Factors and Multiples

© EKAdemy

Factors and Multiples

Find all the factors of 12

12 : 1, 2, 3, 4, 6, 12 [finite factors]

Find all the multiples of 6.

[Infinite]

6 = 6, 12, 18, ...

© EKAdemy

Prime and Composite nos.

Prime nos. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43

1 composite.

1 composite no.

1 composite

Twin prime nos : Two prime numbers when separated by only one composite no. between them.

eg: 3, 5 | 29, 31

5, 7 | 41, 43

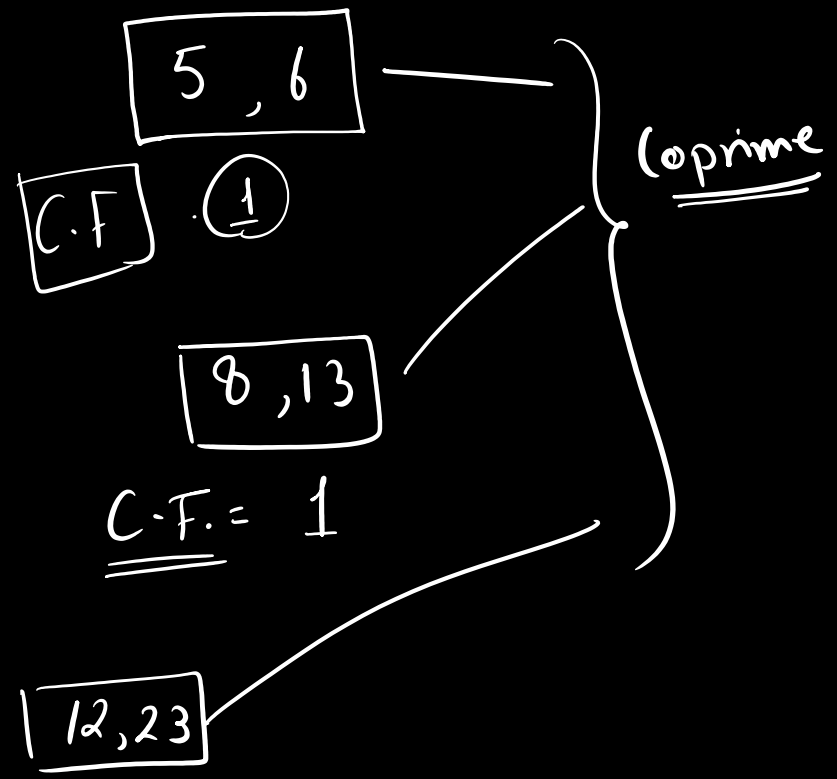
11, 13

17, 19

© EKAdemy

Co-primes : Two numbers are said to be co-prime if they do not have a common factor other than 1.

eg : 2, 3 | 3, 4



Not a coprime

2 , 4

CF : 1, 2

CF = 1

© EKAdemy

Q. Which of the following nos. are prime numbers:

(i) 179 (ii) 117 (iii) 139

Rule: Divide the no. with 2, 3, 5, 7, 11 and 13 if it is divisible by any of these nos. then the given no. is not prime else it is prime.

(i) 179

→ It is a prime

(ii) 117

Divisible by 3 hence not a prime

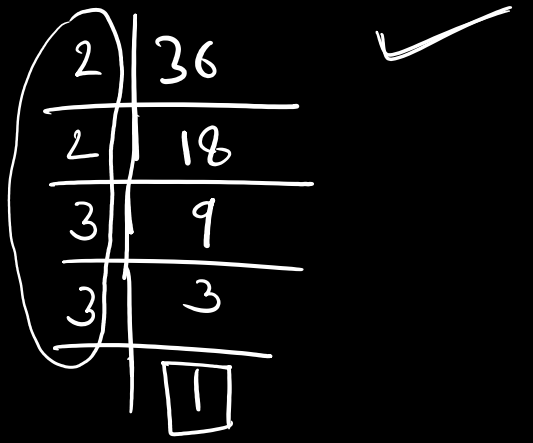
(iii) 139 ⇒ It is a prime.

