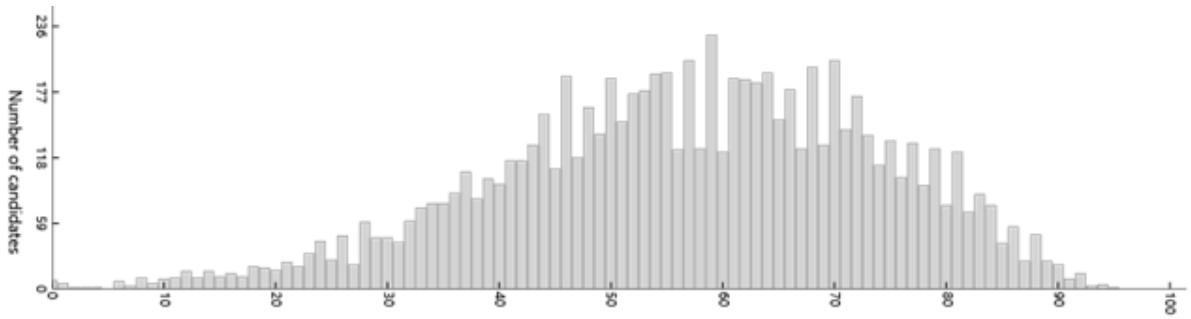
2019 ATAR course examination report:
Mathematics Applications

Year	Number who sat	Number of absentees
2019	8047	163
2018	8451	178
2017	8992	174
2016	8867	199

Examination score distribution–Written



Summary

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

Attempted by 8047 candidates	Mean 56.78%	Max 94.81%	Min 0.00%
Section means were:			
Section One: Calculator-free	Mean 66.08%		
Attempted by 8040 candidates	Mean 23.13(/35)	Max 34.36	Min 0.00
Section Two: Calculator-assumed	Mean 51.92%		
Attempted by 8029 candidates	Mean 33.75(/65)	Max 61.75	Min 0.00

General comments

The examination provided enough questions or part questions for candidates to score reasonably well, with some questions allowing for discrimination between candidate ability. The length of the paper seemed appropriate with 89% of the candidates attempting Question 16 and 85% attempting Question 17. Candidates appeared to be more efficient in the use of CAS calculators with the finance questions. Basic arithmetic skills was lacking amongst many candidates.

Advice for candidates

- Pay attention to the scales on the axes of graphs.
- Show working even if the question is worth only two marks.
- Provide the correct units when required.
- Use brackets when squaring negative numbers on the calculator.

Advice for teachers

- Continue to emphasise the importance of correct terminology.
- Stress the importance of rounding to the nearest whole number when dealing with discrete objects.
- Stress the importance of reading the question carefully.

Comments on specific sections and questions

Section One: Calculator-free (55 Marks)

Candidates performed well in this section, with best performances being in Questions 3 and 4. Question 5 appeared to be the discriminating question.

Question 1 Attempted by 8022 Candidates Mean 6.13(/8) Max 8 Min 0

Part (a) was done well, although some candidates did not use the correct terminology for the naming of edges, the word 'lines' was common. Generally, part (b) was done well, however, some candidates used Euler's formula to calculate missing edges, vertices or faces rather than showing the graph satisfies Euler's formula. Part (c) was done well. The common error was the route A to A, sometimes given as 2 rather than 1. Part (d) was done poorly, with many candidates either writing multiple walks or writing A-A instead of A-A-A.

Question 2 Attempted by 7984 Candidates Mean 5.87(/9) Max 9 Min 0

Part (a) was done well. Part (b) was not done well. Most candidates substituted 10 into the equation but many could not multiply 10.55 by 10 or add two three-digit numbers correctly. Many candidates failed to round the value to a whole number with many candidates not remembering the definition of a trail. Generally, part (c) was done well, with some candidates not paying attention to accuracy when graphing a line. Most candidates used a ruler. In part (d)(i), most candidates were able to draw an approximate residual plot and could follow through from their plot in part (d)(ii).

Question 3 Attempted by 7969 Candidates Mean 7.17(/10) Max 10 Min 0

Most candidates performed well in this question. In part (a), common errors were forgetting thousands and writing totals in the boxes rather than CDAB. In part (b), some candidates struggled with the subtraction of two-digit numbers. In part (c), some candidates minimised rather than maximised the profit.

Question 4 Attempted by 8028 Candidates Mean 8.29(/11) Max 11 Min 0

Part (a)(i) was done very well with only a few candidates writing a route rather than a distance. Generally, part (a)(ii) was done well. The most common error was giving the incorrect route ETUV 2.2 km. Part (c) was done well apart from some candidates not starting at the entrance E. There were a few candidates who visited T twice. Part (c)(i) was done well, with the most common error being the absence of the minimum total length of piping. The lack of units was also quite common. Part (c)(ii) was done very well, with some candidates saying it decreased by one instead of 0.1. Many candidates could not add decimals; for example, 0.8 + 0.7 = 0.15.

Question 5 Attempted by 7992 Candidates Mean 5.53(/11) Max 11 Min 0
Generally, part (a) was done well, with many candidates completing most of the table correctly. Many candidates were unable to identify that H was also a predecessor of L. Part (b) was done well, with most candidates completing at least four nodes correctly. In part (c) most candidates could identify the correct path. A common error was giving the path as BHNM. Part (d) was done rather poorly, with most candidates incorrectly stating that D and F had the same float time. Part (e) was done poorly, with many candidates giving an answer of 13, the number of tasks. Part (f) was not answered well, candidates either knew what to do or not. Part (g) was done poorly. One of the most common responses was 'It is a dummy path'.

