



MATHEMATICS



N.S. Yr. 6 P.79

**Solve problems, recognise patterns,
generalise and predict.**

Equipment

Paper, pencil, card, ruler, scissors (squared paper).

MathSphere

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Concepts

This module continues the theme of investigating a whole range of problems of increasing complexity involving number and shape and being able to recognise and explain patterns. Children should then be able to extend the ideas presented and use these to make predictions and ask 'What if....?' questions.

Problems may appear in many forms such as the following:

Completing patterns such as small sections of table squares.

Filling in missing digits in a sum.

Predicting a term in a sequence and finding a general term for the sequence.

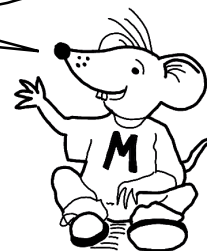
Cracking codes in the form of sums

Converting recurring decimals to fractions or division sums.

Completing a shape given a half of it.

Children should increasingly be able to extend the ideas of a particular problem by adding their own ideas. They should not think of these problems as closed (i.e. with only one possible answer), but should be prepared to spend time on each one, developing possibilities within it.

Here are some ideas to get you going on making your own discoveries. When you have solved each one, see if you can invent some similar problems of your own. Try them out on your friends, or even your teacher!



- Find as many pairs of numbers as you can with a product of **1440**. Underline any pairs in which both numbers are in the four times table.
- Find three numbers with a product of **455** (1 is not allowed).
Find three numbers with a product of **1 309** (1 is not allowed).
- Fill in the gaps in this multiplication square:

×			6		
				27	
				36	44
7			42	63	
	16				88
12		60			

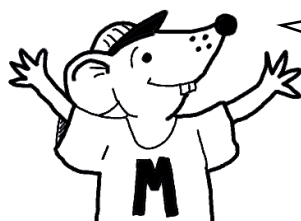
Can you make up one of these for a friend?



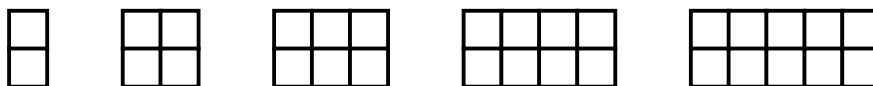
- In this sum, each of the letters **A, B, C, D, E, F** represents one of the digits **2, 3, 4, 5, 6, 7**, but not in the same order.

$$AB \times C + D = 200 + EF$$

Can you work out what each letter stands for?



1. Here is pattern of squares:



This sequence shows the number of squares in each shape:

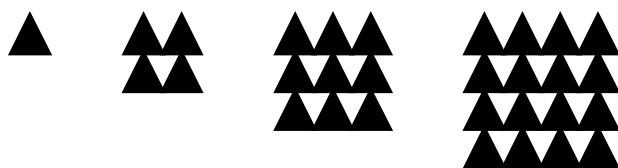
2, 4, 6, 8, 10, ...

What are the next three numbers?

How many squares will there be in the 15th shape?

What is the formula for the number of squares in the n th shape?

2. Here is a pattern of black triangles:



Write the first ten terms in the sequence:

1, 4, 9, 16,

What type of numbers are these?

What is the formula for the number of triangles in the n th shape?

3. The sum of the digits in the three digit number **749** is equal to **20**.

Can you find any other three digit numbers whose digits add up to 20?

Yes, loads!



1. Each of these decimals has been calculated by dividing one whole number by another. What could the division sums have been?

a. 0.4444444...

b. 0.5555555...

c. 0.6363636...

d. 1.3636363...

e. 2.6666666...

f. 1.7142857...

I think part a. is $4 \div 9$



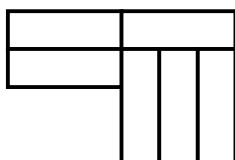
I think it is $8 \div 18$



And I think it is $12 \div 27$



2. Divvy has made this shape from six rectangular tiles.



I'm a genius!



Copy Divvy's design by cutting out squared paper and then make another copy.

See how many different ways you can join the two shapes together so that there is a line of symmetry down the middle. You can turn over one of the shapes if you wish.

3. Shape a piece of clay or plasticine into a regular tetrahedron.

Cut the tetrahedron so that when you separate the two halves, the cut shapes are rectangles.

Can you cut it so that the cut shapes are squares?

Crikey!

