

ADDITION/SUBTRACTION

* Story of 5 Facts to 5

$$\begin{aligned}5 + 0 &= 5 \\4 + 1 &= 5 \\3 + 2 &= 5 \\2 + 3 &= 5 \\1 + 4 &= 5\end{aligned}$$

* Story of 10 Facts to 10

$$\begin{aligned}10 + 0 &= 10 \\9 + 1 &= 10 \\8 + 2 &= 10 \\7 + 3 &= 10 \\6 + 4 &= 10 \\5 + 5 &= 10 \\4 + 6 &= 10 \\3 + 7 &= 10 \\2 + 8 &= 10 \\1 + 9 &= 10 \\0 + 10 &= 10\end{aligned}$$

This principle is also used later on for the **Facts to 100**.

$$\begin{aligned}0 + 100 &= 100 \\10 + 90 &= 100 \\20 + 80 &= 100 \\30 + 70 &= 100 \\40 + 60 &= 100 \\&\text{etc}\end{aligned}$$

Using facts to 10

e.g. 1

$$\begin{aligned}8 + 4 &= 8 + (2 + 2) \\&= 10 + 2 \\&= 12\end{aligned}$$

e.g. 2

$$\begin{aligned}5 + 9 &= 9 + 5 \quad (\text{write bigger number first}) \\&= (9 + 1) + 4 \\&= 10 + 4 \\&= 14\end{aligned}$$

* Adding Doubles

$$\begin{aligned}1 + 1 &= 2 \\2 + 2 &= 4 \\3 + 3 &= 6 \\4 + 4 &= 8 \\5 + 5 &= 10 \\&\vdots \\&\vdots \\8 + 8 &= 16 \\10 + 10 &= 20\end{aligned}$$

* **Adding Using Near Doubles**

$$\begin{aligned} 5 + 6 &= 5 + 5 + 1 \\ &= 10 + 1 \\ &= 11 \end{aligned}$$

* **Adding Looking for Pairs that total 10/20**

e.g. 1

$$\begin{aligned} 6 + 5 + 4 & \\ \mathbf{6} + 5 + \mathbf{4} &= (\mathbf{6} + \mathbf{4}) + 5 \\ &= \mathbf{10} + 5 \\ &= 15 \end{aligned}$$

e.g. 2

$$\begin{aligned} 18 + 9 + 2 & \\ \mathbf{18} + 9 + \mathbf{2} &= (\mathbf{18} + \mathbf{2}) + 9 \\ &= \mathbf{20} + 9 \\ &= 29 \end{aligned}$$

* **Adding 9 by adding 10 and subtracting 1**

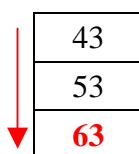
$$\begin{aligned} 7 + 9 &= (7 + 10) - 1 \\ &= 17 - 1 \\ &= 16 \end{aligned}$$

* **Using Number Grid that starts at 1**

* **To add 10 or a multiple of 10 to a 1/2-digit number.**

The spider moves down one or more rows to add 10 or a multiple of 10 to a 2-digit number.

$$43 + 20 =$$

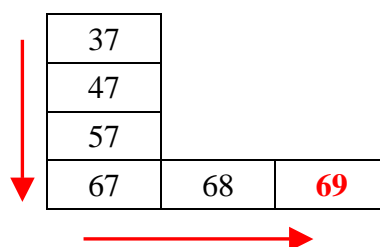


$$\therefore 43 + 20 = \mathbf{63}$$

* **To add 2-digit numbers looking for multiples of 10**

The spider moves right one or two columns to add units to a 1/2-digit number.

e.g. $37 + 32 =$



$$\therefore 37 + 32 = \mathbf{69}$$

* **Facts to 20 (Bonds of 20)**

0 + 20 = 20	11 + 9 = 20
1 + 19 = 20	12 + 8 = 20
2 + 18 = 20	13 + 7 = 20
3 + 17 = 20	14 + 6 = 20
4 + 16 = 20	15 + 5 = 20
5 + 15 = 20	16 + 4 = 20
6 + 14 = 20	17 + 3 = 20
7 + 13 = 20	18 + 2 = 20
8 + 12 = 20	19 + 1 = 20
9 + 11 = 20	20 + 0 = 20
10 + 10 = 20	

