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.

$$1134 \overline{)\ 1215\ (\ 1}$$
$$\underline{1134}$$
$$81 \overline{)\ 1134\ (\ 14}$$
$$\underline{81}$$
$$324$$
$$\underline{324}$$
$$\times$$

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

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

$$81 \overline{)\ 513\ (\ 6}$$
$$\underline{486}$$
$$27 \overline{)\ 81\ (\ 3}$$
$$\underline{81}$$
$$\times$$

$\therefore$ 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 $= 2^3 \times 3^3 \times 5^3 \times 7^4 \times 11$.

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

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. ***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 $= \left(\dfrac{11 \times 693}{77}\right) = 99.$

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.

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

$\therefore$ 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

$$
\begin{array}{r}
1651\overline{)\,2032\,(\,1} \\
\underline{1651} \\
381\overline{)\,1651\,(\,4} \\
\underline{1524} \\
127\overline{)\,381\,(\,3} \\
\underline{381} \\
\times
\end{array}
$$

$\therefore$ 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, $\frac{17}{18} = \frac{17\times10}{18\times10} = \frac{170}{180}$; $\frac{31}{36} = \frac{31\times5}{36\times5} = \frac{155}{180}$;

$\frac{43}{45} = \frac{43\times4}{45\times4} = \frac{172}{180}$; $\frac{59}{60} = \frac{59\times3}{60\times3} = \frac{177}{180}$.

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 2

(OBJECTIVE TYPE QUESTIONS)

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

1. 252 can be expressed as a product of primes as : (IGNOU, 2002)
   (a) $2\times2\times3\times3\times7$ (b) $2\times2\times2\times3\times7$
   (c) $3\times3\times3\times3\times7$ (d) $2\times3\times3\times3\times7$
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 $2^2\times3^3\times5^5$, $2^3\times3^2\times5^2\times7$ and $2^4\times3^4\times5\times7^2\times11$ is :
   (a) $2^2\times3^2\times5$ (b) $2^2\times3^2\times5\times7\times11$
   (c) $2^4\times3^4\times5^5$ (d) $2^4\times3^4\times5^5\times7\times11$
7. The H.C.F. of $2^4\times3^2\times5^3\times7$, $2^3\times3^3\times5^2\times7^2$ and $3\times5\times7\times11$ is :
   (a) 105 (b) 1155 (c) 2310 (d) 27720
8. H.C.F. of $4\times27\times3125$, $8\times9\times25\times7$ & $16\times81\times5\times11\times49$ 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, 82) (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. $1095\overline{)1168}(1$
1095
$73\overline{)1095}(15$
73
365
365
$\times$

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

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

5. $128352\overline{)238368}(1$
128352
$110016\overline{)128352}(1$
110016
$18336\overline{)110016}(6$
110016
$\times$

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

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

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. $2923\overline{)3239}(1$
2923
$316\overline{)2923}(9$
2844
$79\overline{)316}(4$
316
$\times$

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

13. $3444\overline{)3556}(1$
3444
$112\overline{)3444}(30$
3360
$84\overline{)112}(1$
84
$28\overline{)84}(3$
84
$\times$

$\therefore$ 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. = $\left(\frac{148 \times 185}{37}\right) = 740$.

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

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.

∴ 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.

∴ 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.

∴ 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.

∴ 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.

∴ 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, $x = 12$.

∴ 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).

∴ 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).

∴ 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.

∴ Number-pairs with H.C.F. 15 are (45, 60), (45, 75), (60, 75) and (75, 90).

[∵ 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).

∴ 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 = $(50 \times 2) = 100$. 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
$= \text{L.C.M. of } 16, 20, 24 = 240 = 2 \times 2 \times 2 \times 2 \times 3 \times 5.$
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.

5. **Dividing a Decimal Fraction By a Decimal Fraction** : Multiply both the dividend and the divisor by a suitable power of 10 to make divisor a whole number. Now, proceed as above.

Thus, $\frac{0.00066}{0.11} = \frac{0.00066 \times 100}{0.11 \times 100} = \frac{0.066}{11} = .006$.

V. **Comparison of Fractions** : Suppose some fractions are to be arranged in ascending or descending order of magnitude. Then, convert each one of the given fractions in the decimal form, and arrange them accordingly.

Suppose, we have to arrange the fractions $\frac{3}{5}$, $\frac{6}{7}$ and $\frac{7}{9}$ in descending order.

Now, $\frac{3}{5} = 0.6$, $\frac{6}{7} = 0.857$, $\frac{7}{9} = 0.777.....$

Since $0.857 > 0.777 ..... > 0.6$, so $\frac{6}{7} > \frac{7}{9} > \frac{3}{5}$.

VI. **Recurring Decimal** : If in a decimal fraction, a figure or a set of figures is repeated continuously, then such a number is called a ***recurring decimal***.

In a recurring decimal, if a single figure is repeated, then it is expressed by putting a dot on it. If a set of figures is repeated, it is expressed by putting a bar on the set.

Thus, $\frac{1}{3} = 0.333 ..... = 0.\dot{3}$; $\frac{22}{7} = 3.142857142857 ..... = 3.\overline{142857}$.

Pure Recurring Decimal : A decimal fraction in which all the figures after the decimal point are repeated, is called a pure recurring decimal.

Converting a Pure Recurring Decimal Into Vulgar Fraction : Write the repeated figures only once in the numerator and take as many nines in the denominator as is the number of repeating figures.

Thus, $0.\dot{5} = \frac{5}{9}$; $0.\overline{53} = \frac{53}{99}$; $0.\overline{067} = \frac{67}{999}$; etc.

Mixed Recurring Decimal : A decimal fraction in which some figures do not repeat and some of them are repeated, is called a mixed recurring decimal.

e.g., $0.17333..... = 0.17\dot{3}$.

Converting a Mixed Recurring Decimal Into Vulgar Fraction : In the numerator, take the difference between the number formed by all the digits after decimal point (taking repeated digits only once) and that formed by the digits which are not repeated. In the denominator, take the number formed by as many nines as there are repeating digits followed by as many zeros as is the number of non-repeating digits.

Thus, $0.16 = \frac{16-1}{90} = \frac{15}{90} = \frac{1}{6}$; $0.22\overline{73} = \frac{2273-22}{9900} = \frac{2251}{9900}$.

VII. **Some Basic Formulae** :

1. $(a + b)(a - b) = (a^2 - b^2)$.
2. $(a + b)^2 = (a^2 + b^2 + 2ab)$.
3. $(a - b)^2 = (a^2 + b^2 - 2ab)$.
4. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$.
5. $(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$
6. $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$.
7. $(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$.
8. When $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$.

SOLVED EXAMPLES

Ex. 1. ***Convert the following into vulgar fractions :***
(i) 0.75 (ii) 3.004 (iii) .0056.

Sol. (i) $0.75 = \frac{75}{100} = \frac{3}{4}$. (ii) $3.004 = \frac{3004}{1000} = \frac{751}{250}$. (iii) $.0056 = \frac{56}{10000} = \frac{7}{1250}$.

Ex. 2. ***Arrange the fractions $\frac{5}{8}, \frac{7}{12}, \frac{13}{16}, \frac{16}{29}$ and $\frac{3}{4}$ in ascending order of magnitude.***

Sol. Converting each of the given fractions into decimal form, we get :

$\frac{5}{8} = 0.625, \frac{7}{12} = 0.5833, \frac{13}{16} = 0.8125, \frac{16}{29} = 0.5517$ and $\frac{3}{4} = 0.75$.

Now, $0.5517 < 0.5833 < 0.625 < 0.75 < 0.8125$.

$\therefore \quad \frac{16}{29} < \frac{7}{12} < \frac{5}{8} < \frac{3}{4} < \frac{13}{16}$.

Ex. 3. ***Arrange the fractions $\frac{3}{5}, \frac{4}{7}, \frac{8}{9}$ and $\frac{9}{11}$ in their descending order.***
(R.B.I. 2003)

Sol. Clearly, $\frac{3}{5} = 0.6, \frac{4}{7} = 0.571, \frac{8}{9} = 0.88, \frac{9}{11} = 0.818$.

Now, $0.88 > 0.818 > 0.6 > 0.571$.

$\therefore \quad \frac{8}{9} > \frac{9}{11} > \frac{3}{5} > \frac{4}{7}$.

Ex. 4. ***Evaluate : (i) 6202.5 + 620.25 + 62.025 + 6.2025 + 0.62025*** (L.I.C. 2003)
(ii) 5.064 + 3.98 + .7036 + 7.6 + .3 + 2

Sol. (i)
$$\begin{array}{r} 6202.5 \\ 620.25 \\ 62.025 \\ 6.2025 \\ + \quad 0.62025 \\ \hline 6891.59775 \end{array}$$

(ii)
$$\begin{array}{r} 5.064 \\ 3.98 \\ 0.7036 \\ 7.6 \\ 0.3 \\ + \quad 2.0 \\ \hline 19.6476 \end{array}$$

Ex. 5. ***Evaluate : (i) 31.004 – 17.2386 (ii) 13 – 5.1967***

Sol. (i)
$$\begin{array}{r} 31.0040 \\ - \ 17.2386 \\ \hline 13.7654 \end{array}$$

(ii)
$$\begin{array}{r} 13.0000 \\ - \ 5.1967 \\ \hline 7.8033 \end{array}$$

Ex. 6. ***What value will replace the question mark in the following equations ?***
(i) 5172.49 + 378.352 + ? = 9318.678 (B.S.R.B. 1998)
(ii) ? – 7328.96 = 5169.38 (B.S.R.B. 2003)

Sol. (i) Let $5172.49 + 378.352 + x = 9318.678$.

