Quiz 1

1.
Consider an array defined as `int a[10];` on a machine where `sizeof(int)` is 4.

If the value of `&a[0]` is 0x10000, what is the value of `&a[2]`?

○	0x1000C
○	0x10002
○	0x10004
◉	0x10008
○	None of the other answers is correct

2.
In the following code fragment

```
int i;
char *str = "Hello";
for (i = 0; str[i] != '\0'; i++) {
   putchar(str[i]);
}
```

how many times will the `str[i] != '\0'` expression be evaluated?

○	5
◉	6
○	7
○	Very many; it's an infinite loop
○	None of the other answers is correct

3.
Consider the following function:

```
int f(int n)
{
   if (n == 0)
      return 0;
   else
      return n + f(n-1);
}
```

what is the value of `f(4)`?

○	4
○	7
◉	10
○	24
○	None of the other answers is correct

4.
In the following code fragment

```
int a = 5;
int *p;
p = &a;
*p = *p + 1;
a++;
```

what is the final value stored in the variable `a` ?

○	5
○	6
◉	7
○	8
○	None of the other answers is correct

Quiz 2

1.
If the permissions on a Linux file are

```
-rw-r--r-- 1 cs1521 cs1521 38 Aug5 21:58 myFile
```

and the cs1521 user then executes the command

```
chmod 733 myFile
```

then who can write on `myFile`?

Hint: the `rwx` triples in file permissions are represented by a single octal digit. The octal code for `rw-r--r--` is thus octal 644.

○	nobody
○	only the **user** cs1521
○	only the **group** cs1521
○	the **user** cs1521, the **group** cs1521, and nobody else
◉	everyone can write on the file
○	none of the other answers is correct

2.
The output from this call to the C compiler

```
gcc -S myProg.c
```

produces what kind of file?

○	C code, with all macros expanded
◉	assembly language
○	unlinked machine code
○	executable machine code
○	none of the above answers is correct

3.
When using unsigned 8-bit values, what is the result of:

```
(0x55 ^ 0xAA) ^ 0xAA
```

○	0x00
◉	0x55
○	0xAA
○	0xFF
○	none of the other answers is correct

4.
What is the final value of variable `x` if we execute the following code:

```
int x = 5, *z = &x;
*z = *z + 3;
z++;
x++;
```

You can assume that the variable `x` is located at address `0x1000`.

○	none of the other answers is correct
○	3
○	5
○	7
◉	9

Quiz 3

1.
What is the value in `$t1` when the `sw` instruction is executed? (i.e. what value is stored in `result`)

```
   li   $t1, 0
   li   $t2, 1
   li   $t3, 10
loop:
   bgt  $t2, $t3, end_loop
   mul  $t1, $t1, $t2
   addi $t2, $t2, 1
   j    loop
end_loop:
   sw   $t1, result
```

○	10!
◉	0
○	1
○	10
○	None of the other options is correct

2.
Which of the single SPIM pseudo-instructions below are the following three instructions equivalent to:

```
add $t1, $0, $0
lui $t1, 0x4321
ori $t1, $t1, 0x8765
```

○	`li $t1, 0x87654321`
◉	`li $t1, 0x43218765`
○	`lw $t1, 0x8765`
○	`addi $t1, 0x8765, 0x4321`
○	None of the other options is correct

3.
If the label `fun` is at `0x00401000`, what value is contained in register `$ra` immediately after the execution of the `jal` instruction on the `spim` virtual machine?

```
0x00400200   li  $a0, 42
0x00400204   jal fun
0x00400208   nop
0x0040020C   sw  $v0, x
```

○	0x00000000
◉	0x00400208
○	0x0040020C
○	0x00401000
○	None of the other options is correct

4.
Which of the C definitions below is equivalent to the following SPIM directive?

```
vec: .word 1, 2, 3, 4, 5
```

◉	`int vec[5] = { 1, 2, 3, 4, 5 };`
○	`int vec[5];`
○	`int vec[5] = { 5, 4, 3, 2, 1 };`
○	`int vec[5] = { '1', '2', '3', '4', '5' };`
○	None of the other options is correct

Quiz 4

1.
Given the output of the following command:

```
$ ls -l xyz
-rw------- 1 jas jas 2803 Mar 27 21:12 xyz
```

If a user other than `jas` runs the following code, in the directory containing `xyz` ...

```
int fd = open("xyz", O_RDONLY);
if (fd < 0) {
   perror(NULL);
   exit(1);
}
```

what will be the resulting error message?