* **Using partitioning of a 2-digit number to add a 2-digit number to a 1-digit number**

$$\begin{aligned}
 14 + 6 &= (10 + 4) + 6 \\
 &= 10 + 10 \\
 &= 20
 \end{aligned}$$

Or use facts to 20 (bonds of 20)

$$\begin{aligned}
 18 + 4 &= (18 + 2) + 2 \\
 &= 20 + 2 \\
 &= 22
 \end{aligned}$$

This method is only used if facts to 20 have not yet been memorised.

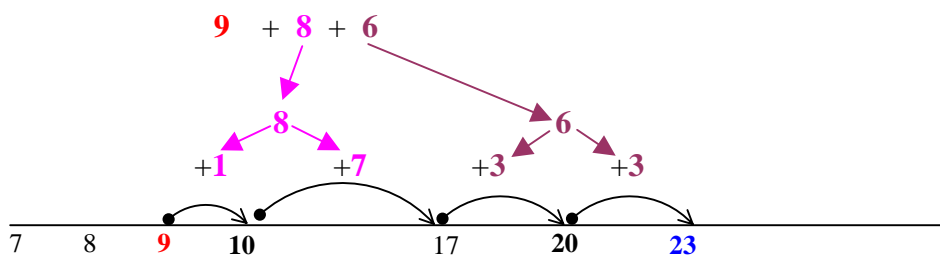
$$\begin{aligned}
 18 + 4 &= 10 + 8 + 4 \\
 &= 10 + \underline{8+2} + 2 \\
 &= 10 + \underline{10} + 2 \\
 &= 22
 \end{aligned}$$

* **Adding a number by counting on to the next multiple of 10**

(a) **adding three 1-digit numbers mentally**

e.g. $6 + 9 + 8$ (No pair of numbers that make ten are present)

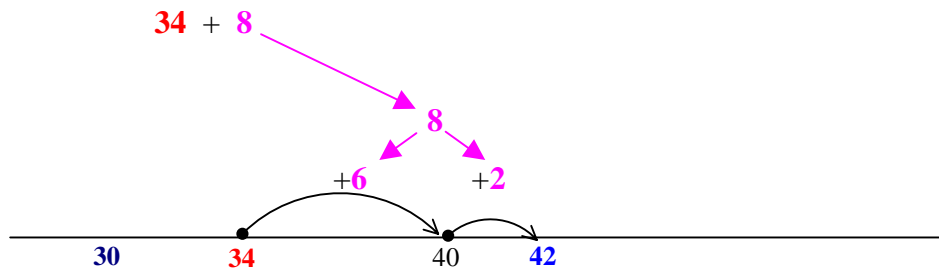
Start with largest number (9)



$$\therefore 9 + 8 + 6 = 23$$

(b) Adding a 2-digit number to a 1-digit number mentally

e.g.



$$34 + 8 = 42$$

*** Doubling numbers using known doubles**

$$\begin{aligned} 12 + 12 &= (10 + 2) + (10 + 2) \\ &= (10 + 10) + (2 + 2) \\ &= 20 + 4 \\ &= 24 \end{aligned}$$

Compare to coins/money

*** Using known doubles for addition of near doubles**

$$\begin{aligned} 20 + 21 &= 20 + 20 + 1 \\ &= (20 + 20) + 1 \\ &= 40 + 1 \\ &= 41 \end{aligned}$$

$$\begin{aligned} 25 + 26 &= (25 + 25) + 1 \\ &= 50 + 1 \\ &= 51 \end{aligned}$$

*** Doubling 2-digit numbers using known doubles**

To double a multiple of 5: – double the tens and then add another 10

$$\begin{aligned} 35 + 35 &= (30 + 30) + 10 \\ &= 60 + 10 \\ &= 70 \end{aligned}$$

