Patterns

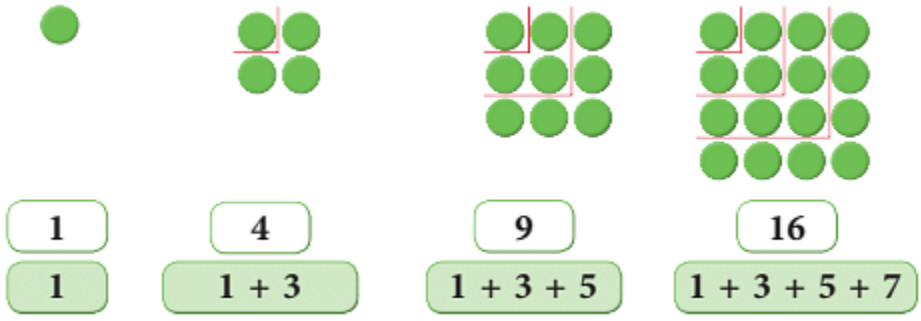
Pattern
A pattern is formed by repeating a unit, which may be a set of numbers or shapes, according to a rule.
Number Patterns

1. Square Numbers
Patterns of squares using dots can be made in two different ways as.
I. Rita uses coloured dots to make patterns of squares as:

1 x 1 = 1
2 x 2 = 4
3 x 3 = 9
4 x 4 = 12
The number of dots in each square names a square number and this is so-called because the dots are arranged in a square shape.
A square number is obtained by multiplying the number by itself.

Now, can you name the next two square numbers and draw the square patterns?

II. Abhinav makes the square patterns as:



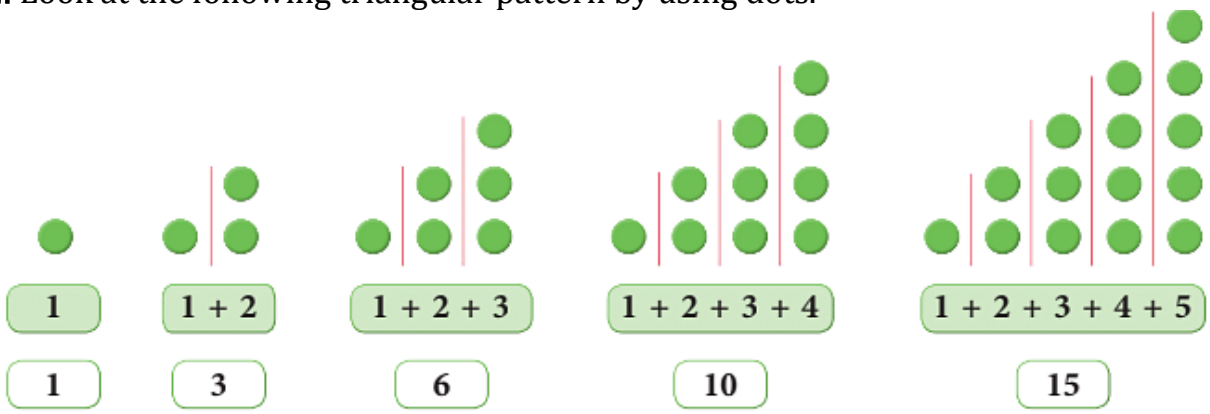
$1 \times 1 = 1$
$2 \times 2 = 4 = 1 + 3$
$3 \times 3 = 9 = 1 + 3 + 5$
$4 \times 4 = 16 = 1 + 3 + 5 + 7$
Thus, we observe that,
First square number = 1 = First odd number
Second square number = 4 = 1 + 3 = Sum of first two odd numbers
Third square number = 9 = 1 + 3 + 5 = Sum of first three odd numbers
Fourth square number = 16 = 1 + 3 + 5 + 7 = Sum of first four odd numbers

2. Triangular Numbers

Triangular patterns using dots can be made in two ways as given below.
The number of dots in each triangle is known as a triangular number.

1. Look at the pattern formed using dots.
The numbers 1, 3, 6, 10, ... show a triangular-shaped picture of dots. So, they are called triangular numbers.
Following the above pattern draw the next two triangular numbers using dots.

2. Look at the following triangular pattern by using dots.



Thus, we observe the pattern as:
First triangular number = 1 = First natural number.
Second triangular number = 3 = 1 + 2 = Sum of first two natural numbers.
Third triangular number = 6 = 1 + 2 + 3 = Sum of first three natural numbers and so on.

Now, see what happens if you add two consecutive triangular numbers?
$1 + 3 = 4$
$3 + 6 = 9$
$6 + 10 = 16$
$10 + 15 = 25$

Square numbers

Tips: We get a square number on adding two

We get a square number by adding two consecutive triangular numbers. The square numbers are shown in a multiplication square as given alongside. They lie on a diagonal line.

