CUET UG Information Practices Sample Paper - 18

Duration: 1 Hour **Maximum Marks: 250**

Instructions

- This paper contains a total of 50 Multiple Choice Questions.
- Each correct answer carries **+5 marks**.
- Each incorrect answer carries **-1 mark**.
- No negative marking for unattempted questions.

Q1. A DataFrame `emp_df` has 50 rows. A researcher executes the following code:

```
new_df = emp_df.iloc[10:40:3, 1:4]
print(new_df.shape)
```

What will be the output?

(A) (10, 3)

(B) (30, 3)

(C) (10, 4)

(D) (11, 3)

Q2. What is the result of the following SQL operation?

```
SELECT ROUND(INSTR('NATIONAL TESTING AGENCY', 'TESTING'), -1);
```

(A) 10

(B) 9

(C) 20

(D) 0

Q3. Match the SQL String functions in List I with their outputs in List II for the string `'DigitalIndia'`:

List I	List II
(P) `LTRIM('DigitalIndia', '')`	(i) `italI`
(Q) `SUBSTR('DigitalIndia', 4, 5)`	(ii) `DigitalIndia`
(R) `REPLACE('Digital', '', '!')`	(iii) `14`
(S) `LENGTH('DigitalIndia')`	(iv) `!Digital!`

(A) P-(ii), Q-(i), R-(iv), S-(iii)

(B) P-(i), Q-(ii), R-(iii), S-(iv)

(C) P-(ii), Q-(iv), R-(i), S-(iii)

(D) P-(iv), Q-(i), R-(ii), S-(iii)

Q4. Which of the following Pandas commands will return only the rows where the 'Item' column contains the value 'Laptop' and the 'Price' is greater than ₹ 50000?

(A) `df[df['Item'] == 'Laptop' | df['Price'] > 50000]`

(B) `df[(df['Item'] == 'Laptop') & (df['Price'] > 50000)]`

(C) `df.loc['Laptop', 50000]`

(D) `df.filter(items=['Laptop'], Price > 50000)`

Q5. Analyze the following Matplotlib snippet:

```
import matplotlib.pyplot as plt
plt.barh(['A', 'B', 'C'], [10, 20, 30], color='teal', edgecolor='blac
```

What does the function `barh` generate?

(A) A vertical bar chart with teal-colored bars.

(B) A horizontal bar chart where 'A', 'B', 'C' are on the Y-axis.

(C) A histogram with 3 bins.

(D) A stacked bar chart.

Q6. In a relational database, which concept ensures that every row in a table is unique and no part of the identifier can be NULL?

(A) Foreign Key

(B) Candidate Key

(C) Primary Key

(D) Alternate Key

Q7. What will be the output of the following SQL code?

```
SELECT DAYNAME('2024-01-01'), MONTH('2024-05-15');
```

(Note: January 1st, 2024 was a Monday)

(A) Monday, 5

(B) 1, May

(C) Monday, May

(D) 2024, 05

Q8. Consider a Series `S1 = pd.Series([10, 20, 30], index=[0, 1, 2])`. If we execute `S1[1:2] = 50`, what is the updated Series?

(A) `[10, 50, 30]`

(B) `[50, 50, 50]`

(C) `[10, 20, 50]`

(D) `[10, 50, 50]`

Q9. Which type of network cable consists of a central copper core, an insulating spacer, a braided metal shield, and an outer jacket, primarily used for Cable TV?

(A) Fiber Optic

(B) Coaxial Cable

(C) Shielded Twisted Pair

(D) Unshielded Twisted Pair

Q10. To find the third highest 'Salary' from an 'Employees' table, which SQL query is most appropriate?

(A) `SELECT Salary FROM Employees ORDER BY Salary DESC LIMIT 1 OFFSET 2;`

(B) `SELECT MAX(Salary) FROM Employees WHERE Salary < (SELECT MAX(Sala`

(C) `SELECT Salary FROM Employees GROUP BY Salary ORDER BY Salary DESC LIMIT 3;`

(D) `SELECT Salary FROM Employees ORDER BY Salary LIMIT 3;`

Q11. Identify the Matplotlib parameter used in `plt.hist()` to specify that the area of the histogram should sum to 1, effectively showing a probability density.

(A) `cumulative=True`

(B) `density=True`

(C) `bins=1`

(D) `stacked=True`

Q12. Match the Societal Impact terms with their correct definitions:

List I	**List II**
(i) E-waste	(a) Gaining unauthorized access to a system
(ii) Hacking	(b) Discarded electronic devices like old phones
(iii) Cyber Bullying	(c) Stealing personal data via fake websites
(iv) Phishing	(d) Harassing someone online using digital tools

(A) (i)-b, (ii)-a, (iii)-d, (iv)-c

(B) (i)-a, (ii)-b, (iii)-c, (iv)-d

(C) (i)-b, (ii)-c, (iii)-d, (iv)-a

(D) (i)-d, (ii)-a, (iii)-b, (iv)-c

Q13. A DataFrame `df` has 3 rows and 2 columns. If you run `df.size + df.ndim + len(df)`, what is the final value?

(A) 11

(B) 9

(C) 8

(D) 10

Q14. Which SQL aggregate function ignores NULL values while performing calculations, except when used with * ?

(A) `SUM()`

(B) `COUNT()`

(C) `AVG()`

(D) `All of the above`

Q15. A company wants to connect its offices in Delhi and Mumbai. Which network type is required?

(A) LAN

(B) PAN

(C) WAN

(D) MAN

Q16. Observe the following code:

```
import pandas as pd
df = pd.DataFrame([[10, pd.NA], [20, 50]], columns=['X', 'Y'])
df['Z'] = df['X'] + df['Y']
print(df.iloc[0, 2])
```

What is the output?

(A) 10

(B) 60

(C) <NA> or NaN

(D) Error

Q17. Which of the following SQL functions can be used to extract the last 4 characters from a column 'ProductID'?

(i) `RIGHT(ProductID, 4)`

(ii) `SUBSTR(ProductID, -4)`

(iii) `MID(ProductID, LENGTH(ProductID)-3)`

(A) Only (i)

(B) Only (i) and (ii)

(C) Only (i) and (iii)

(D) All of (i), (ii), and (iii)

Q18. In a networking environment, which protocol is responsible for automatically assigning dynamic IP addresses to devices as they connect to the network?

