Maths at Court Lane Junior: the how and why

MATHS NO PROBLEM!

TIMES TABLES ROCK STARS

Why Maths No Problem?

Where did it come from?

- Singapore study in 1983 ranked them 16th out of 26.
- Significant research into leading teaching concepts
- Aim = to design a scheme that would:
  - improve results
  - improve understanding of maths and
  - Improve ability to apply maths in the real world.

Why Maths No Problem?

Instrumental understanding	Relational understanding
Follows a “trick” or procedure without understanding why	Understands how methods work, so can apply to reason through new concepts

Teaching to the test – can get questions right (in the current format) but not able to apply to new contexts

Skemp, R. R. (1976).

Why Maths No Problem?

Instrumental understanding

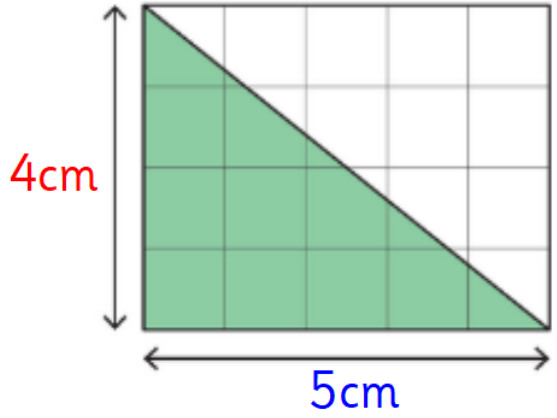
Learning the formulae to calculate areas of rectangles and triangles

Area of rectangle
= Length x breadth

Area of triangle
= ½ Base x height

Relational understanding

Understanding the relationship between rectangles and triangles to see why the formulae work

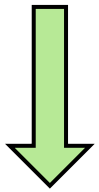


Why Maths No Problem?

MNP allows us to develop the relational understanding of children

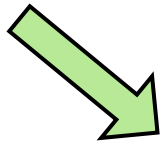
between concepts

e.g. decimals, percentages and fractions



between methods

e.g. column addition and partitioning



between representations

e.g. dienes and place value counters

Spiral approach

Each subject or skill area is revisited at a more sophisticated level each time.

ADDITION AND SUBTRACTION:

YEAR 3:

- Add numbers without renaming.
- Add numbers with renaming.
- Subtract numbers without renaming.
- Subtract numbers with renaming.
- Solve word problems involving addition and subtraction.

YEAR 4:

- Add numbers without renaming.
- Add numbers with renaming.
- Add numbers mentally.
- Subtract numbers without renaming.
- Subtract numbers with renaming.
- Subtract numbers mentally.
- Solve word problems involving addition and subtraction.

YEAR 5:

- Add numbers with more than 4 digits
- Add numbers mentally.
- Subtract numbers with more than 4 digits
- Subtract numbers mentally.
- Use rounding to check answers.
- Solve word problems involving addition, subtraction, multiplication and division, and a combination of these.

YEAR 6:

- Perform mental calculations
- Use estimate to check answers to calculations.
- Use the order of operations
- Solve problems involving addition, subtraction, multiplication and division, and a combination of these.

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Strategies we teach

The most common thing we hear as teachers is:

"That's not how I learnt."

Educational research into the way children learn has led to the development of strategies that help develop relational understanding.

NOT just teaching to answer questions in maths lessons / a test

Teaching to use maths efficiently in real-life.

PLEASE ONLY SUPPORT YOUR CHILDREN WITH THE STRATEGIES THEY ARE LEARNING IN SCHOOL.

Addition strategies:

Expanded column method:

	2	8	1	7
+	4	5	6	4
			1	1
			7	0
	1	3	0	0
	6	0	0	0
	7	3	8	1

Ones

Tens

Hundreds

Thousands

Add the ones and write that on the first row (lining up the digits in the correct place value columns). Repeat for the tens on the second row, the hundreds on the third row and the thousands on the fourth row. Finally, add the values together using column addition.

Compact column method:

	2	8	1	7
+	4	5	6	4
				1
			1	

Add the ones and write that under the ones. If the total is a two-digit number, rename under the tens column.

	2	8	1	7
+	4	5	6	4
			8	1
			1	

Add the tens and any renaming from the ones column, then write the total in the tens column. If the total is a two-digit number, rename under the hundreds.

