SMILE WORKCARDS

Patterns and Generalisations Pack Two

Contents

Cuts to Pieces

You will need string and scissors.

Experiment 1

Here is a piece of string.

With **1** cut you get 2 pieces.

How many pieces with **2** cuts?

What about **3** cuts, **4** cuts . . . ?

Table of results

- Record your findings in a table of results.

Number of cuts (c)	0	1	2	3	4	5	6	7	8
Number of pieces (p)	1	2							

Pattern There is a pattern in these results.

The number of pieces is the same as the number of cuts **plus 1**.

Rule Number of cuts is **c**.

Number of pieces is **p**.

The rule for this experiment is

p = c + 1

- How many pieces of string with 50 cuts?

For each of the following experiments

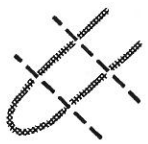
- draw a table of results
- look for the pattern
- find the rule **p** = . . .

Experiment 2

Fold a piece of string once and make **1** cut.

How many pieces?

How many pieces with **2** cuts . . .



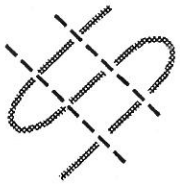
3, **4**, **5** . . . cuts?

Experiment 3

Fold a piece of string twice and make **1** cut.

How many pieces?

How many pieces with **2** cuts . . .



3, **4**, **5**. . . cuts?

Experiment 4

What happens when you fold a piece of string **3** times and cut . . .

4 times

5 times.

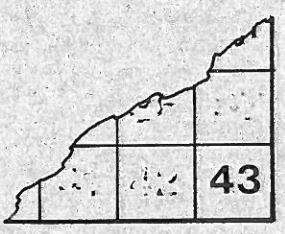
Put all your rules into a table.

Folds	Rule
0	p = c + 1
1	p =
2	p
3	
4	

- Describe the pattern in your rules.

Many Grids

You will need micro-program **Numbers.**



The first number is **8**

The last number is **43**

Try to make this grid in as many ways as you can.

Investigate for other first and last numbers.

Mind Reversal

Enter 2 digits, smallest first.

26

Repeat them to make a 6 figure number.

262626

Add a number to get the digits reversed.
What number did you have to add?

626262

Repeat for other pairs of digits.
Make sure the smallest is first.

383838

What number do you have to add?

838383

Try this several times.
What do you notice about the numbers that have to be added?

If you are interested in this work, Nine Links (1374) will extend the investigation.

SECTIONS

Start with any rectangle:

2 horizontal lines
1 vertical line

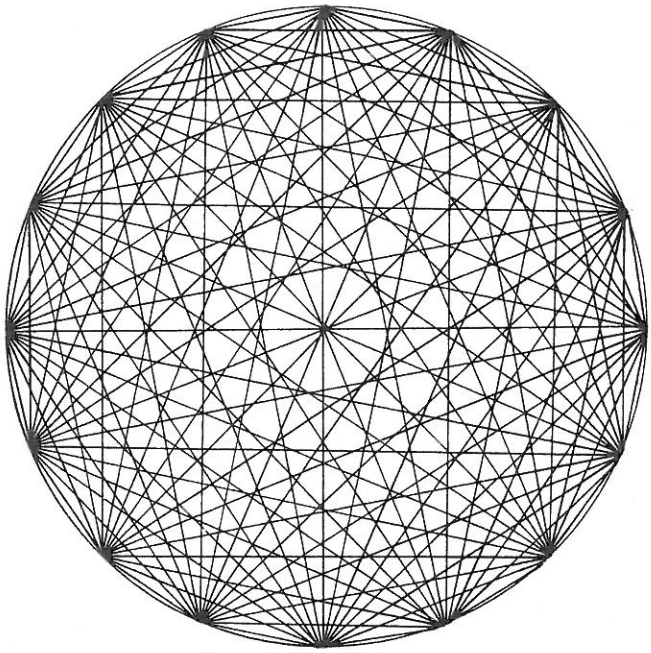
6 Sections

2 horizontal lines
3 vertical lines

12 sections

Investigate

Mystic Rose



How many lines are there in this pattern?

