2 H.C.F. and L.C.M. of Numbers

IMPORTANT FACTS AND FORMULAE

I. Factors and Multiples: If a number a divides another number b exactly, we say that a is a ***factor*** of b. In this case, b is called a ***multiple*** of a.

II. Highest Common Factor (H.C.F.) or Greatest Common Measure (G.C.M.) or Greatest Common Divisor (G.C.D.): The H.C.F. of two or more than two numbers is the greatest number that divides each of them exactly.

There are two methods of finding the H.C.F. of a given set of numbers:

1. ***Factorization Method:*** Express each one of the given numbers as the product of prime factors. The product of least powers of common prime factors gives H.C.F.
2. ***Division Method:*** Suppose we have to find the H.C.F. of two given numbers. Divide the larger number by the smaller one. Now, divide the divisor by the remainder. Repeat the process of dividing the preceding number by the remainder last obtained till zero is obtained as remainder. The last divisor is the required H.C.F.

   Finding the H.C.F. of more than two numbers: Suppose we have to find the H.C.F. of three numbers. Then, H.C.F. of [(H.C.F. of any two) and (the third number)] gives the H.C.F. of three given numbers. Similarly, the H.C.F. of more than three numbers may be obtained.

III. Least Common Multiple (L.C.M.): The least number which is exactly divisible by each one of the given numbers is called their L.C.M.

1. ***Factorization Method of Finding L.C.M.:*** Resolve each one of the given numbers into a product of prime factors. Then, L.C.M. is the product of highest powers of all the factors.
2. ***Common Division Method (Short-cut Method) of Finding L.C.M.:*** Arrange the given numbers in a row in any order. Divide by a number which divides exactly at least two of the given numbers and carry forward the numbers which are not divisible. Repeat the above process till no two of the numbers are divisible by the same number except 1. The product of the divisors and the undivided numbers is the required L.C.M. of the given numbers.

IV. Product of two numbers = Product of their H.C.F. and L.C.M.

V. Co-primes: Two numbers are said to be co-primes if their H.C.F. is 1.

VI. H.C.F. and L.C.M. of Fractions:

1. $\text{H.C.F.} = \dfrac{\text{H.C.F. of Numerators}}{\text{L.C.M. of Denominators}}$ 2. $\text{L.C.M.} = \dfrac{\text{L.C.M. of Numerators}}{\text{H.C.F. of Denominators}}$

VII. H.C.F. and L.C.M. of Decimal Fractions: In given numbers, make the same number of decimal places by annexing zeros in some numbers, if necessary. Considering these numbers without decimal point, find H.C.F. or L.C.M. as the case may be. Now, in the result, mark off as many decimal places as are there in each of the given numbers.

VIII. Comparison of Fractions: Find the L.C.M. of the denominators of the given fractions. Convert each of the fractions into an equivalent fraction with L.C.M. as the denominator, by multiplying both the numerator and denominator by the same number. The resultant fraction with the greatest numerator is the greatest.

SOLVED EXAMPLES

Ex. 1. ***Find the H.C.F. of*** $2^3 \times 3^2 \times 5 \times 7^4$, $2^2 \times 3^5 \times 5^2 \times 7^3$, $2^3 \times 5^3 \times 7^2$.

Sol. The prime numbers common to given numbers are 2, 5 and 7.

$\therefore$ H.C.F. $= 2^2 \times 5 \times 7^2 = 980$.

Ex. 2. ***Find the H.C.F. of:***

(a) 42, 63 and 140 ***(b) 108, 288 and 360*** (L.I.C.A.D.O., 2008)

Sol. (*a*) $42 = 2 \times 3 \times 7$, $63 = 3^2 \times 7$ and $140 = 2^2 \times 5 \times 7$.

$\therefore$ H.C.F. $= 7$.

(*b*) $108 = 2^2 \times 3^3$, $288 = 2^5 \times 3^2$ and $360 = 2^3 \times 5 \times 3^2$.

$\therefore$ H.C.F. $= 2^2 \times 3^2 = 36$.

Ex. 3. ***Find the H.C.F. of 513, 1134 and 1215.***

Sol.

$$\begin{array}{r|l} 1134\overline{)1215}(1 & \text{So, required H.C.F.} = \text{H.C.F. of 513 and 81.} \\ 1134 & \\ \hline 81\overline{)1134}(14 & 81\overline{)513}(6 \\ 81 & 486 \\ \hline 324 & 27\overline{)81}(3 \\ 324 & 81 \\ \hline \times & \times \end{array}$$

$\therefore$ H.C.F. of 1134 and 1215 is 81. $\therefore$ H.C.F. of given numbers = 27.

Ex. 4. ***Reduce $\frac{391}{667}$ to lowest terms.***

Sol. H.C.F. of 391 and 667 is 23.

On dividing the numerator and denominator by 23, we get:

$$\frac{391}{667} = \frac{391 \div 23}{667 \div 23} = \frac{17}{29}.$$

Ex. 5. ***Find the L.C.M. of $2^2 \times 3^3 \times 5 \times 7^2$, $2^3 \times 3^2 \times 5^2 \times 7^4$, $2 \times 3 \times 5^3 \times 7 \times 11$.***

Sol. L.C.M. = Product of highest powers of 2, 3, 5, 7 and 11 $= 2^3 \times 3^3 \times 5^3 \times 7^4 \times 11$. **(L.I.C.A.D.O., 2008)**

Ex. 6. ***Find the L.C.M. of***

(a) 87 and 145 ***(b) 72, 108 and 2100***

Sol. (*a*) $87 = 3 \times 29$ and $145 = 5 \times 29$.

$\therefore$ L.C.M. $= 3 \times 5 \times 29 = 435$.

(*b*) $72 = 2^3 \times 3^2$, $108 = 3^3 \times 2^2$, $2100 = 2^2 \times 5^2 \times 3 \times 7$.

$\therefore$ L.C.M. $= 2^3 \times 3^3 \times 5^2 \times 7 = 37800$.

Ex. 7. ***Find the L.C.M. of 16, 24, 36 and 54.***

Sol.

2	16	–	24	–	36	–	54
2	8	–	12	–	18	–	27
2	4	–	6	–	9	–	27
3	2	–	3	–	9	–	27
3	2	–	1	–	3	–	9
	2	–	1	–	1	–	3

$\therefore$ L.C.M. $= 2 \times 2 \times 2 \times 3 \times 3 \times 2 \times 3 = 432$.

Ex. 8. ***Find the H.C.F. and L.C.M. of $\frac{2}{3}, \frac{8}{9}, \frac{16}{81}$ and $\frac{10}{27}$.***

Sol. H.C.F. of given fractions $= \dfrac{\text{H.C.F. of } 2, 8, 16, 10}{\text{L.C.M. of } 3, 9, 81, 27} = \dfrac{2}{81}$.

L.C.M. of given fractions $= \dfrac{\text{L.C.M. of } 2, 8, 16, 10}{\text{H.C.F. of } 3, 9, 81, 27} = \dfrac{80}{3}$.

Ex. 9. ***Find the H.C.F. and L.C.M. of 0.63, 1.05 and 2.1.***

Sol. Making the same number of decimal places, the given numbers are 0.63, 1.05 and 2.10.

Without decimal places, these numbers are 63, 105 and 210.

Now, H.C.F. of 63, 105 and 210 is 21.

$\therefore$ H.C.F. of 0.63, 1.05 and 2.1 is 0.21.

L.C.M. of 63, 105 and 210 is 630.

$\therefore$ L.C.M. of 0.63, 1.05 and 2.1 is 6.30.

Ex. 10. ***Two numbers are in the ratio of 15: 11. If their H.C.F. is 13, find the numbers.***

Sol. Let the required numbers be $15x$ and $11x$.

Then, their H.C.F. is x. So, $x = 13$.

$\therefore$ The numbers are $(15 \times 13$ and $11 \times 13)$, i.e., 195 and 143.

Ex. 11. ***Two numbers are in the ratio of 3: 4. Their L.C.M. is 84. Find the numbers.*** **(S.S.C., 2010)**

Sol. Let the numbers be $3x$ and $4x$. Then, their L.C.M. $= 12x$.

So, $12x = 84$ or $x = 7$.

$\therefore$ The numbers are 21 and 28.

Ex. 12. ***The H.C.F. of two numbers is 11 and their L.C.M. is 693. If one of the numbers is 77, find the other.***

(P.C.S., 2009)

Sol. Other number $= \left(\frac{11 \times 693}{77}\right) = 99.$

Ex. 13. ***The sum of two numbers is 462 and their highest common factor is 22. What is the minimum number of pairs that satisfy these conditions?*** **(M.A.T., 2004)**

Sol. ***Let the required numbers be $22a$ and $22b$.***

Then, $22a + 22b = 462 \Rightarrow a + b = 21$.

Now, co-primes with sum 21 are (1, 20), (2, 19), (4, 17), (5, 16), (8, 13) and (10, 11).

$\therefore$ Required numbers are $(22 \times 1, 22 \times 20)$, $(22 \times 2, 22 \times 19)$,
$(22 \times 4, 22 \times 17)$, $(22 \times 5, 22 \times 16)$, $(22 \times 8, 22 \times 13)$ and $(22 \times 10, 22 \times 11)$.

Clearly, the number of such pairs is 6.

Ex. 14. ***The sum and difference of the L.C.M and H.C.F. of two numbers are 592 and 518 respectively. If the sum of the numbers be 296, find the numbers.*** **(Section Officer's, 2006)**

Sol. Let L and H denote the L.C.M and H.C.F of the two numbers.

Then, $L + H = 592$ ...(i) And, $L - H = 518$ ....(ii)

Adding (i) and (ii), we get: $2L = 1110$ or $L = 555$.

$\therefore H = 592 - 555 = 37$.

So, H.C.F. = 37 and L.C.M. = 555.

Let the numbers be x and $(296 - x)$.

Then, $x(296 - x) = 555 \times 37 \Rightarrow x^2 - 296x + 20535 = 0$

$\Rightarrow x^2 - 185x - 111x + 20535 = 0 \Rightarrow x(x - 185) - 111(x - 185) = 0$

$\Rightarrow (x - 185)(x - 111) = 0 \Rightarrow x = 185$ or $x = 111$.

Hence the numbers are 111 and 185.

Ex. 15. ***Find the greatest possible length which can be used to measure exactly the lengths 4 m 95 cm, 9 m and 16 m 65 cm.***

Sol. Required length = H.C.F. of 495 cm, 900 cm and 1665 cm.

$495 = 3^2 \times 5 \times 11$, $900 = 2^2 \times 3^2 \times 5^2$, $1665 = 3^2 \times 5 \times 37$.

