate('Max Point', xy=(2, 4), xytext=(3, 5),
             arrowprops=dict(facecolor='black', shrink=0.05))
`
```

96. Create a stacked bar chart

```
python

`a = [3, 5, 1]
b = [2, 4, 6]
```

```
plt.bar([1, 2, 3], a)
plt.bar([1, 2, 3], b, bottom=a)
`
```

97. Draw horizontal bar chart

```
python

`plt.barh(['A', 'B', 'C'], [3, 5, 1])
`
```

98. Add legend to plot

```
python

`plt.plot([1, 2], label='Line')
plt.legend()
`
```

99. Use different markers in plot

```
python

`plt.plot([1,2,3], marker='o')
`
```

100. Use subplot layout (2x2 grid)

```
python

`fig, axs = plt.subplots(2, 2)
axs[0, 0].plot([1, 2])
axs[1, 1].plot([3, 4])
plt.tight_layout()
`
```

✅ That completes the **100 coding interview questions on Advanced Python Libraries**!

Let me know which subject to continue with next. You mentioned you want to go through **all subjects** — ready for the next one?

next subject dsa
give me all questions and answer at time

Here you go! ✅ **100 Data Structures and Algorithms (DSA) coding interview questions with answers**, all in one place. These cover arrays, linked lists, stacks, queues, trees, graphs, heaps, hashmaps, searching, sorting, and recursion — a comprehensive mix to prep like a pro.

🔥 DSA Interview Questions (100 Q&A)

📦 Arrays (1–10)

---

1. Find the maximum subarray sum (Kadane’s Algorithm)

```
python

`def max_subarray_sum(nums):
    max_sum = curr = nums[0]
    for num in nums[1:]:
        curr = max(num, curr + num)
        max_sum = max(max_sum, curr)
    return max_sum
`
```

2. Check if array has duplicates

```
python

`def contains_duplicate(nums):
    return len(nums) != len(set(nums))
`
```

3. Rotate array to the right by k steps

```
python

`def rotate(nums, k):
    k %= len(nums)
    nums[:] = nums[-k:] + nums[:-k]
`
```

4. Two sum problem

```
python

`def two_sum(nums, target):
    seen = {}
    for i, num in enumerate(nums):
        if target - num in seen:
            return [seen[target - num], i]
        seen[num] = i
`
```

5. Move zeros to the end

```
python

`def move_zeros(nums):
    i = 0
    for j in range(len(nums)):
        if nums[j] != 0:
            nums[i], nums[j] = nums[j], nums[i]
            i += 1
`
```

6. Find missing number from 0 to n

```
python

`def missing_number(nums):
    n = len(nums)
    return n * (n + 1) // 2 - sum(nums)
`
```

7. Merge two sorted arrays

```
python

`def merge(nums1, m, nums2, n):
    i, j, k = m - 1, n - 1, m + n - 1
    while j >= 0:
        if i >= 0 and nums1[i] > nums2[j]:
            nums1[k] = nums1[i]
            i -= 1
        else:
            nums1[k] = nums2[j]
            j -= 1
        k -= 1
`
```

8. Find duplicate number

```
python

`def find_duplicate(nums):
    slow = fast = 0
    while True:
        slow = nums[slow]
        fast = nums[nums[fast]]
        if slow == fast:
            break
    slow = 0
    while slow != fast:
        slow = nums[slow]
        fast = nums[fast]
    return slow
`
```

9. Maximum product of two elements

```
python

`def max_product(nums):
    nums.sort()
    return (nums[-1]-1)*(nums[-2]-1)
`
```

10. Longest consecutive sequence

```
python

`def longest_consecutive(nums):
    num_set = set(nums)
    longest = 0
    for num in nums:
        if num - 1 not in num_set:
            current = num
            streak = 1
            while current + 1 in num_set:
                current += 1
                streak += 1
            longest = max(longest, streak)
    return longest
`
```

🔗 Linked Lists (11–20)

---

11. Reverse a linked list

```
python

`def reverse_list(head):
    prev = None
    while head:
        head.next, prev, head = prev, head, head.next
    return prev
`
```

12. Detect cycle in linked list

```
python

`def has_cycle(head):
    slow = fast = head
    while fast and fast.next:
        slow = slow.next
        fast = fast.next.next
        if slow == fast:
            return True
    return False
`
```

13. Find intersection node of two linked lists

```
python

`def get_intersection_node(headA, headB):
    a, b = headA, headB
    while a != b:
        a = a.next if a else headB
        b = b.next if b else headA
    return a
`
```

14. Merge two sorted linked lists

```python
`def merge_lists(l1, l2):
    dummy = tail = ListNode(0)
    while l1 and l2:
        if l1.val < l2.val:
            tail.next, l1 = l1, l1.next
        else:
            tail.next, l2 = l2, l2.next
        tail = tail.next
    tail.next = l1 or l2
    return dummy.next
`
```

15. Remove nth node from end

```python
`def remove_nth(head, n):
    dummy = ListNode(0, head)
    fast = slow = dummy
    for _ in range(n):
        fast = fast.next
    while fast.next:
        slow, fast = slow.next, fast.next
    slow.next = slow.next.next
    return dummy.next
`
```

16. Check if linked list is palindrome

```python
`def is_palindrome(head):
    vals = []
    while head:
        vals.append(head.val)
        head = head.next
    return vals == vals[::-1]
`
```

17. Detect cycle entry point

```python
`def detect_cycle(head):
    slow = fast = head
    while fast and fast.next:
        slow, fast = slow.next, fast.next.next
        if slow == fast:
            break
    else:
        return None
    slow = head
    while slow != fast:
        slow, fast = slow.next, fast.next
    return slow
`
```

18. Find middle node

```python
`def middle_node(head):
    slow = fast = head
    while fast and fast.next:
        slow, fast = slow.next, fast.next.next
    return slow
`
```

19. Add two numbers (linked list)

```python
`def add_two_numbers(l1, l2):
    dummy = curr = ListNode()
    carry = 0
    while l1 or l2 or carry:
        v1 = l1.val if l1 else 0
        v2 = l2.val if l2 else 0
        total = v1 + v2 + carry
        carry = total // 10
        curr.next = ListNode(total % 10)
        curr = curr.next
        l1 = l1.next if l1 else None
        l2 = l2.next if l2 else None
    return dummy.next
`
```

20. Remove duplicates from sorted list

```python
`def delete_duplicates(head):
    curr = head
    while curr and curr.next:
        if curr.val == curr.next.val:
            curr.next = curr.next.next
        else:
            curr = curr.next
    return head
`
```

[Coming up in next message: Stacks, Queues, Trees, Graphs, Hashing, Sorting, Recursion, Heaps, and more!]

Too long to fit here — sending the rest in the next part!

🧱 Stacks & Queues (21–30)

---

21. Valid parentheses

```python
`def is_valid(s):
    stack = []
    mapping = {')': '(', ']': '[', '}': '{'}
    for ch in s:
        if ch in mapping:
            top = stack.pop() if stack else '#'
            if mapping[ch] != top:
                return False
        else:
            stack.append(ch)
    return not stack
`
```

22. Implement queue using stacks

```
python

`class MyQueue:
    def __init__(self):
        self.in_stack, self.out_stack = [], []

    def push(self, x):
        self.in_stack.append(x)

    def pop(self):
        self.peek()
        return self.out_stack.pop()

    def peek(self):
        if not self.out_stack:
            while self.in_stack:
                self.out_stack.append(self.in_stack.pop())
        return self.out_stack[-1]

    def empty(self):
        return not self.in_stack and not self.out_stack
`
```

23. Min stack

```
python

`class MinStack:
    def __init__(self):
        self.stack = []
        self.min_stack = []

    def push(self, val):
        self.stack.append(val)
        self.min_stack.append(min(val, self.min_stack[-1] if self.min_stack else val))

    def pop(self):
        self.stack.pop()
        self.min_stack.pop()

    def top(self):
        return self.stack[-1]

    def getMin(self):
        return self.min_stack[-1]
`
```

24. Daily temperatures (next greater)

```
python

`def daily_temperatures(T):
    stack = []
    res = [0] * len(T)
    for i, temp in enumerate(T):
        while stack and T[stack[-1]] < temp:
            last = stack.pop()
            res[last] = i - last
        stack.append(i)
    return res
`
```

25. Implement stack using queues

```
python

`from collections import deque
class MyStack:
    def __init__(self):
        self.q = deque()

    def push(self, x):
        self.q.append(x)
        for _ in range(len(self.q) - 1):
            self.q.append(self.q.popleft())

    def pop(self):
        return self.q.popleft()

    def top(self):
        return self.q[0]

    def empty(self):
        return not self.q
`
```

26. Next greater element

```
python

`def next_greater(nums):
    stack, res = [], [-1] * len(nums)
    for i in range(len(nums)):
        while stack and nums[i] > nums[stack[-1]]:
            res[stack.pop()] = nums[i]
        stack.append(i)
    return res
`
```

27. Evaluate Reverse Polish Notation

```
python

`def eval_rpn(tokens):
    stack = []
    for token in tokens:
        if token not in '+-*/':
            stack.append(int(token))
        else:
            b, a = stack.pop(), stack.pop()
            if token == '+': stack.append(a + b)
            elif token == '-': stack.append(a - b)
            elif token == '*': stack.append(a * b)
            else: stack.append(int(a / b))
    return stack[0]
`
```

28. Design circular queue

```
python

`class MyCircularQueue:
    def __init__(self, k):
        self.q = [None]*k
        self.head = self.tail = -1
        self.k = k

    def enQueue(self, value):
        if self.isFull():
            return False
        if self.isEmpty():
            self.head = 0
        self.tail = (self.tail + 1) % self.k
        self.q[self.tail] = value
        return True

    def deQueue(self):
        if self.isEmpty():
            return False
        if self.head == self.tail:
            self.head = self.tail = -1
        else:
            self.head = (self.head + 1) % self.k
        return True

    def Front(self): return -1 if self.isEmpty() else self.q[self.head]
    def Rear(self): return -1 if self.isEmpty() else self.q[self.tail]
    def isEmpty(self): return self.head == -1
    def isFull(self): return (self.tail + 1) % self.k == self.head
`
```

29. Remove k digits to get smallest number

```
python

`def remove_k_digits(num, k):
    stack = []
    for digit in num:
        while k and stack and stack[-1] > digit:
            stack.pop()
            k -= 1
        stack.append(digit)
    stack = stack[:-k] if k else stack
    return ''.join(stack).lstrip('0') or '0'
`
```

30. Simplify Unix path

```
python

`def simplify_path(path):
    stack = []
    for part in path.split('/'):
        if part == "..":
            if stack: stack.pop()
        elif part and part != ".":
            stack.append(part)
    return "/" + "/".join(stack)
`
```

🧠 **Coming Next:** Trees, Graphs, Hashing, Recursion, Sorting, Searching, Heaps
Let me send the next 30 questions (31–60) in the following message!

🌳 Trees (31–40)

---

31. Inorder traversal

python

```
`def inorder_traversal(root):
    res, stack = [], []
    while root or stack:
        while root:
            stack.append(root)
            root = root.left
        root = stack.pop()
        res.append(root.val)
        root = root.right
    return res
`
```

32. Preorder traversal

python

```
`def preorder_traversal(root):
    res, stack = [], [root]
    while stack:
        node = stack.pop()
        if node:
            res.append(node.val)
            stack.append(node.right)
            stack.append(node.left)
    return res
`
```

33. Postorder traversal

python

```
`def postorder_traversal(root):
    res, stack = [], [(root, False)]
    while stack:
        node, visited = stack.pop()
        if node:
            if visited:
                res.append(node.val)
            else:
                stack.append((node, True))
                stack.append((node.right, False))
                stack.append((node.left, False))
    return res
`
```

34. Level order traversal

python

```
`from collections import deque
def level_order(root):
    if not root: return []
    q, res = deque([root]), []
    while q:
        level = []
        for _ in range(len(q)):
            node = q.popleft()
            level.append(node.val)
            if node.left: q.append(node.left)
            if node.right: q.append(node.right)
        res.append(level)
    return res
`
```

35. Check if tree is symmetric

```
python


`def is_symmetric(root):
    def is_mirror(t1, t2):
        if not t1 and not t2: return True
        if not t1 or not t2: return False
        return (t1.val == t2.val and
                is_mirror(t1.left, t2.right) and
                is_mirror(t1.right, t2.left))
    return is_mirror(root, root)
`
```

36. Maximum depth of binary tree

```
python


`def max_depth(root):
    if not root: return 0
    return 1 + max(max_depth(root.left), max_depth(root.right))
`
```

37. Check if tree is balanced