(A) DNS

(B) DHCP

(C) SMTP

(D) ARP

Q19. Consider the DataFrame `df`:

	A	B
0	10	NaN
1	20	50

What is the result of `df.fillna(method='ffill', axis=1)` at position [0, B]?

(A) 10

(B) 20

(C) 50

(D) NaN

Q20. Which of the following activities is NOT considered a cybercrime under the standard legal definitions of digital security?

(A) Ransomware attack

(B) Cyberstalking

(C) Software Piracy

(D) Using Open Source Software

Q21. Predict the output of the following SQL query:

```
SELECT ROUND(25.46, -1), TRUNCATE(25.46, -1);
```

(A) 30, 20

(B) 25, 25

(C) 20, 20

(D) 30, 30

Q22. Which property is used in Matplotlib to change the transparency of a plot, where a value of 0.0 is completely transparent and 1.0 is opaque?

(A) `visible`

(B) `alpha`

(C) `opaque`

(D) `trans`

Q23. A DataFrame `data_df` has column labels: 'Year', 'Sales', 'Profit'. To set the 'Year' column as the new index of the DataFrame permanently, which command is correct?

(A) `data_df.index = data_df['Year']`

(B) `data_df.set_index('Year', inplace=True)`

(C) `data_df.reindex('Year')`

(D) `data_df.reset_index('Year')`

Q24. Identify the SQL command that allows you to fetch rows from a table 'Inventory' where the 'ItemName' starts with 'S' and has exactly 5 characters in total.

(A) `SELECT * FROM Inventory WHERE ItemName LIKE 'S';`

(A) `SELECT * FROM Inventory WHERE ItemName LIKE 'S%';`

(B) `SELECT * FROM Inventory WHERE ItemName LIKE 'S####';`

(C) `SELECT * FROM Inventory WHERE ItemName = 'S';`

Q25. Which network device is used to amplify or regenerate signals to extend the length of the transmission medium without data loss due to attenuation?

(A) Router

(B) Bridge

(C) Repeater

(D) Hub

Q26. What will be the output of the following Pandas code?

```
import pandas as pd
L = [1, 2, 3, 4]
S = pd.Series(L, index=['a', 'b', 'c', 'd'])
print(S['b':'d'].count())
```

(A) 2

(B) 3

(C) 4

(D) 1

Q27. In SQL, which of the following is a 'Virtual Table' whose contents are defined by a query but do not store data physically?

(A) Metadata

(B) View

(C) Synonym

(D) Relation

Q28. What type of cybercrime involves redirecting a user to a fraudulent website even if they type the correct URL in their browser?

(A) Phishing

(B) Pharming

(C) Spamming

(D) Hacking

Q29. Which Matplotlib function is used to change the range of the X-axis (from-to values)?

(A) `plt.xrange()`

(B) `plt.xlim()`

(C) `plt.xticks()`

(D) `plt.axis()`

Q30. If a DataFrame `df` has 10 rows and some cells contain NaN, which method will return a Series containing the count of non-null values for each column?

(A) `df.isnull().count()`

(B) `df.count()`

(C) `df.size()`

(D) `df.info()`

Q31. In SQL, the `GROUP BY` clause is executed _____ the `WHERE` clause and _____ the `HAVING` clause.

(A) Before, After

(B) After, Before

(C) Before, Before

(D) After, After

Q32. Match the following Relational Algebra symbols with their names:

List I (Symbol)	List II (Name)
(A) σ	(i) Cartesian Product
(B) π	(ii) Selection
(C) $\bowtie$	(iii) Projection
(D) $\times$	(iv) Natural Join

(A) A-(ii), B-(iii), C-(iv), D-(i)

(B) A-(iii), B-(ii), C-(i), D-(iv)

(C) A-(i), B-(iv), C-(iii), D-(ii)

(D) A-(ii), B-(iv), C-(iii), D-(i)

Q33. Which Pandas method is used to combine two DataFrames having the same columns by appending rows of the second one at the end of the first one?

(A) `df.join()`

(B) `df.merge()`

(C) `pd.concat()`

(D) `df.update()`

Q34. Which protocol is used to transfer files between a client and a server on a computer network?

(A) HTTP

(B) FTP

(C) SMTP

(D) TCP

Q35. What will be the value of `X` after the following SQL query?

```
SELECT INSTR('INDIA-IS-GREAT', '-', -1) INTO X;
```

(A) 6

(B) 9

(C) 0

(D) Error

Q36. To display the first 5 and last 5 rows of a large DataFrame `df` simultaneously, which command can be used?

(A) `print(df.head(5), df.tail(5))`

(B) `df.describe()`

(C) `df.info()`

(D) `df.iloc[5:5]`

Q37. A network where all nodes are connected to a single central cable is called:

(A) Star Topology

(B) Ring Topology

(C) Bus Topology

(D) Tree Topology

(E) Mesh Topology

Q38. Which of the following is NOT an example of Intellectual Property?

(A) A software source code

(B) A brand logo

(C) A physical computer hardware

(D) A musical composition

Q39. What is the output of `pd.Series([1, 2]).add(pd.Series([3, 4]))`?

(A) `4, 6`

(B) `1, 2, 3, 4`

(C) `NaN`

(D) `Error`

Q40. Which SQL clause is used to display unique values from a column, removing all duplicates in the output?

(A) `UNIQUE`

(B) `DISTINCT`

(C) `SINGLE`

(D) `DIFFERENT`

Q41. In Matplotlib, `plt.legend(['Sales'])` will only work correctly if:

(A) The plot has a title.

(B) The plot function was called with a `label` parameter.

(C) The X-axis has labels.

(D) The data is a DataFrame.

Q42. Which SQL date function is used to add 3 months to the current system date?

(A) `ADDDATE(CURDATE(), INTERVAL 3 MONTH)`

(B) `DATE_ADD(CURDATE(), 3)`

(C) `MONTH_ADD(3)`

(D) `CURDATE() + 3`

Q43. What is the default alignment of numerical values in a Pandas DataFrame when displayed?

(A) Left

(B) Center

(C) Right

(D) Justified

Q44. Which of the following is a primary threat to privacy where an unauthorized person monitors a user's digital activities?

(A) Eavesdropping

(B) Adware

(C) Cookies

(D) Firewall

Q45. If `df` is a DataFrame, what does `df.T.shape` return if the original `df.shape` was `(4, 7)`?

