



MATHEMATICS



N.S. Yr. 4 P.78

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

Equipment

Paper, pencil, squared paper, cubes.

MathSphere

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Concepts

This module is concerned with investigating a whole range of problems involving number 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:

Find numbers that satisfy a particular relationship such as totalling a given number.

Arrange a given number of objects in pre-defined patterns such as squares into certain shaped rectangles.

Adding operations of addition, subtraction, multiplication and division to a given set of numbers to make a given answer.

Fill in missing digits.

Construct shapes from a given rule.

On these pages you will have the chance to investigate many different problems.

Think carefully and see what ideas you can think of.

1. Find three consecutive numbers that add up to **24**.
Find three that add up to **42**.
How many numbers are there up to **60** that can be made by adding three consecutive numbers?

2. Two numbers have a sum of **16** and a product of **63**.
What are the numbers?

Can you find two numbers with a sum of **20** and a product of **96** ?

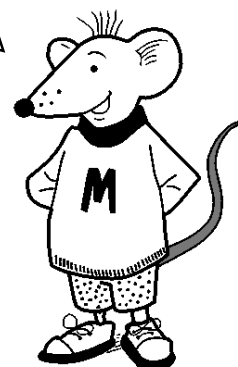
Make up some similar problems for your friends to do.

3. Divvy has **24** squares. He can arrange them into a rectangle **6** squares by **4** squares. What other rectangles can he make?
4. Here's a game to play.
You can only use the digits **1, 2, 3** and **4** and you can only use them once each.
You can also use the signs $+$, $-$, \times , \div .
The game is to make as many numbers starting at 1 as possible.

Here's an example: $47 = 41 + 2 \times 3$

Here's another: $12 = (3 + 1) \times 2 + 4$

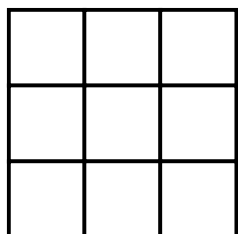
Now you can have a go!



Please don't use the word 'square' when I'm around. I'm cool, man!

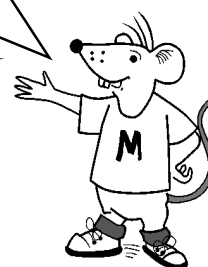


1. Can you put the numbers **1 to 9** in the grid to make a magic square?



Every row, column and diagonal must add up to **15**.

Hint: even numbers go in the corners.



2. Put one of the digits **2, 4, 5, 7** in each box to make this statement true:

$$\square \square - \square \square = 33$$

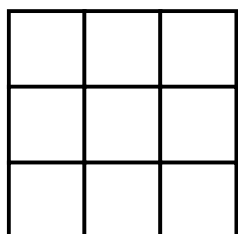
What other numbers can you make like this using the digits **2, 4, 5, 7** ?

3. How many subtraction sums can you make up using four digits with the number **30** at the start, like this?

$$30 - \square \square = \square \square$$

(Here's an example: $30 - 12 = 18$)

4. How many squares are there in this shape?

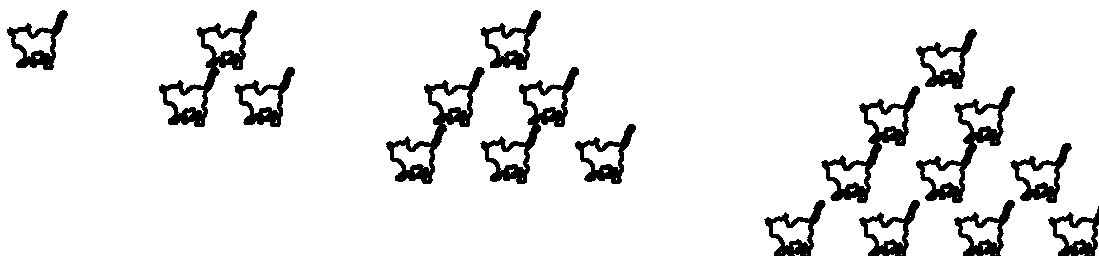


Be careful, there are more than nine!

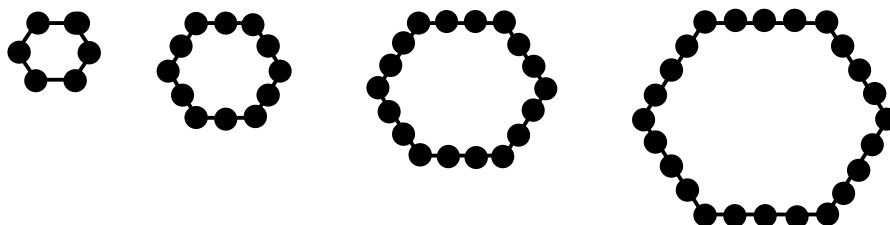
Can you make up other shapes and count the squares?



