OZOBLOCKLY SKILLS 2
SHAPE TRACER 2

PREPARED FOR OZOBOT
BY LINDA MCCLURE, M. ED.

ESSENTIAL QUESTION
How can we teach Ozobot to move using programming?

OVERVIEW
This lesson uses Shape Tracer 2, and follows on from Shape Tracer 1 and OzoBlockly Skills 1 (http://games.ozoblockly.com). Students will use what they learned about creating a block-based program to practice their first computer science concept, Loops, which repeats sections of code.

The format of this lesson is the same as Shape Tracer 1. Students will also create their own Level 11.

You and your students may have noticed that Ozobot might swerve slightly when running a Free Movement program. OzoBlockly Skills 4 and 5 will teach students how to make movement more accurate.

LESSON OUTLINE

1. In Shape Tracer 2, students play the tutorial levels 1-10 to introduce them to OzoBlockly and programming concepts.
   Concepts:
   - Movement forward and turns
   - Loops
   - Nested Loops (optional)
   - Light effects
2. Students will write their own tutorial level in the OzoBlockly Editor.
3. (Optional) Play the unlocked Shape Tracer Game (attached).

PREREQUISITES

It is recommended that students complete OzoBlockly Skills 1 - Shape Tracer Level 1.

GRADE LEVEL

Grade 2 and up. Older students may move more independently through the levels of the tutorials. The tutorials are appropriate for all levels to learn the OzoBlockly programming language.

GROUPING

Groups of two or three students

MATERIALS

- Tablet or computer to access Ozobot Games http://games.ozoblockly.com and the OzoBlockly editor http://ozoblockly.com/editor
- Ozobot **Bit** or **Evo**, 1 per group of 2-3 students
- Student Handout, 1 per student or group
- Optional: printout of the unlocked Shape Tracer Game, one per group

OZOBLOCKLY PROGRAMMING TOPICS

Free Movement, Loops, Light Effects

OZOBLOCKLY MODE

Mode 2 or higher

DURATION

45 - 55 minutes

VOCABULARY

- *Loop* – a repeat command in the OzoBlockly programming language. Multiple command blocks can be put 'inside' a loop. Those commands will be repeated X amount of times.
- *Rotate Right or Left* – Approximate 90° turn
- *Rotate Slightly Right or Left* – Approximate 45° turn
- *Steps* – a unit of movement forward
- *Line Following* – Ozobot's default capability of sensing and following lines on paper or digital screens

QUESTIONS ABOUT THIS LESSON?

Please contact us at ozoEdu@ozobot.com

LESSON

1. GUIDED CLASS ACTIVITY

LEVEL 1

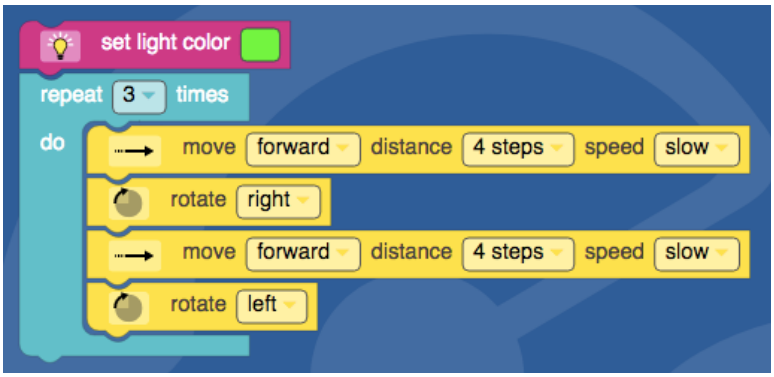
Ask the students for ideas about how they could get their Ozobot Bit or Evo to trace the stair step shape. Write some ideas on the white board. Let students explore and find solutions to the puzzle. Many students will program the Ozobot like this:

Question
"Do you see any patterns in the order and types of blocks?"

Answer
"The blocks start to repeat; the same blocks are used over and over."

Demonstrate this program and ask the students if they see any combination of blocks that repeat.

