MBA PIONEER 2024

Quantitative Aptitude

DPP: 07

HCF and LCM - 1

Q1 How many pairs of positive integers, x and y, exist such that the HCF of x and y is 24, and the LCM of x and y is 144?

(A) 2 (B) 4
(C) 1 (D) 6

Q2 6 different stationery items of counts 16, 108, 68, 44, 92, and 60 were ordered for distribution to an orphanage. They need to be packed in such a way that each box has the same variety of stationery, and the number of items in each box is also the same. What is the minimum number of boxes required to pack all the items?

(A) 94 (B) 97
(C) 120 (D) 110

Q3 In a politician's rally, the public is made to sit to watch the rally. If the coordinators make a row of 17 each, there will be 11 people left. If they make rows of 22 each, then there will be 16 people left, if they make rows of 28 each, there will be 22 people left and if they make rows of 30 each, there will be 24 people left. What is the minimum public attendance in the rally?

(A) 78534 (B) 142,654
(C) 78540 (D) 142,660

Q4 LCM of 2 natural numbers, p and q where p > q is 165. What is the maximum possible sum of the digits of q?

(A) 4 (B) 6
(C) 8 (D) 10

Q5 Six lights of different colors are switched on such that they blink at an interval of 2 seconds, 4 seconds, 5 seconds, 7 seconds, 8 seconds, and 10 seconds respectively. If all the lights were switched on together at 10:00 AM. When is the third time that all the lights will blink together after switching it on?

(A) 10:16 AM (B) 10:12 AM
(C) 10:14 AM (D) 10:10 AM

Q6 The HCF of two numbers $\left(3^{12}-1\right)$ and $\left(27^{6}-1\right)$ is ________.

(A) 242 (B) 80
(C) 244 (D) 728

Q7 At a Road signal a green light flashes seven times in every 280 seconds. while a red light flashes three times every 108 seconds. How many times do the two lights flash simultaneously in two hours if they both start flashing at the same time?

(A) 35 (B) 40
(C) 20 (D) 6

Q8 Three pieces of paper of lengths $2\frac{3}{5}, 1\frac{5}{6}, 1\frac{4}{8}$ (m) are cut into smaller papers of same length. The maximum length is tried to be kept maximum. What can be the minimum possible number of pieces obtained?

(A) 120 (B) 240
(C) 360 (D) 712

Q9 Given two positive real numbers with a sum of 80 and a highest common factor (HCF) of 8, if the lowest common multiple (LCM) of these numbers is 240, what is the sum of their reciprocals?

(A) $\frac{2}{5}$ (B) $\frac{1}{3}$

(C) $\frac{1}{24}$ (D) $\frac{5}{12}$

Q10 Find the sum of the digits of the smallest 4 digit number, which when divided by 27, 36 and 48 leaves a remainder of 10, 19 and 31 respectively.

(A) 20 (B) 19

(C) 18 (D) 17

Q11 The HCF of any pair of positive integers among the three integers x, y, and z is 12. The product of all three numbers is 10368. Then, how many sets of {x, y, z} are possible?

(A) 8 (B) 3

(C) 6 (D) 9

Q12 If chocolates are removed from a basket three, four, five and six at a time, then the chocolates remaining in the basket are 1, 2, 3 and 4 respectively. But when chocolates are removed seven at a time, then there are no chocolates remaining in the basket. What is the least number of chocolates in the basket?

(A) 243 (B) 238

(C) 178 (D) 168

Q13 What is the minimum number of identical cubes one can obtain by cutting a cuboid of size 12 cm × 24 cm ×18 cm?

(A) 24 (B) 18

(C) 12 (D) 15

Q14 If the LCM of 1, 2, 3, 4, 5.....80 is 'n', then the LCM of 1, 2, 3, 4, 5,... 85 in terms of 'n' is ?

(A) 3n (B) 83n

(C) 9n (D) 249n

Q15 How many pairs of positive integers x, y exists such that the HCF of x and y is 42 and the sum of the integers is 966?

(A) 9 (B) 10

(C) 12 (D) 11

Q16 A number N is randomly selected between 1 and 253 (both inclusive). Find the number of such numbers such that the HCF of the number selected and 253 is 1?

(A) 220 (B) 22

(C) 23 (D) 219

Q17 Find the number of unordered pairs of (x, y) which are 2-digit numbers, such that their LCM is thrice the HCF.

