Mean

Key Vocab

Frequency - How 'frequent' something is. The mathematical word for the total

Average - The umbrella term used to incorporate the mode, median and / or mean of a set of data

Measures of Location - The statistical term used to describe statistics which gives information about the position of the data on a number line

Mean - A measure of location (average) which uses the formula $\frac{\sum x}{n}$

Class - The statistical name for the group in which data has been put

Mid Point - The middle value from a class

Weighted Mean - A calculation for the mean which takes into account that one result may have more 'weight' than another

Geometric Mean - An average calculated by n^{th} rooting the product of n data values

Key Knowledge

Arithmetic Mean: We use the statistical formula $\frac{\sum fx}{\sum f}$

Estimate of the Arithmetic Mean: We use the statistical formula $\frac{\sum fx}{\sum f}$ where x is the mid-point of the class

A Weighted Mean allows us to calculate the 'average' of a set of results where one result has more weight than another
To do this we must use the following formula (which is not given in the exam)

$$\frac{\sum(x\ X\ weight)}{\sum weights}$$

The "GEOMETRIC MEAN' is the *nth root* of the *product* of the n items in a distribution.

$$\sqrt[n]{1\ X\ 2\ X\ \dots n}$$

Example

The table shows a summary of the results of a long jump competition.

Distance jumped (x m)	Frequency (f)		
$7.1 < x \leqslant 7.3$	1		
$7.3 < x \leqslant 7.5$	2		
$7.5 < x \leqslant 7.7$	5		
$7.7 < x \leqslant 7.9$	9		
$7.9 < x \leqslant 8.1$	8		
$8.1 < x \leqslant 8.3$	3		

(Source: *IAAF*)

(a) Find an estimate of the mean distance jumped.
You may use the extra columns in the table.

..... m

(3)

Example

Mr Singh collected data about the number of students in each of three classes in his school and the mean mark of each class in a science test.

The table gives some information about his data.

Class	Number of students in the class	Class mean mark
A	28	63
B	32	72
C	n	55

Mr Singh plans to use one of the following two methods to work out the mean mark of **all** the students in the three classes.

Method 1 Work out the mean of 63, 72 and 55

Method 2 Given that Mr Singh knows the value of n, work out the weighted mean mark for the three classes.

(a) For each of these two methods, assess whether or not the method is an appropriate way to work out the mean mark of all the students in the three classes.

Method 1

.....

.....

Method 2

.....

.....

(2)

The weighted mean mark for the three classes is 64.1 correct to one decimal place.

(b) Calculate the value of n.

.....

(2)

Example

The table gives information about the change in the cost of a second class stamp from 2011 to 2017

Year	2011	2013	2015	2017
Cost of second class stamp (pence)	36	50	54	56
Chain base index number		138.9	108	

(Source: www.2ndclassstamp.co.uk)

By working out the geometric mean of 3 appropriate chain base index numbers, what can be deduced about the average two-yearly change in the cost of a second class stamp from 2011 to 2017?

YOU DO a

Ben is investigating how far people travel to work each day.
He asks the people in his office how far, in miles, they travel to work each day.

The grouped frequency table gives information about their answers.

Distance (d miles)	Frequency
$0 < d \leqslant 5$	7
$5 < d \leqslant 10$	10
$10 < d \leqslant 15$	9
$15 < d \leqslant 20$	6
$20 < d \leqslant 25$	3

(a) Calculate an estimate of the mean distance.
Give your answer correct to one decimal place.

..... miles
(3)

Ben finds a newspaper report that says that the average distance travelled to work each day in England and Wales in 2001 was 8.3 miles.

(Source: www.telegraph.co.uk)

From this Ben concludes that the distance travelled to work each day in England and Wales has increased since 2001

(b) Give **two** reasons why Ben's conclusion may not be reliable.

YOU DO b

Rahul, Lisa and Paul are investigating how much the workers in a company earn.

They have been told that in a week the workers earn £260 or £370 or £510

Last week
20% of the workers earned £260
35% of the workers earned £370
45% of the workers earned £510

Rahul, Lisa and Paul want to work out the average earnings for these workers last week.

Rahul thinks that they should find the mean of £260, £370 and £510
Lisa thinks that they should find the median of £260, £370 and £510
Paul thinks that they should find the weighted mean of the earnings.

(a) Which one of these three averages should they use?
Give a reason for your answer.

.....
.....
.....
.....

(2)

Rahul works out that the mean of the earnings is £380
Lisa finds that the median of the earnings is £370

(b) Work out the weighted mean of the earnings for Paul.

£ .....
(2)

YOU DO c

Matthew finds the cost per terabyte of computer data storage in each first quarter of five successive years.

The table gives cost per terabyte, in US$, for computer data storage.
It also gives two of the chain base index numbers, correct to one decimal place, for this information.

Year	2015	2016	2017	2018	2019
Cost per terabyte (US$)	33.33	31.25	29.00	24.87	24.43
Chain base index number		93.8	92.8	.....	.....

(Source: *jcmit.net*)

(a) Find the chain base index numbers for 2018 and 2019 and write them in the table.
Give each value correct to one decimal place.

(2)

(b) (i) Find the geometric mean of the four chain base index numbers.
You must show your working.
Give your answer correct to one decimal place.

.....
.....
(2)

(ii) Interpret your answer.

YOU DO d

Michael recorded the maximum temperature every day in September.

The table shows information about his results.

Temperature (°C)	Frequency
$14 < t \leqslant 18$	4
$18 < t \leqslant 20$	10
$20 < t \leqslant 22$	8
$22 < t \leqslant 24$	5
$24 < t \leqslant 28$	3

Calculate an estimate for the mean maximum temperature.

YOU DO e

A professor uses a weighted mean in order to calculate each student's mark for the term.

Here is information about the weighting of each task.

Task	Assignment 1	Assignment 2	Assignment 3	Final exam
Weighting	2	3	5	8

Each task is marked out of 100 marks and it is not possible to achieve a score greater than 100 marks for a task.

The table below gives the marks achieved by Anders on his three assignments.

Assignment 1	Assignment 2	Assignment 3
72	84	88

To achieve a grade A, the weighted mean for the term must be at least 90 marks.

Anders is going to take his final exam next week.

Determine whether or not Anders can achieve a grade A.