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Concept of New Decimals

PROBLEM OF ERRORS IN CALCULATION : A NEW CONCEPT OF DECIMAL

THE PROBLEM:

Divide the number 10 by number 3. What you would get? The answer is 3.33333……..333…., where, after decimal point (.), 3 is goes on repeating indefinitely or in other words, is repeating for infinite times means a recurring decimal. We can write it like 3.3 (three decimal three bar). Still we have no problem. But, what happen, when we want to multiply back 3.3 (the quotient) by 3 (the divisor).

3.33333333333……….. x 3 = 9.99999999999……… (recovered dividend)

or, in other words, 9.9 (bar)

Here, we see that it is not complete dividend 10. Where this 0.0000000000 …………… 1 has gone? It is called the calculation error. And whenever, we come across the problem like it, where a number is not divisible completely, and in the quotient (after decimal point) – a number or a combination of numbers - are go on repeating - then this problem arises, that, when we try to multiply this quotient back with the divisor, we are not able to get the original number (means the dividend). A fraction of its value lost. Where? – in calculation only. It is the calculation error. OR I will say – it is the basic error in our mathematical operational concept. It had not understood completely, yet.

WHY THIS HAPPEN:

The world is divided into two parts – positive and negative, ups and downs, Left and Right, Right and wrong, on and off, and so on. And Mathematics is also not an exception of it. We think that all numbers belongs to one group. Actually, there are two sets of "groups of numbers".

First Understand: WHAT IS DIVISION:

Lets understand division first. Although, we all know, what is division? but try to understand it here, with me. What is the meaning of division? For example, if number 10 is divided by 5, it means, how many (group of) 5s can be taken out (or subtracted) from 10. Now start subtracting 5 from 10. After first subtraction, remains 5 and on 2nd subtraction, there remains nothing (or zero). Means only two times (a group of) 5s can be take out of 10. So, the quotient is 2. From the above example, it is clear that, quotient reports the number of operations of subtraction of divisor from the dividend.

What happens, when a remainder is there?

Let's take an example:-

Divide 5 by 2. Only two times, we can subtract (a group of) 2s out of 5 and there remains 1. Now divide it further using rule of decimal.

```
2)  5  ( 2 . 5
    4
    ―――
     10
     10
     ――――
     00
```

After placing a decimal point(.) in quotient, a zero comes over the remainder's unit place and remainder pushed up from one's place to ten's place (or to next place). Now divide it (the new dividend so prepared) further by divisor 2. Five times (a group of) 2s can be subtracted from it (the new dividend). Now, remains nothing. So, quotient is 2.5. A Terminating Decimal.

So, after putting a decimal point in quotient, what we had done actually to remainder by placing one zero at the unit's place of the Remainder? After placing decimal in quotient, we actually added some number (i.e. a strategic number) to the Remainder to expand it, to make ease in its further division by the divisor. Here in the above example, (by changing the place value of all the numbers of the remainder), we added 9 in the remainder to expand it, to ease in its further division. So, it became 10 and we further subtracted five times (a group of) 2s from it to make remainder nothing. Understand it by the following illustration:-

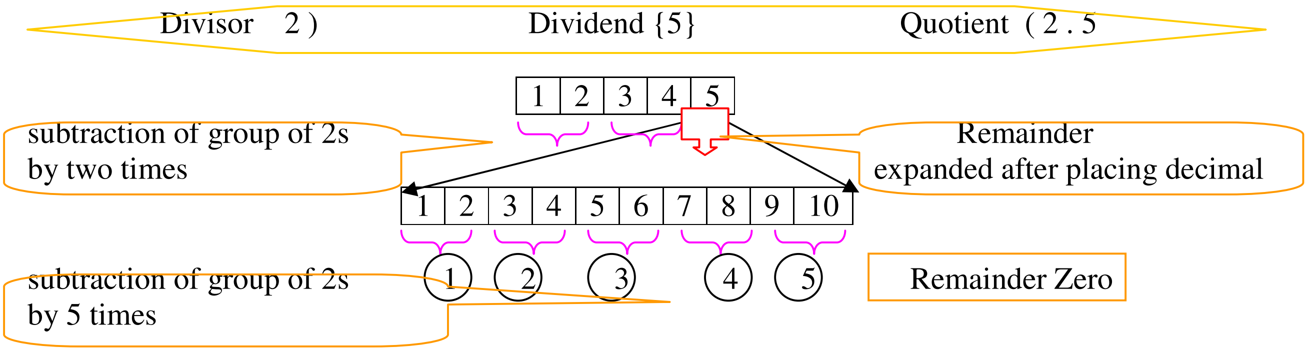

Fig 1. Illustration of Division

Now take the example of repetitive value in quotient after decimal. Divide 10 by 3. Only three times, we can take out (a group of) 3s from 10. After that, there remains 1. As illustrated above, every time expanding this remainder by adding 9, it becomes 10 only, so it starts resonating.

