Time allowed

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

Examination materials provided

- Paper One — Question book
- Paper One — Resource book
- Paper One — Multiple-choice response sheet
- Paper One — Response book

Equipment allowed

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

Not allowed: calculators with computer algebra system (CAS) functionality.

Directions

You may write in this book during perusal time.

Paper One has two parts:

- Part A — Multiple choice (15 questions)
- Part B — Extended response (5 questions)

Attempt all questions.

Suggested time allocation

- Part A: 45 minutes
- Part B: 2 hours 15 minutes

Assessment

Assessment standards are at the end of this book.

After the examination session

Take this book when you leave.
Planning space
Part A — Multiple choice

Part A has 15 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. Select the option that you think is correct or is the best option. Respond on the multiple-choice response sheet.

Suggested time allocation: 45 minutes.

Question 1

A sample of 25 school students were asked to indicate the time, in hours, spent using the internet across the past weekend. The results are displayed in the following graph.

![Graph showing internet usage time](image)

What is the median number in hours?

A 4.0  
B 4.5  
C 5.0  
D 6.0

Question 2

Simone works for $15.60 per hour. She works for six hours on Monday and eight hours on Wednesday. On Saturday she is paid at time-and-a-half for her work.

Last week Simone earned $335.40 in total for her work on Monday, Wednesday and Saturday.

How many hours did she work on Saturday?

A 5 hours  
B 6.5 hours  
C 7.5 hours  
D 11.25 hours
Question 3
Tom’s purchase of computer software for $386 included 10% for GST.
Correct to the nearest ten cents, what was the price of the computer software without GST?
A $347.40
B $350.90
C $424.60
D $428.90

Question 4
The location of Jaruco in Cuba is 23°N 82°W and the location of Dhaka in Bangladesh is 23°N 90°E. The local time at Dhaka is 1:00 am on 1 January 2011.
Ignoring time zones, what is the local time at Jaruco?
A 1:32 am on 31 December 2010
B 1:28 pm on 31 December 2010
C 1:32 pm on 31 December 2010
D 12:28 pm on 31 December 2010

Question 5
A real estate agent’s charges for selling a property are as follows:
   An advertising fee of $850
   PLUS
   2.5% of the first $250000
   1.5% of the next $300000
   1% of the remainder of the sale price.
How much does the agent charge on a property sale of $685400?
A $12104
B $12954
C $34270
D $35120
**Question 6**

Mingli has accepted a quote of $15 per metre to fence the entire boundary of her property, represented in the following diagram by ABCD.

![Diagram](image)

What is the cost, to the nearest dollar, of fencing Mingli’s property?

- A $1669
- B $2172
- C $2199
- D $2729

**Question 7**

The network below shows the distances, in kilometres, along roads connecting Dunmore and Tarragon.

![Network](image)

What is the shortest distance, in kilometres, from Dunmore to Tarragon?

- A 71 km
- B 73 km
- C 78 km
- D 86 km
**Question 8**
A building project has 11 activities which must be completed. The network below shows the activities and their completion time in weeks.

![Network Diagram]

Because of flooding, there is a delay of 4 weeks in completing activity C. The slack time associated with activity J will increase by

A 0 weeks.
B 1 week.
C 2 weeks.
D 3 weeks.

**Question 9**
The locations of three towns, A, B and C, are shown in the diagram below.

![Diagram of Towns]

Town B is due south of town A. Town C is 8 km due east of town B and 16 km from town A.

The bearing of town A from town C is

A S30°E.
B S60°E.
C N30°W.
D N60°W.
**Question 10**

In 2002, the bearing of a cathedral tower from a lookout was $135^\circ07'\text{M}$. The annual change in the magnetic variation is $09'\text{ easterly}$.

The magnetic bearing of the cathedral tower from the lookout in 2011 is

A $133^\circ11'$
B $133^\circ46'$
C $134^\circ26'$
D $136^\circ28'$

**Question 11**

ABCD is a rectangular timber frame in which $AB = 1970$ mm and $BC = 1450$ mm.

Which of these is closest in length to the diagonal brace $DB$?

A $1334$ mm
B $2446$ mm
C $2667$ mm
D $3420$ mm
**Question 12**

Medical scientists at James Cook University have developed a test to determine whether people are carriers of a certain mosquito-borne virus. A group of 347 people was tested for the virus, with some results recorded in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier</td>
<td>?</td>
<td>3</td>
</tr>
<tr>
<td>Not a carrier</td>
<td>16</td>
<td>256</td>
</tr>
</tbody>
</table>

If a person is selected at random from the tested group, which of these is closest to the probability that they were a carrier of the virus and tested positive?

