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Contents

About the ICT sample teaching units for Key Stage 3

This unit is one of a series that illustrates how yearly objectives from the *Framework for teaching ICT capability: Years 7, 8 and 9* can be grouped together and taught.

There is no requirement to use the units. They contain sample lesson plans that you can, if you wish, amend to suit your local circumstances and the needs of your pupils. For example, it may be appropriate to change the exemplar contexts, to use different activities to teach objectives or to teach the unit to a different year group. Word versions of the lesson plans will be published on the Key Stage 3 website at www.standards.dfes.gov.uk/keystage3 so that you can download them and modify the plans.

The units contain plans for lessons of 60 minutes. Each activity in the lessons has a guide time. The guide times will help you to fit the activities into the time available in schools where the lesson length is different. For example, the activities in one lesson could be taught over two lessons, or a skills-based lesson, to teach particular aspects of more complex software, could be inserted at an appropriate point. In both cases, the structure of lessons could be maintained, with the insertion of some extra starter and plenary activities.

The *Framework for teaching ICT capability: Years 7, 8 and 9* recommends that schools offer one hour each week, or 38 hours per year, for the discrete teaching of ICT lessons. The teaching units for a year, if taught without amendment, would require less teaching time than 38 hours. This leaves time for lessons of your own design at appropriate points. So, for example, objectives could be revisited to consolidate learning or to provide opportunities for assessment.

The lesson plans are intentionally very detailed to give busy teachers a full picture of how each lesson might be taught. Teachers' own plans would probably be much less detailed.

Apart from sample teaching unit 7.1, which should be used before any of the others, the order in which the units are taught is not important.

About this sample teaching unit
Unit 7.4 is the first unit in Year 7 which teaches pupils to use spreadsheets as a modelling tool. It gives pupils the opportunity to review the learning from Key Stage 2 as well as introducing them to the Framework objectives for Year 7.

7.4

Introduction to modelling and presenting numeric data

ICT Framework objectives

DEVELOPING IDEAS AND MAKING THINGS HAPPEN

Models and modelling
- Use software to investigate and amend a simple model by:
  - formatting and labelling data appropriately (e.g. formatting cells to display currency);
  - entering rules or formulae and checking their appropriateness and accurate working;
  - explaining the rules governing a model;
  - predicting the effects of changing variables or rules.

- Test whether a simple model operates satisfactorily.

Timing

This unit is expected to take five lessons of 60 minutes. However, each activity has a guide time, which you can adjust to alter the number and duration of lessons, to suit your own school timetable.

Task

In this unit pupils will use spreadsheets to model simple situations. They will use basic spreadsheet functions to construct, explore and amend simple models and consider how to manipulate graphs and tables in order to present their findings effectively. This unit uses the example of a school disco. Teachers can achieve the same learning objectives with a range of other examples. The lessons are designed for pupils working at Levels 4 and 5 with extension work for pupils working at higher levels. Adaptations and additional material are suggested for less-experienced pupils or for pupils working at lower levels.

Resources

- Computer room (minimum of one PC per two pupils)

- Access to a shared area on the network

- Large computer screen display for teacher demonstrations and pupil presentations

- Spreadsheet software

- Whiteboard or flipchart and different coloured pens (optional)

- Teacher resources: 7.4T1b, 7.4T1c, 7.4T1d, 7.4T1e, 7.4T2c, 7.4T3g, 7.4T5a, 7.4T5b, 7.4T5c, 7.4T5d, 7.4T5e

- Pupil resources: 7.4P1a, 7.4P1f, 7.4P1g, 7.4P2a, 7.4P2b, 7.4P2d, 7.4P3a, 7.4P3b, 7.4P3c, 7.4P3d, 7.4P3e, 7.4P3f, 7.4P3h, 7.3P3i, 7.3P3j, 7.4P4a, 7.4P4b, 7.4P4c, 7.4P5d, 7.4P5f, 7.4P5g, 7.4P5h, 7.4P5i

Prior learning

Pupils should already know how to:

- log on to the network;

- load and save work in a shared area, using the file name conventions of the school;

- enter and amend data in a spreadsheet;

- use letter symbols to represent unknown numbers and variables and use simple formulae;

- describe some of the elements of a spreadsheet (e.g. cells, labels, data and formulae);

- use ICT to create a simple graph or chart.

Subject knowledge needed by teachers

To teach this unit, teachers will need to know how to:

- load and save work in a shared area;

- use a large computer screen display effectively;

- enter formulae, numbers and labels into a spreadsheet;

- copy a formula along a row or down a column;

- understand relative and absolute cell references;

- sort data within a spreadsheet;

- format spreadsheets in terms of data types and appearance;

- use a spreadsheet to produce graphs;

- set print areas within spreadsheets;

- cut and paste from a spreadsheet into other applications.

Lesson outlines

LESSON 1
Using a spreadsheet
1   Starter: Problem-solving using a table and paper-based resource
2   Using a formula in a spreadsheet
3   Creating a times table square
4   Setting up a simple spreadsheet
5   Using formulae to enter information into a spreadsheet
6   Plenary: Advantages and disadvantages of using a spreadsheet
    Homework: Recording key advantages and disadvantages of spreadsheets

LESSON 2
Modelling using a spreadsheet
1 Starter: Problem-solving using a simple spreadsheet
2 The idea of a model
3 Using a model to find information
4 Interrogating a model to answer questions
5 Using and interrogating a different model
6 Plenary: Advantages of using a model
   Homework: Identifying rules and variables

LESSON 3
Using a spreadsheet to build a model
1 Starter: Identifying rules and variables
2 Using a model to make predictions
3 Developing the model
4 Increasing the function of the model
5 Plenary: Reviewing the model
   Homework: Limitations of using a model

LESSON 4
Refining and developing a model
1 Starter: Ways of increasing income from an event
2 Adding a variable to the model
3 Adding a further variable to the model
4 Plenary: Weakness of the model
   Homework: Improving the model

LESSON 5
Ways of presenting data from a spreadsheet
1 Starter: Presenting information for audience and purpose
2 Using tables and graphs to present information
3 Inserting tables in a report
4 Creating a report
5 Plenary: Review of the modelling process
   Homework: Evaluating the unit

Using a spreadsheet

ICT Framework objectives

DEVELOPING IDEAS AND MAKING THINGS HAPPEN

Models and modelling
- Use software to investigate and amend a simple model by:
  - formatting and labelling data appropriately;
  - entering rules and formulae.

Key vocabulary

From Year 6: cell, column, cut, data, drag, formula, graph, label, model, paste

From Year 7: address, cell reference, value, variable

From Year 8: absolute cell reference, relative cell reference

Preparation and planning

- Find out about the achievement of the pupils in your class in mathematics, including the extent to which they can create formulae, their use of spreadsheets in mathematics and their familiarity with graphs and charts of different types.

- Ensure that you are familiar with the spreadsheet software and the pupil and teacher resources you will be using.

- Check that all the equipment is working.

- Ensure that:
  - teacher resources 7.4T1d Table square.xls, 7.4T1e Teachers' football league.xls, and 7.4T1g Presentation.ppt are available electronically;
  - pupil resources 7.4T1d Table square.xls, 7.4P1f Football league table.xls, 7.4P1a zoo activity.doc and 7.4T1b zoo activity.xls are available electronically in the shared area.

- If necessary, prepare guidance for the pupils to support the software being used, either as a handout or available on the school's intranet.

- Create a key vocabulary wall display for the unit which will be added to each week as lessons progress.

- Display the objectives for the lesson, phrased so that all pupils will understand them.

Resources

- Large computer screen display
- Calculators (one per pair)
- Sufficient computers for pupils to work in pairs or in small groups
- Spreadsheet software
- Shared network area, or alternative way to pass spreadsheet data to pupils
- Whiteboard or flipchart
- Resource files:
    - 7.4P1a Zoo activity.doc
    - 7.4T1b Zoo.activity.xls
    - 7.4T1c Presentation.ppt
    - 7.4T1d Table square.xls
    - 7.4T1e Teachers' football league.xls
    - 7.4P1f Football league table.xls
    - 7.4P1g Football league table workings.xls

Lesson outline   60 minutes

1	**Starter: Problem-solving using a table and paper-based resource**	Problem-solving Whole class Paired work	10 minutes
2	**Using a formula in a spreadsheet**	Demonstrating software Whole class	10 minutes
3	**Creating a times table square**	Using software Paired work	10 minutes
4	**Setting up a simple spreadsheet**	Demonstration Whole class	10 minutes
5	**Using formulae to enter information into a spreadsheet**	Using software Paired work	15 minutes
6	**Plenary: Advantages and disadvantages of using a spreadsheet**	Discussion Whole class	5 minutes
	Homework	Individual work	

Activities

1 Starter: Problem-solving using a table and paper-based resource

Explain that pupils are going to learn how to use spreadsheets effectively. Discuss the lesson objectives with the class.

Ask pupils to work in pairs. Distribute resources sheet **7.4P1a Zoo activity.doc**. Check the vocabulary with the pupils. Explain any unfamiliar words, such as 'underspend'. Ask pupils to do the first example on the resource sheet, working out the cost of feeding all of the animals.

Zoo activity

First example

7.4P1a

Animal	Cost per week to feed each animal	Number of animals	Total cost per week for animals
Lion	£ 25	22	
Tiger	£ 30	8	
Zebra	£ 5	9	
Elephant	£ 20	9	
Snake	£ 5	8	
Penguin	£ 5	16	
Sea lion	£ 20	3	
Alligator	£ 5	4	
Eagle	£ 1	5	
		Total/cost	
		Allow	

Seco

Encourage pupils to calculate products such as £25 × 10 and £20 × 3 mentally. They may need calculators when they total the columns.

After 3 to 4 minutes, refer pupils to the second example. Say that there will be twelve more lions and four more penguins. Ask 'How does this affect the totals?'

Discuss the changes they will need to make, and which figures they will need to alter, then let them recalculate and find the new total. Ask what might happen to the number next to the word 'Underspend'.

After 6 to 7 minutes, display **7.4T1b Zoo activity.xls**. Make the appropriate alterations to the relevant cells and highlight how the values in other cells change automatically. Draw attention to the use of * for multiplication.

Animal	Cost per week to feed each animal	Number of animals	Total cost per week for animals
Lion	£25	10	£250
Tiger	£30	8	£240
Zebra	£5	9	£45
Elephant	£20	9	£180
Snake	£5	8	£40
Penguin	£5	12	
Sea lion	£20	3	
Alligator	£5	4	
Eagle	£1	5	
		Total	
		Allowed	
		Underspend	

Ask pupils to identify what is represented by the values in individual cells, if they can, and to say what happens to the numbers in the cells. Draw out responses such as:

- the total cost for penguins has changed;
- the cost for lions has changed;
- the values in E3 and E8 have increased;
- the total, E12 has increased;
- the underspend, E14 has decreased;
- there is less money left.