	2	8	1	7
+	4	5	6	4
		3	8	1
	1		1	

Add the hundreds and any renaming from the tens column, then write the total in the hundreds column. If the total is a two-digit number, rename to the thousands.

	2	8	1	7
+	4	5	6	4
	7	3	8	1
	1		1	

Add the thousands and any renaming from the hundreds column, then write the total in the thousands column. If the total is a two-digit number, rename to the ten thousands.

Adding decimals:

15.98 + 8.3 =

	1	5	. 9	8
+		8	. 3	0
	2	4	. 2	8
	1	1		

Adding with decimals applies the same process as the compact column method, but children must line up the decimal points to ensure the place value columns are lined up. This is particularly important if the two numbers being added having different numbers of decimal places. Zeros are used to fill the empty columns as placeholders.

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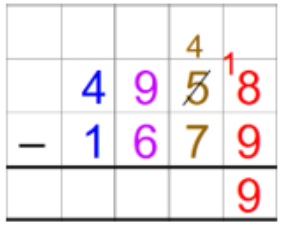
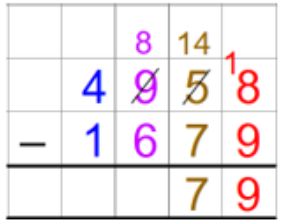
Subtraction strategies:

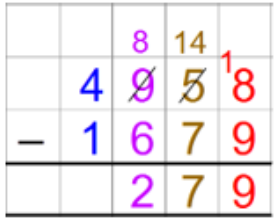
Column method:



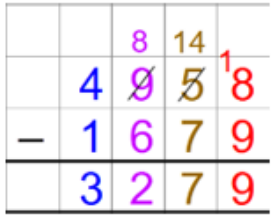
If the digit below is greater than the digit above, rename from the tens column. Subtract the ones and write under the ones.



If the digit below is greater than the digit above, rename from the hundreds column. Subtract the tens and write under the tens.

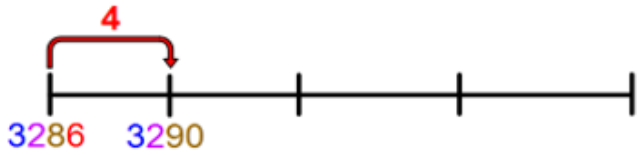


If the digit below is greater than the digit above, rename from the thousands column. Subtract the hundreds and write under the hundreds.

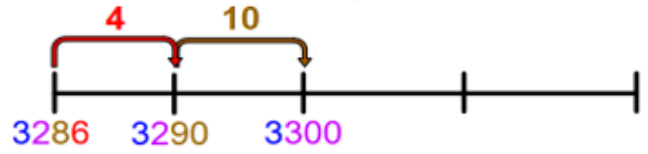


Subtract the thousands and write under the thousands.

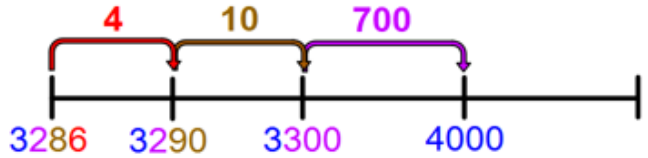
Number line to find the difference:



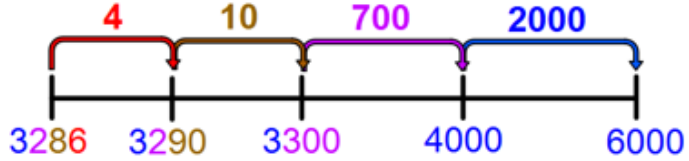
Add ones to jump to the next multiple of 10.



Add tens to jump to the next multiple of 100.

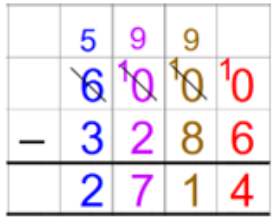


Add hundreds to jump to the next multiple of 1000.

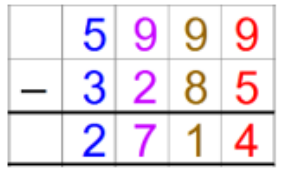


Add remaining jumps to your final number, then total up the jumps to find the difference (2714 here).

