National Curriculum Programme of Study:

- Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- Given a number, identify one more and one less
- Add and subtract one-digit and two-digit numbers to 20, including 0
- Solve one step problems that involve addition and subtraction

Y1

**MENTAL CALCULATION**
Addition & Subtraction

FLUENCY

By the end of Year 1, pupils should fluently derive and recall:

- addition and subtraction facts for all numbers up to at least 20, e.g. 3 + 4, 18 − 5
- number pairs with a total of 10, e.g. 3 + 7, or what to add to a single-digit number to make 10, e.g. 3 + □ = 10
- number pairs with totals to 20, e.g. 17 + 3, or what to add to a 'teens' number to make 20, e.g. □ + 13 = 20
- addition doubles for all numbers to at least 10, e.g. 8 + 8

COUNT TO AND ACROSS 100, FORWARDS AND BACKWARDS, BEGINNING WITH 0 OR 1, OR FROM ANY GIVEN NUMBER

Teaching should focus on:

- Counting on and back in ones from single and two-digit numbers, e.g. 15+3, 45-3 …
- Counting on and back in tens, from a given multiple of 10, e.g. 30+50, 60-40…
- Using a range of mathematical equipment to support visualisation of number structure

- Count from zero in ones, one after the other, around the class. When you clap, the pupils continue the count backwards. On the next clap they count forwards etc. Repeat with counting in twos, tens and fives.

- The image of a number line helps pupils to appreciate the idea of counting forwards and backwards (or 'up' and 'down' using a vertical line.) Model the count using different bead strings, number squares, tracks and lines to underpin the pupils' understanding and support them in developing a visual image. Point out the mis-matched language when using number grids that involve moving 'down' the grid when counting 'up'.
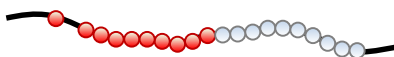
| 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | |

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

57 58 59 60 61 62 63 64
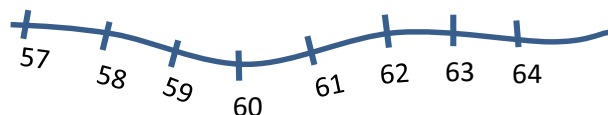
- Use a 1-100 or 0-99 grid to explore patterns emerging when adding on tens, twos or fives. Various electronic images can quickly show emerging patterns e.g. Interactive Teaching Programme 'Number Grid' (National Strategies)

See also Mental Calculation Guidance
Year 1 Multiplication & Division *'count on and back to zero in ones, twos, fives and tens'*

- Sit the pupils in a circle. *'If we count round the circle starting with Ben as '5', who will be 11? Think in your heads and tell me who it would be.' 'What number will I be?' 'What if we started with Chloe saying number 54 and counted backwards in ones – what number will you be? What other numbers will Chloe say if we continue the count?' 'Who will say zero?'*

GIVEN A NUMBER, IDENTIFY ONE MORE AND ONE LESS

Teaching should focus on:

- Understanding the relative position of numbers on a number line and/or grid, and their relationship to each other
- Ordering given numbers according to size

- Use a number line marked in fives. Where would 13 fit on this line? What other numbers are close to 13? Can you think of a number smaller than 20, but very close to it? How far away is it? What is one more than your number?

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0     5    10   15   20   25   30   35   40
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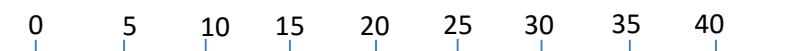
- Think of a number that comes between 15 and 20. Mark it on the line. What is one more than your number? One less?
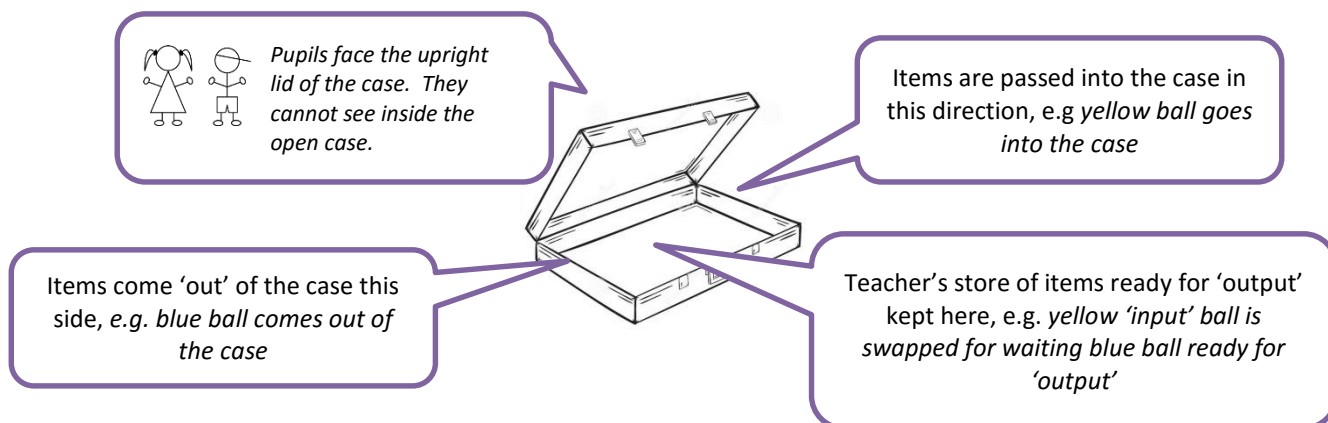 I think of a number. It is one less than 12. What is my number? Mark it on the line.