Ask pupils to identify the benefits of using a spreadsheet for the task on the resource sheet. Draw out responses such as:

- the ease of making changes;
- the spreadsheet does the calculations;
- you can quickly see if you have any money left.

10 minutes	**2 Using a formula in a spreadsheet**

Show **7.4T1c Presentation.ppt** on the large screen display. Point out and identify each of the main parts of a spreadsheet. Open a blank spreadsheet page and use 'alt–tab' to switch between the presentation and the spreadsheet so that you can demonstrate features. Highlight one cell of the spreadsheet and ask, 'What is this?' Explain that each cell has an address or cell reference and ask pupils to give the address of the highlighted cell. Highlight a row and then a column and ask pupils to name each of them correctly.

Show pupils that the spreadsheet has many more rows and columns than they can see on the screen. Ask them to suggest how many there are altogether. (A typical spreadsheet has 65 536 rows and 256 columns, making over 16 million cells altogether.) Explain that we normally use a very small part of a much bigger sheet. Illustrate this by pointing out a small poster or picture on a large wall.

Ask pupils what problems might arise if they forget how big the spreadsheet really is. Draw out points such as:

- not selecting the correct area to print;
- printing out unnecessary cells.

Ask pupils to suggest types of information that may be entered in a spreadsheet, for example, numbers, text, labels and formulae. Use the example on the screen to highlight types of data and other information.

Move the cursor to the bottom right of a cell and point out the small black dot in the corner. Explain that this is the fill handle. Enter a number into each of six consecutive cells in two adjacent columns on the spreadsheet (twelve numbers, two columns of six rows).

Demonstrate how to construct a formula to add two numbers across a row, using '=A4+B4'. Ask pupils to describe what happens to the data in the spreadsheet. Make sure they know that the formula is a rule and that this rule is being applied to the numbers being entered, which are called the variables.

Now demonstrate how to edit the formula and how to subtract and multiply, using − and ∗. Stress that ∗ is used for multiplication in this application. Demonstrate the effect on the address elements of a formula when it is copied and pasted, or dragged by means of the fill handle. Discuss what happens to the cell reference as you copy down. The cell is not copied exactly but relative to the row or column you are moving to. This is called relative cell referencing.

10 minutes	**3 Creating a times table square**

Use **7.4T1d Table square.xls** to demonstrate the effect on numbers, months and days of the week when the cells are dragged by means of the fill handle. Drag down from 'Wednesday' to get days. Drag down from 'Mar' to get months.

Monday	Jan						
Tuesday	Feb	**Table Square**			T1d		
Wednesday	Mar	**X**	2	3	4	5	6
		2	4	6			
		3	6	9			
		4	8	12			
		5	10	15			
		6					

Emphasise the need to select more than one cell when pupils want to produce a sequence of numbers. For example, if they drag from the 6, they will get a row of 6s. The software needs to know at least two numbers to recognise the sequence. Highlight 5 and 6 and, using the fill handle, drag across the row. This produces 7, 8, 9, …. Make sure that 7.4T1c Presentation.ppt is available on the shared area for pupils to use as support material. Demonstrate how pupils can copy the file 7.4T1d Table square.xls into their work area from the shared area. Tell pupils they are going to create a times-table square. Tell them that the table square should go up to the 12 times table but could go further.

Differentiation

Some pupils may start the times table square from scratch, while others may use the file 7.4T1d Table square.xls from the shared area. When checking, expect pupils to know by heart tables to 10×10, although they may not know all multiples of 11 or 12. Tell pupils to use the fill handle to click and drag. Remind them that they must select more than one cell to drag, as this will extend the sequence of numbers and not just copy a single value.

Encourage pupils who manage the task quickly to add colour or shading to the table to make it easier to use. If appropriate, suggest pupils make printouts of the table to help them in mathematics with multiplication by 11 or 12.

4 Setting up a simple spreadsheet

Show pupils **7.4T1e Teachers' football league.xls.** Explain that they will:

- use a spreadsheet to display data about football teams;

- use the spreadsheet to calculate which team has the most points;

- update the table as the teams play more games;

- add their own teams if they wish.

T1e
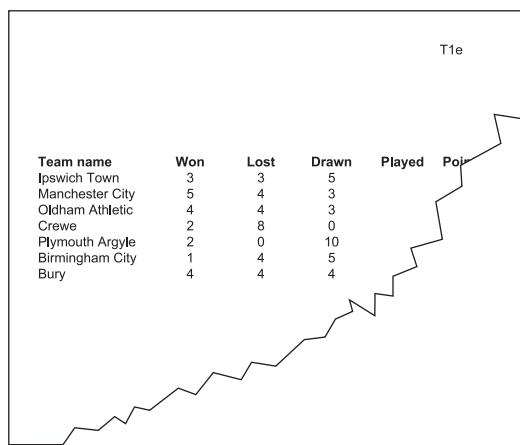
Team name	Won	Lost	Drawn	Played	Poi
Ipswich Town	3	3	5		
Manchester City	5	4	3		
Oldham Athletic	4	4	3		
Crewe	2	8	0		
Plymouth Argyle	2	0	10		
Birmingham City	1	4	5		
Bury	4	4	4		

Ask pupils to suggest how they could use the spreadsheet to calculate the total number of games played and the total number of points gained. Demonstrate how to enter and copy formulae to do this.

If it is appropriate, extend the demonstration by showing pupils how to sort the data. Explain the problems that may occur if the entire table is not highlighted when sorting. Ask pupils to suggest reasons for sorting data of this kind.

5 Using formulae to enter information into a spreadsheet

Show pupils how to copy **7.4P1f Football league table.xls** into their workspace. Tell them to create, enter and copy a formula for the number of games played and a formula for the number of points gained. Check that pupils understand that they will need to multiply for the points won and then add the draw points. Check the position of the 'multiply' operator.

Ask pupils to save their spreadsheets into their own work areas as they will need them at the start of the next lesson.

Differentiation

Pupils who manage the task quickly could be asked to sort the table.

Pupils working at higher levels could set up two cells giving the number of points for a win and the number of points for a draw, then incorporate these into their formulae instead of the numbers 1 and 3.

Show pupils how they could use one cell to hold either the win or draw information to use in their formula. What happens when they copy or drag down the formula? What is needed? Show absolute referencing using the $ sign in front of each cell reference, for example, H4. This makes it possible to change the points awarded easily and efficiently.

7.4P1g Football league table workings.xls demonstrates this and shows the formula with the answers that pupils will work out in lesson 2.

Pupil's name
Form/Class

Team name	Won	Lost	Drawn	Played	Points
West Ham United	8	0	3	11	30
Leeds United	6	1	4	11	
Liverpool	5	2	5	12	
Newcastle United	5	3	2	10	
Manchester United	3	5	6	14	
Arsenal	2	6	5	13	
Everton	2	7	4	13	
Norwich City	1	6	6		
Southampton	0	9	3		
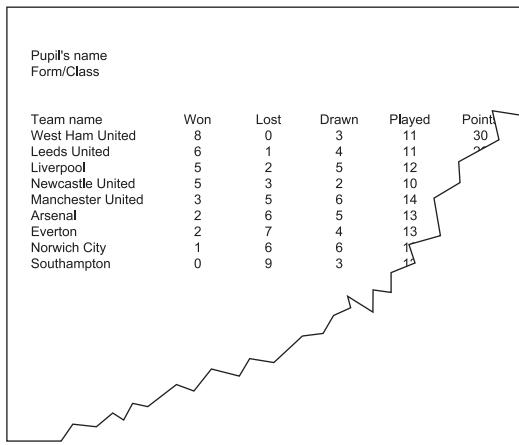
6 Plenary: Advantages and disadvantages of using a spreadsheet

Ask pupils to compare the method of using a spreadsheet for recording football results with using a pen, paper, ruler and, perhaps, calculator to do the same thing.

Draw out advantages such as:

- speed, and the ease of correcting mistakes;
- the possibility of making multiple copies.

Ask them what was difficult about the task. Draw out disadvantages such as:

- the coordination needed to use the mouse;
- the need to work out what the formula should be rather than just adding or multiplying numbers together;
- the possibility of highlighting the wrong cells.

Homework

Ask the pupils to think how they would use a spreadsheet in real life. Ask them to apply the ideas suggested in the plenary and to identify two advantages and two disadvantages for their real-life examples.

Modelling using a spreadsheet

ICT Framework objectives

DEVELOPING IDEAS AND MAKING THINGS HAPPEN

Models and modelling
- Use software to investigate and amend a simple model by:
  - formatting and labelling data appropriately;
  - entering rules or formulae and checking their appropriateness and accurate working;
  - explaining the rules governing a model.

- Test whether a simple model operates satisfactorily.

Key vocabulary

From Year 6: output, predict, simulate

From Year 7: variable

From Year 8: interrogate

Preparation and planning

- Ensure that 7.4T1e Teachers' football league.xls and 7.4T2c Biscuit model.xls are available electronically and that 7.4P1f Football league table.xls and 7.4T2c Biscuit model.xls are available in the shared area.

- Ensure that 7.4P2a Zoo activity.xls is available in the shared area for the start of the lesson.

- Copy 7.4P2b Football league question sheet.doc and 7.4P2d Biscuit question sheet.doc for all the pupils.

- Review 7.4T2e Biscuit answer sheet.doc.

- Print 7.4T2e Biscuit answer sheet.doc, as answer sheets for 7.4P2d Biscuit question sheet.doc, if required.

- Ensure that the Internet is working and models from:
  - http://www.metoffice.com/weather/charts/animation.html
  - http://www.metoffice.com/research/ocean/operational/wave/swellanim.html
  are available.

- Write the task for activity 1 on the whiteboard or flipchart.

- If necessary, prepare guidance for the pupils to support the software being used, either as a handout or available on the school's intranet.

- Add new key vocabulary to the wall display.

- Display the objectives for the lesson, phrased so all pupils will understand them.

Resources

- Large computer screen display
- Sufficient computers for pupils to work in pairs or small groups
- Shared network area, or alternative way to pass spreadsheet data to pupils
- Spreadsheet software
- Whiteboard or flipchart
- Resource files:
  – 7.4T1e Teachers' football league.xls
  – 7.4P1g Football league table workings.xls
  – 7.4P2a Zoo activity.xls
  – 7.4P2b Football league question sheet.doc
  – 7.4T2c Biscuit model.xls
  – 7.4P2d Biscuit question sheet.doc
  – 7.4T2e Biscuit answer sheet.doc
  – 7.4P1f Football league table.xls

Lesson outline   60 minutes

1	**Starter: Problem-solving using a simple spreadsheet**	Reviewing Paired work	10 minutes
2	**The idea of a model**	Discussion and demonstration Whole class	5 minutes
3	**Using a model to find information**	Demonstration Whole class	10 minutes
4	**Interrogating a model to answer questions**	Using software Paired work	10 minutes
5	**Using and interrogating a different model**	Demonstration Whole class Using software Paired work	20 minutes
6	**Plenary: Advantages of using a model**	Checking work Whole class	5 minutes
	Homework	Individual work	

Activities

1 Starter: Problem-solving using a simple spreadsheet

Refer pupils to the objectives for this lesson. Remind them that in lesson 1 they used a spreadsheet to display data and to carry out simple calculations. Tell them that in this lesson they will use the spreadsheet as a model to answer 'What if…?' questions.

