COUNT ON US

PRIMARY CHALLENGE

PUPIL ACTIVITY BOOK: 2022/2023

This activity book belongs to:

_____

INTRODUCTION

Welcome to the 2022/23 Count on Us Primary Challenge! We are really pleased that you will be taking part in our exciting maths programme for pupils in Years 4 and 5 from across London.

We hope you enjoy becoming even more confident in maths and have lots of fun as you try these activities in your classroom or in a maths club. You will then take part in your own tournament in school before your teacher chooses a team of 3 pupils to compete against other schools in the **Count on Us Primary Challenge**.

Some of these activities will require you to work on your own, for others you will need to work as a team. Do your best and practise, practise, practise! And … do not give up. Some activities will take you a long time but the more you practise the better you will get.

Pupils who have taken part in the Primary Challenge shared some helpful advice…

"Teamwork matters the most in the competition, so listen to your teammates."

"Practise 24 as much as you can!"

"Always read the instructions very carefully for codebreaking!"

"Believe in yourself."

YOUR LEARNING JOURNEY

We're about to take you on an exciting learning journey and you might spot a few familiar London landmarks along the way! As you complete each stage of the journey, you will earn a 'sticker' to place on the map on the following page. Each sticker represents a bridge that you have crossed by doing some exciting tasks and become expert Count on Us Challenge Mathematicians. These are the bridges you will cross on your journey:

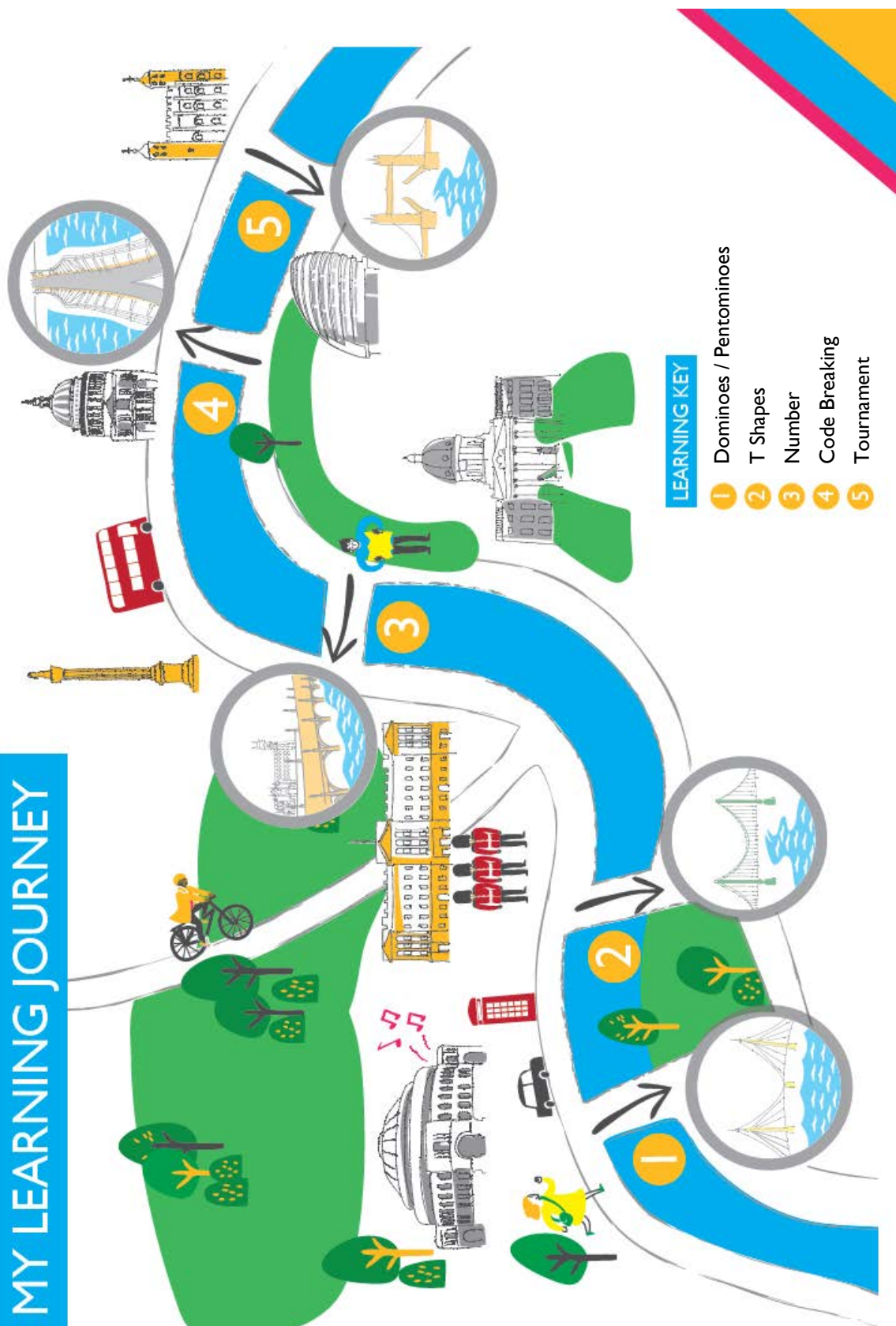**STAGE 1:**   Dominoes and Pentominoes – **ALBERT BRIDGE**

