Number System & Simplification Exercise

1. Minimum difference between x and y such that 1x71y 61 is exactly divisible by 11 is,
(a) 2 (b) 3
(c) 1 (d)0

2. The four integers next lower than 81, and the four next higher than 81, are written down and added together, this sum is divisible by,
(a) 7 (b) 9
(c) 11 (d) 13

3. If'n' is a natural number then the greatest integer less than that or equal to $(2+\sqrt{3})^n$ is
(a) odd
(b) even
(c) even when 'n' is even and odd when 'a' is odd
(d) even when 'n' is odd and odd when n is even

4. How many numbers, between 1 and 300 are divisible by 3 ' and 5 together?
(a) 16 (b) 18 (c) 20 (d) 100

5. What is the remainder when 1! + 2! + 3! + ...+100! is divided by 7 ?
(a) 0 (b) 5 (c) 6 (d) 3

6. How many numbers, lying between 1 and 500, are divisible by 13?
(a) 40 (b) 38
(c) 41 (d) 46

7. Two different numbers when divided by the same divisor, left remainder 11 and 21 respectively, and when their sum was divided by the same divisor, remainder was 4. What is the divisor?
(a) 36 (b) 28
(c) 14 (d) 9

8. A number when divided by a divisor, left remainder 23. When twice of the number was divided by the same divisor, remainder was 11. Find the divisor.
(a) 12 (b) 34
(c) 35 (d) data inadequate

9. A number when divided by 5 leaves a remainder 3. What is the remainder when the square of the same number is divided by 5?
(a) 9 (b) 3
(c) 0 (d) 4

10. The value of
$$3 \div \left[(8-5)+\left\{(4-2)+\left(2+\frac{8}{13}\right)\right\}\right]$$
(a) $\frac{15}{17}$ (b) $\frac{13}{17}$
(c) $\frac{15}{19}$ (d) $\frac{13}{19}$

11. A number when successively divided by 7 and 8 leaves the remainders 3 and 5 respectively. What is the remainder when the same number is divided by 56?
(a) 38 (b) 31
(c) 37 (d) 26

12. A boy wanted to write the numbers from the smallest number to the greatest number of three digits. How many times he needs to press the keys of the computer to do this job?
(a) 2708 (b) 2889
(c) 2644 (d) 2978

13. A number, being successively divided by 3, 5 and 8 leaves 1,2 and 4 as remainders respectively. What are the remainders if the order of divisors be reversed?
(a) 3, 3, 1 (b) 3, 1, 3
(c) 1, 3, 3 (d) None of these

14. The numbers 1 to 29 are written side by side as follows1234567891011.....2829
If the number is divided by 9, then what is the remainder?
(a) 3 (b) 1
(c) 0 (d) None of these

15. If x 959 y is divisible by 44 and y >5, then what are values of the digit x and y?
(a) x = 7, y = 6 (b) x = 4, y = 8
(c) x = 6, y = 7 (d) None of these

16. When $\left(\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}\right)$ is divided by $\left(\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}\right)$the result is:

(a) $2\frac{1}{18}$ (b) $3\frac{1}{6}$
(c) $3\frac{3}{10}$ (d) $5\frac{1}{10}$

17. A boy multiplied a certain number x by 13. He found that the resulting product consisted of all nines entirely. Find the smallest value of x.
(a) 76913 (b) 76933
(c) 76923 (d) 75933

18. A number is successively divided by 5,6,8; leaving remainders 3,4,7 respectively. What will be the remainders if the order of divisors be reversed?
(a) 7,4,3 (b) 5,3,4
(c) 2,5, 4 . (d) 1, 5,4

19. A certain number is divided by 385 by division by factors. The quotient is 102, the first remainder is 4, the second is 6 and the third is 10. Find the number.
(a) 39654 (b) 32754
(c) 38554 (d) None of these

20. Two numbers when divided by a certain divisor leave the remainders 4375 and 2986 respectively; but when the sum of the two numbers be divide 'by the same divisor, the remainder is 2361. The divisor is
(a) 2014 (b) 5000
(c) 625 (d) 2639

21. Find the unit digit in the product $(2467)^{153}\times(341)^{72}$.
(a) 6 (b) 7
(c) 8 (d) 9

22. Which digits should come in place of* and $ if the number 62684*$ is divisible by both 8and 5?
(a) 4,0 (b) 0,4
(c) 0,0 (d) 4,4

