

# Averages (F)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	Mam Janet
Total Marks:	

1. Hardeep asks 25 people how many portions of fruit and vegetables they ate yesterday.

The results are shown in this table.

(a) Calculate the mean number of portions.

Number of portions	Frequency	
4	4	$4 \times 4 = 16$
5	6	$5 \times 6 = 30$
6	8	$6 \times 8 = 48$
7	5	$7 \times 5 = 35$
8	2	$8 \times 2 = 16$
Total	25	145

$$145 \div 25 = 5.8$$

.....5.8..... [3]

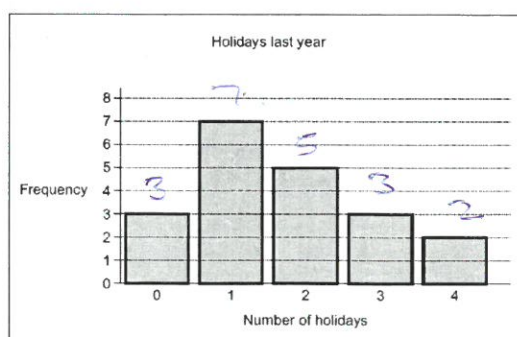
(b) Hardeep ate no portions of fruit and vegetables yesterday. He decides to include this in his results.

Explain how this will affect:

(i) the mode, No effect on mode as zero portions is a new group and mode is currently 6 portions. [1]

(ii) the range. The range will increase from 4 in the table to 8 with the zero included. [1]

2. Noelle asks her friends how many holidays they had last year.



$$3 + 7 = 10$$

$$5 + 3 + 2 = 10$$

$$10 + 10 = 20$$

Her results are shown in this bar chart.

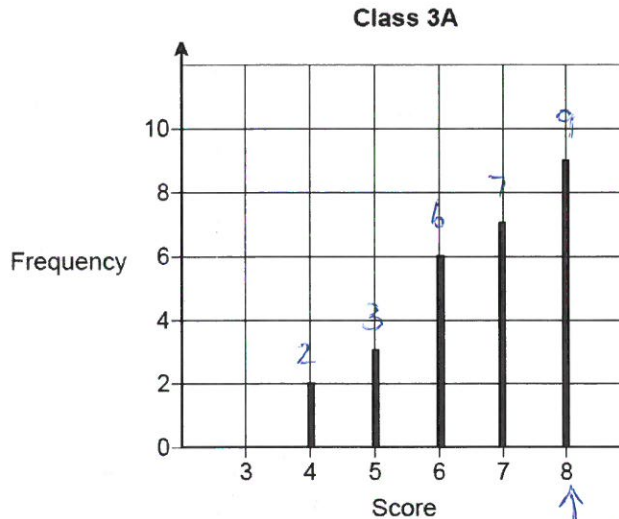
Find the median number of holidays.

middle  
10th is 1  
11th is 2

$20 \div 2 = 10$   
 $21 \div 2 = 10.5$   
median between 10th & 11th

..... 10.5 holidays in a year [2]

3. The diagram shows information about the scores of Class 3A in a spelling test.



total: 27 scores

mode = most often so score 8

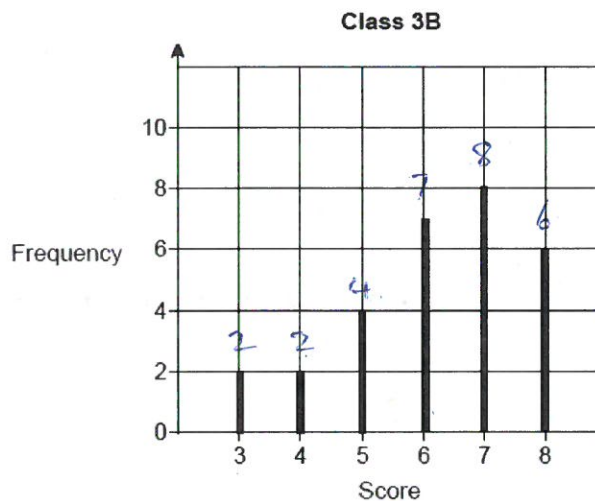
(a) A student is chosen at random from Class 3A.

