

**Problem 1**

Read two natural numbers. Then, define a logical variable and initialize it with **true** if and only if at least one of the numbers 2, 3 and 5 is a common divisor of the two numbers read.

**Problem 2**

Define in your program four numbers of type **int** —  $a_1, a_2, b_1, b_2$  — which we interpret as coordinates on the number axis of end points of two intervals:  $A = [a_1, a_2]$  and  $B = [b_1, b_2]$ . The program reads from the user one number (say,  $x$ ) of type **int** and prints whether it is true that

- $x \in A$
- $x \in B$
- $x \in A \setminus B$
- $x \in B \setminus A$
- $x \in A \cap B$
- $x \in A \cup B$
- $x \in A \ominus B$

where  $\setminus$  denotes the set difference and  $\ominus$  the symmetric difference (quite often the  $\Delta$  symbol is used).

For example, if the defined intervals are  $A = [2, 4]$  and  $B = [1, 6]$  and the number read is  $x = 5$ , the program should print something like:

```
Interval A = [2, 4]
Interval B = [1, 6]
Enter x 5
x in A:           false
x in B:           true
x in A\B:         false
x in B\A:         true
x in intersection of A and B: false
x in union of A and B:  true
x in symmm. diff. of A and B: true
```

Do not use **if** statements (use logical variables instead).

**Problem 3**

Write a program which reads integers from the user until he/she enters 0 (which merely signals *end of input* is not taken in further considerations). Then the program prints the information whether in this series of numbers there were as many odd numbers as even ones.

#### **Problem 4**

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Write a program which reads from the user three non-negative integers and then prints, using symbols '\*', a 'histogram' of the data represented by the numbers, i.e., three vertical bars, aligned at the bottom, with heights equal to the values of the three numbers.

For example, for numbers 3, 1 and 8 the result should look like this:

```
*  
*  
*  
*  
*  
* *  
* *  
***
```

Do not use arrays, strings or any other kind of collections.

#### **Problem 5**

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Write a program reading integers until zero is entered and printing the length of the longest sequence of consecutive numbers of the same value (and this value).

For example, for

```
2 2 2 2 3 3 3 2 6 6 6 0
```

the result should be

```
Longest sequence: 4 times 2
```

for

```
2 2 2 3 3 3 3 3 2 6 6 6 0
```

the result should be

```
Longest sequence: 5 times 3
```

and for

```
2 2 333 333 2 3 -66 -66 -66 0
```

it should be

```
Longest sequence: 3 times -66
```

Do not use arrays, strings or any other kind of collections.

Check your solutions for different cases: when the longest sequence is at the beginning, somewhere in the middle, or at the very end.

**Problem 6** \_\_\_\_\_

Random variables  $a, b, c$ , have uniform distribution on the interval  $[0, 1]$  and are independent. Estimate, using sufficient number of random trials (e.g., 10 000 000), the probability that the equation  $ax^2 + bx + c = 0$  has a real solution.

Compare the result with the value  $(5 + 3 \ln 4)/36 \approx 0.25441342$ .

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