SI Appendix

MS commands for simulating population-genetic models

Basic model

The code below will run 5000 simulations of a basic serial founder model. There are $K = 100$ populations, each of diploid size $N = 10,000$ individuals, each with a sample of $n = 50$ chromosomes. The first founding event occurs at time $t_D = 2,079$ generations ago (51.975 kya). The bottleneck size is $N_b = 250$ individuals and the bottleneck length is $L_b = 2$ generations. The interval of time between a population expansion and the next founding event is $L = 19$ generations. The population mutation rate is $\theta = 4N\mu = 10$ and the population recombination rate is $\rho = 4Nr = 10$. The sequence length is 100,000 bases (100 kb). If t is a length of time in generations, then the coalescent time unit used here is $t/(4N)$.

./ms 5000 5000 -t 10 -r 10 100000 -I 100 50 -en 0.000475 100 0.025 -ej 0.000525 100 99 -en 0.001 99 0.025 -ej 0.00105 99 98 -en 0.001525 98 0.025 -ej 0.001575 98 97 -en 0.00205 97 0.025 -ej 0.0021 97 96 -en 0.002575 96 0.025 -ej 0.002625 96 95 -en 0.0031 95 0.025 -ej 0.00315 95 94 -en 0.003625 94 0.025 -ej 0.003675 94 93 -en 0.00415 93 0.025 -ej 0.0042 93 92 -en 0.004675 92 0.025 -ej 0.004725 92 91 -en 0.0052 91 0.025 -ej 0.00525 91 90 -en 0.005725 90 0.025 -ej 0.005775 90 89 -en 0.00625 89 0.025 -ej 0.0063 89 88 -en 0.006775 88 0.025 -ej 0.006825 88 87 -en 0.0073 87 0.025 -ej 0.00735 87 86 -en 0.007825 86 0.025 -ej 0.007875 86 85 -en 0.00835 85 0.025 -ej 0.0084 85 84 -en 0.008875 84 0.025 -ej 0.008925 84 83 -en 0.009400 83 0.025 -ej 0.00945 83 82 -en 0.009925 82 0.025 -ej 0.009975 82 81 -en 0.01045 81 0.025 -ej 0.0105 81 80 -en 0.010975 80 0.025 -ej 0.011025 80 79 -en 0.0115 79 0.025 -ej 0.01155 79 78 -en 0.012025 78 0.025 -ej 0.012075 78 77 -en 0.01255 77 0.025 -ej 0.0126 77 76 -en 0.013075 76 0.025 -ej 0.013125 76 75 -en 0.0136 75 0.025 -ej 0.01365 75 74 -en 0.014125 74 0.025 -ej 0.014175 74 73 -en 0.01465 73 0.025 -ej 0.0147 73 72 -en 0.015175 72 0.025 -ej 0.015225 72 71 -en 0.0157 71 0.025 -ej 0.01575 71 70 -en 0.016225 70 0.025 -ej 0.016275 70 69 -en 0.01675 69 0.025 -ej 0.0168 69 68 -en 0.017275 68 0.025 -ej 0.017325 68 67 -en 0.0178 67 0.025 -ej 0.01785 67 66 -en 0.018325 66 0.025 -ej 0.018375 66 65 -en 0.01885 65 0.025 -ej 0.0189 65 64 -en 0.019375 64 0.025 -ej 0.019425 64 63 -en 0.0199 63 0.025 -ej 0.01995 63 62 -en 0.020425 62 0.025 -ej 0.020475 62 61 -en 0.02095 61 0.025 -ej 0.021 61 60 -en 0.021475 60 0.025 -ej 0.021525 60 59 -en 0.022 59 0.025 -ej 0.02205 59 58 -en 0.022525 58 0.025 -ej 0.022575 58 57 -en 0.02305 57 0.025 -ej 0.0231 57 56 -en 0.023575 56 0.025 -ej 0.023625 56 55 -en 0.0241 55 0.025 -ej 0.02415 55 54 -en 0.024625 54 0.025 -ej 0.024675 54 53 -en 0.02515 53 0.025 -ej 0.0252 53 52 -en 0.025675 52 0.025 -ej 0.025725 52 51 -en 0.0262 51 0.025 -ej 0.02625 51 50 -en 0.026725 50 0.025 -ej 0.026775 50 49 -en 0.02725 49 0.025 -ej 0.0273 49 48 -en 0.027775 48 0.025 -ej 0.027825 48 47 -en 0.0283 47 0.025 -ej 0.02835 47 46 -en 0.028825 46 0.025 -ej 0.028875 46 45 -en 0.02935 45 0.025 -ej 0.0294 45 44 -en 0.029875 44 0.025 -ej 0.029925 44 43 -en 0.0304 43 0.025 -ej 0.03045 43 42 -en 0.030925 42 0.025 -ej 0.030975 42 41 -en 0.03145 41 0.025 -ej 0.0315 41 40 -en 0.031975 40 0.025 -ej 0.032025 40 39 -en 0.0325 39 0.025 -ej 0.03255 39 38 -en 0.033025 38 0.025 -ej 0.033075 38 37 -en 0.03355 37 0.025 -ej 0.0336 37 36 -en 0.034075 36 0.025 -ej 0.034125 36 35 -en 0.0346 35 0.025 -ej 0.03465 35 34 -en 0.035125 34 0.025 -ej 0.035175 34 33 -en 0.03565 33 0.025 -ej 0.0357 33 32 -en 0.036175 32 0.025 -ej 