7-may-8

HCF and LCM

What is factors?

HCF → Highest common factor ...

LCM → Lowest common multiple ...

⊙ $a \times b = P$

⊙ a, b are factor of P

factor
12 = { 1, 2, 3, 4, 6, 12 }

$n \le 12$
└ Inke sabh 12 aata hai

inke sabh be 10 ata hai
$n \le 10$

factor 10 = { 1, 2, 5, 10 }

$1\overline{)10}(10$ — 10, 0 $2\overline{)10}(5$ — 10, 0 $5\overline{)10}(2$ — 10, 0

30 = { 1, 2, 3, 5, 6, 10, 15, 30 }

1×30
2×15
3×10
5×6
Trick

$a \times b = P$ → means a and b are factor of P

☆ 1 → Smallest factor → Sabka factor

☆ Every num have minimum two factor one and the number itself...

15 = { 1, 5, 3, 15 }

1 x 15
3 x 5

TCS Questions

Q. Every number will have minimum two factor 1 and number of self

- TRUE
- FALSE

1 = {1} → {1} (don't have two factor)

HCF / GCD

Greatest, Divisor, Common

HCF = { 60, 75 }

60 = { 1, 2, 3, 5, 6, 10, 12, 20, 30, 60 }

1 x 60
2 x 30
3 x 20
5 x 12
6 x 10

75 = { 1, 3, 5, 15, 25, 75 }

1 x 75
3 x 25
5 x 15

common factors = { 1, 3, 5, 15 }

Highest common factor = { 15 }

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Lowest common factor = {1}
LCF

HCF =

Multiple of 5 = {5, 10, 15, 20, 25, 30 ---}

multiple of 8 = {8, 16, 24, 32 ---}

multiple of 9 = {9, 18, 27, 36 ---}

$\frac{12}{24}$ = 3 times

multiple divided by num

Example → multiple = 24

24
8 (Divided by number)

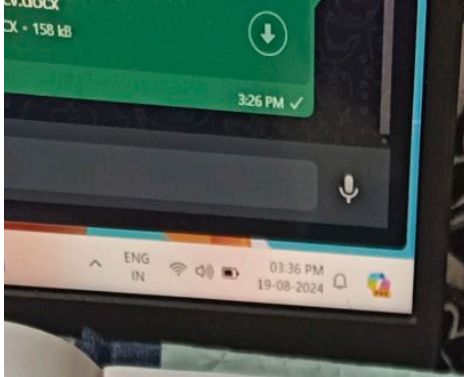
LCM (5, 8, 9)

Least common multiple

5 = {5, 10, 15, 20, 25, 30, 40, 45, 50, 55 ---}
8 = {8, 16, 24, 32, 40, 48, 56, 64, 72, 80 ---}
10 = {10, 20, 30, 40, 50, 60, 70, 80, 90, 100}

LCM = {40}

HCM (Highest common multiple) — Infinite
To find... not possible



$HCF \leq (m, n) \leq LCM$

(5, 8, 10)

$HCF \leq 5$

$LCM \geq 10$

Q HCF (12, 18)

$12 = \{1, 2, 3, 6, 12\}$

$18 = \{1, 2, 3, 6, 9, 18\}$

1 2
2 6
3 4
4 3

$CF = \{1, 2, 3, 6\}$

$HCF = 6$

Q HCF (1822, 1526) ?

Q LCM (5, 15, 20, 30)

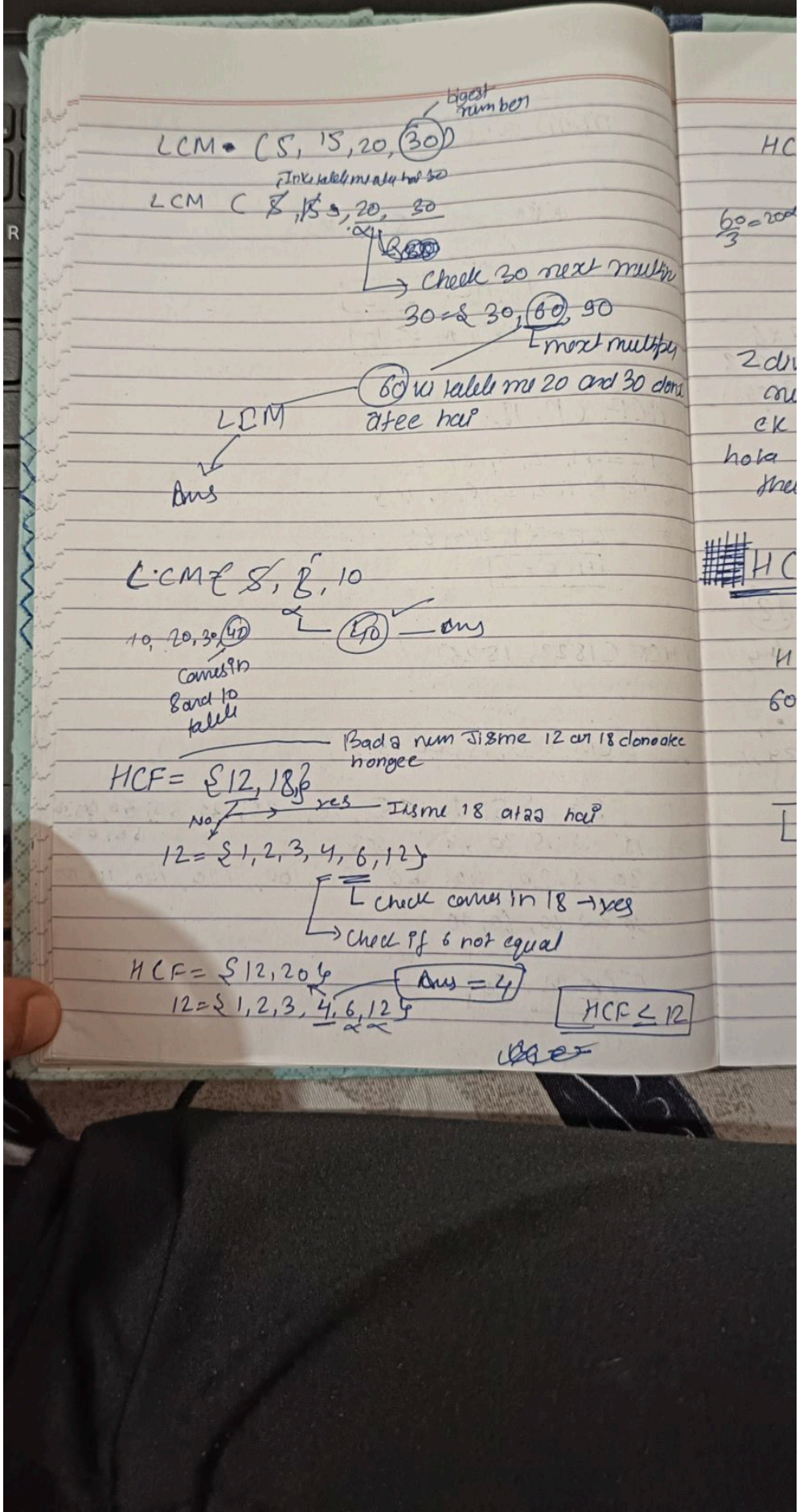
$5 = \{5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60\}$

$15 = \{15, 30, 45, 60\}$

$20 = \{20, 40, 60, 80, 100, 120, 140, 160, 180\}$

$30 = \{30, 60, 90,$

$LCM = 60$



HCF = {60, 75}

$\frac{60}{2} = 30$ — don't comes in 75

$\frac{60}{3} = 20$

$\frac{30}{2} = 15$ → comes in 75

Ans

2 divide is liye bcoz left ka next num dek rahe mtlb us number n ek phele ah HCF me wo chota hota hai but LCM me bada hota hai that's why udar 2* kerte hai...

HCF by Prime factorization

HCF (60, 75)

$60 = 2 \times 30$	$70 = 3 \times 5 \times 5$
$2 \times 3 \times 10$	$70 = 3 \times 5^2$
$2 \times 3 \times 2 \times 5$	
$2 \times 2 \times 3 \times 5$	
$60 = 2^2 \times 3 \times 5$	

Intersection = {3, 5}

min power of 3 = 1 $= 3^1 \times 5^1$

min power of 5 = 1 $= 15$

Ans

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3 HCF (36, 24, 12)

$36 = 2 \times 18$
$2 \times 3 \times 6$
$2 \times 3 \times 2 \times 3$
$= 2^2 \times 3^2$

$24 = 2 \times 12$
$2 \times 6 \times 2$
$2 \times 2 \times 2 \times 3$
$= 2^3 \times 3$

$12 = 2 \times 6$
$= 2 \times 2 \times 3$
$= 2^2 \times 3$

Common $= 2 \times 3$
$= 2^2 \times 3^1$
$= 4 \times 3 = 12$
Ans

My rack (36, 24, 12)

$12 = \{1, 2, 3, 4, 6, 12\}$ common in 24, 12

$\Rightarrow 12$ Ans

Example HCF 36, 27, 80

$36 \rightarrow 6 \times 6$
$= 2 \times 3 \times 2 \times 3$
$= 2^2 \times 3^2$

$27 \rightarrow 3 \times 9$
$= 3 \times 3 \times 3$
$= 3^3$

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$80 \Rightarrow 2^4 \times 5$

27, 36, 80

27 —

$\frac{27}{2}, \frac{27}{3} = 9$ ✗

$27/9 = 3$ $\frac{3}{3} = 1$ ✓

HCF = 1 — If no common then HCF = 1

Method can only be used for smaller numbers and numbers whose prime factor can be found easily

Q → find the HCF of

$2^3 * 3^2 * 5 * 7^4 * 13^4$

$2^2 * 3^5 \times 5^2 \times 7^8$

$2^3 * 5^3 * 7^2 * 13^3$

$= 2^2 \times 5 \times 7^2$

$= 4 \times 5 \times 49$

$= 20 \times 49$

$= 980$

$49 \times 2 = 98$

HCF → minimum

LCM → union

Q LCM(12, 18)