23. A boy multiplies 987 by a certain number and obtains 559981 as his answer. If in the answer, both 9's are wrong but the Other digits are correct, then the correct answer will be:
(a) 553681 (b) 555181
(c) 555681 (d) 556581

24. There is one number which is formed by writing one digit 6 times (e.g. 111111,444444 etc.). Such a number is always divisible by:
(a) 7 and 11 (b) 11 and 13
(c) 7,11 and 13 (d) None of these

25. Find the value of * in the following.
$$1\frac{2}{3}+\frac{2}{7}\times\frac{*}{7}=1\frac{1}{4}\times\frac{2}{3}+\frac{1}{6}$$
(a) 0.006 (b) $\frac{1}{6}$
(c) 0.6 (d) 6

26. A number when divided by 296 gives a remainder 75. When the same number is divided by 37, that the remainder will be:
(a) 1 (b) 2
(c) 8 (d) 11

27. A number was divided successively in order by 4,5 and 6. The remainders were respectively 2,3 and 4. The number is
(a) 214 (b) 476
(c) 954 (d) 1908

28. The least number which must be subtracted from 6709 to make it exactly divisible by 9 is:
(a) 2 (b) 3
(c) 4 (d) 5

29. 2.002 +7.9 {(28 -6.3 (3.6 -1 5) +15.6)} =?
(a) 2.002 (b) 4.2845
(c) 40.843 (d) 42.845

30. $9-1\frac{2}{9}$ of $3\frac{3}{11}+5\frac{1}{7}$ of $\frac{7}{9}$ = ?
(a) $\frac{5}{4}$ (b) 8
(c) $8\frac{32}{81}$ (d) 9

31. A number when divided successively by 4 and 5 leaves remainder 1 and 4 respectively. When it is successively divided by 5 and 4, then the respective remainders will be:
(a) 1,2 (b) 2, 3
(c) 3,2 (d) 4,1

32. How many times must 79 be subtracted from 5×10^4so as to obtain43759?
(a) 77 (b) 78
(c) 79 (d) 80

33. If the product of first sixty positive consecutive integers be divisible by 8^n, where n is an integer, then the largest possible value of n is
(a) 18 (b) 19
(c) 17 (d) 16

34. The digit in the unit's place of the number represented by $(7^{95}-3^{58})$ is:

(a) 0 (b) 4
(c) 6 (d) 7

35. In the product of first fourty positive consecutive integers be divisible by 5^n, where n is an integer, then the largest possible value of n is
(a) 8 (b) 9
(c) 10 (d) 7

36. $55^3 + 17^3 - 72^3$ is divisible by
(a) both 3 and 13 (b) both 7and 17
(c) both 3 and 17 (d) both 7 and 13

37. After the division of a number successively by 3, 4 and 7, the remainders obtained are 2,1 and 4 respectively. What will be the remainder if 84 divides the same number?
(a) 80 (b) 76
(c) 41 (d) 53

38. At a college football game, 4/5 of the seats m the lower deck of the stadium were sold. If 1/4 of all the seating in the stadium is located in the lower deck, and if 2/3 of all the seals In the stadium were sold, then what fraction of the unsold seats in the stadium was in the lower deck ?
(a) 3/20 (b) 1/6
(c) 1/5 (d) 1/3

39. A number A4571203B is divisible by 18. Find the value of A and B.
(a) 8,4 (b) 6, 8
(c) 4, 6 (d) 6,6

40. What is the sum of all two-digit numbers that give a remainder of 3 when they, are divided by 7?
(a) 666 (b) 676
(c) 683 (d) 777

41. Let x and y be positive integers such that x is prime and y is composite. Then
(a) y - x cannot be an even integer
(b) xy cannot be an even integer.
(c) (x+y)/x cannot be an even integer
(d) None of the above statements is true.

42. Evaluate $\frac{\sqrt{24}+\sqrt{6}}{\sqrt{24}-\sqrt{6}}$
(a) 2 (b) 3
(c) 4 (d) 5

43. Arranging the following in descending order $2^{57}, 4^{38}, 15^{19}$ we get
(a) $2^{57} > 4^{38} > 15^{19}$ (b) $4^{38} > 15^{19} > 2^{57}$
(c) $15^{19} > 2^{57} > 4^{38}$ (d) $2^{57} > 15^{19} > 4^{38}$

