Artificial Intelligence Methods
Assignment 1

Exercise 1

a) _ _ _ _ _

out of 52 cards in a deck i choose five

the order doesn't matter, so I can use the formula

$$\frac{n!}{k!(n-k)!}$$

$$\binom{52}{5} = \frac{52!}{5!\,47!} = \frac{52 \cdot 51 \cdot 50 \cdot 48 \cdot 48}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 2598960$$

b) an atomic event - a specific five card poker hand - one of all the possibilieties

$$\frac{1}{2598960}$$

c) Royal straight flush

AS KING QUEEN JACK TEN of the same suit

$$4 \cdot \frac{1}{2598960} = \frac{4}{2598960}$$

4: there are 4 suits in poker

$\frac{1}{2598960}$: a specific atomic event of an as, king, queen, jack and ten of the same suit

Four of a kind

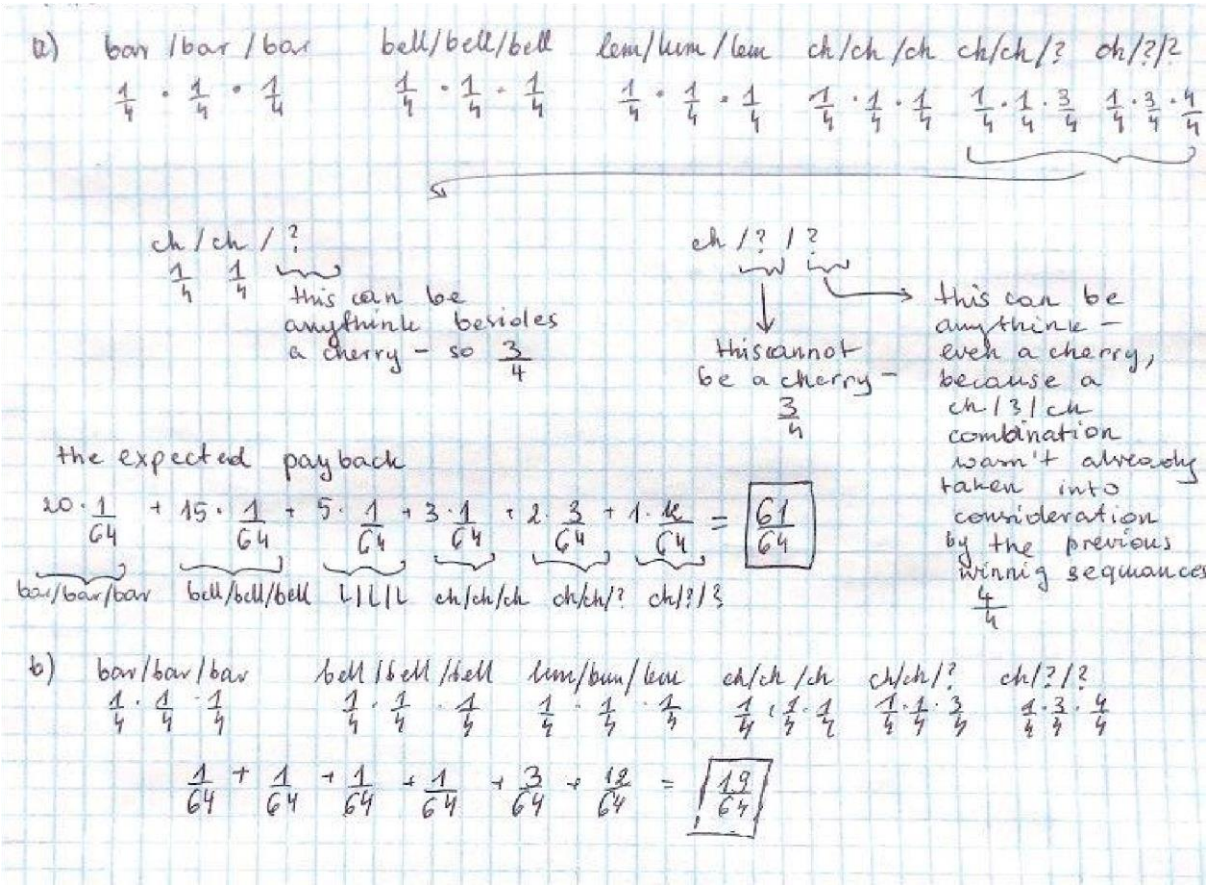
□ □ □ □ ?

