Maths Calculation Policy for Subtraction

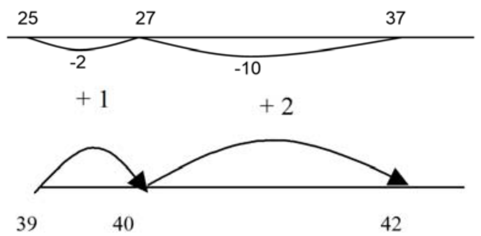
Mental Strategies

Year 2

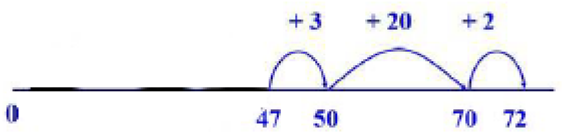
Mental Strategies

Missing number problems:
52 – 8 = □; □ – 20 = 25; 22 = □ + 14;
6 + □ + 3 = 11

It is valuable to use a range of representations (also see Y1).
Continue to use number lines to model take away and difference.
e.g.

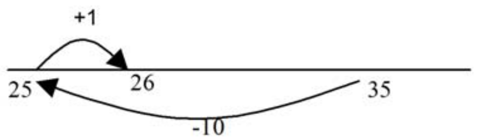


The link between the two may be supported by an image like this, with 47 being taken away from 72, leaving the difference, which is 25.



Children should **count regularly, on and back**, in **steps of 2, 3, 5 and 10**. Counting back in tens from any number should lead to subtracting multiples of 10.

Number lines should continue to be an important image to support thinking, for example to model how to subtract 9 by adjusting (round and adjust).



Children should practise subtraction to 20 to become increasingly fluent. They should use the facts they know to derive others,
e.g. using 10 - 7 = 3 and 7 = 10 - 3 to calculate 100 - 70 = 30 and 70 = 100 - 30.

As well as number lines, 100 squares could be used to model calculations such as 74 – 11, 77 – 9 or 36 – 14, where partitioning or adjusting are used. On the example below, 1 is in the bottom left corner so that 'up' equates to 'add'.

Year 3

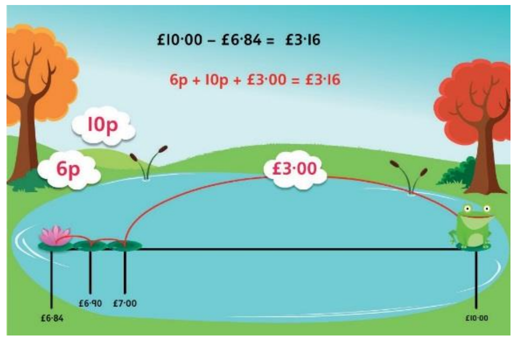
Mental Strategies

Missing number problems:
□ = 43 – 27; 145 – □ =138; 274 – 30 = □;
245 – □ = 195; 532 – 200 = □;
364 – 153 = □

Mental methods should continue to develop, supported by a range of models and images.
Children should continue to count regularly, on and back, now including **multiples of 4, 8, 50, and 100**, and **steps of 1 and 10.**

The **number line** should continue to be used as an important image to support thinking, and the use of **informal jottings** should be encouraged where appropriate. For example when using counting up for subtractions involving money, including finding change.

Use **counting up subtraction** to find change from £1, £5 and £10.
e.g. £10·00 – £6·84



Children should continue to **partition numbers** in different ways. They should be encouraged to choose the **mental strategies which are most efficient for the numbers involved**,
e.g.
counting up (difference, or complementary addition) for 201 –198;
counting back (taking away / partition into tens and ones) for 201 – 12.

The **strategy of adjusting** (round and adjust) can be taken further, e.g.
Subtract 100 and add one back on to subtract 99.
Subtract other near multiples of 10 using this strategy.

The **bar model** should continue to be used to help with problem solving (see Y1 and Y2).
Children should make choices about whether to use complementary addition or counting back, depending on the numbers involved.

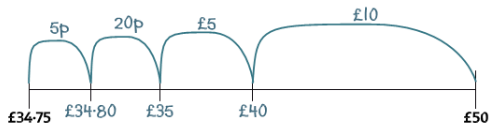
Year 4

Mental Strategies

Missing number/digit problems:
456 + □ = 710; 1□7 + 6□ = 200;
60 + 99 + □ = 340; 200 – 90 – 80 = □;
225 - □ = 150; □ – 25 = 67;
3450 – 1000 = □; □ -2000 = 900

Mental methods should continue to develop, supported by a range of models and images.
The **number line** should continue to be used as an important image to support thinking, and the use of **informal jottings** should be encouraged where appropriate. For example when using counting up for subtractions involving money, including finding change.

e.g. Buy a computer game for £34·75 using £50.



