

MTH4108 Probability I – 2009/10

Feedback on mid-term test

The test results were disappointing. I tried to design the test so that it would be doable by students who regularly attend lectures *and make a serious attempt to do all the questions in the weekly exercises, not just the starred question*. It seems I erred on the side of making it too difficult. I will compensate for this in the end of term test and the final exam.

Nevertheless, I am worried that many students are not making a serious attempt to do the weekly exercises. If you do not do this you will not understand what is going on in this module. You will learn very little if you just read my solutions to the exercises when I put them on the web without first trying to do them for yourself.

Here are comments on some common mistakes to the individual test questions.

Q1

- (ii) $\mathbb{P}(B)$ can be determined by calculating the number of outcomes in B .
- (iii) $\mathbb{P}(A \cap B)$ can be determined by calculating the number of outcomes in $A \cap B$.
- (iv) $\mathbb{P}(A \setminus B) = \mathbb{P}(A) - \mathbb{P}(A \cap B)$. Note that $\mathbb{P}(A \setminus B)$ is not the same as $\mathbb{P}(A|B)$.
- (v) $\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B) - \mathbb{P}(A \cap B)$. The events A and B are *not disjoint* so we do not have $\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B)$.

Q2 This question was done very badly but I am not sure why. I thought it was a fairly straightforward application of what we did on sampling. Many students blindly used formulae for numbers of selections without really understanding what is going on.

Q3 This question was also done very badly.

(i) Let A be the event that I can get to college by the DLR and bus. Let B be the event that I can get to college by the train and tube. Many students calculated $\mathbb{P}(A)$ and $\mathbb{P}(B)$ correctly but then said $\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B)$. This is not true because A and B are *not disjoint*. You need to use the inclusion/exclusion formula $\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B) - \mathbb{P}(A \cap B)$.

(ii) This is just $\mathbb{P}(B)$ since the events that the train, tube lines and DLR are working are independent.

(iii) This can be calculated using the formula for conditional probability and part (i).

Q4 Most students who attempted this question did reasonably well. A general comment when you write proofs is that you should write in sentences. Try to use words like ‘hence’ or ‘thus’ to connect statements. A proof should start with the hypotheses you are given and use them to deduce the conclusion you are asked to prove, rather than just being a list of formula. You should also justify statements which require justification. For example as part of the proof in (ii) you should say:

... We have $\mathbb{P}(A \cap B)/\mathbb{P}(B) > \mathbb{P}(A)$. Since $\mathbb{P}(B) > 0$ this implies that $\mathbb{P}(A \cap B) > \mathbb{P}(A)\mathbb{P}(B)$

(It is not true in general that $x/y > z$ implies that $x > yz$. Consider for example $x = -1$, $y = -1$ and $z = 0$.)