UNIVERSITY OF BRISTOL

Resit Examination Period

FACULTY OF ENGINEERING

2023 Examination for the Degree of
Bachelor and Master of Engineering and Bachelor and Master of
Science

COMS10012
Software Tools

TIME ALLOWED:
2 Hours

Answers to COMS10012: Software Tools

Intended Learning Outcomes:

1. Please make sure you read the instructions on the answer sheet.

2. Each question is worth 1 mark.

3. Only the answer sheet will be marked, the empty pages at the back of the exam are only used for your calculations.

4. When selecting answers, make clear, horizontal marks within the two sets of brackets, making sure that the contained letter is struck through.

5. Avoid marking the answer sheet outside specified areas.

6. Do not crease, dog-ear or otherwise damage the answer sheet.

Q1. Alice wishes to rebase the `bugfix` bugfix branch so that instead of being based on the `release-1.0` branch, it is based on the release-1.1 branch. Which commands should they run?

    A. `git checkout bugfix; git rebase release-1.1`

    B. `git checkout bugfix; git merge release-1.1`

    C. `git checkout release-1.1; git rebase bugfix`

    D. `git checkout checkout release-1.1; git pull bug-fix`

[1 mark]

Q2. Which option most accurately describes what the `git clone` command does?

    A. `git clone` makes a local copy of an entire repository

    B. `git clone` extracts a version of a file under version control at a specific commit point in history.

    C. `git clone` fetches a file from Github and downloads it locally

    D. `git clone` duplicates a repository on a remote Git forge (like Github)

[1 mark]

Q3. Bob maintains a <u>fork</u> of a popular application. After pulling from the main branch of the upstream repo Git reports an issue. When Bob runs `git status` it reports:

```
    git status
On branch openbsd
Your branch is up to date with 'github/openbsd'.

You have unmerged paths.
  (fix conflicts and run "git commit")
  (use "git merge --abort" to abort the merge)

Changes to be committed:
        modified:  .github/workflows/appcast.yml
        modified:  .github/workflows/lint.yml
        modified:  .github/workflows/publish.yml
        modified:  .github/workflows/test.yml
        modified:  CHANGELOG.md

Unmerged paths:
  (use "git add <file>..." to mark resolution)
        both modified: src/maestral/constants.py
```

The rest of the changes have been staged for commit

this particular file requires manual intervention to resolve the conflicts

What should Bob do next?

A. Bob should check `src/maestral/constants.py` and see how the files have diverged

B. Bob's merge has failed. He should abort with `git merge --abort`

C. Bob's rebase has failed. He should abort with `git rebase --abort`

D. Bob should check the `workflows` folder to see how the files have diverged.

[1 mark]

combine multiple commits into a single commit

Q4. Why might a developer want to use the <mark>squash</mark> feature when using `git rebase`

A. To rework a series of commits into a set of coherent patches.

B. To optimise the storage space a git repo uses.

adj.条理清楚的，连贯的；前后一致的

C. To make single commit smaller.

D. To optimise the storage space a git remote uses to host a repository.

[1 mark]

Q5. Bob has the following id:

```
$ id
uid=1000(bob) gid=800(users) groups=800(users)
```

The passwd program has the following permissions:

```
$ ls -l `command -v passwd`
-r-xr-sr-x 1 root bin 21112 Feb 12 00:27 /usr/bin/passwd
```

What user and group will it run as?

A. uid=bob, gid=bin

B. uid=root, gid=bin

C. uid=root, gid=users

D. uid=bob, gid=users

[1 mark]

Q6. Alice is trying to create a link to a file. They try creating a *hard* link to the file and a *symbolic* link. They accidentally delete the original file, and are somewhat surprised to find that whilst the symbolic link is now broken, the hard link still works.

Why is the symbolic link broken?

A. The original file's path is gone, so the symbolic link doesn't refer to a valid file on the path.

B. The symbolic link would have been deleted when the original was deleted. Consequently the symbolic link no longer exists.

C. The file system does not support symbolic links: the link never worked.

D. The link does still work but the linked file is now empty, hence the confusion.

[1 mark]

Q7. Why does the hard link still work?