Explain that this is the purpose of the "Loop" block. Any combination of blocks that repeat can be placed inside a loop block. All you need to do is tell the loop how many times to repeat the commands. The correct way to program this level looks like:

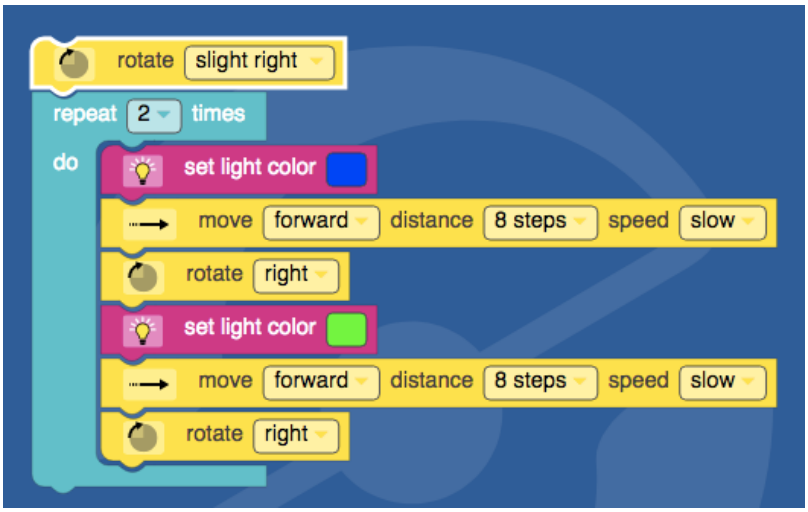


LEVEL 2

This level involves the same skills as level 1. Students solve level 2.

LEVEL 3

Begin this level by letting the students try and figure out the puzzle in groups or individually. After some time experimenting, ask the class what solutions they found. Many will have found solutions like this:



Question
Why is using a loop a better way to program?

Answers
Because you use fewer blocks (lines of code) and do less work.

Because it is easier to change the program if you need to modify it.

Because you are less likely to make a mistake if you don't have a long list of blocks.

This is a perfectly valid solution and you can have students move on to the next level if you like. At this point though, you do have the option to introduce the concept of nested loops. There is a solution that is more efficient than the one above!

Optional: Understanding Nested Loops - *What are nested loops? Nested loops are constructed by putting one repeat block (Loop) inside another to use the fewest number of blocks to complete the task. This video from code.org briefly explains nested loops:* http://www.youtube.com/watch?v=2C0pdRhlZhk

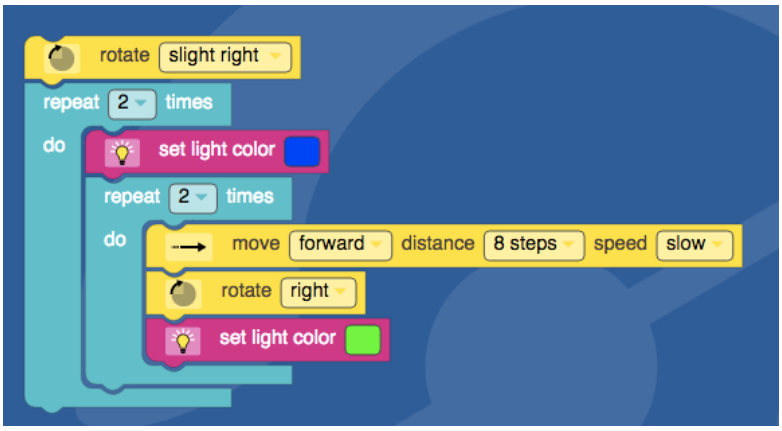
When you create nested loops, the process of running the code begins in the outer loop. When the run hits the inner loop, all those commands are taken to completion before the run once again starts on the outer loop. The total amount of times the whole run will loop is the product of the numbers in both inner and outer loops.

Nested Loop Demonstration

1. *Let students take another look at the program above that uses only one loop. They will probably have realized that the commands almost repeat, but there is*

a slight difference in the commands that prevent them from using fewer blocks. The difference is the change in color.

