

Mathematics

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(Chapter – 1) (Real Numbers)(Exemplar Problems)
(Class – X)

Exercise 1.1

Choose the correct answer from the given four options in the following questions:

Question 3:

$n^2 - 1$ is divisible by 8, if n is

- (A) an integer (B) a natural number
(C) an odd integer (D) an even integer

Answer 3:

(C) an odd integer

Solution:

Let $a = n^2 - 1$

Here n can be even or odd.



Case I

$n = \text{Even}$ i.e., $n = 2k$, where k is an integer.

$$\Rightarrow a = (2k)^2 - 1$$

$$\Rightarrow a = 4k^2 - 1$$

At $k = -1$,

$$a = 4(-1)^2 - 1 = 4 - 1 = 3, \text{ which is not divisible by } 8.$$

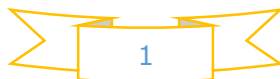
At $k = 0$,

$$a = 4(0)^2 - 1 = 0 - 1 = -1, \text{ which is not divisible by } 8.$$

Case II

$n = \text{odd}$ i.e., $n = 2k + 1$, where k is an integer

$$\Rightarrow a = (2k + 1)^2 - 1$$



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$$\Rightarrow a = 4k^2 + 4k + 1 - 1$$

$$\Rightarrow a = 4k^2 + 4k$$

$$\Rightarrow a = 4k(k + 1)$$

At $k = -1$,

$$a = 4(-1)(-1 + 1) = 0 \quad \text{which is divisible by 8.}$$

At $k = 0$,

$$a = 4(0)(0 + 1) = 0 \quad \text{which is divisible by 8.}$$

At $k = 1$,

$$a = 4(1)(1 + 1) = 8 \quad \text{which is divisible by 8.}$$

Hence, we can conclude from above two cases, if n is odd, then $n^2 - 1$ is divisible by 8.

