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| Level 6- New Zealand Diploma in Software Development (2604v2) | | |
| Title | Assessment 1 (Term 1 - Python Programming) | |
| Assessment Version | 1.0 | |
| Last updated | 15 Jan 2024 | |
| Graduate Profile Outcome(s) | **GPO 2-** Write and maintain complex programs using design patterns, data structures and algorithms to meet specifications and software development standards. | |
| Learning Outcome(s) | 2.1 | Apply programming techniques and principles to write efficient and maintainable code for diverse software applications. (4 credits) |
| 2.2 | Apply a range of algorithms to solve complex programming problems to provide the solution to the business problem. (5 credits) |
| 2.3 | Apply appropriate design patterns to create modular and maintainable code, enhancing software scalability and reusability. (3 credits) |
| 2.5 | Apply different data structures to efficiently store and manipulate data in various programming scenarios. (3 credits) |
| Credits | 15 Credits | |
| Duration | 6 hours | |
| Assessor Name | Arjinder Singh | |

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| Assessment Section | Marks Possible |
| Task1: Programming techniques and principles (LO 2.1) | 40 |
| Task2: Sorting algorithms (LO 2.2) | 50 |
| Task3: Design patterns (LO 2.3) | 30 |
| Task4: Data structures (LO 2.5) | 30 |
| **Total** | **150** |
| Grading Scale A+=95-100%, A=90-94%, A-=85-89%, B+=80-84%, B=70-79%, B-=60-69%, C+=55-59%, C=50-54%, D=Below 50% | |

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| **Learner Declaration Statement**  *Only sign if you agree to the Learner Declaration Before assessment and After assessment sections below* | | | |
| Learner Name | Connor Petford | Learner Signature | A black background with a black square  Description automatically generated with medium confidence |

Learner Instructions and Declaration

**Declaration Statement**

I have read, understood, and agreed on the following (refer to student handbook):

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| Before the assessment |  |
| Techtorium Assessment Conditions and Guidelines | The responsibilities of the learner |
| The assessment environment is safe and accessible | The responsibilities of the assessor |
| The Learning Outcomes that will be assessed | Options for re-assessment |
| This assessment is my own original work unless  otherwise specified | Your completed assessment paper is the property of  Techtorium and should not be removed from the  premises at any time. |
| I have acknowledged all sources of information used in  the writing of this assignment by using the recognised  in-text APA referencing standard using the latest  version. All unpublished sources of information have  been acknowledged. | I have not copied either partially or in full any work from  any other learner or former learner of Techtorium or any  other tertiary institution. I promise not to share this  project in part or whole with any other learner at  Techtorium or outside this campus. |
| I make this declaration in full knowledge and  understanding that, should it be found false, Techtorium  may take disciplinary action. | I understand that Techtorium may make use of systems  such as Turnitin.com to verify the originality of my work. |
| [Academic Fraud](https://www.nzqa.govt.nz/assets/Providers-and-partners/NZQA-Effective-practice-guide.pdf) is a significant issue and will compromise your ability to study at Techtorium. Apply the following to validate authenticity.   * Proper APA referencing must be applied where applicable. * Unique Identifiers must be applied where applicable *(Initials or names added to applied naming standard e.g., Johann.local).*   *Ask your assessor for further clarification if needed.* | |
| During the assessment | |
| 1. NZQA Assessment Conditions and Guidelines as follows | 1. Skills and knowledge will be demonstrated in a regulated assessment environment |
| 1. Simulations and scenarios used during assessments will reflect an on-the-job situation as found in the typical workplace, but which is remote to the workplace | 1. In the event of an emergency or unplanned incident rendering the assessment unsafe or impractical, a re-assessment will be scheduled for the most appropriate time |
| 1. All assessments will satisfy all the NZQA framework requirements and be based on the relevant approved learning framework | 1. All assessors will satisfy the mandatory competency requirements for assessors |
| 1. Assessments will take place strictly according to the approved assessments schedule and all the related time allocation will be adhered to | 1. All assessment activities will be managed via on-site trainer invigilation activities |
| After the assessment |  |
| 1. During the assessment it was clear what I was expected to do | 1. The feedback I received enabled me to find ways of reaching the standard (if it was not reached during the assessment) |
| 1. I was treated fairly | 1. The feedback I received met my needs and expectations |
| Learner feedback - *Please provide feedback in Canvas if you think we can improve our Assessment Process.* | |