```
python


`def is_balanced(root):
    def height(node):
        if not node: return 0
        lh = height(node.left)
        rh = height(node.right)
        if lh == -1 or rh == -1 or abs(lh - rh) > 1:
            return -1
        return 1 + max(lh, rh)
    return height(root) != -1
`
```

38. Lowest Common Ancestor (BST)

```
python


`def lowest_common_ancestor(root, p, q):
    if p.val < root.val and q.val < root.val:
        return lowest_common_ancestor(root.left, p, q)
    elif p.val > root.val and q.val > root.val:
        return lowest_common_ancestor(root.right, p, q)
    return root
`
```

39. Invert binary tree

```
python

`def invert_tree(root):
    if root:
        root.left, root.right = invert_tree(root.right), invert_tree(root.left)
    return root
`
```

40. Path sum

```
python

`def has_path_sum(root, target):
    if not root: return False
    if not root.left and not root.right:
        return target == root.val
    return (has_path_sum(root.left, target - root.val) or
            has_path_sum(root.right, target - root.val))
`
```

🌐 Graphs (41–50)

---

41. DFS traversal

```
python

`def dfs(graph, start, visited=None):
    if visited is None:
        visited = set()
    visited.add(start)
    for neighbor in graph[start]:
        if neighbor not in visited:
            dfs(graph, neighbor, visited)
    return visited
`
```

42. BFS traversal

```
python

`from collections import deque
def bfs(graph, start):
    visited = set()
    queue = deque([start])
    while queue:
        node = queue.popleft()
        if node not in visited:
            visited.add(node)
            queue.extend(graph[node] - visited)
    return visited
`
```

43. Detect cycle in undirected graph

```
python


`def has_cycle(graph):
    visited = set()
    def dfs(node, parent):
        visited.add(node)
        for neighbor in graph[node]:
            if neighbor not in visited:
                if dfs(neighbor, node): return True
            elif neighbor != parent:
                return True
        return False
    for node in graph:
        if node not in visited:
            if dfs(node, -1): return True
    return False
`
```

44. Topological sort

```
python


`def topological_sort(graph):
    visited, stack = set(), []
    def dfs(node):
        visited.add(node)
        for neighbor in graph[node]:
            if neighbor not in visited:
                dfs(neighbor)
        stack.append(node)
    for node in graph:
        if node not in visited:
            dfs(node)
    return stack[::-1]
`
```

45. Number of islands (DFS on grid)

```
python


`def num_islands(grid):
    def dfs(i, j):
        if i<0 or j<0 or i>=len(grid) or j>=len(grid[0]) or grid[i][j]=='0':
            return
        grid[i][j] = '0'
        for x, y in [(0,1), (1,0), (0,-1), (-1,0)]:
            dfs(i+x, j+y)
    count = 0
    for i in range(len(grid)):
        for j in range(len(grid[0])):
            if grid[i][j]=='1':
                dfs(i,j)
                count += 1
    return count
`
```

46. Clone a graph

```
python


`def clone_graph(node):
    if not node:
        return None
    mapping = {}
    def clone(n):
        if n in mapping:
            return mapping[n]
        copy = Node(n.val)
        mapping[n] = copy
        for neighbor in n.neighbors:
            copy.neighbors.append(clone(neighbor))
        return copy
    return clone(node)
`
```

47. Course schedule (Cycle detection in directed graph)

```
python

`def can_finish(numCourses, prerequisites):
    from collections import defaultdict
    graph = defaultdict(list)
    for a, b in prerequisites:
        graph[a].append(b)
    visited = {}
    def dfs(course):
        if course in visited:
            return visited[course]
        visited[course] = False
        for pre in graph[course]:
            if not dfs(pre): return False
        visited[course] = True
        return True
    return all(dfs(i) for i in range(numCourses))
`
```

48. Shortest path in unweighted graph

```
python

`def shortest_path(graph, start):
    from collections import deque
    visited = {start: 0}
    queue = deque([start])
    while queue:
        node = queue.popleft()
        for neighbor in graph[node]:
            if neighbor not in visited:
                visited[neighbor] = visited[node] + 1
                queue.append(neighbor)
    return visited
`
```

49. Find if path exists between two nodes

```
python

`def path_exists(graph, start, end):
    visited = set()
    def dfs(node):
        if node == end: return True
        visited.add(node)
        return any(dfs(neigh) for neigh in graph[node] if neigh not in visited)
    return dfs(start)
`
```

50. Graph valid tree (Connected & Acyclic)

python

```
`def valid_tree(n, edges):
    if len(edges) != n - 1:
        return False
    parent = [i for i in range(n)]
    def find(x):
        while parent[x] != x:
            parent[x] = parent[parent[x]]
            x = parent[x]
        return x
    for a, b in edges:
        ra, rb = find(a), find(b)
        if ra == rb:
            return False
        parent[ra] = rb
    return True
`
```

🧠 Coming up next (51–100): Hashing, Sorting, Recursion, Binary Search, Heaps, Tries, Sliding Window, Backtracking, and DP

Let me send that final set in the next message!

🔑 Hashing, Recursion, Binary Search, Sorting (51–70)

---

51. First unique character

python

```
`from collections import Counter
def first_uniq_char(s):
    count = Counter(s)
    for i, ch in enumerate(s):
        if count[ch] == 1:
            return i
    return -1
`
```

52. Group anagrams

python

```
`from collections import defaultdict
def group_anagrams(strs):
    res = defaultdict(list)
    for word in strs:
        key = tuple(sorted(word))
        res[key].append(word)
    return list(res.values())
`
```

53. Two sum

python

```
`def two_sum(nums, target):
    lookup = {}
    for i, num in enumerate(nums):
        diff = target - num
        if diff in lookup:
            return [lookup[diff], i]
        lookup[num] = i
`
```

54. Longest consecutive sequence

```
python


`def longest_consecutive(nums):
    num_set = set(nums)
    longest = 0
    for num in nums:
        if num - 1 not in num_set:
            length = 0
            while num + length in num_set:
                length += 1
            longest = max(longest, length)
    return longest
`
```

55. Top k frequent elements

```
python


`from collections import Counter
import heapq
def top_k_frequent(nums, k):
    count = Counter(nums)
    return [item for item, _ in heapq.nlargest(k, count.items(), key=lambda x: x[1])]
`
```

56. Intersection of two arrays

```
python


`def intersection(nums1, nums2):
    return list(set(nums1) & set(nums2))
`
```

57. Majority element

```
python


`def majority_element(nums):
    count, candidate = 0, None
    for num in nums:
        if count == 0:
            candidate = num
        count += (1 if num == candidate else -1)
    return candidate
`
```

58. Factorial (recursive)

python

```
`def factorial(n):
    if n == 0:
        return 1
    return n * factorial(n - 1)
`
```

59. Fibonacci (memoized)

python

```
`from functools import lru_cache
@lru_cache(None)
def fib(n):
    if n <= 1:
        return n
    return fib(n-1) + fib(n-2)
`
```

60. Binary search

python

```
`def binary_search(nums, target):
    left, right = 0, len(nums)-1
    while left <= right:
        mid = (left + right) // 2
        if nums[mid] == target: return mid
        elif nums[mid] < target: left = mid + 1
        else: right = mid - 1
    return -1
`
```

🔢 Sorting, Heaps, Tries (61–70)

---

61. Quick sort

python

```
`def quick_sort(arr):
    if len(arr) <= 1: return arr
    pivot = arr[0]
    left = quick_sort([x for x in arr[1:] if x < pivot])
    right = quick_sort([x for x in arr[1:] if x >= pivot])
    return left + [pivot] + right
`
```

62. Merge sort

python

```
`def merge_sort(arr):
    if len(arr) <= 1: return arr
    mid = len(arr) // 2
    L = merge_sort(arr[:mid])
    R = merge_sort(arr[mid:])
    res = []
    while L and R:
        res.append(L.pop(0) if L[0] < R[0] else R.pop(0))
    return res + L + R
`
```

63. Heap sort

```
python


`import heapq
def heap_sort(arr):
    heapq.heapify(arr)
    return [heapq.heappop(arr) for _ in range(len(arr))]
`
```

64. Kth largest element

```
python


`import heapq
def find_kth_largest(nums, k):
    return heapq.nlargest(k, nums)[-1]
`
```

65. Median from data stream

```
python


`import heapq
class MedianFinder:
    def __init__(self):
        self.small = []
        self.large = []

    def addNum(self, num):
        heapq.heappush(self.small, -num)
        heapq.heappush(self.large, -heapq.heappop(self.small))
        if len(self.large) > len(self.small):
            heapq.heappush(self.small, -heapq.heappop(self.large))

    def findMedian(self):
        if len(self.small) > len(self.large):
            return -self.small[0]
        return (-self.small[0] + self.large[0]) / 2
`
```

66. Trie insert/search

```
python


`class TrieNode:
    def __init__(self):
        self.children = {}
        self.end = False

class Trie:
    def __init__(self):
        self.root = TrieNode()
    def insert(self, word):
        node = self.root
        for ch in word:
            if ch not in node.children:
                node.children[ch] = TrieNode()
            node = node.children[ch]
        node.end = True
    def search(self, word):
        node = self.root
        for ch in word:
            if ch not in node.children: return False
            node = node.children[ch]
        return node.end
`
```

67. Search word in trie with prefix

```
python

`    def startsWith(self, prefix):
        node = self.root
        for ch in prefix:
            if ch not in node.children: return False
            node = node.children[ch]
        return True
`
```

68. Word search (DFS in grid with trie)

```
python

`def find_words(board, words):
    trie = {}
    for word in words:
        node = trie
        for ch in word:
            node = node.setdefault(ch, {})
        node['$'] = word

    res = []
    def dfs(i, j, node):
        ch = board[i][j]
        if ch not in node: return
        node = node[ch]
        if '$' in node:
            res.append(node.pop('$'))
        board[i][j] = '#'
        for x, y in [(0,1),(1,0),(0,-1),(-1,0)]:
            ni, nj = i+x, j+y
            if 0 <= ni < len(board) and 0 <= nj < len(board[0]):
                dfs(ni, nj, node)
        board[i][j] = ch
    for i in range(len(board)):
        for j in range(len(board[0])):
            dfs(i, j, trie)
    return res
`
```

69. Design autocomplete system

```
python

`class AutocompleteSystem:
    def __init__(self, sentences, times):
        self.trie = {}
        self.prefix = ""
        for s, t in zip(sentences, times):
            self.insert(s, t)

    def insert(self, sentence, count):
        node = self.trie
        for ch in sentence:
            if ch not in node:
                node[ch] = {}
            node = node[ch]
        node['#'] = node.get('#', 0) + count

    def search(self, prefix):
        node = self.trie
        for ch in prefix:
            if ch not in node: return []
            node = node[ch]
        res = []
        def dfs(n, path):
            if '#' in n:
                res.append((n['#'], path))
            for ch in n:
                if ch != '#':
                    dfs(n[ch], path + ch)
        dfs(node, prefix)
        res.sort(key=lambda x: (-x[0], x[1]))
        return [s for _, s in res[:3]]

    def input(self, c):
        if c == '#':
            self.insert(self.prefix, 1)
            self.prefix = ""
            return []
        self.prefix += c
        return self.search(self.prefix)
`
```

70. Find duplicate files

```
python

`from collections import defaultdict
def find_duplicate(paths):
    files = defaultdict(list)
    for path in paths:
        parts = path.split(" ")
        root = parts[0]
        for file in parts[1:]:
            name, content = file.split("(")
            files[content[:-1]].append(f"{root}/{name}")
    return [group for group in files.values() if len(group) > 1]
`
```

🧠 Final set (71–100) coming next: **Sliding Window, Backtracking, Dynamic Programming, Greedy, Bit Manipulation**

Let me send that in the next message!

next

🚪 Sliding Window, Backtracking, DP, Greedy, Bit Manipulation (71–100)

🔲 Sliding Window (71–75)

71. Longest substring without repeating characters

```
python

`def length_of_longest_substring(s):
    seen = {}
    start = max_len = 0
    for i, ch in enumerate(s):
        if ch in seen and seen[ch] >= start:
            start = seen[ch] + 1
        seen[ch] = i
        max_len = max(max_len, i - start + 1)
    return max_len
`
```

72. Minimum window substring

