Mental computation strategies

addition, subtraction, multiplication and division

Mental computation

Contents

Games 51

Introduction

Mental computation is the most common form of computation used in everyday life. It is used for quick calculations and estimations, but is more than 'mental arithmetic'. Mental computation refers to the process of working out and obtaining exact or approximate answers mentally. When calculating mentally, students select from a range of strategies, depending on the numbers used. As they develop their repertoire of strategies, students select those that are more efficient and effective for them.

When teaching mental computation in the classroom, the learning focus is on the strategies used to obtain answers.

Teachers should only introduce new strategies when students are confident with, and competent in, using previous strategies. Frequent practice is required to develop competence and confidence.

This document lists the facts and strategies introduced in each year level from Year 2 to Year 5. However, teachers should continue to consolidate the facts and strategies throughout the primary years to help students develop fluency.

Note: ▮ denotes facts that have been taught in a previous strategy.

Addition: Year 2

The three main groups of strategies for learning addition facts are:
- count on
- doubles
- tens.

The addition facts taught in Year 2 are shown in the table below.

Count on										
Count on 1	0+1	1+1	2+1	3+1	4+1	5+1	6+1	7+1	8+1	9+1
and turnarounds	1+0		1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9
	Think 'always count on from the larger number'; 'think big, count on'.									
Count on 2	0+2	1+2	2+2	3+2	4+2	5+2	6+2	7+2	8+2	9+2
and turnarounds	2+0	2+1		2+3	2+4	2+5	2+6	2+7	2+8	2+9
Count on 3	0+3	1+3	2+3	3+3	4+3	5+3	6+3	7+3	8+3	9+3
and turnarounds	3+0	3+1	3+2		3+4	3+5	3+6	3+7	3+8	3+9
Count on 0	0+0	1+0	2+0	3+0	4+0	5+0	6+0	7+0	8+0	9+0
and turnarounds		0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9
Extension: Count on 10, 20 and 30	e.g.		20+10	30+20		60+30				
and turnarounds	e.g.		10+20	20+30		30+60				
	Think 'count on in tens'. For 60 + 30, think '6 tens… 7 tens, 8 tens, 9 tens: 60 + 30 = 90'.									

Doubles

Doubles to 9 + 9	0+0 1+1 2+2 3+3 4+4 5+5 6+6 7+7 8+8 9+9
Doubles + 1 to 8 + 9 (or neighbours)	0+1 1+2 2+3 3+4 4+5 5+6 6+7 7+8 8+9
and turnarounds	1+0 2+1 3+2 4+3 5+4 6+5 7+6 8+7 9+8
Extension: Double multiples of ten to 50 + 50	10+10 20+20 30+30 40+40 50+50 🗨 Think 'in tens'. For 50 + 50, think 'double 5 tens is 10 tens: double 50 is 100'.
Extension: Double multiples of ten + 10 to 90	10+20 20+30 30+40 40+50
and turnarounds	20+10 30+20 40+30 50+40 🗨 Think 'in tens'. For 40 + 50, think 'double 4 tens is 8 tens and one more is 9 tens: 40 + 50 = 90'.

Tens

Rainbow 10 (make 10 or addition facts to 10)	1+9 2+8 3+7 4+6 5+5 6+4 7+3 8+2 9+1
and turnarounds	9+1 8+2 7+3 6+4 5+5 4+6 3+7 2+8 1+9
Near 10 (1 more than 10)	2+9 3+8 4+7 5+6
and turnarounds	9+2 8+3 7+4 6+5 🗨 Think 'rainbow 10'. For 4 + 7, think '3 + 7 is 10, so 4 + 7 is one more than 10. 4 + 7 = 11'.
Near 10 (1 less than 10)	0+9 1+8 2+7 3+6 4+5
and turnarounds	9+0 8+1 7+2 6+3 5+4 🗨 Think 'rainbow 10'. For 3 + 6, think '4 + 6 is 10, so 3+ 6 is one less than 10. 3 + 6 = 9'.

Adding 9 (add 10, count back 1)	0+9 1+9 2+9 3+9 4+9 5+9 6+9 7+9 8+9 9+9
and turnarounds	9+0 9+1 9+2 9+3 9+4 9+5 9+6 9+7 9+8
Make to 10 (think 10 or build to 10)	5+7 4+8 5+8 6+8
and turnarounds	7+5 8+4 8+5 8+6 Think 'build to 10', then add what is left. For 8 + 5, think '(8 + 2) + 3'; for 7 + 6, think '(7 + 3) + 3'.
Extension: Make 100 (Rainbow 10)	10+90 20+80 30+70 40+60 50+50 60+40 70+30 80+20 90+10 Think 'in tens'. For 10 + 90, think '1 ten + 9 tens = 10 tens'.

Addition: Year 3

In Year 3, students should be able to recall or work out all addition facts to 9 + 9 and use their knowledge of the strategies to extend the basic facts to larger numbers. They will also begin to work out some generalisations that relate to addition. For example, students might realise that if 4 + 3 = 7 then:

• 40 + 30 = 70
• 400 + 300 = 700
• 43 + 34 = 40 + 30 + 3 + 4 = 77

Students should be able to explain the strategies they use for working out addition of larger numbers. Any strategy students use that provides an accurate answer consistently in a range of situations is acceptable and should not be discouraged.

The addition facts taught in Year 3 are shown in the table below.

Count on	
Revise from Year 2: • Count on 0, 1, 2, and 3, and turnarounds • Count on 10, 20 and 30, and turnarounds	
Extension: Count on 100, 200 and 300	e.g. 200+100 300+200 600+300
and turnarounds	e.g. 100+200 200+300 300+600 Think 'in hundreds'. For 600 + 300, think '6 hundreds… 7, 8, 9 hundreds. 600 + 300 = 900'.

Doubles	
Revise from Year 2: • Doubles to 9 + 9 • Doubles + 1 to 8 + 9, and turnarounds • Double multiples of ten to 50 + 50	
Double multiples of ten to 100 + 100	50+50 60+60 70+70 80+80 90+90 100+100
Extension: Double multiples of one hundred to 500 + 500	100+100 200+200 300+300 400+400 500+500 Think 'in hundreds'. For 300 + 300, think 'double 3 is 6 so double 300 is 600'.

Double multiples of ten + 10 to 80 + 90	10+20 20+30 30+40 40+50 50+60 60+70 70+80 80+90
and turnarounds	20+10 30+20 40+30 50+40 60+50 70+60 80+70 90+80
	Think 'in tens'. For 60 + 70, think 'double 6 tens is 12 tens, so 6 tens + 7 tens must be one more ten. 13 tens or 130'.
Extension: Double multiples of one hundred + 100 to 400 + 500	100+200 200+300 300+400 400+500
and turnarounds	200+100 300+200 400+300 500+400
	Think 'in hundreds'. For 400 + 500, think 'double 4 hundreds is 8 hundreds, so 4 hundreds + 5 hundreds must be one more hundred. 9 hundreds or 900'.

Tens

Revise from Year 2:
- Rainbow 10
- Near 10 (1 more and 1 less than 10) and turnarounds
- Adding 9 (add 10, count back 1) and turnarounds
- Make to 10 and turnarounds
- Make 100

Make 100 (Rainbow 10)	10+90 20+80 30+70 40+60 50+50 60+40 70+30 80+20 90+10
Make 1 000	100+900 200+800 300+700 400+600 500+500 600+400 700+300 800+200 900+100
Near 100 (Near 10)	20+90 30+80 40+70 50+60
and turnarounds	90+20 80+30 70+40 60+50
	Think 'rainbow 10'. For 40 + 70, think 'double 4 tens + 6 tens is 10 tens, so 4 tens + 7 tens is one more ten. It's 11 tens, and 11 tens is 110'.
Adding 19 (Adding 9)	e.g. 6+19 18+19 32+19 56+19
and turnarounds	e.g. 19+6 19+18 19+32 19+56
	Think 'add 20, count back 1'. For 32 + 19, think '32 + 20 is 52. Count back 1 is 51, so 32 + 19 is 51'.

Adding 90 (Adding 9)	e.g.	40+90	50+90	60+90	70+90	80+90	90+90
and turnarounds	e.g.	90+40	90+50	90+60	90+70	90+80	

Think 'add 100, count back 10'. For 70 + 90, think '70 + 100 is 179. Count back 1 ten from 17 tens is 16 tens, so 70 + 90 is 16 tens'.

Make to 100 or build to 100 (Make to 10)	50+70	40+80	50+80	60+80
and turnarounds	70+50	80+40	80+50	80+60

Build to 100, then add what's left. For 80 + 50, think '(8 tens + 2 tens) + 3 tens'. For 70 + 60, think '(7 tens + 3 tens) + 3 tens'.

Addition strategy: Count on

Count on 0, 1, 2 and 3

Counting on is a skill that is developed incidentally during early counting activities. It is therefore the first mental computation strategy introduced to students.

The count on strategy can be used when adding the numbers 0, 1, 2, or 3 to a given number without having to count the larger number. Students identify the larger number and quickly count on to get the answer. This strategy is sometimes known by other names such as 'start big, count small' or 'think big, count on'.

Below is the recommended sequence for introducing the count on strategies:

1. Count on 1

2. Count on 2

3. Move to count on 3 once students can count on 1 and 2 accurately and consistently.
   Note: Counting on more than 3 is not an efficient strategy, especially for students who still count on their fingers. Encourage the use of turnarounds or alternative strategies.

4. Count on 0 is the last of the counting on strategies to be introduced, as it requires students to understand the concept of counting on no more.

The following resources support students in developing recall of the count on facts:

- AV, <u>Count on me!</u>
- Learning objects, <u>The lolly jar</u>, <u>Fact grid</u>, <u>Dice combo</u>, <u>Count-on addition</u> and <u>Count on flowers</u>

For more information, refer to the Supporting learning card, <u>Counting on</u>.

Count on extensions

Students make generalisations about the count on strategy by extending it to larger numbers, such as:

- 50 + 30
- 600 + 300
- 56 + 2
- 560 + 20
- 560 + 200

The strategy of starting with the bigger number and counting on the smaller number still applies. Students who have mastered the skill of skip counting in 10s will have no trouble counting on in 10s (e.g. 50… 60, 70, 80) while other students may find it easier to use the place value names (e.g. 5 tens… 6 tens, 7 tens, 8 tens; 5 hundred and sixty… 6 hundred and sixty, 7 hundred and sixty)

The following resources support students in learning to extend the count on facts:

- Video, <u>Extending the count on strategy</u>
- Learning object, <u>Count on with Fergus</u> and <u>Dice: count on or back</u>
- AV, <u>The time machine</u>

Addition strategy: Doubles

Doubles to 9 + 9

In **Year 2**, students learn doubles up to 9 + 9. Students need to know numbers up to 18 before they begin recording doubles. Students will be familiar with some doubles as a result of learning other strategies, such as 1 count on 1 (double 1), 2 count on 2 (double 2), 5 + 5 as a rainbow fact, and so on.

Doubles involve identifying objects which occur in pairs. Real-life examples of doubles, such as eggs in an egg carton, two lots of two legs on a table, seven days in a week and 14 days in a fortnight, can help students understand and recall the doubles facts. A small mirror is a useful tool to help students see and count double the number of items on a desk.

The following resources support students in developing recall of the doubles facts:
- Sheets, <u>Doubles chart to 10</u>, <u>Doubles chart 12 to 18</u>, <u>Seeing double</u> and <u>Dominoes</u>
- AV, <u>Double trouble</u>
- Learning objects, <u>Fact grid</u>, <u>Doubles addition</u>, <u>Doubles and near doubles</u> and <u>Double and half</u> (1 to 10)

Doubles extensions

The doubles strategy is extended in the latter half of **Year 2** to include:
- double multiples of 10, to 50 + 50
- double other 2-digit numbers, without bridging a ten.
  e.g. double the ones (33 + 43) or double the tens and ones (42 + 42)

In **Year 3**, further generalisations about the doubles addition strategy are developed as students extend the strategy to include:
- double multiples of ten, to 100 + 100
- double multiples of one hundred, to 500 + 500
- double other 2- and 3-digit numbers.