Question 6 Attempted by 7755 Candidates Mean 3.65(/6) Max 6 Min 0
Candidates performed well in all parts of the question. In part (b), those candidates using successive trials did not reach the correct conclusion of 40. A common mistake with the algebraic approach was $\frac{20}{0.5} = 10$.

Section Two: Calculator-assumed (100 Marks)
Most candidates attempted all questions in this section. The last three questions had means below 50% contributing to the low mean for this section. Candidates were comfortable with routine calculations, but had difficulty with questions that required written justification.

Question 7 Attempted by 7739 Candidates Mean 2.72(/6) Max 6 Min 0
Part (a) was done poorly. Many candidates either stated a recursive rule or gave the value of *A* as 84. Part (b) was done well. The performance in part (c) was poor. Many candidates did not understand what was meant by 'after eight minutes' and just repeated what they did in part (b). Generally, part (d) was done well.

Question 8 Attempted by 7880 Candidates Mean 6.96(/13) Max 13 Min 0
Part (a) was answered well, however, some candidates had trouble reading the scale correctly. Part (b) was done well. Common mistakes included using *x* and *y* and not stating the coefficient of determination. Part (c) was done well, with most candidates identifying an increase, but using incorrect units. Generally, part (d) was done well, with most candidates determining an estimate for *T* but misinterpreting this value to be the charge. Part (e) was done well. Parts (f)(i) and (f)(ii) were done poorly. In part (f)(i) many candidates did not use the least-squares line correct to three decimal places. For part (f)(ii), most candidates did not understanding the requirements of the question.

Question 9 Attempted by 7787 Candidates Mean 4.74(/9) Max 9 Min 0
Part (a) was done quite well. Common mistakes included using N = 2 and having different signs for PV and PMT. For those candidates who used recurrence rounded the multiplier to 1.0022 or 1.00216 instead of using $\left(1+\frac{2.6}{1200}\right)$. Generally, part (b) was done well, although some candidates did not round to 62 months. Part (c) was not done well, with many candidates giving N = 48 and reducing FV by 10 000 instead of increasing PV by 10 000.

Question 10 Attempted by 7435 Candidates Mean 4.11(/7) Max 7 Min 0
Part (a) was done reasonably well. It was evident that some candidates seem to have difficulty with the concept of 'show mathematically'. Although part (b) was answered well, many candidates still do not know what is meant by a rule for the n^{th} term and gave a recursive rule. Part (c) was done poorly. Common mistakes included not stating a calendar year, giving the year as 2026 or just giving a term number $n = 34$. Part (d) was done well apart from those candidates that gave the incorrect value for the number of stores in 2012.

Question 11 Attempted by 7905 Candidates Mean 7.13(/13) Max 13 Min 0
Generally, parts (a) and (b) were done well. Part (c) was meant to be a straightforward question, but many candidates multiplied by the seasonal index rather than dividing. Part (d) was done well. Part (e) was done well, but common mistakes included using *n* = 17 and forgetting to multiply by the seasonal index. Part (f) was done poorly. Very few candidates understood that two different methods can be used to smooth data. Part (g) was done poorly, with many candidates just stating that correlation does not imply causation rather than answer in the context of the question. Part (h) was done well.

Question 12 Attempted by 7911 Candidates Mean 4.65(/6) Max 6 Min 0
Part (a)(i) was done very well. Generally part (a)(ii) was done well, however, some candidates clearly did not know what was meant by bipartite. Part (b) was also done well.

Question 13 Attempted by 7679 Candidates Mean 5.55(/10) Max 10 Min 0
Part (a) was done well, however, many candidates used T_1 instead of T_0 and forgot to divide the interest rate by 12. Part (b) was done well, with most candidates using the Finance Application rather than the recursive definition. Part (c) was done well. A common error was not accounting for all the deposits. Part (d) was done well, but a common mistake was to calculate 3 years of $120 deposits.

Question 14 Attempted by 7838 Candidates Mean 6.65(/10) Max 10 Min 0
Part (a)(i) and (a)(ii) were done well. In part (a)(i), a common error was stating the values in thousands of dollars. In part (a)(ii) many candidates rounded to the nearest whole number and hence came up with the wrong conclusion. Part (a)(iii) was done poorly with most candidates not identifying a decrease. Generally, part (b) was done well. In part (b)(i), some candidates discussed both graphs and some had no idea what was meant by form. In part (b)(ii), some candidates incorrectly chose 1.25 or –1.25.

Question 15 Attempted by 7819 Candidates Mean 4.99(/11) Max 11 Min 0
Parts (a), (b), (c) and (d) were done well. In part (a), the flow for Cut 2 caused problems for some candidates. In part (b), some candidates incorrectly wrote P as the source. In part (d), some candidates tried to use Diagram 2 to determine the minimum cut. Part (e) proved to be a discriminating question since both options increased the flow by two. Candidates that had partial success with this question only considered one proposal rather than both.

Question 16 Attempted by 7188 Candidates Mean 3.47(/7) Max 7 Min 0
All parts of the question were done well. In part (a), common errors included stating $r^2 = -0.25$, wasting time calculating the mean for the data and/or not mentioning the word 'variation' in their interpretation. In part (b), some candidates forgot to state the correlation coefficient. A common error in candidate responses for part (c) was incorrectly stating that the correlation coefficient was higher.

Question 17 Attempted by 6815 Candidates Mean 3.19(/8) Max 8 Min 0
Most candidates performed well in this question. In part (a), common errors included not dividing the annual interest by 12 and/or forgetting to add on the monthly contribution. In part (b), common errors included using N = 7 rather than 84, having different signs for PV and PMT and/or using an interest rate of 7.5% instead of 6.5%. In part (c), a common error was using N = 20 rather than 240. For part (d), common errors included having the same signs for PV and FV and incorrectly using effective rate of interest.