142301013
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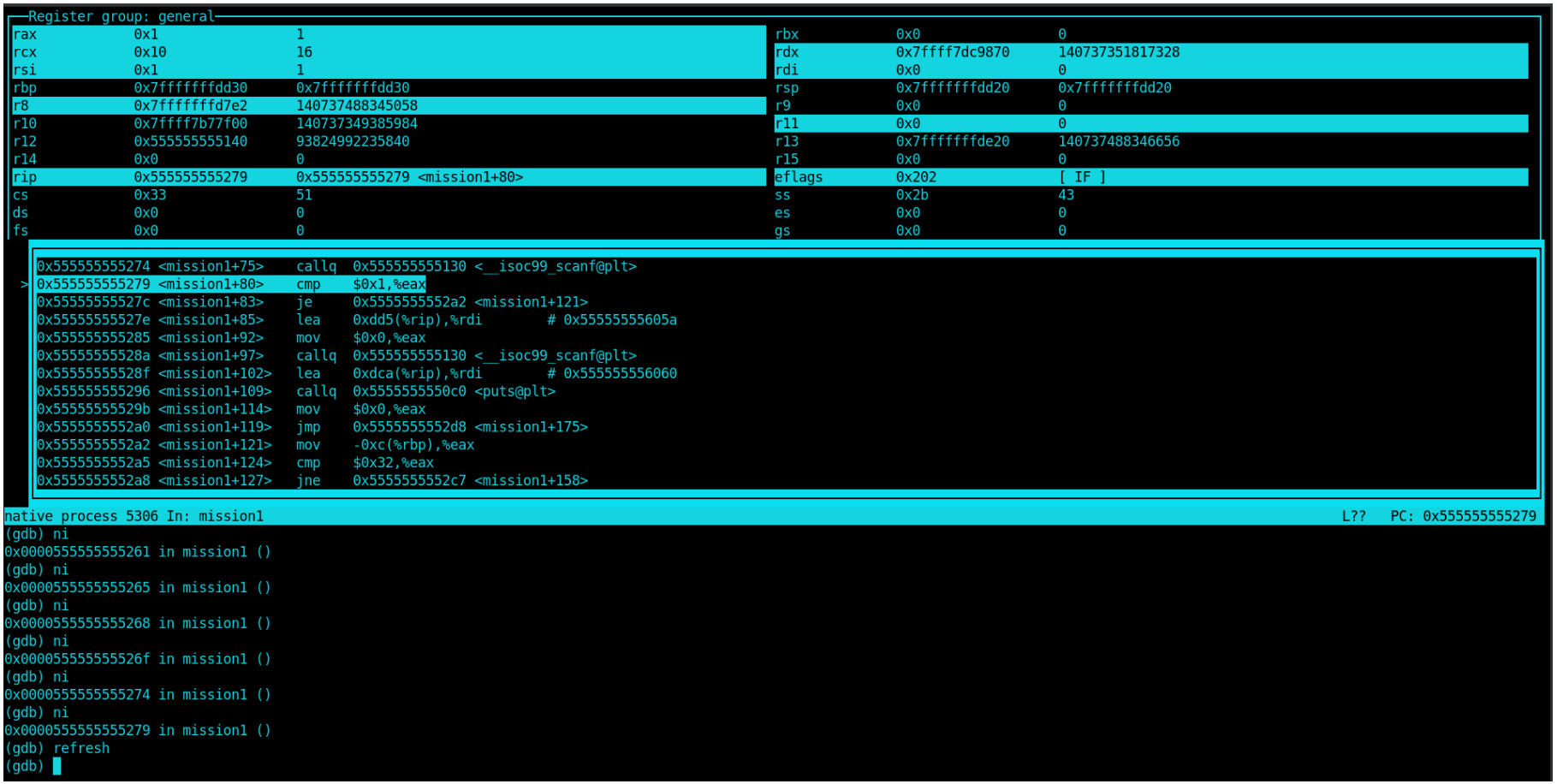
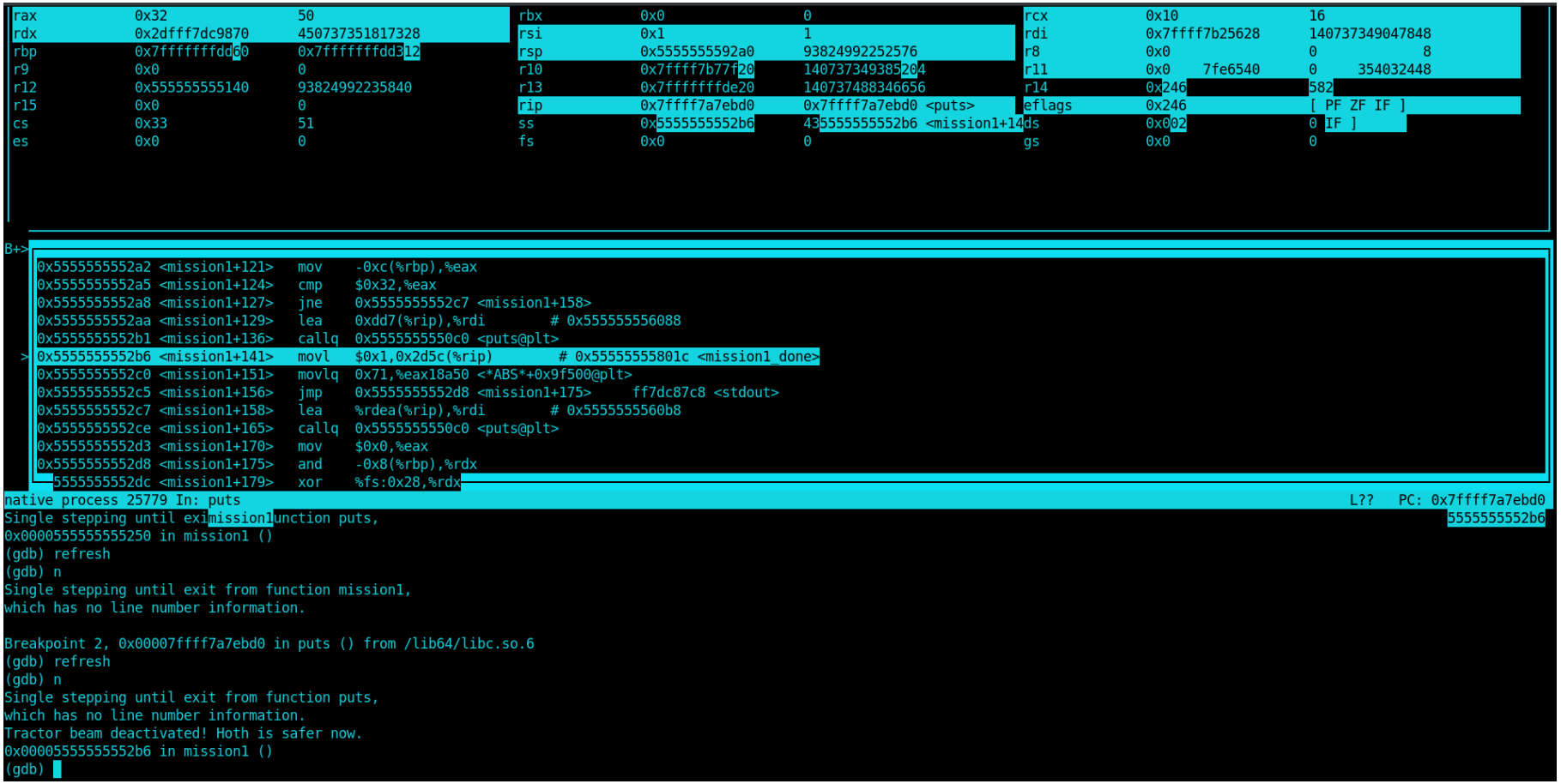
MISSION 1

