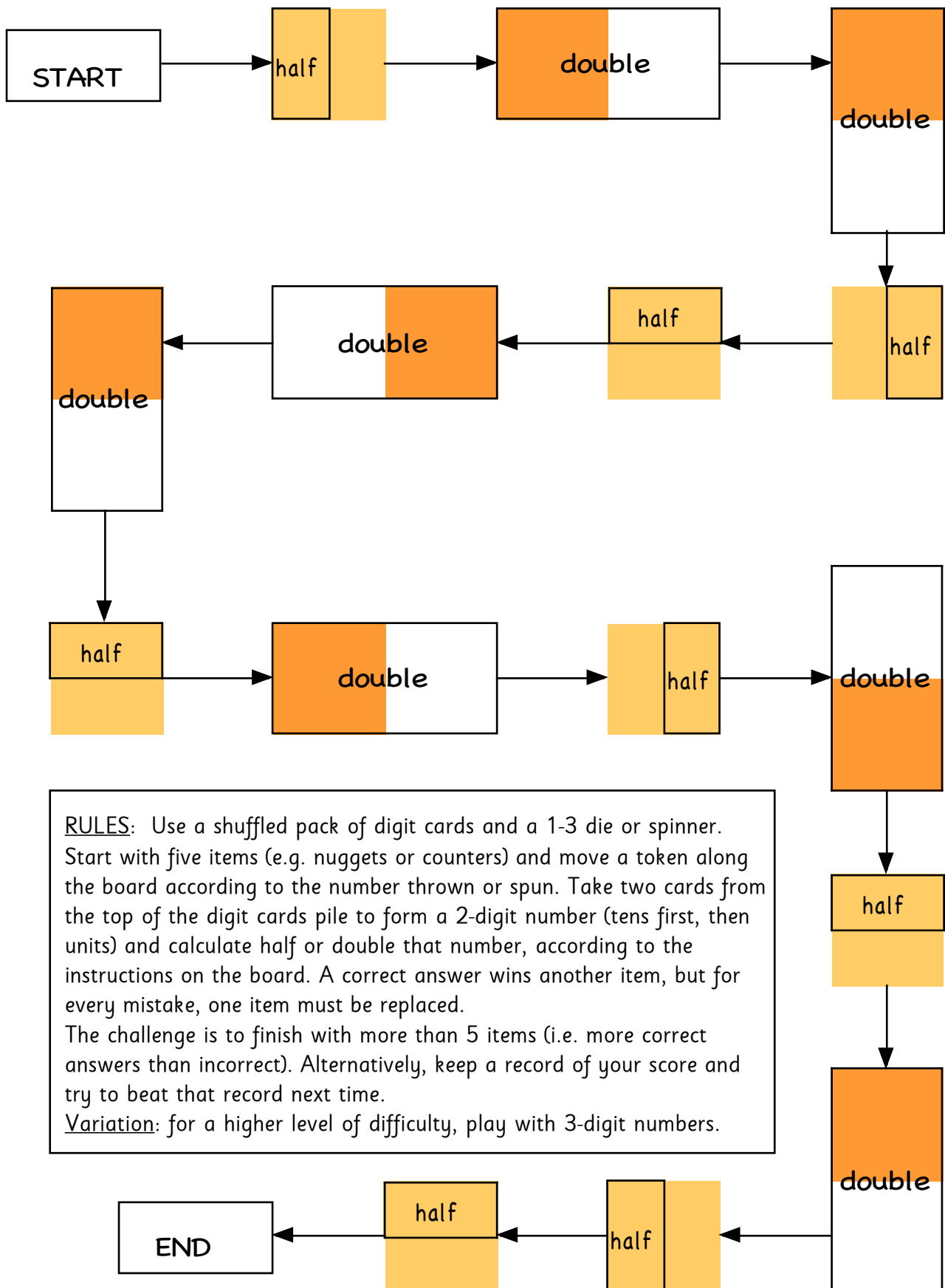


# Double or Half Challenge : A solitaire game



**RULES:** Use a shuffled pack of digit cards and a 1-3 die or spinner. Start with five items (e.g. nuggets or counters) and move a token along the board according to the number thrown or spun. Take two cards from the top of the digit cards pile to form a 2-digit number (tens first, then units) and calculate half or double that number, according to the instructions on the board. A correct answer wins another item, but for every mistake, one item must be replaced. The challenge is to finish with more than 5 items (i.e. more correct answers than incorrect). Alternatively, keep a record of your score and try to beat that record next time.  
**Variation:** for a higher level of difficulty, play with 3-digit numbers.