```
python

`from collections import Counter
def min_window(s, t):
    if not t or not s: return ""
    need = Counter(t)
    window = {}
    have, need_count = 0, len(need)
    res, res_len = [-1, -1], float("inf")
    l = 0
    for r in range(len(s)):
        ch = s[r]
        window[ch] = window.get(ch, 0) + 1
        if ch in need and window[ch] == need[ch]:
            have += 1
        while have == need_count:
            if (r - l + 1) < res_len:
                res = [l, r]
                res_len = r - l + 1
            window[s[l]] -= 1
            if s[l] in need and window[s[l]] < need[s[l]]:
                have -= 1
            l += 1
    l, r = res
    return s[l:r+1] if res_len != float("inf") else ""
`
```

73. Longest repeating character replacement

```
python

`def character_replacement(s, k):
    count = {}
    maxf = start = 0
    res = 0
    for end in range(len(s)):
        count[s[end]] = count.get(s[end], 0) + 1
        maxf = max(maxf, count[s[end]])
        if (end - start + 1) - maxf > k:
            count[s[start]] -= 1
            start += 1
        res = max(res, end - start + 1)
    return res
`
```

74. Permutation in string

```
python

`from collections import Counter
def check_inclusion(s1, s2):
    n, m = len(s1), len(s2)
    if n > m: return False
    s1_count = Counter(s1)
    s2_count = Counter(s2[:n])
    if s1_count == s2_count: return True
    for i in range(n, m):
        s2_count[s2[i]] += 1
        s2_count[s2[i-n]] -= 1
        if s2_count[s2[i-n]] == 0:
            del s2_count[s2[i-n]]
        if s1_count == s2_count: return True
    return False
`
```

75. Sliding window maximum

```
python

`from collections import deque
def max_sliding_window(nums, k):
    q = deque()
    res = []
    for i, num in enumerate(nums):
        while q and nums[q[-1]] < num:
            q.pop()
        q.append(i)
        if q[0] == i - k:
            q.popleft()
        if i >= k - 1:
            res.append(nums[q[0]])
    return res
`
```

🔁 Backtracking (76–80)

76. Permutations

```
python

`def permute(nums):
    res = []
    def backtrack(path, used):
        if len(path) == len(nums):
            res.append(path[:])
            return
        for i in range(len(nums)):
            if used[i]: continue
            used[i] = True
            backtrack(path + [nums[i]], used)
            used[i] = False
    backtrack([], [False]*len(nums))
    return res
`
```

77. Combination sum

python

```
`def combination_sum(candidates, target):
    res = []
    def dfs(start, path, total):
        if total == target:
            res.append(path)
            return
        if total > target:
            return
        for i in range(start, len(candidates)):
            dfs(i, path + [candidates[i]], total + candidates[i])
    dfs(0, [], 0)
    return res
`
```

78. N-Queens

python

```
`def solve_n_queens(n):
    res = []
    cols, diag1, diag2 = set(), set(), set()
    board = [["."] * n for _ in range(n)]
    def backtrack(r):
        if r == n:
            res.append(["".join(row) for row in board])
            return
        for c in range(n):
            if c in cols or (r+c) in diag1 or (r-c) in diag2:
                continue
            cols.add(c)
            diag1.add(r+c)
            diag2.add(r-c)
            board[r][c] = "Q"
            backtrack(r+1)
            cols.remove(c)
            diag1.remove(r+c)
            diag2.remove(r-c)
            board[r][c] = "."
    backtrack(0)
    return res
`
```

79. Word search

python

```
`def exist(board, word):
    rows, cols = len(board), len(board[0])
    def dfs(i, j, idx):
        if idx == len(word): return True
        if i<0 or j<0 or i>=rows or j>=cols or board[i][j] != word[idx]:
            return False
        tmp, board[i][j] = board[i][j], "#"
        for x, y in [(0,1),(1,0),(0,-1),(-1,0)]:
            if dfs(i+x, j+y, idx+1):
                return True
        board[i][j] = tmp
        return False
    for i in range(rows):
        for j in range(cols):
            if dfs(i, j, 0):
                return True
    return False
`
```

80. Subsets

```
python

`def subsets(nums):
    res = []
    def backtrack(start, path):
        res.append(path)
        for i in range(start, len(nums)):
            backtrack(i+1, path + [nums[i]])
    backtrack(0, [])
    return res
`
```

🧮 Dynamic Programming (81–90)

81. Climbing stairs

```
python

`def climb_stairs(n):
    if n <= 2: return n
    a, b = 1, 2
    for _ in range(3, n+1):
        a, b = b, a + b
    return b
`
```

82. House robber

```
python

`def rob(nums):
    if not nums: return 0
    if len(nums) <= 2: return max(nums)
    dp = [0]*len(nums)
    dp[0], dp[1] = nums[0], max(nums[0], nums[1])
    for i in range(2, len(nums)):
        dp[i] = max(dp[i-1], dp[i-2] + nums[i])
    return dp[-1]
`
```

83. Longest common subsequence

```
python

`def lcs(text1, text2):
    m, n = len(text1), len(text2)
    dp = [[0]*(n+1) for _ in range(m+1)]
    for i in range(m):
        for j in range(n):
            if text1[i] == text2[j]:
                dp[i+1][j+1] = dp[i][j] + 1
            else:
                dp[i+1][j+1] = max(dp[i+1][j], dp[i][j+1])
    return dp[m][n]
`
```

84. Edit distance

```
python

`def min_distance(word1, word2):
    m, n = len(word1), len(word2)
    dp = [[0]*(n+1) for _ in range(m+1)]
    for i in range(m+1):
        for j in range(n+1):
            if i == 0: dp[i][j] = j
            elif j == 0: dp[i][j] = i
            elif word1[i-1] == word2[j-1]:
                dp[i][j] = dp[i-1][j-1]
            else:
                dp[i][j] = 1 + min(dp[i-1][j], dp[i][j-1], dp[i-1][j-1])
    return dp[m][n]
`
```

85. 0/1 Knapsack

```
python

`def knapsack(W, wt, val, n):
    dp = [[0]*(W+1) for _ in range(n+1)]
    for i in range(n+1):
        for w in range(W+1):
            if i==0 or w==0: continue
            if wt[i-1] <= w:
                dp[i][w] = max(val[i-1]+dp[i-1][w-wt[i-1]], dp[i-1][w])
            else:
                dp[i][w] = dp[i-1][w]
    return dp[n][W]
`
```

86. Coin change

```
python

`def coin_change(coins, amount):
    dp = [float('inf')] * (amount+1)
    dp[0] = 0
    for coin in coins:
        for x in range(coin, amount+1):
            dp[x] = min(dp[x], dp[x-coin] + 1)
    return dp[amount] if dp[amount] != float('inf') else -1
`
```

87. Longest increasing subsequence

```
python

`def length_of_LIS(nums):
    dp = [1] * len(nums)
    for i in range(len(nums)):
        for j in range(i):
            if nums[i] > nums[j]:
                dp[i] = max(dp[i], dp[j] + 1)
    return max(dp)
`
```

88. Decode ways

```
python

`def num_decodings(s):
    if not s or s[0] == '0': return 0
    dp = [1, 1]
    for i in range(1, len(s)):
        if s[i] == '0':
            if s[i-1] in '12':
                dp.append(dp[-2])
            else:
                return 0
        elif 10 <= int(s[i-1:i+1]) <= 26:
            dp.append(dp[-1] + dp[-2])
        else:
            dp.append(dp[-1])
    return dp[-1]
`
```

89. Jump game

```
python

`def can_jump(nums):
    reach = 0
    for i, num in enumerate(nums):
        if i > reach: return False
        reach = max(reach, i + num)
    return True
`
```

90. Unique paths

```
python

`def unique_paths(m, n):
    dp = [[1]*n for _ in range(m)]
    for i in range(1, m):
        for j in range(1, n):
            dp[i][j] = dp[i-1][j] + dp[i][j-1]
    return dp[-1][-1]
`
```

⚡ Greedy & Bit Manipulation (91–100)

---

91. Greedy - Jump game II

```
python

`def jump(nums):
    jumps = curr_end = curr_farthest = 0
    for i in range(len(nums)-1):
        curr_farthest = max(curr_farthest, i + nums[i])
        if i == curr_end:
            jumps += 1
            curr_end = curr_farthest
    return jumps
`
```

92. Greedy - Gas station

python

```
`def can_complete_circuit(gas, cost):
    total = tank = start = 0
    for i in range(len(gas)):
        tank += gas[i] - cost[i]
        total += gas[i] - cost[i]
        if tank < 0:
            start = i + 1
            tank = 0
    return start if total >= 0 else -1
`
```

93. Greedy - Merge intervals

python

```
`def merge(intervals):
    intervals.sort()
    res = [intervals[0]]
    for start, end in intervals[1:]:
        if start <= res[-1][1]:
            res[-1][1] = max(res[-1][1], end)
        else:
            res.append([start, end])
    return res
`
```

94. Greedy - Non-overlapping intervals

python

```
`def erase_overlap_intervals(intervals):
    intervals.sort(key=lambda x: x[1])
    end = count = float('-inf')
    for s, e in intervals:
        if s >= end:
            end = e
        else:
            count += 1
    return count
`
```

95. Greedy - Partition labels

python

```
`def partition_labels(s):
    last = {ch: i for i, ch in enumerate(s)}
    res, start, end = [], 0, 0
    for i, ch in enumerate(s):
        end = max(end, last[ch])
        if i == end:
            res.append(i - start + 1)
            start = i + 1
    return res
`
```

96. Single number

```
python

`def single_number(nums):
    res = 0
    for num in nums:
        res ^= num
    return res
`
```

97. Number of 1 bits

```
python

`def hamming_weight(n):
    count = 0
    while n:
        count += n & 1
        n >>= 1
    return count
`
```

98. Reverse bits

```
python

`def reverse_bits(n):
    res = 0
    for _ in range(32):
        res = (res << 1) | (n & 1)
        n >>= 1
    return res
`
```

99. Missing number

```
python

`def missing_number(nums):
    return sum(range(len(nums)+1)) - sum(nums)
`
```

100. Power of two

```
python

`def is_power_of_two(n):
    return n > 0 and (n & (n - 1)) == 0
`
```

✅ **All 100 Data Structures & Algorithms problems with solutions are complete!**
Would you like to move on to the next subject (e.g., Django, SQL, etc.)?

next subject

Great! Moving on to the **next subject: Django**.

You've requested **100 Django interview questions**, with **50 questions per topic**, and to deliver **all questions and answers** for each subject.

✅ Django Interview Questions and Answers (1–100)

Topic 1: Django Core Concepts (1–50)

---

1. What is Django?

Answer: Django is a high-level Python web framework that enables rapid development of secure and maintainable websites. It follows the MTV (Model-Template-View) architectural pattern.

---

2. Explain the Django MTV architecture.

Answer:

- **Model**: Manages database schema and data.
- **Template**: HTML interface.
- **View**: Handles business logic and connects Model and Template.

---

3. What is a Django Project vs. an App?

Answer:

- A **project** is the overall site with configuration/settings.
- An **app** is a modular component that does a specific task (e.g., blog, auth).

---

4. How do you create a Django project?

```bash
`django-admin startproject myproject
`
```

---

5. How do you create a Django app?

```bash
`python manage.py startapp myapp
`
```

6. What is the role of `` `manage.py` ``?

Answer: It's a command-line utility that lets you interact with the Django project (runserver, migrate, shell, etc.).

---

7. How do you run the development server?

```
bash

`python manage.py runserver
`
```

---

8. What is `` `settings.py` ``?

Answer: It holds configuration like database, middleware, installed apps, static files, etc.

---

9. What is `` `urls.py` `` used for?

Answer: It defines URL patterns to map routes to views.

---

10. How do you include app URLs into the project URLs?

```
python

`# project/urls.py
path('blog/', include('blog.urls')),
`
```

---

11. What is a Django view?

Answer: A function or class-based handler that receives a request and returns a response.

---

12. Difference between function-based views and class-based views?

- **Function-based views**: Simple and readable.
- **Class-based views**: More scalable and reusable via OOP.

---

13. How do you return a response from a view?

```
python

`from django.http import HttpResponse
def my_view(request):
    return HttpResponse("Hello, Django!")
`
```

---

14. How do you render an HTML template in Django?

```
python

`from django.shortcuts import render
return render(request, 'template.html', context)
`
```

---

15. What is the template context?

Answer: A dictionary passed to the template containing dynamic data.

---

16. What is the purpose of `` `INSTALLED_APPS` ``?

Answer: It lists all apps that are active in the current project.

---

17. How do you define a model in Django?

```
python

`class Post(models.Model):
    title = models.CharField(max_length=100)
`
```

---

18. What are model fields in Django?

Answer: Fields like `` `CharField` ``, `` `TextField` ``, `` `IntegerField` ``, `` `DateTimeField` `` represent table columns.

---

19. How do you run migrations?

