

# Mathematics

(www.tiwariacademy.net)

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

## Exercise 1.3

### Question 5:

Show that the square of any odd integer is of the form  $4m + 1$ , for some integer  $m$ .

### Answer 5:

By Euclid's division algorithm,

we have  $a = bq + r$ , where  $0 \leq r < 4$

Putting  $b = 4$ , we get

$a = 4q + r$ , where  $0 \leq r < 4$  i.e.  $r = 0, 1, 2, 3$ .

If  $r = 0$

$a = 4q$ , which is divisible by 2

$\Rightarrow 4q$  is even.

If  $r = 1$

$a = 4q + 1$ , which is not divisible by 2.

If  $r = 2$

$a = 4q + 2 = 2(2q + 1)$  which is divisible by 2

$\Rightarrow 2(2q+1)$  is even.

If  $r = 3$

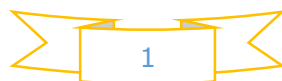
$a = 4q + 3$  which is not divisible by 2.

So, for any positive integer  $q$ ,  $4q + 1$  and  $4q + 3$  are odd integers.

Now,

$$a^2 = (4q + 1)^2 = 16q^2 + 1 + 8q = 4(4q^2 + 2q) + 1$$

$$[\because (a + b)^2 = a^2 + 2ab + b^2]$$



# Mathematics

([www.tiwariacademy.net](http://www.tiwariacademy.net))

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

Which is of the form  $4m + 1$ , where  $m = (4q^2 + 2q)$  is an integer.

Now,

$$a^2 = (4q + 3)^2 = 16q^2 + 9 + 24q = 4(4q^2 + 6q + 2) + 1$$

Which is of the form  $4m + 1$ , where  $m = (4q^2 + 6q + 2)$  is an integer.

Hence, for some integer  $m$ , the square of any odd integer is of the form  $4m + 1$ .