(A) 22 (B) 23

(C) 24 (D) 21

Q18 The combined product of two numbers, and their HCF and LCM is 1600. If it is known that the LCM of 2 numbers is 20, then which of the following can be the sum of the two numbers ?

(A) 22 (B) 15

(C) 12 (D) 16

Q19 A circular racing track was designed in such a way that the perimeter of the track was divided into four equal parts. The sports coach further divided the four parts into 6 equal parts, 8 equal parts, 7 equal parts and 9 equal parts respectively. He notes that the values of all the smaller parts are integral values (meters). The least possible length of the track is ______?

(A) 504 meters

(B) 108 meters

(C) 2016 meters

(D) 252 meters

Q20 If it is given that the HCF of two numbers is 36 and their sum is 288. Which of the following can be the possible difference between the two numbers?

(A) 108 (B) 180

(C) 72 (D) 36

Q21 3 bells chime at an interval of 26 minutes, 36 minutes and 48 minutes respectively. If all the three bells chime together at 9:00 AM, what is the next time at which the three bells will chime together?

(A) 4:12 PM same day

(B) 4:12 PM the next day

(C) 10:00 PM same day

(D) 10:12 AM the next day

Q22 How many 3 digit numbers exist such that the numbers are the multiples of 24 and 36 both?

(A) 12 (B) 13

(C) 10 (D) 11

Q23 Two numbers are in the ration 3: 11. If the HCF of these two numbers is 24, then the sum of the two numbers is ___?

(A) 312 (B) 264

(C) 336 (D) 340

Q24 If the LCM of two numbers is 144 and the two numbers are in the ratio 3: 8, then the difference between the two numbers is __?

(A) 33 (B) 60

(C) 66 (D) 30

Q25 What is the sum of all the multiples of 5, less than 200, which leaves a remainder of 4 when divided by 11?

(A) 380 (B) 410

(C) 390 (D) 400

Q26 The sum of the digits of the largest 4 digit number that leaves a remainder of 6,18,28 and 34 on division with 8,20,30 and 36 respectively is ___?

(A) 25 (B) 16

(C) 23 (D) 18

Q27 Ahmed has a certain number of pencils with him, which he wants to distribute to all the students in a class. If he distributes 7 pencils to each of the students, he is left with 4 pencils. If he distributes 9 pencils each, he is left with 6 pencils and if he distributes 12 pencils to each of the students, he is left with 9 pencils. What can be the minimum number of students in the class?

(A) 251 (B) 250

(C) 252 (D) 249

Q28 There are 2 series given as:

S_1 = 2, 5, 8, 11... 100 terms

S_2 = 5, 9, 13, 17... 100 terms

How many terms are common between the 2 series?

(A) 23 (B) 24

(C) 21 (D) 25

Q29 The dimensions of a floor in an office is 24m × 36 m. What is the minimum number of same sized square tiles that must be used to cover the entire floor?

(A) 8 tiles (B) 6 tiles

(C) 4 tiles (D) 12 tiles

Q30 4 bells ring simultaneously at starting and then at intervals of 4 minutes, 6 minutes, 8 minutes and 12 minutes. How many times do they ring together in 3 hours?

(A) 7 times (B) 8 times

(C) 6 times (D) 10 times

Answer Key

Q1	(A)
Q2	(B)
Q3	(A)
Q4	(D)
Q5	(C)
Q6	(D)
Q7	(C)
Q8	(D)
Q9	(B)
Q10	(B)
Q11	(D)
Q12	(B)
Q13	(A)
Q14	(D)
Q15	(D)
Q16	(A)
Q17	(C)
Q18	(A)
Q19	(C)
Q20	(C)
Q21	(B)
Q22	(A)
Q23	(C)
Q24	(D)
Q25	(C)
Q26	(A)
Q27	(D)
Q28	(D)
Q29	(B)
Q30	(B)

Hints & Solutions

Q1 Text Solution:

The HCF of two integers is the largest number that is a factor of both integers.

The LCM of two integers is the smallest number that is a multiple of both integers.

In this case, the HCF of x and y is 24, which means that 24 is the largest number that is a factor of both x and y.

The LCM of x and y is 144, which means that 144 is the smallest number that is a multiple of both x and y.

Let a and b be co-primes such that x = 24a and y = 24b

So, 24a × b = 144

⇒ a × b = $\frac{144}{24}$

Therefore, ab = 6.