Then, $x = 9318.678 - (5172.49 + 378.352) = 9318.678 - 5550.842 = 3767.836$.

(ii) Let $x - 7328.96 = 5169.38$. Then, $x = 5169.38 + 7328.96 = 12498.34$.

Ex. 7. ***Find the products : (i) 6.3204 × 100 (ii) .069 × 10000***

Sol. (i) $6.3204 \times 100 = 632.04$. (ii) $.069 \times 10000 = .0690 \times 10000 = 690$.

Ex. 8. ***Find the products :***

(i) 2.61 × 1.3 (ii) 2.1693 × 1.4 (iii) .4 × .04 × .004 × 40.

Sol. (*i*) 261 × 13 = 3393. Sum of decimal places of given numbers = (2 + 1) = 3.

∴ 2.61 × 1.3 = 3.393.

(*ii*) 21693 × 14 = 303702. Sum of decimal places = (4 + 1) = 5.

∴ 2.1693 × 1.4 = 3.03702.

(*iii*) 4 × 4 × 4 × 40 = 2560. Sum of decimal places = (1 + 2 + 3) = 6.

∴ .4 × .04 × .004 × 40 = .002560.

Ex. 9. ***Given that 268 × 74 = 19832, find the value of 2.68 × .74.***

Sol. Sum of decimal places = (2 + 2) = 4.

∴ 2.68 × .74 = 1.9832.

Ex. 10. ***Find the quotient :***

(i) 0.63 ÷ 9 (ii) 0.0204 ÷ 17 (iii) 3.1603 ÷ 13.

Sol. (*i*) 63 ÷ 9 = 7. Dividend contains 2 places of decimal.

∴ 0.63 ÷ 9 = .07.

(*ii*) 204 ÷ 17 = 12. Dividend contains 4 places of decimal.

∴ 0.0204 ÷ 17 = .0012.

(*iii*) 31603 ÷ 13 = 2431. Dividend contains 4 places of decimal.

∴ 3.1603 ÷ 13 = .2431.

Ex. 11. ***Evaluate :***

(i) 35 ÷ .07 (ii) 2.5 ÷ 0.0005 **(M.B.A. 1998)**

(iii) 136.09 ÷ 43.9 **(Hotel Management, 2000)**

Sol. (*i*) $\frac{35}{.07} = \frac{35 \times 100}{.07 \times 100} = \frac{3500}{7} = 500.$

(*ii*) $\frac{2.5}{0.0005} = \frac{2.5 \times 10000}{0.0005 \times 10000} = \frac{25000}{5} = 5000.$

(*iii*) $\frac{136.09}{43.9} = \frac{136.09 \times 10}{43.9 \times 10} = \frac{1360.9}{439} = 3.1.$

Ex. 12. ***What value will come in place of question mark in the following equations?***

(i) 0.006 ÷ ? = 0.6 (ii) ? ÷ .025 = 80

Sol. (*i*) Let $\frac{0.006}{x} = 0.6$. Then, $x = \frac{0.006}{0.6} = \frac{0.006 \times 10}{0.6 \times 10} = \frac{0.06}{6} = 0.01.$

(*ii*) Let $\frac{x}{.025} = 80$. Then, $x = 80 \times .025 = 2.$

Ex. 13. ***If $\frac{1}{3.718} = .2689$, then find the value of $\frac{1}{.0003718}$.***

Sol. $\frac{1}{.0003718} = \frac{10000}{3.718} = \left(10000 \times \frac{1}{3.718}\right) = 10000 \times .2689 = 2689.$

Ex. 14. ***Express as vulgar fractions : (i) $0.\overline{37}$ (ii) $0.\overline{053}$ (iii) $3.\overline{142857}$.***

Sol. (*i*) $0.\overline{37} = \frac{37}{99}.$ (*ii*) $0.\overline{053} = \frac{53}{999}.$

(*iii*) $3.\overline{142857} = 3 + 0.\overline{142857} = 3 + \frac{142857}{999999} = 3\frac{142857}{999999}.$

Ex. 15. ***Express as vulgar fractions : (i) $0.1\overline{7}$ (ii) $0.12\overline{54}$ (iii) $2.5\overline{36}$***

Sol. (*i*) $0.1\overline{7} = \frac{17 - 1}{90} = \frac{16}{90} = \frac{8}{45}.$ (*ii*) $0.12\overline{54} = \frac{1254 - 12}{9900} = \frac{1242}{9900} = \frac{69}{550}.$

(iii) $2.53\overline{6} = 2 + 0.53\overline{6} = 2 + \frac{536 - 53}{900} = 2 + \frac{483}{900} = 2 + \frac{161}{300} = 2\frac{161}{300}$.

Ex. 16. ***Simplify*** : $\frac{0.05 \times 0.05 \times 0.05 + 0.04 \times 0.04 \times 0.04}{0.05 \times 0.05 - 0.05 \times 0.04 + 0.04 \times 0.04}$. (IGNOU, 2003)

Sol. Given expression $= \left(\frac{a^3 + b^3}{a^2 - ab + b^2}\right)$, where $a = 0.05$, $b = 0.04$

$= (a + b) = (0.05 + 0.04) = 0.09$.

EXERCISE 3

(OBJECTIVE TYPE QUESTIONS)

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

1. The fraction $101\frac{27}{100000}$ in decimal form is :

   (a) .01027 (b) .10127 (c) 101.00027 (d) 101.000027

2. When .36 is written in simplest fractional form, the sum of the numerator and the denominator is :

   (a) 15 (b) 45 (c) 114 (d) 135

3. What decimal of an hour is a second ?

   (a) .0025 (b) .0256 (c) .00027 (d) .000126

4. If $47.2506 = 4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E$, then the value of 5A + 3B + 6C + D + 3E is : (S.S.C. 2003)

   (a) 53.6003 (b) 53.603 (c) 153.6003 (d) 213.0003

5. Which of the following has fractions in ascending order ? (Bank P.O. 2003)

   (a) $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}, \frac{3}{5}, \frac{5}{6}, \frac{6}{7}$ (b) $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{4}{7}, \frac{5}{6}, \frac{6}{7}$

   (c) $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{5}{6}, \frac{4}{7}, \frac{6}{7}$ (d) $\frac{2}{5}, \frac{3}{5}, \frac{1}{3}, \frac{4}{7}, \frac{5}{6}, \frac{6}{7}$

6. Which of the following has fractions in ascending order ? (NABARD, 2002)

   (a) $\frac{2}{3}, \frac{3}{5}, \frac{7}{9}, \frac{9}{11}, \frac{8}{9}$ (b) $\frac{3}{5}, \frac{2}{3}, \frac{9}{11}, \frac{7}{9}, \frac{8}{9}$ (c) $\frac{3}{5}, \frac{2}{3}, \frac{7}{9}, \frac{9}{11}, \frac{8}{9}$

   (d) $\frac{8}{9}, \frac{9}{11}, \frac{7}{9}, \frac{2}{3}, \frac{3}{5}$ (e) $\frac{8}{9}, \frac{9}{11}, \frac{7}{9}, \frac{3}{5}, \frac{2}{3}$

7. Which of the following are in descending order of their value ? (R.R.B. 2002)

   (a) $\frac{5}{9}, \frac{7}{11}, \frac{8}{15}, \frac{11}{17}$ (b) $\frac{5}{9}, \frac{8}{15}, \frac{11}{17}, \frac{7}{11}$

   (c) $\frac{11}{17}, \frac{7}{11}, \frac{8}{15}, \frac{5}{9}$ (d) $\frac{11}{17}, \frac{7}{11}, \frac{5}{9}, \frac{8}{15}$

8. What is the difference between the biggest and the smallest fraction among $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}$ and $\frac{5}{6}$? (C.B.I. 1998)

   (a) $\frac{1}{6}$ (b) $\frac{1}{12}$ (c) $\frac{1}{20}$ (d) $\frac{1}{30}$

9. Which part contains the fractions in ascending order ?

(a) $\frac{11}{14}, \frac{16}{19}, \frac{19}{21}$ (b) $\frac{16}{19}, \frac{11}{14}, \frac{19}{21}$ (c) $\frac{16}{19}, \frac{19}{21}, \frac{11}{14}$ (d) $\frac{19}{21}, \frac{11}{14}, \frac{16}{19}$

