

AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES SCHOOLS ENRICHMENT CENTRE (AIMSSEC)

AIMING HIGH IS IT A FAIR GAME? is the theme

for this INCLUSION AND HOME LEARNING GUIDE

This Guide suggests related learning activities for all ages from 4 to 17+

Just choose whatever seems suitable for your group of learners

The SCISSORS, PAPER, ROCK activity was designed for Upper Primary and Secondary

SCISSORS, PAPER, ROCK

Game for 2 players



For scissors hold out 2 fingers like a pair of scissors. For paper hold your hand out flat. For rock clench your hand into a fist.

Count 3, 2, 1 and then both players, at the same time, make one of the signs: scissors, or paper or rock.

Scissors beats paper, paper beats rock and rock beats scissors.

It is a draw if both players make the same sign.

Play the game often and enjoy it.



SPR Wide-Splits - In China people play this game standing up facing their opponent. They start with their feet together and when they lose they step to one side so that their feet get further apart. After a while they are doing the splits. Play this game and see who can last longest before giving up or falling over.

SPR Forward-Splits - Play in pairs who should be roughly the same height. Start the game toe to toe with the other foot toe to heel behind. Play one



directly behind their back foot. Whoever loses that round must slide their front foot forward to meet toe to toe with their opponent again. Another round of SPR is played. Whoever wins takes their front foot and puts it directly behind their back foot. Whoever loses that round must slide their front foot forward to meet toe to toe with their opponent again. This continues until someone loses their balance and falls over or ends up in the splits! <u>Watch this video</u> https://youtu.be/dN8xaC-g8Rk to see how the game is played.

LEARN THE MATHS

Play the game with a friend 10 times and keep a record of the results.

round of SPR. Whoever wins takes their front foot and puts it

Player 1	Paper	Scissors	Is it a fair game? Did you both have the same
Player 2	Rock	Rock	chance of winning?
Winner	Player 1	Player 2	

List all the different possible events that can happen each time you play this game. Did all these events happen in your 10 games?

What makes you decide which sign to make? Give your reasons.

Are you equally likely to make the scissors sign, the paper sign or the rock sign? Explain why.

HELP

This table is not for recording the results of the games you play. It gives **all the different results that could happen**. Fill in the other boxes. The table has been started for you.

PLAYER	SCISSORS	SCISSORS	SCISSORS			
1						
PLAYER	SCISSORS	PAPER	ROCK			
2						
WINNER	DRAW	1	2			

NEXT

Make up a similar game with 4 actions instead of 3. Play your game and record the results. Is your game a fair game?

INCLUSION AND HOME LEARNING GUIDE

THEME: IS IT A FAIR GAME?

Early Years and Lower Primary

This is a very suitable game for young children because it is a game of chance. Children have as much chance to win as adults. Once the child has some good coordination and balance, and provided the adult is not a yoga expert, the wide-splits version is a lot of fun. The forward-splits version is only suitable if both players are about the same height. Neither versions involve any counting which can be an advantage. In the wide-splits version, the players in the video below did not do this, but you should start with feet together and just take a small step to the side when you lose. **See the video**.

Upper Primary, Lower and Upper Secondary

Two Upper Secondary learners can play the game and read and work through this for themselves without the help of an adult.

Play this game in a DO, TALK, RECORD cycle. It's a great way to help your children learn maths. Whether you are helping one learner or a group, these guidance notes refer to learners (plural). The game can be played with parents, with other adults or with other children.

All 3 versions of this game as described on page 1 are suitable for learners who have never met probability before. If there are older children involved who have met and understand probability, then you can give them the task in the NEXT box on Page 1.

DO

- 1. Just play the game and enjoy it.
- 2. Copy the top box on Page 1 and read it with your learners.
- 3. Copy the table making 10 columns for the results of 10 games.
- 4. Ask them to play the game 10 times and

RECORD fill the results of their games in the table. You can play with one learner.

TALK about the answers to the following questions.

If your group has more than one learner it is helpful for them to talk about the questions. Key questions help learners to think for themselves, and they should talk to each other and help each other to find the answers before you join in and give your ideas. Try to avoid telling learners what to do, but instead ask questions that guide them to decide for themselves what they might try next. Instead of explaining, it is often better to ask a KEY QUESTION to guide the learners to find their own explanations.

Key questions

- 1. What are the different things that can happen when you play this game?
- 2. How many different events happen when you play this game?
- 3. Did all these events happen in your 10 games?
- 4. How many of those events end in a draw?
- 5. How many of those events end in you winning.
- 6. How many of those events end in your opponent winning?
- 7. What makes you decide which sign to make? Give your reasons.
- 8. Are you equally likely to make the scissors sign, the paper sign or the rock sign? Explain why or why not.
- 9. Are you sure that you have made a list of all the possibilities? How do you know?

10. Is it a fair game? Do both players have the same chance of winning?

If your learners are old enough to do so you can ask them to write down their answers, or you can help them to do so, but for young children recording these answers is not essential.

