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SFWR ENG 2S03
Exercise Sheet 2

SFWR ENG 2S03 — Principles of Programming

20 September 2006

Please bring your work to the tutorial!

Exercise 2.1 — Treasure Hunt (45% of Midterm 1, 2003)

Design and implement a C program to play the "blind" board game "treasure hunt".

- The board has 20×20 fields, from $(1, 1)$ to $(20, 20)$.
- On field $(17, 2)$ there is a treasure.
- The player starts on field $(9, 10)$, but is not told this.
- All fields (x, y) with $(x + 2y)$ divisible by 5 are **forbidden**, i.e., the player must not be allowed to move onto such a field.
- The player navigates the board by entering "numeric keypad cursor control commands":
  - "`2`" moves **down** one step
  - "`8`" moves **up** one step
  - "`4`" moves **left** one step
  - "`6`" moves **right** one step

  After each successful move, **only** the new distance to the treasure is displayed — for this, the 1-norm is used and whether a field is forbidden or not does not matter, so, e.g., the distance from $(9, 10)$ to $(17, 3)$ is 15 (calculated as $8 + 7$).
- When the player tries to move off the board or onto a forbidden field, a message is displayed noting that the move is impossible, but **not** why it is impossible.
- When the player moves to the field where the treasure is, a congratulatory message is displayed and the program terminates.

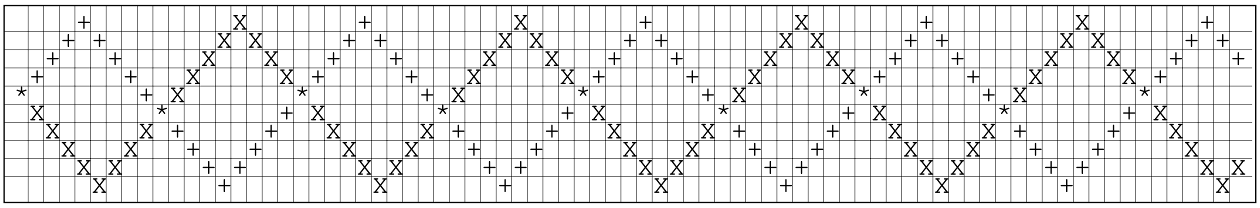
Assume that the user will input only numbers! Do not use arrays!

Exercise 2.2 (Textbook Exercise Recommendation)

Read chapter 4 of the textbook. Do **at least** the following exercises: 4.5–4.14, 4.24, 4.29

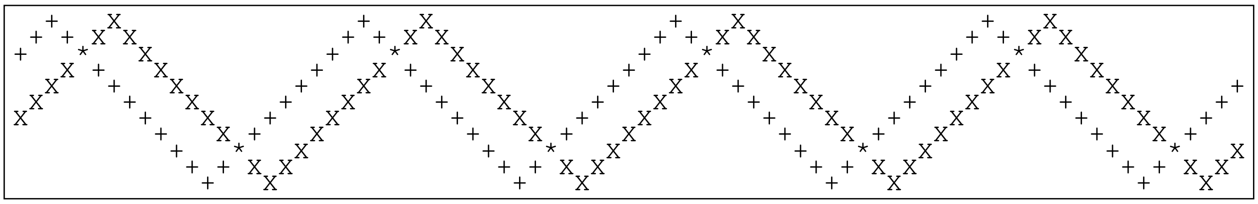
Exercise 2.3 — ASCII Art: Zig-Zag — (50% of Midterm 1, 2004)

Design and implement a C program that asks the user for a height, and for two offset numbers, and uses these three numbers to print a combination of two zig-zag lines of the same height, as in the following example:



Note that one of the zig-zag lines is drawn using the "plus" symbol, the other using the letter "X", and where both zig-zag lines intersect, the asterisk "*" is used.

The grid lines are of course **not** part of the output. Here is another example without those grid lines — any such pattern should be producable:



Assume that the user will input only numbers! Do not use arrays!

Decompose into functions! Design and Document!

Exercise 2.4

What is the output ot the following C program (which prints not more than ten lines):

```
#include <stdio.h>
int main ( void ) {
   char input[] = "terasse";
   char result[] = "      ";   // six spaces
   int i, j = 0, c = 3, q;
   for ( q = 3; q ≥ 0; q = q − c ) {
      for ( i = 0; i < c; i++ ) {
         printf("j = %d\tc = %d\tq = %d\ti = %d\n", j, c, q, i);
         result[j] = input[q + i];
         j = j + 1;
      }
      c = c − 1;
   }
   printf("%s!\n", result);
   return 0;
}
```

What is the value of q after termination of the outer loop?