National Curriculum Programme of Study:

- Add and subtract numbers mentally, including;
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds
- Estimate the answer to a calculation and use inverse operations to check answers
- Add and subtract amounts of money to give change, using both £ and p in practical contexts
- Compare durations of events [for example to calculate the time taken by particular events or tasks]

Y3

MENTAL CALCULATION

Addition & Subtraction

FLUENCY

By the end of Year 3, pupils should fluently derive and recall:

- pairs of two-digit numbers with a total of 100, e.g. 42+58, or 42+☐=100
- all sums and differences of multiples of 10 with up to 3 digits, e.g. 50+80, 120-90, 760+120
- addition doubles for multiples of 10 to 100 and beyond, e.g. 90+90
- different ways of partitioning numbers to at least 1000, e.g. 146=140+6 or 146=130+16

ADD AND SUBTRACT NUMBERS MENTALLY INCLUDING;

- THREE-DIGIT NUMBER AND ONES
- THREE-DIGIT NUMBER AND TENS
- THREE-DIGIT NUMBER AND HUNDREDS

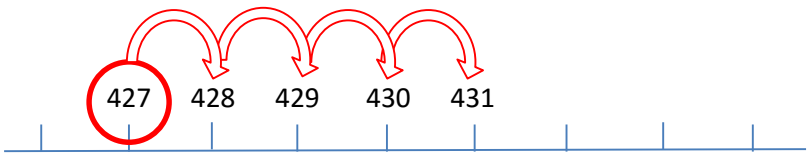
Teaching should focus on:

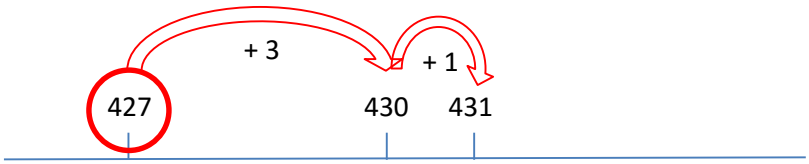
- Reordering numbers when adding, e.g. 300+596 reordered to 596+300
- Identifying the digits which will 'change' when a number is added/subtracted and reasoning why
- Providing clear visual models to support conceptual understanding of addition & subtraction
- Counting on and back in ones from any three-digit number, e.g. 855+3, 245-3 …
- Counting on and back in tens, from any three-digit number, e.g. 457+30, 623-40…
- Identifying the nearest multiples of 100 to a given number to support bridging when calculating

See also Bright Pi Mental Calculation Guidance; Year 2 Addition & Subtraction *'add and subtract numbers using concrete objects, pictorial representations and mentally, including 2-digit and ones, 2-digit and tens, two 2-digit numbers)*

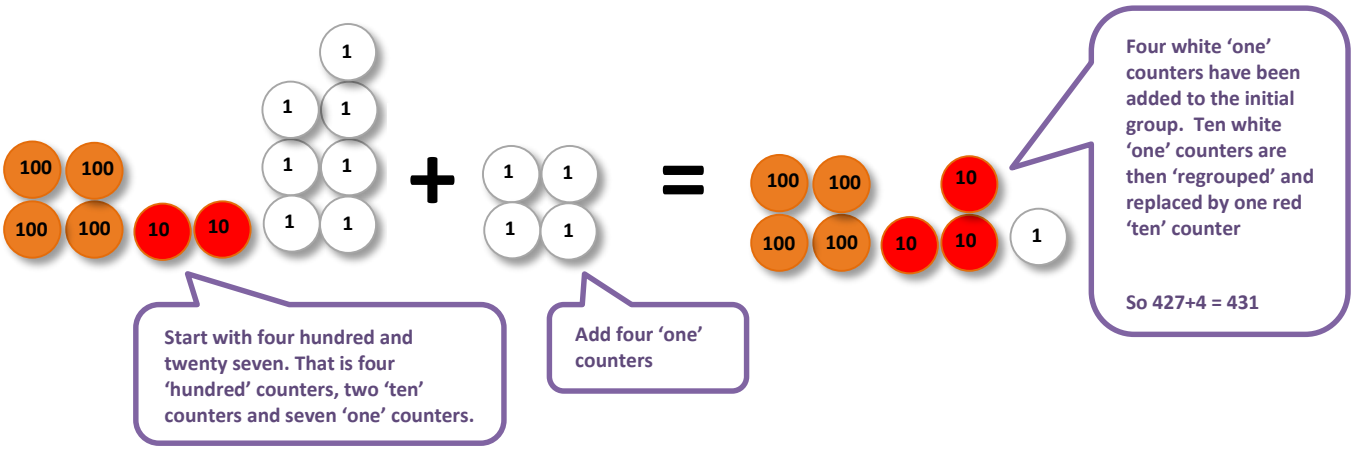
- **Adding/subtracting a 3-digit number and ones**
  By this stage, pupils should have had a great deal of experience using practical equipment for place value activities as well as to support understanding when carrying out addition and subtraction calculations. They should still be expected to model their calculations using a range of equipment when asked, but should be less reliant on them, having established a clear mental image of the number structure.

