Modeling and simulation

ESS-ABM assignment

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Assignment 1

Hawks and doves' simulation

Case 1

Study results

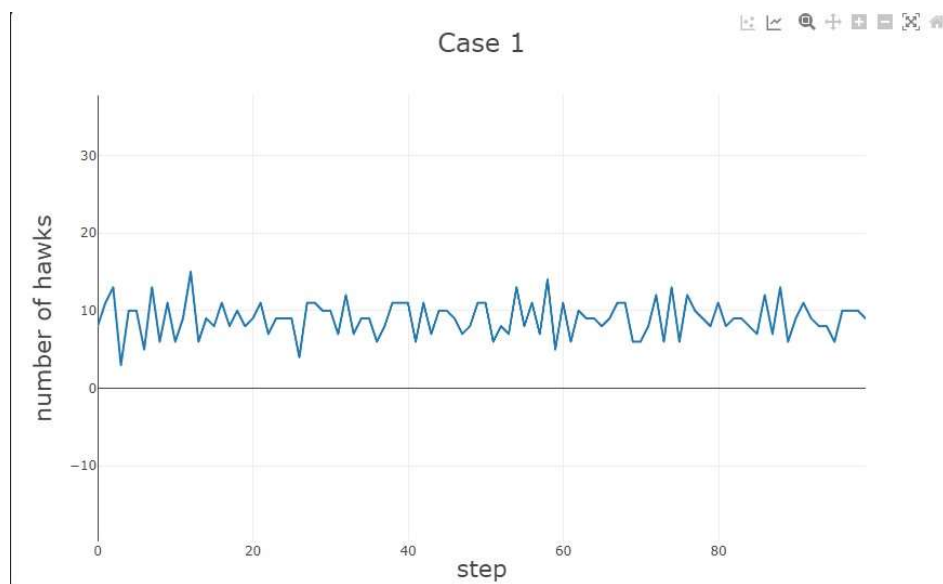In this case study we assumed that both cost and value were constant

C = 10
V = 100

After running the simulation and counting the number of hawks at a sample rate of 10 games / step the results came out as shown below

After calculating the standard deviation which yielded a result of 2.197335393 The significant sample size has yielded to the following

At Z= 1.645 =>   13.06545404
At Z= 1.96 =>   18.54833132
At Z= 2.57 =>   31.89032526

Case 1

Case 2

Study results

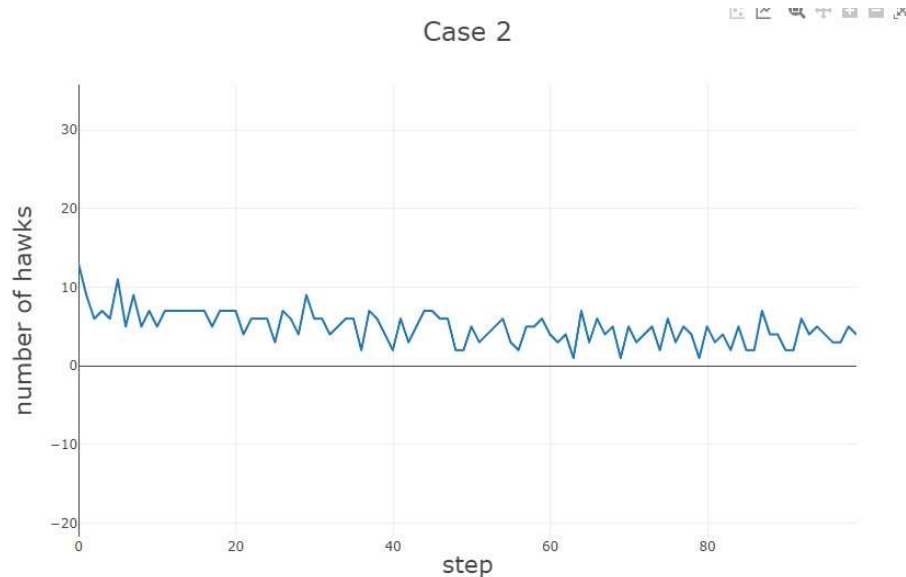In this case study we assumed that both cost and value were constant

