MATHEMATICS

General Certificate of Education (New)

Summer 2018

Advanced Subsidiary/Advanced

APPLIED MATHEMATICS B – A2 UNIT 4 SECTION A

General Comments

Section A was generally very well answered. As this was the first assessment in the new specification, all the candidates sitting this paper were those who were completing the full A level in Mathematics in one year. The cohort sitting this paper was of a particularly high standard with very few weak candidates. Question 3 proved to be the most challenging question. In general, the conditional probability questions were not well answered.

Comments on individual questions

1. Parts (a) and (b) were generally very well answered. The algebraic solution and the alternative, Venn diagram solution were both widely used with those candidates drawing a Venn diagram generally more successful. Part (c) was not as well answered, with 0.3 being the elusive part of the solution. Many varying, incorrect numerators were given.

2. Forming and solving the quadratic equation in part (a) was generally well done. Solutions to part (b) were often disappointing, with many candidates failing to recognise either $\frac{9}{22}$ or $\frac{12}{32}$ as the probabilities required to answer this part successfully.

3. The vast majority of candidates were able to identify the distribution, the mean and the variance, with a small number of candidates stating incorrectly that it was the normal distribution or the Poisson distribution. Finding the probabilities $\frac{1}{4}$ and $\frac{7}{12}$ from the uniform distribution proved too challenging for most candidates. A common incorrect probability seen was $\frac{1}{3}$. Fewer still realised that they had to multiply the correct probabilities of $\frac{1}{4}$ and $\frac{7}{12}$ by 0.88 and 0.12 respectively. Candidates who attempted part (b)(i) and who were awarded method marks in part (b)(i) were often able to go on and answer part (b)(ii).

4. This question was generally well answered. Many candidates were able to give good explanations in parts (a), (c) and particularly (d). In part (b), some candidates only found the probabilities, which made comparing predicted and actual values in part (c), impossible.

5. This question proved to be accessible to most candidates. There was some confusion regarding the two-tailed hypothesis test, with some candidates concluding that there was evidence of a positive correlation. Similarly, there were candidates using a one-tailed test who failed to conclude that the evidence pointed towards a positive correlation. The most common error was in part (a), which was to compare the *p*-value with the product moment correlation coefficient in order to conclude that there was no correlation. They should, of course, have compared the *p*-value with 0.05 as the standard 5% significance level.

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APPLIED MATHEMATICS B – A2 UNIT 4 SECTION B

General Comments

All questions appeared to be accessible to most candidates and it was clear that they were able to finish section B of the paper.

The most challenging questions were notably 7(b), 8(b) and 9(b).

Comments on individual questions

6. This was the most successful question on the paper. Most candidates took moments about the pivot, meaning that there was no need to resolve vertically. It was encouraging to see candidates giving algebraic solutions in terms of g and showing that the end result is independent of g. Many candidates found the distance from *D* to the central pivot. Unfortunately, a small proportion of these candidates did not perform the final calculation to find *AD*, the required distance, and so lost the final A1 mark.

7. This was the most challenging question on the paper. Part (a) caused the least number of problems with many candidates correctly establishing the resistive force as $0.4v$. In part (b), many struggled to legitimately separate the variables, meaning that no further credit could be awarded. For those whose were successful in separating the variables, almost all of them recognised that the resulting integral was a logarithm. There were a small number of candidates who failed to see the importance of the modulus, and hence wrote incorrect expressions such as

$$\ln(-9.8-0.8v) = -0.8t + C\,.$$

For those candidates who attempted part (c), almost all of them recognised that $v = 0$ at the highest point of motion.

8. Overall, efforts were generally disappointing in this question. Part (a) was well received. As expected, almost all candidates correctly resolved the weight of the object parallel and perpendicular to the inclined plane. Consequently, almost all candidates achieved the first two marks for writing down the normal reaction and the maximum friction.

N2L was generally applied with the correct number of forces, although there were frequent sign errors meaning that the final two A1 marks were often sacrificed. Efforts in part (b) were relatively disappointing with many candidates failing to provide a convincing argument. It was evident that that many candidates did not fully appreciate the idea of limiting friction. Many considered $F_{\max}$ as a constant force acting down the plane, thus giving a negative net force. Some deemed this to be sufficient to justify that the object does not move up the plane, with a few using this fact to deduce movement down the plane.

9. Many candidates scored full marks in part (a) of this question on projectiles. A few candidates simply stated the formulae for the range of a projectile, namely $R = \frac{V^2}{g}\sin 2\theta$. However, as indicated in 2.4.8 of the specification, such responses unfortunately gain no credit. For part (b), many candidates were aware of the necessary methods, with some equating heights and others equating the appropriate horizontal distances. However, marks were often lost because of poor algebraic skills.

10. Overall, this question was relatively successful. In part (a), a small number of candidates only found the acceleration vector and hence forfeited the final A1 mark. In part (b), many candidates did not take advantage of the fact that the acceleration vector was constant. Therefore, many used repeated integration which led to unwieldy solutions. Nevertheless, many candidates achieved at least 2 of the 3 marks available with the omission of $\mathbf{r}_0$, the position vector of the particle at $t = 0$, being the main culprit for loss of the final A1.