Time allowed

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

Examination materials provided

- Paper One — Question book
- Paper One — Resource book
- 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**

As part of an experiment, three sample groups of pine trees were planted. Each sample contained 50 trees. One sample was grown under hot conditions, one sample was grown under mild conditions and one sample was grown under cool conditions.

The parallel box plots below show the rate of growth, in centimetres per year, of the three samples.

From the parallel box plots it can be concluded that, as conditions change from hot to mild to cool, the rate of growth for these trees generally

**A** decreases and becomes less variable.

**B** decreases and becomes more variable.

**C** increases and becomes less variable.

**D** increases and becomes more variable.
Question 2
Terry works for $12.40 per hour for eight hours each day on Tuesday and Thursday.
On Saturday he works for six hours at time-and-a-half.
How much does Terry earn in total for Tuesday, Thursday and Saturday?
A $210.80
B $272.80
C $310.00
D $409.20

Question 3
Molly bought a pair of shoes and a jacket at a discount sale for a total of $116. The shoes were normally priced at $60 but Molly received 20% discount. The discount on her jacket was 15%.
What was the normal price of the jacket?
A $48
B $56
C $68
D $80

Question 4
Builders’ levels are set up between points A and B and points B and C on a proposed building site as shown. Measurements are given in metres correct to the nearest millimetre.

What is the average angle of the slope from A to C, to the nearest degree?
A 8°
B 11°
C 13°
D 18°
Question 5

A sample of 14 people were asked how many hours they had spent watching television on the previous night. The results are displayed in the following graph.

Correct to one decimal place, what is the mean and standard deviation of these times?

A  \( \bar{x} = 2.0 \quad s = 1.5 \)

B  \( \bar{x} = 2.1 \quad s = 1.5 \)

C  \( \bar{x} = 2.1 \quad s = 1.6 \)

D  \( \bar{x} = 2.6 \quad s = 1.2 \)

Question 6

The height of each student in a class was measured and it was found that the mean height was 160 cm. Two students were absent.

When the heights of the absent students were included in the data, the mean height did not change.

Which of the following heights are possible for the two absent students?

A  150 cm and 170 cm

B  155 cm and 160 cm

C  157 cm and 165 cm

D  160 cm and 170 cm

Question 7

The back wall of Tom’s house is 5.9 m long x 2.4 m high. Tom is replacing the existing timber boards using 225 mm wide x 15 mm thick hardwood boards, each with a 25 mm overlap. The boards cost $7.20 per lineal metre.

What is the total cost of the hardwood boards?

A  $407.81

B  $432.00

C  $453.12

D  $509.76
Question 8

Two hikers, Arnon and Sue, walk in different directions from the same camp. Sue walks for 12 km on a bearing of 135° to a picnic ground and Arnon walks for 6 km on a bearing of 045° to a lookout.

Arnon walks from the lookout to meet Sue at the picnic ground. On what bearing must Arnon walk?

A 063°
B 108°
C 153°
D 162°

Question 9

Sam and Nguyen each invest $8000. Sam’s investment earns simple interest at the rate of 7.5% per annum. Nguyen's investment earns interest at the rate of 7.5% per annum compounding monthly.

At the end of three years, correct to the nearest cent, Sam will have

A $138.38 less than Nguyen.
B $138.38 more than Nguyen.
C $211.57 less than Nguyen.
D $211.57 more than Nguyen.

Question 10

The shape of the entertainment area at the local park is made up of a semi-circle and a right-angled triangle as illustrated.

Correct to the nearest square metre, the entertainment area is

A 118 m².
B 244 m².
C 715 m².
D 1343 m².
Question 11

In 2001, the magnetic bearing of a bridge from a hill was 245°12’.

The annual change in the magnetic variation is 08’ westerly. Which of the following is closest to the magnetic bearing of the bridge from the hill in 2010?

A 243°52’
B 244°00’
C 246°24’
D 246°32’

Question 12

The roof truss of Jim’s house has a pitch of 28° as shown.

![Diagram of a roof truss](image)

The value of \( x \) in this diagram, correct to the nearest millimetre, is

A 3797.
B 6793.
C 6887.
D 7193.

Question 13

Jay’s direct flight from Perth (32°S, 115°E) to Hong Kong (22°N, 115°E) departs at 4 pm on 1 November 2010. The aircraft has an average speed of 625 km/h. Jay’s estimated time of arrival is

A 5:47 pm on 1 November 2010.
B 1:35 am on 2 November 2010.
C 1:59 am on 2 November 2010.
D 2:40 am on 2 November 2010.
Question 14

The following network shows the time, in hours, that it takes to travel along a series of roads that connect town A to town B.

