


A puzzle for you

$$\text{Racket} + \text{Racket} + \text{Racket} = 30$$

$$\text{Racket} + \text{3 Tennis Balls} + \text{3 Tennis Balls} = 22$$

$$\text{3 Tennis Balls} - \text{Wimbledon Logo} = 0$$

$$\text{Wimbledon Logo} + \text{1 Tennis Ball} + \text{Racket} = ?$$



MATHS
INVESTIGATIONS
KS2 & KS3

Nice idea but when do I have time to use Maths investigations?

- The summer term! It is a great time to consolidate and apply pupils' learning in different contexts.
- Post SATs in Year 6
- Extension tasks – more able pupils
- Homework
- ICT lesson in Maths
- Group projects
- Lesson starters
- Block out a Maths investigation week!
- Maths display board in the classroom

Why use Maths investigations?

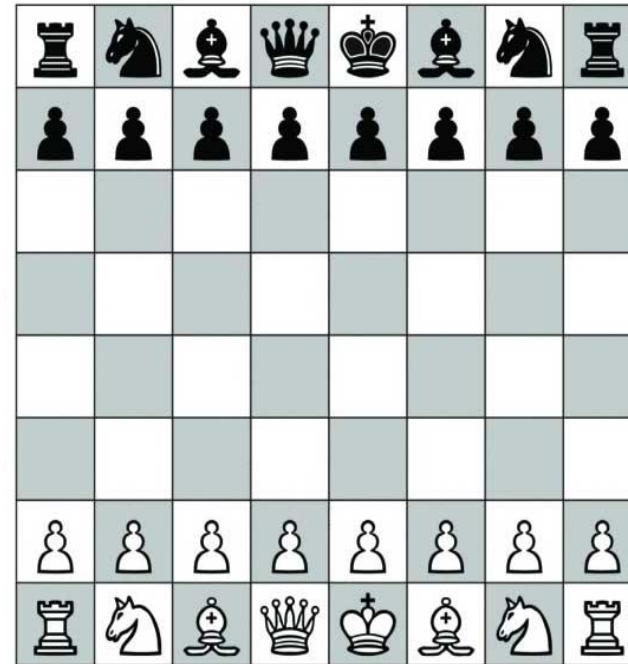
They can:

- Inspire and engage all pupils (Pupils love them! They are different to the *usual* Maths lesson.)
- Be differentiated easily
- Facilitate problem solving, reasoning and fluency ('new' curriculum objectives)
- Reinforce prior learning
- Introduce new or harder concepts (e.g. Year 5 summer term before algebra in Year 6)
- Allow pupils to apply learning in different contexts
- Encourage collaborative learning and good discussion work
- Expect pupils to use various methods, open ended questions, 'it's ok to make mistakes'
- Link to other subjects (art, science, D&T, P.E etc)
- Link to topic work
- Link to time of year / special events (eg. Easter egg hunt problem)

Starters – mini investigations

- Look online – there are so many!
- Hooks pupils into the lesson, gets them thinking and discussing Maths.
 - * Starter of the Day

HOW MANY SQUARES ARE THERE ON A CHESSBOARD?



Refreshing Revision

Teacher:
Scroll down the
page to see how
this Starter can be
customised so that it
is just right for
your class.

Number

What is the 7th:
a) Odd number;
b) Square number;
c) Prime number.

Factors

Find all the factors of:

21

Polygons

What are the names of
regular polygons with:
a) six sides;
b) seven sides;
c) eight sides.

Circle (Vocabulary)

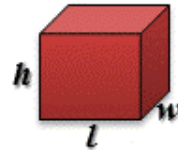
Name the red part.



Shape Formulas

What is the formula?

Surface Area



Decimals (Multiplying)

Calculate the value of:

$$7.5 \times 5.2$$

Adapt it for your pupils

- Eg. Less able pupils – independent task

Refreshing Revision

Number

What is the 5th:

- a) Odd number;
- b) Square number;
- c) Prime number.

Factors

Find all the factors of:

24

Polygons

What are the names of regular polygons with:

- a) eight sides;
- b) nine sides;
- c) ten sides.

Basic Subtraction

Calculate the value of:

62 - 27

Times Tables (3)

9×3

4×3

8×3

7×3

3×3

6×3

5×3

2×3



Roman Numerals (1-12)



XI - IV

Give your answer in Roman numerals.








Leapfrog Investigation

[Online demo](#)

