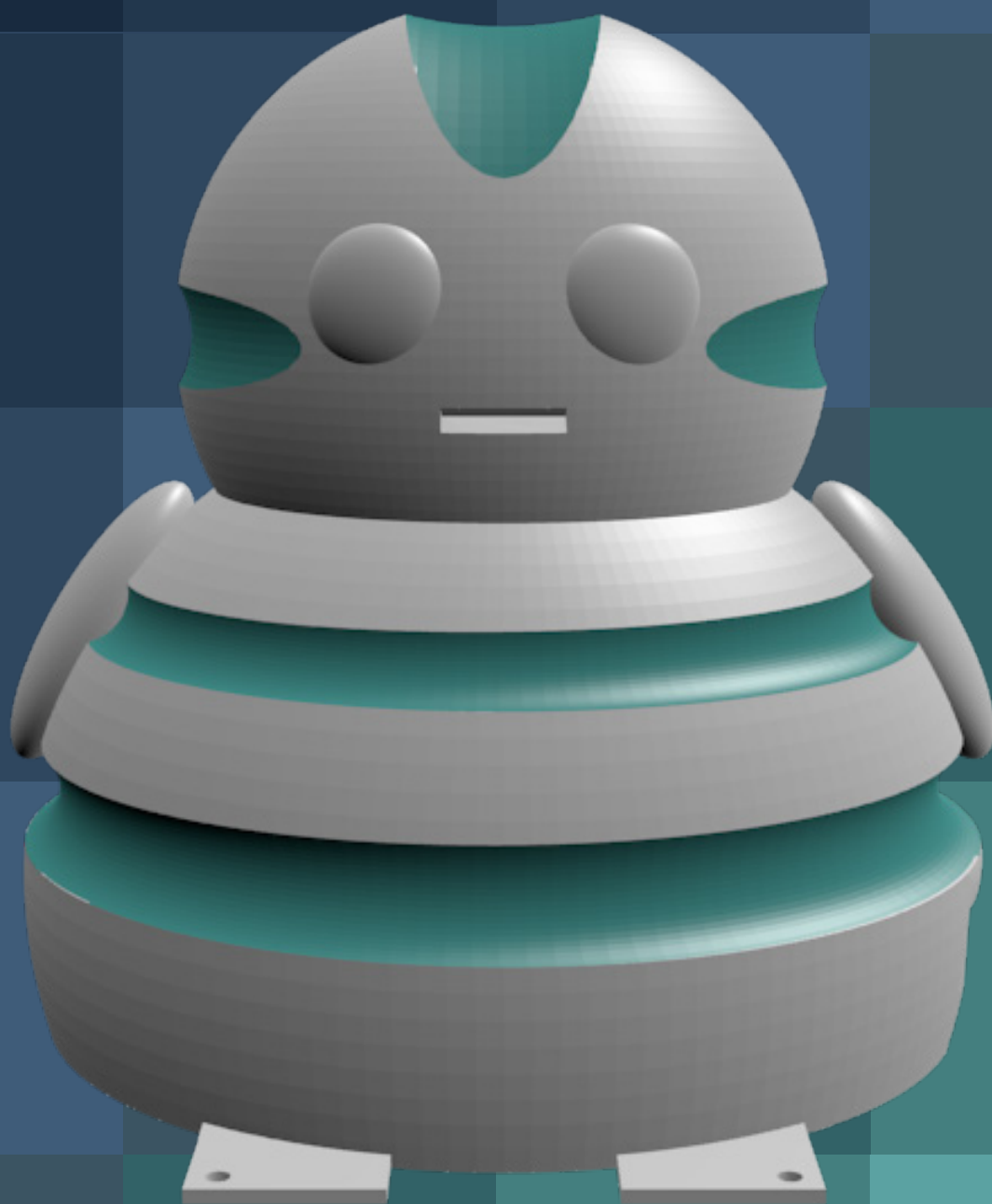


# COSMO

USER MANUAL



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# INTRODUCTION

## WHAT IS IT?

Cosmo is a tool for children age 7-9 to learn the way of thinking used in computer programming. It consists of a robot, tangible command blocks and a designable game board. The command blocks have shapes on them that symbolize a certain action, like move forward, turn or loop. The robot will execute these commands in the order they are put in the robot to follow a certain path over the game board. The game board consists of black, gray and white puzzle pieces. The goal of the game is to get to the gray tile. Children can build the board themselves by connecting the puzzle pieces. In this manual there are some examples of possible game board designs given.