STAGE 2:   T shape – **CHELSEA BRIDGE**

STAGE 3:   24® Game – **WESTMINSTER BRIDGE**

STAGE 4:   Codebreaking – **MILLENNIUM BRIDGE**

STAGE 5:   School Tournament – **TOWER BRIDGE**

MY LEARNING JOURNEY

LEARNING KEY

1. Dominoes / Pentominoes
2. T Shapes
3. Number
4. Code Breaking
5. Tournament

1. DEMANDING DOMINOES and PUZZLING PENTOMINOES!

On the first stop of your learning journey, you will explore **DOMINOES and PENTOMINOES,** as you cross **ALBERT BRIDGE.** We like to think of these as exercises for your brain, as they are certainly very tricky! The tasks below will gradually get harder. Don't give up. The best mathematicians are those who keep going until they solve the problem!

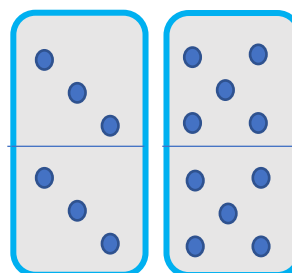## i) DEMANDING DOMINOES:

TASK D1

Making a 2 x 2 grid. (Getting started)

Here's an example:

Using only dominoes with **3** and/or **5** on them, arrange them like the grid below.
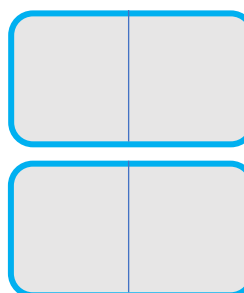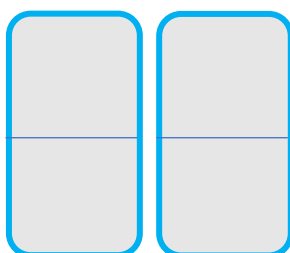
3	**5**
3	**5**

Have a look at the dominoes on the right. They have been laid out so that the dots on the dominoes show the same numbers as the grid on the left.
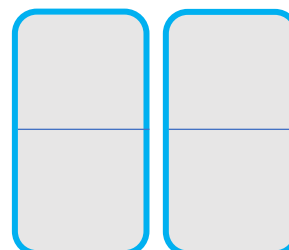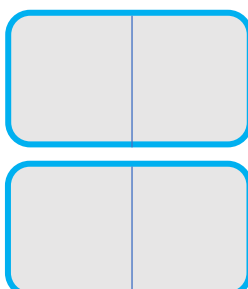
Using only the dominoes with **1**, **3** and/or **5** on them, arrange them like the grids below.

How many ways can you do this? Draw your dominoes in the spaces beside.

1	**5**
3	**1**

3	**5**
3	**1**

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TASK D2

Making a 3 x 2 grid. (Getting better)

i) How many ways can you make this grid, using only dominoes with numbers 1 and/or 6 on them? Draw your dominoes on the right. Can you find any other ways?

