Mathematical investigation (2)

Investigating is a great way to learn to think mathematically, apply logic, spot patterns and improve our perseverance.

Domino Triangles

AIM: Solve a domino puzzle.

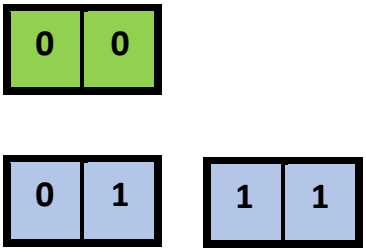
You will need: a set of dominoes (check that you have all 28 - *see resources*). Or, use the interactive set from nrich.maths.org **HERE**.

Have you ever wondered what the total number of spots on a whole set of dominoes is?

In this investigation, we will look at some interesting triangle patterns that will help us find out...

The pattern will also help us predict how many spots there are in larger sets of dominoes!

First, find all of the **'1-dot'** dominoes (i.e. all the dominoes with **only** 0 or 1 dot on either side). Arrange them as a triangle:



Our **'1-dot'** triangle has a total of **3 dots**.

Now make a **'2-dot'** triangle before checking on the next page.

(A 2-dot triangle uses dominoes with no more than 2 dots on any one side.)

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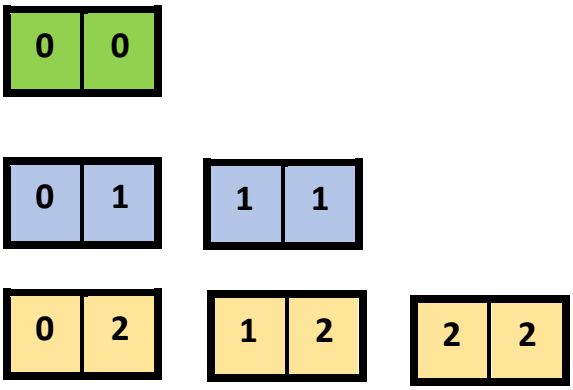

The new row has added **9 more dots** making a total of **12**.

Now use the 3-3, 3-2, 3-1 and 3-0 dominoes to make the next row of the triangle and find the total number for a **'3-dot'** set.

There is one more domino in each row. So, now find 5 dominoes to make the next row of the triangle and find the total number for a **'4-dot'** set.

A good problem-solving strategy is to draw a table to record your results.

Use this table to record what you have found before looking at the next page.

	Number of dots in row	Total number of dots in triangle
1-dot	3	3
2-dot	9	12 (3 + 9)
3-dot		
4-dot		

	Number of dots in row	Total number of dots in triangle
1-dot	3	3
2-dot	9	12 (3 + 9)
3-dot	18	30 (12 + 18)
4-dot	30	60 (30 + 30)
5-dot		
6-dot		

Do you agree with the answers here? Check if you are not sure.

Look at how the number of dots in each row and triangle increases each time…

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3 → **9** → **18** → **30**

HINT: Look at the **difference** between each of the **successive** numbers in the sequence.

Now **predict** how many dots will be in the next row, and the total for a **'5-dot'** set. Make the triangle, check your prediction and add the results to the table.

Now **predict** how many dots will be in the next row and the total for a **'6-dot'** set. Make the triangle, check your prediction and add the results to the table.

Now you know how many spots there are in a whole set of **'6-dot'** dominoes! You can check on the answers page where there is a completed table of results. **Please don't try counting all the dots!**

Challenge: How many dots would there be in total in a '9-dot' set?

HINT: You can continue the table of results, first finding totals for **'7-dot'** and **'8-dot'** sets.

