

UNIT 3: SPREADSHEET DESIGN (ADVANCED)

ABOUT THIS UNIT

This unit helps you to:

- design spreadsheets that process data and present required information
- prepare standard spreadsheets that others can use with their own data
- learn and apply good design and test principles.

You will create a spreadsheet to meet specified requirements. These will require the use of several of the more complex spreadsheet facilities.

This unit applies some of the knowledge and skills gained from Unit 1: Presenting information (Advanced). It links with Unit 7: Programming (Advanced), Unit 5: Systems analysis (Advanced) and Unit 6: Database design (Advanced).

The unit also builds on the work done in Unit 2: Handling information (Intermediate).

This unit provides knowledge, skills and understanding in Using IT NVQ level 3.

This unit will be assessed through your portfolio work only. The grade awarded will be your grade for the unit.

WHAT YOU NEED TO LEARN

The topics are:

- developing a working specification
- using spreadsheet facilities
- designing and developing spreadsheets
- presenting spreadsheet information
- testing spreadsheets
- documentation
- standard ways of working.

You will meet new technical terms in each of these topics. Some of the words may be familiar but have specialised meanings in this area of study. You need to know how to use these terms correctly.

Developing a working specification

You will need to be able to create spreadsheets that meet specified requirements. The user of your spreadsheet will want to enter data and the spreadsheet must process the data to produce the required output. Output may be in the form of numerical values or charts.

You need to learn how to analyse user requirements to determine:

- what output information they want
- how they currently obtain that information (if at all)
- where the data to be input is to come from
- what data-capture methods can be used
- what data processing must be done to get the required output
- what aids can be provided to assist with data input or processing
- how the output information needs to be presented.

You will need to be able to use the answers to these questions to produce a detailed design specification for the spreadsheet. You will find it helpful to discuss with others the user's requirements and how they may be met. A good design specification states the user's needs in such a way that there is no doubt about the scope of the task and the work that has to be done.

You and the user need to agree the design specification before you begin work on the spreadsheet design.

Using spreadsheet facilities

When using spreadsheet facilities, there are a number of activities that you will do regularly. You must learn to carry out these activities without help, including:

- selecting and setting cell formats to match the data format
- selecting and using suitable cell presentation formats
- using and manipulating spreadsheet data
- appropriately using cell referencing facilities
- correctly applying and using operators and formulae
- appropriately using built-in spreadsheet functions
- using wizards.

You will need to learn how to:

- set cell formats to match the data format, including:
 - decimal number
 - integer number
 - percentage
 - date
 - fraction
 - text or character
 - currency
 - scientific
 - custom or special
- set cell presentation formats, including:
 - horizontal alignment
 - colour
 - vertical alignment
 - shading
 - fonts
 - borders
- use and manipulate your spreadsheet to:
 - find data
 - go to a specified cell
 - search and replace data
 - cut, copy, paste, move
 - clear cell formats/contents
 - use paste special

- make appropriate use of cell referencing facilities, including:
 - relative referencing
 - cell ranges
 - absolute cell referencing
 - 3D referencing
 - mixed cell referencing
 - R1C1 referencing
- correctly apply and use the following operators in formulae:
 - arithmetic operators, such as +, -, *, /, %, ^
 - relational operators, such as =, <, >, >=, <=, <>
 - the logical value FALSE, TRUE
 - text concatenation & or +
 - the use of parentheses ()
- use common built-in spreadsheet functions, including:
 - SUM
 - INT
 - COUNT
 - MAX
 - AVERAGE
 - RAND
 - MODE
 - MIN
 - SQUARE
 - IF
 - MEDIAN
 - DATE.

Designing and developing spreadsheets

The design of the spreadsheet must make it easy to use. In creating a spreadsheet for users you should provide simple but effective ways of entering data, including:

- creating sheets that have the appearance of a form
- using data entry forms.

You should provide users with helpful prompts, including:

- providing data entry messages
- using data validation and associated messages.

You will need to present results in appropriate ways, including good use of:

- cell formatting, such as colour and borders
- drawing tools and graphic images
- charts and line graphs.

You will need to make good use of macros to simplify the use of the spreadsheet, including macros that:

- replace multiple key depressions for a required action
- enable or simplify data input
- produce printed or screen reports.

