MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

MATHEMATICAL INDUCTION

Section I Solved Mcqs

1. A series is given in the form

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

Find the sum of the numbers in the rth 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

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

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. Statement -1 For each natural number $n, (n+1)^7 - n^7 - 1$ is divisible by 7.

Statement -2 For each natural number $n, n^7 - n$ is divisible by 7.

A. 1

B. 2

C. 3

D. 4

Answer: A

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Exercise

1. $\forall n \in N, 49^n + 16n - 1$ 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. show that $n\left(n^2-1\right)$, 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. Prove the following by the principle of mathematical induction: $5^{2n} - 1$ is divisible by 24 for all $n \in N$.

A. 6

B. 11

C. 24

D. 26

Answer: C

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

A. 3

B. 8

C. 9

D. 11

Answer: A

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6. For all $n \in N, 4^n - 3n - 1$ 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 first n terms of the following series: $3 + 7 + 13 + 21 + 31 + \cdot$

A. 4n-1

B. $n^2 + 2n$

C. $n^2 + n + 1$

D. $n^2 + 2$

Answer: C

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11. n^{th} term of the series $4 + 14 + 30 + 52 + ... =$

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

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

A. $n^2\left(n^2-1\right)$

B. $n^2\left(2n^2-1\right)$

C. $n^2\left(2n^2+1\right)$

D. $n^2\left(n^2+1\right)$

Answer: B

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14. If $10^n+3\cdot 4^{n+2}$ + is divisible by 9, for all $n\in N$, then the least positive integral value of k is

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

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 $n \in N$ 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 $n \in N$, $\frac{n^5}{5} + \frac{n^3}{3} + \frac{7n}{15}$ 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

$$1+(1+a)+\left(1+a+a^2\right)+\left(1+a+a^2+a^3\right)+\ldots,$$

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+... to n terms $= 2^{n+1} + n - 2$, then nth 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. Using mathematical induction , to prove that

$7^{2n} + 2^{3n-3}.\ 3^{n-1}$ is divisible by 25 , for al $n \in N$

A. 24

B. 25

C. 9

D. 13

Answer: B

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23. Prove that for $n \in N, 10^n + 3.4^{n+2} + 5$ is divisible by 9 .

A. 23

B. 3

C. 9

D. 207

Answer: C

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24. For each $n \in N, n(n+1)(2n+1)$ is divisible by

A. $x + y$

B. $x - y$

C. $x^2 + y^2$

D. none of these

Answer: A

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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 $n \in N$, 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 $n \in N, 1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} + + \frac{1}{\sqrt{n}}$

A. equal to $\sqrt{n}$

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

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

D. none of these

Answer: B

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29. For all $n \in N$, Σn

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 $n \in N$, $\cos\theta \cos 2\theta \cos 4\theta \ldots \cos 2^{n-1}\theta$ 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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