Maths Parent Workshop

Autumn 2021

Aims

You will understand more about...

- ESP's approach to teaching Maths
- Maths Mastery
- How to support your child in learning Maths

National Curriculum – Mathematics KS1 & KS2

Purpose of study

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

# National Curriculum – Mathematics KS1 & KS2

Aims

The national curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language

- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Resources
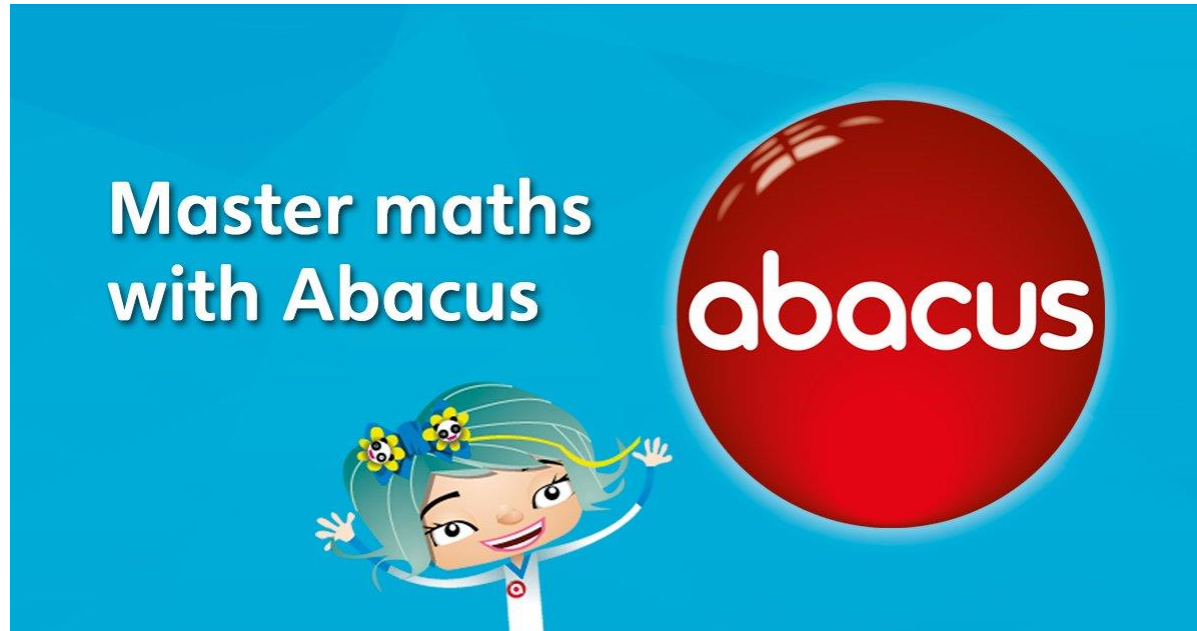
ESP's 'Mathematical journey'...
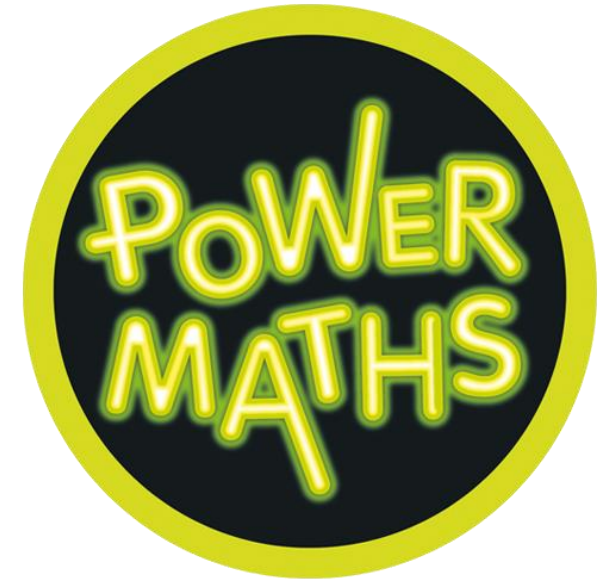
YR...Y1-Y5...Y6

Maths Mastery

'Mastering Maths' means *pupils of all ages acquiring a deep, long-term, secure and adaptable understanding of the subject.*

What does it mean to master something?

