PROD

INTERNATIONAL SOFTWARE ENGINEERING OLYMPIAD

CENTRAL UNIVERSITY

HSE UNIVERSITY

Version 1

Question 1 (2 points)

Select the correct statements.

You can select multiple answers.

- Serialization is the process of converting a data structure into bytes
- Serialization is the process of converting bytes into a data structure in a programming language
- Serialization is applied before sending data over a network
- Serialization is the process of sequential object creation

Question 2 (2 points)

Select the correct commands.

You can select multiple answers.

- git commit -m ‘My code’
- git add file.xlsx
- git put
- git pull
- git exec new _ branch

Question 3 (1 points)

Select the correct statement.

- Method overloading is a mechanism that allows the use of methods with the same name but different parameters
- Method overloading is a mechanism that allows changing the behavior of a method in a child class
- Method overloading allows creating two identical methods with the same parameters and types, but with different return value types

Question 4 (2 points)

Select the correct statements.

You can select multiple answers.

- Data for basic authentication is passed in the request body over HTTP
- Data for basic authentication is passed in the request headers over HTTP
- If the valid username and password are provided for basic authentication, a 401 status code is returned
- If the valid username and password are provided for basic authentication, a 200 status code is returned

Question 5 (2 points)

Select the correct statements.

You can select multiple answers.

- A tree is a graph
- In a graph, you can always find a path from one vertex to another
- In a graph, there are always fewer vertices than edges between them
- There exist graphs in which a path can be built from a vertex back to the vertex itself

Question 6 (2 points)

Which of the following are valid CSS properties?

You can select multiple answers.

- background-size
- margin-top
- text-border
- transition
- font-opacity

Question 7 (2 points)

Select the correct statements.

You can select multiple answers.

- A stack cannot be implemented using an array
- A stack can be implemented using a queue
- A queue can be implemented using a doubly linked list
- A stack can be implemented using a doubly linked list

Question 8 (2 points)

Select the correct statements.

You can select multiple answers.

- A hash function allows arithmetic operations on numbers to be performed faster
- Hash functions can be used to determine whether files are identical or different
- A hash function always returns a string
- Hash functions are used in the algorithm for searching an element in a tree

Question 9 (2 points)

Which data type is correct for storing a transaction amount that will be used in calculations?

- double
- float
- long
- None of the options are correct

Question 10 (2 points)

Select the correct statements.

You can select multiple answers.

- HTML is a declarative programming language
- SQL is an imperative programming language
- Java is an object-oriented programming language
- SQL is a declarative programming language
- SQL is not a programming language

Question 11 (2 points)

For which scenarios, according to REST, is it correct to use the PUT method?

- Updating user information
- User authentication
- Changing a user's phone number
- Retrieving a user's friends

Question 12 (2 points)

Which of the following sorting algorithms run in O(N2) in the worst-case scenario?

- Quick sort
- Merge sort
- Bubble sort
- Counting sort

Question 13 (2 points)

Select the application-layer protocols.

You can select multiple answers.

- HTTP
- TCP
- DNS
- IP

Question 14 (2 points)

Select the UI container objects used for layout and positioning of other UI elements in mobile development.

You can select multiple answers.

- Stack
- Array
- List/Table
- Queue

Question 15 (2 points)

Select the correct statements.

You can select multiple answers.

- The HTTP protocol uses UDP as its underlying protocol
- TCP is an application-layer protocol
- Pagination helps solve the problem of transferring a large list of items from the backend to the frontend
- UDP data transmission can be used for video streaming

Question 16 (2 points)

According to REST, in which part of a GET request should parameters for data filtering be passed?

You can select multiple answers.

- Request header
- Query parameters
- Request body
- In the method name

Question 17 (1 points)

What is a media query?

- A query to a database used for storing multimedia files
- A method for checking internet connectivity to load multimedia content
- A technique used for responsive design that allows changing the styles and layout of a page depending on the device characteristics and screen size
- An API that provides access to multimedia resources on a web page

Question 18 (2 points)

What is the purpose of signing a mobile application?

You can select multiple answers.

- To protect copyright
- To encrypt the executable file
- For security purposes
- To speed up the application launch

Question 19 (2 points)

Select the correct statements.