? : 48 possibilieties for the remaining card

$$\frac{13 \cdot 48}{2598960} = \frac{624}{2598960} = \frac{1}{4165}$$

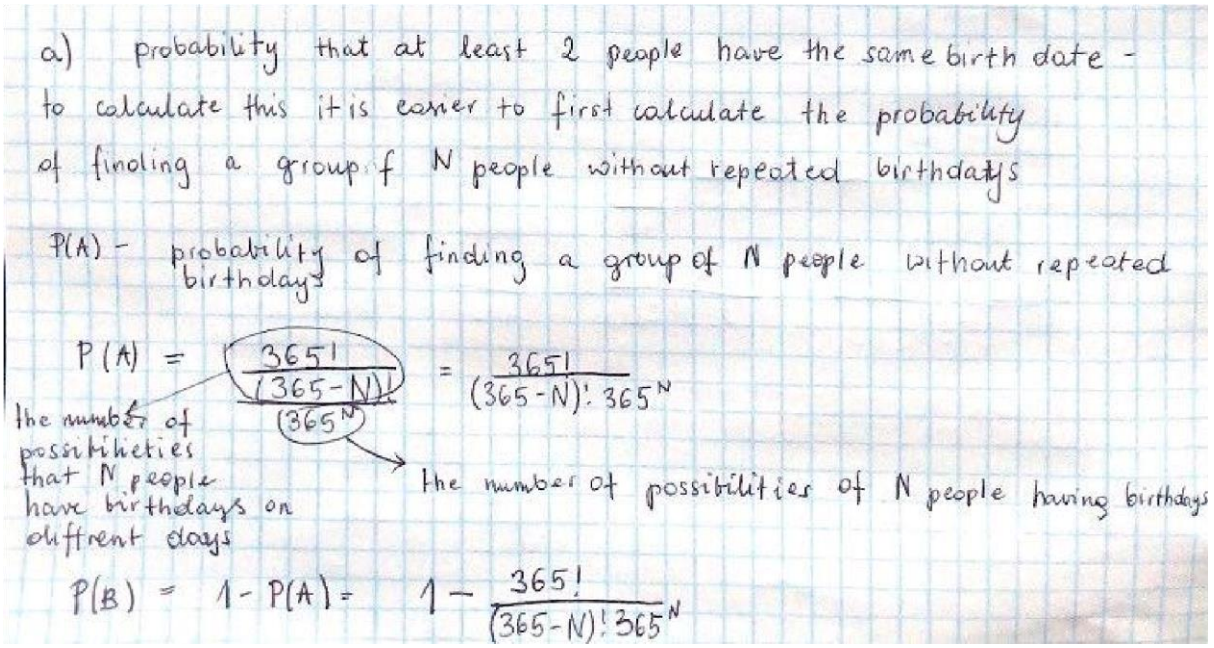
13: there are 13 ranks in poker

Exercise 2



c) The mean and median number of plays you can expect to make until you go broke are:
The mean: approximately 200
The median: approximately 21

Exercise 3 Part One



In this interval, what is the proportion of N where the event happens with the least 50% chance?

The event happens with at least 50% chance for N = [23, 50] which is **0,68** of the interval [10, 50].

What is the smallest N where the probability of the event occurring is at least 50%?

N = 23

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The probabilty that at least 2 people out of 10 have the same birth date is: 0.11694817771107768
The probabilty that at least 2 people out of 11 have the same birth date is: 0.141141378321733
The probabilty that at least 2 people out of 12 have the same birth date is: 0.16702478883806438
The probabilty that at least 2 people out of 13 have the same birth date is: 0.19441027523242937
The probabilty that at least 2 people out of 14 have the same birth date is: 0.223102512004973
The probabilty that at least 2 people out of 15 have the same birth date is: 0.25290131976368635
The probabilty that at least 2 people out of 16 have the same birth date is: 0.2836040052528499
The probabilty that at least 2 people out of 17 have the same birth date is: 0.31500766529656066
The probabilty that at least 2 people out of 18 have the same birth date is: 0.34691141787178936
The probabilty that at least 2 people out of 19 have the same birth date is: 0.37911852603153673
The probabilty that at least 2 people out of 20 have the same birth date is: 0.41143838358057994
The probabilty that at least 2 people out of 21 have the same birth date is: 0.4436883351652058
The probabilty that at least 2 people out of 22 have the same birth date is: 0.4756953076625501
The probabilty that at least 2 people out of 23 have the same birth date is: 0.5072972343239854
The probabilty that at least 2 people out of 24 have the same birth date is: 0.5383442579145288
The probabilty that at least 2 people out of 25 have the same birth date is: 0.5686997039694639
The probabilty that at least 2 people out of 26 have the same birth date is: 0.598240820135939
The probabilty that at least 2 people out of 27 have the same birth date is: 0.626859282263242
The probabilty that at least 2 people out of 28 have the same birth date is: 0.6544614723423994
The probabilty that at least 2 people out of 29 have the same birth date is: 0.680968537477777
The probabilty that at least 2 people out of 30 have the same birth date is: 0.7063162427192686
The probabilty that at least 2 people out of 31 have the same birth date is: 0.7304546337286438
The probabilty that at least 2 people out of 32 have the same birth date is: 0.7533475278503207
The probabilty that at least 2 people out of 33 have the same birth date is: 0.774971854175772
The probabilty that at least 2 people out of 34 have the same birth date is: 0.7953168646201543
The probabilty that at least 2 people out of 35 have the same birth date is: 0.8143832388747152
The probabilty that at least 2 people out of 36 have the same birth date is: 0.8321821063798795
The probabilty that at least 2 people out of 37 have the same birth date is: 0.8487340082163846
The probabilty that at least 2 people out of 38 have the same birth date is: 0.8640678210821209
The probabilty that at least 2 people out of 39 have the same birth date is: 0.878219664366722
The probabilty that at least 2 people out of 40 have the same birth date is: 0.891231809817949
The probabilty that at least 2 people out of 41 have the same birth date is: 0.9031516114817354
The probabilty that at least 2 people out of 42 have the same birth date is: 0.9140304715618692
The probabilty that at least 2 people out of 43 have the same birth date is: 0.9239228556561199
The probabilty that at least 2 people out of 44 have the same birth date is: 0.9328853685514263
The probabilty that at least 2 people out of 45 have the same birth date is: 0.940975899465775
The probabilty that at least 2 people out of 46 have the same birth date is: 0.9482528433672547
The probabilty that at least 2 people out of 47 have the same birth date is: 0.9547744028332994
The probabilty that at least 2 people out of 48 have the same birth date is: 0.9605979728794224
The probabilty that at least 2 people out of 49 have the same birth date is: 0.9657796093226765
The probabilty that at least 2 people out of 50 have the same birth date is: 0.9703735795779884
The proportion of N where the event happens with at least 50% chance 0.6829268292682927
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Part Two

How large a group should Peter expect to form?

Peter should expect to form a group of around 2300 people.