RECORD

Then have a discussion about the answers and list **all the different possible events**. Older learners may know that this is called **the sample space**.

Ask "how can we record these possibilities clearly?" and introduce this table:

PLAYER 1	SCISSORS	SCISSORS	SCISSORS			
PLAYER 2	SCISSORS	PAPER	ROCK			
WINNER	DRAW	1	2			

Get the learners to tell you what to fill in the different cells.

For older learners this is a good context in which to use a 2-way table so you might draw up both tables and talk about them. The advantage of the second table (called a *two-way table*, see solutions) is that it makes it easier to count the number of events in the sample space.

When the learners understand that there are 9 events that can happen, ask the learners what chance Player 1 has of winning? Tell them that the word *'probability'* means 'chance'. Ask them what is the probability of a draw.

The Diagnostic Quiz can be used at the end of the session to find out if the learners have understood the fundamental idea.

SOLUTION

There are 9 possible results when you play this game. They are shown, in different ways, in the tables below. To understand probability you must understand, and be able to describe and count, the events that can happen. Mathematicians call this the *sample space*. Learners in primary school should have the experience of playing games, making lists of what can happen and counting the number of events that fit a particular description, for example 'Player 2 wins', but they don't need to learn the words sample space

PLAYER	SCISSOR	SCISSOR	SCISSOR	PAPER	PAPE	PAPE	ROCK	ROCK	ROCK
1	S	S	S		R	R			
PLAYER	SCISSOR	PAPER	ROCK	SCISSOR	PAPE	ROCK	SCISSOR	PAPE	ROCK
2	S			S	R		S	R	
WINNE	DRAW	1	2	2	DRAW	1	1	2	DRA
R									W

SAMPLE SPACE – ALL POSSIBLE EVENTS

TWO WAY TABLE

Table showin	g winners for	PLAYER 1					
all possible e	vents.	SCISSORS	PAPER	ROCK			
	SCISSORS	Draw	2	1			
PLAYER 2	PAPER	1	Draw	2			
	ROCK	2	1	Draw			

Of the 9 events, Player 1 wins 3 times. We say that his chance of winning is $\frac{3}{9}$ or $\frac{1}{3}$ or 1 in 3.

Probability is another word that means chance.

So Player 1 has a 1 in 3 chance of winning, player 2 has a 1 in 3 chance of winning and there is a 1 in 3 chance of a draw.

So it is a fair game.

Why do this activity?

Learners will enjoy playing this game and it will introduce them to some fundamental mathematical thinking about probability.

Learning objectives

In doing this activity students will have an opportunity to:

- experience involvement in a game that requires some mathematical thinking about probability;
- develop of mathematical thinking about the different possible events in a situation;
- meet the concept of a sample space (**without** technical language);
- explore the concept of equal chances and a fair game.

Generic competences

In doing this activity students will have an opportunity to:

- think mathematically and reason logically;
- **communicate** and exchange ideas with others about the rules of a game and the probability of winning;
- develop life skills and consideration for others in playing games.



- 3. Ask the learners to vote for the right answer again by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers.
- 4. If the concept is needed for the lesson to follow, explain the right answer or give a remedial task.

The correct answer is C. There are 7 events in the sample space. Choosing a red counter gives two of https://diagnosticquestions.com

Follow up

In a Box <u>https://aiminghigh.aimssec.ac.za/years-6-12-in-a-box/</u> Same Sweets <u>https://aiminghigh.aimssec.ac.za/years-4-7-same-sweets/</u>

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PLAY SCISSORS PAPER ROCK LIZARD SPOCK - 5 ACTIONS IN PLACE OF 3



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ACTIONS SPR GAME	Scissors	Paper	Rock	Lizard	Spock
Scissors	D	Sc	R	Sc	S
Paper	Sc	D	Ρ	L	Ρ
Rock	R	Ρ	D	R	S
Lizard	Sc	L	R	D	L
Spock	S	Ρ	S	L	D

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Paper covers Rock. Rock crushes Lizard. Lizard bites Spock. Spock smashes Scissors. Scissors decapitate Lizard.

Lizard eats Paper. Paper criticises Spock. Spock vaporizes Rock. Rock crushes Scissors. Scissors cut Paper.

OR PLAY THE 7 ACTIONS GAME

The rules are in the contingency table. But you need to make up your own 'stories'.

ACTIONS SPR GAME	Rock	Water	Air	Paper	Sponge	Scissors	Fire
Rock	D	W	А	Ρ	R	R	R
Water	W	D	А	Ρ	S	W	W
Air	А	А	D	Ρ	S	Sc	A
Paper	Ρ	Ρ	Ρ	D	S	Sc	F
Sponge	R	S	S	S	D	Sc	F
Scissors	R	W	Sc	Sc	Sc	D	F
Fire	R	W	A	F	F	F	D



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