Display **7.4P2a Zoo activity.xls** on the large screen display and explain that it is also available on the shared area. Ask pupils, in pairs, to complete the activity, using the 'What if…?' questions on the spreadsheet. If there is time, ask pupils to suggest their own 'What if…?' questions. Pupils can extend these by changing variables.

Animal	Cost per week to feed each animal	Number of animals	Total cost per week for animals
Lion	£25	10	£250
Tiger	£30	8	£240
Zebra	£5	9	£45
Elephant	£20	9	£180
Snake	£5	8	
Penguin	£5	12	
Sea lion	£20	3	
Alligator	£5	4	
Eagle	£1	5	
	Totals		
	Budget allowed		
	Overspend / underspend		

What if you …
had only 5 sets of animals, and a bud…

had all 9 sets of animals…

had to pay £…
Ho…
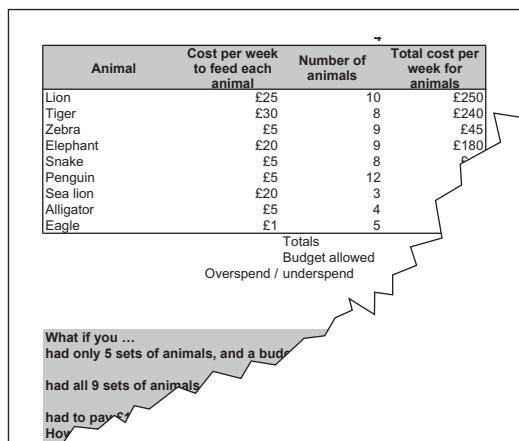
Explain that you have set up a model that will allow pupils to ask questions and solve problems. Ask them to compare this with the pencil-and-paper model they developed in lesson 1. Ask what advantages the spreadsheet has. Draw out responses such as:

- accuracy;
- speed:
- flexibility;
- adaptability.

Review how the model is working, identify the formula or rules, and the variables (input and output). Remind pupils that ∗ is used as a multiplication sign in formulae.

Explain that they are now going to look at other examples of models, where they cannot identify what is actually happening to the data – 'blackbox' models.

2 The idea of a model

Explain that a model is not just a pencil-and-paper table or a spreadsheet. Say that:

- a model is like a simulation, for example, a Formula 1 motor racing computer game;
- models can be used to answer 'What if…?' questions;
- once a model has been set up, it is possible to input different data and see how this affects the outcome or output;

- the input and output data are called variables – the input data can be changed and the output will change correspondingly;

- we often model events that would be difficult or costly to try out in reality, for example, testing orbital paths of rockets, testing how different designs or models of car behave in serious accidents, investigating mass production of a new line of cosmetics.

Demonstrate some ways in which models are used, referring to the sites below or other similar examples:

- in weather forecasting http://www.metoffice.com/weather/charts/animation.html;

- for predicting ocean wave swell http://www.metoffice.com/research/ocean/operational/wave/swellanim.html.

Say that models are used in many other ways, for example to:

- predict profits in business;

- find out how buildings will be affected by earthquakes;

- test escape routes from buildings if they are on fire;

- test new car designs for aerodynamics;

- predict how a disease or virus might spread.

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10 minutes

3 Using a model to find information

Display 7.4T1e Teachers' football league.xls and use it to remind pupils how to:

- create a formula to work out the number of games played by Ipswich;

- copy a formula to work out the number of games played by each team;

- create a formula to work out the number of points gained by Ipswich;

- copy this formula to work out the number of points gained by all the teams;

- sort the league table, in order of points.

Explain the meaning of these terms:

- rule (how different quantities can be combined or manipulated to find a new quantity);

- formula (a mathematical way of writing a rule in symbols);

- variable (a quantity that can change its value).

Ask pupils to identify these in 7.4T1e Teachers' football league.xls. The variables include the number of games won, lost or drawn. How points are awarded and games played are the rules. Demonstrate how 'What if …?' questions can be answered, using the spreadsheet model. Use this example.

- Suppose there are only two games next week, Bury v Manchester City and Ipswich v Plymouth Argyle. Which team could be at the top of the league? How could this happen?

- If draws were worth 2 points rather than 1, which team would become top of the league?

- In the next round of matches, Oldham and Plymouth both win, Ipswich and Crewe lose, Bury and Manchester City draw and Birmingham does not play. Which team will be top of the league? What positions in the league will the rest of the teams hold?

Depending on the ability of the class, decide whether to use a simple formula, as in F7 in 7.4P1g Football league table workings.xls, or an absolute reference for the win and draw cells, as in F8 to F15.

Stress the need to reset values after each question by reloading the original file or using the 'undo' function. Encourage pupils to ask other 'What if…?' questions. Extend the more able pupils by questioning them about the model structure and its operation. Ask these questions:

- How are absolute cell references used?

- How is the sort function used to indicate league positions?

- How could you change the model if 4 points were given for a win?

- How could you extend the model to include goal difference if two teams have the same number of points?

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10 minutes

4 Interrogating a model to answer questions

Ask pupils to use the version of 7.4P1f Football league table.xls they set up in lesson 1 to answer the questions on **7.4P2b Football league question sheet.doc**. Circulate and monitor, assisting pupils where necessary. Make sure they reset values after each question. Encourage pupils who have answered the questions on the sheet correctly to devise their own questions to ask each other.

Use peer groups to check answers against the answer sheet.

Football league question sheet   `7.4P2b`
Use the league table spreadsheet to answer these questions.
1 Matches this week finish with these results

Liverpool	2	Norwich City	1
Arsenal	0	West Ham United	0
Leeds United	3	Newcastle United	4
Manchester United 1	Everton	1

Southampton didn't play this week
Update the league table by entering these results.
Save the updated league table.
2 Sort your updated table to find out which team has the most points.
Which team is top of the league? Which team is bottom?

Top team:
Bottom

Save your sorted league table.
Spreadsheet models allow yo
you can predict what
questions.
Reset

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20 minutes

5 Using and interrogating a different model

Discuss the process of producing biscuits. Ask pupils what information they would need to find the cost of making biscuits. Answers should include:

- list of ingredients;

- numbers or quantities of ingredients;

- the price of ingredients;

- possibly other factors such as equipment or cooking costs.

Use a diagram to illustrate that the ingredients are the inputs, the amounts or quantities are the variables and the cost is the output.

Use **7.4T2c Biscuit model.xls** to demonstrate the biscuit-making model. Ask pupils these questions.

- Which cells contain variables? (A2 and D3 to E8)

- Which of these are most likely to be changed by the user? (A2)

- Which cells contain rules or formulae? (F3 to G8 and E10 and G10)

- What is the output of the model? (G10)

- What does each formula in the model do?
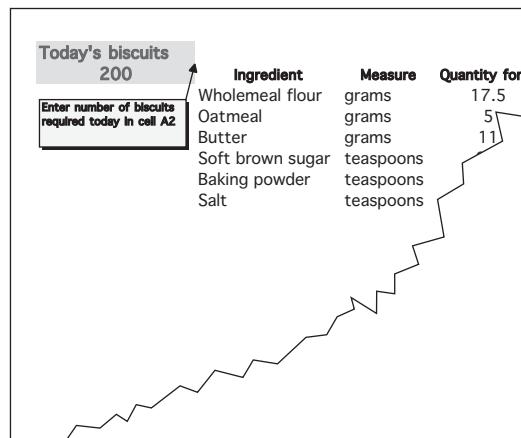
Demonstrate how unit costs can be changed and how the model immediately recalculates to take account of the change(s).

Give pupils **7.4P2d Biscuit question sheet.doc** and ask them to use 7.4T2c Biscuit model.xls to answer the questions.
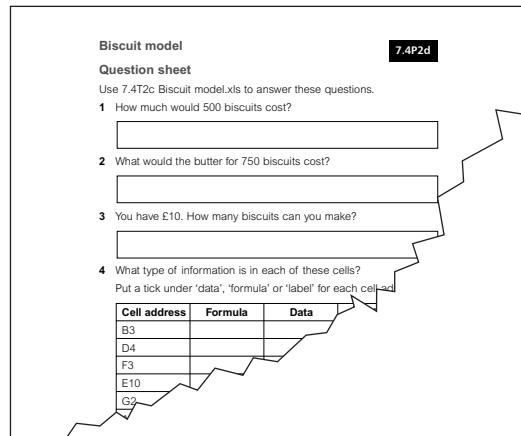
Differentiation

Circulate, asking pupils whether they can remember where they might find the answers. (They are in the presentation from lesson 1 on the shared area.)

Ask if there are other ways of producing the formula for question 6. Three ways are:

- =G3+G4+ ...

- use autosum

- =SUM(G3:G8)

although there may be others.

6 Plenary: Advantages of using a model

Remind the class about the objectives for this lesson and discuss whether they have been met.

Ask all pupils to have their answer sheets for 7.4P2b Football league question sheet.doc and 7.4P2d Biscuit question.doc ready. Ask selected pupils to give their answers to the questions. Use **7.4T2e Biscuit answer sheet.doc** to check and discuss answers with the class. Ask pupils to explain what the rules of the football league model are and draw out what they see as the advantages of using the biscuit production model.

Biscuit model

7.4P2e

Answer sheet

Use 7.4T2c Biscuit model.xls to answer these questions.

1   How much would 500 biscuits cost?

£60

2   What would the butter for 750 biscuits cost?

£22.50

3   You have £10. How many biscuits can you make?

83

4   What type of information is in each of these cells?
Put a tick under 'data', 'formula' or 'label' for ea...

Cell address	Formula	Data
B3		
D4		
F3		
F10		

Homework

Ask pupils to identify the rules and variables for one of these examples:

- the total points for a team playing football for a whole season;
- the total costs of producing biscuits;
- the difference between the numbers of points gained by the team at the top of the league and the team at the bottom of the league;
- the goal difference for a football team.

Using a spreadsheet to build a model

ICT Framework objectives

DEVELOPING IDEAS AND MAKING THINGS HAPPEN

Models and modelling

- Use software to investigate and amend a simple model by:
  - formatting and labelling data appropriately;
  - entering rules or formulae and checking their appropriateness and accurate working;
  - explaining the rules governing a model.

