

Lab 03: Introduction the DS4 and Functions

LAB # 4

SECTION # 4

James Gaul

Submitted: 2/22/24

Lab Date: 2/16/24

Problem 1: Compiler Errors

Lab04-1_1

- a. Errors/Changes Made:
 - i. Line 28/29: Added a missing semicolon
 - ii. Line 36/37: Added missing quotation marks around a string.
 - iii. Line 43/44: Replaced missing bracket after “else”
 - iv. Line 46/47: Corrected “pridf” to “printf”
- b. Initial Error:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-1_1.c -o lab04-1_1.exe
lab04-1_1.c: In function 'main':
lab04-1_1.c:28:33: error: expected ';' before 'scanf'
 28 |         printf("Enter an integer: ")
    |                                     ^
    |                                     ;
 29 |         scanf("%d", &i);
    |         ~~~~~
lab04-1_1.c:31:12: warning: missing terminating " character
 31 |         printf("Enter another integer: );
    |               ^
lab04-1_1.c:31:12: error: missing terminating " character
 31 |         printf("Enter another integer: );
    |               ^~~~~~
lab04-1_1.c:32:20: error: expected ')' before 'if'
 32 |         scanf("%d", &j)
    |                   ^
    |                   )
 33 |
 34 |         if (j % i == 0)
    |         ~
lab04-1_1.c:31:11: note: to match this '('
 31 |         printf("Enter another integer: );
    |         ^
lab04-1_1.c:32:5: warning: passing argument 1 of 'printf' makes pointer from integer without a cast [-Wint-conversion]
 32 |         scanf("%d", &j)
    |         ~~~~~
    |         |
    |         int
In file included from lab04-1_1.c:12:
/usr/include/stdio.h:206:17: note: expected 'const char * restrict' but argument is of type 'int'
 206 | int printf(const char *__restrict, ...)
    |          ^
lab04-1_1.c:41:51: error: expected ';' before '}' token
 41 |         printf("%d %% %d is %d\n", j, i, (j % i));
    |                                                     ^
    |                                                     ;
 42 |     }
    |     ~
lab04-1_1.c: At top level:
lab04-1_1.c:44:5: error: expected identifier or '(' before 'return'
 44 |     return 0;
    |     ~~~~~
lab04-1_1.c:45:1: error: expected identifier or '(' before '}' token
 45 | }
    | ^
```

c. Edited Source Code:

```
1.  /*-----
   2.  -                                     SE 185: Lab 04 - Debugging Code
   3.  -                                     -
   4.  -      Name: James Gaul
   5.  -                                     -
   6.  -      Section: 3
   7.  -                                     -
   8.  -      NetID: 947125207
   9.  -      Date: 2/16/24
  10.  -                                     -
  11.  -                                     Includes
  12.  -                                     -
  13.  -      -----*/
  14.  -      #include <stdio.h>
  15.  -      -----*/
  16.  -      Notes
  17.  -      -----*/
  18.  -      // Compile with gcc lab04-1_1.c -o lab04-1_1
  19.  -      // Run with ./lab04-1_1
  20.  -      /* This program outputs if a integer will divide into another
  21.  -      integer with no remainder. */
  22.  -      -----*/
  23.  -      Implementation
  24.  -      -----*/
  25.  -      int main(int argc, char *argv[])
  26.  -      {
  27.  -          int i, j;
  28.  -          //printf("Enter an integer: ")
  29.  -          printf("Enter an integer: ");
  30.  -          scanf("%d", &i);
  31.  -          //printf("Enter another integer: ");
  32.  -          printf("Enter another integer: ");
  33.  -          //scanf("%d", &j)
  34.  -          scanf("%d", &j);
  35.  -      }
```

```

39.         if (j % i == 0)
40.         {
41.             printf("%d divides %d\n", i, j);
42.
43.         //} else
44.         } else{
45.
46.             //printf("%d does not divide %d\n", i, j);
47.             printf("%d does not divide %d\n", i, j);
48.
49.             printf("%d %% %d is %d\n", j, i, (j % i));
50.         }
51.
52.     return 0;
53. }

```

d. Corrected Output:

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_1.exe
Enter an integer: 6
Enter another integer: 7
6 does not divide 7
7 % 6 is 1

```

Lab04-1_2

a. Errors/Changes Made:

- i. Line 18/19: Changed function variables from “int” to “double”
- ii. Line 34/35: Added variable declaration of “acceleration” for the function “main”

b. Initial Error:

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-1_2.c -o lab04-1_2.exe
lab04-1_2.c: In function 'main':
lab04-1_2.c:35:19: error: 'acceleration' undeclared (first use in this function)
   35 |     scanf("%lf", &acceleration);
      |                   ^~~~~~
lab04-1_2.c:35:19: note: each undeclared identifier is reported only once for each function it appears in
lab04-1_2.c: At top level:
lab04-1_2.c:54:6: error: conflicting types for 'force'; have 'void(double, double)'
   54 | void force(double mass, double acceleration)
      |      ^~~~~
lab04-1_2.c:17:6: note: previous declaration of 'force' with type 'void(int, int)'
   17 | void force(int mass, int acceleration);
      |      ^~~~~

```

c. Edited Source Code:

```
1.  /*-----
   -----
2.  -                                     SE 185: Lab 04 - Debugging Code
   -
3.  -      Name: James Gaul
   -
4.  -      Section: 3
   -
5.  -      NetID: 947125207
   -
6.  -      Date: 2/16/24
   -
7.  -----
   -----*/
8.
9.  /*-----
   -----
10. -                                     Includes
   -
11. -----
   -----*/
12.      #include <stdio.h>
13.
14.      /*-----
   -----
15. -                                     Prototypes
   -
16. -----
   -----*/
17.
18.      //void force(int mass, int acceleration);
19.      void force(double mass, double acceleration);
20.
21.      /*-----
   -----
22. -                                     Notes
   -
23. -----
   -----*/
24.      // Compile with gcc lab04-1_2.c -o lab04-1_2
25.      // Run with ./lab04-1_2
26.      /* This program takes two inputs, acceleration and mass,
27.      * and outputs the force = mass * acceleration */
28.
29.      /*-----
   -----
30. -                                     Implementation
   -
31. -----
   -----*/
32.      int main(int argc, char *argv[])
33.      {
34.          //double mass;
35.          double mass, acceleration;
```

```

36.
37.
38.     printf("Enter an acceleration in m/s^2: ");
39.     scanf("%lf", &acceleration);
40.
41.     printf("Enter the mass of the object in kg: ");
42.     scanf("%lf", &mass);
43.
44.     printf("\nYou entered %lf m/s^2.\n", acceleration);
45.     printf("You entered %lf kg.\n\n", mass);
46.
47.     force(mass, acceleration);
48.
49.     return 0;
50. }
51.
52. /**
53.  * Given mass and acceleration, calculates the force
54.  * exerted.
55.  * @param mass - The given mass of an object in kilograms.
56.  * @param acceleration - The acceleration of an object in
57.  * m/s^2.
58.  */
59. void force(double mass, double acceleration)
60. {
61.     printf("The force is approximately %.2lf Newtons.\n",
        mass * acceleration);

```

d. Fixed Output:

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_2.exe
Enter an acceleration in m/s^2: 9.81
Enter the mass of the object in kg: 60

You entered 9.810000 m/s^2.
You entered 60.000000 kg.

The force is approximately 588.60 Newtons.

```

Lab04-1_3

a) Errors/Changes Made:

- Line 13: Added `stdio.h` inclusion
- Line 14: Added `stdlib.h` inclusion

b) Initial Error:

```
$ gcc lab04-1_3.c -o lab04-1_3.exe
lab04-1_3.c: In function 'main':
lab04-1_3.c:32:5: warning: implicit declaration of function 'srand' [-Wimplicit-function-declaration]
   32 |     srand(time(NULL));
      |     ~~~~~
lab04-1_3.c:36:5: warning: implicit declaration of function 'printf' [-Wimplicit-function-declaration]
   36 |     printf("Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: ");
      |     ~~~~~
lab04-1_3.c:13:13: note: include '<stdio.h>' or provide a declaration of 'printf'
    12 | #include <time.h>
      | ~~~~|+#####include <stdio.h>
    13 |
lab04-1_3.c:36:5: warning: incompatible implicit declaration of built-in function 'printf' [-Wbuiltin-declaration-mismatch]
   36 |     printf("Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: ");
      |     ~~~~~
lab04-1_3.c:37:5: warning: implicit declaration of function 'scanf' [-Wimplicit-function-declaration]
   37 |     scanf("%d", &selection);
      |     ~~~~~
lab04-1_3.c:37:5: note: include '<stdio.h>' or provide a declaration of 'scanf'
lab04-1_3.c:37:5: warning: incompatible implicit declaration of built-in function 'scanf' [-Wbuiltin-declaration-mismatch]
lab04-1_3.c:37:5: note: include '<stdio.h>' or provide a declaration of 'scanf'
lab04-1_3.c:41:21: warning: implicit declaration of function 'rand' [-Wimplicit-function-declaration]
   41 |     selection = rand() % 4;
      |                  ~~~~~
lab04-1_3.c:44:5: warning: implicit declaration of function 'print_face' [-Wimplicit-function-declaration]
   44 |     print_face(selection);
      |     ~~~~~
lab04-1_3.c: At top level:
lab04-1_3.c:54:6: warning: conflicting types for 'print_face'; have 'void(int)'
   54 | void print_face(int selection)
      | ~~~~~
lab04-1_3.c:44:5: note: previous implicit declaration of 'print_face' with type 'void(int)'
   44 |     print_face(selection);
      |     ~~~~~
lab04-1_3.c: In function 'print_face':
lab04-1_3.c:58:9: warning: incompatible implicit declaration of built-in function 'printf' [-Wbuiltin-declaration-mismatch]
   58 |         printf("Have a nice day! :) \n");
      |         ~~~~~
lab04-1_3.c:58:9: note: include '<stdio.h>' or provide a declaration of 'printf'
lab04-1_3.c:61:9: warning: incompatible implicit declaration of built-in function 'printf' [-Wbuiltin-declaration-mismatch]
   61 |         printf(":\\n");
      |         ~~~~~
lab04-1_3.c:64:9: note: include '<stdio.h>' or provide a declaration of 'printf'
lab04-1_3.c:64:9: warning: incompatible implicit declaration of built-in function 'printf' [-Wbuiltin-declaration-mismatch]
   64 |         printf("Meh :\\ \\n");
      |         ~~~~~
lab04-1_3.c:64:9: note: include '<stdio.h>' or provide a declaration of 'printf'
lab04-1_3.c: In function 'hoo':
lab04-1_3.c:76:5: warning: incompatible implicit declaration of built-in function 'printf' [-Wbuiltin-declaration-mismatch]
   76 |     printf(" ____\n {0,0}\n/____)\n_\\"__"\n\n");
      |     ~~~~~
lab04-1_3.c:76:5: note: include '<stdio.h>' or provide a declaration of 'printf'
```

c) Reduced errors after first line changed (adding "#include <stdio.h>")