A 21%

B 25%

C 72%

D 75%

**Question 13**

The following back-to-back stem plot (stem and leaf plot) shows the percentage of male and female smoking rates in a sample of 18 rural townships across Australia in 2010.

For the sampled townships, the smoking rates for males are generally

A lower and less variable than the smoking rates for females.

B lower and more variable than the smoking rates for females.

C higher and less variable than the smoking rates for females.

D higher and more variable than the smoking rates for females.
Question 14

Phoebe bought a new van at the beginning of 2009 for $40000. At the end of 2009 the value of the van had depreciated by 30%. In 2010 the value of the van depreciated by 25% of the value it had at the end of 2009.

What was the value of the van at the end of 2010?

A $18000  
B $19600  
C $21000  
D $22500

Question 15

Paul’s superannuation fund has an expected future value of $540000 in 25 years time. The interest rate is 4% per annum and earnings are calculated six-monthly.

To the nearest dollar, what single amount could be invested now to produce the same amount over the same period of time and at the same interest rate?

A $200625  
B $202563  
C $270000  
D $329147

End of Part A
Part B — Extended response

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.
Suggested time allocation: 2 hours 15 minutes.

Question 1

a. At Tom’s hardware store a lawnmower has an $80 mark-up. If the ticket price of the lawnmower is $635, calculate
   i. the cost price of the lawnmower
   ii. the percentage mark-up on the cost price. (KP)

b. Susan is a casual employee at the city council bus depot and is paid at the following rates:

<table>
<thead>
<tr>
<th>Day</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>$21 per hour</td>
</tr>
<tr>
<td>Saturday</td>
<td>Time-and-a-half</td>
</tr>
<tr>
<td>Sunday</td>
<td>Double time</td>
</tr>
</tbody>
</table>

   Displayed below is Susan’s timesheet for last week.

<table>
<thead>
<tr>
<th></th>
<th>Start</th>
<th>Finish</th>
<th>Unpaid break</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday</td>
<td>7:30 am</td>
<td>4:00 pm</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Saturday</td>
<td>9:00 am</td>
<td>3:00 pm</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Sunday</td>
<td>8:00 am</td>
<td>4:30 pm</td>
<td>45 minutes</td>
</tr>
</tbody>
</table>

   i. Calculate Susan’s gross pay for last week.
   ii. Susan’s employer withholds 24% of her weekly earnings as PAYG tax. Calculate Susan’s PAYG tax for last week. (KP)

   c. Stephen is preparing to go to the USA for six months as an exchange student. He needs to change some Australian dollars (AUD) into United States dollars (USD). Stephen found out that the exchange rate between the Australian dollar and United States dollar was AUD$1 = USD$1.15.
      i. Stephen changed AUD$8000 into USD$. How many USD$ did he receive? (KP)
      ii. During the six months that Stephen was in the USA, the exchange rate changed from USD$1.15 to USD$1.10 per AUD$1. Was it in Stephen’s favour that the exchange rate had changed when he converted his leftover USD$ back to AUD$?
         Show full working and provide a written explanation to justify your conclusion. (MP)
Question 2

a. Convert:
   i. 5.24 m to mm
   ii. 42500 cm² to m².

b. The following diagram represents an inground swimming pool.

![Diagram of an inground swimming pool]

The shaded face of the inground pool is the trapezium $ABCD$. It has the following dimensions:
$AB = 1.5$ metres, $DC = 2.25$ metres, and $AD = 8$ metres.

   i. Calculate the area of the face $ABCD$.
   ii. If the pool is 20 metres long (i.e. $AE = 20$ metres), calculate the volume of the pool.

KP

(c. A surveyor records the angle of elevation of a mountain peak from two different locations on flat ground. From point A, the angle of elevation is 5°. From point B, the angle of elevation is 10°. Point B is 2 km closer to the mountain than point A.

![Diagram of a mountain with angles]

Calculate the height of the mountain, correct to the nearest metre.

**Show full working in your response.**
Question 3

Below is a ground floor plan of the Johnson family’s house drawn to a scale of 1:125.

a.  
   i.  What are the dimensions of bedroom one? State your response in metres.  
   ii. The Johnson family is going to paint the ceiling of bedroom 1. The tradesman employed to paint the ceiling paints at a constant rate of 12 m$^2$ per hour and is paid $54 per hour. Find the labour cost to paint the ceiling if two coats of paint are required.  

