

30s: The Optimal Strategy

(For each situation, the simple strategy, maximum points strategy and risk-avoiding strategy, respectively, are shown. The number indicates the number of dice that have to be used to throw again.)

0 dice put away

1 1 1 1 1 1	3	3	2
1 1 1 1 1 2	3	3	2
1 1 1 1 2 1	3	3	2
1 1 1 2 1 1	3	3	2
1 1 2 1 1 1	2	2	1
1 2 1 1 1 1	1	5	5
2 1 1 1 1 1	1	5	5
1 1 1 1 1 3	1	4	1
1 1 1 1 3 1	3	3	2
1 1 1 3 1 1	3	3	2
1 1 3 1 1 1	3	3	2
1 3 1 1 1 1	2	2	0
3 1 1 1 1 1	1	5	5
1 1 1 1 1 4	1	5	5
1 1 1 1 4 1	1	4	1
1 1 1 4 1 1	3	3	2
1 1 4 1 1 1	3	3	2
1 4 1 1 1 1	2	2	0
1 1 1 1 1 5	1	5	5
1 1 1 1 5 1	1	5	5
1 1 1 5 1 1	1	4	1
1 1 5 1 1 1	1	1	0
1 1 1 1 1 6	3	3	2
1 1 1 1 6 1	2	2	0
1 1 1 6 1 1	3	3	0
1 1 6 1 1 1	2	2	0
1 6 1 1 1 1	1	5	5
6 1 1 1 1 1	1	5	5
1 1 1 1 1 7	1	4	0
1 1 1 1 7 1	1	1	0
1 1 1 7 1 1	3	3	0
1 1 7 1 1 1	4	4	0
1 7 1 1 1 1	3	3	0
7 1 1 1 1 1	2	2	0
1 1 1 1 1 8	0	5	0
1 1 1 1 8 1	0	5	0

1 dice put away

1 1 1 1 1 1	3	3	2
1 1 1 1 1 2	3	3	2
1 1 1 1 2 1	3	3	2
1 1 1 2 1 1	3	3	2
1 1 2 1 1 1	2	2	1
1 2 1 1 1 1	1	4	4
2 1 1 1 1 1	1	4	4
1 1 1 1 1 3	1	4	4
1 1 1 1 3 1	1	4	4
1 1 1 3 1 1	1	4	4
1 1 3 1 1 1	1	4	4
1 3 1 1 1 1	1	4	1
3 1 1 1 1 1	1	4	4
1 1 1 1 1 4	1	4	4
1 1 1 1 4 1	1	4	1
1 1 1 4 1 1	1	4	1
1 1 4 1 1 1	1	4	4
1 4 1 1 1 1	1	4	1
4 1 1 1 1 1	1	4	1
1 1 1 1 1 5	3	3	2
1 1 1 1 5 1	3	3	2
1 1 1 5 1 1	3	3	2
1 1 5 1 1 1	2	2	0
1 1 1 1 1 6	1	4	4
1 1 1 1 6 1	1	4	4
1 1 1 6 1 1	1	4	4
1 1 6 1 1 1	1	4	4
1 6 1 1 1 1	1	4	4
6 1 1 1 1 1	1	4	4
1 1 1 1 1 7	1	4	4
1 1 1 1 7 1	1	4	1
1 1 1 7 1 1	1	4	1
1 1 7 1 1 1	1	4	1
1 7 1 1 1 1	1	4	4
7 1 1 1 1 1	1	4	4
1 1 1 1 1 8	1	1	0
1 1 1 1 8 1	1	1	0
1 1 1 8 1 1	1	4	4
1 1 8 1 1 1	1	4	4
1 8 1 1 1 1	1	4	4
8 1 1 1 1 1	1	4	4
1 1 1 1 1 9	1	1	0
1 1 1 1 9 1	1	1	0
1 1 1 9 1 1	1	4	4
1 1 9 1 1 1	1	4	4
1 9 1 1 1 1	1	4	4
9 1 1 1 1 1	1	4	4
1 1 1 1 1 10	1	1	0
1 1 1 1 10 1	1	1	0
1 1 1 10 1 1	1	4	4
1 1 10 1 1 1	1	4	4
1 10 1 1 1 1	1	4	4
10 1 1 1 1 1	1	4	4

