```c
//
// Created by hfwei on 2024/9/25.
//

#include <stdio.h>

int main(void) {
  const double MOL = 6.02E23;
  const int GRAM_PER_MOL = 32;

  int mass = 6;

  double quantity = mass * 1.0 / GRAM_PER_MOL * MOL;

  printf("quantity = %.3e\nquantity = %.5g\n",
         quantity, quantity);

  return 0;
}
```

```c
//
// Created by hfwei on 2024/9/25.
//

#include <math.h>
#include <stdio.h>
#include <ctype.h>

int main(void) {
  char first_name[] = "Tayu";
  char last_name[] = "Lo";

  char gender = 'm';

  int birth_year = 1954;
  int birth_month = 7;
  int birth_day = 20;
  char weekday[] = "Tuesday";

  int c_score = 50;
  int music_score = 99;
  int medicine_score = 78;

  double mean = (c_score + music_score + medicine_score
) / 3.0;
  double sd = sqrt((pow(c_score - mean, 2) +
      pow(music_score - mean, 2) +
      pow(medicine_score - mean, 2)) / 3.0);

  int rank = 10;

  printf("%s\t%s\t%c\n"
         "%d-%d-%d\t%s\n"
         "%d\t%d\t%d\n"
         "%f\t%f\t%d\n",
         first_name, last_name, gender,
         birth_month, birth_day, birth_year, weekday,
         c_score, music_score, medicine_score,
         mean, sd, rank);

  return 0;
}
```

```c
//
// Created by hfwei on 2024/9/25.
//

#include <stdio.h>

int main(void) {
  // const: constant
  const double PI = 3.14159;

  int radius = 10;

  double circumference = 2 * PI * radius;

  double area = PI * radius * radius;

  /*
   *  format is composed of zero or more directives:
   *    ordinary characters and conversion specifications introduced by %
   */
  printf("radius = %d\ncircumference = %.2f\narea = %.2f\n",
         radius, circumference, area);

  return 0;
}
```

```c
//
// Created by hfwei on 2024/9/25.
//

#include <stdio.h>
#include <math.h>

int main(void) {
  const double PI = 3.14159;

  int radius = 100;

  double surface_area = 4 * PI * pow(radius, 2);
  double volume = 4.0 / 3 * PI * pow(radius, 3);

  // .4: precision
  // 15: minimum width
  // -: flag
  printf("%-15.4f : surface_area\n%-15.4f : volume\n",
         surface_area, volume);

  return 0;
}
```

```c
// Created by hfwei on 2024/9/25.

#include <stdio.h>

int main(void) {
  /*
   * (scanf-ub-1)
   */
  double pi;
  printf("Enter the value of pi:\n");
  scanf("%f", &pi);
  printf("pi = %f\n", pi);

  /*
   * (scanf-ub-2)
   * enter "10000000000000000000" (19 0's)
   */
  int age;
  printf("Enter your age:\n");
  scanf("%d", &age);
  printf("Your age is %d.\n", age);

  /*
   * (scanf-ub-3)
   * enter a long string
   * Linux: *** stack smashing detected *** terminated
   * Aborted
   */
  char name[6];
  printf("What's your name?\n");
  scanf("%s", name);
  printf("Hello %s!\n", name);

  return 0;
}
```

```c
// Created by hfwei on 2024/9/25.

#include <stdio.h>

int main(void) {
  // (printf-ub-1)
  int secret = 42;
  printf("secret = %f\n", secret);

  // (printf-ub-2)
  double pi = 3.14159;
  printf("pi = %d\n", pi);

  // (printf-ub-3)
  int light_speed = 299792458;
  printf("light_speed = %c\n", light_speed);

  return 0;
}
```

```c
//
// Created by hfwei on 2024/9/25.
//

#include <math.h>
#include <stdio.h>
#include <ctype.h>

int main(void) {
  char first_name[] = "Tayu";
  char last_name[] = "Lo";

  char gender = 'm';
  // char upper_gender = 'm' + 'A' - 'a';
  // printf("upper_gender : %c\n", upper_gender);

  int birth_year = 1954;
  int birth_month = 7;
  int birth_day = 20;
  char weekday[] = "Tuesday";

  int c_score = 50;
  int music_score = 99;
  int medicine_score = 78;

  double mean = (c_score + music_score + medicine_score
) / 3.0;
  double sd = sqrt((pow(c_score - mean, 2) +
      pow(music_score - mean, 2) +
      pow(medicine_score - mean, 2)) / 3.0);

  int rank = 10;

  printf("%s %s \t %c\n"
         "%.2d-%d-%d \t %.3s.\n"
         "%d \t %d \t %d\n"
         "%.1f \t %.2f \t %d%%\n",
         first_name, last_name, toupper(gender),
         birth_month, birth_day, birth_year, weekday,
         c_score, music_score, medicine_score,
         mean, sd, rank);

  return 0;
}
```

```c
//
// Created by hfwei on 2024/9/25.
