Genetic programming report

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Grammar

```
grammar gramatyka;

// Following grammar reflects in some way Golang programming language. Reflected Golang features is
// for example 'for' loop.
main: (statement | NL*) (NL* statement)* NL*;
statement:
 printStatement ';'
 | inputStatement ';'
 | conditionalStatement
 | loopStatement
 | variableAssignmentStatement ';';
name: STRING;
printStatement: 'print ' (expression);
inputStatement: 'read';
conditionalStatement:
 'if ' comparison codeBlock (' else ' codeBlock)?;
loopStatement: 'for ' comparison codeBlock;
variableAssignmentStatement:
 name '=' (expression | inputStatement);
comparison:
 expression ('==' | '!=' | '<' | '>' | '<=' | '>=') expression
 | notComparison
 | comparison (' and ' | ' or ') comparison;

notComparison: 'not' comparison;

expression:
 term
 | expression ('+' | '-') expression
 | inputStatement;

term:
 INTEGER
 | name
 | inputStatement
 | '(' expression ')'
 | term ('*' | '/') term;

codeBlock: '{' NL* main NL* '}';

INTEGER: '-'? [0-9]* '.'? [0-9]*;
STRING: [a-zA-Z][a-zA-Z0-9_]*;
NL: [\r\n]*;
WS: [ \t]+ -> skip;
```

Test: 11a

Problem solved!

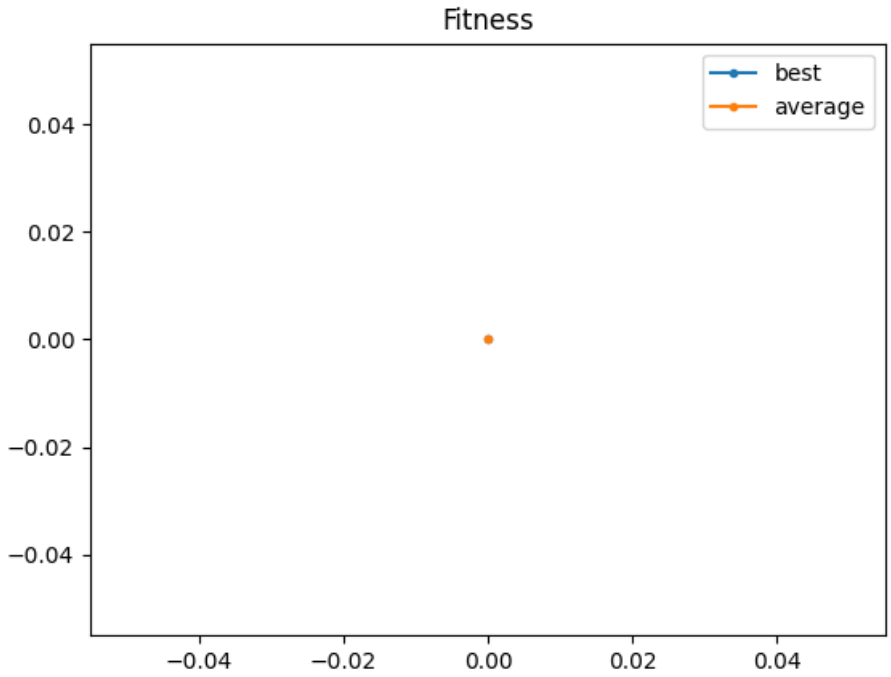
Fitness function:

```
    def test_11a_fitness(input_array, y):
        return 0 if 1 in y else 1000
```

Best fitness: 0

Best program:

```
{
 c = read;
 print c;
 print 7;
 print c;
 c = c / c;
 print c;
 print 6;
 f = read;
 t = read;
}
```



Test: 11b

Problem not solved.