So, the possible pairs of a and b such that a and b are co-primes and their product is 6 are (1,6) and (2,3).

Hence, only 2 such pairs of positive integers exist.

Q2 Text Solution:

All stationery items need to be packed and each box has the same variety.

This implies the number of stationery items in each box should be HCF of different count of stationeries

HCF of 16, 108, 68, 44, 92, 60 = 4

Minimum number of boxes

$= \frac{(16+108+68+44+92+60)}{4} = \frac{388}{4} = 97$

Q3 Text Solution:

17 in a row → 1 left

22 in a row → 16 left

28 in a row → 22 left

30 in a row → 24 left

In all the 4 cases above, the remainder is 6.

(17 – 11) = (22 – 16) = (28 – 22) = (30 – 24)

Hence the required people = LCM (17, 22, 28, 30) – 6

To find the LCM (Least Common Multiple) of 17, 22, 28, and 30, we need to determine the product of the highest powers of all the prime factors involved.

Prime factorization of 17: 17

Prime factorization of 22: 2 $\times$ 11

Prime factorization of 28: 2$\times$2 $\times$ 7

Prime factorization of 30: 2 $\times$ 3 $\times$ 5

Now, we take the highest powers of each prime factor:

$17 \times 11 \times 2 \times 2 \times 7 \times 3 \times 5$

The LCM of 17, 22, 28, and 30 is $3 \times 4 \times 5 \times 7 \times 11 \times 17$ = 78540

Therefore, the minimum attendance of the public

= 78540 – 6 =78534

Q4 Text Solution:

We know that 165 = $3 \times 5 \times 11$

Let p be ha and q be hb such that h is the HCF of p and q and a and b are co-primes to each other.

So, LCM of ha and hb is 165

$h \times a \times b$=165

If h = 1,

p must be 165 and q must be 1.

Here, p > q and sum of digits of q = 1.

If h = 3, for p to be greater than q,

p = 3$\times$11 = 33

q = 3$\times$5 = 15

Sum of digits of q = 6

If h = 5, for p to be greater than q,

p = 5$\times$11 = 55

q = 5$\times$3 = 15

Sum of digits of q = 6

If h = 11, for p to be greater than q,

p = 11×5 = 55

q = 11×3 = 33

Sum of digits of q = 6

If h = 15, for p to be greater than q,

p = 165 and q = 15.

Sum of digits of q = 6

If h = 33 and for p to be greater than q,

p = 165 and q = 33.

Here again, sum of digits of q = 6.

If h = 55, and for p to be greater than q,

p = 165 and q = 55.

The sum of digits of q = 10.

Therefore, the maximum value of sum of digits of q is 10.

Q5 Text Solution:

To find the third time when all the lights will blink together after switching them on, we need to find the least common multiple (LCM) of the blinking intervals of the lights.

Therefore, the LCM of (2,4,5,7,8,10) the blinking intervals is 280 seconds.

Now, to find the third time when all the lights will blink together after switching them on, we can add multiples of the LCM to the initial time of 10:00 AM until we reach the third occurrence.

Blinking start together: 10:00 AM

First blink together: 10:00 AM + 280 seconds

Third blink together: 10:00 AM + 3 × 280 seconds

Converting seconds to minutes, the third time will be:

10:00 AM + 3 × 280 seconds = 10:00 AM + 840 seconds = 10:14 AM.

Therefore, the third time when all the lights will blink together after switching them on is 10:14 AM.

Q6 Text Solution:

We know that the HCF of two numbers in the form of $(a^m - 1)$ and $(a^n - 1)$ is given by:

$HCF = \left(a^{HCF\,of\,m,n} - 1\right)$

So, the first number = $\left(3^{12} - 1\right)$

Second number = $\left(27^{6} - 1\right) = \left(3^{18} - 1\right)$

Therefore, the HCF of these 2 numbers

$= \left(3^{HCF(12,18)} - 1\right)$

$= \left(3^{6} - 1\right)$ = 728

Q7 Text Solution:

Red light flashes three times in every 108 seconds = $\frac{108}{3} = 36\ sec$ (Red light flashes after every 36 sec.)

Green light flashes seven times in every 280 seconds = $\frac{280}{7} = 40$ sec (Means Green light flashes after every 40 sec.)