- I know how to do it
- It becomes automatic and I don't need to think about it- for example: riding a bike, driving a car, times tables
- I'm really good at doing it – painting a room, or a picture
- I can show someone else how to do it.

Mastery of Mathematics

- Achievable for all
- **Deep** and sustainable learning
- The ability to build on something that has already been sufficiently mastered
- The ability to reason about a concept and make connections
- Conceptual fluency, e.g. 3 + 5 = 5 + 3 or $\frac{1}{3} + \frac{2}{5}$.
- Procedural fluency, e.g. 17 − 9, 8 × 4, multiply by 10, 20, or 300

Teaching for Mastery

- The belief that all pupils can achieve

- Keeping the class working together so that all can access and master mathematics

- Development **of deep** mathematical understanding

- Development of both factual/procedural and conceptual fluency in tandem

- Longer time on key topics, providing time to go deeper and embed learning

- Early intervention for pupils needing more support

- Intelligent Practice

- Key facts (e.g. multiplication tables and addition facts within 10) are learnt to automaticity to avoid cognitive overload

Textbooks & Practice Books

High quality textbooks can support teaching for mastery

- Singapore / China

- DfE assessed textbooks. Three of them met the published criteria, including:
    - *Power Maths Key Stage 1*
    - *Power Maths Key Stage 2*
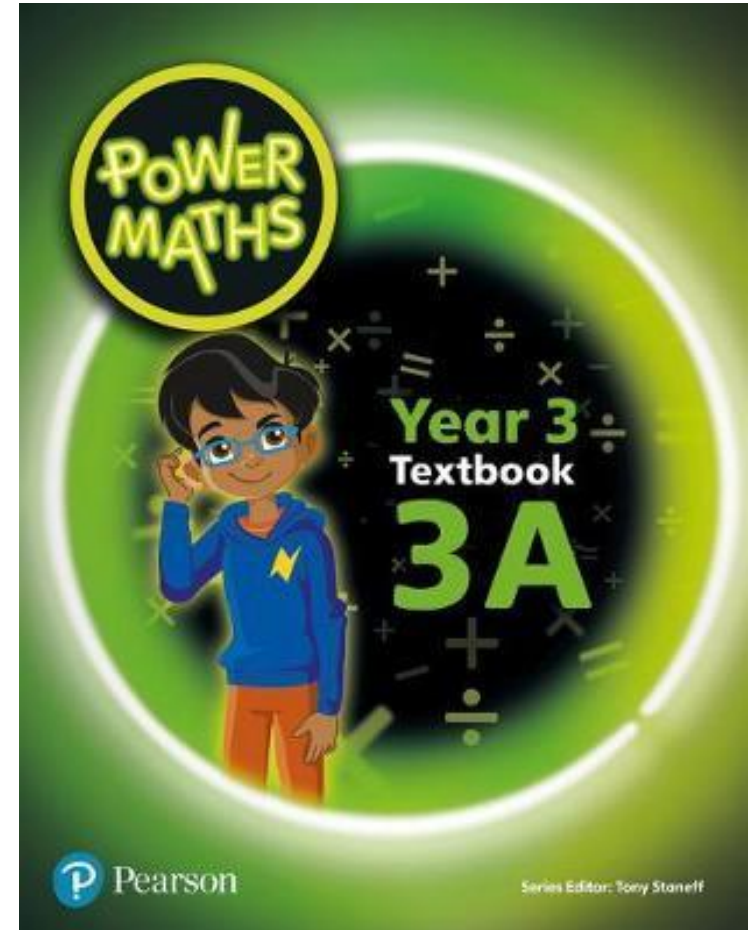
Important aspects of ESP approach and Power Maths resources

