Pupils should be taught to:	As outcomes, Year 7 pupils should, for example:

Calculate statistics from data, using ICT as appropriate	Use, read and write, spelling correctly:
	statistic, interval…
	range, mean, median, mode, modal class/group, average…
	
	Know that:
	• The mode is the only statistic appropriate for data based on non-numeric categories, e.g. the most common way of travelling to school.
	• The mean is often referred to as 'the average'.
	
	Find the mode of a small set of discrete data.
	
	Know that the mode of a set of numbers is the number that occurs most often in the set. For example:
	
	• For 1, 2, 3, 3, 4, 6, 9, the mode is 3.
	  For 3, 4, 4, 4, 7, 7, 8, the mode is 4.
	  For 2, 2, 3, 5, 6, 9, 9, there are two modes, 2 and 9.
	
	In a grouped frequency distribution, the group that contains the most members is called the modal class or modal group.
	
	Calculate the mean for a small set of discrete data, using a **calculator** for a larger number of items.
	
	The mean of a set of numbers is the sum of all the numbers divided by the number of numbers in the set. For example:
	
	• The mean of 2, 6, 8, 9 and 12 is:
	
	$$\frac{2+6+8+9+12}{5} = \frac{37}{5} = 7.4$$
	
	• For this data set for 100 words in a newspaper passage:

No. of letters:	1	2	3	4	5	6	7	8	9	10	11	12	13
No. of words:	5	15	31	12	7	6	14	5	3	0	2	0	0
Total letters:	5	30	93	48	35	36	98	40	27	0	22	0	0

the mean number of letters in a word is:

$$\frac{5 + 30 + 93 + 48 + 35 + 36 + 98 + 40 + 27 + 22}{100} = \frac{434}{100} = 4.34$$

Use vocabulary from previous year and extend to:
distribution…
stem-and-leaf diagram…

Know when it is appropriate to use the mode (or modal class), mean, median and range:

- The median is useful for comparing with a middle value, e.g. half the class swam more than 500 m.
- The range gives a simple measure of spread.
- The mode indicates the item or class that occurs most often and is useful in reporting opinion polls.
- The mean gives an idea of what would happen if there were 'equal shares'.

Find the modal class of a set of continuous data,
i.e. the group with the most members. For example:

- London marathon times: top 100 women

Time (hours:minutes)	Frequency
$2{:}20 \leq T < 2{:}25$	0
$2{:}25 \leq T < 2{:}30$	7
$2{:}30 \leq T < 2{:}35$	3
$2{:}35 \leq T < 2{:}40$	5
$2{:}40 \leq T < 2{:}45$	8
$2{:}45 \leq T < 2{:}50$	4
$2{:}50 \leq T < 2{:}55$	12
$2{:}55 \leq T < 3{:}00$	10
$3{:}00 \leq T < 3{:}05$	33
$3{:}05 \leq T < 3{:}10$	18

Source: www.london-marathon.co.uk

The modal class is a marathon time,
T hours:minutes, of $3{:}00 \leq T < 3{:}05$.

Calculate the mean for a large set of data, using a **calculator** or **spreadsheet**. For example:

- Calculate the mean score thrown by a dice.

	A	B	C	D	E	F	G	H
1	Score	1	2	3	4	5	6	
2	No. of throws	26	30	28	32	31	29	=SUM(B2:G2)
3	Total	=B1*B2	=C1*C2	=D1*D2	=E1*E2	=F1*F2	=G1*G2	=SUM(B3:G3)/H2

	A	B	C	D	E	F	G	H
1	Score	1	2	3	4	5	6	
2	No. of throws	26	30	28	32	31	29	176
3	Total	26	60	84	128	155	174	3.56

The mean score for 176 throws is 3.56 (to 2 d.p.).

Calculate a mean using an assumed mean.
For example:

- Find the mean of 28.7, 28.4, 29.1, 28.3 and 29.5.

