# TRINITY COLLEGE DUBLIN

## School of Computer Science and Statistics

**Week 4 Questions**                    ST3009: Statistical Methods for Computer Science

**For each problem, explain/justify how you obtained your answer in order to obtain full credit. In fact, most of the credit for each problem will be given for the derivation/model used as opposed to the final answer.**

**Question 1.** Consider an experiment where we roll two 6-sided dice. Let random variable $Y$ be the sum of the values rolled. The sample space is $\{(1,1),(1,2),(1,3),\ldots,(6,6)\}$ and recall that a random event is a subset of the sample space.

(a) What random event corresponds to $Y = 2$ ?

(b) What event corresponds to $Y = 3$ ?

(c) What event corresponds to $Y = 4$ ?

(d) Now let $X$ be the indicator random variable associated with the event $\{(1,1),(2,2),(3,3)\}$. What is the probabilities that $X = 1$ ?

**Question 2.** Let $X$ represent the difference between the number of heads and the number of tails obtained when a coin is tossed 3 times.

(a) What are the possible values of $X$ ?

(b) What is $P(X = -3)$ ?

(c) What is $P(X = -1)$ ?

(d) If the coin is assumed fair, calculate the PMF and CDF of $X$ and plot a sketch of both.

**Question 3.** Four 6-sided dice are rolled. The dice are fair, so each one has equal probability of producing a value in $\{1,2,3,4,5,6\}$. Let $X =$ the minimum of the four values rolled. (It is fine if more than one of the dice has the minimal value.)

(a) What is $P(X \geq 1)$ ?

(b) What is $P(X \geq 2)$ ?

(b) What is the CDF of $X$ i.e. $P(X \leq k)$ for all values of $k$ ?