



# Crossing the Pond

## A Probability Game



Excerpts From Bridges in Mathematics

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## **Crossing the Pond: A Probability Game**

A Math Learning Center Publication

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illustrated by Tyson Smith

Bridges Breakout Units

Geometry: Shapes, Symmetry, Area and Number

Bugs Across the Curriculum

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Math Buckets: Sorting and Patterning

Crossing the Pond: A Probability Game

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# Bridges Breakouts

## **Crossing the Pond** A Probability Game

This probability investigation is taken from Bridges in Mathematics, Grade 2. In addition to introducing basic probability concepts, it offers students a chance to practice subtraction facts. It is perfect for playing with your entire class several times, and makes a great learning center or take-home activity too.

The “You’ll need” list outlines supplies you need to gather in order to conduct the lessons. Deluxe Breakout contents are also listed; those who purchased an Economy Breakout will need to collect or make these items as well.

### **You’ll need**

- ★ clipboards, 1 per student (optional)

### **Deluxe Breakout includes**

- ★ 3 Crossing the Pond spinners\*
- ★ 6 Crossing the Pond gameboards\*
- ★ 16 game markers (8 red and 8 blue  $\frac{3}{4}$ ” translucent plastic disks)
- ★ Bucket of Frogs

# Session A

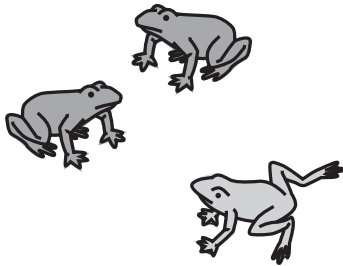


## PROBLEMS & INVESTIGATIONS

### Crossing the Pond

#### Overview

Crossing the Pond is a game that provides an opportunity to practice subtraction facts while exploring probability. As the game is played, students keep track of the differences that come up on a double spinner because the information affects their ability to win the game. If children are able to play the game many times over several days, they can continue to collect data and perfect their strategies.



#### You'll need

- ★ Crossing the Pond gameboard (Overhead 1)
- ★ 16 translucent game markers, 8 red and 8 blue, to represent the Blue Frogs and the Red Frogs
- ★ Crossing the Pond record sheets (Blackline 1, run a class set)
- ★ pencils
- ★ clipboards, if children are working on the floor