10. Which of the following fractions is the smallest ? **(S.S.C. 2002)**

(a) $\frac{13}{16}$ (b) $\frac{15}{19}$ (c) $\frac{17}{21}$ (d) $\frac{7}{8}$

11. Which of the following fractions is greater than $\frac{3}{4}$ and less than $\frac{5}{6}$? **(S.S.C. 1999)**

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{4}{5}$ (d) $\frac{9}{10}$

12. Which of the following fractions is less than $\frac{7}{8}$ and greater than $\frac{1}{3}$?

(a) $\frac{1}{4}$ (b) $\frac{23}{24}$ (c) $\frac{11}{12}$ (d) $\frac{17}{24}$

13. Which of the following numbers does not lie between $\frac{4}{5}$ and $\frac{7}{13}$?

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{3}{4}$ (d) $\frac{5}{7}$

14. The arrangement of rational numbers $\frac{-7}{10}, \frac{5}{-8}, \frac{2}{-3}$ in ascending order is :

(a) $\frac{2}{-3}, \frac{5}{-8}, \frac{-7}{10}$ (b) $\frac{5}{-8}, \frac{-7}{10}, \frac{2}{-3}$ (c) $\frac{-7}{10}, \frac{5}{-8}, \frac{2}{-3}$ (d) $\frac{-7}{10}, \frac{2}{-3}, \frac{5}{-8}$

15. 337.62 + 8.591 + 34.4 = ? **(S.S.C. 1998)**

(a) 370.611 (b) 380.511 (c) 380.611 (d) 426.97

16. The value of (1 + .1 + .01 + .001) is :

(a) 1.001 (b) 1.011 (c) 1.003 (d) 1.111

17. 34.95 + 240.016 + 23.98 = ? **(Bank P.O. 2002)**

(a) 298.0946 (b) 298.111 (c) 298.946 (d) 299.09

18. 617 + 6.017 + 0.617 + 6.0017 = ? **(M.B.A. 1998)**

(a) 6.2963 (b) 62.965 (c) 629.6357 (d) None of these

19. 48.95 – 32.006 = ? **(I.B.P.S. 2002)**

(a) 16.089 (b) 16.35 (c) 16.89 (d) 16.944

20. 792.02 + 101.32 – 306.76 = ? **(NABARD, 2002)**

(a) 586.58 (b) 893.34 (c) 997.11 (d) 1200.10

21. 12.1212 + 17.0005 – 9.1102 = ? **(B.S.R.B. 2003)**

(a) 20.0015 (b) 20.0105 (c) 20.0115 (d) 20.1015

22. 892.7 – 573.07 – 95.007 = ?

(a) 224.623 (b) 224.777 (c) 233.523 (d) 414.637

23. 3889 + 12.952 – ? = 3854.002 **(Bank P.O. 2002)**

(a) 47.095 (b) 47.752 (c) 47.932 (d) 47.95

24. 138.009 + 341.981 – 146.305 = 123.6 + ? **(Bank P.O. 1999)**

(a) 120.085 (b) 120.85 (c) 220.085 (d) None of these

25. 832.58 – 242.31 = 779.84 – ? **(B.S.R.B. 1998)**

(a) 179.57 (b) 199.57 (c) 295.05 (d) None of these

26. What will come in place of question mark in the following equation ?
54. (?) 3 + 543 + 5.43 = 603.26 **(Hotel Management, 2001)**
(a) 5 (b) 6 (c) 8 (d) None of these

27. Which of the following is equal to 3.14×10^6 ? **(Hotel Management, 2003)**
(a) 314 (b) 3140 (c) 3140000 (d) None of these

28. The number 518,000,000 when expressed in scientific notation, equals :
(a) 51.8×10^6 (b) 51.8×10^7 (c) 5.18×10^8 (d) 5.18×10^9

29. 0.000006723 when expressed in scientific notation, is :
(a) 6723×10^{-5} (b) 67.23×10^{-7} (c) 6.723×10^{-6} (d) None of these

30. If $1.125 \times 10^k = 0.001125$, then the value of k is :
(a) – 4 (b) – 3 (c) – 2 (d) – 1

31. $0.002 \times 0.5 = ?$ **(Bank P.O. 2003)**
(a) 0.0001 (b) 0.001 (c) 0.01 (d) 0.1

32. $16.02 \times 0.001 = ?$ **(Bank P.O. 2002)**
(a) 0.001602 (b) 0.01602 (c) 0.1602 (d) 1.6021

33. $0.014 \times 0.014 = ?$ **(Hotel Management, 2001)**
(a) 0.000196 (b) 0.00196 (c) 19.6 (d) 196

34. $40.83 \times 1.02 \times 1.2 = ?$ **(S.B.I.P.O. 2003)**
(a) 41.64660 (b) 42.479532 (c) 49.97592 (d) 58.7952

35. 0.04×0.0162 is equal to : **(M.B.A. 1998)**
(a) 6.48×10^{-3} (b) 6.48×10^{-4} (c) 6.48×10^{-5} (d) 6.48×10^{-6}

36. $3 \times 0.3 \times 0.03 \times 0.003 \times 30 = ?$ **(Hotel Management, 2002)**
(a) 0.0000243 (b) 0.000243 (c) 0.00243 (d) 0.0243

37. How many digits will be there to the right of the decimal point in the product of 95.75 and .02554 ? **(I.A.M. 2002)**
(a) 5 (b) 6 (c) 7 (d) None of these

38. $\left(.00625 \text{ of } \frac{23}{5}\right)$, when expressed as a vulgar fraction, equals :
(a) $\frac{23}{80}$ (b) $\frac{23}{800}$ (c) $\frac{23}{8000}$ (d) $\frac{125}{23}$

39. Which is the closest approximation to the product $0.3333 \times 0.25 \times 0.499 \times 0.125 \times 24$?
(a) $\frac{1}{8}$ (b) $\frac{3}{4}$ (c) $\frac{3}{8}$ (d) $\frac{2}{5}$

40. Consider the following quotients :
1. 368.39 divided by 17 2. 170.50 divided by 62 3. 875.65 divided by 83
Their correct sequence in decreasing order is : **(C.D.S. 2003)**
(a) 1, 3, 2 (b) 2, 1, 3 (c) 2, 3, 1 (d) 3, 1, 2

41. $0.213 \div 0.00213 = ?$
(a) 1 (b) 10 (c) 100 (d) None of these

42. 4.036 divided by 0.04 gives : **(Hotel Management, 2003)**
(a) 1.009 (b) 10.09 (c) 100.9 (d) None of these

43. $\frac{1}{0.04}$ is equal to : **(S.S.C. 2000)**
(a) $\frac{1}{40}$ (b) $\frac{2}{5}$ (c) 2.5 (d) 25

44. $\left(\frac{0.05}{0.25}+\frac{0.25}{0.05}\right)^3 = ?$

(a) 139.4 (b) 140 (c) 140.6 (d) 143.9

45. The value of 0.0396 ÷ 2.51 correct to 2 significant figures is :

(a) 0.015 (b) 0.0157 (c) 0.016 (d) 0.017

46. .04 × ? = .000016.

(a) 0.0004 (b) 0.04 (c) 4 (d) None of these

47. $\frac{.009}{?} = .01$ **(M.B.A. 1998)**

(a) .0009 (b) .09 (c) .9 (d) 9

48. If $\frac{144}{0.144} = \frac{14.4}{x}$, then the value of x is : **(C.B.I. 2003)**

(a) 0.0144 (b) 1.44 (c) 14.4 (d) 144

49. A tailor has 37.5 metres of cloth and he has to make 8 pieces out of a metre of cloth. How many pieces can he make out of this cloth ? **(N.I.F.T. 2000)**

(a) 320 (b) 360 (c) 400 (d) None of these

50. The price of commodity X increases by 40 paise every year, while the price of commodity Y increases by 15 paise every year. If in 2001, the price of commodity X was Rs. 4.20 and that of Y was Rs. 6.30, in which year commodity X will cost 40 paise more than the commodity Y ? **(Bank P.O. 2002)**

(a) 2010 (b) 2011 (c) 2012 (d) 2013

51. When 0.232323 ..... is converted into a fraction, then the result is : **(C.B.I. 1998)**

(a) $\frac{1}{5}$ (b) $\frac{2}{9}$ (c) $\frac{23}{99}$ (d) $\frac{23}{100}$

52. The rational number for the recurring decimal 0.125125 ..... is : **(M.B.A. 2002)**

(a) $\frac{63}{487}$ (b) $\frac{119}{993}$ (c) $\frac{125}{999}$ (d) None of these

53. When $0.\overline{47}$ is converted into a fraction, the result is : **(Section Officers', 2003)**

(a) $\frac{46}{90}$ (b) $\frac{46}{99}$ (c) $\frac{47}{90}$ (d) $\frac{47}{99}$

54. $0.\overline{36}$ expressed in the form of $\frac{p}{q}$ equals :

(a) $\frac{4}{11}$ (b) $\frac{4}{13}$ (c) $\frac{35}{90}$ (d) $\frac{35}{99}$

55. The least among the following is : **(S.S.C. 2002)**

(a) 0.2 (b) 1 ÷ 0.2 (c) $0.\overline{2}$ (d) $(0.2)^2$

56. The correct expression of $6.\overline{46}$ in the fractional form is : **(C.B.I. 1997)**

(a) $\frac{646}{99}$ (b) $\frac{64640}{1000}$ (c) $\frac{640}{100}$ (d) $\frac{640}{99}$