This can be used to double 36

$$\begin{aligned} 36 + 36 &= (35 + 35) + 1 + 1 \\ &= 70 + 2 \\ &= 72 \end{aligned}$$

(36 is one more than 35 so double 36 is *two* more than 70)

* Partitioning a 3-digit number into H T U

$$\begin{aligned} 346 &= 300 + 40 + 6 \\ &= 3 \text{ hundreds} + 4 \text{ tens} + 6 \text{ units} \end{aligned}$$

* Adding Near Multiples of 10 (i.e. – 19, 29, 32 etc)

e.g. 1

$$\begin{aligned} 47 + 29 & \quad \text{(nearly 30)} \\ (47 + 30) - 1 &= 77 - 1 \quad \text{(because we have added 1 too many)} \\ &= 76 \end{aligned}$$

e.g. 2

$$\begin{aligned} 29 + 72 &= (30 + 70) - 1 + 2 \\ &= 100 - 1 + 2 \\ &= 101 \end{aligned}$$

* Adding a 2-digit number to a 3-digit number

$$21 + 176 \quad \text{(focus on 2-digit numbers part of the addition)}$$

$$\begin{aligned} & 21 + 76 \\ = & 21 + 70 + 6 \\ = & 91 + 6 \\ = & 97 \end{aligned}$$

$$\therefore 21 + 176 = 197$$

* Adding two 3-digit numbers using informal method

436 + 160		or																																															
436 = 400 + 30 + 6	+	<table style="border-collapse: collapse; margin: 0 auto;"> <tr><td style="padding: 0 5px;">4</td><td style="padding: 0 5px;">3</td><td style="padding: 0 5px;">6</td></tr> <tr><td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">6</td><td style="padding: 0 5px;">0</td></tr> <tr><td colspan="3" style="border-top: 1px solid black; padding-top: 2px;"></td></tr> <tr><td style="padding: 0 5px;">5</td><td style="padding: 0 5px;">0</td><td style="padding: 0 5px;">0</td></tr> <tr><td style="padding: 0 5px;"></td><td style="padding: 0 5px;">9</td><td style="padding: 0 5px;">0</td></tr> <tr><td style="padding: 0 5px;"></td><td style="padding: 0 5px;"></td><td style="padding: 0 5px;">6</td></tr> <tr><td colspan="3" style="border-top: 1px solid black; padding-top: 2px;"></td></tr> <tr><td style="padding: 0 5px; color: magenta;">5</td><td style="padding: 0 5px; color: magenta;">9</td><td style="padding: 0 5px; color: magenta;">6</td></tr> </table>	4	3	6	1	6	0				5	0	0		9	0			6				5	9	6	+	<table style="border-collapse: collapse; margin: 0 auto;"> <tr><td style="padding: 0 5px;">4</td><td style="padding: 0 5px;">3</td><td style="padding: 0 5px;">6</td></tr> <tr><td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">6</td><td style="padding: 0 5px;">0</td></tr> <tr><td colspan="3" style="border-top: 1px solid black; padding-top: 2px;"></td></tr> <tr><td style="padding: 0 5px;"></td><td style="padding: 0 5px;">9</td><td style="padding: 0 5px;">0</td></tr> <tr><td style="padding: 0 5px;">5</td><td style="padding: 0 5px;">0</td><td style="padding: 0 5px;">0</td></tr> <tr><td colspan="3" style="border-top: 1px solid black; padding-top: 2px;"></td></tr> <tr><td style="padding: 0 5px; color: magenta;">5</td><td style="padding: 0 5px; color: magenta;">9</td><td style="padding: 0 5px; color: magenta;">6</td></tr> </table>	4	3	6	1	6	0					9	0	5	0	0				5	9	6
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<table style="border-collapse: collapse; margin: 0 auto;"> <tr><td style="padding: 0 5px;">160 = 100 + 60</td></tr> <tr><td colspan="3" style="border-top: 1px solid black; padding-top: 2px;"></td></tr> <tr><td style="padding: 0 5px;">500 + 90 + 6</td></tr> </table>	160 = 100 + 60				500 + 90 + 6																																												
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$$\therefore 436 + 160 = 596$$

