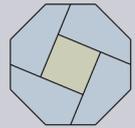


Escape from Lochdonia Manor



The Scottish
Mathematical
Council



It is a cold and dreary day – not that uncommon for a Scottish summer! By a strange twist of events you find yourself at the bottom of a hill with three challenge ladders ... each ladder leads up to a coloured door in to Lochdonia Manor. To reach the entrance, you must answer a set of challenges. Using your maths skills, can you enter, get through and escape Lochdonia Manor?

Moving on Up

Let's enter the Manor! Which ladder will you challenge yourself to climb? Starting at the bottom, change one digit each time as you work your way up from the bottom rung to the door.

change from £2 when I buy:
juice 85p chocolate 55p crisps 45p

20, 25, 30, 35, 40, , 50

+ 20 = 67

odd number between 95 and 100

largest two-digit number

number of degrees in a right angle

number of centimetres in
a half metre

START 5 1

$60 + 40 = \text{input} + 25$

a square number

number of hours in a day

1, 2, 4, 8, 16, 32,

a palindrome*

$\frac{1}{4}$ of 240

$\frac{1}{2}$ as a percentage

START 5 8

number of hours in 15 days

26 hens and 27 pigs, how many
legs altogether?

the angles in a triangle add to
 degrees

$12680 - \text{input} = 4984 + 7513$

ascending consecutive digits

$40 \times \text{input} = 5000$

smallest 3-digit triangular number*

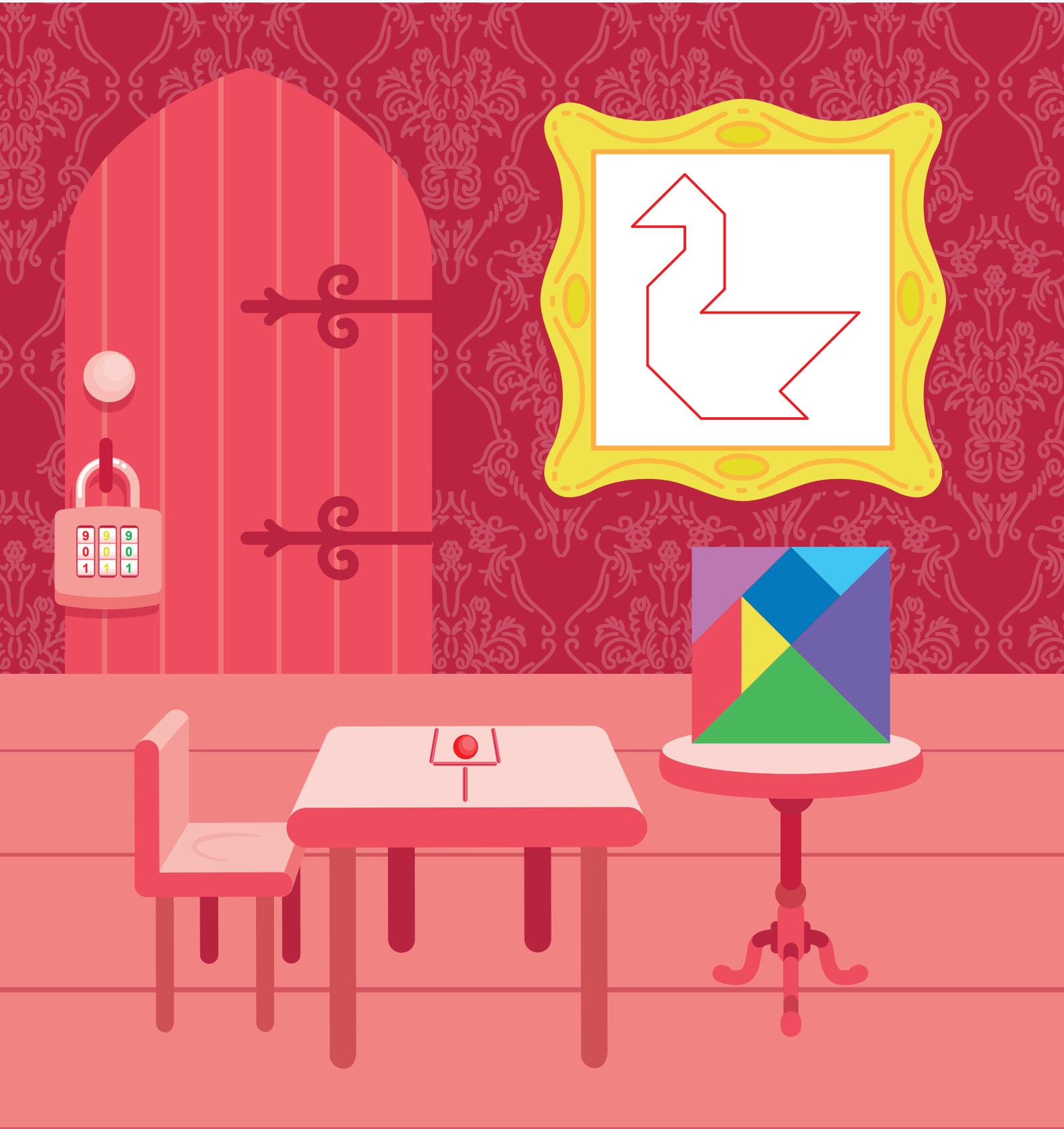
START 1 3 5

Once you have reached the top of each ladder click on the link to open the door and enter the room, where your next challenge awaits you!



Welcome to the RED room

There are three challenges in this room. You do not have to do them in order. If you get stuck with the first one – try the next. Sometimes taking a little time away from a challenge helps you to solve it (this is how mathematicians work).

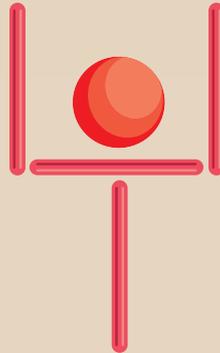


RED room task one

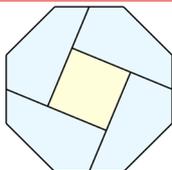
Are you a match for the first challenge? For this you will need: something to recreate the picture such as pens/pencils, strips of paper or sticks, a coin or ball.

You sit down at the table. On the table are the instructions for the first task. Read the instructions below and take on the challenge.

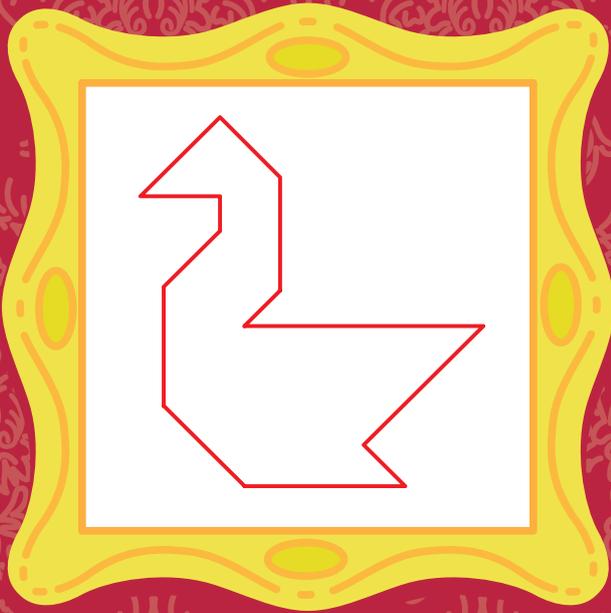
Arrange four lines and a circle as shown below to represent a glass and a cherry.



Your challenge is to leave the cherry outside the glass, moving only two lines and leaving the shape of the glass intact at the end.



RED room task two



In the picture frame is the shape of a swan. On the table is a square that has different coloured shapes inside.

Carefully cut out the shapes in the square... can you arrange them to make the shape of the swan shown in the picture?

*There is a template sheet provided at the end for printing or drawing out.

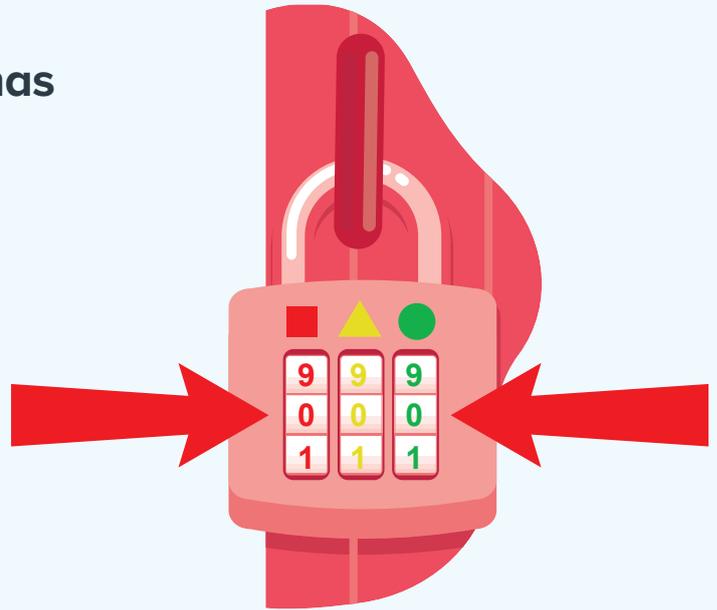


Solutions

RED room task three

The door to leave this room has a padlock with a three-digit combination code.

