

selection) makes the mouse useful for selecting items from drop-down menus or performing operations on files represented as icons on the computer screen.

Optical mice have no moving parts and so do not suffer from dirt clogging the mechanism that detects the mouse's movement. They use laser light to repeatedly 'photograph' the surface they are on.



Figure 2-5: A Cordless Wheel Mouse with Additional Buttons

As with keyboards, extra buttons and features are often added to the mouse. A wheel mouse has a wheel in the centre that allows the user to scroll through documents.

The mouse shown on the left has five extra buttons in addition to the usual left and right mouse buttons. These buttons can be customised by the user.

Cordless mice, which communicate with the computer using radio rather than cables, are increasingly common. They reduce clutter on the user's desk and allow greater freedom as to where the mouse is placed.

A special type of mouse that can be used in mid air rather than needing a flat surface has been developed for use with presentation software, when the person using the mouse may be moving around the room. This type of mouse is called a gyro mouse because it detects movement using a built in gyroscope.

| Mouse Strengths and Weaknesses | | | |
|---|--|---|---|
| 👍 | Good for inputting movement and speed (converted to position). | 👎 | Not very good at inputting text. |
| 👍 | Good for selecting items in a graphic interface or from menus. | 👎 | Limited range of functions. |
| 👍 | Small. | 👎 | Needs a flat space to operate on (but see gyro mouse). |
| 👍 | Optical mice are less vulnerable to dust and dirt. | 👎 | Mechanical mice behave badly in a dusty or dirty environment. |
| Typical Application: Pointing device on a microcomputer. | | | |

Touch Pad

A touch pad does much the same job as a mouse but in a completely different way. The touch pad is a flat area. When the user places a finger on the surface of the touch pad the pad detects its position. Movement of the finger is tracked and the computer system moves the pointer on the screen accordingly – just as with a mouse.

Tapping the touch pad is equivalent to left-clicking the mouse although two buttons are normally provided below the touch pad to reproduce the left and right buttons on a standard mouse.

Touch-pads can be customised so that certain areas on the surface perform specialised functions. An example of this would be to set the right-hand edge of the touch pad to perform the same scrolling function as the wheel on a wheel mouse. Documents could then be scrolled through by moving the finger along this specially configured edge.



Figure 2-6: Laptop with Touch pad

 Technical Vocabulary 5

| | |
|-----------------------------|---|
| Application | A computer program written to perform some task for the user. |
| Bespoke Software | Application software written to order for a particular user. |
| Bootstrap loader | A small computer program that loads the operating system program into the computer's memory when it is first switched on. |
| Computer System | A combination of hardware and software designed to process data. |
| Generic Software | Software written to solve a wide variety of jobs. |
| File Format | A way of structuring data so that it can be read by one or (usually) more applications. All data must be stored in a file format that can be read by at least the application that stored it. |
| Hardware | The physical components of a computer system - e.g. printer, VDU, keyboard etc. |
| Model | Computer software that predicts how some real world situation or object will behave under different conditions. |
| Multi-tasking System | A computer system where several programs are loaded into central memory at the same time. |
| Multi-user System | A computer system where several users appear to have access to the computer at the same time. POS terminals in a supermarket are part of a multi-user system. |
| Operating System | A computer program that is present in memory all the time that the computer is working. It controls and manages the computer system resources. |
| Simulation | Computer software that behaves like some real life system or object. |
| Software | Computer programs that are made up of series of instructions that the computer follows to perform some task. |
| Virtual Reality | Computer system that uses visual and sound input to produce the effect that the user is actually present in a computer generated environment. |

 Key Points 5

- ✓ A computer system is made up of hardware and software.
- ✓ Computer programs are made up of sets of instructions that the computer follows and are called software.
- ✓ There are two types of software, applications software and system software.
- ✓ Applications software is written to make the computer do a particular task for the user. It can be configured to suit the user's needs.
- ✓ Systems software is written to make the computer hardware work.
- ✓ The operating system is a part of the systems software and it controls and manages the computer systems resources.
- ✓ Computer models and simulators use sets of rules to predict how an object or system will behave in real life.
- ✓ Standard file formats allow data to be transferred between different applications software and also between different computer systems.

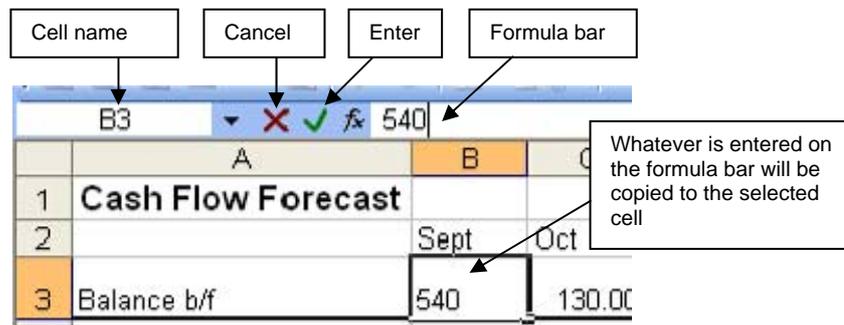


Figure 6-4: Spreadsheet Editing

If major changes are needed, such as inserting or deleting rows and columns, then there is a problem over the existing formulas. If, for example, an extra column is inserted between B and C, then all the columns to the right of the new column B will have to be renamed. B will become C, C become D and so on. Any formulas that referred to the old names will have to be changed. Spreadsheet applications software will automatically update formulas affected by the insertion or deletion of a row or column.