© EKAdemy

Prime Factorisation

36 ⇒ 1, 2, 3, 4, 6, ... , 36 ⇒ All factors of 36

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



© EKAdemy

Q. Factorise 234 into prime factors.

$234 = 2 \times 3 \times 3 \times 13$

2	234
3	117
3	39
13	13
	1

375

~~125~~

3

39

~~117~~

3

$3 \overline{)117}$

125

375

3

© EKAdemy

1

$$\frac{2057}{11} = 187$$

$$\frac{945}{3} = 315$$

$$3 \overline{)945}$$

© EKAdemy

Determine prime factorisation of :

(i) 216

(ii) 13915

(iii) $7325 = 5 \times 5 \times 293$

5	7325
5	1465
293	293
	1

© EKAdemy

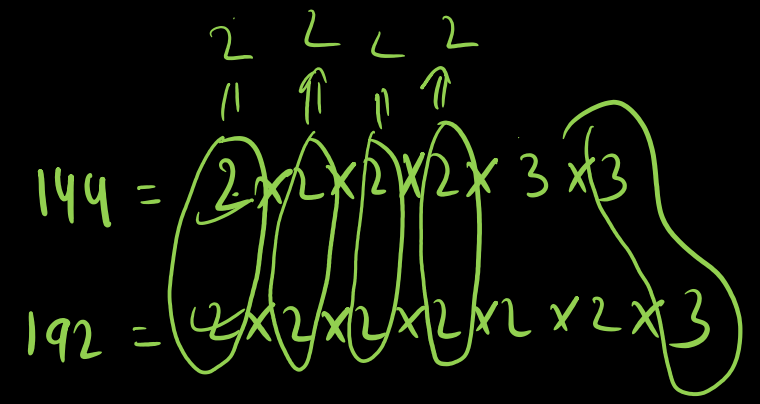
H.C.F.

- Prime factorization method
- Continued division method.

① Find HCF of 144 and 192

2	144
2	72
2	36
2	18
3	9
3	3
	1

2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1



$$HCF(144, 192) = 2 \times 2 \times 2 \times 2 \times 3$$
$$= 48$$

© EKAdemy

HCF (1260, 2376) = 36

⇒ Find the HCF of 144, 180 and 192.

HCF = 2 x 2 x 3 = 12

2	144, 180, 192
2	72, 90, 96
3	36, 45, 48
	12, 15, 16

© EKAdemy

2	1260, 2376
2	630, 1188
3	315, 594
3	105, 198
	35, 66

HCF = 2 × 2 × 3 × 3

= 36

© EKAdemy

Find HCF of 624 and 936.

HCF = 2 x 2 x 2 x 3 x 13

= 24 x 13

= 312

2	624, 936
2	312, 468
2	156, 234
3	78, 117
13	26, 39
	2, 3

$3 \times 1 \times 1^2$

26

84

© EKAdemy

Q. HCF (624, 936, 264) = 24

© EKAdemy

Applications of HCF

Problems:

1: Find the **largest number** which divides 245 and 1029 leaving remainder 5 in each case.

x is HCF of 240 and 1024

x | 245
5

x | 1029
5

x | (245 − 5)
0

x | (1029 − 5)
0

3 | 9

© EKAdemy

largest no.

245

1029

that HCF of

x

HCF (240, 1024)

2	240, 1024
2	120, 512
2	60, 256
2	30, 128
	15, 64

x | 245

5

4

5 | 24 (

-20

4

5 | 20 (

HCF (240, 1024) = 2 × 2 × 2 × 2 = 16

© EKAdemy

$$
\begin{array}{r|l}
16 & 245 \\
\cline{2-2}
 & 15 \\
 & -16 \\
\cline{2-2}
 & 85 \\
 & -80 \\
\cline{2-2}
 & \boxed{5}
\end{array}
$$

$$
\begin{array}{r|l}
16 & 1029 \\
\cline{2-2}
 & 64 \\
 & -96 \\
\cline{2-2}
 & 69 \\
 & -64 \\
\cline{2-2}
 & \boxed{5}
\end{array}
$$

