Question Number	Scheme	Marks
5.(a)	$\left[\bar{x} = \frac{96}{80} = \right]$ **1.2**	B1 (1)
(b)	$P(S = 2) = 3 \times 0.4^2 \times 0.6$ $= \mathbf{0.288}$	M1 A1 (2)
(c)	P(S = 0) = 1 – (0.496 + "0.288") or 0.6^3 = **0.216**	B1ft (1)
(d)(i)	$p_1 = 0.25$ and $p_2 = 0.4$ and $p_3 = 0.55$ $P(T = 3) = p_1 \times p_2 \times p_3 = 0.25 \times 0.4 \times 0.55 =$ 0.055 (*)	M1 A1cso
(ii)	$P(T = 1) = \underline{\underline{0.25}} \times 0.6 \times 0.45 + 0.75 \times \underline{\underline{0.4}} \times 0.45 + 0.75 \times 0.6 \times \underline{\underline{0.55}}$ or = 0.0675 + 0.135 + 0.2475 = 0.45 (*)	M1A1 A1 cso (5)
(e)	$P(T = 0) = 0.75 \times 0.6 \times 0.45$ (or equivalent expression for $P(T = 2)$) = **0.2025** (Allow $\frac{81}{400}$) $P(T = 2) = 1 - (0.505 + \text{"0.2025"}) =$ **0.2925** (Allow $\frac{117}{400}$)	M1 A1 A1ft (3)
(f)	Estimate probs from the data: (or frequencies for *S* and *T*) Ting's model is always closer So **choose Ting's** model	M1 A1 A1 (3)

x	0	1	2	3
f/80	**0.2**	**0.45**	**0.3**	**0.05**
P(*S*=*x*)	*0.216*	0.432	*0.288*	0.064
P(*T*=*x*)	*0.2025*	0.45	*0.2925*	0.055
f	16	36	24	4
S(f)	**17.28**	**34.56**	**23.04**	**5.12**
T(f)	**16.2**	**36**	**23.4**	**4.4**

[15 marks]

Notes

(a) B1 for 1.2 or any exact equivalent

Mark (b) and (c) together (M1 is for a full method for P(*S* = 2))

(b) M1 for $k \times 0.4^2 \times 0.6$ (including $k = 1$) where $k \in \mathbb{Z}^+$ or $3 \times p^2 \times (1-p)$ for some $p \in (0, 1)$

A1 for 0.288 or an exact equivalent e.g. $\frac{36}{125}$

Correct answers in table can score all marks in (b) and (c). Table takes preference.

(c) B1ft for P(*S* = 0) based on sum of probabilities = 1 i.e. 0.216 or 1 – (0.496 + their 0.288) or 0.6^3

(d) 1st M1 for a correct attempt to find all 3 p_i values. Implied by the correct product expr'

1st A1 for a correct numerical product and no incorrect working seen for P(*T* = 3)

2nd M1 for at least 1 correct product in P(*T* = 1) (ft their p_i probabilities)

2nd A1 for at least 2 correct products seen

3rd A1cso for all 3 correct products seen and no incorrect working seen

Beware: $(1 - p_3) = 0.45$ is 2nd M0

Correct answers in table can score all marks in (e). Table takes preference.

(e) M1 for a correct product for P(*T* = 0) or all 3 correct products for P(*T* = 2) (ft their p_i)

1st A1 for either correct probability (correctly labelled or placed in the table)

2nd A1ft for a correct 4th probability or a 4th probability that makes the sum = 1

(f) M1 for attempt at calculating probs from the data or freqs *S*(f) **and** *T*(f) (at least 3 correct)

1st A1 for all figs correct(2sf) and comparison of probs (or frequencies) for the 2 models

2nd A1 for clearly choosing Ting's model (dependent on M1A1 scored)

e.g. "Ting's is best because probabilities (or frequencies) are always closer" scores A1A1

SC (A0A0) B1 choose Ting because probs improve or lack of independence etc (M0A1A0 or M1A1A0)