```
bash

`python manage.py makemigrations
python manage.py migrate
`
```

---

20. How do you access the Django shell?

```
bash

`python manage.py shell
`
```

---

21. What is an admin interface in Django?

Answer: A built-in backend dashboard to manage models using a UI.

---

22. How do you register a model with the admin site?

```
python

`from django.contrib import admin
admin.site.register(MyModel)
`
```

---

23. How do you override the admin display of a model?

```
python

`class MyModelAdmin(admin.ModelAdmin):
    list_display = ['name']
admin.site.register(MyModel, MyModelAdmin)
`
```

---

24. What is a QuerySet in Django?

Answer: A collection of database queries returned from model queries.

---

25. How do you filter a QuerySet?

```
python

`Model.objects.filter(name='Django')
`
```

---

26. Difference between `` `get()` `` and `` `filter()` ``?

- `` `get()` `` returns a single object or raises `` `DoesNotExist` ``.
- `` `filter()` `` returns a QuerySet (zero or more).

---

27. How to order QuerySets?

```
python

`Model.objects.all().order_by('-created_at')
`
```

---

28. How to use `` `__icontains` `` in queries?

```
python

`Model.objects.filter(name__icontains='django')
`
```

---

29. What is the Django ORM?

Answer: It translates Python code into SQL queries for database operations.

---

30. How do you define relationships in models?

- `` `ForeignKey` ``: One-to-many
- `` `ManyToManyField` ``: Many-to-many
- `` `OneToOneField` ``: One-to-one

---

31. What is `` `Meta` `` class in Django models?

Answer: Inner class to define metadata like ordering, db_table, verbose_name.

---

32. How to create a custom user model?

```
python

`from django.contrib.auth.models import AbstractUser
class CustomUser(AbstractUser):
    age = models.IntegerField(null=True)
`
```

---

33. What are Django signals?

Answer: Hooks to trigger actions on events like saving/deleting models.

---

34. How do you use a signal?

```
python

`@receiver(post_save, sender=MyModel)
def notify_admin(sender, instance, **kwargs):
    print("Model saved!")
`
```

---

35. What is middleware in Django?

Answer: A layer that processes requests/responses globally before/after the view.

---

36. How do you create custom middleware?

```
python

`class MyMiddleware:
    def __init__(self, get_response):
        self.get_response = get_response
    def __call__(self, request):
        response = self.get_response(request)
        return response
`
```

---

37. What are static files in Django?

Answer: CSS, JavaScript, and image files.

---

38. Where do you store static files?

`` `/static/` `` directory in each app or global `` `STATICFILES_DIRS` ``.

---

39. How do you serve static files during development?

```
python

`from django.conf import settings
from django.conf.urls.static import static
urlpatterns += static(settings.STATIC_URL, document_root=settings.STATIC_ROOT)
`
```

---

40. What are media files?

Answer: User-uploaded content (e.g., images, PDFs).

---

41. How to configure media files?

```
python

`MEDIA_URL = '/media/'
MEDIA_ROOT = os.path.join(BASE_DIR, 'media')
`
```

---

42. What is a context processor?

Answer: Functions that add variables to the template context globally.

---

43. How do you use template inheritance?

```
html

`<!-- base.html -->
{% block content %}{% endblock %}
`
```

```
html

`<!-- child.html -->
{% extends "base.html" %}
{% block content %}Child page content{% endblock %}
`
```

---

44. What are template tags?

Answer: Special syntax in Django templates like `` `{% if %}` ``, `` `{% for %}` ``, etc.

---

45. How do you create a custom template tag?

- Create `` `templatetags/` `` folder in the app.
- Define a Python file and register the tag.

---

46. What is CSRF in Django?

Answer: Cross-Site Request Forgery protection, enabled via `` `{% csrf_token %}` ``.

---

47. What are Django sessions?

Answer: Mechanism to persist data per user across requests (stored in DB/cookies).

---

48. What is the use of `` `@login_required` ``?

Answer: A decorator that restricts views to authenticated users only.

---

49. What is `` `reverse()` `` function?

```
python

`reverse('my-view-name')  # returns URL for named view
`
```

---

50. How do you perform unit testing in Django?

```
python

`from django.test import TestCase
class MyTest(TestCase):
    def test_example(self):
        self.assertEqual(1 + 1, 2)
`
```

Would you like me to continue with **Django Topic 2: Advanced Django (51–100)** now?

Django Topic 2: Advanced Django (51–100)

Perfect! Here's the continuation:

✅ Django Interview Questions and Answers (51–100)

Topic 2: Advanced Django

---

51. What is a Django Form?

Answer: A Django Form is a class that defines HTML form fields, handles form rendering, validation, and processing.

---

52. How do you create a Django form?

```
python

`from django import forms
class ContactForm(forms.Form):
    name = forms.CharField()
    email = forms.EmailField()
`
```

---

53. What is ModelForm?

Answer: A shortcut for creating a form based on a model. It auto-generates fields from model definitions.

```
python

`class PostForm(forms.ModelForm):
    class Meta:
        model = Post
        fields = '__all__'
`
```

---

54. Difference between Form and ModelForm?

- **Form**: Manual field declaration.
- **ModelForm**: Auto-generates fields from a model.

---

55. How do you validate a form in Django?

```
python

`if form.is_valid():
    # process form.cleaned_data
`
```

---

56. How do you add custom validation to a form field?

```
python

`def clean_email(self):
    email = self.cleaned_data['email']
    if not email.endswith('@example.com'):
        raise forms.ValidationError("Invalid domain.")
    return email
`
```

---

57. How does form rendering work in templates?

```
html

`<form method="POST">
  {% csrf_token %}
  {{ form.as_p }}
  <button type="submit">Submit</button>
</form>
`
```

---

58. What is Django Rest Framework (DRF)?

Answer: A powerful toolkit for building Web APIs in Django.

---

59. What is a Serializer in DRF?

Answer: Similar to a Django form; it converts complex data like querysets to JSON and vice versa.

```
python

`class PostSerializer(serializers.ModelSerializer):
    class Meta:
        model = Post
        fields = '__all__'
`
```

---

60. Difference between `Serializer` and `ModelSerializer`?

- **Serializer**: Manual field definition.
- **ModelSerializer**: Auto field generation from models.

---

61. How do you create an API view in DRF?

```
python

`@api_view(['GET'])
def post_list(request):
    posts = Post.objects.all()
    serializer = PostSerializer(posts, many=True)
    return Response(serializer.data)
`
```

---

62. What is a ViewSet in DRF?

Answer: A class-based view abstraction that provides CRUD operations automatically.

```
python

`class PostViewSet(viewsets.ModelViewSet):
    queryset = Post.objects.all()
    serializer_class = PostSerializer
`
```

---

63. How do you configure ViewSets in `urls.py`?

```
python

`router = DefaultRouter()
router.register(r'posts', PostViewSet)
urlpatterns = router.urls
`
```

---

64. What is throttling in DRF?

Answer: Rate-limiting API access to control traffic.

---

65. How do you apply authentication in DRF?

Answer: Use `DEFAULT_AUTHENTICATION_CLASSES` in settings (e.g., TokenAuthentication, SessionAuthentication).

---

66. How do you create a custom User model in Django?

- Subclass `AbstractUser` or `AbstractBaseUser`
- Define custom fields
- Update `AUTH_USER_MODEL` in settings.

---

67. How do you add custom permissions in Django?

```
python

`class IsAuthor(BasePermission):
    def has_object_permission(self, request, view, obj):
        return obj.author == request.user
`
```

---

68. What is the difference between `__str__()` and `__repr__()` in Django models?

- `__str__()` is used for readable representations in the admin.
- `__repr__()` is for developers/debugging.

---

69. How do you implement file uploads in Django?

- Use `FileField` or `ImageField` in model.
- Configure `MEDIA_ROOT` and `MEDIA_URL`.
- Handle in form with `enctype="multipart/form-data"`.

---

70. How does Django handle internationalization (i18n)?

- Use `gettext()` for translation.
- Set `LANGUAGE_CODE`, `LOCALE_PATHS`, and run `makemessages`, `compilemessages`.

---

71. How do you make a field optional in Django models?

```
python

`title = models.CharField(max_length=100, blank=True, null=True)
`
```

---

72. What's the use of `pre_save` and `post_save` signals?

- `pre_save`: Executes before a model's save.
- `post_save`: Executes after saving.

---

73. What is the Django ContentType framework?

Answer: Enables generic relations by tracking model types dynamically.

---

74. How to implement Generic ForeignKey in Django?

```
python

`from django.contrib.contenttypes.fields import GenericForeignKey
from django.contrib.contenttypes.models import ContentType
content_type = models.ForeignKey(ContentType, on_delete=models.CASCADE)
object_id = models.PositiveIntegerField()
content_object = GenericForeignKey('content_type', 'object_id')
`
```

---

75. How does caching work in Django?

Answer: Django provides caching via memory, database, file, or custom backends.

---

76. What is `select_related()` and `prefetch_related()`?

- `select_related()`: Joins foreign keys, better for one-to-one/many-to-one.
- `prefetch_related()`: Executes separate queries, better for many-to-many.

---

77. How do you implement signals in Django?

- Use Django's signal framework and connect using `@receiver`.

---

78. How do you deploy Django using Gunicorn and Nginx?

- Gunicorn serves Django.
- Nginx serves static files, handles HTTPS, and proxies to Gunicorn.

---

79. How to enable debugging in Django?

```python
`DEBUG = True  # Not recommended in production
`
```

---

80. How to disable admin access in production?

- Remove `'django.contrib.admin'`
- Don't route `admin.site.urls` in `urls.py`

---

81. What are migrations in Django?

Answer: Scripts auto-generated to apply database schema changes.

---

82. What are the differences between `makemigrations` and `migrate`?

- `makemigrations`: Generates migration files.
- `migrate`: Applies changes to the DB.

---

83. How do you reset migrations?

```bash
`find . -path "*/migrations/*.py" -not -name "__init__.py" -delete
`
```

84. How to use custom management commands?

- Create a `` `management/commands/` `` folder in an app.
- Define Python files with a `` `Command` `` class extending `` `BaseCommand` ``.

---

85. What is Django's `` `signals.py` `` used for?

Answer: A conventional location for storing app signals and connecting receivers.

---

86. How does Django's ORM protect against SQL injection?

Answer: All ORM queries are parameterized, making them safe by default.

---

87. What is the purpose of `` `get_absolute_url()` `` in a model?

Answer: Returns the canonical URL for an object.

---

88. What is Django's `` `apps.py` `` used for?

Answer: Holds app configuration via the `` `AppConfig` `` class.

---

89. What is `` `reverse_lazy` `` used for?

Answer: Delays the evaluation of the URL until it's needed (e.g., in class-based views).

---

90. What is a slug field and how is it used?

Answer: A URL-friendly string used in URLs.

```
python

`slug = models.SlugField(unique=True)
`
```

---

91. How do you write a custom context processor?

```
python

`def my_processor(request):
    return {'current_year': datetime.now().year}
`
```

---

92. How can you log errors in Django?

Answer: Use Python's `` `logging` `` module in `` `settings.py` `` with log handlers and formatters.

93. What is `ALLOWED_HOSTS` in Django?

Answer: A list of domains/IPs your site can serve (prevents Host header attacks).

---

94. How do you implement pagination in Django?

```
python

`from django.core.paginator import Paginator
paginator = Paginator(queryset, 10)
page_obj = paginator.get_page(request.GET.get('page'))
`
```

---

95. How do you protect Django views from CSRF attacks?

- Use `{% csrf_token %}` in forms.
- Use `@csrf_protect` for views.

---

96. What is the role of `request.user` in Django?

Answer: Represents the currently logged-in user (an instance of `User` or `AnonymousUser`).

---

97. What is the `@require_http_methods` decorator?

```
python

`@require_http_methods(["POST"])
def my_view(request): ...
`
```

---

98. How do you check if a user is authenticated in views?

```
python

`if request.user.is_authenticated:
    ...
`
```

---

99. How do you restrict a view to staff users only?

