Programación Evolutiva

Práctica 2

Miguel Ángel Castillo Moreno

Juan Pedro Olmos Rojas

# Introducción:

Para esta práctica, hemos introducido los siguientes cambios opcionales, que no estaban presentes en la primeras:

- **Escalado lineal** para las selecciones en las que este tiene sentido: Nos hemos encontrado con el problema de que algoritmos de selección que dependen del fitness como la ruleta estaban introduciendo demasiada presión selectiva y la evolución se acababa estancando. Es para reducir dicha presión para lo que introducimos el escalado lineal en la ruleta, selección universal estocástica.

**- Selección por ranking**: La selección con ranking la hemos implementado de forma que la diferencia entre la posibilidad de elegir al mejor y al peor no sea muy grande. La posibilidad de elegirlos es lineal entre todos, y se escogen de manera similar a la ruleta.

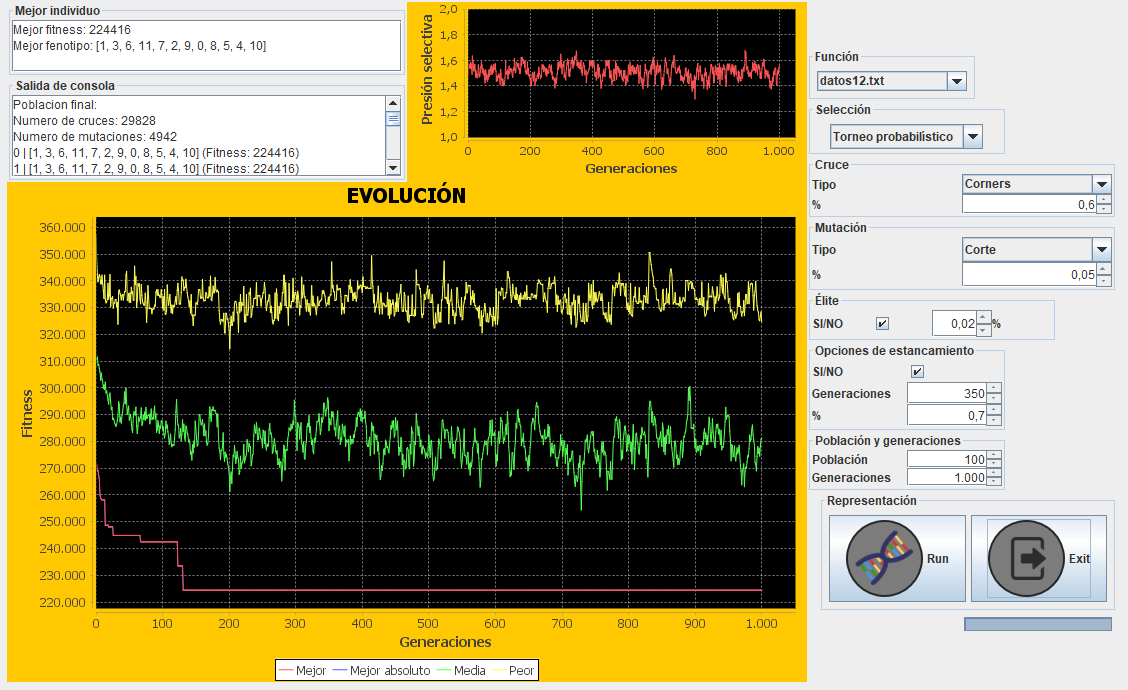
Como operadores inventados u opcionales hemos creado los siguientes:

Cruces:

Mutaciones:

# Problema 1: datos12.dat

## Ejecución representativa:



**Individuo solución:** [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10]

**Aptitud máxima:** 224416

**Aptitud media:** 281162.48

**Aptitud mínima:** 324672

**Numero de cruces:** 29828

**Numero de mutaciones:** 4942

**Población final:**

0 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

1 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

2 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

3 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

4 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

5 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

6 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] (Fitness: 224416)

7 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 4, 5, 10] (Fitness: 242190)

8 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 4, 5, 10] (Fitness: 242190)

9 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

10 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

11 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

12 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

13 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

14 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

15 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

16 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 5, 3, 10] (Fitness: 244346)

17 | [1, 3, 6, 11, 9, 2, 7, 0, 8, 5, 4, 10] (Fitness: 248766)

18 | [1, 3, 6, 11, 7, 2, 5, 0, 8, 9, 4, 10] (Fitness: 249280)

19 | [1, 3, 6, 11, 0, 2, 9, 7, 8, 5, 4, 10] (Fitness: 250764)

20 | [1, 5, 6, 11, 7, 2, 9, 0, 8, 4, 3, 10] (Fitness: 252696)

21 | [1, 5, 6, 11, 7, 2, 9, 0, 8, 4, 3, 10] (Fitness: 252696)

22 | [1, 4, 6, 11, 9, 2, 7, 0, 8, 5, 3, 10] (Fitness: 252876)

23 | [1, 4, 6, 11, 9, 2, 7, 0, 8, 5, 3, 10] (Fitness: 252876)

24 | [1, 4, 6, 11, 9, 2, 7, 0, 8, 5, 3, 10] (Fitness: 252876)

25 | [5, 3, 6, 11, 7, 2, 9, 0, 8, 1, 4, 10] (Fitness: 253712)

26 | [1, 3, 0, 11, 7, 2, 9, 6, 8, 5, 4, 10] (Fitness: 256010)

27 | [1, 3, 6, 11, 7, 8, 9, 0, 2, 5, 4, 10] (Fitness: 257150)

28 | [5, 3, 6, 11, 8, 2, 9, 0, 7, 1, 4, 10] (Fitness: 258380)

29 | [1, 3, 6, 11, 7, 4, 9, 0, 8, 5, 2, 10] (Fitness: 259248)

30 | [1, 3, 6, 11, 7, 4, 9, 0, 8, 5, 2, 10] (Fitness: 259248)

31 | [1, 3, 6, 11, 7, 2, 4, 0, 8, 5, 9, 10] (Fitness: 259580)

32 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 3, 5, 10] (Fitness: 259728)

33 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 3, 5, 10] (Fitness: 259728)

34 | [1, 4, 6, 11, 7, 2, 9, 0, 8, 3, 5, 10] (Fitness: 259728)

35 | [4, 1, 6, 11, 7, 3, 9, 0, 8, 5, 2, 10] (Fitness: 264536)

36 | [5, 3, 6, 11, 7, 2, 4, 0, 8, 1, 9, 10] (Fitness: 265524)

37 | [1, 2, 6, 11, 7, 3, 9, 0, 8, 5, 4, 10] (Fitness: 266706)

