

SOFTWARE DEVELOPMENT

Units 3&4 – Written examination



2020 Trial Examination

SOLUTIONS

SECTION A– Multiple-choice questions

Question 1

Answer: C. Data Dictionary

Explanation: Data Dictionaries identify all variables and data structures and identify the amount of storage space that needs to be allocated for each and how they are used in the code.

Question 2

Answer: C. Record

Explanation: A record can hold many different data types, which will be required if marks and comments are stored.

Question 3

Answer: B. Biometrics

Explanation: Biometrics converts sound or images of a biological nature into digital data and uses this for authentication.

Question 4

Answer: B. Responding to security breaches and recovering data

Explanation: Risk management includes a plan which identifies the following: possible risks to the system, required security, required monitoring systems, how security breaches will be responded to, how the system will recover the data.

Question 5

Answer: C. Binary

Explanation: Quick and Selection are sorting algorithms and Linear search will be too slow.

Question 6

Answer: A. 1

Explanation: After a full pass the pivot is located in the correctly and all the data lower than the pivot is located to the left, while all the rest is located to the right. Here you can see the pivot 40,000 is located between values lower and values higher, BUT they are still not sorted yet. In fact 16,000, 12.500 and 30,000 are still in the same order they were in in the unsorted array.

So PASS 1:

- checks 16,000 against 40,000 (it is moved before it)*
- checks 50,500 against 40,000 (it is moved after it)*
- checks 12,500 against 40, 000 (it is moved before it)*
- checks 70,000 against 40,000 (it is moved after it)*
- checks 30,000 against 40,000 (it is moved before it)*

Question 7

Answer: C. XML files

Explanation: XML files are designed to store records and are easily accessed by all OS and programming languages. XML is a basic text file and can be easily transported.

Question 8

Answer: A. <members>

```
<?xml version="1.0 encoding="UTF-8"?>
<members>
  <membership>
    <givenname>James</givenname>
    <familyname>Acaster</familyname>
    <mobilenumber>0423877987</mobilenumber>
    <email>AcasterJ@gmail.com</email>
  </membership>
  <membership>
    <givenname>Sarah</givenname>
    <familyname>Pascoe</familyname>
    <mobilenumber>0426677332</mobilenumber>
    <email>Passy@gmail.com</email>
  </membership>
</members>
```

Root

Elements

Question 9

Answer: D. to define the version of XML

Question 10

Answer: C. selection

Explanation: Selection is the only control structure that checks for matching data.

Question 11

Answer: A. Use Case Diagram

Explanation: A use case diagram illustrates the interactions between end users and the solution.

Question 12

Answer: A. The Privacy Act 1988

Explanation: The Privacy Act protects personal data such as contact information and financial details.

Question 13

Answer: B. Queue

Explanation: A queue allows for the print jobs to be placed in order of the job being sent. Each job will be done in order of when it was sent. First In, First Out.

Question 14

Answer: A. Type

Explanation: Checking if a field identifies data type is a one of three validation types. (the other two are existence checking and range checking).

Question 15

Answer: A. VPN

Explanation: A Virtual Private Network provides online privacy and anonymity by creating a private network from any internet connection.

Question 16

Answer: B. thin client

Explanation: To ensure the data is up to date, it needs to be downloaded from the system regularly and all processing of updates is made on the server. A thin client does less data storage and processing on the end user device, relying mostly on server access for up to date information.

Question 17

Answer: C. upgrade the website

Explanation: Upgrading the website is measurable (it's completed or it isn't), while the others are goals and less easily measurable or attainable.

Question 18

Answer: A. Usability Testing

Explanation: Usability Testing is very important to the development stage to ensure the solution meets all requirements.

Question 19

Answer: B. Quality Assurance and Acceptance Testing

Question 20

Answer: C. 4

Explanation: Mod (x) 4 will always have 4 possible answers: 0,1,2 and 3.

SECTION B - Short-answer questions

Question 1

(4 marks)

If there are n elements, linear search would need to check every element to find the one being searched for in a 'worst case' scenario. Binary search would only need to check $\log_2 n$ elements.

(2 Marks - There must be an appropriately technical discussion to receive both marks. For example, the first sentence in the sample response would receive 1 mark, with the explanation following required for the second mark to be awarded.)

Binary search is not necessarily faster when you consider that the elements need to be sorted for a binary search to work. The overall efficiency of binary search therefore is highly dependent on the efficiency of the sort algorithm used to sort the elements beforehand.