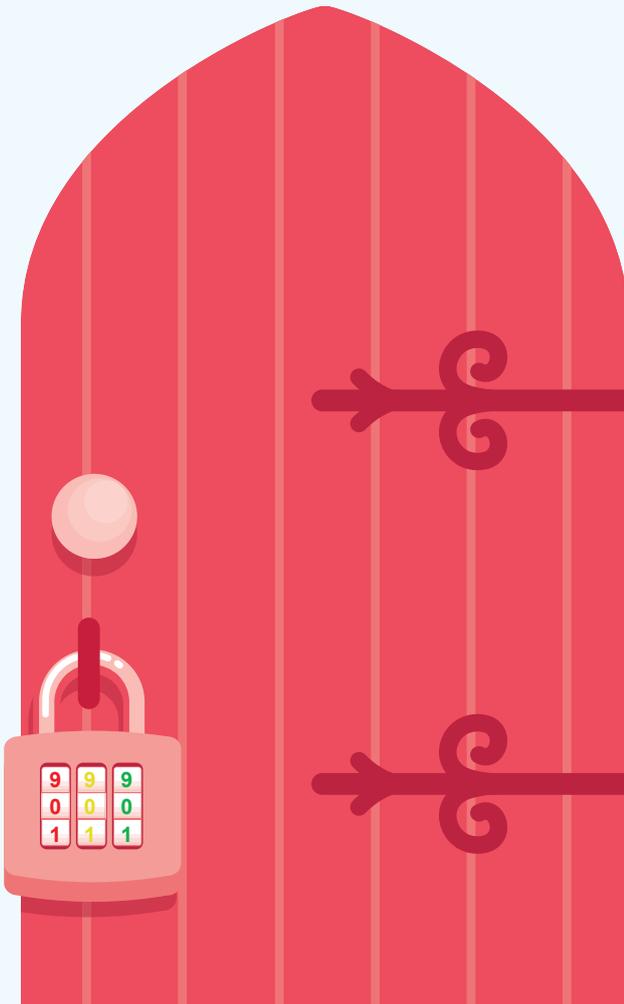
Each set of digits is coloured.



Next to the door is the following information.

$$\begin{array}{l} \text{Green Circle} + \text{Green Circle} = 10 \\ \text{Yellow Triangle} + \text{Green Circle} = 7 \\ \text{Red Square} + \text{Yellow Triangle} + \text{Yellow Triangle} = 7 \end{array}$$

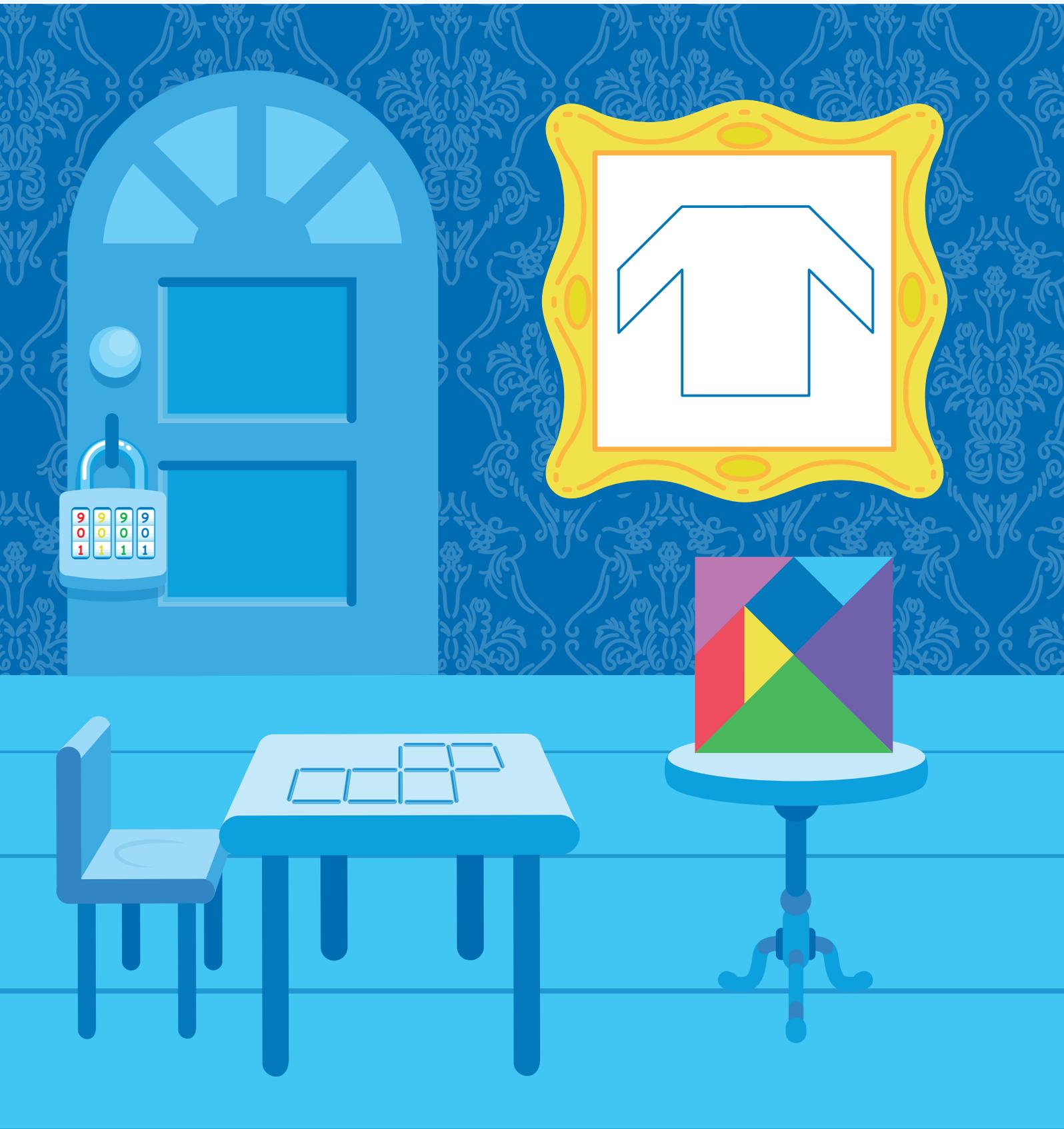
Use this to work out the combination that will open the padlock and the door!



Solutions

Welcome to the BLUE room

There are three challenges in this room. You do not have to do them in order. If you get stuck with the first one – try the next. Sometimes taking a little time away from a challenge helps you to solve it (this is how mathematicians work).

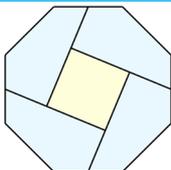
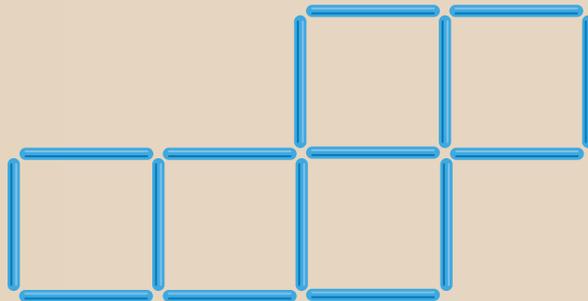


BLUE room task one

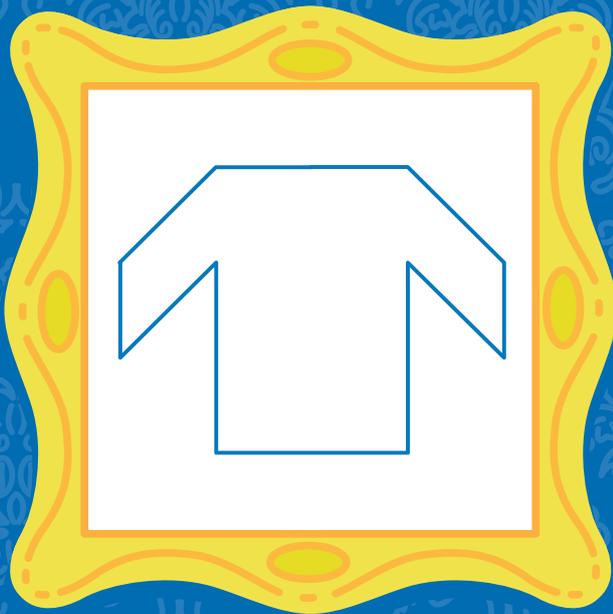
Are you a match for the first challenge? For this you will need something to recreate the picture such as pens/pencils, strips of paper or sticks.

You sit down at the table. On the table are the instructions for the first task. Read the instructions below and take on the challenge.

Move two lines to reduce the number of squares from five to four so that each line forms a side of at least one square.



BLUE room task two



In the picture frame is the shape of a T-shirt. On the table is a square that has different coloured shapes inside. Carefully cut out the shapes in the square ... can you arrange them to make the shape of the T-shirt shown in the picture?