38 | [1, 2, 6, 11, 7, 3, 9, 0, 8, 5, 4, 10] (Fitness: 266706)

39 | [1, 6, 3, 11, 7, 5, 9, 0, 8, 4, 2, 10] (Fitness: 268318)

40 | [1, 6, 3, 11, 7, 5, 9, 0, 8, 4, 2, 10] (Fitness: 268318)

41 | [1, 4, 6, 11, 7, 5, 9, 0, 8, 3, 2, 10] (Fitness: 271902)

42 | [2, 1, 6, 11, 7, 3, 9, 0, 8, 5, 4, 10] (Fitness: 274418)

43 | [5, 9, 6, 11, 7, 2, 4, 0, 8, 1, 3, 10] (Fitness: 274516)

44 | [1, 2, 6, 11, 7, 5, 9, 0, 8, 4, 3, 10] (Fitness: 276698)

45 | [1, 4, 9, 11, 7, 10, 6, 0, 8, 5, 3, 2] (Fitness: 277186)

46 | [1, 4, 9, 11, 7, 10, 6, 0, 8, 5, 3, 2] (Fitness: 277186)

47 | [5, 3, 6, 11, 7, 2, 9, 1, 8, 0, 4, 10] (Fitness: 277512)

48 | [1, 2, 6, 11, 7, 4, 9, 0, 8, 5, 3, 10] (Fitness: 279626)

49 | [1, 5, 0, 11, 7, 2, 9, 6, 8, 3, 4, 10] (Fitness: 282002)

50 | [5, 3, 0, 11, 8, 2, 9, 6, 7, 1, 4, 10] (Fitness: 282828)

51 | [5, 1, 6, 11, 7, 2, 4, 0, 8, 9, 3, 10] (Fitness: 283072)

52 | [6, 3, 9, 0, 8, 2, 5, 11, 4, 1, 7, 10] (Fitness: 283774)

53 | [3, 5, 6, 11, 7, 2, 4, 0, 8, 1, 9, 10] (Fitness: 286538)

54 | [5, 9, 6, 3, 7, 2, 4, 0, 8, 1, 11, 10] (Fitness: 287992)

55 | [2, 9, 0, 8, 5, 11, 10, 1, 4, 6, 3, 7] (Fitness: 288214)

56 | [1, 0, 3, 11, 7, 2, 9, 6, 8, 5, 4, 10] (Fitness: 289444)

57 | [8, 4, 6, 11, 7, 2, 9, 3, 5, 0, 10, 1] (Fitness: 289520)

58 | [1, 3, 0, 11, 7, 10, 6, 9, 8, 5, 4, 2] (Fitness: 289836)

59 | [1, 3, 0, 11, 7, 4, 9, 6, 8, 5, 2, 10] (Fitness: 291862)

60 | [5, 9, 0, 11, 7, 2, 4, 6, 8, 1, 3, 10] (Fitness: 296372)

61 | [10, 6, 3, 1, 7, 11, 2, 4, 0, 5, 8, 9] (Fitness: 296684)

62 | [1, 4, 0, 11, 7, 3, 9, 6, 8, 5, 2, 10] (Fitness: 296968)

63 | [2, 11, 0, 8, 5, 9, 10, 1, 4, 6, 3, 7] (Fitness: 297252)

64 | [10, 9, 11, 1, 5, 4, 6, 3, 7, 2, 8, 0] (Fitness: 299456)

65 | [6, 10, 3, 1, 4, 11, 2, 7, 0, 5, 8, 9] (Fitness: 299476)

66 | [10, 6, 4, 1, 7, 11, 2, 3, 0, 5, 8, 9] (Fitness: 300222)

67 | [9, 0, 8, 5, 2, 10, 1, 4, 6, 11, 7, 3] (Fitness: 300672)

68 | [6, 2, 8, 1, 9, 0, 10, 5, 3, 7, 11, 4] (Fitness: 303772)

69 | [7, 5, 3, 8, 4, 11, 1, 10, 0, 6, 2, 9] (Fitness: 305588)

70 | [1, 5, 3, 10, 8, 9, 6, 11, 7, 2, 4, 0] (Fitness: 307652)

71 | [2, 11, 0, 8, 5, 3, 10, 1, 4, 6, 9, 7] (Fitness: 312304)

72 | [2, 11, 0, 8, 5, 3, 10, 1, 4, 6, 9, 7] (Fitness: 312304)

73 | [10, 1, 5, 6, 11, 7, 2, 9, 0, 8, 4, 3] (Fitness: 312326)

74 | [6, 11, 5, 8, 4, 2, 1, 10, 0, 7, 3, 9] (Fitness: 312588)

75 | [0, 11, 5, 8, 4, 2, 1, 10, 6, 7, 3, 9] (Fitness: 312894)

76 | [0, 11, 8, 4, 10, 5, 2, 7, 3, 9, 6, 1] (Fitness: 313792)

77 | [0, 11, 8, 4, 10, 5, 2, 7, 3, 9, 6, 1] (Fitness: 313792)

78 | [6, 11, 8, 1, 9, 0, 10, 5, 3, 7, 2, 4] (Fitness: 314872)

79 | [7, 2, 3, 1, 11, 8, 5, 9, 0, 10, 6, 4] (Fitness: 315392)

80 | [8, 4, 2, 10, 11, 9, 6, 1, 7, 3, 5, 0] (Fitness: 315492)

81 | [7, 11, 0, 8, 5, 3, 10, 1, 4, 6, 9, 2] (Fitness: 316832)

82 | [1, 9, 3, 10, 8, 4, 6, 11, 7, 2, 5, 0] (Fitness: 318328)

83 | [7, 5, 3, 8, 4, 2, 1, 10, 0, 6, 11, 9] (Fitness: 319484)

84 | [7, 5, 3, 8, 4, 2, 1, 10, 0, 6, 11, 9] (Fitness: 319484)

85 | [7, 5, 3, 8, 4, 2, 1, 10, 0, 6, 11, 9] (Fitness: 319484)

86 | [6, 3, 5, 8, 4, 2, 1, 10, 0, 7, 11, 9] (Fitness: 319554)

87 | [8, 10, 3, 1, 4, 11, 2, 7, 0, 5, 6, 9] (Fitness: 319892)

88 | [0, 11, 8, 4, 10, 5, 2, 7, 3, 6, 9, 1] (Fitness: 320358)

89 | [1, 5, 3, 10, 8, 4, 6, 11, 7, 2, 9, 0] (Fitness: 321084)

90 | [8, 5, 4, 10, 1, 2, 0, 11, 7, 3, 9, 6] (Fitness: 321380)