Blue frogs  **Leapfrog**  Green frogs

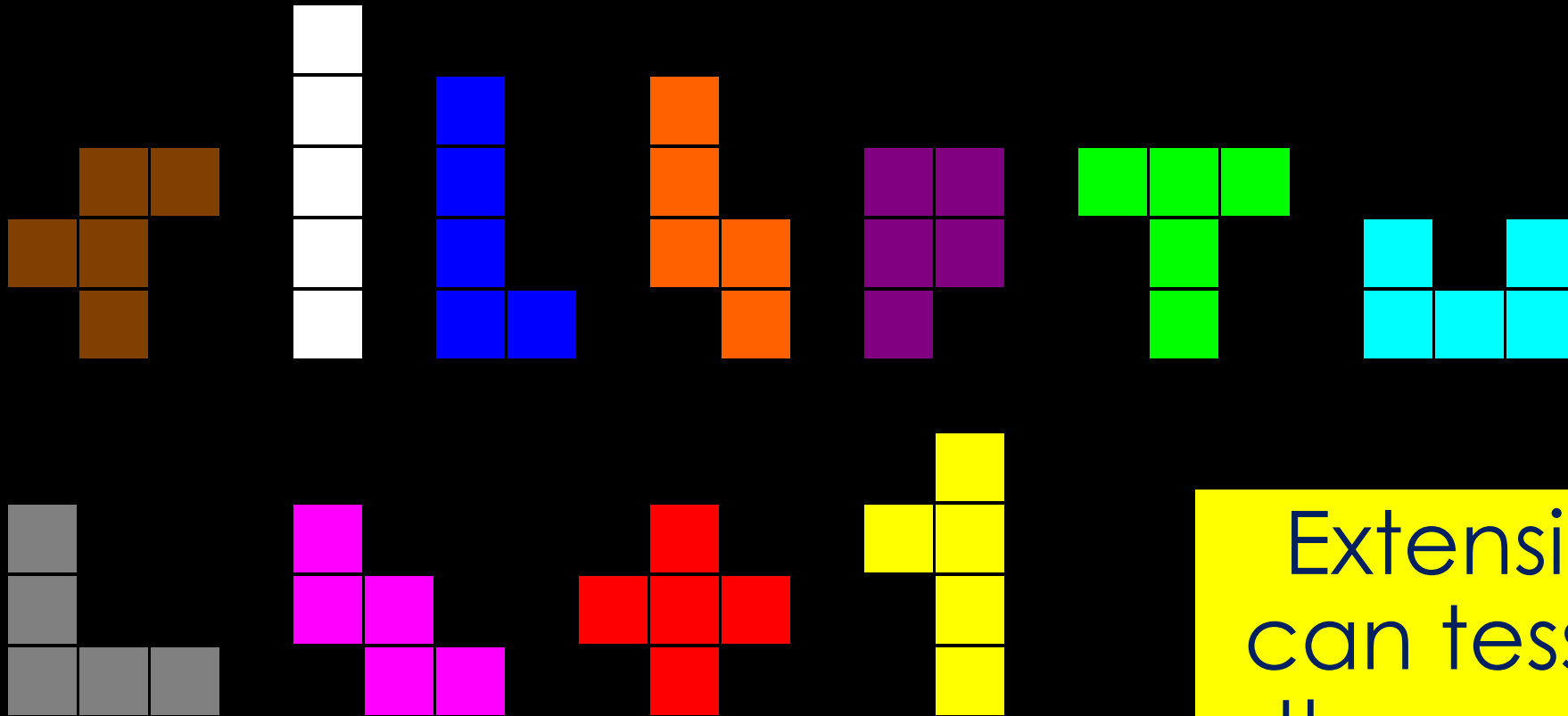
 3  3

Moves: 0

 A  B  C  D  E  F  G

Polyominoes & Pentominoes

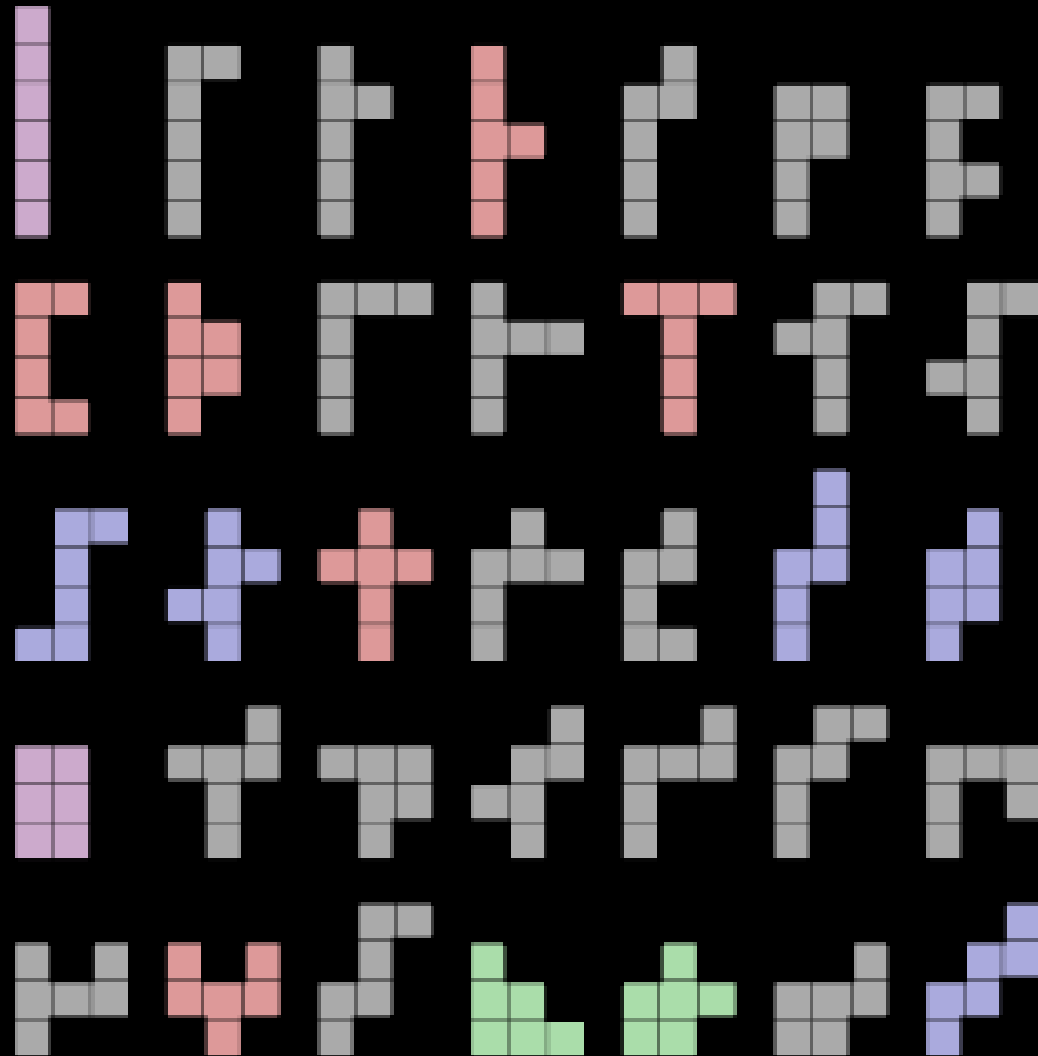
There 12 different pentomino shapes.



