



**Cambridge International Examinations**  
Cambridge International Advanced Level

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**COMPUTER SCIENCE**

**9608/42**

Paper 4 Written Paper

**May/June 2016**

MARK SCHEME

Maximum Mark: 75

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**Published**

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This document consists of **15** printed pages.

| Page 2 | Mark Scheme                                     | Syllabus | Paper |
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| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marks |
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| 1 (a) (i) | <p>TYPE LinkedList 1</p> <p>(DECLARE) Surname : STRING 1</p> <p>(DECLARE) Ptr : INTEGER } 1</p> <p>ENDTYPE 1</p> <p><b>Accept:</b></p> <p>LinkedList : RECORD 1</p> <p>Surname : STRING } 1</p> <p>Ptr : INTEGER 1</p> <p>ENDRECORD 1</p> <p><b>Accept:</b></p> <p>TYPE LinkedList = RECORD 1</p> <p>Surname : STRING } 1</p> <p>Ptr : INTEGER 1</p> <p>ENDTYPE / ENDRECORD 1</p> <p><b>Accept:</b></p> <p>STRUCTURE LinkedList 1</p> <p>(DECLARE) Surname : STRING } 1</p> <p>(DECLARE) Ptr : INTEGER 1</p> <p>ENDSTRUCTURE 1</p> <p>Accept AS / OF instead of :</p> | 3     |
| (ii)      | <p>(DECLARE) <u>SurnameList[1:5000]</u> : <u>LinkedList</u></p> <p>Accept AS / OF instead of :</p> <p>Accept () instead of []</p> <p>Accept without lower bound</p> <p>Index separator can be , : ...</p>                                                                                                                                                                                                                                                                                                                                                             | 2     |
| (b) (i)   | <p>Wu</p> <p>Accept with quotes</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1     |
| (ii)      | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1     |
| (c) (i)   | <p>IsFound + relevant description 1</p> <p>BOOLEAN 1</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2     |

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| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Marks |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (ii)      | <p>Accept () instead of []</p> <pre> 01 Current ← <u>StartPtr</u> 02 IF Current = 0 03 THEN 04 OUTPUT "<u>Empty List</u>" (or similar message)                                 (accept without quotes) Reject "Error" 05 ELSE 06 IsFound ← <u>FALSE</u> 07 INPUT ThisSurname 08 REPEAT 09 IF <u>SurnameList[Current].Surname</u> = ThisSurname 10 THEN 11 IsFound ← TRUE 12 OUTPUT "Surname found at position ", Current 13 ELSE 14 // move to the next list item 15 <u>Current ← SurnameList[Current].Ptr</u> 16 ENDIF 17 UNTIL IsFound = TRUE OR <u>Current = 0</u> 18 IF IsFound = FALSE 19 THEN 20 OUTPUT "Not Found" 21 ENDIF 22 ENDIF </pre> | 6     |
|           | Accept = for assignment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |
| 2 (a) (i) | A procedure which is defined in terms of itself // A procedure which makes a call to itself // A procedure that calls itself                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1     |
| (ii)      | 08 // 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1     |

