University of Sheffield, School of Mathematics and Statistics

MSc in Statistics 2015/16

MAS6002: Introductory Material – Explanatory Notes

Aims and structure of the Introductory Material

The Introductory Material (IM) provides an outline account of some fundamental results, methods and techniques that will be used across the MSc. Much of the material in the IM will be familiar to you; however, most students will not be entirely proficient in all of the topics covered, and there are a few trickier things that most will not have seen. It will be wise to work through and understand as much of the material as possible before you arrive in Sheffield. Probably you should start with Section B1-B3. The IM is the first part of MAS6002, and the first assignment in that module, which is very soon after you arrive, will examine this material. In addition, full knowledge of all the material covered in it may be presumed in any of the modules on the MSc. Notes and exercise sheets are on this web page.

Material

There is a brief sketch of Background Mathematics and some associated exercises. You should probably look through this first.

The IM itself is divided into two main sections

A: Introduction to Probability and Statistics;
B: Statistical Methods.

The first looks at basic theoretical ideas such as fundamental results in probability, properties of random variables, and classical inference. The second looks at the basic tests and methods with which you will need to be familiar; covering data summary, familiar tests for continuous and discrete data, and some introductory regression and ANOVA.

On this website you will find:-

Sketch of Background Mathematics.
Notes for Section A, including some sheets giving information on distributions.
Notes for Section B.

Sets of exercises and 'Hints' (for the exercises in Section A).

An additional booklet an 'Introduction to R'.

There will be introductory sessions on R in Intro Week; if you would like to experiment with R before then it can be downloaded from one of the sites listed at http://cran.r-project.org/mirrors.html (the Bristol site is likely to be the best if you are in the UK). Having a go with R before arrival will be especially worthwhile for Distance Learners: you don't need to develop any proficiency yet, but trying it out will be helpful. Four data sets that are used in Section B are also included on the web pages (as .txt files).

Exercises

The exercises associated with the unit are intended to cover the material in the same order as the notes in Sections A and B. It is important to realise that the exercises are of variable standard of difficulty.

Your strategy for tackling the exercises should firstly be to see if you can do them once you've read the notes. If stuck, check whether the 'hints sheet' helps (for A only). If still stuck, note the problem and ask for help when you reach Sheffield. However, continue with further exercises as they are not necessarily increasingly difficult: it is important that you look at a good proportion of this material as you can before you arrive. You may request assistance with the exercises during the periods set aside for this purpose on the Intro Week timetable, which will certainly be available when you arrive, and will be on these web pages once it is available (look a few days before we start). Duplicated model solutions to the exercises on Blocks A and B will be circulated in due course and you will use these to mark your work and then seek clarification if necessary. No solutions will be provided for the exercises on Background Mathematics. The exercises are preparation for the first assignment, which will be on the material in Blocks A, B (and, at least implicitly, the background mathematics). You need to practice for this assignment by working effectively on the notes and the exercises.

Help

By the start of the course on Monday 21st September 2015, all students should have looked through all of the IM material to acquaint themselves with the overall contents and have attempted a number of exercises. Please allow plenty of time for this 'revision' and do not wait until just before the course starts. It is our intention that you should spend the equivalent of one week full-time on this material before you join us in September. If you suspect or discover errors before then you can email t.heaton@sheffield.ac.uk – however, note that the actual teaching starts on Monday 21st and so more general advice on this material will not be available until then.

During Intro Week (21-25 September) we will offer you help and guidance with this material, devoting time to:

i. discussing the material in the lecture notes through several expository lectures on it –
these will look at Section A and Sections B4-B6 (i.e not B1-B3 and not Background Mathematics);

ii. 'examples classes' which will allow further work/questions on exercises.

Obviously, the lectures will be more useful to some than others, depending on how difficult you have found the material.

Tables

Explicit solutions to some of the exercises require us to find e.g. quantiles of distributions which can only be found by computationally. In the MSc. we will mainly use R to give us these numerical values. In exams you will be either be given R output to answer such questions, or in a few courses, you may be given a formula sheet with a look up table. It is therefore important you familiarise yourself with the required R commands e.g. qnorm() and also how to use a look-up table e.g. Neaves.

August 2015