~~5/5/2020 RL~~
~~Start: 12:10 AM~~
~~End: 12:31 AM~~ 1C 4M 1S

- 7 coppers (c), 3 estates (e)
- Want to start money lender (m) and silver (s)

Turn 1/2

Possible hands

	2c, 3e ↓ 5c, 0e	3c, 2e ↓ 4c, 1e	4c, 1e ↓ 3c, 2e	5c, 0e ↓ 2c, 3e
m	yes	yes	yes	yes
s	no	yes	yes	no
p	$\frac{\binom{7}{2}\binom{3}{3}}{\binom{10}{5}}$	$\frac{\binom{7}{3}\binom{3}{2}}{\binom{10}{5}}$	$\frac{\binom{7}{4}\binom{3}{1}}{\binom{10}{5}}$	$\frac{\binom{7}{5}\binom{3}{0}}{\binom{10}{5}}$
	$0.09\overline{3}$	$0.41\overline{6}$	$0.41\overline{6}$	$0.09\overline{3}$

Notes: # of c turn 2 = 7 - # of c turn 1

1c, 4e is not possible because there are only 3 estates

# of e = 5 - # of c

End: 12:34

~~5/5/2020 RL~~
~~Start: 4:20 AM~~ RL 5/5/2020

Turn 1/2

1. 2-5 split / 5-2 split

deck: 7c, 3e, 1m

$p = 0.1\overline{6}$

possible turn 3 ~~2~~ — Probability of turn 3 outcomes given the split

A. 2c, 3e - 2 coins $\binom{7}{2}\binom{3}{3}/\binom{11}{5}$
B. 1m, 1c, 3e - 3 coins $\binom{7}{1}\binom{3}{3}\binom{1}{1}/\binom{11}{5}$
C. 3c, 2e - 3 coins $\binom{7}{3}\binom{3}{2}/\binom{11}{5}$
D. 1m, 2c, 2e - 4 coins $\binom{7}{2}\binom{3}{2}\binom{1}{1}/\binom{11}{5}$
E. 4c, 1e - 4 coins $\binom{7}{4}\binom{3}{1}/\binom{11}{5}$
F. 1m, 3c, 1e - 5 coins $\binom{7}{3}\binom{3}{1}\binom{1}{1}/\binom{11}{5}$
G. 5c, 0e - 5 coins $\binom{7}{5}/\binom{11}{5}$
H. 1m, 4c, 0e - 6 coins $\binom{7}{4}\binom{1}{1}/\binom{11}{5}$

2. 3-4 split / 4-3 split

deck: 7c, 3e, 1m, 1s

$p = 0.8\overline{3}$

A. 2c, 3e - 2 coins $\binom{7}{2}\binom{3}{3}/\binom{12}{5}$
B. 1m, 1c, 3e - 3 coins $\binom{7}{1}\binom{3}{3}\binom{1}{1}/\binom{12}{5}$
C. 1m, 1s, 3e - 2 coins $\binom{1}{1}\binom{1}{1}\binom{3}{3}/\binom{12}{5}$
D. 1c, 1s, 3e - 3 coins $\binom{7}{1}\binom{1}{1}\binom{3}{3}/\binom{12}{5}$
E. 3c, 2e - 3 coins $\binom{7}{3}\binom{3}{2}/\binom{12}{5}$
F. 1m, 2c, 2e - 4 coins $\binom{7}{2}\binom{3}{2}\binom{1}{1}/\binom{12}{5}$
G. 1s, 2c, 2e - 4 coins $\binom{7}{2}\binom{3}{2}\binom{1}{1}/\binom{12}{5}$
H. 1m, 1s, 1c, 2e - 5 coins $\binom{7}{1}\binom{3}{2}\binom{1}{1}\binom{1}{1}/\binom{12}{5}$
I. 4c, 1e - 4 coins $\binom{7}{4}\binom{3}{1}/\binom{12}{5}$
J. 1m, 3c, 1e - 5 coins $\binom{7}{3}\binom{1}{1}\binom{3}{1}/\binom{12}{5}$
K. 1s, 3c, 1e - 5 coins $\binom{7}{3}\binom{1}{1}\binom{3}{1}/\binom{12}{5}$
L. 1m, 1s, 2c, 1e - 6 coins $\binom{7}{2}\binom{1}{1}\binom{3}{1}\binom{1}{1}/\binom{12}{5}$
M. 5c, 0e - 5 coins $\binom{7}{5}\binom{3}{0}/\binom{12}{5}$
N. 1m, 4c, 0e - 6 coins $\binom{7}{4}\binom{1}{1}\binom{3}{0}/\binom{12}{5}$
O. 1s, 4c, 0e - 6 coins $\binom{7}{4}\binom{1}{1}\binom{3}{0}/\binom{12}{5}$
P. 1m, 1s, 3c, 0e - 7 coins $\binom{7}{3}\binom{1}{1}\binom{1}{1}\binom{3}{0}/\binom{12}{5}$