- Test whether a simple model operates satisfactorily.

Key vocabulary

There is no new vocabulary in this lesson.

Preparation and planning

- Ensure that you are familiar with the resources to be used.

- Ensure that 7.4T3g Disco model.xls is available electronically and that 7.4P3a Disco model.xls is available in the shared area for pupils.

- Copy these resources for pupils:
  - 7.4P3b Rules and variables;
  - 7.4P3f Disco model activity 1.doc;
  - 7.4P3h Disco model activity 2.doc;
  - 7.4P3i Insert.doc;
  - 7.4P3j Interrogate.doc.

- Write the questions for activity 1 on the whiteboard or flipchart.

- If necessary, prepare guidance for the pupils to support the software being used, either as a handout or available on the school's intranet.

- Display the objectives for the lesson, phrased so all pupils will understand them.

Resources

- Large computer screen display

- Sufficient computers for pupils to work in pairs or in small groups

- Spreadsheet software

- Shared network area, or alternative way to pass spreadsheet data to pupils

- Whiteboard or flipchart

- Resource files:
  - 7.4P3a Disco model.xls
  - 7.4P3b Rules and variables.doc
  - 7.4P3c Rules and variables answers.doc
  - 7.4P3d Rule table.doc
  - 7.4T3e Rule table answer.doc
  - 7.4P3f Disco model activity 1.doc
  - 7.4T3g Disco model.xls
  - 7.4P3h Disco model activity 2.doc
  - 7.4P3i Insert.doc
  - 7.4P3j Interrogate.doc

Lesson outline   60 minutes

| 1	**Starter: Identifying rules and variables**	Reviewing Whole class	10 minutes
2	**Using a model to make predictions**	Demonstrating software Whole class	10 minutes
3	**Developing the model**	Using software Paired work	15 minutes
4	**Increasing the function of the model**	Using software Paired work	15 minutes
5	**Plenary: Reviewing the model**	Evaluation Whole class	10 minutes
	Homework	Individual work	

Activities

1 Starter: Identifying rules and variables

Discuss the objectives for the lesson with the class. Review the homework from the previous lesson, identifying rules and variables from a model.

Display **7.4P3a Disco model.xls** on the large screen. Tell pupils that they are going to build up a spreadsheet to model possibilities for a school disco.

Disco model

Name:
Form/Class

Income
Number of tickets sold   250
Ticket price   £2.50
Total income

Costs
Hire disco equipment
Pay the DJ
Cost of the
Tot
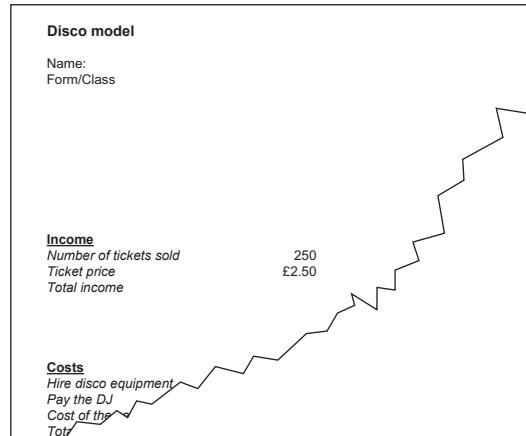
Click on each cell in 7.4P3a Disco model.xls, asking pupils to identify variables (data that can be changed) and rules (formulae). Then ask pupils to use **7.4P3b Rules and variables.doc**, ticking the relevant columns to identify the properties of the listed cells. They can use peer groups to check their answers on **7.4P3c Rules and variables answers.doc**.

Rules and variables   7.4P3b

Use 7.4P3a Disco model.xls to identify the properties of the cells below. Mark them with a ✓.

Cell	Variable	Rule
B15		
B16		
B17		
B23		
B24		
B25		
B26		

Rules and variables answers   7.4T3c

Use 7.4P3a Disco model.xls to identify the properties of the cells below. Mark them with a ✓.

Cell	Variable	Rule
B15	✓	
B16	✓	
B17		✓
B23	✓	
B24	✓	
B25	✓	
B26		

They then study the rules they have identified, and work out the details of each rule and write it out in the formula column on **7.4P3d Rule table.doc**. They can work with peer groups to check their answers, using **7.4P3e Rule table answer.doc**.

Rule table   7.4P3d

Write down the addresses of cells that should contain rules and write down the formula that should go in each cell.

Cell	What is the formula?

Rule table answers   7.4T3e

Write down the addresses of cells that should contain rules and write down the formula that should go in each cell.

Cell	What is the formula?
B17	=B15+B16
B26	=SUM(B23:B25) or =B23+B24+B25
B30	=B17−B26

---

10 minutes

2 Using a model to make predictions

Show pupils 7.4P3a Disco model.xls again. Ask them to think about what they could calculate, using formulae in the spreadsheet. Gather suggestions such as:

- the total amount of money raised (the income);

- the total cost of the disco;

- how much of the money raised was profit.

Make sure that pupils understand that profit is calculated by subtracting the costs (money going out) from the income (money coming in). Explain that the income and costs will be in a particular currency and the spreadsheet should be set up to show this. Demonstrate how to set the currency for the data.

Explain that sometimes the costs may be more than the income, so that the disco would have made a loss. This would be shown as a negative number. Discuss an appropriate display for negative numbers, for example, −£1, (£1) or £1 written in red for clearer viewing on the screen.

Give pupils copies of **7.4P3f Disco model activity 1.doc** and tell them that the spreadsheet 7.4P3a Disco model.xls will provide a starting point for them to set up their model. Explain that this is the first stage of the model and that it will become more complex in later lessons. Say that this is what usually happens when a model is developed.

7.4P3f

Disco model activity 1 Creating formulae and formatting cells
This activity sheet will help you to develop your disco model.

SECTION A: CREATING A FORMULA

1 Formula for *Total income*
To work out the *Total income* you must multiply the *Number of tickets sold* by the *Ticket price*.

In the cell for the *Total income* you should enter the formula as follows.

Always start a formula with an = sign

= __ • __

Enter cell reference for *Number of tickets sold*

• means multiply

Enter the formula and
formula. Check the

2

15 minutes	**3 Developing the model**

An example of what pupils should be producing by the end of this activity is given on sheet 2 – Disco stage 2 – of **7.4T3g Disco model.xls**.

Tell pupils to open 7.4P3a Disco model.xls from the shared area and to follow the instructions on 7.4P3f Disco model activity 1.doc to develop the model. Explain that the worksheet will help them complete their spreadsheet and gives information about formatting data types and presentation.

As pupils work, monitor to check they are using correct formulae. Ask individuals and pairs for reasons for formatting data type and text. Draw out responses such as:

- it is easier to find information;
- it is easier to enter information;
- there is less chance of mixing things up;
- it is easier to recognise currency, for example, £2.50 is clearer than 2.5;
- it enhances the appearance of the sheet.

When pupils have set up their model, ask them to use it to answer the questions at the end of 7.4P3f Disco model activity 1.doc.

Differentiation

Work with a less able group to demonstrate formatting.

15 minutes	**4 Increasing the function of the model**

An example of what pupils should be producing by the end of this activity is given on sheet 3 – Disco stage 3 – of 7.4T3g Disco model.xls.

Tell pupils that they will now add two more variables to their model. Give out **7.4P3h Disco model activity 2.doc** and ask pupils to follow the instructions for adding the number of teachers required and the cost of paying the teachers. Circulate and help pupils who are having difficulty with tasks such as creating formulae. Tell pupils to save their final models for use in the next lesson.

7.4P3h

Disco model activity 2 Adding supervising teachers

This activity sheet will help you to develop your disco model.

As more variables are added to the model it becomes more realistic and useful. You are going to add teachers to your model.

Teachers must be present!
The headteacher at the school has said that the disco can only go ahead if there are teachers present. There must be one teacher for every 50 pupils. If there are 51 pupils then two teachers would be needed, and so on. Each teacher will have to be paid £20 for doing this.

You now have to add three extra pieces of information to your model

1 the number of teachers required (this will change according to the number of pupils)

2 the cost of paying each teacher

3 the total cost of paying the teachers.

Step 1 Adding extra labels
You will need to put a new heading on your spreadsheet for *Additional information*

Type this in cell A6. B
Number of tea

The nu

Differentiation

Pupils who finish the task quickly could be given **7.4P3i Insert.doc** and asked to insert a row to calculate the total cost of the teachers. Remind them that they will need to alter the formula for total costs.

In addition, these pupils could be given **7.4P3j Interrogate.doc** and asked to explore the model to answer the questions on the worksheet.

Identify pupils who do not progress to these worksheets. They will have an opportunity to do so in lesson 4.

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10 minutes

5 Plenary: Reviewing the model

Review the objectives for this lesson. Ask pupils who have completed 7.4P3i Interrogate.doc to explain how the model showed whether the disco would make a profit if it were held on a Wednesday, Thursday or Friday. Ask pupils to judge how effective the model is and whether it could be improved by adding other variables. Then ask about the limitations of the model. If necessary, prompt by saying:

- we used multiples of 50 for the number of tickets sold and calculated the number of teachers by dividing this by 50;

- anything other than multiples of 50 would have caused a problem because of the resulting decimals.

Explain that this is a limitation of the model but, at this stage, it would be too complicated to add a formula to deal with this. Discuss rounding up to the nearest whole number. Explain that pupils will learn more about doing this at a later stage.

Homework

Ask the pupils to identify any further limitations of the model and to suggest possible solutions. Support pupils by offering some limitations from the plenary for them to develop solutions.

- What would be the effects of using different variables?

- Which variables could be added to improve the model?

More able pupils should identify a limitation and develop a solution.

4

Refining and developing a model

ICT Framework objectives

DEVELOPING IDEAS AND MAKING THINGS HAPPEN

Models and modelling
- Use software to investigate and amend a simple model by:
  - entering rules or formulae and checking their appropriateness and accurate working;
  - predicting the effects of changing variables or rules.

- Test whether a simple model operates satisfactorily.

Key vocabulary

There is no new vocabulary in this lesson.

Preparation and planning

- Ensure that you are familiar with spreadsheet functions to round numbers up or down.

- Ensure that 7.4T3g Disco model.xls is available electronically.

- Copy these resources for pupils:
  - 7.4P3i Insert.doc;
  - 7.4P3j Interrogate.doc;
  - 7.4P4a Scenario cards.doc;
  - 7.4P4b Disco model activity 3.doc;
  - 7.4P4c Disco model activity 4.doc.

- Write the questions for activity 1 on the whiteboard or flipchart.

- If necessary, prepare guidance for the pupils to support the software being used, either as a handout or available on the school's intranet.

- Display the objectives for the lesson, phrased so pupils can understand them.

