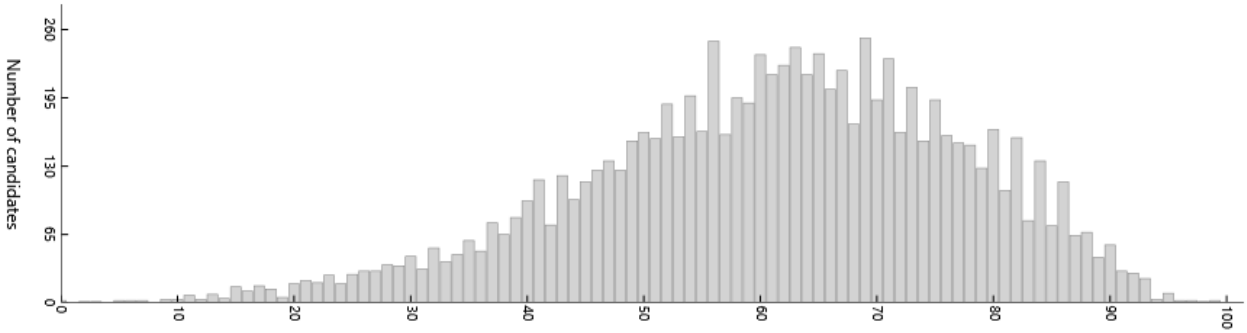
2017 ATAR course examination report: Mathematics Applications

Year	Number who sat	Number of absentees
2017	8992	174
2016	8867	199

Examination score distribution – Written



Summary

Attempted by 8992 candidates Mean 60.96% Max 99.31% Min 1.98%

The examination consisted of two sections: a Calculator-free section and a Calculator-assumed section.

Section means were:

Section One: Calculator-free	Mean 66.56%		
Attempted by 8989 candidates	Mean 23.30(/35)	Max 35.00	Min 1.98
Section Two: Calculator-assumed	Mean 58.01%		
Attempted by 8979 candidates	Mean 37.70(/65)	Max 64.31	Min 0.00

General comments

The examination was fair with some challenging questions, but with plenty of questions that candidates could attempt with confidence. It appeared that there was enough time to answer all questions. Question 2 (Hungarian algorithm) appeared to be the easiest on the paper with a mean of 80.45% and candidates found Question 14 (Loans) with a mean of 28.3% to be the most difficult.

The performance on the network questions this year was done well, with most candidates seeming to have a sound grasp of the terminology. However, questions that involved graphing (points or lines), were not done well. Many candidates did not use a ruler when graphing straight lines. Candidates are still struggling with questions that require some sort of explanation. Basic arithmetic skills are still lacking with many candidates, for example, not being able to convert 16 out of 80 to a percentage. The finance question in Section One proved to be a good discriminating question, with those candidates who read the question carefully, performing very well. However, it was apparent by the responses of many candidates that they thought they could not do the question without a calculator.

Advice for candidates

- Use a ruler when graphing straight lines.
- When asked to graph a least-squares line, clearly indicate the points you used to draw the line.
- Even when a question is worth 2 marks, show some form of working, as an incorrect answer not accompanied by working attracts no marks.

- Make sure you have carefully read the scale on a graph when asked to plot points.
- When writing explanations, write legibly.

Advice for teachers
- Ensure students understand and always use the correct terminology, especially in network questions.
- Emphasise to students to ask the question 'does the answer seem reasonable in the context of the question?'
- Encourage students to write down the values of N, I, PV etc. when using the finance app on their calculator.

Comments on specific sections and questions

Section One: Calculator-free (53 Marks)

Most candidates attempted all questions in this section and found it generally easier than Section Two. Basic arithmetic and algebraic skills were lacking, especially in Questions 1, 4 and 5. Question 4 and Question 6(a) proved to be the most discriminating questions.

Question 1 Attempted by 8936 Candidates Mean 3.62(/8) Max 8 Min 0
Part (a) was done well, with most candidates plotting the points correctly. Common errors were not labelling the axes correctly or not at all, and omitting the final point. Part (b) (i) was done poorly. Many candidates gave a recursive rule and others were not able to write the general rule correctly, even though Question 4 part (c) on last year's paper was identical. Candidates are still writing $T_n = 8 + (n-1) - 3$ rather than $T_n = 8 + (n-1)(-3)$. Part (b) (ii) was done poorly, with some of the common errors being –500 – 11 = –489, not being able to divide 511 by 3, stating that T_{171} was the actual term rather than being the term number. Very few candidates who stated that the term number was 171 gave the actual term (–502).