## CLASSROOMS

Cosmo is meant to be used in classrooms. Children can make groups and work on different assignments. They can improve collaboration skills while trying to achieve the goal together. There is also a competitive element, so that children can play against each other. There is no computer needed to play the game.

## WHY USE COSMO?

Cosmo teaches children important skills for the future. Not only does it improve their computer programming skills; they also learn to work together, be creative and analyze problems. It makes it possible to have a hands-on approach in something like computer programming, without actually needing to have many computers in a classroom.

## WHICH GAMES CAN YOU PLAY?

There is a number of different games you can play with Cosmo. You can collaborate: try to achieve the goal together, or compete: see who achieves the goal first. The different games are explained in *Instructions*.

# HOW IT WORKS

## PUZZLE BOARD

The game board for Cosmo is a customizable puzzle board. All puzzle pieces have the same shape, so that they can be connected to any other puzzle piece. There are three different colors: black, white and gray. The white tiles are the path Cosmo can walk on. The black tiles are the pits, on which Cosmo is not allowed to walk. The gray tile is the goal tile, where Cosmo has to go. Depending on the kind of game that is played, children can create their own puzzle board, making difficult or less difficult game boards together or for each other. In this manual there are several example boards given with their shortest command block chains (see *Puzzle Board Examples*). Unless stated otherwise, Cosmo always starts in the upper left corner in these examples, facing right.

## COMMAND BLOCKS

The command blocks are the way Cosmo is controlled. There is space for three command blocks on Cosmo's back. The command blocks represent different actions, which are executed in the order that they are placed. The different command blocks are:

### *Forward*

This command will move Cosmo forward one tile in the direction that Cosmo is currently facing.

### *Turn Left*

This command will turn Cosmo 90 degrees to the left. Cosmo will stay on the same tile when using this command, he will only face a different direction.

### *Turn Right*

This command will turn Cosmo 90 degrees to the right. Cosmo will stay on the same tile when using this command, he will only face a different direction.

### *Loop 2, 3, 4, etc.*

This command will create a loop. A loop 2 means that all commands between this command and the loop end (see *Loop End*) are executed twice. A loop 3 means that all commands between this command and the loop end are executed three times, etc. The loop can be used to create shorter command chains.

### *Loop Until Goal Reached*

This command will create a loop, just like the other loop commands. However, this loop will not end at a Loop End command, but will end when Cosmo drives over the gray tile.

This way a loop can also be used at the end of the path.

### *Loop End*

This command defines the end of a loop. The Loop End command is not counted as a command block in games where the amount of command blocks is important.

## **BUTTONS**

There are also three buttons on Cosmo.

### *Save Button*

The first button is the save button. In most cases you will need more than three command blocks. With this button you can save your current command chain and add more commands to it. For example, you use Forward, Forward, Turn Left. You click save, and add Forward, Turn Right, Forward and click save again. Your total command chain will now be Forward, Forward, Turn Left, Forward, Turn Right, Forward.

### *Clear Button*

The second button is the clear button. When working with long command chains, the situation can occur where you have accidentally entered the wrong commands. To clear the current command chain, you can press the clear button. This will delete all stored commands.

### *Go Button*

The last button is the go button. This button will start the robot. Cosmo will now execute all stored commands.

## **WINNING AND LOSING**

To show that you have won or lost, Cosmo will play a certain sound. If Cosmo gets to the gray tile without driving over the black pits, you have achieved the goal, and Cosmo will play a melody. When you drive over a black pit, you lose, and Cosmo will also let you know by playing a beeping sound. If you want to use a loop at the end of the path, causing Cosmo to not end exactly at the gray tile, but to drive over it, the Loop Until Goal Reached command can be used.

# INSTRUCTIONS

## Team Cosmo

### SET UP

#### *Game Board*

The players can choose to use an existing puzzle board (see *Puzzle Board Examples*) or make one themselves.

#### *Building the Game Board*

The first player chooses a puzzle piece and places it somewhere on the table. The second player chooses a second puzzle piece and connects it to one of the sides of the first puzzle piece. After that the next player will do the same, until all puzzle pieces are used. While making the puzzle board, make sure that:

- The path is possible (not blocked by pits);
- The starter tile is not connected to the goal.

