

Emphasis on: Review of Arrays, Character Input, Arithmetic, Loops, and Decisions

The bar codes used on most products include a check digit (the last digit in the bar code), which allows checking for transmission errors by the bar code reader. The bar code reader compares the check digit in the bar code to a digit calculated by the following method:

1. Add up all the array values with odd-numbered subscripts (positions 1, 3, ...) in the bar code, excluding the check digit.

For example, using bar code 1347830, you would calculate $3 + 7 + 3 = 13$

2. Multiply each array value with an even-numbered subscript, excluding the check digit, by 2. If the result of the multiplication exceeds 9, add its two digits. Add the sum of these results to the sum calculated in Step 1.

For example, using bar code 1347830,
 $2 * 1 = 2$ and $2 * 4 = 8$ and $2 * 8 = 16$
16 is > 9 , so calculate $1 + 6 = 7$
Then $13 + 2 + 8 + 7 = 30$.

3. Divide the result of Step 2 by 10 and subtract the remainder from 10. If the result is less than 10, the result should equal the check digit. Otherwise, the check digit should be zero.

For example, using bar code 1347830,
 $30 / 10 = 3$ with remainder 0
 $10 - 0$ is 10; 10 is not < 10 ; therefore the check digit should be 0.
So this bar code is correct.

Write a program which inputs bar codes from the keyboard. Read each digit as a character and, if it is a valid digit, convert the character to its corresponding integer value and store it as an element in an integer array. Echo print the bar code back to the screen. To help with your debugging and mine, print the results of the calculations in steps 1 – 3 from the instructions above. Then print CORRECT or WRONG to indicate whether the check digit is correct or not. You may assume that there will be no bar code longer than 20 characters.

Requirements:

- 1) The bar code must be stored and manipulated as an array or string.
- 2) You must use at least 3 functions in addition to main. Some suggestions:
 - input the bar code,
 - convert a character into an integer,
 - do step 1 calculations,
 - do step 2 calculations,
 - do step 3 calculations,
 - determine whether bar code is correct (calculate the check digit and compare with last digit of bar code),
 - explain program to the user,
 - give instructions to the user about the input format expected by the program.
- 3) At least one function must return a value with a return statement; at least one function must have a parameter, and at least one function must have a reference parameter.
- 4) Be sure to explain to the user exactly what format the program expects for its input.

Extra Credit Opportunity

For an extra 10%:

If you find an invalid character (non-digit) anywhere in the code, prompt the user to re-enter the entire code and start over with its processing.

Input data

Use the following bar codes for data. I have put blanks between the digits so that the numbers here are easier to read, but in your program the numbers should be input without any blank spaces.

```
3 5 0 4 6 8 6 1 4 6 2 2
1 2 3 4 5 6 7 8 9 7
9 3 8 6 3 0 1 3 3
9 6 7 5 8 3 7 8 6 5 7 5 4 5 1
3 0 0 2 3 4 9 3
4 7 3 4 0 1 1 8 3 6 4 1
8 5 7 6 8 9 5 4 3 5 4 5 0
9 0 8 7 8 7 8 3 4 5 0 0 0 2 8
4 8 9 0 2 1
1 2 3 4 5 6 7 8 9
```