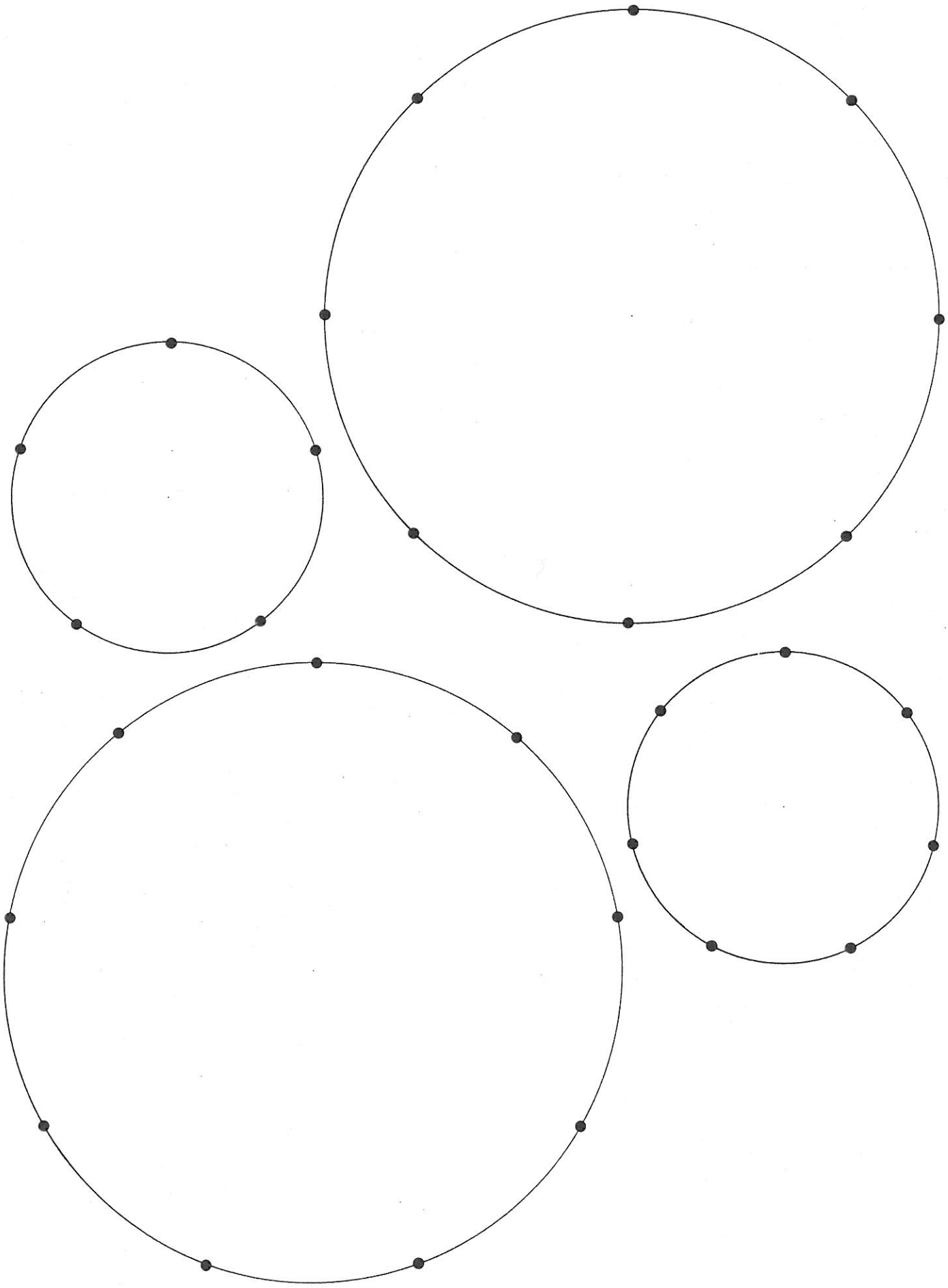
It might help if you draw a simpler one.
(see worksheet 1555A)

Which patterns do not have a hole at the centre?
Can you explain why?

If your school has a micro, have a look at the program 1555B.

Mystic Rose

Smile Worksheet **1555A**



smile

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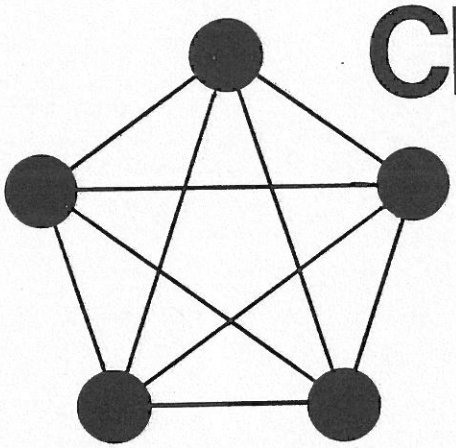
Chess



5 Players are in a chess competition.

Each player has to play all the others - once each.