*There is a template sheet provided at the end.

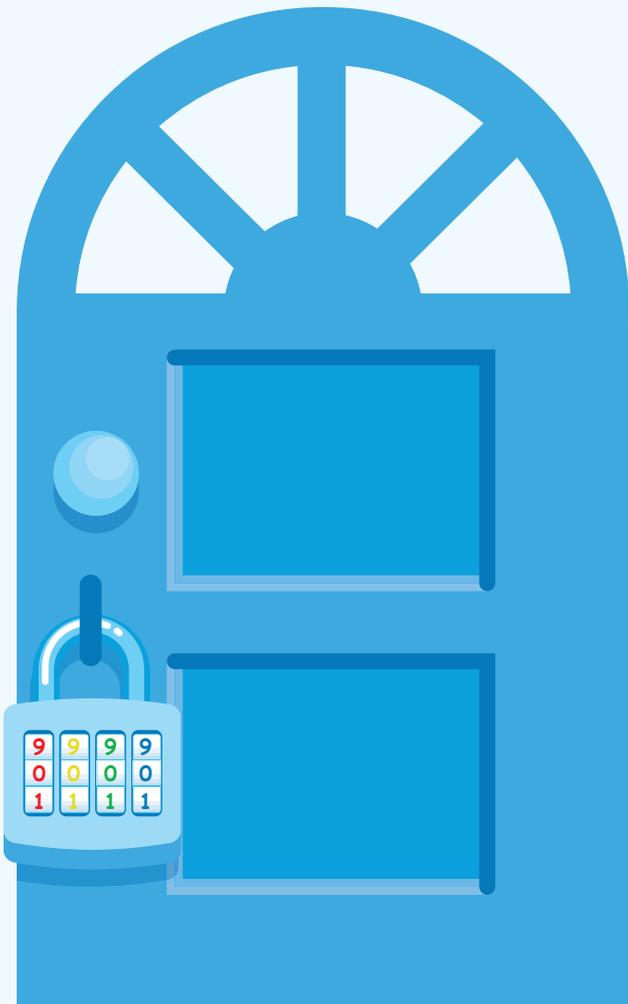
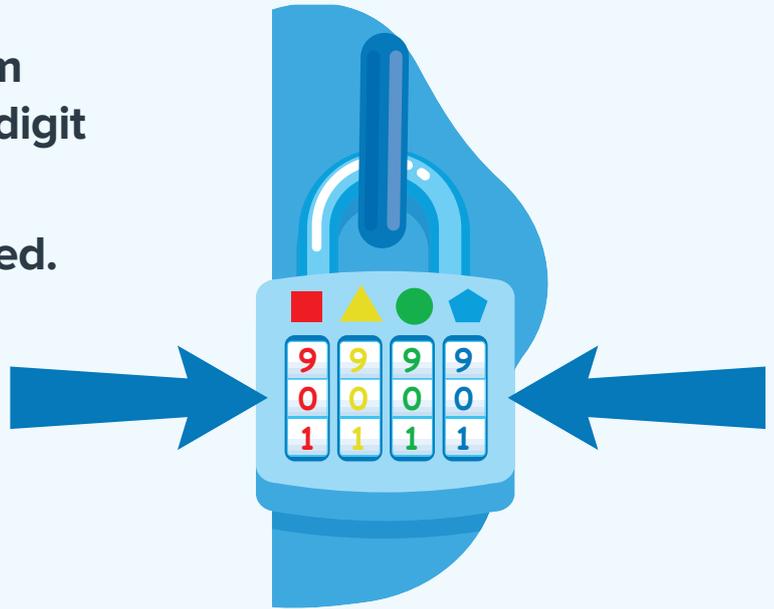


Solutions

BLUE room task three

The door to leave this room has a padlock with a four-digit combination code.

Each set of digits is coloured.



Next to the door is the following information.

$$\triangle + \triangle + \triangle + \triangle = 12$$

$$\triangle + \square + \square + \square = 22$$

$$\square + \square + \circ + \circ = 14$$

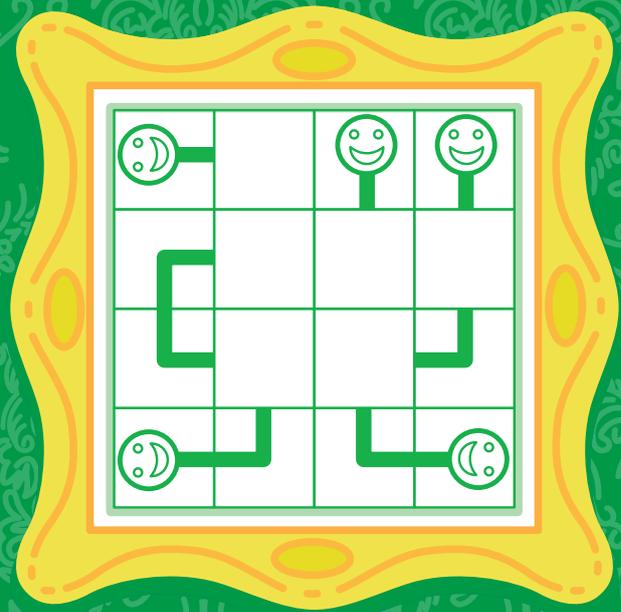
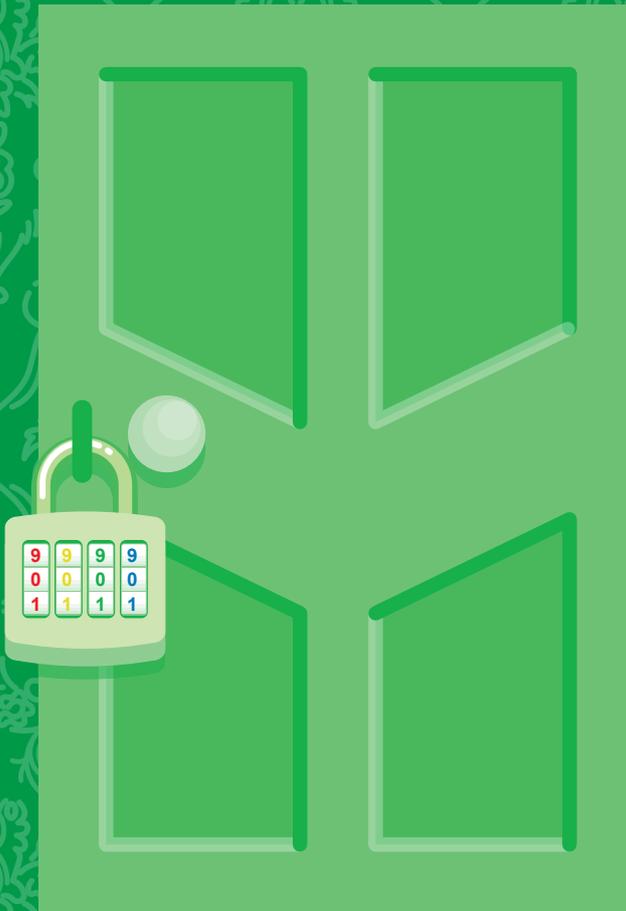
$$\triangle + \square + \circ + \square = 17$$

Use this to work out the combination that will open the padlock and the door!

Solutions

Welcome to the GREEN room

There are three challenges in this room – don't worry if you need to go between them. You might find this easier than trying to solve them one at a time... sometimes taking a little time away from a challenge helps you to solve it.

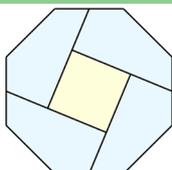
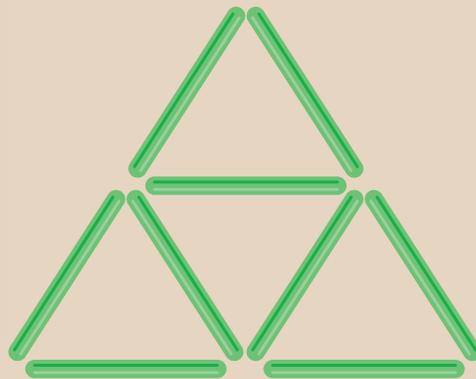


GREEN room task one

Are you a match for the first challenge? For this you will need something to recreate the picture such as pens/pencils, strips of paper or sticks.

You sit down at the table. On the table are the instructions for the first task. Read the instructions below and take on the challenge.