C = uniform distribution
V = 100

After running the simulation and counting the number of hawks at a sample rate of 10 games / step the results came out as shown below

After calculating the standard deviation which yielded a result of 2.112588531 The significant sample size has yielded to the following

At Z= 1.645 =>   12.0770715711098
 At Z= 1.96 =>   17.145177205523
At Z= 2.57 =>   29.4778688371405

Case 2

Case 3

Study results

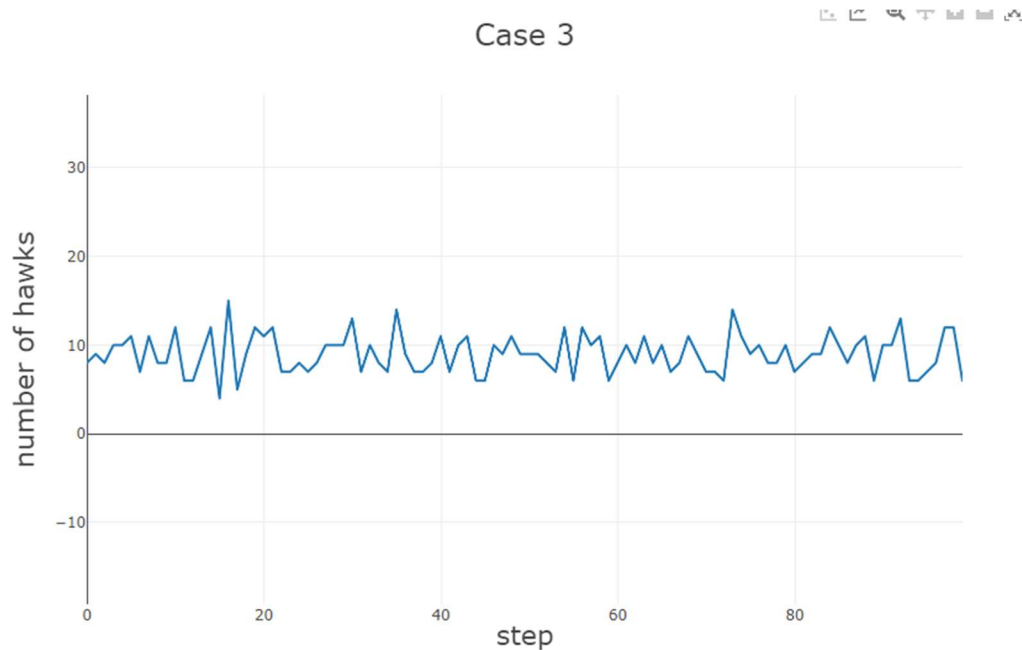In this case study we assumed that both cost and value were constant

C = normal distribution
V = 100

After running the simulation and counting the number of hawks at a sample rate of 10 games / step the results came out as shown below

After calculating the standard deviation which yielded a result of 2.197335393 The significant sample size has yielded to the following

At Z= 1.645 =>   13.0654540432389
At Z= 1.96 =>   18.5483313171559
At Z= 2.57 =>   31.8903252594447