1	6
1	6
1	6
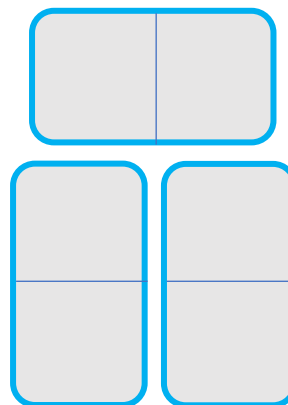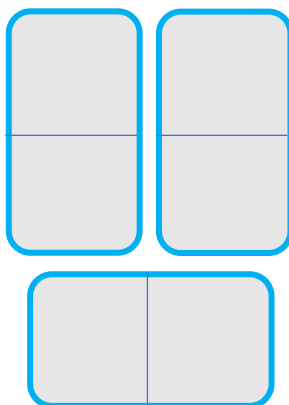
ii) This time try using numbers 3, 4 and/or 5.

Record this on the right-hand side. This time you have to draw your own dominoes!

3	5
3	5
4	4

iii) Make you own number grid, using only numbers 3, 4 and 5. Give to a friend to solve.

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TASK D3

Making a 4 x 4 grid. (Getting better)

Using any of the dominoes, arrange them exactly like the grids below.

If the square is blank, you must use a blank domino.

REMEMBER: you might not get these straight away. Keep trying. You will get better.

2	4	3	6
1	5	2	
5	6	5	
3	1	4	3

Write down how long it took you to solve each grid. You can have another go at doing it on another day. Are you getting quicker?

1st attempt

2nd attempt

3rd attempt

2	4	1	1
4	3	4	5
3	3	3	1
6	2		1

1st attempt

2nd attempt

3rd attempt

1	5	6	2
5	1	2	6
3	3	4	4
4	2	1	4

1st attempt

2nd attempt

3rd attempt

TASK D4

Making a 4 x 5 grid. (Getting really good)

4	4	5	5
4	1	2	3
6	5		4
3	3		6
4	5	3	

1st attempt

2nd attempt

3rd attempt

4	4	4	4
		5	
6		5	5
6	6	5	5
	6	6	4

1st attempt

2nd attempt

3rd attempt

4	4	6	1
1	4	6	1
4	4	1	6
3	3	3	6
6	3	2	6

1st attempt

2nd attempt

3rd attempt

Task 4 Discussion – talking through your strategies

Before you move onto Task 5, think about the strategies you used to solve the grids.

Go back to the **4 x 5** grids. Choose one to do again and think about how you are doing it. Can you explain it to a friend? E.g.

- I think the double **6** must go here because …
- I can't put the **4 5** domino here because …

It often helps to talk through your thinking to help you work out a strategy.

TASK D5

Make your own 5 x 4 domino grids

Some domino grids are easier to solve than others. Can you make an easy one and then a hard one for a friend to solve?

How to make a grid:

- Lay your dominoes out in a 5 x 4 pattern.
- Copy the numbers onto the grid below. Repeat.

I think this is an easier grid

I think this is a harder grid

Self-Reflection: How confident do you feel with domino puzzles? What can you do to get better?

☺ 😐 ☹

ALBERT BRIDGE:

Fantastic work! You've completed the dominoes tasks and are ready to start the pentominoes tasks. If you'd like a bit more of a challenge with dominoes, try the bonus tasks below… Don't forget, you need to do the dominoes and pentominoes tasks to complete the bridge.

BONUS TASKS: DOMINOES

Team up with two other people. You have five minutes to solve these grids together!

		1	3
		6	6
6	5	1	3
6	5	1	1
5	5	5	1

4	3	3	6
4	3	3	1
4	3	3	4
6		6	
6		6	

ii) PUZZLING PENTOMINOES:

Just as with dominoes, perseverance is the key ingredient here. Take as much time as you need to figure out the puzzle and make sure you don't let anyone give it away! It's a really good idea when you start with pentominoes to just play with the pieces, creating your own shapes and patterns, until you get used to how they fit together.