Think 'double 36 = double 30 + double 6 = 60 + 12 = 72' and 'double 428 = double 400 + double 20 + double 8 = 800 + 40 + 16 = 856'.

The following resources support students in learning to extend the doubles facts:
- Video, <u>Extending the doubles strategy</u>
- Learning objects, <u>Throw a double</u> and <u>Double and half</u> (10 to 50)

Doubles + 1

'Doubles + 1' includes all facts where one addend is one more than the other, such as 4 + 5 or 6 + 7. The strategy is to double the small number and then add 1. This strategy is sometimes called 'near doubles' or 'neighbours'.

Be sure students are confident using doubles facts before introducing doubles + 1. Most students find doubles facts easy to remember but need to be taught to recognise doubles + 1 facts.

- Dominoes are useful for illustrating doubles + 1 facts. Two linking cube trains of the same length are useful for working out the answers to doubles facts, and equally useful for showing one more. Counting bears in three different colours can also be used.
  e.g. show 3 red bears and 3 blue bears, then introduce 1 yellow bear

In **Year 2**, students apply the doubles + 1 strategy up to 8 + 9.

The following resources support students in developing recall of the doubles + 1 facts:
- Sheet, Dominoes
- Learning objects, Fact grid and Doubles and near doubles

Doubles + 1 extensions

Year 2 students who can consistently and accurately use the doubles + 1 strategy can extend to include multiples of 10 and other 2-digit numbers to 99, such as:
- 30 + 40
- 40 + 50
- 32 + 43 (double 3 tens + 1 ten and double 2 + 1)
- 54 + 45 (double 4 tens + 1 ten and double 4 + 1)

In **Year 3**, students make further generalisations as they apply the doubles + 1 strategy to 3-digit numbers, such as:
- 300 + 400
- 400 + 500
- 320 + 430 (double 3 hundreds + 1 hundred and double 2 tens + 1 ten)
- 541 + 452 (double 4 hundreds + 1 hundred, double 4 tens + 1 ten and double 1 + 1)

Addition strategy: Tens

Rainbow 10

'Rainbow 10' facts include any fact that adds to 10, such as 3 + 7 or 2 + 8.

A rainbow diagram is an excellent way to identify all the number facts that make 10. Students make the facts by adding the numbers at opposite ends of each rainbow colour. This strategy is sometimes called 'make 10' or 'addition facts to 10'.

Although the use of fingers is not a recommended method of working out basic facts, this is a convenient way of demonstrating the rainbow 10 facts (i.e. the number of fingers folded down and the number of fingers held up will always equal 10).

Ten frames are also useful for showing rainbow 10 facts.

8 + 2 = 10

2 + 8 = 10

The following resources support students in developing recall of the rainbow 10 facts:
- Sheets, Jigsaw squares, Rainbow 10 fact cards and Flowers in vases
- Learning objects, Rainbow 10 facts, Fact grid, Make 10 and Addition stories

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Rainbow 10 extensions: Make 100 and Make 1 000

In the second half of **Year 2**, the rainbow 10 facts are extended to multiples of 10. The strategy of adding multiples of 10 that equal 10 tens is called 'Make 100'. Bundling material is useful for showing the extension.

e.g. 4 bundles of 10 and 6 bundles of 10 makes 10 bundles of 10 (100)

In **Year 3**, the strategy is extended again to include multiples of 100 (the make 1 000 strategy).
e.g. 200 + 800 (2 hundreds and 8 hundreds)

Students might also make generalisations about the rainbow 10 strategy that allow them to add other 2-digit numbers mentally.
e.g. 43 + 67 (4 tens and 6 tens is 10 tens; 3 and 7 is 10; 10 tens and 1 more ten is 11 tens) = 110

Near 10

The near 10 strategy helps students identify the facts close to the rainbow 10 facts.
e.g. 4 + 7 is one more than 4 + 6, which is 10. So 4 + 7 is 11.

This is sometimes called the '1 more than 10' strategy.

Students need to have a good understanding of the rainbow 10 facts before they are introduced to near 10 facts.

Ten frames are useful for illustrating near 10 facts. This example illustrates 8 + 3. The student who recognises 8 + 2 as a rainbow 10 fact will generalise that 8 + 3 must be 1 more than 10.
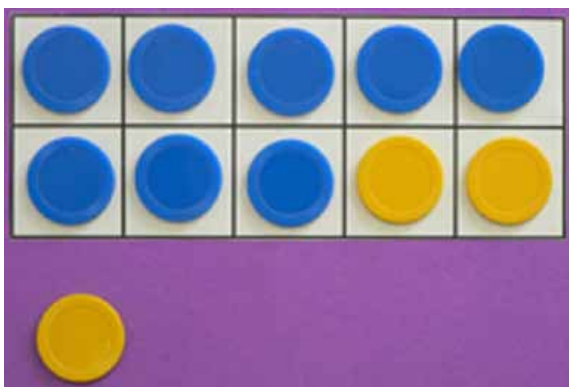
The following resource supports students in developing recall of the near 10 facts:
Sheet, Near 10 fact cards

Near 10 extension: Near 100

In **Year 3**, the near 10 strategy is extended to include multiples of 10 – the near 100 strategy. Students using this strategy recognise when the addition is close to a make 100 fact (i.e. one of the addends is 1 ten more). For example:

- 70 + 40 (70 + 30 is a make 100 fact, so 70 + 40 is 1 ten more than 100) = 110

- 50 + 60 (50 + 50 is a make 100 fact, so 50 + 60 is 1 ten more than 100) = 110

Adding 9

This strategy is sometimes called the 'add 10, count back 1' or the 'see 9, think 10' strategy.

The strategy can be introduced when students are confident adding 10 to another number. Nine is one less than 10, so the answer will be one less than adding 10.
e.g. 9 + 7 is one less than 10 + 7, which is 17. So, 9 + 7 must be 16.

Begin adding 9 to numbers up to 9 + 9, then extend to adding 9 to any 2-digit number. The strategy remains the same (i.e. add 10, count back 1).

The hundred board is a useful tool for illustrating the adding 9 strategy. Locate the larger number, move down one row (add 10), then count back one square.

15 + 9 = (15 + 10) – 1 = 24

37 + 9 = (37 $\overset{47}{+}$ 10) – 1 = 46

0	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

> The following resource supports students in developing recall of the adding 9 facts:
> Learning object, Add 9 and 19 with Undercover Cat

Adding 9 extensions

Once students have a good understanding of the strategy for adding 9 to a number, they will make the generalisation that a similar strategy can be used to add 9 tens (90) to a number. Students using this strategy add on 100 (10 tens) and take away 10 (count back 1 ten).

In **Year 3**, the recommended sequence for introducing extensions to the adding 9 strategy is:

1. adding 90 to multiples of 10 up to 90 + 90

   e.g. 60 + 90 = (60 + 100) – 10 = 150. Or: 6 tens add 10 tens is 16 tens, count back 1 ten is 15 tens (150)

2. adding 90 to any 2-digit number

   e.g. 36 + 90 = (36 + 100) – 10 = 126

Later in Year 3, the strategy is extended again to include 3-digit numbers:

1. adding 9 to 3-digit numbers (add 10, count back 1)

   146 + 9 = (146 $\overset{156}{+}$ 10) – 1 = 155

2. adding 90 to 3-digit numbers (add 100, count back 10)

   146 + 90 = (146 + 100) – 10 = 236

Students might make generalisations about the adding 9 strategy to include other near multiples of 10 (19, 29, 39…). For example, they might realise that to add 19 to another number, they can add 20 and count back 1.

   24 + 19 = (24 $\overset{44}{+}$ 20) – 1 = 43

> The following resource supports students in learning to extend the adding 9 facts:
> Learning object, Add 9 and 19 with Undercover Cat

Make to 10

When all the previous facts have been investigated, there are only a small number of remaining addition facts that involve adding 8 or 9. One strategy for working these out is to make one number in the fact up to 10 and then add the remaining number. This is sometimes called the 'think 10' or 'build to 10' strategy.

For 8 + 4: Make the 8 up to 10 by taking 2 from the other addend (the 4). The addition is now 10 + 2.

A ten frame is useful for demonstrating the make to 10 facts.
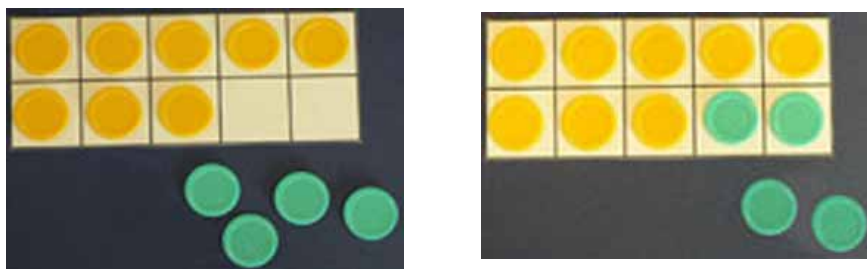
8 + 4   is the same as   10 + 2

The following resources support students in developing recall of the make to 10 facts:
Learning objects, Build-to-ten facts

Make to 10 extension: Make to 100 (or build to 100)

In Year 3, the Make to 10 strategy is extended to include multiples of 10. This strategy is appropriate when one of the addends is close to 100 (i.e. 70, 80 or 90).

Students need to develop a strategy that allows them to think, 'How do I build to 100? What's left to be added?'

For 70 + 40: Make 70 up to 100 by taking 30 from the other addend (40) leaving 10. The addition is now 100 + 10.

Students who need to work with concrete materials to develop deeper understanding could use MAB tens on a grid that is 10 cm x 10 cm square.

Subtraction: Year 2

The main strategy for learning subtraction facts is to relate them to known addition facts. Addition facts must therefore be well known before attempting subtraction facts.

Students who understand the relationship between addition and subtraction will find the basic subtraction facts easy to master. 'Think addition' is a strategy that can be applied to all subtraction facts. For example, when a student sees $9 - 4 = \square$, they can use the inverse addition relationship to find the unknown (i.e. what has to be added to 4 to make 9?).

In **Year 2**, students investigate and practise these subtraction strategies:
- count back and up
- doubles
- zeros
- tens.

Once students have grasped these concepts and shown they can apply them in different situations, the strategies can be extended to include 2- and 3-digit numbers.

Count back	
Count back 1	1–1 2–1 3–1 4–1 5–1 6–1 7–1 8–1 9–1 10–1
Count back 2	2–2 3–2 4–2 5–2 6–2 7–2 8–2 9–2 10–2 11–2 Think 'start big, count back small'.
Count back 3	3–3 4–3 5–3 6–3 7–3 8–3 9–3 10–3 11–3 12–3
Extension: Count back 10, 20, 30	e.g. 60–10 70–20 90–30 Think 'in tens'. For 70 – 20, think '7 tens count back 2 tens is 7… 6, 5. 5 tens is 50'.

Count up	
Count up 1	1–0 2–1 3–2 4–3 5–4 6–5 7–6 8–7 9–8 10–9
Count up 2	2–0 3–1 4–2 5–3 6–4 7–5 8–6 9–7 10–8 11–9
Count up 3	3–0 4–1 5–2 6–3 7–4 8–5 9–6 10–7 11–8 12–9 Think 'start at the small number and count up (on the fingers) to the large number'. For 10 – 7, start at 7, then show fingers as you count '8, 9, 10'.
Extension: Count up 10, 20, 30	e.g. 60–50 70–40 90–70 Think 'in tens', when the numbers are 10, 20 or 30 apart. For 90 – 70, think '7 tens… 8 tens, 9 tens. That's 2 tens' difference. 90 – 70 is 20'.

Doubles	
Doubles to 18 – 9	<mark>0–0</mark> <mark>2–1</mark> <mark>4–2</mark> <mark>6–3</mark> 8–4 10–5 12–6 14–7 16–8 18–9
Extension: Doubles to 100 – 50	20–10 40–20 60–30 80–40 100–50 Think 'in tens'. For 80 – 40, think '8 tens – 4 tens leaves 4 tens, so 80 – 40 = 40'.