How many games are there?

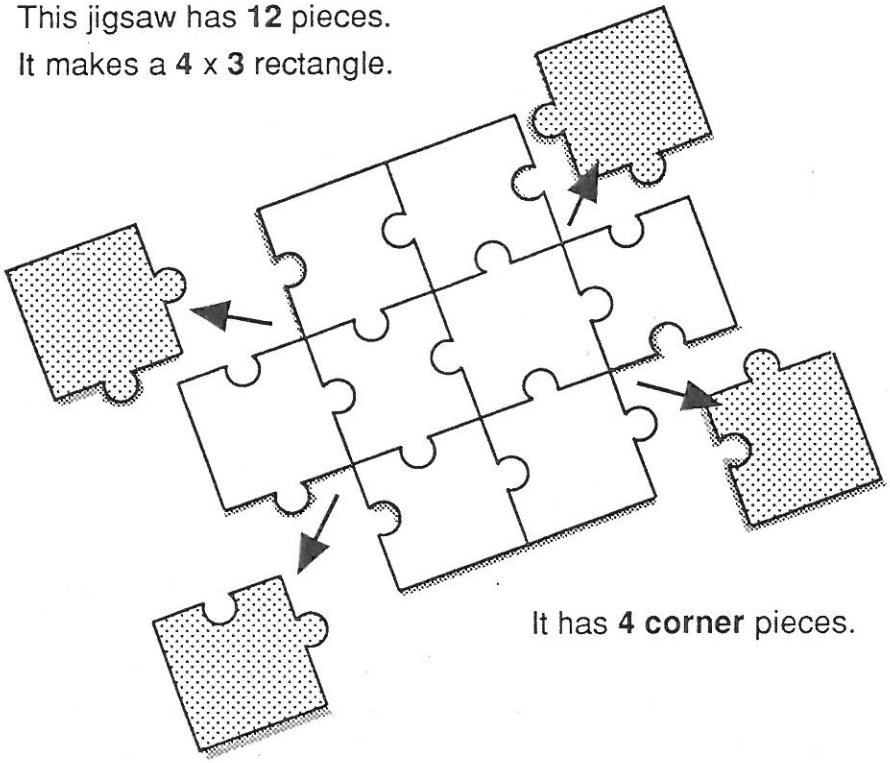
4 players - how many games?

7 players? .....

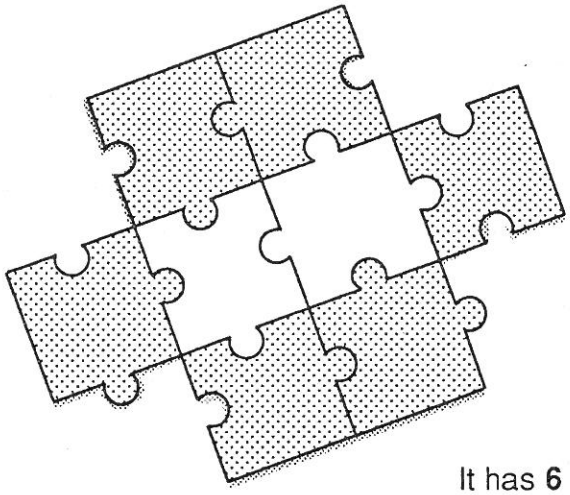
..... any number of players?

Jigsaws

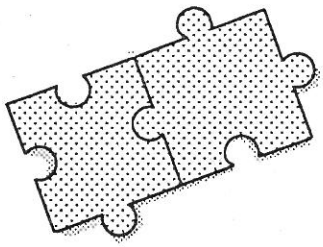
This jigsaw has **12** pieces.
It makes a **4** x **3** rectangle.



It has **4 corner** pieces.



It has **6 edge** pieces.



It has **2 middle** pieces.

- Investigate for jigsaws with different numbers of pieces.
- When you feel that you have explored the problem sufficiently, turn over

Below are some statements about jigsaws.

Use your results to decide whether the following statements are ***always true*** or ***sometimes true*** or ***not true***.

For each statement, try to explain why.

There are four corner pieces.

