

## 1 Head Count

Note 15

Consider a coin with  $\mathbb{P}[\text{Heads}] = 2/5$ . Suppose you flip the coin 20 times, and define  $X$  to be the number of heads.

(a) What is  $\mathbb{P}[X = k]$ , for some  $0 \leq k \leq 20$ ?

(b) Name the distribution of  $X$  and what its parameters are.

(c) What is  $\mathbb{P}[X \geq 1]$ ? Hint: You should be able to do this without a summation.

(d) What is  $\mathbb{P}[12 \leq X \leq 14]$ ?



### 3 Shuttles and Taxis at Airport

Note 19

In front of terminal 3 at San Francisco Airport is a pickup area where shuttles and taxis arrive according to a Poisson distribution. The shuttles arrive at a rate  $\lambda_1 = 1/20$  (i.e. 1 shuttle per 20 minutes) and the taxis arrive at a rate  $\lambda_2 = 1/10$  (i.e. 1 taxi per 10 minutes) starting at 00:00. The shuttles and the taxis arrive independently.

- (a) What is the distribution of the following:
- (i) The number of taxis that arrive between times 00:00 and 00:20?
  - (ii) The number of shuttles that arrive between times 00:00 and 00:20?
  - (iii) The total number of pickup vehicles that arrive between times 00:00 and 00:20?
- (b) What is the probability that exactly 1 shuttle and 3 taxis arrive between times 00:00 and 00:20?
- (c) Given that exactly 1 pickup vehicle arrived between times 00:00 and 00:20, what is the conditional probability that this vehicle was a taxi?
- (d) Suppose you reach the pickup area at 00:20. You learn that you missed 3 taxis and 1 shuttle in those 20 minutes. What is the probability that you need to wait for more than 10 mins until either a shuttle or a taxi arrives?