|               |                                                        |                 |              |
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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marks |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
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| (b) (i)  | <div><table><thead><tr><th>Index</th><th>Item</th></tr></thead><tbody><tr><td>1</td><td>9</td></tr><tr><td>2</td><td></td></tr><tr><td>3</td><td></td></tr><tr><td>4</td><td></td></tr><tr><td>5</td><td></td></tr><tr><td>6</td><td></td></tr><tr><td>7</td><td></td></tr><tr><td>8</td><td></td></tr></tbody></table><table><thead><tr><th colspan="10">MyList</th></tr><tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th></tr></thead><tbody><tr><td>3</td><td>5</td><td>8</td><td>9</td><td>13</td><td>16</td><td>27</td><td>0</td><td>0</td><td>0</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td>13</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td>16</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>27</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table></div> <p>Note: Final mark only if no additional entries in table<br/>Accept last row to show all final values</p> | Index | Item | 1  | 9  | 2  |   | 3 |    | 4 |  | 5 |  | 6 |  | 7 |  | 8 |  | MyList |  |  |  |  |  |  |  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 3 | 5 | 8 | 9 | 13 | 16 | 27 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 13 |  |  |  |  |  |  |  |  |  |  | 16 |  |  |  |  |  |  |  |  |  |  | 27 |  |  |  |  |  |  |  |  |  |  | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 |
| Index    | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| 1        | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
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| 3        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| 4        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| 5        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| 6        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| 7        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| 8        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| MyList   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
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| 3        | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 8     | 9    | 13 | 16 | 27 | 0 | 0 | 0  |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
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|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    | 0  |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |
| (ii)     | <p>Any one from:</p> <p>Deletes/removes parameter value/ Item (from the array <code>MyList</code>)<br/>// Deletes the first entry (in <code>MyList</code>) that equals or is bigger than <code>Item</code></p> <p>Overwrites <code>Item</code> by moving subsequent items up/down/across/left R right</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1     |      |    |    |    |   |   |    |   |  |   |  |   |  |   |  |   |  |        |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |   |   |   |   |    |    |    |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |   |

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| Question                                             | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Marks           |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---|-------------|---|--------------------------------------|---|------------------------------|---|------------------------------------------------------|---|----------------------|---|----------------------------------------------------|---|------------------------------------|--|---------------|--|---|
| 3 (a)                                                | <div><pre>graph TD; HIRE-TRANS --&gt; F_BODY; HIRE-TRANS --&gt; F_TRAILER; F_BODY --&gt; TRANS*; TRANS* --&gt; Customer_data; TRANS* --&gt; Hire_data; Customer_data --&gt; CustomerID; Customer_data --&gt; Customer Name; Hire_data --&gt; Car Reg; Hire_data --&gt; Hire start date; Hire_data --&gt; Number of days hired;</pre></div> <p>Mark as follows:</p> <table><tr><td>Label F_TRAILER</td><td>1</td></tr><tr><td>Label TRANS</td><td>1</td></tr><tr><td>Customer box (Accept label Customer)</td><td>1</td></tr><tr><td>Hire box (Accept label Hire)</td><td>1</td></tr><tr><td>Customer fields : Customer Name, CustomerID/IDnumber</td><td>1</td></tr><tr><td>Hire fields: Car Reg</td><td>1</td></tr><tr><td>Hire fields: Hire start date, Number of days hired</td><td>1</td></tr><tr><td>accept level 5 fields in any order</td><td></td></tr><tr><td>Ignore parent</td><td></td></tr></table> | Label F_TRAILER | 1 | Label TRANS | 1 | Customer box (Accept label Customer) | 1 | Hire box (Accept label Hire) | 1 | Customer fields : Customer Name, CustomerID/IDnumber | 1 | Hire fields: Car Reg | 1 | Hire fields: Hire start date, Number of days hired | 1 | accept level 5 fields in any order |  | Ignore parent |  | 7 |
| Label F_TRAILER                                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| Label TRANS                                          | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| Customer box (Accept label Customer)                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| Hire box (Accept label Hire)                         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| Customer fields : Customer Name, CustomerID/IDnumber | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| Hire fields: Car Reg                                 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| Hire fields: Hire start date, Number of days hired   | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| accept level 5 fields in any order                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |
| Ignore parent                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |   |             |   |                                      |   |                              |   |                                                      |   |                      |   |                                                    |   |                                    |  |               |  |   |