$\therefore$ H.C.F. $= 3^2 \times 5 = 45$.

Hence, required length = 45 cm.

Ex. 16. ***Find the greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively.***

(Section Officer's, 2006)

Sol. Required number = H.C.F. of $(1657 - 6)$ and $(2037 - 5)$ = H.C.F. of 1651 and 2032

$$\begin{array}{l} 1651\overline{)2032}(1 \\ \quad 1651 \\ \hline 381\overline{)1651}(4 \\ \quad 1524 \\ \hline 127\overline{)381}(3 \\ \quad 381 \\ \hline \quad \times \\ \hline \end{array}$$

$\therefore$ Required number = 127.

Ex. 17. ***Find the largest number which divides 62, 132 and 237 to leave the same remainder in each case.***

Sol. Required number = H.C.F. of $(132 - 62)$, $(237 - 132)$ and $(237 - 62)$

= H.C.F. of 70, 105 and 175 = 35.

Ex. 18. ***The H.C.F. of two numbers, each having three digits is 17 and their L.C.M. is 714. Find the sum of the numbers.*** **(C.P.O., 2007)**

Sol. Let the numbers be $17a$ and $17b$.
Then, $17a \times 17b = 17 \times 714 \Rightarrow ab = 42$.
Now, co-primes with product 42 are (1, 42), (2, 21), (3, 14) and (6, 7).
So, the numbers are (17 × 1, 17 × 42), (17 × 2, 17 × 21), (17 × 3, 17 × 14) and (17 × 6, 17 × 7).
Since both the numbers are 3-digit numbers, the suitable pair is (17 × 6, 17 × 7), i.e., (102, 119).
∴ Required sum = 102 + 119 = 221.

Ex. 19. ***Find the least number which is exactly divisible by 32, 36, 45, 60 and 80.*** **(R.R.B., 2006)**

Sol. Required number = L.C.M. of 32, 36, 45, 60, 80

2	32	–	36	–	45	–	60	–	80
2	16	–	18	–	45	–	30	–	40
2	8	–	9	–	45	–	15	–	20
3	4	–	9	–	45	–	15	–	10
5	4	–	3	–	15	–	5	–	10
3	4	–	3	–	3	–	1	–	2
2	4	–	1	–	1	–	1	–	2
	2	–	1	–	1	–	1	–	1

L.C.M. = 2 × 2 × 2 × 3 × 5 × 3 × 2 × 2 = 1440.
Hence, required number = 1440.

Ex. 20. ***Find the least number which when divided by 6, 7, 8, 9 and 12 leaves the same remainder 1 in each case.***

Sol. Required number = (L.C.M. of 6, 7, 8, 9, 12) + 1.

3	6	–	7	–	8	–	9	–	12
2	2	–	7	–	8	–	3	–	4
2	1	–	7	–	4	–	3	–	2
	1	–	7	–	2	–	3	–	1

∴ L.C.M. = 3 × 2 × 2 × 7 × 2 × 3 = 504.
Hence, required number = (504 + 1) = 505.

Ex. 21. ***Find the smallest number which when increased by 10 is completely divisible by 12, 15, 18, 20 and 24.*** **(P.C.S., 2008)**

Sol. Required number
= (L.C.M. of 12, 15, 18, 20, 24) – 10
= (2 × 2 × 3 × 5 × 3 × 2) – 10
= 360 – 10 = 350.

2	12	–	15	–	18	–	20	–	24
2	6	–	15	–	9	–	10	–	12
3	3	–	15	–	9	–	5	–	6
5	1	–	5	–	3	–	5	–	2
	1	–	1	–	3	–	1	–	2

Ex. 22. ***Find the greatest number of five digits which is divisible by 15, 21 and 36.*** **(P.C.S., 2010)**

Sol. Greatest number of five digits = 99999.
Required number must be divisible by L.C.M. of 15, 21, 36, i.e., 1260.
On dividing 99999 by 1260, we get 459 as remainder.
∴ Required number = (99999 – 459) = 99540.

Ex. 23. ***Find the smallest number of five digits exactly divisible by 16, 24, 36 and 54.***

Sol. Smallest number of five digits is 10000.
Required number must be divisible by L.C.M. of 16, 24, 36, 54, i.e., 432.
On dividing 10000 by 432, we get 64 as remainder.
∴ Required number = 10000 + (432 – 64) = 10368.

Ex. 24. ***Find the largest number which when subtracted from 10000, the remainder is divisible by 32, 36, 48 and 50.*** **(R.R.B., 2006)**

Sol. Required number
= 10000 – (L.C.M. of 32, 36, 48, 50)
= 10000 – (2 × 2 × 3 × 4 × 3 × 2 × 3)
= 10000 – 864 = 9136.

2	32	–	36	–	48	–	54	
2	16	–	18	–	24	–	27	
3	8	–	9	–	12	–	27	
4	8	–	3	–	4	–	9	
3	2	–	3	–	1	–	9	
	2	–	1	–	1	–	3	

Ex. 25. ***Find the largest number of five digits which, when divided by 16, 24, 30 or 36, leaves the same remainder 10 in each case.*** **(C.P.O., 2007)**

Sol. Largest number of 5 digits = 99999. L.C.M. of 16, 24, 30 and 36 = 720.

On dividing 99999 by 720, remainder obtained is 639.

$\therefore$ Largest number of 5 digits divisible by 16, 24, 30 and 36 = (99999 – 639) = 99360.

Hence, required number = (99360 + 10) = 99370.

Ex. 26. ***Find the least number which when divided by 20, 25, 35 and 40 leaves remainders 14, 19, 29 and 34 respectively.***

Sol. Here, (20 – 14) = 6, (25 – 19) = 6, (35 – 29) = 6 and (40 – 34) = 6.

$\therefore$ Required number = (L.C.M. of 20, 25, 35, 40) – 6 = 1394.

Ex. 27. ***What is the least number which when divided by the numbers 3, 5, 6, 8, 10 and 12 leaves in each case a remainder 2 but when divided by 13 leaves no remainder?*** **(S.S.C., 2005)**

Sol. L.C.M. of 3, 5, 6, 8, 10 and 12 = 120.

So, the required number is of the form 120 k + 2.

Least value of k for which (120k + 2) is divisible by 13 is k = 8.

$\therefore$ Required number = (120 × 8 + 2) = 962.

Ex. 28. ***The traffic lights at three different road crossings change after every 48 sec., 72 sec. and 108 sec. respectively. If they all change simultaneously at 8:20:00 hours, then at what time will they again change simultaneously?*** **(R.R.B., 2006, M.A.T., 2005)**

Sol. Interval of change = (L.C.M. of 48, 72, 108) sec. = 432 sec.

So, the lights will again change simultaneously after every 432 seconds, i.e., 7 min. 12 sec.

Hence, next simultaneous change will take place at 8:27:12 hrs.

Ex. 29. ***Seema, Meena and Reema begin to jog around a circular stadium and they complete their revolutions in 54 seconds, 42 seconds and 63 seconds respectively. After how much time will they come together at the starting point?*** **(Bank. P.O., 2010)**

Sol. L.C.M of 54, 42 and 63 = 378.

So, the three girls will come together at the starting point in 378 seconds i.e., 6 min 18 sec.

Ex. 30. ***Arrange the fractions*** $\frac{17}{18}, \frac{31}{36}, \frac{43}{45}, \frac{59}{60}$ ***in the ascending order.***

Sol. L.C.M. of 18, 36, 45 and 60 = 180. Now,

$$\frac{17}{18}=\frac{17\times10}{18\times10}=\frac{170}{180};\quad \frac{31}{36}=\frac{31\times5}{36\times5}=\frac{155}{180};\quad \frac{43}{45}=\frac{43\times4}{45\times4}=\frac{172}{180};\quad \frac{59}{60}=\frac{59\times3}{60\times3}=\frac{177}{180}.$$

Since, 155 < 170 < 172 < 177, so, $\frac{155}{180}<\frac{170}{180}<\frac{172}{180}<\frac{177}{180}$.

Hence, $\frac{31}{36}<\frac{17}{18}<\frac{43}{45}<\frac{59}{60}$.

EXERCISE

(OBJECTIVE TYPE QUESTIONS)

Directions: *Mark (✓) against the correct answer:*

1. Find the factors of 330. **(CLAT, 2010)**

(*a*) 2 × 4 × 5 × 11 (*b*) 2 × 3 × 7 × 13

(*c*) 2 × 3 × 5 × 13 (*d*) 2 × 3 × 5 × 11

2. Find the factors of 1122. **(CLAT, 2010)**

(*a*) 3 × 9 × 17 × 2 (*b*) 3 × 11 × 17 × 2

(*c*) 9 × 9 × 17 × 2 (*d*) 3 × 11 × 17 × 3

3. 252 can be expressed as a product of primes as **(IGNOU, 2002)**

(*a*) 2 × 2 × 3 × 3 × 7 (*b*) 2 × 2 × 2 × 3 × 7

(*c*) 3 × 3 × 3 × 3 × 7 (*d*) 2 × 3 × 3 × 3 × 7

4. Which of the following has most number of divisors? **(M.B.A. 2002)**

(*a*) 99 (*b*) 101

(*c*) 176 (*d*) 182

5. A number n is said to be perfect if the sum of all its divisors (excluding n itself) is equal to n. An example of perfect number is

(*a*) 6 (*b*) 9

(*c*) 15 (*d*) 21

6. $\frac{1095}{1168}$ when expressed in simplest form is

(a) $\frac{13}{16}$ (b) $\frac{15}{16}$

(c) $\frac{17}{26}$ (d) $\frac{25}{26}$

7. Reduce $\frac{128352}{238368}$ to its lowest terms. **(IGNOU, 2003)**

(a) $\frac{3}{4}$ (b) $\frac{5}{13}$

(c) $\frac{7}{13}$ (d) $\frac{9}{13}$

8. The simplest reduction to the lowest terms of $\frac{116,690,151}{427,863,887}$ is **(SNAP, 2004)**

(a) $\frac{3}{11}$ (b) $\frac{7}{11}$

(c) $\frac{11}{3}$ (d) None of these

9. The highest common factor of 0 and 6 is **(P.C.S., 2008)**

(a) 0 (b) 3

(c) 6 (d) Undefined

10. The H.C.F. of $2^2 \times 3^3 \times 5^5$, $2^3 \times 3^2 \times 5^2 \times 7$ and $2^4 \times 3^4 \times 5 \times 7^2 \times 11$ is

