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 108, 288 and 360.***

Sol. $108 = 2^2 \times 3^3$, $288 = 2^5 \times 3^2$ 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.

$$
\begin{array}{l}
1134\ )\ 1215\ (\ 1 \\
1134 \\
\hline
81\ )\ 1134\ (\ 14 \\
81 \\
\hline
324 \\
324 \\
\hline
\times
\end{array}
$$

$\therefore$ H.C.F. of 1134 and 1215 is 81.

So, Required H.C.F. = H.C.F. of 513 and 81.

$$
\begin{array}{l}
81\ )\ 513\ (\ 6 \\
486 \\
\hline
27\ )\ 81\ (\ 3 \\
81 \\
\hline
\times
\end{array}
$$

$\therefore$ H.C.F. of given numbers = 27.

Ex. 4. ***Reduce*** $\dfrac{391}{667}$ ***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 $= 2^3 \times 3^3 \times 5^3 \times 7^4 \times 11$.

Ex. 6. ***Find the L.C.M. of 72, 108 and 2100.***

Sol. $72 = 2^3 \times 3^2$, $108 = 3^3 \times 2^2$, $2100 = 2^2 \times 5^2 \times 3 \times 7$.

$\therefore$ 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 $= \frac{\text{H.C.F. of } 2, 8, 16, 10}{\text{L.C.M. of } 3, 9, 81, 27} = \frac{2}{81}$.

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

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.

∴ H.C.F. of 0.63, 1.05 and 2.1 is 0.21.

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

∴ 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, $x = 13$.

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

Ex. 11. ***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.***

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

Ex. 12. ***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.

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

∴ H.C.F. $= 3^2 \times 5 = 45$.

Hence, required length = 45 cm.

Ex. 13. ***Find the greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively.***

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

```
1651 ) 2032 ( 1
       1651
       ----
        381 ) 1651 ( 4
              1524
              ----
               127 ) 381 ( 3
                     381
                     ---
                      ×
```

∴ Required number = 127.

Ex. 14. ***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. 15. ***Find the least number exactly divisible by 12, 15, 20 and 27.***

Sol. Required number = L.C.M. of 12, 15, 20, 27.

3	12	–	15	–	20	–	27
4	4	–	5	–	20	–	9
5	1	–	5	–	5	–	9
	1	–	1	–	1	–	9

$\therefore$ L.C.M. = $3 \times 4 \times 5 \times 9 = 540$.

Hence, required number = 540.

Ex. 16. ***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

$\therefore$ L.C.M. = $3 \times 2 \times 2 \times 7 \times 2 \times 3 = 504$.

Hence, required number = $(504 + 1) = 505$.

Ex. 17. ***Find the largest number of four digits exactly divisible by 12, 15, 18 and 27.***

Sol. The largest number of four digits is 9999.

Required number must be divisible by L.C.M. of 12, 15, 18, 27 *i.e.*, 540.

On dividing 9999 by 540, we get 279 as remainder.

$\therefore$ Required number = $(9999 - 279) = 9720$.

Ex. 18. ***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.

$\therefore$ Required number = $10000 + (432 - 64) = 10368$.

Ex. 19. ***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. 20. ***Find the least number which when divided by 5, 6, 7 and 8 leaves a remainder 3, but when divided by 9 leaves no remainder.***

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

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

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

$\therefore$ Required number = $(840 \times 2 + 3) = 1683$.

Ex. 21. ***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?***

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. 22. *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, $\frac{17}{18} = \frac{17 \times 10}{18 \times 10} = \frac{170}{180}$; $\frac{31}{36} = \frac{31 \times 5}{36 \times 5} = \frac{155}{180}$;

$\frac{43}{45} = \frac{43 \times 4}{45 \times 4} = \frac{172}{180}$; $\frac{59}{60} = \frac{59 \times 3}{60 \times 3} = \frac{177}{180}$.

