

**2016 Examination Package -  
Trial Examination 1 of 3**

**STUDENT NUMBER**

Letter

Figures

Words


--

# SOFTWARE DEVELOPMENT

## Units 3 & 4 – Written examination

*(TSSM's 2013 trial exam updated for the current study design)*

Reading time: 15 minutes

Writing time: 2 hours

### QUESTION & ANSWER BOOK

#### Structure of book

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A	20	20	20
B	4	4	20
C	14	14	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 white out liquid/tape.

#### Materials supplied

- Question and answer book of 26 pages with detachable insert containing a case study for Section C.

#### Instructions

- Print your name in the space provided on the top of this page.
- All written responses must be in English.

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

**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**

The stages of the problem solving methodology are:

- A. Investigation, Design, Development, Evaluation
- B. Analysis, Design, Implementation, Evaluation
- C. Analysis, Design, Manipulation, Evaluation
- D. Analysis, Design, Development, Evaluation

**Question 2**

When programming, if you need to store thousands of values, all of the same data type, you would use:

- A. a listbox.
- B. a record.
- C. an array.
- D. variables.

**Question 3**

In a use case diagram (UCD), a stick figure represents:

- A. a person.
- B. a role.
- C. a process.
- D. data transmission.

**Question 4**

Which of the following is not a factor that influences the design of solutions?

- A. Useability
- B. Affordability
- C. Authenticity
- D. Marketability

**SECTION A - continued**

**Question 5**

Evaluation criteria are created at which stage of the problem solving methodology?

- A. Analysis
- B. Design
- C. Testing
- D. Evaluation

*Refer to the following algorithm when answering questions 6 and 7*

```
1.      FOR i ← 1 TO n-1 DO:
2.          subList ← i
3.          FOR j = i + 1 TO n-1 DO:
4.              IF A[j] < A[subList] THEN
5.                  subList = j
6.              END IF
7.          NEXT j
8.          temp ← A[i]
9.          A[i] ← A[subList]
10.         A[subList] ← temp
11.     NEXT i
```

**Question 6**

What is the purpose of the algorithm?

- A. Selection sort
- B. Quick sort
- C. Linear search
- D. Binary search

**Question 7**

Which control structure does lines 3-7 of the algorithm represent?

- A. Iteration
- B. Recursion
- C. Selection
- D. Sequence

**SECTION A - continued**  
**TURN OVER**

**Question 8**

Middleborough High School in Victoria has recently started an iPad programme, and the powers that be have decided that students aren't allowed to use hard copy textbooks anymore. Your friend Macy had a great money saving idea – After she purchased the e-book for Software Development she handed it out to all of her friends to use on their iPads so they won't have to pay for it.

Which law is Macy in breach of?

- A. Information Privacy Act 2000.
- B. Privacy Act 1988
- C. Copyright Act 1968
- D. Health Records Act 2001

**Question 9**

Which searching technique would work best on an *unsorted* list?

- A. Bubble search
- B. Quick search
- C. Binary search
- D. Linear search

**Question 10**

In a restaurant, when a customer places an order for a main meal about half of them also order dessert. The Use Case Diagram that best describes this scenario is

- A. Order main meal ←<<include>> -- Order dessert
- B. Order main meal ← <<extend>> -- Order dessert
- C. Order main meal -- <<include>>→ Order dessert
- D. Order main meal -- <<extend>> →Order dessert

**SECTION A - continued**

*The following algorithm applies to questions 11 and 12*

```
1  BEGIN
2      READ  grade
3      IF grade > 80 THEN
4          result ← 'distinction'
5      ELSE
6          IF grade > 65 THEN
7              result ← 'credit'
8          ELSE
9              IF grade > 50 THEN
10                 result ← 'pass'
11             ELSE
12                 result ← 'fail'
13             END IF
14         END IF
15     END IF
16 END
```

**Question 11**

When the above algorithm was tested the user input grade as 50. They expected this to result in the output of 'pass', however this was not the case.

This was caused by a:

- A. syntax error.
- B. logic error.
- C. run time error.
- D. compiler error.

