**SLIDE 1**
Hi, my name is …

In todays workshop we are going to learn how to play with code.

To do this we are going to use a clever little device called the Ozobot.

The Ozobot uses a visual programming language (or code) to play games, solve puzzles and dance.

## GOALS FOR THE WORKSHOP

- Understand what coding is
- Learn some simple coding
- Play with Ozobots
- HAVE FUN!!

**SLIDE 2**

Our goals in this workshop are to:

- Understand what coding is
- Learn some simple coding and
- Make the Ozobot complete a task we design for it

How are we going do this?  Through PLAY – we are going to have some fun!

Our first activity is to crack a secret code.

This code isn't written in English and we need you, the top code crackers, to translate it

## SECRET CODE

| | | | | |
|---|---|---|---|---|
| A | 0100 0001 | O | 0100 1111 | |
| B | 0100 0010 | P | 0101 0000 | |
| C | 0100 0011 | Q | 0101 0001 | |
| D | 0100 0100 | R | 0101 0010 | |
| E | 0100 0101 | S | 0101 0011 | |
| F | 0100 0110 | T | 0101 0100 | |
| G | 0100 0111 | U | 0101 0101 | |
| H | 0100 1000 | V | 0101 0110 | |
| I | 0100 1001 | W | 0101 0111 | |
| J | 0100 1010 | X | 0101 1000 | |
| K | 0100 1011 | Y | 0101 1001 | |
| L | 0100 1100 | Z | 0101 1010 | |
| M | 0100 1101 | / | Space | |
| N | 0100 1110 | | | |

What does this read?
01001100 01000101 01010100 / 01001001
01010100 / 01000111 01001111

L = 01001100
E = 01000101
T = 01010100
/
I = 01001001
T = 01010100
/
G = 01000111
O = 01001111

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**SLIDE 3**
**Animation 1**
Everyone open you workbook to page 2, you will find a chart which shows the translation of each letter in the alphabet into a series of 1's and 0's.

We are using this table in this activity.

**Animation 2**
On the same page you will find a piece of code that we are going to translate.

Using the table you will be able to be translate the number code into letters.

Alongside the numbers the secret code statement also uses a slash – this slash represents a space between words.

Let's start work on the first code and insert the space as our first step:

**Animation 3**

| 01001100 | 01000101 | 01010100 | / | 010001001 | 01010100 | / |
|---|---|---|---|---|---|---|
| _____ | _____ | _____ | SPACE _____ | _____ | SPACE | |

01000111     00101111

_____     _____

Now that we have inserted our spaces we can see that there are three words. Let's have a go at translating it together.  What does this combination of numbers represent?

Have a look at your charts and then compare it to the first group of numbers. Each combination of 8 numbers equals one letter.

**Animation 4**
So for example the first letter is L.

**Animation 5**
The next letter after that is E.

Who can translate the third letter?

**Animation 6**
That's right – this equals a T.

Let's translate the remainder of the statement.

Put your hand up if you know what is the next letter?

**Animation 7**
Yes, it is an I, followed by what?

**Animation 8**
A T. Now does anyone want to tell the group what this statement says?

**Animation 9 and 10**
That's right G and O


Well done everyone. Now what skills did you use to work out that answer?

Did you use patterns at all? – OPPORTUNITY FOR DISCUSSION ABOUT HOW THEY TRANSLATED – USE OF PATTERNS, PREDICTION – ANYTHING ELSE?

Now that we have completed one together – you can do some on your own.

NOW YOU TRY

1. 01000010 01000001 01011001 01001101 01000001 01011000 .

2. 01010100 01001111 01001111 01010100 01001000 01001100 01000101
01010011 01010011

3. 01010011 01001000 01000001 01001011 01000101 / 01001001 01010100 /
01001111 01000110 01000110

4. 01001010 01010101 01010011 01010100 / 01010011 01001101 01001001
01001100 01000101 / 01000001 01001110 01000100 / 01010111 01000001
01010110 01000101 / 01000010 01001111 01011001 01010011

5. 01000101 01010110 01000101 01010010 01011001 01010100 01001000
01001001 01001110 01000111 / 01001001 01010011 / 01000001 01010111
01000101 01010011 01001111 01001101 01000101

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**SLIDE 4**

On page three of your workbook are some more codes for you to crack.

If you get stuck or have any questions, please let me know.

You have ten minutes.

SET TIMER – Choose between 5 – 10mins depending on how long the workshop is going for

EXTENSION ACTIVITY

• Translate your first name

• Translate the title of your favourite book or TV show

• Swap with a friend to see if they can guess it

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**SLIDE 5**
If anyone finishes early, try translating your name, your favourite TV show or book and swap it with a friend for them to crack.

MARK TIME AT 5 MINUTES & 8 MINUTES

**ANSWERS**

1. Baymax
2. Toothless
3. Shake it off
4. Just Smile and Wave Boys
5. Everything is Awesome

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**SLIDE 6**

Time is up, how did everyone go? I am going to go through the answers so you can check how you went.

The answers are displayed behind me, with in order the code translating to be:
- Baymax – Character from the movie; Big Hero 6
- Toothless – Character from the movie; How to Train your Dragon
- Shake it off – Song from Taylor Swift
- Just Smile and Wave Boys – Quote from the movie; Madagascar and finally,
- Everything is awesome – Quote from "The Lego Movie"

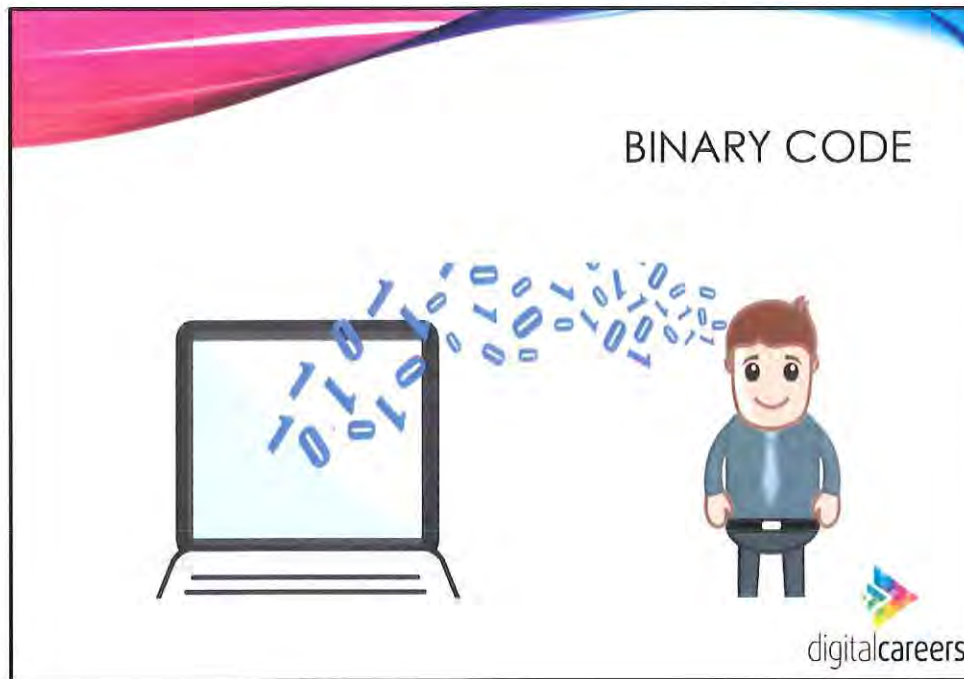How did you all go? Who got five out of five? What other scores did people get?

**SLIDE 7**

Why do you think we might use code?

Where are some places that you would use code?

Other possible answers

**SLIDE 8**

The code we just used is a language called Binary.

The Binary Code is the language which computers use to store information.

As computers don't speak or use a spoken language like we do; the original computer technicians had to figure out a way for computers to understand us.

They had to think of an easier way for people to talk to computers without using a spoken language.

They also needed a global language which didn't change whatever country the user was from.

This is why the binary code was created. It's a language which allows us to communicate using only two symbols- a 1 and a 0.

Because computers are incredibly fast, they are able to quickly read and process all the 1's and 0's. They are then able to understand what we, the users, are asking to be

completed.

Binary code is found everywhere.
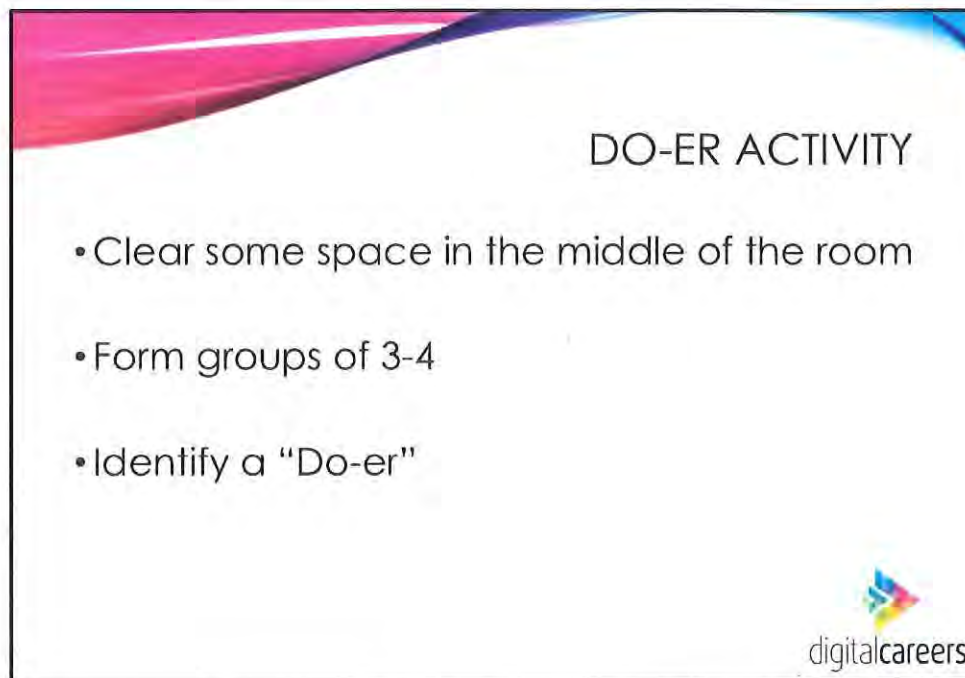What are some examples you can think of where binary code might be used?

POSSIBLE ANSWERS:
Does anyone have a computer or laptop at home?
Who has a car?
It's used in mobile phones, CD's, tablets all sorts of things.
Does anyone have any questions?

Do-er Activity

Okay, now we are going to move onto a new activity.

Clear a space and make some room for people to move around. (Waits for everyone to shuffle around and get into groups)

Form into small groups of 3 or 4 people.

In this activity each group will break into two parts – One member will be "The Do-er" and the remaining members will give the Do-er instructions they must follow.  There are a couple of rules to this activity that you must follow:
- The Do-er can only do what their team members tell them – there is no other speaking between the do-er's  and the rest of the group members
- The Do-er cannot do anything extra to the instructions from their team – no additional steps or turns

Everyone break your groups into two parts:
One team member, the do-er, is going to turn move away from their team members

(identify a space that is separate from the groups – wait for them to move).

I am going to come around to the remaining group members and give each some activity cards and a sealed envelope.

Each of these activity cards are going to have a specific instruction on them, such as take one step forward or turn left or right.

Group members are going to provide instructions to the Do-er to recreate the path that is in the sealed envelop.

ACTIVITY TWO
EXAMPLE PATH

- Example Path

Options
2 X 1 Step Forward
2 X 1 Right Turn
2 X 1 Left Turn

Answer-
2 Steps Forward
1 Right Turn
2 Steps Forward

Scale:
One line = One step

One step

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Do-er Activity

On screen is an example pathway.

Group members are going to arrange the activity cards to guide the Do-er along the path.

We will start at the star and have to make our way to the smiley face.

How do you think we might achieve that with the options we have here?

To start off we need to move forward. Do-er's, take two steps forward.

What is the next direction?

We need to turn, which direction do we need to turn?  Right is the correct answer.

What do we need to do to reach the smiley face? Move forward two steps.

Great job everyone, now it's your turn.

Before the Do-er's return to their groups, each group can open their sealed envelope. In this envelope is the next three tasks within this activity.

Work through each, one at a time, when you complete setting out the instructions for each task get your Do-er to complete it.

Do-er's return to your team into the roles and remember Do-er's can only do what their group has instructed them!!
Record you instructions for each path in your workbooks on page 5, 6 and 7

Let's get started – you have 10 minutes to complete these.