After that, place Cosmo on the starter tile.

### GOAL OF THE GAME

The goal of the game is to get Cosmo to the (gray) goal tile safely with the least amount of command blocks possible. If the players have chosen to use an existing puzzle board, the path of least commands can be checked in this manual. To get to the goal tile, Cosmo has to avoid the black pits and stay on the white tiles. The players must work together to achieve this goal. Cosmo is controlled using command blocks.

### PLAYING THE GAME

The players discuss what would be the shortest path and plug these commands into the robot. Cosmo will execute the commands and give feedback about whether the path was correct.

### WINNING THE GAME

To win the game, Cosmo has to achieve the gray goal tile. If an example board is used, the players can check whether they found least amount of commands.

# INSTRUCTION

## Cosmo Competition

### SET UP

#### *Game Board*

The game board changes every turn. The player on the left of the player who's turn it is can start. The first player chooses a puzzle piece and places it somewhere on the table. The second player chooses a second puzzle piece and connects it to one of the sides of the first puzzle piece. After that the next player, until all puzzle pieces are used. The number of puzzle pieces is mentioned below. The player who's turn it is cannot place any tiles. While making the puzzle board, make sure that:

- The path is possible (not blocked by pits);
- The starter tile is not connected to the goal.

Number of puzzle pieces each round:

- Round one: 8 puzzle pieces
- Round two: 12 puzzle pieces
- Round three: all puzzle pieces

After that, place Cosmo on the starter tile.

### GOAL OF THE GAME

The goal of the game is to get Cosmo to the goal tile safely. Therefore Cosmo has to avoid the pits. Every player tries to create the shortest possible path by themselves. Then the other players get a chance of creating a shorter path. Points will be rewarded for the achievements. The player that has the most points after three rounds, wins the game.

### PLAYING THE GAME

The other players than the player who's turn it is, build the game board. Player 1 has the first turn and places the command blocks in a specific order to follow the path. If Cosmo does not achieve the goal, the player will get 0 points and it is the turn of the next player. If Cosmo does achieve the goal, the player will receive 5 points. Now the other players each get a chance of achieving the goal by using less command blocks, taking turns. For every command block less, the player can "steal" points from player 1. If player 2 used two less command blocks than player 1, player 2 will get 2 points and player 1 will only have 3 points left. A player cannot have less points than 0, so these points cannot be stolen. After that it is the turn of Player 2.

After all players have played with this amount of puzzle pieces once, round 1 ends and round 2 starts. Round 2 has more puzzle pieces. After round 2 ends, round 3 begins and uses all puzzle pieces.

## **WINNING THE GAME**

The game ends when all rounds have been played, and each player has had the same amount of tries. The player with the most points wins the game.



# INSTRUCTION

## Cosmo vs Cosmo

### SET UP

#### *Game Board*

The game board changes every round. The first player chooses a puzzle piece and places it somewhere on the table. The second player (on the left of player 1) chooses a second puzzle piece and connects it to one of the sides of the first puzzle piece. After that the next player, until all puzzle pieces are used. While making the puzzle board, make sure that:

- The path is possible (not blocked by pits);
- The starter tile is not connected to the goal.

After that, place the first Cosmo on the starter tile. The place of the second Cosmo can be chosen by the first player.

### GOAL OF THE GAME

The goal of the game is to defeat the Cosmo of the other player. One Cosmo has to achieve the goal tile. The other Cosmo has to stop the first Cosmo from achieving its goal by shooting a ball. There is an extra command block in this game, called the fire command. Only the second player can use the fire command block. When the command is executed, Cosmo will shoot a ball that has to hit the other Cosmo. The ball can be given back to Cosmo every time it misses, so the second player has multiple chances. Each round the players can only use between one and five command blocks, so that to achieve the goal, multiple rounds are needed.

### PLAYING THE GAME

Both players play at the same time. They use between one and five command blocks (they can choose how many) to define a path. The second player can use the fire command block to try to hit the first Cosmo.

Each turn both players add their command blocks at the same time. Then they press the start button at the same time to execute the commands and see what happens.

### WINNING THE GAME

For the first player the goal is to get to the goal tile before the second player hits his Cosmo with the ball. The goal for the second player is to hit the Cosmo of the other player with the ball.

