#1 The fork and wait pattern

https://android.googlesource.com/platform/prebuilts/gcc/linux-x86/host/i686-linux-glibc2.7-4.6/+/tools_r20/sysroot/usr/include/bits/waitstatus.h

```
/* If WIFEXITED(STATUS), the low-order 8 bits of the status. */
#define __WEXITSTATUS(status) (((status) & 0xff00) >> 8)

/* If WIFSIGNALED(STATUS), the terminating signal. */
#define __WTERMSIG(status) ((status) & 0x7f)

/* If WIFSTOPPED(STATUS), the signal that stopped the child. */
#define __WSTOPSIG(status) __WEXITSTATUS(status)

/* Nonzero if STATUS indicates normal termination. */
#define __WIFEXITED(status) (__WTERMSIG(status) == 0)
```

#2 The fork-exec-wait trilogy

`fork` Are variables shared?

`exec` When does exec return?

`waitpid` Purpose?

#3 What happened to your child? - use the wait macros to extract bits

```
pid_t waitpid(pid_t pid, int * status, int options);

//Decoding the bits of the status integer
01     int s;
02     waitpid(child, &s, 0 );
03       WEXITSTATUS(s)    valid if WIFEXITED(s) != 0
04       WTERMSIG(s)           valid if WIFSIGNALED(s) != 0
```

#4 Who is my parent?

```
01      pid_t vader = getppid();
02      pid_t luke = getpid();
```

#5 Madness- What does this do and how?

```
01      int main(int c, char **v) {
02        while (--c > 1 && !fork());
03        int val  = atoi(v[c]);
04        sleep(val);
05        printf("%d\n", val);
06        return 0;
07      }
```

#6 Puzzle - Two processes for the price of one program

```
01  char * m = "World";
02  int main() {
03    int a = 0;
04    pid_t f = fork();
05    if(f == -1) { perror("fork failed!"); exit(1);}

06    if(_____________) {/* child process */ m = "Hello";}

07    else { // I'm the parent
08       printf("Waiting for %ld to finish", (long)f);

09  ?

10  ?

11    }
12    puts(m);
13    return 42;
14  }
```

Post lecture challenge 1. Write a forking program where the parent process creates N child processes.
or...
Post lecture Challenge 2. Write a forking program that creates a chain of N processes i.e. each process, except the last, has one child process.
(See if you can work this out yourself first before looking at my svn example)

#7 A program to automatically compile and execute my programs

```
01  char * compiler = "gcc";
02  int main(int argc, char** argv) {
03    if(argc != 2) {
04      fprintf(stderr,"%s prog.c",argv[0]);
05      exit(1);
06    }
07    char* target = argv[1];
08    while(1) {
09      pid_t child = fork();

10      if(__________){ // I'm the child

11        execlp(

12        perror(compiler);
13        exit(1);
14      }
15      int status=0;
16
17
18      if(                                ) break;
19      sleep(5);
20    }
21    puts("running your program"); // no flush!?
22    execlp("./a.out","./a.out",(const char*)NULL);
23    perror("Failed to run ./a.out");
24    return 1;
25  }
```

#8 What happens to child processes if their parents die first?

#9 What happens if the parent never finishes and never waits on its children?

#10 What is SIGCHILD ?

#11 C Review / FAQ

What is special about `sizeof(char)` ?

```
int * x =  0x12340;
```

On a 32 bit machine, what is the value of `(x + 1)` ?

Spot the mistake(s)!

```
01    double *a = malloc( sizeof(double*) );
02    double *b = a;
03    free(b); b = 0;
04    *a = (double) 0xbaadf00d;

05    char* result;
06    strcpy(result, "CrashMaybe");

07    void* append(char** ptr, const char*mesg) {
08      if(!*ptr)  ptr = malloc( strlen(mesg) );
09      strcat( *ptr, mesg);
10    }
11
```