



## MATHS

### BOOKS - OBJECTIVE RD SHARMA MATHS

### VOL I (HINGLISH)

### MATHEMATICAL INDUCTION

#### Section I Solved Mcqs

1. A series is given in the form

$$(1) + (2 + 3 + 4) + (5 + 6 + 7 + 8 + 9) + \dots$$

Find the sum of the numbers in the  $r$ th bracket.

A.  $(n - 1)^3 + n^3$

B.  $(n + 1)^3 + 8n^2$

C.  $\frac{(n + 1)(n + 2)}{6n}$

D.  $(n + 1)^3 + n^3$

**Answer: A**



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2. Let  $S(k) = 1 + 3 + 5 + \dots + (2k - 1) = 3 + k^2$ .

Then which of the following is true ?

A. Principle of mathematical Induction can be used  
to prove the formula

B.  $S(k)$  implies  $S(k+1)$

C.  $S(k)$  implies  $S(k+1)$

D.  $S(1)$  is correct

**Answer: B**



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**3.** Assertion: For every natural number

$n$ ,  $(n + 1)^7 - n^7 - 1$  is divisible by 7. Reason: For

every natural number  $n$ ,  $n^7 - n$  is divisible by 7. (A)

Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not the correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

A. 1

B. 2

C. 3

D. 4

**Answer: A**



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## Exercise

1.  $\forall n \in \mathbb{N}$ ,  $49^n + 16n - 1$  is divisible by (A) 64 (B) 49  
(C) 132 (D) 32

A. 64

B. 8

C. 16

D. 4

**Answer: A**



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2.  $n(n^2 - 1)$ , is divisible by 24 if  $n$  is an odd positive number.

A. 6

B. 16

C. 36

D. 24

**Answer: A**



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3. For all  $n \in N$ ,  $7^{2n} - 48n - 1$  is divisible by

A. 25

B. 26

C. 1234

D. 2304

**Answer: D**



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**4.**  $5^{2n} - 1$  is divisible by 24 for all  $n \in \mathbb{N}$

A. 6

B. 11

C. 24

D. 26

**Answer: C**



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5. For all  $n \in \mathbb{N}$ ,  $n^3 + 2n$  is divisible by

A. 3

B. 8

C. 9

D. 11



**Answer: A**



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6. For all  $n \in \mathbb{N}$ ,  $4^n - 3n - 1$  is divisible by

A. 3

B. 8

C. 9

D. 11

**Answer: C**



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7. For all  $n \in N$ ,  $3^{3n} - 26^n - 1$  is divisible by

A. 24

B. 64

C. 17

D. 676

**Answer: D**



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8. If  $n \in N$ , then  $3^{2n} + 7$  is divisible by

A. 3

B. 8

C. 9

D. 11

**Answer: B**



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**9.** For all  $n \in N$ ,  $3n^5 + 5n^3 + 7n$  is divisible by

A. 3

B. 5

C. 10

D. 15

**Answer: D**



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**10.** Find the sum of the first  $n$  terms of the series :

$$3 + 7 + 13 + 21 + 31 + \vdots$$

A.  $4n-1$

B.  $n^2 + 2n$

C.  $n^2 + n + 1$

D.  $n^2 + 2$

**Answer: C**

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11.  $n^{\text{th}}$  term of the series

$$4 + 14 + 30 + 52 + \dots =$$

A.  $5n - 1$

B.  $2n^2 + 2n$

C.  $3n^2 + n$

D.  $2n^2 + 2$

**Answer: C**



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**12.**  $3 + 13 + 29 + 51 + 79 + \dots$  to  $n$  terms =

A.  $2n^2 + 7n^3$

B.  $n^2 + 5n^3$

C.  $n^3 + 2n^2$

D. none of these

**Answer: C**



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13. Sum of  $n$  terms of the following series

$$1^3 + 3^3 + 5^3 + 7^3 + \dots$$

A.  $n^2(n^2 - 1)$

B.  $n^2(2n^2 - 1)$

C.  $n^2(2n^2 + 1)$

D.  $n^2(n^2 + 1)$

**Answer: B**



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14. If  $10^n + 3 \times 4^{n+2} + \lambda$  is divisible by 9 for all  $n \in \mathbb{N}$ , then the least positive integral value of  $\lambda$  is 5 b. 3 c. 7 d. 1

