Question			Answer	Marks	AO	Guidance
13	(a)		$\mu = 40$, $\sigma^2 = 32$ $P(Y > y) = 0.05 \Rightarrow y = 49.3$ (3 sf)	**M1** **A1** **[2]**	**1.2** **1.1**	May see N(40,32) awrt 49.3
13	(b)		$P(X \geq 50) = 0.049\ldots$	**M1**	**3.1**	Attempt $P(X \geq$ '50'$)$ using B $\left(200, \frac{1}{5}\right)$ for their '49'+1 Allow this mark for $P(X<50)=0.95\ldots$ The value must be linked to their correct threshold value of '49'+1(=50) (or '49'), if an inequality is given it must be correct.
			$P(X \geq 49) = 0.069\ldots$	**M1**	**2.1**	Attempt $P(X \geq$ '49'$)$ using B $\left(200, \frac{1}{5}\right)$ for their '49' Allow this mark for $P(X<49)=0.93\ldots$ The value must be linked to their correct threshold value of '49' (or '49'–1=48), if an inequality is given it must be correct.
			Smallest value of X is 50	**A1** **[3]**	**1.1**	Condone $X \geq 50$ (dependent on both method marks) SCB1 for correct answer with no/insufficient working (max. 1/3)

Appendix – Additional Marking Guidance

Question	Answer	Marks	AO	Guidance
13 (b)				SCB1 for correct answer with no/insufficient working (max. 1/3) **Further marking guidance:** For the M1 marks, require two distinct probabilities from the correct binomial distribution B $\left(200, \frac{1}{5}\right)$, which correspond to two values centred around 49 ± 1 or their answer from **(a)** ± 1. Candidates need not state an inequality, but each probability **must** be associated with an appropriate value of X and if an inequality is given it must be correct.

x	$P(X < x)$	$P(X \leq x)$	$P(X > x)$	$P(X \geq x)$
48	0.9056	0.93097	0.06903	0.0944
49	0.93097	0.95065	0.04935	0.06903
50	0.95065	0.9655	0.0345	0.04935

Additional clarifications:

- The above table shows likely values for x=49 ± 1
- FT their '49' from **(a)** for M marks only (check values)
- NB for candidates whose '49' is ~65 or greater, their probabilities may appear as '1' and '0' – allow M1M1 if this follows correct setup.
- Condone 2 probabilities for the same x provided inequalities are given correctly
- Probability values may be given to any degree of accuracy, truncated or rounded.

Do not accept any single probabilities i.e. $P(X = x)$