Resources

- Large computer screen display

- Sufficient computers for pupils to work in pairs or in small groups

- Spreadsheet software

- Shared network area, or alternative way to pass spreadsheet data to pupils

- Whiteboard or flipchart

- Resource files:
  - 7.4P3g Disco model.xls
  - 7.4T3i Insert.doc
  - 7.4P3j Interrogate.doc
  - 7.4P4a Scenario cards.doc
  - 7.4P4b Disco model activity 3.doc
  - 7.4P4c Disco model activity 4.doc

Lesson outline   60 minutes

1	**Starter: Ways of increasing income from an event**	Discussion Paired work Whole class	10 minutes
2	**Adding a variable to the model**	Using software Paired work Discussion Whole class	25 minutes
3	**Adding a further variable to the model**	Using software Paired work	15 minutes
4	**Plenary: Weakness of the model**	Evaluation Whole class	10 minutes
	Homework	Individual work	

Activities

1 Starter: Ways of increasing income from an event

Discuss the objectives for the lesson with the class. Review the homework from the previous lesson, with suggestions for the limitation of the model.

Display 7.4T3g Disco model.xls on the large screen to remind pupils of the model.

Distribute three cards, cut from **7.4P4a Scenario cards.doc**, among the class. The 'Free drinks' card is for lower-attaining pupils and the 'Buy two get one free' is for higher-attaining pupils.

Ask pupils, working in pairs, to look at the given scenario for raising more money at the disco. In the light of their scenario, they should answer the questions written on the whiteboard or flipchart.

- *How will it affect profit and loss?*
- *How will it affect the model?*
- *How many pupils will attend on Wednesday?*
- *How many free drinks would this mean?*
- *How much would this cost?*
- *What is the maximum number of pupils who could attend?*
- *If all pupils attended how many tickets would be sold?*
- *How many would be given free?*

Make sure that pupils are aware of the idea of 'loss leaders' where an action may initially be costly but could ultimately create greater profit by, in this case, encouraging more pupils to attend the disco.

Take answers from pupils and relate them back to the model. Quickly list a sample of answers on the whiteboard or flipchart, for reference.

---

25 minutes

2 Adding a variable to the model

An example of what pupils should be producing by the end of this activity is given in sheet 4 of 7.4T3e Disco model.xls – Disco stage 4.

Distribute **7.4P4b Disco model activity 3.doc**. Ask pupils to follow the instructions and add the variables related to free drinks.

Circulate as pupils work, to check progress and help pupils who are having difficulties with some tasks, for example, with inserting rows or creating formulae. Remind pupils that they may need to alter the formula for total cost after the new row is inserted – they need to check that their formula includes all the costs.

Use 7.4P3i Insert.doc and 7.4P3j Interrogate.doc with groups of pupils that you know did not cover these tasks in lesson 3.

Ask selected pupils to describe and explain the effects of refining the model to predict profits on Wednesday, Thursday and Friday, as described in the worksheet. Discuss whether basing a prediction of increased ticket sales on past experience is helpful for creating a model. Ask what other information, for example, market research, could be used.

| 15 minutes | **3 Adding a further variable to the model** |

An example of what pupils should be producing by the end of this activity is given in sheet 5 of 7.4T3g Disco model.xls – Disco stage 5.

Tell pupils they are going to introduce into the model a further variable: the cost of high-quality, colour posters to advertise the disco. Say that past experience suggests that a poster in the main entrance to the school could increase the number of ticket sales by another 50 but, again, this is not guaranteed. Tell them that posters will also be needed for display in the classroom of each supervising teacher. The cost of each poster is £6.

Distribute **7.4P4c Disco model activity 4.doc**. Ask pupils to develop their models by adding the variables related to the posters. Remind pupils that they will need to check their formula for total cost after the new row is inserted. It will depend where the row is inserted as to whether or not the formula needs amending. As pupils work, circulate to check that they are using the correct formulae in their models.

7.4P4c

Disco model activity 4 Adding posters

This activity sheet will help you to develop your disco model.

As more variables are added to the model it becomes more realistic and useful. This time, you are going to add posters to your model.

High-quality posters!
Past experience suggests that high-quality, colour posters can increase ticket sales by 50. Each of the teachers has agreed to place a poster in their classroom. You also decide to put a poster in the main entrance of the school. The cost of producing one poster is £6.

You now have to add three extra pieces of information to your model:

7   the total number of posters required (teachers' classrooms plus main entrance)

8   the cost of each poster

9   the total cost of paying for the posters.

Step 1 Adding extra labels
You need to add two new labels under the hea…
information.

One label is for the *Cost of poster a…
posters*.

This is what y…
should look…

Differentiation

Work with the more able group when they are ready to work through the extension questions in activity 4. Develop their understanding of prediction by looking at how the model is changing values up or down. Circulate, to observe whether they are making sensible trials. If they are using wild guesses, ask how they think their changes will affect the profit or loss, with reference to the cells that are changing.

4 Plenary: Weakness of the model

Ask selected pupils to demonstrate their models and to explain the effects of adding a free drink and advertising with posters to the predicted profits of the disco. Ask one or two pupils to demonstrate how they extended their model by adding variables. Draw out weaknesses of the model, including:

- with only 450 pupils in the year, you cannot add 100 then another 50 to the number of tickets sold on a Friday;

- it would be difficult to calculate the number of teachers if the number of pupils were not divisible by 50.

If appropriate, for more able pupils, discuss spreadsheet functions that can be used to round answers up or down as required, for example, $A = 1 + INT(N/50)$.

End the lesson by telling pupils that in this lesson they have learned to investigate a model, test whether it is working, amend it and predict the effects of changing it. They will continue this work in the next lesson.

Homework

Ask pupils to write down one or two ways in which the model could be improved and to explain why they believe their improvements to the model would be effective.

5

Ways of presenting data from a spreadsheet

ICT Framework objectives

DEVELOPING IDEAS AND MAKING THINGS HAPPEN

Models and modelling
- Use software to investigate and amend a simple model by:
  - formatting and labelling data appropriately;
  - entering rules or formulae and checking their appropriateness and accurate working;
  - explaining the rules governing a model;
  - predicting the effects of changing variables or rules.

- Test whether a simple model operates satisfactorily.

Key vocabulary

From Year 7: template

Preparation and planning

- Copy 7.4P5i Disco model activity 5 Help sheet 1.doc and 7.4P5j Disco model activity 5 Help sheet 2.doc for pupils who have completed the main activities of the lesson.

- Load a copy of 7.4P5a Sportsday.ppt on the large computer screen display.

- Ensure that 7.4T3g Disco model.xls and 7.4T5d Chart data.xls are available electronically and that 7.4P5g School disco report template.doc is available in the shared area for the pupils.

- If necessary, prepare guidance for the pupils to support the software being used, either as a handout or available on the school's intranet.

- Add new key vocabulary to the wall display.

- Display the objectives for the lesson, phrased so pupils can understand them.

Resources

- Large computer screen display

- Sufficient computers for pupils to work in pairs or in small groups

- Spreadsheet software

- Shared network area, or alternative way to pass spreadsheet data to pupils

- Whiteboard or flipchart

- Resource files:
  - 7.4T3g Disco model.xls
  - 7.4T5a Sportsday.ppt
  - 7.4T5b Sportsday annotated.ppt
  - 7.4T5c Sportsday corrected.ppt
  - 7.4T5d Chart data.xls
  - 7.4T5e Chart data answer.xls
  - 7.4P5f School disco report template.doc
  - 7.4P5g Copying.doc
  - 7.4P5h Disco model Activity 5 Help sheet 1.doc
  - 7.4P5i Disco model Activity 5 Help sheet 2.doc

Lesson outline   60 minutes

1	**Starter: Presenting information for audience and purpose**	Discussion Paired work Whole class	10 minutes
2	**Using tables and graphs to present information**	Demonstrating software Whole class	15 minutes
3	**Inserting tables in a report**	Using software Paired work	10 minutes
4	**Creating a report**	Demonstrating software Paired work	15 minutes
5	**Plenary: Review of the modelling process**	Evaluation Whole class	10 minutes
	Homework	Individual work	

Activities

1 Starter: Presenting information for audience and purpose

Discuss the objectives for the lesson with the class. Review the homework from the previous lesson, with suggestions for improving the model.

Display **7.4T5a Sportsday.ppt** on the large screen display and ask pupils to identify:

- three things that the report tells us;

- three things that the headteacher needs to know but the report does not tell us.
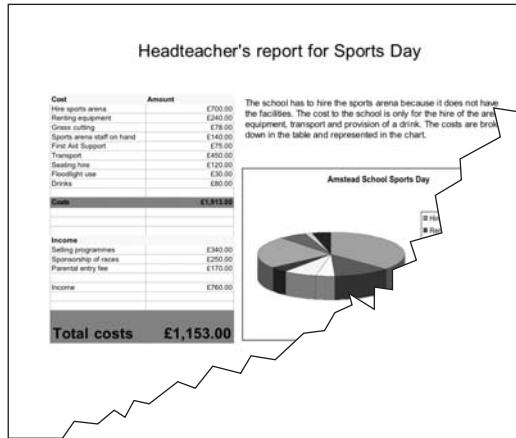
Draw out that the report tells us things about costs that the sports arena has to pay but does not fully provide details of how much profit or loss the school might make from a sports day.

Display **7.4T5b Sportsday annotated.ppt** to provide additional information. Ask the pupils questions about the table and chart.

- Do the table and chart tell us how much the sports day will cost the school?

- What information is represented on the chart?

- Is the chart on the sports day report clear, easy to understand and to read?
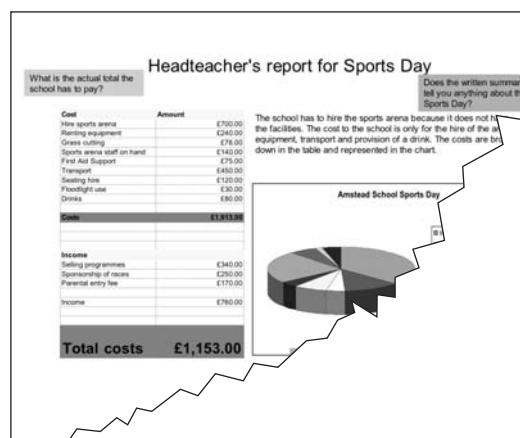
Say that the table, chart and text should give the information that we need to know.

Display **7.4T5c Sportsday corrected.ppt** to show how the data could have been presented more accurately .

Headteacher's report for Sports Day

Cost	Amount	
Hire sports arena	£700.00	
Renting equipment	£240.00	
Transport	£450.00	
Drinks	£80.00	
Costs	**£1,470.00**	
Income		
Selling programmes	£340.00	
Sponsorship of races	£250.00	
Parental entry fee	£170.00	
Income	£760.00	
Actual costs	**£710.00**	

The school has to hire the sports arena because it does not h... the facilities. The cost to the school is only for the hire of the a... equipment, transport and provision of a drink. The costs are br... down in the table and represented in the chart.

