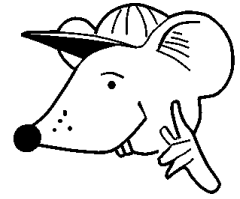# MATHEMATICS

N.S. Yr. 5   P.21

Recognise square numbers
Recognise prime numbers and identify factors

Equipment

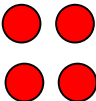Paper, pencil, ruler.
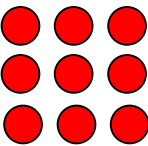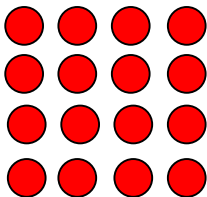
MathSphere

Concepts

The term **'square number'** needs to be recognised and understood.

A square number can be represented by dots in the form of a square. Only square numbers can be represented in this way - no other numbers will complete a square pattern.

| 1 | 4 | 9 | 16 |

2 x 2 can be written as **2^2** This is pronounced " **two squared**".

3 x 3 can be written **3^2** This is pronounced " **three squared**".

Many children are confused with this and believe that the squared sign ^{2} means multiply by two - which is incorrect.

Multiples of numbers are numbers which are produced by multiplying that number by another whole number. Eg **4, 6, 8** are multiples of **2**.

The factors of a number (eg **24**) are those numbers which divide exactly into it.
The factors of **24** are **1, 2, 3, 4, 6, 8, 12, 24.**
Every whole number has at least two factors - one and the number itself.

Extension
A number which only has two factors (one and itself) is called a prime number.
The first prime numbers are **2, 3, 5, 7, 11, 13, 17 and 19**.
(Note that 1 is not usually considered as a prime number.)

To decide whether a number is prime a check has to be made as to whether it has any factors.

Try dividing by the first few prime numbers**, 2, 3, 5, 7, 11**. See examples on sheets.

(See also sheets on multiples and tests of divisibility.)

SQUARE NUMBERS

Below is a tables square up to 100.

**Begin by shading the answer to 1 x 1. Now shade the answer to 2 x 2
and then 3 x 3.**
Continue up to 10 x 10. The first two have been shaded for you.

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

1. Write down all the numbers that you have shaded.

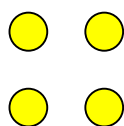**2.** What do you notice about the pattern that you have shaded?

  These numbers are called square numbers. They are made by
multiplying a number by itself.

Write down the answers to these sums:

3. 3 x 3 =   **4.** 5 x 5 =   **5.** 7 x 7 =   **6.** 9 x 9 =

7. 2 x 2 =   **8.** 4 x 4 =   **9.** 6 x 6 =   **10.** 8 x 8 =

All the answers above are **square numbers**.

SQUARE NUMBERS

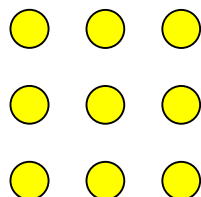**1.** These dots form a square.
There are 2 rows of 2.
Write this sum   2 x 2 =

2. These dots form the next sized square.
There are 3 rows of 3.
Write this sum: 3 x 3 =
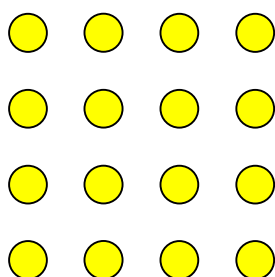
3. These dots form the next sized square.
There are 4 rows of 4.
Write this sum: 4 x 4 =

4. Carry on with this. Draw the next sized square of dots. It should have 5 dots in each row and there should be 5 rows.

5. How many dots altogether are there in your next square?

6. Now make the next sized square. How many dots have you drawn?

7. The numbers 4, 9, 16, 25, and 36 are called SQUARE NUMBERS. Can you think why they are called this?

8. Without drawing out the dots can you work out how many dots you would need to make a square with 7 rows of dots in it?

9. Draw out a 7 row square and see if your answer above is correct.

SQUARE NUMBERS
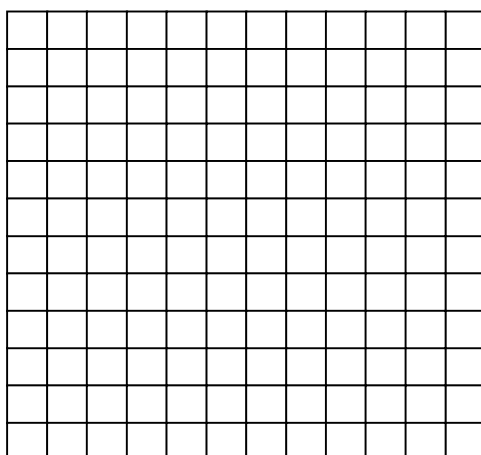
1. On the grid above shade in the top, left hand square.

