

# Mathematics

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

## Exercise 1.4

### Question 5:

Show that one and only one out of  $n$ ,  $n + 4$ ,  $n + 8$ ,  $n + 12$  and  $n + 16$  is divisible by 5, where  $n$  is any positive integer.

### Answer 5:

Given numbers are  $n$ ,  $(n + 4)$ ,  $(n + 8)$ ,  $(n + 12)$  and  $(n + 16)$ , where  $n$  is any positive integer.

Let  $n = 5q + r$ , where  $0 \leq r < 5$

$n = 5q$ ,  $5q + 1$ ,  $5q + 2$ ,  $5q + 3$ ,  $5q + 4$  for any natural number  $q$  [by Euclid's algorithm]

### Case I

When  $n = 5q$

**$n = 5q$  is divisible by 5**

$n + 4 = 5q + 4$  is not divisible by 5

$n + 8 = 5q + 8 = 5q + 5 + 3 = 5(q + 1) + 3$  is not divisible by 5

$n + 12 = 5q + 12 = 5q + 10 + 2 = 5(q + 2) + 2$  is not divisible by 5

$n + 16 = 5q + 16 = 5q + 15 + 1 = 5(q + 3) + 1$  is not divisible by 5

### Case II

When  $n = 5q + 1$

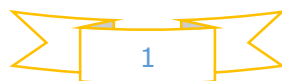
$n = 5q + 1$  is not divisible by 5

**$n + 4 = 5q + 1 + 4 = 5q + 5 = 5(q + 1)$  is divisible by 5**

$n + 8 = 5q + 1 + 8 = 5q + 5 + 4 = 5(q + 1) + 4$  is not divisible by 5

$n + 12 = 5q + 1 + 12 = 5q + 10 + 3 = 5(q + 2) + 3$  is not divisible by 5

$n + 16 = 5q + 1 + 16 = 5q + 15 + 2 = 5(q + 3) + 2$  is not divisible by 5



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## Case III

When  $n = 5q + 2$

$n = 5q + 2$  is not divisible by 5

$n + 4 = 5q + 2 + 4 = 5q + 5 + 1 = 5(q + 1) + 1$  is not divisible by 5

**$n + 8 = 5q + 2 + 8 = 5q + 10 = 5(q + 2)$  is divisible by 5**

$n + 12 = 5q + 2 + 12 = 5q + 10 + 4 = 5(q + 2) + 4$  is not divisible by 5

$n + 16 = 5q + 2 + 16 = 5q + 15 + 3 = 5(q + 3) + 3$  is not divisible by 5

## Case IV

When  $n = 5q + 3$

$n = 5q + 3$  is not divisible by 5

$n + 4 = 5q + 3 + 4 = 5q + 5 + 2 = 5(q + 1) + 2$  is not divisible by 5

$n + 8 = 5q + 3 + 8 = 5q + 10 + 1 = 5(q + 2) + 1$  is not divisible by 5

**$n + 12 = 5q + 3 + 12 = 5q + 15 = 5(q + 3)$  is divisible by 5**

$n + 16 = 5q + 3 + 16 = 5q + 15 + 4 = 5(q + 3) + 4$  is not divisible by 5

## Case V

When  $n = 5q + 4$

$n = 5q + 4$  is not divisible by 5

$n + 4 = 5q + 4 + 4 = 5q + 5 + 3 = 5(q + 1) + 3$  is not divisible by 5

$n + 8 = 5q + 4 + 8 = 5q + 10 + 2 = 5(q + 2) + 2$  is not divisible by 5

$n + 12 = 5q + 4 + 12 = 5q + 15 + 1 = 5(q + 3) + 1$  is not divisible by 5

**$n + 16 = 5q + 4 + 16 = 5q + 20 = 5(q + 4)$  is divisible by 5**

Hence, in each case, one and only one out of  $n$ ,  $n + 4$ ,  $n + 8$ ,  $n + 12$  and  $n + 16$  is divisible by 5.

