

Lesson 8

Subtract Any Which Way Series

Use 9-circle for "Hard-Hard" Type

This is the quick guide to the video. For more complete details watch "Subtract Any Which Way" video 8.

Goal:

To show an alternative, quicker way to subtract
when the subtraction pair
is "Hard-Hard"

9-Circle

We already have a pretty good method for subtracting and for those who are happy with it, stay with it! Don't bother going into this.

But for anyone who wants to go the extra mile and REALLY perfect their subtraction this is the way to go! We'll show you how to speed up your subtraction even more than you already have!

To do this we'll introduce 9-circle.

The answers may seem odd at first, but they turn out to be very effective in subtraction, and actually they happen to speed up a lot of other areas too, so they're well worth knowing about!

Double-Handling

Let's look at subtracting 86 from 624:

The diagram illustrates the double-handling strategy for subtraction. It consists of three parts:

- 10-circle:** A circle with numbers 0-9. A red arrow points from 2 to 8, representing the subtraction $2 - 8$.
- Vertical subtraction:** A subtraction problem $624 - 86$ with a horizontal line. The result is 543 . The middle digit '4' is crossed out with a red diagonal line. Above the '2' and '4' in the original number are the letters 'H' and 'H', indicating 'Hard' subtractions. A green box highlights the '2' and '4' in the original number and the '3' in the result.
- Equation sequence:**
 $2 - 8$
 $= 2 + 2$
 $= 4$

Our normal procedure would be as follows:

Far left, the "6 - 0" comes to 6, but we notice its neighbour, the "2-8", goes below zero and is "hard", so we need to reduce our answer from 6 down to 5.

Ok, fine so far...

Here is where unnecessary double-handling occurs:

It is the middle subtraction (the "2-8") we are interested in.

It is "Hard-Hard".

That's because it itself subtracts below zero, and its neighbour, the "4-6", also subtracts below zero.

We handle a "hard" subtraction by using one of our strategies in 10-circle:

So we'll use the "Add a Complement" strategy, and Instead of subtracting 8 off 2, we'll ADD the complement of 8 (that's 2) onto the original 2 to get "2 + 2 make 4".

But as mentioned, the neighbour, the "4-6", subtracts below zero and is "Hard" also.

It will need to borrow from the "2-8".

The "2-8" will need to be reduced from 4 down to 3.

The final answer is 538, but involves double handling in the "hard-hard" step.

First we subtracted in 10-circle, then we reduced the answer by 1.

We can improve on that!

The Remedy to Double Handling

The strategies we've shown don't just work in 10-circle. They work in any circle.

Watch what happens if we use the "Add a Complement" strategy in 9-circle:

The diagram illustrates the 'Add a Complement' strategy in 9-circle for the subtraction $624 - 86$. It is divided into three parts:

- Left:** A 10-circle (blue) with a red arrow pointing from 8 to 2. Below it, the equation $2 - 8 = 2 + 2 = 4$ is shown in red.
- Middle:** A vertical subtraction problem $624 - 86$ with a horizontal line. The result is 54 , with a red diagonal line through the 4. A green box highlights the tens and hundreds columns (2 and 4 in the top row, 8 and 6 in the bottom row, and 3 in the result row).
- Right:** A 9-circle (red) with a red arrow pointing from 8 to 1. Below it, the equation $2 - 8 = 2 + 1 = 3$ is shown in red.

Instead of working out "2-8" in 10-circle we are going to use 9-circle.

The only difference is that in 9-circle the complement of 8 is 1, not 2.

So if we "add the complement" we'll add 1 to the 2, not 2 to the 2, so we get 3 instead of 4.

The "2-8" becomes "2+1" in 9-circle. The answer of 3 is the final answer we wanted, only we got it immediately.

We didn't need to "reduce it by 1".

By subtracting in 9-circle we got straight to the answer.

So the improvement is:

***If a subtraction is "Hard-Hard"
Just subtract it in 9-circle
and don't bother to reduce it by 1.***

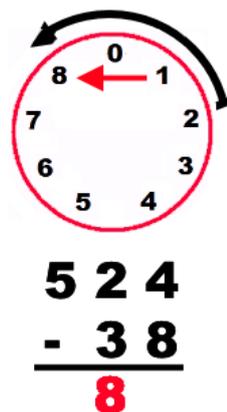
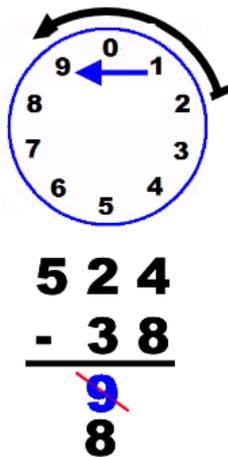
Why The Improvement Works

To see more clearly why that works,
let's look at the subtraction:

$$\begin{array}{r} 524 \\ - 38 \\ \hline \end{array}$$

The middle step ("2 - 3") is "Hard-Hard".
It goes below zero, and its neighbour, the "4-8", also goes below zero.
They're both "Hard" types.

In 10-circle (left in figure below) you can see that 2 less 3 comes to 9,
which we then have to reduce by 1 because of the neighbour,
so it goes down to 8.



However 9-circle is different.
It has one less number in it. It doesn't have a 9.

Consequently when we work out 2 less 3 we come directly to 8,
which is our final answer, straight away.

So if its "Hard-Hard"
just do the subtraction in 9-circle.

You can then learn to subtract quite fast that way.

Let's face it, it is the "Hard-hard" type
which slow everyone else down
when subtracting.

Done this way
they're
easy!

Before you think it will involve learning hundred's of new
9-circle answers - it won't. But that's the subject of the
next video/webpage.

Don't forget - this is just the icing on the cake!
If you have followed how to subtract up to this stage
but find this too difficult,
don't worry about it.

You already have a very good means of subtraction.

This is just for the perfectionists amongst us!
(I happen to be one of them!)

