Qu	Scheme	Marks	AOs
4(a)	Let A = the number of green beads in a pack $A \sim B(10, 0.38)$ $\left[P(A > 6) = 1 - P(A \leqslant 6)\right]$	M1	3.4
	$= 1 - 0.9586... =$ **awrt 0.0413**	A1	1.1b
		(2)	
(b)	<table><tr><td>a</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>P($A = a$)</td><td>8.392×10^{-3}</td><td>0.0514…</td><td>0.1418…</td><td>0.2318…</td><td>0.2487…</td><td>0.1829…</td></tr></table><table><tr><td>a</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>P($A = a$)</td><td>0.0934…</td><td>0.0327…</td><td>7.52×10^{-3}</td><td>1.024×10^{-3}</td><td>6.278×10^{-5}</td></tr></table>	M1	1.1b
	Most likely number of green beads is 4 **together with** $P(A = 3) = 0.2318..., P(A = 4) = 0.2487..., P(A = 5) = 0.1829...$	A1	2.4
		(2)	
(c)	$H_0 : p = 0.2 \qquad H_1 : p > 0.2$	B1	2.5
	Let F = number of faulty bowls $F \sim B(40, 0.2)$ or $P(F \leqslant 12) = 0.9568... > 0.95$ or $P(F \geqslant 13) =$ awrt $0.043...[< 0.05]$	M1	3.3
	CR: $\{F \geqslant 13\}$	A1	1.1b
		(3)	
(d)	awrt 0.043	B1ft	1.1b
		(1)	
(e)	17 is in the CR, sufficient evidence to support the manager's belief **or** proportion of faulty bowls is less than 20%	B1ft	2.2b
		(1)	
(f)	A valid model because e.g. random sampling guarantees independence **or** constant probability	B1	3.5a
		(1)	
			(10 marks)

Notes:

(a) M1: for selecting and using a suitable model, sight of B(10, 0.38) o.e. in words

Can be implied by $P(A \leqslant 6)$ = awrt 0.959 or final answer = awrt 0.0413

A1: for awrt 0.0413

(b) M1: for finding the probability of at least 2 different numbers of green beads or $\frac{0.38}{r+1} > \frac{0.62}{10-r}$ o.e.

A1: for 4 & $P(A = 3) = 0.2318.., P(A = 4) = 0.2487.., P(A = 5) = 0.1829..$ (accept 2dp) or $r < 3.18$

(c) B1: for correctly stating both hypotheses in terms of p or π

M1: For use of tables of B(40, 0.2) to find probability associated with critical value

[$P(F \leqslant 12)$ = awrt 0.957 or $P(F \geqslant 13)$ = awrt 0.043 (may be implied by either correct probability or by the correct CR)]

A1: [$40 \geqslant$] $F \geqslant 13$ o.e. e.g. $F > 12$ Allow '13 or more' or 'CR $\geqslant$ 13' Correct ans only M1A1

(d) B1ft: awrt 0.043 (allow awrt 4.3%) or correct ft their one-tailed upper CR from B(40,0.2) to 3s.f.

(e) B1ft: For commenting on the manager's belief, ft their (c)
(f) B1: Binomial is a valid model with a suitable reason. Must see underlined words.