A LOCAL THEOREM
FOR THE FIRST HITTING TIME
OF A FIXED LEVEL BY A RANDOM WALK

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For the sums $S(n) = X(1) + \cdots + X(n)$ of independent identically distributed random variables with zero mean, we determine the first passage time

$$\eta_y = \inf \left\{ n \geq 1 : S(n) \geq y \right\}$$

across the level $y \geq 0$ from below to above by the random walk $\left\{ S(n); n = 1, 2, \ldots \right\}$. We obtain a local theorem for this random variable, i. e., we find asymptotics of $\mathbb{P}(\eta_y = n)$ for a fixed level $y \geq 0$ as $n \to \infty$.

Key words and phrases: random walk, the first hitting time of a fixed level, the nonlattice distribution condition, the arithmeticity condition, nonlattice distribution, local theorem.

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