7
CHAPTER

ALGEBRA AND SERIES EXPANSION

1. Find the value of $67^2 - 33^2$.

(a) 3200 (b) 3400

(c) 3146 (d) 3143

[RRB JE 2014 GREEN SHIFT]

2. Given that log 2 = 0.3 approx., one billion would be approx.

(a) 2^9 (b) 2^{10}

(c) 2^{20} (d) 2^{30}

[RRB JE 2014 GREEN SHIFT]

3. In how many different ways can 3 identical white balls and 2 identical red balls be arranged besides each other, in a straight line?

(a) 6 (b) 10

(c) 12 (d) 120

[RRB JE 2014 GREEN SHIFT]

4. What is the probability of getting 3 aces if three cards are drawn from a set of 52 playing cards?

(a) 52^3 (b) $\frac{1}{52^3}$

(c) $\frac{1}{52!}$ (d) $\frac{4 \times 3 \times 2}{52 \times 51 \times 50}$

[RRB JE 2014 GREEN SHIFT]

5. In a class of 40 students, 25 are sports persons and 25 are mathematicians. What is the probability that the monitor of the class is both a sports person and a mathematician?

(a) $\frac{1}{40}$ (b) $\frac{1}{25}$

(c) $\frac{1}{4}$ (d) $\frac{1}{50}$

[RRB JE 2014 GREEN SHIFT]

6. Sum of two numbers is 15 and sum of their reciprocals is $\frac{15}{56}$. The two numbers are

(a) 4, 11

(b) 5, 10

(c) 6, 9

(d) 7, 8

[RRB JE 2014 GREEN SHIFT]

7. If α, β are the roots of quadratic equation $x^2 + x + 1 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is

(a) –1 (b) 1

(c) 0 (d) None of these

[RRB JE 2014 GREEN SHIFT]

8. Value of $\sqrt{6 + \sqrt{6 + \sqrt{6 + ...}}}$ is

(a) $\frac{5}{2}$ (b) –2

(c) 3 (d) 4

[RRB JE 2014 GREEN SHIFT]

9. If a, b, c, d, e and f are in arithmetic progression, then e – c is equal to

(a) 2(b – a) (b) c – b

(c) 2 (f – d) (d) 2(d – b)

[RRB JE 2014 GREEN SHIFT]

10. Find the median of the following numbers :

14, 23, 20, 12, 11, 15, 24, 17, 9, 21, 25

(a) 15 (b) 20

(c) 17 (d) 14

[RRB JE 2014 GREEN SHIFT]

11. A student was asked to multiply a number by 12. By mistake he multiplied the number by 21 and got the answer 63 more than the correct answer. What is the correct answer?

(a) 9 (b) 8

(c) 7 (d) 84

[RRB JE 2014 GREEN SHIFT]

12. Find the value of $\frac{(768)^3 + (232)^3}{(768)^2 - (768 \times 232) + (232)^2}$:

(a) 1000 (b) 536

(c) 500 (d) 268

[RRB JE 2014 RED SHIFT]

13. Find the value of (1+ 2 + 3 + 4+.....+45) :

(a) 2140 (b) 2070

(c) 1035 (d) 1280

[RRB JE 2014 RED SHIFT]

14. In an examination, a student gets 4 marks for every correct answer and loses 1 mark for even' wrong answer. If he attempts in all 60 questions and secures 130 marks, then find the number of questions he attempted correctly.

(a) 42

(b) 48

(c) 36

(d) 38

[RRB JE 2014 RED SHIFT]

15. If $\frac{x}{y} = \frac{6}{5}$, then find the value of $\frac{x^2 + y^2}{x^2 - y^2}$:

(a) 11 (b) $\frac{61}{11}$

(c) $\frac{11}{5}$ (d) 6

[RRB JE 2014 RED SHIFT]

16. If $\log_8 x = \frac{2}{3}$, then the value of 'x is :

(a) $\frac{16}{3}$ (b) $\frac{4}{3}$

(c) 12 (d) 4

[RRB JE 2014 RED SHIFT]

17. A student was asked to find answer by dividing a number by 3. But, instead of dividing it, he multiplied it by 3 and got 29.7. What was the correct answer ?

(a) 3.3 (b) 9 3

(c) 9.8 (d) 99

[RRB JE 2014 YELLOW SHIFT]

18. A bag contains three types of coins i.e. one rupee coins, 50 paisa coins and 25 paisa coins totaling 175 coins. If the total value of the coins of each kind be the same, the total amount in the bag is

(a) Rs. 75 (b) Rs. 126

(c) Rs. 175 (d) Rs. 300

[RRB JE 2014 YELLOW SHIFT]

19. If $x = y + \sqrt{\frac{4}{Z}}$ then Z = ?

(a) $4 (X^2 - Y2)$ (b) $\frac{4}{\sqrt{X^2 - Y^2}}$

(c) $4(X - Y)^2$ (d) $\frac{4}{(X - Y)^2}$

[RRB JE 2014 YELLOW SHIFT]

20. The product of two positive numbers is 2500. If one is four times the other, then the sum of two numbers is

(a) 25 (b) 125

(c) 225 (d) 250

[RRB JE 2014 YELLOW SHIFT]

21. A is 2 years older than B who is twice as old as C. If the total of the ages of A, B, C be 27 years, then how old is B?

(a) 9 years (b) 8 years

(c) 10 years (d) 11 years

[RRB JE 2014 YELLOW SHIFT]

22. For given number series, select the option which shall replace ? to continue the pattern in series.

1, 4, 10, 22, 46, ?

(a) 64 (b) 86

(c) 94 (d) 122

[RRB JE 2014 YELLOW SHIFT]

23. The 18^{th} term of the A.P. whose first two terms are –3 and 4 respectively is

(a) 14 (b) 116

(c) 122 (d) –122

[RRB JE 2015 26th AUG 1st SHIFT]

24. The third term of a G.P. is 2. The product of its first five terms is

(a) 2^6 (b) 2^5

(c) 2^4 (d) 2^3

[RRB JE 2015 26th AUG 1st SHIFT]

25. If $(x + 1)$ is a factor of $x^4 - ax^3 + 2x^2 - 3x + 1$, then a is equal to

(a) 4 (b) 3

(c) –3 (d) –7

[RRB JE 2015 26th AUG 1st SHIFT]

26. One of the factor of $(25x^2 - 1) + (1 + 5x)^2$ is

(a) 10x (b) 5 + x

(c) 5 – x (d) 5x – 1

[RRB JE 2015 26th AUG 1st SHIFT]

27. All values of k for which $x^2 + kx + 9 = 0$ has real roots is

(a) $k > 6$ (b) $k \geq 6$

(c) $6 \leq k \leq 6$ (d) $-6 \leq k \leq 6$

[RRB JE 2015 26th AUG 1st SHIFT]