# INSTRUCTION

## Team Cosmo vs Team Cosmo: shortest path

### SET UP

#### *Game Board*

The game board changes every round. The players make teams of 2 (or 3) people. The first team creates the puzzle board together. They try to make it as hard as possible, but still follow the rules mentioned below. They write down what they think is the shortest path. The second team tries to get to the goal tile. The next round the next team can make the board. While making the puzzle board, make sure that:

- The path is possible (not blocked by pits);
- The starter tile is not connected to the goal.

After that, place Cosmo on the starter tile.

### GOAL OF THE GAME

The goal for the first team is to make a very difficult puzzle board together and to define the shortest path. The goal for the other team is to get Cosmo to the goal tile with less or just as many command blocks as the first team defined.

### PLAYING THE GAME

The first team creates the puzzle board and writes down what they think is the shortest path. The second team can now try to get Cosmo to the goal tile in as many as, or less command blocks than the first team wrote down. If the second team does not achieve the goal, they will get 0 points. The first team will get 2 points. If the second team achieves the goal in more command blocks than the first team wrote down, they will get 0 points, and the second team will get 1 point. If the second team achieves the goal in an equal amount of command blocks as the first team wrote down, they will get 1 point, and the other team will get 0 points. If they get to the goal tile in less command blocks than the first team wrote down, they will get 2 points, and the first team will get 0 points.

### WINNING THE GAME

The game ends after every team has had 3 turns (3 different boards). The team with the most points wins the game.

# INSTRUCTION

## Team Cosmo vs Team Cosmo: hardest path

### SET UP

#### *Game Board*

The game board changes every round. The players make teams of 2 (or 3) people. The first team creates the puzzle board together. They try to make it as hard as possible, but still follow the rules mentioned below. They write down what they think is the shortest path. The second team tries to get to the goal tile. The next round the next team can make the board. The players decide for themselves how many puzzle pieces will be used in each round. While making the puzzle board, make sure that:

- The path is possible (not blocked by pits);
- The starter tile is not connected to the goal.

After that, place Cosmo on the starter tile.

### GOAL OF THE GAME

The goal for the first team is to make a very difficult puzzle board together. The goal for the other team is to get Cosmo to the goal tile.

### PLAYING THE GAME

The first team creates the puzzle board. The second team now gets 3 tries to achieve the goal.

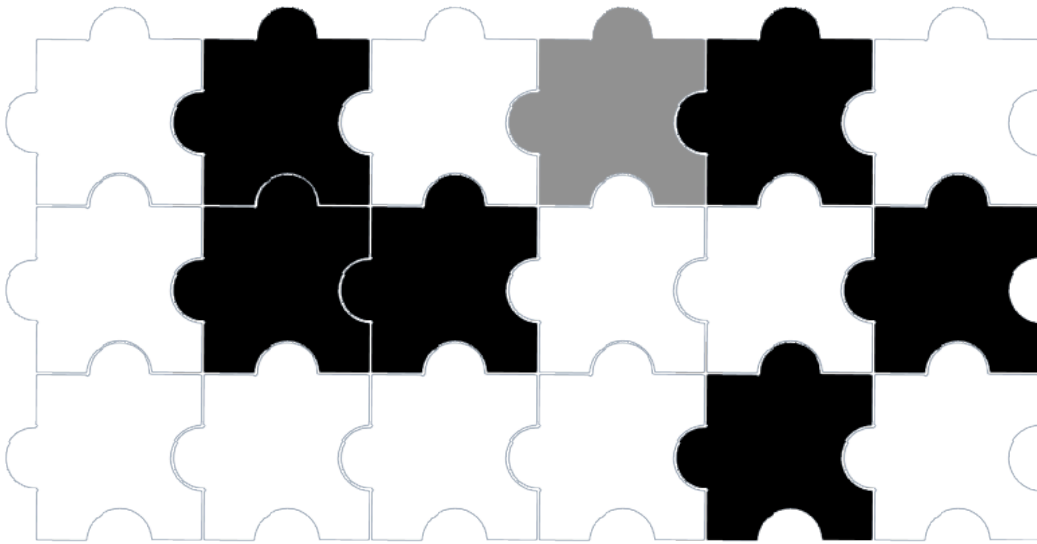
If the second team gets to the goal tile in 1 try, the team gets 3 points, and the first team gets 0 points. If they get it in 2 tries, the team gets 2 points, and the first team gets 1 point. If they get it in 3 tries, the team gets 1 points, and the first team gets 2 points. If the team does not get it at all, the first team gets 3 points, and the second team 0.