A. The underlying inode is still there: deleting the original just decremented the reference count from 2 to 1.

B. The file was copied when the hard link was made.

C. The file was copied to the hard link upon deletion.

D. The hard link seems to work now but its pointing to a free inode. The original data just hasn't been overwritten yet.

[1 mark]

Q8. Alice is trying to build their code with a `Makefile`. The first time they built the code it seemed to compile, but the *second time* it seemed to do nothing. Why?

A. The compiled code is up to date. No recompiling is required.

B. The `Makefile` is syntactically incorrect.

C. They should be using `mvn` instead as `make` does not handle dependencies.

D. They are building on a BSD system. They need to use `gmake`.

[1 mark]

Q9. Alice has created a new program in Java using the Maven buildsystem.

- They build a template using `mvn archetype:generate`
- They edit their code by running `cd src/main/java/uk/ac/bristol/cs` and then `nano App.java`
- They run `mvn compile` to build their code

The following error is reported: what has gone wrong?

```
$ mvn compile
[INFO] Scanning for projects...
[INFO] ------------------------------------------------------------------------
[INFO] BUILD FAILURE
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 0.045s
[INFO] Finished at: Fri Mar 10 11:25:32 GMT 2023
[INFO] Final Memory: 9M/236M
[INFO] ------------------------------------------------------------------------
[ERROR] The goal you specified requires a project to execute but there is no POM in
    this directory (/home/jh18636/softwaretools/src/main/java/uk/ac/bristol/cs).
    Please verify you invoked Maven from the correct directory. -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read
    the following articles:
[ERROR] [Help 1]
    http://cwiki.apache.org/confluence/display/MAVEN/MissingProjectException
```

A. They are running the build from the `src` folder not the project root. Consequently, Maven cannot find the `pom.xml`.

B. They are running the build from the project root not the `src` folder. CConsequently, Maven cannot find the `pom.xml`.

C. The `pom.xml` is syntactically incorrect

D. They edited their source file with `nano`, but `nano` is not a programming text editor.

Q10. Bob wants to store a table containing rankings of different flavours of soup. The table should have 3 attributes:

- `flavor` (text <u>referencing name attribute</u> of the flavour table)
- `ranking` (a number)
- `notes` (optional text containing notes)

What SQL command would create the most appropriate table?

 A. CREATE TABLE soupranking (flavor TEXT PRIMARY KEY, ranking INTEGER NOT NULL, notes TEXT, FOREIGN KEY flavor REFERENCES flavor(name));

 B. CREATE TABLE soupranking (flavor TEXT, ranking INTEGER NOT NULL, notes TEXT, FOREIGN KEY flavor REFERENCES flavor(name));

 C. CREATE TABLE soupranking (flavor TEXT, ranking INTEGER NOT NULL, notes TEXT, PRIMARY KEY (flavor, ranking), FOREIGN KEY flavor REFERENCES flavor(name));

 D. CREATE TABLE soupranking (flavor TEXT NOT NULL, ranking INTEGER NOT NULL, notes TEXT, PRIMARY KEY (flavor, ranking), FOREIGN KEY flavor REFERENCES flavor(name));

[1 mark]

Q11. What normal form is Bob's soup ranking table in?

Flavour	Ranking	Notes
Tomato	8	
Orange	3	Surprising and fruity
Chocolate Orange	0	Disgusting!

A. 3NF

B. No normal form

C. 1NF

D. 2NF

[1 mark]

integer division in SQL will truncate any decimal result to the integer part.

Q12. Bob wants to find what their mean soup ranking is.

Which SQL query will *not* tell them what they want?

A. `SELECT SUM(ranking)/COUNT(ranking) FROM soupranking;`

B. `SELECT AVG(ranking) FROM soupranking;`

C. `SELECT (1.0*SUM(ranking))/COUNT(ranking) FROM soupranking;`

D. `SELECT SUM(ranking)/(1.0*COUNT(ranking)) FROM soupranking;`

[1 mark]

Q13. The `PRIMARY KEY` constraint implies which other constraints (if any)?