You will need to be able to use some of the more complex spreadsheet facilities including:

- lists and tables – sorting, lookup tables, subtotals and totals
- list boxes and drop-down boxes to select data for entry
- styles to create a customised cell format
- named cells and ranges for use in formulae
- auto-fill lists, for lists of dates or days of the week
- validation – restricting data input to acceptable data values
- templates – creating standard spreadsheet layouts for repeated use
- protecting cells by hiding and locking cells
- sort, to sort single and multiple columns of data
- control buttons, to initiate macros
- multiple sheets with links between them
- multiple views or windows.

Presenting spreadsheet information

The presentation of information in your spreadsheet is very important and you must consider this from the start. To present results in appropriate ways, on VDU screens and on printed pages, you must be able to make suitable use of cell formats, page layout, charts and line graphs.

You must be able to create an appropriate page layout, including:

- margins
- headers
- footers
- page size
- page orientation.

You need to present results in graphical form, including:

- line graphs
- bar charts
- pie charts
- using picture markers
- scatter charts.

You should present charts and line graphs appropriately, including using:

- chart or graph title
- axis labels
- background
- legend data series labels
- data labels
- category labels
- axes formats
- axis values
- gridlines.

You should make use of built-in drawing tools and other facilities to improve your presentation, including:

- grouping objects
- object formatting
- graphic lines and shapes
- object positioning
- text boxes
- object sizing.

Testing spreadsheets

You must learn to test your spreadsheets thoroughly. You can do this by asking yourself questions such as:

- does the solution meet the agreed specification?
- do results agree with manual methods of doing the same problem?
- does the spreadsheet cope with normal, extreme and abnormal data?
- can other people use the solution?
- is the spreadsheet robust or can it be made to fail?

You will need to be able to create a test specification that defines tests for:

- acceptable data input values (both maximum and minimum)
- unacceptable data values that should be automatically rejected
- checking, independently, that all functions and formulae work correctly
- checking that the system meets user requirements.

Documentation

You must learn to document the development of your customised spreadsheet and create instructions for users.

Technical documentation is for specialists. It records the design and development of the spreadsheet and could include:

- a copy of the agreed design specification
- details of the hardware, software and other resources required
- instructions for opening and configuring the spreadsheet
- details of all calculations, formulae and functions used
- details of validation and verification procedures
- details of all input and output screens and printed designs
- copies of the test specification.

User documentation helps others to use your custom spreadsheet. You must learn to write user instructions that are simple to understand. Your instructions could include:

- how to start the spreadsheet program
- routes through the spreadsheet menus
- examples of screens and data entry forms
- instructions about data entry
- advice on how to respond to error messages or conditions
- examples of data output screens and printed copy.

Standard ways of working

Note

See Unit 1: Presenting information (Advanced) for full details of the standard ways of working which you need to know and use. This is a shortened version of the requirements written to apply specifically to this unit.

Standard ways of working exist to help people to manage their work effectively. You need to learn to:

- edit and save work regularly, using appropriate names for your documents
- store your work where you and others can easily find it
- keep dated backup copies of files on another disk and in another location
- keep a log of ICT problems you have encountered and how you solved them
- protect confidentiality and observe copyright laws
- avoid bad posture, physical stress, eye strain and hazards from workplace layout.

ASSESSMENT EVIDENCE

You need to produce:

- a spreadsheet solution to meet specified user requirements, involving the use of at least six of the more complex spreadsheet facilities
- user and technical documentation, including a test report.