WORKING TIME

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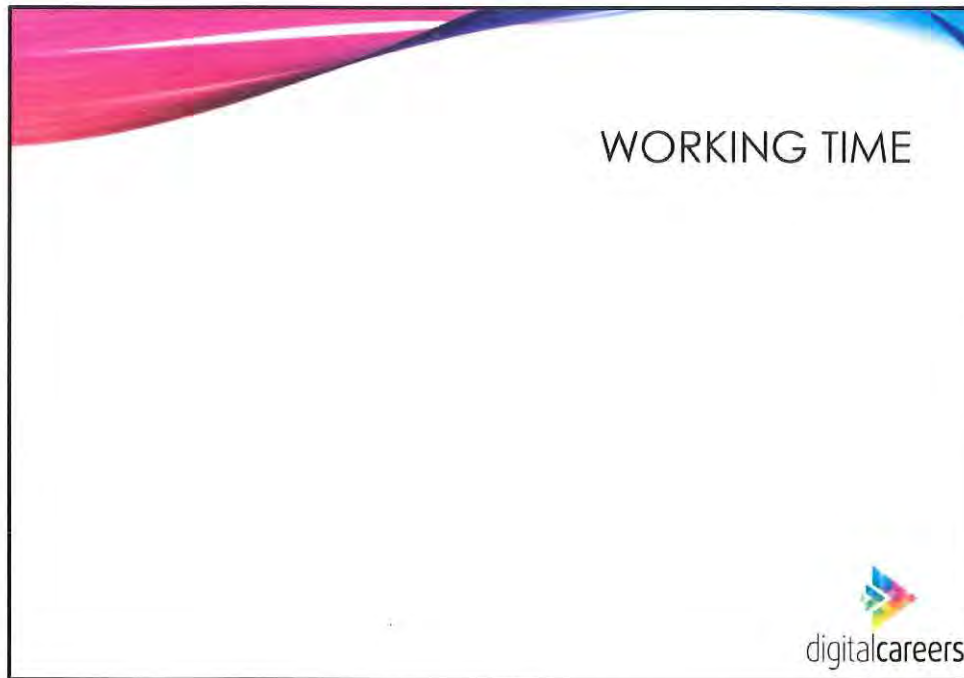
Choose between 5 – 15 mins depending on how long the previous activities and how much time is left over

# ANSWERS

**Path 1**
2 Steps Forward, 1 Left Turn, 2 Steps Forward

**Path 2**
2 Steps Forward, 1 Right Turn, 2 Steps Forward, 1 Left Turn, 2 Steps Forward

**Path 3**
3 Steps Forward, 1 Right Turn, 1 Step Forward, 1 Right Turn,
3 Steps Forward, 1 Left Turn, 1 Step Forward, 1 Left Turn, 3 Steps Forward

**Path 4**
4 Steps Forward, 1 Right Turn, 3 Steps Forward, 1 Right Turn,
4 Steps Forward, 1 Right Turn, 2 Steps Forward, 1 Right Turn,
3 Steps Forward, 1 Right Turn, 1 Step Forward, 1 Right Turn, 1 Step Forward

**Reflection**

Now that you all have tried each task,- how did everyone go?

What worked and what didn't for everyone?

Opportunity for discussion and reflection about the activity.
(Have a 4 minute discussion/reflection about the activity-
Consider the following questions:
- How did your communication work?
- What was it like? Was it hard? Was it easy?
- What worked?
- What didn't?
- Any problems?
- Did the Do-er's find it hard to only follow the instructions?
- What would you do different next time?

BREAK

**We will be working in our groups for the rest of this workshop – please remember who is in your group.**

We are now going to have a break for 10 minutes.
Pass the group back to the teacher who will provide instructions about what the students are to do; like being able to eat or go outside)

BRAINSTORMING

- Where is coding used?

  - Traffic Lights
  - Car
  - GPS
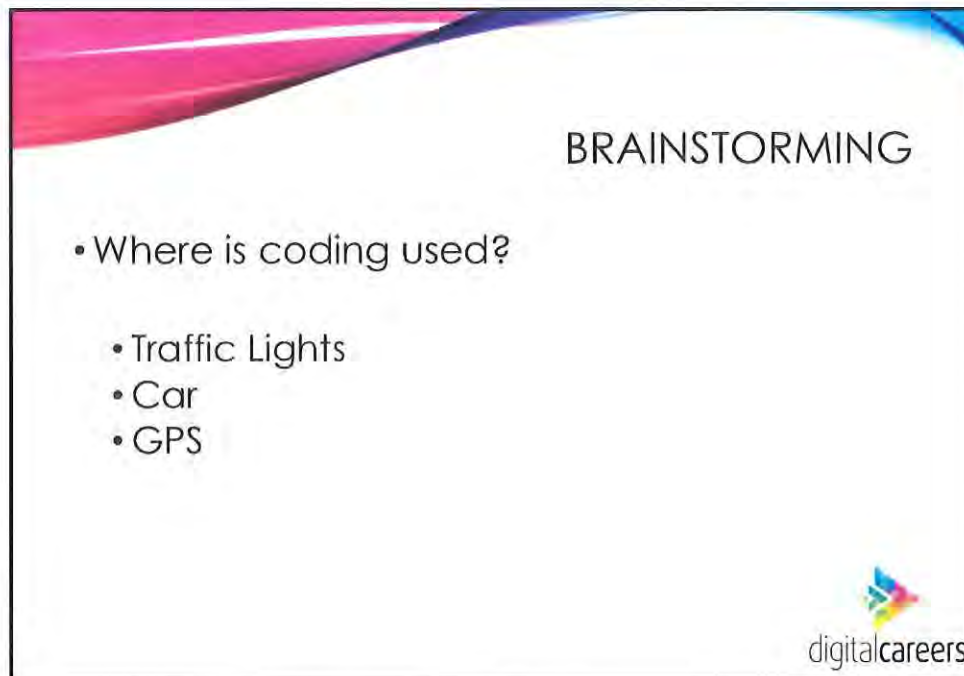
Everybody back into their groups.

Brainstorming!

In this session we are going brainstorm.

I will ask everyone a question – we will go around the group so that everyone has an opportunity to answer that question.

I am then going to write your answers on the whiteboard (can be substituted for paper)

So far in our workshop we have learnt to Crack a Code & we have learnt what binary code is.  We have also given our Do-er's instructions to complete a task.

You could say that we have started to learn to code!

Our question for this session is – Where is coding used?

Can you think of something that needs coding to make it work?  For example – what about traffic lights – do you think they have been coded or programmed to work?

What are some other examples?
- Car
- GPS

I want to you take a few minutes to think about this – you can talk to your neighbour.  When you have an answer put your hand up.

**Additional prompts if needed:**

Think about it, what sort of things do you have at home? Would there anything that you use on a daily bases have programming in them? Think about what you use in the classroom? What do your teachers use?

The answers should be along the following lines:
- Computer
- Phone
- CD
- Music player
- fitbit
- Robots

Try to get the students to think about things that they see every day

BRAINSTORMING OUTCOMES

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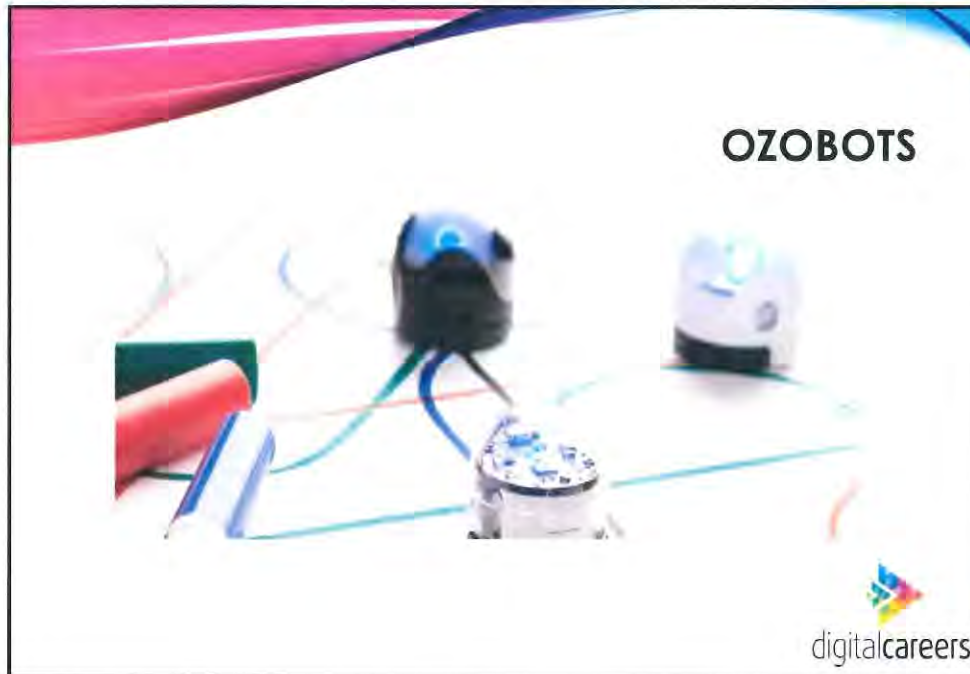
Now that we all have an understanding of what coding or programing is, we can play with the Ozobots

This is an Ozobot. It uses a visual programming language that is really simple.

The Ozobot uses colour sensors located at the bottom of its shell. These sensors recognise colour and will follow a track or line. It will also reflect the colour that it is following.

The colours that it recognises are Black, Red, Green and Blue.

When placed on a surface, the Ozobot will track and follow any lines of these colours.

So for example, if I draw a black line then a red line on this piece of paper. (Draws line on the piece of paper)

The Ozobot will follow it, while lighting up. (Place Ozobot on the line, the instructor has just drawn)

The question now is – How do we program an Ozobot?

How do you think we might do that?

OZOBOTS- EXAMPLE

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The visual program that the Ozobot uses relies on colours.  We can use the different coloured makers to give the Ozobot instructions.

By using a specific combination of colours situated between two black points, you are able to instruct the robot on what you would like it to do.

* **Using these two colours I will draw a combination for the Ozobot to follow. Now watch what happens when the Ozobot drives over it. (Draws the combination then has the Ozobot drives over it)**

What does it do?

It does a U-turn.

Referring to THIS slide and on page 9 of your workbook, you will see all the different combinations of colours and steps that you are able to use to program the Ozobot.

- **Now have a look as I place my Ozobot on these lines that I have drawn and watch the pattern it makes.**

Now it's your turn, so get back into your groups of 3 or 4 students. In this activity you are going to play with some set patterns and get used to the "coding" the Ozobots.
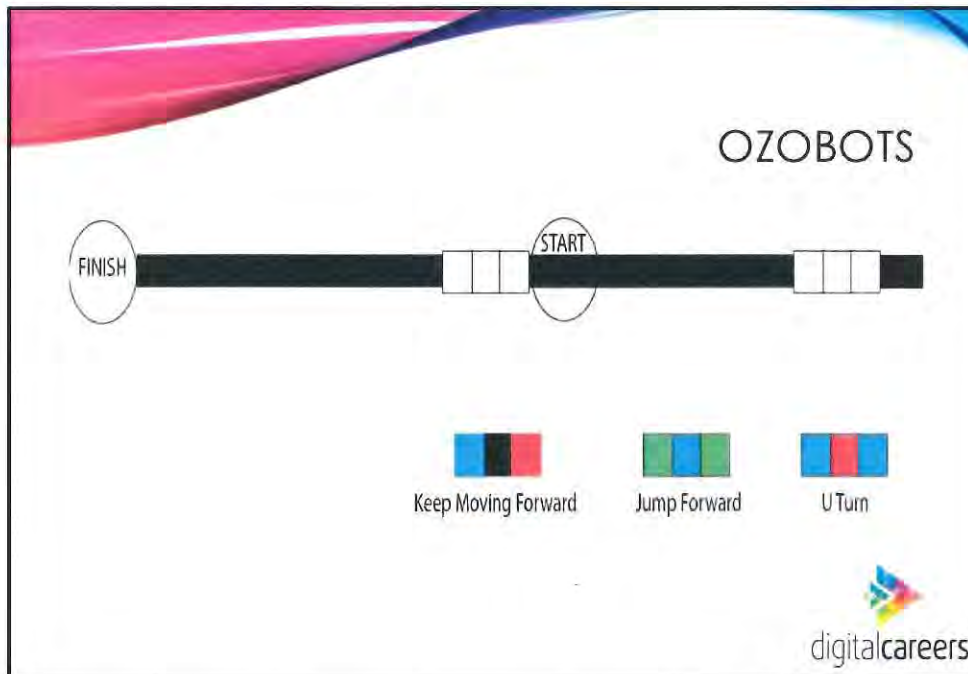
We will complete this example together first. Go to page 9 of your workbook. Using the codes from page 8 you are going to add the code the first map.

The most important thing to remember when drawing these patterns, is that there must be black on each side of the code, otherwise it will not be recognised.

