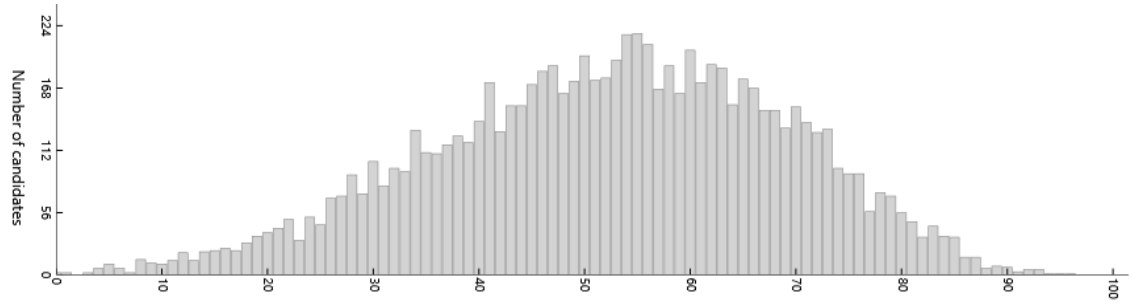
2018 ATAR course examination report: Mathematics Applications

Year	Number who sat	Number of absentees
2018	8451	178
2017	8992	174
2016	8867	199

Examination score distribution–Written



Summary

The examination consisted of two sections, Section One: Calculator-free and Section Two: Calculator-assumed.

Attempted by 8451 candidates	Mean 52.22%	Max 95.74%	Min 0.00%
Section means were:			
Section One: Calculator-free	Mean 55.37%		
Attempted by 8448 candidates	Mean 19.38(/35)	Max 33.73	Min 0.00
Section Two: Calculator-assumed	Mean 50.60%		
Attempted by 8439 candidates	Mean 32.89(/65)	Max 63.65	Min 0.00

General comments

The examination, although a little more challenging than last year, seemed to be well received by most candidates. It provided enough questions or part-questions for candidates to score well. Some feedback suggested that insufficient time was an issue with Section one, despite the mean being higher than that for Section two. This course requires candidates to process questions and identify key information needed to analyse and solve problems in an applied context. Therefore, the examination reflected the rationale of the course by requiring candidates to have good comprehension skills, not just good arithmetic skills.

Advice for candidates

- Pay attention to the context of the question.
- In finance questions, give answers to the nearest cent.
- Highlight your answer, so that it stands out when you have written all over the space that has been allocated for the answer.
- Use a ruler for the drawing of any lines.
- Provide working for all questions worth two or more marks.

Advice for teachers

- Emphasise the importance of correct terminology in mathematics, not only with respect to the syllabus.
- Emphasise the sum in a cut for flow diagrams is dependent on the direction of flow for each edge.
- Ensure that students check their arithmetic.

Comments on specific sections and questions

Section One: Calculator-free (55 Marks)

Candidates attempted most questions in this section, with best performances being in Questions 1 and 2. Parts of Question 6 and most of Question 7 proved to be the most discriminating questions, with many candidates performing poorly.

Question 1 attempted by 8335 Candidates Mean 3.27(/4) Max 4 Min 0
Part (a) was done well, although some candidates attempted to determine the maximum flow for the diagram. Part (b) was done well generally; however, some candidates struggled to sum eight 3-digit numbers correctly.

Question 2 attempted by 8433 Candidates Mean 5.65(/8) Max 8 Min 0
Part (a) was done well. Part (b) was done poorly, with many candidates seeming not to remember the definition of a trail (as per the glossary). Part (c) was done well generally, with only a few candidates giving the route CDEB rather than CDEAB. Part (d) was done well generally; however, some candidates' answers implied that they thought the Hamiltonian path had to start and finish at the same vertex.

Question 3 attempted by 8367 Candidates Mean 4.11(/9) Max 9 Min 0
In Part (a) most candidates stated correctly that the association was strong but did not do particularly well in identifying the non-linear form. Part (b) was done poorly, with most candidates unable to square root 49%. The most common incorrect answer was 0.49. Part (c)(i) was done poorly considering similar questions have been asked in previous examinations. Common mistakes included simply stating that it was a strong positive gradient and giving the increase as 0.83 litres instead of 83 litres. Part (c)(ii) was done well generally; however, some candidates stated it was interpolation, not realising the data stopped at eight. Part (d) was done poorly, with most candidates not exhibiting understanding of what a non-causal explanation was and just stating more people equals more water.