**Learner Instructions**

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| Please take your time to read the provided instructions. |
| **Overview**   1. If you have any questions, you can ask your assessor before you start the assessment. 2. If you have any unforeseen circumstances which may affect your performance during the assessment. Please speak to your assessor before you start the assessment. 3. If you wish to query the Assessor marking, then follow the appeal process stated in the Student Handbook 4. This assessment is to be submitted as a soft copy which will be saved to a location specified by the Assessor at the time of the assessment. 5. If you are referring to external work, you must use the appropriate referencing style APA version 7 [reference link](https://guides.unitec.ac.nz/apareferencing/webpages) or equivalent hyperlinks. 6. If you are attaching any document, you must mention in the Proof of work that “document attached” with the specified name of the document. 7. The assessment will be completed in class during the scheduled time. 8. The product that you submit by the end of the allocated time for this assessment will be considered your last product for assessment. 9. You must complete this assessment on your own (individual work). 10. You are only allowed to use resources as prescribed by each task.   **Technical Details**   1. Assessments will be given through Canvas and must be uploaded through Canvas. 2. Where applicable you must include clear screenshot evidence. Images must not be unreadable when zoomed in or out. 3. You must not modify any part of this document except the relevant sections in which you are expected to write or embed other documents.   **Success Criteria**   1. All work for this assessment must be original including any written work. See referencing section above if you have any doubts. 2. To pass this assessment you must reach a minimum of a C grade (50%) for each task. 3. Your submission will be assessed through Turnitin.com to check the authenticity, **IF** any fraud/duplicate is detected, necessary actions will be taken.   **Learner Resources**  You will have access to the following resources for this assessment:   1. Assessment Coversheet (This document) 2. Declaration from Learner (This document) 3. Learner Instructions (This document) 4. Your own Device |

# Task 1: Programming techniques and principles (40 marks)

**Outcome Mapping:**

**2.1 - Apply programming techniques and principles to write efficient and maintainable code for diverse software applications. (4 credits).**

# Scenario

With the growing number of events being handled by "Stellar Events", the team often finds it challenging to keep track of each vendor's contact details. Misplaced contact information or double bookings due to miscommunication often result in losses and a hit to the company's reputation. To streamline this process and avoid such pitfalls, there's a need for a basic digital solution to manage all vendor contacts.

You have been approached to develop a basic **Contact Book** application that helps manage vendor contacts efficiently. Using this application “Stellar Events” must be able to perform the following:

* Add New Vendor Details: Onboard new vendors; their contact details must be easily added to the system. **This includes their name (or company name), phone number, and email address.**
* Access Vendor Information Quickly: For ongoing projects, team members must quickly access specific vendor details with a simple search.
* Remove Vendors: If a vendor goes out of business or if there's a decision to cease collaboration due to quality issues, their details must be swiftly removed from the system.
* View All Vendors: Before big events, the team can quickly review all available vendors to ensure there are no double bookings and to streamline communication.

Develop an efficient and maintainable Contact Book application using sound programming techniques to fulfil "Stellar Events'" needs for managing vendor contacts effectively.