TASK P1

- Can you make a rectangle using any of the pentomino pieces? ☐
- Count how many squares high and across it is. ☐
- Now try and make the same sized rectangle using different pieces. ☐

TASK P2

- Choose a different number of pentomino pieces and make a new rectangle. ☐
- Count how many squares high and across it is. ☐
- Now try and make the same sized rectangle using different pieces. ☐

TASK P3

- Now use some of the pentomino pieces to create a square. ☐
- Count how many squares across and high it is (e.g. 5 x 5). ☐
- Change the pieces to make another square of the same size. ☐

TASK P4

Now have a go at making the shapes below. After you've ticked all the boxes, try again, this time using different pieces:
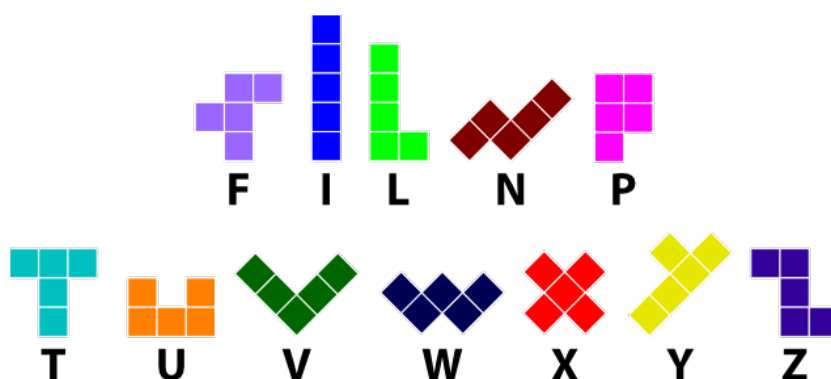
- 4 x 5 rectangle ☐ ☐
- 3 x 10 rectangle ☐ ☐
- 5 x 5 square ☐ ☐

TASK P5

It's quite hard to remember which pieces you've used, isn't it?

Have a look at the pentomino pieces. They all look a bit like capital letters. So, let's give them all letter names!

Find each of the pentomino pieces and lay them out the same as this picture.

F   I   L   N   P

T   U   V   W   X   Y   Z

Here are some things you can do to get quick at finding the pieces:

- In twos or threes, one of you calls out a letter from the picture above and the other one(s) race to point to the letter as quickly as possible.

- One of you calls out three letters and the other one(s) has to find all three pieces as quickly as possible.

- Keep changing the caller and finder. Make up your own challenges.

TASK P6

Now that you know all the letter names for the pieces, write down which letters you used to make the following shapes.

- 6 x 5 rectangle   …………………………………………..

- 7 x 5 rectangle   …………………………………………..

- 5 x 5 square   …………………………………………..

Now it gets a bit trickier. Make the shapes again BUT now you must change at least one piece each time. Write down the letters you used.

- 6 x 5 rectangle   …………………………………………..

- 7 x 5 rectangle   …………………………………………..

- 5 x 5 square   …………………………………………..

Don't stop here! How many different ways can you find to make each of these shapes? How about giving yourself some new shapes to try out, in the same way!

TASK P7

Can you use **ALL** 12 pentomino pieces to make a rectangle? What is the size of your rectangle? (eg 5 x 12?) How many squares can you see in your big rectangle?

?

Now use **ALL** 12 pentomino pieces again to make a different shaped rectangle? What is the size? How many squares can you see in your big rectangle?
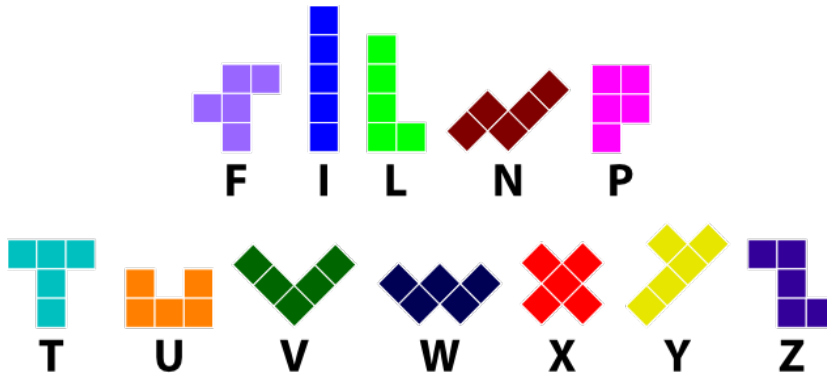
?

How many different ways can you find to make a rectangle using ALL 12 pieces?

Write the sizes of the rectangles below:

TASK P8

Now for something a bit different! Let's go back to the letters picture.

F I L N P
T U V W X Y Z

Find the letter T. You can see that it is 3 squares across the top and 3 squares high.

Make a **double size T shape** – so it will be 6 squares across and 6 squares high. You can use any of the pieces.