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-1_3.c -o lab04-1_3.exe
lab04-1_3.c: In function 'main':
lab04-1_3.c:33:5: warning: implicit declaration of function 'srand' [-Wimplicit-function-declaration]
   33 |     srand(time(NULL));
      |     ^~~~~
lab04-1_3.c:42:21: warning: implicit declaration of function 'rand' [-Wimplicit-function-declaration]
   42 |     selection = rand() % 4;
      |                   ^~~~
lab04-1_3.c:45:5: warning: implicit declaration of function 'print_face'; did you mean 'printf'? [-Wimplicit-function-declaration]
   45 |     print_face(selection);
      |     ^~~~~~
      |     printf
lab04-1_3.c: At top level:
lab04-1_3.c:55:6: warning: conflicting types for 'print_face'; have 'void(int)'
   55 | void print_face(int selection)
      |      ^~~~~~
lab04-1_3.c:45:5: note: previous implicit declaration of 'print_face' with type 'void(int)'
   45 |     print_face(selection);
      |     ^~~~~~
```

d) Edited Code

```
1.  /*-----
   -----
2.  -                               SE 185: Lab 04 - Debugging Code
   -
3.  -   Name: James Gaul
   -
4.  -   Section: 3
   -
5.  -   NetID: 947125207
   -
6.  -   Date: 2/16/24
   -
7.  -----
   -----*/
8.
9.  /*-----
   -----
10. -                               Includes
   -
11. -----
   -----*/
12. #include <time.h>
13. #include <stdio.h> //Added inclusion
14. #include <stdlib.h> //Added inclusion
15.
16. /*-----
   -----
17. -                               Prototypes
   -
18. -----
   -----*/
19. void hoo();
20. void print_face(int selection);
21.
22. /*-----
   -----
23. -                               Notes
   -
24. -----
   -----*/
25. /* This is a simple program that takes a user inputs
26.  * and prints out a message based on that input */
27. // Compile with gcc lab04-1_3.c -o lab04-1_3
28. // Run with ./lab04-1_3
29.
30. /*-----
   -----
31. -                               Implementation
   -
32. -----
   -----*/
33. int main(int argc, char *argv[])
34. {
35.     srand(time(NULL));
36.
```



```

37.         int selection = 0;
38.
39.         printf("Enter 1 for happy, 2 for sad, 3 for neutral, any
other integer for random: ");
40.         scanf("%d", &selection);
41.
42.         if (selection < 1 || selection > 3)
43.         {
44.             selection = rand() % 4;
45.         }
46.
47.         print_face(selection);
48.
49.         return 0;
50.     }
51.
52.     /**
53.      * Prints a funny face.
54.      *
55.      * @param selection - The inputted value which determines which
face to print.
56.      */
57.     void print_face(int selection)
58.     {
59.         if (selection == 1)
60.         {
61.             printf("Have a nice day! :) \n");
62.         } else if (selection == 2)
63.         {
64.             printf(":(\n");
65.         } else if (selection == 3)
66.         {
67.             printf("Meh :\\ \n");
68.         } else
69.         {
70.             hoo();
71.         }
72.     }
73.
74.     /**
75.      * Prints an owl face.
76.      */
77.     void hoo()
78.     {
79.         printf(" * ____* \n {O,O} \n /) ____ \n _ \"__ \"_ \n");
80.     }

```

e. Fixed Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_3.exe
Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: 5
0
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_3.exe
Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: 1
1
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-1_3.c -o lab04-1_3.exe

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-1_3.c -o lab04-1_3.exe

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_3.exe
Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: 3
Meh :\

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_3.exe
Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: 2
:(

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_3.exe
Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: 1
Have a nice day! :)

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_3.exe
Enter 1 for happy, 2 for sad, 3 for neutral, any other integer for random: 5
Meh :\
```

Lab04-1_4

a. Changes Made/Errors:

- i. Changed invalid variable name “speed_of_light!” into “speed_of_light” in all locations (variable names can’t include special characters)
- ii. Changed invalid variable name “wave-length” into “waveLength” in all locations
- iii. Changed invalid variable name “~length_in_meters” to “length_in_meters”
- iv. Changed invalid variable name “plank const” to “plankConst” in all locations (variable names can’t include spaces)
- v. Changed invalid variable name “0energy” to “energy” in all locations (variable names can’t start with a digit)

b. Initial Error:

[illegible]