## Solution Requirements

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| --- | --- | --- | --- |
| SR# | Solution Requirement | Details | Max Marks |
| SR1.1 | Write efficient and maintainable code using appropriate programming techniques and principles to add an option to add details of the new vendor. | Provide evidence of the code written to achieve this SR in the space provided below | 7 |
| Provide your evidence here | | | |
| SR1.2 | Write efficient and maintainable code using appropriate programming techniques and principles to add an option to view vendor information. | Provide evidence of the code written to achieve this SR in the space provided below | 7 |
| Provide your evidence here. | | | |
| SR1.3 | Write efficient and maintainable code using appropriate programming techniques and principles to add an option to remove details of vendors. | Provide evidence of the code written to achieve this SR in the space provided below | 7 |
| Provide your evidence here | | | |
| SR1.4 | Write efficient and maintainable code using appropriate programming techniques and principles to add an option to view the details of all vendors. | Provide evidence of the code written to achieve this SR in the space provided below | 7 |
| Provide your evidence here | | | |
| SR1.5 | Working application | Provide evidence of the successful execution of each feature stated below with input and output.   * Add a vendor. * View a vendor. * View all vendors and * Remove vendors. | 7 |
| Provide your evidence here. | | | |
| SR1.6 | Apply meaningful in-code comments while writing the code for this application. | This task will be evaluated based on the evidence provided in response to the above solution requirements. | 2 |
|  | | | |
| SR1.7 | Apply meaningful and consistent naming convention throughout the development of code. | This task will be evaluated based on the evidence provided in response to the above solution requirements. | 3 |
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# Task 2: Sorting Algorithms (50 marks)

**Outcome Mapping:**

**2.2 - Apply a range of algorithms to solve complex programming problems to provide the solution to the business problem. (5 credits)**

# Scenario

## Birth weight is often used as an indicator of a newborn's health and potential risk factors. Sorting birth weight data can help researchers identify trends and correlations between birth weight and various factors such as maternal age, smoking habits, race, and more. This data can contribute to medical research and studies on maternal and infant health.

The research institute has gathered a large dataset containing birth weight records of newborn babies, along with maternal health information such as age, smoking habits, race, and more. The institute aims to sort and analyse this data to draw meaningful insights that can be used to guide medical practices and policies.

The research institute has approached you to provide a programming solution using an efficient sorting algorithm, which can help them sort their data quickly. Below is the link to the dataset supplied by the research institute.

[BirthWeight.csv](https://techtoriumacnz.sharepoint.com/:x:/s/CLASSSWD/EXAhZfNSy19Jr_UuwXrPMwgBaa7nzJhjNcNXTQDMuQhhpg?e=LIdK6y)

## Apply a range of sorting algorithms to identify the most efficient programming solution for the problem outlined by the research institute. **For this task, you must use a different algorithm for each solution requirement (SR) listed below, determining the most efficient sorting algorithm for the provided dataset.**

Note: Dataset is available along with the assessment component on Canvas.

## Solution Requirements

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| --- | --- | --- | --- |
| SR# | Solution Requirement | Details | Max Marks |
| SR2.1 | Apply your preferred sorting algorithm to the provided dataset, developing a solution that addresses the specific business problem. | Provide Evidence of: Algorithm Name and Code | 8 |
| Provide your evidence here.  Sorting Algorithm Name: Bubble | | | |
| SR2.2 | Apply your preferred sorting algorithm to the provided dataset, developing a solution that addresses the specific business problem. | Provide Evidence of: Algorithm Name and Code | 8 |
| Provide your evidence here. Sorting Algorithm Name: Insertion | | | |
| SR2.3 | Apply your preferred sorting algorithm to the provided dataset, developing a solution that addresses the specific business problem. | Provide Evidence of: Algorithm Name and Code | 8 |
| Provide your evidence here.  Sorting Algorithm Name: Selection | | | |
| SR2.4 | Apply your preferred sorting algorithm to the provided dataset, developing a solution that addresses the specific business problem. | Provide Evidence of: Algorithm Name and Code | 8 |
| Provide your evidence here.  Sorting Algorithm Name: Merge | | | |
| SR2.5 | Apply your preferred sorting algorithm to the provided dataset, developing a solution that addresses the specific business problem. | Provide Evidence of: Algorithm Name and Code | 8 |
| Provide your evidence here.  Sorting Algorithm Name: Quick | | | |
| SR2.6 | Based on the time complexities, identify the efficient solution of the problem given above. | **Record Time Complexities:** For each of the five chosen algorithms, record their time complexities across a minimum of five different test cases. Present this data in a tabular format.  **Analyse Time Complexities:** Examine the recorded time complexities for each test case to conduct a comparative analysis.  **Conclude Efficiency:** Based on your analysis, conclude which algorithm provides the most efficient solution for the dataset provided by the research institute. | 10 |
| Provide your response here.  Given the results my program has provided based on my pc’s performance statistics, I can conclude with confidence that the most efficient sorting algorithm for sorting such a large dataset appears to be quick sort by a mere 0.03 seconds. Quick and merge sort were able to sort a dataset with up to 10,000 values in under a second, while insertion took just over 6 seconds, selection 8 seconds, and bubble sort just under 12 seconds | | | |

