Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

STEM | Exam Builder

Estimating the mean from grouped data

Time allowed: 1 hour 10 minutes

Subject code **0580**

Mathematics

Questions from Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 58

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 58 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

STEM | Exam Builder

Print at 100% (Actual size) so diagrams keep their real measurements.

1 The table shows some information about the heights of 50 plants.

Height (h cm)	$5 < h \leqslant 10$	$10 < h \leqslant 12$	$12 < h \leqslant 20$
Frequency	3	24	23

Calculate an estimate of the mean height.

..... cm [4]

Averages from grouped data Click for more variations

1	13.09	**4**	**M1** for mid-values 7.5, 11 and 16 soi **M1** for Σfx where x-values in correct interval (including boundaries) **M1dep** on second **M1** for $\frac{\Sigma fx}{50}$

STEM | Exam Builder

2 The height of each of 200 people is measured.
The table shows the results.

Height (h cm)	$100 < h \leqslant 120$	$120 < h \leqslant 130$	$130 < h \leqslant 150$	$150 < h \leqslant 190$
Frequency	32	55	64	49

Calculate an estimate of the mean height.

..... cm [4]

Averages from grouped data Click for more variations

2	138.425	**4**	**M1** for mid-points soi (110, 125, 140, 170) **M1** for use of Σfh with h in correct interval including both boundaries **M1** for (dep on 2nd M1) for Σfh ¸ 200

3 Raj measures the height, h cm, of 70 plants.
The table shows the information.

Height (h cm)	$10 < h \leqslant 20$	$20 < h \leqslant 40$	$40 < h \leqslant 50$	$50 < h \leqslant 60$	$60 < h \leqslant 90$
Frequency	7	15	27	13	8

Calculate an estimate of the mean height of the plants.

STEM | Exam Builder

..... cm [4]

Averages from grouped data Click for more variations

3	44.1 or 44.07...	**4**	**M1** for 4 of mid-values 15 30 45 55 75 soi **M1** for $\sum fx$ for any x in intervals including boundaries **M1 dep** for $\sum fx \div 70$ **Dep** on 2nd **M** mark earned

4 The table shows the amount of money, \$$x$, given to a charity by each of 60 people.

Amount (\$$x$)	$0 < x \leqslant 20$	$20 < x \leqslant 25$	$25 < x \leqslant 35$	$35 < x \leqslant 50$	$50 < x \leqslant 100$
Frequency	21	16	6	10	7

Calculate an estimate of the mean.

\$ ..... [4]

Averages from grouped data Click for more variations

4	28.33 or 28.3 or 28.33…	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ **M1 dep** for $\sum fx \div 60$

STEM | Exam Builder

5 The table shows information about the times, t seconds, taken by each of 100 students to solve a puzzle.

Time (t seconds)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 75$
Frequency	9	18	22	30	21

(a) Calculate an estimate of the mean time.

..... s [4]

(b) Emmanuel draws a histogram to show this information.
The table shows the heights, in cm, of some of the bars for this histogram.

Complete the table.

Time (t seconds)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 75$
Height of bar (cm)	3.6	14.4	17.6		

[3]

(a) Averages from grouped data (b) Histograms Click for more variations

5(a)	27.625	**4**	**M1** for 5, 12.5, 17.5, 30, 57.5 **M1** for $\sum fx$ where x is in correct interval including boundaries **M1** dep on second **M1** for $\frac{\Sigma fx}{100}$
5(b)	6 and 2.4	**3**	**B2** for either correct or **M1** for [fd =] 1.5 or 0.6 oe or **B1** for [multiplier] 4

STEM Exam Builder

6 The table shows some information about the mass of each of 200 oranges.

Mass (m grams)	$180 < m \leqslant 200$	$200 < m \leqslant 210$	$210 < m \leqslant 215$	$215 < m \leqslant 230$
Frequency	32	64	74	30

(a) Calculate an estimate of the mean mass of an orange.

..... g [4]

(b) Sarah draws a histogram to show this information.
The table shows the height of one of the bars for this histogram.

Complete the table.

