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YEAR 12 *Trial Exam Paper*

2019

COMPUTING: SOFTWARE DEVELOPMENT

Written examination

Reading time: 15 minutes
Writing time: 2 hours

STUDENT NAME:

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	20	20	20
B	5	5	20
C	12	12	60
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials provided

- Question and answer book of 27 pages
- Detachable insert containing a case study for Section C in the centrefold
- Answer sheet for multiple-choice questions

Instructions

- Detach the insert from the centre of this book during reading time.
- Write your **name** in the space provided above and on the multiple-choice answer sheet.
- All written responses must be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.
- You may keep the detached insert.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination.

SECTION A – Multiple-choice questions

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

In a Gantt chart, the amount of time a task can be delayed before the project finish date is also delayed is referred to as

A. slack time.

B. a milestone.

C. a dependency.

D. the critical path.

Question 2

An entertainment events website sells tickets to customers for events in their local area.

Which one of the following is an example of a functional requirement for the ticket sales system?

A. All navigation must be consistent on all ticket sales pages.

B. Ordering must be available 24 hours a day, seven days a week.

C. Ticket sales pages must be accessible by vision-impaired users.

D. A confirmation email must be sent once a ticket has been purchased.

Question 3

Eden works for a small business. At the end of each financial year, she moves all inactive client data from the company system to an external hard disk drive. Clients become inactive during the year if they cancel their account.

Eden is performing a form of

A. data backup.

B. file disposal.

C. data security.

D. data archiving.

Question 4

Henry is creating an application that handles job bookings for home repairs. He has just finished writing a section of the software that will check a given date and time to see if there is a current booking, returning a value of True if there is and a value of False if there is not.

This section of the software is referred to as

A. a loop.

B. a condition.

C. an iteration.

D. an instruction.

Use the following information to answer Questions 5–7.

Pseudocode for an algorithm is shown below.

```
Algorithm FindWords()
Begin
   allowedLetters ← "ABCDHIJLMNOPQRTUVWXYZ"
   allWords ← open "wordfile.txt" and read all lines
   foundWords ← {}

   For each word in allWords Do
       foundWords[word] ← 0
       For each letter in word Do
           If letter in allowedLetters Then
               foundWords[word] ← foundWords[word]+1
           EndIf
       EndFor
   EndFor

   For each word in foundWords Do
       If length of word = foundWords[word] Then
           Print word
       EndIf
   EndFor
End
```

Question 5

In the pseudocode, FindWords is best described as an implementation of

A. a method.

B. a function.

C. a procedure.

D. an instruction.

Question 6

In the pseudocode, what data structure best describes foundWords?

A. array

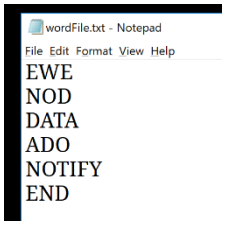
B. record

C. hash table

D. dictionary

Question 7

After the pseudocode has been implemented, the following data is stored in a wordFile.txt file.



Which words will be printed by the algorithm when it is executed?

A. NOD, ADO, END

B. NOD, DATA, ADO

C. EWE, NOTIFY, END

D. EWE, DATA, NOTIFY

Question 8

Kate is writing software to keep track of volunteers for her local community group. The software solution will store the personal details of each volunteer, such as their name, street name and number, postcode, state, phone number and email address.

The most appropriate data structure to store these personal details is a

A. two-dimensional array.

B. record.

C. string.

D. file.

Question 9

Mateo has been given a plain text file containing data that needs to be searched to find a particular item. The file contains a very large amount of data, and the data is sorted alphabetically.

The most appropriate search for Mateo to use is

A. quick.

B. linear.

C. binary.

D. selection.

Use the following information to answer Questions 10 and 11.

Sam is submitting his completed programming folio by transferring it from his USB flash drive to the school server. He selects the folder that contains all of his folio files and moves it to the school server from his submission folder. While it is moving, he decides to free up space on his USB flash drive and begins deleting files that he believes he will no longer need.

Question 10

What procedure for managing files is Sam following by deleting his unwanted files?

A. backup

B. disposal

C. archiving

D. redundancy

Question 11

If Sam were to delete files that are contained within his folio while the files are still being moved, the move process would fail when it tries to move files that no longer exist.

