The NRICH Maths Fair

Ages 7-11

This pack contains 20 of our favourite NRICH activities aimed at children aged about 7-11 to enable you to run a Maths Fair. This pack contains:

- An activity list with information about required resources
- 40 printable activities (their instruction sheets and game boards)
- Printable resources (to be printed and cut out)

Many of the activities require physical resources which are not included. These are standard maths classroom equipment such as multi-link, counters and dice.

Please carefully check the equipment needed for each activity you decide to use. Many require printable cut outs which can be found at the back of this pack. Not all of the printable resources included at the back of the pack are essential.

No.	Activity Name	Age Suitability			Resources	
		7-11	11-14	14-16	Essential	Optional
1	4 DOM	✓	✓		4 specific dominoes (or the printed cutouts).	
2	Add Three Dice	✓			3 dice.	Paper and pencils.
3	Rings	✓			8 counters.	Printed record sheets and pencils.
7	Dicey Operations	✓	✓		Printed grids and pencils	Laminate the question sheet and provide a dry wipe pen.
9	Domino Tetrads	✓	✓		A full set of 28 dominoes (or the printed cutouts).	
11	Egg Tangram	✓			Egg Tangram Pieces.	
13	Fifteen	✓			The digits 1-9 (fridge magnets or the printed cutouts).	
15	Four Colours	✓			8 multi-link cubes (4 colours, 2 of each).	
22	Mixed Up Socks	✓			Printed sock cutouts.	
23	NIM	✓			7 counters.	Additional 2-3 counters.

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The NRICH Maths Fair

No.	Activity Name	Age Suitability			Resources	
		7-11	11-14	14-16	Essential	Optional
25	One Big Triangle	✓			Printed triangle cutouts.	
26	Pentominoes	✓			Squared paper and pencils.	60 multilink cubes, ideally (but not essentially) 12 different colours, 5 of each.
27	Pentanim	✓	✓	✓	10 counters.	
29	Square Tangram	✓	✓		10 printed tangram cutouts in colour.	
33	Teddy Bear Line-Up	✓			16 teddy bear printouts	16 teddy bears (4 each of 4 colours).
34	Teddy Town	✓			18 printed house and teddy cutouts	
35	The Tower of Hanoi	✓	✓	✓	7 printed cutouts	Wooden Tower of Hanoi puzzle
37	Two Stones	✓			4 counters (2 each of 2 different colours)	
38	Two-digit Targets	✓			10 printer number cutouts	
39	What's it Worth?	✓	✓		Paper and pencils.	

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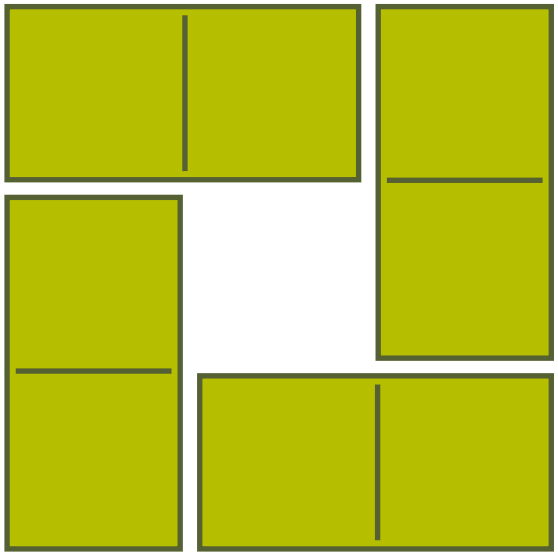
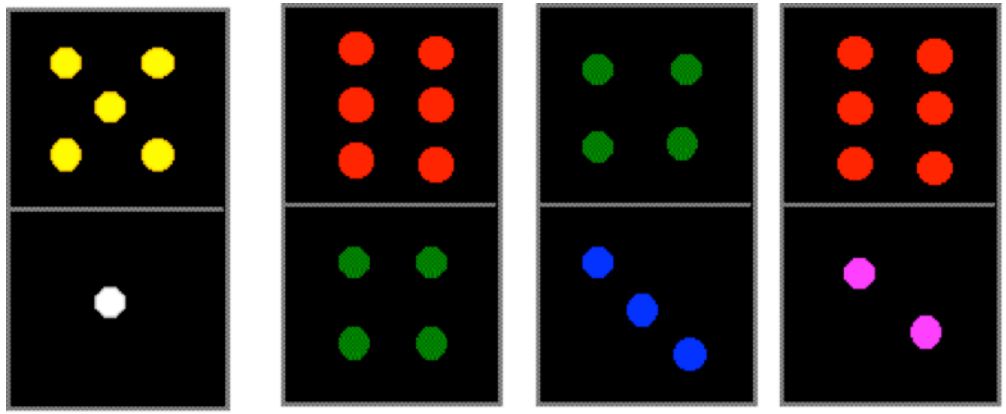
4 DOM

Use the four dominoes on the right to make a square ‘window’ like the one on the left.



The dominoes do not need to match where they touch but there must be the same number of dots on all four sides.



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Add Three Dice

Place three dice in a row like the diagram below.

Find a way to turn each one so that the three numbers on top of the dice total the same as the three numbers on the front of the dice.

There is more than one way to do this. Can you find all of them?

You might want to record your answers.

Look at the totals on the back and bottom of the three dice – what do you notice?

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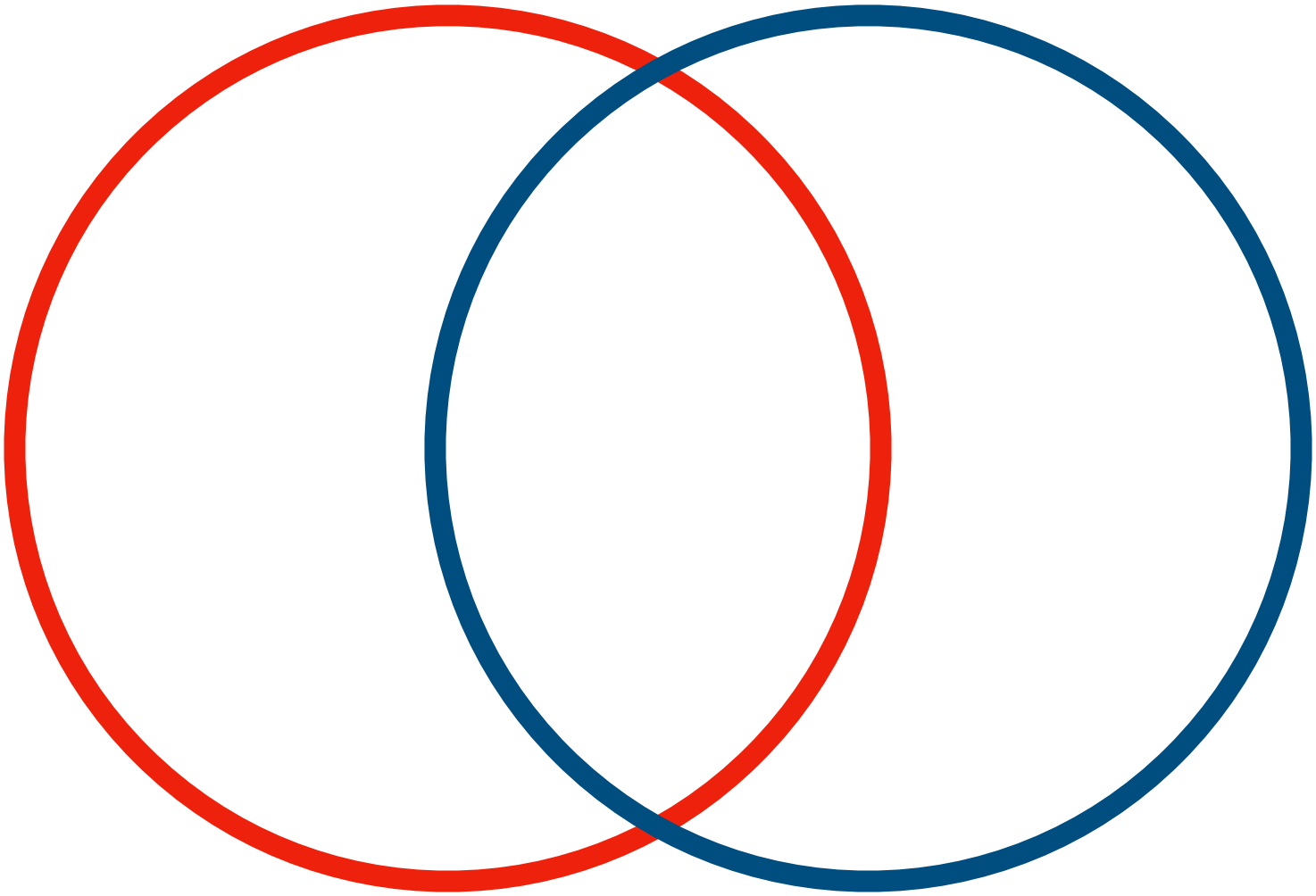
Rings 1



1 Place 8 counters into the rings above so that there are **4 in the blue ring** and **6 in the red ring**.

How many counters need to be in the overlap of the two rings?

2 Now try with **2 in the blue ring** and **7 in the red ring**.

How many counters need to be in the overlap now?

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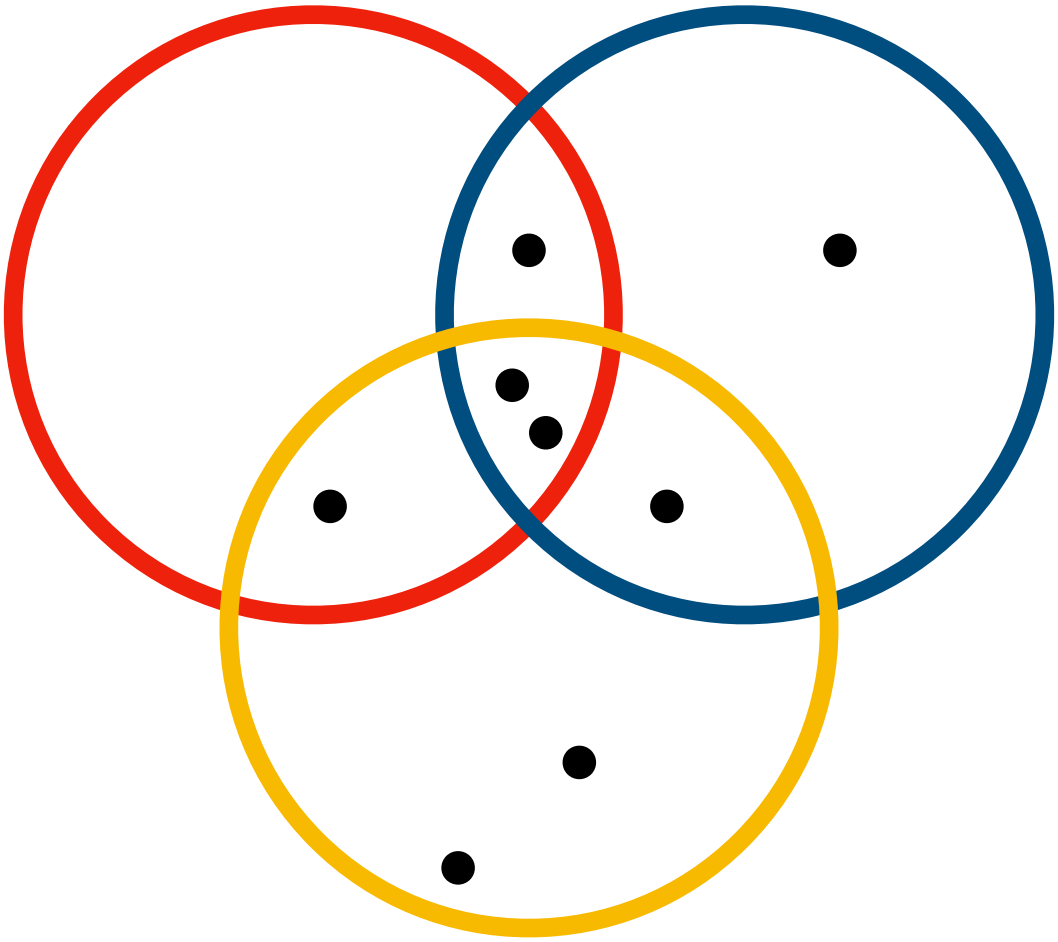
Rings 2



This picture shows **4 in the red ring**, **5 in the blue ring** and **6 in the yellow ring**.

This is not the only way in which it can be done. Use the next sheet to find **at least two more ways** to put 4 in the red ring, 5 in the blue and 6 in the yellow.

How many different ways are there of doing this in total?

You might want to record your answers as you go.

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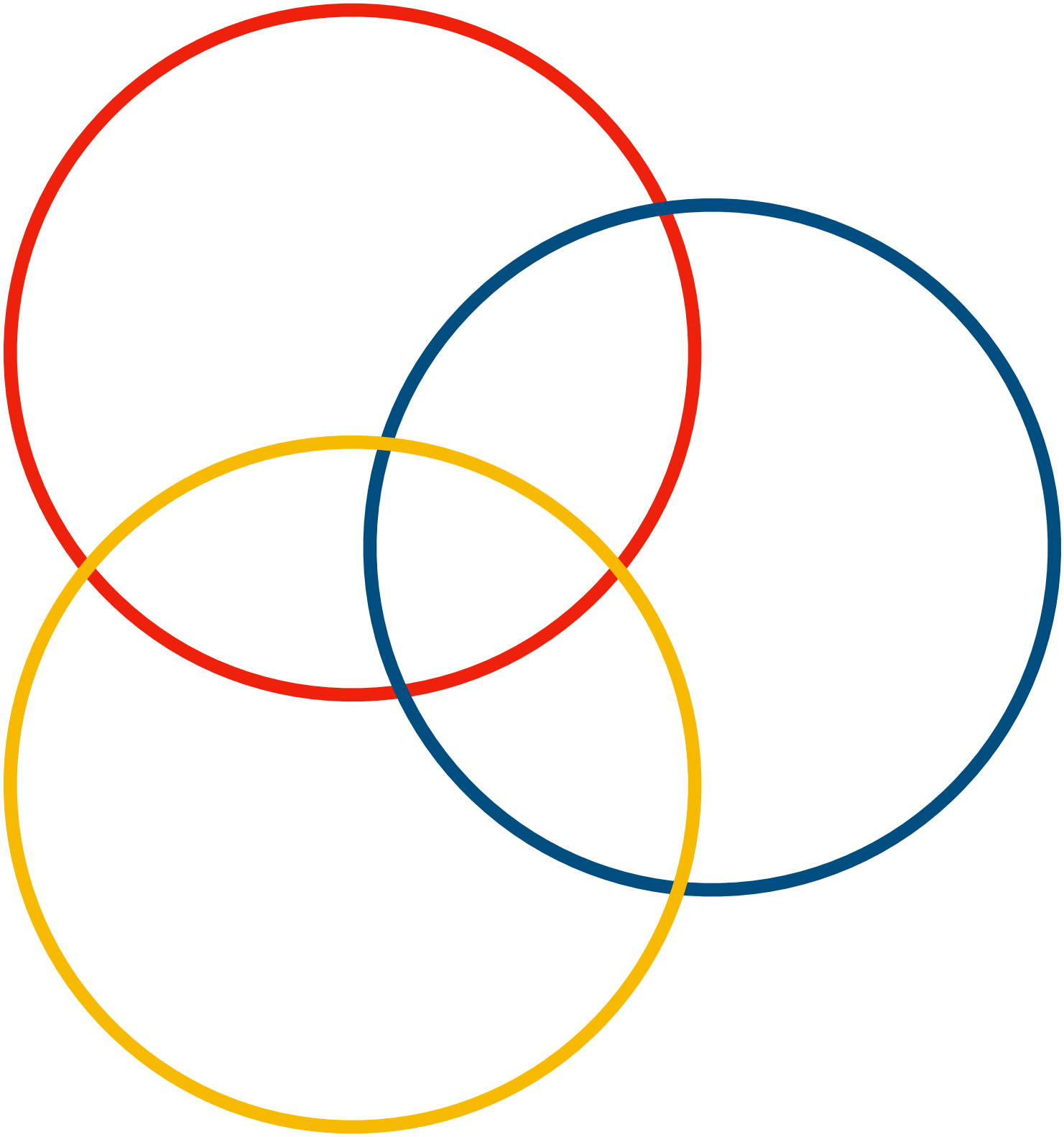
Rings 3



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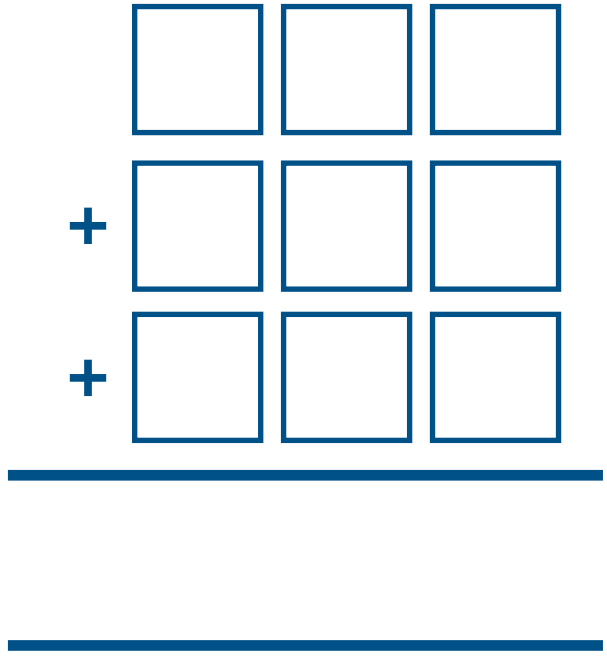
Dicey Operations

This is a game for two players.