0.036225 32 31 -en 0.0367 31 0.025 -ej 0.03675 31 30 -en 0.037225 30 0.025 -ej 0.037275 30 29 -en 0.03775 29 0.025 -ej 0.0378 29 28 -en 0.038275 28 0.025 -ej 0.038325 28 27 -en 0.0388 27 0.025 -ej 0.03885 27 26 -en 0.039325 26 0.025 -ej 0.039375 26 25 -en 0.03985 25 0.025 -ej 0.0399 25 24 -en 0.040375 24 0.025 -ej 0.040425 24 23 -en 0.0409 23 0.025 -ej 0.04095 23 22 -en 0.041425 22 0.025 -ej 0.041475 22 21 -en 0.04195 21 0.025 -ej 0.042 21 20 -en 0.042475 20 0.025 -ej 0.042525 20 19 -en 0.043 19 0.025 -ej 0.04305 19 18 -en 0.043525 18 0.025 -ej 0.043575 18 17 -en 0.04405 17 0.025 -ej 0.0441 17 16 -en 0.044575 16 0.025 -ej 0.044625 16 15 -en 0.0451 15 0.025 -ej 0.04515 15 14 -en 0.045625 14 0.025 -ej 0.045675 14 13 -en 0.04615 13 0.025 -ej 0.0462 13 12 -en 0.046675 12 0.025 -ej 0.046725 12 11 -en 0.0472 11 0.025 -ej 0.04725 11 10 -en 0.047725 10 0.025 -ej 0.047775 10 9 -en 0.04825 9 0.025 -ej 0.0483 9 8 -en 0.048775 8 0.025 -ej 0.048825 8 7 -en 0.0493 7 0.025 -ej 0.04935 7 6 -en 0.049825 6 0.025 -ej 0.049875 6 5 -en 0.05035 5 0.025 -ej 0.0504 5 4 -en 0.050875 4 0.025 -ej 0.050925 4 3 -en 0.0514 3 0.025 -ej 0.05145 3 2 -en 0.051925 2 0.025 -ej 0.051975 2 1

Migration

The code below will run 5000 simulations of a serial founder model with migration between neighboring populations. There are $K = 100$ populations, each of diploid size $N = 10,000$ individuals, each with a sample of $n = 50$ chromosomes. The first founding event occurs at time $t_D = 2,079$ generations ago (51.975 kya). The bottleneck size is $N_b = 250$ individuals and the bottleneck length is $L_b = 2$ generations. The interval of time between a population expansion and the next founding event is $L = 19$ generations. The population mutation rate is $\theta = 4N\mu = 10$, the population recombination rate is $\rho = 4Nr = 10$, and the population migration rate is $M = 4Nm = 40$. The sequence length is 100,000 bases (100 kb). If t is a length of time in generations, then the coalescent time unit used here is $t/(4N)$. Migration parameters are in red.

./ms 5000 5000 -t 10 -r 10 100000 -I 100 50 -ma X 40 0 0 0 0 0 0 0 0 0
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0.049875 6 5 -en 0.05035 5 0.025 -em 0.0504 4 5 0 -em 0.0504 5 4 0 -ej 0.0504 5 4 -en 0.050875 4 0.025 -em 0.050925 3 4 0 -em 0.050925 4 3 0 -ej 0.050925 4 3 -en 0.0514 3 0.025 -em 0.05145 2 3 0 -em 0.05145 3 2 0 -ej 0.05145 3 2 -en 0.051925 2 0.025 -em 0.051975 1 2 0 -em 0.051975 2 1 0 -ej 0.051975 2 1

Archaic admixture

The code below will run 5000 simulations of a serial founder model with archaic admixture. There are $K = 100$ populations, each of diploid size $N = 10,000$ individuals, each with a sample of $n = 50$ chromosomes. The first founding event occurs at time $t_D = 2,079$ generations ago (51.975 kya). The bottleneck size is $N_b = 250$ individuals and the bottleneck length is $L_b = 2$ generations. The interval of time between a population expansion and the next founding event is $L = 19$ generations. The archaic population (population 101 below) has size $N_A = 1,000$ individuals. The archaic population diverges from the modern population $t_D^A = 16,000$ generations ago (400 kya). The admixture occurs in population 25 at time $t_{Admix} = 1584.5$ generations ago at rate $\gamma = 0.05$. The population mutation rate is $\theta = 4N\mu = 10$ and the population recombination rate is $\rho = 4Nr = 10$. The sequence length is 100,000 bases (100 kb). If t is a length of time in generations, then the coalescent time unit used here is $t/(4N)$. Admixture parameters are in red.