Extension: Which can tessellate with themselves? With each other?

Polyominoes & Pentominoes

There are 35 different hexomino shapes.



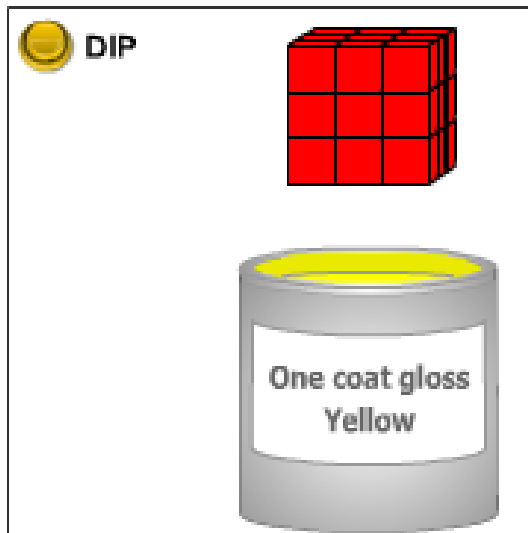
Extension:
Which could
be nets for a
cube?

Painted cube problem

Imagine a large cube made up from **27** small red cubes.

Imagine dipping the large cube into a pot of yellow paint so the whole outer surface is covered, and then breaking the cube up into its small cubes.

How many of the small cubes will have yellow paint on their faces?
Will they all look the same?



Now imagine doing the same with other cubes made up from small red cubes.
What can you say about the number of small cubes with yellow paint on?

Reach 100 investigation

Reach 100

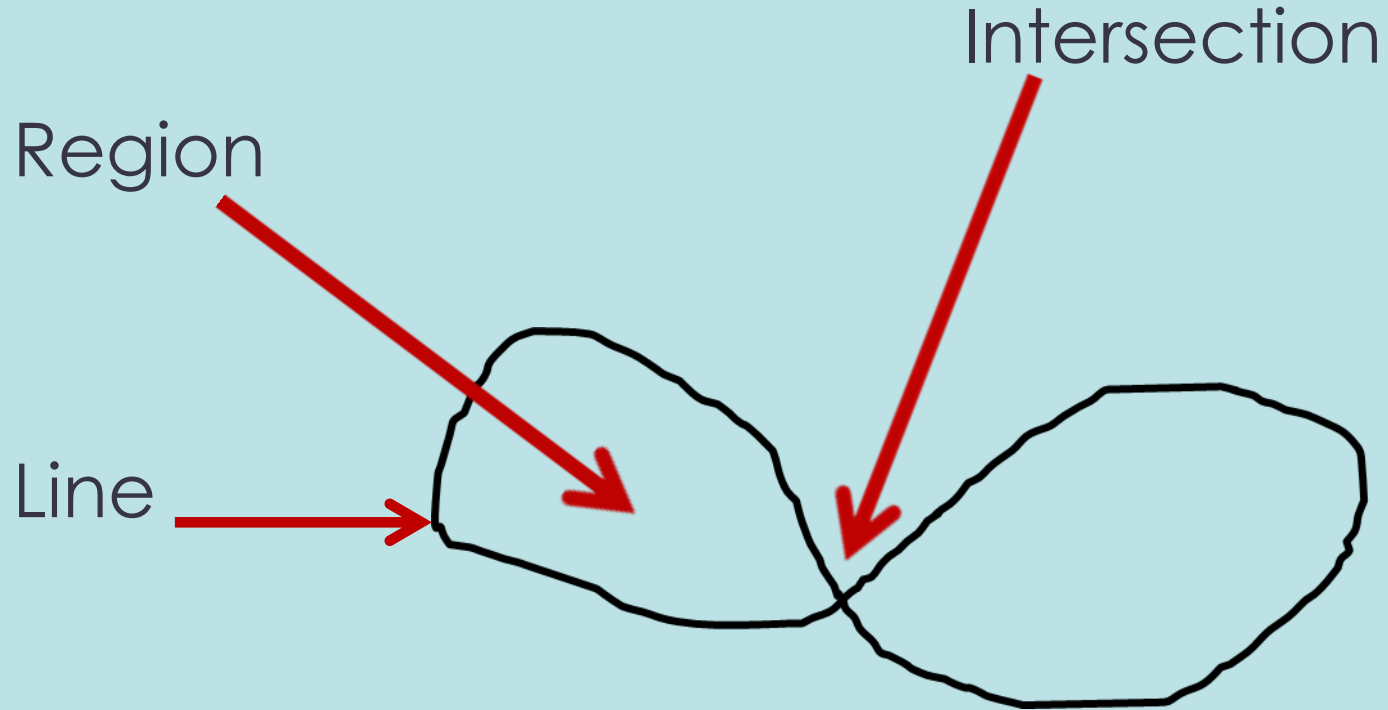
Here is a grid of four "boxes":

You must choose four **different** digits from 1–9 and put one in each box. For example:

5	2
1	9

Extension:
More than one solution?
Different target number?

