Reasoning in the classroom

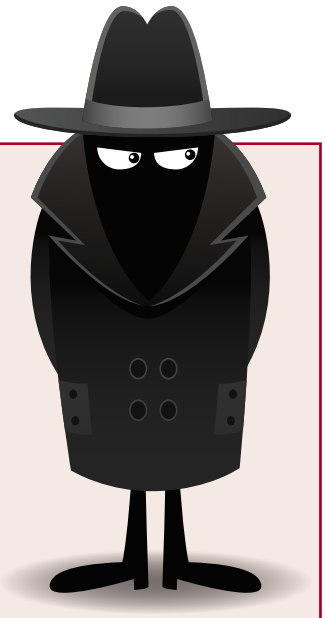
Sping the Spy

Support materials for teachers

Year 3

Llywodraeth Cymru
Welsh Government

Year 3 Reasoning in the classroom – Sping the Spy



These Year 3 activities offer a wide range of opportunities for numerical reasoning.

Activity 1

Sping the Spy

Learners use their spatial understanding to show possible 'walks' for the spy, then offer reasons why the spy must have counted incorrectly. They also solve a problem about Sping's sisters.

Includes:

- Teachers' script
- PowerPoint presentation
- Sping the Spy questions
- Markscheme

Activity 2

Find the clues

They play a game, thinking strategically about how to collect as many clues as possible.

Includes:

- Explain and question – instructions for teachers
- Whiteboard – Find the clues 1
- Whiteboard – Find the clues 2
- Resource sheet – Game board
- Whiteboard – Rules

Activity 3

Beating Boris

They explore the number of ways in which two numbers can be added to make a given total, in order to help Sping beat Boris the Bad.

Includes:

- Explain and question – instructions for teachers
- Whiteboard – Boris and the safe
- Whiteboard – Combination lock
- Whiteboard – Break the code

Reasoning skills required

Identify	Communicate	Review
Learners choose their own methods.	They decide for themselves what to write down and how to explain their findings.	They review their answers, considering whether or not they are reasonable.

Procedural skills

- **Addition**
- **Subtraction**

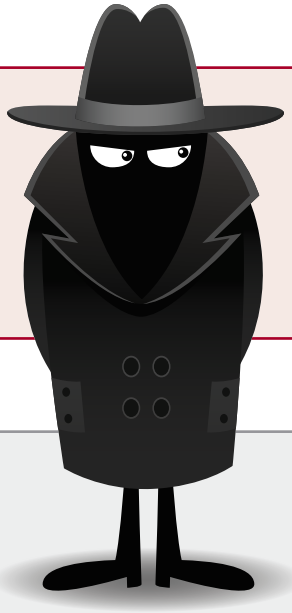
Numerical language

- **Direction**
- **Horizontal**
- **Vertical**
- **Pair**

Activity 1

Sping the Spy

Activity 1 – Sping the Spy



Outline

Learners engage with the stimulus materials that show Sping the Spy busily spying her way through town. They then complete questions relating to that context, including deciding for themselves how to explain why Sping the Spy must have made a mistake. Finally, they work out the ages of Sping's sisters.

You will need

Teachers' script

PowerPoint presentation

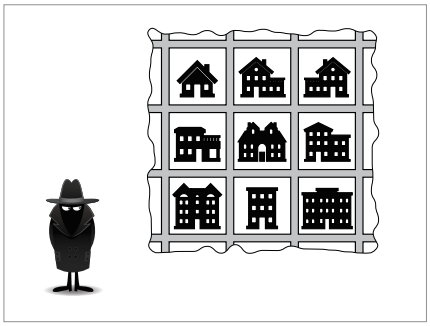
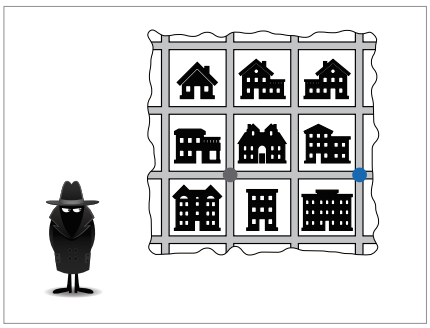
Sping the Spy questions
Three pages for each learner, must be printed single-sided