2. *Create this program to demonstrate to the class:*



3. *Allow the students to watch yours play so they can see how the program runs through the blocks. Play the solution several times and ask volunteers to explain what is happening.*
4. *Have the students program their Ozobot simulator with a nested loop.*

LEVELS 4-10

After students have discussed and learned about movement and loops, allow students to **complete the 10 levels**. If students are loading programs to their bots, they can practice **calibrating** and **loading the program** onto Ozobot. How to calibrate to a screen and troubleshooting tips are found in the OzoBlockly Getting Started Guide (http://files.ozobot.com/stem-education/ozoblockly-getting-started.pdf).

2. INDEPENDENT ACTIVITY

OBJECTIVE

Students will write their own Level 11.

PROCEDURE

Students now have a chance to create a new level with ozoblockly.com/editor. Give students a copy of the attached student handout.

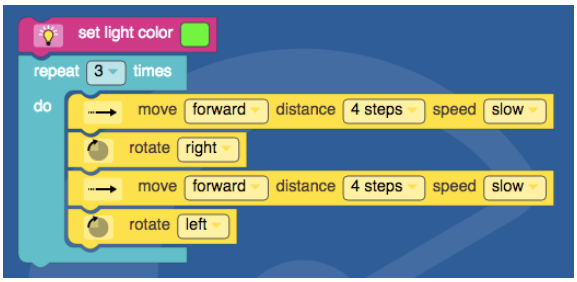
3. OPTIONAL - SHAPE TRACER GAME

PROCEDURE

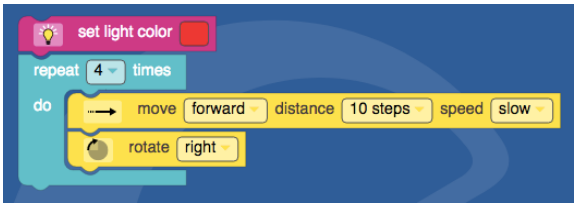
Give each group of students a copy of the Shape Tracer game attached to this lesson. Students will read the rules and cut out the game cards and pieces. This game could also be another class session.