  Use 29.0 as the assumed mean.
  The differences are ⁻0.3, ⁻0.6, 0.1, ⁻0.7 and 0.5, giving a total difference of ⁻1.0.
  The actual mean is 29.0 – (1.0 ÷ 5) = 28.8.

Use vocabulary from previous years and extend to:
raw data, estimate of the mean/median, cumulative frequency…

Select statistics most appropriate to the problem.
Decide which statistics are most suitable in a particular case, choosing between the median and the mean partly on the basis of whether extreme or chance values will influence the measure unduly.
Be aware that the difference will be most significant in skew distributions, where both may need to be quoted.

Find the modal class of a large set of data.
For example:

- Use a population pyramid to find that there are more teenagers in Brazil than other age groups.
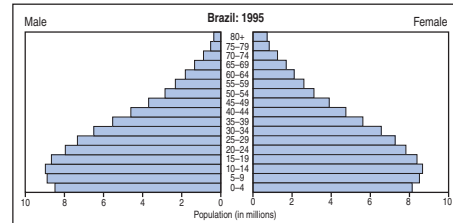
Source: US Census Bureau, International Data Base

Recognise that if the Brazilian population were grouped in 15-year intervals, data would be easier to plot and may show general trends just as clearly.

Calculate an estimate of the mean of a large set of grouped data to a suitable degree of accuracy.

Choose suitable mid-points for class intervals, justifying decisions, e.g. that a suitable mid-interval of the range 10–19 years is 15 years, and of an open interval such as '80+ years' is 90 years. For example:

- Using the data in the table, estimate the mean time spent on homework.

Time spent on homework (minutes)	Frequency
$0 \leq$ time ≤ 30	6
$30 <$ time ≤ 60	14
$60 <$ time ≤ 90	21
$90 <$ time ≤ 120	9
Total	50

The mean time is approximately:
$$\frac{(15 \times 6) + (45 \times 14) + (75 \times 21) + (105 \times 9)}{50} = 64.8 \text{ min}$$

- Estimate the mean age of a head of household in Brazil from this table, using a **spreadsheet** or the statistical facilities on a **calculator**.

Age group	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80+	Totals
Mid-range (x)	15	25	35	45	55	65	75	90	
Frequency (f)	232 813	5 395 646	8 080 436	6 185 652	4 192 554	2 766 020	1 255 301	335 960	28 444 382
$f \times x$	3 492 195	134 891 150	282 815 260	278 354 340	230 590 470	179 791 300	94 147 575	30 236 400	1 234 318 690

The mean age is approximately:
1 234 318 690 ÷ 28 444 382 = 43.3941, or 43.4 years

HANDLING DATA

| Pupils should be taught to: | As outcomes, Year 7 pupils should, for example: |

Calculate statistics from data, using ICT as appropriate, finding the mode, mean, median and range (continued)

Find and use the range of a small set of discrete data.

The range of a set of values is the difference between the largest and smallest numbers in the set. For example, for 2, 3, 4, 7, 9, 10, 12, 15, the range is 15 – 2 = 13.

Find the median of a small set of discrete data.

The median of a set of numbers is the value of the middle number when they are arranged in ascending order. For example, 2, 5, 8, 3, 1, 7, 6 becomes 1, 2, 3, 5, 6, 7, 8, and the median is 5.

If there is no single middle number, the mean of the two middle numbers is taken. For example, the set 1, 5, 7, 8, 9, 10 has a median of (7 + 8)/2 = 7.5.

<table>
<tr><td>

As outcomes, Year 8 pupils should, for example:

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As outcomes, Year 9 pupils should, for example:

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Find the range of a set of continuous data, calculating this as the highest rounded-off figure minus the lowest rounded-off figure. For example:

- Calculate the range of temperatures recorded at a weather station over a 24-hour period. Compare with the range of data from weather stations at different sites.