A. 5

B. 3

C. 7

D. 1

**Answer: A**



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15. If  $x^n - 1$  is divisible by  $x - k$  then the least positive integral value of  $k$  is

A. 1

B. 2

C. 3

D. 4

**Answer: A**



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16. If  $a, b$  are distinct rational numbers, then for all  $n \in \mathbb{N}$  the number  $a^n - b^n$  is divisible by

A.  $a-b$

B.  $a+b$

C.  $2a-b$

D.  $a-2b$

**Answer: A**



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17. If  $n$  is an odd positive integer, then  $a^n + b^n$  is divisible by

A.  $a+b$

B.  $a-b$

C.  $a^2 + b^2$

D. none of these

**Answer: A**



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18. If  $n$  is an even positive integer, then  $a^n + b^n$  is divisible by

A.  $a+b$

B.  $a-b$

C.  $a^2 - b^2$

D. none of these

**Answer: D**



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19. For all  $n \in N$ ,  $\frac{n^5}{5} + \frac{n^3}{3} + \frac{7}{15n}$  is

- A. an integer
- B. a natural number
- C. a positive fraction
- D. none of these

**Answer: B**



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**20.** The sum of  $n$  terms of the series

$$1 + (1 + a) + (1 + a + a^2) + (1 + a + a^2 + a^3) + \dots,$$

is

A.  $\frac{n}{1-a} - \frac{a(1-a^n)}{(1-a)^2}$

B.  $\frac{n}{1-a} + \frac{a(1-a^n)}{(1-a)^2}$

C.  $\frac{n}{1-a} + \frac{a(1+a^n)}{(1-a)^2}$

D.  $-\frac{n}{1-a} + \frac{a(1-a^n)}{(1-a)^2}$

**Answer: A**



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21. If  $3+5+9+17+33+\dots$  to  $n$  terms  $= 2^{n+1} + n - 2$ ,

then  $n$ th term of LHS, is

A.  $3^n - 1$

B.  $2n + 1$

C.  $2^n + 1$

D.  $3n - 1$

**Answer: C**



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22.  $7^{2n} + 2^{3n-3} \cdot 3^{n-1}$  is divisible by 25

A. 24

B. 25

C. 9

D. 13

**Answer: B**



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**23.** Prove that for  $n \in \mathbb{N}$ ,  $10^n + 3 \cdot 4^{n+2} + 5$  is divisible by 9.

A. 23

B. 3

C. 9

D. 207

**Answer: C**



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24. If  $n \in N$ ,  $x^{2n-1} + y^{2n-1}$  is divisible by  $x+y$  if  $n$  is

A.  $x + y$

B.  $x - y$

C.  $x^2 + y^2$

D. none of these

**Answer: A**



25. The sum of the cubes of three consecutive natural numbers is divisible by

A. 7

B. 9

C. 25

D. 26

**Answer: B**



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26.  $\frac{(n + 2)!}{(n - 1)!}$  is divisible by

A. 6

B. 11

C. 24

D. 26

**Answer: A**



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**27.** For all  $n \in \mathbb{N}$ ,  $n^4$  is less than

A.  $10^n$

B.  $4^n$

C.  $4n$

D.  $10^{10}$

**Answer: A**



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28. For all  $n \in \mathbb{N}$ ,  $1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} + \dots + \frac{1}{\sqrt{n}}$

A. equal to  $\sqrt{n}$

B. less than or equal to  $\sqrt{n}$

C. greater than or equal to  $\sqrt{n}$

D. none of these

**Answer: B**



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**29.** For all  $n \in \mathbb{N}$ ,  $\Sigma n$

A.  $< \frac{(2n + 1)^2}{8}$

B.  $> \frac{(2n + 1)^2}{8}$

C.  $= \frac{(2n + 1)^2}{8}$

D. none of these

**Answer: A**



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30. For all  $n \in N$ ,  $\cos \theta \cos 2\theta \cos 4\theta \dots \cos 2^{n-1}\theta$   
equals to

A.  $\frac{\sin 2^n \theta}{2^n \sin \theta}$

B.  $\frac{\sin 2^n \theta}{\sin \theta}$

C.  $\frac{\cos 2^n \theta}{2^n \cos 2\theta}$

D.  $\frac{\cos 2^n \theta}{2^n \sin 2\theta}$

**Answer: A**



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