  Number lines can still be used as a way of modelling mental calculations on paper, although pupils should be encouraged to draw their own lines, and only add necessary markings. Pupils may need to be reminded to start with the largest number when adding HTO + O.
  E.g. 4 + 427 = 431





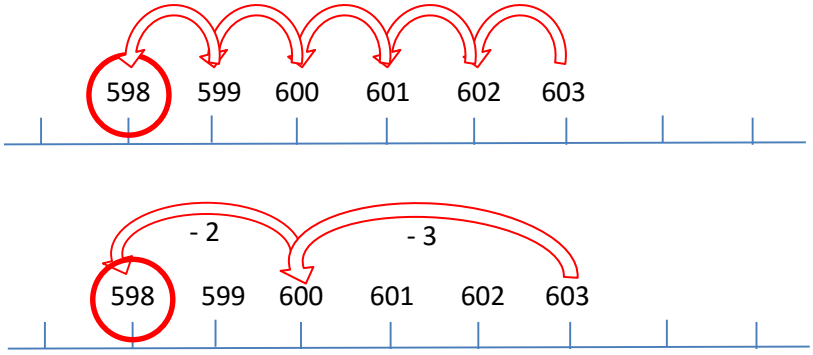
Ask pupils to occasionally model their calculations using practical equipment, encouraging them to explain their actions using appropriate mathematical vocabulary and reinforcing the value of the digits.

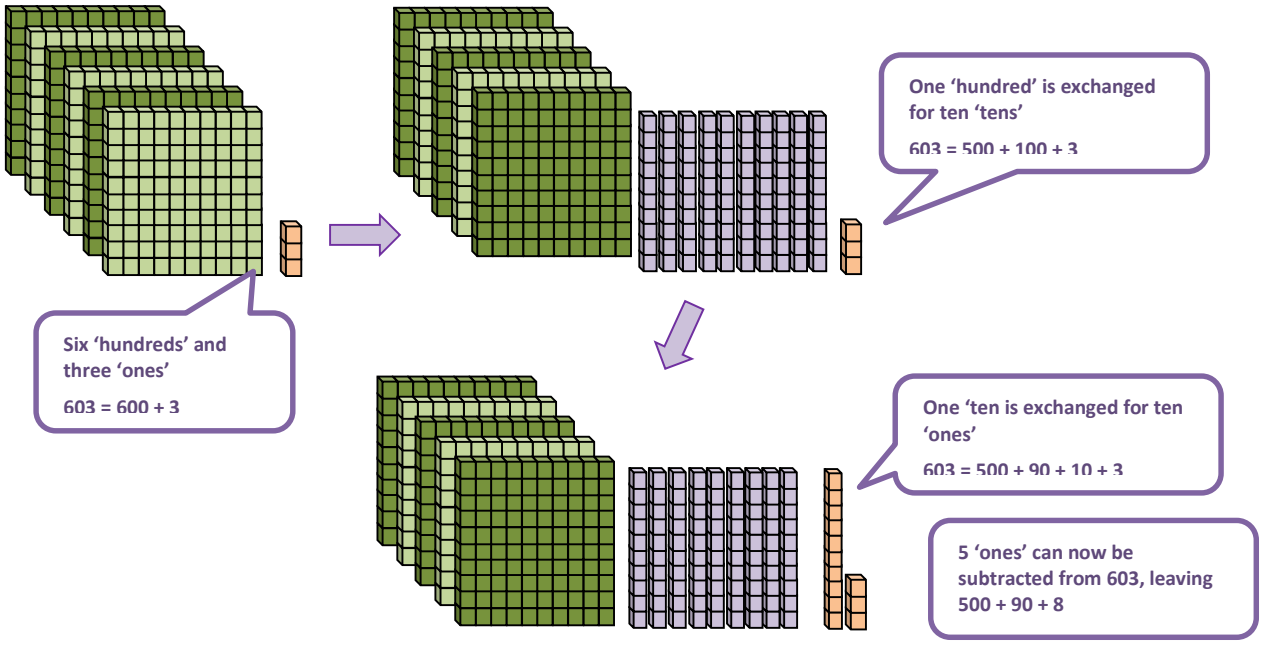


When subtracting a single-digit number from a three-digit number, a 'take-away' model is used (rather than 'find the difference') as it is more efficient.

See Bright Pi Mental Calculation Guidance;
Year 1 Addition & Subtraction, page 4, *for teacher notes on the two different models of 'take-away' and 'find the difference'.*

Pupils should continue to practise counting on and back in ones as well as other multiples, including across ten and hundred boundaries to support their addition and subtraction of small numbers. Encourage them to explain their mental methods verbally, show their working on a number line as well as model with practical equipment.
E.g. 603 - 5

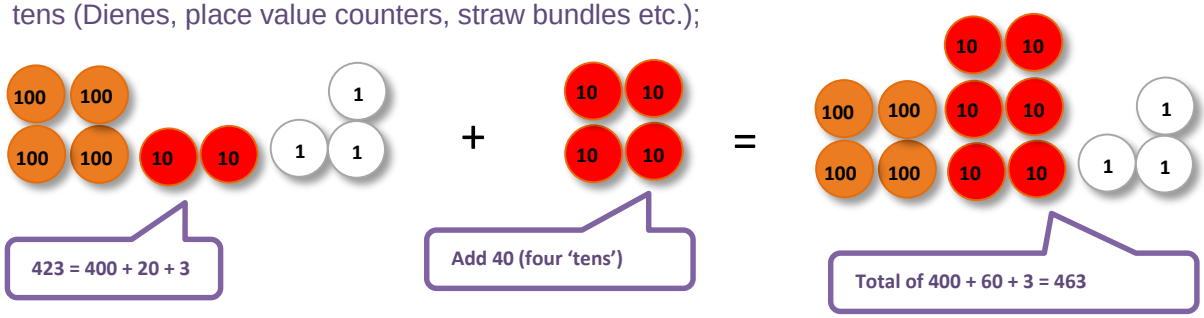




- **Adding/subtracting a 3-digit number and tens**

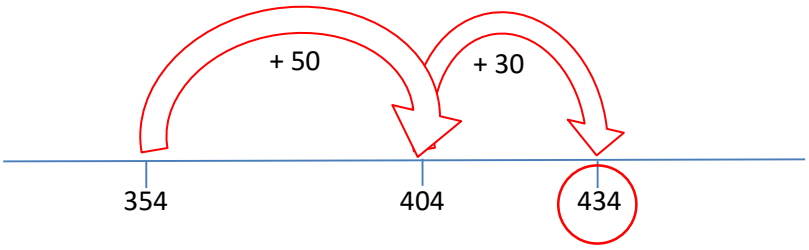
Pupils need to be very secure with their understanding of place value to be able to add/subtract a 'tens' number to/from a 3-digit number.
Start with examples where exchanging is not required, e.g. 548 – 30, 327 + 60. *Which digit in our starting number will change? Which digits will stay the same? Why is this?*

Allow pupils time to consolidate their understanding through the use of practical equipment grouped in tens (Dienes, place value counters, straw bundles etc.);

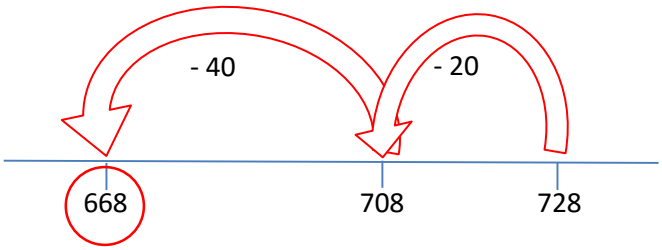


Using number lines can support pupils' visual understanding of addition, and builds on earlier work with smaller numbers. Pupils should be encouraged to partition the 'tens' being added, to enable bridging of multiples of one hundred on the line.

