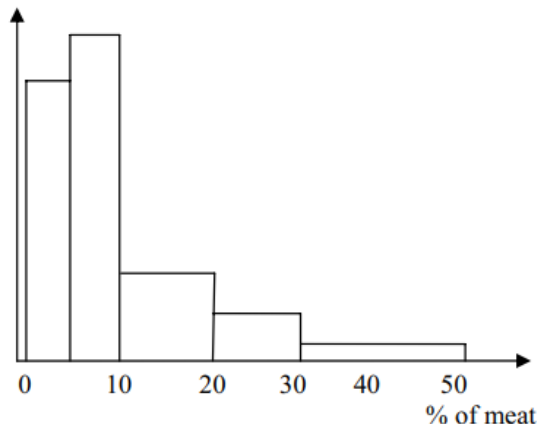


# Representation of Data 2 MS

Q1.

<b>4 (i)</b> $(3 \times 59 + 8 \times 67 + 15.5 \times 38 + 25.5 \times 18 + 40.5 \times 11)/193$ $= 11.4$  $\sigma^2 = (3^2 \times 59 + 8^2 \times 67 + \dots)/193 - (11.43\dots)^2$  $\sigma = 9.78$ or $9.79$	M1	Attempt to calculate the mean using midpoints not ends, with frequencies, can be implied
	A1	Correct mean
	M1	Using $\Sigma x^2 f$ with mean <sup>2</sup> subtracted numerically, can be implied
	A1	<b>4</b> Correct answer, method marks can be implied

<b>(ii)</b> fd = 11.8, 13.4, 3.8, 1.8, 0.55  	M1	Attempt at frequency density or scaling
	A1	Correct heights seen on graph
	B1	Bar lines correctly located at 5.5, 10.5, 20.5 and 30.5, no gaps, their scale which may be non-linear
	B1	correct widths of bars, independent of bar lines
	B1	<b>5</b> Both axes uniform, from at least 0 to 14 if fd and 0.5 to 50.5, and labelled (fd or freq per 5% and % meat or % or meat)

Q2.

<b>1 (i)</b>	$sd^2 = 1957.5/30 - (234/30)^2$ $sd = 2.1$	M1	<b>[2]</b> Subst in formula or expand Accept 2.10
	<b>(ii)</b> $86 = 234/30 + c$ $c = 78.2$	M1 A1	
		A1	<b>[2]</b> 234/30 seen

## Representation of Data 2 MS

Q3.

<p>6 (i) (40, 0), (50, 12) etc. up to (90, 144)</p> <p>cf points</p> <p>(ii) 80 weigh less than 67.2 kg <math>c = 67.2</math></p>	<p>B1</p>      <p>B1 [2]</p>  <p>M1 A1 ft [2]</p>	<p>Axes, (cf) and labels (kg), uniform scales from at least 0–140 and 40.5–69.5 either way round</p>      <p>All points correct, sensible scale (not 12), polygon or smooth curve</p>  <p>Subt 64 from 144 Accept anything between 67 and 68 ft from incorrect graph</p>
<p>(iii) freqs 12, 22, 30, 28, 52</p> <p>mean wt = <math>(45 \times 12 + 55 \times 22 + 62.5 \times 30 + 67.5 \times 28 + 80 \times 52)</math>  <math>\quad\quad\quad / 144</math>  <math>= 9675 / 144</math>  <math>= 67.2</math> kg</p> <p>Var <math>(45^2 \times 12 + 55^2 \times 22 + 62.5^2 \times 30 + 67.5^2 \times 28 + 80^2 \times 52) / 144</math>  <math>- (9675/144)^2 = 127.59</math></p> <p>sd = 11.3, allow 11.2</p>	<p>M1 A1</p> <p>M1</p>  <p>A1</p>  <p>M1</p>    <p>A1 [6]</p>	<p>frequencies attempt not cf Correct freqs</p> <p>Using mid points attempt, i.e. 44.5, 45, 45.5, in correct mean formula, unsimplified, no cfs, condone 1 error.</p> <p>Correct mean</p>  <p>Substituting their mid-pts squared (may be class widths, lower or upper bound) in correct var formula even with cfs with their mean<sup>2</sup></p>  <p>Correct answer</p>

## Representation of Data 2 MS

Q4.

