Results So Far

The test was of moderate difficulty. Most people scored well. On an exam, Q1(a) would be rated E (Easy); Q1(b) and 1(c) would be rated M (Moderate), and Q2(a) and (b) would be at the easier end of H (Hard). The real exam will have a balance between Easy (about 25%), Moderate (about 50%), and Hard (about 25%).

Comments

- Most people got Q1(a), (b), and (c) correct. The most common mistakes were in setting up the equations for part (b), where some people added 1's in the wrong places. If you set up the notation and equations correctly but got the wrong answers after solving, you lost one mark only on the first occasion this happened.

- Most people gave a good attempt at Q2(a), but very few people got it completely correct. Here are some comments:

  — Most people correctly found $\mathbb{E}(X+Y)$ by using $\mathbb{E}(X)+\mathbb{E}(Y)$ and using the Law of Total Expectation for $\mathbb{E}(X)$.

  — The most common problem was how to compute Var$(X+Y)$. Most people incorrectly said X and Y are independent, so they used Var(X) + Var(Y), and correctly calculated Var(X) using the Law of Total Variance. An answer that correctly found $\mathbb{E}(X+Y)$ and Var(X) but missed the point that X and Y are *not* independent got 3 out of 5 marks.

  — ***Please note that X and Y can not be independent, because X is defined through the dependent expression*** $X \mid Y \sim$ Poisson$(3+Y)$.

  — If you recognised that X and Y are not independent and made some attempt at combining the variance of $X+Y$ accordingly, but didn't get the correct answer, you probably got 4 out of 5 marks. Several people mentioned that Var$(X+Y)$ = Var(X) + Var$(Y) + 2$cov(X,Y). A promising attempt at calculating the covariance was needed to get 4 out of 5.

  — The easy way of finding Var$(X+Y)$ is to use the Law of Total Variance directly on Var$(X+Y)$ by conditioning on Y. To do this, remember that Y is treated as a constant when conditioning on Y. For example:

  $\mathbb{E}(X+Y \mid Y) = Y + \mathbb{E}(X \mid Y)$, just as $\mathbb{E}(X+5 \mid Y) = 5 + \mathbb{E}(X \mid Y)$ for any other constant like 5;

  and

  Var$(X+Y \mid Y)$ = Var$(X \mid Y)$, just as Var$(X+5 \mid Y)$ = Var$(X \mid Y)$ for any other constant like 5.

  Alternatively, you could get full marks a harder way, if you remembered the formula for Var$(X+Y)$ = Var(X) + Var$(Y) + 2$cov(X,Y), and then correctly calculated cov$(X,Y) = \mathbb{E}(XY) - \mathbb{E}(X)\mathbb{E}(Y)$ using the Law of Total Expectation for $\mathbb{E}(XY)$.

  — A few people correctly formulated $\mathbb{E}(X) = \mathbb{E}_Y\{\mathbb{E}(X \mid Y)\} = \mathbb{E}_Y\{3+Y\}$, but instead of simplifying to $= 3+\mathbb{E}(Y) = 3+\lambda$, they used a much more complicated method by summing $\sum_{y=0}^{\infty}(3+y)\frac{\lambda^y}{y!}e^{-\lambda}$. This was usually done successfully, but then problems arose when Var$(3+Y)$ was needed, and nobody managed to find the variance correctly by the summation method. The point of the Laws of Total Expectation and Variance is to make your life easier by removing the need to do this involved algebra, so please check out how to do it the easy way.

- Not very many people got the sum in Question 2(c) correct. It would have been nice to see more people getting as far as $\mathbb{P}(X+Y=10) = \sum_{y=0}^{10} \mathbb{P}(X+Y=10 \,|\, Y=y)\mathbb{P}(Y=y)$, because this is just the Partition Theorem. Filling in the individual components is a bit more tricky, but mainly involves being very careful with expressions you already know well, like the Poisson formula.

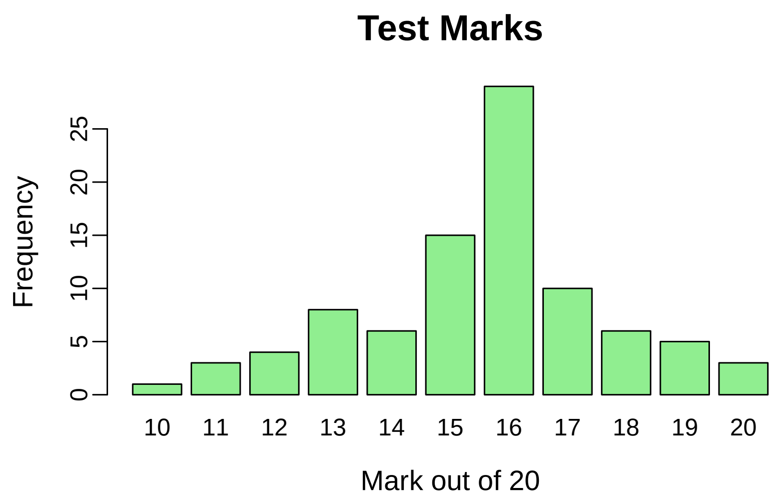
  Note that

  $\mathbb{P}(X+Y=10 \,|\, Y=y) = \mathbb{P}(X=10-y \,|\, Y=y)$ is correct;

  but

  $\mathbb{P}(X+Y=10 \,|\, Y=y) = \mathbb{P}(X=10-y)$ is wrong because you still need the dependence on Y.

A summary of the test results is shown below (out of 20 marks). Results for 325 students were a little better than results for 721 students, though both were broadly similar. 721 students must be very careful not to fall behind on 325 work, which is 80% of the final exam.



Minimum	1st Quartile	Median	3rd Quartile	Maximum	MEAN
10	15	16	17	20	15.6

Here are the grade boundaries that were used for last year's exam (325 students).

- The boundary for $A+$ was 87%.
- The boundary for $A-$ was 77%. About 45% of students gained $A-$ or above.
- The boundary for $B-$ was 62%. About 82% of students got $B-$ or above.
- The boundary for $C-$ was 50%. About 94% of students passed with $C-$ or better.

(Note that entry requirements for Stats 325 mean class ability is skewed towards the upper end.)

Exam Technique

If you get stuck, *skip the question and carry on.* There are *always* carry-through marks available for later parts — even if you have to make up the answer to an earlier part to continue. Just tell me what you're doing.

Clear working sends a strong signal of clear thinking. This is *important* because it means that discretionary marks will tend to go your way.

To see the level of detail that you should write in your answers, use the handwritten solutions to assignments and past exams. The past and mock exams are on the web page at `www.stat.auckland.ac. nz/~stats325/exams.php`.