What best describes this threat to Sam's folio files?

A. legal

B. deliberate

C. accidental

D. events-based

Question 12

Amelia is a social media influencer with over 60 000 followers who lives in regional Victoria. She would like to use her follower database to send special deals to people for discounts on the products that she is sponsored to promote. She intends to send these deals as a message to any follower in her follower list.

Which legislation must Amelia comply with before she sends out these messages?

A. *Spam Act 2003*

B. *Privacy Act 1988*

C. *Privacy and Data Protection Act 2014*

D. *Charter of Human Rights and Responsibilities Act 2006*

Question 13

The following algorithm has been written.

```
Algorithm readFile()
Begin
   Input fileName

   If fileName != Blank Then
        fileContents ← open fileName and read all lines
   EndIf

   Return fileContents
End
```

What type of validation is being used in this algorithm?

A. type checking

B. range checking

C. usability checking

D. existence checking

Question 14

Dillon wants to write a software solution for an information system. He needs the solution to allocate its resources across multiple systems, sharing the processing workload of the software solution. Each connected system can perform the same types of tasks and can share processing power, disk storage and network bandwidth with other connected systems.

What type of modern application architecture would be the most appropriate for Dillon to use?

A. peer-to-peer

B. rich client

C. internet

D. mobile

Question 15

What is the key reason that data is stored using an XML file instead of a plain text file?

A. It can be viewed via a web browser.

B. It forces programmers to always use the same tags in each record.

C. It is safer for storing data, as the contents of an XML file are always secure.

D. It provides an easy-to-read structure that can be used across multiple systems.

Question 16

Yannick has just exported data from a music performance database. Some of the export data is shown below.

songList.xml

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<song_library>
    <piece>
        <title>Crooked Lines</title>
        <band>The Improvisation band</band>
        <director>T. Priest</director>
        <year>2012</year>
    </piece>
    <piece>
        <title>Fanfare for a feline</title>
        <band>Brass Ensemble</band>
        <director>P. Persian, arr. J. Kitten</director>
        <year>2019</year>
    </piece>
    <piece>
        <title>Legend of Bobble Medley</title>
        <band>Symphony Orchestra</band>
        <director>arr. Z. Griffiths</director>
        <year>2015</year>
    </piece>
    <piece>
        <title>We Do Remember</title>
        <band>Finale</band>
        <director>arr. T. Catcher</director>
        <year>2018</year>
    </piece>
</song_library>
```

Which line number contains an example of a tag opening an XML parent?

A. 1

B. 15

C. 17

D. 25

Question 17

A selection sort is performed on the array of numbers below.

[359, 950, 277, 308, 242, 116, 270, 972]

What is the state of the array after three iterations of selection sort?

A. [116, 950, 277, 308, 242, 359, 270, 972]

B. [116, 242, 270, 359, 950, 277, 308, 972]

C. [116, 242, 270, 308, 950, 359, 277, 972]

D. [116, 242, 270, 277, 950, 359, 308, 972]

Question 18

Maryam is working on a software solution that connects to an external server on the internet and downloads an XML file containing the results of scientific experiments. Her software processes the XML file and creates graphical representations of the results of experiments so that they can be distributed to research institutions. The research institutions that receive the graphical representations can then use the information in their own experiments.

The most relevant characteristic of the XML data required to maintain its integrity is

A. authenticity.

B. consistency.

C. reasonableness.

D. communication of message.

Question 19

Markus has been asked by his boss to take the company's database of customers and their order history, and write software that will predict trends in purchasing over the next twelve months. This will help his boss decide which products she should order in bulk.

What Markus has been asked to do is best described as

A. data manipulation.

B. data visualisation.

C. data validation.

D. data mining.

Question 20

A method of representing part of the design of a software solution for the primary purpose of allowing relationships between data to be shown is

A. a context diagram.

B. a layout diagram.

C. an annotation.

D. a mock-up.

END OF SECTION A

SECTION B – Short-answer questions

Instructions for Section B

Answer **all** questions in the spaces provided.

Question 1 (2 marks)

Using an accurate example, explain the relationship between a file and a record.

Question 2 (8 marks)

Francesca has designed and built a system for a clothing manufacturer that automates the cloth-cutting process that prepares cloth for sewing items of clothing.

During the testing stage, Francesca asked the sewing employees in one of the manufacturer's factories to test the new system.

One of the employees mentioned that sometimes the system would reject a piece of cloth as not being large enough, even though it was.

Francesca went to the source code of the software and found the algorithm that deals with cutting cloth. The system uses this fnCheckLength algorithm to check whether or not a piece of cloth will be large enough to be used for an item of clothing.

The algorithm is shown below.