* Adding three 3-digit numbers using written methods vertically

$$364 + 123 + 255$$

H	T	U
3	6	4
1	2	3
+	2	5
7	4	2
1	1	

We put the **1** *below* in the tens column because 12 is 1 ten and 2 units; \therefore we write the **1** close to the 2 to signify 12.

1. Add units in units column

$$4 + 3 + 5 = 12$$

Write units part (2) in units column and tens part (**1**) below in tens column.

2. Now add the tens in the tens column.

6 tens + 2 tens + 5 tens and 1 more ten is 14 tens i.e. one hundred and forty.

We write the tens digit (4) in the tens column and the hundreds digit (**1**) below in the hundreds column.

3. Now add the hundreds in the hundreds column.

3 hundreds + 1 hundred + 2 hundred and 1 more hundred i.e. 7 hundreds.

$$\therefore 364 + 123 + 255 = 742$$

SUBTRACTION

* Relation between addition and subtraction

e.g. $2 + 3 = 5$
 $3 + 2 = 5$
 $5 - 3 = 2$
 $5 - 2 = 3$

* Subtracting 10 from a 'teen' (using the Number Grid)

e.g. $18 - 10 = 8$

7	8	9
17	18	19
27	28	29

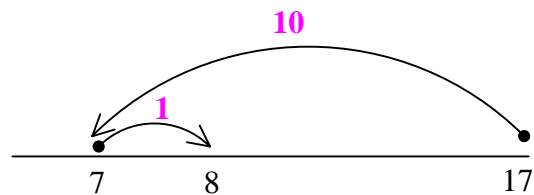
* Subtracting 10 from a 2-digit number (using the Number Grid)