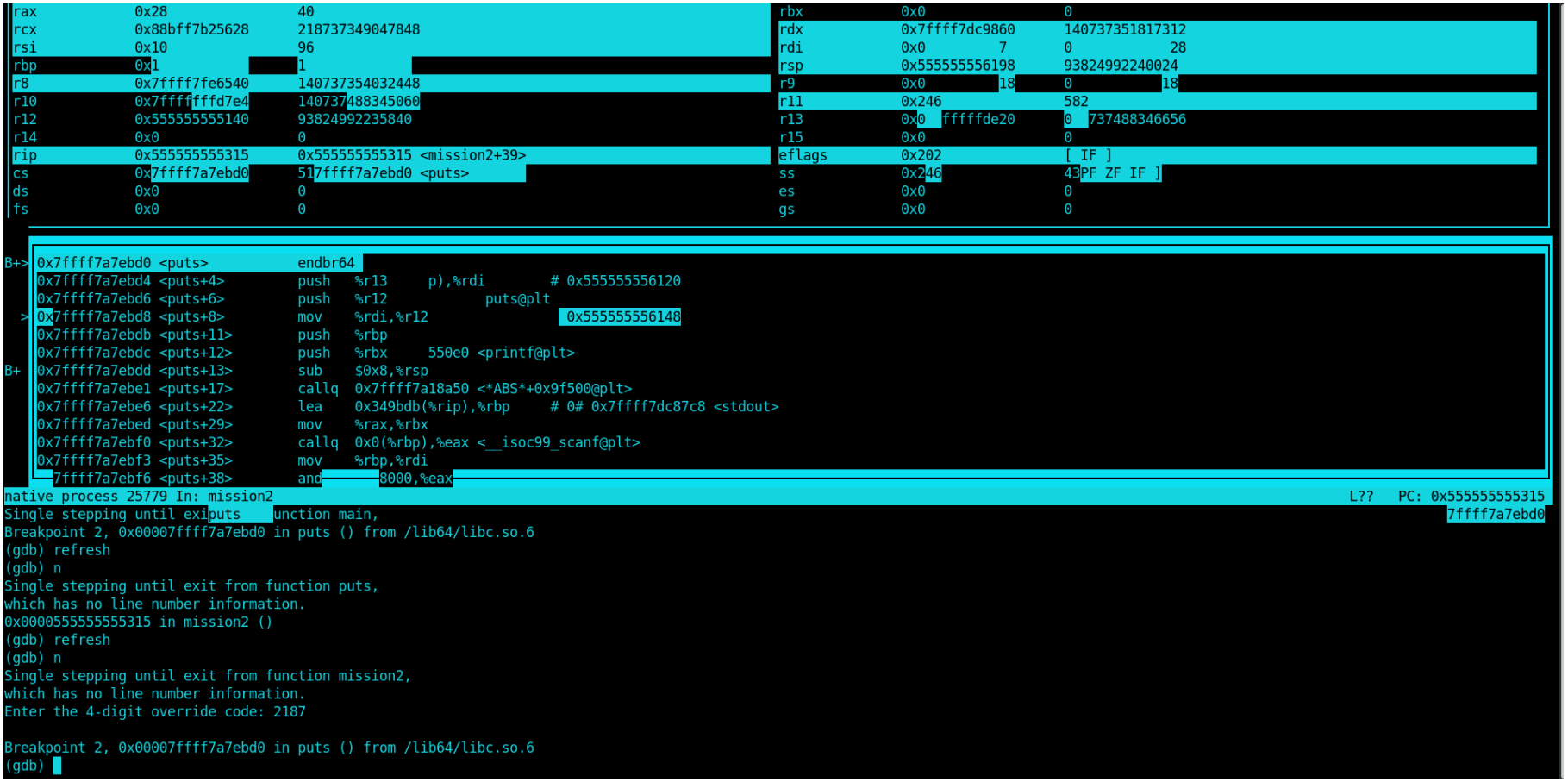
Answer: 50



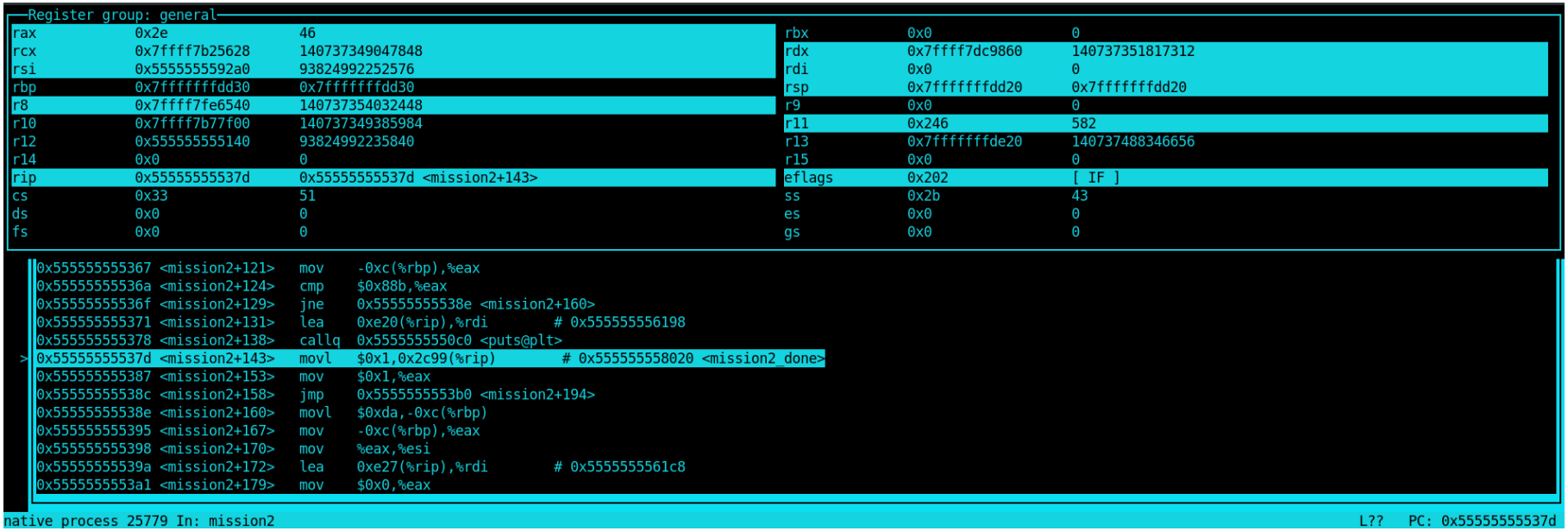
Here we can see a comparison operation at address <mission+124>, where we are comparing the value in %eax to 0x32 (50)
Now, it it is not equal to 50, as we can see it jumps to <mission+158>, and from the image below, we can see that the <mission_done> is at the address<mission+141>, which will only be called if %eax is equal to 50.