28. The sum and product of the roots of the equation $x^2 - 4x + 3 = 0$ are respectively

(a) 3, –4 (b) 4, –3

(c) 4, –3 (d) 4, 3

[RRB JE 2015 26th AUG 1st SHIFT]

29. Which term of AP; 7, 14, 21, 28, ... is 77 ?

(a) 9^{th} (b) 10^{th}

(c) 11^{th} (d) 12^{th}

[RRB JE 2015 26th AUG 2nd SHIFT]

30. The third term of a G.P. is – 3. The product of its first five terms is

(a) 3^4 (b) -3^4

(c) 3^5 (d) -3^5

[RRB JE 2015 26th AUG 2nd SHIFT]

31. If (x – 2) is a factor of $ax^3 + 3x^2 + 4x + 4$, then a is equal to

(a) 3 (b) 4

(c) –3 (d) –4

[RRB JE 2015 26th AUG 2nd SHIFT]

32. One of the factors of $(36x^2 - 1) + (1 + 6x)^2$ is

(a) $6 + x$ (b) $6 - x$

(c) $6x - 1$ (d) $12x$

[RRB JE 2015 26th AUG 2nd SHIFT]

33. All values of k for which $x^2 + kx + 16 = 0$ has real roots is

(a) $8 \le k \le -8$ (b) $-8 \le k \le 8$

(c) $k \ge 8$ (d) $k \ge -8$

[RRB JE 2015 26th AUG 2nd SHIFT]

34. The sum and product of the roots of the equation $x^2 - 4x + 5 = 0$ are respectively

(a) 5, –4 (b) 4, –5

(c) –4, –5 (d) 4, 5

[RRB JE 2015 26th AUG 2nd SHIFT]

35. The first term of an AP is –5 and third term is 17. Its seventh term is

(a) 31 (b) 41

(c) 61 (d) 71

[RRB JE 2015 26th AUG 3rd SHIFT]

36. The 12^{th} term of the G.P 1, –3, 9, –27 ..., is

(a) 3^{12} (b) -3^{12}

(c) 3^{11} (d) -3^{11}

[RRB JE 2015 26th AUG 3rd SHIFT]

37. If $(x - 1)$ is a factor of $3x^3 - 2ax^2 - 3x + 6$, then a is equal to

(a) 3 (b) –3

(c) +6 (d) –6

[RRB JE 2015 26th AUG 3rd SHIFT]

38. One of the factors of $(81x^2 - 1) + (1 + 9x)^2$ is

(a) $18x$ (b) $9 + x$

(c) $9 - x$ (d) $9x - 1$

[RRB JE 2015 26th AUG 3rd SHIFT]

39. All values of k for which $x^2 - kx + 9 = 0$ has real roots is

(a) $-6 \le k \le 6$ (b) $6 \le k \le -6$

(c) $k \ge 6$ (d) $k \le -6$

[RRB JE 2015 26th AUG 3rd SHIFT]

40. The sum and product of the roots of the equation $x^2 - 8x + 4 = 0$ are respectively

(a) –8, 4 (b) 8, –4

(c) 8, 4 (d) –8, –4

[RRB JE 2015 26th AUG 3rd SHIFT]

41. The common difference of an AP in which $a_{18} - a_{13} = 45$ is

(a) –9 (b) 9

(c) –5 (d) 5

[RRB JE 2015 27th AUG 1st SHIFT]

42. The tenth term of the GP 3, 1, $\frac{1}{3}$, ... is

(a) 3^{-10} (b) 3^{-9}

(c) 3^{-8} (d) 3^9

[RRB JE 2015 27th AUG 1st SHIFT]

43. If (x – 1) is a factor of $x^4 + x^3 - 2x^2 + ax + 1$, then a is equal to

(a) 1 (b) –1

(c) 2 (d) –2

[RRB JE 2015 27th AUG 1st SHIFT]

44. One of the factors of $(49x^2 - 1) + (1 + 7x)^2$ is

(a) 7 + x (b) 7 – X

(c) 14 x (d) 7x – 1

[RRB JE 2015 27th AUG 1st SHIFT]

45. All values of k for which $2x^2 - kx + 8 = 0$ has real roots is

(a) $-8 \le k \le 8$

(b) $8 \le k \le -8$

(c) $-2\sqrt{2} \le k \le 2\sqrt{2}$

(d) $2\sqrt{2} \le k \le -2\sqrt{2}$

[RRB JE 2015 27th AUG 1st SHIFT]

46. The sum and product of the roots of the equation $-5x^2 + 2x - 10 = 0$ are respectively

(a) $-\frac{2}{5}, 2$ (b) $2, -\frac{2}{5}$

(c) $\frac{2}{5}, 2$ (d) $-\frac{2}{5}, -2$

[RRB JE 2015 27th AUG 1st SHIFT]

47. The first term of an AP is 1 and third term is 10. Its 21st term is

(a) 98 (b) 62

(c) –98 (d) –62

[RRB JE 2015 27th AUG 2nd SHIFT]

48. The third term of a G.P. is 16 and sixth term is –128. The common ratio of the G.P. is

(a) (b) –2

(c) 4 (d) –4

[RRB JE 2015 27th AUG 2nd SHIFT]

49. If $(x + 2)$ is a factor of $x^4 - 4x^2 + 3ax - 12$, then a is equal to

(a) 2 (b) –2

(c) $\frac{10}{3}$ (d) $-\frac{10}{3}$

[RRB JE 2015 27th AUG 2nd SHIFT]

50. One of the factor of $(12x^2 - 1) + (1 + 11x)^2$ is

(a) $(11 + x)$ (b) $(11 - x)$

(c) $(11x - 1)$ (d) $22x$

[RRB JE 2015 27th AUG 2nd SHIFT]

51. All values of k for which $x^2 + kx + 25 = 0$ has real roots is

(a) $5 \le k \le -5$ (b) $-5 \le k \le 5$

(c) $k \ge 5$ (d) $k \ge -5$

[RRB JE 2015 27th AUG 2nd SHIFT]

52. The sum and product of the roots of the equation $x^2 - x - 4 = 0$ are respectively

(a) 4, 1 (b) 1, 4

(c) –4, 1 (d) 1, –4

[RRB JE 2015 27th AUG 2nd SHIFT]

53. Sum of first 20 terms of the AP

–4, –2, 0, 2, … is

(a) 600

(b) 340

(c) 300

(d) 460

[RRB JE 2015 27th AUG 3rd SHIFT]

54. The sum of infinite GP 1, $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \cdots$ is

(a) $\frac{5}{3}$ (b) $\frac{3}{2}$

(c) $\frac{4}{3}$ (d) $\frac{3}{5}$

[RRB JE 2015 27th AUG 3rd SHIFT]