$12 = 2^2 \times 3$

$18 = 2 \times 3^2$

$= 2 \times 3$ → Take big power

$= 2^2 \times 3^2 = 36$

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LCM using prime factorisation method

- The LCM of $2^6 * 3^2 * 5 * 7$, $2^3 * 3^5 * 7$ and $2 * 3^4 * 5^8$

(a) $2^6 * 35$ (b) $2^6 * 3^5 * 5 * 7$

(c) $2^6 * 3^5 * 7$ (d) None of them ✓

Ans $= 2 \times 3 \times 5 \times 7$

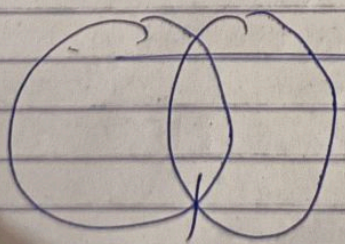
$= 2^6 \times 3^5 \times 5^1 \times 7^1$

$24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$

$60 = 2 \times 3 \times 5 = 2^2 \times 3 \times 5$

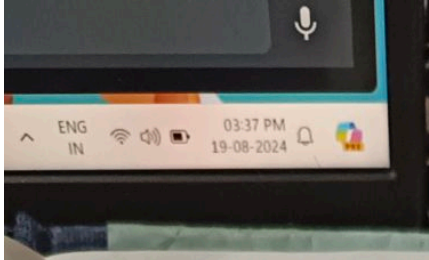
$HCF = 2^2 \times 3^1 = 12$

$LCM = 2^3 \times 3 \times 5 = 120$



→ LCM = union of max powers

HCF → Region of intersection



- Tees time:-
- Shaam:-
- ~~Example + input + output~~
- CLI VS Code:-

Let a = 24
b = 60.

Product of number = HCF * LCM
= 12 x 120
= 1440

24 x 60 = 1440

TCS 2020

If HCF of 189 and 297 is 27, find their LCM

189 x 297 = HCF x LCM
189 x 297 = 27 x LCM

$$LCM = \frac{189 \times 297}{27}$$

LCM = 2079

63
33
189
189 x
2079

9 | 189
7 | 21
3 | 7
7 | 7
1

= 7 x 9 x 3 x 11
= 7 x 3^3 x 11
= 3^3 x 11 x 7
LCM = 3^3 x 7 x 11

Infosys 2019, 2021

Q) find the smallest number that leaves a reminder of 4 on division by 5, 5 on division by 6, 6 on division by 7, 7 on division by 8 and 8 on division by 9

(a) 2519 (B) 5039 (C) 1079 (D) 979

Reminder 4 — on division by 5

R=5 — 6

R=6 — ÷7

R=7 — ÷8

R=8 — ÷9

Smallest num log HCF m GP

$a \div 5 = 4$

$a \div 6 = 5$

$a = 4/5$ $a \div 7 = 6$

$a \% 8 = 7$

$a \% 9 = 8$

$A = \frac{2519}{5}$

Understanding

Let 'n' = number

$n \% 5 = 4$
$n \% 6 = 5$
$n \% 7 = 6$
$n \% 8 = 9$
$n \% 9 = 8$

$\boxed{n \% n-1 = n}$

2519 % 5 =
1039
5039
5
1079
5
929
5
1

find the smallest num which divided by 5, 6, 7, 8, 9

option > given num = LC

LCM (5, 6, 7, 8, 9)

HCF (5, 6, 7, 8, 9)

$\boxed{\begin{array}{l} HCF \leq 5 \\ LCM \geq 9 \end{array}}$

→ 2520

9 = {9, 18, 27, 36, 45, 54, 63, 72, 81, 90
---------- 2520 ---}

$\{5, 2\times3, 7, 2^3, 3\}$

↳ 2519 ✓ Ans

Q. How many pair of positive integer x, y exist such that HCF of $x, y = 35$

Sum of x and $y = 1085$

(A) 12 (B) 18 (C) 15 (D) Cannot be determined

$HCF(x, y) = 35$

$x + y = 1085$

Aise kitne pair banenge jinka HCF 35 aur sum 1085 hota hai

$x \times y = HCF \times LCM$

$x + y = 1085$

$x = 1085 - y$

$1085y - y^2 = 35 \times LCM$

12 - 1, 2, 3, 4, 6, 12

4 ki table me 12 आता है

$4 \times b = 12$

$\boxed{4b = 12}$

35 → factor b to usme x and y ka hi hoga

similarly $x = 35a$
$y = 35b$

35 is a factor of x and y

HCF (a, b) = 1

highest common factor is 35 so a and b have nothing common in between

Let a = b = 2 $x = 70$, $y = 70$ → that's

$x = 35a$
$y = 35b$

$x + y = 1085$
$35(a+b) = 1085$
$\boxed{a+b = 31}$