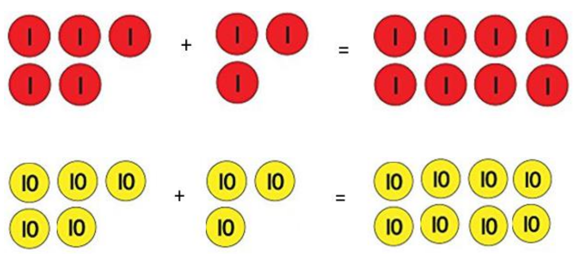
Planning Overview
Year 4 Addition and Subtraction

Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.
Estimate and use inverse operations to check answers to a calculation.
Solve addition and subtraction twostep problems in contexts, deciding which operations and methods to use and why.

4NF–3 Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 100)

	Teaching and Learning
Using Place Value to aid mental calculation – Addition and subtraction of multiples of 1, 10, 100 and 1000. **Same number of digits no bridging**	**Known facts** Children should be able to recognise when known facts will help them with a calculation. Use patterns of calculations and concrete resources like place value counters to help them to identify this for themselves. Ask “What do you notice?” 5 + 3 = 8 50 + 30 = 80 500 + 300 = 800 ‘I have 5 ones added to 3 ones which has given me 8 ones. 5 tens and 3 tens has given me 8 tens. 5 hundreds and 3 hundreds has given me 8 hundreds’ Can the children see how the numbers have been scaled? ‘I have made each number 10 times bigger’ ‘I have made each number 100 times bigger’ Can you continue the pattern? Can you use place value counters to prove this is true?  Will 5000 + 300 be in the pattern? Why not? ‘One number has been made 1000 times bigger whereas the other number has been made 100 times bigger’

Repeat for subtraction
8 – 3 = 5
80 – 30 = 50
800 – 300 = 500

Can you continue the pattern? Can you explain the pattern?

Provide the children with a fact and see what related facts they can work out. Children may like to use a bar model to show the related facts.

Can the children link this to missing number calculations? 8000 – ? = 3000. If the children are secure with using a bar model, this will support them with identifying which part of the bar model represents the missing number.

'I can scale each number down to make the calculation 8 – ? = 3. I know 8 – 5 = 3. I can now scale my missing number up by 1000 to answer my original question.'

Encourage the children to look at patterns like those below to consider the best way to calculate.

Mastery assessment – Left hand column only

Mastery

What do you notice about the calculations below?
Can you find easy ways to calculate?

5000 + 4000 =	5230 + 400 =	5023 + 28 =
4000 + 5000 =	4230 + 500 =	4023 + 28 =
3000 + 6000 =	3230 + 600 =	3023 + 28 =
2000 + 7000 =	2230 + 700 =	2023 + 28 =
1000 + 8000 =	1230 + 800 =	1023 + 48 =

What's the same and what's different about each calculation?

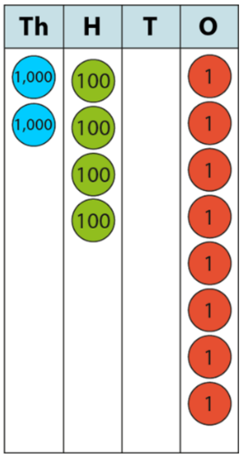
Developing Reasoning
Sometimes/Always/Never
If I add 1000 to one side of a calculation and take 1000 off the other side, the calculation will stay the same.

Do children see that this works for addition but not subtraction?

<table>
<tr>
<td>Add multiples of 1, 10, 100 and 1000

Different number of digits – with bridging</td>
<td>How can place value help us to calculate?

Show the children a number made up on a place chart with place counters or dienes.



If I add 40 to this number, how will it change?

What about 400? 4000?

When do we need to use other methods to help us calculate?

What about if I add 25 to the number?

What impact does it have on the number?

Which part of the number was easy to add, and which was more difficult?

Consider how numbers can be partitioned in different ways to aid calculation. What would be the best way to partition the numbers to help us calculate?

Give the children chance to become secure with mentally calculating questions in the sections below.

3427 + 8 (encourage children to split 8 into 3 + 5 to bridge through 3430)

5370 + 60 (encourage children to split 60 into 30 + 30 to bridge through 5400). Keep 0 in the ones column of the starting number.

3700 + 600 (encourage children to split 600 into 300 + 300 to bridge through 4000). Keep 0 in the tens and ones column of the starting number.

Encourage the children to complete part-part-whole models to help consider how to partition a number to help them calculate mentally.

Now complete adding tens and hundreds when there is a value in the tens and ones columns. Why is this more difficult?

Children may need to complete these in 3 jumps instead of 2 jumps to bridge through the multiples of 100 and 1000.
5375 + 60
+ 20 = 5395
+ 10 = 5405
+ 30 = 5435</td>
</tr>
</table>

<table>
<tr>
<td></td>
<td>3746 + 600
+ 200 = 3946
+100 = 4046
+300 = 4346

Mastery assessment – middle and right-hand column

Mastery
What do you notice about the calculations below?
Can you find easy ways to calculate?
<table>
<tr><td>5000 + 4000 =</td><td>5230 + 400 =</td><td>5023 + 28 =</td></tr>
<tr><td>4000 + 5000 =</td><td>4230 + 500 =</td><td>4023 + 28 =</td></tr>
<tr><td>3000 + 6000 =</td><td>3230 + 600 =</td><td>3023 + 28 =</td></tr>
<tr><td>2000 + 7000 =</td><td>2230 + 700 =</td><td>2023 + 28 =</td></tr>
<tr><td>1000 + 8000 =</td><td>1230 + 800 =</td><td>1023 + 48 =</td></tr>
</table>
Can you order the following calculations from difficult to easy? Why have you put them in this order?
3870 + 50, 6392 + 400, 8367 + 8, 2840 + 4000

True or False – The more digits a number has, the more difficult the calculation?</td>
</tr>
<tr>
<td>Subtract multiples of 1, 10, 100 and 1000</td>
<td>3424 - 8
5320 - 60
6330 - 70
3400 - 600
6300 - 800

What would be the best way to partition the number that you are subtracting? Can you explain why?

6351 - 800
Why is this calculation more difficult to complete mentally?

How do you need to split the number in this calculation?

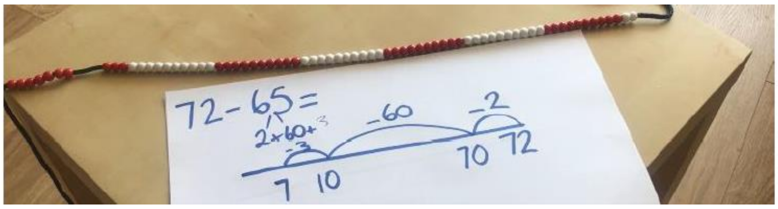
Repeat with all digits having a value.
5325 - 60
6334 - 70
3489 - 600
6336 – 800

Can you order the following calculations from difficult to easy? Why have you put them in this order?
3820 - 50, 2892 - 500, 1363 - 5, 9848 – 3000

Can you create a set of calculations for your partner to order from easy to hard? How have you made calculations more difficult?</td>
</tr>
</table>

Finding the difference

Using a bead string, model how finding the difference still relates to subtraction. To calculate 72 - 65, slide 28 beads out of the way so that you are working with just 72 beads for both methods.

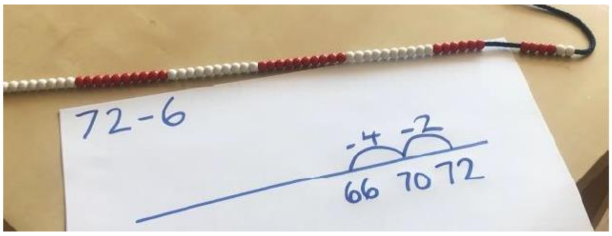


Model subtracting 65 beads by counting them as you slide them to the right (which is equivalent to counting back on a number line). Show that there are 7 beads left at the end of the bead string (see image above). Talk to the children about how it took us a long time to count back all 65 beads.

Then go back to starting position and quickly identify where 65 is counting from the left – you can tell the children that this time you are going to take away 65 beads, starting at the left. Notice the 7 beads that make up the rest of the original 72. Show how this is the equivalent to counting on from 65 to 72 beads and showing that you have 7 beads as a difference between the two numbers.

Repeat with 5 examples where there is a small difference.

Now look at a calculation where it is more efficient to count back e.g. 72 – 6.



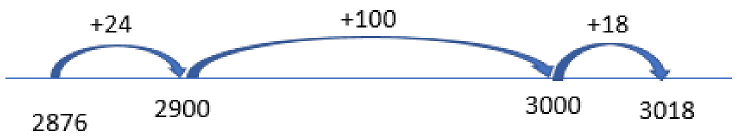
Is it quicker to count on from 6 to 72 or count back 7 from 72?
Talk to the children about which was the most efficient method.

When numbers are close together, finding the difference by counting on from the smaller number to the larger number is the most efficient strategy. When the numbers are far away subtracting the smaller number from the larger number by counting back becomes the most efficient strategy.

Allow children time to become fluent with this strategy, increasing to larger numbers e.g. 2007 – 1995.

3018 – 2876

Because these numbers have a small difference and are both close to 3000, a mental method of counting on from the smaller to the larger number is appropriate:



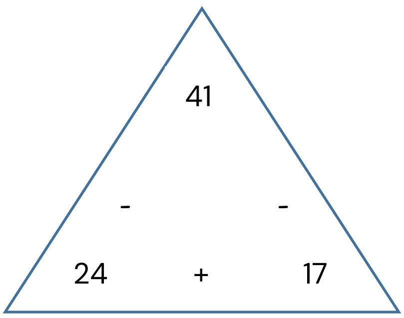
Give children a range of calculations and ask when they would count on and when they would count back.

Greater Depth – can children create their own calculations to show when to count on and count back?

Use addition and subtraction to calculate the inverse

Reinforce the use of the number facts triangle and bar model to explore the relationship between addition and subtraction.

41	
24	17



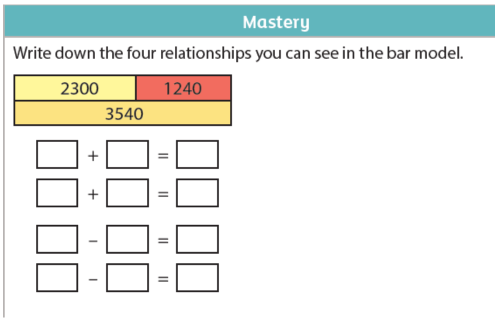
24 + 17 = 41

17 + 24 = 41

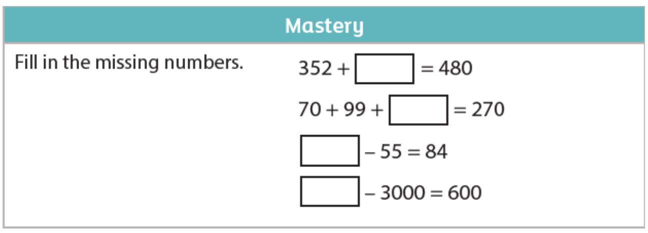
41 – 17 = 24

41 – 24 = 17

Allow children time to practise finding the four related facts.



How could you use these models and images to help you to decide what operation to use in calculations like these below? What mental methods can you use to solve these calculations?



Have children retained their written methods from Y3?
Once children understand the inverse with mental calculations, this may be a good opportunity to assess their retention of written methods.

234 + ? = 653
817 – ? = 345
? – 431 = 256

Is a mental method efficient or do you need to use a written method?

Mastery with Greater Depth

Find the missing numbers.
What do you notice?

Make 9999	Make 9998	Make 9990
5000 + ☐ = 9999	5230 + ☐ = 9998	5023 + ☐ = 9990
4000 + ☐ = 9999	4230 + ☐ = 9998	4023 + ☐ = 9990
3000 + ☐ = 9999	3230 + ☐ = 9998	3023 + ☐ = 9990
2000 + ☐ = 9999	2230 + ☐ = 9998	2023 + ☐ = 9990
1000 + ☐ = 9999	1230 + ☐ = 9998	1023 + ☐ = 9990

Encourage children to use the inverse operation to check calculations.

Spot the mistake – use the inverse operation to check if this calculation is correct.

3455 + 5433 = 8988

Reordering

Use practical resources to explore how reordering numbers in a calculation can help us find a solution more efficiently.

e.g. Use Numicon to support children in seeing number bonds within a set of numbers like 17 + 28 + 13

Ask children to think about other calculations where a different order would make the calculation easier.
Include larger numbers. E.g.
2400 + 850 + 600 + 50 =
146 + 58 – 26 =

Use money, Dienes and place value counters to help support the concept of using number bonds to make a complete ten, hundred, thousand or whole number.

<table>
<tr>
<td></td>
<td>

Mastery

Ali and Sarah calculate 420 + 221 + 280 using different strategies.

This is Sarah's strategy:	This is Ali's strategy:
420 + 221 + 280	420 + 221 + 280
420 + 221 = 641	420 + 280 = 700
641 + 280 = 921	700+ 221 = 921
Answer = 921	Answer = 921

Which do you prefer?

Explain your reasoning.

Now calculate 370 + 242 + 130 using your preferred strategy.

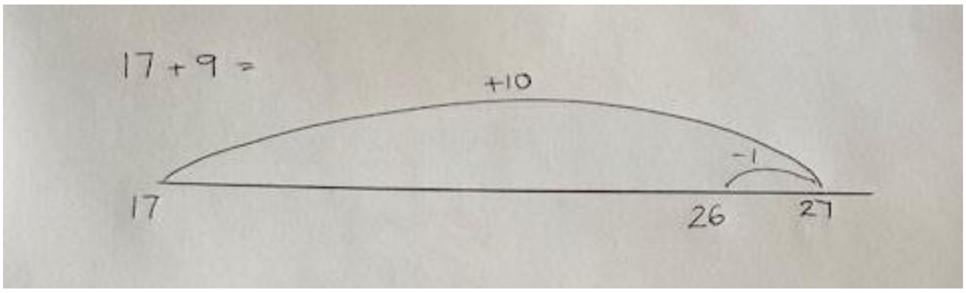
</td>
</tr>
<tr>
<td>

Compensating

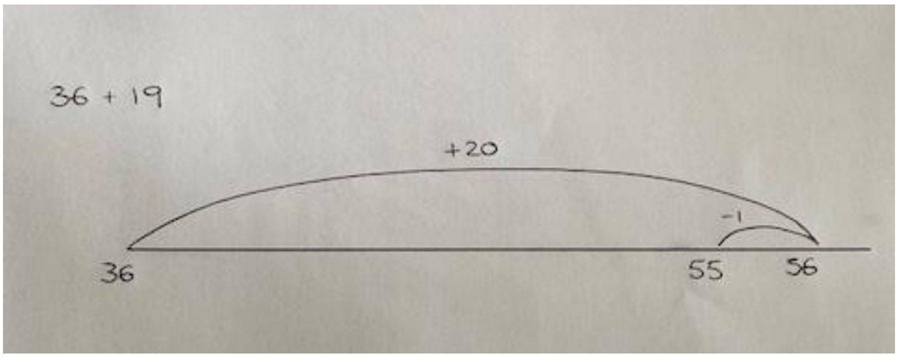
</td>
<td>

Discuss adding 9 to a number. Talk to the children about adding 10 to the number instead but them compensating for what they have done by subtracting one from their answer.

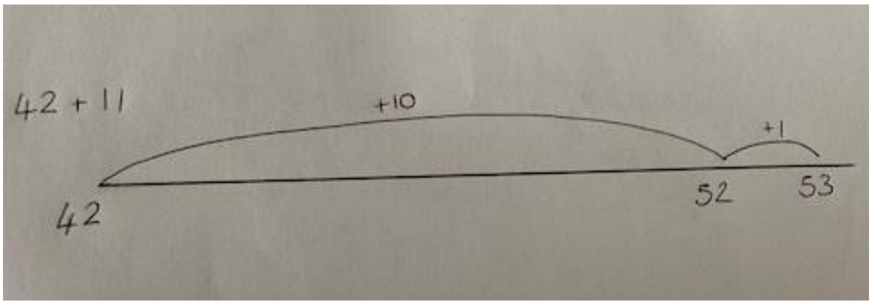
Model on a blank number line



Apply this to adding other near multiples of 10 e.g. adding 19…



Demonstrate how the number line can support adding 11, 21, etc

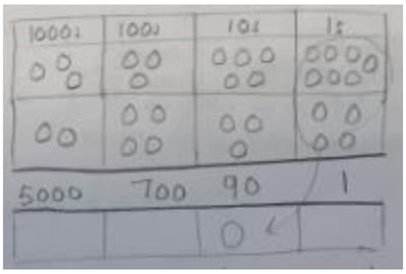


</td>
</tr>
</table>

	Repeat for subtraction of other near multiples of 10. Ask children to consider if they would see a pattern when adding 8, 18, etc… Explore patterns to help children apply the concept to other numbers e.g. adding/subtraction of 90, 900, 9000… 7 + 9 = 16 70 + 90 = 160 700 + 900 = 1600 Can they suggest whether 70000 + 9000 would be in the sequence? Why not? Adam wants to use partitioning to do these subtractions: 83 - 28 142 – 98 256 – 129 Has he chosen the best method? Can you explain to Adam why you think you may have a better method?
Estimation	Recap rounding numbers. If we were adding 413 + 589, how would we use rounding to estimate an answer to this calculation? How can this help us? Why should we bother estimating? Making an estimate Which of these calculations have an answer that is between 500 and 600? 1733 – 1187 3345 – 2776 9314 – 8756 Estimation can now be consolidated as we teach children the written methods.
Using a standard written method to add 4-digit numbers	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, hundreds column. Finally calculations where more than one exchange is needed - ones and tens, ones and hundreds, then ones, tens and hundreds. To ensure deep conceptual understanding of why they are exchanging, children may need to move back through the stages in the CPA approach as the calculations get more complex.

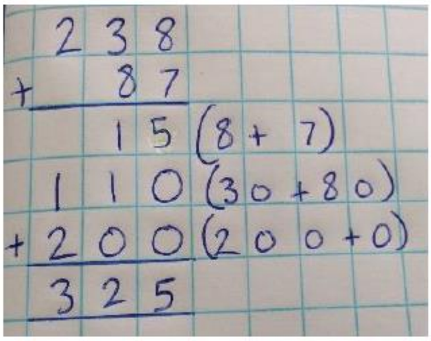
	Encouraging the children to draw pictorial representations of the calculations they are completing.

Encourage the children to draw pictorial representations of the calculations they are completing.



Once the understanding is embedded move to the written method for 3-digit and then 4-digit numbers.

For some children look at the expanded method – either expanded in this way

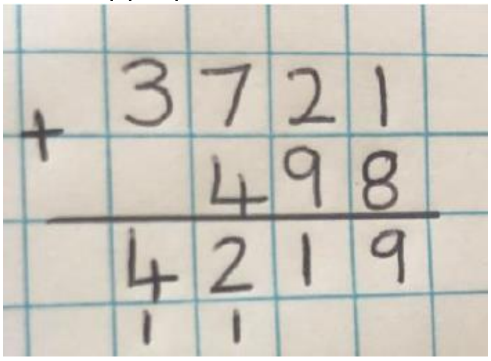


Or this way

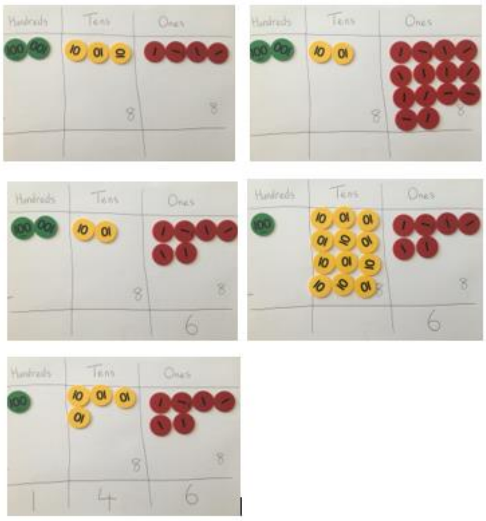
Expanded Method

200	and	40	and	3
300	and	60	and	8
600	and	10	and	1
100		10		

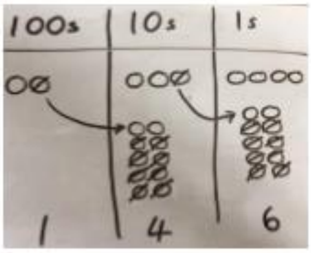
When appropriate move onto the compact method.



	Encouraging children to complete missing digit calculations.
	
	First with no regrouping
	  5 ? 4 ?
	+ ? 5 ? 5
	  8 8 7 8
	
	Then with regrouping
	  3 ? 4 ?
	+ ? 5 ? 7
	  8 3 1 9
	
	Play with a partner. Decide on a 4-digit target number. Take turns to throw a 0-9 dice to generate a digit. Decide where to place it. Try to make the total as close to your target as possible. Encourage children to estimate the possible total as they are playing.
	  □ □ □ □
	+ □ □ □ □

Using a standard written method to subtract 4-digit numbers	As with addition, use Dienes or place value counters on a place value grid to help children understand the concept of exchange. Unlike addition, only represent the larger number with materials. Ask children why we don't represent both numbers (we are taking the smaller number away from the larger).  Here, 234 – 88 is represented. 1 ten is exchanged for 10 ones to enable us to take 8 ones away from the 4 ones we have. 8 are removed to leave 6 ones. In order to take 8 tens away from the 2 tens we have left, another exchange of 1 hundred for 10 tens is done. Again 8 tens are now taken to leave 4 tens. 1 hundred remains.

