

STEP III, 2000 Q13

- 13 A set of n dice is rolled repeatedly. For each die the probability of showing a six is p . Show that the probability that the first of the dice to show a six does so on the r th roll is

$$q^{nr}(q^{-n} - 1)$$

where $q = 1 - p$.

Determine, and simplify, an expression for the probability generating function for this distribution, in terms of q and n . The first of the dice to show a six does so on the R th roll. Find the expected value of R and show that, in the case $n = 2$, $p = 1/6$, this value is $36/11$.

Show that the probability that the last of the dice to show a six does so on the r th roll is

$$(1 - q^r)^n - (1 - q^{r-1})^n.$$

Find, for the case $n = 2$, the probability generating function. The last of the dice to show a six does so on the S th roll. Find the expected value of S and evaluate this when $p = 1/6$.



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to

NextStepMaths.com