Choose the code that will help your Ozobot reach the goal.

Once you have decided which the correct one is, get the markers and fill in the blank squares.

Make sure to pick the right ones, because you will be testing them with the Ozobots soon.

Does anyone have any questions before we start?

Then go ahead and start.

Okay. Has everyone finished?
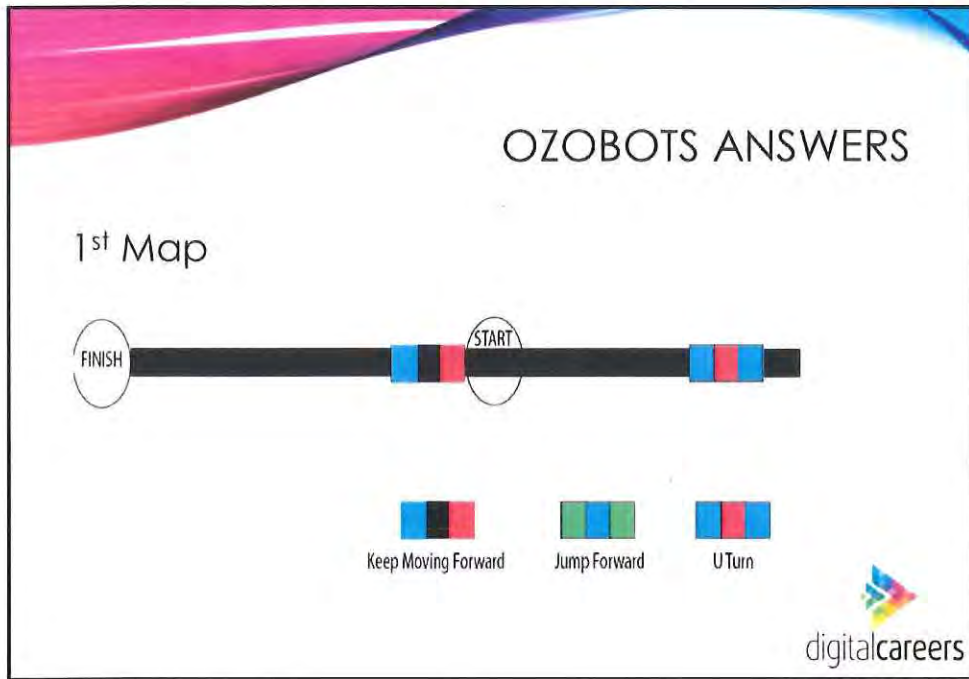
The answers for this map are:

Code 1: U-Turn
Code 2: Keep Moving Forward

How did you go?

## OZOBOTS ACTIVITIES

- Please complete the activities on page 10 - 14 with the Ozobots

- Some tips for you to consider
  - When drawing these patterns, there must be black on each side of the code, otherwise it will not be recognised.
  - Make sure your Ozobot moves in the direction indicated by the arrow on your maps

- Please put your hand up if you need my help

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Now we are going to work through the remaining maps and then test them using the Ozobots.

Starting with the map on page 10 and working through to page 14 – I want you to discuss in your groups the answers for these maps.

Put your code for each map in the workbook of one member of your team – at the end each member of your team should have the code you decide on in at least on map in your workbook.

Get started!  You have 10 minutes.

**OZOBOTS ANSWERS**

- Time's Up
- Collect an Ozobot
- Test your answers
- Check your answers

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One person from each group can come up to collect one Ozobot to take back to their group? (Wait until this is done)

Each member of your group can run the Ozobot over one of your maps that we have been working on.

Test it out on each of the maps – you have 5 minutes.

Time's up

Let's look at the answers:

2nd Map

OZOBOTS ANSWERS
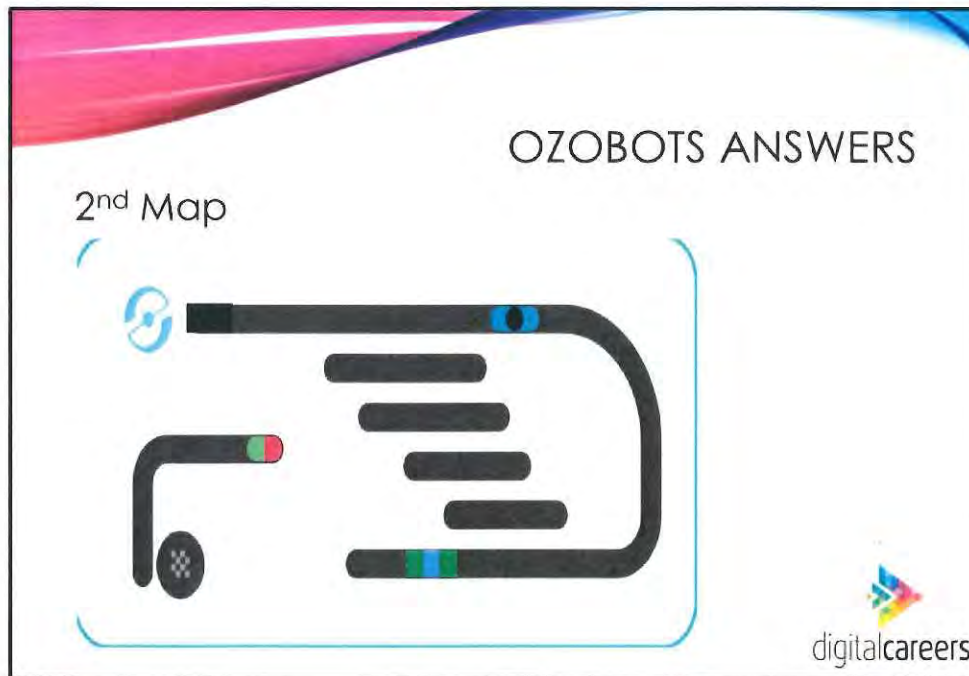
The answers for this map are:

Code 1:  Fast
Code 2:  Jump straight
Code 3:  Finish Code (GameOver)

How did you go?

The answers for this map are:

Code 1:  Jump Left
Code 2:  Jump Right
Code 3:  U Turn
Code 4:  Jump Left
Code 5:  Jump Straight
Code 6:  Finish Code (GameOver)

How did you go?
Who used different code?
Did it work?
What did you use?

The answers for this map are:

Code 1: Jump Right
Code 2: U Turn
Code 3: Jump Right
Code 4: U Turn
Code 5: Jump Left
Code 6: U Turn
Code 7: Jump Right
Code 9: Go Straight
Code 10: U Turn
Code 11: Go Straight
Code 12: Go Straight


How did you go?
Who used different code?
Did it work?
What did you use?

Extension Maps– 2nd Map OZOBOTS ANSWERS
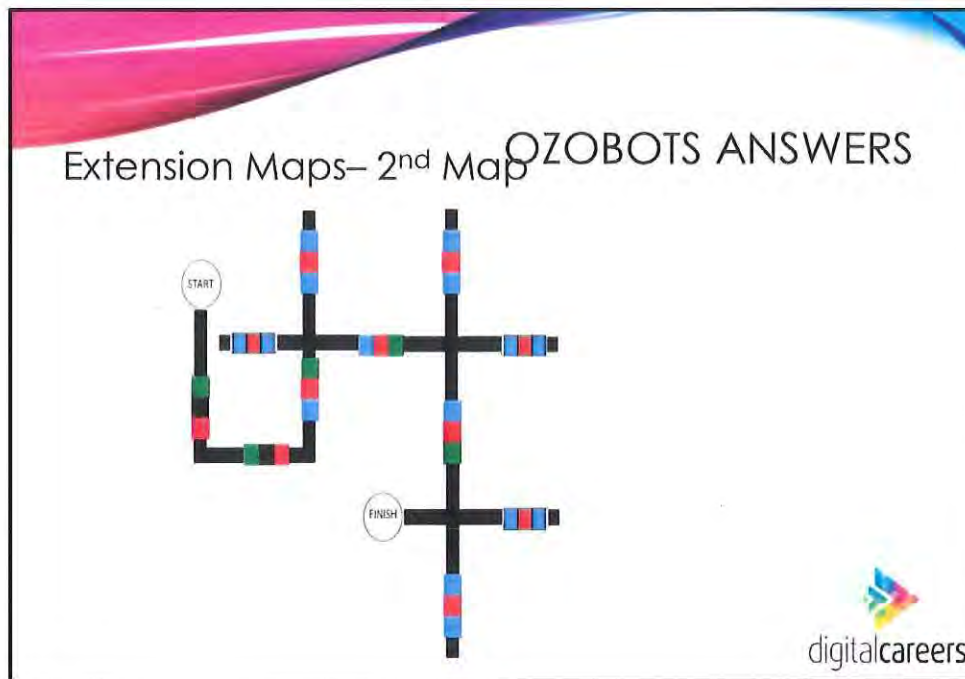
The answers for this map are:

Code 1:  Turn Left
Code 2:  Turn Left
Code 3:  Turn Right
Code 4:  Turn Right
Code 5:  Turn Right


How did you go?
Who used different code?
Did it work?
What did you use?


Jump Left
Jump Right
Jump Straight
U Turn
Finish Code
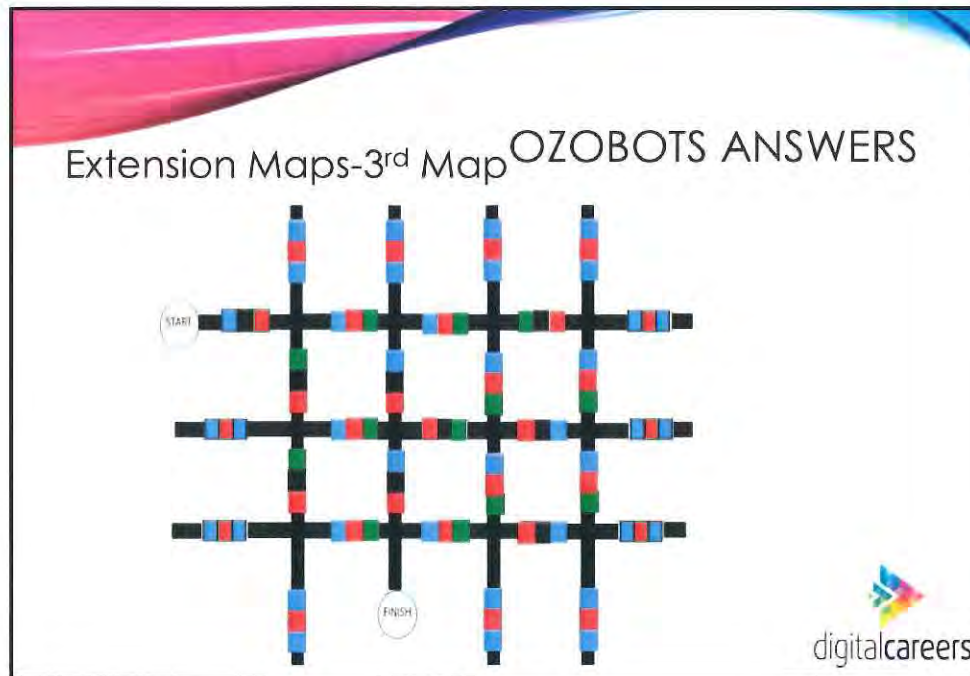
The answers for this map are:
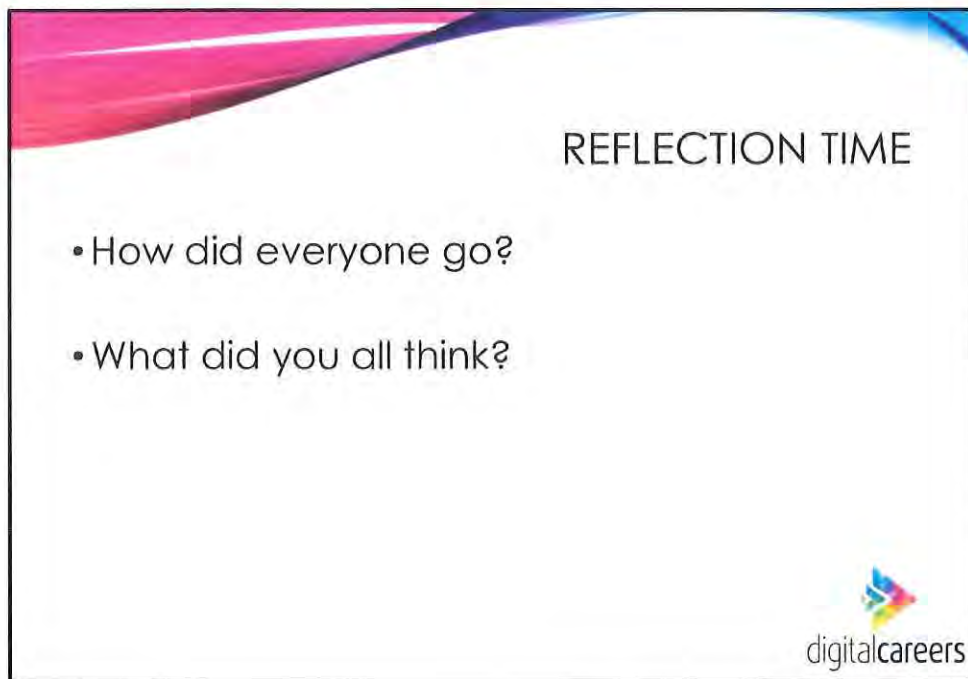
Code 1: Go Straight
Code 2: Go Left
Code 3: Go Straight
Code 4: Go Straight

(Code is from the path taken from the start to finish)


How did you go?
Who used different code?
Did it work?
What did you use?