To Start: You need a die and two empty grids.

How to play: Takes turns to roll a die and write the number you rolled into a square on your grid.

To Win: When your grid is complete add together the three 3-digit numbers. The closest to 1000 wins.

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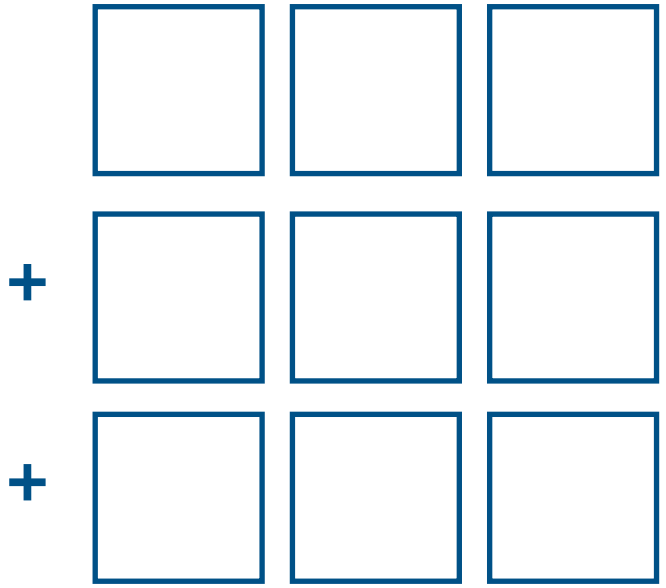
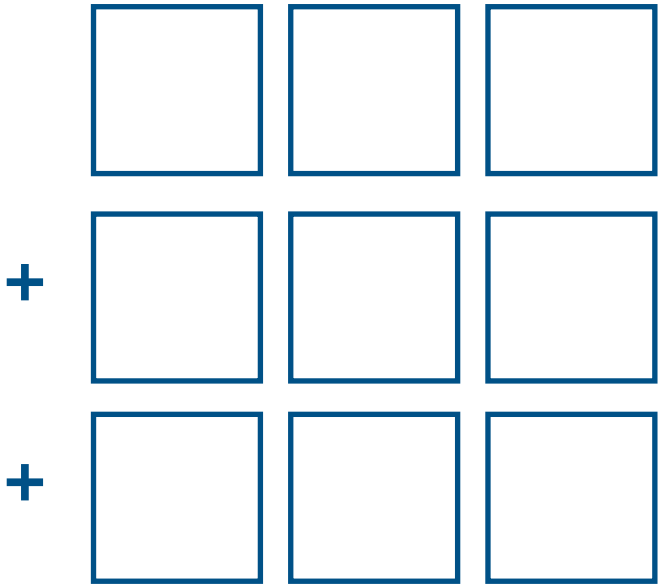
Dicey Operations

Player 1



Player 2



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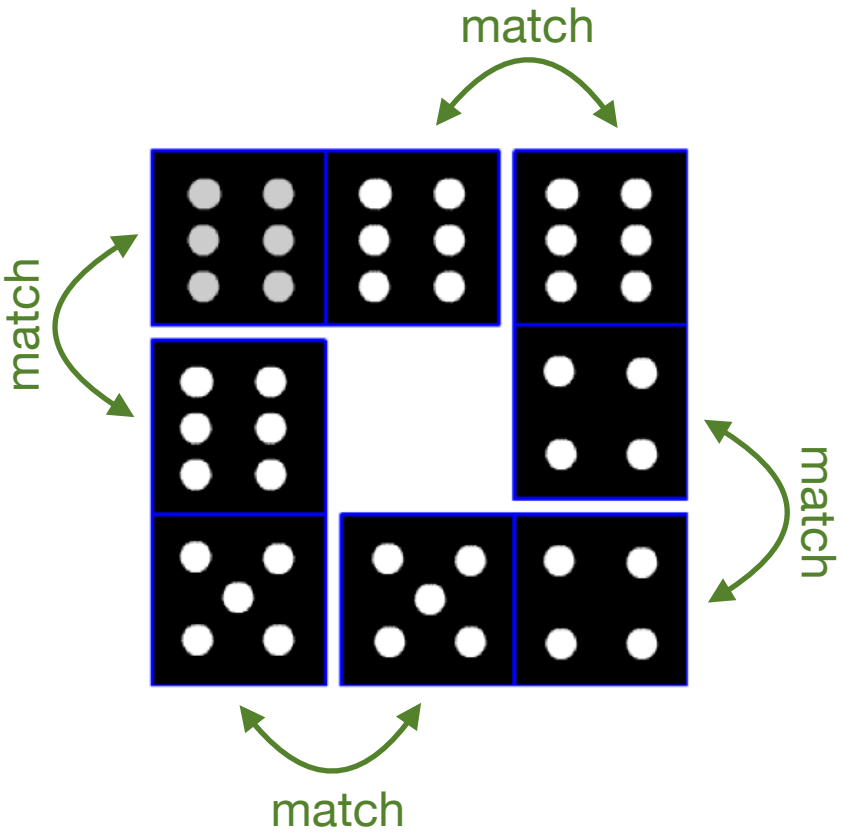
Domino Tetrads

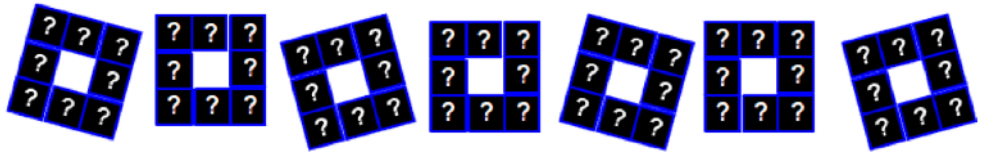
You can make a small square like the example on the right by using four dominoes.



Make sure that where the dominoes touch, the numbers of spots on each side is the same.

Your Task

Using a full set of 28 dominoes can you make 7 small squares (each with 4 dominoes)?



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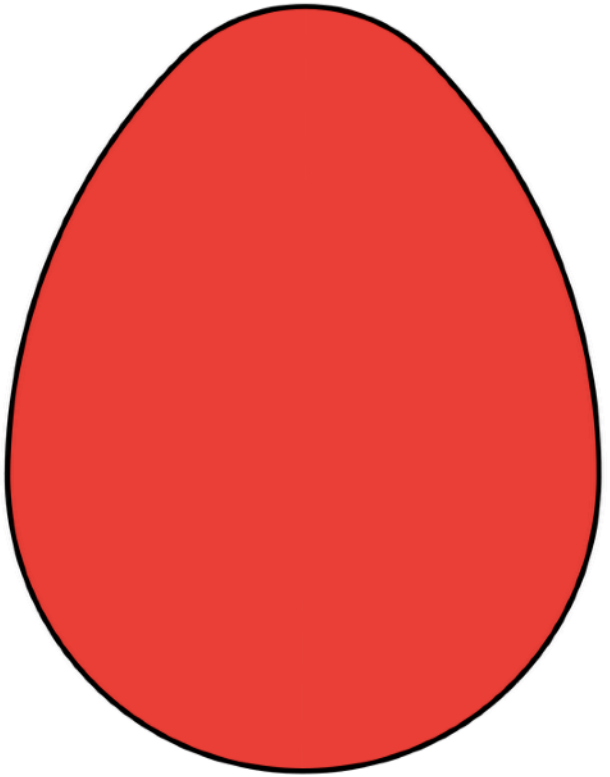
Egg Tangram 1

First, try to make this egg shape using **all 9 pieces**.

When you have done that, see if you can make some of the bird shapes on the other sheet, each bird uses **all 9 pieces**.



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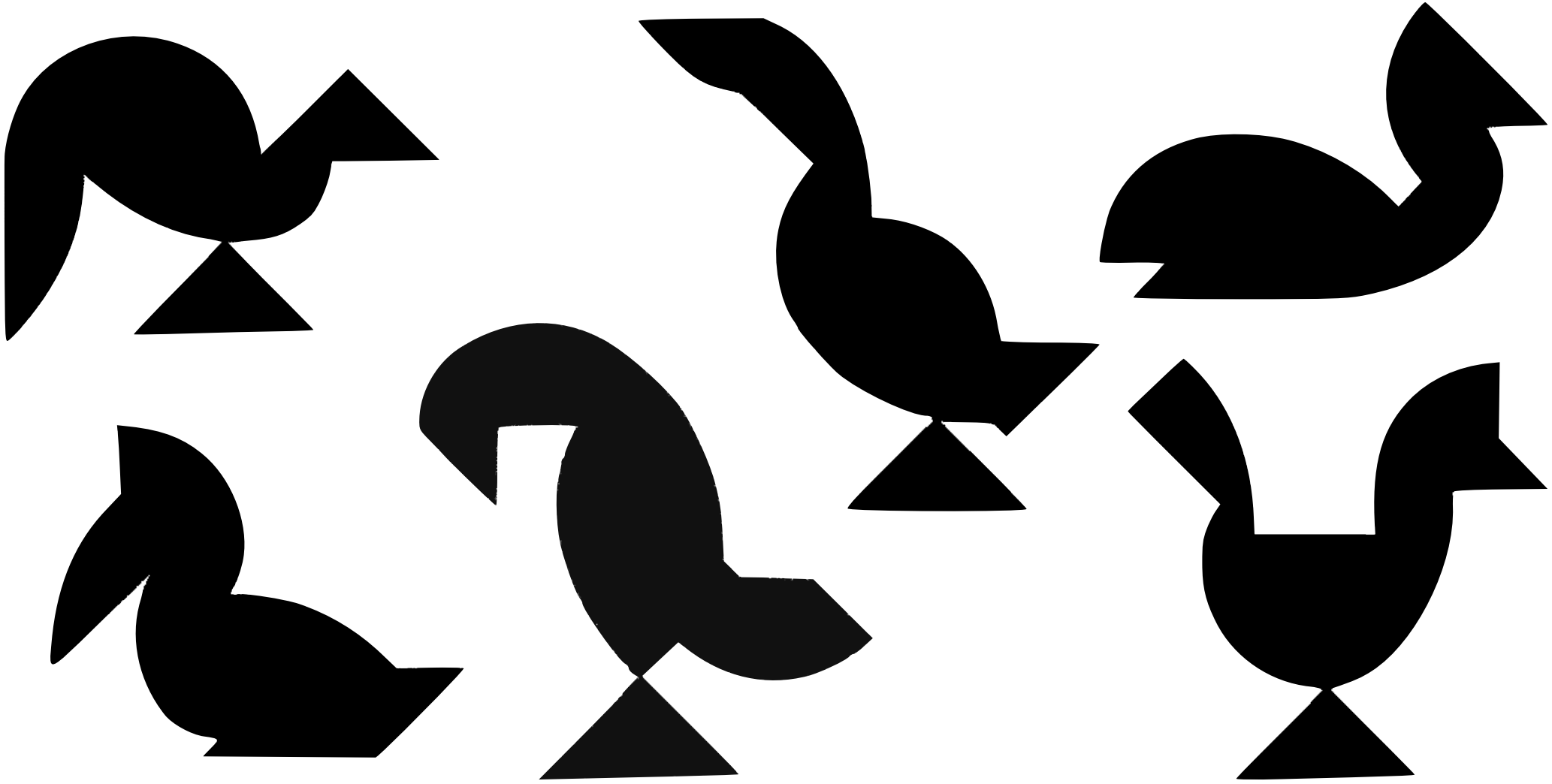
Egg Tangram 2



nrich.maths.org/mathsfair

Activity 11

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Fifteen

This is a game for two players.

To Play the Game

Take it in turns to choose a number from **1** to **9**.

Each number can only be chosen once.

To Win the Game

If any three of your numbers add up to **15**, you win.

If both players have three numbers but neither has a total of 15, continue choosing numbers. **Any** three of them can make 15 to win.

If there are no numbers left to choose and no-one has won then it is a draw.

Is there a winning strategy to the game?

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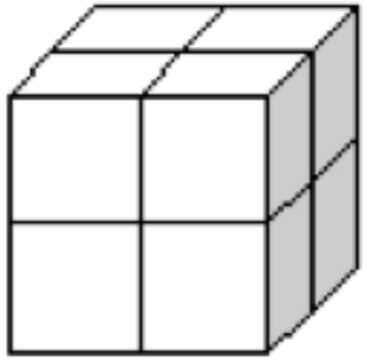
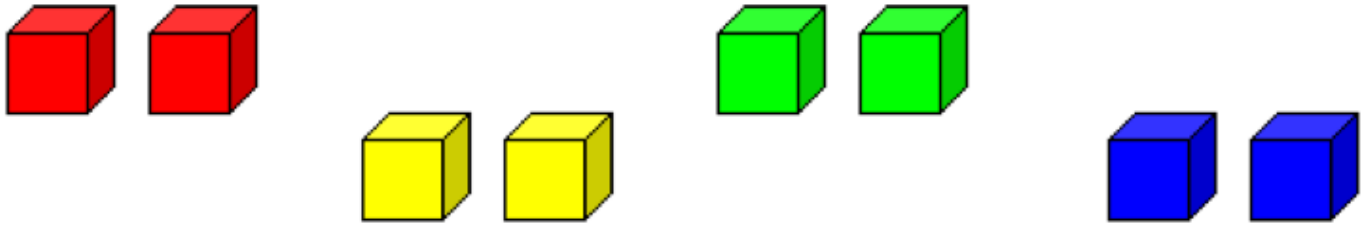
Four Colours

Fit these 8 smaller cubes together to make a larger cube.

On each face there must be one of each colour.





Is there more than one way to do it?

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Mixed Up Socks

Start with three pairs of socks.

Mix them up so that each pair has two different socks in it.

Now can you mix them so that each pair is different from the other pairs?

Now try it with four pairs of socks. Can you find more than one way to do it?

How many ways are there to do it? How do you know you have found all the ways?

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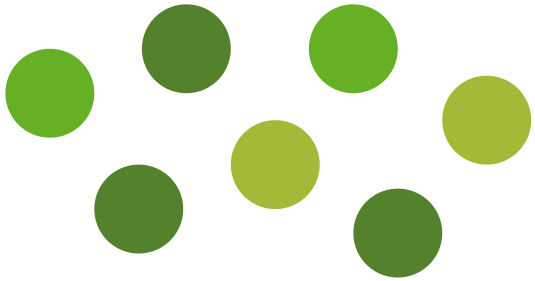
NIM



This is a game for two players.

To Start: Place the 7 counters in a group.

How you play: Takes turns to pick up either one or two counters.

To Win: The player that picks up the last counter loses.

Can you find a winning strategy that guarantees you will win?

Does it matter who goes first?

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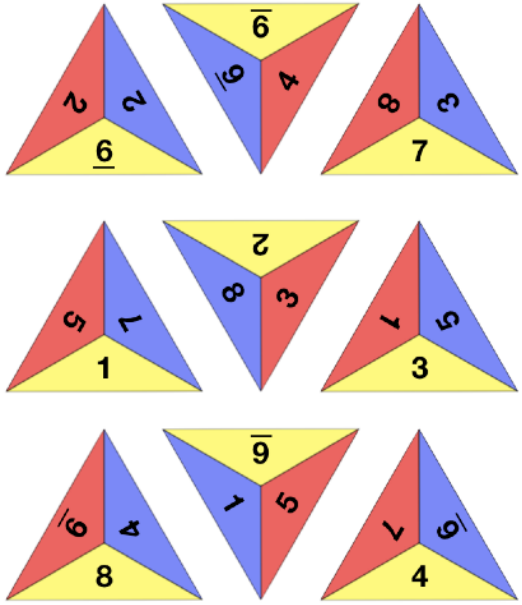
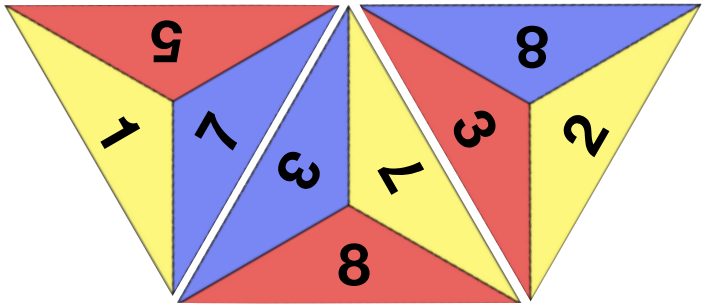
One Big Triangle

You have nine triangles, each triangle has three numbers on it.



