



National  
Qualifications  
2026

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## **2026 Computing Science**

### **Higher**

## **Question Paper Finalised Marking Instructions**

These marking instructions have been prepared by examination teams for use by Qualifications Scotland appointed markers when marking external course assessments.

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## General marking principles for Higher Computing Science

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this paper. These principles must be read in conjunction with the detailed marking instructions, which identify the key features required in candidate responses.

- (a) Marks for each candidate response must **always** be assigned in line with these general marking principles and the detailed marking instructions for this assessment.
- (b) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted.
- (c) If a candidate response is not covered by either the principles or detailed marking instructions, and you are uncertain how to assess it, you must seek guidance from your team leader.
- (d) Award marks regardless of spelling, as long as the meaning is unambiguous. This applies to all responses, including code. Award marks as per the detailed marking instructions, regardless of syntax errors, if the intention of the coding is clear.
- (e) For questions where candidates are asked to design or write code, a sample response is shown in the detailed marking instructions. This will not be the only valid response. You must use the detailed marking instructions and additional guidance to ensure that you consider alternative approaches and nuances of different programming languages. If in doubt you should refer to your Team Leader.
- (f) If a candidate puts a score through a response and makes a further attempt, you should only mark the further attempt. If no further attempt is made and the original is legible, you should mark the original response.
- (g) Where an incorrect response is carried forward and used correctly in a following part of the question, you should give credit for subsequent responses that are correct with regard to the original error. Candidates should not be penalised more than once for the same error.
- (h) Only award marks for a valid response to the question asked. Where candidates are asked to:
  - **Identify, name, give or state**, they need only name or present in brief form.
  - **describe**, they must provide a statement or structure of characteristics and/or features. This will be more than an outline or a list. It may refer to, for example, a concept, process, experiment, situation, or facts, in the context of and appropriate to the question. Candidates must make the same number of factual/appropriate points as there are marks available in the question.
  - **explain**, they must relate cause and/or effect and/or make relationships between things clear, in the context of the question or a specific area within the question.
  - **write code**, they must write recognisable code, not prose nor a diagram.
  - **design**, they must use a design technique appropriate to the problem. Award marks as per the detailed marking instructions, regardless of errors in the exemplification of the technique, if the intention of the design is clear.
- (i) In the marking instructions, if a word is underlined then it is essential; if a word is in brackets() then it is not essential. Words separated by/are alternatives.

## Marking instructions for each question

### SECTION 1- SOFTWARE DESIGN AND DEVELOPMENT, AND COMPUTER SYSTEMS

| Question   |               |  | Expected response                                                                                                                                                               | Max mark | Additional guidance                                                                  |       |               |            |              |   |                                                                                                               |
|------------|---------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------|-------|---------------|------------|--------------|---|---------------------------------------------------------------------------------------------------------------|
| 1.         | (a)           |  | -86                                                                                                                                                                             | 1        |                                                                                      |       |               |            |              |   |                                                                                                               |
|            | (b)           |  | 10                                                                                                                                                                              | 1        |                                                                                      |       |               |            |              |   |                                                                                                               |
| 2.         | (a)           |  | Sign: 0<br>Mantissa: 111 0000 0000 0000<br>Exponent: 0000 0001                                                                                                                  | 3        |                                                                                      |       |               |            |              |   |                                                                                                               |
|            | (b)           |  | increase number of bits assigned to mantissa and decrease number of bits assigned to exponent                                                                                   | 1        |                                                                                      |       |               |            |              |   |                                                                                                               |
| 3.         |               |  | <table><tr><th>Formal</th><th>Actual</th></tr><tr><td>price</td><td>originalPrice</td></tr><tr><td>percentage</td><td>discountRate</td></tr></table>                            | Formal   | Actual                                                                               | price | originalPrice | percentage | discountRate | 2 | Award <b>2 marks</b> for correct pair.<br><br>Award <b>1 mark</b> for one correctly identified formal/actual. |
| Formal     | Actual        |  |                                                                                                                                                                                 |          |                                                                                      |       |               |            |              |   |                                                                                                               |
| price      | originalPrice |  |                                                                                                                                                                                 |          |                                                                                      |       |               |            |              |   |                                                                                                               |
| percentage | discountRate  |  |                                                                                                                                                                                 |          |                                                                                      |       |               |            |              |   |                                                                                                               |
| 4.         |               |  | <ul style="list-style-type: none"><li>fewer cache hits</li><li>fewer frequently used instructions stored</li><li>more fetch executes required (to slower main memory)</li></ul> | 2        | Award <b>1 mark</b> for each bullet. Maximum <b>2 marks</b> .<br><br>Accept inverse. |       |               |            |              |   |                                                                                                               |
| 5.         |               |  | <ul style="list-style-type: none"><li>loop for each character</li><li>identifying position of @ character</li><li>set domainName to all characters after the "@" sign</li></ul> | 3        | Accept use of predefined functions for bullets 1 and 2.                              |       |               |            |              |   |                                                                                                               |