57. The value of $0.5\overline{7}$ is :

(a) $\frac{57}{10}$ (b) $\frac{57}{99}$ (c) $\frac{26}{45}$ (d) $\frac{52}{9}$

58. Let F = $0.84\overline{181}$. When F is written as a fraction in lowest terms, the denominator exceeds the numerator by :

(a) 13 (b) 14 (c) 29 (d) 87

59. The value of $4.1\overline{2}$ is :

(a) $4\frac{11}{90}$ (b) $4\frac{11}{99}$ (c) $\frac{371}{900}$ (d) None of these

60. The value of $2.13\overline{6}$ is : (L.I.C.A.A.O. 2003)

(a) $\frac{47}{220}$ (b) $\frac{68}{495}$ (c) $2\frac{3}{22}$ (d) None of these

61. The value of $(0.\overline{2} + 0.\overline{3} + 0.\overline{4} + 0.\overline{9} + 0.\overline{39})$ is : (C.B.I. 1997)

(a) $0.\overline{57}$ (b) $1\frac{20}{33}$ (c) $2\frac{1}{3}$ (d) $2\frac{13}{33}$

62. $3.\overline{87} - 2.\overline{59} = ?$ (A.A.O. Exam, 2003)

(a) 1.20 (b) $1.\overline{2}$ (c) $1.\overline{27}$ (d) $1.\overline{28}$

63. The simplification of $3.\overline{36} - 2.\overline{05} + 1.\overline{33}$ equals : (S.S.C. 2003)

(a) 2.60 (b) 2.64 (c) $2.\overline{61}$ (d) $2.\overline{64}$

64. $(0.\overline{09} \times 7.\overline{3})$ is equal to : (S.S.C. 2003)

(a) $.\overline{6}$ (b) $.\overline{657}$ (c) $.\overline{67}$ (d) $.65\overline{7}$

65. $(0.3\overline{467} + 0.1\overline{333})$ is equal to : (Hotel Management, 2002)

(a) $0.4\overline{8}$ (b) $0.\overline{48}$ (c) $0.480\overline{1}$ (d) 0.48

66. $(8.3\overline{1} + 0.\overline{6} + 0.00\overline{2})$ is equal to : (S.S.C. 2002)

(a) $8.9\overline{12}$ (b) $8.\overline{912}$ (c) $8.9\overline{79}$ (d) $8.97\overline{9}$

67. The sum of $\overline{2}.75$ and $\overline{3}.78$ is : (Section Officers', 2001)

(a) $\overline{1}.03$ (b) $\overline{1}.53$ (c) $\overline{4}.53$ (d) $\overline{5}.53$

68. If $\frac{547.527}{0.0082} = x$, then the value of $\frac{547527}{82}$ is : (Hotel Management, 1999)

(a) $\frac{x}{10}$ (b) $10x$ (c) $100x$ (d) None of these

69. If 2994 ÷ 14.5 = 172, then 29.94 ÷ 1.45 = ? (L.I.C. 2003)

(a) 0.172 (b) 1.72 (c) 17.2 (d) 172

70. If 213 × 16 = 3408, then 1.6 × 21.3 is equal to : (Assistant Grade, 1998)

(a) 0.3408 (b) 3.408 (c) 34.08 (d) 340.8

71. If $\frac{1}{6.198} = 0.16134$, then the value of $\frac{1}{0.0006198}$ is : (S.S.C. 1997)

(a) 0.016134 (b) 0.16134 (c) 1613.4 (d) 16134

72. When 52416 is divided by 312, the quotient is 168. What will be the quotient when 52.416 is divided by 0.0168 ? (Hotel Management, 1998)

(a) 3.12 (b) 312 (c) 3120 (d) None of these

73. Given 168 × 32 = 5376, then 5.376 ÷ 16.8 is equal to :

(a) 0.032 (b) 0.32 (c) 3.2 (d) 32

74. 54.327 × 357.2 × 0.0057 is the same as : (Hotel Management, 1997)

(a) 5.4327 × 3.572 × 5.7 (b) 5.4327 × 3.572 × 0.57

(c) 54327 × 3572 × 0.0000057 (d) None of these

75. $\frac{5.3472 \times 324.23}{3.489 \times 5.42}$ is the same as :

(a) $\frac{53472 \times 3.2423}{3.489 \times 54.2}$ (b) $\frac{53472 \times 32423}{3489 \times 542}$ (c) $\frac{534.72 \times 324.23}{34.89 \times 5.42}$ (d) $\frac{53472 \times 3242.3}{3489 \times 542}$

76. $\frac{96.54 - 89.63}{96.54 + 89.63} + \frac{965.4 - 896.3}{9.654 + 8.963} = ?$

(a) 10^{-2} (b) 10^{-1} (c) 10 (d) None of these

77. If $1^3 + 2^3 + ... + 9^3 = 2025$, then the value of $(0.11)^3 + (0.22)^3 + ... + (0.99)^3$ is close to : **(S.S.C. 2003)**

(a) 0.2695 (b) 0.3695 (c) 2.695 (d) 3.695

78. $8.7 - [7.6 - (6.5 - (5.4 - \overline{4.3 - 2})]]$ is simplified to : **(S.S.C. 2004)**

(a) 2.5 (b) 3.5 (c) 4.5 (d) 5.5

79. The value of $\frac{1}{4} + \frac{1}{4 \times 5} + \frac{1}{4 \times 5 \times 6}$ correct to 4 decimal places is :

(a) 0.3075 (b) 0.3082 (c) 0.3083 (d) 0.3085

80. Find the value of the following expression upto four places of decimals.

$\left[1 + \frac{1}{1 \times 2} + \frac{1}{1 \times 2 \times 4} + \frac{1}{1 \times 2 \times 4 \times 8} + \frac{1}{1 \times 2 \times 4 \times 8 \times 16}\right]$ **(Hotel Management, 2002)**

(a) 1.6414 (b) 1.6415 (c) 1.6416 (d) 1.6428

81. The sum of the first 20 terms of the series $\frac{1}{5 \times 6} + \frac{1}{6 \times 7} + \frac{1}{7 \times 8} + ...$ is :

(a) 0.16 (b) 1.6 (c) 16 (d) None of these **(Hotel Management, 1998)**

82. If $1.5x = 0.04y$, then the value of $\left(\frac{y - x}{y + x}\right)$ is :

(a) $\frac{730}{77}$ (b) $\frac{73}{77}$ (c) $\frac{7.3}{77}$ (d) None of these

83. The value of $\left[35.7 - \left(3 + \frac{1}{3 + \frac{1}{3}}\right) - \left(2 + \frac{1}{2 + \frac{1}{2}}\right)\right]$ is :

(a) 30 (b) 34.8 (c) 36.6 (d) 41.4

84. $\frac{(0.1667)(0.8333)(0.3333)}{(0.2222)(0.6667)(0.1250)}$ is approximately equal to : **(M.B.A. 1998)**

(a) 2 (b) 2.40 (c) 2.43 (d) 2.50

85. The value of $\frac{3.6 \times 0.48 \times 2.50}{0.12 \times 0.09 \times 0.5}$ is : **(S.S.C. 1998)**

(a) 80 (b) 800 (c) 8000 (d) 80000

86. $\frac{0.0203 \times 2.92}{0.0073 \times 14.5 \times 0.7} = ?$ **(R.R.B. 1998)**

(a) 0.8 (b) 1.45 (c) 2.40 (d) 3.25

87. The value of $\frac{3.157 \times 4126 \times 3.198}{63.972 \times 2835.121}$ is closest to : **(C.B.I. 2003)**

(a) 0.002 (b) 0.02 (c) 0.2 (d) 2

88. The value of $\frac{489.1375 \times 0.0483 \times 1.956}{0.0873 \times 92.581 \times 99.749}$ is closest to : **(C.B.I. 1997)**

(a) 0.006 (b) 0.06 (c) 0.6 (d) 6

89. The value of $\frac{241.6 \times 0.3814 \times 6.842}{0.4618 \times 38.25 \times 73.65}$ is close to :

(a) 0.2 (b) 0.4 (c) 0.6 (d) 1

90. $(0.2 \times 0.2 + 0.01)(0.1 \times 0.1 + 0.02)^{-1}$ is equal to : **(Section Officers', 2003)**