44. Arranging the following in ascending order $2^{1000}, 10^{3000}, 3^{6000}, 7^{4000}$ we get
(a) $3^{6000} < 10^{3000} < 2^{10000} < 7^{4000}$
(b) $2^{10000} < 7^{4000} < 10^{3000} < 3^{6000}$
(c) $10^{3000} < 3^{6000} < 7^{4000} < 2^{10000}$
(d) $7^{4000} < 3^{6000} < 2^{10000} < 10^{3000}$

45. If all the fractions $\frac{3}{5}, \frac{1}{8}, \frac{8}{11}, \frac{4}{9}, \frac{2}{7}, \frac{5}{12}$ and $\frac{5}{12}$ are arranged in the descending order of their values, which one will be the third?
(a) $\frac{1}{8}$ (b) $\frac{4}{9}$
(c) $\frac{5}{12}$ (d) $\frac{8}{11}$

46. The smallest of $\sqrt{8}+\sqrt{5}, \sqrt{7}+\sqrt{6}, \sqrt{10}+\sqrt{3}$, and $\sqrt{11}+\sqrt{2}$ is:
(a) $\sqrt{8}+\sqrt{5}$ (b) $\sqrt{7}+\sqrt{6}$
(c) $\sqrt{10}+\sqrt{3}$ (d) $\sqrt{11}+\sqrt{2}$

47. Which one of the following is the least?
$\sqrt{3}, \sqrt[3]{2}, \sqrt{2}$ and $\sqrt[3]{4}$
(a) $\sqrt{2}$ (b) $\sqrt[3]{4}$
(c) $\sqrt{3}$ (d) $\sqrt[3]{2}$

48. The smallest of $\sqrt{8}+\sqrt{5}, \sqrt{7}+\sqrt{6}, \sqrt{10}+\sqrt{3}$ and $\sqrt{11}+\sqrt{2}$ is:
(a) $\sqrt{8}+\sqrt{5}$ (b) $\sqrt{7}+\sqrt{6}$
(c) $\sqrt{10}+\sqrt{3}$ (d) $\sqrt{11}+\sqrt{2}$

49. $\left[\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}} + \frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}\right]$ in simplified form equals to:
(a) 1 (b) $\sqrt{2}$
(c) $\frac{1}{\sqrt{2}}$ (d) 0

50. The value of $\frac{\sqrt{2}(\sqrt{3}+1)(2-\sqrt{3})}{(\sqrt{2}-1)(3\sqrt{3}-5)(2+\sqrt{2})}$ is
(a) 1 (b) $2-\sqrt{3}$
(c) $2+\sqrt{3}$ (d) $\sqrt{3}$-2

51. When a ball bouinces it rises to $\frac{3}{4}$ of the height from which it fell. If the ball is dropped from a height of 32 m, how high will, it rise at the third bounce?
(a) 13 m (b) $13\frac{1}{2}$m

(c) $14\frac{1}{2}$m (d) None of these

52. $\frac{1}{10}$ of a pole is coloured red, $\frac{1}{20}$ white, $\frac{1}{30}$ blue, $\frac{1}{40}$ black, $\frac{1}{50}$ violet, $\frac{1}{60}$ yellow and the rest is green. If the length of the green portion of the pole is 12.08 metres, then the length of the pole is:
(a) 16 m (b) 18 m
(c) 20 m (d) 30 m

53. The fluid contained in a bucket can fill four large bottles or seven small bottles. A full large bottle is used to fill an empty small bottle. What fraction of the fluid is left over in the large bottle when the small one is full?
(a) $\frac{2}{7}$ (b) $\frac{3}{7}$
(c) $\frac{4}{7}$ (d) $\frac{5}{7}$

54. At an International Dinner, $\frac{1}{5}$ of the people attending were French men. If the number of French women at the dinner was $\frac{2}{3}$ greater than the number of French men, and there were no other French people at the dinner, then what fraction of the people at the dinner were not French?
(a) $\frac{1}{5}$ (b) $\frac{2}{5}$
(c) $\frac{2}{3}$ (d) $\frac{7}{15}$

55. From a number of apples, a man sells half the number of existing apples plus 1 to the first customer, sells $\frac{1}{3}$ rd of the remaining apples plus 1 to the second customer and $\frac{1}{5}$ th of the remainingapples plus 1 to the third customer. He then finds that he has 3 apples left. How many apples did he have originally?
(a) 15 (b) 18
(c) 20 (d) 25