55. If $(x - 2)$ is a factor of $x^3 + 2x^2 - ax + 4$, then a is equal to

(a) 8 (b) –8

(c) –10 (d) 10

[RRB JE 2015 27th AUG 3rd SHIFT]

56. One of the factor of $(2x + 3y)^3 - (5x - 2y)^3$ is

(a) $(7x + y)$ (b) $(7x - y)$

(c) $(3x + 5y)$ (d) $(5y - 3x)$

[RRB JE 2015 27th AUG 3rd SHIFT]

57. The value of k for which $x^2 + 5x - 2k = 0$ has equal roots is

(a) $\frac{25}{8}$ (b) $-\frac{25}{8}$

(c) $\frac{5}{2}$ (d) $-\frac{5}{2}$

[RRB JE 2015 27th AUG 3rd SHIFT]

58. The sum of squares of the roots of the equation $x^2 + x - 2 = 0$ is

(a) 1 (b) 2

(c) 5 (d) 3

[RRB JE 2015 27th AUG 3rd SHIFT]

59. The sum of first 16 terms of the AP

10, 7, 4, 1,..., is

(a) –400 (b) –300

(c) –200 (d) –800

[RRB JE 2015 28th AUG 1st SHIFT]

60. The sum of infinite GP 1, $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$, ... is

(a) 5 (b) 4

(c) 3 (d) 2

[RRB JE 2015 28th AUG 1st SHIFT]

61. If $(x + 2)$ is a factor of $ax^2 - 5x + 6 = 0$, then a is equal to

(a) 8 (b) –8

(c) –4 (d) 4

[RRB JE 2015 28th AUG 1st SHIFT]

62. One of the factor of $(3x - 4y)^3 + (4x - 3y)^3$ is

(a) $(y + x)$ (b) $(7x - y)$

(c) $(7y - 3x)$ (d) $(x - y)$

[RRB JE 2015 28th AUG 1st SHIFT]

63. The value of k for which $3x^2 - 5x + k = 0$ has equal roots is

(a) $\frac{25}{24}$ (b) $\frac{25}{6}$

(c) $\frac{25}{12}$ (d) $\frac{25}{18}$

[RRB JE 2015 28th AUG 1st SHIFT]

64. The sum of squares of the roots of the equations $x^2 - 5x + 4 = 0$ is

(a) 15 (b) 17

(c) 20 (d) 25

[RRB JE 2015 28th AUG 1st SHIFT]

65. The sum of first 20 terms of the AP 5, 9, 13, 17, ..., is

(a) 850 (b) 840

(c) 820 (d) 860

[RRB JE 2015 28th AUG 2nd SHIFT]

66. The stun of infinite GP 5, 1, $\frac{1}{5}$, $\frac{1}{5^2}$, $\cdots$, is

(a) $\frac{25}{4}$ (b) $\frac{28}{5}$

(c) $\frac{29}{4}$ (d) $\frac{29}{5}$

[RRB JE 2015 28th AUG 2nd SHIFT]

67. If $(x + 1)$ is a factor of $x^4 - 2ax^3 + x^2 - 4$, then a is equal to

(a) –1 (b) 2

(c) 1 (d) –2

[RRB JE 2015 28th AUG 2nd SHIFT]

68. One of the factor of $(5x - 7y)^3 - (3y - 4x)^3$ is

(a) $(x - 10y)$ (b) $(x - 4y)$

(c) $(9x + 4y)$ (d) $(9x - 10y)$

[RRB JE 2015 28th AUG 2nd SHIFT]

69. The value of k for which $3x^2 - 2x + 3k = 0$ has equal roots is

(a) $\frac{1}{9}$ (b) 9

(c) $\frac{1}{18}$ (d) 18

[RRB JE 2015 28th AUG 2nd SHIFT]

70. The sum of squares of the roots of the equations $x^2 - 5x - 6 = 0$ is

(a) 26 (b) 30

(c) 35 (d) 37

[RRB JE 2015 28th AUG 2nd SHIFT]

71. The sum of first 21 terms ol he AP 20, –18, –16, ..., is

(a) 0 (b) –4

(c) –8 (d) 4

[RRB JE 2015 28th AUG 3rd SHIFT]

72. The sum of infinite GP is 6.If common ratio is $\frac{1}{3'}$ the first term is

(a) 6 (b) 4

(c) 3 (d) 2

[RRB JE 2015 28th AUG 3rd SHIFT]

73. If $(x + 2)$ is a factor of $5x^3 - 3x^2 + ax + 2$, then a is equal to

(a) –25 (b) –20

(c) 15 (d) 27

[RRB JE 2015 28th AUG 3rd SHIFT]

74. One of the factor of $(5x - 7y)^3 - (3x - 4y)^3$ is

(a) $(2x - 3y)$ (b) $(2x - 11y)$

(c) $(8x - 3y)$ (d) $(2x + 3y)$

[RRB JE 2015 28th AUG 3rd SHIFT]

75. The value of k for which $kx^2 + 5x - 1 = 0$, has equal roots is

(a) $\frac{5}{4}$ (b) $-\frac{5}{4}$

(c) $\frac{25}{4}$ (d) $-\frac{25}{4}$

[RRB JE 2015 28th AUG 3rd SHIFT]

76. The sum of squares of the roots of the equations $x^2 - 7x + 6 = 0$ is

(a) 37 (b) 35

(c) 29 (d) 27

[RRB JE 2015 28th AUG 3rd SHIFT]

77. The values of a, for which the equation $x^2 - (3a - 1)x + 2a^2 + 2a - 11 = 0$ will have equal roots are

(a) 4,5 (b) 5,6

(c) 6,9 (d) 5,9

[RRB JE 2015 29th AUG 1st SHIFT]

78. The quadratic equation, whose roots are reciprocal of the roots of $3x^2 - 7x + 8 = 0$, is

(a) $8x^2 - 7x + 3 = 0$

(b) $8x^2 + 7x - 3 = 0$

(c) $8x^2 - 7x - 3 = 0$

(d) $8x^2 + 7x + 3 = 0$

[RRB JE 2015 29th AUG 1st SHIFT]

79. One of the factors of $(x + 2)(x - 3)(x + 4)(x - 5) + 40$ is

(a) $x^2 + x - 16$ (b) $x^2 - x - 16$

(c) $x^2 + x - 10$ (d) $x^2 - x + 10$

[RRB JE 2015 29th AUG 1st SHIFT]

80. Factorization of $x^4 - 5x^3 + 14x^2 - 20x + 16$ is

(a) $(x^2 - 2x + 4)(x^2 - 3x + 4)$

(b) $(x^2 - 2x - 4)(x^2 - 3x - 4)$

(c) $(x^2 + 2x + 4)(x^2 - 3x + 4)$

(d) $(x^2 + 2x - 4)(x^2 - 3x - 4)$

[RRB JE 2015 29th AUG 1st SHIFT]