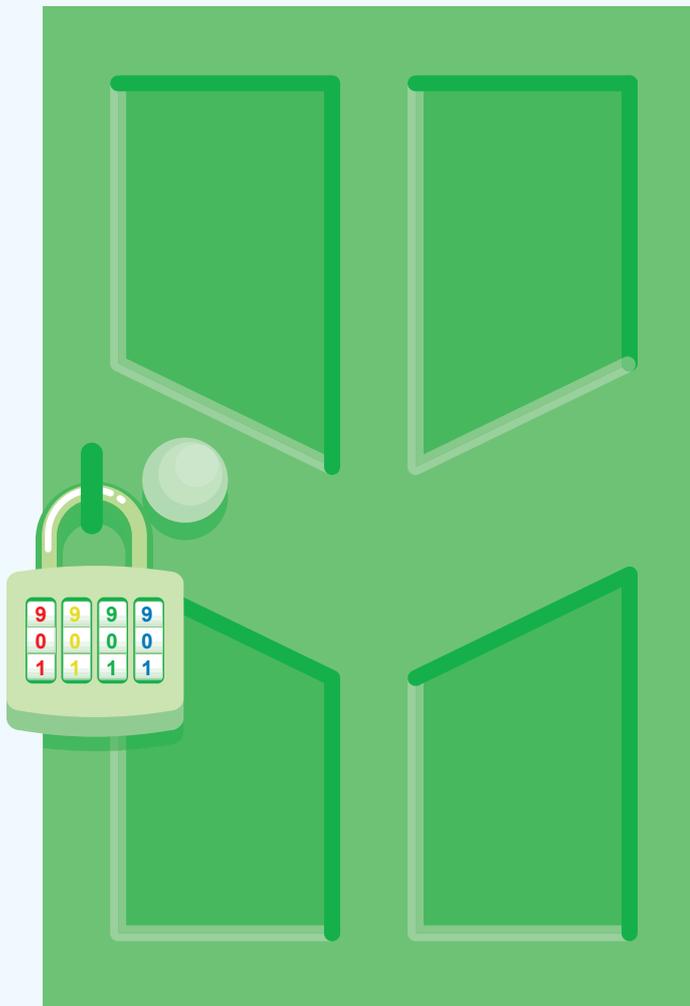
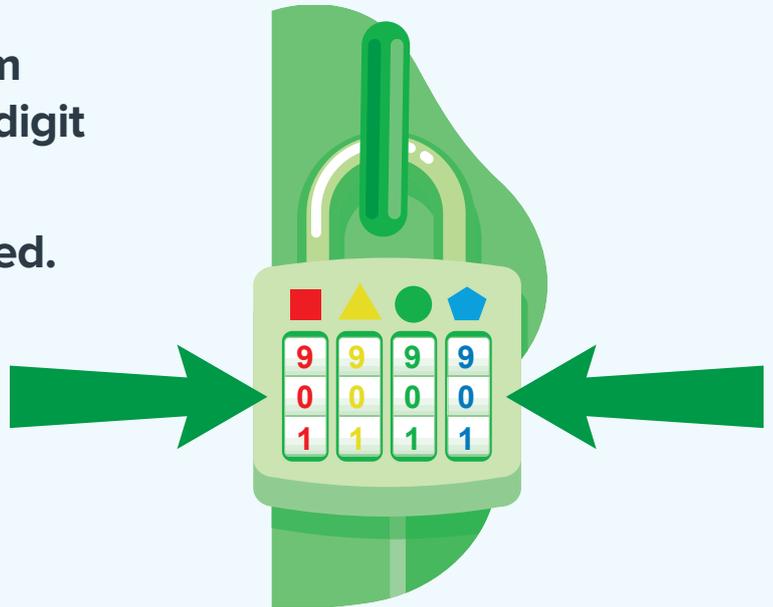
Can you remove two lines to leave two equilateral triangles? Every line must form part of a triangle.



GREEN room task three

The door to leave this room has a padlock with a four-digit combination code.

Each set of digits is coloured.



Next to the door is the following information.

$$\begin{array}{l} \triangle + \square + \triangle + \square = 22 \\ \square + \square + \square + \triangle = 23 \\ \bigcirc + \bigcirc + \pentagon + \triangle = 19 \\ \pentagon + \bigcirc + \square + \triangle = 22 \end{array}$$

Use this to work out the combination that will open the padlock and the door!

Solutions

**WELL DONE, YOU'VE ESCAPED
THE ROOM, BUT NOT THE MANOR**

**NOW IT'S TIME TO MEET AND
DEFEAT THE GATEKEEPER!**

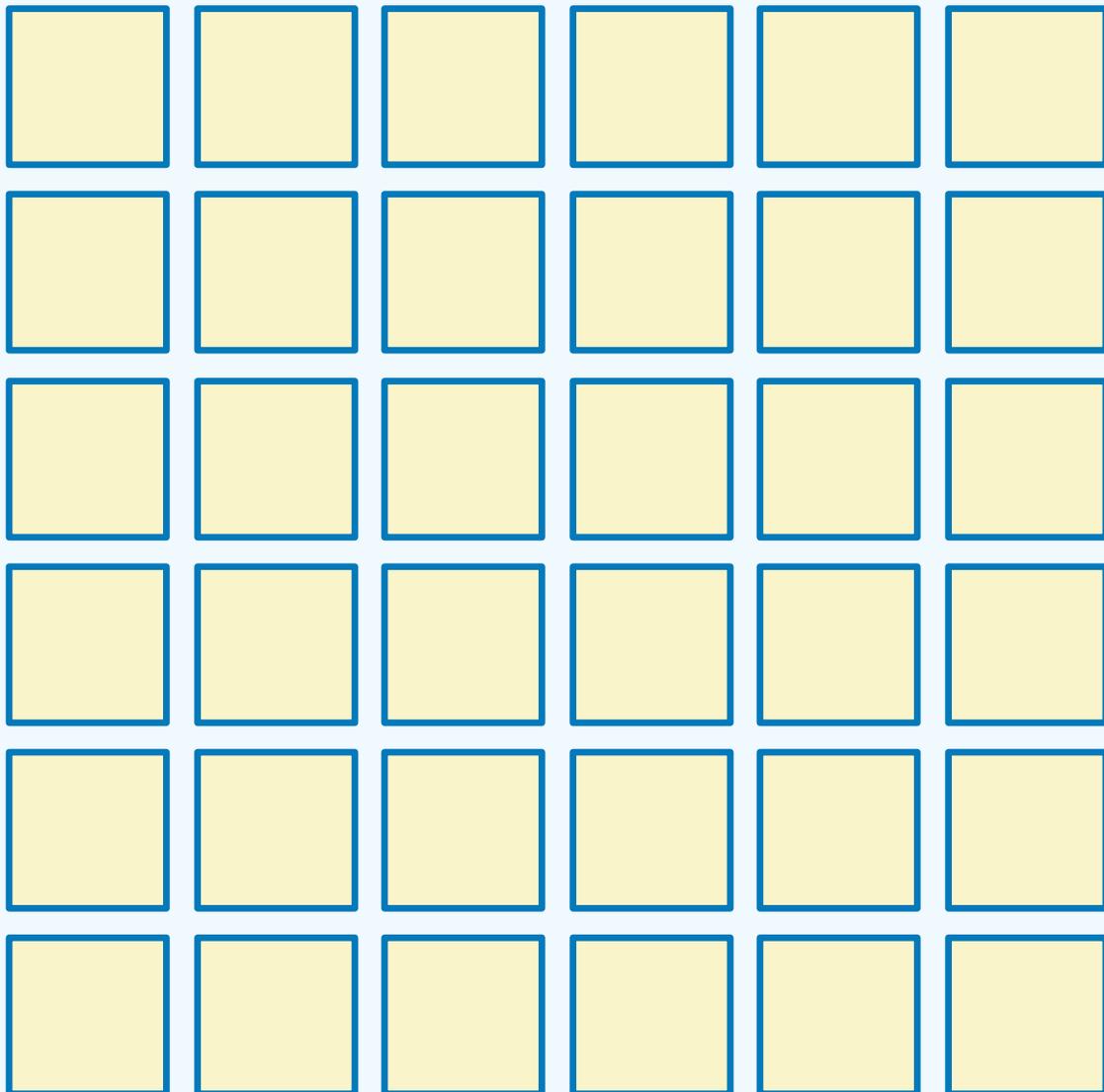
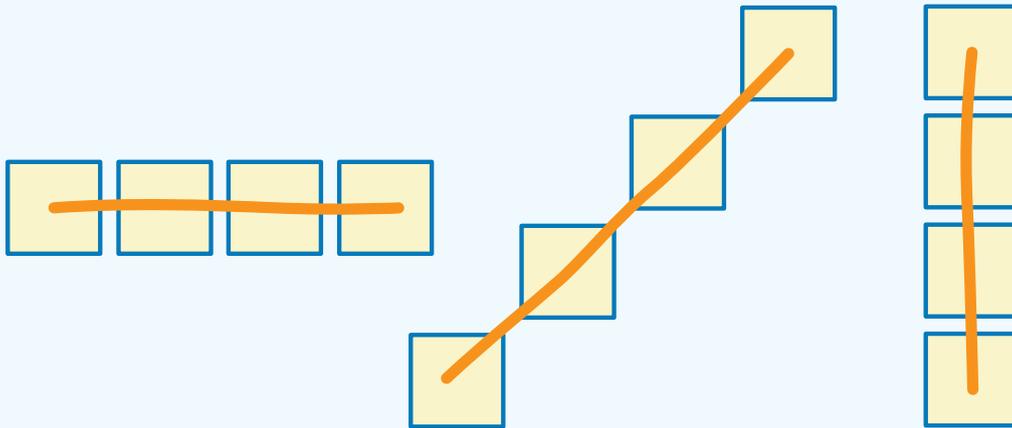


The Gatekeeper says you cannot pass, unless you can defeat him in one of his games. Each game links to a different colour but why not try them all? Play them as often as you like. You will need a partner to take on the role of Gatekeeper.