91 | [1, 0, 5, 8, 4, 2, 3, 10, 11, 7, 6, 9] (Fitness: 321576)

92 | [10, 6, 4, 1, 7, 5, 2, 3, 0, 8, 11, 9] (Fitness: 322192)

93 | [9, 11, 7, 10, 6, 4, 8, 5, 0, 2, 1, 3] (Fitness: 323104)

94 | [0, 2, 3, 1, 11, 8, 5, 9, 7, 10, 6, 4] (Fitness: 323196)

95 | [2, 9, 0, 8, 5, 3, 10, 1, 4, 6, 11, 7] (Fitness: 323802)

96 | [2, 9, 0, 8, 5, 3, 10, 1, 4, 6, 11, 7] (Fitness: 323802)

97 | [10, 9, 11, 1, 8, 4, 6, 3, 7, 2, 5, 0] (Fitness: 323846)

98 | [8, 4, 2, 10, 1, 9, 6, 11, 7, 3, 5, 0] (Fitness: 324672)

99 | [8, 4, 2, 10, 1, 9, 6, 11, 7, 3, 5, 0] (Fitness: 324672)

## Tabla resumen:

|  |  |  |
| --- | --- | --- |
| Nº Ejecución | Individuo | Aptitud |
| 1 | [6, 2, 10, 0, 4, 8, 5, 3, 1, 7, 11, 9] | 238270 |
| 2 | [10, 11, 3, 0, 8, 9, 5, 7, 1, 4, 2, 6] | 233848 |
| 3 | [1, 9, 4, 3, 5, 11, 8, 0, 10, 7, 6, 2] | 239302 |
| 4 | [10, 7, 3, 0, 8, 5, 9, 4, 6, 11, 2, 1] | 234788 |
| 5 | [9, 2, 10, 11, 5, 4, 1, 3, 8, 7, 0, 6] | 237756 |
| 6 | [10, 11, 3, 0, 8, 9, 5, 7, 1, 4, 2, 6] | 233848 |
| 7 | [7, 3, 8, 11, 1, 2, 9, 0, 6, 4, 5, 10] | 229092 |
| 8 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] | 224416 |
| 9 | [10, 11, 3, 0, 1, 9, 4, 8, 7, 5, 2, 6] | 230704 |
| 10 | [7, 3, 8, 11, 1, 2, 9, 0, 6, 4, 5, 10] | 229092 |
| 11 | [1, 2, 7, 0, 4, 9, 10, 8, 6, 11, 5, 3] | 240492 |
| 12 | [10, 11, 3, 0, 1, 9, 4, 8, 7, 5, 2, 6] | 230704 |
| 13 | [6, 7, 4, 0, 10, 5, 9, 8, 3, 2, 11, 1] | 241360 |
| 14 | [2, 4, 9, 3, 8, 7, 10, 0, 6, 11, 5, 1] | 243460 |
| 15 | [9, 3, 5, 0, 2, 6, 8, 7, 1, 4, 11, 10] | 236006 |
| 16 | [10, 7, 3, 0, 8, 5, 9, 4, 6, 11, 2, 1] | 234788 |
| 17 | [10, 11, 3, 0, 1, 9, 4, 8, 7, 5, 2, 6] | 230704 |
| 18 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] | 224416 |
| 19 | [9, 11, 5, 0, 10, 1, 4, 8, 3, 7, 2, 6] | 235554 |
| 20 | [1, 3, 6, 11, 7, 2, 9, 0, 8, 5, 4, 10] | 224416 |

**Mejor solución:** 224416

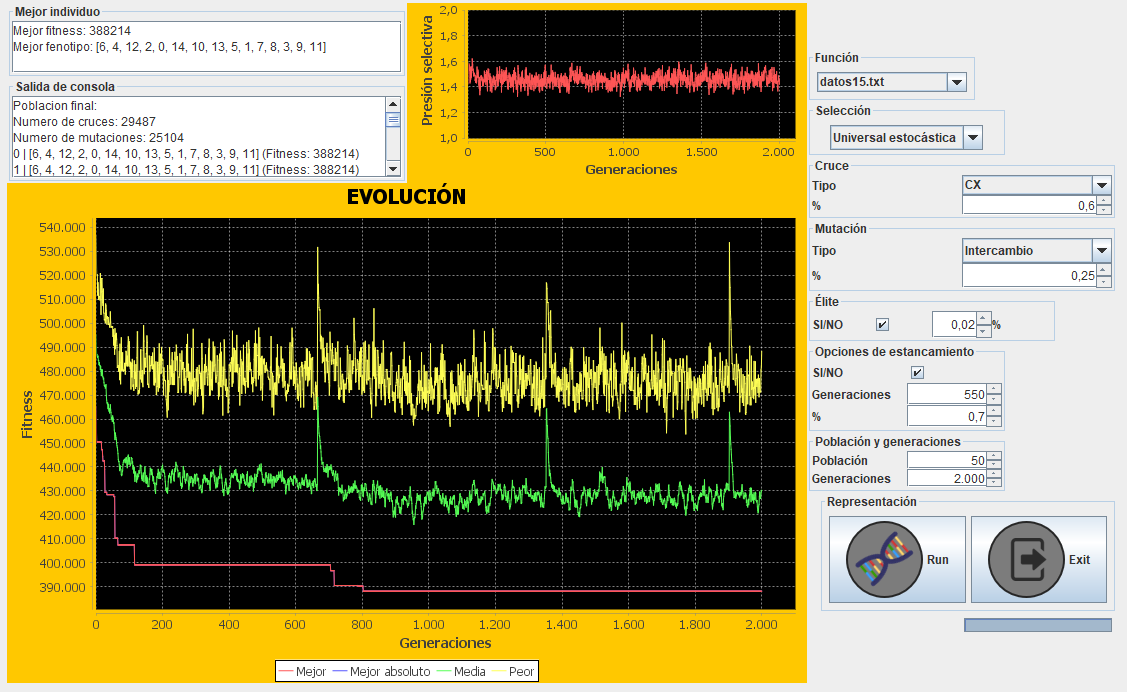
**Peor solución:** 243460

**Media:** 233650.8

**Desviación típica:** 5513.0485

# Problema 2: datos15.dat

## Ejecución representativa:



**Individuo solución:** [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11]

**Aptitud máxima:** 388214

**Aptitud media:** 430203.52

**Aptitud mínima:** 488198

**Numero de cruces:** 29487

**Numero de mutaciones:** 25104

**Población final:**

0 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)

1 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)

2 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)

3 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)

4 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 388214)

5 | [9, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 396320)