ANSWER KEY

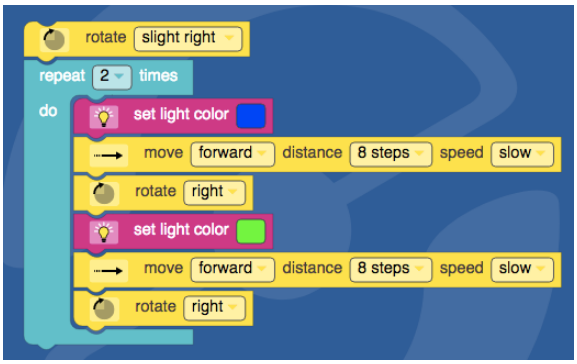
Level 1



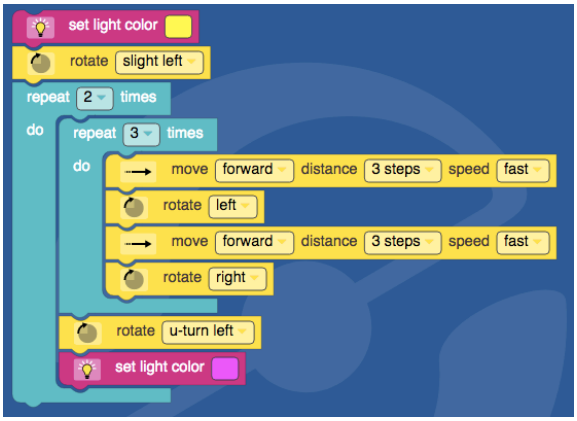
Level 2



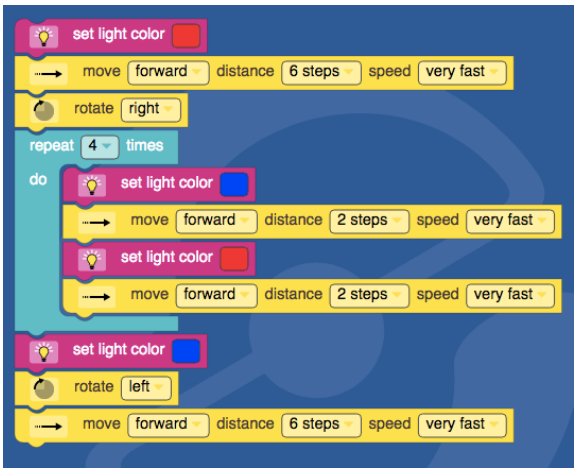
Level 3



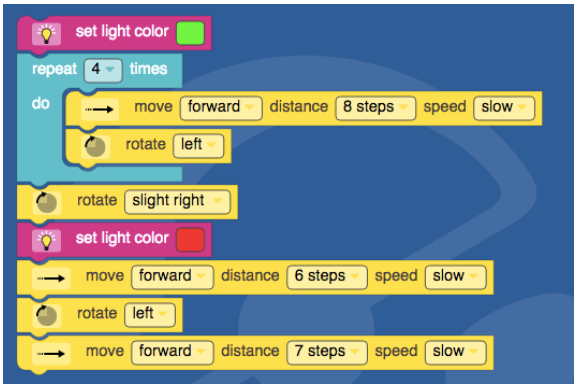
Level 4



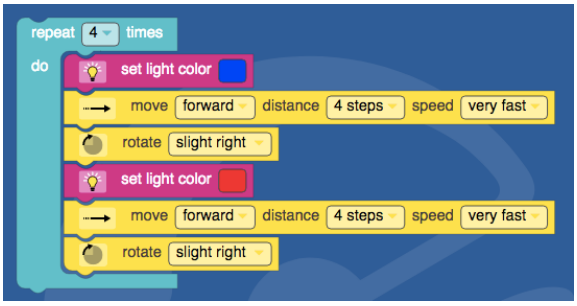
Level 5



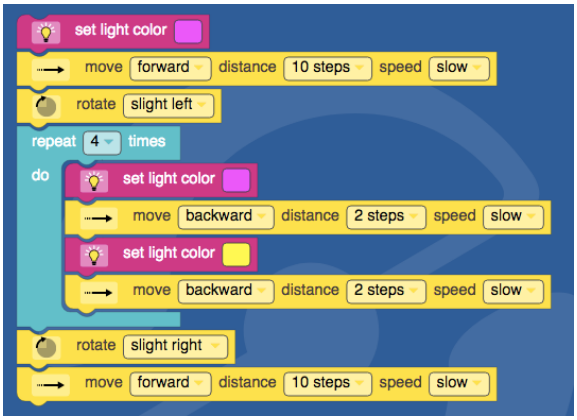
Level 6



Level 7



Level 8



Level 9

Level 10

STUDENT HANDOUT
CREATE A SHAPE TRACER 2 LEVEL

RULES

1. Sketch a path in the box below to be the basis of Level 11. The path should be slightly more difficult than levels 1-10. Check out the example for ideas.

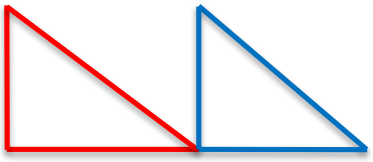
   Requirements:

   - The path should change colors at least twice.
   - The loop block should be used at least once. A nested loop would be even more interesting!
   - The turns must be 45°, 90°, 180° or a combination of these.

2. Go to ozoblockly.com/editor on a computer or tablet.
3. Choose "Bit" or "Evo" below the OzoBlockly logo (see right).
4. Choose "Beginner" (2) or "Intermediate (3)" modes
5. Write the program.
6. Test the program with your Bit or Evo and fix any problems (bugs).

   Note: Your Bit or Evo may swerve a little bit off a straight line. Don't worry, that's normal. In future lessons you will learn how to help that.

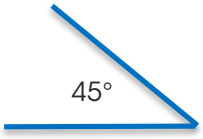
Example

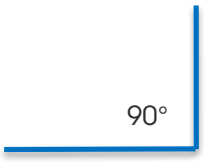


Set LED red	Forward 6 steps
Repeat 2 times:	Set LED blue
Forward 5 steps	Rotate Left 45°
Rotate Right	Forward 4 steps
Forward 4 steps	Rotate Right 45°
Rotate Right 45°	Rotate Right 90° …

Some commands:

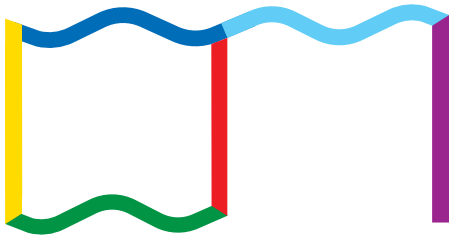
Repeat _____ times
Forward ____steps
Rotate Left/Right (90°)
Rotate Slightly Left/Right (45°)
Rotate U-turn Left/Right (180°)
Set LED to _____





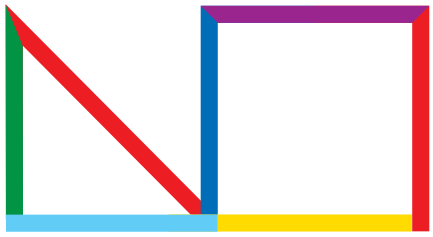
Shape Tracer Cards: Cut along dotted line

Shape Tracer F1 Ozobot.com



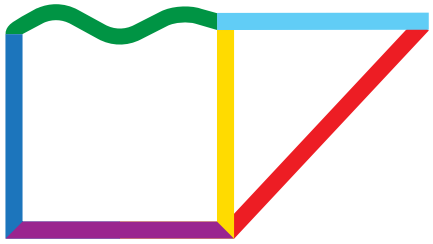
Ozobot.com F1 Shape Tracer

Shape Tracer F2 Ozobot.com



Ozobot.com F2 Shape Tracer

Shape Tracer F3 Ozobot.com



Ozobot.com F3 Shape Tracer

Shape Tracer F4 Ozobot.com

Ozobot.com F4 Shape Tracer

Shape Tracer 2

Ozobot.com

Be the fastest to identify the shapes and score the most points!

Instructions:

- First, choose one player to act as the programmer. This player will need to know and use OzoBlockly. (OzoBlockly.com)
- Everyone else chooses a player number.
- The programmer chooses a random Shape Tracer card without showing the group. They then recreate that shape using OzoBlockly, and load to Ozobot.
- Players gather around the Game Mat with their player number cards ready. When the programmer runs Ozobot, players will have to guess what shape Ozobot is creating by putting their player card on the correct shape.
- Watch Out! Once your card is placed, you can not change your answer!

Scoring:

- The first person to place their card on the correct answer wins 2 points, all other correct answers win 1 point.
- If no players get the correct answer, no points are given.
- The first player to reach 7 points, wins!

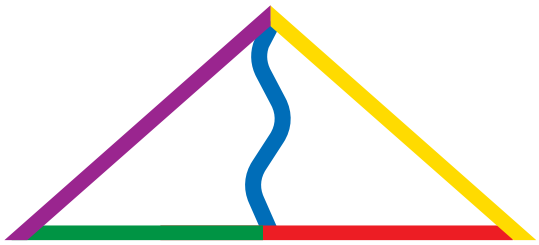
Optional Gameplay:

- Each player card has 2 colors on it. If the first color Ozobot uses for each shape matches a color on your player card, you get a point!

Combine Shape Tracer 1 and Shape Tracer 2 games for a MEGA Shape Tracer Game!

