Prob & Stat HW 1

(1) On an n by m grid, total moves $= (n-1)+(m-1)$

Total moves: $(9-1)+(8-1) = 15$

On an n by m grid, total paths $= \binom{\text{total moves}}{(n-1) \text{ or } (m-1)}$

Total paths: $\binom{15}{9-1} = \boxed{6435}$

(2) (a) In a string of length p, where each character is in a set of size q, the number of possible strings is q^p

10 digits, 3 digits long $= 10^3 = \boxed{1000}$

(b) The number of possible concatenated strings in an ordered set of N strings, each of which having a length p_i and a character set of size q_i is calculated by $\prod_{i=1}^{N} q_i^{p_i}$

$8^1 \times 2^1 \times 10^1 = \boxed{160}$

(c) $10^1 \times 9^1 \times 8^1 = \boxed{720}$

(3) possession

(a) Length: 10

distinct letters: 6

$10P6 = \frac{10!}{4!} = \boxed{151200}$

(b) effective length: 9

distinct letters: 6

$9P6 = \frac{9!}{3!} = \boxed{60480}$

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a) G: >60000 L: ≤60000

{GGGG, GGGL, GGLG, GGLL, GLGG, GLGL, GLLG, GLLL,
LGGG, LGGL, LGLG, LGLL, LLGG, LLGL, LLLG, LLLL}

b) A: {GGGG, GGGL, GGLG, GGLL, GLGG, GLGL, GLLG, LGG
LGGL, LLGG}

B: {GGLL, GLGL, GLLG, LGGL, LGLG, LLGG}

C: {GGGL, GGLG, GLGG, LGGG}

c)
$P(A) = \frac{10}{16} = 5/8$

$P(B) = 6/16 = 3/8$

$P(C) = 4/16 = 1/4$

5

a)
$8! = 40320$

$7! = 5040$

$6! = 720$

b)
$nCr(25, 3) = 2300$

$nPr(25, 3) = 13800$

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Python 3.11.4 (main, Jun  7 2023, 00:00:00) [GCC 13.1.1 20230511 (Red Hat 13.1.1-2)] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy as np
>>> def factorial(n) -> int:
...   tmp = 1
...   for j in range(n, 0, -1):
...     tmp *= j
...   return tmp
...
>>> def nPr(n, r) -> int:
...   result = factorial(n) // factorial(n - r)
...   return result
...
>>> def nCr(n, r) -> int:
...   result = factorial(n) // (factorial(r) * factorial(n - r))
...   return result
...
>>> factorial(8)
40320
>>> factorial(7)
5040
>>> factorial(6)
720
>>> nCr(25, 3)
2300
>>> nPr(25, 3)
13800
>>>
```