© EKAdemy

2. Find the largest number divides 2053 and 967 and leaves a remainder of 5 and 7 respectively.

$$64 \overline{)2048+5}$$

$$\frac{}{0_5}$$

$$64 \overline{)960+7}$$

$$\frac{}{0_7}$$

$$64 \overline{)2053}$$

$$\frac{}{5}$$

$$64 \overline{)967}$$

$$\frac{}{7}$$

© EKAdemy

3. Find the largest number that will divide 398, 436 and 542 leaving remainder 7, 11 and 15 respectively.

HCF of $(398-7)$, $(436-11)$ and $(542-15)$

HCF of $(391, 425, 527)$

$= 17$

Required no. = 17

© EKAdemy

4. Two tankers contain 850 litres and 680 litres of milk respectively. Find the maximum capacity of the container which can measure the milk of either tanker in exact number of times.

© EKAdemy

LCM

Lowest common multiple

© EKAdemy

$$12 + 16(5)$$
$$= 12 + 80$$
$$= 92$$

$$12 + 2^4(2+3)$$
$$= 12 + 2^4(5)$$
$$= 12 + 16(5)$$
$$= 12 + 80$$
$$= 92$$

$$\Rightarrow 12 + 16(2+3)$$
$$= 12 + 16(5)$$
$$= 12 + 80$$
$$= 92$$

© EKAdemy

LCM

1. Find the LCM of 624 and 936.

2	624 , 936
2	312 , 468
2	156 , 234
3	78 , 117
13	26 , 39
	2 , 3

$LCM = 2 \times 2 \times 2 \times 3 \times 13 \times 2 \times 3$

$= 2^4 \times 3^2 \times 13$

$= 16 \times 9 \times 13$

$= 1872$ ✓

2) 312 (

312 ÷ 2

234

468 ÷ 2

156

312 ÷ 2

© EKAdemy

LCM of 75, 250, 225 and 525

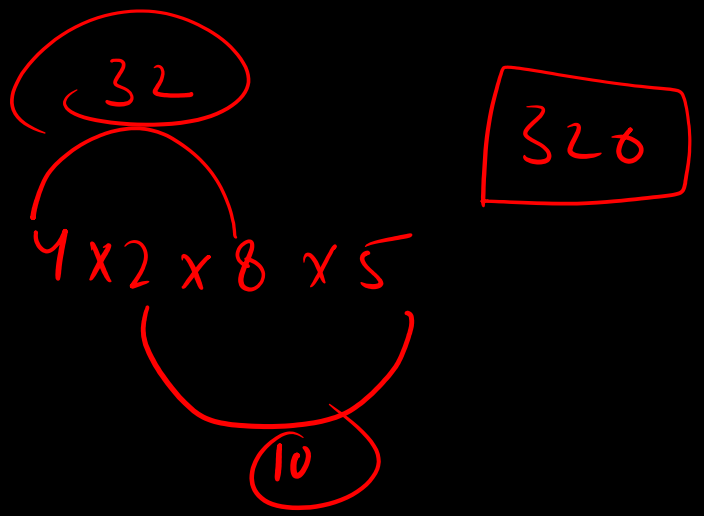
| 43, 19, 11

Find LCM of 15, 30, 90

3	15, 30, 90
5	5, 10, 30
2	1, 2, 6
	1, 1, 3

LCM = $3 \times 5 \times 2 \times 1 \times 1 \times 3$

$= 90$



© EKAdemy

LCM (108, 135, 162)

3	108, 135, 162
3	36, 45, 54
3	12, 15, 18
2	4, 5, 6
	2, 5, 3

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

$2 \times 5 = 10$

$= 81 \times 2 \times 10 = 162 \times 10 = \underline{1620}$

© EKAdemy

Q. Determine the lowest natural number which when divided by 16, 28, 40, 77 leaves remainder 8 in each case.

N / 16 → R = 8

N / 28 → R = 8

N / 40 → R = 8

N / 77 → R = 8

77 × 8

LCM (16, 28, 40, 77)

