Answers

8 Spreadsheets

8.1 Create a spreadsheet

1 A spreadsheet is a two-dimensional **table** split into **rows** and **columns**. It is made up of a number of individual **cells**. Each **cell** has an address, for example: G7. A spreadsheet is sometimes called a **sheet** or even a **worksheet**. In *Excel* many sheets can be held within a single **workbook**.

Rows and columns are interchangeable.
Sheet and worksheet are interchangeable.

2 In any order:
- Number
- Label
- Formula

3 **a** Label
b Number/Numeric value
c Formula

4 Three from:
- Move the mouse over the sheet name of the worksheet to be renamed …
- … press the right mouse button to open the drop-down menu.
- Select **Rename** from the drop-down menu to highlight this sheet.
- Overtype the highlighted sheet name with the new sheet name and press <Enter> to make this change.

5 Click on the **New Sheet** button/circle with a plus sign in it.
Rename this worksheet as **Invoice**.

8.1.1 Create the structure

6 Select the **Page Layout** tab.
Select the drop-down menu from the **Size** icon.
Select **A3** from the drop-down menu.

7 Select the **Page Layout** tab.
Select the drop-down menu from the **Orientation** icon.
Select **Landscape** from the drop-down menu.

8 Select the **Page Layout** tab.
Select the drop-down menu from the **Margins** icon.
Click on the text **Custom Margins** at the bottom of the drop-down menu.
Enter **3** in the **Top** box.
Enter **3** in the **Left** box.
Enter **2** in the **Right** box.
Enter **4** in the **Bottom** box.
Click the OK button.

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9 Select the **Page Layout** tab.
Click on the small arrow in the bottom right corner of the **Page Setup** section to open the Page Setup window.
Select the **Header/Footer** tab.
Select the **Custom Header** button.
Select the **Left section** box and enter your name.
Click the OK button.

10 **a** Page number
b Number of pages
c Date
d Time
e Filename with file path
f Filename only
g Worksheet name

11 Select the **Page Layout** tab.
Locate the **Sheet Options** section.
Locate the **Gridlines** column.
Select the check box for Print.

12 Select the **Page Layout** tab.
Locate the **Sheet Options** section.
Locate the **Headings** column.
Select the check box for Print.

13 Click the right mouse button on the spreadsheet where you wish to insert the cell. From the drop-down menu select **Insert** .../open the Insert window.
Select the option to **Shift cells down**.
Click the OK button.

14 **a** Either:
Click the right mouse button on the row header that contains the number 2.
Select **Insert** from the drop-down menu.
Or:
Click the right mouse button on any cell in row 2.
From the drop-down menu select **Insert** .../open the Insert window.
Select the option for **Entire row**.
Click the OK button.

b Either:
Click the right mouse button on the row header that contains the number 5.
Select **Delete** from the drop-down menu.
Or:
Click the right mouse button on any cell in row 5.
From the drop-down menu select **Delete** .../open the Delete window.
Select the option for **Entire row**.
Click the OK button.

c Click the right mouse button on the row header that contains the number 8.
Select **Hide** from the drop-down menu.

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15 **a** Column A is not wide enough to display all the data held in it.
b Move the cursor between the row headings A and B.
Click the cursor on the drag handle to select it and …
… hold down the left mouse button and drag the handle to the right …
… until all text in this column is fully visible.

16 **a** Highlight the range A1:E1.
Select the **Home** tab.
In the Alignment group, click on the **Merge & Center** icon.

17 **a** Text wrapping is used where the text in a cell does not fit within the column width.
It is often truncated or runs into the next cell if this is empty.
Text wrapping formats the text so that it fits within the same column width but on two or more lines.
b Place the cursor in the cell/highlight the range of cells to be wrapped.
Select the **Home** tab.
In the **Alignment** group, click on the **Wrap Text** icon.
Use the drag handle to increase the row height so that all the wrapped text is visible.

18 **a** Highlight cells in the range D7:E9.
Select the **Home** tab.
Select the drop-down menu in the **Alignment** group/open the Format Cells window.
Select the **Protection** tab.
Select the check box for **Locked**.
Select the **Review** tab.
In the **Protect** group, select **Protect Sheet**/Open the Protect Sheet window.
Enter the password **BbSi**.
Verify your password entry.
Click the OK button.

8.1.2 Create formulae and use functions

19 =

20 **a** +
b –
c *
d /
e ^

21 Four from:
- Absolute referencing for a cell will fix that cell name/address and not change it …
- Relative referencing will allow cell names/addresses to be changed …
- … when the formula is replicated.
- A $ symbol represents absolute referencing.
- Good example of absolute referencing like: $A$1 will not change when replicated.
- Good example of relative referencing like: A1 will change to A2 when replicated one cell below.

22 Select the **Formulas** tab.
In the **Formula Auditing** section.
Click on the **Show Formulas** icon.

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23 **a** `=B3*D3`
b `=SUM(E3:E6)`
c `=E7*B8`
d `=E7+E8` or `=SUM(E7,E8)` or `=SUM(E7:E8)`

24 **a** Click the right mouse button on cell B8.
Select **Define Name ...** from the drop-down menu/Open the New Name window.
Enter the word **TAX** in the **Name:** box.
Add an appropriate message in the **Comment:** box.
Click the OK button.

