1. An algorithm is a _____ set of precise instructions for performing computation.
a) Infinite
b) Finite
c) Constant
d) None of the mentioned
View Answer

Answer: b
Explanation: By the definition of an algorithm.
2. Out of the following which property algorithms does not share?
a) Input
b) Finiteness
c) Generality
d) Constancy
View Answer

Answer: d
Explanation: All the others are the properties of algorithms.
3. In _____ search each element is compared with x till not found.
a) Binary
b) Sequential
c) Merge
d) None of the mentioned
View Answer

Answer: b
Explanation: In linear or sequential search entire list is searched sequentially for x.
4. If the entire list is searched sequentially without locating x in linear search, the solution is _____
a) 0
b) -1
c) 1
d) 2
View Answer

Answer: a
Explanation: If the element is not found in the entire list, then the solution is 0.
5. To sort a list with n elements, the insertion sort begins with the _____ element.
a) First
b) Second
c) Third
d) Fourth
View Answer

Answer: b
Explanation: The insertion sort compares the second element with the first element to start sorting.
6. _____ comparisons required to sort the list 1, 2, 3…….n using insertion sort.
a) (n2 + n + 2) / 2
b) (n3 + n – 2) / 2
c) (n2 + n – 2) / 2
d) (n2 – n – 2) / 2
View Answer

Answer: c
Explanation: 2+3+4+….6n = (n2 + n – 2) / 2.
7. The Worst case occurs in linear search algorithm when _____
a) Item is somewhere in the middle of the array
b) Item is not in the array at all
c) Item is the last element in the array
d) Item is the last element in the array or is not there at all
View Answer

Answer: d
Explanation: The Worst case occur in linear search algorithm when Item is the last element in the array or is not there at all.
8. List obtained in third pass of selection sort for list 3, 5, 4, 1, 2 is _____
a) 1, 2, 4, 3, 5
b) 1, 2, 3, 4, 5
c) 1, 5, 4, 3, 2
d) 3, 5, 4, 1, 2
View Answer

Answer: b
Explanation: The selection sort begins with finding the least element in the list. This element is moved to front and then the least element among the remaining elements. Is found and put into the second position and so on.
9. The operation of processing each element in the list is known as _____
a) Sorting
b) Merging
c) Inserting
d) Traversal
View Answer

Answer: d
Explanation: The operation of processing each element in the list is known as Traversal.
10. The complexity of Bubble sort algorithm is _____
a) O(n)
b) O(log n)
c) O(n2)
d) O(n log n)
View Answer

Answer: c
Explanation: The complexity of Bubble sort algorithm is O(n2).

1. An Algorithm is _____
a) A procedure for solving a problem
b) A problem
c) A real life mathematical problem
d) None of the mentioned
View Answer

Answer: a
Explanation: An algorithm is a stepwise solution to the problem.
2. An algorithm in which we divide the problem into subproblem and then we combine the subsolutions to form solution to the original problem is known as _____
a) Brute Force
b) Divide and Conquer
c) GreedyAlgorithm
d) None of the mentioned
View Answer

Answer: b
Explanation: In Divide and Conquer we divide the problem and then recombine the solution.
3. An algorithm which uses the past results and uses them to find the new results is _____
a) Brute Force
b) Divide and Conquer
c) Dynamic programming algorithms
d) None of the mentioned
View Answer

Answer: c
Explanation: In Dynamic programming algorithms we utilize previous results for new ones.
4. A Complexity of algorithm depends upon _____
a) Time only
b) Space only
c) Both Time and Space
d) None of the mentioned
View Answer

Answer: c
Explanation: For Complexity, we calculate both time and space consumed.
5. An algorithm which tries all the possibilities unless results are satisfactory is and generally is time-consuming is _____
a) Brute Force
b) Divide and Conquer
c) Dynamic programming algorithms
d) None of the mentioned
View Answer

Answer: a
Explanation: In Brute force, all the possibilities are tried.
6. For a recursive algorithm _____
a) a base case is necessary and is solved without recursion.
b) a base case is not necessary
c) doesnot solve a base case directly
d) none of the mentioned

View Answer

Answer: a
Explanation: Base case ends recursion and therefore it is necessary for finite recursion.
7. Optimization of algorithm means _____
a) making that algorithm fast by time and compact by space
b) making that algorithm slow by time and large by space
c) making that algorithm fast by time and large by space
d) making that algorithm slow by time and compact by space
View Answer

Answer: a
Explanation: An Algorithm should be fast and compact.
8. For an algorithm which is the most important characteristic that makes it acceptable _____
a) Fast
b) Compact
c) Correctness and Precision
d) None of the mentioned
View Answer

Answer: c
Explanation: An algorithm should be correct otherwise it’s of no use even if it is fast and compact.
9. An algorithm: can be represented through _____
a) flow charts
b) pseudo codes
c) instructions in common language
d) all of the mentioned
View Answer

Answer: d
Explanation: Algorithm is represented through pseudo codes, normal language sentences or flow charts.
10. There are two algorithms suppose A takes 1.41 milli seconds while B takes 0.9 milliseconds, which one of them is better considering all other things the same?
a) A is better than B
b) B is better than A
c) Both are equally good
d) None of the mentioned
View Answer

Answer: b
Explanation: B takes less time than A for the same task.

1. Which of the following case does not exist in complexity theory?
a) Best case
b) Worst case
c) Average case
d) Null case
View Answer

Answer: d
Explanation: Null case does not exist in complexity Theory.
2. The complexity of linear search algorithm is _____
a) O(n)
b) O(log n)
c) O(n2)
d) O(n log n)
View Answer

Answer: a
Explanation: The worst case complexity of linear search is O(n).
3. The complexity of Binary search algorithm is _____
a) O(n)
b) O(log)
c) O(n2)
d) O(n log n)
View Answer

Answer: b
Explanation: The compexity of binary search is O(logn).
4. The complexity of merge sort algorithm is _____
a) O(n)
b) O(log n)
c) O(n2)
d) O(n log n)
View Answer

Answer: d
Explanation: The worst case complexity for merge sort is O(nlogn).
5. The complexity of Bubble sort algorithm is _____
a) O(n)
b) O(log n)
c) O(n2)
d) O(n log n)
View Answer

Answer: c
Explanation: The worst case complexity for Bubble sort is O(n2) and best case is O(n).
6. The Worst case occur in linear search algorithm when _____
a) Item is somewhere in the middle of the array
b) Item is not in the array at all
c) Item is the last element in the array
d) Item is the last element in the array or is not there at all
View Answer

Answer: d
Explanation: The Worst case occur in linear search algorithm when Item is the last element in the array or is not there at all.
7. The worst case complexity for insertion sort is _____
a) O(n)
b) O(log n)
c) O(n2)
d) O(n log n)
View Answer

Answer: c
Explanation: In worst case nth comparison are required to insert the nth element into correct position.
8. The complexity of Fibonacci series is _____
a) O(2n)
b) O(log n)
c) O(n2)
d) O(n log n)
View Answer

Answer: a
Explanation: Fibonacci is f(n) = f(n-1) + f(n-2), f(0) = 0, f(1) = 1. Let g(n) = 2n. Now prove inductively that f(n) > = g(n).
9. The worst case occurs in quick sort when _____
a) Pivot is the median of the array
b) Pivot is the smallest element
c) Pivot is the middle element
d) None of the mentioned
View Answer

Answer: b
Explanation: This happens when the pivot is the smallest (or the largest) element. Then one of the partitions is empty, and we repeat recursively the procedure for N-1 elements.
10. The worst case complexity of quick sort is _____
a) O(n)
b) O(log n)
c) O(n2)
d) O(n log n)
View Answer

Answer: c
Explanation: The worst case complexity of quick sort is O(n2).

1. Which is used to measure the Time complexity of an algorithm Big O notation?
a) describes limiting behaviour of the function
b) characterises a function based on growth of function
c) upper bound on growth rate of the function
d) all of the mentioned
View Answer

Answer: d
Explanation: Big O notation describes limiting behaviour, and also gives upper bound on growth rate of a function.
2. If for an algorithm time complexity is given by O(1) then the complexity of it is _____
a) constant
b) polynomial
c) exponential
d) none of the mentioned
View Answer

Answer: a
Explanation: The growth rate of that function will be constant.
3. If for an algorithm time complexity is given by O(log2n) then complexity will be _____
a) constant
b) polynomial
c) exponential
d) none of the mentioned
View Answer

Answer: d
Explanation: The growth rate of that function will be logarithmic therefore complexity will be logarithmic.
4. If for an algorithm time complexity is given by O(n) then the complexity of it is _____
a) constant
b) linear
c) exponential
d) none of the mentioned
View Answer

Answer: b
Explanation: The growth rate of that function will be linear.
5. If for an algorithm time complexity is given by O(n2) then complexity will _____
a) constant
b) quadratic
c) exponential
d) none of the mentioned
View Answer

Answer: b
Explanation: The growth rate of that function will be quadratic therefore complexity will be quadratic.
6. If for an algorithm time complexity is given by O((3⁄2)n) then complexity will be _____
a) constant
b) quardratic
c) exponential
d) none of the mentioned
View Answer

Answer: c
Explanation: The growth rate of that function will be exponential therefore complexity will be exponential.
7. The time complexity of binary search is given by _____
a) constant
b) quardratic
c) exponential
d) none of the mentioned
View Answer

Answer: d
Explanation: It is O(log2n), therefore complexity will be logarithmic.
8. The time complexity of the linear search is given by _____
a) O(log2n)
b) O(1)
c) exponential
d) none of the mentioned
View Answer

Answer: d
Explanation: It is O(n), therefore complexity will be linear.
9. Which algorithm is better for sorting between bubble sort and quicksort?
a) bubble sort
b) quick sort
c) both are equally good
d) none of the mentioned
View Answer

Answer: b
Explanation: Running time of quicksort is logarithmic whereas for bubble sort it is quadratic.
10. Time complexity of the binary search algorithm is constant.
a) True
b) False
View Answer

Answer: b
Explanation: It is O(log2n), therefore complexity will be logarithmic.

1. The binary notation of 231 is _____
a) (11010111)2
b) (10111011)2
c) (11100011)2
d) (11100111)2
View Answer

Answer: d
Explanation: By binary Expansion of 11100111 is 1*20 + 1*21 + 1*22 + 1*25 + 1*26 + 1*27 is equal to 231.
2. The decimal notation of 101010101 is _____
a) 34010
b) 34110
c) 34210
d) 31510
View Answer

Answer: b
Explanation: (101010101)2 = 1*20 + 1*22 + 1*24 + 1*26 + 1*28 = 341.
3. The binary notation of ABBA is _____
a) 1010 1011 1011 1010
b) 1010 1001 1011 1011
c) 1011 1000 1010 1001
d) 1001 1000 1000 1111
View Answer

Answer: a
Explanation: By the base conversion algorithm.
4. The hexadecimal notation of (1011 0111 1011)2 is _____
a) (B2B)16
b) (B5B)16
c) (B7B)16
d) (A7B)16
View Answer

Answer: c
Explanation: (1011)2 = 11 and (0111)2 = 7, 11 in hexadecimal notation represents B. So it is (B7B)16.
5. The octal expansion of (10 1011 1011)2 is _____
a) (1245)8
b) (1276)8
c) (1275)8
d) (1273)8
View Answer

Answer: d
Explanation: (10 1011 1011)2 = (699)10. Using base conversion algorithm, (699)10 = (1273)8.
6. The hexadecimal expansion of (177130)10 is _____
a) (2B3EB)16
b) (2B3EA)16
c) (2C3AA)16
d) (2B2AA)16
View Answer

Answer: b
Explanation: Successively divide 177130 by 16 to obtain remainder they are (2B3EA)16.
7. The greatest common divisor of 414 and 662 is?
a) 4
b) 5
c) 2
d) 6
View Answer

Answer: c
Explanation: By using Euclid Lemma.
8. The greatest common divisor of 12 and 18 is?
a) 2
b) 3
c) 4
d) 6
View Answer

Answer: d
Explanation: By using Euclid Lemma, 6 divides 12 and 18.
9. The decimal expansion of (2AE0B)16 is?
a) (175627)10
b) (175624)10
c) (178566)10
d) (175622)10
View Answer

Answer: a
Explanation: (2AE0B)16 = 2*164 + 10*163 + 14*162 + 0*16+11 = (175627)10.
10. The greatest common divisor of 7 and 5 is?
a) 1
b) 2
c) 5
d) 7
View Answer

Answer: a
Explanation: Two numbers 7 and 5 are relatively prime, so gcd(7, 5) = 1.

1. The quotient when 19 is divided by 6 is?
a) 1
b) 2
c) 3
d) 0
View Answer

Answer: c
Explanation: According to the Division Algorithm 19 = 6(3) + 1. Hence, quotient when 19 divided by 6 is 3 = 19 div 6.
2. The remainder when 111 is divided by 12 is?
a) 0
b) 1
c) 2
d) 3
View Answer

Answer: d
Explanation: According to the Division Algorithm 111 = 12(9) + 3. Hence, remainder when 111 divided by 12 is 3 = 111 mod 12.
3. The quotient and remainder when -1 is divided by 3 is?
a) -1 and -1
b) -1 and 2
c) 1 and 2
d) -1 and -2
View Answer

Answer: b
Explanation: According to the Division Algorithm -1 = 3(-1) + 2. Hence, quotient when -1 divided by 3 is -1 = -1 div 3 and remainder when -1 divided by 3 is 2 = -1 mod 3.
4. The value of 12 mod 3 is?
a) 0
b) 1
c) 2
d) 3
View Answer

Answer: a
Explanation: By the Division algorithm 12 = 3(4) + 0. Where remainder is 12 mod 3.
5. The value of 155 mod 9 is?
a) 0
b) 1
c) 2
d) 3
View Answer

Answer: c
Explanation: By the Division algorithm 155 = 9(17) + 2. Where remainder is 155 mod 9.
6. Is 17 congruent to 4 modulo 6.
a) True
b) False
View Answer

Answer: b
Explanation: 6 does not divide 17 – 4 = 13.
7. If a|b and a|c, then?
a) a|bc
b) c|a
c) a|(b+c)
d) b|a
View Answer

Answer: c
Explanation: If a|b and a|c then b = am and c = an for some integer m and n. Hence, b + c = a(m + n). Therefore, a|(b+c).
8. Is 102 congruent to 6 modulo 16.
a) True
b) False
View Answer

Answer: a
Explanation: 16 divide 102 – 6 = 96.
9. The quotient and remainder when 18 is divided by 5 is?
a) 2 and 3
b) 1 and 2
c) 3 and 2
d) 3 and 3
View Answer

Answer: d
Explanation: According to the Division Algorithm 18 = 5(3) + 3. Hence, quotient when 18 divided by 5 is 3 = 18 div 5 and remainder when 18 divided by 5 is 3 = 18 mod 5.
10. The value of 15 mod 11 is?
a) 1
b) 2
c) 3
d) 4
View Answer

Answer: d
Explanation: By the Division algorithm 15 = 11(1) + 4. Where the remainder is 15 mod 11.