Shape Tracer Cards: Cut along dotted line

Shape Tracer D1 Ozobot.com



Ozobot.com D1 Shape Tracer

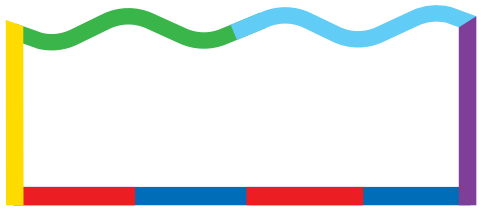
Shape Tracer D2 Ozobot.com

Ozobot.com D2 Shape Tracer

Shape Tracer D3 Ozobot.com

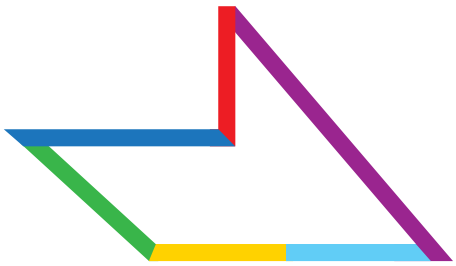
Ozobot.com D3 Shape Tracer

Shape Tracer D4 Ozobot.com



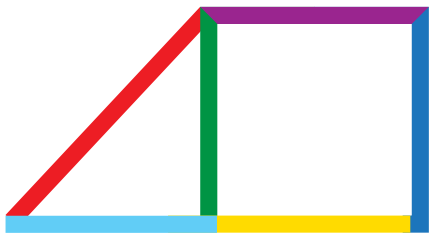
Ozobot.com D4 Shape Tracer

Shape Tracer E1 Ozobot.com



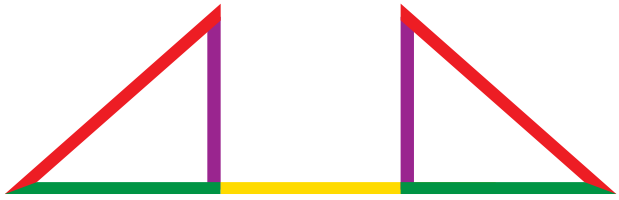
Ozobot.com E1 Shape Tracer

Shape Tracer E2 Ozobot.com



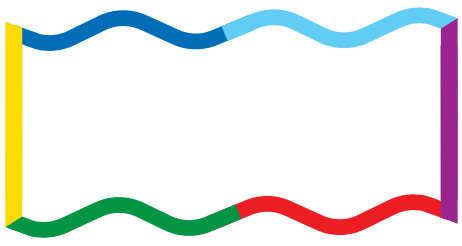
Ozobot.com E2 Shape Tracer

Shape Tracer E3 Ozobot.com



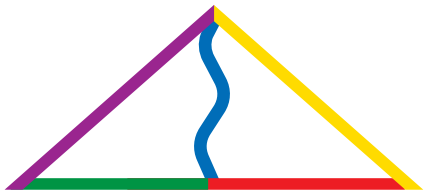
Ozobot.com E3 Shape Tracer

Shape Tracer E4 Ozobot.com



Ozobot.com E4 Shape Tracer

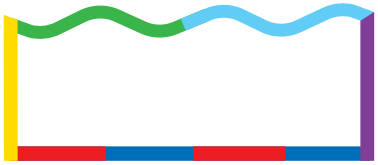
D1



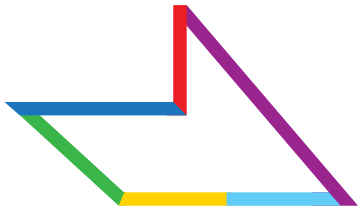
D2

D3

D4



E1



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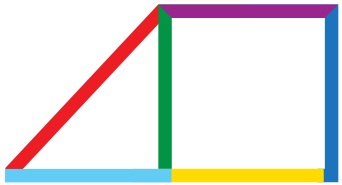
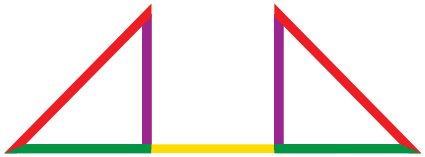


E3



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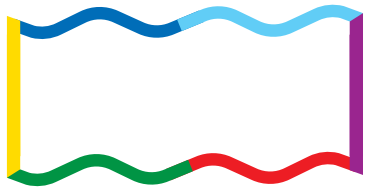
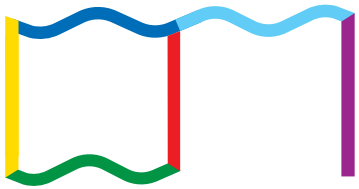


F1



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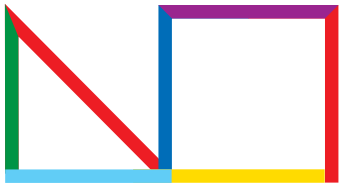

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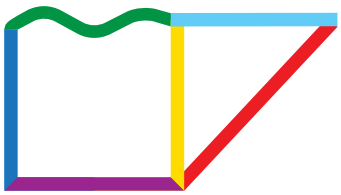