c. Edited Code:

```
/*-----  
-  
-                               SE 185: Lab 04 - Debugging Code  
-  
-   Name: James Gaul  
-  
-   Section: 3  
-  
-   NetID: 947125207  
-  
-   Date: 2/16/24  
-  
-----  
*/  
  
/*-----  
-  
-                               Includes  
-  
-----  
*/  
#include <stdio.h>  
#include <math.h>  
  
/*-----  
-  
-                               Notes  
-  
-----  
*/  
// Compile with gcc lab04-1_4.c -o lab04-1_4  
// Run with ./lab04-1_4  
/* This program calculates the energy of one photon  
 * of user-inputted wave-length of light */  
  
/*-----  
-  
-                               Implementation  
-  
-----  
*/  
int main(int argc, char *argv[])  
{  
    //double speed_of_light!;  
    double speed_of_light;  
    //double wave-length;  
    double waveLength;  
    //double ~length_in_meters;  
    double length_in_meters;  
    //double plank const;  
    double plankConst;  
    //double 0energy;  
    double energy;  
  
    //plank const = 6.62606957 * pow(10, -34); // Planck's constant
```

```

    plankConst = 6.62606957 * pow(10, -34);
    //speed_of_light! = 2.99792458 * pow(10, 8); // Constant for the speed
of light
    speed_of_light = 2.99792458 * pow(10, 8);
    //wave-length = 0;
    waveLength = 0;
    //~length_in_meters = 0;
    length_in_meters = 0;
    //0energy = 0;
    energy = 0;

    printf("Welcome! This program will give the energy, in Joules,\n");
    printf("of 1 photon with a certain wave-length.\n");
    printf("Please input a wave-length of light in nano-meters.\n");
    printf("Please do not enter a negative, or zero, wave-length.\n");

    //scanf("%lf", &wave-length);
    scanf("%lf", &waveLength);

    //if (wave-length > 0.0)
    if (waveLength > 0.0)
    {
        //~length_in_meters = wave-length / pow(10, 9); // Converting nano-
meters to meters
        length_in_meters = waveLength / pow(10, 9);

        //0energy = (plank const * speed_of_light!) / ~length_in_meters;
// Calculating the energy of 1 photon
        energy = (plankConst * speed_of_light);
        /*printf("A photon with a wave-length of %08.3lf nano-meters,
carries "
                "\napproximately %030.25lf joules of energy.", wave-length,
0energy);
        */
        printf("A photon with a wave-length of %08.3lf nano-meters,
carries "
                "\napproximately %030.25lf joules of energy.", waveLength,
energy);
    } else
    {
        printf("Sorry, you put in an invalid number.");
        printf("Please rerun the program and try again.");
    }

    return 0;
}

```

d. Fixed Output:

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_4.exe
Welcome! This program will give the energy, in Joules,
of 1 photon with a certain wave-length.
Please input a wave-length of light in nano-meters.
Please do not enter a negative, or zero, wave-length.
5
A photon with a wave-length of 0005.000 nano-meters, carries
approximately 0000.000000000000000000000002 joules of energy.

```

Lab04-1_5

a. Errors/Changes Made:

- i. Line 19: Removed "main" redefinition
- ii. Lines 44-47 Commented out alternate "main" function (it was never called and had no apparent purpose)

b. Initial Error:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-1_5.c -o lab04-1_5
lab04-1_5.c:44:5: error: redefinition of 'main'
  44 | int main(int argc, char *argv[])
      | ~~~~~
lab04-1_5.c:31:5: note: previous definition of 'main' with type 'int(int, char **)'
  31 | int main(int argc, char *argv[])
      | ~~~~~
```

c. Edited Code:

```
1. /*-----
   -----
2. -                                     SE 185: Lab 04 - Debugging Code
   -
3. -      Name: James Gaul
   -
4. -      Section: 3
   -
5. -      NetID: 947125207
   -
6. -      Date: 2/16/24
   -
7. -----*/
8.
9. /*-----
   -----
10. -                                     Includes
   -
11. -----*/
12.      #include <stdio.h>
13.
14.      /*-----
   -----
15. -                                     Prototypes
   -
16. -----*/
17.      int sum_function(int number);
18.
19.      //int main(); -Removed main redefinition
20.
21.      /*-----
   -----
22. -                                     Notes
   -
```

```

23.  -----*/
24.  // Compile with gcc lab04-1_5.c -o lab04-1_5
25.  // Run with ./lab04-1_5
26.  /* This program calculates the sum of 1 to x, where x is a user
    input */
27.
28.  /*-----
    -----
29.  -                                     Implementation
    -
30.  -----*/
31.  int main(int argc, char *argv[])
32.  {
33.      int input;
34.
35.      printf("Please input a number from to sum up to: ");
36.
37.      scanf("%d", &input);
38.
39.      printf("The sum of 1 to %d is %d\n", input,
    sum_function(input));
40.
41.      return 0;
42.  }
43.
44.  /*int main(int argc, char *argv[])
45.  {
46.      printf("Sum is 32!\n");
47.  }
48.  */
49.  /**
50.   * Calculates the sum of 1 to number of a given number.
51.   *
52.   * @param number - The number that determines what the sum will
    stop adding at.
53.   * @return - The sum of 1 to the given number.
54.   */
55.  int sum_function(int number)
56.  {
57.      return (number * (number + 1)) / 2;
58.  }

```

d. Fixed Output:

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-1_5.exe
Please input a number from to sum up to: 6
The sum of 1 to 6 is 21

```

Part 2: Unintended Results (Logic Errors)

Lab04-2_1

a. Changes Made/Errors:

- i. Line 34/35: Changed “==” to “=” (double equal signs is used for comparisons, not variable definition)
- ii. Lines 40/41 and 46/47: Changed “=” to “==” (single equal sign is used for variable definition, not comparisons)

b. Initial Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-2_1.c -o lab04-2_1.exe
lab04-2_1.c: In function 'main':
lab04-2_1.c:40:23: error: lvalue required as left operand of assignment
 40 |         if (is_odd(input) = 1)
    |                             ^
lab04-2_1.c:45:24: error: lvalue required as left operand of assignment
 45 |         if (is_even(input) = 1)
    |                             ^
```

