

Questions on Process Management

When the OS runs the same application twice, is each run treated as the same process?
(multiple choice with single correct answer)

- A. TRUE
- B. FALSE

What does the stack pointer point to?
(multiple choice question with SINGLE correct answer)

- a. The largest possible address of the stack.
- b. The middle portion of the stack.
- c. The smallest possible address of the stack.

Where are dynamically allocated variables stored?
(multiple choice question with ONE correct answer)

- a. Stack segment
- b. Heap segment
- c. Data segment

What is the value of x at the end running the following code? What is the value of y?
(numeric answer question)

```
#include <stdlib.h>
#include <stdio.h>

int sum(int varX, int varY) {
    static int funcCounter = 0;
    funcCounter++;
    return (funcCounter + varX + varY);
}

int main (int argc, char** argv) {
    int x = 0, y = 0;
    x = sum(1,2);
    printf("%d\n", x);
    return 0;
}
```

Which of the following are stored in a process control block (PCB) of a process?
(multiple choice question with multiple correct answers)

- A. Stack pointer
- B. Program counter
- C. Register values
- D. Process data files

Each child process can have multiple parent processes.
(multiple choice question with ONE correct answer)

- a. True
- b. False

Each parent process can have multiple children processes.
(multiple choice question with ONE correct answer)

- a. True
- b. False

Which of the following happens after a fork() call is invoked?
(multiple choice question with multiple correct answers)

- A. The child process is created and is an identical clone of the parent.
- B. The return value of fork() is set to 0 for the child process.
- C. The return value of fork() is set to 0 for the parent process.
- D. The return value of fork() is set to the child's pid for the child process.
- E. The return value of fork() is set to the child's pid for the parent process

Which of the following are reset at an exec() system call by a child process?
(multiple choice question with multiple correct answers)

- A. Child process heap
- B. Parent process heap
- C. Child process stack

When a parent process dies, what is the child process called?
(multiple choice question with ONE correct answer)

- A. Zombie process
- B. Orphan process

When a child process terminates but the parent does not call wait on the child, what is the child process called?

(multiple choice question with ONE correct answer)

- A. Init process
- B. Daemon process
- C. Zombie process

A virtual machine allows us to run multiple operating systems on a single computer. Select the best answer.

(multiple choice question with ONE correct answer)

- A. True
- B. False

The static global variables that reside in the data segment of a process's memory are generated at compile, not runtime. Select the best answer.

(multiple choice question with ONE correct answer)

- A. True
- B. False

Copy-on-write is a mechanism used to reduce the overhead of forking new processes. Select the best answer.

(multiple choice question with ONE correct answer)

- A. True
- B. False

The "Root" process, init, is created when the OS is booted. Select the best answer.

(multiple choice question with ONE correct answer)

- A. True
- B. False

After the exec() call, the child's data segment is preserved and kept similar to that of its parent. Select the best answer.

(multiple choice question with ONE correct answer)

- A. True
- B. False

Consider the following program:

```
#include <stdlib.h>
#include <stdio.h>
int sum(int varX, int varY) {
    char *cArray = NULL;
    cArray = (char*) malloc (1024 * sizeof(char));
    static int funcCounter = 0;
    funcCounter++;
    free(cArray);
    return (funcCounter + varX + varY);
}

int main (int argc, char** argv) {
    int x = 0, y = 0;
    x = sum(1,2);
    y = sum(3,4);
    printf("%d %d\n", x, y);
    return 0;
}
```

Where is the cArray stored in memory? Select the best answer.

(multiple choice question with ONE correct answer)

- A. Heap segment
- B. Stack segment
- C. Data segment

Which of the following statements is true if `free(cArray)` is left out? Select the best answer.
(multiple choice question with ONE correct answer)

- A. We will get a segmentation fault when running the program.
- B. `cArray` will be removed from the heap after the sum function call returns.
- C. `cArray` will be retained on the heap after the sum function call returns.

