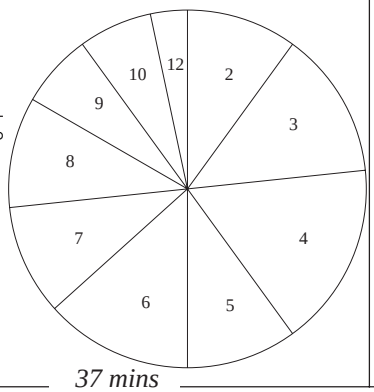
Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 1	*Frequency Tables: Pie Charts*
Activity		***Notes***
		Ps will each need a protractor, a pair of compasses and a ruler for Lesson Plan 1, Activity 4B
1	**Checking on data collection** T: Are you still keeping your daily diary? Today's notes will be the last ones you will need to write because we're going to look at them all tomorrow. And what about the Top 20 singles you chose at the beginning of September - are they still around? Does anyone still listen to them? Are the groups that made them still together? This week will be the last time you will need to note their chart progress. T: Which of the topics we covered in the last year is connected to our activities in the last fortnight? What have we been doing? *(Collecting data)* T: Now we're going to review the work we did on Data Analysis last year.	A fortnight ago, T asked Ps to begin collecting data for use in this unit: 1. Each P was given a copy of Activity 5.1, and was asked to keep a diary of data for these points for 10 weekdays. 2. In their first maths lesson of term, Ps had to each choose 5 singles from the UK Top 20 and follow the progress of these tracks for 10 weeks. Data is available on the internet (e.g. http://www.top40-charts.com/) T should have checked from time to time that Ps were doing this.
	3 mins	
2	**Types of data** T: What types of data have you dealt with? *(Qualitative data and quantitative data)* **OS 5.1** T (after putting on the OS): What is shown in the table at the top of the slide? *(Information about the results of a maths test)* T: What name is given to a collection of information? *(Database)* T: What type of data is shown here? *(Quantitative data)* T: Have you met any other types of data? *(Continuous data)* T: Can you remember 'tally charts' and 'frequencies'? Who'd like to start filling in the table?	Whole class activity. Task appears on OHP, with final column ('Angle') covered. First T asks Ps general questions about the OS ... ... then T asks a volunteer slower P to start work on the tally chart at OHP. About halfway through, T points to an encouraged slower P to complete the chart, then a third one to count frequencies. Other Ps listen and correct if necessary. Agreement. Praising.
	7 mins	
3	**Drawing a tally chart and finding frequencies** **PB 5.1, Q2 (drawing tally chart and finding frequencies only)**	Individual work. T monitors Ps' work and helps struggling ones to construct an appropriate tally chart to complete. Verbal checking of frequencies: T says data (numbers of videos hired in any hour, e.g. in increasing order), and points to Ps to say the frequencies. Agreement, feedback, self-correction. Praising.
	17 mins	

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 1	*Frequency Tables: Pie Charts*
Activity		***Notes***
3 *(continued)*	T: How can we illustrate data? *(Pictograms, bar charts, pie charts, vertical line diagrams)* T: Can you remember how to construct a pie chart? *(We have to divide an angle around a point into pieces according to the data's frequencies)* T: Let's look at our first example. **OS 5.1, completing column 'Angle'**	Mental work. OS 5.1 appears again on OHP, but now with final column uncovered. First volunteer Ps, then encouraged slower Ps, should be asked to calculate mentally and then dictate the $\frac{f}{20}$ of $360°$. T points to P, waits for the answer, waits for agreement or correction and then writes angles on OS. Praising.
4B	T: Now let's construct our pie chart. **OS 5.2**	Whole class activity. T has told Ps that they will need a protractor, a pair of compasses and a ruler for this unit. Each P has a copy of Activity 5.2 to work on. T asks Ps, Ps say next step and work on their sheet. For struggling Ps, T also demonstrates on BB, using board equipment. At the end, T walks among Ps monitoring their work and praising.
	27 mins	
5	**Completing a tally chart and answering questions** **PB 5.1, Q2 (a) - (d)**	Individual work. T suggests Ps complete their tally charts with a fourth column to determine the angles for the pie chart. T monitors Ps' work and helps slower ones, mainly with construction of angles. Checking: completed tally chart appears on OHP. Ps check their angles in the chart, T checks their pie charts by walking among them. Self-correction. Praising.