Replication

When a formula is needed in cells that are next to each other in a row or column we often find that the pattern of the formula is the same, only the row or column identifiers need to be changed.

Figure 6-5 shows a spreadsheet that calculates the total from three tests for each of six pupils. These totals are calculated in column E. Row 10 gives the average mark for each of the three tests.

| | A | B | C | D | E |
|----|---------|---------------|---------------|---------------|-------------|
| 1 | | | | | |
| 2 | | Test 1 | Test 2 | Test 3 | Total |
| 3 | Alan | 24 | 30 | 16 | =SUM(B3:D3) |
| 4 | James | 50 | 60 | 65 | =SUM(B4:D4) |
| 5 | John | 45 | 60 | 50 | =SUM(B5:D5) |
| 6 | Mary | 14 | 36 | 55 | =SUM(B6:D6) |
| 7 | Sarah | 80 | 82 | 75 | =SUM(B7:D7) |
| 8 | Susan | 70 | 50 | 85 | =SUM(B8:D8) |
| 9 | | | | | |
| 10 | Average | =SUM(B3:B8)/6 | =SUM(C3:C8)/6 | =SUM(D3:D8)/6 | |
| 11 | | | | | |

These formulas calculate the average mark for each test. Only the column letter changes from formula to formula.

These formulas calculate the total mark for each pupil. Only the row number changes from formula to formula.

Figure 6-5: Formulas on a Mark Sheet

Cells E3 to E8 contain similar formulas. Only the row number changes from one to the next. It would be time consuming to type in each of these formulas by hand. The formulas do not change much from row to row so the typing would be repetitive and boring. This would increase the chances of making a mistake in the formula. If there had been thirty pupils in the group, rather than six, then almost identical formulas would have had to be typed out thirty times, once for each pupil.

Spreadsheets allow a special type of copying called replication. When a cell containing a formula is replicated (copied) downwards from row to row then all the row references are automatically increased. Similarly, when a cell containing a formula is replicated from column to column, all the column references are increased. This type of replication is called relative replication because the row and column references are increased relative to how far the destination cell is from the original.

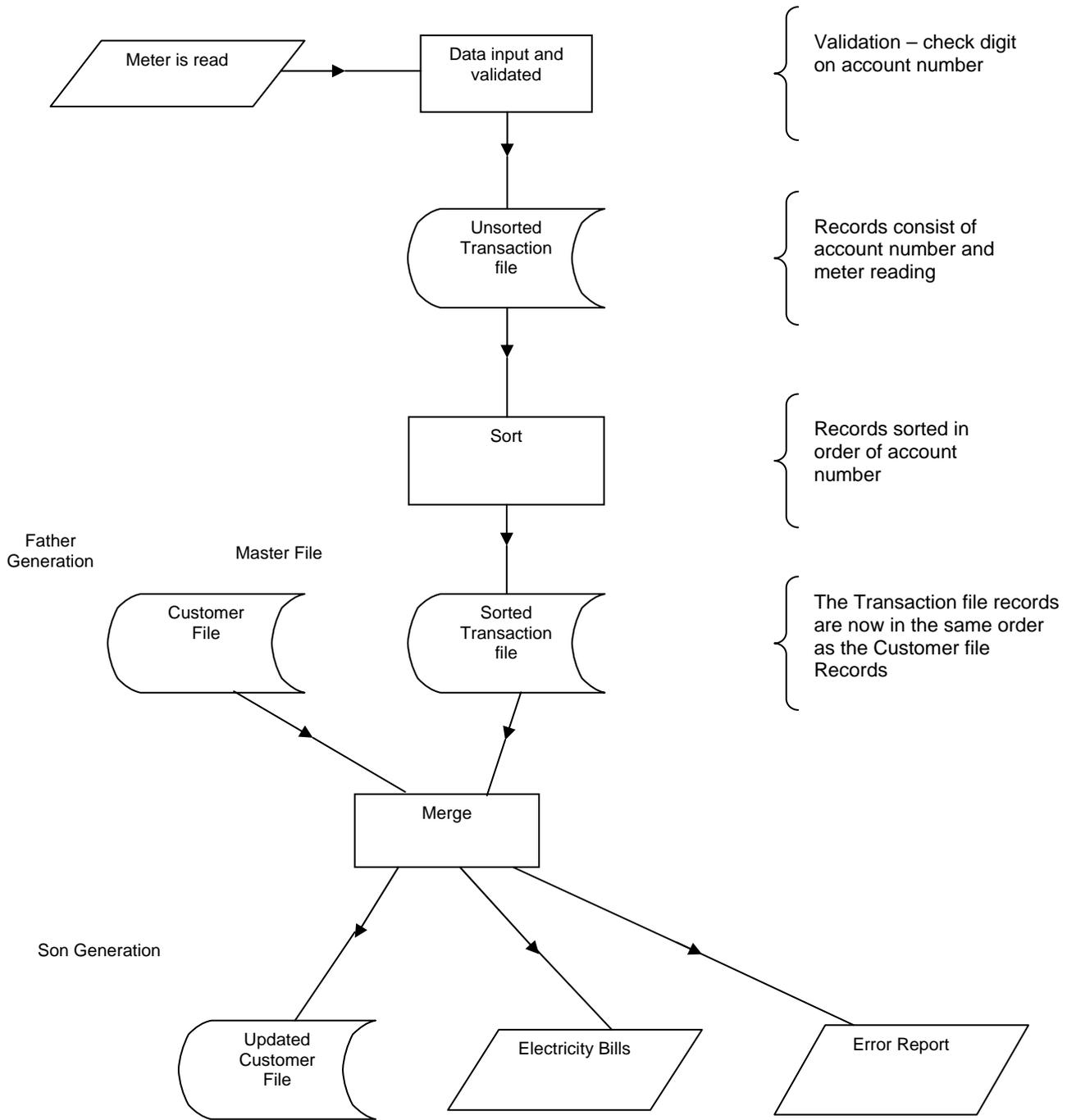
In the sample worksheet above, if cell E3 were copied one row down into cell E4 then the formula would be correctly changed to =SUM(B4:D4) so that E4 would contain the correct formula. Similarly, copying from E3 to E5 would result in the formula =SUM(B5:D5) being put in cell E5. In