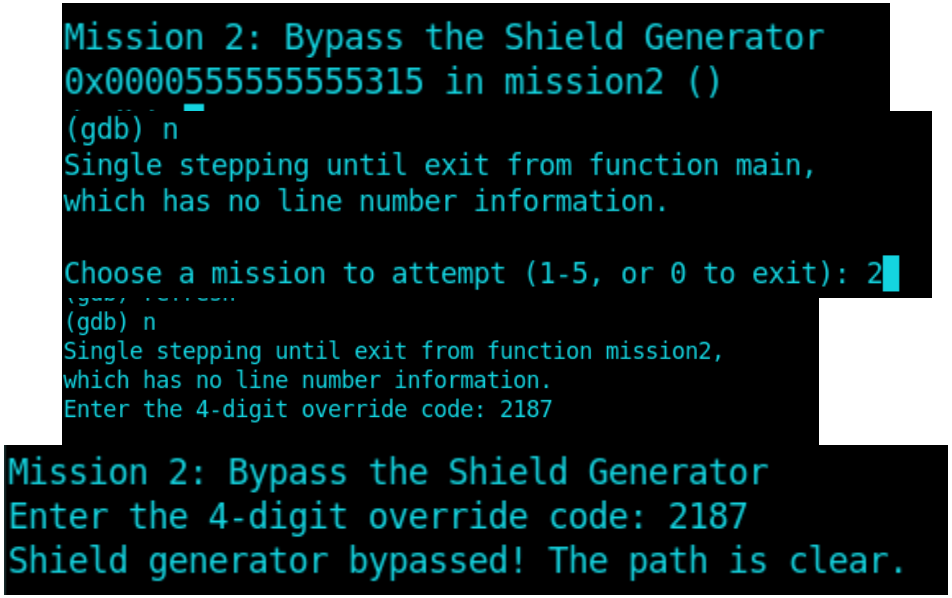

rax 0x32 50
rbx 0x0 0
rcx 0x10 16
rdx 0x2dfff7dc9870 450737351817328
rsi 0x1 1
rdi 0x7ffff7b25628 140737349047848
rbp 0x7fffffffdd60 0x7fffffffdd312
rsp 0x5555555592a0 93824992252576
r8 0x0 0
r9 0x0 0
r10 0x7ffff7b77f20 140737349385204
r11 0x0 0x7fe6540 0 354032448
r12 0x555555555140 93824992235840
r13 0x7fffffffde20 140737488346656
r14 0x246 582
r15 0x0 0
rip 0x7ffff7a7ebd0 0x7ffff7a7ebd0 <puts>
eflags 0x246 [PF ZF IF]
cs 0x33 51
ss 0x5555555552b6 435555555552b6 <mission1+14
ds 0x002 0 IF]
es 0x0 0
fs 0x0 0
gs 0x0 0
B+>
0x5555555552a2 <mission1+121> mov -0xc(%rbp),%eax
0x5555555552a5 <mission1+124> cmp $0x32,%eax
0x5555555552a8 <mission1+127> jne 0x5555555552c7 <mission1+158>
0x5555555552aa <mission1+129> lea 0xdd7(%rip),%rdi # 0x555555556088
0x5555555552b1 <mission1+136> callq 0x5555555550c0 <puts@plt>
> 0x5555555552b6 <mission1+141> movl $0x1,0x2d5c(%rip) # 0x55555555801c <mission1_done>
0x5555555552c0 <mission1+151> movlq 0x71,%eax18a50 <*ABS*+0x9f500@plt>
0x5555555552c5 <mission1+156> jmp 0x5555555552d8 <mission1+175> ff7dc87c8 <stdout>
0x5555555552c7 <mission1+158> lea %rdea(%rip),%rdi # 0x5555555560b8
0x5555555552ce <mission1+165> callq 0x5555555550c0 <puts@plt>
0x5555555552d3 <mission1+170> mov $0x0,%eax
0x5555555552d8 <mission1+175> and -0x8(%rbp),%rdx
5555555552dc <mission1+179> xor %fs:0x28,%rdx
native process 25779 In: puts L?? PC: 0x7ffff7a7ebd0
Single stepping until exi mission1 unction puts, 5555555552b6
0x0000555555555250 in mission1 ()
(gdb) refresh
(gdb) n
Single stepping until exit from function mission1,
which has no line number information.
Breakpoint 2, 0x00007ffff7a7ebd0 in puts () from /lib64/libc.so.6
(gdb) refresh
(gdb) n
Single stepping until exit from function puts,
which has no line number information.
Tractor beam deactivated! Hoth is safer now.
0x00005555555552b6 in mission1 ()
(gdb)

MISSION 2
Answer:2187



Here similar to the previous question, we enter the code 2187. This is because at the address <mission2+124> we compare $0x88b(2187) with the value in %eax. And if it is not equal to it, we jump to <mission2+160>, as we can see from the image below, bu the <mission2_done> is at the address <mission2+143> and hence the value given should be equal to 2187 to complete the mission2.