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 2

(OBJECTIVE TYPE QUESTIONS)

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

1. 252 can be expressed as a product of primes as : (IGNOU, 2002)
   (a) $2 \times 2 \times 3 \times 3 \times 7$ (b) $2 \times 2 \times 2 \times 3 \times 7$
   (c) $3 \times 3 \times 3 \times 3 \times 7$ (d) $2 \times 3 \times 3 \times 3 \times 7$
2. Which of the following has most number of divisors ? (M.B.A. 2002)
   (a) 99 (b) 101 (c) 176 (d) 182
3. 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
4. $\frac{1095}{1168}$ when expressed in simplest form is : (M.B.A. 1998)
   (a) $\frac{13}{16}$ (b) $\frac{15}{16}$ (c) $\frac{17}{26}$ (d) $\frac{25}{26}$
5. Reduce $\frac{128352}{238368}$ to its lowest terms. (IGNOU, 2003)
   (a) $\frac{3}{4}$ (b) $\frac{5}{13}$ (c) $\frac{7}{13}$ (d) $\frac{9}{13}$
6. 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) $2^4 \times 3^4 \times 5^5 \times 7 \times 11$
7. 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
8. 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 : (C.B.I. 1997)
   (a) 180 (b) 360 (c) 540 (d) 1260
9. Find the highest common factor of 36 and 84. (R.R.B. 2003)
   (a) 4 (b) 6 (c) 12 (d) 18
10. The H.C.F. of 204, 1190 and 1445 is :
    (a) 17 (b) 18 (c) 19 (d) 21
11. Which of the following is a pair of co-primes ?
    (a) (16, 62) (b) (18, 25) (c) (21, 35) (d) (23, 92)

12. The H.C.F. of 2923 and 3239 is :
(a) 37 (b) 47 (c) 73 (d) 79

13. The H.C.F. of 3556 and 3444 is :
(a) 23 (b) 25 (c) 26 (d) 28

14. 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) $2^5 \times 3^4 \times 5^3 \times 7^2 \times 11$

15. Find the lowest common multiple of 24, 36 and 40. **(R.R.B. 2003)**
(a) 120 (b) 240 (c) 360 (d) 480

16. The L.C.M. of 22, 54, 108, 135 and 198 is : **(M.B.A. 1998)**
(a) 330 (b) 1980 (c) 5940 (d) 11880

17. The L.C.M. of 148 and 185 is :
(a) 680 (b) 740 (c) 2960 (d) 3700

18. 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) $\frac{160}{81}$

19. 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) $\frac{3}{2800}$ (d) $\frac{63}{700}$

20. 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

21. 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) $\frac{12}{455}$

22. The H.C.F. of 1.75, 5.6 and 7 is :
(a) 0.07 (b) 0.7 (c) 3.5 (d) 0.35

23. 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

24. The H.C.F. of 0.54, 1.8 and 7.2 is :
(a) 1.8 (b) 0.18 (c) 0.018 (d) 18

25. The L.C.M. of 3, 2.7 and 0.09 is :
(a) 2.7 (b) 0.27 (c) 0.027 (d) 27

26. 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 : **(S.S.C. 1999)**
(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) $2^3 \times 3^5 \times 7^2$

27. 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
(Section Officers', 2001)

28. 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
(S.S.C. 2002)

29. 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, 16-

30. 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 : **(C.B.I. 1997)**

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

31. 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

32. 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

33. The product of two numbers is 4107. If the H.C.F. of these numbers is 37, then the greater number is : **(S.S.C. 2003)**

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

34. The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is : **(C.B.I. 2003)**

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

35. 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

(S.S.C. 2003)

36. The L.C.M. of two numbers is 48. The numbers are in the ratio 2 : 3. The sum of the numbers is : **(S.S.C. 2003)**

(*a*) 28 (*b*) 32 (*c*) 40 (*d*) 64

37. 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

(M.B.A. 2003)

38. The H.C.F. of two numbers is 11 and their L.C.M. is 7700. If one of the numbers is 275, then the other is : **(Section Officers', 2001)**