(a)

No. of Videos	*Tally*	*Frequency*	*Angle*
1		0	0°
2	𝍸	3	36°
3	𝍸 I	4	48°
4	𝍸 𝍸	5	60°
5	𝍸	3	36°
6	𝍸 I	4	48°
7	𝍸	3	36°
8	𝍸	3	36°
9	II	2	24°
10	II	2	24°
11		0	0°
12	I	1	12°
	TOTAL	30	360°

(b) 12 (c) 2 (d) 4



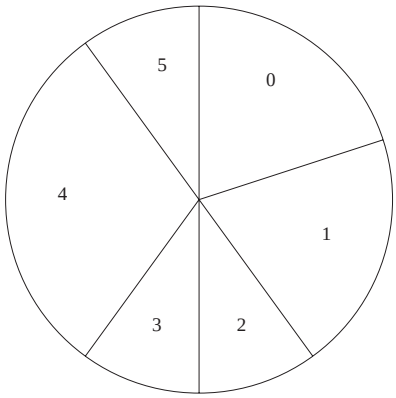
Then answering questions (b) - (d). T points out obvious misconceptions (e.g. that the most common value of data is 4 and the frequency is 5.)

37 mins

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 1	*Frequency Tables: Pie Charts*
Activity		***Notes***
6	**Individual work** T: Now work through all the steps of this question on your own. **PB 5.1, Q3**	Individual work, but before Ps start, T asks them to repeat the steps they will need to do: - draw a tally chart - count frequencies - determine sizes of angles - construct pie chart. T monitors work, helping slower Ps. Verbal checking of frequencies, then T sketches an 'approximate pie chart' on BB to compare. Feedback, self-correction (of pie chart, at home). Praising.

(a)

No. of Goals	*No. of Matches*	*Angle* (°)
0	2	72
1	2	72
2	1	36
3	1	36
4	3	108
5	1	36
	10	360



(b) 4 goals

45 mins

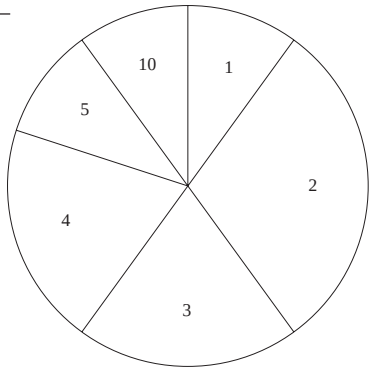
Set homework
PB 5.1, Q1

Y8 UNIT 5 *Data Analysis* Lesson Plan 2

Frequency Tables: Vertical Line Diagrams

Activity		***Notes***
1	**Checking homework** **PB 5.1, Q1** ***(a)***	T has prepared solution on an OS and puts it on OHP at beginning of lesson. Feedback, self-correction (only frequencies). Praising.

No. of Conkers	*No. of Days*	*Angle* (°)
1	1	36
2	3	108
3	2	72
4	2	72
5	1	36
6	0	0
7	0	0
8	0	0
9	0	0
10	1	36



(b) *Perhaps strong winds had dislodged more conkers than usual when 10 were found.*

5 mins

2A (Struggling Ps)

(1) Correction of homework for struggling Ps

Ps who had difficulties with homework (e.g. could not construct pie chart), sit around T, who explains the method and shows how it is done, on paper, one more time. Ps do the same, step-by-step. Praising.

2A (Other Ps)

(2) PB 5.1, Q4 for others

(a) 15°

(b)

Score	*Angle*	*Frequency (No. of Pupils)*
3	45°	3
4	90°	6
5	60°	4
6	15°	1
7	90°	6
8	30°	2
9	15°	1
10	15°	1
TOTAL	360°	24

T: Was it difficult to work out the number of pupils getting each score?

Ps: Yes.

T: Why?

Ps: Because we had to measure the angles and then do a calculation.

