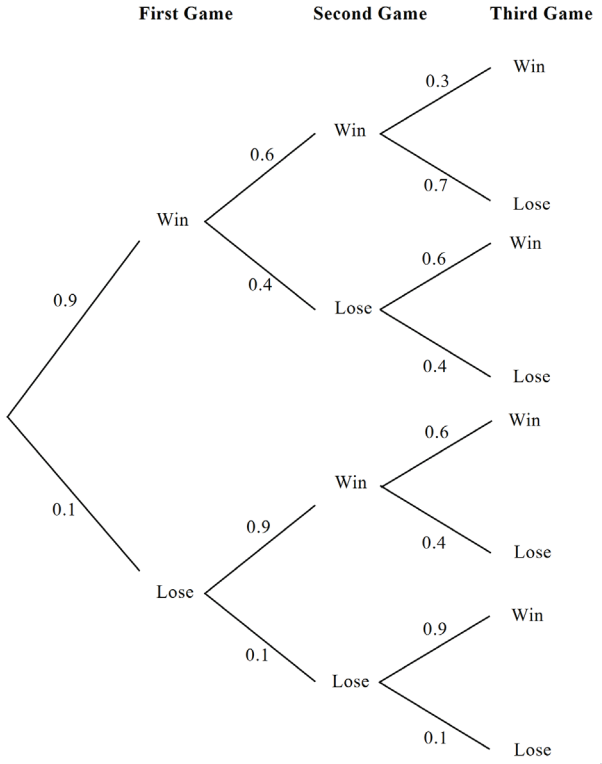
Question Number	Scheme	Marks
1 (a)	[E(X) =] 3	B1
		(1)
(b)	$\left[\mathrm{E}(X^2) = \sum x^2 \mathrm{P}(X = x) =\right] 1^2 \times \frac{1}{5} + 2^2 \times \frac{1}{5} + 3^2 \times \frac{1}{5} + 4^2 \times \frac{1}{5} + 5^2 \times \frac{1}{5}$ or $[\mathrm{E}(X^2) = \mathrm{Var}(X) + \mathrm{E}(X)^2 =] \frac{5^2 - 1}{12} + 3^2 [= 2 + 9]$	M1
	$\left[\mathrm{E}(X^2) =\right] 11$	A1
		(2)

	Notes	Total 3
(a)	**B1**	cao Do not isw if they divide by 5 again after achieving 3
(b)	**M1**	for a correct method to find $\mathrm{E}(X^2)$ using $\sum x^2 \mathrm{P}(X = x)$ Condone one omission. May be implied by 11 provided it is not an intermediate answer to an incorrect method to finding $\mathrm{E}(X^2)$ Condone further work attempting to use 11 to find Var(X) for this mark Alternatively score for use of $\mathrm{E}(X^2) = \mathrm{Var}(X) + \mathrm{E}(X)^2$ May be implied by 2+'3'^{2}
	A1	cao (correct answer with no incorrect working 2/2) do not isw if they divide by 5 again or they proceed to find Var(X)

Question Number	Scheme	Marks
2 (a)		B1 B1 dB1
		(3)
(b)	$0.9\times0.6\times0.3=0.162$	M1 A1
		(2)
(c)	$0.9\times0.6\times'0.7'+0.9\times'0.4'\times'0.6'+'0.1'\times'0.9'\times'0.6'$ [='0.378'+'0.216'+'0.054']	M1 dM1
	$=0.648$	A1
		(3)

		Notes	Total 8
(a)	**B1**	for a complete structure with labels win and lose (Condone W and L for win and lose or other labels if clearly defined)	
	B1	for correct probabilities on branches for the first and second game	
	dB1	dep on both previous B marks it is for a fully correct tree diagram	
(b)	**M1**	for $0.9\times0.6\times0.3$ oe **only** May be implied by 0.16(2) but not if this is part of an incorrect method i.e. do not isw	
	A1	for 0.162 oe (e.g. $\frac{81}{500}$) (correct answer with no incorrect working 2/2)	
(c)	**M1**	for one correct product. You may ft on their tree diagram provided all are probabilities. They must be multiplying the 3 probabilities together. May be implied by one of 0.37(8) or 0.21(6) or 0.054 (allow rounded to 2sf or truncated)	
	dM1	dep on previous M. It is for all 3 correct products and attempting to add the three different products together. You may ft on their tree diagram of the correct structure provided all are probabilities. May be implied by $0.37(8)+0.21(6)+0.054$ (allow rounded to 2sf or truncated) Note if in (a) 1st B mark is B0 as they are missing the branches after WIN-LOSE then it is unlikely they will score this mark unless from a restart.	
	A1	for 0.648 oe (e.g. $\frac{81}{125}$) correct answer which has not clearly come from an incorrect method (3/3)	

