| University of Central Lancashire logo  **School of Psychology and Computer Science** | UCLan Coursework Assessment Brief | | | 2020 - 2021 |
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| Module Title: Computational Thinking Module Code: CO2412 | | | Level 5 |
| Billy Bonka’s Chocolate Factory | This assessment is worth 60% of the overall module mark | | |
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| **THE BRIEF/INSTRUCTIONS** Module Learning Outcomes  |  |  | | --- | --- | | **On successful completion of this module a student will be able to:** | | | **1.** | Use appropriate methods including logic and probability to reason about algorithms and data structures. | | **2.** | Compare, select and justify algorithms and data structures for a given situation | | **3.** | Analyse the space and time complexity of simple algorithms | | **4.** | Use a range of appropriate notations to represent and analyse problems | | **5.** | Implement and test algorithms and data structures |  The Background You are a systems developer working at the world-famous Billy Bonka’s Chocolate Factory. Mr Bonka has fallen out with his head Oompa Lumpa who has gone over to a competitor taking all the delicious chocolate recipes with him and Billy needs to assess his chocolate making options. You are responsible for generating new ideas from the lists of ingredients you have been given and a list of processes.   |  |  |  | | --- | --- | --- | | Ingredient 1 | Ingredient 2 | Process | | Strawberry | Rosemary | Surprise | | Mint | Thyme | Whip | | Nougat | Sage | Delight | | Truffle | Chilli | Explosion | | Hazelnut | Pepper | Cream | | Orange | Lemongrass | Crunch | | Toffee | Sea salt | Whirl |   Part 1 – Making Chocolates  **(Learning Outcomes 2, 5)**  **Learning Materials - Week 2 Decomposition and Functions, Week 5 C# Overview**  You should write a C# program that creates **all possible permutations** of the ingredients + processes and writes them to a text file (all\_chocolates.txt). You can hardcode the lists into your solution, but you must write your output to a text file using the format given. You should concatenate the ingredients as follows Ingredient 1 + “ and “ + Ingredient 2  eg.  “Strawberry and Rosemary” or “Mint and Thyme”  Add a single process to each ingredients combination you create and number each line of your output file so that it is formatted the same as the example output below.  Example Output:   1. Strawberry and Rosemary Surprise 2. Strawberry and Rosemary Whip   ….   1. Mint and Thyme Whip   ….   1. Toffee and Sea Salt Whirl   Note that “Strawberry and Rosemary Surprise” is considered the same as “Rosemary and Strawberry Surprise” and you should avoid duplicating in this way. Deliverables  1. C# program processing the lists and performing the text file write 2. A txt file containing a numbered list of the permutations you have generated (all\_chocolates.txt)  Part 2 – Making Gift Boxes **Learning Materials - Week 4 Sorts and Optimisation, Week 5 C# Overview**  After all your hard work making new chocolates Billy has put you in charge of his next big campaign, “Bonka’s Awesome Giftboxes”. Billy has personally selected 20 awesome chocolates and for each chocolate has calculated the production cost of each chocolate (what it costs to make) and the retail value (what it can be sold for). Your job is to work out the best permutation of the 20 chocolates so that Billy maximises the retail value of the gift box whilst keeping the cost below or equal to £1.96. Each gift box must contain a minimum of 14 chocolates. The chocolates Billy has selected are in the chocolates.txt file. **You should not alter chocolates.txt.**  You should:   1. Create suitable data structures (eg a class, struct or List<T>) to hold    1. Details for a single chocolate    2. A record of all the chocolates   **(Learning Outcomes 1, 2, 5)**   1. Write a method to read the file (chocolates.txt) holding details of the 20 chocolates selected by Billy into your data structures and output them to screen. The data in the data file chocolates.txt is in the format   Chocolate Name (string), Chocolate production cost (double £), Chocolate retail value (double £)  **(Learning Outcomes 5)**   1. Perform a full enumeration of the solution space to calculate the optimal solution whilst meeting the constraints.   **(Learning Outcomes 1, 2, 5)**  Optimal is defined as:   * 1. maximising the retail value of the gift box   The Constraints are   1. Production cost <= £1.96 2. Number of chocolates >= 14 3. Chocolates cannot be duplicated in the box. 4. Define a suitable data structure to store the optimal solution, this should hold:    1. The names of all the chocolates selected for the gift box    2. The total cost of the selection    3. The total value of the selection   **(Learning Outcomes 1, 2, 5)**   1. Print out the optimal solution to a text file in the following format. **Profit is calculated as Retail Price – Cost.**   1: strawberry and thyme whip  2: strawberry and lemongrass whirl  …  n: chocolate name (where n >= 14 and n <= 20)  Cost £ x.xx  Retail Price £x.xx  Profit £x.xx  **(Learning Outcomes 5)** Deliverables  1. A C# program (1, 2, 3, 4, 5) 2. A text file (5)  Part 3 – Report **Learning Materials Week 3 Algorithmic Complexity**  **Further Reading Metaheuristic Search Concepts (Chapter 2) (Zapfel et Al)**  Prepare a short report (500 words limit) explaining how you reached your solution.  Your report should contain the following:   1. An explanation as to why this is an optimal solution 2. The efficiency of your solution 3. Limitations of your solution eg is it scalable 4. Potential alternative approaches to finding an optimal solution which address the limitations you have identified. 