- Provide pupils with a set of five numbers and ask them to place them in order, from smallest to largest. Can they represent each one using equipment? Does the equipment make it easier to see which is the largest number? Provide them with a number line and ask them to circle their numbers. Which is the second smallest? Third largest? What is one more than each of their numbers?

- Introduce the pupils to the concept of a function machine. There are several interactive examples available online, although initially, a simple box or 'open briefcase' will suffice. Place a set of objects (see below) and number cards in the box, out of view of the pupils (open the case towards you as a teacher). Explain to the pupils that when things are slid into your 'Magic Case', something special happens to them. The case is very strange though as it doesn't always change them in the same way! Pass a small ball into the case, and pull out another ball of a different colour (identical in every other way). What has the magic case done? What do you think will happen if the new coloured ball is passed back into the case? Pass the ball back in the way it came out to introduce inverse (opposite) operations.

  A similar idea can be used to look at an object being made bigger, or being 'scaled up'. E.g. pass a small ball into the case and pull a larger ball (identical in colour) out of the other side.

  Ask a pupil to suggest a number less than 20. Place a number card showing this number into the case. Select the card that is one more from inside the case and push it 'out'. What do they think has happened? Repeat with other numbers. Can they predict what number will come out? Ask them what they think will happen if they push their number back in (the way it came out) – model with the original number coming back out at the 'start'. Discuss one more and less and encourage pupils to predict outcomes.

  Vary the activity by using playing cards. Push the '3 diamonds' card in and ask them to draw the card that might come out. This can lead to a useful discussion relating to the pattern of number and help them to subitise.


Pupils face the upright lid of the case. They cannot see inside the open case.

Items are passed into the case in this direction, e.g *yellow ball goes into the case*

Items come 'out' of the case this side, *e.g. blue ball comes out of the case*

Teacher's store of items ready for 'output' kept here, e.g. *yellow 'input' ball is swapped for waiting blue ball ready for 'output'*

See also Mental Calculation Guidance
***Year 1 Multiplication & Division** 'using function machines for doubling and halving'*

ADD AND SUBTRACT ONE-DIGIT AND TWO-DIGIT NUMBERS TO 20, INCLUDING ZERO

Teaching should focus on:

- Representing numbers using a range of equipment and manipulatives, both grouped in tens and otherwise

- Reordering numbers to make calculations as efficient as possible. E.g.
    - reorder 3+14 to 14+3, starting with the number of highest value
    - reorder 10+4+10 to 10+10+4, grouping tens together
    - reorder 5+3+5 to 5+5+3, looking for number bonds to 10, grouping 5s together
    - understanding that 16-5 cannot be reordered

- Add 9 to single-digit numbers by adding 10 then subtracting 1 (compensating)

- Recall of doubles and finding near doubles using partitioning skills. E.g.
    - Learn that 6+6=12. So 6+7 is the same as double 6 and add 1, or double 7 and subtract 1.