Case 3

Case 4

Study results

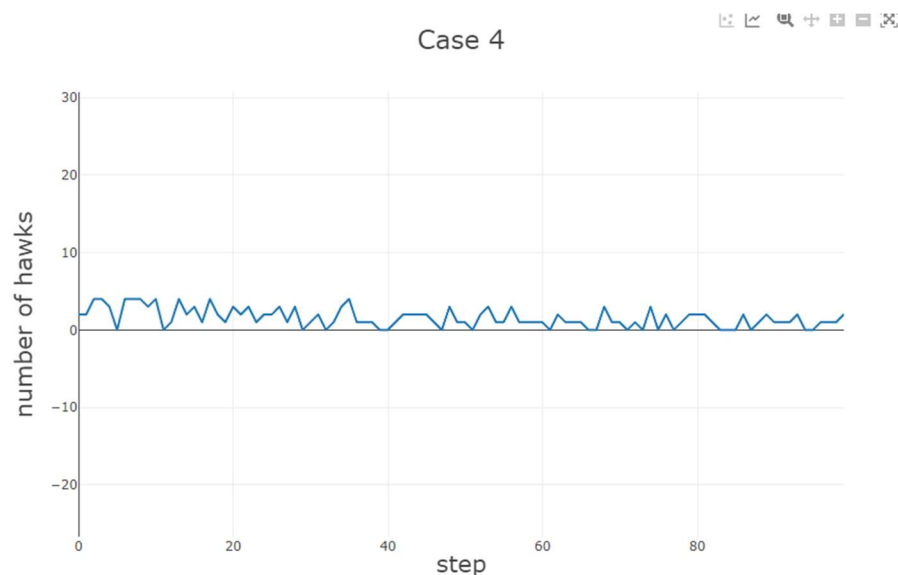In this case study we assumed that both cost and value were constant

C = normal distribution
V = normal distribution

After running the simulation and counting the number of hawks at a sample rate of 10 games / step the results came out as shown below

After calculating the standard deviation which yielded a result of 1.217880258 The significant sample size has yielded to the following

At Z= 1.645 =>   4.02685702817624

At Z= 1.96 =>   5.69798529136892

At Z= 2.57 =>   9.79660116903441

Case 4

ESS-ABM assignment

Screen shots

- Case 1

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Battle room (3): Player (37) [ Dove ] VS Player (35) [ Dove ] => Draw => Player (37) will not change strategy. : Player (35) will not change strategy.
Battle room (4): Player (93) [ Dove ] VS Player (71) [ Hawk ] => Player (71) wins => Player (93) will change strategy. : Player (71) will change strategy.
Battle room (5): Player (19) [ Hawk ] VS Player (84) [ Hawk ] => Draw => Player (19) will not change strategy. : Player (84) will not change strategy.
Battle room (6): Player (92) [ Hawk ] VS Player (18) [ Hawk ] => Draw => Player (92) will not change strategy. : Player (18) will not change strategy.
Battle room (7): Player (33) [ Hawk ] VS Player (44) [ Dove ] => Player (33) wins => Player (33) will change strategy. : Player (44) will change strategy.
Battle room (8): Player (46) [ Dove ] VS Player (51) [ Dove ] => Draw => Player (46) will not change strategy. : Player (51) will not change strategy.
Battle room (9): Player (73) [ Hawk ] VS Player (28) [ Hawk ] => Draw => Player (73) will not change strategy. : Player (28) will not change strategy.
Battle room (10): Player (1) [ Dove ] VS Player (47) [ Dove ] => Draw => Player (1) will not change strategy. : Player (47) will not change strategy.
Battle room (11): Player (2) [ Hawk ] VS Player (50) [ Dove ] => Player (2) wins => Player (2) will change strategy. : Player (50) will change strategy.
Battle room (12): Player (24) [ Hawk ] VS Player (41) [ Dove ] => Player (24) wins => Player (24) will change strategy. : Player (41) will change strategy.
Battle room (13): Player (81) [ Hawk ] VS Player (62) [ Dove ] => Player (81) wins => Player (81) will change strategy. : Player (62) will change strategy.
Battle room (14): Player (14) [ Dove ] VS Player (12) [ Hawk ] => Player (12) wins => Player (14) will change strategy. : Player (12) will change strategy.