Work out the probability that the student's score was the mode for the class.

$\frac{9}{27}$  is the probability a student gets the mode.  
ie Probability =  $\frac{1}{3}$

[3]

The diagram shows information about the scores of Class 3B in the same test.



29 scores

(b) Show that Class 3A had more consistent scores than Class 3B.

Use the data from both diagrams.

range

Range of 3A =  $8 - 4 = 4$   
Range of 3B =  $8 - 3 = 5$

Class 3A has a smaller range than 3B so the scores are more consistent

[2]

(c) Lucy is one of the 29 students in Class 3B.

Her score was the same as the median score for her class.

Work out her score.

~~6~~ ~~7~~ is her score.

Middle.  $29+1=30$   
 $30 \div 2 = 15$   
 15th score.

[2]

4. Here is a list of numbers

~~11~~ ~~12~~ ~~12~~ ~~12~~ 13 ~~15~~ ~~15~~ ~~17~~ ~~19~~  
~~12~~ ~~19~~ ~~12~~ ~~15~~ ~~11~~ ~~15~~ ~~12~~ ~~13~~ ~~17~~

Find the median. = middle.

13

[2]

5. The table shows some information about the foot lengths of 40 adults.

Foot length ( $f$ cm)	Number of adults	Estimate	
$16 \leq f < 18$	3	17	$3 \times 17$
$18 \leq f < 20$	6	19	$6 \times 19$
$20 \leq f < 22$	10	21	$10 \times 21$
$22 \leq f < 24$	12	23	$12 \times 23$
$24 \leq f < 26$	9	25	$9 \times 25$
total		40	876

most.  $\rightarrow$

(a) Write down the modal class interval.

most.

$22 \leq f < 24$

[1]

(b) Calculate an estimate for the mean foot length.

$876 \div 40 = 21.9$   
 check 21.9 is reasonable.

21.9

cm [3]

6. The table shows information about the ages of all the people at a party.

Age (years)	Frequency
11 - 20	6
21 - 30	16
31 - 40	10
41 - 50	8

40 or less  
 $10 + 16 + 6 = 32$

(a) Work out the total number of these people who were aged 40 or less.

..... 32 ..... [1]

Andy says that the range of ages is 39 years because  $50 - 11 = 39$

(b) The range may not be 39 years.

Explain why.

The smallest and largest values may not be 11 or 50 because the ages are intervals. They could be 20 and 41 as well. [1]

7. Rachel carried out a survey of 10 people to find out the type of fruit they like best.

The table gives information about her results.

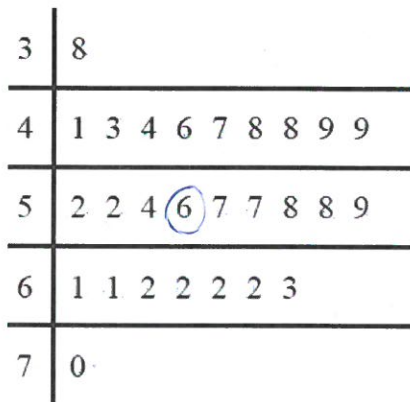
Type of fruit	Number of people
apple	2
banana	5
orange	3

Which type of fruit is the mode?

"most"

..... banana ..... [1]

8. The stem and leaf diagram gives information about the speeds of 27 cars.



Key:

3 | 8 means 38 miles per hour

(a) Find the median speed.

"middle"

$$27 + 1 = 28$$

$$28 \div 2 = 14$$

14th pt is middle value.

..... 56 ..... miles per hour [1]

(b) Work out the range.