Both lights will flash together if the multiples of flushing times are common

i.e. LCM (36,40) = 360 sec

Thus, both lights will flash together at intervals of 360 sec.

In 2 hour = 7200 sec. , both lights flash together $\frac{7200}{360}$ = 20 times.

Hence, these two lights will flash together 20 times in two hours.

Hence, 20 is the answer.

Q8 Text Solution:

HCF of $2\frac{3}{5},\ 1\frac{5}{6},\ 1\frac{4}{8}$

$= HCF\ of\ \frac{13}{5},\ \frac{11}{6},\ \frac{12}{8}$

$= \frac{HCF\ of\ 13,\ 11\ and\ 12}{LCM\ of\ 5,\ 6\ and\ 8}$

$= \frac{1}{120}$

$Total\ number\ of\ pieces\ will\ be$

$\frac{13}{5}\ x\ 120 + \frac{11}{6}\ x\ 120 + \frac{12}{8}\ x\ 120$

$= 312 + 220 + 180$

$= 712$

Q9 Text Solution:

Let the numbers be xa and xb. HCF of the numbers = x and LCM of the numbers = xab.

Sum of reciprocals = $\frac{x(a+b)}{xab}$

x(a+b) = 80 given

x = 8 given

(a+b) = 10

xab = LCM = 240

So, sum of reciprocals = $\frac{80}{240} = \frac{1}{3}$

Q10 Text Solution:

We see that the difference between the divisor and the remainder is 17 in each of the 3 cases.

So, the LCM of 27, 36 and 48 is 432.

Therefore the number will be of the form 432n - 17

When n = 1, the number is 415.

When n = 2, the number is 847.

When n = 3, the number is 1279.

Therefore the smallest 4 digit number that satisfies the criteria is 1279.

Therefore the sum of the digits of 1279 will be 19

Q11 Text Solution:

Given that the HCF of any 2 pair among the three integers is 12.

So, let x = 12a

y = 12b and

z = 12c.

Such that a, b and c are co prime to each other.

So, the product of these 3 integers = $12a \times 12b \times 12c$ = 10368

⇒ 1728abc = 10368

So, $a \times b \times c$ = 6

6 can be expressed as $1 \times 1 \times 6$ *or* $1 \times 2 \times 3$

For the first case, x, y, z can take up 3 possible values - {1, 1, 6}, {1, 6, 1} and {6, 1, 1}.

For the second case, we have 6 possible values for a, b and c which will be (1,2,3) (1,3,2) (2,1,3) (2,3,1) (3,1,2) (3,2,1).

Therefore, in total we have 3 + 6 = 9 sets of possible values for x, y and z.

Q12 Text Solution:

To find the least number of chocolates in the basket, we need to find the least common multiple (LCM) of the numbers 3, 4, 5, and 6

The LCM of 3, 4, 5, and 6 is 60.

From the given information, we know that when chocolates are removed three, four, five, and six at a time, there are 1, 2, 3, and 4 chocolates remaining in the basket, respectively. The difference between the divisor and the remainder is constant, i.e. 2.

So, the total chocolates must be of the form (60n - 2)

When n = 1, total chocolates = 58 which is not divisible by 7.

When n = 2, total chocolates = 118, which again is not divisible by 7

When n = 3, total chocolates = 178, which is not divisible by 7

When n = 4, total chocolates = 238, which is divisible by 7.

Therefore, the minimum number of chocolates required = 238

Q13 Text Solution:

Minimum number of cubes will be obtained when the volume of each cube and consequently the side of each cube is kept minimum possible.

The HCF of the dimensions of the cuboid is 6.

So, the minimum number of cubes that can be obtained $= \frac{12\times18\times24}{6\times6\times6} = 2 \times 3 \times 4 = 24.$

Q14 Text Solution:

81 can be expressed as 3^4

82 = 2×41

83 is a prime number

84 = $2 \times 2 \times 3 \times 7$

85 = 5×17

When we have the numbers starting from 1 to 80, all the numbers are included except for the fourth power of 3 and 83 which is a prime number.

Hence, the LCM of numbers from 1 to 85 becomes $n \times 3 \times 83$ = 249n

Q15 Text Solution:

Let the HCF of x and y be h.

So, x = ha and y = hb, where a and b are co-primes to each other.

Now, ha + hb = 966

⇒ h(a + b) = 966

⇒ 42(a + b) = 966

a + b = 23.

