Question	Scheme	Marks
3(a)	A **list** of **all** the **shops**	B1
		(1)
(b)	The shops	B1
		(1)
(c)	Advantage - A sample is quicker/ cheaper / easier to process	B1
	Disadvantage – less accurate/ may be biased / may not be representative	B1
		(2)
(d)	$P(X \leqslant 6) = 0.0172$ or $P(X \geqslant 18) = 0.0212$ or $P(X \leqslant 17) = 0.9788$ or $X \leqslant 6$ or $X \geqslant 18$	M1
	$\left[P(X \leqslant 6)\right] = 0.0172$ **and** $\left[P(X \geqslant 18)\right] = 0.0212$	A1
	CR: $[0 \leqslant X \leqslant 6, 18 \leqslant X \leqslant 30]$	A1
		(3)
(e)	20 is in the critical region therefore there is evidence that **Jian's belief** is incorrect	B1ft
		(1)
(f)	$H_0 : p = 0.4 \quad H_1 : p < 0.4$	B1
	$J \sim B(150, 0.4) \Rightarrow \approx N(60, 36)$	M1A1
	$P(J \leqslant 47) \approx P\left(Z \leqslant \frac{47.5-60}{6}\left[=-2.08333...\right]\right)$ | $\frac{(n+0.5)-60}{6} = -1.6449$	M1 M1
	$= 0.0188$ (calc 0.018610…) | CR: $J <$ awrt 49.6	A1
	There is sufficient evidence to suggest that the **proportion** of **shops** where the stocktaking system is being used incorrectly **is less than 0.4/decreased**	A1
		(7)

	Notes		Total 15
(a)	**B1**	for the idea of a list/database(oe) of **all shops** list of all stocktaking systems is B0	
(b)	**B1**	for allow shop or store(s) the number of shops is B0 the stocktaking systems at each shop is B0	
(c)	**B1**	for a correct advantage for a sample oe eg allow census take longer than a sample e.g. 'a sample is more uncertain' on its own is B0	
	B1	for a correct disadvantage for a sample oe eg a census is more accurate than a sample	
		If there is no reference to sample or census assume referring to sample. Ignore extraneous non-contradictory comments	
(d)	**M1**	for one of these probability statements correct or awrt 0.017 or awrt 0.021 or awrt 0.98 or one correct CR	
	A1	for both probabilities awrt 0.0172 and awrt 0.0212	
	A1	for both CR correct oe e.g. $X < 7$, $X > 17$ ignore any symbol used between the two CR tails allow any or no letter (do not allow CR stated as probabilities)	
(e)	**B1ft**	for stating 20 is in the CR **and** give correct statement. Allow the belief in words. Only ft if their CR is in the form $X \leqslant C_1 \cup X \geqslant C_2$ (allow as probability statements)	
(f)	**B1**	for both hypotheses correct, using p or π. Must be attached to H_0 and H_1	
	M1	for writing or using N(60,…)	
	A1	for writing or using N(60, 36)	
	M1	for standardising (allow ±) using their "60" and "6" with either 46.5, 47 or 47.5 for CR method n, $n + 0.5$ or $n - 0.5$ and equate to -1.6449 or better	
	M1	for using the correct continuity correction 47.5 or $(n + 0.5)$	
	A1	for awrt 0.019 or CR: $J <$ awrt 49.6 or $J + 0.5 <$ awrt 50.1 Exact binomial gives 0.01756…and scores M0A0M0M0A0	
	A1	dep on previous A1 for a correct conclusion in context using bold word (oe) Do not allow 'number' for 'proportion'	