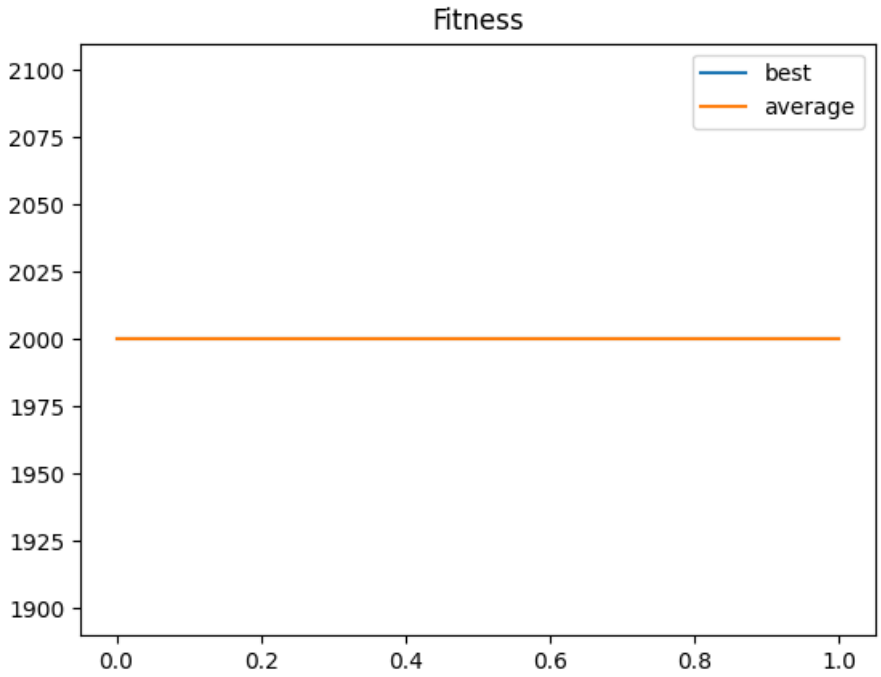
Fitness function:

```
    def test_11b_fitness(input_array, y):
        return 0 if 789 in y else 1000
```

Best fitness: 2000

Best program:

```
{
 w = read;
 print 3;
 print w;
 print w;
 if w != w {
 print 19;
 print -1;
}
 i = read;
 print 16;
}
```



Test: 11c

Problem not solved.

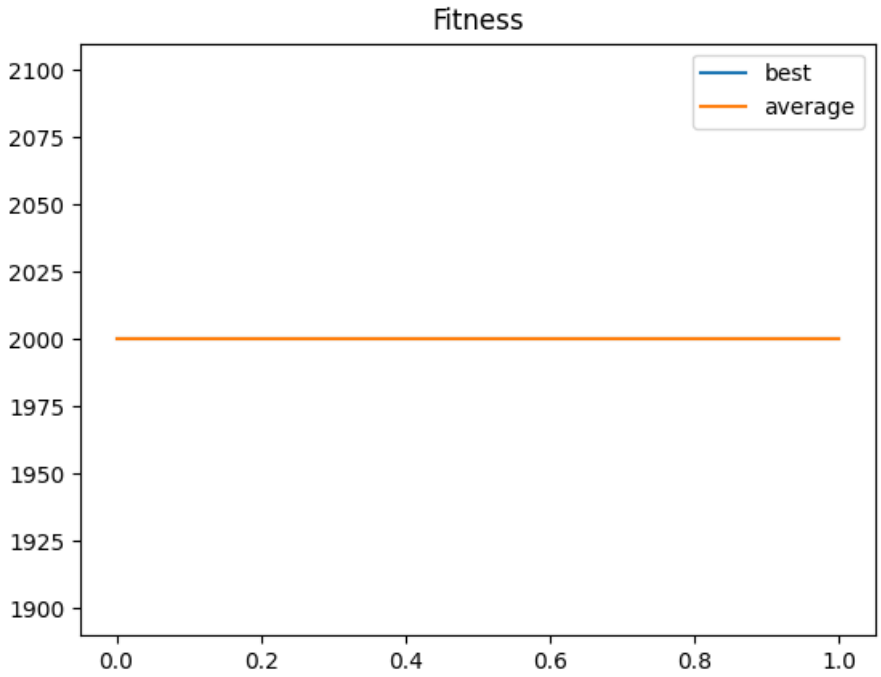
Fitness function:

```
    def test_11c_fitness(input_array, y):
        return 0 if 31415 in y else 1000
```

Best fitness: 2000

Best program:

```
{
 z = read;
 print 14;
}
```



Test: 11d

Problem solved!

