

A fair coin is flipped until the total number of heads is equal to the total number of tails. What is the expected number of flips this will take?

Please submit the answer only to puzzles@actuary.org or by mail to Contingencies, 1100 Seventeenth Street NW, Seventh Floor, Washington, DC 20036, Attn: Becky Horst. No solution is required. Please submit your answer as soon as possible to make the solvers list, especially those outside the United States.



**MARCH/APRIL SOLVERS:**

Jeff Adams, Robert Ballmer, Rajesh K. Barnwal, Graham Bryce, Francis de

Regnaucourt, Lance Dyrland, Michael Carlyle Eastburn, Leonard Helfgott, Don Onnen, Timothy Pollis, Robert Shapland, Gary Stanford, Adrian Tanner, Kevin Trapp, Lam Wong

**Correction:** The solution to the problem of the buzz saw/stick problem incorrectly said the function should be integrated from 0 to 1. In fact it should have stated 0.2 to 0.8.

**ANSWER TO LAST ISSUE'S PUZZLE**

Given a coin with probability of heads  $p$  and tails  $1-p$ , what is the probability that if you flip it an infinite number of times the number of heads will ever equal the number of tails?

The answer is  $2 \cdot \min(p, 1-p)$ .

**Solution:**

Think of this problem instead as a random walk on the number line, where the question is the probability of returning to the origin.

► Let  $A$  = probability of revisiting current square from the right.

► Let  $B$  = probability of ever moving one to the left from where you are.

$$B = q + Aq + A^2q + A^3q + \dots = q/(1-A).$$

$$A = pB \implies B = A/p \implies B = A/(1-q).$$

$$q/(1-A) = A/(1-q) \implies A = q, 1-q.$$

It stands to reason that  $A$  is the smaller of  $q$  and  $1-q$ . Next, reverse the words "left" and "right" in the above definitions of  $A$  and  $B$  and the answer will be the same. Since the random walker can revisit the origin from either side the answer is  $2 \cdot \min(q, 1-q)$ .

**MAY/JUNE SOLVERS:**

Robert S. Ballmer, Kevin Conley, Mark Evans, Yu Feng, Yan Fridman, John Herder, Mike Lawler, Lee Michelson, Andrew Newman, Chris Norman, David Promislow, David Oakden, Tim Ross, George Salmons, Bruce Schobel, Al Spooner, Mike Weiler

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