

DEBUGGING ASSIGNMENT

Roll no : 0801CS221093.

Q1:

```
#include <stdio.h>
int main()
{
int a,b;
int c=a+b;
printf("%d",c); // Output: 5
return 0;
}
```

```
cn/dc-17@cn/dc17-OptiPlex-3050-AIO:~$ gcc file1.c -g -o file1
cn/dc-17@cn/dc17-OptiPlex-3050-AIO:~$ gdb ./file1
GNU gdb (Ubuntu 12.1-0ubuntu1~22.04) 12.1
Copyright (C) 2022 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
Type "show copying" and "show warranty" for details.
This GDB was configured as "x86_64-linux-gnu".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<https://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.

For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from ./file1...
(gdb) break main
Breakpoint 1 at 0x1155: file file1.c, line 5.
(gdb) run
Starting program: /home/cn/dc-17/file1
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db

Breakpoint 1, main () at file1.c:5
5      int c=a+b;
(gdb) set variable a = 2
(gdb) set variable b = 3
(gdb) n
6      printf("%d",c); // Output: 5
(gdb) n
7      return 0;
(gdb) n
8  }
(gdb) n
__libc_start_call_main (main=main@entry=0x555555555149 <main>, argc
74  ./sysdeps/nptl/libc_start_call_main.h: No such file or dir
(gdb) n
5[Inferior 1 (process 4973) exited normally]
```

Q2:

```
#include <stdio.h>
int main()
{
```

```

int d=2;
printf("Enter the value of d:");
scanf("%d",d);
printf("The value of d is:%d",d);
return 0;
}

```

```

cndc-17@cndc17-OptiPlex-3050-AIO:~$ nano file2.c
cndc-17@cndc17-OptiPlex-3050-AIO:~$ gcc file2.c -g -o file2
file2.c: In function 'main':
file2.c:6:9: warning: format '%d' expects argument of type 'int *', but argument 2 has type 'int' [-Wformat=]
   6 | scanf("%d",d);
     |         ~^  ~
     |         |  |
     |         |  +-- int
     |         +--- int *
cndc-17@cndc17-OptiPlex-3050-AIO:~$

```

AFTER DEBUGGING :

```

#include <stdio.h>
int main()
{
int d=2;
printf("Enter the value of d:");
scanf("%d",&d);
printf("The value of d is:%d",d);
return 0;
}

```

```

No breakpoints or watchpoints.
(gdb) break main
Breakpoint 1 at 0x1195: file file2.c, line 3.
(gdb) run
Starting program: /home/cndc-17/file2
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".

Breakpoint 1, main () at file2.c:3
3      {
(gdb) n
4      int d=2;
(gdb) n
5      printf("Enter the value of d:");
(gdb) n
6      scanf("%d",&d);
(gdb) n
Enter the value of d:5
7      printf("The value of d is:%d",d);
(gdb) n
8      return 0;
(gdb) n
9      }
(gdb) n
__libc_start_call_main (main=main@entry=0x555555555189 <main>, argc=argc@entry=1, argv=argv@entry=0x7fffff
74  ../sysdeps/nptl/libc_start_call_main.h: No such file or directory.
(gdb) n
The value of d is:5[Inferior 1 (process 6046) exited normally]
(gdb) quit

```

Q3.

```

#include<stdio.h>
#include <stdlib.h>
int factorial(int n);

```

```

int main(void) {
int n = 5;
int f = factorial(n);
printf("The factorial of %d is %d.\n", n, f);
n = 17;
f = factorial(n);
printf("The factorial of %d is %d.\n", n, f);
return 0;
}
//A factorial is calculated by  $n! = n * (n - 1) * (n - 2) * \dots * 1$ 
//E.g.  $5! = 5 * 4 * 3 * 2 * 1 = 120$ 
int factorial(int n) {
int f = 1;
int i = 1;
while (i <= n) {
f = f * i;
i++;
}
return f;
}