Doodles investigation

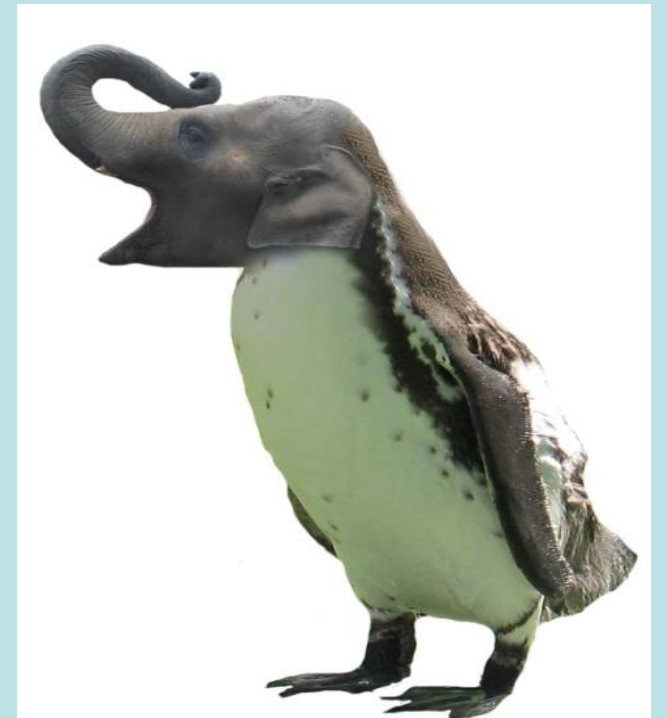
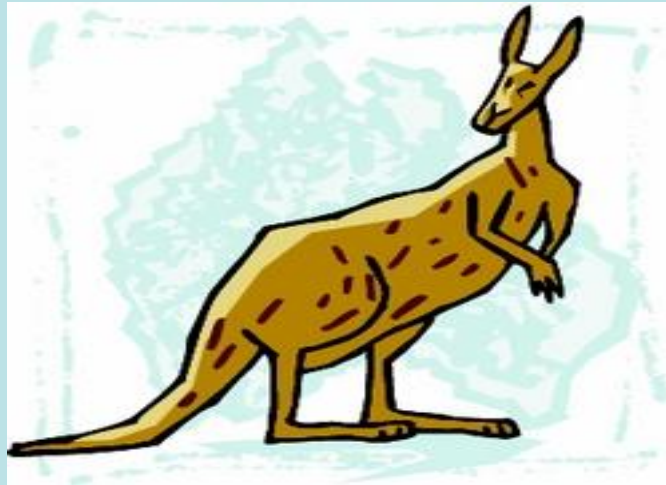
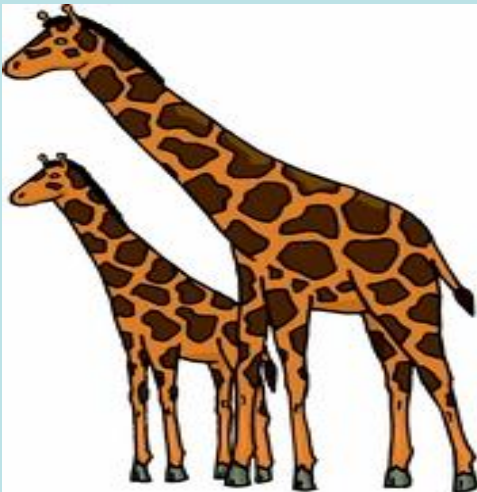


A doodle is drawn when you take your pencil for a walk over the paper.
The pencil must cross the line at least once.
The pencil must end up where it started.

