Question Number	Scheme	Marks
5(a)(i)	B(20, 0.45)	
	$[P(X=6)] = {}^{20}C_6 \times 0.45^6 \times 0.55^{14} = 0.0746$ ((Calc: 0.074599…) **awrt 0.0746**	M1 A1
(ii)	B(30, 0.2)	
	$[P(X \geqslant 12)] = 1 - P(X \leqslant 11) = 1 - 0.9905$	M1
	= 0.0095 (Calc: 0.00949…)) **awrt 0.0095**	A1
		(4)
(b)	$\sqrt{10p(1-p)} = 1.5$	M1
	$10p^2 - 10p + 2.25 = 0$ (o.e)	M1
	p = awrt 0.658 **and** p = awrt 0.342	A1
	Mean = np So mean $= 10 \times$ "0.3418..." **or** mean $= 10 \times$ "0.6581..."	M1
	= awrt 3.42 and awrt 6.58	A1
		(5)
(c)	As the probability of completing a **medium** trick is 0.45 you would expect the probability of completing an **easy** trick to have a higher probability (0.6581…) (o.e)	M1
	So most likely value is awrt 6.58	A1
		(2)
(d)	$H_0 : p = 0.2$ $H_1 : p > 0.2$	B1
	$[P(X \geqslant 10) = 1 - P(X \leqslant 9)] = 1 - 0.9389$ or $[P(X \geqslant 11) = 1 - P(X \leqslant 10)] = 1 - 0.9744$	M1
	= 0.0611 or CR: $X \geqslant 11$ or $X > 10$ (o.e)	A1
	Do not reject H_0/Not in CR/Not significant	M1
	Insufficient evidence to support **Paula's or her belief (o.e)** \ Insufficient evidence to suggest that the **probability** of completing a **hard trick** successfully has **increased** (o.e)	A1ft
		(5)

	Notes		Total 16
(a)(i)	**M1**	Correct method to finding $P(X=6)$. Allow equivalent expressions. Using $P(X <= 6) - P(X <= 5)$ M1. May be implied by awrt 0.0746	
	A1	awrt 0.0746 (Calc: 0.074599…).	
(ii)	**M1**	For writing or using $1 - P(X \leqslant 11)$ (Implied by $1 - 0.9905$)	
	A1	awrt 0.0095 (Calc: 0.00949…) (Correct answer 2/2)	
(b)	**M1**	For use of $\sqrt{np(1-p)} = 1.5$ or $\sqrt{np(1-p)} = \sigma$	
	M1	Correct three-term quadratic $10p^2 - 10p + 2.25 = 0$ (o.e)	
	A1	p = awrt 0.658 **and** p = awrt 0.342. condone ($p = \frac{10+\sqrt{10}}{20}$ and $p = \frac{10-\sqrt{10}}{20}$) (Correct values seen with no incorrect working seen M1M1A1)	
	M1	Use of mean = np , (Follow through their p values ($0 \leq p \leq 1$))	
	A1	awrt 3.42 and awrt 6.58 or condone ($\frac{10+\sqrt{10}}{2}$ and $\frac{10-\sqrt{10}}{2}$)	

(c)	**M1**	Identifying 'their' probability of an **easy** trick must greater than 0.45 \ has larger probability than a **medium** trick (o.e) They must be comparing 'their' probability of an easy trick with 0.45 \ probability of a medium trick Must be 6.58 (or surd form) since using 0.348 would mean an **easy** trick is harder than a **medium** trick M1A1
	A1	identifying awrt 6.58 condone ($p = \frac{10+\sqrt{10}}{2}$)
(d)	**B1**	For correct hypotheses and attached to H_0 and H_1 in terms of p or π
	M1	Use of either $1-\mathrm{P}(X \leqslant 9)$ or $1-\mathrm{P}(X \leqslant 10)$ (calculating **just** $\mathrm{P}(X=10)$ M0). (Implied by awrt 0.0611 or 0.0256)
	A1	awrt 0.0611 or critical region : $X \geqslant 11$, $X > 10$ (o.e), (Condone 0.9389 < 0.95 o.e)
	M1	A correct non contextual statement. Do not allow contradictory statements. May be implied by a correct contextual statement on its own. (0.0256/0.0355 and comparing to 0.05 is M0. Follow through their probability / critical region.
	A1ft	correct contextual statement using the bolded word (o.e). Don't accept chance as an alternative to probability.