Class : Nine
Section : Zinnia
Subject - Mathematics

<u>Exercise-1</u>

21. If $n = 2x - 1$, where $x \in N$. Prove that n^2 when divided by 8 gives 1 as remainder .

Given ,

$n = 2x - 1$; where $x \in N$

$\therefore\ n^2 = (2x-1)^2$

$= 4x^2 - 4x + 1$

$= 4x(x-1) + 1$

Since , $(x-1)$ and x are two consecutive natural numbers , one of them must be even number.

Hence $x(x-1)$ is divisible by 2

So , $4x(x-1)$ is divisible by $4 \times 2 = 8$.

Therefore , if we divided $4x(x-1)+1$ by 8 then as a result the remainder will be 1 .

Again ,

If $n = 1$

Then $n^2 = 1$, the remainder is 1 when divided by 8 .

$\therefore\ n^2$ is divided by 8 every time the remainder is 1 .

[**Proved**]

Extra. **If $\boldsymbol{n = 2x - 1}$, where $\boldsymbol{x \in Z}$. Prove that $\boldsymbol{n^2}$ when divided by 8 gives 1 as remainder .**

Given ,

$n = 2x - 1$; where $x \in Z$

$\therefore\ n^2 = (2x - 1)^2$

$= 4x^2 - 4x + 1$

$= 4x(x - 1) + 1$

Since , $(x - 1)$ and x are two consecutive integer numbers , one of them must be even number.

Hence $x(x - 1)$ is divisible by 2

So , $4x(x - 1)$ is divisible by $4 \times 2 = 8$.

Therefore , if we divided $4x(x - 1) + 1$ by 8 then as a result the remainder will be 1 .

$\therefore\ n^2$ is divided by 8 every time the remainder is 1 .

[**Proved**]

Extra : Show that , if the square of an odd natural number is divided by 8 then in each case the remainder will be 1 .

If n is an odd natural number ,

$n = 2x - 1$; where $x \in N$

In this case ,

$n^2 = (2x-1)^2$

$= 4x^2 - 4x + 1$

$= 4x(x-1) + 1$

Since , $(x-1)$ and x are two consecutive natural numbers , one of them must be even number.

Hence $x(x-1)$ is divisible by 2

So , $4x(x-1)$ is divisible by $4 \times 2 = 8$.

Therefore , if we divided $4x(x-1)+1$ by 8 then as a result the remainder will be 1 .

Again ,

If $n = 1$

Then $n^2 = 1$, the remainder is 1 when divided by 8.

Therefore , when the square of an odd natural number is divided by 8 then in each case the remainder will be 1.

[**Showed**]