

### MSO205 PRACTICE PROBLEMS SET 3

Question 1. Fix  $p \in (0, 1)$ . Suppose we have a coin such that tossing it results in a head with probability  $p$  and a tail with probability  $1 - p$ . The coin is tossed twice independently and the number  $X$  of heads is observed.

- (i) Compute  $\mathbb{P}(X^{-1}(A))$  for all subsets  $A$  of  $\mathbb{R}$ .
- (ii) Find the DF of  $X$ .

Question 2. Fix  $p \in (0, 1)$ . Suppose we have a coin such that tossing it results in a head  $H$  with probability  $p$  and a tail  $T$  with probability  $1 - p$ . Consider the random experiment of tossing the coin once and look at the following RV  $X : \Omega \rightarrow \mathbb{R}$  given by  $X(H) = 1, X(T) = -1$ .

- (i) Compute the law  $\mathbb{P} \circ X^{-1}$ , i.e. find  $\mathbb{P} \circ X^{-1}(A)$  for all subsets  $A$  of  $\mathbb{R}$ .
- (ii) Find the DF of  $X$ .

Question 3. Suppose that an event  $A$  is independent of itself. What can you say about  $\mathbb{P}(A)$ ?