(2 Marks - There must be an appropriately technical discussion in relation to how the efficiency of binary search is dependent on the sort algorithm used to sort the elements beforehand.)

Question 2

(2 marks)

Trace tables are multi-row, multi-column tables, where each column shows a variable and each row shows the initial and subsequent values of those variables when executing an algorithm. Trace tables help developers reduce the likelihood of logic errors occurring in the algorithms they write, as they allow a programmer to manually check

(1 Mark – correct description of a Trace Table and 1 Mark for describing how trace tables are used in programming)

Question 3

(4 marks)

Any two of the following responses are acceptable to attain full marks:

Project plans such as Gantt charts are useful even if a project is small – and with the increase in clients, there is no guarantee that the projects will remain small.

All projects have deadlines, and therefore they will all have milestones that need to be met. The best way to manage time efficiently would be to divide up work between team members and coordinate the completion of tasks to maximise efficiency. The simplest way to do this is to track the duration of tasks on a Gantt chart, and determine sequence and order after considering the dependencies of each task.

Project plans are also useful in tracking and managing delays and unforeseen events in the lifecycle of a project. Slack time is visually apparent, as well as dependent tasks. The critical path assists developers in identifying all the important tasks.

Gantt charts can help determine the number of programmers needed for a task and the amount of time they need to spend, which can help when constructing budgets or preparing quotes for clients.

(2 marks for each well-explained reason as to why project plans are of benefit (up to 4 marks)

Question 4

(3 Marks)

a) Data Flow: Username, password OR Search request, OR New Data, Account Found

b) Entity: Customer

c) Process: Check Account OR Update Account

Question 5

(4 Marks)

Cat-6 Cabling would have more reliable connections than Wi-Fi, but the number of connections within each room would be limited to the number of Ethernet connections at each outlet.

Wi-Fi would allow Graham to add new systems to his network quite easily, but wireless connectivity would not be as fast or as secure as the wired network.

There are other advantages and disadvantages that could be discussed, including the following:

- *Maintenance for Cat 6 cabling would likely be more difficult and more expensive than for*

Wi-Fi when there have been cables installed behind walls and under floors.

- *Interference would be a concern for Wi-Fi,*
- *Cat 6 cabling may become dated if fibre-optic cable to the office becomes the standard.*

(2 marks for explaining one advantage and one disadvantage of Cat 6 cabling and 2 marks for explaining one advantage and one disadvantage of Wi-Fi)

Question 6

(3 Marks)

Internal documentation can be included as headers on each of the program files in the project that include the author's name, a description of the code in the file, its current version number and its revision details. Above each function or method can be a short description of what it does and its purpose in the whole program. Hungarian notation and Camel Case can be used for all variables and functions which includes type and purpose such as strName.

SECTION C- Case study

Question 1

(1 Mark)

The Director’s belief is an organisational objective, as it is a quantifiable statement that helps achieve his goal of keeping more people safe.

Question 2

(6 Marks)

Tasks	Days														
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
1 Collect data requirements	█	↘													
2 Develop membership data storage and login system		█	█	↘											
3 Test and debug the membership system				█	█	↘									
4 Membership System Completed						◆									
5 Develop the Emergency Service Team update system						█	█	↘							
6 Test and debug the Service Team system								█	█	↘					
7 Emergency Service Team System Completed										◆					
8 Integrate new elements into current event system										█	█	↘			
9 Test and debug system											█	█	↘		
10 Prototype Test ready														◆	
11 Conduct usability tests														█	↘
12 Respond to usability tests															█
13 Prototype competed															◆

1 Mark for correctly entering development and testing durations

1 Mark for each milestone included

1 Mark for all dependencies accurately shown

Question 3

(4 Marks)

*Steven could go to a regional fire station and conduct a **focus group** to discuss how best the app would assist them, and the other issues that may arise when out on an emergency.*

*He could schedule an **interview** with the Vic Emergency administrative director to clearly outline all the requirements the organisation has for the upgrade.*

Steven could schedule an **interview** with the current web and app administrator to discuss issues regarding constraints and possible scope.

He could **survey** potential members of the system who live in rural areas affected by fire to identify the expectations and requirements they may have.

(1 Mark for each of the two collection techniques and 1 Mark for well explained purpose of the data collection)

Question 4

(4 Marks)

Advantages (One mark out of two for each included)

- Fire Fighters will receive up to date data on fire outbreaks faster and with more detail so they can be at the location where help is needed faster
- Rescue crews will be able to identify the locations of people requiring assistance quickly so they can get to them on time.
- Community members will be able to see if help is on its way in real time so they can make a decision about their next action
- Community members can report issues as they arise.