Subtract one from both:



I can use column method, but there will be a lot of renaming, which increases the chance of making a mistake.



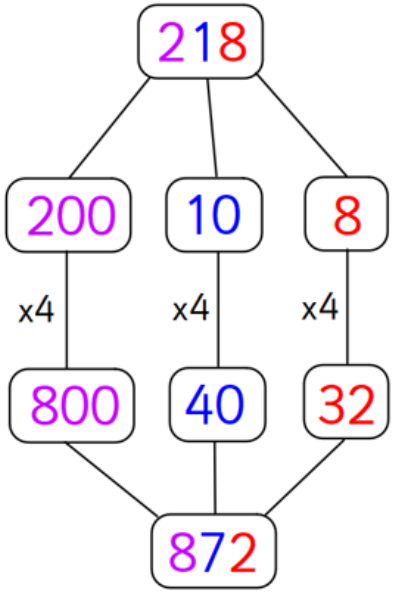
If I subtract one from both numbers, the difference (gap) between the two numbers remains the same, but we don't need to do any renaming.

This is particularly useful for money problems (e.g., items cost £13.65 and you pay with a £20 note, how much change do you get?)

Multiplication strategies:

EXAMPLE METHODS FOR: 218 x 4
multiplicand multiplier

Partitioning:



Partition the number into hundreds, tens and ones, multiply each part by the multiplier, then add the parts together to reach an answer.

Expanded column method:

		H	T	O	
		2	1	8	
	x			4	
			3	2	(4 x 8 = 32)
			4	0	(4 x 10 = 40)
+		8	0	0	(4 x 200 = 800)
		8	7	2	

Multiply the ones by the multiplier and write that on the first row (lining up the digits in the correct place value columns). Repeat for the tens on the second row, and the hundreds on the third row. Finally, add the values together using column addition.

Compact column method:

	H	T	O
	2	1	8
x			4
			2
		3	

Multiply the ones by the multiplier and write that under the ones. If the product is a two-digit number, rename under the tens column.

	H	T	O
	2	1	8
x			4
		7	2
		3	

Multiply the tens by the multiplier. Add any renaming from the ones column, then write the total in the tens column. If the product is a two-digit number, rename under the hundreds.

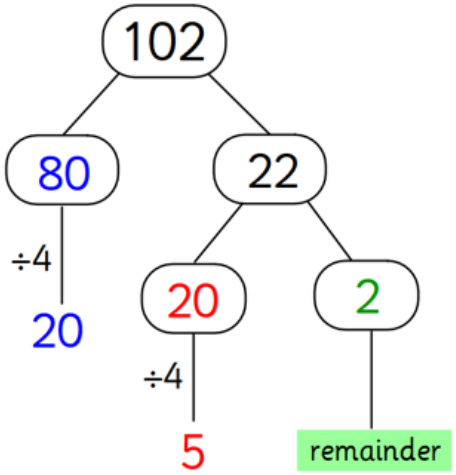
	H	T	O
	2	1	8
x			4
	8	7	2
		3	

Multiply the hundreds by the multiplier. Add any renaming from the tens column, then write the total in the hundreds column. If the product is a two-digit number, rename to the thousands.

Division strategies:

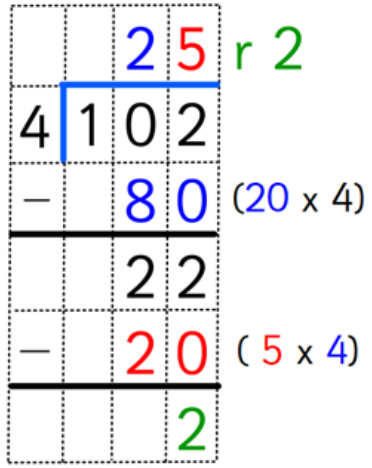
EXAMPLE METHODS FOR: 102 ÷ 4
dividend divisor

Partitioning:



First, partition the dividend into the largest multiple of the divisor you can (80), and whatever is left over (22). Then partition what is left over (22) into the largest multiple of the divisor (20) and whatever is left over (2). Divide each part by the divisor and add together to reach your answer (25). Whatever is left over (that cannot be divided by the divisor) is the remainder (2).