- Structures and representations (CPA)
- Intelligent practice
- Early intervention – FIXIT time
- Strengthening & Deepening
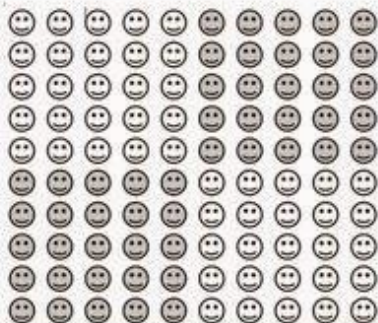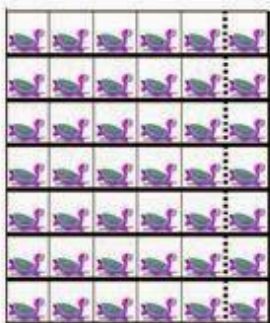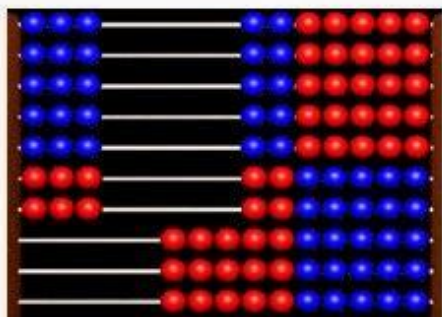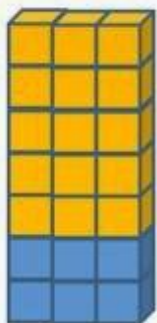
Structures and representations

Concrete-Pictorial-Abstract (C-P-A) approach

CONCRETE   PICTORIAL   ABSTRACT

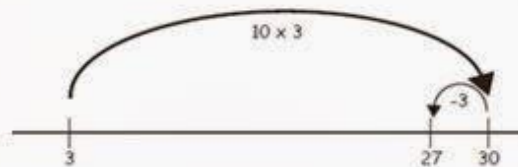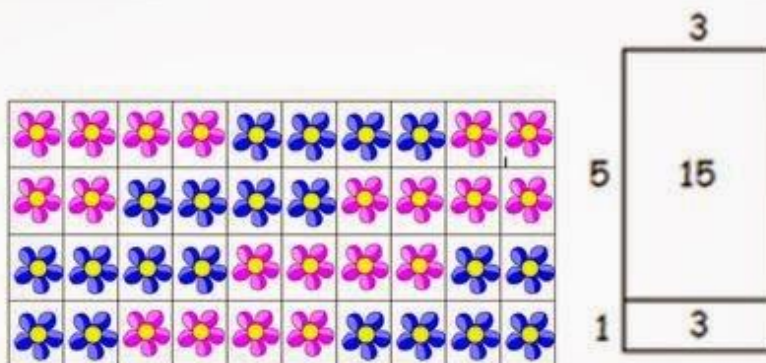| Concrete	Representational	Abstract
Students manipulate hands-on, concrete materials	Students draw and observe diagrams, or watch the teacher touching and moving hands-on materials	Numbers and mathematical symbols

x 4 Patterns

4	8	12	16	20
24	28	32	36	40

8 x 5

(4 x 2) x 5

4 x (2 x 5)

4 x 10

40

45 ÷ 5

(50-5) ÷ 5

(50÷5) - (5÷5)

10-1

9

The role of practice

- **Intelligent practice -** in which all children become fluent in maths through varied, frequent and thoughtful practice that deepens and embeds conceptual understanding in a logical, planned sequence.

Traditional practice

- Repetition can be rote – no need for a child to think hard about what they are doing.

- Praise may be misplaced.

- Does this prove understanding?

Intelligent practice

- Varied methods – concrete, pictorial and abstract.

- Calculations expressed in different ways, requiring thought and understanding.

- Constructive feedback.