(a) $\frac{5}{3}$ (b) $\frac{9}{5}$ (c) $\frac{41}{4}$ (d) $\frac{41}{12}$

91. $\frac{5 \times 1.6 - 2 \times 1.4}{1.3} = ?$ **(Bank P.O. 2003)**

(a) 0.4 (b) 1.2 (c) 1.4 (d) 4

92. The value of $(4.7 \times 13.26 + 4.7 \times 9.43 + 4.7 \times 77.31)$ is : **(IGNOU, 2003)**

(a) 0.47 (b) 47 (c) 470 (d) 4700

93. Simplify : $\frac{0.2 \times 0.2 + 0.2 \times 0.02}{0.044}$. **(S.S.C. 1999)**

(a) 0.004 (b) 0.4 (c) 1 (d) 2

94. The value of $\left(\frac{8.6 \times 5.3 + 8.6 \times 4.7}{4.3 \times 9.7 - 4.3 \times 8.7}\right)$ is :

(a) 3.3 (b) 6.847 (c) 13.9 (d) 20

95. The value of $\left(\frac{.896 \times .763 + .896 \times .237}{.7 \times .064 + .7 \times .936}\right)$ is :

(a) .976 (b) 9.76 (c) 1.28 (d) 12.8

96. The value of $(68.237)^2 - (31.763)^2$ is :

(a) 3.6474 (b) 36.474 (c) 364.74 (d) 3647.4

97. Evaluate : $\frac{(2.39)^2 - (1.61)^2}{2.39 - 1.61}$. **(R.R.B. 2003)**

(a) 2 (b) 4 (c) 6 (d) 8

98. On simplification of $\frac{(2.644)^2 - (2.356)^2}{0.288}$, we get : **(S.S.C. 1999)**

(a) 1 (b) 4 (c) 5 (d) 6

99. $\frac{(36.54)^2 - (3.46)^2}{?} = 40.$

(a) 3.308 (b) 4 (c) 33.08 (d) 330.8

100. The value of $\frac{(67.542)^2 - (32.458)^2}{75.458 - 40.374}$ is : **(Hotel Management, 1997)**

(a) 1 (b) 10 (c) 100 (d) None of these

101. $\left(\frac{1.49 \times 14.9 - 0.51 \times 5.1}{14.9 - 5.1}\right)$ is equal to : **(S.S.C. 2004)**

(a) 0.20 (b) 2.00 (c) 20 (d) 22

102. $\frac{4.2 \times 4.2 - 1.9 \times 1.9}{2.3 \times 6.1} = ?$ **(R.R.B. 1998)**

(a) 0.5 (b) 1 (c) 1.9 (d) 4.2

103. Simplify : $\frac{5.32 \times 56 + 5.32 \times 44}{(7.66)^2 - (2.34)^2}$.

(a) 7.2 (b) 8.5 (c) 10 (d) 12

104. $\frac{(0.6)^4 - (0.5)^4}{(0.6)^2 + (0.5)^2}$ is equal to :

(a) 0.1 (b) 0.11 (c) 1.1 (d) 11

105. $(7.5 \times 7.5 + 37.5 + 2.5 \times 2.5)$ is equal to : **(S.S.C. 2000)**

(a) 30 (b) 60 (c) 80 (d) 100

106. The simplification of $\frac{0.2 \times 0.2 + 0.02 \times 0.02 - 0.4 \times 0.02}{0.36}$ gives :

(a) 0.009 (b) 0.09 (c) 0.9 (d) 9

107. The expression $(11.98 \times 11.98 + 11.98 \times x + 0.02 \times 0.02)$ will be a perfect square for x equal to :

(a) 0.02 (b) 0.2 (c) 0.04 (d) 0.4

108. The value of $\frac{(2.697 - 0.498)^2 + (2.697 + 0.498)^2}{2.697 \times 2.697 + 0.498 \times 0.498}$ is :

(a) 0.5 (b) 2 (c) 2.199 (d) 3.195

109. The value of $\frac{(0.137 + 0.098)^2 - (0.137 - 0.098)^2}{0.137 \times 0.098}$ is :

(a) 0.039 (b) 0.235 (c) 0.25 (d) 4

110. The value of $\left(\frac{0.051 \times 0.051 \times 0.051 + 0.041 \times 0.041 \times 0.041}{0.051 \times 0.051 - 0.051 \times 0.041 + 0.041 \times 0.041}\right)$ is : **(S.S.C. 2003)**

(a) 0.00092 (b) 0.0092 (c) 0.092 (d) 0.92

111. The value of $\left(\frac{.953 \times .953 - .953 \times .047 + .047 \times .047}{.953 \times .953 \times .953 + .047 \times .047 \times .047}\right)$ is :

(a) .32 (b) .886 (c) 1.1286 (d) None of these

112. The value of $\left(\frac{0.125 + 0.027}{0.5 \times 0.5 + 0.09 - 0.15}\right)$ is : **(S.S.C. 2002)**

(a) 0.08 (b) 0.2 (c) 0.8 (d) 1

113. $\left(\frac{10.3 \times 10.3 \times 10.3 + 1}{10.3 \times 10.3 - 10.3 + 1}\right)$ is equal to : **(S.S.C. 2004)**

(a) 9.3 (b) 10.3 (c) 11.3 (d) 12.3

114. $\left[\frac{8(3.75)^3 + 1}{(7.5)^2 - 6.5}\right]$ is equal to : **(S.S.C. 2003)**

(a) $\frac{9}{5}$ (b) 2.75 (c) 4.75 (d) 8.5

115. The value of $\left(\frac{0.1 \times 0.1 \times 0.1 + 0.02 \times 0.02 \times 0.02}{0.2 \times 0.2 \times 0.2 + 0.04 \times 0.04 \times 0.04}\right)$ is : **(Hotel Management, 2003)**

(a) 0.0125 (b) 0.125 (c) 0.25 (d) 0.5

116. The value of $\left(\frac{8.94 \times 8.94 \times 8.94 - 3.56 \times 3.56 \times 3.56}{8.94 \times 8.94 + 8.94 \times 3.56 + 3.56 \times 3.56}\right)$ is :

(a) 0.538 (b) 5.38 (c) 0.0538 (d) 53.8

117. The value of $\frac{(0.96)^3 - (0.1)^3}{(0.96)^2 + 0.096 + (0.1)^2}$ is : **(S.S.C. 2004)**

(a) 0.86 (b) 0.95 (c) 0.97 (d) 1.06

118. The value of $\frac{(2.3)^3 - .027}{(2.3)^2 + .69 + .09}$ is : **(S.S.C. 1997)**

(a) 0 (b) 1.6 (c) 2 (d) 3.4

119. The value of $\frac{(0.06)^2 + (0.47)^2 + (0.079)^2}{(0.006)^2 + (0.047)^2 + (0.0079)^2}$ is :

(a) 0.1 (b) 10 (c) 100 (d) 1000

ANSWERS

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

SOLUTIONS

1. $101\frac{27}{100000} = 101 + \frac{27}{100000} = 101 + .00027 = 101.00027.$

2. $0.36 = \frac{36}{100} = \frac{9}{25}$. Sum of Numerator and Denominator = 9 + 25 = 34.

3. Required decimal $= \frac{1}{60 \times 60} = \frac{1}{3600} = .00027.$

4. $4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E = 47.2506$

$\Rightarrow \quad 4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E = 40 + 7 + 0.2 + 0.05 + 0.0006$

Comparing the terms on both sides, we get :

$4A = 40, \frac{7}{B} = 7, 2C = 0.2, \frac{5}{D} = 0.05, 6E = 0.0006$

or $A = 10, B = 1, C = 0.1, D = 100, E = 0.0001.$

$\therefore \quad 5A + 3B + 6C + D + 3E = (5 \times 10) + (3 \times 1) + (6 \times 0.1) + 100 + (3 \times 0.0001)$

$= 50 + 3 + 0.6 + 100 + 0.0003 = 153.6003.$

5. Converting each of the given fractions into decimal form, we get :

$\frac{1}{3} = 0.33, \frac{2}{5} = 0.4, \frac{4}{7} = 0.57, \frac{3}{5} = 0.6, \frac{5}{6} = 0.82, \frac{6}{7} = 0.857.$

Clearly, $0.33 < 0.4 < 0.57 < 0.6 < 0.82 < 0.857$. So, $\frac{1}{3} < \frac{2}{5} < \frac{4}{7} < \frac{3}{5} < \frac{5}{6} < \frac{6}{7}$.

6. Converting each of the given fractions into decimal form, we get :

$\frac{2}{3} = 0.66, \frac{3}{5} = 0.6, \frac{7}{9} = 0.77, \frac{9}{11} = 0.81, \frac{8}{9} = 0.88.$

Clearly, $0.6 < 0.66 < 0.77 < 0.81 < 0.88$. So, $\frac{3}{5} < \frac{2}{3} < \frac{7}{9} < \frac{9}{11} < \frac{8}{9}$.

7. Converting each of the given fractions into decimal form, we get :

$\frac{5}{9} = 0.55, \frac{7}{11} = 0.63, \frac{8}{15} = 0.533, \frac{11}{17} = 0.647.$

Clearly, $0.647 > 0.63 > 0.55 > 0.533$. So, $\frac{11}{17} > \frac{7}{11} > \frac{5}{9} > \frac{8}{15}$.

8. Converting each of the given fractions into decimal form, we get :

$\frac{2}{3} = 0.66, \frac{3}{4} = 0.75, \frac{4}{5} = 0.8, \frac{5}{6} = 0.833.$

Since $0.833 > 0.8 > 0.75 > 0.66$, so $\frac{5}{6} > \frac{4}{5} > \frac{3}{4} > \frac{2}{3}$.

$\therefore$ Required difference $= \left(\frac{5}{6} - \frac{2}{3}\right) = \frac{1}{6}$.

9. Clearly, $\frac{11}{14} = 0.785, \frac{16}{19} = 0.842, \frac{19}{21} = 0.904.$

Now, $0.785 < 0.842 < 0.904$. So, $\frac{11}{14} < \frac{16}{19} < \frac{19}{21}$.

