Sample Assignment: Unit 10 Numerical Modelling using Spreadsheets

ASSIGNMENT 1 – VALUE VAN HIRE

This assignment will allow you to meet all of the assessment requirements for Unit 10: Numerical Modelling Using Spreadsheets. You should look at the Assessment Evidence Grid to check what you need to demonstrate in each task to achieve each mark band.

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Dear Sir / Madam

Spreadsheet Business Problem

Introduction

I am looking for a spreadsheet solution to a business problem I have. I am the Managing Director of a small but successful van rental business. I have recently invested in a PC for the business, and I want to use it to produce invoices for van rentals.

The current system has been adequate for the past fifteen months, but has involved me preparing written invoices by hand. As the business is beginning to expand, I am looking to use a more efficient system.

I am asking you to provide a solution to all the core requirements listed below.

However, there are **several ways that this problem can be extended**, and if you wish to do this, there are also some suggestions how this can be done. Do not feel that you have to attempt all of the extension ideas; you can attempt as few or as many as you like.

You will provide me with a report as your final solution, and I recommend that, as you write your report, you check the Assessment Evidence Grid very carefully. I have given some guidance on this process to help you.

Here is the problem. I have 15 vans for rental, of three different sizes.

Small	2.2 m^3 capacity	7 available
Medium	3.4 m^3 capacity	5 available
Large	5.1 m3 capacity	3 available

Most rentals are for periods of less than a week, for which I charge a daily rate as follows:

Small	£32.00 per day
Medium	£41.00 per day
Large	£52.00 per day

I have a few customers who rent vans for longer periods, and I charge weekly rates for these as follows:

Small	£120.00 per week
Medium	£160.00 per week
Large	£205.00 per week

I make a **fixed insurance charge** of £18.00 for every rental.

Most rentals are used locally, and do not involve long journeys. However, for rentals that involve more than 100 miles, I charge a **high-mileage surcharge (hms)** of £0.07 for every mile over 100 miles.

VAT at 17.5% is added to the cost of the rental, insurance and hms.

The core requirement of your solution is to produce invoices for van rentals. These invoices must:

- Include the Value Van Hire Company details
- Accurately and consistently calculate and display the total rental charge
- Clearly set out the elements that make up the total rental charge *(size of van, daily/weekly rate, period of rental, insurance, high-mileage charge, VAT)*
- Have a method for inserting the customer details (*Title, Surname, Address, Post Code*) onto the invoice
- Be printed easily.

The Van Rental Invoice Examples file gives examples of how the invoice could be set out. These examples also include some typical rentals. You could use this data for part of your testing.

How to Present your Solution

I would like your solution in the form of a written report. I suggest that this report contains six sections, and is related to the Assessment Evidence Grid as follows:

1 Design Specification – Assessment Evidence Task a

This section should show how you analysed the problem and planned your solution. It should contain the following (*minimum*) details:

- A summary of my requirements (to show you have understood the problem)
- The input data required for the invoice
- The processing you intend to use to calculate the total rental charge – **be detailed here because this is at the heart of the solution!**
- How you will produce the finished invoice
- What spreadsheet facilities, functions, formulae and user aids you will use
- Sketches of what your finished spreadsheet screens and invoice will look like.

2 Implementation Record – Assessment Evidence Tasks b and c

This section should show how you implemented your planned solution using a spreadsheet. A good way of documenting this is to write a historical record of the stages your solution went through. This could be in the form of a historical diary, or it could be a step-by-step description of the process you went through in creating your solution.

Screen shots and printouts can be used here to show the evidence of the process you went through. Make sure they are legible and fully annotated.

Make sure you include explanations of any problems you encountered, and how you solved these problems using spreadsheet techniques.

3 Testing Record - Assessment Evidence Task d

This section should provide proof that your solution works, and meets the requirements of the design specification. A good way of tackling this section is to:

- **Itemise** all aspects of the solution that have some effect on its overall functionality
- Devise a **series of tests** with suitable test data, which should include a mixture of normal data, abnormal and boundary data
- Show that the results produced by your spreadsheet **functions and formulae** agree with what you would expect by calculating the results manually
- Show that **other facilities** you may have used all work as intended
- Include screen shots as proof for some of your tests
- If some of your tests show that your solution needs improving, then record this and how you made the improvements.

4 User Guide - Assessment Evidence Task e

This is a short(ish) printed manual that explains how to use your spreadsheet solution. It should be sufficient for my staff and I to be able to start and use the solution as you intended it. Try to make it graphical, with examples of menus, screens and outputs that the user will meet. You could also include examples of possible error messages, and what to do if they occur.