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| Question                                                                | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Marks                                         |   |                                                                         |   |                                                                   |   |                                                                        |   |                                                              |   |   |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---|-------------------------------------------------------------------------|---|-------------------------------------------------------------------|---|------------------------------------------------------------------------|---|--------------------------------------------------------------|---|---|
| (b)                                                                     | <div><pre>graph TD     CAR_REPORT[CAR_REPORT] --&gt; CAR[CAR *]     CAR -- "No hires" --&gt; NO_HIRE[NO_HIRE]     CAR -- "One or more hires" --&gt; CAR_HIRE[CAR_HIRE]     NO_HIRE     CAR_HIRE     subgraph Box1 [ ]         CAR_HIRE --&gt; CR[Car registration]         CAR_HIRE --&gt; HL[HIRE_LIST]         CAR_HIRE --&gt; CT[Car total]     end     HL --&gt; HIRE[HIRE *]     HIRE --&gt; SD[Start date]     HIRE --&gt; ND[Number of days]</pre></div> <p><i>Mark as follows:</i></p> <table><tr><td>Selection symbol x 2 (Car-hire / No car-hire)</td><td>1</td></tr><tr><td>Labelling for <u>CAR_HIRE</u> / <u>NO_HIRE</u> (accept similar labels*)</td><td>1</td></tr><tr><td>Labelling for <u>Car registration</u> and Car total / Total hires</td><td>1</td></tr><tr><td>Iteration symbol for <u>HIRE</u> (accept in <u>HIRE_LIST</u> as a BOD)</td><td>1</td></tr><tr><td>Labelling for start date and number of days (as per diagram)</td><td>1</td></tr></table> <p>* For <u>CAR_HIRE</u> label:<br/>Accept: Hires / hired / Car data / hire data / hire record / one or more hires</p> | Selection symbol x 2 (Car-hire / No car-hire) | 1 | Labelling for <u>CAR_HIRE</u> / <u>NO_HIRE</u> (accept similar labels*) | 1 | Labelling for <u>Car registration</u> and Car total / Total hires | 1 | Iteration symbol for <u>HIRE</u> (accept in <u>HIRE_LIST</u> as a BOD) | 1 | Labelling for start date and number of days (as per diagram) | 1 | 5 |
| Selection symbol x 2 (Car-hire / No car-hire)                           | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                               |   |                                                                         |   |                                                                   |   |                                                                        |   |                                                              |   |   |
| Labelling for <u>CAR_HIRE</u> / <u>NO_HIRE</u> (accept similar labels*) | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                               |   |                                                                         |   |                                                                   |   |                                                                        |   |                                                              |   |   |
| Labelling for <u>Car registration</u> and Car total / Total hires       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                               |   |                                                                         |   |                                                                   |   |                                                                        |   |                                                              |   |   |
| Iteration symbol for <u>HIRE</u> (accept in <u>HIRE_LIST</u> as a BOD)  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                               |   |                                                                         |   |                                                                   |   |                                                                        |   |                                                              |   |   |
| Labelling for start date and number of days (as per diagram)            | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                               |   |                                                                         |   |                                                                   |   |                                                                        |   |                                                              |   |   |