Zeros	
Where all are taken	<mark>0–0</mark> <mark>1–1</mark> <mark>2–2</mark> <mark>3–3</mark> 4–4 5–5 6–6 7–7 8–8 9–9
Where none are taken	0–0 1–0 2–0 3–0 4–0 5–0 6–0 7–0 8–0 9–0
Extensions: Where all are taken (multiples of 10)	e.g. 10–10 20–20 30–30 40–40
Where none are taken (multiples of 10)	e.g. 10–0 20–0 30–0 40–0

Tens	
Take from 10 (rainbow 10)	<mark>10–1</mark> <mark>10–2</mark> <mark>10–3</mark> 10–4 <mark>10–5</mark> 10–6 10–7 10–8 10–9
Extension: Take from 100 (Rainbow 10 for multiples of ten)	100–10 100–20 100–30 100–40 100–50 100–60 100–70 100–80 100–90 Think 'in tens'. For 100 – 60, think '10 tens – 6 tens is 4 tens, so 100 – 60 is 40'.

Subtraction: Year 3

Count back	
Revise from Year 2: • Count back 0, 1, 2 and 3 • Count back 10, 20, 30	
Extension: Count back 100, 200, 300	e.g. 500–100 600–200 400–300 550–100 685–200 739–200 970–300

Count up	
Revise from Year 2: • Count up 1, 2 and 3 • Count up 10, 20, 30	
Extension: Count up 100, 200, 300	e.g. 500–400 900–800 600–400 800–600 700–400 900–600

Doubles	
Revise from Year 2: • Doubles to 18 – 9 • Doubles to 100 – 50	
Extension: Doubles of all remaining multiples of 10 to 200 – 100	120–60 140–70 160–80 180–90 200–100 Think 'in tens'. For 160 – 80, think '16 tens – 8 tens is 8 tens, so 160 – 80 = 80'.
Extension: Doubles of multiples of one hundred to 800 – 400	200–100 400–200 600–300 800–400 Think 'in hundreds'. For 600 – 300, think '6 hundreds – 3 hundreds is 3 hundreds, so 600 – 300 = 300'.
Doubles + 1 (Near doubles or neighbours)	3–1 5–2 7–3 9–4 11–5 13–6 15–7 17–8 19–9 Think 'when the big number is one more than double the small number, the answer will be one more than the small number'.
Doubles – 1 (Near doubles or neighbours)	3–2 5–3 7–4 9–5 11–6 13–7 15–8 17–9 Think 'when the big number is one less than double the small number, the answer will be one less than the small number'.

Zeros

Revise from Year 2:
- Where all are taken
- Where all are taken (multiples of 10)
- Where none are taken
- Where none are taken (multiples of 10)

Extension: Zeros where all are taken (multiples of 100 up to 900)	100–100 200–200 300–300 400–400 up to 900–900
Extension: Zeros where none are taken (multiples of 100 up to 900)	100–0 200–0 300–0 400–0 up to 900–0

Tens

Revise from Year 2:
- Rainbow 10 (take from 10)
- Take from 100 (Rainbow 10 for multiples of ten)

Extension: Take from 1 000 (Rainbow 10)	1 000–100 1 000–200 1 000–300 1 000–400 1 000–500 1 000–600 1 000–700 1 000–800 1 000–900 Think 'in hundreds'. For 1 000 – 600, think '10 hundreds – 6 hundreds is 4 hundreds, so 1 000 – 600 is 400'.
Take from one more than 10 (Near 10)	11–2 11–3 11–4 11–5 11–6 11–7 11–8 11–9 Think 'one more than rainbow 10'. For 11 – 4, think '11 – 4 is one more than 10 – 4, which is 6. So 11 – 4 is 7'.
Take from one less than 10 (Near 10) **Note**: All of these facts have been taught using other strategies.	9–2 9–3 9–4 9–5 9–6 9–7 9–8 9–9 Think 'one less than rainbow 10'. For 9 – 4, think '9 – 4 is one less than 10 – 4, which is 6. So 9 – 4 is 5'.
Take nine, think 10	10–9 11–9 12–9 13–9 14–9 15–9 16–9 Think 'take 10 add 1'. For 12 – 9, think '12 – 10 is 2 so 12 – 9 is 3'.
Take eight, think 10	10–8 11–8 12–8 13–8 14–8 15–8 16–8 Think 'take 10 add 2'. For 12 – 8, think '12 – 10 is 2 so 12 – 8 is 4'.
Take all the ones and one more	9–0 10–1 11–2 12–3 13–4 14–5 15–6 16–7 17–8 18–9 Think 'take all the ones away then count back one'. For 14 – 5, think '14 – 4 is 10 so 14 – 5 is 9'.

Remaining facts

These facts are not covered by any of the subtraction strategies above.	12–4 12–5 12–7 13–5 14–6 Students generate their own strategies. For 12 – 7, think '12 is two less than double 7 so the answer must be two less than 7 (5)'. Or '13 – 5 is three more than the rainbow 10 fact 10 – 5. So 13 – 5 is three more than 5 (8)'.

Subtraction strategy: Count back

Count back

This strategy is used when the number to be taken away is small (e.g. 1, 2 o r 3). Students can quickly count back from the larger number. This strategy is also sometimes referred to as the 'start big, count back small' strategy.

Students are ready to use the count back subtraction strategy once they can count backwards in ones.

A number line is useful for demonstrating the count back facts.

> The following resources support students in developing recall of the count back 1, 2 and 3 facts:
> - Learning objects, Number track - Count back 1 or 2, Counting on and back, Take-away operations, Function machine: Subtraction and Subtraction strategies
> - Sheets, Count back cupcakes, Cupcakes and lollies, Count back dice and Count back 1 and 2 cards
>
> For more information about this strategy, refer to the Supporting learning card, Counting back.

Count back extensions

In **Year 3**, the count back strategy is extended to include:
- multiples of 10
  e.g. 60 – 20 (6 tens count back 2 tens)
- multiples of 100
  e.g. 600 – 200 (6 hundreds count back 2 hundreds)

Students make generalisations about the count back strategy to help them mentally subtract other 2- and 3-digit numbers, such as:
- 46 – 20 (count back 2 in the tens place)
- 190 – 30 (19 tens count back 3 tens)
- 350 – 100 (count back 1 in the hundreds place)
- 965 – 231 (count back 2 hundreds, 3 tens and 1 one)

> The following resource supports students in learning to extend the count back 1, 2 and 3 facts:
> Learning objects, Take me away, Fergus and Dice: count on or back

Subtraction strategy: Count up

The count up strategy can be used when the numbers in the subtraction fact are close together. Students find the difference between numbers by counting up (on their fingers) from the smaller number to the larger number.

Note: Using fingers to keep track of mental computation is not usually encouraged because it is neither efficient nor fast when the difference is greater than five. However, using fingers to 'record' or remember the count up is an aid used by many people, including adults.

> The following resources support students in developing recall of the count up subtraction facts:
> Learning objects, Take me away, Fergus, Undercover Cat and Subtraction strategies

Count up extensions

Once students have a good grasp of counting up in single digits, they can apply the strategy to larger numbers. They continue to count the steps up on their fingers. In **Year 2**, they count up to find the differences between multiples of 10, such as:

- 90 – 60 (count up in tens from 60 to 90)
- 120 – 100 (10 tens… 11 tens, 12 tens)

In **Year 3**, students extend the strategy to include other 2-digit numbers, multiples of 100 and other 3-digit numbers, such as:

- 88 – 60 (count up from 60 to 80, then add the ones)
- 88 – 68 (68…. 78, 88)
- 700 – 400 (400…. 500, 600, 700)
- 850 – 650 (650… 750, 850)

> The following resources support students in learning to extend the count up 1, 2 and 3 facts:
> Learning object, Undercover Cat

Subtraction strategy: Doubles

Doubles to 18 – 9

Students are ready to use the doubles subtraction strategy when they are confident with the doubles addition facts and understand the inverse relationship between addition and subtraction.

Examples of doubles in pictures, poems, stories or charts can be used to explore the doubles subtraction facts. For example, for 8 take away 4, cover half the spider's legs on the Doubles chart to 10. Students can also show subtraction by making trains of linking cubes and breaking them in half, or placing an equal number of cubes on either side of a set of balance scales.

> The following resources support students in developing recall of the doubles subtraction facts:
> - Sheets, Doubles chart to 10 and Doubles chart 12 to 18
> - Learning objects, Doubles take-away facts, Fact grid, Double and half (1 to 10) and Subtraction strategies

Doubles extensions

In the second half of **Year 2**, the doubles subtraction strategy is extended to include multiples of 10, such as:
- 60 – 30 (double 3 tens is 6 tens, so 6 tens take away 3 tens is 3 tens)
- 100 – 50 (10 tens is double 5 tens, so 10 tens take away 5 tens is 5 tens)

In **Year 3**, students may apply generalisations about the doubles strategy to multiples of 100 (up to 800) and other 2- and 3-digit numbers, such as:
- 600 – 300
- 84 – 42 (8 tens is double 4 tens and 4 is double 2, so 84 – 42 is 42)

> The following resource supports students in learning to extend the doubles subtraction facts:
> Learning object, Double and half (10 to 50)

Near doubles

In **Year 3**, students use their knowledge of doubles to work out the answers to the neighbouring subtraction facts.

If the first number is near (i.e. one more or one less than) double the number being subtracted, the answer will be one more or less than that number. These subtraction facts are called:
- doubles + 1

  e.g. 15 – 7 (15 is one more than double 7, so the answer is one more than 7)

- doubles – 1

  e.g. 13 – 7 (13 is one less than double 7, so the answer is one less than 7).

Subtraction strategy: Zeros

Where all are taken

Zero is an abstract concept for young students, so they need to have a clear understanding of its meaning before they begin exploring the zero subtraction strategies.

Discuss subtraction situations students are familiar with where zero things might be left behind, such as when all are taken away, eaten, spent or lost. Use concrete materials to count the objects in a collection, then remove the whole collection, leaving zero behind. Show the zero subtraction facts on a number line drawn on the ground and have students stand on the starting number, then jump back that number to show that zero is the answer.

Show related zero subtraction facts on a fact family triangle. Say/write the facts.

$1 - 1 = 0$	$4 - 4 = 0$	$9 - 9 = 0$
$1 - 0 = 1$	$4 - 0 = 4$	$9 - 0 = 9$
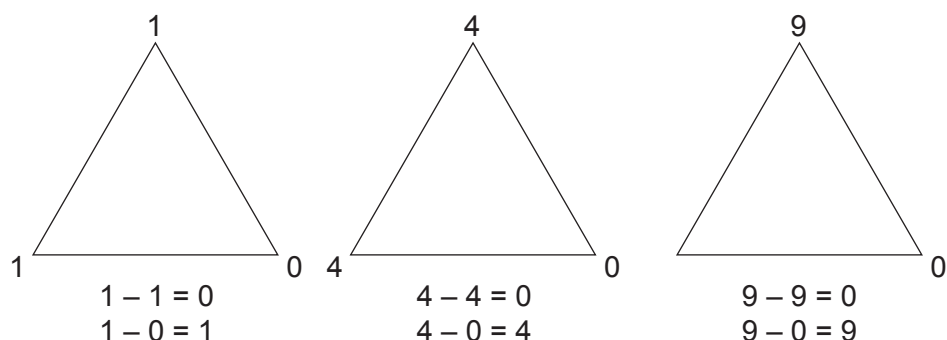
Where none are taken

Older students with a strong understanding of number find it obvious that if you take nothing away, you end up with the number you started with. However, younger students who have internalised the rule that subtraction results in a smaller number might have to spend time using concrete materials to count how many are in a collection, then count again how many are left after none are taken away, eaten, spent or lost.