e.g. $46 - 10 = 36$

35	36	37
45	46	47
55	56	57

* Subtracting a near 10

e.g. $17 - 9 = (17 - 10) + 1$
 $= 7 + 1$
 $= 8$



* Subtracting 10 and multiples of 10 from a 2-digit number

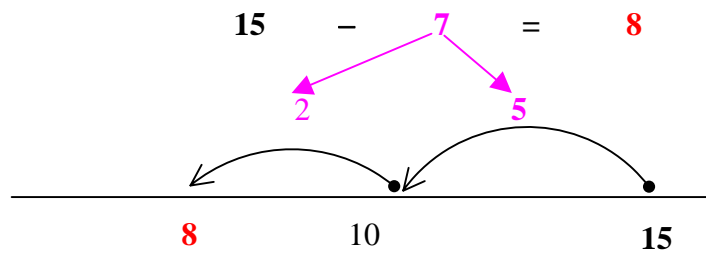
Use the number grid

e.g. $47 - 23 = (47 - 20) - 3$
 $= 27 - 3$
 $= 24$

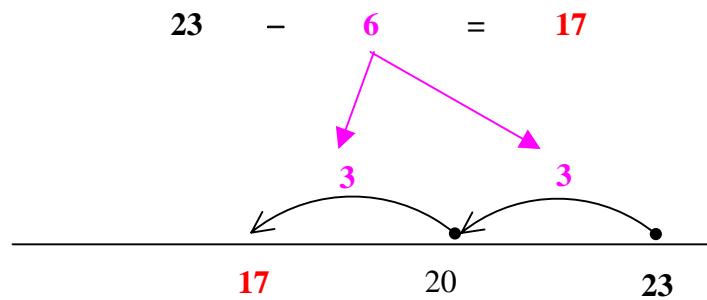
24	25	26	27
34	35	36	37
44	45	46	47

*** Subtracting a 1-digit number from a ‘teens’ and a ‘twenties’ number**

e.g. 1



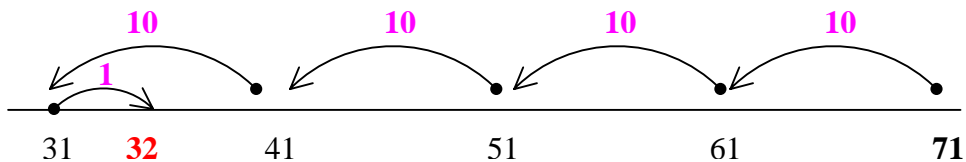
e.g. 2



*** Subtracting a near multiple of ten**

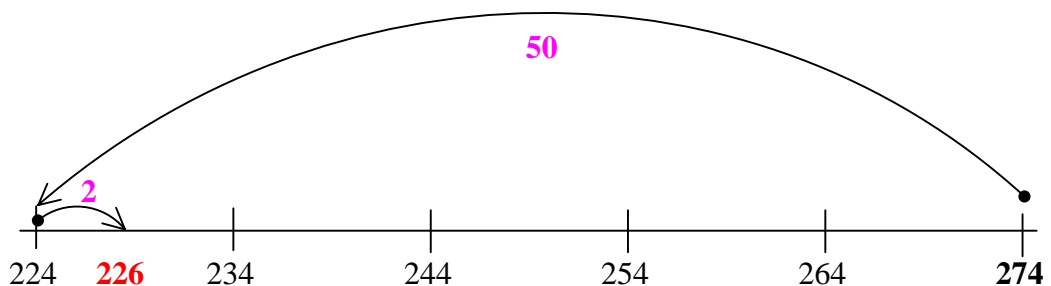
e.g. 1

$$\begin{aligned}
 &71 - 39 && (39 \text{ is nearly } 40) \\
 &= (71 - 40) + 1 && (\text{because we have subtracted } 1 \text{ too many}) \\
 &= 31 + 1 \\
 &= 32
 \end{aligned}$$

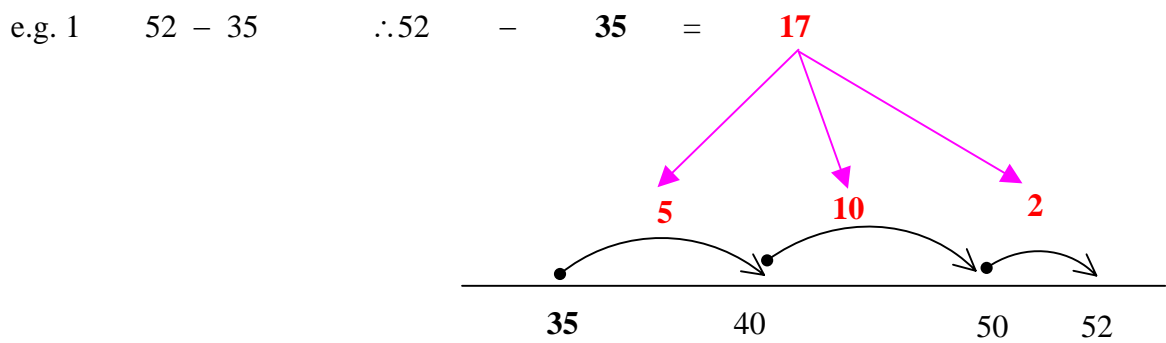


e.g. 2

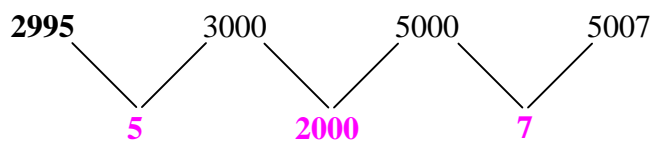
$$\begin{aligned}
 &274 - 48 && (48 \text{ is nearly } 50) \\
 &= (274 - 50) + 2 && (\text{because we have subtracted } 2 \text{ too many}) \\
 &= 224 + 2 \\
 &= 226
 \end{aligned}$$