Battle room (15): Player (68) [ Dove ] VS Player (21) [ Dove ] => Draw => Player (68) will not change strategy. : Player (21) will not change strategy.
Battle room (16): Player (59) [ Dove ] VS Player (85) [ Dove ] => Draw => Player (59) will not change strategy. : Player (85) will not change strategy.
Battle room (17): Player (77) [ Dove ] VS Player (55) [ Dove ] => Draw => Player (77) will not change strategy. : Player (55) will not change strategy.
Battle room (18): Player (89) [ Dove ] VS Player (15) [ Hawk ] => Player (15) wins => Player (89) will change strategy. : Player (15) will change strategy.
Battle room (19): Player (39) [ Dove ] VS Player (49) [ Hawk ] => Player (49) wins => Player (39) will change strategy. : Player (49) will change strategy.
Battle room (20): Player (83) [ Dove ] VS Player (60) [ Hawk ] => Player (60) wins => Player (83) will change strategy. : Player (60) will change strategy.
Battle room (21): Player (78) [ Dove ] VS Player (54) [ Hawk ] => Player (54) wins => Player (78) will change strategy. : Player (54) will change strategy.
Battle room (22): Player (65) [ Dove ] VS Player (34) [ Dove ] => Draw => Player (65) will not change strategy. : Player (34) will not change strategy.
Battle room (23): Player (10) [ Hawk ] VS Player (100) [ Dove ] => Player (10) wins => Player (10) will change strategy. : Player (100) will change strategy.
Battle room (24): Player (16) [ Dove ] VS Player (4) [ Hawk ] => Player (4) wins => Player (16) will change strategy. : Player (4) will change strategy.
Battle room (25): Player (52) [ Dove ] VS Player (97) [ Hawk ] => Player (97) wins => Player (52) will change strategy. : Player (97) will change strategy.
Battle room (26): Player (23) [ Hawk ] VS Player (88) [ Hawk ] => Draw => Player (23) will not change strategy. : Player (88) will not change strategy.
Battle room (27): Player (98) [ Hawk ] VS Player (56) [ Hawk ] => Draw => Player (98) will not change strategy. : Player (56) will not change strategy.
Battle room (28): Player (29) [ Dove ] VS Player (31) [ Dove ] => Draw => Player (29) will not change strategy. : Player (31) will not change strategy.
Battle room (29): Player (90) [ Hawk ] VS Player (11) [ Dove ] => Player (90) wins => Player (90) will change strategy. : Player (11) will change strategy.
Battle room (30): Player (96) [ Hawk ] VS Player (57) [ Hawk ] => Draw => Player (96) will not change strategy. : Player (57) will not change strategy.
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- Case 2