1. How many cats are there in each of the patterns? Can you continue the number sequence?



2. How many dots are there in each shape? Can you continue the number sequence?



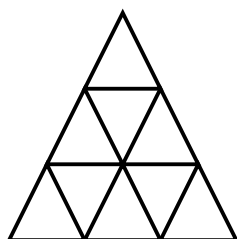
Can you make up a similar pattern on squares?

3. Which three numbers add up to 60 ?

23, 31, 24, 15, 32, 46, 25, 18, 27, 37

Make up a similar problem and give it to a friend.

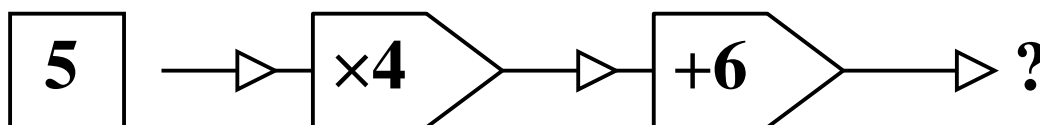
4. How many triangles are there in this shape?



Crumbs, have you got any easy problems?



1.



If **5** is put into the left side of this number machine, what number comes out on the right?

What numbers come out if these numbers are put in?

10, 8, 7, 0

Can you find a number that makes **22** come out?

2. Put a digit in each box to make the sums right.

$$4\Box + \Box 3 = 67$$

$$8\Box - \Box 6 = 58$$

$$5\Box + \Box 3 = 122$$

When you think you have the answers you could check them with a calculator.

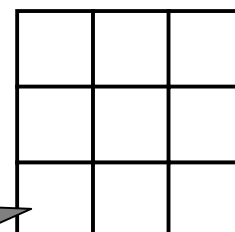


3. Can you make a magic square from these numbers?

6, 7, 8, 9, 10, 11, 12, 13, 14



Big hint: Put the middle number in the middle and a prime number in a corner.



1. The product of two numbers is **1** and their sum is **2**. What are the two numbers?
2. Use these numbers for this question:

18, 22, 26, 30, 34, 38, 42, 46, 50, 54, 58

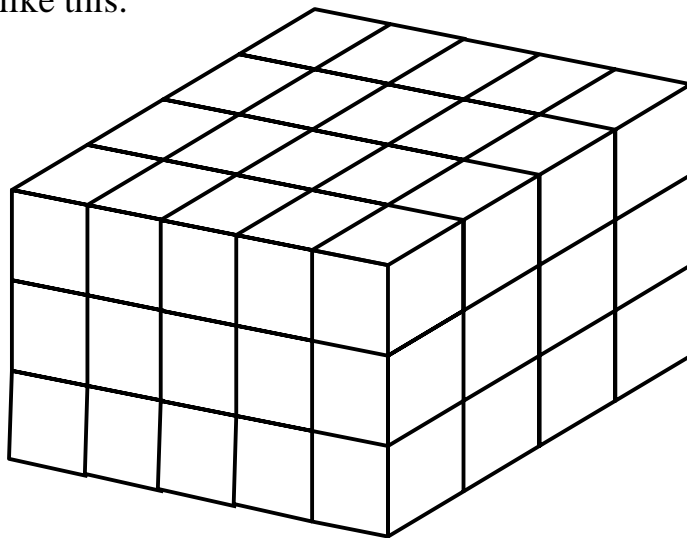
Write down three numbers that have a sum of **114**.

Write down another three numbers that have a sum of **114**.

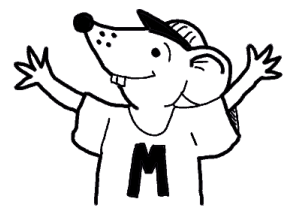
How many sets of three numbers can you find that have a sum of **114**?
What do you notice about them?

Can you make up a similar question with a different set of numbers?

3. Addy has **60** cubes. He can arrange them into a cuboid **$3 \times 4 \times 5$** cubes like this:



Very artistic, don't you think?



Which other ways can he arrange the **60** cubes to make cuboids?

4. Subby thinks of a number.
It is between **18** and **42**.
It is more than a half of **58**.
It is a multiple of **5**.
2 is **not** a factor of the number.

What is Subby's number?



Thinking

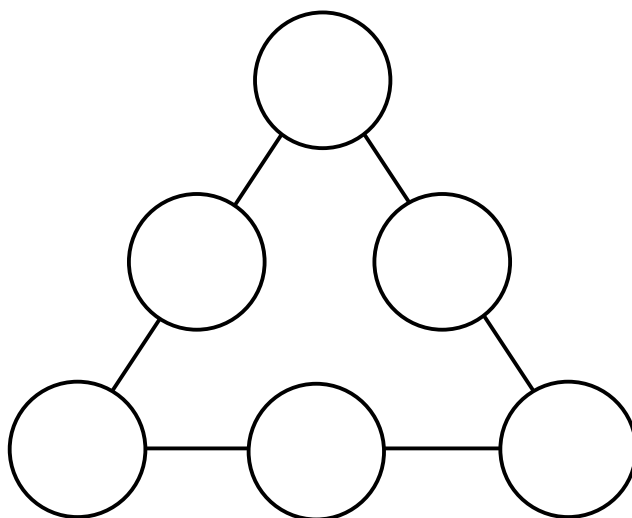


Nearly there



Got it!

