MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

SOME SPECIAL SERIES

Solved Examples And Exercises

1. If $S_k = \frac{1+2+\ldots.+k}{k}$, find the value of $S_1^2 + S2^2 + \ldots. + S_n^2$.

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2. Find the sum of n terms of the series $1.\ 2^2 + 2.\ 3^2 + 3.\ 4^2 + \ldots\ldots$

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3. Prove that :$1 + 2 + 3 + \ + n = \frac{n(n+1)}{2}$

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4. The sum of the series $\frac{2}{3} + \frac{8}{9} + \frac{26}{27} + \frac{80}{81} +$ to n terms is $n - \frac{1}{2}\left(3^{-n} - 1\right)$ (b) $n - \frac{1}{2}\left(1 - 3^{-n}\right)$ (c) $n + \frac{1}{2}\left(3^n - 1\right)$ (d) $n - \frac{1}{2}\left(3^n - 1\right)$

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5. Value of : $1^3 + 2^3 + 3^3 + \ + n^3 =$

A. $\left\{\frac{n(n+1)}{2}\right\}^2$.

B. $\left\{\frac{n(n+1)}{2}\right\}^3$.

C. $\left\{\frac{n(n+1)}{2}\right\}$.

D. None of these

Answer: A

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6. Prove that :

$$1^2 + 2^2 + 3^2 + \ + n^2 = \frac{n(n+1)(2n+1)}{6}$$

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7. Find the sum of the series $2^2 + 4^2 + 6^2 + ... + (20)^2$

A. 1500

B. 1540

C. 1600

D. None of these

Answer: B

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8. Find the sum of nth term of this series and S_n denote the sum of its n terms. Then, $T_n = \left[1 + (n - 1 \times 2)^2\right] = (2n - 1)^2 = 4n^2 - 4n + 1$

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9. Sum the following series to n terms: $\frac{1}{1.6} + \frac{1}{6.11} + \frac{1}{11.16} + \frac{1}{16.21} + \ldots\ldots$. infinite terms

A. 5

B. $\frac{1}{5}$

C. infinite

D. None of these

Answer: B

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10. Sum the following series to n terms:

$1 + 4 + 13 + 40 + 121 +$

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11. Find the sum of all possible products of the first n natural numbers taken two by two.

(a) $\frac{1}{24}n(n+1)(n-1)(3n+2)$

(b) $\frac{1}{6}n(n+1)(n-1)(2n+2)$

(c) $\frac{1}{24}n(n-1)(n+1)(2n+3)$

(d) none of these

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12. Sum of n terms the series :

$1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 +$

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13. Find the sum to n terms of the series:

$$\frac{1}{1+1^2+1^4} + \frac{2}{1+2^2+2^4} + \frac{3}{1+3^2+3^4} +$$

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14. Sum the following series to n terms:

$4 + 6 + 9 + 13 + 18 +$

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15. Find the sum : $\sum_{r=1}^{n} \frac{1}{(ar+b)(ar+a+b)}$

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16. Find the sum to n terms of the series:

$\frac{3}{1^2.2^2} + \frac{5}{2^2.3^2} + \frac{7}{3^2.4^2} +$

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17. Sum the following series to n terms:

$5 + 7 + 13 + 31 + 85 +$

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18. Find the sum to n terms of the series:

$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} +$

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19. Find the sum to n terms of the series:

$3 + 9 + 15 + 35 + 63 +$

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20. Find the sum to n terms of the series:

$1 + 5 + 12 + 22 + 35 +$

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21. Find the sum of the series:

$1.n + 2.(n-1) + 3.(n-2) + \ + (n-1).2 + n.1.$

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22. Find the sum of series

$(3^3 - 2^3) + (5^3 - 4^3) + (7^3 - 6^3) +$ upto 10 terms

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23. If $S_n = \sum_{r=1}^{n} \frac{1+2+2^2+\ldots\ldots+2^r}{2^r}$, then S_n is equal to (a)$2^n n-1$ (b) $1-\frac{1}{2^n}$ (c) $2n-1+\frac{1}{2^n}$ (d) 2^n-1

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24. The value of $\sum_{r=1}^{n}\left\{(2r-1)a+\frac{1}{b^r}\right\}$ is equal to (a) $an^2+\frac{b^{n-1}-1}{b^n(b-1)}$. (b) $an^2+\frac{b^n-1}{b^n(b-1)}$ (c) $an^3+\frac{b^{n-1}-1}{b^n(b-1)}$ (d) none of these

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25. The sum of the series:

$\frac{1}{(\log)_2 4}+\frac{1}{(\log)_4 4}+\frac{1}{(\log)_8 4}++\frac{1}{(\log)_{2^n} 4}$ is

$\frac{n(n+1)}{2}$ (b) $\frac{n(n+1)(2n+1)}{12}$ (c) $\frac{n(n+1)}{4}$ (d) none of these

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26. The sum n terms of the series

$\frac{1}{\sqrt{1}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{7}}+$ is

$\sqrt{2n+1}$ (b) $\frac{1}{2}\sqrt{2n+1}$ (c) $\frac{1}{2}\sqrt{2n+1}-1$ (d) $\frac{1}{2}\{\sqrt{2n+1}-1\}$

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27. Find the sum of n terms of the series

$1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + 3 \cdot 4 \cdot 5 \ldots\ldots\ldots .$

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28. Sum the series $3.\ 8 + 6.\ 11 + 9.\ 14 + \ldots$ to n terms.