56. The charges of hired car are Rs 4 per km for the first 60 km, Rs. 5 per km for the next 60 km and Rs.8 for every 5 km for further journey. If the balance amount left over with Rohit is one-fourth of what be paid towards the charges of the hired car for travelling 320 km, how much money did he have initially with him?
(a) Rs. 1075 (b) Rs. 1255
(c) Rs. 1540 (d) None of these

57. Arrange the following in ascending order $3^{34}, 2^{51}, 7^{17}$,weget
(a) $3^{34}>2^{51}>7^{17}$ (b) $7^{17}>2^{51}>3^{34}$
(c) $3^{34}>7^{17}>2^{51}$ (d) $25^{51}>3^{34}>7^{17}$

58. If the product of first fifty positive consecutive integers be divisible by 7^n, where n is an integer, then the largest possible value of n is
(a) 7 (b) 8
(c) 10 (d) 5

59. In an examination, a boy was asked to multiply a given number by $\frac{7}{19}$. By mistake, he divided the given number by $\frac{7}{19}$ and got a result 624 more than the correct answer.
The sum of digits of the given number is
(a) 10 (b) 11
(c) 13 (d) 14

ANSWER KEY				
1. (a)	2. (b)	3. (a)	4. (c)	5. (b)
6. (b)	7. (b)	8. (d)	9. (d)	10. (b)
11. (a)	12. (b)	13. (a)	14. (a)	15. (a)
16. (d)	17. (c)	18. (d)	19. (a)	20. (b)
21. (b)	22. (a)	23. (c)	24. (c)	25. (d)
26. (a)	27. (a)	28. (c)	29. (d)	30. (b)
31. (b)	32. (c)	33. (a)	34. (b)	35. (b)
36. (c)	37. (d)	38. (a)	39. (b)	40. (b)
41. (d)	42. (b)	43. (b)	44. (a)	45. (b)
46. (d)	47. (d)	48. (d)	49. (c)	50. (c)
51. (b)	52. (a)	53. (b)	54. (d)	55. (c)
56. (a)	57. (b)	58. (b)	59. (d)	

Number System & Simplification Hints & Explanations

1. (a) As 1x71y 61 is exactly divisible by 11.
(1 +7 + y+ 1) - (x+ 1 + 6) = 0 or multiple of 13 for minimum difference
9+y – 7 – x = 0
⇒ x – y = 2

2. (b) Four integers next lower than 81 is 80,79,78,77 four integers next higher than 81 is 82,83,84,85
Sum=(80 + 82)+(79 + 83)+(78 + 84)+ (77+ 85)
= 81+81+81+81 = 4 × 81
Sum is divisible by 9 as 81 is divisible by 9.

3. (a) putting n = 1, we get $2 + \sqrt{3}$ = whose integral part is3 putting n=2,we get$(2 + \sqrt{3})^2$ = $4 + 3 + 4\sqrt{3}$
whose integral part is 11
which is again an odd number
Now, through the options it can be judged that the greatest integer must always be an odd number.

4. (c) LCM of3 and 5 = 15
Number divisible by 15 are 15,30, 45 ....300.
Let total numbers are n
300 = 15+ (n - 1) × 15
300 = 15 +15 n-15
⇒ n = 20

5. (b) 7! +8!+9! + 10! +....+100 = 7.6! + 8.7.6!+9.8.7.6! +..... + 100! is completely divisible by 7 as each of the terms contain at least one 7 in it.
Now, 1!+2! +3!+4! +5! +6!
= 1+2+6+24+120+720 = 873
which leaves a remainder of 5 when divided by 7.

6. (b) Number divisible by 13,26,39,.... 494
Let n be the total numbers 494 = 13 + (n - 1) × 13
⇒n = 38

7. (b) Divisor = [Sum of remainders]-[Remainder when sum is divided]
= 11 +21 – 4 – 28

8. (d) Let number be N.
Then, N = Divisor × Q_1 + 23
2N = Divisor × Q_2 + 11,
where Q_1 and Q_2 are quotients respectively.
Here, we have two equations and 3 variables. There equations cannot be solved.

9. (d) Let the number be 5q + 3, where q is quotient
Now, $(5q + 3)^2 = 25q^2 + 30q + 9$
$= 25q^2 + 30 q + 5 + 4$
$= 5 [5q^2 + 6q+ 1] + 4$
Hence, reminder is 4.