Misfits investigation

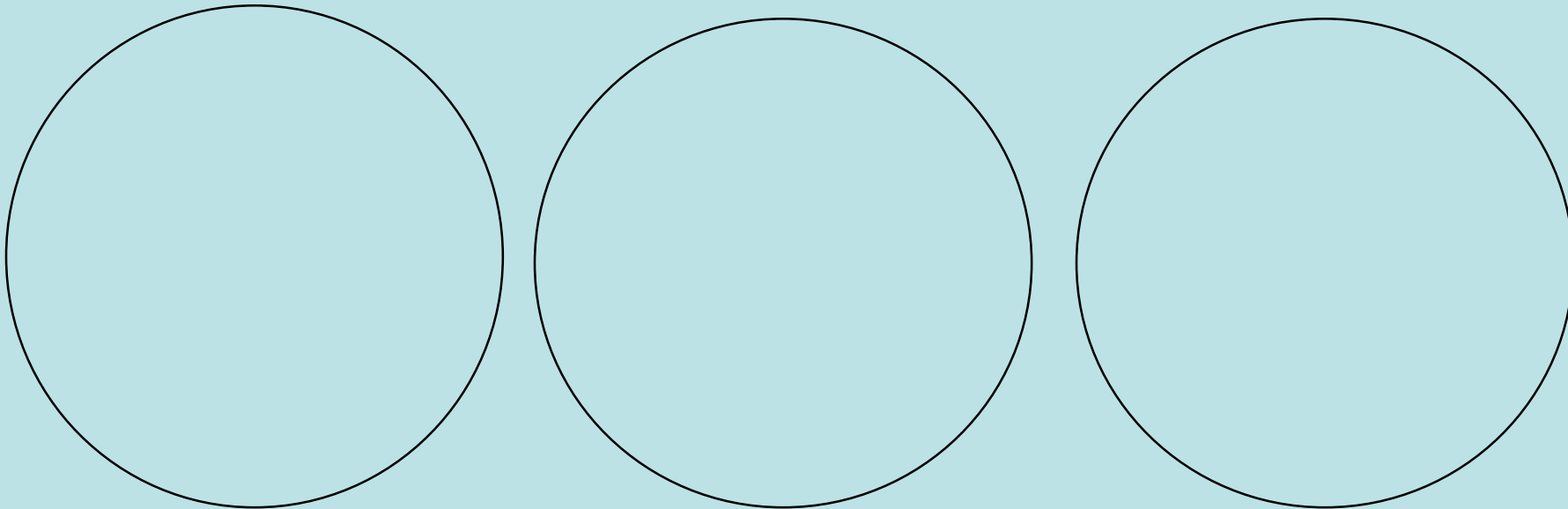
A misfit is a picture made with one half of one thing and one half of something else.

Imagine the misfit made with the top half of a giraffe and the bottom half of an kangaroo!



Pizza investigation

- Show three different ways of cutting pizzas using 2 cuts. Do you always have the same number of pieces?
- The cut must go from edge to edge. The cut must be straight. Try using 3 cuts and then 4 cuts.





Happy numbers

Is 13 is a happy number?

To find out whether a number is happy square each of its digits, add the answers and repeat.

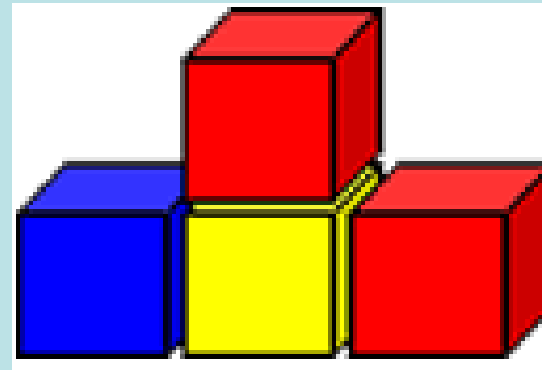
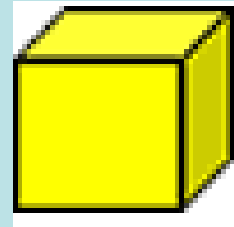
If you end up with 1 the number is happy.

Extension: If 10 is happy, what else do I know?

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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

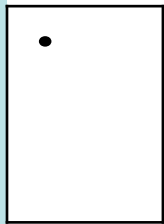
Staircases investigation

- One block is needed to make an up-and-down staircase, with one step up and one step down.
- 4 blocks make an up-and-down staircase with 2 steps up and 2 steps down.