(*a*) 279 (*b*) 283 (*c*) 308 (*d*) 318

39. 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

40. 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 : **(M.A.T. 1997)**

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

41. 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 : **(S.S.C. 1999)**

(*a*) 10 (*b*) 46 (*c*) 70 (*d*) 90

42. 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

43. If the sum of two numbers is 55 and the H.C.F. and L.C.M. of these numbers are 5 and 120 respectively, then the sum of the reciprocals of the numbers is equal to :

(*a*) $\frac{55}{601}$ (*b*) $\frac{601}{55}$ (*c*) $\frac{11}{120}$ (*d*) $\frac{120}{11}$

(C.D.S. 2003)

44. The L.C.M. of two numbers is 45 times their H.C.F. If one of the numbers is 125 and the sum of H.C.F. and L.C.M. is 1150, the other number is :

(*a*) 215 (*b*) 220 (*c*) 225 (*d*) 235

45. 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

46. 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

47. Product of two co-prime numbers is 117. Their L.C.M. should be : **(C.B.I. 1997)**
(*a*) 1 (*b*) 117 (*c*) equal to their H.C.F. (*d*) cannot be calculated

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

49. 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
(S.S.C. 2000)

50. 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 : **(S.S.C. 2004)**
(*a*) 276 (*b*) 299 (*c*) 322 (*d*) 345

51. 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

52. The H.C.F. and L.C.M. of two numbers are 11 and 385 respectively. If one number lies between 75 and 125, then that number is : **(C.B.I. 1998)**
(*a*) 77 (*b*) 88 (*c*) 99 (*d*) 110

53. Two numbers, both greater than 29, have H.C.F. 29 and L.C.M. 4147. The sum of the numbers is : **(S.S.C. 2002)**
(*a*) 666 (*b*) 669 (*c*) 696 (*d*) 966

54. 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
(S.S.C. 1999)

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

56. 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. 2003)**
(*a*) 15 cm (*b*) 25 cm (*c*) 35 cm (*d*) 42 cm

57. Three different containers contain 496 litres, 403 litres and 713 litres of mixtures of milk and water respectively. What biggest measure can measure all the different quantities exactly ?
(*a*) 1 litre (*b*) 7 litres (*c*) 31 litres (*d*) 41 litres

58. The maximum number of students among them 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 : **(S.S.C. 1999)**
(*a*) 91 (*b*) 910 (*c*) 1001 (*d*) 1911

59. 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 ? **(N.I.F.T. 2000)**
(*a*) 14 cms (*b*) 21 cms (*c*) 42 cms (*d*) None of these

60. Find the greatest number that will divide 43, 91 and 183 so as to leave the same remainder in each case. **(L.I.C. 2003)**
(*a*) 4 (*b*) 7 (*c*) 9 (*d*) 13

61. 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

62. 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

63. The greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively, is : **(R.R.B. 2004)**
(*a*) 123 (*b*) 127 (*c*) 235 (*d*) 305

64. Which of the following fractions is the largest ? **(IGNOU, 2003)**
(*a*) $\frac{7}{8}$ (*b*) $\frac{13}{16}$ (*c*) $\frac{31}{40}$ (*d*) $\frac{63}{80}$

65. What will be the least number which when doubled will be exactly divisible by 12, 18, 21 and 30 ? **(S.S.C. 2003)**
(*a*) 196 (*b*) 630 (*c*) 1260 (*d*) 2520

66. The smallest fraction, which each of $\frac{6}{7}, \frac{5}{14}, \frac{10}{21}$ will divide exactly, is : **(S.S.C. 1998)**
(*a*) $\frac{30}{7}$ (*b*) $\frac{30}{98}$ (*c*) $\frac{60}{147}$ (*d*) $\frac{50}{294}$

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

68. The greatest number of four digits which is divisible by 15, 25, 40 and 75 is :
(*a*) 9000 (*b*) 9400 (*c*) 9600 (*d*) 9800 **(S.S.C. 2002)**