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| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Marks                       |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------|-------------------------|--|--------|-----------------------------|--|----------|-------|--|------------------|-----------------------------|---|
| 4 (a) (i) | a03, h07, a23<br>accept in any order, must be lower case                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (ii)      | The car must <u>pass</u> (both) brake test <b>and</b> tyres test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (b)       | <pre> retestAllowed(<b>ThisCar</b>) 1 If (<b>testBrakes(ThisCar, pass) and testTyres(ThisCar, fail)</b>) 1 <b>or (testBrakes(ThisCar, fail) and testTyres(ThisCar, pass))</b> 1 </pre> (one mark per bold underlined all correct)<br>accept another variable instead of <b>ThisCar</b> , but must be same throughout.                                                                                                                                                                                                                                                                              | 3                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (c) (i)   | a07<br>[p03]<br><br>must be []<br>must be lower case, but don't penalise twice, so follow through from part(b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (ii)      | [p05, m04]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (iii)     | [ ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (d)       | [ ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| 5 (a) (i) | <table border="1"> <thead> <tr> <th>Mark</th><th>Description</th><th>Expected result (Grade)</th></tr> </thead> <tbody> <tr> <td></td><td>Normal</td><td>FAIL/PASS/MERIT/DISTINCTION</td></tr> <tr> <td></td><td>Abnormal</td><td>Error</td></tr> <tr> <td></td><td>Extreme/Boundary</td><td>FAIL/PASS/MERIT/DISTINCTION</td></tr> </tbody> </table><br>3 × (mark + matching grade)<br>for abnormal data accept negative values, non-integer values, Expected Result: Error<br>0 and marks above 100 are still acceptable values<br>Do not accept FAIL in expected result column for Abnormal data | Mark                        | Description | Expected result (Grade) |  | Normal | FAIL/PASS/MERIT/DISTINCTION |  | Abnormal | Error |  | Extreme/Boundary | FAIL/PASS/MERIT/DISTINCTION | 3 |
| Mark      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Expected result (Grade)     |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
|           | Normal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FAIL/PASS/MERIT/DISTINCTION |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
|           | Abnormal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Error                       |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
|           | Extreme/Boundary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | FAIL/PASS/MERIT/DISTINCTION |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (ii)      | (The programmer is) concerned only with the input (i.e. the mark) to the function and monitoring the expected output (i.e. the grade)<br>// can compare expected result and actual result                                                                                                                                                                                                                                                                                                                                                                                                          | 1                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |
| (b)       | Exception:<br>1. situation causing a crash / run-time error / fatal error 1<br><br>Exception handling:<br>2. code which is called when a run-time error occurs 1<br>3. ... to avoid the program terminating/crashing 1                                                                                                                                                                                                                                                                                                                                                                             | 3                           |             |                         |  |        |                             |  |          |       |  |                  |                             |   |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (c)      | <ol style="list-style-type: none"> <li>1 Open a non-existent file</li> <li>2 Directory path does not exist</li> <li>3 Attempt to read past the end of the file // attempt to read an empty file</li> <li>4 Array subscript is out of range</li> <li>5 Non-integer value / corrupt data read</li> <li>6 File already open in a different mode // wrong file permissions</li> </ol>                                                                                                                                                                                                                                                                       | Max 3 |
| (d) (i)  | 09 // 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1     |
| (ii)     | <ol style="list-style-type: none"> <li>1 Line 11 catches exceptions (only) between lines 05 and 10</li> <li>2 Line 11 stops the program from crashing</li> <li>3 Different exception types recognised</li> <li>4 Each exception type has an appropriate message output</li> <li>5 The program language has an (object) type <code>EXCEPTION</code></li> <li>6 <code>ThisException</code> is the instance of <code>EXCEPTION</code> which has been raised</li> <li>7 <code>EXCEPTION</code> objects have a 'Message' property</li> </ol> <p>// the message property for <code>ThisException</code> is "Arithmetic operation resulted in an overflow"</p> | Max 3 |
| 6 (a)    | <p>Max 3 marks if extra states/transitions added.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 4     |