(a) $2^2 \times 3^2 \times 5$ (b) $2^2 \times 3^2 \times 5 \times 7 \times 11$

(c) $2^4 \times 3^4 \times 5^5$ (d) $2^4 \times 3^4 \times 5^5 \times 7 \times 11$

11. The H.C.F. of $2^4 \times 3^2 \times 5^3 \times 7$, $2^3 \times 3^3 \times 5^2 \times 7^2$ and $3 \times 5 \times 7 \times 11$ is

(a) 105 (b) 1155

(c) 2310 (d) 27720

12. H.C.F. of $4 \times 27 \times 3125$, $8 \times 9 \times 25 \times 7$ & $16 \times 81 \times 5 \times 11 \times 49$ is

(a) 180 (b) 360

(c) 540 (d) 1260

13. Find the highest common factor of 36 and 84. **(R.R.B., 2003)**

(a) 4 (b) 6

(c) 12 (d) 18

14. Even numbers are formed by taking at least two at a time from the numbers 0, 4, 8, 9. Their H.C.F. is **(Hotel Management, 2007)**

(a) 2 (b) 4

(c) 10 (d) None of these

15. The H.C.F. of 204, 1190 and 1445 is

(a) 17 (b) 18

(c) 19 (d) 21

16. Which of the following is a pair of co-primes?

(a) (16, 62) (b) (18, 25)

(c) (21, 35) (d) (23, 92)

17. The H.C.F. of 2923 and 3239 is

(a) 37 (b) 47

(c) 73 (d) 79

18. The H.C.F. of 3556 and 3444 is

(a) 23 (b) 25

(c) 26 (d) 28

19. The L.C.M. of $2^3 \times 3^2 \times 5 \times 11$, $2^4 \times 3^4 \times 5^2 \times 7$ and $2^5 \times 3^3 \times 5^3 \times 7^2 \times 11$ is

(a) $2^3 \times 3^2 \times 5$ (b) $2^5 \times 3^4 \times 5^3$

(c) $2^3 \times 3^2 \times 5 \times 7 \times 11$ (d) $2^5 \times 3^4 \times 5^3 \times 7^2 \times 11$

20. Find the lowest common multiple of 24, 36 and 40.

(a) 120 (b) 240

(c) 360 (d) 480

21. The L.C.M. of 22, 54, 108, 135 and 198 is

(a) 330 (b) 1980

(c) 5940 (d) 11880

22. The L.C.M. of 148 and 185 is

(a) 680 (b) 740

(c) 2960 (d) 3700

23. The H.C.F. of $\frac{a}{b}, \frac{c}{d}, \frac{e}{f}$ is equal to **(I.A.M. 2007)**

(a) $\frac{\text{L.C.M. of } a, c, e}{\text{H.C.F. of } b, d, f}$ (b) $\frac{\text{H.C.F. of } a, c, e}{\text{L.C.M. of } b, d, f}$

(c) $\frac{\text{H.C.F. of } a, c, e}{\text{H.C.F. of } b, d, f}$ (d) $\frac{ace}{bdf}$

24. The H.C.F. of $\frac{2}{3}, \frac{8}{9}, \frac{64}{81}$ and $\frac{10}{27}$ is :

(a) $\frac{2}{3}$ (b) $\frac{2}{81}$

(c) $\frac{160}{3}$ (d) $\frac{160}{81}$

25. The H.C.F. of $\frac{9}{10}, \frac{12}{25}, \frac{18}{35}$ and $\frac{21}{40}$ is

(a) $\frac{3}{5}$ (b) $\frac{252}{5}$

(c) $\frac{3}{1400}$ (d) $\frac{63}{700}$

26. The L.C.M. of $\frac{1}{3}, \frac{5}{6}, \frac{2}{9}, \frac{4}{27}$ is

(a) $\frac{1}{54}$ (b) $\frac{10}{27}$

(c) $\frac{20}{3}$ (d) None of these

27. The L.C.M. of $\frac{2}{3}, \frac{3}{5}, \frac{4}{7}, \frac{9}{13}$ is

(a) 36 (b) $\frac{1}{36}$

(c) $\frac{1}{1365}$ (d) $\frac{12}{455}$

28. The L.C.M. of $\frac{3}{4}, \frac{6}{7}, \frac{9}{8}$ is **(L.I.C.A.D.O., 2008)**

(*a*) 3 (*b*) 6
(*c*) 9 (*d*) 18

29. The H.C.F. of 1.75, 5.6 and 7 is

(*a*) 0.07 (*b*) 0.7
(*c*) 3.5 (*d*) 0.35

30. The G.C.D. of 1.08, 0.36 and 0.9 is **(Hotel Management, 2002)**

(*a*) 0.03 (*b*) 0.9
(*c*) 0.18 (*d*) 0.108

31. The H.C.F. of 0.54, 1.8 and 7.2 is

(*a*) 1.8 (*b*) 0.18
(*c*) 0.018 (*d*) 18

32. The L.C.M. of 3, 2.7 and 0.09 is

(*a*) 2.7 (*b*) 0.27
(*c*) 0.027 (*d*) 27

33. If A, B and C are three numbers, such that the L.C.M. of A and B is B and the L.C.M of B and C is C, then the L.C.M. of A, B and C is

(*a*) *A* (*b*) *B*
(*c*) *C* (*d*) $\frac{A+B+C}{3}$

34. H.C.F. of 3240, 3600 and a third number is 36 and their L.C.M. is $2^4 \times 3^5 \times 5^2 \times 7^2$. The third number is **(M.A.T., 2005)**

(*a*) $2^2 \times 3^5 \times 7^2$ (*b*) $2^2 \times 5^3 \times 7^2$
(*c*) $2^5 \times 5^2 \times 7^2$ (*d*) $2^3 \times 3^5 \times 7^2$

35. Three numbers are in the ratio 1: 2: 3 and their H.C.F. is 12. The numbers are

(*a*) 4, 8, 12 (*b*) 5, 10, 15
(*c*) 10, 20, 30 (*d*) 12, 24, 36

36. The ratio of two numbers is 3: 4 and their H.C.F. is 4. Their L.C.M. is

(*a*) 12 (*b*) 16
(*c*) 24 (*d*) 48

37. The sum of two numbers is 216 and their H.C.F. is 27. The numbers are

(*a*) 27, 189 (*b*) 81, 189
(*c*) 108, 108 (*d*) 154, 162

38. The sum of two numbers is 528 and their H.C.F. is 33. The number of pairs of numbers satisfying the above conditions is

(*a*) 4 (*b*) 6
(*c*) 8 (*d*) 12

39. The number of number-pairs lying between 40 and 100 with their H.C.F. as 15 is

(*a*) 3 (*b*) 4
(*c*) 5 (*d*) 6

40. The H.C.F. of two numbers is 12 and their difference is 12. The numbers are

(*a*) 66, 78 (*b*) 70, 82
(*c*) 94, 106 (*d*) 84, 96

41. The product of two numbers is 4107. If the H.C.F. of these numbers is 37, then the greater number is

(*a*) 101 (*b*) 107
(*c*) 111 (*d*) 185

42. The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is **(A.A.O., 2010; P.C.S., 2009)**

(*a*) 1 (*b*) 2
(*c*) 3 (*d*) 4

43. Three numbers which are co-prime to each other are such that the product of the first two is 551 and that of the last two is 1073. The sum of the three numbers is

(*a*) 75 (*b*) 81
(*c*) 85 (*d*) 89

44. The ratio of two numbers is 13: 15 and their L.C.M. is 39780. The numbers are **(P.C.S., 2009)**

(*a*) 884, 1020 (*b*) 884, 1040
(*c*) 670, 1340 (*d*) 2652, 3060

45. Three numbers are in the ratio of 3: 4: 5 and their L.C.M. is 2400. Their H.C.F. is

(*a*) 40 (*b*) 80
(*c*) 120 (*d*) 200

46. The L.C.M. and ratio of four numbers are 630 and 2: 3: 5: 7 respectively. The difference between the greatest and least numbers is **(I.A.M., 2007)**

(*a*) 6 (*b*) 14
(*c*) 15 (*d*) 21

47. The H.C.F. and L.C.M. of two numbers are 12 and 336 respectively. If one of the numbers is 84, the other is **(S.S.C., 2010)**

(*a*) 36 (*b*) 48
(*c*) 72 (*d*) 96

48. If the product of two numbers is 324 and their H.C.F. is 3, then their L.C.M. will be **(P.C.S., 2008)**

(*a*) 972 (*b*) 327
(*c*) 321 (*d*) 108

49. If H.C.F. of p and q is x and $q = xy$, then the L.C.M. of p and q is **(C.D.S., 2004)**

(*a*) pq (*b*) qy
(*c*) xy (*d*) py

50. The sum of two numbers is 2000 and their L.C.M. is 21879. The two numbers are

(*a*) 1993, 7 (*b*) 1991, 9
(*c*) 1989, 11 (*d*) 1987, 13

51. The H.C.F. and L.C.M. of two numbers are 84 and 21 respectively. If the ratio of the two numbers is 1: 4, then the larger of the two numbers is

(*a*) 12 (*b*) 48
(*c*) 84 (*d*) 108

52. The L.C.M. of two numbers is 495 and their H.C.F. is 5. If the sum of the numbers is 10, then their difference is
(*a*) 10 (*b*) 46
(*c*) 70 (*d*) 90

53. The product of the L.C.M. and H.C.F. of two numbers is 24. The difference of two numbers is 2. Find the numbers.
(*a*) 2 and 4 (*b*) 6 and 4
(*c*) 8 and 6 (*d*) 8 and 10

54. If the sum of two numbers is 36 and their H.C.F. and L.C.M. are 3 and 105 respectively, the sum of the reciprocals of the two numbers is **(S.S.C., 2010)**
(*a*) $\frac{2}{35}$ (*b*) $\frac{3}{35}$
(*c*) $\frac{4}{35}$ (*d*) None of these

55. The L.C.M. of two numbers is 12 times their H.C.F. The sum of H.C.F. and L.C.M. is 403. If one number is 93, find the other. **(M.B.A., 2007)**
(*a*) 124 (*b*) 128
(*c*) 134 (*d*) None of these

56. The H.C.F. and L.C.M. of two numbers are 50 and 250 respectively. If the first number is divided by 2, the quotient is 50. The second number is
(*a*) 50 (*b*) 100
(*c*) 125 (*d*) 250

57. The product of two numbers is 1320 and their H.C.F. is 6. The L.C.M. of the numbers is
(*a*) 220 (*b*) 1314
(*c*) 1326 (*d*) 7920

58. Product of two co-prime numbers is 117. Their L.C.M. should be
(*a*) 1 (*b*) 117
(*c*) equal to their H.C.F. (*d*) cannot be calculated

