

Simplex Method Test Cases

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Test Cases for the Simplex Method Implementation

Below are six test cases for the Simplex Method program. Each test case includes the **Input** that a user would provide and the corresponding **Output** expected from the program.

TEST #1

Input:

```
1 Choose optimization type ('max' for maximization, 'min' for minimization):  
    max  
2 Enter the objective function coefficients C separated by spaces (e.g., 3 2)  
    : 3 2  
3 Enter the number of constraints (m): 2  
4 Enter the coefficients for constraint 1 separated by spaces (must be 2  
    numbers): 1 2  
5 Enter the right-hand side for constraint 1 (b1): 6  
6 Enter the coefficients for constraint 2 separated by spaces (must be 2  
    numbers): 3 2  
7 Enter the right-hand side for constraint 2 (b2): 12  
8 Enter the precision (e.g., 1e-5): 1e-5
```

Output:

```
1 Result:  
2 x1 = 3.0000  
3 x2 = 1.5000  
4 Maximum value of the objective function: 12.0000
```

TEST #2

Input:

```
1 Choose optimization type ('max' for maximization, 'min' for minimization):  
    max  
2 Enter the objective function coefficients C separated by spaces (e.g., 3 2)  
    : 2 1  
3 Enter the number of constraints (m): 2  
4 Enter the coefficients for constraint 1 separated by spaces (must be 2  
    numbers): 1 1  
5 Enter the right-hand side for constraint 1 (b1): 4  
6 Enter the coefficients for constraint 2 separated by spaces (must be 2  
    numbers): 2 0  
7 Enter the right-hand side for constraint 2 (b2): 4  
8 Enter the precision (e.g., 1e-5): 1e-5
```

Output:

```
1 Result:  
2 x1 = 4.0000  
3 x2 = 0.0000  
4 Maximum value of the objective function: 8.0000
```

TEST #3

Input:

```
1 Choose optimization type ('max' for maximization, 'min' for minimization):  
    max  
2 Enter the objective function coefficients C separated by spaces (e.g., 3 2)  
    : 1 1  
3 Enter the number of constraints (m): 1  
4 Enter the coefficients for constraint 1 separated by spaces (must be 2  
    numbers): -1 1  
5 Enter the right-hand side for constraint 1 (b1): 1  
6 Enter the precision (e.g., 1e-5): 1e-5
```

Output:

```
1 Result:  
2 The method is not applicable!
```

TEST #4

Input:

```
1 Choose optimization type ('max' for maximization, 'min' for minimization):  
    max  
2 Enter the objective function coefficients C separated by spaces (e.g., 3 2)  
    : 5 4  
3 Enter the number of constraints (m): 3  
4 Enter the coefficients for constraint 1 separated by spaces (must be 2  
    numbers): 1 1  
5 Enter the right-hand side for constraint 1 (b1): 5  
6 Enter the coefficients for constraint 2 separated by spaces (must be 2  
    numbers): 2 1  
7 Enter the right-hand side for constraint 2 (b2): 8  
8 Enter the coefficients for constraint 3 separated by spaces (must be 2  
    numbers): 0 1  
9 Enter the right-hand side for constraint 3 (b3): 4  
10 Enter the precision (e.g., 1e-5): 1e-5
```

Output:

```
1 Result:  
2 x1 = 4.0000  
3 x2 = 1.0000  
4 Maximum value of the objective function: 24.0000
```

TEST #5

Input:

```

1 Choose optimization type ('max' for maximization, 'min' for minimization):
   max
2 Enter the objective function coefficients C separated by spaces (e.g., 3 2)
   : 2 3 1
3 Enter the number of constraints (m): 3
4 Enter the coefficients for constraint 1 separated by spaces (must be 3
   numbers): 1 1 1
5 Enter the right-hand side for constraint 1 (b1): 4
6 Enter the coefficients for constraint 2 separated by spaces (must be 3
   numbers): 2 1 0
7 Enter the right-hand side for constraint 2 (b2): 5
8 Enter the coefficients for constraint 3 separated by spaces (must be 3
   numbers): 0 1 2
9 Enter the right-hand side for constraint 3 (b3): 6
10 Enter the precision (e.g., 1e-5): 1e-5

```

Output:

```

1 Result:
2 x1 = 1.0000
3 x2 = 3.0000
4 x3 = 0.0000
5 Maximum value of the objective function: 11.0000

```

TEST #6

Input:

```

1 Choose optimization type ('max' for maximization, 'min' for minimization):
   min
2 Enter the objective function coefficients C separated by spaces (e.g., 3 2)
   : 4 5
3 Enter the number of constraints (m): 2
4 Enter the coefficients for constraint 1 separated by spaces (must be 2
   numbers): 2 3
5 Enter the right-hand side for constraint 1 (b1): 12
6 Enter the coefficients for constraint 2 separated by spaces (must be 2
   numbers): 1 1
7 Enter the right-hand side for constraint 2 (b2): 5
8 Enter the precision (e.g., 1e-5): 1e-5

```

Output:

```

1 Result:
2 x1 = 3.0000
3 x2 = 2.0000
4 Minimum value of the objective function: 22.0000

```

Summary of Test Cases

Test #	Optimization Type	Objective Function (C)	Constraints (m)	Constraints Coefficients (A)
1	Max	$[3, 2]$	2	$[[1, 2], [3, 2]]$
2	Max	$[2, 1]$	2	$[[1, 1], [2, 0]]$
3	Max	$[1, 1]$	1	$[-1, 1]$
4	Max	$[5, 4]$	3	$[[1, 1], [2, 1], [0, 1]]$
5	Max	$[2, 3, 1]$	3	$[[1, 1, 1], [2, 1, 0], [0, 1, 2]]$
6	Min	$[4, 5]$	2	$[[2, 3], [1, 1]]$