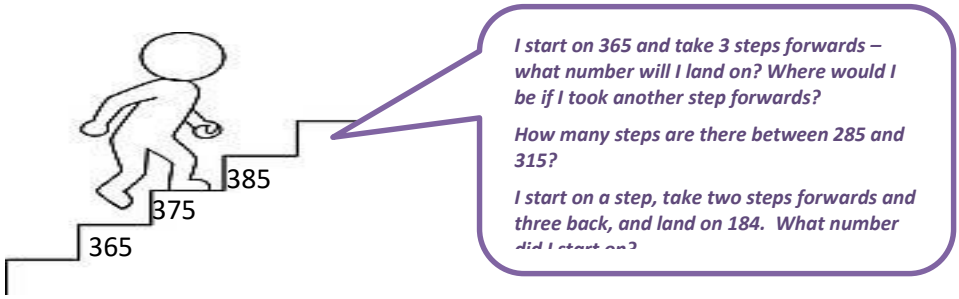
E.g. 354 + 80 = 354 + 50 + 30 = 434



E.g. 728 – 60 = 728 – 20 – 40 = 668
Subtraction will be carried out as 'take-away', i.e. '728 take away 60… ' as the numbers are too far apart to make 'finding the difference' efficient



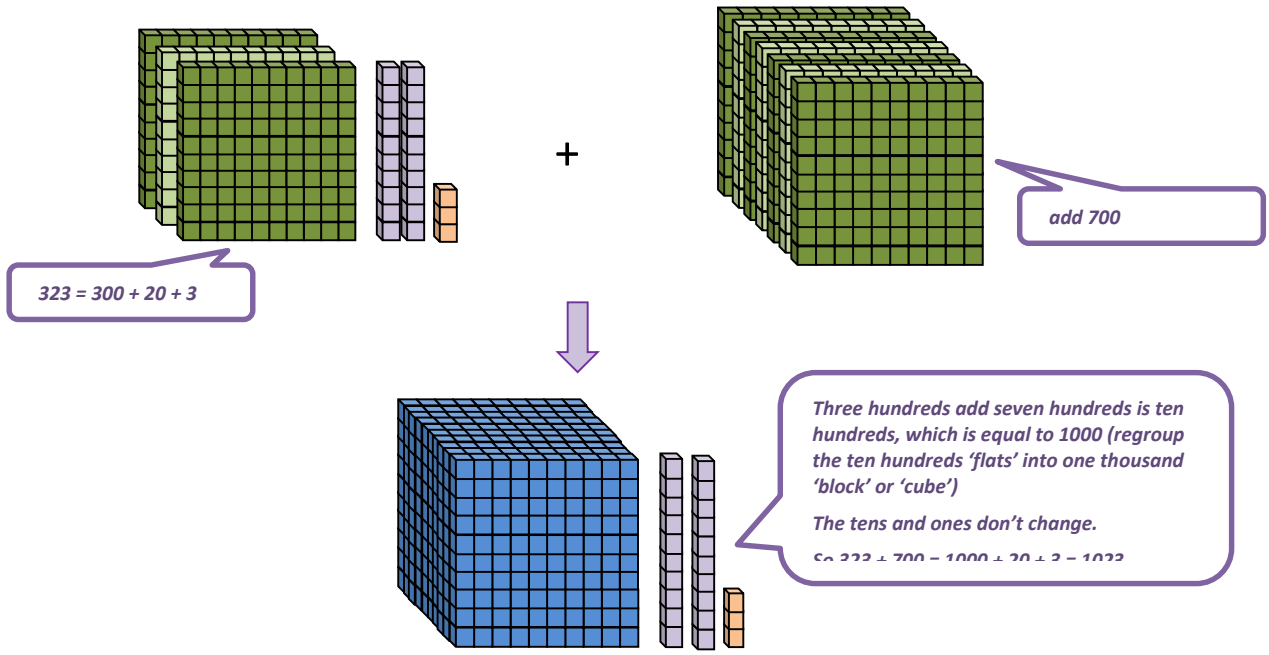
As pupils become more proficient at imagining the number line in their heads, they should be able to take part in activities such as 'Step 10'. Explain to the pupils that you are standing on a step, which has a number. If you step forwards (or up the stairs), the number increases by 10, and if you step backwards (or down the stairs), the number decreases by 10.



