Time allowed

- Perusal time: 10 minutes
- Working time: 3 hours

Examination materials provided

- Paper Two – Question book
- Paper Two – Resource book
- Multiple-choice response sheet
- Paper Two – Response book

Equipment allowed

- QSA-approved equipment
- ruler (metric, parallel or rolling)
- protractor
- drawing compass
- set squares
- templates (without formulas)
- non-programmable calculator
- graphics/graphing calculator

Calculators with computer algebra system (CAS) functionality are not allowed.

Directions

You may write in this book during perusal time.

Paper Two has two parts:

- Part A: Questions 1–10 (multiple choice)
- Part B: Questions 1–5 (extended response)

Attempt all questions.

Suggested time allocation

- Part A: 30 minutes
- Part B: 2 hours 30 minutes

Assessment

Assessment standards are at the end of this book.

After the examination

Take this book when you leave the examination room.
Planning space
Part A

Multiple-choice

Suggested time allocation: **30 minutes**.

Part A has 10 questions of equal value. The questions assess Knowledge and Procedures (KP) and Modelling and Problem solving (MP).

Attempt all questions.

Each question contains four options, one of which is correct or is the best option. Respond to each question by selecting one of the four possible options and blackening the appropriate circle on the multiple-choice response sheet. Use a 2B pencil to blacken the circles.

No credit for your response will be given if more than one circle is blackened.

**Question 1**

The true bearing of the entrance to a harbour is 203°T. If the variation is 5°W, what compass course should be steered to get to the harbour’s entrance?

A 193° magnetic

B 198° magnetic

C 203° magnetic

D 208° magnetic

**Question 2**

Betty owns a holiday park and has been quoted $45 per metre (inclusive of GST) to provide connecting paths to each of the cabins, as shown below. All measurements are in metres.

What is the least it will cost Betty to provide each cabin with at least one concrete path that connects to the network?

A $6435

B $6885

C $7470

D $8820
Question 3

The histogram below displays the numbers of people visiting a museum by age groupings across five days.

![Histogram](image)

The average daily number of people visiting the museum is closest to

A 19.
B 33.
C 40.
D 167.

Question 4

Zali borrows $420000 to buy a house. Interest is charged at 7.2% p.a. compounding monthly.

At the end of the first month, she makes a $4000 payment. How much does she now owe?

A $410240
B $418496
C $418520
D $445952
**Question 5**

What is the true bearing of A from B?

A 031°  
B 149°  
C 239°  
D 329°

---

**Question 6**

Using the internet, Bruno was able to obtain loan quotations from four banks for his fashion business. Bruno recorded the emailed quotations as follows:

<table>
<thead>
<tr>
<th>Monthly repayment on $1000 borrowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual interest rate (compounding monthly)</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>3.4%</td>
</tr>
<tr>
<td>3.8%</td>
</tr>
<tr>
<td>4.0%</td>
</tr>
<tr>
<td>4.6%</td>
</tr>
</tbody>
</table>

On a loan package of $70000, which loan arrangement has the least interest?

A 3.4% per annum compounding monthly over 10 years  
B 3.8% per annum compounding monthly over 9 years  
C 4.0% per annum compounding monthly over 8 years  
D 4.6% per annum compounding monthly over 7 years
Question 7

Last year Stanley purchased 150 shares at $2.00 a share. They are now worth $2.50 per share. Stanley receives a dividend of $0.10 per share.

What is the yield percentage?

A 4%
B 5%
C 10%
D 20%

Question 8

David randomly selected a coloured pen from a bag of pens. He recorded its colour and returned it to the bag. David repeated this process a number of times but did not complete his table.

<table>
<thead>
<tr>
<th>Pen colour</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Blue</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Black</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Green</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Orange</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on these experimental results, what is the probability that David will select an orange pen on his next selection?

A 20%
B \( \frac{3}{25} \)
C 0.32
D \( \frac{8}{17} \)
**Question 9**

The following table shows statistics of the results of the five in-class mathematics tests for Jay, Rhys, Shannon and Stephanie.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jay</td>
<td>13.6</td>
<td>3.8</td>
<td>7</td>
</tr>
<tr>
<td>Rhys</td>
<td>13.9</td>
<td>4.2</td>
<td>7</td>
</tr>
<tr>
<td>Shannon</td>
<td>13.8</td>
<td>2.7</td>
<td>7</td>
</tr>
<tr>
<td>Stephanie</td>
<td>14.0</td>
<td>3.4</td>
<td>7</td>
</tr>
</tbody>
</table>

Which student has the more consistent results?