1. The number of factors of prime numbers are _____
a) 2
b) 3
c) Depends on the prime number
d) None of the mentioned
View Answer

Answer: a
Explanation: A prime number is only divisible by 1 and itself.
2. What is the number ‘ 1’?
a) Prime number
b) Composite number
c) Neither Prime nor Composite
d) None of the mentioned
View Answer

Answer: c
Explanation: 1 is neither prime number nor composite.
3. All prime numbers are odd.
a) True
b) False
View Answer

Answer: b
Explanation: 2 is even as well as prime.
4. 3 is the smallest prime number possible.
a) True
b) False
View Answer

Answer: b
Explanation: 2 is also a prime number.
5. How many prime numbers are there between 1 to 20?
a) 5
b) 6
c) 7
d) None of the mentioned
View Answer

Answer: d
Explanation: The prime numbers between 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19.
6. There are finite number of prime numbers.
a) True
b) False
View Answer

Answer: b
Explanation: There are infinite numbers of primes.
7. Sum of two different prime number is a _____
a) Prime number
b) Composite number
c) Either Prime or Composite

d) None of the mentioned
View Answer

Answer: c
Explanation: Eg:- 2 + 3 = 5 a prime, 3 + 7 = 10 a composite.
8. Difference of two distinct prime numbers is?
a) Odd and prime
b) Even and composite
c) None of the mentioned
d) All of the mentioned
View Answer

Answer: c
Explanation: 3 – 2 = 1 is neither prime nor composite.
9. If a, b, c, d are distinct prime numbers with an as smallest prime then a * b * c * d is a _____
a) Odd number
b) Even number
c) Prime number
d) None of the mentioned
View Answer

Answer: b
Explanation: Since a is 2, 2 * b * c * d = Even number.
10. If a, b are two distinct prime number than a highest common factor of a, b is _____
a) 2
b) 0
c) 1
d) ab
View Answer

Answer: c
Explanation: HCF of two prime numbers is 1.

1. If there exist an integer x such that x2 ≡ q (mod n). then q is called _____
a) Quadratic Residue
b) Linear Residue
c) Pseudoprime
d) None of the mentioned
View Answer

Answer: a
Explanation: q is called quadratic residue if it is congruent to a perfect square modulo n.
2. If there exist no integer x such that x2 ≡ q (mod n). then q is called _____
a) Quadratic Residue
b) Quadratic Nonresidue
c) Pseudoprime
d) None of the mentioned
View Answer

Answer: b
Explanation: q is called quadratic nonresidue if it is not congurent to a perfect square modulo n.
3. The Fermat's little theorem for odd prime p and coprime number a is?
a) ap-1 ≡ 1 (mod p)
b) ap-1 ≡ 7 (mod p)
c) ap(2)-1 ≡ 1 (mod p)
d) none of the mentioned
View Answer

Answer: a
Explanation: According to Fermat's little theorem ap-1 ≡ 1 (mod p).
4. 5 is quardratic non-residue of 7.
a) True
b) False
View Answer

Answer: a
Explanation: Since there exists no number which gives 5 modulo 7 when squared.
5. 4 is quardratic residue of 7.
a) True
b) False
View Answer

Answer: a
Explanation: Since 25 ≡ 4(mod)7, 4 is quardratic residue of 7.
6. 8 is quardratic residue of 17.
a) True
b) False
View Answer

Answer: a
Explanation: Since 25 ≡ 8(mod)17.
7. 8 is quardratic residue of 11.
a) True
b) False
View Answer

Answer: b
Explanation: Since x2 ≡ 8(mod)17 has no solutions.
8. Which of the following is a quardratic residue of 11?
a) 4
b) 5
c) 9
d) All of the mentioned
View Answer

Answer: d
Explanation: Since 4, 16, 32 satisfies the criteria, all are quardratic residue of 11.
9. What is pseudo prime number?
a) is a probable prime and is not a prime number
b) is a prime number
c) does not share any property with prime number
d) none of the mentioned
View Answer

Answer: a
Explanation: A pseudo prime number is an integer that shares a property common to all prime number and is not a prime number.
10. Pseudo prime are classified based on property which they satisfy, which of the following are classes of pseudoprimes?
a) Fermat pseudoprime
b) Fibonacci pseudoprime
c) Euler pseudoprime
d) All of the mentioned
View Answer

Answer: d
Explanation: Fermat pseudoprime, Fibonacci pseudoprime, Euler pseudoprime are different classes of pseudoprimes.

1. A Least Common Multiple of a, b is defined as _____
a) It is the smallest integer divisible by both a and b
b) It is the greatest integer divisible by both a and b
c) It is the sum of the number a and b
d) None of the mentioned
View Answer

Answer: a
Explanation: Definition of LCM(a, b)-smallest multiple of a and b.
2. The LCM of two number 1, b(integer) are _____
a) b + 2
b) 1
c) b
d) None of the mentioned
View Answer

Answer: c
Explanation: Since b is the smallest integer divisible by 1 and b.
3. If a, b are integers such that a > b then lcm(a, b) lies in _____
a) a>lcm(a, b)>b
b) a>b>lcm(a, b)
c) lcm(a, b)>=a>b
d) none of the mentioned
View Answer

Answer: c
Explanation: LCM of number is either equal to the biggest number or greater than all.
4. LCM of 6, 10 is?
a) 60
b) 30
c) 10
d) 6
View Answer

Answer: b
Explanation: Since 30 is the smallest integer divisible by 6 and 10.
5. The product of two numbers are 12 and their Greatest common divisor is 2 then LCM is?
a) 12
b) 2
c) 6
d) None of the mentioned
View Answer

Answer: c
Explanation: The lcm of two number a and b is given by
lcm(a, b) = ab/(GCD(a, b)).
6. If LCM of two number is 14 and GCD is 1 then the product of two numbers is?
a) 14
b) 15
c) 7
d) 49
View Answer

Answer: a
Explanation: The lcm of two number a and b is given by
lcm(a, b) = ab/(GCD(a, b)), this implies ab = lcm(a, b) * gcd(a, b).
7. If a number is 22 x 31 x 50 and b is 21 x 31 x 51 then lcm of a, b is?
a) 22 x 31 x 51
b) 22 x 32 x 52
c) 23 x 31 x 50
d) 22 x 32 x 50
View Answer

Answer: a
Explanation: Lcm is the product of sets having highest exponent value among a and b.
8. State whether the given statement is True or False.
LCM (a, b, c, d) = LCM(a,(LCM(b,(LCM(c, d)))).
a) True
b) False
View Answer

Answer: a
Explanation: LCM function can be reursively defined.
9. LCM(a, b) is equals to _____
a) ab/(GCD(a, b))
b) (a+b)/(GCD(a, b))
c) (GCD(a, b))/ab
d) none of the mentioned
View Answer

Answer: a
Explanation: ab = lcm(a, b)*gcd(a, b), which implies
LCM(a,b) = ab/(GCD(a,b)).
10. The lcm of two prime numbers a and b is _____
a) a/b
b) ab
c) a + b
d) 1
View Answer

Answer: b
Explanation: LCM(a, b) = ab/(GCD(a, b)), Since (GCD(a, b)) = 1 therfore LCM(a, b) = ab.

1. A Highest Common Factor of a, b is defined as _____
a) It is the smallest integer divisible by both a and b
b) It is the greatest integer divisor of both a and b
c) It is the sum of the number a and b
d) None of the mentioned
View Answer

Answer: b
Explanation: Defination of HCF(a, b)-greatest integer divisor of both a and b.
2. The HCF of two number 1, b(integer) are _____
a) b + 2
b) 1
c) b
d) None of the mentioned
View Answer

Answer: b
Explanation: Since 1 is the greatest integer divisor of both 1 and b.
3. If a,b are integers such that a > b then hcf(a, b) lies in _____
a) a> hcf(a, b)>b
b) a>b> = hcf(a, b)
c) hcf(a, b)> = a>b
d) None of the mentioned
View Answer

Answer: b
Explanation: Hcf of number is either equal to smallest number or is least among all.
4. HCF of 6, 10 is?
a) 60
b) 30
c) 10
d) 2
View Answer

Answer: d
Explanation: Since 2 is the greatest integer divisor of both 6 and 10.
5. The product of two numbers are 12 and there LCM is 6 then HCF is?
a) 12
b) 2
c) 6
d) None of the mentioned
View Answer

Answer: b
Explanation: The hcf of two number a and b is given by
(hcf(a, b)) = ab/ lcm(a, b).
6. If LCM of two number is 10 and GCD is 5 then the product of two numbers is?
a) 45
b) 50
c) 7
d) 49
View Answer

Answer: b
Explanation: The lcm of two number a and b is given by
lcm(a,b) = ab/(GCD(a, b)), this implies ab = lcm(a, b) * gcd(a, b).
7. If a number is 22 x 31 x 50 and b is 22 x 31 x 51 then hcf of a, b is?
a) 22 x 31 x 51
b) 22 x 32 x 52
c) 21 x 31 x 50
d) 22 x 32 x 50
View Answer

Answer: c
Explanation: Hcf is the product of sets having least exponent value among a and b.
8. State whether the given statement is True or False.

HCF (a, b, c, d) = HCF(a,(HCF(b,(HCF(c, d)))).
a) True
b) False
View Answer

Answer: a
Explanation: HCF function can be reursively defined.
9. HCF(a, b) is equals to _____
a) ab/(LCM(a, b))
b) (a + b)/(LCM(a, b))
c) (LCM(a, b))/ab
d) None of the mentioned
View Answer

Answer: a
Explanation: ab = lcm(a, b)*hcf(a, b), which implies
HCF(a,b) = ab/(LCM(a, b)).
10. The HCF of two prime numbers a and b is _____
a) a/b
b) ab
c) a + b
d) 1
View Answer

Answer: d
Explanation: Since they doesnot have any factor in common other than 1.

1. Which of the number is not allowed in Binary representation of a number?
a) 0
b) 1
c) 2
d) None of the mentioned
View Answer

Answer: c
Explanation: Binary numbers are formed with a combination of 0 & 1 only.
2. Which of the number is not allowed in Octal representation of a number?
a) 0
b) 4
c) 8
d) None of the mentioned
View Answer

Answer: c
Explanation: Octal numbers are formed with a combination of 0 to 7 only.
3. Hexadecimal number equivalent of decimal 10 is?
a) 10
b) A
c) F
d) None of the mentioned
View Answer

Answer: b
Explanation: In hexadecimal representation A is represented as decimal 10.
4. Decimal equivalent of binary number 1010 is?
a) 11
b) A
c) 10
d) None of the mentioned
View Answer

Answer: c
Explanation: 0X1 + 1X2 + 0X4 + 1X8 = 10 in decimal.
5. Decimal 13 in base 8 can be represented as _____
a) 15
b) 12
c) 22
d) None of the mentioned
View Answer

Answer: a
Explanation: 1X8 + 5X1 = 12, 15 is the octal representation of 13.
6. F in hexadecimal representation is equivalent to 9 in decimal.
a) True
b) False
View Answer

Answer: b
Explanation: F in hexadecimal representation is equivalent to 15 in decimal.

7. Octal number may contain digits from 1 to 8.
a) True
b) False
View Answer

Answer: b
Explanation: Octal number contains digits from 0 to 7, * is not allowed.
8. For some base r, the digits which are allowed in its representation are?
a) Digits from 1 to r
b) Digits from 0 to r-1
c) Digits from 1 to r-1
d) None of the mentioned
View Answer

Answer: b
Explanation: A base r number may contain digits from 0 to r-1.
9. The binary number 100110 in octal is represented by _____
a) 45
b) 10012
c) 46
d) 58
View Answer

Answer: c
Explanation: Pairing 3 numbers from right hand side we get 110 as 6 and 100 as 4 in octal so the number is 46.
10. A number greater than 32 would require a minimum of how may bits in binary representation?
a) 5
b) 6
c) 4
d) 10
View Answer

Answer: b
Explanation: Since through 5 bits we can only represent numbers till 31 since 25 = 32 we need greater than 5 bits, so minimum would be 6.

1. One’s complement in binary is defined as _____
a) Flipping each binary bit
b) Adding one to the binary number
c) Flipping only bits having zero in it
d) None of the mentioned
View Answer

Answer: a
Explanation: While taking 1’s complement we replace 1 with zero and vice versa.
2. What is the one’s complement of the number 1010110?
a) 1111111
b) 0101001
c) 1100110
d) None of the mentioned
View Answer

Answer: b
Explanation: While taking 1’s complement we replace 1 with zero and vice versa.
3. One’s complement of a number x is y, then one’s complement of y is?
a) y
b) x
c) x + y
d) None of the mentioned
View Answer

Answer: b
Explanation: Complement of Complement of number gives the same number.
4. Nine’s complement of a number is formed by _____
a) replacing each digit by 9 minus that digit
b) replacing each digit by 1plus that digit
c) replacing each digit by 8 minus that digit
d) None of the mentioned
View Answer

Answer: a
Explanation: Nine’s complement of a number is formed by replacing each digit by 9 minus that digit.
5. Radix complement can be obtained fromdiminished radix’s complement by _____
a) Adding one to diminished radox’s complement
b) Subtracting one to diminished radox’s complement
c) Both are same things
d) None of the mentioned
View Answer

Answer: a
Explanation: Radix complement = diminished radix complement +1.
6. In binary signed representation if most significant bit is one then that number is positive.
a) True
b) False
View Answer

Answer: b

Explanation: In signed representation, if the most significant bit is one then that number is negative, for positive numbers msb = 0.
7. In signed representation 5 is represented in binary as 0101.
a) True
b) False
View Answer

Answer: a
Explanation: Here msb is the signed bit which is zero, 101 evaluates to 5 hence it is +5.
8. The two's complement of 101110100 is represented as?
a) 010001100
b) 101110101
c) 010001100
d) None of the mentioned
View Answer

Answer: a
Explanation: 2's complement = 1's complement +1, 1's complement = 010001011.
9. 9's complement of 23456 is?
a) 87654
b) 76543
c) 12345
d) none of the mentioned
View Answer

Answer: b
Explanation: Nine's complement of a number is formed by replacing each digit by 9 minus that digit.
10. Decimal equivalent of one's complement of 11111001 is?
a) 5
b) 6
c) 4
d) 10
View Answer

Answer: b
Explanation: One's complement of that number is 00000110 which is 6 in decimal.

1. For some number b, (1⁄b)-n is equal to _____
a) -bn
b) nb
c) bn
d) none of the mentioned
View Answer

Answer: c
Explanation: b-1 reciprocal of b.
2. If ab = 1, where a and b are real numbers then?
a) a = b-1
b) b = a
c) a = b = 2
d) none of the mentioned
View Answer

Answer: a
Explanation: This means that a is inverse of b or b is inverse of a.
3. If a is a real number than a0 is defined as _____
a) 0
b) a
c) 1
d) -1
View Answer

Answer: a
Explanation: Any number to the power zero is one.
4. For some number a, b and c, ca x cb is equal to _____
a) ca-b
b) ca+b
c) c
d) none of the mentioned
View Answer

Answer: b
Explanation: If base are same then exponenents powers are added.
5. For some number a, b and c, ca/cb is equal to _____
a) ca-b
b) ca+b
c) c
d) None of the mentioned
View Answer

Answer: a
Explanation: If base are same then exponenents powers are added, 1/cb = c-b.
6. State whether the given statement is true or false.
Exponentiation is commutative.
a) True
b) False
View Answer

Answer: b

Explanation: Ab is not equal to bA, exponentiation is not commutative.
7. State whether the given statement is true or false.
Exponentiation is associative.
a) True
b) False
View Answer

Answer: b
Explanation: Exponentiation is not associative.
8. If 2a-b = 1 then the value of a-b is equal to _____
a) 1
b) 0
c) 2
d) none of the mentioned
View Answer

Answer: b
Explanation: 1 = 20, so a-b = 0.
9. For some number a, b and c, ac x bc is equal to _____
a) (ab)c
b) (ac)b
c) (cb)a
d) None of the mentioned
View Answer

Answer: a
Explanation: If power are same then bases are multiplied.
10. If 0a is not equal to zero then which of the values a cannot take _____
a) 1
b) 2
c) -1
d) 0
View Answer

Answer: d
Explanation: a0 = 1, for any real number.