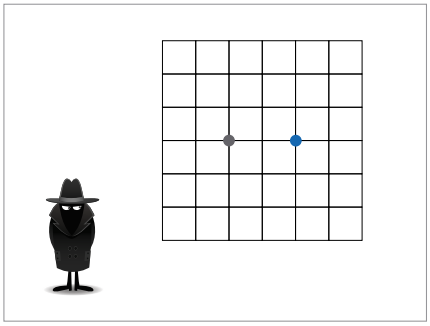
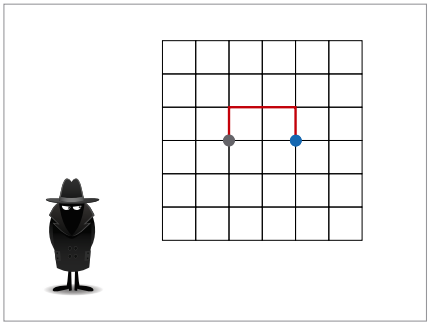
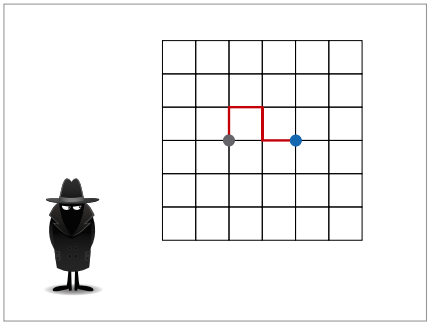
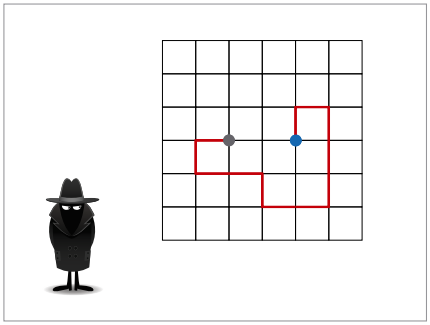
Markscheme

TS

Presentation to be shown to learners before they work on Sping the Spy

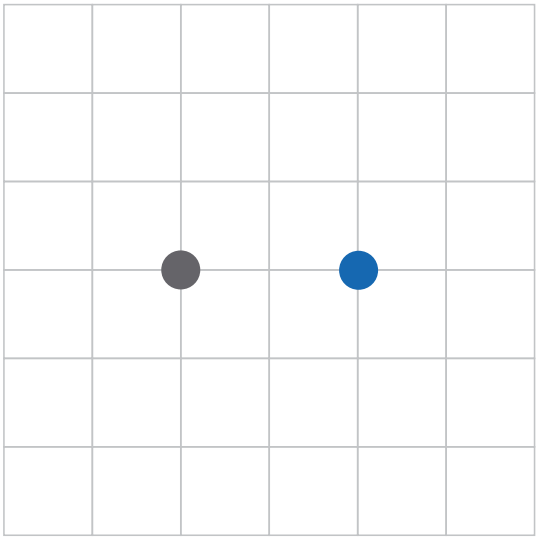
The text in the right-hand boxes (but not italics) should be read to learners. You can use your own words, or provide additional explanation of contexts, if necessary. However, if you are using this as an assessment item, no help must be given with the numeracy that is to be assessed.

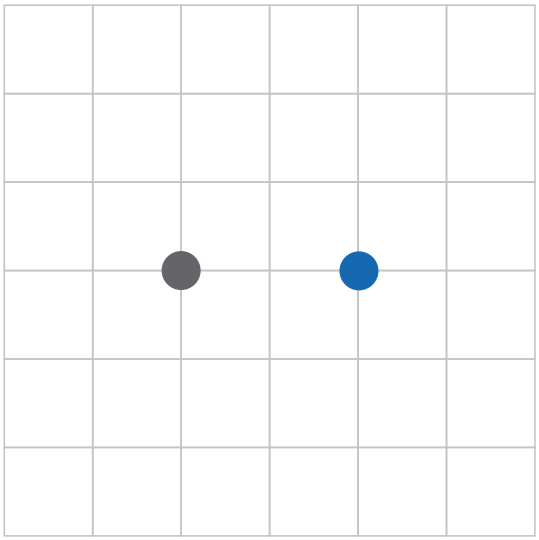
Slide 1		*(Keep this slide on the screen until you are ready to start the presentation.)*
Slide 2		This is Sping. She is a spy!
Slide 3		She lives in a town that has roads that go straight across and straight up *(point)*.
Slide 4		Every day Sping the Spy walks from here *(point to the grey circle at the intersection of two roads)* and she finishes here *(the blue circle)*. There are many more roads than this in Sping's town . . . the roads continue in all directions.

