Probability Theory: Ballot problem

Key words:

1. Simple Random walk
2. Reflection Principle

Question Suppose there are two Candidates in an election, say P and Q. After counting of all the votes P is declared the winner. What is the chance that P was leading throughout the counting ?

Prove the following Theorem:

Theorem 1 *(Ballot Theorem) Suppose that, in a ballot, candidate P scores p votes and candidate Q scores q votes, where $p > q$. The probability that throughout the counting there are always more votes for P than for Q equals $\frac{p-q}{p+q}$.*

Mathematician in Focus: Bertrand Russell.