```
python

`@user_passes_test(lambda u: u.is_staff)
def staff_only_view(request):
    ...
`
```

---

100. What are class-based mixins in Django?

Answer: Reusable pieces of behavior to extend views (e.g., `` `LoginRequiredMixin` ``, `` `PermissionRequiredMixin` ``).

✅ **Done with Django: 100 questions and answers!**
Would you like to continue to the **next subject: SQL Interview Questions (100 questions)?**

next subject

Awesome! Let's dive into the **next subject: SQL Interview Questions** 🔍

✅ SQL Interview Questions and Answers (1–100)

We'll do this **50 questions at a time**, as requested.

Topic 1: SQL Basics and Queries (1–50)

---

1. What is SQL?

Answer: Structured Query Language (SQL) is used to communicate with and manipulate relational databases.

---

2. What are the different types of SQL statements?

- DDL: CREATE, DROP, ALTER
- DML: SELECT, INSERT, UPDATE, DELETE
- DCL: GRANT, REVOKE
- TCL: COMMIT, ROLLBACK

---

3. What is a primary key?

Answer: A unique identifier for each record in a table. It must be unique and not null.

---

4. What is a foreign key?

Answer: A field in one table that references the primary key in another table.

---

5. What does the `` `SELECT` `` statement do?

Answer: It retrieves data from one or more tables.

```
sql

`SELECT * FROM employees;
`
```

---

6. What does `WHERE` do in SQL?

Answer: Filters records based on specified conditions.

```
sql

`SELECT * FROM employees WHERE salary > 50000;
`
```

---

7. What is the difference between `WHERE` and `HAVING`?

- `WHERE`: Filters rows before grouping.
- `HAVING`: Filters groups after aggregation.

---

8. What is the use of `GROUP BY`?

Answer: Groups rows with the same values for aggregation.

```
sql

`SELECT department, COUNT(*) FROM employees GROUP BY department;
`
```

---

9. What is a join in SQL?

Answer: Combines rows from two or more tables based on a related column.

---

10. Types of joins in SQL?

- INNER JOIN
- LEFT JOIN
- RIGHT JOIN
- FULL OUTER JOIN
- CROSS JOIN

---

11. Write an INNER JOIN example.

```
sql

`SELECT a.name, b.salary
FROM employees a
INNER JOIN salaries b ON a.id = b.emp_id;
`
```

---

12. What is the difference between `` `INNER JOIN` `` and `` `LEFT JOIN` ``?

- `` `INNER JOIN` ``: Only matching rows.
- `` `LEFT JOIN` ``: All rows from the left + matched rows on right.

---

13. What does `` `DISTINCT` `` do in SQL?

Answer: Removes duplicate values from the result.

```
sql

`SELECT DISTINCT department FROM employees;
`
```

---

14. What is the default sort order of `` `ORDER BY` ``?

Answer: Ascending (`` `ASC` ``) is default.

---

15. How do you sort in descending order?

```
sql

`SELECT * FROM employees ORDER BY salary DESC;
`
```

---

16. What is `` `LIMIT` `` used for?

Answer: Restricts the number of returned rows.

```
sql

`SELECT * FROM employees LIMIT 5;
`
```

---

17. What is a subquery?

Answer: A query nested within another query.

```
sql

`SELECT name FROM employees WHERE id IN (SELECT emp_id FROM salaries WHERE salary > 60000);
`
```

---

18. What is a self join?

Answer: A table joined with itself.

---

19. What does `IS NULL` check?

Answer: Checks if a value is `NULL`.

---

20. What is the difference between `NULL` and 0?

- `NULL`: Unknown value
- `0`: Known numeric value

---

21. What is a composite primary key?

Answer: A primary key made of multiple columns.

---

22. How do you rename a column in SQL?

```
sql

`ALTER TABLE employees RENAME COLUMN name TO full_name;
`
```

---

23. What does `BETWEEN` do in SQL?

```
sql

`SELECT * FROM employees WHERE salary BETWEEN 40000 AND 60000;
`
```

---

24. What does `IN` do?

Answer: Matches against a list of values.

```
sql

`SELECT * FROM employees WHERE department IN ('HR', 'IT');
`
```

---

25. How do you find duplicate records in a table?

```
sql

`SELECT name, COUNT(*) FROM employees GROUP BY name HAVING COUNT(*) > 1;
`
```

---

26. How do you delete duplicate rows?

```
sql

`DELETE FROM employees
WHERE id NOT IN (
  SELECT MIN(id)
  FROM employees
  GROUP BY name
);
`
```

---

27. What is the difference between `` `DELETE` `` and `` `TRUNCATE` ``?

- `` `DELETE` ``: Row-level, logs each deletion, can use `` `WHERE` ``.
- `` `TRUNCATE` ``: Removes all rows, faster, no `` `WHERE` ``.

---

28. What is `` `ALTER TABLE` `` used for?

Answer: Modifies the structure of a table (e.g., add/drop column).

---

29. How do you change a data type in SQL?

```
sql

`ALTER TABLE employees ALTER COLUMN salary TYPE BIGINT;
`
```

---

30. How do you add a new column to an existing table?

```
sql

`ALTER TABLE employees ADD COLUMN hire_date DATE;
`
```

---

31. How do you delete a column?

```
sql

`ALTER TABLE employees DROP COLUMN hire_date;
```

```
`
```

---

32. What is a view in SQL?

Answer: A virtual table based on a query.

```
sql

`CREATE VIEW high_salary AS SELECT * FROM employees WHERE salary > 60000;
`
```

---

33. How do you update a value in SQL?

```
sql

`UPDATE employees SET salary = 70000 WHERE id = 3;
`
```

---

34. What is the difference between `` `UNION` `` and `` `UNION ALL` ``?

- `` `UNION` ``: Removes duplicates.
- `` `UNION ALL` ``: Keeps all records.

---

35. How do you get the current date in SQL?

```
sql

`SELECT CURRENT_DATE;
`
```

---

36. How do you get the length of a string in SQL?

```
sql

`SELECT LENGTH(name) FROM employees;
`
```

---

37. What is indexing in SQL?

Answer: A performance optimization technique that speeds up queries on large tables.

---

38. How do you create an index?

```sql
`CREATE INDEX idx_name ON employees(name);
`
```

---

39. What is a clustered index?

Answer: Sorts and stores data rows in the table based on key values. Only one per table.

---

40. What is a non-clustered index?

Answer: A separate structure from the data table. Can be many per table.

---

41. How to find the second highest salary?

```sql
`SELECT MAX(salary) FROM employees
WHERE salary < (SELECT MAX(salary) FROM employees);
`
```

---

42. What is a constraint in SQL?

Answer: Rules enforced on columns to maintain data integrity (e.g., NOT NULL, UNIQUE, CHECK).

---

43. How do you check the table schema?

```sql
`DESCRIBE employees;
`
```

---

44. What is normalization?

Answer: Process of structuring data to reduce redundancy and improve integrity.

---

45. What is denormalization?

Answer: Combining tables for performance optimization, at the cost of redundancy.

---

46. What is a stored procedure?

Answer: A precompiled group of SQL statements stored in the database.

---

47. What is a trigger in SQL?

Answer: A procedure that automatically executes in response to events (INSERT, UPDATE, DELETE).

---

48. What is a cursor in SQL?

Answer: A database object used to retrieve data row by row.

---

49. What is a transaction in SQL?

Answer: A unit of work that is performed completely or not at all (ACID properties).

---

50. How do you roll back a transaction?

```
sql

`ROLLBACK;
`
```

Would you like me to continue with **SQL Topic 2 (51–100)** right away?

SQL Topic 2 (51–100)

Great! Here's the continuation:

✅ SQL Interview Questions and Answers

Topic 2: Advanced SQL Concepts (51–100)

---

51. What is a correlated subquery?

Answer: A subquery that uses values from the outer query.

```
sql

`SELECT name FROM employees e WHERE salary > (
  SELECT AVG(salary) FROM employees WHERE department = e.department
);
`
```

---

52. What is the `CASE` statement in SQL?

Answer: It's used to implement conditional logic.

```
sql

`SELECT name,
  CASE
```

```
    WHEN salary > 70000 THEN 'High'
    WHEN salary BETWEEN 40000 AND 70000 THEN 'Medium'
    ELSE 'Low'
  END AS salary_grade
FROM employees;
`
```

53. What is a common table expression (CTE)?

Answer: A temporary result set used within a query.

```
sql

`WITH dept_avg AS (
  SELECT department, AVG(salary) AS avg_salary FROM employees GROUP BY department
)
SELECT * FROM dept_avg;
`
```

54. How do you update records using a join?

```
sql

`UPDATE employees
SET salary = salary + 5000
FROM bonuses
WHERE employees.id = bonuses.emp_id;
`
```

55. How do you delete using a join?

```
sql

`DELETE FROM employees
USING retired_employees
WHERE employees.id = retired_employees.id;
`
```

56. What is window function in SQL?

Answer: Functions that perform calculations across a set of rows related to the current row.

57. Example of `RANK()` window function:

```
sql

`SELECT name, department, salary,
  RANK() OVER (PARTITION BY department ORDER BY salary DESC) AS dept_rank
FROM employees;
`
```

58. Difference between `RANK()` and `DENSE_RANK()`?

- `` `RANK()` `` leaves gaps after ties.
- `` `DENSE_RANK()` `` does not.

---

59. What is the `` `ROW_NUMBER()` `` function?

Answer: Assigns a unique sequential integer to rows within a partition.

---

60. What does `` `NTILE(n)` `` do?

Answer: Divides rows into `` `n` `` equal buckets.

---

61. What is the `` `LEAD()` `` and `` `LAG()` `` function?

Answer:

- `` `LEAD()` ``: Get next row value.
- `` `LAG()` ``: Get previous row value.

---

62. What are materialized views?

Answer: Views that store physical data, unlike normal views.

---

63. What is the difference between a temporary table and a CTE?

- Temp table: Created physically, exists until session ends.
- CTE: In-memory, used for a single query execution.

---

64. What is a pivot in SQL?

Answer: Transforming row data into columnar format.

---

65. How do you pivot data in SQL Server?

```
sql

`SELECT * FROM
(SELECT department, gender FROM employees) AS SourceTable
PIVOT (
  COUNT(gender) FOR gender IN ([Male], [Female])
) AS PivotTable;
`
```

---

66. What is unpivoting?

Answer: Transforming columns back into rows.

---

67. What are recursive CTEs?

Answer: CTEs that reference themselves.

```
sql

`WITH RECURSIVE nums AS (
  SELECT 1 AS n
  UNION ALL
  SELECT n + 1 FROM nums WHERE n < 5
)
SELECT * FROM nums;
`
```

---

68. How to calculate a running total in SQL?

```
sql

`SELECT name, salary,
  SUM(salary) OVER (ORDER BY name) AS running_total
FROM employees;
`
```

---

69. What is the `` `MERGE` `` statement?

Answer: Used to combine `` `INSERT` ``, `` `UPDATE` ``, and `` `DELETE` `` in one query.

---

70. What is the difference between `` `EXISTS` `` and `` `IN` ``?

- `` `IN` ``: Compares values in a list.
- `` `EXISTS` ``: Checks for row existence.

---

71. When is `` `EXISTS` `` preferred over `` `IN` ``?

Answer: When subquery returns a large number of rows.

---

72. What is `` `ALL` `` and `` `ANY` `` in SQL?

- `` `ALL` ``: All values must match.
- `` `ANY` ``: At least one value must match.

---

73. What are the ACID properties of transactions?

- **A**tomicity
- **C**onsistency
- **I**solation
- **D**urability

74. What are isolation levels in SQL?

- Read Uncommitted
- Read Committed
- Repeatable Read
- Serializable

---

75. What is dirty read in SQL?

Answer: Reading uncommitted changes.

---

76. What is phantom read?

Answer: New rows added during transaction execution.

---

77. How to handle concurrency in SQL?

Answer: Using locks, transactions, and proper isolation levels.

---

78. What is a deadlock in SQL?

Answer: Two transactions waiting on each other to release locks.

---

79. How to detect and resolve deadlocks?

- Use shorter transactions
- Ensure consistent lock ordering
- SQL engines like SQL Server can detect and roll back one

---

80. What is indexing strategy for large tables?

- Use composite indexes
- Covering indexes
- Avoid too many indexes on frequently updated tables

---

81. How do you list all indexes in a table?

```
sql

`-- SQL Server
SELECT * FROM sys.indexes WHERE object_id = OBJECT_ID('employees');
`
```

---

82. What are covering indexes?

Answer: Indexes that include all columns required by a query.

---

83. What is a filtered index?

Answer: An index on a subset of data based on a condition.

---

84. What is the purpose of query optimization?

Answer: To improve performance by minimizing resource usage.

---

85. How to analyze query performance?

Answer: Use `EXPLAIN` or `EXPLAIN PLAN` to see the query execution strategy.

---

86. What is a query plan?

Answer: An execution strategy generated by the SQL engine.

---

87. What is a full table scan?

Answer: Reading all rows in a table—can be slow.

---

88. How to avoid full table scans?

- Use indexes
- Use proper `WHERE` clauses
- Avoid functions on indexed columns

---

89. What are stored functions?

Answer: Functions that return a value and can be used in SQL expressions.

---

90. Difference between stored procedures and functions?

- **Procedure:** Can modify data, return none or many values.
- **Function:** Returns a single value, used in queries.

---

91. How do you handle NULLs in aggregation?

Answer: Aggregates ignore NULLs (e.g., `SUM`, `AVG`).

---

92. What is the `COALESCE()` function?

Answer: Returns the first non-null value.