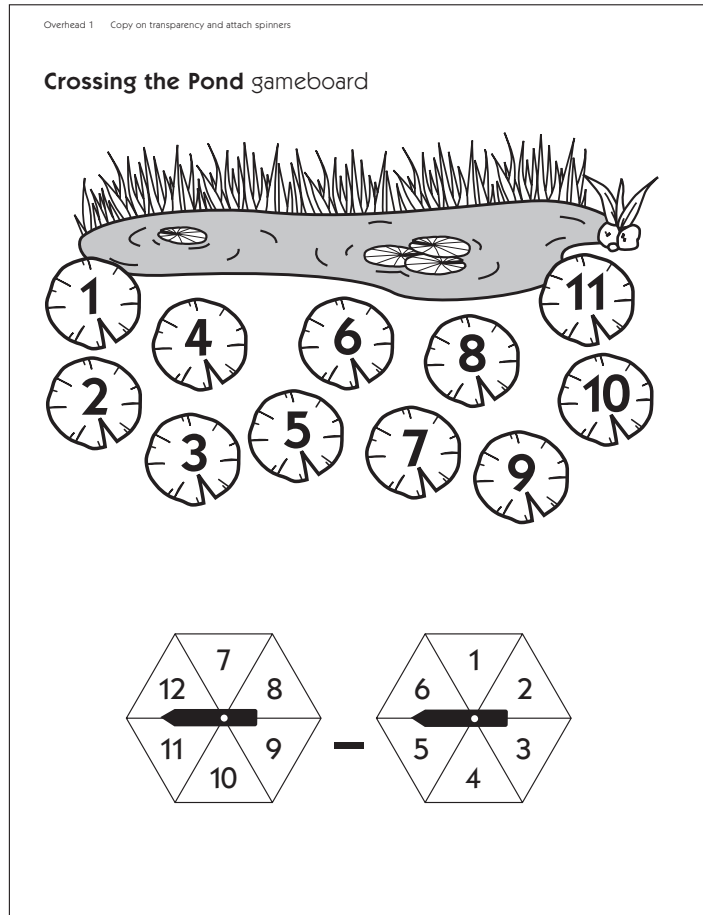
#### Skills

- ★ practicing subtraction facts
- ★ collecting data and recording it on a graph
- ★ making decisions based on collected information
- ★ exploring probability

To begin the game, show the overhead transparency and take a few minutes to let children make observations. Once students have had a chance to offer any observations they might have about the gameboard, divide them into two teams, the Red and the Blue, and tell them a bit about the game. They don't have to understand everything to play the first time around, but they should know that there is a hungry fox lurking around the near side of the pond. The object of the game is to be the first team to get all 8 frogs across the pond to the safety of the plants on the other side. Frogs are hopped across by spinning the double spinner and subtracting the number on the second spinner from the number on the first. If one of the teams spins  $10 - 2$ , for instance, and happens to have one of its frogs waiting on lily pad 8, that frog may be moved across to the plants on the other side of the pond.

The teams should be allowed to talk among themselves for a minute about where they want to place their frogs to begin the game, and then individuals from each team can take turns placing the red and blue markers, representing frogs. Needless to say, there won't be perfect agreement among the 10 to

15 individuals on each team, but the majority of children on both teams will probably favor either a fairly even distribution or some kind of placement revolving around their favorite or “lucky” numbers. Be sure to let them know that they can place more than one frog on a particular lily pad if they want. The first time around, it really doesn’t matter. After students have played the game for a little while, they may begin to modify their ideas about where to place their frogs.



Once the “frogs” have been placed, you’re ready to begin. Distribute copies of the record sheets and explain that both teams will find it useful to keep track of the differences that are being spun each time. That way, the next time they play the game, they’ll know better where to place their “frogs.” Have children from each team take turns spinning the double spinners at the top of the overhead and moving their frogs across the pond when the appropriate differences are spun. There will be plenty of times when a team can’t move a frog, either because they didn’t place a frog on that number to begin with or because all the frogs on that number have already been moved. If a team can’t make a move, play simply reverts back to the other team—no one gets an extra turn in this game.

Each time a spin is made for either team, have everyone mark it on his or her record sheet. The idea of keeping the record sheets is to help children have a better idea of where they want to place their markers on the gameboard the next time around. If the difference of 7 comes up many times during the first game, and the difference of 2 is only spun once or twice, students may think twice about placing any of their markers on 2 next time.

Blackline 1  
 NAME Kevin DATE Nov. 21

**Crossing the Pond** record sheet

Mark the differences for each team so you can see where to place your frogs next time!

						7				
						7				
				5		7				
				5		7				
				5	6	7				
1			4	5	6	7	8			
1		3	4	5	6	7	8		10	
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>

**Kevin** Man! Next time we play, I'm not putting any of my frogs on 2!

**Kaitlin** I'm going to put all of mine on 7!

**Ciel** I'm going to put half of mine on 5 and half on 7.

**Peter** I still think we should have put all of our markers on the middle numbers. They always fill up first!

About halfway through the game, when one of the teams has managed to get 3 or 4 of its frogs across, offer both teams a chance to reposition their remaining "frogs." Children may be very heavily influenced by the data in terms of where they choose to relocate. Their reactions will probably be quite literal too. If 7 happened to come up as a difference lots of times during the first

part of the game, they may put lots of “frogs” on 7 and tend to ignore the surrounding numbers. After their markers are repositioned, have them continue playing back and forth until one of the teams has moved all its frogs to the far side of the pond. Have them continue to collect data on their record sheets during the second half of the game; the information they collect now might influence their ability to win the game when they play it independently.

