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# GCSE

## Computer Science

4512/1 Practical Programming  
Specimen Controlled Assessment  
Scenario 3 – Traditional Application

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4512  
Version: 1.0

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*This scenario is one of four available. Each of the four scenarios is available in a separate candidate booklet. You must complete **two** of the four scenarios.*

- You have approximately 25 hours in which to complete this scenario.
- Before starting work on the problem, read the whole of this Candidate Booklet thoroughly. You can ask your teacher to explain anything in this booklet, except Computer Science specific terms, that you do not understand.
- There are restrictions on when and where you can work on this problem. Your teacher will explain them to you. For example, you should only do work that you intend to hand in for marking when a teacher is present, so that he or she can confirm that the work is your own. The Candidate Booklet must **not** be taken outside your school/college.
- You may need to use the Internet to research certain parts of the problem. This does not have to be within the 25 hours recommended time.
- You will need to complete and sign a Candidate Record Form which your teacher will provide.

### Information

You will also be marked on your use of English. It is important to:

- make sure that all your work is legible
- use correct spelling, punctuation and grammar
- use a style of writing which suits the person you are writing for
- organise your information clearly, so that you make yourself understood
- use Computer Science terms where they are needed.

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Specimen

## Component 1: Practical programming

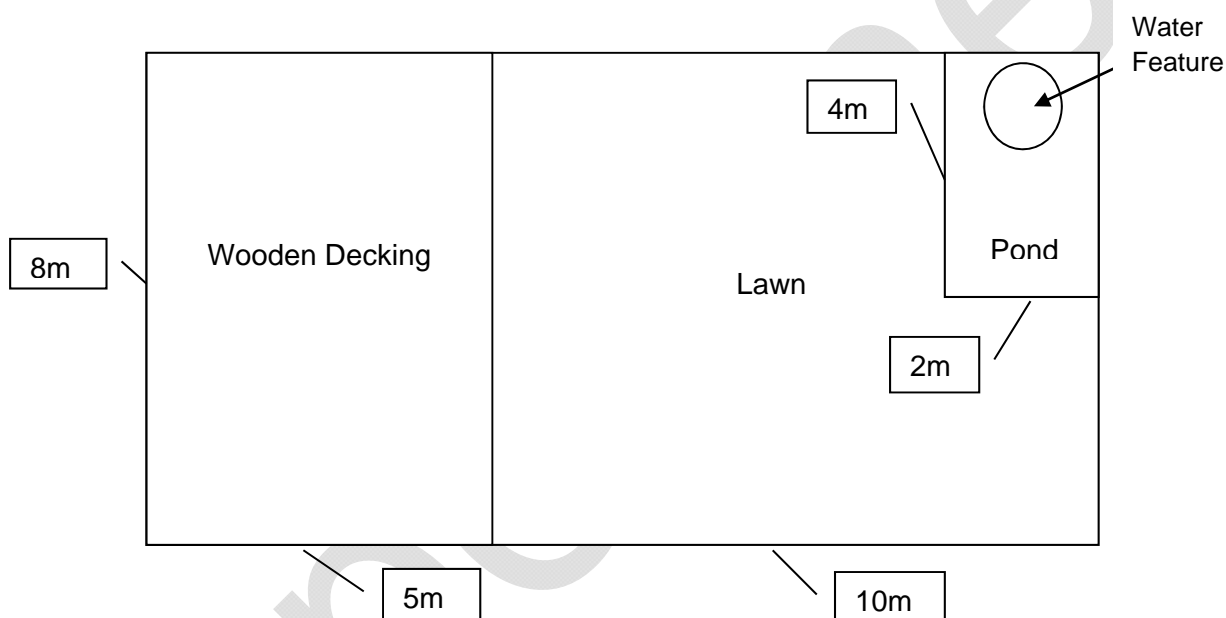
### Scenario 3 – Traditional Solution

#### Background

You have been contacted by a local landscape gardening company. The company improves the gardens of customers. The company needs to be able to give customers an accurate cost (quotation) for work to be completed. They have asked you to develop a computer system to allow them to do this.

Customers provide the company with a plan of what they want their garden to look like. The company uses this plan to create a quotation showing an accurate cost for the work. An example plan is shown in figure 1 below:

**Figure 1**



#### Important note

The suppliers of lawns, concrete and decking provide the landscape gardening company with all materials in 'pre-cut' sections. For example, in the plan above they will be given enough lawn to cover 10m x 8m, even though there is a pond and water feature taking up some of the area of the full lawn. The customer would need to pay for the full 10m x 8m of lawn.