The **bar model** should continue to be used to help with problem solving.

Children should continue to **count regularly**, on and back, now including **multiples of 6, 7, 9, 25 and 1000, and steps of 1 and 100.**

Children should continue to **partition** numbers in different ways.
They should be encouraged to choose from a **range of strategies**:
- **Counting forwards and backwards:** 124 – 47, count back 40 from 124, then 4 to 80, then 3 to 77
- **Reordering:** 28 + 75, 75 + 28 (thinking of 28 as 25 + 3)
- **Partitioning - counting on or back:** 5.6 + 3.7, 5.6 + 3 + 0.7 = 8.6 + 0.7
- **Partitioning - bridging through multiples of 10:** 6070 – 4987, 4987 + 13 + 1000 + 70
- **Round and adjust:** 138 + 69, 138 + 70 - 1
- **Partitioning** - using **'near' doubles:** 160 + 170 is double 150, then add 10, then add 20, or double 160 and add 10, or double 170 and subtract 10
- **Partitioning - bridging through 60** to calculate a time interval – What was the time 33 minutes before 2.15pm?

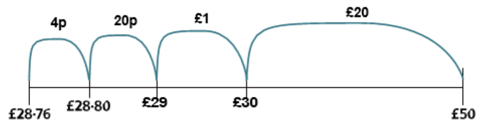
Year 5

Mental Strategies

Missing number/digit problems:
6.45 = 6 + 0.4 + □;
119 - □= 86;
1 000 000 - □ = 999 000;
600 000 + □ + 1000 = 671000;
12 462 – 2 300 = □

Mental methods should continue to develop, supported by a range of models and images.
The **number line** should continue to be used as an important image to support thinking, and the use of **informal jottings** should be encouraged where appropriate. For example when using counting up for subtractions involving money, including finding change.

e.g. £50 – £28·76



The **bar model** should continue to be used to help with problem solving.

Children should continue to **count regularly**, on and back, now including steps of powers of 10.
Children should continue to **partition** numbers in different ways.
They should be encouraged to choose from a **range of strategies**:
- **Counting forwards and backwards** in tenths and hundredths: 1.7 + 0.55
- **Reordering**: 4.7 + 5.6 – 0.7, 4.7 – 0.7 + 5.6 = 4 + 5.6
- **Partitioning - counting on or back**: 540 + 280, 540 + 200 + 80
- **Partitioning - bridging through multiples of 10**
- **Round and adjust**: 5.7 + 3.9, 5.7 + 4.0 – 0.1
- **Partitioning - using 'near' double**: 2.5 + 2.6 is double 2.5 and add 0.1 or double 2.6 and subtract 0.1
- **Partitioning - bridging through 60** to calculate a time interval: It is 11.45. How many hours and minutes is it to 15.20?
- **Using known facts and place value** to find related facts.

Year 6

Mental Strategies

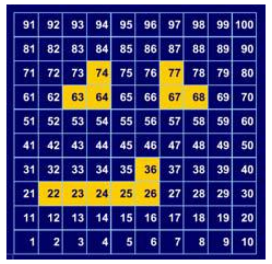
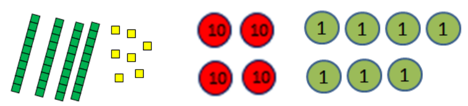
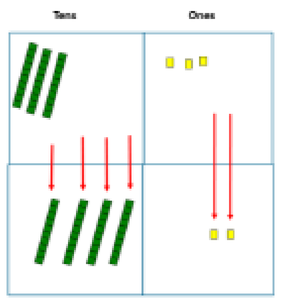
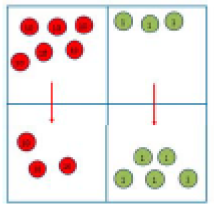
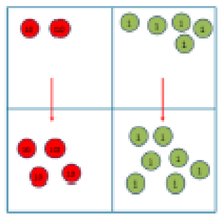
Missing number/digit problems:
□ and # each stand for a different number.
= 34. # + # = □ + □ + #.
What is the value of □?
What if # = 28? What if # = 21?
10 000 000 = 9 000 100 + □
7 – (2 x 3) = □; (7 – 2) x 3 = □;
(□ - 2) x 3 = 15

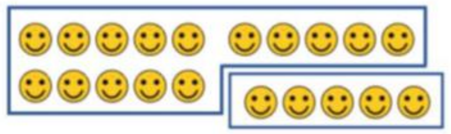
Mental methods should continue to develop, supported by a range of models and images, including the number line.
The **number line** should continue to be used as an important image to support thinking, and the use of **informal jottings** should be encouraged where appropriate (for calculating time problems and when working with negative numbers).