Mass (m grams)	$180 < m \leqslant 200$	$200 < m \leqslant 210$	$210 < m \leqslant 215$	$215 < m \leqslant 230$
Height of bar (cm)			7.4	

[3]

(a) Averages from grouped data (b) Histograms Click for more variations

STEM | Exam Builder

6(a)	208	**4**	**M1** for midpoints soi 190, 205, 212.5, 222.5 **M1** for use of Σfx where x is in the correct interval including boundaries $190 \times 32 + 205 \times 64 + 212.5 \times 74 + 222.5 \times 30$ **M1** (dep on second M1) for $\Sigma fx \div 200$
6(b)	0.8 3.2 1	**3**	**B2** for two correct or **B1** for one correct or **M1** for three of 1.6, 6.4, 14.8 and 2 seen

STEM | Exam Builder

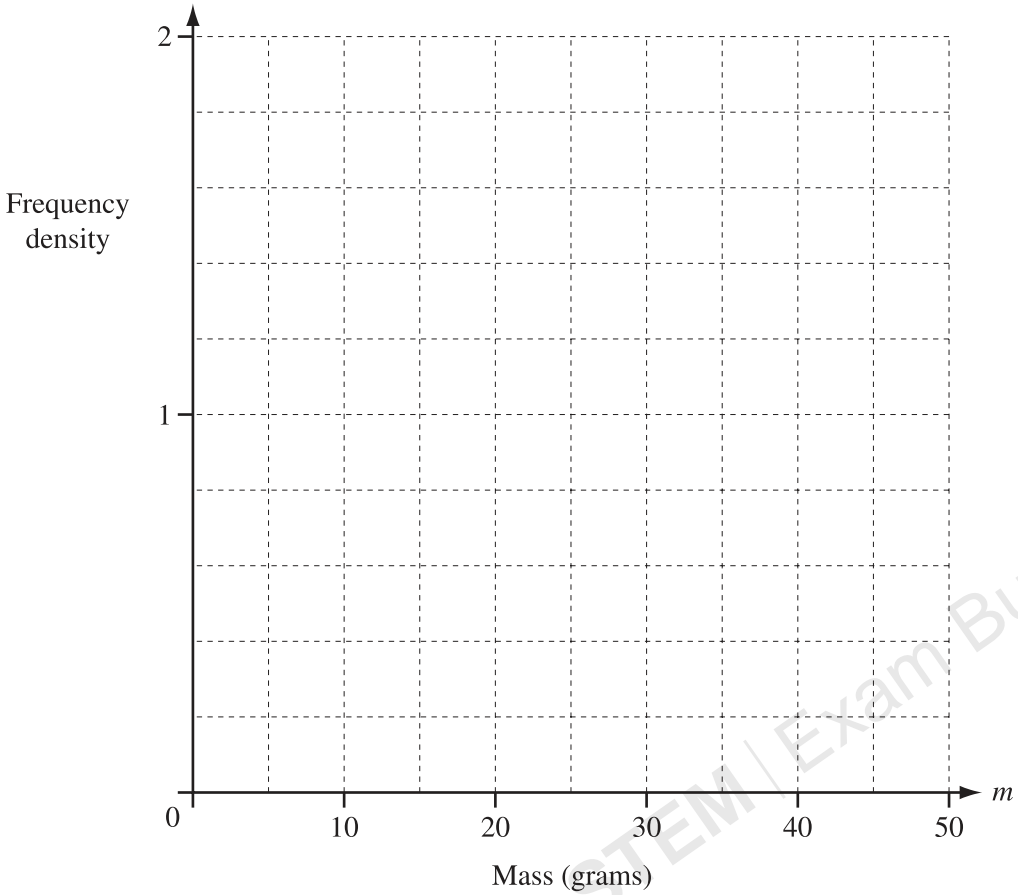
7 The masses of 60 potatoes are measured.
The table shows the results.

Mass (m grams)	$10 < m \leqslant 20$	$20 < m \leqslant 40$	$40 < m \leqslant 50$
Frequency	10	30	20

(a) Calculate an estimate of the mean.

Answer(a) ..... g [4]

(b) On the grid, draw an accurate histogram to show the information in the table.



[3]

STEM | Exam Builder

(a) Averages from grouped data (b) Histograms Click for more variations

7 (a)	32.5 cao www4	4	**M1** for mid-values seen **M1** for use of Σfx with x's anywhere in each interval $(10 \times 15 + 30 \times 30 + 20 \times 45)$ **M1** $\div 60$ dependent on second M1
(b)	Histogram drawn	3	**B1** Bars correct positions and widths – no gaps **B2** Heights of bars 1, 1.5 and 2 (**B1** for any two correct or for heights in the ratio 2:3:4)