Question Number	Scheme	Marks
3 (a)	Width = 1.6[cm]	B1
	$[\text{their}'h \times w'=]$awrt 21.0 or Area of 21[cm^2 for a frequency of 14] or FD = 1.6 or k = 1.75 or 1.5	M1
	Height = 13.125 (cm)	A1
		(3)
(b)	$[20.5]+\frac{32-21}{14}\times 5$ or $[20.5]+\frac{32.5-21}{14}\times 5$	M1
	= awrt 24.4 or = awrt 24.6	A1
		(2)
(c) (i)	$\frac{1517.25}{64}=23.707...=23.71*$	B1*
(ii)	$\sqrt{\frac{41368.3125}{64}-\left('\frac{1517.25}{64}'\right)^2}=9.1845....$ awrt 9.18	M1 A1
		(3)
(d)	Exact values are not known	B1
		(1)
(e)	Mean < Median so negative skew or Mean ≈ Median so no skew or $\frac{3("23.71"-"24.4"/"24.6")}{"9.1845"}$ so negative skew	B1ft
		(1)

	Notes	Total 10
(a)	**B1**	for width = 1.6 oe ignore units
	M1	for sight of 21 or 1.6 (provided this is not the width) or 1.75 or 1.5 which may be part of a calculation and may be unsimplified e.g. $21=14\times1.5$ so you may need to check this): Examples: $\left[\frac{\text{Height}}{\text{F.D.}}\Rightarrow\right]\frac{\text{Height}}{\frac{14}{5}(=2.8)}=\frac{7.5}{'1.6'}\Rightarrow\text{Height}=\frac{21}{'1.6'}$ (cm) **Using areas of the bars** $7.5\times3.2=24\,\text{cm}^2=16\,\text{photographers}\Rightarrow'1.6'\times h=\frac{14}{16}\times24\Rightarrow h=13.125$ **Using area proportional to frequency:** Frequency ratio: $\frac{14}{16}$ Width ratio is $\frac{5}{10}=\frac{1}{2}$ $\Rightarrow\frac{\text{Height}}{7.5}\times\frac{1}{2}=\frac{14}{16}\Rightarrow\text{Height}=\left(\frac{14}{16}\times2\right)\times7.5[=13.125]$ **Direct ratio formula:** $\frac{h_2}{h_1}=\frac{\frac{f_2}{w_2}}{\frac{f_1}{w_1}}\Rightarrow\frac{\text{Height}}{7.5}=\frac{\frac{14}{5}}{\frac{16}{10}}\Rightarrow\text{Height}=7.5\times\frac{\frac{14}{5}}{\frac{16}{10}}[=13.125]$ May be implied by 13.1 or better
	A1	13.125 oe (e.g. allow the exact fraction $\frac{105}{8}$ and allow 13.1 ignore units)
	SC	width = awrt 1.42 and height = awrt 14.8 score B0M1A0