```
Function fnCheckLength(flClothMinLength, flLengthProvided)
Begin
        returnValue ← False
        If flLengthProvided > flClothMinLength Then
              returnValue ← True
        EndIf
        Return returnValue
End
```

For testing purposes, Francesca decides to test the algorithm using a cloth length (flClothMinLength) of 1.1 metres. This length was chosen at random.

a. Using the cloth length that Francesca has chosen for testing, select appropriate testing values for flLengthProvided. Justify your selection by explaining the reason behind each value being selected.

3 marks

b. Using the values you selected in **part a.** for flLengthProvided, state what should be returned by the fnCheckMinLength algorithm and what will be returned by the algorithm.

3 marks

_____

_____

_____

_____

_____

_____

c. In the space provided below, construct a trace table for the fnCheckLength algorithm using a flClothMinLength of 3.0 metres and cloth length flLengthProvided of 3.2 metres.

2 marks

Question 3 (4 marks)

Rami is developing a software solution that will store data for a game he likes to play. This software will allow him to keep track of player information so that he can look up the history of any player before deciding if he should compete against them. In the game, Rami enters a combat room where a number of players wait for others to challenge them. When he enters the room, his software will download a master file from the gaming website that contains the player information of all of the players currently in the combat room: their name, level, number of wins and number of losses. All player names are unique.

Rami needs to retrieve the history of each player from the master file. As his software retrieves each player history, he needs it to store their player information in a data structure. Once the history of all players are retrieved, Rami's software will open a new file on his local hard drive and write all of the player data to that file.

a. What is the most appropriate data structure for Rami to use to store the player information of a single player? Justify your response.

2 marks

_____

_____

_____

_____

b. What is the most appropriate data structure for Rami to then use to store all of the players' information? Justify your response.

2 marks

_____

_____

_____

_____

Question 4 (3 marks)

Samara needs to write a sorting algorithm for a data collection tool. There are approximately 50 000 records in the data set that need to be sorted. Samara is deciding between using quick sort or selection sort as the algorithm to sort the data.

Referring to how each sort works, select and justify which sort is more efficient for Samara to use. Refer to mathematical comparisons in your response.

Question 5 (3 marks)

The algorithm fnGetMedian takes as input three values that are all integers. It then calculates the median of those three values and displays the median as output. Two examples are given below.

Test case 1
Input: 25, 55, 65
Output: Median is 55

Test case 2
Input: 5, 22, 14
Output: Median is 14

Complete the pseudocode below for the algorithm fnGetMedian.

```
Algorithm fnGetMedian
Begin
      Input firstNumber, secondNumber, thirdNumber
      median ← 0