* **Subtracting by counting on to the next ten or hundred or thousand**
(Starting from the smaller number)

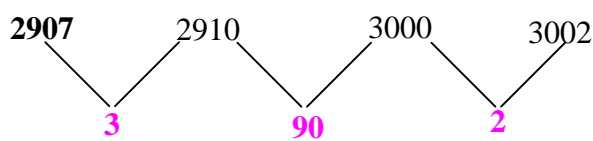


e.g. 2 $5007 - 2995$



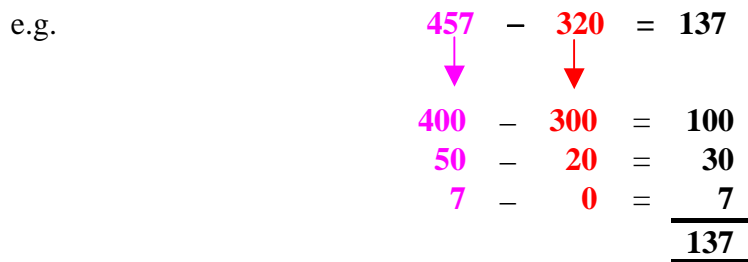
$$5007 - 2995 = 5 + 2000 + 7 = 2012$$

e.g. 3 $3002 - 2907$



$$3002 - 2907 = 3 + 90 + 2 = 95$$

* **Subtracting a 3-digit from a 3-digit number** (Use place value cards)



* Subtracting TU from HTU and HTU from HTU using *informal* written methods

e.g. $152 - 87 =$

(Record the *hops* vertically and then add all the *hops* together)

$\therefore 152 - 87 = 3 + 10 + 50 + 2$
 $= 65$

* Subtracting TU from HTU and HTU from HTU using *standard* written methods

e.g. 1 $382 - 167 = 215$

	200		
	H	T	U
		7	1
	3	8	2
-	1	6	7
	2	1	5

Steps involved

1. Give an estimate
2. Subtract the units, '*changing*' a ten for 10 units (12 units – 7 units)
3. Subtract the tens (7 tens – 6 tens)
4. Subtract the hundreds (3 hundreds – 1 hundred)
5. Check with estimate

DO NOT USE THE WORD '*BORROWING*'

The term 'borrowing' implies 'giving back'. Use instead the terms '*changing*' or '*swapping*'

e.g. 2 $527 - 192 = 335$

	300		
	H	T	U
		1	2
	4	5	7
-	1	9	2
	3	3	5

Steps involved

1. Give an estimate
2. Subtract the units (7 units – 2 units)
3. Subtract the tens '*changing*' a hundred for 10 tens (12 tens – 9 tens)
4. Subtract the hundreds (4 hundreds – 1 hundred)
5. Check with estimate

e.g. 3

$$523 - 386$$

$$\begin{array}{r} \text{100} \\ \text{H T U} \\ 5 \overset{1}{\cancel{2}} \overset{1}{3} \\ - 3 \ 8 \ 6 \\ \hline 7 \end{array}$$

Subtract the units ,
'changing' a ten
for 10 units
(13 units - 6 units)

$$\begin{array}{r} \text{100} \\ \text{H T U} \\ 4 \overset{11}{\cancel{5}} \overset{1}{\cancel{2}} \overset{1}{3} \\ - 3 \ 8 \ 6 \\ \hline 3 \ 7 \end{array}$$

Subtract the tens ,
'changing' a
hundred for 10 tens
(11 tens - 8 tens)

$$\begin{array}{r} \text{100} \\ \text{H T U} \\ 4 \overset{11}{\cancel{5}} \overset{1}{\cancel{2}} \overset{1}{3} \\ - 3 \ 8 \ 6 \\ \hline \mathbf{1 \ 3 \ 7} \end{array}$$

Subtract the
hundreds

$$\therefore 523 - 386 = \mathbf{137}$$