

TRICKY PROBLEM

Find the four digit number whose digits get reversed after multiplying with 4

Sol: Let **abcd** be the four digit number

$$4(abcd) = dcba$$

It is difficult to check with many integers. This problem cannot be solved directly since it contains four variables. Only elegant idea helps to get the solution for the equation. Let us see the solution

since a, b, c, d are the positive single digit natural numbers, let us start guessing

If a = 3, 4,.....then left hand side becomes five digit number whereas right hand side becomes four digit number. Hence 'a' cannot be more than 2. i.e a = 1 or 2.

If a = 1 then LHS becomes even since it is a multiple of 4 whereas RHS becomes odd number. Hence 'a' cannot be one

i.e a = 2 which implies d can be either 3 or 8

d cannot be 3 because LHS is a four multiple of four digit number which is more than 3000. Hence 'd' cannot be 3.

Hence d = 8.

$$\begin{aligned} 4(2bc8) &= 8cb2 \Rightarrow 4(2000 + b(100) + c(10) + 8) = 8000 + c(100) + b(10) + 2 \\ &\Rightarrow 400b + 40c + 32 = 10b + 100c + 2 \end{aligned}$$

$$\Rightarrow 390b - 60c + 30 = 0 \Rightarrow 13b - 2c + 1 = 0 \Rightarrow c = \frac{13b+1}{2} \Rightarrow b=1, c=7 \text{ (If } b \text{ is greater than 1 then } c > 10 \text{) which is not possible)}$$

Hence four digit number which satisfies given condition = 2178