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Battle room (57): Player (95) [ Dove ] VS Player (88) [ Dove ] => Draw => Player (95) will not change strategy. : Player (88) will not change strategy.
Battle room (58): Player (40) [ Hawk ] VS Player (75) [ Dove ] => Player (40) wins => Player (40) will change strategy. : Player (75) will change strategy.
Battle room (59): Player (97) [ Dove ] VS Player (21) [ Hawk ] => Player (21) wins => Player (97) will change strategy. : Player (21) will change strategy.
Battle room (60): Player (91) [ Hawk ] VS Player (34) [ Dove ] => Player (91) wins => Player (91) will change strategy. : Player (34) will change strategy.
Battle room (61): Player (32) [ Hawk ] VS Player (87) [ Hawk ] => Draw => Player (32) will not change strategy. : Player (87) will not change strategy.
Battle room (62): Player (26) [ Hawk ] VS Player (35) [ Hawk ] => Draw => Player (26) will not change strategy. : Player (35) will not change strategy.
Battle room (63): Player (7) [ Dove ] VS Player (99) [ Dove ] => Draw => Player (7) will not change strategy. : Player (99) will not change strategy.
Battle room (64): Player (66) [ Dove ] VS Player (52) [ Hawk ] => Player (52) wins => Player (66) will change strategy. : Player (52) will change strategy.
Battle room (65): Player (42) [ Hawk ] VS Player (27) [ Dove ] => Player (42) wins => Player (42) will change strategy. : Player (27) will change strategy.
Battle room (66): Player (71) [ Dove ] VS Player (49) [ Hawk ] => Player (49) wins => Player (71) will change strategy. : Player (49) will change strategy.
Battle room (67): Player (84) [ Dove ] VS Player (30) [ Hawk ] => Player (30) wins => Player (84) will change strategy. : Player (30) will change strategy.
Battle room (68): Player (24) [ Dove ] VS Player (60) [ Hawk ] => Player (60) wins => Player (24) will change strategy. : Player (60) will change strategy.
Battle room (69): Player (37) [ Hawk ] VS Player (62) [ Dove ] => Player (37) wins => Player (37) will change strategy. : Player (62) will change strategy.
Battle room (70): Player (36) [ Dove ] VS Player (55) [ Hawk ] => Player (55) wins => Player (36) will change strategy. : Player (55) will change strategy.
Battle room (71): Player (67) [ Hawk ] VS Player (90) [ Dove ] => Player (67) wins => Player (67) will change strategy. : Player (90) will change strategy.
Battle room (72): Player (33) [ Dove ] VS Player (79) [ Dove ] => Draw => Player (33) will not change strategy. : Player (79) will not change strategy.
Battle room (73): Player (22) [ Dove ] VS Player (4) [ Dove ] => Draw => Player (22) will not change strategy. : Player (4) will not change strategy.
Battle room (74): Player (94) [ Dove ] VS Player (70) [ Dove ] => Draw => Player (94) will not change strategy. : Player (70) will not change strategy.
Battle room (75): Player (2) [ Dove ] VS Player (6) [ Dove ] => Draw => Player (2) will not change strategy. : Player (6) will not change strategy.
Battle room (76): Player (80) [ Hawk ] VS Player (51) [ Dove ] => Player (80) wins => Player (80) will change strategy. : Player (51) will change strategy.
Battle room (77): Player (86) [ Dove ] VS Player (73) [ Dove ] => Draw => Player (86) will not change strategy. : Player (73) will not change strategy.
Battle room (78): Player (43) [ Hawk ] VS Player (31) [ Dove ] => Player (43) wins => Player (43) will change strategy. : Player (31) will change strategy.
Battle room (79): Player (83) [ Hawk ] VS Player (65) [ Dove ] => Player (83) wins => Player (83) will change strategy. : Player (65) will change strategy.
Battle room (80): Player (93) [ Dove ] VS Player (23) [ Dove ] => Draw => Player (93) will not change strategy. : Player (23) will not change strategy.
Battle room (81): Player (63) [ Hawk ] VS Player (41) [ Dove ] => Player (63) wins => Player (63) will change strategy. : Player (41) will change strategy.
Battle room (82): Player (92) [ Dove ] VS Player (89) [ Dove ] => Draw => Player (92) will not change strategy. : Player (89) will not change strategy.
Battle room (83): Player (17) [ Hawk ] VS Player (5) [ Hawk ] => Draw => Player (17) will not change strategy. : Player (5) will not change strategy.
Battle room (84): Player (39) [ Dove ] VS Player (18) [ Dove ] => Draw => Player (39) will not change strategy. : Player (18) will not change strategy.
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ESS-ABM assignment

