

# Mathematics

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

## Exercise 1.2

### Question 5:

A positive integer is of the form  $3q + 1$ ,  $q$  being a natural number. Can you write its square in any form other than  $3m + 1$ , i.e.,  $3m$  or  $3m + 2$  for some integer  $m$ ? Justify your answer.

### Answer 5:

No,

By Euclid's Lemma,  $b = aq + r$ ,  $0 \leq r < a$ .

Here,  $b$  is any positive integer and  $a = 3$ ,

$$b = 3q + r \quad \text{for } 0 \leq r < 3$$

So, this must be in the form  $3q$ ,  $3q + 1$  or  $3q + 2$ .

Now,

$$(3q)^2 = 9q^2 = 3m$$



[where,  $m = 3q^2$ ]

$$\text{and } (3q + 1)^2 = 9q^2 + 6q + 1$$

$$= 3(3q^2 + 2q) + 1 = 3m + 1$$

[where,  $m = 3q^2 + 2q$ ]

$$\text{Also, } (3q + 2)^2 = 9q^2 + 12q + 4$$

$$= 9q^2 + 12q + 3 + 1$$

$$= 3(3q^2 + 4q + 1) + 1$$

$$= 3m + 1$$

[where,  $m = 3q^2 + 4q + 1$ ]

Hence, square of a positive integer is of the form  $3q + 1$  is always in the form  $3m + 1$  for some integer  $m$ .