### WINNING THE GAME

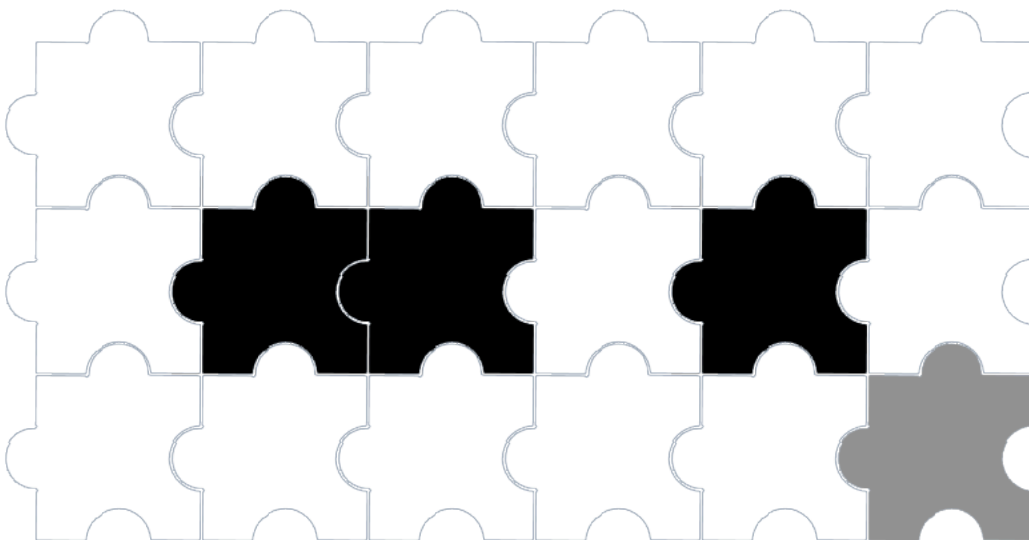
The game ends after every team has had 3 turns (3 different boards). The team with the most points wins the game.