Disadvantages (One mark out of two for each included)

- Fire Stations may have more work to do keep devices functioning, charged and updated.
- Extra work may be required if there are reports that are intentionally inaccurate (time-wasters recording assistance needed when it is not)
- Monitoring membership can be a full time job and this can be costly.
- Relying on an app in the field may become treacherous if mobile phone coverage goes down.
- Any other possible answer than may cost the organisation in time, effort or financial cost.

Question 5

(6 Marks)

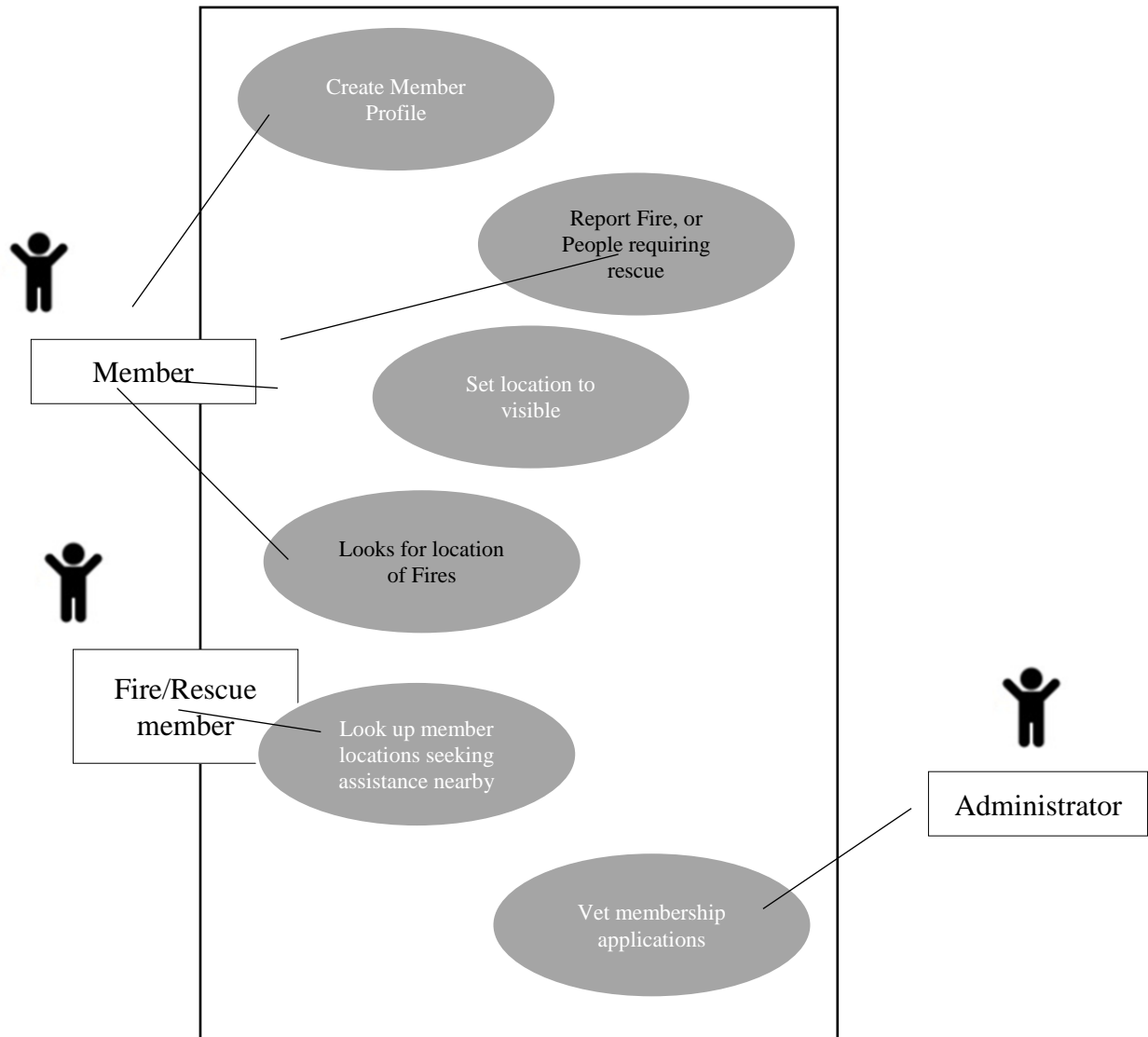
- **Legal Constraint:** Membership personal details must be kept secure
- **Technical Constraint:** Portable app solution for devices, web enabled solution for website.
- **Time Constraint:** The prototype needs to be completed early enough to allow for enough time for the complete solution to be ready before next fire season.
- **Skill/Social Constraint:** Fire fighters will be using this app in the field wearing fire protection gloves – there may need to be an interface designed for this. Community members may include a wide range of app competencies.

