Lesson 1

Subtract Any Which Way Series

The Complement of the Difference Strategy

This is the quick guide to the video. For more complete details watch "Subtract Any Which Way" video 1.

Goals:

To introduce a second alternative subtraction strategy

To outline how the two strategies work best together

The Problem

In the "Add a Comp" strategy the examples used tended to be with

the larger single digit numbers: 7, 8 and 9

The strategy still works with the smaller numbers

but it is not as efficient:

$$
\begin{array}{r} 6\,2 \\ -\ 9 \\ \hline 5\,3 \end{array}
\qquad
\begin{array}{r} 6\,2 \\ -\ 3 \\ \hline 5\,9 \end{array}
$$

For 62 - 9:

Drop to 50
Complement of 9 is 1
1 + 2 = 3
fairly easy to do

But for 62 - 3:

Drop to 50
Complement of 3 is 7
7 + 2 = 9
a bit harder and slower

The following strategy would render the second sum

a lot easier and would get to the answer a lot faster!

The Complement of the Difference Strategy

We will show you how to do it by just doing a few examples:

$$
\begin{array}{r} 6\,\boxed{2} \\ -\,\boxed{3} \end{array}
\qquad
\begin{array}{r} 4\,\boxed{6} \\ -\,\boxed{8} \end{array}
\qquad
\begin{array}{r} 8\,\boxed{3} \\ -\,\boxed{6} \end{array}
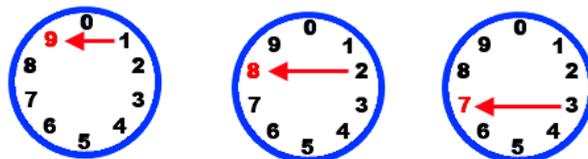$$

Step 1:
check the subtractions
go below zero in the units column.
They do.

$$
\begin{array}{r} 6\,2 \\ -\,3 \\ \hline 5 \end{array}
\qquad
\begin{array}{r} 4\,6 \\ -\,8 \\ \hline 3 \end{array}
\qquad
\begin{array}{r} 8\,3 \\ -\,6 \\ \hline 7 \end{array}
$$

Step 2:
Reduce the tens digit by 1.
sixty drops to fifty, forty to thirty and eighty to seventy.

$$
\begin{array}{r} 6\,2 \\ -\,3 \\ \hline 5\,9 \end{array}
\qquad
\begin{array}{r} 4\,6 \\ -\,8 \\ \hline 3\,8 \end{array}
\qquad
\begin{array}{r} 8\,3 \\ -\,6 \\ \hline 7\,7 \end{array}
$$

Step 3:
Take Complement of the Differences:
3 and 2 are 1 apart
1 => 9
8 and 6 are 2 apart

2 => 8
6 and 3 are 3 apart
3 => 7
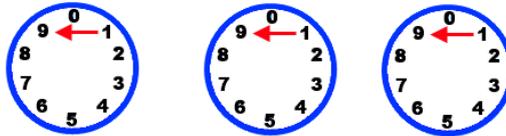
More Examples

The following examples are all 1 apart:

1 APART

8 4	6 1	3 6
- 5	- 2	- 7

The difference is 1.
The complement of 1 is 9.
The answers are as follows:

1 APART

8 4	6 1	3 6
- 5	- 2	- 7
7 9	5 9	2 9

By inspection one can see that the end digits are 1 apart.

Instantly you know it ends in 9.

Likewise it is easy to spot digits which are 2 apart:

2 APART

5 6	7 3	2 4
- 8	- 5	- 6

The difference is 2
The complement of the difference is 8.
The answers are as follows:

```
  5 6        7 3        2 4
  - 8        - 5        - 6
  ___        ___        ___
  4 8        6 8        1 8
```
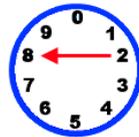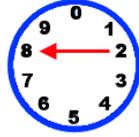
Seeing the end digits are 2 apart

instantly means the subtractions end in 8.

and so on.

Note 1

**BOTH
strategies
WORK
in
ALL
cases**

They are universal.
To show this we will do two sums both strategies:

Comp of Diff

```
  3 2        2 3
  - 8        - 4
  ___        ___
  2 4        1 9
```

Step 1:
Both 2 - 8 and 3 - 4 would subtract below zero.

Step 2:

Thirty drops to twenty and the twenty of twenty-three drops to the teens.

Step 3:

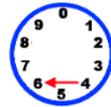8 and 2 are 6 apart and the complement of 6 is 4.

4 and 3 are 1 apart and the complement of 1 is 9.

Add a Comp

```
  3 2        2 3
  - 8        - 4
  2 4        1 9
```


Step 1:

Both 2 - 8 and 3 - 4 would subtract below zero.

Step 2:

Thirty drops to twenty and the twenty of twenty-three drops to the teens.

Step 3:

The complement of 8 is 2 and add that to the existing 2 gives 4.

The complement of 4 is 6 and add that to the 3 gives 9.

As you can see

BOTH sums can be done using BOTH strategies.

Each strategy is complete in its own right.

HOWEVER

you may have noticed

the strategies were

not equally easy

to apply.

How to Pick the Best Strategy

There are no hard and fast rules one can apply.

It comes down to individual practice and skill.
One picks the best path for oneself.
However
There are some general guidelines:

Comp of Diff	**Add a Comp**
close together	**subtract big number**
3 3 **- 4**	3 3 **- 9**

If the last digits are close together (in 33 - 4 the 3 and 4 are only 1 apart)
then the "Complement of the Difference" strategy
will probably work best.

If the number being subtracted is a high end digit like 7, 8 or 9 (in 33 - 9 it is 9)
then the "Add a Complement" strategy
will probably work best.

Try them both ways.
The important steps:
33 - 4
3 and 4 are 1 apart. The complement of 1 is 9. The answer is 29.
The complement of 4 is 6. Add it to the 3 to get 9. The answer is 29.
The "Comp of Diff" way seems easier.

33 - 9
3 and 9 are 6 apart. The complement of 6 is 4. The answer is 24.
The complement of 9 is 1. 3 and 1 make 4. The answer is 24.
The "Add a Comp" way seems easier.

It is possible to get subtractions which fall between the two:

4 6
- 8

Try it both ways.
6 and 8 are close together favouring the "Comp of Diff" strategy
but 8 is a one of the large digits, favouring the "Add a Comp" strategy.

Pick for yourself which you prefer.
It may be different for someone else.

One strategy is usually better than another for
a particular subtraction
and a particular person
on a particular day.

But between them they cover the ground.
Their relationship is expressed by the poem:

Jack Spratt could eat no fat,
His wife could eat no lean.
And so, between them both, you see
They licked the platter clean.