Amstead School Sports Day

Make sure that pupils are aware that their report needs to show clearly the cost to the school. They need to use their findings as criteria for their own reports.

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15 minutes

2 Using tables and graphs to present information

Use data from **7.4T5d Chart data.xls** to demonstrate how to use the spreadsheet's chart tools to present data.

This information comes from two surveys on ... collected from a large school and a small s... showed the same pattern.

Littleworth School

Travel method	Number of pu...
Walk	
Car	
Bus	
Cycle	
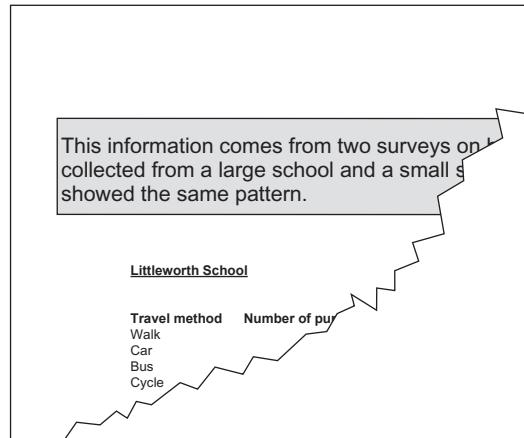
Explain the terms:

- select a data range;
- highlight;
- chart title;
- legend;
- series;
- values;
- labels.

Use the same data to produce different types of graph, including some that present the data well and others that do not. Ask pupils to say why some presentations are more effective than others.

Refer pupils to **7.4T5e Chart data answer.xls**. Ask them to discuss what the two pie charts which are shown side by side represent. Ensure that pupils understand that the largest of all the sectors in the two diagrams does not necessarily represent the largest number for the two schools. Sectors in a pie chart represent proportions, not actual values. For example, the 31 pupils travelling by car to Littleworth School are represented by a larger sector than that for the 51 pupils travelling by car to Major Manner School.

This information comes from two surveys on ho
collected from a large school and a small sc
showed the same pattern.

Littleworth School

Travel method	Number of pupils
Walk	
Car	
Bus	
Cycle	

---
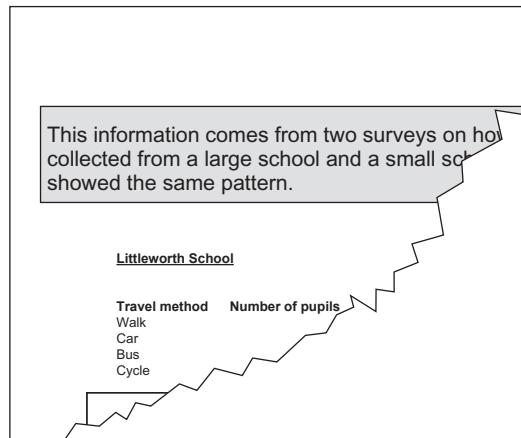
10 minutes	**3 Inserting tables in a report**

Introduce the activity by explaining that pupils are going to use information from their school disco model to prepare a report for the headteacher that should include a table to show and compare the costs for each of Wednesday, Thursday and Friday. Tell pupils they should use different styles and effects to highlight the important parts of the table.

Show **7.4P5f School disco report template.doc**. Give pupils **7.4P5g copying.doc** which shows them how to copy information from a spreadsheet into another document. Ask them to insert appropriate items from their model into the report.

7.4P5f

School disco report

This report contains information relating to the proposed school disco. The disco will be held on a Wednesday, Thursday or Friday. For each day we have produced a chart to show a breakdown of the different costs. We have also included a small table to show the predicted income, costs and profit for each of the three days.

To: The headteacher

From:

Date:

Wednesday
Number of pupils expected:
Costs breakdown

Income/costs/profit inform

Thursday

School disco report

This report contains information relating to the proposed school disco. The disco will be held on a Wednesday, Thursday or Friday. For each day we have produced a chart to show a breakdown of the different costs. We have also included a small table to show the predicted income, costs and profit for each of the three days.

To: The headteacher

From:

Date:

Wednesday	
Number of pupils expected:	
Costs breakdown	
Income/costs/profit informa	

| Thursday | |

Demonstrate how to copy and paste the relevant part of their spreadsheet into 7.4P5f School disco report template.doc.

Say that the headteacher also requires a table showing the information on total income, total costs and profits. Circulate, monitoring pupils as they work, to make sure that they can all complete the task. While you are doing so, ask able pupils who have chosen different styles to explain and justify their choices.

---

15 minutes

4 Creating a report

Explain to pupils that their reports will need a breakdown of information for each of the proposed three days, as well as their tables. The content of the table needs to be summarised with a conclusion. They should write a paragraph, referring to the favoured day and content of the table.

Differentiation

Pupils who have completed activities 3 and 4 could be given **7.4P5h Disco model activity 5 Help sheet 1.doc** and **7.4P5i Disco model activity 5 Help sheet 2.doc**, and asked to add a graph or chart to their reports. This should link to the written conclusion and represent the choice of day.

Disco model activity 5: Help sheet 1

This activity sheet will help you to use Chart Wizard to create charts from your model.

Create a graph or chart

You are now going to produce a chart to display your Costs table. Your teacher has already demonstrated how to use the Chart Wizard to draw a chart. These instructions will act as a reminder.

1 Highlight the area of data you wish to display in the chart.

2 Click on the Chart Wizard button on the tool bar.

3 Select the type of chart you wish to use. Click on Next.

Disco model activity 5: Help sheet 2

This activity sheet will help you copy charts and information from your model into the report.

Copying a chart into your report

1 Click on your Chart to select it.

2 Click on the Copy tool .

3 Open up your Headteacher report fil

15 minutes

5 Plenary: Review of the modelling process

Ask pupils to tell you the main points they need to remember when they use a spreadsheet for modelling, for example, identifying variables and using rules. Select one or two pupils to show the class their tables and written paragraphs about income, costs and profits. Compare the advantages and disadvantages of presenting data in numeric and written form.

Summarise the whole unit, referring back to its overall objectives.

Homework: Evaluating the unit

Ask pupils to explain how a spreadsheet model would be useful for organising a school trip. Encourage them to use the key vocabulary they have learned during this unit.

Ask more able pupils who inserted graphs in their reports in activity 4 also to describe how using graphs or charts could enhance their reports.

Zoo activity

First example

Animal	Cost per week to feed each animal	Number of animals	Total cost per week for animals
Lion	£ 25	10	
Tiger	£ 30	8	
Zebra	£ 5	9	
Elephant	£ 20	9	
Snake	£ 5	8	
Penguin	£ 5	12	
Sea lion	£ 20	3	
Alligator	£ 5	4	
Eagle	£ 1	5	
		Total/cost	£
		Allowed	£1000
		Underspend	

Second example

Animal	Cost per week to feed each animal	Number of animals	Total cost per week for animals
Lion	£ 25	22	
Tiger	£ 30	8	
Zebra	£ 5	9	
Elephant	£ 20	9	
Snake	£ 5	8	
Penguin	£ 5	16	
Sea lion	£ 20	3	
Alligator	£ 5	4	
Eagle	£ 1	5	
		Total/cost	£
		Allowed	£1000
		Underspend	

Football league question sheet

Use the league table spreadsheet to answer these questions.

1 Matches this week finish with these results

Liverpool	2	Norwich City	1
Arsenal	0	West Ham United	0
Leeds United	3	Newcastle United	4
Manchester United	1	Everton	1

Southampton didn't play this week

Update the league table by entering these results.

Save the updated league table.

2 Sort your updated table to find out which team has most points. Which team is top of the league? Which team is bottom?

> Top team: ....
>
> Bottom team: ....

Save your sorted league table.

Spreadsheet models allow you to ask 'What if …?' questions so that you can predict what might happen in the future. Try these questions. Remember to reset the values for each question by reloading the saved file from question 2.

3 The next three results for Newcastle United are a win, a loss and a draw. How many points does Newcastle United have now?

> .... points

4 Liverpool loses all the rest of their games. How many games would Southampton have to win, in a row, to have more points than Liverpool?

> .... games

5 The number of points for a draw is changed to 2. Which team now has the most points?

> ....

Extension
Write down a question of your own and ask another pupil to try to answer it.
Was it possible to answer the question, using the spreadsheet?

> ....

Biscuit model

Question sheet

Use 7.4T2c Biscuit model.xls to answer these questions.

1 How much would 500 biscuits cost?

2 What would the butter for 750 biscuits cost?

3 You have £10. How many biscuits can you make?

4 What type of information is in each of these cells?

Put a tick under 'data', 'formula' or 'label' for each cell address.

Cell address	Formula	Data	Label
B3			
D4			
F3			
E10			
G2			
A2			

5 What cells are added together in G10?

6 Write down a formula that you could write in G10.

7 Imagine that you want to find out the total cost of producing the biscuits. What information do you think is missing from the model?

Biscuit model

Answer sheet

Use 7.4T2c Biscuit model.xls to answer these questions.

1 How much would 500 biscuits cost?

> £60

2 What would the butter for 750 biscuits cost?

> £22.50

3 You have £10. How many biscuits can you make?

> 83

4 What type of information is in each of these cells?

Put a tick under 'data', 'formula' or 'label' for each cell address.

Cell address	Formula	Data	Label
B3			✓
D4		✓	
F3	✓		
E10	✓		
G2			✓
A2		✓	

5 What cells are added together in G10?

> G3 TO G8

6 Write down a formula that you could write in G10.

> =SUM(G3:G8) or =G3+G4+G5+G6+G7+G8

7 Imagine that you want to find out the total cost of producing the biscuits. What information do you think is missing from the model?

> labour costs, fuel costs, packaging costs

Rules and variables

Use 7.4P3a Disco model.xls to identify the properties of the cells below. Mark them with a ✓.

Cell	Variable	Rule
B15		
B16		
B17		
B23		
B24		
B25		
B26		
B30		

Rules and variables answers

Use 7.4P3a Disco model.xls to identify the properties of the cells below. Mark them with a ✓.

Cell	Variable	Rule
B15	✓	
B16	✓	
B17		✓
B23	✓	
B24	✓	
B25	✓	
B26		✓
B30		✓

Rule table

Write down the addresses of cells that should contain rules and write down the formula that should go in each cell.

Cell	What is the formula?

Write down the addresses of cells that should contain rules
and write down the formula that should go in each cell.

Cell	What is the formula?
B17	=B15+B16
B26	=SUM(B23:B25) or =B23+B24+B25
B30	=B17-B26

Disco model activity 1: Creating formulae and formatting cells

This activity sheet will help you to develop your disco model.

