```
runner% cat freq_typedef.c
/* Calculate fequencies of letters in an input file */
#include <stdio.h>
#include <ctype.h>

typedef struct {
   char letter;
   int count;
} table_type;

void bubble(table_type table[]);
void swap(table_type *table1,
          table_type *table2);
void printfreq(table_type table[], int tot);

void main(void)
{
   table_type table[26];
   int i;       /* index for lc array */
   int tot = 0; /* total number of alpha characters */
   int ch;      /* int so that EOF will work */
   for (i = 0; i < 26; i++) {
      table[i].letter = (char) (i + 'a');
      table[i].count = 0;
   }
   while ((ch = getchar()) != EOF)
      if (isalpha(ch = tolower(ch))) {
         tot++;
         table[ch - 'a'].count++;
      }
   bubble(table);
   printfreq(table, tot);
}

/* bubble: sort lc array into decreasing order.
   Carry alf along */
void bubble(table_type table[])
{
   int i, dum;
   for (dum = 0; dum < 25; dum++)
      for (i = 0; i < 25; i++)
         if (table[i].count < table[i+1].count)
            swap(&table[i], &table[i+1]);
}

void swap(table_type *table1, table_type *table2)
{
   table_type temp;
   temp = *table1;
   *table1 = *table2;
   *table2 = temp;
}

/* printfreq: print out the frequency table */
void printfreq(table_type table[], int tot)
{
   int i;
   printf("Frequency of letters, out of total: %d\n\n",
      tot);
   printf("  Letter   Frequency (%)\n");
   for (i = 0; i < 26; i++)
      printf("%6c %13.3f%%\n", table[i].letter,
         (double)table[i].count/tot*100.0);
}

runner% freq_typedef
AaAaA
bbbBBbbbbb
ZzZzZZZzzZzzzzz  (ctrl-D)
Frequency of letters, out of total: 30

  Letter   Frequency (%)
     z        50.000%
     b        33.333%
     a        16.667%
     c         0.000%
     d         0.000%
     e         0.000%
     f         0.000%
   ...
```

```
runner% cat freq_simp.c
/* Calculate fequencies of letters in an input file */
#include <stdio.h>
#include <ctype.h>

char letter[26];
int count[26];

/* bubble: sort lc array into decreasing order. */
void bubble(void)
{
   int i, dum;
   for (dum = 0; dum < 25; dum++)
      for (i = 0; i < 25; i++)
         if (count[i] < count[i+1]) {
            int temp = count[i];
            char tempc = letter[i];
            count[i] = count[i+1];
            letter[i] = letter[i+1];
            count[i+1] = temp;
            letter[i+1] = tempc;
         }
}

/* printfreq: print out the frequency table */
void printfreq(int tot)
{
   int i;
   printf("Frequency of letters, out of total: %d\n\n",
      tot);
   printf("  Letter   Frequency (%)\n");
   for (i = 0; i < 26; i++)
      printf("%6c %13.3f%%\n", letter[i],
         (double)count[i]/tot*100.0);
}

void main(void)
{
   int i;       /* index for lc array */
   int tot = 0; /* total number of alpha characters */
   int ch;      /* int so that EOF will work */
   for (i = 0; i < 26; i++) {
      letter[i] = (char) (i + 'a');
      count[i] = 0;
   }
   while ((ch = getchar()) != EOF)
      if (isalpha(ch = tolower(ch))) {
         tot++;
         count[ch - 'a']++;
      }
   bubble();
   printfreq(tot);
}
```

```
runner% freq_simp
AaAaA
bbbBBbbbbb
ZzZzZZZzzZzzzzz  (ctrl-D)
Frequency of letters, out of total: 30

  Letter   Frequency (%)
     z        50.000%
     b        33.333%
     a        16.667%
     c         0.000%
     d         0.000%
     e         0.000%
     f         0.000%
   ...
```