STEM | Exam Builder

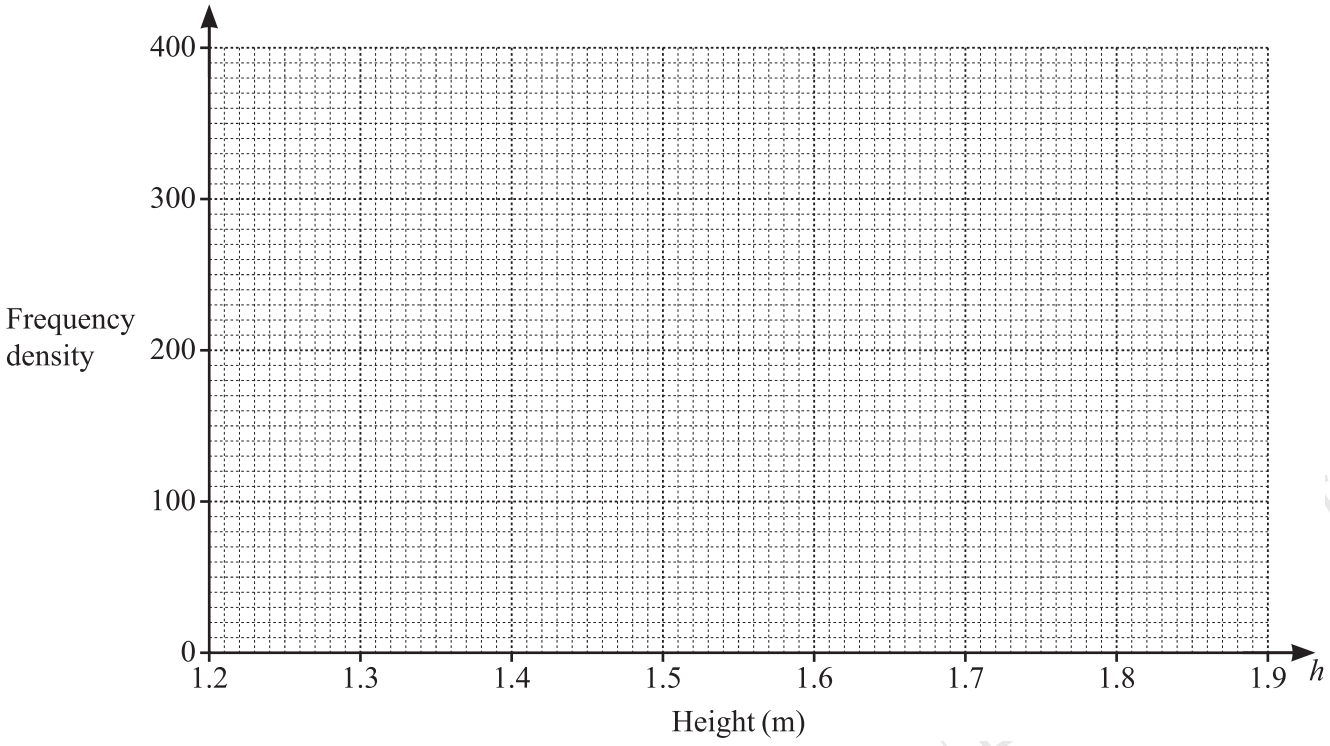
8 Virat records the height of each of 80 sunflowers.
The results are shown in the table.

Height (h m)	$1.2 < h \leq 1.5$	$1.5 < h \leq 1.6$	$1.6 < h \leq 1.7$	$1.7 < h \leq 1.9$
Frequency	12	20	34	14

(a) Calculate an estimate of the mean height.

..... m [4]

(b) Draw a histogram to show the information in the table.



[3]