To achieve a grade E, your work must show:	To achieve a grade C your work must show:	To achieve a grade A your work must show:
<ul style="list-style-type: none"> • a clear design specification that meets user requirements, including appropriate selection of more complex facilities, details of sources of data, outline screen data entry forms, calculations required, user aids to operation and how output is presented • suitable data entry facilities, including input messages and macros that reduce keystrokes and improve user efficiency • suitable printed or screen output that makes appropriate use of cell formats, charts or graphs, page or screen layout and graphic images • clear technical documentation identifying formulae and functions used, and screen and printed report layouts • clear user documentation with copies of menus and screens and examples of input and output • testing of your spreadsheet against the design specification and careful checking of the accuracy of the data used and the output generated. 	<ul style="list-style-type: none"> • a good understanding of spreadsheet design and attention to detail by creating an imaginative customised spreadsheet that makes good use of design and layout facilities • detailed test specifications together with examples of a full range of acceptable and unacceptable input, associated expected output and any associated error messages • that you can work independently to produce your work to agreed deadlines. 	<ul style="list-style-type: none"> • a good understanding of the purpose and value of more complex facilities by using them effectively in your spreadsheet design • customised data input using facilities such as forms, dialogue boxes and list boxes that are clear, well laid out, suitably labelled and that validate data input • comprehensive records of spreadsheet drafting, testing and refinement that show how the spreadsheet was developed and how any problems were resolved • high-quality, clear user documentation making good use of graphic images in detailed instructions for use with examples of menus and data input screens, types of output available and possible error messages.

ESSENTIAL INFORMATION FOR TEACHERS

Teaching strategies

Students will need to practise various skills and solve many small and varied problems before they are ready to undertake a major task. Together, these problems should require students to use all the spreadsheet skills described. For the final spreadsheet, students should use only those techniques relevant to its solution. Clearly, however, the task must be sufficiently weighty to go beyond sums and averages.

Students should experience a wide variety of spreadsheets particularly those of a business nature such as those used for invoices, for quotations and in stock control systems.

The order of teaching different topics is unimportant. What does matter is that students see that the presentation of a spreadsheet is as important a part of design as thinking about which spreadsheet functions will be most useful in solving a problem.

Some time should be spent considering the layout of data input screens. Students should devise some screens that appear as forms, such as invoices and records of contacts. They should investigate the many ways in which a user can be guided to enter the correct data in any one cell. This would include the use of cell messages. They should also learn to create suitable validation for the entry of data as well as error messages to inform users of mistakes.

Students may gain from contributing to a team project before they try to produce a spreadsheet for assessment. Each team member could be allocated a separate role, such as designing input screens, processing data, presenting information and writing a user guide. The sharing of such experiences should help students to see the benefits of teamwork and the value of breaking down major tasks into smaller, manageable chunks.

Assessment strategies

The result of your assessment of student evidence is an overall uniform mark for the unit. This is then used to generate a unit grade. It also contributes to the total uniform mark for the qualification that in turn is used to generate a qualification grade.

The mark you award must take into account the extent to which the evidence matches the requirements of the banner, the set of criteria in the grade E column of the grid, and the grading standards, represented progressively by the criteria in the grade C and grade A columns. Thus the overall mark you determine for a particular student is based on best-fit judgements of the evidence against successive sets of criteria presented as cumulative grade descriptions for grades E, C and A.

When grading student evidence you should consider the following general qualities that distinguish between the three grades:

- increasing depth and breadth of understanding
- increasing coherence, evaluation and analysis
- increasing independence and originality
- increasing objectivity and critical understanding.

Grade E

To achieve an E grade, students should aim to provide evidence that covers all the requirements stated in the E grade criteria of the assessment grid. It may be, however, that a student demonstrates considerable effort and skill in some areas at the expense of coverage of another. Professional judgement should be used to decide the extent to which the relative strengths shown in most of the criteria compensate for any weaknesses.

Students must produce a clear design specification. This will need to include details of where they obtained their information for entry into the spreadsheet. They will need to describe how they enable data entry, such as the use of data entry forms, what calculations are necessary, the formulae used and any aids to the user such as messages, validation cells and macros. Students should create spreadsheets that have the appearance of forms such as invoices. These forms must make appropriate and attractive use of cell formats, charts, line graphs, page or screen layout and graphic images. They may be both input and output forms. The technical and user documentation must provide clear details of the operation of the spreadsheet. It must include details of the formulae used, the cell formatting, examples of screens used and typical input and output. Students must show that they have correctly tested their spreadsheets against the design specification.

Grade C

To achieve a C grade the student's spreadsheet should make good use of design and layout facilities and be suitably customised to meet user needs. Students must provide clear and easy to use data input facilities, such as forms, dialog boxes and list boxes, and these must be well laid out and suitably labelled. They must proof-read and correct most errors in their documentation.