81. If the sums of first n terms of two arithmetic progressions are in the ratio (2n + 1) : (n + 1), then the ratio of their 10th terms is

(a) 39 : 20 (b) 37 : 22

(c) 37 : 19 (d) 21 : 11

[RRB JE 2015 29th AUG 1st SHIFT]

82. The sum of the infinite geometric series $10 + 8 + 6\frac{2}{5} + \ldots\ldots\ldots\ldots$ is

(a) 42 (b) 48

(c) 50 (d) 52

[RRB JE 2015 29th AUG 1st SHIFT]

83. If α and β are the roots of the equation $ax^2 + bx + c = 0$, then the roots of the equation $cx^2 + bx + a = 0$ are

(a) $-\alpha, -\beta$ (b) $\frac{1}{\alpha}, \frac{1}{\beta}$

(c) $\frac{1}{\alpha}, \alpha$ (d) $\frac{1}{\beta}, \alpha$

[RRB JE 2015 29th AUG 2nd SHIFT]

84. If the equation $(n + 1)x^2 - 4(n + 2)x + 25 = 0$ has equal roots, then the values of n are

(a) $\frac{-3}{4}, \frac{3}{4}$ (b) $3, -3$

(c) $3, \frac{-3}{4}$ (d) $-3, \frac{4}{3}$

[RRB JE 2015 29th AUG 2nd SHIFT]

85. One of the factors of $(x + 1)(x + 3)(x + 5)(x + 7) - 9$ is

(a) $x^2 + 8x + 6$ (b) $x^2 + 8x - 10$

(c) $x^2 + 8x - 9$ (d) $x^2 + 8x + 8$

[RRB JE 2015 29th AUG 2nd SHIFT]

86. Factorisation of $x^4 - 9x^2 + 20$ is

(a) $(x - 4)(x + 1)(x^2 - 5)$

(b) $(x - 2)(x - 2)(x^2 + 5)$

(c) $(x + 4)(x + 1)(x^2 - 5)$

(d) $(x - 2)(x + 2)(x^2 - 5)$

[RRB JE 2015 29th AUG 2nd SHIFT]

87. If (p + 2)th term of an arithmetic series is 5p + 6, then the sum of its first five terms is

(a) 44 (b) 49

(c) 54 (d) 55

[RRB JE 2015 29th AUG 2nd SHIFT]

88. If the sum of an infinite number of terms of a geometric series is 20, and sum of their squares is 100, then the common ratio of the original series is

(a) $\frac{3}{5}$ (b) $\frac{2}{5}$

(c) $\frac{3}{4}$ (d) $\frac{1}{4}$

[RRB JE 2015 29th AUG 2nd SHIFT]

89. If the equation $(k - 12)x^2 + 2(k - 12)x + 2 = 0$ has real and equal roots, then the sum of the possible values of k is

(a) 12 (b) 14

(c) 22 (d) 26

[RRB JE 2015 29th AUG 3rd SHIFT]

90. The ratio of the sum and product of the roots of $ax^2 - 2bx + c = 0$, (a, b, c > 0) is

(a) 2b : c (b) 2c : b

(c) 2a : b (d) 2b : a

[RRB JE 2015 29th AUG 3rd SHIFT]

91. The expression $x^4 + 2x^3 - 6x^2 - 14x - 7$ is factored as

(a) $(x + 1)(x + 1)(x^2 - 7)$

(b) $(x - 1)(x - 1)(x^2 + 7)$

(c) $(x - 1)(x + 1)(x^2 + 7)$

(d) $(x - 1)(x - 1)(x^2 - 7)$

[RRB JE 2015 29th AUG 3rd SHIFT]

92. One of the factors of $x(3x + 2)(x - 2)(3x - 4) - 21$ is

(a) 3x + 7 (b) x – 1

(c) 3x – 7 (d) $3x^2 + 4x + 3$

[RRB JE 2015 29th AUG 3rd SHIFT]

93. If the sum of first n terms of an arithmetic progression is $3n^2 + 2n$, then its 10^{th} term is

(a) 45

(b) 59

(c) 110

(d) 320

[RRB JE 2015 29th AUG 3rd SHIFT]

94. Fourth term of an infinite geometric series is $\frac{4}{49}$ and common ratio is $\frac{1}{7}$. The sum of this series is

(a) $32\frac{2}{3}$ (b) $30\frac{1}{3}$

(c) 19 (d) 24

[RRB JE 2015 29th AUG 3rd SHIFT]

95. If $(x + 1)$ and $(x - 2)$ be the factors of $x^3 + (a + 1)x^2 - (b - 2)x - 6$, then the value of a and b will be

(a) 2 and 8 (b) 1 and 7

(c) 5 and 3 (d) 3 and 7

[RRB JE 2015 30th AUG 3rd SHIFT]

96. If $f(x) = 4x^3 - 2x^2 + 5x - 8$ is divided by $x - 2$, what will be the remainder

(a) 25 (b) 42

(c) 16 (d) 26

[RRB JE 2015 30th AUG 3rd SHIFT]

97. Find the sum of an AP of 40 terms whose first and last terms are 80 and 275

(a) 8400 (b) 7200

(c) 7100 (d) 4800

[RRB JE 2015 30th AUG 3rd SHIFT]

98. The common ratio of a GP is –4/5 and the sum to infinity is 80/9. Find the first term.

(a) 14 (b) 16

(c) 18 (d) 10

[RRB JE 2015 30th AUG 3rd SHIFT]

99. If $x = a(b - c)$, $y = b(c - a)$ and $z = c(a - b)$, then $\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3$

(a) $\frac{3xyz}{abc}$ (b) $\frac{xyz}{abc}$

(c) 3xyzabc (d) 3

[RRB JE 2015 30th AUG 3rd SHIFT]

100. The sum of three numbers of a GP is 14 and the sum of their squares is 84. Find the argest number

(a) 8 (b) 6

(c) 4 (d) 2

[RRB JE 2015 16th SEP 3rd SHIFT]

101. Two number A and B are such that their GM is 20 % lower than their AM. Find the ratio between the numbers.

(a) 3 : 2

(b) 4 : 1

(c) 2 : 1

(d) 3 : 1

[RRB JE 2015 16th SEP 3rd SHIFT]

102. Find the value of $x^3 - (1/x^3)$ when $x - (1/x) = a$

(a) $a^3 - 3a$

(b) $3a^3 - a$

(c) $a^3 + 3a$

(d) $3a^3 + a$

[RRB JE 2015 16th SEP 3rd SHIFT]