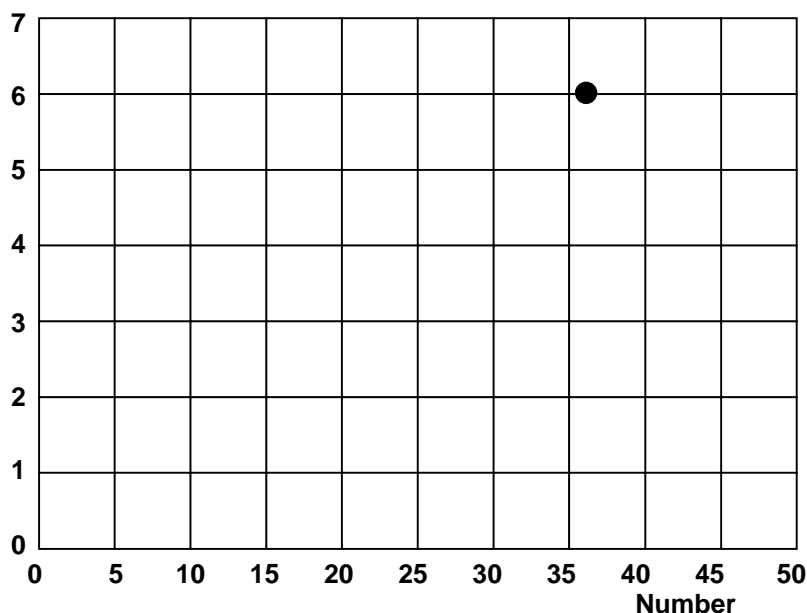


- Find as many pairs of numbers as you can with a product of **700**. Underline any pairs in which both numbers are in the five times table.
- What are the square roots of these numbers:

1, 4, 9, 16, 25, 36, 49

Plot the square roots on this graph:

Square
root



The square root of **36** has been done for you.



Can you now plot the square roots of **20** and **30** ? You may need a calculator.

- Fill in the gaps in this multiplication square:

×				9	
		12		36	
		15			50
6	12			54	
	16		56		

1. In this sum, each of the letters **A, B, C, D, E, F, G** represents one of the digits **1, 2, 3, 4, 5, 6, 7**, but not in the same order.

$$\mathbf{A \times BC + DEF = 700 + G}$$

Can you work out what each letter stands for?

Clue: A and G are both less than 4.

Don't tell anyone I told you!

2. Each of these decimals has been calculated by dividing one whole number by another.
What could the division sums have been?

a. 0.777777...

b. 0.111111...



Divide the following sums and make a note of the results:

$$28 \div 99, \quad 42 \div 99, \quad 12 \div 99$$

Now use what you have discovered to work out the sums that gave these decimals:

c. 0.353535...

d. 0.787878...

e. 0.272727...

f. 0.929292...

Can you extend this to these decimals?

g. 0.5275275...

h. 0.4064064...

i. 0.7237237...

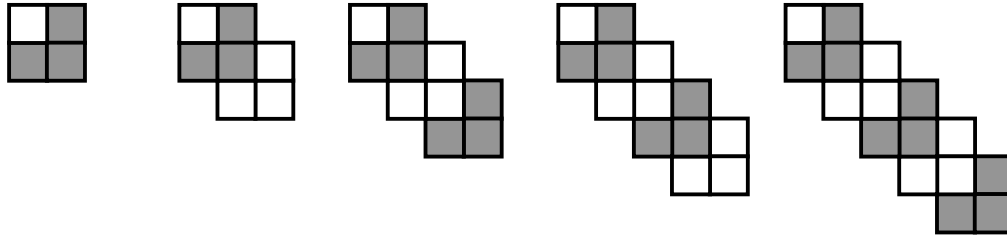
j. 0.9399399...

Piece of cake, really. All you need is a calculator, a pencil, a piece of paper, a clear head, nine hours sleep, a drink of lemonade and a chocolate biscuit or three.



And a piece of cake, of course!

1. Here is pattern of squares:



This sequence shows the number of squares in each shape:

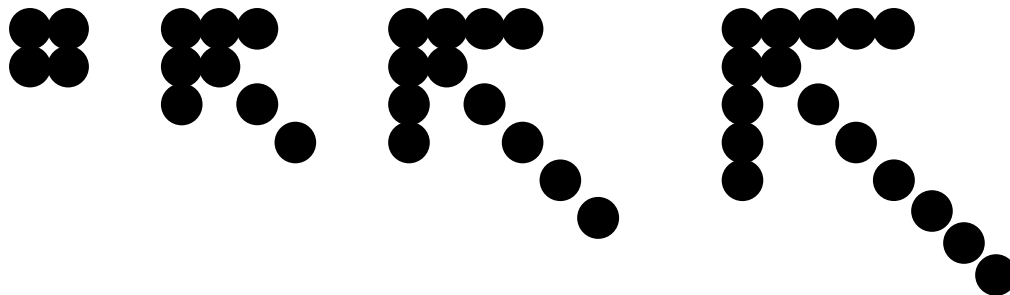
4, 7, 10, 13, 16, ...

What are the next three numbers?

