01

In the following sequence, there are one '1', two '2's, three '3's, four '4's and so on. What is the 888th number in the sequence ?

1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6 .....

Trial and error method: Since there are one 1, two 2's, three 3's and so on, the sum of the number of terms (1 + 2 + 3 + ... + n) should be close to 888.

Total number of terms until the last term of "40" is

$$1 + 2 + 3 + ... + 40 = \frac{40 \times 41}{2} = 820$$

Trying again,

$$1 + 2 + 3 + ... + 41 = \frac{41 \times 42}{2} = 861$$

$$1 + 2 + 3 ..... + 42 = \frac{42 \times 43}{2} = 903$$

Hence, the 888th term will occur in the "42" group

02

In a hall, seats were arranged equally in rows. Swarup seat on one of the seats. There were 7 seats to his right and 12 seats to his left. There were 6 rows of seats in front of him and 14 rows behind him. How many seats were there in the hall ?

1 + 7 + 12 = 20 seats (each row)

6 + 14 + 1 = 21 rows

20 × 21 = 420 seats

∴ There are 420 seats

03 **By reversing the digits of a 2-digit number ab, one obtains another 2-digit number b a, where a and b are distinct. If their sum ab + ba is divisible by 11, find the 2-digit number ab if it is to be, (a) the smallest (b) the largest.**

Sum of the 2 numbers = (10a + b) + (10b + a) = 11 (a + b)

Since, 11(a + b) is divisible by 11, (a + b) can take any whole number

Since a and b are distinct, $a + b \neq 1 + 1 = 2$

(a) Hence, a + b = 3.

Take ab = 12 for ab to be the smallest

(b) For ab to be the largest, take ab to be 98

04 **What is the ones digit of $25^{55} + 17^{77}$?**

The ones digit of 5^n is always 5, where n is any positive integer

The ones digit of 7^n recurs in block of 4 at 7, 9, 3, 1

$\therefore 77 \div 4 = 19$ R 1

$\Rightarrow$ ones digit of 17^{77} is 7

Hence, $25^{55} + 17^{27} = 5 + 7 = 12$

05

The number 119 is very amazing.

When divided by 2, it leaves a remainder of 1.

When divided by 3, it leaves a remainder of 2.

When divided by 4, it leaves a remainder of 3.

When divided by 5, it leaves a remainder of 4.

When divided by 6, it leaves a remainder of 5.

Find another 3-digit number closest to 119 which has this property.

L.C.M. of 2, 3, 4, 5 and 6 is 60

$\therefore$ 119 + 60 = 179

Hence, 179 also follows the same property

06 **Find the value of**

$$\left(1+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}\right)\left(\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}\right)-\left(1+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}\right)\left(\frac{1}{6}+\frac{1}{7}+\frac{1}{8}\right)$$

Let $a=\frac{1}{6}+\frac{1}{7}+\frac{1}{8}$ and $b=\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}$

$$\Rightarrow \left(1+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}\right)\left(1+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}\right)-$$

$$\left(1+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}\right)\left(\frac{1}{6}+\frac{1}{7}+\frac{1}{8}\right)$$

$= (a + 1)b – (1 + b)a$

$= ab + b – a – ba$

$= b – a$

$$=\left(\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}\right)-\left(\frac{1}{6}+\frac{1}{7}+\frac{1}{8}\right)=\frac{1}{9}$$