6 | [9, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 396320)

7 | [10, 4, 12, 2, 0, 14, 9, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 398432)

8 | [6, 4, 12, 2, 0, 14, 8, 13, 5, 1, 7, 10, 3, 9, 11] (Fitness: 399236)

9 | [6, 4, 12, 3, 0, 14, 10, 13, 5, 1, 7, 8, 2, 9, 11] (Fitness: 402462)

10 | [6, 4, 12, 2, 7, 0, 10, 9, 5, 1, 13, 8, 3, 14, 11] (Fitness: 405898)

11 | [6, 4, 12, 8, 0, 14, 10, 13, 5, 1, 7, 2, 3, 9, 11] (Fitness: 405980)

12 | [6, 4, 12, 8, 0, 14, 10, 13, 5, 1, 7, 2, 3, 9, 11] (Fitness: 405980)

13 | [6, 4, 12, 2, 0, 14, 10, 13, 7, 1, 5, 8, 3, 9, 11] (Fitness: 410200)

14 | [6, 4, 12, 2, 0, 9, 10, 13, 5, 1, 7, 8, 3, 14, 11] (Fitness: 411476)

15 | [6, 4, 12, 2, 0, 9, 10, 13, 5, 1, 7, 8, 3, 14, 11] (Fitness: 411476)

16 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 9, 7, 8, 3, 1, 11] (Fitness: 412628)

17 | [6, 4, 12, 2, 0, 14, 10, 13, 11, 1, 7, 8, 3, 9, 5] (Fitness: 415776)

18 | [6, 4, 12, 2, 0, 11, 10, 13, 5, 8, 7, 1, 3, 9, 14] (Fitness: 419188)

19 | [6, 1, 12, 2, 0, 14, 10, 13, 5, 4, 7, 8, 3, 9, 11] (Fitness: 421494)

20 | [6, 14, 12, 2, 0, 4, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 422024)

21 | [6, 4, 12, 2, 0, 14, 13, 11, 5, 1, 8, 10, 3, 9, 7] (Fitness: 423418)

22 | [0, 4, 12, 2, 6, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] (Fitness: 424664)

23 | [9, 4, 2, 12, 0, 14, 10, 13, 5, 1, 7, 8, 3, 6, 11] (Fitness: 430468)

24 | [14, 4, 12, 2, 0, 6, 10, 13, 5, 9, 7, 8, 3, 1, 11] (Fitness: 430712)

25 | [3, 4, 12, 2, 14, 11, 10, 9, 5, 1, 7, 8, 13, 6, 0] (Fitness: 430810)

26 | [9, 4, 1, 2, 0, 14, 10, 13, 5, 12, 7, 8, 3, 6, 11] (Fitness: 431684)

27 | [6, 8, 9, 2, 0, 14, 10, 13, 5, 1, 7, 4, 3, 12, 11] (Fitness: 434238)

28 | [11, 8, 12, 2, 0, 14, 10, 5, 13, 1, 7, 4, 3, 9, 6] (Fitness: 434288)

29 | [3, 4, 12, 2, 13, 0, 10, 14, 5, 1, 7, 9, 6, 8, 11] (Fitness: 435106)

30 | [6, 1, 12, 2, 4, 14, 10, 13, 5, 0, 7, 8, 3, 9, 11] (Fitness: 435936)

31 | [6, 4, 12, 1, 0, 14, 10, 13, 5, 8, 7, 2, 3, 9, 11] (Fitness: 437544)

32 | [6, 4, 13, 2, 0, 11, 10, 12, 5, 1, 14, 8, 3, 9, 7] (Fitness: 438358)

33 | [9, 4, 5, 2, 12, 7, 10, 13, 0, 1, 14, 8, 3, 6, 11] (Fitness: 440144)

34 | [6, 4, 8, 12, 0, 14, 10, 13, 5, 9, 7, 2, 3, 1, 11] (Fitness: 440552)

35 | [12, 4, 9, 2, 0, 14, 10, 13, 1, 5, 7, 8, 3, 6, 11] (Fitness: 444266)

36 | [3, 4, 12, 2, 0, 14, 10, 7, 5, 1, 6, 11, 8, 9, 13] (Fitness: 448348)

37 | [6, 10, 12, 4, 0, 7, 2, 13, 5, 1, 14, 8, 3, 9, 11] (Fitness: 455214)

38 | [3, 4, 12, 2, 7, 14, 0, 8, 5, 1, 10, 13, 6, 9, 11] (Fitness: 459726)

39 | [6, 4, 12, 5, 11, 14, 10, 2, 13, 1, 7, 0, 3, 9, 8] (Fitness: 461144)

40 | [10, 14, 12, 2, 9, 4, 6, 13, 7, 1, 5, 8, 3, 0, 11] (Fitness: 461972)

41 | [9, 10, 1, 2, 0, 14, 8, 13, 5, 12, 7, 4, 3, 6, 11] (Fitness: 462468)

42 | [2, 6, 12, 4, 8, 14, 10, 13, 5, 1, 7, 0, 3, 9, 11] (Fitness: 463932)

43 | [14, 4, 3, 2, 0, 8, 10, 13, 1, 5, 7, 11, 12, 9, 6] (Fitness: 464622)

44 | [9, 4, 3, 2, 6, 14, 10, 13, 8, 1, 7, 5, 12, 0, 11] (Fitness: 464820)

45 | [12, 4, 6, 2, 0, 11, 10, 14, 8, 5, 13, 1, 3, 9, 7] (Fitness: 468120)

46 | [6, 4, 12, 2, 7, 14, 10, 1, 9, 13, 11, 8, 3, 5, 0] (Fitness: 471424)

47 | [6, 5, 1, 8, 7, 14, 10, 3, 4, 12, 0, 2, 9, 13, 11] (Fitness: 471704)

48 | [6, 4, 10, 2, 0, 14, 12, 13, 5, 11, 7, 8, 3, 9, 1] (Fitness: 480336)

49 | [9, 4, 12, 0, 2, 3, 10, 11, 14, 1, 7, 8, 6, 5, 13] (Fitness: 488198)