2 coins (1.A, 2.A) ← turn 3 2.C

$P = 0.1\bar{6} \times \frac{\binom{7}{2}\binom{3}{3}}{\binom{11}{5}} + 0.8\bar{3} \times \frac{\binom{7}{2}\binom{3}{3} \cdot (1)}{\binom{12}{5}} = 0.03071$ ~~0.02967~~

3 coins (1.B, 1.C, 2.B, 2.D, 2.E)

$P = 0.1\bar{6} \times \left(\frac{\binom{7}{1}}{\binom{11}{5}} + \frac{\binom{7}{3}\binom{3}{2}}{\binom{11}{5}}\right) + 0.8\bar{3}\left(\frac{\binom{7}{1}}{\binom{12}{5}} + \frac{\binom{7}{1}}{\binom{12}{5}} + \frac{\binom{7}{3}\binom{3}{2}}{\binom{12}{5}}\right) = 0.1656$

4 coins (1.D, 1.E, 2.F, 2.G, 2.I)

$P = 0.1\bar{6} \times \left(\frac{\binom{7}{2}\binom{3}{2}}{\binom{11}{5}} + \frac{\binom{7}{4}\binom{3}{1}}{\binom{11}{5}}\right) + 0.8\bar{3}\left(\frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} + \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} + \frac{\binom{7}{4}\binom{7}{1}}{\binom{12}{5}}\right) = 0.30366$

5 coins (1.F, 1.G, 2.H, 2.J, 2.K, 2.M)

$P = 0.1\bar{6}\left(\frac{\binom{7}{3}\binom{3}{1} + \binom{7}{5}}{\binom{11}{5}}\right) + 0.8\bar{3}\left(\frac{\binom{7}{3}\binom{3}{1} + \binom{7}{1}\binom{3}{2} + \binom{7}{3}\binom{7}{1} + \binom{7}{5}}{\binom{12}{5}}\right) = 0.3106$

6 coins (1.H, 2.L, 2.N, 2.O)

$P = 0.1\bar{6}\left(\frac{\binom{7}{4}}{\binom{11}{5}}\right) + 0.8\bar{3}\left(\frac{\binom{7}{2}\binom{3}{1} + \binom{7}{4} + \binom{7}{4}}{\binom{12}{5}}\right) = 0.152567\,34$

7 coins (2.P)

$P = 0.8\bar{3}\left(\frac{\binom{7}{5}}{\binom{12}{5}}\right) = 0.0368266$

~~Probability given turn 3~~

Turn 3	possible Turn 4
1.A	1.G, 1.H
B	1.B
C	1.E, 1F, ~~2.G~~, 1.H
D	1.E, 1.G
E	1.L, 1.D, 1F
F	1.E, 1.C
G	1.A, 1.B, 1.D
H	1.C, 1A
2.A	2.M, 2.N, 2.O, 2P
B	2.M, 2.O
C	2.M
D	2.M, 2.N
E	~~2.A~~, 2.I, 2.J, 2.K, 2.L, 2.N, 2.O, 2.P
F	2.I, 2.K, 2.M, 2.O
G	2.I, 2.J, 2.M, 2.N
H	2.I, 2M
I	2.E, 2.F, 2.G, 2.H, 2.J, 2.K, 2.L, 2.P
J	2.E, 2.G, 2.I, 2.K, 2.O
K	2.E, 2.F, 2.I, 2.J, 2.N
L	2.E, 2.I, 2.M
M	2.A, 2.B, 2.C, 2.D, 2.F, 2.G, 2.H, 2.L
N	2.A, 2.O, 2.E, 2.G, 2.K
O	2.A, 2.C, 2.E, 2.F, 2.J
P	2.A, 2.E, 2.I