A  Jay  
B  Rhys  
C  Shannon  
D  Stephanie

**Question 10**

Jack operates a plumbing business that is currently subcontracted to the local shire council to install a drainage system for the town’s parkland. Jack has prepared the following network for the project.

Each activity is measured in days. Activity K is on the critical path but its value is not given on Jack’s network. The minimum time to complete the drainage system is 40 days. How much slack time does Jack have with activity J?

A  6 days  
B  7 days  
C  10 days  
D  13 days

**End of Part A**
Part B

Extended response

Suggested time allocation: 2 hours 30 minutes.

Part B has five questions. Each question assesses Knowledge and Procedures (KP), Modelling and Problem solving (MP) or a combination of both. Communication and Justification (CJ) will be assessed by an overall judgment of your responses to Part B.

Attempt all questions.
Write your responses in the response book provided.

Question 1

a. Louis deposits $25000 into an investment account earning 8% p.a. compounding semi-annually over three years.
   i. Calculate the value of his investment after three years.
   ii. Find the amount of interest earned at the end of the three years.

b. Sherin is considering purchasing a television at a price of $3990. Sherin has a deposit of $500 but needs to borrow the rest of the money. A finance company offers her the money she needs over four years at 21% p.a. flat, repaid monthly.
   Sherin arranges to buy the television through the finance company.
   i. What is the total amount that Sherin must borrow to purchase the television?
   ii. Calculate the simple interest paid on the amount borrowed over four years at 21% p.a.
   iii. Calculate the monthly repayment on the loan correct to the nearest cent.
   iv. The effective rate of interest on the loan can be calculated using the formula
       \[ E = \frac{2Rn}{(n + 1)} \]
       where \( R \) is the flat rate of interest and \( n \) is the number of instalments.
       What is the effective interest rate on Sherin’s loan?

b. Nguyen’s manufacturing company purchased $50000 worth of equipment at the end of June 2009. At the beginning of July 2010 and July 2011, the value of the equipment will be depreciated by $8000 per year.
   i. What will be the depreciated value of the equipment at the beginning of July 2011?
   ii. At the beginning of July 2011, Nguyen changed the method of depreciation. Nguyen has chosen to apply the diminishing value method of depreciation until the value of the equipment is written off. Two years later, the equipment had a salvage value of $16000.
      What was the average annual rate of depreciation during this two year period?
      Show full working to justify your response.
Question 2

a. Fifteen students travelling to Tasmania have their bags weighed at the airport check-in counter. The weights of the bags in kilograms are listed in order as follows:

8 9 10 10 15 18 21 21 25 29 35 37 38 41 43

i. The five-number summary for the weights of the bags are:

8 10 21 37 43

Construct an accurate boxplot (box-and-whisker plot) to display the distribution of the weights of the bags.

ii. Calculate the interquartile range of the weights.

(KP)

b. Use the table on page 17 of your response book to respond to Question 2b.

Rosa is employed as a marketing adviser by the owner of a cinema complex. She has randomly surveyed 210 movie patrons to obtain a sample of opinions about the current movie program. Rosa presented her survey data, as follows, in table form.

<table>
<thead>
<tr>
<th>Movie patrons who liked one or more of the presentations</th>
<th>Movie patrons aged &lt;30 years</th>
<th>Movie patrons aged &gt;30 years</th>
<th>Total surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movie patrons who did not like any of the presentations</td>
<td>88</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td>Patron totals</td>
<td>A</td>
<td>B</td>
<td>227</td>
</tr>
</tbody>
</table>

i. Determine the values of A and B in the table.

ii. Briefly describe a method that Rosa could use to randomly select the movie patrons.

iii. What is the probability that a randomly selected movie patron is more than 30 years old and did not like any of the movies?

(KP)

Question 2 continues overleaf
c. As part of a company’s quality-control measures, routine inspection and testing is performed on two filling and packaging machines.
Both machines are meant to fill and pack 250 gram packets of confectionery. Each package is labelled “Weight 250 grams”. Twenty packets of confectionery are selected at random for testing from each machine. The tables below show the weights of the packets selected.

