

# Sums. They're Math Magic

## 1 – Just Counting

**This series of Maths activities has been written by Derrick Willer and has a deliberately random sequence designed to maintain interest, excitement and involvement in the many problems and solutions described.**

**Derrick is a Chartered Engineer and whose engineering career has taken him to many countries across the world.**

**He is a STEM Ambassador and volunteer Education Officer for the IET Coventry and Warwickshire Network.**

**Derrick has supported education in schools and colleges for some 30 years, initially as a Neighbourhood Engineer in the 1980's, leading the local Year of Engineering Success campaign in 1996 and the Campaign to Promote Engineering from 1997 to 2004.**

**Derrick was awarded an MBE for services to Education in 2018.**

**He has also created over 50 pupil challenges for teachers, parents and pupils to use and which can be downloaded free of charge from his web-site.**



# Sums. They're Math Magic

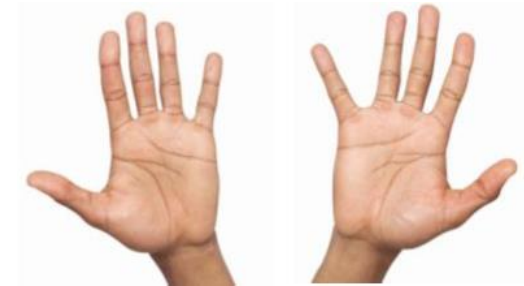
## 1 – Just Counting

**Please go through each slide stopping until you have understood the concept described**

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## 1 - Just Counting

Everyone agrees that we count in tens because we have ten digits on our hands. We call this “Decimal” counting.



But is 10 a good number?

We can divide 10 by 1, 2 and 5

But 12 could be better because it is divisible by 1,2,3,4 and 6.

Can we get a number that is divisible by 1,2,3,4 and 5?

It is 60. That is a very big number to use as a basis for counting.

So, perhaps we will stay with Decimal counting in tens.

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But what if we did not have as many as ten digits?

Perhaps an intelligent alien or a clever dinosaur which only has three digits on each “hand” like those opposite.



They would surely count in sixes!

At least 6 is divisible by 1,2 and 3 but what would the counting look like?

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Alien	Decimal	Alien	Decimal	Alien	Decimal	Alien	Decimal	Alien	Decimal	Alien	Decimal
1	1	11	7	21	13	31	19	41	25	51	31
2	2	12	8	22	14	32	20	41	26	52	32
3	3	13	9	23	15	33	21	43	27	53	33
4	4	14	10	24	16	34	22	44	28	54	34
5	5	15	11	25	17	35	23	45	29	55	35
10	6	20	12	30	18	40	24	50	30	100	36

So aliens may well count in sixes, called “senary” or, if they have four digits, eights, called “octal” depending on the number of digits on each “hand”.

We think that the Aztecs used 20.

There are some indigenous groups of people in South America who used 3 or 4.

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## 1 - Just Counting

### Roman Counting

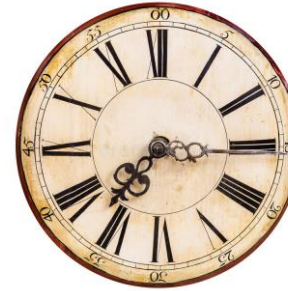
We will also all be aware of Roman counting, many clock faces use this.

They used the numbers I V X L C D M and to get larger numbers put a bar over the top to multiply by 1000, such as

Here I = 1, V = 5, X = 10, L = 50, C = 100, D = 500 and M = 1000

But they also put a smaller number before the larger number such as:

IV meaning 1 before 5 = 4, so XL = 40, XCIV = 94 (ten before 100 plus 1 before 5)



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The Romans counted like this:

Roman	Decimal	Roman	Decimal
I	1	XI	11
II	2	XII	12
III	3	XIII	13
IV	4	XIV	14
V	5	XV	15
VI	6	XVI	16
VII	7	XVII	17
VIII	8	XVIII	18
IX	9	XIX	19
X	10	XX	20

Roman	Decimal	Roman	Decimal
XLI	41	XCI	91
XLII	42	XCII	92
XLIII	43	XCIII	93
XLIV	44	XCIV	94
XLV	45	XCV	95
XLVI	46	XCVI	96
XLVII	47	XCVII	97
XLVIII	48	XCVIII	98
XLIX	49	XCIX	99
L	50	C	100

Roman	Decimal	Roman	Decimal	Roman	Decimal	Roman	Decimal
I	1	XI	11	XLI	41	XCI	91

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## 1 - Just Counting

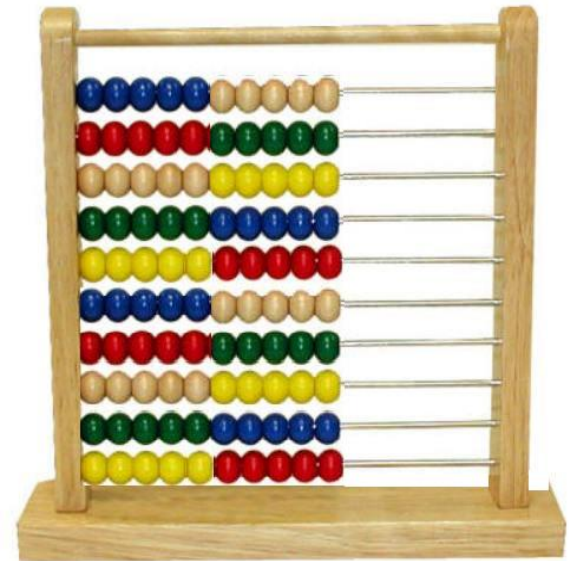
Try to do some sums using the Roman system!

That is why they used an abacus and only a few educated people could do this.

So lets try to multiply 13 by 19 = 247

This is XIII = 13 multiplied by IXX = 19 and the answer is CCXLVII = 247

And you can actually do this in a similar way to decimal multiplication.





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## 1 - Just Counting

We usually multiply each digit at a time and then add the results. e.g.

Decimal

$$13 \times 19$$

$$10 \times 19 = 190$$

$$3 \times 10 = 30$$

$$3 \times 9 = 27$$

$$\begin{array}{r} \text{Add} \quad \text{-----} \\ 247 \end{array}$$

Roman

$$XIII \times XIX$$

$$X \times X = C$$

$$X \times I = X$$

but this is subtracted  
because the I is before the X

$$X \times X = C$$

$$III \times X = XXX$$

$$III \times I = III$$

but this is also subtracted

$$III \times X = XXX$$

$$\text{Adding} \quad \text{-----}$$

$$CCXXXXX-III = CCXLVII$$

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## 1 - Just Counting

We usually multiply each digit at a time and then add the results. e.g.

Decimal

$$13 \times 19$$

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$$3 \times 9 = 27$$

Add

247

Roman

$$XIII \times XIX$$

the X

$$X \times X = C$$

$$III \times X = XXX$$

$$III \times I = III$$

subtracted

$$III \times X = XXX$$

Adding -----

$$CCXXXXX-III = CCXLVII$$

No wonder the ordinary Romans thought that the Roman tax man was robbing them; we think exactly the same today!

but this is subtracted because the I is before

but this is also

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## 1 - Just Counting

**Please go to the next lesson.**

**Sum Fun With Algebra**

**How do you count cows?**



**With a cowculator!**

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