This answer caters to Ozobots entering from different start positions.


Turn Left
Turn Right
U turn
Go Straight s

REFLECTION TIME

- How did everyone go?

- What did you all think?

Have all the groups had a go?

Please put all of the Ozobots down for a couple of minutes and focus here.

So what did everyone think?
Did everyone like the activities?
What was your favourite?
What was the one that was your least favourite?
Did you enjoy yourself? If so, why?
Did everyone learn something today?
What was that?
Does have any questions? Any other finale thoughts?

FREE TIME

- Create your own patterns

- Complete the rest of the workbook

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Okay so now we have some time left for everyone to play with the Ozobot and have a go at drawing their own patterns.

One member from each group can come up and get some paper and pens.

Feel free to try out different combinations and experiment.

You can also work through the rest of the workbook if you would like to.

THANKS FOR LISTENING

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Does anyone have any questions before we start packing up?

If anyone is also wanting to learn more about technology or coding, on page 15 of your workbook, you will find a link to Digital Careers, this website has loads of information about events and places you can find more information about IT.

Okay so now we need to start packing up, can you please return the Ozobots to me? I will then come around and collect your markers and the rest of the unused paper.

Thank you all for listening today, and I hope everyone enjoyed the workshop. Have a lovely day.

# Playing with Code

TUTOR WORKBOOK

NAME:

Worksheet

| A | 0100 0001 | O | 0100 1111 |
|---|---|---|---|
| B | 0100 0010 | P | 0101 0000 |
| C | 0100 0011 | Q | 0101 0001 |
| D | 0100 0100 | R | 0101 0010 |
| E | 0100 0101 | S | 0101 0011 |
| F | 0100 0110 | T | 0101 0100 |
| G | 0100 0111 | U | 0101 0101 |
| H | 0100 1000 | V | 0101 0110 |
| I | 0100 1001 | W | 0101 0111 |
| J | 0100 1010 | X | 0101 1000 |
| K | 0100 1011 | Y | 0101 1001 |
| L | 0100 1100 | Z | 0101 1010 |
| M | 0100 1101 | / | Space |
| N | 0100 1110 | | |

Example Code

01001100 01000101 01010100 / 01001001 01010100 / 01000111 01001111

L   E   T   /   I   T   /   G   O

Activity 1

1. 01000010 01000001 01011001 01001101 01000001 01011000

   Answer: <u>Baymax</u>– Character from the movie; Big Hero 6

2. 01010100 01001111 01001111 01010100 01001000 01001100
   01000101 01010011 01010011

   Answer: <u>Toothless – Character from the movie; How to Train your Dragon</u>

3. 01010011 01001000 01000001 01001011 01000101 / 01001001
   01010100 / 01001111 01000110 01000110

   Answer: <u>Shake it off – Song from Taylor Swift</u>

4. 01001010 01010101 01010011 01010100 / 01010011 01001101
   01001001 01001100 01000101 / 01000001 01001110 01000100 /
   01010111 01000001 01010110 01000101 / 01000010 01001111
   01011001 01010011

   Answer: <u>Just Smile and Wave Boys – Quote from the movie; Madagascar</u>

5. 01000101 01010110 01000101 01010010 01011001 01010100
   01001000 01001001 01001110 01000111 / 01001001 01010011 /
   01000001 01010111 01000101 01010011 01001111 01001101
   01000101

   Answer: <u>Everything is awesome.- Quote from "The Lego Movie"</u>

## Extension Activities Space:

## Activity 2

- Form into groups of 3 or 4
- Pick a Do-er
- The rest of the group are going to provide instructions to recreate the path in the sealed envelop

## Path 1-Answer

1. 2 Steps Forward
2. 1 Left Turn
3. 2 Steps Forward

## Path 2

1. 2 Steps Forward
2. 1 Right Turn
3. 2 Steps Forward
4. 1 Left Turn
5. 2 Steps Forward

Path 3

1. 3 Steps Forward
2. 1 Right Turn
3. 1 Step Forward
4. 1 Right Turn
5. 3 Steps Forward
6. 1 Left Turn
7. 1 Step Forward
8. 1 Left Turn
9. 3 Steps Forward

Path 4

1. 4 Steps Forward
2. 1 Right Turn
3. 3 Steps Forward
4. 1 Right Turn
5. 4 Steps Forward
6. 1 Right Turn
7. 2 Steps Forward
8. 1 Right Turn
9. 3 Steps Forward
10. 1 Right Turn
11. 1 Step Forward
12. 1 Right Turn
13. 1 Step Forward

# Ozobots Activities

## Ozobots Code



**OzoCodes** — Color code reference chart

**ozobot**

### SPEED

| | | |
|---|---|---|
| SNAIL PACE | SLOW | CRUISE |
| FAST | TURBO | NITRO BOOST |

### DIRECTION

| | | |
|---|---|---|
| GO LEFT | GO STRAIGHT | GO RIGHT |
| JUMP LEFT | JUMP STRAIGHT | JUMP RIGHT |
| U-TURN | U-TURN (LINE END) | |

### TIMERS

| | | |
|---|---|---|
| TIMOTION (60 SEC TIMEOUT) | TIMOTION | PAUSE (3 SEC) |

### COOL MOVES

### WIN/EXITS

WIN/EXIT (PLAY AGAIN)

WIN/EXIT (GAME OVER)

### COUNTERS

ENABLE X ING COUNTER

ENABLE TURN COUNTER

ENABLE PATH COLOR COUNTER

ENABLE OZOBOT COUNTER
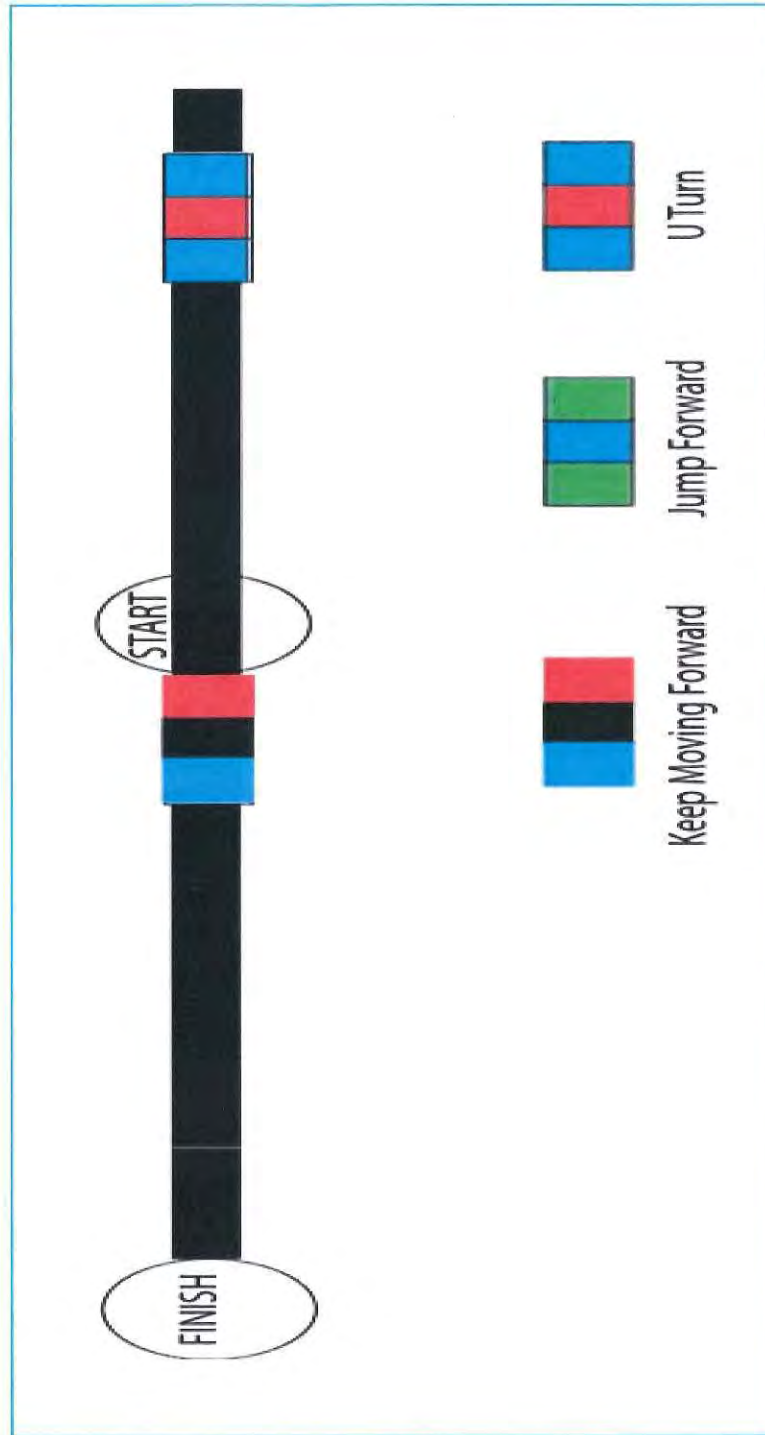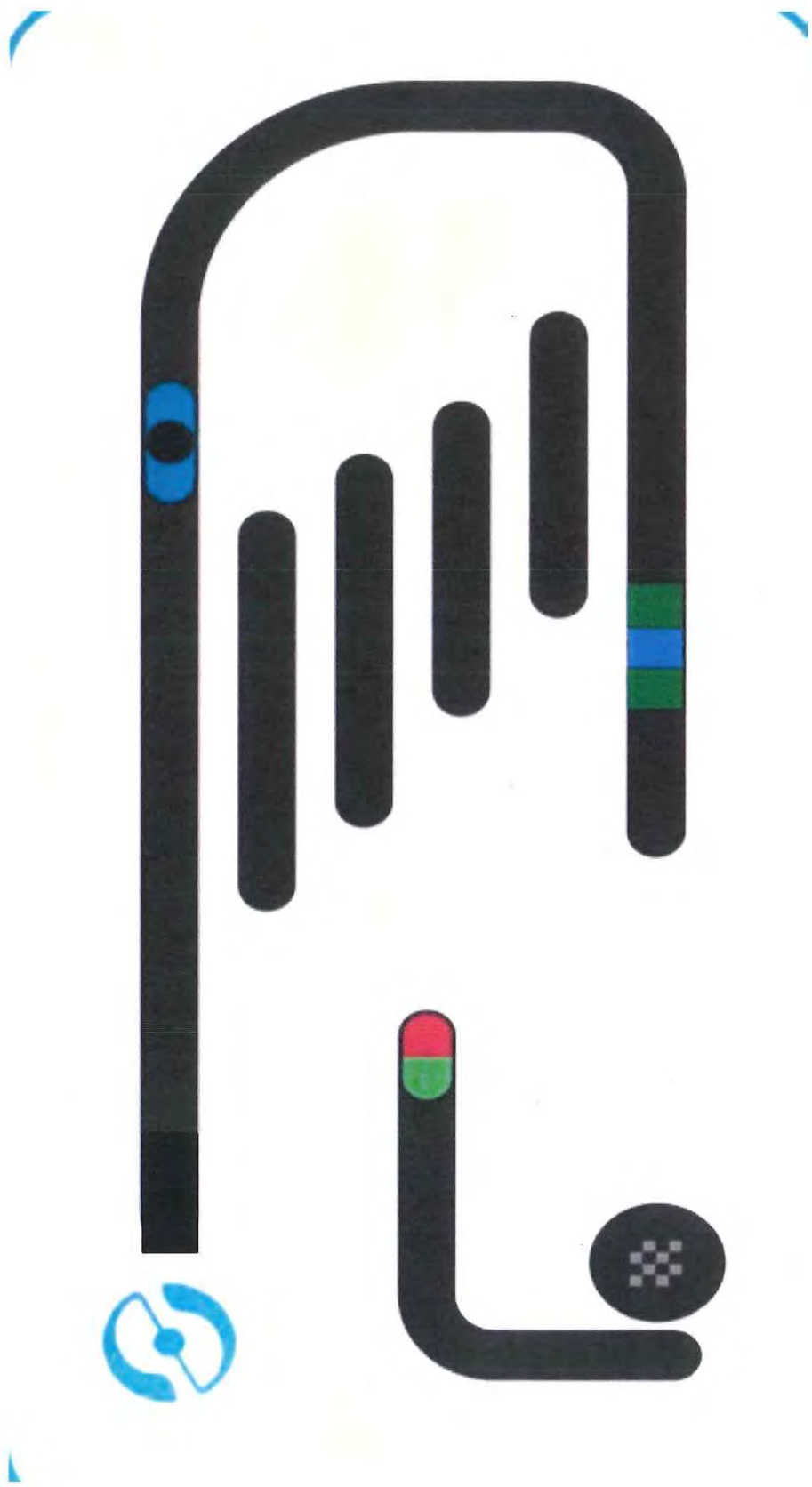
# Map 1

