

Qu 2	Scheme	Marks	AO
(a)	Comment in context about either independence or random packing e.g. “ <u>prizes</u> must be placed in <u>packets</u> at <u>random/independently</u> of each other” or about constant probability e.g. “the <u>probability</u> of a <u>packet</u> containing a <u>prize</u> is <u>constant/ the same/fixed</u> ”	B1 (1)	3.5b
(b)(i)	$[P(T = 6) =]$ 0.17273... awrt 0.173	B1	1.1b
(ii)	$[P(T < 3) = P(T \leq, 2) =]$ 0.061587... awrt 0.0616	B1 (2)	1.1b
(c)	$[K = \text{no. of boxes with fewer than 3 packets containing a prize}]$ $K \sim B(5, “0.0616”)$ $P(K = 2) = 0.031344\dots$ in the range [0.0313~0.0314]	M1 A1 (2)	1.1b 1.1b
(d)	$H_0 : p = \frac{1}{7}$ $H_1 : p < \frac{1}{7}$ $[X = \text{no of packets containing a prize}] X \sim B(110, \frac{1}{7})$ $[P(X \leq, 9)] = 0.038292\dots$ [Significant result or reject H_0] E.g. there <u>is</u> evidence to <u>support</u> Kamil’s <u>claim</u>	B1 M1 A1 A1 (4)	2.5 3.3 3.4 2.2b
		(9 marks)	
Notes			
(a)	B1 May use idea of independent events: a suitable reason, in context , covering idea of <u>random</u> packing or packets filled <u>independently</u> . Should mention key words/ideas of: <u>prizes</u> in <u>packets</u> or <u>packets</u> in <u>boxes</u> May use idea of constant probability. Must see key words underlined in scheme. Idea of probability with “independence” or “not affected by other packets” is B0 B0 for: Idea of only 2 cases. E.g. <u>Packet</u> contains a <u>prize</u> or not or Idea of a fixed number of trials. E.g. Need a <u>fixed</u> number of <u>packets</u> in each <u>box</u>		
(b)(i)	B1 for awrt 0.173		
(ii)	B1 for awrt 0.0616		
(c)	M1 for sight of $B(5, “0.0616”)$ or ${}^5C_2 (“0.0616”)^2 (1 - “0.0616”)^3$ ft their answer to (b)(ii). A1 for an answer in the range [0.0313 to 0.0314] Use of 0.0616 gives 0.031356..ans only 2/2		
(d)	B1 for both hypotheses correct in terms of p or π M1 for selecting an appropriate model, may be implied by 1 st A1 or $P(X = 9) = 0.0199(2\dots)$ 1 st A1 for 0.038 or better or allow 0.04 with sight of $P(X \leq, 9)$		
ALT	Critical Region. Allow CR of $X \leq, 9$ (or $X < 10$) provided a supporting probability is seen e.g. A1 for correct CR plus $P(X \leq, 10) = 0.0718\dots$ (accept 2sf or 1sf if prob statement seen) 2 nd A1 (dep on 1 st A1 but indep of hyp’s) for a suitable conclusion in context that suggests <u>support</u> for (Kamil’s) <u>claim</u> or states that there is evidence that <u>proportion</u> / <u>probability</u> / <u>chance</u> of packets containing a <u>prize</u> is less than $\frac{1}{7}$		
Normal	Do not award 2 nd A1 for contradictory statements e.g. “not significant” so “supports claim” Sight of $N\left(\frac{110}{7}, \frac{660}{49}\right)$ or awrt 13.5 or probability of 0.045(20..) or 0.033(66..) scores M1		