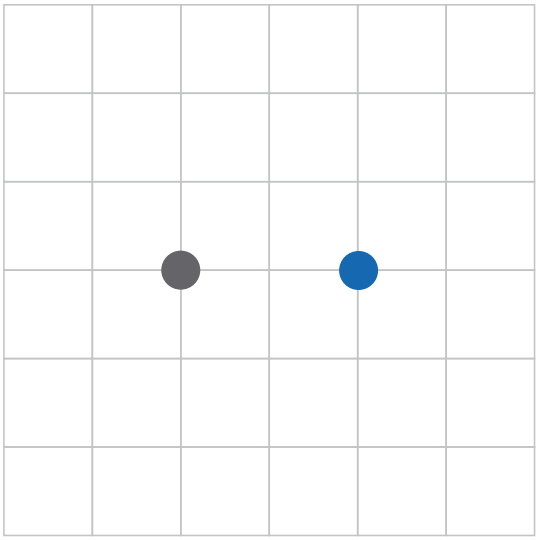
Slide 5		Here you can see more roads in Sping the Spy's town. Where does she start her walk? *(Grey circle)* Where does she finish? *(Blue circle)*
Slide 6		The red lines show one way that Sping the Spy can walk. She walks four blocks. *(Show by counting that each unit is a block.)* Of course because she is a spy she never uses the same route twice. The next day she goes a different way.
Slide 7		How many blocks is this walk? *(Again, count them to show there are four blocks.)*
Slide 8		Sometimes Sping the Spy goes long distances. How many blocks is this walk? *(Count together to show that the walk has 12 blocks.)* *(Make sure each learner understands how blocks are counted as they need this understanding to complete the first questions.)* Now you are going to answer some questions about Sping the Spy. Remember to show your working so that someone else can understand what you are doing and why. *(If you are using this item for assessment purposes, you may wish to limit the time available, e.g. 15 minutes.)*

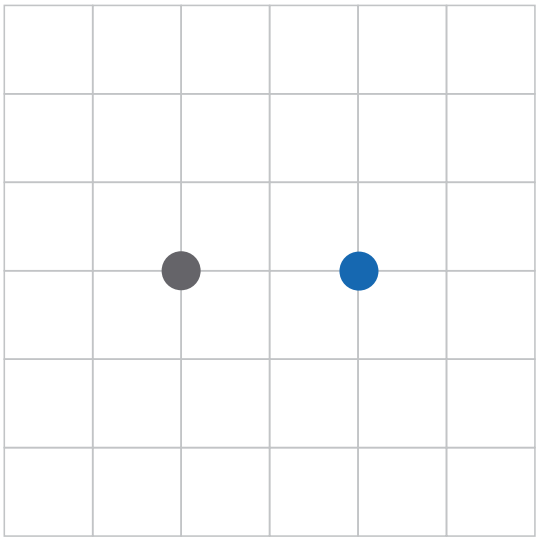
1 Show four **different** walks from ● to ●

Each walk must be **6** blocks.