# Task 3: Design patterns (30 marks)

**Outcome Mapping:**

**2.3 - Apply appropriate design patterns to create modular and maintainable code, enhancing software scalability and reusability. (3 credits)**

# Scenario

You are developing a software tool that provides information about different programming languages such as Python, C#, and Java. Your goal is to create objects representing different programming subjects, each with its own set of details. You want to use a design approach that allows for easy addition of new subjects without modifying existing code. Implement a solution that showcases the creation of different programming subject objects using a common interface.

## Solution Requirements

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| --- | --- | --- | --- |
| SR# | Solution Requirement | Details | Max Marks |
| SR3.1 | Select and apply the appropriate design pattern to provide the programming solution for the above-given scenario.  Write a Python code using the appropriate design pattern. | Provide Evidence of: Pattern Name and Code | 30 |
| Provide your evidence here. | | | |

# Task 4: Data structures (30 marks)

**Outcome Mapping:**

**2.5 - Apply different data structures to efficiently store and manipulate data in various programming scenarios. (3 credits)**

# Scenario

## You have been tasked to write the solutions for the problems given below using different data structures such as lists, tuples, and stacks by storing the information.

## Solution Requirements

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| SR# | Solution Requirement | Details | Max Marks |
| SR4.1 | You're managing the inventory of a tech gadget store that sells a wide range of products, including smartphones, laptops, tablets, and accessories. With an upcoming sale, you need to quickly assess the stock levels to ensure there are enough gadgets available for the event. Each product type has been listed in a Python list according to the inventory count.  Input: ["smartphone", "laptop", "tablet", "smartphone case", "laptop charger", "tablet cover"].  Output: Total count of items in the inventory.  Write a Python program that counts the total number of items in the inventory list. | Provide evidence of the code and output after running the code | 8 |
| Provide your evidence here. | | | |
| SR4.2 | You are organizing the inventory for your office's supply closet. The inventory needs to include a list of different types of office supplies, such as pens, notebooks, and staplers. Since the types of supplies are relatively fixed and don't change often, you decide to use a tuple to store this information for its immutability and simplicity.  Create a Python program that defines a tuple with three different types of office supplies. Implement the following operations:   * Display the third item in the tuple. * Check if "sticky notes" are present in the tuple. | Provide evidence of the code and output after running the code | 8 |
| Provide your evidence here. | | | |
| SR4.3 | Write the output of the following code: |  | 6 |
| Provide your response here.  Tuples are a type of data structure that cannot be changed after it’s been implemented therefore the output would be 1, 2, 3, 4 | | | |
| SR4.4 | Explain each line of code and write the output of the code. |  | 8 |
| Provide your response here.  ­first line defines a method to produce a mystery code with the parameter being a string input  Second line defines an empty list named stack  Syntax lines  Fourth line to ninth initiates a for loop, so for each char (character?) in the user’s string input, if it’s alpha, (alphabet I’m assuming) then it will add it to the stack, then an else if is added below in case a character inserted by the user is a special character such as an exclamation mark or hashtag, which will be deleted by implementing stack.pop. pop is one of the few ways to delete or break something within python  Following the for loop, result is defined as  The next line returns the result of the for loop, with the stack sorted so it should contain all the string characters the user inputted, without special characters  Input\_text is finally defined at the bottom, this is the parameter first mentioned at the top when the method/function was defined mystery\_code(input\_text)  Output is just I guess a naming convention for the mystery code function  Then the program prints the mystery code with the original input  ­­­ | | | |

# ------------------------------------------------------------------------------------------- End of Assessment ---------------------------------------------------------------------------------------