

Lesson 4

Subtract Any Which Way Series

Long Subtraction: How to Handle a "Hard" Subtraction Pair

This is the quick guide to the video. For more complete details watch "Subtract Any Which Way" video 4.

Goal:

To introduce Long Subtraction so it can be done in any direction with ease.

To show how to handle a subtraction which goes BELOW zero (and is "hard").

The Hard Steps

$$\begin{array}{r} 8256073685 \\ - 1932451946 \\ \hline \end{array}$$

In the above subtraction the subtraction pairs which

come to a result

BELOW ZERO

have been highlighted.

We don't know what they come to

so they are also termed "hard".

To find out what they come to we use either of our two

subtraction strategies.

Add a Complement

or

Complement of the Difference.

To see why:

Consider just the start of the subtraction:

$$\begin{array}{r} 82 \\ - 19 \\ \hline \end{array} \qquad \begin{array}{r} 82 \\ - 9 \\ \hline \end{array}$$

and get rid of the 1 of 19 to make it just 9.

We have done subtractions like that earlier in previous videos.

In such a case we use one of the two strategies to give us the last digit of the answer.

And that is all we are after in this case.

Normally we would say $82 - 9$ drops to seventy something.

But in this particular situation we don't care about that digit.

The last digit is all we want.

So we use the strategies!

Which Strategy?

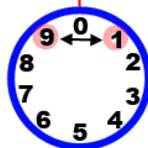
Either strategy will work.

In this case because 9 is a large number we will use the

Add a Complement

Strategy:

$$\begin{array}{r} 8256073685 \\ - 1932451946 \\ \hline \end{array}$$



Add a Complement

9 from 2 "won't go"

The result is BELOW zero.

So instead Add the complement of 9 (which is 1)

to the 2

to get $1 + 2 = 3$

That is our answer!

Or is it?

We need to check the neighbour out first!

The neighbour is $5 - 3$ which comes to a result

Above zero and is "easy" in that we know it comes to 2.

We can take 3 off 5 without any trouble

and there is no need for $5 - 3$ to "borrow from its neighbour"

(the 2 - 9 in this case on its left)

SO

As long as the

NEIGHBOUR is BELOW ZERO

we just

USE EITHER of the two STRATAGIES

we have covered in previous video/web pages.

And take the answer

AS IT IS.

In this case it is 3:

$$\begin{array}{r} 8256073685 \\ - 1932451946 \\ \hline 3 \end{array}$$

As another example we will jump to the very end subtraction pair, "5 - 6":

$$\begin{array}{r}
 8256073685 \\
 -1932451946 \\
 \hline
 3
 \end{array}$$

Complement of Difference

Because 5 and 6 are obviously just one apart

we will prefer to use the

Complement of the Difference Strategy:

The difference is 1

The complement of that is 9.

9 is the answer.

Or is it?

What is the neighbour doing?

There IS NO NEIGHBOUR!

That is the end of the line!

So we treat it as an "easy" neighbour BELOW zero.

The point is that there is NO neighbour

which needs to borrow from it!

So it will allways be taken

EXACTLY

AS IT IS.

Here are the remaining "hard" subtraction pair answers

all of which turn out to have an "easy" neighbour:

$$\begin{array}{r}
 8256073685 \\
 -1932451946 \\
 \hline
 3679
 \end{array}$$

The remaining "Easy" subtraction pairs can be filled in any time, using the information from the previous video / webpage

Here is the final result:

$$\begin{array}{r}
 8256073685 \\
 -1932451946 \\
 \hline
 6323621739
 \end{array}$$

Question: Do I have to do them in that order?

Answer: Not at all. Do them in any order you like.

You could work out "0-4 = 6" then jump to "5-3 = 2" then go to "5-6 = 9" and so on if you wished.

While order is irrelevant

it is a good idea to go LEFT TO RIGHT

as this is how we tend to read the answer.