Turn 3 Turn 4

1. A → 1.G - 5 coins

$P = 0.1\overline{6} \frac{\binom{7}{2}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{5}{5}}{\binom{6}{5}} = 0.00126$

1. A → 1.H - 6 coins

$P = 0.1\overline{6} \frac{\binom{7}{2}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{5}{4}}{\binom{6}{5}} = 0.00631$

1. B → 1.G - 5 coins

$P = 0.1\overline{6} \frac{\binom{7}{1}}{\binom{11}{5}} \frac{\binom{6}{5}}{\binom{6}{5}} = 0.00\overline{25}$

1. C → 1.E - 4 coins

$P = 0.1\overline{6} \frac{\binom{7}{3}\binom{3}{2}}{\binom{11}{5}} \frac{\binom{4}{4}\binom{1}{1}}{\binom{6}{5}} = 0.00631$

1. C → 1.F - 5 coins

$P = 0.1\overline{6} \frac{\binom{7}{3}\binom{3}{2}}{\binom{11}{5}} \frac{\binom{4}{3}}{\binom{6}{5}} = 0.0\overline{25}$

1. C → 1.H - 6 coins

$P = 0.1\overline{6} \frac{\binom{7}{3}\binom{3}{2}}{\binom{11}{5}} \frac{\binom{4}{4}}{\binom{6}{5}} = 0.00631$

1. D → 1.E - 4 coins

$P = 0.1\overline{6} \frac{\binom{7}{2}\binom{3}{2}}{\binom{11}{5}} \frac{\binom{5}{4}}{\binom{6}{5}} = 0.0189\overline{3}$

1. D → 1.G - 5 coins

$P = 0.1\overline{6} \frac{\binom{7}{2}\binom{3}{2}}{\binom{11}{5}} \frac{\binom{5}{5}}{\binom{6}{5}} = 0.00378$

1. E → 1. C - 3 coins

$P = 0.1\overline{6} \frac{\binom{7}{4}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{7}{3}\binom{3}{2}}{\binom{6}{5}} = 0.00631$

1. E → 1. D - 4 coins

$P = 0.1\overline{6} \frac{\binom{7}{4}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{3}{2}}{\binom{6}{5}} = 0.0189\overline{3}$

1. E → 1. F - 5 coins

$P = 0.1\overline{6} \frac{\binom{7}{4}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{8}{5}\binom{2}{1}}{\binom{6}{5}} = 0.01\overline{26}$

1. F → 1. E - 4 coins

$P = 0.1\overline{6} \frac{\binom{7}{3}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{4}{4}\binom{2}{1}}{\binom{6}{5}} = 0.01\overline{26}$

1. F → 1. C - 3 coins

$P = 0.1\overline{6} \frac{\binom{7}{3}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{4}{3}}{\binom{6}{5}} = 0.0\overline{25}$

1. G → 1. A - 2 coins

$P = 0.1\overline{6} \frac{\binom{7}{5}}{\binom{11}{5}} \frac{\binom{2}{2}}{\binom{6}{5}} = 0.00\overline{126}$

1. G → 1. B - 3 coins

$P = 0.1\overline{6} \frac{\binom{7}{5}}{\binom{11}{5}} \frac{\binom{2}{1}}{\binom{6}{5}} = 0.00\overline{25}$

1. G → 1. D - 4 coins

$P = 0.1\overline{6} \frac{\binom{7}{2}\binom{3}{2}}{\binom{11}{5}} \frac{\binom{3}{2}}{\binom{6}{5}} = \frac{0.01\overline{26}}{0.00378}$

1. H → 1. A - 2 coins

$P = 0.1\overline{6} \frac{\binom{7}{4}\binom{3}{1}}{\binom{11}{5}} \frac{\binom{3}{2}}{\binom{6}{5}} = 0.00631$