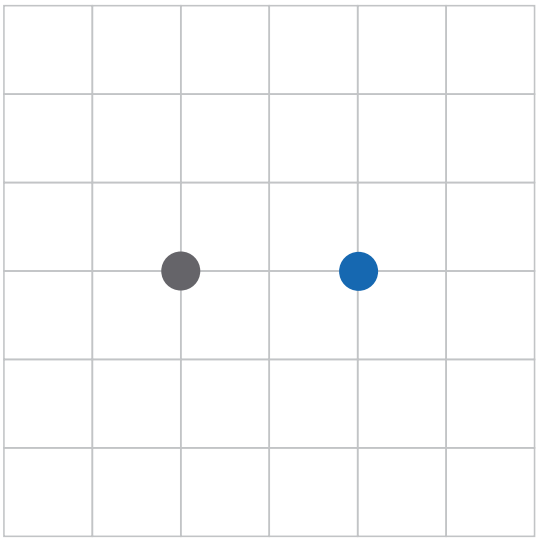




4m

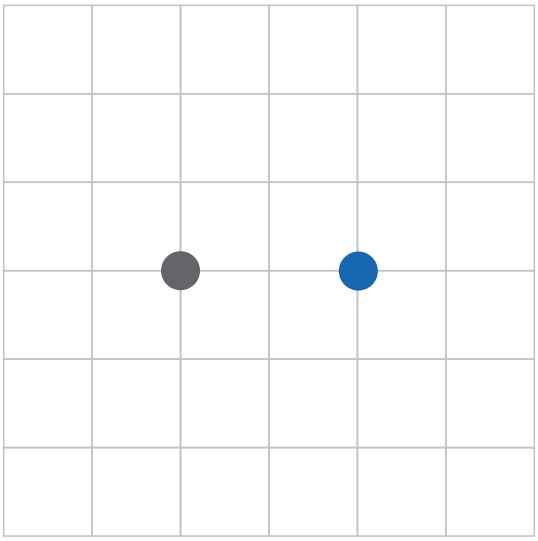
Show an **8** blocks walk

from ● to ●



Show a **10** blocks walk

from ● to ●



1m

1m

I did an **11** blocks walk

from ● to ●

Write why Sping the Spy **must** be wrong.

1m

2 Sping has two sisters, Spong and Spydo.

Spong

Spydo

Spong is **5 years older** than Spydo.

Their ages add up to **21**

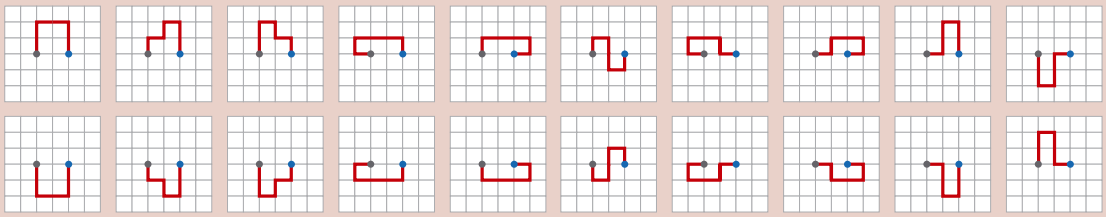
How old are Spong and Spydo?

Spong is _____ years old.

Spydo is _____ years old.

3m

Activity 1 – Sping the Spy – Markscheme

Q	Marks	Answer
1i	4m	Shows any **four** of the following routes: 
	Or 3m	Shows any 3 of the routes above Or Miscounts the number of blocks but draws 4 different diagrams of that number of blocks
	Or 2m	Shows any 2 of the routes above Or Miscounts the number of blocks but draws 3 different diagrams of that number of blocks
	Or 1m	Shows any 1 of the routes above Or Miscounts the number of blocks but draws 2 different diagrams of that number of blocks
1ii	1m	Shows an 8-block walk
1iii	1m	Shows a 10-block walk
1iv	1m	Shows that an 11-block walk is not possible, e.g. • She can only walk even numbers • 11 is odd • If you go up one you have to come down one so it is in pairs • She can do 10 and 12 but not 11

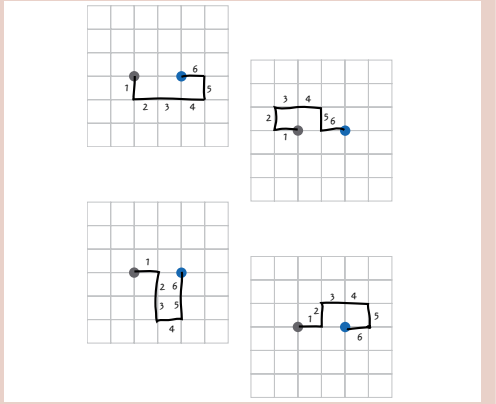
Throughout, accept lines that are not accurate provided the learner's intention is clear

Activity 1 – Sping the Spy – Markscheme (continued)

Q	Marks	Answer
2	3m	**Spong 13** years old and **Spydo 8** years old
	Or 2m	Spong 8 years old and Spydo 13 years old Or Shows at least three pairs of numbers that sum to 21, e.g. • 11, 10 14, 7 16, 5 Or Shows at least three pairs of numbers that have a difference of 5, e.g. • 11, 6 7, 2 14, 9
	Or 1m	Shows at least one pair of numbers that sum to 21 Or Shows at least one pair of numbers that has a difference of 5

