5.40 (*Simulation: heads or tails*) Write a program that simulates flipping a coin one million times and displays the number of heads and tails.

5.41 (*Occurrence of max numbers*) Write a program that reads integers, finds the largest of them, and counts its occurrences. Assume that the input ends with number **0. Suppose that you entered **3 5 2 5 5 5 0**; the program finds that the largest number is **5** and the occurrence count for **5** is **4**. (Hint: Maintain two variables, **max** and **count**. The variable **max** stores the current maximum number, and **count** stores its occurrences. Initially, assign the first number to **max** and **1** to **count**. Compare each subsequent number with **max**. If the number is greater than **max**, assign it to **max** and reset **count** to **1**. If the number is equal to **max**, increment **count** by **1**.)

```
Enter a number (0: for end of input): 3   ↵Enter
Enter a number (0: for end of input): 5   ↵Enter
Enter a number (0: for end of input): 2   ↵Enter
Enter a number (0: for end of input): 5   ↵Enter
Enter a number (0: for end of input): 5   ↵Enter
Enter a number (0: for end of input): 5   ↵Enter
Enter a number (0: for end of input): 0   ↵Enter
The largest number is 5
The occurrence count of the largest number is 4
```

**5.42 (*Monte Carlo simulation*) A square is divided into four smaller regions as shown in (a). If you throw a dart into the square one million times, what is the probability for the dart to fall into an odd-numbered region? Write a program to simulate the process and display the result. (Hint: Place the center of the square in the center of a coordinate system, as shown in (b). Randomly generate a point in the square and count the number of times for a point to fall in an odd-numbered region.)

(a)   (b)
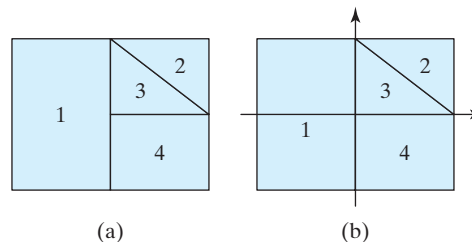
*5.43 (*Math: combinations*) Write a program that displays all possible combinations for picking two numbers from integers **1** to **7**. Also display the total number of combinations.

```
1 2
1 3
...
...
The total number of all combinations is 21
```

**5.44 (*Decimal to binary*) Write a program that prompts the user to enter a decimal integer and displays its corresponding binary value.