

# Year 6

**Number Awareness**

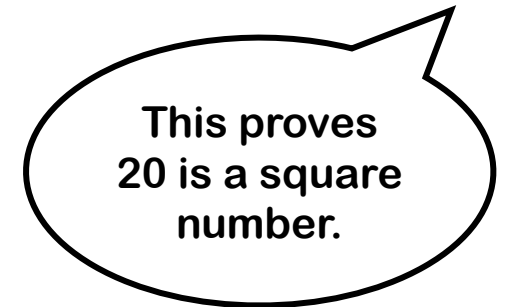
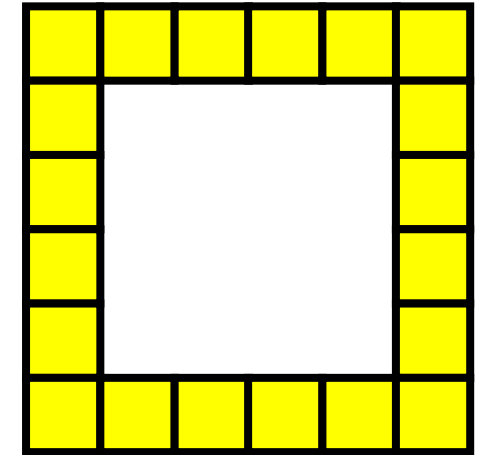
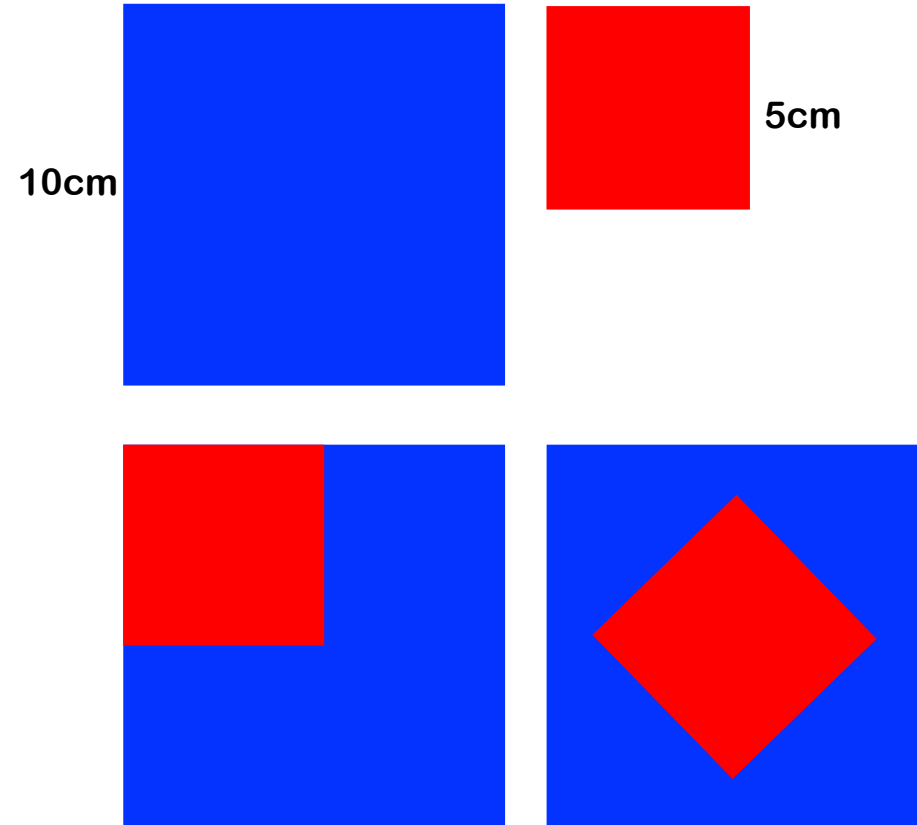
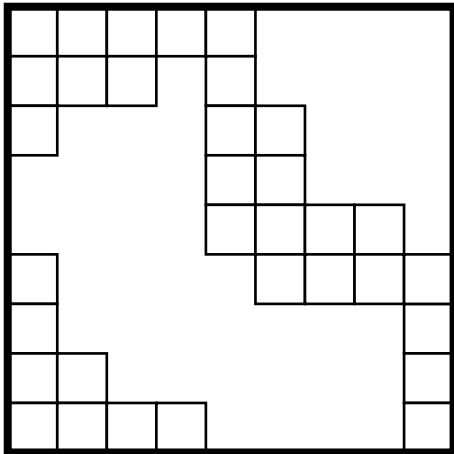
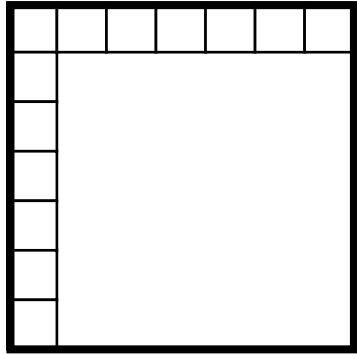
**Week 2**