2 dice put away

1 1 1 1 1 1	3	3	2
1 1 1 1 1 2	3	3	2
1 1 1 1 2 1	3	3	2
1 1 1 2 1 1	3	3	2
1 1 2 1 1 1	2	2	1
1 2 1 1 1 1	3	3	2
2 1 1 1 1 1	3	3	2
1 1 1 1 1 3	2	2	0
1 1 1 1 3 1	1	1	0
1 1 1 3 1 1	1	1	0
1 1 3 1 1 1	1	1	0
1 3 1 1 1 1	1	1	0
3 1 1 1 1 1	3	3	2
1 1 1 1 1 4	2	2	0
1 1 1 1 4 1	1	1	0
1 1 1 4 1 1	1	1	0
1 1 4 1 1 1	3	3	2
1 4 1 1 1 1	2	2	0
4 1 1 1 1 1	1	1	0
1 1 1 1 1 5	1	1	0
1 1 1 1 5 1	1	1	0
1 1 1 5 1 1	1	1	0
1 1 5 1 1 1	1	1	0
1 5 1 1 1 1	1	1	0
5 1 1 1 1 1	1	1	0
1 1 1 1 1 6	1	1	0
1 1 1 1 6 1	1	1	0
1 1 1 6 1 1	1	1	0
1 1 6 1 1 1	1	1	0
1 6 1 1 1 1	1	1	0
6 1 1 1 1 1	1	1	0
1 1 1 1 1 7	3	3	0
1 1 1 1 7 1	4	4	0
1 1 1 7 1 1	4	4	0
1 1 7 1 1 1	4	4	0
1 7 1 1 1 1	4	4	0
7 1 1 1 1 1	4	4	0
1 1 1 1 1 8	3	3	0
1 1 1 1 8 1	3	3	0
1 1 1 8 1 1	3	3	0
1 1 8 1 1 1	3	3	0
1 8 1 1 1 1	3	3	0
8 1 1 1 1 1	3	3	0
1 1 1 1 1 9	2	2	0
1 1 1 1 9 1	2	2	0
1 1 1 9 1 1	2	2	0
1 1 9 1 1 1	2	2	0
1 9 1 1 1 1	2	2	0
9 1 1 1 1 1	2	2	0
1 1 1 1 1 10	2	2	0
1 1 1 1 10 1	2	2	0
1 1 1 10 1 1	2	2	0
1 1 10 1 1 1	2	2	0
1 10 1 1 1 1	2	2	0
10 1 1 1 1 1	2	2	0

4 dice put away

1 1 1 1 1 1	1	1	0
1 1 1 1 1 2	1	1	0
1 1 1 1 2 1	1	1	0
1 1 1 2 1 1	1	1	0
1 1 2 1 1 1	1	1	0
1 2 1 1 1 1	1	1	0
2 1 1 1 1 1	1	1	0
1 1 1 1 1 3	1	1	0
1 1 1 1 3 1	1	1	0
1 1 1 3 1 1	1	1	0
1 1 3 1 1 1	1	1	0
1 3 1 1 1 1	1	1	0
3 1 1 1 1 1	1	1	0
1 1 1 1 1 4	1	1	0
1 1 1 1 4 1	1	1	0
1 1 1 4 1 1	1	1	0
1 1 4 1 1 1	1	1	0
1 4 1 1 1 1	1	1	0
4 1 1 1 1 1	1	1	0
1 1 1 1 1 5	1	1	0
1 1 1 1 5 1	1	1	0
1 1 1 5 1 1	1	1	0
1 1 5 1 1 1	1	1	0
1 5 1 1 1 1	1	1	0
5 1 1 1 1 1	1	1	0
1 1 1 1 1 6	1	1	0
1 1 1 1 6 1	1	1	0
1 1 1 6 1 1	1	1	0
1 1 6 1 1 1	1	1	0
1 6 1 1 1 1	1	1	0
6 1 1 1 1 1	1	1	0
1 1 1 1 1 7	2	2	0
1 1 1 1 7 1	2	2	0
1 1 1 7 1 1	2	2	0
1 1 7 1 1 1	2	2	0
1 7 1 1 1 1	2	2	0
7 1 1 1 1 1	2	2	0
1 1 1 1 1 8	2	2	0
1 1 1 1 8 1	2	2	0
1 1 1 8 1 1	2	2	0
1 1 8 1 1 1	2	2	0
1 8 1 1 1 1	2	2	0
8 1 1 1 1 1	2	2	0
1 1 1 1 1 9	2	2	0
1 1 1 1 9 1	2	2	0
1 1 1 9 1 1	2	2	0
1 1 9 1 1 1	2	2	0
1 9 1 1 1 1	2	2	0
9 1 1 1 1 1	2	2	0

