



**Advanced Mathematics  
Support Programme®**



# Ibn Sina's two rules of summation

A classroom resource containing two  
numerical problems from Ibn Sina

# Summing odd numbers

Investigate the sums of successive odd numbers starting with 1.

$$1 + 3 =$$

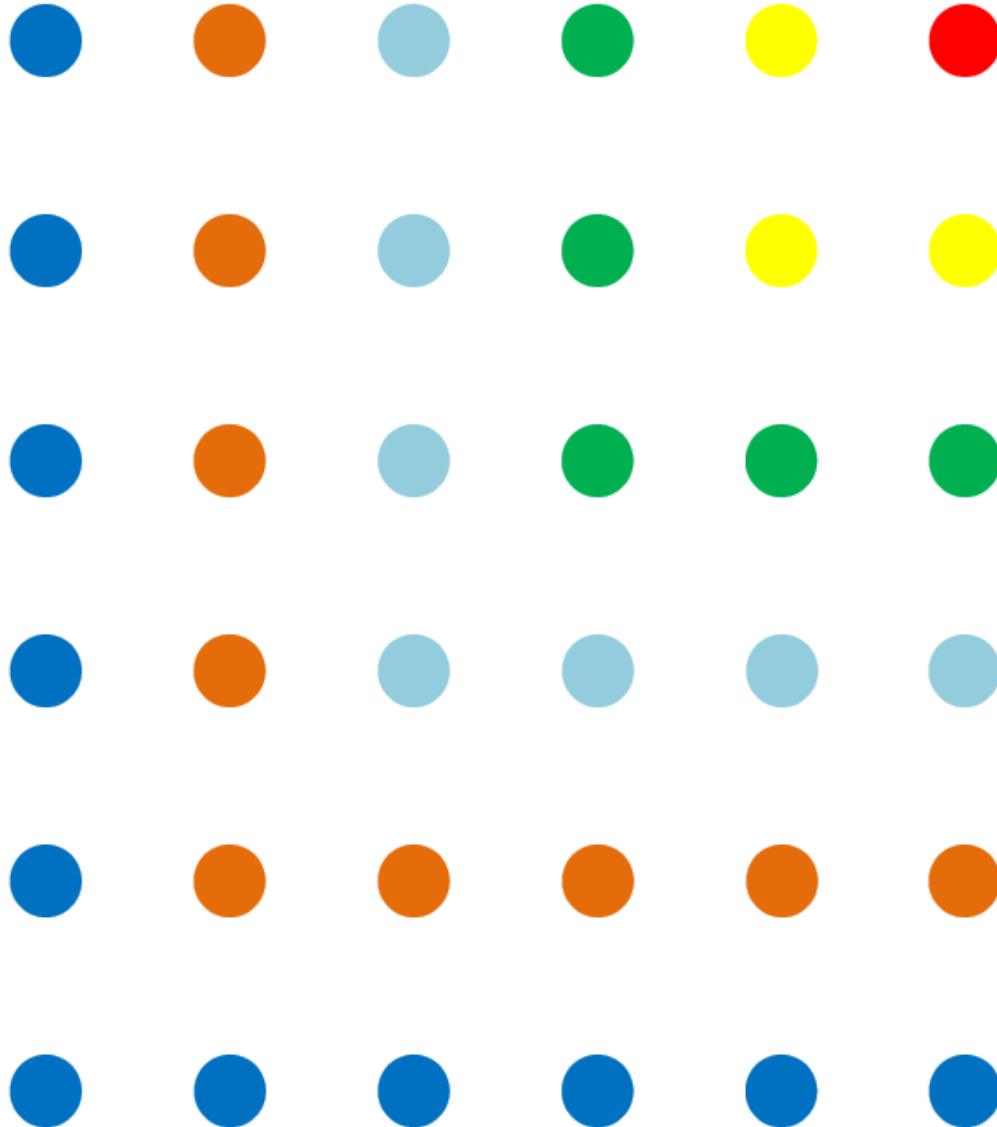
$$1 + 3 + 5 =$$

$$1 + 3 + 5 + 7 =$$

etc.

# Summing odd numbers

$1$	$1$
$1 + 3$	$4$
$1 + 3 + 5$	$9$
$1 + 3 + 5 + 7$	$16$
$1 + 3 + 5 + 7 + 9$	$25$



# Abu Ali al-Husain ibn Abdallah ibn Sina

Known as Ibn Sina

Born: Uzbekistan, c. 980

Died: Iran, June 1037

Islamic philosopher & scientist

Wrote about geometry,  
medicine, astronomy,  
arithmetic & music



# What do you notice?

<b>5</b>	<b>3</b>	<b>1</b>
<b>11</b>	<b>9</b>	<b>7</b>
<b>17</b>	<b>15</b>	<b>13</b>

# What do you notice?

<b>5</b>	<b>3</b>	<b>1</b>
<b>11</b>	<b>9</b>	<b>7</b>
<b>17</b>	<b>15</b>	<b>13</b>

... about which numbers appear?

... about how the numbers are arranged?

... about the sum of the diagonals?

... about the sum of all the numbers in the grid?