For jigsaws with 30 pieces the maximum number of middle pieces is 20.

The number of edge pieces equals the middle pieces plus the corner pieces.

For any number of pieces, it is possible to find a jigsaw which has no middle pieces.

smile

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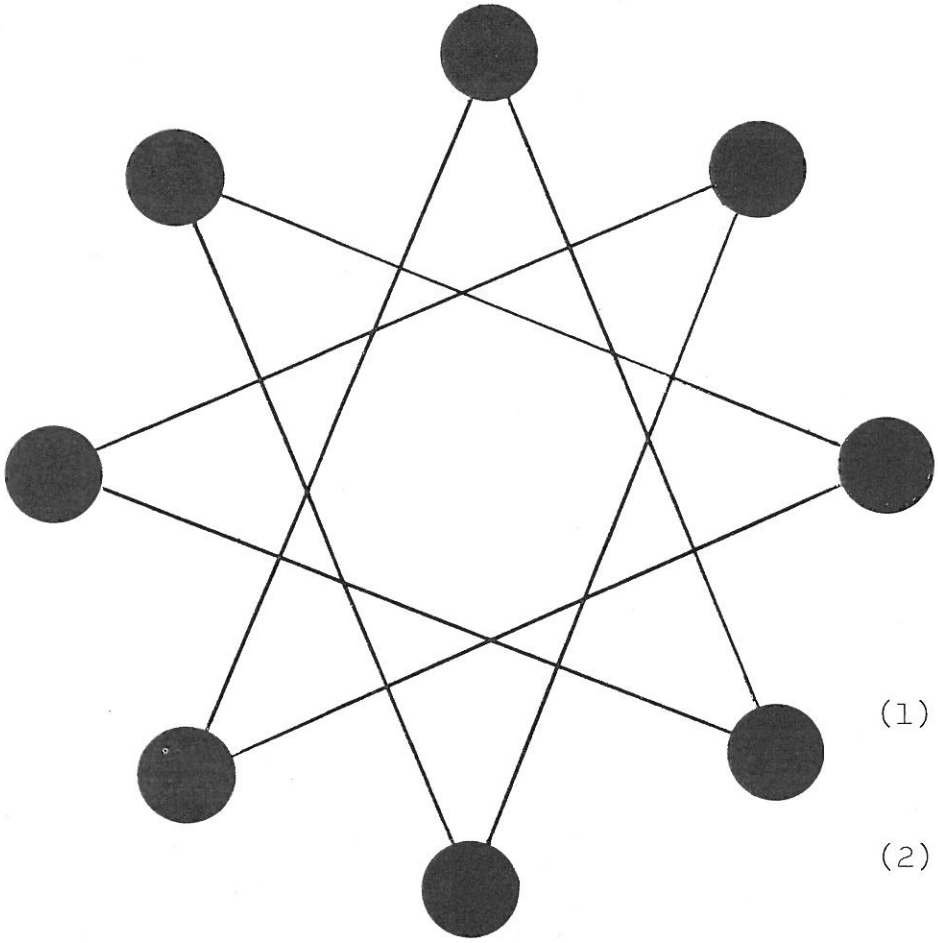
You will need: 7 counters

STAR PUZZLES



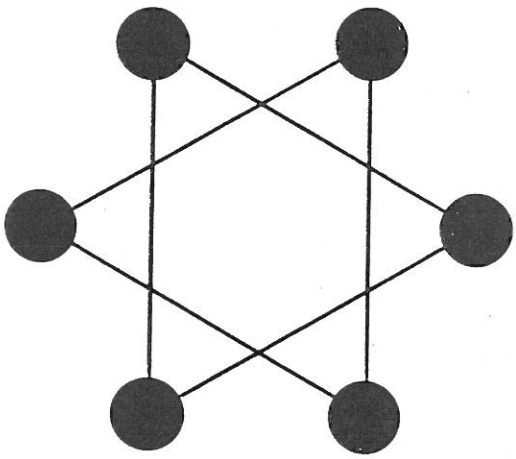
(1) Put a counter on any circle and slide it along a line to another circle.

(2) Put a 2nd counter on a free circle and slide it along a line to another free circle.

(3) Repeat until uou have used 7 counters.

(4) This puzzle is the same as the one above - except that you have to use 5 counters.

Any Problem?!



(5) One of these puzzles is impossible.
Which one?

(6) Explain <u>why</u> one puzzle can be done and the other cannot.

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