1. H → 1. C - 3 coins

$P = 0.1\overline{6} \frac{\binom{7}{4}}{\binom{11}{5}} \frac{\binom{3}{3}\binom{3}{2}}{\binom{6}{5}} = 0.00631$

Turn 3 → Turn 4

2A → 2M - 5 coins

$P = 0.8\overline{3} \frac{\binom{7}{2}}{\binom{12}{5}} \frac{\binom{5}{5}}{\binom{7}{5}} = 0.00105\overline{22}$

2A → 2N - 6 coins

$P = 0.8\overline{3} \frac{\binom{7}{2}}{\binom{12}{5}} \frac{\binom{5}{4}}{\binom{7}{5}} = 0.005261$

2A → 2O - 6 coins

$P = 0.8\overline{3} \frac{\binom{7}{2}}{\binom{12}{5}} \frac{\binom{5}{4}}{\binom{7}{5}} = 0.005261$

2A → 2P - 7 coins

$P = 0.8\overline{3} \frac{\binom{7}{2}}{\binom{12}{5}} \frac{\binom{8}{5}}{\binom{7}{5}} = 0.010522$

2B → 2M - 5 coins

$P = 0.8\overline{3} \frac{\binom{7}{1}}{\binom{12}{5}} \frac{\binom{6}{5}}{\binom{7}{5}} = 0.0021044$

2B → 2O - 6 coins

$P = 0.8\overline{3} \frac{\binom{7}{1}}{\binom{12}{5}} \frac{\binom{6}{4}}{\binom{7}{5}} = 0.005261$

2C → 2M - 5 coins

$P = 0.8\overline{3} \frac{1}{\binom{12}{5}} \frac{\binom{5}{5}}{\binom{7}{5}} = 0.00105\overline{22}$

2D → 2M - 5 coins

$P = 0.8\overline{3} \frac{\binom{7}{1}}{\binom{12}{5}} \frac{\binom{6}{5}}{\binom{7}{5}} = 0.0021044$

2D → 2N - 6 coins

$P = 0.83 \frac{\binom{7}{1}}{\binom{12}{5}} \frac{\binom{6}{4}}{\binom{7}{5}} = 0.005261$

2E → 2I - 4 coins

$P = 0.8\overline{3} \frac{\binom{3}{3}\binom{8}{2}}{\binom{12}{5}} \frac{1}{\binom{7}{5}} = 0.00526$

2E → 2J - 5 coins

$P = 0.8\overline{3} \frac{\binom{3}{3}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{4}{3}}{\binom{7}{5}} = 0.021044$

2E → 2K - 5 coins

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{4}{3}}{\binom{7}{5}} = 0.021044$

2E → 2L - 6 coins

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{4}{2}}{\binom{7}{5}} = 0.0315\overline{6}$

2E → 2N - 6 coins

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{2}}{\binom{12}{5}} \frac{1}{\binom{7}{5}} = 0.00526$

2E → 2O - 6 coins

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{2}}{\binom{12}{5}} \frac{1}{\binom{7}{5}} = 0.00526$

2E → 2P - 7 coins

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{4}{3}}{\binom{7}{5}} = 0.021044$

Turn 3 → Turn 4

2F → 2I - 4 coins

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{4}}{\binom{7}{5}} = 0.0158$

2F → 2K - 5 coins

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{3}}{\binom{7}{5}} = 0.03156\overline{}$

2F → 2M - 5

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{5}}{\binom{7}{5}} = 0.003156\overline{}$

2F → 2O - 6

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{4}}{\binom{7}{5}} = 0.0158$

2G → 2I - 4

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{4}}{\binom{7}{5}} = 0.0158$

2G → 2J - 5

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{3}}{\binom{7}{5}} = 0.03156\overline{}$

2G → 2M - 5

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{5}}{\binom{7}{5}} = 0.003156\overline{}$

2G → 2O - 6

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{5}{4}}{\binom{7}{5}} = 0.0158$

2H → 2I - 4

$P = 0.8\overline{3} \frac{\binom{7}{1}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{6}{4}}{\binom{7}{5}} = 0.015782\overline{}$