```
./ms 5000 5000 -t 10 -r 10 100000 -I 100 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 -en 0.000475 100 0.025 -ej 0.000525 100 99 -en 0.001 99 0.025 -ej 0.00105 99 98 -en 0.001525 98 0.025 -ej 0.001575 98 97 -en 0.00205 97 0.025 -ej 0.0021 97 96 -en 0.002575 96 0.025 -ej 0.002625 96 95 -en 0.0031 95 0.025 -ej 0.00315 95 94 -en 0.003625 94 0.025 -ej 0.003675 94 93 -en 0.00415 93 0.025 -ej 0.0042 93 92 -en 0.004675 92 0.025 -ej 0.004725 92 91 -en 0.0052 91 0.025 -ej 0.00525 91 90 -en 0.005725 90 0.025 -ej 0.005775 90 89 -en 0.00625 89 0.025 -ej 0.0063 89 88 -en 0.006775 88 0.025 -ej 0.006825 88 87 -en 0.0073 87 0.025 -ej 0.00735 87 86 -en 0.007825 86 0.025 -ej 0.007875 86 85 -en 0.00835 85 0.025 -ej 0.0084 85 84 -en 0.008875 84 0.025 -ej 0.008925 84 83 -en 0.009400 83 0.025 -ej 0.00945 83 82 -en 0.009925 82 0.025 -ej 0.009975 82 81 -en 0.01045 81 0.025 -ej 0.0105 81 80 -en 0.010975 80 0.025 -ej 0.011025 80 79 -en 0.0115 79 0.025 -ej 0.01155 79 78 -en 0.012025 78 0.025 -ej 0.012075 78 77 -en 0.01255 77 0.025 -ej 0.0126 77 76 -en 0.013075 76 0.025 -ej 0.013125 76 75 -en 0.0136 75 0.025 -ej 0.01365 75 74 -en 0.014125 74 0.025 -ej 0.014175 74 73 -en 0.01465 73 0.025 -ej 0.0147 73 72 -en 0.015175 72 0.025 -ej 0.015225 72 71 -en 0.0157 71 0.025 -ej 0.01575 71 70 -en 0.016225 70 0.025 -ej 0.016275 70 69 -en 0.01675 69 0.025 -ej 0.0168 69 68 -en 0.017275 68 0.025 -ej 0.017325 68 67 -en 0.0178 67 0.025 -ej 0.01785 67 66 -en 0.018325 66 0.025 -ej 0.018375 66 65 -en 0.01885 65 0.025 -ej 0.0189 65 64 -en 0.019375 64 0.025 -ej 0.019425 64 63 -en 0.0199 63 0.025 -ej 0.01995 63 62 -en 0.020425 62 0.025 -ej 0.020475 62 61 -en 0.02095 61 0.025 -ej 0.021 61 60 -en 0.021475 60 0.025 -ej 0.021525 60 59 -en 0.022 59 0.025 -ej 0.02205 59 58 -en 0.022525 58 0.025 -ej 0.022575 58 57 -en 0.02305 57 0.025 -ej 0.0231 57 56 -en 0.023575 56 0.025 -ej 0.023625 56 55 -en 0.0241 55 0.025 -ej 0.02415 55 54 -en 0.024625 54 0.025 -ej 0.024675 54 53 -en 0.02515 53 0.025 -ej 0.0252 53 52 -en 0.025675 52 0.025 -ej 0.025725 52 51 -en 0.0262 51 0.025 -ej 0.02625 51 50 -en 0.026725 50 0.025 -ej 0.026775 50 49 -en 0.02725 49 0.025 -ej 0.0273 49 48 -en 0.027775 48 0.025 -ej 0.027825 48 47 -en 0.0283 47 0.025 -ej 0.02835 47 46 -en 0.028825 46 0.025 -ej 0.028875 46 45 -en 0.02935 45 0.025 -ej 0.0294 45 44 -en 0.029875 44 0.025 -ej 0.029925 44 43 -en 0.0304 43 0.025 -ej 0.03045 43 42 -en 0.030925 42 0.025 -ej 0.030975 42 41 -en 0.03145 41 0.025 -ej 0.0315 41 40 -en 0.031975 40 0.025 -ej 0.032025 40 39 -en 0.0325 39 0.025 -ej 0.03255 