10. We have : $\frac{13}{16} = 0.8125, \frac{15}{19} = 0.7894, \frac{17}{21} = 0.8095$ and $\frac{7}{8} = 0.875$.

Since 0.7894 is the smallest, so $\frac{15}{19}$ is the smallest.

11. $\frac{3}{4} = 0.75, \frac{5}{6} = 0.833, \frac{1}{2} = 0.5, \frac{2}{3} = 0.66, \frac{4}{5} = 0.8, \frac{9}{10} = 0.9.$

Clearly, 0.8 lies between 0.75 and 0.833.

$\therefore$ $\frac{4}{5}$ lies between $\frac{3}{4}$ and $\frac{5}{6}$.

12. $\frac{7}{8} = 0.875, \frac{1}{3} = 0.333, \frac{1}{4} = 0.25, \frac{23}{24} = 0.958, \frac{11}{12} = 0.916, \frac{17}{24} = 0.708.$

Clearly, 0.708 lies between 0.333 and 0.875.

$\therefore$ $\frac{17}{24}$ lies between $\frac{1}{3}$ and $\frac{7}{8}$.

13. $\frac{4}{5} = 0.8, \frac{7}{13} = 0.53, \frac{1}{2} = 0.5, \frac{2}{3} = 0.66, \frac{3}{4} = 0.75, \frac{5}{7} = 0.714.$

Clearly, 0.5 does not lie between 0.53 and 0.8.

$\therefore$ $\frac{1}{2}$ does not lie between $\frac{4}{5}$ and $\frac{7}{13}$.

14. $\frac{-7}{10} = -0.7, \frac{5}{-8} = -\frac{5}{8} = -0.625, \frac{2}{-3} = -\frac{2}{3} = -0.66.$

Since $-0.7 < -0.66 < -0.625$, so $\frac{-7}{10} < \frac{2}{-3} < \frac{5}{-8}$.

15.
$$\begin{array}{r} 337.62 \\ 8.591 \\ +\ 34.4 \\ \hline 380.611 \end{array}$$

16.
$$\begin{array}{r} 1.0 \\ 0.1 \\ 0.01 \\ +\ 0.001 \\ \hline 1.111 \end{array}$$

17.
$$\begin{array}{r} 34.95 \\ 240.016 \\ +\ 23.98 \\ \hline 298.946 \end{array}$$

18.
$$\begin{array}{r} 617.00 \\ 6.017 \\ 0.617 \\ +\ 6.0017 \\ \hline 629.6357 \end{array}$$

19. $\begin{array}{r} 48.950 \\ -\ 32.006 \\ \hline 16.944 \end{array}$ **20.** $\begin{array}{r} 792.02 \\ +\ 101.32 \\ \hline 893.34 \end{array}$ $\begin{array}{r} 893.34 \\ -\ 306.76 \\ \hline 586.58 \end{array}$

21. Given expression = (12.1212 + 17.0005) – 9.1102 = (29.1217 – 9.1102) = 20.0115.

22. Given expression = 892.7 – (573.07 + 95.007) = 892.7 – 668.077 = 224.623.

23. Let 3889 + 12.952 – x = 3854.002.

Then, x = (3889 + 12.952) – 3854.002 = 3901.952 – 3854.002 = 47.95.

24. Let 138.009 + 341.981 – 146.305 = 123.6 + x.

Then, x = (138.009 + 341.981) – (146.305 + 123.6) = 479.99 – 269.905 = 210.085.

25. Let 832.58 – 242.31 = 779.84 – x.

Then, x = (779.84 + 242.31) – 832.58 = 1022.15 – 832.58 = 189.57.

26. Let x + 543 + 5.43 = 603.26. Then, x = 603.26 – (543 + 5.43) = 603.26 – 548.43 = 54.83.

∴ Missing digit = 8.

27. $3.14 \times 10^6 = 3.140000 \times 1000000 = 3140000$.

28. $518{,}000{,}000 = 5.18 \times 100000000 = 5.18 \times 10^8$.

29. $0.000006723 = \dfrac{0.000006723 \times 10^6}{10^6} = \dfrac{6.723}{10^6} = 6.723 \times 10^{-6}$.

30. $10^k = \dfrac{0.001125}{1.125} = \dfrac{1.125}{1125} = \dfrac{1.125 \times 10^3}{1125 \times 10^3} = \dfrac{1}{10^3} = 10^{-3}$.

∴ $k = -3$.

31. 2 × 5 = 10. Sum of decimal places = 4.

∴ 0.002 × 0.5 = 0.0010 = 0.001.

32. 1602 × 1 = 1602. Sum of decimal places = 5.

∴ 16.02 × 0.001 = 0.01602.

33. 14 × 14 = 196. Sum of decimal places = 6.

∴ 0.014 × 0.014 = 0.000196.

34. 4083 × 102 × 12 = 4997592. Sum of decimal places = 5.

∴ 40.83 × 1.02 × 1.2 = 49.97592.

35. 4 × 162 = 648. Sum of decimal places = 6.

∴ $0.04 \times 0.0162 = 0.000648 = 6.48 \times 10^{-4}$.

36. 3 × 3 × 3 × 3 × 30 = 2430. Sum of decimal places = 6.

∴ 3 × 0.3 × 0.03 × 0.003 × 30 = 0.002430 = 0.00243.

37. Sum of decimal places = 7.

Since the last digit to the extreme right will be zero (∵ 5 × 4 = 20), so there will be 6 significant digits to the right of the decimal point.

38. $\left(.00625 \text{ of } \dfrac{23}{5}\right) = \left(\dfrac{625}{100000} \times \dfrac{23}{5}\right) = \dfrac{23}{800}$.

39. Given product = $0.3 \times 0.25 \times 0.5 \times 0.125 \times 24$

$$= \left(\frac{3}{10} \times \frac{25}{100} \times \frac{5}{10} \times \frac{125}{1000} \times 24\right) = \frac{9}{80} = \frac{1}{8} \text{ (App.)}$$

40. 1. 36839 ÷ 17 = 2167. Dividend contains 2 places of decimal.

∴ 368.39 ÷ 17 = 21.67.

2. 17050 ÷ 62 = 275. Dividend contains 2 places of decimal.

∴ 170.50 ÷ 62 = 2.75.

3. $87565 \div 83 = 1055$. Dividend contains 2 places of decimal.

$\therefore\ 875.65 \div 83 = 10.55$.

Since $21.67 > 10.55 > 2.75$, the desired order is 1, 3, 2.

41. $\dfrac{0.213}{0.00213} = \dfrac{0.213 \times 100000}{0.00213 \times 100000} = \dfrac{213 \times 100}{213} = 100.$

42. $\dfrac{4.036}{0.04} = \dfrac{403.6}{4} = 100.9.$

43. $\dfrac{1}{0.04} = \dfrac{100}{4} = 25.$

44. $\left(\dfrac{0.05}{0.25} + \dfrac{0.25}{0.05}\right)^3 = \left(\dfrac{5}{25} + \dfrac{25}{5}\right)^3 = \left(\dfrac{1}{5} + 5\right)^3 = \left(\dfrac{26}{5}\right)^3 = (5.2)^3 = 140.608.$

45. $\dfrac{0.0396}{2.51} = \dfrac{3.96}{251} = \left(\dfrac{396}{251 \times 100}\right) = \dfrac{1.577}{100} = 0.01577 = 0.016.$

46. Let $.04 \times x = .000016$. Then, $x = \dfrac{.000016}{.04} = \dfrac{.0016}{4} = .0004.$

47. Let $\dfrac{.009}{x} = .01$. Then, $x = \dfrac{.009}{.01} = \dfrac{.9}{1} = .9.$

48. $\dfrac{144}{0.144} = \dfrac{14.4}{x} \Leftrightarrow \dfrac{144 \times 1000}{144} = \dfrac{14.4}{x} \Leftrightarrow x = \dfrac{14.4}{1000} = 0.0144.$

49. Length of each piece $= \left(\dfrac{1}{8}\right)$ m $= 0.125$ m.

$\therefore$ Required number of pieces $= \left(\dfrac{37.5}{0.125}\right) = \left(\dfrac{375 \times 100}{125}\right) = 300.$

50. Suppose commodity X will cost 40 paise more than Y after z years. Then,

$(4.20 + 0.40z) - (6.20 + 0.15z) = 0.40$

$\Leftrightarrow\ 0.25z = 0.40 + 2.10 \Leftrightarrow z = \dfrac{2.50}{0.25} = \dfrac{250}{25} = 10.$

$\therefore$ X will cost 40 paise more than Y 10 years after 2001 *i.e.*, in 2011.

51. $0.232323\ldots\ldots = 0.\overline{23} = \dfrac{23}{99}.$

52. $0.125125\ldots\ldots = 0.\overline{125} = \dfrac{125}{999}.$

53. $0.\overline{47} = \dfrac{47}{99}.$

54. $0.\overline{36} = \dfrac{36}{99} = \dfrac{4}{11}.$

55. $1 \div 0.2 = \dfrac{1}{0.2} = \dfrac{10}{2} = 5;\ 0.\overline{2} = 0.222\ldots\ldots;\ (0.2)^2 = 0.04.$

$0.04 < 0.2 < 0.22\ldots\ldots < 5.$

Since 0.04 is the least, so $(0.2)^2$ is the least.

