Stat 330
Homework 2

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1)

(a) $|\Omega| \geq |A|, \quad |\Omega| \geq 0, \quad$ therefore $|A| \div |\Omega| \geq 0$.
This satisfies the first axiom.

(b) By definition, the sum of the probabilities of all outcomes (P(A)) is one, satisfying the second axiom.

(c)

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2)

(a) 12 * 11 * 10 = 1320 possible permutations

(b) 1320 possible permutations, 3 * 2 * 1 = 6 orders per group
1320 / 6 = 220 possible combinations.

(c) 3 * 2 * 1 = 6 possible permutations

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3)

(a) $26 + 26 + 3 = 55$ letters, 10 numbers.
$55 + 10 = 65$ possible options per character.
$65^8 = 3.186448129 * 10^{14}$ possible passwords.

Remove all with no letters (10^8) and those with no numbers (55^8), resulting in $2.34910775 * 10^{14}$ possible permutations.
This rounds to 235 trillion permutations.

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4)

(a) $8 * 7 * 6 * 5 * 4 * 3 * 2 * 1 = 8! = 40320$ possible ways.

(b) Removing two letter choices effectively makes this a 6 letter word, thus there are $6! = 720$ possible ways.

(c) $720 \div 40320 = 1.79\%$

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5) For a probability $\geq .5$, there must be at least 23 people in a room

fx = 1-(PERMUT(365,A1)/(365^A1))

	A	B	C	D	E
1	1	0		21	0.4436883352
2	2	0.002739726027		22	0.4756953077
3	3	0.008204165885		23	0.5072972343
4	4	0.01635591247		24	0.5383442579
5	5	0.0271355737		25	0.568699704
6	6	0.04046248365		26	0.5982408201
7	7	0.0562357031		27	0.6268592823
8	8	0.07433529235		28	0.6544614723
9	9	0.09462383389		29	0.6809685375
10	10	0.1169481777		30	0.7063162427
11	11	0.1411413783		31	0.7304546337
12	12	0.1670247888		32	0.7533475279
13	13	0.1944102752		33	0.7749718542
14	14	0.223102512		34	0.7953168646
15	15	0.2529013198		35	0.8143832389
16	16	0.2836040053		36	0.8321821064
17	17	0.3150076653		37	0.8487340082
18	18	0.3469114179		38	0.8640678211
19	19	0.379118526		39	0.8782196644
20	20	0.4114383836		40	0.8912318098

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6)

(a) $\left(\binom{7}{4}\binom{4}{0}\binom{1}{0}\right) \div \binom{12}{4} = 35 \div 495 = 7.1\%$ chance

(b) $\left(\binom{7}{1}\binom{4}{2}\binom{1}{1}\right) \div \binom{12}{4} = 42 \div 495 = 8.5\%$ chance

(c) P(At least 1 Comet) = 1 - P(No Comets):
$\left(\binom{5}{4}\right) \div \binom{12}{4}$ = 1 - ($5 \div 495$) = 98.99% chance