1. The linear combination of gcd(252, 198) = 18 is?
a) 252*4 – 198*5
b) 252*5 – 198*4
c) 252*5 – 198*2
d) 252*4 – 198*4
View Answer

Answer: a
Explanation: By using the Euclidean algorithm.
2. The inverse of 3 modulo 7 is?
a) -1
b) -2
c) -3
d) -4
View Answer

Answer: b
Explanation: By using the Euclidean algorithm, 7 = 2*3 + 1. From this we see that -2*3 + 1*7 = 1. This show that -2 is an inverse.
3. The integer 561 is a Carmichael number.
a) True
b) False
View Answer

Answer: a
Explanation: By using the Fermat's theorem, it follows that b560 is congruent to 1 (mod 561).
4. The linear combination of gcd(117, 213) = 3 can be written as _____
a) 11*213 + (-20)*117
b) 10*213 + (-20)*117
c) 11*117 + (-20)*213
d) 20*213 + (-25)*117
View Answer

Answer: a
Explanation: By using the Euclidean algorithm.
5. The inverse of 7 modulo 26 is?
a) 12
b) 14
c) 15
d) 20
View Answer

Answer: c
Explanation: By using the Euclidean algorithm.
6. The inverse of 19 modulo 141 is?
a) 50
b) 51
c) 54
d) 52
View Answer

Answer: d

Explanation: By using the Euclidean algorithm.
7. The integer 2821 is a Carmichael number.
a) True
b) False
View Answer

Answer: a
Explanation: By using the Fermat's theorem, it follows that b2820 is congruent to 1 (mod 2821).
8. The solution of the linear congruence 4x = 5(mod 9) is?
a) 6(mod 9)
b) 8(mod 9)
c) 9(mod 9)
d) 10(mod 9)
View Answer

Answer: b
Explanation: The inverse of 5 modulo 9 is -2. Multiply by (-2) on both sides in equation 4x = 5(mod 9), it follows that x is congruent to 8(mod 9).
9. The linear combination of gcd(10, 11) = 1 can be written as _____
a) (-1)*10 + 1*11
b) (-2)*10 + 2*11
c) 1*10 + (-1)*11
d) (-1)*10 + 2*11
View Answer

Answer: a
Explanation: By using the Euclidean theorem, it follows that 1 = (-1)*10 + 1*11.
10. The value of 52003 mod 7 is?
a) 3
b) 4
c) 8
d) 9
View Answer

Answer: a
Explanation: By using the Fermat's theorem.

1. If the multiplicative inverse of “53 modulo 21” exists, then which of the following is true?
a) GCD(53,21) = 1
b) GCD(53,21) = 29
c) GCD(53,21) = 53
d) GCD(53,21) = 12
View Answer

Answer: a
Explanation: The multiplicative inverse of “a modulo m” can be found out by extended Euler’s GCD algorithm, and the time complexity of this method is O(logm). We know that the multiplicative inverse of “x modulo n” exists if and only if x and n are relatively prime (i.e., if gcd(a, m) = 1). So, in this case GCD(53,21) = 1.
2. A multiplicative monoid defines the property of exponentiation with _____
a) integer exponents
b) fractional exponents
c) rational exponents
d) negative integer exponents
View Answer

Answer: a
Explanation: Exponentiation with integer exponents is termed in any multiplicative monoid. Exponentiation is described inductively by 1) h0 = 1 for all h ∈ S, hn+1 = hn h and non-negative integers n, If n is a negative integer then hn is only defined if h has an inverse in S. Monoids define many structures including groups and rings (under multiplication).
3. Which of the following algorithms has better computational complexity than standard division algorithms?
a) Montgomery algorithm
b) Classical modular exponentiation algorithm
c) ASM algorithm
d) FSM algorithm
View Answer

Answer: b
Explanation: To multiply m and n, they are converted to Montgomery form: mR mod X and nR mod X. When multiplied, these produce mnR2 mod X, and the Montgomery reduction produces abR mod N which is the Montgomery form of the desired product. After that, the low bits are discarded which gives a result less than 2X. One final subtraction reduces this to less than X. Hence, this procedure can have a better computational complexity than standard division algorithms.
4. Which of the following methods uses the concept that exponentiation is computationally inexpensive in the finite field?
a) Diffie-HEllman key exchange
b) RSA key exchange
c) Arithmetic key exchange
d) FSM method
View Answer

Answer: a
Explanation: Exponentiation in the finite fields has its many applications in the public key cryptography system. Now, the Diffie–Hellman key exchange can have the concept that exponentiation is computationally inexpensive in the finite fields and the discrete logarithm which is the inverse of exponentiation, can be computationally expensive.
5. If there is a unique prime number p1 then a finite field F has the property of _____
a) p1x = 0 for all x in F
b) f(x) = f(xp1) for all x in F
c) p1 = y for all y in F
d) xy + p1 for all x, y in F
View Answer

Answer: a
Explanation: A field can be defined as an algebraic structure in which multiplication, addition, subtraction, and division are well-defined and satisfy similar properties. If there is a unique prime number p1 then a finite field F has the property of p1x = 0, for all x in F and this prime number is called the characteristics of the field.
6. Evaluate the expression 6359 mod 320.
a) 681
b) 811
c) 3781
d) 279
View Answer

Answer: d
Explanation: By definition, we can have 6359 ≡ 279 (mod320), hence the answer is 279.
7. The time complexity to perform the modular exponentiation of a ≡ cg (mod m).
a) O(m+a)
b) O(a*g)
c) O(gm)
d) O(g)
View Answer

Answer: d
Explanation: The modular exponentiation completely depends on the operating system environment and the processor for its performance. The above said method requires a time complexity of O(g) for its completion.
8. According to congruence relation, find the remainder of 56 mod 24.
a) 10
b) 12
c) 6
d) 4
View Answer

Answer: c
Explanation: According to congruence relation, 56 ≡ 6 (mod 24), because 56 − 32 = 24, which is a multiple of 24. So, the remainder is 6.
9. In cryptography system, the value of z in x ≡ ze (mod m) should be at least _____
a) 1024 bits
b) 1GB
c) 596 bits
d) 54 Bytes
View Answer

Answer: a
Explanation: In cryptography system, the value of z in x ≡ ze (mod m) should be at least 1024 bits.
10. Determine the value of x, where y = 7, e = 12 and n = 566 using modular exponentiation method (x ≡ ye (mod n)).
a) 735
b) 321
c) 872
d) 487
View Answer

Answer: d
Explanation: Given y = 5, e = 12, and n = 566 and so x ≡ 512 (mod 566). Now 512 comes out to 244140625 and taking this value modulo 566, x is determined to be 487.

1. The prime factorization of 7007 is _____

a) 73.11.13

b) 72.11.13

c) 7.11.13

d) 7.113.13

View Answer

Answer: b

Explanation: Perform successive division beginning with 2.

2. Out of following which one is Mersenne Primes?

a) 3

b) 7

c) 2047

d) 31

View Answer

Answer: c

Explanation: 2047 = 23.89 also not in form of 2b-1 form.

3. Out of the following which of these integers is not prime?

a) 21

b) 35

c) 71

d) 101

View Answer

Answer: b

Explanation: 35 = 5.7 which is the product of two prime numbers.

4. The prime factorization of 1001 is _____

a) 73.11.13

b) 72.11.13

c) 7.11.13

d) 7.113.13

View Answer

Answer: c

Explanation: Perform successive division beginning with 2.

5. Which positive integer less than 21 are relatively prime to 21?

a) 18

b) 19

c) 21

d) 24

View Answer

Answer: b

Explanation: gcd(19,21) = 1. According to the definition of relatively prime gcd of two numbers is 1.

6. Is 7, 8, 9, 11 are pairwise relatively prime.

a) True

b) False

View Answer

Answer: a

Explanation: gcd(7, 9) = gcd(8, 9) = gcd(9, 11) = gcd(11, 7) = 1. The numbers 7 and 11 are prime and numbers 8 and 9 are relatively prime.

7. The greatest common divisor of 313.517 and 212.35 is _____

a) 30

b) 31

c) 33

d) 35

View Answer

Answer: d

Explanation: gcd(a, b) = 3min(13, 5).5min(17, 0).2min(12, 0).

8. The greatest common divisor of 0 and 5 is _____

a) 0

b) 1

c) 2

d) 5

View Answer

Answer: b

Explanation: gcd(0, 5) = 0min(1, 0).5min(0, 1).

9. The lcm of 3 and 21 is _____ if gcd(3,21)=3.

a) 3

b) 12

c) 21

d) 42

View Answer

Answer: c

Explanation: 3 * lcm(3, 21) = 63 hence, lcm(3, 21) = 63 / 3 = 21.

10. The least common multiple of 41.42 and 42.41 is _____

a) 42

b) 41

c) 84

d) 41.42

View Answer

Answer: d

Explanation: lcm(41 * 42, 42 * 42) = 41.42.42.41 / 41.42 = 41.42.

1. How many bytes of the secret key is generated using Diffie-Hellman encryption/decryption scheme?

a) 256

b) 871

c) 1024

d) 962

View Answer

Answer: a

Explanation: Diffie-Hellman encryption/decryption scheme generates 256 bytes shared a secret key. This secret key then is used by AES key to encrypt this data.

2. In which of the following systems, encryption slower than decryption?

a) elliptic curve cryptography

b) parabolic curve cryptography

c) symmetric cryptography

d) antisymmetric cryptography

View Answer

Answer: b

Explanation: It is known that performing encryption using the public key takes more time than performing decryption using the private key in elliptic curve cryptography (ECC) and the key consists of 60 bytes.

3. If there are 256 cipher texts per plain text and a total of 218 plaintexts of length 18 exists. Then determine the number of distinct ciphertexts?

a) 761

b) 274

c) 186

d) 289

View Answer

Answer: b

Explanation: If there are 256 cipher texts per plain text and a total of 218 plaintexts of length 18 exists which will all decrypt to the same plaintext, and this holds for every plaintext. There are a total of 256 plaintexts of length 56. Now, there must be 256. 218 = 274 distinct ciphertexts which all decrypt to plaintexts of length 56. If all those ciphertexts are the same length, they must be at least 74 bits long.

4. TEA cipher uses which of the following structure?

a) standard cipher structure

b) pseudo random structure

c) feistel structure

d) block structure

View Answer

Answer: c

Explanation: The Feistel structure system TEA operates on two 32-bit unsigned integer numbers. It uses a 128-bit key that can be used to build a simple key schedule by mixing all of the key elements.

5. Let A’s public key is n=6, 736, 180, 7817, 961, 456, 267 and e = 5 and B sends the ciphertext. c = 456, 871, 122, 391, 882, 538 to A. Determine B’s message in numeric format?

a) 235813

b) 57971.89

c) 770190.04

d) 687651.9

View Answer

Answer: c

Explanation: It is known that to get original message m after decrypting we can have the formula m=c1/e. In this case: (456,871,122,391,882,538)1/3 = 770190.04 and this is the required answer.

6. In encryption, which of the following is the best text encoding technique?

a) ASCII encoding

b) Hex-encoding

c) Unicode technique

d) Base64 encoding

View Answer

Answer: c

Explanation: Base64 and hex encoding scheme encode characters(or only bytes). First, we need to encode the characters as bytes and after that encode the bytes. In terms of compactness and simplicity, the best technique is Unicode scheme.

7. _____ are used as the base of the Public Key Infrastructure.

a) SSL certificates

b) TLS certificates

c) X.509 certificates

d) HAS certificates

View Answer

Answer: c

Explanation: The X.509 certificates may be used as a base of the Public Key Infrastructure. PKIX is a tree structure where a Certificate Authority can be used to give trust to end entity certificates. X.509 certificates cannot directly use symmetric cryptography.

8. The default key size of RC2 Feistel cipher is _____

a) 64GB

b) 64 bits

c) 64 bytes

d) 64KB

View Answer

Answer: c

Explanation: RC2 is a 64-bit source-heavy Feistel cipher system with a default key size of 64 bits. It is a complex cipher which uses secret indices and performs bitwise rotations, logical operations(AND, NOT, and OR) and modular addition.

9. How many combinations of keys can be constructed from a 72 ciphertext stream cipher?

a) 4271

b) 7345

c) 3291

d) 2556

View Answer

Answer: d

Explanation: For stream cipher, if there are n ciphertexts then there are n*(n−1)/2 combination of keys to be made.

= 72∗72−12

= 72*35.5

= 2556.

10. What is the block size of RC6 Feistel block cipher?

a) 5013 bits

b) 128 bits

c) 596 bits

d) 1768 bits

View Answer

Answer: b

Explanation: The RC6 Feistel block cipher is a 20-round cipher scheme which includes a fixed block size of 128 bits and it supports 128, 192, and 256-bit keys for encryption of messages.

1. Suppose that there are two primes, P1 = 229 and p2 = 61. Find the value of z and Φ.

a) 13969, 13680

b) 5853, 23452

c) 7793, 34565

d) 17146, 69262

View Answer

Answer: a

Explanation: We know that, z = p1*p2 = 229*61 = 13969 and Φ = (p1 – 1)(p2 – 1) = (229 – 1)(61 – 1) = 228*60 = 13680.

2. _____ can decrypt traffic to make it available to all other network security functions such as web proxies.

a) SSL visibility appliances

b) RSA appliances

c) Rodriguez cipher system

d) Standard cipher system

View Answer

Answer: a

Explanation: In the data loss prevention systems, Web proxies and antivirus network security functions, SSL visibility appliances decrypt traffic to make it available for all networks.

3. The ROT13 caesar cipher system has an offset of _____

a) 13

b) 45

c) 71

d) 37

View Answer

Answer: a

Explanation: The ROT13 Caesar cipher system has an offset of 13 and it is one of the comprehensive cipher scheme. However, the Vigenere cipher employs Caesar cipher as one element of the encryption process.

4. In a public key system, the cipher text received is C = 10 if RSA encryption used with a public key(e = 11, n = 77) to deduce the plain text. Determine the value of ϕ(n)?

a) 49

b) 60

c) 123

d) 70

View Answer

Answer: b

Explanation: Given n = 77, that means p and q must be 7 and 11 that is they must be co-prime to each other. Now we know that ϕ(n) = (p – 1) (q – 1)

ϕ(n) = (7 – 1) (11 – 1)

ϕ(n) = 6*10

ϕ(n) = 60.

5. To encrypt a message _____ is used on the character's positions.

a) boolean algebra

b) bijective function

c) inverse function

d) surjective function

View Answer

Answer: b

Explanation: We have a mathematical notion that a bijective function can be used on the characters' positions to encrypt a message and an inverse function is used to decrypt the message.

6. The public key of given user, in an RSA encryption system is e = 57 and n = 3901. What is the value of Euler's totient function ϕ(n) for calculating the private key of the user?

a) 4369

b) 3772

c) 871

d) 7892

View Answer

Answer: b

Explanation: Given that n=3901 and e=31. We know that n = p∗q where p and q are prime numbers, which gives 3901 = 47*83. Now, ϕ(n) is Euler's totient function i.e., ϕ(n) = (p−1)∗(q−1)

ϕ(n) = (47−1)∗(83−1)

ϕ(n) = 46*82 = 3772.

7. Using RSA algorithm what is the value of cipher test c if the plain text e = 7 and P = 5, q = 16 & n = 832. Determine the Euler's totient function for the plain text?

a) 47

b) 584

c) 428

d) 60

View Answer

Answer: d

Explanation: Given plain text (m) = 7, P = 5, Q = 16, where P and Q are two prime integer

n = P * Q ⇒ n = 5*16 = 80 ⇒ Z = (P-1)*(Q-1) ⇒ Z = (5-1)*(16-1) = 4*15 = 60.