How many squares will there be in the 12th shape?

What is the formula for the number of squares in the n th shape?

2. Here is a pattern of circles:



Write the first ten terms in the sequence:

4, 8, 12, 16,

What type of numbers are these?

What is the formula for the number of circles in the n th shape?

Answers**Page 3**

1. 1×1440 2×720 3×480 4×360 5×288 6×240 8×180
 9×160 10×144 12×120 15×96 16×90 18×80 20×72
 24×60 30×48 32×45 36×40

2. $5 \times 7 \times 13$ $7 \times 11 \times 17$

3.

×	2	5	6	9	11
3	6	15	18	27	33
4	8	20	24	36	44
7	14	35	42	63	77
8	16	40	48	72	88
12	24	60	72	108	132

4. A = 5, B = 6, C = 4, D = 3, E = 2, F = 7

Page 4

1. 12, 14, 16; 30 in 15th shape; $2n$

2. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100

These are square numbers.

$$n^2$$

3. 299, 389, 398, 479, 497, 488, 569, 596, 578, 587, 659, 695, 668, 686, 677, 749, 794, 758, 785, 767, 776, 839, 893, 848, 884, 857, 875, 866, 929, 992, 938, 983, 947, 974, 956, 965

Page 5

1. a. $4 \div 9$ or $8 \div 18$ or $12 \div 27$ etc

b. $5 \div 9$ or $10 \div 18$ or $15 \div 27$ etc

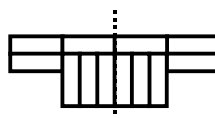
c. $7 \div 11$ or $14 \div 22$ or $21 \div 33$ etc

d. $15 \div 11$ or $30 \div 22$ or $45 \div 33$ etc

e. $8 \div 3$ or $16 \div 6$ or $24 \div 9$ etc

f. $12 \div 7$ or $24 \div 14$ or $36 \div 21$ etc

2. There are many ways. One such is



3. Good luck!

Answers (Contd)**Page 6**

1. 1×700

2×350

4×175

5×140

7×100

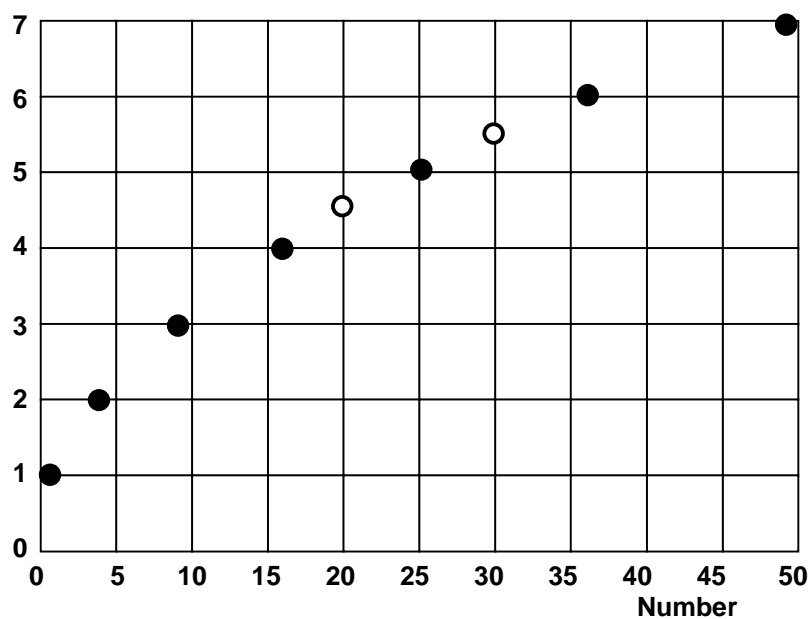
10×70

14×50

20×35

25×28

2. 1, 2, 3, 4, 5, 6, 7

Square
root

3.

×	2	3	7	9	10
4	8	12	28	36	40
5	10	15	35	45	50
6	12	18	42	54	60
8	16	24	56	72	80

Answers (Contd)**Page 7**

1. $A = 3$, $B = 4$, $C = 7$, $D = 5$, $E = 6$, $F = 1$, $G = 2$

2. a. $7 \div 9$, $14 \div 18$ etc

b. $1 \div 9$, $2 \div 18$ etc.

0.2828282, 0.4242424, 0.1212121

c. $35 \div 99$

d. $78 \div 99$

e. $27 \div 99$

f. $92 \div 99$

g. $527 \div 999$

h. $406 \div 999$

i. $723 \div 999$

j. $939 \div 999$

Page 8

1. 19, 22, 25

37

$3n + 1$

2. 4, 8, 12, 16, 20, 24, 28, 32, 36, 40

These are all multiples of 4 (in the four times table).

$4n$