25 Absolute cell reference

26 Four from:
- A range/array of cells ...
- ... given a pre-defined name ...
- ... which is short and meaningful
- ... which when used refers to the values held in the range of cells
- It is easier to remember and use this name (e.g., **VAT**) than the cell references (e.g., `$F$14:$G$16`).

27 **a** **i** `SUM`
ii `AVERAGE`
iii `MAX`
iv `MIN`
b **i** `=$B$1*B4`
with B1 only as an absolute referencing.
ii `=SUM(B4:B8)`
Range can have absolute or relative referencing.
iii `=MIN(B4:B8)`
Range can have absolute or relative referencing.
c Either:
Select and hold the drag handle in bottom right of cell C4 ...
... drag this down to cell C8.
Or:
Copy contents of cell C4.
Paste into cells C5 to C8.

28 A function has a pre-defined name (built into the spreadsheet) ...
... which performs a calculation/operation.

29 It adds the contents ...
... of all 3 cells in the range A1 to A3/of cells A1, A2 and A3 ...
... and the contents of cell A8 and A16.

30 It adds the contents ...
... of all cells in the range ...
... that has been named **Revenue**.

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31 It finds the mean (average) …
… of the contents of all 4 cells …
… in the range C4 to C7.
Equivalent formula: `=(C4+C5+C6+C7)/4` or `=SUM(C4:C7)/4`

32 It checks through the contents …
… of all cells in the named range **Revenue** …
… and displays the contents of the cell that contains the largest value.

33 It looks through the contents …
… of all cells in the named range **Revenue** …
… and displays the contents of the cell that contains the smallest value.

34 Either:
The contents of cell C9 …
… are truncated to 0 decimal places …
… and displayed in this cell/cell A4.
Or:
The integer/whole number part …
… of cell C9 is extracted …
… and displayed in this cell/cell A4.

35 `ROUNDUP` and `ROUNDDOWN` are both similar to the `ROUND` function …
… they have the same syntax as the `ROUND` function …
… and like the round function can be used to round to a number of digits.
`ROUNDUP` always rounds the number up.
`ROUNDDOWN` always rounds the number down.

36 The `COUNT` function counts the number of numeric values (within a specified range of cells).
The `COUNTA` function counts the number of alphanumeric values (within a specified range of cells).

37
a **i** Rounds the contents of A1 to 2 decimal places/to the nearest hundredth.
ii 64.55
b **i** Rounds the contents of A1 to 0 decimal places.
(If the contents have a decimal value >=0.5 then the value is rounded up; if the decimal value <0.5 then the value is rounded down.)
ii 65
c **i** Rounds the contents of A1 to the nearest ten.
ii 60
d **i** Truncates/removes all the decimal part of the contents of cell A1.
ii 64

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38 The formula counts the number of people in the list.
It counts the number of alphanumeric values/cells contains containing a label or value in the list …
… and subtracts from it the number of numeric values/numbers.
It displays the number of cells that contain only text.
`COUNTA()` counts the number of non-blank cells.

39 It counts the number of times the text **Winner** …
… is stored in the cells between F16 and F26.

40 It counts the number of times the text **Winner** …
… is stored in the named range **Result** …
… which has already been defined by the user.

41 **a** It counts the number of times the contents of cell D3 …
… is stored in the named range **Result** …
… which has already been defined by the user.

b `$D$3` is an absolute cell reference.
This cell reference will not change when the cell is replicated/copied.
If a relative cell reference like D3 was used the reference would change when it was replicated/copied.

42 `=COUNTIF($A$2:$A$20,C2)`

43 Nested functions involve placing one (or more) functions inside another function.

44 The `IF` function checks a given logical condition.
It performs an operation if the condition is met.
Or performs a different operation if the condition is not met.
The operations could be to place a value or label in the cell …
… it could place a reference to another cell …
… or it could involve a more complex calculation.

45 **a** Both functions trap errors …
… in other formulae or functions performed in the cell.
`ISERROR` always returns a value of True or False.
`IFERROR` gives the result if there is no error.
`IFERROR` combines the `IF` function and `ISERROR` function.

b **i** any suitable example e.g.
`=A4/A5`
The error will occur when A5 contains 0.
It will show as a division by zero error.

ii `=IF(ISERROR(A4/A5)=TRUE,0,A4/A5)`

iii `=IFERROR(A4/A5,0)`

46 One from:
`=IF(D7<3,"Low",IF(D7>7,"High","Medium"))`
`=IF(D7<3,"Low",IF(D7<=7,"Medium","High"))`
`=IF(D7>7,"High",IF(D7>2,"Medium","Low"))`
`=IF(D7>7,"High",IF(D7<3,"Low","Medium"))`

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47 `=IFS(D7<3,"Low",(AND(D7>2,D7<8),"Medium", D7>7,"High"))`