Section A: Creating a formula

1 Formula for *Total income*

To work out the *Total income* you must multiply the *Number of tickets sold* by the *Ticket price*.

In the cell for the *Total income* you should enter the formula as follows.

Always start a formula with an = sign

= ___ * ___

Enter cell reference for *Number of tickets sold*

* means multiply

Enter cell reference for *Ticket price*
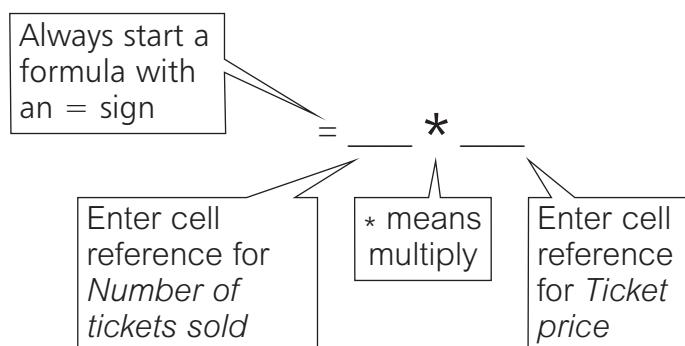
Enter the formula and press the <Enter> key. The spreadsheet will calculate the formula. Check that your answer is sensible and has been calculated correctly.

2 Formula for *Total costs*

To work out the *Total costs* you have to add all the costs together. There are three ways of doing this.

You can use a formula to add the cell references together, like this.

= ___ + ___ + ___   Enter cell reference

Alternatively, you can use the AutoSum function Σ on the tool bar.

In the cell for the *Total costs*, click on the AutoSum function Σ . The spreadsheet will try to SUM (add together) the cells that it thinks you wish to add. These cells will be highlighted. If this is correct, press <Enter> to calculate. If this is incorrect, highlight the cells you wish to add, and then press <Enter>.

Or you can type =SUM(xx:xx and then drag over the cells you want to add together, then type).

Try each method to see which you prefer!

3 Formula for *Overall profit*

To work out the overall profit you have to take away *Total costs* from *Total income*.

You are going to copy the *Total costs* and the *Total income* cells to the bottom of the model so that you have all of your main totals together. To do this, simply type = and then the cell address you want to copy in that cell. For example, if you wanted the same information in B23 as you had in B11 you would type =B11. Try it!

Now take away the *Total costs* from the *Total income* as follows.

= ____ − ____ >‾‾ Enter cell references

Section B: Formatting cells

You can change the way text and numbers appear in cells to improve presentation. This is called **formatting**.

1 Bold, italics and underline

The **bold**, *italic* and <u>underline</u> tools **B** *I* <u>U</u> can be found on the toolbar.

For example, you could have all of your totals in bold and all of your headings could be underlined. Then it will be easy to distinguish quickly between the different types of information. Other tools such as the Font colour tool **A·** can also help improve presentation of your work.

Try this now to improve the presentation of your spreadsheet.

2 General numbers and currency

In your model you are using two different data types for your numbers. One is *General number*. This is used for entering amounts, for example, the number of tickets sold. When you first load your spreadsheet package all the cells are set to this data type.

The other data type you are using for your numbers is *Currency*. Every cell where you enter or calculate an amount of money should be formatted as currency. This will ensure it has two decimal places and a £ sign.

1   Click on the cell you wish to format.

2   Click on format `Format` on the toolbar.

3   Click on Cells `Cells...        Ctrl+1` .

4   Click on currency.

5   Click on OK.

Format all cells containing money as currency.
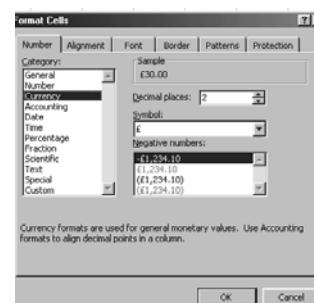
Using your model to answer questions

Now that you have set up your model you are going to use it to find out what happens to the overall profit in certain situations.

The school is not sure what day of the week to hold the disco. It is considering three days – Wednesday, Thursday or Friday.

There are 450 pupils in the year. Pupils were asked about preferred days and who would come. Responses were as follows:

If you hold the disco on Wednesday, 150 pupils would attend.

If you hold the disco on Thursday, 250 pupils would attend.

If you hold the disco on Friday, 350 pupils would attend.

For each day, change the number of tickets sold (in cell B15) and complete the table below. You may find that you have a negative number in your *Profit* cell. This means you will not have made a profit; in fact, you will have lost money.

Profit forecast

	Wednesday	Thursday	Friday
Tickets sold			
Profit			
Would you make a loss? (Yes/No)			

Disco model activity 2: Adding supervising teachers

This activity sheet will help you to develop your disco model.

As more variables are added to the model it becomes more realistic and useful. You are going to add teachers to your model.

Teachers must be present!

The headteacher at the school has said that the disco can only go ahead if there are teachers present. There must be one teacher for every 50 pupils. If there are 51 pupils then two teachers would be needed, and so on. Each teacher will have to be paid £20 for doing this.

You now have to add three extra pieces of information to your model:

1   the number of teachers required (this will change according to the number of pupils)

2   the cost of paying each teacher

3   the total cost of paying the teachers.

Step 1 Adding extra labels

You will need to put a new heading on your spreadsheet for *Additional information*.

	A
1	**Disco Model**
2	
3	**Name:**
4	**Form/Class**
5	
6	**Additional information**
7	*Number of teachers*
8	*Cost per teacher*

Type this in cell A6. Below it enter a label for the *Number of teachers* and a label for *Cost per teacher*.

The numbers will go alongside in column B.

Step 2 How to work out the *Number of teachers*

You know that you need one teacher for every 50 pupils. So the formula that you enter into cell B7 will have to include a step to divide the *Number of tickets sold* by 50.

> Remember: the / sign is used to show division in a spreadsheet formula.

Use the cell reference for the number of tickets sold and divide it by 50.

Enter the formula into B7.

Step 3 Adding the *Cost per teacher*

The cost per teacher is £20. This information is just typed into B8. This cell refers to money so you will need to format the cell as currency.

Step 4 Inserting an extra row

You now have to add the *Total cost of teachers* into the list of costs. As you can see there is no room so you will have to insert a row.

22	**Costs**
23	*Hire disco equipment*
24	*Pay the DJ*
25	*Cost of the caretakers*
26	*Total costs*

To insert a row:

1   Click where you want the row inserted (click on label for *Hire of disco equipment*).

2   Click on the Insert menu.

3   Click on Row.
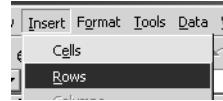
Now type in your label and your list should look like this.

22	**Costs**
23	*Total cost of teachers*
24	*Hire disco equipment*
25	*Pay the DJ*
26	*Cost of the caretakers*
27	*Total costs*

Step 5 Calculating the *Total cost of teachers*

You can now put the formula to calculate the *Total cost of teachers* into cell B23. The formula needs to multiply *Number of teachers* by *Cost per teacher*.

Remember: the * sign is used to show multiplication in a spreadsheet formula.

Step 6 Recalculating the formula for *Total costs*

Your formula for *Total costs* has now moved down to B27. This will need to be recalculated to make sure it includes all costs.

Interrogating your model to answer questions

Now that you have altered your model to include paying teachers, you are going to use it again to find out what happens to your overall profit on the three different days.

Remember, there are 450 pupils in the year.

If you hold the Disco on Wednesday, 150 pupils would attend.

If you hold the Disco on Thursday, 250 pupils would attend.

If you hold the Disco on Friday, 350 pupils would attend.

For each day, change the number of tickets sold in cell B15 and complete the table below. You may find that you have a negative number in your Profit cell. This means you will not have not made a profit; in fact you will have lost money.

Profit forecast after teachers have been added

	Wednesday	Thursday	Friday
Tickets sold			
Profit			
Would you make a loss? (Yes/No)			

Selling raffle tickets

Buy two tickets, get one ticket free

Free drink

Costs the school 20 pence per drink

Disco model activity 3: Adding free drinks

This activity sheet will help you to develop your disco model.

As more variables are added to the model it becomes more realistic and useful. This time, you are going to add free drinks to your model.

Free drinks for all!
There will be a free drink for all pupils and all teachers, to try to increase the number of tickets sold. In the past a free drink has increased ticket sales by 100. It will add 25p to the cost of each person attending – including the teachers.

You now have to add three extra pieces of information to your model:

4   the total number of people for free drinks (pupils plus teachers)

5   the cost of each drink

6   the total cost of paying for the drinks.

Step 1 Adding extra labels
You need to add two new labels under your heading *Additional information*.

One label is for the *Total number of people* (including both pupils and teachers) and the other is for the *Cost per drink*. This is the price the disco organisers have to pay for the drinks.

This is what your additional information table should look like now.

6	**Additional Information**
7	Number of teachers
8	Cost per teacher
9	Total number of people
10	Cost per drink

Step 2 How to work out the *Total number of people*
The *Total number of people* will be given by a formula that will add the *Number of teachers* to the *Number of tickets sold*.

Enter the formula in B9.

Step 3 Adding the *Cost per drink*
The cost per drink is 25p. This information is just typed into B10. This cell refers to money so you will need to format the cell as currency.

Step 4 Inserting an extra row
You now have to add the *Cost of free drinks* into the list of *Costs*.

As you can see, there is no room so you will need to insert a row.

22	**Costs**
23	Cost of free drinks
24	Total cost of teachers
25	Hire disco equipment
26	Pay the DJ
27	Cost of the caretakers
28	Total costs

To insert a row:

1   Click where you want the row inserted (click on label for *Total cost of teachers*).

2   Click on the Insert menu.

3   Click on Row.
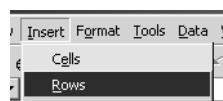
Now type in your label and your list should look like this.

22	**Costs**
23	*Cost of free drinks*
24	*Total cost of teachers*
25	*Hire disco equipment*
26	*Pay the DJ*
27	*Cost of the caretakers*
28	*Total costs*

Step 5 Calculating the *Cost of free drinks*

You can now put the formula to calculate the *Cost of the free drinks* into cell B23. The formula needs to multiply the *Cost of a free drink* by the *Total number of people*.

> Remember: the * sign is used to show multiplication in a spreadsheet formula.

Step 6 Recalculating the formula for *Total costs*

Your formula for *Total costs* has now moved down to B28. This will need to be recalculated to make sure it includes all costs.

Using your model to answer questions

Now that you have added free drinks into your model you are going to use it again to find out what happens to your overall profit on the three different days.

On past experience, the free drinks will increase ticket sales by 100 for each night.

So, with free drinks, you can make the following predictions.