**Question 12**

Test the above algorithm with the value grade=65.

The variable `result` will contain:

- A. 'distinction'
- B. 'credit'
- C. 'pass'
- D. 'fail'

**SECTION A - continued**  
**TURN OVER**

**Question 13**

Evaluation of an information system is conducted:

- A. during the design phase.
- B. immediately following the development phase.
- C. after the system has been implemented and has been running for a period of time.
- D. at the same time as it is being tested.

**Question 14**

When using a sequential file, data can only be accessed:

- A. by reading from the start of the file.
- B. in alphabetical order.
- C. after the contents have been sorted.
- D. in numerical order.

**Question 15**

A nature photographer takes about 100 images per day of the wildlife that he sees in his travels. Each of these images are 6MB, and he takes pictures 50 days per year (he tries to get out at least once every weekend!). At the end of an entire year, how much storage space is required to store all of his images?

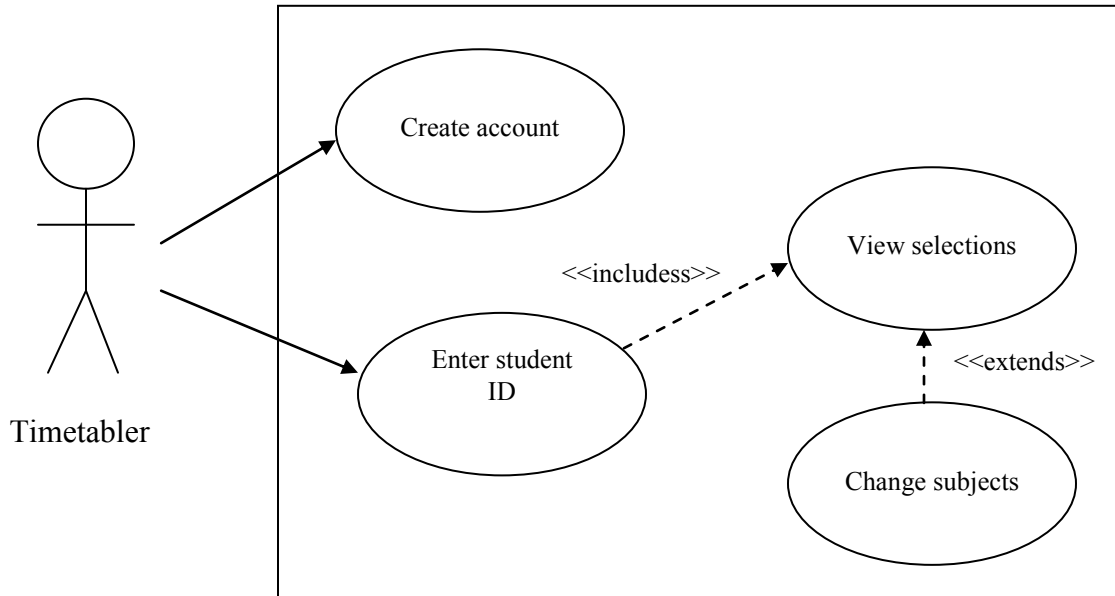
- A. 30,000 gigabytes
- B. 30 gigabytes
- C. 3 gigabytes
- D. 300 megabytes

**SECTION A - continued**

*The following Use Case Diagram applies to questions 16 and 17*

It's subject selection time and the timetabler (Mr. Phillips) is currently very busy! He has many students requesting to not only input their subject selections, but also view them to make sure that they chose the correct subjects and change them if necessary.

Mr. Phillips uniquely identifies each student through their student ID when viewing and changing all of these details, and the student ID is created during the student's first visit.



### Question 16

What are the lines connecting the use cases known as?

- A. Associations
- B. Data flows
- C. System boundaries
- D. Actors

### Question 17

What is the difference between the <<includes>> and the <<extends>> lines?

- A. The associated use cases are of less importance to the system as a whole
- B. The <<extends>> require an external system for the use case to be implemented
- C. The <<includes>> will always occur with the main process, the <<extends>> is conditional.
- D. There is no difference.