56. $6.\overline{46} = 6 + 0.\overline{46} = 6 + \dfrac{46}{99} = \dfrac{594 + 46}{99} = \dfrac{640}{99}.$

57. $0.5\overline{7} = \dfrac{57 - 5}{90} = \dfrac{52}{90} = \dfrac{26}{45}.$

58. $0.84\overline{181} = \dfrac{84181 - 841}{99000} = \dfrac{83340}{99000} = \dfrac{463}{550}.$

$\therefore$ Required difference $= (550 - 463) = 87.$

59. $4.1\overline{2} = 4 + 0.1\overline{2} = 4 + \frac{12-1}{90} = 4\frac{11}{90}$.

60. $2.1\overline{36} = 2 + 0.1\overline{36} = 2 + \frac{136-1}{990} = 2 + \frac{3}{22} = 2\frac{3}{22}$.

61. $0.\overline{2} + 0.\overline{3} + 0.\overline{4} + 0.\overline{9} + 0.\overline{39} = \left(\frac{2}{9} + \frac{3}{9} + \frac{4}{9} + \frac{9}{9} + \frac{39}{99}\right) = \left(\frac{9}{9} + \frac{9}{9} + \frac{39}{99}\right) = 2 + \frac{13}{33} = 2\frac{13}{33}$.

62. $3.\overline{87} - 2.\overline{59} = (3 + 0.\overline{87}) - (2 + 0.\overline{59}) = \left(3 + \frac{87}{99}\right) - \left(2 + \frac{59}{99}\right) = 1 + \left(\frac{87}{99} - \frac{59}{99}\right)$

$= 1 + \frac{28}{99} = 1.\overline{28}$.

63. $3.\overline{36} - 2.0\overline{5} + 1.\overline{33} = [(3 + 0.\overline{36}) + (1 + 0.\overline{33})] - (2 + 0.0\overline{5})$

$= \left[4 + \left(\frac{36}{99} + \frac{33}{99}\right)\right] - \left[2 + \frac{5}{99}\right] = 2 + \left(\frac{36}{99} + \frac{33}{99} - \frac{5}{99}\right) = 2 + \frac{64}{99} = 2.\overline{64}$.

64. $0.\overline{09} \times 7.\overline{3} = \frac{9}{99} \times 7\frac{3}{9} = \frac{1}{11} \times \frac{66}{9} = \frac{2}{3} = 0.\overline{6}$.

65. $0.3\overline{467} + 0.1\overline{333} = \frac{3467-34}{9900} + \frac{1333-13}{9900} = \frac{3433+1320}{9900} = \frac{4753}{9900} = \frac{4801-48}{9900} = 0.\overline{4801}$.

66. $(8.3\overline{1} + 0.\overline{6} + 0.00\overline{2}) = 8 + \frac{31-3}{90} + \frac{6}{9} + \frac{2}{900} = \frac{7200+280+600+2}{900}$

$= \frac{8082}{900} = 8\frac{882}{900} = 8 + \frac{979-97}{900} = 8.97\overline{9}$.

67. $\overline{2}.75 + \overline{3}.78 = (-2 + 0.75) + (-3 + 0.78) = -5 + (0.75 + 0.78) = -5 + 1.53$

$= -5 + 1 + 0.53 = -4 + 0.53 = \overline{4}.53$.

68. $\frac{547527}{82} = \frac{54.7527}{0.0082} = \left(\frac{547.527}{0.0082} \times \frac{1}{10}\right) = \frac{x}{10}$.

69. $\frac{29.94}{1.45} = \frac{299.4}{14.5} = \left(\frac{2994}{14.5} \times \frac{1}{10}\right) = \frac{172}{10} = 17.2$.

70. $1.6 \times 21.3 = \left(\frac{16}{10} \times \frac{213}{10}\right) = \left(\frac{16 \times 213}{100}\right) = \frac{3408}{100} = 34.08$.

71. $\frac{1}{0.0006198} = \frac{10000}{6.198} = \left(10000 \times \frac{1}{6.198}\right) = (10000 \times 0.16134) = 1613.4$.

72. Given, $\frac{52416}{312} = 168 \Leftrightarrow \frac{52416}{168} = 312$.

Now, $\frac{52.416}{0.0168} = \frac{524160}{168} = \left(\frac{52416}{168} \times 10\right) = (312 \times 10) = 3120$.

73. Given, $168 \times 32 = 5376$ or $5376 \div 168 = 32$.

Now, $\frac{5.376}{16.8} = \frac{53.76}{168} = \left(\frac{5376}{168} \times \frac{1}{100}\right) = \frac{32}{100} = 0.32$.

74. Number of decimal places in the given expression = 8.
Number of decimal places in (a) = 8.
Number of decimal places in (b) = 9.
Number of decimal places in (c) = 7.
Clearly, the expression in (a) is the same as the given expression.

75. For the expressions to be equivalent, the difference between the sum of the decimal places in the numerator and that in the denominator must be equal.
This difference is 1 in the given expression and 1 in (*d*). So, (*d*) is the answer.

76. Given expression $= \frac{(96.54 - 89.63)}{(96.54 + 89.63)} \times \frac{(9.654 + 8.963)}{(965.4 - 896.3)} = \frac{(96.54 - 89.63)}{(965.4 - 896.3)} \times \frac{(9.654 + 8.963)}{(96.54 + 89.63)}$

$= \frac{(96.54 - 89.63)}{10\,(96.54 - 89.63)} \times \frac{(96.54 + 89.63)}{10\,(96.54 + 89.63)}$

$= \frac{1}{10} \times \frac{1}{10} = \frac{1}{100} = \frac{1}{10^2} = 10^{-2}.$

77. $(0.11)^3 + (0.22)^3 + \ldots\ldots + (0.99)^3 = (0.11)^3\,(1^3 + 2^3 + \ldots\ldots + 9^3)$

$= 0.001331 \times 2025 = 2.695275 = 2.695.$

78. Given expression $= 8.7 - [7.6 - \{6.5 - (5.4 - 2.3)\}] = 8.7 - [7.6 - (6.5 - 3.1)]$

$= 8.7 - (7.6 - 3.4) = 8.7 - 4.2 = 4.5.$

79. $\frac{1}{4} + \frac{1}{4 \times 5} + \frac{1}{4 \times 5 \times 6} = \frac{1}{4}\left(1 + \frac{1}{5} + \frac{1}{30}\right) = \frac{1}{4}\left(\frac{30 + 6 + 1}{30}\right) = \frac{1}{4} \times \frac{37}{30} = \frac{37}{120} = 0.3083.$

80. Given expression $= \frac{2 \times 4 \times 8 \times 16 + 4 \times 8 \times 16 + 8 \times 16 + 16 + 1}{2 \times 4 \times 8 \times 16}$

$= \frac{1024 + 512 + 128 + 16 + 1}{1024} = \frac{1681}{1024} = 1.6^{4}16.$

81. Given expression $= \frac{1}{5 \times 6} + \frac{1}{6 \times 7} + \frac{1}{7 \times 8} + \ldots\ldots + \frac{1}{24 \times 25}$

$= \left(\frac{1}{5} - \frac{1}{6}\right) + \left(\frac{1}{6} - \frac{1}{7}\right) + \left(\frac{1}{7} - \frac{1}{8}\right) + \ldots\ldots + \left(\frac{1}{24} - \frac{1}{25}\right)$

$= \left(\frac{1}{5} - \frac{1}{25}\right) = \frac{4}{25} = 0.16.$

82. $\frac{x}{y} = \frac{0.04}{1.5} = \frac{4}{150} = \frac{2}{75} \Rightarrow \frac{y - x}{y + x} = \frac{1 - \frac{x}{y}}{1 + \frac{x}{y}} = \frac{1 - \frac{2}{75}}{1 + \frac{2}{75}} = \frac{73}{77}.$

83. Given expression $= 35.7 - \left(3 + \frac{1}{\frac{10}{3}}\right) - \left(2 + \frac{1}{\frac{5}{2}}\right) = 35.7 - \left(3 + \frac{3}{10}\right) - \left(2 + \frac{2}{5}\right)$

$= 35.7 - \frac{33}{10} - \frac{12}{5} = 35.7 - \left(\frac{33}{10} + \frac{12}{5}\right) = 35.7 - \frac{57}{10} = 35.7 - 5.7 = 30.$

84. Given expression $= \frac{(0.3333)}{(0.2222)} \times \frac{(0.1667)\,(0.8333)}{(0.6667)\,(0.1250)} = \frac{3333}{2222} \times \frac{\frac{1}{6} \times \frac{5}{6}}{\frac{2}{3} \times \frac{125}{1000}}$

$= \left(\frac{3}{2} \times \frac{1}{6} \times \frac{5}{6} \times \frac{3}{2} \times 8\right) = \frac{5}{2} = 2.50.$

85. $\frac{3.6 \times 0.48 \times 2.50}{0.12 \times 0.09 \times 0.5} = \frac{36 \times 48 \times 250}{12 \times 9 \times 5} = 800.$

86. $\frac{0.0203 \times 2.92}{0.0073 \times 14.5 \times 0.7} = \frac{203 \times 292}{73 \times 145 \times 7} = \frac{4}{5} = 0.8.$

87. $\dfrac{3.157\times4126\times3.198}{63.972\times2835.121}=\dfrac{3.2\times4126\times3.2}{64\times2835}=\dfrac{32\times4126\times32}{64\times2835}\times\dfrac{1}{100}$

$=\dfrac{66016}{2835}\times\dfrac{1}{100}=\dfrac{23.28}{100}=0.23\approx0.2.$

88. $\dfrac{489.1375\times0.0483\times1.956}{0.0873\times92.581\times99.749}=\dfrac{489\times0.05\times2}{0.09\times93\times100}=\dfrac{489}{9\times93\times10}$

$=\dfrac{163}{279}\times\dfrac{1}{10}=\dfrac{0.58}{10}=0.058\approx0.06.$

89. $\dfrac{241.6\times0.3814\times6.842}{0.4618\times38.25\times73.65}=\dfrac{240\times0.38\times6.9}{0.46\times38\times75}=\dfrac{240\times38\times69}{46\times38\times75}\times\dfrac{1}{10}$

$=\left(\dfrac{24}{5}\times\dfrac{1}{10}\right)=\dfrac{4.8}{10}=0.48.$

So, the value is close to 0.4.

