NPRG065: Progamming in Python

Practicals 3

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Assignments

1. Write a program that creates a list containing tuples of elements in the multiplication table:

```
[(1,1,1), (1,2,2),...(10,9,90), (10,10,100)]
```

2. Write a program that creates two lists containing tuples of elements in the multiplication table – one for the odd numbers and one for the even numbers:

```
[(1,1,1), (1,2,2),...(3,1,3), (3,2,6)...]
[(2,1,2), (2,2,4),...(4,1,4), (4,2,8)...]
```

ASSIGNMENTS

3. Write a simple calculator that takes as the input an expression in the reverse Polish notation (i.e., the postfix notation)
   - the expressions are accepted as command line arguments, e.g.:
     `pcalc.py 1 2 3 + +`
     prints out 6

ASSIGNMENTS

4. Write a program that prints out the number of occurrences of particular characters of a given string
   - e.g., for `"mississippi"`, the result would be:

```
m: 1 times
i: 4 times
s: 4 times
p: 2 times
```

ASSIGNMENTS

5. Implement the Select sort algorithm
   - as a function that takes a list of ints and sorts it
6. Summary of the algorithm:
   - finds the smallest value in the whole array (0:n) and swaps it with the first item
   - finds the smallest value in the rest of the array (1:n) and swaps it with the second item
   - finds the smallest value in the rest of the array (2:n) and swaps it with the third item
   - etc., until the end of the array is reached

Assignments

7. Implement heapsort (without help of heapq)
   - a function that takes a list of ints and sorts it
8. Summary of the algorithm:
   - sorting using a heap
   - heap – binary tree where each node keeps a smaller value than its children
   - heap is constructed directly in the array
   - children of a node `i` are `2*i+1` and `2*i+2`
   - pseudocode:

```
procedure heapsort(a, count)
  heapify(a, count)
  end = count - 1
  while end > 0 do
    swap(a, end, 0)
    end = end - 1
    siftDown(a, 0, end)
```