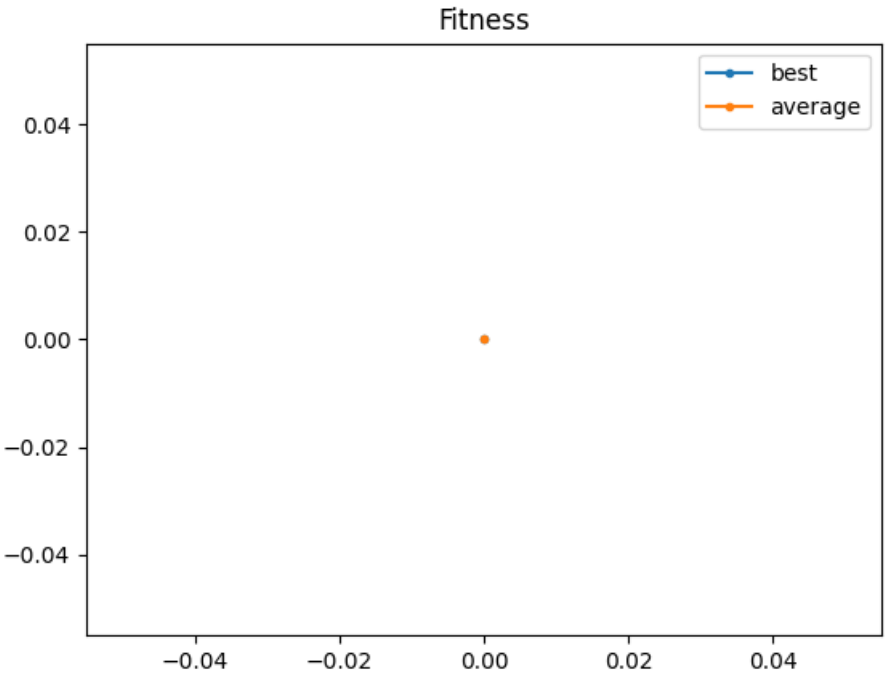
Fitness function:

```
    def test_11d_fitness(input_array, y):
        if len(y) == 0:
            return 1000
        return 0 if y[0] == 1 else 1000
```

Best fitness: 0

Best program:

```
{
 e = read;
 print 7;
}
```



Test: 11e

Problem not solved.

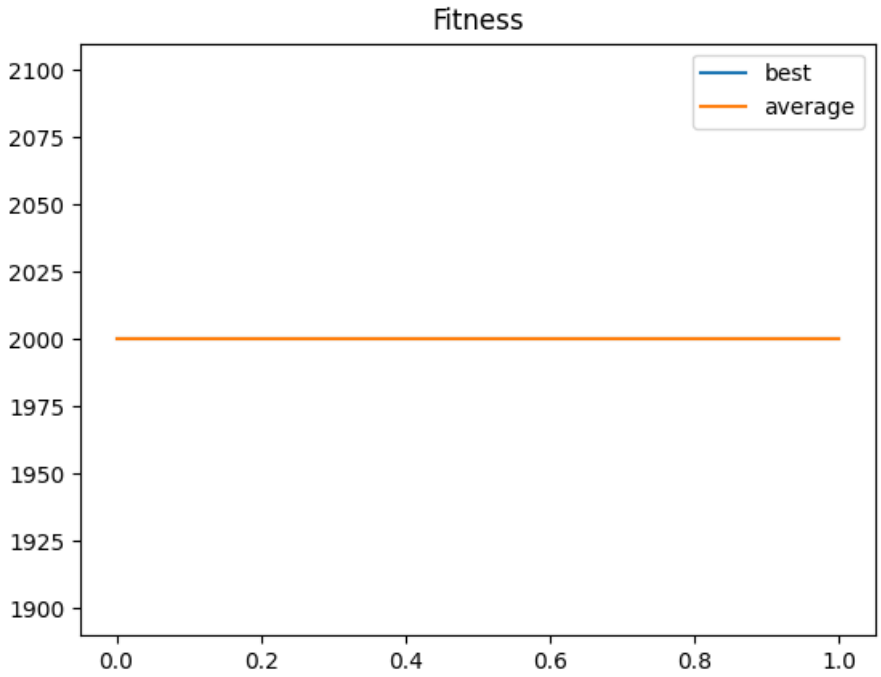
Fitness function:

```
    def test_11e_fitness(input_array, y):
        if len(y) == 0:
            return 1000
        return 0 if y[0] == 789 else 1000
```

Best fitness: 2000

Best program:

```
{
 d
 print 20;
}
```



Test: 11f

Problem not solved.

Fitness function:

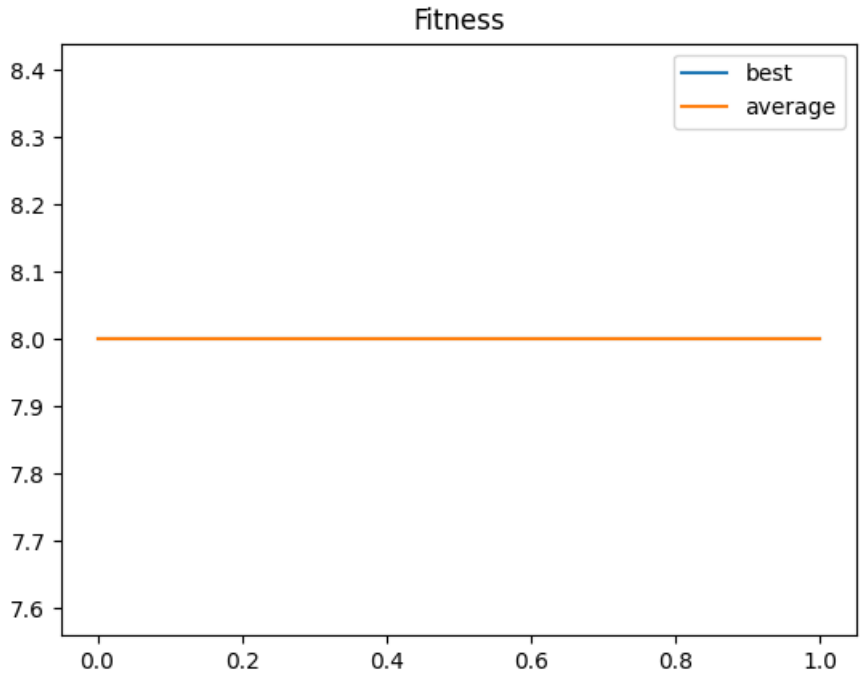
```
    def test_11f_fitness(input_array, y):
        if len(y) == 0:
            return 1000
        if len(y) > 1:
            return len(y)
        return 0 if y[0] == 1 else 1000
```