## Tabla resumen:

|  |  |  |
| --- | --- | --- |
| Nº Ejecución | Individuo | Aptitud |
| 1 | [5, 0, 12, 7, 4, 3, 6, 11, 8, 9, 13, 14, 1, 10, 2] | 396492 |
| 2 | [13, 0, 12, 2, 8, 4, 6, 5, 3, 10, 11, 7, 1, 9, 14] | 394654 |
| 3 | [13, 0, 12, 2, 8, 4, 6, 5, 3, 10, 11, 7, 1, 9, 14] | 394654 |
| 4 | [14, 4, 13, 7, 12, 2, 6, 11, 1, 0, 8, 9, 10, 5, 3] | 399670 |
| 5 | [3, 0, 13, 11, 12, 4, 6, 7, 8, 9, 14, 5, 10, 1, 2] | 394658 |
| 6 | [8, 7, 12, 0, 6, 1, 4, 13, 3, 11, 10, 14, 2, 5, 9] | 401276 |
| 7 | [13, 8, 14, 11, 12, 3, 10, 4, 9, 0, 2, 5, 6, 7, 1] | 391586 |
| 8 | [9, 1, 12, 14, 4, 2, 6, 10, 13, 11, 8, 7, 0, 5, 3] | 392520 |
| 9 | [6, 8, 4, 2, 12, 7, 5, 3, 0, 10, 1, 11, 13, 9, 14] | 401936 |
| 10 | [6, 4, 12, 3, 9, 0, 8, 7, 5, 1, 13, 14, 2, 10, 11] | 391744 |
| 11 | [0, 8, 4, 11, 12, 2, 6, 14, 13, 7, 1, 5, 10, 9, 3] | 391288 |
| 12 | [0, 11, 2, 8, 1, 3, 10, 6, 14, 13, 9, 5, 4, 7, 12] | 395612 |
| 13 | [12, 5, 13, 8, 1, 6, 4, 2, 7, 3, 10, 11, 0, 14, 9] | 399452 |
| 14 | [6, 4, 12, 2, 0, 14, 10, 13, 5, 1, 7, 8, 3, 9, 11] | 388214 |
| 15 | [9, 3, 2, 4, 7, 0, 8, 1, 11, 10, 14, 13, 5, 6, 12] | 391170 |
| 16 | [8, 6, 7, 12, 11, 0, 10, 9, 2, 14, 5, 1, 3, 4, 13] | 404332 |
| 17 | [9, 13, 12, 0, 14, 3, 10, 7, 1, 11, 4, 5, 6, 8, 2] | 404012 |
| 18 | [8, 4, 12, 7, 0, 3, 10, 5, 1, 11, 13, 14, 9, 6, 2] | 402290 |
| 19 | [8, 5, 13, 9, 7, 6, 2, 4, 1, 11, 14, 10, 3, 12, 0] | 398010 |
| 20 | [10, 9, 0, 6, 14, 11, 3, 1, 4, 8, 12, 5, 13, 2, 7] | 405440 |

**Mejor solución:** 388214

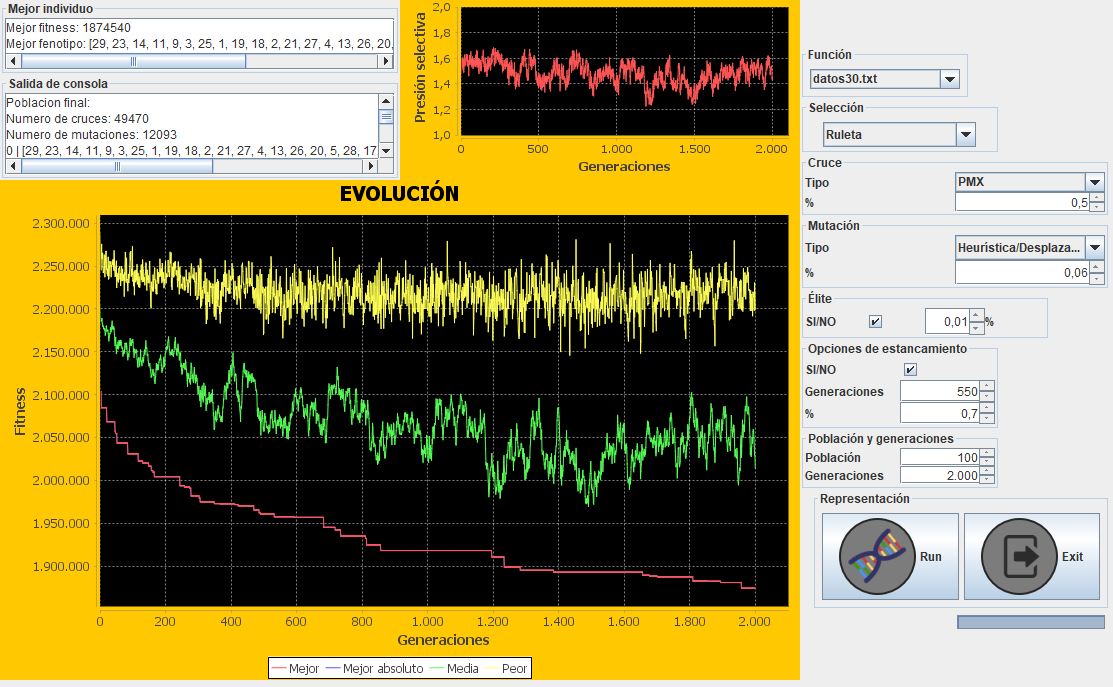
**Peor solución:** 405440

**Media:** 396950.5

**Desviación típica:** 4991.986653628

# Problema 3: datos30.dat

## Ejecución representativa:



**Individuo solución:** [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6]

**Aptitud máxima:** 1874540

**Aptitud media:** 2014473.68

**Aptitud mínima:** 2198958

**Numero de cruces:** 49470

**Numero de mutaciones:** 12093

**Población final:**

0 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

1 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

2 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

3 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

4 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

5 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

6 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

7 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1874540)

8 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 15, 22, 6] (Fitness: 1898796)

9 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 15, 22, 6] (Fitness: 1898796)

10 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 6, 22, 15] (Fitness: 1906110)

11 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 5, 4, 13, 26, 20, 27, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1909386)

12 | [29, 23, 14, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 6, 10, 12, 24, 0, 15, 22, 8] (Fitness: 1911564)

13 | [29, 6, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 23] (Fitness: 1920704)

14 | [29, 6, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 23] (Fitness: 1920704)

15 | [29, 23, 14, 11, 9, 3, 26, 1, 25, 18, 2, 21, 27, 4, 13, 19, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] (Fitness: 1920890)

16 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 22, 15, 6] (Fitness: 1921586)

17 | [29, 23, 14, 6, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 11, 22, 15] (Fitness: 1922730)

18 | [29, 23, 14, 11, 9, 3, 19, 1, 25, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 6] (Fitness: 1926204)

19 | [29, 23, 14, 11, 9, 3, 19, 1, 25, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 15, 24, 0, 12, 22, 6] (Fitness: 1928222)

20 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 22, 15] (Fitness: 1931556)

21 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 22, 15] (Fitness: 1931556)