> The following resources support students in developing recall of the zeros subtraction facts:
> *   Sheet, Zero fact cards
> *   Learning object, Subtraction strategies

Subtraction strategy: Tens

Take from 10 (rainbow 10)

Students can use their knowledge of rainbow 10 addition facts to help with the take from 10 subtraction facts. Remind students why these facts are also called 'rainbow 10' facts (see page 11) and show how the rainbow can be used to work out the answers for subtraction as well as addition. For example:
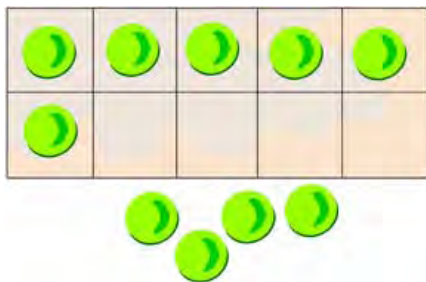
* 10 – 8, start at the 8 on the rainbow and follow it around to the answer, 2.

The ten frame is useful for showing the take from 10 subtraction facts. For 10 – 4, start with a full ten frame and remove 4. How many are left?

> The following resources support students in developing recall of the rainbow 10 subtraction facts:
> * Sheet, Rainbow 10 subtraction fact cards
> * Learning object, Subtraction strategies

Take from 10 extensions: Take from 100 and Take from 1 000

Once students have mastered the rainbow 10 facts for addition and subtraction, they can extend the strategy in **Year 2** to include multiples of 10 (the 'take from 100' strategy).
e.g. 100 – 40 = 60 (10 tens – 4 tens is 6 tens)

In **Year 3**, students make further generalisations about the rainbow 10 facts to include multiples of 100 (the 'take from 1 000' strategy).
e.g. 1 000 – 400 = 600 (10 hundreds – 4 hundreds is 6 hundreds)

> The following resource supports students in learning to extend the rainbow 10 subtraction facts:
> Learning object, Take me away, Fergus

Near 10

Students who are competent using the rainbow 10 subtraction strategy can use their knowledge to subtract from numbers that are near ten (11 and 9).

* For 11 – 7, think '11 take away 7 is one more than 10 take away 7 (3), so the answer is one more than 3 (4)'. This is called the 'take from one more than 10' strategy.

* For 9 – 3, think '9 take away 3 is one less than 10 take away 3 is 7, so the answer is one less than 7 (6)'. This is called the 'take from one less than 10' strategy.

Take nine/eight, think 10

This strategy is the inverse of the make to 10 strategy in addition. Students using this strategy adjust one number in the fact so they can 'make' or 'think' ten, and then adjust the other number accordingly. For example:

- for 13 – 9, students might add one to the 9 (to think 10) and then adjust the answer by adding 1. Alternatively they might increase both numbers by one, making 14 – 10.
- for 15 – 8, students might add two to the 8 (to think 10) then add 2 to the answer. Alternatively, increase both numbers by 2, making 17 – 10.

Once students are confident using this strategy, it can be extended to include taking eight and nine from other 2-digit numbers. For example:

- for 25 – 9, think (25 – 10) + 1, or 26 – 10
- for 74 – 8, think (74 – 10) + 2, or 76 – 10

Take all the ones and one more

In **Year 3**, students begin subtracting in situations where the numbers bridge the tens. The 'take all the ones and one more' strategy belongs in both the zeros section (because all the ones are being taken in the first place) and in the tens family of subtraction strategies (because taking all the ones brings the number to a multiple of 10 before one more is subtracted).

- For 15 – 6, think (15 – 5) – 1
- For 37 – 8, think (37 – 7) – 1

Multiplication: Introduction

Multiplication builds on addition, so it is important that students have a good understanding of addition and recall of addition facts before they begin exploring multiplication facts. Some strategies rely heavily on addition, particularly the 'build up' facts such as the 3s and 6s.

Students are introduced to multiplication informally in **Year 2** through making equal groups, arrays and skip counting. The multiplication symbol 'x' is also introduced in Year 2, but is read as 'groups of' or 'rows of'. The formal teaching of multiplication facts and strategies for working them out begins in **Year 3**. Before teaching any set of facts, make sure students have a sound understanding of the symbolic representation (e.g. 3 x 2 = 6).

As with addition and subtraction, the emphasis in teaching multiplication facts is to present students with one or more strategies that will help them work out answers. Recall of multiplication facts is developed gradually after significant exposure and opportunity to practise the strategies.

Students begin by developing strategies for working out the easier facts (1s, 2s, 5s and 10s). They continue to practise those facts while strategies for new facts are introduced. By the end of Year 7, students should have recall of all facts to 10 x 10.

The two main strategies for representing multiplication are:
- making equal groups (e.g. 3 jars with 6 in each jar)
- making arrays (e.g. 3 rows with 6 in each row).

The turnaround (commutative) principle should be emphasised as each strategy is introduced. This significantly reduces the number of new strategies to learn.

The following steps could be used as a guide to teaching each set of facts:
1. Teach a strategy for working out the new set of facts and explore other strategies that could be used.
2. Practise the facts using several different strategies and in a variety of contexts, including games and rote. See the Tips section on page 47 and the Games section on page 51 for ideas.
3. Look for known facts when each new set of facts is introduced. For example, when students are introduced to the 5s facts they might identify 5 x 2 as a fact they know already from their experience with doubles, the 2s facts or skip counting.

Each new set of facts should be introduced only when students are confident and competent in working out (or recalling) previously taught facts.

Note: Avoid the use of the word 'times' in multiplication facts. Acceptable terms include '3 multiplied by 6', 'three 6s' and '3 by 6'.

Multiplication: Year 3

The multiplication facts taught in Year 3 are shown below.

Sequence	
2s facts	2x0 2x1 2x2 2x3 2x4 2x5 2x6 2x7 2x8 2x9
and turnarounds	0x2 1x2 2x2 3x2 4x2 5x2 6x2 7x2 8x2 9x2
5s facts	5x0 5x1 **5x2** 5x3 5x4 5x5 5x6 5x7 5x8 5x9
and turnarounds	0x5 1x5 **2x5** 3x5 4x5 5x5 6x5 7x5 8x5 9x5
	Think 'double and halve'. For 5 x 4, think '10 x 4 is 40. Half of 40 is 20'.
4s facts	4x0 4x1 **4x2** 4x3 4x4 **4x5** 4x6 4x7 4x8 4x9
and turnarounds	0x4 1x4 **2x4** 3x4 4x4 **5x4** 6x4 7x4 8x4 9x4
	Think 'double doubles'. For 4 x 3, think 'double double 3. Double 3 is 6 and double 6 is 12'.
1s facts	1x0 1x1 **1x2** 1x3 **1x4** **1x5** 1x6 1x7 1x8 1x9
and turnarounds	0x1 1x1 **2x1** 3x1 **4x1** **5x1** 6x1 7x1 8x1 9x1
10s facts	10x0 **10x1** **10x2** 10x3 **10x4** **10x5** 10x6 10x7 10x8 10x9
and turnarounds	0x10 **1x10** **2x10** 3x10 **4x10** **5x10** 6x10 7x10 8x10 9x10
	Think 'place value'. For 10 x 5, think 'that's 5 tens, another name for
9s facts	9x0 **9x1** **9x2** 9x3 **9x4** **9x5** 9x6 9x7 9x8 9x9
and turnarounds	0x9 **1x9** **2x9** 3x9 **4x9** **5x9** 6x9 7x9 8x9 9x9
	Think '10s facts take away 1 row'. For 9 x 4 think '10 x 4 take away 4. 40 – 4 =

Note: The 10s facts are not technically basic number facts because they have a 2-digit multiplier. However, they are included here because of their usefulness in working out other facts.

Multiplication strategy: Group

Introduce the group strategy for multiplication by asking students to make equal groups and then count how many altogether. Later they can match pictorial representations with symbolic representations.
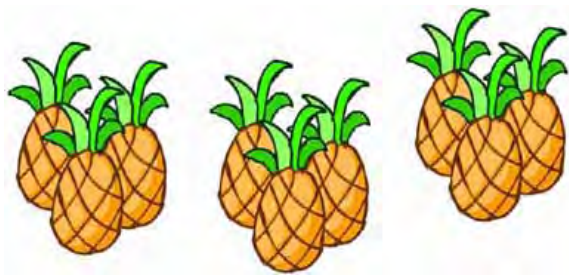
3 x 3 = 9

3 groups of 3

three 3s

3 multiplied by 3

Once students understand the relationship between the pictures and the symbols, provide them with a symbolic representation and ask them to draw a matching picture or make matching groups.

Multiplication strategy: Array

The array strategy is the preferred strategy for teaching multiplication facts because it emphasises the commutativity of those facts.

Students are exposed to arrays regularly in their everyday life in the form of egg cartons, chocolate bars, packets of biscuits, students in lines and so on.

To see real-world examples of arrays, watch the AV slideshow, Arrays.

The array strategy allows students to visualise the thinking required for mastering multiplication facts. It helps them visualise multiplication as repeated addition and, by physically turning the array around, builds an understanding of the turnaround (commutative) facts.
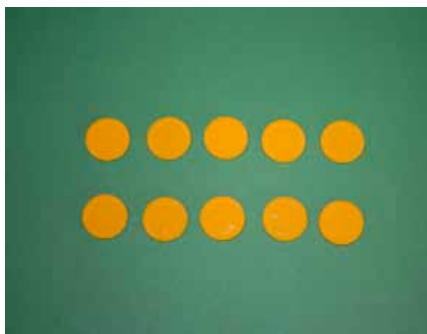
This array shows 2 rows of 5, or 2 x 5.
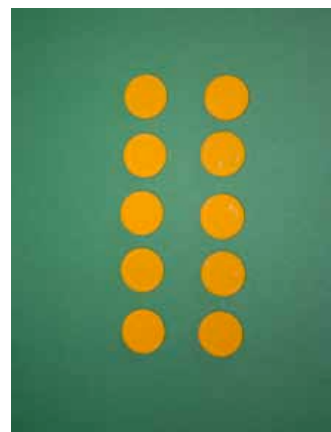
This array shows 5 rows of 2, or 5 x 2.

The following resources support students in developing an understanding of arrays:
- AV, Arrays
- Learning objects, Arrays, Finding arrays and Pobble arrays: find a factor
- Sheet, Groups and arrays

Multiplication strategy: Skip counting

Students who can skip count by rote can use skip counting sequences to work out answers to multiplication facts. For example, to work out 6 x 5, students can count in 5s along six of their fingers or along six jumps on a number line.

Multiplication strategy: Known facts

Known facts can be built on when introducing new facts. In this way, students can construct new understandings from prior learning.

• The 2s facts will be familiar to students through:
  – skip counting in 2s
  – the doubles addition strategy (double 6 can be read as 6 + 6, 2 groups of 6 or 2 x 6).

• The 5s facts will be familiar through:
  – skip counting in 5s
  – counting in five-minute intervals on an analogue clock face.

• The 10s facts will be familiar through:
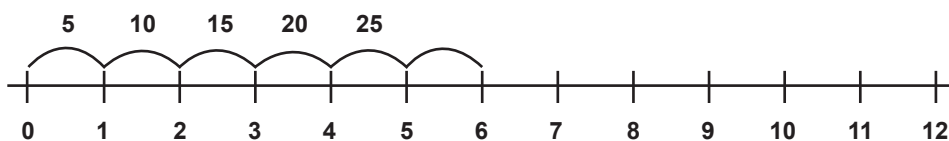 – working with bundles of 10 and MAB
  – place value understandings.

Multiplication strategy: Doubles

Students should be encouraged to think about doubling if one of the numbers in a fact is 2, 4 or 8.

• The 2s facts involve doubling, so 2 x 3 is double 3 = 6.

• The 4s facts involve doubling the double, so 4 x 3 is double double 3 or 2 x (2 x 3) = 12.

• The 8s facts involve doubling the double doubles, so 8 x 3 is double double double 3 or 2 x 2 x (2 x 3) = 24.