You can select multiple answers.

- Vertical scaling increases the fault tolerance of a distributed system
- Horizontal scaling increases the fault tolerance of a distributed system
- Increasing the number of CPU cores allows processing a greater number of user requests
- Increasing the hard drive capacity improves system security

Question 20 (2 points)

Which of the following pseudo-classes exist in CSS?

You can select multiple answers.

- visited
- first-letter
- after
- read-write

Question 21 (2 points)

Select the correct statements.

You can select multiple answers.

- Inserting into a dynamic array at the end runs in O(1)
- Inserting into a dynamic array at the beginning runs in O(1)
- Inserting into a dynamic array at the end runs in O(N)
- Inserting into a dynamic array at the beginning runs in O(N)

Question 22 (2 points)

Which data structures exist in JavaScript according to the current standard?
You can select multiple answers.

- Object
- Map
- Stack
- Generator
- Text

Question 23 (2 points)

Select the correct statements.

You can select multiple answers.

- Any recursive function can be replaced with a loop
- A recursive function, unlike loops, does not incur overhead
- A recursive function, unlike loops, performs less efficiently
- A recursive function can cause a memory stack overflow

Question 24 (2 points)

Which APIs does the browser provide?

You can select multiple answers.

- Audio API
- Geolocation API
- Device Rotation API
- Fullscreen API
- Alarm API

Question 25 (5 points)

Select the correct program implementation for caching.

- def cache _ get _ money(id):
  if (cache.exists(id)):
  return cache.get(id)
  else:
  return http _ client.get('https://get-money.prod/' + id)
- def cache _ get _ money(id):
  if (cache.exists(id)):
  return cache.get(id)
  cache.put(id, http _ client.get('https://get-money.prod/' + id))
- def cache _ get _ money(id):
  if not cache.exists(id):
  cache.put(id, http _ client.get('https://get-money.prod/' + id))
  return cache.get(id)
- def cache _ get _ money(id):
  if (cache.exists(id)):
  return cache.get(id)
  result = http _ client.get('https://get-money.prod/' + id)
  return result

Question 26 (5 points)

Refactor the code so that it works idempotently. In other words, when the task status is updated to the same status multiple times, the message is not sent again.

- def update _ task _ status(id, new _ status):
  task = db.get _ task(id)
  task.status = new _ status
  db.save _ task(task)
  send(task.author _ id, 'The task has been moved to a new status')
- def update _ task _ status(id, new _ status):
  task = db.get _ task(id)
  cur _ status = task.status
  task.status = new _ status
  db.save _ task(task)
  if cur _ status == new _ status:
  send(task.author _ id, 'The task has been moved to a new status')
- def update _ task _ status(id, new _ status):
  task = db.get _ task(id)
  if task.status != new _ status:
  task.status = new _ status
  db.save _ task(task)
  send(task.author _ id, 'The task has been moved to a new status')
- def update _ task _ status(id, new _ status):
  task = db.get _ task(id)
  task.status = new _ status
  db.save _ task(task)
  if task.status != new _ status:
  send(task.author _ id, 'The task has been moved to a new status')
- def update _ task _ status(id, new _ status):
  task = db.get _ task(id)
  cur _ status = task.status
  task.status = new _ status
  db.save _ task(task)
  if task.status == new _ status:
  send(task.author _ id, 'The task has been moved to a new status')

Question 27 (6 points)

Select the code variants that would add the ability to retry actions multiple times in case of a message sending error. You can select multiple answers.

- def send _ message(message):
  http _ client = HttpClient()
  http _ client.post(body=message)

- def send _ message _ with _ retry(message, count):
  for i in range(count):
  try:
  send _ message(message)
  except Exception as e:
  Continue
- def send _ message _ with _ retry(message, count):
  for i in range(count):
  try:
  send _ message(message)
  break
  except Exception as e:
  Continue
- def send _ message _ with _ retry(message, count):
  error = None
  for i in range(count):
  try:
  send _ message(message)
  break
  except Exception as e:
  error = e
  continue
  raise error
- def send _ message _ with _ retry(message, count):
  error = None
  for i in range(1, count):
  try:
  send _ message(message)
  return
  except Exception as e:
  error = e
  continue
  raise error

Question 28 (6 points)

Imagine you're implementing a chat message module that must return all messages for a given chat. However, your system has a huge number of chats and all messages across all chats cannot fit in a single DBMS, so you decide to distribute the chats evenly across several DBMSs. There are three DBMSs in total, each numbered from 1 to 3. To determine which DBMS to store a message in, you need to get the remainder of dividing the chat ID by 3. Select the correct implementations of the logic for storing and retrieving messages by a list of chat IDs.