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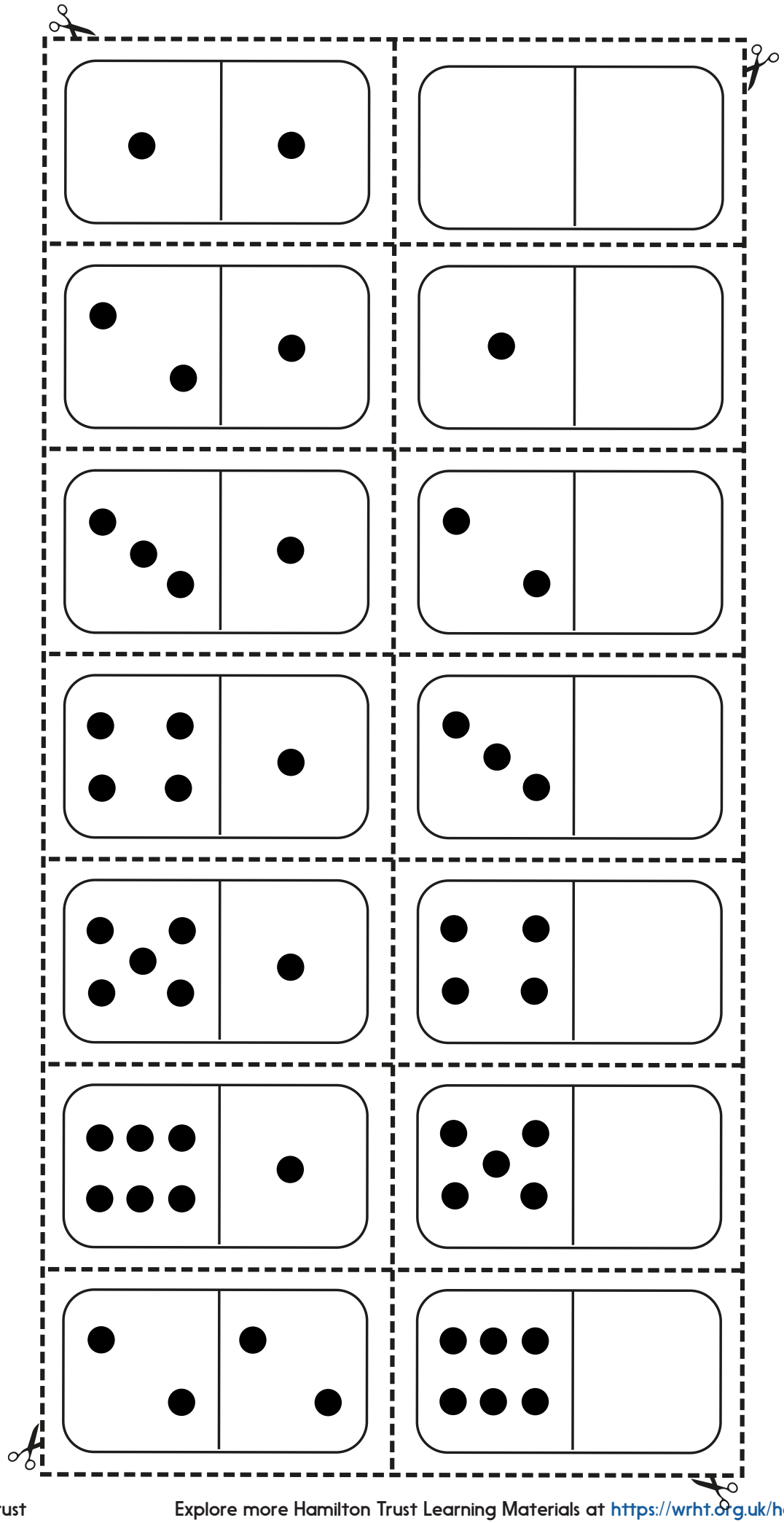