We’re not expecting any mastery of probability here. For some students this game will just provide an opportunity to practice subtraction facts. Others may really begin to base decisions about placing their frogs on the data they collect. A few students may even begin to figure out why they’re spinning differences of 6 more often than differences of 1 or 11. If you examine the chart below, you’ll see why for yourself.

–	7	8	9	10	11	12
1	<b>6</b>	7	8	9	10	11
2	5	<b>6</b>	7	8	9	10
3	4	5	<b>6</b>	7	8	9
4	3	4	5	<b>6</b>	7	8
5	2	3	4	5	<b>6</b>	7
6	1	2	3	4	5	<b>6</b>



**WORK PLACE**

## Crossing the Pond

**This Work Place basket will need**

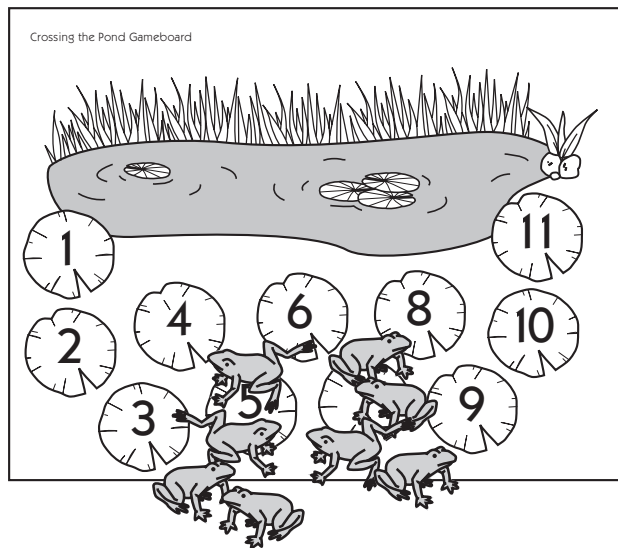
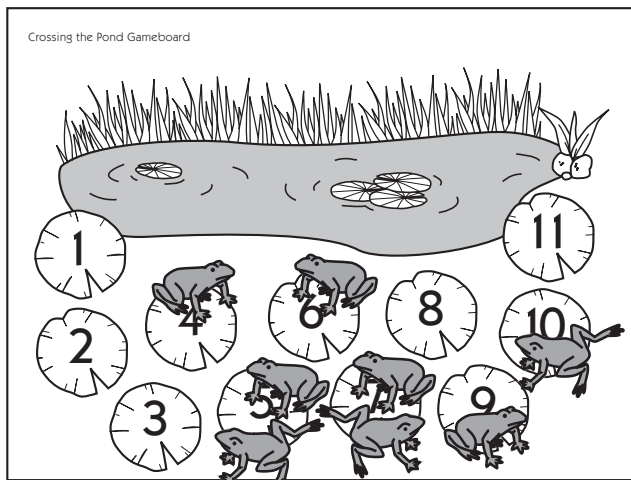
- ★ 3 Crossing the Pond spinners
- ★ 6 Crossing the Pond gameboards
- ★ Crossing the Pond record sheets  
(Blackline 1, run 30 copies and place in a folder)
- ★ 48 frogs (6 sets of 8 similarly colored frogs, perhaps stored in a small ziplock bag)

**Skills**

- ★ practicing subtraction facts
- ★ graphing data
- ★ making decisions based on collected data
- ★ exploring probability

