Solutions to Quiz 3 (September 29)

Servers (1 point)

We've seen that event handling in the browser uses callbacks like the following:

```javascript
widget.mouseenter(function() {
    console.log('Mouse over widget');
});
```

We've also seen that request handling in a server uses callbacks like the following:

```javascript
http.createServer(function(req, res) {
    console.log('Request received');
});
```

1. What is the most complete explanation for this similarity of structure?

   (A) A browser is analogous to a server, where the user's actions are the requests
   (B) In JavaScript everything has to be a callback
   (C) The callback structure goes with an event-loop approach to concurrent activities
   (D) Both A and C
   (E) The console.log call is single-threaded

**Solution.** D. Both A and C are pretty good answers individually, but we did ask for the most complete explanation.

Web Servers (2 points)

Questions 2-6 use the following letter choices:

(A) Body
(B) Cookie
(C) Header field
(D) Method
(E) Status Code
(F) URI

For each of the following questions, pick the letter corresponding to the part of the HTTP protocol that most closely matches the description given

2. Identifies action to be taken, only sent from client to server.

**Solution.** This matches only a method, choice D.
3. Numeric indicator of operation effect, only sent from server to client.  
**Solution.** This matches only a status code, choice E

4. Identifies resource using standardized syntax, may be sent either direction.  
**Solution.** The best match to this description is URI, choice F.  
A hasty reading might lead to either “body” or “header field” as a plausible choice. However, neither of those is focused on resource identification – both headers and bodies are used for many other purposes. A body also doesn’t really have a “standardized syntax.” Since we asked for the part that most closely matches, URI is the best answer.

5. Set by server, presented by browser, encoded as key-value pairs.  
**Solution.** The best match here is cookie, choice B.  
It is possible to think of header fields as key-value pairs, but header fields don’t fit well with the “set by server, presented by browser” phrase. A really strained interpretation might see certain body usages as “set by server, presented by browser” but there’s no sense in which a body is required to be encoded as key-value pairs.

6. Provides a wide variety of modifying or supplemental information; may be sent either direction. Many are sent both directions in a typical single request/response pair.  
**Solution.** The best match here is header field, choice C.  
It is possible to think of cookies in these terms, but cookies are not used for as many different purposes; most uses of cookies are for session state.

These questions are unrelated to the previous questions, and have different choices:

7. Which of the following is NOT a method in the HTTP protocol?  
   (A) GET  (B) CREATE  (C) DELETE  (D) PUT  (E) POST  
**Solution.** B

8. Some HTTP methods should be idempotent. Which one of the following application actions is idempotent?  
   (A) Increment the value of variable x by 1  
   (B) Dispense $20 from the ATM’s cash drawer  
   (C) Set the value of variable z to be the string “foo”  
   (D) Append the string “foo” at the end of an array of strings  
   (E) Put the current value of the real-time clock into variable y  
**Solution.** C. All of the other choices will produce a different end state if they are performed twice, but C produces the same result whether it is executed 1, 2, or n times.
Databases (2 points)

We are considering whether Mongo is a suitable DB choice for an application we are building. For each of the following application characteristics, indicate whether Mongo is suitable or unsuitable. Please consider each application characteristic independently – each is a characteristic of a single application, they are not cumulative or otherwise related.

9. The data can be naturally represented as documents containing key-value pairs. Different documents may have different key-value pairs. Any two documents might not necessarily contain any identical key-value pairs.

   (A) Mongo is suitable  (B) Mongo is unsuitable

Solution. A. Since Mongo has a flexible schema and is organized as documents containing key-value pairs, this would be a great match.

10. The data will need to be accessed by many readers at once. However, it’s acceptable to have only one single writer at a time.

    (A) Mongo is suitable  (B) Mongo is unsuitable

Solution. A. Although Mongo cannot support more-sophisticated locking, it can support this level of single-writer, multi-reader behavior.

11. Integrity of the data is critical. Changes to the database must be ACID transactions, and the isolation must be complete: no program using the database sees intermediate effects of another program.

    (A) Mongo is suitable  (B) Mongo is unsuitable

Solution. B. Mongo does not provide facilities to build transactions with ACID properties, and it is possible for concurrent activities to see partial effects of each other’s modifications.

12. Users of the application are familiar with the SQL query language, and expect to be able to issue similar queries against the database.

    (A) Mongo is suitable  (B) Mongo is unsuitable

Solution. B. Mongo does not support SQL queries. It would be challenging to integrate it into a system where people expected to use that style of querying.