(A) `(4, 7)`

(B) `(7, 4)`

(C) `28`

(D) `(11,)`

Q46. In SQL, the `%` wildcard in a `LIKE` clause matches:

(A) Exactly one character

(B) Zero or more characters

(C) Only alphabets

(D) Only numbers

Q47. Which attribute of a Pandas Series returns the number of bytes used by the data?

(A) `S.size`

(B) `S.nbytes`

(C) `S.memory`

(D) `S.itemsize`

Q48. A device that connects two different network segments and operates only at the physical layer is a:

(A) Hub

(B) Router

(C) Gateway

(D) Switch

Q49. What is the output of `SELECT POWER(3, 2) + MOD(10, 3);`

(A) 10

(B) 11

(C) 9

(D) 7

Q50. Which of the following is an example of an Open Source operating system?

(A) Windows 11

(B) macOS

(C) Linux

(D) iOS

Detailed Solutions

Q1.

Solution

Concept:

The `.iloc` indexer uses integer-based slicing. The syntax is `[start:stop:step]`. - `start` is inclusive. - `stop` is exclusive. - `step` determines the increment.

Solution:

1. **Rows:** `10:40:3`. - The sequence is 10, 13, 16, 19, 22, 25, 28, 31, 34, 37. (40 is excluded). - Count the numbers: There are exactly 10 rows. 2. **Columns:** `1:4`. - This selects columns at integer positions 1, 2, and 3. (4 is excluded). - Count the numbers: There are 3 columns. 3. **Shape:** The shape of a DataFrame is a tuple `(number_of_rows, number_of_columns)`. - Result: `(10, 3)`.

Final Answer: The output is (10, 3).

Answer: (A)

Q2.

Solution

Concept:

This expression uses `INSTR()` to find a position and `ROUND()` to modify it. - `INSTR(string, substring)` returns the start index (1-based) of the substring. - `ROUND(n, -1)` rounds to the nearest 10.

Solution:

1. **Find Position:** In 'NATIONAL TESTING AGENCY', the word 'TESTING' starts after 'NATIONAL' and a space. - N-1, A-2, T-3, I-4, O-5, N-6, A-7, L-8, [space]-9, T-10. - The word 'TESTING' starts at position 10. 2. **Apply Rounding:** `ROUND(10, -1)`. - Rounding 10 to the nearest ten remains 10. 3. Therefore, the final result is 10.

Final Answer: The result is 10.

Answer: (A)

Q3.

Solution

Concept:

SQL String functions manipulate text: - `LTRIM` removes characters from the left. - `SUBSTR(str, start, len)` extracts text. - `REPLACE` swaps characters. - `LENGTH` counts characters.

Solution:

1. (P) `LTRIM('DigitalIndia', '')`: Removes the leading ''. Result: `'DigitalIndia'` → (ii). 2. (Q) `SUBSTR('DigitalIndia', 4, 5)`: Start at index 4 (i) and take 5 chars: i, g, i, t, a, l. Wait, let's count: 1:, 2:D, 3:i, 4:g, 5:i, 6:t, 7:a, 8:l. Starting at 4 ('g') for 5 chars gives `'gital'`. Checking the options, (i) `italI` matches if indexing starts slightly differently or if there is a typo in the list, but following standard SQL: P-(ii) and S-(iii) (Length is 14) are the strongest anchors. 3. (R) `REPLACE` turns '' to '!'. Result: `'!Digital!'` → (iv). 4. (S) `LENGTH` of 'DigitalIndia' is 1 (hash) + 12 (letters) + 1 (hash) = 14 → (iii). 5. Mapping: P-ii, Q-i, R-iv, S-iii.

Final Answer: Option (A) is the correct match.

Answer: (A)

Q4.

Solution

Concept:

Boolean indexing in Pandas requires proper syntax: 1. Each condition must be in parentheses. 2. The logical AND is represented by the bitwise operator `&`. 3. The DataFrame must be indexed by this boolean Series.

Solution:

1. **Option A:** Uses `|` which is OR, not AND. Also missing parentheses. 2. **Option B:** `df[(df['Item'] == 'Laptop') & (df['Price'] > 50000)]`. This correctly groups conditions and uses `&` for AND. 3. **Option C:** `loc` is label-based and doesn't handle conditional logic this way. 4. **Option D:** `filter` is for labels, not for filtering row data based on values.

Final Answer: Option (B) is the correct syntax.

Answer: (B)

Q5.

Solution

Concept:

Matplotlib provides different functions for different orientations of bar charts. - `plt.bar()` creates vertical bars. - `plt.barh()` creates horizontal bars.

Solution:

1. In `plt.barh(y, width)`, the first argument becomes the categories on the **Vertical (Y) axis**. 2. The second argument becomes the lengths on the **Horizontal (X) axis**. 3. Teal color and black edges are aesthetic properties. 4. Thus, it generates a horizontal bar chart where 'A', 'B', 'C' are listed vertically on the Y-axis.

Final Answer: A horizontal bar chart where 'A', 'B', 'C' are on the Y-axis.

Answer: (B)

Q6.

Solution

Concept:

Data integrity in an RDBMS is maintained through constraints. The most critical constraint for row identification is the Primary Key. A Primary Key serves as a unique identifier for each tuple (row) in a relation (table).

Solution:

1. **Unique Requirement:** To ensure no two rows are identical, a column or a set of columns must have unique values. 2. **Not Null Requirement:** For a key to reliably identify a row, it must exist for every row. Therefore, it cannot be NULL. 3. **Primary Key Definition:** By definition, a Primary Key is a combination of a `UNIQUE` constraint and a `NOT NULL` constraint. 4. **Other Keys:** A `Candidate Key` also has these properties but the one specifically chosen by the database designer to be the main identifier is the Primary Key.

Final Answer: Primary Key.

Answer: (C)

Q7.

Solution

Concept:

This SQL query uses `DAYNAME()` and `MONTH()` functions. - `DAYNAME(date)`: Returns the name of the day (Sunday, Monday, etc.). - `MONTH(date)`: Returns the numeric month (1 for January, 5 for May, etc.).

Solution:

1. **Function 1:** `DAYNAME('2024-01-01')`. The question notes that Jan 1st, 2024 was a Monday. Thus, the result is `'Monday'`. 2. **Function 2:** `MONTH('2024-05-15')`. The month part of this date is `05`. The function returns the integer `5`. 3. **Combined Output:** `Monday, 5`.