| Question |     |  | Expected response                                                                                                                                                                                                                                                                                                                                              | Max mark | Additional guidance              |
|----------|-----|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|
| 6.       | (a) |  | <ul style="list-style-type: none"> <li>• pressure must be a real number or integer</li> <li>• required pressure input(s) must be &gt; 0</li> <li>• pressure input cannot exceed the maximum (100)</li> <li>• maximum pressure &gt; 0</li> </ul>                                                                                                                | 1        | Award 1 mark for any one bullet. |
|          | (b) |  | <ul style="list-style-type: none"> <li>• (domain) name of the site/IP address</li> <li>• name of organisation issued to the public key</li> <li>• date on which the certificate is issued</li> <li>• the name of the issuing Certificate Authority</li> <li>• the digital signature (of the issuing Certificate Authority)</li> <li>• Serial Number</li> </ul> | 1        | Award 1 mark for any one bullet. |
|          | (c) |  | <p><b>Digital certificate:</b></p> <ul style="list-style-type: none"> <li>• proves identity of the sender/website</li> <li>• allows encryption/security</li> </ul> <p><b>Digital signature:</b></p> <ul style="list-style-type: none"> <li>• proves message has not been altered/integrity of the message</li> </ul>                                           | 2        |                                  |
|          | (d) |  | <p><b>Traffic is kept moving by:</b></p> <ul style="list-style-type: none"> <li>• using a variety of information from cameras and sensors, along with control of traffic signals</li> <li>• navigation systems rerouting cars away from busy traffic/towards more eco friendly routes</li> </ul>                                                               | 1        | Award 1 mark for any one bullet. |