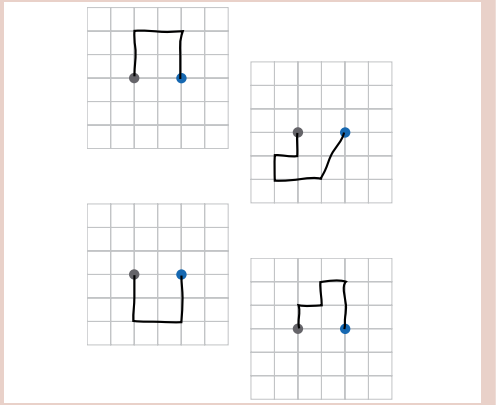
Activity 1 – Sping the Spy – Exemplars

Question 1, part i



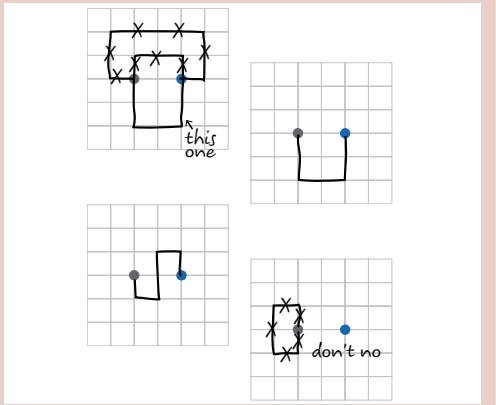
Four correct routes; **4 marks**

- This learner numbers the lines: this is an effective way of checking their routes.



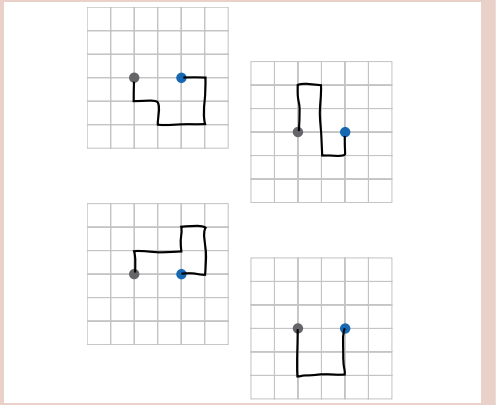
Three correct routes; **3 marks**

- Although the first route on the right shows 6 lines, one of the lines goes through a diagonal and is more than one unit in length so is incorrect.
- The two routes on the left show an insight into symmetry, but this learner would benefit from using a ruler.



Two correct routes; **2 marks**

- The two routes on the left are correct (as the incorrect routes are crossed out, there is no ambiguity regarding the first of these routes). However, the first route on the right has already been drawn so cannot be credited.

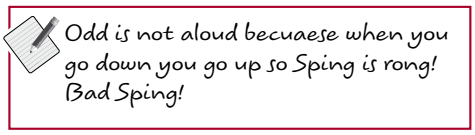


Three different routes of 8 blocks; **2 marks**

- As there are three different diagrams of 8 blocks, 2 marks are given. (Although the final diagram is correct for 6 blocks, this would score 1 mark only.) This learner would benefit from checking their work.

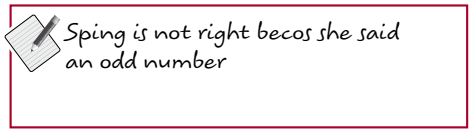
Activity 1 – Sping the Spy – Exemplars (continued)

Question 1, part iv

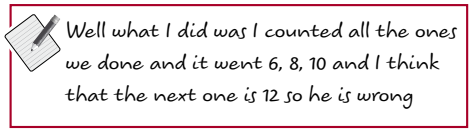


Correct; **1 mark**

- This learner shows good insight, recognising that the number of blocks cannot be odd and attempting to justify why. This is impressive for a Year 3 learner.

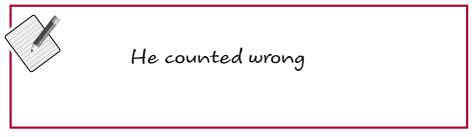


Correct; **1 mark**



Correct; **1 mark**

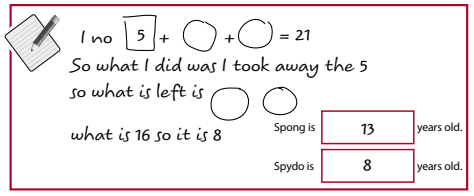
- This learner recognises the pattern in the number of blocks walked.