TO WIN FOUR A WAY OUT:

For this game you will need a six by six square grid - shown below — and two different colours of pens/pencils or counters.

Players take turns to put a mark or counter in an empty square. The winner is the first to get four in a row up, down, across or diagonally.



RUN THE PENTA-GAUNTLET

You must create a path from top to bottom across the pentagon gauntlet. Beware! The gatekeeper will try to block your path with their pentagons. Take turns to fill in a pentagon with a colour or marking. You do not need to play next to one of your previous moves, but the final path must be connected edge-to-edge.



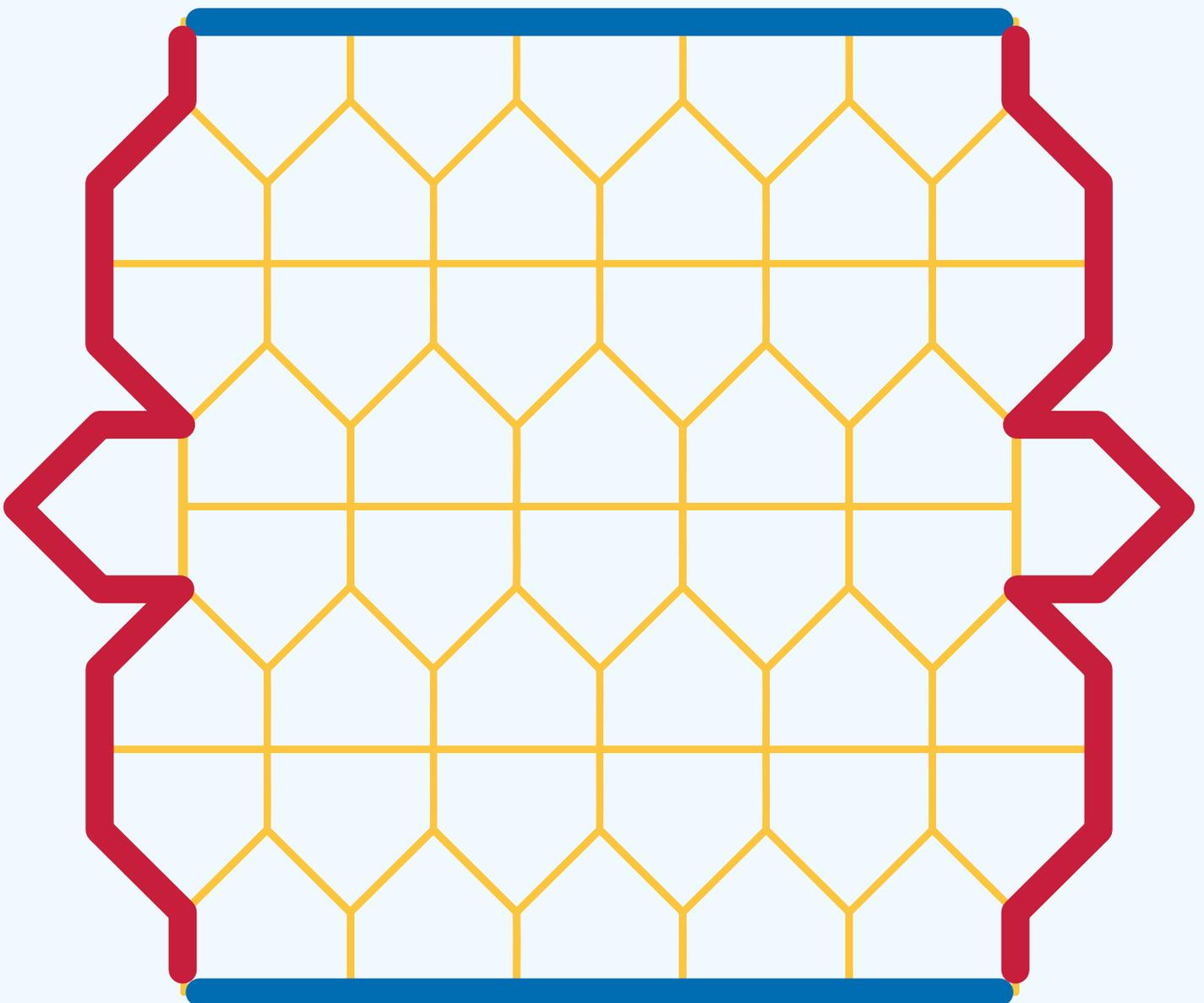
For example

is a path



is not a path.

If the Gatekeeper stops you making a complete path, or they make a successful path across, then you are defeated and you must try again.



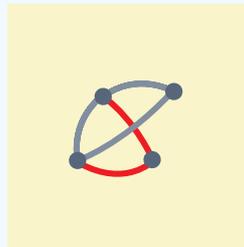
SPROUTS FOR A WAY OUT

Sprouts is a game for two players. You will need: one piece of paper, a pen or pencil each, ideally differently coloured.

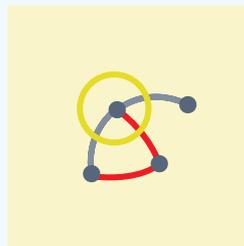
Player one draws two dots and then joins them with a line and places a new dot anywhere on that line. Player two must then join any two dots with a new line and draw a new dot on the line they have just created.



Lines cannot cross other lines.

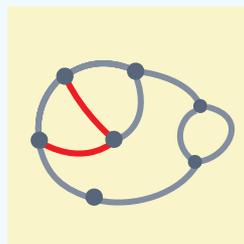


A dot cannot have more than three lines connected to it. No more lines can connect to the dot with a circle round it in the example below.



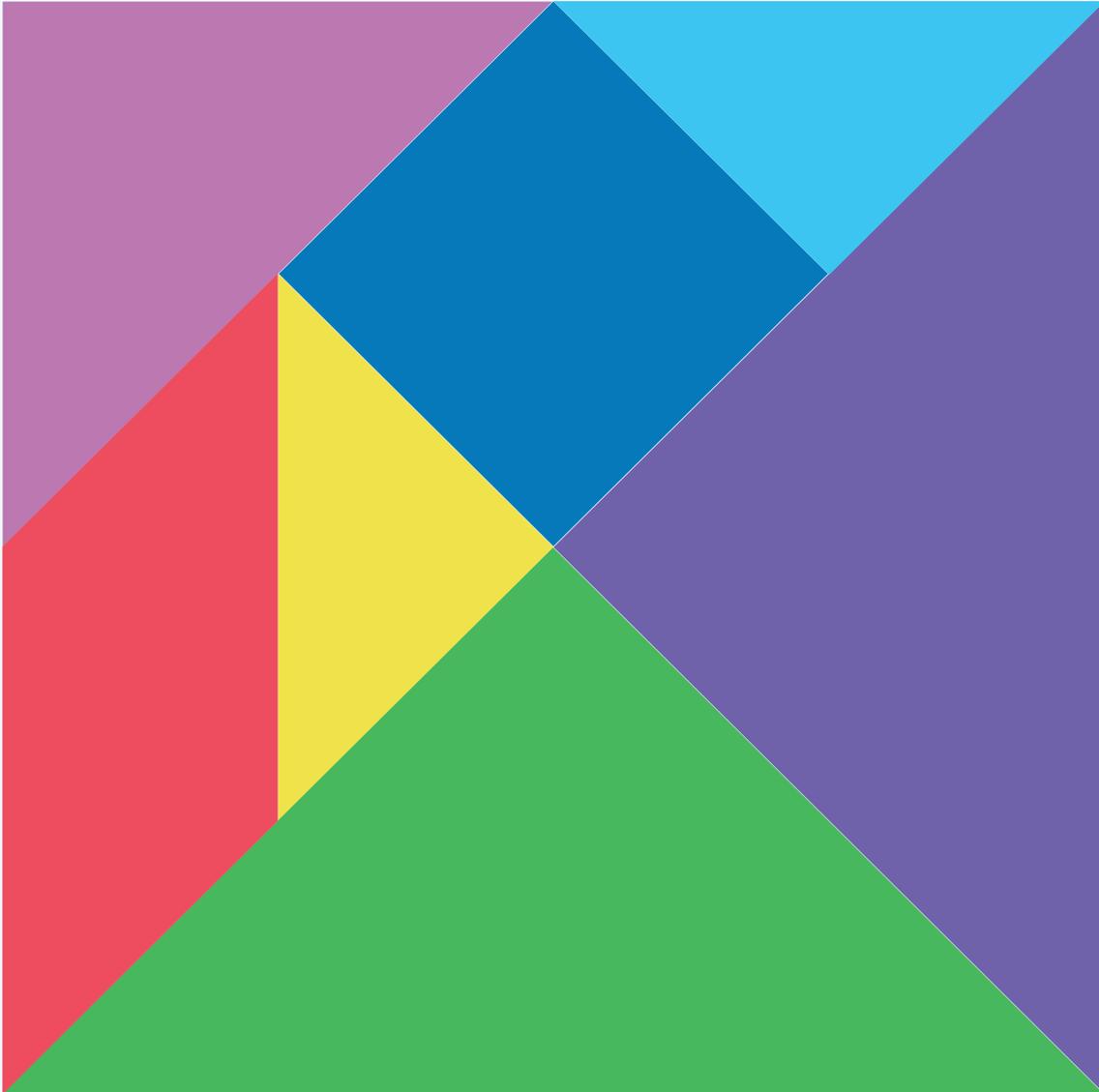
The first player who is unable to draw a new line loses!