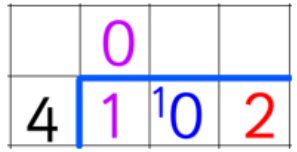
Repeated subtraction:



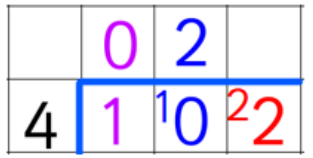
Division is repeated subtraction: you have to work out how many lots of the divisor go into the dividend; so this method involves subtracting the largest chunks of the divisor that you can, until you cannot subtract any more.

If you record how many lots of the divisor you are subtracting, you answer will be the total number of lots that are subtracted. Whatever is left over is the remainder.

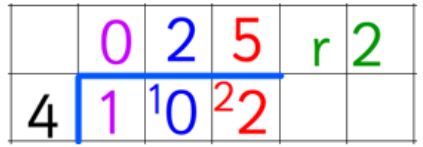
BUSSTOP:



First, look at how many lots of the divisor go into the hundreds. Write the number of lots above the hundreds digit. Anything left over is renamed to the tens.



Next, look at how many lots of the divisor go into the tens (including any renamed from the hundreds). Write the number of lots above the tens digit. Anything left over is renamed to the ones.



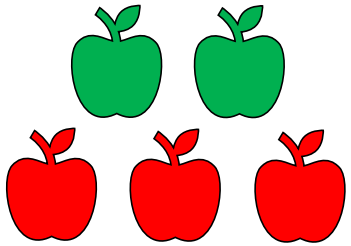
Finally, look at how many lots of the divisor go into the ones (including any renamed from the tens).

Write the number of lots above the ones digit. Anything left over is the remainder.

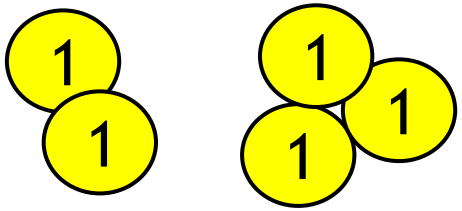
Using representations to develop understanding

Concrete → Pictorial → Abstract

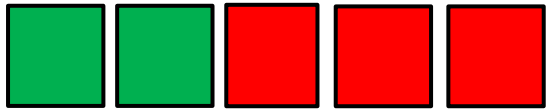
Real-life objects



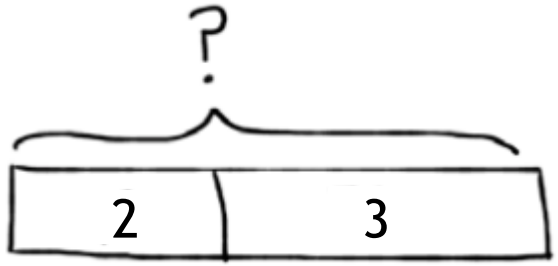
Place value counters, dienes, numicon etc.



Drawing things that represent something else



Bar modelling



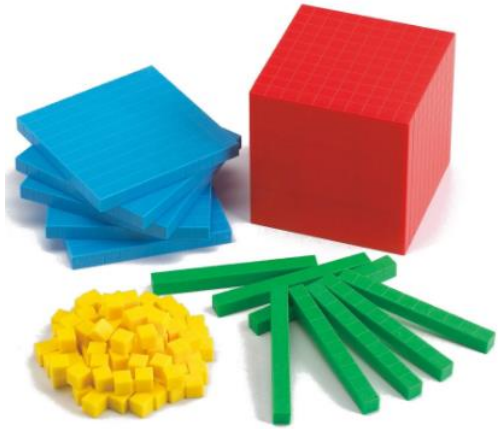
Mathematical symbols

$$2 + 3 = 5$$

Bruner, J. (1965)

Examples of concrete resources:

Place value counters

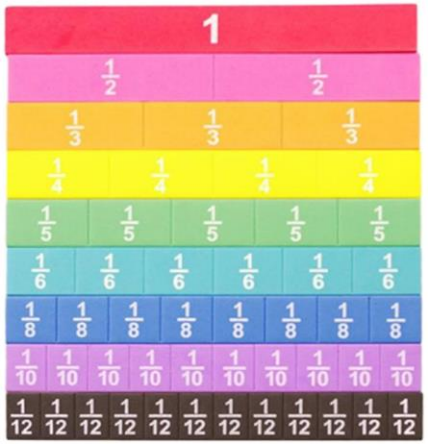


Dienes (Base 10)

Multilink

Numicon

Clocks



Fraction walls

Why do we use representations?

