

```

*Main> rankAll

Rank programs with stacks

p:[LDI 3,DUP,ADD,LDI 5,SWAP] s:[B True] ==> Just 3
p:[LDI 8,POP 1,LDI 3,DUP,POP 2,LDI 4] s:[I 2] ==> Just 2
p:[LDI 3,LDI 4,LDI 5,MULT,ADD] s:[I 1,I 3] ==> Just 3
p:[DUP] s:[B False,I 4,I 7] ==> Just 4
p:[POP 4] s:[I 1,I 4,I 6] ==> Nothing
p:[LDB True,IFELSE [ADD] [LDI 7],ADD] s:[I 10] ==> Nothing
p:[LDB True,LDI 1,LDI 10,LDI 5,IFELSE [ADD] [LDI 7],ADD] s:[I 100,I 6] ==> Just 3
p:[LDI 20,LDI 1,LDI 10,LDI 5,LEQ,IFELSE [ADD] [LDI 7],DUP] s:[I 10,I 20,I 1] ==> Just 5
p:[LDB True,LDB False,MULT] s:[I 3,I 8] ==> Just 3
p:[LDI 10,DEC,DUP,DUP,DUP,POP 2] s:[I 1,I 4,I 6] ==> Just 5
p:[LDI 10,LDI 20,LEQ,DEC] s:[I 10] ==> Just 2
p:[LDI 10,LDI 5,LDB True,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] s:[I 100,I 6] ==> Just 3
p:[LDI 10,LDI 5,LDB True,IFELSE [LDB False,IFELSE [ADD,DUP] [MULT]] [LDI 7]] s:[I 10,I 20,I 1] ==> Just 4
p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] s:[I 3,I 8] ==> Just 3
p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,ADD] [MULT]] [LDI 7]] s:[I 3,I 8] ==> Just 2

```

```

*Main> runAll
s:[B True] p:[LDI 3,DUP,ADD,LDI 5,SWAP] ==> A [I 6,I 5,B True]
s:[I 2] p:[LDI 8,POP 1,LDI 3,DUP,POP 2,LDI 4] ==> A [I 4,I 2]
s:[I 1,I 3] p:[LDI 3,LDI 4,LDI 5,MULT,ADD] ==> A [I 23,I 1,I 3]
s:[B False,I 4,I 7] p:[DUP] ==> A [B False,B False,I 4,I 7]
s:[I 1,I 4,I 6] p:[POP 4] ==> RankError
s:[I 10] p:[LDB True,IFELSE [ADD] [LDI 7],ADD] ==> RankError
s:[I 100,I 6] p:[LDB True,LDI 1,LDI 10,LDI 5,IFELSE [ADD] [LDI 7],ADD] ==> TypeError
s:[I 10,I 20,I 1] p:[LDI 20,LDI 1,LDI 10,LDI 5,LEQ,IFELSE [ADD] [LDI 7],DUP] ==> A [I 21,I 21,I 10,I 20,I 1] X
s:[I 3,I 8] p:[LDB True,LDB False,MULT] ==> TypeError
s:[I 1,I 4,I 6] p:[LDI 10,DEC,DUP,DUP,DUP,POP 2] ==> A [I 9,I 9,I 1,I 4,I 6]
s:[I 10] p:[LDI 10,LDI 20,LEQ,DEC] ==> TypeError
s:[I 100,I 6] p:[LDI 10,LDI 5,LDB True,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] ==> A [I 15,I 15,I 100,I 6]
s:[I 10,I 20,I 1] p:[LDI 10,LDI 5,LDB True,IFELSE [LDB False,IFELSE [ADD,DUP] [MULT]] [LDI 7]] ==> A [I 50,I 10,I 20,I 1]
s:[I 3,I 8] p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] ==> A [I 7,I 5,I 10,I 3,I 8]
s:[I 3,I 8] p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,ADD] [MULT]] [LDI 7]] ==> A [I 7,I 5,I 10,I 3,I 8]

```

```

*Main> rankAllEmpty

Rank programs with empty stacks

p:[LDI 3,DUP,ADD,LDI 5,SWAP] s:[] ==> Just 2
p:[LDI 8,POP 1,LDI 3,DUP,POP 2,LDI 4] s:[] ==> Just 1
p:[LDI 3,LDI 4,LDI 5,MULT,ADD] s:[] ==> Just 1
p:[DUP] s:[] ==> Nothing
p:[POP 4] s:[] ==> Nothing
p:[LDB True,IFELSE [ADD] [LDI 7],ADD] s:[] ==> Nothing
p:[LDB True,LDI 1,LDI 10,LDI 5,IFELSE [ADD] [LDI 7],ADD] s:[] ==> Just 1
p:[LDI 20,LDI 1,LDI 10,LDI 5,LEQ,IFELSE [ADD] [LDI 7],DUP] s:[] ==> Just 2
p:[LDB True,LDB False,MULT] s:[] ==> Just 1
p:[LDI 10,DEC,DUP,DUP,DUP,POP 2] s:[] ==> Just 2
p:[LDI 10,LDI 20,LEQ,DEC] s:[] ==> Just 1
p:[LDI 10,LDI 5,LDB True,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] s:[] ==> Just 1
p:[LDI 10,LDI 5,LDB True,IFELSE [LDB False,IFELSE [ADD,DUP] [MULT]] [LDI 7]] s:[] ==> Just 1
p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] s:[] ==> Just 1
p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,ADD] [MULT]] [LDI 7]] s:[] ==> Nothing

```

```

*Main> runAllEmpty
s:[] p:[LDI 3,DUP,ADD,LDI 5,SWAP] ==> A [I 6,I 5]
s:[] p:[LDI 8,POP 1,LDI 3,DUP,POP 2,LDI 4] ==> A [I 4]
s:[] p:[LDI 3,LDI 4,LDI 5,MULT,ADD] ==> A [I 23]
s:[] p:[DUP] ==> RankError
s:[] p:[POP 4] ==> RankError
s:[] p:[LDB True,IFELSE [ADD] [LDI 7],ADD] ==> RankError
s:[] p:[LDB True,LDI 1,LDI 10,LDI 5,IFELSE [ADD] [LDI 7],ADD] ==> TypeError
s:[] p:[LDI 20,LDI 1,LDI 10,LDI 5,LEQ,IFELSE [ADD] [LDI 7],DUP] ==> A [I 21,I 21] X
s:[] p:[LDB True,LDB False,MULT] ==> TypeError
s:[] p:[LDI 10,DEC,DUP,DUP,DUP,POP 2] ==> A [I 9,I 9]
s:[] p:[LDI 10,LDI 20,LEQ,DEC] ==> TypeError
s:[] p:[LDI 10,LDI 5,LDB True,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] ==> A [I 15,I 15]
s:[] p:[LDI 10,LDI 5,LDB True,IFELSE [LDB False,IFELSE [ADD,DUP] [MULT]] [LDI 7]] ==> A [I 50]
s:[] p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,DUP] [MULT]] [LDI 7]] ==> A [I 7,I 5,I 10]
s:[] p:[LDI 10,LDI 5,LDB False,IFELSE [LDB True,IFELSE [ADD,ADD] [MULT]] [LDI 7]] ==> RankError X

```