SPAB – assignment 01

Johanna Becher, 2576526

Lisa Raber, 2578464

Task 1.1

3 : 0.0021
4 : 0.0063
5 : 0.0125
6 : 0.0208
7 : 0.0292
8 : 0.0375
9 : 0.0437
10: 0.0479
11: 0.0500
12: 0.0500
13: 0.0500
14: 0.0500
15: 0.0500
16: 0.0500
17: 0.0500
18: 0.0500
19: 0.0500
20: 0.0500
21: 0.0500
22: 0.0500
23: 0.0479
24: 0.0437
25: 0.0375
26: 0.0292
27: 0.0208
28: 0.0125
29: 0.0063
30: 0.0021

Task 1.2

We are concerned about 3 cases:

Case 1: 4 correct

$\binom{6}{4}$ = drawn 4 from 6 correct

$\binom{49-6}{2} = \binom{43}{2}$ = drawn 2 from 43 false

Case 2: 5 correct

$\binom{6}{5}$ = drawn 5 from 6 correct

$\binom{49-6}{1} = \binom{43}{1}$ = drawn 1 from 43 false

Case 3: 6 correct

$\binom{6}{6}$ = drawn 6 from 6 correct

$\binom{49-6}{0} = \binom{43}{0}$ = drawn no false

We calculate $P(|G \cap D|)$

$$\frac{\overset{\text{case 1}}{\binom{6}{4}\binom{43}{2}} + \overset{\text{case 2}}{\binom{6}{5}\binom{43}{1}} + \overset{\text{case 3}}{\binom{6}{6}\binom{43}{0}}}{\binom{49}{6}}$$

$$= \frac{15 \cdot 903 + 6 \cdot 43 + 1 \cdot 1}{1.3983816 \cdot 10^7} = \boxed{0.00099}$$

Task 1.3

1 $1 \cdot \frac{5}{6} \cdot \frac{4}{6} \cdot \frac{3}{6} = \frac{5}{18}$

2 $\prod_{i=0}^{29} \frac{365-i}{365} = 0.2937$

3 $\binom{200}{10} = 2.2451 \cdot 10^{16}$

4 $\dfrac{\binom{29}{7}}{\binom{32}{10}} = \dfrac{3}{124}$

$3 \cdot \dfrac{3}{124} = \dfrac{9}{124}$

Task 1.4

n = 250, k = 200

ntuples:
3872591914849318272818030633286351847570219192048790865487762941344416348097685964862682234277014596908057542507554467539370836398992350315522318050653350492002436065270530802738432038373174754090809367646454942400181270162578968846816261130394654088604511343874037265777587890625000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000

npermutations:
1062946785711495341871362233734634380837672331173292586646719460995781733829139895647955615755442925904390734631730485941213809818168497012378620633593763301850339199682078294058073475838402989465514954002202382228165149912866604496959812310987538304313483357597362874236868864677142209734671575227418310278663133307672138947614391931851307678994434871574962742232786254245658624000000000000000000000000000000000000000000000000000000000

ncombinations:
13477920270588433307311530626078879280554739851329 5360

nmultisets:
3776968978119763694067040332417641143468200448773883290121330818195202732647920253843700888040607432069236736663438410440973496614912