Multiplication strategy: Build up and build down

Students who understand the repeated addition aspect of multiplication can use known facts to help them work out new facts.

• For the 6s facts, students might think about the 5s facts, then add (build up) one more row. So for 6 x 3, students might think '5 rows of 3 and add 3 more'.

Arrays can be used to illustrate the build up.

e. g. for 6 x 3:

5 x 3 = 15

15 + 3 = 18

- For the 3s facts, students might think about the 2s facts (double), then add one more row.

  e. g. for 3 x 6   • • • • • •

                 • • • • • •   double 6 is 12

                 • • • • • •   12 + 6 = 18

- For the 7s facts, students might think about the 5s facts and add (build up) two more rows. So for 7 x 4, students might think '5 rows of 4 and add double 4', which is 20 + 8.

- For the 9s facts, students might think about the 10s facts and subtract (build down) one row. So for 9 x 4, students might think '10 x 4 then take away 4', which is 40 – 4.

Multiplication strategy: Place value (break up strategy)

This strategy is most likely to be used by students who are attempting to multiply 2-digit numbers mentally. They use their knowledge of the value of numbers in each place to break 2-digit numbers into manageable chunks. For example, when students see 24 x 3, they break the multiplication down to 20 x 3 and 4 x 3. This strategy could later be extended to include 3-digit numbers and decimal numbers.

Multiplication facts: Year 3

2s facts

Most students will be confident counting in 2s by the beginning of Year 3, but their understanding of the relationship between counting in 2s and multiplication may not have developed.

Using arrays

Making arrays is a useful way to help students develop understanding of all the multiplication facts. Begin by making (or drawing) an array to show two rows of 2. Use the language 'two 2s', '2 rows of 2' and/or '2 multiplied by 2'.

• •
• •   2 x 2 = 4

Add another row to represent 3 rows of 2.

• •
• •   3 x 2 = 6
• •

Continue to add rows one at a time up to 9 rows of 2.

Each time a new array is made, encourage students to turn the array 90° and say the turnaround fact. In this way, the number of new facts to be learned is halved.

Fact	Array	Turnaround
3 x 2 = 6	• •	• • •
3 rows of 2 = 6	• •	• • •
	• •	
	3 x 2 = 6	2 x 3 = 6
	3 rows of 2 = 6	2 rows of 3 = 6

Using doubles

The 2s facts can be represented as doubles. Use pictures of doubles to represent the 2s facts and their turnarounds. For example:

Fact	Turnaround	Pictorial representation
8 x 2 = 16	2 x 8 = 16	
	(double 8)	

The doubles strategy is important as it can be used to work out harder facts, such as doubling 2-digit numbers. For example, students working out 34 x 2 think 'double 34. Double 30 is 60 and double 4 is 8. 60 and 8 is 68'.

The following resources support students in developing recall of the 2s multiplication facts:

• Learning objects, Counting in 2s, 2s facts and turn arounds, Fact family triangle: Multiplication and division, Multiplication grid and Maths – Sing it! (*2s facts* song)
• Sheets, 2s multiplication facts, Seeing double, Doubles chart to 10, Doubles chart 12 to 18 and Tug of war gameboard
• AV, Double trouble

5s facts

Most students will be confident counting in 5s by the beginning of Year 3, but their understanding of the relationship between counting in 5s and multiplication may not have developed.

Using arrays

Use concrete materials to make arrays or encourage students to draw arrays to represent the 5s facts. As with the 2s facts, begin by asking students to show or draw 2 rows of 5, then add one row at a time up to 9 rows of 5.

Fact	Array	Recording
2 rows of 5	• • • • • • • • • •	2 x 5 = 10
3 rows of 5	• • • • • • • • • • • • • • •	3 x 5 = 15

Each time an array is represented, it should be turned 90° to show that the number of dots in the turnaround fact remains the same regardless of the order. Encourage students to explain the commutativity of the turnaround fact.

Fact	Array	Turnaround
2 x 5 = 10 2 rows of 5 = 10	• • • • • • • • • • 2 x 5 = 10	• • • • • • • • • • 5 x 2 = 10 5 rows of 2 = 10

Using the clock face

Students who are familiar with the concept of five-minute intervals on an analogue clock face and competent at skip counting in 5s will find the clock a useful mnemonic for practising the 5s facts. Discuss the relationship between the numbers on the clock and the minutes they represent.
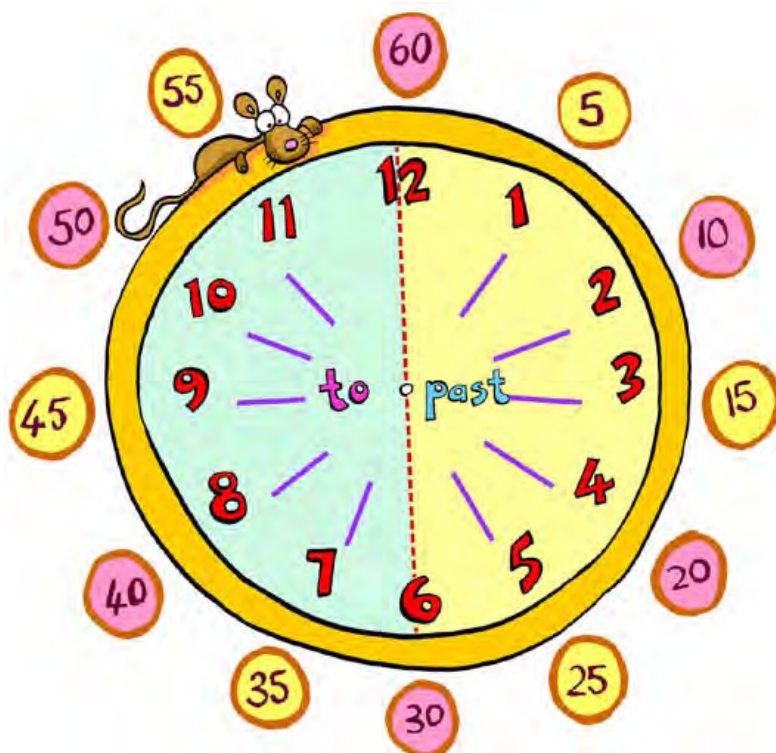
Doubling and halving

Students who know the 10s facts already might realise that the 5s facts are half of the 10s facts. Once they have made this connection, they can use the 10s facts to find the answers to the 5s facts. This method is called 'doubling and halving'.

For 5 x 4, think 'double the 5 and halve the 4' to make 10 x 2.

Alternatively, for 5 x 5, think '10 x 5 is 50. Half of 50 is 25'.

The following resources support students in developing recall of the 5s multiplication facts:

- Learning objects, Fact family triangle: Multiplication and division, More 5s facts, Counting in 2s and 5s and Maths – Sing it! (*5s facts* song)
- Sheets, 5s multiplication facts and Tug of war gameboard

4s facts

The most common strategy for working out the 4s facts is to double the number being multiplied by 4, then double it again.

- For 6 x 4, think 'double 6 (12) then double it again (24)'.
- For 3 x 4, think 'double 3 (6) then double it again (12)'.

It is also important that students are competent in extending the doubles strategy to multiples of 10, to help them work out facts involving 2-digit numbers multiplied by 4. For example:

• For 12 x 4, think 'double 10 add double 2 (20 + 4) then double it again (40 + 8)'.

The following resources support students in developing recall of the 4s multiplication facts:
• Learning object, Maths – Sing it! (*4s facts* song)
• Sheet, 4s multiplication facts

1s facts

Students tend to find the 1s facts confusing because they expect numbers to get bigger when they are multiplied. Encourage students to use concrete materials when they are first introduced to the 1s facts.

Begin by asking students to make groups of 1 and counting how many altogether.

e.g. Make 6 groups of 1 and use the language of 'six 1s'. Students who have worked with MAB will understand that 6 groups of 1 and six 1s are both ways of saying '6'.

Once students have internalised the idea that groups can hold just one item, introduce the concept of arrays with just one object in each row, such as a column of windows, a set of drawers or a small chocolate bar. Ask students to stand in a line one behind the other and discuss the arrangement (e.g. 25 rows of 1).

Ask students to make or draw arrays to represent the everyday examples they have seen.

For 6 rows with 1 window in each row, show   •
                                              •
                                              •   and record as 6 x 1.
                                              •
                                              •
                                              •

Begin with 1 row of 1, drawing the array and recording the fact. Build up the 1s facts one row at a time, up to 9 rows of 1. Introduce the turnaround as each fact is made.

Fact	**Array**	**Turnaround**
6 x 1 = 6 6 rows of 1	• • • • • • 6 x 1 = 6	• • • • • • 1 x 6 = 6 1 row of 6 = 6

The following resources support students in developing recall of the 1s multiplication facts:
• Learning object, Maths – Sing it! (*1s facts* song)
• Sheet, 1s multiplication facts

10s facts

The 10s facts are not technically basic number facts because they have a 2-digit multiplier. However, they are included here because of their usefulness in working out other facts, including the 9s and 5s facts.

Encourage students to use or think 'place value' when working out answers to the 10s facts. For example, students know that '3 tens' is another name for 30, so 3 x 10 is also 30.

A common student-generated strategy is to use the 10s facts to work out the 5s facts (by doubling and halving).
- For 5 x 6, think 'double the 5 and halve the six to make 10 x 3'.
- For 7 x 5, think 'double the 5 to make 7 x 10, then halve the answer (half of 70 is 35)'.

> The following resources support students in developing recall of the 10s multiplication facts:
> - Learning object, Maths – Sing it! (*10s facts* song)
> - Sheet, 10s multiplication facts

9s facts

Introduce the 9s facts in the same way the other sets of facts were introduced (i.e. by making or drawing arrays, recording and showing the turnarounds).

There are several strategies for working out the 9s facts.

Think 10s facts and take away a row

The 9s facts can be found by 'thinking 10' (to make the calculation easy), then building down one row. Encourage students to use or think 'place value' when working out each 10s fact.

For 9 x 3, think '10 x 3, then take away one row of 3' (30 – 3 = 27).

Look for patterns in the answers

Write a list of the 9s facts from 1 x 9 to 9 x 9 and their answers. Discuss the patterns in the tens and ones in the answers. There are several patterns, including:

- the number in the ones column is decreasing by one

- the number in the tens column is increasing by one

- the number in the tens column is one less than the number of 9s

- the two digits always add to 9

- the answers have symmetry. The first 2-digit number (18) is the reverse of the last number (81); the second number 2-digit number (27) is the reverse of the second last number (72) and so on.

x 9	
1	9
2	18
3	27
4	36
5	45
6	54
7	63
8	72
9	81

Some of these observations can be used to work out answers to the 9s facts.

For 6 x 9, the number in the tens will be one less than six (5) and the number in the ones adds to 5 to make 9 (4). 6 x 9 = 54.

Use finger patterns

Hold out both hands, palms facing towards you. Give each finger a number from 1 to 10, starting with the left thumb. Fold down the finger that represents the number of 9s. The number of tens in the answer is represented by the number of fingers to the left of the folded down finger, and the number of ones is represented by the number of fingers to the right. For example, for 4 x 9, hold down finger number 4 and count the number of fingers on either side.
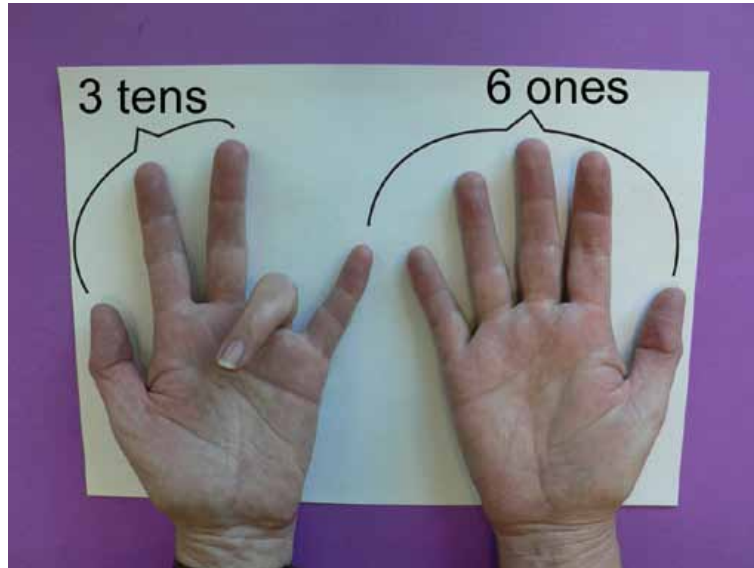
The following resources support students in developing recall of the 9s multiplication facts:
- Learning object, Maths – Sing it! (*9s facts* song)
- Sheet, 9s multiplication facts

The remaining multiplication facts are dealt with in Year 4.

Multiplication: Year 4

By the end of Year 4, students should have developed recall of the 1s, 2s, 4s, 5s, 9s and 10s facts and explored strategies for extending these facts to multiples of 10 and 100. By the end of Year 4, they will also have developed strategies to work out the remaining facts (3s, 6s, 7s and 8s).

Students should be encouraged to work out their own strategies for multiplying larger numbers, which might include:

• breaking up numbers (using known facts to work out unknown facts)

  e.g. for 12 x 8, students think '3 x 4 x 2 x 4' or '10 x 8 + 2 x 8'

• doubling and halving (double the larger number and halve the small number).

  e.g. for 12 x 4, think '24 x 2'; for 15 x 6, think '30 x 3'

Sequence										
Revise from Year 3: 1s, 2s, 4s, 5s, 9s and 10s facts										
3s facts	3x0	3x1	3x2	3x3	�	3x5	3x6	3x7	3x8	▮
and turnarounds	0x3	1x3	▮	3x3	4x3	5x3	6x3	7x3	8x3	9x3

Think 'double plus one more row'. For 3 x 5, think 'double 5 is 10, then add another 5. 10 + 5 = 15'.

6s facts	6x0	6x1	6x2	6x3	6x4	6x5	6x6	6x7	6x8	6x9
and turnarounds	0x6	1x6	▮	3x6	4x6	5x6	6x6	7x6	8x6	▮

Think '5s facts plus one more row'. For 4 x 6, think '4 x 5 is 20, then add another 6. 4 x 6 is 24'.

8s facts	8x0	8x1	8x2	8x3	8x4	8x5	▮	8x7	8x8	8x9
and turnarounds	0x8	▮	2x8	▮	4x8	5x8	6x8	7x8	8x8	9x8

Think 'double double double'. For 8 x 5, think 'double 5 is 10, double 10 is 20 and double 20 is 40'.

0s facts	0x0	0x1	0x2	0x3	▮	0x5	▮	0x7	0x8	0x9
and turnarounds	0x0	1x0	2x0	3x0	▮	5x0	▮	7x0	8x0	9x0

Think 'empty groups' or 'arrays with empty rows'. For 0 x 5, think 'zero rows of 5'. For the turnaround, think '5 groups with 0 in each group'.

Square number facts	0x0	1x1	▮	3x3	▮	5x5	6x6	7x7	▮	9x9

7s facts	7x0 7x1 7x2 7x3 7x4 ▮ 7x6 7x7 7x8 7x9
and turnarounds	0x7 1x7 2x7 3x7 ▮ 5x7 6x7 7x7 8x7 9x7
Extension: Multiples of 10 x 1-digit numbers	e.g. 20x0 20x1 30x2 40x3 30x4 40x5 50x6 20x7 30x8 50x9
and turnarounds	e.g. 0x20 1x20 2x30 3x40 4x30 5x40 6x50 7x20 8x30 9x50

Multiplication facts: Year 4

3s facts

The 3s facts can be worked out by adding one more row to a 2s fact. Therefore, the 2s facts must be well known before students are introduced to the 3s facts.

Use arrays to demonstrate how to work out answers to the 3s facts.

For 3 x 4, begin with 2 rows of 4 (double 4), then add another row of 4.

• • • •   add another row of 4   • • • •

• • • •   • • • •

2 x 4   • • • •   3 x 4 = (2 x 4) + 4

Students should be able to explain that, for the above example, 3 x 4 is the same as two 4s add another 4 (double 4 add 4).

The following resources support students in developing recall of the 3s multiplication facts:
- Learning object, Maths – Sing it! (*3s facts* song)
- Sheet, 3s multiplication facts

6s facts

The answers to the 6s facts can be worked out by building on the 5s facts. Therefore, the 5s facts must be well known before students are introduced to the 6s facts.

Use arrays to demonstrate how to work out answers to the 6s facts.

For 6 x 4, begin with 5 rows of 4, then add another row of 4

• • • •   add another row of 4   • • • •

• • • •   • • • •

• • • •   • • • •

• • • •   • • • •

• • • •   • • • •

5 x 4   • • • •   6 x 4 = (5 x 4) + 4

The following resources support students in developing recall of the 6s multiplication facts:
- Learning object, Maths – Sing it! (*6s facts* song)
- Sheet, 6s multiplication facts

8s facts

The 8s facts are often considered difficult facts for students, but if the array model is used to demonstrate these facts, students will see that multiplying by 8 is a chain of doubling. In fact, the 8s facts are sometimes called the 'double, double, double facts'.

To show 8 x 4, start with an array that shows 2 x 4 (double 4).

```
• • • •    then double    • • • •       then double again       • • • •

• • • •                   • • • •                                • • • •
                          ‾‾‾‾‾‾‾
Double 4 = 8              • • • •                                • • • •

                          • • • •                                • • • •
                                                                 ‾‾‾‾‾‾‾
                      Double 8 = 16                              • • • •

                                                                 • • • •

                                                                 • • • •

                                                                 • • • •

                                              Double 16 = 32, so 4 x 8 = 32
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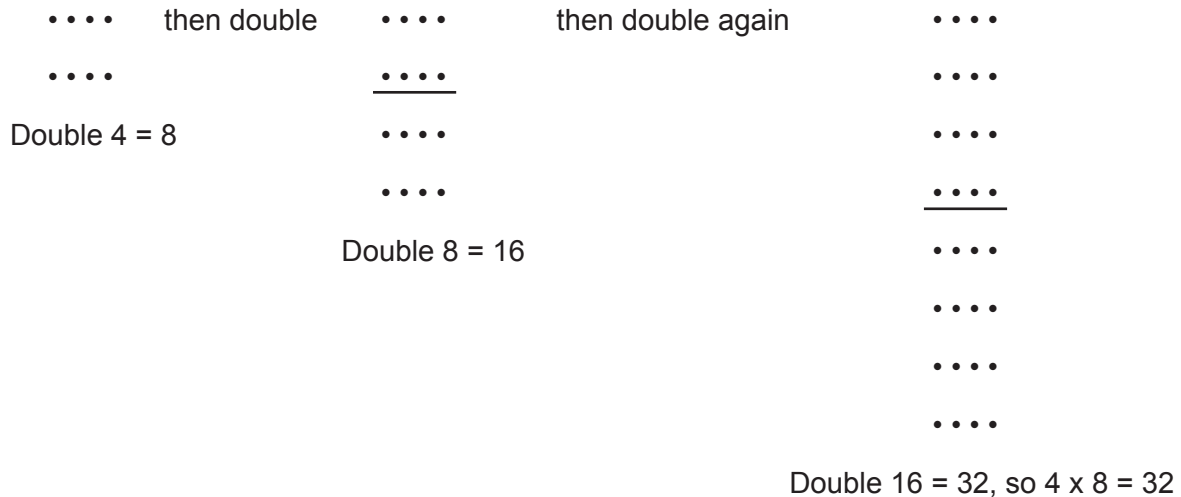
> The following resources support students in developing recall of the 8s multiplication facts:
> * Learning object, Maths – Sing it! (*8s facts* song)
> * Sheet, 8s multiplication facts

0s facts

The 0s facts may be difficult for students to understand because they cannot see real-life examples of empty groups or empty arrays, and cannot draw arrays to represent these facts or their turnarounds.

Begin by acting out situations that involve zero or empty groups. For example:

* show three buckets, each holding two marbles. Discuss the fact represented (3 x 2). Remove one **bucket** and discuss the new fact shown by the buckets (2 x 2). Remove the remaining buckets and discuss the new facts (1 x 2, then 0 x 2). Show there are no marbles left.

* show the turnaround fact by removing the **marbles** one at a time from the three buckets and discussing the facts: Three buckets with two marbles (3 x 2), three buckets with one marble (3 x 1) and three buckets with no marbles (3 x 0).

* show an egg carton with eggs in it, then remove the eggs one row at a time. Start with 3 rows of 2, then show 2 rows of 2, 1 row of 2 and finally 0 rows of 2. The egg carton can be turned to show the turnarounds.

* arrange the students in even rows (e.g. 5 rows of 5). Ask one student in each row to sit down until there are 5 rows with 0 students standing. To show the turnaround, ask rows of students to sit down until there are 0 rows of 5.

The emphasis is on helping students to understand that whether there are zero rows/groups or zero items in each row/group, there are zero items altogether.

> The following resources support students in developing recall of the 0s multiplication facts:
> * Learning object, Maths – Sing it! (*0s facts* song)
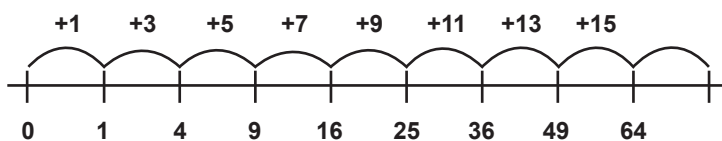> * Sheet, 0s multiplication facts

Square number facts

By the time the square number facts are introduced, students should have a strategy for working them out (except 7 x 7) and these strategies should be maintained. However, it is worth demonstrating how the array model builds to show the square number facts (add one column and one row for each consecutive square number). Square grid paper is also useful for illustrating how the array model builds.
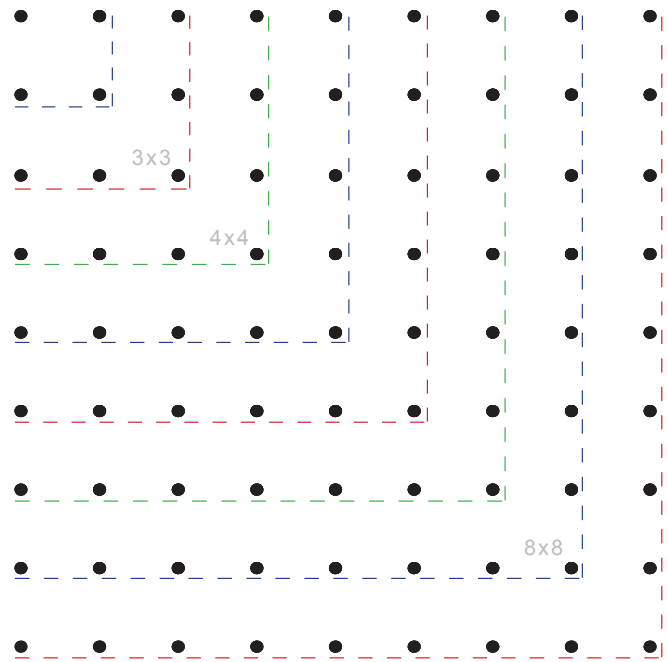
Ask students to shade the answers to the square number facts on a multiplication grid. Discuss the pattern.

Write the square numbers and look for a number pattern.

7s facts

The 7s facts are the last of the multiplication facts to be introduced because there is no traditional strategy for working out answers. Furthermore, every fact in the 7s set of facts has been taught previously in another set of facts.

Students may generate their own strategy for finding answers to the 7s facts. They need to be able to explain the strategy, which should work consistently for all 7s facts. For example:

- build up from 5s facts by working out the answer to the closest 5s fact and then adding on two more rows. For 7 x 3, students might think '5 x 3 is 15. Add two more 3s. That's 18… 21'.
- build down from 8s facts (double double double then remove one row). For 7 x 3, students might think 'double double double 3 (6, 12, 24) take away 3 (21)'.
- break into manageable parts. For 7 x 3, students might think '5 x 3 and 2 x 3, which is 15 and 6'.

The following resources support students in developing recall of the 7s multiplication facts:
- Learning object, Maths – Sing it! (*7s facts* song)
- Sheet, 7s multiplication facts

Division: Introduction

The main strategy for learning division facts is to relate them to known multiplication facts. Therefore, the division facts should only be introduced when students have a solid understanding of multiplication facts and the inverse relationship between multiplication and division.

Students are introduced to division informally in **Year 2** through making equal groups and sharing. Students need considerable practice in representing grouping and sharing situations using diagrams and symbols, followed by recording the division. The division symbol '÷' is introduced in **Year 3**, and is read initially as 'shared among' and later as 'divided by'. The formal teaching of division facts begins in **Year 4**. By the end of **Year 7** students should have immediate recall of the division facts.

Students should continue to use concrete materials and pictorial representations throughout **Year 4** and beyond, as they develop their understanding of the division concept. Both the partition and quotition models should be demonstrated for students.

> **Partition** means sharing into equal groups.
>
> **Quotition (grouping)** means how many equal groups can be made.

To solve 15 ÷ 3 using **partition**, think 'share 15 equally into 3 rows. How many in each row?'