10. (b) $3 \div \left[(8-5) \div \left\{(4-2) \div \left(2 + \frac{8}{13}\right)\right\}\right]$

$$\Rightarrow 3 \div \left[(3) \div \left(2 \div \frac{34}{13}\right)\right]$$

$$\Rightarrow 3 \div \left[(3) \div \left(2 \times \frac{13}{34}\right)\right]$$

$$\Rightarrow 3 \div \left[\frac{3 \times 34}{13 \times 2}\right]$$

$$\Rightarrow \frac{3 \times 13 \times 2}{3 \times 34} = \frac{13}{17}$$

11. (a)∵ 56 = $d_1 \times d_2$
∴ required remainder = $d_1 r_2 + r_1$ where $d_1 = 7$ and $r_1 = 3$ and$r_2 = 5$.
i.e. 7 × 5 +3 = 38

12. (b) He wants to write from l to 999. He has to write 9 numbers of one digit, 90 numbers of two digits and 900 numbers of three digits.
Total number of times = 1 × 9 + 2 × 90 + 3 × 900 = 2889

13. (a) ∴Complete remainder = $d_1 d_2 r_3 + d_1 r_2 + r_1$
= 3 × 5 × 4 + 3 × 2 + 1 = 67
Divided 67 by 8,5 and 3, the remainders are 3,3,1.

14. (a) Sum of the digits of the 'super' number
= 1+2+3+.....+29

$$= \frac{29}{2} . \{2 \times 1 + (29-1).1\}$$

$$= \frac{29}{2} . (2 + 28) = \frac{29 \times 30}{2} = 29 \times 15 = 435$$

435 when divided by 9 leave remainder 3.

15. (a) x989y is divisible by 44 it means divisible by 4 and 11 both.

∵x959y is divisible by 4.9y is divisible by 4.
Therefore y = 6 (given y >5)
Now x9596 is divisible by 11
(x+5+6)-(9+9) =0
(11+x) – 18 =0
x = 7,y=6

16. (d) $\frac{\left(\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}\right)}{\left(\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}\right)}=\frac{\left(\frac{30-15+12-10}{60}\right)}{\left(\frac{2}{5}+\frac{3}{5}\right)-\left(\frac{5}{9}+\frac{7}{18}\right)}=\frac{\left(\frac{17}{60}\right)}{1-\frac{17}{18}}$

$=\left(\frac{17}{60}\times 18\right)=\frac{51}{10}=5\frac{1}{10}$

17. (c) By actual division, we find that 999999 is exactly divisible by 13. The quotient 76923 is the required number.

18. (d) Complete remainder= $d_1\, d_2\, r_3 + d_1\, r_2 + r_1$
= 5 × 6 × 7 + 5 × 4 + 3 =233.
Dividing 233, by reversing the divisors i.e. by 8,6,5; respective remainders are 1,5,4.

19. (a) Let the number be z. Now 385 = 5×7×11

5	Z	Remainders
7	Y	4
11	X	6
	102	10

x = 11 × 102 + 10 = 1132
y = 7x + 6=7 × 1132+6 = 7930
z=5y+4 = 5× 7930 + 4 = 39654

20. (b) Required Divisor = (sum of remainders)
- Remainder when sum is divided
= [4375 + 2986] - 2361 =5000

21. (b) Clearly, unit's digit in the given product = unit's digit in $7^{153}\times 1^{72}$.
Now, 7^4 gives unit digit 1.
∴ 7^{153} gives unit digit(l × 7) =7. Also 1^{72} gives unit digit l.
Hence, unit's digit in the product = (7 × l) = 7.

22. (a) Since the given number is divisible by 5, so 0 or 5 must come in place of $. But, a number ending with 5 is never divisible by 8. So,0 will replace $.
Now, the number formed by the last three digits is 4*0, which becomes divisible by 8, if* is replaced by 4. Hence, digits in place of* and $ are 4 and 0 respectively.

23. (c) 987 = 3 × 7 × 47
So, required number must be divisible by each one of 3,7,47.
None of the numbers in (a) and (b) are divisible by 3, while (d) is not divisible by 7.
∴ Correct answer is (c).

24. (c) Since 111111 is divisible by each one of 7, 11 and 13, so each one of given type of numbers is divisible by each one of 7, 11, and 13. as we may write, 222222 = 2 ×111111, 333333 = 3 × 111111, etc.

