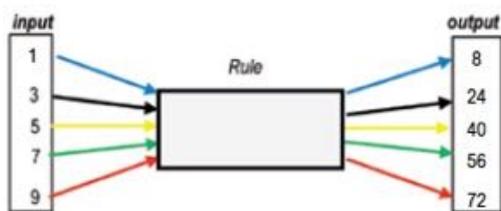


FUNCTION GAME (Grades 7 TO 10)

What is the rule (or function) that gives the outputs corresponding to the inputs shown in the diagram mapping 1 to 8 and 3 to 24 etc?



The Function Game is played in silence. Learners have to guess the function in the teacher's mind. The teacher tells the learners that she wants them **to tell her what she is doing**. She asks the learners to give her numbers and writes them on the board in a column with the outputs for the

functions rule she is thinking of alongside. She asks "What am I doing?" A learner who thinks he or she has guessed what the teacher is doing puts up a hand and the teacher suggests a number and asks the learner to do the same with it and give the answer. If the learner gets the right output the teacher congratulates him and writes it on the board. The game continues until most of the learners have guessed the rule. Then learners who have guessed it explain what the teacher was doing for the benefit of those who did not guess it and the game is repeated with another rule.

For example if the function is $x \rightarrow 3x+5$ then $2 \rightarrow 11$, $3 \rightarrow 14$, $10 \rightarrow 35$ etc.

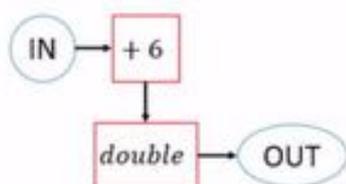
VARIATION TO INVERSE FUNCTIONS The game can be varied by sometimes using the numbers suggested by learners as inputs and sometimes as outputs, the teacher writing the numbers in the appropriate input and output columns. This can lead to a class discussion of inverse functions.

For example, if the output is 41 for the function $x \rightarrow 3x+5$ how do you find the input? The inverse function is $x \rightarrow (x - 5)/3$ so the input is 12.

Notes for teachers

Diagnostic Assessment This should take about 5–10 minutes.

- Write the question on the board, say to the class:
"Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D".
- Notice how the learners responded. Ask a learner who gave answer A to explain why he or she gave that answer and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.
- Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.
- Ask the class again to vote for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers. It is important for learners to explain the reason for their answer otherwise many learners will just make a guess.
- If the concept is needed for the lesson to follow, explain the right answer or give a remedial task.



If I put the numbers 3 and 7 into this function machine, what comes out?

- | | | | |
|----------|-----------------|----------|------------|
| A | 9 and 14 | B | 18 and 26 |
| C | - 4.5 and - 2.5 | D | 81 and 169 |

B. is the correct answer.

Common Misconceptions

A. Learners did not understand the question, they gave reasons like $3+6 = 9$ and $7+7 = 14$

B. Here learners give reasons like: Because -4.5 add $6 = 2.5$

D. Probably a guess

<https://diagnosticquestions.com>

Why do this activity?

By playing this game learners will learn about functions and inverse functions, and they will practice finding the formulas in an enjoyable way. By asking “What am I doing?” the teacher can introduce functions *without using any technical language* and then later she can introduce and use the words ‘rule’, ‘input’, ‘output’, ‘function’ and ‘inverse function’. After that frequent use of these terms while playing the game will help the learners to learn the mathematical language. These games can be played many times for a short while each time, to provide a gentle introduction to functions and also, for older learners, as a way to revise previous work on functions and inverse functions. Learners need a lot of practice in thinking algebraically and these activities provide practice in an undemanding and playful way.

Possible approach

Play the Function Game as described above. With younger learners play it several times before gradually introducing the mathematical language. Also with younger learners play the game several before introducing the variation with inverse functions.

You could ask the learners to make up their own rule or function and draw a flow chart for it like the one above. They could work in pairs or small groups. After they have invented their own function charts they can exchange them with other learners who have to find the rule. Or they can come to the board in pairs and play the role of the teacher in leading the Function Game with the teacher acting as referee.

Finally the teacher should provide a summary of what has been learned giving the mathematical terms: rule, input, output, function and inverse function.

Key Questions

What am I doing?

If I give you the number 5 can you do the same and give me the answer?

Can you explain what I am doing with your numbers? Now can you explain that with a formula?

If the rule is $x \rightarrow 3x + 5$ and the input is 6 what is the output? (give different rules and inputs)

If the rule is $x \rightarrow 3x + 5$ what does 6 map to? (give different rules and inputs)

If the rule is $x \rightarrow 3x + 5$ what do you do to the input to get the output?

If the rule is $x \rightarrow 3x + 5$ what do you do to the output to get the input?

Possible Extension

As described above, learners can make up a similar activity of their own in pairs. They can think up their own function rules and sets of inputs and outputs. They can come to the board and take the role of the teacher with the teacher as referee.

Possible Support

For learners who struggle to guess the rule give simple rules like $x \rightarrow 2x$ and then the next time $x \rightarrow 2x + 1$

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