Early Intervention

- Intervention is focused on keeping up now, not catching up later, so interventions should happen as soon as they are needed:
  - Practice questions are designed to bring misconceptions to the surface, allowing teachers to address in the lesson
  - Weekly FIXIT time / responsive lessons

Strengthening & Deepening

Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. National Curriculum

- Practice questions through the lesson become progressively more sophisticated
- Power Maths provides additional materials "Strengthening & Deepening"
- Supplement other materials e.g. White Rose Maths

Power Maths – lesson sequence

- Power Up
- Discover
- Share
- Think together
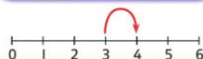- Practice
- Challenge
- (Deepening)
- Reflect

Year 1

Unit 3
Addition and subtraction within 10 ①

We will need some maths words. Which ones mean the same thing?

In this unit we will …
- ⚡ Add parts to find the whole
- ⚡ Find a missing part
- ⚡ Practise using number bonds
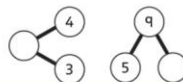- ⚡ Find fact families
- ⚡ Solve word problems

altogether (say 'all-too-geth-er')

in total   add, added   count on

missing part   number stories

We need these too! Use them to make number sentences.

Do you remember what this is called? Use it to find one more than 3.

0 1 2 3 4 5 6

4 / 3

9 / 5

⚡ Power Up

How many ways can you make 5?

| 3 | 0 | 2 | 5 | 4 |

What number is needed to make another bond to 5?

I'm going to use my fingers to check.

Finding the whole – adding together

Discover

① a) How many 🎳 are left up?

How many 🎳 are knocked over?

How many 🎳 are there **altogether**?

b) 1 more 🎳 is knocked over.

Now there are 5 🎳 left up and 5 🎳 knocked over.

How many 🎳 are there altogether?

Share

To **add** we need to put the two parts together and count the whole.

There are two parts.

a)

There are 6 🎳 left up.

There are 4 🎳 knocked over.

There are 10 🎳 altogether.

6 / 4

6 + 4 = 10

b) There are 5 🎳 left up.

There are 5 🎳 knocked over.

There are 10 🎳 altogether.

5 / 5

5 + 5 = 10

Think together

① How many 🎳 are there **in total**?

3 / 4
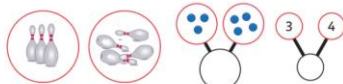
3 + 4 = ☐

There are ☐ in total.

In total also means the two parts added together.

② How many 🎳 are there in total?

☐ + ☐ = ☐

There are ☐ in total.

③ How many in total? Use ◯ to help you.

5 / 2

5 + 2 = ☐

Can you write this addition in other ways? There are 3 more.

I know **plus** (+) means add the parts.

→ Practice book 1A p61

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② How many 🍎 are there in total?

a) ☐ + ☐ = ☐

b) ☐ + ☐ = ☐

c) ☐ + ☐ = ☐

③ How many cars in total?

☐ + ☐ = ☐

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④ Complete the number sentences in four different ways.

☐ + ☐ = 9   ☐ + ☐ = 9

☐ + ☐ = 9   ☐ + ☐ = 9
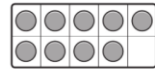
I used 9 counters.

⑤ Complete the number sentence.

4 + 2 = ☐ + ☐

Reflect

I can find the total number of 🎩 and 👟 by

POWER MATHS Deepen Activities

① Crack the codes!

a) ★ + △ = 10
   △ + ◯ = 5
   ◯ + ★ = 9

   ★ = ☐   △ = ☐
   ◯ = ☐   🐞 = ☐

b) 🐞 + ❄ = 6
   ❄ + 4 = 🐞

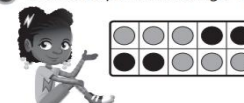   ❄ = ☐   🍐 = ☐

c) 🍐 + 5 = 🍌
   🍌 = 5 + 🍎

   🍌 = ☐   🍎 = ☐

What other numbers could the fruit stand for?

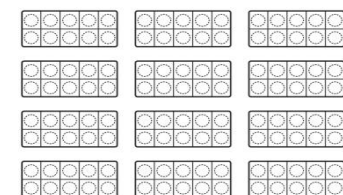② Draw a story that has 2 + 3, 1 + 4 and 2 + 2. It can be set anywhere you like.

