Study Skills: Preparing for University, Access to Science and Engineering.

Tutorial Experience

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Outline

- Introduction.
- What is a tutorial? And how to get the most out of it.
- How does it work?
- Mini maths tutorial.
- Questions?

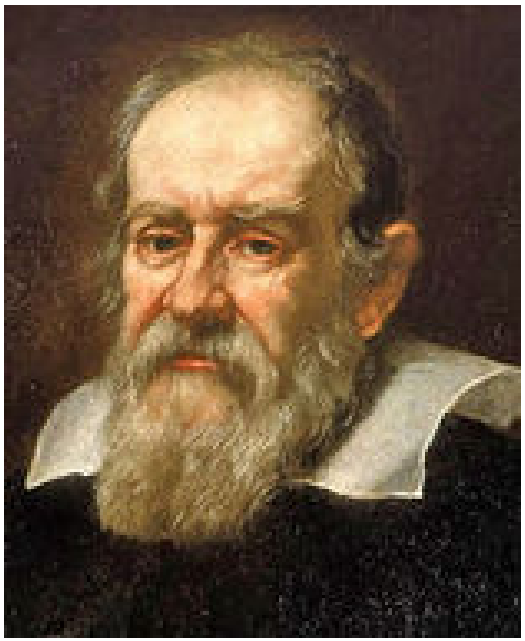
Introduction

I am currently Director of Maths Gym

- Maths Gym is a student support service giving advice to any student who has maths/stats questions,
- We deal with maths/stats applied to many different disciplines, from engineering, chemistry, business studies, physics, psychology and many more...
- Similar services exist at **all** Scottish Universities - though they are all delivered in slightly different ways.

Introduction

"Mathematics is the language with which God has written the universe" - Galileo Galilei



Introduction

You will have to deal with mathematics and/or statistics to some degree, at some point in your studies!

Don't panic, there is lots of support! And practice makes perfect...tutorials!

What is a tutorial?

According to Cambridge Dictionary Online (https://dictionary.cambridge.org/dictionary/)

tut_def.jpg

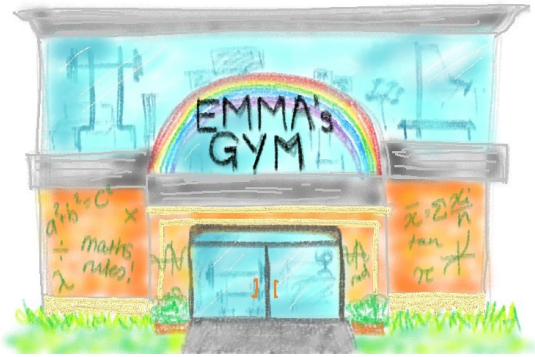
BUT I think it is so much more...

What is a tutorial?

- Timetabled session to work through relevant problems with the help of tutors and/or lecturer
- Chance to chat with your peers about the problems and help each other
- Ask questions!
- Get more in-depth answers/discussions
- Develop your technical skills
- Develop communication skills

How to get the most out of it.

- University is a bit like a gym membership - the more you put in, the more you get out!
- Lectures provide the (very important) information you need - bit like an orientation at the gym.
- Self-study: you will have textbooks, exercises, homework to use this information - working out in the gym.



zumba.png

- Workshops, Labs and Tutorials give you a chance to apply your knowledge with support - going to a zumba class!
- Other student support services add to this eg library, study support services, wellbeing services...
- Don't underestimate peer support too :)

How does it work?

- Your lecture class will be broken down into smaller groups of 8-20 (ish).
- The exact format depends on your lecturer/tutor but all very similar with same goal.
- Meet regularly (weekly) with to discuss problems/exercises related to lecture material.

`tut_me.png`

- Work through the exercises in the tutorial with tutor walking around to help.
- Discuss exercises you tried at home in preparation for the tutorial.
- Chance to ask questions, talk to your group, get more detail...

A mini-tutorial

Probability appears in many applied sciences - what are the chances?

- What is the probability that a medical test result is a false positive?
- What are the chances of side effects from a new drug?
- Clinical trials - hypothesis testing.
- Quantum mechanics: wave function of a particle - Heisenberg's uncertainty principle.
- Bayesian inference in robotics - AI.
- Analysis of any experimental data.
- Uncertainty quantification.

The Monty Hall Problem

To demonstrate the importance (and tricky nature) of probability we are going to play a game!

The Monty Hall Problem

The goats and car are hidden behind the 3 doors - you don't know which.

What are your chances of winning the car? Why?

The Monty Hall Problem

Now the 'host' of the game, before opening your chosen door, opens one of the other doors to show you a goat. You are then given the option to stick with your original door, or switch to the other un-opened door.

- What are your chances of winning now?
- Should you stick or switch?
- Does it matter?
- Why?

The Monty Hall Problem

In your pairs - play the game multiple times:

- One member of each pair should be the host - you know where the car is, so you must reveal a goat AFTER the player has chosen a door.
- The other player can choose to switch or stick - half the group are always going to stick and the other half will always switch.
- Record the number of times you play and the number of times you win.

The Monty Hall Problem

Let's collate our results and see what is happening!

The Monty Hall Problem

The following table shows all our options and possible results. Your choice is Door 1, the host opens the blue cells, and the winning results are highlighted pink cells.

Door 1	Door 2	Door 3	Switch Result	Stick Result
Goat	Goat	Car	Car	Goat
Goat	Car	Goat	Car	Goat
Car	Goat	Goat	Goat	Car

Whether you switch or stick there are 3 possible outcomes (3 rows in the table) but if you switch 2 of those are winners (red cells), while only one winner if you stick!

$$\mathbb{P}(\text{win when switching}) = \frac{2}{3}$$

$$\mathbb{P}(\text{win when sticking}) = \frac{1}{3}$$

Questions

Thank you and any questions?

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