(a) Averages from grouped data (b) Histograms Click for more variations

STEM

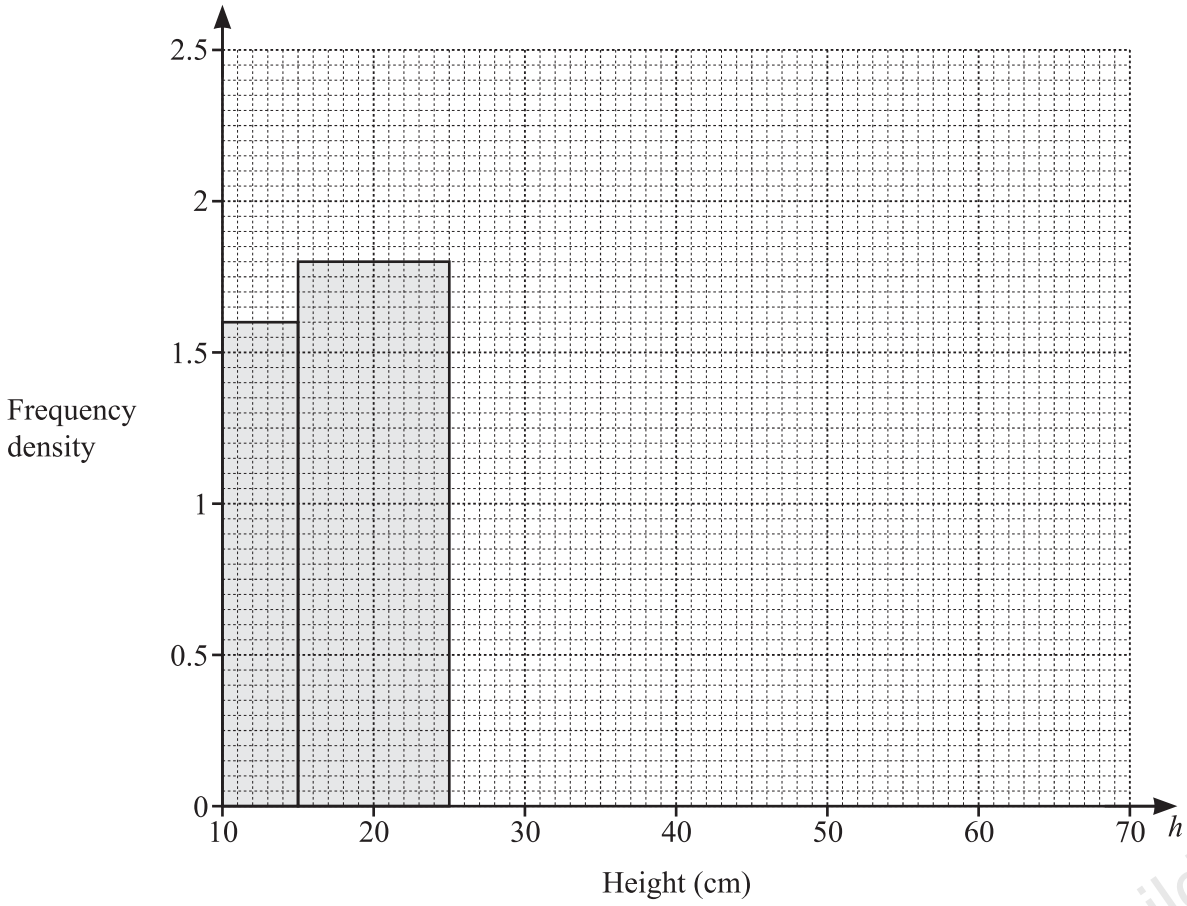
8(a)	1.606 25	**4**	**M1** for mid-points **soi** (1.35, 1.55, 1.65, 1.8) **M1** for use of Σfm with m in correct interval including both boundaries **M1 dep** (dep on 2nd M1) for $\Sigma fm \div 80$
8(b)	Correct histogram	**3**	**B2** for 3 correct blocks or **B1** for 2 correct blocks If 0 scored, **SC1** for 3 correct freq densities soi (40, 200, 340, 70)

STEM | Exam Builder

9 The height, h cm, of each of 100 plants is recorded.
The table shows information about the heights of these plants.

Height (h cm)	$10 < h \leqslant 15$	$15 < h \leqslant 25$	$25 < h \leqslant 40$	$40 < h \leqslant 60$	$60 < h \leqslant 70$
Frequency	8	18	28	33	13

(a) Complete the histogram to show this information.
The first two blocks have been drawn for you.



[3]

(b) Calculate an estimate of the mean height.