T: What can you see immediately from a pie chart?

Ps: The ratio of frequencies of data.

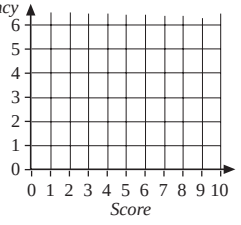
T: Can you suggest another way of illustrating data where we can see the frequencies at first sight?

Ps: Vertical line diagrams.

T: That's right. Let's draw one using the data from this question.

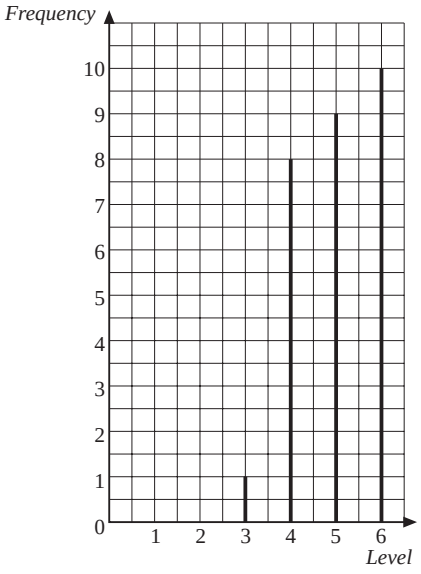
18 mins

Individual work.
Checking: a volunteer P introduces and explains the problem (also helpful for struggling Ps). Then calculation of number of degrees to represent each pupil and checking the number getting each score (Ps dictate, agree, T writes on BB, praises). Discussion leads to the topic for this lesson. Ps can answer in chorus - no need to wait for volunteers. Short discussion on how to draw a vertical line diagram, agreeing on names for the axes (values put on the horizontal axis; frequencies, here the number of Ps, on the vertical axis). Then T sketches grid on BB, Ps dictate, T draws the vertical lines on BB, Ps in Ex.Bs.



Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 2	*Frequency Tables: Vertical Line Diagrams*
Activity		***Notes***
3	**Vertical line graphs** **OS 5.3** *25 mins*	Whole class activity. Task appears on OHP. Ps are asked to come to OHP, one to draw tallies, one to count frequencies and six to draw vertical lines (one P for each line). Other Ps watch, listen and correct if necessary. T praises. T should draw attention to the naming of axes (contrary to previous task, the numbers of pupils are *not* the frequencies here).
4	**Individual work with vertical line graphs** **PB 5.1, Q5** ***(a)***	Individual work, monitored, helped.

Level	*Tally*	*Frequency*
3	𝍸	1
4	𝍸 𝍸 | | |	8
5	𝍸 𝍸 | | | |	9
6	𝍸 𝍸 𝍸 |	10



Verbal checking to agree frequencies, then a P sketches the vertical line diagram on BB.

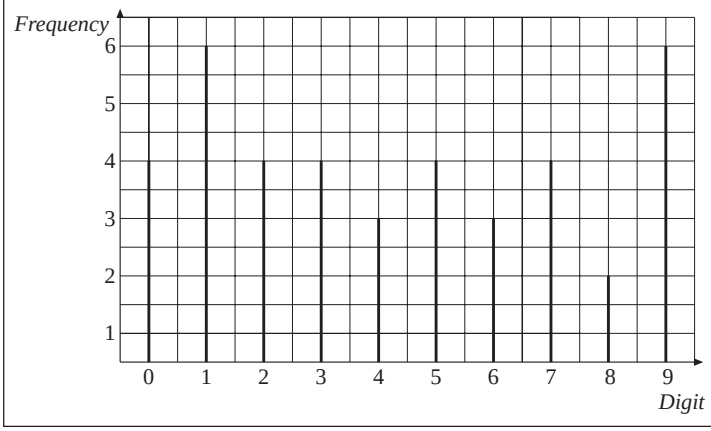
(b) Level 6 obtained by the most pupils

Agreement, feedback, self-correction. Praising.