A Solution : A New Concept of Decimal:

In our formal decimal approach of Division – After putting the decimal point(.) in quotient, we expand the remainder by changing its place value. Or in other words – we can say that we expand the remainder by adding a number, in multiple of 9. For example, if remainder is 1, we make it 10 by adding 9 to it. If remainder is 2, we make it 20 by adding 18 to it. If remainder is 3, we make it 30 by adding 27 to it. And …….. and ……. ; if remainder is 13, we make it 130 by adding 117 (a multiple of 9) to it. And so on. Indeed, a very good approach of division (or multiple subtraction of same number (out of) from a given number – the dividend). But, for a set of a 'group of numbers' – the problem of resonant quotient arises. When we expand the remainder in same fashion every time (means in a multiple of 9), then for a set of a group of numbers - the answer may stick to some fashion of number/numbers (means resonate). For example, when we divide 10 (dividend) by divisor 3, then after placing decimal in quotient, when we expand the remainder 1 by adding 9 to it – it always becomes 10. So, the problem of repetition arises. I will say that, you get stick in calculation. Then, whatever you are doing further in division is a ridiculous and a time wasting act only. There is no meaning in doing further division of it.

So, It is the point – where we should stop and start thinking in right direction. Why our calculation sticks? How to get rid of it?

My point is – Why to apply same decimal to every set of 'group of numbers'? Why to expand this type of "group of numbers" (like "3 & 10", "7 & 22" , etc.) by adding a multiple of 9 to its remainder (after placing decimal in quotient)?

Now, Do it like this –

NEW DECIMAL (THE 1-DECIMAL): (!) or (1)

Let's consider the same problem – division of 10 by 3. After subtracting 3 times (the group of) 3s from the dividend 10, there remains 1. Now, put a new decimal (1), instead of normal decimal point (.) and put a 1 in one's place of the remainder and push the remainder's digit 1 to the ten's place. Or in other words, expand the remainder by adding 10 to the remainder.

```
3)  10   ( 3(1) 37
    9
    ---
     11
     9
     ---
      21
      21
     ----
      00
```