Best fitness: 8

Best program:

```
{
 l = read;
 if l < l {
 l = l * l;
 if l != l {
 print 8;
 print 18;
 if l < l {
 print 6;
 print 0;
 print -2;
 print 3;
 l = l - l;
 l = l + l;
 print 10;
}
}
}
 for l > l {
 print 3;
 if l <= l {
 print 4;
 print 4;
 l = l + l;
 if l >= l {
 print 1;
 print 16;
 print 8;
 print -1;
 print 20;
 q = read;
 print 7;
```

```
 print 9;
}
}
 print 18;
}
 print 12;
 print 7;
 print 17;
 print 1;
 print 1;
 h = read;
 print 20;
}
```



Test: 12a

Problem not solved.

Fitness function:

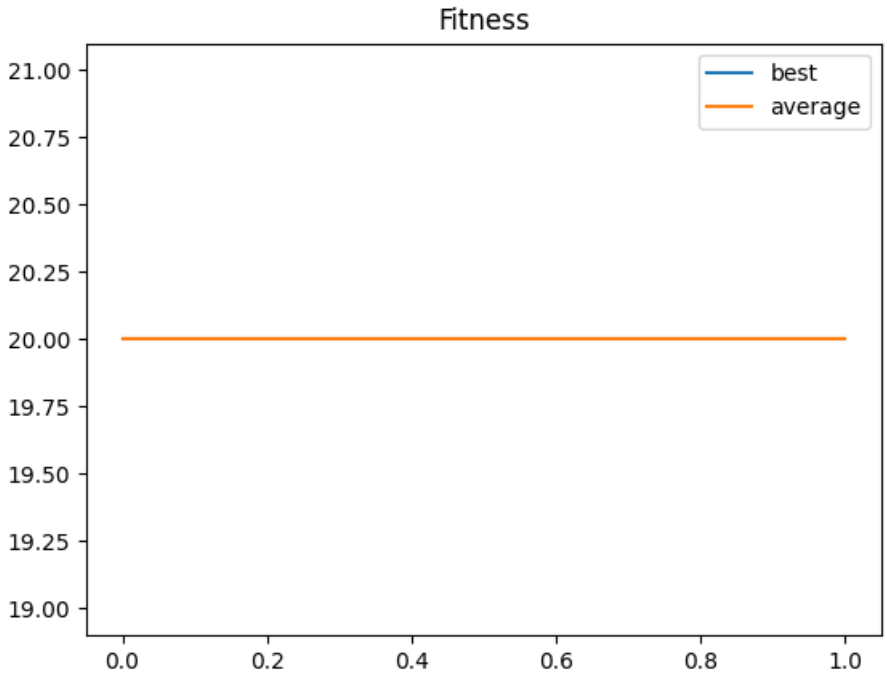
```
    def test_12a_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000
        s = input_array[0] + input_array[1]
        return abs(s - y[0])
```

Best fitness: 20

Best program:

```
{
 h = read;
 for h != h {
 print 3;
 h = h * h;
 print 9;
 if h == h {
 print 8;
 print 11;
 print h;
 print -1;
 h = h - h;
 print 6;
 print 18;
 print 14;
 print 2;
}
```

```
 print h;
 print 13;
 print 17;
 print 13;
}
 if h < h {
 print h;
 print 15;
 if h < h {
 print 17;
 print 0;
 if h >= h {
 print 16;
 print 10;
 print h;
 print 4;
 h = h + h;
 print 19;
 print h;
 print 0;
 print 17;
 print print 20;;
}
}
 print h;
 print 7;
}
 p = read;
}
```



Test: 12b

Problem not solved.