ANSWERS

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

EXPLANATIONS

1. $67^2 - 33^2 = (67 + 33)(67 - 33)$

$= 100 \times 34 = 3400.$

2. 1 billion = 10^9

Let $10^9 = 2^n$

$\Rightarrow$ Taking log both sides we get,

9 lot 10 = n log 2

$\Rightarrow$ 9 = n × 0.3

$\Rightarrow$ n = 30

3. Required number of ways

$$\frac{5!}{3! \times 2!} = 10.$$

4. Required probability

$$= \frac{^4C_3}{^{52}C_3} = \frac{4 \times 3a2}{52 \times 51 \times 50}$$

5. Number of boys who are both sports person and a mathematician = 254 + 25 – 10 = 40

Hence, required probability $= \frac{10}{40} = \frac{1}{4}.$

6. a + b = 15 and $\frac{1}{a} + \frac{1}{b} = \frac{15}{56}$

$$\Rightarrow \frac{a+b}{ab} = \frac{15}{56}$$

$\Rightarrow$ (a, b) = (7, 8)

7. $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta}$

given, $\alpha + \beta = -1$ & $\alpha\beta = 1$

Hence, $\frac{\alpha + \beta}{\alpha\beta} = \frac{-1}{1} = -1.$

8. $\sqrt{6 + \sqrt{6 + \sqrt{6 + ...}}} = x$

squaring both sides we get,

$6 + x = x^2$

$\Rightarrow x = 3$

9. e – c = (e – d) + (d – c)

= 2(b – a)

10. 14, 23, 20, 12, 11, 15, 24, 17, 9, 21, 25

When written in ascending order becomes:

9, 11, 12, 14, 15, 17, 20, 21, 23, 24, 25

Hence, median or mid-term = 17

11. set the number be x.

$\Rightarrow x \times 21 = x + 12 + 63$

$\Rightarrow x = 7$

Hence, correct answer = 12 × 7 = 84

12. $$\frac{(768)^3 + (232)^3}{(768)^2 - (768 \times 232) + (232)^2}$$

$$= \frac{(768 + 232)\left[(768)^2 - (768 \times 232) + (232)^2\right]}{(768)^2 - (768 \times 232) + (232)^2}$$

= 768 + 232

= 1000

13. Required sum = (1 + 4S) ×45

= 23 × 4S - 1035

14. set the no. of correct questions be x

$\Rightarrow x \times 4 - (60 - x) \times 1 = 130$

$\Rightarrow$ Sx – 60 = 130

$\Rightarrow x = 38$

15. $\frac{x}{y} = \frac{6}{5}$

$$\Rightarrow \frac{x^2 + y^2}{x^2 - y^2} = \frac{6^2 + 5^2}{6^2 - 5^2} = \frac{61}{11}$$

16. $\log_8 x = \frac{2}{3}$

$\Rightarrow x = (8)^{2/3}$

$\Rightarrow x = (2^3)^{2/3}$

$\Rightarrow x = 4$

17. Let the number be x.

$\Rightarrow x \times 3 = 29.7$

$\Rightarrow x = 9.9$

Hence, required answer = 9.9 = 3.3

18. Let the number of Rs. 1, 50 paisa and 25 paisa coins be x, y and z.

$\Rightarrow x + y + z = 175$

and $x = \frac{y}{2} = \frac{2}{4} = K$ (Let's assume)

$\Rightarrow x = K, y = 2K$ and $z = 4K$

Hence, K + 2K + 4K = 175

$\Rightarrow K = 25$

and total amount = 25 × 3 = Rs. 75

19. $x = y + \sqrt{\frac{4}{2}}$

$\Rightarrow (x - y) = \sqrt{\frac{4}{2}}$

$\Rightarrow (x - y)^2 = \frac{4}{2}$

$\Rightarrow z = \frac{4}{(x - y)^2}$

20. $2500 = 25 \times 100$

Hence, required sum = 25 + 100 = 125

21. A + B + C = 27

$\Rightarrow 2 + 2C + 2C + C = 27$

$\Rightarrow C = 5$

Hence, age of B = 2C = 2 × 5 = 10 years

22.

1	4	10	22	46	P = 94
	$+3\times2^0$	$+3\times2^1$	$+3\times2^2$	$+3\times2^3$	$+3\times2^4$

23. First term of the A.P. is – 3 and second term is 4 which means common difference = 7.

Hence, 18^{th} term of the A.P.

= – 3 + (18 – 1) × 7 = 119 – 3 = 116.

24. Given that the third term of a G.P is 2 and we are supposed to find out the product of first five terms of this G.P for which 2 will be the middle term.

Hence, required product = 2^5.

25. Putting x = – 1 in $x^4 - ax^3 + 2x^2 - 3x + 1$ and equating it with zero we get:

1 + a + 2 + 3 + 1 = 0

$\Rightarrow a = -7$

26. $(25x^2 - 1) + (1 + 5x)^2 = 25x^2 - 1 + 1 + 25x^2 + 10x$

$= 50x^2 + 10x = 10x(5x + 1)$

Hence, required factor will be 10x.

27. In order to get the roots as real the discriminant for the given equation i.e.

$k^2 - 4 \times 9 >= 0$

$\Rightarrow k^2 \geq 36$

Hence, 6 d" k d" – 6.

28. Sum of the roots of the given equation will be

$-\frac{(-4)}{1} = 4$ and product of the root = $\frac{3}{1} = 3$.

29. $7 = 2 \times 1$

$\Rightarrow 77 \times 7 \times 11$

Hence, 77 will be 11^{th} term of the A.P.

30. –3 will be the middle term of the first 5 terms.

Hence, required product

$= (-3) = -3^5$.

31. Putting x = 2 in $ax^3 + 3x^2 + 4x + 4$

and equating it with zero we get,

$a \times 2^3 + 3 \times 2^2 + 4 \times 2 + 4 = 0$

$\Rightarrow 8a + 24 = 0$

$\Rightarrow Q = \frac{-24}{8} = -3$.

32. $36x^2 - 1 + (1 + 6x)^2$

$= 36x^2 - 1 + 1 + 36x^2 + 2 \times 1 \times 6x$

$= 72x^2 + 12x$

$= 12x(6x + 1)$

Hence, required factor is 12x.

33. In order to have real roots,

$K^2 - 4 \times 1 \times 16 \geq 0$

$\Rightarrow K^2 \geq 64$

$\Rightarrow 8 \leq K \geq -8$.

