



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**COMPUTER SCIENCE**

**0478/22**

Paper 2

**March 2017**

MARK SCHEME

Maximum Mark: 50

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**Published**

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This document consists of **5** printed pages.

| Question                       | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Marks          |                        |                                |                   |                     |          |                     |          |         |          |   |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------|--------------------------------|-------------------|---------------------|----------|---------------------|----------|---------|----------|---|
| 1(a)(i)                        | Many correct answers, the identifier must be meaningful and appropriate size if present. These are examples only<br>ReactionTime [1:650], ReactionTime [0:649],<br>ReactionTime [650], ReactionTime[649], ReactionTime[ ]                                                                                                                                                                                                                                                                                                          | 1              |                        |                                |                   |                     |          |                     |          |         |          |   |
| 1(a)(ii)                       | Many correct answers, the identifier must be the same as part 1(a)(i) including appropriate size if present. These are examples only<br>ReactionTime [1:50], ReactionTime [0:49], ReactionTime [50],<br>ReactionTime[49], ReactionTime[ ]                                                                                                                                                                                                                                                                                          | 1              |                        |                                |                   |                     |          |                     |          |         |          |   |
| 1(a)(iii)                      | Any <b>two</b> from:<br>– can store multiple reaction times under a single identifier<br>– reduces the number variables<br>– arrays have an index which identifies each stored element<br>– can use iteration to loop through an array<br>– allows for more efficient programming<br>– programs are easier to debug                                                                                                                                                                                                                | 2              |                        |                                |                   |                     |          |                     |          |         |          |   |
| 1(b)                           | Any <b>three</b> from:<br><br>– an effective loop to accept 650 records<br>– prompt for <b>all three</b> inputs<br>– within the loop reads <b>all three</b> INPUT values<br>– storing input values in appropriate arrays<br><br>Sample Answer.<br>FOR Counter ← 1 TO 650<br>OUTPUT ('Input House, Age and Reaction Time')<br>INPUT HouseArray [Counter], AgeArray [Counter],<br>ReactionTimeArray[Counter]<br>NEXT                                                                                                                 | 3              |                        |                                |                   |                     |          |                     |          |         |          |   |
| 1(c)                           | 1 mark for correct type of test data (max 3)<br>..... 1 mark for appropriate example (max 3)<br><table border="1"><tr><td>Normal / Valid</td><td>12 / 13 / 14 / 15 / 16</td></tr><tr><td>Erroneous / Abnormal / Invalid</td><td>13.5 / Twelve / 9</td></tr><tr><td>Boundary (accepted)</td><td>12 or 16</td></tr><tr><td>Boundary (rejected)</td><td>11 or 17</td></tr><tr><td>Extreme</td><td>12 or 16</td></tr></table>                                                                                                          | Normal / Valid | 12 / 13 / 14 / 15 / 16 | Erroneous / Abnormal / Invalid | 13.5 / Twelve / 9 | Boundary (accepted) | 12 or 16 | Boundary (rejected) | 11 or 17 | Extreme | 12 or 16 | 6 |
| Normal / Valid                 | 12 / 13 / 14 / 15 / 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                        |                                |                   |                     |          |                     |          |         |          |   |
| Erroneous / Abnormal / Invalid | 13.5 / Twelve / 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                        |                                |                   |                     |          |                     |          |         |          |   |
| Boundary (accepted)            | 12 or 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                        |                                |                   |                     |          |                     |          |         |          |   |
| Boundary (rejected)            | 11 or 17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                        |                                |                   |                     |          |                     |          |         |          |   |
| Extreme                        | 12 or 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                        |                                |                   |                     |          |                     |          |         |          |   |
| 1(d)                           | Any <b>five</b> from following explanations:<br>– user input for House and Age<br>– loop through the arrays<br>– use selection statements to identity the elements that meet <u>both</u> criteria<br>– maintain counter of elements (that met criteria of House and Age input)<br>– maintain a sum of reaction times (that match criteria of House and Age input)<br>– calculate the average from element counter and sum of reaction times<br>– create appropriate output message<br>– output message and average outside of loop | 5              |                        |                                |                   |                     |          |                     |          |         |          |   |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                         | Marks    |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1(e)     | Any <b>two</b> from following explanations:<br>– variable used to hold fastest time will have to initialised to a high value /<br>variable used to hold <b>fastest</b> time will be given first record value<br>– store array value in variable if reaction time less than current value in variable<br>– store array value of age with the same index in a variable<br>– Output age and fastest reaction time | <b>2</b> |