25. (d) Let $\frac{5}{3}\div\frac{2}{7}\times\frac{x}{7}=\frac{5}{4}\times\frac{2}{3}\div\frac{1}{6}$. Then
$\frac{5}{3}\times\frac{7}{2}\times\frac{x}{7}=\frac{5}{4}\times\frac{2}{3}\times 6\Leftrightarrow\frac{5}{6}x=5'\Leftrightarrow$
$x=\left(\frac{5\times 6}{5}\right)=6$

26. (a) Number = (296 × Q) + 75 = (37 × 8Q) + (37 × 2) + 1
= 37 × (8Q + 2) + 1
∴ Remainder = 1.

27. (a)

4	X	Remainders
5	y	-2
6	z	-3
	1	-4

z = 6 ×1 + 4 = 10
y = 5 × 10 + 3 = 53
x = 4 × 53+2=214

28. (c) On dividing 6709 by 9, we get remainder = 4.
∴Required number to be subtracted = 4.

29. (d) Given exp. =2.002+7.9 (2.8-6.3 × 2.1 +15.6)
= 2.002+7.9(2.8-13.23+15.6) = 2.002 +7.9 × 15.1
= 2.002 +40.843 = 42.845

30. (b) Given exp. = $9-\frac{11}{9}$ of $\frac{36}{11}\div\frac{36}{7}$ of $\frac{7}{9}$= 9 – 4 ÷4=9-1=8

31. (b) Complete remainder = $d_1\, r_2 + r_1$
= 4 × 4 + 1 = 17
Now, 17 when divided successively by 5 and 4
∴ The remainders are 2,3.

32. (c) Let x be the number of times, then
79x +43759 = 50,000
$\Rightarrow x=(50000-43759)\div 79=\frac{6241}{79}$=79

33. (a) Product of first sixty consecutive integers = 60!
$8 = 2\times 2\times 2 = 2^3$

highest power of 2 is 60!

$$= \left[\frac{60}{2}\right] + \left[\frac{60}{2^2}\right] + \left[\frac{60}{2^3}\right] + \left[\frac{60}{2^4}\right] + \left[\frac{60}{2^5}\right]$$

= 30 + 15 + 7 + 3 + 1 = 56

highest power of 80 or $(2^3) = \left[\frac{56}{3}\right] = 18$

34. (b) Unit digit in 7^4 is 1. So, unit digit in 7^{92} is 1.
∴Unit digit in 7^{95} is 3.
Unit digit in 3^4 is 1.
∴ Unit digit in 3^{56} is 1.
∴ Unit digit in $3^{58}$is 9.
∴Unit digit in $(7^{95} - 3^{58}) = (13 - 9) = 4$.

35. (b) Product of first fourty positive integers
$1 \times 2 \times 3 \times$— $\times 40 = 40!$

Highest power of 5 = $\left[\frac{40}{5}\right] + \left[\frac{40}{5^2}\right] = 8+1 = 9$

largest possible value of n is 9

36. (c) $55^3+17^3- 72^3= (55)^3 + (17)^3 -(55+17)^3$
$= 55^3 + 17^3 – [(55)^3 + (17)^3 + 3 \times 55 \times 17 \times 72]$
$= -3 \times 55 \times 17 \times 72$

37. (d) The required no. is 3 [4 (7x + 4) + 1] + 2 = 84x + 53 So the remainder is 53, when divided by 84.
number of seats in the lower deck be x and number of Seats in upper deck be y.
∴ p = x + y, x = p/4, y = 3p/4
Now in the lower deck, 4x/5 seats were sold and x/5 seats were unsold.
No. of total seats sold in the stadium = 2p/3.
No. of unsold seats in the lower deck = x/5 = p/20
No. of unsold seats in the stadium = p/3
∴ Required fraction = $\frac{p/20}{p/3} = \frac{3}{20}$

39. (b) The number is divisible by 18 i.e., it has to be divisible by 2 and 9.
∴B may be 0,2,4,6,8.
A+4+5+7+1+2+0+3 + B = A + B + 22.
A + B could be5,14 (as the sum can't exceed 18, since A and B are each less than 10).
So, A and B can take the values of 6,8.