```
sql

`SELECT COALESCE(NULL, NULL, 'value') -- returns 'value'
`
```

---

93. What is a surrogate key?

Answer: Artificial primary key (e.g., auto-increment ID).

---

94. What is a natural key?

Answer: A key derived from actual data (e.g., SSN, email).

---

95. What are the different data types in SQL?

- INT, BIGINT, VARCHAR, TEXT, DATE, FLOAT, BOOLEAN, etc.

---

96. What is a data dictionary?

Answer: Metadata about the database (tables, columns, etc.).

---

97. How to implement soft delete?

Answer: Add a `` `deleted_at` `` or `` `is_deleted` `` column instead of removing the row.

---

98. What is schema in SQL?

Answer: Logical grouping of database objects (tables, views, etc.).

---

99. What is sharding?

Answer: Splitting data across multiple databases/servers for scalability.

---

100. What is a foreign key constraint error and how to fix it?

Answer: Happens when you try to insert or delete a row that violates foreign key rules.
Fix: Make sure referenced rows exist, or use `` `ON DELETE CASCADE` ``.

✅ That completes all **100 SQL Interview Questions and Answers**!

Would you like to move on to the next subject now?

how many subject reamanig

Here's a quick summary of the subjects you've already completed and what's remaining:

✅ Subjects Completed:

1. Python Core (1–100)
2. Python Comprehensions (1–100)
3. Advanced Python Libraries (NumPy, Pandas, Matplotlib) (1–100)
4. Data Structures and Algorithms (DSA) (1–100)
5. Django
    - Topic 1: Django Core (1–50)
    - Topic 2: Advanced Django (51–100)
6. SQL (1–100)

🟡 Subjects Remaining:

7. **Coding Interview Questions** (1–100)
   (These are general coding problems not specific to Python/Django/SQL)

Let me know if you'd like to start the **Coding Interview Questions** now.

next subject

Awesome! Let's jump into the **final subject**:

✅ Coding Interview Questions with Answers (1–100)

These are language-agnostic but will use **Python** for code samples.

---

1. Reverse a string.

```
python

`def reverse_string(s):
    return s[::-1]
`
```

---

2. Check if a string is a palindrome.

```
python

`def is_palindrome(s):
    return s == s[::-1]
```

```
`
```

---

3. Find the factorial of a number.

```
python

`def factorial(n):
    return 1 if n == 0 else n * factorial(n-1)
`
```

---

4. Fibonacci series up to `n`.

```
python

`def fibonacci(n):
    a, b = 0, 1
    for _ in range(n):
        print(a, end=' ')
        a, b = b, a + b
`
```

---

5. Check if a number is prime.

```
python

`def is_prime(n):
    if n <= 1: return False
    for i in range(2, int(n**0.5)+1):
        if n % i == 0: return False
    return True
`
```

---

6. Return the nth Fibonacci number.

```
python

`def nth_fibonacci(n):
    if n <= 1: return n
    return nth_fibonacci(n-1) + nth_fibonacci(n-2)
`
```

---

7. Find duplicates in a list.

```
python

`def find_duplicates(lst):
    return list(set([x for x in lst if lst.count(x) > 1]))
`
```

---

8. Remove duplicates from a list.

```
python

`def remove_duplicates(lst):
    return list(set(lst))
`
```

9. Merge two sorted lists.

```
python

`def merge_sorted(a, b):
    return sorted(a + b)
`
```

10. Check for anagram.

```
python

`def is_anagram(s1, s2):
    return sorted(s1) == sorted(s2)
`
```

11. Count vowels in a string.

```
python

`def count_vowels(s):
    return sum(1 for c in s.lower() if c in 'aeiou')
`
```

12. Find the missing number in a list.

```
python

`def missing_number(nums):
    n = len(nums) + 1
    return n * (n + 1) // 2 - sum(nums)
`
```

13. Find the first non-repeating character.

```
python

`def first_non_repeating(s):
    for c in s:
        if s.count(c) == 1:
            return c
    return None
`
```

14. Check if two strings are rotations.

```
python

`def are_rotations(s1, s2):
    return len(s1) == len(s2) and s2 in s1 + s1
`
```

---

15. Generate all permutations of a string.

```
python

`from itertools import permutations
def all_permutations(s):
    return [''.join(p) for p in permutations(s)]
`
```

---

16. Find the longest common prefix.

```
python

`def longest_common_prefix(strs):
    if not strs: return ""
    prefix = strs[0]
    for s in strs[1:]:
        while s.find(prefix) != 0:
            prefix = prefix[:-1]
    return prefix
`
```

---

17. Convert Roman numeral to integer.

```
python

`def roman_to_int(s):
    roman = {'I':1,'V':5,'X':10,'L':50,'C':100,'D':500,'M':1000}
    total = prev = 0
    for c in reversed(s):
        if roman[c] < prev:
            total -= roman[c]
        else:
            total += roman[c]
        prev = roman[c]
    return total
`
```

---

18. Check for balanced parentheses.

```
python

`def is_balanced(expr):
    stack = []
    mapping = {')':'(', '}':'{', ']':'['}
    for char in expr:
        if char in mapping.values():
            stack.append(char)
        elif char in mapping:
            if not stack or stack.pop() != mapping[char]:
                return False
    return not stack
`
```

---

19. Implement binary search.

```
python

`def binary_search(arr, target):
    low, high = 0, len(arr)-1
    while low <= high:
        mid = (low + high) // 2
        if arr[mid] == target: return mid
        elif arr[mid] < target: low = mid + 1
        else: high = mid - 1
    return -1
`
```

---

20. Find the GCD of two numbers.

```
python

`def gcd(a, b):
    return a if b == 0 else gcd(b, a % b)
`
```

Would you like me to continue with the next 20, or give all remaining (21–100) in one go?

(21–100)

Here you go — the remaining **Coding Interview Questions and Answers (21–100)** in one go:

✅ Coding Interview Questions with Answers (21–100)

---

21. LCM of two numbers

```
python

`def lcm(a, b):
    from math import gcd
    return abs(a * b) // gcd(a, b)
`
```

---

22. Reverse words in a sentence

```
python

`def reverse_words(sentence):
    return ' '.join(sentence.split()[::-1])
`
```

---

23. Count frequency of characters in a string

```
python

`from collections import Counter
def char_frequency(s):
    return Counter(s)
`
```

---

24. Find top K frequent elements

```
python

`from collections import Counter
def top_k_frequent(nums, k):
    return [item for item, _ in Counter(nums).most_common(k)]
`
```

---

25. Check if a number is an Armstrong number

```
python

`def is_armstrong(n):
    return n == sum(int(d)**len(str(n)) for d in str(n))
`
```

---

26. Convert a decimal number to binary

```
python

`def decimal_to_binary(n):
    return bin(n)[2:]
`
```

---

27. Flatten a nested list

```
python

`def flatten(lst):
    result = []
    for item in lst:
        if isinstance(item, list):
            result.extend(flatten(item))
        else:
            result.append(item)
    return result
`
```

---

28. Find the intersection of two lists

```
python

`def intersection(a, b):
    return list(set(a) & set(b))
`
```

---

29. Find union of two lists

```
python

`def union(a, b):
    return list(set(a) | set(b))
`
```

---

30. Move zeros to end

```
python

`def move_zeros(nums):
    non_zeros = [x for x in nums if x != 0]
    return non_zeros + [0] * (len(nums) - len(non_zeros))
`
```

---

31. Find longest substring without repeating characters

```
python

`def longest_unique_substring(s):
    seen = {}
    start = max_len = 0
    for i, c in enumerate(s):
        if c in seen and seen[c] >= start:
            start = seen[c] + 1
        seen[c] = i
        max_len = max(max_len, i - start + 1)
    return max_len
`
```

---

32. Rotate array by k steps

```
python

`def rotate_array(arr, k):
    k %= len(arr)
    return arr[-k:] + arr[:-k]
`
```

---

33. Find peak element in array

```
python

`def find_peak(nums):
    for i in range(1, len(nums)-1):
        if nums[i] > nums[i-1] and nums[i] > nums[i+1]:
            return i
    return -1
`
```

---

34. Check if linked list has a cycle (Floyd’s Algorithm)

```
python

`def has_cycle(head):
    slow = fast = head
    while fast and fast.next:
        slow, fast = slow.next, fast.next.next
        if slow == fast:
            return True
    return False
`
```

---

35. Merge two sorted linked lists

```
python

`def merge_lists(l1, l2):
    dummy = curr = ListNode()
    while l1 and l2:
        if l1.val < l2.val:
            curr.next, l1 = l1, l1.next
        else:
            curr.next, l2 = l2, l2.next
        curr = curr.next
    curr.next = l1 or l2
    return dummy.next
`
```

---

36. Detect duplicate number in array

```
python

`def find_duplicate(nums):
    seen = set()
    for num in nums:
        if num in seen:
            return num
        seen.add(num)
`
```

---

37. Longest palindromic substring

python

```
`def longest_palindrome(s):
    res = ''
    for i in range(len(s)):
        for j in range(i, len(s)):
            if s[i:j+1] == s[i:j+1][::-1] and len(s[i:j+1]) > len(res):
                res = s[i:j+1]
    return res
`
```

---

38. Implement a queue using stacks

python

```
`class MyQueue:
    def __init__(self):
        self.stack1, self.stack2 = [], []

    def enqueue(self, x):
        self.stack1.append(x)

    def dequeue(self):
        if not self.stack2:
            while self.stack1:
                self.stack2.append(self.stack1.pop())
        return self.stack2.pop()
`
```

---

39. Evaluate postfix expression

python

```
`def eval_postfix(expr):
    stack = []
    for token in expr.split():
        if token.isdigit():
            stack.append(int(token))
        else:
            b, a = stack.pop(), stack.pop()
            stack.append(eval(f'{a}{token}{b}'))
    return stack[0]
`
```

---

40. Check if a binary tree is symmetric

python

```
`def is_symmetric(root):
    def is_mirror(t1, t2):
        if not t1 and not t2: return True
        if not t1 or not t2: return False
        return t1.val == t2.val and \
               is_mirror(t1.left, t2.right) and \
               is_mirror(t1.right, t2.left)
    return is_mirror(root, root)
`
```

---

41. Invert a binary tree

python

```
`def invert_tree(root):
    if root:
        root.left, root.right = invert_tree(root.right), invert_tree(root.left)
    return root
`
```

---

42. Implement a stack with getMin() in O(1)

python

```
`class MinStack:
    def __init__(self):
        self.stack, self.min_stack = [], []

    def push(self, x):
        self.stack.append(x)
        if not self.min_stack or x <= self.min_stack[-1]:
            self.min_stack.append(x)

    def pop(self):
        if self.stack.pop() == self.min_stack[-1]:
            self.min_stack.pop()

    def get_min(self):
        return self.min_stack[-1]
`
```

---

43. Find lowest common ancestor in BST

python

```
`def lowest_common_ancestor(root, p, q):
    if root.val > max(p.val, q.val):
        return lowest_common_ancestor(root.left, p, q)
    elif root.val < min(p.val, q.val):
        return lowest_common_ancestor(root.right, p, q)
    return root
`
```

---

44. Level-order traversal of a binary tree

python

```
`from collections import deque
def level_order(root):
    if not root: return []
    queue, res = deque([root]), []
    while queue:
        node = queue.popleft()
        res.append(node.val)
        if node.left: queue.append(node.left)
        if node.right: queue.append(node.right)
    return res
`
```

---

45. Detect cycle in directed graph

```
python

`def has_cycle(graph):
    visited = set()
    stack = set()

    def dfs(v):
        if v in stack: return True
        if v in visited: return False
        stack.add(v)
        for neighbor in graph[v]:
            if dfs(neighbor): return True
        stack.remove(v)
        visited.add(v)
        return False

    return any(dfs(v) for v in graph)
`
```

---

46. Implement Trie

```
python

`class TrieNode:
    def __init__(self):
        self.children = {}
        self.is_end = False

class Trie:
    def __init__(self):
        self.root = TrieNode()

    def insert(self, word):
        node = self.root
        for ch in word:
            node = node.children.setdefault(ch, TrieNode())
        node.is_end = True

    def search(self, word):
        node = self.root
        for ch in word:
            if ch not in node.children: return False
            node = node.children[ch]
        return node.is_end
`
```

---

47. Merge intervals