8. There are 67 people in a company where they are using secret key encryption and decryption system for privacy purpose. Determine the number of secret keys required for this purpose?

a) 887

b) 6529

c) 2211

d) 834

View Answer

Answer: c

Explanation: Since every two employee have their own secret key encryption and decryption. Both users have to agree on a secret key to communicate using symmetric cryptography. After that, each message is encrypted with that key it is transmitted and decrypted with the same key. Here, key distribution must be secret. For n = 67 we would need $n(n-1)2=67(67-1)2$ = 2211 keys.

9. In a transposition cipher, the plaintext is constructed by the _____ of the ciphertext.

a) permutation

b) combination

c) sequence

d) series

View Answer

Answer: a

Explanation: In cryptography, a method of encryption where the positions of plaintext held by units are shifted according to a regular system so that the ciphertext constructs a permutation of the plaintext is termed as transposition cipher.

10. How many bits of message does the Secure Hash Algorithm produce?

a) 160 bits

b) 1035 bits

c) 621 bits

d) 3761 bits

View Answer

Answer: a

Explanation: The Secure Hash Algorithm or SHA is based on MD4 encryption system. This algorithm gives an output of a longer 160-bit message that is why it is harder to construct another message that yields the same resultant message.

1. _____ is an example of asymmetric ciphers.

a) Block cipher

b) RSA encryption

c) AES encryption

d) Advanced cryptology

View Answer

Answer: b

Explanation: The asymmetric ciphers use asymmetric algorithms that use one key to encrypt data and a different key to decrypt ciphers. These algorithms are used in RSA encryption and public-key cryptography in which the public key is used to encrypt data and the private key is used to decrypt data.

2. There is no secret key in case of _____

a) Symmetric ciphers

b) Asymmetric ciphers

c) RSA encryption

d) Alpha-numeric cryptography

View Answer

Answer: a

Explanation: A symmetric algorithm uses the same key to encrypt data as well as to decrypt data. For example, a symmetric algorithm will use the key to encrypt some plaintext information like a password into a ciphertext. Then, it uses again to take that ciphertext and turn it back into the password.

3. Suppose in order to get a message across enemy lines, we need to choose an initial secret key say, 100110. What will be the decrypted cipher when the original message is 010010011.

a) 110100

b) 1001011

c) 0011010

d) 011011

View Answer

Answer: a

Explanation: In order to decrypt the given cipher text, we need to XOR each bit with the corresponding bit in the secret key. As, the cipher text is longer than the secret key, wrap around the remaining cipher text and begin again at the starting. When there will be a chance to decrypt the 7th bit of the cipher text, XOR it with the first bit of the secret key. Hence, after decrypting every bit in the cipher text, the original message will be 110100.

4. Electronic Code Book process is used in _____

a) caesar cipher

b) antisymmetric cipher

c) block cipher

d) stream cipher

View Answer

Answer: c

Explanation: The block cipher takes a plaintext in the chuck of bits and the bits of key are used to produce bits of ciphertext. They operate on blocks of bits at a time and so it is termed as block ciphers. TIn current cryptomeric systems, the messages that are larger than one block long that need to be split up into smaller messages by using a process called Electronic Code Book (ECB).

5. _____ uses the concept of pseudo-random sequence.

a) Stream cipher

b) DES encryption

c) Caesar cipher

d) Block cipher

View Answer

Answer: a

Explanation: The stream cipher is the one-time pad that uses the XOR function on the plaintext with a pseudo-random sequence. The input plaintext is encrypted one byte at a time incrementally. As the random sequence is not possible, a pseudo-random sequence is used. These pseudo-random sequence are the outputs of a generator given an initial seed which is a number used to initialize a pseudo-random number generator.

6. How many bits are there for random bits and error detection bits in the case of DES block ciphers?

a) 72, 1024

b) 56, 8

c) 104, 45

d) 32, 198

View Answer

Answer: b

Explanation: DES is a symmetric system that uses block ciphers which consist of 56 random bits, and 8 more bits are used for error detection. First the data is sent into the system and then divided into two 32-bit blocks. Those two blocks are sent through the entire system using criss-cross which is known as the Feistel system. There are 16 layers in DES. At each layer, one half of the data passes through the Fiestel function and after its completion, it is XORd with the other half of the data. Each layer has its own subkey which is derived from the main 56-bit key by using a key scheduler.

7. What are the steps in the Feistel function?

a) expansion, mixing, substitution, permutation

b) extract, transform, load

c) extract, load, transform

d) expansion, divide, mixing, permutation

View Answer

Answer: a

Explanation: The Feistel function which occurs in every block has 3 steps

i) Expansion:- The incoming 32-bit block has half of its bits duplicated, making it a 48-bit block.

ii) Mixing:- The new, 48-bit input block is put through an XOR gate with this round's unique subkey.

iii) Substitution:- The mixed, 48-bit block is divided into 8 6-bit pieces. Each of these 8 pieces is put through an S-block which will output only 4-bits using non-linear-transformation. Permutation: The 32 output bits are then arranged in a specific permutation that ensures that they will be distributed among different S-blocks in the next round. This is the most important part of security in DES and it helps to avoid simple, algebra-based attacks.

8. What type of algorithm does AES encryption use?

a) Stream cipher

b) Symmetric block cipher

c) Asymmetric caesar cipher

d) DES encryption

View Answer

Answer: b

Explanation: AES encryption uses symmetric block ciphers to encrypt the messages. It is at least 6 times faster than 3 DES. AES uses a substitution-permutation network and this network is a series of operations that either replaces input with output bits (substitution) or shuffles the bits (permutation). It uses 128-bit input plaintext and it operates on bytes rather than bits. Here, the input is represented as 16 bytes (because 128 bits = 16 bytes) and is arranged in a 4 x 4 matrix.

9. What is the block size of blowfish block cipher?

a) 64 bits

b) 128 bits

c) 1043 bits

d) 10 bits

View Answer

Answer: a

Explanation: Blowfish symmetric block cipher was created after DES but before AES. Its block size is 64 bits, and it can use key lengths from 32 up to 448 bits. It is a 16-round Feistel cipher and unlike in DES it’s S-boxes are key-dependent and so they are generated dynamically.

10. In which cipher each letter of the plaintext is substituted by any other letter to form the cipher message?

a) Shift cipher

b) DES encryption

c) Block cipher

d) AES encryption

View Answer

Answer: a

Explanation: Shift cipher is a mono-alphabetic cipher in which each letter of the plaintext is substituted by another letter to form the ciphertext. It is the simplest form of substitution cipher scheme wherein the concept is to replace each alphabet by another alphabet which is ‘shifted’ by some fixed number between 0 and 25. In this scheme, both sender and receiver agree on a secret shift number for shifting the alphabet and this number lies between 0 and 25 becomes the key to the encryption. Occasionally, Caesar cipher is used to describe the Shift cipher when the ‘shift of three’ is used.

1. What is the base case for the inequality 7n > n3, where n = 3?

a) 652 > 189

b) 42 < 132

c) 343 > 27

d) 42 <= 431

View Answer

Answer: c

Explanation: By the principle of mathematical induction, we have 73 > 33 ⇒ 343 > 27 as a base case and it is true for n = 3.

2. In the principle of mathematical induction, which of the following steps is mandatory?

a) induction hypothesis

b) inductive reference

c) induction set assumption

d) minimal set representation

View Answer

Answer: a

Explanation: The hypothesis of Step is a must for mathematical induction that is the statement is true for n = k, where n and k are any natural numbers, which is also called induction assumption or induction hypothesis.

3. For m = 1, 2, …, 4m+2 is a multiple of _____

a) 3

b) 5

c) 6

d) 2

View Answer

Answer: d

Explanation: For n = 1, 4 * 1 + 2 = 6, which is a multiple of 2. Assume that 4m+2 is true for m=k and so 4k+2 is true based on the assumption. Now, to prove that 4k+2 is also a multiple of 2 ⇒ 4(k+1)+2 ⇒ 2 * 4k – 4k + 6 ⇒ 2*4k+4 – 4k+2 ⇒ 2(4k+2) – 2(2k+1). Here, the first term 2(4k+2) is true as per assumption and the second term 2(4k+2) is must to be a multiple of 2. Hence, 4(k+1)+2 is a multiple of 2. So, by induction hypothesis, (4m+2) is a multiple of 2, for m = 1,2,3,…

4. For any integer m>=3, the series 2+4+6+…+(4m) can be equivalent to _____

a) m2+3

b) m+1

c) mm

d) 3m2+4

View Answer

Answer: a

Explanation: The required answer is m2+3. Now, by induction assumption, we have to prove 2+4+6+…+4(k+1) = (k+1)2+3 also can be true, 2+4+6+…+4(k+1) = 2+4+6+⋯+(4k+4) and by the subsequent steps, we can prove that (m+1)2+3 also holds for m=k. So, it is proved.

5. For every natural number k, which of the following is true?

a) (mn)k = mknk

b) m*k = n + 1

c) (m+n)k = k + 1

d) mkn = mnk

View Answer

Answer: a

Explanation: In the first step, for k = 1, (mn)1 = m1n1 = mn, hence it is true. Let us assume the statement is true for k = l, Now by induction assumption, (mn)1 = m1n1 is true. So, to prove, (mn)l+1 = ml + 1nl+1, we have (mn)l = mlnl and multiplying both sides by (mn) ⇒ (mn)1(mn)=(m1n1)(mn)

⇒ (mn)l+1 = (mm1)(nn1) ⇒ (mn)l+1 = (ml+1nl+1). Hence, it is proved. So, (mn)k = mknk is true for every natural number k.

6. By induction hypothesis, the series 12 + 22 + 32 + … + p2 can be proved equivalent to _____

a) p2+27

b) p∗(p+1)∗(2p+1)6

c) p∗(p+1)4

d) p+p2

View Answer

Answer: b

Explanation: By principle of mathematical induction, we now assume that p (b) is true 12 + 22 + 32 + … + b2 = b(b+1)(2b+1)6

so to prove P(b+1): 12 + 22 + 32 + … + b2 + (b + 1)2 = b(b+1)(2b+1)6 + (b + 1)2

By induction assumption it is shown that 12 + 22 + 32 + … + b2 + (b + 1)2 = (b+1)[(b+2)(2b+3)]6. Hence it is proved that 12 + 22 + 32 + … + p2 = p∗(p+1)∗(2p+1)6.

7. For any positive integer m _____ is divisible by 4.

a) 5m2 + 2

b) 3m + 1

c) m2 + 3

d) m3 + 3m

View Answer

Answer: d

Explanation: The required answer is, m3 + 3m. Now, by induction hypothesis, we have to prove for m=k, k3+3k is divisible by 4. So, (k + 1)3 + 3 (k + 1) = k3 + 3 k2 + 6 k + 4

= [k3 + 3 k] + [3 k2 + 3 k + 4] = 4M + (12k2 + 12k) – (8k2 + 8k – 4), both the terms are divisible by 4. Hence (k + 1)3 + 3 (k + 1) is also divisible by 4 and hence it is proved for any integer m.

8. According to principle of mathematical induction, if P(k+1) = m(k+1) + 5 is true then _____ must be true.

a) P(k) = 3m(k)

b) P(k) = m(k) + 5

c) P(k) = m(k+2) + 5

d) P(k) = m(k)

View Answer

Answer: b

Explanation: By the principle of mathematical induction, if a statement is true for any number m = k, then for its successor m = k + 1, the statement also satisfies, provided the statement is true for m = 1. So, the required answer is p(k) = mk + 5.

9. Which of the following is the base case for 4n+1 > (n+1)2 where n = 2?

a) 64 > 9

b) 16 > 2

c) 27 < 91

d) 54 > 8

View Answer

Answer: a

Explanation: Statement By principle of mathematical induction, for n=2 the base case of the inequation 4n+1 > (n+1)2 should be 64 > 9 and it is true.

10. What is the induction hypothesis assumption for the inequality m ! > 2m where m>=4?

a) for m=k, k+1!>2k holds

b) for m=k, k!>2k holds

c) for m=k, k!>3k holds

d) for m=k, k!>2k+1 holds

View Answer

Answer: b

Explanation: By the induction hypothesis, assume that p (k) = k! > 2k is true, for m=k and we need to prove this by the principle of mathematical induction.

1. A polygon with 7 sides can be triangulated into _____

a) 7

b) 14

c) 5

d) 10

View Answer

Answer: c

Explanation: A simple polygon with n sides can be triangulated into n-2 triangles, where n > 2.

2. Every simple polynomial has an interior diagonal.

a) True

b) False

View Answer

Answer: a

Explanation: By using Strong Induction.

3. A polygon with 12 sides can be triangulated into _____

a) 7

b) 10

c) 5

d) 12

View Answer

Answer: b

Explanation: A simple polygon with n sides can be triangulated into n-2 triangles, where n > 2.

4. Let P(n) be the statement that postage of n cents can be formed using just 3-cents stamps and 5-cents stamps. Is the statements P(8) and P(10) are Correct?

a) True

b) False

View Answer

Answer: a

Explanation: We can form 8 cent of postage with one 3-cent stamp and one 5-cent stamp. P(10) is true because we can form it using two 5-cent stamps.

5. Which amount of postage can be formed using just 4-cent and 11-cent stamps?

a) 2

b) 5

c) 30

d) 10

View Answer

Answer: d

Explanation: We can form 30 cent of postage with two 4-cent stamp and two 11-cent stamp.

6. 22-cent of postage can be produced with two 4-cent stamp and one 11-cent stamp.

a) True

b) False

View Answer

Answer: b

Explanation: By using two 4-cent stamp and one 11-cent stamp, 27-cent postage is produced.

7. Which amount of postage can be formed using just 3-cent stamp and 10-cent stamps?

a) 27

b) 20

c) 11

d) 5

View Answer

Answer:a

Explanation: We can form 27 cent of postage with nine 3-cent stamp and 20-cent postage can be formed by using two 10-cent stamps.

8. Suppose that P(n) is a propositional function. Determine for which positive integers n the statement P(n) must be true if: P(1) is true; for all positive integers n, if P(n) is true then P(n+2) is true.

a) P(3)

b) P(2)

c) P(4)

d) P(6)

View Answer

Answer: a

Explanation: By induction we can prove that P(3) is true but we can’t conclude about P(2), p(6) and P(4).

9. Suppose that P(n) is a propositional function. Determine for which positive integers n the statement P(n) must be true if: P(1) and P(2) is true; for all positive integers n, if P(n) and P(n+1) is true then P(n+2) is true.

a) P(1)

b) P(2)

c) P(4)

d) P(n)

View Answer

Answer: d

Explanation: By induction, we can prove that P(n) is true.

10. A polygon with 25 sides can be triangulated into _____

a) 23

b) 20

c) 22

d) 21

View Answer

Answer: a

Explanation: A simple polygon with n sides can be triangulated into n-2 triangles, where n > 2.

1. Which of the following is contained in a recursive grammar?

a) semantic rules

b) production rules

c) recursive language

d) recursive function

View Answer

Answer: b

Explanation: In natural language semantics, recursive grammar plays a vital role as well as in syntax. A recursive grammar in a context free language is a formal grammar which consists of recursive production rules.

2. _____ is the consequence of dynamic programming.

a) Bellman equation

b) Frobenius equation

c) Linear equation

d) Boolean expression

View Answer

Answer: a

Explanation: Dynamic programming can lead to recursive optimization that can restate a multistep optimization problem in its recursive form. The Bellman equation that writes the value of the optimization problem at an earlier time in terms of its value at a later time is the result of dynamic programming.

3. How many types of self-referential recursive data are there in computer programs?

a) 6

b) 2

c) 10

d) 4

View Answer

Answer: b

Explanation: There are two types of self-referential definitions and these are inductive and coinductive definitions. An inductively defined recursive data definition must have to specify how to construct instances of the data. For example, linked lists are defined as an inductively recursive data definition.