The **bar model** should continue to be used to help with problem solving.

Consolidate previous years.

Children should experiment with the order of operations, investigating the effect of positioning the brackets in different places, e.g. 20 – (5 x 3) = 5;
(20 – 5) x 3 = 45

	 Children should learn to **check their calculations**, including by adding to check (using the **inverse**). They should continue to see subtraction as both take away and finding the difference, and should find a small difference by counting up. They should use **Dienes** to model **partitioning** into tens and ones and learn to partition numbers in different ways, e.g. 23 = 20 + 3 = 10 + 13. The **bar model** should continue to be used, as well as images in the context of **measures**.	**Manipulatives** can be used to support mental imagery and conceptual understanding. Children need to be shown how these images are related e.g. What's the same? What's different? 	• **Using known facts and place value** to find related facts.		
Written Methods	**Towards a Written Method** Recording addition and subtraction in expanded columns can support understanding of the quantity aspect of place value and prepare for efficient written methods with larger numbers. The numbers may be represented with Dienes apparatus for those who need a less abstract representation. e.g. 75 – 42  70 5 - 40 2 30 3 **Generalisations** • Noticing what happens when you count in tens (the digits in the ones column stay the same). • Odd – odd = even; odd – even = odd etc. • show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot. • Recognise and use the **inverse** relationship between addition and subtraction and use this to check calculations and missing number problems. This understanding could be supported by images such as this:	**Towards a Written Method (progressing to 3-digits)** Introduce expanded column subtraction with no decomposition, modelled with place value counters (Dienes could be used for those who need a less abstract representation).  90 8 - 30 5 60 3 For some children this will lead to exchanging, modelled using place value counters (or Dienes).  60 12 ~~70~~ ~~2~~ - 40 7 20 5 Move on to expanded column subtraction with 3-digit numbers. 140 700 ~~40~~ 13 ~~800~~ ~~50~~ ~~3~~ - 300 60 9 400 80 4	**Written Methods (progressing to 4-digits)** The use of a formal columnar algorithm, will initially be introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method. **Sequence of borrowing**: • Borrow from the hundreds to help the tens • Borrow from the tens to help the units • Borrow from more than one column When understanding of the expanded method is secure, children will move on to the formal method of decomposition (which can be initially modelled with place value counters). e.g. 726 – 358 110 600 ~~10~~ 16 ~~700~~ ~~20~~ ~~6~~ - 300 50 8 300 60 8 6 11 16 ~~7~~ ~~2~~ ~~6~~ – 3 5 8 3 6 8	**Written Methods (progressing to more than 4-digits)** If not already using the compact column method of subtraction, when individual children's understanding of the expanded method is secure, children will progress on to the formal columnar method of decomposition for subtracting whole numbers and decimal numbers as an efficient written algorithm. e.g. 16 324 - 8516 0 15 13 1 14 ~~1~~ ~~6~~ ~~3~~ ~~2~~ ~~4~~ – 8 5 1 6 7 8 0 8 This can be initially modelled with place value counters if necessary to aid understanding. **Estimate by rounding**, then check estimate against actual answer. Use the **inverse operation to check**. Progress to calculating with **decimals**, including those with different numbers of decimal places. **Generalisations** The difference between a number and its reverse will be a multiple of 9 e.g. 14 and 41 (difference = 27) 26 and 62 (difference = 36)	**Written Methods** Same as Year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency with decomposition to be secured. e.g. 34 685 – 16 458 2 14 7 15 ~~3~~ ~~4~~ 6 ~~8~~ ~~5~~ – 1 6 4 5 8 1 8 2 2 7 Continue calculating with decimals, including those with different numbers of decimal places. **Estimate by rounding**, then check estimate against actual answer. Use the **inverse operation to check**. **Generalisations** Order of operations: brackets first, then multiplication and division (left to right) before addition and subtraction (left to right). Children could learn an acrostic such as BIDMAS. Subtracting numbers makes them smaller.