48 **a** `=(COUNTIF($B$3:$M$14,"Draw")-COUNTIF($B$3:$M$14,"Abandoned"))/2`

b
Week 1 `=COUNTIFS(B3:B14,"<>Abandoned",C3:C14,"Draw")/2`
Week 2 `=COUNTIFS(D3:D14,"<>Abandoned",E3:E14,"Draw")/2`
Week 3 `=COUNTIFS(F3:F14,"<>Abandoned",G3:G14,"Draw")/2`
Week 4 `=COUNTIFS(H3:H14,"<>Abandoned",I3:I14,"Draw")/2`
Week 5 `=COUNTIFS(J3:J14,"<>Abandoned",K3:K14,"Draw")/2`
Week 6 `=COUNTIFS(L3:L14,"<>Abandoned",M3:M14,"Draw")/2`

c

15		
16	**Number of drawn games**	2
17		
18	**Drawn games**	

d

	L	M
16	**Average winning score for game 6**	

e

	A	B
16	**Number of drawn games**	=(COUNTIF($B$3:$M$14,"Draw")-COUNTIF($B$3:$M$14,"Abandoned"))/2
17		
18	**Drawn games**	
19	**Game 1**	=COUNTIFS(B3:B14,"<>Abandoned",C3:C14,"Draw")/2
20	**Game 2**	=COUNTIFS(D3:D14,"<>Abandoned",E3:E14,"Draw")/2
21	**Game 3**	=COUNTIFS(F3:F14,"<>Abandoned",G3:G14,"Draw")/2
22	**Game 4**	=COUNTIFS(H3:H14,"<>Abandoned",I3:I14,"Draw")/2
23	**Game 5**	=COUNTIFS(J3:J14,"<>Abandoned",K3:K14,"Draw")/2
24	**Game 6**	=COUNTIFS(L3:L14,"<>Abandoned",M3:M14,"Draw")/2

49 Looks through the contents of cells F3 to F23 …
… to see which are equal to the content of cell A3 (which is the text **AF**).
It then adds up the contents of the corresponding cells G3 to G23.

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50 **a** `=SUMIF(B3:M3,">200")`

b `=AVERAGEIF(M3:M14,"Win",L3:L14)`

c

	O
1	
2	**Score greater than 200**
3	=SUMIF(B3:M3,">200")
4	=SUMIF(B4:M4,">200")
5	=SUMIF(B5:M5,">200")
6	=SUMIF(B6:M6,">200")
7	=SUMIF(B7:M7,">200")
8	=SUMIF(B8:M8,">200")
9	=SUMIF(B9:M9,">200")
10	=SUMIF(B10:M10,">200")
11	=SUMIF(B11:M11,">200")
12	=SUMIF(B12:M12,">200")
13	=SUMIF(B13:M13,">200")
14	=SUMIF(B14:M14,">200")

	L	M
16	**Average winning score for game 6**	
17	=AVERAGEIF(M3:M14,"Win",L3:L14)	

51 Mean: the average found by adding each number and dividing the total by the number of numbers. In *Excel* it is calculated using the `AVERAGE` function.
Median: The `MEDIAN` function is used to find the middle value when all data items are listed in ascending order.
Mode: The `MODE` function is used to find the piece of data that occurs most frequently.

52 **a** It does not work because if C1 contains any number less than 3 it does not display **Grade D** because it has already displayed **Grade C** when the first condition `IF(C1<5` … was met.

b Either:

```
=IF(C1<3,"Grade D",IF(C1<6,"Grade C",IF(C1<9,"Grade B","Grade A")))
```

Or:

```
=IF(C1>8,"Grade A",IF(C1>5,"Grade B",IF(C1>2,"Grade C","Grade D")))
```

53 `HLOOKUP` performs a horizontal look up of data …
… where the data in the lookup array is held in rows.
`VLOOKUP` performs a vertical look up of data …
… where the data in the lookup array is stored is held in columns.
`XLOOKUP` can perform either horizontal or vertical lookups …
… where the data in the lookup array can be stored in either rows or columns.
The reference data can be stored in rows/columns before the lookup value/it allows backward referencing within an array.

54 Four from:
- Performs a vertical lookup.
- To compare and match the contents of cell X4 …
- … with the first cell it finds in the range F3 to H16/left column of the range.
- When a match is made it returns the value held in the same row in the third column of the range, that is, H3 to H16.
- It will only accept an exact match (because the ,0 is false).

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55 Four from:
- This parameter determines the type of lookup performed.
- The value of 0 is the same as 'false' …
- … this forces an exact match between the cell and the values in the array/range.
- The value of 1 is the same as 'true' …
- … this forces an approximate match between the cell and the values in the array/range.
- If the data in the array/range is not sorted using a value of 1 can give errors.

56 Six from:
- Performs a vertical lookup with backwards referencing.
- To compare and match the contents of cell X4 …
- … with the cells in the range F2 to F16.
- When a match is made it returns the value held in the same row in the range D2 to D16.
- If no match is made it displays the text **Data corrupt**.
- It will only accept an exact match (because the ,0 is false in the 5th element).
- It will perform a search starting at the first item (because the option 1 is selected).

57 **a** `=XLOOKUP(B1,E5:E15,B5:B15,"Wrong contract ID",0)`

58 `INDEX`: The `INDEX` function returns values from a given location in a table, where the user specifies the row and column position of the item in the table.
`MATCH`: The `MATCH` function searches for a specified item in a range of cells and returns the relative position of that item in the range.

59 **a** `=INDEX(C6:C161,MATCH(C2,D6:D161,0),3)`
Or:
`=INDEX(A6:D161,MATCH(C2,D6:D161,0),3)`
b Phailin Suramongkol
c Tasanee Wattana

60 The `CONCATENATE` function joins …
… string items together …
… and displays the result as text.

61 **a** `=MID(B1,8,8)`
b `=RIGHT(B1,6)`
c `=MID(B1,17,6)`
d `=LEFT(B1,6)`
e `=MID(B1,1,6)`
f `=LEN(B1)`

62 **a** `=CONCATENATE(B3,": ",B1," ",B2)`
b `=B3 & ": " & B1 & " " & B2` or `=B3&": "&B1&" "&B2`

63 Three functions can be in any order:
`ISTEXT(X5)`
Checks if the cell contains text …
… including special characters
and returns True or False.
`ISNUMBER(X5)`
Checks if the cell contains numeric data.
`ISNONTEXT(X5)`
Checks if the cell holds no contents/is blank.

