Planning Overview
Year 3 Addition and Subtraction

Add and subtract numbers mentally, including

- A three-digit number and ones
- A three-digit number and tens
- A three-digit number and hundreds

Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
Estimate the answer to a calculation and use inverse operations to check answers
Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

3NF–1 Secure fluency in addition and subtraction facts that bridge 10, through continued practice.
3NF–3 Apply place-value knowledge to known additive and multiplicative number facts
AS–1 Calculate complements to 100
AS–2 Add and subtract up to three-digit numbers using columnar methods.
AS–3 Manipulate the additive relationship: Understand the inverse relationship between addition and subtraction, and how both relate to the part–part–whole structure. Understand and use the commutative property of addition, and understand the related property for subtraction.

	Teaching and Learning
Number facts	Before starting this unit consider which skills the children will need to recall from KS1 e.g. • Number bonds to 10 and related facts • Number bonds to 100 and related facts • Adding two 1-digit numbers. • Subtracting a 1-digit number from a teen number Consider whether they need to use tens frames, Numicon or bead strings to be able to 'see' the number facts. For 6 + 7 can they reorder/partition/use near doubles to work it out? Once the children show that they understand number facts continue to consolidate through games, daily routines and home learning.

+	0	1	2	3	4	5	6	7	8	9	10
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+10
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	2+10
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7	3+8	3+9	3+10
4	4+0	4+1	4+2	4+3	4+4	4+5	4+6	4+7	4+8	4+9	4+10
5	5+0	5+1	5+2	5+3	5+4	5+5	5+6	5+7	5+8	5+9	5+10
6	6+0	6+1	6+2	6+3	6+4	6+5	6+6	6+7	6+8	6+9	6+10
7	7+0	7+1	7+2	7+3	7+4	7+5	7+6	7+7	7+8	7+9	7+10
8	8+0	8+1	8+2	8+3	8+4	8+5	8+6	8+7	8+8	8+9	8+10
9	9+0	9+1	9+2	9+3	9+4	9+5	9+6	9+7	9+8	9+9	9+10
10	10+0	10+1	10+2	10+3	10+4	10+5	10+6	10+7	10+8	10+9	10+10

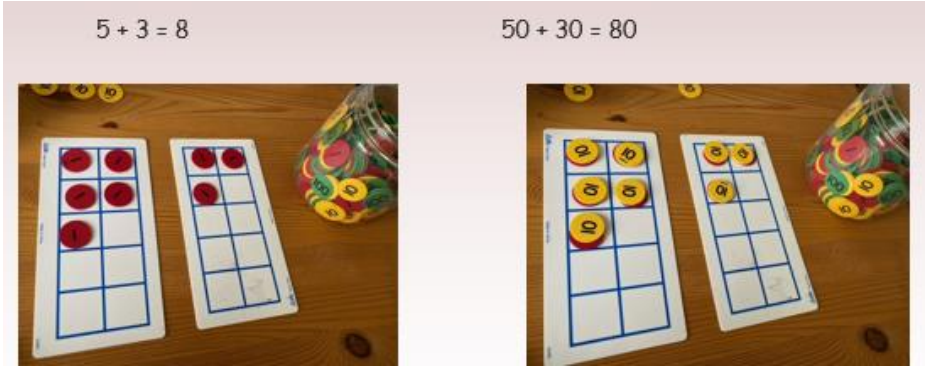
Mathematics guidance: key stages 1 and 2 Non-statutory guidance for the national curriculum in England.

Ask children to reflect on the above calculation grid. How many of these are known facts? Which answers can they establish by doubling or by using near doubles? Which answers can they calculate by compensating or adjusting (adding 9 or 11 by adding 10 and compensating for example) or being able to add by bridging effectively?

Related number facts

3 + 5
30 + 50
300 + 500
3 tens and 5 tens
3 hundreds and 5 hundreds

Use a model and image such as place value counters. Discuss how each yellow counter is 10 times larger than the red counters so each digit in the initial calcualtion becomes 10 times larger.



What is the relationship between 3 + 4 = 7 and 30 + 40 = 70
'The numbers in the second calculation get 10 times larger so the answer gets 10 times larger' How could this understanding help us to tackle calculations like this 50 + 70 = ?

'I need to make each number 10 times smaller to make the calculation 5+7 which is 12. I then need to make my answer 10 times bigger to be able to answer the original question'

Build up to missing box questions

4. Fill in the missing numbers.

$30 + \square = 110$

Mathematics guidance: key stages 1 and 2 Non-statutory guidance for the national curriculum in England.

Show related facts in a bar model/triangle/part-whole model.

300 + 500 = 800, 500 + 300 = 800
800 – 500 = 300, 800 – 300 = 500

Lead to the relationship with missing numbers 300 + ? = 800

3 + 5 will also help with 33 + 5? Why?
What other facts would it help with?

Complete these calculations. What do you notice?

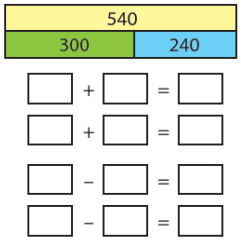
3 + 7 =	8 + 2 =	6 + 4 =
30 + 70 =	80 + 20 =	60 + 40 =
33 + 7 =	88 + 2 =	66 + 4 =
333 + 7 =	888 + 2 =	666 + 4 =
300 + 700 =	800 + 200 =	600 + 400 =

How does the first fact help work out the other facts

Missing box and inverses
Teach children how to use a bar model to find the 4 related calculations in an addition and subtraction fact family. Discuss how addition is the inverse to subtraction.

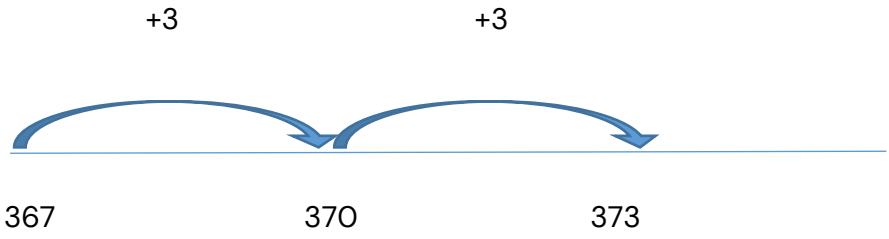
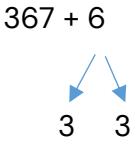
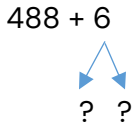
Mastery

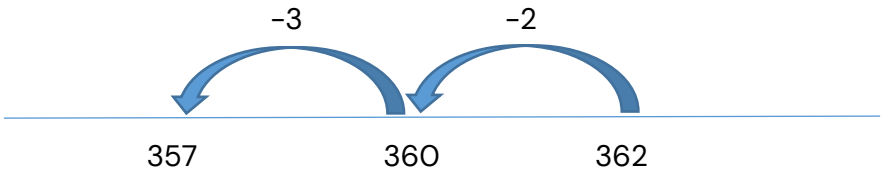
Write the four number facts that this bar model shows.



Solve missing number calculations using related facts from the bar model. E.g. 300 + ? = 540

How could you use a bar model and an addition and subtraction fact family to check the answer to this calculation?
345 + 243 = 588

Adding a 3-digit number and ones mentally	234 + 5 which related fact can we use to work this out? What does it look like on a number line? Use Place Value Counters, what does the starting number look like, what are we doing to it? What does the end number look like? 367 + 6 = Use Place Value Counters, what does the starting number look like, what are we doing to it? What happens when we get ten counters in one column? What does the end number look like? How would you work this out on a number line? How could we partition the 6 to add it on in the most efficient way?   What if we were adding 6 to 488? How would you split it then?  Practise adding numbers using bridging. **Mastery with Greater Depth** For positive integers are the following statements always, sometimes or never true? ■ The sum of 2 odd numbers is even. ■ The sum of 3 odd numbers is even. ■ Adding 5 to a number ending in 6 will sum to a number ending in 1. ■ Adding 8 to a number ending in 2 will always sum to a multiple of 10. Explain why in each case. Children can give True and False examples for the statements above to help decide whether they are S/A/N true. They should then use these examples to create a generalisation to explain why it is Sometimes, Always or Never True.

Subtracting a 3-digit number and ones mentally	236 – 5 which related fact can we use to work this out? What does it look like on a number line? Use Place Value Counters, what does the starting number look like, what are we doing to it? What does the end number look like? 362 – 5 = Use Place Value Counters, what does the starting number look like, what are we doing to it? What happens when we get ten counters in one column? What does the end number look like? How would you work this out on a number line?  362 – 5 = -2 -3 What if we were subtracting 5 from 483? How would you split it then? 483 – 5 = -? -? Practise subtracting numbers using bridging. I think of a number and add 6, my answer is 363 what was my starting number?

Adding a 3-digit number and tens mentally, including compensating

Addition of 10s with no bridging e.g. 40 + 50 and 34 + 40

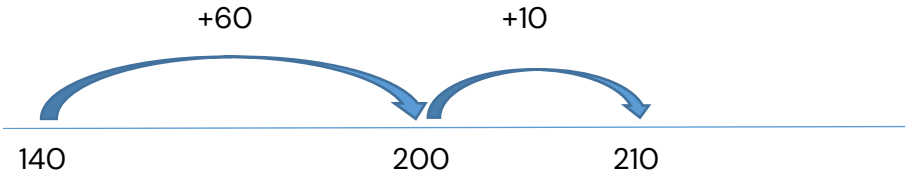
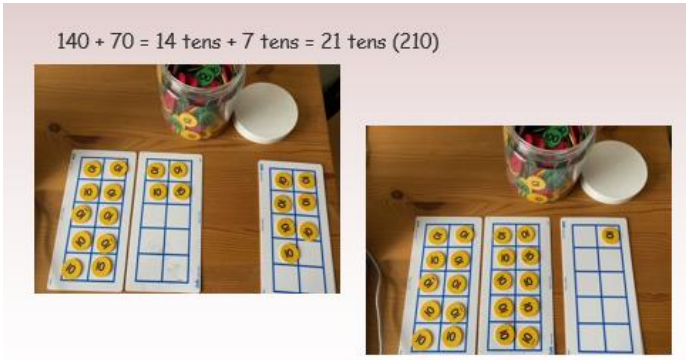
Addition of 10s crossing boundaries. E.g. 70 + 50.

Support children who are struggling to cross the boundary with a 200 grid

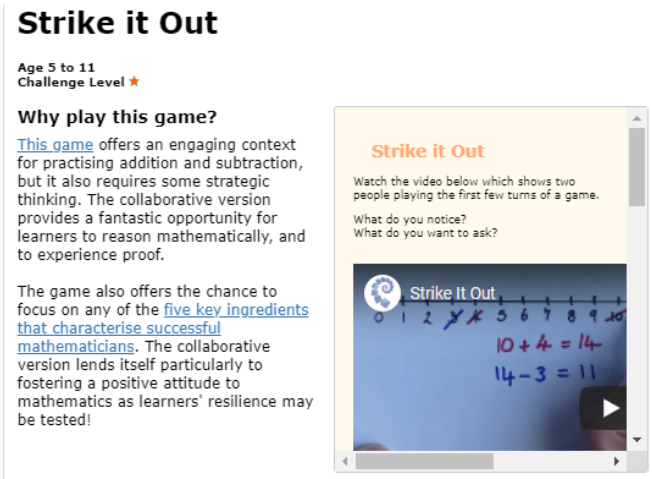
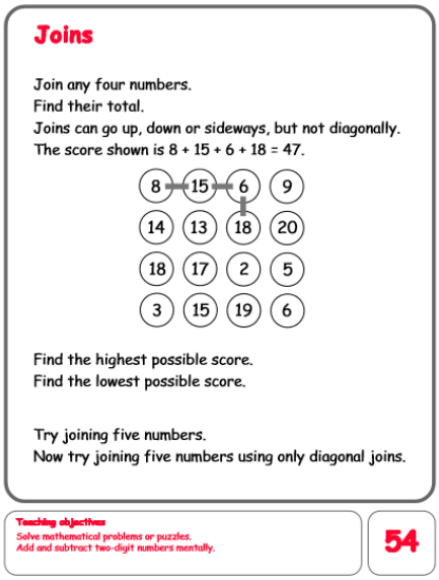
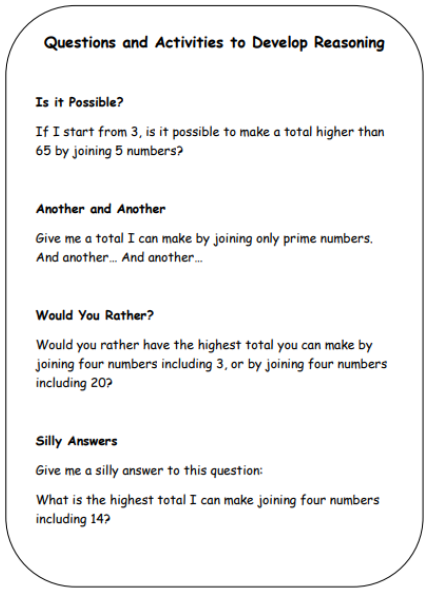
Two-hundred grid

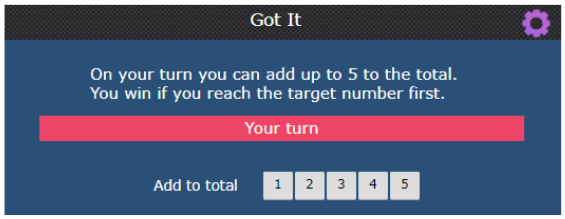
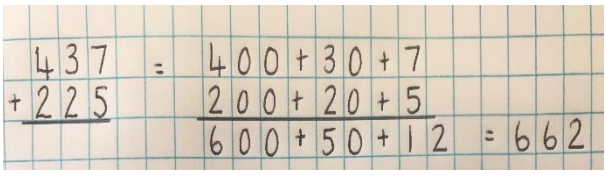
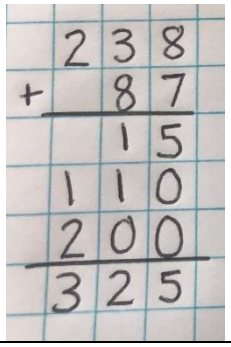
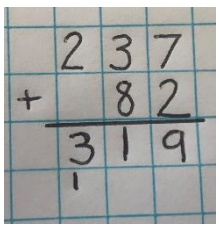
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

NCETM PD Materials

	Addition of 10s crossing boundaries beyond 200. E.g. 140 + 70. Model tackling these calculations in different ways including partitioning the 70 into 60 + 10 in order to bridge through 200. 140 + 60 + 10 Demonstrate on a number line if necessary  See 140 as 14 tens and 70 as 7 tens. 14 tens + 7 tens = 21 tens. 210  Add 10s when there is a value in the 1s column 364 + 70 Reinforce with counters. How would you complete 364 + 90? '90 is a harder number to add on than 100 so I am going to add on 100 instead and then -10 from my answer' Sort questions into Easy and Hard. Explain your thinking.
Subtracting a 3-digit number and tens mentally, including compensating	Subtraction of 10s with no bridging e.g. 90 – 40 and 84 – 30 Subtraction of 10s crossing boundaries 240 – 70. Partition 70 into 40 and 30 to bridge back through 200. 240 – 40 – 30. 24 tens – 7 tens = 17 tens. Children may need support to bridge through the hundreds when there is a number in the ones column. E.g. 234 – 70 234 – 30 = 204 204 – 10 = 194 194 – 30 = 164 23 tens and 4 ones - 7 tens = 16 tens and 4 ones = 164

	234 – 70 partition 70 into 34 and 36 to bridge back through 200. Which method do you prefer? 523 – 80 what range of ways could we do this. Discuss compensation. Extend to missing number and missing digit questions. 14? – 60 = 85 How did you know? 342 - ? = 282 34 tens and 2 28 tens and 2 How many tens would you need to take away?
Adding and subtracting a 3-digit number and hundreds mentally	Add and subtract 100s looking at the digit that changes. I think of a number and subtract 400, my answer is 345, what was my starting number? Word problems. 432 - 300. Write 2 word problems that link to this calculation? Always/sometimes/never linked to a range of digits. E.g. if I add tens, only the tens column changes. Is this always, sometimes or never true?
Estimation	Talk about near numbers. If we were adding 413 + 589 what would be a near answer to this calculation? How can this help us? Why should we bother estimating? **Making and estimate** Which of these calculations have an answer that is between 50 and 60? 173 – 118 334 – 277 931 – 870
Finding the difference	Using a bead string, model how finding the difference still relates to subtraction. 25 – 18. Model counting back first and show that there are 7 beads left at the end of the bead string. Then slide the first 18 beads to the end and show that you can count on from 18 to 25 to show that the difference is 7. Allow children time to become fluent with this strategy.

	Strike it out – NRICH (consolidation of addition facts, finding the difference and subtraction)  **Strike it Out** Age 5 to 11 Challenge Level ★ **Why play this game?** This game offers an engaging context for practising addition and subtraction, but it also requires some strategic thinking. The collaborative version provides a fantastic opportunity for learners to reason mathematically, and to experience proof. The game also offers the chance to focus on any of the five key ingredients that characterise successful mathematicians. The collaborative version lends itself particularly to fostering a positive attitude to mathematics as learners' resilience may be tested! Strike it Out Watch the video below which shows two people playing the first few turns of a game. What do you notice? What do you want to ask? Strike It Out 10 + 4 = 14 14 − 3 = 11 Give children a range of calculations and ask when they would count on and when they would count back.
Problem solving with mental calculations	Joins https://www.first4maths.co.uk/product/maths-challenges-with-reasoning/  **Joins** Join any four numbers. Find their total. Joins can go up, down or sideways, but not diagonally. The score shown is 8 + 15 + 6 + 18 = 47. 8 15 6 9 14 13 18 20 18 17 2 5 3 15 19 6 Find the highest possible score. Find the lowest possible score. Try joining five numbers. Now try joining five numbers using only diagonal joins. Teaching objectives Solve mathematical problems or puzzles. Add and subtract two-digit numbers mentally. 54  **Questions and Activities to Develop Reasoning** **Is it Possible?** If I start from 3, is it possible to make a total higher than 65 by joining 5 numbers? **Another and Another** Give me a total I can make by joining only prime numbers. And another… And another… **Would You Rather?** Would you rather have the highest total you can make by joining four numbers including 3, or by joining four numbers including 20? **Silly Answers** Give me a silly answer to this question: What is the highest total I can make joining four numbers including 14? **Mastery** What do you notice? Is there a relationship between the calculations? 500 + 400 = 523 + 400 = 523 + 28 = 400 + 500 = 423 + 500 = 423 + 28 = 300 + 600 = 323 + 600 = 323 + 28 = 200 + 700 = 223 + 700 = 223 + 28 = 100 + 800 = 123 + 800 = 123 + 48 =

	NRICH – Got it **Got It** **Age 7 to 14** **Challenge Level** ★★ Got It is an adding game for two players. You can play against the computer or with a friend. It is a version of a well known game called Nim. Start with the Got It target 23. The first player chooses a whole number from 1 to 4. Players take turns to add a whole number from 1 to 4 to the running total. The player who hits the target of 23 wins the game. Play the game several times. Can you find a winning strategy? Can you always win? Does your strategy depend on whether or not you go first?  **Mastery with Greater Depth** Flo and Jim are answering a problem: Danny has read 62 pages of the class book, Jack has read 43. How many more pages has Danny read than Jack? Flo does the calculation 62 + 43. Jim does the calculation 62–43. Who is correct? Explain how you know. *Pupils might demonstrate using a bar model to explain their reasoning.*
Written methods of addition	In line with your school calculation policy move from using concrete resources such as, Dienes or Place Value counters to expanded methods then to the compact method as appropriate. Start with no exchange, then exchange in ones column, tens column and then ones and tens. Each time children move to more exchanges they will need to move back through the stages in the CPA approach.   