Incomplete; **0 marks**

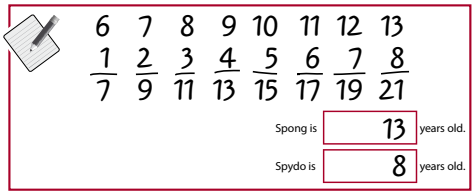
Common error This learner offers no evidence to show how they know that the counting is incorrect. This is a common error.

Question 2



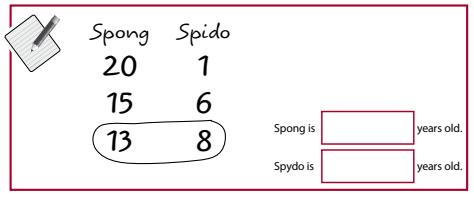
Correct; **3 marks**

- This learner subtracts 5 then shares the 16 equally. This is a powerful general strategy that can be applied to problems set in a variety of contexts.



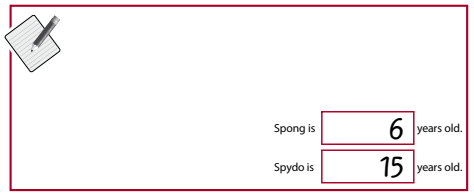
Correct; **3 marks**

- This learner writes numbers with a difference of 5 until they find a pair that sums to 21. This is an effective strategy.



Correct; **3 marks**

- This learner writes numbers that sum to 21 until they find a pair with a difference of 5. This is also an effective strategy.



Numbers that sum to 21; **1 mark**

Common error Even though Spydo's age is more than Spong's, this scores 1 mark. Ignoring one of the constraints is a common error.

Activity 2

Find the clues

Activity 2 – Find the clues

Outline

This activity follows on from **Activity 1 – Sping the Spy**.

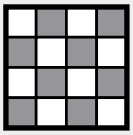
It requires learners to think strategically, planning routes in order to gather 'clues' using random throws of two dice.

This activity is designed to be presented in the classroom. It could, however, be replicated in the playground, using a chalked grid and a learner as Sping, rather than a board and counters.

You will need

WB **Whiteboard – Find the clues 1**

WB **Whiteboard – Find the clues 2**



Resource sheet – Game board
One for each group of four (two pairs)
Or any grid-based board, such as a chess board

WB **Whiteboard – Rules**

Each group of four (two pairs) also needs:

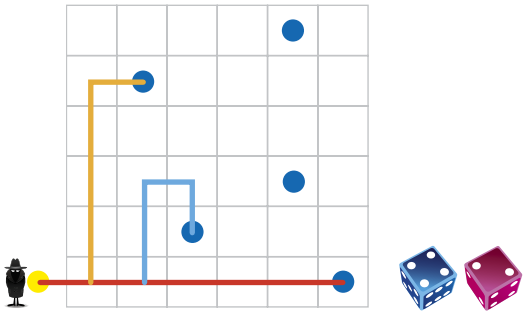
- **five counters of one colour**
- **one counter of a different colour** (to represent Sping)
- **two dice**

Activity 2 – Find the clues

Explain

Show **Find the clues 1** on the whiteboard and explain that Sping needs to collect clues to solve a great mystery. The clues are hidden in the squares with the magnifying glass. *(Sadly, as they are top secret we will never know what is written on them!)*

They are going to throw two dice to find the number of squares that Sping can move. Show **Find the clues 2** (showing 4 and 2 on the dice) and say that she must move 6 squares, because 4 + 2 = 6. Remind learners that Sping can move in any horizontal or vertical direction, but not diagonal. Ask whether Sping can collect a clue. *(Using any of the three routes shown below, she could collect a clue. Emphasise, however, that she can only remove one clue each throw.)*



Tell learners that they are going to play a game with another pair and the winner will be the pair that collects the most clues *(counters)*. Explain that if the total of the dice does not let them land **exactly** on a clue, they move Sping to a square that she can land on, ready to be moved by the next team.

Give each group of four (two pairs) a copy of the **Game board**, a set of five counters, one different-coloured counter and two dice. Explain that the five counters are the clues, and the single counter is Sping. On the whiteboard, show **Rules** to remind learners what they can and cannot do. The game can be repeated as often as is appropriate, with pairs taking it in turns to place the counters on the board.