**SECTION A - continued**  
**TURN OVER**

**Question 18**

Spyware is an example of what type of threat to the security and integrity of data?

- A. Disappointing
- B. Deliberate
- C. Events-based
- D. Accidental

**Question 19**

Your friend has recently downloaded what he thought was a great new music track from an internet peer-to-peer application. After he double clicked on it to play it, his computer immediately opened up pop-up advertisements, and it has been happening ever since.

What has he downloaded?

- A. A virus
- B. Spyware
- C. A worm
- D. A Trojan

**Question 20**

An organisation wishes to establish a VPN between their web server and the homes of their employees, so they can securely access their work from home. The most appropriate method of security they should use is:

- A. TCP/IP
- B. SSL
- C. FTP
- D. HTTP

**END OF SECTION A**



**SECTION B - Short-answer questions**

**Instructions for Section B**

Answer **all** questions in the spaces provided

**Question 1**

Jimmy, a newly hired programmer at your company has been asked to design and create a software solution for roll marking software that will be implemented in a secondary school. One of the first things he has been asked to do is list the functional and the non-functional requirements.

- a.** Jimmy has asked you to define for him what exactly the difference between a functional and a non-functional requirement is, and give him one example of each for the school's software solution.

---

---

---

---

---

---

---

4 marks

**SECTION B - continued**  
**TURN OVER**

## SOFTWARE DEVELOPMENT EXAM

- b.** As a part of the design phase, Jimmy is required to write criteria that will be used to evaluate the solution even though he is not conducting the evaluation. Why is this the case?

---

---

---

---

2 marks  
Total 6 marks

### Question 2

Anthony, who is a novice programmer, needs to create a module to store the surnames of the members of his yacht club to make it easy to search for a required member.

- a.** Which data structure should be used for this purpose?

---

1 mark

- b.** In order for a search to be made for a particular surname, the data needs to be sorted. List and explain what technique you would use to sort the data, and why you would use it.

---

---

---

---

2 marks  
Total 3 marks

**SECTION B** - continued

**Question 3**

Monique runs a very successful law firm in Toorak. She has 3 employees and many rich and famous clients. Now that all of her employees seem to have mobile devices that they use for checking email and other online activities, she has set up a wireless network. She trusts all of her employees (as they are all very honest), so she hasn't set a password for the wifi.

- a. Name one law that Monique may be in breach of, and state why.

---

---

---

---

2 marks

- b. Now that Monique knows about the implications of not securing her clients' details she is worried about the data sent between mobile devices and her network, and would like to ensure that it is secure. Outline one technique for securing data during transmission.

---

---

---

---

---

---

3 marks

Total 5 marks

**SECTION B - continued**  
**TURN OVER**

**Question 4**

A software solution for managing client orders has recently been installed on a network that at any time can have up to 80 computers accessing it concurrently. As it has been in operation for a few months, it is time to evaluate it.

- a. List one criteria that could be used to measure the effectiveness of the new solution.

---

---

1 mark

- b. List one criteria that could be used to measure the efficiency of the new solution.

---

---

1 mark

- c. Explain two methods of data collection that could be used for the evaluation, and why they would be used.

---

---

---

---

---

---

---

4 marks

Total 6 marks

**END OF SECTION B**

**SECTION C – Case study****Instructions for Section C**

Answer **all** questions in the spaces provided. Remove the case study insert and read **all** the information provided before you answer these questions. Answers must apply to the case study.

**Question 1**

Now that the recommendations have been made and accepted, Andrew has given Mack an algorithm of how it will calculate the cost of a trip. He has said that this will be far quicker and more accurate than the current method, which will save *Captain Mack's tackle and charters* money and increase the number of bookings. He has also requested a 10% discount for clients who book for five or more days.

Upon initiation, all of the guides are set to available unless the program modifies them to be booked on particular dates.

```
1      BEGIN
2          INPUT start_date
3          INPUT end_date
4
5          total_days = end_date - start_date
6
7          cost ← operator_cost * total_days
8
9          IF total_days >= 5 THEN
10             cost ← cost * 0.1
11          END IF
12
13          DISPLAY cost
14      END
```

Unfortunately, when implementing the code, there were numerous errors found. Although the program worked, it continually misquoted clients. Complete the testing table on the following page to assist with finding out the problem.