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| Question       | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Marks        |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>(b) (i)</b> | Mark as follows:<br>1 Declaration for array (character or string data type)<br>2 FOR loop for x going from 1 to 8, generating column index used in array<br>3 FOR loop for y going from 1–2, 3–6, 7–8<br>(Accept all squares being set to 'E' and then overwritten with 'B', 'W' respectively)<br>4 Setting squares to 'B', 'E', 'W' (must be in quotes, accept single or double)                                                                                                                                                                                                                                                                         | <b>4</b>     |
| <b>(ii)</b>    | Mark as follows:<br>1 Procedure heading and declaration of 2 local variables 1<br>2 Establishing the stopper colour – opposite to the mover 1<br>3 Test for piece in column 1 ( $x > 1$ ) // column 8 ( $x < 8$ ) 1<br>4 Test for 'E' 1<br>5 Correct method for moving left // for moving right 1<br>6 until edge of board reached 1<br>7 until other colour (stopper colour) encountered 1<br>8 until own colour encountered (PieceColour) 1<br>9 Correct output for cell indexes 1<br>(accept for moving in 1 direction only)<br>10 including the 'REMOVE' message 1<br><br>Note: must use given parameter identifiers: PieceColour, xCurrent, yCurrent | <b>Max 5</b> |
| <b>(c) (i)</b> | Classes could be designed for :<br>• the board<br>• a piece<br>Containment (Board contains Pieces)<br>The pieces are <u>instances/objects</u> (of the Piece class)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Max 2</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (ii)     | <p>Accept any reasonable answer, for example:</p> <p>BOARD class:</p> <p>Properties:</p> <ul style="list-style-type: none"> <li>• Number of squares / size / dimensions</li> <li>• Current state of all squares</li> </ul> <p>Methods: –</p> <ul style="list-style-type: none"> <li>• Set the starting board</li> <li>• Capture the finishing state of the board</li> <li>• Display the state of the board after each move</li> </ul> <p>PIECE class:</p> <p>Properties:</p> <ul style="list-style-type: none"> <li>• Starting x position</li> <li>• Starting y position</li> <li>• Current x position</li> <li>• current y position</li> <li>• Colour</li> <li>• State / Removed / Active</li> </ul> <p>Methods:</p> <ul style="list-style-type: none"> <li>• Move piece</li> <li>• Remove piece</li> </ul> <p>Mark as follows:<br/>two correct responses are worth 1 mark</p> <p>Accept other classes: Game, Player</p> | Max 2 |

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**Programming code****6 (b) (i)****VB.NET**

```

Dim Board(8, 8) As Char
Dim Row, Column As Integer
For Row = 1 To 2
    For Column = 1 To 8
        Board(Row, Column) = "B"
    Next
Next
For Row = 3 To 6
    For Column = 1 To 8
        Board(Row, Column) = "E"
    Next
Next
For Row = 7 To 8
    For Column = 1 To 8
        Board(Row, Column) = "W"
    Next
Next

```

**PASCAL**

```

var Row, Column : integer;
    Board : array[1..8, 1..8] of char;
begin
    for Row := 1 to 2 do
        for Column := 1 to 8 do
            Board[Row, Column] := 'B';
        end for;
    end for;
    for Row := 3 to 6 do
        for Column := 1 to 8 do
            Board[Row, Column] := 'E';
        end for;
    end for;
    for Row := 7 to 8 do
        for Column := 1 to 8 do
            Board[Row, Column] := 'W';
        end for;
    end for;
end.

```

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**PYTHON**

```

Board = ["" for j in range(9)] for i in range(9)]
for Row in range(1, 3) :
    for Column in range(1, 9) :
        Board[Row][Column] = "B"
for Row in range(3, 7) :
    for Column in range(1, 9) :
        Board[Row][Column] = "E"
for Row in range(7, 9) :
    for Column in range(1, 9) :
        Board[Row][Column] = "W"

```

**Alternative declarations of Board array :**

```

Board = ["" * 9 for i in range(9)]

Board = []
for i in range(9) :
    for j in range(9) :
        Board.append("")

```

Instead of initialising with empty string, could initialise with 'E'. this would then only require 'B' and 'W' loops later.

**For example:**

```

Board = ["E" * 9 for i in range(9)] // Board = ["E"*9]*9
for Row in range(1, 3) :
    for Column in range(1, 9) :
        Board[Row][Column] = "B"
for Row in range(7, 9) :
    for Column in range(1, 9) :
        Board[Row][Column] = "W"

Board = []
for i in range(9):
    Board.append(["E"*9])