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64 **a** `=UPPER(X5)`
b `=LOWER(X5)`

65 Compares two text strings …
… to check that they are identical including their case.

66 This finds the ASCII code …
… for the first character only …
… of the string in cell X5/of **Hello**.

67 This finds the character/letter …
… with the ASCII code (number) …
… held in cell Y5/of 65.

68 The `DEC2HEX` function converts a decimal (base 10) number …
… into its hexadecimal (base 16) equivalent.

69 The `HEX2BIN` function converts a hexadecimal (base 16) number …
… into its binary (base 2) equivalent.

70 This is used to return a number between 1 and 7 from …
… a given date/ the contents of cell T5.
If the day is a Sunday, 1 is returned, Monday is 2 and so on.
Cell T5 must contain a date in order for this function to work.

71 **a** This calculates the difference between two dates …
… held in cells A1 and B1 …
… and returns this difference as the number of days.
b Two from (in any order):
i Change made: changed to **M**.
Displayed: the difference returned as the number of complete months.
ii Change made: changed to **Y**.
Displayed: the difference returned as the number of complete years.
iii Change made: changed to **MD**.
Displayed: the difference returned as the number of days ignoring the number of months and years.
iv Change made: changed to **YM**.
Displayed: the difference returned as the number of months ignoring the number of days and years.

72 The `HOUR` function is used to return the number of hours …
… between 0 and 23/using the 24-hour clock …
… from a given time.

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73 The MINUTE function is used to return the number of minutes …
… between 0 and 59 from a given time.

74 The SECOND function is used to return the number of seconds …
… between 0 and 59 from a given time.

75 Data validation

76 **a** Currency format in dollars with 2 decimal places
b Percentage format

77 **a** 01 09 25
b 01 Sep 2025
c 01 September 2025

78 **a** Cells merged between A1 and E1
Text size enlarged
Background colour applied
Text wrap applied
b Text orientation set to vertical/rotated 90 degrees
Text emboldened
Background colour applied
c Text emboldened
Text centre aligned
d Text right aligned

79 **a** The number held in the cell does not change.
The way this number is displayed does change.
b **i** 97
ii 96.6
iii 96.62
iv 96.625

80 Three from:
– Changes the display format/font style/background colour …
– within a cell/range of cells …
– … automatically …
– depending upon the contents of the cell/or formula applied.

8.2 Test a spreadsheet

81 Four from:
– data entry/data to be entered/data selected
– data type
– expected result
– actual result
– remedial action.

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82 Three from:
- normal data
- abnormal data
- extreme data.

83

Entered before test:	Entered after the test:
Data entry/data to be entered/data selected	Actual result
Data type	Remedial action
Expected result	

8.3 Use a spreadsheet

84
a equal to/like
b not equal to
c greater than
d less than
e greater than or equal to
f less than or equal to

85 Select the data to be searched.
Select **Filter**.
Select **Custom Filter**.
Type the filter criteria including …
? to represent a single character
* to represent any series of characters.

86 **a** **i** This data is not sorted into any order.
ii This data is sorted into ascending order
… of First name.
iii This data is sorted into ascending order
… of Surname.
iv This data is sorted into descending order
… of Tutor group …
… then into descending order …
… of Surname.
b Text wrap

87 Highlight all related data before performing the sort.
Make sure that data highlighted to be sorted does not include hidden rows.

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88 **a** Data integrity has been lost …
… surnames do not match the first name/tutor group for each person.
b If all cells A2 to C7 had been selected …
… before the sort …
… the data integrity would be maintained.

89 A pivot table is a 2-dimensional table …
… that can analyse data
… that can summarise data.
It is used to see patterns and trends in data.

90 **a** The data header row …
… has been included in the sorted data.
b If all cells A2 to C7 had been selected …
… before the sort …
… the data integrity would be maintained.
Or:
The check box for **My data has headers** …
… must be ticked …
… before the data was sorted.

91 **a** Select **File** …
… **Export** …
… then with the Create PDF/XPS Document box selected …
… click on **Create PDF/XPS** …
… select the location to save the file …
… click on the **Publish** button.
b In the PDF data can be highlighted/selected/copied …
… but data cannot be changed …
… results are shown but formulae are not shown/formulae are lost when PDF created.

8.4 Automate operations with a spreadsheet

92 It is used to save time/reduce errors …
… when operations are used repeatedly in a spreadsheet.
It is quicker to record a macro …
… and assign it a button/keystrokes to activate it …
… than repeatedly performing the same set of operations/actions.

8.5 Graphs and charts

93 **a** Pie chart
Use: To compare parts of a whole/percentage values.
Example: Percentage of males and females in a class.
b Bar chart
Use: To show the difference between different items.
Example: To show the number of hours of sunshine for each day of a week.
c Line graph
Use: To plot trends between two variables.
Example: Plotting distance travelled against time taken.
Please note, other appropriate examples can be used to demonstrate these answers.