Your challenge is to arrange these triangles to make one big triangle, so the numbers that touch add up to 10.

For example:



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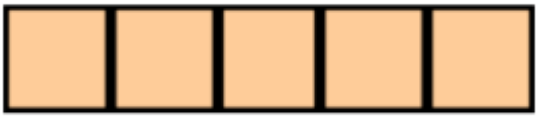
Pentominoes 1

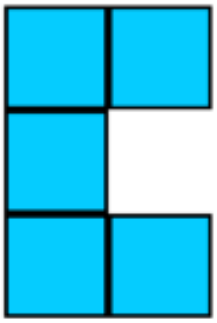
Penta people always build their houses using **five square rooms on one level** (the ground level).

The houses can be made in a variety of different shapes, but a room **must be joined to at least one other room by a wall.**

Here is an example of a Penta house,
viewed from above:



Here is different example:



Try to find **all** the different shapes that a Penta house can be.

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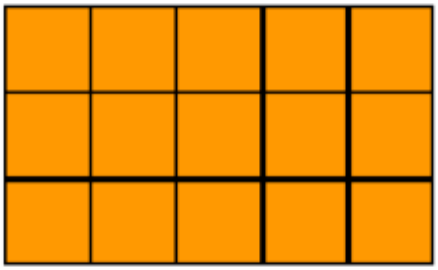
Pentominoes 2

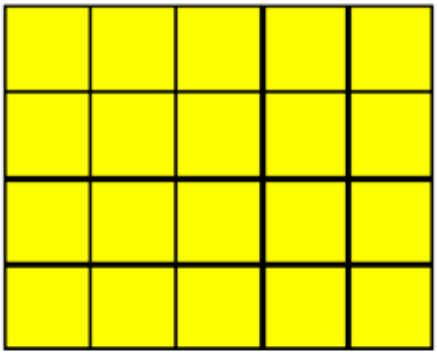
New Penta houses are being built in Penta Place.

The homes are built right next to each other and are arranged and fitted together to create rectangles.

1) Use **three of the Penta houses** you created and fit them together to make a 3x5 rectangle like this one.

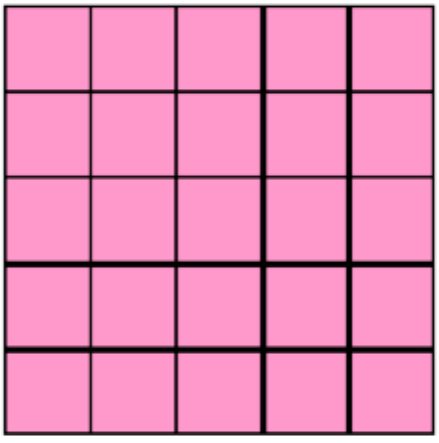


2) Can you make other sized rectangles using **three of the Penta houses**?



3) Try to find **four of the Penta houses** that fit together to make a larger rectangle like the one on the left.

4) On the right is a 5 by 5 square. Use **five of the Penta houses** to construct a similar square.



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Pentanim 1

This is a game for two players.

To Start

Put 10 counters onto the ‘Pentanim’ game board, one in each space.

To Play

Take turns to remove either one counter or two counters from the board. You can only remove two counters if they are connected by a straight line (there can be empty spaces between the two counters).

To Win

The winner is the player who picks up the last counter (or the last two counters).

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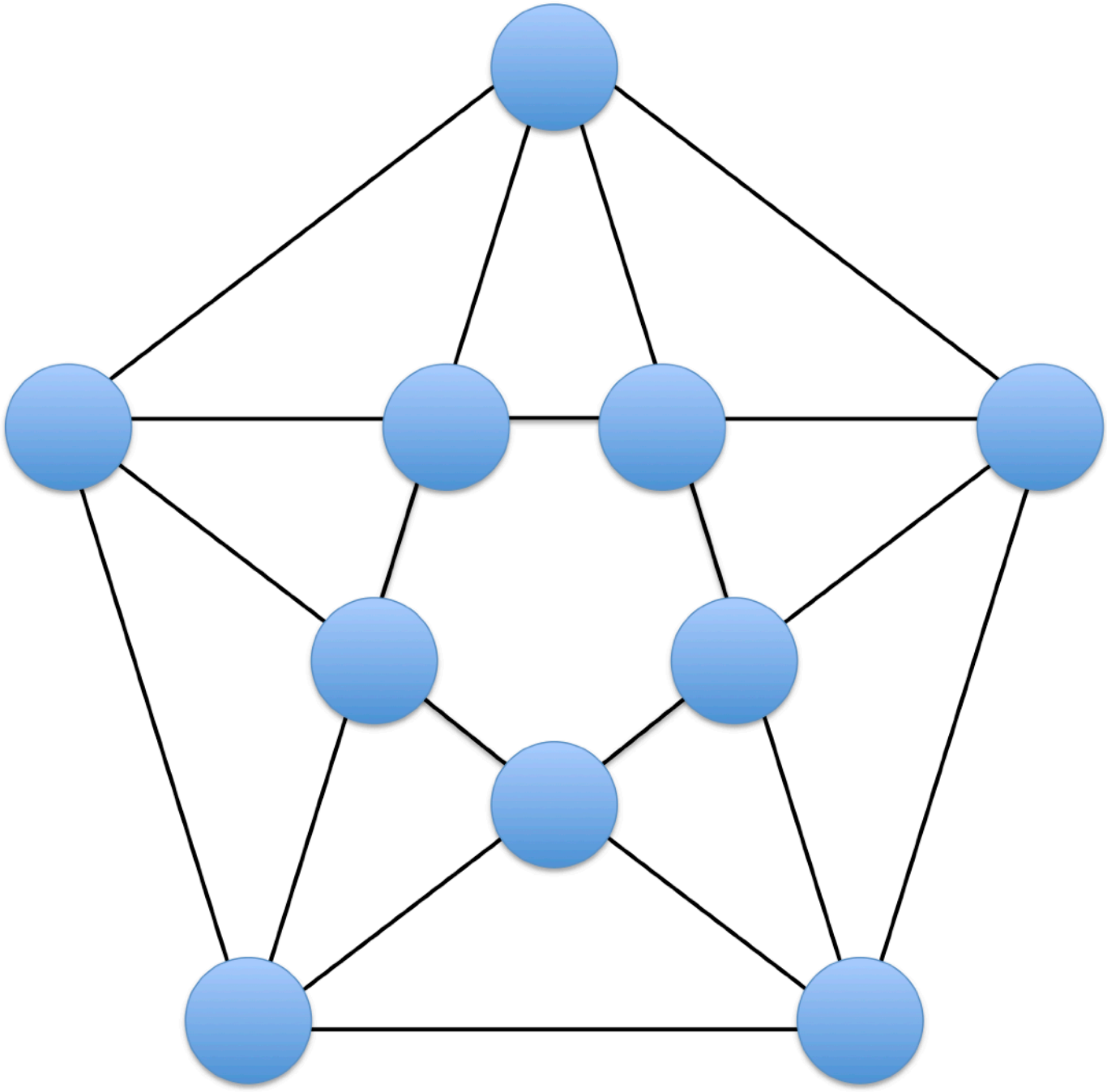
Pentanim 2



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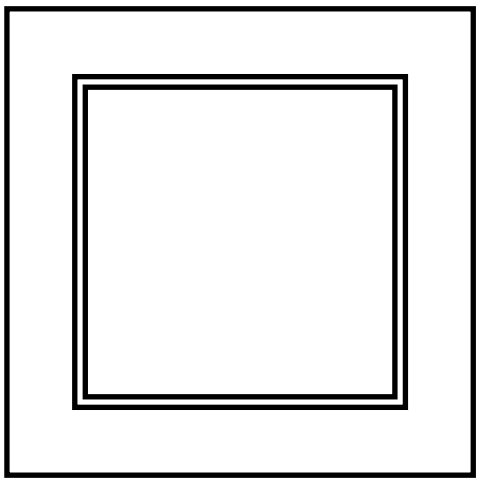
Square Tangram

The first task is to make a square using four pieces of the same colour.

It will fit in the smallest square outline in the middle of the sheet.



Now try making a square using five pieces of the same colour.

It will fit in the middle square outline (only slightly larger than the smallest square outline).

The final challenge is to make a square using all 10 pieces.

It will fill the largest square outline on the sheet.

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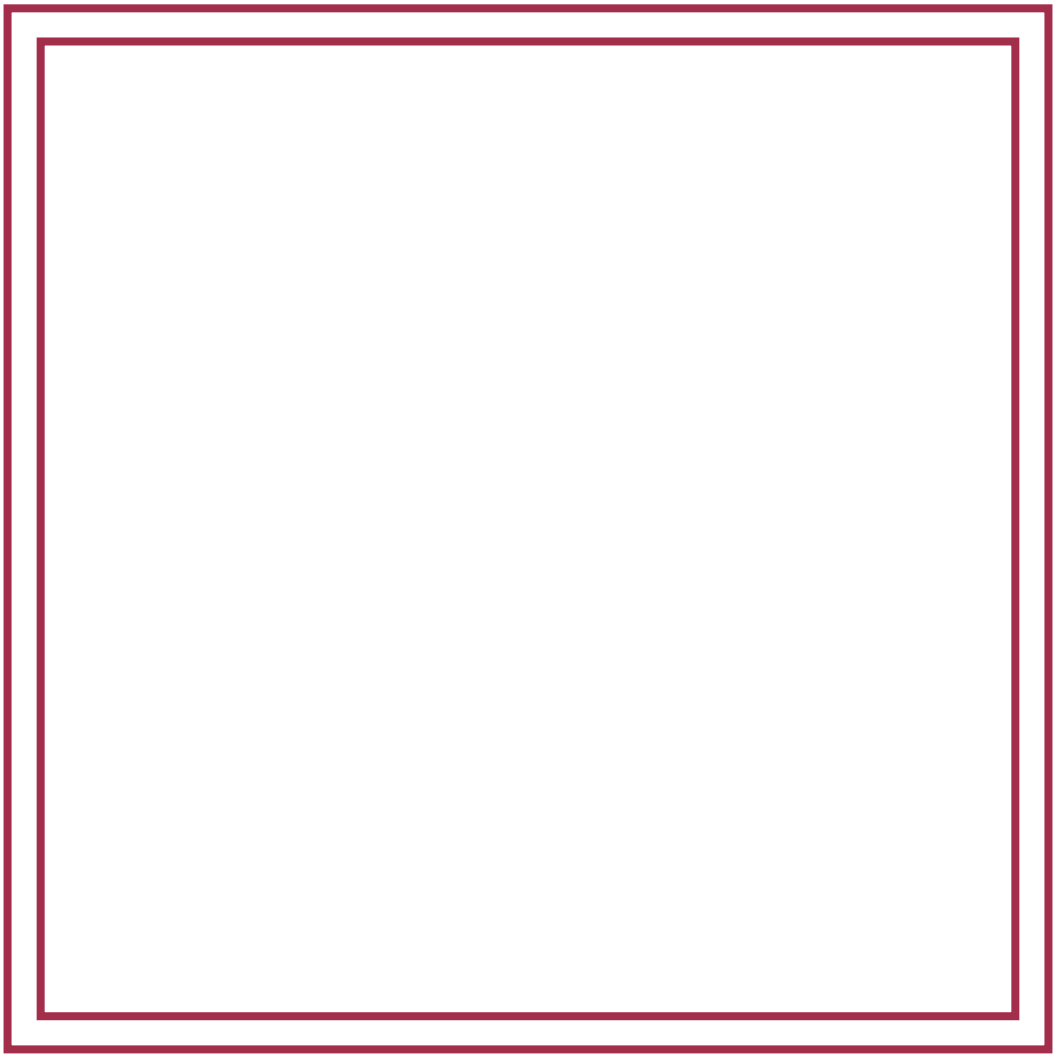
Square Tangram



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Teddy Bear Line-Up

To Start

Line up all 16 teddy bears so that there are:

- four greens next to each other,
- then four yellows next to each other,
- then four blues next to each other,
- and finally four reds next to each other.

The Challenge

Swap the position of two bears, then do the same again and again until no two bears of the same colour are next to each other.

The Big Question

What's the smallest number of swaps you need to complete the challenge?

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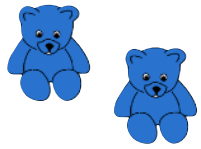
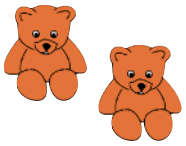
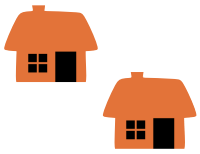
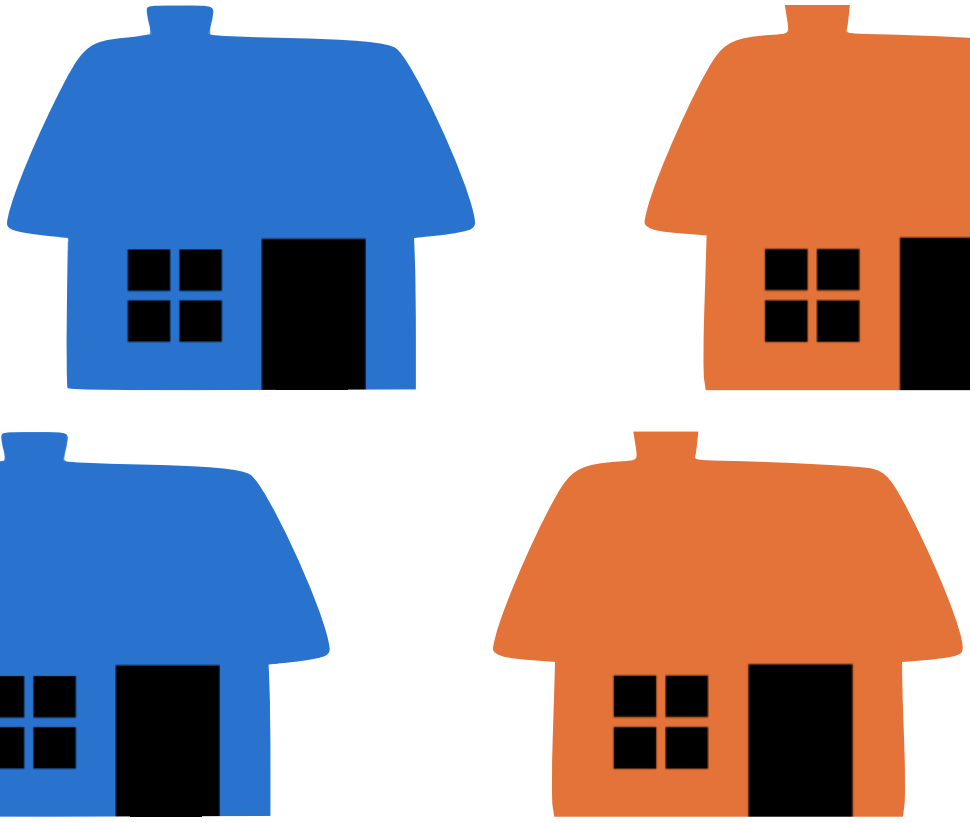
Teddy Town 1

In Teddy Town, there are:

2 blue teddies 	2 yellow teddies 
2 blue houses	2 yellow houses 

Can you put each teddy into a house so that all four combinations are different from each other?