- *Economic Constraint: Vic Emergencies will have a budget they will need to work within to complete the solution.*

(1 Mark for each type of constraint and 1 mark for each explanation)

Question 6

(6 Marks)



(1 Mark each for correctly naming actors, 1 Mark each for identifying the use cases and 1 Mark for correctly adding associations)

Question 7

(4 Marks)

Functional Requirements include:

- *Member can create a profile*
- *Member can update data to profile*
- *Member can make location visible on app map*
- *Member can report fires or other emergencies*
- *Member can see locations of fires and rescue crews*
- *Fire/Rescue crew members can update data to map*
- *Fire/Rescue crew members can update status to profiles*
- *Fire/Rescue crew members can see locations of fires and rescue crews*
- *All end users can use authentication methods to login*

(1 Mark for each correct requirements provided)

Question 8

(2 Marks)

DD data needs to be checked for their number of decimals to ensure they have enough information to locate with enough accuracy to find fires and persons in needs of assistance. To count decimal places, the longitude and latitude values can be converted to strings and concatenated into Arrays so each character can be counted.

(1 Mark for array, 1 Mark for correct explanation)

Question 9

(9 Marks)

Begin

Input Longitude ← string
Input Latitude ← string

2 Marks for a correct method used to concatenate string characters to Array

For i = Longitude(length) to 0
 LongArray(i) ← character

2 Marks to find the decimal point and its index using variables.

For j = Latitude(length) to 0
 LatArray(j) ← character

2 marks for using a pre-test loop to find the decimal point.

LongCount ← 0
LongDecimal ← False
LongDecimalIndex ← 0
LongDecimalAmount ← 0

1 mark to calculate the number of decimals

2 marks to test the number of decimal places.

```
WHILE (Decimal =False)
    IF LongArray(LongCount) = "." THEN
        LongDecimal = True
        LongDecimalIndex ← LongCount
        LongDecimalAmount = Longitude – DecimalIndex
    ENDIF
END WHILE
IF LongDecimalAmount < 6 OR LatDecimalAmount < 6 THEN
    Invalid Data
ELSE
    Display Data
END IF
```

This section needs to be done for Latitude as well – but it can be assumed. Example (Same for LatArray)

End

Question 10

(6 marks)

An incident could be set up where a crew member or member of the community identifies the location of a fire using the app or website. It could be observed how long it takes that data to be made available for fire crew to see it. Time recording. Fire Crew could attempt to locate the incident while wearing protective gear. They could report back on how easy it was to use and any suggestion why might have to make it more usable through a focus group or interview. Fire Crew could report back on how easy the app was to locate the fire incident and if it takes longer to find –timing recorded)

2 Marks for identifying correct users

2 Marks for correct tests

2 Marks for methods of collecting data

Question 11

(3 Marks)

a)

Relying on google data for locations means a separate database of DD data will not need to be set up. If data is collected directly, this will avoid the cost of paying technicians to design and connect a huge database and have it integrated into the website and app.

(2 Marks for identifying how the data could be otherwise managed, 1 Mark for an example of the possible costs.)

b)

(3 Marks)

Relying on another organisation to provide correct data means they are dependent on the accuracy of the data provided by google. If the accuracy is affected, then the app will not be functional. If Google was to not be able to provide data online – from time to time all website go down – this would affect the timeliness of the reporting of locations. If the locations are not reported accurately – rescue crews may show up at the wrong location, or get lost and find themselves in danger. If the location is not updated in a timely way, people needing assistance could be left in danger longer, or fires could be responded to, too late.

(1 Mark for discussing accuracy, 1 mark for discussing timeliness and 1 Mark for an explanation in relation to this case study)

c)

(2 Marks)

Fires could get out of control if emergency crews are not informed in time. (1 Mark)

People who need rescue crews may be put in mortal danger. (1 Mark)

Question 12

(4 Marks)

The Privacy Act protects data pertaining to personal information such as name, address and location. Only authorised administrators of the solution should have access to the data who are aware of their legal requirements.

(2 Marks)

Volunteers are not employees and are may not be informed, trained or subject to the requirements of the legislation. If personal data is easily accessible by community members, the data could be used for purposes other than locating community members in a crisis.

(2 Marks)