33 mins

5	**Pie charts** **Activity 5.1** T: Take out the diary you kept for 10 weekdays. What kind of data do you have on your list? *(Qualitative and quantitative)* T: Which data is qualitative? *(Breakfast, lunch, sport, ...)* T: Which is quantitative? *(Sleeping time, waking up time, ...)* T: Choose the first one in the list from each of the two types of data. Your task is to show the data of one type on a pie chart, and to show the data of the other type on a vertical line diagram. Which type of data would be better shown on a pie chart? *(Qualitative data, here, the breakfast eaten by Ps)* *45 mins*	First discussion ... ...then individual work. Ps have to illustrate their breakfast on a pie chart, their sleeping time on a vertical line diagram. Before they draw their tally charts, T suggests that they round sleeping times to the nearest 0.5 hour. T monitors Ps' work, checking at the same time, and helps slower ones.

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 2	*Frequency Tables: Vertical Line Diagrams*
Activity		***Notes***
	Set homework **(1) PB 5.1, Q7** **(2) Find the winning numbers (without the Bonus Balls) in the past 13 weeks UK National Lottery 'Lotto' draws (on Wednesdays and Saturdays)** (See http://lottery.merseyworld.com/)	

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 3	*Measures of Central Tendency*
Activity		***Notes***
1	**Checking homework** **(2) Winning numbers in National Lottery 'Lotto'** **(1) PB 5.1, Q7**	T has asked one of Ps to write down the results of the last 13 weeks 'Lotto' draw on BB as soon as P arrives. P has to write $6 \times 26 = 156$ numbers on BB (for Wednesday and Saturday draws). While P is writing on BB, other Ps check their answers to homework (1).
	Digits / *No. of Times*: 0: 4; 1: 6; 2: 4; 3: 4; 4: 3; 5: 4; 6: 3; 7: 4; 8: 2; 9: 6  	T has prepared an OS showing the solution to part (a), and now puts it on OHP.
	e.g: T: What would be the expected distribution? *(Frequency of 4 for each number)* T: Do you think that the calculator was fair? *(Yes - No, discussion)* T: How can we decide on its fairness with more certainty? *(Produce more, for example, 4000 random digits, instead of 40)*	Self-correction, feedback. Praising. Then discussion of the answers for part (b). Finally, Ps are given some minutes to check if the numbers in their Ex.Bs are correct. T should also do the same. (T has also found the 'Lotto' numbers on the internet, to be able to take part in the debate.)
	8 mins	
2 *(continued)*	**Individual practice with vertical line graphs** **Activity 5.2, Q2**	Individual work. After agreeing on the numbers in the last 26 draws, Ps are given the same task they had in their homework: illustrating and deciding if the draws seem fair.

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 3	*Measures of Central Tendency*
Activity		***Notes***
2 *(continued)*	T: How many numbers were drawn during the last 13 weeks? *(* $26 \times 6 = 156$ *numbers)* T: How many different numbers can be drawn in the UK National Lottery 'Lotto' ? *(49)* T: What is the expected frequency for each number? *(*$\left(\frac{156}{49}\right) \approx 3.18$*)* T: Do you think the 'Lotto' draw is fair? *(Yes - No, discussion)* *20 mins*	Verbal checking of frequencies; diagrams are checked by T walking among Ps. Then discussion.
3	**Mode, median and mean** T: Last year, as well as looking at ways of displaying data, we also looked at ways of examining it. Can you remember what measures we used? *(We used measures of central tendency and measures of dispersion of the data)* T: Let's practise some of them. **OS 5.7** T (after putting OS on OHP): What do suggest we do first? *(Draw a tally chart/frequency table)* P_1:	Whole class activity. Task appears on OHP. T encourages Ps to remember averages and range. First a slower P counts frequencies at BB.

Size	*Tally*	*Frequency*
6	II	2
7	IIII	4
8	~~IIII~~	5
9	~~IIII~~ I	6
10		0
11	I	1
12	I	1
13	I	1
	TOTAL	20

	T: Let's look at the measures and what they mean. What is the mean of a set of data? How do we use the table? P_2: We have to divide the sum of all the values by the number of values. Here (P writes on OS): $\frac{6\times2+7\times4+8\times5+9\times6+10\times0+11\times1+12\times1+13\times1}{20}$ $= \frac{170}{20} = 8.5$ T: What is the median? P_3: The middle value after arranging the data in order. T: If? P_3: ? Ps: If we have an odd number of values. T: Otherwise?
(continued)	

Then T asks what concepts Ps leant in Year 7, Unit 18. Ps volunteer, come to OHP, try to answer questions (others agree or not), and apply definitions.
T ensures correct spoken mathematics is used. Praising.