Register group: general
rax 0x2e 46
rbx 0x0 0
rcx 0x7ffff7b25628 140737349047848
rdx 0x7ffff7dc9860 140737351817312
rsi 0x5555555592a0 93824992252576
rdi 0x0 0
rbp 0x7fffffffdd30 0x7fffffffdd30
rsp 0x7fffffffdd20 0x7fffffffdd20
r8 0x7ffff7fe6540 140737354032448
r9 0x0 0
r10 0x7ffff7b77f00 140737349385984
r11 0x246 582
r12 0x555555555140 93824992235840
r13 0x7fffffffde20 140737488346656
r14 0x0 0
r15 0x0 0
rip 0x55555555537d 0x55555555537d <mission2+143>
eflags 0x202 [IF]
cs 0x33 51
ss 0x2b 43
ds 0x0 0
es 0x0 0
fs 0x0 0
gs 0x0 0
0x555555555367 <mission2+121> mov -0xc(%rbp),%eax
0x55555555536a <mission2+124> cmp $0x88b,%eax
0x55555555536f <mission2+129> jne 0x55555555538e <mission2+160>
0x555555555371 <mission2+131> lea 0xe20(%rip),%rdi # 0x555555556198
0x555555555378 <mission2+138> callq 0x5555555550c0 <puts@plt>
> 0x55555555537d <mission2+143> movl $0x1,0x2c99(%rip) # 0x555555558020 <mission2_done>
0x555555555387 <mission2+153> mov $0x1,%eax
0x55555555538c <mission2+158> jmp 0x5555555553b0 <mission2+194>
0x55555555538e <mission2+160> movl $0xda,-0xc(%rbp)
0x555555555395 <mission2+167> mov -0xc(%rbp),%eax
0x555555555398 <mission2+170> mov %eax,%esi
0x55555555539a <mission2+172> lea 0xe27(%rip),%rdi # 0x5555555561c8
0x5555555553a1 <mission2+179> mov $0x0,%eax
native process 25779 In: mission2
L?? PC: 0x55555555537d


Mission 2: Bypass the Shield Generator
0x0000555555555315 in mission2 ()
(gdb) n
Single stepping until exit from function main,
which has no line number information.
Choose a mission to attempt (1-5, or 0 to exit): 2
(gdb) n
Single stepping until exit from function mission2,
which has no line number information.
Enter the 4-digit override code: 2187
Mission 2: Bypass the Shield Generator
Enter the 4-digit override code: 2187
Shield generator bypassed! The path is clear.