My double size T used the letters

Now find the letter Z. Can you make a **double size Z shape.**

My double size Z used the letters

TOP TIP: "*Look at the individual pentominoes and look at how you can build the outside and then work your way to the inside*."

Sunnyfields Primary School

Self-Reflection: How confident do you feel with pentomino puzzles?

☺ ☺ ☹

ALBERT BRIDGE:

Fantastic work! You've completed the dominoes and pentominoes tasks. You can put a sticker on the Albert Bridge. If you'd like a bit more of a challenge with pentominoes, try the bonus tasks below…

BONUS TASKS: PENTOMINOES

1. Team up with two other people. You have five minutes to make these shapes and record the letters used:

> Two different 5 x 5 squares at the same time:
>
> i)
>
> ii)

> Two different 4 x 5 rectangles using different pieces in each:
>
> i)
>
> ii)

> A double sized L shape:

2. An investigation! Can you make ALL of the pentominoes letters into double size letters?
Are there any that can't be done?

> Record your findings here:

2. TRICKY T-SHAPES

Now it's time to march across **CHELSEA BRIDGE** on your map, as you challenge your mind with the T-Shape! You may find these tricky to begin with. Just keep trying. Take as much time as you need to figure out the puzzles and make sure you **don't let anyone** give them away (otherwise you won't learn how to do them for yourself!).

TASK T1

Play with your T-Shape pieces. Can you put them together to make a shape you recognise? Give your picture a name. Draw your shape below.
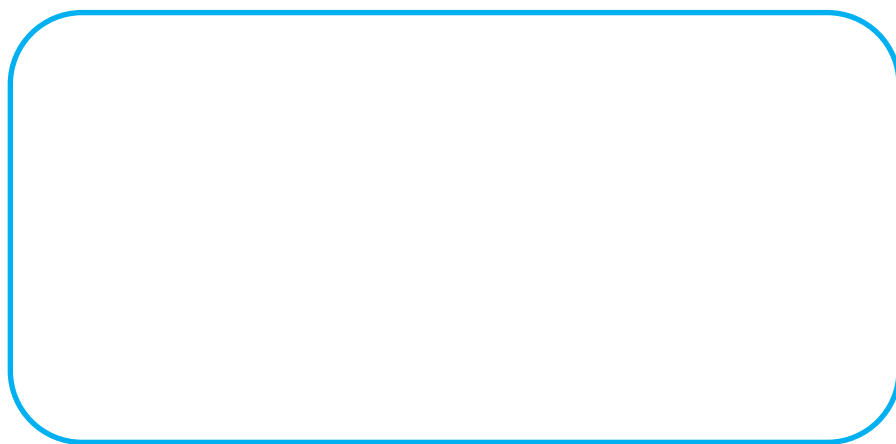
TASK T2

Choose 2 of the pictures below. Can you make them from your T-Shape pieces? These are very tricky, so don't give up!
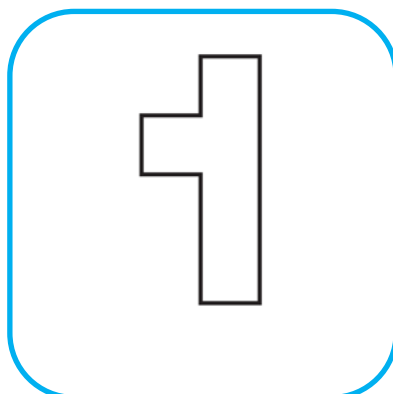
TASK T3

Some more pictures to make. With a partner, make all the pictures below (you might find these a bit harder). Talk through what you are doing.
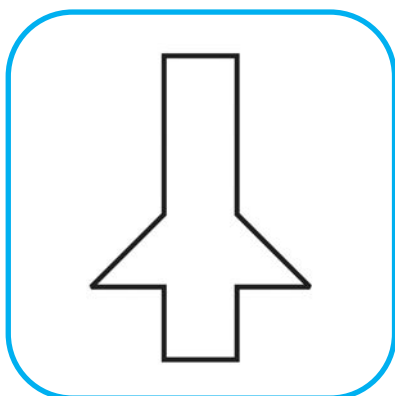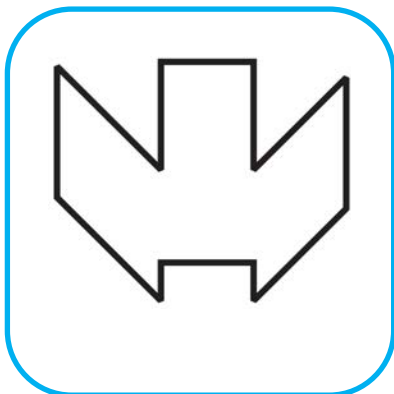
TASK T4