Question 2 Attempted by 8972 Candidates Mean 5.63(/7) Max 7 Min 0
Parts (a) and (b) (i) were done well generally. In part (b) (ii), most candidates knew why an allocation of drivers could not be made but could not state this correctly. Part (b) (iii) was done poorly. It was evident candidates had been shown two methods but switched between them in their solution. The most common error was entering the time in the table rather than the delivery number.

Question 3 Attempted by 8967 Candidates Mean 7.48(/11) Max 11 Min 0
Part (a) of the question did not explicitly state that the planar graph should be connected; however, candidates made this assumption, particularly as they were required to determine a Hamiltonian cycle for the graph in part (iii). There was no evidence reported by the examination of candidates drawing unconnected graphs. In part (a) (i), candidates performed well; however, poor arithmetic let some down. In Part (a) (ii), crossing paths was the main issue. In Part (a) (iii), a few candidates did not return to their starting node. In Part (a) (iv), candidates seemed to understand the concept but the main error was providing poor justification or poor analysis of their previously drawn graph. Parts (b) (i) and (ii) were done poorly. Common errors were stating the minimum as 5 and the maximum as 9. Part (b) (iii) was done well generally.

Question 4 Attempted by 8776 Candidates Mean 2.26(/5) Max 5 Min 0
Part (a) was done well generally. A common error was reading 4% instead of 6%. Part (b) was meant to be a straightforward question but there were few candidates who answered it correctly. Common errors were multiplying 4.060 by 100 and not realising that it was 4.060%, or trying to use the compound interest formula. Part (c) was also done poorly, with most candidates unable to multiply by 30. Again, many candidates tried using the compound interest formula, without considering that the interest needed to be written as a decimal.

Question 5 Attempted by 8984 Candidates Mean 6.99(/9) Max 9 Min 0
Parts (a) and (b) were done well generally. In part (c), candidates demonstrated poor arithmetic skills. $\frac{80}{16} = 20$ was a common error. In Part (d), association was interpreted poorly, with candidates writing long sentences which made no sense in the context of the question.

Question 6 Attempted by 8963 Candidates Mean 5.28(/7) Max 7 Min 0
Although part (a) was meant to be an easy question, candidates struggled to obtain the correct answer. An answer of 370 minutes was the most common response. Many candidates interpreted it as either a minimum path, minimal spanning tree or a maximum flow question. Part (b) was answered well, with most candidates obtaining the correct minimal spanning tree. The most common error was not adding up the branches correctly.

Question 7 Attempted by 8914 Candidates Mean 4.18(/6) Max 6 Min 0
Part (a) was answered well generally. A common mistake was stating it is not semi - Eulerian because of the bridge. Part (b) was also done well, with only a few candidates not drawing a planar graph.

Section Two: Calculator-assumed (94 Marks)
Most candidates attempted all questions in this section. It appeared candidates found this more difficult than the first section. Some of the finance questions, particularly Question 14, proved to be the most difficult. Showing inadequate working was quite common. This resulted in candidates not attracting full marks for their answers.

Question 8 Attempted by 7937 Candidates Mean 2.57(/6) Max 6 Min 0
Part (a) was done quite well, with candidates using a wide range of strategies to answer the problem. These included the finance app, e-activities, compound interest formula and sequence apps. Candidates often solved for the $6000 perpetuity rather than the principal amount of $98 974. Part (b) highlighted the candidate's ability to use the finance app on their calculator. Some candidates had trouble identifying the payments, compounds and present and future values for the investment.

Question 9 Attempted by 8732 Candidates Mean 9.58(/13) Max 13 Min 0
Parts (a) (i) and (a) (ii) were done well by candidates, except for those who rounded incorrectly. Part (a) (iii) was done poorly, with very few candidates recognising that the gradient of the least-squares line was monthly. Parts (a) (iv) and (a) (v) were done very well, apart from candidates not acknowledging that the answer for (a) (v) had to be a percentage. Part (b) (i) was done very well. The major issue was that some candidates did not read the scale on the graph correctly. In part (b) (iii), most candidates stated that a linear model was not appropriate; however, their reasons were often incorrect.