Fitness function:

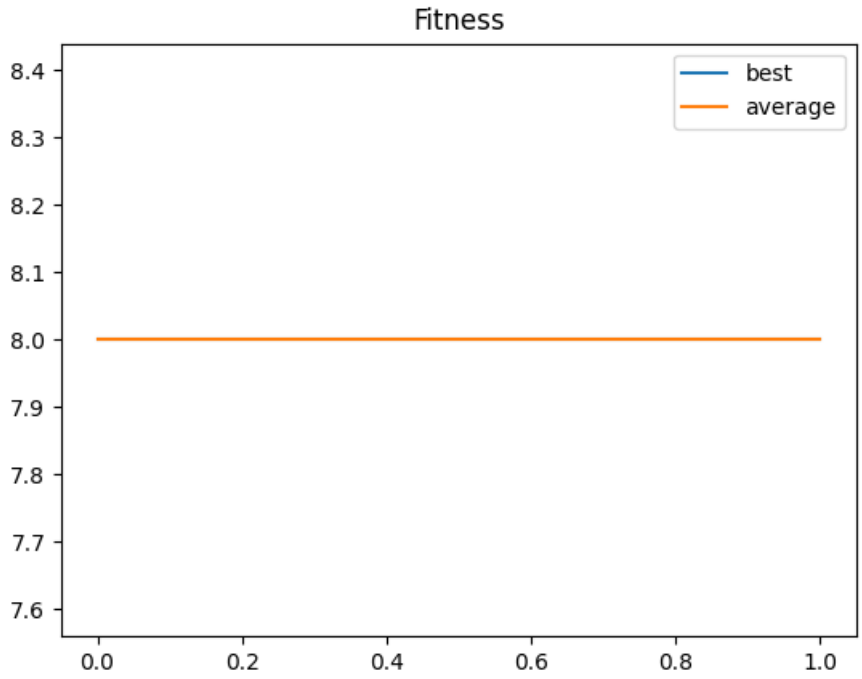
```
    def test_12b_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000
        s = input_array[0] + input_array[1]
        return abs(s - y[0])
```

Best fitness: 8

Best program:

```
{
```

```
 e = read;
 print -1;
}
```



Test: 12c

Problem not solved.

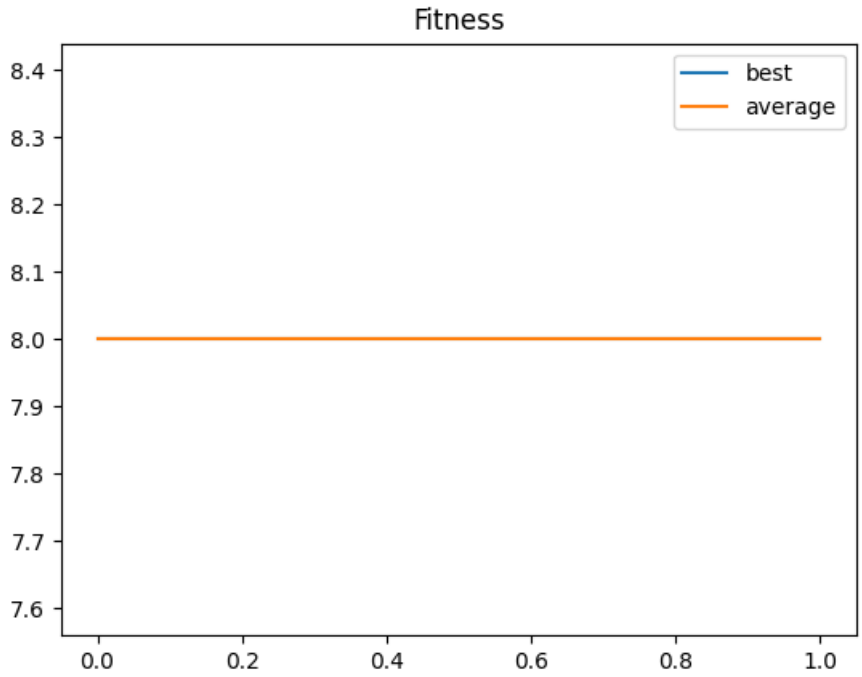
Fitness function:

```
    def test_12c_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000
        s = input_array[0] + input_array[1]
        return abs(s - y[0])
```

Best fitness: 8

Best program:

```
{
 p = read;
 print 12;
 p = i = read;;
 j = read;
 print 6;
 if p <= p {
 print -2;
 print 4;
 print -1;
 print 3;
 print 5;
}
}
```



Test: 12d

Problem not solved.