○	"No such file or directory"
◉	"Permission denied"
○	"Segmentation fault"
○	There is no error, so there will be no error message
○	The call to `perror()` will fail, because of the NULL argument, and produce no message
○	None of the other answers is correct

2.
Consider a file of records of the following type:

```
typedef struct {
   int   id;        // unique identifier
   char  desc[100]; // description of item
   float price;     // wholesale price
} Record;
```

And the following variables:

```
int    fd;  // file descriptor, open on file for read/write
Record rec; // record which is set to appropriate values
```

If the file is non-empty and `fd` is currently positioned at the end-of-file, which of the following pairs of statements will update the 11th record in the file `fd` with the value currently stored in `rec`?

○	None of the other options is correct
◉	`lseek(fd, 10*sizeof(Record), SEEK_SET);` `write(fd, &rec, sizeof(Record));`
○	`lseek(fd, 10, SEEK_SET);` `write(fd, rec, sizeof(Record));`
○	`lseek(fd, 10, SEEK_SET);` `write(fd, &rec, sizeof(Record));`
○	`lseek(fd, 10*sizeof(Record), SEEK_CUR);` `write(fd, rec, sizeof(Record));`

3.
Consider the following function call which attempts to write 100 bytes from a buffer `buf` to a file `fd`, where `fd` is open for writing:

```
write(fd, &buf[0], 100);
```

Which of the following are possible return values from the function call?

○	either 0 or 100
○	any value in the range 0..100
○	either -1 or 0 or 100
◉	-1 or any value in the range 0..100
○	None of the other options is correct

4.
Consider a page table that maps process addresses to memory addresses. Pages and frames are 4096 bytes in size. There are 8 pages in the process P address space and 2000 memory frames, which are shared by 500 active processes. The page mappings for process P are as follows:

```
Page 0 is in Frame 50
Page 1 is in Frame 999
Page 2 is in Frame 1
Page 3 is not loaded
Page 4 is not loaded
Page 5 is not loaded
Page 6 is in Frame 42
Page 7 is in Frame 1500
```

If process P makes a reference to address 8200, with the page table in the above state, what physical address does that map to? (all addresses are in decimal)

○	8
◉	4104
○	8200
○	4091912
○	Undetermined, because this address generates a page fault
○	None of the other options is correct

Quiz 5

1.
Consider the following code

```
int main(void)
{
   pid_t id;  int stat;
   if ((id = fork()) != 0) {
      printf("A = %d\n", id);
      wait(&stat);
      return 1;
   }
   else {
      printf("B = %d\n", getppid());
      return 0;
   }
}
```

Assuming that

- **all required `#include`'s are done**
- **the shell that invoked the above program has process ID 15000**
- **the invoked program has process ID 16000**
- **the child process has ID 16001**

What value appears after the `B =` ?

○	15000
○	15999
◉	16000
○	16001
○	None of the other options is correct

2.
In the previous example, and assuming that there are no errors, what value is stored in the `stat` variable after `wait()` returns?

◉	0
○	1
○	0x00000100
○	16001
○	None of the other options is correct

3.
Consider the following output from the Linux `ps` command:

```
USER       PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
jas       6475  0.0  0.0   5984  1800 pts/12   Ss   19:49   0:00 -bash
jas       6557  0.0  0.0   3176   320 pts/12   S    19:49   0:00 checkmail
jas      10559  0.0  0.0   5876  1768 pts/6    Ss   Oct13   0:00 -bash
jas      19578  0.0  0.0  41152  6200 pts/12   Tl   20:49   0:00 vim sig3.c
jas      26436  0.0  0.0   5504   988 pts/12   R+   21:00   0:00 ps u
```

What does the RSS field represent?

○	RSS is the number of pages in the process's run-time stack (run-time stack size)
○	RSS is the minimum number of pages required for the process to run (required storage size)
○	RSS is the total number of KB of data in the process's virtual memory (runnable set size)
◉	RSS is the number of KB of physical memory a process is currently using (resident set size)
○	None of the other options is correct

4.
Which signal does the following code generate?

```
char *x = 0;  *x = 'a';
```

○	SIGABRT
○	SIGALRM
◉	SIGSEGV
○	SIGQUIT
○	None of the other options is correct