Name ANSWERS	Class

MATHS TEACHER HUB

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Averages

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

1 The table shows information about the heights of 80 children.

Height (h cm)	Frequency
$130 < h \leqslant 140$	4
$140 < h \leqslant 150$	11
$150 < h \leqslant 160$	24
$160 < h \leqslant 170$	22
$170 < h \leqslant 180$	19

Find the class interval that contains the median.

$150 < h \leqslant 170$

(1)

November 2017 – Paper 3H

(Total for Question 1 is 1 mark)

3 The table shows information about the heights of 80 plants.

Height (h cm)	Frequency
$10 < h \leqslant 20$	7
$20 < h \leqslant 30$	13
$30 < h \leqslant 40$	14
$40 < h \leqslant 50$	12
$50 < h \leqslant 60$	16
$60 < h \leqslant 70$	18

Find the class interval that contains the median.

$40 < h \leqslant 50$

(1)

June 2019 – Paper 3H

(Total for Question 3 is 1 mark)

3 Seija works at a weather station.
The table gives information about the temperature, T °C, at midday for each of 50 cities in the UK on Tuesday.

Temperature (T °C)		Frequency	
$10 < T \leqslant 15$ (12.5)	×	2	25
$15 < T \leqslant 20$ (17.5)	×	8	140
$20 < T \leqslant 25$ (22.5)	×	13	292.5
$25 < T \leqslant 30$ (27.5)	×	21	577.5
$30 < T \leqslant 35$ (32.5)	×	6	195
		50	1230

(a) Calculate an estimate for the mean temperature.

$$\text{mean} = \frac{1230}{50} = 24.6$$

24.6 °C

(3)

Seija says,

> "The median temperature is 22.5 °C because 22.5 is the middle number in the middle group."

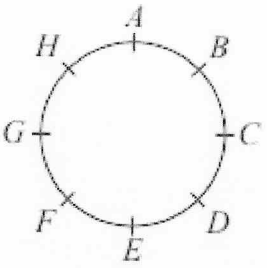
(b) Is Seija correct?
Give a reason for your answer.

No, the median is in the group $25 < T \leqslant 30$

(1)

(Total for Question 3 is 4 marks)

3 Hasmeet walks once round a circle with diameter 80 metres.



There are 8 points equally spaced on the circumference of the circle.

(a) Find the distance Hasmeet walks between one point and the next point.

Circumference $= \pi \times 80$

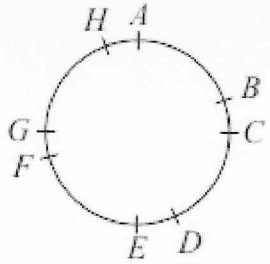
$= 80\pi$

$\frac{80\pi}{8} = 10\pi$

10π m

(2)

Four of the points are moved, as shown in the diagram below.



Hasmeet walks once round the circle again.

(b) Has the mean distance that Hasmeet walks between one point and the next point changed?
You must give a reason for your answer.

There are still 8 parts, so the mean distance will stay the same.

(1)

(Total for Question 3 is 3 marks)

3 The table shows some information about the dress sizes of 25 women.

Dress size	Number of women	
8	2	2
10	9	11
12	8	19
14	6	25

Find the median dress size.

$25 \div 2 = 12.5$

13th woman is in the 12th group

12

(1)

(Total for Question 3 is 1 mark)

4 The mean length of 5 sticks is 4.2 cm.

Nawal measured the length of one of the sticks as 7 cm.

(a) Work out the mean length of the other 4 sticks.

$5 \times 4.2\text{cm} = 21\text{cm}$

$21\text{cm} - 7\text{cm} = 14\text{cm}$

$\frac{14\text{cm}}{4} = \frac{7\text{cm}}{2} = 3.5\text{cm}$

3.5 cm

(3)

Nawal made a mistake.
The stick was not 7 cm long.
It was 17 cm long.

(b) How does this affect your answer to part (a)?

The other sticks would be shorter.