Students should show clear records of thorough spreadsheet testing and indicate how identified problems were resolved. Their user documentation will make good use of graphic images including examples of data input screens, types of output available and possible error messages.

They should plan their work and work independently to meet a given deadline, once they have acquired the necessary knowledge and understanding. This requirement does not mean without teacher intervention or assistance, rather it means that students do not display undue dependence. The agreed deadline may be re-negotiated between the student and teacher to take into account unforeseen circumstances.

Grade A

For this grade, students' design specifications and technical documentation will be coherent, comprehensive, will contain appropriate and fluent technical language and be easy to read. These, together with their spreadsheet, will show an in-depth understanding of spreadsheet design.

The students will pay attention to detail by creating an imaginative customised spreadsheet making good use of design and layout facilities available to them including validation of input. They will produce detailed test specifications together with examples of a full range of acceptable and unacceptable input and associated expected output. They will define fully and clearly in the technical documentation all functions, formulae and validation techniques and the design of all user screens and dialog boxes.

Key skills

This guidance highlights the most relevant key skills opportunities in this unit. It contains suggestions only. You will need to check that students have produced all the evidence required to meet part A **and** part B of the key skills specifications. Students may need to develop additional evidence elsewhere to meet fully the requirements of the key skills specifications.

Guidance is referenced in two ways:

K – keys to attainment

These are key skills or aspects of key skills which students should achieve as they meet the vocational requirements of the units. Only part B of the key skill is highlighted – you will need to check that students achieve part A.

S – signposting

These are opportunities that can be incorporated naturally into the learning programme.

APPLICATION OF NUMBER, LEVEL 3		Key skills reference
When students are:	They should be able to develop the following key skills evidence:	
<ul style="list-style-type: none"> collecting information for the design of the spreadsheet and for test purposes designing the spreadsheet 	Plan and carry through at least one substantial and complex activity that includes tasks for N3.1, N3.2 and N3.3.	
	N3.1 Plan and interpret information from two different types of sources, including a large data set.	K
<ul style="list-style-type: none"> creating the spreadsheet 	N3.2 Carry out multi-stage calculations to do with: <ul style="list-style-type: none"> a amounts and sizes b scales and proportion c handling statistics d rearranging and using formulae. You should work with a large data set on at least one occasion.	K K K K
	N3.3 Interpret results of your calculations, present your findings and justify your methods. You must use at least one graph one chart and one diagram.	K

COMMUNICATION, LEVEL 3		Key skills reference
When students are:	They should be able to develop the following key skills evidence:	
<ul style="list-style-type: none"> producing clear technical and user documentation, including images of the spreadsheet 	<p>C3.3 Write two different types of documents about complex subjects.</p> <p>One piece of writing should be an extended document and include at least one image.</p>	K
PROBLEM SOLVING, LEVEL 3		Key skills reference
When students are:	They should be able to develop the following key skills evidence:	
<ul style="list-style-type: none"> producing a spreadsheet to meet specified requirements 	<p>Provide at least one substantial example of meeting the standard for PS3.1, PS3.2 and PS3.3.</p> <p>PS3.1 Explore a complex problem, come up with three options for solving it and justify the option selected for taking forward.</p> <p>PS3.2 Plan and implement at least one option for solving the problem, review progress and revise your approach as necessary.</p> <p>PS3.3 Apply agreed methods to check if the problem has been solved, describe the results and review your approach to problem solving.</p>	<p>S</p> <p>S</p> <p>S</p>
WORKING WITH OTHERS, LEVEL 3		Key skills reference
When students are:	They should be able to develop the following key skills evidence:	
<ul style="list-style-type: none"> producing a spreadsheet to meet specified requirements 	<p>Provide at least one substantial example of meeting the standard for WO3.1, WO3.2 and WO3.3 (you must show you can work in both one-to-one and group situations).</p> <p>WO3.1 Plan complex work with others, agreeing objectives, responsibilities and working arrangements.</p> <p>WO3.2 Seek to establish and maintain cooperative working relationships over an extended period of time, agreeing changes to achieve agreed objectives.</p> <p>WO3.3 Review work with others and agree ways of improving collaborative work in the future.</p>	<p>S</p> <p>S</p> <p>S</p>