They should be able to model their calculation, when asked, using base ten equipment such as Dienes, straws, place value counters etc.

- **Adding/subtracting a 3-digit number and hundreds**

Pupils are likely to be quite confident adding and subtracting hundreds to/from a 3-digit number, until they reach the 'thousand boundary'. Place value activities should have taken them to 1000 and beyond, but they may still need visual support to get a 'feel' for the numbers involved.



Once pupils have used a range of models and images to support them in adding ones, tens and hundreds to a 3-digit number, they can tackle activities combining all three skills.

Provide pupils with an individual '*Gattegno*' (place value) chart, showing numbers up to 1000 initially, and then 10 000 when appropriate. On an enlarged version of the chart cover numbers from each row to make a 3-digit number. Ask the pupils to use counters to cover the same numbers on their charts. What number do they have altogether? (537). How could we show adding 2? (move the red 'ones' counter two places to the right) Now we have 537. Now add 30 by moving the green 'tens' counter three places to the right. Add 200 by moving the blue 'hundreds' counter two places to the right.

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1000	2000	3000	4000	5000	6000	7000	8000	9000

537 + 200 + 30 + 2 = 769

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1000	2000	3000	4000	5000	6000	7000	8000	9000

Examples which require the pupils to bridge the hundred or thousand boundary will need to be carefully modelled. E.g. 583 + 604 will involve moving the blue 'hundreds' counter 6 places, and being partitioned into 1000 and 100.

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1000	2000	3000	4000	5000	6000	7000	8000	9000

The resource can be used in a similar way to model subtraction by moving counters to the left.
E.g. 786 - 254

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1000	2000	3000	4000	5000	6000	7000	8000	9000

The chart can be used to support pupils when answering a range of other questions;

- *Use your counters to show 295. What do I need to subtract to get to 153?*
- *Show this number using the Dienes equipment*
- *How can I move from 153 to 246?*
- *I start on 255. How much do I need to add to reach 400? Show this number on your chart.*

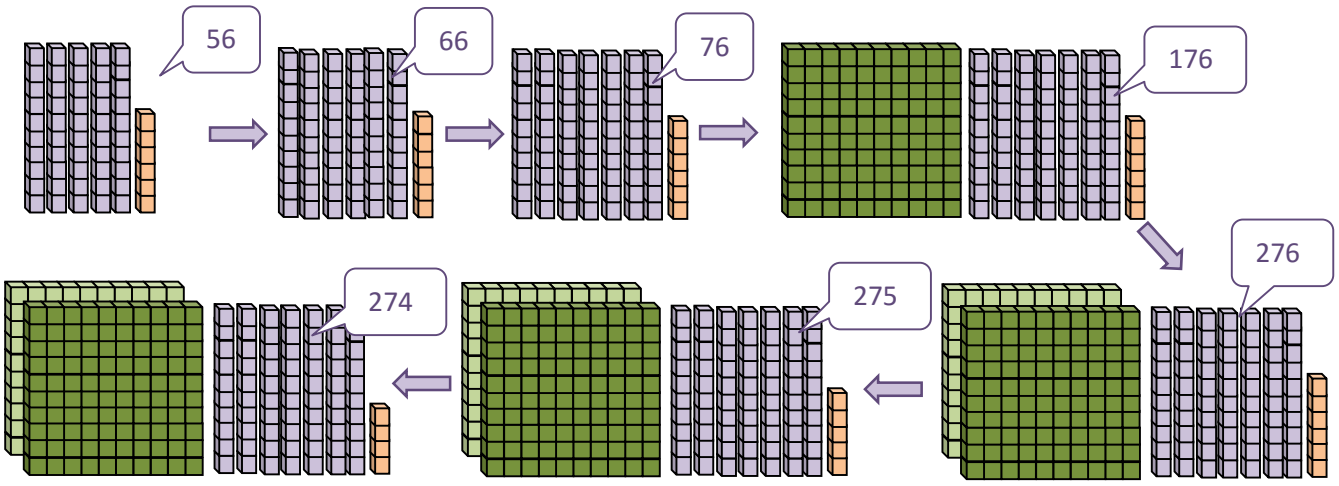
Hop, Skip & a Jump!
Tell the pupils that a 'hop' is worth 1, a 'skip' is worth 10 and a 'jump' is worth '100. '*I start on 372 and take two hops and one jump forwards – what number do I land on?'* (372 + 2 + 100 = 474). *'I start on the number 836 and take 3 'skips' forwards followed by a backwards 'jump'. What number do I finish on?'* (836 + 30 – 100 = 766). *'I need to travel from 485 to 276. What are the fewest moves I can make?'* (485 – 200 – 10 + 1 = 276… so take 2 'jumps' backwards, 1 'skip' backwards and 1 'hop' forwards)

