9	(a)		Area of 20-30 block \div total area = $\frac{110}{10}$ or $\frac{22}{10}$ or $\frac{4.4}{10} = 0.147$ (3 sf) (AC)	M1	1.2	attempted, using any units, eg small squares or cm^2
			750 01 150 01 30 0.147 (5 51) (AO)	[2]	1.1	Not any method starting with 0.147, eg $0.147 \times 150 = 22.05$
9	(b)	(i)	Roughly bell-shaped	B1	2.2b	or Roughly symmetrical <u>and</u> peaks in middle or has one peak <u>and</u> tails off at each end, or drops off either side All 3 of these must be seen (except "Bell-shaped" scores B1) Not "Shape is like normal curve" Ignore all else
9	(b)	(ii)	Roughly symmetrical about $x = 40$, or area to left of $40 \approx$ area to right of 40 or the peak is at 40 or 40 is in the middle $70 - 40 \approx 3\sigma$, hence $\sigma \approx 10$ or most values within 20 of mean, so $20 \approx 2\sigma$	B1	2.4	or calculate mean and obtain $\frac{5915}{150}$ or 39.4 Allow 40 has the highest frequency or frequency density Ignore all else or calculate sd and obtain 10.3 Most data is within 6σ

or (Area within 40±10)/total eg 510/750 or 102/150 = 0.68 or $\approx \frac{2}{3}$ B1 3.3 Must see correct fraction and $\approx \frac{2}{3}$, or 68% or 0.68 9 (c) 0.136 (3 sf) B1 1.1 BC 9 (d) $m = 39.4$ or $\frac{5915}{150}$ or $\frac{1183}{30}$, $s = 10.3$ (3 sf) or $s^2 = 106$ (3 sf) B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4$ or $\frac{5915}{150}$ or $\frac{1183}{30}$, $s = 10.3$ (3 sf) or $s^2 = 106$ (3 sf) B1 1.1 Allow $105.5 \le s^2 \le 108.5$ or $10.27 \le s \le 10.42$ Ignore (Use of denominator n or $(n - 1)$ is OK for full matrix	2 e method ·ks) heights) 20, 2
or $102/150 = 0.68$ or $\approx \frac{2}{3}$ B1 3.3 Must see correct fraction and $\approx \frac{2}{3}$, or 68% or 0.68 9 (c) 0.136 (3 sf) B1 1.1 BC 9 (d) $m = 39.4$ or $\frac{5915}{150}$ or $\frac{1183}{30}$, $s = 10.3$ (3 sf) or $s^2 = 106$ (3 sf) B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4$ or $\frac{5915}{150}$ or $\frac{1183}{30}$, $s = 10.3$ (3 sf) or $s^2 = 106$ (3 sf) B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4$ or $\frac{5915}{150}$ or $\frac{1183}{30}$, $s = 10.3$ (3 sf) or $s^2 = 106$ (3 sf) B1 3.1a Allow $105.5 \le s^2 \le 108.5$ or $10.27 \le s \le 10.42$ Ignore (Use of denominator n or $(n-1)$ is OK for full matrix	2 e method ks) heights) 20, 2
3 [2] 9 (c) $0.136 (3 sf)$ B1 [1] 1.1 [1] BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 \text{ sf}) \text{ or } s^2 = 106 (3 \text{ sf})$ B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 \text{ sf}) \text{ or } s^2 = 106 (3 \text{ sf})$ B1 3.1a Allow $105.5 \le s^2 \le 108.5 \text{ or } 10.27 \le s \le 10.42$ Ignore (Use of denominator n or $(n-1)$ is OK for full matrix	2 e method ·ks) heights) 20, 2
9 (c) 0.136 (3 sf) B1 1.1 BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 sf) \text{ or } s^2 = 106 (3 sf)$ B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 sf) \text{ or } s^2 = 106 (3 sf)$ B1 1.1 Allow $105.5 \le s^2 \le 108.5 \text{ or } 10.27 \le s \le 10.42$ Ignore (Use of denominator n or $(n - 1)$ is OK for full matrix	2 e method ks) heights) 20, 2
y (c) $0.130 (3 \text{ sf})$ Di I.1 BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 \text{ sf}) \text{ or } s^2 = 106 (3 \text{ sf})$ B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 \text{ sf}) \text{ or } s^2 = 106 (3 \text{ sf})$ B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 \text{ sf}) \text{ or } s^2 = 106 (3 \text{ sf})$ B1 3.1a Allow $105.5 \le s^2 \le 108.5$ or $10.27 \le s \le 10.42$ Ignore (Use of denominator <i>n</i> or $(n-1)$ is OK for full matrix	2 e method ks) heights) 20, 2
9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 \text{ sf}) \text{ or } s^2 = 106 (3 \text{ sf})$ B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC 9 (d) $m = 39.4 \text{ or } \frac{5915}{150} \text{ or } \frac{1183}{30}$, $s = 10.3 (3 \text{ sf}) \text{ or } s^2 = 106 (3 \text{ sf})$ B1 3.1a Allow $39.1 \le m \le 39.7$ Ignore method BC (Use of denominator n or $(n-1)$ is OK for full matrix B1 1.1 Allow $105.5 \le s^2 \le 108.5 \text{ or } 10.27 \le s \le 10.42$ Ignore	2 e method ·ks) heights) 20, 2
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	e method ·ks) heights) ?0, 2
B1 B1 B1 Allow $105.5 \le s^2 \le 108.5$ or $10.27 \le s \le 10.42$ Ignore (Use of denominator <i>n</i> or $(n-1)$ is OK for full mat	e method 'ks) heights) 20, 2
(Use of denominator n or (n-1) is OK for full matrix	rks) heights) 20, 2
	heights) 20, 2
M1 for attempting, find frequencies or areas (NOT	20, 2
or at least five of these seen: 4 22 23 28 29 22	-0, 2
or 20, 110, 115, 140, 145, 110, 100, 10	
0.150 or 0.151 or 0.152 (3 sf) Allow 0.15 B2 3.4 cao Correct with unclear or no working; B1B1B1E	1
B1 1.1 or B1 for 0.145 to 0.158	
NB No retrospective marks if 0.151 seen in table for	or (e)(i)
[4]	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	
B1 1.1 B1 for middle row correct ± 0.001 NB	
$N(m, s^2) = 0.030 = 0.151 = 0.153 = 0.189 = 0.183 = 0.142 = 0.130 = 0.023 = 0.123 = 0.023 = 0.123 = 0.023 = 0.123 = 0.023 = $	
[2]	
9 (e) (ii) Nina's model better fit for lower values of X Allow "more accurate" or "less accurate" or simila	r
Nina's model better fit for any ranges < 40 B1 3.5a	
Nina's model less good fit for 40-45 (or >60)	
Sam's model better fit for higher values	
Sam's model better fit for any ranges > 40 B1 3.5 9 BUT SC: "Both less good fit for >60 " alone: B1 or	1v
Sam's model less good fit for 20-30 (or >60) NOT "Both are fairly good fit" B0B0	цу