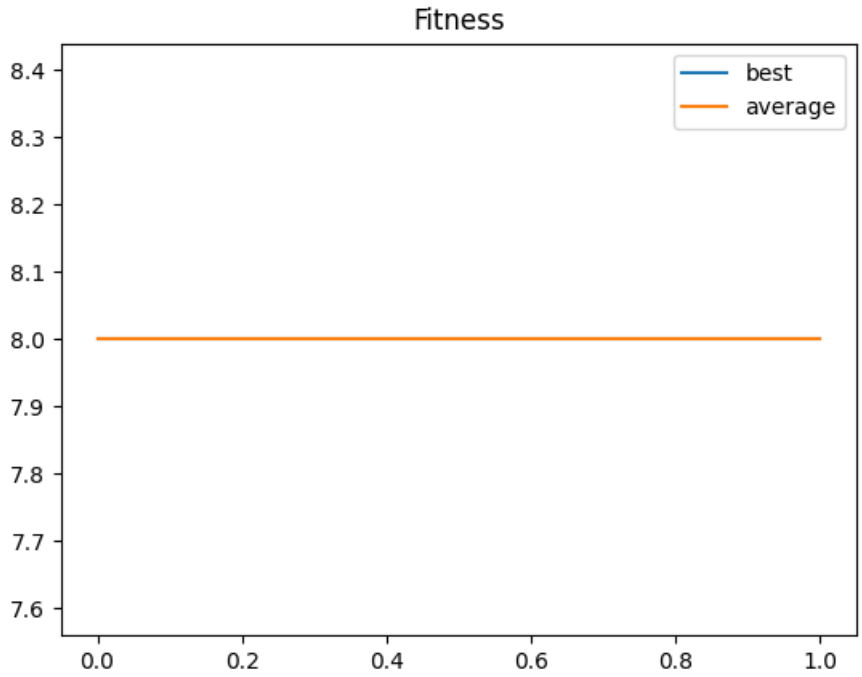
Fitness function:

```
    def test_12d_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000
        s = input_array[0] - input_array[1]
        return abs(s - y[0])
```

Best fitness: 8

Best program:

```
{
 p = read;
 print 6;
 print 19;
 k = read;
 p = p - k;
 w = read;
 print 16;
 for w <= k {
 print 19;
 print 19;
 print -1;
 z = read;
 print w;
 print 14;
 print 14;
 print 2;
 print w;
}
}
```



Test: 12e

Problem not solved.

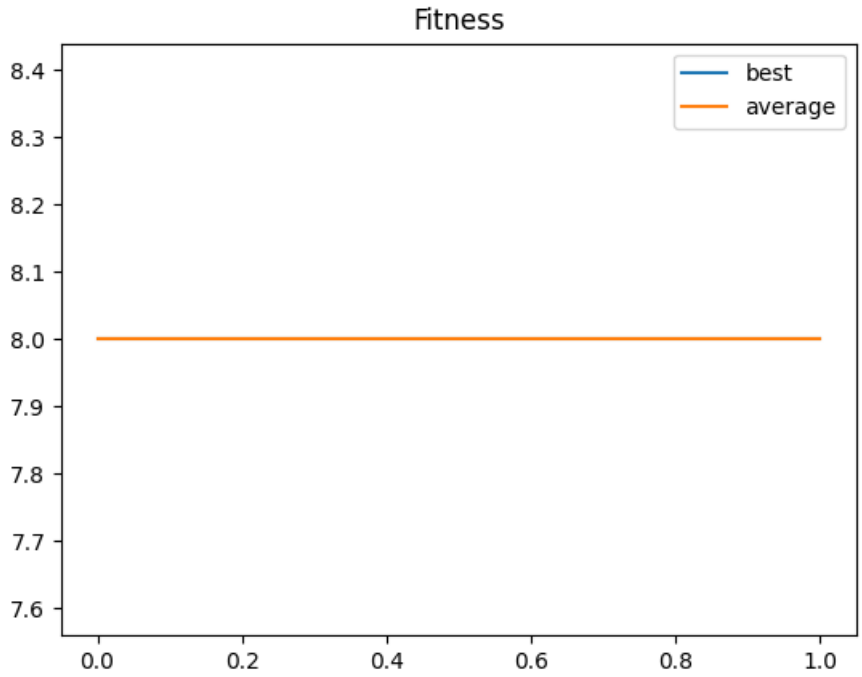
Fitness function:

```
    def test_12e_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000
        s = input_array[0] * input_array[1]
        return abs(s - y[0])
```

Best fitness: 8

Best program:

```
{
 u = read;
 d = read;
 if u != u {
 print 18;
 print 5;
 print 6;
}
 print 2;
 k = read;
 print 7;
 print -1;
}
```



Test: 13a

Problem not solved.