Write the following on the board. The boxes denote the step size for counting.

+ 100	**+ 10**	**+ 1**
- 100	**- 10**	**- 1**

Agree a 2 or 3-digit starting number with the pupils, e.g. 56. Point to one of the boxes of the grid to set the step size, e.g. +10. Count together out loud as a whole class, *"56…66…76…"* changing the step size by pointing to a different area of the grid, whilst continuing the count, *"56…66…76…(point to +100) 176, 276… (point to -1) 275…274…"*.

Visualisation of the count can be supported through the manipulation of concrete resources alongside;



ESTIMATE THE ANSWER TO A CALCULATION AND USE INVERSE OPERATIONS TO CHECK ANSWERS

Teaching should focus on:

- Ensuring pupils have a good understanding of the value of numbers to 1000 and beyond, and be able to partition them in different ways
- Positioning numbers on a number line and visually understanding rounding as the closest 10, 100, 10p, £1 etc.
- Adding and subtracting multiples of 10, 100 etc. to find approximate answers to calculations
- Using practical equipment to model the addition/subtraction inverse when calculating

The skill of estimating the answer to calculations appears for the first time in the statutory curriculum in Year 3. Prior to this, pupils will have experienced estimation through counting. Several skills contribute to effective estimation; including a sound understanding of place value, the ability to visualise position and size of numbers and the ability to round numbers to the nearest required division, e.g. 10, 100, 10p, £1 etc.

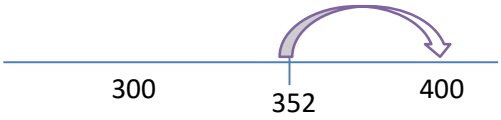
Estimation should be used when calculating both mentally and when using a formal vertical written method. Encourage the pupils to ask themselves these questions…

Am I expecting my answer to be larger or smaller than the numbers I started with? Why?

Have I already carried out a similar calculation that would help me to know if my answer is reasonable?

Can I round the numbers in my calculation to give me an easier calculation that would be a good estimate for mv actual calculation?

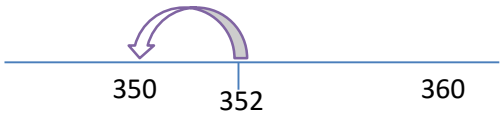
Explicitly plan to develop estimation skills, making use of the number line. E.g. 352 + 289 could be carried out using a formal vertical written method (***See Bright Pi Written Calculation Guidance; Year 3 Addition & Subtraction)*** but pupils should be encouraged to estimate first. Activities should enable them to decide for themselves the most efficient estimation method, requiring them to compare strategies, e.g. deciding between rounding to the nearest 100 or the nearest 10.



352 rounded to the nearest 100 = 400 **289 rounded to the nearest 100 = 300**

400 + 300 = 700

As both numbers were rounded 'up', we would expect the actual answer to be lower than this estimation.



352 rounded to the nearest 10 = 350 **289 rounded to the nearest 10 = 290**

350 + 290 = 640

This will be a closer approximation to the actual answer to 352+289 as the rounded numbers were closer to the actual numbers.

