

Fun With Numbers

MANY people find numbers quite boring. But for others playing with numbers is a favourite past-time. And so, for those who find numbers boring, here are a few numbers that may sound interesting.

Smith Number

Smith Number is a composite number the sum of whose digits is equal to the sum of the digits of its prime factors. An example of a Smith number is the number 666.

$$666 = 2 \cdot 3 \cdot 3 \cdot 37$$

$$\text{Now } 6 + 6 + 6 = 18$$

$$\text{and } 2 + 3 + 3 + (3 + 7) = 18.$$

The first few Smith numbers are 4, 22, 27, ...

The number 666 is an interesting number:

$$666 = 1 + 2 + 3 + 4 + 567 + 89$$

$$666 = 123 + 456 + 78 + 9$$

$$666 = 9 + 87 + 6 + 543 + 21$$

$$666 = 1^6 - 2^6 + 3^6$$

$$666 = 1 + 2 + 3 + 4 + 5 + 6 + \dots + 34 + 35 + 36$$

Factorion

A Factorion is an integer that is equal to the sum of factorials of its digits. There are exactly four such numbers:

$$1! = 1$$

$$2! = 2$$

$$145 = 1! + 4! + 5! = 1 + 24 + 120 = 145$$

$$40585 = 4! + 0! + 5! + 8! + 5! = 24 + 1 + 120 +$$

$$40320 + 120 = 40585$$

Narcissistic Numbers

An n-digit number that is the sum of the n^{th} powers of its digits is called a narcissistic number.

Examples:

$$153 = 1^3 + 5^3 + 3^3$$

$$370 = 3^3 + 7^3 + 0^3$$

$$371 = 3^3 + 7^3 + 1^3$$

$$407 = 4^3 + 0^3 + 7^3$$

$$1634 = 1^4 + 6^4 + 3^4 + 4^4$$

$$54748 = 5^5 + 4^5 + 7^5 + 4^5 + 8^5$$

Cullen Numbers

Cullen Numbers are numbers that can be expressed in the form $2^n \times n + 1$.

$$3 = 2^1 \times 1 + 1$$

$$9 = 2^2 \times 2 + 1$$

$$25 = 2^3 \times 3 + 1$$

$$65 = 2^4 \times 4 + 1$$

Kaprekar Numbers

If on squaring a number (say x) we get y , and adding the right n digits of y to the left n or $(n - 1)$ digits of y the resultant is equal to the number x , then it is a Kaprekar Number. Examples:

$$9^2 = 81 = 8 + 1$$

$$55^2 = 3025 = 30 + 25$$

$$297^2 = 88209 = 88 + 209$$

Pythagorean Triplets

If n is any odd integer > 1 , and it represents either the base or the perpendicular of a right-angled triangle, then the other two sides are given by $\frac{1}{2}(n^2 - 1)$ and $\frac{1}{2}(n^2 + 1)$.

Interesting Numbers

I. The number **381654729** is a special number because:

The first **two** digits (from the left) form a number that is divisible by **2**;

The first **three** digits (from the left) form a number that is divisible by **3**;

The first **four** digits (from the left) form a number that is divisible by **4**;

The first **five** digits (from the left) form a number that is divisible by **5**;

The first **six** digits (from the left) form a number that is divisible by **6**;

The first **seven** digits (from the left) form a number that is divisible by **7**;

The first **eight** digits (from the left) form a number that is divisible by **8**;

The first **nine** digits (from the left) form a number that is divisible by **9**;

It contains all the digits from 1 to 9 exactly once.

II. The number **2^{2520}** is a special number, because:

It is the smallest positive number (> 1), which can be expressed as a first power, second power, third power, fourth power, fifth power, sixth power, seventh power, eighth power, and a ninth power.

$$(2^{1260})^2, (2^{840})^3, (2^{630})^4, (2^{504})^5, (2^{420})^6, (2^{360})^7, (2^{315})^8, (2^{280})^9.$$

SHORT FEATURE

III. What will be the sum of all the unique four digit numbers that can be formed with the digits 6,7,8 and 9 occurring in each number exactly once.

The common tendency is to write all four-digit unique numbers that can be formed with the digits 6,7,8, and 9:

6789, 6798, 6879, 6897, 6978, 6987

7689, 7698, 7869, 7896, 7968, 7986

8679, 8697, 8769, 8796, 8967, 8976,

9678, 9687, 9768, 9786, 9867, 9876,

and then find the sum (which works out to 199980). **But** there is a shorter method:

The digit 6 occurs in the **thousand's** place 6 times. Similarly, it occurs in the **hundred's** place 6 times and in the **ten's** place 6 times and also in the **units** place exactly six times. The sum of such numbers will be $6 \times (6000 + 600 + 60 + 6) = 6 \times (6666)$.

Similarly, for 7 the sum will be $6 \times (7000 + 700 + 70 + 7) = 6 \times 7777$.

Similarly, for 8 the sum will be 6×8888 .

And similarly, for 9 the sum will be 6×9999 .

i.e. $6 \times (6666 + 7777 + 8888 + 9999)$

$= 6 \times 33330$

$= 199980$.

[As an exercise, you can carry out the test for all unique four digit numbers that can be formed with the digits 1,3,5 and 6].

IV. 73939133 is an interesting number because:

7 is prime

73 is prime

739 is prime

7393 is prime

73939 is prime

739391 is prime

7393913 is prime

73939133 is prime

V. The number 6 is a very special number:

$6 \times 1 = 6$ $=$ 6

$6 \times 2 = 12$ $=$ $(1 + 2) = 3$

$6 \times 3 = 18$ $=$ $(1 + 8) = 9$

$6 \times 4 = 24$ $=$ $(2 + 4) = 6$

$6 \times 5 = 30$ $=$ $(3 + 0) = 3$

$6 \times 6 = 36$ $=$ $(3 + 6) = 9$

$6 \times 7 = 42$ $=$ $(4 + 2) = 6$

$6 \times 8 = 48$ $=$ $(4 + 8) = 12$ and $(1 + 2) = 3...$

The pattern 3, 9, 6 keeps on repeating. How far? (No one knows)

VI. The number 8 is a very special number:

$8 \times 1 = 8$ $=$ 8

$8 \times 2 = 16$ $=$ $(1 + 6) = 7$

$8 \times 3 = 24$ $=$ $(2 + 4) = 6$

$8 \times 4 = 32$ $=$ $(3 + 2) = 5$

$8 \times 5 = 40$ $=$ $(4 + 0) = 4$

$8 \times 6 = 48$ $=$ $(4 + 8) = 12$; $(1 + 2) = 3$

$8 \times 7 = 56$ $=$ $(5 + 6) = 11$; $(1 + 1) = 2$

$8 \times 8 = 64$ $=$ $(6 + 4) = 10$ and $(1 + 0) = 1$

$8 \times 9 = 72$ $=$ $(7 + 2) = 9$

We get a decreasing order 8,7,6,5,4,3,2...

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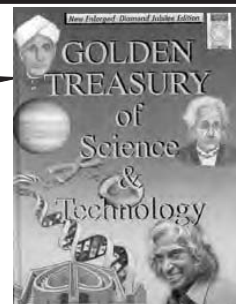
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