3 dice put away

1 1 1 1 1 1	2	2	1
1 1 1 1 1 2	2	2	0
1 1 1 1 2 1	1	1	0
1 1 1 2 1 1	1	1	0
1 1 2 1 1 1	1	1	0
1 2 1 1 1 1	1	1	0
2 1 1 1 1 1	1	1	0
1 1 1 1 1 3	2	2	0
1 1 1 1 3 1	2	2	0
1 1 1 3 1 1	2	2	0
1 1 3 1 1 1	2	2	0
1 3 1 1 1 1	1	1	0
3 1 1 1 1 1	1	1	0
1 1 1 1 1 4	2	2	0
1 1 1 1 4 1	2	2	0
1 1 1 4 1 1	2	2	0
1 1 4 1 1 1	2	2	0
1 4 1 1 1 1	1	1	0
4 1 1 1 1 1	1	1	0
1 1 1 1 1 5	2	2	0
1 1 1 1 5 1	2	2	0
1 1 1 5 1 1	2	2	0
1 1 5 1 1 1	2	2	0
1 5 1 1 1 1	2	2	0
5 1 1 1 1 1	2	2	0
1 1 1 1 1 6	2	2	0
1 1 1 1 6 1	2	2	0
1 1 1 6 1 1	2	2	0
1 1 6 1 1 1	2	2	0
1 6 1 1 1 1	2	2	0
6 1 1 1 1 1	2	2	0

1 1 1 1 1 7	2	2	0
1 1 1 1 7 1	2	2	0
1 1 1 7 1 1	2	2	0
1 1 7 1 1 1	2	2	0
1 7 1 1 1 1	2	2	0
7 1 1 1 1 1	2	2	0
1 1 1 1 1 8	2	2	0
1 1 1 1 8 1	2	2	0
1 1 1 8 1 1	2	2	0
1 1 8 1 1 1	2	2	0
1 8 1 1 1 1	2	2	0
8 1 1 1 1 1	2	2	0
1 1 1 1 1 9	2	2	0
1 1 1 1 9 1	2	2	0
1 1 1 9 1 1	2	2	0
1 1 9 1 1 1	2	2	0
1 9 1 1 1 1	2	2	0
9 1 1 1 1 1	2	2	0

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Strategies

Heuristic - A strategy that is easy to remember and almost optimal: "Always put away fives and sixes, and if that only leaves a four, also put that away."

Maximize - Maximize your score

Minloss - Minimize your number of points

30over - Maximize the chance of getting 30 or more

Aggressive - Also considering the second stage of the game, maximize the difference between your number of points and that of your opponent.

Parameters

For each of the strategies, consider the following:

E(value) - Expected sum of the dice

P(≥ 30) - Chance of ending up with 30 or more

E(loss) - Expected number of points for ourself

E(w >30) - Expected number of points over 30

E(opp') - Expected number of points for the opponent, also considering the second stage.

When starting with ones, twos, threes, fours, fives or sixes, the expected values for the second stage are, respectively:

2,975, 5,881, 8,805, 11,729, 14,653, 17,554

Expected values of parameters per strategy

	E(value)	P(≥ 30)	E(loss)	E(w >30)	E(opp')
30over	29,92	67,44	1,05	0,97	2,86
aggressive	30,13	60,79	1,12	1,25	3,68
minloss	29,95	65,60	1,00	0,95	2,80
maximize	30,15	62,17	1,07	1,23	3,60
heuristic	30,15	62,08	1,07	1,22	3,57

Distribution of final score for various strategies