34. sum and product of the roots of $x^2 - 4x + 5 = 0$

are –(4) = 4 and $\frac{5}{1} = 5$ respectively

35. First term of AP = a – 5

n^{th} term of AP = a + (n – 1)d ,where d → common difference

3^{rd} term = a = (3 – 1)d = 17

$\Rightarrow 2d = 17 - (-5) \Rightarrow d = 11$

$\therefore$ 7^{th} term = a + (7 – 1)d

= – 5 + 6 × 11 = 61

36. For a GP a, ar, ar^2, ... till n terms n^{th} term

$= ar^{n-1}$

$\therefore$ for 1, – 3, 9, – 27, ...

a = 1 and r = – 3

$\therefore$ 12^{th} term = $1.(-3)^{11} = -3^{11}$

37. $\therefore$ (x – 1) is factor of $3x^3 - 2ax^2 - 3x + 6 = f(x)$

$\therefore f(x) = (x - 1)(3x^3 - (2a - 3)x - 6)$

$= 3x^3 - (2a - 3)x^2 - 3x^2 - 6x + (2a - 3)x + 6$

$= 3x^2 - 2ax^2 - (9 - 2a)x + 6$ (1)

Comparing (1) with $3x^3 - 2ax^2 - 3x + 6$, 9 – 2a = 3

$\Rightarrow a = 3$

38. $(81x^2 - 1) + (1 + 9x)^2$

$= ((9x)^2 - 1^2) + (1 + 9x)^2$

$= (9x - 1)(9x + 1) + (9x + 1)^2$

$= (9x - 1)(9x - 1 + 9x + 1)$

$= 18x(9x + 1)$

$\therefore$ 18x is a factor

39. $x^2 - Kx + 9 = 0$

for real roots, $D \geq 0$

$\Rightarrow K^2 - 4 \times 9 \geq 0$

$\Rightarrow K^2 \ 36$

$\Rightarrow -6 \geq K \geq +6$

40. Comparing $x^2 - 8x + 4 = 0$ with standard equation $ax^2 - (a + b) + ab = 0$ with a & b as roots,

Sum of roots = 8

Product of roots = 4

Answer $\rightarrow$ 8,4

41. n^{th} term of and AP (a, a_1, a_2 .....) is $a + (n - 1)d$

$\therefore a_{18} - a_{13} = 45$

$\Rightarrow \left(a + (18-1)d\right) - \left(a + (13-1)d\right) = 45$

$\Rightarrow d = 9$

42. n^{th} term of a GP (a, ar, ar^2, ...)

is ar^{n-1}.

$\therefore$ for 3, 1, $\frac{1}{3}$, ...

10th term = $3\left(\frac{1}{3}\right)^{10-1} = 3^{-8}$

43. Writing $x^4 + x^3 - 2x^2 + ax + 1$ as

$(x - 1)(x^3 + 2x^2 + K)$, where K is a constant

$\Rightarrow x^4 + x^3 - 2x + Kx - K$

Comparing this equation with $x^4 + x^3 - 2x^2 + ax + 1$

we get $a = -1$

44. $(49x^2 - 1) + (1 + 7x)^2$

$= \left((7x)^2 - 1\right) + (1 + 7x)^2$

$= (7x - 1)(7x + 1) + (7x + 1)$

$= (7x + 1)(7x + 7x)$

$= 14x(7x + 1)$

$\therefore$ 14x is a factor

45. For $2x^2 + Kx + 8 = 0$ to have real roots,

$D \geq 0$

$\Rightarrow \quad K^2 - 4 \times 2 \times 8 \geq 0$

$\Rightarrow K \geq \sqrt{64}$

$\Rightarrow -8 \geq K \geq 8$

46. $-5x^2 + 2x - 10 = 0$

$\Rightarrow x^2 - \frac{2}{5}x + 2 = 0$

Comparing with standard equation $x^2 - (a + b) + ab = 0$

where a & b are roots.

We get sum of roots = $\frac{2}{5}$

product of roots = 2

answer = $\frac{2}{5}$, 2

47. Ist term = a + (21 – 1)d

3rd term = 18 + (3 – 1)d = 10

$\Rightarrow d = -4$

$\therefore$ Answer = $18 + 20 \times (-4) = -62$

48. $\frac{6^{th} \text{ term of GP}}{3^{rd} \text{ term of GP}} = \frac{ar^5}{ar^2} = r^3$

$\therefore \quad \frac{-128}{16} = r^3 \Rightarrow r = -2$

49. $f(x) = x^4 - 4x^2 + 3ax - 12$

Given $f(-2) = 0$

$\Rightarrow 2^4 - 4 \times 2^2 + 3a \times (-2) - 12 = 0$

$\Rightarrow a = -2$

50. $(121x^2 - 1) + (1 + 11x)^2$.