Encourage children to record the process in pictorial form:



Some children may benefit from recording the calculation in expanded form before moving to a compact method. For example:

563 – 248

500 and 60 and 3
<u>-200 and 40 and 8</u>

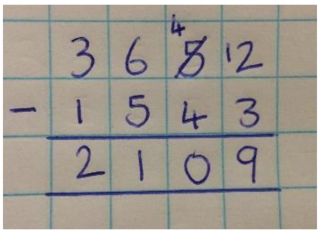
Exchange 60 into 50 and 10

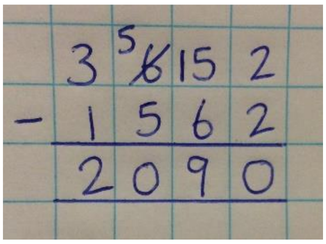
500 and 50 and 13
<u>-200 and 40 and 8</u>
300 and 10 and 5

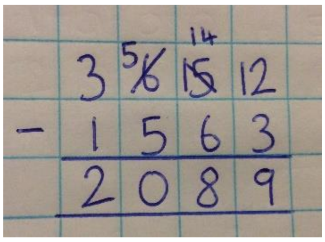
5 1
5~~6~~3
- <u>248</u>
<u>315</u>

Ask children "What is the same and what is different?

Move the children onto completing 4-digit fluency questions.
No exchange, exchange in the tens, exchange in the hundreds and then exchange in both. Children may need to revert to an expanded method at these stages.







Complete a variety of missing digit calculations.

Adjusting numbers to manipulate standard written method	*NB – this strategy can be difficult for children to retain if they do not gain a clear understanding of the difference between adjusting when adding and when you are subtracting. If children are confident with the previous mental and written methods, allow them to explore this method while other children in the class consolidate their understanding of the previous methods. This method can then be revisited in money and measure for those that are able to retain in.* Encourage the children to consider when we can play with (adjust) a number to make the calculation more efficient. **Addition** 2999 + 1 3000 + 6789 - 1 + 6788 With addition if you +1 to one number it needs to be taken away from the other number to give an equivalent calculation Can children use smaller numbers and resources to explain why this works e.g. 9 + 6 on two tens frames, then move one counter from the 6 and add it to the 9 to show 10 + 5 is the same amount of counters but adjusted. Practise with larger numbers and numbers where the adjusting is by more than 1? E.g. 5995 + 2396 add and subtract 5 to make an equivalent calculation of 6000 + 2391 **Subtraction** When subtracting the difference between the two numbers needs to stay the same so we subtract one from each side. We need to adjust but maintain the difference  7000 -1 6999 5456 -1 5455 These numbers have the same difference but 6999 – 5455 is an easier calculation than 7000 - 5456 Start with small numbers e.g. 20 – 6, if we take one away from our starting number before we calculate we need to take away one less so the number we are taking away needs to be one less e.g. 20 – 6 = 19 – 5 5000 – 2749 is equal to 4999 – 2748, why is this easier to calculate?

Mastery with Greater Depth

Write >, = or < in each of the circles to make the number sentence correct.

1023 + 24 + 24 ◯ 1023 + 48

1232 – 232 ◯ 1355 – 252

1237 – 68 + 32 ◯ 1242 – 69 + 31

Pupils should reason about the numbers and relationships, rather than calculate.

Ask children to consider whether they would use a mental or written method for these calculations. This may depend on the numbers that they put in the bars in the final bar model. Can you add 493 and 754 using adjusting/compensating or is a written method more efficient?

Mastery with Greater Depth

Identify the missing numbers in these bar models. They are not drawn to scale.

1000		
	353	354

2000		
493		754

Select your own numbers to make this bar model correct.

5000		

Reflecting on an appropriate method.

Encourage the children to consider how they would solve a set of calculations? Choose the most appropriate strategy and show your workings:

Reordering
Partitioning
Counting on or back (number line)
Compensating
Adjusting
Formal written method

Mastery

Decide on a mental or written strategy for each of these calculations and perform them with fluency.