There are 450 pupils in the year.

If you hold the disco on Wednesday, 250 pupils would attend.

If you hold the disco on Thursday, 350 pupils would attend.

If you hold the disco on Friday, 450 pupils would attend.

For each day, change the number of tickets sold in cell B15 and complete the table below. You may find that you have a negative number in your *Profit* cell. This means you will not have not made a profit; in fact you will have lost money.

Profit forecast after free drinks have been added

	Wednesday	Thursday	Friday
Tickets sold			
Profit			
Would you make a loss? (Yes/No)			

Disco model activity 4: Adding posters

This activity sheet will help you to develop your disco model.

As more variables are added to the model it becomes more realistic and useful. This time, you are going to add posters to your model.

High-quality posters
Past experience suggests that high-quality, colour posters can increase ticket sales by 50. Each of the teachers coming to the disco has agreed to place a poster in their classroom. You also decide to put a poster in the main entrance of the school. The cost of producing one poster is £6.

You now have to add three extra pieces of information to your model:

7   the total number of posters required (teachers' classrooms plus main entrance)

8   the cost of each poster

9   the total cost of paying for the posters.

Step 1 Adding extra labels
You need to add two new labels under the heading *Additional information*.

One label is for the *Cost of poster* and the other is for the *Number of posters*.

This is what your additional information table should look like now.

6	**Additional Information**
7	*Number of teachers*
8	*Cost per teacher*
9	*Total number of people*
10	*Cost per drink*
11	*Cost of poster*
12	*Number of posters*

Step 2 How to work out the *Number of posters* needed
Each of the teachers coming to the disco will be putting a poster in their classroom. Another poster is to be placed in the main school entrance.

So, the *Number of posters* needed is set by how many teachers you have, plus one.

Number of posters = Number of teachers + 1

Enter the formula in B12.

Step 3 Adding the *Cost of a poster*
The cost of a poster is £6. This information is just typed into B11. The cell refers to money so you will need to format the cell as currency.

### Step 4 Inserting an extra row
You now have to add the *Cost of posters* into the list of *Costs*.

As you can see, there is no room so you will need to insert a row.

22	**Costs**
23	*Total cost of teachers*
24	*Hire disco equipment*
25	*Pay the DJ*
26	*Cost of the caretakers*
27	*Total costs*

To insert a row:

1   Click where you want the row inserted (click on the label for *Cost of free drinks*).

2   Click on the Insert menu.

3   Click on Row.

Now type in your label and your list should look like this.
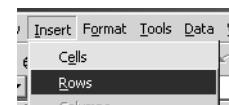
22	**Costs**
23	Cost of posters
24	Cost of free drinks
25	Total cost of teachers
26	Hire disco equipment
27	Pay the DJ
28	Cost of the caretakers
29	Total costs

Step 5 Calculating the *Cost of posters*
You can now put the formula to calculate *Cost of posters* into cell B23. The formula needs to multiply the *Cost per poster* by the *Number of posters*.

Remember: the * sign is used to show multiplication in a spreadsheet formula.

Step 6 Recalculating the formula for *Total costs*
Your formula for *Total costs* has now moved down to B29. This will need to be checked to make sure it includes all costs from row 23 to row 28.

Using your model to answer questions
Now that you have added posters into your model you are going to use it again to find out what happens to your overall profit on the three different days. The posters will increase your ticket sales by 50 for each night.

There are 450 pupils in the year.

If you hold the disco on Wednesday, 300 pupils would attend.

If you hold the disco on Thursday, 400 pupils would attend.

If you hold the disco on Friday, 450 pupils would attend.

Profit forecast after posters have been added.

	Wednesday	Thursday	Friday
Tickets sold			
Profit			
Would you make a loss? (Yes/No)			

Extension questions

1   You are going to change the *Number of tickets* sold in B15 to 400. **Before** you do this, think about how many different values will also be changed across the spreadsheet by doing this. Write down their cell references.

Now enter 400 in B15. Did it change all the values you expected?

2   You are going to find out what would happen if you reduced your *Ticket price*.
Set the *Number of tickets sold* to 400.

If you set the *Ticket price* to £2.00 you will make a loss. Try this. Now keep changing the *Ticket price* until you only just make a profit.

What was the price?

Price £....................

What was the profit?

Profit ....

3   You are going to find out what would happen if you increased the cost of each poster. Keep the *Number of tickets* sold at 400. Change the *Ticket price* back to £2.50. Keep increasing your poster cost until you only just make a profit.

What is the highest poster cost that still lets you make a profit?

£ ....

4   Try asking a question of the model yourself. Ask another pupil to try to answer it. Did they answer it? Was it a sensible question to ask of the model?

Describe what happened.

School disco report

This report contains information relating to the proposed school disco. The disco will be held on a Wednesday, Thursday or Friday. For each day we have produced a chart to show a breakdown of the different costs. We have also included a small table to show the predicted income, costs and profit for each of the three days.

To: The headteacher

From:

Date:

Wednesday	
Number of pupils expected:	
Costs breakdown	
Income/costs/profit information	

Thursday	
Number of pupils expected:	
Costs breakdown	
Income/costs/profit information	

Friday	
Number of pupils expected:	
Costs breakdown	
Income/costs/profit information	

We hope that this report will be useful to you.

Signed

Copying information from your spreadsheet to your report

- Highlight the information you wish to copy (A33 to B35 showing total income, total costs and profit).

32		
33	Total income	£1,000.00
34	Total costs	£946.00
35	Profit	£54.00

- Click on the Copy tool [icon] .

- Open up your *Headteacher report* file.

- Move the cursor to where you want the chart to appear.

- Click on the Paste tool [icon] .

Disco model activity 5: Help sheet 1

This activity sheet will help you to use Chart Wizard to create charts from your model.

Create a graph or chart

You are now going to produce a chart to display your Costs table. Your teacher has already demonstrated how to use the Chart Wizard to draw a chart. These instructions will act as a reminder.

1 Highlight the area of data you wish to display in the chart.

20		
21		
22	Costs	
23	Cost of posters	£54.00
24	Cost free drinks	£102.00
25	Total cost of teachers	£160.00
26	Hire Disco eqipment	£500.00
27	Pay the DJ	£100.00
28	Cost of the school keepers	£30.00
29	*Total costs*	**£946.00**
30		

2 Click on the Chart Wizard button 📊 on the tool bar.

3 Select the type of chart you wish to use. Click on Next.
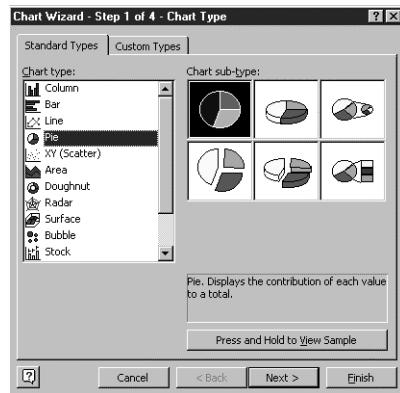
**4** Check the chart is correct. Click on Next.
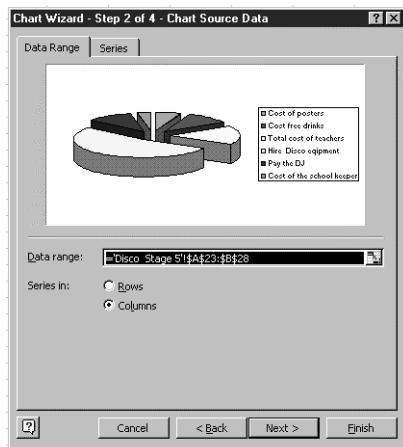
5 Add the title *Costs*.

Now select the Data labels tab and select Show value.

Click on Next.
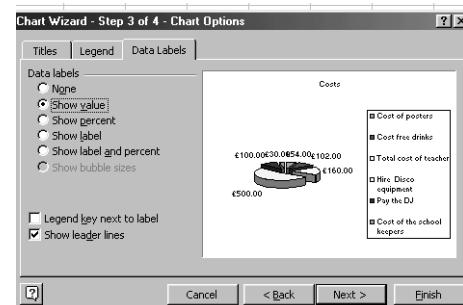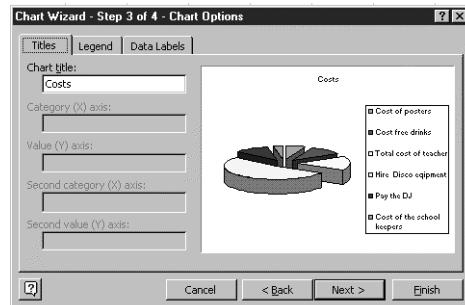
6 Click on Finish.
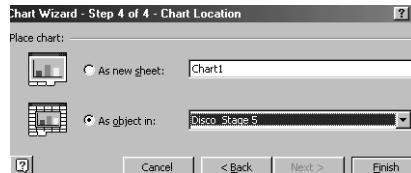
You have used the Chart Wizard to create a chart.

You can now use your mouse pointer to drag the actual chart and make it bigger. Select the chart and drag from one of the corners (clicking on the black dot) until your chart is the size you want it to be. Other features can also be edited from here if necessary.

Disco model activity 5: Help sheet 2

This activity sheet will help you copy charts and information from your model into the report.

Copying a chart into your report

1   Click on your Chart to select it.

2   Click on the Copy tool .
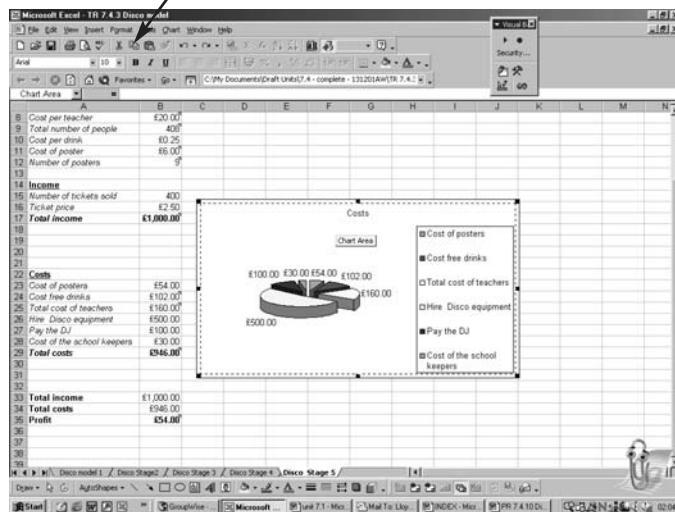
3   Open up your Headteacher report file.

4   Place the cursor to where you want the chart to appear.

5   Click on the Paste tool .

Notes

Key Stage 3 National Strategy / ICT Sample teaching unit 7.4

Notes

Key Stage 3 National Strategy / ICT Sample teaching unit 7.4

Notes

Notes

Notes