For example, no more moves can be made in the game shown below.



Once you have mastered this version of the game, try starting by drawing three dots... or four... or more... before player one chooses two of them to join with their first line.

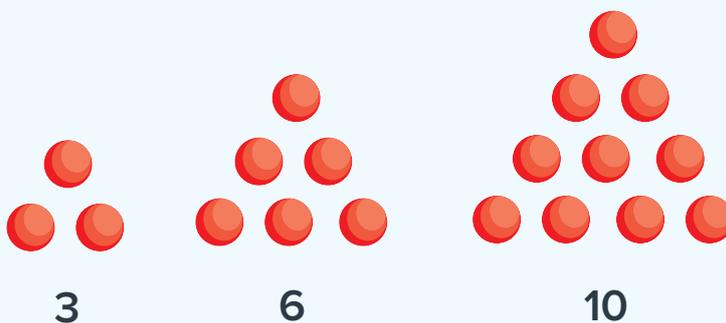
Printables or templates for drawing

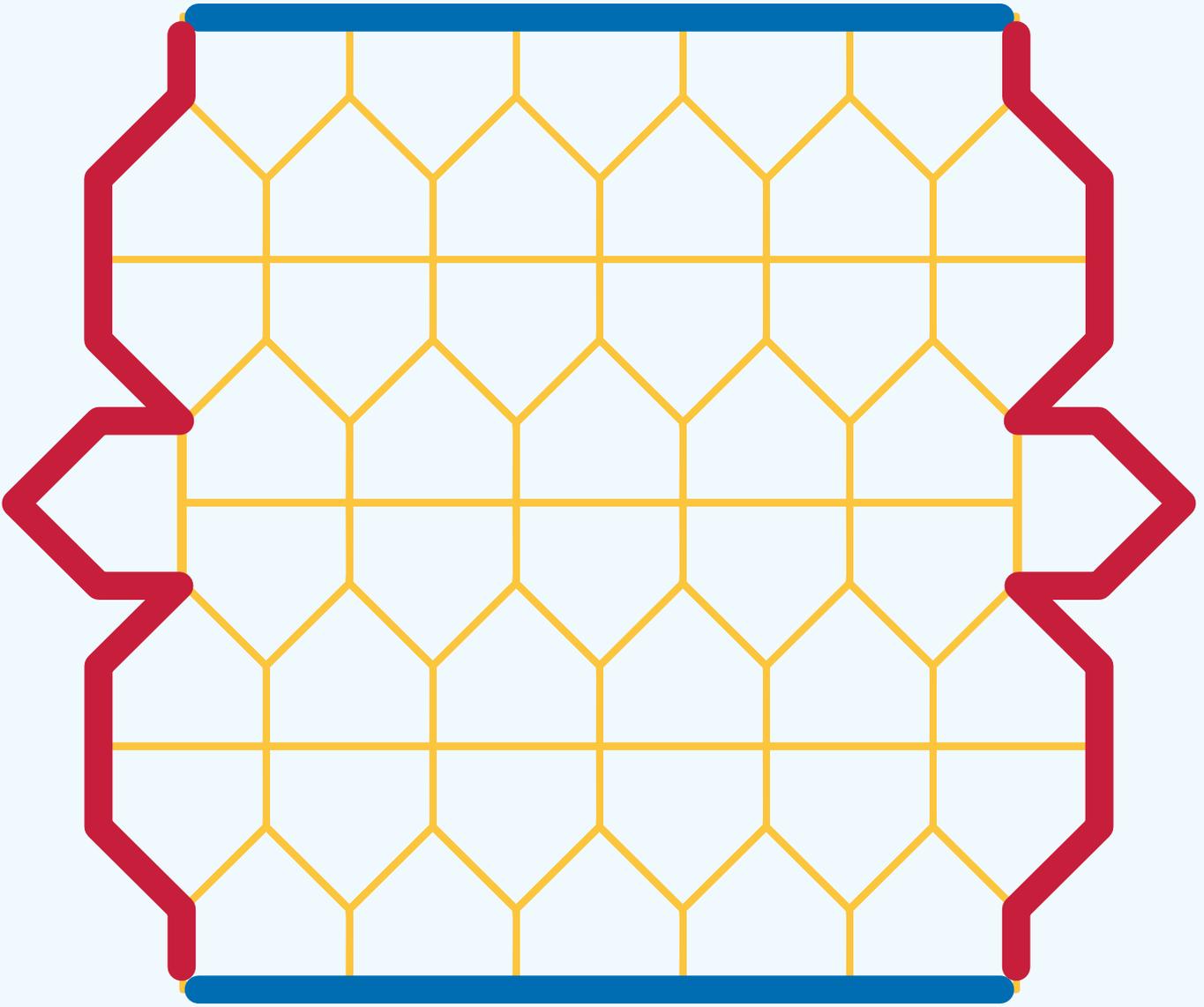


Definitions

Palindrome: a number that reads the same forwards and backwards, for example 868.

Triangular number: a number that can make a dot pattern in the shape of a triangle, for example:





Moving on Up Solutions

change from £2 when I buy:
juice 85p chocolate 55p crisps 45p

20, 25, 30, 35, 40, , 50

+ 20 = 67

odd number between 95 and 100

largest two-digit number

number of degrees in a right angle

number of centimetres in
a half metre

START

$60 + 40 = \text{ } + 25$

a square number

number of hours in a day

1, 2, 4, 8, 16, 32,

a palindrome

$\frac{1}{4}$ of 240

$\frac{1}{2}$ as a percentage

START

number of hours in 15 days

26 hens and 27 pigs, how many
legs altogether?

