binomial coeff

probability of getting

$$\frac{N!}{(N-n)!\,(n)!} \cdot \left(P^{n} \cdot (1-P)^{N-n}\right)$$

$(1-P)$ → q

N = total # of coins
n = desired # of heads
P = probability of flipping heads
q = probability of flipping tails

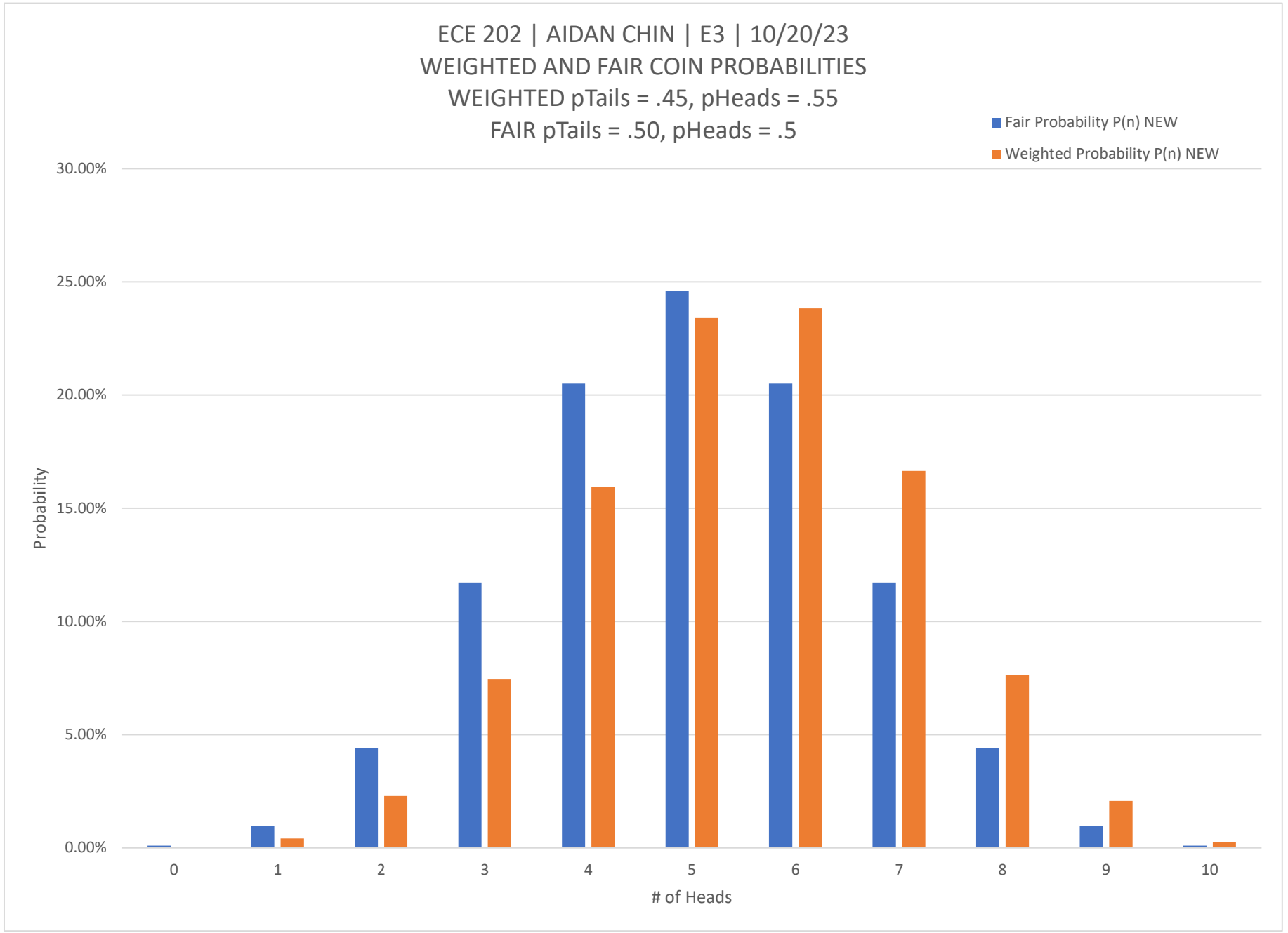
$$P(n) = \frac{N!}{n!(N-n)!} \cdot \left(\frac{1}{2}^{N-1} \cdot \frac{1}{2}^{1}\right)$$