//

#include <math.h>
#include <stdio.h>
#include <ctype.h>

int main(void) {
  char first_name[10];
  char last_name[10];

  char gender;

  int birth_year;
  int birth_month;
  int birth_day;
  char weekday[10];

  int c_score;
  int music_score;
  int medicine_score;
  int rank;

  double mean = (c_score + music_score + medicine_score
) / 3.0;

  double sd = sqrt((pow(c_score - mean, 2) +
                    pow(music_score - mean, 2) +
                    pow(medicine_score - mean, 2)) / 3.0);

  /*
   * zero or more directives:
   * (1) one or more white-space characters ( , \t, \n);
   * (2) ordinary characters (neither % nor white-space
characters)
   * (3) conversion specification introduced by %
   */
  scanf("%s%s%c %d%d%d%s %d%d%d %lf%lf %d%%",
        first_name, last_name, &gender,
        &birth_year, &birth_month, &birth_day, weekday,
        &c_score, &music_score, &medicine_score,
        &mean, &sd, &rank);

```

```c
  printf("%s %s \t %c\n"
         "%.2d-%d-%d \t %.3s.\n"
         "%d \t %d \t %d\n"
         "%.1f \t %.2f \t %d%%\n",
         first_name, last_name, toupper(gender),
         birth_month, birth_day, birth_year, weekday,
         c_score, music_score, medicine_score,
         mean, sd, rank);

  return 0;
}
```

```
add_executable(circle circle.c)

add_executable(sphere sphere.c)
target_link_libraries(sphere m)

add_executable(mol mol.c)

add_executable(admin admin.c)
target_link_libraries(admin m)

add_executable(admin-final admin-final.c)
target_link_libraries(admin-final m)

add_executable(admin-scanf admin-scanf.c)
target_link_libraries(admin-scanf m)

add_executable(admin-scanf-final admin-scanf-final.c)
target_link_libraries(admin-scanf-final m)

add_executable(printf-ub printf-ub.c)
add_executable(scanf-ub scanf-ub.c)

add_executable(scanf-c17-ex2 scanf-c17-ex2.c)
add_executable(scanf-c17-ex3 scanf-c17-ex3.c)
```

```c
// Created by hfwei on 2024/9/25.

// Get-Content .\scanf-c17-ex2-input.txt | .\scanf-c17-ex2.exe > scanf-c17-ex2-output.txt
// ./scanf-c17-ex2 < scanf-c17-ex2-input.txt > scanf-c17-ex2-output.txt

#include <stdio.h>

// Example 2 from C17 (Page 234)
int main(void) {
  int i;
  double x;
  char name[50];

  // enter "56789 0123 56a72"
  scanf("%2d%lf%*d %[0123456789]",
        &i, &x, name);

  // fscanf(stdin, ...);

  printf("i = %d\n"
         "x = %f\n"
         "name = %s\n",
         i, x, name);

  return 0;
}
```

```c
// Created by hfwei on 2024/9/25.

#include <stdio.h>

// Example 3 from C17 (Page 234)
int main(void) {
  int count = 0;
  double quant = 0;
  char units[21] = "";
  char item[21] = "";

  // input:
  // 2 quarts of oil
  // -12.8degrees Celsius
  // lots of luck
  // 10.0LBS
  // of
  //     dirt
  // 100ergs of energy
  do {
    count = scanf("%lf%20s of %20s",
                  &quant, units, item);
    scanf("%*[^\n]");

    // added
    printf("count = %d\n"
           "quant = %f\n"
           "units = %s\n"
           "item = %s\n",
           count, quant, units, item);
  } while (!feof(stdin) && !ferror(stdin));

  // output:
  // count = 3;
  // quant = 2; strcpy(units, "quarts"); strcpy(item, "oil
");

  // count = 2; // "C" fails to match "o"
  // quant = -12.8; strcpy(units, "degrees");

  // count = 0; // "l" fails to match "%f"

  // count = 3;
  // quant = 10.0; strcpy(units, "LBS"); strcpy(item, "
```

```c
dirt");

  // count = 0; // "100e" fails to match "%f" // 100.000000 rgs energy!!! (not conformed to the C Standard)

  // count = EOF;

  // A bug in gcc: https://sourceware.org/bugzilla/show_bug.cgi?id=1765#c1

  // input & output:
  // 2 quarts of oil
  // quant = 2.000000
  // units = quarts
  // item = oil

  // -12.8degrees Celsius
  // quant = -12.800000
  // units = degrees
  // item = oil

  // lots of luck
  // quant = -12.800000
  // units = degrees
  // item = oil

  // 10.0LBS
  // of
  //     dirt
  // quant = 10.000000
  // units = LBS
  // item = dirt

  // 100ergs of energy
  // quant = 100.000000
  // units = rgs
  // item = energy

  return 0;
}
```

```c
//
// Created by hfwei on 2024/9/25.
//

#include <math.h>
#include <stdio.h>
#include <ctype.h>

int main(void) {
  char first_name[10];
  char last_name[10];

  char gender;

  int birth_year;
  int birth_month;
  int birth_day;
  char weekday[10];

  int c_score;
  int music_score;
  int medicine_score;
  int rank;

  /*
   * zero or more directives:
   * (1) one or more white-space characters ( , \t, \n);
   * (2) ordinary characters (neither % nor white-space characters)
   * (3) conversion specification introduced by %
   */
  scanf("%9s%9s %c %d-%d-%d %9s %d%d%d %*lf%*lf %d%%",
        first_name, last_name, &gender,
        &birth_year, &birth_month, &birth_day, weekday,
        &c_score, &music_score, &medicine_score,
        &rank);

  double mean = (c_score + music_score + medicine_score) / 3.0;

  double sd = sqrt((pow(c_score - mean, 2) +
      pow(music_score - mean, 2) +
      pow(medicine_score - mean, 2)) / 3.0);

```

```c

  printf("%s %s \t %c\n"
         "%.2d-%d-%d \t %.3s.\n"
         "%d \t %d \t %d\n"
         "%.1f \t %.2f \t %d%%\n",
         first_name, last_name, toupper(gender),
         birth_month, birth_day, birth_year, weekday,
         c_score, music_score, medicine_score,
         mean, sd, rank);

  return 0;
}
```

```
1 56789 0123 56a72
```

```
1 2 quarts of oil
2 -12.8degrees Celsius
3 lots of luck
4 10.0LBS
5 of
6 dirt
7 100ergs of energy
```