Machine A

<table>
<thead>
<tr>
<th>234</th>
<th>247</th>
<th>248</th>
<th>251</th>
<th>250</th>
<th>252</th>
<th>249</th>
<th>253</th>
<th>255</th>
<th>253</th>
</tr>
</thead>
<tbody>
<tr>
<td>251</td>
<td>248</td>
<td>250</td>
<td>253</td>
<td>256</td>
<td>253</td>
<td>252</td>
<td>269</td>
<td>255</td>
<td>249</td>
</tr>
</tbody>
</table>

Machine B

<table>
<thead>
<tr>
<th>256</th>
<th>239</th>
<th>240</th>
<th>267</th>
<th>266</th>
<th>246</th>
<th>252</th>
<th>250</th>
<th>266</th>
<th>251</th>
</tr>
</thead>
<tbody>
<tr>
<td>241</td>
<td>231</td>
<td>235</td>
<td>257</td>
<td>240</td>
<td>244</td>
<td>257</td>
<td>271</td>
<td>251</td>
<td>254</td>
</tr>
</tbody>
</table>

Following analysis of the test results, the company decides that both machines need adjustment. The company can afford to shut down and adjust only one machine at a time.

Construct back-to-back stemplots (stem-and-leaf plots) to compare the data. Make a recommendation to management about which machine should be adjusted first.

Refer to your stemplots to justify your response.

(MP)
Question 3

a. At 11:45 am, the yacht *Stormbird* leaves point A on a training course and sails 48.4 nautical miles on a bearing 067°T to point B. Without stopping, the *Stormbird* turns on a bearing 337°T and sails 26.5 nautical miles to point C.

i. How far is point C from A, correct to the nearest nautical mile?

ii. Calculate the bearing of point A from point C. Give your response correct to the nearest degree.

iii. The *Stormbird* arrives back at point A at 4:45 pm. What was its average speed for the entire course? Give your response correct to the nearest knot.

b. Use pages 18 and 19 of your response book to respond to Question 3b.

All chart work must be clearly shown and all intermediate calculations provided.

A maritime patrol craft departs Cape Smith and sails until it reaches a point P with latitude 32° 10’ and longitude 113° 20’ E.

i. Clearly mark the point P on the chart.

ii. Calculate the magnetic bearing of Port Flanagan from point P in 2009. Respond correct to the nearest degree.

iii. In kilometres, how far is Port Flanagan from point P? Respond correct to the nearest kilometre.

(KP)

c. Use pages 20 and 21 of your response book to respond to Question 3c.

All chart work must be clearly shown and all intermediate calculations provided.

At 1300 hours, the navigator on board the yacht *Lady Galway* sights Cape Lincoln on a bearing of 305°T. The *Lady Galway* is heading 040°T at a steady speed of 20 knots when at 1430 hours the bearing of Cape Lincoln changed to 250°T.

Mark on the chart *Lady Galway*’s position at 1430 hours. Determine the bearing of and distance to Kings Point at this time. Give your bearing correct to the nearest degree and your distance correct to the nearest nautical mile.

Show full working to justify your response.

(MP)
Question 4

a. Use the grid on page 22 of your response book to respond to Question 4a.

Mahmoud is building a garage and laying a driveway in his front yard. He has organised the project (in days) into the following network.

i. Find the minimum time to complete the project.

ii. State the critical path.

iii. How would a delay of 10 days in completing activity J affect the finish time for this project? (KP)

b. The graph below illustrates the waiting time in a queue across a 60-minute period at the exchange counter of a large clothing store on a typical working day.

i. At the start of the 60-minute period, how many customers were waiting to be served?

ii. What is the longest time a customer has to queue before being served?

iii. What is the average amount of time a typical customer spends at the exchange counter waiting to be served? (KP)
c. The table below shows the distances in metres between botanical exhibits in an enclosure at the proposed 2010 Brisbane Exhibition.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50</td>
<td>70</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>30</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>50</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td>45</td>
<td>90</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

Develop a path which could be placed on a map prepared for visitors. This path would visit all exhibits and progress all visitors to the exit without revisiting exhibits.

Draw the path on your network and calculate its length.

If all visitors had to enter at A and exit at G, would this restrict how the network is designed? Explain your reasoning.

(MP)
**Question 5**

**a.** The following is a table of fees and charges associated with buying and selling shares.

<table>
<thead>
<tr>
<th>STAMP DUTY</th>
<th>60 cents per $100 or part thereof</th>
</tr>
</thead>
<tbody>
<tr>
<td>BROKERAGE</td>
<td>Minimum charges:</td>
</tr>
<tr>
<td></td>
<td>$30 on buying and $20 on selling</td>
</tr>
<tr>
<td>Rate: $5 PLUS</td>
<td>2.5% of value up to $5000</td>
</tr>
<tr>
<td></td>
<td>2% of next $10000</td>
</tr>
<tr>
<td></td>
<td>1.5% of next $35000</td>
</tr>
<tr>
<td></td>
<td>1% over $50000</td>
</tr>
</tbody>
</table>

**i.** Find the **brokerage only** (not stamp duty) that Tom must pay when buying 6500 NZK shares at 28 cents each, given that the fees are at the rates shown in the table.