"largest - smallest"

$$70 - 38 = 32$$

..... 32 ..... miles per hour [1]

$$\begin{array}{r} 70 \\ - 38 \\ \hline 32 \end{array}$$

One of the cars is chosen at random.

Jack says,

"The probability that the speed of this car is more than 60 miles per hour is  $\frac{1}{3}$ "

(c) Jack is wrong.

Explain why.

Number cars more than 60 is 8  
 $P(\text{speed} > 60) = \frac{8}{27} \neq \frac{1}{3}$  ( $\frac{9}{27} = \frac{1}{3}$ )  
 there are only 8 cars with speed greater than 60 not 9. You would need 9 for Jack to be correct.

[2]

9. Ross rolled an ordinary dice 30 times.

The frequency table gives information about his results.

Score	Frequency
1	7
2	5
3	4
4	4
5	6
6	4

$\left. \begin{array}{l} \{ \\ \{ \\ \{ \\ \{ \\ \{ \\ \{ \end{array} \right\} 12$   
 $\left. \begin{array}{l} \{ \\ \{ \\ \{ \\ \{ \\ \{ \\ \{ \end{array} \right\} 8$   
 $\left. \begin{array}{l} \{ \\ \{ \\ \{ \\ \{ \\ \{ \\ \{ \end{array} \right\} 10$   
 $\left. \begin{array}{l} \{ \\ \{ \\ \{ \\ \{ \\ \{ \\ \{ \end{array} \right\} 30$

Ross worked out the mean score as 8

(a) Explain why it is impossible for the mean score to be 8

Because you can only get scores 1-6. The mean would be between 1 & 6 (including).

[1]

Graham also worked out the mean score.

Here is his working.

$$1 \times 7 + 2 \times 5 + 3 \times 4 + 4 \times 4 + 5 \times 6 + 6 \times 4 = 99$$

$$99 \div 6 = 16.5 \quad \text{should be } 99 \div 30 \text{ not } 6.$$

The mean score is 16.5

(b) Describe the mistake Graham made in his method to work out the mean score.

Should divide by 30 not 6 because there are 30 scores.

[1]

10. Here are seven numbers.

13      6      12      7      6      4      8

(a) Work out the range of the seven numbers.

Circle your answer.  $13 - 4 = 9$

[1]

5      6      7      8      9

(b) What is the mode of the seven numbers?

Circle your answer.

[1]

5      6      7      8      9

11. The table shows information about the marks of 30 students in a test.

Mark	Frequency	
14	2	$2 \times 14 = 28$
15	10	$15 \times 10 = 150$
16	2	$16 \times 2 = 32$
17	3	$17 \times 3 = 51$
18	13	$18 \times 13 = 234$
Total = 30		495

$\begin{array}{r} 17 \\ 17 \\ \hline 217 \\ 51 \\ \hline \end{array}$ 
  
 $\begin{array}{r} 10 \ 8 \\ 10 \ 100 \ 80 \\ 3 \ 30 \ 24 \\ \hline 130 \ 104 \end{array}$

Students who scored less than the mean mark have to retake the test.

How many students have to retake the test?

You must show your working.

$495 \div 30 = 16.5$  mean

$2 + 10 + 2 = 14$  students need to retake the test.

[3]

$\begin{array}{r} 10 \times 30 = 300 \\ 5 \times 30 = 150 \quad 450 \\ 1 \times 30 = 30 \quad 480 \\ 0.5 \times 30 = 15 \quad 495 \end{array}$

12. The times that 80 customers waited at a supermarket checkout are shown.

Time, $t$ (minutes)	Frequency
$0 \leq t < 2$	32
$2 \leq t < 4$	19
$4 \leq t < 6$	20
$6 \leq t < 8$	7
$8 \leq t < 10$	2

$\rightarrow$   $\left. \begin{matrix} 32 \\ 19 \end{matrix} \right\} < 6 \text{ mins}$

(a) In which class interval is the median?

Circle your answer.