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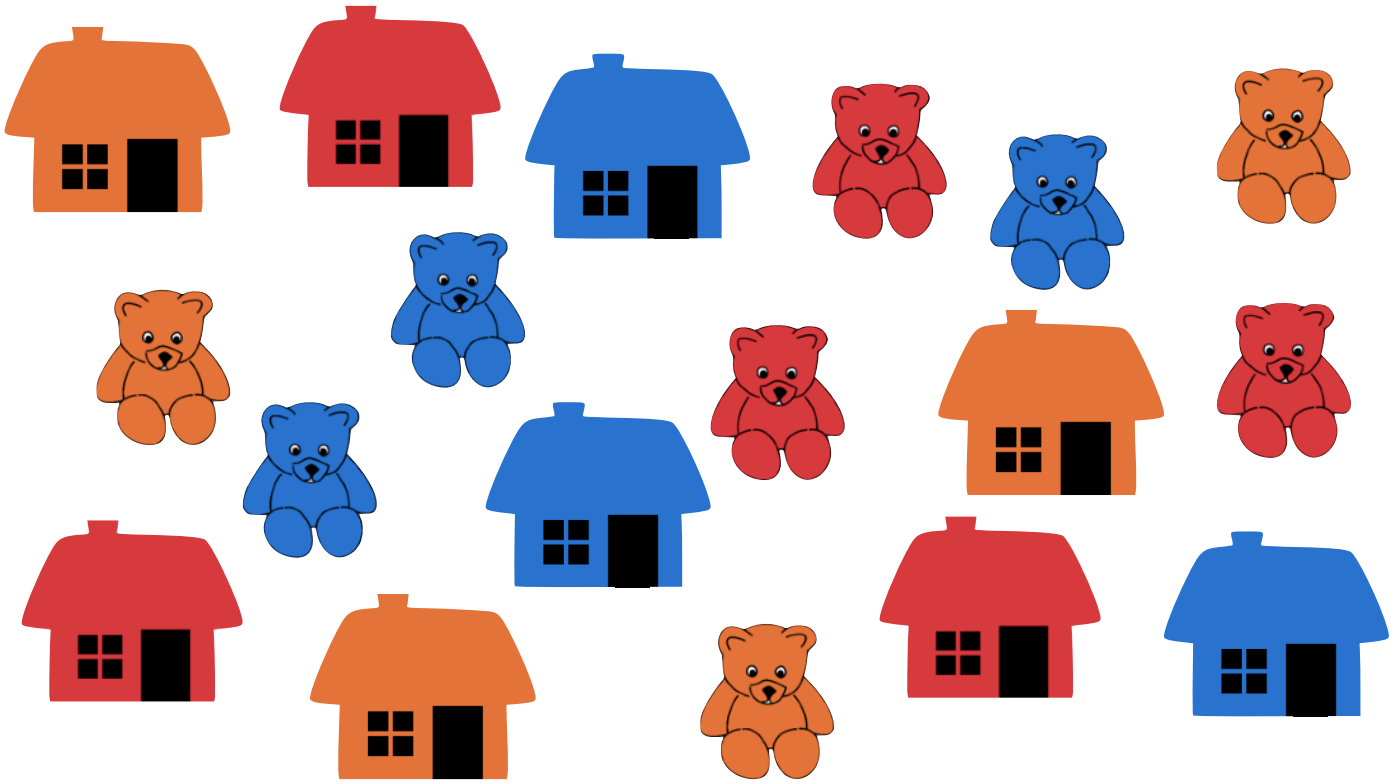
Teddy Town 2

Teddy town has grown and there are now **three** different colours of teddies and houses: red, yellow and blue.

In Teddy Town there are now 9 teddies and 9 houses:



Can you make nine different combinations of teddies in houses?

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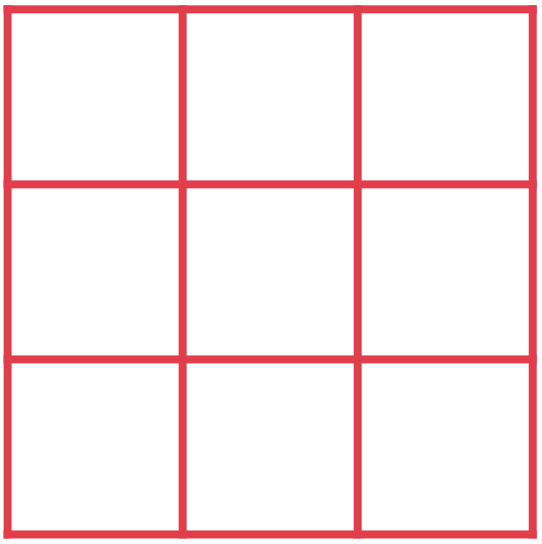
Teddy Town 3

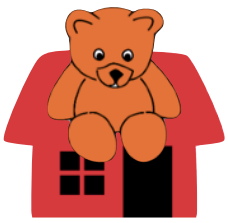


To the right is a small map of Teddy Town, where the streets are very special.

If you walk along any street in any direction all the houses are a different colour and the teddies living in the houses are different colours too.

In other words, each row and column on the grid must have different coloured houses and different coloured teddies.

Can you arrange the nine different combinations you've found on the large map?



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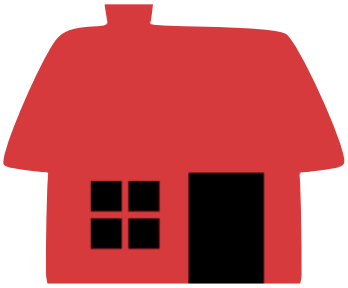
Teddy Town 4



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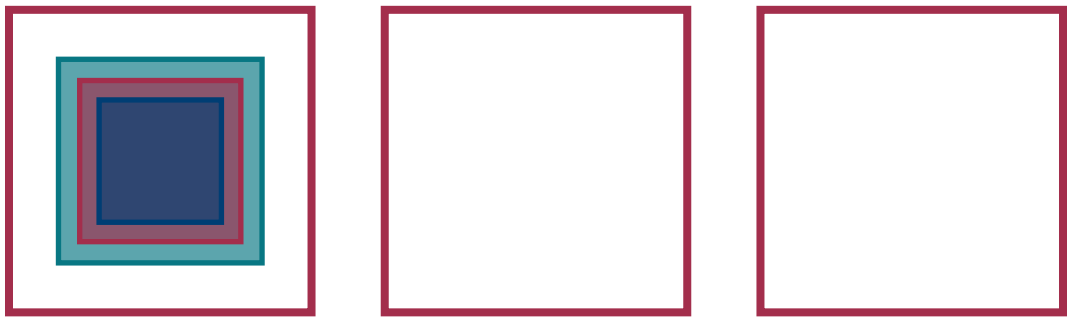
The Tower of Hanoi

This is a very old puzzle from Asia which is sometimes called “The Tower of Brahma”.



To Start

Put the three smallest pieces in the left square with the largest on the bottom and the smallest on the top.

The Aim

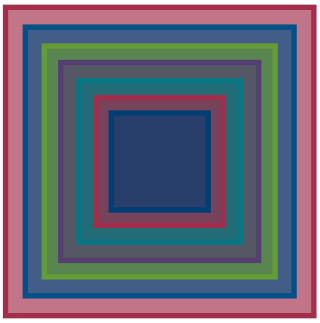
Move all three pieces to the right area.

The Rules

- You can only move one piece at a time.
- You may not place a larger piece on top of a smaller piece.

What is the smallest number of moves with which you can move all the pieces?

Now try starting with 4 pieces on the left, then with 5 and so on…



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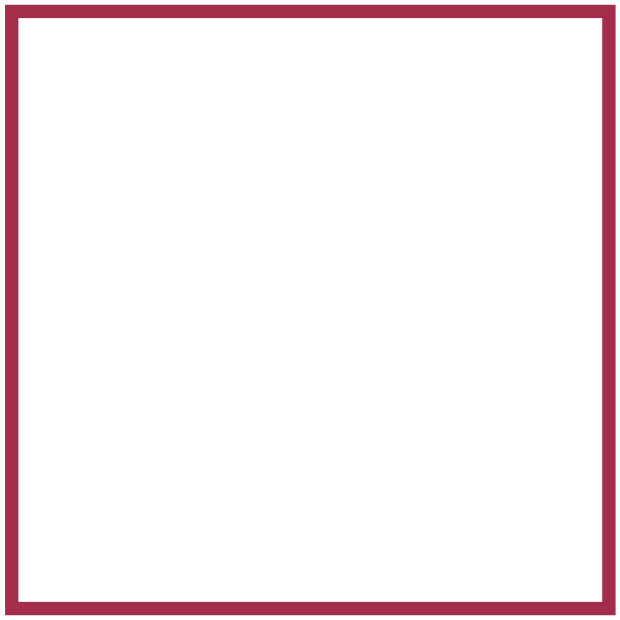
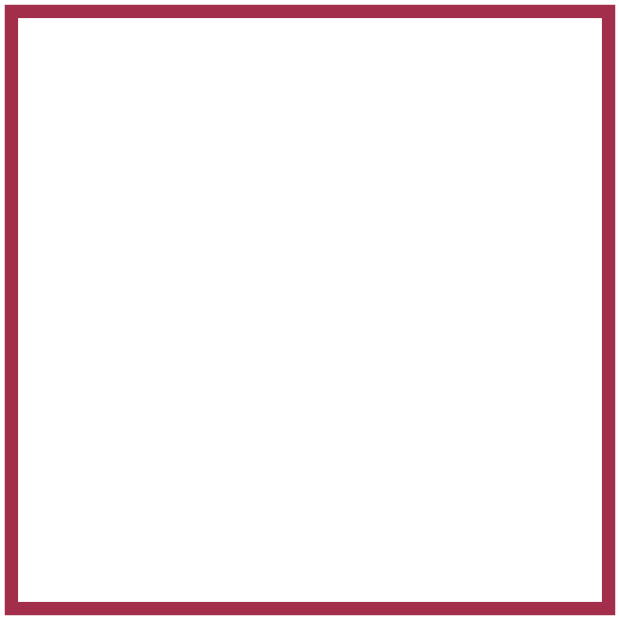
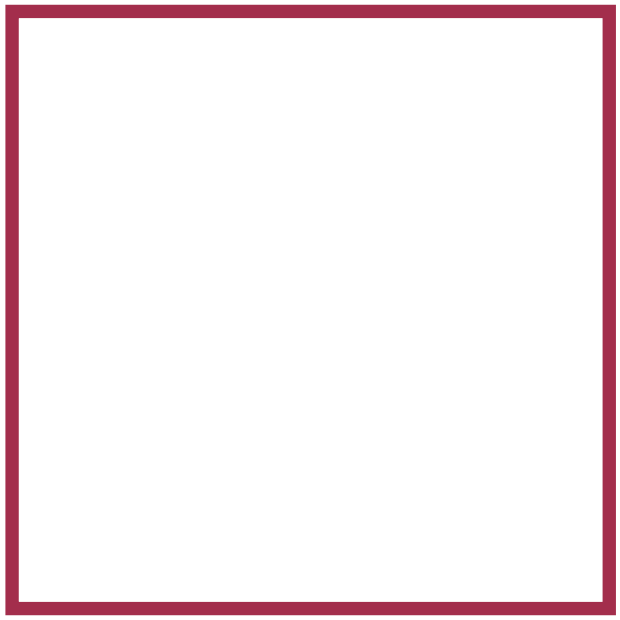
The Tower of Hanoi



Start with all the pieces in this space.





Finish with all the pieces in this space.

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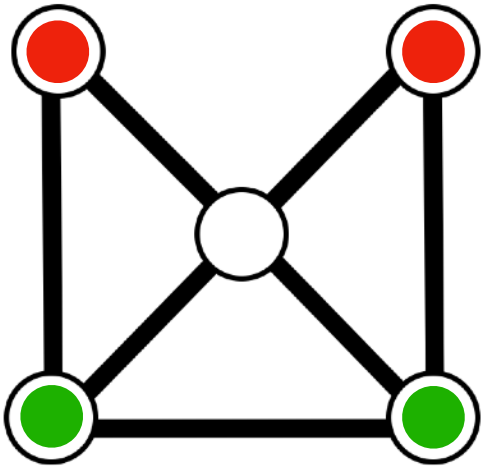
Two Stones

This game is for two players. Each player plays with two counters of the same colour.



To Start

Place two stones at the top and two at the bottom as shown on the right.

To Play

Players take turns at sliding one stone along a line to an empty spot. (So the first move will always be to the middle).

To Win

You have to block the other player so that they cannot move.

Next Game

At the start of each game the players should swap positions.

In China this game is known as **Pong hau k'i** and in Korea it is called **Ou-moul-ko-no**.

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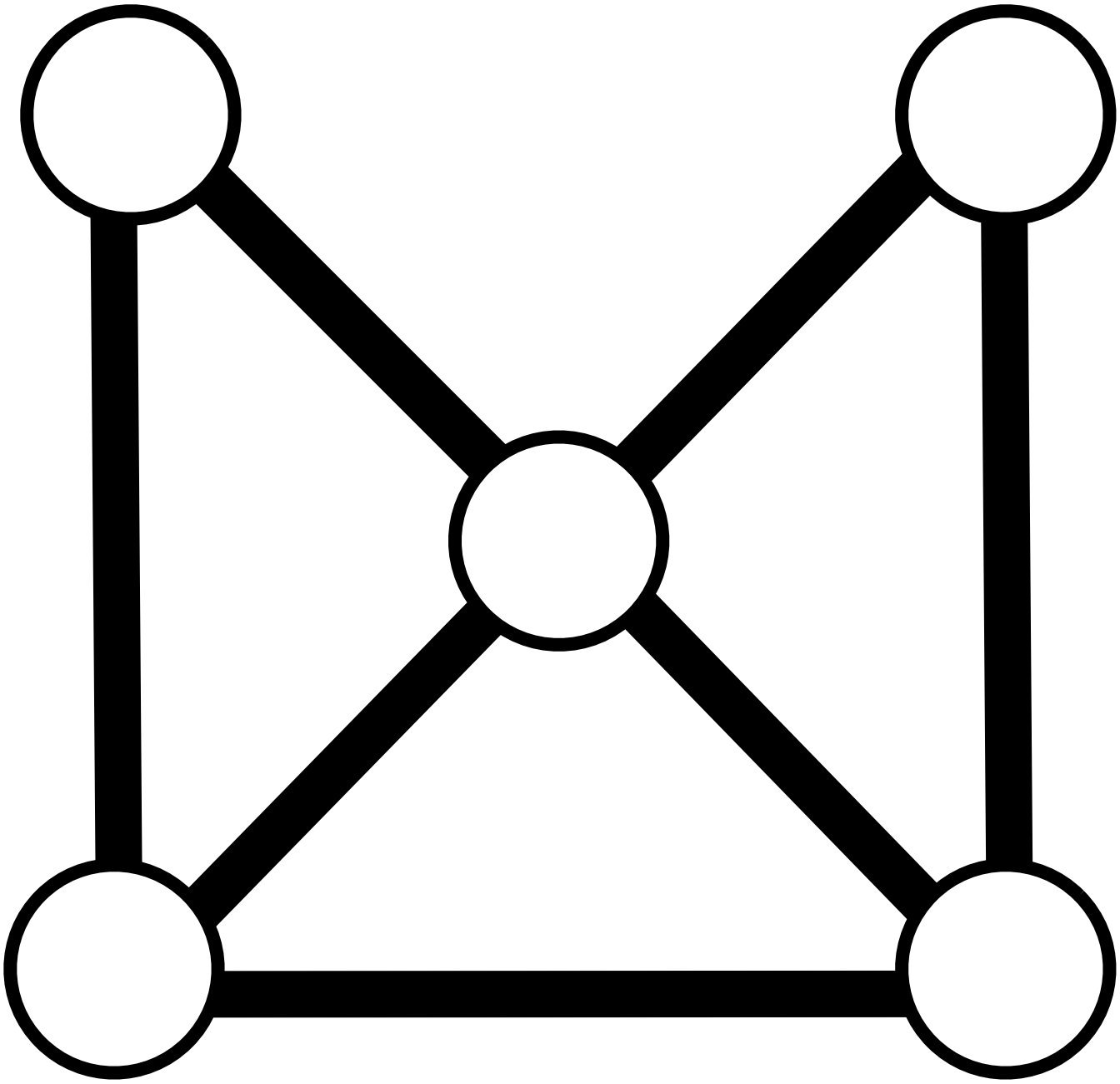
Two Stones



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Two Digit Targets

Arrange the digits 0-9 in the five boxes below to make two-digit numbers as close to the targets as possible. You can use each digit once only.

a) Largest even number

b) Largest odd number

c) Smallest odd number

d) Largest multiple of 5

e) Number closest to 50

For a challenge, use all your answers in the sum:

a + b - c + d + (difference between e and 50)

What is the highest total you can make?

