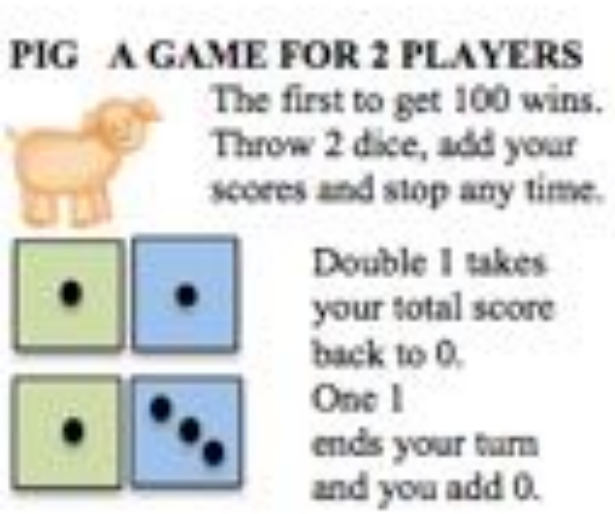
AIMSSEC

AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES
SCHOOLS ENRICHMENT CENTRE
TEACHER NETWORK



Both players start with zero points and take turns to throw the dice *as many times as they like* adding the total at each throw to their score.

You throw a double one. On the next throw, is your chance of throwing a double one the same, more likely or less likely?

On each throw, which of the following 3 options is *most likely* and which is *least likely*? How do you know?

(A) 1 and some other number
(B) A double 1
(C) Two numbers other than 1.

Can you work out a strategy so that you can win more often than you lose?

You can play this game against a computer on NRICH https://nrich.maths.org/1260 and play a different version of the game https://nrich.maths.org/1258

SOLUTION

Table showing scores for all possible throws.

	1	2	3	4	5	6
1		0	0	0	0	0
2	0	4	5	6	7	8
3	0	5	6	7	8	9
4	0	6	7	8	9	10
5	0	7	8	9	10	11
6	0	8	9	10	11	12

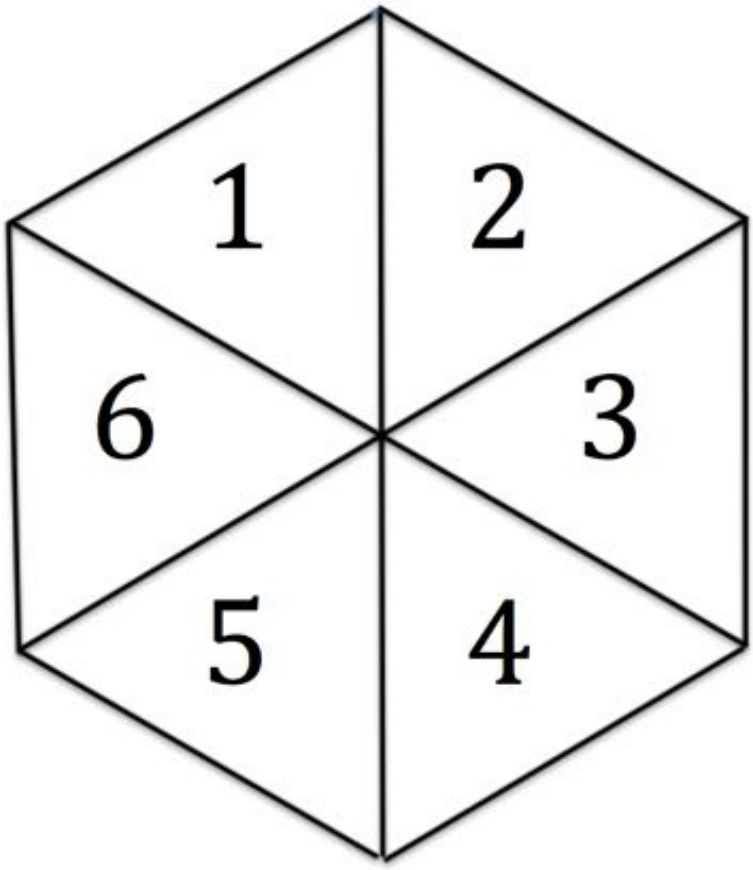
After throwing a double 1 you have the **same chance** of throwing a double one on the next throw.