A. `NOT NULL, UNIQUE`

B. `NOT NULL`

C. `UNIQUE`

D. No other constraints

[1 mark]

Q14. Alice says Bob's code is dangerous. Bob says it isn't. The code doesn't seem to crash and compiles. Who is right and why?

```
final String query = "SELECT password FROM users WHERE user LIKE "+username;
```

A. Alice is probably right: it looks like it may be vulnerable to SQL injection.

B. Bob is probably right: it doesn't crash

C. Alice is probably right: there is a buffer overflow

D. Bob is probably right: they have used prepared statements

[1 mark]

Q15. Bob is trying to run a command but it isn't working. To debug their issue they run their command with <u>strace</u>. What command are they trying to run?

```
execve("/usr/bin/ls", ["ls", "/hoem"], 0x7ffef4661138 /* 45 vars */) = 0
brk(NULL)                        = 0x1ca1000
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
    0x7fa9994c8000
access("/etc/ld.so.preload", R_OK) = -1 ENOENT (No such file or directory)
open("/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=213800, ...}) = 0
mmap(NULL, 213800, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fa999493000
close(3)                         = 0
open("/lib64/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0`&\2\0\0\0\0\0\0"..., 832) = 832
fstat(3, {st_mode=S_IFREG|0755, st_size=2156592, ...}) = 0
mmap(NULL, 3985920, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) =
    0x7fa9988a5000
mprotect(0x7fa998a69000, 2093056, PROT_NONE) = 0
mmap(0x7fa998c68000, 24576, PROT_READ|PROT_WRITE,
    MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1c3000) = 0x7fa998c68000
mmap(0x7fa998c6e000, 16896, PROT_READ|PROT_WRITE,
    MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fa998c6e000
close(3)                         = 0
open("/lib64/libdl.so.2", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\0\0\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\16\0\0\0\0\0\0"..., 832) =
    832
fstat(3, {st_mode=S_IFREG|0755, st_size=19248, ...}) = 0
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
    0x7fa999491000
mmap(NULL, 2109744, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) =
    0x7fa99843f000
mmap(0x7fa998641000, 8192, PROT_READ|PROT_WRITE,
    MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x2000) = 0x7fa998641000
close(3)                         = 0
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
    0x7fa999490000
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
    0x7fa99948e000
arch_prctl(ARCH_SET_FS, 0x7fa99948e840) = 0
set_tid_address(0x7fa99948eb10)  = 1511
set_robust_list(0x7fa99948eb20, 24) = 0
brk(NULL)                        = 0x1ca1000
brk(0x1cc2000)                   = 0x1cc2000
open("/usr/lib/locale/locale-archive", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=106176928, ...}) = 0
mmap(NULL, 106176928, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fa991adb000
close(3)                         = 0
ioctl(1, TCGETS, {B115200 opost isig icanon echo ...}) = 0
ioctl(1, TIOCGWINSZ, {ws_row=43, ws_col=132, ws_xpixel=1320, ws_ypixel=989}) = 0
stat("/hoem", 0x1ca20e0)         = -1 ENOENT (No such file or directory)
lstat("/hoem", 0x1ca20e0)        = -1 ENOENT (No such file or directory)
```

(cont.)

```
open("/usr/share/locale/locale.alias", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=2502, ...}) = 0
mmap(NULL, 4096, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) =
    0x7fa9994c7000
read(3, "# Locale name alias data base.\n#"..., 4096) = 2502
read(3, "", 4096)                = 0
close(3)                         = 0
munmap(0x7fa9994c7000, 4096)     = 0
open("/usr/share/locale/en_GB.UTF-8/LC_MESSAGES/coreutils.mo", O_RDONLY) = -1 ENOENT
    (No such file or directory)
open("/usr/share/locale/en_GB.utf8/LC_MESSAGES/coreutils.mo", O_RDONLY) = -1 ENOENT
    (No such file or directory)
open("/usr/share/locale/en_GB/LC_MESSAGES/coreutils.mo", O_RDONLY) = -1 ENOENT (No
    such file or directory)
open("/usr/share/locale/en.UTF-8/LC_MESSAGES/coreutils.mo", O_RDONLY) = -1 ENOENT
    (No such file or directory)
open("/usr/share/locale/en.utf8/LC_MESSAGES/coreutils.mo", O_RDONLY) = -1 ENOENT (No
    such file or directory)
open("/usr/share/locale/en/LC_MESSAGES/coreutils.mo", O_RDONLY) = -1 ENOENT (No such
    file or directory)
write(2, "ls: ", 4ls: )              = 4
write(2, "cannot access /hoem", 19cannot access /hoem) = 19
open("/usr/share/locale/en_GB.UTF-8/LC_MESSAGES/libc.mo", O_RDONLY) = -1 ENOENT (No
    such file or directory)
open("/usr/share/locale/en_GB.utf8/LC_MESSAGES/libc.mo", O_RDONLY) = -1 ENOENT (No
    such file or directory)
open("/usr/share/locale/en_GB/LC_MESSAGES/libc.mo", O_RDONLY) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=1474, ...}) = 0
mmap(NULL, 1474, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fa9994c7000
close(3)                         = 0
open("/usr/share/locale/en.UTF-8/LC_MESSAGES/libc.mo", O_RDONLY) = -1 ENOENT (No
    such file or directory)
open("/usr/share/locale/en.utf8/LC_MESSAGES/libc.mo", O_RDONLY) = -1 ENOENT (No such
    file or directory)
open("/usr/share/locale/en/LC_MESSAGES/libc.mo", O_RDONLY) = -1 ENOENT (No such file
    or directory)
write(2, ": No such file or directory", 27: No such file or directory) = 27
write(2, "\n", 1
)                        = 1
close(1)                         = 0
close(2)                         = 0
exit_group(2)                    = ?
+++ exited with 2 +++
```

