Time allowed

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

Examination materials provided

- Paper One — Question book
- Paper One — Response book

Equipment allowed

- QSA-approved equipment
- non-programmable calculator

Directions

You may write in this book during perusal time.

Paper One has three parts:

- Part A — Deductive Logic (Propositional Logic)
- Part B — Deductive Logic (Monadic and Dyadic Logic)
- Part C — Critical Reasoning (Probability and Causation)

Attempt all questions.

Suggested time allocation

- Part A: 60 minutes
- Part B: 60 minutes
- Part C: 40 minutes

The suggested time allocation allows 20 minutes for checking responses.

Assessment

Assessment standards are at the end of this book.

After the examination session

Take this book when you leave.
Planning space
Part A — Deductive Logic (Propositional Logic)

Part A has five questions. Attempt all questions.
Write your responses in the response book.
Suggested time allocation: 60 minutes.

Question 1

Let:  
W = The Winter Olympics are successful  
M = An Australian wins a medal  
C = Canada wins the hockey  
S = The spectators are happy

a. Translate each of the following into a single well-formed formula of Propositional Logic, using only the dictionary provided.
   i. The Winter Olympics are successful if Canada wins the hockey and the spectators are happy.
   ii. The spectators are not happy if and only if neither Canada wins the hockey nor an Australian wins a medal.
   iii. If the spectators are not happy then it is not the case that both Canada wins the hockey and an Australian wins a medal; but the Winter Olympics are successful.
   iv. That Canada wins the hockey is not necessary for the Winter Olympics to be successful.

b. Translate each of the following into a single meaningful English sentence, using only the dictionary provided.
   i. S ≠ (∼ C & W)
   ii. (C & W) v (∼ (M ⊃ S))
   iii. W ⊃ (∼ (M ≡ (∼ C v S)))

Question 2

Use truth tables to determine whether each of the formulas below is a tautology, a contradiction or a contingency.

a. ∼ ((P ⊃ Q) ≠ (P & ∼ Q))

b. R & ∼ (∼ (Q ≡ P) v ∼ (Q ⊃ ∼ P))

Note: Each response must contain a clearly identified full main column. Responses which are not complete truth tables must contain in every row sufficient truth value entries to provide evidence of the reasoning supporting the main column value.
Question 3

The main columns of Propositional Logic formulas (a) to (e) shown below were established as follows:

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<th>(c)</th>
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a. Determine the truth-tabular relationships between the following pairs of formulas:

i. (a) and (b)
ii. (b) and (c)
iii. (b) and (e)
iv. (c) and (e)

Note: Types of responses required are:
- (m) is equivalent to (n)
- (m) is contradictory to (n)
- (m) is contrary to (n)
- (m) is subcontrary to (n)
- (m) implies (n)
- (m) is implied by (n)
- (m) is indifferent to (n)

b. Respond to the following:

i. What truth-tabular relationship exists between (d) and (e)?
ii. Explain, in English, the reasoning supporting your response.
Question 4

Use truth trees (or any other appropriate method) to determine whether each of the symbolised arguments below is valid or invalid.

Set out clearly the reasoning supporting your decisions. If invalid, provide a counter-example. No test of any counter-example is required.

a. \((P \equiv T) \supset \sim (P \land Q)\)
\[ R \supset S \]
\[ \sim (P \neq T) \lor R \]

\[
\sim (Q \lor S) \lor \sim P
\]

b. \((\sim K \lor (L \supset M)) \supset (W \land P)\)
\[ W \equiv T \]
\[ T \land P \]

\[
K \supset (L \supset M)
\]

Question 5

a. Use truth trees to show that the formula below is a contingency.
\((A \land B) \supset C\)

b. Explain, in English, how your truth trees show that the formula is a contingency.

End of Part A
Part B — Deductive Logic (Monadic and Dyadic Logic)

Part B has four questions. Attempt all questions.
Write your responses in the response book.
Suggested time allocation: 60 minutes.