- Case 3

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Battle room (10): Player (92) [ Hawk ] VS Player (81) [ Dove ] => Player (92) wins => Player (92) will change strategy. : Player (81) will change strategy.
Battle room (11): Player (83) [ Dove ] VS Player (17) [ Dove ] => Draw => Player (83) will not change strategy. : Player (17) will not change strategy.
Battle room (12): Player (39) [ Dove ] VS Player (9) [ Hawk ] => Player (9) wins => Player (39) will change strategy. : Player (9) will change strategy.
Battle room (13): Player (91) [ Hawk ] VS Player (98) [ Hawk ] => Draw => Player (91) will not change strategy. : Player (98) will not change strategy.
Battle room (14): Player (76) [ Dove ] VS Player (8) [ Hawk ] => Player (8) wins => Player (76) will change strategy. : Player (8) will change strategy.
Battle room (15): Player (60) [ Dove ] VS Player (75) [ Hawk ] => Player (75) wins => Player (60) will change strategy. : Player (75) will change strategy.
Battle room (16): Player (41) [ Hawk ] VS Player (6) [ Hawk ] => Draw => Player (41) will not change strategy. : Player (6) will not change strategy.
Battle room (17): Player (1) [ Dove ] VS Player (61) [ Hawk ] => Player (61) wins => Player (1) will change strategy. : Player (61) will change strategy.
Battle room (18): Player (62) [ Dove ] VS Player (37) [ Dove ] => Draw => Player (62) will not change strategy. : Player (37) will not change strategy.
Battle room (19): Player (95) [ Hawk ] VS Player (50) [ Hawk ] => Draw => Player (95) will not change strategy. : Player (50) will not change strategy.
Battle room (20): Player (46) [ Dove ] VS Player (15) [ Dove ] => Draw => Player (46) will not change strategy. : Player (15) will not change strategy.
Battle room (21): Player (28) [ Hawk ] VS Player (88) [ Dove ] => Player (28) wins => Player (28) will change strategy. : Player (88) will change strategy.
Battle room (22): Player (65) [ Dove ] VS Player (97) [ Dove ] => Draw => Player (65) will not change strategy. : Player (97) will not change strategy.
Battle room (23): Player (2) [ Hawk ] VS Player (47) [ Hawk ] => Draw => Player (2) will not change strategy. : Player (47) will not change strategy.
Battle room (24): Player (94) [ Dove ] VS Player (48) [ Dove ] => Draw => Player (94) will not change strategy. : Player (48) will not change strategy.
Battle room (25): Player (12) [ Dove ] VS Player (79) [ Hawk ] => Player (79) wins => Player (12) will change strategy. : Player (79) will change strategy.
Battle room (26): Player (4) [ Hawk ] VS Player (93) [ Hawk ] => Draw => Player (4) will not change strategy. : Player (93) will not change strategy.
Battle room (27): Player (49) [ Hawk ] VS Player (19) [ Dove ] => Player (49) wins => Player (49) will change strategy. : Player (19) will change strategy.
Battle room (28): Player (31) [ Dove ] VS Player (43) [ Dove ] => Draw => Player (31) will not change strategy. : Player (43) will not change strategy.
Battle room (29): Player (24) [ Dove ] VS Player (53) [ Dove ] => Draw => Player (24) will not change strategy. : Player (53) will not change strategy.
Battle room (30): Player (55) [ Dove ] VS Player (40) [ Dove ] => Draw => Player (55) will not change strategy. : Player (40) will not change strategy.
Battle room (31): Player (54) [ Hawk ] VS Player (42) [ Dove ] => Player (54) wins => Player (54) will change strategy. : Player (42) will change strategy.
Battle room (32): Player (82) [ Dove ] VS Player (72) [ Dove ] => Draw => Player (82) will not change strategy. : Player (72) will not change strategy.
Battle room (33): Player (84) [ Hawk ] VS Player (44) [ Dove ] => Player (84) wins => Player (84) will change strategy. : Player (44) will change strategy.
Battle room (34): Player (27) [ Dove ] VS Player (30) [ Dove ] => Draw => Player (27) will not change strategy. : Player (30) will not change strategy.
Battle room (35): Player (99) [ Dove ] VS Player (7) [ Dove ] => Draw => Player (99) will not change strategy. : Player (7) will not change strategy.
Battle room (36): Player (77) [ Hawk ] VS Player (70) [ Dove ] => Player (77) wins => Player (77) will change strategy. : Player (70) will change strategy.
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- Case 4