```

```

cndc-17@cndc17-OptiPlex-3050-A10:~$ gcc file3.c -g -o file3
file3.c: In function 'main':
file3.c:6:1: warning: implicit declaration of function 'printf' [-Wimplicit-function-declaration]
  6 | printf("The factorial of %d is %d.\n", n, f);
    | ^~~~~~
file3.c:2:1: note: include '<stdio.h>' or provide a declaration of 'printf'
  1 | #include <stdlib.h>
+++ |+#include <stdio.h>
  2 | int factorial(int n);
file3.c:6:1: warning: incompatible implicit declaration of built-in function 'printf' [-Wbuiltin-declaration-mismatch]
  6 | printf("The factorial of %d is %d.\n", n, f);
    | ^~~~~~
file3.c:6:1: note: include '<stdio.h>' or provide a declaration of 'printf'

```

AFTER DEBUGGING :

```

#include<stdio.h>
#include <stdlib.h>
long long int factorial(int n);
int main(void) {
int n = 5;
long long int f = factorial(n);
printf("The factorial of %d is %lld.\n", n, f);
n = 17;
f = factorial(n);
printf("The factorial of %d is %lld.\n", n, f);
return 0;
}
//A factorial is calculated by  $n! = n * (n - 1) * (n - 2) * \dots * 1$ 
//E.g.  $5! = 5 * 4 * 3 * 2 * 1 = 120$ 
long long int factorial(int n) {
long long int f = 1;
int i = 1;
while (i <= n) {
f = f * i;

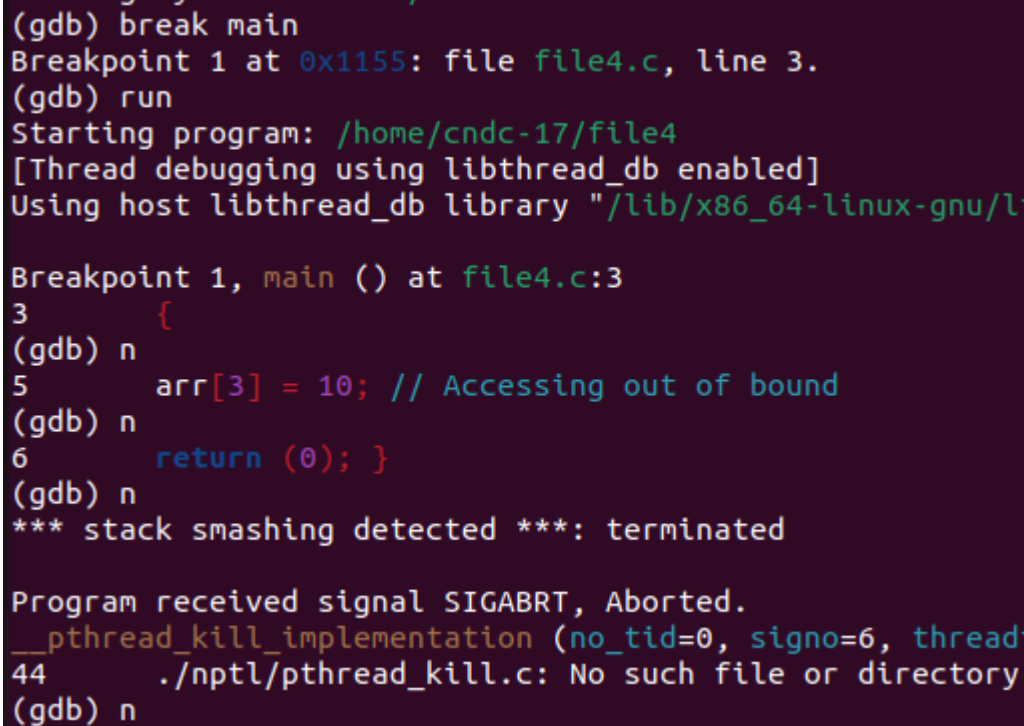
```

```
i++;  
}  
return f;  
}
```

```
(gdb) break main  
Breakpoint 1 at 0x1155: file file3.c, line 5.  
(gdb) run  
Starting program: /home/cndc-17/file3  
[Thread debugging using libthread_db enabled]  
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".  
  
Breakpoint 1, main () at file3.c:5  
5      int n = 5;  
(gdb) n  
6      long long int f = factorial(n);  
(gdb) n  
7      printf("The factorial of %d is %lld.\n", n, f);  
(gdb) n  
The factorial of 5 is 120.  
8      n = 17;  
(gdb) n  
9      f = factorial(n);  
(gdb) n  
10     printf("The factorial of %d is %lld.\n", n, f);  
(gdb) n  
The factorial of 17 is 355687428096000.  
11     return 0;  
(gdb) n  
12     }  
(gdb) n  
__libc_start_call_main (main=main@entry=0x55555555149 <main>, argc=1, argv=0x0, envp=0x55555555149 <main>)  
74     ../sysdeps/nptl/libc_start_call_main.h: No such file or directory  
(gdb) n  
[Inferior 1 (process 7498) exited normally]  
(gdb) n  
The program is not being run.  
(gdb)
```

