Hypothesis tests for the geometric distribution

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** H0: p = 1/6, H1: p < 1/6; large values of X **b)** H0: p = 0.05, H1: p > 0.05; small values of X **c)** H0: p = 0.3, H1: p ≠ 0.3; very small or very large values of X	3
2	H0: p = 0.25, H1: p < 0.25; P(X ≥ 12) = $0.75^{1}1$ = 0.0422 < 0.05, so reject H0: there is evidence that fewer than 25% of the puzzles are rated easy.	4
3	H0: p = 0.05, H1: p > 0.05; P(X ≤ 3) = 1 - 0.95^{3} = 0.1426 > 0.10, so do not reject H0: there is not enough evidence that the new compost increases the proportion of variegated plants.	4
4	**a)** H0: p = 0.15, H1: p < 0.15 **b)** X ≥ 20 **c)** 0.0456	5
5	**a)** H0: p = 0.01, H1: p > 0.01; X ≤ 5 **b)** 0.0490	5
6	**a)** X = 1 or X ≥ 75 **b)** 0.0888	6
7	**a)** P(X ≤ 1) = 0.25 > 0.05, so the critical region is empty **b)** 25% **c)** X ≥ 12, actual significance level 0.0422	6
8	**a)** H0: p = 0.2, H1: p < 0.2; X ≥ 22 **b)** 0.00922 **c)** Do not reject H0; no evidence at 1% **d)** Yes: P(X ≥ 19) = 0.0180 < 0.05, so reject H0 at 5%	7
9	**a)** Y ≤ 1, 0.0353 **b)** X ≥ 10, 0.0404 **c)** 10/3 = 3.33 boxes; e.g. fewer boxes expected, size closer to 5%	8
10	**a)** 0.216 (shown) **b)** H0: p = 0.216, H1: p < 0.216; R ≥ 14 **c)** 0.0423 **d)** Do not reject H0; no evidence the probability of a good round has decreased	8
11	**a)** H0: p = 1/6, H1: p < 1/6; X ≥ 18 **b)** 0.0451 **c)** 0.3118 **d)** Significant, but such results are likely among 25 fair dice: weak evidence	9
12	**a)** $e^{-}1.6$ = 0.2019 (shown) **b)** T ~ Geo(p); days independent (constant p) **c)** H0: p = 0.2019, H1: p < 0.2019 **d)** T ≥ 15 **e)** 0.0425 **f)** Reject H0: evidence that the mean number of faults per day has increased	10

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

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