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5. Some children are playing a game involving throwing a ball into a bucket. Each child has 3 throws and the number of times the ball lands in the bucket, x, is recorded. Their results are given in the table below.

x	0	1	2	3
Frequency	16	36	24	4

(a) Find $\bar{x}$

(1)

Sandra decides to model the game by assuming that on each throw, the probability of the ball landing in the bucket is 0.4 for every child on every throw and that the throws are all independent. The random variable S represents the number of times the ball lands in the bucket for a randomly selected child.

(b) Find P($S = 2$)

(2)

(c) Complete the table below to show the probability distribution for S.

s	0	1	2	3
P($S = s$)		0.432		0.064

(1)

Ting believes that the probability of the ball landing in the bucket is not the same for each throw. He suggests that the probability will increase with each throw and uses the model

$$p_i = 0.15i + 0.10$$

where $i = 1, 2, 3$ and p_i is the probability that the ith throw of the ball, by any particular child, will land in the bucket.
The random variable T represents the number of times the ball lands in the bucket for a randomly selected child using Ting's model.

(d) Show that

(i) P($T = 3$) = 0.055

(ii) P($T = 1$) = 0.45

(5)

(e) Complete the table below to show the probability distribution for T, stating the exact probabilities in each case.

t	0	1	2	3
P($T = t$)		0.45		0.055

(3)

(f) State, giving your reasons, whether Sandra's model or Ting's model is the more appropriate for modelling this game.

(3)

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Question 5 continued

Q5

(Total 15 marks)