    A. `ls /hoem`

    B. `ls /`

    C. `ls`

    D. `ls /Users/`

[1 mark]

Q16. Bob is trying to run a command but it still isn't working. Using the trace above: what's the problem?

n. [口]排印错误；排字工；印刷工

A. They've made a <u>typo</u> in their file path   '/hoem' shoule be '/home'

B. The program they're trying to run doesn't exist

C. The permissions are set to prevent their command running

D. Localisation library files are missing

[1 mark]

Q17. What is `ltrace` and what is it used for?

A. It traces which library functions a program uses

B. It is an interactive debugger that provides breakpoints and stepping functionality

C. It traces what system calls a program uses

D. It is the *Linux / Tux Race* game: a modern 3D games program for the Linux enthusiast

[1 mark]

Q18. Alice is trying to set up key-based login on a service she currently accesses via using `ssh` and entering her password. Here are listings of her `.ssh` directory on her local machine:

```
-rw------- 1 alice alice 389 Jan 19 10:56 authorized_keys
-rw------- 1 alice alice 395 Feb 21 13:03 id_rsa
-rw-r--r-- 1 alice alice 395 Feb 21 13:03 id_rsa.pub
-rw-r--r-- 1 alice alice 225 Feb 21 13:01 known_hosts
```

And on the server:

```
-rw-r--r-- 1 alice alice 395 Feb 21 13:21 id_rsa.pub
-rw-r--r-- 1 alice alice 225 Jan 19 11:02 known_hosts
```

There's a problem evident with her current setup. Identify which file's presence, abscence or visible details indicates the problem.

A. The problem lies with 'authorized_keys' on the local machine.

B. The problem lies with 'authorized_keys' on the server.

C. The problem lies with 'known_hosts' on the local machine.

D. The problem lies with 'id_rsa.pub' on the server.

Solution: <u>The absence of an authorized_keys file on the server is a clear problem for key-based login.</u> The permissions on the files are all correct. Moreover, 'authorized_keys' serves no purpose locally, and 'known_hosts' and 'id_rsa.pub' don't matter on the server. We went through this key-based setup process in the SSH labs at the start of Part 1.

authorized_keys —> server, to store the public keys that allow to log in
known_hosts —> client, keep a record of the remote SSH hosts
id_rsa —> client, private key
id_rsa.pub —> server, public key that needed to be added to the 'authorized_keys' file

[1 mark]

Q19. Which of the below would redirect both standard output and standard error from the command `noisy` to /dev/null?

       A. `noisy > /dev/null 1> /dev/null`

       B. `noisy 2&1> /dev/null`

       C. `noisy 1> /dev/null 2> /dev/null`   1> /dec/null   redirect stdout to /dev/null
                                        2> / dec/null   redirect stderr to /dev/null

       D. `noisy 2>&1 > /dev/null` '1> /dec/null' the same as '> /dec/null'
                                    so D should be modified as   " noisy > /dec/null 2>&1

> **Solution:** A doesn't redirect stderr, D has the right idea but sends stderr to stdout before redirecting stdout (we covered exactly this issue in the lecture), B looks sort of plausible but simply isn't valid. C would have output problems if it went to a file, but since we're redirecting to /dev/null we clearly don't care about that.