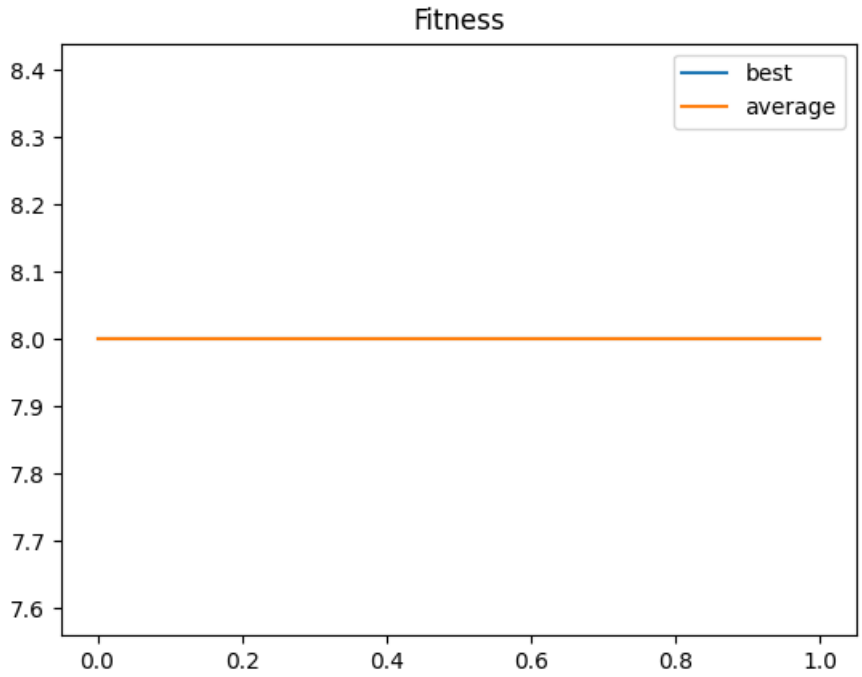
Fitness function:

```
    def test_13a_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000
        if input_array[0] > input_array[1]:
            return 0 if y[0] == input_array[0] else 1000
        else:
            return 0 if y[0] == input_array[1] else 1000
```

Best fitness: 8

Best program:

```
{
 d = read;
 print 8;
 print 19;
 print 2;
 print 3;
 print 9;
 print 15;
 print 17;
}
```



Test: 13b

Problem not solved.

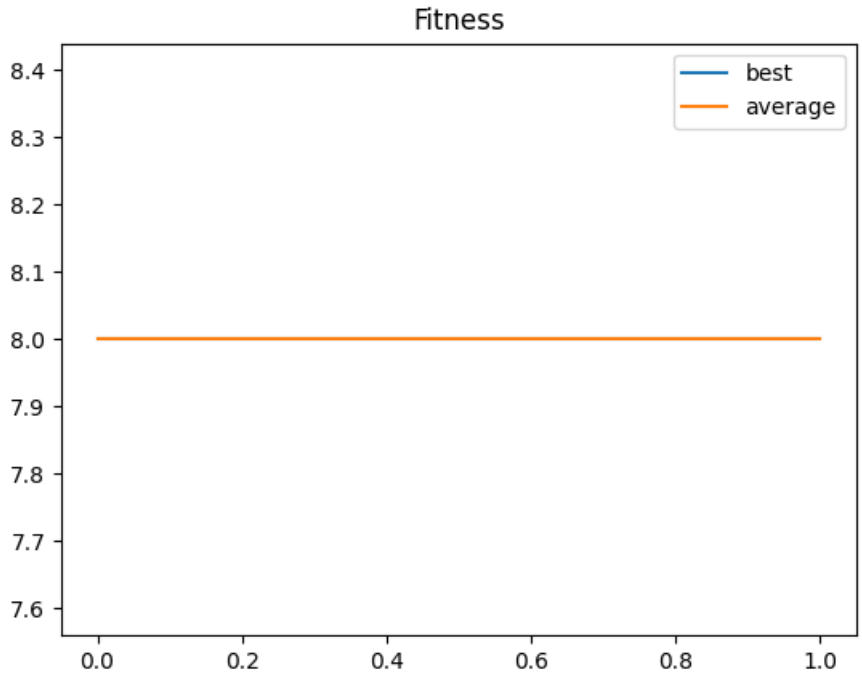
Fitness function:

```
    def test_13b_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000
        if input_array[0] > input_array[1]:
            return 0 if y[0] == input_array[0] else 1000
        else:
            return 0 if y[0] == input_array[1] else 1000
```

Best fitness: 8

Best program:

```
{
 s = read;
 print s;
 print 12;
 print 3;
 print 2;
 print 0;
 1
 s = s * s;
 print 0;
}
```



Test: 14a

Problem not solved.