chance of getting tails
$N-1$
prob
$\frac{1}{2}$ = chance
1 = number of heads
N = # of coin

Chance of heads
$\frac{1}{2}$ = chance ∴ P
1 = # of heads ∴ n
$\frac{1}{2} = q = P$
∴ $1 = n$

	A	B	C	D	E
1	Marco F. Duarte	Aidan Chin			
2	10.11.2023	10/20/2023			
3	ECE 202 Lecture 16	ECE 202 E3	this excel doc calculates the probability of getting a certain number of heads at 50% heads and 55% heads		
4	Adapting N = 4 coins to N <= 20	Adapting for N = 10 and P = .55			
5					
6	number of coins (N <= 20)	10			
7	predict total # of microstates (n)	1024			
8	predict total # of macrostates	11	q (probability of inverse result)	Most Likely Number of heads FAIR	Most Likely Number of heads WEIGHTED
9	Weighted Probability (P)	55.00%	45.00%	5	6
10	Fair Probability(P)	50.00%	50.00%		
11					
12		count microstates	Check NEW vs. OLD --->	0.00%	
13		1024		(should be 0%)	
14			OLD, FAIR	NEW, FAIR	NEW, WEIGHTED
15	check total # of macrostates	check total # of microstates	check total probability	check total probability	check total probability
16	0	0	100.00%	100.00%	100.00%
17	(should be zero)	(should be zero)	(should be 100%)	(should be 100%)	(should be 100%)
18			heads 50% of the time	heads 50% of the time	heads 55% of the time
19	Macrostate n (# of heads showing)	# of microstates	Fair Probability P(n) OLD	Fair Probability P(n) NEW	Weighted Probability P(n) NEW
20	0	1	0.10%	0.10%	0.03%
21	1	10	0.98%	0.98%	0.42%
22	2	45	4.39%	4.39%	2.29%
23	3	120	11.72%	11.72%	7.46%
24	4	210	20.51%	20.51%	15.96%
25	5	252	24.61%	24.61%	23.40%
26	6	210	20.51%	20.51%	23.84%
27	7	120	11.72%	11.72%	16.65%
28	8	45	4.39%	4.39%	7.63%
29	9	10	0.98%	0.98%	2.07%
30	10	1	0.10%	0.10%	0.25%