| Question |     |             | Expected response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Max mark | Additional guidance |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|----------|-----|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------|--------------|-------------------|--------------|-------------------|---|---|--|--|--|---|--|---------|--|--|---|--|--|-----|--|---|--|--|--|---|---|--|---------|--|--|---|---|--|--|--|---|--|---------|--|--|---|--|--|--------|--|---|--|--|--|---|---|--|---------|--|--|--|
| 7.       | (a) |             | <ul style="list-style-type: none"><li>Line 6 totals = [0,0,0]</li><li>both updates of currentDrink</li><li>Line 8 currentDrinkTotal = 4</li><li>Line 9 totals = [0,4,0]</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4        |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             | <table><tr><th>Line Number</th><th>index</th><th>totals</th><th>currentDrink</th><th>currentDrinkTotal</th></tr><tr><td>5</td><td>0</td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td>[0,0,0]</td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td>Tea</td><td></td></tr><tr><td>8</td><td></td><td></td><td></td><td>5</td></tr><tr><td>9</td><td></td><td>[5,0,0]</td><td></td><td></td></tr><tr><td>5</td><td>1</td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td>[0,0,0]</td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td>Coffee</td><td></td></tr><tr><td>8</td><td></td><td></td><td></td><td>4</td></tr><tr><td>9</td><td></td><td>[0,4,0]</td><td></td><td></td></tr></table> |          | Line Number         | index        | totals            | currentDrink | currentDrinkTotal | 5 | 0 |  |  |  | 6 |  | [0,0,0] |  |  | 7 |  |  | Tea |  | 8 |  |  |  | 5 | 9 |  | [5,0,0] |  |  | 5 | 1 |  |  |  | 6 |  | [0,0,0] |  |  | 7 |  |  | Coffee |  | 8 |  |  |  | 4 | 9 |  | [0,4,0] |  |  |  |
|          |     | Line Number | index                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          | totals              | currentDrink | currentDrinkTotal |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 5           | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 6           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          | [0,0,0]             |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 7           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     | Tea          |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 8           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              | 5                 |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 9           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          | [5,0,0]             |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 5           | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 6           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          | [0,0,0]             |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 7           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     | Coffee       |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 8           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              | 4                 |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     | 9           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          | [0,4,0]             |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
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|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
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|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
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|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
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|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
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|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
|          |     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                     |              |                   |              |                   |   |   |  |  |  |   |  |         |  |  |   |  |  |     |  |   |  |  |  |   |   |  |         |  |  |   |   |  |  |  |   |  |         |  |  |   |  |  |        |  |   |  |  |  |   |   |  |         |  |  |  |
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| Question |     |       | Expected response                                                                                                                                                                                                                                                        | Max mark | Additional guidance                                             |
|----------|-----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------|
| 8.       | (a) |       | <ul style="list-style-type: none"> <li>• use of mod function/operator</li> <li>• arguments (number, total) in order and assignment to result</li> </ul>                                                                                                                  | 2        | Example answer:<br>SET result TO number MOD total               |
|          | (b) |       | <ul style="list-style-type: none"> <li>• use of function name <code>checkHarshad</code> with assignment to <code>finalResult</code></li> <li>• parameter <code>checkNo</code> passed into function</li> </ul>                                                            | 2        | <code>finalResult = checkHarshad(checkNo)</code>                |
|          | (c) | (i)   | It is declared/used/accessible inside the function/lines 1 - 12.                                                                                                                                                                                                         | 1        |                                                                 |
|          |     | (ii)  | The variables are only in memory when the function is being executed.                                                                                                                                                                                                    | 1        |                                                                 |
| 9.       | (a) | (i)   | 3                                                                                                                                                                                                                                                                        | 1        |                                                                 |
|          |     | (ii)  | <ul style="list-style-type: none"> <li>• only stores/displays the position of the last (thriller)</li> <li>• does not display multiple positions</li> </ul>                                                                                                              | 1        | Position is set to 0 (and will be returned as 0 if none found). |
|          |     | (iii) | <ul style="list-style-type: none"> <li>• move line 8 to after line 5/display within if statement</li> <li>• create an array/concatenate a string to store each position value</li> <li>• remove line 8 and change line 5 to display <code>Index</code></li> </ul>        | 1        | Award 1 mark for any one bullet.                                |
|          | (b) |       | <ul style="list-style-type: none"> <li>• initialise and update number of movies</li> <li>• loop for entire array</li> <li>• if current genre = "Drama" and current type = "TV Show"</li> <li>• open/create file</li> <li>• write the number of movies to file</li> </ul> | 5        |                                                                 |
|          | (c) |       | Can represent a larger amount of characters/languages.                                                                                                                                                                                                                   | 1        |                                                                 |
|          | (d) |       | Can build profile of sites that are visited/target advertisements.                                                                                                                                                                                                       | 1        |                                                                 |