$= ((11x)^2 - 1^2) + (1 + 11x)^2$

$= (11x - 1)(11x + 1) + (11x + 1)^2$

$= (11x + 1)\,22x$

$\therefore$ 22x will be the required faster

51. A/Q $D \geq 0 \Rightarrow K^2 - 4 \times 25 \geq 0$

$\Rightarrow K^2 - 100$

$\Rightarrow -10 \geq K \geq 10$

answer is not available in the options given

52. $x^2 - x + (-4) = 0$

Comparing with $x^2 - (a + b)x + ab = 0$ for roots a 4b,

answer = 1, –4

53. Sum = $\frac{20}{2}\left\{2 \times -4 + (20-1) \times 2\right\} = 300$

$\therefore$ Sum A.P = $\frac{4}{2}\left\{2a + (4+1)d\right\}$

54. $\text{Sum}_\infty \text{G.P} = \frac{a}{1-r}$

$\Rightarrow \frac{1}{1 - \frac{1}{3}} = \frac{3}{2}$

55. $f(x) = x^3 + 2x^2 - ax + 4$

Taking $f(2) = 0$

$\Rightarrow 2^3 + 2 \times 2^2 - 2a + 4 = 0$

$\Rightarrow 2a = 20$

$\Rightarrow a = 10$

56. $(2x + 3y)^3 - (5x - 2y)^3$

$\Rightarrow (a3 - b3)$ is divisible by $a - b$

$\Rightarrow$ above expression is divisible by

$(2x + 3y - (5x - 2y)) = (5y - 3x)$

57. A/Q $D = 0 \Rightarrow b^2 - 4ac = 0$

$\Rightarrow 5^2 - 4 \times (-2k) = 0$

$\Rightarrow k = \dfrac{-25}{8}$

58. $\alpha^2 + \beta^2 = (\alpha + \beta)2\alpha\beta$

$= (-1)2 - 2 \times (-2) = 5$

59. $S_n = \dfrac{4}{2}\{2a + (4-1)d\}$

$= \dfrac{16}{2}\{2 \times 10 + (16-1) \times -3\}$

$= -200$

60. $S_\infty G.P = \dfrac{a}{1-r}$

$= \dfrac{1}{1 - \frac{1}{2}} = 2$

61. $f(x) = ax^2 - 5x + 6 = 0$

$\because$ $(x + 2)$ is a factor

$\Rightarrow f(-2) = 0$

$\Rightarrow a(-2)^2 - 5 \times (-2) + 6 = 0$

$\Rightarrow 4a = 16$

$\Rightarrow a = 4$

62. $(x - 4y)^3 + (4x - 3y)^3$

$a^3 + b^3$ is divisible by $(a + b)$

$\Rightarrow$ The above expression is divisible by

$(3x - 4y) + (4x - 3y)$

$= 7x - 7y = 7(x - y)$

$\therefore$ it is divisible by $(x - y)$

63. $3x^2 - 5x + 2K = 0$

has equal roots

$\Rightarrow D = 0$

$\Rightarrow p^2 - 4ac = 0$

$\Rightarrow (-5)^2 - 4 \times 3 \times 2K = 0$

$\Rightarrow k = \left(\dfrac{25}{24}\right)$

64. $(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta$

$\Rightarrow \alpha^2\beta^2 = (\alpha\beta)^2 - 2\alpha\beta$

$= (5)^2 - 2 \times 4 = 17$

$\therefore$for a general quadratic $ax^2 + bx + c = 0$

sum of roots $= -\dfrac{b}{a}$

Product of roots $= \dfrac{c}{a}$.

65. $\text{Sum}_{A.P} = \dfrac{n}{2}\{2a + (4-1)d\}$

$= \dfrac{20}{2}\{2 \times 5 + (20-1)4\}$

$= 860$

66. $S_{\infty GP} = \dfrac{a}{1-r}$

$= \dfrac{5}{1 - \frac{1}{5}} = \dfrac{5}{\frac{4}{5}} = \dfrac{25}{4}$

67. $\because$ $(x + 1)$ is a factor of

$f(x) = x^4 - 2ax^3 + x^2 - 4$

$\Rightarrow f(-1) = 0$

$\Rightarrow (-1)^4 - 2a(-1)^3 + (-1)^2 - 4 = 0$

$\Rightarrow 1 + 2a + 1 - 4 = 0$

$\Rightarrow 2a = 2$

$\Rightarrow a = 1$

68. $(5x - 7y)^3 - (3y - 4x)^3$

$\because$ $a^3 - b^3$ is always divisible by $a - b$

$\Rightarrow$ The above expression is divisible by

$(5x - 7y) - (3y - 4x)$

$= (9x - 10y)$

69. $3x^2 - 2x + 3k = 0$ has equal roots

$\Rightarrow D = 0$

$\Rightarrow b^2 - 4ac = 0$

$\Rightarrow (-2)^2 - 4 \times 3 \times 3k = 0$

$\Rightarrow k = \dfrac{1}{9}$

70. For a general Quadratic equation $ax^2 + bx + c$

Sum of roots = – b/a

Product of roots = c/a

$\Rightarrow \alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$

$= (-5)^2 - 2 \times (-6)$

$= 37$

71. $\text{Sum} = \frac{n}{2}\left(2a + (n-1)d\right)$

$= \frac{21}{2}\left(2 \times (-20) + (21-1)2\right)$

$= 0$

72. sum of

$\text{GP} = \frac{a}{1-r} \Rightarrow 6 = \frac{a}{1-\frac{1}{3}}$

$\Rightarrow a = 4$

73. $\because$ (x + 2) is a factor of

$f(x) = 5x^3 - 3x^2 + ax + 2$

$\Rightarrow f(-2) = 0$

$\Rightarrow 5(-2)^3 - 3(-2)^2 + a(-2) + 2 = 0$

$\Rightarrow -40 - 12 - 2 + 2 = 0$

$\Rightarrow a = -25$

74. $(5x - 7y)^3 - (3x - 4y)^3$

$\because \quad a^3 - b^3$ is always divisible by a – b

$\Rightarrow$ the expression is divisible by

$(5x - 7y) - (3x - 4y) = (2x - 3y)$

75. $Kx^2 + 5x + 1 = 0$

for equal roots, D = 0

$\Rightarrow b^2 - 4ac = 0$

$\Rightarrow 5^2 - K = 0$

$\Rightarrow K = \frac{25}{4}$

76. For a general Quadratic equation,

$ax^2 + bx + c$

sum of roots $= -\frac{b}{a}$

product of roots = 4a

$\Rightarrow \alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta$

$= (7)^2 - 2 \times 6$

$= 37$

77. $x^2 - (3a - 1)x + 2a^2 - 11 = 0$

for equal roots $D = 0 \Rightarrow b^2 - 4ac = 0$

for equation $ax^2 + bx + c = 0$

$\Rightarrow (3a-1)^2 - 4(2a^2 + 2a - 11) = 0$

$\Rightarrow a^2 - 14a + 45 = 0$

$\Rightarrow a = 5, 9$

78. $3x^2 - 7x + 8 = 0$

$\Rightarrow x^2 - \frac{7}{3}x + \frac{8}{3} = 0$

Comparing with $ax^2 - (b + a)x + ab = 0$ for roots = a,b

$\alpha + \beta = \frac{7}{3}, \alpha\beta = \frac{8}{3}$

$\therefore$ Equation with roots $\frac{1}{\alpha}$ & $\frac{1}{\beta}$:→

$x^2 - \left(\frac{1}{\alpha} + \frac{1}{\beta}\right)x + \frac{1}{\alpha}\frac{1}{\beta} = 0$

$\Rightarrow x^2 - \left(\frac{\alpha+\beta}{\alpha\beta}\right)x + \frac{1}{\alpha\beta} = 0$

using values of α & β,

$x^2 - \frac{7 \times 3}{3 \times 8}x + \frac{3}{8} = 0$

$\Rightarrow 8x^2 - 7x + 3 = 0$

79.

80. $x^4 - 5x^3 + 14x^2 - 20x + 16$

$= x^4 - 3x^3 - 2x^3 + 4x^2 + 6x^2 + 4x^2 - 8x - 12x + 16$

$= x^4 - 3x^3 + 4x^2 - 2x^3 + 6x^2 - 8x + 4x^2 - 12x + 16$

$= x^2(x^2 - 3x + 4) - 2x(x^2 - 3x + 4) + 4(x^2 - 3x + 4)$

$= (x^2 - 2x + 4)(x^2 - 3x + 4)$

81. Ratio of 10^{th} terms $\Rightarrow \frac{a_1 + (m-1)d_1}{a_2 + (m-1)d_2}$

$= \frac{2a_1 + ((2m-1)-1)d_1}{2a_2 + ((2m-1)-1)d_2}$

$\therefore$ Ratio of 10^{th} terms = Ratio of Sum of

2m – 1 i.e. 2 × 10 – 1 = 19 terms

$\Rightarrow \frac{2n+1}{n+1} = \frac{2 \times 19 + 1}{19 + 1}$

$= 39 : 20$

82. $\text{Sum} = \frac{a}{1-r}$

$= \frac{10}{1-\frac{8}{10}} = 50$

83. $\alpha + \beta = \frac{b}{a}$ and $\alpha\beta = \frac{c}{a}$

Let roots of $cx^2 + bx + a = 0$

be p and q.