	A	B	C	D	E
1	Marco F. Duarte	Aidan Chin			
2	10.11.2023	45219			
3	ECE 202 Lecture 16	ECE 202 E3	this excel doc calculates the probability of getting a certain number of heads at 50% heads and 55% heads		
4	Adapting N = 4 coins to N <= 20	Adapting for N = 10 and P = .55			
5					
6	number of coins (N <= 20)	10			
7	predict total # of microstates (n)	= 2^B6			
8	predict total # of macrostates	= 1+B6	q (probability of inverse result)	Most Likely Number of heads FAIR	Most Likely Number of heads WEIGHTED
9	Weighted Probability (P)	0.55	= 1-B9	= A25	= A26
10	Fair Probability(P)	0.5	= 1-B10		
11					
12		count microstates	Check NEW vs. OLD --->	= ABS(C16-D16)	
13		= SUM(B20:B30)		(should be 0%)	
14			OLD, FAIR	NEW, FAIR	NEW, WEIGHTED
15	check total # of macrostates	check total # of microstates	check total probability	check total probability	check total probability
16	= COUNT(A20:A38)-B8	= SUM(B20:B30)-B7	= SUM(C20:C30)	= SUM(D20:D30)	= SUM(D20:D38)
17	(should be zero)	(should be zero)	(should be 100%)	(should be 100%)	(should be 100%)
18			heads 50% of the time	heads 50% of the time	heads 55% of the time
19	Macrostate n (# of heads showing)	# of microstates	Fair Probability P(n) OLD	Fair Probability P(n) NEW	Weighted Probability P(n) NEW
20	0	= FACT(B$6) / (FACT(A20) * FACT(B$6-A20))	= B20/$B$7	= $B$10^$A20 * $C$10^($B$6-$A20) * $B20	= $B$9^$A20 * $C$9^($B$6-$A20) * $B20
21	= A20+1	= FACT(B$6) / (FACT(A21) * FACT(B$6-A21))	= B21/$B$7	= $B$10^$A21 * $C$10^($B$6-$A21) * $B21	= $B$9^$A21 * $C$9^($B$6-$A21) * $B21
22	= A21+1	= FACT(B$6) / (FACT(A22) * FACT(B$6-A22))	= B22/$B$7	= $B$10^$A22 * $C$10^($B$6-$A22) * $B22	= $B$9^$A22 * $C$9^($B$6-$A22) * $B22
23	= A22+1	= FACT(B$6) / (FACT(A23) * FACT(B$6-A23))	= B23/$B$7	= $B$10^$A23 * $C$10^($B$6-$A23) * $B23	= $B$9^$A23 * $C$9^($B$6-$A23) * $B23
24	= A23+1	= FACT(B$6) / (FACT(A24) * FACT(B$6-A24))	= B24/$B$7	= $B$10^$A24 * $C$10^($B$6-$A24) * $B24	= $B$9^$A24 * $C$9^($B$6-$A24) * $B24
25	= A24+1	= FACT(B$6) / (FACT(A25) * FACT(B$6-A25))	= B25/$B$7	= $B$10^$A25 * $C$10^($B$6-$A25) * $B25	= $B$9^$A25 * $C$9^($B$6-$A25) * $B25
26	= A25+1	= FACT(B$6) / (FACT(A26) * FACT(B$6-A26))	= B26/$B$7	= $B$10^$A26 * $C$10^($B$6-$A26) * $B26	= $B$9^$A26 * $C$9^($B$6-$A26) * $B26
27	= A26+1	= FACT(B$6) / (FACT(A27) * FACT(B$6-A27))	= B27/$B$7	= $B$10^$A27 * $C$10^($B$6-$A27) * $B27	= $B$9^$A27 * $C$9^($B$6-$A27) * $B27
28	= A27+1	= FACT(B$6) / (FACT(A28) * FACT(B$6-A28))	= B28/$B$7	= $B$10^$A28 * $C$10^($B$6-$A28) * $B28	= $B$9^$A28 * $C$9^($B$6-$A28) * $B28
29	= A28+1	= FACT(B$6) / (FACT(A29) * FACT(B$6-A29))	= B29/$B$7	= $B$10^$A29 * $C$10^($B$6-$A29) * $B29	= $B$9^$A29 * $C$9^($B$6-$A29) * $B29
30	= A29+1	= FACT(B$6) / (FACT(A30) * FACT(B$6-A30))	= B30/$B$7	= $B$10^$A30 * $C$10^($B$6-$A30) * $B30	= $B$9^$A30 * $C$9^($B$6-$A30) * $B30


ECE 202 | AIDAN CHIN | E3 | 10/20/23
WEIGHTED AND FAIR COIN PROBABILITIES
WEIGHTED pTails = .45, pHeads = .55
FAIR pTails = .50, pHeads = .5
Fair Probability P(n) NEW
Weighted Probability P(n) NEW
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Probability
0
1
2
3
4
5
6
7
8
9
10
# of Heads