(1)

(Total for Question 4 is 4 marks)

4 Festival A will be in a rectangular field with an area of 80 000 m^2
The greatest number of people allowed to attend Festival A is 425

Festival B will be in a rectangular field 700 m by 2000 m.
The greatest number of people allowed to attend Festival B is 6750

700 × 2000
= 1400000 m^2

The area per person allowed for Festival B is greater than the area per person allowed for Festival A.

(a) How much greater?
Give your answer correct to the nearest whole number.

(A) $\frac{80000}{425}$ = 188.235 m^2 per person

(B) $\frac{1400000}{6750}$ = 207.407 m^2 per person

207.407 − 188.235 = 19.172 m^2

19 m^2

(4)

Callum says,

"300 cm^2 is the same as 3 m^2 because there are 100 cm in 1 m so you divide by 100"

Callum's method is wrong.

(b) Explain why.

1 m^2 = 100 cm × 100 cm = 10000 cm^2

He should divide by 10000 not 100

(1)

(Total for Question 4 is 5 marks)

4 The table gives information about the times taken, in seconds, by 18 students to run a race.

Time (t seconds)		Frequency	
$5 < t \leqslant 10$ (7.5)	×	1	7.5
$10 < t \leqslant 15$ (12.5)	×	2	25
$15 < t \leqslant 20$ (17.5)	×	7	122.5
$20 < t \leqslant 25$ (22.5)	×	8	180
		18	335

Work out an estimate for the mean time.
Give your answer correct to 3 significant figures.

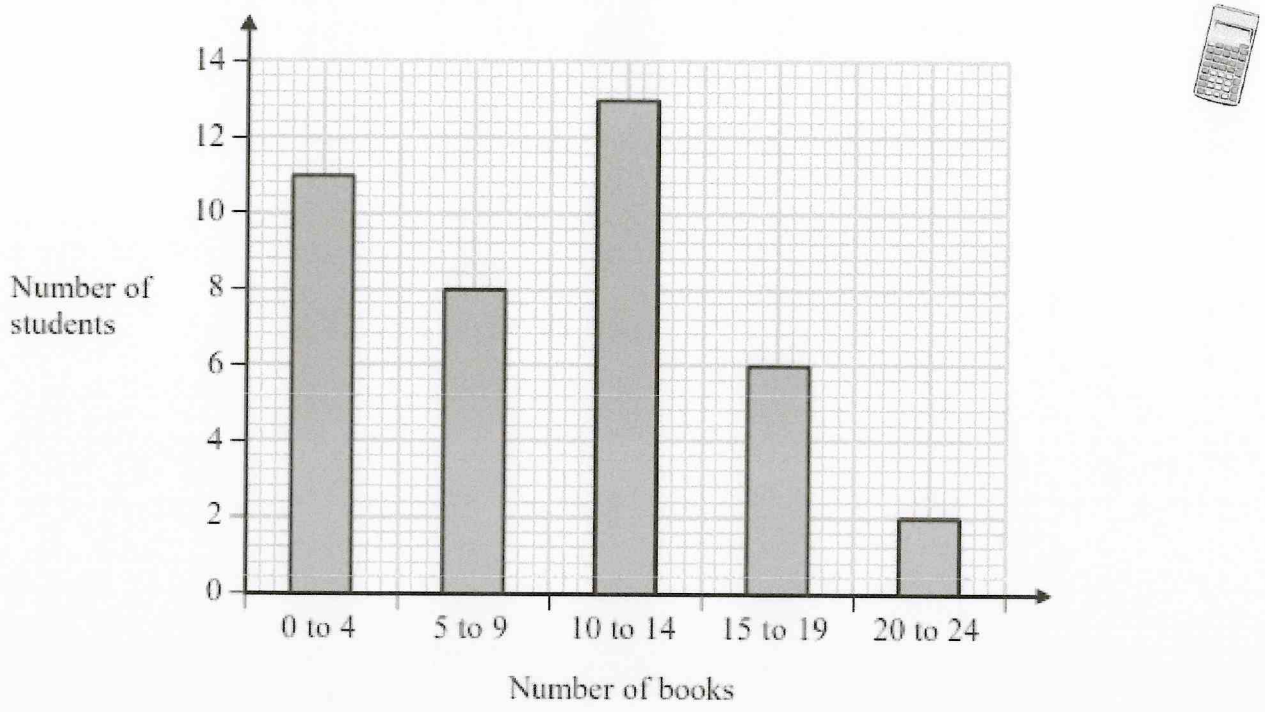
$$\text{mean} = \frac{335}{18} = 18.61111$$

