

Learning outcomes: Chapter 1

1. You should

- know the difference between the classical/frequentist/subjective interpretations of probability;
- be able to give examples of events whose probabilities can be found using the classical/frequentist/subjective interpretations of probability;
- be able to explain if the probabilities of events can be found using the classical/frequentist/subjective interpretations of probability;
- be able to explain the drawbacks of the classical/frequentist/subjective interpretations of probability.
- Note: Much of this was bookwork, to be completed in your own time, by reading Section 1.2 of the notes. **We will revisit this in class before the exam!**

2. You should be able to

- state the result for the *conditional probability* of one event given that another has occurred;
- define a *partition* of the sample space;
- state, and prove, the *Law of Total Probability*;
- state, and prove, *Bayes Theorem*;
- apply Bayes Theorem to simple examples in probability;
- use Bayes Theorem to formulate diagnostic rules given some observed states/symptoms.
- Note: Since you will have a ‘take-home exam’ this year, I will not include proofs from the lecture notes. **In fact, I won’t include any proofs at all!**

3. You should

- know that the *likelihood function* for a parameter θ is simply the joint probability density function after observing data $\mathbf{x}$; assuming i.i.d. observations, this gives

$$f(\mathbf{x}|\theta) = \prod_{i=1}^n f_X(x_i|\theta);$$

- be able to determine the likelihood function for commonly-used statistical models, or indeed *any* given probability density function for data $\mathbf{x}$.

4. You should

- be able to state the *Factorisation Theorem*;
- be able to show that a given statistic $T(\mathbf{X})$ is *sufficient* for a parameter θ by using the Factorisation Theorem;
- be able to use the Factorisation Theorem to determine a sufficient statistic for θ .
- Note: Definitions 1.4 and 1.5 are omitted from the course this year. **Example 1.8 is omitted from the course this year, and you will not see an example like this in your exam.**
- Note: All material on page 21 is non-examinable; we will revisit this material in MAS3902 next year.