40. (b) Number is of the form = 7n + 3; n = 1 to 13
So, S = $\sum_{n=1}^{13}(7n + 3) = \frac{7n\,(n+1)}{2} + 3n$
Putting n = 13 we get $7 \times 13 \times 7+39 = 676$

41. (d) x is primesay 7
y is not prime but composite no say 8,9,21
(a) 9 – 7 = 2 (b) $7 \times 8 = 56$
(c) $\frac{21+7}{7} = 4$
Put x = 2 and y = 6 and check for the options.
By hit and trial all the 3 options can be proved wrong

42. (b) $\frac{\sqrt{24}+\sqrt{6}}{\sqrt{24}-\sqrt{6}} = \frac{2\sqrt{6}+\sqrt{6}}{2\sqrt{6}-\sqrt{6}} = \frac{3\sqrt{6}}{\sqrt{6}} = 3$

43. (b) $2^{57} = (2^3)^{19} = 8^{19}$
$4^{38} = (4^2)^{19} = 16^{19}$
$4^{38} > 15^{19} > 2^{57}$

44. (a) $2^{10000} = (2^{10})^{1000} = (1024)^{1000}$
$(10)^{3000} = (10^3)^{1000} = (1000)^{1000}$
$3^{6000} = (3^6)^{1000} = (729)^{1000}$
$7^{4000} = (7^4)^{1000} = (1029)^{1000}$
$3^{6000} < 10^{3000} < 2^{10000} < 7^{4000}$

45. (b) $\frac{3}{5} = 0.6., \frac{4}{9} = 0.44$

$$\frac{1}{8} = 0.0125, \frac{2}{7} = 0.28$$

$$\frac{8}{11} = 0.727, \frac{5}{12} = 0.41$$

therefore, the descending order is

$$\frac{8}{11} > \frac{3}{5} > \frac{4}{9} > \frac{5}{12} > \frac{2}{7} > \frac{1}{8}$$

So, the third fraction is = $\frac{4}{9}$

46. (d) Here, $(\sqrt{8} + \sqrt{5})^2 = (\sqrt{8})^2 + (\sqrt{5})^2 + 2 \times \sqrt{8} \times \sqrt{5}$
$= 8 + 5 + 2 \times \sqrt{8 \times 5} = 13 + 2\sqrt{40}$
$(\sqrt{7} + \sqrt{6})^2 = 7+6+2\times\sqrt{7 \times 6} = 13 + 2\sqrt{42}$
$= (\sqrt{10} + \sqrt{3})^2 = 10 + 3 + 2 \times \sqrt{10 \times 3} = 13 + \sqrt{30}$
$= (\sqrt{11} + \sqrt{2})^2 = 11 + 2 + 2 \times \sqrt{11 \times 2} = 13 + 2\sqrt{22}$

47. (d) The smallest number is $\sqrt[3]{2}$

48. (d) Here, $(\sqrt{8} + \sqrt{5})^2$
$= (\sqrt{8})^2 + (\sqrt{5})^2 + 2 \times \sqrt{8} \times \sqrt{5}$
$= 8+5+2 \times \sqrt{8 \times 5} = 13 + 2\sqrt{40}$
Similarly,
$(\sqrt{7} + \sqrt{6})^2 = 7+6+2\times\sqrt{7 \times 6} = 13 + 2\sqrt{42}$
$(\sqrt{10} + \sqrt{3})^2$

$= 10 + 3 + 2 \times \sqrt{10 \times 3} = 13 + 2\sqrt{30}$, $(\sqrt{11} + \sqrt{22}$

$= 11 + 2 + 2 \times \sqrt{11 \times 2} = 13 + 2\sqrt{22}$

Clearly, $13 + 2\sqrt{22}$ is the smallest among these.

$\therefore \sqrt{11} + \sqrt{2}$ is the smallest.

49. (c) $\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}$

$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{[\sqrt{2}+\sqrt{3}+\sqrt{5}]} = \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2+3+2\sqrt{6}-5}$

$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2\sqrt{6}}$

Similarly, $\frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}$

$$= \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{[\sqrt{2}-\sqrt{3}-\sqrt{5}][(\sqrt{2}-\sqrt{3})+\sqrt{5}]}$$

$$= \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{-2\sqrt{6}}$$

$\therefore$ Expression

$$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2\sqrt{6}} - \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{2\sqrt{6}}$$

$$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}-\sqrt{2}+\sqrt{3}-\sqrt{5}}{2\sqrt{6}}$$

$$= \frac{\sqrt{3}}{\sqrt{6}} = \frac{1}{\sqrt{2}}$$

50. (c) Expression

$$= \frac{\sqrt{2}(\sqrt{3}+1)(2-\sqrt{3})}{(\sqrt{2}-1)\sqrt{2}(\sqrt{2}+1)(3\sqrt{3}-5)}$$

$$= \frac{\sqrt{2}(2\sqrt{3}-3+2-\sqrt{3})}{\sqrt{2}(2-1)(3\sqrt{3}-5)}$$

$$= \frac{\sqrt{3}-1}{3\sqrt{3}-5} = \frac{\sqrt{3}-1}{(3\sqrt{3}-5)} \times \frac{3\sqrt{3}+5}{3\sqrt{3}+5}$$

$$= \frac{9-3\sqrt{3}+5\sqrt{3}-5}{27-25}$$

$= \frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$

51. (b) Height at the third bounce

$$= \left(32 \times \left(\frac{3}{4}\right)^3\right) \text{m} = \left(32 \times \frac{27}{64}\right) \text{m} = \frac{27}{2} \text{m} = 13\frac{1}{2} \text{m}.$$