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

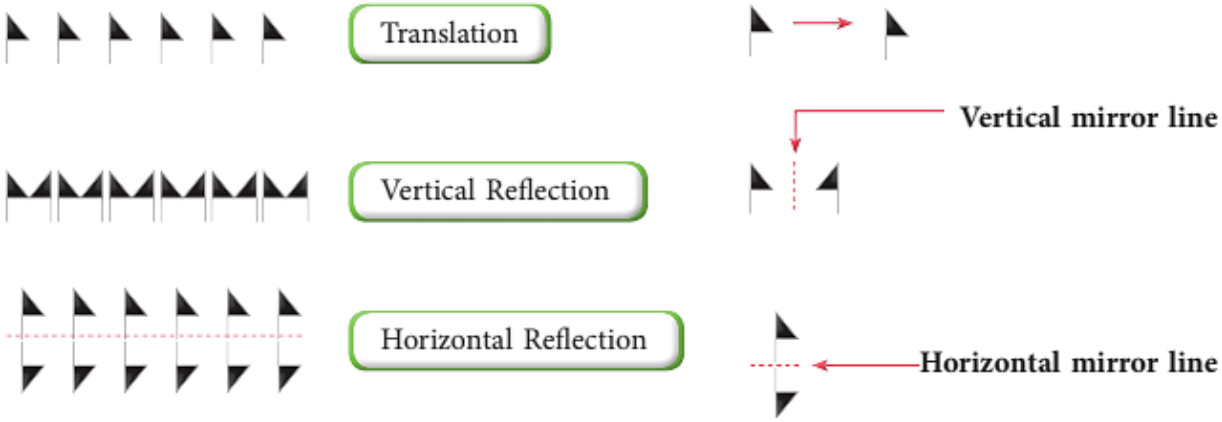
Border Patterns

Observe the following patterns around you. Patterns in the border of dupatta, bedsheets,
floors, etc.

These are called border patterns. We see that border patterns enhance the original beauty.
These border patterns are formed by repeating a certain shape or unit in one direction.
Following a basic symmetry repetition, maybe of translation, vertical reflection or horizontal reflection.
To understand better, let us take an example.

Consider the symbol  as the basic unit or shape in the border pattern. We can get the

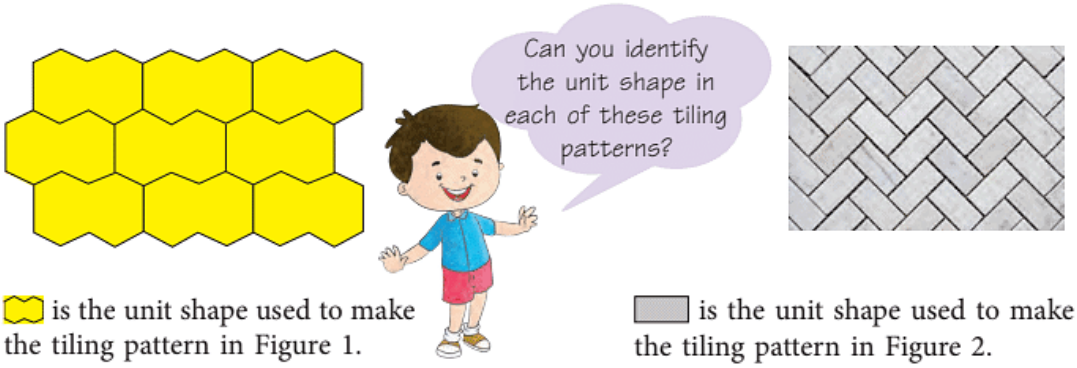
following patterns when  follows the different symmetries as shown below.



Tiling Patterns

The most familiar examples of translations are the patterns formed by pairing stones or
bricks and the cross-section of beehives.
A tiling pattern is formed by the repetition of a single unit or shape which when repeated, fills the plane with no gaps and no overlaps.

Look at the following patterns.



 is the unit shape used to make the tiling pattern in Figure 1.

 is the unit shape used to make the tiling pattern in Figure 2.

Now, observe these patterns. Are they tiling patterns? If not, then why not?

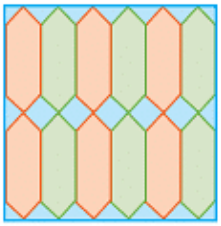
Thus, the above patterns are not tiling patterns.

Tiling Patterns Around Us

Tiling patterns are found in things around us.

Floor Tiles

Carpets



Window Panes

Multiple tiling patterns can be made using a single shape as shown.