```

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**6 (b) (ii)****VB.NET**

```

Sub ValidMoves(ByVal PieceColour As Char, ByVal xCurrent As Integer,
ByVal yCurrent As Integer)
    Dim i As Integer
    Dim StopperColour As Char
    Dim NoFurther As Boolean
    If PieceColour = "B" Then
        StopperColour = "W"
    Else
        StopperColour = "B"
    End If
    Console.WriteLine("Possible moves are : ")
    If xCurrent <> 1 Then
        Console.WriteLine("Moving LEFT . . .")
        i = xCurrent - 1
        NoFurther = False
        do
            if Board(i, yCurrent) = "E" Then
                Console.WriteLine(i & " " & yCurrent)
            End If
            if Board(i, yCurrent) = StopperColour Then
                Console.WriteLine(i & " " & yCurrent & " REMOVE PIECE")
                NoFurther = True
            End If
            i = i - 1
        Loop Until i = 0 Or NoFurther = True
    End If
    if xCurrent <> 8 Then
        Console.WriteLine("Moving RIGHT . . .")
        i = xCurrent + 1
        NoFurther = False
        do
            if Board(i, yCurrent) = "E" :
                Console.WriteLine(i & " " & yCurrent)
            End If
            if Board(i, yCurrent) = StopperColour Then
                Console.WriteLine(i & " " & yCurrent & " REMOVE PIECE")
                NoFurther = True
            End If
            i = i + 1
        Loop Until i = 9 Or NoFurther = True
    End If
End Sub

```

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**PASCAL**

```

procedure ValidMoves(PieceColour : char; xCurrent, yCurrent : integer);
var StopperColour : char;
    i : integer;
    NoFurther : boolean;
begin
    if (PieceColour = 'B') then
        StopperColour := 'W'
    else
        StopperColour := 'B';
    writeln('Possible moves are : ');
    if (xCurrent <> 1) then
        begin
            writeln('Moving LEFT . . . ');
            i := xCurrent - 1;
            NoFurther := false;
            repeat
                if (Board[i, yCurrent] = 'E') then
                    writeln(intToStr(i) + ' ' + intToStr(yCurrent));
                if (Board[i, yCurrent] = StopperColour) then
                    begin
                        writeln(intToStr(i) + ' ' + intToStr(yCurrent) + ' REMOVE
                        PIECE');
                        NoFurther := true;
                    end;
                i := i - 1;
            until ((i = 0) or (NoFurther = true));
        end;
    if (xCurrent <> 8) then
        begin
            writeln('Moving RIGHT . . . ');
            i := xCurrent + 1;
            NoFurther := false;
            repeat
                if (Board[i, yCurrent] = 'E') then
                    writeln(intToStr(i) + ' ' + intToStr(yCurrent));
                if (Board[i, yCurrent] = StopperColour) then
                    begin
                        writeln(intToStr(i) + ' ' + intToStr(yCurrent) + ' REMOVE
                        PIECE');
                        NoFurther := true;
                    end;
                i := i + 1;
            until ((i = 9) or (NoFurther = true));
        end;
    end;
end;

```

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**PYTHON**

```

def ValidMoves(PieceColour, xCurrent, yCurrent) :
    if PieceColour == "B" :
        StopperColour = "W"
    else :
        StopperColour = "B"
    print("Possible moves are : ")
    if xCurrent != 1 :
        print("Moving LEFT . . .")
        i = xCurrent - 1
        NoFurther = False
        while i > 0 and NoFurther == False :
            if Board[i][yCurrent] == "E" :
                print(str(i) + " " + str(yCurrent))
            if Board[i][yCurrent] == StopperColour :
                print(str(i) + " " + str(yCurrent) + " REMOVE PIECE")
                NoFurther = True
            i = i - 1
    if xCurrent != 8 :
        print("Moving RIGHT . . .")
        i = xCurrent + 1
        NoFurther = False
        while i < 9 and NoFurther == False :
            if Board[i][yCurrent] == "E" :
                print(str(i) + " " + str(yCurrent))
            if Board[i][yCurrent] == StopperColour :
                print(str(i) + " " + str(yCurrent) + " REMOVE PIECE")
                NoFurther = True
            i = i + 1

```