52. (a) Green portion $= \left[1 - \left(\frac{1}{10} + \frac{1}{20} + \frac{1}{30} + \frac{1}{40} + \frac{1}{50} + \frac{1}{60}\right)\right]$

$$= \left[1 - \frac{1}{10}\left(1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{3} + \frac{1}{5} + \frac{1}{6}\right)\right]$$

$$= 1 - \frac{1}{10} \times \frac{147}{60}$$

$$= 1 - \frac{147}{600} = \frac{453}{600}$$

Let the length of the pole be x metres.

Then, $\frac{453}{600}x = 12.08 \Leftrightarrow x = \left(\frac{12.08 \times 600}{453}\right) = 16$

53. (b) Let the capacity of the bucket be x litres. Then,

Capacity of 1 large bottle = $\frac{x}{4}$; Capacity of 1 small bottle = $\frac{x}{7}$.

Fluid left in large bottle = $\left(\frac{x}{4} - \frac{x}{7}\right) = \frac{3x}{28}$

$\therefore$ Required fraction $= \left(\frac{3x/28}{x/4}\right) = \left(\frac{3x}{28} \times \frac{4}{x}\right) = \frac{3}{7}$

54. (d) French men = $\frac{1}{5}$; French women

$$= \left(\frac{1}{5} + \frac{2}{3} \times \frac{1}{5}\right) = \frac{5}{15} = \frac{1}{3}$$

French people = $\left(\frac{1}{5} + \frac{1}{3}\right) = \frac{8}{15}$

$\therefore$ Not-French = $\left(1 - \frac{8}{15}\right) = \frac{7}{15}$

55. (c) Let the total number of apples be x. Then

Apples sold to 1st customer = $\left(\frac{x}{2} + 1\right)$

Remaining apples = x - $\left(\frac{x}{2} + 1\right) = \left(\frac{x}{2} - 1\right)$

Apples sold to 2nd customer = $\frac{1}{3}\left(\frac{x}{2} - 1\right) + 1 = \frac{x}{6} - \frac{1}{3} + 1$

$$= \left(\frac{x}{6} + \frac{2}{3}\right)$$

Remaining apples = $\left(\frac{x}{2} - 1\right) - \left(\frac{x}{6} + \frac{2}{3}\right)$

$= \left(\frac{x}{2} - \frac{x}{6}\right) - \left(1 + \frac{2}{3}\right) = \left(\frac{x}{3} - \frac{5}{3}\right)$

Apples sold 3rd customer $= \frac{1}{5}\left(\frac{x}{3} - \frac{5}{3}\right) + 1 = \left(\frac{x}{15} + \frac{2}{3}\right)$

Remaining apples $= \left(\frac{x}{3} - \frac{5}{3}\right) - \left(\frac{x}{15} + \frac{2}{3}\right)$

$= \left(\frac{x}{3} - \frac{x}{15}\right) - \left(\frac{5}{3} + \frac{2}{3}\right) = \left(\frac{4x}{15} - \frac{7}{3}\right)$

$\therefore \frac{4x}{15} - \frac{7}{3} = 3 \Leftrightarrow \frac{4x}{15} = \frac{16}{3} \Leftrightarrow x = \left(\frac{16}{3} \times \frac{15}{4}\right)$

$= 20$

56. (a) Hire charges = Rs. $\left(60 \times 4 + 60 \times 5 + \frac{8}{5} \times 200\right)$ = Rs. 860

Suppose Rohit has Rs. x with him initially.

Then, $x - 860 = \frac{1}{4} \times 860$

$\Leftrightarrow x = 1075$.

57. (b) $3^{34} = (3^2)^{17} = 9^{17}$

$2^{51} = (2^3)^{17} = 8^{17}$

Clearly, $7^{17} > 8^{17} > 9^{17}$

or $7^{17} > 2^{51} > 3^{34}$