4. _____ recursion consists of multiple self-references.

a) binary recursion

b) single recursion

c) multiple recursion

d) coinductive recursion

View Answer

Answer: c

Explanation: A recursion which consists of multiple self-references and requires exponential time and space is called multiple recursion. Multiple recursions include tree traversal of a graph, such as in a depth-first search. However, single recursion is more efficient than multiple recursion.

5. The argument of each recursive call is the content of a field of the original output. This definite characteristic belongs to which of the following function?

a) Structurally recursive function

b) Generativity recursive function

c) General function

d) Indirect recursive function

View Answer

Answer: a

Explanation: A structurally recursive function has a characteristic that the argument to each recursive call is the content of a field of the original input. This recursion function includes mostly all tree traversals which includes binary tree creation and search, XML processing etc.

6. The mutual recursion is also termed as _____

a) indirect recursion

b) constructive recursion

c) generative recursion

d) definitive recursion

View Answer

Answer: a

Explanation: When a function is not called by itself but by another function which it has called either directly or indirectly is termed as Indirect recursion. Mutual recursion is a more symmetric term of Indirect recursion.

7. In which of the following problems recurrence relation holds?

a) Optimal substructure

b) Tower of Hanoi

c) Hallmark substitution

d) Longest common subsequence

View Answer

Answer: b

Explanation: We can have recurrence relation for tower of hanoi and that is hn = 2 hn-1 + 1h1 = 1, for n number of disks in one peg.

8. Which of the following functions generates new data at each step of a method?

a) corecursive function

b) structural recursive function

c) unirecursive function

d) indirect function

View Answer

Answer: a

Explanation: The generatively recursive functions or corecursive functions is defined as generation of the new data at each step that is successive approximation in Regula Falsi method. In terms of loop variants, there is no such loop variant, and termination depends on error of approximation.

9. Every recursive algorithm must have the problem of _____

a) overhead of repeated function calls

b) collision of different function calls

c) searching for all duplicate elements

d) make only two recursive calls

View Answer

Answer: a

Explanation: Due to the overhead of repeated function calls and returns, recursive algorithms may be inefficient for small data. Any recursion can be replaced by iteration with an explicit call stack whereas iteration can be replaced with tail recursion.

10. If the height of a binary tree is 54, how many null pointers are there as children?

a) 1267

b) 358

c) 56

d) 255

View Answer

Answer: d

Explanation: Depth-first search (DFS) algorithm of a binary tree, is a trivial example of short-circuiting. We can have a standard recursive algorithm in case of DFS. Now, a perfect binary tree of height h has 2h+1 Null pointers as children.

h = 54

254+1

255.

1. How many even 4 digit whole numbers are there?

a) 1358

b) 7250

c) 4500

d) 3600

View Answer

Answer: c

Explanation: The thousands digit cannot be zero, so there are 9 choices. There are 10 possibilities for the hundreds digit and 10 possibilities for the tens digit. The units digit can be 0, 2, 4, 6 or 8, so there are 5 choices. By the basic counting principle, the number of even five digit whole numbers is $9 \times 10 \times 10 \times 5 = 45,00$.

2. In a multiple-choice question paper of 15 questions, the answers can be A, B, C or D. The number of different ways of answering the question paper are _____

a) 65536 x 47

b) 194536 x 45

c) 23650 x 49

d) 11287435

View Answer

Answer: a

Explanation: There are $415 = 65536$ x 47 different ways of answering the exam paper of 15 MCQs.

3. How many words with seven letters are there that start with a vowel and end with an A? Note that they don't have to be real words and letters can be repeated.

a) 45087902

b) 64387659

c) 12765800

d) 59406880

View Answer

Answer: d

Explanation: The first letter must be a vowel, so there are 5 choices. The second letter can be any one of 26, the third letter can be any one of 26, the fourth letter can be any one of 26 and fifth and sixth letters can be any of 26 choices. The last letter must be an A, so there is only 1 choice. By the basic counting principle, the number of 'words' is $5 \times 26 \times 26 \times 26 \times 26 \times 26 \times 1 = 59406880$.

4. Neela has twelve different skirts, ten different tops, eight different pairs of shoes, three different necklaces and five different bracelets. In how many ways can Neela dress up?

a) 50057

b) 14400

c) 34870

d) 56732

View Answer

Answer: b

Explanation: By the basic counting principle, the number of different ways = 12 × 10 × 8 × 3 × 5 = 14400. Note that shoes come in pairs. So she must choose one pair of shoes from ten pairs, not one shoe from twenty.

5. How many five-digit numbers can be made from the digits 1 to 7 if repetition is allowed?

a) 16807

b) 54629

c) 23467

d) 32354

View Answer

Answer: a

Explanation: 75 = 16807 ways of making the numbers consisting of five digits if repetition is allowed.

6. For her English literature course, Ruchika has to choose one novel to study from a list of ten, one poem from a list of fifteen and one short story from a list of seven. How many different choices does Rachel have?

a) 34900

b) 26500

c) 12000

d) 10500

View Answer

Answer: d

Explanation: By the Basic Counting Principle, the number of different choices is 10 × 15 × 7 = 10500.

7. There are two different Geography books, five different Natural Sciences books, three different History books and four different Mathematics books on a shelf. In how many different ways can they be arranged if all the books of the same subjects stand together?

a) 353450

b) 638364

c) 829440

d) 768700

View Answer

Answer: c

Explanation: There are four groups of books which can be arranged in 4! different ways. Among those books, two are Geography books, five are Natural Sciences books, three are History books and four are Mathematics books. Therefore, there are 4! × 2! × 5! × 3! × 4! = 829440 ways to arrange the books.

8. The code for a safe is of the form PPPQQQQ where P is any number from 0 to 9 and Q represents the letters of the alphabet. How many codes are possible for each of the following cases? Note that the digits and letters of the alphabet can be repeated.

a) 874261140

b) 537856330

c) 549872700

d) 456976000

View Answer

Answer: d

Explanation: 103 × 264 = 456976000 possible codes are formed for the safe with the alphanumeric digits.

9. Amit must choose a seven-digit PIN number and each digit can be chosen from 0 to 9. How many different possible PIN numbers can Amit choose?

a) 10000000

b) 9900000

c) 67285000

d) 39654900

View Answer

Answer: a

Explanation: By the basic counting principle, the total number of PIN numbers Amit can choose is 10 × 10 × 10 × 10 × 10 × 10 × 10 = 10,000000.

10. A head boy, two deputy head boys, a head girl and 3 deputy head girls must be chosen out of a student council consisting of 14 girls and 16 boys. In how many ways can they are chosen?

a) 98072

b) 27384

c) 36428

d) 44389

View Answer

Answer: b

Explanation: There are $16 \times 15 \times 14 + 14 \times 13 \times 12 \times 11 = 27384$ ways to choose from a student council.

1. A drawer contains 12 red and 12 blue socks, all unmatched. A person takes socks out at random in the dark. How many socks must he take out to be sure that he has at least two blue socks?

a) 18

b) 35

c) 28

d) 14

View Answer

Answer: d

Explanation: Given 12 red and 12 blue socks so, in order to take out at least 2 blue socks, first we need to take out 12 shocks (which might end up red in worst case) and then take out 2 socks (which would be definitely blue). Thus we need to take out total 14 socks.

2. The least number of computers required to connect 10 computers to 5 routers to guarantee 5 computers can directly access 5 routers is _____

a) 74

b) 104

c) 30

d) 67

View Answer

Answer: c

Explanation: Since each 5 computer need directly connected with each router. So 25 connections + now remaining 5 computer, each connected to 5 different routers, so 5 connections = 30 connections. Hence,

c1->r1, r2, r3, r4, r5

c2->r1, r2, r3, r4, r5

c3->r1, r2, r3, r4, r5

c4->r1, r2, r3, r4, r5

c5->r1, r2, r3, r4, r5

c6->r1

c7->r2

c8->r3

c9->r4

c10->r5

Now, any pick of 5 computers will have a direct connection to all the 5 routers.

3. In a group of 267 people how many friends are there who have an identical number of friends in that group?

a) 266

b) 2

c) 138

d) 202

View Answer

Answer: b

Explanation: Suppose each of the 267 members of the group has at least 1 friend. In this case, each of the 267 members of the group will have 1 to 267-1=266 friends. Now, consider the numbers from 1 to n-1 as holes and the n members as pigeons. Since there is n-1 holes and n pigeons there must exist a hole which must contain more than one pigeon. That means there must exist a number from 1 to n-1 which would contain more than 1 member. So, in a group of n members there must exist at least two persons having equal number of friends. A similar case occurs when there exist a person having no friends.

4. When four coins are tossed simultaneously, in _____ number of the outcomes at most two of the coins will turn up as heads.

a) 17

b) 28

c) 11

d) 43

View Answer

Answer: c

Explanation: The question requires you to find number of the outcomes in which at most 2 coins turn up as heads i.e., 0 coins turn heads or 1 coin turns head or 2 coins turn heads. The number of outcomes in which 0 coins turn heads is 4C0 = 1 outcome. The number of outcomes in which 1 coin turns head is 4C1 = 6 outcomes. The number of outcomes in which 2 coins turn heads is,

4C2 = 15 outcomes. Therefore, total number of outcomes = 1 + 4 + 6 = 11 outcomes.

5. How many numbers must be selected from the set {1, 2, 3, 4} to guarantee that at least one pair of these numbers add up to 7?

a) 14

b) 5

c) 9

d) 24

View Answer

Answer: b

Explanation: With 2 elements pairs which give sum as 7 = {(1,6), (2,5), (3,4), (4,3)}. So choosing 1 element from each group = 4 elements (in worst case 4 elements will be either {1,2,3,4} or {6,5,4,3}). Now using pigeonhole principle = we need to choose 1 more element so that sum will definitely be 7. So Number of elements must be 4 + 1 = 5.

6. During a month with 30 days, a cricket team plays at least one game a day, but no more than 45 games. There must be a period of some number of consecutive days during which the team must play exactly _____ number of games.

a) 17

b) 46

c) 124

d) 24

View Answer

Answer: d

Explanation: Let a1 be the number of games played until day 1, and so on, ai be the no games played until i. Consider a sequence like a1,a2,…a30 where $1 \leq ai \leq 45$, ∀ai. Add 14 to each element of the sequence we get a new sequence a1+14, a2+14, … a30+14 where, $15 \leq ai+14 \leq 59$, ∀ai. Now we have two sequences 1. a1, a2, …, a30 and 2. a1+14, a2+14, …, a30+14. having 60 elements in total with each elements taking a value ≤ 59. So according to pigeon hole principle, there must be at least two elements taking the same value ≤59 i.e., ai = aj + 14 for some i and j. Therefore, there exists at least a period such as aj to ai, in which 14 matches are played.

7. In how many ways can 8 different dolls be packed in 5 identical gift boxes such that no box is empty if any of the boxes hold all of the toys?

a) 2351

b) 365

c) 2740

d) 1260

View Answer

Answer: d

Explanation: Dolls are different but the boxes are identical. If none of the boxes is to remain empty, then we can pack the dolls in one of the following ways:

Case i. 2, 2, 2, 1, 1

Case ii. 3, 3, 1, 1

Case i: Number of ways of achieving the first option 2, 2, 2, 1, 1. Two dolls out of the 8 can be selected in 8C2 ways, another 2 out of the remaining 6 can be selected in 6C2 ways, another 2 out of the remaining 4 can be selected in 4C2 ways and the last two dolls can be selected in 1C1 ways each. However, as the boxes are identical, the two different ways of selecting which box holds the first two dolls and which one holds the second set of two dolls will look the same. Hence, we need to divide the result by 2. Therefore, total number of ways of achieving the 2, 2, 2, 1, 1 is = (8C2 * 6C2 * 4C2 * 1C1 * 1C1) / 2 = 1260.

8. A group of 20 girls plucked a total of 200 oranges. How many oranges can be plucked one of them?

a) 24

b) 10

c) 32

d) 7

View Answer

Answer: a

Explanation: Suppose all of them plucked the different number of oranges. A girl can pluck at least 0 oranges and the number of oranges plucks by each student is distinct. So, total number of plucked oranges should be less than 100. But 0+1+2…..+19+20 = 210>200 a contradiction.

Thus there exist two girls who plucked the same number of oranges. If thus there exist two girls who plucked the same number of oranges. It means each girl of remaining 18 students plucked different number of oranges. Number of oranges Plucked by 18 students = 0+1+2+3…+17 = 153 oranges. Number of oranges plucked by remaining 2 student = 200 – 153 = 47. Both students plucked same number of oranges. So, Number of oranges plucked by one of them = 47/2=24.

9. In a get-together party, every person present shakes the hand of every other person. If there were 90 handshakes in all, how many persons were present at the party?

a) 15

b) 14

c) 16

d) 17

View Answer

Answer: b

Explanation: Let the total number of persons present at the party be m, Then, [{x *(x−1)}/2] = 90.

x = 14.

10. A bag contains 25 balls such as 10 balls are red, 7 are white and 8 are blue. What is the minimum number of balls that must be picked up from the bag blindfolded (without replacing any of it) to be assured of picking at least one ball of each colour?

a) 10

b) 18

c) 63

d) 35

View Answer

Answer: b

Explanation: Consider three buckets red, white and blue and we want the total number of balls such that each bucket contain at least one ball. Now consider the state of picking up a ball without replacement : (normally you consider the worst case scenario in these cases) Starting 10 balls all are red and thus goes to bucket name Red. Now again picking up

the ball gives 7 balls which are of same colour and put all of them in a bucket named White. The next pick will definitely be of different colour thus: we picked 10 + 7 + 1 = 18.

1. How many substrings (of all lengths inclusive) can be formed from a character string of length 8? (Assume all characters to be distinct)

a) 14

b) 21

c) 54

d) 37

View Answer

Answer: d

Explanation: Let's consider the given string is CLEAN, so set of string of length 1 = {C,L,E,A,N} ; cardinality of set = 5 set of string of length 2 = {CL,EE,EA,NN}, set of string of length 3 = {CLE,LEE,EAN}, set of strings of length 4 = {CLEN,LEAN}, set of strings of length 5 = {CLEAN} and set of string of length 0 = {} and we cannot have any substring of length 6 as given string has only 5 length. So total no of substrings are possible = 0 length substring + 1 length substring + 2 length substrings +3 length substrings + 4 length substrings + 5 length substrings = 1 + 5 + 4 + 3 + 2 + 1 = 16 means for 1 length string to n length substrings it will sum of the n natural no from 1 to n.

so 1+2+3+…+n = n(n+1)2 so total no substrings possible = 0 length strings + n(n+1)2 = 1+ [n(n+1)2] so total no of substrings possible in n length string (All length inclusive)= 1 + [n(n+1)2]=8(8+1)2 = 37.

2. The number of diagonals can be drawn in a hexagon is _____

a) 9

b) 32

c) 16

d) 21

View Answer

Answer: a

Explanation: A hexagon has 6 sides. We obtain the diagonals by joining the vertices in pairs.

Total number of sides and diagonals = 6C2 = 6∗52∗1 = 5×3 = 15. This includes its 6 sides also. So, Diagonals = 15 – 6 = 9. Hence, the number of diagonals is 9.

3. The number of binary strings of 17 zeros and 8 ones in which no two ones are adjacent is _____

a) 43758

b) 24310

c) 32654

d) 29803

View Answer

Answer: a

Explanation: First place 17 zeroes side by side _ 0 _ 0 _ 0 … 0 _ and 8 1’s can be placed in any of the (17+1) available gaps hence the number of ways = n+1Ck = 43758.

