|  |  |  |  |
| --- | --- | --- | --- |
| Symbol | Name | Excluded | Included |
| G | Granularity | (1, 1, 6, 3) | (1, 1, 6, 7) |
| O | Opposition | No | Yes |
| R | Random | Zeros | Gaussian |
| D | Discount | 0.999 | (0.99, 100) |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Single Q-Learning | | | | | | | | |
| Combination | Mean | S.T.D | Median | I.Q.R | Max | Min | Failed | Difference |
| None | | | | | | | | |
| - | 257.27 | 14.94 | 256.0 | 25.0 | 288 | 235 | 0 | 0 |
| One | | | | | | | | |
| G | 237.03 | 12.74 | 236.0 | 17.0 | 269 | 217 | 0 | 11.66 |
| D | 257.97 | 15.28 | 259.0 | 21.0 | 294 | 230 | 0 | 0 |
| R | 266.47 | 17.92 | 263.5 | 25.0 | 305 | 235 | 0 | 0 |
| O | - | - | - | - | - | - | - | - |
| Two | | | | | | | | |
| G + R | 231.10 | 9.32 | 231.5 | 12.0 | 250 | 216 | 0 | 18.48 |
| G + D | 238.30 | 14.59 | 236.5 | 16.0 | 273 | 217 | 0 | 9.85 |
| G + O | 256.23 | 12.85 | 252.0 | 16.0 | 287 | 239 | 0 | 0 |
| D + R | 260.77 | 16.24 | 259.5 | 18.0 | 313 | 237 | 0 | 0 |
| O + D | - | - | - | - | - | - | - | - |
| O + R | - | - | - | - | - | - | - | - |
| Three | | | | | | | | |
| G + D + R | 234.57 | 13.34 | 232.0 | 17.0 | 268 | 216 | 0 | 13.95 |
| G + O + D | 250.03 | 8.18 | 249.0 | 10.0 | 275 | 236 | 2 | 0 |
| G + O + R | 252.80 | 10.53 | 254.0 | 14.0 | 276 | 229 | 0 | 0 |
| O + D + R | - | - | - | - | - | - | - | - |
| Four | | | | | | | | |
| G + O + D + R | 247.80 | 7.06 | 247.0 | 12.0 | 261 | 237 | 0 | 2.25 |

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| Double Q-Learning | | | | | | | | |
| Combination | Mean | S.T.D | Median | I.Q.R | Max | Min | Failed | Difference |
| None | | | | | | | | |
| - | 254.90 | 19.99 | 252.5 | 29.0 | 303 | 223 | 1 | 0 |
| One | | | | | | | | |
| G | 230.03 | 16.98 | 224.5 | 23.0 | 275 | 206 | 1 | 17.36 |
| D | 249.83 | 17.32 | 252.0 | 22.0 | 296 | 215 | 4 | 0 |
| R | 252.77 | 19.85 | 251.0 | 25.0 | 328 | 221 | 0 | 0 |
| O | - | - | - | - | - | - | - | - |
| Two | | | | | | | | |
| G + D | 229.50 | 19.48 | 223.5 | 16.0 | 283 | 207 | 0 | 17.05 |
| G + O | 243.77 | 17.88 | 239.0 | 24.0 | 299 | 221 | 0 | 3.32 |
| G + R | 238.63 | 38.79 | 229.0 | 24.0 | 418 | 201 | 0 | 0.48 |
| D + R | 256.47 | 19.06 | 255.0 | 29.0 | 298 | 216 | 4 | 0 |
| O + D | - | - | - | - | - | - | - | - |
| O + R | - | - | - | - | - | - | - | - |
| Three | | | | | | | | |
| G + D + R | 232.57 | 13.84 | 230.5 | 19.0 | 265 | 205 | 0 | 15.80 |
| G + O + R | 246.97 | 18.29 | 243.5 | 23.0 | 296 | 217 | 0 | 0 |
| G + O + D | 249.60 | 15.99 | 248.0 | 22.0 | 290 | 218 | 1 | 0 |
| O + D + R | - | - | - | - | - | - | - | - |
| Four | | | | | | | | |
| G + O + D + R | 245.97 | 13.43 | 244.5 | 18.0 | 285 | 228 | 0 | 2.53 |