59. The L.C.M. of three different numbers is 120. Which of the following cannot be their H.C.F.? **(Campus Recruitment, 2010)**
(*a*) 8 (*b*) 12
(*c*) 24 (*d*) 35

60. The H.C.F. of two numbers is 8. Which one of the following can never be their L.C.M.?
(*a*) 24 (*b*) 48
(*c*) 56 (*d*) 60

61. If the L.C.M. of three numbers is 9570, then their H.C.F. can be
(*a*) 11 (*b*) 12
(*c*) 19 (*d*) 21

62. The H.C.F. of two numbers is 23 and the other two factors of their L.C.M. are 13 and 14. The larger of the two numbers is
(*a*) 276 (*b*) 299
(*c*) 322 (*d*) 345

63. About the number of pairs which have 16 as their H.C.F. and 136 as their L.C.M., we can definitely say that
(*a*) no such pair exists
(*b*) only one such pair exists
(*c*) only two such pairs exist
(*d*) many such pairs exist

64. The H.C.F. and L.C.M. of two numbers are 21 and 4641 respectively. If one of the numbers lies between 200 and 300, the two numbers are **(M.A.T., 2006)**
(*a*) 273, 357 (*b*) 273, 359
(*c*) 273, 361 (*d*) 273, 363

65. Two numbers, both greater than 29, have H.C.F. 29 and L.C.M. 4147. The sum of the numbers is
(*a*) 666 (*b*) 669
(*c*) 696 (*d*) 966

66. L.C.M. of two prime numbers x and y ($x > y$) is 161. The value of $3y - x$ is
(*a*) – 2 (*b*) – 1
(*c*) 1 (*d*) 2

67. The greatest number that exactly divides 105, 1001 and 2436 is
(*a*) 3 (*b*) 7
(*c*) 11 (*d*) 21

68. 21 mango trees, 42 apple trees and 56 orange trees have to be planted in rows such that each row contains the same number of trees of one variety only. Minimum number of rows in which the trees may be planted is **(M.B.A., 2005)**
(*a*) 3 (*b*) 15
(*c*) 17 (*d*) 20

69. The greatest possible length which can be used to measure exactly the lengths 7 m, 3 m 85 cm, 12 m 95 cm is **(R.R.B., 2008)**
(*a*) 15 cm (*b*) 25 cm
(*c*) 35 cm (*d*) 42 cm

70. The capacity of two pots is 120 litres and 56 litres respectively. Find the capacity of a container which can exactly measure the contents of the two pots. **(R.R.B., 2005)**
(*a*) 7500 cc (*b*) 7850 cc
(*c*) 8000 cc (*d*) 9500 cc

71. A daily wage labourer was engaged for a certain number of days for ₹ 5750, but being absent on some of those days he was paid only ₹ 5000. What was his maximum possible daily wage? **(C.P.O., 2006)**
(*a*) ₹ 125 (*b*) ₹ 250
(*c*) ₹ 375 (*d*) ₹ 500

72. A person has to completely put each of three liquids: 403 litres of petrol, 465 litres of diesel and 496 litres of Mobil Oil in bottles of equal size without mixing any of the above three types of liquids such that

each bottle is completely filled. What is the least possible number of bottles required?
(Civil Services, 2007)
(a) 34 (b) 44
(c) 46 (d) None of these

73. The maximum number of students among whom 1001 pens and 910 pencils can be distributed in such a way that each student gets the same number of pens and same number of pencils is
(a) 91 (b) 910
(c) 1001 (d) 1911

74. A rectangular courtyard 3.78 metres long and 5.25 metres wide is to be paved exactly with square tiles, all of the same size. What is the largest size of the tile which could be used for the purpose?
(a) 14 cm (b) 21 cm
(c) 42 cm (d) None of these

75. The least number of square tiles required to pave the ceiling of a room 15 m 17 cm long and 9 m 2 cm broad is (M.B.A., 2006)
(a) 656 (b) 738
(c) 814 (d) 902

76. Three sets of English, Mathematics and Science books containing 336, 240 and 96 books respectively have to be stacked in such a way that all the books are stored subjectwise and the height of each stack is the same. Total number of stacks will be
(S.S.C., 2007)
(a) 14 (b) 21
(c) 22 (d) 48

77. Four metal rods of lengths 78 cm, 104 cm, 117 cm and 169 cm are to be cut into parts of equal length. Each part must be as long as possible. What is the maximum number of pieces that can be cut?
(Civil Services, 2009)
(a) 27 (b) 36
(c) 43 (d) 480

78. Find the greatest number that will divide 43, 91 and 183 so as to leave the same remainder in each case.
(a) 4 (b) 7
(c) 9 (d) 13

79. If r is the remainder when each of 7654, 8506 and 9997 is divided by the greatest number d $(d > 1)$, then $d - r$ is equal to (A.A.O., 2010)
(a) 14 (b) 18
(c) 24 (d) 28

80. Let N be the greatest number that will divide 1305, 4665 and 6905, leaving the same remainder in each case. Then sum of the digits in N is (S.S.C., 2004)
(a) 4 (b) 5
(c) 6 (d) 8

81. A milkman has 3 jars containing 57 litres, 129 litres and 177 litres of pure milk respectively. A measuring can, after a different number of exact measurements of milk in each jar, leaves the same amount of milk unmeasured in each jar. What is the volume of the largest such can? (J.M.E.T., 2004)
(a) 12 litres (b) 16 litres
(c) 24 litres (d) None of these

82. The greatest number which can divide 1356, 1868 and 2764 leaving the same remainder 12 in each case is
(a) 64 (b) 124
(c) 156 (d) 260

83. Which greatest number will divide 3026 and 5053 leaving remainders 11 and 13 respectively?
(C.P.O., 2006)
(a) 15 (b) 30
(c) 45 (d) 60

84. Find the greatest number that will divide 964, 1238 and 1400 leaving remainders 41, 31 and 51 respectively. (I.I.F.T., 2005)
(a) 61 (b) 71
(c) 73 (d) 81

85. Which of the following fractions is the largest?
(a) $\frac{7}{8}$ (b) $\frac{13}{16}$
(c) $\frac{31}{40}$ (d) $\frac{63}{80}$

86. What is the least natural number which leaves no remainder when divided by all the digits from 1 to 9? (C.D.S., 2004)
(a) 1800 (b) 1920
(c) 2520 (d) 5040

87. What will be the least number which when doubled will be exactly divisible by 12, 18, 21 and 30?
(a) 196 (b) 630
(c) 1260 (d) 2520

88. The sum of two numbers is 45. Their difference is $\frac{1}{9}$ of their sum. Their L.C.M. is (S.S.C., 2007)
(a) 100 (b) 150
(c) 200 (d) 250

89. The smallest fraction, which each of $\frac{6}{7}, \frac{5}{14}, \frac{10}{21}$ will divide exactly is
(a) $\frac{30}{7}$ (b) $\frac{30}{98}$
(c) $\frac{60}{147}$ (d) $\frac{50}{294}$

90. The least number of five digits which is exactly divisible by 12, 15 and 18 is
(a) 10010 (b) 10015
(c) 10020 (d) 10080

91. The greatest number of four digits which is divisible by 15, 25, 40 and 75 is
(a) 9000 (b) 9400
(c) 9600 (d) 9800

92. The number between 4000 and 5000 which is divisible by 12, 18, 21 and 32 is **(P.C.S., 2006)**
(*a*) 4023 (*b*) 4032
(*c*) 4203 (*d*) 4302

93. The number nearest to 43582 divisible by each of 25, 50 and 75 is **(C.P.O., 2007)**
(*a*) 43500 (*b*) 43550
(*c*) 43600 (*d*) 43650

94. The least number which should be added to 2497 so that the sum is exactly divisible by 5, 6, 4 and 3 is
(*a*) 3 (*b*) 13
(*c*) 23 (*d*) 33

95. The greatest number which when subtracted from 5834, gives a number exactly divisible by each of 20, 28, 32 and 35 is **(S.S.C., 2010)**
(*a*) 1120 (*b*) 4714
(*c*) 5200 (*d*) 5600

96. The least number which is a perfect square and is divisible by each of the numbers 16, 20 and 24, is
(*a*) 1600 (*b*) 3600
(*c*) 6400 (*d*) 14400

97. The smallest number which when diminished by 7, is divisible by 12, 16, 18, 21 and 28 is
(*a*) 1008 (*b*) 1015
(*c*) 1022 (*d*) 1032

98. The least number which when increased by 5 is divisible by each one of 24, 32, 36 and 54 is
(*a*) 427 (*b*) 859
(*c*) 869 (*d*) 4320

99. The least number, which when divided by 12, 15, 20 and 54 leaves in each case a remainder of 8 is
(*a*) 504 (*b*) 536
(*c*) 544 (*d*) 548

100. A number less than 500, when divided by 4, 5, 6, 7 leaves remainder 1 in each case. The number is **(Hotel Management, 2007)**
(*a*) 211 (*b*) 420
(*c*) 421 (*d*) 441

101. What is the greatest number of 3 digits which when divided by 6, 9 and 12 leaves a remainder of 3 in each case? **(M.B.A., 2007)**
(*a*) 903 (*b*) 939
(*c*) 975 (*d*) 996

102. The largest four-digit number which when divided by 4, 7 or 13 leaves a remainder of 3 in each case, is
(*a*) 8739 (*b*) 9831
(*c*) 9834 (*d*) 9893

103. Let the least number of six digits, which when divided by 4, 6, 10 and 15, leaves in each case the same remainder of 2, be N. The sum of the digits in N is **(S.S.C., 2007)**
(*a*) 3 (*b*) 4
(*c*) 5 (*d*) 6

104. The least multiple of 13, which on dividing by 4, 5, 6, 7 and 8 leaves remainder 2 in each case is
(*a*) 840 (*b*) 842
(*c*) 2520 (*d*) 2522

105. Find the least number which when divided by 12, leaves a remainder of 7; when divided by 15, leaves a remainder of 10 and when divided by 16, leaves a remainder of 11. **(L.D.C., 2006)**
(*a*) 115 (*b*) 235
(*c*) 247 (*d*) 475

106. The least number, which when divided by 48, 60, 72, 108 and 140 leaves 38, 50, 62, 98 and 130 as remainders respectively is **(P.C.S., 2011)**
(*a*) 11115 (*b*) 15110
(*c*) 15120 (*d*) 15210

107. Find the least multiple of 23, which when divided by 18, 21 and 24 leaves remainders 7, 10 and 13 respectively.
(*a*) 3002 (*b*) 3013
(*c*) 3024 (*d*) 3036

108. What is the third term in a sequence of numbers that leave remainders of 1, 2 and 3 when divided by 2, 3 and 4 respectively? **(M.A.T., 2004)**
(*a*) 11 (*b*) 17
(*c*) 19 (*d*) 35

109. Find the greatest number of 4 digits which when divided by 4, 5, 6, 7 and 8 leaves 1, 2, 3, 4 and 5 as remainders. **(M.C.A., 2005)**
(*a*) 9237 (*b*) 9240
(*c*) 9840 (*d*) 9999

110. The least number which when divided by 5, 6, 7 and 8 leaves a remainder 3, but when divided by 9 leaves no remainder, is **(Section Officers', 2005; L.I.C., 2007)**
(*a*) 1677 (*b*) 1683
(*c*) 2523 (*d*) 3363

111. Find the least number which when divided by 16, 18, 20 and 25 leaves 4 as remainder in each case, but when divided by 7 leaves no remainder.
(*a*) 17004 (*b*) 18000
(*c*) 18002 (*d*) 18004

112. A gardener has to plant trees in rows containing equal number of trees. If he plants in rows of 6, 8, 10 or 12, then five trees are left unplanted. But if he plants in rows of 13 trees each, then no tree is left. What is the number of trees that the gardener plants? **(J.M.E.T., 2004)**
(*a*) 485 (*b*) 725
(*c*) 845 (*d*) None of these

113. When Seeta made necklaces of either 16 beads, 20 beads or 36 beads, not a single bead was left over. What could be the least number of beads Seeta had? **(Bank Recruitment, 2008)**
(*a*) 700 (*b*) 720
(*c*) 750 (*d*) 780

114. An electronic device makes a beep after every 60 sec. Another device makes a beep after every 62 sec. They beeped together at 10 a.m. The next time, when they would beep together at the earliest is **(M.B.A., 2007)**

(*a*) 10.30 a.m. (*b*) 10.31 a.m.
(*c*) 10.59 a.m. (*d*) 11 a.m.

115. Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together? **(M.B.A., 2006)**

(*a*) 4 (*b*) 10
(*c*) 15 (*d*) 16

116. Four bells begin to toll together and toll respectively at intervals of 6, 7, 8 and 9 seconds. In 1.54 hours, how many times do they toll together and in what interval (seconds)? **(R.R.B., 2006)**

(*a*) 14, 504 (*b*) 14, 480
(*c*) 12, 504 (*d*) 16, 580

117. Four different electronic devices make a beep after every 30 minutes, 1 hour, $1\frac{1}{2}$ hour and 1 hour 45 minutes respectively. All the devices beeped together at 12 noon. They will again beep together at

(*a*) 12 midnight (*b*) 3 a.m.
(*c*) 6 a.m. (*d*) 9 a.m.

118. Three girls start jogging from the same point around a circular track and each one completes one round in 24 seconds, 36 seconds and 48 seconds respectively. After how much time will they meet at one point? **(Specialist Officers', 2009)**

(*a*) 2 minutes 20 seconds (*b*) 2 minutes 24 seconds
(*c*) 3 minutes 36 seconds (*d*) 4 minutes 12 seconds

119. Three persons walking around a circular track complete their respective single revolutions in $15\frac{1}{6}$ seconds, $16\frac{1}{4}$ seconds and $18\frac{2}{3}$ seconds respectively. They will be again together at the common starting point after an hour and

(*a*) 10 seconds (*b*) 20 seconds
(*c*) 30 seconds (*d*) 40 seconds

120. A, B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 seconds, B in 308 seconds and C in 198 seconds, all starting at the same point. After what time will they meet again at the starting point?

(*a*) 26 minutes 18 seconds (*b*) 42 minutes 36 seconds
(*c*) 45 minutes (*d*) 46 minutes 12 seconds

121. Three wheels can complete 40, 24 and 16 revolutions per minute respectively. There is a red spot on each wheel that touches the ground at time zero. After how much time, all these spots will simultaneously touch the ground again?

(*a*) $7\frac{1}{2}$ sec (*b*) 18 sec
(*c*) $7\frac{1}{2}$ min (*d*) 18 min

122. A pendulum strikes 5 times in 3 seconds and another pendulum strikes 7 times in 4 seconds. If both pendulums start striking at the same time, how many clear strikes can be listened in 1 minute?

(*a*) 195 (*b*) 199
(*c*) 200 (*d*) 205

123. Find the HCF of 132, 204 and 228. **[Indian Railways—Gr. 'D' Exam, 2014]**

(*a*) 12 (*b*) 18
(*c*) 6 (*d*) 21

124. If three numbers are $2a$, $5a$ and $7a$, what will be their LCM? **[Indian Railways—Gr. 'D' Exam, 2014]**

(*a*) $70a$ (*b*) $65a$
(*c*) $75a$ (*d*) $70a^3$

125. The product of two whole numbers is 1500 and their HCF is 10. Find the LCM. **[Indian Railways—Gr. 'D' Exam, 2014]**

(*a*) 15000 (*b*) 150
(*c*) 150 (*d*) 15

126. A number x is divided by 7. When this number is divided by 8, 12 and 16. It leaves a remainder 3 in each case. The least value of x is: **[SSC—CHSL (10 + 2) Exam, 2015]**

(*a*) 148 (*b*) 149
(*c*) 150 (*d*) 147

127. The number of pair of positive integers whose sum is 99 and HCF is 9 is **[SSC—CHSL (10 + 2) Exam, 2015]**

(*a*) 5 (*b*) 4
(*c*) 3 (*d*) 2

128. The ratio of two numbers is 3 : 4 and their LCM is 120. The sum of numbers is **[SSC—CHSL (10 + 2) Exam, 2015]**

(*a*) 70 (*b*) 140
(*c*) 35 (*d*) 105

129. The greatest four digit number which is exactly divisible by each one of the numbers 12, 18, 21 and 28 **[SSC—CHSL (10 + 2) Exam, 2015]**

(*a*) 9288 (*b*) 9882
(*c*) 9828 (*d*) 9928

130. The traffic lights at three different signal points change after every 45 seconds, 75 seconds and 90 seconds respectively. If all change simultaneously at 7 : 20 : 15 hours, then they will change again simultaneously at **[CLAT, 2016]**

(*a*) 7 : 28 : 00 hours (*b*) 7 : 27 : 45 hours
(*c*) 7 : 27 : 30 hours (*d*) 7 : 27 : 50 hours

ANSWERS

1. (d)	2. (b)	3. (a)	4. (c)	5. (a)	6. (b)	7. (c)	8. (a)	9. (d)	10. (a)
11. (a)	12. (a)	13. (c)	14. (a)	15. (a)	16. (b)	17. (d)	18. (d)	19. (d)	20. (c)
21. (c)	22. (b)	23. (b)	24. (b)	25. (c)	26. (c)	27. (a)	28. (d)	29. (d)	30. (c)
31. (b)	32. (d)	33. (c)	34. (a)	35. (d)	36. (d)	37. (a)	38. (a)	39. (b)	40. (d)
41. (c)	42. (b)	43. (c)	44. (d)	45. (a)	46. (c)	47. (b)	48. (d)	49. (d)	50. (c)
51. (c)	52. (a)	53. (b)	54. (c)	55. (a)	56. (c)	57. (a)	58. (b)	59. (d)	60. (d)
61. (a)	62. (c)	63. (a)	64. (a)	65. (c)	66. (a)	67. (b)	68. (c)	69. (c)	70. (c)
71. (b)	72. (b)	73. (a)	74. (b)	75. (d)	76. (a)	77. (b)	78. (a)	79. (a)	80. (a)
81. (c)	82. (a)	83. (c)	84. (b)	85. (a)	86. (c)	87. (b)	88. (a)	89. (a)	90. (d)
91. (c)	92. (b)	93. (d)	94. (c)	95. (b)	96. (b)	97. (b)	98. (b)	99. (d)	100. (c)
101. (c)	102. (b)	103. (c)	104. (d)	105. (b)	106. (b)	107. (b)	108. (d)	109. (a)	110. (b)
111. (d)	112. (c)	113. (b)	114. (b)	115. (d)	116. (c)	117. (d)	118. (b)	119. (d)	120. (d)
121. (a)	122. (b)	123. (a)	124. (a)	125. (b)	126. (d)	127. (a)	128. (a)	129. (c)	130. (b)

SOLUTIONS

1.

2	330
3	165
5	65
	11

$\therefore \quad 330 = 2 \times 3 \times 5 \times 11$

2.

2	1122
3	165
11	187
	17

$\therefore \quad 1122 = 2 \times 3 \times 11 \times 17$

3. Clearly, $252 = 2 \times 2 \times 3 \times 3 \times 7$.

4. $99 = 1 \times 3 \times 3 \times 11$;
$101 = 1 \times 101$;
$176 = 1 \times 2 \times 2 \times 2 \times 2 \times 11$;
$182 = 1 \times 2 \times 7 \times 13$.

So, divisors of 99 are 1, 3, 9, 11, 33 and 99;
divisors of 101 are 1 and 101;
divisors of 176 are 1, 2, 4, 8, 11, 16, 22, 44, 88 and 176;
divisors of 182 are 1, 2, 7, 13, 14, 26, 91 and 182.

Hence, 176 has the most number of divisors.

5.

n	*Divisors excluding n*	*Sum of divisors*
6	1, 2, 3	6
9	1, 3	4
15	1, 3, 5	9
21	1, 3, 7	11

Clearly, 6 is a perfect number.

6.

$$1095\overline{)\,1168\,(1}$$
$$1095$$
$$73\overline{)\,1095\,(15}$$
$$73$$
$$365$$
$$365$$
$$\times$$

So, H.C.F. of 1095 and 1168 = 73.

$\therefore \quad \dfrac{1095}{1168} = \dfrac{1095 \div 73}{1168 \div 73} = \dfrac{15}{16}$.

7.

$$128352\overline{)\,238368\,(1}$$
$$128352$$
$$110016\overline{)\,128352\,(1}$$
$$110016$$
$$18336\overline{)\,110016\,(6}$$
$$110016$$
$$\times$$

So, H.C.F. of 128352 and 238368 = 18336.

$\therefore \quad \dfrac{128352}{238368} = \dfrac{128352 \div 18336}{238368 \div 18336} = \dfrac{7}{13}$.

8.

$$116690151\overline{)\,427863887\,(3}$$
$$350070453$$
$$77793434\overline{)\,116690151\,(1}$$
$$77793434$$
$$38896717\overline{)\,77793434\,(2}$$
$$77793434$$
$$\times$$

So, H.C.F. of 116,690,151 and 427,863,887 = 38896717.

$$\frac{116,690,151}{427,863,887}=\frac{116690151\div 38896717}{427863887\div 38896717}=\frac{3}{11}.$$

9. Since division by 0 is undefined, so 0 cannot be a factor of any natural number.

Hence, H.C.F. of 0 and 6 is undefined.

10. H.C.F. = Product of lowest powers of common factors
$= 2^2 \times 3^2 \times 5$.

11. H.C.F. = Product of lowest powers of common factors
$= 3 \times 5 \times 7 = 105$.

12. $4 \times 27 \times 3125 = 2^2 \times 3^3 \times 5^5$;

$8 \times 9 \times 25 \times 7 = 2^3 \times 3^2 \times 5^2 \times 7$;

$16 \times 81 \times 5 \times 11 \times 49 = 2^4 \times 3^4 \times 5 \times 7^2 \times 11$.

$\therefore$ H.C.F. $= 2^2 \times 3^2 \times 5 = 180$.

13. $36 = 2^2 \times 3^2$; $84 = 2^2 \times 3 \times 7$.

$\therefore$ H.C.F. $= 2^2 \times 3 = 12$.

14. Since all the numbers formed are even, 2 is a common factor.

Also, H.C.F. of two of the numbers i.e., 48 and 490, is 2.

So, the H.C.F. of all the numbers formed is 2.

15. $204 = 2^2 \times 3 \times 17$;

$1190 = 2 \times 5 \times 7 \times 17$; $1445 = 5 \times 17^2$.

$\therefore$ H.C.F. = 17.

16. H.C.F. of 18 and 25 is 1. So, they are co-primes.

17.
$$\begin{array}{r|l} 2923 & 3239 \ (\ 1 \\ & 2923 \\ \hline 316 & 2923 \ (\ 9 \\ & 2844 \\ \hline 79 & 316 \ (\ 4 \\ & 316 \\ \hline & \times \end{array}$$

$\therefore$ H.C.F. = 79.

18.
$$\begin{array}{r|l} 3444 & 3556 \ (\ 1 \\ & 3444 \\ \hline 112 & 3444 \ (\ 30 \\ & 3360 \\ \hline 84 & 112 \ (\ 1 \\ & 84 \\ \hline 28 & 84 \ (\ 3 \\ & 84 \\ \hline & \times \end{array}$$

$\therefore$ H.C.F. = 28.

19. L.C.M. = Product of highest powers of prime factors = $2^5 \times 3^4 \times 5^3 \times 7^2 \times 11$.

20.
2	24	–	36	–	40
2	12	–	18	–	20
2	6	–	9	–	10
3	3	–	9	–	5
	1	–	3	–	5

L.C.M. = $2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$.

21.
2	22	–	54	–	108	–	135	–	198
3	11	–	27	–	54	–	135	–	99
3	11	–	9	–	18	–	45	–	33
3	11	–	3	–	6	–	15	–	11
11	11	–	1	–	2	–	5	–	11
	1	–	1	–	2	–	5	–	1

L.C.M. = $2 \times 3 \times 3 \times 3 \times 11 \times 2 \times 5 = 5940$.

22. H.C.F. of 148 and 185 is 37. $\therefore$ L.C.M. $= \left(\frac{148\times 185}{37}\right)=740$.

23. H.C.F. of fractions $= \frac{\text{H.C.F. of Numerators}}{\text{L.C.M. of Denominators}}$.

H.C.F. of $\frac{a}{b},\frac{c}{d},\frac{e}{f}=\frac{\text{H.C.F. of } a, c, e}{\text{L.C.M. of } b, d, f}$.

24. Required H.C.F. $= \frac{\text{H.C.F. of } 2, 8, 64, 10}{\text{L.C.M. of } 3, 9, 81, 27}=\frac{2}{81}$.

25. Required H.C.F. $= \frac{\text{H.C.F. of } 9, 12, 18, 21}{\text{L.C.M. of } 10, 25, 35, 40}=\frac{3}{1400}$.

26. Required L.C.M. $= \frac{\text{L.C.M. of } 1, 5, 2, 4}{\text{H.C.F. of } 3, 6, 9, 27}=\frac{20}{3}$.

27. Required L.C.M. $= \frac{\text{L.C.M. of } 2, 3, 4, 9}{\text{H.C.F. of } 3, 5, 7, 13}=\frac{36}{1}=36$.

28. Required L.C.M. $= \frac{\text{L.C.M. of } 3, 6, 9}{\text{H.C.F. of } 4, 7, 8}=\frac{18}{1}=18$.

29. Given numbers with two decimal places are: 1.75, 5.60 and 7.00. Without decimal places, these numbers are: 175, 560 and 700, whose H.C.F. is 35.

$\therefore$ H.C.F. of given numbers = 0.35.

30. Given numbers are 1.08, 0.36 and 0.90. H.C.F. of 108, 36 and 90 is 18.

$\therefore$ H.C.F. of given numbers = 0.18.

31. Given numbers are 0.54, 1.80 and 7.20. H.C.F. of 54, 180 and 720 is 18.

$\therefore$ H.C.F. of given numbers = 0.18.

32. Given numbers are 3.00, 2.70 and 0.09. L.C.M. of 300, 270 and 9 is 2700.

$\therefore$ L.C.M. of given numbers = 27.00 = 27.

33. L.C.M. of A and B is B; L.C.M. of B and C is C $\Rightarrow$ L.C.M. of A, B and C is C.

34. $3240 = 2^3 \times 3^4 \times 5$; $3600 = 2^4 \times 3^2 \times 5^2$;

H.C.F. $= 36 = 2^2 \times 3^2$.

Since H.C.F. is the product of lowest powers of common factors, so the third number must have $(2^2 \times 3^2)$ as its factor.

Since L.C.M. is the product of highest powers of common prime factors, so the third number must have 3^5 and 7^2 as its factors.

$\therefore$ Third number $= 2^2 \times 3^5 \times 7^2$.

35. Let the required numbers be x, $2x$ and $3x$. Then, their H.C.F. $= x$. So, $x = 12$.

$\therefore$ The numbers are 12, 24 and 36.

36. Let the numbers be $3x$ and $4x$. Then, their H.C.F. = x. So, $x = 4$.
So, the numbers are 12 and 16.
L.C.M. of 12 and 16 = 48.

37. Let the required numbers be $27a$ and $27b$.
Then, $27a + 27b = 216 \Rightarrow a + b = 8$.
Now, co-primes with sum 8 are (1, 7) and (3, 5).
$\therefore$ Required numbers are $(27 \times 1, 27 \times 7)$ and $(27 \times 3, 27 \times 5)$ *i.e.*, (27, 189) and (81, 135).
Out of these, the one available in the given alternatives is the pair (27, 189).

38. Let the required numbers be $33a$ and $33b$.
Then, $33a + 33b = 528 \Rightarrow a + b = 16$.
Now, co-primes with sum 16 are (1, 15), (3, 13), (5, 11) and (7, 9).
$\therefore$ Required numbers are $(33 \times 1, 33 \times 15)$, $(33 \times 3, 33 \times 13)$, $(33 \times 5, 33 \times 11)$, $(33 \times 7, 33 \times 9)$.
The number of such pairs is 4.

39. Numbers with H.C.F. 15 must contain 15 as a factor.
Now, multiples of 15 between 40 and 100 are 45, 60, 75 and 90.
$\therefore$ Number-pairs with H.C.F. 15 are (45, 60), (45, 75), (60, 75) and (75, 90).
[$\because$ H.C.F. of (60, 90) is 30 and that of (45, 90) is 45]
Clearly, there are 4 such pairs.

40. Out of the given numbers, the two with H.C.F. 12 and difference 12 are 84 and 96.

41. Let the numbers be $37a$ and $37b$.
Then, $37a \times 37b = 4107 \Rightarrow ab = 3$.
Now, co-primes with product 3 are (1, 3).
So, the required numbers are $(37 \times 1, 37 \times 3)$ *i.e.*, (1, 111).
$\therefore$ Greater number = 111.

42. Let the numbers be $13a$ and $13b$.
Then, $13a \times 13b = 2028 \Rightarrow ab = 12$.
Now, co-primes with product 12 are (1, 12) and (3, 4).
So, the required numbers are $(13 \times 1, 13 \times 12)$ and $(13 \times 3, 13 \times 4)$.
Clearly, there are 2 such pairs.

43. Since the numbers are co-prime, they contain only 1 as the common factor.
Also, the given two products have the middle number in common.
So, middle number = H.C.F. of 551 and 1073 = 29;

$$\text{First number} = \left(\frac{551}{29}\right) = 19;$$

$$\text{Third number} = \left(\frac{1073}{29}\right) = 37.$$

$\therefore$ Required sum = (19 + 29 + 37) = 85.

44. Let the numbers be $13x$ and $15x$.
Then, their L.C.M. = $195x$.
So, $195x = 39780$ or $x = 204$.
$\therefore$ The numbers are 2652 and 3060.

45. Let the numbers be $3x$, $4x$ and $5x$.
Then, their L.C.M. = $60x$.
So, $60x = 2400$ or $x = 40$.
$\therefore$ The numbers are (3×40), (4×40) and (5×40).
Hence, required H.C.F. = 40.

46. Let the numbers be $2x$, $3x$, $5x$ and $7x$ respectively.
Then, their L.C.M. = $(2 \times 3 \times 5 \times 7)\, x = 210x$.
[$\because$ 2, 3, 5, 7 are prime numbers]
So, $210x = 630$ or $x = 3$.
$\therefore$ The numbers are 6, 9, 15 and 21.
Required difference = 21 – 6 = 15.

47. Other number $= \left(\dfrac{12 \times 336}{84}\right) = 48.$

48. L.C.M. $= \dfrac{324}{3} = 108.$

49. Product of numbers = H.C.F. × L.C.M.
$\Rightarrow pq = x \times$ L.C.M.

$$\Rightarrow \text{L.C.M.} = \frac{pq}{x} = \frac{p(xy)}{x} = py.$$

50. Let the numbers be x and $(2000 - x)$.
Then, their L.C.M. = $x\,(2000 - x)$.
So, $x\,(2000 - x) = 21879$
$\Leftrightarrow x^2 - 2000x + 21879 = 0$
$\Leftrightarrow (x - 1989)\,(x - 11) = 0$
$\Leftrightarrow x = 1989$ or $x = 11$.
Hence, the numbers are 1989 and 11.

51. Let the numbers be x and $4x$.

$$\text{Then, } x \times 4x = 84 \times 21 \Leftrightarrow x^2 = \left(\frac{84 \times 21}{4}\right) \Leftrightarrow x = 21.$$

Hence, larger number = $4x = 84$.

52. Let the numbers be x and $(100 - x)$.
Then, $x\,(100 - x) = 5 \times 495$
$\Leftrightarrow x^2 - 100x + 2475 = 0$
$\Leftrightarrow (x - 55)\,(x - 45) = 0$
$\Leftrightarrow x = 55$ or $x = 45$.
$\therefore$ The numbers are 45 and 55.
Required difference = (55 – 45) = 10.

53. Let the numbers be x and $(x + 2)$.
Then, $x\,(x + 2) = 24$
$\Leftrightarrow x^2 + 2x - 24 = 0$
$\Leftrightarrow (x - 4)\,(x + 6) = 0 \Leftrightarrow x = 4$.
So, the numbers are 4 and 6.

54. Let the numbers be a and b.
Then, $a + b = 36$ and $ab = 3 \times 105 = 315$.

$$\therefore \text{ Required sum } = \frac{1}{a} + \frac{1}{b} = \frac{a+b}{ab} = \frac{36}{315} = \frac{4}{35}.$$

55. Let H.C.F be h and L.C.M. be l.
Then, $l = 12h$ and $l + h = 403$.
$\therefore$ $12h + h = 403$ or $h = 31$.
So $l = (403 - 31) = 372$.

$$\text{Hence, other number } = \left(\frac{31 \times 372}{93}\right) = 124.$$

56. First number = (50 × 2) = 100.

Second number = $\left(\frac{50\times250}{100}\right)$ = 125.

57. L.C.M. = $\frac{\text{Product of numbers}}{\text{H.C.F.}} = \frac{1320}{6}$ = 220.

58. H.C.F. of co-prime numbers is 1. So, L.C.M. = $\frac{117}{1}$ = 117.

59. Since H.C.F. is always a factor of L.C.M., we cannot have three numbers with H.C.F. 35 and L.C.M. 120.

60. H.C.F. of two numbers divides their L.C.M. exactly. Clearly, 8 is not a factor of 60.

61. The factors of 9570 are 2, 3, 5, 11 and 29.

Clearly, H.C.F. can be any of these factors occurring not more than once and no number other than 2, 3, 5, 11 or 29 or having any factor other than these, can be the H.C.F.

So, the only possibility is 11.

2	9570
3	4785
5	1595
11	319
	29

62. Clearly, the numbers are (23 × 13) and (23 × 14).

∴ Larger number = (23 × 14) = 322.

63. Since 16 is not a factor of 136, it follows that there does not exist any pair of numbers with H.C.F. 16 and L.C.M. 136.

64. Product of numbers = 21 × 4641 = 97461.

Let the numbers be 21a and 21b.

Then, 21a × 21b = 97461 ⇒ ab = 221.

Now, co-primes with product 221 are (1, 221) and (13, 17).

So, the numbers are (21 × 1, 21 × 221) and (21 × 13, 21 × 17).

Since one number lies between 200 and 300, the suitable pair is (273, 357).

65. Product of numbers = 29 × 4147.

Let the numbers be 29a and 29b.

Then, 29a × 29b = (29 × 4147) ⇒ ab = 143.

Now, co-primes with product 143 are (1, 143) and (11, 13).

So, the numbers are (29 × 1, 29 × 143) and (29 × 11, 29 × 13).

Since both numbers are greater than 29, the suitable pair is (29 × 11, 29 × 13), i.e., (319, 377).

∴ Required sum = (319 + 377) = 696.

66. H.C.F. of two prime numbers is 1.

Product of numbers = (1 × 161) = 161.

Let the numbers be a and b. Then, ab = 161.

Now, co-primes with product 161 are (1, 161) and (7, 23).

Since x and y are prime numbers and $x > y$, we have x = 23 and y = 7.

∴ $3y - x = (3 \times 7) - 23 = -2$.

67. H.C.F. of 2436 and 1001 is 7. Also, H.C.F. of 105 and 7 is 7.

∴ H.C.F. of 105, 1001 and 2436 is 7.

68. For the minimum number of rows, the number of trees in each row must be the maximum.

∴ Number of trees in each row = H.C.F. of 21, 42, 56 = 7.

Hence, number of rows

= $\left(\frac{21+42+56}{7}\right)=\frac{119}{7}=17$.

69. Required length = H.C.F. of 700 cm, 385 cm and 1295 cm = 35 cm.

70. Required capacity

= H.C.F. of 120 litres and 56 litres

= 8 litres = 8000 cc. [∵ 1 litre = 1000 cc]

71. Maximum possible daily wage = H.C.F. of ₹ 5750 and ₹ 5000 = ₹ 250.

72. For the least number of bottles, the capacity of each bottle must be maximum.

∴ Capacity of each bottle = H.C.F. of 403 litres, 465 litres and 496 litres = 31 litres.

Hence, required number of bottles

= $\left(\frac{403+465+496}{31}\right)=\frac{1364}{31}=44$.

73. Required number of students = H.C.F. of 1001 and 910 = 91.

74. Largest size of the tile = H.C.F. of 378 cm and 525 cm = 21 cm.

75. For the least number of tiles, the size of the tile must be the maximum.

Maximum size of the tile = H.C.F. of 1517 cm and 902 cm = 41 cm.

Hence, required number of tiles

= $\frac{\text{Area of ceiling}}{\text{Area of each tile}}=\left(\frac{1517\times902}{41\times41}\right)=814$.

76. Number of books in each stack = H.C.F. of 336, 240 and 96 = 48.

Hence, total number of stacks = $\left(\frac{336+240+96}{48}\right)=\frac{672}{48}=14$.

77. Maximum length of each part = H.C.F. of 78 cm, 104 cm, 117 cm, 169 cm = 13 cm.

∴ Number of pieces =

$\left(\frac{78+104+117+169}{13}\right)=\frac{468}{13}=36$.

78. Required number

= H.C.F. of (91 – 43), (183 – 91) and (183 – 43)

= H.C.F. of 48, 92 and 140 = 4.

79. d = H.C.F. of (8506 – 7654), (9997 – 8506) and (9997 – 7654)

= H.C.F. of 852, 1491 and 2343 = 213.

Clearly, r = 199.

∴ $d - r$ = 213 – 199 = 14.

213) 7654 (35
639
1264
1065
199

80. N = H.C.F. of (4665 – 1305), (6905 – 4665) and (6905 – 1305)

= H.C.F. of 3360, 2240 and 5600 = 1120.

Sum of digits in N = (1 + 1 + 2 + 0) = 4.

81. Required volume

= [H.C.F. of (129 – 57), (177 – 129) and (177 – 57)] litres

= (H.C.F. of 72, 48 and 120) litres = 24 litres.

82. Required number
= H.C.F. of (1356 – 12), (1868 – 12) and (2764 – 12)
= H.C.F. of 1344, 1856 and 2752 = 64.

83. Required number
= H.C.F. of (3026 – 11) and (5053 – 13)
= H.C.F. of 3015 and 5040 = 45.

84. Required number
= H.C.F. of (964 – 41), (1238 – 31) and (1400 – 51)
= H.C.F. of 923, 1207 and 1349 = 71.

85. L.C.M. of 8, 16, 40 and 80 = 80.

$\frac{7}{8} = \frac{70}{80}; \frac{13}{16} = \frac{65}{80}; \frac{31}{40} = \frac{62}{80}.$

Since, $\frac{70}{80} > \frac{65}{80} > \frac{63}{80} > \frac{62}{80}$, so $\frac{7}{8} > \frac{13}{16} > \frac{63}{80} > \frac{31}{40}$. So, $\frac{7}{8}$ is the largest.

86. Required number
= L.C.M. of 1, 2, 3, 4, 5, 6, 7, 8, 9
= 2 × 2 × 3 × 5 × 7 × 2 × 3 = 2520.

2	1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9
2	1 – 1 – 3 – 2 – 5 – 3 – 7 – 4 – 9
3	1 – 1 – 3 – 1 – 5 – 3 – 7 – 2 – 9
	1 – 1 – 1 – 1 – 5 – 1 – 7 – 2 – 3

87. L.C.M. of 12, 18, 21, 30
= 2 × 3 × 2 × 3 × 7 × 5
= 1260.
∴ Required number = (1260 ÷ 2) = 630.

2	12 – 18 – 21 – 30
3	6 – 9 – 21 – 15
	2 – 3 – 7 – 5

88. Let the two numbers be a and b.
Then, $a + b = 45$ ...(*i*)
And, $a - b = 5$ ...(*ii*)
Adding (*i*) and (*ii*), we get: $2a = 50$ or $a = 25$.
Putting $a = 25$ in (*i*), we get: $b = 20$.
∴ L.C.M. = 5 × 4 × 5 = 100.

5	20 – 25
	4 – 5

89. Required fraction

$= \text{L.C.M. of } \frac{6}{7}, \frac{5}{14}, \frac{10}{21} = \frac{\text{L.C.M. of 6, 5, 10}}{\text{H.C.F. of 7, 14, 21}} = \frac{30}{7}.$

90. Least number of 5 digits is 10000. L.C.M. of 12, 15 and 18 is 180.
On dividing 10000 by 180, the remainder is 100.
∴ Required number = 10000 + (180 – 100) = 10080.

91. Greatest number of 4 digits is 9999.

5	15 – 25 – 40 – 75
5	3 – 5 – 8 – 15
3	3 – 1 – 8 – 3
	1 – 1 – 8 – 1

L.C.M. of 15, 25, 40 and 75 = 5 × 5 × 3 × 8 = 600.
On dividing 9999 by 600, the remainder is 399.
∴ Required number = (9999 – 399) = 9600.

92. L.C.M. of 12, 18, 21 and 32 = 2 × 2 × 3 × 3 × 7 × 8 = 2016.

2	12 – 18 – 21 – 32
2	6 – 9 – 21 – 16
3	3 – 9 – 21 – 8
	1 – 3 – 7 – 8

So, the required number is a multiple of 2016 and lies between 4000 and 5000.
Hence, required number = 4032.

93. L.C.M. of 25, 50 and 75 = 5 × 5 × 2 × 3 = 150.

5	25 – 50 – 75
5	5 – 10 – 15
	1 – 2 – 3

On dividing 43582 by 150, the remainder is 82 and quotient is 290.
So, required number = 150 × 291 = 43650.