```
•  •  •  •  •

•  •  •  •  •

•  •  •  •  •
```

To solve using **quotition**, think 'share 15 so that there are 3 in each group. How many groups?'

Encourage students to think about the partner facts when they are working out the answers to division facts. There are no turnarounds as division is not commutative. However, teaching the partner fact reduces the number of new facts to be learned.

e.g. 12 ÷ 2 = 6 and 12 ÷ 6 = 2

Division facts can be recorded in different ways. For example, 15 divided by 3 can be written as:

- 15 ÷ 3 = 5 or

- 3)‾15‾

In both cases, students need to be able to explain which number represents the amount to be shared and which number represents the number of equal groups.

> The following resources support students in developing the concept of division and recall of the division facts:
>
> Learning objects, [Introduction to the division symbol](), [Fact family triangle: Multiplication and division]() and [Multiplication grid]()
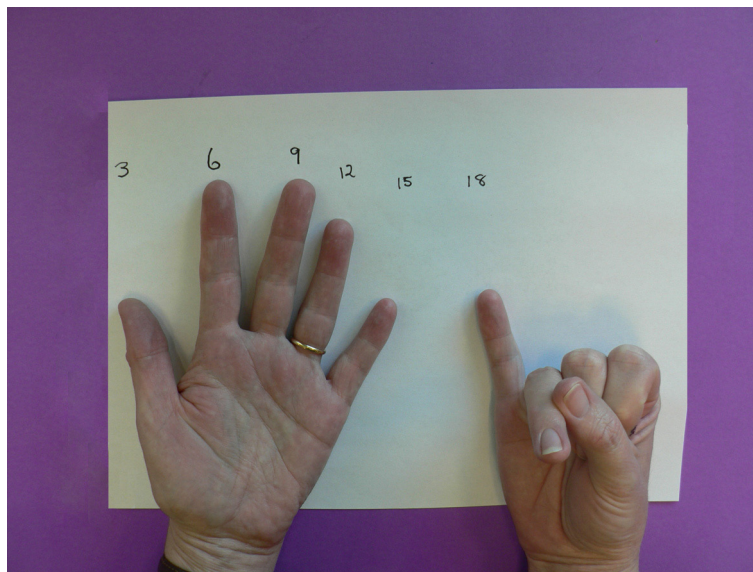
Division strategy: Think multiplication

The most commonly used strategy for working out division facts is to change the division into a multiplication. Understanding the inverse relationship between multiplication and division is essential.

For 15 ÷ 3, think '3 "whats" are 15 (3 x □ = 15). 3 fives are 15, so 15 ÷ 3 is 5'.

Division strategy: Skip count

Another strategy is to skip count up to the number being shared and use fingers to record the count.

This example shows skip counting on fingers to find 18 ÷ 3. There are six fingers so 18 ÷ 3 = 6.

Division: Year 4

The division facts taught in Year 4 are shown below.

Sequence									
2s facts	2÷2	4÷2	6÷2	8÷2	10÷2	12÷2	14÷2	16÷2	18÷2
and partners	2÷2	4÷2	6÷3	8÷4	10÷5	12÷6	14÷7	16÷8	18÷9
5s facts	5÷5	10÷5	15÷5	20÷5	25÷5	30÷5	35÷5	40÷5	45÷5
and partners	5÷1	10÷2	15÷3	20÷4	25÷5	30÷6	35÷7	40÷8	45÷9

Think 'multiplication'. For 15 ÷ 5, think '5 multiplied by what is 15?'

4s facts	4÷4	8÷4	12÷4	16÷4	20÷4	24÷4	28÷4	32÷4	36÷4
and partners	4÷1	8÷2	12÷3	16÷4	20÷5	24÷6	28÷7	32÷8	36÷9

Think 'opposite/inverse of double doubles' (halve and halve again). For 12 ÷ 4, think 'half of 12 is 6 and half of 6 is 3, so 12 ÷ 4 is 3'.

1s facts	1÷1	2÷1	3÷1	4÷1	5÷1	6÷1	7÷1	8÷1	9÷1
and partners	1÷1	2÷2	3÷3	4÷4	5÷5	6÷6	7÷7	8÷8	9÷9

Think 'shared into one group or one row'. For 7 ÷ 1, think 'if I shared 7 equally into 1 group, there would be 7 in the group'. For the partner fact (7 ÷ 7), think 'if I shared 7 equally into 7 rows, there would be 1 in each row'.

9s facts	9÷9	18÷9	27÷9	36÷9	45÷9	54÷9	63÷9	72÷9	81÷9
and partners	9÷1	18÷2	27÷3			54÷6	63÷7	72÷8	81÷9

10s facts	10÷10	20÷10	30÷10	40÷10	50÷10	60÷10	70÷10	80÷10	90÷10
and partners	10÷2	20÷2	30÷3	40÷4	50÷5	60÷6	70÷7	80÷8	90÷9

Think 'how many tens'. For 30 ÷ 10, think 'there are 3 tens in 30, so it can be shared into 3 equal groups. For the partner fact (30 ÷ 3), think '3 tens shared equally into 3 groups'.

Note: Resources in grey font are currently in development.

Division: Year 5

The division facts taught in Year 5 are shown below.

Sequence									
3s facts	3÷3	6÷3	9÷3	12÷3	15÷3	18÷3	21÷3	24÷3	27÷3
and partners	3÷1	6÷2	9÷3	12÷4	15÷5	18÷6	21÷7	24÷8	27÷9

Think 'multiplication'. For 12 ÷ 3, think '3 multiplied by what is 12?'

6s facts	6÷6	12÷6	18÷6	24÷6	30÷6	36÷6	42÷6	48÷6	54÷6
and partners	6÷1	12÷2	18÷3	24÷4	30÷5	36÷6	42÷7	48÷8	54÷9
8s facts	8÷8	16÷8	24÷8	32÷8	40÷8	48÷8	56÷8	64÷8	72÷8
and partners		16÷2	24÷3	32÷4	40÷5	48÷6	56÷7	64÷8	

Think 'opposite/inverse of double double doubles' (halve, halve and halve again). For 24 ÷ 8, think 'half of 24 is 12, half of 12 is 6 and half of 6 is 3 so 24 ÷ 8 is 3'.

Square number facts	1÷1	4÷2	9÷3	16÷4	25÷5	36÷6	49÷7	64÷8	81÷9
7s facts	7÷7		21÷7		35÷7				63÷7
and partners	7÷1			28÷4		42÷6		56÷8	
0s facts	0÷1	0÷2	0÷3	0÷4	0÷5	0÷6	0÷7	0÷8	0÷9

Tips

For basic facts

When teaching mental computation:

- Encourage students to solve problems mentally as their **first** resort. Use jottings only if necessary.

- Encourage students to develop strategies for working out facts before developing recall. This will help them make generalisations about facts and extend the strategy to include larger numbers.

- Avoid teaching rules that do not include the underlying process.

  e.g. rather than tell students to 'just add a zero' when multiplying by ten, help them to understand that when multiplying by ten, the answer will be a multiple of ten

- Demonstrate ways of adjusting numbers to make them more manageable. Sensible adjustments include:
  - rounding
    e.g. for 39 x 4, round to 40 x 4, then take 4
  - adding to one number and subtracting from another
    e.g. 27 + 34 = 30 + 31
  - doubling and halving.
    e.g. 15 x 4 = 30 x 2

- Use concrete materials, hundred boards and number lines to help students make connections and identify patterns.

When practising mental computation:

- Remind students about the relevant strategy before asking them to complete number facts. Model the strategy.

- When students are solving subtraction facts, remind them to use the addition fact to help them find the answer.

  e.g. for 9 – 6, students think '6 + □ = 9'

- When students are solving division facts, remind them to use the multiplication fact to help them find the answer.

  e.g. for 9 ÷ 3, students think '3 x □ = 9'

- Discuss whether answers will be bigger or smaller than the number students start with.

- Say or write random facts and ask students to explain which strategy they would use to solve them. There is often more than one strategy.

  e.g. 9 + 3 could be solved using the count on, make to 10, near 10 or adding 9 strategy; students may even have a self-generated strategy

- Write the (count on addition) facts in order (e.g. 0 + 3, 1 + 3, 2 + 3, 3 + 3, 4 + 3) and look for facts that are already known or ones that can be solved using a different strategy.

  e.g. 2 + 3 is a count on fact and a double + 1 fact

- Make up problems that involve basic facts. Ask students to solve the problems and explain the strategy they used.

- Ask students to pose problems for others to solve.

- Give an answer and ask students to say a fact.

When using fact cards:

- Make addition fact cards that require a variety of strategies to solve them and ask students to sort the cards according to the strategy they would use. Pick one group and complete the facts.

- Shuffle a set of fact cards. Choose one at a time and say the answer. Check the answer on a calculator. This can be done as a team game, in pairs or students can work individually.

- Make up answer cards, then ask students to match fact cards and answer cards.

- Match fact cards that are in the same fact family.
  e.g. 3 + 4, 4 + 3, 7 – 4 and 7 – 3

- Have students make sets of fact cards with the answer on the back. Feed the cards through a 'function machine' so that they go into the machine fact side up and come out answer side up.
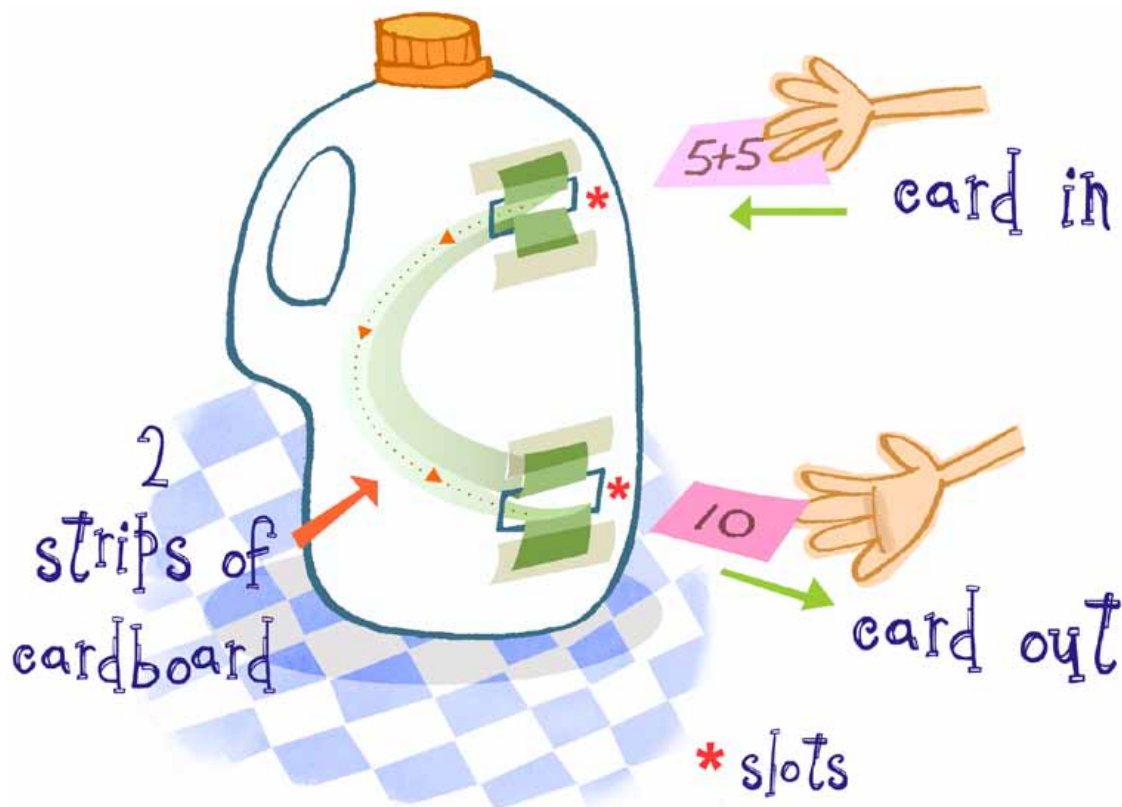
- Each time students come across a fact they do not know or cannot work out, they write it on a card and carry it in their pocket for a whole day, regularly taking it out to practise answering.

When using other resources:

- Throw two 10-sided dice (concrete or onscreen). Ask students to add, subtract or multiply the numbers rolled and explain the strategy they used.

- Place beads in zip-lock bags. Hold up two bags and discuss which strategy could be used to add them.

- Use dominoes to represent count on 0, 1, 2 and 3, rainbow 10, doubles and doubles + 1 addition facts.

- Sing the facts. Use Maths – Sing it!. Encourage students to add movement as they sing.
  e.g. tap the foot, wriggle and clap

- Jump along a number line, starting at the larger number and jumping forward the smaller number. A long rope can be knotted at even intervals to make a portable number line, or numbers can be attached to the rope by pegs.

- Write a set of random facts and ask students to identify and solve one particular set.
  e.g. identify which are doubles facts and use the doubles strategy to answer the facts

- Show a fact using counters. Say the fact, then say or show the next fact in the sequence.
  e.g. show 3 rows of 4; students say *3 x 4 is 12* and *4 x 4 is 16*

- Highlight a random number on a hundred board and ask students to tell you a fact about the number.
  e.g. 10 is: 10 + 0, 9 + 1, double 5, 5 x 2, 13 – 3, half of 20

- Use a number track, number line or ruler to find the answers.
  e.g. for 5 + 2, start at 5 and count on 2; for double 6, jump 6 then jump 6 more; for 10 – 7, start at 7 and count up 10; for 3 x 4, make 3 jumps of 4

- Use students to demonstrate facts.
  e.g. 5 boys and 3 girls = □ students; 4 rows of 5 = □ students; 16 students stand up, then 8 sit down, so 16 – 8 = □ students

- Write facts with missing addends, subtrahends or products and encourage students to use the inverse to find the answer.
  e.g. 10 – 7 = □, 4 + □ = 9, 3 x □ = 9