(b)	**M1**	for a correct fraction including the sign to find the median using either n or $n + 1$ or allow the fraction including the sign if working from the upper limit e.g. $[25.5]-\frac{3}{14}\times 5$ Alternatively allow the equation: $\frac{32-21}{m-20.5}=\frac{14}{5}$ oe. May be implied by $\frac{171}{7}$ or $\frac{689}{28}$ or a correct answer.
	A1	for awrt 24.4 or awrt 24.6 Do not accept a fraction for this mark.
(c)(i)	**B1***	for a correct expression for the mean **or** 23.707… or better. Cannot be scored if only seen within the calculation for the standard deviation.
(ii)	**M1**	for a correct method to find the standard deviation including the square root i.e. $\sqrt{\frac{41368.3125}{64}-\mu^2}$. Follow through on their mean. May be implied by awrt 9.18 or $\sqrt{84.356..}$ May attempt $\sum fx^2$ using the table – look for an attempt with at least 3 correct products. Allow attempt at finding the s e.g. $\sqrt{\frac{41368.3125-64\times '23.707...'^2}{63}}=9.257...$ which may be implied by awrt 9.25 or awrt 9.26 or e.g. $\sqrt{85.6955...}$
	A1	awrt 9.18 or accept 9.185 or if using sample sd then awrt 9.26 or awrt 9.25 (correct answer scores 2/2)
(d)	**B1**	a correct reason given which explains that the exact values are not known. Do not allow references to the midpoints/exact values to score without further explanation that they are being used **because the exact values are not known** oe
(e)	**B1ft**	a correct comparison of the mean and median with a correct conclusion, ft their median or a correct calculation involving the **given** mean, their median and their standard deviation with a correct conclusion for their values. Note they may attempt to find the LQ and UQ for the data – they must be correct to at least 3sf if using n: $Q_1=17.4, Q_3=29.3$ if using $n+1$ $Q_1=17.5, Q_3=29.5$ $Q_2-Q_1>Q_3-Q_2\Rightarrow$ negative skew but condone incorrect values in this attempt if they have also made a comparison of the mean with their median which is correct and the conclusion using the quartiles is consistent with this. Any comparison with the mode only is B0

Question Number	Scheme	Marks
4 (a)	$a+a^2+0.26+0.34+0.16=1$	M1
	$a^2+a-0.24=0\Rightarrow(a-0.2)(a+1.2)=0\Rightarrow a=...$	dM1
	$a = 0.2$ as e.g. a cannot be negative *	A1*
		(3)
(b)	$\mathrm{E}(X)=1\times0.2+2\times0.2^2+3\times0.26+4\times0.34+5\times0.16\left[=3.22=\frac{161}{50}\right]$	M1
	$\mathrm{E}(2X+4)=2\mathrm{E}(X)+4=2\times'3.22'+4$	M1
	= 10.44 awrt 10.4	A1
		(3)
Alt(b)	$Y = 2X + 4$ so y = 6, 8, 10, 12, 14	M1
	$\mathrm{E}(Y)=6\times0.2+8\times0.2^2+10\times0.26+12\times0.34+14\times0.16\ [=10.44]$	M1
	= 10.44 awrt 10.4	A1
		(3)
(c)	$\mathrm{E}(X^2)=1^2\times0.2+2^2\times0.2^2+3^2\times0.26+4^2\times0.34+5^2\times0.16\left[=12.14=\frac{607}{50}\right]$	M1
	$\mathrm{Var}(X)='12.14'-'3.22'^2\ [=1.7716]$	M1
	$\mathrm{Var}(2X+4)=4\mathrm{Var}(X)=4\times'1.7716'$	M1
	= 7.0864 awrt 7.09	A1
		(4)
Alt(c)	$Y = 2X + 4$ so y^2 = 36, 64, 100, 144, 196	M1
	$\mathrm{E}(Y^2)=36\times0.2+64\times0.2^2+100\times0.26+144\times0.34+196\times0.16[=116.08]$	M1
	$\mathrm{Var}(Y)='116.08'-'10.44'^2\ [=7.0864]$	M1
	= 7.0864 awrt 7.09	A1
		(4)
(d)	awrt "7.09"	B1ft
		(1)

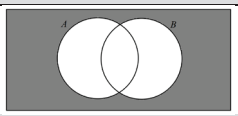
	Notes	Total 11
(a)	**M1**	for use of $\sum \mathrm{P}(X=x)=1$ which may be implied by a correct 3TQ
	dM1	dep on 1st M for a 3TQ in a and attempts to solve the 3TQ by factorising, completing the square or quadratic formula proceeding to at least one value. If they state the roots without working (e.g. solving directly from a calculator) they must state **both** 0.2 and -1.2 oe. Correct roots from a correct 3TQ scores M1dM1 Condone when factorising if their factors are for the equivalent quadratic equation $\times25$ e.g. $a^2+a-0.24=0\Rightarrow(5a-1)(5a+6)=0\Rightarrow a=0.2$
	A1*	for achieving the given answer and a reason for selecting 0.2 following a correct quadratic. They either need to explain why they are rejecting the other root e.g. -1.2 is negative or probs are between 0 and 1 (or it is not a probability) or they need to explain why they are selecting 0.2 e.g. a must be greater than (or equal to) 0 Do not accept vague reasons e.g. -1.2 is not possible SC verification scores M1M0A0.