On each throw all 36 outcomes are **equally likely**.

(A) 1 and some other number — Probability 10/36
(B) A double 1 — **Least likely**, probability 1/36
(C) Two numbers other than 1 — **Most likely**, probability 25/36

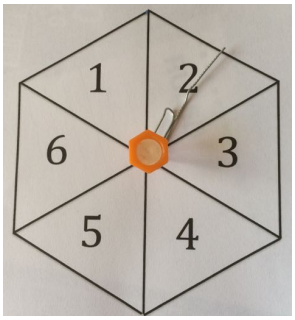
A good strategy is only to throw once if you are ahead. That way you are most likely to stay ahead and avoid the disaster of throwing a double 1.

For a detailed analysis of the game see Durango Bill's website.



MAKE YOUR OWN SPINNERS

You will need a pair of dice or a spinner for each pair of learners.



To make your own spinner as shown in the picture you will need a paper clip and a pin. Straighten out one end of the paper clip, cut out the template and then pin the paper clip and the hexagon on a flat surface so that the spinner spins freely. Now you are ready to play the game.

NOTES FOR TEACHERS

Why do this activity?

This activity provides an enjoyable introduction to probability for younger learners. For other learners it provides a context in which to review some of the basic concepts of probability. Because they will want to win the game, learners can be motivated to understand what will give them the best chance and so to count all the possible outcomes (members of the sample space), to count the number of outcomes which lead to a particular event, both fundamental to probability, and to understand how to find probabilities. The activity can also provide a context in which to introduce 2-way tables.

Intended learning outcomes

Primary:
An introduction to the concepts of ‘most likely’, ‘least likely’ and ‘equal chances’.
Lower secondary:
Review of the basic concepts of probability.
Practice in counting all the possible outcomes (members of the sample space) and counting the number of outcomes which lead to a particular event.
Introduction to two-way tables or practice in using two-way tables.

Suggestions for teaching

Play the game as a class a few times so that all the learners become familiar with the rules. Divide the class in two and have a representative from each group at the front to take turns to throw the dice. Each time the teams have to decide whether to stop or to throw again. Write the scores on the board.

Then get learners to play the game in pairs. They will need dice or a spinner. With one die or a spinner they will need to throw or spin twice at each throw.

Then, as a whole class, discuss whether the probabilities are the same on every throw and the question: "On each throw, which of the following 3 options is *most likely* and which is *least likely*? How do you know?
(A) 1 and some other number (B) A double 1 (C) Two numbers other than 1.

Misconceptions about a 'run of good or bad luck' are common. It is important for learners to understand that, whatever has happened in the past, all the probabilities are the same on the next throw.

An essential and fundamental idea in probability is counting the number of possibilities that make up the sample space. With a younger class it is enough to understand that 'there are more ways of getting a single one then getting a double one so a single one is *more likely* than a double one. And similarly there are more ways of getting other scores than throwing 1 or 2 ones so getting a positive score is *more likely* than scoring zero. Older learners can go on to listing and counting the 36 possibilities and working out the probabilities.

Key questions

Does a double 1 come up more often or less often than a single 1?
Which is more likely - a double 1 or a single 1?
Does a double 1 come up more often or less often than a pair of numbers without a 1?
Which is more likely - a double 1 or a pair of numbers without a 1?
Are you winning at the moment?
Is it worth the risk of throwing again?
Why would you want to go on and throw again?
Why would you want to stop now?

Possible extension

See Nines and Tens https://aiminghigh.aimssec.ac.za/grades-7-to-10-nines-and-tens/

Possible support

See Rock, Paper, Scissors https://aiminghigh.aimssec.ac.za/grades-4-to-8-scissors-paper-rock/

Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA and to Years 4 to 12 in the UK.				
	Lower Primary or Foundation Phase	Upper Primary	Lower Secondary	Upper Secondary
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6