*middle*  
 $80 + 1 = 81$   
 $81 \div 2 = 40.5$   
 between 40th & 41st

$0 \leq t < 2$        $2 \leq t < 4$        $4 \leq t < 6$        $6 \leq t < 8$

[1]

(b) The manager of the supermarket says,

"90% of our customers wait less than 6 minutes."

Does the data support this statement?

You must show your working.

$$\begin{array}{r} 32 \\ 19 \\ 20 \\ \hline 71 \end{array}$$

$$\frac{71}{80}$$

are less than 6 mins

$$= 88.75\%$$

$$90\% = \frac{72}{80}$$

Would need 72 below 6 to support statement.  
 No

16  
24  
32  
40  
48  
56  
64  
72

[2]

13. Adam and six other men ran a race.

The times, in seconds, of the six other men are shown.

$$9.75 + 9.79 + 9.80 + 9.88 + 9.94 + 9.98 = 59.14$$

The mean time for **all seven** men was 9.83 seconds.

Did Adam win the race?

You must show your working.

$$9.83 \times 7 = 68.81 \text{ is total}$$

$$68.81 - 59.14 = 9.67 \text{ s} \leftarrow \text{Adam's time}$$

Yes Adam won as he was quickest in 9.67s

[3]

14. Susan recorded the temperature outside her house five times on one day.

She recorded the first temperature at 7:00 a.m. and repeated the process every three hours.

The temperatures she recorded are shown in the table below.

- (a) Complete the table to show the times at which she recorded the other three temperatures.

Time	7:00 a.m.	10:00am	1:00pm	4:00pm	7:00 p.m.
Temperature	14°C	18°C	23°C	19°C	16°C

[2]

- (b) What was the range of the temperatures that Susan recorded?

$$23 - 14 = 9^{\circ}\text{C} \leftarrow \text{range}$$

[1]

- (c) What was the mean of the temperatures that Susan recorded?

$$14 + 18 + 23 + 19 + 16 = 90$$

$$90 \div 5 = 18^{\circ}\text{C} \leftarrow \text{mean}$$

[2]

- (d) Explain why the answers you have found may not be the correct mean and range of the temperature for the whole time between 7:00 a.m. and 7:00 p.m.

It may have been hotter during the day than just at 1pm. [1]

15. Angela plays netball for her local team.

The number of goals she has scored in her first seven games is 3, 4, 5, 5, 6, 8 and 9.

- (a) Explain why the mode is 5.

Mode is 5 because that is the most frequent total of goals per game. [1]

- (b) Angela's coach thinks that it is possible for Angela to achieve a median of 6 and a range of 7 after two more games are completed.

Give a possible number of goals scored in each of the next two games that would allow Angela to achieve this.

3, 4, 5, 5, 6, 8, 9  
 9 games so median needs to be 5th place. So scores of 6 and 7 would give a median of 6.  
 In fact any score greater than 5 would work. [2]

16. (a) When visiting a hat shop, each customer had the circumference of their head measured.

The table shows the results for the customers who bought a hat during December.



Estimate

Head circumference, $c$ (cm)	Number of customers
$50 \leq c < 54$	12
$54 \leq c < 58$	32
$58 \leq c < 62$	14
$62 \leq c < 66$	2

60 = Total

Calculate an estimate for the mean head circumference.

$$12 \times 52 = 624$$

$$32 \times 56 = 1792$$

$$14 \times 60 = 840$$

$$2 \times 64 = 128$$

$$\begin{array}{r} 211 \\ 3384 \\ \hline \end{array}$$

$$3384 \div 60 = 56.4$$

Estimate for mean is 56.4 cm.

[4]

(b) The hat shop sells 4 different sizes of hats.

The conversion table from head circumference to hat size is shown below

Head circumference, $c$ (cm)	Hat size
$50 \leq c < 54$	1
$54 \leq c < 58$	2
$58 \leq c < 62$	3
$62 \leq c < 66$	4

A salesman places an order for new stock for the hat shop.

