

Qu 5	Scheme	Marks	AO
(a)	$P(L > 16) = 0.69146...$ awrt 0.691	B1 (1)	1.1b
(b)	$P(L > 20 L > 16) = \frac{P(L > 20)}{P(L > 16)}$ $= \frac{0.308537...}{(a)} \quad \text{or} \quad \frac{1-(a)}{(a)}, = 0.44621...$ For calc to work require $(0.44621...) ^4 = 0.03964...$ awrt 0.0396	M1 A1ft, A1 dM1 A1 (5)	3.1b 1.1b 1.1b 2.1 1.1b
(c)	Require: $[P(L > 4)]^2 \times [P(L > 20 L > 16)]^2$ $= (0.99976...) ^2 \times ("0.44621...")^2$ $= 0.19901...$ awrt 0.199 (*)	M1 A1ft A1cso* (3)	1.1a 1.1b 1.1b
(d)	$H_0 : \mu = 18 \quad H_1 : \mu > 18$ $\bar{L} \sim N\left(18, \left(\frac{4}{\sqrt{20}}\right)^2\right)$ $P(\bar{L} > 19.2) = P(Z > 1.3416...) = 0.089856...$ (0.0899 > 5%) or (19.2 < 19.5) or 1.34 < 1.6449 so not significant Insufficient evidence to support Alice's claim (or belief)	B1 M1 A1 A1 A1 (5)	2.5 3.3 3.4 1.1b 3.5a
(14 marks)			
Notes			
(a)	B1 for evaluating probability using their calculator (awrt 0.691) Accept 0.6915		
(b)	1 st M1 for a first step of identifying a suitable conditional probability (either form) 1 st A1ft for a ratio of probabilities with numerator = awrt 0.309 or 1 – (a) and denom = their (a) 2 nd A1 for awrt 0.446 (o.e.) Accept 0.4465 (from $\frac{0.3085}{0.691} = 0.44645...$) NB $\frac{P(16 < L < 20)}{P(L > 16)} = 0.5538...$ scores M1A1A1 when they do 1 – 0.5538 = 0.4462... 2 nd M1 (dep on 1 st M1) for 2 nd correct step i.e. (their 0.446...) ⁴ or $X \sim B(4, "0.446")$ and $P(X = 4)$ 3 rd A1 for awrt 0.0396		
(c)	1 st M1 for a correct approach to solving the problem (May be implied by A1ft) 1 st A1ft for $P(L > 4) =$ awrt 0.9998 used and ft their 0.44621 in correct expression If use $P(L > 20) = 0.3085..$ as 0.446.. in (b) then M1 for $(0.3085..) ^2 \times [P(L > 4)]^2$; A1ft as above * 2 nd A1cso for 0.199 or better with clear evidence of M1 [NB $(0.4662..) ^2 = 0.199...$ is M0A0A0] Must see M1 scored by correct expression in symbols or values (M1A1ft)		
(d)	B1 for both hypotheses in terms of μ . M1 for selecting a suitable model. Sight of <u>normal</u> , <u>mean</u> 18, <u>sd</u> $\frac{4}{\sqrt{20}}$ (o.e.) or <u>variance</u> = 0.8 1 st A1 for using the model correctly. Allow awrt 0.0899 or 0.09 from correct prob. statement CR $(\bar{L}) > 19.471...$ (accept awrt 19.5) or CV of 1.6449 (or better: calc 1.6448536..)		
ALT	2 nd A1 for correct non-contextual conclusion. Wrong comparison or contradictions A0 Error giving 2 nd A0 implies 3 rd A0 but just a correct contextual conclusion can score A1A1 3 rd A1 dep on M1 and 1 st A1 for a correct contextual conclusion mentioning <u>Alice's claim</u> / <u>belief</u> or there is insufficient evidence that the mean <u>lifetime</u> is more than 18 hours		