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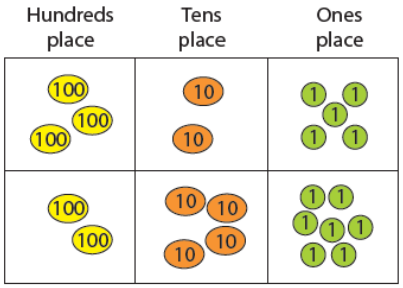
Mastery

Solve calculations using a place value grid and equipment alongside a column method to demonstrate understanding.



325
+ 247
_____

Sam has completed these calculations, but he is incorrect.
Explain the errors he has made.

325
+ 247
581

355
– 247
112

Using the grid below roll the dice 6 times and try to make a number closest to 1000, make it even, make it odd etc. Where have you placed the digits? Why?

Mastery with Greater Depth

There are six 3-digit addition calculations shown below.

a) 124 + 233 = _____

b) 644 + 172 = _____

c) 366 + 277 = _____

d) 579 + 221 = _____

e) 791 + 163 = _____

f) 567 + 233 = _____

Which calculations have no carry digits?
Which calculations have a carrying digit only once?
Which calculations have a carrying digit twice?
Which calculation has the largest answer?
Which calculation has the smallest answer?

Check that children are looking at the numbers involved, rather than doing the calculations.

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<tr>
<td>Written methods of subtraction</td>
<td>In line with your school calculation policy move from using concrete resources such as, Dienes or Place Value counters to expanded methods then to the compact method as appropriate.

Start with no exchange, then requiring exchange into ones column, into the tens column and then into the ones and tens.

Each time children move to more exchanges they will need to move back through the stages in the CPA approach.</td>
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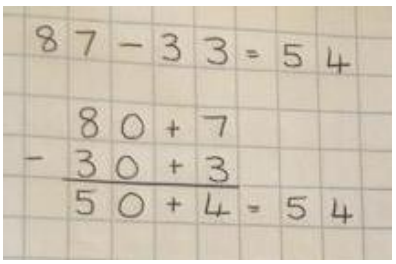
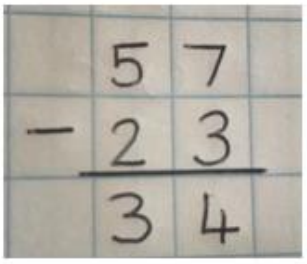
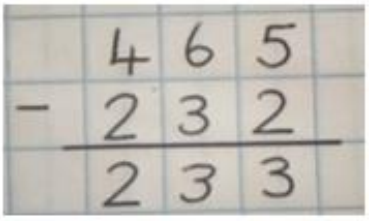
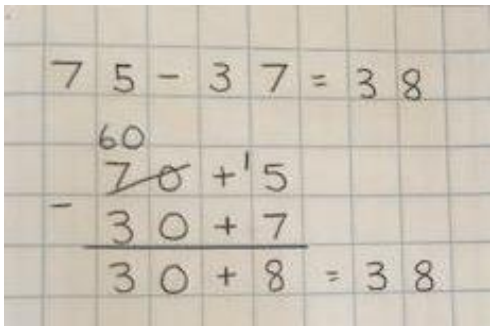
No Exchange