T may help Ps to find a quicker method.
Ps discuss and guess if the mean can be the measure of the most use in this case (as it usually is) or not.

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 3	*Measures of Central Tendency*
Activity		***Notes***
3 *(continued)*	P_3: We have to use the mean of the two middle values. T: So what do we do here? P_3: As there are 20 values, the median will be the mean of the 10th and the 11th values. T: Do you have to write them all down again, this time in increasing order? How can the frequency table help? P_3: The numbers are already in increasing order in the frequency table. So we have to count the first 10 numbers: two 6s + four 7s + five 8s; these are eleven values, so the tenth and eleventh ones are both 8. The median is 8. T: What about the mode? P_4: The mode is the most common value; here it is 9. T: And which of these measures best represents the data? Which would the manager of this shoe shop use when ordering new stock? *(The manager will choose a range of whole numbers; the mode would be the most important one)* T: There is another important type of average used for comparing data, that we haven't mentioned yet. What is it, and what is it used for? P_5: The range, used to describe the spread of a set of data. T: How do we define it? p_5: The range is the difference between the largest and the smallest value. Here the range is $13 - 6 = 7$.	Finally, T asks how the measure of the spread of data can be described. Agreement. Praising.
	30 mins	
4	**Mental work** **PB 5.2, Q1 (a), (c)** e.g. T: Look at the following set of data (writes on BB): 3, 6, 3, 7, 4, 3, 9 Which of the averages is obvious? *(The mode is 3)* T: What else can you say about them without too much thought? *(The range is* $9 - 3 = 6$*)* T: Can you put them in order, in your head? Which is the median value? *(From the seven values, the fourth number is the middle value; this is the 4)* T: Can you add up the seven numbers? What do they total? *(The sum of the numbers is 35, so the mean* $= 35 \div 7 = 5$*)* Similar process with part (c). *(Mean* 7.5 Median 7.5 *Mode* none *Range* 5*)*	Mental work for practice, and for T to check that slower Ps remember the different measures of central tendency and spread of data. T writes data from (a) on BB and encourages Ps to calculate mentally as far as they can. Slower Ps can use Ex.Bs. T asks, waits for Ps to think, points to a volunteer P, P answers, T waits for agreement or correction, then praises.
	38 mins	
5 *(continued)*	**Individual work with averages** **PB 5.2, Q3** *(b) Mean* = 1.83 *(2 d.p.)* *(c) Median* = 1.5 *(d) Mode* = 1 *goal* *(e) Range* = 6	Individual work, monitored, helped. Verbal checking of frequencies first, then answering and explaining solutions to parts (b) - (e). Agreement, feedback, self-correction. Praising.

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 3	*Measures of Central Tendency*
Activity **5** *(continued)*		***Notes*** Finally, T can introduce Greek capital 'sigma' (σ) sign with its meaning (sum).
	45 mins	
	Set homework **(1) PB 5.2, Q7** **(2)** Ps choose the 2 singles that stayed in the Top 20 for the longest time, out of the 5 they followed for 10 weeks. Write the chart progress of these two singles in Ex.Bs (or complete it retrospectively from internet).	