Working against the clock! Go back to the pictures in Task 2. Have another go BUT this time record how long it takes you to do them. Try to do a picture in under 3 minutes!
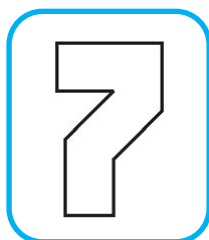
1ˢᵗ attempt
2ⁿᵈ attempt
3ʳᵈ attempt

1ˢᵗ attempt
2ⁿᵈ attempt
3ʳᵈ attempt
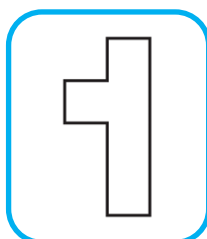
1ˢᵗ attempt
2ⁿᵈ attempt
3ʳᵈ attempt

Self-Reflection: How confident do you feel with T-Shape puzzles? How can you get better?

☺ 😐 ☹

CHELSEA BRIDGE:

Excellent work! You've completed the tasks and can go ahead and tick the Chelsea Bridge on your learning journey map. If you'd like a bit more of a challenge, why not have a go at the bonus tasks below…

BONUS TASKS

Now that you have had a lot of practice with the T Shapes, it's now time for your big challenge! Can you make these two different letter Ts from your pieces? They look easy, don't they? When you have completed them, **DO NOT** show any of your classmates. They will have much more fun finding out for themselves. AND don't be tempted to ask anyone. Just keep trying (even at home!).
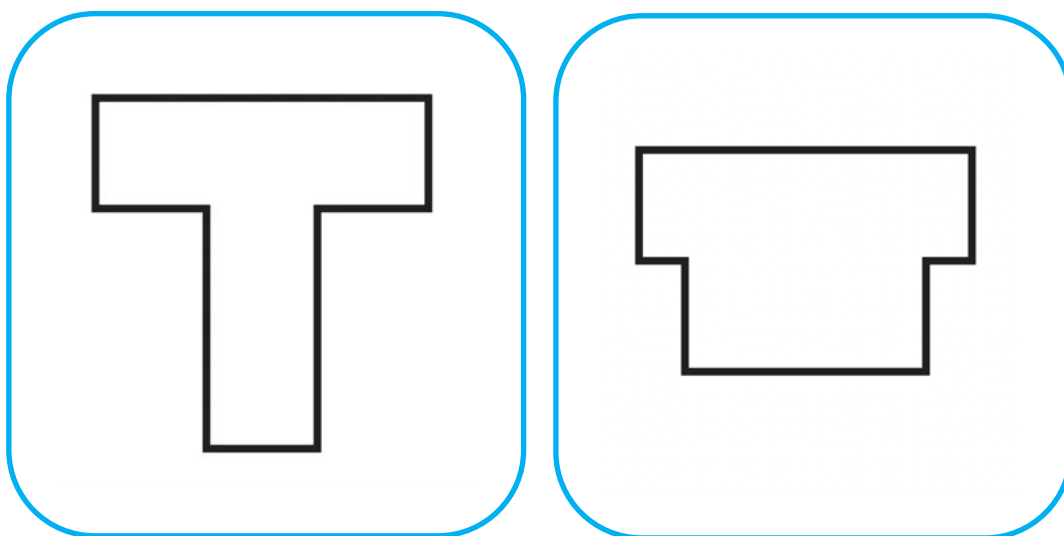
3. NIFTY NUMBERS: 24® Game

Now you're going to cross **WESTMINSTER BRIDGE,** and get really quick with your mental arithmetic skills! Let us introduce you to the fast paced, dynamic 24® Game…

TASK 1

How many **pairs** of numbers can you find that **multiply, add, divide** or **subtract** to make **24**? Write down as many as you can think of:

E.g. 6 x 4

_____   _____

_____   _____

_____   _____

How to Play the 24® Game

All four numbers on the card must be used once and once only to make 24 using the four basic arithmetic operations: **+** **-** **×** and **÷**

For example: you get a card with the numbers: **4   2   4   3**

You could use the numbers in this way: **4 - 2 = 2   4 × 3 = 12**

So, the **'last stage'** solution is: **2 × 12 = 24**

When you claim a card, you MUST give the 'last stage' (2 × 12) first, before explaining your solution!

