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#!/usr/bin/python
__author__="morganlnance"
__question__="hw1_q9"
from itertools import permutations

def get_permutations( heads_and_tails, num_choices ):
    #:param heads_and_tails: list( 'H' and 'T' ) ex) [ 'H', 'H', 'H',
    'T' ]
    #:param num_choices: N
    #:return: list( set( tuples of permutations ) )
    return list( set( [ ''.join( x ) for x in
permutations( heads_and_tails, num_choices ) ] ) )

def get_microstates( states, N ):
    microstates = {}
    macrostate_num = 0

    # ex) N = 4, ii = 0, 1, 2, 3, 4. heads = ii, tails = N - ii
    for ii in range( N + 1 ):
        heads = states[0] * ii
        tails = states[1] * ( N - ii )
        # ex) [ 'H', 'H', 'H', 'T' ]
        heads_and_tails = list( ''.join( [ heads, tails ] ) )
        permutation_set = get_permutations( heads_and_tails, N )
        microstates[ macrostate_num ] = permutation_set

        macrostate_num += 1

    return microstates

states = [ 'H', 'T' ]

N = 4
microstates = get_microstates( states, N )
macrostates = sorted( microstates.keys() )
print "For N = %s," %N
for macrostate in macrostates:
    print "    Macrostate number %s has a multiplicity of %s" %
( macrostate, len( microstates[ macrostate ] ) )

N = 10
microstates = get_microstates( states, N )
macrostates = sorted( microstates.keys() )
print "For N = %s," %N
for macrostate in macrostates:
    print "    Macrostate number %s has a multiplicity of %s" %
( macrostate, len( microstates[ macrostate ] ) )

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