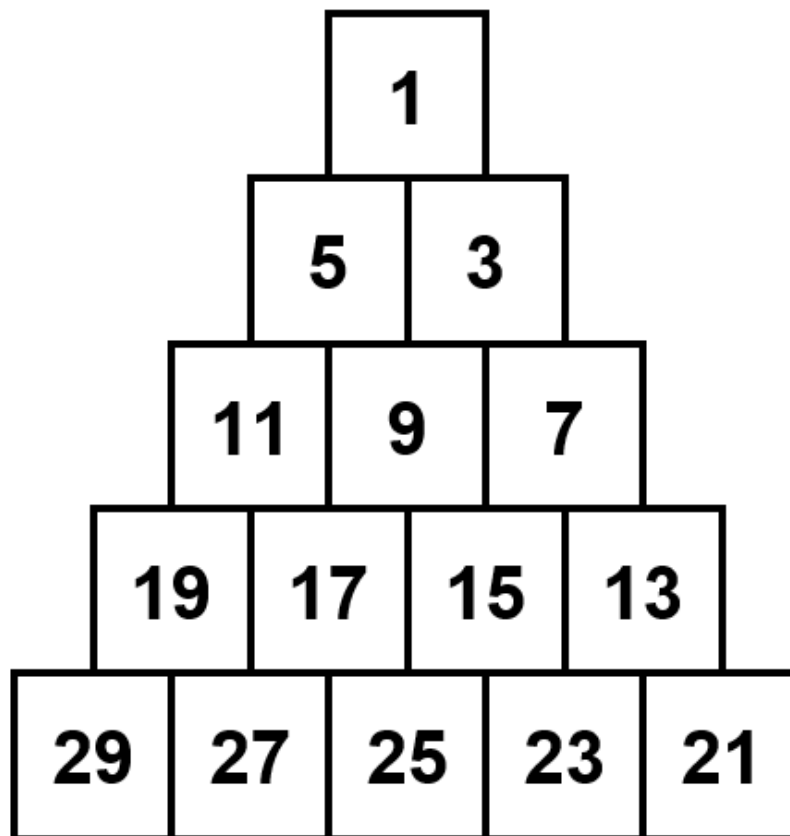


# Ibn Sina's Rule 1

<b>5</b>	<b>3</b>	<b>1</b>
<b>11</b>	<b>9</b>	<b>7</b>
<b>17</b>	<b>15</b>	<b>13</b>

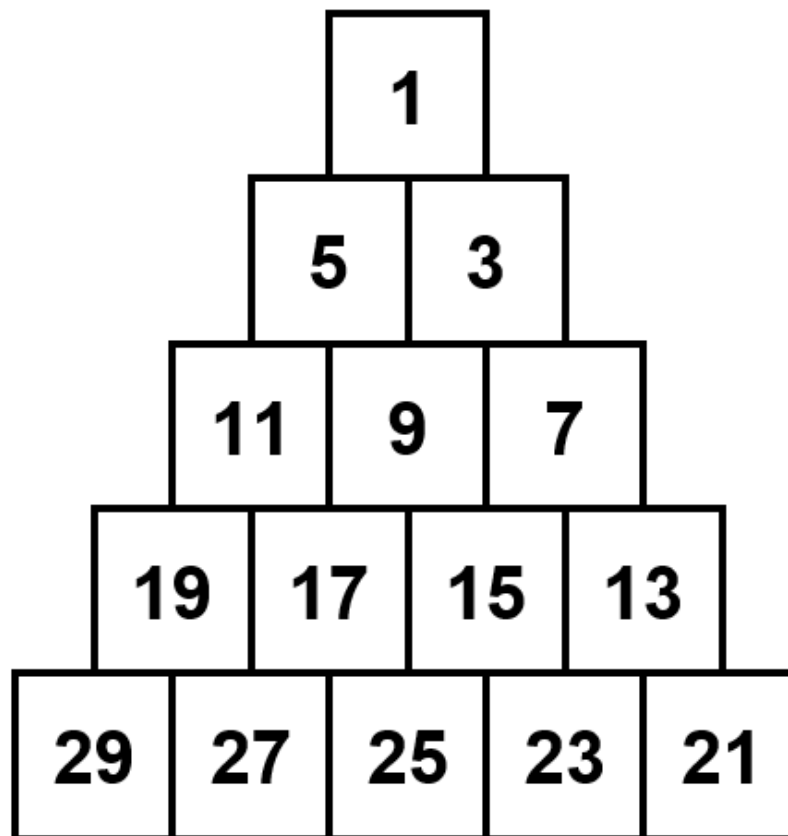
‘If successive odd numbers are placed in a square table, the sum of the numbers lying on the diagonal will be equal to the cube of the side; the sum of the numbers filling the square will be the fourth power of the side.’

# What do you notice?



# Ibn Sina's Rule 2

‘If successive odd numbers are placed in a triangle, the sum of the numbers taken from one row equals the cube of the [row] number.’



# About the AMSP

- A government-funded initiative, managed by MEI, providing national support for teachers and students in all state-funded schools and colleges in England.
- It aims to increase participation in AS/A level Mathematics and Further Mathematics, and Core Maths, and improve the teaching of these qualifications.
- Additional support is given to those in priority areas to boost social mobility so that, whatever their gender, background or location, students can choose their best maths pathway post-16, and have access to high quality maths teaching.

# Contact the AMSP



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