

# CS 160: Lab Assignment 1

1.

Consider four processes with the following starting and ending times:

Process	Start time	End time
A	5	7
B	2	4
C	3	6
D	1	8

For each pair of processes, indicate whether they run concurrently (y) or not (n):

Process pair	Concurrent?
AB	_____
AC	_____
AD	_____
BC	_____
BD	_____
CD	_____

2.

How many “hello” output lines does this program print?

---

```
1  #include "csapp.h"
2
3  int main()
4  {
5      int i;
6
7      for (i = 0; i < 2; i++)
8          Fork();
9      printf("hello\n");
10     exit(0);
11 }
```

---

3.

How many “hello” output lines does this program print?

---

```
1  #include "csapp.h"
2
3  void doit()
4  {
5      Fork();
6      Fork();
7      printf("hello\n");
8      return;
9  }
10
11 int main()
12 {
13     doit();
14     printf("hello\n");
15     exit(0);
16 }
```

---

4.

What is one possible output of the following program?

---

```
1  #include "csapp.h"
2
3  int main()
4  {
5      int x = 3;
6
7      if (Fork() != 0)
8          printf("x=%d\n", ++x);
9
10     printf("x=%d\n", --x);
11     exit(0);
12 }
```

---

5.  
How many “hello” lines does this program print?

---

```
1  #include "csapp.h"
2
3  void doit()
4  {
5      if (Fork() == 0) {
6          Fork();
7          printf("hello\n");
8          return;
9      }
10     return;
11 }
12
13 int main()
14 {
15     doit();
16     printf("hello\n");
17     exit(0);
18 }
```

---

6.  
What is the output of the following program?

---

```
1  #include "csapp.h"
2  int counter = 1;
3
4  int main()
5  {
6      if (fork() == 0) {
7          counter--;
8          exit(0);
9      }
10     else {
11         Wait(NULL);
12         printf("counter = %d\n", ++counter);
13     }
14     exit(0);
15 }
```

---

7.  
Consider the following program:

---

```
1  #include "csapp.h"
2
3  void end(void)
4  {
5      printf("2");
6  }
7
8  int main()
9  {
10     if (Fork() == 0)
11         atexit(end);
12     if (Fork() == 0)
13         printf("0");
14     else
15         printf("1");
16     exit(0);
17 }
```

---

Determine which of the following outputs are possible. Note: The `atexit` function takes a pointer to a function and adds it to a list of functions (initially empty) that will be called when the `exit` function is called.

- A. 112002
- B. 211020
- C. 102120
- D. 122001
- E. 100212

8.  
How many lines of output does the following function print? Give your answer as a function of  $n$ . Assume  $n \geq 1$ .

---

*code/ecf/forkprob8.c*

```
1  void foo(int n)
2  {
3      int i;
4
5      for (i = 0; i < n; i++)
6          Fork();
7      printf("hello\n");
8      exit(0);
9  }
```

---

*code/ecf/forkprob8.c*