

## Finding the Median

You need to be able to find the median of both listed data and of grouped data.

### Listed data

Items	$n$	Position of median	Median
1,4,7,9,10	5		
4,9,10,15	4		
2,4,5,7,8,9,11	7		
1,2,3,5,6,9,9,10,11,12	10		

Can you think of a rule to find the position of the median given  $n$ ?

### Grouped data

IQ of L6Ms2 ( $q$ )	Frequency ( $f$ )
$80 \leq q < 90$	7
$90 \leq q < 100$	5
$100 \leq q < 120$	3
$120 \leq q < 200$	2

Position to use for median:

## Linear Interpolation

Height of tree (m)	Freq	C.F.
$0.55 \leq h < 0.6$	55	55
$0.6 \leq h < 0.65$	45	100
$0.65 \leq h < 0.7$	30	130
$0.7 \leq h < 0.75$	15	145
$0.75 \leq h < 0.8$	5	150

## Formula

### Examples

Weight of cat (kg)	Freq	C.F.
$1.5 \leq w < 3$	10	10
$3 \leq w < 4$	8	18
$4 \leq w < 6$	14	32

Time (s)	Freq	C.F.
$8 \leq t < 10$	4	4
$10 \leq t < 12$	3	7
$12 \leq t < 14$	13	20

## Class width

Weight of cat to nearest kg	Frequency
10 – 12	7
13 – 15	2
16 – 18	9
19 – 20	4

## Linear Interpolation with gaps

Example

Summarised below are the distances, to the nearest mile, travelled to work by a random sample of 120 commuters.

Distance (to the nearest mile)	Number of commuters
0 – 9	10
10 – 19	19
20 – 29	43
30 – 39	25
40 – 49	8
50 – 59	6
60 – 69	5
70 – 79	3
80 – 89	1

For this distribution,

- (a) describe its shape. (1)
- (b) use linear interpolation to estimate its median. (2)

## Test Your Understanding

Use linear interpolation to estimate the median of the following:

1)

Age of relic (years)	Frequency
0-1000	24
1001-1500	29
1501-1700	12
1701-2000	35

2)

Shark length (cm)	Frequency
$40 \leq x < 100$	17
$100 \leq x < 300$	5
$300 \leq x < 600$	8
$600 \leq x < 1000$	10

## Supplementary Exercise 1

### Q1) Solomon Paper A Q5b

The number of patients attending a hospital trauma clinic each day was recorded over several months, giving the data in the table below.

Number of patients	10 - 19	20 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 69
Frequency	2	18	24	30	27	14	5

Use linear interpolation to estimate the median of these data.

### Q2) Solomon Paper E Q4a

The ages of 300 houses in a village are recorded given the following table of results.

Age $a$ (years)	Number of houses
$0 \leq a < 20$	36
$20 \leq a < 40$	92
$40 \leq a < 60$	74
$60 \leq a < 100$	39
$100 \leq a < 200$	14
$200 \leq a < 300$	27
$300 \leq a < 500$	18

Use linear interpolation to estimate the median.

**Q3) Solomon Paper L Q7a**

A cyber-café recorded how long each user stayed during one day giving the following results.

Length of stay (minutes)	Number of houses
$0 \leq l < 30$	15
$30 \leq l < 60$	31
$60 \leq l < 90$	32
$90 \leq l < 120$	23
$120 \leq l < 240$	17
$240 \leq l < 360$	2

Use linear interpolation to estimate the median of these data.

**Q4) S1 May 2013 Q4**

The following table summarises the times,  $t$  minutes to the nearest minute, recorded for a group of students to complete an exam.

Time (minutes) $t$	11 – 20	21 – 25	26 – 30	31 – 35	36 – 45	46 – 60
Number of students $f$	62	88	16	13	11	10

[You may use  $\sum ft^2 = 134281.25$ ]

(a) Estimate the mean and standard deviation of these data. (5)

(b) Use linear interpolation to estimate the value of the median. (2)