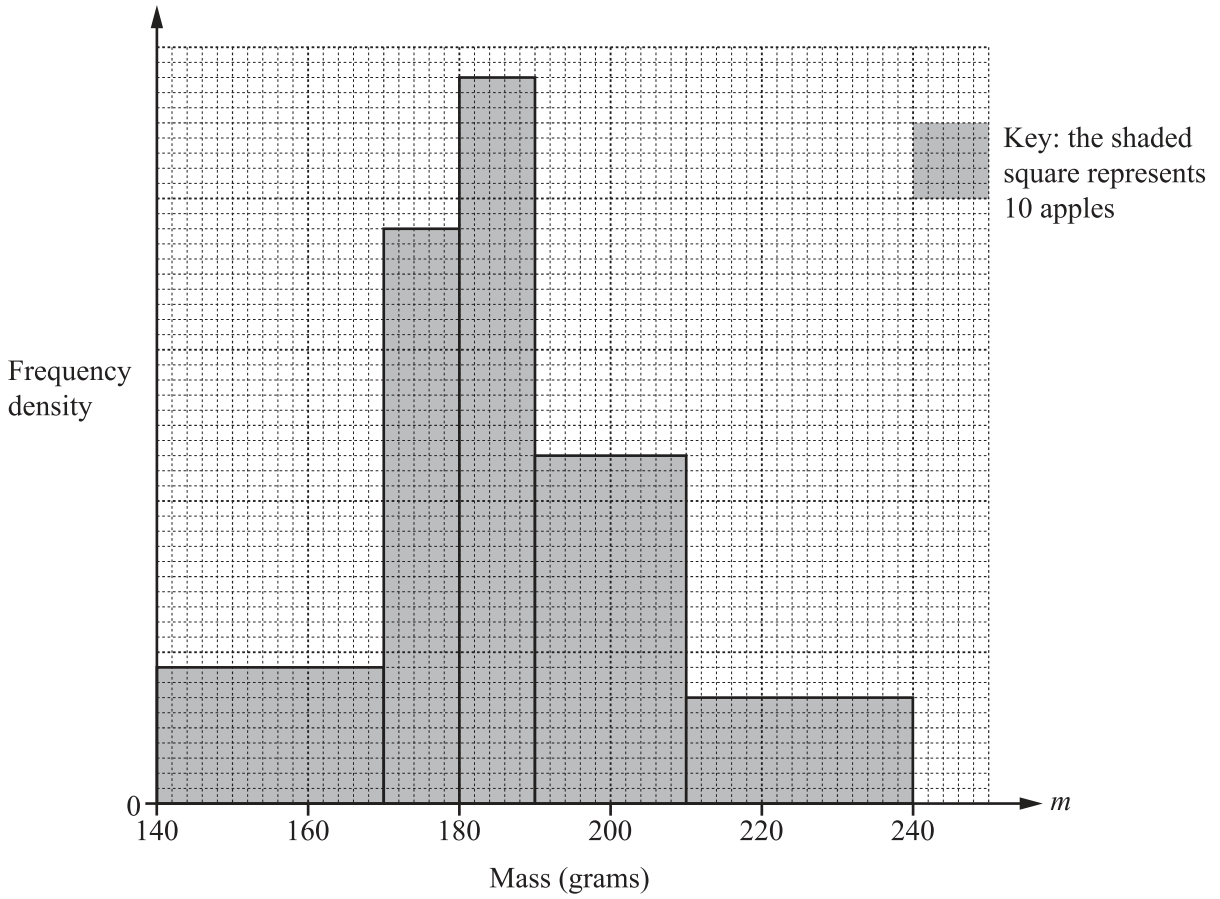
..... cm [4]

(a) Histograms (b) Averages from grouped data Click for more variations

STEM | Exam Builder

9(a)	Correct histogram	**3**	**B1** for each correct block If 0 scored, **SC1** for two of $\frac{28}{15}$, $\frac{33}{20}$, $\frac{13}{10}$ or 1.87 or 1.866 to 1.867, 1.65, 1.3
9(b)	38.65	**4**	**M1** for 12.5, 20, 32.5, 50, 65 soi **M1** for $\sum fx$ where x is in the correct interval including boundaries **M1dep** for $\sum fx \div 100$

10 The histogram shows the distribution of the masses, m grams, of 360 apples.



(a) Use the histogram to complete the frequency table.

Mass (m grams)	Number of apples
$140 < m \leqslant 170$	
$170 < m \leqslant 180$	
$180 < m \leqslant 190$	
$190 < m \leqslant 210$	92
$210 < m \leqslant 240$	42

[3]

STEM | Exam Builder

(b) Calculate an estimate of the mean mass of the 360 apples.

..... g [4]

(a) Histograms (b) Averages from grouped data Click for more variations

10(a)	54, 76, 96	**3**	**B1** for each
10(b)	187 or 186.8 to 186.9 nfww	**4**	**M1** for 155, 175, 185, 200, 225 soi **M1** for Σ*fm* with *their* frequencies from **(a)** 155 × *their* 54 + 175 × *their* 76 + 185 × *their* 96 + 200 × 92 + 225 × 42 **M1** (dep on second **M1**) for *their* Σ*fm* ÷ 360

STEM | Exam Builder