Mark (b) and (c) together **Look for values by the table for evidence of method or by the question**		
(b)	**M1**	for use of $\sum xP(X=x)$ (with at least 3 correct products or terms with intention to add) but division by 5 is M0. May see 0.2+ 0.08+0.78+1.36+0.8 - **cannot be implied by 3.22 alone.** Look out for attempts at $2X$ which can score this mark. e.g. $2\times0.2+4\times0.04+6\times0.26+8\times0.34+10\times0.16$ (with at least 3 correct products or terms with intention to add) but division by 5 is M0
	M1	for use of $2E(X)+4$ ft their E(X) In the attempt at $2X$ for the first M they would need to add 4 for this mark
	A1	awrt 10.4 (provided all previous marks scored) Accept $\frac{261}{25}$
Alt(b)	**M1**	for y = 6, 8, 10, 12, 14 (May be seen in part (c)). They do not have to be evaluated. May be implied by the values 1.2, 0.32, 2.6, 4.08, 2.24
	M1	for use of $\sum yP(Y=y)$ (with at least 3 correct products or terms with intention to add) but division by 5 is M0. May see 1.2+0.32+2.6+4.08+2.24 which can imply the first two M marks - **cannot be implied by awrt 10.4 alone**
	A1	awrt 10.4 (provided all previous marks scored) Accept $\frac{261}{25}$
(c)	**M1**	for use of $\sum x^2P(X=x)$ (with at least 3 correct products or terms with intention to add) but division by 5 is M0. May see 0.2+0.16+2.34+5.44+4 **Cannot be implied by 12.14 alone.** Condone if labelled as Var(X)
	M1	for use of $E(X^2)-E(X)^2$ ft their values for $E(X^2)$ and $E(X)$
	M1	for use of $4\text{Var}(X)$ ft their **positive** Var(X) – it cannot be for e.g. $4E(X^2)$ i.e. it must be a changed value from $E(X^2)$ even if it is labelled as Var(X)
	A1	awrt 7.09 (provided all previous marks scored)
Alt(c)	**M1**	for y = 36, 64, 100, 144, 196. They do not need to be evaluated. May see 7.2+2.56+26+48.96+31.36 **Cannot be implied by 116.08 alone.** Condone if labelled as Var(X) If they attempt $2X$ the values 4, 16, 36, 64, 100 oe can score this mark (note they do not need to add 4 for the Var(X))
	M1	for use of $\sum y^2P(Y=y)$ (with at least 3 correct products or terms with intention to add) or may attempt for just $2X$ (e.g. $4\times0.2+16\times0.04+36\times0.26+64\times0.34+100\times0.16$ oe) but division by 5 is M0
	M1	for use of $E(Y^2)-E(Y)^2$ ft their values for $E(Y^2)$ and $E(Y)$. May use the equivalent formula for $2X$
	A1	awrt 7.09 (provided all previous marks scored)
(d)	**B1ft**	awrt 7.09 or ft their **positive** answer in (c). Condone if their answer to (c) has subsequently been rounded to 3sf or better

Question Number	Scheme	Marks
5 (a)(i)	$\sum x^2 = 10\left(148.05 + 163.5^2\right)[= 268803]$ *	
	or	
	$148.05 = \frac{\left(\sum x^2\right)}{10} - 163.5^2 \Rightarrow \frac{\sum x^2}{10} = 148.05 + 163.5^2 \Rightarrow \sum x^2 = 268803$ *	B1*
	or	
	$148.05 = \frac{268803}{10} - 163.5^2 = 148.05 \Rightarrow \sum x^2 = 268803$ *	
(ii)	$\sum y^2 = 10\left(205.25 + 61.5^2\right)$	M1
	$\sum y^2 = 39875$	A1
		(3)
(b)(i)	$S_{yy} = 39875 - \frac{615^2}{10}[= 2052.5]$ or $S_{yy} = 205.25 \times 10[= 2052.5]$	
	or	B1*
	$S_{yy} = 39875 - 10 \times 61.5^2[= 2052.5]$	
(ii)	$S_{xy} = 102230 - \frac{1635 \times 615}{10}$	M1
	$= 1677.5$	A1
		(3)
(c)	$\frac{'1677.5'}{\sqrt{1480.5 \times 2052.5}} = 0.9623...$ awrt 0.962	M1 A1
		(2)
(d)	e.g. [Strong] positive correlation	B1ft
		(1)
(e)	e.g. The point (163.5, 61.5) is equal to $(\bar{x}, \bar{y})$	M1
	So PMCC will remain the same	A1
		(2)