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      _____

      Print "Median is " + median
End
```


END OF SECTION B

SECTION C – Case study

Instructions for Section C

Please remove the insert from the centre of this book during reading time.

Use the case study provided in the insert to answer the questions in this section. Answers must apply to the case study.

Answer **all** questions in the spaces provided.

Question 1 (4 marks)

State **four** functional requirements of the proposed Bilbyroo system.

Requirement 1 _____

Requirement 2 _____

Requirement 3 _____

Requirement 4 _____

Question 2 (3 marks)

What type of modern application architecture would be most appropriate for Avinash to use for his new system? Justify your selection.

_____

_____

_____

_____

_____

_____

Question 3 (8 marks)

Avinash has hired Maia and Elizabeth to write the Bilbyroo software. They intend to write the software using a desktop computer with an Android emulator for testing purposes.

Maia is the lead developer and has identified the following tasks for the project.

Task	Duration
Research Android operating system.	2 days
Design Bilbyroo application.	3 days
Develop Bilbyroo application on desktop computer.	10 days
Create online database to be used for sync.	2 days
Upload online database to be used for sync.	1 day
Install Bilbyroo application on Android operating system.	1 day
Import spreadsheet of currently attending children.	1 day
Avinash to enter waitlist information.	3 days

Maia shared this with Avinash, who was a little upset that it looked like it would take 23 working days before the software would be ready to use.

Maia explained that, as both she and Elizabeth would be working on the project, it would take less than 23 days.

She has prepared the following Gantt chart for the project and uses it to help her explain the schedule to Avinash.

Task	Duration (days)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Research Android operating system.	2																				
Design Bilbyroo application.	3																				
Develop Bilbyroo application on desktop computer.	10																				
Create online database to be used for sync.	2																				
Upload online database to be used for sync.	1																				
Install Bilbyroo application on Android operating system.	1																				
Import spreadsheet of currently attending children.	1																				
Avinash to enter waitlist information.	3																				

a. Using evidence from the Gantt chart on page 16, outline two reasons why the project would take fewer than 23 days to complete.

4 marks

1. _____

_____

_____

2. _____

_____

_____

b. For each task listed below, describe the consequences Maia, Elizabeth and Avinash will face if the task takes longer than they originally planned.

2 marks

- Research Android operating system.

_____

_____

_____

- Avinash to enter waitlist information.

_____

_____

_____

c. Maia plans to add some milestones to help convince Avinash that the project will proceed as planned.

Indicate, using the diamond (♦) symbol, **two** milestones on the Gantt chart on page 16 that Maia could add.

2 marks

Question 4 (2 marks)

Avinash has asked Maia and Elizabeth to create a software requirements specification (SRS) document for the project.

He has provided the following two statements that must be acknowledged in the SRS:

- Statement 1

  A family on the waitlist will be removed from the waitlist after 12 months.

- Statement 2

  Bilbyroo must run on a tablet running the Android operating system.

Identify from the list below which section of the SRS will consider each statement.

scope	constraints	functional requirements	non-functional requirements

Statement 1 _____

Statement 2 _____

Question 5 (3 marks)

Avinash wants the software to work on his Android tablet.

Provide **three** technical considerations that need to be taken into account when designing the software.

- Technical consideration 1

_____

_____

- Technical consideration 2

_____

_____

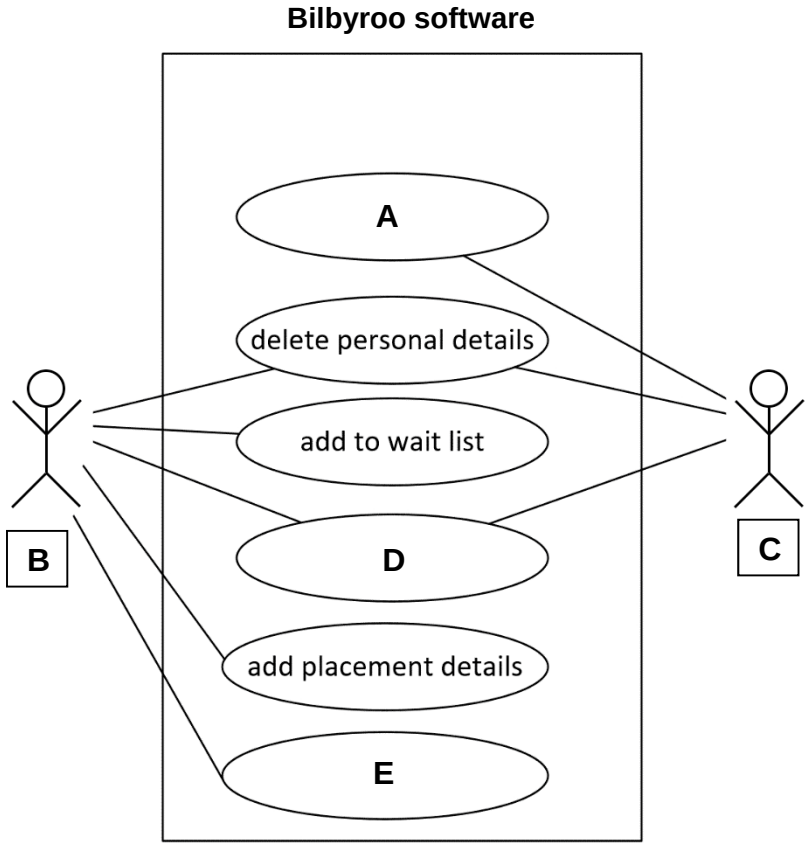
- Technical consideration 3

_____

_____

Question 6 (10 marks)

Elizabeth has been tasked with creating a use case diagram for the Bilbyroo system. In the middle of creating it she came down with the flu and had to stay home from work to recover. The incomplete use case diagram is shown below.



a. What are the ovals shown in the use case diagram above referred to as?

1 mark

_____

b. Using information from the case study, complete the use case diagram that Elizabeth has drawn by writing the correct labels for A, B, C, D and E in the spaces provided below.

5 marks

	Label
A	
B	
C	
D	
E	

c. Elizabeth will need to create a context diagram after the use case diagram is complete.

Explain the differences between a use case diagram and a context diagram. Use examples from the case study as part of your explanation.

4 marks

Question 7 (6 marks)

When a family adds a child to the waitlist, the child is allocated to a potential room based on their age using a function called fnAllocateAge.

The child's age (childAge) is passed into the function after having been calculated using their date of birth, where their age is rounded down to the nearest whole integer. It is then used in conditional statements to determine the correct room allocation, which is returned.

If the age is not acceptable, an 'Invalid room' result will be returned.

The following pseudocode is used to return the room a child should be allocated to.