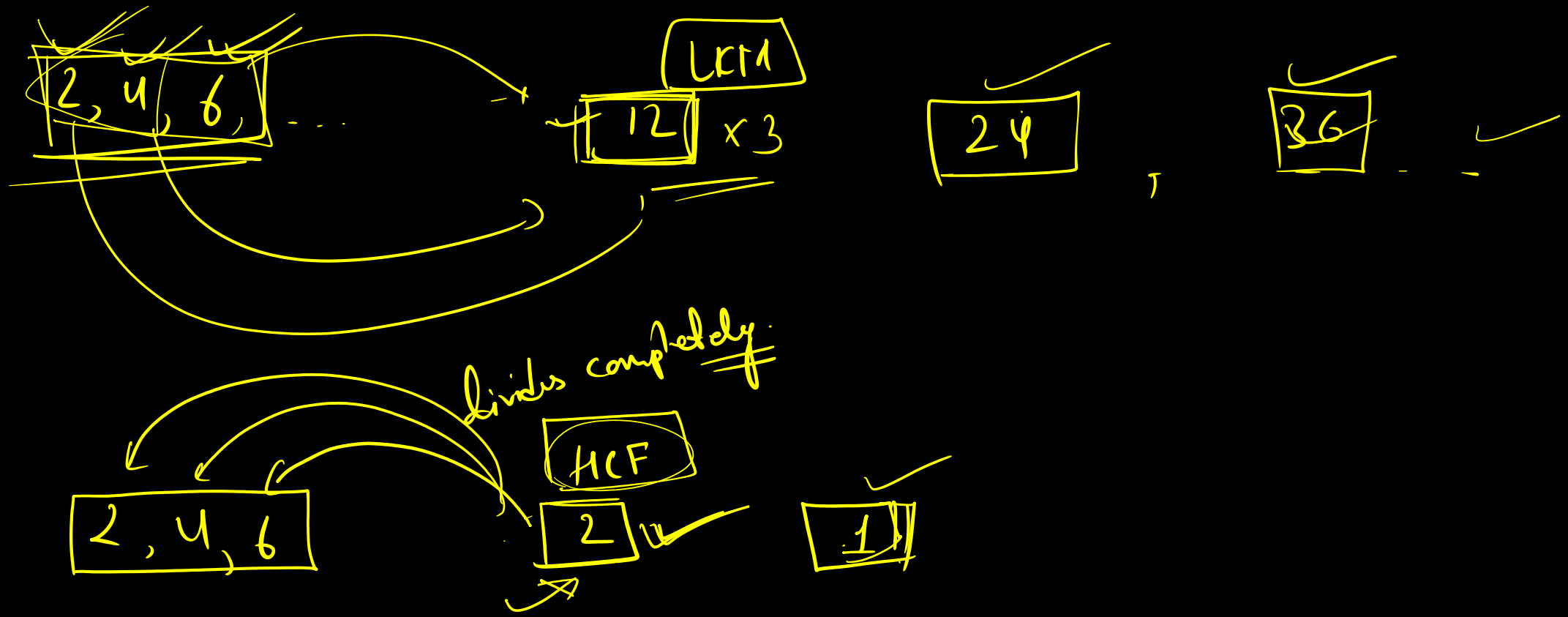
2	16, 28, 40, 77
2	8, 14, 20, 77
2	4, 7, 10, 77
7	2, 7, 5, 77
	2, 1, 5, 11

LCM: 2 × 2 × 2 × 2 × 7 × 5 × 11

= 8 × 77 × 10

LCM = 6160

© EKAdemy



© EKAdemy

2. The students in a class can be divided into the groups of 2, 3, 5 and 6. What is the least no. of children this class can have?