Question

- Are you checking each time to see if you can land on a clue? And are you checking the moves of the other team?
- Are you working together as a team? How?
- When Sping can't land exactly on a clue, how do you know which is the best place to put her, so you don't help the other team?
- Did you have to wait until the end of the game, when all five clues were collected, to know who had won the game? Why not?
- When placing the clues on the board, are there places you should avoid? Why?

Rules

Team A

- Choose where to put the 5 clues on the board.

Team B

- Throw both dice and add the numbers.
- Move Sping that number of squares (try to collect a clue!).

Then it is Team A's turn to roll the dice, and so on.

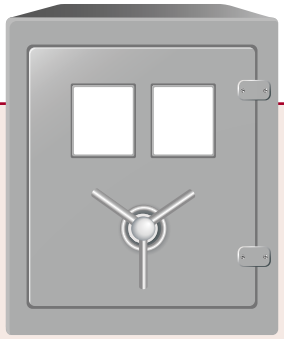
Remember

To collect a clue, you must land **exactly** on the square.

Activity 3

Beating Boris

Activity 3 – Beating Boris



Outline

This activity can either follow on from **Activity 2 – Find the clues**, or directly from **Activity 1 – Sping the Spy**.

Learners use simple combinations to help find a secret code, making their own decisions about how to record their work and check their findings.

You will need

WB **Whiteboard – Boris and the safe**

WB **Whiteboard – Combination lock**

WB **Whiteboard – Break the code**

Activity 3 – Beating Boris

Explain

Introduce the activity by telling learners that Sping the Spy is trying to save the world from Boris the Bad. Boris has stolen some VERY important secrets and hidden them away. Sping's job is to get them back!

Ask where they think Boris might put his secrets and lead into a discussion about the purpose of a safe.

Show **Boris and the safe** explaining that no one can get into the safe unless they can open the lock.

Show **Combination lock** and explain how it works. Make sure learners understand that each box holds one number and that only 1 to 10 can be used.

Explain that Sping has found Boris the Bad's safe, but now needs to know the numbers to use. Fortunately, she has found a clue!

Show **Break the code** and on the whiteboard write 4 in the red box and also after the equals sign *(this enables you to delete the number and insert alternatives later)*. Ask the learners to tell you two numbers that might unlock the door, then lead into an exploration of what the pairs of numbers could be *(1 and 3, 3 and 1, 2 and 2)*. Explain that Sping could then try the different pairs until she found the one that worked.

Once the learners understand the concept, tell them Boris has changed the number in the red box to 5. Ask pairs/small groups to work out all the possible combinations and then compare with other groups.

