

Question 5 (Total 13 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{27.29 - 28}{\sigma} = -1.6449$	M1	This mark is given for standardising as part of a method to find σ
	$\sigma = 0.4316$	A1	This mark is given for a correct value of σ
	$P(D > K) = 0.6$ or $P(D < K) = 0.4$	B1	This mark is given for finding two probabilities
	$\frac{k - 28}{\sigma} = \frac{k - 28}{0.4316} = 0.2533$	M1	This mark is given for using a normal model to find the probability
	$k = 28.11$	A1	This mark is given for a correct value for k
(b)	$Y \sim B(200, 0.55)$ so $W \sim N(110, 49.5)$	B1	This mark is given for setting up the normal distribution approximation of the binomial
	$P(Y < 100) \approx P(W < 99.5) = P\left(Z < \frac{99.5 - 110}{\sqrt{49.5}}\right)$	M1	This mark is given for using the normal model with a continuity correction
	$= 0.0678$	A1	This mark is given for finding a correct value of the probability
(c)	$H_0 : \mu = 28$ $H_1 : \mu < 28$	B1	This mark is given for both hypotheses in terms of μ found correctly
	$\bar{D} \sim N\left(28, \frac{0.7^2}{20}\right)$	M1	This mark is given for a method to set up the normal distribution
	$P(\bar{D} < 27.72) = 0.0368$	A1	This mark is given for using the model to find a correct p -value
	$p = 0.0368 < 0.05$, so reject H_0	M1	This mark is given for a correct comparison and non-contextual conclusion
	There is sufficient evidence to support Hannah's belief that the mean amount of liquid put in each bottle is less than 28 ml	A1	This mark is given for a correct conclusion in context stated