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94 **a** G
b B, F
c A, C, D
d A, C, D
e A, C, D
f E
g B,F,A,C,D
Please note for question g: with data like this and only 3 different data items, either a bar chart or pie chart would be suitable.

95 **a** Line graph
b Bar chart
c Pie chart
d Pie chart

96 **a** Line graph
b It is a line graph because the time intervals along are all the same/20 seconds …
… by using a line graph it will allow you to accurately evaluate the volume of water at other times (like after 17 seconds).
c Time in seconds would be plotted on the *x*-axis.
Volume of water would be plotted on the *y*-axis.

97 **a** G15:H15 or H15:I15 or G15:I15
b G15 and I15

98 CTRL key

99 If graph is a comparative bar/line/combo chart …
… there are two data series which hold different types of data.
The value axis only shows one of these values.
So, secondary axis is required to allow comparisons to be easily seen/understood.

100 Maximum axis value
Minimum axis value
Axis Unit value (may be called Major Unit or Minor Unit).

101 Click the left mouse button to select ONLY the sector for Programmer
Hold the left mouse button down and drag this sector …
… down and to the left.

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9 Modelling

9.3 Using what-if analysis

1 Goal Seek is used to place a value in a cell …
… rather than the user guessing a value/trial and error/process of iteration …
… that will give a specific result in another cell …
… where one cell is dependent on one or more other cells …
… through a formula/formulae.

2 Place the cursor in cell D94.
Use the **Data** tab and locate the **Forecast** group.
From the **What-if Analysis** icon …
… use the drop-down menu to select **Goal Seek**.
Enter in the **To value:** box of the **Goal Seek window**, the value **250**.
Enter in the **By changing cell:** box the cell reference A3 …
… then click the OK button.

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10 Databases and file concepts

10.1 Database basics

10.1.1 Database types

1 A database is an organised collection of data.

A database program is software.
It stores the data and the links between the data items.
It stores data using files, records and fields.

2 **a** A database **file** holds all the data stored in a database …
… in the case of a flat-file database it may hold a single table, …
… or for a relational database all the data from a number of tables.
In some databases (which are DBMS) like Microsoft *Access*, …
… it also holds other information …
… for example: on how to manage the data in a database, …
… for example: pre-defined searches etc.

b A **field** holds a single piece of information or data from one record.

c A **record** contains a row of data in a database table.
It can contain many different fields/single data items.

d A **flat-file database** stores its data in one **table**, …
… which are organised by rows and columns.

e A **relational database** stores the data in more than table …
… with each table linked to one or more other tables … using keys …
… with common data sets.
The same data is not stored many times.

f A table contains data elements set in a 2-dimensional format …
… usually with each row containing the records …
… and columns containing the fields.

g A **primary key** is a field …
… that contains unique data
… that cannot contain a blank record
… and may be used to enforce referential integrity in a relational database.

h A **foreign key** is a field …
… in a relational database …
… which is linked by a relationship …
… to a primary key field in another table.

3 To reduce the amount of duplicate data that is stored …
… which reduces the amount of internal memory and external storage space required
… to reduce the potential for errors when data is added/deleted/amended
… to enable very large databases to be created/used
… to increase the speed of searching in large databases.

4 **a** Field name

b Record

c Field

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10.1.2 Data types

5 **a** **i** Alphanumeric
ii Boolean
b **i** Name : Integer
Description: Whole numbers stored in this data type.
May be stored as Integer or Long Integer fields in some databases.
ii Name : Decimal/Real
Description: Decimal sub-types contain integer and/or decimal numbers.
Can hold a large number of decimal places.
iii Name : Currency
Description: The values are stored as a decimal/real number …
… but the database will display formatting …
… in a specified currency …
… with a specified number of decimal places.
The currency symbols are not stored …
… for every data item to save storage space.
iv Name : Date and Time
Description: This sub-type stores either the date, time or both as a numeric value …
… but the database will display formatting …
… in a date/time format.

6 Data types cannot be defined.
Relationships cannot be established between tables/sheets.

10.1.3 Relationship types

7 **a** Name: One-to-one relationship
Description: Each record in one table relates to only one record in another table.
The linked fields in both tables must contain the same values …
… and contain unique values.
b Name: One-to-many relationship
Description: Each record in one table can relate to many records in another table.
The primary key field in a table …
… that contains unique values …
… is linked to a foreign key field in another table.
c Name: Many-to-many relationship
Description: A theoretical type of relationship, created by using a link table.
A primary key field in the first table …
… is linked to a foreign key field in the link table.
A primary key field in the second table …
… is linked to a foreign key field in the link table.
The link table contains …
… an ID field …
… and two fields that match the field names, as foreign keys …
… and data types of the two primary key fields.

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10.1.4 Key fields

8 **a** A **primary key** field holds unique data/contains no duplicate data.
It is the field used to identify a record within the table.
It is used as part of the link/relationship between two tables.
Primary key fields are often set as indexes as they contain unique data.

b A **foreign key** in one table …
… holds the same data as a primary key field in another table …
… and is used to link the two tables together.
A table can hold more than one foreign key.

c A **compound key** field is created where no single field holds unique data.
It is created using a number of foreign key fields …
… which when the data is combined together …
… creates a unique value.
In *Access* no data in any of these foreign key fields can be blank.