$p + q = -\frac{b}{c}$ and $pq = \frac{a}{c} = \frac{1}{\alpha\beta}$

$p + q = \frac{-b}{\alpha\beta a} \Rightarrow p + q = \frac{\alpha+\beta}{\alpha\beta} = \frac{1}{\alpha} + \frac{1}{\beta}$

or $p, q = \frac{1}{\alpha}$ and $\frac{1}{\beta}$

84. $b^2 - 4ac = 0$ or $[4(n + 2)]^2 = 4(n + 1)(25)$

$4(n + 2)^2 = 25n + 25$

$4n^2 + 16n + 16 = 25n + 25$

$4n^2 - 9n - 9 = 0$

or $n = 3, \frac{-3}{4}$.

85. $(x + 1)(x + 7) = (x^2 + 8x + 7) = p$

and $(x + 3)(x + 5) = x^2 + 8x + 15 = p + 8$

$p(p + 8) - 9 = p^2 + 8p - 9 = 0$

$p(p + 9) - 1(p + 9) = 0$

$(p - 1)(p + 9) = 0$

$p - 1 = 0$ or $x^2 + 8x + 6 = 0$

86. Check from options, we see

$x^2 = 5$, $x = 2$ and $x = -2$ all

solve $x^4 - 9x^2 + 20 = 0$

$\therefore (x - 2)(x + 2)(x^2 - 5) = x^4 - 9x^2 + 20$

87. Sum of first 5 terms

$= 5(-1) + 5(0) + 5(1) + 5(2) + 5(3) + (6 \times 5)$

$= 10 + 15 + 30 = 55.$

88. $\frac{a}{1-r} = 20$ or $\frac{a}{20} = (1 - r)$

and $\frac{a^2}{1-r^2} = 100$

$a^2 = 100(1 - r)(1 + r)$

$a = 5(1 + r)$ or $5(1 + r) = 20(1 - r)$

or $1 + r = 4 - 4r$ or $5r = 3$ or $r = \frac{3}{5}$.

89. $b^2 - 4ac = 0$ or $[2(k - 12)]^2 = 4(k - 12)^2$

$4(k - 12)^2 = 4(k - 12)^2$

$k = 14$

Also if $k = 12$, $b^2 = 4ac = 0$

$\therefore$ Sum of possible values $= 14 + 12 = 26.$

90. $\alpha + \beta = \frac{2b}{a}$, $\alpha\beta = \frac{c}{a}$ or $\frac{2b}{a} : \frac{c}{a}$

$\therefore$ Ans $= 2b : c.$

91. Substituting $x = -1$ and $x^2 = 7$, we get

$x^4 + 2x^3 - 6x^2 - 14x - 7 = 0$

$\therefore (x + 1)(x + 1)(x^2 - 7)$

92. $x(3x - 4) : 3x^2 - 4x$ and $(3x + 2)(x - 2) = 3x^2 - 4x - 4$

$3x^2 - 4 = a$

$a(a - 4) - 21 = 0$

$a^2 - 4a - 21 = 0$

$a^2 - 7a + 3a - 21 = 0$ or $a(a - 7) + 3(a - 7) = 0$

$(a + 3)(a - 7) = 0$

$(3x^2 - 4x + 3)(3x^2 - 4x - 7) = 0$

Taking $3x^2 - 4x - 7 = 0$, we get

$(3x^2 + 3x - 7x - 7) = 0$

$(3x(x + 1) - 7(x + 1)) = 0$

$(3x - 7)(x + 1) = 0$

or $3x - 7$ is a factor.

93. 10th term $= 3(10)^2 + 2(10) - 3(9)^2 - 2(9)$

$= 300 + 20 - 243 - 18$

$= 57 + 2 = 59.$

94. $ar^3 = \frac{4}{49}$ and $r = \frac{1}{7}$ or $a = \frac{4}{49} \times 343$ or $a = 28$

$\frac{a}{1-r} = \frac{28 \times 7}{6} = \frac{196}{6} = 32\frac{2}{3}.$

95. Directly substitute options and solve.

We get $a = 1$ and $b = 7$.

96. $f(2) = 32 - 8 + 10 - 8 = 26.$

97. $a = 80, l = 275, n = 40$

$s = \frac{40}{2} \times (275 + 80) = 20 \times 355 = 7100.$

98. $\frac{a}{1-r} = \frac{80}{9}$

$a = \frac{80}{9}\frac{(1+4)}{5} = \frac{80}{9} \times \frac{9}{5} = 16.$

99. $(b-c)^3 + (c-a)^3 + (a-b)^3$

Using $x^3 + y^3 + z^3 = (x+y+z)(x^2+y^2+z^2-xy-yz-zx) + 3xyz$

We get

$(b-c)^3 + (c-a)^3 + (a-b)^3 = 3(b-c)(c-a)(a-b)$

$= \frac{3xyz}{abc}$.

100. Let GP be a, ar, ar^2.

Given, $a + ar + ar^2 = 14$

$\Rightarrow a(1 + r + r^2) = 14$ ....(i)

Also, $a^2 + a^2 r^2 + a^2 r^4 = 84$

$\Rightarrow a(1 + r + r^2)\, a(r^2 - r + 1) = 84$

$\Rightarrow 14a(r^2 - r + 1) = 84$ [using (i)]

$\Rightarrow a(1 - r + r^2) = 6$ ....(ii)

Solving (1) & (ii),

$ar = 4$

$\therefore$ GP :- 2, 4. 8

Largest number = 8

101. Let the 2 numbers = a & b

$AM = \frac{a+b}{2}$ and $GM = \sqrt{ab}$

$\therefore \sqrt{ab} = \frac{80}{100}\left(\frac{a+b}{2}\right)$

$\Rightarrow a^2 + b^2 - 4.25\, ab = 0$

$\Rightarrow \frac{a^2}{b^2} - 4.25\frac{a}{b} + 1 = 0$

$\Rightarrow \frac{a}{b} = 4$

$\therefore$ Ratio = 4 : 1

102. Using $(a-b)^2 = a^2 + b^2 - 2ab$

$\left(x - \frac{1}{x}\right)^2 = a^2$

$\left[\because x - \frac{1}{x} = a\right]$

$\Rightarrow x^2 + \frac{1}{x^2} = a^2 + 2$ ....(i)

Using $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

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

Using (i) and given $x - \frac{1}{x} = a$

$\Rightarrow a(a^2 + 2 + 1) = a^3 + 3a$