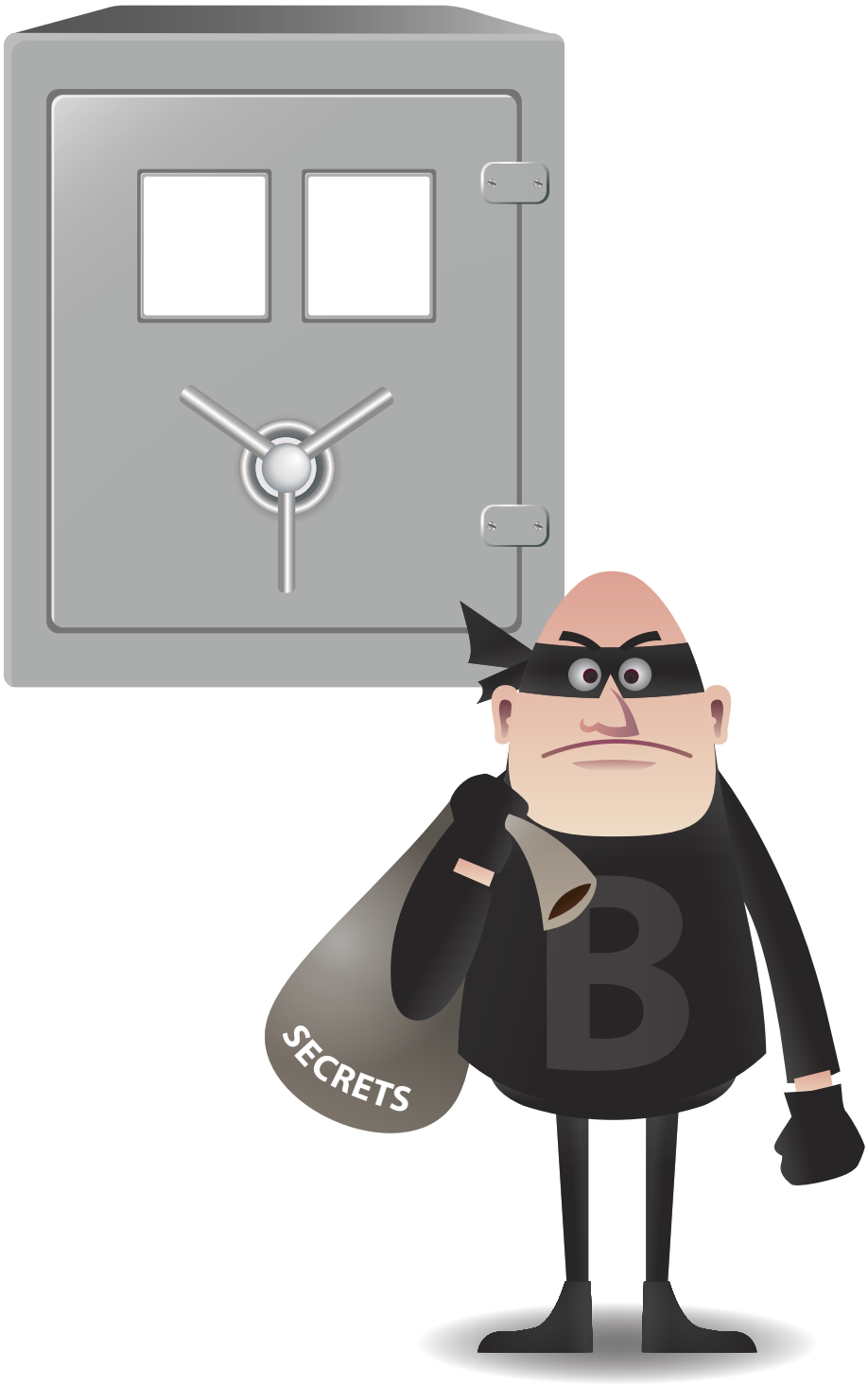
Then ask if they can work out how many different pairs of numbers there would be if Boris made the total 6, or 7 or . . . ?

Question

- How are you writing down your pairs of numbers? Will other people understand what you have written?
- How do you know that you have all possible pairs? Have you got a system?
- Why does increasing the number in the red box make it harder for Sping?
- Can you see any patterns in the number of pairs? How many pairs of numbers would there be if the number in the red box was 10? How do you know without writing them all down? *(The number of pairs is always one less than the number in the red box.)*

Extension

- What happens if as well as being able to use the numbers 1 to 10, you are allowed to use zero? *(The number of pairs is always one more than the number in the red box.)*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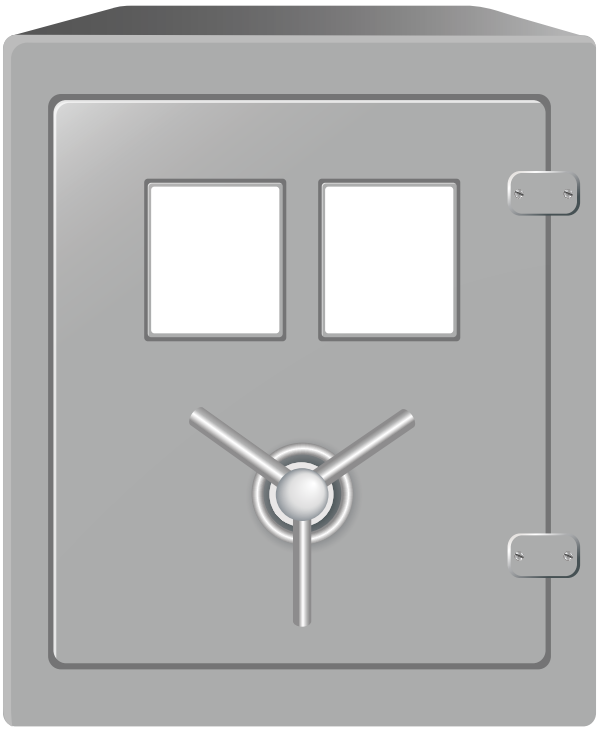

In each box, any number
from 1 to 10

Do not read.

The two numbers

add up to