```
Function fnAllocateAge(childAge)
Begin
    If childAge <= 1 and childAge >= 0 Then
        room ← "Bilbies"
    ElseIf childAge <= 2 and childAge >= 1 Then
        room ← "Possums"
    ElseIf childAge <= 4 and childAge >= 3 Then
        room ← "Wombats"
    ElseIf childAge <= 7 and childAge >= 5 Then
        room ← "Wallabies"
    ElseIf childAge <= 12 and childAge >= 8 Then
        room ← "Kangaroos"
    Else
        room ← "None"
    EndIf

    If room = "None" Then
        Return "Invalid room"
    Else
        Return room
    EndIf
End
```

a. What type of check is the validation performing on childAge?

1 mark

_____

b. Complete the following test table so that the pseudocode provided is fully tested, and include expected and actual results.

3 marks

Test no.	childAge	room	Expected result	Actual result
1	–1	None	Invalid room	Invalid room
2	14	None	Invalid room	Invalid room
3	12	Kangaroos	Kangaroos	Kangaroos
4	8	Kangaroos	Kangaroos	Kangaroos
5	7	Wallabies	Wallabies	Wallabies
6	5	Wallabies	Wallabies	Wallabies
7				
8				
9				
10				
11				

c. What is the error in the pseudocode that would cause some of the 'Actual result' column results to be different from the 'Expected result' column results in the test table?

1 mark

_____

_____

d. Rewrite the line of pseudocode containing the error with changes so that it works correctly.

1 mark

_____

_____

Question 8 (4 marks)

Maia has created a data dictionary for the Bilbyroo software system. Shown below is an extract from it, listing variable names and explaining how those variables will be used in development.

From the following list of data types and data structures, select the most appropriate data type or data structure for each variable and its accompanying description.

Write your selections in the spaces provided in the table below. Some could be used more than once.

integer floating point Boolean character string array record

Variable name	Data type or structure	Description
childDetails		contains all of the data related to a single child, including date of birth and allergies
contactNumber		the contact number of the primary caregiver in a family (can be a mobile number or landline number)
waitlist		whether or not the child is on the waitlist
dropoffTime		drop-off time for a child, using a 12-hour clock

Question 9 (6 marks)

Avinash is concerned that, once he switches all of Bilbyroo's customer data to the new software system, he is at risk of losing all of his data or having it stolen, because the data is being stored in an online database.

Elizabeth suggests that the data stored in the online database should be encrypted, whereas Maia suggests that Avinash put in place a backup strategy for the online database, as well as for the data on the tablet.

Compare the techniques of using a backup strategy and data encryption and describe how they will help address Avinash's concerns about lost or stolen data.

Question 10 (4 marks)

Maia is working on implementing the online data sync between the Bilbyroo software system and the online database.

She has suggested that Avinash should outsource the storage of the software data to a company that specialises in online data storage, as this will be more efficient in the longer term.

Describe **two** advantages and **two** disadvantages of using an external company to store the Bilbyroo data.

Advantage 1_____

_____

_____

_____

Advantage 2_____

_____

_____

_____

Disadvantage 1 _____

_____

_____

_____

Disadvantage 2 _____

_____

_____

_____

Question 11 (4 marks)

Avinash is considering sharing the Bilbyroo database with a local party-planning company so that they can contact families to offer them special deals and birthday packages. He has asked Maia and Elizabeth to add the ability to export family data, which includes names and addresses, as well as details about their child or children such as birthdates and any allergies the child may have.

a. Maia mentions to Avinash that this type of modification to the software system is outside of the project's scope.

Describe what this means in the context of the Bilbyroo system.

2 marks

_____

_____

_____

_____

b. Elizabeth is concerned about possible breaches of privacy if sharing data with a third party.

Describe what Avinash must do to meet his responsibilities regarding the privacy of family data.

2 marks

_____

_____

_____

_____

Question 12 (6 marks)

Maia has developed evaluation criteria to measure the effectiveness of the software solution developed for Bilbyroo.