39 38 -en 0.033025 38 0.025 -ej 0.033075 38 37 -en 0.03355 37 0.025 -ej 0.0336 37 36 -en 0.034075 36 0.025 -ej 0.034125 36 35 -en 0.0346 35 0.025 -ej 0.03465 35 34 -en 0.035125 34 0.025 -ej 0.035175 34 33 -en 0.03565 33 0.025 -ej 0.0357 33 32 -en 0.036175 32 0.025 -ej 0.036225 32 31 -en 0.0367 31 0.025 -ej 0.03675 31 30 -en 0.037225 30 0.025 -ej 0.037275 30 29 -en 0.03775 29 0.025 -ej 0.0378 29 28 -en 0.038275 28 0.025 -ej 0.038325 28 27 -en 0.0388 27 0.025 -ej 0.03885 27 26 -en 0.039325 26 0.025 -ej 0.039375 26 25 -es 0.0396125 25 0.95 -en 0.0396125 101 0.1 -en 0.03985 25 0.025 -ej 0.0399 25 24 -en 0.040375 24 0.025 -ej 0.040425 24 23 -en 0.0409 23 0.025 -ej 0.04095 23 22 -en 0.041425 22 0.025 -ej 0.041475 22 21 -en 0.04195 21 0.025 -ej 0.042 21 20 -en 0.042475 20 0.025 -ej 0.042525 20 19 -en 0.043 19 0.025 -ej 0.04305 19 18 -en 0.043525 18 0.025 -ej 0.043575 18 17 -en 0.04405 17 0.025 -ej 0.0441 17 16 -en 0.044575 16 0.025 -ej 0.044625 16 15 -en 0.0451 15 0.025 -ej 0.04515 15 14 -en 0.045625 14 0.025 -ej 0.045675 14 13 -en 0.04615 13 0.025 -ej 0.0462 13 12 -en 0.046675 12 0.025 -ej 0.046725 12 11 -en 0.0472 11 0.025 -ej 0.04725 11 10 -en 0.047725 10 0.025 -ej 0.047775 10 9 -en 0.04825 9 0.025 -ej 0.0483 9 8 -en 0.048775 8 0.025 -ej 0.048825 8 7 -en 0.0493 7 0.025 -ej 0.04935 7 6 -en 0.049825 6 0.025 -ej 0.049875 6 5 -en 0.05035 5 0.025 -ej 0.0504 5 4 -en 0.050875 4 0.025 -ej 0.050925 4 3 -en 0.0514 3 0.025 -ej 0.05145 3 2 -en 0.051925 2 0.025 -ej 0.051975 2 1 -ej 0.4 101 1
```

Archaic persistence

The code below will run 5000 simulations of the archaic persistence model. There are $K = 100$ populations, each of diploid size $N = 1,000$ individuals, each with a sample of $n = 50$ chromosomes. The populations diverge $t_D = 40,000$ generations ago (one million years ago). The first wave (from population 1 to population 2) begins 2,079 generations ago (51.975 kya). The interval of time between the end of one wave and the start of the next wave is 19 generations, and each wave lasts for $L_w = 2$ generations. Therefore, the wave from population k to population $k+1$ starts $t_k = 2,079 - 21(k-1)$ generations ago. The population mutation rate is $\theta = 4N\mu = 1$, the population recombination rate is $\rho = 4Nr = 1$, and the population migration rate is $M = 4Nm = 0.1$. During the migration wave the population migration rate increases to $W = 4Nw = 1000$. The sequence length is 100,000 bases (100 kb). If t is a length of time in generations, then the coalescent time unit used here is $t/(4N)$.

