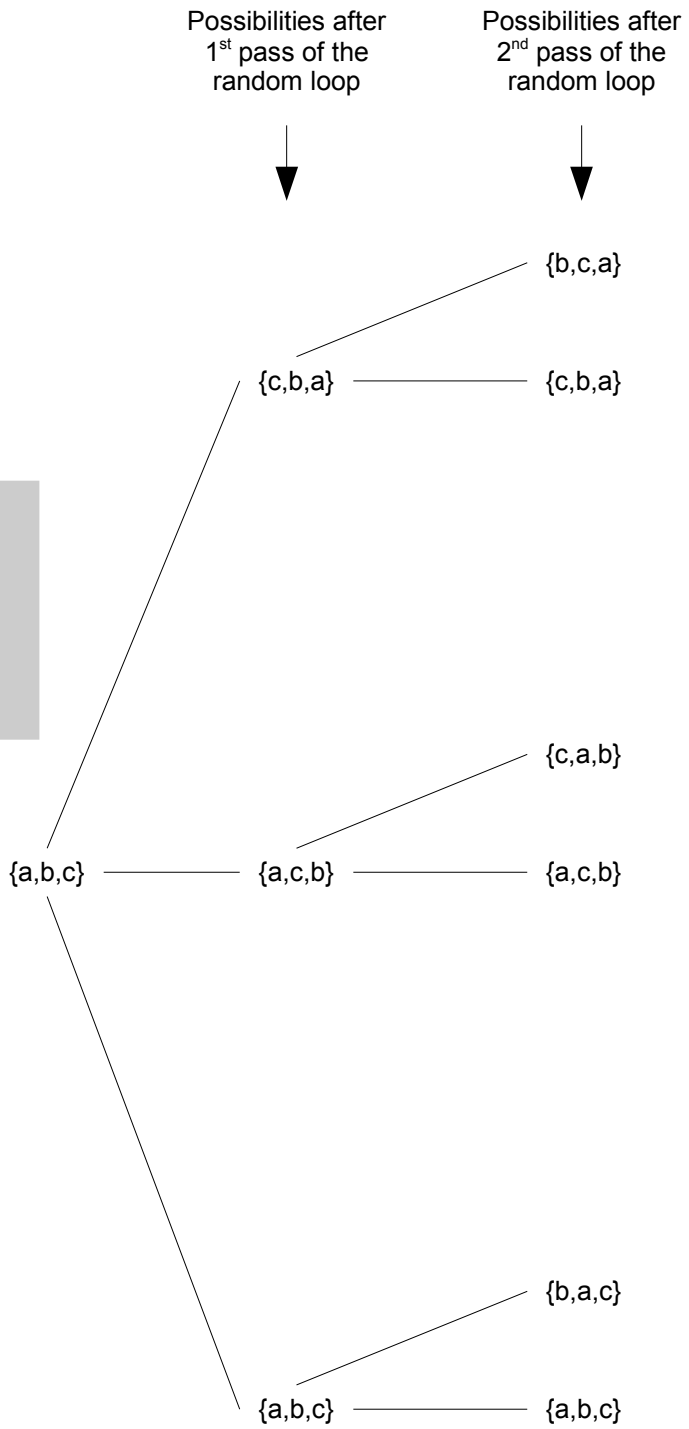
Jürgen Lüthje, 2009-09-24

Knuth shuffle



PureBasic program

```
n = 3
Dim s$(n-1)
For i = 0 To n-1
   s$(i) = Chr('a'+i)
Next

For i = n-1 To 1 Step -1
   Swap s$(i), s$(Random(i))
Next
```

For each result:
p = 1/3 * 1/2 = 1/6

For 3 elements, there are 1*2*3 = 6 possible permutations:

{a,b,c} ➔ p = 1 * 1/6
{a,c,b} ➔ p = 1 * 1/6
{b,a,c} ➔ p = 1 * 1/6
{b,c,a} ➔ p = 1 * 1/6
{c,a,b} ➔ p = 1 * 1/6
{c,b,a} ➔ p = 1 * 1/6

All probabilities are equal.

