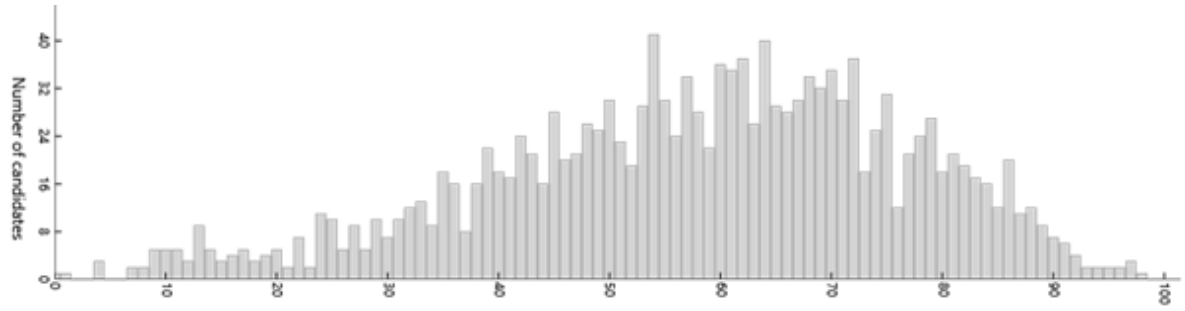
Government of **Western Australia**
School Curriculum and Standards Authority

Summary report of the 2020 ATAR course examination:
Mathematics Specialist

Year	Number who sat	Number of absentees
2020	1526	23
2019	1435	32
2018	1546	21
2017	1463	12

The number of candidates sitting and the number attempting each section of the examination can differ as a result of non-attempts across sections of the examination.

Examination score distribution–Written



Summary
The examination consisted of Section One: Calculator-free and Section Two: Calculator-assumed.

Attempted by 1525 candidates	Mean 57.74%	Max 97.82%	Min 0.00%
Section means were:			
Section One: Calculator-free	Mean 64.56%		
Attempted by 1525 candidates	Mean 22.59(/35)	Max 35.00	Min 0.00
Section Two: Calculator-assumed	Mean 54.08%		
Attempted by 1525 candidates	Mean 35.15(/65)	Max 64.24	Min 0.00

General comments
The paper appeared to be well received, yet it contained some different questions that required a deep level of understanding. However, the paper still contained a range of questions allowing the typical Mathematics Specialist candidate to show facility with key standard concepts.

A proportion of the candidates did not appear to be prepared for questions, such as Question 4, that involved the case of non-parallel planes yielding no solutions. It is notable that this concept had not been examined previously in the Mathematics Specialist ATAR papers of 2016–2019. Question 6 linked several separate areas of the course (inverse functions, implicit differentiation, and integration by partial fractions) and many candidates seemed unaccustomed to this combination of ideas.

Questions requiring concept development/proof (Questions 8 and 20) allowed the most capable candidates to exhibit their talent.

The length of the paper was deemed to be appropriate, as evidenced by the high percentage of candidates attempting Questions 19 (99%), 20 (92%) and 21 (91%).

The distribution of marks in 2020 exhibits a large spread, indicated by the standard deviation of 18.79%, which was similar to the 2019 figure of 18.93%. This points to the wide range of abilities of the Mathematics Specialist 2020 cohort.

Advice for candidates

- Ensure that working is copied correctly from line to line. For example, in Question 2, many candidates wrote a negative number in one line that then became a positive number in the next line.
- Improve the command of algebra and the use of brackets.
- Ensure your working shows an obvious sequence of steps and conclusion, enabling the marker to follow your line of thought and to observe a conclusion. Markers cannot be expected to extract meaning from a collection of numbers on the page.
- Ensure that the correct units are used in giving answers, particularly in questions asking for a rate of change. Careful reading of the question is central to this.
- Improve the legibility of digits.

Advice for teachers

- Provide opportunities for students to prove mathematics results, specifically in the vectors section of the syllabus.
- Improve the conceptual understanding of the intersection of planes in space, the understanding of the connection between logistic growth and its corresponding differential equation, and with motion where the velocity is given as a function of displacement.
- Emphasise the use of correct mathematics vocabulary and provide students with opportunities to explain mathematics concepts.

Comments on specific sections and questions

Section One: Calculator-free (49 Marks)

Candidates performed quite well on many straightforward questions in this section. The mean score of 64.56% reflected this. It was gratifying to see a number of able candidates being able to show concise and original solutions in Question 8.

Strengths in this section were:

- determining the rational function coefficients from the graph (Question 3)
- sketching the graph of the reciprocal of a given function (Question 5 part (a))
- writing the inverse rule of the given trigonometric function (Question 6 part (a))
- using an integration constant for an anti-derivative (Question 6 part (d)).

Weaknesses evident in this section were:

- calculation of the cross product (Question 2 part (a))
- understanding of the intersection of planes in space (Question 4)
- algebraic shortcomings with the integration using a given substitution (Question 7).

Section Two: Calculator-assumed (86 Marks)

Candidates did not perform as well (mean of 54.08%) compared to the Calculator-free section, primarily since it contained some questions that required a depth of conceptual understanding beyond routine skill or textbook-type questions. Question 15 part (b) and Question 20 were more testing for candidates. The last question on the paper (Question 21) was generally well attempted, despite many bypassing or finding Question 20 too difficult. Most candidates were able to construct a fair response to this question that tested understanding of how a function's graph determines the number of solutions to an equation.

Strengths in this section were:

- solving the complex equation giving solutions in correct polar form (Question 13)
- the improved performance in making a comparison between a sample mean and a known population mean (Question 18 part (c))
- use of the technique of increments (Question 19 part (c)).

Weaknesses evident in this section were:

- choosing the appropriate form of a complex number (Question 11 part (a))
- converting a complex number (in quadrant III) into the correct polar form (Question 15 part (a))
- forming the correct area expression using an appropriate definite integral (Question 16 part (a))
- the ability to form correct vector expressions (Question 20 part (a))
- the ability to form the correct area expression (Question 20 part (b)).