

Lesson 6

Long Division

This is the quick guide to the video. For more complete details watch video 6.

Goals:

- To show how long division can be done WITHOUT knowing any times tables
- It must act as a suitable introduction to the more formal technique
- The strategy must be EASY enough for a very young child to do
 - It must be based on the fundamentals of division

Method

We are already familiar by this stage with how to repeatedly subtract using the "Add a Comp" strategy.

For example, we could repeatedly subtract 9 from 56 as follows (we'll write the 9 out once to show it is 9 we are repeatedly subtracting,

otherwise we will simply write the answers to the subtractions as we go):

$$\begin{array}{r} 9 \mid 56 \\ 47 \\ 38 \\ 29 \\ 20 \\ 11 \\ 02 \end{array}$$

We can at this stage do that without too much strain and fairly quickly.

This is presumed before you continue. If you cannot yet do this with absolute ease then:



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Practice the "Add a Comp" Strategy
until you CAN do it swiftly without strain

Let's extend our subtraction so we can practice without running out.

Please bear with me here, there is a good reason for doing this as you will see shortly.

The problem we meet in practicing subtraction is that we run out after about 8 or 9 steps.

Here is how to extend that:

Simply add another digit on (any digit whatsoever).

Just tack it on at the end and when you "run out" just bring it down.

To demonstrate I'll add a 3 onto the above example:

$$\begin{array}{r} 9 \mid \underline{563} \\ 47 \\ 38 \\ 29 \\ 20 \\ 11 \\ \underline{023} \\ 14 \\ \underline{05} \end{array}$$

By adding on the 3 at the end we can drop it down when we run out to create the new starting number, **23**,

(ignoring the 0 in front) - and continue our subtraction process.

Obviously we could do this again and again if we wished,
adding on any numbers we wanted to as far as we wished to go.

Long Division

At this stage there is nothing much to teach you about how to perform long division as you have pretty much already done it.

Long division is just repeated subtraction, and that is what we have been doing!

To get our answer we only need to count up the steps:

$$\begin{array}{r}
 \text{6 2 r 05} \\
 9 \overline{) 563} \\
 \underline{47} \\
 38 \\
 \underline{29} \\
 20 \\
 \underline{11} \\
 023 \\
 \underline{14} \\
 05
 \end{array}$$

A red bracket on the left groups the first six rows of the subtraction process (47, 38, 29, 20, 11, 023) and is labeled "6 steps".
 A red bracket on the right groups the last two rows (14, 05) and is labeled "2 steps".

Ruling off is quite helpful. So rule off at the start (under the 563) and after each time you stop because you "can't take any more 9's off" (under the 023 and the 05).

Then count up the steps and that is your answer to a long division!

Any number at the end is your remainder.

Here is another example for you:

$$\begin{array}{r}
 \text{4 3 r 5} \\
 9 \overline{) 392} \\
 \underline{30} \\
 21 \\
 \underline{12} \\
 032 \\
 \underline{23} \\
 14 \\
 \underline{05}
 \end{array}$$

A red bracket on the left groups the first four rows of the subtraction process (30, 21, 12, 032) and is labeled "4 steps".
 A red bracket on the right groups the last three rows (23, 14, 05) and is labeled "3 steps".

Once again in the above example we have started with 39 and have subtracted 9 off it 4 times until we reached a remainder of 03.

Then we dropped down the 2 and began again subtracting 9's off 32.

This we did in 3 steps ending with a remainder of 5.

Because we stopped at this point the 05 is our final remainder
(0's at the start can be ignored, they just mean "zero tens").

Subtracting this way never requires any knowledge of the times tables.
That means a child old enough to subtract can start doing long divisions.
It is easy because it is based on the easy to do "Add a Complement" strategy.

Because it is based on "repeated subtraction" it represents exactly what long division is actually
doing.

Sometimes this is clouded by the methods used and children don't get that picture.

This way they do, and because it is based on bedrock fundamentals
it makes a suitable introduction to the standard long division process.