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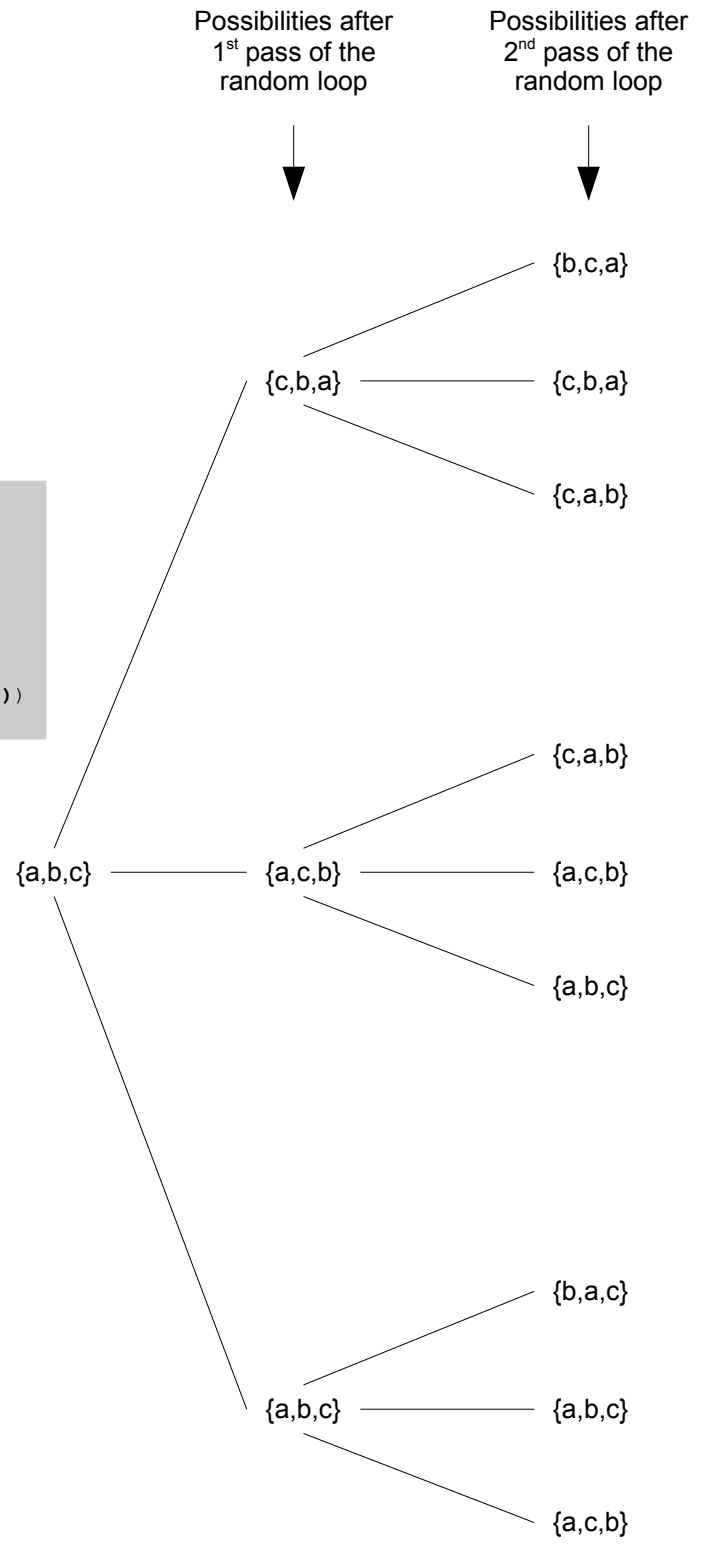
Unfair shuffle #1

PureBasic program

```
n = 3
Dim s$(n-1)
For i = 0 To n-1
   s$(i) = Chr('a'+i)
Next

For i = n-1 To 1 Step -1
   Swap s$(i), s$(Random(n-1))
Next
```



For each result:
p = 1/3 * 1/3 = 1/9

For 3 elements, there are 1*2*3 = 6 possible permutations:

{a,b,c} ➔ p = 2 * 1/9
{a,c,b} ➔ p = 2 * 1/9
{b,a,c} ➔ p = 1 * 1/9
{b,c,a} ➔ p = 1 * 1/9
{c,a,b} ➔ p = 2 * 1/9
{c,b,a} ➔ p = 1 * 1/9

The probabilities are not all equal.

