CAMBRIDGE
Cambridge University Press
978-1-108-84330-0 — Game Theory Basics
Bernhard von Stengel
Index
More Information

Index

abelian group, 1, 10, 14
affine combination, 174
Allais paradox, 121, 133
almost complementary, 251
almost completely labeled, 231, 251, 259
angle, 192, 194
antisymmetric, 8
artificial equilibrium, 230, 231, 235, 250, 251
associative, 10
Aumann, Robert, xii, 74, 334

background material, xi
  converging subsequences, 188
  directed graphs and trees, 80
  Euclidean norm and distance, 187
  expected value, 81
  line segments, 130
  matrix multiplication, 141, 143
  partial orders, 8
  undirected graphs, 170
  visualizing matrix multiplication, 143
backward induction, 83, 314, 319
  more special than SPE, 284, 293
bargaining axioms, 302, 303
bargaining solution, 303, 329
barycenter, 176–178, 190
barycentric coordinates, 176
basic solution, 252
basic variables, 251
Battle of the Sexes, 60
behavior strategy, **280**, 285
best response, 46, 57, **58**
best-response condition, 135, **145**, **148**
best-response diagram, 227
bimatrix game, **142**
binary system, 1, 5
bluff, 269
Bolzano–Weierstrass theorem, **188**
Braess paradox, 43, 44, 49
Brouwer's fixed-point theorem, **151**, 153, 189, **195**, 203, 258

castle, 234
Chicken, 60, 74, 334
Chomp, 31, 33, 35
cold game, 30
column shift, 239, 240
commitment game, **93**
common knowledge, 55, 132
commutative, 10
compact set, **149**, 151, 171, 190, 212, 248, 302
complementary, 251
complementary pivoting, 252, 255, 260
completely labeled, 172, 173, 181, 227–229, 247, 249, 251
concave function, **130**
concave utility function, 131, 312
conditional probability, 269, 337
Condorcet Paradox, 110, 133
congestion game, **45**
congestion network, 40, 43, **44**
continuity axiom, 108
Continuous Ultimatum game, 316
contractive map, 195
convex combination, 150, 165, 174
convex hull, **174**, 301
convex set, **149**, **174**

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-84330-0 — Game Theory Basics
Bernhard von Stengel
Index
More Information

cooperative game theory, 299, 330
coordination game, 61, 236
copycat principle, 13
correlated equilibrium, **338, 339**
correlated moves, 282, 290
correlated strategies, 336
correlation device, 337, 338
cost, 41, 206
Cournot duopoly, 66, 74
Cram, 25, 32, 34, 36

decision theory, 110
Dedekind cut, 31
degenerate game, 162, **164**, 233, 238
degree of a map (Brouwer), 203
degree of graph node, **170**
descendant, **80**, 91
deviation, 41, 46
dictionary, 251
difference trick, **156**, 209
digraph, 45
digraph game, 17, 31, 35
dimension, 174
dominance solvable, 53, **65**, 74, 342
dominated
  strategy, 342
dominated option, 27
Domineering, 24
domino, 24, 32, 34, 36
downward closed set, 313
duality of linear programming, 218
duplicate label, 231

edge, 40, 170, 176, 181, 230
end node of a path, 170, 232
ending condition, 2, 7, 10
endpoint of an edge, 170
entering variable, 252
equilibria (plural of equilibrium), 59
equilibrium, 53, **58**, 73
  correlated, 338, 339
  in a congestion game, 41, 46, 48
  mixed, 148, 152
  Nash, 59, 338
  pure, 53
  refinement, 62, 74
  selection, 62
equilibrium path, 95
equivalence
  of impartial games, 11
  of partizan games, 25, 31
  relation, 11
  strategic, 239, 259
  strong strategic, 241, 259
Euclidean distance, **187**
Euclidean norm, **187**
expected payoff, 85, 148
expected value, 81
expected-utility function, 103, 106, 112, 117, 124, 208
exponential size of game tree, 90
extreme point, 176, 204

face, 176, 245
facet, 176
Farkas's Lemma, 220
first-mover advantage, 96
flow, 41
  atomic (non-splittable), 39, 48
  splittable, 40, 48, 50
follower, 96
Freudenthal triangulation, **197**
full-dimensional, 197