5. You have been asked to maximise the retail value of the chocolates whilst meeting the constraints, but this solution will not necessarily produce the optimal profit. Describe what changes you could make to the program to maximise profit.   **There is no requirement to formally reference this report**  **(Learning Outcomes 1, 2, 3, 4 5)** Deliverables  1. Word processed report (500 words maximum).  Marking Scheme Marking bands are indicative and can be overridden at the marker’s discretion with justification. 40 – 49% (Pass Criteria)Successfully complete Part 1  * Suitable data structures are created and initialised (10 marks) * All permutations of the lists are generated (15 marks) * Output file is created and the permutations are successfully written to it (10 marks) * Output file is correctly formatted (5 marks)   **Additional marks to a maximum overall mark of 49%** will be given for following good programming practices such as commenting, naming conventions, and correct indentation 50 – 59% (2.2 Criteria)Complete all pass criteriaPart 2  * Suitable Data structures identified and created (2 marks) * Data structures have public properties (2 marks) * Data structures have suitable constructors (2 marks) * Input file is read into data structures and output to screen (2 marks) * Object ToString() method is overridden for consistent output (2 marks)   **Additional marks to a maximum overall mark of 59%** will be given for following good programming practices such as commenting, naming conventions, and correct indentation 60 – 69% (2.1 Criteria)Complete all (2.2 Criteria)  * Enumeration bounds are calculated (2 marks) * Perform full enumeration (5 marks) * Formatted output written to file (3 marks)  70 – 100% (1st Criteria)  * The report uses suitable technical language (2 marks) * Technical Terms eg. optimal are clearly explained (2 marks) * Algorithmic efficiency is given using appropriate notation (3 marks) * Limitations of the approach taken are given with regards to algorithmic efficiency (10 marks) * Alternative approaches identified mitigate the limitations identified (7 marks) * Alternative means of optimising profit are identified and explained (6 marks) | | | | |
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| **PREPARATION FOR THE ASSESSMENT**  Before attempting this assessment you should complete the exercises in weeks 1 – 5 on Blackboard | | | | |
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| **RELEASE DATES AND HAND IN DEADLINE**  Assessment Release date: 2nd November 2020 Assessment Deadline Date and time: 11th December 2020, 17.00 hours.  Please note that this is the latest time you can submit – not the time to submit!  Your feedback/feed forward and mark for this assessment will be provided on 18th January 2021 when feedback can be accessed. | | | | |
| **SUBMISSION DETAILS**  You should compress your work into a single zip file and submit using the assignments tab on Blackboard. **Do not use other compression formats**. For each part of your submission, clearly identify the question you are answering. | | | | |
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| **HELP AND SUPPORT**   * Questions regarding this assessment should be asked through the CO2412 Module Teams Channel “Lab Work and Assessment” * For support with using library resources, please contact Bob Frost, RSFrost@uclan.ac.uk or [SubjectLibrarians@uclan.ac.uk](mailto:SubjectLibrarians@uclan.ac.uk). You will find links to lots of useful resources in the My Library tab on Blackboard. * If you have not yet made the university aware of any disability, specific learning difficulty, long-term health or mental health condition, please complete a [Disclosure Form](https://forms.office.com/Pages/ResponsePage.aspx?id=gpn262sDxEyyAnrrGUxQZf4Gb8AdfcJGv3uVCD0jKDBUQVpUMkY3VUhHQlROSFEwSDRTWk40NVBYWS4u).  The [Inclusive Support team](mailto:inclusivesupport@uclan.ac.uk) will then contact to discuss reasonable adjustments and support relating to any disability.  For more information, visit the [Inclusive Support site](https://www.uclan.ac.uk/students/support/disability_services.php). * To access mental health and wellbeing support, please complete our [online referral form.](https://www.uclan.ac.uk/students/support/support-request-form.php) Alternatively, you can email [wellbeing@uclan.ac.uk](mailto:wellbeing@uclan.ac.uk), call 01772 893020 or visit our [UCLan Wellbeing Service](https://www.uclan.ac.uk/students/support/wellbeing-service.php) pages for more information. * If you have any other query or require further support you can contact The <i>, The Student Information and Support Centre.  Speak with us for advice on accessing all the University services as well as the Library services. Whatever your query, our expert staff will be able to help and support you. For more information , how to contact us and our opening hours visit [Student Information and Support Centre](https://www.uclan.ac.uk/students/library-it/library/the_i.php). * If you have any valid mitigating circumstances that mean you cannot meet an assessment submission deadline and you wish to request an extension, you will need to apply online prior to the deadline. | | | | |
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| Disclaimer: The information provided in this assessment brief is correct at time of publication. In the unlikely event that any changes are deemed necessary, they will be communicated clearly via e-mail and a new version of this assessment brief will be circulated. | | | Version: 1 | |