NOM, Prénom :

About 7

Euro 1re

Method

Watch the video "Method Without Subtitles" once.
You can watch it a second time and if you feel lost, ask the teacher for the subtitled version.

Did you need the subtitled version ? ☐ YES ☐ NO

What's the video about ?

Give another example which shows how the method described in the video works.

Proof

Watch the video "Proof Without Subtitles" once.
You can also watch this one a second time and/or ask the teacher for the subtitled version.

Did you need the subtitled version ? ☐ YES ☐ NO

Explain why this method is correct.

Beware

> In the video, the man forgot an important detail : he actually proved that 5 times the original number is divisible by 7 if and only if $x + 5y$ is divisible by 7...but that's it !
> We will admit that if $5n$ is a multiple of 7, then n is also a multiple of 7.

One step further

There is another method we can use to work out wether an integer is divisible by 7, here it is showed on an example : is 12345 divisible by 7 ?

Let's take 12345, split it into 1234 and 5 and calculate $1234 - 2 \times 5$.
This gives us 1224, let's repeat the process :
$122 - 2 \times 4 = 114$
$11 - 2 \times 8 = -5$ so, as -5 is not divisible by 7, 12345 isn't either.

Prove that this method is valid.

APPENDIX : theorems used in the video (or not)

Theorem 1

Let a, b and c be three integers, with b and c not equal to zero.

If a is divisible by b then ca is divisible by b.

Example

4 is divisible by 2 so 4×123 is also divisible by 2.

Theorem 2

Let a, b and c be three integers such that $a = b + c$
Suppose that c is divisible by k, then either a and b are also divisible by k, or none of them are.

Example

x is an integer.

1. Suppose $30 = x + 5$, then x is also divisible by 5.
2. Suppose $30 = x + 11$, then x is not divisible by 11.

Theorem 3 (Gauss, to be used with $a = 7$ and $b = 5$)

Let a, b and c be three integers such that a divides bc and a and b have no common factor (except 1).

Then a divides c.

Example

If 7 divides $5n$, since 7 and 5 have no common factors other than 1, we can conclude that 7 divides n.