# Map 2

# Map 3
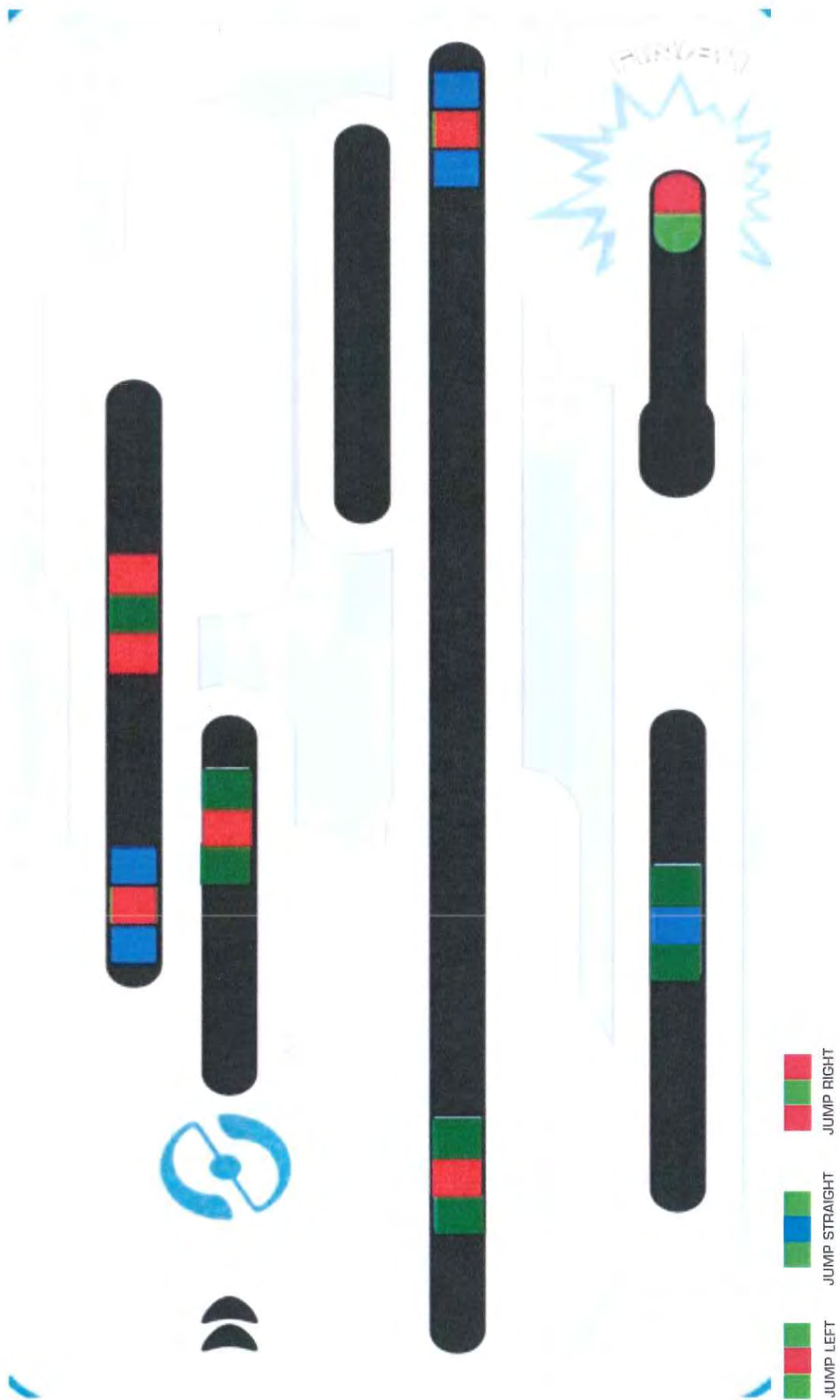
Extension Activities-choose from the codes on the Ozobot sheet

Extension Map 1
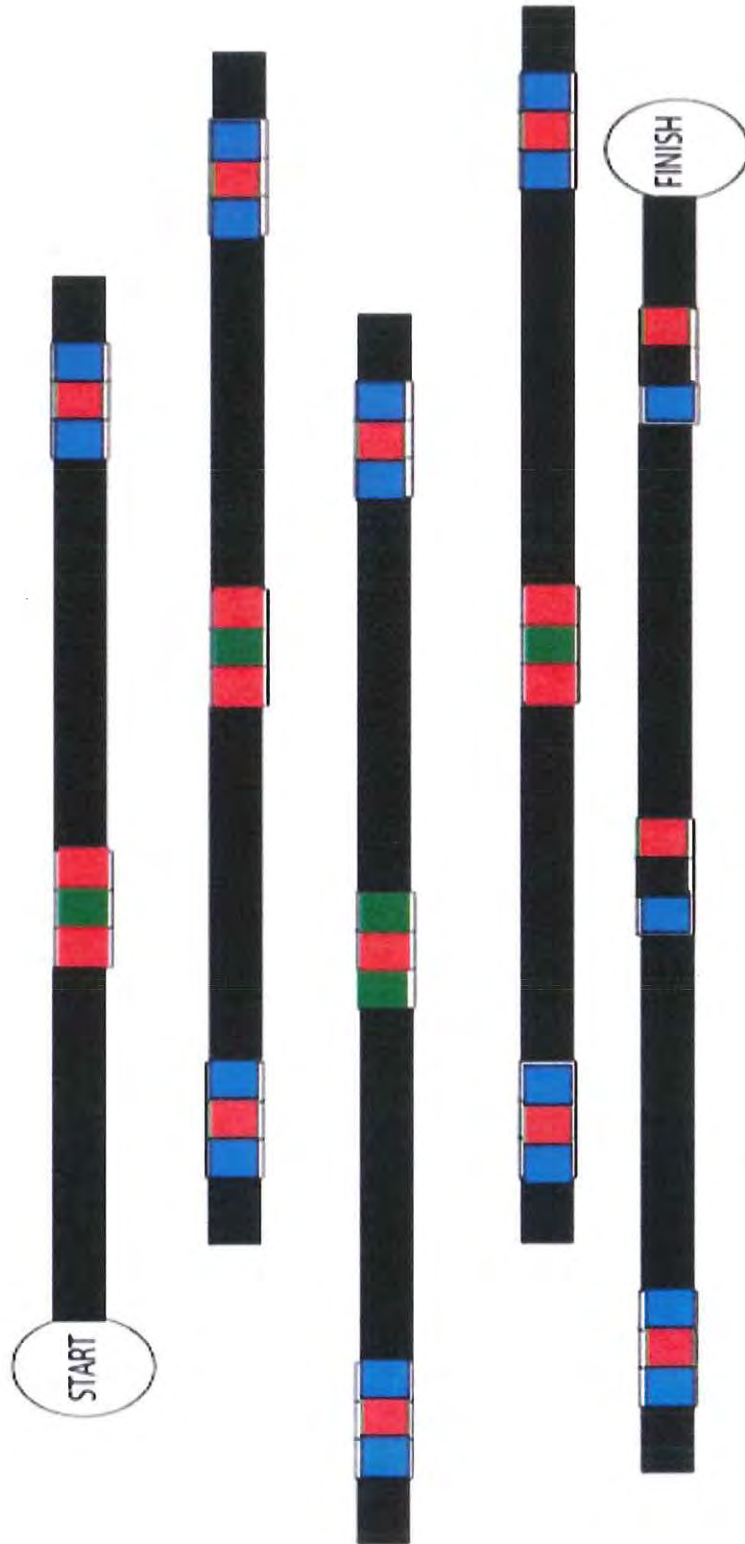
# Extension Map 2
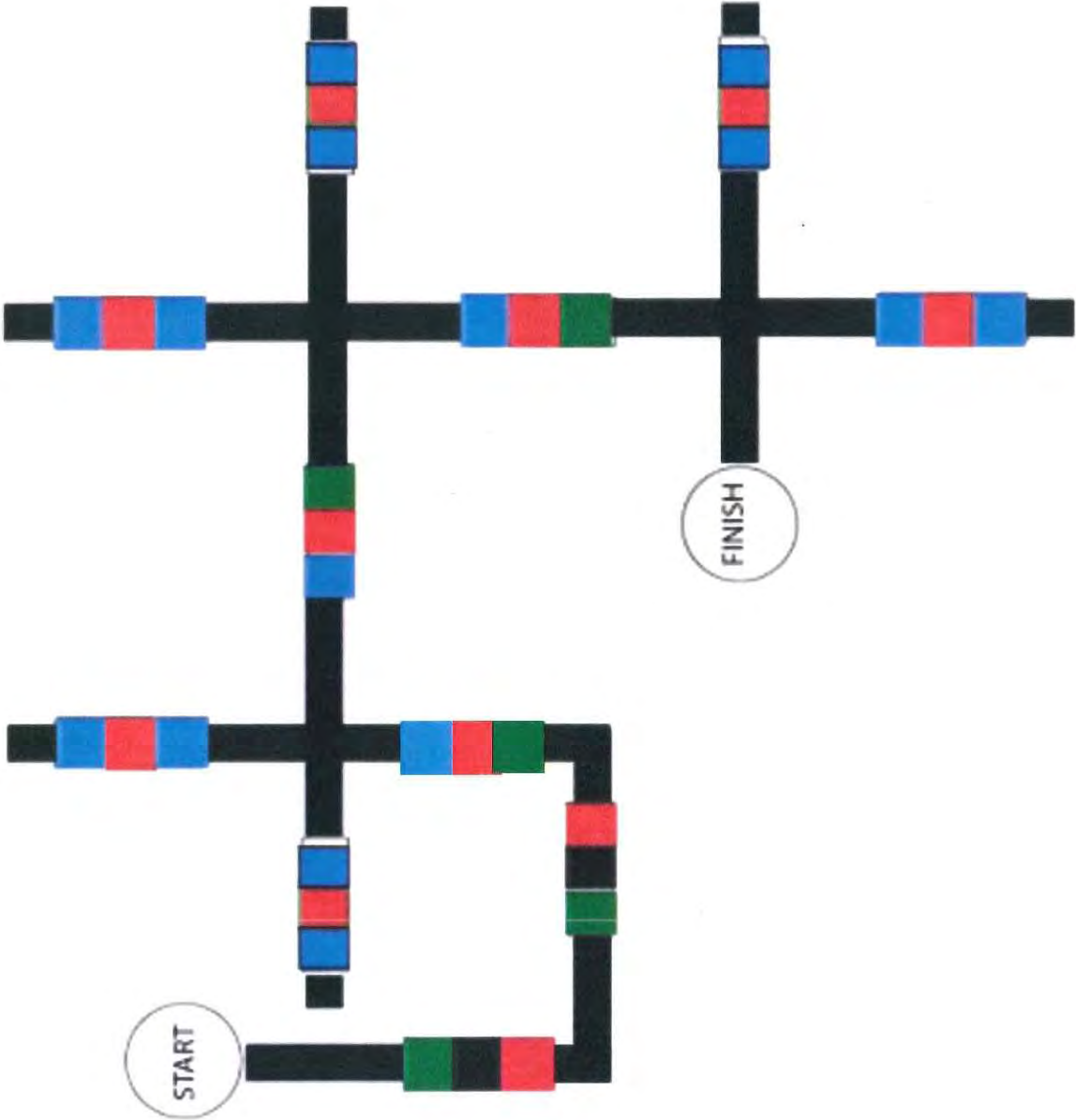
# 3rd Map
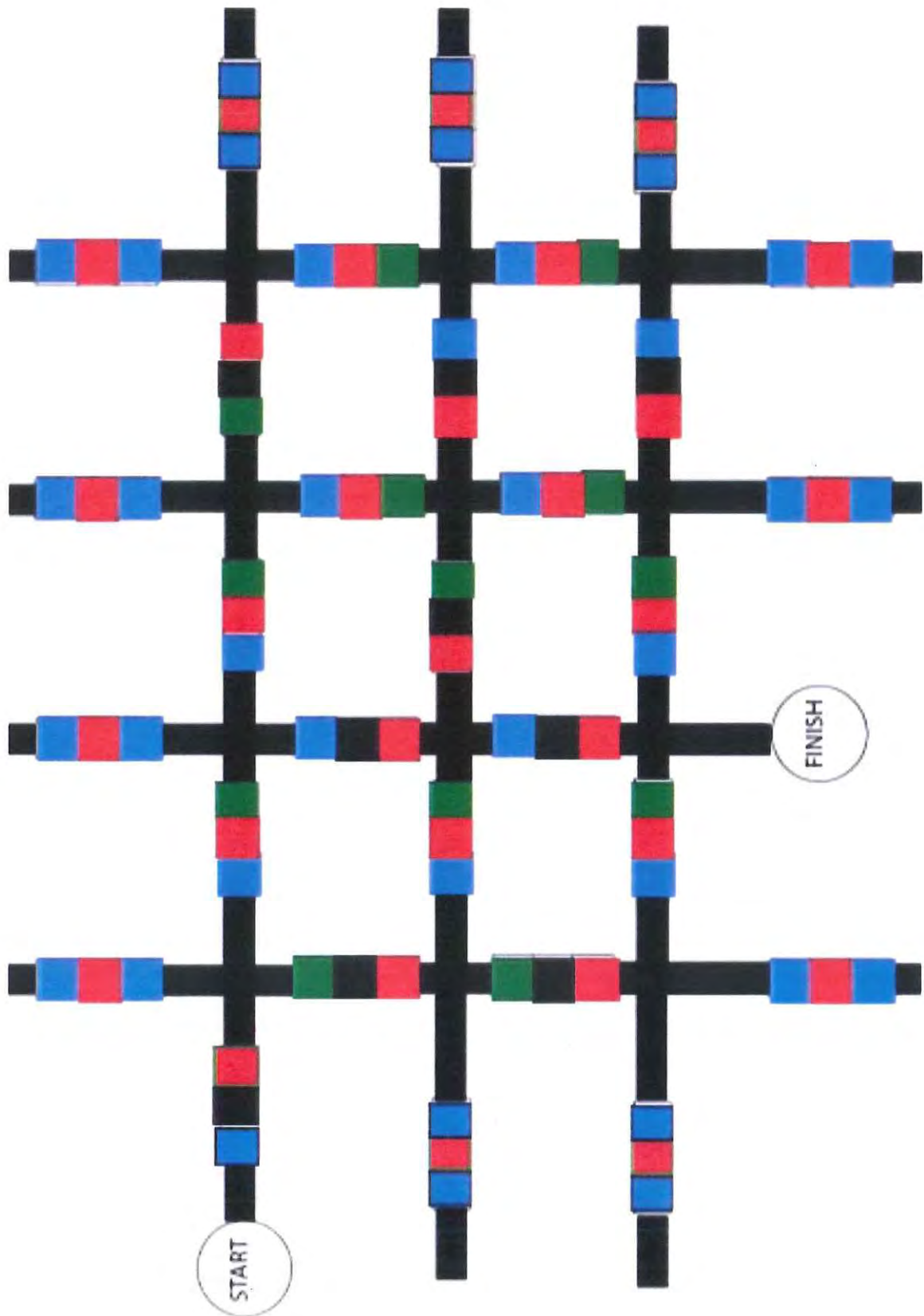
# Playing with Code