4. How many words that can be formed with the letters of the word ‘SWIMMING’ such that the vowels do not come together? Assume that words are of with or without meaning.

a) 430

b) 623

c) 729

d) 1239

View Answer

Answer: c

Explanation: The word ‘SWIMMING contains 8 letters. Of which, I occurs twice and M occurs twice. Therefore, the number of words formed by this word = 8!2!∗2! = 10080. In order to find the number of permutations that can be formed where the two vowels I and I come together, we group the letters that should come together and consider that group as one letter. So, the letters are S, W, M, M, N, G, (I, I). So, the number of letters are 7 the number of ways in which 7 letters can be arranged is 7! = 5040. In I and I, the number of ways in which I and I can be arranged is 2!. Hence, the total number of ways in which the letters of the ‘SWIMMING’ can be arranged such that vowels are always together are 7!2!∗2! = 5040 ways. The number of words in which the vowels do not come together is = (10080 – 5040) = 5040.

5. A number lock contains 6 digits. How many different zip codes can be made with the digits 0–9 if repetition of the digits is allowed upto 3 digits from the beginning and the first digit is not 0?

a) 254307

b) 453600

c) 458760

d) 972340

View Answer

Answer: b

Explanation: For the first position, there are 9 possible choices (since 0 is not allowed). After that number is chosen, there are 10 possible choices (since 0 is now allowed) for the second digit, for the third digit there are 10 possible choices, 9 possible choices for the fourth digit and 8 possible choices for the fifth digit and 7 possible choices for the sixth digit. The count of number locks = 453600.

6. Let M be a sequence of 9 distinct integers sorted in ascending order. How many distinct pairs of sequences, N and O are there such that i) each are sorted in ascending order, ii) N has 5 and O has 4 elements, and iii) the result of merging N and O gives that sequence?

a) 84

b) 35

c) 194

d) 138

View Answer

Answer: a

Explanation: Selecting any 3 elements from given 9 elements gives 9C3 = 84 number of distinct pairs of sequences.

7. 14 different letters of alphabet are given, words with 6 letters are formed from these given letters. How many number of words are there which have at least one letter repeated?

a) 892742

b) 999988

c) 213216

d) 786730

View Answer

Answer: b

Explanation: Number of words which have at least one letter replaced = total number of words – total number of words in which no letter is repeated, => 106 – 12P6 => 1000000 − 924 = 999988.

8. In how many ways can 10 boys be seated in a row having 28 seats such that no two friends occupy adjacent seats?

a) 13P5

b) 9P29

c) 19P10

d) 15P7

View Answer

Answer: c

Explanation: First let us take the 18 unoccupied seats. They create 19 slots i.e., one on the left of each seat and one on the right of the last one. So we can place the 10 boys in any of these 19 slots that are, 19P10 ways.

9. In how many ways can the letters of the word SANFOUNDRY be rearranged such that the vowels always appear together?

a) (8+3)!2!

b) 6!2!

c) 8!*3!

d) 4!8!

View Answer

Answer: c

Explanation: Take AOU together and treat it like 1 entity and arrange SNFNDRY in 8! Ways. Then, the AOU can be arranged in 3! ways. So, total arrangements = 8! * 3! = 40320 * 6 = 241920.

10. How many ways can 8 prizes be given away to 7 students, if each student is eligible for all the prizes?

a) 40325

b) 40320

c) 40520

d) 40720

View Answer

Answer: b

Explanation: Now the first student is eligible to receive any of the 8 available prizes (so 8 ways), the second student will receive a prize from rest 7 available prizes (so 7 ways), the third student will receive his prize from the rest 6 prizes available(so 6 ways) and so on. So total ways would be 8! = 8*7*6*5*4*3*2*1 = 40320. Hence, the 7 prizes can be distributed in 40320 ways.

1. In a playground, 3 sisters and 8 other girls are playing together. In a particular game, how many ways can all the girls be seated in a circular order so that the three sisters are not seated together?

a) 457993

b) 3386880

c) 6544873

d) 56549

View Answer

Answer: b

Explanation: There are 3 sisters and 8 other girls in total of 11 girls. The number of ways to arrange these 11 girls in a circular manner = (11– 1)! = 10!. These three sisters can now rearrange themselves in 3! ways. By the multiplication theorem, the number of ways so that 3 sisters always come together in the arrangement = 8! × 3!. Hence, the required number of ways in which the arrangement can take place if none of the 3 sisters is seated together: 10! – (8! × 3!) = 3628800 – (40320 * 6) = 3628800 – 241920 = 3386880.

2. How many numbers of three digits can be formed with digits 1, 3, 5, 7 and 9?

a) 983

b) 120

c) 345

d) 5430

View Answer

Answer: b

Explanation: Here number of digits, n = 5 and number of places to be filled-up r = 3. Hence, the required number is 5P3 = 5!/2!*3! = 120.

3. The size of a multiset is 6 which is equal to the number of elements in it with counting repetitions (a multiset is an unordered collection of elements where the elements may repeat any number of times). Determine the number of multisets can be grouped from n distinct elements so that at least one element occurs exactly twice?

a) 326

b) 28

c) 45

d) 62

View Answer

Answer: c

Explanation: There are six places to be filled in the multiset using the n distinct elements. At least one element has to occur exactly twice and that would leave 4 more places in the multiset means that at most four elements can occur exactly once. Thus there are two mutually exclusive cases as follows: 1) Exactly one element occurs exactly twice and select this

element in n ways. Fill up the remaining four spots using 5 distinct elements from the remaining n−1 elements in n-1C4 ways. 2) Exactly four elements that occur at least once each. Hence, the total number of ways to form the multiset is

nC2 + n * n-1C4 = 6C2 + 6 * 6-1C4 = 45.

4. How many words can be formed with the letters of the word ‘CASTLE’ when ‘O’ and ‘A’ occupying end places.

a) 217

b) 48

c) 75

d) 186

View Answer

Answer: b

Explanation: When ‘O’ and ‘A’ are occupying end-places => A.S.T.L. (CE). We can see that (CE) are fixed, hence A, S, T, L can be arranged in 4! Ways and (C, E) can be arranged themselves is 2! ways. So, the number of words formed = 4! x 2! = 48 ways.

5. Determine the number of ways of choosing a cricket team (consists of 11 players) out of 18 players if a particular player is never chosen.

a) 12798

b) 22800

c) 31824

d) 43290

View Answer

Answer: c

Explanation: If a particular player is never chosen that would mean 11 players are selected out of 18 players. Hence, required number of ways = 18C11 = 31824.

6. How many different choices can be made from 5 roses, 4 marigold and 8 sunflowers if at least one flower is to be chosen for making of garland?

a) 269

b) 270

c) 281

d) 320

View Answer

Answer: a

Explanation: Number of ways of selecting roses = (5+1) = 6 ways, number of ways of selecting marigold = (4+1) = 5 ways, and the number of ways of selecting sunflowers = (8+1) = 9 ways. Total number of ways of selecting flowers= 6 * 5

* 9 = 270. But this includes when no flowers or zero flowers is selected (There is no flowers of a different type, hence n=0 => 2n = 20 = 1). Hence, the number of ways of selecting at least one fruit = 270 – 1 = 269.

7. In how many ways 6 pens can be selected from 15 identical black pens?

a) 9*3!

b) 21

c) 14!

d) 1

View Answer

Answer: d

Explanation: Here the pens are identical, the total number of ways of selecting 6 pens is 1.

8. Determine the number of ways of selecting one or more letters from the letters BBBBBB?

a) 6

b) 73

c) 23

d) 56

View Answer

Answer: a

Explanation: The number of ways of selecting one ‘B’s = 1, selecting two ‘B’s = 1, selecting three ‘B’s = 1, selecting four ‘B’s = 1, selecting five ‘B’s = 1 and selecting six ‘B’s = 1. Hence, the required number of ways = 6.

9. Determine the number of ways such that 5 men and 5 women be seated at a round table if no two women are seated together.

a) 654870

b) 144521

c) 362160

d) 5634

View Answer

Answer: c

Explanation: The men and women can be seated alternately so that no two women will sit together. Hence, 4 women can be seated on alternate seats at a round table in (4 – 1)! or 6

ways. Now, the 5 men can be seated in the remaining seats in 5! or 120 ways. Therefore the total number of ways in this case will be (10-1)! – (120 * 6) = 362160.

10. Find the number of ways in which 4 people E, F, G, H, A, C can be seated at a round table, such that E and F must always sit together.

a) 32

b) 290

c) 124

d) 48

View Answer

Answer: d

Explanation: E and F can sit together in all arrangements in 2! Ways. Now, the arrangement of the 5 people in a circle can be done in (5 – 1)! or 24 ways. Therefore, the total number of ways will be 24 x 2 = 48.

1. There are 6 equally spaced points A, B, C, D, E and F marked on a circle with radius R. How many convex heptagons of distinctly different areas can be drawn using these points as vertices?

a) 7! * 6

b) 7C5

c) 7!

d) same area

View Answer

Answer: d

Explanation: Since all the points are equally spaced; hence the area of all the convex heptagons will be the same.

2. There are 2 twin sisters among a group of 15 persons. In how many ways can the group be arranged around a circle so that there is exactly one person between the two sisters?

a) 15 *12! * 2!

b) 15! * 2!

c) 14C2

d) 16 * 15!

View Answer

Answer: a

Explanation: We know that n objects can be arranged around a circle in (n−1)!2. If we consider the two sisters and the person in between the brothers as a block, then there will 12 others and this block of three people to be arranged around a circle. The number of ways of arranging 13 objects around a circle is in 12! ways. Now the sisters can be arranged on either side of the person who is in between the sisters in 2! ways. The person who sits in between the two sisters can be any of the 15 in the group and can be selected in 15 ways. Therefore, the total number of ways 15 *12! * 2!.

3. The number of words of 4 consonants and 3 vowels can be made from 15 consonants and 5 vowels, if all the letters are different is _____

a) 3! * 12C5

b) 16C4 * 4C4

c) 15! * 4

d) 15C4 * 5C3 * 7!

View Answer

Answer: d

Explanation: There are 4 consonants out of 15 can be selected in 15C4 ways and 3 vowels can be selected in 5C3 ways. Therefore, the total number of groups each containing 4 consonants and 3 vowels = 15C4 * 4C3. Each group contains 7 letters which can be arranged in 7! ways. Hence, required number of words = 15C4 * 5C3 * 7!.

4. How many ways are there to arrange 7 chocolate biscuits and 12 cheesecake biscuits into a row of 19 biscuits?

a) 52347

b) 50388

c) 87658

d) 24976

View Answer

Answer: b

Explanation: Consider the situation as having 19 spots and filling them with 7 chocolate biscuits and 19 cheesecake biscuits. Then we just choose 7 spots for the chocolate biscuits and let the other 10 spots have cheesecake biscuits. The number of ways to do this job is 19C7 = 50388.

5. If a, b, c, d and e are five natural numbers, then find the number of ordered sets(a, b, c, d, e) possible such that a+b+c+d+e=75.

a) 65C5

b) 58C6

c) 72C7

d) 74C4

View Answer

Answer: d

Explanation: Let assumes that there are 75 identical balls which are to be arranged in 5 different compartments (Since a, b, c, d, e are distinguishable). If the balls are arranged in the row. We have 74 gaps where we can place a ball in each gap since we need 5 compartments we need to place only 4 balls. We can do this in 74C4 ways.

6. There are 15 people in a committee. How many ways are there to group these 15 people into 3, 5, and 4?

a) 846

b) 2468

c) 658

d) 1317

View Answer

Answer: d

Explanation: The number of ways to choose 3 people out of 9 is 15C3. Then, number of ways to choose 5 people out of (15-3) = 12 is 12C5. Finally, the number of ways to choose 4 people out of (12-4) = 8 is 8C4. Hence, by the rule of product, 15C3 + 12C5 + 8C4 = 1317.

7. There are six movie parts numbered from 1 to 6. Find the number of ways in which they be arranged so that part-1 and part-3 are never together.

a) 876

b) 480

c) 654

d) 237

View Answer

Answer: b

Explanation: The total number of ways in which 6 part can be arranged = 6! = 720. The total number of ways in which part-1 and part-3 are always together: = 5!*2! = 240. Therefore, the total number of arrangements, in which they are not together is = 720 − 240 = 480.

8. How many ways are there to divide 4 Indian countries and 4 China countries into 4 groups of 2 each such that at least one group must have only Indian countries?

a) 6

b) 45

c) 12

d) 76

View Answer

Answer: a

Explanation: The number of ways to divide 4+4=8 countries into 4 groups of 2 each is as follows: (10C2 * 10C2 * 10C2 * 10C2)/4! = 30. Since it is required that at least one group must have only Indian countries, we need to subtract 30 from the number of possible groupings where all 4 groups have 1 Indian country and 1 China country each. This is equivalent to the number of ways to match each of the 4 Indian countries with one China country: 4! = 24. Therefore, the answer is 30 – 24 = 6.

9. Find the number of factors of the product 58 * 75 * 23 which are perfect squares.

a) 47

b) 30

c) 65

d) 19

View Answer

Answer: b

Explanation: Any factor of this number should be of the form 5a * 7b * 2c. For the factor to be a perfect square a, b, c has to be even. a can take values 0, 2, 4, 6, 8, b can take values 0, 2, 4 and c can take values 0, 2. Total number of perfect squares = 5 * 3 * 2 = 30.

10. From a group of 8 men and 6 women, five persons are to be selected to form a committee so that at least 3 women are there on the committee. In how many ways can it be done?

a) 686

b) 438

c) 732

d) 549

View Answer

Answer: a

Explanation: We may have (2 men and 3 women) or (1 men and 4 woman) or (5 women only). The Required number of ways = (8C2 × 6C3) + (8C1 × 6C4) + (6C5) = 686.

1. Calculate sum of divisors of n = 1900.

a) 6530

b) 5346

c) 3387

d) 4123

View Answer

Answer: d

Explanation: The prime factorization of 1800 is 19 * 22 * 52 and

S(22) = 1 + 2 + 4 = 7

S(52) = 1 + 5 + 25 = 31

Therefore, S(1800) = 19 * 7 * 31 = 4123.

2. Given the factorization of a number n, then the sum of divisors can be computed in _____

a) linear time

b) polynomial time

c) O(logn)

d) o(n+1)

View Answer

Answer: b

Explanation: The exact number of running time depends on the computational model. When analyzing arithmetic with large numbers, we usually count either bit operations or arithmetic operations of size O(logn) (where n is the input size). Now, given the factorization of a number n, then the sum of divisors can be computed in polynomial time.

3. Calculate the sum of divisors of N = 9600.

a) 23250

b) 47780

c) 54298

d) 31620

View Answer

Answer: d

Explanation: The prime factorization of 1800 is 3 * 27 * 52 and

S(3) = 1 + 3 = 4

S(22) = 1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 = 255

S(52) = 1 + 5 + 25 = 31

Therefore, S(1800) = 4 * 255 * 31 = 31620.

4. Find the number of odd positive integers of the number 456.

a) 54

b) 27

c) 16

d) 8

View Answer

Answer: d

Explanation: To find the number of odd factors (which includes 1), we can exclude any power of 2 and do the same. So, for 456, we have (3 + 1)(1 + 1) = 8 odd positive factors.

5. The number of even positive integers of 3200 is _____

a) 24

b) 32

c) 164

d) 209

View Answer

Answer: a

Explanation: To find the number of even factors, we can multiply the number of even factors by the power of 2. For 3200, we have (5 + 1)(1 + 1)(2) = 24 even factors.