	Notes	Total 11
(a)(i)	**B1***	for a correct expression for $\sum x^2$ on its own with sight of 10, 148.05 and 163.5 (or 26732.25) in their solution **or** if they have an equation with $\sum x^2$ as the only unknown, they need an intermediate stage of working before proceeding to 268803 Alternatively, show by verification that $\sum x^2 = 268803$ with a minimal conclusion. There should be no errors seen.

(ii)	**M1**	for a correct method to find $\sum y^2$ May be implied by 39875
	A1	39875 (correct answer scores M1A1)
(b)(i)	**B1***	for a correct expression for S_{yy}
(ii)	**M1**	for a correct method for S_{xy} May be implied by 1677.5
	A1	1677.5 oe (correct answer scores M1A1)
(c)	**M1**	for a correct method to find r using $S_{yy} = 2052$ and ft on their S_{xy} Does not need to be evaluated so do not be concerned by a value for r that is outside the valid range $[-1, 1]$. May be implied by awrt 0.96
	A1	awrt 0.962
(d)	**B1ft**	for indicating positive correlation provided $0 < r < 1$. Allow e.g. as x increases, y increases or positive linear relationship but positive relationship is B0 (too vague) ft on their r with a conclusion about correlation consistent with their value e.g. if $\lvert r \rvert < 0.4$ allow no correlation oe May conclude negative correlation if $-1 < r < 0$
(e)	**M1**	for a correct reason about the point being equal to the means of x and y e.g. the values are the same as the means (of x and y)
	A1	for stay the same oe **Note that M0A1 is not possible**

Question Number	Scheme	Marks
6 (a)		B1
		(1)
(b)(i)	$[\mathrm{P}(C) =] \, x + 0.2$	B1
(ii)	$\left[\mathrm{P}(D \mid C) =\right] \dfrac{0.2}{x + 0.2}$	B1
		(2)
(c)	$\left[\mathrm{P}\left(C \cup D\right) =\right] \, x + y + 0.2$	B1
		(1)
(d)	$x + y + 0.44 = 1$ oe or $x + y + 0.2 = 0.76$ oe	M1
	$x + 0.2 = 3\left(y + 0.2\right)$ **or** $x + y + 0.2 = 0.6 + 4y \; \left[\Rightarrow x - 3y = 0.4\right]$	M1
	$y = 0.04$ and $x = 0.52$	A1A1
		(4)
(e)	$\mathrm{P}(C) = 0.72, \mathrm{P}(D) = 0.24, \mathrm{P}(C \cap D) = 0.2$ or $\mathrm{P}(C) = 0.72, \mathrm{P}(C \mid D) = 0.8333...$ or $\mathrm{P}(D) = 0.24, \mathrm{P}(D \mid C) = 0.2777...$	M1
	$\mathrm{P}(C) \times \mathrm{P}(D) \neq \mathrm{P}(C \cap D)$ or $\mathrm{P}(C \mid D) \neq \mathrm{P}(C)$ or $\mathrm{P}(D \mid C) \neq \mathrm{P}(D)$ So not independent	A1
		(2)