- Ask pupils to represent the number 15 in as many different ways as they can, using a range of equipment grouped in tens. Are they familiar with balloons, straws, bead strings, Dienes, multilink cubes, coins etc.?
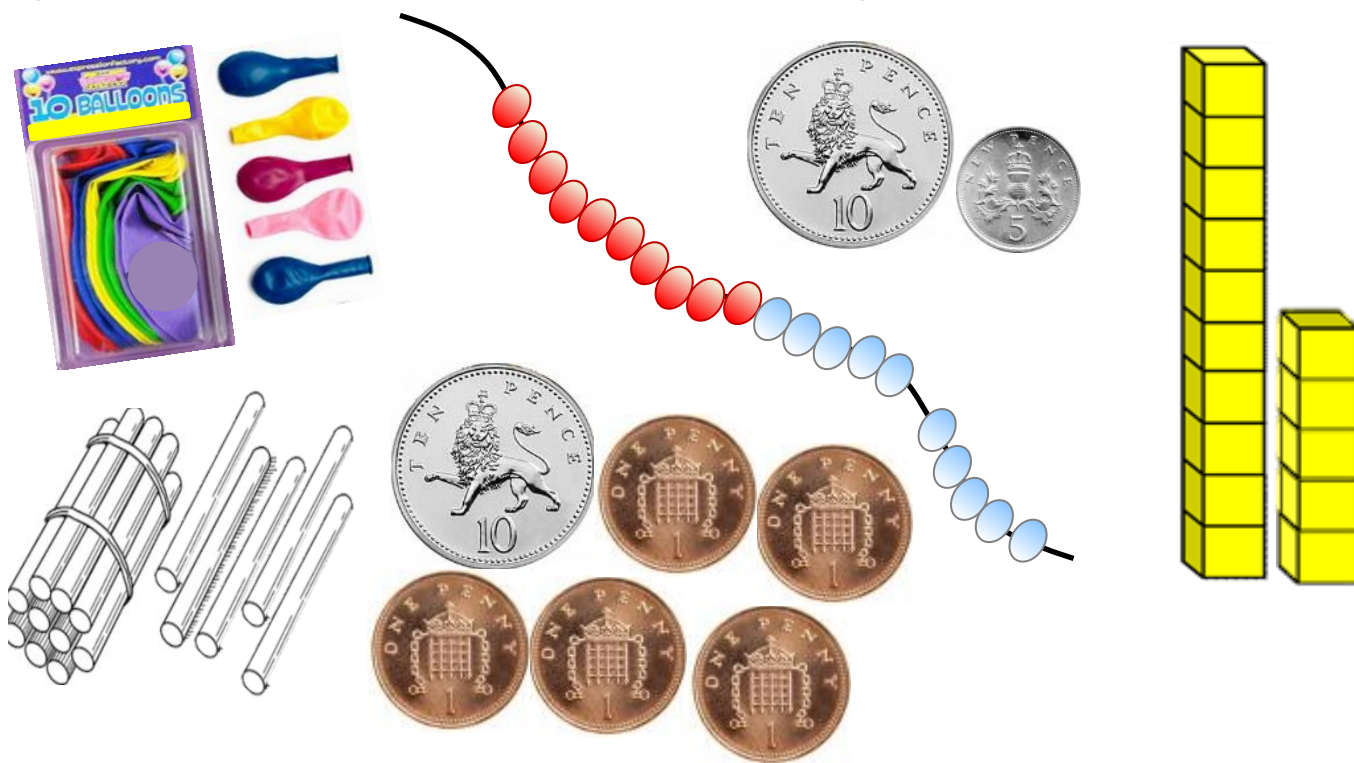
Now ask them to choose one and represent '3' in the same way. Ask them to find their total. Look for the order in which they add. Discuss whether it is more efficient to add the 3 to the 15, or the 15 to the 3.

- Present pupils with groups of three numbers (up to 20) to add in their head. Make sure that in each group of numbers, there are two with a total of 10, e.g. 8 + 4 + 2

- Play number games where pupils have to decide in which order to add their numbers. Give four pupils a number card each and ask them to stand in pairs. Each pair should add their numbers as quickly as possible using any strategies/equipment they choose. The pair with the highest total wins a point. E.g.
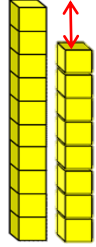
Pair one: **6 9**   Pair two: **5 8**

Encourage them to reason by asking questions such as; *'Could you tell who would win without doing the addition?', 'What if your first number was double your first one?', Did it matter which order you added the numbers?'* Extend the activity by asking them to find the difference between their numbers, the winning pair being the one with the lowest difference. *'What if one of the cards is zero – how does that make the addition/subtraction calculation easy?'*

- Subtraction is commonly introduced as 'take away', but the distinction between the 'take away' model and that for 'finding the difference' needs to be made very clear to both staff and pupils.

Subtraction model	Take away	Finding the difference
Generally used when…	…subtracting a very small number from a larger, or where the difference between the two numbers is large	… the subtraction involves two numbers that are very close to each other on the number line
Example	17 - 2 It is more efficient to take 2 away from 17, than to 'count up' to 17 from 2	17 – 15 It is more efficient to 'count up' from 15 to 17 than to take 15 away, one at a time
Modelled using…	Separate cubes, counters, or other individual items. E.g. start with 17 and physically 'take away' two, one at a time. Typically children will count the two removed, and then go back to count the remainder (*it is not as easy to model 'take away' using apparatus such as Numicon or Cuisenaire rods as the individual 'ones' cannot be separated*)	Separate items that can be grouped together to form the two numbers, e.g. towers of multilink cubes. *The difference between 10 and 8 is 2*
Context	I have 19 pence and spend 3 pence on a lollipop. How much do I have left? I am 15. My brother is two years younger than me. How old is my brother?	I have a 10p and two 5p coins. My friend says he has 18 pence. Who has more? How much more? I am 15 and my sister is 13. How much older than my sister am I? (or what is the difference in our ages?)