**To Work**

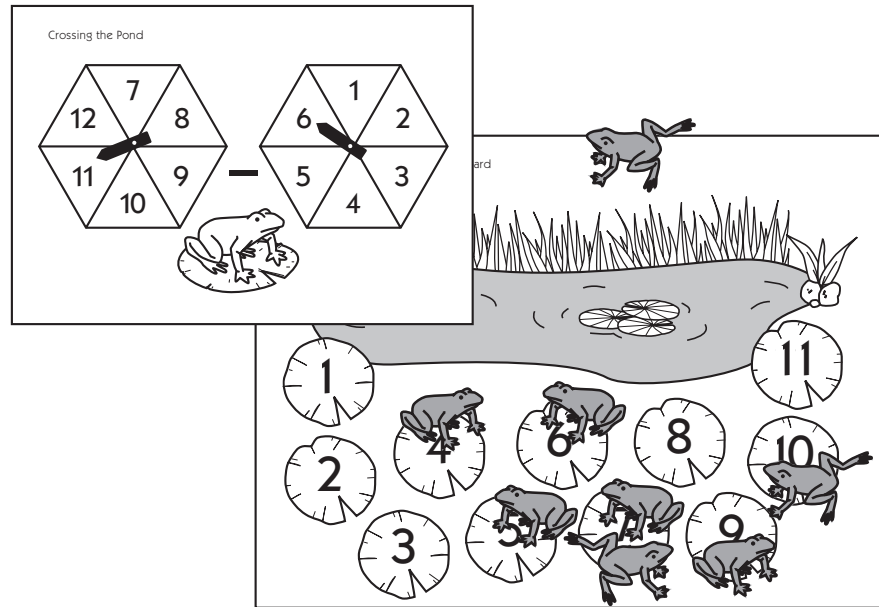
1. Find a partner. You will each need your own gameboard, 8 frogs, a record sheet, and a pencil. You will also need 1 double spinner to share.
2. Before you begin the game, place your frogs on the lily pads you want them to start on. You can put more than 1 frog on a particular lily pad, and you'll probably want to take the information you got during Session 16 into consideration. Did differences of 1, 2, or 3 come up very often? Which differences did come up the most? If you can remember, you'll want to place your frogs on some of the numbers that seemed to come up most frequently.



**John** *I put two of my frogs on lily pad 5 and two on 7 because we kept spinning 5's and 7's yesterday. But I still want to spread them out a bit, just in case we get some other numbers, like 4 and 6. And I put one frog on 10 because it's my lucky number.*

**Andrea** *Not me! I put half my frogs on 5 and half on 7 because that's mostly what we got. I'm not going to waste my frogs anywhere else!*

3. Take turns spinning. If you spin and the difference between the two numbers matches one of the numbers where you have a frog, you can move him across the pond to safety on the other side. You can only move 1 frog at a time, though. If you have 2 or 3 frogs on a particular number, you have to wait until you spin that difference again to move one of the others.



**John** *Hey, look! I got  $11 - 6$ . That's 5! I get to move one of my frogs across the pond already. I knew we'd get more 5's today!*

4. As you and your partner spin, keep track of the differences both of you get on the record sheet. Keeping track may help you make better and better decisions about where to place your frogs.

5. When you get about halfway through the game—to the point where either you or your partner has moved 4 frogs across the pond—you can relocate your remaining frogs. This is where your record sheet will come in handy. What differences seem to have come up frequently? Are there any that haven't come up at all?

6. Once you've repositioned your frogs, keep playing until one of you has moved them all across the pond. The first to do so is the winner.