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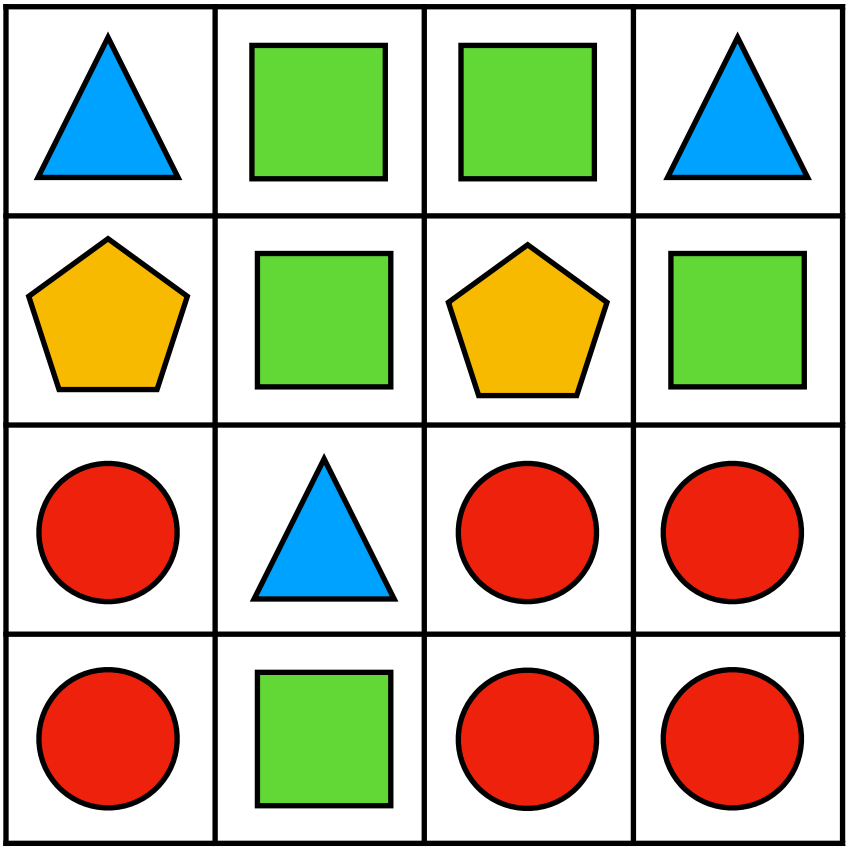
What's it Worth?

Each symbol has a numerical value.

The total for the symbols is written at the end of each row and column.

Can you find the missing total that should go where the question mark has been put?



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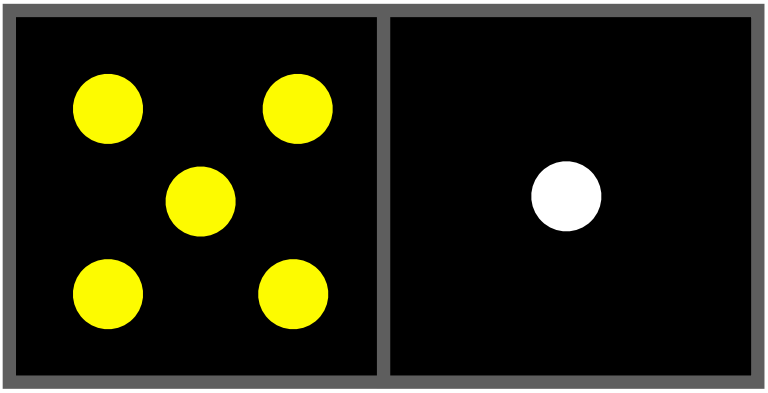
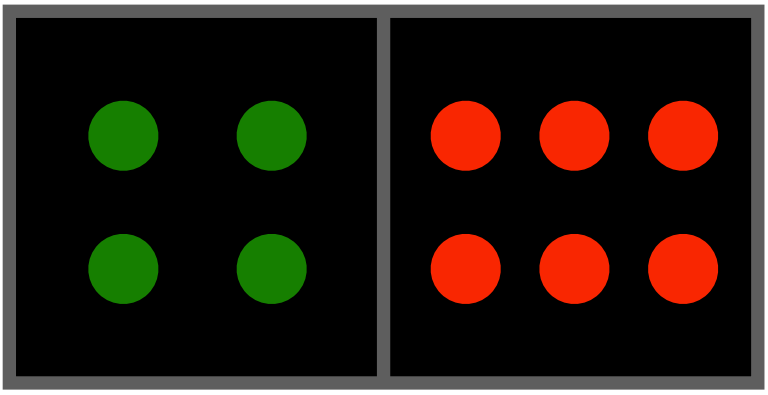
Activity 1

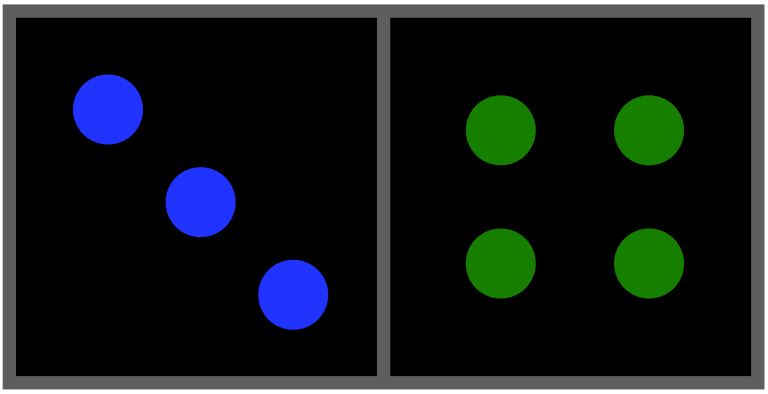
4 DOM

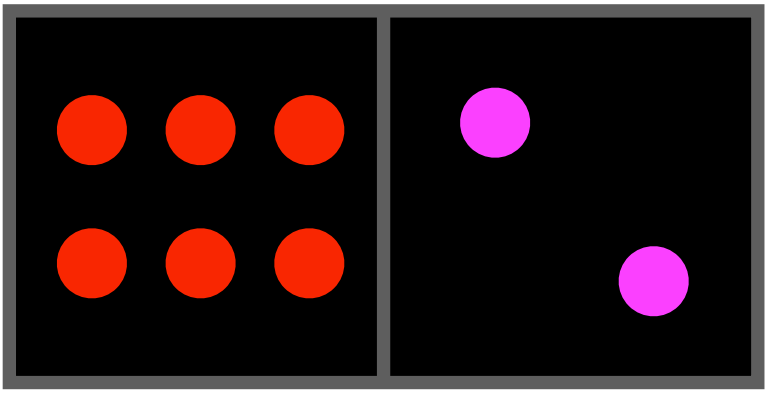
Version 1

Print and cut out the 4 dominoes below:









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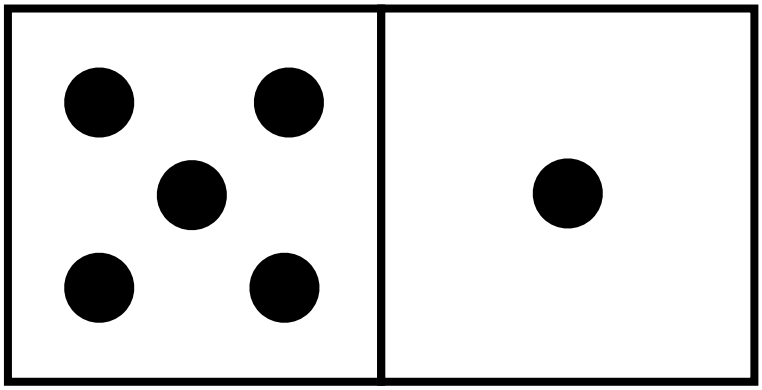
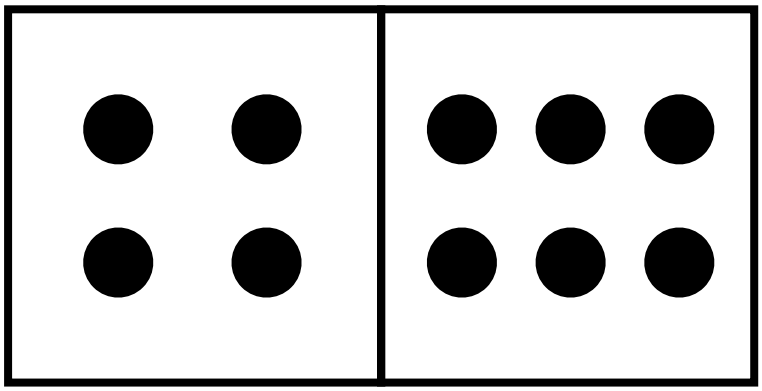
Activity 1

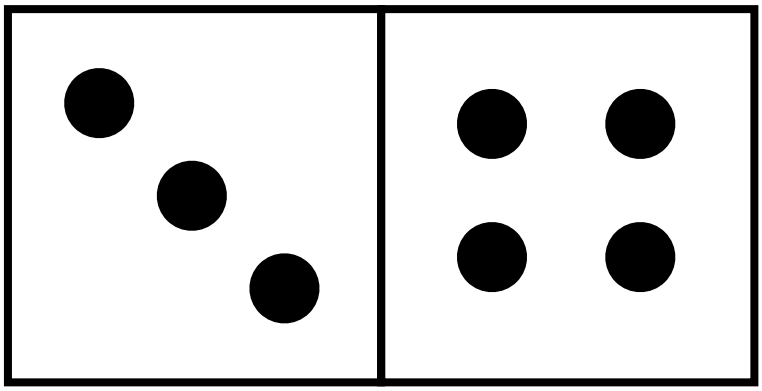
4 DOM

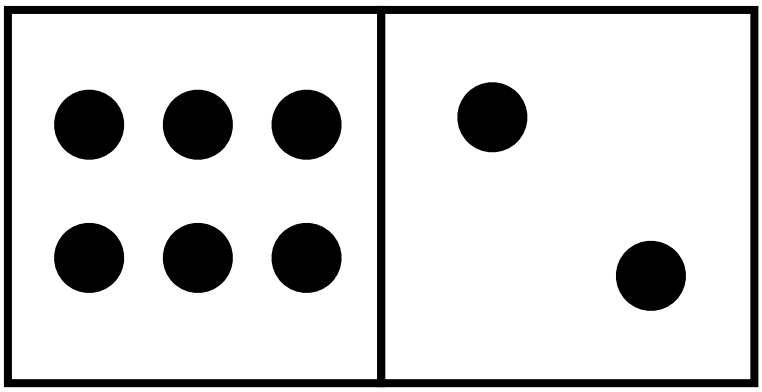
Version 2

Print and cut out the 4 dominoes below:









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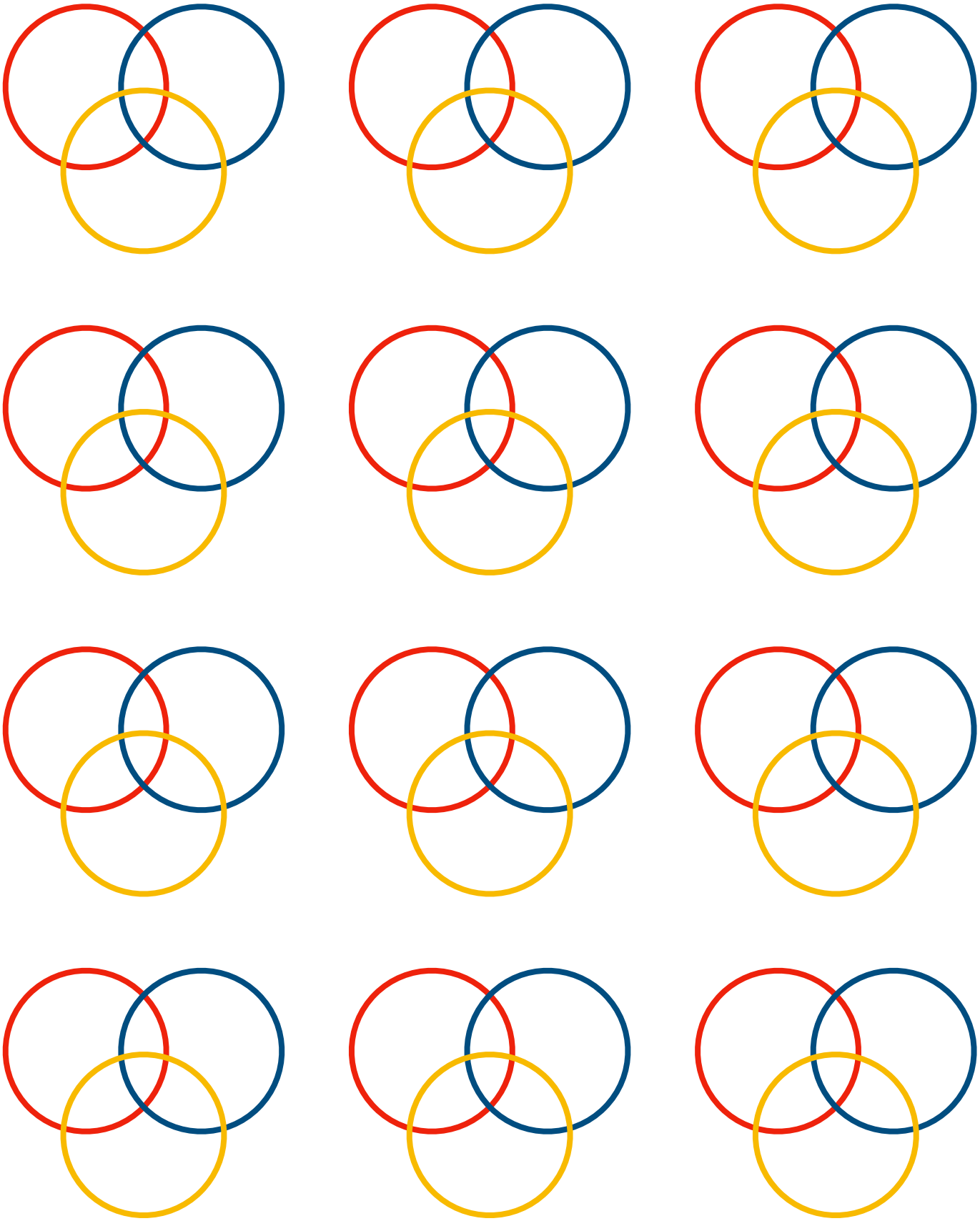
Activity 3

Rings

You can record your different answers on this sheet.



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Activity 7

Dicey Operations

Player 1

+

+

Player 2

+

+

Player 1

+

+

Player 2

+

+

Player 1

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Player 2

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Player 1

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Player 2

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Player 1

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Player 2

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Player 1

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Player 2

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Player 1

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Player 2

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Player 1

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Player 2

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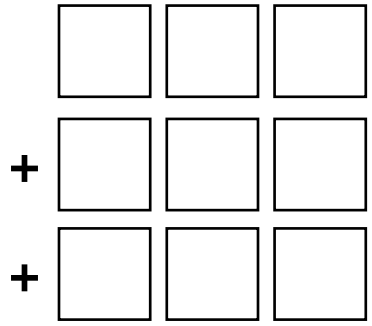
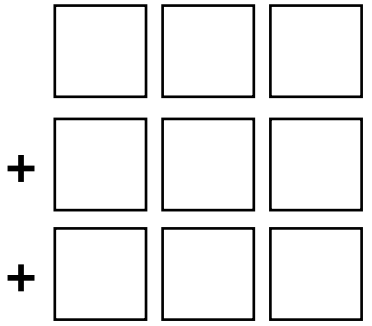
Activity 7