- def save(messages):
  for message in messages:
  chat _ id = message.chat _ id
  db _ id = chat _ id % 3
  databases[db _ id].save(message)

```
def get(chat _ ids):
chats = {}
for chat _ id in chat _ ids:
db _ id = chat _ id % 3
messages = databases[db _ id].get _ all(chat _ id)
chats[chat _ id] = messages
return chats
```

- ```
  def save(messages):
  for message in messages:
  chat _ id = message.chat _ id
  db _ id = chat _ id % 3 + 1
  databases[db _ id].save(message)
  ```

  ```
  def get(chat _ ids):
  chats = {}
  for chat _ id in chat _ ids:
  db _ id = chat _ id % 3 + 1
  messages = databases[db _ id].get _ all(chat _ id)
  chats[chat _ id] = messages
  return chats
  ```

- ```
  def save(messages):
  for message in messages:
  chat _ id = message.chat _ id
  db _ id = chat _ id % 3
  databases[chat _ id].save(message)
  ```

  ```
  def get(chat _ ids):
  chats = {}
  for chat _ id in chat _ ids:
  db _ id = chat _ id % 3
  messages = databases[db _ id].get _ all(chat _ id)
  chats[chat _ id] = messages
  return chats
  ```

- ```
  def save(messages):
  for message in messages:
  db _ id = message.chat _ id % 3 + 1
  databases[db _ id].save(message)
  ```

  ```
  def get(chat _ ids):
  chats = {}
  for chat _ id in chat _ ids:
  db _ id = chat _ id % 3 + 1
  database = databases[db _ id]
  messages = database.get _ all(chat _ id)
  chats[chat _ id] = messages
  return chats
  ```
  ```

Question 29 (16 points)

Implement a program that validates an entered login and password. The login must contain no fewer than 3 and no more than 15 characters, and consist of any sequence of Latin alphabet letters, digits, and the characters '_', '.', '-'. The password must contain no fewer than 10 and no more than 25 characters, and consist of any sequence of Latin alphabet letters, digits, and special characters '_', '.', '-', '@', '#', '&', but must contain at least one special character, at least one uppercase letter, one lowercase letter, and one digit.

Input and output

The first line contains the total number of tests T as input; then, over the next 2 * T lines, pairs are provided, each on a separate line: ai and bi, where ai is the login and bi is the password. For each test case, print yes on a separate line if the login and password are valid, and no if they are not. The length of the login and password does not exceed 105 characters.

Question 30 (16 points)

There is an advertising system for various products. It is used by different people, but for advertising effectiveness, we want to show each person relevant products to increase purchases. Thus, we only show an advertisement for a product to its potential audience. Some of these customers will view the advertising banner, and then some of those who viewed it will purchase the product. You need to implement a report on a completed advertising campaign. The report must include the following: the number of views, the percentage of people who viewed the advertisement, the percentage of people who purchased the product among those who viewed the advertisement, the total amount spent by customers on the product, the number of customers who made two or more purchases, and the total number of purchases.

Input format

The first line contains three integers A, V, and T: the number of people who can

see the advertisement, the number of views, and the number of purchases made, respectively.

The following T lines contain pairs of numbers ai and bi: the customer ID and the purchase amount.

0 < A, V, T < 107, 0 < ai < 105, 0 < bi < 105

Output format

Print the following values on a single line:

- The number of people who can
- see the advertisement
- The number of views
- The number of unique buyers

- The percentage of people who viewed the advertisement, rounded to the nearest integer
- The percentage of people who purchased the product among those who viewed the advertisement
- rounded to the nearest integer. The total amount spent by customers on the product
- The number of customers who made two or more purchases
- The total number of purchases