TASK 2

Have a go at playing 24® Game with a friend. Choose a 1 dot card. Can you find a card that has two different ways of making 24? Draw the card and write your 'last stage' solutions below:

_____

_____

TASK 3

Team up with one of your classmates. Select a trickier '2 dot' or '3 dot' card and see if you can come up with a solution together.

TOP TIP: *"When you are playing 24, look for patterns and that will help you find ways of making 24 more quickly. So, for example, sometimes I look for ways of making 6 and 4 or 8 and 3 because when you multiply them, they make 24."*

Welbourne Primary School

TASK 4

Challenge three different classmates to a 24® Game match. Keep track of how many cards you have won in each game and write your score below (give yourself 1 point for each 1 dot card, 2 points for each 2 dot card and 3 points for 3 dot cards).

GAME 1:   _____ (against …………………..)

GAME 2:   _____ (against …………………..)

GAME 3:   _____ (against …………………..)

Self-Reflection: How confident do you feel with the 24® Game?

WESTMINSTER BRIDGE:

You are now super quick at mental arithmetic (but don't stop. Keep practising!) You've completed the 24® tasks and can go ahead and tick Westminster Bridge on your learning journey map. If you'd like a bit more of a challenge, why not have a go at the bonus tasks below…

BONUS TASK

Keep practising and playing the 24® Game with friends and family until you can tick the following boxes:

- Find the solutions to 5 '1 dot' cards in 30 seconds ☐

- Find the solutions to 5 '2 dot' cards in 45 seconds ☐

- Find the solutions to 5 '3 dot' cards in 1 minute ☐

REMEMBER: You must give the **FINAL STAGE first** and then the full solution!

Why not create some of your own 24® Game cards? Take them home and challenge someone to have a go against you! Be patient, they might be a bit slower than you!

TOP TIP: *"Always look for bonds to 24 first.*
When it is a level 3 card, remember 8 x 9 = 72, and 72 divided by 3 = 24"

Lancasterian Primary School

4. CLEVER CODE BREAKING

You're nearly there! Code breaking is the last part of the Count on Us Primary Challenge tournament (and our favourite round!) For this round, you will need to become expert at decoding secret messages, solving problems, and working as a team.

Let's work on all of these great skills as you set out across **MILLENNIUM BRIDGE!**

TOP TIP: "*For the codebreaking, practise with your team as much as possible. Listen to the rest of your group carefully and work as a team*"

Reay Primary School

Remember:

The shift tells you how many letters to move. When you find what 'a' will become, write it as the cipher text under the plaintext 'a'. Then you can continue writing the following letters.

TASK 1

The chart below helps you to use the Caesar Cipher code.

Complete this chart using a shift (offset) of **3**

plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text	d												
plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

Using your chart, can you decode this cipher text message?

L D P D Q H A S H U W F R G H E U H D N H U

_____

TASK 2

Complete this Caesar Cipher chart using a shift (offset) of **12**

plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

Using your chart, can you decode the message below? Write the message on the line below the code.

F T U E   Y Q E E M S Q   U E   F A B   E Q O D Q F

_____

TASK 3

Which famous authors are these? Use the blank charts on the next page to help you decipher.

P D O R U L H   E O D F N P D Q (shift of 3) :

B Y K V N   N K R V (shift of 10) :

Y U O T M Q X   Y A D B G D S A (shift of 12) :

TOP TIP: "*When doing the code breaking challenge look for double letters and the length of words as this will help you to crack the code.*"

Nelson Primary School

Shift:

plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

Shift:

plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

Shift:

plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

TASK 4

Write a coded message to a friend and challenge them to decipher the message.

Select a shift (offset) of your choice to encode your message with.

Shift: ☐

plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

Write your coded message here:

_____

_____

_____

Self-Reflection: How confident do you feel with code breaking?