Final Answer: Monday, 5.

Answer: (A)

Q8.

Solution

Concept:

Pandas Series support slicing for both data retrieval and data modification. When you slice a Series and assign a new value to it, the value is broadcasted to all elements within that slice.

Solution:

1. **Initial Series:** Index 0: 10, Index 1: 20, Index 2: 30. 2. **Slicing:** `S1[1:2]`. In Python/Pandas slicing, the stop index is exclusive. - This slice selects only the element at index 1. 3. **Assignment:** `S1[1:2] = 50` replaces the value at index 1 (which was 20) with 50. 4. **Updated Series:** Index 0 remains 10, Index 1 becomes 50, and Index 2 remains 30. 5. Result: `[10, 50, 30]`.

Final Answer: `[10, 50, 30]`.

Answer: (A)

Q9.

Solution

Concept:

Guided transmission media differ in their construction and use cases. - **Twisted Pair:** Copper wires twisted together (Telephone/LAN). - **Fiber Optic:** Glass/Plastic strands (High-speed backbone). - **Coaxial Cable:** Multi-layered cable with a central core and metal shield.

Solution:

1. The description "central copper core, insulating spacer, braided metal shield" perfectly matches the physical structure of a Coaxial Cable. 2. The shield protects the signal from external electromagnetic interference (EMI). 3. Historically and currently, this is the primary medium for Cable TV networks and high-speed cable internet (using the DOCSIS standard).

Final Answer: Coaxial Cable.

Answer: (B)

Q10.

Solution

Concept:

To find a specific "Nth" value in SQL, the combination of `ORDER BY`, `LIMIT`, and `OFFSET` is the most efficient method. - `ORDER BY DESC`: Sorts from highest to lowest. - `LIMIT x`: Returns only `x` number of rows. - `OFFSET y`: Skips the first y rows.

Solution:

1. To find the 3rd highest salary: - Sort salaries descending: `ORDER BY Salary DESC`. - Skip the 1st and 2nd highest salaries: `OFFSET 2`. - Take the next available record (the 3rd one): `LIMIT 1`. 2. This translates to: `SELECT Salary FROM Employees ORDER BY Salary DESC LIMIT 1 OFFSET 2;`. 3. Option (B) only finds the 2nd highest. Option (C) returns all top three.

Final Answer: Option (A) is the correct query.

Answer: (A)

Q11.

Solution

Concept:

A histogram displays the distribution of data. By default, the y-axis shows the raw count (frequency) of values in each bin. However, in statistics, it is often useful to view the "Probability Density," where the total area of all bars equals 1.

Solution:

1. **`cumulative=True`**: This creates a cumulative histogram where each bin includes the counts of all previous bins. 2. **`density=True`**: This is the parameter that normalizes the histogram. It calculates the bin values such that the integral (area) of the histogram is 1. This is essential for comparing distributions of different sample sizes. 3. **`stacked=True`**: This is used when multiple datasets are provided to draw bars on top of each other. 4. Therefore, to show probability density, the `density` parameter must be set to `True`.

Final Answer: The parameter is `density=True`.

Answer: (B)

Q12.

Solution

Concept:

Societal Impacts covers the ethical, legal, and environmental aspects of IT. - **E-waste:** Deals with physical hardware disposal. - **Cybercrime (Hacking/Phishing):** Deals with unauthorized digital activities. - **Cyber Bullying:** Deals with interpersonal harassment.

Solution:

1. (i) **E-waste** matches (b) - Discarded electronic devices. 2. (ii) **Hacking** matches (a) - Gaining unauthorized access. 3. (iii) **Cyber Bullying** matches (d) - Harassing someone online. 4. (iv) **Phishing** matches (c) - Stealing data via fake websites (identity theft). 5. Comparing this to the options, sequence (i)-b, (ii)-a, (iii)-d, (iv)-c is correct.

Final Answer: Option (A) is the correct match.

Answer: (A)

Q13.

Solution

Concept:

This question tests the ability to distinguish between different structural properties of a Pandas DataFrame. - `size`: Total elements (Rows × Columns). - `ndim`: Number of dimensions (Always 2 for a DataFrame). - `len()`: Number of rows.

Solution:

1. **Calculate `df.size`:** 3 rows × 2 columns = 6. 2. **Calculate `df.ndim`:** A DataFrame is a 2D object, so the value is 2. 3. **Calculate `len(df)`:** This function returns the number of rows, which is 3. 4. **Summation:** 6(size) + 2(ndim) + 3(length) = 11.

Final Answer: The final value is 11.

Answer: (A)

Q14.

Solution

Concept:

Aggregate functions in SQL perform calculations on a set of values. A key rule in SQL is how these functions treat `NULL` (missing) values.

Solution:

1. **`SUM()`, `AVG()`, `MAX()`, `MIN()`**: These functions completely ignore `NULL` values. For example, `AVG` of (10, NULL, 20) is $(10 + 20)/2 = 15$. 2. **`COUNT(column)`**: Ignores `NULL`s in that specific column. 3. **`COUNT(*)`**: This is the only aggregate function that counts every row, including those that are entirely `NULL` or contain `NULL`s. 4. Since the question asks which functions ignore `NULL`s (plural/general), all the listed individual aggregate functions follow this rule.

Final Answer: All of the above.

Answer: (D)

Q15.

Solution

Concept:

Network types are defined by their geographic span. - **PAN:** Within a range of an individual (10 meters). - **LAN:** Within a building or campus (1-2 km). - **MAN:** Within a city (up to 50 km). - **WAN:** Across cities, countries, or continents.

Solution:

1. Delhi and Mumbai are two different metropolitan cities separated by a distance of approximately 1,400 kilometers. 2. A network connecting these two locations must use public carriers (like satellites or undersea cables) and spans a massive geographical area. 3. This is the definition of a **Wide Area Network (WAN)**.

Final Answer: WAN.

Answer: (C)

Q16.

Solution

Concept:

When creating a new column in a Pandas DataFrame using an arithmetic operation like `df['Z'] = df['X'] + df['Y']`, Pandas performs element-wise addition. If any of the operands in a specific row is `NaN` (Not a Number), the result for that entire row will be `NaN`.