69. The least number which should be added to 2497 so that the sum is exactly divisible by 5, 6, 4 and 3 is : **(Hotel Management, 2003)**
(*a*) 3 (*b*) 13 (*c*) 23 (*d*) 33

70. 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

71. The smallest number which when diminished by 7, is divisible by 12, 16, 18, 21 and 28 is : **(L.I.C. 2003)**
(*a*) 1008 (*b*) 1015 (*c*) 1022 (*d*) 1032

72. 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

73. The least number, which when divided by 12, 15, 20 and 54 leaves in each case a remainder of 8, is : **(R.R.B. 2003)**
(*a*) 504 (*b*) 536 (*c*) 544 (*d*) 548

74. 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

75. 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. 2003)**
(*a*) 3 (*b*) 4 (*c*) 5 (*d*) 6

76. The least multiple of 7, which leaves a remainder of 4, when divided by 6, 9, 15 and 18 is : **(A.A.O. Exam, 2003)**
(*a*) 74 (*b*) 94 (*c*) 184 (*d*) 364

77. The least number, which when divided by 48, 60, 72, 108 and 140 leaves 38, 50, 62, 98 and 130 as remainders respectively, is : **(C.B.I. 1997)**
(*a*) 11115 (*b*) 15110 (*c*) 15120 (*d*) 15210

78. 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

79. 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 : **(L.I.C.A.A.O. 2003)**
(*a*) 1677 (*b*) 1683 (*c*) 2523 (*d*) 3363

80. 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

81. 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 ?
(a) 4 (b) 10 (c) 15 (d) 16

82. 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.

83. 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 ? **(S.S.C. 2003)**
(a) 26 minutes 18 seconds (b) 42 minutes 36 seconds
(c) 45 minutes (d) 46 minutes 12 seconds

ANSWERS

1. (a)	2. (c)	3. (a)	4. (b)	5. (c)	6. (a)	7. (a)	8. (a)	9. (c)
10. (a)	11. (b)	12. (d)	13. (d)	14. (d)	15. (c)	16. (c)	17. (b)	18. (b)
19. (c)	20. (c)	21. (a)	22. (d)	23. (c)	24. (b)	25. (d)	26. (a)	27. (d)
28. (d)	29. (a)	30. (a)	31. (b)	32. (d)	33. (c)	34. (b)	35. (c)	36. (c)
37. (a)	38. (c)	39. (c)	40. (c)	41. (a)	42. (b)	43. (c)	44. (c)	45. (c)
46. (a)	47. (b)	48. (d)	49. (d)	50. (c)	51. (a)	52. (a)	53. (c)	54. (a)
55. (b)	56. (c)	57. (c)	58. (a)	59. (b)	60. (a)	61. (a)	62. (a)	63. (b)
64. (a)	65. (b)	66. (a)	67. (d)	68. (c)	69. (c)	70. (b)	71. (b)	72. (b)
73. (d)	74. (b)	75. (c)	76. (d)	77. (b)	78. (b)	79. (b)	80. (d)	81. (d)
82. (d)	83. (d)							

SOLUTIONS

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

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

3.

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.

4.
```
1095 ) 1168 ( 1
       1095
       ----
         73 ) 1095 ( 15
               73
              ---
              365
              365
              ---
               ×
```

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

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

5.
```
128352 ) 238368 ( 1
         128352
         ------
         110016 ) 128352 ( 1
                  110016
                  ------
                   18336 ) 110016 ( 6
                           110016
                           ------
                              ×
```

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

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

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

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

8. $4 \times 27 \times 3125 = 2^2 \times 3^3 \times 5^5$; $8 \times 9 \times 25 \times 7 = 2^3 \times 3^2 \times 5^2 \times 7$;

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

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

9. $36 = 2^2 \times 3^2$; $84 = 2^2 \times 3 \times 7$.