| Question |     |      | Expected response                                                                                                                                                                                                                                                             | Max mark | Additional guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|-----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.      | (a) | (i)  | <ul style="list-style-type: none"> <li>record declaration</li> <li>4 appropriate fields within a record</li> </ul> <p>Example answer:<br/> RECORD book IS {STRING title,<br/> STRING author, INTEGER year, REAL buyingPrice }</p>                                             | 2        | <p>If data types are indicated they must be appropriate.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                |
|          |     | (ii) | <ul style="list-style-type: none"> <li>array of 2000 elements</li> <li>using data structure from (i)</li> </ul> <p>Example answer:<br/> DECLARE books AS ARRAY OF book INITIALLY []*2000</p>                                                                                  | 2        | <p>Allow indexing from 1 to 2000.</p> <p>Award 1 mark for<br/> books = [Book()]*2000<br/> books = [Book]*2000</p>                                                                                                                                                                                                                                                                                                                                                                           |
|          | (b) |      | <p>Step1 OUT:</p> <ul style="list-style-type: none"> <li>books()</li> </ul> <p>Step 3 IN:</p> <ul style="list-style-type: none"> <li>books(), searchTitle, searchAuthor</li> </ul> <p>Step 4 IN:</p> <ul style="list-style-type: none"> <li>foundPosition, books()</li> </ul> | 3        | <p>Array passed out in step 1 does not need to match part(a) but must avoid confusion with specific fields.</p> <p>For each step the mark is awarded for the correct parameter(s) with no additional parameters.</p> <p>If candidate passes out parallel arrays/ fields:</p> <ul style="list-style-type: none"> <li>do not award step 1</li> <li>step 3 IN:</li> <li>year()/array().year, title()/array().title, author()/array().author</li> <li>step 4 IN: year()/array().year</li> </ul> |

| Question |     |  | Expected response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Max mark | Additional guidance                                                                                                                                                                                                      |
|----------|-----|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.      | (c) |  | <ul style="list-style-type: none"> <li>• suitable initialisation and update of foundPosition</li> <li>• suitable initialisation and update firstYear</li> <li>• if condition = searchTitle and condition = searchAuthor</li> <li>• if condition &lt; firstYear with loop to iterate through all elements of array</li> <li>• array name matching to (a)</li> <li>• use of field name(s) in IF condition (title, author, year)</li> </ul> <p>Example answer:</p> <pre>SET foundPosition TO -1 SET firstYear TO &lt;any suitable large value&gt;  FOR x FROM 0 to length(books)-1 DO   IF books[x].title = searchTitle AND books[x].author =     searchAuthor AND books[x].year &lt; firstYear THEN     SET foundPosition TO counter     SET firstYear TO books[x].year   END IF END FOR</pre> | 6        | <p>Award <b>1 mark</b> for each bullet.</p> <p>At bullet 2,3,4 do not penalise if parallel arrays are used.</p> <p>If parallel arrays are used do not award bullets 5 and 6.<br/>Array index must be used correctly.</p> |