```
./ms 5000 5000 -t 1 -r 1 100000 -I 100 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50
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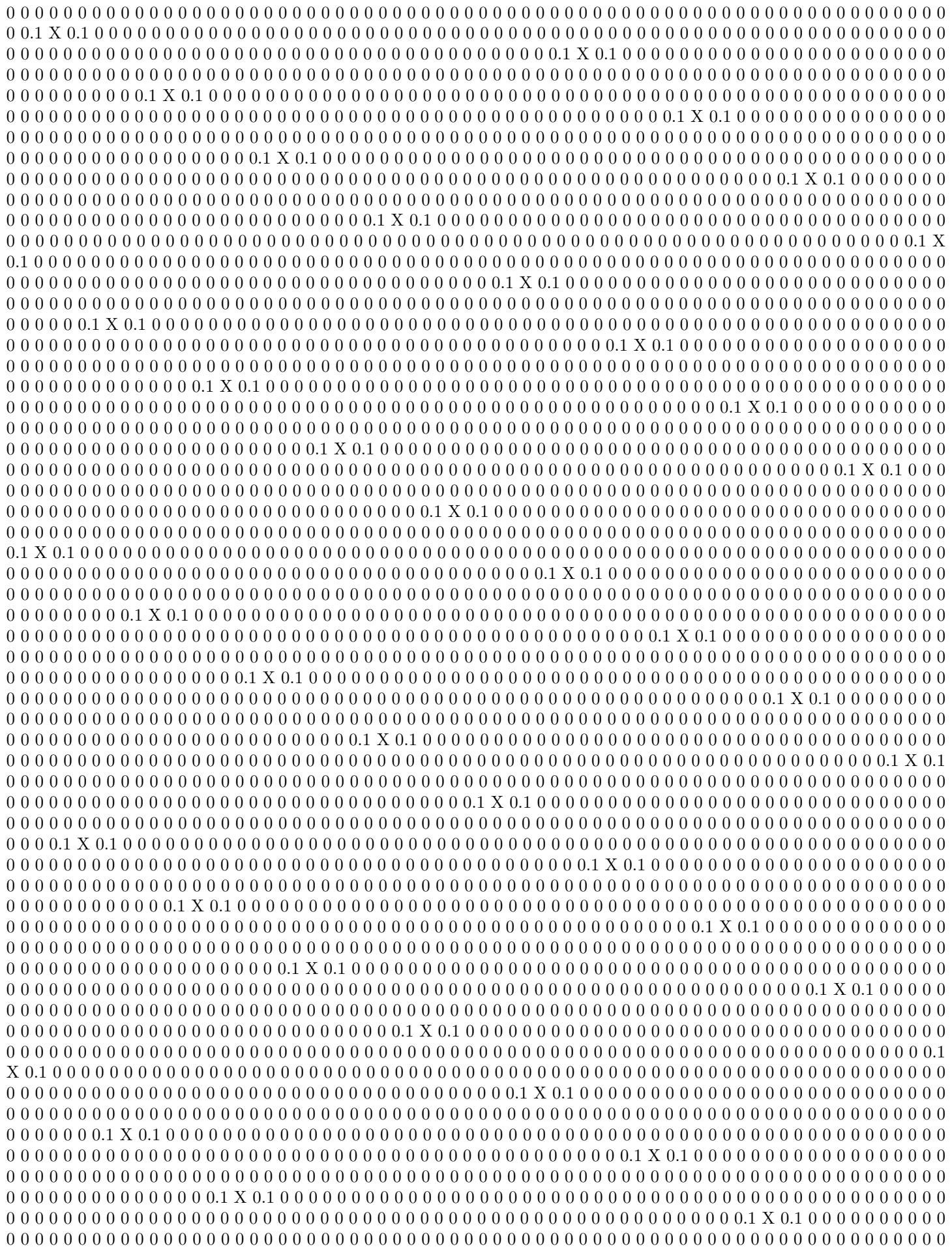

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100 99 0.1 -em 0.01 99 98 1000 -em 0.0105 99 98 0.1 -em 0.01525 98 97 1000 -em 0.01575 98 97 0.1 -em 0.0205 97 96 1000
-em 0.021 97 96 0.1 -em 0.02575 96 95 1000 -em 0.02625 96 95 0.1 -em 0.031 95 94 1000 -em 0.0315 95 94 0.1 -em 0.03625
94 93 1000 -em 0.03675 94 93 0.1 -em 0.0415 93 92 1000 -em 0.042 93 92 0.1 -em 0.04675 92 91 1000 -em 0.04725 92 91 0.1
-em 0.052 91 90 1000 -em 0.0525 91 90 0.1 -em 0.05725 90 89 1000 -em 0.05775 90 89 0.1 -em 0.0625 89 88 1000 -em 0.063
89 88 0.1 -em 0.06775 88 87 1000 -em 0.06825 88 87 0.1 -em 0.073 87 86 1000 -em 0.0735 87 86 0.1 -em 0.07825 86 85 1000
-em 0.07875 86 85 0.1 -em 0.0835 85 84 1000 -em 0.084 85 84 0.1 -em 0.08875 84 83 1000 -em 0.08925 84 83 0.1 -em 0.094 83
82 1000 -em 0.0945 83 82 0.1 -em 0.09925 82 81 1000 -em 0.09975 82 81 0.1 -em 0.1045 81 80 1000 -em 0.105 81 80 0.1 -em
0.10975 80 79 1000 -em 0.11025 80 79 0.1 -em 0.115 79 78 1000 -em 0.1155 79 78 0.1 -em 0.12025 78 77 1000 -em 0.12075 78
77 0.1 -em 0.1255 77 76 1000 -em 0.126 77 76 0.1 -em 0.13075 76 75 1000 -em 0.13125 76 75 0.1 -em 0.136 75 74 1000 -em

0.1365 75 74 0.1 -em 0.14125 74 73 1000 -em 0.14175 74 73 0.1 -em 0.1465 73 72 1000 -em 0.147 73 72 0.1 -em 0.15175 72 71 1000 -em 0.15225 72 71 0.1 -em 0.157 71 70 1000 -em 0.1575 71 70 0.1 -em 0.16225 70 69 1000 -em 0.16275 70 69 0.1 -em 0.1675 69 68 1000 -em 0.168 69 68 0.1 -em 0.17275 68 67 1000 -em 0.17325 68 67 0.1 -em 0.178 67 66 1000 -em 0.1785 67 66 0.1 -em 0.18325 66 65 1000 -em 0.18375 66 65 0.1 -em 0.1885 65 64 1000 -em 0.189 65 64 0.1 -em 0.19375 64 63 1000 -em 0.19425 64 63 0.1 -em 0.199 63 62 1000 -em 0.1995 63 62 0.1 -em 0.20425 62 61 1000 -em 0.20475 62 61 0.1 -em 0.2095 61 60 1000 -em 0.21 61 60 0.1 -em 0.21475 60 59 1000 -em 0.21525 60 59 0.1 -em 0.22 59 58 1000 -em 0.2205 59 58 0.1 -em 0.22525 58 57 1000 -em 0.22575 