



















Q6.

Question	Scheme	Marks	AOs
(a)	Let $X = L - 4S$ then $E(X) = 19.6 - 4 \times 4.8$	M1	2.3
	$= 0.4$	A1	1.1b
	$\text{Var}(X) = \text{Var}(L) + 4^2 \text{Var}(S) = 0.6^2 + 16 \times 0.3^2$	M1	2.1
	$= 1.8$	A1	1.1b
	$P(X > 0) = [P(Z > \frac{0-0.4}{\sqrt{1.8}} = -0.298, \dots)]$	M1	2.1
	$= 0.617202..$ awrt <u>0.617</u>	A1	1.1b
	(6)		
(b)	$T = S_1 + S_2 + S_3 + S_4$ (May be implied by 0.36)	M1	3.3
	$T \sim N(19.2, 0.36)$ $E(T) = 19.2$	B1	1.1b
	$\text{Var}(T) = 0.36$ or $0.6^2$	A1	1.1b
		(3)	
(c)	Let $Y = L - T$ $E(Y) = E(L) - E(T) = [0.4]$	M1	3.3
	$\text{Var}(Y) = \text{Var}(L) + \text{Var}(T) = [0.72]$	M1	1.1b
	Require $P(-0.2 < Y < 0.2)$	M1	3.1a
	$= 0.16708...$ awrt <u>0.167</u>	A1	1.1b
		(4)	
(13 marks)			

Notes	
(a)	<p>M1: Selecting and using an appropriate model i.e <math>\pm(L - 4S)</math>. May be implied by 0.4</p> <p>A1: 0.4 oe</p> <p>M1: For realising the need to use <math>\text{Var}(L) + 4^2 \text{Var}(S)</math>. Allow use of 0.6 for <math>\text{Var}(L)</math> instead of <math>0.6^2</math> and/or 0.3 for <math>\text{Var}(S)</math> instead of <math>0.3^2</math> may be implied by 1.8</p> <p>A1: 1.8 only</p> <p>M1: For realising <math>P(X &gt; 0)</math> is required and an attempt to find it e.g. <math>\frac{0-0.4}{\sqrt{\text{their Var}(X)}}</math> but do not allow a negative <math>\text{Var}(X)</math></p> <p>A1: awrt 0.617</p>
(b)	<p>M1: Selecting and using an appropriate model ie <math>S_1 + S_2 + S_3 + S_4</math>: may be implied by 0.36</p> <p>B1: 19.2 only</p> <p>A1: 0.36</p>
(c)	<p>M1: Setting up and using the model <math>Y = L - T</math>. May be implied by <math>E(Y) = E(L) - E(T)</math></p> <p>M1: Using <math>\text{Var}(Y) = \text{Var}(L) + \text{Var}(T)</math></p> <p>M1: Dealing with the modulus and realising they need to find <math>P(-0.2 &lt; Y &lt; 0.2)</math></p> <p>A1: awrt 0.167</p>