c. Edited Source Code:

```
1.  /*-----
   2.  -----
   3.  -                                     SE 185: Lab 04 - Debugging Code
   4.  -
   5.  - Name: James Gaul
   6.  -
   7.  - Section: 3
   8.  -
   9.  - NetID: 947125207
  10.  -
  11.  - Date: 2/16/24
  12.  -----*/
  13.  /*-----*/
  14.  -----*/
  15.  -                                     Includes
  16.  -----*/
  17.  #include <stdio.h>
  18.
  19.  /*-----*/
  20.  -----*/
  21.  -                                     Prototypes
  22.  -----*/
  23.  int is_odd(int number);
```



```

18.
19.  int is_even(int number);
20.
21.  /*-----
    -----
22.  -                                     Notes
    -
23.  -----*/
24.  // Compile with gcc lab04-2_1.c -o lab04-2_1
25.  // Run with ./lab04-2_1
26.  /* This program accepts a user input and determines
27.   * if the integer is an odd or an even number */
28.
29.  /*-----
    -----
30.  -                                     Implementation
    -
31.  -----*/
32.  int main(int argc, char *argv[])
33.  {
34.      //int input == 0;
35.      int input = 0;
36.
37.      printf("Please input an integer: ");
38.      scanf("%d", &input);
39.
40.      //if (is_odd(input) = 1)
41.      if (is_odd(input) == 1)
42.      {
43.          printf("%d is an odd number!\n", input);
44.      }
45.
46.      //if (is_even(input) = 1)
47.      if (is_even(input) == 1)
48.      {
49.          printf("%d is an even number!\n", input);
50.      }
51.
52.      return 0;
53.  }
54.
55.  /**
56.   * Determines whether the given number is even.
57.   *
58.   * @param number - The number in question of even status.
59.   * @return - True if the given number was even.
60.   */
61.  int is_even(int number)
62.  {
63.      return !(number % 2);
64.  }
65.
66.  /**
67.   * Determines whether the given number is odd.
68.   *

```

```
69.     * @param number - The number in question of odd status.
70.     * @return - True if the given number was odd.
71.     */
72. int is_odd(int number)
73. {
74.     return number % 2;
75. }
```

d. Fixed Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_1.exe
Please input an integer: 6
6 is an even number!

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_1.exe
Please input an integer: 3
3 is an odd number!
```

Lab04-2_2

a. Changes Made/Errors:

- Changed text of if/else statements, using a simple “greater than or equal to” statements to compare values.

b. Initial Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_2.exe
Please input an integer from 1 up to 100000000: 640321
8 digits
```

c. Edited Source Code:

```
/*-----*/
-                                     SE 185: Lab 04 - Debugging Code
-
-      Name: James Gaul
-                                     -
-      Section: 3
-                                     -
-      NetID: 947125207
-                                     -
-      Date: 2/16/24
-                                     -
/*-----*/

/*-----*/
-                                     Includes
-                                     -
```

```

-----
*/
#include <stdio.h>

/*-----
-
-                               Prototypes
-
-----

*/
void how_many_whole_digits(int number);

/*-----
-
-                               Notes
-
-----

*/
/* This program calculates the number of digits in a number from 1 to
100000000 */
// Compile with gcc lab04-2_2.c -o lab04-2_2
// Run with ./lab04-2_2

/*-----
-
-                               Implementation
-
-----

*/
int main(int argc, char *argv[])
{
    int input;

    printf("Please input an integer from 1 up to 100000000: ");

    scanf("%d", &input);

    if (input > 100000000 || input < 1)
    {
        printf("Invalid number!\n");
        return -1;
    }

    how_many_whole_digits(input);

    return 0;
}

/**
 * This function divides a number by the 10^n, to
 * see if the divided number has "n" digits
 *
 * @param number - The number to determine how many whole digits exist
 * within.
 */
void how_many_whole_digits(int number)
{

```

```

//if ((double) number / 10000000 != 0)
    if ((double) number >= 10000000)
    {
        printf("8 digits\n");
    } //else if ((double) number / 1000000 != 0)
    else if ((double) number >= 1000000)
    {
        printf("7 digits\n");
    } //else if ((double) number / 100000 != 0)
    else if ((double) number >= 100000)
    {
        printf("6 digits\n");
    } //else if ((double) number / 10000 != 0)
    else if ((double) number >= 10000)
    {
        printf("5 digits\n");
    } //else if ((double) number / 1000 != 0)
    else if ((double) number >= 1000)
    {
        printf("4 digits\n");
    } //else if ((double) number / 100 != 0)
    else if ((double) number >= 100)
    {
        printf("3 digits\n");
    } //else if ((double) number / 10 != 0)
    else if ((double) number >= 10)
    {
        printf("2 digits\n");
    } //else if ((double) number / 1 != 0)
    else if ((double) number >= 1)
    {
        printf("1 digit\n");
    }
}

```

d. Fixed Output:

```

jagau@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_2.exe
Please input an integer from 1 up to 10000000: 643
3 digits

```

Lab04-2_3

a. Changes Made/Errors:

- i. Line 37/38: In "scanf" statement, changed variable identifiers from "%lf" (for long format variables) to "%d" (for integer variables)

b. Initial Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_3.exe
Please input two integers separated by a space: 6 7

Now doing a swap using an extra variable:
Before Swap: First: 1075576832, Second: 0
After Swap: First: 0, Second: 1075576832

Now doing a swap using addition and subtraction:
Before Swap: First: 1075576832, Second: 0
After Swap: First: 0, Second: 1075576832
```

c. Edited Source Code:

```
1.  /*-----
2.  -                                     SE 185: Lab 04 - Debugging Code
3.  -                                     -
4.  -                                     -
5.  -                                     -
6.  -                                     -
7.  -----*/
8.
9.  /*-----
10. -                                     Includes
11. -                                     -
12. -----*/
13. #include <stdio.h>
14. /*-----
15. -                                     Prototypes
16. -                                     -
17. -----*/
18. void variable_swap(int i, int j);
19. void math_swap(int i, int j);
20.
21. /*-----
22. -                                     Notes
23. -                                     -
24. -----*/
25. /* This program accepts two integers as user input and
    * swaps their values using two different methods */
```

```

26.      // Compile with gcc lab04-2_3.c -o lab04-2_3
27.      // Run with ./lab04-2_3
28.
29.      /*-----
30.      -                                     Implementation
31.      -----*/
32.      int main(int argc, char *argv[])
33.      {
34.          int first = 0, second = 0;
35.          printf("Please input two integers separated by a space: ");
36.
37.          //scanf("%lf %lf", &first, &second);
38.          scanf("%d %d", &first, &second);
39.
40.          printf("\n");
41.          variable_swap(first, second);
42.
43.          printf("\n");
44.          math_swap(first, second);
45.
46.          return 0;
47.      }
48.
49.      /**
50.       * Swaps the values of two integers using a temp variable.
51.       *
52.       * @param i - The first value to be swapped.
53.       * @param j - The second value to be swapped.
54.       */
55.      void variable_swap(int i, int j)
56.      {
57.          printf("Now doing a swap using an extra variable: \n");
58.          printf("Before Swap: First: %d, Second: %d\n", i, j);
59.
60.          int temp = i;
61.          i = j;
62.          j = temp;
63.
64.          printf("After Swap: First: %d, Second: %d\n", i, j);
65.      }
66.
67.      /**
68.       * Swaps the values of two integers without using a temp
69.       * variable.
70.       *
71.       * @param i - The first value to be swapped.
72.       * @param j - The second value to be swapped.
73.       */
74.      void math_swap(int i, int j)
75.      {
76.          printf("Now doing a swap using addition and subtraction:
77.          \n");

```

```
78.         i = i + j;
79.         j = i - j;
80.         i = i - j;
81.
82.         printf("After Swap: First: %d, Second: %d\n", i, j);
83.     }
```

d. Fixed Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_3.exe
Please input two integers separated by a space: 6 7

Now doing a swap using an extra variable:
Before Swap: First: 6, Second: 7
After Swap: First: 7, Second: 6

Now doing a swap using addition and subtraction:
Before Swap: First: 6, Second: 7
After Swap: First: 7, Second: 6
```

Lab04-2_4

a. Changes Made/Errors:

- i. Line 37/38: Changed “int” variable declarations to “double”, consistent with the rest of the program.

b. Initial Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_4.exe
selection:
1 for voltage
2 for resistance
3 for current
3
Enter floating point numbers for input...
Please enter a resistance value: 3.5
Please enter a voltage value: 1.5
Your current is: -nan Amps
```

c. Edited Source Code:

```
/*-----  
-  
-                               SE 185: Lab 04 - Debugging Code  
-  
-      Name: James Gaul  
-  
-      Section: 3  
-  
-      NetID: 947125207  
-  
-      Date: 2/16/24
```

```

-----
*/

/*-----
-
-
-
Includes
-
-----
*/
#include <stdio.h>

/*-----
-
-
-
Prototypes
-
-----
*/
double voltage(double resistance, double current);

double resistance(double voltage, double current);

double current(double voltage, double resistance);

/*-----
-
-
-
Notes
-
-----
*/
// Compile with gcc lab04-2_4.c -o lab04-2_4
// Run with ./lab04-2_4
/* This program calculates values of resistances,
 * voltages, or current using Ohm's Law */

/*-----
-
-
-
Implementation
-
-----
*/
int main(int argc, char *argv[])
{
    int selection = 0;
    //int v, i, r;
    double v, i, r;

    printf("selection:\n1 for voltage\n2 for resistance\n3 for current\n");

    scanf("%d", &selection);

    if (selection > 3 || selection < 1)
    {
        printf("Invalid number\n");
        return -1;
    }

    printf("Enter floating point numbers for input...\n");

```



```

    if (selection == 1)
    {
        printf("Please enter a resistance value: ");
        scanf("%lf", &r);

        printf("Please enter a current value: ");
        scanf("%lf", &i);

        printf("Your voltage is: %lf Volts\n", voltage(r, i));
    } else if (selection == 2)
    {
        printf("Please enter a voltage value: ");
        scanf("%lf", &v);

        printf("Please enter a current value: ");
        scanf("%lf", &i);

        printf("Your Resistance is: %lf Ohms\n", resistance(v, i));

    } else if (selection == 3)
    {
        printf("Please enter a resistance value: ");
        scanf("%lf", &r);

        printf("Please enter a voltage value: ");
        scanf("%lf", &v);

        printf("Your current is: %lf Amps\n", current(v, r));
    }

    return 0;
}

/**
 * Given the resistance and current, calculates and returns the voltage.
 *
 * @param resistance - The resistance used to calculate the voltage.
 * @param current - The current used to calculate the voltage.
 * @return - The voltage calculated from the resistance and current.
 */
double voltage(double resistance, double current)
{
    return resistance * current;
}

/**
 * Given the voltage and current, calculates and returns the resistance.
 *
 * @param voltage - The voltage used to calculate the resistance.
 * @param current - The resistance used to calculate the resistance.
 * @return - The resistance calculated from the voltage and current.
 */
double resistance(double voltage, double current)
{
    return voltage / current;
}

```