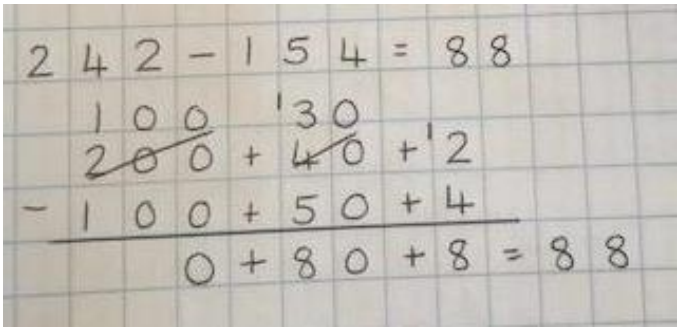




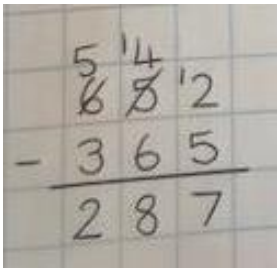
Exchange into the ones column



Exchange into both the tens and ones columns using an expanded method



Exchange into both the tens and ones columns using column method



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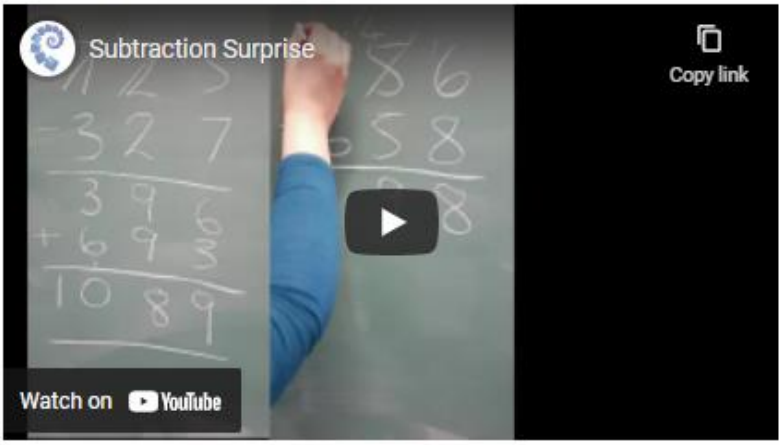
<tr><td></td><td>NRICH – Subtraction Surprise
Subtraction Surprise
Age 7 to 14
Challenge Level ★
In the video below, Alison chooses some three-digit numbers and carries out some calculations which lead to a surprising result!

Watch the video. What do you notice?
Can you figure out the steps that Alison carries out in each calculation?
 
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<tr><td>Problem solving and consolidation</td><td>Give children a range of word problems to solve. Can children identify which are single step problems or multi-step problems?

Can they identify the language associated with additon and subtraction?

Use the bar model to support children when they are deciding which operations are needed to solve the problems. What is the most efficient method to solve each problem?

Move to more open-ended problems as you assess that the children are secure with the range of methods and can solve word problems efficiently. e.g. NRICH- Dicey Operations in a Line

□ □ □ + □ □ □ =

Throw a 1 to 6 dice and each time record the digit in one of the place holders. The aim is to get the sum as low as possible. Repeat to find different answers.
Could you have done it in a different way?
Compete against a friend and compare your answers.</td></tr>
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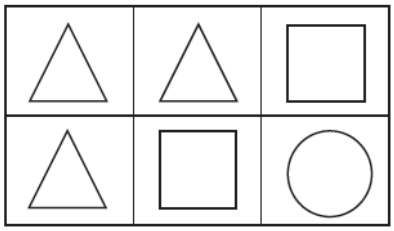
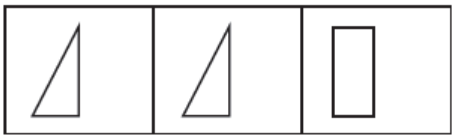
First4Maths Digging Deeper Activity

Present children with the grid. Can children use mental strategies and column addition and subtraction to solve this grid?



The shapes have been halved – what is the total of this row?

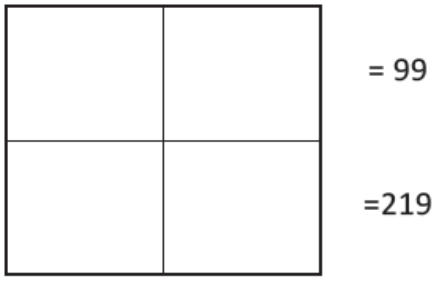


True or false?

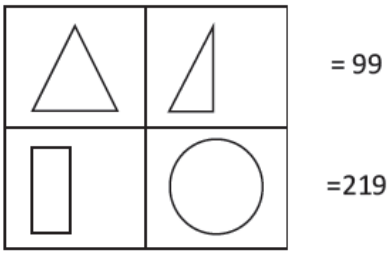
Using all of the shapes we have made so far, we can use 2 shapes to create a total of 127.

Do the shapes have to be wholes? Can the children halve or quarter the original shapes?

Can the children use the shapes to fill in this grid?



Suggested answer



Can children use the shapes to create grids of their own to solve with a partner? What clues/prompts can they give to help their partner solve the grid?