Gambit software, xii
game position, 7
game sum, 10
Game Theory Explorer (GTE), xii
game tree, 3, **79**, 270
generic game, 84
goalpost method, 159, 208, 226
graph, **170**
Grundy value, 16, 31

Hackenbush
  Black-White, 30, 37
  Gray, 36
halfline, 192
halfspace, 193, 245
heap, *see* Nim heap
history of moves, 3, 81

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-84330-0 — Game Theory Basics
Bernhard von Stengel
Index
More Information

Homo Ludens (Huizinga), 330
hot game, 30
hotel with seaview, 188, 204
hyperplane, 193

identity matrix, 344
impartial game, 2
imperfect recall, 275
incentive constraints, 338
independence axiom, 104, 108, **121**
index of an equilibrium, 259
indifference, 106, **112**, 139
information set, 265, 266
Inspection game, 137
insurance
  accidental breakdown, 109
  car rental, 109, 110
intransitive preferences, 110, 114, 133
invariant under utility scaling, 303
irrelevant alternatives, 303
iterated elimination of dominated strategies, 64, 65, 69, 71, 222
iterated-offers bargaining game, 317–330

Kayles, 17, 23, 31
Kuhn's theorem, 284

label, 172, 227
Last Year in Marienbad, 4
leader, 96
leadership game, 96
leaf, **80**
learning, 349
leaving variable, 252
Left player, 24
Lemke's algorithm, 260
Lemke–Howson
  algorithm, 232
  graph, 233, 235, 259
  path, 231, 232, 244
lexico-minimum ratio test, 258
lexico-positive, 257
lexicographic order, 105, **114**, 123, 124
LH, *see* Lemke–Howson
line segment, 130
linear complementarity problem, 260
linear programming, 218, 221, 255, 260, 296
linear programming duality, 206, 218
losing position, 3, 25
lottery, **106**, **111**
  simple, 104, **117**
lower envelope, 209
$\mathcal{L}$-position, **25**

majority vote, 110
Marienbad, 4
Markov chain, **344**
Maschler, Michael, 334
Matching Pennies, **72**
matrix game, **207**
matrix multiplication, 141, 143
max-min strategy, 138, 210, **211**
maximizer, **207**
mex rule, 15, **16**, 31
min-max strategy, **211**, 212
minimal element, 8
minimax theorem, 213, **214**, 216, 344, 347
minimizer, **207**
minimum ratio test, 255
misère Nim, 4, 32
misère play, 2, 14
missing label, 231
mixed equilibrium, **148**, 152, 228
mixed extension, 139, **148**, 212
mixed strategy, **143**
mixed-strategy profile, 148
mixed-strategy set, 144

negative game, 11, 13, 25
neighbor, **170**
Nim, **2**, 32
Nim heap, 2, 15
  notation $n*$, 15
Nim sum, 5, 20
Nim value, **16**, 27
nimber, 27
node, 170, 230
nonbasic variables, 252
nondegenerate, 254
normal form, 74

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-84330-0 — Game Theory Basics
Bernhard von Stengel
Index
More Information

normal play, 2
normal vector, 193, 245
normative, 112, 114, 120, 133
Northcott's game, 31, 34
$\mathcal{N}$-position, **25**
number (partizan game), 27, **28**

optimal strategy, 215
option, 3, 7, 10, 26
order
    partial, 8
    total, 8
origin of utility scale, 104, 107, 116
orthogonal, **191**
outcome class, 3, 25
outcome set for decisions, **111**