1.



Can you put the numbers **1, 2, 3, 4, 5, 6** in the circles so that each side of the triangle totals **11** ?

2. What are the remainders when these numbers are divided by **6** ?

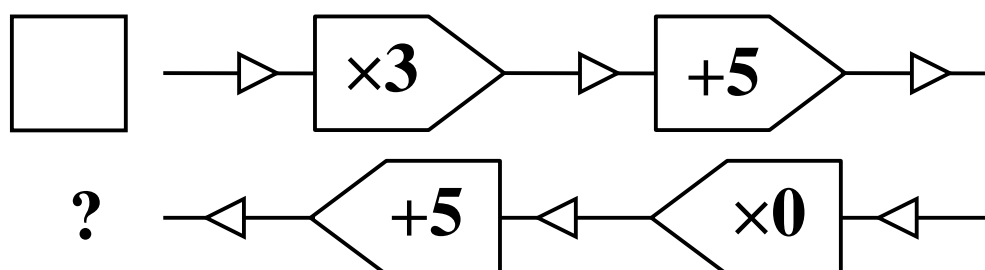
8, 35, 40, 47, 56

3. Put one digit in each box to make this true:

$$\square \square \times \square = 180$$

How many different ways can you do it?

4.



Put numbers in the number machine and see what answers come out.
Can you explain what is happening?

Answers**Page 3**

1. 7, 8, 9 13, 14, 15 The numbers must be in the three times table, so they are 3 (0, 1, 2); 6 (1, 2, 3); 9, 12,60

2. 7, 9 8, 12

3. 1×24 2×12 3×8

4. $1 = 2 \times 3 - 4 - 1$ $2 = 1 + 2 + 3 - 4$ etc

Page 4

1.

| | | |
|---|---|---|
| 6 | 1 | 8 |
| 7 | 5 | 3 |
| 2 | 9 | 4 |

Allow reflections, rotations etc
such as:

| | | |
|---|---|---|
| 8 | 1 | 6 |
| 3 | 5 | 7 |
| 4 | 9 | 2 |

2. $75 - 42$ Other numbers (not including negative numbers):
5, 15, 18 (2 ways), 22 (2 ways), 27 (2 ways), 33, 49, 51

3. $30 - 10 = 20$

$30 - 11 = 19$

$30 - 12 = 18$

\vdots

\vdots

$30 - 20 = 10$

4. 14 squares (9 at 1×1 , 4 at 2×2 and 1 at 3×3)

Page 5

1. 1, 3, 6, 10, **15, 21, 28 etc.**

2. 6, 12, 18, 24 (6 times table)
Square would be 4 times table.

3. $15 + 18 + 27$

4. 14 (9 small triangles, 3 with 4 small triangles and 1 with 9 triangles)

Page 6

1. 26 $10 \rightarrow 46$, $8 \rightarrow 38$, $7 \rightarrow 34$, $0 \rightarrow 6$ Extra question $4 \rightarrow 22$

2. $44 + 23 = 67$

$84 - 26 = 58$

$59 + 63 = 122$

3.

| | | |
|----|----|----|
| 13 | 6 | 11 |
| 8 | 10 | 12 |
| 9 | 14 | 7 |

Allow reflections and rotations

Answers (Contd)**Page 7**

1. 1 and 1

2. All these sets make 114:

$$18 + 38 + 58$$

$$22 + 38 + 54$$

$$26 + 38 + 50$$

$$30 + 38 + 46$$

$$34 + 38 + 42$$

They all have 38 in the middle and the other two numbers are equally spaced from the 38.

3. $1 \times 1 \times 60$

$$1 \times 2 \times 30$$

$$1 \times 3 \times 20$$

$$1 \times 4 \times 15$$

$$1 \times 5 \times 12$$

$$1 \times 6 \times 10$$

$$2 \times 2 \times 15$$

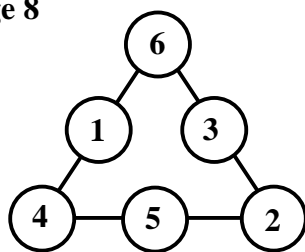
$$2 \times 3 \times 10$$

$$2 \times 5 \times 6$$

4. 35

Page 8

1.



2. 2, 5, 4, 5, 2

3. 90×2

$$60 \times 3$$

$$45 \times 4$$

$$36 \times 5$$

$$30 \times 6$$

$$20 \times 9$$

4. The answer is always 5 because the $\times 0$ reduces everything to zero and then 5 is added.