- Draw on the board a circle containing the numbers 10 to 15, and another containing the numbers 0 to 5. Provide pupils with strips of paper divided into three squares. Ask them to write a number from the first circle in their first square and a number from the other circle in their second square. They should write the total of their numbers in the last square. Ask them to complete several strips.
  Collect the strips and show one with your thumb covering one of the numbers. How can they find the missing number? Use the language of both addition and subtraction to describe the number situation. '*How do you know when to add the numbers and when to subtract them?*' Encourage pupils to justify the way in which they carried out the calculation. (To find missing numbers children will use 'take away' rather than 'difference' as the numbers will have a significant difference)

| 12 | | 16 | | 8 | 11 | |

- Practise adding 9 and 11 to numbers less than 100.
  Shade 2 or 3 numbers in each row of a 1-100 grid. Explain to the pupils that these are the 'traps'. Two coloured teams (red and blue) each start with their coloured counter at the top of the grid. The aim is to be the first to reach the bottom without falling into a 'trap'. Spin a spinner labelled '1','9','10','11' and decide whether it is safe to add this number to that which their counter currently covers. If it is safe, move to the new number. If not, stay still until your next turn.

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

- Doubling
  Use a wide range of equipment to enable pupils to 'see' doubles of single-digit numbers. Encourage them to select their own resources, or draw a representation of say, double 4 as two sets of 4. This could include any 'mathematical' or 'everyday' resource.

- 'Cuisenaire' number rods laid in a rod track, (or unifix cubes laid along a number line) clearly show the effect of doubling a number
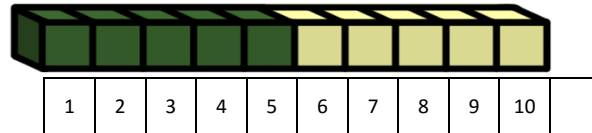
- The function machine or 'Magic Case' introduced above for 'one more/less' can be useful for practising doubling skills and helping to visualise the inverse of halving

See also ***Mental Calculation Guidance,***
                  Year 1 Multiplication & Division *'Doubling and halving'*

SOLVE ONE STEP PROBLEMS THAT INVOLVE ADDITION AND SUBTRACTION

Teaching should focus on:

- Using and applying their skills of counting, reordering, compensating and knowledge of near doubles
- Pupils understanding a given problem and explaining their reasoning using their own diagrams, jottings and/or manipulatives

- Provide a range of problems and activities, in different contexts, for pupils to practice their taught skills;

> How old are you? How old were you last year? How old will you be two years from now? How old is your sister? Who is older? What is the difference in your ages?

> *Use a number/time line to plot current age and discuss where last year's age and that for two years' time lies on the line. Can they plot other siblings/friends and calculate differences?*

> Imagine a set of dominoes. Which of them have a total of 1 spot? 2 spots? 3 spots…. 11 spots, 12 spots?

> *Allow pupils time to explore the set of 'double six' dominoes. What patterns can they see? How many dominoes do they think there are with 1 spot at one of the ends? How could they find the total?*

> My pack of 5 stamps contains only 2p and 5p stamps. What are the possible values of the whole pack?

> *Ideally provide pupils with 2p and 5p stamps, alternatively use 2p and 5p coins. How many can they have in total? How could they make the largest cost? Least? How many different totals are there?*

Continued on next page…

What do you 'see' in your mind when you hear each of the following numbers? Can you show these numbers in pence? Which would need the least number of coins?
5, 10, 12, 3, 24, 6

Can they imagine that number of objects, or does it remind them of something (e.g. house number, 10 fingers/toes, 6 eggs in a box etc.) What coins do we have? Encourage them to use different coins to try to make each value.

How many different ways could you pay for a ball costing 20p with silver coins?

What do we mean by silver coins? How many different silver coins are there? Can you describe their shapes? Could we have 10p+5p+2p+2p+1p?.

I am 13. My two younger brothers will both be an even number age on their birthdays this year. One is four years older than the other – how old could they be? How old will we all be next year? Will our ages be odd or even?

Ask the pupils how a number/time line could help to work this out. What could we mark on? Why is it a good idea to cross out all the other odd numbers? How does the pattern of odd/even numbers help us?

8 goals were scored in a football match. How many different final scores could there have been?

Provide circular counters to represent 'goals' in the match. What is the highest number of goals one of the team could have scored? What is the least? Encourage independent recording.

Take turns with a partner to add either one or two 'fish' into the bowl. The player who adds the twentieth fish to the bowl wins the game.
What if each player can add 1, 2 or 3 fish - does it make it easier to win?
Now start with 20 fish in the bowl. Take turns to 'fish' out two or three fish. The player to take the last fish is the winner.

Allow pupils time to 'play' with this, using paper fish and a goldfish bowl image