

EXERCISES ON PROBABILITY TREES

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1. Use the data in the table below to find the following probabilities:

- (a) $P(A)$
- (b) $P(D)$
- (c) $P(A^c)$
- (d) $P(A \cup D)$
- (e) $P(A \cap D^c)$

	A	B	C	Total
D	3	20	40	63
D^c	7	20	10	37

2. A certain genetic feature F is associated with eye color. The table below shows results for 300 random individuals.

	Eye Color		
Trait	X	Y	Z
T	70	30	20
T'	20	110	50

In the table T/T' indicate presence/absence respectively of the genetic trait. X indicates blue eyes, Y brown eyes Z other eye color

- (a) Find the probability $P[X]$ that a person has blue eyes.
- (b) Find the probability $P[T]$ that a person has the trait.
- (c) Are the events X and T independent? Justify.
- (d) Are the events X and Z mutually exclusive? Justify your answer.

- (a) Two cards are chosen with replacement from a standard deck. Calculate the following probabilities using a tree diagram.

- i. $P[\text{second is } \heartsuit \mid \text{first is } \heartsuit]$
- ii. $P[\text{second is } \heartsuit]$
- iii. $P[\text{both are } \heartsuit \text{ 's}]$

- iv. Recalculate (a) using the formula for conditional probability.

3. In a test for HIV the probability of a false positive result is 0.04 and the probability of a false negative result is 0.02. Si 0.1% of the population has HIV find the probability that a randomly selected person will have HIV if their test is positive.

4. Find a suitable sample space Ω for the random experiment of tossing an unbiased coin three times. Let $X : \Omega \rightarrow \mathbb{R}$ be the number of heads.

- (a) Find the density function f_X for the random variable X .
- (b) Calculate the mean and variance of X .
- (c) Draw a probability histogram of the distribution of X .
- (d) Draw a graph of the distribution function F_X .