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29. Find the sum of n terms of the series whose nth term is: $2n^2 - 3n + 5$

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30. Find the sum to n terms of the series whose nth term is

$n^2 + 2^n$.

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31. Find the sum of the series

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \ldots \text{ up to } n \text{ terms.}$$

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32. Show that

$$\frac{1 \times 2^2 + 2 \times 3^2 + \ldots + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + \ldots + n^2 \times (n+1)} = \frac{3n+5}{3n+1}.$$

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33. If S_1, S_2, S_3 are the sums of first n natural numbers, their squares and cubes respectively, show that $9S_2^2 = S_3(1 + 8S_1)$.

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34. Find the sum to n terms of the series : $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \ldots$

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35. The sequence N of natural numbers is divided into classes as follows. Show that the sum of the numbers in nth row is $\left(2n^2+1\right)$

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36. Find the sum of the following series to n term: $1^3+3^3+5^3+7^3+\ldots\ldots\ldots$

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37. Find the sum of the following series to n term: $2^3+4^3+6^3+8^3+\ldots\ldots\ldots$

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38. Find the sum of the following series to n term:

$1.2.5 + 2.3.6 + 3.4.7 + \ldots\ldots\ldots$

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39. Find the sum of the following series to n term:

$1.2.4 + 2.3.7 + 3.4.10 + \ldots\ldots$

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40. Find the sum to 10 terms of the series

$1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 5 + \ldots\ldots$

A. 400

B. 440

C. 385

D. None of these

Answer: B

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41. Find the sum of the following series to n term:

$3 \times 1^2 + 5 \times 2^2 + 7 \times 3^2 + \ldots\ldots\ldots\ldots$

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42. Find the sum of the following series whose nth term is: $2n^3 + 3n^2 - 1$.

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43. Find the sum of the following series whose nth term is: $n^3 - 3^n$.

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44. Find the sum of the following series whose nth term is: $n(n+1)(n+4)$

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45. Find the sum of the following series whose nth term is:

$(2n-1)^2$

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46. Find the 20th term and the sum of 20 terms of the series: $2 \times 4 + 4 \times 6 + 6 \times 8 + ...$

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47. Find the sum of the first n terms of the series : $3 + 7 + 13 + 21 + 31 + \vdots$

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48. Find the sum of first n terms of the following series:

$5 + 11 + 19 + 29 + 41 + \ldots\ldots\ldots\ldots\ldots$

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49. Find the sum of n terms of the series:

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots\ldots\ldots\ldots + \frac{1}{n.(n+1)}$$

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50. Sum of the following series to n term:

$3 + 5 + 9 + 15 + 23 + \ldots\ldots .$

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51. Sum of the following series to n term:

$1 + 3 + 7 + 13 + 21 + \ldots\ldots\ldots$

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52. Sum of the following series to n term:

$1 + 3 + 6 + 10 + 15 + \ldots\ldots\ldots$

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53. Sum of the following series to n term:

$$\frac{1}{1 \cdot 4} + \frac{1}{4 \cdot 7} + \frac{1}{7 \cdot 10} + \ldots\ldots\ldots\ldots$$

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54. Find the sum $2 + 5 + 10 + 17 + 26 + \ldots$.

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55. Find the sum of the series 3+7+14+24+37..

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56. Sum of the following series to n term:

$2 + 4 + 7 + 11 + 16 + ...$

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57. Write the sum of the series

$2 + 4 + 6 + 8 + ... + 2n$

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58. Write the sum of the series

$1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 ..... . + (2n-1)^2 - (2n)^2$

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59. Write the sum of n term for a series whose r^{th} term is: $r + 2^r$.

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60. If $\sum_{r=1}^{n} r = 55$,find $\sum_{r=1}^{n} r^3$.

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61. If the sum of first n even natural numbers is equal to k times the sum of first n odd natural number then $k =$

a. $\frac{1}{n}$ b. $\frac{n-1}{n}$ c. $\frac{n+1}{2n}$ d. $\frac{n+1}{n}$

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62. Write the sum of 20 terms of the series: $1+\frac{1}{2}(1+2)+\frac{1}{3}(1+2+3)+$

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63. If t_n denotes the nth term of the series $2+3+6+11+18+\ldots then t_{50}$ a. 49^2-1 b. 49^2 c. 50^2+1 d. 49^2+2

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64. Let S_n denote the sum of the cubes of the first n natural numbers and s_n denote the sum of the first n natural numbers. Then $\sum_{r=1}^{n} \frac{S_r}{s_r}$ is equal to

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65. If $\sum n = 210$, then $\sum n^2 =$

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66. If $1 + \frac{1+2}{2} + \frac{1+2+3}{3} + \ldots\ldots$ n terms is $S.t$ Then, S is equal to a. $\frac{n(n+3)}{4}$ b. $\frac{n(n+2)}{4}$ c. $\frac{n(n+1)(n+2)}{6}$ d. n^2

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67. What is the sum of n terms of the series $\sqrt{2}+\sqrt{8}+\sqrt{18}+\sqrt{32}+..$

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68. The sum of 10 terms of the series $\sqrt{2}+\sqrt{6}+\sqrt{18}+...$ is

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69. The sum of the series $1^2 + 3^2 + 5^2 + \ldots\ldots$ n terms is a. $\frac{n(n+1)(2n+1)}{2}$ b. $\frac{n(2n-1)(2n+1)}{3}$ c. $\frac{(n-1)^2(2n+1)}{6}$ d. $\frac{(2n+1)^3}{3}$

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