| Question      | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Marks                                                     |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------|------------------------------|------------|--------|-----------------------------------------------------------|---------|---------|-----------------------------|---------------|---------|-------------------------------------------|----------|------|--------------------------------------------|---|--|----|---|----|---|---|---|--|--|---|---|--|--|---|---|---|----|--|--|------|---|
| Section B     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                           |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| 2             | <p>1 mark for each error identified <b>with</b> effective corrective action</p> <pre>01 Num18 = 0 02 INPUT Age 03 WHILE Age &gt;= 0 DO 04     IF Age &gt;= 18 THEN 05         Num18 = Num18 + Age 06     END IF 07 END WHILE 08 PRINT Num18 - Age</pre> <p>Error – Line 04 or IF Age &gt;= 18 and Correction – IF Age &gt;18</p> <p>Error – Line 05 or Num18 =Num18 + Age and Correction – Num18 = Num18 + 1</p> <p>Error – Line 08 or PRINT Num18 - Age and Correction – PRINT Num18</p> <p>Error – INPUT Age missing inside loop and Correction – Include INPUT Age after test and before exiting loop</p> | 4                                                         |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| 3             | <p>1 mark for each correctly completed element of the grid</p> <table><tr><th>Variable</th><th>Data Type</th><th>Appropriate Validation Check</th></tr><tr><td>EmployeeID</td><td>String</td><td>Length Check / Presence Check / Format Check / Type check</td></tr><tr><td>Manager</td><td>Boolean</td><td>Type Check / Presence Check</td></tr><tr><td>AnnualHoliday</td><td>Integer</td><td>Type Check / Range Check / Presence Check</td></tr><tr><td>PayGrade</td><td>Char</td><td>Presence Check / Length Check / Type Check</td></tr></table>                                                         | Variable                                                  | Data Type | Appropriate Validation Check | EmployeeID | String | Length Check / Presence Check / Format Check / Type check | Manager | Boolean | Type Check / Presence Check | AnnualHoliday | Integer | Type Check / Range Check / Presence Check | PayGrade | Char | Presence Check / Length Check / Type Check | 8 |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| Variable      | Data Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Appropriate Validation Check                              |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| EmployeeID    | String                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Length Check / Presence Check / Format Check / Type check |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| Manager       | Boolean                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Type Check / Presence Check                               |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| AnnualHoliday | Integer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Type Check / Range Check / Presence Check                 |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| PayGrade      | Char                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Presence Check / Length Check / Type Check                |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| 4             | <p>1 mark for each correct column</p> <table><tr><th>A</th><th>B</th><th>C</th><th>Output</th></tr><tr><td>4</td><td>4</td><td>4</td><td></td></tr><tr><td></td><td>8</td><td>3</td><td></td></tr><tr><td></td><td>12</td><td>2</td><td></td></tr><tr><td></td><td>16</td><td>1</td><td>16</td></tr><tr><td>3</td><td>3</td><td>3</td><td></td></tr><tr><td></td><td>6</td><td>2</td><td></td></tr><tr><td></td><td>9</td><td>1</td><td>9</td></tr><tr><td>-1</td><td></td><td></td><td>Exit</td></tr></table>                                                                                               | A                                                         | B         | C                            | Output     | 4      | 4                                                         | 4       |         |                             | 8             | 3       |                                           |          | 12   | 2                                          |   |  | 16 | 1 | 16 | 3 | 3 | 3 |  |  | 6 | 2 |  |  | 9 | 1 | 9 | -1 |  |  | Exit | 4 |
| A             | B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | C                                                         | Output    |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| 4             | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4                                                         |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
|               | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                                                         |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
|               | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                                         |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
|               | 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                                                         | 16        |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| 3             | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3                                                         |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
|               | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2                                                         |           |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
|               | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1                                                         | 9         |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |
| -1            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                           | Exit      |                              |            |        |                                                           |         |         |                             |               |         |                                           |          |      |                                            |   |  |    |   |    |   |   |   |  |  |   |   |  |  |   |   |   |    |  |  |      |   |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks                               |                          |                          |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|--------------------------|---------------|---------------------|--------|--------|--------|--------|--------|-------|--|--|--|--|-------|-------------------------------------|-------------------------------------|--------------------------|--------------------------|-----------|--|-----------|---------------|--|-----|--|-----------|--|-------|---|
| 5(a)      | <div>– initialising counter outside the loop</div> <div>– updating counter inside loop</div> <div>– suitable exit value at start of loop</div> <div>– correct use of WHILE ... DO ... ENDWHILE</div> <div>Example:</div> <div>INPUT Num</div> <div>Counter ← 1</div> <div>WHILE Counter &lt;= 12 DO</div> <div>    Num ← Num * Counter</div> <div>    A [Counter] ← Num</div> <div>    Counter ← Counter + 1</div> <div>ENDWHILE</div>                                                                                                                                                                                                                                      | 4                                   |                          |                          |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| 5(b)      | <div>– WHILE has criteria check at start / pre-test</div> <div>– may never run</div> <div>– REPEAT UNTIL has criteria check at end / post-test</div> <div>– will always run at least once</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 4                                   |                          |                          |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| 6(a)      | <div>Alan Swales    Chantel Law</div> <div><ul style="list-style-type: none"><li>• Correct data</li><li>• Correct order</li></ul></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2                                   |                          |                          |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| 6(b)      | <table><tr><td>Field:</td><td>Device ID</td><td>Device Type</td><td>Purchase Date</td><td>Purchase Price (\$)</td></tr><tr><td>Table:</td><td>DEVICE</td><td>DEVICE</td><td>DEVICE</td><td>DEVICE</td></tr><tr><td>Sort:</td><td></td><td></td><td></td><td></td></tr><tr><td>Show:</td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>Criteria:</td><td></td><td>“Desktop”</td><td>&lt;#31/12/2016#</td><td></td></tr><tr><td>or:</td><td></td><td>“Desktop”</td><td></td><td>&lt;1000</td></tr></table> <div>1 mark for each correct column</div> | Field:                              | Device ID                | Device Type              | Purchase Date | Purchase Price (\$) | Table: | DEVICE | DEVICE | DEVICE | DEVICE | Sort: |  |  |  |  | Show: | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Criteria: |  | “Desktop” | <#31/12/2016# |  | or: |  | “Desktop” |  | <1000 | 4 |
| Field:    | Device ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Device Type                         | Purchase Date            | Purchase Price (\$)      |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| Table:    | DEVICE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DEVICE                              | DEVICE                   | DEVICE                   |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| Sort:     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                     |                          |                          |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| Show:     | <input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| Criteria: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | “Desktop”                           | <#31/12/2016#            |                          |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |
| or:       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | “Desktop”                           |                          | <1000                    |               |                     |        |        |        |        |        |       |  |  |  |  |       |                                     |                                     |                          |                          |           |  |           |               |  |     |  |           |  |       |   |