The new system that you are going to create must allow the company to:

- type in the details of the customer's planned garden
- produce an itemised list of all the details of the work that needs to be done
- work out the costs that the customer needs to pay.

The following table shows the prices that the company charges for the different types of work that they provide:

| Work to be done                              | Cost of materials         | Time to install            |
|--|---------------------------|----------------------------|
| Laying a lawn                                | £15.50 per m <sup>2</sup> | 20 mins per m <sup>2</sup> |
| Laying a concrete patio                      | £20.99 per m <sup>2</sup> | 20 mins per m <sup>2</sup> |
| Laying a wooden deck                         | £15.75 per m <sup>2</sup> | 30 mins per m <sup>2</sup> |
| Digging and filling a rectangular pond       | £25.00 per m <sup>2</sup> | 45 mins per m <sup>2</sup> |
| Installing a water feature (e.g. a fountain) | £150.00 each              | 60 mins each               |
| Installing garden lights                     | £5.00 each                | 10 mins each               |

There is also a labour charge of £16.49 for every hour of work done. This charge is shown as a separate item at the bottom of the quotation.

## Tasks

Your system must allow the following inputs into the program:

1. Length and width of the lawn
2. Length and width of the concrete patio
3. Length and width of the wooden deck
4. Length and width of the rectangular pond
5. Number of water features
6. Number of garden lights

Remember customers may only want some of the services that the company provides. So some gardens may not have all of the above inputs. Your system should allow you to enter a 0 (zero) for any inputs that are not needed.

### Task 1

The system must provide the following outputs:

1. Lawn costs
  - a. Length and width of the lawn area
  - b. Total area of the lawn ( $\text{m}^2$ )
  - c. Cost of the lawn (per  $\text{m}^2$ )
  - d. Total cost of the lawn
2. Concrete patio costs
  - a. Length and width of the concrete patio area
  - b. Total area of the concrete patio ( $\text{m}^2$ )
  - c. Cost of the concrete patio (per  $\text{m}^2$ )
  - d. Total cost of the concrete patio
3. Wooden deck costs
  - a. Length and width of the wooden deck area
  - b. Total area of the wooden deck ( $\text{m}^2$ )
  - c. Cost of the wooden deck (per  $\text{m}^2$ )
  - d. Total cost of the wooden deck
4. Rectangular pond costs
  - a. Length and width of the rectangular pond area
  - b. Total area of the rectangular pond ( $\text{m}^2$ )
  - c. Cost of the rectangular pond (per  $\text{m}^2$ )
  - d. Total cost of the rectangular pond area
5. Water feature costs
  - a. Number of water features

- b. Cost of one water feature
- c. Total cost of the water features
  
- 6. Garden lighting costs
  - a. Number of garden lights
  - b. Cost of one garden light
  - c. Total cost of the garden lights
  
- 7. Working costs
  - a. Total time to complete the work (labour) in hours
  - b. Cost of the work (per hour)
  - c. Total cost of the work (labour)
  
- 8. Total fee payable by the customer

This is calculated by adding together the total costs from items 1 to 7 above.

## Task 2

The company has asked if it would be possible to save customer quotations so that these can be viewed at a later date. Create a section of the program that allows quotations to be saved and retrieved by the company.

## Task 3

The Managing Director of the company has also explained that there are times when the cost of raw materials can change.

Develop a way to allow the user of the system to store the costs of raw materials in an external file, so that these costs can be changed when the prices of the materials rise and fall.

#### Task 4

The Managing Director of the company has asked if there is a way that she can use this system to prepare a monthly report that compares the total cost of all materials purchased per month across all jobs undertaken.

She would find this information useful in predicting the future needs for materials at different times of the year.

The user of the system would type in the name of the month or the month number (e.g. 6 for June). The program will then read all of the materials purchased for that month and calculate the totals in the following format:

| Month                | June           |                               |                        |                     |
|----------------------|----------------|-------------------------------|------------------------|---------------------|
| Total Working Costs: | Item           | Total Square Metres Purchased | Total Number Purchased | Total Monthly Value |
|                      | Lawn           | 567                           |                        | £8788.50            |
|                      | Concrete       | 822                           |                        | £17253.78           |
|                      | Wooden decking | 1042                          |                        | £16411.50           |
|                      | Ponds          | 45                            |                        | £1125.00            |
|                      | Water features |                               | 2                      | £300.00             |
|                      | Garden lights  |                               | 18                     | £90.00              |
|                      |                |                               |                        |                     |
| <b>Total</b>         |                |                               |                        | <b>£43968.78</b>    |

You can assume that this system will only store data for the previous 12 months.

