

**Advanced Statistics**  
Instructor: Shashi Prabh

**Problem Set 2. Probability theory - counting, conditional probability, independence**

**References**

- FPP: Statistics (4/e), Freedman, Pisani, Purves
- Wasserman: All of Statistics, Springer, 2003
- JWHT: An Introduction to Statistical Learning with Applications in R, James, Witten, Hastie and Tibshirani, Springer, 2017
- VS: An Introduction to R, Venables and Smith

1. FPP page 227: Exercise set B
2. FPP page 230: Exercise set C
3. FPP page 230: Exercise set D
4. FPP page 235: 3, 5, 6, 7, 8, 9, 10
5. FPP pages 240-241: 1, 2, 3, 4
6. FPP pages 242-243: Exercise set B
7. FPP pages 246-247: Exercise set C
8. FPP pages 250-251: Exercise set D
9. FPP pages 252-254: 1, 3, 4, 5, 7, 8, 10, 12
10. Describe the Paradox of Chevalier de Méré. Resolve the paradox.
11. In how many ways can eight colored beads, all colored differently, be arranged on (i) a straight wire and (ii) a circular necklace?
12. A firm has to choose seven people from its R&D team of eleven to send to a conference on computer systems. How many ways are there of doing this
  - i. when there are no restrictions?
  - ii. when two of the team are so indispensable that only one of them can be permitted to go?
  - iii. when it is essential that a certain member of the team goes?
13. Prove that the number of ways that a group of  $r$  objects can be chosen from  $n$  objects using sampling with replacement where the order of selection does not matter is given by  $\binom{n+r-1}{r}$ .
14. State and prove inclusion-exclusion principle.