SolveNook

Ten-flip coin experiment

Questions - name: _____ date: _____

1. Choose your sequence before you flip

Write one order of ten flips containing exactly seven H and three T. H means heads and T means tails. Keep this prediction for all three batches.

2. Collect three batches of ten

Flip a fair coin ten times, or set Number of flips to 10 and select Flip coin. Record the order. Repeat twice, marking both matches separately each time.

Batch	Order of ten flips (H or T)	Heads	Seven heads?	Exact order?
1				
2				
3				

3. Read one batch

Suppose a batch has seven heads. What fraction of its flips were heads? Does that fraction give the probability that a new batch will have exactly seven heads?

4. Find the chance of your exact order

Each flip is independent. How many ten-flip orders are possible? How many match the one order you wrote before flipping?

5. Find the chance of exactly seven heads

Which three positions could hold the tails? Count the possible sets of three positions. Use that count to find the probability of exactly seven heads in any order.

6. Compare class results and predict one more flip

Pool the class batches. For each match column, divide its yes count by the total number of batches. Must these frequencies equal the theoretical probabilities? After three heads in a row, what is the chance of heads next?

H = heads. T = tails. Each batch contains ten independent flips of a fair coin.

Print page 1 for students. Page 2 contains the worked answers.

Ten-flip coin experiment

Worked answers - compare the reasoning, not only the result.

1. Choose your sequence before you flip

One possible prediction is HHHHHHHTTT. Any one order containing seven H and three T works. Pick it before flipping so you can test that same prediction each time.

2. Collect three batches of ten

For the prediction HHHHHHHTTT, three example orders are HHHHHHHTTT (7 heads, yes/yes), HHTHHHTHTH (7, yes/no) and THTHTHTHTH (5, no/no). The first flag asks about seven heads; the second asks about your exact order. Your results may differ.

3. Read one batch

Seven of its ten flips were heads: 7/10, or 70%. That describes one observed batch. To find the chance of exactly seven heads in a new batch, count all the ten-flip orders with seven heads.

4. Find the chance of your exact order

Each of ten positions has two choices, giving 2 to the power of 10 = 1,024 equally likely orders. Only one is your prediction, so its chance is 1/1,024 (about 0.098%).

5. Find the chance of exactly seven heads

Choose 3 of 10 positions for tails. There are (10 x 9 x 8) / (3 x 2 x 1) = 120 choices; the other positions are heads. The chance is 120/1,024 = 15/128, about 11.72%.

6. Compare class results and predict one more flip

Use the number of batches as the denominator for both match rates. Finite class results can differ from 1/1,024 and 15/128, even with zero matches. After three heads, the next fair, independent flip still has a 1/2 chance of heads.

H = heads. T = tails. Each batch contains ten independent flips of a fair coin.

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