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Battle room (10): Player (90) [ Hawk ] VS Player (2) [ Dove ] => Player (90) wins => Player (90) will change strategy. : Player (2) will change strategy.
Battle room (11): Player (83) [ Dove ] VS Player (72) [ Dove ] => Draw => Player (22) will change strategy. : Player (72) will change strategy.
Battle room (12): Player (89) [ Hawk ] VS Player (87) [ Dove ] => Player (89) wins => Player (89) will change strategy. : Player (87) will change strategy.
Battle room (13): Player (21) [ Dove ] VS Player (80) [ Hawk ] => Player (80) wins => Player (21) will change strategy. : Player (80) will change strategy.
Battle room (14): Player (17) [ Dove ] VS Player (41) [ Dove ] => Draw => Player (17) will change strategy. : Player (41) will change strategy.
Battle room (15): Player (86) [ Dove ] VS Player (55) [ Dove ] => Draw => Player (86) will change strategy. : Player (55) will change strategy.
Battle room (16): Player (18) [ Dove ] VS Player (75) [ Hawk ] => Player (75) wins => Player (18) will change strategy. : Player (75) will change strategy.
Battle room (17): Player (64) [ Hawk ] VS Player (84) [ Dove ] => Player (64) wins => Player (64) will change strategy. : Player (84) will change strategy.
Battle room (18): Player (26) [ Hawk ] VS Player (5) [ Dove ] => Player (26) wins => Player (26) will change strategy. : Player (5) will change strategy.
Battle room (19): Player (97) [ Dove ] VS Player (67) [ Dove ] => Draw => Player (97) will change strategy. : Player (67) will change strategy.
Battle room (20): Player (99) [ Dove ] VS Player (44) [ Hawk ] => Player (44) wins => Player (99) will change strategy. : Player (44) will change strategy.
Battle room (21): Player (19) [ Dove ] VS Player (6) [ Dove ] => Draw => Player (19) will not change strategy. : Player (6) will not change strategy.
Battle room (22): Player (73) [ Hawk ] VS Player (98) [ Dove ] => Player (73) wins => Player (73) will change strategy. : Player (98) will change strategy.
Battle room (23): Player (69) [ Dove ] VS Player (95) [ Hawk ] => Player (95) wins => Player (69) will change strategy. : Player (95) will change strategy.
Battle room (24): Player (45) [ Dove ] VS Player (81) [ Hawk ] => Player (81) wins => Player (45) will change strategy. : Player (81) will change strategy.
Battle room (25): Player (36) [ Hawk ] VS Player (35) [ Dove ] => Player (36) wins => Player (36) will change strategy. : Player (35) will change strategy.
Battle room (26): Player (78) [ Hawk ] VS Player (54) [ Dove ] => Player (78) wins => Player (78) will change strategy. : Player (54) will change strategy.
Battle room (27): Player (7) [ Dove ] VS Player (53) [ Dove ] => Draw => Player (7) will change strategy. : Player (53) will change strategy.
Battle room (28): Player (82) [ Dove ] VS Player (1) [ Dove ] => Draw => Player (82) will change strategy. : Player (1) will change strategy.
Battle room (29): Player (76) [ Dove ] VS Player (62) [ Dove ] => Draw => Player (76) will not change strategy. : Player (62) will not change strategy.
Battle room (30): Player (57) [ Dove ] VS Player (71) [ Dove ] => Draw => Player (57) will not change strategy. : Player (71) will not change strategy.
Battle room (31): Player (56) [ Dove ] VS Player (61) [ Hawk ] => Player (61) wins => Player (56) will change strategy. : Player (61) will change strategy.
Battle room (32): Player (79) [ Hawk ] VS Player (10) [ Dove ] => Player (79) wins => Player (79) will change strategy. : Player (10) will change strategy.
Battle room (33): Player (14) [ Dove ] VS Player (68) [ Dove ] => Draw => Player (14) will not change strategy. : Player (68) will not change strategy.
Battle room (34): Player (77) [ Dove ] VS Player (13) [ Hawk ] => Player (13) wins => Player (77) will change strategy. : Player (13) will change strategy.
Battle room (35): Player (38) [ Dove ] VS Player (29) [ Dove ] => Draw => Player (38) will change strategy. : Player (29) will change strategy.
Battle room (36): Player (85) [ Dove ] VS Player (27) [ Hawk ] => Player (27) wins => Player (85) will change strategy. : Player (27) will change strategy.
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