



**GCE AS/A LEVEL – NEW**

2500U20-1



S17-2500U20-1

**COMPUTER SCIENCE – AS unit 2**  
**Practical Programming to Solve Problems**

FRIDAY, 9 JUNE 2017 – MORNING

2 hours

For Examiner's use only		
Section	Maximum Mark	Mark Awarded
A	44	
B	16	
Total	60	

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**INSTRUCTIONS TO CANDIDATES**

Answer **ALL** questions.

The question paper is divided into two main sections. Below are the recommended timings for this assessment.

**Section A**

You are advised to spend no more than **60 minutes** on this section.

You will be required to analyse and deconstruct the scenario to consider its component parts in terms that can be addressed through automated computation.

**Section B**

You are advised to spend no more than **60 minutes** on this section.

You will be required to develop programs that solve computing problems referring to the initial scenario.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

The total number of marks available is 60.

Assessment will take into account the quality of written communication used in your answers.

You will need a computer with an installed functional copy of the Integrated Development Environment (IDE) appropriate to your chosen programming language and word processing software.

A calculator is allowed in this examination.

Remember to save your work regularly.

## Scenario



## **Pete's Plumbers**

**Pete's Plumbers** is a plumbing company based in Aberystwyth.

**Pete's Plumbers** wishes to offer its clients the best possible service by providing the most suitable plumber to carry out work. The company wants a computerised job booking system, which will allow clients to book a job.

Clients will be able to access pricing and time estimates via an online computer system or by speaking to a member of staff who will access the system and provide quotes for the client.

This new system will store details of clients. The system will also store details of the different plumbers' call-out rates and hourly working rates. The system will provide a simple job booking facility, where clients choose a specific plumber, based on their expertise with the particular job the client requires.

The main requirements of the new computer system for **Pete's Plumbers** are:

- The ability to store and search client details
- The ability to store plumbers' details and search for plumbers using various attributes, such as; search for all "drainage specialists" or all "gas safe heating qualified plumbers", search by call-out price of plumber, search by hourly rates, search by number of years' experience, or search by first name or surname
- The ability to calculate an estimated price for a job.

**Pete's Plumbers** has the following partially completed entity-relationship diagram as an overview of the system they would like to create:

Clients Table	Job Booking Table	Plumbers Table
ClientID	JobID	PlumberID
...	...	...
...	...	...
...	...	...

**Section A: Analysis and Design (44 marks)**

You have been asked to analyse the scenario as a preliminary step towards creating a prototype computer system for **Pete's Plumbers**.

**Answer all questions.**

**Present your answers as a single word-processed document named *Section A - Analysis and Design*.**

1. Copy and complete the entity relationship diagram provided in the scenario. [6]
2. Draw **two** data structure tables that will allow **Pete's Plumbers** to store clients' and plumbers' details. [10]
3. Construct a flowchart for the process of searching a list (for example a list of plumbers) for a search item. If the item is found the flowchart should output the location in the list where the item was found. If the item is not found the flowchart should output "Not Found". [8]
4. Select and fully justify your proposed method of solution for the **three** main requirements listed in the scenario. [6]
5. **Pete's Plumbers** will have to consider different methods of backing up its data.  
  
**Pete's Plumbers** is a small company with limited data. Describe different procedures **Pete's Plumbers** could use for backing up and recovering data. You should explain why the different backup methods are suitable for **Pete's Plumbers**. Your answer should include three different secondary storage devices **Pete's Plumbers** could use. [6]

6. **Pete's Plumbers** stores the details of its plumbers' hourly rates in a sorted array (lowest to highest).

**PlumberRate[ ]:**

		0	1	2	3	4	5	6	7	...
<b>PlumberID</b>	0	101	102	103	104	105	106	107	108	...
<b>HourlyRate £</b>	1	30	45	50	60	60	65	75	90	...

Using a recognised convention, design and implement an algorithm that generates an estimated price for completing a job. [8]

The algorithm should accept the following inputs:

- The **PlumberID**
- The **number of hours** a job will take
- The **cost** of parts needed.

The algorithm should output:

- The hourly rate for the plumber
- The total cost of labour (hourly rate multiplied by the number of hours a job will take)
- The total estimated cost of the job (total cost of labour plus cost of parts)
- An error if an invalid plumberID is entered.

For example:

If the user entered the following **values**:

PlumberID = **102**

Number of hours = **4**

Cost of parts = **£100**

then the algorithm would output:

Hourly Rate: £45

Total cost of labour: £180

Total estimated cost: £280

**Save your work as Section A - Analysis and Design.**

## Section B: Develop programs (16 marks)

Select the programming language of your choice from section BI, BII or BIII and answer all 3 questions within your chosen section.

### BI Visual Basic

*Pete's Plumbers* wants the prototype computer system to be developed using Visual Basic.

1. Open the file clients
  - Read through the code and familiarise yourself with its contents
  - The file contains incomplete code, which is intended to save clients details and return the number of clients on file that match the search criteria entered e.g. First name.

**Complete this code.**

**Remember to save the changes made to the file clients**

[4]

2. Create a new form, with a suitable interface, that will allow *Pete's Plumbers* to:
  - Input plumber details
  - Validate plumber details
  - Store plumber details on disc in a text file called plumberdetails.txt
  - Search for the number of plumbers matching the criteria entered.

**Save your new form with the filename plumbers**

[8]

3. Using the internal facility of Visual Basic, annotate your code from question BI (2) to clearly explain the design of your program to another software developer.

**Remember to save the changes made to the file named plumbers**

[4]

## BII Java

***Pete's Plumbers* wants the prototype computer system to be developed using Java.**

1. Open the Java project: clients
  - Read through the code and familiarise yourself with its contents
  - The file contains incomplete code, which is intended to save clients details and return the number of clients on file that match the search criteria entered e.g. First name.

**Complete this code.**

**Remember to save the changes made to the file clients**

[4]

2. Create a new form, with a suitable interface, that will allow ***Pete's Plumbers*** to:

- Input plumber details
- Validate plumber details
- Store plumber details on disc in a text file called plumberdetails.txt
- Search for the number of plumbers matching the criteria entered.

**Save your new code with the filename plumbers**

[8]

3. Using the internal facility of your chosen IDE, annotate your code from question BII (2) to clearly explain the design of your program to another software developer.

**Remember to save the changes made to the file named plumbers**

[4]

## BIII Python

***Pete's Plumbers* wants the prototype computer system to be developed using Python.**

1. Open the file clients
  - Read through the code and familiarise yourself with its contents
  - The file contains incomplete code, which is intended to save clients details and return the number of clients on file that match the search criteria entered e.g. First name.

**Complete this code.**

**Remember to save the changes made to the file clients**

[4]

2. Create a new form, with a suitable interface, that will allow ***Pete's Plumbers*** to:

- Input plumber details
- Validate plumber details
- Store plumber details on disc in a text file called plumberdetails.txt
- Search for the number of plumbers matching the criteria entered.

**Save your new form with the filename plumbers**

[8]

3. Using the internal facility of your chosen IDE, annotate your code from question BIII (2) to clearly explain the design of your program to another software developer.

**Remember to save the changes made to the file named plumbers**

[4]

**END OF PAPER**