I will draw a missing number story.

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③ Flo made a pattern showing 4 + 6.

How many ways can you show 4 + 6 = 10?

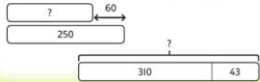Let's try making some different patterns.

Year 3

Unit 3
Addition and subtraction ②

In this unit we will ....
- Add and subtract 3-digit numbers
- Decide if we need to exchange
- Exchange across more than one column
- Learn how to check our answers in different ways
- Use bar models to solve 1- and 2-step problems

We will need some maths words. Which word means to find a rough answer?
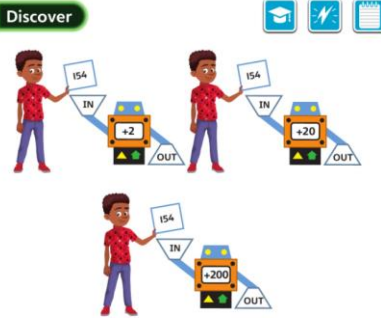
exchange   column method
mental method
estimate   approximate
digits   multiple

We need to remember about parts and wholes. Use this model to find a family of 8 facts.

240
150   90

Do you remember how to find the missing information on these bar models?

? | 60
250

?
310 | 43

98   99

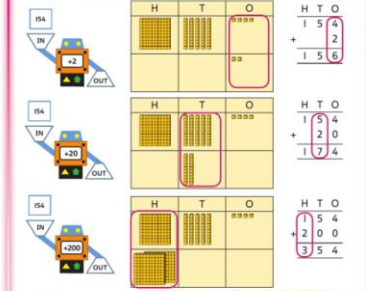## Addition and subtraction patterns

Discover

① a) Lee inputs 154 into each function machine.
What will the outputs be?

b) Jamie inputs a number into the + 200 machine. The output is 797.
What number did she put in?

100

Share

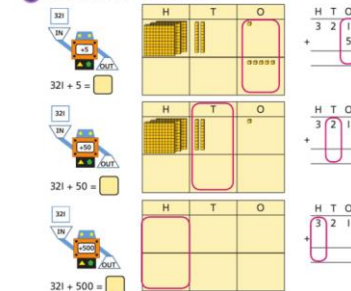a) The first machine adds 1s. The second adds 10s. The third adds 100s.

H	T	O		H	T	O
				1	5	4
			+			2
				1	5	6

H	T	O		H	T	O
				1	5	4
			+		2	0
				1	7	4

H	T	O		H	T	O
				1	5	4
			+	2	0	0
				3	5	4

b) ☐ + 200 = 797

797
200 ○

This is a missing number problem. I will use a part-whole model to help.

797 − 200 = 597
Jamie put in number 597.

101

Think together

① Find the outputs for these machines.

321 IN +5 OUT

H	T	O		H	T	O
				3	2	1
			+			5

321 + 5 = ☐

321 IN +50 OUT

H	T	O		H	T	O
				3	2	1
			+			

321 + 50 = ☐

321 IN +500 OUT

H	T	O		H	T	O
				3	2	1
			+			

321 + 500 = ☐

② 546 is input into each machine. Find the missing outputs.

546 IN −3 OUT   546 IN −30 OUT   546 IN −300 OUT

H	T	O
5	4	6
−		

102

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③ a) The functions are missing from these machines.
Write the calculations to work out the missing functions.

253 IN OUT 259   253 IN OUT 953   253 IN OUT 203

b) Now work out the missing parts of these calculations.

113 = 111 + ☐   555 = 755 ○ ☐
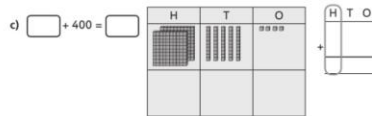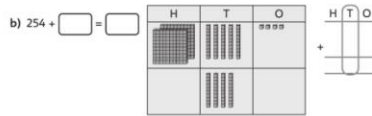131 = 111 + ☐   555 = 557 ○ ☐
311 = 111 + ☐   555 = 575 ○ ☐
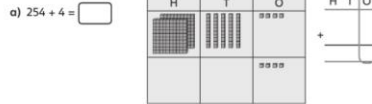
I will guess the function and test my ideas by doing additions.