	Notes		Total 10
(a)	**B1**	for a correct shading – needs some indication of sections shaded / unshaded	
(b)(i)	**B1**	cao isw following a correct expression seen	
(ii)	**B1**	cao isw following a correct expression seen	
(c)	**B1**	cao Condone if they equate their expression to 0.76 only May be seen in (d) but must be an expression which is clearly labelled and not just embedded within an equation.	
(d)	**M1**	for either $x + y + 0.44 = 1$ oe or $x + y + 0.2 = 0.76$ oe May have already substituted in $x + 0.2 = 3\left(y + 0.2\right)$ e.g. $3y + 0.6 + y + 0.24 = 1$ which scores M1M1 Also allow if they state or find probabilities for x and y where $x + y = 0.56$ oe Note if the equations are seen elsewhere they must be used in this part to score.	
	M1	for $x + 0.2 = 3\left(y + 0.2\right)$ oe or $x + y + 0.2 = 0.6 + 4y$ oe may be seen within an equation	
	A1	for either $y = 0.04$ oe **or** $x = 0.52$ oe	
	A1	for both $y = 0.04$ oe **and** $x = 0.52$ oe	
	Note	**Beware e.g.** $3(x + 0.2) = y + 0.2 \Rightarrow x = 0.04, \; y = 0.52$ **which scores M1M0A0A0**	
(e)	**M1**	for labelling all of the probabilities needed for a test of independence (probabilities must be correct or correct ft on their probabilities for x and y) Allow e.g. $0.2 + '0.52'$ as a probability. Must use C and D. The probabilities may be seen in a calculation which matches their stated test. Either $\mathrm{P}(C)$, $\mathrm{P}(D)$ and $\mathrm{P}(C \cap D)$ or $\mathrm{P}(D \mid C)$ and $\mathrm{P}(D)$ or $\mathrm{P}(C \mid D)$ and $\mathrm{P}(C)$ (must all be probs)	
	A1	for stating the correct test with the correct probabilities $\mathrm{P}(C) \times \mathrm{P}(D) \neq \mathrm{P}(C \cap D)$	

		or e.g. $P(D \mid C) \neq P(D)$ and correct conclusion of not independent. If e.g. $P(C) \times P(D)$ is evaluated then it must be correct (allow to be rounded)

Question Number	Scheme	Marks
7 (a)	$b = \frac{5780}{6948} = 0.83189...$	M1 A1
	$a = 62 - 'b' \times 55 = 16.2458...$	M1
	So $p = 16.2 + 0.832t$	A1
		(4)
(b)	Every extra mark in the theory test adds "0.832" marks to the practical test	B1ft
		(1)
(c)	16.2 + 62 × 0.832 [= 67.784] or 16.2 + 20 × 0.832 [= 32.84]	M1
(i) &(ii)	68 or awrt 67.8 33 or awrt 32.8/32.9	A1ft A1ft
		(3)
(d)	Student A is interpolation (and student B is extrapolation)	M1
	So the result for student A (is more reliable)	A1
		(2)

	Notes		Total 10
(a)	**M1**	for a correct method to find b **Cannot be implied by awrt 0.83** but may be implied by a correct fraction. Condone $\frac{S_{tp}}{S_{tt}}$ to score this mark.	
	A1	awrt 0.83 oe (condone $\frac{1445}{1737}$ but not $\frac{5780}{6948}$) May be seen in further work / final equation	
	M1	for a correct method to find a **Cannot be implied by awrt 16.2**	
	A1	for p = awrt 16.2 + awrt 0.832t (do not accept fractions for a and b for this mark) with all previous marks scored. Allow p = 16.25 Must be in terms of p and t **Note that answer with no working scores 0 marks**.	
	Note	May see attempts to use the straight-line equation e.g. $p - 62 = \frac{5780}{6948}(t - 55)$ which would score M1A0M1A0 until further work done to simplify the gradient and reach the required form. Send to review if unsure.	
(b)	**B1ft**	for a correct interpretation ft their gradient in context – must mention theory (t), practical (p) and marks (condone scores). Must be clear that for each additional theory test mark, the practical mark increases by "0.832"	
(c)	**M1**	for substitution of 62 or 20 into their regression line. May be implied by awrt 68 or awrt 33 or the answer using their regression line to 2sf. Allow truncated.	
(i)	**A1ft**	for 68 or awrt 67.8 ft their regression line provided the answer is >0	
(ii)	**A1ft**	for 33 or awrt 32.8/32.9 ft their regression line provided the answer is >0	
	Note	If their regression line is not correct then you will need to check their answer Answers should be correct to 3sf but condone if they have given them to the nearest integer.	
(d)	**M1**	for a correct reason '**interpolation**' oe on its own or allow reference to the marks. e.g. A as the value/mark in the **theory test** used is within the range. i.e. it has to be clear that it is the **theory** test mark (t) that is within the range of values (and not the practical mark) Mentioning 62 or 20 will imply they are referring to the theory test marks or referring to the range 21 to 97 (condone 23 to 80). Allow e.g. '62 because it is closer to the mean' (it must be clear they are referring to the theory test mark)	