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

10. $204 = 2^2 \times 3 \times 17$; $1190 = 2 \times 5 \times 7 \times 17$; $1445 = 5 \times 17^2$.

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

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

12.
```
2923 ) 3239 ( 1
       2923
       ----
        316 ) 2923 ( 9
              2844
              ----
                79 ) 316 ( 4
                     316
                     ---
                      ×
```

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

13.
```
3444 ) 3556 ( 1
       3444
       ----
        112 ) 3444 ( 30
              3360
              ----
                84 ) 112 ( 1
                      84
                     ---
                      28 ) 84 ( 3
                           84
                           --
                            ×
```

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

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

15.
```
2 | 24 - 36 - 40
2 | 12 - 18 - 20
2 |  6 -  9 - 10
3 |  3 -  9 -  5
  |  1 -  3 -  5
```

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

16.
```
 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. $= 2 \times 3 \times 3 \times 3 \times 11 \times 2 \times 5 = 5940$.

17. H.C.F. of 148 and 185 is 37.

$\therefore$ L.C.M. $= \left(\dfrac{148 \times 185}{37}\right) = 740$.

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

19. Required H.C.F. $= \dfrac{\text{H.C.F. of } 9, 12, 18, 21}{\text{L.C.M. of } 10, 25, 35, 40} = \dfrac{3}{2800}$.

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

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

22. 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.

23. 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.

24. 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.

25. 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.

26. $3240 = 2^3 \times 3^4 \times 5$; $3600 = 2^4 \times 3^2 \times 5^2$; 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 $= 2^2 \times 3^5 \times 7^2$.

27. 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.

28. 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.

29. 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 given one in the answer is the pair (27, 189).

30. 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.

31. 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.

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

33. 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.

34. 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.

35. 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;
First number $= \left(\frac{551}{29}\right) = 19$; Third number $= \left(\frac{1073}{29}\right) = 37$.
$\therefore$ Required sum = (19 + 29 + 37) = 85.

36. Let the numbers be $2x$ and $3x$. Then, their L.C.M. = $6x$. So, $6x = 48$ or $x = 8$.
$\therefore$ The numbers are 16 and 24.
Hence, required sum = (16 + 24) = 40.

37. 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.

38. Other number $= \left(\frac{11 \times 7700}{275}\right) = 308$.

39. 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.

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

41. 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.

42. 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.

43. Let the numbers be a and b. Then, $a + b = 55$ and $ab = 5 \times 120 = 600$.
$\therefore$ Required sum $= \frac{1}{a} + \frac{1}{b} = \frac{a + b}{ab} = \frac{55}{600} = \frac{11}{120}$.

44. Let H.C.F. be h and L.C.M. be l. Then, $l = 45h$ and $l + h = 1150$.
$\therefore 45h + h = 1150$ or $h = 25$. So, $l = (1150 - 25) = 1125$.
Hence, other number $= \left(\frac{25 \times 1125}{125}\right) = 225$.

45. First number = (50 × 2) = 100. Second number $= \left(\frac{50 \times 250}{100}\right) = 125$.

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

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

48. 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.

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

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

$\therefore$ Larger number $= (23 \times 14) = 322$.

51. 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.

52. Product of numbers $= 11 \times 385 = 4235$.

Let the numbers be $11a$ and $11b$. Then, $11a \times 11b = 4235 \Rightarrow ab = 35$.

Now, co-primes with product 35 are (1, 35) and (5, 7).

