Heuristic One
Number – Name H1 – Zeros
English If the goal is zero and zero is among the numbers, then multiply all of the numbers together.
Pseudocode
If (the goal is zero) **and** (zero is among the numbers)
Then [multiply the numbers together]
Examples
 Numbers = {5,4,0,8,9} goal = 0
(5 * (4 * (0 * (8 * 9))))

 Numbers = {0,5,3,5,8} goal = 0
(0 * (5 * (3 * (5 * 8))))

 Numbers = {7,6,7,1,0} goal = 0
(7 * (6 * (7 * (1 * 0))))

Heuristic Two

Number – Name H2 – Zero and Goal

English If the goal is nonzero and zero and the goal are among the numbers, then add the goal to the result of multiply all of the remaining numbers together.

Pseudocode

If (the goal is not zero) **and** (zero is among the numbers) **and** (the goal is among the numbers)

Then [add the goal to the product of the remaining numbers together]

Examples

 Numbers = {7,0,9,2,6} goal = 9

(9 + (7 * (0 * (2 * 6))))

 Numbers = {5,4,3,1,0} goal = 4

(4 + (5 * (3 * (1 * 0))))

 Numbers = {0,2,3,5,3} goal = 3

(3 + (0 * (2 * (3 * 5))))

Heuristic Three

Number – Name H3 – Zero Goal and Pair

English If the goal is zero and a pair exists among the numbers, then multiply the difference between the pair of numbers by all of the remaining numbers.

Pseudocode

If (the goal is zero) **and** (a pair exists among the numbers)
Then [multiply the difference between the pair of numbers by all of the remaining numbers]

Examples

 Numbers = {4,5,6,4,9} goal = 0
((4 – 4) * (5 * (6 * 9)))

 Numbers = {5,0,6,0,7} goal = 0
((0 – 0) * (5 * (6 * 7)))

 Numbers = {1,0,1,2,3} goal = 0
((1 – 1) * (0 * (2 * 3)))

Heuristic Four

Number – Name H4 – One Goal, Zero is in the numbers and One different Numbers

English If the goal is one, zero is in the numbers and two numbers differ by one, then subtract the two numbers that differ by one, multiply all the others by 0 and subtract the results.

Pseudocode

If (the goal is one) **and** (zero is in the numbers) **and** (two numbers differ by one)

Then [subtract the two numbers that differ by one, multiply all the others by 0 and subtract the results]

Examples

 numbers = {4,5,6,0,9,} and goal = 1
((5 - 4) - (6 * (0 * 9)))

 numbers = {5,0,6,0,7,} and goal = 1
((6 - 5) - (0 * (0 * 7)))

 numbers = {6,0,7,2,3,} and goal = 1
((7 - 6) - (0 * (2 * 3)))

Heuristic Five

Number – Name H5 – All numbers are equal to the goal

English If the goal is equal to all the numbers, then subtract two numbers, subtract other two numbers, subtract their results and them subtract the last one to the result.

Pseudocode

If (the goal is equal to all the numbers) **Then** [subtract two numbers, subtract other two numbers, subtract their results and them subtract the last one to the result]

Examples

 Numbers = {5,5,5,5,5} goal = 5
(5 - ((5 - 5) - (5 - 5)))

 Numbers = {9,9,9,9,9} goal = 9
(9 - ((9 - 9) - (9 - 9)))

 Numbers = {2,2,2,2,2} goal = 2
(2 - ((2 - 2) - (2 - 2)))

Heuristic Six

Number – Name H6 – The goal can be created by the numbers

English If the goal can be created by the sum of two numbers and zero is among the numbers, then create the goal using the numbers, multiply the others by zero and subtract the results.

Pseudocode

If (If the goal can be created by the sum of two numbers) **and** (zero is among the numbers) **Then** [create the goal using the numbers, multiply the others by zero and subtract the results]

Examples

 numbers = {1,5,0,4,9,} and goal = 6
((1 + 5) - (0 * (4 * 9)))

 numbers = {1,9,0,4,1,} and goal = 2
((1 + 1) - (9 * (0 * 4)))

 numbers = {5,1,0,3,2,} and goal = 7
((5 + 2) - (1 * (0 * 3)))

Heuristic Seven

Number – Name H7 – The goal can be created by the numbers

English If the goal can be created by the difference of two numbers and zero is among the numbers, then create the goal using the numbers, multiply the others by zero and subtract the results.

Pseudocode

If (If the goal can be created by the difference of two numbers) **and** (zero is among the numbers) **Then** [create the goal using the numbers, multiply the others by zero and subtract the results]

Examples

 numbers = {8,5,2,9,0,} and goal = 3

((8 - 5) - (2 * (9 * 0)))

 numbers = {9,5,7,2,0,} and goal = 4

((9 - 5) - (7 * (2 * 0)))

 numbers = {9,5,7,8,0,} and goal = 2

((9 + 7) - (5 * (8 * 0)))

Heuristic Eight

Number – Name H8 – Two numbers create a third and the goal is zero

English If the goal is zero and two numbers can create a third, then use the sum of the two numbers to create the third one, subtract them and multiply the difference of the remaining numbers.

Pseudocode

If (If the goal is zero) **and** (two numbers can create a third) **Then** [sum of the two numbers to create the third one, subtract them and multiply the difference of the remaining numbers]

Examples

 numbers = {1,2,3,8,9,} and goal = 0

((3 - (1 + 2)) * (8 - 9))

 numbers = {5,2,3,8,9,} and goal = 0

((5 - (2 + 3)) * (8 - 9))

 numbers = {6,2,4,8,9,} and goal = 0

((6 - (2 + 4)) * (8 - 9))