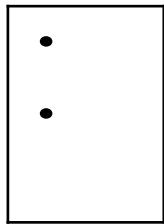


Number of steps up	Total number of cubes
1	1
2	4
3	
4	
5	
6	
7	
8	
9	
10	

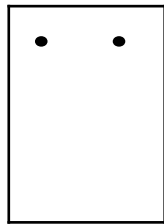
Braille investigation



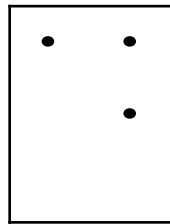
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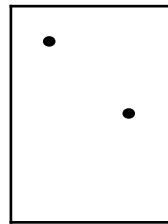
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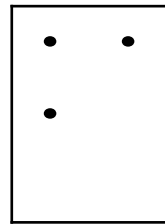
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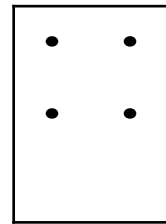
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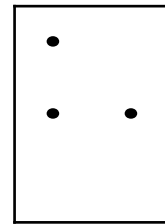
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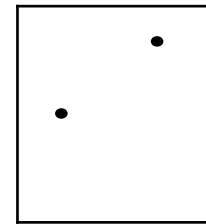
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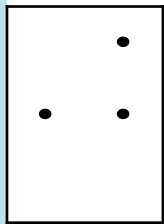
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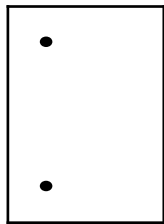
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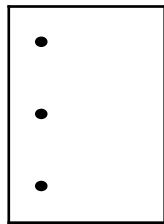
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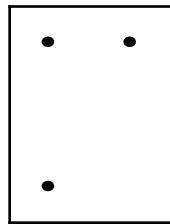
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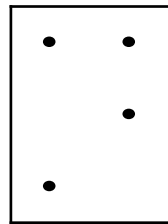
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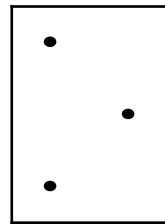
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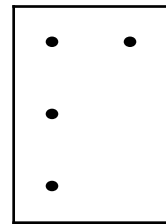
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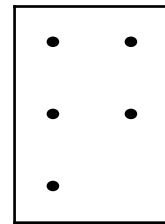
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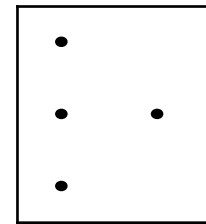
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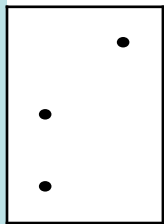
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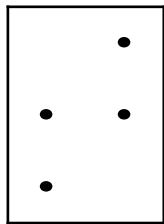
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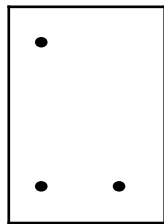
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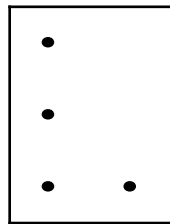
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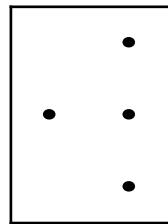
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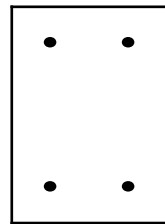
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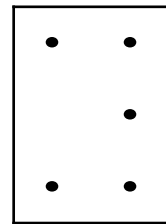
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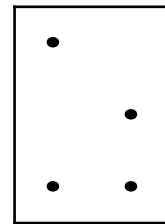
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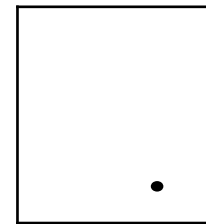
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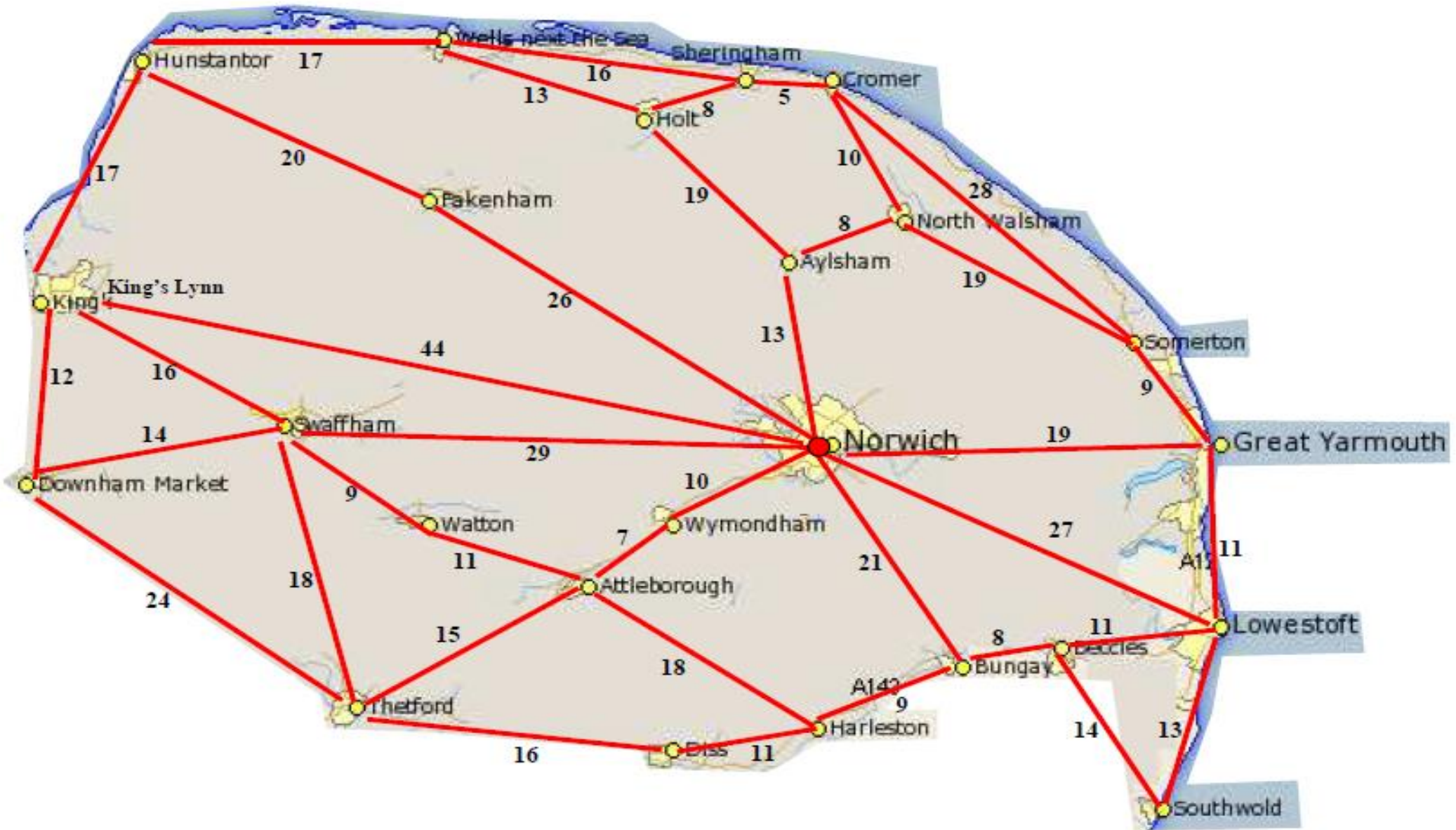