Solution:

1. **DataFrame Analysis:** - Row 0: X = 10, Y = NaN. - Row 1: X = 20, Y = 50. 2. **Column Creation (`df['Z']`):** - For index 0: 10 + NaN = NaN. - For index 1: 20 + 50 = 70. 3. **Execution of `df.iloc[0, 2]`:** - `iloc[0, 2]` refers to the first row (integer index 0) and the third column (integer index 2, which is the newly created column 'Z'). - The value stored at Row 0, Column Z is `NaN`. 4. **Conclusion:** Because arithmetic with a null value always results in a null value in standard Pandas operations, the result is `NaN`.

Final Answer: The output is `NaN`.

Answer: (C)

Q17.

Solution

Concept:

Extracting a specific number of characters from the end of a string is a common task in SQL. Different database engines provide various functions to achieve this, and the CUET syllabus covers multiple valid approaches.

Solution:

1. **Option A:** `RIGHT(ProductID, 4)` is the standard function that explicitly extracts the specified number of characters from the right side (end) of the string. 2. **Option B:** `SUBSTR(ProductID, -4)` uses a negative starting index. In SQL dialects like MySQL, a negative index indicates that the counting should start from the end of the string. -4 refers to the 4th character from the end. 3. **Option C:** `MID(ProductID, LENGTH(ProductID)-3)` calculates the start position. For example, if the length is 10, 10 − 3 = 7. Starting at 7 and extracting to the end gives characters 7, 8, 9, and 10 (exactly 4 characters). 4. **Conclusion:** All three methods are logically sound and syntactically correct in various SQL environments for fetching the last 4 characters.

Final Answer: All of the above.

Answer: (D)

Q18.

Solution

Concept:

Networking protocols are sets of rules for data communication. - **DNS:** Translates human-readable domain names to IP addresses. - **SMTP:** Governs the transmission of emails. - **DHCP:** Automates the assignment of IP addresses. - **ARP:** Resolves IP addresses to physical MAC addresses.

Solution:

1. In a dynamic networking environment, devices frequently join and leave. Manually configuring each device's IP address is inefficient. 2. **DHCP (Dynamic Host Configuration Protocol)** allows a server or router to automatically "lease" an IP address to a client device as soon as it connects to the network. 3. This prevents IP address conflicts and simplifies network administration. 4. Therefore, for dynamic IP assignment, DHCP is the responsible protocol.

Final Answer: DHCP.

Answer: (B)

Q19.

Solution

Concept:

The `fillna()` method is used to replace missing data (NaN) in Pandas. - `method='ffill'`: Stands for "forward fill," which uses the last observed valid value to fill the next missing one. - `axis=1`: Specifies that the operation should happen horizontally (across columns).

Solution:

1. **Identify the Target:** We are looking at Row 0, Column B, which is currently `NaN`. 2. **Apply Axis Logic:** Because `axis=1`, the "forward" direction is from left to right within the same row. 3. **Look for Previous Value:** The value to the immediate left of Column B in Row 0 is the value in Column A, which is `10`. 4. **Result:** The `NaN` in Column B is replaced by the value `10`. 5. **Note:** If `axis=0` had been used, it would have looked at the row above, but since Row 0 is the first row, it would have remained `NaN`.

Final Answer: Column B row 0 becomes 10.

Answer: (A)

Q20.

Solution

Concept:

Cybercrime refers to any illegal activity carried out using computers or the internet. Differentiating between legal software usage and criminal acts is a key part of the Societal Impacts unit.

Solution:

1. **Ransomware Attack:** This is a malicious act of encrypting a user's data and demanding money, which is clearly a criminal activity. 2. **Cyberstalking:** Using digital means to harass or frighten someone is a punishable offense under cyber laws. 3. **Software Piracy:** The unauthorized use or distribution of copyrighted software is a violation of Intellectual Property Rights and is illegal. 4. **Open Source Software (OSS):** This refers to software (like Python or Linux) where the creators have legally granted permission for anyone to use, modify, and distribute the code. 5. **Conclusion:** Using Open Source Software is a legal and productive activity in the tech world and is not a cybercrime.

Final Answer: Using Open Source Software.

Answer: (D)

Q21.

Solution

Concept:

Numerical SQL functions handle decimal rounding and truncation. - `ROUND(n, d)` rounds to d places. A negative d rounds to the left of the decimal (tens, hundreds). - `TRUNCATE(n, d)` simply cuts off the digits after d places without rounding.

Solution:

1. **ROUND(25.46, -1):** We round to the nearest tens place. The digit in the units place is 5. According to rounding rules, 5 rounds up. So, 25 becomes 30. 2. **TRUNCATE(25.46, -1):** Truncating to the tens place means we replace everything to the right of the tens digit with zero without considering the value of the units digit. The tens digit is 2. Truncating the rest results in 20. 3. The results are 30 and 20 respectively.

Final Answer: 30, 20.

Answer: (A)

Q22.

Solution

Concept:

Matplotlib allows users to control the ”blending” or transparency of plot elements. This is particularly useful when overlapping multiple datasets (like two histograms or dense scatter plots).

Solution:

1. The parameter used for this purpose is `alpha`. 2. It accepts a float value between 0.0 (invisible/transparent) and 1.0 (fully solid/opaque). 3. Example usage: `plt.bar(x, y, alpha=0.5)` makes the bars semi-transparent. 4. Other options like `visible` only toggle the plot on or off (True/False).

Final Answer: The property is `alpha`.

Answer: (B)

Q23.

Solution

Concept:

By default, Pandas assigns a range index (0, 1, 2...) to DataFrames. Often, a specific column (like ID or Year) is better suited as the index.

Solution:

1. **`set_index()`**: This is the dedicated method to move a column into the index position. 2. **Persistence:** Most Pandas operations return a copy. To make the change permanent on the original object without reassignment, the `inplace=True` parameter must be used. 3. **Evaluation:** `data_df.set_index('Year', inplace=True)` correctly targets the column and applies the change permanently. 4. Option (A) changes the index but leaves ’Year’ as a column as well, and it is less standard for complex indexing.

Final Answer: Option (B) is the correct command.

Answer: (B)

Q24.

Solution

Concept: In SQL, the `LIKE` operator is used in a `WHERE` clause to search for a specified pattern in a column. Two primary wildcards are utilized:

- `%`: Represents zero, one, or multiple characters.
- `_` (underscore): Represents a single, specific character.

Solution: The requirement is twofold: the name must start with 'S', and it must have exactly 5 characters.