☺ 😐 ☹

MILLENNIUM BRIDGE:

You are now ready to become a Count on Us Challenge code breaker! Go ahead and tick the Millennium Bridge sticker on your learning journey map.

Have a go at the bonus task if you are ready for a new challenge!

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BONUS TASK: Attractions

Get a photograph with royalty or Justin Bieber at Madam Tussauds.

You must go and see the Crown Jewels at the Tower of London.

I love walking through the shark tunnel at the London Aquarium.

Visit the War Rooms, where Churchill planned his attacks.

Have you seen Tim Peake's space capsule at the Science Museum?

Take a selfie with a tiger at London Zoo. But don't get too close!!

But you never get to see the King if you visit Buckingham Palace!

My favourite view of London is from the London Eye.

LONDON SEA LIFE AQUARIUM

SCIENCE MUSEUM

CHURCHILL MUSEUM and CABINET WAR ROOMS

LONDON ZOO

Tourist information

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BONUS TASK

It is helpful to see what the codebreaking round task looks like in the tournaments. So, this bonus task is part of an activity that has been used at the Count on Us Challenge events. Are you ready to be in a tournament?

A great day out in London – but where?

Crack the codes to discover the names of four famous London attractions hidden in the clues. Then go to the final task and follow instructions.

- Each attraction is hidden using a **Caesar Shift** code.
- But you won't get the name of the attraction, you will only get a clue.

So, follow these simple instructions:

- Using the shift given for each attraction, fill in the cipher charts
- Decode the clue to find the famous London attraction
- Then go to the final task and read the instructions carefully to complete the mission.

Attraction 1: Jhw idfh wr idfh zlwk vkdunv !   Use shift (offset) **3**

Plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
Plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

CLUE:

LONDON ATTRACTION:

Attraction 2: Dopjo pz aol olhcplza jyvdu? Use shift (offset) 7

Plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
Plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

CLUE:

LONDON ATTRACTION:

Attraction 3: Lt ts f anwyzfq ytzw tk xufhj Use shift (offset) 5

Plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
Plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

CLUE:

LONDON ATTRACTION:

Attraction 4: Qod k covpso gsdr dro aeoox Use shift (offset) 10

Plaintext	a	b	c	d	e	f	g	h	i	j	k	l	m
cipher text													
Plaintext	n	o	p	q	r	s	t	u	v	w	x	y	z
cipher text													

CLUE:

LONDON ATTRACTION:

A great day out in London: final task

Now you have found out which **4** London attractions were hidden in the clues, work out how much it would cost to buy a ticket for an adult and a child for each of these **4** attractions. Then put them in order, below the chart, starting with the most expensive.

	adult	child	total
London Aquarium	£20.00	£15.00	
Buckingham Palace	£24.00	£13.50	
London Eye	£23.00	£16.25	
Madame Tussaud's	£31.00	£25.00	
Science Museum	£0.00	£0.00	
London Zoo	£24.30	£18.00	
Tower of London	£21.50	£9.70	
Churchill War Rooms	£18.90	£9.45	

The four London attractions, starting with most expensive:

1.

2.

3.

4.

Congratulations!!

5. FINALLY – Tower Bridge: SCHOOL TOURNAMENT

You've made it! Well done for all your hard work tackling dominoes and pentominoes, T-Shapes, 24® Game and code breaking. You've crossed four bridges and there's just one left to go…**TOWER BRIDGE**. To complete this stage, you need to take part in a tournament in your school. That can be in your class, with your year group or even with another school.

Good luck and have fun!

Once you have completed the tournament, tell us about your experience…

TASK 1

Write one thing you've learned from taking part in the Count on Us Primary Challenge:

_____

_____

TOP TIP: *"Work together as a team and don't be afraid if other teams are better in certain areas."*

Millennium Primary School

TASK 2

Write down one thing you would like to get better or quicker at:

_____

_____

TOP TIP: "*Once you have found a solution to a really tricky 24 card, make sure you write it down so you don't forget.*"

St Clement and St James Primary School

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TASK 3

Write down your top tip for a pupil who is new to the Primary Challenge:

_____

_____

TOWER BRIDGE:

We hope you had a fantastic tournament!

It's time to tick the very last bridge on your Count on Us Challenge Learning Journey Map.

Congratulations, you have completed all the tasks and crossed all five bridges on the Count on Us Primary Challenge learning journey!