<p><b>3</b> <math>\Sigma(x-5) = 116 - 18 \times 5</math>  <math>= 26</math></p> $\frac{\Sigma(x-5)^2}{18} - \left(\frac{26}{18}\right)^2 = \frac{967}{18} - \left(\frac{58}{9}\right)^2$ <p><math>\Sigma(x-5)^2 = 257</math></p> <p>OR coded mean = <math>58/9 - 5 = 1.444</math>  <math>\Sigma(x-5) = 1.444 \times 18 = 26</math></p> <p><math>\Sigma(x-5)^2 = \Sigma x^2 - 10\Sigma x + 25 \times 18</math>  <math>= 967 - 1160 + 450 = 257</math></p>	M1		Obtaining $\Sigma x$ and subtracting $18 \times 5$ Correct answer
	A1		
	M1	5	Subst in correct var formula all coded vals Subst in correct var formula all uncoded
	M1		
	A1	Correct answer	
	M1	Subtracting 5 from true mean and mult by 18 Correct answer	
A1			
M1	Expanding $\Sigma(x-5)^2$ 3 terms needed Any 2 terms correct Correct answer		
A1			
A1			

Q5.

<p><b>4 (i)</b> number = <math>1.5 \times 50 = 75</math> (AG)</p> <p><b>(ii)</b> freqs are 10, 25, 50, 75, 30 (15, 15)</p> <p>Mean = <math>(10 \times 125 + 25 \times 162.5 + 50 \times 187.5 + 75 \times 225 + 30 \times 300)/190</math>  <math>= 40562.5/190 = 213</math> (213.48 ...)</p> <p><math>sd^2 = 10 \times 125^2 + 25 \times 162.5^2 + 50 \times 187.5^2 + 75 \times 225^2 + 30 \times 300^2 / 190 - (213.48 \dots)^2</math></p> <p>sd = 46.5 or 46.6</p> <p><b>(iii)</b> have used the mid-point of each interval and not the raw data</p>	B1	[1]	Must see $1.5 \times 50$
	M1		
	A1	6	Attempt at freqs not fd Correct freqs attempt at mid points not cw or ucb or lcb
	M1		
	A1	correct mean	
	M1	subst their $\Sigma fx^2$ in correct variance formula	
A1	[6]		
B1	[1]		

Q6.

<p><b>1</b> mean = <math>(5 + (-2) + 12 + 7 + (-3) + 2 + (-6) + 4 + 0 + 8) / 10</math>  <math>= 2.7</math></p> <p>var = <math>(5^2 + (-2)^2 + \dots + 8^2) / 10 - 2.7^2 =</math>  <math>= 27.8</math></p>	B1	3	Subst in correct var formula must have $-\text{mean}^2$ Correct answer
	M1		
	A1		

## Representation of Data 2 MS

Q7.

<b>5</b>	<b>(i)</b>	$\text{new mean} = \frac{9 \times 7.1 + 18 \times 5.2}{27}$ $= 5.83$	<b>M1</b>	Mult by 9 and 18 and dividing by 27
			<b>A1 [2]</b>	correct answer
	<b>(ii)</b>	$1.45^2 = \text{so } \frac{\sum x_i^2}{9} = 472.6125 \text{ mm}$ $0.96^2 = \frac{\sum x_g^2}{18} - 5.2^2 \text{ so}$ $\sum x_g^2 = 503.3088$ $\frac{\text{New sd}^2}{27} = \frac{472.6125 + 503.3088}{27} - 5.83^2 = 2.117$ New sd = 1.46	<b>M1</b>	subst in a correct variance formula sq rt or not
			<b>A1</b>	correct $\sum x_i^2$ (rounding to 470)
			<b>A1</b>	correct $\sum x_g^2$ (rounding to 500)
			<b>M1</b>	using $\sum x_i^2 + \sum x_g^2$ , dividing by 27 and sub comb mean <sup>2</sup>
			<b>A1 [5]</b>	correct answer

Q8.

<b>3</b>	<b>(i)</b>	$a = 9/cw$ $= 9/2 = 4.5$ $1.5 = b/4 \text{ so } b = 6$	<b>M1</b>	Using $fd = f/cw$
			<b>A1</b>	Correct $a$
			<b>A1 [3]</b>	Correct $b$
	<b>(ii)</b>		<b>B1<sup>✓</sup></b>	Correct heights fit their $b$
			<b>B1</b>	Correct widths, ie 3, 2, 3, 4 starting either 60 or 59.5
			<b>B1 [3]</b>	Labels fd, time or minutes and squiggle and bars from 59.5 to 71.5