**ii.** Use the stamp duty and brokerage rates given to determine the total amount Charley received when she sold 10000 Royal shares at $4.95 each.

(KP)

**b.** Michael is currently able to claim the full dependent spouse rebate of $1650 for his wife Mara. However, this rebate is reduced by $1 for every $4 per year for any income that Mara earns over and above $282.

Mara is considering taking a casual job working two days a week for 40 weeks each year. The job would pay $105 a day but, although she claims the tax-free threshold, the job’s casual status means that she has no leave loading.

If Mara estimates that her lunches and transport costs would amount to $15 per day, should she accept the position? Would Michael and Mara be financially better off if Mara worked?

**Fully justify your response.**

(MP)

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**End of Part B**

**End of Paper Two**
## Assessment standards from the 2006 Senior External Syllabus for Mathematics A

|----------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Knowledge and procedures   | The overall quality of a candidate’s achievement across the full range within the contexts of application, technology and complexity, and across topics, consistently demonstrates:  
  • accurate recall, selection and use of definitions and rules  
  • use of technology  
  • recall and selection of procedures, and their accurate and proficient use. | The overall quality of a candidate’s achievement across a range within the contexts of application, technology and complexity, and across topics, generally demonstrates:  
  • accurate recall, selection and use of definitions and rules  
  • use of technology  
  • recall and selection of procedures, and their accurate use. | The overall quality of a candidate’s achievement in the contexts of application, technology and complexity, generally demonstrates:  
  • accurate recall and use of basic definitions and rules  
  • use of some technology  
  • accurate use of basic procedures. | The overall quality of a candidate’s achievement in the contexts of application, technology and complexity, sometimes demonstrates:  
  • accurate recall and use of some definitions and rules  
  • use of some technology. | The overall quality of a candidate’s achievement rarely demonstrates knowledge and use of procedures. |
| Modelling and problem solving | The overall quality of a candidate’s achievement across the full range within each context, and across topics generally demonstrates mathematical thinking which includes:  
  • interpreting, clarifying and analysing a range of situations, and identifying variables  
  • selecting and using effective strategies  
  • informed decision making ... and generally demonstrates mathematical thinking which includes:  
  • interpreting and clarifying a range of situations  
  • selecting strategies and/or procedures. | The overall quality of a candidate’s achievement across a range within each context, and across topics, generally demonstrates mathematical thinking which includes:  
  • interpreting, clarifying and analysing a range of situations, and identifying variables  
  • selecting and using strategies ... and sometimes demonstrates mathematical thinking which includes:  
  • selecting and using procedures required to solve a range of problems  
  • informed decision making. | The overall quality of a candidate’s achievement demonstrates mathematical thinking which includes:  
  • interpreting and clarifying a range of situations  
  • selecting strategies and/or procedures. | The overall quality of a candidate’s achievement demonstrates mathematical thinking which includes following basic procedures and/or using strategies. | The overall quality of a candidate’s achievement rarely demonstrates mathematical thinking which includes following basic procedures and/or using strategies. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication and justification</td>
<td>The overall quality of a candidate’s achievement across the full range within each context <strong>consistently demonstrates:</strong></td>
<td>The overall quality of a candidate’s achievement across a range within each context <strong>generally demonstrates:</strong></td>
<td>The overall quality of a candidate’s achievement in some contexts <strong>generally demonstrates:</strong></td>
<td>The overall quality of a candidate’s achievement <strong>demonstrates</strong> evidence of the use of the <strong>basic</strong> conventions of language and mathematics.</td>
<td>The overall quality of a candidate’s achievement rarely <strong>demonstrates</strong> use of the <strong>basic</strong> conventions of language or mathematics.</td>
</tr>
<tr>
<td></td>
<td>• accurate use of mathematical terms and symbols</td>
<td>• accurate use of mathematical terms and symbols</td>
<td>• accurate use of basic mathematical terms and symbols</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• accurate use of language</td>
<td>• accurate use of language</td>
<td>• accurate use of basic language</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• organisation of information into various forms suitable for a given use</td>
<td>• organisation of information into various forms suitable for a given use</td>
<td>• organisation of information into various forms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• use of mathematical reasoning to develop logical arguments in support of conclusions, results and/or decisions</td>
<td>• use of mathematical reasoning to develop simple logical arguments in support of conclusions, results and/or decisions</td>
<td>• use of some mathematical reasoning to develop simple logical arguments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• justification of procedures.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>