Q4.

```
#include <stdio.h>
int main(void)
{
int arr[2];
arr[3] = 10; // Accessing out of bound
return (0); }
```

A screenshot of a GDB terminal session. The user sets a breakpoint at the start of the main function in file4.c and runs the program. The program attempts to access arr[3], which is out of bounds for an array of size 2. GDB detects this as a stack smashing error and terminates the program with a SIGABRT signal. The error message indicates that the program received signal SIGABRT, Aborted, and provides details about the pthread_kill implementation. The user then enters the command (gdb) n.

```
(gdb) break main
Breakpoint 1 at 0x1155: file file4.c, line 3.
(gdb) run
Starting program: /home/cndc-17/file4
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".

Breakpoint 1, main () at file4.c:3
3      {
(gdb) n
5      arr[3] = 10; // Accessing out of bound
(gdb) n
6      return (0); }
(gdb) n
*** stack smashing detected ***: terminated

Program received signal SIGABRT, Aborted.
__pthread_kill_implementation (no_tid=0, signo=6, thread_id=
44      ./nptl/pthread_kill.c: No such file or directory
(gdb) n
```

AFTER DEBUGGING

```
#include <stdio.h>
int main(void)
{
int arr[2];
arr[1] = 10; // Accessing out of bound
return (0);
}
```

```

(gdb) break main
Breakpoint 1 at 0x1155: file file4.c, line 3.
(gdb) run
Starting program: /home/cndc-17/file4
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".

Breakpoint 1, main () at file4.c:3
3      {
(gdb) n
5      arr[1] = 10; // Accessing out of bound
(gdb) n
6      return (0);
(gdb) n
7      }
(gdb) n
__libc_start_call_main (main=main@entry=0x555555555149 <main>, argc=argc@entry=1, argv=argv@entry=0x7ffffdfe0000) at ../sysdeps/nptl/libc_start_call_main.h:74
74      ../sysdeps/nptl/libc_start_call_main.h: No such file or directory
(gdb) n
[Inferior 1 (process 4739) exited normally]
(gdb) █

```

Q5 .

```

#include <stdio.h>
int main()
{
int *p;
printf("%d",*p);
return 0;
}

```



```

(gdb) break main
Breakpoint 1 at 0x1155: file file5.c, line 5.
(gdb) run
Starting program: /home/cndc-17/file5
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".

Breakpoint 1, main () at file5.c:5
5      printf("%d",*p);
(gdb) n
6      return 0;
(gdb) n
7  }
(gdb) n
__libc_start_call_main (main=main@entry=0x555555555149 <main>, argc=argc@entry
74      ../sysdeps/nptl/libc_start_call_main.h: No such file or directory.
(gdb) n
-98693133[Inferior 1 (process 4912) exited normally]
(gdb) n
The program is not being run.
(gdb) █

```

AFTER DEBUGGING :

```

#include <stdio.h>
int main()
{
int *p;
int b = 10;
p = &b;
printf("%d",*p);
return 0;
}

```

```

(gdb) break main
Breakpoint 1 at 0x1175: file file5.c, line 3.
(gdb) run
Starting program: /home/cndc-17/file5
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/x86_64-linux-gnu/libthread_db.so.1".

Breakpoint 1, main () at file5.c:3
3      {
(gdb) n
5      int b = 10;
(gdb) n
6      p = &b;
(gdb) n
7      printf("%d",*p);
(gdb) n
8      return 0;
(gdb) n
9  }
(gdb) n
__libc_start_call_main (main=main@entry=0x555555555169 <main>, argc=argc@entry
74      ../sysdeps/nptl/libc_start_call_main.h: No such file or directory.
(gdb) n
10[Inferior 1 (process 5253) exited normally]
(gdb) █

```