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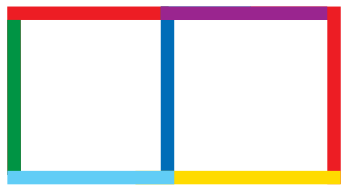
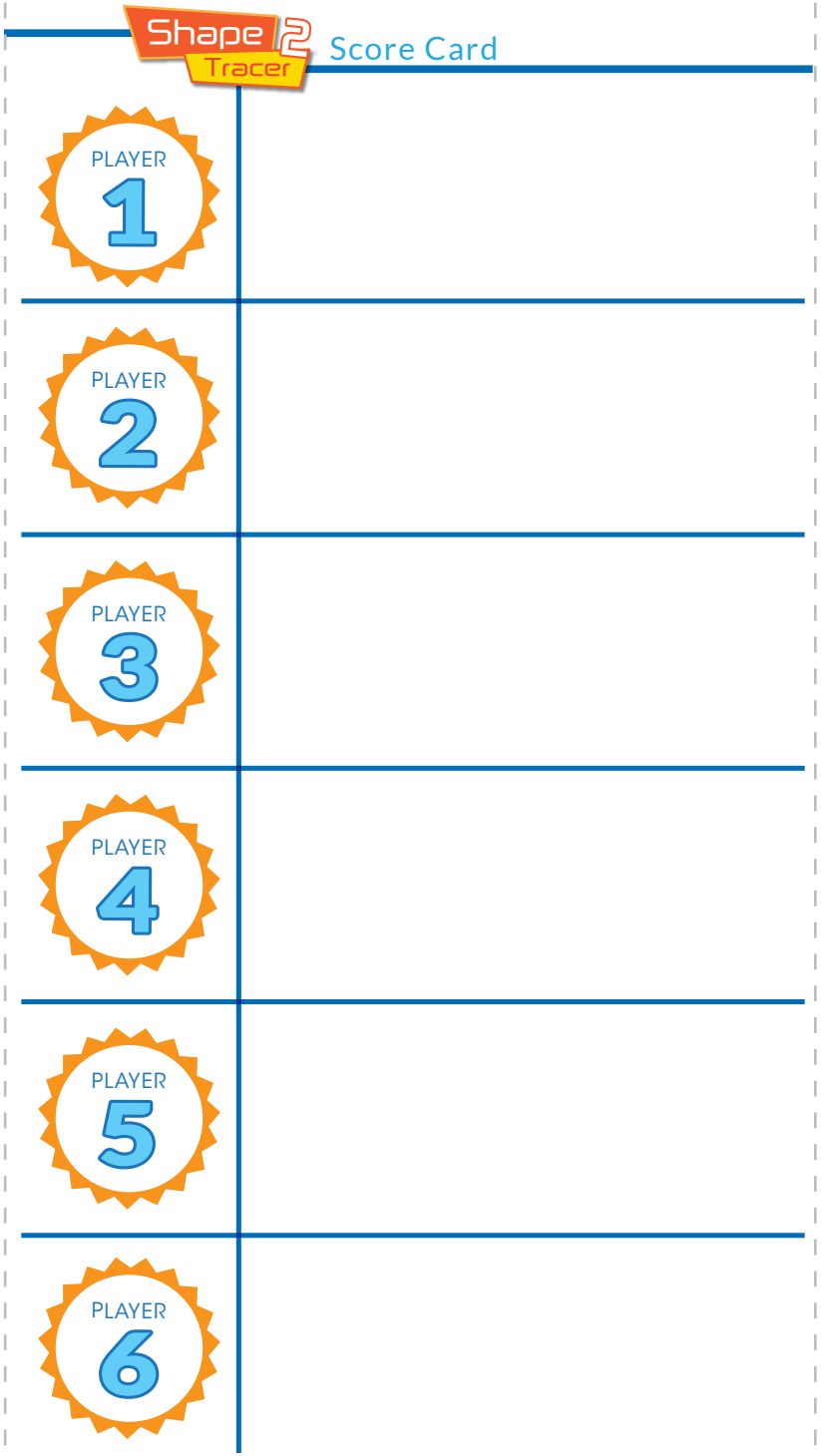


Player Cards: Cut along dotted line

Score Card: Cut along dotted line