Time allowed

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

Examination materials provided

- Paper Two — Question book
- Paper Two — Resource book
- 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
- graphing calculator

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

Directions

You may write in this book during perusal time.
Paper Two has five extended-response questions.
Attempt all questions.

Assessment

Assessment standards are at the end of this book.

After the examination session

Take this book when you leave.
Planning space
Extended response

Paper Two 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.

Attempt all questions. Write your responses on the labelled pages in the response book. Show full working in all responses. Partial credit can only be awarded if working is shown.

Question 1

a. Kevin has purchased a $45000 truck for his business.
   i. He can depreciate this vehicle using the straight line depreciation method of 12% of its purchase price every year. Find the value of Kevin’s truck after four years using the straight line depreciation method.
   ii. Kevin can also use the diminishing value depreciation method to depreciate the vehicle by 18% per annum. Find the value of the truck after 10 years using the diminishing value depreciation method.

b. The table below shows the fees and charges associated with buying and selling shares.

<table>
<thead>
<tr>
<th>Stamp duty</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 cents per hundred dollars or part thereof</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brokerage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum charges: $30 on buying and $20 on selling</td>
</tr>
<tr>
<td>Rate: $5 plus 2.5% of value up to $5000</td>
</tr>
<tr>
<td>2% of next $10000</td>
</tr>
<tr>
<td>1.5% of next $35000</td>
</tr>
<tr>
<td>1% over $50000</td>
</tr>
</tbody>
</table>

Do not include GST in any transaction.

i. Find the brokerage only (i.e. not including stamp duty) that Tammy must pay when buying 7000 Anzas shares at 32 cents each, using the rates shown in the table above.

ii. Using the stamp duty and brokerage rates shown, determine the total amount Li received when he sold 4000 Hilton Pty Ltd shares at $3.75 each.

(KP)

c. Tahlia has invested $100000 in a term deposit account which pays interest at 6% per annum compounding monthly for three years.
   i. Calculate the amount of interest Tahlia will earn.
   ii. At the same time, Tahlia invests $100000 in a second account. What annual rate of interest in this second account would enable Tahlia to earn as much as her term deposit account if this interest is calculated and added semi-annually over three years?

(KP) (MP)
Question 2

a.  
   i. Draw an ordered stemplot (stem-and-leaf plot) for the following set of scores.

   21  45  29  27  19  35  23  58  34  27

   ii. Calculate the median, the mean and standard deviation of the set of scores. Where required, write the values correct to one decimal place.

   (KP)

b.  
   A number of people were tested for an infectious disease. Some of the people were suffering from the disease, some were not. Unfortunately the test does not always give accurate results. The following table lists the test results.

<table>
<thead>
<tr>
<th>Accurate</th>
<th>Not accurate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people with the disease</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Number of people without the disease</td>
<td>A</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>20</td>
</tr>
</tbody>
</table>

   i. Find the values of A and B in the table.
   
   ii. From the test results, what percentage of the results were accurate?
   
   iii. One person selected at random from the group did not have the disease. What is the probability that this person had the disease?

   (KP)

c.  
   A diving competition was scored by eight judges as shown below. After the highest and lowest scores for each diver are ignored, the final score awarded to each diver (not shown) is the mean of the remaining six scores.

<table>
<thead>
<tr>
<th>Diver</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>William</td>
<td>6.8  5.7  8.2  7.4  8.3  6.4  8.0  7.7</td>
</tr>
<tr>
<td>Mary</td>
<td>9.1  6.4  7.6  7.2  7.0  7.5  8.3  6.6</td>
</tr>
<tr>
<td>Joe</td>
<td>7.8  6.9  8.2  6.6  8.0  7.1  7.4  6.2</td>
</tr>
</tbody>
</table>

   Which diver complained about the scoring system?

   Justify your response, referring to the data.