22 | [6, 23, 14, 11, 9, 3, 25, 1, 26, 18, 2, 21, 27, 4, 13, 19, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 29] (Fitness: 1936576)

23 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

24 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

25 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

26 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

27 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1940618)

28 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 6, 22, 15, 0] (Fitness: 1950322)

29 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 6, 22, 15] (Fitness: 1953356)

30 | [6, 20, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 23, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 29, 22, 15] (Fitness: 1962814)

31 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 5, 4, 13, 26, 20, 27, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 22, 15] (Fitness: 1963174)

32 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 25, 6, 22, 15] (Fitness: 1963868)

33 | [29, 23, 14, 11, 9, 3, 19, 1, 25, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 8, 12, 24, 22, 4, 15, 10, 6] (Fitness: 1967132)

34 | [29, 10, 14, 0, 9, 3, 25, 1, 19, 18, 2, 21, 5, 4, 13, 26, 20, 27, 28, 17, 7, 16, 8, 22, 12, 24, 11, 15, 23, 6] (Fitness: 1971730)

35 | [29, 6, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 15, 12, 0, 24, 22, 23] (Fitness: 1973908)

36 | [6, 23, 14, 9, 11, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 24, 8, 10, 12, 16, 0, 15, 22, 29] (Fitness: 1974356)

37 | [29, 23, 14, 11, 9, 3, 0, 19, 26, 18, 2, 21, 27, 4, 13, 1, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 25, 15, 22, 6] (Fitness: 1977374)

38 | [29, 23, 22, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 8, 10, 24, 12, 0, 6, 14, 15] (Fitness: 1984368)

39 | [29, 23, 22, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 8, 10, 24, 12, 0, 6, 14, 15] (Fitness: 1984368)

40 | [11, 23, 14, 15, 9, 3, 25, 1, 19, 18, 2, 21, 0, 4, 13, 26, 20, 5, 28, 17, 7, 29, 16, 10, 12, 6, 27, 22, 8, 24] (Fitness: 1985328)

41 | [11, 23, 14, 15, 9, 3, 25, 1, 19, 18, 2, 21, 0, 4, 13, 26, 20, 5, 28, 17, 7, 29, 16, 10, 12, 6, 27, 22, 8, 24] (Fitness: 1985328)

42 | [29, 23, 15, 7, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 11, 16, 8, 10, 24, 12, 0, 6, 14, 22] (Fitness: 1989226)

43 | [12, 29, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 23, 28, 17, 7, 16, 8, 10, 22, 24, 0, 6, 5, 15] (Fitness: 1989810)

44 | [29, 23, 14, 6, 9, 3, 0, 1, 19, 18, 2, 21, 27, 16, 13, 26, 20, 5, 28, 17, 7, 11, 8, 10, 12, 24, 25, 22, 15, 4] (Fitness: 1991810)

45 | [29, 23, 14, 6, 9, 3, 0, 1, 19, 18, 2, 21, 27, 16, 13, 26, 20, 5, 28, 17, 7, 11, 8, 10, 12, 24, 25, 22, 15, 4] (Fitness: 1991810)

46 | [29, 1, 22, 11, 9, 3, 25, 23, 19, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 6, 10, 12, 24, 4, 15, 14, 8] (Fitness: 1992492)

47 | [8, 15, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 23, 5, 28, 17, 7, 29, 16, 10, 12, 24, 0, 20, 22, 6] (Fitness: 1996588)

48 | [8, 15, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 23, 5, 28, 17, 7, 29, 16, 10, 12, 24, 0, 20, 22, 6] (Fitness: 1996588)

49 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 0, 4, 13, 26, 20, 5, 28, 17, 7, 16, 10, 15, 12, 27, 24, 22, 8, 6] (Fitness: 2019208)

50 | [29, 1, 14, 11, 9, 25, 10, 23, 19, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 8, 12, 24, 22, 4, 15, 3, 6] (Fitness: 2019814)

51 | [29, 1, 14, 11, 9, 25, 10, 23, 19, 18, 2, 21, 27, 0, 13, 26, 20, 5, 28, 17, 7, 16, 8, 12, 24, 22, 4, 15, 3, 6] (Fitness: 2019814)

52 | [25, 20, 14, 11, 9, 3, 29, 23, 19, 18, 2, 21, 27, 4, 13, 26, 1, 5, 28, 17, 7, 16, 6, 10, 12, 8, 0, 24, 22, 15] (Fitness: 2020354)

53 | [29, 12, 14, 11, 9, 0, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 10, 28, 17, 7, 16, 8, 5, 24, 6, 3, 15, 22, 23] (Fitness: 2022456)

54 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 0] (Fitness: 2022794)

55 | [29, 18, 14, 6, 9, 3, 25, 1, 19, 4, 11, 21, 2, 27, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 15, 22, 23] (Fitness: 2025254)

56 | [8, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 13, 26, 6, 15, 5, 28, 17, 7, 29, 16, 10, 12, 24, 0, 20, 22, 4] (Fitness: 2026296)

57 | [29, 0, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 16, 6, 23, 12, 24, 10, 22, 17, 8] (Fitness: 2031830)

58 | [29, 23, 10, 11, 9, 3, 26, 1, 25, 16, 2, 21, 27, 4, 13, 19, 20, 5, 28, 17, 7, 18, 8, 12, 24, 22, 0, 15, 14, 6] (Fitness: 2034232)

59 | [29, 1, 14, 11, 9, 25, 12, 23, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 15, 24, 6, 22, 3, 0] (Fitness: 2039392)

60 | [29, 10, 14, 0, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 16, 6, 23, 12, 24, 11, 17, 22, 8] (Fitness: 2041692)

61 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 25] (Fitness: 2048862)

62 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 25] (Fitness: 2048862)

63 | [29, 23, 14, 11, 9, 3, 0, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 22, 10, 25] (Fitness: 2048862)

64 | [24, 1, 14, 6, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 12, 5, 11, 17, 7, 16, 20, 10, 28, 0, 29, 8, 22, 15] (Fitness: 2049910)

65 | [29, 23, 14, 11, 9, 3, 19, 1, 21, 0, 13, 26, 27, 4, 2, 25, 12, 28, 5, 17, 7, 18, 8, 10, 24, 20, 16, 15, 22, 6] (Fitness: 2053300)

66 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 22, 26, 5, 28, 17, 7, 16, 8, 10, 13, 12, 24, 0, 15, 20, 6] (Fitness: 2053430)

67 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 4, 6, 21, 2, 27, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 22, 15, 18] (Fitness: 2054530)