Question 4 attempted by 8433 Candidates Mean 5.21(/8) Max 8 Min 0
Part (a) was done very well. Part (b) was done well generally, with the most common error being referring to workers and machines rather than rows and columns of the matrix. Part (c) was done well, apart from some candidates attempting to minimize the length of shade cloth. Also, some candidates struggled to work with the column of zeros, completely ignoring them when performing row reductions.

Question 5 attempted by 8362 Candidates Mean 5.71(/9) Max 9 Min 0
Part (a)(i) was done well generally; however, a common mistake was candidates just stating the adjacency matrix was not symmetrical and failing to mention the leading diagonal. Part (a)(ii) was also done well generally, apart from some candidates giving only one reason. In part (b)(i) most candidates could identify the correct element in the matrix but failed to mention it was a two-stage matrix. Part (b)(ii) was done well generally. In part (c)(i) many candidates failed to identify the two odd nodes and mostly joined vertices D and E. Part (c)(ii) was not answered well, with many candidates confusing the difference between Eulerian and semi-Eulerian.

Question 6 attempted by 8277 Candidates Mean 5.50(/11) Max 11 Min 0
Part (a) was done well generally. The most common error was not connecting task W to the end of the network. Part (b) was done well generally, with many candidates stating the correct critical path, but poor arithmetic led to the incorrect minimum completion time. Parts (c)(i) and (ii) were done well generally; however, some candidates gave non-zero float times for activities on the critical path. Part (d) was done poorly, with most candidates giving an elapsed time rather than an a.m./p.m. time. Part (e) was done very poorly. While almost all candidates recognised that the minimum completion time would increase, they could not justify this mathematically.

Question 7 attempted by 7402 Candidates Mean 1.45(/6) Max 6 Min 0
Part (a) was done poorly. Candidates who determined the ratio as $\frac{24}{36}$ could not simplify it to $\frac{2}{3}$. Also, many candidates did not recognise the sequence as geometric. Part (b) was done poorly, with many candidates not knowing the difference between a recursive rule and a rule for the nth term. The lack of brackets was quite common, i.e. $\frac{2}{3}^{n-1}$ rather than $\left(\frac{2}{3}\right)^{n-1}$. Part (c) was done very poorly or not at all. Candidates had difficulty expanding $\left(\frac{2}{3}\right)^4$ or $\left(\frac{2}{3}\right)^5$ giving answers as $\frac{8}{12}$ or $\frac{10}{15}$.

Section Two: Calculator-assumed (96 Marks)
Most candidates attempted all questions in this section. Question 14, a finance question, and Question 17, a maximum flow network question, proved to be the most difficult. Many candidates did not showing adequate working for questions worth more than two marks.

Question 8 attempted by 7770 Candidates Mean 3.13(/7) Max 7 Min 0
Part (a)(i) was answered well generally, with most candidates completing the table correctly. Part (a)(ii) was also done well generally. Common mistakes included stating $T_1 = 4500$ rather than $T_0 = 4500$ and using $T_n\left(1+\frac{0.0324}{4}\right)^4$. Part (b) was not answered well, with many candidates misinterpreting the question and not including calculations.

Question 9 attempted by 8188 Candidates Mean 4.66(/8) Max 8 Min 0
Part (a) was done quite well, with most candidates giving the correct percentage. Part (b) was done well generally, although some candidates did not round to a whole number. Part (c) was done well generally, with most candidates adequately describing the situation without using the term ‘steady state’. Part (d)(i) was done quite well. The most common mistake was stating term ten instead of term eleven for the value of *c*. Part (d)(ii) was done quite well, apart from those candidates that misread thirtieth for thirteenth. Part (e) was done well generally; however, even though the equation was given, many candidates could not get started.