## SECTION 2 – DATABASE DESIGN AND DEVELOPMENT

| Question                  |                                         |  | Expected response                                                                                                                                                                                                                                                                                                                                                                                                    | Max mark                  | Additional guidance                                                                    |          |                       |                 |                                         |          |   |            |                                               |  |  |
|---------------------------|-----------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------|----------|-----------------------|-----------------|-----------------------------------------|----------|---|------------|-----------------------------------------------|--|--|
| 11.                       |                                         |  | <ul style="list-style-type: none"><li>Customer - Vehicle (1:M)</li><li>Mechanic - Job (1:M)</li><li>Vehicle - Job (1:M)</li></ul> <div><div>Customer</div><div>Vehicle</div><div>Job</div><div>Mechanic</div></div>                                                                                                                                                                                                  | 3                         |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| 12.                       |                                         |  | <table><tr><th>Season</th><th>Shortest Route</th></tr><tr><td>Autumn</td><td>9</td></tr><tr><td>Summer</td><td>8</td></tr><tr><td>Spring</td><td>4</td></tr></table>                                                                                                                                                                                                                                                 | Season                    | Shortest Route                                                                         | Autumn   | 9                     | Summer          | 8                                       | Spring   | 4 | 2          | Three correct records.<br>Correct sort order. |  |  |
| Season                    | Shortest Route                          |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| Autumn                    | 9                                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| Summer                    | 8                                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| Spring                    | 4                                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| 13.                       |                                         |  | <ul style="list-style-type: none"><li>SUM</li><li>calculation and alias</li><li>use of wildcards in search criteria</li></ul> <p>Example answer:<br/>SELECT SUM(billedCost - expenses) as [Total profit]<br/>FROM Job<br/>WHERE jobDescription LIKE '%paint%'</p>                                                                                                                                                    | 3                         | Note: Access will use *<br><br>Accept SUM(billedCost)<br>SUM(expenses) for bullet 1/2. |          |                       |                 |                                         |          |   |            |                                               |  |  |
| 14.                       | (a)                                     |  | eventid, archerID                                                                                                                                                                                                                                                                                                                                                                                                    | 1                         | Both required.                                                                         |          |                       |                 |                                         |          |   |            |                                               |  |  |
|                           | (b)                                     |  | <ul style="list-style-type: none"><li>FROM clause includes 'Overall Average'</li><li>points &gt; AveragePoints</li><li>Archer, Event, Result tables with joins</li></ul> <p>Example answer:<br/>SELECT forename, surname, eventName, points<br/>FROM Archer, Event, Result, OverallAverage<br/>WHERE Archer.archerID = Result.archerID<br/>AND Event.eventID = Result.eventID<br/>AND points &gt; AveragePoints;</p> | 3                         |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
|                           | (c)                                     |  | <ul style="list-style-type: none"><li>COUNT aggregate function</li><li>three tables</li><li>type = "Lawn" and style = "Left-handed"</li></ul>                                                                                                                                                                                                                                                                        | 3                         |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
|                           |                                         |  | <table><tr><td>Field(s) and Calculations</td><td>COUNT(*)</td></tr><tr><td>Table(s)</td><td>Event, Result, Archer</td></tr><tr><td>Search Criteria</td><td>type = "Lawn" AND style = "Left-handed"</td></tr><tr><td>Grouping</td><td></td></tr><tr><td>Sort Order</td><td></td></tr></table>                                                                                                                         | Field(s) and Calculations | COUNT(*)                                                                               | Table(s) | Event, Result, Archer | Search Criteria | type = "Lawn" AND style = "Left-handed" | Grouping |   | Sort Order |                                               |  |  |
| Field(s) and Calculations | COUNT(*)                                |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| Table(s)                  | Event, Result, Archer                   |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| Search Criteria           | type = "Lawn" AND style = "Left-handed" |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| Grouping                  |                                         |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |
| Sort Order                |                                         |  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                           |                                                                                        |          |                       |                 |                                         |          |   |            |                                               |  |  |

| Question |     |  | Expected response                                                                                                                                                                                                                                                                                                                                                    | Max mark | Additional guidance                                                                                                                                                                                                                       |
|----------|-----|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15.      | (a) |  | <b>Create a query to:</b> <ul style="list-style-type: none"> <li>• use MAX/search for the highest cost of a boat trip (and display the name of the customer who booked that trip)</li> <li>• use MAX/search for the highest number of booking (and display the name of the captain)</li> <li>• use COUNT/calculate the number of trips on a specific date</li> </ul> | 2        | Award <b>1 mark</b> for any one bullet. Maximum <b>2 marks</b> .                                                                                                                                                                          |
|          | (b) |  | <ul style="list-style-type: none"> <li>• correct UPDATE syntax with criteria</li> <li>• calculation and set new value</li> </ul>                                                                                                                                                                                                                                     | 2        | Award <b>0 marks</b> for first bullet if SQL clauses are in the wrong order.<br><br><pre>UPDATE Booking SET price = price-15 WHERE partySize &lt; 10 AND timeOut &lt; "12:00"</pre> Accept 12,#12:00# or no speech marks/square brackets. |
|          | (c) |  | <ul style="list-style-type: none"> <li>• boatName field and alias</li> <li>• AVG(passengers) with tables and equijoin</li> <li>• GROUP BY boatName/boatID</li> </ul> <b>Example answer:</b><br><pre>SELECT boatName, AVG(passengers) AS [Average Passengers] FROM Boat, BoatBooking WHERE Boat.boatID = BoatBooking.boatID GROUP BY boatName</pre>                   | 3        |                                                                                                                                                                                                                                           |
|          | (d) |  | <ul style="list-style-type: none"> <li>• missing MIN around passengers</li> <li>• missing join between Booking and BoatBooking tables</li> <li>• missing ORDER BY MIN(passengers)/[Least passengers] DESC</li> </ul>                                                                                                                                                 | 3        |                                                                                                                                                                                                                                           |