STUDENT WORKBOOK

NAME:

Worksheet

| A | 0100 0001 | O | 0100 1111 |
|---|-----------|---|-----------|
| B | 0100 0010 | P | 0101 0000 |
| C | 0100 0011 | Q | 0101 0001 |
| D | 0100 0100 | R | 0101 0010 |
| E | 0100 0101 | S | 0101 0011 |
| F | 0100 0110 | T | 0101 0100 |
| G | 0100 0111 | U | 0101 0101 |
| H | 0100 1000 | V | 0101 0110 |
| I | 0100 1001 | W | 0101 0111 |
| J | 0100 1010 | X | 0101 1000 |
| K | 0100 1011 | Y | 0101 1001 |
| L | 0100 1100 | Z | 0101 1010 |
| M | 0100 1101 | / | Space |
| N | 0100 1110 | | |

Example Code

01001100 01000101 01010100 / 01001001 01010100 / 01000111 01001111

_____  _____  _____/  _____  _____/  _____  _____

Activity 1

1. 01000010 01000001 01011001 01001101 01000001 01011000

   Answer: _____

2. 01010100 01001111 01001111 01010100 01001000 01001100 01000101 01010011 01010011

   Answer: _____

3. 01010011 01001000 01000001 01001011 01000101 / 01001001 01010100 / 01001111 01000110 01000110

   Answer: _____

4. 01001010 01010101 01010011 01010100 / 01010011 01001101 01001001 01001100 01000101 / 01000001 01001110 01000100 / 01010111 01000001 01010110 01000101 / 01000010 01001111 01011001 01010011

   Answer: _____

5. 01000101 01010110 01000101 01010010 01011001 01010100 01001000 01001001 01001110 01000111 / 01001001 01010011 / 01000001 01010111 01000101 01010011 01001111 01001101 01000101

   Answer: _____
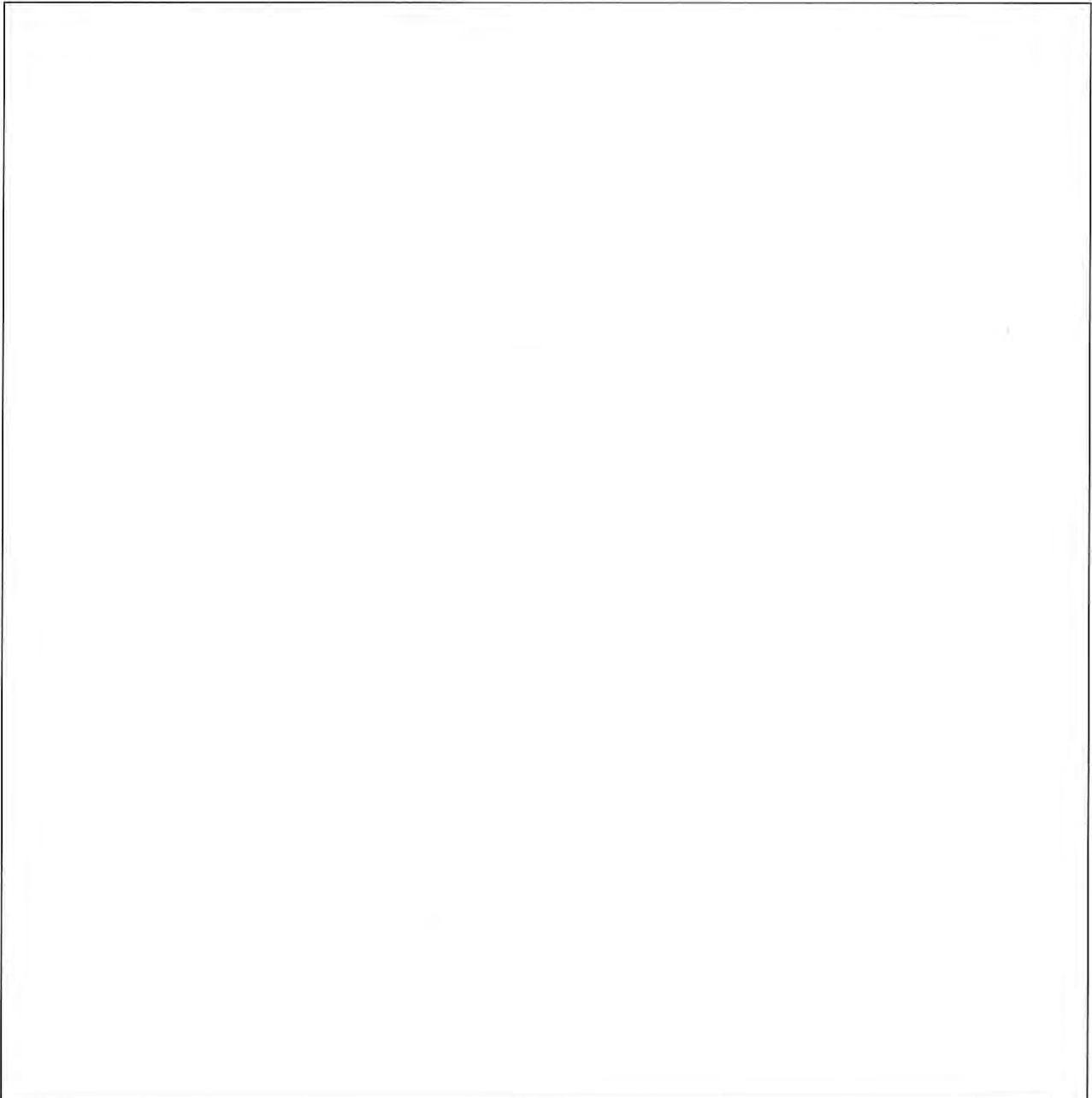
## Extension Activities Space:

## Activity 2 – Do-er Activity

- Form into groups of 3 or 4
- Pick a Do-er
- The rest of the group are going to provide instructions to recreate the path in the sealed envelop

## Path 1-Answer Space

## Path 2-Answer Space

## Path 3-Answer Space

## Path 4-Answer Space

# Ozobots Activities

## Ozobots Code



**Color code reference chart**

**OzoCodes**      ozobot

**SPEED**

| | | |
|---|---|---|
| SNAIL DOSE | SLOW | CRUISE |
| FAST | TURBO | NITRO BOOST |

**DIRECTION**

| | | |
|---|---|---|
| GO LEFT | GO STRAIGHT | GO RIGHT |
| JUMP LEFT | JUMP STRAIGHT | JUMP RIGHT |
| U TURN | U TURN (LINE END) | |

**TIMERS**

| | | |
|---|---|---|
| TIMER ON (30 SEC. TO STOP) | TIMER OFF | PAUSE (3 SEC.) |

**COOL MOVES**

| | | | |
|---|---|---|---|
| TORNADO | ZIGZAG | SPIN | BACKWALK |

**WIN/EXITS**

WIN/EXIT (PLAY AGAIN)

WIN/EXIT (GAME OVER)