58 57 0.1 -em 0.2305 57 56 1000 -em 0.231 57 56 0.1 -em 0.23575 56 55 1000 -em 0.23625 56 55 0.1 -em 0.241 55 54 1000 -em 0.2415 55 54 0.1 -em 0.24625 54 53 1000 -em 0.24675 54 53 0.1 -em 0.2515 53 52 1000 -em 0.252 53 52 0.1 -em 0.25675 52 51 1000 -em 0.25725 52 51 0.1 -em 0.262 51 50 1000 -em 0.2625 51 50 0.1 -em 0.26725 50 49 1000 -em 0.26775 50 49 0.1 -em 0.2725 49 48 1000 -em 0.273 49 48 0.1 -em 0.27775 48 47 1000 -em 0.27825 48 47 0.1 -em 0.283 47 46 1000 -em 0.2835 47 46 0.1 -em 0.28825 46 45 1000 -em 0.28875 46 45 0.1 -em 0.2935 45 44 1000 -em 0.294 45 44 0.1 -em 0.29875 44 43 1000 -em 0.29925 44 43 0.1 -em 0.304 43 42 1000 -em 0.3045 43 42 0.1 -em 0.30925 42 41 1000 -em 0.30975 42 41 0.1 -em 0.3145 41 40 1000 -em 0.315 41 40 0.1 -em 0.31975 40 39 1000 -em 0.32025 40 39 0.1 -em 0.325 39 38 1000 -em 0.3255 39 38 0.1 -em 0.33025 38 37 1000 -em 0.33075 38 37 0.1 -em 0.3355 37 36 1000 -em 0.336 37 36 0.1 -em 0.34075 36 35 1000 -em 0.34125 36 35 0.1 -em 0.346 35 34 1000 -em 0.3465 35 34 0.1 -em 0.35125 34 33 1000 -em 0.35175 34 33 0.1 -em 0.3565 33 32 1000 -em 0.357 33 32 0.1 -em 0.36175 32 31 1000 -em 0.36225 32 31 0.1 -em 0.367 31 30 1000 -em 0.3675 31 30 0.1 -em 0.37225 30 29 1000 -em 0.37275 30 29 0.1 -em 0.3775 29 28 1000 -em 0.378 29 28 0.1 -em 0.38275 28 27 1000 -em 0.38325 28 27 0.1 -em 0.388 27 26 1000 -em 0.3885 27 26 0.1 -em 0.39325 26 25 1000 -em 0.39375 26 25 0.1 -em 0.3985 25 24 1000 -em 0.399 25 24 0.1 -em 0.40375 24 23 1000 -em 0.40425 24 23 0.1 -em 0.409 23 22 1000 -em 0.4095 23 22 0.1 -em 0.41425 22 21 1000 -em 0.41475 22 21 0.1 -em 0.4195 21 20 1000 -em 0.42 21 20 0.1 -em 0.42475 20 19 1000 -em 0.42525 20 19 0.1 -em 0.43 19 18 1000 -em 0.4305 19 18 0.1 -em 0.43525 18 17 1000 -em 0.43575 18 17 0.1 -em 0.4405 17 16 1000 -em 0.441 17 16 0.1 -em 0.44575 16 15 1000 -em 0.44625 16 15 0.1 -em 0.451 15 14 1000 -em 0.4515 15 14 0.1 -em 0.45625 14 13 1000 -em 0.45675 14 13 0.1 -em 0.4615 13 12 1000 -em 0.462 13 12 0.1 -em 0.46675 12 11 1000 -em 0.46725 12 11 0.1 -em 0.472 11 10 1000 -em 0.4725 11 10 0.1 -em 0.47725 10 9 1000 -em 