[1 mark]

Q20. What would be the output when executing the following piped command?

```
echo "words in a string" | sed 's/in //' | head -1
```

       A. "words a string"   s/pattern/replacement/flags

       B. "words in a"   head -1 takes the first line of its input and outputs it.

       C. "words"

       D. "words in in a string"

> **Solution:** We covered both sed and head in the piping exercises in the POSIX labs. The sed command removes one of the words in the original text, but head would have no effect on this output because it operates on lines.

[1 mark]

Q21. The Unix philosophy suggests that:

       A. Programs are imitations of abstract eternal ideals.

       B. Programs do not need to be able to cooperate.

       C. The universal interface between programs should be IP packets.

       D. None of the above.

> **Solution:** This should be straightforward. B and C are pretty obviously corrupt, A would be some sort of programmer-Platonism. We covered the Unix philosophy in the Pipes 1 lecture.

[1 mark]

Shell Redirection

Redirect stdout

`> /dev/null` and `1> /dev/null` both discard **standard output**

`> /dev/null`
- This redirects the standard output (stdout) of a command to `/dev/null`, effectively discarding it.
- `/dev/null` is **a special file that discards all data written to it** (think of it as a data black hole)

`1>`
This is another way of specifying redirection of the standard output. The number `1` represents stdout.
`1> /dev/null` would do the same as `> /dev/null`, redirecting stdout to `/dev/null`

Redirect stderr

`2>`
- This redirects the standard error (stderr) to a specified location.
- The number `2` represents stderr.
- So, `2> /dev/null` redirects all **standard error** to `/dev/null`, discarding them

Combine

- When used in a full command like `command > /dev/null 2>&1`, it means "redirect stderr to the same place as stdout, which has been redirected to `/dev/null`."
  `2>&1` is used to **redirect stderr (2) to wherever stdout (1) is currently directed**
- Essentially, it merges both standard output and error streams into one (stdout) and then discards them if stdout is directed to `/dev/null`.

Q22. If `command2` needs to be given a string argument that comes from the output of `command1`, how can we capture the output of `command1` to be used by `command2`?

    A. `command1 > command2`

    B. `command2 $(command1)`

    C. `command1 | command2`

    D. `command2 <(command1)`

Solution: Note that we specified that command2 requires an argument, so A and C are misguided. D uses the output as contents of a dummy file, which is not what command2 would understand. This redirection is covered in the Pipes lecture.

[1 mark]

Q23. Consider the following HTTP request as received by a web server:

```
GET /hello.txt HTTP/1.1
User-Agent: curl/7.16.3 libcurl/7.16.3 OpenSSL/0.9.7l zlib/1.2.3
Host: www.example.com
Accept-Language: en, mi
```

Assuming the request headers can be trusted, which of the following best describes what has happened to cause this request?

      A. An internal server error has occurred.

      B. Someone accessed `http://www.example.com/hello.txt` with `curl`

      C. Someone accessed `www.example.com` in Safari.

      D. The client has made an error in forming the request.

> **Solution:** A & D are nonsense as they would relate to a response, C involves a misreading of the user-agent and ignoring the path component of the GET request. The first lab involved studying these requests.

[1 mark]

Q24. You encounter an unfamiliar HTTP status code 307. Without knowing more than this code, which of the below might you reasonably conclude?

      A. The request has completed successfully, with some additional effects.

      B. The server needs to redirect you to another location.

      C. The server has encountered an internal error.

      D. There is an error in the request sent by the client.

> **Solution:** We covered HTTP status codes and the first-digit meanings in the HTTP lecture (slide 11).

[1 mark]

Q25. Consider this snippet of HTML:

```
<p>
  I'm creating a link to
  <a
    href="https://www.mozilla.org/en-US/"
    title="The best place to find more information about Mozilla's
           mission and how to contribute">the Mozilla homepage</a>.
</p>
```

Which of the below reflects the text you would click on in the browser to follow the link?

