COURSE NUMBER: DSE 210 Work Sheet 2 HW 1
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PAGE: 1 of ____

1)

a) $\Omega = \{A, B\}$

b) $\Omega = \{H, T\}$

c) $\Omega = \{(\text{Jan}, \text{Sun}), (\text{Jan}, \text{mon}), (\text{Jan}, \text{Tue}) \ldots (\text{Dec}, \text{Fri}), (\text{Dec}, \text{sat})\}$ $\quad |\Omega| = 12 \times 7$

d) $\Omega = \{a, b, c, d, e, f, g, h, i, j\}$ $\quad |\Omega| = 10$

e) $\Omega = \{$(red, black), (red, beige), (black, black) (black, beige), (Silver, black), (Silver, beige) (green, black) (green, beige)$\}$

2)

a) A fair coin tossed 200 times in a row $\Omega = \{H, T\}^{200}$

b) $\Omega = \{0, 1, 2, \ldots, \text{worlds population}\}$ ~~$0 \le |\Omega| \le$ worlds population~~

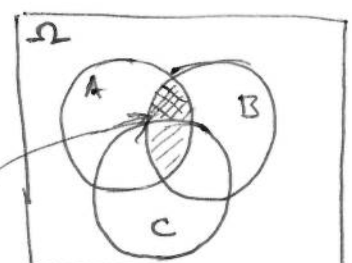
c) $\Omega = \{$set of all words in Hamlet$\}$

3) Given $\Omega = \{A, B, C\}$

a) All 3 events occur $= A \cap B \cap C$

b) Atleast one event occur $= A \cup B \cup C$

c) A and B occur but not C $= A \cap B \cap \overline{C}$



COURSE NUMBER: ________
STUDENT NAME: ________________________________
PAGE: 2 of ____

4) Given $\Omega = \{a, b, c\}$

a) $P(a) + P(b) + P(c) = P(\Omega) = 1$

$P(c) = 1 - \frac{1}{2} - \frac{1}{3} = \frac{1}{6}$

b) $\{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{a,c\}$

$\{a,b,c\}, \Phi$

c) $P(\{a\}) = \frac{1}{2}$ $\quad P(\{b\}) = \frac{1}{3}$ $\quad P(\{c\}) = \frac{1}{6}$

$P(\{a,b\}) = P(a) + P(b) = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$

$P(\{b,c\}) = P(b) + P(c) = \frac{1}{3} + \frac{1}{6} = \frac{1}{2}$

$P(\{a,c\}) = P(a) + P(c) = \frac{1}{2} + \frac{1}{6} = \frac{2}{3}$

$P(\{a,b,c\}) = P(\Omega) = 1$

$P(\phi) = 1 - P(\Omega) = 0$

5) Given $\{H,T\}^3$ $\quad |\Omega| = 2^3 = 8$

a) $E_1 = \{HHH, HHT, HTH, HTT\} \Rightarrow$ ~~At least one head (one or more heads)~~

First toss is always Head

$P(E_1) = \frac{|E_1|}{|\Omega|} = \frac{4}{8} = 2$

b) E_2 $\{HHH, TTT\} \Rightarrow$ All tosses are either heads or tails (Identicle)

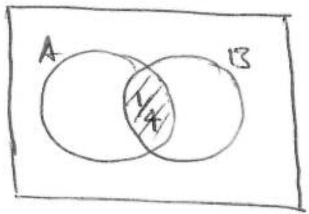
$P(E_2) = \frac{2}{8} = \frac{1}{4}$

COURSE NUMBER: ________
STUDENT NAME: ________
PAGE: 3 of ____

5) c) $E_3 = \{HHT, HTH, THH\} \Rightarrow$ Two heads and one tail (Exact 2 heads)

$P(E_3) = \frac{3}{8}$

6) $\Omega = \{A, B\}$, $P(B) = \frac{1}{2}$



$P(A) = 1 - P(A^c) = 1 - \frac{1}{3}$

$= \frac{2}{3}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{2}{3} + \frac{1}{2} - \frac{1}{4} = \frac{11}{12}$

7) Sample space for pair of dice $\Omega = \{1, 2, 3, 4, 5, 6\}^2$

$|\Omega| = 36$

$E = \{(1,1), (2,2), (3,3), (4,4) (5,5), (6,6)\}$, $|E| = 6$

$\therefore P(E) = \frac{|E|}{|\Omega|} = \frac{6}{36} = \frac{1}{6}$

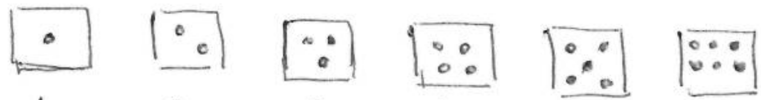
8) total sample space with a sequence of 9 $\Rightarrow \Omega = \{\text{dot}, \text{dash}\}^9$