90. Given expression $=\dfrac{(0.2\times0.2+0.01)}{(0.1\times0.1+0.02)}=\dfrac{0.04+0.01}{0.01+0.02}=\dfrac{0.05}{0.03}=\dfrac{5}{3}.$

91. Given expression $=\dfrac{8-2.8}{1.3}=\dfrac{5.2}{1.3}=\dfrac{52}{13}=4.$

92. Given expression $=4.7\times(13.26+9.43+77.31)=4.7\times100=470.$

93. Given expression $=\dfrac{0.2(0.2+0.02)}{0.044}=\dfrac{0.2\times0.22}{0.044}=\dfrac{0.044}{0.044}=1.$

94. Given expression $=\dfrac{8.6\times(5.3+4.7)}{4.3\times(9.7-8.7)}=\dfrac{8.6\times10}{4.3\times1}=20.$

95. Given expression $=\dfrac{.896\times(.763+.237)}{.7\times(.064+.936)}=\dfrac{.896\times1}{.7\times1}=\dfrac{8.96}{7}=1.28.$

96. Given expression $=(a^2-b^2)=(a+b)(a-b)=(68.237+31.763)(68.237-31.763)$

$=(100\times36.474)=3647.4.$

97. Given expression $=\dfrac{a^2-b^2}{a-b}=\dfrac{(a+b)(a-b)}{(a-b)}=(a+b)=(2.39+1.61)=4.$

98. Given expression $=\dfrac{(2.644)^2-(2.356)^2}{2.644-2.356}=\dfrac{a^2-b^2}{a-b}=(a+b)=(2.644+2.356)=5.$

99. Let $\dfrac{(36.54)^2-(3.46)^2}{x}=40.$ Then, $x=\dfrac{(36.54)^2-(3.46)^2}{40}=\dfrac{(36.54)^2-(3.46)^2}{36.54+3.46}$

$=\dfrac{a^2-b^2}{a+b}=(a-b)=(36.54-3.46)=33.08.$

100. Given expression $=\dfrac{(67.542)^2-(32.458)^2}{(67.542+7.196)-(32.458+7.916)}$

$=\dfrac{(67.542)^2-(32.458)^2}{67.542-32.458}=(67.542+32.458)=100.$

101. Given expression $=\left(\dfrac{1.49\times1.49\times10-0.51\times0.51\times10}{1.49\times10-0.51\times10}\right)$

$=\dfrac{10[(1.49)^2-(0.51)^2]}{10(1.49-0.51)}=(1.49+0.51)=2.$

102. Given expression $= \dfrac{(a^2 - b^2)}{(a+b)(a-b)} = \dfrac{(a^2 - b^2)}{(a^2 - b^2)} = 1.$

103. Given expression $= \dfrac{5.32 \times (56 + 44)}{(7.66 + 2.34)(7.66 - 2.34)} = \dfrac{5.32 \times 100}{10 \times 5.32} = 10.$

104. Given expression $= \dfrac{[(0.6)^2]^2 - [(0.5)^2]^2}{(0.6)^2 + (0.5)^2} = \dfrac{[(0.6)^2 + (0.5)^2]\,[(0.6)^2 - (0.5)^2]}{(0.6)^2 + (0.5)^2}$

$= (0.6)^2 - (0.5)^2 = (0.6 + 0.5)(0.6 - 0.5) = (1.1 \times 0.1) = 0.11.$

105. Given expression $= (7.5 \times 7.5 + 2 \times 7.5 \times 2.5 + 2.5 \times 2.5)$

$= (a^2 + 2ab + b^2) = (a + b)^2 = (7.5 + 2.5)^2 = 10^2 = 100.$

106. $0.2 \times 0.2 + 0.02 \times 0.02 - 0.4 \times 0.02 = 0.2 \times 0.2 + 0.02 \times 0.02 - 2 \times 0.2 \times 0.02$

$= (a^2 + b^2 - 2ab) = (a - b)^2 = (0.2 - 0.02)^2$

$= (0.18)^2.$

$\therefore$ Given expression $= \dfrac{(0.18 \times 0.18)}{0.36} = 0.09.$

107. Given expression $= (11.98)^2 + (0.02)^2 + 11.98 \times x.$

For the given expression to be a perfect square, we must have

$11.98 \times x = 2 \times 11.98 \times 0.02$ or $x = 0.04.$

108. Given expression $= \dfrac{(a-b)^2 + (a+b)^2}{a^2 + b^2} = \dfrac{2(a^2 + b^2)}{(a^2 + b^2)} = 2.$

109. Given expression $= \dfrac{(a+b)^2 - (a-b)^2}{ab} = \dfrac{4ab}{ab} = 4.$

110. Given expression $= \dfrac{(0.051)^3 + (0.041)^3}{(0.051)^2 - (0.051 \times 0.041) + (0.041)^2} = \left(\dfrac{a^3 + b^3}{a^2 - ab + b^2}\right)$

$= (a + b) = (0.051 + 0.041) = 0.092.$

111. Given expression $= \dfrac{(.953)^2 - (.953 \times .047) + (.047)^2}{(.953)^3 + (.047)^3}$

$= \left(\dfrac{a^2 - ab + b^2}{a^3 + b^3}\right) = \dfrac{1}{a+b} = \dfrac{1}{.953 + .047} = 1.$

112. Given expression $= \dfrac{(0.5)^3 + (0.3)^3}{(0.5)^2 + (0.3)^2 - (0.5 \times 0.3)} = \left(\dfrac{a^3 + b^3}{a^2 + b^2 - ab}\right)$

$= (a + b) = (0.5 + 0.3) = 0.8.$

113. Given expression $= \dfrac{(10.3)^3 + (1)^3}{(10.3)^2 - (10.3 \times 1) + (1)^2} = \left(\dfrac{a^3 + b^3}{a^2 - ab + b^2}\right)$

$= (a + b) = (10.3 + 1) = 11.3.$

114. Given expression $= \dfrac{(2 \times 3.75)^3 + (1)^3}{(7.5)^2 - (7.5 \times 1) + (1)^2} = \dfrac{(7.5)^3 + (1)^3}{(7.5)^2 - (7.5 \times 1) + (1)^2}$

$= \left(\dfrac{a^3 + b^3}{a^2 - ab + b^2}\right) = (a + b) = (7.5 + 1) = 8.5.$

115. Given expression $= \dfrac{(0.1)^3 + (0.02)^3}{2^3\,[(0.1)^3 + (0.02)^3]} = \dfrac{1}{8} = 0.125.$

116. Given expression $= \dfrac{(8.94)^3 - (3.56)^3}{(8.94)^2 + 8.94 \times 3.56 + (3.56)^2} = \left(\dfrac{a^3 - b^3}{a^2 + ab + b^2}\right)$

$= (a - b) = (8.94 - 3.56) = 5.38.$

117. Given expression $= \dfrac{(0.96)^3 - (0.1)^3}{(0.96)^2 + (0.96 \times 0.1) + (0.1)^2} = \left(\dfrac{a^3 - b^3}{a^2 + ab + b^2}\right)$

$= (a - b) = (0.96 - 0.1) = 0.86.$

118. Given expression $= \dfrac{(2.3)^3 - (0.3)^3}{(2.3)^2 + (2.3 \times 0.3) + (0.3)^2} = \left(\dfrac{a^3 - b^3}{a^2 + ab + b^2}\right)$

$= (a - b) = (2.3 - 0.3) = 2.$

119. Given expression $= \dfrac{a^2 + b^2 + c^2}{\left(\dfrac{a}{10}\right)^2 + \left(\dfrac{b}{10}\right)^2 + \left(\dfrac{c}{10}\right)^2}$, where $a = 0.6$, $b = 0.47$ and $c = 0.079$.

$= \dfrac{100\,(a^2 + b^2 + c^2)}{(a^2 + b^2 + c^2)} = 100.$