Fitness function:

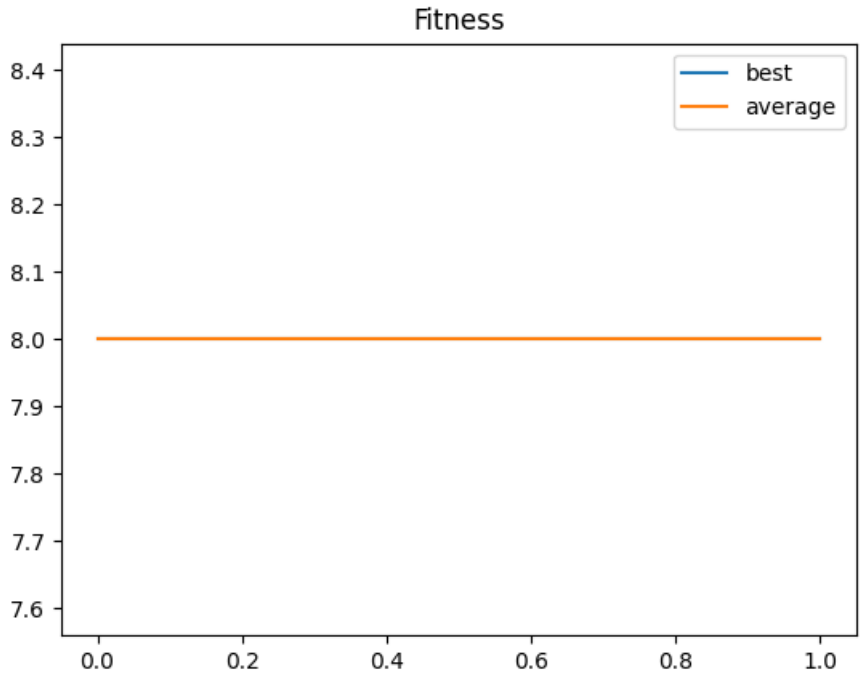
```
    def test_14a_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000

        avg = sum(input_array) / len(input_array)
        return abs(avg - y[0])
```

Best fitness: 8

Best program:

```
{
 d = read;
 print 18;
}
```



Test: 14b

Problem not solved.

Fitness function:

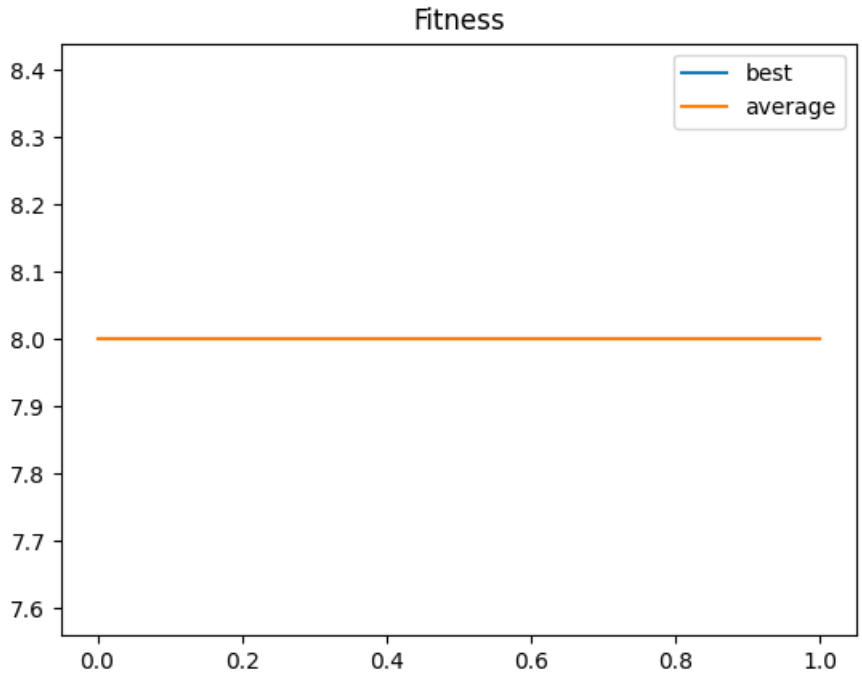
```
    def test_14b_fitness(input_array, y):
        if len(y) > 1:
            return len(y)
        if len(y) == 0:
            return 1000

        avg = sum(input_array[1:]) / len(input_array[1:])
        return abs(avg - y[0])
```

Best fitness: 8

Best program:

```
{
 {
 q = read;
 print 7;
 print 15;
 q = q / q;
 q = q - q;
 print q;
 print 0;
 print 14;
 print 14;
 print q;
} = read;
 print z;
 print 2;
}
```


Fitness
best
average
8.4
8.3
8.2
8.1
8.0
7.9
7.8
7.7
7.6
0.0
0.2
0.4
0.6
0.8
1.0