18.6 seconds

(Total for Question 4 is 3 marks)

4 Fran asks each of 40 students how many books they bought last year.

The chart below shows information about the number of books bought by each of the 40 students.



Show that an estimate for the mean number of books bought is 9.5
You must show all your working.

Books	Frequency	Midpoint	MP × F	
$0 \leqslant n \leqslant 4$	11	2	11×2 =	22
$5 \leqslant n \leqslant 9$	8	7	8×7 =	56
$10 \leqslant n \leqslant 14$	13	12	13×12 =	156
$15 \leqslant n \leqslant 19$	6	17	6×17 =	102
$20 \leqslant n \leqslant 24$	2	22	2×22 =	44
	40			380

$$\text{mean} = \frac{380}{40} = 9.5$$

(4)

(Total for Question 4 is 4 marks)

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

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

Write down the modal class interval.

$160 < h \leqslant 170$

(1)

Specimen 1 – Paper 2H **(Total for Question 4 is 1 mark)**

4 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	$28 < w \leqslant 32$ (30)	×	24	720
Medium	$32 < w \leqslant 36$ (34)	×	12	408
Large	$36 < w \leqslant 40$ (38)	×	8	304
Extra Large	$40 < w \leqslant 44$ (42)	×	6	252
			50	1684

Calculate an estimate for the mean waist size.

$\text{mean} = \frac{1684}{50} = 33.68$

33.68 inches

(3)

Specimen 1 – Paper 3H **(Total for Question 4 is 3 marks)**

5 The table shows information about the weekly earnings of 20 people who work in a shop.

Weekly earnings (£x)		Frequency	
$150 < x \leqslant 250$	200	1	200
$250 < x \leqslant 350$	300	11	3300
$350 < x \leqslant 450$	400	5	2000
$450 < x \leqslant 550$	500	0	0
$550 < x \leqslant 650$	600	3	1800
		20	7300

(a) Work out an estimate for the mean of the weekly earnings.

mean = $\frac{7300}{20}$ = 365

£ 365

(3)

Nadiya says,

"The mean may **not** be the best average to use to represent this information."

(b) Do you agree with Nadiya?
You must justify your answer.

Yes, the mean is affected by all values, The median may be better.

(1)

November 2017 – Paper 1H **(Total for Question 5 is 4 marks)**

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

Foot length (f cm)		Number of adults	
$16 \leqslant f < 18$	17	3	51
$18 \leqslant f < 20$	19	6	114
$20 \leqslant f < 22$	21	10	210
$22 \leqslant f < 24$	23	12	276
$24 \leqslant f < 26$	25	9	225
		40	876

(a) Write down the modal class interval.

$22 \leqslant f < 24$

(1)

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

$$\text{mean} = \frac{876}{40} = 21.9$$

21.9 cm

(3)

(Total for Question 5 is 4 marks)

6 4 red bricks have a mean weight of 5 kg.
5 blue bricks have a mean weight of 9 kg.
1 green brick has a weight of 6 kg.

Donna says,

"The mean weight of the 10 bricks is less than 7 kg."

Is Donna correct?
You must show how you get your answer.

Red total weight
$4 \times 5\text{kg}$
$= 20\text{kg}$

Blue total weight
$5 \times 9\text{kg}$
$= 45\text{kg}$

Green total weight
$1 \times 6\text{kg}$
$= 6\text{kg}$

Total weight
$= 71\text{kg}$

$\frac{71\text{kg}}{10} = 7.1\text{kg}$

Donna is wrong
$7.1 > 7$

(Total for Question 6 is 3 marks)

7 There is a total of 45 boys and girls in a choir.

The mean age of the 18 boys is 16.2 years.
The mean age of the 27 girls is 16.7 years.