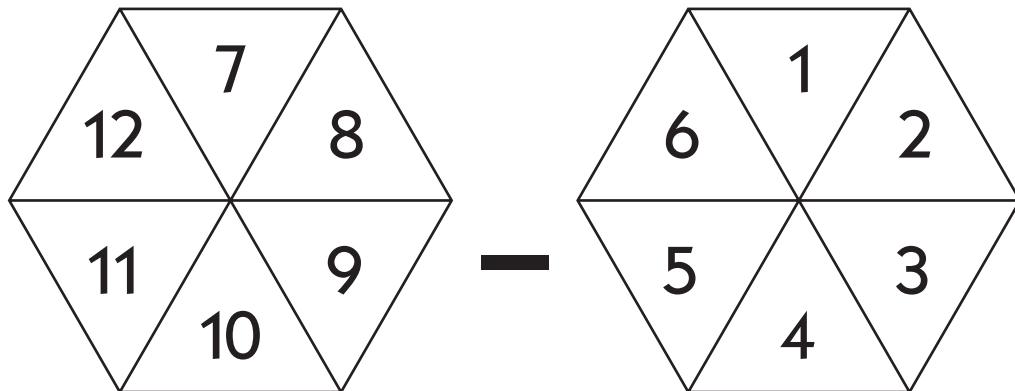
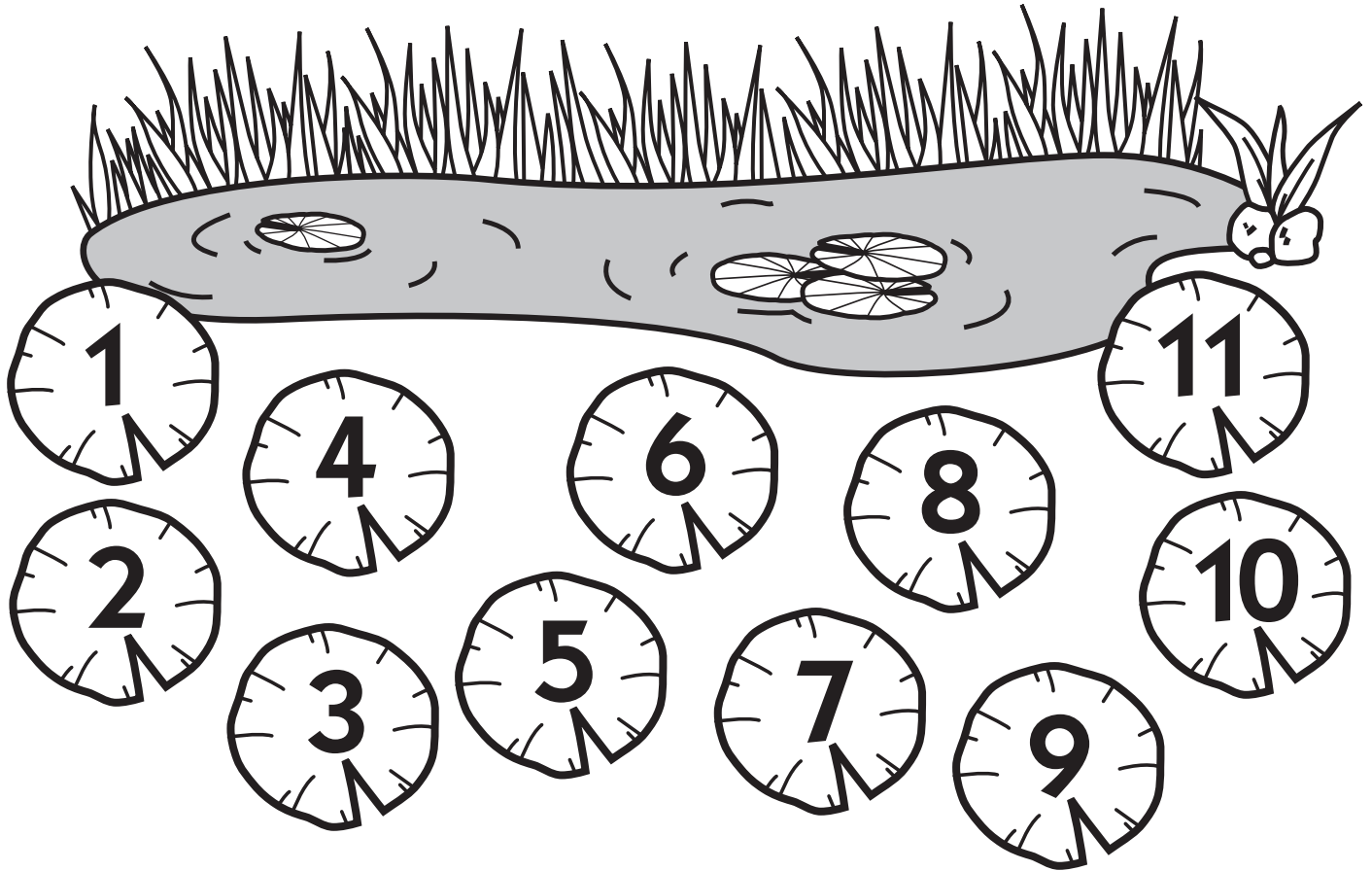