0.47775 10 9 0.1 -em 0.4825 9 8 1000 -em 0.483 9 8 0.1 -em 0.48775 8 7 1000 -em 0.48825 8 7 0.1 -em 0.493 7 6 1000 -em 0.4935 7 6 0.1 -em 0.49825 6 5 1000 -em 0.49875 6 5 0.1 -em 0.5035 5 4 1000 -em 0.504 5 4 0.1 -em 0.50875 4 3 1000 -em 0.50925 4 3 0.1 -em 0.514 3 2 1000 -em 0.5145 3 2 0.1 -em 0.51925 2 1 1000 -em 0.51975 2 1 0.1 -em 10 99 100 0 -em 10 100 99 0 -ej 10 100 1 -em 10 98 99 0 -em 10 99 98 0 -ej 10 99 1 -em 10 97 98 0 -em 10 98 97 0 -ej 10 98 1 -em 10 96 97 0 -em 10 97 96 0 -ej 10 97 1 -em 10 95 96 0 -em 10 96 95 0 -ej 10 96 1 -em 10 94 95 0 -em 10 95 94 0 -ej 10 95 1 -em 10 93 94 0 -em 10 94 93 0 -ej 10 94 1 -em 10 92 93 0 -em 10 93 92 0 -ej 10 93 1 -em 10 91 92 0 -em 10 92 91 0 -ej 10 92 1 -em 10 90 91 0 -em 10 91 90 0 -ej 10 91 1 -em 10 89 90 0 -em 10 90 89 0 -ej 10 90 1 -em 10 88 89 0 -em 10 89 88 0 -ej 10 89 1 -em 10 87 88 0 -em 10 88 87 0 -ej 10 88 1 -em 10 86 87 0 -em 10 87 86 0 -ej 10 87 1 -em 10 85 86 0 -em 10 86 85 0 -ej 10 86 1 -em 10 84 85 0 -em 10 85 84 0 -ej 10 85 1 -em 10 83 84 0 -em 10 84 83 0 -ej 10 84 1 -em 10 82 83 0 -em 10 83 82 0 -ej 10 83 1 -em 10 81 82 0 -em 10 82 81 0 -ej 10 82 1 -em 10 80 81 0 -em 10 81 80 0 -ej 10 81 1 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9 8 0 -ej 10 9 1 -em 10 7 8 0 -em 10 8 7 0 -ej 10 8 1 -em 10 6 7 0 -em 10 7 6 0 -ej 10 7 1 -em 10 5 6 0 -em 10 6 5 0 -ej 10 6 1 -em 10 4 5 0 -em 10 5 4 0 -ej 10 5 1 -em 10 3 4 0 -em 10 4 3 0 -ej 10 4 1 -em 10 2 3 0 -em 10 3 2 0 -ej 10 3 1 -em 10 1 2 0 -em 10 2 1 0 -ej 10 2 1

Instantaneous divergence

The code below will run 5000 simulations of the instantaneous divergence model. There are $K = 100$ populations, with diploid size N_k individuals for population k. Each population has a sample of $n = 50$ chromosomes. The populations diverge $t_D = 2,079$ generations ago (51.975 kya). The population mutation rate is $\theta = 4N\mu = 10$ and the population recombination rate is $\rho = 4Nr = 10$. The sequence length is 100,000 bases (100 kb). If t is a length of time in generations, then the coalescent time unit used here is $t/(4N)$.