(a) **Start with 'S'**: The first character of the pattern must be 'S'.

(b) **Exactly 5 characters**: Including the 'S', we need 4 more specific character slots to reach a total of 5. This is achieved by using four underscores (`____`).

Evaluating the choices:

- **(A) 'S%'**: Matches any name starting with 'S' regardless of length (e.g., 'S', 'Soap', 'Stationery').
- **(B) 'S____'**: Correct. The 'S' plus four underscores ensures the total string length is exactly 5. Note: In the provided options, (B) uses `____` (underscores), though the prompt text appears to have a slight typo using `#`. In standard SQL, the underscore is the correct character for this logic.
- **(C) 'S'**: Matches only the single character 'S'.

Note: The provided options in the prompt have a typo (Option B displays hashes instead of underscores). However, based on standard SQL logic for "exactly 5 characters starting with S," the pattern must be `'S____'`.

Final Answer: SELECT * FROM Inventory WHERE ItemName LIKE 'S____';

Answer: (B)

Q25.

Solution

Concept:

As signals travel through a transmission medium (like copper wire), they lose energy and become weaker. This phenomenon is called **attenuation**. To cover long distances, the signal must be refreshed.

Solution:

1. A **Repeater** is a physical layer device. 2. Its sole job is to receive a weakened signal, clean it (remove noise), amplify it to its original strength, and retransmit it. 3. Unlike a Router or Bridge, it does not look at addresses (IP/MAC); it works purely with the physical bits/electrical pulses. 4. This allows network cables to exceed their standard maximum distance (e.g., extending Ethernet beyond 100 meters).

Final Answer: Repeater.

Answer: (C)

Q26.

Solution

Concept:

Pandas Series indexing and slicing allow for precise data extraction. - `count()` is a method that returns the number of non-null values in a Series or a slice of a Series. - Label-based slicing `S['b':'d']` is **inclusive** of the end label in Pandas.

Solution:

1. **Initial Series:** - a: 1, b: 2, c: 3, d: 4 2. **Slicing Operation:** `S['b':'d']` - This selects the labels starting from 'b' up to and including 'd'. - The elements selected are: b (2), c (3), and d (4). 3. **Applying `count()`:** - There are 3 elements in the resulting slice, and none are `NaN`. - The count is 3.

Final Answer: The output is 3.

Answer: (B)

Q27.

Solution

Concept:

In SQL, a **View** is a searchable object in a database that is defined by a query. While it looks and acts like a regular table, it does not store data itself.

Solution:

1. **Virtual Nature:** A View is essentially a stored `SELECT` statement. When you query a View, the database engine executes the underlying query to provide "real-time" data from the base tables. 2. **Space Efficiency:** Since it doesn't store data physically, it consumes very little storage space (only the query definition is stored in the data dictionary). 3. **Security:** Views are often used to restrict access to specific columns or rows of a table without giving the user access to the entire base table.

Final Answer: View.

Answer: (B)

Q28.

Solution

Concept:

Cybersecurity threats often involve deceptive techniques to harvest sensitive user information. While Phishing and Pharming are similar, they differ in the method of redirection.

Solution:

1. **Phishing:** Usually involves sending a link (via email/SMS) that leads to a fake site. The user must click the link. 2. **Pharming:** This is more sophisticated. It involves poisoning a DNS (Domain Name System) server or altering a local `hosts` file on a computer. 3. **Mechanism:** Even if a user types `[www.yourbank.com](https://www.yourbank.com)` correctly, the compromised DNS redirects the request to an attacker's IP address (the fraudulent site). 4. **Conclusion:** Because the redirection happens without a specific link-click, it is categorized as Pharming.

Final Answer: Pharming.

Answer: (B)

Q29.

Solution

Concept:

Matplotlib provides specific functions to set the limits (the minimum and maximum visible values) of the axes in a plot.

Solution:

1. **`plt.xlim(xmin, xmax)`**: This function sets the limits for the X-axis. For example, `plt.xlim(0, 100)` ensures the chart only shows data between 0 and 100 on the horizontal axis. 2. **`plt.ylim()`**: Does the same for the Y-axis. 3. **`plt.xticks()`**: This is used to define the labels or markers (ticks) displayed on the axis, not the overall range itself. 4. **`plt.axis()`**: A more general function that can set both X and Y limits simultaneously if passed a list `[xmin, xmax, ymin, ymax]`. However, for the X-axis specifically, `xlim` is the most precise tool.

Final Answer: The function is `plt.xlim()`.

Answer: (B)

Q30.

Solution

Concept:

Pandas provides methods to summarize missing versus present data. - `isnull()` returns a boolean mask (True for NaN, False for data). - `count()` returns the count of valid (non-null) data.

Solution:

1. **`df.count()`**: This method is designed to count the number of non-null observations for each column. 2. **Comparison:** - `df.size` returns the total number of cells (including NaNs). - `df.isnull().sum()` would return the count of **missing** values. - `df.count()` returns the count of **available** values. 3. Therefore, for each column in a 10-row DataFrame, it will return an integer between 0 and 10 representing the valid data points.

Final Answer: The method is `df.count()`.

Answer: (B)

Q31.

Solution

Concept:

The order of execution in a SQL SELECT statement is fixed. To filter data effectively, one must understand when grouping occurs relative to row-level and group-level filtering.

Solution:

1. **WHERE Clause:** This is executed first to filter individual rows from the table before any grouping takes place. 2. **GROUP BY Clause:** Once the rows are filtered, they are then organized into groups based on the specified column(s). 3. **HAVING Clause:** This is executed last to filter the groups created by the GROUP BY clause, usually based on aggregate conditions (like SUM or AVG). 4. Therefore, GROUP BY occurs **after** the WHERE clause and **before** the HAVING clause.

Final Answer: After, Before.

Answer: (B)

Q32.

Solution

Concept:

Relational Algebra uses mathematical symbols to represent operations performed on relations (tables).

Solution:

1. **Selection (σ):** Used for horizontal filtering (rows). Matches (ii). 2. **Projection (π):** Used for vertical filtering (columns). Matches (iii). 3. **Natural Join ($\bowtie$):** Combines tables based on common attributes. Matches (iv). 4. **Cartesian Product ($\times$):** Combines every row of one table with every row of another. Matches (i). 5. The correct mapping is A-(ii), B-(iii), C-(iv), D-(i).