## SECTION 3 – WEB DESIGN AND DEVELOPMENT

| Question |     |      | Expected response                                                                                                                                                                                                                                  | Max mark | Additional guidance                                                                                                                               |
|----------|-----|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 16.      | (a) |      | <ul style="list-style-type: none"> <li>a form to create an account</li> <li>a form to sign into an account</li> <li>JavaScript to view the details of a selected player</li> </ul>                                                                 | 2        |                                                                                                                                                   |
|          | (b) |      | <ul style="list-style-type: none"> <li>the Manager Page doesn't link to the Staff Page/only accessible through the Player page</li> <li>the European Page doesn't link to the Tickets Page/should not be accessed through the shop page</li> </ul> | 2        |                                                                                                                                                   |
| 17.      |     |      | <ul style="list-style-type: none"> <li>name, address, email and mobile number all being required</li> <li>dropdown menu or radio buttons for favourite type of photography</li> <li>submit button</li> </ul>                                       | 3        | Accept firstname/surname.<br><br>Accept */required for bullet 1.                                                                                  |
| 18.      | (a) | (i)  | <pre>function displayNew(my_image){   my_image.src =   ../images/newBadge.png'; }</pre>                                                                                                                                                            | 1        | Mark can be awarded if function correct with or without relative file path.                                                                       |
|          |     | (ii) | <ul style="list-style-type: none"> <li>calling displayOld using onmouseover</li> <li>calling new function using onmouseout</li> </ul>                                                                                                              | 2        | <pre>&lt;img src="newBadge.png" onmouseover="displayOld(this)" onmouseout="displayNew(this)"&gt;</pre> New function for bullet 2 must match a(i). |
|          | (b) |      | <ul style="list-style-type: none"> <li>header h1</li> <li>display: inline</li> </ul>                                                                                                                                                               | 2        | Accept float:left for bullet 2.<br><br><pre>header h1{display: inline;}</pre>                                                                     |
|          | (c) |      | <pre>header, footer {margin-top: 10px;} header {height: 200px;} footer {height: 40px;} #stadiumImg, #infoSection{ float: left; width: 590px; height: 600px }</pre>                                                                                 | 3        |                                                                                                                                                   |
|          | (d) |      | <ul style="list-style-type: none"> <li>dropdown list allows multiple selection</li> <li>dropdown menu takes up less space on the page</li> </ul>                                                                                                   | 2        | Accept inverse.                                                                                                                                   |

| Question |     |  | Expected response                                                                                                                                                                                                                                                         | Max mark | Additional guidance                                                                                                                                                                                                                                     |
|----------|-----|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19.      | (a) |  | <ul style="list-style-type: none"> <li>• <code>#leftSection { margin-right:10px; }</code></li> <li>• <code>#rightSection { padding: 20px; }</code></li> </ul>                                                                                                             | 2        | Accept <code>margin-left</code> added to <code>#right</code><br><br><code>padding:20 20 20 20;</code><br><br><code>padding-left:20px;</code><br><code>padding-top:20px;</code><br><code>padding-right:20px;</code><br><code>padding-bottom:20px;</code> |
|          | (b) |  | <ul style="list-style-type: none"> <li>• descendant (selector)</li> <li>• used to style the unordered lists within the nav element</li> </ul>                                                                                                                             | 2        |                                                                                                                                                                                                                                                         |
|          | (c) |  | <ul style="list-style-type: none"> <li>• <code>select</code> element copied with multiple removed</li> <li>• <code>size = "3"</code> added</li> </ul>                                                                                                                     | 2        | <code>&lt;select name = "volunteer" size = "3"&gt;</code>                                                                                                                                                                                               |
|          | (d) |  | <b>Persona:</b> <ul style="list-style-type: none"> <li>• (a tester) playing the role of a typical end user</li> </ul> <b>Test case:</b> <ul style="list-style-type: none"> <li>• a set of actions executed (by a tester) to test a particular feature/function</li> </ul> | 2        |                                                                                                                                                                                                                                                         |

[END OF MARKING INSTRUCTIONS]