The salesman's order form shows that about half of the hats ordered are size 2.

The owner of the shop says the order should show that about a quarter of the hats ordered are size 2.

Who is more likely to be correct, the salesman or the owner of the shop?

You must give a reason for your answer.

32 out of 60 is nearer  $\frac{1}{2}$  than  $\frac{1}{4}$  so the Salesman is correct based on the number of customers that currently buy hats.

[2]

17. The manager of a clothes shop recorded the size of each dress sold one morning.

10 10  
 12 12  
 14 14 14 14 14 14  
 16 16 16 16  
 18 18 18  
 20 20 20

The sizes of dresses are always even numbers.

The mean size of the dresses sold that morning is 15.3

The manager says: "The mean size of the dresses is not a very useful average."

(i) Explain why the manager is right.

*It would be better to give an actual dress size rather than the mean value. 15 or 15.3 doesn't mean anything.*

(ii) Which is the more useful average for the manager to know, the median or the mode?

You must give a reason for your answer.

*I would use mode because that tells you the most popular dress size which is 14.*

[2]

18. The grouped frequency table gives information about the heights of 30 students.

Height ( $h$ cm)	Frequency
$130 < h \leq 140$	1
$140 < h \leq 150$	7
$150 < h \leq 160$	8
$160 < h \leq 170$	10
$170 < h \leq 180$	4