**SECTION C - continued**  
**TURN OVER**

## SOFTWARE DEVELOPMENT EXAM

- a. Select logical test data for total\_days to fully test the boundaries of the algorithm. You may assume that operator\_cost is 200.

Variable	Test data	Expected value	Actual value
total_days			
total_days			
total_days			

3 marks

- b. Describe an error in the algorithm.

---

---

---

1 mark

- c. Suggest a way in which the algorithm could be altered to fix the error you found in part b.

---

---

---

---

---

2 marks

Total 6 marks

**SECTION C - continued**

**Question 2**

As you can see, Captain Mack has decided to save costs rather than having their database hosted online by their ISP. They can store it on the computer at the tackle shop and set it up to act as a web server. The two employees will be given mobile devices with 3G capabilities so that they can access it wherever they are to obtain quotes and create bookings. Captain Mack has decided that it isn't worth the cost to implement encryption on the web server.

- a.** Explain to Captain Mack what you think about his idea of not including encryption, weighing up the positives and negatives of having it as opposed to not having it.

---

---

---

---

---

---

---

---

---

---

4 marks

- b.** Identify a law that Captain Mack may be breaking by not including encryption. Be specific.

---

---

---

---

2 marks

**SECTION C - continued**  
**TURN OVER**

## SOFTWARE DEVELOPMENT EXAM

- c. Why wouldn't Andrew recommend that the booking details just be stored on each device so that the employees can make quotes and take bookings then update the central database at the end of each day? Give 2 reasons.

i. Reason 1: \_\_\_\_\_

Explanation: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

ii. Reason 2: \_\_\_\_\_

iii. Explanation: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

6 marks

Total 12 marks

### Question 3

As part of the design of the new system, Andrew has set some evaluation criteria. Fill in the table below, explaining a technique for testing each criteria.

Criteria	Technique
Is the solution easy to use?	
Are accurate results produced when data is entered?	

2 marks

**SECTION C** – continued



**Question 4**

In order for the *total\_days* of a charter to be calculated, there needs to be two inputs: *start\_date* and *end\_date*. Explain 3 validation techniques that need to be performed on these inputs, and in which order they should occur.

---

---

---

---

---

---

---

---

---

---

4 marks

**Question 5**

Andrew explains that when creating the solution, he will ensure that about 50% of the code is internal documentation. Captain Mack says that this isn't required, as it doesn't help the functionality of the program. What is internal documentation, and why has Andrew suggested that they write in so much?

---

---

---

---

2 marks

**SECTION C - continued**  
**TURN OVER**

**Question 6**

List two **non-functional requirements**, and explain how they would apply specifically to the solution *BookFish*.

Non-functional requirement: \_\_\_\_\_

Explanation: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Non-functional requirement: \_\_\_\_\_

Explanation: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

6 marks

**Question 7**

Captain Mack is worried about the costs involved with all of these extra devices that are being bought, and asks why they can't just have a computer. List four components that make up an information system.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

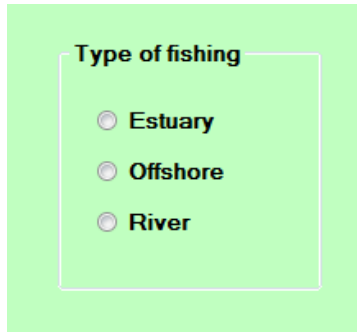
\_\_\_\_\_

2 marks

**SECTION C – continued**

**Question 8**

Below is a small part of the interface used for bookings:



Why has Andrew made use of radio buttons instead of checkboxes?

---

---

---

---

---

2 marks

**Question 9**

List and explain two constraints for using the mobile devices to access *BookFish*.

---

---

---

---

---

2 marks

**SECTION C - continued**

**TURN OVER**

**Question 10**

Captain Mack has been told that they will need to ensure that the solution has been thoroughly tested. What would be included within a testing table, and how can it assist with ensuring output is accurate?