9 Foreign key

10.1.5 Entity relationship diagrams

10 **a** Name: Entities
Description: The objects or items to be used …
… often the tables to be used.

b Name: Attributes
Description: The facts about …
… or properties of an entity …
… often the fields to be used.

c Name: Relationships
Description: The links between the entities.

11 **a** Entity A has a one-to-one relationship with entity B.

b Entity C has a one-to-many relationship with entity D.

c Entity E has a many-to-many relationship with entity G.
This is created by a one-to-many relationship between entity E and a link table/entity F …
… and a one-to-many relationship between entity G and the link table/entity F.

12 All three designs contain entities, attributes and relationships.
All three design types use information gathered from the requirements of a business.
Relationships are not drawn from attribute to attribute in any of the ERD designs.
The conceptual design is used to create a database design/model which is not dependent upon the choice of DBMS.
Relationships do not have precise definitions and often use '**a kind of**' definition.
The logical design is used to create a database design/model where the DBMS has already been selected.
The logical design is more complex than a conceptual design …
… in that it contains a map of rules that will be followed.
Column types may be set to help the business analysis.
Conceptual design and logical design are not about database creation. A logical design is often created and developed to become a **physical design**.
The physical design is designing the actual database …
… based on the requirements gathered during logical database modelling …

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… so that it can be implemented within the DBMS.
The physical design contains more detail than the other types of ERD …
… for example: column types from logical designs become data types …
… field lengths are also included in the design.
The physical design includes primary and foreign key fields.

13 **a** Physical design
b Conceptual design
c Logical design

10.2 Designing the database structure

14 Three from:
- Short
- Meaningful
- Contain no spaces
- Contain no special characters except underscore

15 Table name

16 Field name

17 Data types …
… are selected and added.

18 Field lengths …
… and key fields …
… are selected and added.

10.3 Creating the database structure

19 Open *Access* and create a new database.
Create each table using the entity name as the table name.
Within each table create each field name using the attribute name.
For each alphanumeric field, set the field length that is specified in the attribute.
Create primary key fields where the attribute shows **PK**.
Set these primary key fields as indexed fields …
… with no duplicate data allowed.
Open the relationship diagram.
Create relationships from each primary key fields …
… to the field in other table showing **FK** …
… where there is a relationship line between the entities …
… and the data is the same.
Check that the relationship type created matches the relationship type show in the entity relationship diagram.

20 Referential integrity forces table relationships to be consistent.
This means that the data in the foreign key field …
… must match the data …
… in the primary key field.
It prevents a user from accidentally changing …
… or deleting data in one table …
… without the same action happening to the related data in another table.

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21 Four from:
- Open the data table in Design View
- Select the required field
- In the General tab
- Select Format
- Use the drop-down list to select On/Off

22 Method: Visual verification/checking
Description: Manually compare data from original document to that entered into the database.
Method: Double entry
Description: Data is keyed in twice and computer compares both sets of data entry flagging differences to the user.

10.5 Querying the database

23
a Simple query
b Find duplicates query
c Simple query
d Crosstab query
e Simple query

24
a =
b >
c <
d >=
e <=
f <>

25 `>=0.2 AND <=0.4`

26 `"Blue" OR "Black" OR "White"`

27 `NOT "Blue"`

28 `LIKE "*wood*"`

29 `>#23/01/2023# AND <#17/03/2024#`
Or
`BETWEEN #24/01/2023# AND #16/03/2024#`

30 `BETWEEN #08:00:00# AND #17:00:00#`

31 `IS NULL`

32 Both static and dynamic parameter queries are queries that require criteria/parameters to operate.
In a static parameter query the criteria/parameters are pre-defined/saved within the query.
This means that the parameter that the query uses has been set as a fixed value within the query.
The criteria/parameters can only be changed by re-creating the query …
… or editing its structure.
In a dynamic parameter query the criteria/parameters are entered …
… by the user …
… as the query run/executed.

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This can save time rather than creating a new query each time and changing the value/s within the query.
The criteria/parameters entered can be a value or formula.

33 This is a dynamic parameter query …
… with two parameters/variables.
Two values are entered by the user …
… the lower discount rate …
… and the higher discount rate.
The query compares the value held in the **Discount** field, …
… for each record in this database.
The record is displayed/stored in the query results if …
It is greater than or equal to the lower discount rate …
… AND …
… it is less than or equal to the higher discount rate.

34 This is a dynamic parameter query …
… with two parameters/variables.
Two values are entered by the user …
… the start date …
… and end date.
The query compares the value held in the **Order_Date** field, …
… for each record in this database.
The record is displayed/stored in the query results if …
It is after/greater than the start date …
… AND …
… it is before/less than the end date.

35 The term nested query means running one or more queries …
… based upon the results of a previous query.
This is often required when data is selected in a query and then used for a different type of query …
… for example: producing a query to summarise data …
… based upon the results from a simple/complex query.

36 This query contains a field named **Total** …
… that is calculated at run-time.
It subtracts the data in the **Discount** field …
… for each record …
… from the data in the **Sales_Price** field.
The resulting data is not stored in the database …
… but is recalculated each time the query is run/executed.

37 This query contains a field named **Duration** …
… that is calculated at run-time.
This calculates the number of days …
… between the date held in the **End_Date** field …
… and the date held in the **Start_Date** field.
The resulting data is not stored in the database …
… but is recalculated each time the query is run/executed.

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38 Type: `IIf(Left([Code],2)="TR","Tree",IIf(Left([Code],2)="SH","Shrub","Code Error"))`

39 This query contains a field named **Price_per_sq_m** …
… that is calculated at run-time.
This calculates the **Price** …
… divided by …
… the product of the data held in the …
… **Length** and **Width** fields.
The resulting data is not stored in the database …
… but is recalculated each time the query is run/executed.

40 Ensure that the table containing duplicate data is closed.
Select the **Create** tab …
… then the **Query wizard** icon and OK.
Select the **Find Duplicates Query Wizard** …
… then the table containing the duplicate values then click Next >.
Move all 4 fields …
… apart from the primary key field – as this can't have duplicate values …
… from the **Available fields:** box into the **Duplicate-value fields:** box, then click Finish.
Delete one copy of each record.
Re-run this query to make sure that the table contains no duplicate data.

41 **a** It is calculated in a report.
It is often to calculate the sum, average, maximum or minimum values of the selected data …
… or to count the number of items selected within the report.

b A calculated field is calculated in a query and a calculated control is calculated in a report.
The calculated control can calculate for each record …
… or to produce summary data for a number of records …
… whereas a calculated field calculates for each record.

42 Four from:
- SUM
- COUNT
- MAXIMUM
- MINIMUM
- AVERAGE

10.6 Sorting and grouping data

43 Data can be sorted …
… into ascending or descending order …
… on all the selected data within a report …
… but all selected data items for each record are displayed unless data is grouped.
Data can be sorted within each group within a report.
Grouped data takes all the similar data (within a group) …
… and displays the similar data only once …
… with all other data within this group …
… displayed on individual lines (usually) below it.
Grouped data can have sub-groups/different levels of grouping.

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10.7 Creating a data entry form

44 Four from:
A form allows a user to enter/amend data in a database.
A form can make data more accessible because:
- It can be created/tailored for different users.
- It can display questions in full rather than just shortened fieldnames.
- It can include instructions on how to add the data.
- It can be used to create a menu/switchboard.

45 Closed questions.

46 **b** Option group with radio (option) buttons
c List box (drop down list) with limit to list
e Tick Box (Check box)

47 Four from:
Navigation buttons allow the user to move to the …
… first record …
… previous record …
… next record …
… last record …
… in the current data set (do not allow table/database as form may be built on a query).

48 Four from:
- Similar fields grouped but not crowded together/should not look overcrowded.
- White space between each data entry box.
- Title stating what data will be entered.
- Instructions on how to fill in the form.
- Worded questions (not just field names).
- Each field has appropriate space for the data that will be added.
- The form should be filled without large areas of white space.
- Option groups/radio buttons/list boxes/tick boxes should be used where possible.
- Navigation buttons are present.

49 A list box will restrict data entry …
… to only items from a given list.
… to only items from a stored list.
A combo box will allow users to select data …
… from a given list …
… from a stored list …
… or to enter their own data.

50 A sub-form is a form within a form.
It is used when you want to display data from multiple tables …
… where there is a one-to-many relationship between these tables.
For example, you use a sub-form if you want to create an invoice …
… stored in an invoice table …
… with the customer details …
… stored in a customer table, as a sub-form …
… with the product details …
… stored in a product table, as a sub-form.

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10.8 Designing a switchboard

51 A switchboard appears when the database is opened.
It allows users with little database experience to use the database with ease.
It makes it easier for the user to add, edit or search for data.
The switchboard will often include a title …
… instructions for the user …
… a company logo/other relevant images …
… a number of navigation buttons to open forms and reports.
It should be easy to read with well-spaced-out buttons …
… no large areas of white space …
… like items grouped together.

52 **d** Form

10.10 Normalising data

53 Four from:
- Normalisation is a technique used to reduce the duplication of data …
  … in a relational database.
- It helps to organise data in an efficient way.
- It helps to remove redundant (duplicated) data.
- It helps to make sure that only related data is stored in a table.

54 ONF is an un-normalised database.
It is usually a flat-file database/single table.
It usually contains duplicated/redundant data.
It usually contains complex data structures within a field/non-atomic data.

55 Five from:
- all data is stored in a database table
- a unique key must exist in each table …
- … often a primary or compound key
- only atomic data is stored
- each field has a unique name
- each record is unique
- there are no repeating groups of columns.

56 To remove to a new table …
… any non-key attributes that are more dependent on other non-key attributes …
… than on the tables key field/s

10.11 Creating a data dictionary

57 Eight from:
- table names
- field names
- data types and sub-types where appropriate
- field size for alphanumeric fields
- the primary key and foreign key fields
- input masks
- validation rules
- default field values
- description of data.

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58 Two from:
- data types
- field size for alphanumeric fields
- default field values.

10.12 File and data management

59 Proprietary file formats belonging to a company, organisation or individual …
… and are often specific to a program created by that company.
The exact details of the data stored, the encoding and its structure within the file are often kept secret …
… and/or patented by the company or organisation who created the software.
Generic file formats allow you to save files so that they can be opened on any platform.
The files may not contain all the formatting that can be saved in a package specific format.
It is not always possible to open proprietary file formats on other platforms.