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| Triple Q-Learning | | | | | | | | |
| Combination | Mean | S.T.D | Median | I.Q.R | Max | Min | Failed | Difference |
| None | | | | | | | | |
| - | 242.50 | 18.16 | 237.5 | 15.0 | 304 | 220 | 3 | 4.50 |
| One | | | | | | | | |
| G | 217.13 | 10.23 | 215.5 | 10.0 | 248 | 205 | 0 | 32.23 |
| D | 242.37 | 13.40 | 242.5 | 16.0 | 274 | 218 | 5 | 6.13 |
| R | 242.03 | 19.36 | 236.5 | 21.0 | 296 | 212 | 9 | 4.56 |
| O | 291.23 | 31.16 | 283.5 | 27.0 | 409 | 256 | 0 | 0 |
| Two | | | | | | | | |
| G + R | 218.13 | 14.51 | 215.0 | 16.0 | 255 | 199 | 1 | 30.04 |
| G + D | 220.33 | 13.83 | 217.5 | 15.0 | 254 | 201 | 0 | 28.05 |
| G + O | 225.00 | 9.20 | 223.0 | 15.0 | 246 | 210 | 0 | 24.61 |
| D + R | 238.33 | 12.83 | 234.5 | 18.0 | 272 | 221 | 6 | 10.34 |
| O + R | 284.07 | 18.16 | 278.5 | 25.0 | 324 | 257 | 0 | 0 |
| O + D | 294.67 | 33.95 | 284.5 | 40.0 | 418 | 254 | 1 | 0 |
| Three | | | | | | | | |
| G + O + D | 221.77 | 5.95 | 221.5 | 7.0 | 236 | 209 | 0 | 28.48 |
| G + D + R | 222.03 | 12.89 | 220.5 | 17.0 | 251 | 204 | 1 | 26.62 |
| G + O + R | 224.77 | 11.15 | 223.0 | 9.0 | 262 | 206 | 0 | 24.36 |
| O + D + R | 283.00 | 11.83 | 282.5 | 20.0 | 305 | 261 | 0 | 0 |
| Four | | | | | | | | |
| G + O + D + R | 224.40 | 9.05 | 227.0 | 14.0 | 238 | 206 | 0 | 25.24 |

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| Quadruple Q-Learning | | | | | | | | |
| Combination | Mean | S.T.D | Median | I.Q.R | Max | Min | Failed | Percentage |
| None | | | | | | | | |
| - | 233.60 | 15.50 | 231.0 | 21.0 | 275 | 211 | 13 | 14.27 |
| One | | | | | | | | |
| G | 223.77 | 20.00 | 219.0 | 17.0 | 299 | 194 | 13 | 22.60 |
| D | 234.53 | 12.92 | 232.0 | 11.0 | 276 | 213 | 13 | 14.11 |
| R | 234.73 | 16.79 | 231.5 | 18.0 | 282 | 213 | 7 | 12.72 |
| O | 275.10 | 13.73 | 274.0 | 17.0 | 323 | 256 | 0 | 0 |
| Two | | | | | | | | |
| G + O | 217.23 | 7.31 | 216.0 | 12.0 | 234 | 207 | 0 | 32.78 |
| G + D | 218.53 | 13.39 | 215.5 | 15.0 | 262 | 202 | 9 | 29.98 |
| G + R | 220.30 | 21.51 | 212.0 | 15.0 | 295 | 202 | 12 | 25.53 |
| D + R | 242.60 | 24.30 | 235.5 | 39.0 | 297 | 217 | 18 | 2.21 |
| O + D | 274.17 | 15.20 | 271.0 | 13.0 | 329 | 254 | 0 | 0 |
| O + R | 279.23 | 29.03 | 274.0 | 18.0 | 410 | 244 | 0 | 0 |
| Three | | | | | | | | |
| G + O + D | 218.20 | 6.28 | 217.5 | 7.0 | 233 | 204 | 0 | 31.99 |
| G + O + R | 219.23 | 8.09 | 219.0 | 9.0 | 238 | 205 | 0 | 30.62 |
| G + D + R | 226.57 | 23.56 | 220.5 | 37.0 | 301 | 197 | 15 | 18.51 |
| O + D + R | 279.07 | 17.36 | 275.0 | 20.0 | 316 | 249 | 0 | 0 |
| Four | | | | | | | | |
| G + O + D + R | 219.03 | 10.13 | 218.0 | 12.0 | 249 | 203 | 0 | 30.36 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Quintuple Q-Learning | | | | | | | | |
| Combination | Mean | S.T.D | Median | I.Q.R | Max | Min | Failed | Percentage |
| None | | | | | | | | |
| - | - | - | - | - | - | - | - | - |
| One | | | | | | | | |
| O | 263.10 | 14.37 | 260.5 | 12.0 | 298 | 239 | 0 | 0 |
| G | - | - | - | - | - | - | - | - |
| D | - | - | - | - | - | - | - | - |
| R | - | - | - | - | - | - | - | - |
| Two | | | | | | | | |
| G + O | 215.53 | 7.88 | 214.0 | 11.0 | 231 | 199 | 0 | 34.36 |
| O + D | 267.60 | 21.01 | 263.5 | 25.0 | 330 | 237 | 0 | 0 |
| O + R | 268.70 | 16.30 | 267.0 | 19.0 | 305 | 248 | 0 | 0 |
| G + D | - | - | - | - | - | - | - | - |
| G + R | - | - | - | - | - | - | - | - |
| D + R | - | - | - | - | - | - | - | - |
| Three | | | | | | | | |
| G + O + R | 214.07 | 9.53 | 214.5 | 12.0 | 231 | 196 | 0 | 35.46 |
| G + O + D | 219.63 | 7.65 | 218.5 | 10.0 | 239 | 205 | 1 | 30.31 |
| O + D + R | 273.13 | 24.76 | 267.5 | 25.0 | 379 | 245 | 0 | 0 |
| G + D + R | - | - | - | - | - | - | - | - |
| Four | | | | | | | | |
| G + O + D + R | 217.07 | 6.33 | 216.5 | 9.0 | 231 | 208 | 0 | 33.11 |