Calculate the mean age of all 45 boys and girls.

Boys

18×16.2

$= 291.6$

Girls

27×16.7

$= 450.9$

Total age $= 742.5$

$\text{mean} = \frac{742.5}{45} = 16.5$

16.5 years

(Total for Question 7 is 3 marks)

7 There are 10 boys and 20 girls in a class.
The class has a test.

The mean mark for all the class is 60
The mean mark for the girls is 54

Work out the mean mark for the boys.

$$\frac{(10 \times x) + (54 \times 20)}{30} = 60$$

$$\frac{10x + 1080}{30} = 60$$

$$10x + 1080 = 1800$$

$$10x = 720$$

$$x = 72$$

72

(Total for Question 7 is 3 marks)

8 The table shows the amount of snow, in cm, that fell each day for 30 days.

Amount of snow (s cm)		Frequency	
$0 \leqslant s < 10$ (5)	×	8	40
$10 \leqslant s < 20$ (15)	×	10	150
$20 \leqslant s < 30$ (25)	×	7	175
$30 \leqslant s < 40$ (35)	×	2	70
$40 \leqslant s < 50$ (45)	×	3	135
		30	570

Work out an estimate for the mean amount of snow per day.

$$\text{mean} = \frac{570}{30} = 19$$

19 cm

(Total for Question 8 is 3 marks)

8 There are 30 women and 20 men at a gym.

The mean height of all 50 people is 167.6 cm
The mean height of the 20 men is 182 cm

Work out the mean height of the 30 women.

$$\frac{(30 \times x) + (20 \times 182)}{50} = 167.6$$

$$\frac{30x + 3640}{50} = 167.6$$

$$30x + 3640 = 8380$$

$$30x = 4740$$

$$x = 158$$

158 cm

November 2022 – Paper 3H

(Total for Question 8 is 3 marks)

8 Len has 8 parcels.

The mean weight of the 8 parcels is 2.5 kg.
The mean weight of 3 of the parcels is 2 kg.

Work out the mean weight of the other 5 parcels.

$8 \times 2.5 = 20$ kg

$3 \times 2 = 6$ kg

$20 - 6 = 14$ kg

$14 \div 5 = 2.8$

2.8 kg

May 2024 – Paper 1H

(Total for Question 8 is 3 marks)

9 Walkden Reds is a basketball team.

At the end of 11 games, their mean score was 33 points per game.
At the end of 10 games, their mean score was 2 points higher.

Jordan says,

"Walkden Reds must have scored 13 points in their 11th game."

Is Jordan right?
You must show how you get your answer.

$$\frac{(10 \times 35) + x}{11} = 33$$

$$\frac{350 + x}{11} = 33$$

$$350 + x = 363$$

$$x = 13$$

Jordan is correct.

Specimen 1 – Paper 1H

(Total for Question 9 is 3 marks)

13 Mr Brown gives his class a test.
The 10 girls in the class get a mean mark of 70%
The 15 boys in the class get a mean mark of 80%

Nick says that because the mean of 70 and 80 is 75 then the mean mark for the whole class in the test is 75%

Nick is not correct.
Is the correct mean mark less than or greater than 75%?
You must justify your answer.

$$= \frac{(10 \times 70) + (15 \times 80)}{25}$$

$$= \frac{700 + 1200}{25}$$

$$= 76$$

The mean is greater than 75% its 76%

Specimen 2 – Paper 1H

(Total for Question 13 is 2 marks)

17 The table shows information about the distances 570 students travelled to a university open day.

Distance (d miles)	Frequency
$0 < d \leqslant 20$	120
$20 < d \leqslant 50$	90
$50 < d \leqslant 80$	120
$80 < d \leqslant 150$	140
$150 < d \leqslant 200$	100

120
210
330
470
570

570

Estimate the median distance.

$\frac{570}{2} = 285^{th}$ student

$50 < d \leqslant 80$ miles

(2)

November 2018 – Paper 3H

(Total for Question 17 is 2 marks)