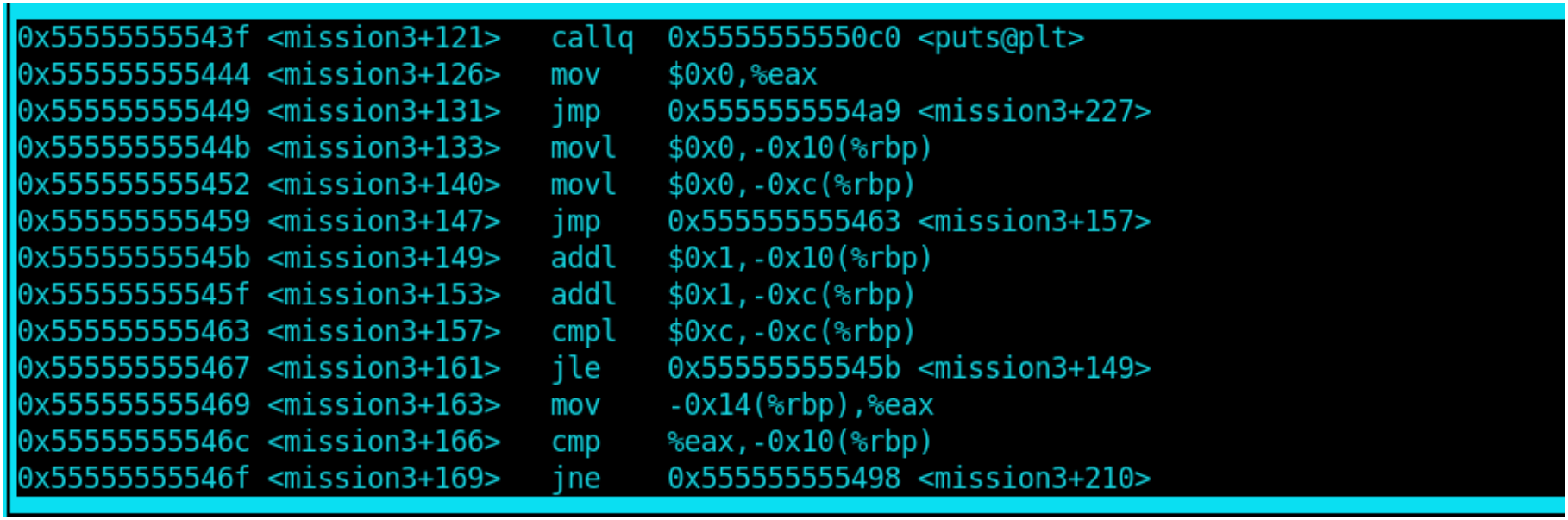
MISSION 3

Answer:13

```
Mission 3: Navigate the Asteroid Field
The Millennium Falcon made the Kessel Run in less than 12 parsecs.
Enter the number of parsecs to plot the course: 13
Course plotted successfully in 13 parsecs!
```

```
0x555555555469 <mission3+163>   mov    -0x14(%rbp),%eax
0x55555555546c <mission3+166>   cmp    %eax,-0x10(%rbp)
0x55555555546f <mission3+169>   jne    0x555555555498 <mission3+210>
0x555555555471 <mission3+171>   mov    -0x14(%rbp),%eax
0x555555555474 <mission3+174>   mov    %eax,%esi
0x555555555476 <mission3+176>   lea    0xe5b(%rip),%rdi        # 0x5555555562d8
0x55555555547d <mission3+183>   mov    $0x0,%eax
0x555555555482 <mission3+188>   callq  0x5555555550e0 <printf@plt>
0x555555555487 <mission3+193>   movl   $0x1,0x2b93(%rip)        # 0x555555558024 <mission3_done>
```

Here we are comparing the given value at -0x14(%rbp) with a value in -0x10(%rbp).
We get the value of -0x10(%rbp) from the loop below.
Where we initialize two variables -0x10(%rbp) and -0xc(%rbp), and here -0xc(%rbp) is similar to the int i initialization in a typical for loop.
Here the loop runs 13 times and increments -0x10(%rbp) ny one every time. The loop runs for 13 times because of the jle comparison, where we compare 0xc (12) with -0xc(%rbp). Therefore, we get a value of 13 in -0x10(%rbp).



The above is the loop which goes from <mission3+133> to <mission3+161>.

MISSION 4

Answer: 5678

```
Mission 4: Launch the Defense Fighters
Enter the launch authorization code: 5678
Launch code accepted! Fighters are away.
```

The answer is 5678.
The important thing to note here is that the function mission4 calls is not verifyLaunchCode but rather verifyLandingCode

```
0x555555555571 <mission4+126>   callq  0x5555555554d9 <verifyLandingCode>
0x555555555576 <mission4+131>   test   %eax,%eax
0x555555555578 <mission4+133>   je     0x555555555597 <mission4+164>
0x55555555557a <mission4+135>   lea    0xe4f(%rip),%rdi        # 0x5555555563d0
0x555555555581 <mission4+142>   callq  0x5555555550c0 <puts@plt>
0x555555555586 <mission4+147>   movl   $0x1,0x2a98(%rip)        # 0x555555558028 <mission4_done>
0x555555555590 <mission4+157>   mov    $0x1,%eax
```

As we can see at the address <mission4+126> we call the function verifyLandingCode and then compare its return value to get the mission done.

```
B+> 0x5555555554d9 <verifyLandingCode>      endbr64
    0x5555555554dd <verifyLandingCode+4>    push   %rbp
    0x5555555554de <verifyLandingCode+5>    mov    %rsp,%rbp
    0x5555555554e1 <verifyLandingCode+8>    mov    %edi,-0x4(%rbp)
    0x5555555554e4 <verifyLandingCode+11>   cmpl   $0x162e,-0x4(%rbp)
    0x5555555554eb <verifyLandingCode+18>   sete   %al
    0x5555555554ee <verifyLandingCode+21>   movzbl %al,%eax
    0x5555555554f1 <verifyLandingCode+24>   pop    %rbp
    0x5555555554f2 <verifyLandingCode+25>   retq
B+  0x5555555554f3 <mission4>               endbr64
    0x5555555554f7 <mission4+4>             push   %rbp
    0x5555555554f8 <mission4+5>             mov    %rsp,%rbp
    0x5555555554fb <mission4+8>             sub    $0x10,%rsp
```

And in the verify landing code function, we compare it with 0x162e which is equal to 5678 and if it is correct we return the value.

MISSION 5