- 64 + 36
- 640 + 360
- 64 + 79 + 36
- 378 + 562
- 876 + 921
- 999 + 999
- 1447 + 2362
- 1999 + 874

First4Maths – Digging Deeper Activity

The children take on the role of teacher.
You have been asked to teach a year 4 class in another school. The children have sorted their calculations into the methods that they would use to solve them. Do you agree with where they have placed them? Can you explain why you agree or disagree?

Recall	Mental strategies	Mental strategies with jottings	Written methods
1000 – 200 2006 + 1999 234 + 450	2001 + 3005 750 + 250 6578 – 2489	685 + 425 1005 – 992 999 + 999	4537 + 2682 7643 – 2756 7000 – 4549

You need to set another activity for the children so that they can practise their addition and subtraction methods. What calculations would you put in each section? Why have you put them in that section? How would you hope that the children would solve each question?

Recall	Mental strategies	Mental strategies with jottings	Written methods

Mastery with Greater Depth

Write three calculations where you would use mental calculation strategies and three where you apply a column method.

Explain the decision you made for each calculation.

Solve addition and subtraction two step problems in contexts, deciding which operations and methods to use and why

Explore a variety of word problems involving addition and/or subtraction.

Give children the opportunity to sort word problems into one-step or two-step and then sort into addition, subtraction or both.

Ask children to evaluate the methods that they have chosen to use for each calculation. Was it the most efficient method? Why?

Mastery

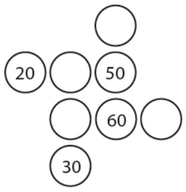
Fill in the empty boxes to make the equations correct.

$\boxed{7}\boxed{}\boxed{1} + \boxed{}\boxed{3}\boxed{} = 999$

$\boxed{7}\boxed{}\boxed{1} + \boxed{}\boxed{3}\boxed{} = 1000$

Mastery with Greater Depth

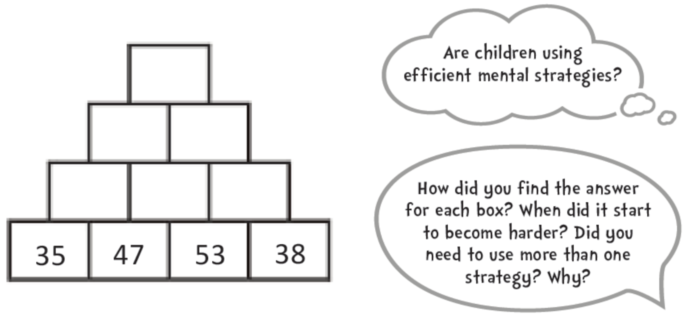
Complete this diagram so that the three numbers in each row and column add up to 140.



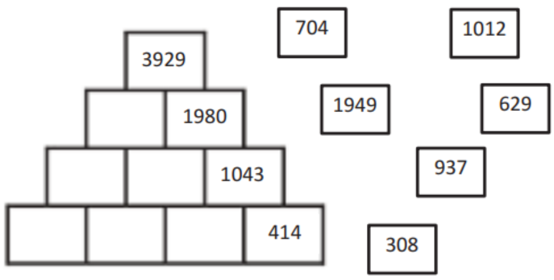
Now create your own diagram with a total of 250.

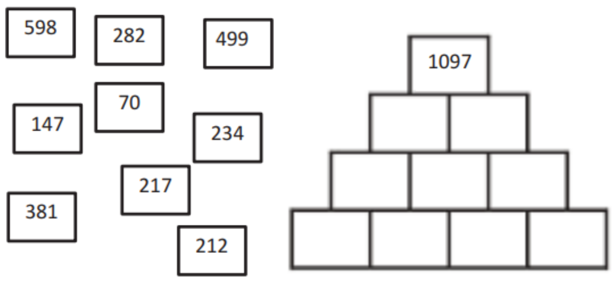
First4Maths – Digging Deeper Problem Solving

Show the children the pyramids below. Explain that to complete the pyramids the children will need to find the totals of the two boxes below.



These blocks have fallen out of the pyramid, how do you know where to put them?





Explain to the children that they are now going to have the opportunity to design a pyramid for their partner to solve. They are not going to fill in any numbers on the pyramid but give their partner all the building blocks to be able to put it together.