Two of these criteria are as follows:

- The first eligible family on the waitlist will be notified of a vacancy within one day of a vacancy becoming available.
- At least 98% of families are satisfied with their child's experience at Bilbyroo.

Describe a suitable evaluation strategy and explain how the data collected will be used to evaluate each criterion.

Criterion	Strategy	Explanation
All eligible families on the waitlist will be notified of a vacancy within one day of a vacancy becoming available.		
At least 98% of families are satisfied with their child's experience at Bilbyroo.		

END OF QUESTION AND ANSWER BOOK

Insert for Section C – Case study

Please remove from the centre of this book during reading time.

Avinash runs Bilbyroo, a childcare centre in the outer suburbs of Sydney, NSW. Bilbyroo staff look after young children, aged from birth to 12 years old, from 6 a.m. to 6 p.m. weekdays.

The Bilbyroo premises is partitioned to allow children to play together in specified age groups. There are currently five playrooms, one for each of the following age ranges:

- children aged under 1 year old
- children aged 1–2
- children aged 3–4
- children aged 5–7
- children aged 8–12.

These playrooms allow children to play safely with other children who are close to their own age. Each room has been named after an Australian animal.

The following table outlines the names of the rooms and the age ranges of the children in them.

Room name	Age group	Children per staff member
Bilbies	under 1 year	2
Possums	1–2 years	4
Wombats	3–4 years	5
Wallabies	5–7 years	6
Kangaroos	8–12 years	8

Bilbyroo is a very popular childcare centre and Avinash has now started a waitlist to keep track of the families who want their children to attend. Up until now, he has been using a notebook to write down the families that want to attend, but there are now so many families on the waitlist that he is finding it hard to keep track of who they are, how many children they have, the ages of the children, which days of the week they would like their children to attend and the children's allergies.

To solve Avinash's problem, a new software system needs to be created to manage customer details for families currently attending the centre, as well as for those on the waitlist. The system will need to store family personal information and placement details for children, including which days they will attend, as well as drop-off and pick-up times. Families that want to be added to the waitlist will need to lodge an application with their personal details and the days they wish their child cared for. The families must be tagged within the system as being on the waitlist. The date and time they joined the waitlist should also be stored.

Avinash needs the software to be able to produce a list of all details of children currently attending the childcare centre, including each child's age and the room to which they are allocated. Rooms are allocated (based on age) automatically once the child has been added to the system. Avinash also needs the ability to list all families on the waitlist, sorted by date (earliest first), as well as the ability to move a family from the waitlist to be active attendees, (or to delete them from the system entirely if they request it). Avinash already has a hard-copy waitlist that he will need to enter into the software once it is complete. He uses a spreadsheet to store the details of the children who currently attend the childcare centre and would like this to be imported into the software program once it is complete.

Avinash would like the new software to work on his current tablet, which is running an Android operating system. His tablet may not always be connected to the internet but, when it is, he would like the data stored on the tablet hard disk to sync with an online database copy. When the tablet is not connected to the internet, a local copy of the data should be stored on the tablet hard disk.

He also wants to have a second tablet device placed in the childcare centre for prospective families to apply for child care by entering their details, desired days for care and their child's name, date of birth and allergies. Families should also be able to remove themselves from the waitlist if they no longer wish to be on it, and delete their entire details from the waitlist if they no longer wish to have their child attend Bilbyroo.

END OF INSERT