Dicey Operations

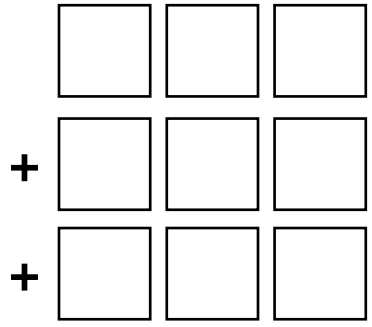
Player 1



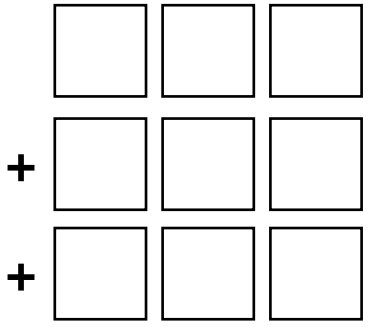
Player 2



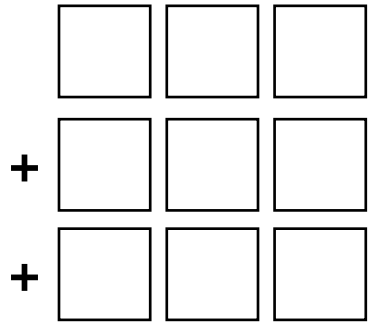
Player 1



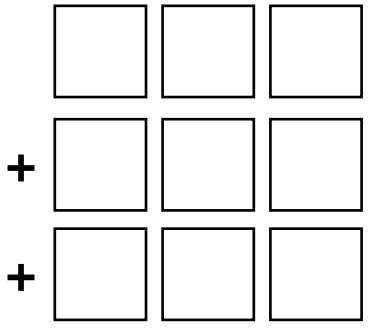
Player 2



Player 1



Player 2



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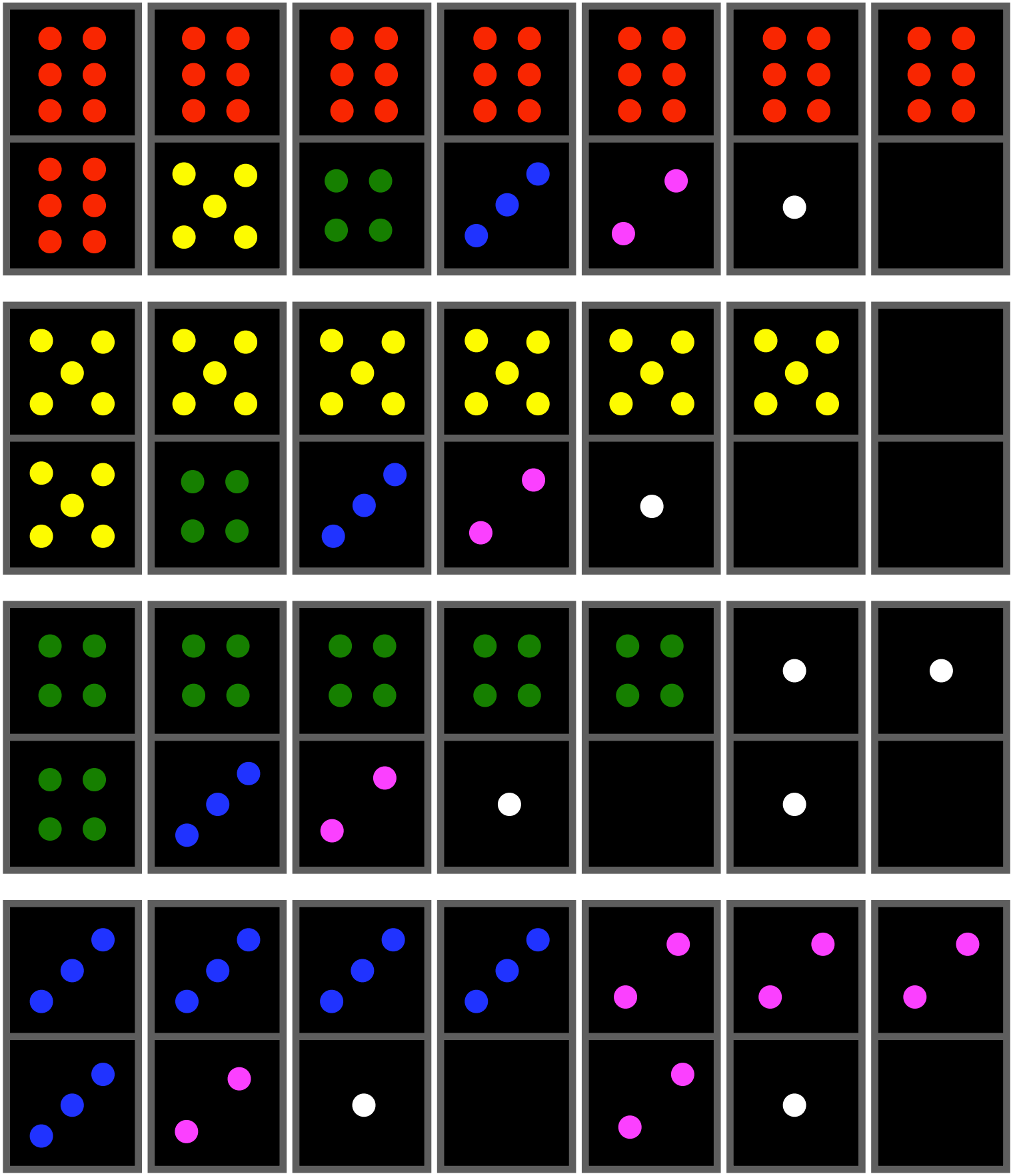
Activity 9

Domino Tetrads

Version 1: Print and cut out the 28 dominoes below



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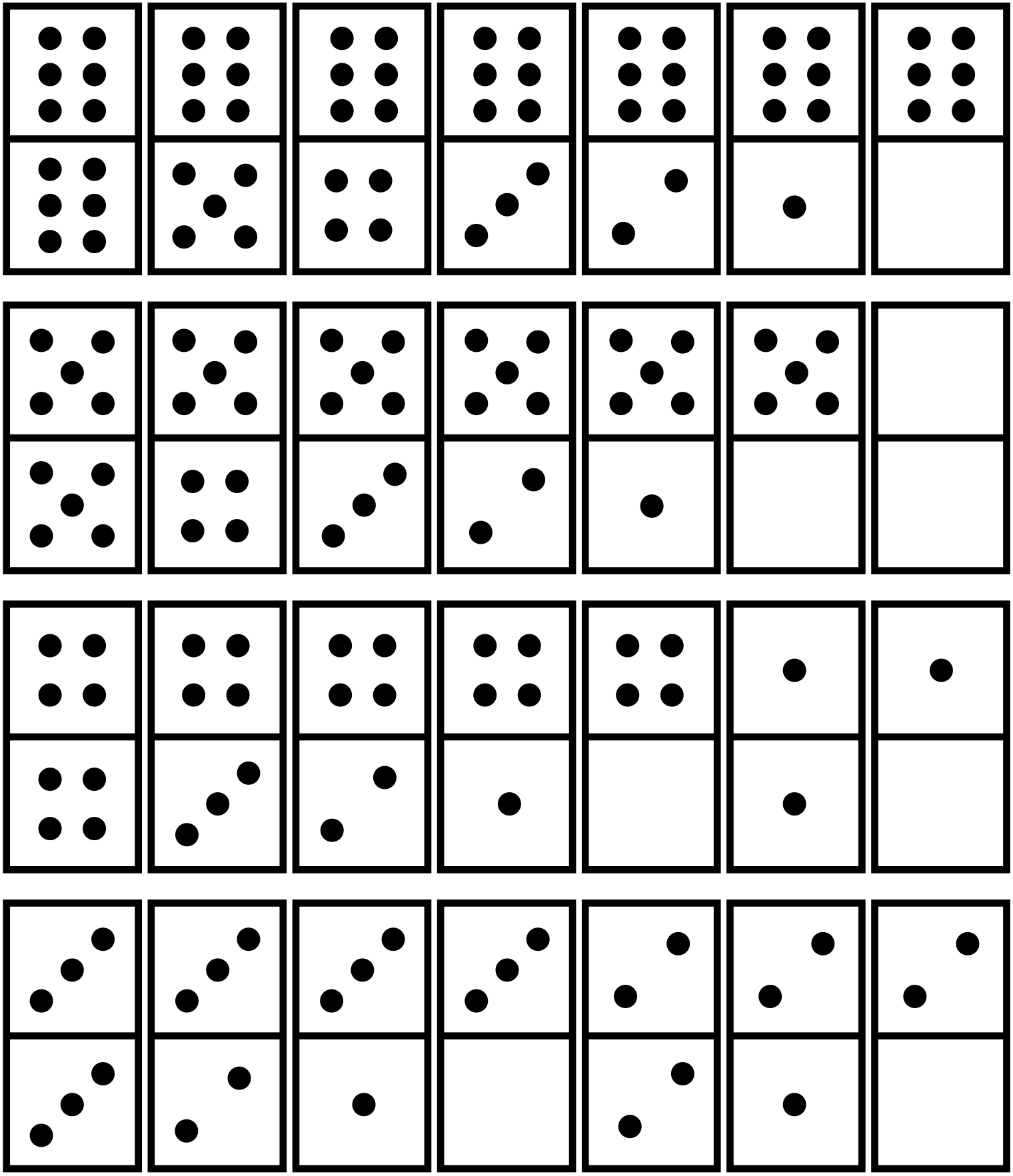
Activity 9

Domino Tetrads

Version 2: Print and cut out the 28 dominoes below



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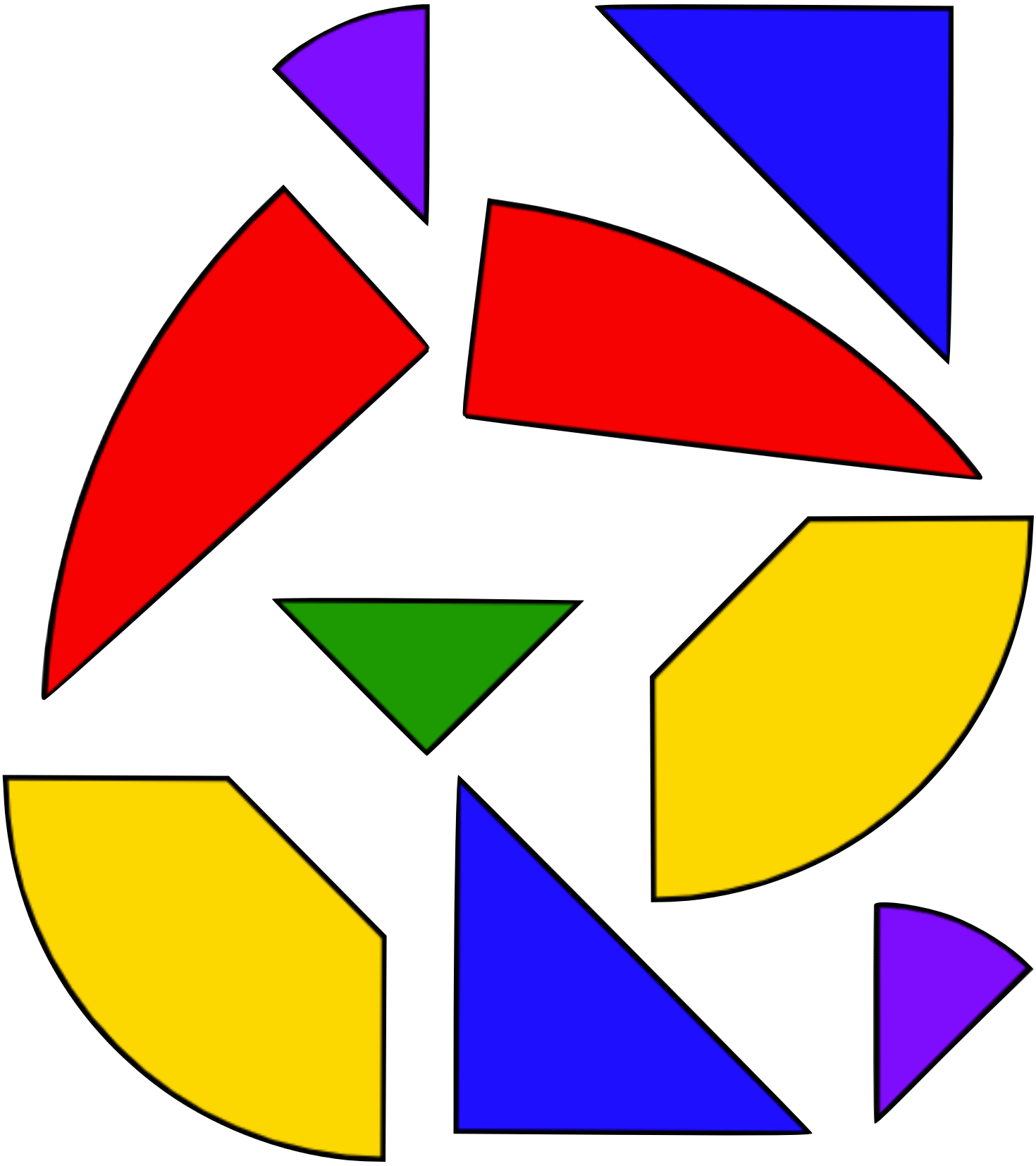
Activity 11

Egg Tangram

Print and cut out the 9 pieces below:



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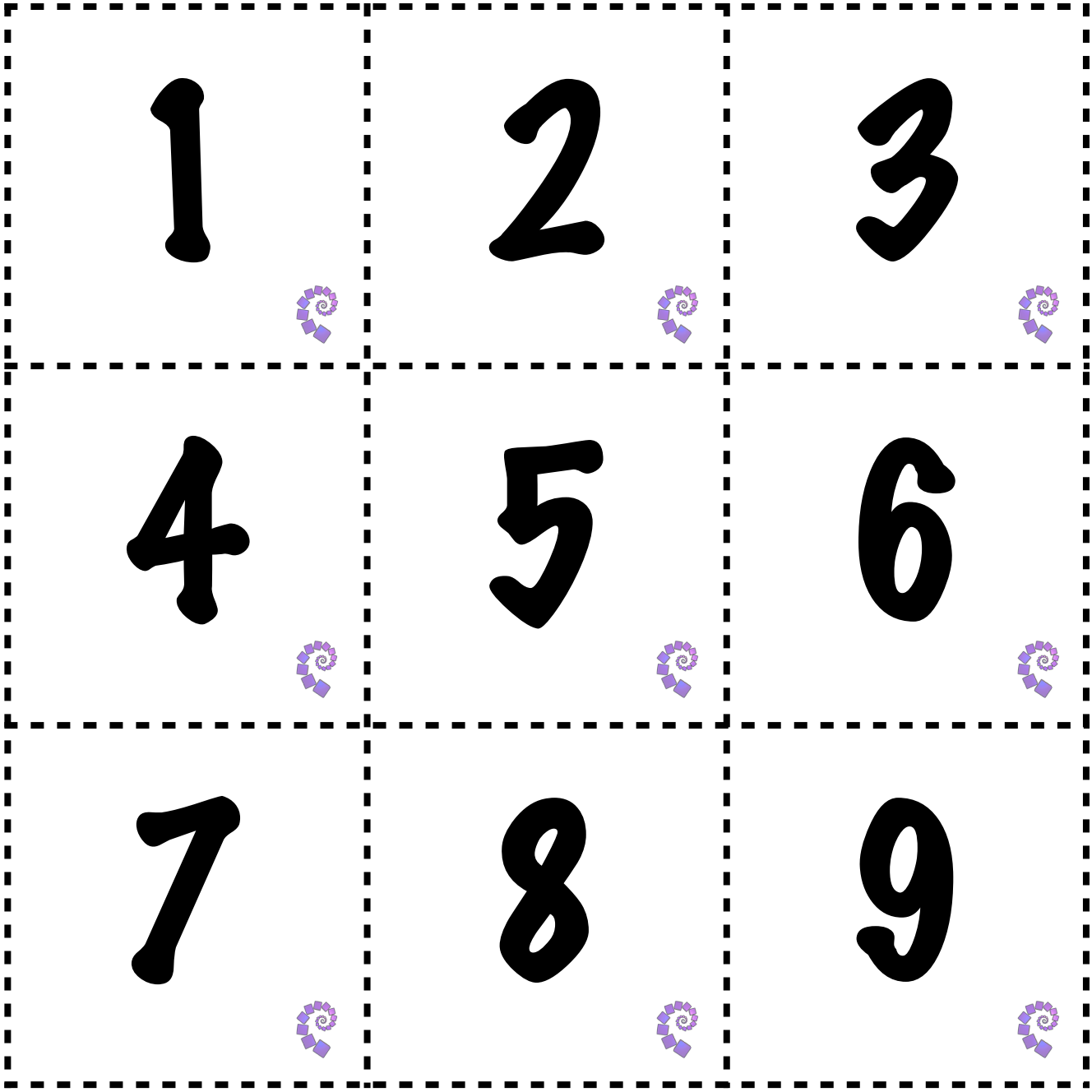
Activity 13

Fifteen

Print and cut out the 9 digits below:



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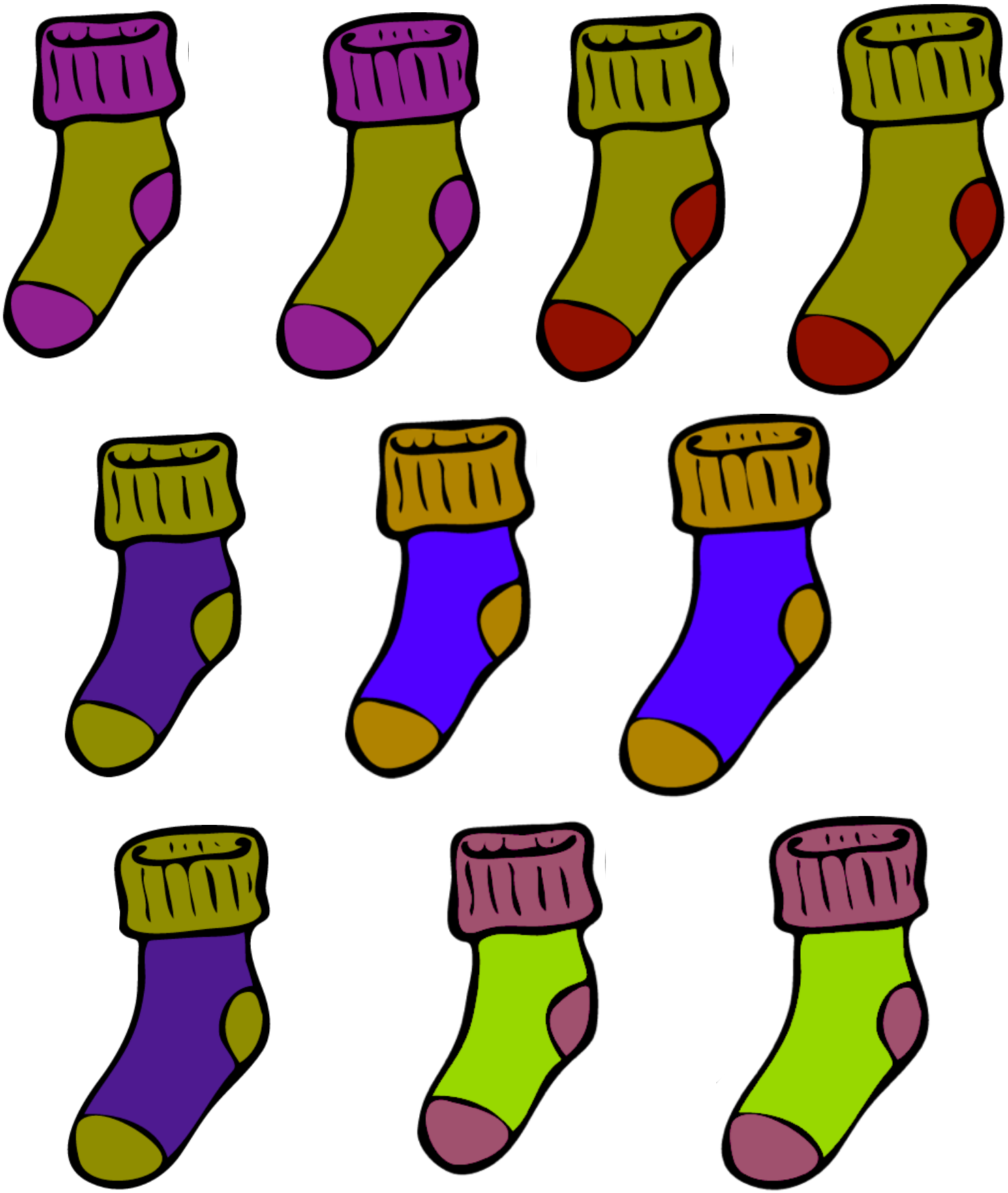
Activity 22

Mixed Up Socks

Print and cut out the socks below:



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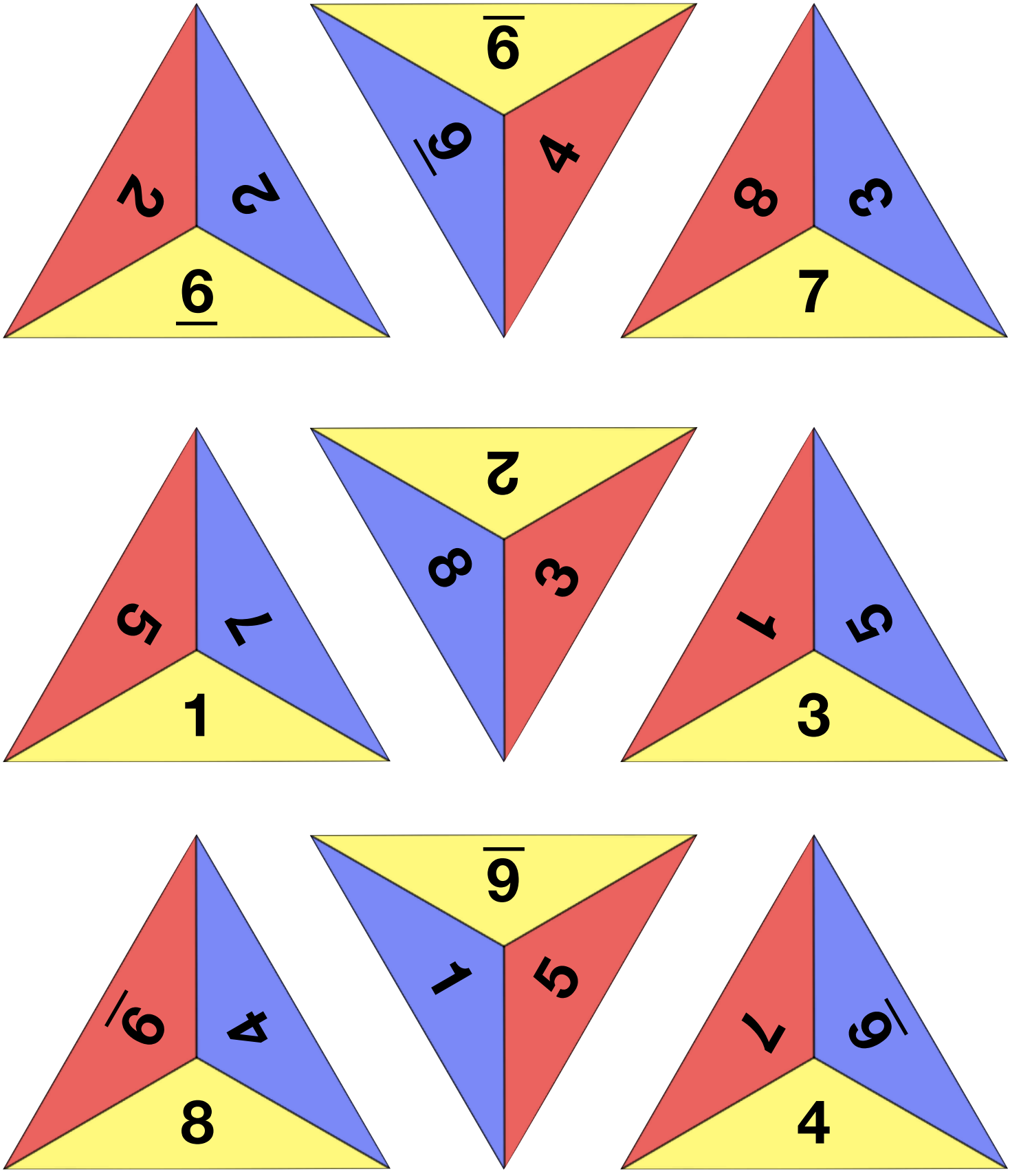
Activity 25

One Big Triangle

Print and cut out the nine triangles below.



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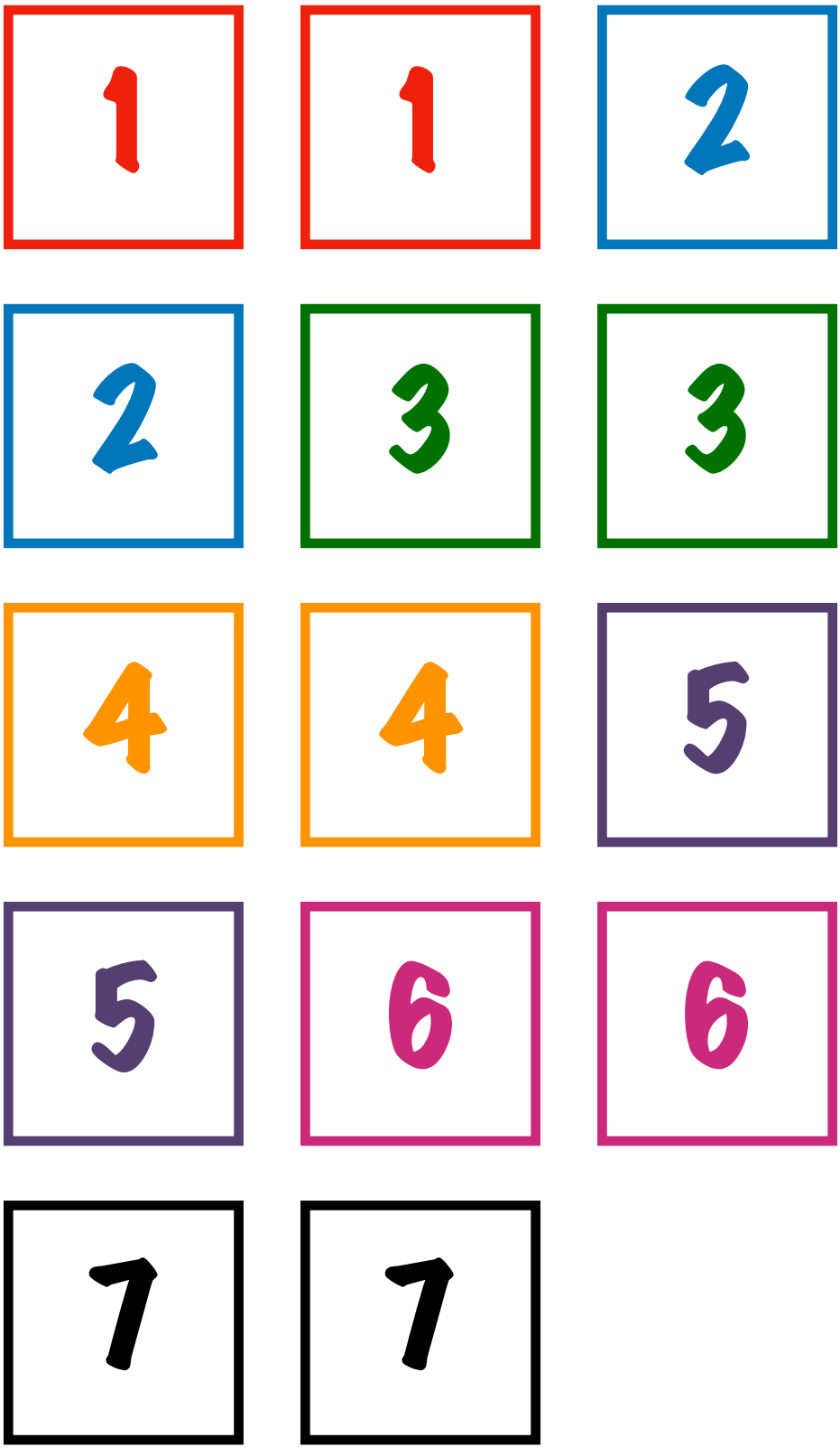
Activity 28

Sandwiches

Print and cut out the 14 numbers below:



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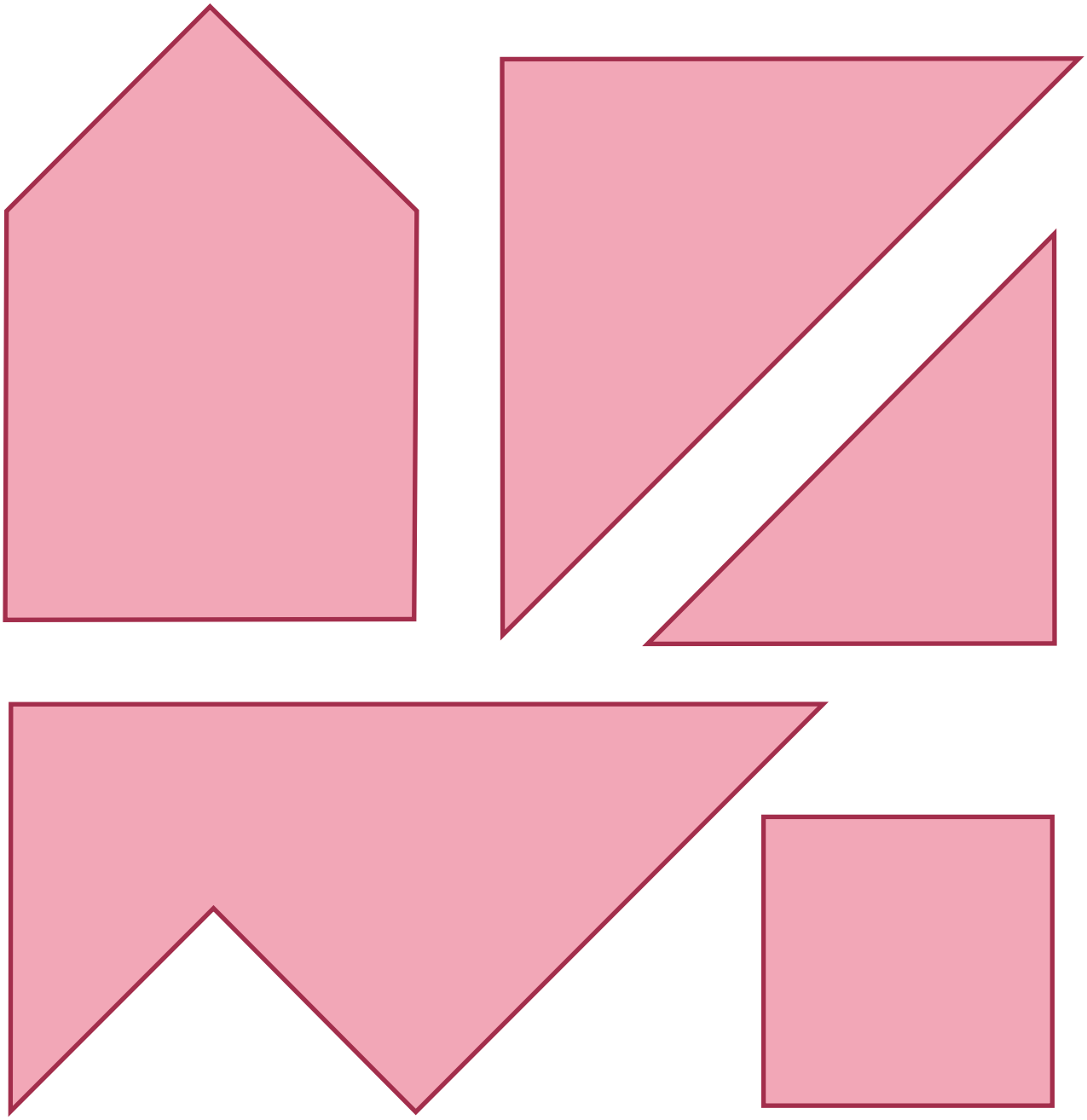
Activity 29

Square Tangram

Print and cut out the 5 red tangram pieces on this page and the 5 blue tangram pieces on the next page.



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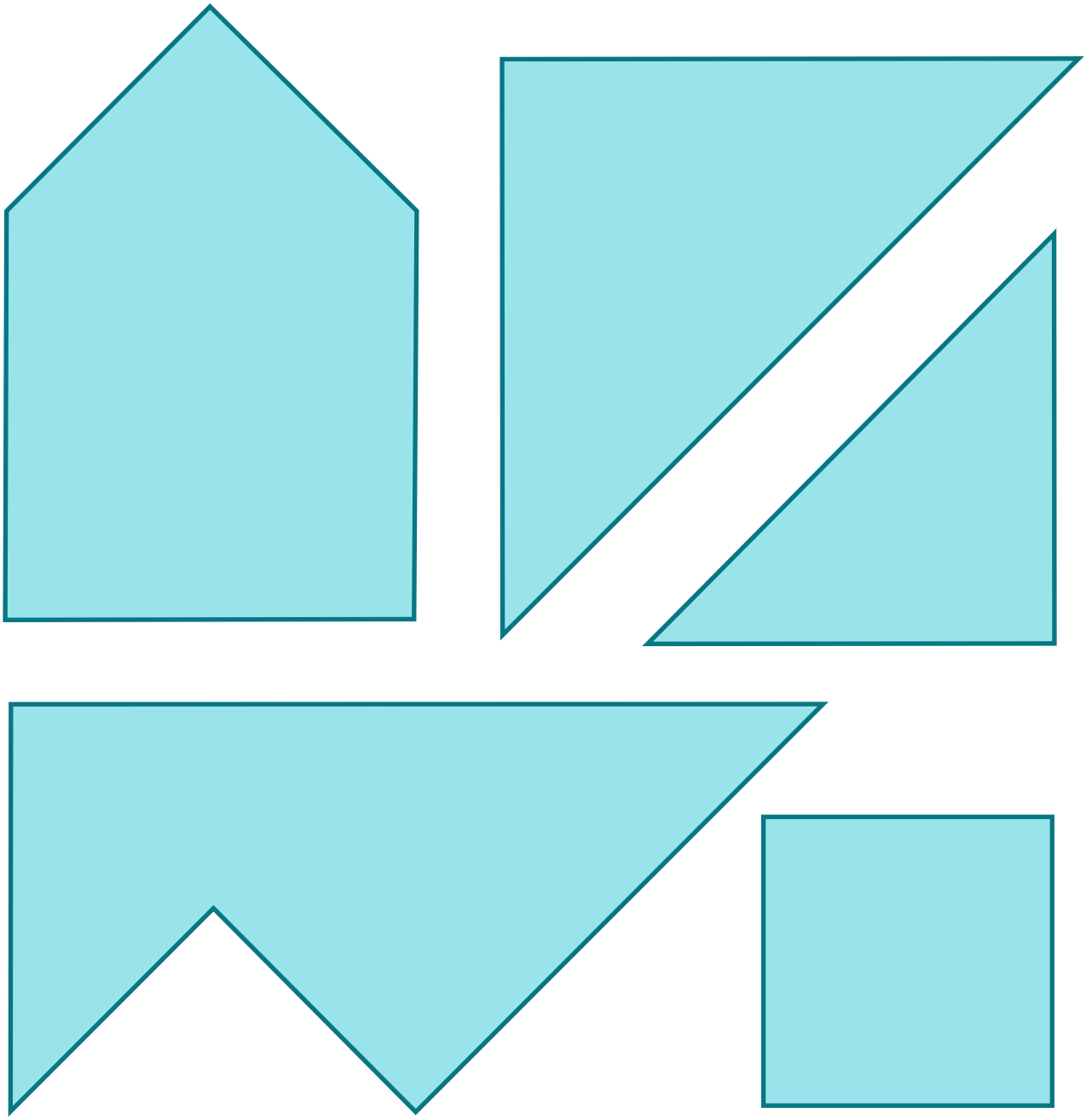
Activity 29

Square Tangram

Print and cut out the 5 blue tangram pieces on this page and the 5 red tangram pieces on the previous page.