What is the least amount of time, in hours, that it would take to travel from town A to town B?

A  9
B  10
C  11
D  12
Question 15

The following network shows the activities that are needed to complete a project and their completion times in hours.

If activity G is delayed by 5 hours, then activity K will be delayed by

A 4 hours.
B 5 hours.
C 7 hours.
D 9 hours.

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. The retail price of a new golf bag is $500. The bag is discounted by $150 at a sale.
i. What is the price of the golf bag after the $150 discount has been applied?
ii. Calculate the discount as a percentage of the retail price. (KP)

b. Sandy travels to Europe via the USA. After leaving the USA, she has USD$1400 to add to the AUD$4000 she plans to spend in Europe. She converts all of her money to euros.

Note: AUD$1 = USD$0.90 and AUD$1 = 0.65 euros.

How many euros does she have to spend in Europe? (KP)

c. Charles works for a large real estate company. His retainer is $650 a week and he receives a commission based on property sale prices. His commission schedule is as follows.

<table>
<thead>
<tr>
<th>Sale price</th>
<th>Commission rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0–$350000</td>
<td>1.5%</td>
</tr>
<tr>
<td>$350001–$450000</td>
<td>$5250 + 2% of each dollar over $350000</td>
</tr>
<tr>
<td>$450001–$875000</td>
<td>$7250 + 3.5% of each dollar over $450000</td>
</tr>
<tr>
<td>More than $875000</td>
<td>4% of the property price</td>
</tr>
</tbody>
</table>

One week, Charles sold a house for $480750.
i. How much did Charles receive in commission for the sale of the house?
ii. What was Charles’ total pay for the week? (KP)

d. Interest calculated on a loan is offered at $r\%$ per annum flat or 10% per annum on the reducing balance. Jennifer notes that after five years the effective rate of interest is equal to the reducible rate.

Use the formula below to calculate the equivalent flat rate of interest of Jennifer’s loan.

$$E = \frac{(1 + r)^n - 1}{n}$$

Note: $E$ = effective rate of interest, $r$ = annual flat rate of interest and $n$ = number of years.

Show full working to justify your response. (MP)
Question 2

a. Convert:
   i. 274000 cm to km.
   ii. 1.5 m² to cm².  

b. The angle of elevation from a point M on the ground to the top of a flagpole mounted on a building is 67° and to the top of the building is 65°. The building is 80 metres tall.

   i. Calculate the distance from the point M to the base of the building at A, correct to one decimal place.  

   ii. Find the height of the flagpole. 
       Show full working to justify your response.

   c. The local community hall has a cylindrical water tank. The radius of the tank is 3.75 metres and it is 2 metres deep.

   i. Calculate the volume of the cylindrical tank, correct to the nearest cubic metre.
   ii. Sprinklers water the gardens at the rate of 5000 litres per hour. For how many hours can the sprinklers be used before the full tank is empty? 
       Note: 1000 litres of water occupies 1 cubic metre of space.
Question 3

Below is a ground floor plan of the Maksoud family residence drawn to a scale of 1:150.

a. Mrs Maksoud is planning to replace the floor tiles in the living and dining areas. The new tiles, inclusive of materials and laying, cost $96 per square metre. How much will it cost to completely replace the tiles?

(KP)

b. The Maksoud family residence is on a rectangular block of land. The front end of the block faces due south and the house is positioned five metres from the front end and six metres from the fence on the eastern side of the property. The front of the block is 40 metres long and the property is 60 metres deep.

Draw a plan of the block with the house suitably positioned on it using a scale of 1:250.

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

(KP)
c. Mrs Maksoud is building a back fence for her property. She already has the posts for the fence, and the materials for a 3 metre wide gate. Mrs Maksoud now needs to buy sufficient quantities of the following materials to build the fence:

- Hardwood rails, each 75 mm × 50 mm ($2.45 per metre)
- Treated pine palings, each 15 mm × 75 mm × 1500 mm ($1.90 each).

If Mrs Maksoud needs three rails to run the length of the fence, and there is to be a 25 mm gap between palings, how much will it cost to buy the materials to build the fence?  

(KP)

d. Mrs Maksoud has three 5 metre lengths of timber and one 2 metre length to make the frame of a simple gate measuring 3 metres by 1.5 metres.

She recognises the need for some kind of bracing and, before she builds the gate, she needs to design it using the timber pieces A, B, C and D.

Design the gate providing full justification for your calculations. Bear in mind the building regulation requirement that bracing must be of an angle between 37º and 53º.