### Worked Example

Figure 1 on page 2 is an example of a garden plan with measurements that a customer has drawn for the landscape gardening company. This plan would be used to work out the cost of the work that needs to be done.

Using the information in Figure 1, the following is input into the system:

|                  | Length<br>(m) | Width<br>(m) | Number<br>Bought |
|------------------|---------------|--------------|------------------|
| Lawn             | 10            | 8            |                  |
| Concrete Patio   | 0             | 0            |                  |
| Wooden Deck      | 5             | 8            |                  |
| Rectangular Pond | 2             | 4            |                  |
| Water Features   |               |              | 1                |
| Garden Lights    |               |              | 0                |



These inputs should produce the following outputs from the system. You can use this example to test that your system works as expected:

| Working Costs:         |        |       |                              |                         |            |
|------------------------|--------|-------|------------------------------|-------------------------|------------|
| Lawn Costs             |        |       |                              |                         |            |
|                        | Length | Width | Total Area (m <sup>2</sup> ) | Cost per m <sup>2</sup> | Total Cost |
|                        | 10     | 8     | 80                           | £15.50                  | £1240.00   |
| Concrete Patio Costs   |        |       |                              |                         |            |
|                        | Length | Width | Total Area (m <sup>2</sup> ) | Cost per m <sup>2</sup> | Total Cost |
|                        | 0      | 0     | 0                            | £20.99                  | £0.00      |
| Wooden Deck Costs      |        |       |                              |                         |            |
|                        | Length | Width | Total Area (m <sup>2</sup> ) | Cost per m <sup>2</sup> | Total Cost |
|                        | 5      | 8     | 40                           | £15.75                  | £630.00    |
| Rectangular Pond Costs |        |       |                              |                         |            |
|                        | Length | Width | Total Area (m <sup>2</sup> ) | Cost per m <sup>2</sup> | Total Cost |
|                        | 2      | 4     | 8                            | £25.00                  | £200.00    |
| Water Features         |        |       |                              |                         |            |
|                        | Number |       | Cost per water feature       |                         | Total Cost |
|                        | 1      |       | £150                         |                         | £150.00    |
| Garden Lighting        |        |       |                              |                         |            |
|                        | Number |       | Cost per garden light        |                         | Total Cost |
|                        | 0      |       | £5.00                        |                         | £0.00      |
| Total Working Costs:   |        |       |                              |                         | £2220.00   |

|                             |                                  |                                   |                          |
|-----------------------------|----------------------------------|-----------------------------------|--------------------------|
| <b>Labour Costs:</b>        |                                  |                                   |                          |
| Lawns                       |                                  |                                   |                          |
|                             | <b>Minutes per m<sup>2</sup></b> | <b>Total Area (m<sup>2</sup>)</b> | <b>Total Minutes</b>     |
|                             | 20                               | 80                                | 1600                     |
| Concrete Patio              |                                  |                                   |                          |
|                             | <b>Minutes per m<sup>2</sup></b> | <b>Total Area (m<sup>2</sup>)</b> | <b>Total Minutes</b>     |
|                             | 20                               | 0                                 | 0                        |
| Wooden Deck                 |                                  |                                   |                          |
|                             | <b>Minutes per m<sup>2</sup></b> | <b>Total Area (m<sup>2</sup>)</b> | <b>Total Minutes</b>     |
|                             | 30                               | 40                                | 1200                     |
| Rectangular Pond            |                                  |                                   |                          |
|                             | <b>Minutes per m<sup>2</sup></b> | <b>Total Area (m<sup>2</sup>)</b> | <b>Total Minutes</b>     |
|                             | 45                               | 8                                 | 360                      |
| Water Feature               |                                  |                                   |                          |
|                             | <b>Minutes per feature</b>       | <b>Number Purchased</b>           | <b>Total Minutes</b>     |
|                             | 60                               | 1                                 | 60                       |
| Garden Lights               |                                  |                                   |                          |
|                             | <b>Minutes per light</b>         | <b>Number purchased</b>           | <b>Total Minutes</b>     |
|                             | 10                               | 0                                 | 0                        |
|                             |                                  |                                   |                          |
| <b>Total Work (Minutes)</b> | <b>Total Work (Hours)</b>        | <b>Cost of Labour (per hour)</b>  | <b>Total Labour Cost</b> |
| 3220                        | 53.6666                          | £16.49                            | £884.96                  |

|                            |                           |                                 |
|----------------------------|---------------------------|---------------------------------|
| <b>Total Working Costs</b> | <b>Total Labour Costs</b> | <b>Total to Pay by Customer</b> |
| £2220.00                   | £884.96                   | £3104.96                        |