Where is the variable `x` stored in memory? Select the best answer.
(multiple choice question with ONE correct answer)

- A. Heap segment
- B. Stack segment
- C. Data segment

If the variable `funcCounter` in the sum function is declared without the `static` keyword, what would be the output in the `printf()` of the main function? Select the best answer.
(multiple choice question with ONE correct answer)

- A. 8
- B. 9
- C. 7

Which of the following are part of a process' execution context?
(multiple choice question with multiple correct answers)

- A. Its contents in memory
- B. Its CPU register values
- C. Its open files
- D. Files that the process opened many months ago (the computer was shut down and restarted since).

Which of the following are NOT stored in a PCB?
(multiple choice question with multiple correct answers)

- A. Most current stack pointer value of currently running process
- B. Last known stack pointer of a process when it stopped running

Physical memory pages used by process

During context switching from one user level process to another, the kernel transitions from user to kernel mode,
and then back to user mode.

(multiple choice question with one correct answer)

- A. True
- B. False

When a blocked process is unblocked, what state does it transition to?
(multiple choice question with SINGLE correct answer)

- A. Ready
- B. Running

A larger time-slice will result in:

(multiple choice question with MULTIPLE correct answers)

- A. More sluggish behavior for interactive applications
- B. Higher throughput for the OS

When a process calls exec, it can become blocked. [T/F]

Multiple choice question with SINGLE correct answer

- A. True
- B. False

When a process does a system call to read a file, what states can it end up in right after the call?

(multiple choice question with MULTIPLE correct answers)

- A. Ready
- B. Running
- C. Blocked

Which of the following are pushed onto the stack during a function call to remember the execution context of a process?

(multiple choice question with MULTIPLE correct answers)

- a. Program counter
- b. Compute registers
- c. File descriptor table

Is the following statement true or false? Select the best response.

In a function call, there is no need to transition to kernel mode.

- A. True
- B. False

Is the following statement true or false? Select the best response.

A process can jump to any location in the kernel via a system call.

- A. True
- B. False

Which of the following statements about system calls are true? Select all that apply.

(multiple choice question with MULTIPLE correct answers)

- A. System calls are more expensive in terms of CPU resources compared to function calls.
- B. System calls require context switching but function calls do not.
- C. After a system call, the original system caller may not get to run immediately.

During a system call, a TRAP instruction occurs and executing the correct system call requires a jump to a specific address in OS address space, as indexed by the system call number.

(multiple choice question with SINGLE correct answer)

- A. True
- B. False

When executing a TRAP instruction during a system call, the CPU mode bit changes from supervisor to user.

(multiple choice question with SINGLE correct answer)

- A. True
- B. False

A regular function call requires fewer CPU cycles than a system call (assuming both have the same code).

(multiple choice question with SINGLE correct answer)

- A. True
- B. False

Consider the following piece of code where a parent creates a child, a child creates a grandchild, and a grandchild creates a great-grandchild process. Assume that parent, child (`child_pid`), grandchild (`grandchild_pid`), and great-grandchild (`greatgrandchild_pid`) have PIDs 100, 200, 300, and 400, respectively.

```
child_pid = fork();
if (child_pid != 0) {
    /* parent's code*/
} else {
    /* child */
    grandchild_pid = fork();
    if (grandchild_pid != 0) {
        /* child's code */
    } else {
        /* grandchild's code */
        greatgrandchild_pid = fork();
    }
}
```

Enter the value of the `child_pid` variable in the parent's address space.

(Numeric answer question)

Enter the value of the `greatgrandchild_pid` variable in the grandchild's address space.

(Numeric answer question)

Enter the value of the `greatgrandchild_pid` variable in the greatgrandchild's address space.

(Numeric answer question)

Enter the value of the grandchild_pid variable in the grandchild's address space.
(Numeric answer question)

Is the following statement true or false?

When a process makes a system call, after the call completes, it may not get to run immediately.

(multiple choice question with ONE correct answer)

A. True

B. False

Is the following statement true or false?

During a system call, the system call number corresponding to the system call function is pushed onto the stack initially.

(multiple choice question with ONE correct answer)

A. True

B. False

Is the following statement true or false?

During a system call, the system call function caller's current register values are first stored in the heap and then copied to the PCB.

(multiple choice question with ONE correct answer)

A. True

B. False

Is the following statement true or false?

System calls are more expensive (i.e. require more instructions to run) than regular function calls.

(multiple choice question with ONE correct answer)

A. True

B. False