6. What is the sum of divisors of the number 1872?

a) 12493

b) 5438

c) 45862

d) 654

View Answer

Answer: a

Explanation: The prime factorization of 1872 is 13 * 32 * 24 and S(24) = 1 + 2 + 4 + 8 + 16 = 31, S(52) = 1 + 5 + 25 = 31. Therefore, S(1872) = 31 * 31 * 13 = 12493.

7. Find the odd positive integer of the number 6500.

a) 43

b) 17

c) 12

d) 87

View Answer

Answer: c

Explanation: To find the number of odd factors, we can exclude any power of 2 and do the same. So, for 6500, we have (5 + 1)(1 + 1) = 6 * 2 = 12 odd positive factors.

8. How many even positive integers are there in the number 7362?

a) 16

b) 58

c) 35

d) 165

View Answer

Answer: a

Explanation: To find the number of even factors, we can multiply the number of even factors by the power of 2. For 5065, we have (3 + 1)(1 + 1)(2) = 4 * 2 * 2 = 16 even factors.

9. Calculate sum of divisors of n = 8620.

a) 7549

b) 54201

c) 18102

d) 654

View Answer

Answer: c

Explanation: The prime factorization of 1800 is 431 * 22 * 5 and

S(22) = 1 + 2 + 4 = 7

S(52) = 1 + 5 = 6

Therefore, S(1800) = 6 * 7 * 431 = 18102.

10. Find the odd positive integer of the number 4380.

a) 108

b) 48

c) 75

d) 8

View Answer

Answer: b

Explanation: To find the number of odd factors, we can exclude any power of 2 and do the same. So, for 6500, we have (5 + 1)(3 + 1)(1 + 1) = 6 * 4 * 2 = 48 odd positive factors.

1. For a gaming competition, 8 girls are planning on splitting up into 3 (non-empty) groups. How many ways can they split up into these groups?

a) 465

b) 1056

c) 966

d) 3215

View Answer

Answer: c

Explanation: Using the inclusion-exclusion principle, the total number of ways of splitting the girls into 3 groups is 38 + 3.(28) + 3.(18). However, since the three groups are identical we need to divide by 3!. Hence, the answer is 966.

2. In a picnic with 20 persons where 6 chocolates will be given to the top 8 children(the chocolates are distinct: first, second). How many ways can this be done?

a) 18C6

b) 20P6

c) 25C4 * 6!

d) 19P5

View Answer

Answer: b

Explanation: This is a permutation problem since the chocolates are distinct. The answer is P(20, 6) -> the number of ways to arrange 20 things taken 6 at a time -> which is 20!(20−6)! = 20*19*18*17*16*15.

3. How many ways can one choose 20 cookies from 45 different types (assuming there are at least 20 of each type)?

a) 64C21 * 15

b) 64C20

c) 44C20 * 2!

d) 65C22

View Answer

Answer: b

Explanation: Imagine the 20 cookies one is choosing are indistinguishable dots. The 45 different types of cookies are like 45 distinguishable boxes and so the answer is C(45 + 20-1, 20) = 64C20.

4. Assume that it is an afternoon. What is the time on the 24 hour clock after 146 hours?

a) 12:10 pm

b) 8:30 am

c) 3 am

d) 2 pm

View Answer

Answer: d

Explanation: Divide 146 with 24. The remainder is the time on the 24 hour clock. So, 146 = 6*24 + 2 and the result is 2pm.

5. There are 28 identical oranges that are to be distributed among 8 distinct girls. How many ways are there to distribute the oranges?

a) 22P7

b) 34C6

c) 35C7

d) 28C8

View Answer

Answer: c

Explanation: By the definition of star and bar problem, there are n+r-1Cr-1 possible distributions of n identical objects among r distinct bins. Now, there are n = 28 identical objects and r = 8 distinct bins. Using the formula above, there are 35C7 ways to distribute the oranges.

6. There are 5 distinct fruits. How many ways can they be planted into identical fruit plants?

a) 87

b) 52

c) 76

d) 128

View Answer

Answer: b

Explanation: These fruits can be placed into 1, 2, 3, 4 or 5 fruit plants. The number of distributions of fruits into fruit plants will thus be the sum of Stirling numbers of the second kind: S(5,1) + S(5,2) + S(5,3) + S(5,4) + S(5,5) = 1 + 15 + 25 + 10 + 1 = 52.

7. A woman has 14 identical pens to distribute among a group of 10 distinct students. How many ways are there to distribute the 14 pens such that each student gets at least one pencil?

a) 15C10

b) 10C5 * 11

c) 15C8 * 4!

d) 13C9

View Answer

Answer: d

Explanation: For this type of problem, n>=r must be true and so according to stars and bars model, the number of possible arrangements of stars and bars is n-1Cr-1 or equivalently, there are n-1Cr-1 distributions of n identical objects into r distinct non-empty bins. In this example, there are n = 14 identical objects to be distributed among r=10 distinct bins. Using the above formula, the number of possible distributions is 13C9.

8. Suppose that M is the product of k distinct primes. Find the number of ways to write N as the product of positive integers(>1), where the order of terms does not matter.

a) MCN-k

b) NCM

c) N * Bk

d) Bk

View Answer

Answer: d

Explanation: To solve the problem first find the prime factorization of each term of the product, and place the factors of each term into a box. Then, since N is the product of distinct prime factors, each prime factor appears in a unique box. Since the product of all of these terms is N, each prime factor must be in a box. Conversely, for any arrangement of these n distinct primes into r identical boxes, multiply the primes in a box to create a term and the product of these terms results in N. This establishes the bijection and the number of ways is Bk which is Bell number.

9. How many ways are there to place 7 differently colored toys into 5 identical urns if the urns can be empty? Note that all balls have to be used.

a) 320

b) 438

c) 1287

d) 855

View Answer

Answer: d

Explanation: The problem can be described as distinct objects into any number of identical bins and this number can be found with $B7 = \sum S(7,k)$, where S(7,k) is the number of distributions of 5 distinct objects into k identical non-empty bins, so that S(7,1) = 1, S(7,2) = 63, S(7,3) = 301, S(7,4) = 350 and S(7,5) = 140. These values can be found using the recurrence relation identity for Stirling numbers of the second kind. Thus, B7 = 1 + 63 + 301 + 350 + 140 = 855.

10. Suppose, there are 7 of your friends who want to eat pizza (8 distinct people in total). You order a 16-cut pizza (16 identical slices). How many distributions of pizza slices are there if each person gets at least one slice of pizza?

a) 346

b) 6435

c) 3214

d) 765

View Answer

Answer: b

Explanation: This problem can be viewed as identical objects distributed into distinct non-empty bins. Using the formula for these kind of distributions n-1Cr-1 = 15C7 = 6435. Thus, there are distributions of the pizza slices.

1. The linear system Cx = d is known as _____ if d! = 0.

a) homogeneous

b) heterogeneous

c) nonhomogeneous

d) augmented system

View Answer

Answer: c

Explanation: A linear system Cx = d is known as a homogeneous system if d! = 0. The homogeneous linear system Ax = 0 is called its corresponding homogeneous linear system.

2. Every linear equation determines a _____ in n-dimensional space for n variables.

a) shipshape

b) hyperplane

c) cone

d) pyramid

View Answer

Answer: b

Explanation: In an m-dimensional space, every linear equation produces a hyperplane for n variables. The solution set is the intersection of these hyperplanes and is planar which may have any dimension smaller than m.

3. Determine all possibilities for the number of solutions of the system of 7 equations in 5 unknowns and it has x1 = 0, x2 = −6, and x3 = 4 as a solution.

a) unique or infinitely many

b) unique

c) finitely many

d) zero

View Answer

Answer: a

Explanation: Let i be the number of equations and j be the number of unknowns in the given system. Since i> j, the system has at least one solution x1 = 0, x2 = −6, and x3 = 4 and so it is consistent. Thus, it results in either a unique solution or infinitely many solutions.

4. Determine all possibilities for the solution set of the homogeneous system that has y1 = 6, y2 = −4, y3 = 0 as a solution.

a) zero

b) infinitely many

c) finitely many

d) only one

View Answer

Answer: b

Explanation: Since m<n, the system is either inconsistent or has infinitely many solutions. Since y1 = 6, y2 = −4, y3 = 0 is a solution of the system, the system is not inconsistent. Thus the only possibility is infinitely many solutions.

5. Determine all possibilities for the solution set of the homogeneous system of 5 equations in 3 unknowns and the rank of the system is 3.

a) more than two

b) only one

c) zero

d) infinite

View Answer

Answer: c

Explanation: Since the rank of this homogeneous system(which is always consistent) and the number of unknowns are equal, the only possible solution is zero and it is a unique solution.

6. Determine all possibilities for the solution set of a homogeneous system that has y1 = 5, y2 = −3, y3 = 2 as a solution.

a) one

b) finitely many

c) infinitely many

d) either one or infinitely many

View Answer

Answer: c

Explanation: The possibilities for the solution set for any homogeneous system is either a unique solution or infinitely many solutions. Since the homogeneous system has the zero solution and y1 = 5, y2 = −3, y3 = 2 is another solution, it has at least two distinct solution. Thus the only possibility is infinitely many solutions.

7. Determine all possibilities for the solution set of the system of 2 equations in 3 unknowns that has x1 = 4, x2 = −7, x3 = 0 as a solution.

a) one or finitely many

b) infinite

c) finite

d) zero

View Answer

Answer: b

Explanation: Since m1 = 4, x2 = −7, x3 = 0 is a solution of the system, the system is not inconsistent. Thus the only possibility is infinitely many solutions.

8. Determine all possibilities for the solution set of a homogeneous system of 4 equations in 4 unknowns.

a) only one

b) finitely many or zero

c) zero

d) one or infinitely many

View Answer

Answer: b

Explanation: Here the number of equations and the number of unknowns are equal and the system is homogeneous, so it may have the zero solution or infinitely many solutions.

9. Determine all possibilities for the solution set of a homogeneous system of 6 equations in 5 unknowns.

a) only one

b) zero

c) one or infinitely many

d) finitely many

View Answer

Answer: c

Explanation: Since the system is homogeneous and there are more equations than the number of unknowns, so the possibilities are either a unique solution or infinitely many solutions. However, if the rank r of the system is 5, then it can be a unique solution as well as if r<5, then there are infinitely many solutions.

10. Determine all possibilities for the solution set of a homogeneous system of 5 equations in 4 unknowns and the rank of the system is 3.

a) finite

b) zero or finitely many

c) only one

d) infinite

View Answer

Answer: d

Explanation: A homogeneous system is consistent. The rank is r = 3 and the number of variables is n = 4. Hence there is n – r = 1 free variable. Thus there are infinitely many solutions.

1. Determine the number of derangements of (2, 4, 6, 1, 3, 5) that end with integer 2, 4 and 6 in some order?

a) 128

b) 29

c) 54

d) 36

View Answer

Answer: d

Explanation: The place of 2, 4, 6 is specified i.e. each of them will get their place out of the last 3 places only. So 1, 3, 5 will automatically get one of the places in the first 3 places. This must ensure that 2, 4 and 6 occupies one of the last 3 places each and 1, 3 and 5 one of 1st 3 places each. Hence, 1, 3 and 5 can be arranged in 3! ways and 2, 4 and 6 also in 3! Ways. So, no of such derangements = 3! * 3! = 6 * 6 = 36.

2. A nursery teacher has 5 pencil boxes to give out to her five students. Determine the probability that at least one student gets their name tag?

a) 1930

b) 2647

c) 123537

d) 1279

View Answer

Answer: a

Explanation: There are 5!= 120 ways to give out the pencil boxes. By using complementary probability, the number of ways where nobody gets their pencil boxes is

5!(10!–11!+…–15!)

= 44. Hence, the required probability is 120–44120=1930.

3. Farhan has received 9 gifts from 9 different people. In how many ways can Farhan receives the gifts such that no one gives him real gifts?

a) 133496

b) 326654

c) 218744

d) 745331

View Answer

Answer: a

Explanation: By the derangements formula, the number of possible derangements should be 9!(10!–11!+…–19!) = 133496. Hence, there are a total of ways to give the gifts to him such that no one distributes the real gifts.

4. There are 7 groups in a picnic who has brought their own lunch box, and then the 7 lunch box are exchanged within those groups. Determine the number of ways that they can exchange the lunch box such that none of them can get their own.

a) 655

b) 328

c) 1854

d) 3765

View Answer

Answer: c

Explanation: This can be solved by the derangement formula:

$!n = n!(1 – 11!+12!–13!+…+(−1)n1n!) \Rightarrow 7! = 1854.$

5. Computational complexity of derangements is of _____

a) NP-complete

b) NP-hard

c) NP

d) P

View Answer

Answer: a

Explanation: Computational complexity of derangements is NP-complete in order to determine whether a given permutation group consists of any derangements or not.

6. There are 5 different-colored boxes in a room each with a distinct cover. Find out the number of ways so that these covers can be put on the boxes such that none of the boxes can have right covers on it? (Assume that all the covers must be on the boxes).

a) 208

b) 137

c) 239

d) 24

View Answer

Answer: d

Explanation: Let the box covers be A, B, C, D and E. The possible ways for the covers to not be in the exact order of A, B, C, D, E are: 4! = 24 ways. (Since correct order i.e., A, B, C, D and E must be eliminated from such arrangements).

7. A postman can put 12 letters into their respective envelopes such that exactly 5 will go into the right envelope. Find the number of ways of doing this work.

a) 2984300

b) 1610496

c) 5322167

d) 3768650

View Answer

Answer: b

Explanation: The number of ways in which the 5 correct envelopes can be selected = 12C5 = 864

Derangement of the remaining 7 envelopes & letters = 1864 (derangement value for 7 is 1864)

Total No of ways of arrangement = 1864 * 864 = 1610496.

8. Determine the number of ways In a single competition a singing couple from 5 boys and 5 girls can be formed so that no girl can sing a song with their respective boy?

a) 123

b) 44

c) 320

d) 21

View Answer

Answer: b

Explanation: This is a case of derangement of 5 boys and 5 girls. The required number of ways can be described as D = 5! (1 – 11!+12!–13!+14!–15!)=120(1130) = 44 ways.

9. What is the sum of all 6 digit numbers which can be formed using the digits 2, 3, 5, 6 and 9 exactly once?

a) 986546600

b) 25611866

c) 433338798

d) 319999680

View Answer

Answer: d

Explanation: Note that sum of all possible numbers = (n-1)!(sum of the digits involved)(1111…n times), where n is the number of digits. Here n = 6, we have (6-1)!(2+3+5+6+9)(111111) = 5!*(24)*(111111) = 319999680.

10. Determine the average of all four digit numbers that can be made using all the digits 2, 3, 5, 7 and 11 exactly once?

a) 3993

b) 1555

c) 5486

d) 1347

View Answer

Answer: b

Explanation: First we need to find the sum of all possible numbers and then divide it by the total such numbers possible to gain an average of all the numbers. So, we have (n-1)!(sum of digits)(1111…n times)/n!. Here n = 4. Therefore, (5-1)! (2+3+5+7+11)(1111)/5! = 1555.

1. In a blindfolded game, a boy can hit the target 8 times out of 12. If he fired 8 shots, find out the probability of more than 4 hits?

a) 2.530

b) 0.1369

c) 0.5938

d) 3.998

View Answer

Answer: c

Explanation: Here, n = 8, p = 0.6, q = 0.4. Suppose X = number of hits x0 = 0 number of hits, x1 = 1 hit, x2 = 2 hits, and so on.

So, (X) = P(x5) + P(x6) + P(x7) + P(x8) = 8C5(0.6)5(0.4)3 + 8C5(0.6)6(0.4)2 + 8C7(0.6)7(0.4)1 + 8C8(0.6)8(0.4)0 = 0.5938.