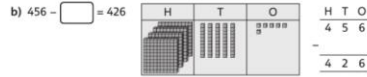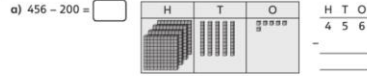Let's try to work it out by looking at which digits change.

→ Practice book 3A p74

103

Addition and subtraction patterns

① Complete these additions.

a) 254 + 4 = ☐

H	T	O

b) 254 + ☐ = ☐

H	T	O

c) ☐ + 400 = ☐

H	T	O

74

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② Complete the missing parts of these calculations.

a) 456 − 200 = ☐

H	T	O
4	5	6

b) 456 − ☐ = 426

H	T	O
4	5	6
4	2	6

③ Zac put the same number into each machine. The outputs were 791, 737 and 197. What number did Zac put into the machines?

IN −6 OUT   IN −60 OUT   IN −600 OUT
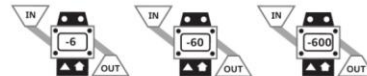
The number was ☐

④ Complete these calculations.

a) 345 + 200 = ☐   b) ☐ = 777 − 20
345 + 20 = ☐   ☐ = 777 − 2
345 + 2 = ☐   777 = ☐ − 200

75

---

c) 444 + ☐ = 474   d) 111 = 311 ○ ☐
444 + ☐ = 744   111 = 411 ○ ☐
444 + ☐ = 447   511 = 111 ○ ☐

⑤ Explain the mistake Dexter has made.

232 + 20   212 − 200
292 + 20   322 − 90
922 − 200   292 − 20
322 + 90

I will only need to change one digit to answer these because they all just add or subtract 10s or 100s.

_____

Reflect

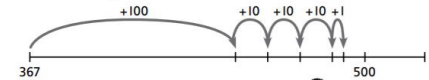Show how you would work out 654 − 300 and 654 + 300.

76

Deepen Activities

① Roll a dice 3 times to make a 3-digit number. This is your start number.

Can you get to 500 using five jumps of 1, 10 or 100?

How close can you get?

+100   +10 +10 +10 +1
367   500

I'm not sure how close I can get. I will try out different ways.

② a) What is 24 + 25 + 26 + 27?
b) Find four numbers that follow each other that add to 202.
c) Find four numbers that follow each other that add to 502.

I looked for connections in the numbers.

③ Play with a partner. Start at 301.

Take 4 place value counters from a bag containing 1s and 10s. Mentally subtract the value of your counters from 301. Say the answer.

Your partner now takes 4 counters from the bag, mentally subtracts the value from your answer, and says the new answer.

Repeat in turn until the total gets to 0.

Whoever gets to 0 wins.

You don't have to use all your counters on the winning turn!

Year 5

Unit 3
Addition and subtraction

In this unit we will ...
- Add and subtract numbers with up to 5 digits
- Use the column method for addition and subtraction
- Round numbers to estimate answers to problems
- Add and subtract mentally
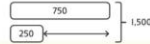- Solve problems involving addition and subtraction

We will need some maths words. How many of these can you remember?
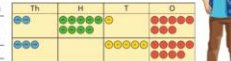
add   subtract   ones (1s)   tens (10s)
hundreds (100s)   thousands (1,000s)
ten thousands (10,000s)   mentally
inverse   round   estimate
distance chart

Laying a calculation out neatly in columns can help us to understand the value of each digit.

What information does this comparison bar model give you? What can you use it to work out?

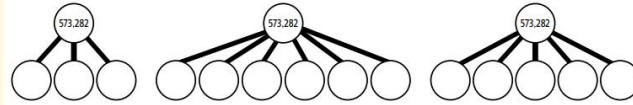
⚡ Power Up

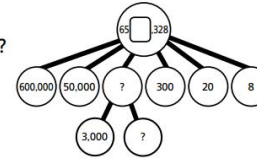Find three ways to partition the number 573,282.

