

# Assignment 7 (NCERT Class 12)

Gautam Singh (CS21BTECH11018)

**Abstract**—This document contains the solution to Question 5 of Exercise 13.1 in Chapter 13 (Probability) of the NCERT Class 12 Mathematics Textbook.

**Exercise 13.1, Q5.** If  $\Pr(A) = \frac{6}{11}$ ,  $\Pr(B) = \frac{5}{11}$  and  $\Pr(A \cup B) = \frac{7}{11}$ , find

- (i)  $\Pr(A \cap B)$
- (ii)  $\Pr(A|B)$
- (iii)  $\Pr(B|A)$

**Solution:** We know that, given events A and B,

$$\Pr(AB) = \Pr(A) + \Pr(B) - \Pr(A + B) \quad (1)$$

and also,

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \quad (2)$$

Using (1), we get

$$\Pr(AB) = \frac{6}{11} + \frac{5}{11} - \frac{7}{11} = \frac{4}{11} \quad (3)$$

From (2) and (3),

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} = \frac{4}{5} \quad (4)$$

and

$$\Pr(B|A) = \frac{\Pr(AB)}{\Pr(A)} = \frac{2}{3} \quad (5)$$

The C code `./codes/7_1.c` verifies the solution, within limits of float precision.

**Note:** Derivation of (1) using Boolean Algebra:

We note that for any events A and B we have the following:

$$A + B = AB + AB' + A'B \quad (6)$$

$$\Pr(A) = \Pr(AB') + \Pr(AB) \quad (7)$$

and so, taking probabilities in (6), since all the events are mutually disjoint,

$$\Pr(A + B) = \Pr(AB') + \Pr(AB) + \Pr(A'B) \quad (8)$$

$$= \Pr(A) + \Pr(B) - \Pr(AB) \quad (9)$$

$$= \Pr(A) + \Pr(B) - \Pr(AB) \quad (10)$$