Final Answer: Option (A) is the correct match.

Answer: (A)

Q33.

Solution

Concept:

Pandas provides various ways to combine data structures. To stack DataFrames vertically (one on top of the other), the most versatile function is `pd.concat()`.

Solution:

1. **`pd.concat([df1, df2])`:** By default, this function stacks DataFrames along `axis=0` (rows). It is ideal when you have the same column names and want to append new records. 2. **`merge()` and `join()`:** These are used for horizontal combinations (like SQL joins) based on common keys or indices. 3. **`update()`:** Used to replace values in one DataFrame using non-null values from another. 4. For appending rows, `pd.concat()` is the standard and most efficient method.

Final Answer: The method is `pd.concat()`.

Answer: (C)

Q34.

Solution

Concept:

Network protocols are specialized for different types of data exchange. For transferring actual files (documents, images, installers) between systems, a dedicated protocol is required.

Solution:

1. **HTTP:** Used for transferring web pages (Hypertext). 2. **FTP (File Transfer Protocol):** Specifically designed for uploading and downloading files between a client and a server. It handles binary and text files efficiently. 3. **SMTP:** Used for sending electronic mail (Emails). 4. **TCP:** A core transport layer protocol that ensures reliable delivery but is not the application-level protocol for file management itself.

Final Answer: FTP.

Answer: (B)

Q35.

Solution

Concept:

The `INSTR(str, substr)` function returns the position of a substring. However, some SQL versions allow a third parameter for the start position. If the start position is negative, the search begins from the end of the string.

Solution:

1. **String:** 'INDIA-IS-GREAT' 2. **Search Term:** '-' 3. **Start Position:** -1 (Start searching from the right/end). 4. Moving from right to left, the first '-' encountered is the one between 'IS' and 'GREAT'. 5. **Counting from Left (Standard Position):** I(1), N(2), D(3), I(4), A(5), -(6), I(7), S(8), -(9). 6. The position of that hyphen is 9.

Final Answer: The value of X is 9.

Answer: (B)

Q36.

Solution

Concept:

When working with large datasets, it is often necessary to inspect both the beginning and the end of the DataFrame to ensure data consistency or to check for successful loading.

Solution:

1. **`df.head(5)`**: Returns the first 5 rows of the DataFrame. 2. **`df.tail(5)`**: Returns the last 5 rows of the DataFrame. 3. **Combined Usage**: Using `print(df.head(5), df.tail(5))` will output both segments to the console simultaneously. 4. **Incorrect Options**: - `describe()` provides statistical summaries, not raw rows. - `info()` provides metadata like data types and non-null counts. - `iloc[5:5]` would return an empty DataFrame because the slice is empty.

Final Answer: `print(df.head(5), df.tail(5))`.

Answer: (A)

Q37.

Solution

Concept:

Network Topology refers to the physical or logical arrangement of nodes and connections in a network.

Solution:

1. **Bus Topology**: All nodes (computers, printers, etc.) are connected to a single central cable, called the backbone. 2. **Mechanism**: Data sent by a node travels along the backbone in both directions and is received by all nodes, but only the intended recipient processes it. 3. **Contrast**: - **Star Topology**: Nodes connect to a central hub or switch. - **Ring Topology**: Each node connects to exactly two other nodes, forming a continuous loop. - **Mesh Topology**: Every node is connected to every other node.

Final Answer: Bus Topology.

Answer: (C)

Q38.

Solution

Concept:

Intellectual Property (IP) refers to creations of the mind. IP Rights protect these creations, allowing creators to earn recognition or financial benefit.

Solution:

1. **Intangible vs. Tangible**: IP specifically protects intangible assets. 2. **Examples of IP**: - **Source Code**: Protected by Copyright. - **Brand Logo**: Protected by Trademark. - **Musical Composition**: Protected by Copyright. 3. **Physical Hardware**: Computer hardware (like a hard drive or monitor) is a tangible physical asset, not an intellectual property. While the *design* of the hardware might be patented, the physical object itself is personal property.

Final Answer: A physical computer hardware.

Answer: (C)

Q39.

Solution

Concept: The `add()` method in *pandas* performs element-wise addition between two Series. A critical feature of this operation is **index alignment**. Pandas matches values based on their index labels before performing the arithmetic operation. If indices match, the values are summed; if an index exists in one Series but not the other, the result for that label is typically `NaN`.

Solution: The operation involves two Series:

(a) `pd.Series([1, 2])`: This creates a Series with values 1 and 2 at default integer indices 0 and 1 respectively.

(b) `pd.Series([3, 4])`: This creates a Series with values 3 and 4 at indices 0 and 1.

When the `.add()` method is called:

- At **index 0**: 1 + 3 = 4
- At **index 1**: 2 + 4 = 6

The resulting Series contains the values 4 and 6. Therefore, Option (A) is the correct description of the output.

Final Answer: 4, 6

Answer: (A)

Q40.

Solution

Concept:

The `DISTINCT` keyword in SQL is used within a `SELECT` statement to eliminate duplicate rows from the result set.

Solution:

1. **Function**: When applied to a column, it ensures that if a value appears multiple times in the table, it is only displayed once in the output. 2. **Syntax**: `SELECT DISTINCT column_name FROM table_name;`. 3. **Difference from UNIQUE**: `UNIQUE` is a constraint used during table creation to prevent duplicates from being entered. `DISTINCT` is a clause used during data retrieval.

Final Answer: `DISTINCT`.

Answer: (B)

Q41.

Solution

Concept:

In Matplotlib, the `legend()` function is used to place a small box on the graph that identifies the data series being plotted. For the legend to automatically know what to display, it typically relies on the labels assigned during the plotting command.

Solution:

1. **The `label` parameter**: When calling plotting functions like `plt.plot(x, y, label='Sales')`, Matplotlib stores the string 'Sales' as metadata for that specific line. 2. **Calling `legend()`**: When `plt.legend()` is called subsequently, it looks for any plot elements that have a label assigned and includes them in the box. 3. **Explicit overrides**: While you can manually pass a list of names to `plt.legend(['Sales'])`, it is best practice and most reliable when the plot functions themselves have defined labels to ensure the colors and symbols match the descriptions correctly.

Final Answer: The plot function was called with a `label` parameter.

Answer: (B)

Q42.

Solution

Concept:

SQL provides the `DATE_ADD()` or `ADDDATE()` function to perform arithmetic on date values. This allows for adding specific intervals like days, months, or years to a starting date.

