Question Number	Scheme	Marks
7 (a)	$W = S_1 + S_2 + S_3 + L_1 + L_2 + L_3 + L_4$	
	$W \sim \mathrm{N}\left(3\times 7.7 + 4\times 20,\ 3\times 0.01^2 + 4\times 0.02^2\right)$ So $W \sim \mathrm{N}(103.1,\ 0.0019)$	M1 A1
	$\left[\mathrm{P}(W > 103.15) =\right] \mathrm{P}\left(Z > \dfrac{103.15 - '103.1'}{'\sqrt{0.0019}'}\right) \left[= \mathrm{P}(Z > 1.1470...)\right]$	M1
	$[1 - 0.8749] = 0.1251$ (Calculator gives 0.12567…) awrt 0.13	A1
		(4)
(b)	Let $Y = L_1 - L_2$	
	$Y \sim \mathrm{N}\left(0,\ 2\times 0.02^2\right)$ So $Y \sim \mathrm{N}(0,\ 0.0008)$	M1 A1
	$\mathrm{P}\left(Z > \dfrac{0.01 - '0'}{'\sqrt{0.0008}'}\right)$ or $\mathrm{P}\left(Z < \dfrac{-0.01 - '0'}{'\sqrt{0.0008}'}\right)$	M1
	$2\times(1 - 0.6368) = 0.7264$ (Calculator gives 2 × 0.36183…) awrt 0.724 – 0.726	M1 A1
		(5)
(c)	$T \sim \mathrm{N}\left(\mu, \sigma^2\right)$	
	$\mu = 7.7n - 7.7n [= 0]$	M1
	$\sigma^2 = 0.0001n^2 + 0.0001n$	M1
	$\dfrac{2 - '0'}{\sqrt{'0.0001n^2 + 0.0001n'}} = 1.99$	M1 B1
	$0.0001n^2 + 0.0001n - 1.01[00755...] = 0$	dM1
	$n = 100$	A1
		(6)
	Notes	**Total 15**

(a)	**M1**	For setting up a normal distribution with a mean 103.1
	A1	For a correct expression for variance (0.0019) or standard deviation (0.04358…) Implied by a correct variance or a correct standard deviation
	M1	For standardising using 103.15, their mean and their standard deviation If their mean and/or their standard deviation/variance are incorrect then working must be shown
	A1	awrt 0.13
(b)	**M1**	For $L_1 - L_2$ May be implied by a correct mean or variance
	A1	For $\mathrm{N}(0,\ 0.0008)$
	M1	For standardising using 0.01, their mean and their standard deviation (May be implied by awrt 0.6368 or awrt 0.3632 or awrt 0.3618 or awrt 0.6382)
	M1	For 2 times *p* where 2*p* is a probability (Calculator gives 2 × 0.36183…)
	A1	For answers in the range awrt 0.724 – awrt 0.726
(c)	**M1**	For a correct expression for μ Implied by a mean of 0
	M1	For a correct expression for σ^2
	M1	For standardising using 2, their mean and their standard deviation and set = to a *z* value where $1.95 < \lvert z \rvert < 2$
	B1	awrt 1.99 seen or used
	dM1	Dependent on 2nd M1. For rearranging to get a correct 3 term quadratic e.g. $n^2 + n - 10101$ or $n^2 + n - 10102$
	A1	cao (Must reject –101 if found)

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom