FUNDAMENTAL THEOREM OF ARITHMETIC

Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

PRIME AND COMPOSITE NUMBERS

Prime and Composite Numbers Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

4 = 2 x 2
6 = 2x3
8 = 2x2x2
9 = 3x3
10=2x5
12=2x2x3
14=2x7
15=3x5
16=2x2x2x2
18=2x3x3
20=2x2x5

21=3 x7
22 =2x11
24=2x2x2x3
25= 5 x5
26 =2x13
27= 3x3x3
28 =2x2x7
30= 2x3x5
32 =2x2x2x2x2
34=2x17
35=5x7

32760 =2x2x2x3x3x5x7x13 = 2^3 x3^2 x 5 x 7 x 13

HOW TO FIND HCF & LCM, PRIME FACTORISATION METHOD

HCF = PRODUCT OF THE SMALLEST POWER OF EACH COMMON PRIME FACTORS.

LCM = PRODUCT OF THE GREATEST POWER INVOLVED IN THE NUMBERS

$6 = 2^1 \times 3^1$ HCF(6,20) = 2^1

$20 = 2^2 \times 5^1$ LCM(6,20) = $2^2 \times 3^1 \times 5^1$

Eg : Find the HCF of 96 and 404 by prime factorisation method. Hence, find their LCM.

96 = 2x2x2x2x2x3 = 2^5 x3

404 = 2 x 2 x 101 = 2^2 x 101

HCF(96,404) = 2^2 =4 (SMALLEST POWER)

LCM(96,404) =2^5 x 3 X 101(GREATEST POWER) = 9696

PRODUCT OF NUMBERS = HCF X LCM

LCM = PRODUCT/HCF= 96 x 404/4=9696

Eg. Find the HCF & LCM of 6,72 &120, using prime factorisation method.

$6 = 2 \times 3$

$72 = 2^3 \times 3^2$

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

$HCF(6,72,120) = 2^1 \times 3^1$ (SMALLEST POWERS) $= 6$

$LCM(6,72,120) = 2^3 \times 3^2 \times 5^1$ (GREATEST POWERS) $= 360$

EXERCISE 1.2

Q1. Express each number as a product of its prime factors.

(i) 140 = 2x2x5x7x1= 2^2 x 5 x 7

(ii) 156 =2 x2x3x13x1 = 2^2 x 3 x13

(iii) 3825 = 3 x3x5x5x17x1 = 3^2 x5^2 x 17

(iv) 5005 = 5 x7 x 11x 13

(v) 7429 = 17x19x23

Q2. FIND THE HCF & LCM OF THE FOLLOWING PAIRS OF INTEGERS AND VERIFY THAT LCM X HCF = PRODUCT OF THE TWO NMBERS

(i) 26 and 91

26 = 2 x13 & 91 = 7 x 13

LCM(26,91) = 2 x 7x 13=182

HCF (26,91) = 13

(ii) 510 & 92

510 = 2 x3x5x17; 92 = 2 x2x 23

LCM(510,92) = 2x2x3x5x17x23 = 23460

HCF(510,92) =2

(iii) 336 and 54

336 =2x2x2x2x3x7 and 54 = 2x3x3x3

LCM(336,54) $=2^4 x 3^3 x7$ =3024

HCF(336,54) = 2x3 =6

3. Find the LCM and HCF of the following integers by applying the prime factorisation method

(i) 12, 15 and 21

12 = 2x2x3 , 15 =3 x5 and 21 = 3 x7

LCM(12,15,21) =2x2x3x5x7 =420

HCF(12,15,21) =3

(ii) 17,23 and 29

17 = 17x1, 23 = 23x1 and 29 = 29 x1

LCM(17,23,29) = 17x23x29 =11339

HCF(17,23,29) =1

Q4. Given that HCF(306, 657)=9, find LCM(306,657)

HCF x LCM = PRODUCT OF GIVEN NUMBERS

LCM = 306 x 657/9 = 22338

Q5. Check whether 6^n can end with the digit 0 for any natural number n.

If it ends with 0, then it should be divisible by 5.

$6^n = (2x3)^n$, it does not contain 5, hence 6^n cannot end with zero.

Q6.Explain why 7 x11x13 +13 and 7x6x5x4x3x2x1+5 are composite numbers.

By the defn of composite number, it has factors other than 1 and itself.

7 x11x13 +13 = 13(7x11 +1) = 13 x(77+1) =13 x 78 = 13x3x2x13

7x6x5x4x3x2x1+5 =5(7x6x4x3x2x1+1) = 5x1009

Hence 7 x11x13 +13 and 7x6x5x4x3x2x1+5 are composite numbers.

Q7.there is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field. While Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point?

18= 2x3x3 and 12 = 2 x 2x3

LCM(18,12) =2x2x3x3 = 36

Sonia and Ravi will again meet at the starting point after 36 minutes