

Qu 3	Scheme	Marks	AO										
(a)	The <u>probability</u> of a dart hitting the target is <u>constant</u> (from child to child and for each throw by each child) (o.e.) The <u>throws</u> of each of the darts are <u>independent</u> (o.e.)	B1 B1 (2)	1.2 1.2										
(b)	$[P(H \geq 4) = 1 - P(H \leq 3) = 1 - 0.9872 = 0.012795.. =]$ awrt <u>0.0128</u>	B1 (1)	1.1b										
(c)	$P(F = 5) = 0.9^4 \times 0.1, = 0.06561$ = awrt <u>0.0656</u>	M1, A1 (2)	3.4 1.1b										
(d)	<table border="1"><tr><td>n</td><td>1</td><td>2</td><td>...</td><td>10</td></tr><tr><td>$P(F = n)$</td><td>0.01</td><td>$0.01 + \alpha$</td><td>...</td><td>$0.01 + 9\alpha$</td></tr></table> Sum of probs = 1 $\Rightarrow \frac{10}{2}[2 \times 0.01 + 9\alpha] = 1$ [i.e. $5(0.02 + 9\alpha) = 1$ or $0.1 + 45\alpha = 1$] so $\alpha = \mathbf{0.02}$	n	1	2	...	10	$P(F = n)$	0.01	$0.01 + \alpha$	...	$0.01 + 9\alpha$	M1 M1A1 A1 (4)	3.1b 3.1a 1.1b 1.1b
n	1	2	...	10									
$P(F = n)$	0.01	$0.01 + \alpha$	...	$0.01 + 9\alpha$									
(e)	$P(F = 5 \text{ Thomas' model}) = \mathbf{0.09}$	B1ft (1)	3.4										
(f)	<u>Peta's</u> model assumes the <u>probability</u> of hitting target is <u>constant</u> (o.e.) and <u>Thomas'</u> model assumes this <u>probability increases</u> with each attempt(o.e.)	B1 (1)	3.5a										
		(11 marks)											

	Notes
(a)	1 st B1 for stating that the <u>probability</u> (or possibility or chance) is <u>constant</u> (or fixed or same) 2 nd B1 for stating that <u>throws</u> are <u>independent</u> ["trials" are independent is B0]
(b)	B1 for awrt 0.0128 (found on calculator)
(c)	M1 for a probability expression of the form $(1 - p)^4 \times p$ where $0 < p < 1$ A1 for awrt 0.0656 SC Allow M1A0 for answer only of 0.066
(d)	1 st M1 for setting up the distribution of F with at least 3 correct values of n and $P(F = n)$ in terms of α . (Can be implied by 2 nd M1 or 1 st A1) 2 nd M1 for use of sum of probs = 1 and clear summation or use of arithmetic series formula (allow 1 error or missing term). (Can be implied by 1 st A1) 1 st A1 for a correct equation for α 2 nd A1 for $\alpha = 0.02$ (must be exact and come from correct working)
(e)	B1ft for value resulting from $0.01 + 4 \times \text{"their } \alpha \text{"}$ (provided α and the answer are probs) Beware If their answer is the same as their (c) (or a rounded version of their (c)) score B0
(f)	B1 for a suitable comment about the <u>probability</u> of hitting the target ALT Allow idea that Peta's model suggests the dart may never hit the target but Thomas' says that it will hit at least once (in the first 10 throws).