Y8 UNIT 5 *Data Analysis* Lesson Plan 4 — *Comparing Data*

Activity		*Notes*
1	**Checking homework** **(1) PB 5.2, Q7** (a) Mean = 5.24 Median = 5 Mode = 4 (b) Modal value **(2)** Copying the 10 weeks' chart progress of 2 singles.	Verbal checking of part (a), to include review of definitions, for struggling Ps at BB, if necessary. Agreement. Praising. Then discussion of part (b), asking for more explanation, encouraging Ps to talk about their ideas. Agreement. Praising. T checks that each P has written data in their Ex.B, by walking among them
	5 mins	
2	**Mental work with averages** **M 5.2** e.g: T: Calculate the mean of 7, 10 and 4 ... I'll repeat the numbers: 7, 10 and 4 (points to P_1). P_1: The mean is 7 because this is the middle number when arranging them in order - 4, 7, 10, and these are symmetrical about 7.	Mental work. Before using different types of averages to compare sets of data, T makes Ps review them once more. T reads out tasks slowly and clearly (struggling Ps may write them in Ex.Bs), waits for all Ps to think, then points to volunteer P to answer and explain. Agreement. Praising.
	13 mins	
3	**Further work with averages** T: Now we know how to describe a set of data and how to compare data sets. For PB 5.1, Q5, we constructed a tally chart for the maths levels reached by a class (draws the frequency table on BB). Copy this into your Ex.Bs.	Whole class activity.

Level	*Tally*	*Frequency*
3	|	1
4	𝍸 |||	8
5	𝍸 ||||	9
6	𝍸 𝍸	10

T draws the table on BB, Ps copy it into their Ex.Bs.

PB 5.1, Q6

T: This class was also tested in English. Your task is to compare the two sets of data and comment on the differences by calculating averages and ranges.

Levels for English

Level	*Tally*	*Frequency*
3	|||	3
4	𝍸 𝍸	10
5	𝍸 ||||	9
6	𝍸 |	6

T draws a similar table on BB for this question, and asks two slower Ps to draw tallies and count frequencies.

Slower Ps are also asked to calculate the measures of central

(continued)

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 4	*Comparing Data*
Activity		***Notes***
3 *(continued)*	*For Maths:* P_1: Range $= 6 - 3 = 3$ P_2: Mode $= 6$ P_3: Median $= 5$ P_4: Mean $= \frac{3 \times 1 + 4 \times 8 + 5 \times 9 + 6 \times 10}{28}$ $= \frac{140}{28} = 5$ *For English:* P_1: Range $= 6 - 3 = 3$ P_2: Mode $= 4$ P_3: Median $= 5$ P_4: Mean $= \frac{3 \times 3 + 4 \times 10 + 5 \times 9 + 6 \times 6}{28}$ $= \frac{130}{28} \approx 4.64$ *17 mins*	tendency and the spread of the data, either at BB or mentally. Other Ps listen and watch, correcting if necessary, then write in Ex.Bs. Praising. Discussion follows: comparing and commenting on the data (differences between the two sets are obvious).
4 *(continued)*	**Group work comparing data sets** **PB 5.2, Q9**	Work in groups. T divides class into two groups, by seating. One group will take the part of Class A, the other, Class B. Each group has to represent their data as a vertical line diagram and count their own averages and range. Ps can work together but each P must prepare the diagram in their own Ex.B. When groups are ready, T asks one P from each group to draw their diagrams on BB (T has already drawn two grids on BB for this) and two other Ps to write down averages and ranges close to their diagram. T agrees and asks groups to explain why their result is better than the other group's. (This will be difficult as both groups have the same range, median and mean. Class B has higher mode (10) but Class A has two quite high modes (6 and 8) with the same frequency as B's mode.

Y8	**UNIT 5** ***Data Analysis*** Lesson Plan 4	*Comparing Data*
Activity **4** *(continued)*		***Notes*** The results of Class A are mainly around the median, whilst Class B has many poor results as well as its outstanding ones. This can also be seen from the diagrams.) T 'chairs' debate and tries to lead Ps to agree. Praising.
	35 mins	
5	**Individual work** **Activity 5.4**	Individual work. Each P uses their own data on the chart progress of two singles, and is given a copy of Activity 5.4 to work on. When Ps have seen the Activity Sheet, but before they start work, T can ask them to summarise what is to be done. Then they do as instructed, monitored and helped by T. Since each P has different data, T can check their work while monitoring progress. At the end of the lesson, volunteer Ps can show their work. Praising, then discussion of Q5.
	45 mins	
	Set homework **PB 5.2, Q10, extended with** **'Draw vertical line diagrams to illustrate Paul's and David's data.'**	