2H → 2M - 5

$P = 0.8\overline{3} \frac{\binom{7}{1}\binom{3}{2}}{\binom{12}{5}} \frac{\binom{6}{5}}{\binom{7}{5}} = 0.00631\overline{}$

2I → 2E - 3

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{3}{3}}{\binom{7}{5}} = 0.005261$

2I → 2F - 4

$P = 0.8\overline{3} \frac{\binom{7}{4}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{3}{2}}{\binom{7}{5}} = 0.015782\overline{}$

2I → 2G - 4

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{3}{2}}{\binom{7}{5}} = 0.015782\overline{}$

2I → 2H - 5

$P = 0.8\overline{3} \frac{\binom{7}{4}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{3}{1}}{\binom{12}{5}} 0.015782\overline{}$

2I → 2J - 5

$P = 0.8\overline{3} \frac{\binom{7}{4}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{7}{1}}{\binom{7}{5}} = 0.010522$

Turn 3 → Turn 4

2I → 2K - 5

$P = 0.8\overline{3} \frac{\binom{7}{4}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{7}{1}}{\binom{7}{5}} = 0.010522$

2I → 2L - 6

$P = 0.8\overline{3} \frac{\binom{7}{4}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{9}{1}\binom{3}{2}}{\binom{7}{5}} = 0.08156\overline{}$

2I → 2N - 7

$P = 0.8\overline{3} \frac{\binom{7}{4}\binom{3}{1}}{\binom{12}{5}} \frac{1}{\binom{7}{5}} = \cancel{0.015782}$ 0.005261

2J → 2E - 3

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{4}{3}}{\binom{7}{5}} = 0.021044$

2J → 2G - 4

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{4}{2}}{\binom{7}{5}} = 0.03156\overline{}$

2J → 2I - 4

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{7}{1}}{\binom{7}{5}} = 0.010522$

2J → 2K - 5

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{4}{3}\binom{7}{1}}{\binom{7}{5}} = 0.04209$

2J → 2O - 6

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{1}{\binom{7}{5}} = \cancel{0.015782}$ 0.005261

2K → 2E - 3

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{4}{3}}{\binom{7}{5}} = 0.021044$

2K → 2F - 4

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{4}{2}}{\binom{7}{5}} = 0.03156\overline{}$

2K → 2I - 4

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{7}{1}}{\binom{7}{5}} = 0.010522$

2K → 2J - 5

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{4}{3}\binom{3}{1}}{\binom{7}{5}} = 0.04209$

2K → 2N - 6

$P = 0.8\overline{3} \frac{\binom{7}{3}\binom{3}{1}}{\binom{12}{5}} \frac{1}{\binom{7}{5}} = \cancel{0.015782}$ 0.005261

2L → 2E - 3

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{5}{3}}{\binom{7}{5}} = 0.03156\overline{}$

2L → 2I - 4

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{5}{4}\binom{7}{1}}{\binom{7}{5}} = 0.03156\overline{}$

2L → 2M - 5

$P = 0.8\overline{3} \frac{\binom{7}{2}\binom{3}{1}}{\binom{12}{5}} \frac{\binom{5}{5}}{\binom{7}{5}} = 0.003156\overline{}$

$2M \to 2A - 2$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{1}{\binom{7}{5}} = 0.0010522$

$2M \to 2B - 3$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{\binom{5}{1}}{\binom{7}{5}} = \cancel{0.0021044}\ 0.003156$

$2M \to 2C - 2$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{1}{\binom{7}{5}} = 0.0010522$

$2M \to 2D - 3$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{\binom{2}{1}}{\binom{7}{5}} = \cancel{0.0021044}$

$2M \to 2F - 4$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{\binom{3}{2}}{\binom{7}{5}} = 0.003156$

$2M \to 2G - 4$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{\binom{3}{2}}{\binom{7}{5}} = 0.003156$

$2M \to 2H - 5$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{\binom{2}{1}\binom{3}{2}}{\binom{7}{5}} = 0.00631$

$2M \to 2L - 5$

$P = 0.8\overline{3} \dfrac{\binom{7}{5}}{\binom{12}{5}} \dfrac{\binom{3}{1}}{\binom{7}{5}} = 0.003156$