2. Now, using a different colour, shade in the squares that will make the next biggest square on the grid. This will have to be two squares along and two squares down.

See below for an example:
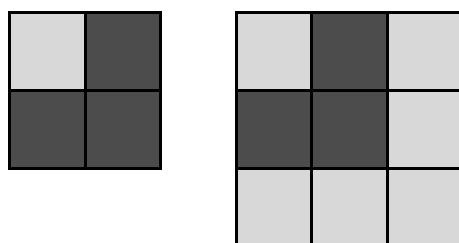
3. How many squares did you need to colour to make the second square?

4. Now shade in the squares that will make the next biggest square on the grid. This will have to be three squares along and three squares down.

The first square was made by shading one square   1

The second was made by adding 3   1 + 3 = 4

The third square was made by adding 5 more   1 + 3 + 5 = 9

5. Carry on making the next biggest square each time, until you have filled the whole square. Note how many you have to add each time. Can you make a rule up?

SQUARE NUMBERS

1. What number multiplied by itself gives 4 ?

2. What number multiplied by itself gives 64 ?

3. What number multiplied by itself gives 100 ?

4. What number multiplied by itself gives 9 ?

5. What number multiplied by itself gives 25 ?

The square of the number 4 is   4 x 4 which equals 16.

The square of the number 7 is   7 x 7 which equals 49.

Another way of writing ' the square of the number 4' is 4^2

4^2 means ' four squared ' or 4 x 4.

5^2 means ' five squared ' or 5 x 5

Write down in words what these mean;

6. 3^2 **7.** 8^2 **8.** 2^2 **9.** 10^2 **10.** 9^2

The value of 3^2 is 3 x 3 which is 9.

What is the value of these:

11. 4^2 **12.** 5^2 **13.** 2^2 **14.** 3^2 **15.** 9^2

16. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100 are all square numbers.

Learn this sequence of numbers, off by heart, so that you can repeat them in order.

MULTIPLES

You can get a MULTIPLE of a whole number by multiplying that number by another whole number.

The answers to all your 'times tables' are multiples.

Eg   2, 4, 6, 8, 10, 12, 14   etc are all MULTIPLES of 2.

3, 6, 9, 12, 15, 18, 21 are all MULTIPLES OF 3.

1. Write down the first ten multiples of 5.

2. What do you notice? Look especially at the units digits.

3. Which of these numbers are multiples of 5?

26,   60,   10,   44,   35,   95,   111

4. Write down the first ten multiples of 10.

5. What do you notice? Look especially at the units digit.

6. Which of these numbers are multiples of 10?

49,   30,   212,   120,   50,   99,   200

7. Write down the first ten multiples of 2.

8. What do you notice. Again look especially at the units digits.

9. Write down which of these numbers are multiples of 2:

34,   45,   56,   67,   78,   89,   90

10. Which of these numbers are multiples of both 2 and 5?

44,   50,   24,   30,   26,   10,   11

FACTORS

The factors of a number are those numbers that divide exactly into it, without leaving a remainder.

Eg the factors of 8 are: 1, 2,   4,   and   8,   because;

$$1 \times 8 = 8 \qquad \text{and} \qquad 2 \times 4 = 8$$

Every number has a factor of 1, because 1 will divide exactly into any whole number.

Every number has itself as a factor, because any whole number will divide into itself exactly once.

How do you find the factors of a number?

Let's try 18:

a. First of all write down 1 and the number itself as factors.
            (1, 18)

b. Then see if 2 will divide exactly into the number. The answer is yes,
              2 x 9 = 18 so 2 and 9 are factors.
          (1, 2, 9, 18)

c. Then try 3.   Yes!   3 x 6 = 18 so 3 and 6 are factors.
          (1, 2, 3, 6, 9, 18)

d. Carry on with each number, 4 next.
    No,   4 will not divide exactly into 18.
    Neither will 5.
    6   we have already got in 3 x 6.

e. We can stop here. In fact we can stop when a factor squared is at least as large as the number.

        The factors of 18 are: 1, 2, 3, 6, 9, 18

In the same way, find the factors of:
1. 10   **2.** 14   **3.** 5   **4.** 30   **5.** 26

FACTORS

Remember, the factors of a number are the numbers that will divide exactly into it, without a remainder.

If you know your tables you should find this work easy.