2. A fair coin is tossed 15 times. Determine the probability in which no heads turned up.

a) 2.549 * 10-3

b) 0.976

c) 3.051 * 10-5

d) 5.471

View Answer

Answer: c

Explanation: According to the null hypothesis it is a fair coin and so in that case the probability of flipping at least 59% tails is = 15C0(0.5)15 = 3.051 * 10-5.

3. When a programmer compiles her code there is a 95% chance of finding a bug every time. It takes three hours to rewrite her code when she finds out a bug. Determine the probability such that she will finish her coding by the end of her workday. (Assume, a workday is 7 hours)

a) 0.065

b) 0.344

c) 0.2

d) 3.13

View Answer

Answer: c

Explanation: A success is a bug-free compilation, and a failure is the finding out of a bug. The programmer has 0, 1, 2, or 3 failures and so her probability of finishing the program is : Pr(X=0) + Pr(X=1) + Pr(X=2) + Pr(X=3) = (0.95)0(0.05) + (0.95)0(0.05) + (0.95)0(0.05) + (0.95)0(0.05) = 0.2.

4. Determine the probability when a die is thrown 2 times such that there are no fours and no fives occur?

a) 49

b) 5689

c) 1346

d) 397

View Answer

Answer: a

Explanation: In this experiment, throwing a die anything other than a 4 is a success and rolling a 4 is failure. Since there are two trials, the required probability is

b(2; 2, 56) = 2C2 * (46)2 * (26)0 = 49.

5. In earlier days, there was a chance to make a telephone call would be of 0.6. Determine the probability when it could make 11 successes in 20 attempts of phone call.

a) 0.2783

b) 0.2013

c) 0.1597

d) 3.8561

View Answer

Answer: c

Explanation: Probability of success p=0.6 and q=0.4. X=success in making a telephone call. Hence, the probability of 11 successes in 20 attempts = P(X=11) = 20C11(0.6)11(0.4)20 – 11 = 0.1597.

6. By the expression (x3+1x)5, evaluate the middle term in the expression.

a) 10*(x5)

b) 15∗(x4)

c) 10*(x3)

d) 6*(x3)

View Answer

Answer: c

Explanation: By using Binomial theorem,the expression (x3+1x)5 can be expanded as
(x3+1x)5=5C0(x3)5+5C1(x3)4(1x)1+5C2(x3)3(1x)2

+5C3(x3)2(1x)3+5C4(x3)1(1x)4 = (x3)5+5.(x3)+10.(x3)+10.(13x)+5(13x3). Hence, the middle term is 10*(x3).

7. Evaluate the expression (y+1)4 – (y-1)4.

a) 3y2 + 2y5

b) 7(y4 + y2 + y)

c) 8(y3 + y1)

d) y + y2 + y3

View Answer

Answer: c

Explanation: By using Binomial theorem,the expression (y+1)4 – (y-1)4 can be expanded as = (y+1)4 = 4C0y4 + 4C1y3 + 4C2y2 + 4C3y1 + 4C4y0 and (y-1)4 = 4C0y4 – 4C1y3 + 4C2y2 – 4C3y1 + 4C4y0. Now, (y+1)4 – (y-1)4 = (4C0y4 + 4C1y3 + 4C2y2 + 4C3y1 + 4C4y0) – (4C0y4 – 4C1y3 + 4C2y2 – 4C3y1 + 4C4y0) = 2(4C1y3 + 4C3y1) = 8(y3 + y1).

8. Find the coefficient of x7 in (x+4)9.

a) 523001

b) 428700

c) 327640

d) 129024

View Answer

Answer: d

Explanation: It is known that (r+1)th term, in the binomial expansion of (a+b)n is given by, Tr+1 = nCran-rbr. Assuming that x7 occurs in the (r+1)th term of the expansion (x+4)9, we obtain Tr+1 = 129024x4.

9. Determine the 7th term in the expansion of (x-2y)12.

a) 6128y7

b) 59136y6

c) 52632x6

d) 39861y5

View Answer

Answer: b

Explanation: By assuming that x7 occurs in the (r+1)th term of the expansion (x-2y)12, we obtain Tr+1 = nCran-rbr = 12C6 x6 (2y)6 = 59136y6.

10. What is the middle term in the expansion of (x/2 + 6y)8?

a) 45360x4

b) 34210x3

c) 1207x4

d) 3250x5

View Answer

Answer: a

Explanation: We know that in the expansion of (x+y)n, if n is even then the middle term is (n/2 + 1)th term. Hence, the middle term in the expansion of (x/2 + 6y)8 is (8/2+1)th = 5th term.

Now, assuming that x5 occurs in the (r+1)th term of the expansion (x/2+6y)8, we obtain Tr+1 =nCrxn-ryr = 8C4(x/2)4(6y)4 = 45360x4.

1. Calculate the value of 8C5.

a) 79

b) 43

c) 120

d) 56

View Answer

Answer: d

Explanation: We can use the formula nCk = n!k!(n−k)! to calculate the value of 8C5 = 8!5!(8−5)! = 56.

2. In how many ways can you select 9 cupcakes from a box containing 17 cupcakes?

a) 42769

b) 45398

c) 24310

d) 36214

View Answer

Answer: c

Explanation: The number of ways to choose 9 cupcakes out of a set of 17 is 17C9 = 17!9!(17−9)! = 24,310.

3. How many 4-digit numbers can be formed by using 2, 4, 6, 8, 10, 12 without repetition of digits?

a) 15

b) 42

c) 70

d) 127

View Answer

Answer: a

Explanation: Here making a 4-digit number is equivalent to filling 4 places with 6 numbers. So, the number of ways of filling all the four places is 6C4 = 15. Hence, the total possible 4-digit numbers from the above 6 numbers are 15.

4. What is the coefficient of x9 in the expansion of (x+5)14?

a) 5! * 14C6

b) 14C5

c) 54 * 14C5

d) 34 * 11C5

View Answer

Answer: c

Explanation: the binomial theorem is (x+y)a = Σ aCi xa-i yi. In order to get the coefficient of x9, we need to have a-i=9. Since a=14, i=5. Thus, the answer is aC5 * y4 = 54 * 14C5.

5. Determine the independent term of x7 in the expansion of (3x2 + 4)12.

a) 220 * 46

b) 230

c) 548* 3!

d) 220 * 36 * 46

View Answer

Answer: d

Explanation: By using Binomial theorem = n∑k=0 (nk) xkyn-k = n0x0yn + n1x1yn-1 + n2x2yn-2 + … + nnxny0, where (nk) = n!k!(n−k)!. Now, Tr+1 = nCran-rbr, T9+1 = 12C6a12-6b6 = 220 * (3x2)6 * (4)6 = 220 * 36 * 46. Hence the coefficient is 220 * 36 * 46.

6. In a game, a fair coin is tossed 6 times. Each time the coin comes up tails, A will pay Rs. 15 but if each time heads come up, A will pay nothing. Determine the probability that A will win Rs. 45 by playing the game?

a) 516

b) 431

c) 37

d) 1265

View Answer

Answer: a

Explanation: By using the binomial distribution, to calculate how likely to win Rs. 45 (or equivalently, the likelihood the coin comes up tails 3 times). The possible outcomes of this game are to win Rs. 45. Therefore, the required probability is 6C326=516.

7. Find the coefficient of x8 in the expansion of (x+2)11.

a) 640

b) 326

c) 1320

d) 456

View Answer

Answer: c

Explanation: The coefficient of the 8th term is 11C8 = 165. Hence, the 8th term of the expansion is 165 * 23 * x8 = 1320x8, where the coefficient is 1320.

8. Determine the coefficient of the x5y7 term in the polynomial expansion of (m+n)12.

a) 792

b) 439

c) 382

d) 630

View Answer

Answer: a

Explanation: Note that, the “x” in the binomial has to be chosen 5 times out of 12. Thus, the coefficient of the term x5y7 must be equal to the number of combinations of 5 objects out of 12: 12C5 = 792.

9. The last digit of the number ((51−−√ + 1)51 – 51−−√ – 1)51 is _____

a) 32

b) 8

c) 51

d) 1

View Answer

Answer: b

Explanation: Consider the binomial expansion of (m+1)71 and (m-1)71 which gives these two

expressions below respectively: 1) m51 + 51C1m50 + 51C2m49 + 51C3m48 + … + 51C50m1 + 51C51m0

2) m51 – 51C1m50 + 51C2m49 – 51C3m48 + … + 51C50m1 – 51C51m0 .

By taking the difference we have, 2(51C1m50 + 51C3m48 – 51C5m46 + … + 51C50m2 – 51C51m0).

In this case, m = 51−−√ and 2(51C1m50 + 51C3m48 – 51C5m46 + … + 51C50m2 – 51C51m0).

Consider, module 10 on the powers(for any natural number n): (51)n ≡ (51 mod 10n) ≡ 1 gives 2(51C1 + 51C3 + 51C5 + … + 51C50 + 51C51). Now, by adding the odd terms of the 51st row of the Pascal Triangle 2.(12 * 251) = 251 = 2(51 mod 4) = 23 = 8.

10. The independent term of x is 80000 in the expansion of (3x+b/x)6, where b is a positive constant. What the value of b?

a) 3.97

b) 6.87

c) 8.3

d) 5.2

View Answer

Answer: d

Explanation: By using the Binomial Theorem, the terms are of the form 6Cn * (4x)6-n * (b/x)n.

For the term to be independent of x, we need x6-n(1/x)n = x0 ⇒ x6-n(x-1)n = x0 ⇒ x6-nx-n = x0 ⇒ 6 – n = n ⇒ 2n = 6 and n = 3. Thus, we have a constant term of 6C3 * 33 * b3 = 8000

20 * 27 * b3 = 80000

540 * b3 = 80000

b3 = 148.14 ⇒ b= 5.2.

1. Consider the recurrence relation a1=4, an=5n+an-1. The value of a64 is _____

a) 10399

b) 23760

c) 75100

d) 53700

View Answer

Answer: a

Explanation: an=5n+an-1

= 5n + 5(n-1) + … + an-2

= 5n + 5(n-1) + 5(n − 2) +…+ a1

= 5n + 5(n-1) + 5(n − 2) +…+ 4 [since, a1=4]

= 5n + 5(n-1) + 5(n − 2) +…+ 5.1 – 1

= 5(n + (n − 1)+…+2 + 1) – 1

= 5 * n(n+1)/ 2 – 1

an = 5 * n(n+1)/ 2 – 1

Now, n=64 so the answer is a64 = 10399.

2. Determine the solution of the recurrence relation Fn=20Fn-1 − 25Fn-2 where F0=4 and F1=14.

a) an = 14*5n-1

b) an = 7/2*2n−1/2*6n

c) an = 7/2*2n−3/4*6n+1

d) an = 3*2n−1/2*3n

View Answer

Answer: b

Explanation: The characteristic equation of the recurrence relation is → x2−20x+36=0

So, (x-2)(x-18)=0. Hence, there are two real roots x1=2 and x2=18. Therefore the solution to the recurrence relation will have the form: an=a2n+b18n. To find a and b, set n=0 and n=1 to get a system of two equations with two unknowns: 4=a20+b180=a+b and 3=a21+b61=2a+6b. Solving this system gives b=-1/2 and a=7/2. So the solution to the recurrence relation is,

an = 7/2*2n−1/2*6n.

3. What is the recurrence relation for 1, 7, 31, 127, 499?

a) bn+1=5bn-1+3

b) bn=4bn+7!

c) bn=4bn-1+3

d) bn=bn-1+1

View Answer

Answer: c

Explanation: Look at the differences between terms: 1, 7, 31, 124,…. and these are growing by a factor of 4. So, 1·4=4, 7·4=28, 31·4=124, and so on. Note that we always end up with 3 less than the next term. So, bn=4bn-1+3 is the recurrence relation and the initial condition is b0=1.

4. If Sn=4Sn-1+12n, where S0=6 and S1=7, find the solution for the recurrence relation.

a) an=7(2n)−29/6n6n

b) an=6(6n)+6/7n6n

c) an=6(3n+1)−5n

d) an=nn−2/6n6n

View Answer

Answer: b

Explanation: The characteristic equation of the recurrence relation is → x2−4x-12=0

So, (x-6)(x+2)=0. Only the characteristic root is 6. Therefore the solution to the recurrence relation will have the form: an=a.6n+b.n.6n. To find a and b, set n=0 and n=1 to get a system of two equations with two unknowns: 6=a60+b.0.60=a and 7=a61+b.1.61=2a+6b. Solving this system gives a=6 and b=6/7. So the solution to the recurrence relation is, an=6(6n) −6/7n6n.

5. Find the value of a4 for the recurrence relation an=2an-1+3, with a0=6.

a) 320

b) 221

c) 141

d) 65

View Answer

Answer: c

Explanation: When n=1, a1=2a0+3, Now a2=2a1+3. By substitution, we get a2=2(2a0+3)+3.

Regrouping the terms, we get a4=141, where a0=6.

6. The solution to the recurrence relation an=an-1+2n, with initial term a0=2 are _____

a) 4n+7

b) 2(1+n)

c) 3n2

d) 5*(n+1)/2

View Answer

Answer: b

Explanation: When n=1, a1=a0+2. By substitution we get, a2=a1+2 ⇒ a2=(a0+2)+2 and so on. So the solution to the recurrence relation, subject to the initial condition should be an=2+2n=2(1+n).

7. Determine the solution for the recurrence relation bn=8bn-1−12bn-2 with b0=3 and b1=4.

a) 7/2*2n−1/2*6n

b) 2/3*7n-5*4n

c) 4!*6n

d) 2/8n

View Answer

Answer: a

Explanation: Rewrite the recurrence relation bn-8bn-1+12bn-2=0. Now from the characteristic equation: x2−8x+12=0 we have x: (x−2)(x−6)=0, so x=2 and x=6 are the characteristic roots. Therefore the solution to the recurrence relation will have the form: bn=b2n+c6n. To find b and c, set n=0 and n=1 to get a system of two equations with two unknowns: 3=b20+c60=b+c, and 4=b21+c61=2b+6c. Solving this system gives c=-1/2 and b=7/2. So the solution to the recurrence relation is, bn=7/2*2n−1/2*6n.

8. What is the solution to the recurrence relation an=5an-1+6an-2?

a) 2n2

b) 6n

c) (3/2)n

d) n!*3

View Answer

Answer: b

Explanation: Check for the left side of the equation with all the options into the recurrence relation. Then, we get that 6n is the required solution to the recurrence relation an=5an-1 + 6an-2.

9. Determine the value of a2 for the recurrence relation an = 17an-1 + 30n with a0=3.

a) 4387

b) 5484

c) 238

d) 1437

View Answer

Answer: d

Explanation: When n=1, a1=17a0+30, Now a2=17a1+30*2. By substitution, we get a2=17(17a0+30)+60. Then regrouping the terms, we get a2=1437, where a0=3.

10. Determine the solution for the recurrence relation an = 6an-1−8an-2 provided initial conditions a0=3 and a1=5.

a) an = 4 * 2n – 3n

b) an = 3 * 7n – 5*3n

c) an = 5 * 7n

d) an = 3! * 5n

View Answer

Answer: b

Explanation: The characteristic polynomial is x2−6x+8. By solving the characteristic equation, x2−6x+8=0 we get x=2 and x=4, these are the characteristic roots. Therefore we know that the solution to the recurrence relation has the form an=a*2n+b*4n, for some constants a and b. Now, by using the initial conditions a0 and a1 we have: a=7/2 and b=-1/2. Therefore the solution to the recurrence relation is: an = 4 * 2n – 1*3n = 7/2 * 2n – 1/2*3n.

Discreate probability