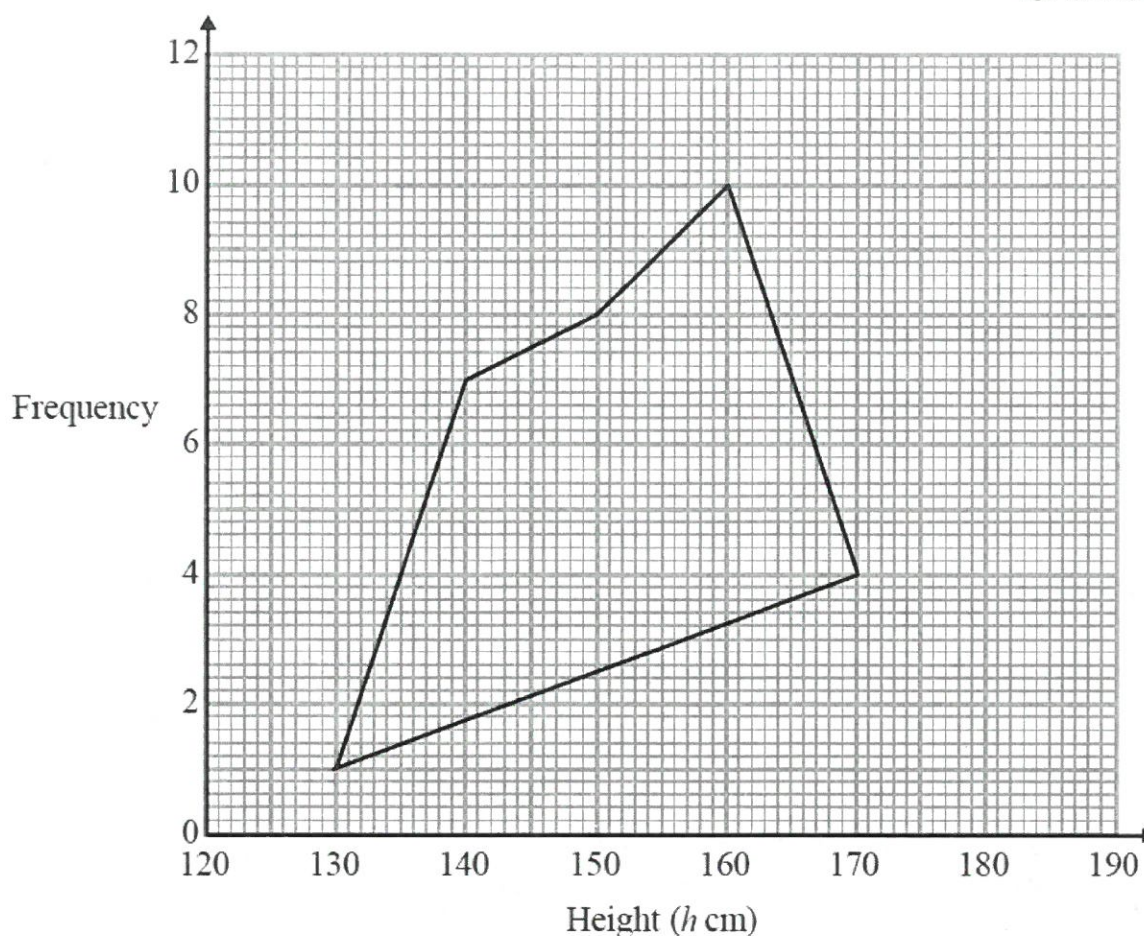
*30*

(a) Write down the modal class interval.

*most*

..... *160 < h ≤ 170* ..... [1]

This incorrect frequency polygon has been drawn for the information in the table.



(b) Write down two things wrong with this incorrect frequency polygon.

- 1 *Need to plot the middle value of each interval not the first value.*
- 2 *There shouldn't be a line joining up the first & last point.*

[2]

19. Jenny works in a shop that sells belts.

The table shows information about the waist sizes of 50 customers who bought belts from the shop in May.

Belt size	Waist ( $w$ inches)	Frequency
Small	$28 < w \leq 32$	24
Medium	$32 < w \leq 36$	12
Large	$36 < w \leq 40$	8
Extra Large	$40 < w \leq 44$	6

50

*Est.*  
 $30 \times 24$   
 $34 \times 12$   
 $38 \times 8$   
 $42 \times 6$   
 1684

(a) Calculate an estimate for the mean waist size.

$$1684 \div 50 = 33.68$$

.....33.68.....inches [3]

Belts are made in sizes Small, Medium, Large and Extra Large.

Jenny needs to order more belts in June.

The modal size of belts sold is Small.

Jenny is going to order  $\frac{3}{4}$  of the belts in size Small.

The manager of the shop tells Jenny she should not order so many Small belts.

(b) Who is correct, Jenny or the manager?

$$\frac{24}{50} \sim \frac{1}{2}$$

You must give a reason for your answer.

The manager. I think she should order about half the belts as small based on the data collected. Since 24 out of 50 is approx half. [2]

20. At a nursery, the mean age of 4 children is 31 months.

Katy joins the nursery.

The mean age of all 5 children is now 30 months.

Work out the age of Katy.

$$30 \times 5 = 150 \text{ months (total of ages) afterwards.}$$

$$31 \times 4 = 120 + 4 = 124 \text{ months (total of ages before)}$$

$$150 - 124 = 26 \text{ months.}$$

[4]

Katy is 26 months.

## CREDITS AND NOTES

Question	Awarding Body	Question	Awarding Body
1	OCR	12	AQA
2	OCR	13	AQA
3	AQA	14	WJEC Eduqas
4	Pearson Edexcel	15	WJEC Eduqas
5	Pearson Edexcel	16	WJEC Eduqas
6	Pearson Edexcel	17	Pearson Edexcel
7	Pearson Edexcel	18	Pearson Edexcel
8	Pearson Edexcel	19	Pearson Edexcel
9	Pearson Edexcel	20	AQA
10	AQA		
11	AQA		

### **Notes:**

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board's (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.



### **Links:**

AQA <http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300>

OCR <http://ocr.org.uk/gcsemaths>

Pearson Edexcel <http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html>

WJEC Eduqas <http://www.eduqas.co.uk/qualifications/mathematics/gcse/>

### **Contents:**

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2.

WJEC Eduqas – Sample Assessment Material