68 | [24, 1, 14, 6, 9, 3, 25, 7, 19, 18, 2, 21, 27, 4, 13, 26, 12, 28, 17, 15, 5, 16, 20, 10, 11, 0, 29, 8, 22, 23] (Fitness: 2064476)

69 | [6, 1, 14, 0, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 24, 8, 10, 12, 16, 11, 17, 22, 29] (Fitness: 2067542)

70 | [20, 25, 14, 11, 9, 22, 2, 1, 21, 19, 18, 4, 27, 13, 26, 23, 29, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 6, 3, 15] (Fitness: 2069652)

71 | [29, 23, 14, 6, 9, 3, 25, 1, 19, 4, 11, 21, 2, 27, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 24, 12, 0, 22, 15, 18] (Fitness: 2071866)

72 | [23, 15, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 20, 5, 28, 17, 7, 16, 29, 8, 10, 12, 24, 26, 22, 0, 6] (Fitness: 2073116)

73 | [29, 23, 14, 16, 9, 3, 19, 1, 25, 18, 2, 21, 27, 13, 26, 20, 8, 5, 28, 17, 7, 6, 11, 10, 12, 15, 24, 0, 4, 22] (Fitness: 2081370)

74 | [4, 23, 14, 9, 3, 11, 25, 1, 19, 18, 2, 21, 27, 13, 26, 6, 15, 5, 17, 28, 7, 16, 8, 10, 12, 24, 0, 20, 22, 29] (Fitness: 2082932)

75 | [29, 23, 6, 11, 9, 3, 26, 1, 25, 16, 2, 21, 0, 4, 13, 19, 20, 5, 28, 17, 7, 18, 10, 15, 12, 27, 24, 22, 8, 14] (Fitness: 2084036)

76 | [29, 10, 22, 0, 9, 3, 25, 1, 19, 24, 2, 21, 27, 4, 13, 26, 20, 5, 28, 15, 7, 16, 6, 23, 12, 18, 11, 17, 14, 8] (Fitness: 2087088)

77 | [29, 23, 12, 11, 9, 3, 25, 1, 19, 17, 2, 21, 0, 4, 13, 26, 20, 5, 28, 18, 7, 16, 15, 8, 24, 22, 27, 10, 14, 6] (Fitness: 2087450)

78 | [24, 1, 14, 6, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 12, 28, 17, 15, 5, 16, 20, 10, 7, 0, 29, 8, 22, 11] (Fitness: 2091844)

79 | [24, 1, 14, 6, 9, 3, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 12, 28, 17, 15, 5, 16, 20, 10, 7, 0, 29, 8, 22, 11] (Fitness: 2091844)

80 | [23, 10, 14, 19, 9, 3, 6, 1, 29, 2, 25, 21, 27, 4, 13, 26, 20, 5, 11, 17, 7, 28, 15, 8, 24, 12, 22, 0, 16, 18] (Fitness: 2094452)

81 | [23, 15, 14, 11, 9, 3, 0, 19, 26, 18, 2, 21, 27, 4, 13, 20, 5, 28, 17, 7, 16, 29, 8, 10, 12, 24, 1, 22, 25, 6] (Fitness: 2098620)

82 | [0, 11, 23, 22, 9, 14, 20, 26, 19, 18, 2, 21, 27, 4, 13, 6, 15, 5, 28, 17, 7, 24, 8, 10, 12, 1, 3, 16, 29, 25] (Fitness: 2101664)

83 | [0, 11, 23, 22, 9, 14, 20, 26, 19, 18, 2, 21, 27, 4, 13, 6, 15, 5, 28, 17, 7, 24, 8, 10, 12, 1, 3, 16, 29, 25] (Fitness: 2101664)

84 | [0, 11, 23, 22, 9, 14, 20, 26, 19, 18, 2, 21, 27, 4, 13, 6, 15, 5, 28, 17, 7, 24, 8, 10, 12, 1, 3, 16, 29, 25] (Fitness: 2101664)

85 | [12, 23, 14, 11, 9, 3, 0, 1, 21, 19, 18, 4, 27, 13, 26, 20, 29, 25, 28, 17, 7, 16, 8, 10, 22, 24, 2, 6, 5, 15] (Fitness: 2104222)

86 | [12, 20, 14, 11, 9, 22, 2, 1, 21, 19, 18, 4, 27, 13, 26, 23, 29, 25, 28, 17, 7, 16, 8, 10, 3, 24, 0, 6, 5, 15] (Fitness: 2110062)

87 | [29, 23, 12, 11, 9, 3, 25, 1, 19, 17, 2, 21, 4, 13, 26, 0, 20, 5, 28, 18, 7, 16, 15, 8, 24, 22, 27, 10, 14, 6] (Fitness: 2112042)

88 | [29, 3, 23, 11, 25, 1, 19, 2, 9, 6, 21, 14, 4, 27, 26, 13, 20, 5, 28, 17, 7, 16, 8, 10, 12, 18, 0, 24, 15, 22] (Fitness: 2114402)

89 | [6, 14, 9, 11, 3, 23, 19, 1, 25, 18, 2, 21, 27, 13, 26, 20, 8, 5, 28, 17, 7, 29, 16, 10, 12, 15, 24, 0, 4, 22] (Fitness: 2117956)

90 | [6, 23, 14, 11, 9, 3, 25, 1, 19, 4, 16, 21, 2, 27, 13, 26, 20, 5, 28, 15, 24, 18, 10, 7, 12, 17, 29, 22, 8, 0] (Fitness: 2118322)

91 | [1, 6, 3, 11, 14, 9, 25, 23, 19, 18, 2, 21, 27, 4, 13, 26, 20, 7, 5, 28, 17, 16, 8, 12, 15, 10, 0, 24, 22, 29] (Fitness: 2145086)

92 | [18, 23, 14, 7, 9, 3, 19, 1, 29, 2, 25, 21, 27, 4, 13, 26, 20, 28, 17, 15, 5, 16, 6, 10, 12, 8, 0, 24, 22, 11] (Fitness: 2151178)

93 | [29, 20, 14, 11, 9, 22, 25, 2, 1, 18, 0, 21, 27, 4, 13, 19, 26, 23, 7, 5, 28, 17, 16, 8, 12, 15, 24, 6, 3, 10] (Fitness: 2172130)

94 | [18, 23, 14, 11, 9, 19, 1, 2, 25, 21, 27, 20, 4, 13, 26, 3, 5, 28, 17, 7, 29, 0, 16, 6, 10, 12, 8, 24, 22, 15] (Fitness: 2179392)