Through the use of practical base 10 equipment, pupils should now be familiar with the concept of addition and subtraction being the inverse of each other. Encourage them to use this knowledge when calculating to check answers.

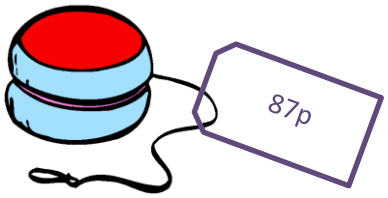
E.g. Having calculated that 265 + 70 = 335, ask them to use subtraction to check. They might choose to calculate 335-70 or 335-265 and should be able to explain their actions and what they expect to find out. Use practical equipment as appropriate to model this inverse operation visually.

ADD AND SUBTRACT AMOUNTS OF MONEY TO GIVE CHANGE, USING BOTH £ AND P IN PRACTICAL CONTEXTS

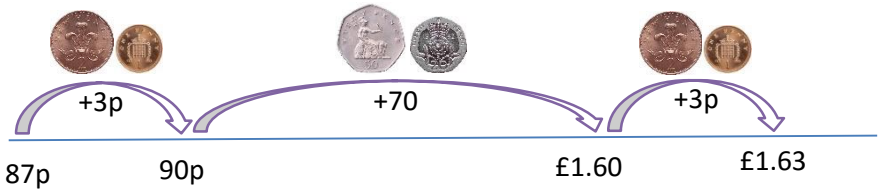
Teaching should focus on:

- Consolidation of using coins and notes to make up given amounts of money in different ways, noting the most efficient
- Modelling the use of coins and notes in a 'shopkeeper scenario' to show addition and subtraction of amounts
- Using the number line to show how given amounts have been broken down to support adding and subtracting, including giving change

It is important for children to continue to practice matching coins and notes to prices or amounts. Games can be played using pre-made matching cards, or asking children to create their own.



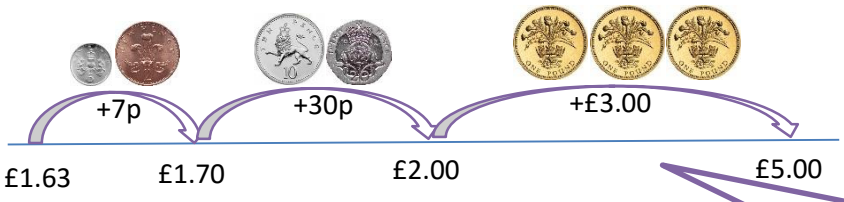
Number lines should be used alongside the physical coins to model the addition of two amounts
E.g. The total cost of a newspaper and a yoyo (76p + 87p)



Using the physical model of the number line and the coins, the use of subtraction as the inverse operation can be clearly seen to model working back along the line; £1.63 – 76p = 87p.

When finding change, pupils should use the 'finding the difference' model of subtraction, and not 'take away'. This enables them to 'count up' from the total amount of goods purchased, to the amount given to the shopkeeper.

E.g. How much change should I receive from £5.00 if I buy the newspaper and the yoyo?



Pupils should be able to use the number line to clearly model both their addition of items purchased as well as the change received from a given amount

E.g. my magazine costs £1.25, sweets cost 85p and my drink costs 69p. How much change do I receive from £5?

The difference between £5.00 and £1.63 is £3.37.

So my change from £5.00 after buying the newspaper and the yoyo will be £3.37.

COMPARE DURATIONS OF EVENTS
[FOR EXAMPLE TO CALCULATE THE TIME TAKEN BY PARTICULAR EVENTS OR TASKS]