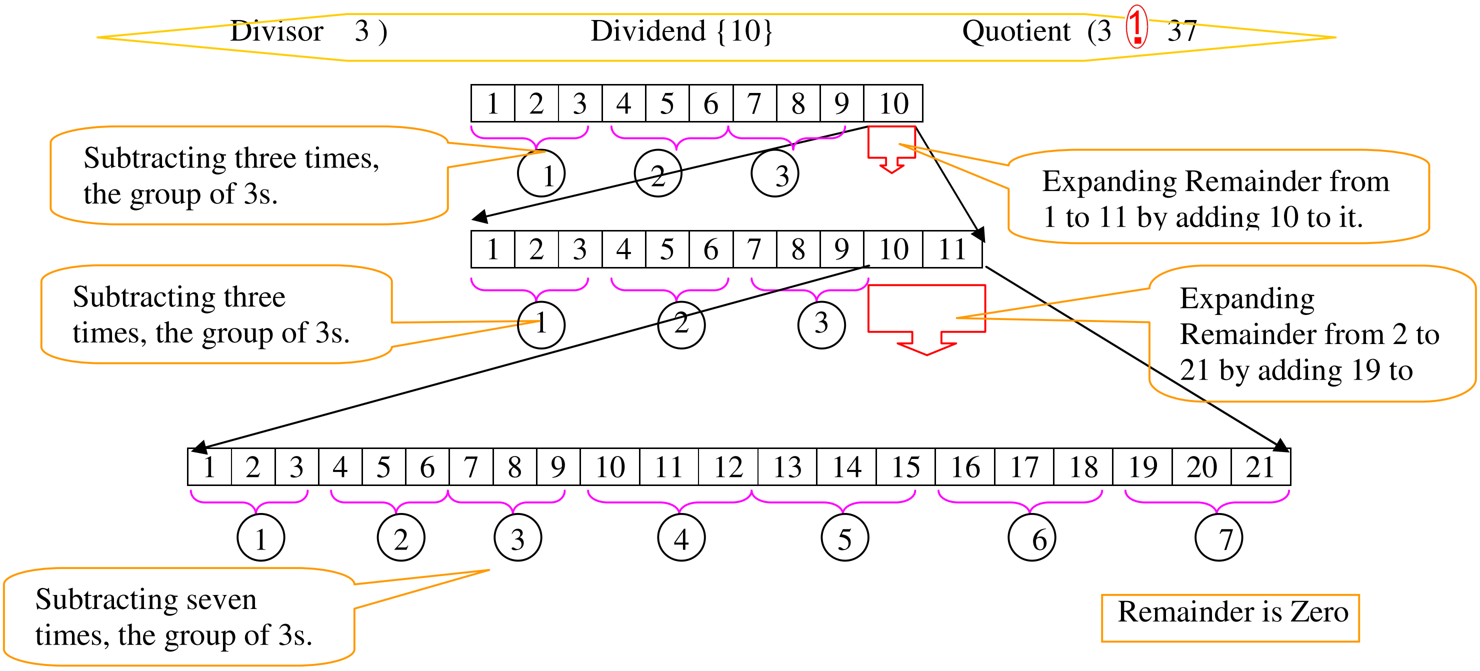

Fig 2. Illustration of Division by using 1-Decimal

Now, we can subtract three times (the group of) 3s from it. Now remainder comes 2. Again expand it to 21 (by placing 1 at one's place and pushing 2 to the ten's place) by adding 19 to it. Now we can subtract 7 times (a group of) 3s out of it. Remains nothing. No repetitive terms in quotient. (The perfect terminating Decimal). Now multiply quotient back by division to obtain the dividend. Perfect ! You will get back 10.

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Note for Multiplication for 1-decimal ① {for example – 3① 37(multiplicand) by 3(multiplier) }:-

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When you first multiply 3 (multiplier) by 7 (number at the one's place of the multiplicand) – the product will be the 21. Subtract 1 from this product and it becomes 20. So, place 0 at the one's place of the product bar and 2 will be the carry. Do the same for the rest of the numbers; that every time, whatever the product you got – subtract 1 from it **{**because here it is 1-decimal (①) and not the decimal point (.) **}** and then decide the product digit and its carry.

3 ①37 X 3 21 – 1 = 20 0 **2 carry**	3①37 X 3 9 + 2 (carry) = 11 – 1 = 10 00 **1 carry**	3 ①37 X 3 9 + 1 (carry) = 10 10.00

Or, do multiplication simply – with ① 1-decimal :-

3① 37
X 3
10 ① 11

Now, replace① in product result by decimal point(.) and make all 1's after ① to 0. (or subtract 0.11 from the product result to replace ① by (.) decimal point).

Thus, we see that no error will be there in calculation by using this new decimal method for such type of set of the 'group of numbers', with no repetitive terms in the quotient and so we will always be able to get the dividend back on multiplying the divisor by the quotient, perfectly.

FEW MORE DECIMAL POINTS/ METHODS OF DIVISION :

Now, let's broaden our concept of new decimal points to further – from '1-Decimal' to '2-Decimal'②, and further '3-Decimal'③, '4-Decimal'④, '5-Decimal'⑤, '6-Decimal'⑥, '7-Decimal'⑦, '8-Decimal'⑧ & upto '9-Decimal'⑨.

All these operations/ methods are self explanatory. In 2-Decimal division method, after placing a '2-decimal' in the quotient, put 2 at the one's place of the remainder and push the remainder one place up.

3) 10 (3②4

```
 9
 --
  12
  12
  --
   00
```

Try it for all other decimal points and play.

ONE HURDLE :

Divide 5 by 2 using the 1-Decimal division method.

```
2)   5   (2 1 5
 4
 --
  11
  10
  --
   1
```

A repetitive quotient with "normal sets of numbers". It means that, we cannot apply this new '1-decimal' 1 to "normal sets of numbers", (whose division with normal decimal point(.) is always a non-recurring quotient). So, we have to identify the two distinct sets of numbers and its method to find it all. Or, alternatively, we can apply a asynchronous division method in which we have to apply the two divisive methods in a alternative fashion to make it applicable to all sets of numbers without any recurrence in quotient.

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It is to certify that the whole work is unpublished, original and belongs to me (the author) only.

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