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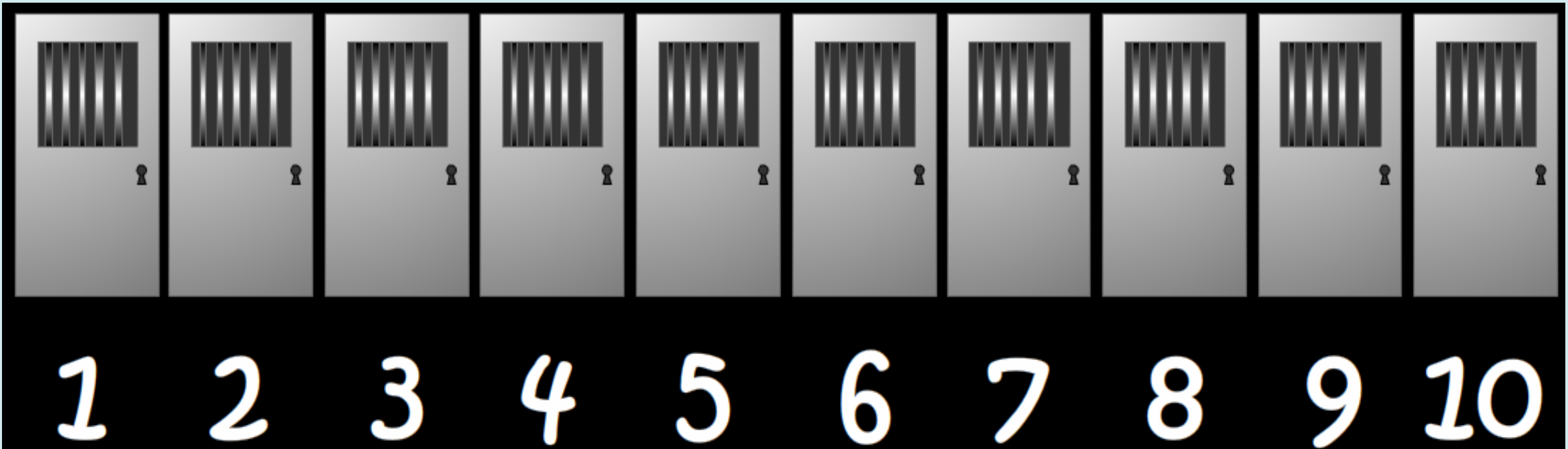


capital

Easter egg hunt



Prison cells investigation



“There are 10 locked cells with 10 prisoners ... one in each cell. There are also 10 guards, who are due to go off duty.

As they leave, they depart in a very “strange way”.

Guard number one goes to every cell (every multiple of one) and unlocks it.

Guard number two goes to every second cell (every multiple of two) and locks it.

Guard number three goes to every multiple of 3. If it is locked, he unlocks it and if it is unlocked, he locks it.

Guard number four ...etc.

After all 10 guards have left, which cells are left unlocked so that the prisoners are able to escape?”

Biscuit decorations problem



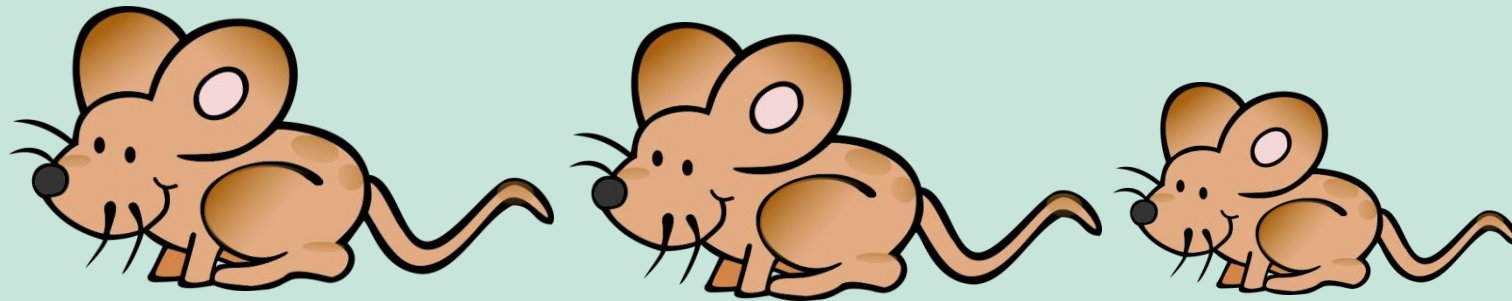
Andrew decorated **30 biscuits** to take to a party.
He lined them up and put icing on every 2nd biscuit.
Then he put a cherry on every 3rd biscuit.
Then he put a chocolate button on every 4th biscuit.
So there was nothing on the first biscuit.