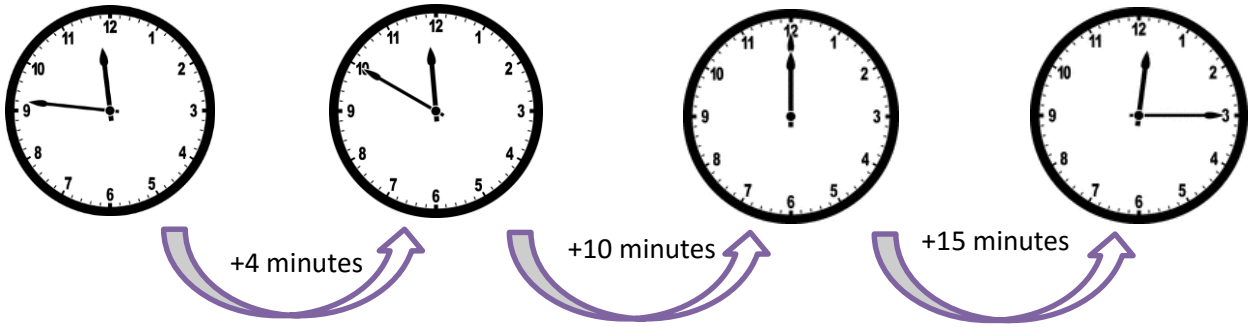
Teaching should focus on:

- Ensuring all pupils can tell the time to the nearest minute using an analogue clock
- Using physical clocks to show given times and record the passing of time
- The use of digital clocks to show 12-hour times and matching these to analogue clocks.

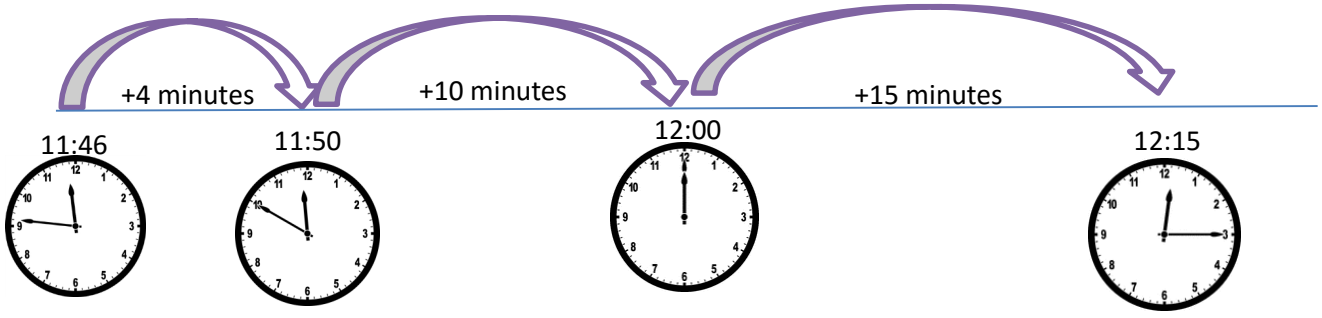
Time is a universal non-metric measure. The same format is used all across the world, working in 'base 60' for seconds, minutes and hours. A digital clock displaying 9:59 will, in two minutes, display 10:01 and not 9:61. When pupils are calculating with time intervals they need to be able to bridge through 60 (not 10 as with other measures). For this reason, it is extremely important that they are provided with tools to support them with their calculations. Formal vertical methods of addition and subtraction are not appropriate (due to the different base structure) and so children should be encouraged to make accurate use of the number line.

The Statutory Programme of Study does not require children to read digital clocks until Year 4, although it is advised in the non-statutory guidance that children in Year 3 use '*both analogue and digital 12-hour clocks and record their times'*.

Display both digital and analogue clocks in the classroom. At various times of the day ask "*how many minutes until the next hour (or next 'o'clock')?"* Encourage pupils to count on from 46 to 50, then to 60, to give a total of 14 minutes.
Then ask questions such as "*how long will it be until 12:15?"* Get them to count on to 12:00 and then add on the extra 15 minutes. Model the passing of time on an analogue clock as they calculate, moving the hands as they bridge each time;



The calculation can then be modelled on a number (time) line labelled with the appropriate times.



Provide children with worded problems requiring them to calculate duration of time;
E.g. "*Jane leaves home at 8:15am and arrives at school at 9:10am. How long is her journey to school?"*
Problems can also be linked to the school day to find the amount of time spent eating lunch, taking the register, working, break times etc.

Within 'Statistics', children in year 3 are required to interpret data presented in charts. Bus and train timetables are a useful way of combining the different elements of the mathematics curriculum, calculating the time taken by trains/buses to travel from one place to another. This method can usefully be applied to other instances of subtraction, such as 'The cake went in the oven at 3:40pm and came out at 4:15pm. How long was it in the oven?'