Range of temperatures at Snowdon on 10 May 2000

	Min.	Max.	Range
Summit	6.8 °C	13.8 °C	7 degrees
Llanberis	9.3 °C	15.5 °C	6.2 degrees
Clogwyn Station	9.3 °C	22.0 °C	12.7 degrees

Source: Snowdonia Weather Stations Project

Know that it can be helpful to state the range of a set of data as well as the mean, mode or median.

Find the median of a large set of data.
For example, find the median of:

- the time taken to run the London marathon;
- marks in a test taken by Year 8 pupils;
- the cost of a particular chocolate bar from various retailers.

Use a stem-and-leaf diagram to help find the median, range and mode. For example:

- Hours of sunshine for UK weather stations 10/05/00

Hours of sunshine for UK weather stations: 10/05/00

(stem = hours, leaves = tenths)

```
0 | 6 9
1 | 6 9
2 | 2 2 5 6 6 7 9
3 | 0 0 0 0 1 2 2 5 5 5 7 8 9
4 | 0 1 5 5 6 6 6 7 9
5 | 0 1 5 5 6 8 9 9
6 | 1 2 2 2 3 6 6 7 8 8 9 9 9 9 9
7 | 0 0 1 6 7 8 8
8 | 0 0
```

There are 65 items of data.
The median is the 33rd item, 4.9 hours (4 hours and 54 minutes) of sunshine.
The range is 8.0 – 0.6 = 7.4 hours.
The mode is 6.9 hours.

Estimate the range of a large set of grouped data.
For example:

- Estimate the range of the distances jumped by 67 pupils, from the data in this table.

| Distance jumped (cm)	No. of pupils
$180 \leq d < 190$	2
$190 \leq d < 200$	6
$200 \leq d < 210$	9
$210 \leq d < 220$	7
$220 \leq d < 230$	15
$230 \leq d < 240$	18
$240 \leq d < 250$	8
$250 \leq d < 260$	2

The first class is 180–189 cm, then 190–199cm, and so on. The last class is 250–259cm.
An estimate of the range is calculated by using the lowest class value in the first class (or 179.5cm) and the highest class value in the last class (or 259.5cm), giving an estimate of the range to be 259.5 – 179.5 = 80cm.

Estimate the median and interquatile range of a large set of grouped data, where the original data are not available. For example:

- Estimate the median distance jumped by 67 pupils, from the data in the table above.

  There are 67 pupils; the middle pupil is the 34th. The median must lie in the interval $220 \leq d < 230$, representing 15 pupils, from the 25th to 39th pupils. The 34th pupil is estimated to be 10/15 of the way along the interval of 10 cm, so an estimate of the median is 227cm to the nearest centimetre.

- Estimate the median and quartiles from a cumulative frequency diagram, e.g. by reading data for the 25th pupil from a graph showing the time that 50 pupils spent on homework.
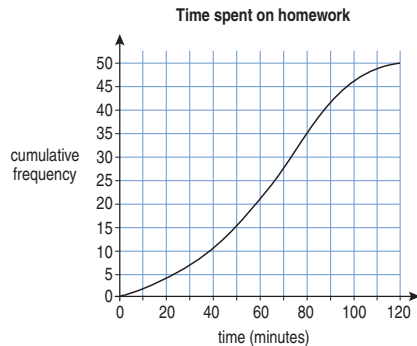
Time spent on homework

Pupils should be taught to:	As outcomes, Year 7 pupils should, for example:

Calculate statistics from data, using ICT as appropriate, finding the mode, mean, median and range (continued)

Calculate statistics. For example:

- A competition has three different games.
  Jane has played two of the games.

	Game A	Game B	Game C
Score	62	53	

To win, Jane needs a mean score of 60.
How many points does she need to score in game C?

- Phil has these four cards.
  The mean is 4.

1	8	5	2

  Phil takes another card. The
  mean of the five cards is still 4.
  What number is on his new card?

