Question	Scheme	Marks	AOs
3(a)	$p + 0.2 + 4p = 1$	M1	1.1b
	B(inomial)	M1	3.3
	$n = 40$ $p = 0.16$	A1	1.1b
		(3)	
(b)(i)	$H_0 : p = 0.2$ $H_1 : p > 0.2$	B1	2.5
	$[X \sim]$ B(40, 0.2)	M1	3.3
	$[P(X \geqslant 11) = 1 - 0.8392\ldots] = 0.1607...$ awrt 0.16	A1	3.4
	[Do not reject H_0/not significant…] There is insufficient evidence to support Jayda's belief.	A1	2.2b
		(4)	
(ii)	Require $P(X \leqslant k) > 0.95$ so $[P(X \leqslant 11) =] 0.9125$ or $[P(X \leqslant 12) =] 0.9568$	M1	3.4
	$[0 \leqslant] X \leqslant 12$	A1	1.1b
		(2)	
			(9 marks)

Notes

(a)

M1: use of sum of probabilities = 1 (may be implied by $p = 0.16$)

M1: identifying the B(inomial) distribution to model this situation (must be seen in part (a))

A1: both correct parameters $n = 40$ and $p = 0.16$
Answer only B(40, 0.16) scores M1M1A1.

Mark (b)(i) and (b)(ii) together

(b)(i)

B1: both hypotheses correct in terms of p or π

M1: writing or using Binomial (40, 0.2) (implied by awrt 0.16 or awrt 0.073)

A1: awrt 0.16
If $P(X \geqslant 11)$ = awrt 0.16 is seen, isw if a different p–value is stated.
Watch out $[P(X = 8) =] 0.156$ and is A0

A1: dep on M1A1 (but independent of hypotheses)
for suitable conclusion in context that suggests **Jayda's belief** is **not supported <u>or</u>** states that there is **not** enough evidence that the **proportion/probability** of **green counters** in the bag is **greater than 0.2**
with bold words oe Do not allow **number** for proportion/probability
Allow not increased/not changed/is 0.2 for not greater than 0.2
A0 for contradictory statements e.g. Reject H_0 ∴ Jayda's belief is not supported.

SC: Use of critical region without stating p-value can score max B1M1A0A1
The final A1 is for the correct contextual conclusion **<u>and</u>** a correct CR $X \geqslant 13$ seen (allow any letter) or equivalent.

(b)(ii)

M1: Use of B(40, 0,2) to find a relevant acceptance region probability
i.e. awrt 0.91 or awrt 0.96 or awrt 0.088 or awrt 0.043
Allow if these are seen in part (b)(i) as part of a critical region approach

A1: correct acceptance region or equivalent, e.g. $X < 13$. Allow any letter. May be stated in words. Correct acceptance region on its own scores M1A1.
Do **not** allow probability statements for acceptance region e.g. P($X < 13$)

SC: Use of a two-tailed test in (b)(i) leading to an acceptance region of $3 \leqslant X \leqslant 13$ scores M1A0