```

/**
 * Given the voltage and resistance, calculates and returns the current.
 *
 * @param voltage - The voltage used to calculate the current.
 * @param resistance - The resistance used to calculate the current.
 * @return - The current calculated from the voltage and resistance.
 */
double current(double voltage, double resistance)
{
    return voltage / resistance;
}

```

d. Fixed Output:

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_4.exe
selection:
1 for voltage
2 for resistance
3 for current
1
Enter floating point numbers for input...
Please enter a resistance value: 3.36
Please enter a current value: 3.67
Your voltage is: 12.331200 Volts

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_4.exe
selection:
1 for voltage
2 for resistance
3 for current
2
Enter floating point numbers for input...
Please enter a voltage value: 6.7
Please enter a current value: 8.9
Your Resistance is: 0.752809 Ohms

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_4.exe
selection:
1 for voltage
2 for resistance
3 for current
3
Enter floating point numbers for input...
Please enter a resistance value: 1.2
Please enter a voltage value: 3.4
Your current is: 2.833333 Amps

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-2_4.exe
selection:
1 for voltage
2 for resistance
3 for current
4
Invalid number

```

Lab04-2_5

a. Changes Made/Errors:

- i. Line 47/48: Changed “%lf” to “%d”, to match an integer variable.
- ii. Line 114/115: Changed variable name from “n” to “number”.

b. Initial Output:

```
jagau1@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-2_5.c -o lab04-2_5.exe
lab04-2_5.c: In function 'is_zero':
lab04-2_5.c:112:35: error: 'n' undeclared (first use in this function)
   112 |         printf("%d is zero and ", n);
       |                                   ^
lab04-2_5.c:112:35: note: each undeclared identifier is reported only once for each function it appears in
```

c. Fixed Code:

```
toahe@MSI ~/CprE185
$ ./lab04-2_5
Please type a number between -10000 and 10000: 4555
4555 is positive and 4555 is non-negative and 0 is non-zero and 4555 is a whole
number.
```

Problem 3: Putting it all together

Lab04-3_1

a. Changes Made/Errors

- i. Line 13: added inclusion of “stdlib.h”, so that the “srand” function can be used.
- ii. Line 16: Fixed missing “/*” to multiline comment, which caused inclusions to be ignored.
- iii. Line 24: Added missing declaration of function “run_game”
- iv. Line 36: Fixed missing “*/”, which commented out variable declarations of the “main()” function.
- v. Line 53/54: fixed a typo in the variable name, changing “playd” to “played”
- vi. Line 76/77: Replaced a missing “&” in the scanf statement
- vii. Line 107: Added variable definition.
- viii. Line 111/112: Changed “%c” to “%d”, as the input variable was an int rather than a char.
- ix. Line 120/121: changed “=” to “==”, as the if statement seeks to compare values, not assign them.

b. Initial Output:

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ gcc lab04-3.c -o lab04-3.exe
lab04-3.c: In function 'main':
lab04-3.c:47:9: warning: implicit declaration of function 'run_game'; did you mean 'rename'? [-Wimplicit-function-declaration]
   47 |     run_game(computer_guess);
      |     ^~~~~~
      |     rename
lab04-3.c:48:30: error: 'playd' undeclared (first use in this function); did you mean 'played'?
   48 |     prompt = ask_to_play(playd);
      |                        ^~~~~~
      |                        played
lab04-3.c:48:30: note: each undeclared identifier is reported only once for each function it appears in
lab04-3.c: In function 'select_random_number':
lab04-3.c:88:5: warning: implicit declaration of function 'srand' [-Wimplicit-function-declaration]
   88 |     srand(time(NULL));
      |     ^~~~~
lab04-3.c:89:12: warning: implicit declaration of function 'rand' [-Wimplicit-function-declaration]
   89 |     return rand() % 100;
      |            ^~~~~
lab04-3.c: At top level:
lab04-3.c:97:6: warning: conflicting types for 'run_game'; have 'void(int)'
   97 | void run_game(int computer_number)
      |      ^~~~~~
lab04-3.c:47:9: note: previous implicit declaration of 'run_game' with type 'void(int)'
   47 |     run_game(computer_guess);
      |     ^~~~~~
lab04-3.c: In function 'run_game':
lab04-3.c:105:13: error: 'correct' undeclared (first use in this function)
  105 |     while (!correct) /* This line does not contain an error */
      |             ^~~~~~
lab04-3.c:119:11: error: 'else' without a previous 'if'
  119 |     } else
      |       ^~~~

```

c. Output after fixing compiler errors:

- e. An error in a scanf statement (using %c rather than %d) results in a segmentation fault.

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-3.exe
Do you want to play a game? Enter 'y' to play, anything else not to play. :(
-> y
Segmentation fault (core dumped)

```

d. Output after fixing Segmentation fault error

- The code automatically proceeds without input, as the & statement is missing from the scanf line.

```

jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-3.exe
Do you want to play a game? Enter 'y' to play, anything else not to play. :(
-> y
ytest

You are guessing a number. The options are 1 through 100.

What is your guess on what number I will select?
->
The number was 30!

You guessed the number correctly!

Do you want to play again? ('y' for yes)
-> n

```

e. Output after fixing scanf() error

- An “if” statement included “number = computer_number” instead of “number == computer_number”. This automatically set the number to the requested value, resulting in automatically returning “correct”.