1	8	5	2	?

- Rajshree has six cards.

10	10	10	10	?	?

  The six cards have a mean of 10 and a range of 6.
  What are the numbers on the other two cards?

- I can catch either a Direct bus or a Transit bus to go home.
  For my last five journeys on each bus, this is how long I had to wait:

  | Direct bus | 10 min | 8 min | 5 min | 9 min | 8 min |
  | Transit bus | 16 min | 1 min | 2 min | 15 min | 1 min |

  Calculate the mean of the waiting time for each bus.
  Decide which bus it would be more sensible to catch.
  Explain why.

- Five careful measurements were made to find the mass of a nugget of gold. The five measurements were:
    2.003 2.012 1.998 2.000 1.989 ounces.
  Find the mean of the five measurements.

See Y456 examples (pages 116–17).

Calculate statistics. For example:

- Imran and Nia play three games.
  Their scores have the same mean.
  The range of Imran's scores is twice the range of Nia's scores.
  Write the missing scores in the table below.

Imran's score		40	
Nia's score	35	40	45

- John has three darts scores with a mean of 30 and a range of 20.
  His first dart scored 26.
  What were his other two scores?

- Collect data from weather stations over a 24-hour period.

Wind speed (mph) Snowdon 10/05/00

Location/time	Summit (1085 m)	Clogwyn (770 m)	Llanberis (105 m)
00:00	1	6	2
01:00	2	8	3
02:00	3	7	8
03:00	3	8	9
04:00	5	6	11
05:00	3	7	9
06:00	5	5	21
07:00	8	10	15
08:00	6	12	11
09:00	3	9	10
10:00	3	4	10
11:00	3	5	12
12:00	8	3	18
13:00	8	2	17
14:00	10	2	17
15:00	10	2	24
16:00	12	5	30
17:00	15	9	30
18:00	17	11	33
19:00	20	12	38
20:00	27	12	41
21:00	35	14	47
22:00	36	14	57
23:00	34	13	45

Source: Snowdonia Weather Stations Project

Calculate the mean and median wind speeds and the range.

	Summit	Clogwyn	Llanberis
Mean	11.54	7.75	21.58
Median	8	7.5	17
Range	35	12	55

Which place had the least reliable weather?

Calculate statistics. For example:

- Three people have a median age of 30 and a mean age of 36. The range of their ages is 20. How old is each person?

- Three children have a mean age of 10.
  The range of their ages is 6.
  What is the lowest possible age:
  a. of the youngest child?
  b. of the oldest child?

- Amrita has five cards numbered in the range 0 to 20. She says:
  'The range of my cards is 4, the mode is 6 and the mean is 5.'
  Is this possible?

- Look at these two frequency diagrams.
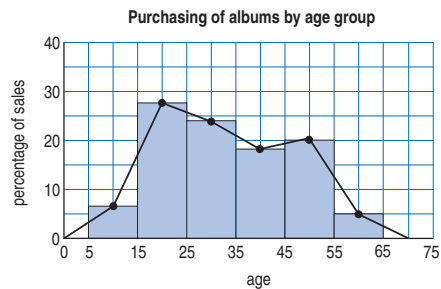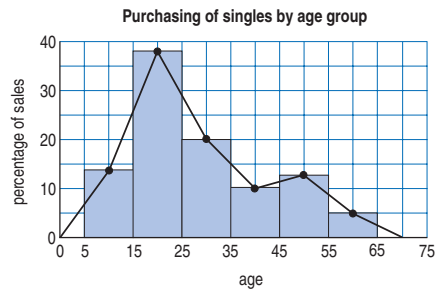
Purchasing of singles by age group

Purchasing of albums by age group

a. Estimate the mean age of people buying singles.
b. Estimate the median age of people buying singles.
c. Estimate the mean age of people buying albums.
d. Estimate the median age of people buying albums.

What conclusions can you draw from your answers?