Since 23 is a prime number, all the numbers lesser than 23 that add upto 23 are co-primes to each other.

So, in total there are $\frac{(23-1)}{2} = 11 pairs.$

Q16 Text Solution:

HCF of any number, N and 253 can be 1 only when both numbers are co-prime.

253 = 11×23.

To find the total number of co-primes of 253 which are less than 253, just remove the multiples of its prime factors.

$= 253 \times \left(1 - \frac{1}{11}\right) \times \left(1 - \frac{1}{23}\right)$

$= 253 \times \left(\frac{10}{11}\right) \times \left(\frac{22}{23}\right) = 220.$

Therefore, total such numbers will be 220.

Q17 Text Solution:

Let the HCF of 2 numbers be h. The two numbers are ha and hb such that a and b are co-primes.

Given, LCM = 3h.

h × ab = 3h

⇒ ab = 3

It is only possible when one of the numbers is three times the other.

So, the smallest possible ordered pair of 2 digit numbers is (10, 30) and the largest is (33, 99).

Therefore total unordered pairs are 33 – 10 + 1 = 24

Q18 Text Solution:

We know that the product of two numbers equals the product of their HCF and their LCM.

So, if the two numbers are x and y,

$x \times y \times HCF \times LCM = 1600$

$x \times y \times x \times y = 1600$

$x^2 \times y^2$ = 1600

⇒ x × y = 40

Product of 2 numbers = 40.

So, the numbers can be (1, 40), (2, 20), (4, 10), (5, 8)

The LCM of the 2 numbers can be 20 only in case of (2, 20) or (4, 10).

So, the sum of the numbers can be either 22 or 14.

Q19 Text Solution:

Since each of the four equal parts is further divided into 6, 7, 8 and 9 parts, the minimum possible length of each of the 4 equal parts must be the LCM of 6, 7, 8, and 9.

LCM of 6,7,8 and 9 is 504 meters.

So, the length of one quadrant must be a minimum of 504 meters.

Therefore, the length of the entire track is 504 × 4

= 2016 meters.

Q20 Text Solution:

It is given that the two numbers have the HCF of 36.

Then the two numbers are 36x and 36y, where x and y are co-primes to each other.

Given,

$36(x + y) = 288$
Therefore, $x + y = 8$.
The possible values for x and y are (1, 7) and (3, 5)
Therefore, the possible numbers are (36, 252) and (108, 180)
So, the possible values of the difference of the two numbers are 216 and 72.

Q21 Text Solution:

To find the next time at which all three bells will chime together, we need to find the least common multiple (LCM) of the intervals between the chimes.
The given intervals are 26 minutes, 36 minutes, and 48 minutes.
To find the LCM, we can prime factorize each interval and take the highest power of each prime factor that appears in any of the intervals.
Prime factorization of 26:
$26 = 2 \times 13$
Prime factorization of 36:
$36 = 2^2 \times 3^2$
Prime factorization of 48:
$48 = 2^4 \times 3$
Now, take the highest power of each prime factor that appears:
$2^4 \times 3^2 \times 13 = 1{,}872$
So, the LCM of the intervals is 1,872 minutes = 31 hours 12 minutes
Since the three bells chimed together at 9:00 AM, we add 31 hours 12 minutes to that time to find the next time they will chime together:
= 4:12 PM (next day)
Therefore, the next time at which the three bells will chime together is 4:12 PM on the following day.

Q22 Text Solution:

To find the 3-digit numbers that are multiples of both 24 and 36, we need to find the LCM (Least Common Multiple) of 24 and 36, and then determine how many multiples of that LCM fall within the range of 3-digit numbers (100 to 999).
Prime factorization of 24:
$$24 = 2^3 \times 3$$
Prime factorization of 36:
$$36 = 2^2 \times 3^2$$
To find the LCM, we take the highest power of each prime factor that appears:
$$2^3 \times 3^2 = 72$$
So, the LCM of 24 and 36 is 72.
Now, we need to find how many multiples of 72 are within the range of 100 to 999.
The first 3-digit multiple of 72 is the second multiple of 72, i.e. 144. To determine the last 3-digit multiple, we divide 999 by 72 and round down to the nearest whole number:
$$\frac{999}{72} \approx 13.875$$
Rounding down, we get 13.
Therefore, the number of 3-digit multiples of both 24 and 36 are 2nd to 13th multiples of 72.
So, there are 13 – 2 + 1 = 12 three digit multiples of both 24 and 36.

