1.

Question Number	Scheme	Marks
(a)	$2.8 + 5.6 + 2.3 + 9.4 + 0.5 + 1.8 + 84.6 = 107$ mean = 107 / 28 (= 3.821…) **(awrt 3.8)**	M1 A1 (2)
(b)	It will have no effect since one is 4.5 under what it should be and the other is 4.5 above what it should be.	B1 dB1 (2) **[4]**
	Notes	
(a)	M1 for a clear attempt to add the two sums. Accept a full expression or $2.8 + 5.6 + \ldots + 84.6 = x$ where $100<x<110$ i.e. seeing at least two correct terms of Keith's and the 84.6 with a slip. A1 for awrt 3.8 (Condone 1 dp/2sf here since data is given to 1 dp or 2 sf) Accept $\frac{107}{28}$ or $3\frac{23}{28}$ or any exact equivalent **Correct answer implies M1A1**	
(b)	1st B1 for clearly stating that it will have no effect. ("roughly the same" is B0 B0) 2nd dB1 for a supporting reason that mentions the fact that the increase and decrease are the same and gives some numerical value(s) to support this. e.g. Sum of Keith's observations is still 22.4 (or mean is still 3.2) or Sum is still 107 or $9.4 - 4.9 = 5 - 0.5$ (o.e.) This second B1 is dependent on their saying there is no effect so B0B1 is not possible.	

2.

Question Number	Scheme	Marks
	<table><tr><td>Width</td><td>1</td><td>1</td><td>4</td><td>2</td><td>3</td><td>5</td><td>3</td><td>12</td></tr><tr><td>Freq. Density</td><td>6</td><td>7</td><td>2</td><td>6</td><td>5.5</td><td>2</td><td>1.5</td><td>0.5</td></tr></table> 0.5×12 or 6 Total area is $(1\times6)+(1\times7)+(4\times2)+....,=70$ $(90.5-78.5)\times\frac{1}{2}\times\frac{140}{\text{their } 70}$ "70 seen anywhere" Number of runners is 12	**M1** **A1** **M1** **B1** **A1** **(5)** **Total 5 marks**
	1st M1 for attempt at width of the correct bar (90.5 - 78.5) [Maybe on histogram or in table] 1st A1 for 0.5×12 or 6 (may be seen on the histogram. Must be related to the area of the bar above 78.5 - 90.5. 2nd M1 for attempting area of correct bar $\times\frac{140}{\text{their } 70}$ B1 for 70 seen anywhere in their working 2nd A1 for correct answer of 12. Minimum working required is $2\times0.5\times12$ where the 2 should come from $\frac{140}{70}$ Beware 90.5 - 78.5 = 12 (this scores M1A0M0B0A0) Common answer is $0.5\times12=6$ (this scores M1A1M0B0A0) If unsure send to review e.g. $2\times0.5\times12=12$ without 70 being seen	

3.

Question	Scheme	Marks	AOs
3	Overall method	M1	2.1
	$a+b=2c+0.3$ oe **or** $a+b=2(1-a-b)$	B1	2.2a
	$a+b+c=0.85$ oe	B1 A1	1.1b
	$3c=0.55$ $\left[c=0.1833\ldots \text{ or } \frac{11}{60}\right]$	M1	1.1b
	P(scoring 3,5 or 5,3 or 4,4) = $2\times "\frac{11}{60}"\times 0.1+0.05^2$	M1	3.1b
	$=0.039$ oe	A1cso	1.1b
		(7)	
			(7 marks)

Notes		
3	**M1:**	A fully correct method with all the required steps. For gaining 2 correct equations with at least one correct(allow if unsimplified). Attempting to solve to find a value of c followed by **correct method** to find the probability
	B1:	Forming a correct equation from the information given in the question
	B1:	A correct equation using the sum of the probabilities equals 1
	M1:	Correct method for solving 2 equations to find c Implied by $c=\frac{11}{60}$
	M1:	Recognising the ways to get a total of 8. Condone missing arrangments or repeats. Do not ignore extras written unless ignored in the calculation. May be implied by $m\times "\frac{11}{60}"\times 0.1+n\times 0.05^2$ where m and n are positive integers
	A1cso:	Cao 0.039, $\frac{7}{200}$ oe

4.

(a)	X ~ B(10, p)	Binomial (10, 0.75)	B1, B1 (2)
(b)	P(X = 6) = 0.9219 – 0.7759 = 0.1460	P(X≤6) – P(X≤5) 0.1460	M1 A1 (2)
(c)	H_0: $p = 0.75$ (or $p = 0.25$)	Correct H_0	B1
	H_1: $p < 0.75$ (or $p > 0.25$)	One tailed H_1	B1
	Under H_0, X ~ B(20, 0.75) (or Y ~ B(20,0.25))	Implied	B1
	P($X \leq 13$) = 1 – 0.7858 = 0.2142 (or P($Y \geq 7$)) Insufficient evidence to reject H_0 as 0.2412 > 0.05	P($X \leq 13$) and 1 - , 0.2142	M1, A1
	Doctor's belief is not supported by the sample	Context	A1
	(OR CR P($X \leq 12$) = 1 – 0.8982 = 0.1018 *(or P($Y \geq 8$))* *P($X \leq 11$) = 1 – 0.9591 = 0.0409* *(or P($Y \geq 9$))* *13 outside critical region* *(or 7))*	*either*	(6) (*M1 A1*)
(d)	P($X \leq$ c) ≤ 0.01 for p=0.75 (or P($Y \geq$ 20-c) ≤ 0.01 for p=0.25) P($X \leq 9$) = 1 – 0.9961 = 0.0039 (or P($Y \geq 11$) P($X \leq 10$) = 1 – 0.9861 = 0.0139 (or P($Y \geq 10$) C. R. is [0,9], so greatest no. of patients is 9.	0.9961 or 0.9981 9	M1 A1 B1 B1 (4) **Total 14**