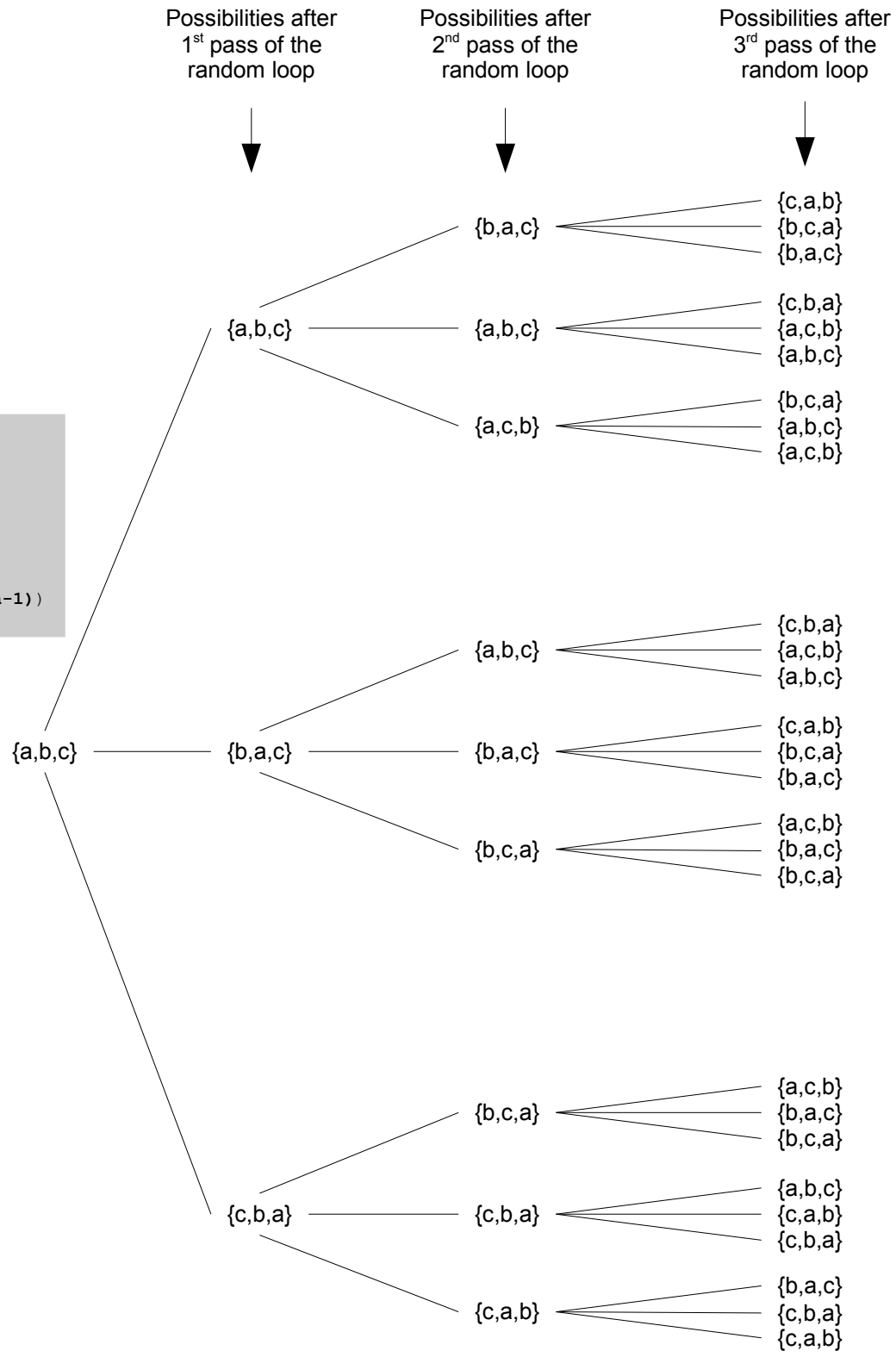
Jürgen Lüthje, 2009-09-24

Unfair shuffle #2

PureBasic program

```
n = 3
Dim s$(n-1)
For i = 0 To n-1
   s$(i) = Chr('a'+i)
Next

For i = 0 To n-1
   Swap s$(i), s$(Random(n-1))
Next
```



For each result:
p = 1/3 ∗ 1/3 ∗ 1/3 = 1/27

For 3 elements, there are 1∗2∗3 = 6 possible permutations:

{a,b,c} ➔ p = 4 ∗ 1/27

{a,c,b} ➔ p = 5 ∗ 1/27

{b,a,c} ➔ p = 5 ∗ 1/27

{b,c,a} ➔ p = 5 ∗ 1/27

{c,a,b} ➔ p = 4 ∗ 1/27

{c,b,a} ➔ p = 4 ∗ 1/27

The probabilities are not all equal.