Q23 Text Solution:

Let the two numbers be 3x and 11x.
Since both 3 and 11 are prime numbers then, the HCF of the two numbers = x.
It is given that x = 24 (HCF).
Hence the two numbers are 3 × 24 and 11 × 24 = 72 and 264.
The sum of the two numbers = 72 + 264 = 336

Q24 Text Solution:

Let the two numbers be 3x and 8x. Then the LCM of the two numbers become 3*8*x = 24x.
it is given that 24x = 144
So, x = 6.

The two numbers are 3x and 8x.

The difference between the two numbers = 5x or $5 \times 6 = 30$

Q25 Text Solution:

The numbers can be written in the form of 11k + 4.

Also, 11k + 4 is a multiple of 5 and 11k + 4 < 200.

The numbers in the form 11k + 4 are 4, 15, 26, 37, 48, 59, 70,..

Out of these, we need to see multiples of 5.

Therefore, first such number will be 15 and after this the following numbers will increase by LCM of 5 and 11 which is 55.

Therefore, the numbers will be of the form 15+55k

Therefore, the required numbers will be

15, 70, 125 and 180

Taking sum of these, we have 390 as the required answer.

Q26 Text Solution:

We see that the difference between the divisor and the remainder in each case is same = 2.

And the LCM of 8,20,30 and 36 is 360.

The smallest number that satisfies the given condition = 360 - 2 = 358.

All other numbers can be written in the form of 360n - 2.

For n = 28, we have the number = $360 \times 28 - 2$ = 10,080 - 2 = 10078, which is the smallest 5 digit number satisfying the criteria.

The largest 4 digit number is when n = 27.

Number = $360 \times 27 - 2 = 9720 - 2 = 9718$.

The sum of the digits = 9 + 7 + 1 + 8 = 25

Q27 Text Solution:

We see that the difference between the divisor and the remainder in each case is consistent, i.e. 7 - 4 = 9 - 6 = 12 - 9 = 3

So, the minimum number of students in the school = LCM of (7, 9, 12) - 3

LCM of 7, 9 and 12 = 252

Hence, 252- 3 = 249

Q28 Text Solution:

We can see that terms of the first series are of the form $2 + (n-1) \times 3$

So the last term of the first series will be $2 + 99 \times 3 = 299$

Similarly, it may be observed that the terms of the second series are of the form $5 + (n-1) \times 4$

So the last term of the second series will be $5 + 99 \times 4 = 401$

We can also observe that the first common term of the above given series is 5.

Now, the common difference of the first and the second series is 3 and 4 respectively, therefore for obtaining the next common term, we will keep adding the LCM of the common difference which will be 12 in this case.

Therefore the series of common terms will look like the following,

5, 17, 29, 41........

Therefore, the terms of the above series are of the form $5 + (n-1) \times 12$ which can be written as 5 + 12n – 12 or 12n – 7.

Now 12n – 7 will be less than or equal to 299

$12n - 7 \leq 299$

$12n \leq 306$

$n \leq 25.5$

As n is an integral value, n will be 25.

Q29 Text Solution:

Given, the length and breadth of the floor are 36 m and 24 m respectively.

For minimizing the number of square tiles used on the floor, we need to have the square tiles of greatest possible length.

The side of the greatest possible square tile that must be used is the HCF of the length and breadth, i.e. 12 meters.

Then the minimum square tiles required $= \frac{36 \times 24}{12 \times 12} = 3 \times 2 = 6 tiles.$

Q30 Text Solution:

To determine how many times the four bells ring together in a given time frame, we need to find the least common multiple (LCM) of the intervals between the chimes and then calculate how many times that LCM fits into the given time frame.

The given intervals are 4 minutes, 6 minutes, 8 minutes, and 12 minutes.

The LCM of the intervals is 24 minutes.

To calculate how many times the bells ring together in 3 hours (180 minutes), we divide the total time frame by the LCM:

$\frac{180 \text{ minutes}}{24 \text{ minutes}} = 7.5$

However, we need to consider whole occurrences, so we round down the above result to 7 times. Additionally, we also need to add up the first simultaneous toiling of the bells.

Therefore, the four bells ring together 8 times in 3 hours.