      Qu. continues ...

A. The whole paragraph.

B. The contents of the anchor tag.

C. The href attribute.

D. The title attribute.

> **Solution:** This example comes from the required MDN reading, and answering it only requires understanding how anchor tags work, which is explained in the HTML5 lecture.

[1 mark]

Q26. Client-side validation of HTML form fields...

    A. Protects the server from malicious requests.

    B. Provides a helpful aid for users to fill in a form correctly.

    C. Cannot be disabled in most browsers.

    D. All of the above.

> **Solution:** Client-side validation was part of the required reading in the second session. It provides no protection to the server, and is easily disabled in most browsers.

[1 mark]

Q27. Which of the following HTML elements should contain `<meta>` elements?

    A. `<header>`

    B. `<style>`

    C. `<nav>`

    D. None of the above.

> **Solution:** We covered the fact that metadata goes in the `<head>` in the first HTML lecture, and `<header>` was clearly covered as distinct from `<head>` in the MDN reading.

[1 mark]

Q28. A Thymeleaf application is acting as a frontend to a database of student grades. You see that one method in the `Controller.java` file has an annotation:

`@GetMapping("/student/ids")`

What do you know about the method this annotation is attached to?

    A. It accepts a student ID as a parameter.

    B. It returns a student ID.

    C. The method will not be called because the mapping is malformed.

    D. None of the above.

> **Solution:** The get mapping refers to the mapping of the get request to a method, and curly braces would indicate a parameter that the method will be passed. This exact syntax was a key part of the second exercise in the HTML lab.

[1 mark]

Q29. Which of these CSS selectors will apply a style to any `<p>` element that is the direct child of a `<div>` element with the class attribute 'info'?

      A. `div#info p`

      B. `div.info > p`

      C. `div#info ~ p`

      D. `div.info + p`

Solution: Classes are identified as `div.info`, the `#info` would refer to an element with the ID of 'info', not the class. The '+' would refer to a following element, while '>' relates to a child. This was addressed in the first CSS lecture.

[1 mark]

Q30. A style with the selector of #aside, h2, h3 would be applied to:

    A. All elements with the class 'aside', and all second- and third- level headings.

    B. The element with the ID 'aside', and all second- and third- level headings.

    C. Any third-level headings subordinate to a second-level heading inside an element with the ID 'aside'.

    D. Any third-level headings or second-level headings inside an element with the class 'aside'.

Solution: The comma indicates an 'and' relationship between selectors. Selector syntax was covered in the first CSS lecture.

[1 mark]

Q31. When representing a colour in CSS, the keyword 'red' is equivalent to

    A. #FF0000

    B. #00F000

    C. #00F00F

    D. #00FF00

Solution: The system is R-G-B. Colour keywords were discussed in the MDN reading, and both hexadecimal and other representations were mentioned in the frst CSS lecture.

[1 mark]

Q32. You have been tweaking the style of an <img> element so that it has a visible border. You want to create some visual space between the border and the image itself, with twice as much space below as there is above. Which of these rules should you use?

    A. padding: 10px 5px 20px 5px;

    B. margin: 8px 8px 16px 8px;

    C. padding: 16px 8px 16px 8px;

    D. margin: 5px 5px 5px 10px;

Solution: Two pieces of information allow you to answer this question: you want the padding rather than the margin for space to the content, and the four dimensions are listed clockwise starting from the top. This was covered in the discussion of the box model in the first CSS lecture.

[1 mark]

Q33. Consider the following stylesheet:

```
html { font-size: 14px; }
p {font-size: 0.5em; }
div {font-size: 1.5em; }
```

Imagine this stylesheet is applied to a page which contains a `<p>` element inside a `<div>` element. What would be the size of the text in the `<p>` element, as measured in px?

    A. 16

    B. 24

    C. 12

    D. 8

> **Solution:** If you understand that the `<p>` size is defined relative to the `<div>` that contains it, which modifies the root font-size, then this becomes a simple test of arithmetic. 16*1.5*0.5 = 12 (though just knowing it is not going to be 16,24 or 8 would land you at the answer).