### **Instructional Considerations for Crossing the Pond**

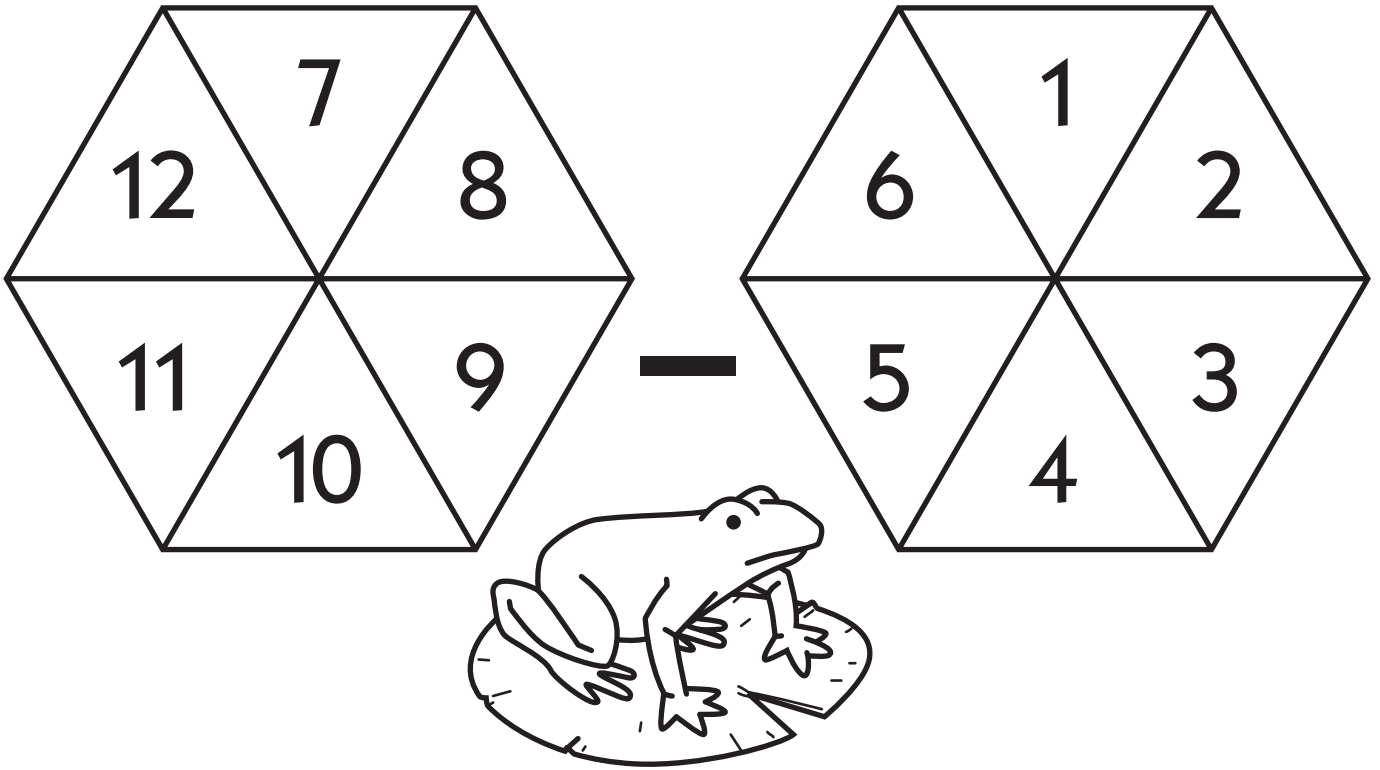
When you introduce this game, be sure to remind students that they have the option of repositioning their frogs halfway through. Being able to change midway through motivates children to graph the differences as the game proceeds, and to consider their data carefully. Most will continue to respond to the data they collect in a very concrete manner for some time to come, choosing to station most of their frogs at the one or two differences that come up most frequently. It will be the rare child who distributes his or her frogs evenly among the middle numbers, understanding that in the long run, 6 and 8 are at least as likely to be spun as 5 and 7, even if they haven't come up yet. Again, this game is intended to give children an opportunity to base decisions on experimental data—to begin to explore the realm of probability—while practicing basic subtraction facts.