Question 6

Let:

- \( Wx = x \) is a wizard
- \( Mx = x \) is male
- \( Ex = x \) is a death eater
- \( xPy = x \) plays \( y \)
- \( xDy = x \) defeats \( y \)
- \( xKy = x \) kills \( y \)
- \( xCy = x \) is the child of \( y \)

a. Translate each of the following into a single well-formed formula of Predicate Logic (QT) using only the dictionary provided.

i. Harry is a male wizard who defeats Voldemort, and kills him.
ii. Some wizards kill death eaters, but Snape is a wizard who plays quidditch.
iii. All wizards’ children are wizards.
iv. Only the son of a wizard can defeat a death eater.

b. Translate each of the following well-formed formulas of Predicate Logic (QT) into a single meaningful English sentence, using only the dictionary provided.

i. \( \neg (\exists x)((Mx \& Wx) \& Ex) \)
ii. \( (\exists x)(Wx \& (\forall y)(Ey \supset xKy)) \)
iii. \( (\forall x)((Mx \& xPq) \supset (xDs \supset sKx)) \)
iv. \( \neg (\forall x)(\exists y)((Mx \& Wx) \supset (\neg My \& Ey \& xCy)) \)

Question 7

a. Test

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<th>B</th>
<th>C</th>
<th>a</th>
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to determine whether the values provided form a counter-example to the formula below.
Set out clearly the reasoning supporting your decision.

\( (\exists x)(Bx \& (\forall y)xCy) \)
b. Test

<table>
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<th>J</th>
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<th>L</th>
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to determine whether the values provided form a counter-example to the argument below. Set out clearly the reasoning supporting your decision.

\[
(\forall x)(Jx \supset Kx) \\
(\exists x)(Kx \& Lx) \\
(\forall x)(Kx \supset Lx)
\]

**Question 8**

a. Use a **truth tree** to produce a counter-example to the argument below. No test of your counter-example is required.

\[
\sim (\exists x)(Px \& Qx) \\
(\forall x)(Rx \supset Px) \\
(\forall x)(Px \supset Rx)
\]

b. Use a **truth tree** to test the argument below for validity. Set out clearly the reasoning supporting your decision. If it is invalid, set out as much of a counter-example as the tree provides. No test of any counter-example is required.

\[
(\forall x)((Fx \& (\exists y) xLy) \supset (Gx \& Ix)) \\
(\forall x)(\sim (Gx \vee Ix) \supset Hx) \\
(\exists x)(\exists y)(Fx \& By \& xLy) \\
(\exists x)Hx
\]

**Question 9**

Consider whether the true meaning of each of the sentences below can be conveyed by a symbolic logic language. For each sentence, either provide a dictionary and symbolise the sentence or explain (in 1–2 sentences) why the true meaning cannot be conveyed with a symbolic logic language.

a. If she comes over tonight, I won’t get any study done.

b. You are the sun, I am the moon, you are the words, I am the tune …

c. If you do it, it will only be over my dead body.

d. It’s not rocket science.

**End of Part B**
Part C — Critical Reasoning (Probability and Causation)

Part C has **two** questions. Attempt **both** questions.

Write your responses in the response book.

Suggested time allocation: **40 minutes**.

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**Question 10**

**a.** Calculate the following:

i. You draw twice from a standard 52 card deck, replacing the first card before drawing the second. What is the probability that you will draw two aces?

ii. What is the probability of drawing two aces if you do **not** replace the first card before drawing the second?

iii. You draw once from a standard 52 card deck. What is the probability of drawing an ace **or** a club?

**Note:** Your response should be in the form of fractions, for example $\frac{1}{4} \times \frac{1}{2}$, $\frac{2}{3} \times \frac{1}{8}$ etc. No further calculation from this form is required.

**b.** Camille wants to study law at university. She calculates that the probability of getting into university if she passes all of her examinations is $\frac{1}{2}$. If she does not pass all of her subjects, her chances are only $\frac{1}{5}$. The probability that she will pass all of her examinations is $\frac{7}{8}$.

What is the probability that Camille will be accepted into university?

Let: $U =$ Camille gets into university

$E =$ Camille passes all of her examinations

**Note:** Your response should be in the form of fractions, for example $\frac{1}{4} \times \frac{1}{2}$, $\frac{2}{3} \times \frac{1}{8}$ etc. No further calculation from this form is required.