So, the numbers are $(11 \times 1, 11 \times 35)$ and $(11 \times 5, 11 \times 7)$.

Since one number lies between 75 and 125, the suitable pair is (55, 77).

Hence, required number = 77.

53. Product of numbers $= 29 \times 4147$.

Let the numbers be $29a$ and $29b$. Then, $29a \times 29b = (24 \times 4147) \Rightarrow ab = 143$.

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

So, the numbers are $(29 \times 1, 29 \times 143)$ and $(29 \times 11, 29 \times 13)$.

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

$\therefore$ Required sum $= (319 + 377) = 696$.

54. H.C.F. of two prime numbers is 1. Product of numbers $= (1 \times 161) = 161$.

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 $y = 7$.

$\therefore$ $3y - x = (3 \times 7) - 23 = -2$.

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

$\therefore$ H.C.F. of 105, 1001 and 2436 is 7.

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

57. Required measurement = (H.C.F. of 496, 403, 713) litres = 31 litres.

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

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

60. Required number = H.C.F. of $(91 - 43)$, $(183 - 91)$ and $(183 - 43)$

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

61. 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 $= (1 + 1 + 2 + 0) = 4$.

62. Required number = H.C.F. of $(1356 - 12)$, $(1868 - 12)$ and $(2764 - 12)$

= H.C.F. of 1344, 1856 and 2752 = 64.

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

= H.C.F. of 1651 and 2032 = 127.

64. 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, $\frac{70}{80} > \frac{63}{80} > \frac{65}{80} > \frac{62}{80}$, so $\frac{7}{8} > \frac{63}{80} > \frac{13}{16} > \frac{31}{40}$.

So, $\frac{7}{8}$ is the largest.

65. L.C.M. of 12, 18, 21, 30

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

$= 2 \times 3 \times 2 \times 3 \times 7 \times 5 = 1260.$

$\therefore$ Required number $= (1260 \div 2) = 630.$

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

67. 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.
$\therefore$ Required number $= 10000 + (180 - 100) = 10080.$

68. Greatest number of 4 digits is 9999. L.C.M. of 15, 25, 40 and 75 is 600.
On dividing 9999 by 600, the remainder is 399.
$\therefore$ Required number $= (9999 - 399) = 9600.$

69. L.C.M. of 5, 6, 4 and 3 = 60. On dividing 2497 by 60, the remainder is 37.
$\therefore$ Number to be added $= (60 - 37) = 23.$

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

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

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

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

74. Greatest number of 4 digits is 9999. L.C.M. of 4, 7 and 13 = 364.
On dividing 9999 by 364, remainder obtained is 171.
$\therefore$ Greatest number of 4 digits divisible by 4, 7 and 13 $= (9999 - 171) = 9828.$
Hence, required number $= (9828 + 3) = 9831.$

75. 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.
$\therefore$ Least number of 6 digits divisible by 4, 6, 10 and 15 $= 100000 + (60 - 40) = 100020.$
$\therefore$ $N = (100020 + 2) = 100022$. Sum of digits in $N = (1 + 2 + 2) = 5.$

76. L.C.M. of 6, 9, 15 and 18 is 90.
Let required number be $90k + 4$, which is a multiple of 7.
Least value of k for which $(90k + 4)$ is divisible by 7 is $k = 4$.
$\therefore$ Required number $= 90 \times 4 + 4 = 364.$

77. Here $(48 - 38) = 10, (60 - 50) = 10, (72 - 62) = 10, (108 - 98) = 10$ & $(140 - 130) = 10.$
$\therefore$ Required number = (L.C.M. of 48, 60, 72, 108, 140) − 10 = 15120 − 10 = 15110.

78. Here $(18 - 7) = 11, (21 - 10) = 11$ and $(24 - 13) = 11$. L.C.M. of 18, 21 and 24 is 504.
Let required number be $504k - 11$.
Least value of k for which $(504k - 11)$ is divisible by 23 is $k = 6$.
$\therefore$ Required number $= 504 \times 6 - 11 = 3024 - 11 = 3013.$

79. L.C.M. of 5, 6, 7, 8 = 840.
$\therefore$ Required number is of the form $840k + 3$.
Least value of k for which $(840k + 3)$ is divisible by 9 is $k = 2$.
$\therefore$ Required number $= (840 \times 2 + 3) = 1683.$

80. 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 $k = 5$.
$\therefore$ Required number $= (3600 \times 5 + 4) = 18004.$

81. 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.

82. 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.

83. 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.