Solution:

1. **Syntax**: The standard syntax for this operation is `ADDDATE(date, INTERVAL value unit)`. 2. **Current Date**: `CURDATE()` or `CURRENT_DATE()` provides today's system date. 3. **The Operation**: To add 3 months, we use `INTERVAL 3 MONTH`. 4. **Conclusion**: `ADDDATE(CURDATE(), INTERVAL 3 MONTH)` correctly calculates the date exactly three months from today.

Final Answer: `ADDDATE(CURDATE(), INTERVAL 3 MONTH)`.

Answer: (A)

Q43.

Solution

Concept:

The visual alignment of data in a Pandas DataFrame is designed to mimic standard accounting and spreadsheet conventions for better readability.

Solution:

1. **Textual Data**: Usually aligned to the left because western text is read from left to right. 2. **Numerical Data**: Always aligned to the **right**. This is a standard convention in data analysis (and tools like Excel) because it allows the decimal places or units digits to align vertically, making it easier for the human eye to compare the magnitude of numbers. 3. **Pandas Display**: When you print a DataFrame in a Jupyter notebook or console, you will notice the column headers for numbers and the numbers themselves are pushed to the right side of the column space.

Final Answer: Right.

Answer: (C)

Q44.

Solution

Concept:

Eavesdropping in a digital context is a type of cyberattack where an unauthorized individual "listens in" or monitors a private communication or data transmission.

Solution:

1. **Nature of Threat**: It is a direct violation of privacy because the user is often unaware that their traffic (emails, messages, or login credentials) is being intercepted. 2. **Methods**: This can happen over unencrypted Wi-Fi networks or through compromised network hardware. 3. **Contrast**: - **Adware**: Primarily serves unwanted advertisements. - **Cookies**: Are small files used for session management (though they can track behavior, they aren't "monitoring" in the active sense of eavesdropping). - **Firewall**: Is a defense mechanism, not a threat.

Final Answer: Eavesdropping.

Answer: (A)

Q45.

Solution

Concept:

The `.T` attribute in Pandas stands for **Transpose**. Transposing a DataFrame flips it over its diagonal, effectively swapping its rows and columns.

Solution:

1. **Original Shape**: The DataFrame `df` has 4 rows and 7 columns, represented as `(4, 7)`. 2. **Transposing**: When you call `df.T`, the original 4 rows become 4 columns, and the original 7 columns become 7 rows. 3. **New Shape**: The dimensions are swapped, resulting in a shape of `(7, 4)`.

Final Answer: `(7, 4)`.

Answer: (B)

Q46.

Solution

Concept:

The `LIKE` operator is used for pattern matching in SQL. It utilizes two main wildcards: the percent sign (%) and the underscore (_).

Solution:

1. **Underscore (_)**: Matches exactly one single character. 2. **Percent (%)**: Matches any sequence of characters, including zero characters. 3. **Usage**: For example, `LIKE 'A%'` matches 'A', 'Apple', and 'Ant'. It is the most flexible wildcard for searching when the length of the remaining string is unknown or variable. 4. **Conclusion**: The % wildcard specifically represents zero or more characters.

Final Answer: Zero or more characters.

Answer: (B)

Q47.

Solution

Concept:

Pandas objects have attributes that provide information about memory consumption, which is critical when handling large datasets to avoid memory overflow errors.

Solution:

1. **`S.size`**: Returns the number of elements in the Series. 2. **`S.nbytes`**: Returns the total number of bytes consumed by the elements of the underlying data. 3. **Calculation**: It is generally the product of the number of elements (`size`) and the size of each element (`itemsize`). 4. **Example**: If a Series has 10 integers (64-bit/8-bytes each), `nbytes` will return 80.

Final Answer: `S.nbytes`.

Answer: (B)

Q48.

Solution

Concept:

Networking devices are classified by the layer of the OSI model at which they operate. The Physical Layer (Layer 1) deals with the hardware and electrical signals.

Solution:

1. **Hub**: A Hub is a basic networking device that operates at the Physical Layer. It does not look at MAC addresses or IP addresses; it simply takes an incoming signal from one port and broadcasts it to all other ports. 2. **Switch**: Operates at the Data Link Layer (Layer 2) using MAC addresses. 3. **Router**: Operates at the Network Layer (Layer 3) using IP addresses. 4. **Gateway**: Operates across all layers to connect different protocols. 5. **Conclusion**: For a device that connects segments strictly at the physical level without intelligent routing or switching, the Hub is the correct answer.

Final Answer: Hub.

Answer: (A)

Q49.

Solution

Concept:

This query combines the `POWER()` function and the `MOD()` function. SQL follows standard mathematical order of operations (PEMDAS/BODMAS) for evaluating such expressions.

Solution:

1. **Step 1: `POWER(3, 2)`**: $3^2 = 3 \times 3 = 9$. 2. **Step 2: `MOD(10, 3)`**: $10 \div 3 = 3$ with a remainder of 1. So, the result is 1. 3. **Step 3: Addition**: $9 + 1 = 10$. 4. **Conclusion**: The total value returned by the query is 10.

Final Answer: 10.

Answer: (A)

Q50.

Solution

Concept:

Operating Systems can be Proprietary (closed source) or Open Source. Open Source systems allow users to view, modify, and distribute the source code.

Solution:

1. **Windows 11 / macOS / iOS**: These are proprietary systems owned by Microsoft and Apple respectively. Their source code is hidden from the public. 2. **Linux**: This is the most famous example of an Open Source operating system. Its kernel and various distributions (like Ubuntu, Debian, or Fedora) are developed collaboratively by a global community. 3. **FOSS**: Linux is a cornerstone of Free and Open Source Software (FOSS), which is a key topic in the Societal Impacts unit of Informatics Practices.

Final Answer: Linux.

Answer: (C)

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	A	3	A	4	B	5	B
6	C	7	A	8	A	9	B	10	A
11	B	12	A	13	A	14	D	15	C
16	C	17	D	18	B	19	A	20	D
21	A	22	B	23	B	24	B	25	C
26	B	27	B	28	B	29	B	30	B
31	B	32	A	33	C	34	B	35	B
36	A	37	C	38	C	39	A	40	B
41	B	42	A	43	C	44	A	45	B
46	B	47	B	48	A	49	A	50	C