Find all the factors of these numbers:

1. 6

2. 12

3. 8

4. 9

5. 15

6. 20

7. 3

8. 24

9. 11

10. 7

> Let's see, start with one…..then two….then three….

Fill in the missing factors:

11. The factors of 4 are: 1, ☐ ,   4

12. The factors of 21 are: 1,   3,   7, ☐

13. The factors of 24 are: 1, ☐ , 3,   4, ☐ ,   8,   12, ☐

14. The factors of 16 are: 1,   2, ☐ , 8   16

15. The factors of 18 are: ☐ ,   2,   3, ☐ ,   9,   18

PRIME NUMBERS - extension

1 2 3 4 5 6 7 8 9 10

11 12 13 14 15 16 17 18 19 20

21 22 23 24 25 26 27 28 29 30

1. Except for the number 2, cross out all the numbers which divide by two. That is, all the even numbers.

2. Except for the number 3, cross out all the numbers which divide by three. (Think of your 3 times table!)

3. Except for the number 5, cross out all the numbers which divide by five. (Think of your 5 times table!)

4. Write down all the numbers that you have left.

You should have 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29.

Check that these are the numbers that you have not crossed out.

Apart from 1, all these numbers are called PRIME NUMBERS.

(Number 1 is not usually thought of as a prime number)

5. Try to learn this list of numbers. It will prove to be very useful later on in Maths.

PRIME NUMBERS - extension

A number which only has factors of 1 and itself is called a PRIME NUMBER.

For example the factors of 3 are 1 and 3. There is no other way of multiplying two whole numbers to make 3.   3 is a prime number.

1. Work through the numbers 2 to 10 to see which of them are prime numbers. Make a list of them.

How to find whether a larger number is prime.

There is a quick way to check whether larger numbers are prime without dividing all lower numbers into it.

Start by seeing if the first few prime numbers will divide exactly. These are: 2, 3, 5, 7, and 11.

There is no need to divide by any of the other numbers between one and eleven.   Example:

Is 27 a prime number?

Does 27 divide exactly by 2 ?   No, because it is an odd number.
Does 27 divide exactly by 3 ?   Yes, 3 x 9 = 27.
27 is not a prime number.

Is 43 a prime number?

Does 43 divide exactly by 2 ?   No, because it is an odd number.
Does 43 divide exactly by 3 ?   No.
Does 43 divide exactly by 5 ?   No, because it does not end in 0 or 5.
Does 43 divide exactly by 7 ?   No.

There is no need to go any further because 7 x 7 is 49, which is more than 43.

43 is a prime number.

2. In the same way as above check the numbers between 21 and 30 to see which are prime.

Answers

Page 3
1. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100   **2.** Diagonal, left to right.
3. 9   **4.** 25   **5.** 49   **6.** 81   **7.** 4   **8.** 16   **9.** 36   **10.** 64

Page 4
1. 2 x 2 =4   **2.** 3 x 3 = 9   **3.** 4 x 4 = 16   **5.** 25   **6.** 36   **8.** 49

Page 5
3. 4, (3and 1)   **5.** Add the next odd number for each new square.

Page 6
1. 2   **2.** 8   **3.** 10   **4.** 3   **5.** 5
6. Three squared **7.** Eight squared **8.** two squared   **9.** Ten squared **10.** Nine squared
11. 16   **12.** 25   **13.** 4   **14.** 9   **15.** 81

Page 7
1. 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 **2.** all end in 0 or 5   **3.** 60, 10, 35, 95
4. 10, 20, 30, 40, 50, 60, 70, 80, 90, 100   **5.** All end in 0   **6.** 30, 120, 50, 200
7. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 **8.** 2, 4, 6, 8, 0 units repeat   **9.** 34, 56, 78, 90
11. 50, 30, 10

Page 8
1. 1, 2, 5, 10   **2.** 1, 2, 7, 14   **3.** 1, 5   **4.** 1, 2, 3, 5, 6, 10, 15, 30 **5.** 1, 2, 13, 26

Page 9
1. 1, 2, 3, 6   **2.** 1, 2, 3, 4, 6, 12   **3.** 1, 2, 4, 8   **4.** 1, 3, 9   **5.** 1, 3, 5, 15
6. 1, 2, 4, 5, 10, 20   **7.** 1, 3   **8.** 1, 2, 3, 4, 6, 8, 12, 24   **9.** 1, 11   **10.** 1, 7
11. 2   **12.** 21   **13.** 2, 6, 24   **14.** 4   **15.** 1, 6

Page 10
4. 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

Page 11.
1. 2, 3, 5, 7 (not 9)   **2.** 23, 29