95 | [29, 12, 8, 26, 21, 9, 3, 23, 25, 1, 11, 19, 2, 17, 0, 4, 13, 20, 5, 18, 7, 16, 24, 22, 27, 10, 28, 14, 15, 6] (Fitness: 2181810)

96 | [1, 29, 11, 9, 3, 6, 19, 24, 18, 2, 21, 14, 4, 27, 26, 20, 5, 28, 17, 7, 16, 8, 10, 13, 12, 15, 0, 22, 23, 25] (Fitness: 2188540)

97 | [24, 2, 23, 8, 9, 14, 28, 5, 11, 13, 7, 17, 18, 1, 21, 4, 3, 26, 20, 27, 19, 16, 22, 10, 15, 12, 0, 6, 29, 25] (Fitness: 2192042)

98 | [29, 3, 23, 11, 25, 1, 19, 2, 9, 6, 21, 14, 4, 27, 26, 20, 5, 28, 17, 7, 16, 8, 10, 13, 12, 24, 0, 18, 15, 22] (Fitness: 2198514)

99 | [3, 11, 20, 19, 9, 6, 27, 25, 13, 1, 14, 28, 21, 29, 4, 7, 16, 26, 8, 15, 24, 23, 0, 18, 17, 5, 2, 12, 10, 22] (Fitness: 2198958)

## Tabla resumen:

|  |  |  |
| --- | --- | --- |
| Nº Ejecución | Individuo | Aptitud |
| 1 | [6, 20, 27, 19, 28, 21, 3, 2, 4, 8, 7, 23, 11, 24, 12, 5, 18, 29, 25, 10, 1, 9, 26, 16, 0, 17, 22, 14, 15, 13] | 1916578 |
| 2 | [14, 18, 25, 8, 11, 7, 12, 1, 9, 16, 15, 4, 10, 17, 27, 20, 21, 0, 6, 23, 5, 29, 26, 24, 3, 2, 19, 13, 22, 28] | 1888216 |
| 3 | [0, 11, 1, 4, 26, 25, 21, 18, 28, 16, 29, 12, 17, 15, 20, 9, 10, 22, 5, 8, 24, 3, 13, 7, 2, 19, 27, 23, 6, 14] | 1905400 |
| 4 | [13, 11, 12, 6, 26, 29, 9, 21, 23, 1, 4, 19, 18, 22, 24, 16, 7, 15, 25, 5, 3, 20, 17, 0, 2, 28, 27, 14, 8, 10] | 1912518 |
| 5 | [8, 6, 25, 17, 7, 9, 11, 5, 27, 2, 12, 18, 16, 14, 24, 15, 26, 23, 4, 20, 3, 21, 29, 1, 0, 10, 19, 13, 22, 28] | 1918272 |
| 6 | [27, 19, 0, 21, 22, 18, 23, 3, 15, 9, 17, 10, 1, 29, 20, 8, 24, 2, 28, 6, 7, 5, 14, 16, 4, 13, 11, 12, 25, 26] | 1910258 |
| 7 | [18, 20, 1, 4, 29, 19, 8, 10, 9, 0, 3, 21, 5, 15, 24, 23, 17, 25, 27, 13, 12, 26, 2, 22, 28, 6, 16, 11, 14, 7] | 1903182 |
| 8 | [0, 2, 13, 15, 9, 7, 6, 16, 14, 19, 3, 18, 21, 4, 23, 22, 1, 10, 8, 25, 17, 28, 12, 20, 26, 29, 27, 5, 24, 11] | 1909976 |
| 9 | [17, 19, 9, 26, 25, 15, 11, 0, 6, 27, 3, 16, 29, 7, 12, 8, 1, 21, 5, 24, 22, 4, 14, 23, 20, 13, 18, 28, 10, 2] | 1894928 |
| 10 | [17, 6, 12, 2, 9, 27, 16, 19, 8, 13, 11, 1, 0, 26, 3, 24, 10, 18, 7, 23, 28, 4, 25, 14, 5, 29, 21, 22, 20, 15] | 1902742 |
| 11 | [23, 14, 1, 9, 25, 28, 11, 8, 6, 21, 19, 3, 17, 18, 12, 15, 2, 22, 20, 24, 27, 26, 29, 16, 4, 13, 10, 7, 5, 0] | 1907024 |
| 12 | [14, 8, 25, 11, 26, 28, 4, 19, 13, 20, 5, 0, 22, 24, 27, 16, 21, 12, 2, 10, 18, 23, 1, 7, 15, 3, 29, 9, 17, 6] | 1907448 |
| 13 | [29, 23, 14, 11, 9, 3, 25, 1, 19, 18, 2, 21, 27, 4, 13, 26, 20, 5, 28, 17, 7, 16, 8, 10, 12, 24, 0, 15, 22, 6] | 1874540 |
| 14 | [5, 27, 23, 2, 11, 7, 4, 1, 24, 0, 20, 18, 25, 13, 14, 3, 12, 10, 6, 16, 17, 29, 26, 15, 8, 19, 22, 9, 21, 28] | 1876188 |
| 15 | [11, 15, 1, 8, 23, 9, 4, 22, 12, 16, 28, 19, 5, 10, 27, 26, 20, 6, 2, 0, 17, 29, 21, 24, 25, 3, 14, 18, 7, 13] | 1898272 |
| 16 | [10, 27, 12, 20, 4, 3, 19, 15, 28, 22, 7, 9, 17, 14, 13, 5, 8, 18, 1, 25, 2, 26, 23, 0, 11, 16, 6, 21, 29, 24] | 1914482 |
| 17 | [29, 20, 6, 26, 18, 14, 9, 7, 0, 13, 17, 5, 25, 16, 8, 28, 24, 3, 2, 1, 10, 15, 22, 12, 21, 23, 11, 19, 27, 4] | 1890264 |
| 18 | [14, 5, 0, 25, 4, 6, 2, 1, 24, 16, 19, 17, 15, 20, 29, 11, 21, 7, 8, 10, 18, 23, 26, 9, 3, 27, 22, 13, 12, 28] | 1880728 |
| 19 | [17, 18, 1, 0, 4, 13, 29, 8, 11, 27, 24, 22, 7, 16, 19, 3, 28, 15, 6, 20, 14, 9, 25, 12, 26, 5, 23, 10, 2, 21] | 1899872 |
| 20 | [17, 18, 1, 0, 4, 13, 29, 8, 11, 27, 24, 22, 7, 16, 19, 3, 28, 15, 6, 20, 14, 9, 25, 12, 26, 5, 23, 10, 2, 21] | 1899872 |

**Mejor solución:** 1874540

**Peor solución:** 1918272

**Media:** 1900538

**Desviación típica:** 12599.0578