Department of Mathematics
MTL 106 (Introduction to Probability Theory and Stochastic Processes)
Tutorial Sheet No. 1
Answer for selected Problems

1. $|\ \Omega\ | = 12$
   $\Omega = \{DD, NDD, NDND, NNDD, NNDN, NNNN, NNND, NDNN,$
   $DNNN, DNDN, DNND, DNDD\}$

2. No

3. $\frac{1}{2}$

4. (a) $\frac{1}{N+1}\sum_{i=1}^{N}\frac{1}{i}$
   (b)Updated Answer: Required probability= P(exactly one)+P(exactly two)+P(none)=
   $\sum_{i=1}^{n} P(A_i \cap (\cup_{j=1,j\neq i}^{n} A_j)^C) + \sum_{i=1}^{n}\sum_{k<i} P((A_k \cap A_i) \cap (\cup_{j=1,j\neq i,k}^{n} A_j)^C) + P(\cup_{j=1}^{n} A_j)^C$
   $= \frac{1}{N+1}\sum_{i=1}^{N}\frac{1}{i} + \frac{1}{N+1}\sum_{j=2}^{N}\sum_{i=1}^{j}\frac{1}{ij} + \frac{1}{N+1}$

7. $\frac{4}{35}$

9. $({}^{12}C_2 - 1)\left(\frac{1}{3}\right)^{12}\left(\frac{2}{3}\right)^{2}$

10. (a) $\mathcal{F}_1 = \{\phi, \Omega\}, \mathcal{F}_1 = \{\phi, \{1\}, \{2,3,4\}, \Omega\}, \mathcal{F}_3 = P(\Omega)$
    (b) Define $P(i) = 0.25,$ for $i = 1, 2, 3, 4$

11. $\frac{23}{64}$

12. Yes

14. 0, 1

15. $\dfrac{3! \times 2^3}{6 \times 6 \times 6} = \dfrac{2}{9}$

16. (a) $\dfrac{\lfloor \frac{N}{3} \rfloor + \lfloor \frac{N}{4} \rfloor - \lfloor \frac{N}{12} \rfloor}{N}$ where $\lfloor . \rfloor$ =floor function (b) $\dfrac{1}{2}$

17. $\frac{1}{4}$

19. A, B, C are pairwise as well as mutually independent

20. $P(A|B)$

21. $p_0 + p_1\ p_0 + p_2\ (p_0)^2$

22. $\frac{30}{61}$

23. $\frac{40! \times\ {}^{41}P_4}{44!}$

24. $2 \times (0.5)^4$

25. $\frac{43}{216}, \frac{173}{216}$

26. (a) $\frac{1}{2}$ (b) $\frac{1}{7}$

27. (a) $R^4 +\ {}^4C_3R^3(1-R) +\ {}^4C_2R^2(1-R)^2$
    (b) $R^4 + +\ {}^4C_3R^3(1-R) +\ {}^2C_1R(1-R) \times\ {}^2C_1R(1-R)$

28. $p^4 + 4p^3q + 2p^2q^2$

29. $\frac{b}{b+r+c}$

30. $\frac{1}{2}(1+\ln 2)$

31. $\frac{^{(N-D)}C_n}{^{N}C_n}$