Question 10 Attempted by 8918 Candidates Mean 7.20(/12) Max 12 Min 0
In part (a), most candidates only selected the first equation as being correct and looked no further. Parts (b) and (c) were done quite well, with most candidates solving the equation correctly but not stating the correct week. In part (d), most candidates were able to determine the population after eight weeks but seemed unsure of what to do next. Part (e) was done quite well, with many candidates calculating R = 1.28 correctly but then some did not state the new growth rate of 28%. Part (f) was also done quite well. The most common error was not converting the days into weeks.

Question 11 Attempted by 8905 Candidates Mean 8.21(/11) Max 11 Min 0
Part (a) was done well generally. The most common error was leaving out Activity E. Part (b) was done very well since Activity E was not on the critical path. Part (c) was done poorly. Candidates should be encouraged to show full working on their diagrams, indicating backwards and forwards scans. Part (d) was done poorly, with many candidates often getting the completion times as 34 and 35 hours and then choosing 35 as the answer. This could be because with project networks, the longest time is the important time.

Question 12 Attempted by 8889 Candidates Mean 4.52(/8) Max 8 Min 0
Part (a) was done quite well; however, some candidates demonstrated poor graphing skills, especially interpreting scale. Although part (b) was meant to be a routine question, many candidates did not indicate two points on the graph and simply drew the line by eye. Also, many candidates did not use a ruler. Part (c) was done well. In part (d), many candidates did not recognise the pattern and hence stated 'linear'. Part (e) was not answered well, with many candidates contradicting themselves by saying 'yes', the statement was true, but then saying that correlation does not imply causation.

Question 13 Attempted by 8851 Candidates Mean 5.31(/8) Max 8 Min 0
Part (a) was done well generally. The most common error was stating the answer as 49 cars per hour, instead of 4900 cars per hour. Part (b) was either done well or not at all. Most candidates did not seem to understand the correct use of minimum cut. Part (c) (i) was done well. Part (c) (ii) was done well generally; however, many candidates either stated the increase or the maximum flow, but not both.

Question 14 Attempted by 8564 Candidates Mean 3.68(/13) Max 13 Min 0
Part (a) (i) was not answered well, with many candidates not dividing the annual rate by 12 or subtracting the deposit from the loan. Part (a) (ii) was done well generally. In part (b), most candidates used the finance app on their calculator rather than the recursive rule. Those candidates who gave a correct answer without any supporting evidence did not receive full marks. Parts (c) and (d) were done poorly. In part (e), many candidates did not appreciate that the answer to this question was effectively developed for them using answers from previous parts of the question. Very few candidates coped well with this question.

Question 15 Attempted by 8872 Candidates Mean 9.34(/15) Max 15 Min 0
Parts (a) (i) and (ii) were done well generally. Although part (b) (i) was done well generally, some candidates did not round the value of *C* correctly. Part (b) (ii) was done well generally, apart from some candidates writing 1.554 instead of 1.1554. Part (b) (iii) was done well by most candidates; however, some omitted this question completely. Part (b) (iv) was done poorly, with many candidates demonstrating a lack of graphing skills. Part (b) (v) was done well generally. The most common error was candidates not multiplying by the seasonal index for December. Part (b) (vi) was done very poorly. Most candidates stated that it was extrapolation and, therefore, unreliable. However, making predictions within one cycle of known data, in time series questions, is reliable.

Question 16 Attempted by 8613 Candidates Mean 5.41(/8) Max 8 Min 0
Part (a) (i) was done very poorly. Many candidates simply stated that it was a 7.5% decrease in population (information that was given in the question). Other common errors were candidates stating that the population is increasing by 0.925, or that 0.925 crocodiles remain. Some candidates even interpreted 0.925 as a correlation coefficient. Part (a) (ii) was done well by candidates. Part (b) was done well generally, with most candidates able to plot the correct points. Responses in part (c) were varied, with candidates often omitting to note that the population was increasing before reaching a steady state. The word 'exponentially' was used frequently. Part (d) was done well generally.