Find five more ways to partition 573,282.

Part of this whole is unknown. What could it be?

I can write an addition number sentence to show the whole.

Adding whole numbers with more than 4 digits ①

Discover

Share

a) Add the number of video views for Tuesday and Wednesday.

I will use counters to help me. I will set out the work in columns and add them together, starting with the column of least place value.

The total number of video views for Tuesday and Wednesday is 39,328.

I will use trial and improvement to find the correct 2 days. I will need to take my time and be careful not to miss any.

The last digit of Wednesday is 5.
The last digit of Friday is 7.
5 + 7 = 12

I think there may be a way you can tell by just adding the last digits.

Wednesday and Friday have the total number of views of 37,592.

a) What is the total number of video views for Tuesday and Wednesday?
b) Which two days have the total number of views of 37,592?

Think together

① What is the total number of views for Thursday and Friday?
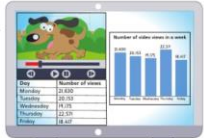
The total number of views is ☐.

② On Saturday, the video is viewed 1,564 times. What is the total number of views for Friday and Saturday?

The total number of views is ☐.

③ Here are the total views for four other videos.

CUTE CAT — VIEWS: 36,171
Talent Show — VIEWS: 61,426
Dancing Stars — VIEWS: 5,458
Bike Stunts — VIEWS: 1,033

Work out the total views for any two of the videos.
Then see if your partner can work out which two videos you added together.

The last digits will help me work out which two videos my partner added.

Be careful when the numbers do not have the same number of digits. Remember to set out the addition correctly.

Adding whole numbers with more than 4 digits ①

① Work out the following additions.

a)

b)

c)
```
  TTh Th H  T  O
    1  8 7  2  4
  + 2  4 1  0  0
```

d)
```
  TTh Th H  T  O
    5  7 8  8
  + 7  2 0  0  8
```

e)
```
  TTh Th H  T  O
    3  9 1  7  5
  + 4  2 3  3  4
```

f)
```
  TTh Th H  T  O
    1  5 2  6  1
          9  8  4
```

② Kate works out 53,175 + 4,362.
```
  TTh Th H  T  O
    5  3 1  7  5
  + 4  3 6  2
    9  6 7  9  5
```
a) What mistake has Kate made?

b) What is the correct answer to the addition?
```
  TTh Th  H  T  O
  +
```

③ Solve the following calculations.
a) 17,270 + 24,195   b) 45,907 + 33,284

④ Work out the missing digits.
a)
```
  TTh Th H  T  O
       3     1  0
  + 2  6 1
       1  6 4  8
```
c) 2☐,3☐7 + 18,☐7☐ = 39,199

b)
```
  TTh Th H  T  O
    7  3 8  2
  +     3  9  5
    7  8     0
```

🔵 Deepen Activities

① What are the missing digits?
The same digit is missing in each calculation.

```
 ☐4 6, 7 3 ☐        ☐ ☐, 2 ☐ 8       4 ☐6, ☐ ☐ ☐
- 1 2 ☐, 6 ☐ 8     - 1 4 8, ☐ ☐ 7     - 1 4 9, 6 5 ☐
   4                     7                  8
```

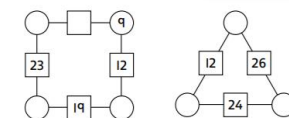I will use the digits in the answers as clues.

② Each letter represents a different digit, 0, 1, 2, 3, 6, 7 or 9. What is the addition?
```
    A  B  C
  + D  B  C
    A  E  F  G
```

③ The number in each square is the total of the two circles either side of it. Complete the puzzles.

In the first puzzle I will think about the order I find the missing numbers.

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Supporting your child

- Talking about maths, e.g. counting
- Fluency
- Adapting the format of our Maths homework:
  - *A work in progress*
  - Times Tables Rock Stars – fluency
  - Developing & deepening understanding…

Earley St Peter's
CE Primary School