$2N \to 2A - 2$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{3}}{\binom{7}{5}} = \cancel{0.00175}\ 0.005261$

$2N \to 2D - 3$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{1}}{\binom{7}{5}} = \cancel{0.0035073}\ 0.005261$

$2N \to 2E - 3$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{2}}{\binom{7}{5}} = 0.005261$

$2N \to 2G - 4$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{2}\binom{3}{2}}{\binom{7}{5}} = 0.015782$

$2N \to 2K - 5$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{7}{1}}{\binom{7}{5}} = 0.005261$

$2O \to 2A - 2$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{2}}{\binom{7}{5}} = \cancel{0.0017536}\ 0.005261$

$2O \to 2B - 3$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{5}{1}}{\binom{7}{5}} = \cancel{0.0035073}\ 0.005261$

$2O \to 2E - 3$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{2}}{\binom{7}{5}} = 0.005261$

$2O \to 2F - 4$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{2}\binom{3}{2}}{\binom{7}{5}} = 0.015782$

$2O \to 2J - 5$

$P = 0.8\overline{3} \dfrac{\binom{7}{4}}{\binom{12}{5}} \dfrac{\binom{3}{1}}{\binom{7}{5}} = 0.005261$

$2P \to 2A - 2$

$P = 0.8\overline{3} \dfrac{\binom{7}{3}}{\binom{12}{5}} \dfrac{\binom{4}{2}}{\binom{7}{5}} = 0.010522$

$2P \to 2E - 3$

$P = 0.8\overline{3} \dfrac{\binom{7}{3}}{\binom{12}{5}} \dfrac{\binom{4}{2}\binom{3}{2}}{\binom{7}{5}} = \cancel{0.005261}\ 0.021044$

$2P \to 2I - 4$

$P = 0.8\overline{3} \dfrac{\binom{7}{3}}{\binom{12}{5}} \dfrac{\binom{3}{1}}{\binom{7}{5}} = 0.005261$

2 coins

$0.00126 + 0.00631 + \cancel{0.003156} + 0.0010522 + 0.0010522 + \cancel{0.003156}$
$+ \cancel{0.00175} + \cancel{0.0017536} + 0.010522 + 0.005261$
$+ 0.005261$
$= 0.03072$

3 coins

$0.00631 + 0.025 + 0.0025 + 0.00631 + 0.005261$
$+ 0.021044 + 0.021044 + 0.03156 + \cancel{0.0021044}$
$+ 0.0021044 + \cancel{0.0035073} + 0.005261$
$+ \cancel{0.0035073} + 0.005261 + \cancel{0.005261} + \cancel{0.00631}$
$+ 0.003156 + 0.005261 + 0.005261$
$+ 0.021044$
$= 0.1667$

4 coins

$0.00631 + 0.01893 + 0.01893 + 0.0126 + 0.00378$
$+ 0.005261 + 0.0158 + 0.0158 + 0.0158 + 0.0158$
$+ 0.0158 + 0.03156 + 0.010522 + 0.03156$
$+ 0.010522 + 0.03156 + 0.003156 + 0.003156$
$+ 0.0158 + 0.0158 + 0.005261$
$= 0.3038$

5 coins

$0.00126 + 0.00025 + 0.025 + 0.00378 + 0.0126$
$+ 0.0010522 + 0.0021044 + 0.0010522$
$+ 0.0021044 + 0.021044 + 0.021044 + 0.03156$
$+ 0.003156 + 0.03156 + 0.003156 + 0.00631$
$+ 0.015782 + 0.010522 + 0.010522 + 0.04209$
$+ 0.04209 + 0.003156 + 0.00631 + 0.005261$
$+ 0.005261$
$= 0.3106$

6 coins

$0.00631 + 0.00631 + 0.005261 + 0.005261 + 0.005261 + 0.005261 +$
$0.03156 + 0.005261 + 0.005261 + \cancel{0.0158} + \cancel{0.0158} + 0.03156$
$+ 0.0158 + 0.0158 + 0.003156 + 0.005261 + 0.005261$
$= 0.1526$

7 coins

$0.010522 + 0.021044 + 0.005261$
$= \cancel{0.03157}\ 0.03683$