[1 mark]

Q34. Karen is using `wget` to download a website `example.com`. The index page of `example.com` contains the following HTML:

```
<!DOCTYPE html>
<html>
<head>
        <meta charset="UTF-8">
        <link type="text/css" href="custom.css" rel="stylesheet">
        <link type="text/css" href="chrome.css" rel="stylesheet">
        <title>Example Page</title>
</head>
<body>
<h1>Example Page</h1>
<p>See the <a href="./about.html">about</a> page for more about this
site, or check out the <a href="https://www.iana.org/domains/example">
IANA resources</a> for more about example pages.</p>

</body>
</html>
```

If she downloads the page by invoking

```
 wget -r -l 1 http://example.com
```

How many files will be retrieved in total?

    A. 2

(cont.)

    B. 3

    C. 4

    D. 5

> **Solution:** The index page, the about.html page and the two CSS files from the header will be retrieved. -l 1 means no further recursion will proceed on linked pages, and wget will not follow the link to the external domain. Controlling wget recursion is part of the first set of web scraping exercises.

[1 mark]

Q35. Which of the following statements is true?

    A. Functions are popped of the call stack after they finish executing.

    B. Functions remain in the call stack after they finish executing.

    C. Call stacks are not used in JavaScript.

    D. JavaScript uses linked lists for navigating between functions.

[1 mark]

Q36. What will be the output of `console.log(a);`?

```
var a = "John Doe";
console.log(a.length);
```

    A. 7

    B. 8

    C. 6

    D. 0

[1 mark]

Q37. What will be the output of `console.log(a);` in each of the cases?

1
```
function hello(b){
   console.log(a);
}
var a = "William";
hello();
```

2
```
function hello(b){
 console.log(a);
     function Name(c){
     var a = "William";
     }

}
hello();
```

    A. William & William

    B. William & Undefined

    C. Undefined & William

    D. William & Reference Error

[1 mark]

Q38. What will be the output of `console.log();` below?

```
const obj1 = {Name: "John", Age: 20};
console.log(obj1.Name);
```

    A. Undefined

    B. Reference error

    C. John

    D. Not defined

[1 mark]

Q39. What will be the output of the following function?

```
mult = () => {return(10*10);}
```

    A. 100

    B. Exception will be thrown

    C. Memory leak

    D. Error

[1 mark]

Q40. `JSON.stringify()` does one of the following.

    A. JSON object to JavaScript object.

    B. JavaScript object to JSON object

    C. None of the above.

    D. This is not JavaScript methods.

[1 mark]

Q41. `JSON.parse()` will output?.

```
const string = '{"Name":"Joe","City":"Bristol"}'
const myJSON = JSON.parse(string);
console.log(string);
```

    A. Name:"Joe", City:"Bristol"

    B. "Name":"Joe","City":"Bristol"

    C. Name: 'Joe', City: 'Bristol'

    D. None of the above.

[1 mark]

Q42. What will be the output of the following code?

```
const numbers = [1,2,3,4,5];
numbers.forEach((number,index,array) => {
console.log(index,number);
});
```

    A. 1,2,3,4,5

    B.
```
1 0 [ 1, 2, 3, 4, 5 ]
2 1 [ 1, 2, 3, 4, 5 ]
3 2 [ 1, 2, 3, 4, 5 ]
4 3 [ 1, 2, 3, 4, 5 ]
5 4 [ 1, 2, 3, 4, 5 ]
```

    C.
```
0 1
1 2
2 3
3 4
4 5
```

    D. Prints empty array

[1 mark]

Q43. What will be the output of the following code?

```
function printArray(a){
var len = a.length, i=0;
if (len==0)
    console.log("Empty Array");
else
    {
      do
        {
          console.log(a[i]);
          i++;
        }while(i<=len);
    }
 }
 b = [1,2,3,4,5];
 printArray(b);
```

A. 5,4,3,2,1

B. Prints 0 to length of the array

C. 1,2,3,4,5

D. Prints empty array

[1 mark]

Q44. What happens when you put this in a render() method?

```
let names = ["John","Matt","Joseph"];
function App() {
   return (
<div className="App">
{names.map(it => <p>{names[1]}</p>)}
 </div>)
  }
```

A.   Matt

B.   Matt
                 Matt
                 Matt

C. Joseph

D. None of the above.

[1 mark]

(cont.)

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Qu. continues ...

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(cont.)

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Qu. continues …

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