**COUNTERS**
FIVE DOWN TO STOP

ENABLE X-ING COUNTER

ENABLE TURN COUNTER

ENABLE PATH COLOR COUNTER

ENABLE OZOPILL COUNTER

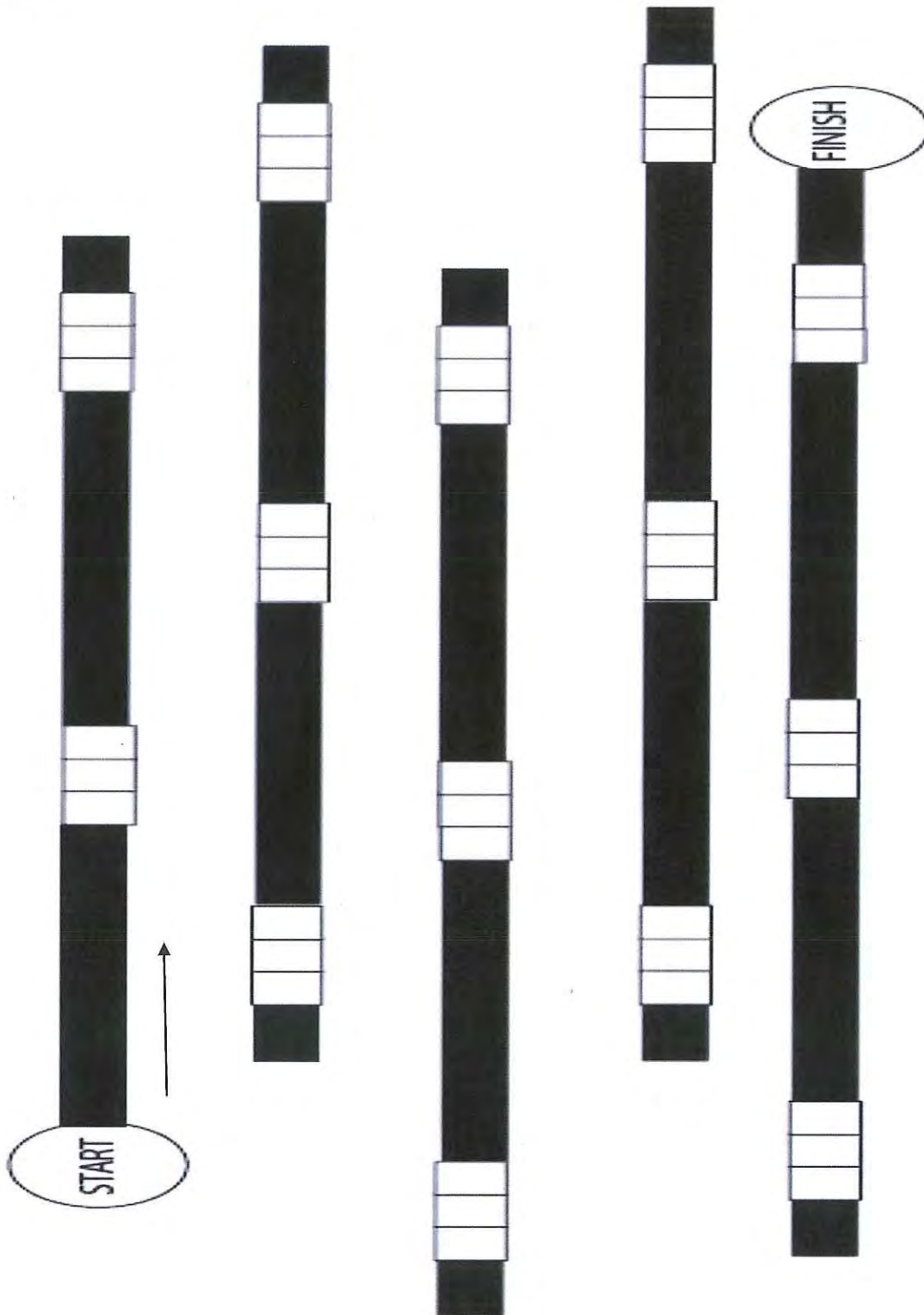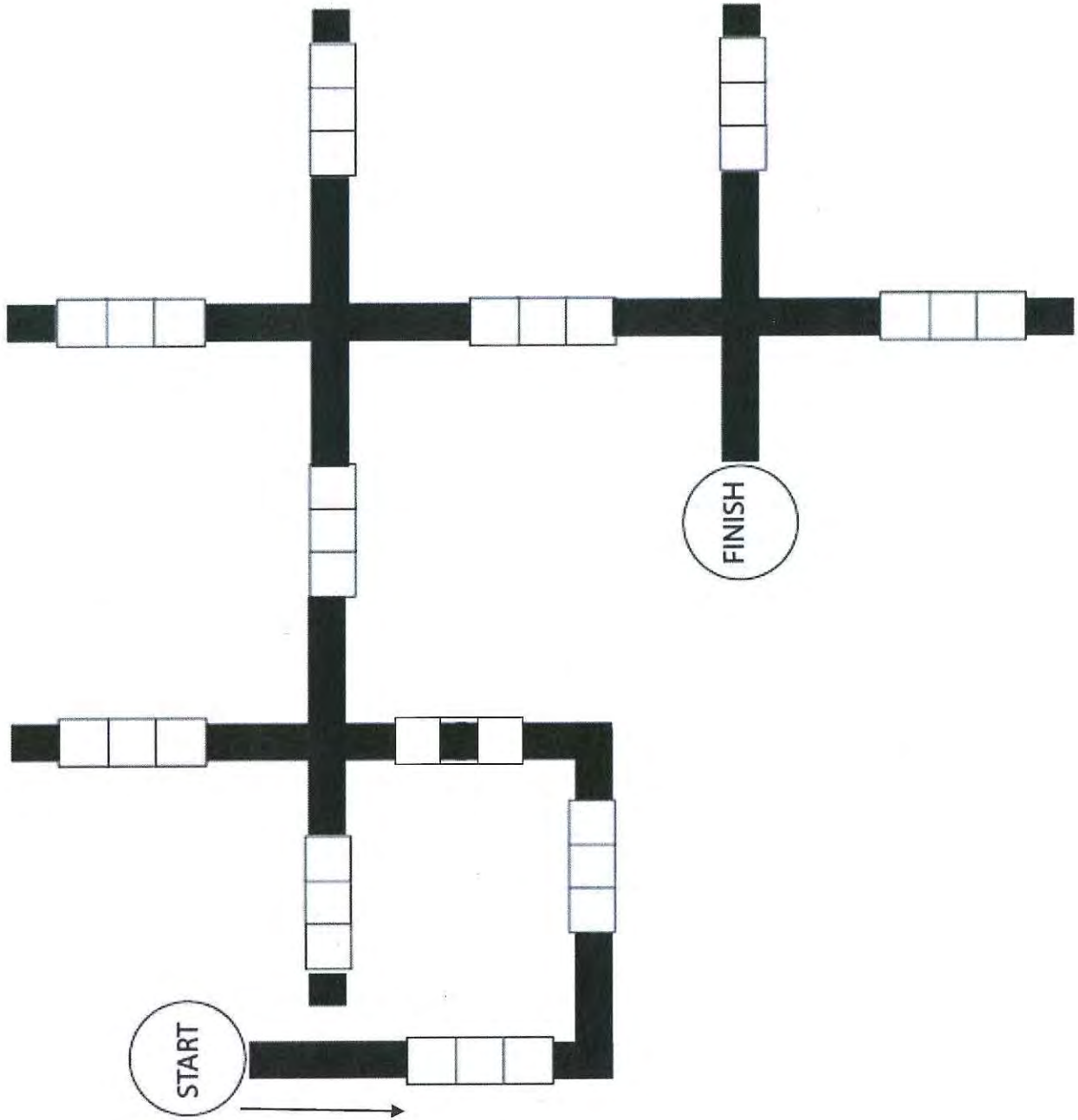OZOPILL +1

OZOPILL -1
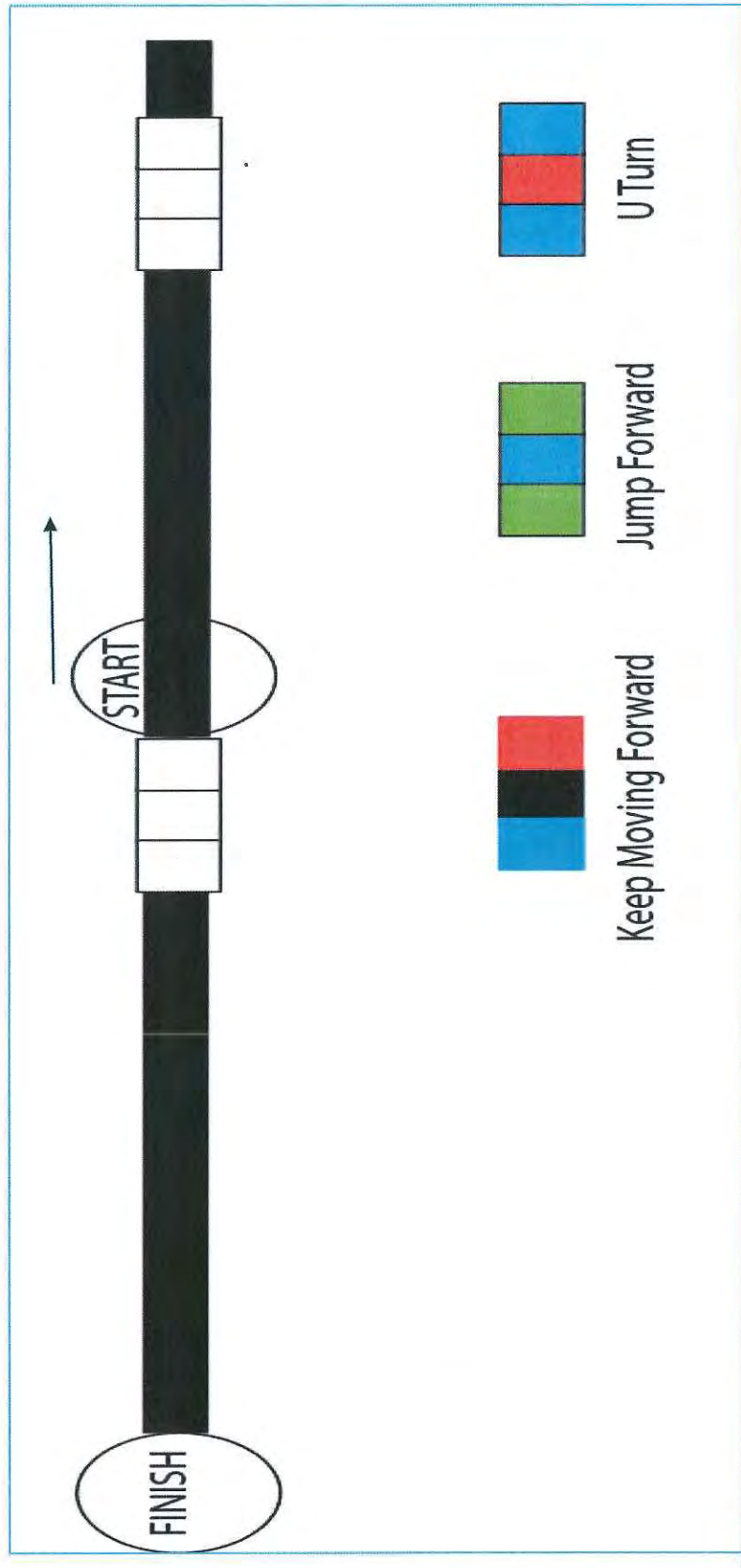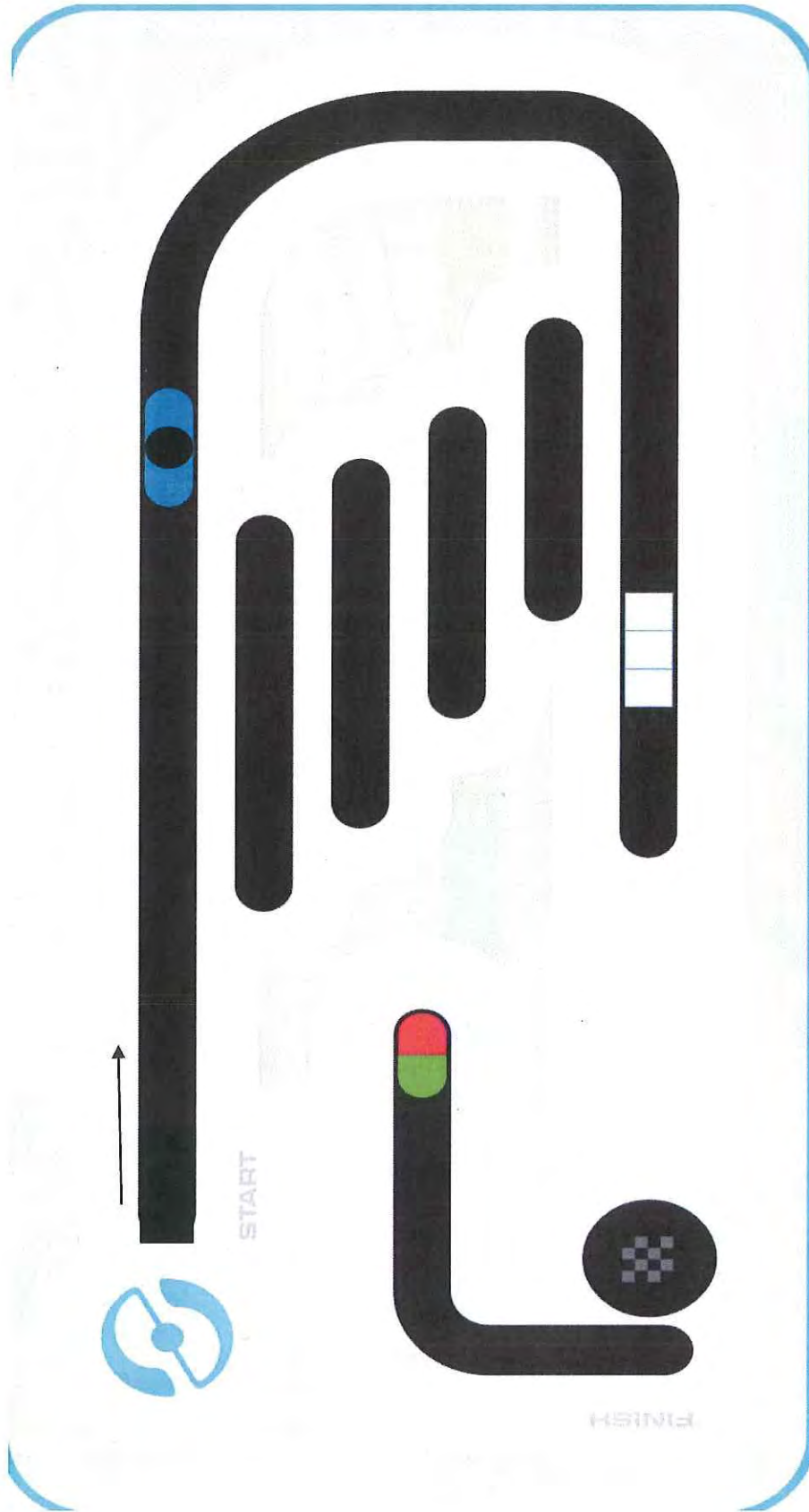
# 1st Map
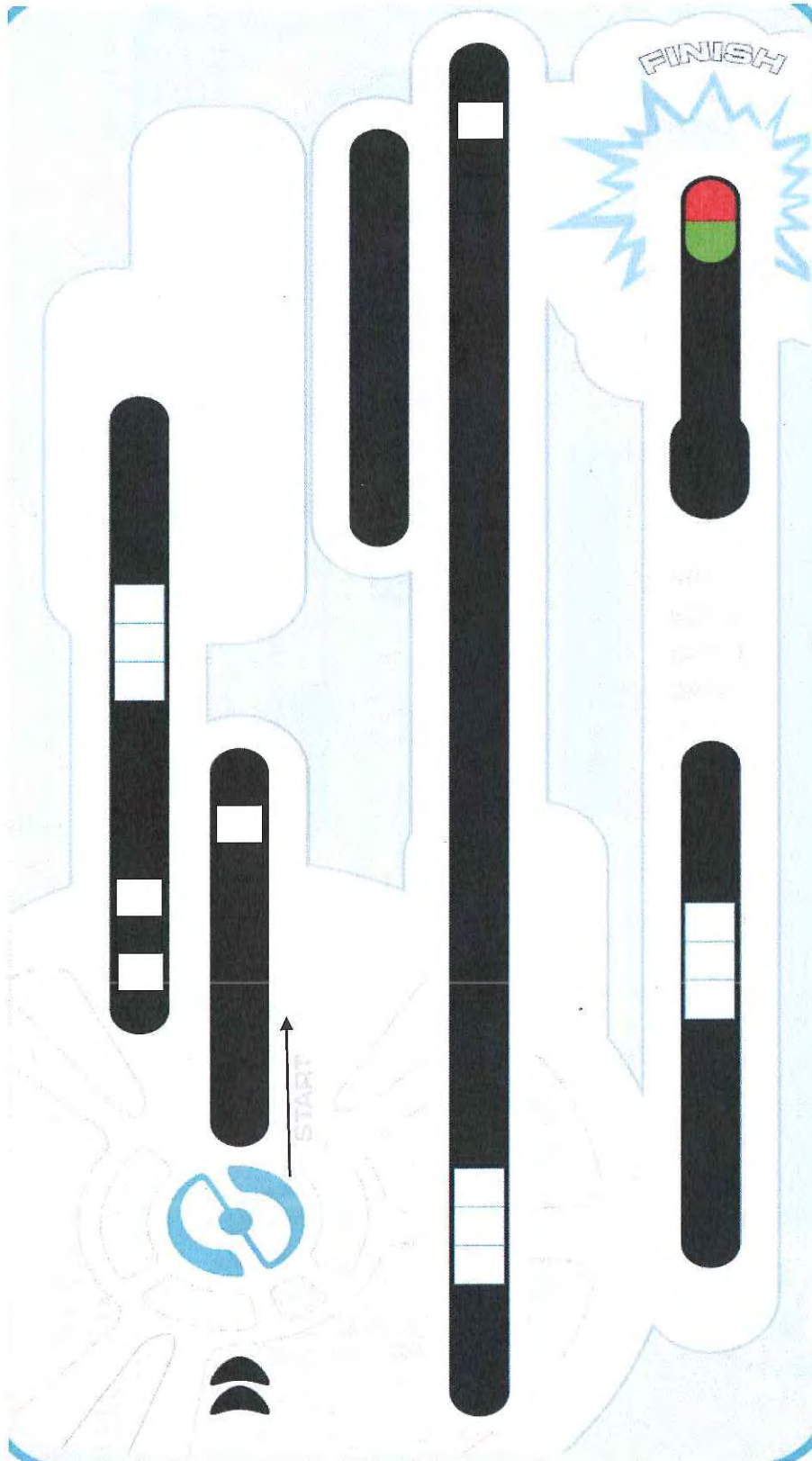
2<sup>nd</sup> Map

