

This question paper has been based on the Practical Exercise – Peter’s Petrol Pumps – which was given in the 2008 specification. A copy of this exercise is given below for reference purposes only.

AS Practical Exercise (CPT3) – Peter’s Petrol Pumps

Background

Petrol stations selling petrol usually show prices and amount of petrol dispensed on each petrol pump and also have a console in the office showing information about each sale from each petrol pump on the garage forecourt.

Each petrol pump shows how much petrol has been sold, the price per litre in pence to one decimal place and the total amount to pay. The console also displays this information for each pump.

Peter owns a small petrol station with **one** petrol pump. Every day Peter needs to know the number of litres of petrol that are sold and the total amount of money taken for the pump.

You have been asked to write a **PROGRAM** to simulate the display on the pump and on the console.

The system you are to develop is simplified and should not include details about taking money from the customers but just assume that the amount displayed is the amount of money received. Also you are **not** required to test for the customer’s petrol tank overflowing when the petrol is being dispensed.

Specification

1.

You have been asked to write a program to simulate the display of **one** petrol pump only and the console. The program needs to record the amount of petrol sold in tenths of a litre and the amount to be paid in pounds and pence every time the pump is used.

The display on the petrol pump uses seven segment LCDs (Liquid Crystal Displays). As part of your programming you will need to write and test a procedure to display a number as a seven segment figure. The console must also display the total amount of money taken but does not need to use an LCD.

XXX.XX Amount to Pay (£ p)

XX.X Litres

XXX.X Pence per litre

Note to teachers: if a candidate is unable to successfully write a procedure to simulate a seven segment LCD display, a simplified display could be programmed but the candidate may be unable to provide appropriate evidence to answer some questions set in the examination.



2.

Peter at the console can:

- set and change the price per litre
- zero the petrol dispensed (this will also automatically zero the amount paid)
- view the total takings and total petrol sold
- set the total takings and total petrol sold to zero at the beginning of each day.

3.

The customer buying petrol can:

- remove nozzle from holster to indicate they are ready to buy petrol
- squeeze the nozzle to put petrol in the tank
- stop squeezing the nozzle to stop putting petrol in the tank
- replace the nozzle to finish putting petrol in the tank.

Each of the above can be simulated by keystrokes or the use of a button or similar.

4.

The petrol pump displays:

- the current price in pence per litre to 1 decimal place as a seven segment LCD
- the amount of petrol dispensed at any time as a seven segment LCD showing the number of litres to one decimal place. This display remains after the petrol has been displayed until zeroed by Peter
- the amount to pay at any time as seven segment LCDs showing the amount in pounds and pence. This display remains after the petrol has been dispensed until the number of litres of petrol dispensed has been zeroed by Peter.

The pump can dispense between 0.5 and 100 litres in tenths of a litre. The price per litre can be up to 199.9 pence per litre.

5.

The console displays:

- the state of the pump:
 - ready for use (display set to zero customer can start putting petrol in tank)
 - in use
 - out of use (waiting for Peter to zero the display)
- the amount of petrol being dispensed by the pump when it is in use, showing the number of litres to one decimal place. This display remains after the petrol has been dispensed until zeroed by Peter

Turn over ►



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- the amount to pay when the pump is in use in pounds and pence. This display remains after the petrol has been dispensed until the number of litres of petrol dispensed has been zeroed by Peter.

When the nozzle is replaced in the holster the amount of petrol dispensed is added to the total amount, and the amount paid is added to the total amount paid. The pump is flagged as out of use until the number of litres dispensed is zeroed on the pump and the console, it is then set ready for use by the next customer.

Testing 6.

Candidates will need to design and use test data, including boundary values, to test the following:

- the correct working of the seven segment LCDs on the petrol pump
- the correct working of the console display
- a day's operation of the petrol pump that includes at least **seven** customers buying petrol
- that the displays on the console and the LCDs on the petrol pump must match
- resetting the pump after each purchase
- setting the daily totals on the console to zero at the start of the day
- changing the price of a litre of petrol.

The console display and the LCDs for the pump can appear on the same screen for testing purposes.

Requirements of the Practical Exercise

Candidates will need to design and implement an appropriate computing system and provide sufficient documentation to demonstrate the following practical skills.

- Design.
- Implement/Test.

The task may be undertaken by writing a program in a chosen high level language.

Candidates are expected to produce brief documentation including some or all of the following, as appropriate.

Design

- Definition of data storage requirements.
- User interface design for console and petrol pumps.



- Algorithms for:
 - pump operation
 - console operation
 - simulating the seven segment LCD display
 - production of daily totals.

Implementation/Testing

- Details of test plan with explanation, and evidence of testing having been carried out.
- Clearly set out and commented, where appropriate, program listing.

This documentation is to be brought to the examination and handed in with the candidate's answer script for Unit 3 (CPT3) at the end of the examination. A Cover Sheet, signed by the teacher and the candidate, authenticating the work of the candidate, must be attached to the documentation (see Appendix B of the specification).