- Place concrete materials on either side of a set of balance scales to show a fact.
  e.g. 3 lots of 3 on one side and 9 on the other; 3 blue cubes and 2 red cubes on one side, and 5 yellow on the other

Turnaround tips

Many of the tips above can also be used to practise turnarounds. Other ideas:

- Show the addition fact by attaching pegs to a coat hanger, then turn the coat hanger around and say the turnaround fact.
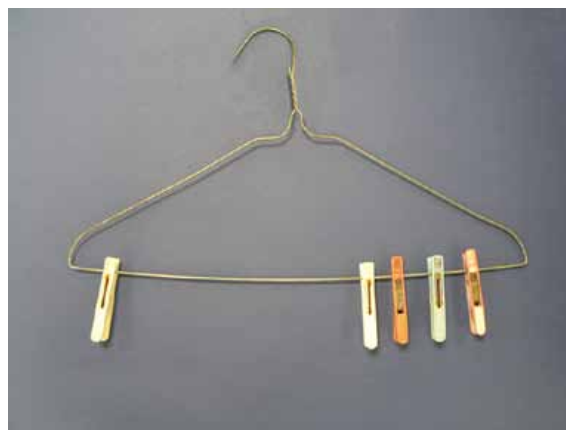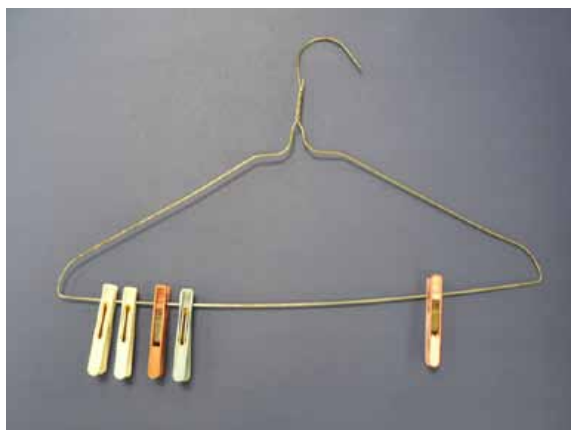
- Make linking cube trains in two different colours to represent the addends. Say the fact, then turn the train around and say the turnaround.

- Show the fact with counters on a ten frame. Turn it around and say the turnaround fact.

- Use dot cards or picture cards to represent the addition fact. Swap positions to represent the turnaround.

- Place counters on an ice-cream lid/plate, then turn the lid around.

- Place counters in the palms of the hands to represent an addition fact, then cross arms to show the turnaround.

- Find dominoes that represent addition facts. Turn them around to represent the turnaround fact.

- Place counters in zip-lock bags to represent addition facts. Hold one bag in each hand and say the addition fact, then cross arms and say the turnaround.

- Use fact cards to match count on facts with their turnarounds. Say both facts.

- Draw arrays on cards. Say the multiplication fact, turn the card around and say the turnaround fact.

- Show the fact and its turnaround with movement.

  e.g. take four steps, then two steps, to the left to show 4 + 2 = 6, then take two steps and four steps to the right to show 2 + 4 = 6.

- Use playing cards to represent the addition fact and its turnaround.

Extension tips

Many of the tips above can also be used to practise extensions of basic facts. Other ideas:

- Use bundling material to represent addition of multiples of 10.

- Represent addition facts on a number line to 100 (or 1 000 in Year 3).

- Use a hundred board to count in multiples of 10 (in rows).

Games

The games described below can be used for practising addition, subtraction, multiplication and division facts.

Decide which strategies or facts are being practised before the game begins and provide a suitable range of answers or resources.

Each game is suitable for two or more players.

Throw the dice

Find or make two dice showing numbers up to 10. Throw both dice and decide which strategy would be best for adding, subtracting or multiplying the two numbers. Score one point for each correct answer.

Suggested resource: Learning object, [Double dice](#)

Bingo

Ask students to write six numbers within an appropriate range. Say a fact. Players cross out the answer to that fact. The first player to cross out all six numbers is the winner.

Board game

Make or adapt board games that incorporate the facts being practised. For example, if practising count on 2 facts, play a game of 'Snakes and ladders', but when rolling the dice, count on 2 from the number rolled before moving around the board.

Beat the calculator

Work in pairs. One player uses a calculator and the other uses mental computation to answer each fact. Partners compete to answer the fact first.

Card game

Remove the picture cards from a deck of playing cards. Place the remaining cards in a pile. Take turns to turn over the top two cards. Players add, subtract or multiply. The first player to give the correct answer keeps the cards. The player with the most cards at the end of the game is the winner.

Snap

Provide a set of fact cards and answer cards into a pile. Share the cards equally between the players. Players take turns to turn over their top card. If the cards are a match (e.g. a rainbow 10 fact and '10'), players 'snap' by placing their hand on top of the pile of cards. The player with the most cards at the end of the game is the winner.

Concentration

Provide a set of fact cards and matching answer cards. Place the cards face down in rows. Players take turns to turn over two cards to try to match a fact card with an answer card. They keep matching pairs. The player with the most pairs when all the cards have been matched is the winner.

Go fish

Provide a set of fact cards and matching answer cards. Deal five cards to each player. Players take turns to ask each other for a matching fact or answer card. The player with the most pairs at the end of the game is the winner.

e.g. If they are holding a card that says 4 x 5, they would say *Do you have a 20?* If they are holding a 20 they might ask, *Do you have a 4 multiplied by 5/5 multiplied by 4/2 multiplied by 10/10 multiplied by 2/double 10?*

Strategy dice

Roll two 10-sided dice. Score one point for each time the designated strategy is rolled.

e.g. If 'rainbow 10 facts' is the designated strategy, a player who rolls a two and an eight scores a point. If the strategy is 'double doubles', a player who rolls a four and any other number scores a point.

Suggested resource: Learning object, [Double dice](#)

Shoot the sheriff

Two players stand back-to-back. As the caller counts slowly to three, they take three steps away from each other. On the count of three, the caller says a fact and the players turn and 'fire' (say) the answer. The first player to fire the correct answer is the winner. (The winner could also be decided by best of three.) The winner remains in the game and the loser chooses who will compete against the winner next.

Relations race

Players stand at a 'starting line'. A caller says an addition/multiplication fact and the players call out the related subtraction/division fact (e.g. the caller says 'double 6 is 12' and the players call '12 take 6 is 6'). The first player to call the related fact takes a step forward. The winner is the player who is furthest ahead after a given time or number of calls.

One step at a time

Players stand at a 'starting line'. The caller says a fact and the players call the answer. The first player to call the correct answer takes a step forward. The winner is the player who is furthest ahead at the end of the game.

Race around the hundred board

Players choose a marker and place it on the 0 square of a hundred board. Players take turns to throw two dice (concrete or [onscreen](#)), say the associated fact, then move that many squares. The winner is the first player to reach 100.

e.g. If players are practising the count on addition strategy and player 1 throws a 5 and a 1, they say, *Five… six. 5 add 1 is 6*, and move forward six spaces, counting to six as they move around the board.

Note: The game can be made more complex by adding rules.
e.g. if a player lands on a number ending in 0, they have to go back two squares

Show me the money

This game gives the opportunity to answer facts and practise swapping $2 coins for the equivalent amount of $1 coins.

Find $10 in coins ($1 and $2) for each player and place in a 'bank'. Find and shuffle the cards for the facts that are being practised and place them face down in a pile. Players take turns to turn over the top card and answer the fact. They take $1 from the bank each time they answer a fact correctly. Players may need to swap two $1 coins for a $2 coin to do this. Discuss with players how to solve this problem. The winner is the player with the most money at the end of the game.

Target practice

The number of rounds and how the winner is chosen should be decided before the game begins. e.g. the player with the largest score after five rounds is the winner

Create a large target showing numbers to 10 (e.g. draw a target on large sheets of paper/draw in chalk on cement/modify a commercially produced target). Throw two small soft markers onto the target and add, subtract or multiply the two numbers. The answer is that player's score for that round.

Note: If one marker doesn't land on a number, throw again. If both markers land on the same number, the answer will be zero.

Number facts competition with dominoes

Each player places half a set of dominoes face down in front of them. One student acts as referee. Players take turns to turn one of their dominoes face up so other players can see it. They add/subtract/multiply the number of spots on each end of the domino together. The first player to say the correct answer keeps the domino. If the referee decides it was a tie, the domino is removed from play. The player with the most dominoes at the end of the game is the winner.

Around the world

Two students stand while the rest of the class (the 'world') remains seated. A caller says a number fact and both students call out an answer. The first student to answer correctly is the winner and remains standing while the other sits down. The next person in line stands up to compete against the winner. Play continues until every student has competed. The winner is the last student standing. In the event of a tie, call another fact.