Questions 8

- (8.1) A Stock file contains records about items sold by a supermarket. Some of the fields used are:
- BarCodeNumber
 - Description (A description of the item - e.g. Baked Beans)
 - Price (How much this item costs)
 - QuantityInStock (How many of this item there are left)
 - MinimumQuantity (The smallest number there should be before the item is re-ordered)
 - ReOrderQuantity (The number of this item that is ordered)
- The instruction:
- LIST Description, Price FOR QuantityIn Stock GREATER THAN 100**
- would result in a printout listing description and price of all items that the supermarket had more than 100 of. What instructions would produce lists giving:
- (a) Description and number in stock of all items which cost more than £10
 - (b) Description and price of all items with the description "Baked Beans"
 - (c) Description and number in stock for the item with 5 013413 604531 as its bar code number
 - (d) Description and re-order quantity for items with the description "Large Cake" that cost more than £5
 - (e) Description, quantity in stock and reorder quantity for items which need re-ordering.
- (8.2) Which of the fields in the Stock file is the primary key?
- (8.3) What is the purpose of a validation check?
- (8.4) Write down suitable validation checks for the following data
- (a) Date of Birth for Year 10 student
 - (b) Pupil's percentage mark for an examination
 - (c) Pupil's attainment grade on report
- (8.5) Describe in your own words what is meant by the terms:
- (a) Validation
 - (b) Range Check
 - (c) List Check
- (8.6) What validation checks would be most appropriate in each of the following cases - note that it is possible for more than one validation check to be performed on a particular data item
- (a) Customer account number (key field)
 - (b) Pupil test result (percentage mark)
 - (c) Number of items in stock
 - (d) Price of item
 - (e) Sex of pupil
- (8.7) Find a check digit for:
- (a) 3044
 - (b) 1292
- (8.8) A number with a check digit can be validated by re-calculating the check digit and seeing if it agrees with the check digit that is actually present. Start by writing the number down without the check digit and then perform the same calculation as in question 8.7. Compare your answer to the check digit to see if the number was valid.
- Use this method to find if each of the following numbers is valid. Show all your working.
- (a) 3117 – 8
 - (b) 1044 – X

Electricity Billing

The following system flowchart shows an electricity billing system that uses batch processing.



11-2: Electricity Billing System

The error report will give details of errors detected during the merge. Errors could be detected as a result of validation at any stage of the processing. One example of validation that could be carried out is to check that the current meter reading is greater than or equal to the last meter reading. An error would also be reported if an account number in the transaction file did not exist in the Customer master file.

The customer file records will have the account number as the key fields. Other data that must be stored if the system is to work will be the customer's name and address – so that the bill can be posted to them and the previous meter reading – so that the amount of electricity used can be calculated. If the meter is not read, then the system will produce an estimated bill based on the