   (MP)
Question 3

a. The yacht \textit{Paradise} leaves point A and sails 10 nautical miles on a bearing 032° T to point B. Without stopping, the \textit{Paradise} then turns on a bearing 122° T and travels to point C due East of point A.

\begin{itemize}
  \item[i.] State the bearing of point B from point C, correct to the nearest degree.
  \item[ii.] How far is point C from point B, correct to the nearest nautical mile.
  \item[iii.] The \textit{Paradise} maintained an average speed of 13 knots when sailing from Point A to Point C via Point B. In hours, how long did the trip take?
\end{itemize}

\textbf{Clearly show all chart work and provide all intermediate calculations.}

b. From Port Barren, a boat sailed on a bearing 195° T for three hours at 8 knots. It then changed course and sailed on a bearing of 250° T for two hours at 5 knots.

\begin{itemize}
  \item[i.] By plotting the course on the chart provided, determine the location of the boat.
  \item[ii.] How far and in what direction must the boat travel to continue its journey to Broken Bay?
\end{itemize}

\textbf{Clearly show all chart work and provide all intermediate calculations.}

c. On New Year’s Day 2012, at 10:25 am, a naval vessel is observed from Point Avalon bearing 260° T. At the same time, the navigator on board the vessel observes Port Phillip bearing 088° M. At 2:05 pm, Kingfisher Point bears 118° M and Port Phillip bears 068° M from the vessel. If the naval vessel has maintained the same steady speed over this period of time, what is its speed?

\textbf{(MP)}
Question 4

a. The distances, in kilometres, between medical centres in a city are represented in the following network.

Find the minimum spanning tree of the network.

b. A builder has organised a project (in weeks) into the following network.

Indicate the critical path and state the minimum time to complete the project.
To explore ways of improving service times at a community store, the owner collected the following data during a busy 15-minute period. The store currently has one checkout.

<table>
<thead>
<tr>
<th>Time</th>
<th>Customer served</th>
<th>Arrivals</th>
<th>Queue length</th>
<th>People in queue</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A</td>
<td>–</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>B, C</td>
<td>2</td>
<td>B, C</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>D</td>
<td>3</td>
<td>B, C, D</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>E</td>
<td>3</td>
<td>C, D, E</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>–</td>
<td>2</td>
<td>D, E</td>
</tr>
<tr>
<td>5</td>
<td>D</td>
<td>–</td>
<td>1</td>
<td>E</td>
</tr>
<tr>
<td>6</td>
<td>D</td>
<td>–</td>
<td>1</td>
<td>E</td>
</tr>
<tr>
<td>7</td>
<td>D</td>
<td>–</td>
<td>1</td>
<td>E</td>
</tr>
<tr>
<td>8</td>
<td>E</td>
<td>F, G</td>
<td>2</td>
<td>F, G</td>
</tr>
<tr>
<td>9</td>
<td>E</td>
<td>H</td>
<td>3</td>
<td>F, G, H</td>
</tr>
<tr>
<td>10</td>
<td>E</td>
<td>I, J</td>
<td>5</td>
<td>F, G, H, I, J</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>G</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>G</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>G</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>H</td>
<td>–</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

i. Complete the table using the information in the “Customer served” column.  

ii. Using the data in the table, develop a graph which shows how the waiting and service times for customers A–G would change if two checkouts are used.
Question 5

Jim, a personal trainer, is planning his annual budget for 2013.

His expected after-tax income is:

- $1420 each fortnight
- the annual interest earned from an investment of $3000 at the rate of 6% p.a.
- the annual dividend received through his 2500 TezraByte shares which have a par value of $4.50 and current market value of $6.80 per share. The shares have an annual dividend percentage of 3%.

Jim’s anticipated expenses are:

- $80 each week for public transport
- $60 each week for lunches
- $180 each month for health insurance
- $150 each fortnight for entertainment
- $375 each week for shared accommodation.

Jim uses the following table for his budget.

<table>
<thead>
<tr>
<th>Income</th>
<th>Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wages</td>
<td>Transport and lunches</td>
</tr>
<tr>
<td>$36920</td>
<td>Health and entertainment $6060</td>
</tr>
<tr>
<td>Interest on his investment</td>
<td>Accommodation</td>
</tr>
<tr>
<td>Dividends on his shares</td>
<td>A</td>
</tr>
</tbody>
</table>

a. Assuming that there are 52 weeks in the year and Jim’s anticipated expenses are maintained across the whole year, determine the values of A, B, C and D.

(KP)

b. At the beginning of 2013, Jim plans to start saving so he can purchase a car. Will he be able to save $8000 for a car during 2013 if he can keep to his budget? If not, suggest how he can modify his budget to meet the required target of $8000.

Show full working to justify your response.

(MP)

End of Paper Two
|----------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| **Knowledge and procedures (KP)** | 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 (MP)** | 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 **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. |
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.