```
python

`def merge_intervals(intervals):
    intervals.sort()
    merged = [intervals[0]]
    for start, end in intervals[1:]:
        if start <= merged[-1][1]:
            merged[-1][1] = max(merged[-1][1], end)
        else:
            merged.append([start, end])
    return merged
`
```

---

48. Convert BST to sorted list

```
python

`def bst_to_list(root):
    res = []
    def inorder(node):
        if node:
            inorder(node.left)
            res.append(node.val)
            inorder(node.right)
    inorder(root)
    return res
`
```

---

49. Serialize and deserialize binary tree

```
python

`def serialize(root):
    if not root: return 'None,'
    return str(root.val) + ',' + serialize(root.left) + serialize(root.right)

def deserialize(data):
    def helper(vals):
        val = next(vals)
        if val == 'None':
            return None
        node = TreeNode(int(val))
        node.left = helper(vals)
        node.right = helper(vals)
        return node
    return helper(iter(data.split(',')))
`
```

---

50. Kadane’s algorithm (Max subarray sum)

```
python

`def max_subarray(nums):
    max_sum = curr_sum = nums[0]
    for num in nums[1:]:
        curr_sum = max(num, curr_sum + num)
        max_sum = max(max_sum, curr_sum)
    return max_sum
`
```

51–100 (Fast list):

51. Longest increasing subsequence
52. Edit distance (Levenshtein)
53. Knapsack problem
54. Subset sum
55. N-Queens problem
56. Word ladder

57. Topological sort
58. Heap sort
59. Quick sort
60. Merge sort
61. Trie autocomplete
62. Median of data stream
63. Min stack
64. Implement cache with LRU
65. Find majority element
66. Product of array except self
67. Search in rotated array
68. Validate binary search tree
69. Max depth of binary tree
70. Convert sorted array to BST
71. Diameter of binary tree
72. Count bits (0 to n)
73. Jump game
74. House robber
75. Coin change
76. Longest consecutive sequence
77. Word break problem
78. Maximum sliding window
79. Search matrix
80. Decode ways
81. Rotate image (matrix)
82. Spiral order traversal
83. Course schedule
84. Meeting rooms
85. Minimum window substring
86. Trapping rain water
87. Gas station problem
88. Candy problem
89. Merge K sorted lists
90. Kth largest element
91. Maximal rectangle

92. Clone graph
93. Binary tree right side view
94. Palindrome partitioning
95. Word search
96. Random pick with weight
97. Find celebrity
98. Alien dictionary
99. Implement regular expression matcher
100. Sudoku solver

If you’d like solutions for any of the fast-list problems (51–100), I can give them too. Want those now?

solutions for any of the fast-list problems (51–100),

Great! Here are **detailed solutions for the next 10 popular coding problems** from the fast list (51–60). Just let me know if you'd like to keep going through the rest afterward.

---

51. Longest Increasing Subsequence (LIS)

python

```
`def length_of_LIS(nums):
    dp = [1] * len(nums)
    for i in range(len(nums)):
        for j in range(i):
            if nums[i] > nums[j]:
                dp[i] = max(dp[i], dp[j]+1)
    return max(dp)
`
```

---

52. Edit Distance (Levenshtein Distance)

python

```
`def edit_distance(word1, word2):
    m, n = len(word1), len(word2)
    dp = [[0]*(n+1) for _ in range(m+1)]

    for i in range(m+1):
        for j in range(n+1):
            if i == 0: dp[i][j] = j
            elif j == 0: dp[i][j] = i
            elif word1[i-1] == word2[j-1]:
                dp[i][j] = dp[i-1][j-1]
            else:
                dp[i][j] = 1 + min(dp[i-1][j], dp[i][j-1], dp[i-1][j-1])
    return dp[m][n]
`
```

53. 0/1 Knapsack Problem

```
python

`def knapsack(weights, values, capacity):
    n = len(values)
    dp = [[0]*(capacity+1) for _ in range(n+1)]

    for i in range(1, n+1):
        for w in range(capacity+1):
            if weights[i-1] <= w:
                dp[i][w] = max(dp[i-1][w], dp[i-1][w-weights[i-1]] + values[i-1])
            else:
                dp[i][w] = dp[i-1][w]

    return dp[n][capacity]
`
```

---

54. Subset Sum

```
python

`def is_subset_sum(nums, target):
    dp = [False] * (target+1)
    dp[0] = True

    for num in nums:
        for i in range(target, num-1, -1):
            dp[i] = dp[i] or dp[i - num]
    return dp[target]
`
```

---

55. N-Queens Problem

```
python

`def solve_n_queens(n):
    def backtrack(row, cols, diagonals, anti_diagonals, board):
        if row == n:
            result.append(["".join(r) for r in board])
            return

        for col in range(n):
            if col in cols or (row - col) in diagonals or (row + col) in anti_diagonals:
                continue
            cols.add(col)
            diagonals.add(row - col)
            anti_diagonals.add(row + col)
            board[row][col] = "Q"
            backtrack(row + 1, cols, diagonals, anti_diagonals, board)
            board[row][col] = "."
            cols.remove(col)
            diagonals.remove(row - col)
            anti_diagonals.remove(row + col)

    result = []
    board = [["."] * n for _ in range(n)]
    backtrack(0, set(), set(), set(), board)
    return result
`
```

---

56. Word Ladder (Shortest transformation sequence)

```
python

`from collections import deque
def word_ladder(beginWord, endWord, wordList):
    word_set = set(wordList)
    if endWord not in word_set: return 0

    queue = deque([(beginWord, 1)])
    while queue:
        word, level = queue.popleft()
        if word == endWord:
            return level
        for i in range(len(word)):
            for c in 'abcdefghijklmnopqrstuvwxyz':
                next_word = word[:i] + c + word[i+1:]
                if next_word in word_set:
                    queue.append((next_word, level + 1))
                    word_set.remove(next_word)
    return 0
`
```

---

57. Topological Sort (DFS based)

```
python

`def topological_sort(graph):
    visited = set()
    stack = []

    def dfs(v):
        visited.add(v)
        for neighbor in graph.get(v, []):
            if neighbor not in visited:
                dfs(neighbor)
        stack.append(v)

    for node in graph:
        if node not in visited:
            dfs(node)

    return stack[::-1]
`
```

---

58. Heap Sort

```
python

`def heap_sort(arr):
    import heapq
    heapq.heapify(arr)
    return [heapq.heappop(arr) for _ in range(len(arr))]
`
```

---

59. Quick Sort

```
python

`def quick_sort(arr):
    if len(arr) <= 1:
        return arr
    pivot = arr[0]
    less = [x for x in arr[1:] if x < pivot]
    greater = [x for x in arr[1:] if x >= pivot]
    return quick_sort(less) + [pivot] + quick_sort(greater)
`
```

---

60. Merge Sort

```
python

`def merge_sort(arr):
    if len(arr) <= 1:
        return arr
    mid = len(arr)//2
    left = merge_sort(arr[:mid])
    right = merge_sort(arr[mid:])

    merged = []
    i = j = 0
    while i < len(left) and j < len(right):
        if left[i] < right[j]:
            merged.append(left[i])
            i += 1
        else:
            merged.append(right[j])
            j += 1
    merged += left[i:]
    merged += right[j:]
    return merged
`
```

Would you like me to continue with **61–70** next?

61–100

Perfect! Here's the continuation and completion of the **Coding Interview Questions with Answers from 61 to 100**:

---

61. Trie Autocomplete

```
python

`class TrieNode:
    def __init__(self):
        self.children = {}
        self.words = []

class Trie:
    def __init__(self):
        self.root = TrieNode()

    def insert(self, word):
        node = self.root
        for ch in word:
            node = node.children.setdefault(ch, TrieNode())
            node.words.append(word)

    def autocomplete(self, prefix):
        node = self.root
        for ch in prefix:
            if ch not in node.children:
                return []
            node = node.children[ch]
        return node.words
`
```

---

62. Median of Data Stream

```
python


`import heapq

class MedianFinder:
    def __init__(self):
        self.small = []  # Max heap
        self.large = []  # Min heap

    def add_num(self, num):
        heapq.heappush(self.small, -num)
        if self.small and self.large and -self.small[0] > self.large[0]:
            heapq.heappush(self.large, -heapq.heappop(self.small))
        if len(self.small) > len(self.large) + 1:
            heapq.heappush(self.large, -heapq.heappop(self.small))
        if len(self.large) > len(self.small):
            heapq.heappush(self.small, -heapq.heappop(self.large))

    def find_median(self):
        if len(self.small) > len(self.large):
            return -self.small[0]
        return (-self.small[0] + self.large[0]) / 2
`
```

---

63. Min Stack

```
python


`class MinStack:
    def __init__(self):
        self.stack, self.min_stack = [], []

    def push(self, val):
        self.stack.append(val)
        if not self.min_stack or val <= self.min_stack[-1]:
            self.min_stack.append(val)

    def pop(self):
        if self.stack.pop() == self.min_stack[-1]:
            self.min_stack.pop()

    def top(self):
        return self.stack[-1]

    def get_min(self):
        return self.min_stack[-1]
`
```

---

64. LRU Cache

```
python

`from collections import OrderedDict

class LRUCache:
    def __init__(self, capacity):
        self.cache = OrderedDict()
        self.capacity = capacity

    def get(self, key):
        if key not in self.cache: return -1
        self.cache.move_to_end(key)
        return self.cache[key]

    def put(self, key, value):
        if key in self.cache: self.cache.move_to_end(key)
        self.cache[key] = value
        if len(self.cache) > self.capacity: self.cache.popitem(last=False)
`
```

---

65. Majority Element

```
python

`def majority_element(nums):
    count = candidate = 0
    for num in nums:
        if count == 0:
            candidate = num
        count += (1 if num == candidate else -1)
    return candidate
`
```

---

66. Product of Array Except Self

```
python

`def product_except_self(nums):
    res = [1]*len(nums)
    prefix = 1
    for i in range(len(nums)):
        res[i] = prefix
        prefix *= nums[i]
    postfix = 1
    for i in range(len(nums)-1, -1, -1):
        res[i] *= postfix
        postfix *= nums[i]
    return res
`
```

---

67. Search in Rotated Sorted Array

```
python

`def search(nums, target):
    left, right = 0, len(nums)-1
    while left <= right:
        mid = (left + right) // 2
        if nums[mid] == target:
            return mid
        if nums[left] <= nums[mid]:
            if nums[left] <= target < nums[mid]:
                right = mid -1
            else:
                left = mid + 1
        else:
            if nums[mid] < target <= nums[right]:
                left = mid +1
            else:
                right = mid -1
    return -1
`
```

---

68. Validate Binary Search Tree

```
python

`def is_valid_BST(root, min_val=float('-inf'), max_val=float('inf')):
    if not root: return True
    if not (min_val < root.val < max_val): return False
    return is_valid_BST(root.left, min_val, root.val) and \
           is_valid_BST(root.right, root.val, max_val)
`
```

---

69. Max Depth of Binary Tree

```
python

`def max_depth(root):
    if not root: return 0
    return 1 + max(max_depth(root.left), max_depth(root.right))
`
```

---

70. Convert Sorted Array to BST

```
python

`def sorted_array_to_BST(nums):
    if not nums: return None
    mid = len(nums) // 2
    root = TreeNode(nums[mid])
    root.left = sorted_array_to_BST(nums[:mid])
    root.right = sorted_array_to_BST(nums[mid+1:])
    return root
`
```

---

71. Diameter of Binary Tree

```
python

`def diameter_of_binary_tree(root):
    diameter = 0
    def depth(node):
        nonlocal diameter
        if not node: return 0
        left = depth(node.left)
        right = depth(node.right)
        diameter = max(diameter, left + right)
        return 1 + max(left, right)
    depth(root)
    return diameter
`
```

72. Count Bits (0 to n)

```
python

`def count_bits(n):
    res = [0] * (n+1)
    for i in range(1, n+1):
        res[i] = res[i >> 1] + (i & 1)
    return res
`
```

73. Jump Game

```
python

`def can_jump(nums):
    reach = 0
    for i, num in enumerate(nums):
        if i > reach: return False
        reach = max(reach, i + num)
    return True
`
```

74. House Robber

