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H.CF

Euclid

Divided = divisor × Q + Remainder

Theorem 1.1 out

$$\boxed{a = bq + r}$$

$$0 \le r < b$$

H.CF

find HCF 455 & 42

$455 = 42 \times 1 + 35$

$42 = 35 \times 1 + 7$

$35 = \underbrace{7}\times 1 + 0$

42) 455 (1
42
35) 42 (1
35
7) 35 (5
35
×

HCF = 7

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HCF = 7

Q. 420, 30

30) 420 (14
30
120
120
×

$420 = 30 \times 14 + 0$

HCF = 30

360, 28

28) 360 (12
28
80
56
24) 28 (1
24
4) 24 (6
24
0

$360 = 28 \times 12 + 24$

$28 = 24 \times 1 + 4$

$24 = 4 \times 6 + 0$

$$\boxed{HCF = 4}$$

TJ 2nd class

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find HCF & Express

$255 = 135 \times 1 + 120$

$135 = 120 \times 1 + 15$

$120 = 15 \times 8 + 0$

$\boxed{HCF = 15}$

$$\begin{array}{r} 135 \overline{)255}(1 \\ 135 \\ \hline 120 \overline{)135}(1 \\ 120 \\ \hline 15 \overline{)120}(8 \\ 120 \\ \hline 0 \end{array}$$

Extra. Express in the linear form

$15 = 135 - 120 \times 1$

$15 = 135 - (255 - 135)$

$15 = 135 - 255 + 135$

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$15 = 2 \times 135 - 255$

$15 = 135x + 255y$

$\boxed{x = 2, y = -1}$

Q $455 = 42 \times 1 + 35$

$42 = 35 \times 1 + 7$

$35 = 7 \times 5 + 0$

$HCF = 7$

$7 = 42 - 35 \times 1$

$7 = 42 - (455 - 42 \times 1$

$7 = 42 - 455 + 42$

$7 = 2 \times 42 - 455$

$7 = 42x + 455y$

$x = 2, y = -1$

Home Work
1.1 Q 1

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Example 2

Let a be any positive integer and b = 2 ~~and~~.

$\therefore a = bq + r$

$\boxed{a = 2q + r}$ $\quad 0 \le r < 2$

put $r = 0$

$a = 2q + 0$

$a = 2q$

It is divisible by 2.

$\therefore$ It is even

put $r = 1$

$\boxed{a = 2q + 1}$

It is odd

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Ex 3

$4q+1,\ 4q+3$

Let a be any +ve integer and $b = 4$

$a = 4q + r$ where $0 \le r < 4$

put $r = 0$,

$a = 4q + 0,\ = 4q$ / put $r = 1$ $a = 4q+1$, put $r = 2$ $a = 4q+2$

put $r = 3$

$a = 4q + 3$

Clearly $4q$ & $4q+2$ are divisible by 2

$\therefore 4q+1,\ 4q+3$ are odd integers let a be any (+ve) integer & b = 3

$\therefore a = 3q + r$ where $0 \le r < 3$

Put $r = 0$,

$a = 3q + 0$

$a = 3q$

Sq both side

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

$a^2 = 9q^2$

$a^2 = 3 \times 3q^2$

$a^2 = 3m$

where $m = 3q^2$

Put $r = 1$

$a = 3q + 1$

Sq both.

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

$a^2 = (3q)^2 + (1)^2 + 2 \times 3q \times 1$

$a^2 = 9q^2 + 1 + 6q$

$a^2 = 9q^2 + 6q + 1$

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

$= 3m + 1$

where

$m = 3q^2 + 2q$

Put $r = 2$

$a = 3q + 2$

Sq. both side

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

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

$= 9q^2 + 4 + 12q$

$= 9q^2 + 12q + 4$

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

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

$= 3m + 1$ where $m = 3q^2 + 4q + 1$

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Let a be any (+ve) integer & $b = 3$

$a = 3q + r$, where $0 \le r < 3$

put $r = 0$

$a = 3q$

Taking cube both side

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

$a^3 = 27q^3$

$a^3 = 9 \times 3q^3$

$\boxed{a^3 = 9m}$

where $m = 3q^3$

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put $r = 1$

$a = 3q + 1$

Taking cube both side

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

$= (3q)^3 + (1)^3 + 3(3q)^2 \times 1 + 3(3q)(1)^2$

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

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

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

$= 9m + 1$, where $m = 3q^3 + 3q^2 + q$

put $r = 2$

$a = 3q + 2$

Tak

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

$= (3q)^3 + (2)^3 + 3(3q)^2 \times 2 + 3(3q)(2)^2$

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

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

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

$= 9m + 8$

where $m = 3q^3 + 6q^2 + 4q$

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Q Let a be any (+ve) integer in which

$b = 5$

$a = 5q + r$ where $0 \leq r < 5$

put $r = 0$

$a = 5q$,

put $r = 1$

$a = 5q + 1$,

put $r = 2$

$a = 5q + 2$

put $r = 3$

$\boxed{a = 5q + 3}$

put $r = 4$

$a = 5q + 4$

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clearly $5q + 2$, $5q + 4$ is divisible by 2

$\therefore$ $5q$, $5q + 1$, $5q + 3$ are odd integers