**c.** The surf lifesaving association is selling raffle tickets in shopping centres around Brisbane. They will sell 20000 tickets, for $10 each. The prize is a car worth $40000. What is the expected value of each ticket? Set out a table (or other evidence) to verify your response.

**d.** Write a short paragraph explaining the mistake in the following argument.

“An airline is very proud of the fact that none of its aircraft have ever crashed. They really shouldn’t advertise this fact if they want to keep their customers — a crash is well overdue!”
Question 11

The publishers of a “Students’ Examination Handbook” would like to include some tips for academic success in the next edition. Following last year’s Philosophy and Reason examination, six students were interviewed in an attempt to find out what factors lead to good examination results. A summary of their responses is presented below.

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<th>R&amp;G</th>
<th>GvT</th>
<th>RvB</th>
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Key:  
R = regular attendance at class  
G = studying with a group of fellow students  
T = engaging a private tutor  
S = interest in the subject matter  
B = purchasing a textbook  
Z = good results (a result of High Achievement or better)  
1 = present  
0 = absent

Use only the simple conditions or complex conditions (conjunctions and disjunctions) listed in the table.

a. In your response book, reproduce the three columns for the complex factors R&G, GvT and RvB, and fill in the values.

b. Based on the information in the table:
   i. Was any listed simple condition a possible necessary condition for good results? If so, list all these conditions.
   ii. Was any listed complex condition a possible necessary condition for good results? If so, list all these conditions.
   iii. Was any listed simple condition a possible sufficient condition for good results?
       If so, list all these conditions.
   iv. Was any listed complex condition a possible sufficient condition for good results? If so, list all these conditions.
   v. Was any listed simple or complex condition a possible both necessary and sufficient condition for good results? If so, list all these conditions.

c. Identify and explain one mistake in reasoning that the publishers of the handbook would be making if they based their study tips on the results of this survey.

End of Part C

End of Paper One
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<tbody>
<tr>
<td>Knowledge</td>
<td>The candidate demonstrates accurate recall and extensive understanding of a comprehensive range of concepts, ideas, procedures and principles. Occasional minor errors may be made, but do not indicate fundamental misunderstandings.</td>
<td>The candidate demonstrates accurate recall and understanding of a range of concepts, ideas, procedures and principles.</td>
<td>The candidate recalls and describes most concepts, ideas, procedures and principles.</td>
<td>The candidate recalls and describes some concepts, ideas, procedures and principles.</td>
<td>The candidate describes few concepts, ideas, procedures and principles.</td>
</tr>
<tr>
<td>Application</td>
<td>The candidate: • applies appropriate techniques and procedures of deductive reasoning to simple and complex tasks with facility and accuracy • classifies and evaluates a wide range of simple and complex artificial arguments and constructs well-supported arguments drawing on a wide range of inductive skills.</td>
<td>The candidate: • applies appropriate techniques and procedures of deductive reasoning with accuracy to simple (and some complex) tasks • classifies and evaluates a range of simple and complex artificial arguments and constructs, with some support, arguments that draw on a range of inductive skills.</td>
<td>The candidate: • uses prescribed techniques and procedures of deductive reasoning in most simple tasks and applies them with accuracy • classifies and evaluates simple arguments and constructs arguments drawing on some inductive skills.</td>
<td>The candidate: • uses prescribed techniques and procedures of deductive reasoning in some simple tasks, with some lapses in accuracy • classifies some simple arguments; few inductive skills are evident.</td>
<td>The candidate: • uses prescribed techniques and procedures of deductive reasoning inaccurately and incompletely • occasionally classifies some simple arguments.</td>
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<tr>
<td>Communication</td>
<td>The candidate: • consistently organises and presents information cogently and coherently, and communicates both evident and implied meaning effectively • produces explanations, descriptions, arguments and justifications that are precise, pertinent and purposeful.</td>
<td>The candidate: • organises and presents information coherently, and communicates meaning effectively • produces clear and purposeful explanations, descriptions, arguments and justifications.</td>
<td>The candidate: • organises and presents information so that meaning is usually evident • produces explanations, descriptions and arguments that are adequate to convey intention.</td>
<td>The candidate: • presents information and produces explanations that lack detail and clarity.</td>
<td>The candidate: • presents disjointed information and descriptions.</td>
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