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-3.exe
Do you want to play a game? Enter 'y' to play, anything else not to play. :(
-> y
ytest

You are guessing a number. The options are 1 through 100.

What is your guess on what number I will select?
-> 53

The number was 79!

You guessed the number correctly!

Do you want to play again? ('y' for yes)
-> y
y

You are guessing a number. The options are 1 through 100.

What is your guess on what number I will select?
-> 32

The number was 39!

You guessed the number correctly!

Do you want to play again? ('y' for yes)
-> .....
```

f. Final Edited Source Code:

```
1. /*-----
   -----
2. -                               SE 185: Lab 04 - Debugging Code
   -
3. -      Name: James Gaul
   -
4. -      Section: 3
   -
5. -      NetID: 947125207
   -
6. -      Date: 2/16/24
   -
7. -----
   -----*/
8.
9. /*-----
   -----
10. -                               Includes
   -
```

```

11.  -----*/
12.  #include <stdio.h>
13.  #include <stdlib.h> //Added inclusion
14.  #include <time.h>
15.
16.  //fixed comment error on prototypes
17.  /*-----*/
18.  -                                     Prototypes
19.  -----*/
20.  char ask_to_play(int times_played);
21.
22.  int select_random_number();
23.
24.  //declared function run_game
25.  void run_game(int computer_number);
26.
27.  /*-----*/
28.  -                                     Notes
29.  -----*/
30.  // Compile with gcc lab04-3.c -o lab04-3
31.  // Run with ./lab04-3
32.  /* This program will play a simple Guessing Game with the
   computer. */
33.
34.  /*-----*/
35.  -                                     Implementation
36.  -----*/
37.  //fixed implementation header commenting
38.
39.  int main(int argc, char *argv[])
40.  {
41.      char prompt = '-';
42.      int played = 0;
43.      int computer_guess = 0;
44.
45.      prompt = ask_to_play(played);
46.      played = 1;
47.
48.
49.      while (prompt == 'y') /* This line does not contain an
error */
50.      {
51.          computer_guess = select_random_number();
52.          run_game(computer_guess);
53.          //prompt = ask_to_play(played);
54.          prompt = ask_to_play(played);
55.      }

```

```

56.
57.     printf("\n\nThanks for playing!\n");
58.
59.     return 0;
60. }
61.
62. /**
63.  * Asks the player if they want to play the Guessing Game.
64.  *
65.  * @param played_before - Whether the player has played a round
of the game before or not.
66.  * @return - Whether the player wants to play again or not.
67.  */
68. char ask_to_play(int played_before)
69. {
70.     char yes_or_no;
71.
72.     if (!played_before)    /* This line does not contain an error
*/
73.     {
74.         printf("Do you want to play a game? "
75.             "Enter 'y' to play, anything else not to play.
: (\n -> ");
76.         //scanf(" %c", yes_or_no);
77.         scanf(" %c", &yes_or_no);
78.     } else
79.     {
80.         scanf(" %c", &yes_or_no);
81.     }
82.
83.     printf("%c", yes_or_no);
84.
85.     return yes_or_no;
86. }
87.
88. /**
89.  * Generates a random number between 1 to 100, inclusive.
90.  *
91.  * @return - A number between 1 and 100, inclusive.
92.  */
93. int select_random_number()
94. {
95.     srand(time(NULL));
96.     return rand() % 100;
97. }
98.
99. /**
100.  * Starts the Guessing Game for you to play!
101.  *
102.  * @param computer_number - The randomly generated number to be
used for the game.
103.  */
104. void run_game(int computer_number)
105. {
106.     int number = 0;
107.     int correct = 0; //added variable declaration
108.

```

```

109.         printf("\n\nYou are guessing a number. The options are 1
through 100.\n\n");
110.         printf("What is your guess on what number I will select?\n -
> ");
111.         //scanf("%c", &number); Source of core dump error
112.         scanf("%d", &number);
113.
114.         while (!correct)      /* This line does not contain an error */
115.         {
116.             if (number < 1 || number > 100)
117.             {
118.                 printf("\nYour number is not within the correct range
of numbers. Guess again\n -> ");
119.             }
120.             //else if (number = computer_number)
121.             else if (number == computer_number)
122.             {
123.                 printf("\nThe number was %d!\n", computer_number);
124.                 printf("\nYou guessed the number correctly!\n\n"
125.                     "Do you want to play again? ('y' for yes)\n -
> ");
126.                 correct = 1;
127.             } //else if (number < computer_number);
128.             else if (number < computer_number)
129.             {
130.                 printf("\nYou guessed too low. Enter another guess.\n
-> ");
131.             } else
132.             {
133.                 printf("\n You guessed too high. Enter another
guess.\n -> ");
134.             }
135.
136.             scanf("%d", &number);
137.         }
138.     }

```


139. Final Output:

```
jagaul@C02048-10 /cygdrive/u/spring2024/cpre185/lab04
$ ./lab04-3.exe
Do you want to play a game? Enter 'y' to play, anything else not to play. :(
-> y
y

You are guessing a number. The options are 1 through 100.

What is your guess on what number I will select?
-> 50

You guessed too low. Enter another guess.
-> 75

You guessed too low. Enter another guess.
-> 85

You guessed too low. Enter another guess.
-> 90

You guessed too high. Enter another guess.
-> 87

You guessed too high. Enter another guess.
-> 86

The number was 86!

You guessed the number correctly!

Do you want to play again? ('y' for yes)
-> n
n

Thanks for playing!
```