Question Number	Scheme	Marks
3(a)(i)	$X \sim \text{B}(10,\ 0.45)$	M1
	$\text{P}(X \leq 1) = 0.0233$ awrt 0.0233	A1
(ii)	$\text{P}(X \geq 6) = 1 - \text{P}(X \leq 5)$ or $1 - 0.7384$	M1
	$= 0.2616\ldots$ awrt 0.262	A1
		(4)
(b)	$F \sim \text{N}(54,\ 29.7)$	M1A1
	$\frac{c + 0.5 - 54}{\sqrt{29.7}} \leq -1.6449$ **or** $\frac{d - 0.5 - 54}{\sqrt{29.7}} \geq 1.6449$	M1M1B1 A1
	$c = 44$ and $d = 64$	A1cso
		(7)
(c)	H_0: $p = 0.45$ H_1: $p < 0.45$	B1
	$Y \sim \text{B}(30, 0.45)$ therefore $\text{P}(Y \leq 8) = 0.03...$ or CR $Y \leq 8$	B1
	8 is in the critical region or Reject H_0 oe or significant	dM1
	therefore the data collected supports the **manufacturer's claim**.	A1
		(4)

	Notes	**Total 15**
(a)(i)	**M1**	Writing or using B(10, 0.45) in (i) or (ii) implied by a correct answer to (i) or (ii)
	A1	awrt 0.0233
(ii)	**M1**	For writing or using $1 - \text{P}(X \leq 5)$ oe
	A1	awrt 0.262
(b)	**M1**	For writing or using N(54,…)
	A1	For writing or using N(54, 29.7)
	M1	For standardising (allow $\pm$) using their "54" and "29.7" and putting = to z value where $1 < \lvert z \rvert < 2$ Condone missing ± 0.5
	M1	M1 for using a continuity correction $\pm\ 0.5$ in standardisation. No need to put = to z value
	B1	For using 1.6449 or better (calc gives) 1.64485… Allow if written then gone on to use 1.65 or1.64 or better in equation
	A1	One correct inequality. Allow written as an equation. Allow with 1.65/1.64 or better
	A1cso	All previous marks awarded. Both c and d correct integers
		NB: c and d correct with no working can be awarded full marks
(c)	**B1**	Both hypotheses correct in terms of p or π Must be attached to H_0 and H_1
	B1	0.03 or better (0.03120…) or CR stated as $Y \leq 8$ oe do not accept $\text{P}(Y \leq 8) = ...$ for CR Condone 0.97 or better (0.96879…)
	dM1	Dep on 2nd B1 A correct statement – need not be contextual but do not allow contradicting non contextual comments. Allow opposite conclusion if 2-tail hypotheses given.
	A1	Correct conclusion for their H_1. If H_1 is 2- tail the opposite conclusion must be given. No hypotheses or H_1 $p > 0.45$ is A0. Allow belief instead of claim. Allow the data collected supports that the **proportion/percentage/probability/number/amount oe** of flawed **plates** has **decreased/reduced/is not 0.45/has changed oe**