LCM (2, 3, 5, 6) = 30

15 15 => 30

10 10 10 => 30

6 6 6 6 6 => 30

5 5 5 5 5 5 => 30

© EKAdemy

$(-2)^2 = (-2) \times (-2) = 4$

$(2)^2 = 2 \times 2 = 4$

$\sqrt{4} =$

$\sqrt{4} = \boxed{2}$ and $\boxed{-2}$

$= \pm 2$

© EKAdemy

3. Determine the two numbers nearest to 10000 which are exactly divisible by each of 2, 3, 4, 5, 6 and 7.

LCM (2, 3, 4, 5, 6, 7) = 420

$$23$$
$$420 \overline{)10000}$$
$$-840$$
$$1600$$
$$-1260$$
$$340$$

First nearest no. = 10000 − 340
= 9660

Second nearest no. = 9660 + 420
= 10080

Method II: ⇒ 10000 + (420 − 340)
= 10080

© EKAdemy

Properties of HCF and LCM

- HCF of given nos. is not greater than any of the numbers.
- LCM of given nos. is not less than any of the numbers.
- HCF of two / co-prime (or more) numbers is always 1.
  - for example 5 and 7 $\Rightarrow$ HCF (5, 7) = 1
- LCM of two or more coprime numbers is equals to their product.

  eg: 5 and 7 $\Rightarrow$ LCM = 5 × 7 = 35
- HCF of given numbers is always a factor of their LCM.

  eg: 14, 21 $\Rightarrow$ HCF(14, 21) = 7, LCM (14, 21) = 42

  7 is a factor of 42

© EKAdemy

- The product of the HCF and the LCM of two number is equal to the product of the given numbers.

Say a and b are two numbers

$$\boxed{LCM(a,b) \times HCF(a,b) = a \times b}$$

eg: 14 and 21

$LCM(14, 21) = 42$

$HCF(14,21) = 7$

$LCM(14,21) \times HCF(14,21) = 42 \times 7 = 294$

$14 \times 21 = 294$

© EKAdemy

$$LCM \times HCF = a \times b$$

$$LCM = \frac{a \times b}{HCF}$$

$$HCF = \frac{a \times b}{LCM}$$

© EKAdemy

Q. Find HCF and LCM of 1152 and 1664

$HCF = 2^7 = 128$

$LCM = \frac{128 \times 9 \times 13}{} =$ **Method I**

$= 14976$

64	8	2 | 1152, 1664
		2 | 576, 832
		2 | 288, 416
	8	2 | 144, 208
		2 | 72, 104
		2 | 36, 52
		2 | 18, 26
		9, 13

Method II :

$HCF \times LCM = 1152 \times 1664$

$$LCM = \frac{1152 \times 1664}{HCF} = \frac{1152 \times 1664}{128} = 14976$$

© EKAdemy

2. Given that the HCF of two numbers is 16 and their product is 6400, determine their LCM.

Sol. HCF × LCM = product of the number.

$$LCM = \frac{\text{product of the number}}{HCF}$$

$$LCM = \frac{6400}{16} = 400$$

$$\boxed{LCM = 400}$$

Given:
Product of the number = 6400
HCF = 16

© EKAdemy

3. The HCF and LCM of two numbers are 13 and 1989 respectively. If one of the numbers is 117, determine the other number.

Sol:

→ LCM × HCF = number 1 × number 2

number 1 × number 2 = LCM × HCF

$$\text{number 2} = \frac{\text{LCM} \times \text{HCF}}{\text{number 1}} = \frac{13 \times 1989}{117}$$

(13 cancels to 1, 1989 cancels to 221, 117 cancels to 9)

$$\frac{1989}{9}$$

number 2 = 221

© EKAdemy

4. Can two number have 14 as their HCF and 204 as their LCM. Give reason in support of your answer.

Sol. Check 14 is factor of 204 or not.
(HCF) (LCM)

If 14 is factor 204 then two numbers can have 14 as HCF and 204 as LCM else not.

∵ 14 is not a factor of 204,

∴ we can't have two numbers that have 14 as HCF and 204 as LCM.

© EKAdemy

End of the chapter

© EKAdemy