Discuss the strengths and limitations of your proposed model.

Show full working to justify your response.  

(MP)
Question 4


A team of researchers investigated 12 students to see if they took longer to perform a study task when listening to music than when not listening to music.

The researchers presented the data in the following two five-number summary tables.

<table>
<thead>
<tr>
<th>Five-number summary</th>
<th>Listening to music (in minutes)</th>
<th>Not listening to music (in minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Q1</td>
<td>18.5</td>
<td>18</td>
</tr>
<tr>
<td>Q2</td>
<td>24.5</td>
<td>21.5</td>
</tr>
<tr>
<td>Q3</td>
<td>32</td>
<td>26</td>
</tr>
<tr>
<td>Maximum</td>
<td>33</td>
<td>30</td>
</tr>
</tbody>
</table>

i. Draw back-to-back box plots of the data.

ii. Consider the following comment made by one of the students.

“*It does not take any longer to complete a study task if you are listening to music.*”

Is this a reasonable comment based on the data?

Use the box plots to compare and contrast the data.

**Fully justify your response.**

b. Government workplace health and safety officers intend to survey 60 workers from a factory about asbestos-related issues at their workplace.

The table below shows the number of people by age and work category at the factory.

<table>
<thead>
<tr>
<th></th>
<th>Age less than 30 years</th>
<th>Age 30 years or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>80</td>
<td>45</td>
</tr>
<tr>
<td>Technical</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Labour and support</td>
<td>100</td>
<td>35</td>
</tr>
</tbody>
</table>

i. How many of the sixty workers should be selected from each of the six categories?

ii. Describe a sampling method which could be used to select the survey respondents.
Question 5

a. Clarissa wants to buy a $5995 home entertainment system from the Legends Super Store. Her purchasing options are as follows:

<table>
<thead>
<tr>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legends Super Store</td>
<td>ANY Bank personal loan</td>
<td>Finance company</td>
</tr>
<tr>
<td>• 1/2 deposit</td>
<td>• $1250 deposit</td>
<td>• 1/3 deposit</td>
</tr>
<tr>
<td>• 6 months interest free and no repayments for 6 months</td>
<td>• 24 equal monthly repayments of $265 each month</td>
<td>• 18 equal monthly repayments of $390</td>
</tr>
<tr>
<td>THEN pay the FULL balance due</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

i. Compare each of the loans in terms of the total monthly repayments and interest paid. (KP)

ii. On the basis of your findings, examine the strengths and weaknesses of the proposals and provide advice to Clarissa on the best purchase. Show full working to justify your response. (MP)

b. Jonathan lives at home and pays board to his parents. He has a car to pay off and maintain. Jonathan earns $525 per week after tax.

Here is his budget:

<table>
<thead>
<tr>
<th>Expenses</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board</td>
<td>$70 per week</td>
</tr>
<tr>
<td>Car repayments</td>
<td>$210 per fortnight</td>
</tr>
<tr>
<td>Car registration and insurance</td>
<td>$1040 per annum</td>
</tr>
<tr>
<td>Fuel</td>
<td>$60 per week</td>
</tr>
<tr>
<td>Car maintenance and servicing</td>
<td>$780 per year</td>
</tr>
<tr>
<td>Gym subscription</td>
<td>$70 per fortnight</td>
</tr>
<tr>
<td>Entertainment</td>
<td>$60 per week</td>
</tr>
<tr>
<td>Clothing</td>
<td>$50 per fortnight</td>
</tr>
<tr>
<td>Health insurance</td>
<td>$1820 per annum</td>
</tr>
</tbody>
</table>

i. Calculate Jonathan’s annual after-tax income.

ii. Calculate the total of Jonathan’s current annual after-tax expenditure.

iii. How much, on average, is Jonathan able to save per week?

Note: In your calculations, use 52 weeks in a year. (KP)

End of Part B

End of Paper One
## 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:  
- selecting and using procedures to solve a wide range of problems  
- initiative in exploring the problem  
- recognising strengths and limitations of models. | 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 **rarely demonstrates** mathematical thinking which includes following basic procedures and/or using strategies. |
<table>
<thead>
<tr>
<th></th>
<th></th>
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<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 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.</td>
<td>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.</td>
<td>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.</td>
<td>The overall quality of a candidate’s achievement demonstrates evidence of the use of the basic conventions of language and mathematics.</td>
<td>The overall quality of a candidate’s achievement rarely demonstrates use of the basic conventions of language or mathematics.</td>
</tr>
</tbody>
</table>