the angles in a triangle add to
 degrees

$12680 - \text{ } = 4984 + 7513$

ascending consecutive digits

$40 \times \text{ } = 5000$

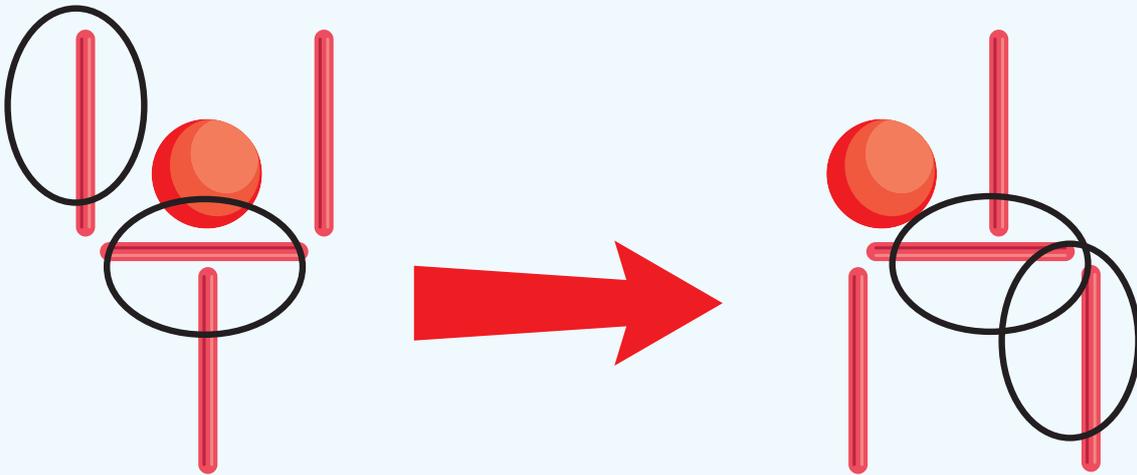
smallest 3-digit triangular number

START

Welcome to the RED room solutions

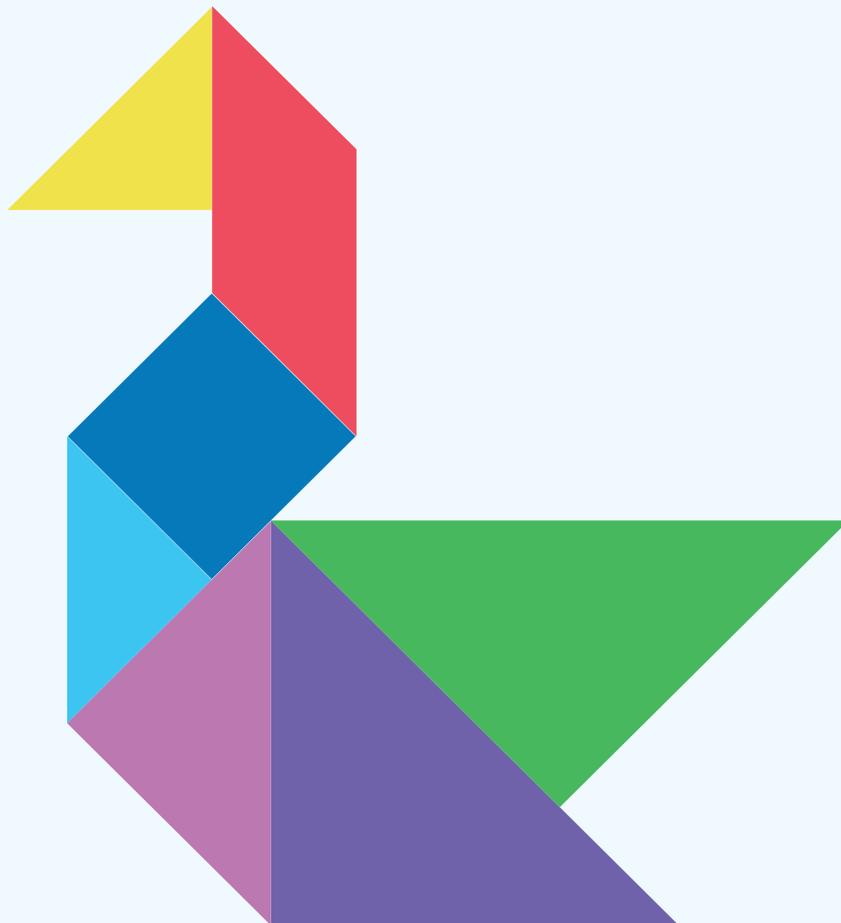
Task 1

Arrange four lines and a circle as shown below to represent a glass and a cherry.



Leave the cherry outside the glass, moving only two lines and leaving the shape of the glass intact at the end.

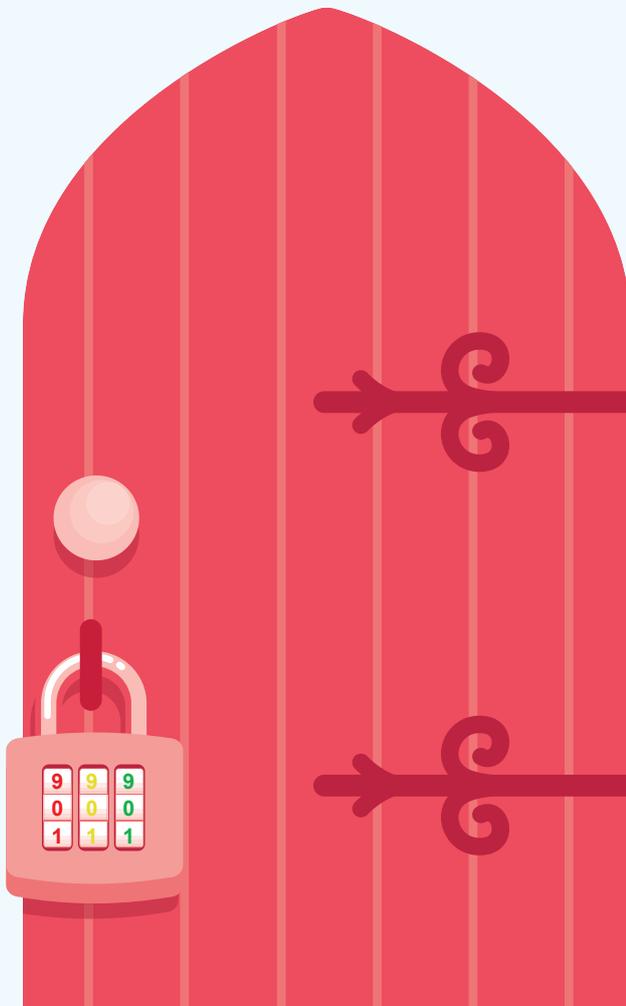
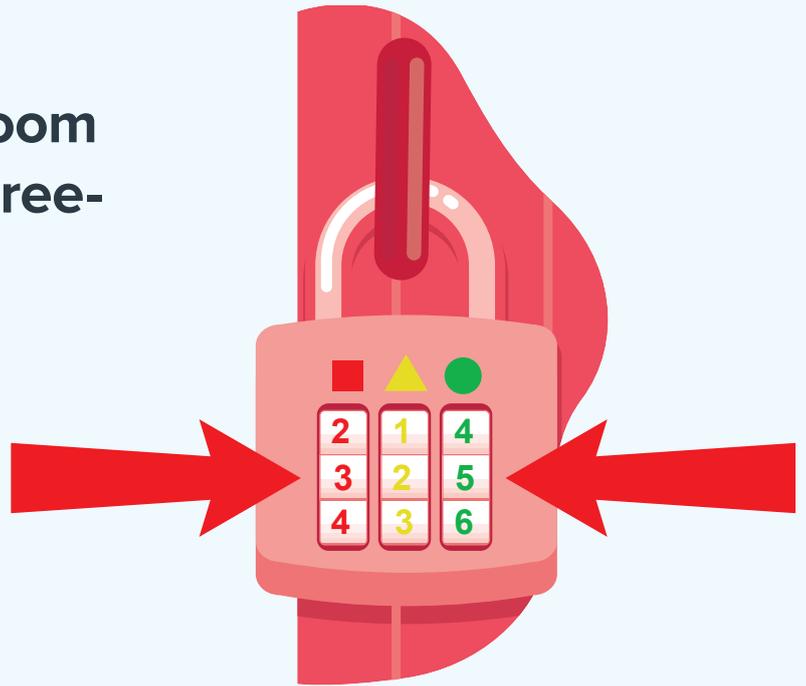
Task 2



Task 3

The door to leave the room has a padlock with a three-digit combination code.

Each set of digits is coloured.



Next to the door is the following information.

$$\text{5} + \text{5} = 10$$

$$\text{2} + \text{5} = 7$$

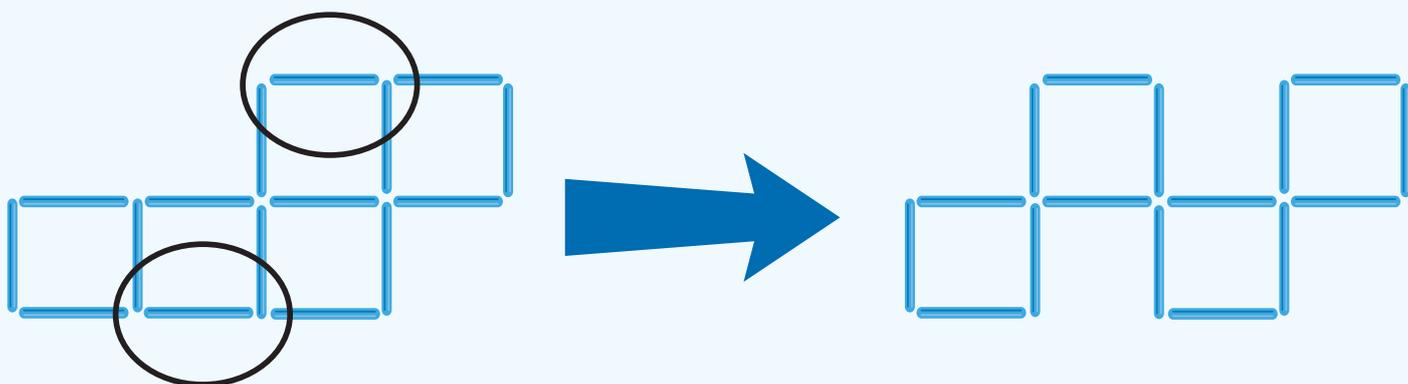
$$\text{3} + \text{2} + \text{2} = 7$$

The combination is 325!