**Square Numbers**

**Notes for teachers in school or at home:**

- **Learn to visualize square numbers**
- **Remember key square numbers**
- **Recognise common mistakes**
- **Understand square notation**
- **Explore patterns in square numbers**
- **Begin to use algebra with square numbers**

# Seeing Squares!



Some of the small tiles have been removed. What size are the whole squares?

The red square overlaps the blue in different ways. What area of blue can you see now?

What is wrong with this idea?

# Square numbers

This row says "1 squared", "2 squared" etc	$1^2$	$2^2$	$3^2$	$4^2$	$5^2$	$6^2$	$7^2$	$8^2$	$9^2$	$10^2$	...
This is the calculation	$1 \times 1$	$2 \times 2$	$3 \times 3$	$4 \times 4$	$5 \times 5$	$6 \times 6$	$7 \times 7$	...	...	...	...
These are the square numbers	1	4	9	16	25	36	49	...	...	...	...

Calculate the square numbers up to  $12^2$ .

Is there a patterns of odds and evens? Why?

First, learn all the square numbers up to  $10^2$ .

When you know those, learn from  $11^2$  to  $20^2$ .

Use a calculator.

Try squaring lots of different numbers. Can you find square numbers that end with all these digits, or are some digits impossible?

0 1 2 3 4 5 6 7 8 9

None of my square numbers end in a digit '2'!  
Is that wrong?

# Exploring Square Numbers

1	4	9	16	25	36	49	64	81	100	121	...
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What do you have to add to a square number to make the next square number?

Explore this pattern.

$$2^2 = 4$$

$$20^2 = \square$$

$$3^2 = 9$$

$$30^2 = \square$$

$$4^2 = 16$$

$$40^2 = \square$$

Explore this pattern.

Now try to find:

$$50^2$$

$$90^2$$

$$100^2$$

Challenge: What number do you square to get 490,000?

When I add 4 and 9 I get 13, which is not a square number.

When I multiply 4 and 9 I get 36, which is another square number.

Can two square numbers ever add to make another square number?

Challenge: Do you always get another square number when you multiply two square numbers?

# Calculating with square numbers

$$6^2 - 1$$

$$10^2 - 1$$

$$3^2 - 1$$

$$8^2 - 1$$

$$5^2 - 1$$

$$4 \times 6$$

$$9 \times 7$$

$$5 \times 7$$

$$11 \times 9$$

$$4 \times 2$$

Find matching pairs.

Do you notice anything?

Can you find the rule and invent new matching pairs to test the idea?

$2a^2$  means

‘two lots of the square number called  $a^2$ ’

$2a^2$  does not mean

‘two times  $a$ , then square it.’

If  $a=3$ ,  $a^2=9$ .

So  $2a^2$  is 2 lots of 9, which is 18

$2a^2 = 18$ , when  $a=3$

Work out each of these, when:

$$a = 3$$

$$b = 10$$

$$c = 5$$

$$y = 100$$

$$z = \frac{1}{2}$$

$$10 + 5a^2$$

$$5y^2$$

$$2b^2$$

$$b^2 + a^2$$

$$z^2$$

$$4y^2$$

$$45 - 5a^2$$

$$5a^2$$

$$a^2 + 2b^2$$

$$5y^2 - 1$$

$$z \times c^2$$