	 $15 + 5 = 20$ **<u>Problem Solving</u>** Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.	**<u>Generalisations</u>** Odd – odd = even etc. (see Year 2). Inverses and related facts – develop fluency in finding related addition and subtraction facts. Develop the knowledge that the inverse relationship can be used as a checking method. If and when appropriate, **estimate by rounding**, then check estimate against actual answer. When possible use the **inverse operation to check**. **<u>Problem Solving</u>** Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. **<u>Fractions</u>** Begin to subtract fractions with the same denominator e.g. $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$ Use fractions that add to 1 to find fraction complements to 1 e.g. $1 - \frac{1}{4} = \frac{3}{4}$ $1 - \frac{5}{8} = \frac{3}{8}$	Build on expanded column subtraction to develop compact column subtraction (decomposition) with 4-digit numbers. **Estimate by rounding**, then check estimate against actual answer. When possible use the **inverse operation to check**. **<u>Problem Solving</u>** Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. 1200 110 7000 ~~200~~ ~~10~~ 18 ~~8000~~ ~~300~~ ~~20~~ ~~8~~ - 5000 600 70 9 2000 600 40 9 7 12 11 18 8 ~~3~~ ~~2~~ ~~8~~ - 5 6 7 9 2 6 4 9 **<u>Fractions</u>** Subtract fractions with the same denominator e.g. $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$ Use fractions that add to 1 to find fraction complements to 1 e.g. $1 - \frac{1}{4} = \frac{3}{4}$ $1 - \frac{5}{8} = \frac{3}{8}$	**<u>Problem Solving</u>** Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. **<u>Fractions</u>** Subtract related fractions e.g. $\frac{3}{4} - \frac{1}{8} = \frac{5}{8}$	**<u>Problem Solving</u>** Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. **<u>Fractions</u>** Subtract unlike fractions including mixed numbers e.g. $\frac{3}{4} - \frac{1}{3} = 5/12$ e.g. $2\frac{1}{4} - 1\frac{1}{3} = 11/12$

Vocabulary	**<u>Vocabulary</u>** -, subtraction, subtract, take away, difference, difference between, minus How many more to make…? =, equals, sign, is the same as, tens, ones/units, partition, near multiple of 10, tens boundary, less than, one less, two less…ten less…one hundred less more than, one more, two more… ten more… one hundred more	**<u>Vocabulary</u>** Hundreds, tens, ones/units, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, rounding, expanded column addition, expanded column subtraction, exchange. *See also Y2*	**<u>Vocabulary</u>** add, addition, sum, more, plus, increase, total, altogether, double, near double How many more to make..? How much more? Ones/units boundary, tens boundary, hundreds boundary, thousands boundary, tenths boundary, hundredths boundary, rounding, inverse How many more/fewer? =, equals sign, is the same as, expanded column addition, expanded column subtraction, compact column addition, compact column subtraction	**<u>Vocabulary</u>** Tens of thousands boundary, *also see previous years*	**<u>Vocabulary</u>** *See previous years*
Opportunities for Mastery	**NCETM/AET Challenges** Is this true or false? If I know that 7 + 2 = 9, what else do I know? (e.g. 2 + 7 = 9; 9 – 7 = 2; 9 – 2 = 7; 90 – 20 = 70 etc.) What do you notice? What patterns can you see?	**NCETM/AET Challenges** What's the same? What's different? Can you spot the mistake? Convince me? Always, Sometimes, Never Show Me Prove It Think (Abacus) Do, then explain True or false? Odd One Out The answer is… What is the question?	**NCETM/AET Challenges** What's the same? What's different? Can you spot the mistake? Convince me? Always, Sometimes, Never Show Me Undo Prove It Think (Abacus) Do, then explain True or false? Odd One Out The answer is… What is the question?	**NCETM/AET Challenges** What's the same? What's different? Can you spot the mistake? Convince me? Always, Sometimes, Never Show Me Undo Prove It Think (Abacus) Do, then explain True or false? Odd One Out The answer is… What is the question?	**NCETM/AET Challenges** What's the same? What's different? Can you spot the mistake? Convince me? Always, Sometimes, Never Show Me Undo Prove It Think (Abacus) Do, then explain True or false? Odd One Out The answer is… What is the question?