# PUZZLE BOARD EXAMPLES

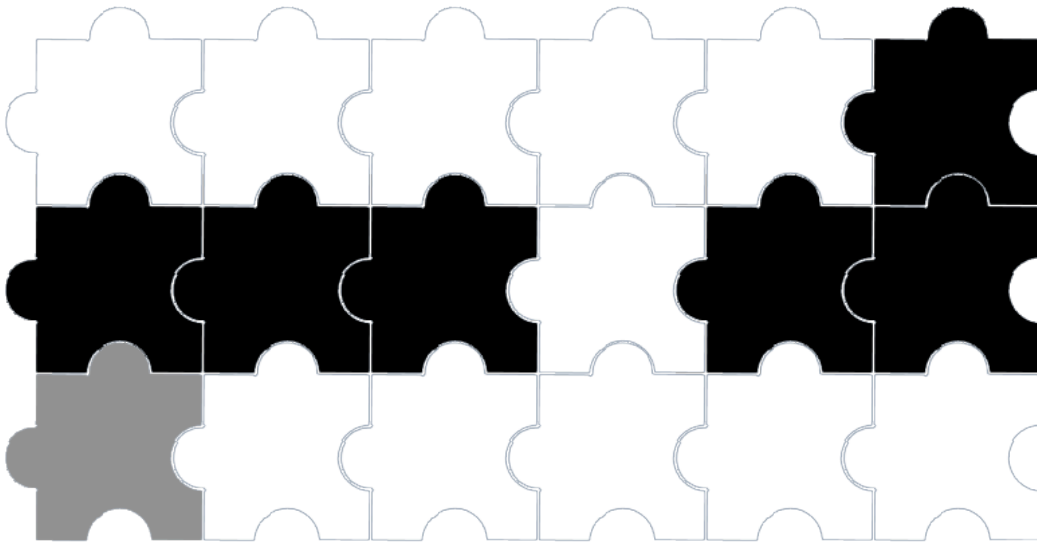
**BOARD 1 \*\*\***



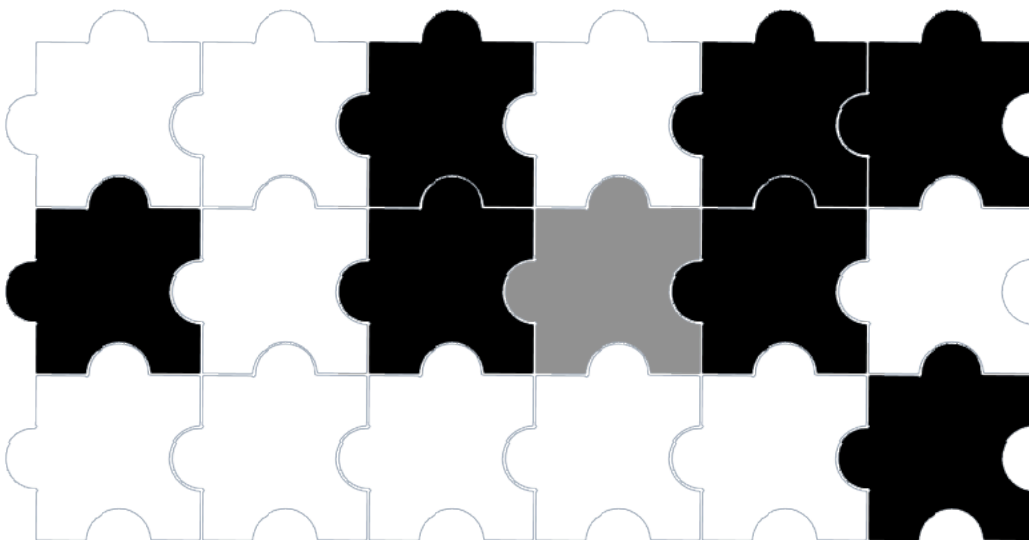
**BOARD 2 \***



### BOARD 3 \*\*



### BOARD 4 \*\*



# PUZZLE BOARD EXAMPLES

## Answers

### **BOARD 1 \*\*\***

#### *No Loops*

Turn Right, Forward, Forward, Turn Left, Forward, Forward, Forward, Turn Left, Forward, Forward

Total: 10

#### *Shortest Path*

Turn Right, Loop 2, Forward, (Loop End), Loop Until Goal Reached, Turn Left, Loop 3, Forward, (Loop End)

Total: 7

#### *With Brackets*

Turn Right, Loop 2(Forward), Loop Until Goal Reached(Turn Left, Loop 3(Forward))

### **BOARD 2 \***

#### *No Loops*

Forward, Forward, Forward, Forward, Forward, Turn Right, Forward, Forward

Total: 8

#### *Shortest Path*

Loop 5, Forward, (Loop End), Turn Right, Loop 2, Forward, (Loop End)

Total: 5

#### *With Brackets*

Loop 5(Forward), Turn Right, Loop 2(Forward)

### **BOARD 3 \*\***

#### *No Loops*

Forward, Forward, Forward, Turn Right, Forward, Forward, Turn Right, Forward, Forward, Forward

Total: 10

*Shortest Path*

Loop 3, Forward, (Loop End), Loop 2, Turn Right, Loop 2, Forward, (Loop End), (Loop End), Forward

OR

Loop 3, Forward, (Loop End), Loop 2, Turn Right, Forward, Forward, (Loop End), Forward

Total: 7

*With Brackets*

Loop 3(Forward), Loop 2(Turn Right, Forward, Forward), Forward

OR

Loop 3(Forward), Loop 2(Turn Right, Loop 2(Forward)), Forward

## **BOARD 4 \*\***

*No Loops*

Forward, Turn Right, Forward, Forward, Turn Left, Forward, Forward, Turn Left, Forward

Total: 9

*Shortest Path*

Forward, Turn Right, Loop Until Goal Reached, Loop 2, Forward, (Loop End), Turn Left

OR

Forward, Turn Right, Loop Until Goal Reached, Forward, Forward, Turn Left

Total: 6

*With Brackets*

Forward, Turn Right, Loop Until Goal Reached(Forward, Forward, Turn Left)

OR

Forward, Turn Right, Loop Until Goal Reached(Loop 2(Forward), Turn Left)