94. L.C.M. of 5, 6, 4 and 3 = 60. On dividing 2497 by 60, the remainder is 37.
∴ Number to be added = (60 – 37) = 23.

95. L.C.M. of 20, 28, 32, 35 = 2 × 2 × 5 × 7 × 8 = 1120.
Required number = (5834 – 1120) = 4714.

2	20 – 28 – 32 – 35
2	10 – 14 – 16 – 35
5	5 – 7 – 8 – 35
7	1 – 7 – 8 – 7
	1 – 1 – 8 – 1

96. The least number divisible by 16, 20, 24
= L.C.M. of 16, 20, 24 = 240 = 2 × 2 × 2 × 2 × 3 × 5.
To make it a perfect square, it must be multiplied by 3 × 5.
∴ Required number = 240 × 3 × 5 = 3600.

97. Required number = (L.C.M. of 12, 16, 18, 21, 28) + 7
= 1008 + 7 = 1015.

98. Required number = (L.C.M. of 24, 32, 36, 54) – 5
= 864 – 5 = 859.

99. Required number = (L.C.M. of 12, 15, 20, 54) + 8
= 540 + 8 = 548.

100. L.C.M. of 4, 5, 6, 7 = 420.
∴ Required number = 420 + 1 = 421.

101. Greatest number of 3 digits is 999. L.C.M. of 6, 9 and 12 is 36.
On dividing 999 by 36, the remainder obtained is 27.
So, required number = (999 – 27) + 3 = 975.

102. Greatest number of 4 digits is 9999. L.C.M. of 4, 7 and 13 = 364.
On dividing 9999 by 364, the remainder obtained is 171.
∴ Greatest number of 4 digits divisible by 4, 7 and 13 = (9999 – 171) = 9828.
Hence, required number = (9828 + 3) = 9831.

103. Least number of 6 digits is 100000. L.C.M. of 4, 6, 10 and 15 = 60.
On dividing 100000 by 60, the remainder obtained is 40.
∴ Least number of 6 digits divisible by 4, 6, 10 and 15

= 100000 + (60 – 40) = 100020.

∴ N = (100020 + 2) = 100022.

Sum of digits in N = (1 + 2 + 2) = 5.

104. L.C.M. of 4, 5, 6, 7 and 8 is 840.

Let the required number be $840k + 2$, which is a multiple of 13.

Least value of k for which $(840k + 2)$ is divisible by 13 is $k = 3$.

∴ Required number = 840 × 3 + 2 = 2522.

105. Here (12 – 7) = 5, (15 – 10) = 5 and (16 – 11) = 5.

∴ Required number = (L.C.M. of 12, 15, 16) – 5

= 240 – 5 = 235.

106. Here (48 – 38) = 10, (60 – 50) = 10, (72 – 62) = 10

(108 – 98) = 10 & (140 – 130) = 10.

∴ Required number = (L.C.M. of 48, 60, 72, 108, 140) – 10 = 15120 – 10 = 15110.

107. Here (18 – 7) = 11, (21 – 10) = 11 and (24 – 13) = 11.

L.C.M. of 18, 21 and 24 is 504.

Let the required number be $504k – 11$.

Least value of k for which $(504k – 11)$ is divisible by 23 is $k = 6$.

∴ Required number = 504 × 6 – 11 = 3024 – 11 = 3013.

108. Clearly, (2 – 1) = 1, (3 – 2) = 1 and (4 – 3) = 1.

L.C.M. of 2, 3, 4 = 12.

So, the sequence shall have numbers of the form $12k – 1$, where $k = 1, 2, 3,.....$

∴ Third term of the sequence = 12 × 3 – 1

= 36 – 1 = 35.

109. Clearly, (4 – 1) = 3, (5 – 2) = 3, (6 – 3) = 3, (7 – 4) = 3 and (8 – 5) = 3.

L.C.M. of 4, 5, 6, 7, 8 = 840.

Greatest number of 4 digits = 9999.

On dividing 9999 by 840, the remainder is 759.

So, required number = (9999 – 759) – 3 = 9237.

110. L.C.M. of 5, 6, 7, 8 = 840.

∴ Required number is of the form $840k + 3$.

Least value of k for which $(840k + 3)$ is divisible by 9 is $k = 2$.

∴ Required number = (840 × 2 + 3) = 1683.

111. L.C.M of 16, 18, 20, 25 = 3600.

Required number is of the form $3600k + 4$.

Least value of k for which $(3600k + 4)$ is divisible by 7 is $k = 5$.

∴ Required number = (3600 × 5 + 4) = 18004.

112. L.C.M. of 6, 8, 10, 12 = 120.

∴ Required number is of the form $120k + 5$.

Least value of k for which $(120k + 5)$ is divisible by 13 is $k = 7$.

∴ Required number = (120 × 7 + 5) = 845.

113. Required number of beads = L.C.M. of 16, 20, 36 = 720.

114. Interval of change = (L.C.M. of 60 and 62) sec = 1860 sec = 31 min.

So, the devices would beep together 31 min after 10 a.m., i.e., at 10.31 a.m.

115. L.C.M. of 2, 4, 6, 8, 10, 12 is 120.

So, the bells will toll together after every 120 seconds, i.e., 2 minutes.

In 30 minutes, they will toll together $\left[\left(\frac{30}{2}\right)+1\right]$ = 16 times.

116. Interval after which the bells will toll together

= (L.C.M. of 6, 7, 8, 9) sec = 504 sec.

In 1.54 hours, they will toll together $\left[\left(\frac{1.54\times 60\times 60}{504}\right)+1\right]$ times = 12 times.

117. Interval after which the devices will beep together

= (L.C.M. of 30, 60, 90, 105) min.

= 1260 min = 21 hrs.

So, the devices will again beep together 21 hrs. after 12 noon i.e., at 9 a.m.

118. L.C.M. of 24, 36, 48 = 144.

So, the three girls will meet at one point in 144 seconds i.e., 2 min 24 sec.

119. L.C.M. of $\frac{91}{6}, \frac{65}{4}$ and $\frac{56}{3} = \frac{\text{L.C.M. of } 91, 65, 56}{\text{H.C.F. of } 6, 4, 3} = 3640.$

So, the three persons will be together at the starting point in 3640 sec

i.e., 1 hour 40 seconds.

120. L.C.M. of 252, 308 and 198 = 2772.

So, A, B and C will again meet at the starting point in 2772 sec. *i.e.*, 46 min. 12 sec.

121. For one complete revolution, the first, second and third wheels take $\frac{60}{40}, \frac{60}{24}, \frac{60}{16}$ seconds i.e., $\frac{3}{2}, \frac{5}{2}, \frac{15}{4}$ seconds respectively.

∴ Time taken for all red spots to touch the ground again simultaneously.

$$= \left(\text{L.C.M. of } \frac{3}{2}, \frac{5}{2}, \frac{15}{4}\right)\text{sec} = \left(\frac{\text{L.C.M.of } 3, 5, 15}{\text{H.C.F. of } 2, 2, 4}\right)\text{sec}$$

$$= \frac{15}{2}\text{sec} = 7\frac{1}{2}\text{sec}.$$

122. First pendulum strikes once in $\frac{3}{5}$ seconds. Second pendulum strikes once in $\frac{4}{7}$ seconds.

L.C.M. of $\frac{3}{5}$ and $\frac{4}{7} = \frac{\text{L.C.M. of 3 and 4}}{\text{H.C.F. of 5 and 7}} = 12.$

So, they strike together after every 12 seconds.

Thus, they strike together $\left(\frac{60}{12}+1\right)$ = 6 times in 1 minute.

∴ Total number of clear strikes heard

$$= \left[\frac{60}{\left(\frac{3}{5}\right)}+\frac{60}{\left(\frac{4}{7}\right)}\right]-6 = \left(60\times\frac{5}{3}+60\times\frac{7}{4}\right)-6$$

= (100 + 105) – 6 = 199.

123. H.C.F. of 132, 204 and 228.

$132 = 2 \times 2 \times 3 \times 11$;

$204 = 2 \times 2 \times 3 \times 17$;

$228 = 2 \times 2 \times 3 \times 19$

$\therefore$ HCF of 132, 204 and 228 is $2 \times 2 \times 3$ i.e. 12

$\therefore$ Required HCF = 12

Alternative method:

$$132\overline{)204}\,(1$$
$$132$$
$$72\overline{)132}\,(1$$
$$72$$
$$60\overline{)72}\,(1$$
$$60$$
$$12\overline{)60}\,(5$$
$$60$$
$$\times$$

Again HCF of 12 and 228

12	228	19
	12	
	108	
	108	
	×	

$\therefore$ Required HCF = 12

124. The given three numbers are $2a$, $5a$ and $7a$. LCM of $2a$, $5a$ and $7a = 2 \times 5 \times 7 \times a = 70a$

125. Product of two numbers = 1500, HCF = 10

$$\text{LCM} = \frac{\text{Product of two numbers}}{\text{Their HCF}}$$

$$= \frac{1500}{10} = 150$$

Required LCM is 150.

126. LCM of 8, 12 and 16 = 48

2	8 – 12 – 16
2	4 – 6 – 8
2	2 – 3 – 4
	1 – 3 – 2

$2 \times 2 \times 2 \times 2 \times 3 = 48$

$\therefore$ Required number $= 48a + 3$

Which is divisible by 7.

$\therefore x = 48a + 3 = 7 \times 6a + 6a + 3$

$= (7 \times 6a) + (6a + 3)$ which is divisible by 7.

i.e. $6a + 3$ is divisible by 7.

When $a = 3$, $6a + 3 = 18 + 3 = 21$ which is divisible by 7.

$\therefore x = 48 \times 3 + 3 = 144 + 3 = 147$

127. Number of pair of positive integers whose sum is 99 and HCF is 9 is (9, 90; (18, 81); (27, 72); (36, 63) ; (45, 54).

128. Let the numbers are $3x$ and $4x$

So, HCF = x

$\because$ HCF $\times$ LCM = Product of numbers

$\Rightarrow x \times 120 = 3x \times 4x$

$\Rightarrow x \times 120 = 12x^2$

$\Rightarrow 120 = 12x$

$\Rightarrow x = 10$

$\therefore$ Numbers are 30 and 40.

$\therefore$ Sum of two numbers = 30 + 40 = 70

129. The greatest 4 digit number is 9999

The LCM of 12, 18, 21, 28 is 252

On dividing 9999 by 252 the remainder comes out to be 171

$\therefore$ Required number = 9999 – 171 = 9828

130.

5	45 – 75 – 90
3	9 – 15 – 18
3	3 – 5 – 6
	1 – 5 – 2

$\Rightarrow 5 \times 3 \times 3 \times 5 \times 2 = 450$

LCM of 45, 75, 90 is 450

$\therefore$ Traffic lights will change simultaneously after 7 minutes 30 seconds i.e. at 7 : 27 : 45 hours.