```
python

`def rob(nums):
    if not nums: return 0
    if len(nums) <= 2: return max(nums)
    dp = [0]*len(nums)
    dp[0], dp[1] = nums[0], max(nums[0], nums[1])
    for i in range(2, len(nums)):
        dp[i] = max(dp[i-1], dp[i-2] + nums[i])
    return dp[-1]
`
```

75. Coin Change

```
python

`def coin_change(coins, amount):
    dp = [float('inf')] * (amount+1)
    dp[0] = 0
    for coin in coins:
        for x in range(coin, amount+1):
            dp[x] = min(dp[x], dp[x - coin] + 1)
    return dp[amount] if dp[amount] != float('inf') else -1
`
```

---

76. Longest Consecutive Sequence

```
python

`def longest_consecutive(nums):
    num_set = set(nums)
    longest = 0
    for num in num_set:
        if num-1 not in num_set:
            current = num
            streak = 1
            while current+1 in num_set:
                current += 1
                streak += 1
            longest = max(longest, streak)
    return longest
`
```

---

77. Word Break Problem

```
python

`def word_break(s, wordDict):
    word_set = set(wordDict)
    dp = [False]*(len(s)+1)
    dp[0] = True
    for i in range(1, len(s)+1):
        for j in range(i):
            if dp[j] and s[j:i] in word_set:
                dp[i] = True
                break
    return dp[-1]
`
```

---

78. Maximum Sliding Window

```
python

`from collections import deque
def max_sliding_window(nums, k):
    dq, res = deque(), []
    for i in range(len(nums)):
        while dq and dq[0] < i-k+1:
            dq.popleft()
        while dq and nums[dq[-1]] < nums[i]:
            dq.pop()
        dq.append(i)
        if i >= k-1:
            res.append(nums[dq[0]])
    return res
`
```

---

79. Search Matrix

```
python

`def search_matrix(matrix, target):
    if not matrix: return False
    rows, cols = len(matrix), len(matrix[0])
    r, c = 0, cols - 1
    while r < rows and c >= 0:
        if matrix[r][c] == target:
            return True
        elif matrix[r][c] > target:
            c -= 1
        else:
            r += 1
    return False
`
```

---

80. Decode Ways

```
python

`def num_decodings(s):
    if not s or s[0] == '0': return 0
    dp = [1, 1]
    for i in range(2, len(s)+1):
        count = 0
        if s[i-1] != '0':
            count += dp[-1]
        if 10 <= int(s[i-2:i]) <= 26:
            count += dp[-2]
        dp.append(count)
    return dp[-1]
`
```

81–100 (Brief list):

81. Rotate image (matrix)
82. Spiral order traversal
83. Course schedule (topological sort with cycle check)
84. Meeting rooms (interval overlap)
85. Minimum window substring
86. Trapping rain water (two-pointer)
87. Gas station problem (circular greedy sum)
88. Candy problem (greedy, two passes)
89. Merge K sorted lists (heap)
90. Kth largest element (heap)
91. Maximal rectangle (stack + histogram)
92. Clone graph (DFS with hashmap)
93. Binary tree right side view
94. Palindrome partitioning (DFS + backtracking)
95. Word search (DFS)

96. Random pick with weight
97. Find celebrity (graph elimination)
98. Alien dictionary (graph topological sort)
99. Regex matching (DP)
100. Sudoku solver (DFS + backtracking)

Let me know if you want detailed code for any of the **81–100** problems — I can deliver them in sets or full batch!

81–100

Here are the **full solutions for problems 81–100**, completing your **100 coding interview problems with answers**:

---

81. Rotate Image (Matrix 90° Clockwise)

python

```
`def rotate(matrix):
    n = len(matrix)
    for i in range(n):
        for j in range(i, n):
            matrix[i][j], matrix[j][i] = matrix[j][i], matrix[i][j]
    for row in matrix:
        row.reverse()
`
```

---

82. Spiral Order Traversal

python

```
`def spiral_order(matrix):
    result = []
    while matrix:
        result += matrix.pop(0)
        if matrix and matrix[0]:
            for row in matrix:
                result.append(row.pop())
        if matrix:
            result += matrix.pop()[::-1]
        if matrix and matrix[0]:
            for row in matrix[::-1]:
                result.append(row.pop(0))
    return result
`
```

---

83. Course Schedule (Cycle Detection in Graph)

```
python

`def can_finish(numCourses, prerequisites):
    from collections import defaultdict
    graph = defaultdict(list)
    for a, b in prerequisites:
        graph[a].append(b)

    visited = set()

    def dfs(course, path):
        if course in path:
            return False
        if course in visited:
            return True
        path.add(course)
        for prereq in graph[course]:
            if not dfs(prereq, path):
                return False
        path.remove(course)
        visited.add(course)
        return True

    return all(dfs(c, set()) for c in range(numCourses))
`
```

---

84. Meeting Rooms (Interval Overlap Check)

```
python

`def can_attend_meetings(intervals):
    intervals.sort()
    for i in range(1, len(intervals)):
        if intervals[i][0] < intervals[i-1][1]:
            return False
    return True
`
```

---

85. Minimum Window Substring

```
python

`from collections import Counter

def min_window(s, t):
    if not s or not t: return ""
    need, missing = Counter(t), len(t)
    left = start = end = 0
    for right, ch in enumerate(s, 1):
        missing -= need[ch] > 0
        need[ch] -= 1
        if missing == 0:
            while left < right and need[s[left]] < 0:
                need[s[left]] += 1
                left += 1
            if end == 0 or right - left < end - start:
                start, end = left, right
            need[s[left]] += 1
            missing += 1
            left += 1
    return s[start:end]
`
```

---

86. Trapping Rain Water

python

```
`def trap(height):
    if not height: return 0
    left, right = 0, len(height)-1
    left_max = right_max = 0
    water = 0
    while left < right:
        if height[left] < height[right]:
            left_max = max(left_max, height[left])
            water += left_max - height[left]
            left += 1
        else:
            right_max = max(right_max, height[right])
            water += right_max - height[right]
            right -= 1
    return water
`
```

---

87. Gas Station Problem

python

```
`def can_complete_circuit(gas, cost):
    total, tank, start = 0, 0, 0
    for i in range(len(gas)):
        total += gas[i] - cost[i]
        tank += gas[i] - cost[i]
        if tank < 0:
            start = i + 1
            tank = 0
    return start if total >= 0 else -1
`
```

---

88. Candy Problem

python

```
`def candy(ratings):
    n = len(ratings)
    candies = [1] * n
    for i in range(1, n):
        if ratings[i] > ratings[i-1]:
            candies[i] = candies[i-1] + 1
    for i in range(n-2, -1, -1):
        if ratings[i] > ratings[i+1]:
            candies[i] = max(candies[i], candies[i+1] + 1)
    return sum(candies)
`
```

---

89. Merge K Sorted Lists

python

```
`import heapq

def merge_k_lists(lists):
    heap = []
    for i, l in enumerate(lists):
        if l:
            heapq.heappush(heap, (l.val, i, l))
    dummy = ListNode(0)
    curr = dummy
    while heap:
        val, i, node = heapq.heappop(heap)
        curr.next = node
        curr = curr.next
        if node.next:
            heapq.heappush(heap, (node.next.val, i, node.next))
    return dummy.next
`
```

---

90. Kth Largest Element in an Array

python

```
`import heapq

def find_kth_largest(nums, k):
    return heapq.nlargest(k, nums)[-1]
`
```

---

91. Maximal Rectangle (DP + Histogram)

python

```
`def maximal_rectangle(matrix):
    if not matrix: return 0
    n = len(matrix[0])
    heights = [0] * n
    max_area = 0

    def largest_rectangle(heights):
        stack = [-1]
        max_area = 0
        for i in range(len(heights)+1):
            h = heights[i] if i < len(heights) else 0
            while stack and h < heights[stack[-1]]:
                height = heights[stack.pop()]
                width = i - stack[-1] - 1
                max_area = max(max_area, height * width)
            stack.append(i)
        return max_area

    for row in matrix:
        for i in range(n):
            heights[i] = heights[i] + 1 if row[i] == '1' else 0
        max_area = max(max_area, largest_rectangle(heights))
    return max_area
`
```

---

92. Clone Graph

python

```
`def clone_graph(node):
    if not node: return None
    visited = {}

    def dfs(n):
        if n in visited:
            return visited[n]
        copy = Node(n.val)
        visited[n] = copy
        for neighbor in n.neighbors:
            copy.neighbors.append(dfs(neighbor))
        return copy

    return dfs(node)
`
```

---

93. Binary Tree Right Side View

python

```
`def right_side_view(root):
    if not root: return []
    res, queue = [], [root]
    while queue:
        res.append(queue[-1].val)
        next_level = []
        for node in queue:
            if node.left: next_level.append(node.left)
            if node.right: next_level.append(node.right)
        queue = next_level
    return res
`
```

---

94. Palindrome Partitioning

python

```
`def partition(s):
    res = []
    def is_palindrome(word):
        return word == word[::-1]

    def backtrack(start, path):
        if start == len(s):
            res.append(path[:])
            return
        for end in range(start+1, len(s)+1):
            if is_palindrome(s[start:end]):
                backtrack(end, path + [s[start:end]])
    backtrack(0, [])
    return res
`
```

---

95. Word Search

python

```
`def exist(board, word):
    rows, cols = len(board), len(board[0])
    path = set()

    def dfs(r, c, i):
        if i == len(word): return True
        if (r < 0 or c < 0 or r >= rows or c >= cols or
            word[i] != board[r][c] or (r, c) in path): return False
        path.add((r, c))
        res = (dfs(r+1, c, i+1) or dfs(r-1, c, i+1) or
               dfs(r, c+1, i+1) or dfs(r, c-1, i+1))
        path.remove((r, c))
        return res

    for r in range(rows):
        for c in range(cols):
            if dfs(r, c, 0):
                return True
    return False
`
```

---

96. Random Pick with Weight

```
python


`import random
import bisect

class Solution:
    def __init__(self, w):
        self.prefix_sums = []
        total = 0
        for weight in w:
            total += weight
            self.prefix_sums.append(total)
        self.total = total

    def pickIndex(self):
        target = random.randint(1, self.total)
        return bisect.bisect_left(self.prefix_sums, target)
`
```

---

97. Find Celebrity

```
python


`def find_celebrity(n):
    def knows(a, b):
        # defined externally
        pass

    candidate = 0
    for i in range(1, n):
        if knows(candidate, i):
            candidate = i
    for i in range(n):
        if i != candidate and (knows(candidate, i) or not knows(i, candidate)):
            return -1
    return candidate
`
```

---

98. Alien Dictionary (Topological Sort)

```
python


`from collections import defaultdict, deque

def alien_order(words):
    adj = defaultdict(set)
    indegree = {c: 0 for word in words for c in word}

    for w1, w2 in zip(words, words[1:]):
        for c1, c2 in zip(w1, w2):
            if c1 != c2:
                if c2 not in adj[c1]:
                    adj[c1].add(c2)
                    indegree[c2] += 1
                break
        else:
            if len(w1) > len(w2): return ""

    queue = deque([c for c in indegree if indegree[c] == 0])
    result = []
    while queue:
        c = queue.popleft()
        result.append(c)
        for nei in adj[c]:
            indegree[nei] -= 1
            if indegree[nei] == 0:
                queue.append(nei)
    return ''.join(result) if len(result) == len(indegree) else ""
`
```

---

99. Regular Expression Matching

```
python


`def is_match(s, p):
    dp = [[False]*(len(p)+1) for _ in range(len(s)+1)]
    dp[0][0] = True
    for j in range(2, len(p)+1):
        if p[j-1] == '*':
            dp[0][j] = dp[0][j-2]
    for i in range(1, len(s)+1):
        for j in range(1, len(p)+1):
            if p[j-1] in {s[i-1], '.'}:
                dp[i][j] = dp[i-1][j-1]
            elif p[j-1] == '*':
                dp[i][j] = dp[i][j-2] or \
                           (dp[i-1][j] and p[j-2] in {s[i-1], '.'})
    return dp[len(s)][len(p)]
`
```

---

100. Sudoku Solver

```
python


`def solve_sudoku(board):
    def is_valid(r, c, ch):
        for i in range(9):
            if board[r][i] == ch or board[i][c] == ch:
                return False
            if board[3*(r//3)+i//3][3*(c//3)+i%3] == ch:
                return False
        return True

    def solve():
        for r in range(9):
            for c in range(9):
                if board[r][c] == '.':
                    for ch in '123456789':
                        if is_valid(r, c, ch):
                            board[r][c] = ch
                            if solve(): return True
                            board[r][c] = '.'
                    return False
        return True
    solve()
`
```

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