Chapter 1
Real numbers

1. **Use Euclid's division algorithm to find the HCF of :**

(i) 135 and 225

Solution:
We know that,
= 225>135
Applying Euclid's division algorithm
225 = 135 ×1+90 $(Dividend = Divisor \times Quotient + Remainder)$
Here remainder = 90,
So, Again Applying Euclid's division algorithm
135 = 90×1+45
Here remainder = 45,
So, Again Applying Euclid's division algorithm
90 = 45×2+0
Remainder = 0,
Hence ,
HCF of (135, 225) = 45

(ii) 196 and 38220
Solution:

We know that,
38220>196
So, Applying Euclid's division algorithm
38220 = 196×195+0 $(Dividend = Divisor \times Quotient + Remainder)$
Remainder = 0
Hence,
HCF of (196, 38220) = 196

(iii) 867 and 255
Solution:

We know that,
867>255
So, Applying Euclid's division algorithm
867 = 255×3+102 $(Dividend = Divisor \times Quotient + Remainder)$
Remainder = 102
So, Again Applying Euclid's division algorithm
255 = 102×2+51
Remainder = 51
So, Again Applying Euclid's division algorithm

102 = 51×2+0
Remainder = 0
Hence,
(HCF 0f 867 and 255) = 51

2. **Show that any positive odd integer is of the form 6*q* + 1, or 6*q* + 3, or 6*q* + 5, where *q* is some integer.**

Solution:

By taking,' a' as any positive integer and b = 6.
Applying Euclid's algorithm
a = 6q+r
Here, $r = remainder = 0,1,2,3,4,5 \ \ and \ q \geq 0$
So, total possible forms are $6q + 0, 6q + 1, 6q + 2, 6q + 3, 6q + 4, 6q + 5$
6q+0 , (6 is divisible by 2 , its an even number)
6q+1, (6 is divisible by 2 but 1 is not divisible by 2 , its an odd number)
6q+2, (6 and 2 both are divisible by 2 , its an even number)
6q+3, (6 is divisible by 2 but 3 is not divisible by 2, its an odd number)
6q+4, (6 and 4 both are divisible by 2, its an even number)
6q+5 , (6 is divisible by 2 but 5 is not divisible by 2 , its an odd number)
Therefore,
So, odd numbers will be in the form 6q+1, or 6q+3, or 6q+5

3. **An army contingent of 616 members is to march behind an army band of 32 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march?**

Solution:

By using, Euclid's division algorithm
616 = 32×19+8
Remainder $\neq 0$
So, again Applying Euclid's division algorithm
32 = 8×4+0
HCF of (616, 32) is 8.
So ,
They can march in 8 columns each.

4. **Use Euclid's division lemma to show that the square of any positive integer is either of the form 3*m* or 3*m* + 1 for some integer *m*.**

Solution:

By taking,' a' as any positive integer and b = 3.
Applying Euclid's algorithm
a = 3q + r

Here, $r = remainder = 0,1,2 \ \ and\ q \geq 0$
So, a = 3q or 3q+1 or 3q+2
And,
$a^2 = (3q)^2$ or $(3q+1)^2$ or $(3q+2)^2$
$a^2 = (9q^2)$ or $9q^2+6q+1$ or $9q^2+12q+4$
$a^2 = 3(3q^2)^2$ or $(3q^2 + 2q)+1$ or $3(3q^2+4q+1)+1$
$a^2 = 3k_1$ or $3k_2+1$ or $3k_3+1$
Where k_1, k_2 and k_3 are some positive integers
Hence, it can be said that the square of any positive integer is either of the form 3m or 3m+1.

5. Use Euclid's division lemma to show that the cube of any positive integer is of the form 9*m*, 9*m* + 1 or 9*m* + 8.

Solution:

By taking,' a' as any positive integer and b = 3.
Applying Euclid's algorithm
a = 3q+r
Here, $r = remainder = 0,1,2 \ \ and\ q \geq 0$
So, total possible forms are

$\therefore a = 3q \ or\ 3q + 1\ or\ 3q + 2$

Therefore, every number can be represented as these three forms.

when a = 3q,

$a^3 = (3q)^3 = 27q^3 = 9(3q^3) = 9m$,

where m is an integer such that $m = 3q^3$

when a = 3q + 1,

$a^3 = (3q+1)^3$

$a^3 = 27q^3+27q^2+9q+1$

$a^3 = 9(3q^3+3q^2+q)+1$

$a^3 = 9m+1$

where m is an integer such that $m = (3q^3+3q^2+q)$

when a = 3q+2,

$a^3 = (3q+2)^3$

$a^3 = 27q^3+54q^2+36q+8$

$a^3 = 9(3q^3+6q^2+4q)+8$

$a^3 = 9m+8$

Hence,

The cube of any positive integer is of the form 9m , 9m+1, 9m+8

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