Exercise 1.1 (Real Numbers)

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

(i) 135 and 225

(ii) 196 and 38220

(iii) 867 and 255

Answer

(i) 225 > 135 we always divide greater number with smaller one.

Divide 225 by 135 we get 1 quotient and 90 as remainder so that

$225 = 135 \times 1 + 90$

Divide 135 by 90 we get 1 quotient and 45 as remainder so that

$135 = 90 \times 1 + 45$

Divide 90 by 45 we get 2 quotient and no remainder so we can write it as

$90 = 2 \times 45 + 0$

As the remainder now is 0, so divisor 45 is our HCF.

(ii) 38220 > 196 we always divide greater number with smaller one.

Divide 38220 by 196 then we get quotient 195 and no remainder so we can write it as

$38220 = 196 \times 195 + 0$

As there is no remainder so divisor 196 is our HCF.

(iii) 867 > 255 we always divide greater number with smaller one.

Divide 867 by 255 then we get quotient 3 and remainder is 102 so we can write it as

$867 = 255 \times 3 + 102$

Divide 255 by 102 then we get quotient 2 and remainder is 51 so we can write it as

$255 = 102 \times 2 + 51$

Divide 102 by 51 we get quotient 2 and no remainder so we can write it as

$102 = 51 \times 2 + 0$

As there is no remainder so divisor 51 is our HCF.

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

Answer

Let take a as any positive integer and b = 6.

Then using Euclid's algorithm we get a = 6q + r here r is remainder and value of q is more than or equal to 0 and r = 0, 1, 2, 3, 4, 5 because $0 \le r < b$ and the value of b is 6

So total possible forms will 6q + 0 , 6q + 1 , 6q + 2,6q + 3, 6q + 4, 6q + 5

6q + 0

6 is divisible by 2 so it is a even number

6q + 1

6 is divisible by 2 but 1 is not divisible by 2 so it is a odd number

6q + 2

6 is divisible by 2 and 2 is also divisible by 2 so it is a even number

6q +3

6 is divisible by 2 but 3 is not divisible by 2 so it is a odd number

6q + 4

6 is divisible by 2 and 4 is also divisible by 2 it is a even number

6q + 5

6 is divisible by 2 but 5 is not divisible by 2 so it is a odd number

So odd numbers will in form of 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?

Answer

HCF (616, 32) will give the maximum number of columns in which they can march.

We can use Euclid's algorithm to find the HCF.

$616 = 32 \times 19 + 8$

$32 = 8 \times 4 + 0$

The HCF (616, 32) is 8.

Therefore, 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 form 3m or 3m + 1 for some integer m.

[Hint: Let x be any positive integer then it is of the form 3q, 3q + 1 or 3q + 2. Now square each of these and show that they can be rewritten in the form 3m or 3m + 1.]

Answer

Let a be any positive integer and b = 3.

Then a = 3q + r for some integer $q \geq 0$

And r = 0, 1, 2 because $0 \leq r < 3$

Therefore, a = 3q or 3q + 1 or 3q + 2

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Or,

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

	a = 3q	a=3q+1	a=3q+2
a^2	9q^2	9q^2+ 6q+1	9q^2+12q+4
	3(3q^2)	3 (3q^2+2q) + 1	3(3q^2 + 4q+1) +1
	3X	3Y+1	3Z+1
	X = (3q^2)	Y = (3q^2+2q)	Z = (3q^2 + 4q+1)

Where X, Y and Z 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 9m, 9m + 1 or 9m + 8.

Answer

Let a be any positive integer and b = 3

a = 3q + r, where q ≥ 0 and 0 ≤ r < 3

∴ a = 3q or 3q + 1 or 3q + 2

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

Case 1: When a = 3q,

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

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

Case 2: When a = 3q + 1,

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

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

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

= 9m + 1

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

Case 3: When a = 3q + 2,

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

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

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

= 9m + 8

Where m is an integer such that m = $(3q^3 + 6q^2 + 4q)$

Therefore, the cube of any positive integer is of the form 9m, 9m + 1 or 9m + 8.

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