Solutions to Exercises from The Art of Computer Programming, by Donald Knuth

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1 Chapter 1

1.1 Solutions for section1.1

1. Using a temp variable t the values can be rotated like this -
   $t \leftarrow a, a \leftarrow b, b \leftarrow c, c \leftarrow d, d \leftarrow t$

2. At step [**E3**] r is assigned to n and n to m. As r is reminder of division of m by n, r should be $< n$. Hence $m < n$.

3. Below are the steps of modified algorithm [**F**] which takes m and n as input.

   [**F1**] Divide m by n and let the reminder by r.

   [**F2**] if $r = 0$ return n. Terminate

   [**F3**] Invoke [**F**] with n, r as input and return result.

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5. From the procedure reading the book following properties are missing which means it's not a proper algorithm.

   - Finiteness is missing - the whole procedure goes in a loop and does not actually terminate.
   - Output is missing - the procedure does not a definite output.

- Effectiveness is missing - The steps cannot be done on pencil/paper or a real computer realistically.

  Comparison with [**E**]: [**E**] terminates after finite number of steps and is effective(steps can be performed on pen and paper and has definite output.

6. The answer should be close to 3. I dint calculate the exact value though.

7. $T_m + 1 = U_m$

1.2 Mathematics Preliminary

1.2.1 Solutions for section 1.2.1

1.2.2 Solutions for section 1.2.2