(KP)

b.  
   The Johnson family’s house is on a rectangular block of land. The front end of the block faces due north. The house is positioned four metres from the front end and five metres from the fence on the western side of the property. The front of the block is 20 metres wide and the property is 27 metres deep.

Draw a plan of the block with the house correctly positioned on it using a scale of 1:125.

Note: It is sufficient to represent the house as a rectangle on the block; detail is not required.

(KP)
c. The Johnson family is installing a veranda to provide shade along the full length of the wall facing south. The roof of the veranda (AB) is constructed as an arc of a circle with a central angle (angle AOB) equal to 90° and a radius (AO) of 1.8 metres, as shown in the following diagram.

A builder has quoted $110 per m² of roof area to build the veranda plus $65 per supporting post (EF).

Calculate the cost of the veranda attached to the full length of the southern wall of the house if there are four supporting posts.

Show full working in your response.
Question 4

a. The annual income of 70 employees at a fast food restaurant chain is shown in the frequency distribution table below.

<table>
<thead>
<tr>
<th>Annual income</th>
<th>Class centre (x)</th>
<th>Number of employees (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10000 to less than 20000</td>
<td>$15000</td>
<td>16</td>
</tr>
<tr>
<td>$20000 to less than 30000</td>
<td>$25000</td>
<td>24</td>
</tr>
<tr>
<td>$30000 to less than 40000</td>
<td>$35000</td>
<td>11</td>
</tr>
<tr>
<td>$40000 to less than 50000</td>
<td>$45000</td>
<td>9</td>
</tr>
<tr>
<td>$50000 to less than 60000</td>
<td>$55000</td>
<td>7</td>
</tr>
<tr>
<td>$60000 to less than 70000</td>
<td>$65000</td>
<td>3</td>
</tr>
</tbody>
</table>

i. Calculate the mean and standard deviation of the income of the 70 employees.

ii. The owners of the restaurant chain are going to employ another eight people. Four of the new employees will earn $15000 each per annum, and the other four will earn $65000 each per annum.

By how much will the incomes of the new employees change the original mean and standard deviation?

(KP)

Respond to Question 4b on pages 18 and 19 of your response book.

b. Two school classes performed an experiment to determine the correct volume of a chemical solution. Their results, in millilitres, were presented as five-number summaries as follows.

<table>
<thead>
<tr>
<th>Five-number summary</th>
<th>Class A</th>
<th>Class B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>24.6</td>
<td>22.5</td>
</tr>
<tr>
<td>Q1</td>
<td>24.9</td>
<td>23.6</td>
</tr>
<tr>
<td>Median</td>
<td>26.5</td>
<td>26.6</td>
</tr>
<tr>
<td>Q3</td>
<td>27.1</td>
<td>27.7</td>
</tr>
<tr>
<td>Maximum</td>
<td>28.0</td>
<td>28.4</td>
</tr>
</tbody>
</table>

i. Draw parallel box plots of the data.

(KP)

ii. One student claimed that there was no difference between the results of the classes.

Is the student’s comment reasonable if based on the data?

Using the box plots, compare and contrast the data to justify your response.

(MP)
Question 5

a. Michael is a finance broker and has a gross income of $95 540. Michael has paid $21 790 tax on this income.
   i. What is Michael’s total annual taxable income, assuming he has $16 500 in allowable tax deductions?
   ii. Using the tax table below, calculate the total tax payable on his income.

<table>
<thead>
<tr>
<th>Taxable income</th>
<th>Tax on this income</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1–$6000</td>
<td>Nil</td>
</tr>
<tr>
<td>$6001–$21 600</td>
<td>17c for each $1 over $6000</td>
</tr>
<tr>
<td>$21 601–$58 000</td>
<td>$2 652 plus 30c for each $1 over $21 600</td>
</tr>
<tr>
<td>$58 001–$70 000</td>
<td>$13 572 plus 42c for each $1 over $58 000</td>
</tr>
<tr>
<td>$70 001 and over</td>
<td>$18 612 plus 47c for each $1 over $70 000</td>
</tr>
</tbody>
</table>

   iii. Calculate Michael’s refund or tax owing assuming that the Medicare levy of 1.5% must be applied.

b. Tina has a new job as a sales representative. Tina is to be paid weekly and her employers have offered her two payment options — she is to select one of them.
   Option 1: $650 retainer plus 5.5% commission on weekly sales.
   Option 2: No retainer but 20% commission on weekly sales.
   Her employers have informed Tina that she can expect weekly sales of between $4 000 and $8 000. What are the strengths and limitations of both of the proposed options?
   Show full working and justify your response.
## Assessment standards from the 2006 senior external syllabus for Mathematics A

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