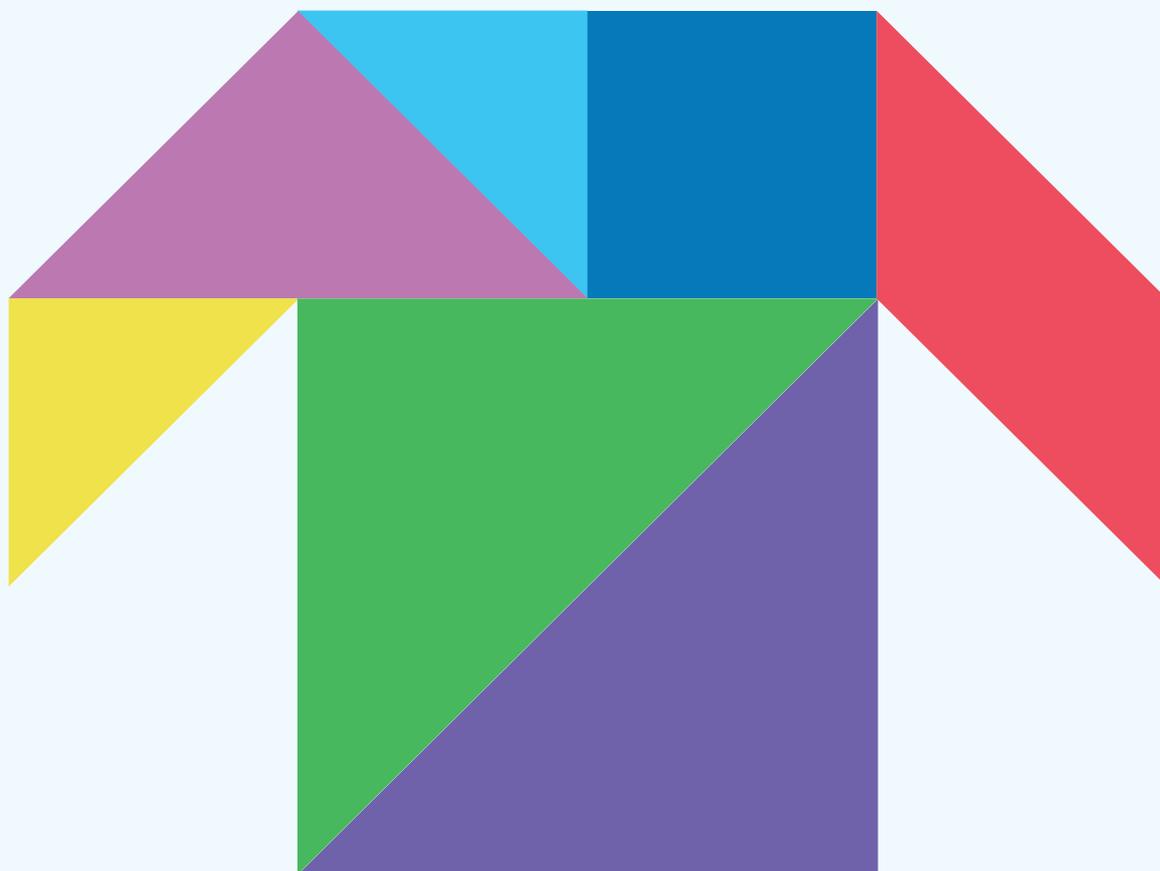
Welcome to the BLUE room solutions

Task 1

Move two lines to reduce the number of squares from five to four so that each line forms a side of at least one square.



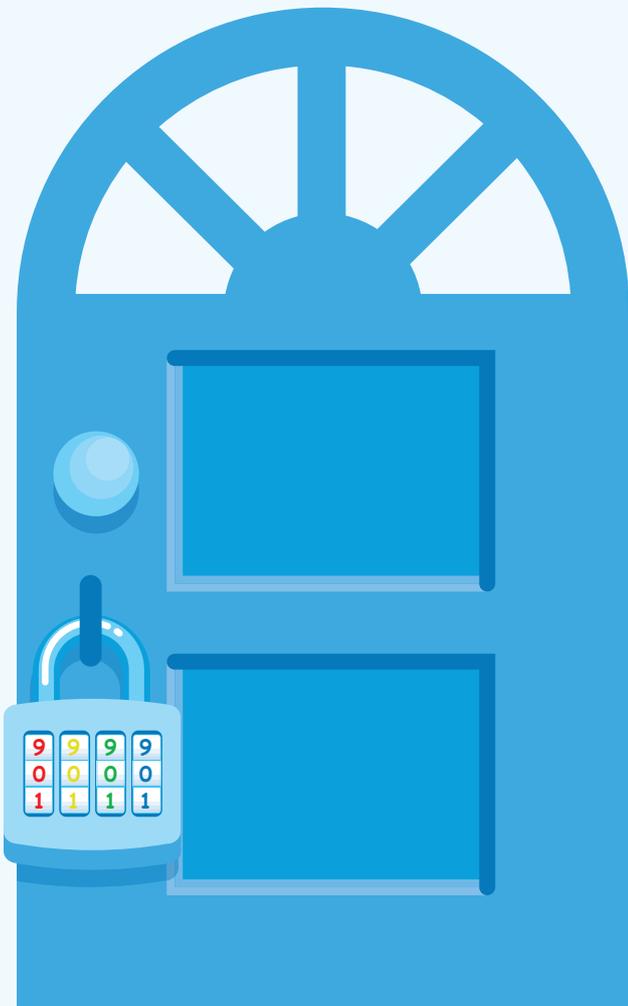
Task 2



Task 3

The door to leave the room has a padlock with a three-digit combination code.

Each set of digits is coloured.



Next to the door is the following information.

$$\triangle 3 + \triangle 3 + \triangle 3 + \triangle 3 = 12$$

$$\triangle 3 + \text{pentagon } 7 + \text{pentagon } 7 + \square 5 = 22$$

$$\square 5 + \square 5 + \circ 2 + \circ 2 = 14$$

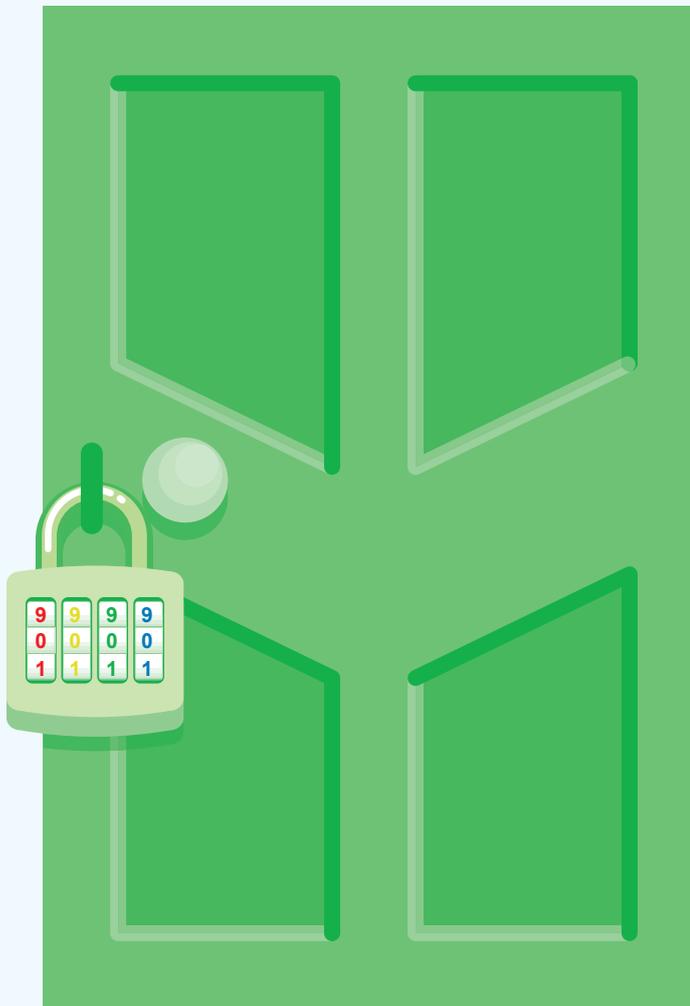
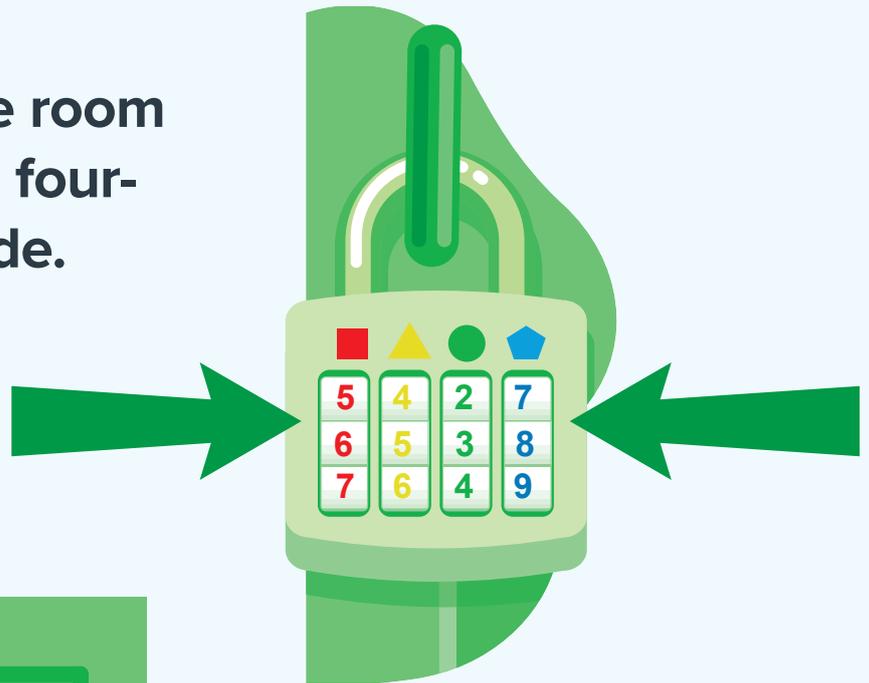
$$\triangle 3 + \square 5 + \circ 2 + \text{pentagon } 7 = 17$$

The combination is 5327!

Task 3

The door to leave the room has a padlock with a four-digit combination code.

Each set of digits is coloured.



Next to the door is the following information.

$$\triangle 5 + \square 6 + \triangle 5 + \square 6 = 22$$

$$\square 6 + \square 6 + \square 6 + \triangle 5 = 23$$

$$\circ 3 + \circ 3 + \pentagon 8 + \triangle 5 = 19$$

$$\pentagon 8 + \circ 3 + \square 6 + \triangle 5 = 22$$

The combination is **6538!**