# 3<sup>rd</sup> Map

# Extension Activities-choose from the codes on the Ozobot sheet

## 1st Map

# 2nd Map

# 3rd Map
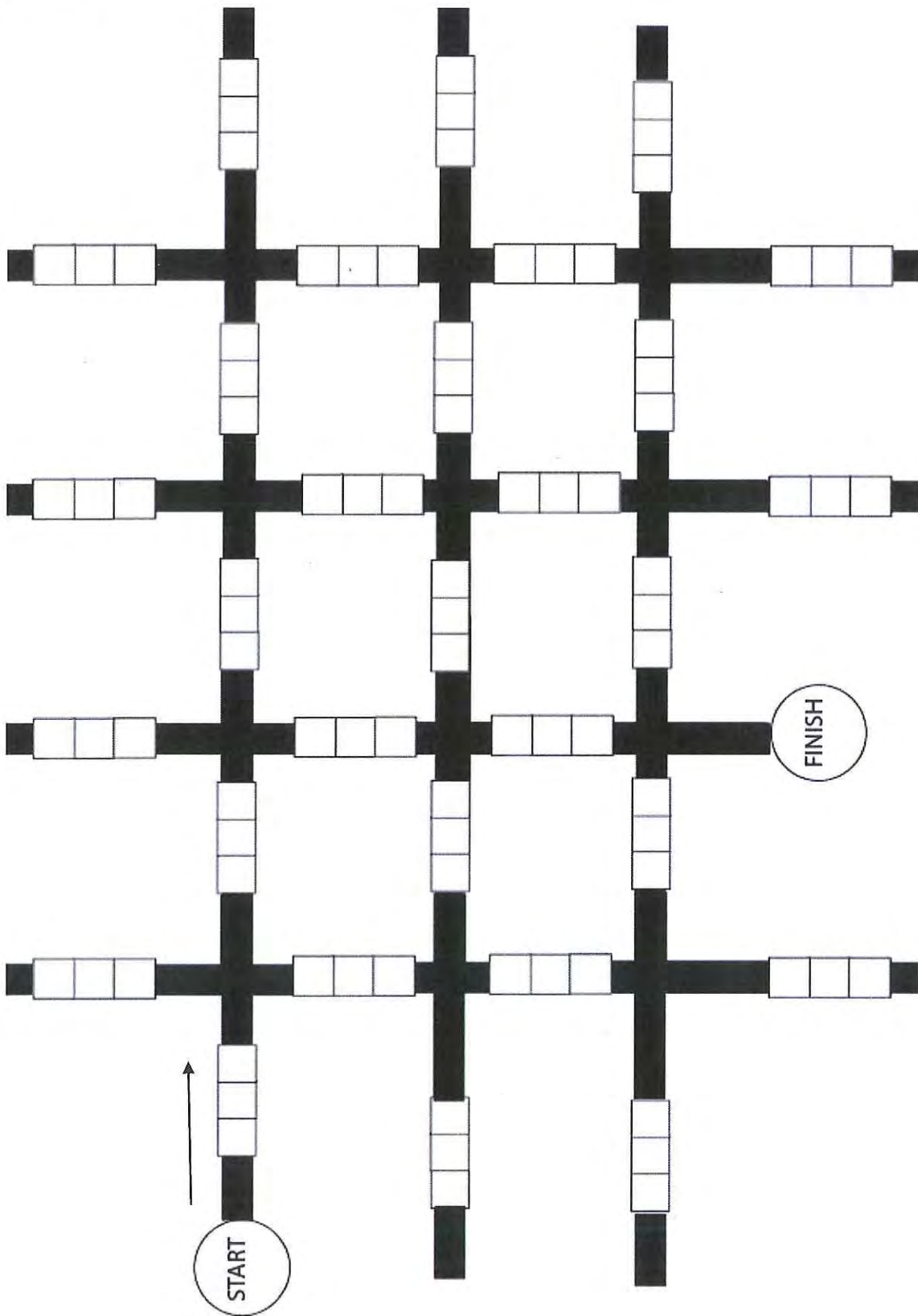
Resources from Digital Careers (http://digitalcareers.edu.au/resources/)

**FREE CODING COURSES**

**Learn to code!**
http://code.org/learn

**Hour of Code**
The Hour of Code is a global movement reaching tens of millions of students in 180+ countries. Anyone, anywhere can organize an Hour of Code event. One-hour tutorials are available in over 30 languages. No experience needed. Ages 4 to 104. http://hourofcode.com/au

**CODING EDITORS and RESOURCES – James Cook University**

**jsplayground.crunchycodes.net**
a javascript + CSS + html5 editor (left) with instant execution in a mobile phone-like view (right) capable of deploying code onto a real mobile device

**example workshop** pdf: http://jsplayground.crunchycodes.net/help

**KHAN ACADEMY**
For free. For everyone. Forever.
Courses offered in many disciplines including maths, science and computer programming. http://khanacademy.org

**UDACITY**
Online courses developed and taught by experts at leading tech companies. Includes courses on data science, web development, software engineering, android and ios development
https://www.udacity.com

**SCRATCH** Create **stories, games and animations** http://scratch.mit.edu/

**ROBOTICS**
Build and program **robots**
http://mindstorms.lego.com

**GAMING**
Develop your own **games** with GameMaker
http://www.yoyogames.com/gamemaker/studio

Path 1
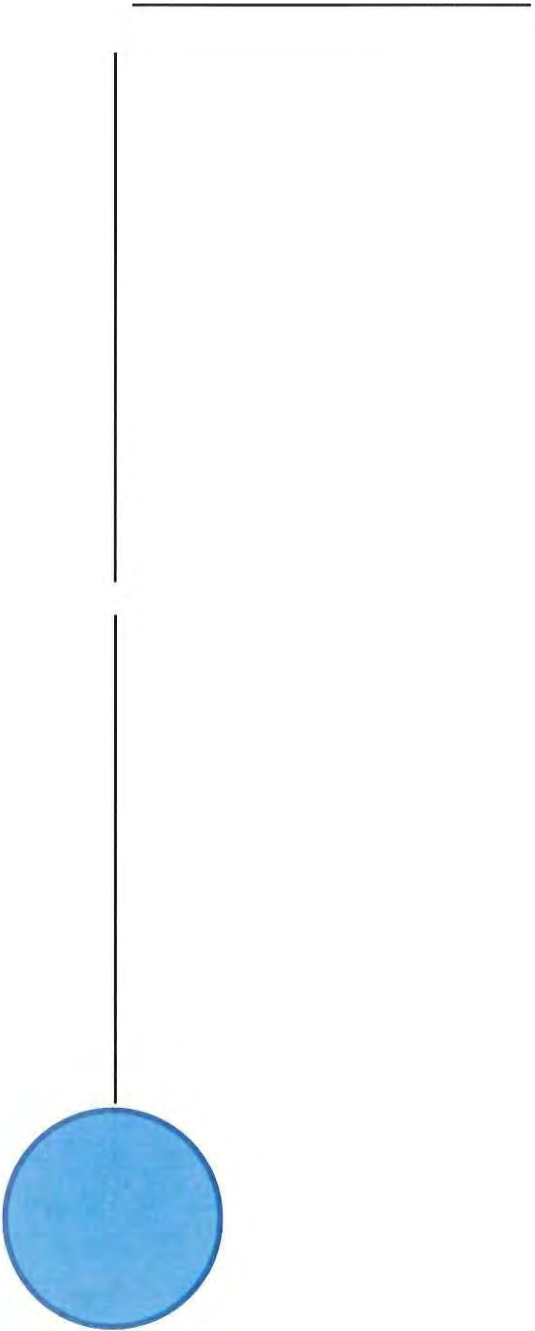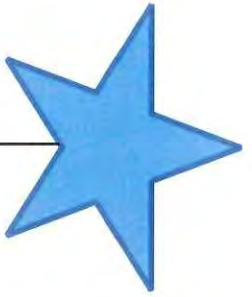
= 1 step

Path 2



= 1 step

Path 3

= 1 step

Path 4

= 1 step

1 Step Forward



1 Step Forward



1 Step Forward



1 Step Forward



1 Step Forward



1 Step Forward



1 Step Forward



1 Step Forward



1 Step Forward



1 Step Forward

1 Right Turn



1 Right Turn



1 Right Turn



1 Right Turn



1 Right Turn



1 Right Turn



1 Right Turn



1 Right Turn



1 Right Turn



1 Right Turn

1 Left Turn



1 Left Turn



1 Left Turn



1 Left Turn



1 Left Turn



1 Left Turn



1 Left Turn



1 Left Turn



1 Left Turn



1 Left Turn