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## intro

There are quite a few investigations like this one. Although the initial enquiry doesn't go much beyond collecting results, there is still plenty to interest and involve younger pupils.



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## first steps

The investigation is easy to explain . . . In Scotland there are two kinds of ladybird, the *highland ladybird* and the *island ladybird* – one kind has 4 spots and the other kind has 7 spots (though no-one can ever remember which is which). In some parts of Scotland you can see both kinds of ladybird and that's how this investigation comes about . . .

Fiona saw two ladybirds on a leaf and said she could count 11 spots altogether; can you work out what were the two ladybirds on her leaf? Rob had to go one better – he found a leaf with three ladybirds on it and he counted 12 spots; what were the three ladybirds on his leaf? After this, Martin said he'd also seen a leaf with some ladybirds on it – and that on his leaf the spots added up to 13 . . .

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## the investigation

The aim of the investigation is to look at different ways of combining these two sorts of ladybird on one leaf – and to find what different numbers of spots you can make. To start things off, you might need to get the children thinking about one or two specific examples eg, 'How could you make up 8 spots? How could you make 11 spots?'

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## practical

You can make simple 'ladybirds' from red card (and you can buy stick-on spots from a stationer); for leaves, use green paper stuck onto white card (and then laminated to use again and again). Working in twos or threes, children can use these to investigate different combinations and count the spots. They'll have to think about how to record their results – some might like to draw pictures to show all the combinations they've found whilst others will prefer to make lists . . .

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## results

When the children have completed their investigations, you can get them to tell you what they've found and you can summarise their results on the board. Ask them :

- Has anyone found a number that's impossible to arrange?
- What other numbers are impossible to arrange?
- Are there any numbers you can reach in more ways than one?

Here's a list of combinations giving up to 30 spots :

4-spot ladybirds	7-spot ladybirds	total no of spots
0	1	4
1	0	7
2	0	8
1	1	11
3	0	12
0	2	14
2	1	15
4	0	16
1	2	18
3	1	19
5	0	20

4-spot ladybirds	7-spot ladybirds	total no of spots
0	3	21
2	2	22
4	1	23
6	0	24
1	3	25
3	1	26
5	1	27
7	0	28
0	4	28
2	3	29
4	2	30

impossible : 1, 2, 3, 5, 6, 9, 10, 13, 17 ...

## notes

- If you need a challenge for the more able, ask them to work out how many 4-spot and 7-spot ladybirds they would need to produce eg 40 spots, 70 spots, 33 spots, 50 spots, 99 spots . . . (they should be looking at combining results already obtained)
- There's plenty of scope here for displaying findings!

## extension

A simple way of varying this investigation is of course to try some different spot pairings (ie mutant ladybirds) and see what the results are eg 3-spot with 8-spot or 2-spot with 5-spot or even perhaps 4-spot with 6-spot . . .