```
./ms 5000 5000 -t 10 -r 10 100000 -I 100 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 -n 1 1 -n 2 0.963839 -n 3 0.930201 -n 4 0.898833 -n 5 0.869511 -n 6 0.842041 -n 7 0.816254 -n 8 0.792 -n 9 0.769145 -n 10 0.747573 -n 11 0.727177 -n 12 0.707865 -n 13 0.689552 -n 14 0.672163 -n 15 0.655629 -n 16 0.639889 -n 17 0.624887 -n 18 0.610573 -n 19 0.596899 -n 20 0.583825 -n 21 0.571311 -n 22 0.559322 -n 23 0.547826 -n 24 0.536793 -n 25 0.526196 -n 26 0.516009 -n 27 0.506209 -n 28 0.496774 -n 29 0.487685 -n 30 0.478922 -n 31 0.470468 -n 32 0.462308 -n 33 0.454426 -n 34 0.446809 -n 35 0.439442 -n 36 0.432314 -n 37 0.425414 -n 38 0.418731 -n 39 0.412255 -n 40 0.405975 -n 41 0.399885 -n 42 0.393974 -n 43 0.388235 -n 44 0.382662 -n 45 0.377246 -n 46 0.371981 -n 47 0.366861 -n 48 0.36188 -n 49 0.357032 -n 50 0.352313 -n 51 0.347717 -n 52 0.343239 -n 53 0.338875 -n 54 0.334621 -n 55 0.330472 -n 56 0.326425 -n 57 0.322476 -n 58 0.318621 -n 59 0.314857 -n 60 0.311181 -n 61 0.30759 -n 62 0.304081 -n 63 0.300651 -n 64 0.297297 -n 65 0.294018 -n 66 0.29081 -n 67 0.287671 -n 68 0.2846 -n 69 0.281593 -n 70 0.278649 -n 71 0.275766 -n 72 0.272942 -n 73 0.270175 -n 74 0.267464 -n 75 0.264807 -n 76 0.262202 -n 77 0.259648 -n 78 0.257143 -n 79 0.254686 -n 80 0.252275 -n 81 0.24991 -n 82 0.247588 -n 83 0.24531 -n 84 0.243073 -n 85 0.240876 -n 86 0.238719 -n 87 0.2366 -n 88 0.234518 -n 89 0.232472 -n 90 0.230462 -n 91 0.228487 -n 92 0.226545 -n 93 0.224635 -n 94 0.222758 -n 95 0.220912 -n 96 0.219096 -n 97 0.21731 -n 98 0.215552 -n 99 0.213823 -n 100 0.212121 -ej 0.051975 100 1 -ej 0.051975 99 1 -ej 0.051975 98 1 -ej 0.051975 97 1 -ej 0.051975 96 1 -ej 0.051975 95 1 -ej 0.051975 94 1 -ej 0.051975 93 1 -ej 0.051975 92 1 -ej 0.051975 91 1 -ej 0.051975 90 1 -ej 0.051975 89 1 -ej 0.051975 88 1 -ej 0.051975 87 1 -ej 0.051975 86 1 -ej 0.051975 85 1 -ej 0.051975 84 1 -ej 0.051975 83 1 -ej 0.051975 82 1 -ej 0.051975 81 1 -ej 0.051975 80 1 -ej 0.051975 79 1 -ej 0.051975 78 1 -ej 0.051975 77 1 -ej 0.051975 76 1 -ej 0.051975 75 1 -ej 0.051975 74 1 -ej 0.051975 73 1 -ej 0.051975 72 1 -ej 0.051975 71 1 -ej 0.051975 70 1 -ej 0.051975 69 1 -ej 0.051975 68 1 -ej 0.051975 67 1 -ej 0.051975 66 1 -ej 0.051975 65 1 -ej 0.051975 64 1 -ej 0.051975 63 1 -ej 0.051975 62 1 -ej 0.051975 61 1 -ej 0.051975 60 1 -ej 0.051975 59 1 -ej 0.051975 58 1 -ej 0.051975 57 1 -ej 0.051975 56 1 -ej 0.051975 55 1 -ej 0.051975 54 1 -ej 0.051975 53 1 -ej 0.051975 52 1 -ej 0.051975 51 1 -ej 0.051975 50 1 -ej 0.051975 49 1 -ej 0.051975 48 1 -ej 0.051975 47 1 -ej 0.051975 46 1 -ej 0.051975 45 1 -ej 0.051975 44 1 -ej 0.051975 43 1 -ej 0.051975 42 1 -ej 0.051975 41 1 -ej 0.051975 40 1 -ej 0.051975 39 1 -ej 0.051975 38 1 -ej 0.051975 37 1 -ej 0.051975 36 1 -ej 0.051975 35 1 -ej 0.051975 34 1 -ej 0.051975 33 1 -ej 0.051975 32 1 -ej 0.051975 31 1 -ej 0.051975 30 1 -ej 0.051975 29 1 -ej 0.051975 28 1 -ej 0.051975 27 1 -ej 0.051975 26 1 -ej 0.051975 25 1 -ej 0.051975 24 1 -ej 0.051975 23 1 -ej 0.051975 22 1 -ej 0.051975 21 1 -ej 0.051975 20 1 -ej 0.051975 19 1 -ej 0.051975 18 1 -ej 0.051975 17 1 -ej 0.051975 16 1 -ej 0.051975 15 1 -ej 0.051975 14 1 -ej 0.051975 13 1 -ej 0.051975 12 1 -ej 0.051975 11 1 -ej 0.051975 10 1 -ej 0.051975 9 1 -ej 0.051975 8 1 -ej 0.051975 7 1 -ej 0.051975 6 1 -ej 0.051975 5 1 -ej 0.051975 4 1 -ej 0.051975 3 1 -ej 0.051975 2 1
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