Question 10 attempted by 8382 Candidates Mean 5.25(/8) Max 8 Min 0
Part (a) was done very well. Part (b) was not answered well, with most candidates comparing the percentages of the three categories rather than the total new vehicle sales. Part (c) was done well generally; however, many candidates compared percentages of sales rather than number of sales. Part (d) was done fairly well, apart from those candidates who referred to particular states rather than all other states.

Question 11 attempted by 7656 Candidates Mean 3.86(/8) Max 8 Min 0
Part (a) was done well generally. Common mistakes included omitting the minus sign on either PV or FV and not supporting an answer with justification as required by a three-mark question. Part (b)(i) was done well generally, apart from those candidates who did not round down to 12 whole years. Part (b)(ii) was not answered well, with many candidates not giving the correct value of N or putting P/Y = C/Y = 1.

Question 12 attempted by 8275 Candidates Mean 3.45(/6) Max 6 Min 0
Part (a) was done very well generally. Part (b) was also done well generally, with only a few mathematical errors in the calculation of the values of B and C. Part (c) was not answered well, with many candidates opting for the 4-point centred moving average.

Question 13 attempted by 8308 Candidates Mean 7.41(/13) Max 13 Min 0
Part (a) was done well generally; however, many candidates had difficulty interpreting the scale. Part (b)(i) was done well, with most candidates able to plot the line correctly. A ruler would have helped with the accuracy of the plot. Part (b)(ii) was done well generally, with most candidates able to describe the trend; however, not many candidates referred to the high and low points of the graph. Part (c) was done poorly, with many candidates writing an answer only, without providing working. Also, most candidates treated this as a prediction type question. Parts (c)(i) and (ii) were done well generally. The most common errors included choosing the wrong index, or multiplying when it should have been dividing, or dividing when it should have been multiplying.

Question 14 attempted by 7736 Candidates Mean 3.41(/12) Max 12 Min 0
Part (a)(i) was done poorly, with many candidates not stating the recurrence relation; or if they did state the recurrence relation, not giving the value of T_0 and giving the wrong interest rate. Part (a)(ii) was also done poorly, with many candidates only stating an answer. Many candidates who provided working failed to subtract 36 from their answer. Part (b) was done very poorly or not at all. Most candidates did not treat this as a compounding problem, misinterpreting it as a linear reduction. Part (c) proved difficult for most candidates. However, some candidates did identify the time taken to pay off the loan but were unable to go further.

Question 15 attempted by 8217 Candidates Mean 8.92(/12) Max 12 Min 0
Part (a) was done well generally. Part (b)(i) was also done well generally, apart from candidates using the incorrect variables for the least-squares line. Part (b)(ii) was done quite well. Part (b)(iii) was done well generally. Part (b)(iv) was done quite well, with only a few candidates not using the dollar sign. Part (c)(i) was done well generally; however, some candidates failed to plot the points correctly. Part (c)(ii) was done well generally. Part (d) was also done well generally. Overall this question proved to be one of the better questions in terms of overall performance.

Question 16 attempted by 7771 Candidates Mean 6.23(/11) Max 11 Min 0
Parts (a) and (b) were done well generally. The most common mistake was not referring to the compounding period. Part (c) was done well generally, with most candidates determining the best account. Part (d) was also done well generally, with most candidates showing the required result adequately. Part (e) was done well generally. The most common error was stating the value of $c = 1.06$. Part (f)(i) was done well generally. The most common errors included not subtracting from 35 000 to determine the shortfall and not rounding to two decimal places. Part (f)(ii) was done well generally but there were some candidates who took the result from part (f)(i) and divided this value by 24.

Question 17 attempted by 8183 Candidates Mean 4.37(/11) Max 11 Min 0
Part (a) was done moderately well but many candidates did not determine the value of cuts 2 and 3 by not observing that there was flow in the opposite direction. Parts (b)(i) and (ii) were done poorly, with many candidates struggling with the interpretation of the flow diagram. Part (c) was done poorly, with most candidates stating that all pipes were at full capacity. Part (d) was done well generally. Parts (e)(i) and (ii) were done poorly. Many candidates did not appear to understand the effects of the increase across the network of pipes.