

Answer. A

8. For a given length of the perimeter, which of the following plane figures have the maximum area?
A. equilateral triangle B. rhombus C. square D. regular pentagon

Answer. D

9. The value of $1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + \dots + 84 \cdot 85$ is
A. 2406800 B. 204680 C. 204860 D. 204086

Answer. B

10. If $3^x - 2 \cdot 3^{x-1} + 3^{x-2} = 4$, then $x^3 - 2x^2 + 1$ equals
A. 0 B. 1 C. 2 D. none of the previous options

Answer. B

11. The remainder when $2^{2016} + 3^{2016}$ is divided by 2017 is
A. 0 B. 1 C. 2 D. 2016

Answer. C

12. Let $ABCD$ be a quadrilateral. The circles with AB , BC , CD , DA as their respective diameters
A. completely cover the quadrilateral $ABCD$ B. cover approximately half of the area of the quadrilateral $ABCD$
C. cover less than half of the area of the quadrilateral $ABCD$
D. cover at most one third of the area of the quadrilateral $ABCD$

Answer. A

13. The number of local maxima of the function $f(x) = x^{-x}$ over the set of positive real numbers is
A. 0 B. 1 C. 2 D. 3

Answer. B

14. There are infinitely many primes p such that
A. both $p + 2$ and $p + 4$ are prime B. $3p + 1$ is prime C. $p + 2$ is composite
D. none of the previous options hold

Answer. C

15. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function such that $f(x) = \int_0^x f(t)dt$ and $\lim_{x \rightarrow 0} \frac{f(x)}{x} = \frac{1}{2}$. Then $f(\log_e 3)$ is equal to
A. $\frac{3}{2}$ B. 1 C. 2 D. 3

Answer. B

16. The numbers of squares of all sizes on an $n \times n$ chessboard is

A. n^2 B. $\binom{n+1}{3}$ C. $\binom{n+2}{3}$ D. $\binom{n+1}{3} + \binom{n+2}{3}$

Answer. D

17. Let m and n be positive integers. Then the gcd (i. e. the greatest common divisor) of $2^m - 1$ and $2^n - 1$ is

A. $2^{\min\{m,n\}} - 1$ B. $2^{\gcd\{m,n\}} - 1$ C. $2^{|m-n|} - 1$ D. $2^{||m|-|n||} - 1$

Answer. B

18. Given that $\log_{10} 3 = 0.4771212547$ and $\log_{10} 5 = 0.6989700043$, which of the following is the number of digits of 15^{100000} in base 10?

A. 33349 B. 117609 C. 33350 D. 117610

Answer. D

19. If z is a complex number such that $\sqrt{z} + \frac{1}{\sqrt{z}} = 2$, then $z^4 + \frac{1}{z^4}$ is equal to

A. 2 B. 4 C. 8 D. 16

Answer. A

20. Suppose, there were 206 students in your batch at your college. You know the email addresses of 85 of them and phone numbers of 98 of them. If you do not have any contact information about 57 of them, then how many of your college batchmates shared only their email addresses with you but not their phone numbers?

A. 34 B. 23 C. 51 D. none of the other options is true

Answer. C