60 comma separated values/.csv
text/.txt
rich text format/.rtf

61 Three from:
- graphics interchange format/gif
- joint photographic expert group/jpg/jpeg
- portable document format/.pdf
- portable network graphics:/.png
- moving pictures experts group layer 4/.mp4

62 moving pictures experts group layer 3/.mp3

63 cascading style sheet/.css
hypertext markup language/.htm/.html
These files have a .htm (or sometimes a .html) file extension. This is a text-based language used to create markup that a web browser will be able to display information a web page.

64 Common generic compressed files include:
- roshal archive/.rar
- zip/.zip

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11 Sound and video editing

11.1 Video editing

1 16:9
4:3

2 Trim removes parts of a video that are unwanted …
… by shortening the length of the video clip.

3 The people watching the video may have a hearing impairment …
… so, subtitles help them understand what is being said.
The video may be displayed in a public place …
… where there is lots of background noise making it difficult to hear.
The video may be displayed in a quiet public place …
… such as a doctor's waiting room, where if they switched on the audio …
… it could be disruptive/annoying other people.
The viewers might not speak the same language as the people in the video …
… so, subtitles in different languages could be provided.
People tend to be more engaged with a video if the subtitles reinforce what the video is saying.

4 Splice joins two pieces of video together.
It is a term used for physically cutting and joining traditional film footage stored on a reel …
… that is now used for just appending one digital video clip to another.

5 A caption is text displayed within a video clip …
… that is used to describe/give further information …
… that may be required/useful to the audience …
… and cannot be clearly understood from the clip alone.

6 Have different styles of text …
… for the subtitles and captions …
… by changing the font style/size/colour/enhancements …
… of the subtitle text so that it is clear that it is different from the caption text.
Position the caption text and subtitle text in different areas of the display.

7 For feature length productions there are usually both opening and closing credits.
Opening credits are shown at the beginning …
… and closing credits at the end of the video.
For short videos all credits are usually placed at the end of the video.
Their purpose is to inform viewers who was involved in the production of the video …
… for example: filming, editing, sound, etc. …
… and usually include production details like filming location, date, etc.

8 To indicate that a period of time has passed between two scenes in a video …
… by fading out the first scene and fading in to the next scene.
It can be used to ease the audience's emotions after a troubling scene.
Fading effects in can be created using transitions …
… which are used to link two parts of a video together with a smooth change …
… rather than one frame moving to a different frame …
… with a jerky effect as the video plays.

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9 To make the focal point of the image …
… slowly zoom in on a new focal point …
… or pan across an image …
… or a combination of both.

10 A codec is short for coder/decoder …
… it is a program …
… which knows how to handle video …
… when stored in a particular format …
… often for data transmission.
It is used to encode the video …
… within the container.
The same codec must be used to decode the video.
If the codec is not present in the software …
… the video will not play.

11 Apply a filter to the video …
… using the sepia filter.

12 Lossless compression means that the compressed file can be returned back to the original quality when uncompressed again.
Lossy compression means that the the quality of the original file cannot be recovered once it has been compressed. Lossy compression results in a significantly reduced file size.

11.2 Audio editing

13 **a** DC offset is when an audio track has an offset waveform/the waveform is not centred along the 0 line.
This can happen when a file is converted from analogue to digital values using a faulty audio device.
DC offset can cause clicks, distortion and loss of audio volume.

b Select the **Effect** tab …
… then from the drop-down menu select **Normalize** …
Tick the **Remove DC offset** box, then click the Next > button.
This changes the waveforms of both left and right audio channels …
… which also has the effect of amplifying both channels.

14 Fade out may be used because a sound clip does not contain an obvious ending/is longer than a video clip.
The beginning/end of an audio clip may not be smooth so a fade-in/fade-out is necessary.
There may need to be a clear section of silence before the audio starts.
A fade-in may be needed if it is necessary to soften the sound of the drum and/or percussion instruments.

15 Select the clip, then from the **Tracks** tab …
… select the drop-down menu …
… select **Mix** …
… select from the sub-menu **Mix Stereo Down to Mono**.

16 Amplify/Amplification

17 If the clips contain music and both clips are in different keys (e.g., C and F) …
… it may be necessary to change the key of one clip to match the other.

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18 Noise reduction helps to reduce background sounds …
… that are constantly present …
… for example: hiss, hum, buzzing or fan noise.
It cannot remove irregular background noise …
… for example: clicks, traffic noise, noise from an audience.

19 Reverb is an effect whereby the sound produced by a musical instrument or amplifier is made to echo slightly (reverberate).
The effect sounds like an echo that you would get when speaking or playing an instrument in a cavern or an empty room.
By altering the 'size' of the cavern or room the amount of echo changes.
Reverb can be used to give extra 'depth' to a voice.

20 A high-pass filter allows high frequencies to pass through while filtering or cutting low frequencies.
A physical high-pass filter (device) was originally connected to smaller speakers (tweeters) to remove the bass elements being sent to these speakers.
High-pass filters are also included as optional settings in some top-end microphones when they are used for recording in offices or warehouses.
High-pass filters can filter out the low frequency noises from devices like fans or air conditioning units.
A low-pass filter allows low frequencies to pass through while filtering or cutting high frequencies.

21 Echo copies the same sound …
… and replays it after a given delay time
… usually with fewer decibels than the original sound.
The process of losing decibels each time the sound is repeated is called decay.

22 hertz
kilohertz

23 The frequency for each sample is stored in a number of bits.
This is sometimes called bit depth.
Each additional bit doubles the number of values that can be stored.
Data is compressed when the audio is exported.

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