$|\Omega| = 2^9 = 512$

$\therefore P(\text{sos}) = \frac{1}{|\Omega|} = \frac{1}{512}$

COURSE NUMBER: DSE210 HW1 worksheet - 2
STUDENT NAME: ____________
PAGE: 4 of ____

9)



$p \Rightarrow \frac{1}{21} \quad \frac{2}{21} \quad \frac{3}{21} \quad \frac{4}{21} \quad \frac{5}{21} \quad \frac{6}{21}$

$P(\text{even}) = p(\{2,4,6\}) = \frac{2}{21} + \frac{4}{21} + \frac{6}{21} = \frac{12}{21} = \frac{4}{7}$

10)

with 3 picks out of 100 total num of outcomes $|\Omega| = {}^{100}C_3$

$|\Omega| = {}^{100}C_3 = 161700$

$|S|$ = Num of favorable outcomes = $|\{$ at least one ball matches with pick $\}|$

$= \cancel{{}^{100}C_3 - {}^{97}C_3}$

$= \text{total} - |\{\text{no balls match}\}|$

$= {}^{100}C_3 - {}^{97}C_3$

$= 14260$

$\therefore$ prob of winning $= \frac{|S|}{|\Omega|} = \frac{14260}{161700} = 0.08818$

11) num of ways to arrang 5 people $= {}^5P_5 = 5 \times 4 \times 3 \times 2 = 120$

$\therefore$ Prob of lineup with encreasing order $= P = \frac{1}{120}$

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COURSE NUMBER: ________
STUDENT NAME: ________
PAGE: 5 of ____

12) Each person has 5 options

Total outcomes for 5 people $= 5^5$

Num of Favorable outcomes $= 5P_5 = 5!$

$\therefore$ Prob of each person get off at different - door $= \frac{5!}{5^5} = \frac{5\times4\times3\times2\times1}{5^5} = \frac{24}{625}$

13) Total number of outcomes $|\Omega| = 52P_5 = \cancel{52\times51\times50\times49}$

$= 52\times51\times50\times49\times48$

Outcomes with first 4 Aces and 5th king

$|A| = 4P_4 \times 4$

$\therefore$ Prob of A $= \frac{\cancel{4}\times\cancel{3}\times2\times\cancel{4}}{52\times51\times\cancel{50}_{25}\times49\times\cancel{48}} = \frac{1}{3248700}$

14) Total number of outcomes of choosing 10 apples from 100 $= |\Omega| = {}^{100}C_{10}$

Number of ways choosing 10 good apples $= |A| = {}^{90}C_{10}$

$\therefore$ Prob(A) $= \frac{90C_{10}}{100C_{10}} = 0.33047$

COURSE NUMBER: ________
STUDENT NAME: ____________________
PAGE: 6 of ____

15)

Total outcomes of choosing 4 hats $= |\Omega| = {}^4P_4$

$\therefore$ Prob of getting 1 correct sequence $= \frac{1}{{}^4P_4} = \frac{1}{4 \times 3 \times 2} = \frac{1}{24}$

16)

total sample space $\Omega = \{B, G\}^6$

$$|\Omega| = 2^6 = 64$$

$A = \{$ Exactly 3 boys and 3 girls $)$

$|A| = {}^6C_3 = \frac{6!}{(6-3)!\,(3)!} = \frac{6 \times 5 \times 4}{3 \times 2 \times 1} = 20$

$\therefore P(A) = \frac{|A|}{|\Omega|} = \frac{20}{64} = \frac{5}{16}$

17) total number of way three dwarfs can be choosen from seven $|\Omega| = {}^7C_3 = 35$

a) ~~Number~~ $A = \{$ Dopey is one of three $\}$

$$|A| = {}^6C_2 = 15$$

$Pr(A) = \frac{|A|}{|\Omega|} = \frac{15}{35} = \frac{3}{7}$

b) $B = \{$ Dopy and Sneezy are in the group $\}$,

$|B| = {}^5C_1 = 5 \quad Pr(B) = \frac{5}{35} = \frac{1}{7}$

c) $C = \{$ Both Dopy & Sneezy are not in group $\}$

$|C| = {}^5C_3 = 10 \quad Pr(C) = \frac{10}{35} = \frac{2}{7}$

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