---

---

---

---

---

---

---

---

---

---

---

4 marks

**SECTION C – continued**

**Question 11**

Captain Mack has now decided that he would like to have the names in the list sorted by surname. *Logical IT Solutions* have come up with the following algorithm for sorting the data:

```
1.      FOR i ← 1 TO n-1 DO:
2.          subList ← i
3.          FOR j = i + 1 TO n-1 DO:
4.              IF A[j] < A[subList] THEN
5.                  subList = j
6.              END IF
7.          NEXT j
8.          temp ← A[I]
9.          A[I] ← temp
10.         A[subList] ← temp
11.     NEXT i
```

a. What type of sorting algorithm have *Logical IT Solutions* used?

---

1 mark

b. What data structure has been made use of for A[ ]?

---

1 mark

c. Describe the error in the algorithm

---

---

---

---

2 marks

**SECTION C - continued**  
**TURN OVER**

## SOFTWARE DEVELOPMENT EXAM

- d. Suggest one way that you could fix the algorithm. Include what you would change and/or what you would add to it.

---

---

---

---

2 marks

### Question 12

*Logical IT Solutions* have created and implemented the solution. Captain Mack has been offered the choice between two training methods:

1. Captain Mack attends their Gippsland office for four hours to receive training and then he is responsible for showing his employees how to use *BookFish*.
2. *Logical IT Solutions* can send out a trainer to the tackle shop for 8 hours to train Captain Mack and his employees.

- a. What is the training method in option 1 known as?

---

1 mark

- b. State one advantage of each training method:

---

---

---

---

2 marks

**SECTION C – continued**

## SOFTWARE DEVELOPMENT EXAM

- c. Which training method would you recommend, and why?

---

---

---

1 mark

Total 4 marks

### Question 13

- a. Captain Mack also wants to protect his bookings data. To do this, he would like to start backing up his data in the event that his computer or an employee deletes the data accidentally. Recommend and justify a suitable backup medium that Captain Mack can use to store his data.

---

---

---

---

---

2 marks

**SECTION C - continued**  
**TURN OVER**

b. Explain a backup procedure that Captain Mack can implement.

---

---

---

---

---

---

---

3 marks

Total 5 marks

**Question 14**

*Logical IT Solutions* will be creating user documentation for Captain Mack and his employees so that they can use *BookFish* efficiently and effectively. Which type of user documentation would you recommend that they create, and why?

---

---

---

---

---

---

---

3 marks

**END OF QUESTION AND ANSWER BOOK**



**CASE STUDY INSERT FOR SECTION C**

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

## **Case Study**

### **Captain Mack's tackle and charters**

Captain Mack owns a small fishing business that sells fishing gear and organises charters with local operators (for a standard 15% “finder’s fee” of course). Located in East Gippsland, he advertises through “The Star” (a local newspaper) and a very basic website. He also owns a shop where customers can come and stock up on tackle.

When a potential client first contacts Captain Mack, he writes down the information about what they would like to do, such as the type of fishing (estuary, offshore or river – they can only select one), which operator can be used and which location they would like to fish (East Gippsland is full of fishy locations). Captain Mack then prepares a quote and he calls them back with the details and they can accept or decline.

Captain Mack knows all of his local operators and what their numbers are, what type of fishing they cover etc., so he has never bothered to keep very good records apart from writing down their numbers on a piece of paper that he has stuck on the wall next to his phone.

### **The problem**

After the floods of the last couple of years, the waterways of East Gippsland have thrived, which has led to an increase in the number of fishermen in the area. Captain Mack is always finding it too busy working in his tackle shop to keep up with demand. He has hired another two employees to assist him with running the tackle shop and organising charters. In an attempt to be more efficient, Captain Mack has put the three mobile phone numbers up on the website so that they can be contacted to book charters anytime, anywhere.

Although there is a record number of bookings, this has led to some problems:

1. A few times both employees have put in bookings for the same charter operator at the same time, as the spreadsheet of bookings is saved back at the shop.
2. Even though Captain Mack knows all about the charter operators and what specialty each one has, the employees don't, so sometimes they struggle to answer questions from prospective clients when the Captain Mack is away from the shop, which has led to missed bookings.