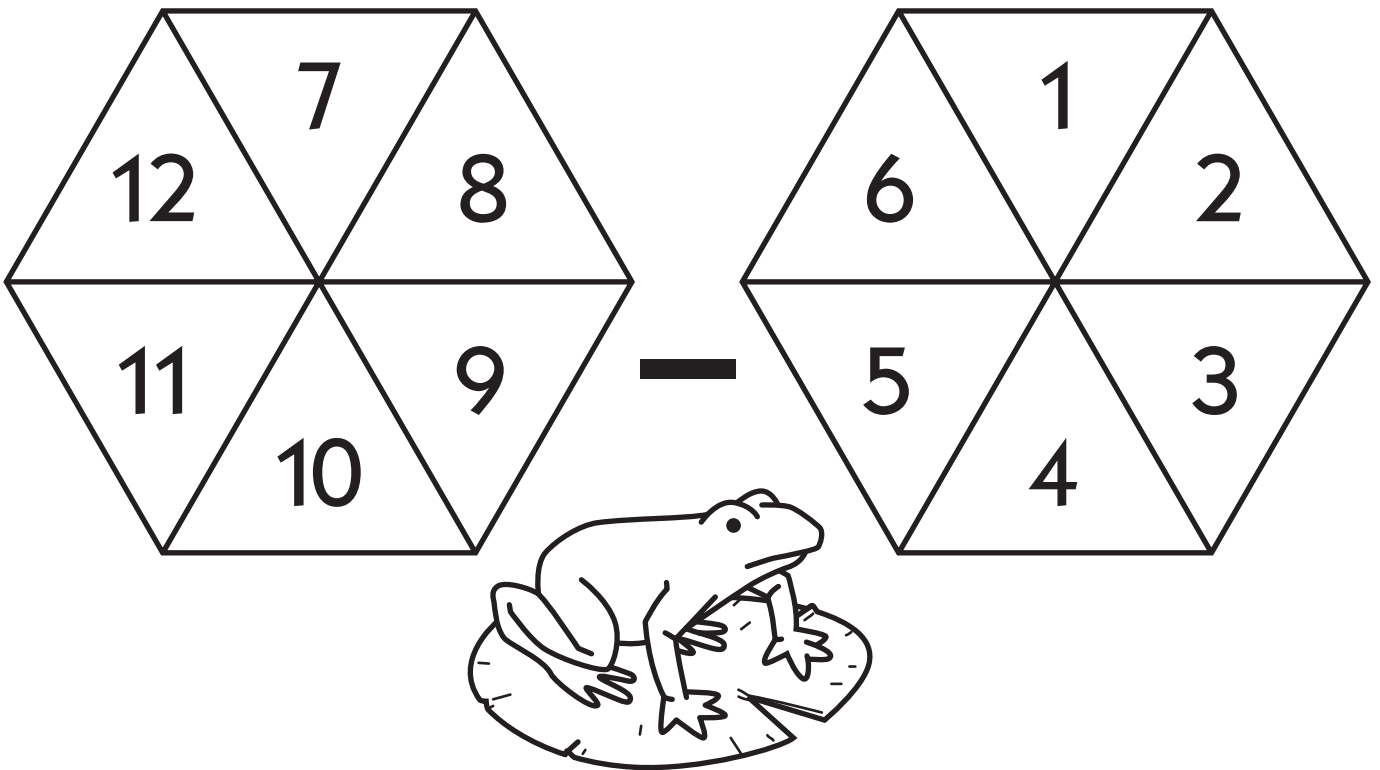
# Crossing the Pond gameboard



# Crossing the Pond

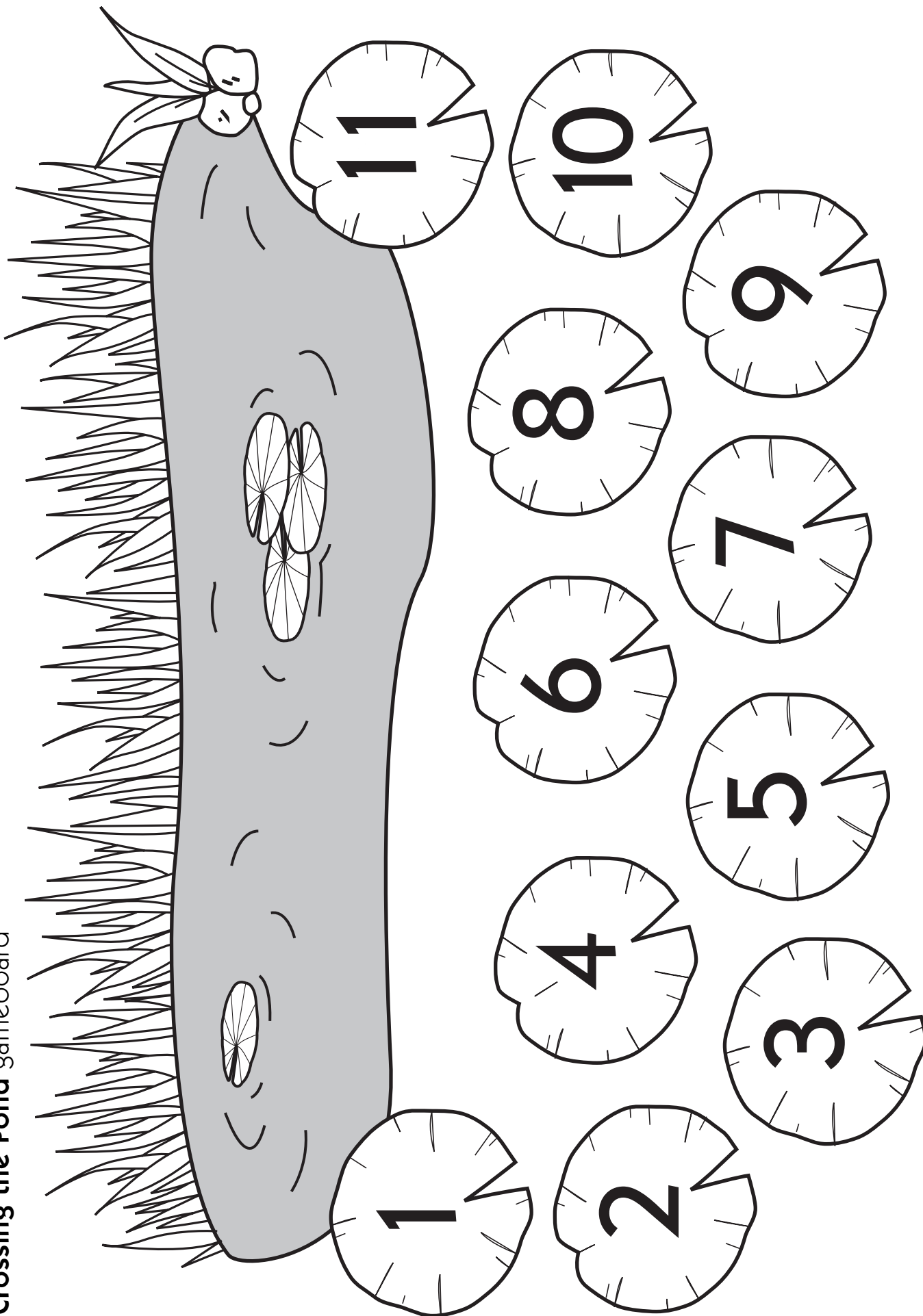


# Crossing the Pond



Make 2 copies on cardstock (3 double spinners needed). Cut apart on thin lines. Laminate. Attach spinners.

**Crossing the Pond** gameboard



Make 6 copies on cardstock. Laminate.