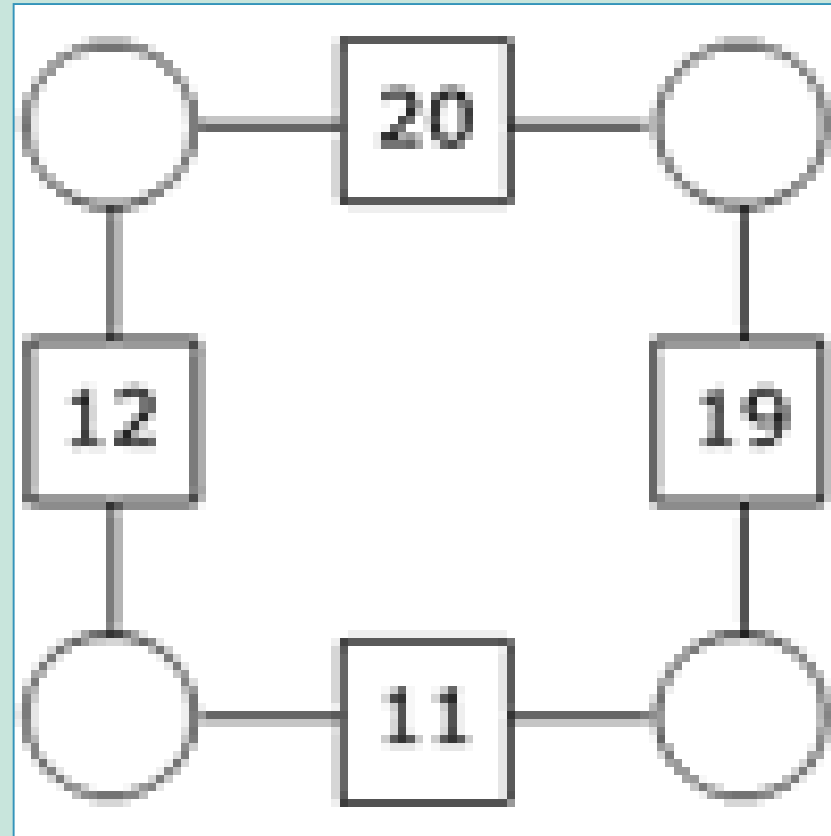
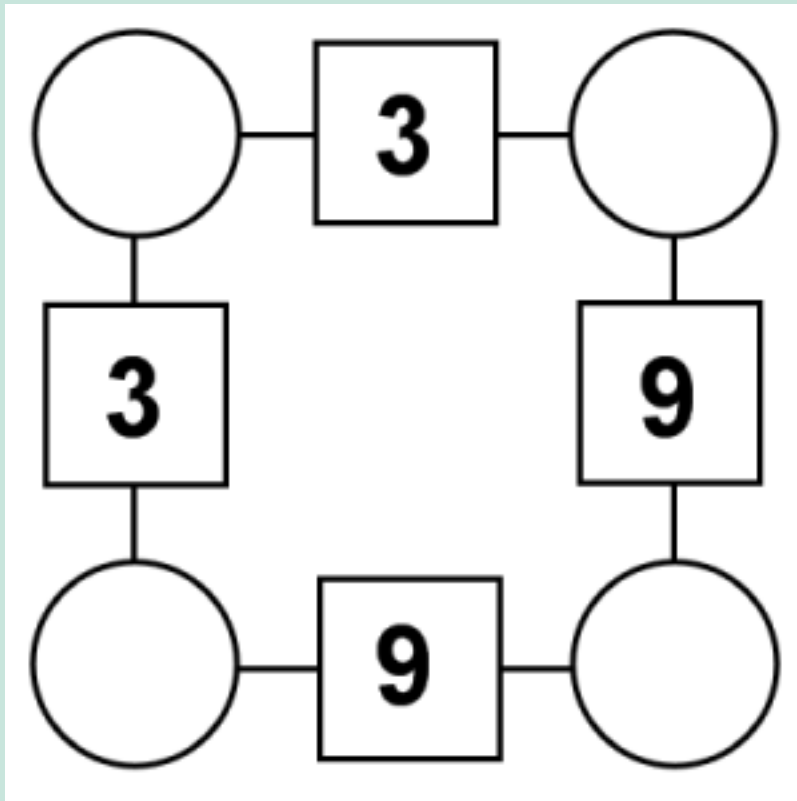
1. Which other biscuits had no decoration?
2. Which biscuits got all three decorations?
3. Why?

Mathematical Mice investigation

- When the dice shows 1 or 2, the **small mouse** goes through the door.
- When the dice shows 3 or 4, the **medium-sized** mouse goes through the door.
- When the dice shows 5 or 6, the **large mouse** goes through the door.



Arithmagons investigation



Change numbers in the squares, how many solutions can you find?

Write ups

- ❖ Make a simple table for results
- ❖ Pupils can write up the investigation (similar to science)
- ❖ Design a front cover (homework / early morning work)
- ❖ Best investigations go up on display

Investigation write up

Introduction – What is the investigation all about?

Include definitions and diagrams.

Aim – What are you hoping to find out?

Method – Explain what you did to collect results.

Results – Show your results in a table.

Conclusion – What did you find out?

Describe the patterns you can see in the results.

Evaluation – Answer the questions about how you did the investigation.

Evaluation



- I enjoyed
- I am proud of
- The most difficult part was
- If I was doing the investigation again, I would improve it by
- I would like to investigate

Refer to handout

- Useful websites
- Interesting books linked to Maths
- Any questions or resources you'd like, please email:
rwang@exwickheights.devon.sch.uk