### **Proposed system**

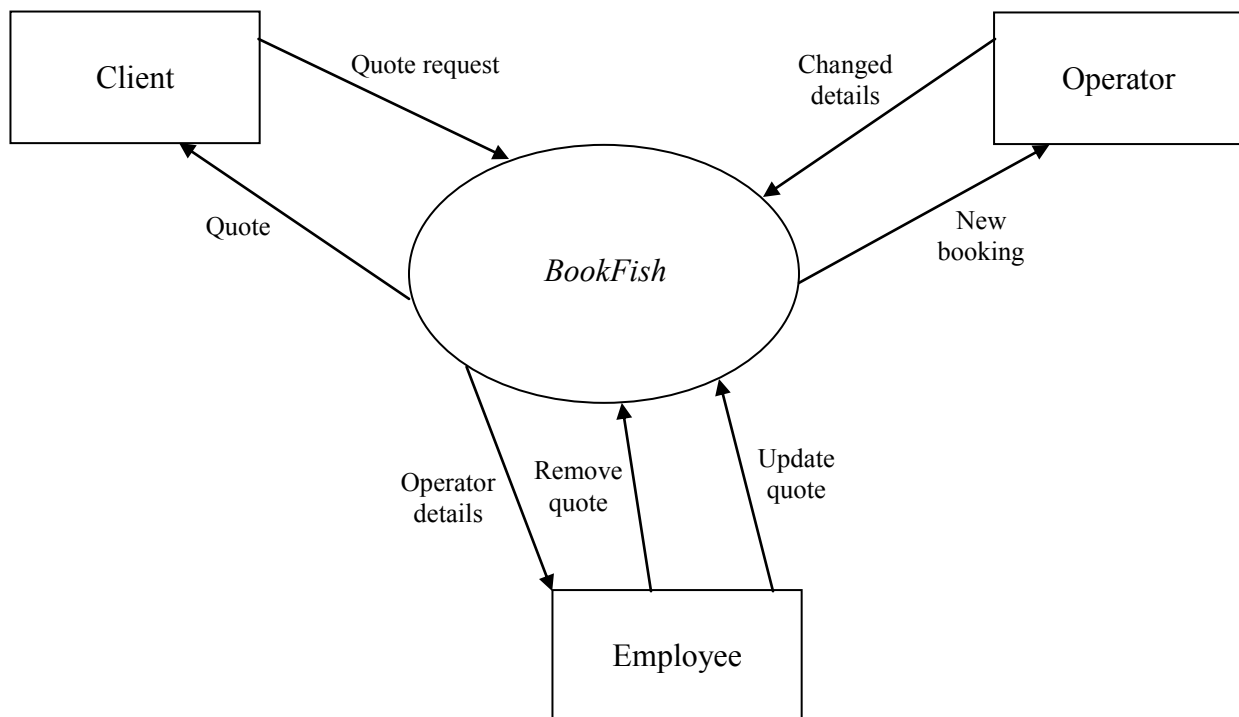
Although an “old man of the sea”, Captain Mack has asked his son Andrew (who has just completed a Software Engineering degree) to analyse the problems he is facing and make some recommendations on what he should do.

Andrew has given him the following recommendations:

1. Set up a central database that includes all details about charter operators, including their number, what type of fishing they specialise in, which location(s) they fish and their

- available dates. This can be updated as they add or remove operators (which they do often, as it can be very seasonal).
2. Set up the database on a computer at the tackle shop to act as a webserver so it can be accessed remotely.
  3. Purchase mobile computing devices to be used by Captain Mack and his 2 employees.
  4. Create a new software solution, *BookFish* to:
    - View operator details
    - Create quotes for potential clients
    - Send quote electronically to a client's email address
    - Update and remove quotes
    - Upload confirmed bookings to the central database
    - Send confirmed bookings to the local operator
  5. Allow operators to access it to change their details

**Context diagram**



**END OF CASE STUDY INSERT FOR SECTION C**