	A1	dep on M1 scored. It is for identifying student A (as more reliable) oe (e.g. allow 62 or 68 for A) **Note that M0A1 is not possible**

Question Number	**Scheme**	**Marks**
8 (a)(i)	$\left[\mathrm{P}\left(X<440\right)=\right]\mathrm{P}\left(Z<\dfrac{440-443}{3}\right)$	M1
	$\left[\mathrm{P}\left(Z<-1\right)=1-0.8413\right]=0.1587$ (Calc 0.158655…) **awrt 0.159**	A1
(ii)	$\left[\mathrm{P}\left(441.5<X<447.5\right)=\right]\mathrm{P}\left(\dfrac{441.5-443}{3}<Z<\dfrac{447.5-443}{3}\right)$	M1
	$\left[\mathrm{P}\left(-0.5<Z<1.5\right)=0.9332-0.3085\right]=0.6247$ (Calc 0.62465…) **awrt 0.625**	A1
		(4)
(b)	$\dfrac{443+k-443}{3}=2.3263$ or $\dfrac{443-k-443}{3}=-2.3263$	M1 B1
	$k=6.9789$ **awrt 6.98**	A1
		(3)
(c)	$\mathrm{P}\left(Y<338.1\right)=0.025\Rightarrow\dfrac{338.1-\mu}{\sigma}=-1.96$ or $\mathrm{P}\left(Y>344\right)=0.30\Rightarrow\dfrac{344-\mu}{\sigma}=0.5244$	M1 A1A1
	$\left[5.9=2.4844\sigma\Rightarrow\right]\sigma=...,\ \mu=...$	dM1
	$\sigma=2.3748...$ and $\mu=342.7546...$ **awrt 2.37 and awrt 343**	A1
		(5)

Notes		**Total 12**
	Note	Standardising using $\sigma=9$ scores maximum (a)(i) M0A0 (ii) M0A0 (b)M0B1A0
(a)(i)	**M1**	for standardising using 443 and 3 oe (implied by ±1)
	A1	awrt 0.159 and evidence of standardisation is seen (**answer only is 0/2**)
(ii)	**M1**	for standardising **both** parts using 443 and 3 oe (implied by ±0.5 **and** ±1.5). It cannot be implied by $0.9332-0.3085$
	A1	awrt 0.625 and evidence of standardisation is seen **(answer only is 0/2)**
(b)	**M1**	for achieving an expression of $\pm\frac{k}{3}$ which may be unsimplified. May be seen in an equation or within a probability statement. Look out for use of e.g. $x=443+k$ and standardise $\dfrac{x-443}{3}$ which would still score this mark. Condone if they use k for 'x' provided evidence of substituting back correctly in later work.
	B1	for sight of ± 2.3263 or better
	A1	awrt 6.98 (correct answer with no incorrect method seen scores 3/3) Allow 6.96 for use of $z=\pm2.32$ and allow 6.99 for use of $z=\pm2.33$

		Note that M1B0A1 is possible
Alt(b)	**M1**	Sets $443+k=a$ where $448<a<452$ or sets $443-k=b$ where $434<b<438$
	B1	for sight of either 449.97(90438…) so awrt 449.98 or 436.02(0956…) so awrt 436.02
	A1	awrt 6.98 (correct answer with no incorrect method seen scores 3/3)
(c)	**M1**	for standardising with 338.1 and σ and setting = to a z value where $1.9<\|z\|<2$ or for standardising with 344 and setting = to a z value where $0.5<\|z\|<0.6$
	A1	for **one** correct equation with z value 3sf or better with compatible signs
	A1	for **both** equations correct with z values 3sf or better with compatible signs
	dM1	dep on the previous M. It is for solving simultaneously their two equations in μ and σ and proceeding to values for **both** μ and σ. Condone if σ is negative for this mark. You do not need to check this on your calculator.
	A1	dep on all previous marks scored it is for awrt 2.37 (also accept 2.375) and awrt 343 and **both z values seen** are 3sf or better