parallel edges, 40, 41, 49
Pareto-optimal, 303
parity argument, 170, 184, 203, 232, 234
partial order, 8, 32, 142
partial strategy profile, 339
partizan game, 2, 24, 37, 38
path, 45, **80**, **170**
payoff equivalent, **62**
perfect information, 2
perfect recall, 275–279, 285
permutation, 198
Pigou network, 40, 42, 44, 49
pivoting, 252
play of a game, 77
Poker, 268, 297
Poker Nim, **15**, 16, 17
polyhedron, 245, 341
polytope, 175, 245
potential function, 39, 46, 48, 49
potential game, 50, 74
PPAD, 259
$\mathcal{P}$-position, **25**
preference
    relation, **111**
    strict, **106**, **112**
Price of Anarchy, 49
prime number decomposition theorem, 9
Prisoner's Dilemma, **55**, 73, 300
product graph, 231
projection, 171, **191**

Quality game, 62
quantity competition, 66
Queen-move game, 22, 34

random variable, 81
rationality, 66, 132
    sequential, 91
ray, 192
ray termination, 255
realization equivalence, 284
recursive, 4, 10
reduced strategic form, 87, 275
reduced strategy, 78, 87, 274
reflexive, 8, 11
regret, 109, 122, 349
rental car insurance, 109
Right player, 24
Rock-Paper-Scissors, **72**, 74
Rook-move game, 17
$\mathcal{R}$-position, **25**

scalar product, **142**, 144
scale-equivalent, **115**, 116, 118
Schelling, Thomas, 74
seaview hotel, 188, 204
security strategy, 212
Seoul (Korea), 44, 49
separating hyperplane, 193, 220
sequence form, 295
set inclusion, 8
sg-value, 16
simple lottery, 104, **117**
simplex, 175, 339
simplex algorithm, 255, 260
simplicial subdivision, **176**
slack variables, 251
Social Choice, 110, 133
social optimum, 41, 42, 49
SPE, *see* subgame-perfect equilibrium
Sperner condition, **180**, 184
Sperner labeling, **180**
Sprague–Grundy value, 16, 31
Stackelberg game, 96, 98

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-84330-0 — Game Theory Basics
Bernhard von Stengel
Index
More Information

Stag Hunt, 73
staggered payoffs, 56, 74
stationary distribution, **344**
stationary strategy, 325
strategic equivalence, 239
strategic form, 74, 273
strict order, 8, 32
strict preference, 106, **112**
strictly concave, 131
strictly dominated strategy, 62
strong strategic equivalence, 241
sub-facet, **176**, 178, 182
sub-segment, 173
sub-simplex, 176
subgame, 91, **291**
subgame-perfect equilibrium, 91, 292
subjective probability, 111
subtree, 91, 291
symmetric
  bimatrix game, **142**
  equilibrium, 61, 73
  game, 55, 60, 66, **72**
symmetry axiom, 303

temperature scale, 104, 107, 116
terminal node, 80
threat point, 302
tight inequality, 245
top-down induction, **8**
total order, 8
total relation, 112
tradeoff, 114
transformation
  positive-affine, **115**
  projective, 249
  strictly increasing, 115
transitive, 8, 11
transposed matrix, **141**
triangulation, **176**
Trust Dilemma, 61

Ultimatum game, 314
unit cube, **196**
unit of utility scale, 104, 107, 116
unit simplex, 151, 169–171, 175, 190
unit vector, **150**, 169, **171**
upper envelope, 158, 225, 241, 246
utility function, 103–133
  cardinal, 104, 107, **115**
  ordinal, 106, 115
utility scale, 104, 116, 137, 240

vertex, 176, 204, 245

walk, **80**
Wardrop equilibrium, 50
weakly dominated strategy, **62**, 63, 64, 75, 219
  elimination may lose equilibria, 63, 220
Wilson, Robert, 259
winning move, 3, 4
winning position, 3, 25

zero-sum game, **207**

© in this web service Cambridge University Press www.cambridge.org