Help you “see” the problem

The visual representation can help make the process much clearer – “see” what calculations are needed – formulate a plan to solve it

Reduce cognitive load

If you can record bits of information in a visual format, the working memory is free to focus on calculating what you need to.

Structure of a MNP lesson:

Explore

CHILDREN EXPLORE
– how do they solve the problem?

Guidance questions are displayed on the board to prompt thought but very limited guidance is given at this stage.

Discussion is GOOD!

Master

TEACHER MODELLING:
Demonstrate the different methods or representations to solve that problem.

Explain the relationship between the methods
OR
Explain how a representation shows the problem

Guided Practice

TEACHER ASSESSMENT:
Children are given more examples (with different contexts/numbers) to apply what they have just learnt.

Teachers assess whether they need more input or move onto the workbook independently.

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The importance of TTRS:

Children who know their multiplication (and division) facts find it much easier to understand concepts in maths lessons:

Strategies for multiplication

Strategies for division

Fractions

Area

Percentages

Time

Converting units

Decimals

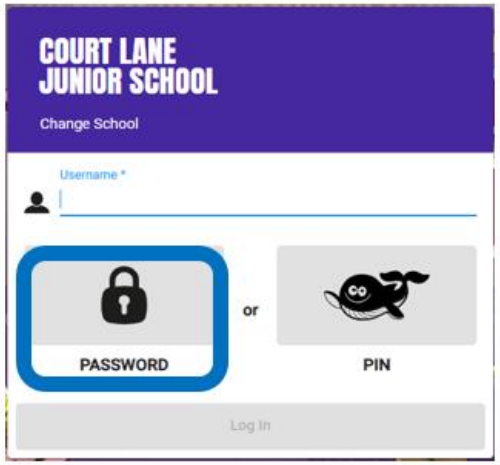
Perimeter

Measures

Money

How to help your child with TTRS:

1. Go to the website: https://play.ttrockstars.com
2. Select “School” then “Student”
3. Type in the name of the school (if you start typing Court Lane, it should come up)
4. Type in the child’s username (as given by the teacher)
5. Select password and type the password in.

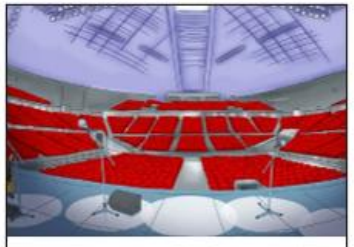


JAMMING
Take it easy

- No timer
- Select multiplication only, division only or a mixture of both.
- Select a specific table to practise

GARAGE
Complete your heatmap

- Set the duration of the game (1, 2 or 3 mins)
- Practise all tables you have been set
- See how many you can get right in the time



SOUNDCHECK
Beat the clock

- 25 questions
- 6 seconds per question (like the Multiplication Check at the end of Year 4)

STUDIO
Get a rock status

- This is how you get a TTRS status (need to complete 10 studios initially)

GIG
Perform once a month

- 5 minutes
- Evaluates which tables children need to focus on (use as a check each month, then use jamming to practise those tables)

Where to find help:

www.courtlanejnr.co.uk

INFORMATION

↓

CURRICULUM

↓

MATHS CURRICULUM

Supporting documents (strategies, expectations and schemes of work)

↓

USEFUL VIDEOS

Demonstrations for some of the strategies used for four operations

Maths No Problem! Parent Videos

Videos explaining key concepts from the Maths No Problem Scheme

KS2 Maths - BBC Bitesize

Or speak to your child's class teacher

How to help your child:

Make sure they are accessing TTRS regularly.

(If they can't access at home, speak to their class teacher about getting them to access in school instead).

Don't teach them "easier" methods at home

MNP has been designed to help build children's relational understanding to enable them to apply learning to new situations. If we teach "tricks" or "easier" methods, that understanding is by-passed, which makes it harder for us to teach them as they move up the school. They WILL get to the "easier" methods when their understanding allows.

Provide real-life opportunities for maths:

- Use of money – rounding to find out roughly how much your shopping would be; calculating how much change you will get
- Following recipes – scaling up/down; weighing ingredients
- Time – basic telling the time; calculating how long until we need to …..