Part A: Reflection questions

Reflection 1:

We have a set of values. Addition and multiplication always satisfy a series of axioms, such that whenever these operations are performed on elements of the set they are nonetheless satisfied. Such a set is called a field. Examples of fields include rational numbers and real numbers. A non -example would be the set of integers. This is because axiom F10 is not satisfied. A counterexample that doesn’t satisfy this condition is when x: =4. The product of this integer with another is even. So, 4 does not have a multiplicative inverse. Therefore, this condition is not satisfied.

If we have a set V and F as a field, and there is an addition (as in V1) and scalar multiplication (as in V6), which obey the specific set of axioms, then the quadruple is called an F-vector space. So, we have the elements of the set V are called vectors and F is called its field of scalars. An example of a vector space is the set of all functions from the reals to the reals.

A key difference between a vector space and a field can be found with the axioms. One of the field axioms F10, states that any non-zero element x∊F, has a multiplicative inverse y∊F, such that the product is equal to 1. There is no corresponding property with the vector space axioms. Both vector spaces and fields have operations called multiplication, but these operations are different. This difference is empathised in the definition of vector spaces where the term ‘scalar multiplication’ is used instead.

Reflection 2:

Members of the group enjoy the more numerical based modules (100 series from first year). This is mostly due to the familiar nature of the modules. Specifically, statistics was a module that was thoroughly enjoyed by all members of the group. This was for a few reasons. Firstly, the module included a lot of examples from the real world. This includes data to do with: coronavirus, earthquakes, floods etc. Also, the statistics project required us to use R (programming language) to complete the task and analyse data. The normal distribution is a model that is very commonly used in the real world, so it was useful to model specific behaviour with it.

Reflection 3:

A geographical coordinate system defines feature on a model of the earth (sphere). Its units are angular, usually degrees. You can’t take latitude, longitude, elevation as the rectangular coordinates of a vector. The issue is that the transformation between latitude, longitude, and elevation and a 3d position is non-linear.

Reflection 4:

Is there a specific approach that can be used to approach proof-based questions?