Assignment 10: Density

10.1 Scanning a String

Since a character string in C terminates with the null character (`'\0'`), most string functions in C do not require the length of the string even if a string is an array of characters. This fact is sometimes the source of vulnerability, but useful in many situations if used with caution. The following code shows an example of a string copy function utilizing this fact:

```c
#include <stdio.h>

static char* strcpy(char t[], const char s[])
{
    char *rv = t;
    while (*t++ = *s++);
    return rv;
}

int main()
{
    char *source = "Hello", target[10];

    strcpy(target, source);
    puts(source);
    puts(target);

    return 0;
}
```

Though `strcpy` is defined in `<string.h>`, the above code defines a local function `strcpy`. To make it local, the keyword `static` is used for `strcpy`.

10.2 Programming Assignment 10: density.c

Assume that the alphabets in several lines are living in a rectangular district. With this assumption, you can calculate the density of alphabets in s as follows:

$$d(s) = \frac{p(s)}{A(s)} \times 100$$

where$d(s)$ is the density of alphabets in the set of lines s, $p(s)$ is the number of alphabets in s, and $A(s)$ is the area of the rectangular district occupied by s. You want to write a program calculating the density of alphabets.

Given the following two lines of strings, for example:

```
A boy
in a box
```

the alphabets are considered to live in the following districts:

A		b	o	y			
i	n		a		b	o	x

implying that the area of the district is 16. Since the number of alphabets is 10 and the area is 16, the density of alphabets is 62.5%.

Your program is to read from standard input. The first line of the input contains n, the number of lines containing character strings. Each of the following n lines contains a character string consisting only of alphabets, spaces, and the newline. The trailing newline

character should not be counted, i.e. the new line is not a part of the rectangular district. Your program should print the density of the alphabet in two decimal digits after the decimal point. Do not print the percent symbol (`%`).

Additional requirements for bonus points

- Define and use a function counting the number of alphabets in a string accepting only a single parameter.
- The alphabet counting function should not declare nor use any other variables other than the single parameter.

Input	**Output**

`2`
`A boy`
`in a box`
	`62.50`

`4`
`Four score and seven years ago`
`our fathers`
`brought forth on this continent`
`a new nation`
	`58.06`