## THE DOUBLE OR HALF CHALLENGE - A SOLITAIRE GAME

I created this game in order to provide practice in doubling and halving, in the form of a challenge to make it fun for my pupils, and without producing a static game board that would soon prove repetitive and restrictive. By creating a game board without numbers, designed to be played in conjunction with a set of digit cards, every game presents a random set of new numbers and therefore new challenges.

The game is for a single player but should be overseen by someone who can judge if the answers are correct or incorrect. If no such person is available, answers can be checked on a calculator.

### TEACHING POINTS

The game provides practice in both doubling and halving. Before play, pupils should be taught how to double and halve and should also be able to identify which strategies to use on different numbers.

All the doubles and half facts up to  $10 + 10$  should be known by heart. Therefore, doubling any number below 10 and halving any even number below 20 will simply rely on the pupil's memory.

In order to double a number greater than 10, the pupil should be taught how to partition the number into place-value chunks, so that each partitioned chunk can be doubled separately and then combined to produce the final answer. Pupils should be encouraged to work from left to right, i.e. to double the digits of greatest value first. Learners should not try to visualise a written addition set out vertically in columns, since this is likely to put too great a strain on their working memory and therefore result in an incorrect answer. An informal arrow notation is useful for learning and later for visualising the doubling procedure (see my books for more about this).

The doubling process is straightforward if all the digits are below 5. For digits above 5, the pupil will need to practise the 'stepping stone' technique, in which the solution is found in sequential steps. For example, if the question is 'double 68', the pupils mentally calculates and holds onto the number 120 as the 'stepping stone' while deciding that 16 is still to be added, to reach the final answer of 136.

The halving process is straightforward if all the digits are even. To halve any multi-digit number, pupils should be encouraged to partition the number mentally into chunks, this time not necessarily along place value lines, and to work from left to right, so as to halve the digits of greatest value first. Pupils should be discouraged from trying to visualise a written division problem. An informal arrow notation is useful for learning and later for visualising the halving procedure, just as it was for the doubling procedure (above).

In order to halve an odd number, the pupil must first be shown that half of 1 is a half. They should then be encouraged to partition the odd number into 'even number + 1' before halving each chunk separately. For example, to find half of 5, first partition it into  $4 + 1$ , then halve each part separately to reach  $2\frac{1}{2}$ .

For numbers in which there are an odd number of tens, the pupil should be encouraged to mentally partition the number into the teen number and what's left, rather than into the more obvious place value chunks, and halve each chunk separately. For example, a good way to find half of 56 is to first partition the number into  $40 + 16$  and then halve each chunk to produce the answer 28. (This method avoids the very common mistakes at the combining stage that can occur when a pupil tries to halve 56 by splitting it into  $50 + 6$  before halving.) To find half of 57, the number is best partitioned into  $40 + 16 + 1$  before halving each chunk separately.

## **EQUIPMENT NEEDED TO PLAY THE GAME**

The game board (above) printed off onto A4 paper or card

A 1–3 die or spinner

A pack of digit cards made up of 4 each of the numbers 1 to 9 inclusive

A token to move around the board

Approximately fifteen nuggets or counters.

## **RULES**

Start by putting a token on the board in the 'Start' position and placing the shuffled pack of digit cards face down. Take five nuggets or counters to put into your winning pile.

Throw the dice or spin the spinner and move your token one, two or three spaces along the track, according to the number thrown or spun. The position you land on tells you whether the number you are about to create from the digit cards must be doubled or halved. Generate a 2-digit number by turning over two cards from the top of your pack: the first card represents the tens and the second card, placed immediately to the right, represents the digits. Calculate your answer mentally and say it aloud.

If your answer is correct, you win a nugget to add to your winning pile. If it is incorrect you lose one of your nuggets.

Continue in the same way until you reach the end of the board.

When you first play the solitaire game, the aim is to get to the end of the board with more than 5 nuggets in your winning pile. This would mean you have given more correct answers than incorrect ones during the course of the game. Once you have practised your doubling and halving techniques, your aim should be to win as many nuggets as possible and to try and beat your previous record on subsequent games.

## **VARIATIONS**

The game can be played at three different levels, depending on the abilities and difficulties of the individual learner. The rules above describe a Level 2 game.

At Level 1 use digit cards for numbers between 1 and 20 only for the doubling questions, and prepare a separate set of cards that show only the even numbers between 1 and 20 for the halving questions.

At Level 3 use the same pack of digit cards as for Level 2 but turn over three cards on every turn to generate random 3-digit numbers to be doubled or halved.