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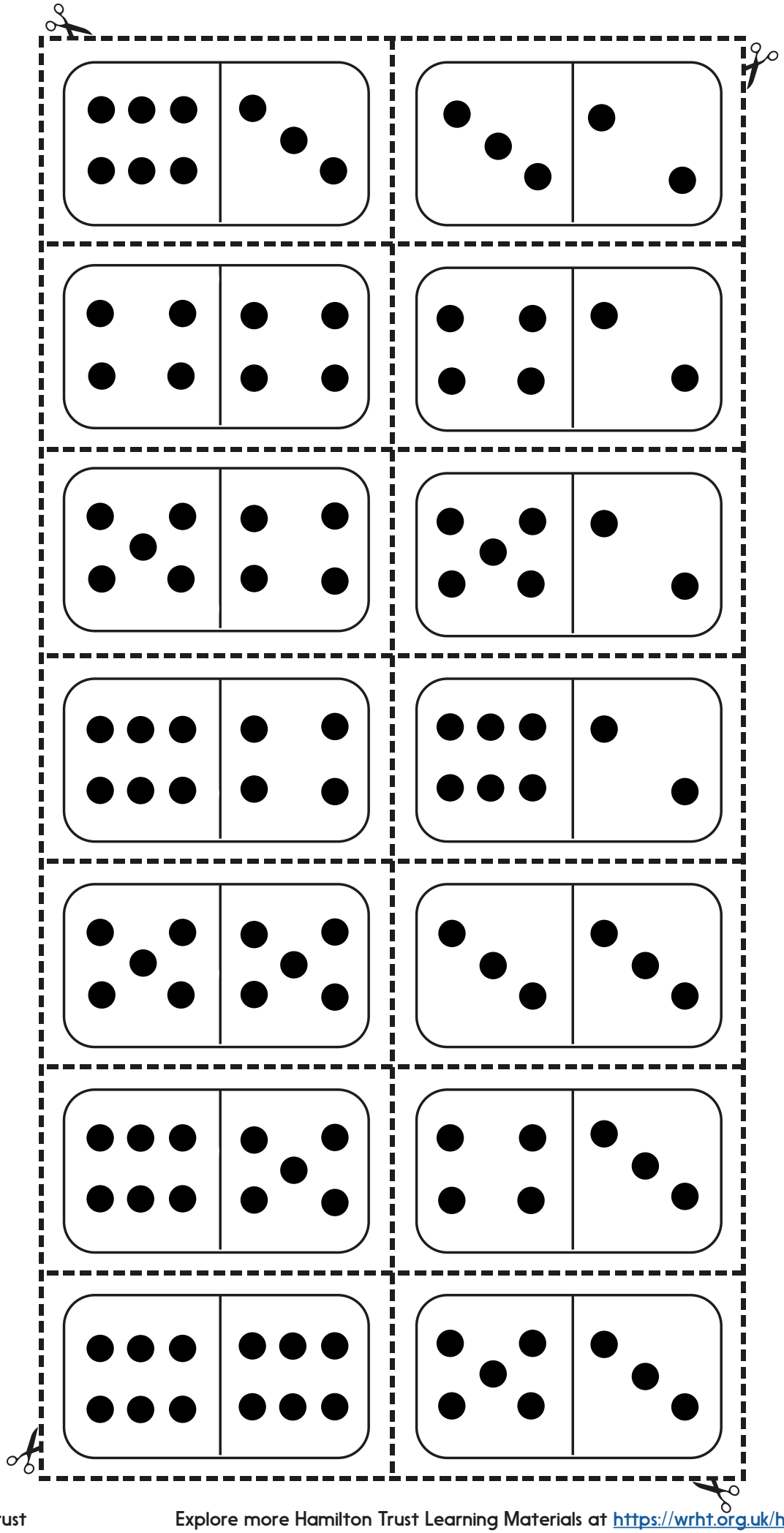

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Answers

	Number of dots in row	Number of dots in triangle
1-dot	**3**	**3**
2-dot	**9**	**12 (3 + 9)**
3-dot	**18**	**30 (12 + 18)**
4-dot	**30**	**60 (30 + 30)**
5-dot	**45**	**105 (60 + 45)**
6-dot	**63**	**168 (105 + 63)**

So, 168 dots in total on a '6-dot' set.

A '9-dot' set would have 495 dots in total, where the '7-dot', '8-dot' and '9-dot' rows add to 84, 108 and 135, respectively.

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