5 Technical Documentation - Assessment Evidence Task e

This section is your opportunity to explain any technical details of your solution that have not already been covered. A good check here is to ask the question, 'Will my explanations enable another student to construct my spreadsheet solution exactly as I did?'

Items in this section include:

- Explanations of any macro coding you have generated
- Printouts and explanations of all formulae and functions
- How the user will install the spreadsheet solution
- The hardware and software required to run the solution
- Advanced spreadsheet facilities you have used - what, why and how?

6 Evaluation - Assessment Evidence Task f

This section is your chance to reflect on how effective you think your solution is. So use it to say, with as much detail as possible, what you think the strengths and weaknesses of your solution are. If you had another month to work on it, what would you do to make it an even better solution?

You could also test the solution on a 'pretend' user – *perhaps your teacher or another student* – and obtain feedback from them.

Finally, use this section to reflect on your individual performance. These questions might help you complete this part:

- What did you do well, and what did you struggle with?
- How good were you at solving problems?
- How good were you at being able to break down the 'big' problem into lots of 'smaller', more manageable problems?
- How good were you at getting to grips with understanding, and then applying unfamiliar spreadsheet techniques?
- How much guidance or encouragement did you need to keep your solution progressing?
- How well did you manage your time to produce your solution and your write-up?
- What would you do differently if you had to solve a similar problem in the future?

Make sure you structure your evaluation well and that you carefully check for and correct errors in spelling, punctuation and grammar.

Extending your Solution beyond the Core Requirements

You may feel that you are able to provide a solution to my problem that goes beyond the core requirements outlined above. Feel free to do so.

However, a word of caution here! I would recommend that any extensions are linked to the production of the invoice, and make it more efficient to produce, or add more relevant details to the invoice.

Below are some possible areas of extension that may be worth considering. You can do one or more of these, but do not feel that you have to tackle all of them!

Adding Extra Functions to the Solution

- A database of regular customers, so that if a regular customer makes a new rental, the customer details can be looked up and transferred to the invoice rather than inputted directly to the invoice.
- An input screen so that new customers can automatically be added to the customer database.
- A database of vans for rental, so that the registration number of the van can be looked up and added to the invoice.
- An invoice summary list, so that for each new invoice, an entry is made onto this invoice list. This invoice list would need to include the invoice number, date, basic customer details, van category, hire charge, mileage charge and total rental charge.

Improving the Numerical Modelling

You may feel that my current pricing structure is unrealistic and needs improving. You are probably correct!

For example, it is currently cheaper to rent a small van for one week (£120.00) than to rent it for four days (4 * £32.00 = £128.00).

Use this opportunity to improve the numerical model upon which the pricing structure is based. Here are some ideas on how you might do this:

- I am thinking of introducing two new sizes of van, a **midi van** at 2.8m^3 and a **maxi van** at 6.2m^3. What daily and weekly rates should I charge for these?
- Are my charges for daily and weekly rates correctly linked to van size?
- Could your solution enable the addition of new van types?
- The two-step model of daily and weekly rates is a bit too simple and unrealistic. Could the link between length of rental period and price be improved?
- Is the high-mileage fee realistic? Does it penalise customers that use the vans for long distances? Should it be linked to length of rental (say 100 free miles for every day's rent)?
- The insurance fee is currently a fixed rate of £18.00 per rental. Should this vary according to length of rental and size of van? Also, younger and inexperienced drivers are more of an insurance risk. Should the insurance fee vary according to the age of driver, or how long they have held a full licence? If so, how are these linked?
- I should not be charging VAT on the insurance fee, as insurance is VAT exempt.
- I may wish to increase my basic rental rates by a small percentage each year, in line with inflation. Could you include a quick way of doing this, that doesn't upset the rest of the solution?
- Should I have a discount structure for regular customers?

You could try to include some or all of these ideas into your solution. If you do attempt to include them, then remember two things:

- I would like your model to make my rental business more profitable because of a more sophisticated pricing structure.
- By making the model more sophisticated, you have changed the original problem into a more complex one. Make sure that this is included in your report, from the specification onwards.

Presenting your Extensions in your Report

To gain credit for any extension work you have undertaken, you must include a write-up of this work in your report. You can do this in one of two ways:

- Complete your extensions, and then write your report following the sections outlined previously. Make sure all extension work is documented.
- If you have completed your report for the core requirements, and then have decided to tackle some extension work, then write the extension work up as a separate section to the main report. However, do follow the same six sections outlined previously.

Finally

Good luck! I hope you enjoy tackling this problem, and learn lots about numerical modelling with spreadsheets along the way. I look forward to seeing your solutions in action, and reading your reports.

Alan Greaves

Alan Greaves
Managing Director
Value Van Hire Company