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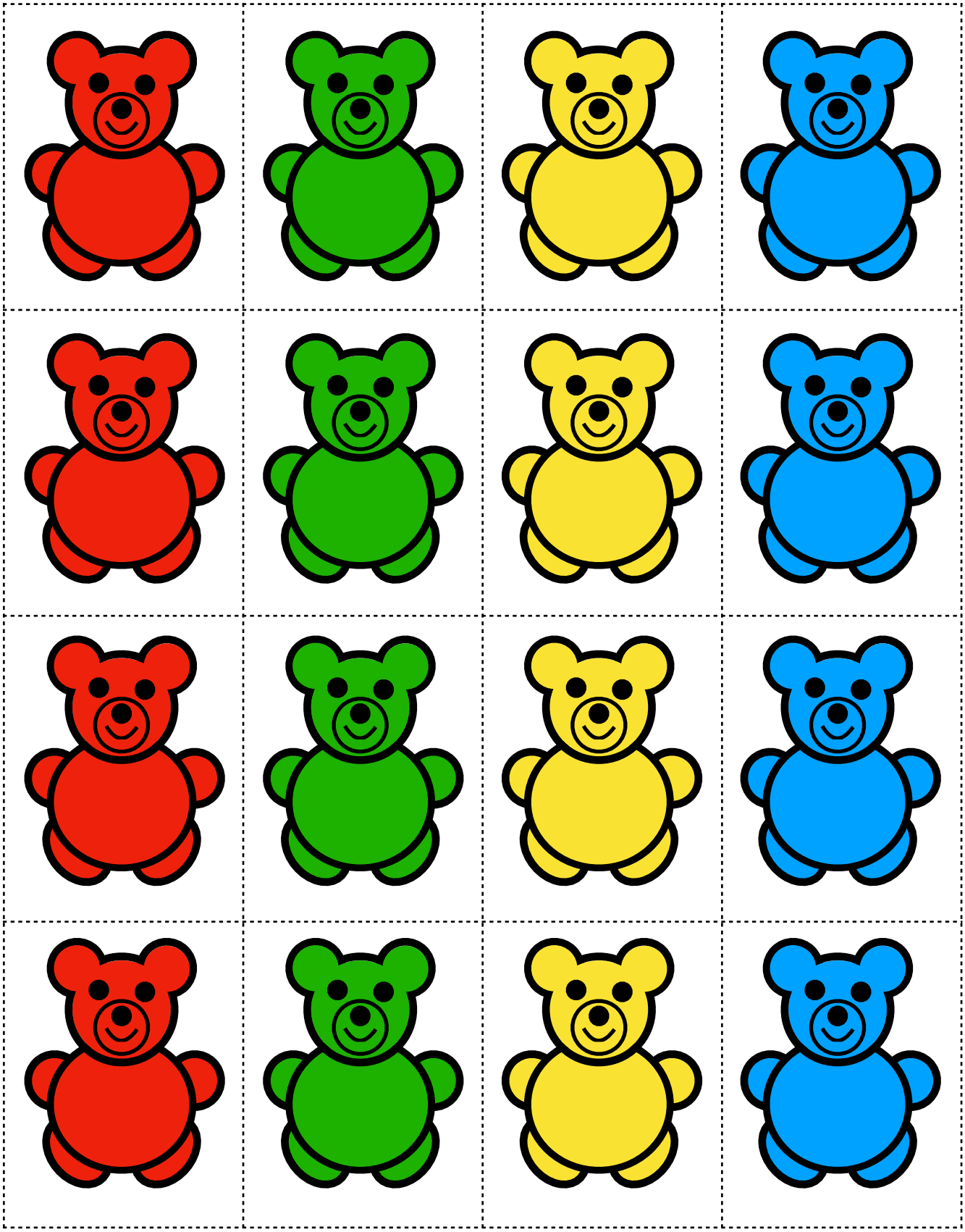
Activity 33

Teddy Bear Line-Up

Print and cut out the 16 teddy bears below:



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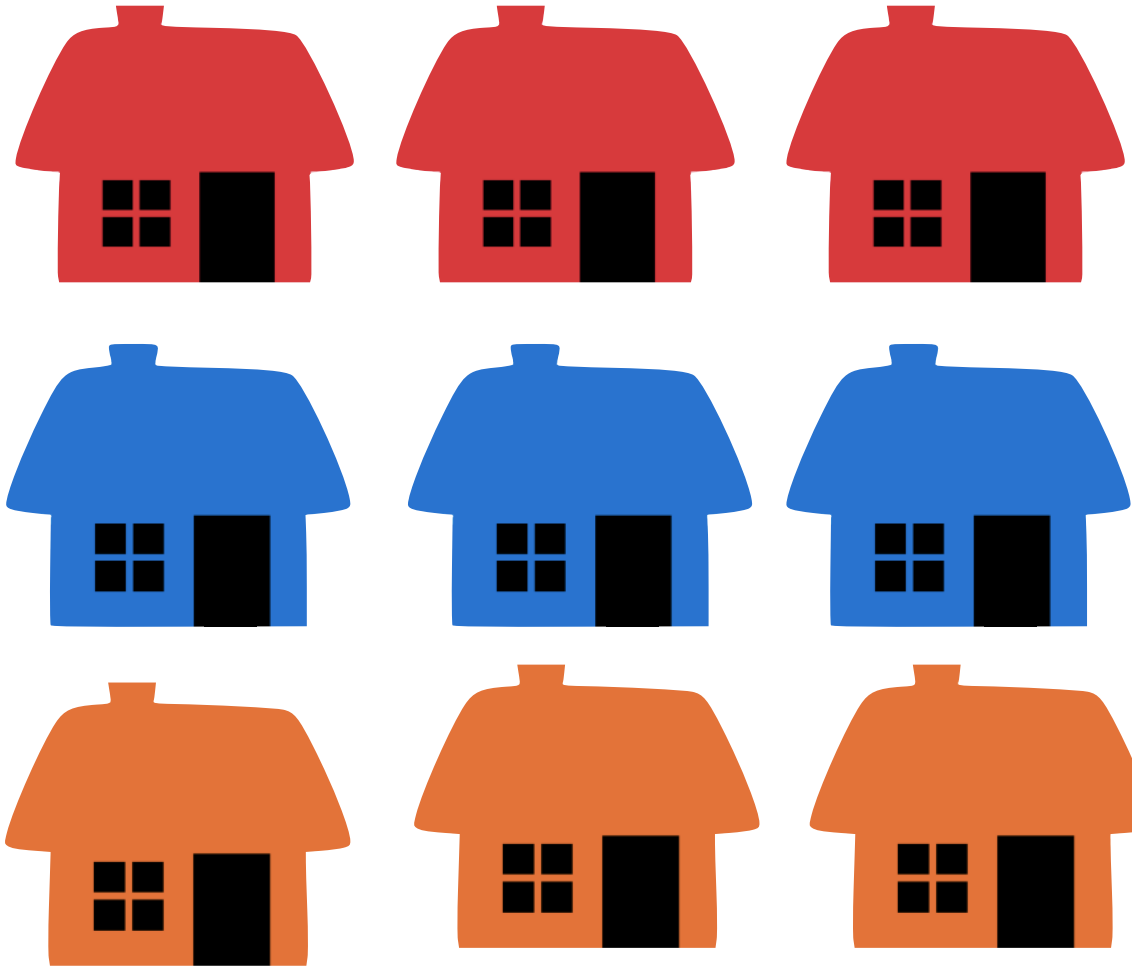
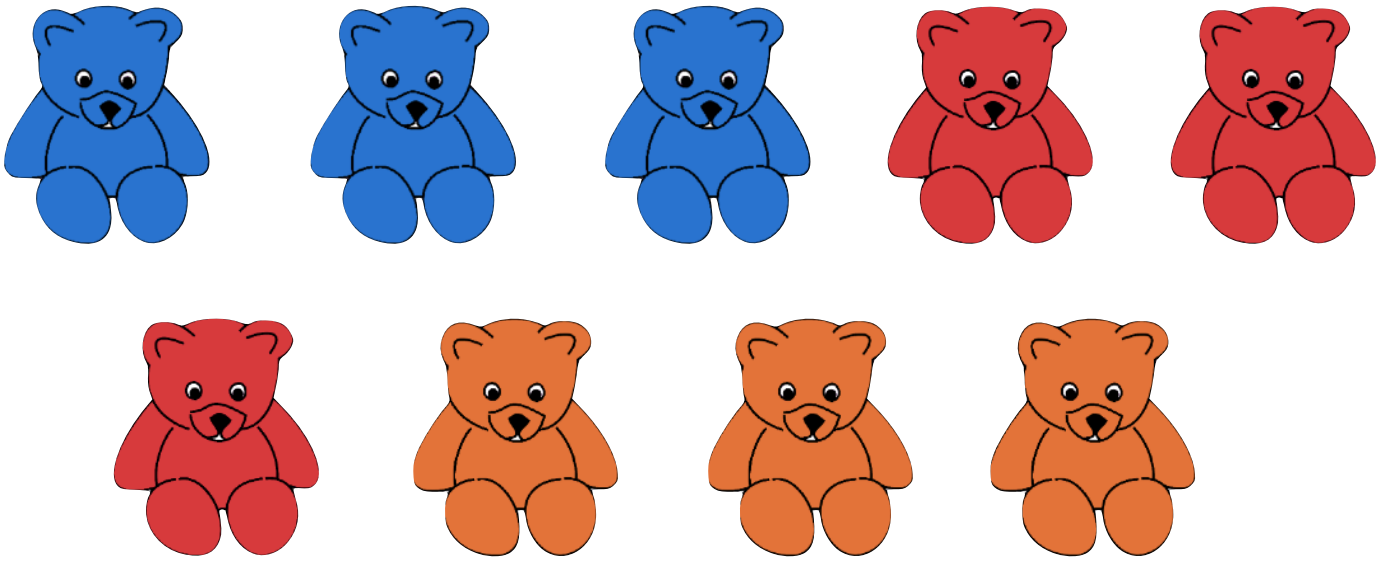
Activity 34

Teddy Town

Print and cut out the houses and teddies below:





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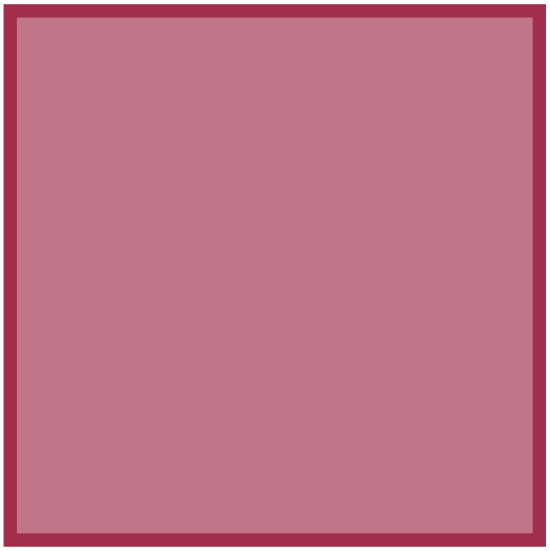
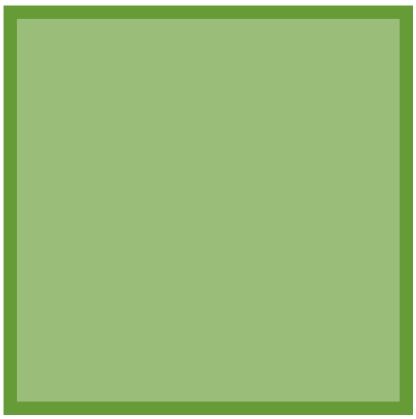
Activity

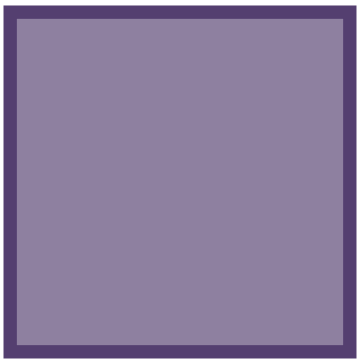
35

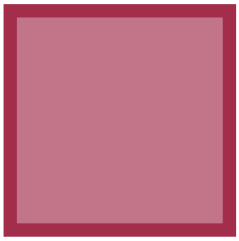
The Tower of Hanoi

Print and cut out all the 7 pieces below









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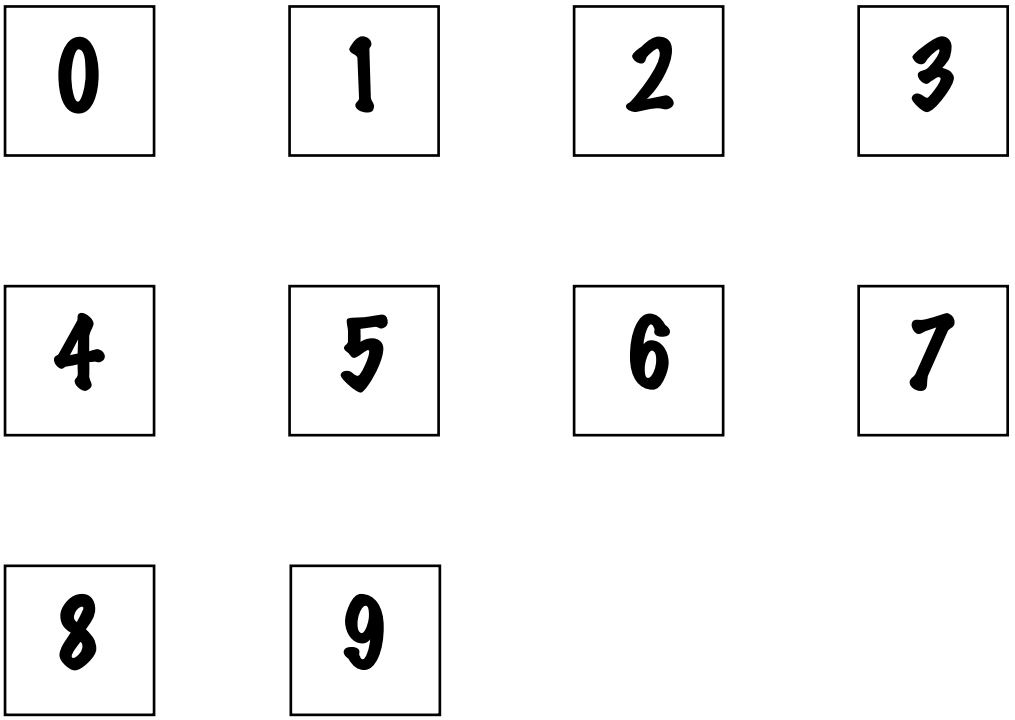
Activity 38

Two Digit Targets

Print and cut out the 10 digits below:



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